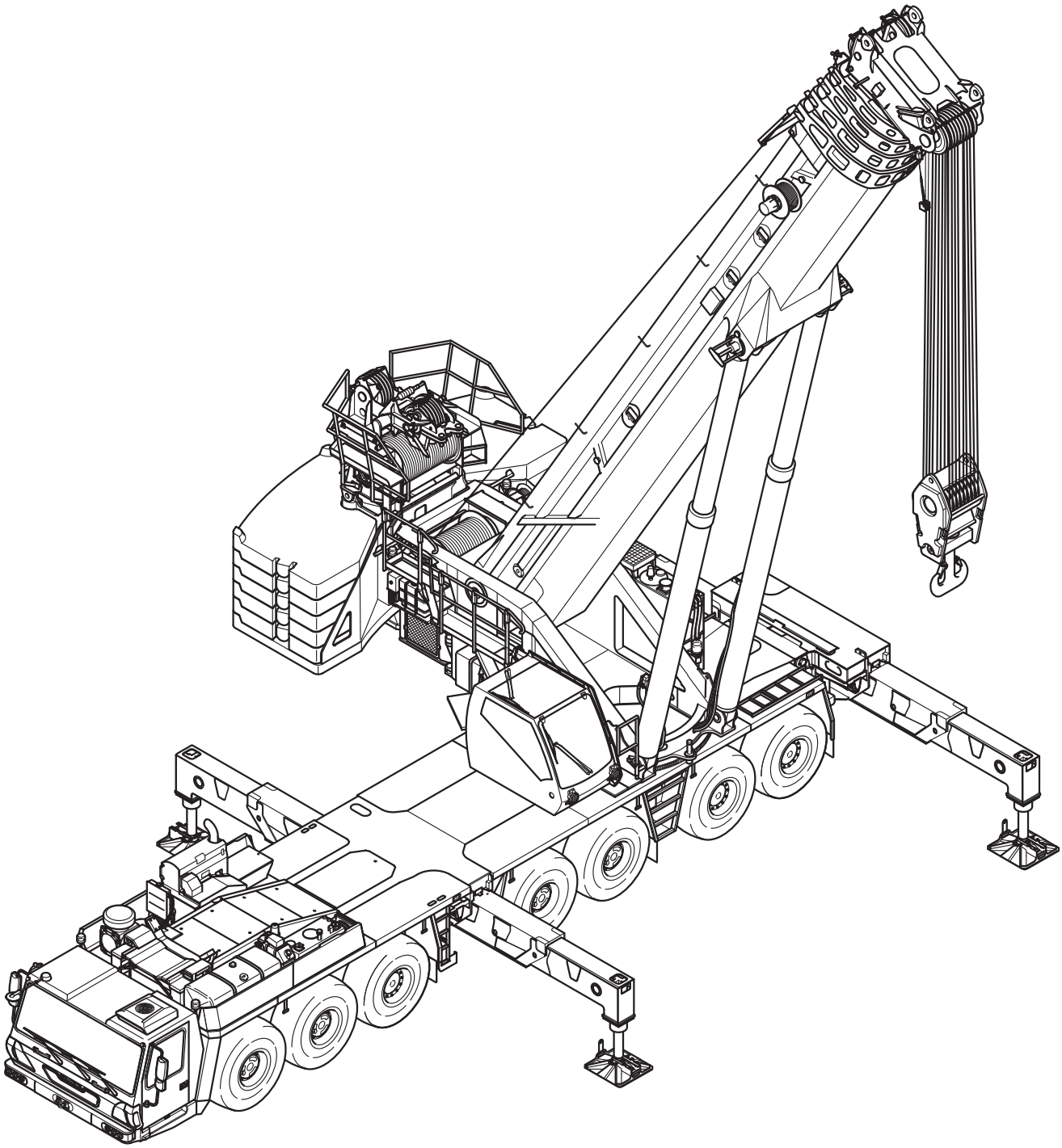
GROVE GMK7450

Operating Manual
Part 1 – Driving Operation



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Important note

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This operating manual is divided into two parts:

Part 1 – Driving Operation

Part 2 – Crane Operation

Content overview of Part 1:

Chapter 9 to Chapter 15 are in Part 2 – Crane Operation.

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1 Overview

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1 Overview

1.1 Accidents

In the event of an accident, contact the relevant branch office of **Manitowoc Crane Care** in the country in which you are working and specify your crane type and serial number.

Adhere to the requirements regarding the obligation to report accidents prevalent in the country in which you are working and inform the supervisory authorities responsible for that particular type of accident (e.g. material damage, injuries to persons).

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1.2 Branch offices

1.2.1 Manitowoc Crane Care

If you need help or support with the operation on your truck crane, you can contact our branches at the following addresses **Manitowoc Crane Care**:

http://www.manitowoccranes.com

You can also scan the following QR code.

1.2.2 Dealer list

Visit the following address for a global list of dealers:

http://www.manitowoccranes.com

You can also scan the following QR code.

1.3 Warranty specifications

Please see the separately enclosed warranty certificate for information.

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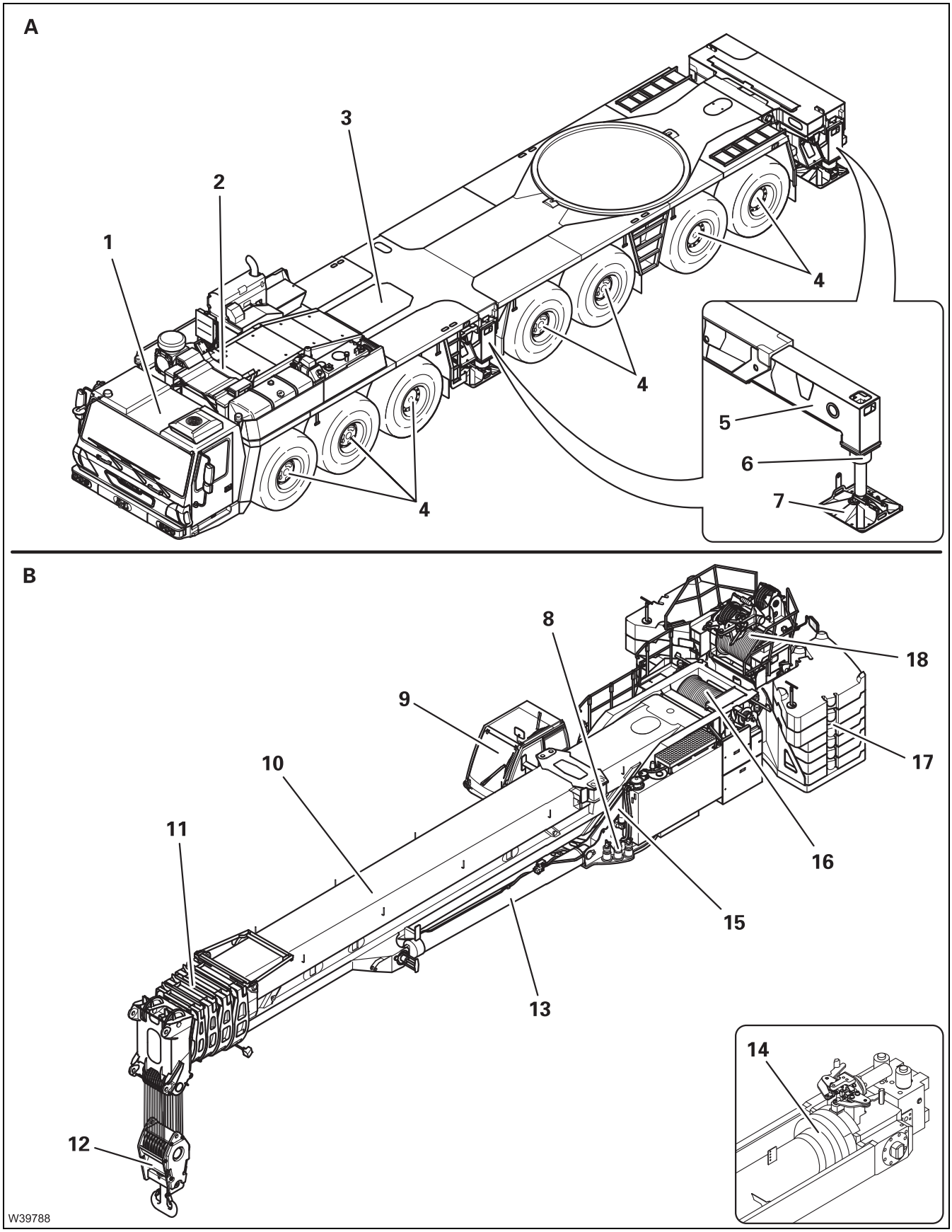
1.4 Terms used



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(A) – Carrier

1 Driver's cab
2 Boom rests
3 Counterweight platform
4 Axle lines
5 Outrigger beams
6 Outrigger cylinders
7 Outrigger pads

(B) – Superstructure

8 Slewing gear
9 Crane cab
10 Main boom with telescoping mechanism
11 Telescopic sections
12 Hook block
13 Derricking cylinder, derricking gear
14 Telescoping cylinder
15 Turntable
16 Main hoist
17 Counterweight
18 Auxiliary hoist[1)]

[1)] Additional equipment

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1.5 Technical data

GROVE truck crane GMK7450

Permissible temperature range:	-25 °C to +40 °C (-13 °F to +104 °F)

Crane designation:	Truck crane as per DIN 15 001, Part 1
Crane application:	Service crane as per DIN 15 001, Part 2
Crane classification:	Hoist class H1 to DIN 15 018, Part 1 Crane class A1 to ISO 4301, Part 2

The crane is designed to crane class A1 (as defined in ISO standard 4301 - 2). This relates to the engineering design (specification of quality) and is not a guarantee in the sense of §443 BGB (German Federal Law).

1.5.1 Maximum lifting capacity (DIN/ISO/EN)

Max. load bearing capacity:	360 t (788,000 lbs)[1)]
Max. load moment	
– In working position 0° to the rear:	1,368 tm (114 t x 12 m)
– Within the 360° slewing range:	1,298 tm (114 t x 11 m)

[1)]In the case of special equipment 450 t (990,000 lbs)

1.5.2 Maximum lifting capacity (ANSI B 30.5)

Max. load bearing capacity:	360 t (788,000 lbs)[1)]
Max. load moment	
– In working position 0° to the rear:	1,440 tm (120 t x 12 m)
– Within the 360° slewing range:	1,364 tm (124 t x 11 m)

[1)]In the case of special equipment 450 t (990,000 lbs)

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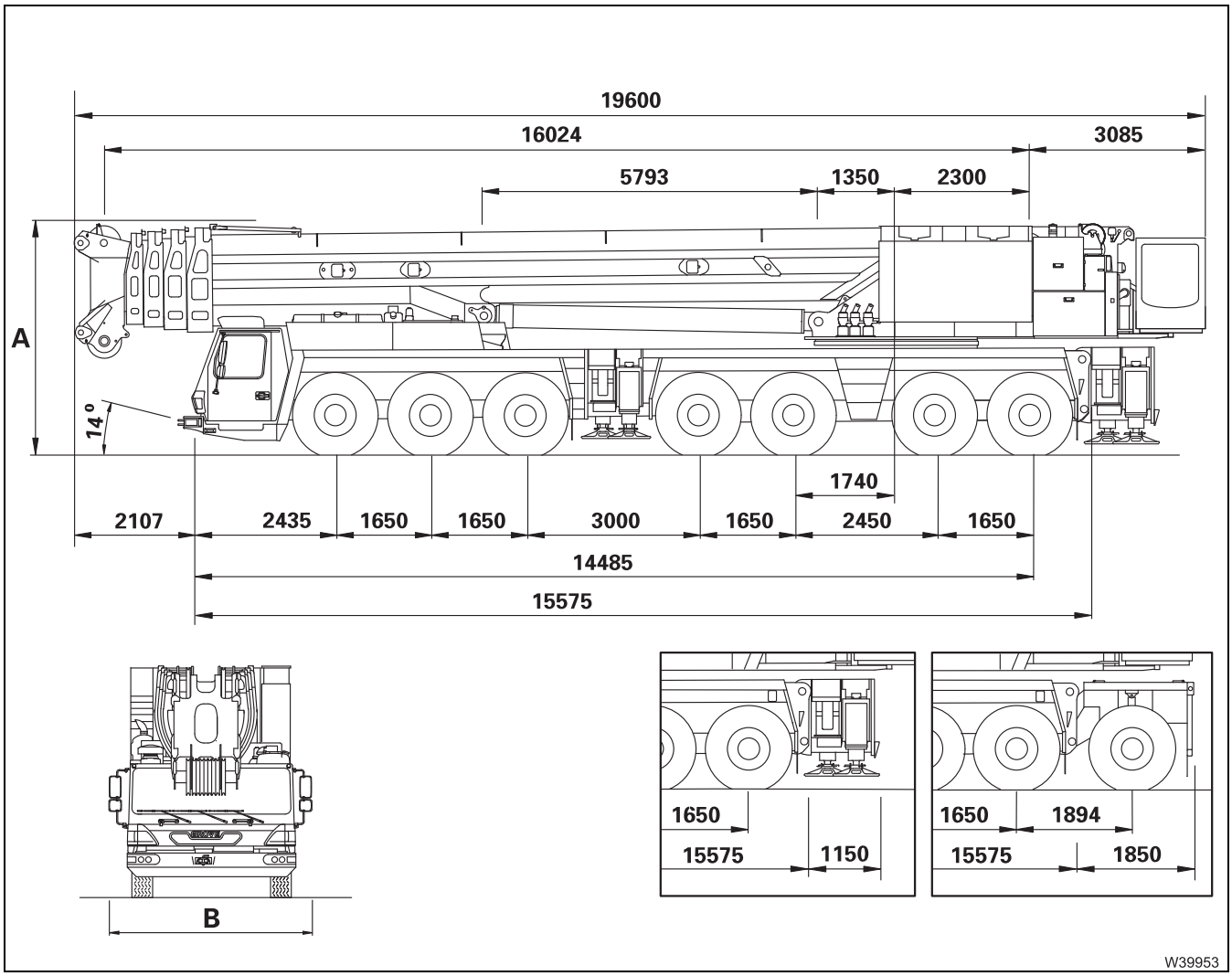
1.5.3 Dimensions and weights of the truck crane, axle loads

All dimensions in the illustration are in mm.



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Dimensions

All measurements were taken with the equipment in a state suitable for on-road driving (➠ *Driving modes*, p. 6 - 1) with the guard rails for rigging work pushed in and the hoist mirror folded in (➠ p. 12 - 25).

Dimensions of the parts that have to be transported on separate vehicles when driving on the road; ➠ *Dimensions and weights of removable parts*, p. 1 - 10.

Length without auxiliary hoist:		19.60 m (64 ft)
A	Height:	At on-road level:
	– 385/95 R25	3.95 m (12.9 ft)
	– 445/95 R25	4.00 m (13.1 ft)
	– 525/80 R25	4.00 m (13.1 ft)
	Max. level change	-130/+170 mm (-5.1/+6.7 in)
B	Width:	
	– 385/95 R25	3.00 m (9.8 ft)
	– 445/95 R25	3.00 m (9.8 ft)
	– 525/80 R25	3.11 m (10.2 ft)

Angle of negotiable banks:	At on-road level (445/95 R25)
Front:	approx. 14°
Rear:	approx. 11°

Weight and axle loads

For equipment with the specified axle loads in on-road mode; ➠ *Driving modes*, p. 6 - 1.

Weight of the parts that have to be transported on separate vehicles when driving on the road; ➠ *Dimensions and weights of removable parts*, p. 1 - 10.

Total weight:	Depending on driving mode 84 t (185,100 lbs)
Axle loads:	Depending on driving mode 12 t (26,500 lbs)

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1.5.4 Dimensions and weights of removable parts

This section contains the dimensions and weights of the parts that can be removed for on-road driving; ➠ *Driving modes*, p. 6 - 1.

Spare wheel

Designation	Length x width x height in m (ft)	Weight in kg (lbs)	
		1)	2)
Spare wheel 385/95 R25	1.36 x 1.36 x 0.40 (4.46 x 4.46 x 1.31)	250 (551)	186 (410)
Spare wheel 445/95 R25	1.50 x 1.50 x 0.45 (4.92 x 4.92 x 1.47)	300 (661)	223 (491)
Spare wheel 525/80 R25	1.50 x 1.50 x 0.52 (4.92 x 4.92 x 1.70)	345 (760)	267 (588)

1) With steel rim

2) With aluminium rim

Outriggers

Designation	Length x width x height in m (ft)	Weight in kg (lbs)
Per outrigger pad	0.81 x 0.81 x 0.31 (2.66 x 2.66 x 1.10)	87 (192)
Front outrigger[1)], complete per packet	4.70 x 0.45 x 1.20 (15.42 x 1.48 x 3.94	1,860 (4,100)
Rear outrigger box, complete, with outrigger beams and outrigger cylinders (without outrigger pads)	1.30 x 3.00 x 1.60 (4.27 x 9.85 x 5.25)	6,730 (14,837)
Supports for packing, each	0.47 x 0.4 x 0.63 (1.52 x 1.31 x 2.10)	30 (66)
Deposit supports	1.15 x 0.46 x 0.16 (3.77 x 1.51 x 0.53	17 (37.5)

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Lighting carrier

Designation	Length x width x height in m (ft)	Weight in kg (lbs)
Lighting carrier complete with pins	2.10 x 3.00 x 0.90 (6.89 x 8.69 x 2.95)	105 (231)

Additional axle

Designation	Length x width x height in m (ft)	Weight in kg (lbs)
Additional axle (installable 8th axle, complete)	2.10 x 3.00 x 1.75 (6.89 x 8.69 x 5.74)	2,820 (6,216)
Deposit supports		

Derricking cylinder support

Designation	Length x width x height in m (ft)	Weight in kg (lbs)
Derricking cylinder support	2.70 x 0.25 x 0.40 (8.86 x 0.82 x 1.31)	135 (297)

Main boom

The dimensions and weights include the entire main boom with add-on parts (RCL length indicator drum, holders) and pulling devices.

Designation	Length x width x height in m (ft)	Weight in kg (lbs)
Complete main boom	17.00 x 2.85 x 2.00 (55.77 x 9.35 x 6.56)	33,100 (72,973)

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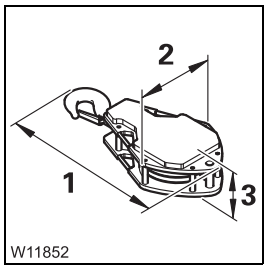
Hook blocks and hook tackle



Designation	(1) x (2) x (3) in m (ft)	Weight in kg (lbs)
Double hook, 13 rollers, load bearing capacity **320 t**	2.40 x 1.15 x 0.75 (7.87 x 3.77 x 2.46	4,000 (8,819)
Double hook, 11 rollers, load bearing capacity **320 t**	2.40 x 1.05 x 0.75 (7.87 x 3.44 x 2.46	3,500 (7,717)
Double hook, 9 rollers, load bearing capacity **250 t**	2.30 x 0.95 x 0.75 (7.55 x 3.12 x 2.46)	3,000 (6,614)
Double hook, 7 rollers, load bearing capacity **200 t**	2.00 x 0.85 x 0.75 (6.56 x 2.79 x 2.46)	2,400 (5,291)
Double hook, 5 rollers, load bearing capacity **160 t**	1.85 x 0.65 x 0.75 (6.07 x 2.13 x 2.46)	1,800 (3,968)
Double hook, 3 rollers, load bearing capacity **100 t**	1.75 x 0.40 x 0.75 (5.74 x 1.31 x 2.46)	1,300 (2,866
Single hooks, 3 rollers, load bearing capacity **100 t**	1.95 x 0.40 x 0.75 (6.40 x 1.31 x 2.46)	1,300 (2,866)
Single hook 1 roller, load bearing capacity **40 t**	1.50 x 0.25 x 0.75 (4.92 x 0.82 x 2.46)	850 (1,874)
Hook tackle, Lifting capacity of **16 t**	0.91 x 0.45 x 0.45 (3.00 x 1.48 x 1.48)	450 (992)

Lifting capacity of the hook blocks; ➠ *Lifting capacity table*.

Auxiliary hoist

Designation	Length x width x height (m) (ft)	Weight in kg [1] (lbs)
Auxiliary hoist including rope and connections	2.40 x 2.85 x 2.10 (7.90 x 9.35 x 6.90)	5,450 (12,020)

Heavy duty equipment

Designation	Length x width x height in m (ft)	Weight in kg (lbs)
Adapter for rope deflection, including securing pin	1.90 x 1.35 x 0.35 (6.23 x 4.43 x 1.15)	365 (805)

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Counterweight parts

Designation	Length x width x height in m (ft)	Weight in kg[1)] (lbs)
20 t base plate including hoist unit	5.50 x 2.50 x 2.10 (18.04 x 8.20 x 6.89)	20,000 (44,092)
10 t section, each	2.75 x 2.50 x 0.40 (9.02 x 8.20 x 1.31)	10,000 (22,046)
10 t block, each	2.75 x 1.95 x 0.50 (9.02 x 6.40 x 1.64)	10,000 (22,046)
Tension rods, each (hooked onto the 20 t base plate for transportation)	1.25 x 0.35 x 0.20 (4.10 x 1.15 x 0.65)	25 (55)

1) There may be deviations of up to ± 3% due to the manufacturing procedure.

The stability of the crane rigged with the counterweight parts delivered has been tested.

Counterweight combinations

➠ *Assembling the counterweight version*, p. 12 - 58.

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1.5.5 Carrier

Engine

Make:	Cummins
Type:	QSX 15
Power:	447 kW (608 PS) at 2,100 rpm (ECE R 120)
Engine emissions:	97/68/EG Level 4 (TIER 4 Final/Euromot 4)
Fuel tank:	approx. 500 l (132 gal)
AdBlue tank	approx. 49 l (12.9 gal)

transmission Allison 4500 SP R automatic transmission with integrated retarder and 2 driving programs, each with 7 forward gears and 1 reverse gear.

Transfer case Kessler VG2600 2-stage transfer case with pneumatic, lockable longitudinal differential lock.

Axle lines

Drive:	**14 x 6 x 14**
1. axle line:	Steered and driven axle line
2. axle line:	Steered axle line
3. axle line:	Steered axle line
4th axle line:	Steered and driven axle line, steering can be switched on
5. axle line:	Steered and driven axle line, steering can be switched on
6. axle line:	Steered axle line
7. axle line:	Steered axle line

Drive:	**14 x 8 x 14 (**Additional equipment**)**
1. axle line:	Steered and driven axle line
2. axle line:	Steered and driven axle line
3. axle line:	Steered axle line
4th axle line:	Steered and driven axle line (steering can be switched on)
5. axle line:	Steered and driven axle line (steering can be switched on)
6. axle line:	Steered axle line
7. axle line:	Steered axle line

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Steering

Make:	ZF
Type:	Dual-circuit hydraulic steering with engine-independent emergency steering pump

When separate steering is switched on, the wheels of the 4th, 5th, 6th and 7th axle lines are steered separately.

Tyres

14 x 385/95 R25 on disc wheels 9.50-25/1.7
14 x 445/95 R25[1)] on disc wheels 11.00-25/1.7
14 x 525/80 R25[1)] on disc wheels 17.00-25/1.7

[1)] Additional equipment

Torque for wheel nuts: 650 Nm (480 lbf ft).

Tyre pressure; ➠ *Maintenance manual*

Electrical system

Alternator:	24 V/110 A
Batteries:	2 each of 12 V/180 Ah
Voltage:	24 V

Tool

1 tool kit in tool box,
wheel chocks (number according to national regulations)

Towing couplings

Front towing coupling:	100 kN (22,480 lbf) permissible tension[1)]
Rear tow lug:	75 kN (16,860 lbf) permissible tension[1)]

[1)] Only permissible at certain tension angles; ➠ p. 5 - 59

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Outriggers

Design:	4-point telescoping outrigger system
Control system:	Can be controlled from both sides on the carrier and individually from the crane cab
Outrigger spans:	8.76 x 8.90 m (28.7 x 29.1 ft) 8.76 x 6.10 m (28.7 x 20.0 ft) 8.76 x 2.63 m (28.7 x 8.6 ft) 7.78 x 8.90/1.22 m (25.5 x 29.1/4.0 ft) (rear outriggers)
Outrigger pads	Size: 800 x 800 mm (31.5 x 31.5 in) Area: 3,600 cm^2 (558 in^2)
Stroke of supporting cylinders	Front and rear: 550 mm (21.6 in)
Inclination indicator:	In the crane cab, at the *Outrigger* control units.
Outrigger pressure display:	Integrated into the outriggers with a display in the crane cab and on the *outrigger* operating units.

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Driving speeds At an engine speed of 1,800 rpm

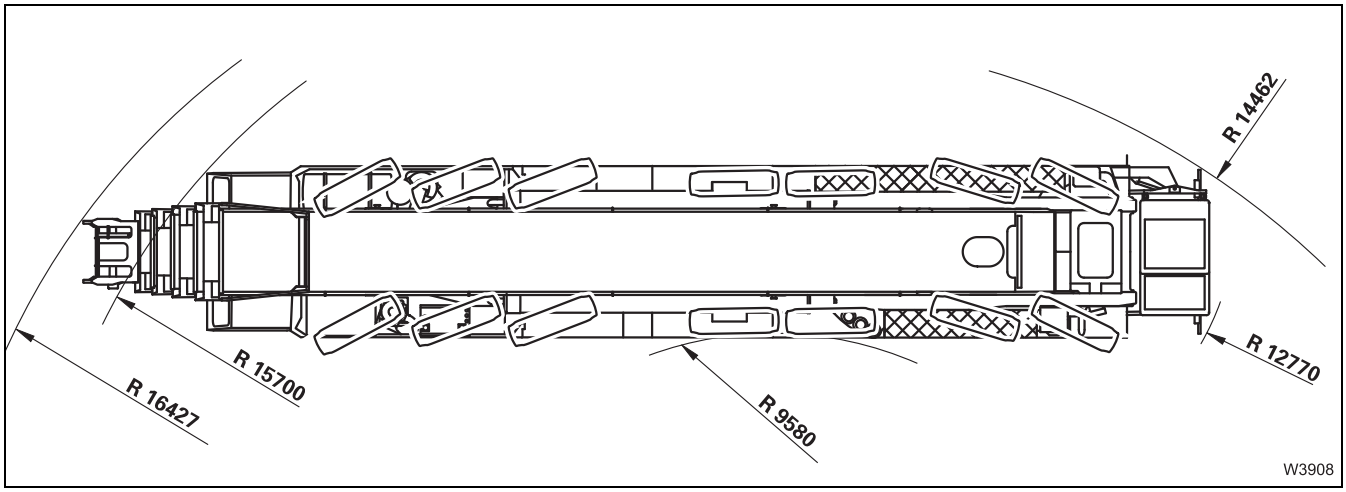
Forwards: max. 85.0 km/h (52.8 mph)

Reverse: Approx. 14 km/h (8.7 mph) depending on the tyres

Climbing ability Transport weight 84 t (185,100 lbs)

Drive	Transfer case	Climbing ability		
		14.00 tyres	16.00 tyres	Tyres 20.5
14 x 6 x 14	On-road gear	35.2%	32.1%	32.1%
	Off-road gear	36.0%	32.9%	32.9%
14 x 8 x 14	On-road gear	35.2%	32.1%	32.1%
	Off-road gear	56.1%	50.6%	50.6%

Turning radii All dimensions in the illustration are in mm.



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1.5.6 Superstructure

Engine

Make:	Cummins
Type:	QSX 6.7
Power:	224 kW (304 PS) at 2,500 rpm (ECE R 120)
Engine emissions:	97/68/EG Level 4 (TIER 4 Final/Euromot 4)
Fuel tank:	approx. 300 l (80 gal)
AdBlue tank:	approx. 31.5 l (8.3 gal)

Slewing gears

Make:	Siebenhaar
Type:	01 DD
Power unit group	M2 (to ISO 4301 - 2)

Derricking gear

Cylinder:	Differential cylinder
Adjusting angle (main boom):	-1.2° to + 82° from horizontal position
Power unit group	M2 (to ISO 4301 - 2)

Main boom

Main boom lengths:	16.03 m to 60.00 m (52.6 ft to 196.9 ft)
Main boom head:	9 sheaves (standard) 11 sheaves (additional equipment) 13 Rollers (Additional equipment)
Cylinder:	One single-level telescoping cylinder with integrated locking/unlocking mechanism
Power unit group	M 1 (to ISO 4301 - 2)
Telescoping mechanism:	

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Main hoist

Make:	Zollern
Type:	ZHP 4.26
Drum diameter:	502 mm (19.8 inch) (rope centre to rope centre)
Rope diameter:	24 mm (0.94 inch)
Rope length:	400 m (1,312 ft) (EC member states) 460 m (1,509 ft) (USA)
Max. rope pull:	**As per EN 13000/ISO4308** (EC member states): 125 kN/rope (≅ 12.7 t)
	As per ASME B30.5 (USA): 110 kN/rope (≅ 11.2 t) (24,730 lbf/rope (≅ 24,692 lbs)
Power unit group:	M 3 (to ISO 4301 - 2)
Load spectrum:	L 1
Factor of the load spectrum	Km = 0.125
Theoretical service life:	D = 3,200 h

Auxiliary hoist

Make:	Zollern
Type:	ZHP 4.26
Drum diameter:	502 mm (19.8 inch) (rope centre to rope centre)
Rope diameter:	24 mm (0.94 inch)
Rope length:	690 m (2,263 ft)
Max. rope pull:	**As per EN 13000/ISO4308** (EC member states): 104 kN/rope (≅ 10.6 t)
	As per ASME B30.5 (USA): 104 kN/rope (≅ 10.6 t) (23,380 lbf/rope (≅ 23,370 lbs))
Power unit group:	M 3 (to ISO 4301 - 2)
Load spectrum:	L 1
Factor of the load spectrum	Km = 0.125
Theoretical service life:	D = 3,200 h

Lattice extension ➠ *Lattice extension operating manual*

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Working speed and times without load

The operating speeds below apply to an engine speed of approx. 1,800 min^{-1}

Hoists:	Rope speed for hoisting and lowering, maximum 130 m/min (426 ft/min) (high speed)
Slewing gear:	0 to 1.1 revolutions per minute
Telescoping mechanism:	Telescoping the main boom from 16.03 m to 60.00 m (52.6 ft to 196.9 ft) approx. 420 s [1)]
Derricking gear:	Approx.135 s (- 1.2° to 82°) (high-speed) Approx. 160 s (82° to -1.2°)

[1)] In automatic mode during uninterrupted locking and telescoping operations.

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1.6 Documentation supplied

The precise number of documents supplied depends on the rigging mode of the truck crane. The following documents are included in delivery:

– **Operating Manual**
  Contains information on driving and crane operation.

– **Lattice extension operating manual**
  Is only supplied when the truck crane is equipped with a lattice extension or other parts for extending the main boom (for example, auxiliary single-sheave boom top and heavy load lattice extension).

– **Operating manual for additional equipment**
  This is only supplied when the truck crane is supplied with additional equipment which is not described in the operating manual for driving and crane operation.

– **Documents from other manufacturers**
  Original documentation for parts not manufactured by **Manitowoc Crane Group Germany GmbH** such as the engine and central lubrication system, as well as the tachograph, auxiliary heaters, radio and, where appropriate, other additional equipment.

– **Maintenance manual**
  Contains solely information on maintenance work and contains no instructions for repair work.

– **Safety manual**
  Provides information on the safe operation of the truck crane.

– **Circuit diagrams**
  Circuit diagrams for the electrical systems, hydraulic systems and pneumatic systems are supplied.

– **Lifting capacity table**
  Information on the lifting capacity when the truck crane is in different rigging modes.

– **Outrigger pressure table**
  Information on the outrigger pressure when the truck crane is in different rigging modes.

– **Spare parts list**
  For procurement of spare parts. Information about the position and quantity of plating.

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1.6.1 Questions on documentation

Consult your dealer if you have questions on the documentation supplied for your truck crane.

You can find your responsible dealer here: ➠ *Dealer list*, p. 1 - 3.

You can also send questions in either German or English directly to:

Email: whv-techpublications@manitowoc.com

For repeat orders for documentation, please contact our EMEA service.

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1.7 Notes on the operating manual

This operating manual is not a training manual for prospective crane operators! All descriptions are written explicitly for crane operators who have been trained to operate truck cranes!
This operating manual is designed as a reference manual. It provides either a brief or a detailed explanation to the crane driver, based on his prior knowledge, of the individual operating steps and procedures.

1.7.1 What do the symbols used mean?

The following designations and symbols are used in the operating manual and in the maintenance manual to highlight particularly important information.

The vertical line to the left of the hazards and warnings indicates that: This text, regardless of its length, relates to the warning symbol.

This symbol indicates hazards related to the described operation, which can endanger persons. The type of danger (for example, danger to life, risk of injury or risk of crushing) usually precedes the warning.

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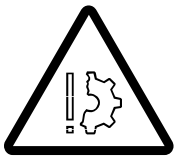
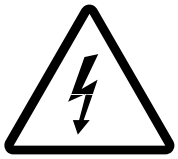


This symbol indicates dangers which represent a hazard to objects, for example, damage to the truck crane or other parts which are located within the working range.



This symbol warns you about situations where there is a danger of electric shock.

This symbol is to remind you that you are working with substances which pose a risk to the environment. Exercise special caution. Further information on handling substances that are harmful to the environment;
➠ *Maintenance manual*, Chapter *Safety and environmental protection*.

The hand with the pointing finger indicates passages that contain additional instructions and tips regarding truck crane operation.

This symbol indicates that the topic is continued on the next page. So turn the page!

Horizontal lines always indicate the start or the end of an example. The text used for examples is in a different font.

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1.7.2 How is the operating manual structured?

Division

The operating manual is divided into two parts.

– **Part 1** with chapters **1** to **8** contains a description of how to drive the truck crane.

– **Part 2** with chapters **9** to **15** contains a description of the crane operation.

One part on its own does not constitute a complete operating manual; both parts must be carried along with the truck crane.
The basic safety instructions, also for crane operation, are included in **Chapter 2** only. Please read these safety instructions and observe them.

Structure of the chapters

Chapters **3** and **9** are structured in relation to the product, and give an overview of all operating elements on the truck crane. You will find cross-references to the associated brief descriptions, and from there, to further chapters.

Chapters **4** to **7** and **10** to **14** describe procedures, and are therefore structured in relation to these operations. For more extensive processes, the description is given with **checklists** and **operating instructions**.

– The checklists show the procedure in the required sequence, for example, for rigging work. From there, cross-references take you to the corresponding operation descriptions.

– The operation descriptions describe the work in detail, including the required **warnings and safety instructions**.
You are obliged to read these sections before using the truck crane for the first time **and** if you are still unsure about how to operate the truck crane.

Risk of accidents when only referring to the checklists during operation!
The checklists and operating instructions should always be regarded as a single unit for the comprehensive description of the rigging.
It is only safe to operate the truck crane by referring to the checklists when you are familiar with all the dangers which may occur, and are confident in completing the necessary steps as described in the relevant operating instructions.
If in doubt, always first read the section which is referred to in the checklist.

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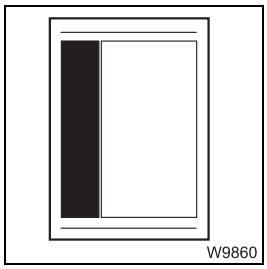
Structure of the pages

Each page in the operating manual is divided into a wide text column and a narrow column.



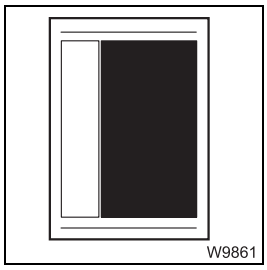
The **narrow column** contains various pieces of information:

– Chapter and section numbers

– Headings of the subsections

– Information and warning symbols

– Images with individual operating elements with parts of the truck crane or with pictograms



Different methods of emphasis are used in the **text column**:

– When a section is preceded by a hyphen (as in this section, for example), you will find a list.

– When a section is preceded by a bullet, you will be required to take concrete action, for example,

  • shift the transmission to neutral.

– The following text passages are highlighted in *italics*:

  – Designations of operating elements and switching states, such as e.g. *Automatic* or *Manual*.

  – Headings of sections to which a reference is made.

  – The names of other documents to which a reference is made.

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1.7.3 How do I find the information I need?

The operating manual contains the following guides for orientation.

- The **Contents** at the front in sections 1 and 2 list all the chapters in the section.
- The **Table of contents** before each chapter provides an overview of the topics it contains.
- The **Index** in chapters **8** and **15** gives an alphabetic list of keywords and search terms with a reference to the relevant page in the operating instructions.
- Cross-references are labelled with an arrow (➠) and refer to other pages in the operating instructions. These pages contain more detailed information, or information that relates to the topic in question.
  Furthermore, you can use the cross-references to systematically familiarize yourself with general to specific information on the truck crane or look up the functioning of individual elements.

The following pages give an example of how to use the cross-references.

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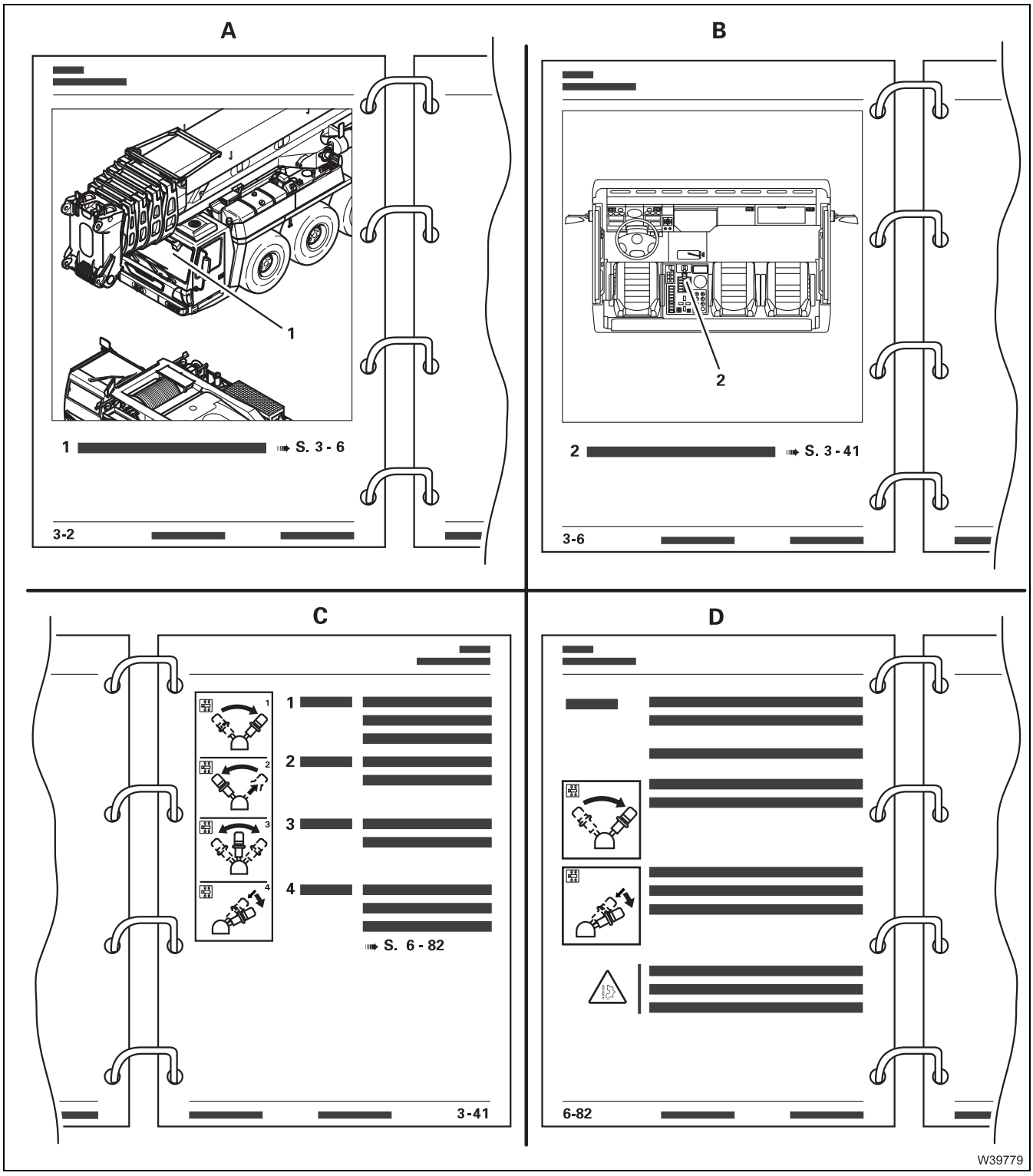
Cross-references example

The illustrations and texts in this section are only an example and may differ from the conditions on your truck crane.



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The parking brake is used as an example to show how the cross-references guide you through the operating manual.

A In this example, the general overview is shown on page 3 - 2.
The driver's cab is labelled as number **1**. The related table contains a cross-reference in the form

1 Driver's cab ➠ p. 3 - 6

B The p. 3 - 6 shows a top view of the driver's cab.
The parking brake is labelled as number **2**. The related table contains a cross-reference in the form

1 Parking brake ➠ p. 3 - 41

C p. 3 - 41 gives a brief description of all the functions of the parking brake.
If further information is available, the brief description contains a cross-reference, e.g.

4 Test position for towing a trailer:	– Pull the parking brake lever back until it locks into place – Press in the parking brake lever and pull it further backwards; ➠ p. 6 - 82.

D Follow the cross-reference to pages 6 - 82. Here, the test position of the parking brake when towing a trailer is described in detail, with all requirements and safety instructions.

There may be additional cross-references here, e.g. to related pages in the chapter *Malfunctions in driving mode*.

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1.7.4 What information is available for operations planning?

Extensive information is required for operations planning in order to guarantee safe, smooth and efficient operation of the truck crane:

The operating manual contains

– Dimensions and weights of the truck crane; ➠ p. 1 - 8
– Driving modes permitted on public roads; ➠ p. 6 - 2
– Dimensions and weights of removable equipment; ➠ p. 1 - 10
– Turning radii; ➠ p. 1 - 17
– The permitted outrigger spans; ➠ p. 12 - 34
– The size of the outrigger pads; ➠ p. 1 - 16

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1.8 Conversion table for US measuring units

The following conversion factors will help you convert from metric to US units and vice versa when the truck crane is being used in countries that use US units of measurement.

Converting from	in	Multiply by
mm	in	0.03937
in	mm	25.4
m	ft	3.28084
ft	m	0.30479
m^2	ft^2	10.76391
cm^2	in^2	0.155
cm^3	in^3	0.061
l	gal (US)	0.264178
kg	lbs	2.204622
lbs	kg	0.45359
t	lbs	2,204.622
lbs	t	0.0004536
kN	lbf	224.809
daN/cm^2	lbf/in^2	14.50378
lbf/in^2	daN/cm^2	0.06895
bar	psi	14.50378
psi	bar	0.06895
m/s	ft/s	3.28084
km/h or km	mph or mi	0.62137
mph or mi	km/h or km	1.60935
Nm	lbf ft	0.7375
°C	°F	1.8 x °C+32
°F	°C	(°F-32)/1.8
t/m^2	lbs/ft^2	204.8
m^2/t	ft^2/lbs	0.04882

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1.9 Training – Information

Manitowoc Crane Group Germany GmbH offers comprehensive training for crane types GMK and GTK in the EMEA regions (**E**urope, **M**iddle **E**ast, **A**frica).

Our training centre is located in a maritime environment, on Germany's North Sea coast in Wilhelmshaven. It is there where we train our qualified service personnel and provide you, as the customer (or sales and marketing employee), with a training programme specific to your target group.

Knowledge of crane technology, components and systems used, crane functions and measures for the prevention of accidents that is acquired from the training is tailored to each target group and designed for safe, time-saving operation of your crane or else consolidates your specialist know-how of sales, marketing and service.

Our range of training programmes includes more than 20 different courses. Take advantage of our services:

- Training for prevention of accidents and crane operation.
- Crane technology training.
- Training tailored to your needs and level of experience, for different levels of difficulty from beginner to specialist.
- Theoretical and practical training, on simulators and on (your) crane.
- Training in the vicinity of GMK and GTK production.
- Training courses with the duration required by the individual; from two days to several weeks.
- Our coaches can also visit you to provide you with training on your own crane.

Have us design a suitable training programme for you today.
We would be pleased to advise you! Your **Training Centre Wilhelmshaven**.

Our contact information and an overview of our current training courses can be found online at:

http://www.manitowoccranes.com

You can also scan the following QR code.

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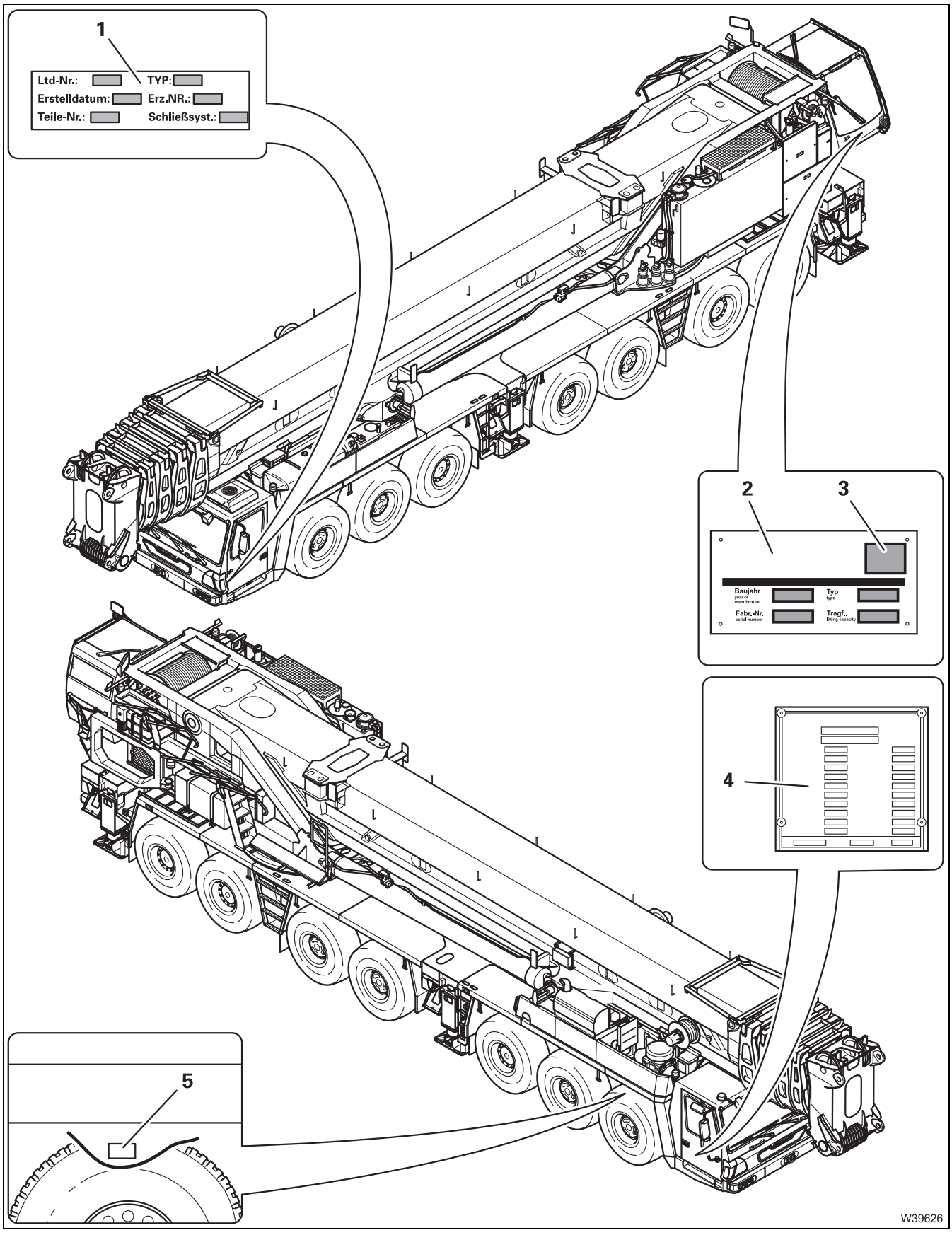
1.10 Identification



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These operating instructions are intended only for the truck crane with the serial number specified on the front cover.

The following plates and numbers are attached to the truck crane for identification purposes:

1 The serial number of the driver's cab

2 Serial number and crane type

3 The CE mark, only with truck cranes that are delivered to member countries of the EU.

4 The chassis number and crane type

5 The chassis number in front of the first axle line in the frame.

The location of the identification numbers on removable rigging parts (for example, counterweights, lattice extension) is described in the corresponding chapters or in the relevant operating manual provided.

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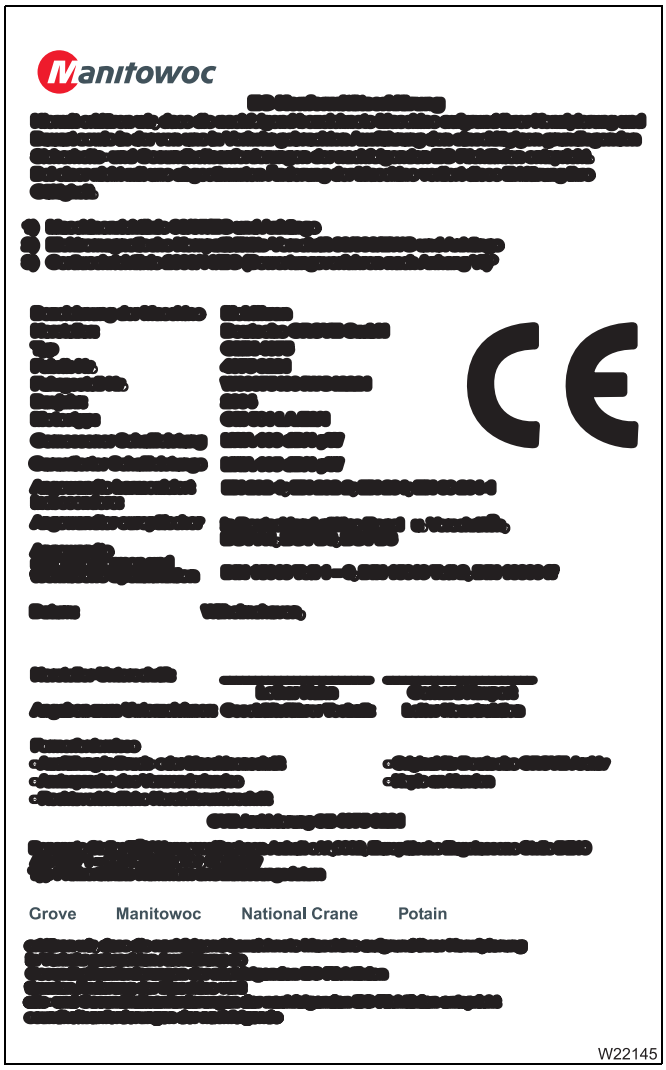
1.11 EC Declaration of Conformity



On initial delivery, operators of truck cranes receive a Declaration of Conformity as a supplement to the delivery protocol. An illustration of the Declaration of Conformity is shown below.

The enclosed Declaration of Conformity is valid only if the truck crane complies with all of the guidelines and standards specified in the EC Declaration of Conformity. This applies in particular to the programming and function of the overload protection. Only then does the truck crane receive a CE mark upon delivery.

The Declaration of Conformity shall become invalid and the CE mark must be removed if any modifications that do not comply with the specified guidelines and standards are made to the crane.

Please refer to the additional information provided on the EC Declaration of Conformity supplied.

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2 Basic safety instructions

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2 Basic safety instructions

Notes on the warnings used; ➠ *What do the symbols used mean?*, p. 1 - 23.

2.1 Intended use

The GMK7450 truck crane is constructed in accordance with the latest technology and the recognised safety regulations. Nevertheless, the operator or third parties can still be endangered and the crane or other property put at risk while using it.

The truck crane may be modified only with the consent of **Manitowoc Crane Group Germany GmbH**.

The GMK7450 truck crane may be used only when it is in perfect technical condition and for its intended purpose and with due attention paid to safe operation and possible hazards.
Any malfunctions that could impair safety must be eliminated immediately.

The GMK7450 truck crane may only be operated without the corresponding special equipment within the permitted temperature range; ➠ *Technical data*, p. 1 - 7.

The GMK7450 truck crane is designed solely for lifting loads which are within the permitted GMK7450 lifting capacities. The load must be slung as prescribed to a hook block which is positioned vertically over the load prior to lifting.

Intended use also includes

– observing the entire crane documentation, consisting of the operating manual(s), the lifting capacity table, the outrigger pressure table and the safety manual

– adhering to the inspection and maintenance requirements specified in the maintenance manual.

The GMK7450 may only be operated with parts of equipment that have been approved by **Manitowoc Crane Group Germany GmbH** and which are labelled with the serial number of the GMK7450.

The manufacturer is not liable for any damage caused by improper or unauthorized use of the GMK7450 truck crane. The user alone bears the risk.

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2.1.1 Improper use

Die **Manitowoc Crane Group Germany GmbH** is not liable for damage resulting from improper or unauthorized use of the GMK7450 truck crane. The user alone bears the risk.

Improper use includes:

- Transporting loads on the carrier.
- Pushing, pulling or lifting loads with the level adjustment system, outrigger beams or outrigger cylinders.
- Pushing or pulling loads or lifting them off the ground using the slewing gear, derricking gear or telescoping mechanism.
- Pulling off fixed objects with the crane.
- Ramming and pulling of sheet-pile walls, sheet piles, beams etc.,
- Two-hook operation with the boom extension and two-hook operation on the main boom head without additional equipment.
- Setting RCL codes that do not correspond to the actual rigging mode.
- Working with an overridden RCL or overridden lifting limit switch.
- After RCL shutdown, increasing the working radius by pulling the raised load at an angle (e.g. with a chain hoist).
- Misuse of the outrigger pressure display as a safety function to prevent the crane from overturning (outrigger pressure higher than 0 t).
- On-road driving in an impermissible driving mode (axle load, dimension).
- Moving the rigged crane in an impermissible driving mode.
- Using equipment that is not permitted for the crane.
- Transporting people in any way using the lifting tackle, on the load, or in the crane cab while driving.
- Transporting passengers outside the driver's cab.
- Loading and unloading work, i.e. continuous operation without a sufficiently long break.
- Use for any kind of sport or recreation event, especially for bungee jumping.

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2.2 Organisational measures

The operating manual and the lifting capacity table should be kept in the truck crane for immediate access at all times, and must not be removed from the truck crane. You must have read and understood the operation and safety instructions in this operating manual and comply with them when working.

In addition to the operating manual and the lifting capacity table, observe all general, statutory and otherwise applicable regulations concerning accident prevention and environmental protection. You must have read and understood these and observe them when operating the crane and driving.

They could include:

– How to deal with hazardous materials

– The wearing of personal protective equipment

– Road traffic regulations and

– All applicable regulations concerning the operation of a crane

Make sure that persons who will work on the truck crane are provided with the required information prior to starting operations. Instruct your personnel (e.g. banksmen, slingers, rigging personnel) accordingly.

Make sure the maintenance personnel have the necessary expertise for safe crane operation. Make sure the maintenance personnel have access to the operating manual.

Only qualified or trained personnel may carry out work on the truck crane. Responsibilities regarding the operation of the truck crane, rigging, maintenance and repair work must be clearly defined.

Make sure only authorised personnel carry out work on the truck crane.

Do not leave long hair untied and do not wear loose clothing or jewellery (including rings) during work. These could get caught or pulled into the unit and result in injury.

Use your personal protective gear whenever necessary or prescribed.

Observe all safety instructions and warnings on the truck crane.

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Keep all safety instructions and warnings on the truck crane in a legible condition.

Observe the operational organisation at the site. Report your arrival to site management. Ask for the personnel authorised to instruct you.

Find out where the fire extinguishers are and how to operate them at every site.

Note the fire alarm and fire-fighting facilities.

Should the operating behaviour of the truck crane change in such a manner that safety is impaired or if you are in doubt about the operational safety of the truck crane, stop the truck crane immediately and inform the responsible departments or persons.

Do not make any changes to the programmable control systems (e.g. the RCL).

Do not modify or retrofit additional units to the truck crane without the consent of the manufacturer if such changes would affect the safety. This also applies to:

– Installation of safety devices

– Adjustment of safety devices and valves

All welding work (especially on load carrying members) may only be performed by qualified professional personnel with the prior written permission of **Manitowoc Crane Group Germany GmbH**.
To avoid damage, especially to electronic parts, there are certain measures you must take before doing any welding work. You should therefore always consult **Manitowoc Crane Care** before carrying out any welding work.

Make sure that the prescribed intervals and the intervals specified in the operation and maintenance manual for periodic inspections, tests and maintenance work are adhered to.

Replace the hydraulic hose lines, or have them replaced, at the prescribed intervals, even if no safety defects are noticeable.

Spare parts must fulfil the technical requirements defined by the manufacturer. Genuine spare parts always meet these requirements.

Appropriate servicing equipment is absolutely necessary in order to carry out maintenance work.

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Observe national regulations that apply to transport when loading the truck crane. Also observe the prescribed safety measures of the carrying agent or railway company

Monitor the work of personnel, at least occasionally, and make sure they work in accordance with the operating instructions in a safe and conscientious manner.

2.3 Personnel qualifications

This operating manual is not a training manual for prospective crane operators!
All descriptions are written explicitly for crane operators who have been trained to operate truck cranes.

Personnel in training may only operate the truck crane under supervision.

Only reliable personnel may operate or carry out work on the truck crane.

As a crane operator you must fulfil a number of requirements:

- You must possess a driving licence for this type of vehicle that is valid in the country in which you are working.
- You must have general knowledge about working with cranes and the qualifications required in the country in which you are working.
- You must be familiar with and understand the operating instructions.
- You must be familiar with and have understood the accident prevention regulations.
- You must fulfil all physical and mental requirements for truck crane operation; for example, perfect sight and hearing and the ability to react quickly.

Please also refer to the section in the *Safety manual* titled *You as driver and crane operator*.

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Only experienced personnel who are familiar with the valid accident prevention regulations are authorised to sling loads and instruct the crane operator.

Your responsibilities as a crane operator (including those concerning traffic requirements) must be clearly defined. You must be in a position to refuse instructions given to you by third parties that violate the safety regulations.

Only trained personnel with special knowledge and experience in the fields of hydraulics, pneumatics and electrical equipment and electronics may carry out maintenance work on the truck crane.

Manitowoc Crane Group Germany GmbH conducts general and type-specific crane operator courses and technical courses.

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2.4 Safety instructions for driving the truck crane

Walk around and inspect the truck crane before you start the vehicle. Check the condition of the truck crane carefully using the checklists in the operating manual. Do not assume everything is in working order simply because it was in working order at the end of the last shift.

Check that all covers and safety devices are fitted properly and that they are in good condition before starting the vehicle.

Use the appropriate access aids when checking overhead crane parts. Do not use parts of the crane as access aids.

Keep all handles, steps, step treads and ladders free of dirt, snow and ice.

Keep all electric and hydraulic connections free of dirt. Check the connecting points for dust, foreign bodies and moisture before installation. This also applies to protective caps and bridging plugs.

After a lightning strike, always have the truck crane checked by **Manitowoc Crane Care** before you drive the truck crane – even if you do not notice any impairment to its function. Electronic components may be damaged by a lightning strike and may fail unexpectedly, either immediately or during later operation.

Check all operating and control elements in the driver's cab before starting the engine.

After starting the engine, take note of all the lights and control elements.

After driving, secure the truck crane against unauthorised use.

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2.5 Safety instructions for crane operation

Carefully select a safe site for the truck crane, where you can work safely.

Walk around the truck crane and inspect it before beginning crane operation. Check the condition of the truck crane carefully using the checklists in the operating manual. Do not assume everything is in working order simply because it was in working order at the end of the last shift.

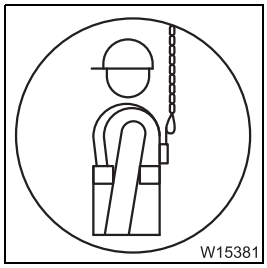
Check daily that all covers and safety devices are fitted properly and are in good condition before crane operation.

Check the safety devices (RCL, lifting limit switch, dead man's switch, emergency stop switches) every day before you start work.

Use the appropriate access aids when carrying out overhead rigging or maintenance work. Do not use parts of the crane as access aids.

Walk on only those parts of the truck crane which are equipped with appropriate step grids and railings and therefore guarantee safety.

Use a suitable safety harness when walking on other surfaces – this also applies to sanded surfaces.



All locations designed for fastening a fall prevention safety system are marked with a symbol.

Always use a ladder for work above head height.

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If necessary, remove any ice and snow from the truck crane before commencing crane operation.

Keep all handles, steps, step treads and ladders free of dirt, snow and ice.

Keep all electric and hydraulic connections free of dirt. Check the connecting points for dust, foreign bodies and moisture before installation. This also applies to protective caps and bridging plugs.

Check all operating and control elements in the crane cab before starting the engine.

After starting the engine, take note of all the lights and control elements.

Make sure that there are no unauthorised people in the vicinity of or on the truck crane during rigging work or crane operation. Cordon off the danger area clearly and mark the area as such.

When lifting a load, balance out the increase in working radius caused by flexure of the boom by raising the boom, so that the load is lifted vertically and does not drag, injure helpers or topple into the hoist rope (e.g. from a vehicle or scaffolding). Inform any banksmen and helpers about this issue as well.

Support the truck crane with the outrigger span required for the currently rigged counterweight before turning the superstructure.

Always level the truck crane before operating the crane.

Only use parts of equipment (counterweight sections, lattice extension) that belong to your truck crane. Both the truck crane and the equipment must have the same serial number.

Lifting loads simultaneously with two cranes is particularly hazardous. Carry out this type of work with special caution.

Always set the load down when there is a break in work, and never leave the truck crane while a load is raised.

Whenever you leave the truck crane, secure it against unauthorised use.

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After a lightning strike, always have the truck crane checked by **Manitowoc Crane Care** before you operate the truck crane – even if you do not notice any impairment to its function. Electronic components may be damaged by a lightning strike and may fail unexpectedly, either immediately or during later operation.

Crane operation carried out in the vicinity of live electrical cables as well as oil, gas or other supply lines is dangerous and requires that special precautionary measures be taken. Please observe the instructions in the section titled *Crane operation under special operating conditions* in the *Safety manual* and the respective national regulations.

Testing the truck crane by lifting an excessively heavy load (overload testing) is prohibited. This presents the danger of hidden damage that can lead to severe accidents during subsequent crane operation. If locally applicable national regulations require the truck crane to be tested by lifting an excessively heavy load (overload test), always first consult **Manitowoc Crane Care**.

Ramming or pulling sheet-pile walls, sheet piles, beams etc. can damage the truck crane or cause it to tip over.

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2.6 Safety instructions for load-bearing/lifting tackle

Safety-relevant parts

Load-bearing equipment (e.g. hook blocks) and lifting tackle (e.g. stop chains) are safety-relevant parts that may be used only if they are in perfect original condition.

Required checks

- Before each use, check all load-bearing equipment/lifting tackle for proper condition and carry out in good time the checks and maintenance work specified in the supplied *Maintenance manual* and prescribed by the manufacturer.
- Always check also the load-bearing equipment/lifting tackle thoroughly for damage in case there were collisions during transport or crane operation. These checks must be carried out before the next use.

Use only parts in perfect working order

- Never use damaged load-bearing equipment/lifting tackle. Damaged load-bearing equipment/lifting tackle must be replaced and marked as unusable.

If you are concerned about safe use, contact **Manitowoc Crane Care**.

Modifications prohibited

Under no circumstances may changes or repairs, e.g. by welding, be carried out on load-bearing equipment/lifting tackle. The use of repaired or modified load-bearing equipment/lifting tackle is not permitted.

Risk of accidents through use of impermissible parts
Damaged, repaired, modified, poorly maintained and incorrectly equipped load-bearing equipment/lifting tackle can be overloaded during crane operation. This can cause loads or parts to fall, causing serious or fatal injuries. Keep in mind that the consequences of overloading can sometimes occur only after several crane operations, which can initially lead to a false sense of security.

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2.7 Instructions on transporting persons

The truck crane is intended for lifting loads. Transporting persons is considered improper use of the truck crane.

It is prohibited to:

- Transport persons in any way with the lifting tackle or on the load.
- Transport persons outside the driver's cab.
- Transport persons on the lattice extensions or boom extensions.
- Use the truck crane for any kind of sport or recreation event, especially for “bungee“ jumping.
- Directly attach equipment for lifting persons on a luffing jib.
- Transport persons with the truck crane when another, less dangerous method of transporting persons is possible.

In addition to the provisions of in this section, always also observe the legal requirements and guidelines for transporting persons applicable in the country in which you are working.

Further information on transporting persons can be found under the address: *http://fem-eur.com.*

You can also scan the following QR code.

Equipment for lifting persons

When lifting persons, only use equipment for lifting persons that comply with the requirements specified in the standards and regulations applicable in the country in which you are working.

The equipment for lifting persons must be fastened and secured as prescribed.

The prescribed personal protection equipment must be available and used (safety harnesses, etc.).

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Personnel

Only authorised and properly qualified personnel are permitted to transport persons.

The crane operator must comply with the specifications of the manufacturer and the restrictions with regard to the lifting accessories (hooks, lifting gear, equipment for lifting persons, etc.).

The crane operator must have knowledge of and meet the requirements of the relevant legal regulations and standards (e.g. the DGUV in Germany or the ASME B30 in the USA).

The crane operator must have the necessary knowledge for operating the truck crane and the equipment used for lifting persons.

The crane operator and the persons to be transported must be made aware of all the known dangers involved when transporting persons.

operation

Operations planning for transporting persons must be carried out with special care. If official registration is required in the country in which you are working, this must be done with the relevant authorities in good time.

The truck crane must be rigged as prescribed and be level.

Before transporting persons, the crane operator must make sure that the safety devices and emergency operation functions are in perfect working order.

Before transporting persons, the crane operator must make sure that the lifting limit switch is **not** overridden.

The *Operating manual* and the *Lifting capacity table* must be in the crane cab and in easy reach of the crane operator.

All crane movements must be performed slowly and with extreme care.

The crane operator is not allowed to leave the crane cab until the equipment for lifting persons has been set down and the person transported has left it.

The crane operator must take care that the degree of utilisation does not exceed 50% during operation.

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The number of reeved rope lines must be selected such that the load on the hoist rope does not exceed 50% of the rope pull. At the same time, the total weight of the lifted load must be considered, consisting of the weights of the hook block, the lifting gear and the equipment for lifting persons including the maximum payload.

When transporting persons, the crane operator must maintain the safe distances from overhead power lines applicable in the country in which he is working. The distances are normally greater than the distances for lifting loads specified in the *Safe distance from overhead power lines* section.

The person being transported must be in radio contact with the crane operator.

When used for transporting persons, the truck crane must not be used for other tasks.

The crane operator is not permitted to exceed the maximum permissible wind speeds and wind loads for transporting persons applicable in the country in which he is working. These values are normally lower than those for lifting loads specified in the *Lifting capacity table*.

When the equipment for lifting persons is being used and is in a stationary position, then the slewing gear, hoist, derricking gear and telescoping mechanism must be secured against accidental use by being switched off.

Truck crane

The truck crane must be equipped (e.g. with hydraulic emergency operation) so that the equipment for lifting persons can be set down and the persons being transported can safely leave it even if there is a failure of the drive or crane controls.

The hook holding the lifting gear for the equipment for lifting persons must be fitted with a lockable latch that completely seals the hook opening.

The truck crane must be serviced as prescribed, regularly inspected and repaired, if required. All safety stickers must be affixed in their appropriate places and be legible.

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3 Operating elements for driving

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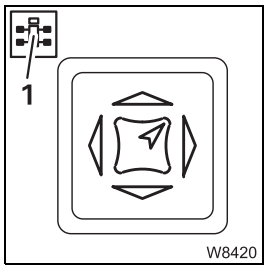
3 Operating elements for driving

All operating elements for crane operation are described in Chapter 9.

3.1 Overview of the operating elements

This section shows the position and designation of the operating elements for driving. This also includes display elements such as lights or displays.

Operating elements available only with additional equipment are designated accordingly. These designations are made in this section only and are not repeated in the following sections.



Some figures show details from a different perspective than the general overview. The perspective is indicated in these figures by the symbol (**1**).

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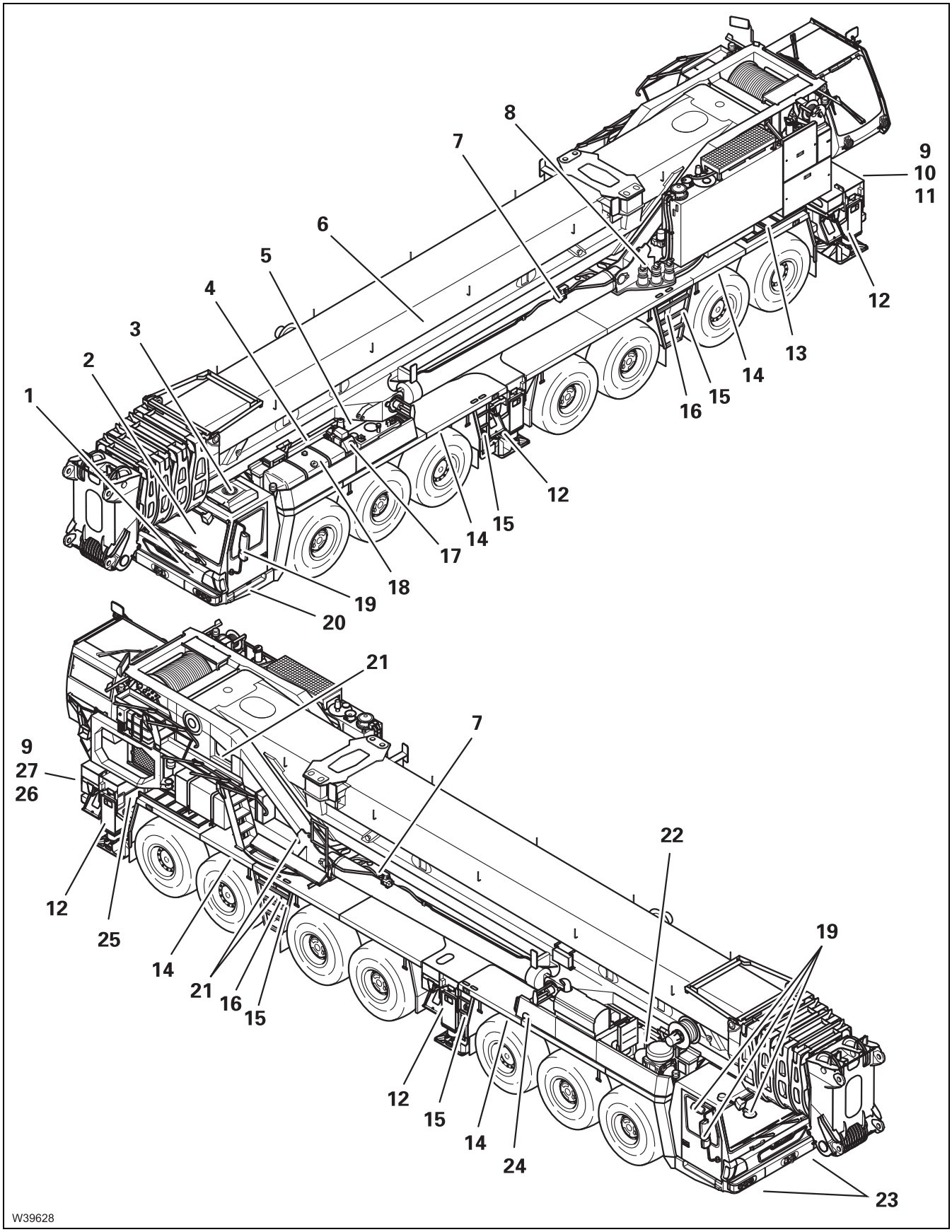
3.1.1 On the outside of the truck crane



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[1)] Additional equipment

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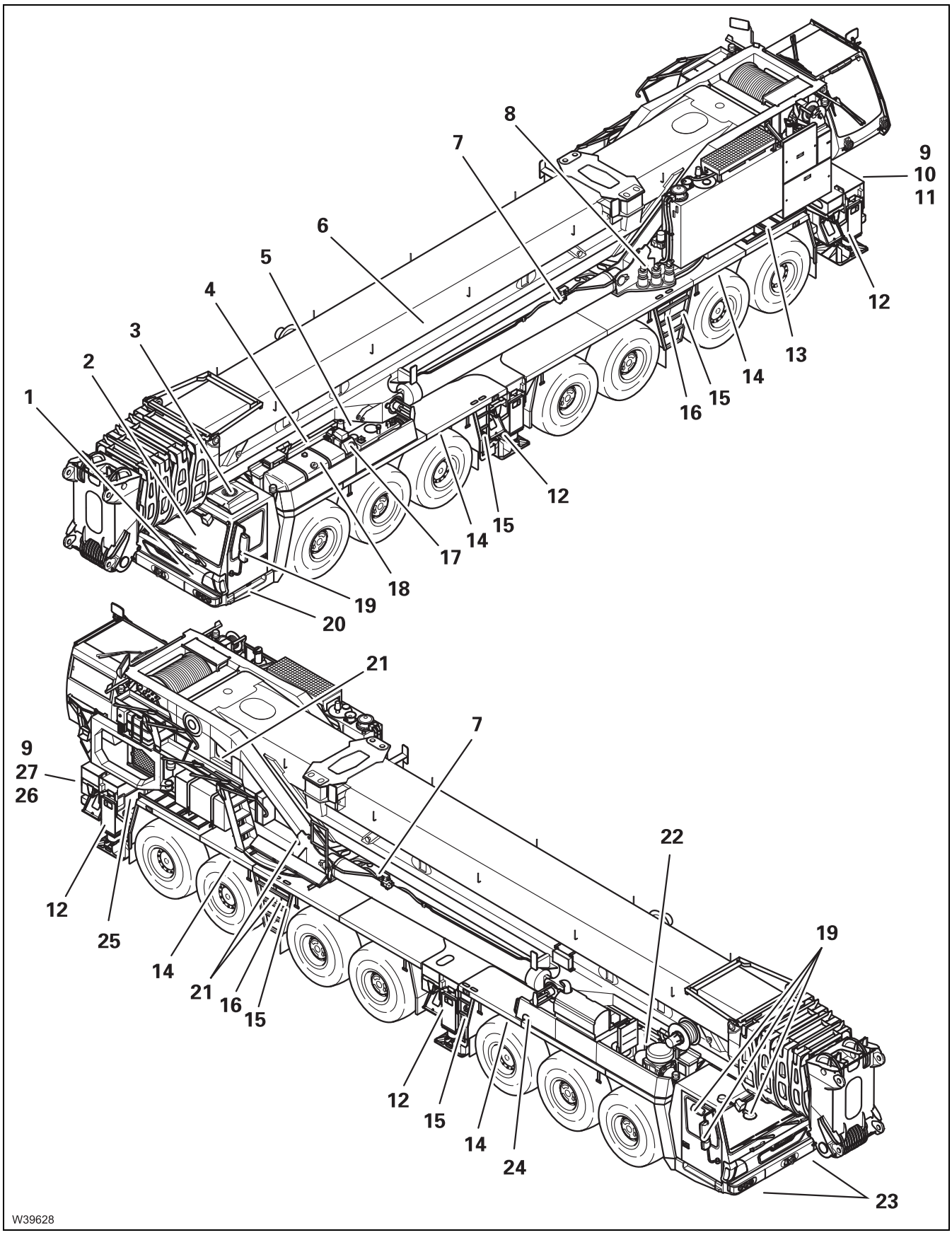
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14	3rd and 6th Raising/lowering axle lines[1)]	p. 6 - 114
15	Fixed ladders	p. 4 - 5
16	Outrigger control units Emergency stop switch	p. 3 - 23 p. 4 - 19
17	AdBlue tank[1)]	p. 4 - 8
18	Fuel tank	p. 4 - 7
19	Adjusting the mirrors	p. 5 - 8
20	Compressed-air supply Tyre inflator connection	p. 7 - 6 p. 7 - 16
21	– Hydraulic emergency operation[1)] – Control panel for hydraulic emergency operation[1)] – Connections for emergency supply[1)]	p. 14 - 63 p. 14 - 68 p. 14 - 65
22	Air intake inhibitor[1)]	p. 4 - 20
23	Warning plates for vehicle width	p. 5 - 9
24	– Battery master switch – External starting socket[1)] – Battery charger[1)]	p. 4 - 9 p. 7 - 9 p. 7 - 10
25	Carrier lock control unit[1)]	p. 3 - 24
26	Reverse camera[1)]	p. 3 - 40
27	Connecting/disconnecting the dolly power supply cables[1)]	p. 6 - 12

[1)] Additional equipment

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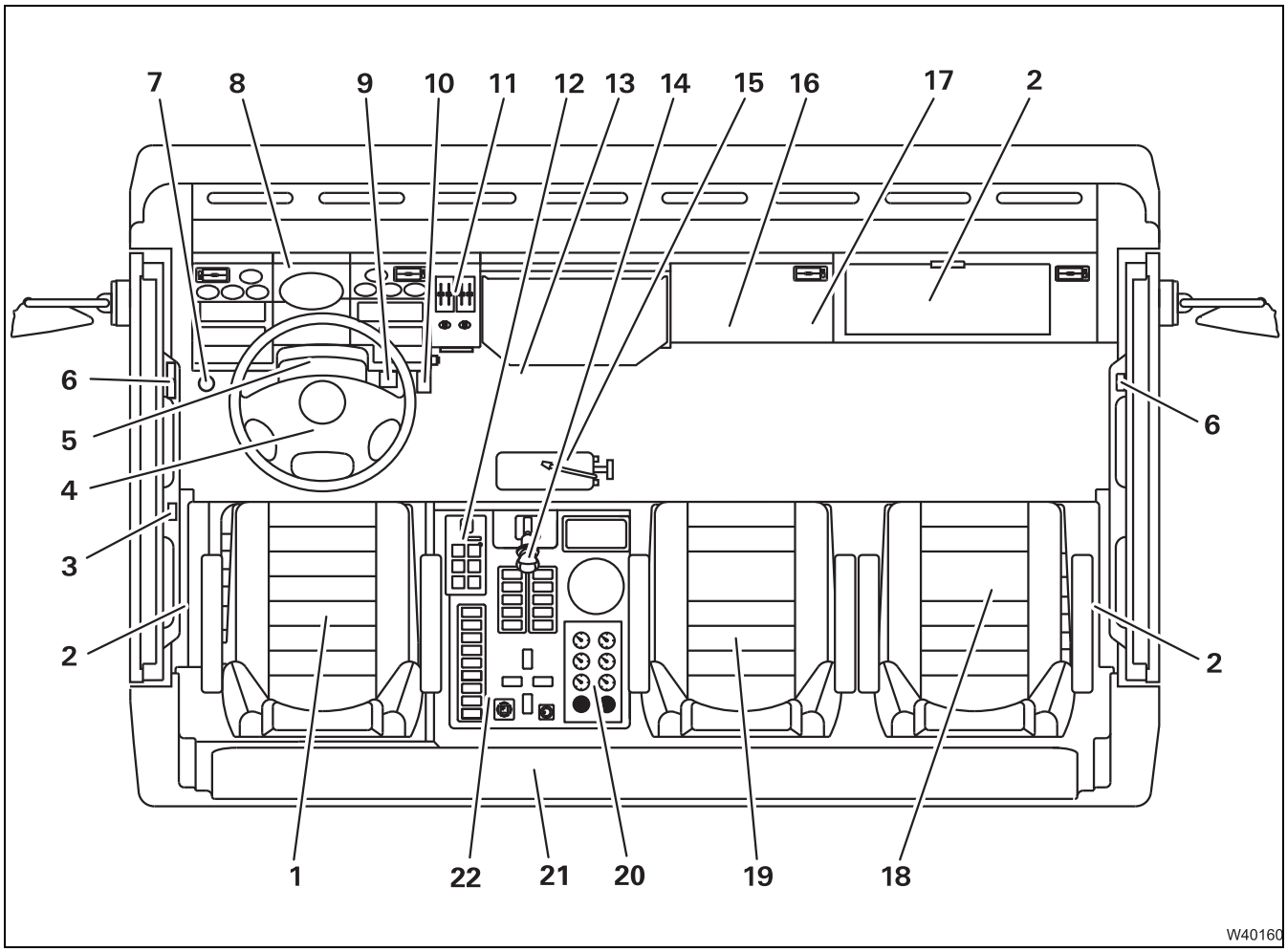
3.1.2 Driver's cab

Overview



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1	Driver's seat	➠ p. 5 - 12
2	Storage compartment	
3	Steering/separate steering	➠ p. 3 - 43
4	Steering wheel	➠ p. 3 - 19
5	Adjusting the steering column	➠ p. 5 - 14
6	Windows	➠ p. 3 - 53
7	Engine retarder[1)]	➠ p. 3 - 42
8	Instrument panel	➠ p. 3 - 11
9	service brake	➠ p. 5 - 28
10	Accelerator	➠ p. 5 - 25
11	Standard heating system	➠ p. 3 - 21
12	Transmission control unit	➠ p. 3 - 18
13	Socket 12 V[1)]	➠ p. 3 - 32
14	Parking brake	➠ p. 3 - 41
15	Fire extinguisher[1), 2)]	
16	Fuses in the driver's cab	➠ p. 7 - 20
17	Diagnostics	➠ p. 3 - 10
18	Passenger's seat	➠ p. 5 - 13
19	Third seat[1)]	➠ p. 5 - 13
20	Suspension operating pressure gauge[1)]	➠ p. 3 - 44
21	Fold-up berth[1)]	➠ p. 5 - 48
22	Instrument panel,	➠ p. 3 - 15

[1)] Additional equipment

[2)] ➠ *Maintenance manual*

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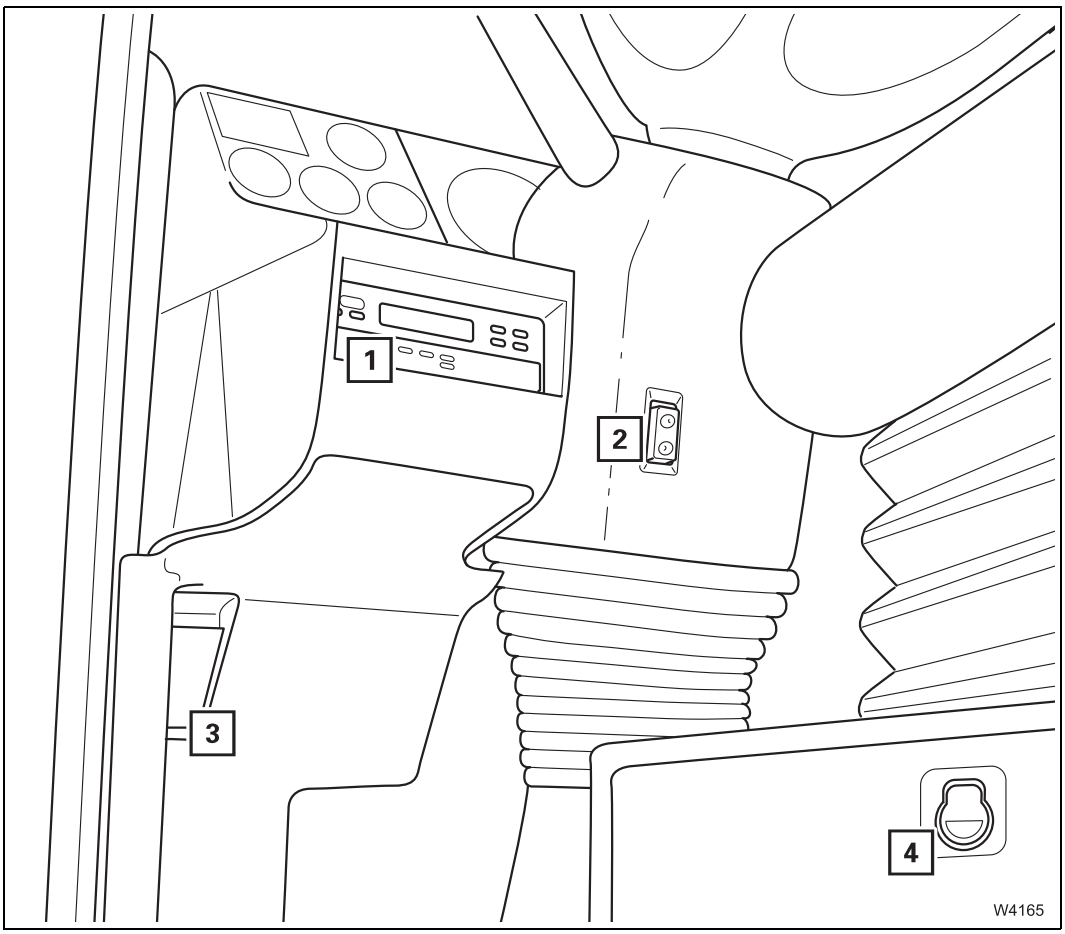
Below in the driver's cab



1 Tachograph[1), 2)] or cover ➠ p. 3 - 20
2 Adjusting the steering column ➠ p. 5 - 14
3 Unlocking Front flap ➠ p. 3 - 55
4 Storage compartment

1) Additional equipment
2) ➠ *Separate operating manual*

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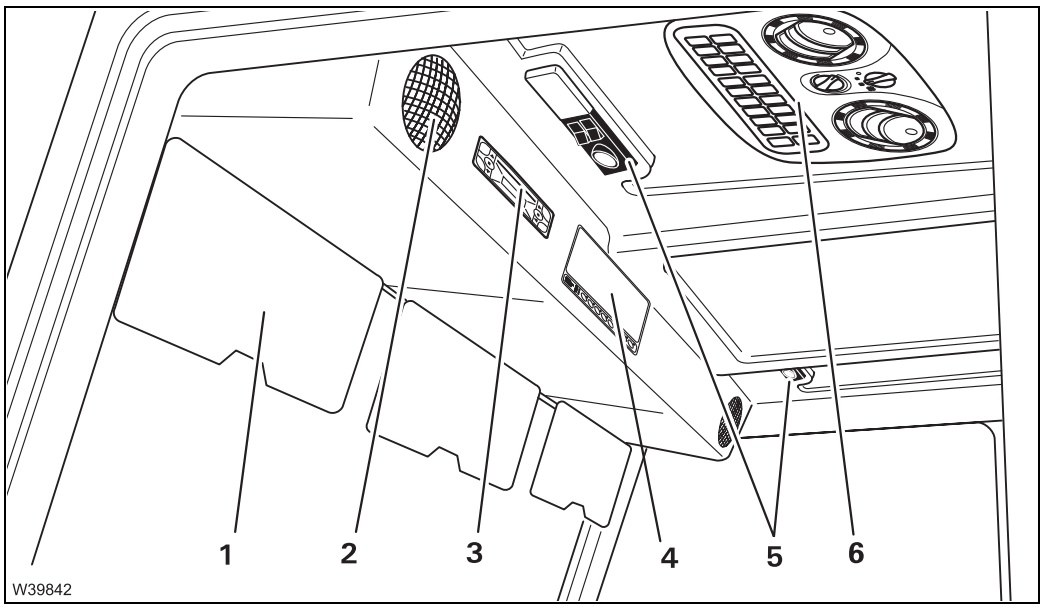
Overhead in the driver's cab



1 Sun visor

2 Loudspeaker[1)]

3 Radio/cassette/CD[1), 2)]

4 Reverse camera monitor[1)] ➠ p. 3 - 40

5 Cab lighting ➠ p. 3 - 48

6 Air-conditioning system[1)] or roof ventilator[1)] ➠ p. 5 - 66

[1)] Additional equipment

[2] ➠ *Separate operating manual*

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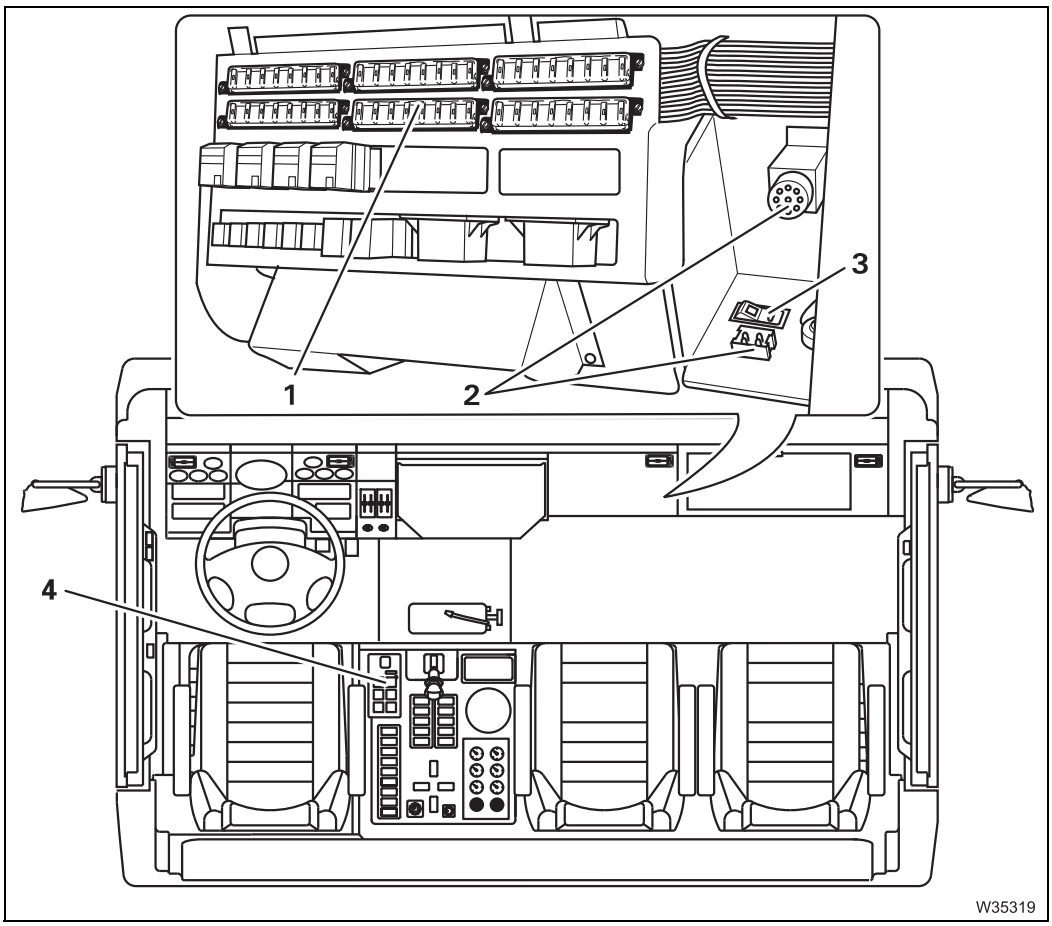
Behind the cover



1 Fuses ➠ p. 7 - 19

2 Diagnostics ➠ p. 3 - 52

3 Hydraulic emergency operation on/off[1)] ➠ p. 14 - 67

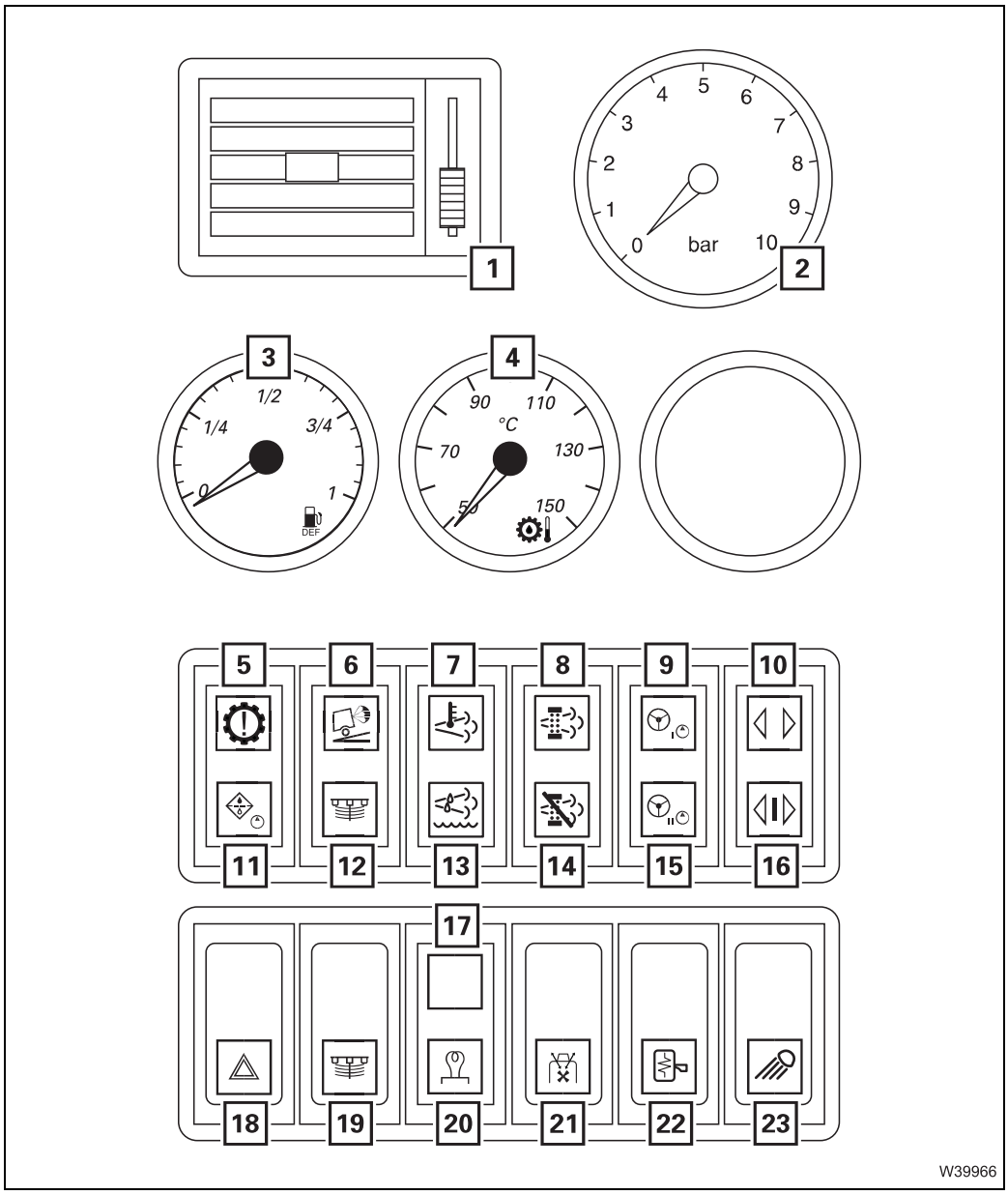
4 Instrument panel – transmission control unit

[1)] Additional equipment

23.10.2018

3.1.3 Instrument panel

Left

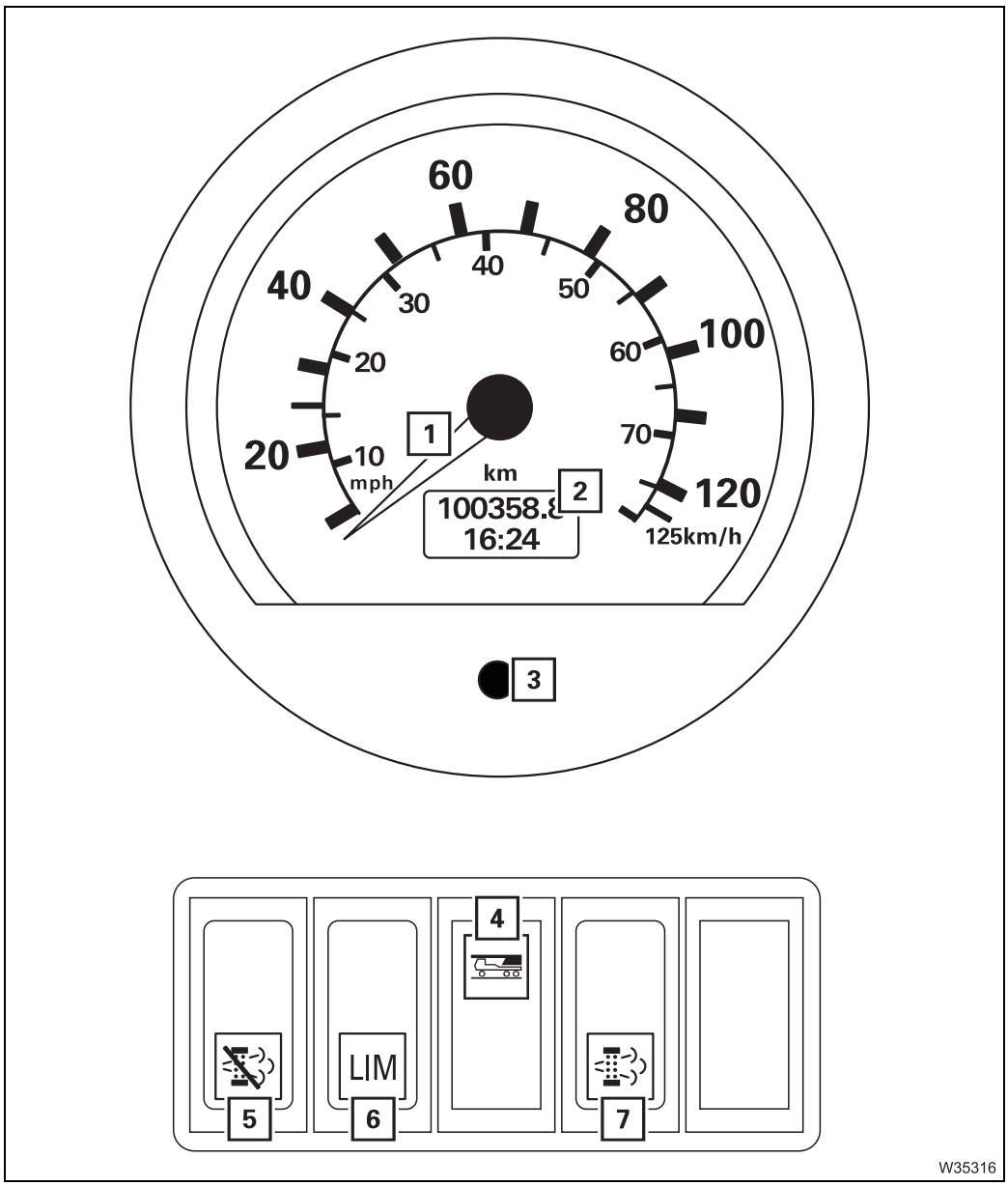


1 Adjusting the air vents ➠ p. 5 - 64
2 Display of supply pressure in brake circuits ➠ p. 3 - 41
3 AdBlue level display ➠ p. 3 - 30
4 Transmission oil temperature display ➠ p. 3 - 37
5 Transmission electronics warning ➠ p. 3 - 37
6 Additional brake monitoring lamp ➠ p. 3 - 42
7 Exhaust system temperature too high ➠ p. 3 - 30
8 Exhaust system cleaning required ➠ p. 3 - 30
9 Steering circuit warning I ➠ p. 3 - 43
10 Turn signal indicator lamp ➠ p. 3 - 46
11 Warning – replace hydraulic oil filter[2)]
12 Suspension on/off signal lamp ➠ p. 3 - 44
13 AdBlue warning ➠ p. 3 - 30
14 Exhaust system cleaning disabled ➠ p. 3 - 31
15 Steering circuit warning II ➠ p. 3 - 43
16 Indicator lamp for trailer turn signal indicator[1)] ➠ p. 3 - 46
17 Exhaust system run-down ➠ p. 3 - 28
18 Hazard warning system on/off ➠ p. 3 - 47
19 Suspension on/off ➠ p. 3 - 44
20 Flame start system ➠ p. 4 - 12
21 Roof fan[1)]
22 Mirror heating
23 Outrigger lighting on/off[2)]

[1)] Additional equipment
[2)] ➠ *Maintenance manual*

23.10.2018

Middle



1	Speed indicator	➠ p. 3 - 51
2	Speedometer display	➠ p. 3 - 51
3	Tachograph malfunction warning	
4	Boom not set down indicator[1)]	➠ p. 3 - 52
5	Disable exhaust system cleaning	➠ p. 3 - 31
6	Overriding torque reduction	➠ p. 3 - 31
7	Manually start exhaust system cleaning	➠ p. 3 - 30
	Engine electronics diagnostics on/off	➠ p. 3 - 29

1) Additional equipment

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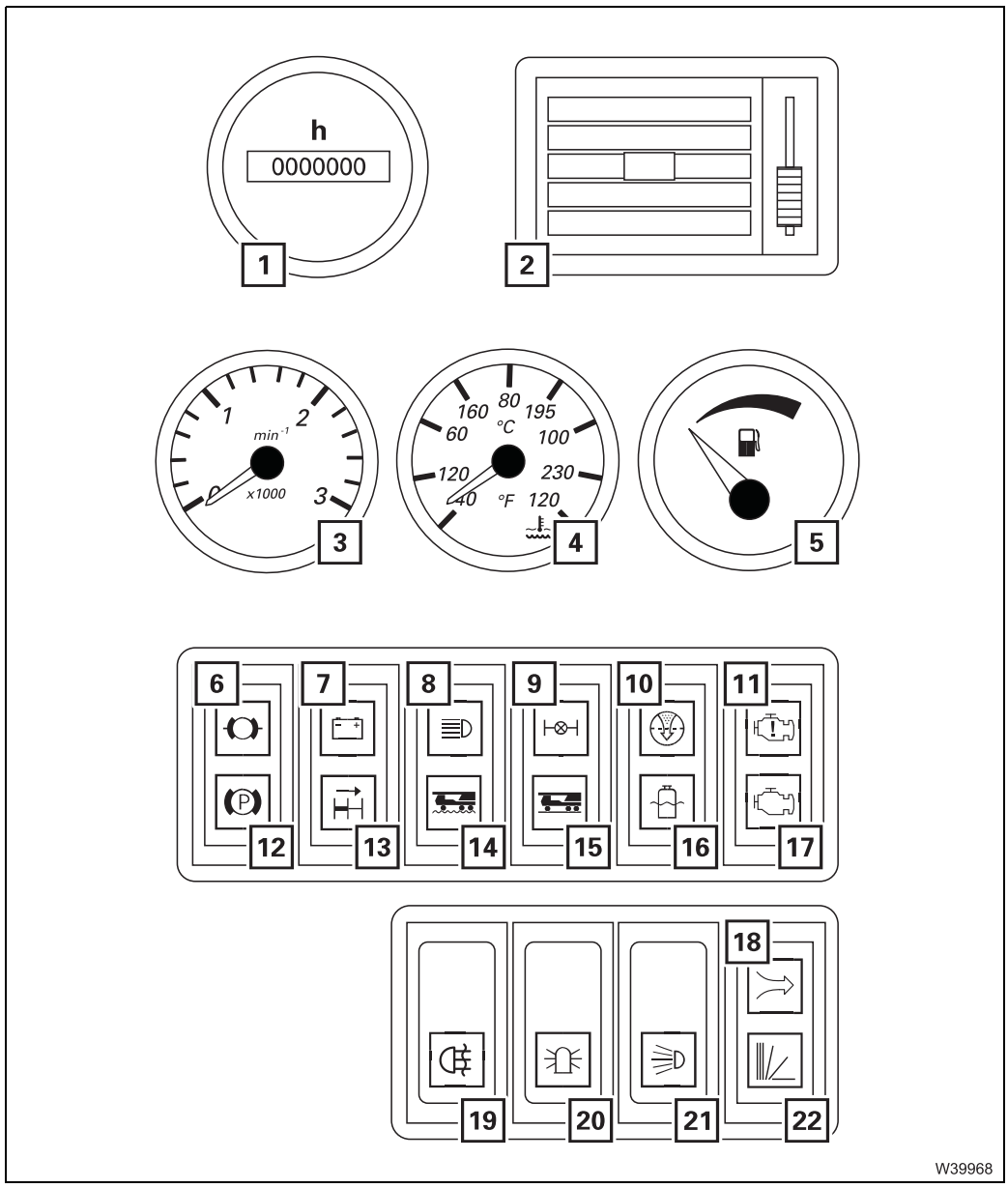
Right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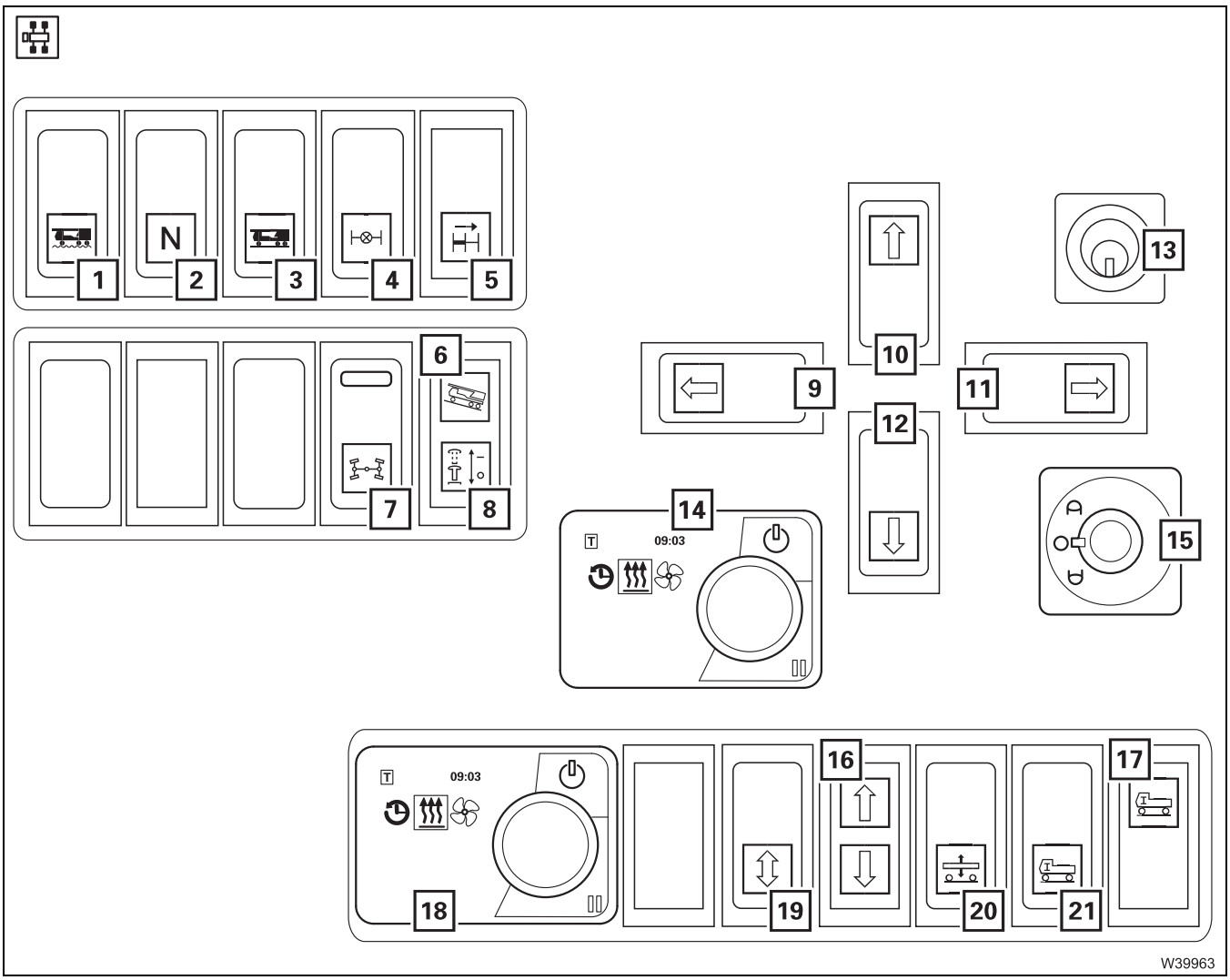
1	Operating hours of the engine	➠ p. 4 - 15
2	Adjusting the air vents	➠ p. 5 - 64
3	Engine speed	➠ p. 4 - 15
4	Coolant temperature	➠ p. 4 - 15
5	Fuel level	➠ p. 4 - 15
6	Warning lamp for brake circuit supply pressure	➠ p. 3 - 41
7	Voltage monitoring warning	➠ p. 3 - 32
8	Full-beam headlight	➠ p. 3 - 46
9	Check transverse differential locks	➠ p. 3 - 39
10	Warning – replace air filter[2)]	
11	Engine malfunction warning	➠ p. 3 - 29
12	Parking brake indicator lamp	➠ p. 3 - 42
13	Longitudinal differential lock indicator lamp	➠ p. 3 - 39
14	Off-road gear on	➠ p. 3 - 38
15	On-road gear on	➠ p. 3 - 38
16	Warning – coolant level too low[2)]	
17	Engine malfunction early warning	➠ p. 3 - 28
18	Air intake inhibitor triggered[1)]	➠ p. 3 - 28
19	Fog tail light/fog light on/off[1)]	➠ p. 3 - 47
20	Rotating beacon on/off	➠ p. 3 - 47
21	Parking light/headlight on/off	➠ p. 3 - 47
22	Collective warning light for carrier	➠ p. 3 - 33

1) Additional equipment

2) ➠ *Maintenance manual*

23.10.2018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1	Off-road gear on	p. 3 - 38
2	Select neutral	p. 3 - 38
3	On-road gear on	p. 3 - 38
4	Transverse differential locks On/off	p. 3 - 39
5	Longitudinal differential lock on/off[1)]	p. 3 - 39
6	transmission mode L	p. 5 - 25
7	Separate steering on/off	p. 3 - 43
8	Warning – steering unlocked	p. 3 - 43
9	lower/raise the front level	p. 3 - 49
10	lower/raise the right level	p. 3 - 49
11	lower/raise the rear level	p. 3 - 49
12	lower/raise the left level	p. 3 - 49
13	Key-operated switch	p. 3 - 33
14	Auxiliary water heating system[1)]	p. 3 - 22
15	Adjusting the mirrors	p. 5 - 8
16	Lift/lower pre-selection level indicator lamp	p. 3 - 49
17	Not on-road level indicator lamp	p. 3 - 50
18	Battery heating[1)]	
19	Lift/lower pre-selection level	
20	Level change overall	p. 3 - 50
21	Setting the on-road level	p. 3 - 50

1) Additional equipment

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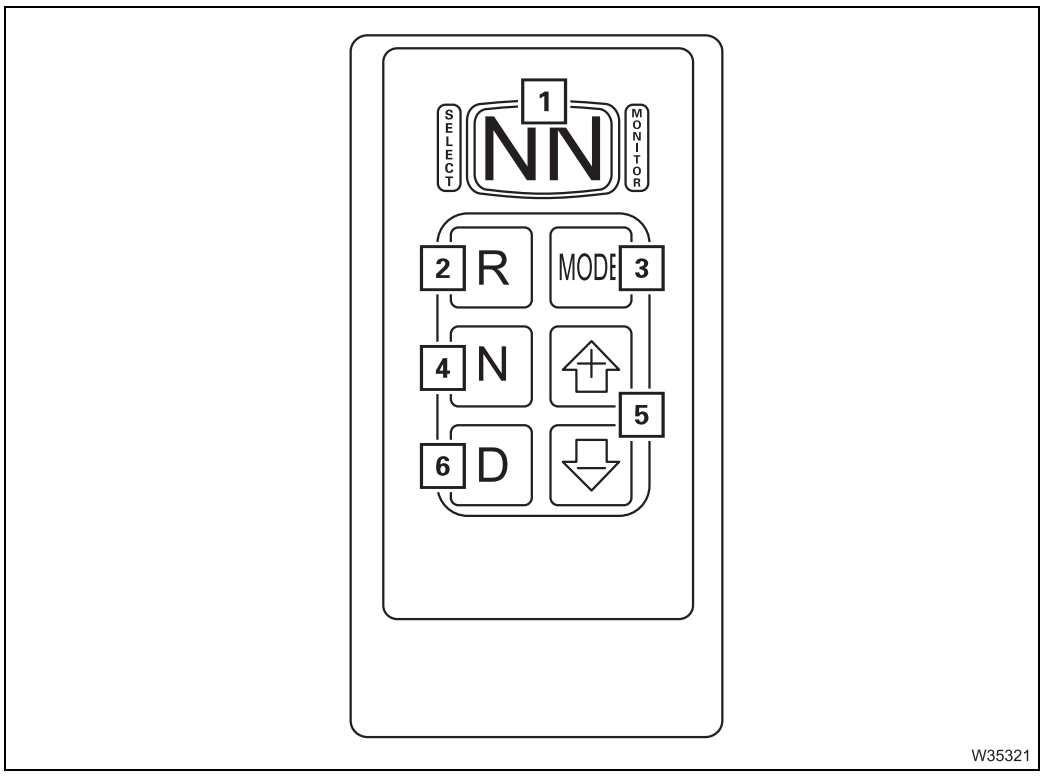
Transmission control unit



1 Transmission display p. 3 - 34

2 Transmission mode R p. 3 - 35
Reverse camera on

3 Changing the driving mode p. 3 - 36

4 Neutral position N p. 3 - 35

5 Selecting a gear p. 3 - 36

6 Transmission mode D p. 3 - 35

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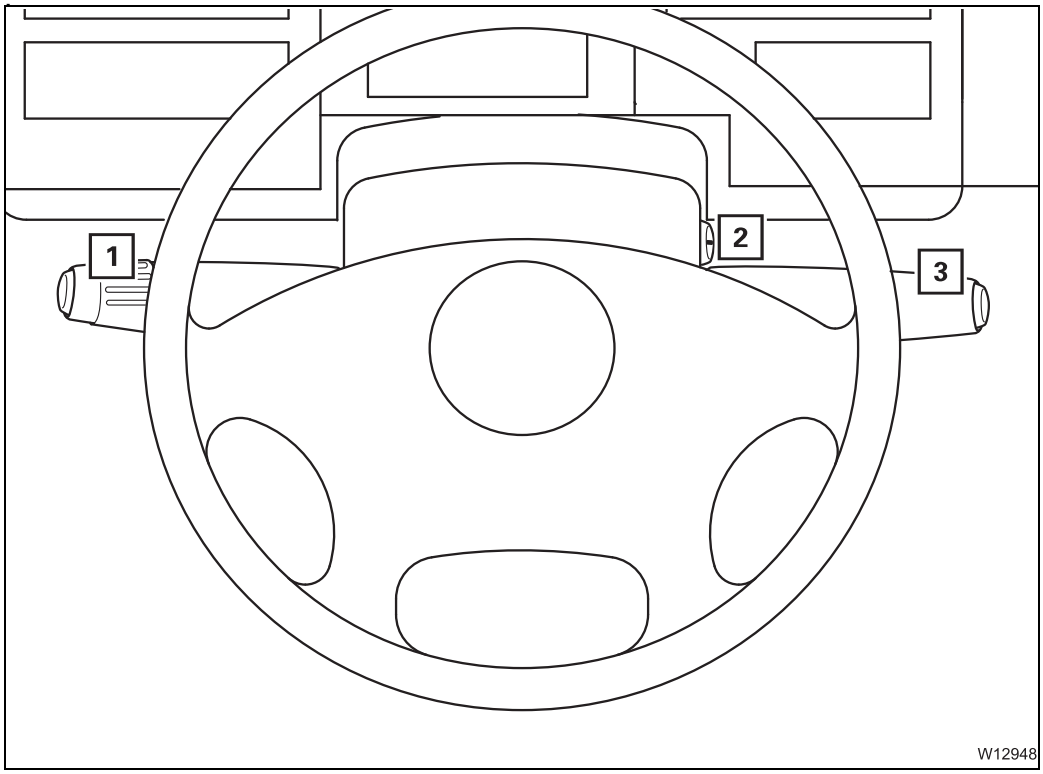
3.1.4 Steering wheel



1 Horn/headlight flasher/headlight – full beam p. 3 - 46
Turn signal indicator/wiper-washing system p. 3 - 46

2 Ignition lock p. 3 - 26

3 – Setting the idling speed p. 3 - 27
– Setting the Tempomat[1)] p. 3 - 27
– Setting the Temposet[1)] p. 3 - 27
– Engine retarder/transmission retarder[1)] p. 3 - 42

[1)] Additional equipment

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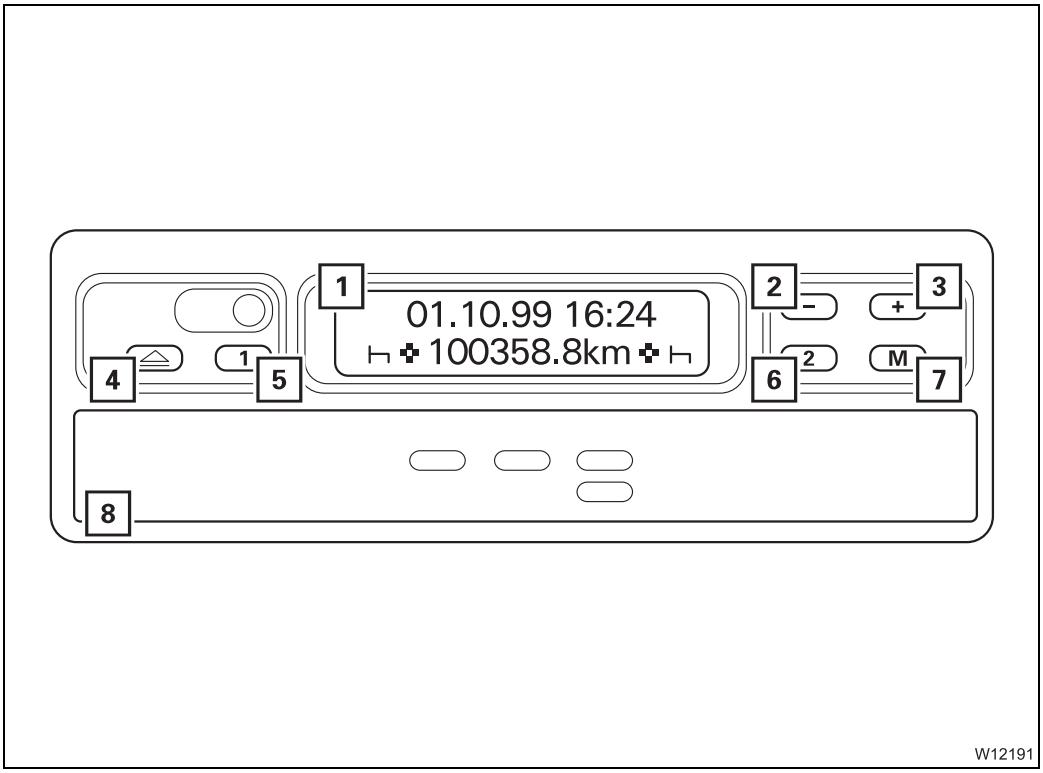
3.1.5 Tachograph



1 Display p. 5 - 19
2 Time correction – p. 3 - 51
3 Time correction + p. 3 - 51
4 Opening the drawer p. 5 - 17
5 Setting time groups – Driver 1 p. 5 - 19
6 Setting time groups – Driver 2 p. 5 - 19
7 Correcting the time p. 3 - 52
8 Drawer p. 5 - 17

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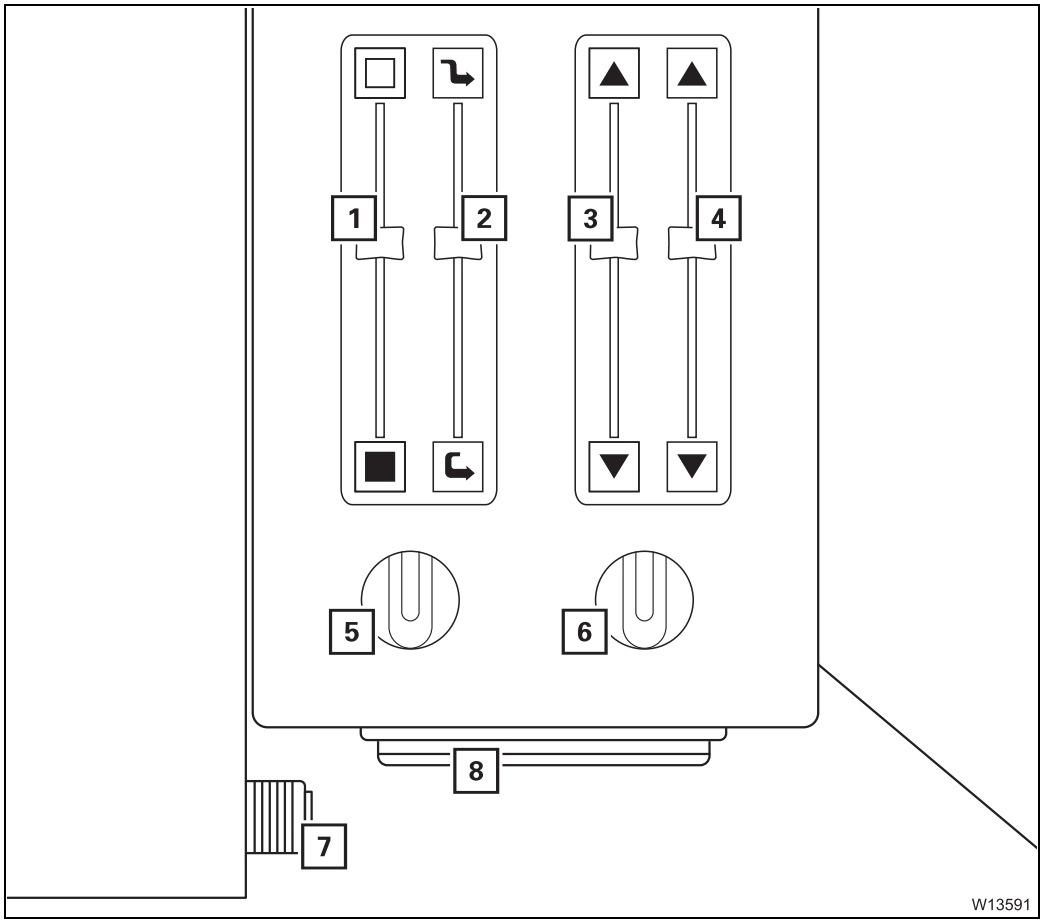
3.1.6 Heating/Air-conditioning system

Standard heating system



1 Setting the temperature ➠ p. 5 - 63
2 Setting fresh air/mixed air/recirculated air ➠ p. 5 - 63
3 Driver's side air distribution ➠ p. 5 - 64
4 Passenger side air distribution ➠ p. 5 - 64
5 Fan, driver's side ➠ p. 5 - 63
6 Fan, passenger side ➠ p. 5 - 63
7 Cigarette lighter
8 Ashtray

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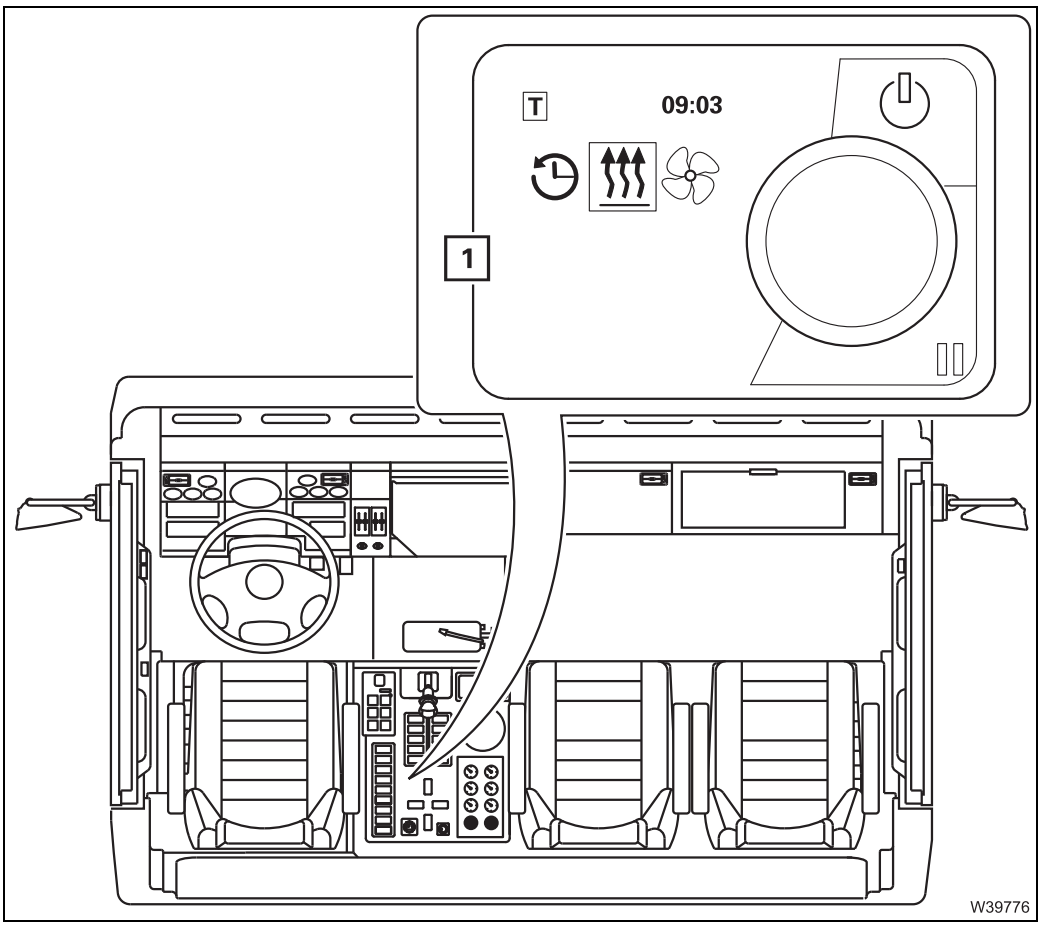
Auxiliary water heating system



1 Heating display and control panel p. 5 - 71

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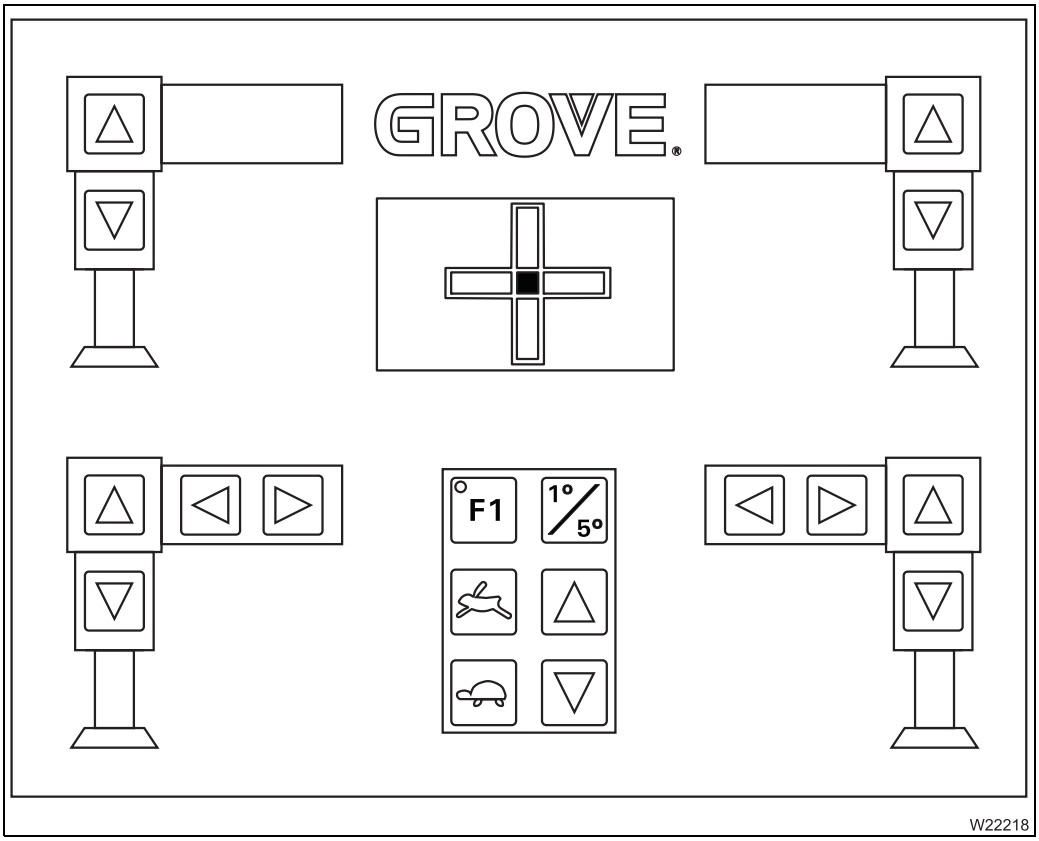
3.1.7 Outrigger control units



➠ *Outrigger control units*, p. 9 - 45.

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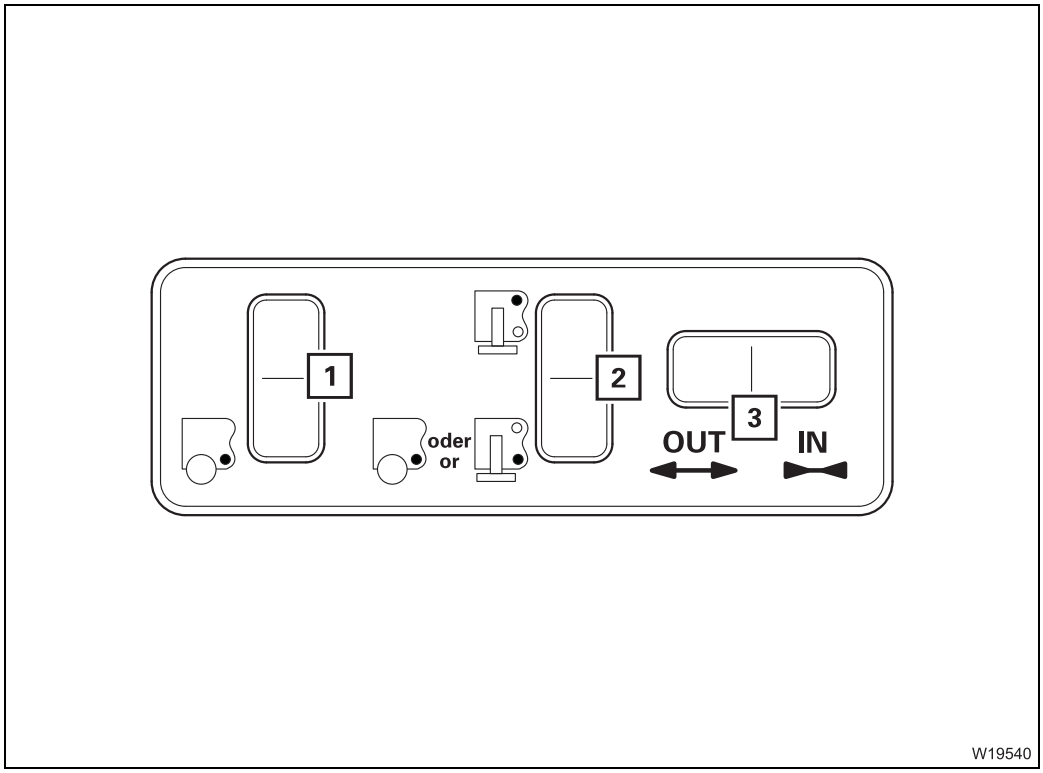
3.1.8 Carrier lock control unit



1 Selection of additional axle/rear outrigger lock[1)] p. 3 - 45

2 Selecting lock for rear outrigger/rear of carrier p. 3 - 45
Selecting lock for additional axle/rear of carrier

3 Establish/disconnect lock p. 3 - 45

[1)] Function **1** Additional equipment

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3.2 Brief description of the operating elements

Risk of accident by operator error!
This section is not a complete operating manual. It only provides a general overview of the functionality of the operating elements.
Before using the operating elements for the first time, read through the following chapters and the safety instructions listed there.

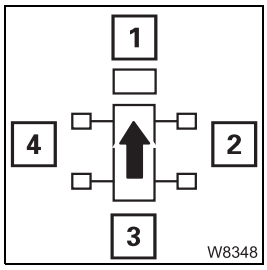
This section does not contain all the requirements that must be fulfilled for several operating elements to be active.
If some operating elements do not work, first read the chapters referred to at the respective places before contacting **Manitowoc Crane Care**.

3.2.1 Definition of direction information

Basic rule

Directions always depend on whether the carrier or the superstructure is being operated.

On the carrier

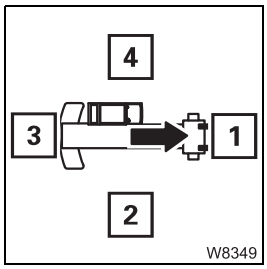


The driver's cab is always at the front, which means that:

1: front **2:** right
3: rear **4:** left

Forwards always means with driver's cab leading.
Backwards always means the rear lights on the carrier are to the front.

On the superstructure



The main boom head is always at the front, which means that:

1: front **2:** right
3: rear **4:** left

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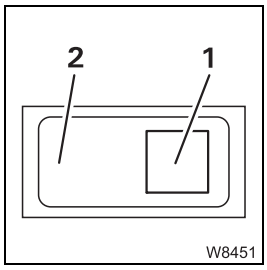
Switches and buttons

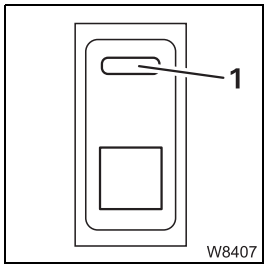
For switches and buttons, the terms at the **bottom** and **top** are used.



Regardless of the fitting position (vertical, horizontal, diagonal, perpendicular or turned), the following always applies:

- **Down:** press (**1**) – next to the symbol
- **Up:** press (**2**) – opposite the symbol

3.2.2 General notes on the operating elements



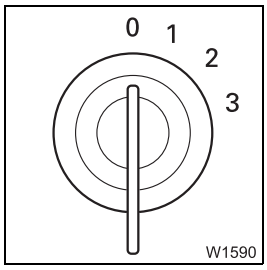
Some switches have a lock button (**1**). The lock button is not mentioned again during operation. The following applies to all switches with a lock button:

- **Switch on:**
  - first press the lock button
  - then press the switch in at the bottom
- **Switch off:** Press the switch in at the top until the lock button latches into place

3.2.3 Engine

Steering column

Ignition lock



- **0** Ignition off, engine off, key can be removed
- **1** Power supply on for:
  Heating, engine/transmission diagnostics, radio/telephone
- **2** Ignition on, driving position
- **3** Starting position

➠ p. 4 - 10

Lock/unlock steering column ➠ p. 5 - 14

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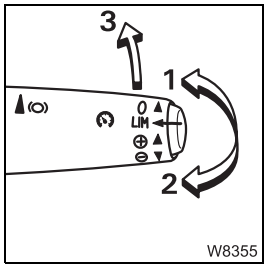
Multipurpose switch

Different functions are carried out by actuating the multipurpose switch in the same way.



– Setting the idling speed

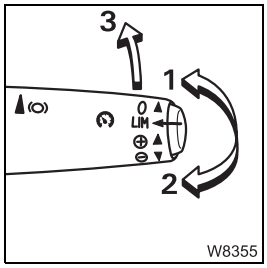
The truck crane must be stationary.

1 Up: Increase idling speed

2 Down: Reduces the idling speed

3 Forward: Idling speed setting off

➠ p. 4 - 17



– Setting the Tempomat

The truck crane drives at a speed of at least 15 km/h (9 mph).

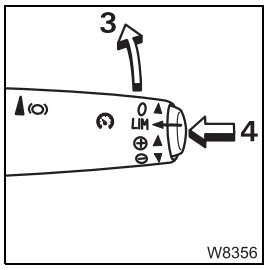
1 Up: Switches on or increases the speed

2 Down: Switches on or reduces the speed

3 Forward: Switch off

Tempomat on = current speed is maintained

➠ p. 5 - 35



– Setting the Temposet

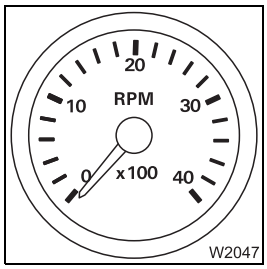
The truck crane drives at a speed of at least 15 km/h (9 mph).

4 Press once: Current speed = maximum

3 Forwards 2 x: Temposet off

➠ p. 5 - 37

Instrument panel



Tachometer

1 Display, engine speed in rpm; ➠ p. 4 - 15

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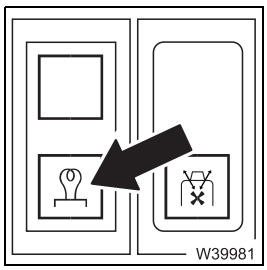
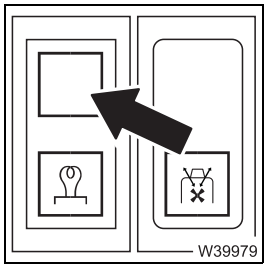


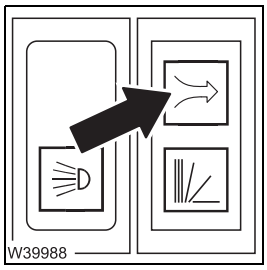
Pre-heating on

– **Lights up:** Engine not ready to start – is being pre-heated
– **Gone out:** Engine ready to start – pre-heating finished



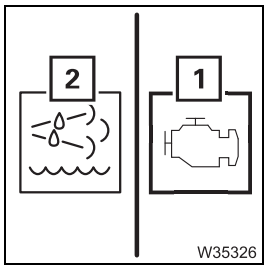
Exhaust system run-down

– **Lights up:** After switching off the engine – the exhaust system runs down for approx. 1 minute
Do not switch off the battery master switch!
– **Gone out:** Run-down finished – battery master switch can be switched off



Air intake inhibitor triggered

– **Lights up:** Air intake inhibitor is triggered – flap closed
– **Gone out:** Air intake inhibitor is not triggered – flap open



Engine malfunction early warning

The lamp (**1**) has various different functions.

When the diagnostic mode is switched off

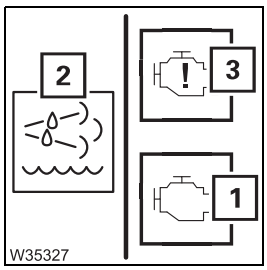
– **Lights up alone**
An engine malfunction is present. Read the error message at the next interruption in driving/crane operation; ➠ p. 7 - 34.

– **Lights up together with the lamp (2)**
The torque reduction is active; ➠ p. 4 - 21.

When the diagnostic mode is switched on

➠ *Diagnostics display*, p. 3 - 29

23.10.2018



Engine malfunction warning

The lamp (**1**) has various different functions.

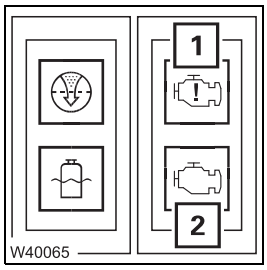
When the diagnostic mode is switched off

– **Lights up alone**
A severe engine malfunction is present.
Stop the truck crane under consideration of the current traffic situation.
Switch off the engine and read the error message; ➠ p. 7 - 34.

– **Lights up together with the lamps (2) and (3)**
The torque reduction is active; ➠ p. 4 - 21.

When the diagnostic mode is switched on

➠ *Diagnostics display*, p. 3 - 29

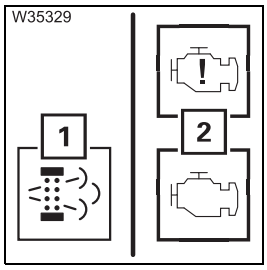


Diagnostics display

The engine electronics diagnostics are switched on.

2	**– Lights up:**	Information – error code display begins or Information – error code display is finished
	– Gone out:	Error code is displayed – flashing code on lamp (**1**) or no error present
1	**– Gone out:**	No error message
	– Flashing	Flashing error code is displayed

Reading error messages, p. 7 - 34



Engine electronics diagnostics on/off

The engine is switched off

1	**– Press down once:**	Engine electronics diagnostics on – the lamps (**2**) show existing errors as a flashing code.

Reading error messages, p. 7 - 34

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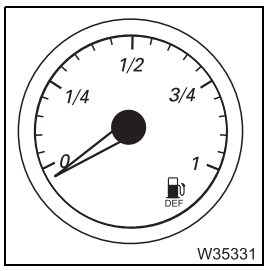
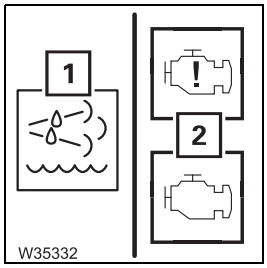
3.2.4 AdBlue exhaust system



AdBlue level display

Shows the current filling level in the AdBlue tank; ➠ *AdBlue tank*, p. 4 - 8.



AdBlue warning

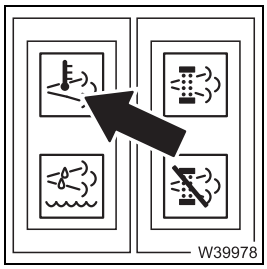
1 – Lights up: AdBlue supply is used up or malfunction in the exhaust system

– Flashing: Torque reduction advance warning or

Torque reduction active – additional display on lamps (**2**)

– Gone out: AdBlue supply is sufficient, no malfunction in the exhaust system

➠ *Torque reduction*, p. 4 - 21

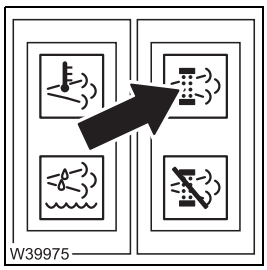


Exhaust system temperature too high

– Lights up: Maximum operating temperature exceeded

– Gone out: Maximum operating temperature not reached

➠ *Cleaning the exhaust system*, p. 4 - 24



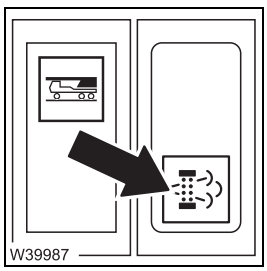
Exhaust system cleaning required

– Lights up: Cleaning required

– Flashing: Cleaning procedure running

– Gone out: Cleaning not required

➠ *Cleaning the exhaust system*, p. 4 - 24



Manually start exhaust system cleaning

The engine must be running.

– Press down once: Manual cleaning starts

➠ *Cleaning the exhaust system*, p. 4 - 24

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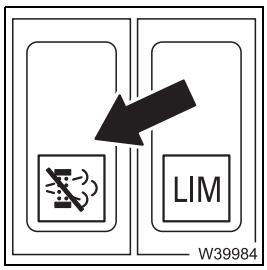
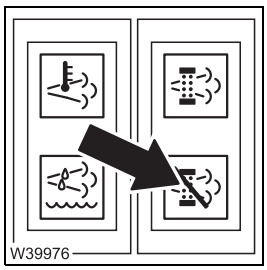


Disable exhaust system cleaning

– **In at the bottom:** Disable automatic and manual cleaning
– **In at the top:** Enable automatic and manual cleaning

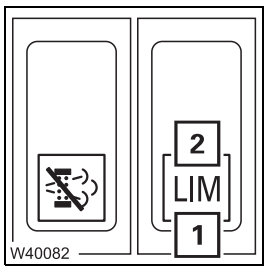
➠ *Cleaning the exhaust system*, p. 4 - 24



Exhaust system cleaning disabled

– **Lights up:** Cleaning disabled
– **Gone out:** Enable automatic and manual cleaning

➠ *Cleaning the exhaust system*, p. 4 - 24



Overriding torque reduction

The torque reduction is active

1 – **Press down once:** – Lamp (**2**) on
– Torque reduction overridden

after 30 minutes: – Lamp (**2**) goes off
– Torque reduced

– **Press down once:** Reaction as described above
– **Press down once:** Reaction as described above

After this, the button has no function until the next time the engine is restarted; ➠ *Overriding torque reduction*, p. 4 - 23

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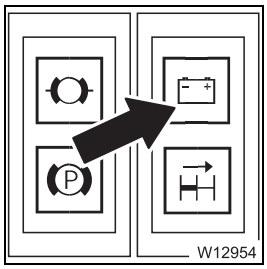
3.2.5 Electrical system

Electrical system

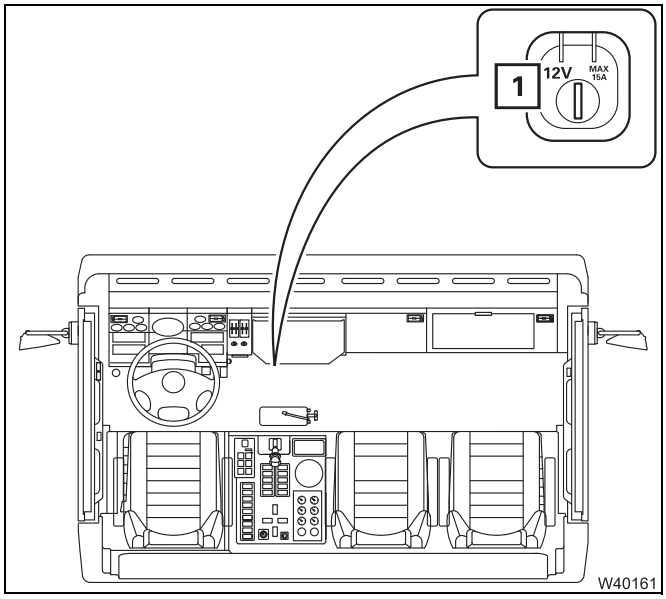


Voltage monitoring warning

- **Lights up:** Engine off – ignition on
  or
  Engine on – power failure – switch off engine
- **Gone out:** Engine on – no malfunction

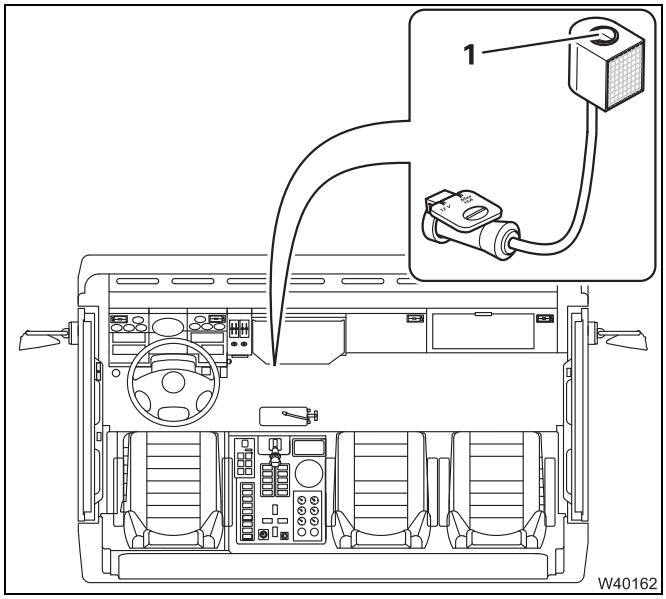
➠ p. 4 - 10, ➠ p. 4 - 14

Socket 12 V



Only connect electrical devices with the matching specification to the sockets.

Reading lamp 12 V



As additional equipment, the truck crane is equipped with a reading lamp.

- If necessary, plug the 12 V reading lamp into the 12 V socket.
- Press the button (**1**) – lamp on/off.

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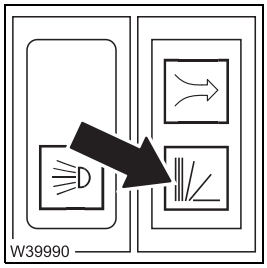
Electronics

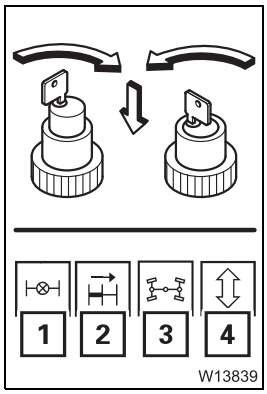


Collective warning light for carrier

– **Flashing:** Error message – error code is stored
– **Gone out:** No malfunction

Key-operated switch

The truck crane drives slower than approx. 5 km/h (3 mph).



– **Switch on:** Turn the key to the right, push in the switch and turn the key to the left – the switch latches into place.

The following switches are released – depending on your positions, the corresponding switching operations will be executed:

– Transverse differential locks on/off (**1**).
– Longitudinal differential lock on/off (**2**).
– Separate steering on/off (**3**).
– Lift/lower preselection level (**4**).

The transmission shifts up to a maximum of 6th gear. The transmission shifts up to the 6th gear maximum. If the transmission is in a higher gear when switched on, the speed limit is only active after it is shifted down into the 6th gear.

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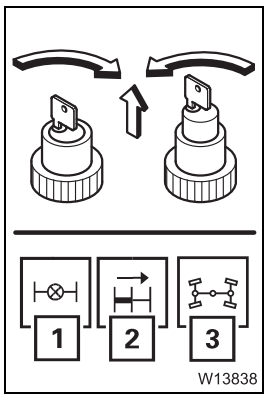


– **Switch off:** Turn the key to the right – the switch disengages, remove the key

The following gear shifts are executed – regardless of the positions of the corresponding switch:

– Transverse differential locks off (**1**).

– Longitudinal differential lock off (**2**).

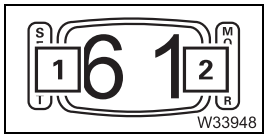
– Separate steering off (**3**).

3.2.6 Transmission

Transmission display

– Neutral position **N** switched on

– Gear position **R** switched on



– Gear position **D** switched on

1 Currently selected gear

2 Highest possible gear, 1 to 7 possible
– Number flashing – engine off

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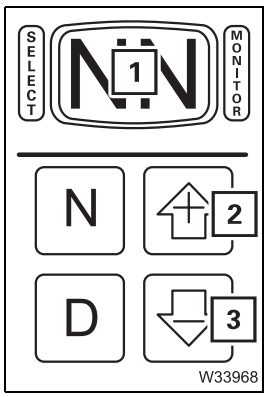


– For diagnostics and oil-level gauge

1 Continuous character string for error/oil level

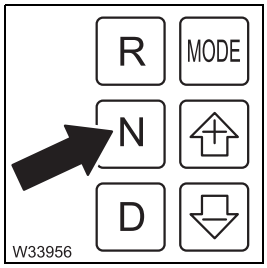
– For diagnostics

1 Displayed error is active

2 Press button once – display of next error

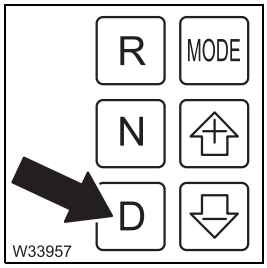
3 Press button once – display of previous error

Switching on diagnostics/oil-level gauge; ➠ p. 3 - 37



Neutral position N

– **Press once:** Neutral position on – no gear engaged



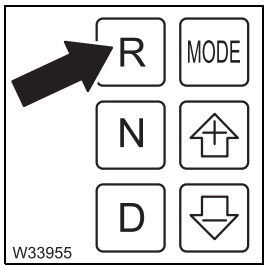
Transmission mode D

Press once

– **At a standstill:** Select forwards starting gear

– **For driving forwards:** Suitable gear on – clutch engages

– **For driving in reverse:** At first no gear change,
Just before standstill – forward gear on



Transmission mode R

Press once

– **At a standstill:** Select reverse starting gear

– **For driving in reverse:** Suitable gear on – clutch engages
Reverse camera on

– **For driving forwards:** At first no gear change,
Just before standstill – reverse gear on

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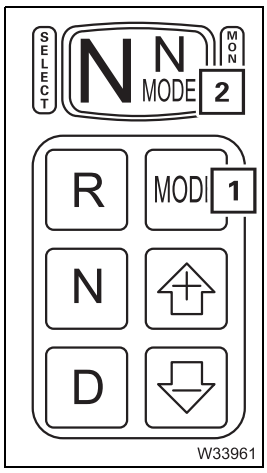
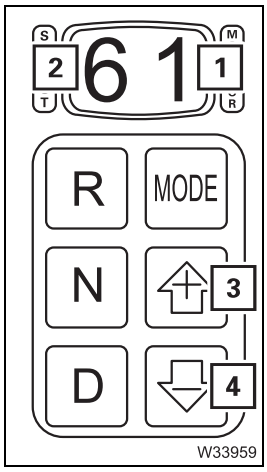


Changing the driving mode

1	**Press the button once:**	Driving mode switches to other driving mode
2	**– Lights up:**	Driving mode **P** on (Power) Gear change at high engine speed
	– Gone out:	Driving mode **E** on (Economy) Gear change at low engine speed

Additional function; ➠ *For diagnostics*, p. 3 - 35



Selecting a gear

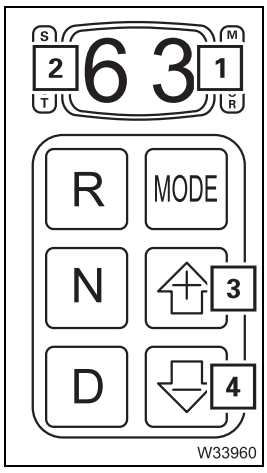
– The truck crane is stationary – starting gear engaged

1 Starting gear

2 Highest possible gear

3	Press the button once:	Highest possible gear +1 If starting gear = highest possible gear, depending on driving mode – starting gear +1
4	Press the button once:	Highest possible gear -1 If highest possible gear = starting gear, starting gear -1

➠ p. 5 - 25



– The truck crane is in motion

1 Current gear

2 Highest possible gear

3	Press the button once:	Highest possible gear +1 Depending on driving mode – current gear +1
4	Press the button once:	Highest possible gear -1 Depending on driving mode – current gear -1

➠ p. 5 - 25

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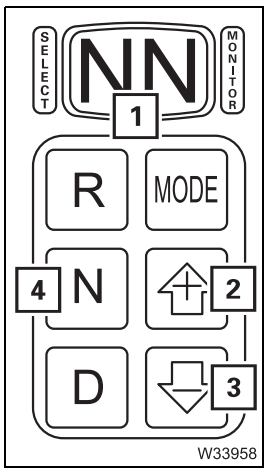
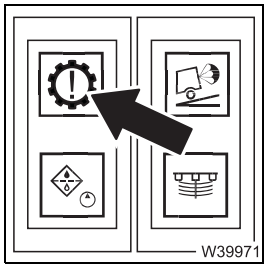


– Additional function, oil-level gauge – the truck crane is stationary
  – **Switch on:** Press buttons (**2**) + (**3**) once –
    Display (**1**) switched to oil-level gauge
  – **Switch off:** Press button (**4**) once

➠ p. 5 - 29

– Additional function, diagnostics – the truck crane is stationary
  – **Switch on:** Press buttons (**2**) + (**3**) twice –
    Display (**1**) switched to error display
  – **Switch off:** Press button (**4**) once or
    Press buttons (**2**) + (**3**) once

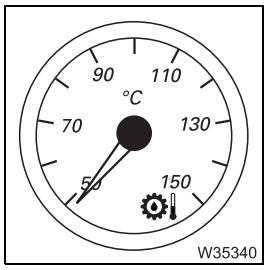
➠ p. 5 - 31



Transmission electronics warning

– **Lights up:** Severe malfunction; the warning buzzer sounds – stop truck crane
– **Gone out:** No severe malfunction

➠ p. 5 - 33



Transmission oil temperature display

Displays the gear oil temperature in °Celsius.

– Normal operating temperature: 70 - 90 °C (158 - 194 °F)
– Maximum constant temperature: 105 °C (221 °F)
– Maximum short-term temperature when driving: approx. 130 °C (266 °F)
– Maximum short-term temperature in retarder mode: approx. 165 °C (329 °F)

➠ p. 4 - 15

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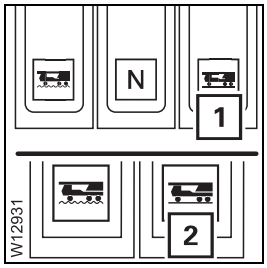
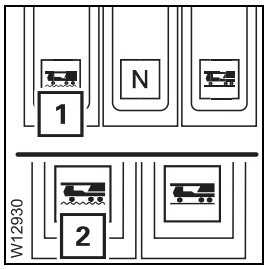
3.2.7 Transfer case

Transfer case – switching on off-road/on-road gears, p. 5 - 51



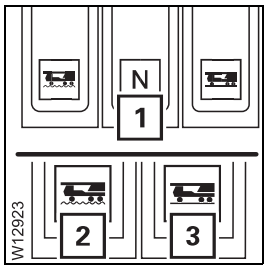
On-road gear on

1 Press button once – lamp (**2**) lights up.



Off-road gear on

1 Press button once – lamp (**2**) lights up.



Select neutral

1 Press button once – lamps (**2**) and (**3**) go out.

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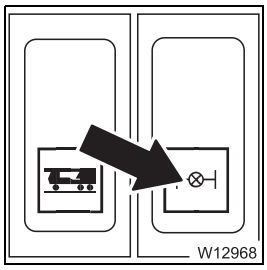
3.2.8 Final drive

Transverse differential locks

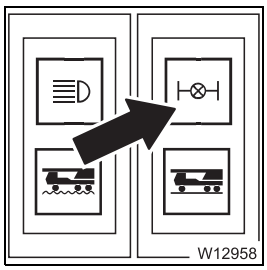


Transverse differential locks on/off

The key-operated switch is switched on.

- **In at the bottom:** Switch on
- **In at the top:** Switch off

➠ p. 5 - 53

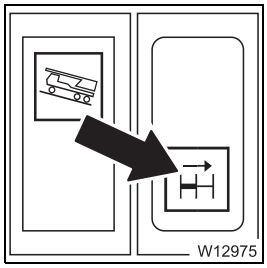


Check transverse differential locks

- **Lights up:** Transverse differential locks on
- **Flashing:** Intermediate position
- **Gone out:** Transverse differential locks off

➠ p. 5 - 53

Longitudinal differential lock



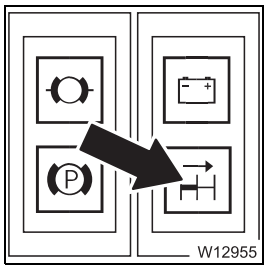
Longitudinal differential lock on/off

The key-operated switch is switched on.

- **In at the bottom:** Switch longitudinal differential lock and the drive for the 4th axle line on.
- **In at the top:** Switch longitudinal differential lock and the drive for the 4th axle line off.

➠ p. 5 - 52

Switches the longitudinal differential locks in the transfer case and the 4th. axle line and, in with additional equipment, the drive of the 2nd axle line on and off.



Longitudinal differential lock indicator lamp

- **Lights up:** Longitudinal differential lock on
- **Gone out:** Longitudinal differential lock off

➠ p. 5 - 52

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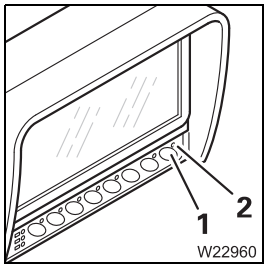
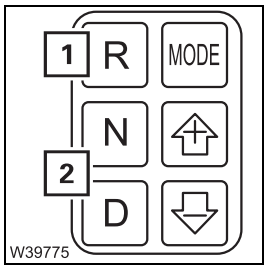
3.2.9 Reverse camera



Reverse camera monitor

1 – Switch on: Press button once – lamp (**2**) lights up.

– Switch off: Press button once – lamp (**2**) turns off.

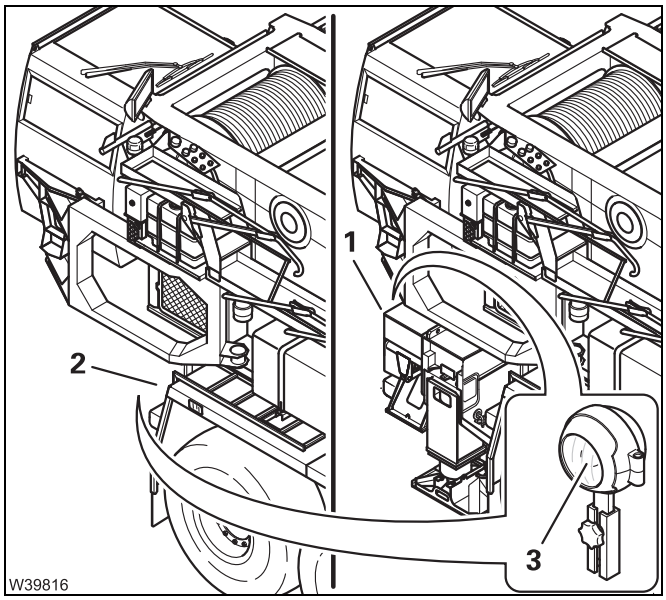


Reverse camera on/off

1 – Switch on: Select the *reverse* driving direction – the *reverse camera* monitor shows the area behind the truck crane.

2 – Switch off: Select *forwards* direction of travel or switch the transmission to the neutral position.

➠ *Adjusting the reverse camera*, p. 5 - 9



- Mount the reverse camera (**3**) according to the driving state:
  - on the outrigger box (**1**) or
  - on the carrier (**2**); ➠ *Installing the reverse camera*, p. 6 - 50.
- Align the reverse camera (**3**) so that the monitor provides a good overview of the area behind the truck crane.

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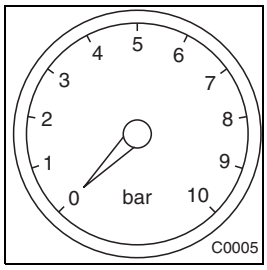
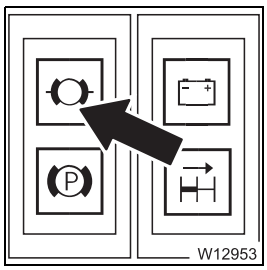
3.2.10 Brakes

Service brake



Display of supply pressure in brake circuits

Shows the current supply pressure in the brake circuits in bar (two pointers);
➠ p. 5 - 43.



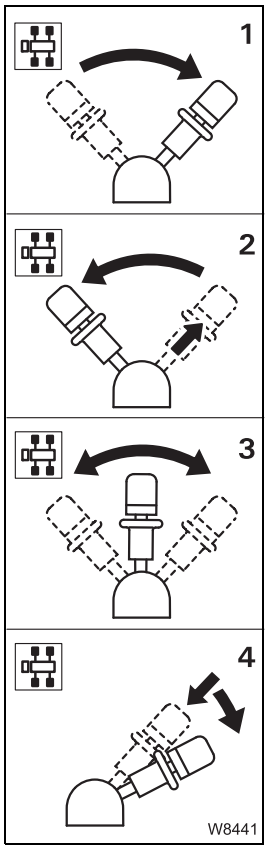
Warning lamp for brake circuit supply pressure

– **Lights up:** Supply pressure below approx. 5 bar (7 psi)

– **Gone out:** Supply pressure above 5.5 bar (80 psi)

➠ p. 5 - 43

Parking brake



1 To engage the parking brake: Pull the parking brake lever back until it locks into place

2 To release the parking brake: Raise the locking ring and push the parking brake lever forwards as far as it will go

3 To operate as an auxiliary brake: Shift the parking brake lever to intermediate position
The braking force is increased continuously by moving the lever from the front to the rear.

4 Test position for towing a trailer:
– Pull the parking brake lever back until it locks into place
– Press in the parking brake lever and pull it further backwards

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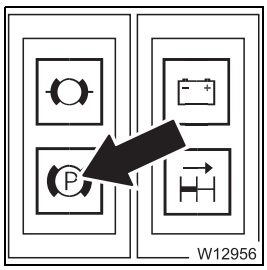
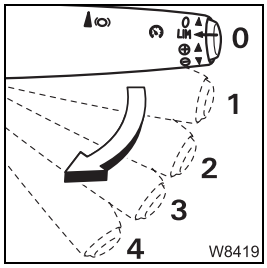


Parking brake indicator lamp

– **Lights up:** Parking brake applied
– **Gone out:** Parking brake released

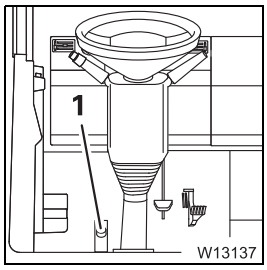
Additional brakes Engine retarder/transmission retarder; ➠ *Additional brakes*, p. 5 - 40

Multipurpose switch



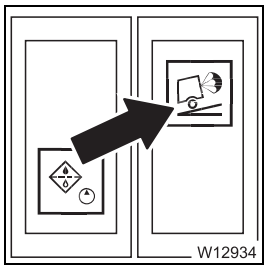
0 Forward: Engine retarder[1)] and transmission retarder off
1 Back: Engine retarder[1)], transmission retarder 25%
2 Back: Engine retarder[1)], transmission retarder 50%
3 Back: Engine retarder[1)], transmission retarder 75%
4 Back: Engine retarder[1)], transmission retarder 100%

[1)] Only with standard equipment



Engine retarder

– **Switch on:** Press button (**1**)
– **Switch off:** Release button (**1**)



Additional brake monitoring lamp

– **Lights up:** Engine retarder/transmission retarder on
– **Gone out:** Engine retarder/transmission retarder off

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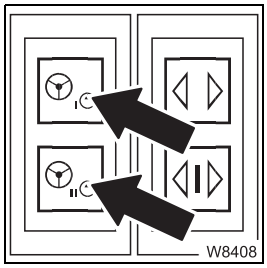
3.2.11 Steering/separate steering

➠ *Separate steering*, p. 5 - 60

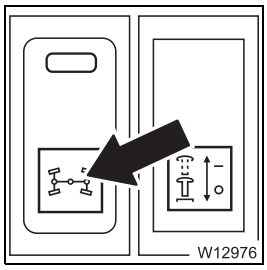
Instrument panels



Warning lamp for steering circuit I and steering circuit II

- **Lights up:** approx. 10 km/h (6 mph) not reached
  or
  with 1 lamp – sluggish steering
  with 2 lamps – steering faulty – stop
- **Gone out:** Approx. 10 km/h (6 mph) exceeded, and steering OK.

➠ p. 5 - 33

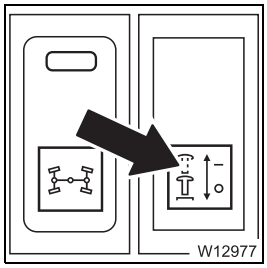


Separate steering on/off

The key-operated switch is switched on.

- **In at the bottom:** Switch on
- **In at the top:** Switch off

➠ p. 5 - 60

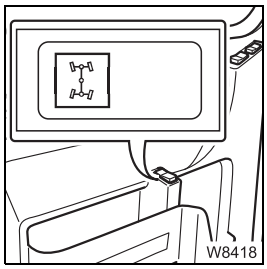


Warning – steering unlocked

- **Lights up:** Unlocked – switching status for separate steering
- **Flashing:** Intermediate position
- **Gone out:** Locked – switching status for normal steering

➠ p. 5 - 60

In the driver's door



Separate steering

The separate steering is switched on.

- **Left:** 6th and 7th axle lines – turn to the left
- **Right:** 6th and 7th axle lines – turn to the right

➠ p. 5 - 61

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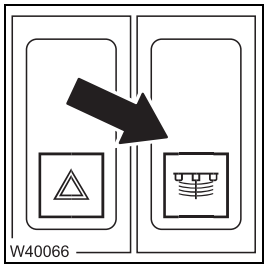
3.2.12 Suspension

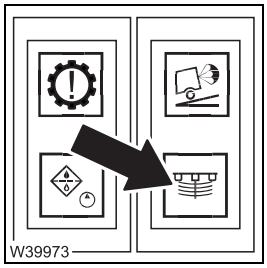
➠ *Switching the suspension on/off*, p. 5 - 15.



Suspension on/off

- **In at the bottom:** switch off – lock suspension cylinders (crane operation)
- **In at the top:** switch on – release suspension cylinders (on-road driving)

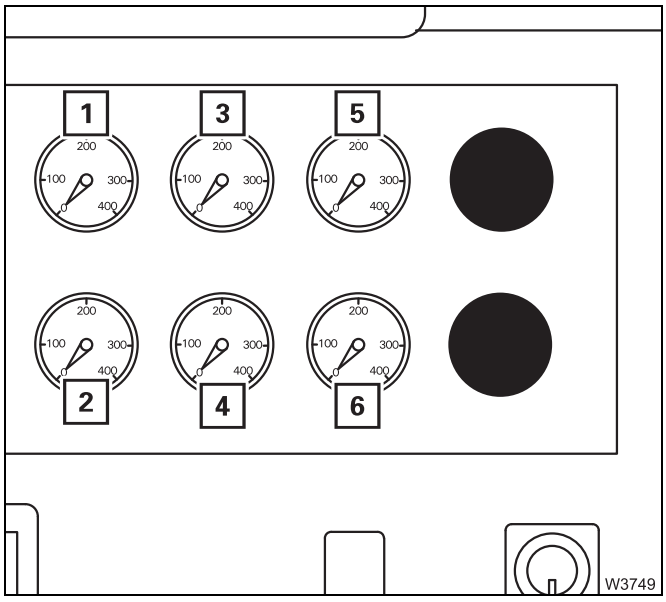
➠ p. 5 - 15



Suspension on/off signal lamp

- **Lights up:** Suspension off – blocked for crane operation
- **Gone out:** Suspension on – enabled for on-road driving

➠ p. 5 - 15



Suspension operating pressure gauge

The following connections are under the covering.

1 Suspension pressure for 1st, 2nd and 3rd axle line to the right

2 Suspension pressure for 1st, 2nd and 3rd axle line to the left

3 Suspension pressure for 4th and 5th axle line to the right

4 Suspension pressure for 4th and 5th axle line to the left

5 Suspension pressure for 6th and 7th axle line to the right

6 Suspension pressure for 6th and 7th axle line to the left

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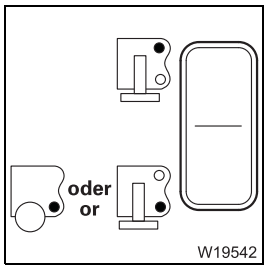
3.2.13 Hydraulic system

Carrier lock control unit

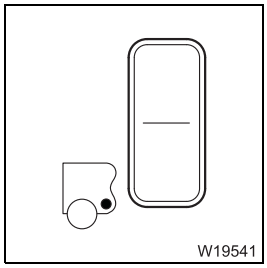


Selecting lock for rear outrigger/rear of carrier

- **In at the top:** The upper lock is selected
- **In at the bottom:** The lower lock is selected

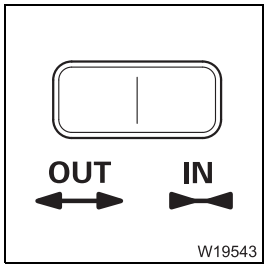
Selecting lock for additional axle/rear of carrier

- **In at the bottom:** The lower lock is selected



Selection of additional axle/rear outrigger lock

- **In at the bottom:** The lower lock is selected



Establish/disconnect lock

A lock is selected.

- **press right:** Disconnect the lock (pins retract)
- **press left:** Establish the lock (pins extend)

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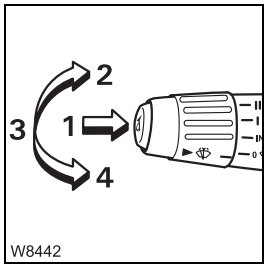
3.2.14 Lighting/windscreen wipers/horn

Steering column Multipurpose switch

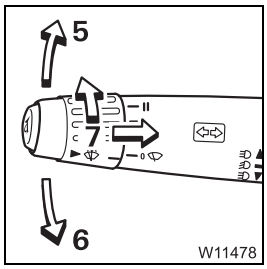


Horn/headlight flasher/headlight – full beam

1	**Horn**	Press the button
2	**Headlight flash**	Upwards

The parking light/headlight must be switched on:

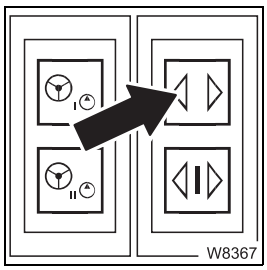
3	**Parking light/headlight**	Middle position
4	**Full-beam headlight**	Down – latches into place



Turn signal indicator/wiper-washing system

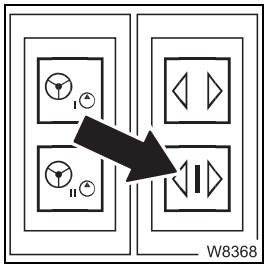
5	**Right turn signal indicator:**	Forwards
6	**Left turn signal indicator:**	Backwards
7	**Windscreen wiper/washing system:**	Press
7	**Windscreen wiper:**	Turn – off (0), intermittent, slow, fast

Instrument panel



Turn signal indicator lamp

1	**– Flashing:**	Turn signal indicator on
	– Gone out:	Turn signal indicator off, or turn signal indicator on and filament lamp defective



Indicator lamp for trailer turn signal indicator

– Flashing:	Turn signal indicator on and trailer electrically connected
– Flashes once:	Turn signal indicator on and trailer not electrically connected
– Gone out:	Turn signal indicator off

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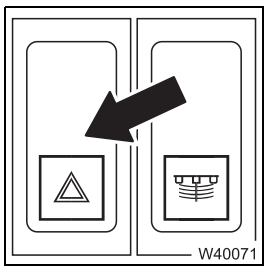
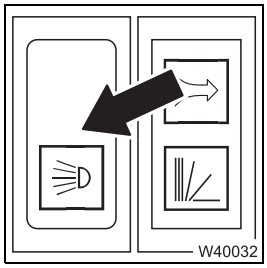


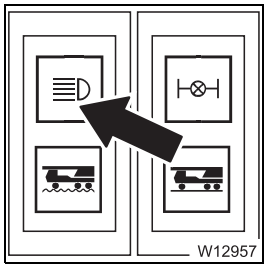
Hazard warning system on/off

- **Switch on:** Press in at the bottom – light in the switch flashes
  If not flashing – lamp is defective.
- **Switch off:** Press in at the top



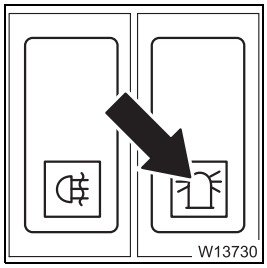
Parking light/headlight on/off

- **To switch off the light:** Press in at the top
- **Parking light:** Middle position – instrument lighting on
- **Headlight:** Press in at the bottom – instrument lighting on



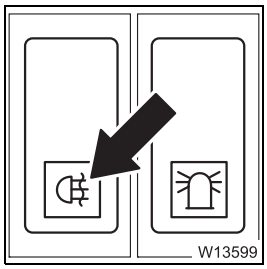
Full beam headlight indicator lamp

- **Lights up:** Headlight – full beam on
- **Gone out:** Headlight – full beam off



Rotating beacon on/off

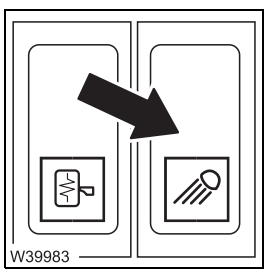
- **Switch on:** Press in at the bottom
- **Switch off:** Press in at the top



Fog tail light/fog light on/off

The headlight is switched on.

- **Fog light/fog tail light off:** Press in at the top
- **To switch on the fog light:** In middle position
- **Fog light/fog tail light on:** Press in at the bottom – the lamp in the switch lights up.



Outrigger lighting on/off

- **Switch on:** Press in at the bottom
- **Switch off:** Press in at the top

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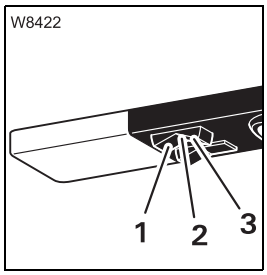
Overhead in the driver's cab

The lamps on the driver's and passenger's side are identical.

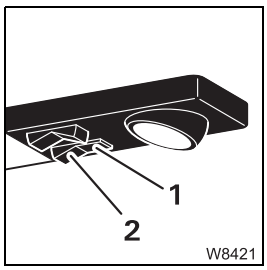


Cab lighting

1 Always on

2 Always off

3 On/off via door contact



Reading lamp

1 On

2 Off

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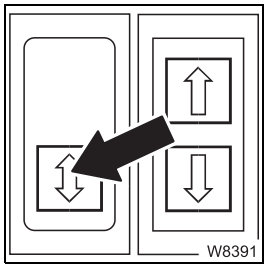
3.2.15 Level adjustment system

➠ *Operating the level adjustment system*, p. 5 - 54.

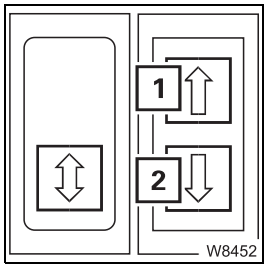
Instrument panel



Lift/lower pre-selection level

- **In at the bottom:** Preselect lowering
- **In at the top:** Preselect lifting

➠ p. 5 - 56



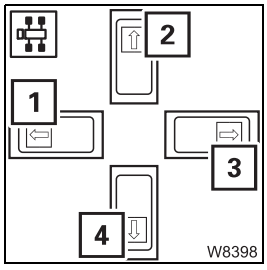
Lift/lower pre-selection level indicator lamp

The key-operated switch is switched on.

- **1 Lights up:** Lifting preselected
- **2 Lights up:** Lowering preselected

A lamp lights continuously

➠ p. 5 - 56



Change of front/right/rear/left level

The key-operated switch and the suspension are switched on.

- **1 Press down:** lower/raise the front level
- **2 Press down:** lower/raise the right level
- **3 Press down:** lower/raise the rear level
- **4 Press down:** lower/raise the left level

➠ p. 5 - 56

Movement stops after the button is released and when an end position is reached.

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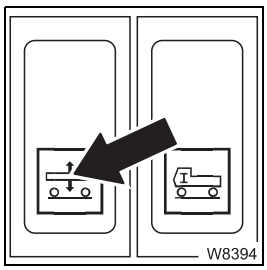
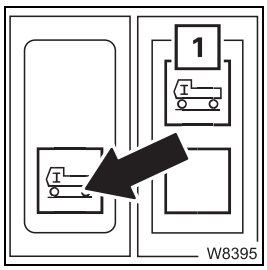


Level change overall

The key-operated switch is switched on.
The suspension is switched on.

– **Press down:** Evenly lift/lower the level overall

p. 5 - 56

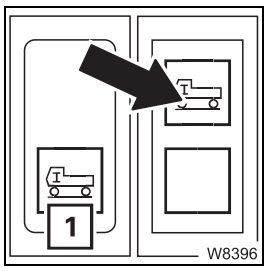


Setting the on-road level

The key-operated switch is switched on.
The suspension is switched on.

– **Press down:** The level is changed until the on-road driving level is reached – lamp (**1**) goes out.

p. 5 - 57



Not on-road level indicator lamp

The key-operated switch is switched on.
The button (**1**) is activated.

– **Lights up:** No on-road driving level reached

– **Gone out:** On-road driving level reached

p. 5 - 57

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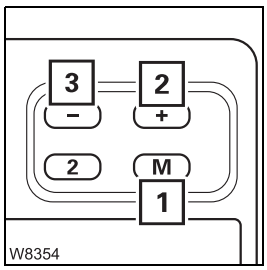
3.2.16 Tachograph/speedometer

➠ *Setting the tachograph*, p. 5 - 16.

Tachograph

Correcting the time:



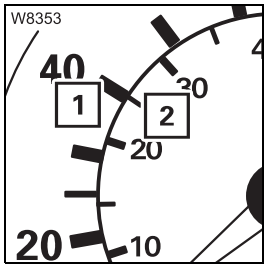
1 Open the time menu: Press the button – the time correction menu opens

2 Time correction +: Press the button – the time is increased

3 Time correction –: Press the button – the time is decreased

Speedometer

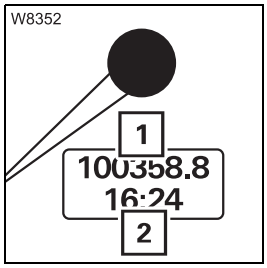
Displays the speed, route and time:



Speed indicator

1 Indicates the speed in km/h

2 Indicates the speed in mph

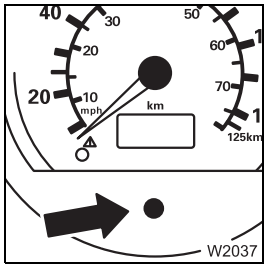


Speedometer display

The ignition must be switched on.

1 Overall route in kilometres –
Position after the decimal point: 1 = 100 m (33 ft)

2 Displays the time or day's kilometres as required



Display time/day's kilometres

– To switch over the display: Press button once – the display switches between the time and the day's kilometres.

– To reset the day's kilometres to zero:

1. Switch over to day's kilometres
2. Press the button for longer than two seconds

   The day's kilometres display will be set to zero.

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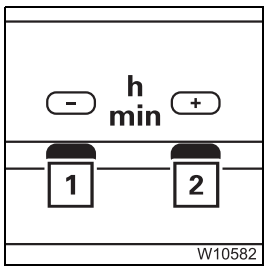


Set the speedometer time

1 Press the button – the time is increased

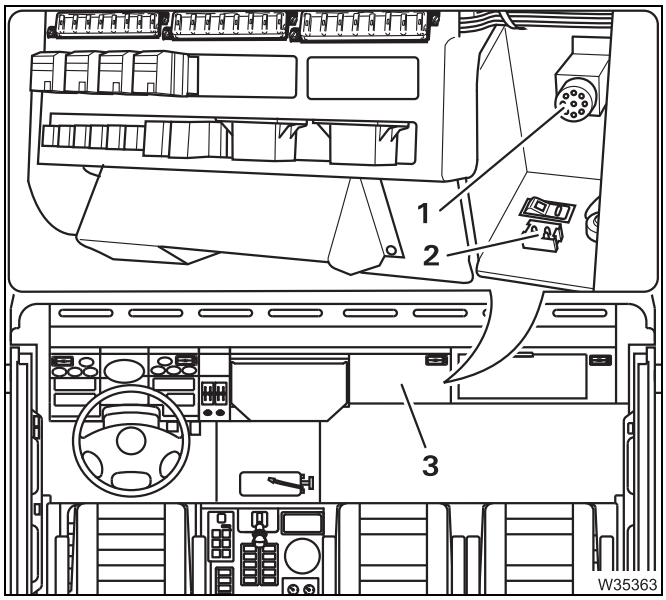
2 Press the button – the time is decreased

Set the hours: Press buttons (**1**) + (**2**) once – press the button for setting within 10 seconds

Set the minutes: Ignition on or
do not press a button for approx. 10 seconds

3.2.17 Other operating elements

Diagnostics



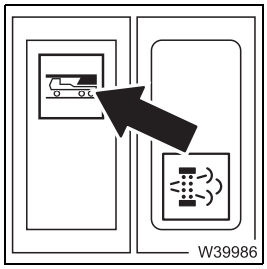
The diagnostics connections may only be operated by service staff from the engine manufacturer/transmission manufacturer, or by **Manitowoc Crane Care**.

The diagnostic connections are located under the cover (**3**).

1 Engine/transmission diagnostics

2 Carrier electronics diagnostics

Boom not set down indicator



– Lights up: Boom **does not** lie in the boom rest

– Gone out: Boom lies in the boom rest

p. 5 - 10

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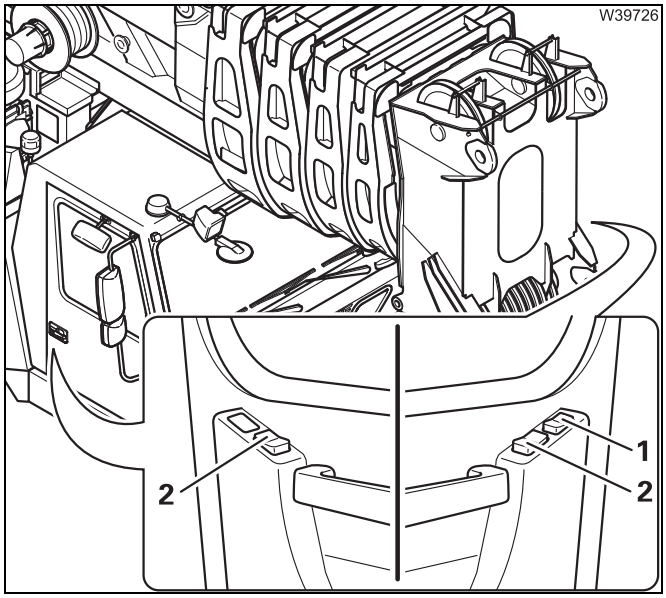
3.2.18 Windows, doors, keys

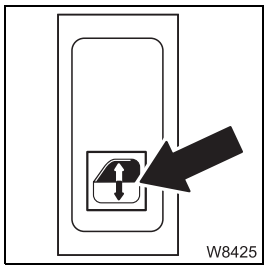
Windows Buttons for electric window winders



1 Window winder in the driver's door
2 Window winder in the driver's door

The operation is the same for all buttons:

Risk of crushing when closing the windows!
If the window winders encounter resistance, they do not stop but keep on moving at reduced power.



– **To open the window:** Press in at the bottom
– **To close the window:** Press in at the top

The window opens or closes until the button is released, or until an end position is reached.

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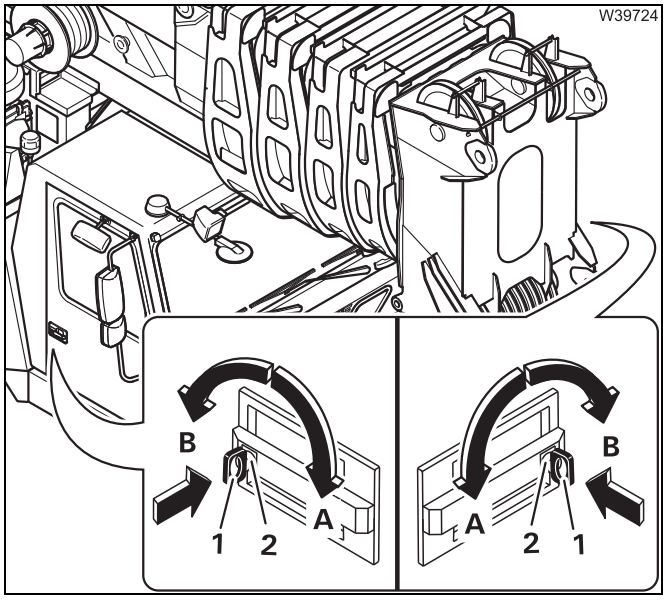
Doors The same key is used for the driver's and passenger's door.

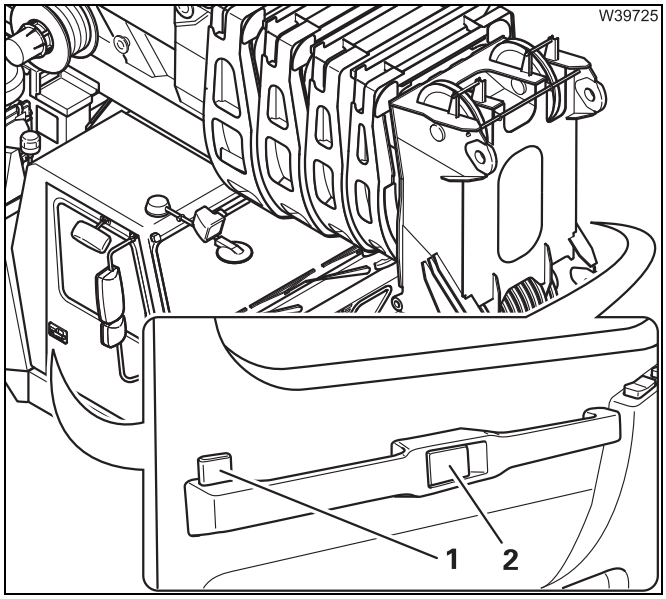


From outside

– **Unlocking**
Turn the key (**1**) forwards towards **A**

– **Locking**
Turn the key (**1**) backwards, towards **B**

– **Opening**
Press the knob (**2**)



From inside

– **Locking**
Push down the knob (**1**)

– **Unlocking**
Push up the knob (**1**)

– **Opening**
Pull the lever (**2**)

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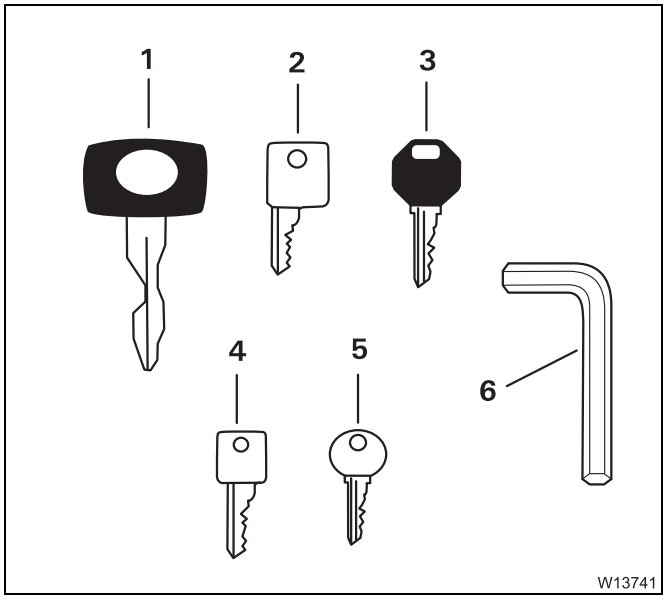
Keys



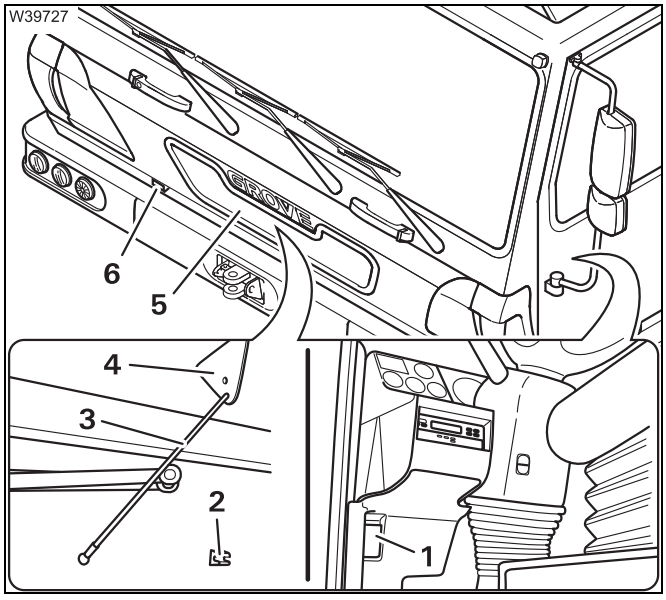
Different keys are supplied:

1 Door locks/ignition lock of driver's cab
2 Key-operated switch
3 Control unit, outrigger[1)]
4 Padlock for shut-off valve, 3rd and 6th axle line[1)]
5 Fuel tank[1)]
6 Covers

[1)] Additional equipment

3.2.19 Front flap

The front flap has two locks. For securing, one of the two locks can only be released from the driver's cab.



Opening the front flap

– To release, pull the lever (**1**),
– Press the lever **(6**) to the right and fold the front flap (**5**) up,
– Fold the support (**3**) up and attach it to the holder (**4**).

Close the front flap

– Lift the front flap (**5**).
– Pull the support (**3**) from the holder (**4**) and secure it in the holder (**2**)
– Fold down the front flap
– Press the front flap against the driver's cab until you can hear it latch into place.

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4 Starting/turning off the engine for driving

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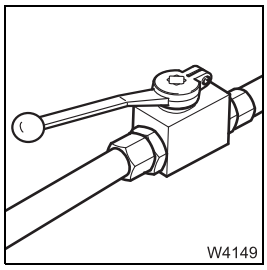
4 Starting/turning off the engine for driving

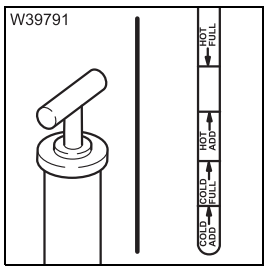
4.1 Starting the engine

4.1.1 CHECKLIST: Starting the engine

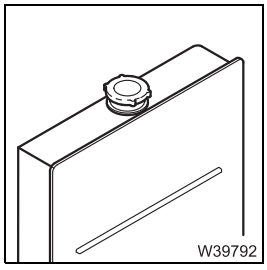
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions there!



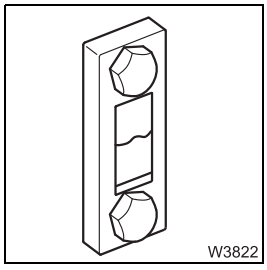
1. Check that the valves on the hydraulic tank are open; ➠ p. 4 - 9.



2. Pre-check the oil level in the automatic transmission;
➠ *Maintenance manual*.



3. Check the coolant level in the engine; ➠ *Maintenance manual*.



4. Check the oil level in the hydraulic system; ➠ *Maintenance manual*.

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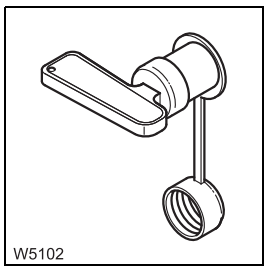
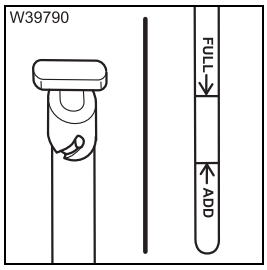
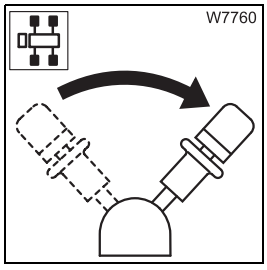


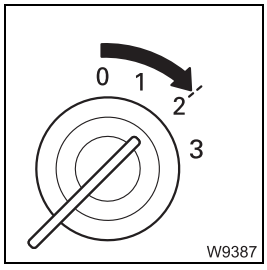
5. Switch on the battery master switch; ➠ p. 4 - 9.



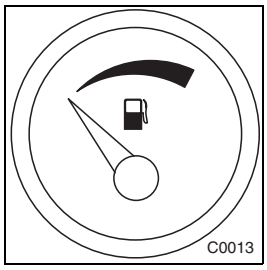
6. Check the oil level in the engine and gearbox; ➠ *Maintenance manual*.



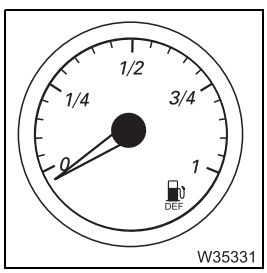
7. Check that the parking brake is engaged.



8. Switch on the ignition and check the instruments and displays; ➠ p. 4 - 10.



9. Check the fuel level; ➠ p. 4 - 7.



10. Check the AdBlue level; ➠ p. 4 - 8.

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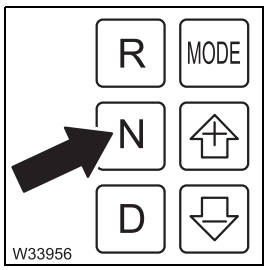
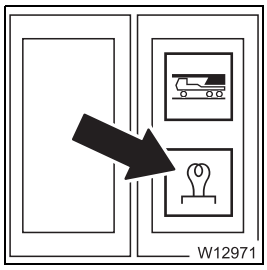
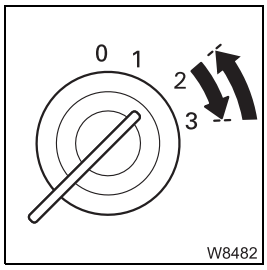


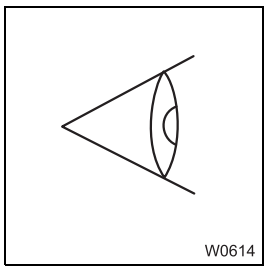
11. Switch the transmission to the neutral position; ➠ p. 5 - 51.



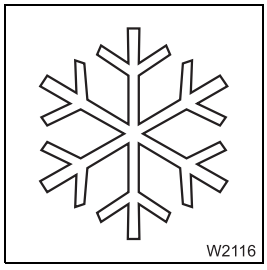
12. If necessary, wait until the lamp goes out; ➠ p. 4 - 12.



13. Start the engine; ➠ p. 4 - 11.



14. Perform the necessary checks after starting the engine; ➠ p. 4 - 14.



15. In the event of low outside temperature;
➠ *CHECKLIST: At low temperatures*, p. 4 - 4.

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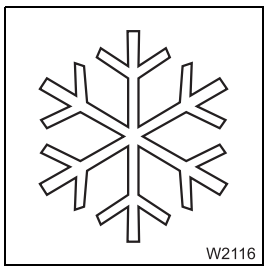
4.1.2 CHECKLIST: At low temperatures



You must also observe the following points when operating the truck crane at low outside temperatures:

1. The fuel and engine oil must be suitable for use at the respective outside temperature; ➠ *Separate Betriebsanleitung Motor-Hersteller*.
2. The engine coolant must contain sufficient antifreeze; ➠ *Separate Betriebsanleitung Motor-Hersteller*.
3. The windscreen washing system must contain sufficient antifreeze; ➠ *Maintenance manual*.

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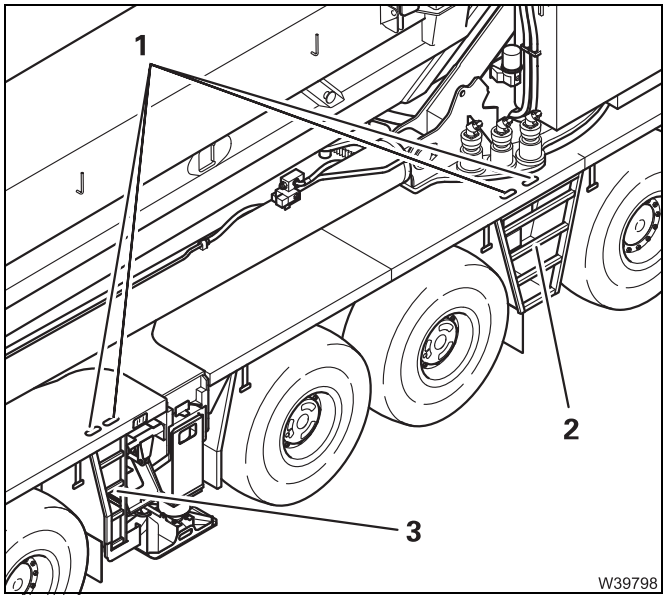
4.1.3 Fixed ladders and folding ladders

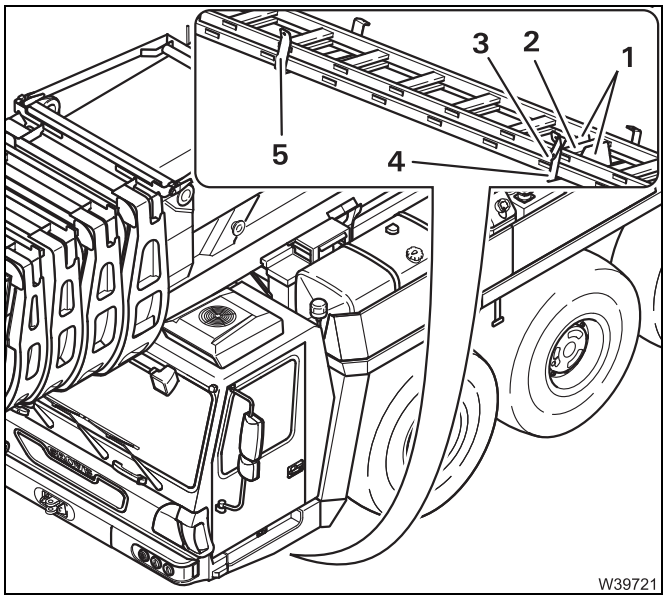
Fixed ladders The access ladders are fixed in position.



Fixed ladders (**2**) and (**3**) with hand holes (**1**) are located on both sides.

Ladders There are different ladders on the truck crane.

Risk posed by ladders falling down!
Always secure the ladders before driving. This prevents the ladders from falling down while driving and endangering other vehicles.

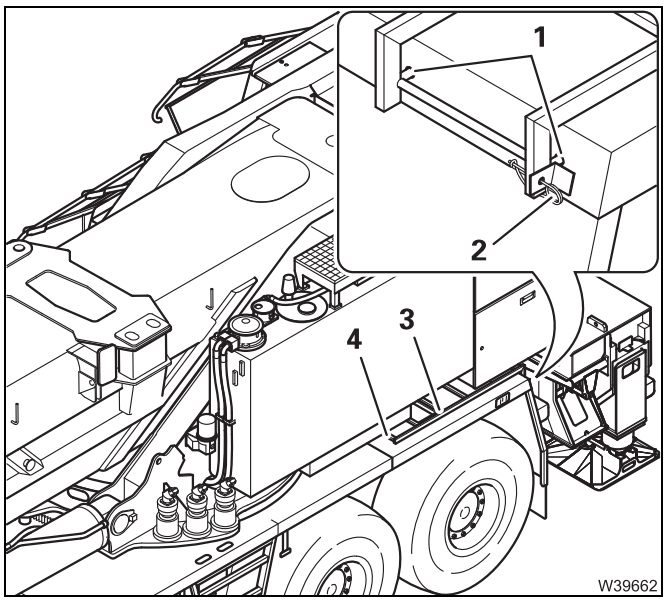


For driving

The extendable ladder can be transported at the front underneath the truck crane.

- Raise the holder (**4**) slightly and release the lock with the lever (**3**).
- Fold down the holder (**4**).
- Insert the ladder into the holder (**5**).
- Position one rung (**2**) of the ladder between the bracket (**1**).
- Fold up the holder (**4**) and secure it with the lock (**3**).

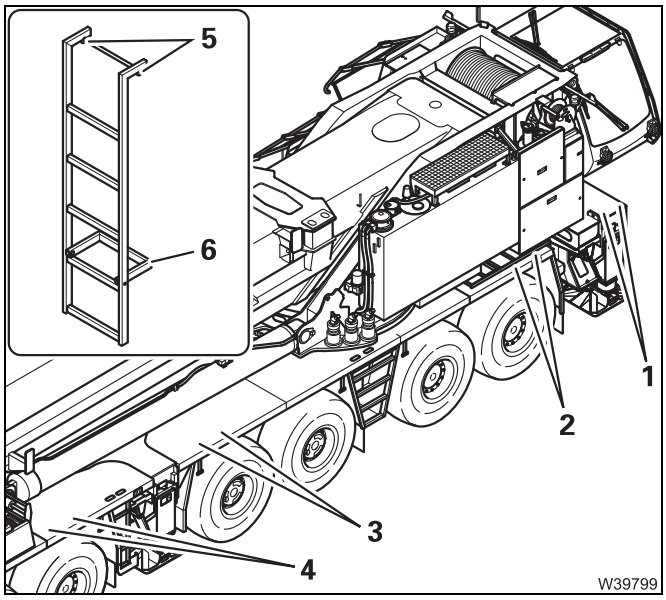
You can also secure the holder (**4**) with a lock.



For driving, the ladders (**3**) on both sides of the carrier are pushed with the lower ring under the angle piece (**4**) so that the pins (**1**) fit into the holes at the rear of the vehicle. The ladders are secured with a retaining pin (**2**).

For crane operation

The ladders can be hung on both sides of the truck crane, in the holes (**1**) to (**4**).



- Hang the ladder so that the pegs (**5**) are fully inserted in the holes.
- Fold out the spreader (**6**) at the bottom of the ladder so that it is safely braced against the sheet metal panel or the tyres.

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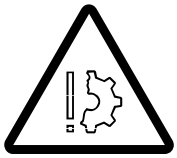
4.1.4 Refuelling

Fuel tank

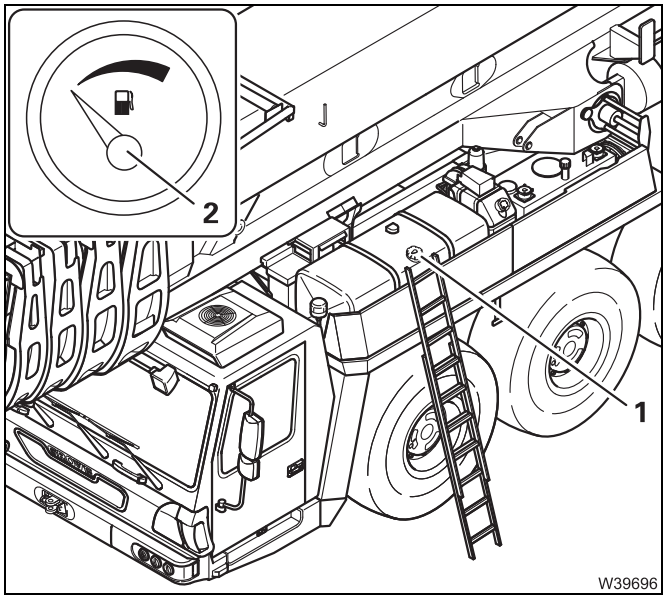
Use only permitted consumables; ➠ *Separate Betriebsanleitung Motor-Hersteller*.

Danger of fire due to inflammable gases!
Switch off the engine, the heater and all additional heaters before refuelling.

Risk of accidents if the tank is not closed!
Close the tank each time you have refuelled.
In this way you can prevent other vehicles from being endangered by the cap falling off or fuel escaping.



Risk of damage to the engine and catalytic converter!
Unauthorised consumables can damage the engine and catalytic converter and void the warranty. Only use consumables approved by the engine manufacturer.



The display (**2**) shows the fuel level in the tank (**1**).

Refill the fuel in due time, and close the tank (**1**) with the lid. Leave sufficient space for the fuel to expand.

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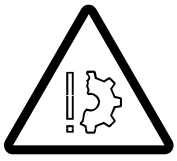
AdBlue tank

AdBlue is a consumable for exhaust gas treatment. For *AdBlue* there are registered trademarks of Kruse GmbH & Co KG, BASF SE and the German Association of the Automotive Industry.
Use only permitted consumables; ➠ *Separate Betriebsanleitung Motor-Hersteller*.

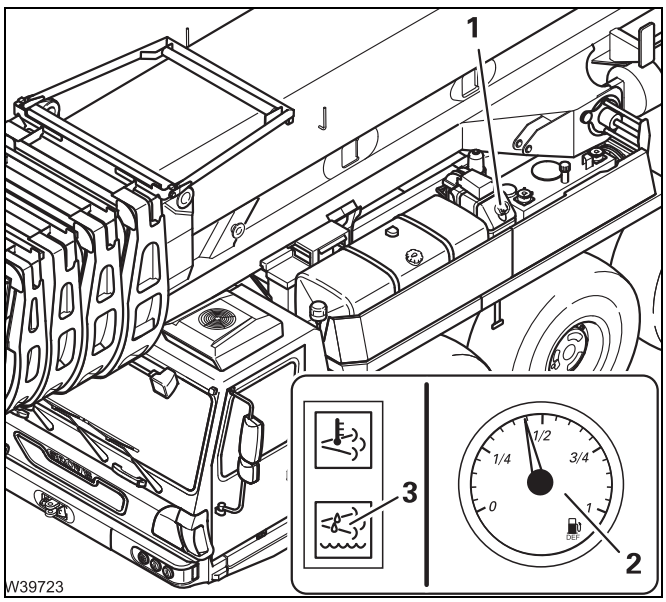
Risk of accidents if the tank is not closed!
Close the tank each time you have refilled it.
In this way you can prevent other vehicles from being endangered by the cap falling off or consumables escaping.

Risk of damage to the engine and catalytic converter!
Unauthorised consumables can damage the engine and catalytic converter and void the warranty. Only use consumables approved by the engine manufacturer.

Risk of injury from ammonia vapours!
Ammonia vapours can escape if the *AdBlue* tank is opened at high outside temperatures. Ammonia vapours can irritate mucous membranes, skin and eyes.
Ensure that there is adequate fresh air supply and do not breathe in the escaping ammonia vapours.



Risk of damage to painted or aluminium surfaces!
AdBlue can cause corrosion of these surfaces. Clean up spilled *AdBlue* with water immediately.



The display (**2**) shows the current filling level.

¼ – approx. 12.2 l (3.2 gal)

½ – approx. 24.5 l (6.5 gal),

¾ – approx. 36.7 l (9.7 gal)

1 – approx. 49.0 l (13.0 gal)

- Refill the AdBlue tank (**1**) in good time and seal it using the cap.

The lamp (**3**) lights up when the AdBlue tank is empty.

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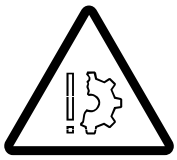
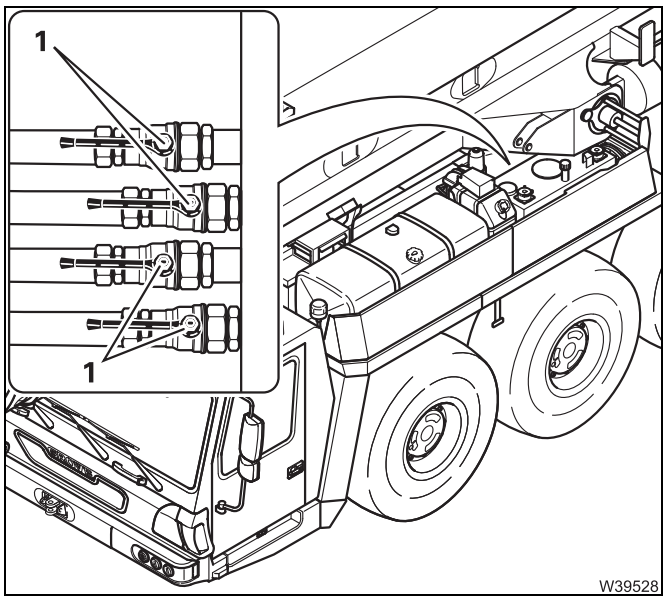
4.1.5 Checks before starting the engine

At the hydraulic tank



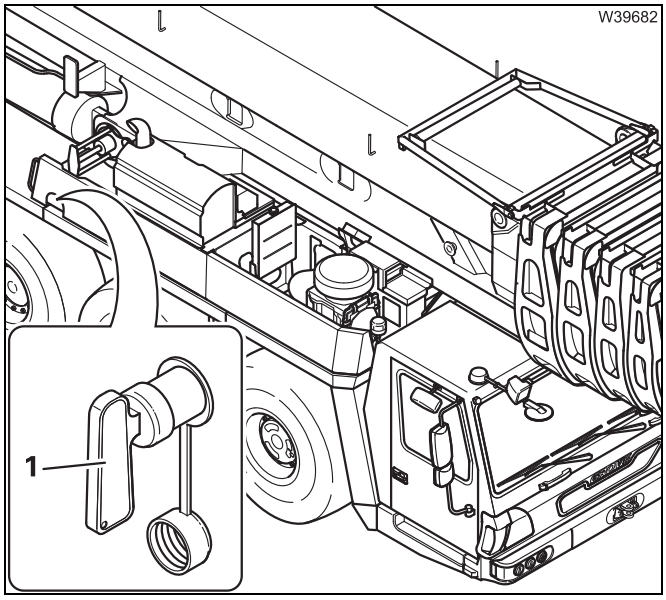
Risk of damage to hydraulic pumps!
You may only start the engine when all the valves on the hydraulic tank are open.



- Check that the valves are open – lever parallel to the line.
- Open all the closed valves.

Battery master switch

You can only start the engine when the battery master switch is switched on.



- Switch on the battery master switch (**1**) – the selector handle cannot be pulled off.

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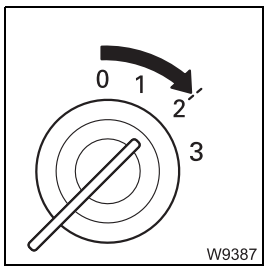
4.1.6 Switching the ignition on

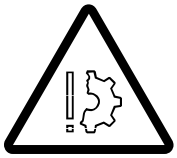


- Insert the ignition key into the ignition lock and turn the key to position **2**.

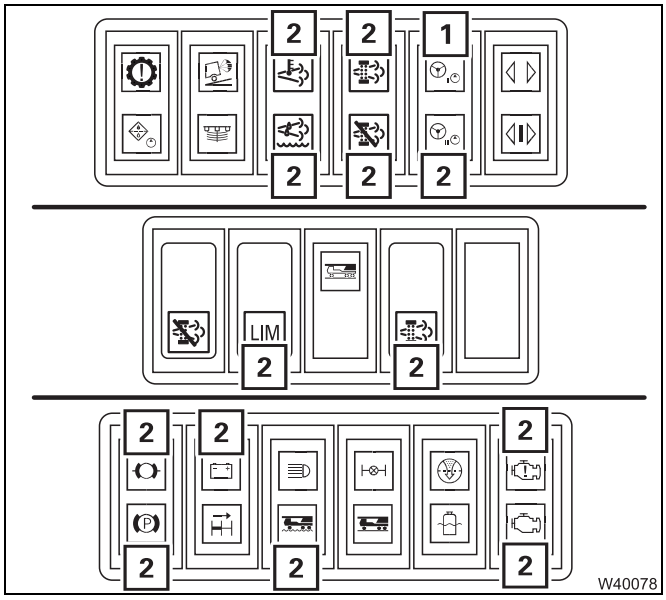
After switching on the ignition, a lamp test is carried out, and switching states are checked if necessary.

4.1.7 Lamp test/equalisation of the switching states

Lamp test

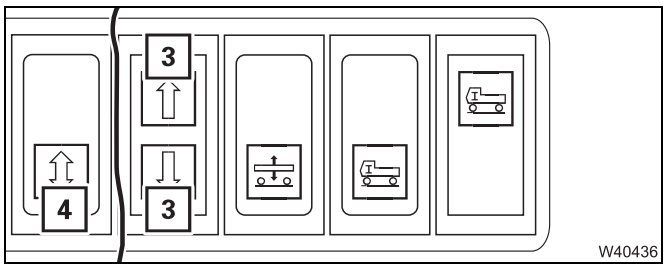


Risk of accident from faulty lamps!
The lamps that are used to provide warnings and information during operation light up for control purposes whenever the ignition is switched on. Always perform the following lamp tests and immediately replace faulty lamps or have them replaced!
In this way, you will avoid accidents and damage that occur when malfunctions are not identified in time.



- Check that the lamps (**1**) light up briefly, if they are present. If the specified time is insufficient, switch on the ignition again.

- If necessary, engage the parking brake and check that the lamps (**2**) light up continuously.



- When the key-operated switch is switched on, check that the lamp (**3**) is lit continuously. To check the other lamps (**3**), press the button (**4**) once.

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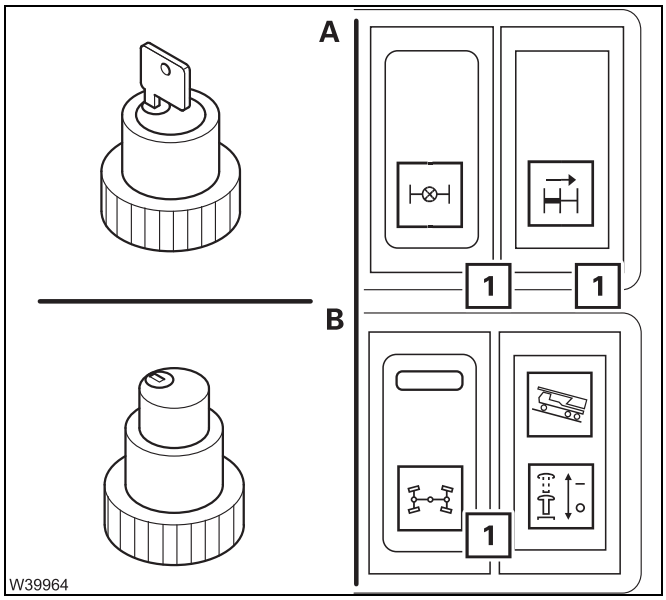
Equalisation of the switching states

The switching states for the differential locks and the separate steering are aligned depending on the position of the key switch.



(A) – Key-operated switch on

The switching procedures are triggered which are specified by the positions of the switch (**1**).

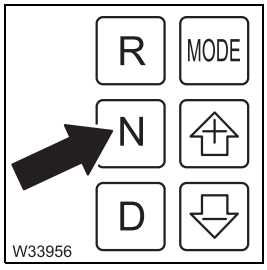
(B) – Key-operated switch off

No alignment takes place.

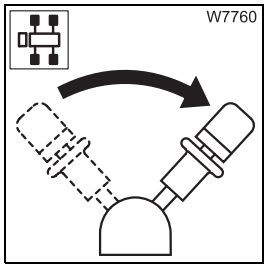
– The transverse and longitudinal differential locks are switched off.
– The switching state *Steering locked/unlocked* remains as it was before the ignition was switched on.

4.1.8 Starting the engine

Refer to the separate operating manual provided by the engine manufacturer for operating the engine.



The engine can only be started when the transmission is in the neutral position; ➠ p. 5 - 51.



- Check that the parking brake is applied.

If the engine is equipped with a flame start system;
➠ *With flame start system*, p. 4 - 12.

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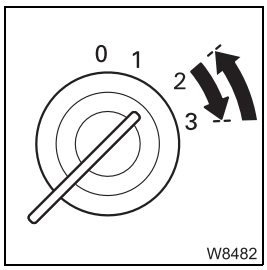
Without flame start system

This section pertains to starting a warm and cold engine.

Danger of explosion when using starter fuel!
The engine may never be started with the aid of starter fuel. The starter fuel sprayed into the intake manifold can ignite.

- Do not press the accelerator.



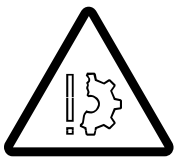
- Turn the ignition key to position **3** and hold it there until the engine starts.
- Release the ignition key after the engine starts.

If the engine does not start, release the ignition key after about 15 seconds and wait one minute before trying again.

If the engine does not start after several attempts; ➠ *Engine malfunctions*, p. 7 - 27.

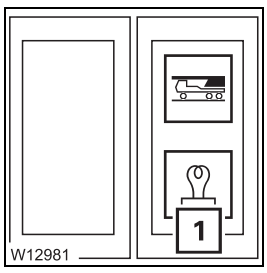
With flame start system

This section pertains to starting a warm and cold engine.



Danger of explosion when using starter fuel
The engine may never be started with the aid of starter fuel. The starter fuel sprayed into the intake manifold can ignite.

The flame start system warms the suction air of the engine. It is activated each time the ignition is switched on:



– **When the engine is warm**, the lamp (**1**) will light up only briefly (2 to 3 seconds).
– **When the engine is cold**, the lamp (**1**) goes out as soon as the engine is preheated (duration of up to 20 seconds).
Start the engine within the next 30 seconds; otherwise, you must switch on the ignition again and wait until the lamp goes out.

If the lamp (**1**) does not go out, there is a malfunction in the flame start system; ➠ *Engine malfunctions*, p. 7 - 27.

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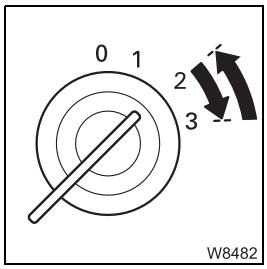
- Wait until the lamp (**1**) goes out.
- Do not press the accelerator.



- Turn the ignition key to position **3** and hold it there until the engine starts.
- Release the ignition key after the engine starts.

If the engine does not start, release the ignition key after about 15 seconds and wait one minute before trying again.

If the engine does not start after several attempts;
➠ *Engine malfunctions*, p. 7 - 27.

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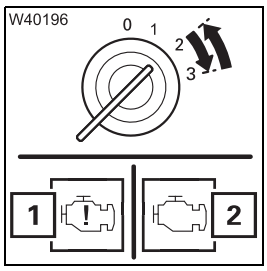
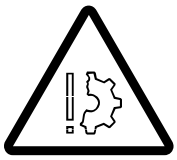
4.1.9 Checks after starting the engine

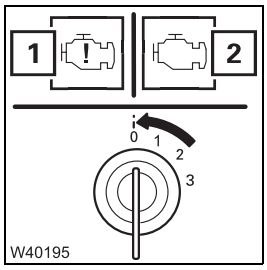


- Watch the lamps (**1**) and (**2**) immediately after starting the engine. They must not flash after starting the engine.

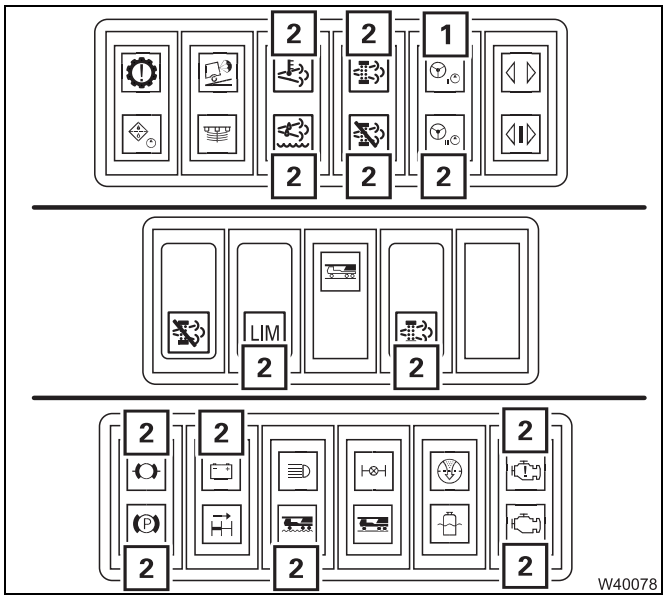
Switch off the engine immediately if the lamps (**1**) and (**2**) do not go out.



Risk of damage to the engine if the oil pressure is too low!
The oil pressure may be too low if the lamps (**1**) and (**2**) do not go out after 10 seconds. Switch the crane engine off and look for the cause;
➠ *Reading error messages*, p. 7 - 34.



Turn the key-operated switch to position 0 if lamps (**1**) and (**2**) do not go out;
➠ *Reading error messages*, p. 7 - 34.



- Check that the lamps (**2**) go out when the engine is running.

If the lamps (**2**) do not got our or if another lamp lights up for a warning message;
➠ p. 5 - 42.

The lamp (**1**) only goes out when the vehicle starts moving.

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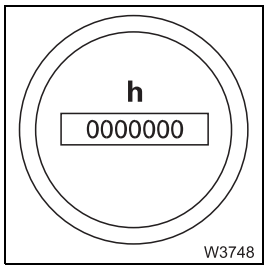
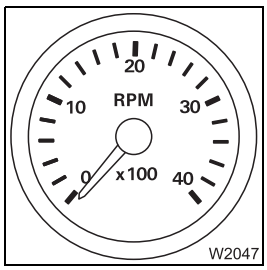
4.1.10 Monitoring elements



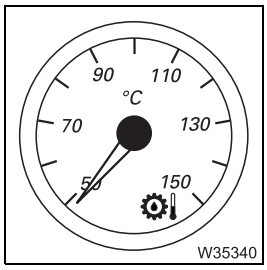
– Operating hours of the engine

All periods between the engine being started and stopped again count as operating hours.



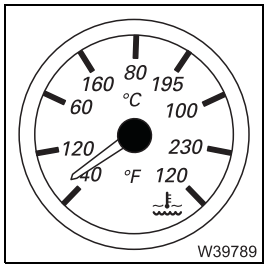
– Engine speed

The speed is shown in min^{-1} (rpm); ➠ *Inspections when driving downhill*, p. 5 - 38.



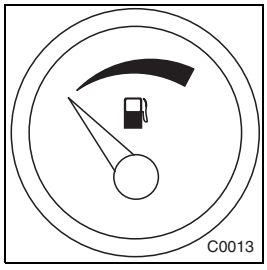
– Transmission oil temperature display

This is displayed in °C; ➠ p. 5 - 44.



– Coolant temperature

This is displayed in °C; ➠ p. 5 - 43.



– Fuel level

Never run the fuel tank completely dry; always refuel in due time; ➠ p. 4 - 7.

If the fuel tank is almost empty, air can be sucked in and the fuel system must then be bled; ➠ *Maintenance manual*.

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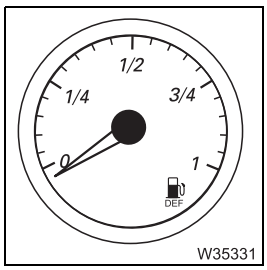
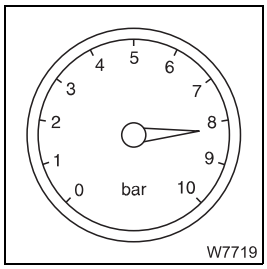


– AdBlue tank level

Never run the AdBlue tank completely dry; always refuel in due time; ➠ p. 4 - 8.



– Brake circuits supply pressure

This is displayed in bar; ➠ p. 5 - 10.

In order to comply with exhaust emission regulations, the truck crane may only be driven with AdBlue. Driving without AdBlue will invalidate the truck crane's licence for use on public roads and you are no longer permitted to drive on public roads.

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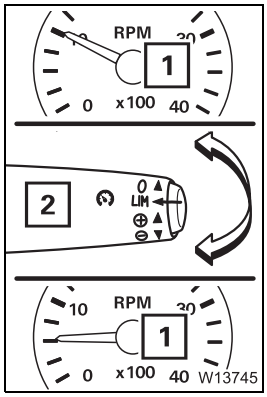
4.1.11 Setting the idling speed

After the engine is started, the idling speed is regulated automatically. If necessary, you can adjust the idling speed manually using the multipurpose switch.

You can only set the idling speed when the truck crane is stationary.

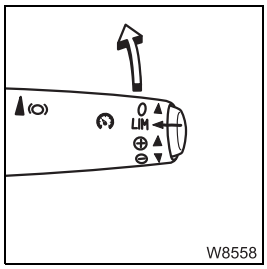


Increasing/reducing the idling speed

- Press the switch (**2**) up/down until the required engine speed (**1**) has been reached.

  or

- Press the switch (**2**) up/down once. The engine speed (**1**) is increased/ reduced by 20 rpm.



Switching off the idling speed change:

- Push the switch forwards once. The idling speed is set automatically.

  or

- Accelerate to more than 20 km/h (12 mph).

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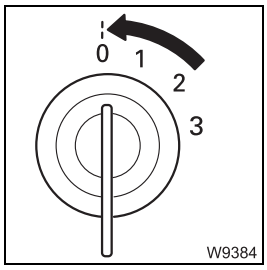
4.2 Switching off the engine

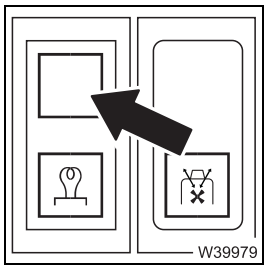
4.2.1 Stopping the engine from the driver's cab

Risk of accidents because the truck crane cannot be steered!
Switch the engine off only once the truck crane has come to a standstill. If you remove the ignition key, the steering will lock and you will lose control of the moving truck crane.

If the temperature of the coolant is very high, let the engine run on for another one or two minutes at increased idling speed.



- Turn the ignition key to position 0 – the engine will stop.



Exhaust system run-down

After shutting down the engine – the lamp lights up:

- Do not switch off the battery master switch. The exhaust system runs down for approx. 1 minute.

  Run-down is finished when the lamp goes out – the battery master switch can be switched off.

After turning off If you want to park the truck crane; ➠ p. 5 - 46.

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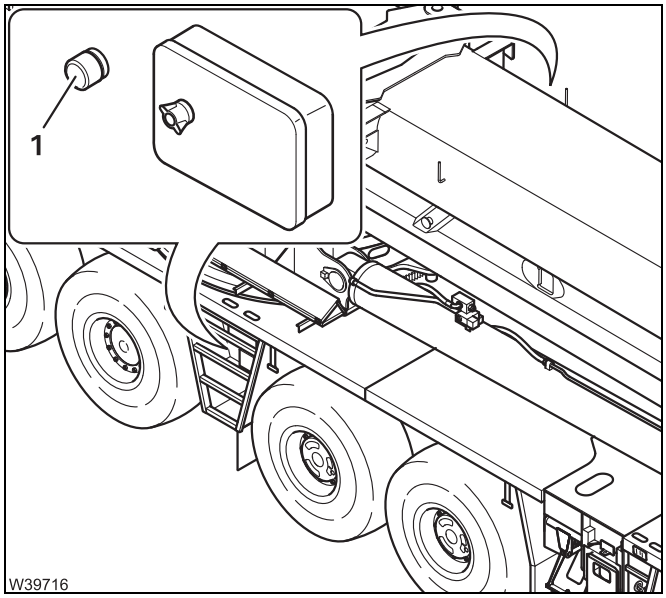
4.2.2 Stopping the engine with the emergency stop switches



Two emergency stop switches are provided for an emergency. They are located next to the operating unit *support.*

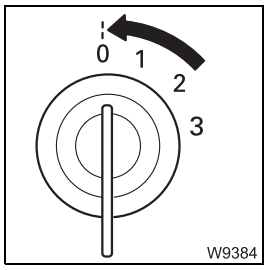
- Press an emergency stop switch (**1**).

The switch engages and the engine stops.

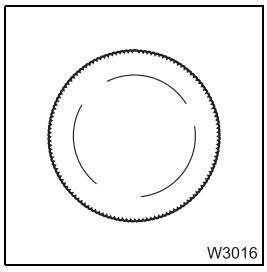
If an air intake inhibitor is fitted, it is triggered.

Resetting the emergency stop switch

You can restart the engine only after you have reset the emergency stop switch.



- Turn off the ignition.



- Turn the actuated emergency-stop switch until it disengages.

If air intake inhibitors are fitted, you must open them;
➠ *Opening the air intake inhibitor*, p. 4 - 20.

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4.3 Air intake inhibitor

When an air intake inhibitor is fitted, a valve in the air intake line is closed (emergency stop switch) and the engine goes out.

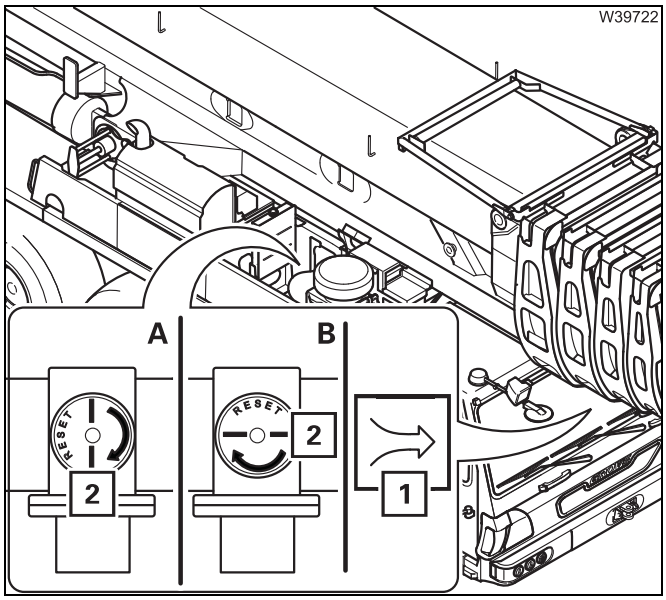
The engine can be restarted only after the flap has been opened.

Opening the air intake inhibitor

The following requirements must be met in order to open the air intake inhibitor:

– The ignition must be switched off.

– The emergency stop switch must be reset.



A marking (**2**) on the flap displays the current state.

- (**A**) – If the flap is closed, the marking (**2**) is diagonal to the pipe. The lamp (**1**) lights up.
- (**B**) – Turn the flap in the direction of the arrow until it engages.
  If the flap is open, the marking (**2**) is parallel to the pipe and the light (**1**) goes out.

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4.4 Torque reduction

Torque reduction can occur for various different reasons.

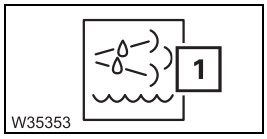
– The AdBlue tank is empty.

– A system malfunction has been detected.

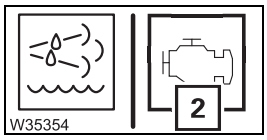
The torque reduction occurs automatically and can be overridden for a short period of time.

AdBlue tank level

- Check the AdBlue supply before and during driving and be sure to refill with AdBlue in time.



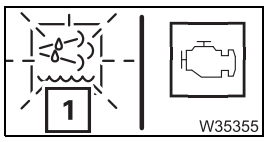
The lamp (**1**) lights up when the AdBlue tank reaches the reserve level.



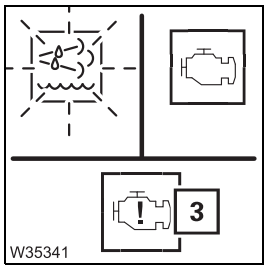
The yellow lamp (**2**) lights up if AdBlue usage continues.

The torque reduction is automatically switched to level 1 – reduction by 25%.

The torque reduction can be overridden for a short period of time during levels 1 and 2; ➠ p. 4 - 23.



The lamp (**1**) starts flashing if AdBlue usage continues.
The torque reduction is increased to level 2 – reduction by 50%.



After approx. 30 minutes the red lamp (**3**) also lights up – level 3 is active.
The torque reduction can no longer be overridden and a currently active override is switched off.
After 2 minutes the torque is slowly reduced further until the engine speed reaches the idling speed.

- Refill the AdBlue tank as soon as possible.

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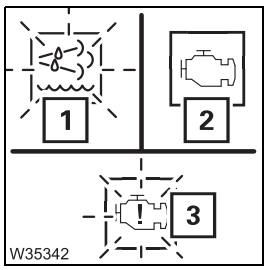
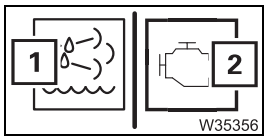


After refilling the AdBlue tank

- Start the engine – the lamp (**1**) goes out immediately.
- Actuate the accelerator or parking brake – the lamp (**3**) goes out immediately and the lamp (**2**) then goes out approx. 10 minutes later.

System malfunctions

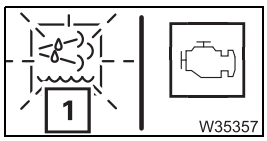
System malfunctions can be caused by poor-quality AdBlue, technical defects and electronic malfunctions.



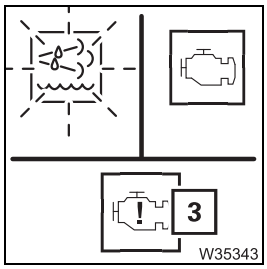
If the exhaust gas system detects a fault then the lamps (**1**) and (**2**) light up.

If operation continues, the torque reduction is switched to level 1 – reduction by 25%.

The torque reduction can be overridden for a short period of time during levels 1 and 2; ➠ p. 4 - 23.

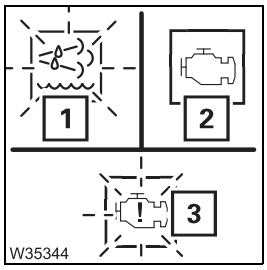


After approx. 75 minutes of further operation the lamp (**1**) starts to flash. The torque reduction is increased to level 2 – reduction by 50%.



After approx. 15 minutes of further operation the red lamp (**3**) also lights up – level 3 is active. The torque reduction can no longer be overridden and a currently active override is switched off.
After 2 minutes the torque is slowly reduced further until the engine speed reaches the idling speed.

- Stop at the next opportunity.
- Read out the error messages; ➠ p. 7 - 34.
- Have the fault corrected.



When the fault has been corrected

- Start the engine – the lamp (**1**) goes out immediately.
- Actuate the accelerator or parking brake – the lamp (**3**) goes out immediately and the lamp (**2**) then goes out approx. 10 minutes later.

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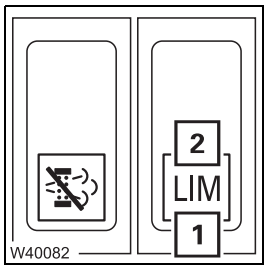
4.4.1 Overriding torque reduction

You can override the torque reduction for a limited time during operation so that the full motor output is available (e.g. for driving to a service station).



- Push the button (**1**) down once.

The lamp (**2**) lights up – the torque reduction is overridden.

After 30 minutes the (**2**) light goes out – the torque is automatically reduced again.

You can override the reduction three times, after this the button (**1**) will become inactive until the engine is restarted.

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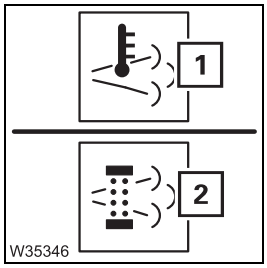
4.5 Cleaning the exhaust system

Risk of burns during the cleaning procedure!
The exhaust system can heat to over 600 °C (1,110 °F) during automatic and manual cleaning.
Keep away from the exhaust system and ensure that no persons on the carrier are in the region of the exhaust system or exhaust pipe. This will prevent severe burns.

Risk of fire!
Ensure that no inflammable materials or liquids are in the vicinity of the exhaust system or exhaust pipe before performing a cleaning procedure. Also observe all information in the enclosed engine manufacturer's operating instructions.

Automatic cleaning

The exhaust system cleaning procedure usually runs automatically, unless it has been manually disabled; ➠ *Disabling cleaning*, p. 4 - 25.



The lamp (**1**) lights up during automatic cleaning.

The lamp (**2**) lights up if automatic cleaning is not performed in time.
In this case you can drive with an increased load for approx. 20 minutes. Perform a manual cleaning if this is not possible or the light does not go out afterwards.

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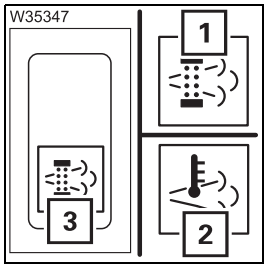
Manual cleaning

Manual cleaning is only performed when all prerequisites specified here have been fulfilled.

– The engine runs at idling speed – the idling speed must not be exceeded by more than 50 rpm during the cleaning procedure.
– The accelerator pedal is not actuated.
– The service brake is not actuated.
– The parking brake is engaged.

• Ensure that all prerequisites remain satisfied during the entire cleaning procedure.



• Push the button (**3**) down once.

The cleaning procedure begins.
– The lamp (**1**) lights up.
– The lamp (**2**) flashes.

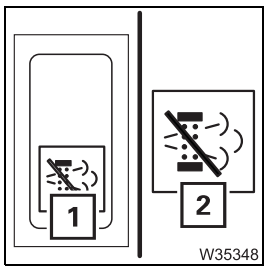
The lamp (**2**) goes out when the cleaning procedure has finished.
The lamp (**1**) goes out once the exhaust system has cooled to the operating temperature.

If the idling speed is exceeded by more than 50 rpm then the manual cleaning procedure is interrupted and automatic cleaning can start, depending on the degree of soiling.

Disabling cleaning

Automatic cleaning cannot be performed and manual cleaning cannot be started when cleaning is disabled. This function is for sites where an exhaust temperature greater than 600 °C (1,110 °F) presents a danger.

In normal operation, automatic cleaning is performed without interrupting operation and is the best solution for the exhaust system. Therefore, only disable cleaning when the site makes this necessary. Take care to ensure that cleaning is enabled again when the truck crane is outside the danger area.



Disabling cleaning

• Press the button (**1**) in at the bottom – the lamp (**2**) lights up.

Enabling cleaning

• Press the button (**1**) in at the top – the lamp (**2**) goes out.

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5 Driving

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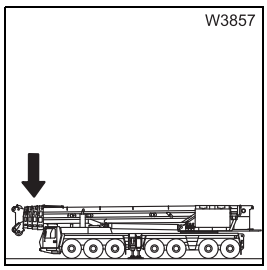
5 Driving

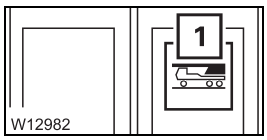
5.1 Before driving

5.1.1 CHECKLIST: checks before on-road driving

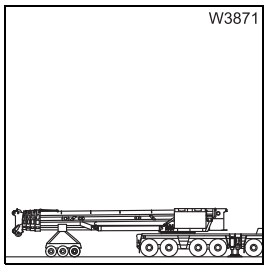
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions there!



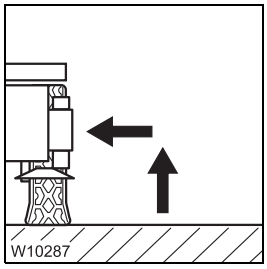
1. **When the boom is on the boom rest:**
   – All telescopic sections are interlocked; lock the telescoping cylinder with telescopic section I.
   – Lock the superstructure; ➠ p. 11 - 14.



The lamp (**1**) has gone out (if present); ➠ p. 3 - 52.



2. **When the main boom is resting on a dolly:**
   – Lock all telescopic sections to each other; lock the telescoping cylinder with telescopic section I.
   – Do **not** lock the superstructure; ➠ p. 11 - 14.
   – Switch on the boom floating position; ➠ p. 6 - 8.
   – Switch on slewing gear freewheel; ➠ p. 6 - 5.
   – If necessary, switch on the boom pre-tensioning; ➠ p. 6 - 9.
   – Switch off the houselock, if necessary; ➠ p. 11 - 15.



3. On the outriggers
   – Fully retract all outrigger beams and secure to prevent extension; ➠ p. 12 - 33.
   – Bring the outrigger pads into the driving position; ➠ p. 12 - 39.

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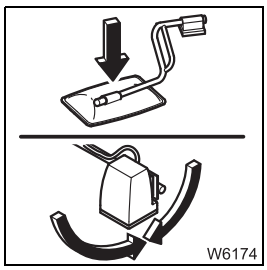
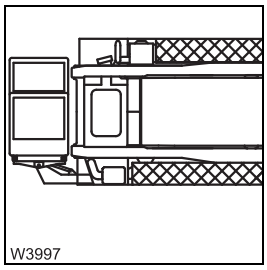
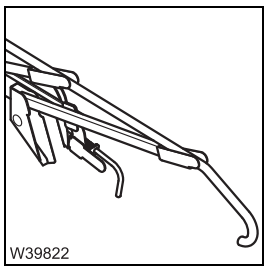


4. Fold in or remove all mirrors used for crane operation; ➠ p. 12 - 25.

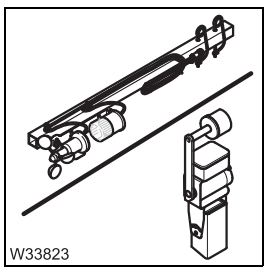
Fold down the spotlight (if present); ➠ p. 11 - 108.



5. Bring the crane cab into the *Driving* position, fold in the step and stow the hand-held control in the driver's cab; ➠ *Driving mode position*, p. 12 - 20.



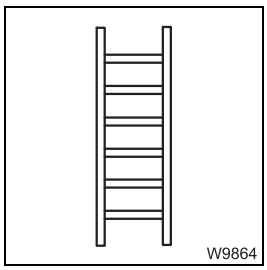
6. The railings and the tread grid are in the *Driving* position; ➠ p. 12 - 24.



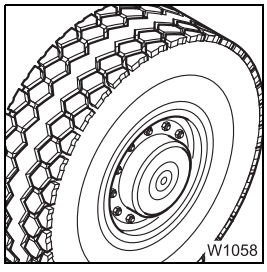
7. Anemometer, air traffic control light and camera system are removed;

➠ *Anemometer and air traffic control light*, p. 12 - 118.

➠ *Cameras for crane operation*, p. 12 - 121



8. Secure all ladders; ➠ *Ladders*, p. 4 - 5.



9. Check the tyres:

– Tyre pressure when tyres are cold in on-road mode; ➠ *Maintenance manual*.

– Other checks; ➠ *Maintenance manual*.

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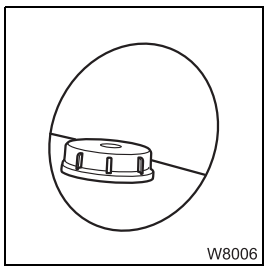
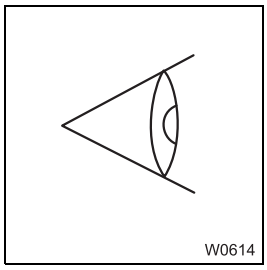
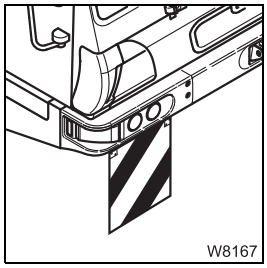


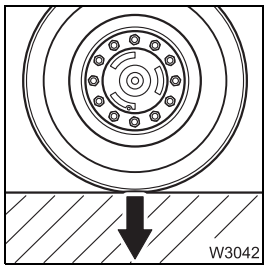
10. Windscreen washing system – check the filling level;
➠ *Maintenance manual*.



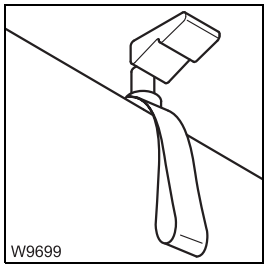
11. Carry out an inspection of the truck crane, looking out in particular for any leaking fluids (oil, fuel or water).



12. Fold down the warning signs for the designation of the vehicle width,
Vehicle width; ➠ p. 1 - 8,
Warning signs; ➠ p. 5 - 9.



13. The detachable equipment parts are stripped down so that they fulfil the regulations of the country in which you are working as regards permissible weights and axle loads, lengths, widths, height etc.
For a driving mode with a maximum axle load of 12 t (26,500 lbs);
➠ *Driving modes*, p. 6 - 1.



14. Fold up and secure the fold-up berth; ➠ p. 5 - 48.

15. Secure all additional parts that may be transported against falling down.

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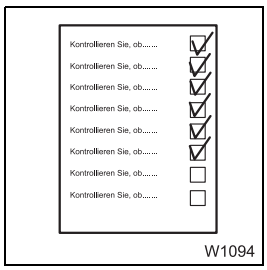
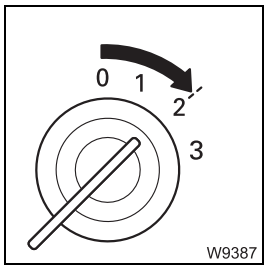
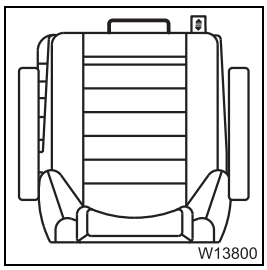


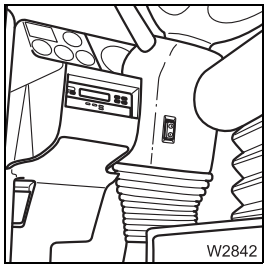
16. Carry out all activities and inspections required for starting the engine; ➠ *CHECKLIST: Starting the engine*, p. 4 - 1, points **1.** to **7.**



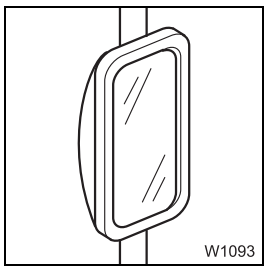
17. Switch on the ignition; ➠ p. 4 - 10.



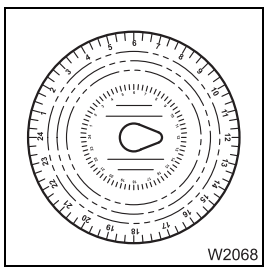
18. Adjust the driver's seat; ➠ p. 5 - 12.



19. Adjust the steering column; ➠ p. 5 - 14.



20. Adjust the mirrors; ➠ p. 5 - 8.



21. Set the tachograph, insert the diagram sheet; ➠ p. 5 - 16.

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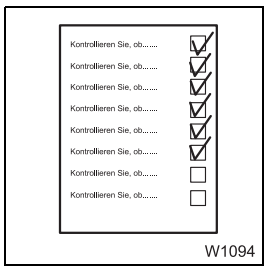
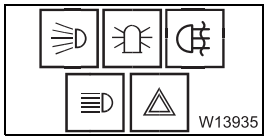
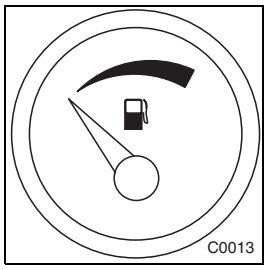


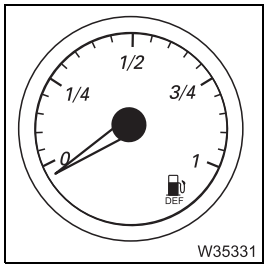
22. Start the engine and carry out all inspections; ➠ *Checks after starting the engine*, p. 4 - 14.



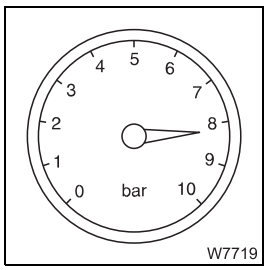
23. Check the electrical system; ➠ p. 5 - 7.



24. Check the fuel level; ➠ p. 4 - 7.



25. Check the AdBlue level; ➠ p. 4 - 8.



26. Check the compressed air and brake systems; ➠ p. 5 - 10.

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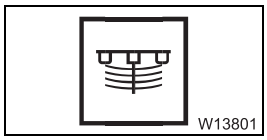
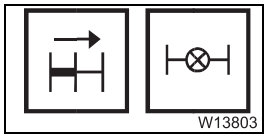
27. Check that all switching states are correctly set for driving on roads:

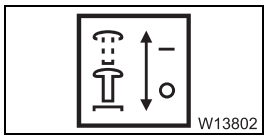


– The suspension is switched on; ➠ p. 5 - 15,

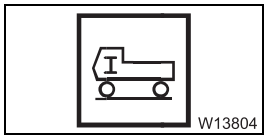


– Longitudinal differential locks switched off; ➠ p. 5 - 52,

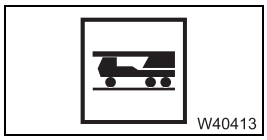
– Transverse differential locks are switched off; ➠ p. 5 - 53,



– The axle line steering is locked; ➠ p. 5 - 62,



– On-road level is set; ➠ p. 5 - 57.



– Transfer case – on-road gear switched on; ➠ p. 5 - 51

Establish the switching states for on-road driving if necessary.

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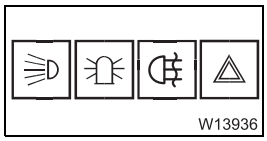
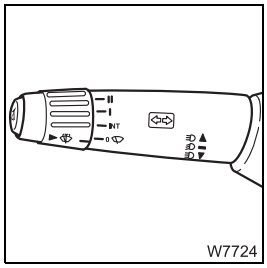
5.1.2 Checking the condition of the truck crane

Electrical system



- Check the following functions and arrange for faulty parts to be repaired:
  - Parking light/Headlight, rotating beacons, fog tail light, fog light, clearance lamps,
  - Hazard warning system,
  - Brake lights,
  - Reversing lamp/buzzer,



  - Headlight – full beam,
  - Turn signal indicator,
  - Windscreen wipers,
  - Windscreen washing system,
  - Horn.

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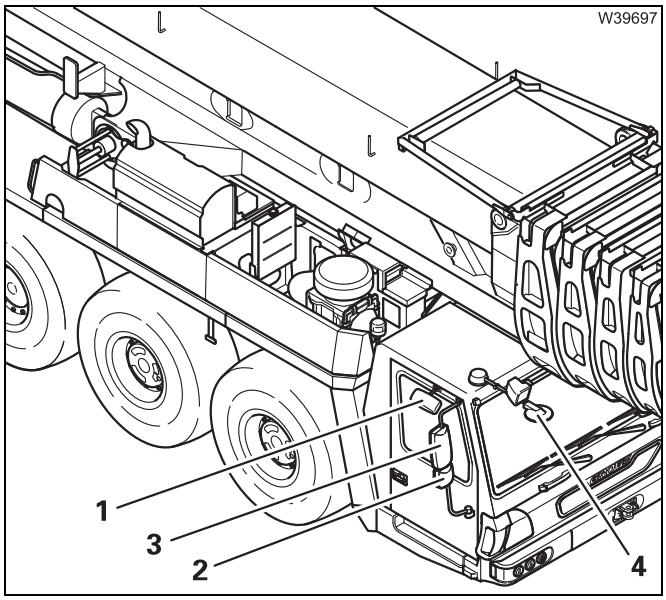
Adjusting the mirrors

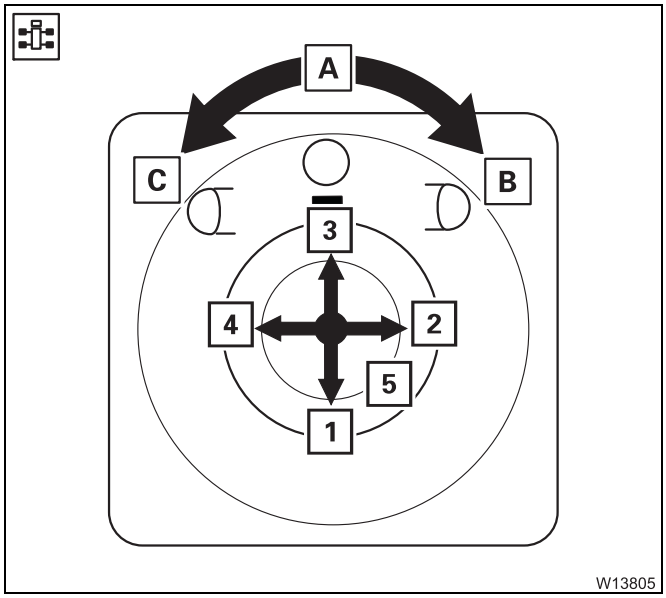
Adjust all the mirrors to suit your sitting position.



Manual adjustment

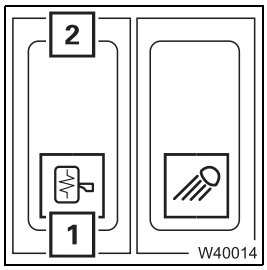
- Manually adjust the mirrors (**1**), (**3**) and (**4**).

The mirrors (**2**) are adjusted electrically on both sides.



Electrical adjustment

- Turn the button to position
  - **A** Neutral position
  - **B** Mirror on the passenger side.
  - **C** Driver's side mirror
- Press the button (**5**) – the mirror moves.
  - **1** up
  - **2** right
  - **3** Down
  - **4** left



Mirror heating

1 Switching on: Press button once – the lamp in the button lights up

2 Switching off: Press button once – the lamp in the button goes out

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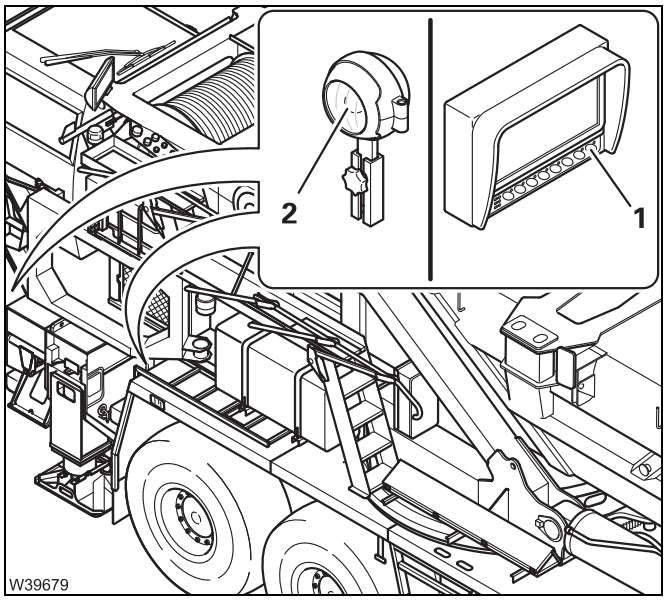
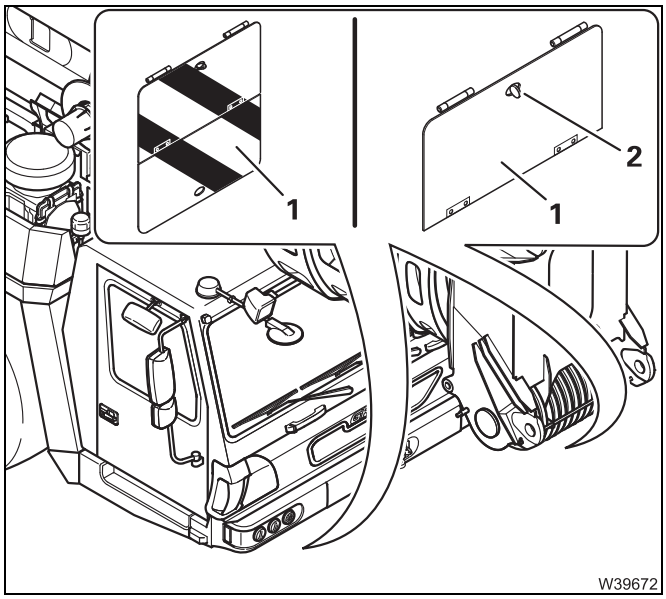
Adjusting the reverse camera

If present, the reverse camera is automatically switched on when a reversing gear is engaged.



- Switch on the monitor – button (**1**). The monitor shows the image after a few seconds.
- Align the reverse camera (**2**) so that the monitor provides a good overview of the area behind the truck crane.

Warning plates for vehicle width

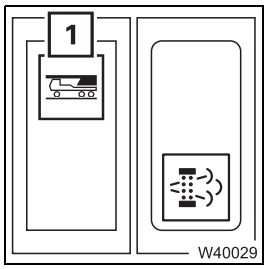


The warning plates (**1**) must be folded down to indicate the vehicle width during on-road driving.

For off-road driving, the warning plates can be folded up and fastened with the locking bar (**2**).

Boom not set down indicator

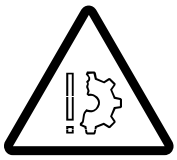
The vehicle height given at on-road driving level is only maintained when the main boom is resting in the boom rest; ➠ p. 1 - 8.



When the lamp (**1**) is present, the position of the main boom in the boom rest is monitored.

- Check that the lamp (**1**) has gone out.

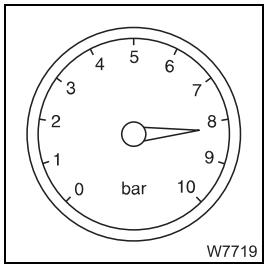
If the lamp is lit, derrick the main boom out until the lamp goes out.



Risk of accidents by exceeding total permissible height!
Check that the lamp (**1**) has gone out.
Otherwise the indicated total height will also be exceeded at on-road level.

Supply pressure

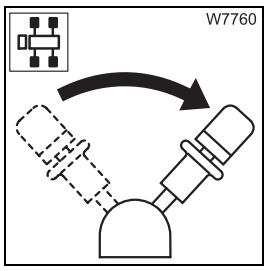
The brake system and some consumers (e.g. differential locks, driver's seat, etc.) require sufficient supply pressure in order function properly.



- Check that the supply pressure is about 8 bar (116 psi).

If the supply pressure is too low, such as after repairs, you can build it up as follows.

Building up supply pressure



- Check that the parking brake is applied.

Risk of accidents by truck crane moving unintentionally!
Make sure that the lever is pointing to the rear before building up the supply pressure.
This prevents the parking brake releasing as soon as sufficient pressure is available and the truck crane moving unintentionally.

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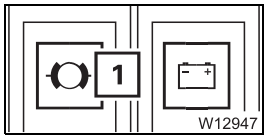
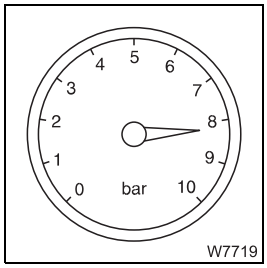


- Allow the engine to keep running. The supply pressure builds up and you can speed up this process by pressing the accelerator.

The light (**1**) turns off once the supply pressure reaches about 5.5 bar (80 psi).

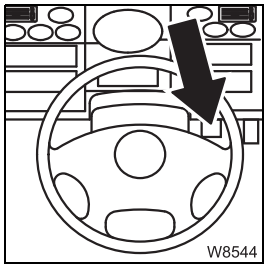


- Build the supply pressure until:
  - about 8 bar (116 psi) is reached **and**
  - a valve audibly discharges pressure.

There is now sufficient supply pressure.

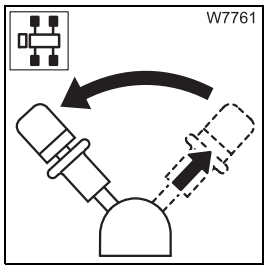
Parking brake

Check the function of the parking brake.

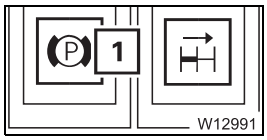


- Apply the service brake.

Risk of accidents by truck crane moving unintentionally!
Always apply the service brake before releasing the parking brake.
This prevents the truck crane rolling in an uncontrolled manner when the parking brake is released.



- Release the parking brake.



When the supply pressure is sufficient, the parking brake is released and the lamp (**1**) goes out.

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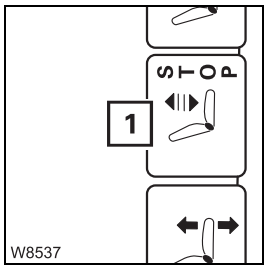
5.1.3 Adjusting the seat and the steering column

Driver's seat

The seat height and lumbar area support are adjusted pneumatically. You can only make these settings when

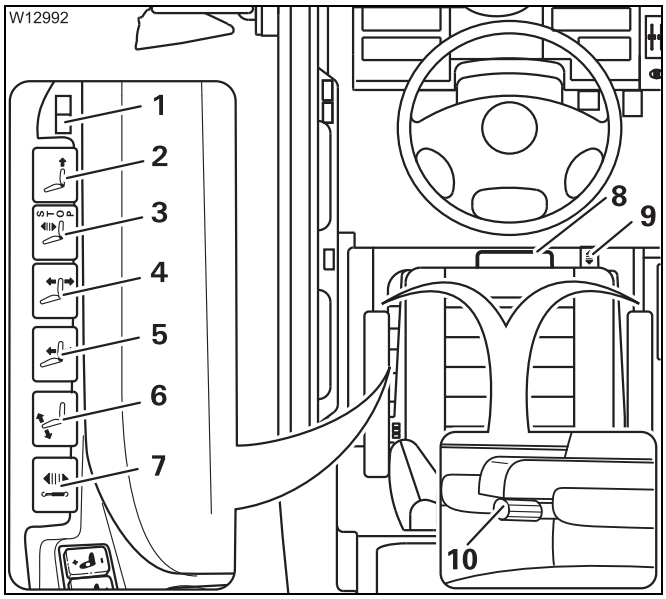


– The switch (**1**) on the driver's seat is switched off (not pressed in),

– Sufficient air pressure is available in the secondary consumer circuit. You may have to build up the supply pressure; ➠ p. 5 - 10.

• Sit down on the driver's seat. The seat lifts to the last set position.

You can make adjustments to suit your body size and shape.



Settings for body size

1 Seat heating on/off[1)]
2 Cushion longitudinal adjustment
3 Lower it to the lowest position
4 Seat – inclination
5 Seat – height
6 Back rest – angle
7 Vertical suspension – hardness
8 Seat – longitudinal adjustment
9 Horizontal suspension on/off
10 Angle setting of the armrest

[1)] Additional equipment

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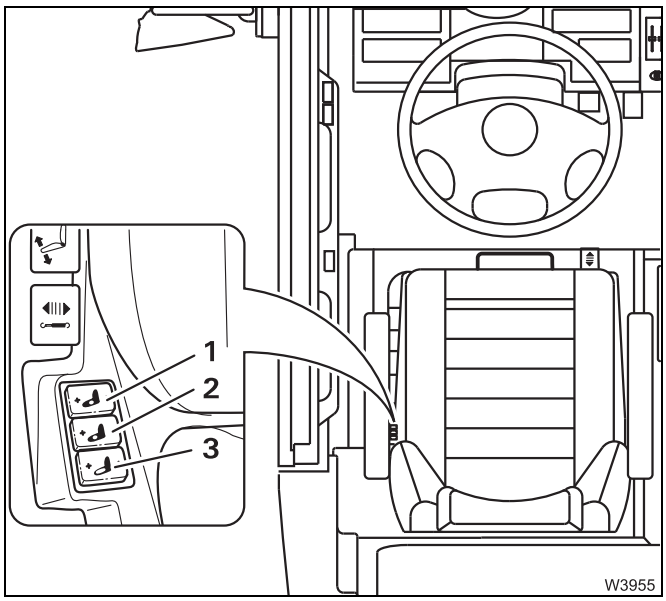


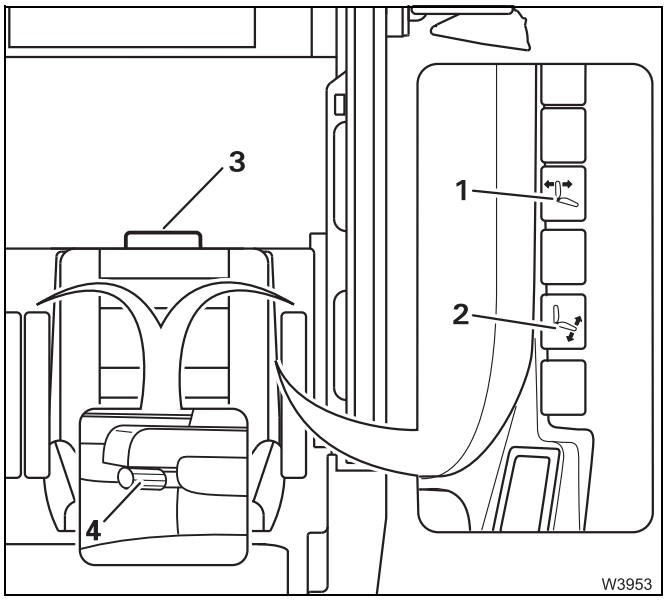
Settings for body shape

1 Lower lumbar area support
2 Upper lumbar area support
3 Lateral support

The settings are made pneumatically. For all buttons:

Empty the air cushion: Press **–**
Fill the air cushion: Press **+**

Passenger's seat The passenger's seat is adjusted mechanically.



1 Cushion longitudinal adjustment
2 Seat – inclination
3 Back rest – angle
4 Angle setting of the armrest

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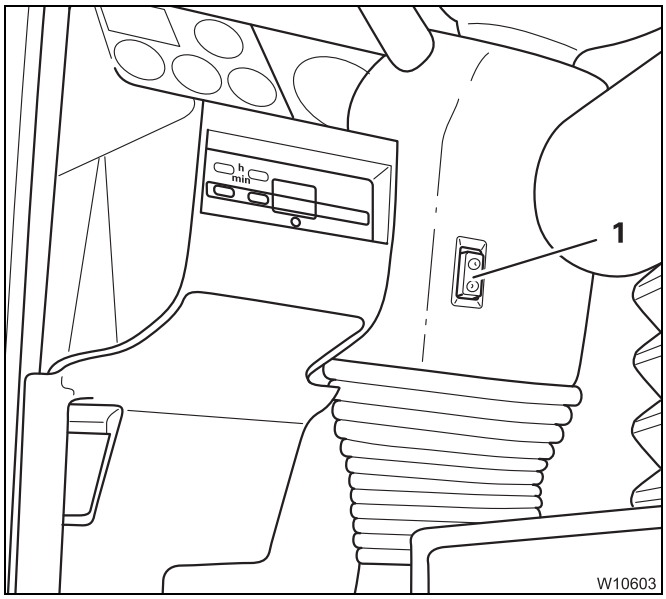
Adjusting the steering column

The steering column is unlocked pneumatically.

Risk of accidents by unlocked steering column!
Always stop the truck crane before you unlock the steering column.
Once the steering column is unlocked you can no longer steer safely.

The steering column is only unlocked when sufficient supply pressure has been built up; ➠ *Building up supply pressure*, p. 5 - 10.



- Push the button (**1**) down once. The steering column is unlocked for about 6 seconds.
- Move the steering column into the desired position.
- Press the button (**1**) in at the top once, or wait until the steering column automatically locks (after approx. 6 seconds).

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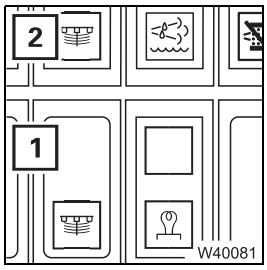
5.1.4 Switching the suspension on/off

The truck crane must be stationary in order to switch this on/off.

Switching on the suspension

The suspension cylinders are enabled when the suspension is switched on. This state must be established for on-road driving.



- Press switch (**1**) in at the top.

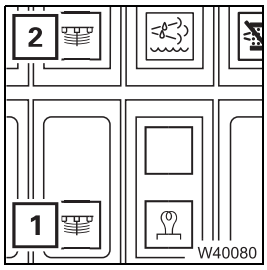
If the suspension is switched on, the lamp (**2**) goes out.

If the lamp (**2**) does not go out, the air pressure may be too low. In this case the suspension will only be switched on if sufficient supply pressure is built up; ➠ *Building up supply pressure*, p. 5 - 10.

Switching off the suspension

When the suspension is switched off, the suspension cylinders are locked. This state is intended only for crane operation.

Risk of damage to the axle lines!
Always switch the suspension on for on-road driving.
The axle lines may become damaged and the steering behaviour may change if the suspension is switched off.



- Press switch (**1**) in at the bottom.

The lamp goes on (**2**) if the suspension is switched off.

The suspension is switched off whenever the ignition is switched off.

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5.1.5 Setting the tachograph

In the tachographs, the diagram sheets (24-hour discs) can be inserted for two drivers.

As a crane operator, you are obligated to set each activity on the tachograph.

This section only describes the basic operation of the tachograph (inserting diagram sheets, setting time groups, operating errors).
Before operation, also note the information in the tachograph manufacturer's separate operating manual.
There you will find detailed information (marking the diagram sheets, possible malfunctions, etc.).

Risk of damage to the tachograph drawer!
Open the tachograph drawer only to insert or remove diagram sheets and do not use the opened drawer as a shelf or surface (e.g. to mark the diagram sheets). This prevents contamination and damage.

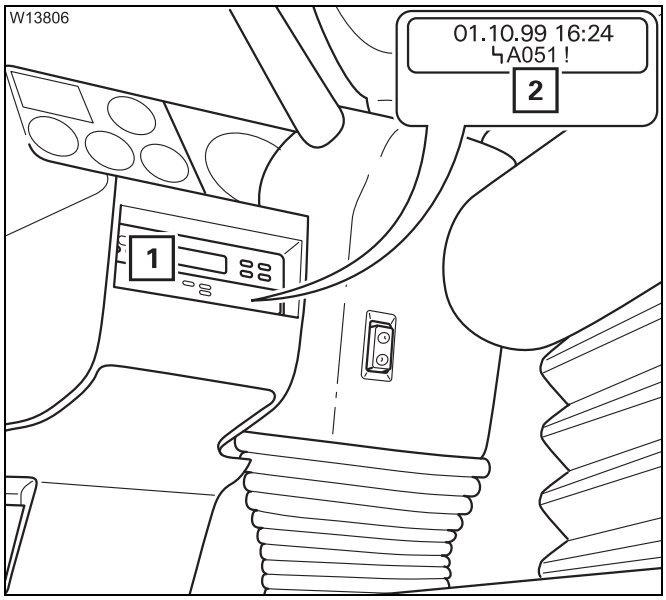
Prerequisites

To set the tachograph, the following requirements must be met:

- The ignition is switched on
- The truck crane is stationary
- No error message is displayed.

If a malfunction occurs

Check that a malfunction has occurred.



When a malfunction occurs, the display (**2**) in the tachograph (**1**) shows an error message;
➠ *Separate Betriebsanleitung*.

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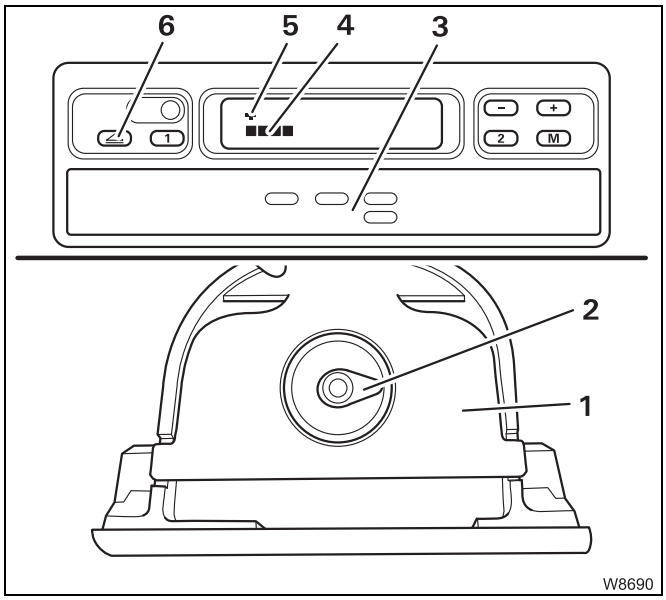
Setting the tachograph

To set the tachograph, you must first open the drawer and check the time setting. You can then insert the diagram sheets and set the time groups.



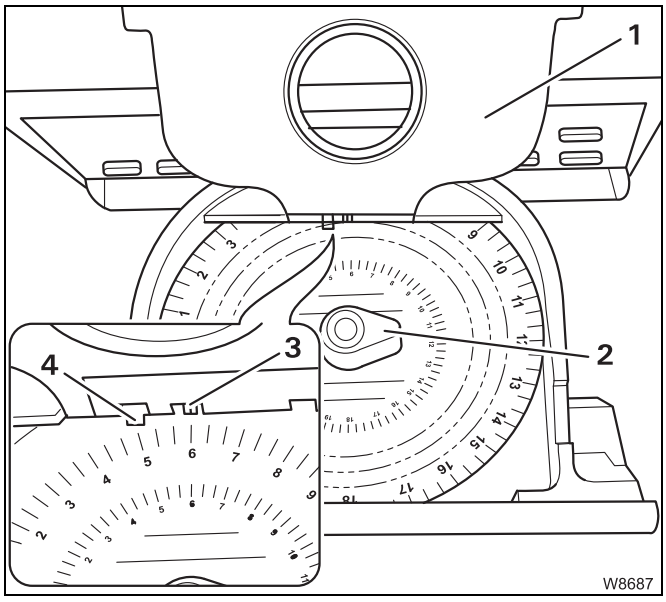
Opening the drawer

- Press the button (**6**) once.

First the symbol (**5**) and the running bar (**4**) appear, then the drawer (**3**) opens.

- Pull out the drawer (**3**) as far as it will go.

The diagram sheet mounting (**2**) and an isolating plate (**1**) are in the drawer.



Checking the time setting

- First check the time setting for the diagram sheet mounting (**2**); fold the isolating plate (**1**) upwards to do this.
- Insert a diagram sheet. Make sure that the diagram sheet is under the spring (**4**).
- Check whether the diagram sheet's time scale on the marking (**3**) is showing the current time.

You can correct the time in the following way:

- Take all the diagram sheets out of the diagram sheet mounting.
- Close the drawer.
  The time setting is corrected automatically.
- Open the drawer and insert the required diagram sheets.

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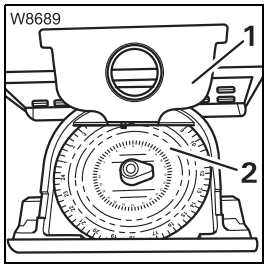
Inserting diagram sheets

Only insert diagram sheets that are properly marked.
The diagram sheets are always inserted with the front facing upwards.

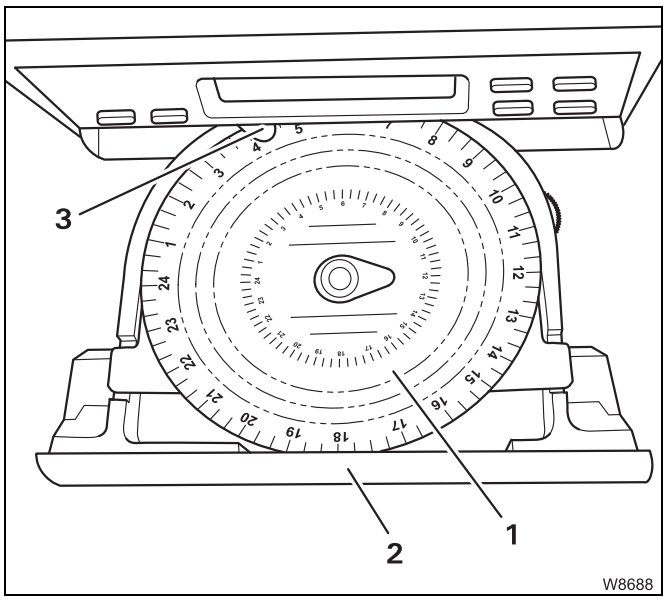
Risk of malfunctions in the electronics!
If a diagram sheet has been damaged by being marked several times, this might cause malfunctions in the electronics. Always insert the plastic diagram sheet supplied should you not need to use the tachograph.



With **2-driver operation** a diagram sheet (**2**) for driver 2 must be placed below the isolating plate (**1**):

– After checking the time, leave the diagram sheet (**2**) where it is.

– After checking the time, insert the diagram sheet (**2**).



- Fold the isolating plate downwards.
- Put the diagram sheet (**1**) for driver 1 on the isolating plate.
- Take care that the diagram sheet is under the holder (**3**).
- Push the drawer (**2**) back in until it engages.

For **single-driver operation**, the diagram sheet mounting under the isolating plate is empty and only the diagram sheet (**1**) for driver 1 is inserted.

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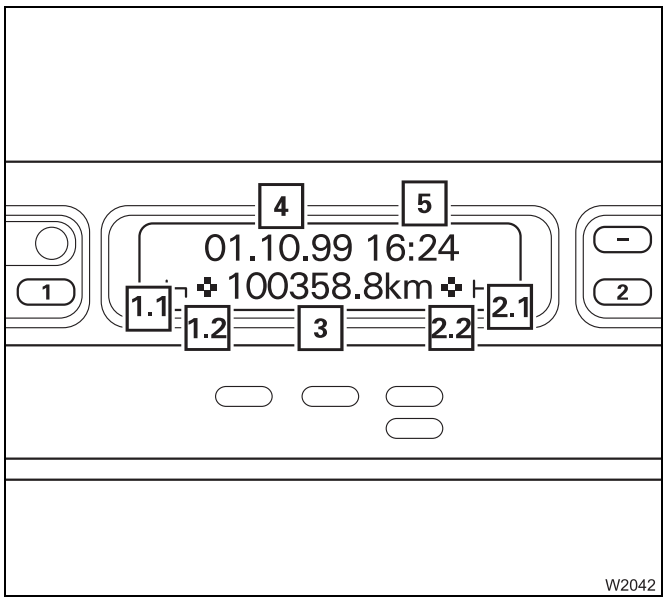
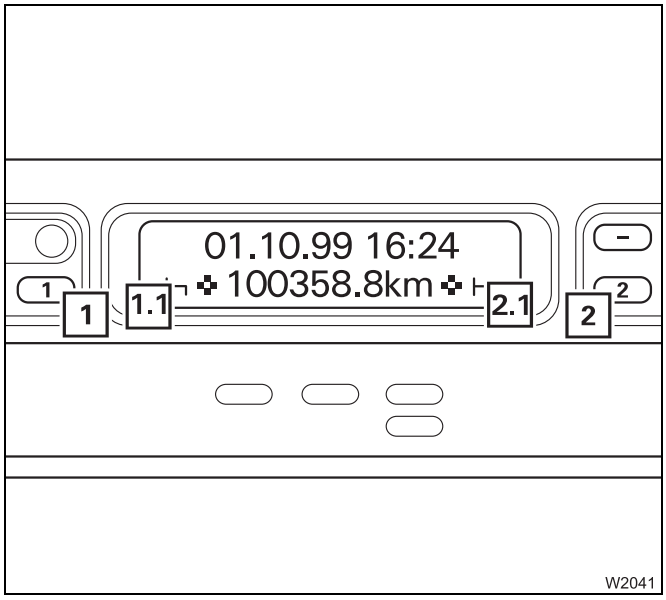


Display

If no malfunction is present, the display now shows the basic display:

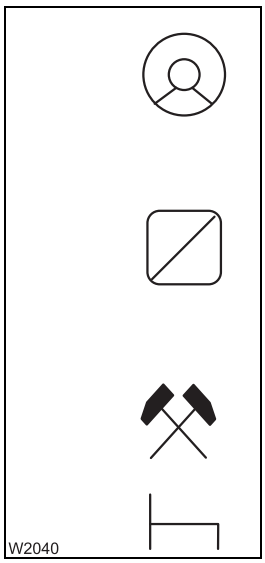
– Date (**4**) and time (**5**)
– Driver 1 time group (**1.1**)
– Driver 1 diagram sheet inserted (**1.2**)
– Total kilometres of the truck crane (**3**)
– Driver 2 time group (**2.1**)
– Driver 2 diagram sheet inserted (**2.2**)



Setting time groups

1 Setting the time group for driver 1
1.1 Display of time group for driver 1
2 Setting the time group for driver 2
2.1 Display of time group for driver 2

The different time groups are shown with the following symbols:



Driving times: As soon as the vehicle starts to move, the tachograph automatically switches to the symbol for driver 1 driving time.
If there are two diagram sheets inserted, the tachograph automatically switches to stand-by time for two-driver operation.

Working hours: For all other work, the same activities apply as for stand-by time.
When setting the working hours and stand-by time, observe the applicable local regulations for the country in which you are working.

Stand-by time: Periods of presence at the truck crane, e.g. crane operation, maintenance work or passenger time.

Breaks and periods of rest: These times are prescribed by law and must be observed.

If the drivers swap during **two-driver operation**, the diagram sheets in the trip recorder also have to be changed. The driving time is always recorded on the diagram sheet which is on the isolating plate (driver 1).

In **single-driver operation**, the symbol for resting must always be set for driver 2 otherwise an error message will appear.

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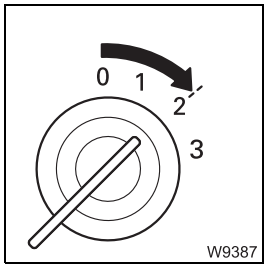
5.2 Operating the transmission

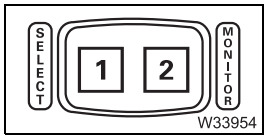
The transmission automatically controls all gear changes. However, gears can be changed manually at any time.

5.2.1 Switching on

Risk posed by unexpected rolling!
When the ignition is switched on, the transmission switches to the neutral position **N**.
Therefore always apply the parking brake or the service brake before you switch on the ignition.
This prevents the truck crane from suddenly rolling away.

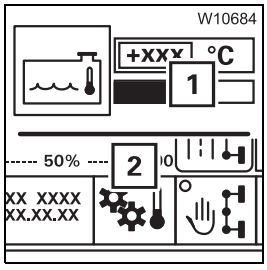


- Switch on the ignition.



– The electronic gear system is switched on and a test program runs. At the same time, the displays (**1**) and (**2**) light up in the *Transmission* display.

– If a gear is engaged when the ignition is switched off, the transmission switches into the neutral position. The entry **NN** appears in the *Transmission* display.



If an error occurs, which may be of importance for continued driving, the corresponding symbols appear on the displays (**1**), (**2**); ➠ p. 7 - 39.

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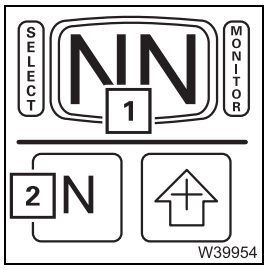
5.2.2 Shifting the transmission to neutral position

The neutral position can be switched on at any time. You should only switch to neutral position at standstill.

You can only start the motor when the transmission is in the neutral position.

Risk of accidents when driving in neutral position!
Never switch into neutral position while driving.
In the neutral position, you cannot accelerate the truck crane, and the engine retarder does not work.

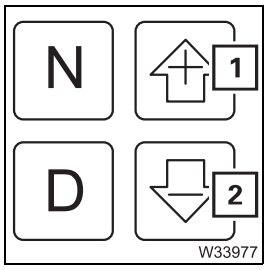


- Press the button (**2**) once.

As soon as the neutral position is switched on, this is shown on the display (**1**).

While driving

If you have shifted into neutral while driving, then proceed as follows to shift down in order to return to a safe driving mode.



- Release the accelerator.
- Press button (**2**) once **while driving forward**.
- Press button (**1**) once **while driving in reverse**.

An appropriate gear will be engaged.

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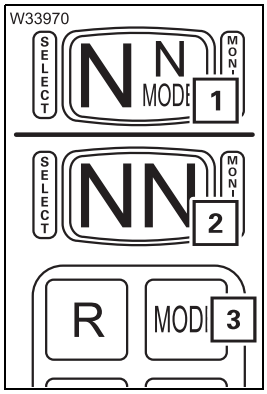
5.2.3 Changing the driving mode

You may switch between two driving modes:

– The **E** (Economy) driving mode is designed mostly for level driving conditions. A higher gear is selected at a low engine speed to save on fuel consumption.

– The **P** (Power) driving mode is designed mostly for driving uphill and off-road. A high gear is selected only when a high engine speed has been reached for more power.



- Press button (**3**) once – the driving mode switches to the other driving mode.
  – The display shows the current state.
    1 Driving mode **P** on
    2 Driving mode **E** on

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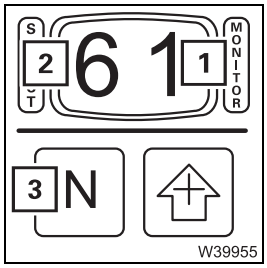
5.2.4 Selecting the driving direction

The following conditions must be met:

– The vehicle engine is running at idling speed,
– The accelerator is not being operated
– The parking brake or holding brake is applied to secure the truck crane

Risk of accidents from unexpected movement!
If the engine speed is too high when selecting the driving direction, then no gear will be engaged. However, if the engine speed briefly drops low enough, then the gear will be engaged and the truck crane will begin to move, e.g. when you release the accelerator.

Risk of accidents if brakes not applied!
If the brakes are not applied, the truck crane moves immediately once the driving direction has been selected. Therefore, always apply the parking brake or the holding brake to secure the truck crane before selecting the driving direction.

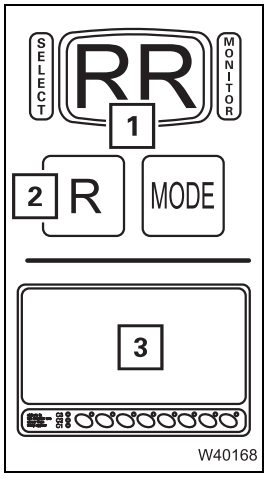


For forward travel

• Press the button (**3**) once.

A suitable starting gear (**1**) is selected and displayed, e.g. gear **1**.

Additionally, the highest gear (**2**) which is selected during driving is displayed. You can change this gear; ➠ p. 5 - 25.



For reverse travel

• Press the button (**2**) once.

The reverse gear (**1**) is selected and displayed.

The reverse camera is switched on.

The display (**3**) shows the area behind the truck crane.

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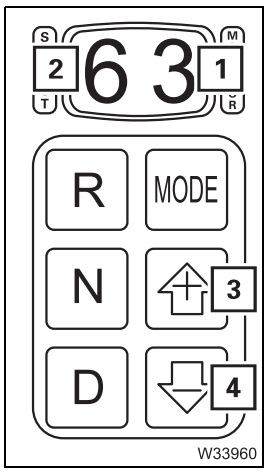
5.2.5 Changing highest gear/starting gear



The highest gear (**2**), which is selected during driving, and the engaged starting gear (**1**) are displayed.

Changing the highest gear

- Press button (**3**) or (**4**) until the required highest gear (**2**) is displayed.

Selecting a lower starting gear

- Select a gear which is lower than the engaged starting gear (**1**) to be the highest gear (**2**), e.g. gear 1.

The starting gear is switched down to the highest gear.

5.2.6 Starting

To start moving, you have to:

– Apply the service brake

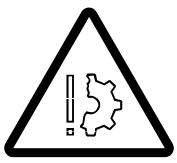
– Release the parking brake

– Release the service brake – the truck crane starts to move

– Press the accelerator

If the load is too high that the truck crane cannot move:

- Release the accelerator after 30 seconds at the latest



Risk of damage to the transmission!
Release the accelerator after 30 seconds at the latest when the load is too high.
This prevents the transmission from being damaged due to overheating.
The starting gear is not automatically disengaged.

- Switch into the neutral position and let the motor run until the gear oil temperature drops below about 93 °C (199 °F); ➠ *Monitoring elements*, p. 4 - 15.
- Select a lower starting gear or driving mode **P** and start driving again.

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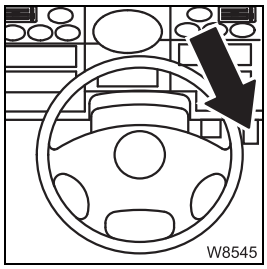
5.2.7 Driving and changing gears

While driving, the transmission changes to the gear suitable for the current load, engine speed and position of the accelerator.

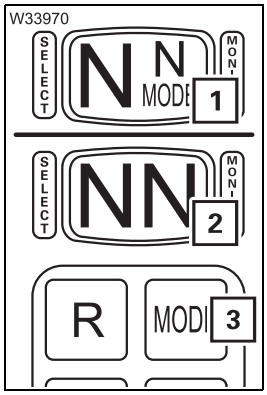
When the gear oil temperature falls below approx. -7 °C (20 °F) only gears 1 and 2 are used in transmission mode **D**.



Automatic upshifting

You can influence upshifting by using the accelerator.

- Pressing the accelerator slightly: Upshifting at low engine speed
- Pressing the accelerator harder: Upshifting at high engine speed



You can influence upshifting by using the driving mode – button (**3**).

1 Driving mode **P** on: Upshifting at high engine speed

2 Driving mode **E** on: Upshifting at low engine speed

Automatic downshifting

- When you slow down the truck crane by braking, the transmission shifts down when the appropriate engine speed is reached.
- If you fully depress the accelerator full (kick down), the transmission first shifts to a lower gear. After that, it will shift to a higher gear only once a higher engine speed has been reached, so as to achieve maximum acceleration.

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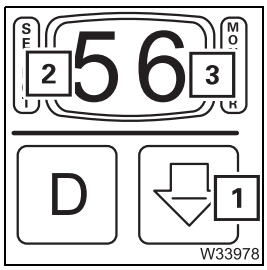
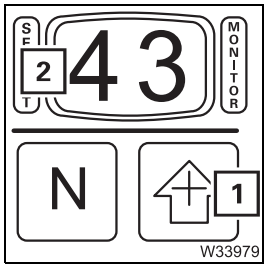


Manual downshifting

- Select a gear that is smaller than the current gear (**3**) as the highest gear (**2**) by using the button (**1**).

If it is permissible for the current driving mode, then transmission shifts down. It may be necessary for you to slow down by braking until an engine speed is reached that is permissible for downshifting.



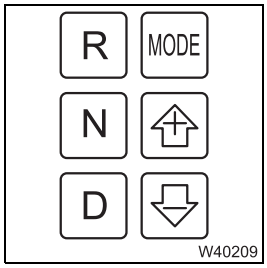
Manual upshifting

The truck crane is being driven in the highest gear that is smaller than gear 6.

- Select a higher gear (**2**) by using the button (**1**).

If it is permissible for the current driving mode, then transmission shifts up.

5.2.8 Changing the driving direction



- Stop the truck crane and leave the vehicle engine running at idling speed.
- Switch to neutral position **N**.
- Switch to transmission mode **D** or **R** for the opposite direction.
- Start moving.

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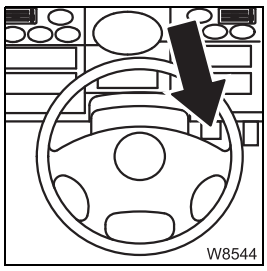
5.2.9 Stopping the truck crane



- In order to stop, remove your foot from the accelerator and press the brake pedal.

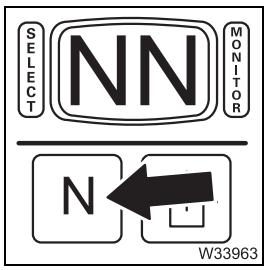
Stopping for a long period of time

In order to stop for a longer time with the engine running, you must:

– Apply the parking brake and

– Shift the transmission to the neutral position **N**.

5.2.10 On the roller type dynamometer



- Always switch to neutral position **N** after driving onto a roller type dynamometer.
- Allow the engine to keep running.

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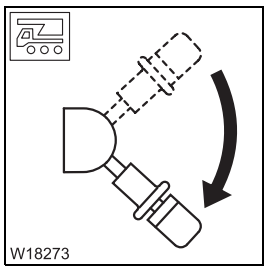
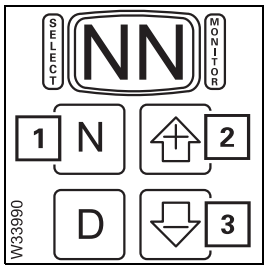
5.2.11 Oil level gauge

You can call up information on the current oil level in the transmission.

If in doubt about the accuracy of the oil-level reading, you can always check the oil level using the dipstick when the gear oil is warm;
➠ *Maintenance manual*.



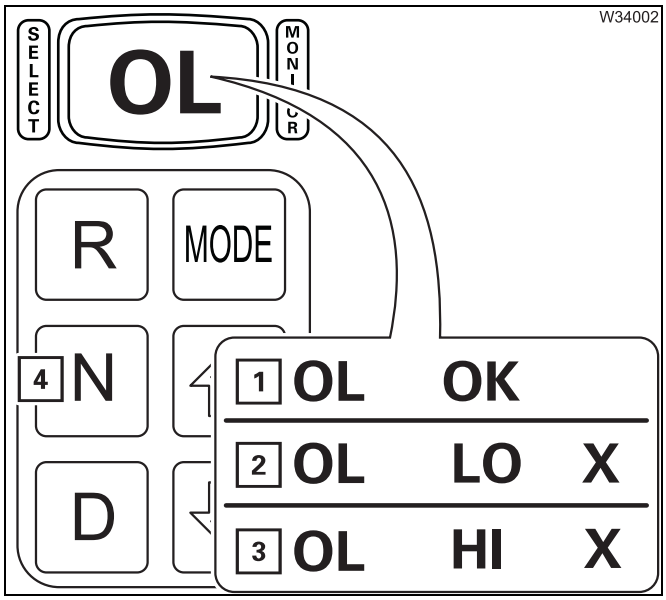
- Park the truck crane on a level surface.
- Apply the parking brake.
- Let the motor run at idling speed.
- Wait about 3 minutes – required resting time.



- Switch to the neutral position – button (**1**).
- Press buttons (**2**) and (**3**) together once.

The *Transmission* display shows a code
– for the oil level or
– if the oil level cannot be read, for an error.

Each code consists of different displays which are shown continuously in succession.



Displays for the oil level

1 Oil level correct
2 Oil level **x** litres too low
3 Oil level **x** litres too high

- Press button (**4**) once to exit the oil-level gauge.

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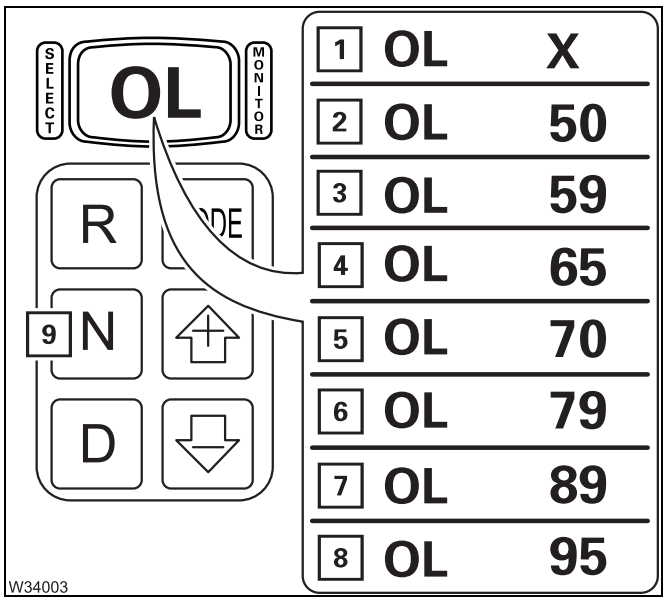

Displays for errors

1 Resting time is elapsing,
X = counters 8 to 1

2 Engine speed too low

3 Engine speed too high

4 No neutral position

5 Transmission oil too cold

6 Transmission oil too hot

7 No standstill

8 Error on the sensor

- Press button (**9**) once to exit the oil-level gauge.
- Rectify the error and call up the oil level gauge again.

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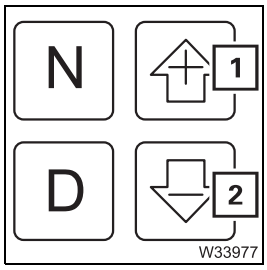
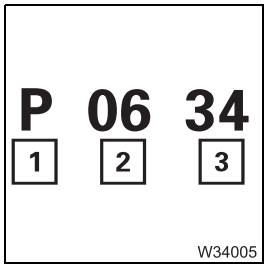
5.2.12 Reading out error codes

You can display all the stored error codes one after the other.



- Press buttons (**1**) and (**2**) simultaneously twice.

The *Transmission* display shows the first stored error code.

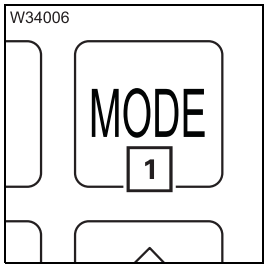


Each error code consists of four displays which are shown continuously in succession.

1 Error type

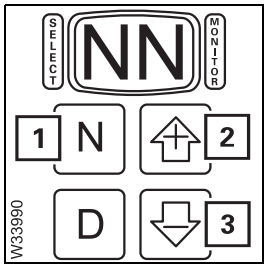
2 Error number, 1st part

3 Error number, 2nd part



- To read further error codes, press button (**1**).
  Each time you press the button, the next error code will be displayed.

As long as error codes are shown, the driving mode switched on has no influence on the lamp (**2**).



- Press button (**1**) once to exit the error display.

or

- Press buttons (**2**) and (**3**) together once.

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Blank page

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5.3 Driving the truck crane and parking it

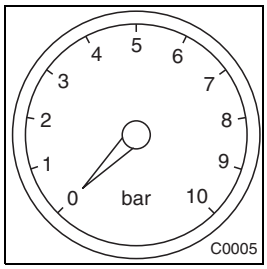
Risk of accidents because the truck crane cannot be steered!
Never switch off the ignition or remove the ignition key while the truck crane is moving!
This precaution prevents the steering locking and consequent loss of control of the moving truck crane.

5.3.1 Checks while driving

Immediately after you start to move

- Check the service and parking brakes for correct functioning immediately after starting out.

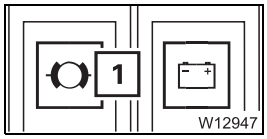
Monitor the following indicator lamps while driving:



Supply pressure of brake circuits I and II

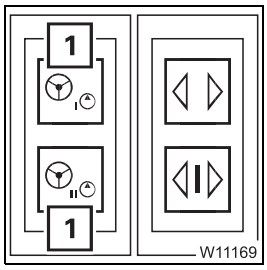
The operation pressure is about 8 bar (116 psi).

The pressure in both brake circuits **must** be over 5.5 bar (80 psi) while driving.



The warning lamp (**1**) will light up if the pressure in a brake circuit falls under 5.5 bar (80 psi).

Checking the steering



- Check the lamps (**1**).

At speeds of above 10 km/h (6 mph), the lamps (**1**) **must** go out. If a lamp does not go out, this indicates a malfunction in the steering.

Risk of accidents if one of the steering circuits fails!
If one of the two lamps lights up, reduce the speed. Stop the truck crane at the next opportunity and try to find the cause!
You may continue to drive **slowly** in order to reach the next garage if one of the steering circuits fails!

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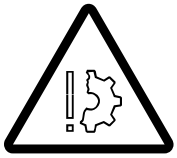
Risk of accidents if the steering circuits fail!
Stop the truck crane immediately if both lamps are on!
The steering is sluggish and the truck crane can no longer be steered safely!

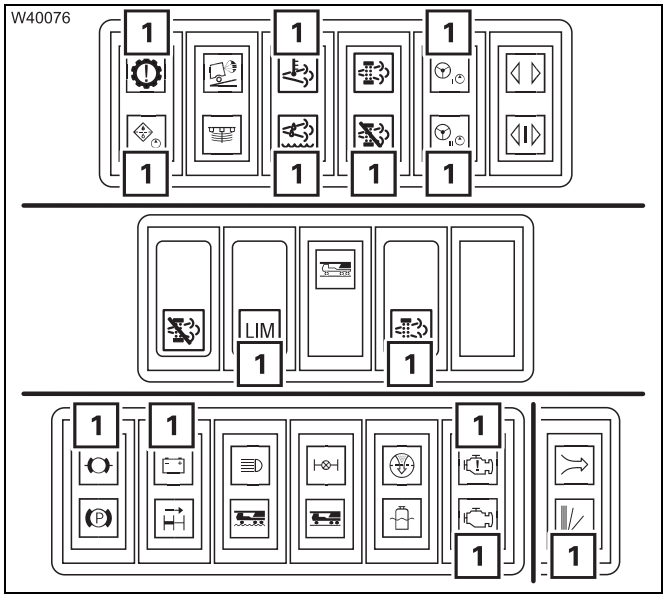
➠ *Steering malfunctions*, p. 7 - 31

While driving

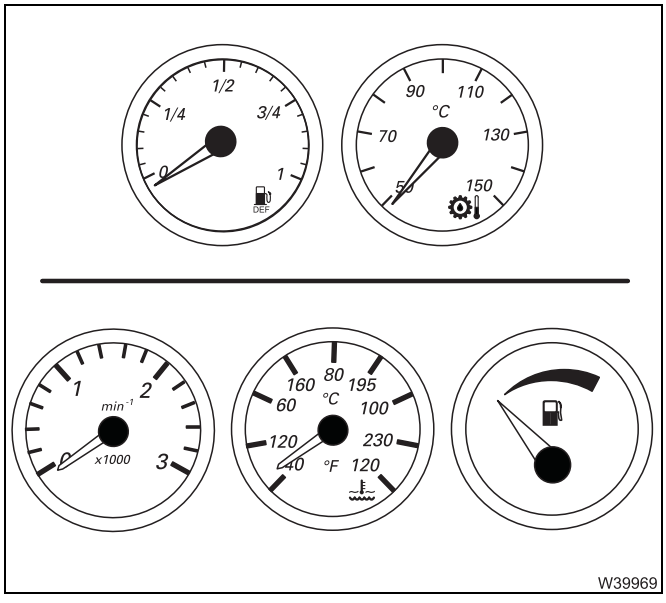
- Observe all warning messages.



Risk of damage if warning messages are not observed!
Observe all information in section *Warning messages in driving mode* and take the appropriate remedial measures if a warning message appears. This prevents these malfunctions causing defects in the truck crane.



– If a warning message lamp (**1**) lights up;
➠ *Warning messages in driving mode*, p. 5 - 42.



- Also pay attention to the monitoring elements for:

– AdBlue tank level
– Transmission oil temperature
– Engine speed
– Coolant temperature
– Fuel level;

➠ *Monitoring elements*, p. 4 - 15.

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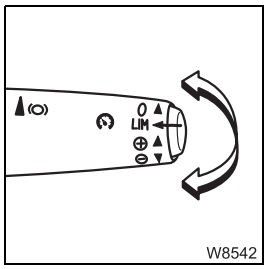
5.3.2 Cruise control

The Tempomat enables you to drive at a constant speed without pressing the accelerator.

Risk of accidents due to carelessness!
Always be ready to brake even if the Tempomat is switched on!
Only switch the Tempomat on if the traffic situation permits a constant speed.

Switching on

You can only switch on the cruise control at speeds of over 15 km/h (9 mph).



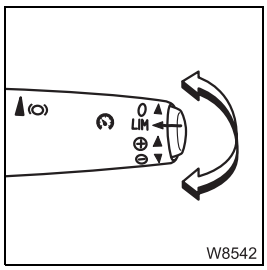
- Press the multipurpose switch upwards or downwards once.

The Tempomat is switched on, and the current speed is maintained.

On downhill slopes, the speed set may be exceeded, since the Tempomat does not brake the truck crane. Switch the Tempomat off on downhill slopes.

In an emergency, or when overtaking, you can increase the speed with the accelerator. After the accelerator is released, the truck crane slows down again to the speed set.

Driving with the Tempomat



Increasing/reducing the speed

- Press the switch up/down until the required speed has been reached

  or

- Push the switch upwards/downwards once. The speed will increase/ decrease by 0.5 km/h (0.3 mph).

The set speed is maintained.

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Switching off

Automatic switch-off

The Tempomat is switched off automatically,

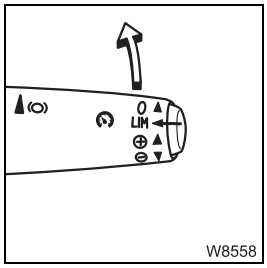
– if the service brake, the engine retarder or the transmission retarder are actuated,

– if 10 km/h (6 mph) is not reached,

– when the Temposet function is switched on,

– when the ignition is turned off.

Manual switch-off



• Press the multipurpose switch forwards once.

The Tempomat is switched off. You must now regulate the speed with the accelerator.

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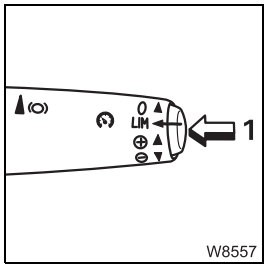
5.3.3 Temposet

You can use Temposet to limit the maximum speed.

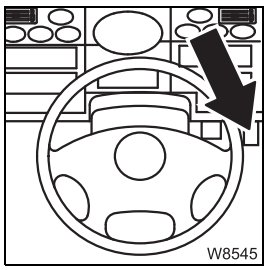
Switching on

You can switch on Temposet only at speeds greater than 15 km/h (9 mph).

- Bring the truck crane up to the required maximum speed.
- Press the button (**1**) once.

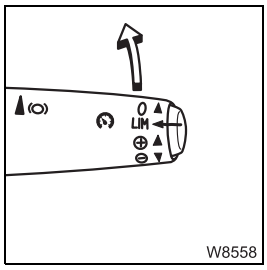


The current speed is stored as the maximum speed.



You can exceed the speed by pressing the accelerator as far down as it will go (kick-down). The Temposet limits the speed again only once you release the accelerator and press it again.

Switching off



- Push the switch forwards once.

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5.3.4 Driving downhill

Risk of accidents when driving in neutral position!
Never switch into neutral position while driving.
In neutral position, the truck crane may accelerate and the engine retarder is ineffective.

Starting

The engine must be running.

To start moving, you have to:

– Select a starting gear

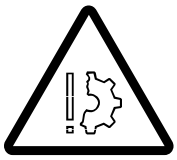
– Release the parking and service brakes

– Press the accelerator

If the truck crane starts to move forwards in neutral position **N**, you can still select the *forwards* driving direction. A gear appropriate to the speed is engaged and the engine brake power is effective.

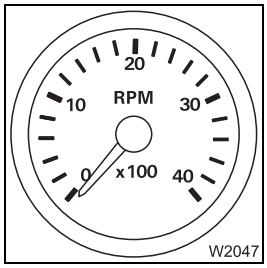
Inspections when driving downhill

While driving, the engine speed may not exceed (2,000 rpm). The engine speed is not limited automatically.



Risk of damage due to excessive engine speed!
Shift to a higher gear or slow the truck crane down when the maximum permissible engine speed has been reached.
This prevents the engine or transmission from being damaged or the air intake inhibitor from being triggered.

If an air intake inhibitor is present, it will be triggered if the maximum permissible engine speed is exceeded and the motor will stop running; ➠ p. 4 - 20.



- Check the current speed on the tachometer while driving.
- Brake the truck crane before the speed exceeds (2,000 rpm).

When the maximum permissible engine speed is reached, a warning buzzer sounds. Additionally

– the sustained action brake is switched on and

– the transmission shifts up, and if appropriate, the highest gear is automatically selected.

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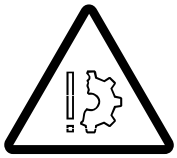


Risk of damage from resonance vibrations!
Always maintain a speed below 85 km/h (53 mph). Stop the truck crane promptly.

When driving downhill, you can also slow down the truck crane as follows, in addition to using the service brake:

– By shifting down from the highest gear; ➠ p. 5 - 39,

– With the additional brake; ➠ p. 5 - 40,

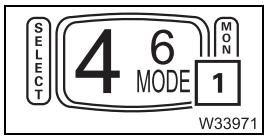
– With the eddy current retarder; ➠ p. 5 - 40.

Shifting down from the highest gear

If you shift down from the highest gear, the braking force of the engine is increased.

• Shift down from the highest gear, e.g. to 4th gear.

• Brake the truck crane.
When a permissible speed has been reached, the transmission will shift down.



You can also increase the braking force of the engine by switching to the **P** (**1**) driving mode.

If the maximum permissible speed is also reached in a lower gear, the transmission will automatically engage the highest gear and shift up.

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Additional brakes

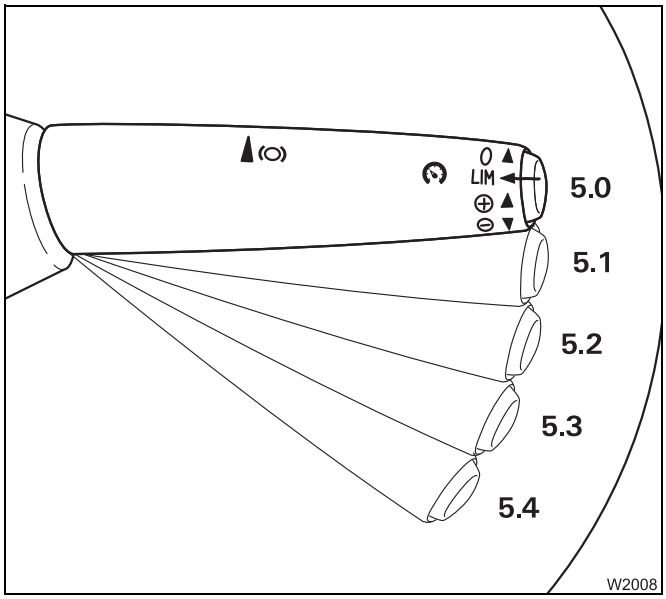
Engine retarder

The truck crane has an engine flap brake which it uses as an engine retarder. When the maximum permissible speed is reached, the sustained action brake is automatically switched on.

Risk of accidents from unexpected acceleration!
Maintain sufficient distance when the engine retarder is switched on.
The effectiveness of the engine retarder is interrupted during gear shifting.
This may cause the truck crane to accelerate briefly.

Transmission retarder

The truck crane can also be rigged with an eddy current retarder.
The braking force of the eddy current retarder depends on the speed.
The higher the speed, the higher the braking power.



Switching on the additional brakes

- Pull the multipurpose switch back to the required level (latch into place briefly at each level).

  Connection to the retarder power:

  5.1 Engine retarder[1)], transmission retarder 25%

  5.2 Engine retarder[1)], transmission retarder 50%

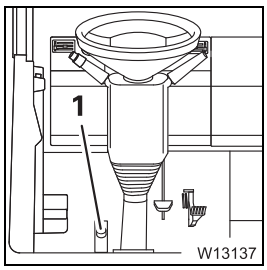
  5.3 Engine retarder[1)], transmission retarder 75%

  5.4 Engine retarder[1)], transmission retarder 100%

  [1)] Only with standard equipment

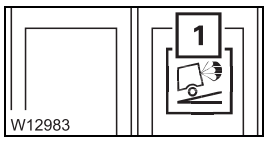
Switching on the additional brakes

- Pull the multipurpose switch forwards.



Engine retarder on/off

– Switching on: Press button (**1**)
– Switching off: Release button (**1**)



When the additional brake is switched on, the lamp (**1**) lights up.

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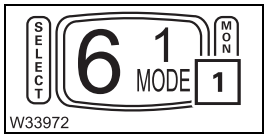
5.3.5 Driving uphill

Starting

The engine must be running.



- To start moving and to drive on steep uphill roads, switch to the **P** (**1**) driving mode; ➠ p. 5 - 23.

To start moving, you have to:

– Apply the parking brake

– Select the driving direction and wait until the starting gear is shown

– Actuate the accelerator gently

– Release the parking brake and press the accelerator

Risk of damage to the transmission!
Release the accelerator after 30 seconds at the latest when the load is too high.
This prevents the transmission from being damaged due to overheating.
The starting procedure is not automatically cancelled.

Driving

On certain gradients, the transmission may switch continuously back and forth between two gears. Either take your foot slightly off the accelerator or select a lower gear.

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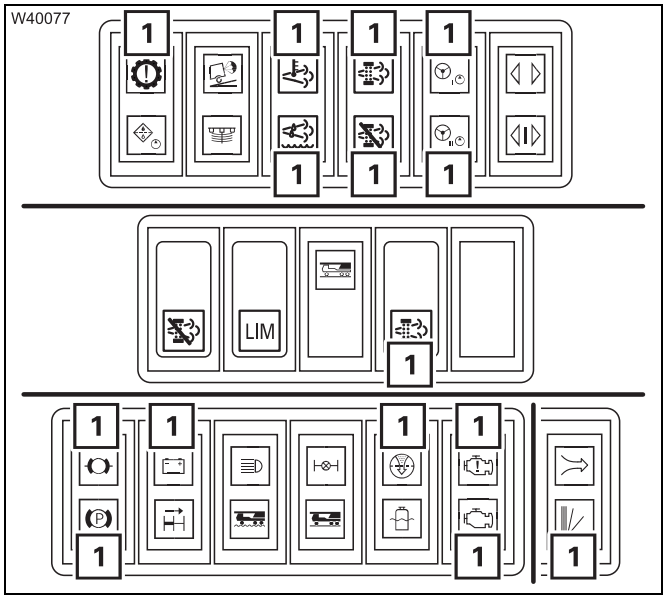
5.3.6 Warning messages in driving mode

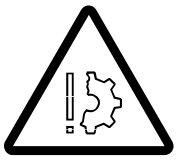


A warning message indicates that certain values do not correspond to a target value.

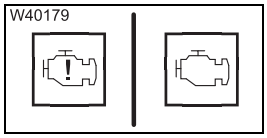
If a warning message is given, the appropriate lamp (**1**) lights up, and in some cases, a warning buzzer also sounds.

Meaning of the lamps

Make the following inspections if a lamp lights up:



Risk of damage if warning messages are not observed!
Observe the following information in good time and take the appropriate remedial measures if a warning message appears. This prevents these malfunctions causing defects in the truck crane.



Oil pressure too low

A warning buzzer sounds at the same time.

- Stop the truck crane as quickly as possible while observing the traffic situation and switch off the engine.
- Read out the error message; ➠ p. 7 - 34.
- Check the oil level; ➠ *Maintenance manual*.
- Add oil if necessary. If the error message is still displayed, contact **Manitowoc Crane Care**.

Risk of damage to the engine if the oil pressure drops!
Turn the engine off as soon as possible and look for the cause if the lamp goes on or the warning buzzer sounds!
Only restart the engine once you have found the cause and eliminated the problem!

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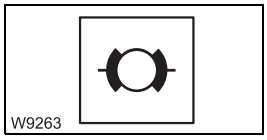
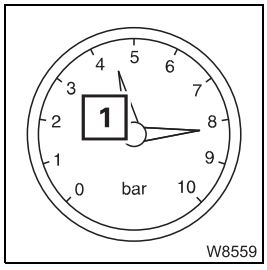


Supply pressure in the brake circuits too low

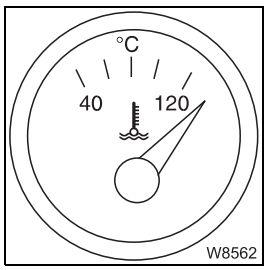
The pressure in a brake circuit is below approx. 5.5 bar (80 psi).

Risk of accidents if one or both brake circuits fail!
Stop the truck crane immediately and identify the cause!
Only restart the engine once you have found the cause and eliminated the problem! ➠ p. 7 - 27



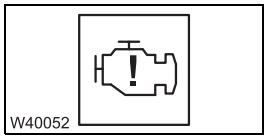
- Check the supply pressure.

If the supply pressure in only one brake circuit, e.g. (**1**) is below approx. 5.5 bar (80 psi) and you cannot identify the cause, you may still continue driving at a low speed until you reach the next garage.
If the supply pressure in both brake circuits is below approx. 5.5 bar (80 psi), the parking brake is engaged and you can only continue driving after repairs have been carried out.



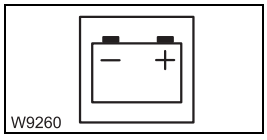
Coolant temperature

The reason for the malfunction can be that the coolant temperature exceeds approx. 120 °C (248 °F)); ➠ *Engine malfunctions*, p. 7 - 27.



Engine electronic system

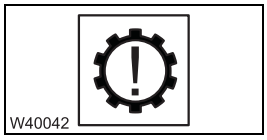
Stop the truck crane as quickly as possible while observing the traffic situation look for the cause; ➠ *Engine malfunctions*, p. 7 - 27.



Voltage monitoring

The voltage in the carrier electrical system is too high or too low.

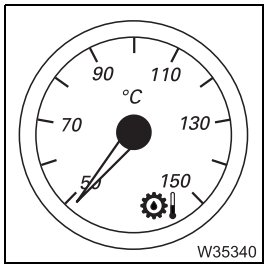
- Switch the crane engine off and look for the cause.



Electronic gear system

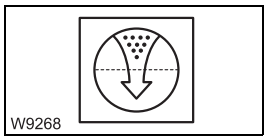
A warning buzzer sounds at the same time.

- Stop as quickly as possible, taking account of the traffic situation; ➠ *Procedure in the event of transmission malfunctions*, p. 7 - 35.



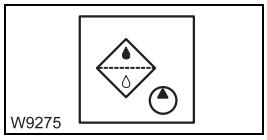
Transmission oil temperature display

The reason for the malfunction can be that the coolant temperature exceeds approx. 105 °C (221 °F)); ➠ *Malfunctions in the transmission*, p. 7 - 29.



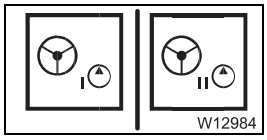
Replacing the air filter

- Replace the air filter as soon as possible; ➠ *Maintenance manual*.



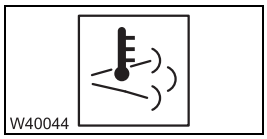
Replacing the hydraulic oil filter

Replace the hydraulic oil filter as quickly as possible; ➠ *Maintenance manual*.



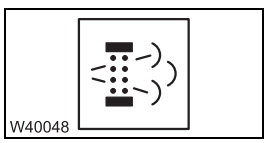
Steering malfunction

➠ p. 7 - 31.



Exhaust gas temperature too high

- Reduce speed under consideration of the current traffic situation.



Exhaust system cleaning required

- Start manual exhaust gas cleaning; ➠ p. 4 - 24.

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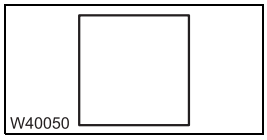
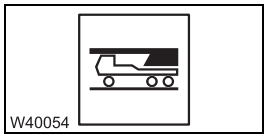


Exhaust system run-down active

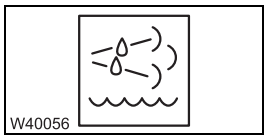
- Do not switch off the battery master switch.

The exhaust system runs down for approx. 1 minute.



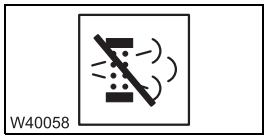
Main boom not set down

- Lower the main boom until the lamp goes out.



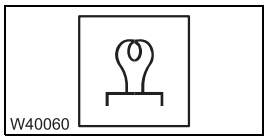
AdBlue tank level

- Fill up with AdBlue; ➠ p. 4 - 8.



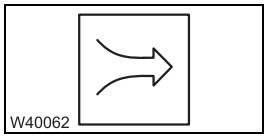
Exhaust gas cleaning disabled

The automatic exhaust gas cleaning is disabled; ➠ p. 4 - 24.



Pre-heating required

The engine is not ready for starting while the lamp is lit; ➠ p. 4 - 1.



Air intake inhibitor triggered

The air intake inhibitor has been triggered – the flap in the air intake line is closed. The engine can be restarted only after the flap has been opened.; ➠ p. 4 - 20.

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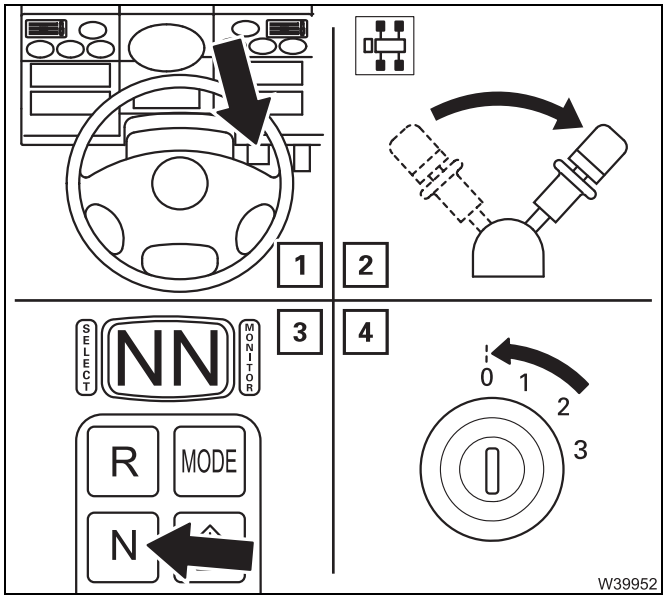
5.3.7 Parking the truck crane



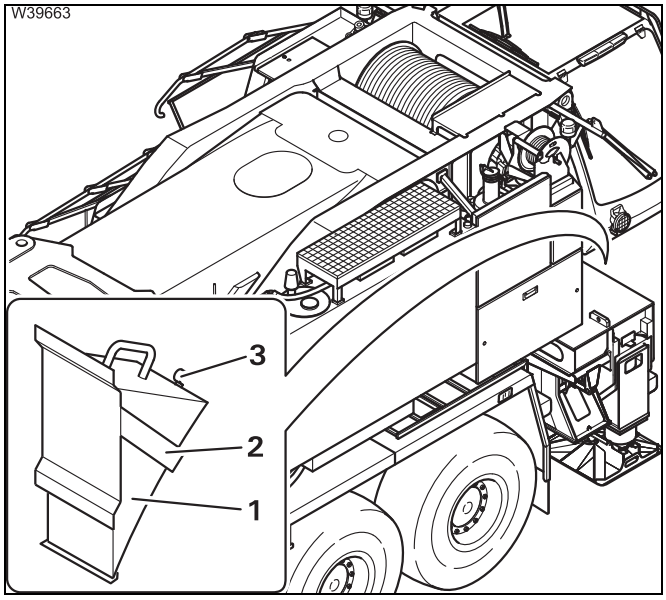
To park the truck crane off, you must:

1. Stop the truck crane
2. Apply the parking brake
3. Switch to neutral gear; p. 5 - 22
4. Turn off the engine; p. 4 - 18

Securing the truck crane against rolling away

The number of wheel chocks supplied varies according to country.

Risk of accidents by truck crane moving unintentionally!
On uphill and downhill gradients secure the truck crane using wheel chocks in addition to the parking brake.



When you no longer need the chocks:

- Insert the wheel chock (**1**) in the bracket (**2**).
- Press the chock downwards until the clamp (**3**) engages.
- Affix a second wheel chock in the same way.

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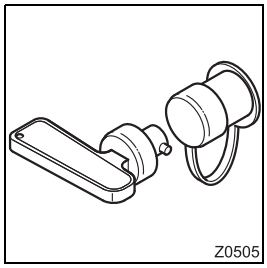
When stationary for more than 8 hours

- Switch off all current consumers, for example, auxiliary heaters.
- Switch the engine off.

In order to prevent malfunctions, you should only switch off the battery switch when the engine has been turned off.



- Switch off the battery master switch.

Securing the truck crane against unauthorised use

- Secure the truck crane against unauthorised use by:
  - Stowing away the hand-held control in the crane cab
  - Removing the ignition keys from the driver's cab and the crane cab and
  - Locking the driver's cab and the crane cab.

Danger due to unauthorised use!
Always stow away the hand-held control in the crane cab or in the driver's cab before leaving the truck crane and lock the doors. In this way you can prevent unauthorised persons from starting the crane engine with the hand-held control.

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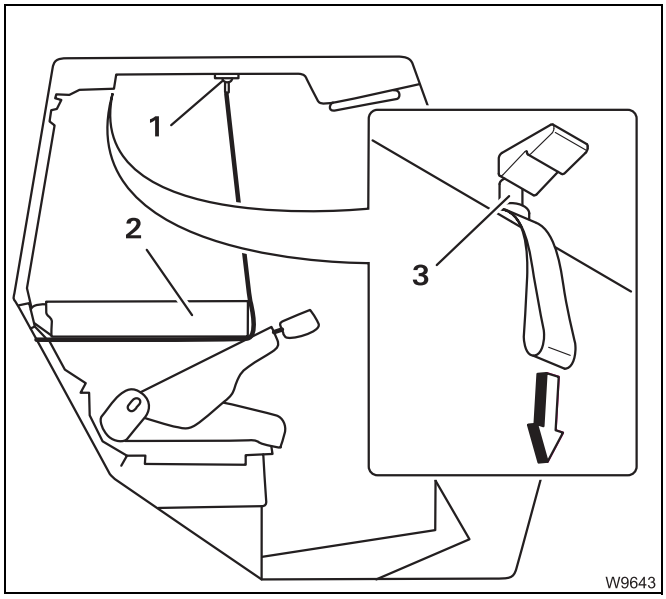
5.3.8 Fold-up berth

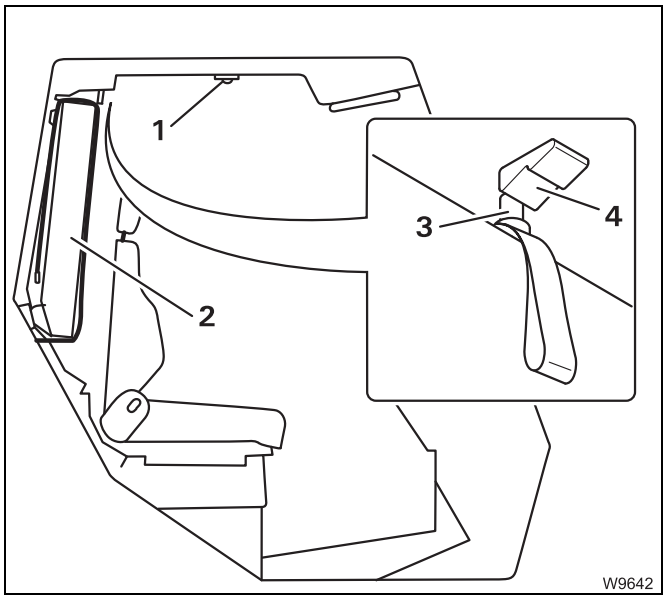
The berth must always be folded up for driving.

Risk of accidents due to the berth folding down!
Check that the locking bar has engaged and put up the back rest of the seats before driving. This prevents the berth folding down when braking, resulting in uncontrolled manoeuvres due to fright.



Folding down

- Tilt the backrests of the seats forwards.
- Pull the locking bar (**3**) and fold the berth (**2**) down.
- Fasten both belts in the sockets (**1**).



Folding up

- Undo the belts from the retainers (**1**) and place them on the berth.
- Fold up the berth (**2**) until you can hear the locking bar (**3**) latch into place behind the bracket (**4**).
- Put up the back rests of the seats.

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5.4 Off-road driving

This section describes adjustments, connections and procedures for adapting the vehicle handling to off-road conditions.

Adjustments to the transmission

If you drive continuously for short periods of time with different loads or on a slippery surface, the transmission may switch gears too late or too early. In this event you can make the following adjustments:

– Shift to a lower starting gear; ➠ p. 5 - 25.

– Select the *Manual* operating mode. This way you will be able to drive carefully and shift gears on time; ➠ *Changing the driving mode*, p. 5 - 23.

Connections

If the adjustments to the transmission are insufficient on their own, you can additionally connect the following one after the other:

– First, you can switch on the **off-road gear** in the transfer case; ➠ p. 5 - 51.

– Then switch on the **longitudinal differential lock**; ➠ p. 5 - 52.

– Then switch on the **transverse differential lock**; ➠ p. 5 - 53.

Changing the vehicle level

You can also using the level adjustment system to adapt the truck crane to the off-road inclination or lift and lower the truck crane; ➠ p. 5 - 54.

Rocking the vehicle free and towing

If the truck crane is stuck in terrain; ➠ *Freeing a stuck truck crane*, p. 5 - 58.

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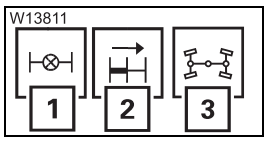
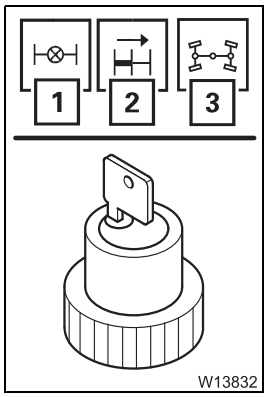
5.4.1 Key-operated switch



The key-operated switch locks the switches for the transverse differential locks (**1**), longitudinal differential locks (**2**) and the separate steering (**3**). When the key switch is switched off, the three switches have no function.

When switching on



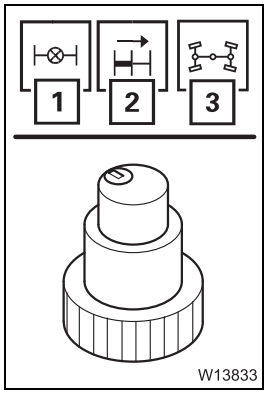
When switches (**1**), (**2**) and (**3**) are pressed in at the bottom (ON position), the corresponding switching procedures are executed when the key-operated switch is switched on.

- Check each time you switch on the key switch that the switches (**1**), (**2**) and (**3**) are pressed in at the top for switching procedures which are not required (OFF position).

This prevents unnecessary switching procedures when the key-operated switch is switched on.

When the key-operated switch is on, the gear will shift up to the 2nd gear at most. This limits the speed.

When switching off



When switching off the key-operated switch, the transverse differential locks, longitudinal differential lock and separate steering are always switched off simultaneously, regardless of the position of switches (**1**), (**2**) and (**3**).

- After switching off the key-operated switch, press switches (**1**), (**2**) and (**3**) in at the top (OFF position).

This prevents unnecessary switching procedures when the key-operated switch is next switched on.

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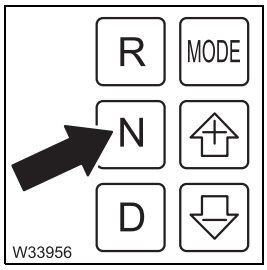
5.4.2 Transfer case – switching on off-road/on-road gears

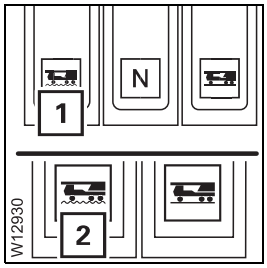
The off-road gear increases the thrust of the driven wheels.

Risk of the transfer case not functioning properly!
Only change the operating mode of the transfer case when the vehicle is stationary and the transmission is in the neutral position **N**. Never press the *On-road and Neutral* or *Off-road* buttons at the same time. This can result in faulty shifting in the transfer case.



Prerequisites

- Stop the truck crane.
- Switch the transmission to neutral position **N**.



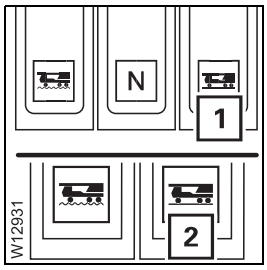
Engaging the off-road gear

- Press button (**1**) in at the bottom.

The off-road gear is switched on when lamp (**2**) is lit.

If lamp (**2**) does not light up:

- Switch the transmission to the **D** position, drive briefly and then switch back to the neutral position **N**.
- Press the button (**1**).



Switching on the on-road gear

- Press button (**1**) in at the bottom.

The on-road gear is switched on when lamp (**2**) is lit.

If lamp (**2**) does not light up:

- Switch the transmission to the **D** position, drive briefly and then switch back to the neutral position **N**.
- Press the button (**1**).

Neutral position

For towing, you can also switch the transfer case to the neutral position **N**; ➠ p. 7 - 7.

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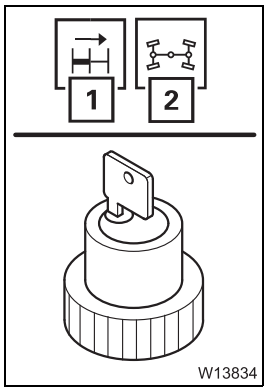
5.4.3 Operating the longitudinal differential lock

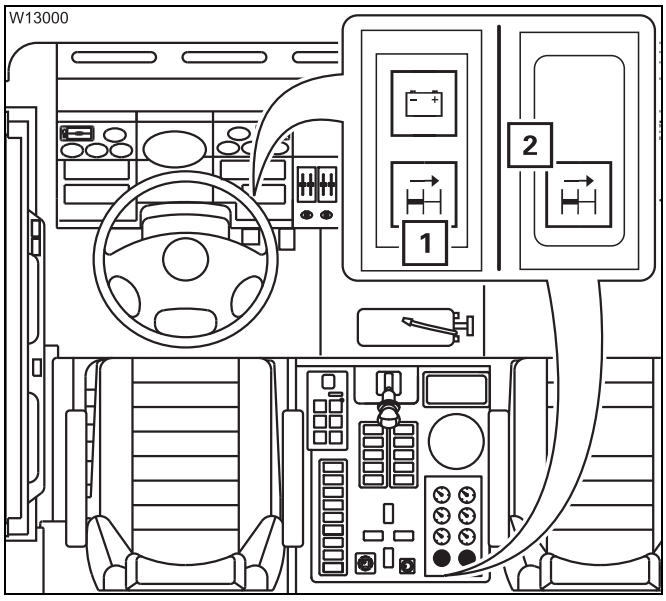
The longitudinal differential locks prevent individual axle lines spinning when driving on a slippery surface. With the 14 x 8 x 14 drive, the 2nd axle line is switched on and off together with the longitudinal differential locks.

Risk of damage to the axle lines!
Leave the longitudinal differential locks switched on only for as long as necessary. Always switch off the longitudinal differential locks before driving on a firm surface!

- Stop the truck crane.
- Straighten the steering.



- Press switches (**1**) and (**2**) in at the top for switching operations that are not required; ➠ *When switching on*, p. 5 - 50.
- Switch on the key-operated switch.



Switching on

- Press the switch (**2**) in at the bottom – lamp (**1**) flashes.
- Drive slowly until lamp (**1**) lights up – longitudinal differential lock on.

Switching off

- Press the switch (**2**) in at the top – lamp (**1**) flashes.

When lamp (**1**) goes out, the longitudinal differential lock is switched off.

If the lamp does not go out, you can support the switching off process by driving slowly forwards and backwards.

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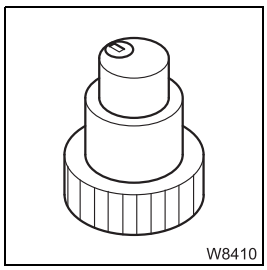
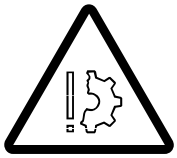


- Switch off the key-operated switch if it is no longer required for other gear shifts.

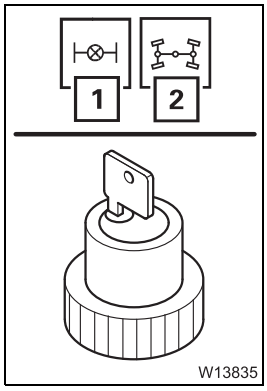
5.4.4 Operating the transverse differential locks

The transverse differential locks prevent individual wheels spinning when driving on a slippery surface.



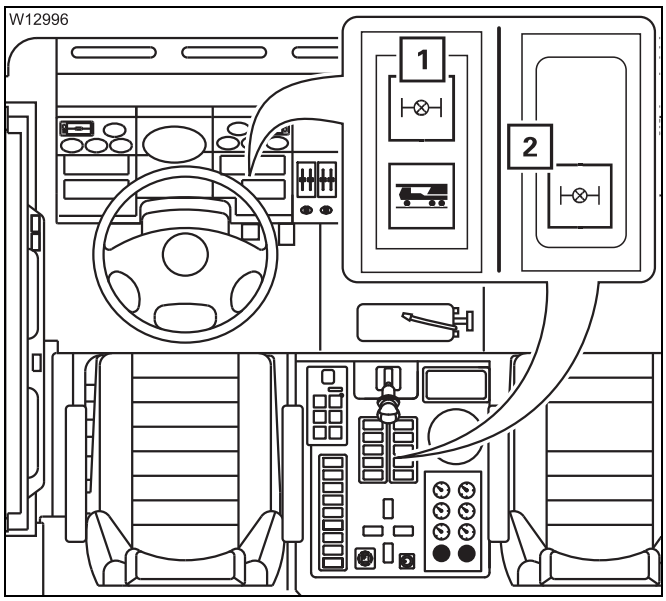
Risk of damage to the transverse differential locks!
Leave the transverse differential locks switched on only for as long as necessary. Always switch off the transverse differential locks when driving on firm ground and around corners!

- Stop the truck crane.
- Straighten the steering.



- Press switches (**1**) and (**2**) in at the top for switching operations that are not required; ➠ *When switching on*, p. 5 - 50.

- Switch on the key-operated switch.



Switching on

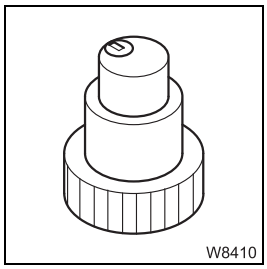
- Press the switch (**2**) in at the bottom – lamp (**1**) flashes.
- Drive slowly until lamp (**1**) lights up – longitudinal differential lock on.

Switching off

- Press the switch (**2**) in at the top – lamp (**1**) flashes.

When lamp (**1**) goes out, the transverse differential lock is switched off.

If the lamp does not go out, you can support the switching off process by driving slowly forwards and backwards.

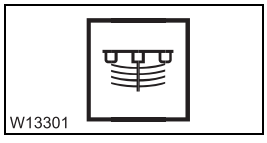


- Switch off the key-operated switch if it is no longer required for other gear shifts.

5.4.5 Operating the level adjustment system

You can use the level adjustment system to set the on-road driving level, change the overall level and incline the truck crane.

Danger of accidents when the suspension is blocked!
Check the state of the suspension at the 3rd and 6th axle lines before every level adjustment. axle lines. Doing this helps you to prevent
– The tyres being overstrained when the vehicle level is lowered and bursting, either immediately, or later when driving.
– A wheel losing contact with the ground without being noticed, resulting in an impermissible vehicle state after lifting the vehicle level.



The wheels of the 3rd and 6th axle lines touch the ground

- Check that the suspension is enabled; ➠ p. 6 - 115.

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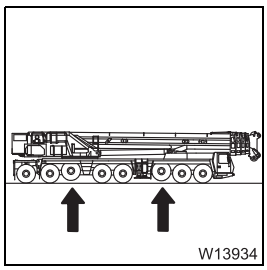
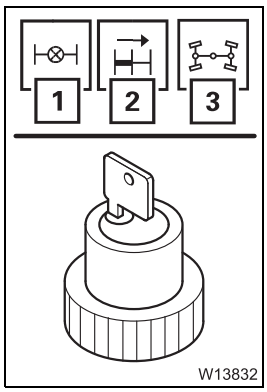


The wheels of the 3rd and 6th axle lines are raised:

- Be sure that the wheels do not touch the ground when lowering.

Before changing the level



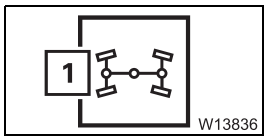
- Press switches (**1**), (**2**) and (**3**) in at the top for switching operations that are not required; ➠ *When switching on*, p. 5 - 50.

- Switch on the key-operated switch.

You can only change the level when:

– The current speed is below approx. 5 km/h (3 mph) and

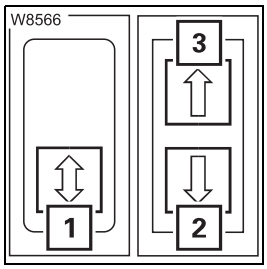
– The suspension is switched on – lamp (**1**) has gone out.



Risk of accidents by exceeding total permissible height!
Always bring the truck crane to on-road level before driving on roads after changing the level.
If the truck crane is on a higher level, then the specified overall height will be exceeded.
➠ *Setting the on-road level*, p. 5 - 57

Preselecting level lift/lower

Before you change the level, you must preselect the direction of movement.



Preselecting lifting

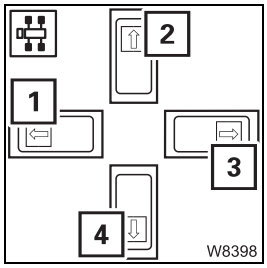
- Press the switch (**1**) at the top – the lamp (**3**) lights up.

Preselecting lowering

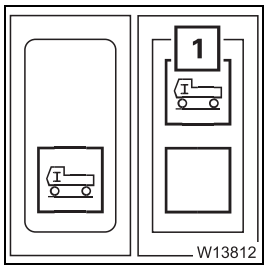
- Push the switch (**1**) in at the bottom – the lamp (**2**) lights up.

Inclining the truck crane

- Preselect the required direction of movement – *lifting /lowering*.
- To incline the truck crane, press the button for the required level change.
  - **Lifting/lowering at the front:** Press the button (**1**)
  - **Lifting/lowering at the rear:** Press the button (**3**)
  - **Lifting/lowering on the right hand side:** Press the button (**2**)
  - **Lifting/lowering on the left hand side:** Press the button (**4**)



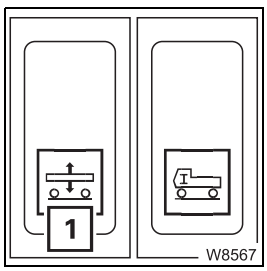
The level is continuously changed until you release the button or the end position is reached.



The lamp (**1**) goes on as soon as the truck crane is no longer at on-road level.

Changing the overall level

- Preselect the required direction of movement – *lifting /lowering*.



- Press switch (**1**) in at the bottom. The overall level is evenly lifted or lowered.

The movement continues till you release the button or an end position is reached.

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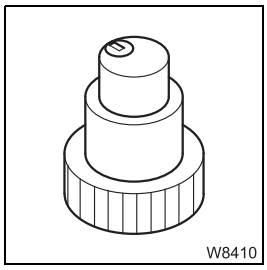
After level adjustment

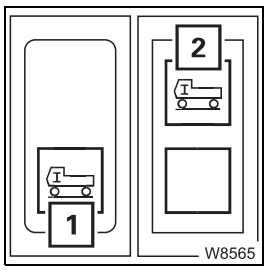


- Switch off the key-operated switch if it is no longer required for other gear shifts.

Setting the on-road level

For on-road driving, you must always set the on-road level in order to adhere to the specified overall height.

- Park the truck crane on a level surface.
- Straighten the steering.



- Press the button (**1**) in at the bottom until the lamp (**2**) goes out.

When the lamp (**2**) has gone out, the truck crane is at on-road driving level.

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5.4.6 Freeing a stuck truck crane

Rocking the truck crane free

If the truck crane is stuck in terrain, you can try to free it by driving back and forth (rocking it free):

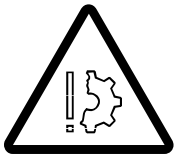
Before rocking free you should

– switch on the transverse differential locks,

– switch on the longitudinal differential locks,

– switch to the **P** driving mode and

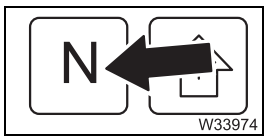
– switch on the off-road gear in the transfer case.



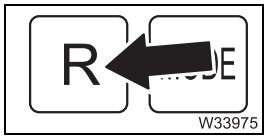
Risk of damage to the transmission!
Release the accelerator after 30 seconds at the latest when the load is too high.
This prevents the transmission from being damaged due to overheating.
The starting gear is not automatically disengaged.

- Let the motor run at idling speed.

- Select a gear position, e.g. gear position **R**.
- Drive as far as you can as high as possible.



- Remove your foot from the accelerator and switch to the neutral position **N**.
- Let the truck crane roll in the opposite direction.



- Before you reach the highest point, select the gear position again, e.g. gear position **R**.
- Drive as far as possible until you reach the highest point, and repeat the procedure.

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Towing free forwards

- Fasten a steel rope to the front towbar coupling.

Risk of damage to the chassis!
Only tow the truck crane free while observing the procedure given for the pulling direction.
Jerking the truck crane or pulling it at an angle can cause damage to the chassis.

The front towbar coupling is designed for a maximum tensile force of 117 kN (approx. 12 t) (26,300 lbf (approx. 26,455 lbs)):

– The direction of pull runs forward along the longitudinal axle or at an angle of 45° to the right or left of the longitudinal axle **and**

– The direction of pull runs along the longitudinal axle towards the rear without diverting up or down.

Towing free in reverse gear

- Fasten a steel rope to one of the towing eyes on the rear of the truck crane using a shackle.

Risk of damage to the chassis!
Only tow the truck crane free while observing the procedure given for the pulling direction. Otherwise the chassis may be damaged or the towing eyes may be torn off or bend.

The towing eyes on the vehicle tail or the ROB are designed for a maximum tensile force of 75 kN (approx. 7.5 t) (16,860 lbf (approx. 16,530 lbs)), when:

– The direction of pull runs along the level of the longitudinal axle **and**

– The direction of pull runs along the longitudinal axle towards the rear without diverting up or down.

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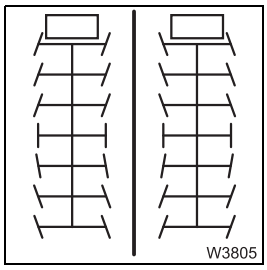
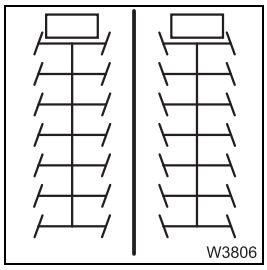
5.4.7 Separate steering

There are two steering modes with separate steering.



– **Driving around corners:**

  When separate steering is switched on, the steering angle is larger than for normal steering mode – the turning circle is smaller.



– **Crab travel mode:**

  When separate steering is switched on, you can turn the wheels of the front and rear axle lines in the same direction – the truck crane drives sideways.

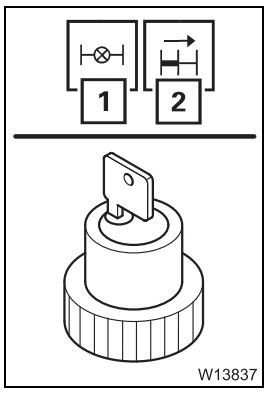
Switching to separate steering

Always switch to separate steering when:

– Driving with the rigged truck crane or

– when steering at low speed

Risk of accidents when driving on-road with unlocked steering!
After driving with separate steering, change over immediately to normal steering mode. The locking condition for normal steering is only re-established when the lamp has gone out.



- Press switches (**1**) and (**2**) in at the top for switching operations that are not required; ➠ *When switching on*, p. 5 - 50.

- Switch on the key-operated switch.

You can only change over to separate steering when the current speed is below approx. 5 km/h (3 mph).

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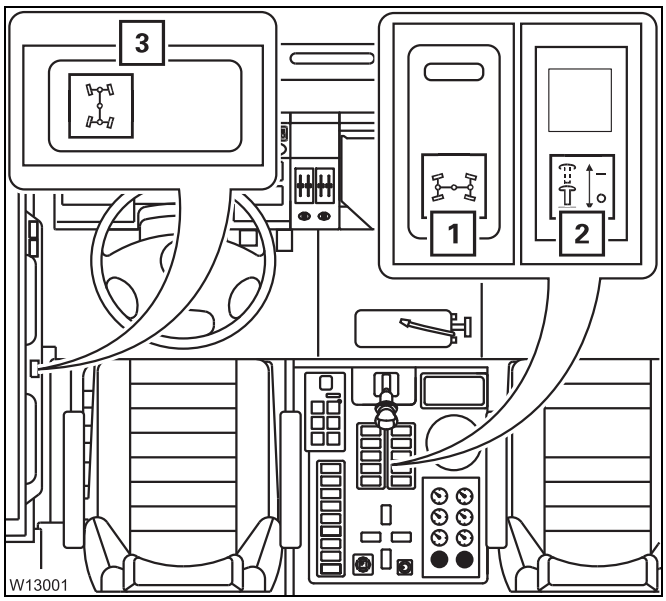


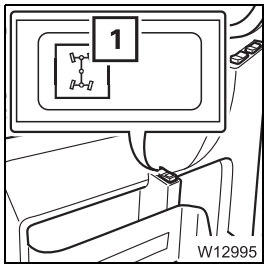
- Press switch (**1**) in at the bottom.

The lamp (**2**) lights up when you have changed over to separate steering – steering is unlocked.

When the lamp (**2**) does not light up or flashes:

- Steer using the button (**3**) and if necessary, drive slowly forwards and backwards slightly, until the lamp (**2**) lights up.

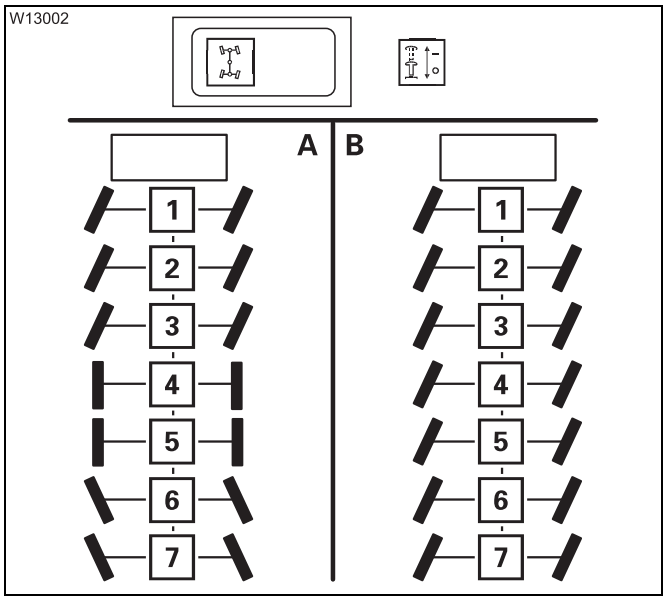
Steering



- Steer the 1st to 3rd axle line with the steering wheel.
- Steer the 6th and 7th axle lines with the button (**1**).

– **To turn to the left:** • Push the button to the left.
– **To turn to the right:** • Push the button to the right.

The axle line is steered as long as you keep the button pressed or until an end position is reached.



(A) – For driving around corners

- Steer the 6th and 7th axle lines opposite to the 1st, 2nd and 3rd axle lines. axle lines.

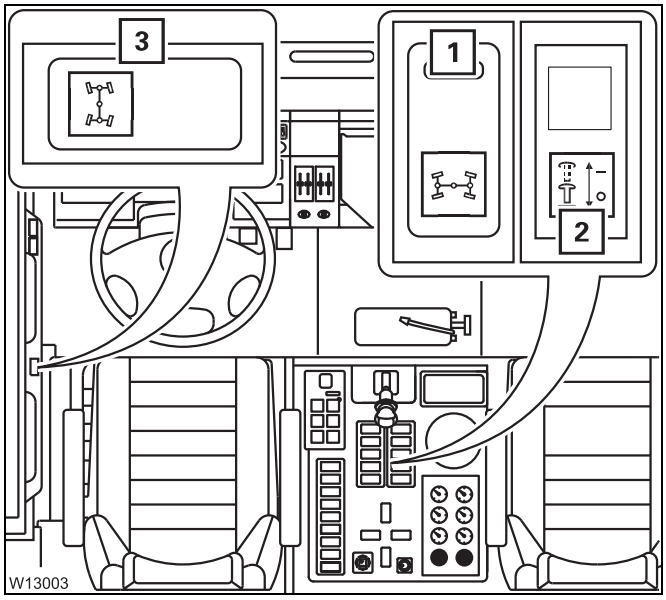
(B) – For crab travel mode

- Steer the 6th and 7th axle lines in the same direction as the 1st, 2nd and 3rd axle lines. axle lines.

The 4th and 5th axle lines are automatically steered.

Switching to normal steering mode

Risk of accidents when driving on-road with unlocked steering!
Changing over to normal steering is only completed when the lamp has gone out. Otherwise, the steering is not locked on the 6th and 7th axle lines.



- Press switch (**1**) in at the top.

The lamp (**2**) goes out when you have changed over to normal steering – steering is locked.

When the lamp (**2**) does not go out or flashes:

- Use the button (**3**) to steer into the straight position, until the lamp (**2**) goes out.

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5.5 Heating and air-conditioning system

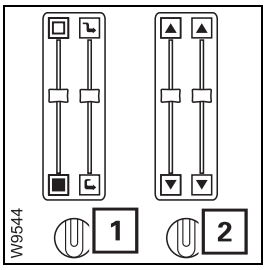
5.5.1 Standard heating system

Switching on

- Start the engine. Heating is only available when the engine is running.

Heating

You must set the blower and the temperature.



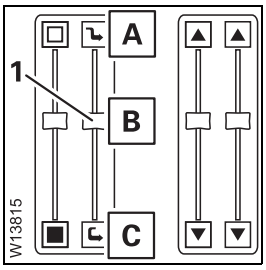
Setting the fan

With the switches (**1**) and (**2**) you can regulate the air volume for

1 Driver's side

2 Passenger's side

- Turn the switches (**1**) and (**2**) to the desired level.



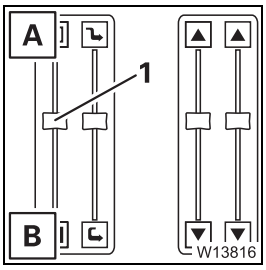
Setting fresh air/mixed air/recirculated air

- Slide the regulator (**1**) to the required position

A Fresh air – outdoor air is sucked in.

B Mixed air – fresh air and recirculated air are mixed.

C Recirculated air – air is sucked in from the driver's cab. Change to fresh air often to ensure that oxygen is supplied.



Setting the temperature

- Slide the regulator (**1**) to the required position

A cold

B warm

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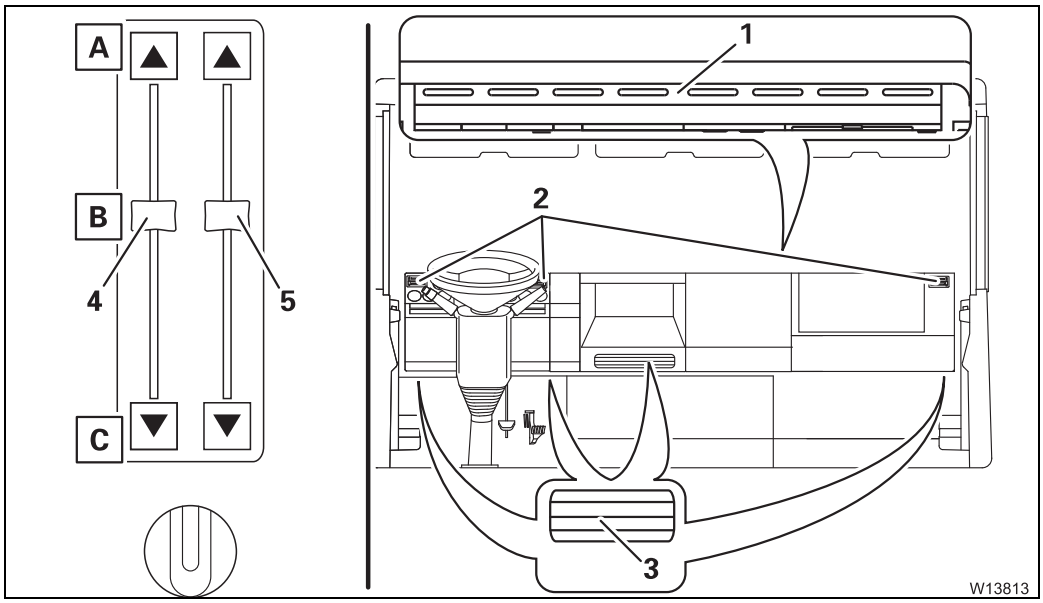
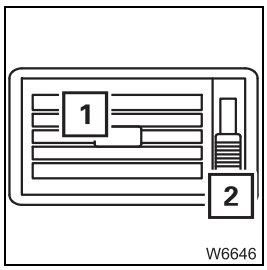
Air distribution

You can direct the air to flow out of various air vents.



- Slide the regulators for the driver's side (**4**) and passenger side (**5**) to the position for the desired air vents.
  - **A** Air vents (**1**), (**2**) – front windscreen, middle
  - **B** Air vents (**1**) to (**3**)
  - **C** Air vents (**3**) – cab floor

You can adjust air vents (**2**) and (**3**).



Adjusting the air vents

1 To direct the air flow

2 – To open: Upwards

– To close: Downwards

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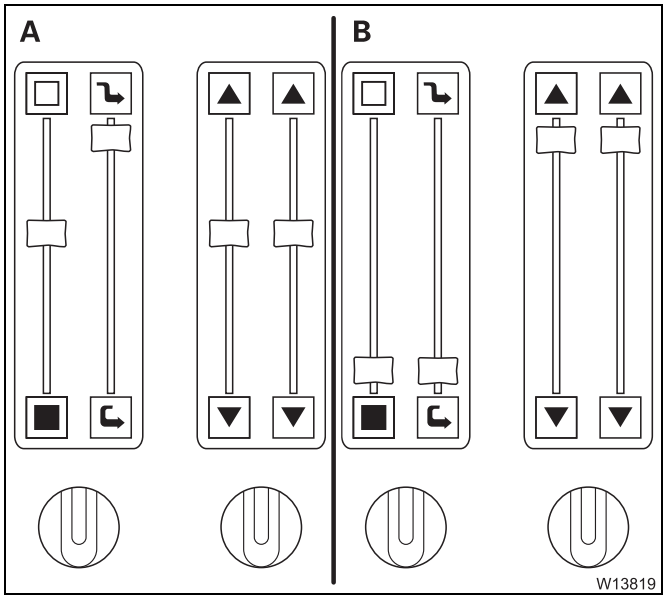
Examples

This section only contains examples of the settings.
Always adjust the setting to the current conditions (warm, cold, damp).



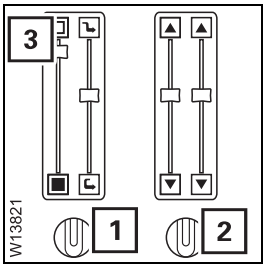
(A) – Ventilate

– Bring the regulators and switches to the indicated positions.
– Open the air vents if necessary.

(B) – Defrosting the front windscreen

– Bring the regulators and switches to the indicated positions.
– Close the air vents.

Switching off



Switching off the heater

• Slide the regulator (**3**) upwards to *Cold*.

Switching off the ventilation

• Turn the switches (**1**) and (**2**) to the *Fan off* position.

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5.5.2 Air-conditioning system

You can cool the driver's cab and dry the air using the air-conditioning system.

Notes

Do not cool the air too much.
The difference between the outside temperature and the inside temperature should be at the most 10 °C to 14 °C (18 °F to 25 °F).

If the cooling is too severe, you may frequently feel physically uncomfortable, albeit mostly only after you leave the cool environment.

Avoid having cold air blowing directly on to your body.

When using recirculated air, you should switch over to fresh air mode to ensure a fresh supply of oxygen at the same time. Adjust the cooling output to your actual needs:
If the truck crane has been exposed to strong sunlight for a long period of time, for example, the air-conditioning system should initially be operated at the highest blower level with the engine running.

The door or at least the windows should be left open for a short while to thoroughly air the cab. The cooling-down procedure can be accelerated by increasing the engine speed.

If the air-conditioning system is operated continuously, close the windows and doors to ensure sufficient cooling.

Once the inside temperature has reached the desired temperature, set the fan to a lower level.

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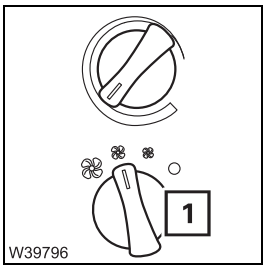
Switching on

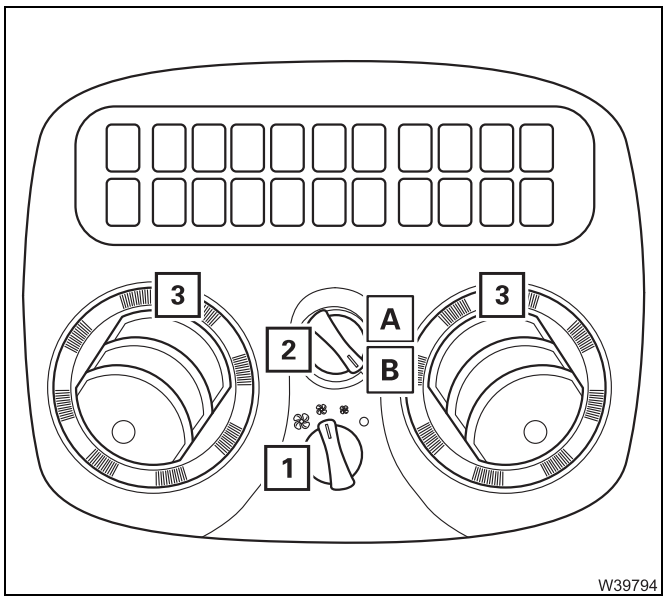
- Start the engine. The air-conditioning system only functions when the engine is running.
- Switch off the heating
  - – *Standard heating system*, p. 5 - 63,
  - – *Auxiliary heater*, p. 5 - 69,
  - – *Auxiliary water heater*, p. 5 - 71.



- Turn switch (**1**) to the required level.

Cooling

The illustration shows only a sample setting. Adjust the setting to suit the current conditions.



- Switch on the air conditioning – set switch (**1**) to the desired level.
- Turn the switch (**2**) to the desired position
  - **A** Warmer
  - **B** Colder
- If necessary, adjust the air vents (**3**).

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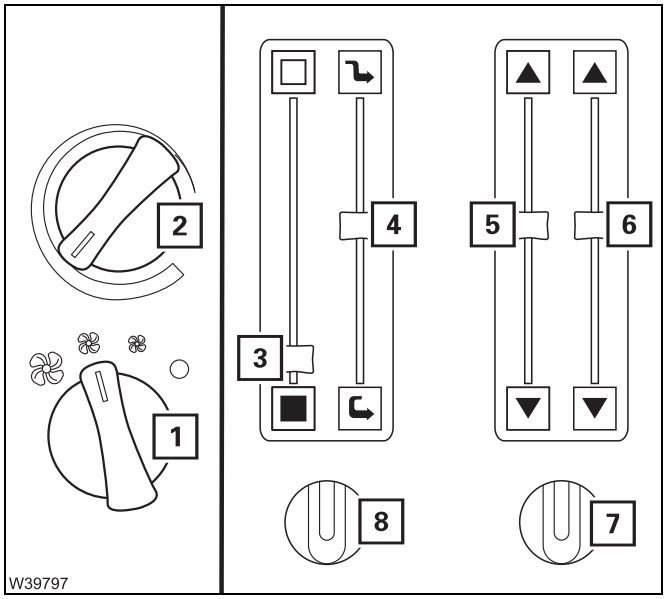
Drying

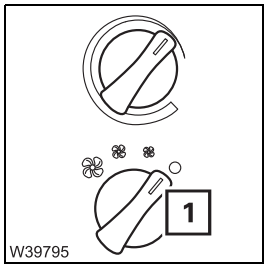
You can dry the air in the driver's cab.



- Switch the fan on – turn switches (**8**) and (**7**) to the required level.
- Slide the regulator (**3**) downwards.
- Turn the switch (**4**) to the required level – adjust the fresh air/mixed air/recirculating air setting to suit the current conditions (humidity and temperature of the outside air).
- Use the controls (**5**) and (**6**) to set the air distribution – open the air vents if necessary; ➠ *Air distribution*, p. 5 - 64.
- Switch on the air conditioning – turn switch (**1**) to the desired level.
- Turn the switch (**2**) to the desired position.

When drying, the air-conditioning system and the heating system work against each other. After drying, switch off the device that you do not require.

Switching off



- Turn the switch (**1**) anti-clockwise as far as it will go.

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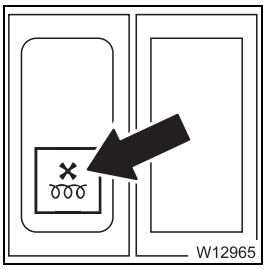
5.5.3 Auxiliary heater

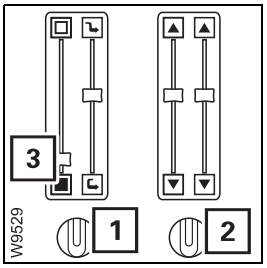


You can use the auxiliary heating to preheat the driver's cab or provide additional heating.
The auxiliary heater is supplied from the fuel tank.

The batteries will be drained if you operate the auxiliary heater with the engine switched off. You must recharge the batteries at shorter intervals if you use the auxiliary heater frequently!

Preheating the engine

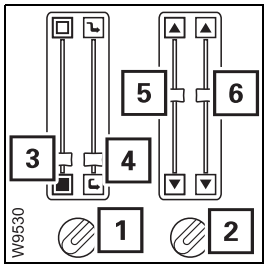
Adjust the heating as follows if only the engine is to be preheated with the auxiliary heater.



- Turn the regulator (**3**) as far as it will go, to *Warm*.
- Turn the switches (**1**) and (**2**) anti-clockwise until they reach a stop.

Preheating the driver's cab

Adjust the heating system as follows if the driver's cab is to be preheated in addition to the engine.



- Slide the regulator (**3**) to the *warm* position.
- Slide the regulator (**4**) to the *Recirculated air* position.
- Turn the switches (**1**) and (**2**) to the desired level.
- Set the regulators (**5**) and (**6**) to the middle position.
- Open the air vents; ➠ p. 5 - 64.

The time required to preheat the vehicle engine is increased considerably by heating the driver's cab simultaneously.

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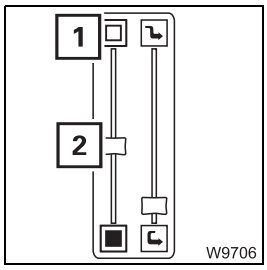
Switching on

- Before switching on the heating system, check whether it is allowed to be operated at the current location of the truck crane. Find out whether there are any possible sources of danger that could result in an explosion.

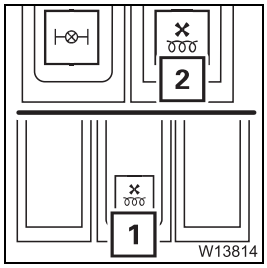
Risk of explosion when operating the heating system!
The heating system may not be operated:
– At service stations and tank farms
– At places where flammable gases or vapours can be found or formed (for example, at places where fuel is stored and in chemical factories),
– At places where explosive dust can be found or formed (e.g. carbon dust, wood dust and grain dust).

Risk of suffocation when operating the heating system!
Do not use the heater in closed spaces (e.g. a garage).



The auxiliary heater is not switched on if the regulator (**2**) is pushed upwards as far as it will go (**1**) into the *cold* position.

- Slide the regulator (**2**) to the desired temperature.



- Press switch (**1**) in at the bottom. The lamp in the switch lights up. The heating starts after about 15 seconds.

The heating is active when

– Lamp (**2**) lights up,

– the engine temperature increases and

– with driver's cab preheating the air is heated via the air vents.

If the heating does not start after 30 seconds, or a malfunction occurs, the heating switches itself off. Switch the heating off, wait 3 seconds and switch the heating on again.

Always switch the auxiliary heater off if you switch off the truck crane while the battery master switch is switched on. In this way, you prevent the auxiliary heater from restarting and the batteries from running down after the engine has cooled down.

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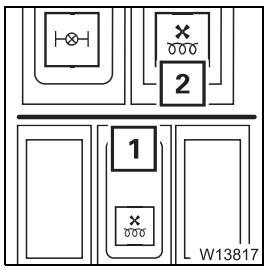
Switching off



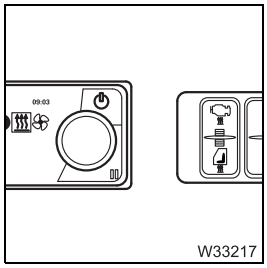
- Press switch (**1**) in at the top. The lamp in the switch and lamp (**2**) go out. To cool down, the heating continues to run for a while (even when the battery master switch is switched off).

5.5.4 Auxiliary water heater

The batteries will be drained if you operate the auxiliary heater with the engine switched off. You must recharge the batteries at shorter intervals if you use the auxiliary heater frequently!

Further information on the operation of the auxiliary water heating system is provided at the address *Webasto.com*.

You can also scan the following QR code.



You can use the auxiliary water heater to:

– preheat the engine or

– pre-heat the engine and driver's cab.

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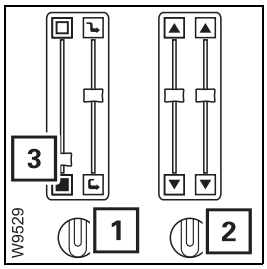
Preheating the engine

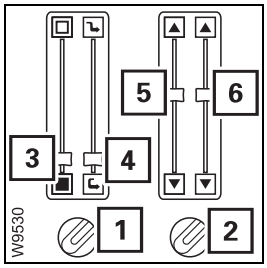
If only the engine is to be preheated, adjust the heating system as follows:



- Switch (**3**) to position *Warm*.
- Switches (**1**) and (**2**) in the *Fan off* position.

Preheating the driver's cab

Adjust the heating system as follows if the driver's cab is to be preheated in addition to the engine:



- Slide the regulator (**3**) to the *warm* position.
- Slide the regulator (**4**) to the *Recirculated air* position.
- Turn the switches (**1**) and (**2**) to the desired level.
- Set the regulators (**5**) and (**6**) to the middle position.
- Open the air vents; ➠ p. 5 - 64.

If you heat the driver's cab at the same time, the amount of time required to preheat the engine will increase significantly.

Switching on the auxiliary heater

- Check whether the auxiliary heater is allowed to be operated at the current site of the truck crane before switching it on. Find out whether there are any possible sources of danger that could result in an explosion.

Risk of explosion when operating the auxiliary heater!
The auxiliary heater is not allowed to be operated:
– At service stations and tank farms
– At places where flammable gases or vapours can be found or formed (for example, at places where fuel is stored and in chemical factories),
– At places where explosive dust can be found or formed (e.g. carbon dust, wood dust and grain dust).

Danger of suffocation when operating the auxiliary heater!
Do not use the auxiliary heater in closed spaces (for example, garage).

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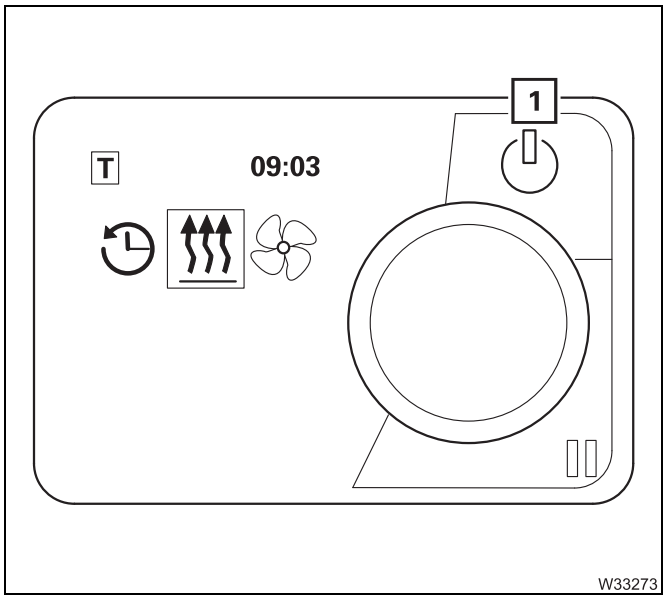
This section describes how to switch on manually. The auxiliary heater can also be switched on automatically; ➠ *Storing the heating start*, p. 5 - 75.

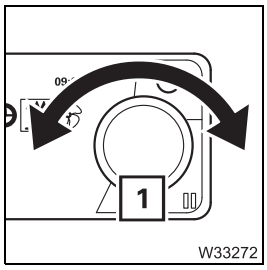
- Switch on the ignition; ➠ *Switching the ignition on*, p. 4 - 10.



- Press the button (**1**) once. The auxiliary heater is switched on and the control panel and buttons are illuminated.

The status of the auxiliary water heating system is indicated by the coloured light on the button (**1**):

Lights up green:	Heater operating
Lights up blue:	Fan operating
Lights up white:	Heater off – controls on
Flashing red:	Error
Flashing green:	Heater operation programmed
Flashing blue:	Fan operation programmed

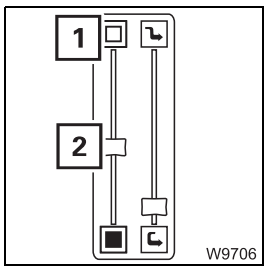


Menu control

The jog-dial (rotary push button) (**1**):

– turn to select,

– press to confirm.



Setting the temperature

The auxiliary heater is not switched on if the regulator (**2**) is pushed upwards as far as it will go (**1**) into the *cold* position.

- Slide the regulator (**2**) to the desired temperature.

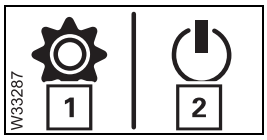
The auxiliary heater only supports the heating capacity of the standard heating system as long as the engine is cold. If the engine is warm, the heater is switched off. However, the pump for the auxiliary heater continues to run until you switch the auxiliary heater off.

Always switch the auxiliary heater off if you switch off the truck crane while the battery master switch is switched on. In this way, you prevent the auxiliary heater from restarting and the batteries from running down after the engine has cooled down.

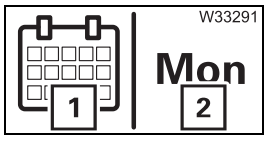
Setting the date and time

The error code **TEB** is shown in the display if the power supply has been interrupted for more than 8 minutes. You must reset the date and time.

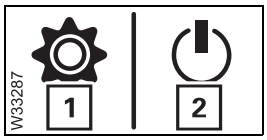
Always set the current time and current day of the week. These settings are required for the correct activation point of the automatic heating start.



- Select and confirm the symbol *Settings* (**1**) – display symbol *Immediate start* (**2**).



- Select and confirm the symbol *Day of the week* (**1**) – display symbol (**2**), e.g. **MON** for Monday.
- Select and confirm the desired day of the week.



- Select and confirm the symbol *Settings* (**1**) – display symbol *Immediate start* (**2**).

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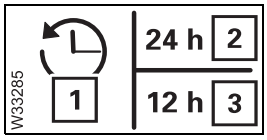


- Select and confirm the symbol Time *Time* (**1**) – display symbol *Time format*.
- Select and confirm the desired time format (**2**) or (**3**).

The *Time* display flashes.

- At the flashing display, set the hours and confirm the selection.

- Set the minutes at the flashing display and confirm the selection.

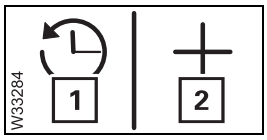
The time and day of the week have now been set.

Storing the heating start

Heating is started automatically on schedule only if the time and the day of the week have been correctly set; *Setting the date and time*, p. 5 - 74.

You can set three different automatic heating starts – up to seven days in advance.

If you call up values in order to change them during the following setting process, they flash for 5 seconds. The entry must be made within this period. The value stops flashing after 5 seconds and is saved as the new value.



- Select and confirm the symbol *Timer* (**1**) – display symbol *Add timer* (**2**).
- Select and confirm the symbol *Add timer* (**2**).

- Select and confirm the desired day of the week, e.g. **MON** for Monday.

The *Switch-on time* display flashes.

- At the flashing display, set the hours and confirm the selection.

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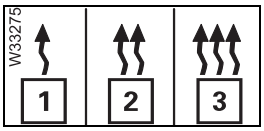
- Set the minutes at the flashing display and confirm the selection.

The switch-on time is now set.
Next you must set the switch-off time.

The *Switch-off time* display flashes.

- At the flashing display, set the hours and confirm the selection.

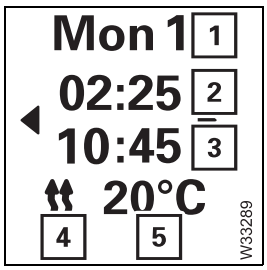
- Set the minutes at the flashing display and confirm the selection.



- Select and confirm the desired heating mode:
  - economical (**1**)
  - comfortable (**2**)
  - quick (**3**)

- Select and confirm the desired temperature.

After the desired temperature has been input, the set values are saved and shown in the display:



- Day (**1**)
- Switch-on time (**2**)
- Switch-off time (**3**)
- Heating mode (**4**)
- Temperature (**5**)

- Confirm the set values.

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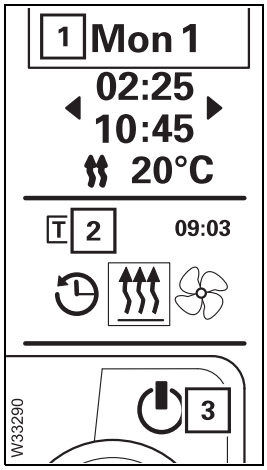
- Confirm the *Activate* symbol.



A heating start that is activated is shown by:

– A white marking (**1**)

– The symbol *T* (**2**) in the main menu

– If the display is switched off, the button (**3**) flashes **green**.

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6 Driving modes and rigging for on-road driving

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6 Driving modes and rigging for on-road driving

This chapter contains:

– Driving modes of the GMK7450, in which the maximum axle load is 12 t (26,500 lbs).

– Rigging work required in order to set down the main boom on a dolly.

– Removing/installing the main boom, outrigger beams and auxiliary hoist.

6.1 Driving modes

Information about the axle loads

The GMK7450 truck crane is designed for driving with maximum axle loads of 12 t (26,500 lbs).
Die **Manitowoc Crane Group Germany GmbH** notes that driving with an axle load exceeding 12 t (26,500 lbs) can overheat the brake system and the braking deceleration required by the EU partial type-approval cannot be ensured.

If country-specific regulations allow the truck crane to be driven with axle loads greater that 12 t (26,500 lbs), the crane driver/operator bears the sole responsibility for driving in this condition and for any subsequent damage. This also applies to damage due to premature wear.

Risk of accidents from increased braking distance!
When driving with axle loads in excess of 12 t (26,500 lbs), the braking deceleration required by the EU partial type-approval cannot be met. Please bear in mind that the braking distance of the truck crane will be increased.

Risk of damage from premature wear!
Premature wear of parts under particular strain (brake system, steering, tyres, wheels, suspension, drive shafts) cannot be ruled out even if the axle loads only briefly exceed 12 t (26,500 lbs).

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6.1.1 Driving modes for a maximum axle load of 12 t (26,500 lbs)

This section only shows some standard driving modes. For further information on additional or individual driving modes, please contact **Manitowoc Crane Care**.

Possible equipment of the truck crane:

– 385/95 R25 or 445/95 R25 or 525/80 R25 tyres.

– steel rims or aluminium rims.

– drive 14 × 6 × 14 or 14 × 8 × 14.

Required rigging mode

For the above-mentioned attachments, the following rigging mode must be established for maximum axle loads of 12 t (26,500 lbs):

– The rear outrigger is dismounted

– The lighting carrier is mounted

– The front outrigger beams are removed

– The crane cab is in the *Driving* position and the tread grid is folded in

– The counterweight and auxiliary hoist are completely unrigged

– All lattice extensions have been removed.

– All hook blocks are set down on separate vehicles or the 1-sheave hook block is set down in the lighting carrier[1)].

In addition, the railing on the superstructure access ladder must be pushed in and the hoist mirror folded up, so that the overall height is not exceeded at on-road level; ➠ *Dimensions and weights of the truck crane, axle loads*, p. 1 - 8.

[1)] The weight of the hook block is based on the information in this operating manual; ➠ p. 1 - 12.

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6.1.2 Maximum permitted speeds with an axle load of over 12 t (26,500 lbs)

Should your national regulations allow driving with axle loads over 12 t (26,500 lbs), you may under no circumstances exceed the maximum permitted speed specified here.

Risk of accidents from overloading tyres!
Never exceed the maximum permitted speed which is given for the current axle load and tyre size.
This prevents the tyres from becoming overloaded and bursting.

The maximum permissible speed depends on the size of the tyres and the axle load. The following values only apply to the given tyre pressure, and are maximum values. Also note the information provided by the tyre manufacturer regarding the maximum permitted load duration.

Tyre size/ Tyre pressure[1)]	Current Axle load in t (lbs)	Maximum permissible speed In km/h (mph)
385/95 R25	Up to 13.5 (29,800)	58 (36)
	Up to 14.5 (32,000)	45 (28)
	Up to 15.5 (34,200)	32 (20)
	Up to 16.5 (36,400)	22 (14)
445/95 R25 525/80 R25	Up to 13.5 (29,800)	65 (40)
	Up to 14.5 (32,000)	65 (40)
	Up to 15.5 (34,200)	65 (40)
	Up to 16.5 (36,400)	58 (36)

1) ➠ *Maintenance manual*.

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6.2 Rigging work for driving with a dolly

To reduce the axle loads to the specifications applicable in the country in which you are working, you can set the main boom onto a dolly when driving.
For this purpose, the truck crane must be fitted with a slewing gear freewheel, boom floating position and if necessary, with a boom pre-tensioning device.

Before driving with the dolly, you must:

– Switch on the slewing gear freewheel; ➠ p. 6 - 5,

– Switch on the boom floating position; ➠ p. 6 - 8,

– Switch on boom pre-tensioning, if necessary; ➠ p. 6 - 9,

– Switch off the houselock, if necessary; ➠ p. 11 - 15.

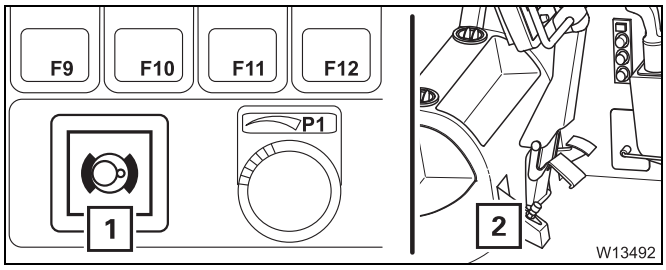
6.2.1 Switching on the slewing gear freewheel

When the main boom is set down on a dolly, the superstructure must be able to slew when driving around corners. You must switch on the slewing gear freewheel for this purpose.

• Switch off the houselock if necessary; ➠ p. 11 - 17.

Risk of accidents from the houselock being switched on!
Always switch off the houselock before setting down the main boom on the dolly. Otherwise the superstructure will be unable to slew when driving around corners.

• Place the boom on the dolly as described in section *Switching on the boom floating position*, p. 6 - 8.



Prerequisites:

– The engine for crane operation must be running.

– The foot-operated switch (**2**) in the crane cab is activated and the lamp (**1**) is out.

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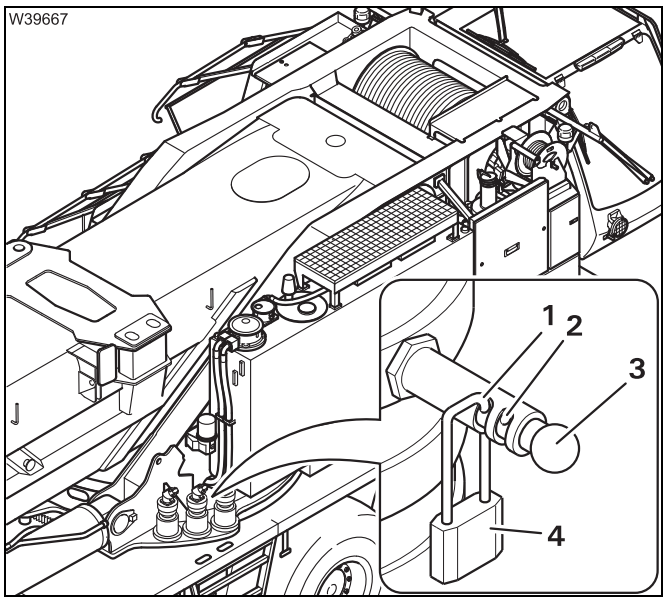
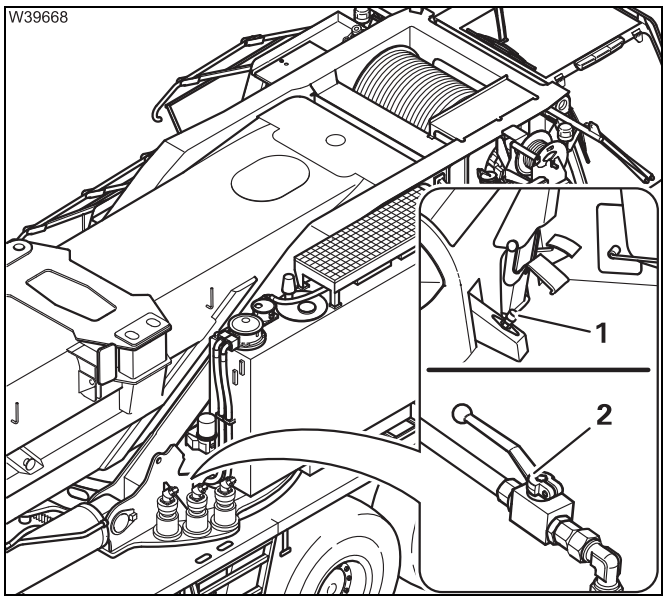


Switching on

- Remove the lock (**4**) from the hole (**2**).
- Push the pin (**3**) inward as far as it will go.
- Secure the pin with the padlock in the bore (**1**) and remove the key.
- Proceed in the same manner for all slewing gears.

Now the slewing gear freewheel is switched on and secured.

Risk of accidents if the bolts are not secured!
Always secure the bolts with the lock.
This prevents the slewing gear freewheel from being switched off unintentionally while driving.



- Release the foot-operated switch (**1**).

The slewing gear freewheel only takes effect once the supply and return lines are hydraulically connected.

- Open the valve – lever (**2**) parallel to the line.

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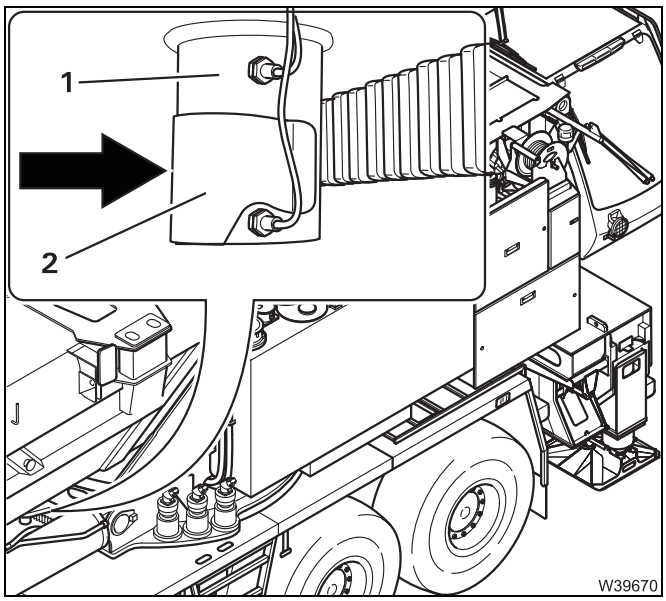

Secure the pin of the turntable lock against unintentional extending.

- Push the cover (**2**) as far as possible onto the turntable lock (**1**).

Switching off the slewing gear freewheel; ➠ p. 12 - 27.

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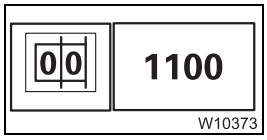
6.2.2 Switching on the boom floating position

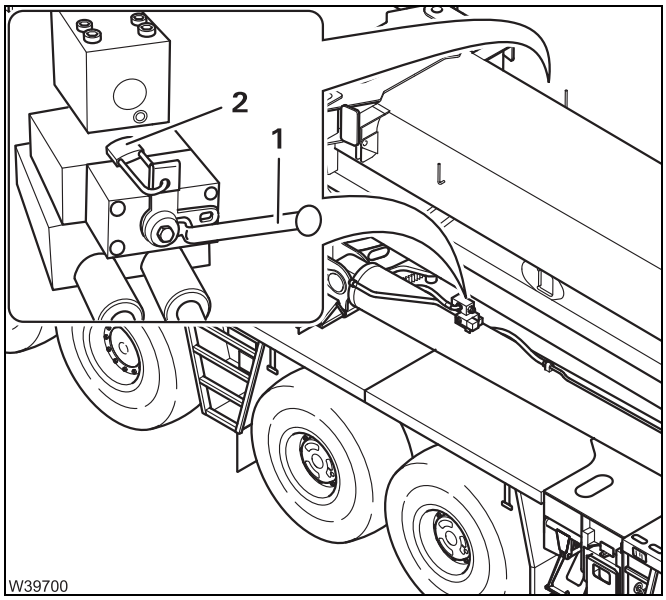
If the main boom has been placed on a dolly, the boom floating position must be switched on so that the main boom can move up and down.

Risk of accidents from the boom floating position being switched off!
Always switch on the boom floating position when the main boom is on a dolly.
This prevents the full weight of the dolly briefly becoming suspended from the main boom on uneven ground, the axle loads from rising suddenly, or the truck crane from tipping when driving around corners.



- Enter the RCL code for the current rigging mode.
- Fully retract the main boom.
- Raise the main boom to a permitted angle within the working range.
- Turn the superstructure to the *0° to the rear* working position and place the main boom on a dolly.

Risk of accidents from the main boom dropping down!
You may only switch the boom to the floating position once the main boom has already been set down on the dolly. This prevents the raised main boom from dropping down.



- Remove the padlock (**2**).
- Switch the valve I over – lever (**1**) positioned vertically pointing outwards or inwards, depending on its fitting position.
- Secure the lever (**1**) with the padlock (**2**).
- Switch on boom floating position on the other derricking cylinder as well.

The boom floating position is now switched on.

Switching off the boom floating position; ➠ p. 12 - 29.

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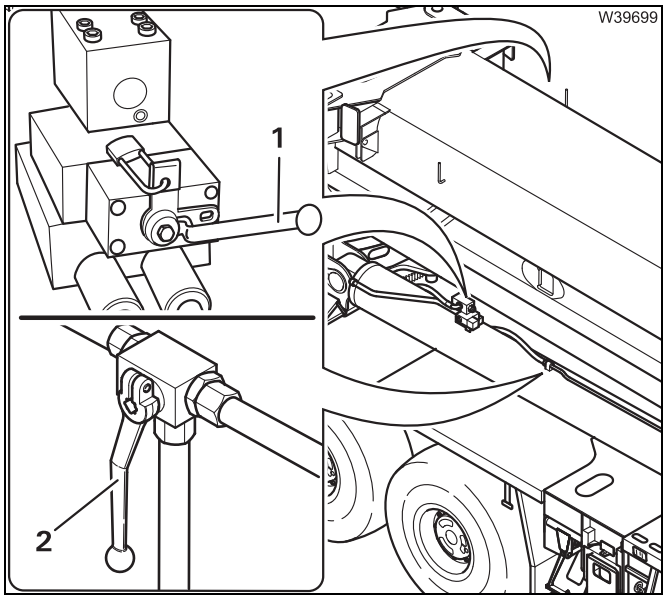
6.2.3 Switching on boom pre-tensioning

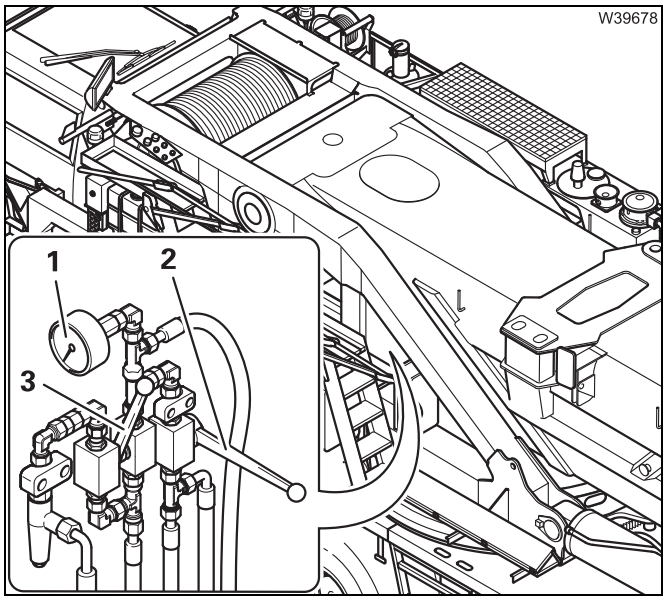
If the main boom has been set down on a dolly, you can change the axle loads on the rear axle lines by switching on the boom pre-tensioning.

To switch on the boom pre-tensioning, you must bring the valves I to IV into the required positions, and fill the pressure accumulator.



The boom floating position is switched on – lever (**1**) of the valves IR and IL is horizontal.

- Switch the valve IV over – lever (**2**) downwards.



The valves II and III are under the pressure gauge (**1**).

- Close the valve II – the lever (**2**) is horizontal.
- Open the valve III – the lever (**3**) points upward.

You can now fill the pressure accumulator.

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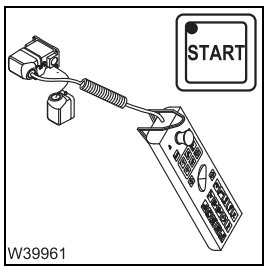
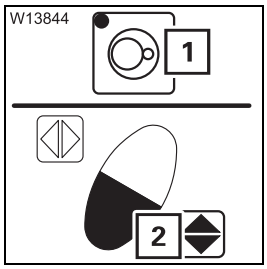
Filling the pressure accumulators

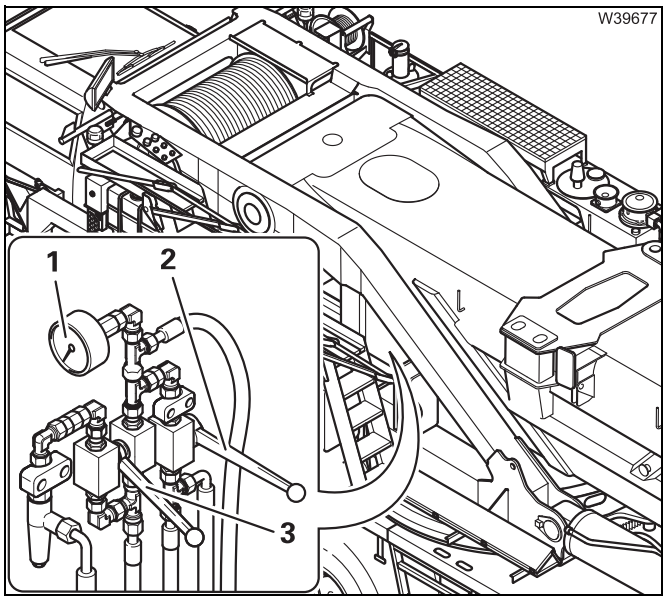
- Connect the hand-held control to a socket on the crane cab arm; ➠ p. 12 - 18.



- Press the button – the engine starts; ➠ p. 10 - 19.

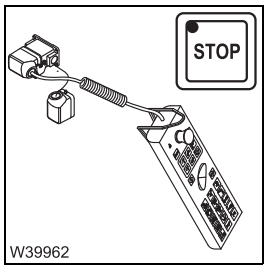


- Press the button (**1**). The lamp in the button lights up.
- Press the key combination (**2**) – the pressure accumulator will be filled.



- Fill up the pressure accumulator until the pressure stops rising on the pressure gauge (**1**).
- Close the valve III – the lever (**3**) points down.

Boom pre-tensioning is now switched on.



- Press the button – the engine will switch off.

Switching off the boom pre-tensioning; ➠ p. 12 - 30.

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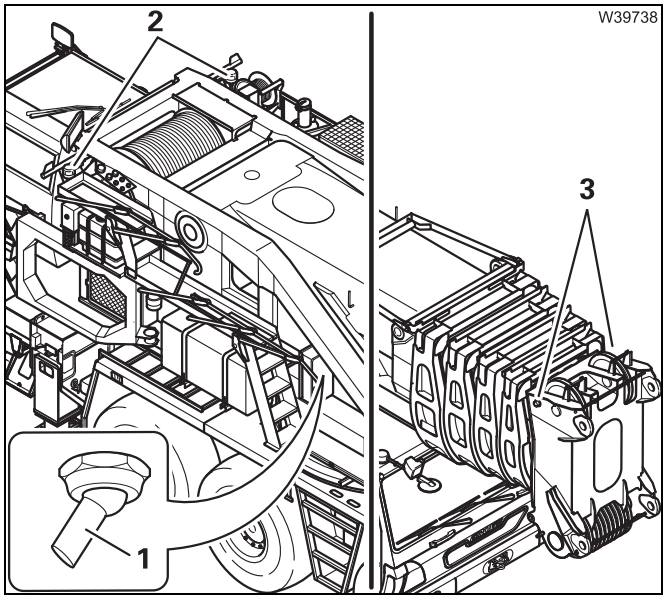
6.2.4 Switching the superstructure driving lights on/off



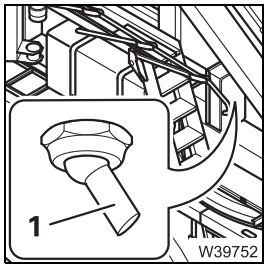
The lighting for the *superstructure* includes lamps (**2**) and (**3**).

With standard equipment, lamps (**2**) and (**3**) are always switched on and off together with the parking light and the headlights.

With additional equipment lamps (**2**) and (**3**) can be switched on or off separately with the switch (**1**), when the parking light or headlights are switched on.

Switching off

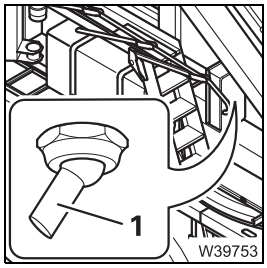
When the boom is set down on a dolly, you can switch off the *Superstructure* driving lights when necessary, e.g. in order to conform to country-specific regulations for the colour of front and rear lights.



- Push the switch (**1**) to the right – outwards.

Switching on

When the main boom is on the boom rest, the *Superstructure* driving lights must be switched on.



- Push the switch (**1**) to the left – towards the turntable.

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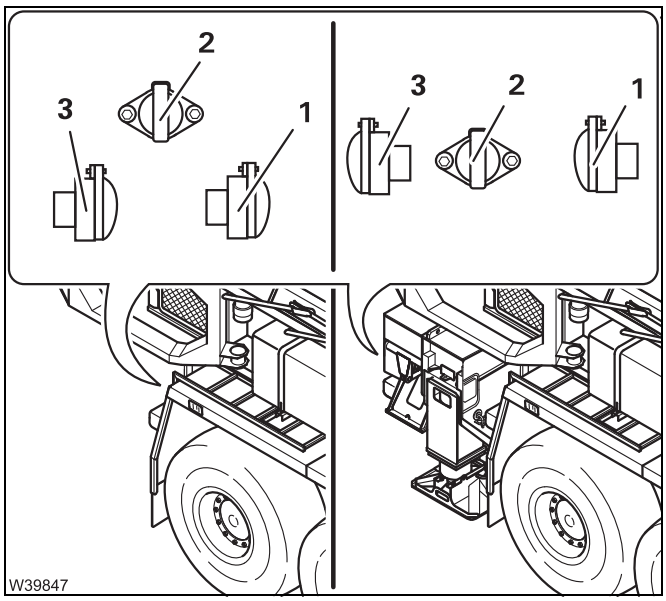
6.2.5 Connecting/disconnecting the dolly power supply cables

Connecting



- Insert the plug of the dolly electrical system into the socket (**2**).
- First connect the hose of the brake pipe to the yellow coupling head (**3**).
- Then connect the hose of the supply line to the red coupling head (**1**).

Risk of accidents if the hoses are too short or incorrectly routed!
The hose lines may not come off even when driving around corners. When connecting the hoses, make sure they are long enough and have enough clearance.

- Check the function of the dolly lighting.
- Test the service brake and parking brake immediately after setting off.

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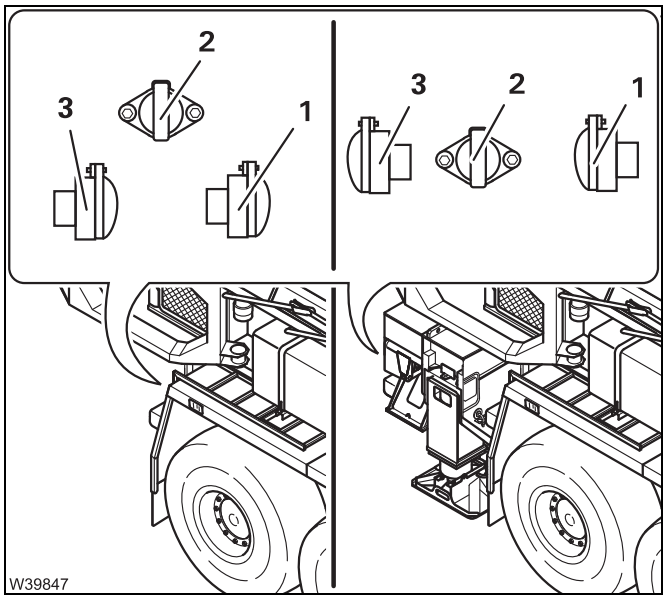
Removing

Risk of accidents due to trailer moving unintentionally!
Always first remove the hose from the supply line so that the dolly is braked. This prevents the trailer dolly moving when you remove the brake hose.



- Proceed as follows:
  - First disconnect the hose of the supply line from the coupling head (**1**) – red. Now the trailer is braked.
  - Then disconnect the hose of the brake line from the coupling head (**3**) – yellow.
- Pull the plug of the dolly electrical system out of the socket (**1**).

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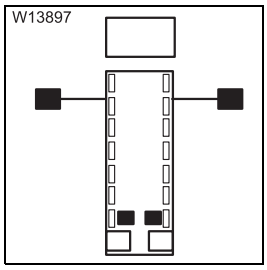
6.3 Rigging an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft)



With this outrigger span, the truck crane is supported at the front with an outrigger width of 8.90 m (29.2 ft). At the rear, the bearings on the tail are supported with the connection pieces. This results in an outrigger span of 1.22 m (4.0 ft).

You must rig this outrigger span before:

– Slewing the superstructure with the rear outrigger box removed

– Removing/installing the rear outrigger/additional axle

– Removing/installing the lighting carrier

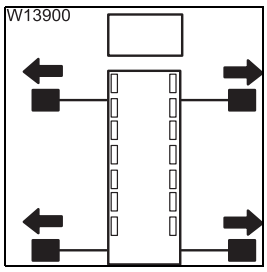
– Setting down the main boom on a dolly, or raising the main boom from a dolly

Risk of damage to the suspension struts and tyres!
Always support the truck crane with the supplied supports before carrying out the procedures listed.
This prevents the suspension struts and tyres from becoming overloaded and damaged.

Forces of up to 50 t (110,200 lbs) can be applied to each bearing if the truck crane is only on the supports. If the ground cannot support this force, you must determine the required ground bearing area and install the supports.
➠ *Determining the required load-bearing area*, p. 12 - 11
➠ *Enlarging the load-bearing area*, p. 12 - 40

Rigging

• Prepare the truck crane.



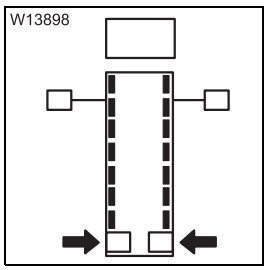
– When the outrigger span is rigged to 8.76 x 8.90 m (28.7 x 29.2 ft)

• Check that the following prerequisites are met:

– The counterweight is completely unrigged.

– The main boom is completely retracted and has been lowered onto the boom rest.

• Level the truck crane with the outriggers.



– When a different outrigger span is rigged

• Set the truck crane onto the wheels and retract the rear outrigger.

• Switch on the suspension; ➠ p. 5 - 15.

• Further preparations; ➠ *When the truck crane is standing on all wheels*, p. 6 - 16.

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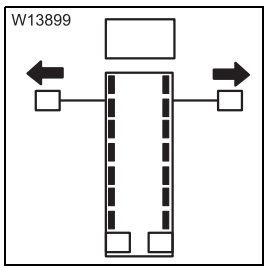


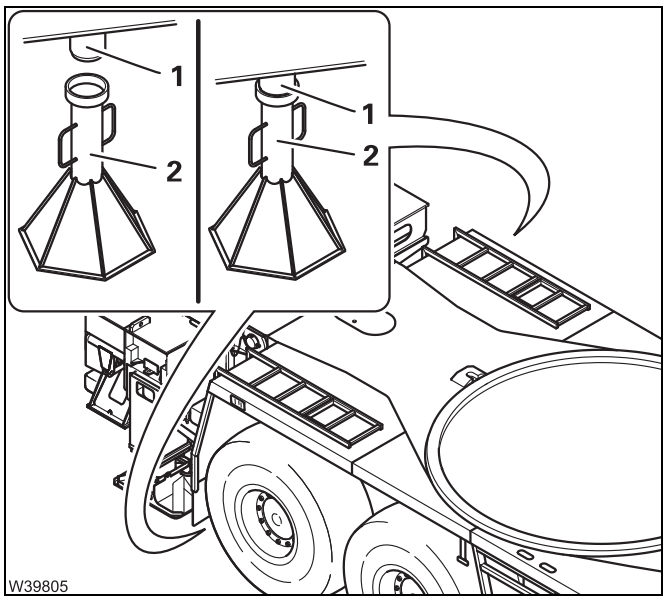
– When the truck crane is standing on all wheels

- Align the truck crane horizontally with the level adjustment system; *Levelling the truck crane*, p. 12 - 43.
- Extend the front outrigger beams to a span of 8.90 m (29.2 ft); *CHECKLIST: Extending the outriggers*, p. 12 - 31.
- Leave the outrigger cylinders retracted.

Put the truck crane on the supports

- Make sure that the horizontal alignment of the truck crane is maintained when raising/lowering.
- In the event that you need to use the supports as packing, make sure that you align the packing horizontally.

Danger of tipping when not horizontally aligned!
Ensure that the truck crane and carrier are always level. This prevents the outriggers from slipping off the packing or overloading the truck crane.



- Raise the truck crane – with the outriggers or level adjustment.
- Place the supports (**2**) under the bearings (**1**). Make sure that both supports are at the same height.
- Lower the truck crane until the bearings (**1**) are longer in the recesses in the supports (**2**).

Lower the truck crane somewhat further so that the supports are loaded.

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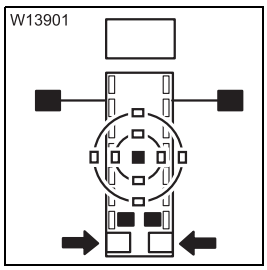
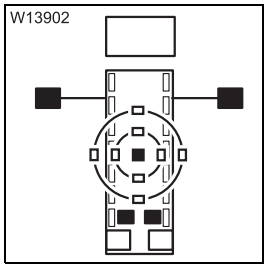


When the truck crane is supported

- Completely retract the rear outrigger beams and secure them.
- Align the truck crane horizontally with the front outriggers, if necessary.



When the truck crane is standing on all wheels

- Switch off the suspension; ➠ p. 5 - 15.
- Align the truck crane horizontally with the front outriggers.

Unrigging

- Prepare the truck crane.

– **When the rear outriggers are installed**

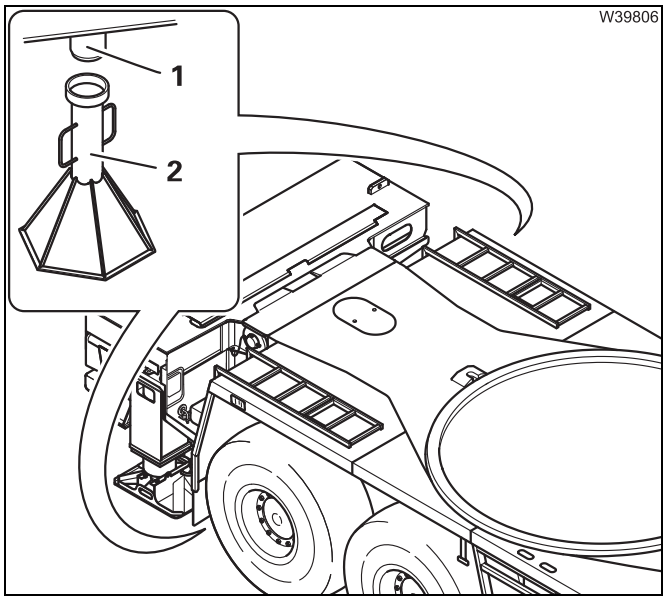
- Raise the truck crane with the outriggers.

or

- Proceed in the same manner as when removing the rear outriggers.

– **When the rear outriggers are removed**

- Place the truck crane on the wheels.
- Switch on the suspension; ➠ p. 5 - 15.
- Raise the truck crane with the level adjustment system.



Removing the connection pieces

- Raise the truck crane until the bearings (**1**) are no longer in the recesses in the supports (**2**).
- Remove the supports and any packing.

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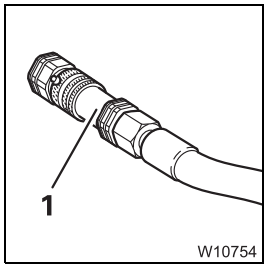
6.4 Installing/removing the outrigger beams



To rig the outrigger beams, the outriggers must be fitted with hydraulic connections (**1**) that can be separated.

During rigging, each outrigger beam is removed and mounted as a complete "package", consisting of inner and outer outrigger beams, cylinders and add-on parts.

Risk of truck crane overturning if not properly supported!
Loads may only be lifted when the truck crane is supported by all the outriggers.
For this reason, always use an auxiliary crane to lift the outrigger beams.

You will require the following equipment with a sufficient load bearing capacity:

– An auxiliary crane
– Suitable lifting gear and guide ropes
– A separate vehicle

Dimensions and weight of the outrigger beams; ➠ p. 1 - 10.

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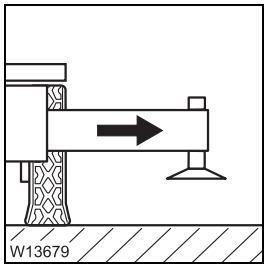
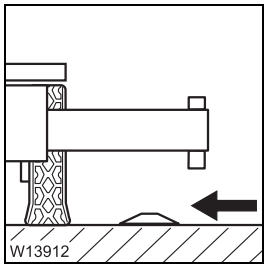
6.4.1 CHECKLIST: Removing the outrigger beams

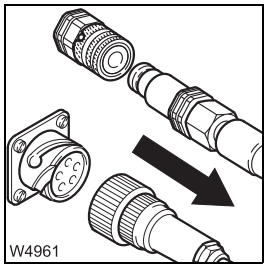
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions specified there!



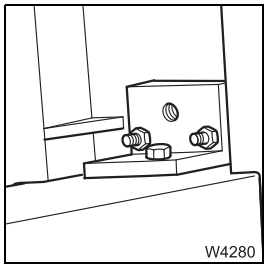
1. Prepare the truck crane – Mark the front outrigger beams and extend them to a span of 6.10 m (20.0 ft); ➠ p. 6 - 24.



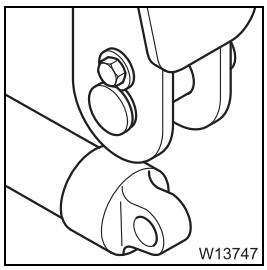
2. Depending on type of transport:
- Remove the outrigger pads; ➠ p. 6 - 25
- Place the outrigger pads in the working position; ➠ p. 6 - 25



3. – Disconnect the hydraulic connections; ➠ p. 6 - 27.
– Disconnect the electrical connection if necessary; ➠ p. 6 - 28.



4. Bring the holding bracket into the transport position; ➠ p. 6 - 28.



5. Release the connection to the support box; ➠ p. 6 - 30.

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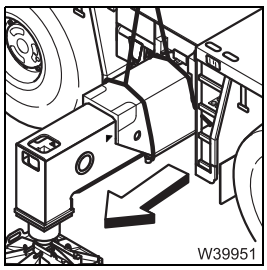
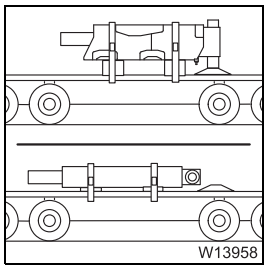


6. – Turn the spacer down; ➠ p. 6 - 29

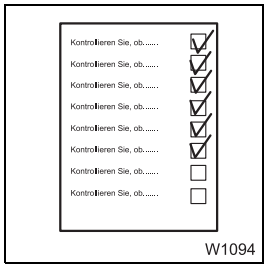
– Sling the outrigger beam and pull it out of the support box; ➠ p. 6 - 31.



7. – Lift the outrigger beam onto a separate vehicle and remove the sling gear.

– If necessary, place the outrigger pads on a separate vehicle.

➠ *Transporting the outrigger beams*, p. 6 - 34



8. Dismount the other outrigger beams in the same way in accordance with this checklist.

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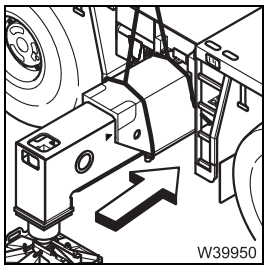
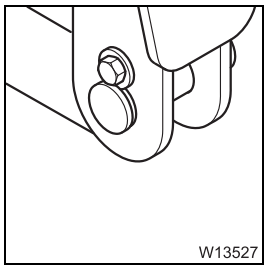
6.4.2 CHECKLIST: Installing the outrigger beams

This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions specified there!

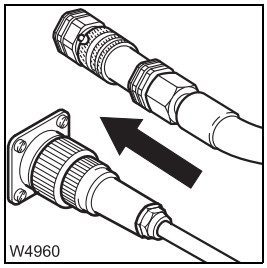
1. Prepare the truck crane for installation of the outrigger beams; ➠ p. 6 - 24.



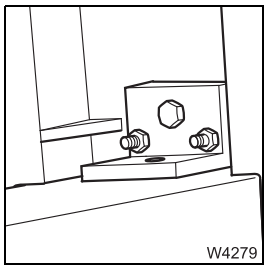
2. – Sling the outrigger beam and insert it into the support box; ➠ p. 6 - 31.
– Remove the sling gear.



3. Establish the connection to the support box; ➠ p. 6 - 30.



4. – Establish the hydraulic connections; ➠ p. 6 - 27.
– Establishing the electrical connection if necessary; ➠ p. 6 - 28.



5. Bring the holding bracket into the operating position; ➠ p. 6 - 28.

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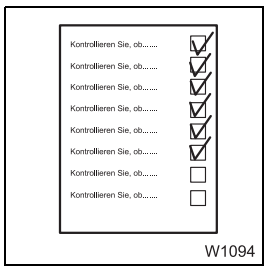
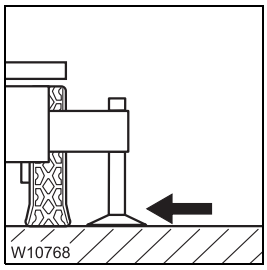
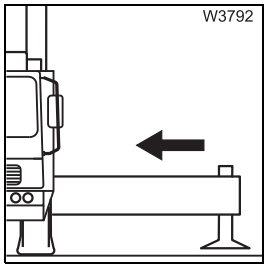


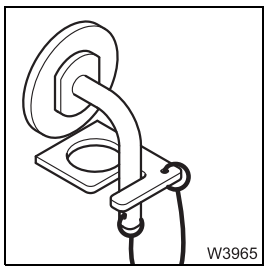
6. Mount the other outrigger beams in the same way in accordance with this checklist.



7. If necessary put outrigger pads into position; ➠ p. 6 - 26.



8. Unlock the front outrigger beams, retract them completely and set the spacers;
➠ *Extending/retracting outrigger beams*, p. 12 - 37,
➠ *Unscrewing/screewing in the spacers*, p. 6 - 29.



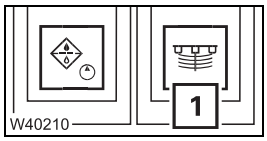
9. Secure the front outrigger beams.

6.4.3 Preparing the truck crane

Prerequisites

The following requirements must be met before mounting/removing the outrigger beams:

- All rigging work which involves slewing the superstructure has been completed.
- The parking brake is engaged.
- The truck crane has been levelled with the level adjustment system; ➠ p. 5 - 54.
- The rear outrigger was already removed (if necessary).
- The front outrigger beams are extended to a span of 6.10 m (20.0 ft); ➠ p. 12 - 37.

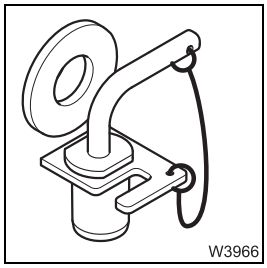


- The suspension is switched off (locked), the lamp (**1**) is lit; ➠ p. 5 - 15.

For removal

Labelling the outrigger beams

- Before you remove all outrigger beams for the first time, label them with the correct installation point and if necessary, also with the serial number of the truck crane.



Release the outrigger beams

- Pull out the pins (**1**).

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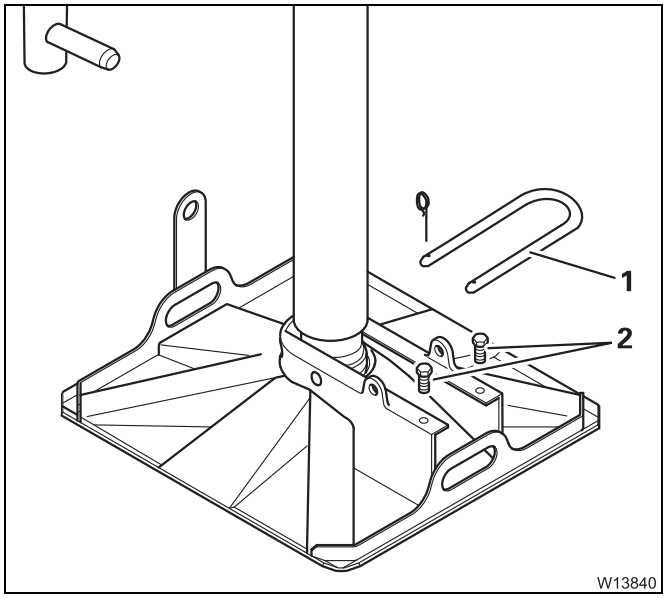
6.4.4 Removing/attaching outrigger pads

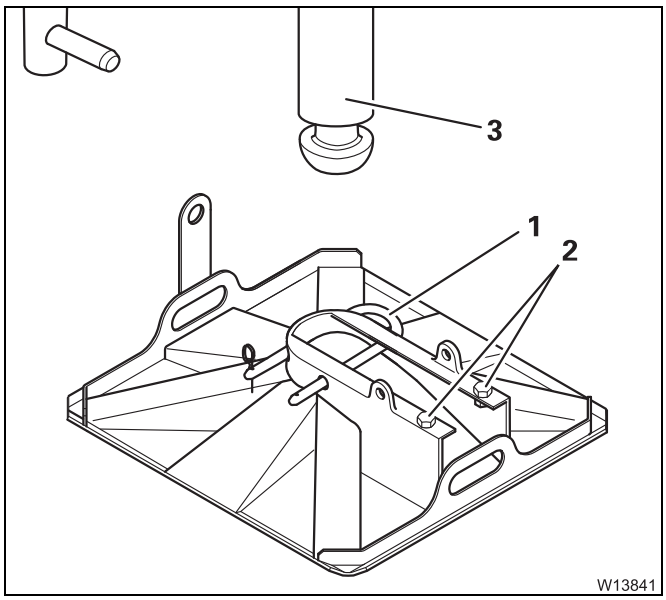
You only need remove the outrigger pads if the outrigger beams are to be transported lying on their side.
For transportation in a suitable holding frame, the outrigger beams can be set down on the outrigger pad.

Removing the outrigger pads

Handling is easier if you remove the outrigger pad before removing the outrigger beams.



- Loosen the retaining pin and pull the bracket (**1**).
- Move the outrigger pad into operating position.
- Extend the outrigger cylinder until the outrigger pad just touches the ground but is not yet under strain.
- Unscrew both screws (**2**).



- Pull the outrigger pad off the outrigger cylinder (**3**).
- Fasten the screws (**2**).
- Insert the bracket (**1**) and secure it.
- Fully retract the outrigger cylinder.
- Remove the other outrigger pads in the same way.

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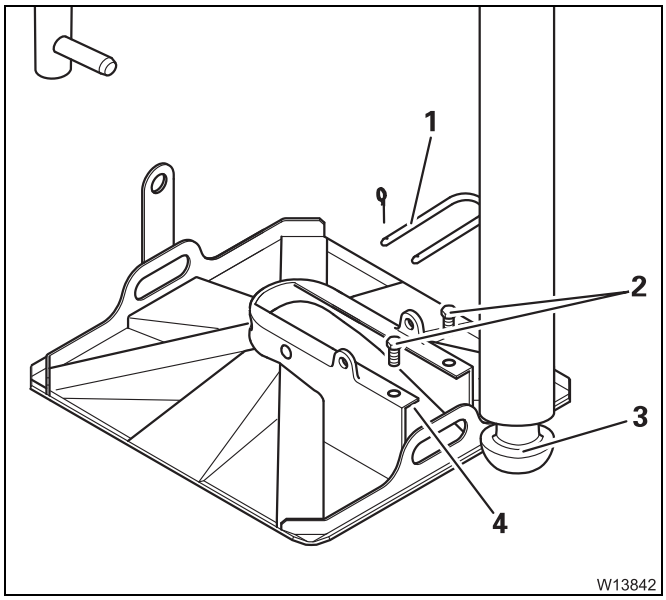
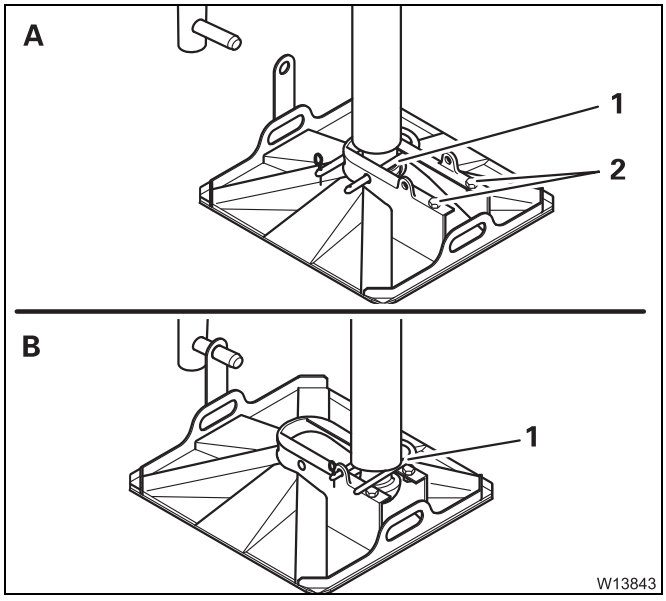
Attaching the outrigger pads

After mounting the outrigger beams, you must attach the outrigger cylinder.



- Unscrew both screws (**2**).
- Loosen the retaining pin and pull the bracket (**1**).
- Extend the outrigger cylinder far enough so that the bearing surface (**3**) is below the guide (**4**).



- Push the outrigger pad onto the outrigger cylinder.
- Fasten the screws (**2**).
- Move the outrigger pad into required position.
  - On site, move it to the working position (**A**).
  - If you need to drive to the site, in driving position (**B**).
- Insert the bracket (**1**) and secure it.

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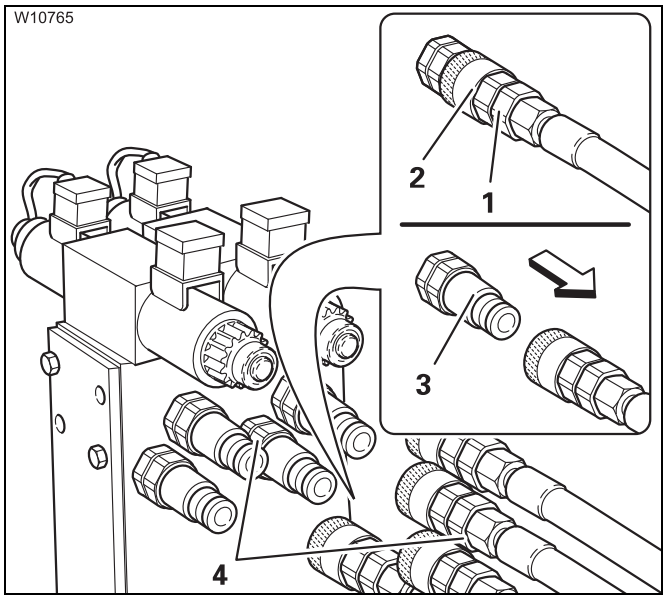
6.4.5 Disconnecting/establishing hydraulic connection

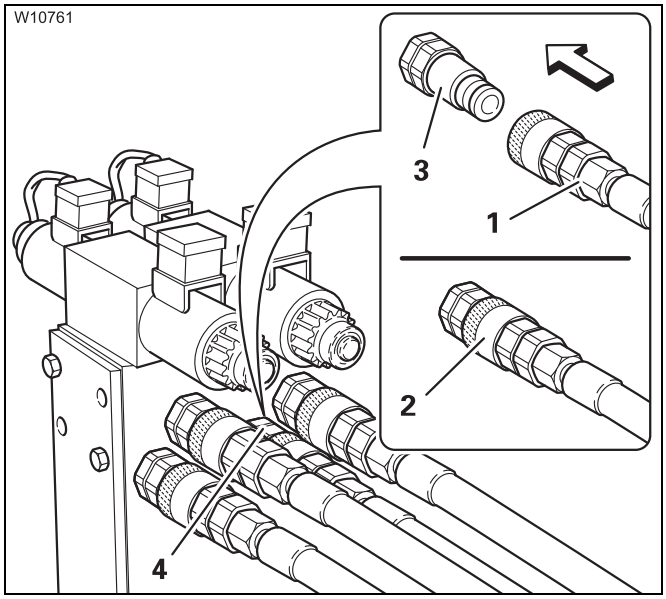
There is a valve block on each outrigger beam. The position of the valve block may differ from the drawings, depending on the outrigger beam.



Disconnecting the connection

Always disconnect all connections (**4**).

- Hold the hose (**1**) firmly.
- Pull the lock (**2**) against the stop. The hose is pushed out of the connection (**3**).
- Seal all connecting points.



Establishing the connection

Always establish all connections (**4**).
The assignment is specified by colour designations.

- Press the hose (**1**) into the connection (**3**).
- The lock (**2**) engages.

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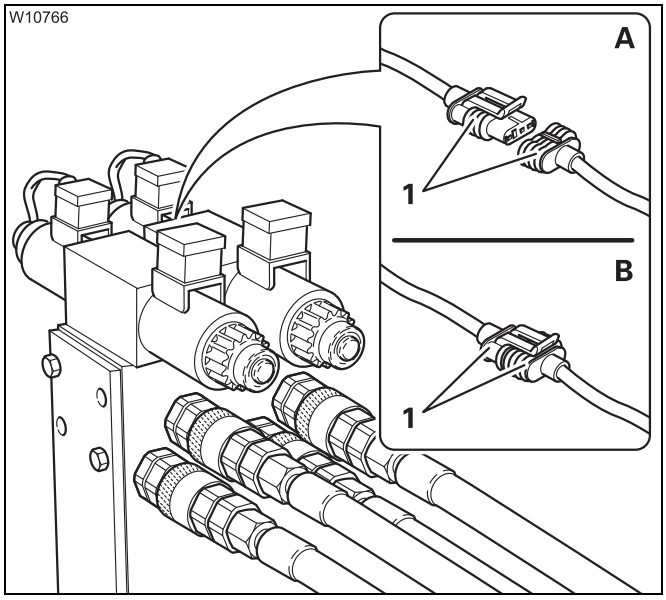
6.4.6 Disconnecting/establishing the electrical connection

The electrical connection is only present on truck cranes with an outrigger pressure indicator.

Risk of malfunctions in the electronic system!
Always turn off the ignition before you disconnect or establish the electrical connection. This prevents malfunctions and corresponding error messages in the subsequent crane operation.



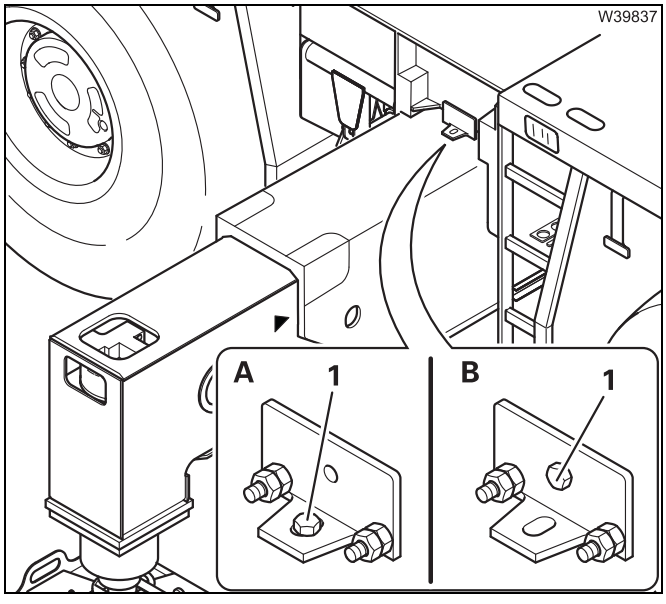
(A) – Disconnecting the connection

- Pull the plugs (**1**) apart. Protect the plugs against dirt and moisture.

(B) – Establishing the connection

- Connect the plugs (**1**) together.
- Protect the separating points against dirt and moisture.

6.4.7 Holding angle position



(A) – Transport position

- Fasten the holding angle to the outrigger beam with the screw (**1**).

(B) – Working position

- Fasten the holding angle to the outrigger box with the screw (**1**).

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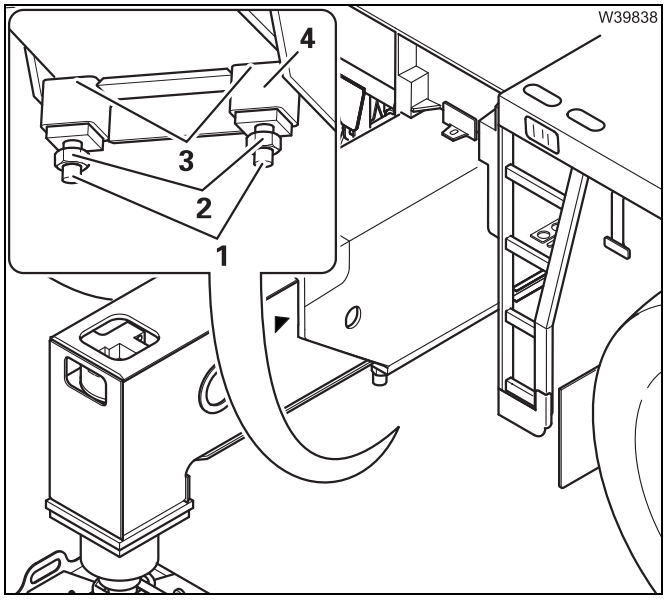
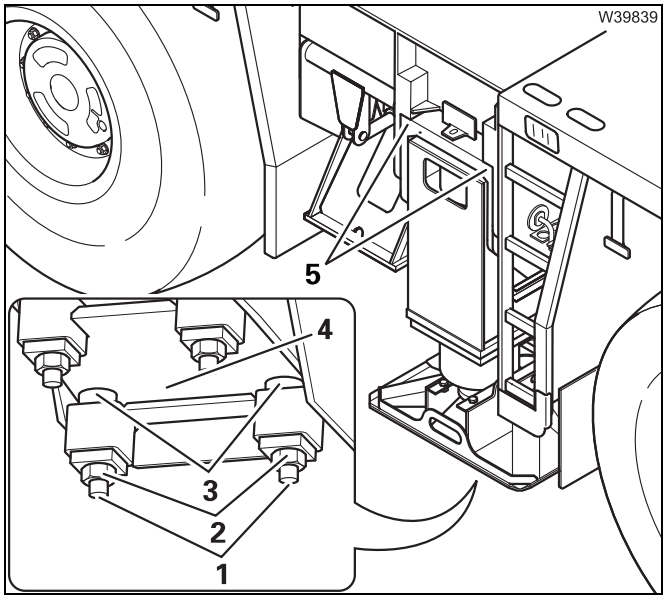
6.4.8 Unscrewing/screwing in the spacers



Unscrewing

- Undo the nuts (**2**).
- Unscrew the screws (**1**) until the spacers (**3**) are screwed completely into the outrigger box (**4**).



Screwing in

- Screw in the bolts (**1**),
  - until the spacers (**3**) lie on top on the outrigger beam (**4**) **and**
  - until the distance to the outrigger box (**5**) is an even 3 mm (0.12 in) over the entire width.
- Lock the bolts in place with the nuts (**2**).

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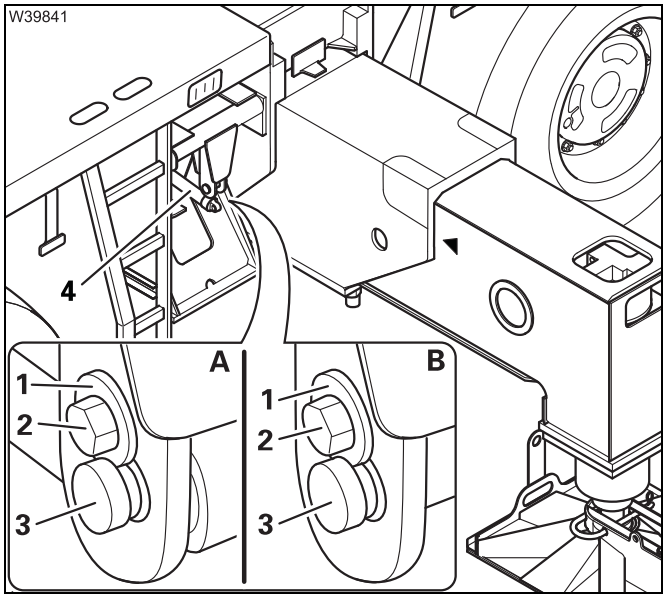
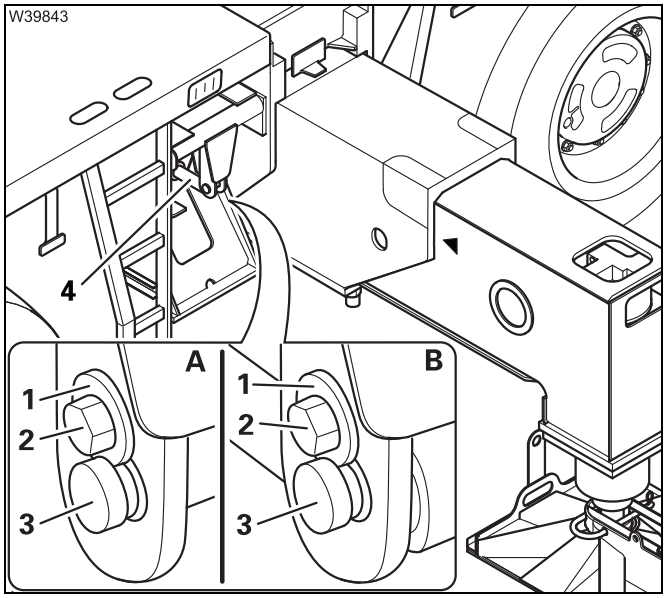
6.4.9 Disconnecting/establishing the connections to the support box



Disconnecting the connection

- (**A**) – Undo the screw (**2**) and remove the washer (**1**).
- Pull out the pin (**3**) – the cylinder (**4**) falls into the transport position.
- (**B**) – Insert the pin (**3**) and secure it with the washer (**1**) and the screw (**2**).



Establishing the connection

- (**A**) – Undo the screw (**2**) and remove the washer (**1**).
- Pull out the pin (**3**).
- **(B**) – Lift the cylinder (**4**) and fasten it with the pin (**3**).
- Secure the pin (**3**) with the washer (**1**) and bolt (**2**).

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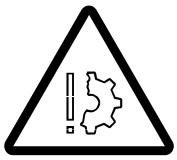
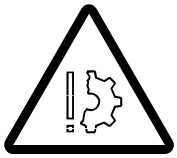
6.4.10 Pulling out/Inserting the outrigger beam

Notes

Risk of being crushed by the swinging outrigger beam!
Secure the outrigger beam with the guide ropes when pulling it in and out. Keep a suitable distance to avoid injuring yourself or others on the swinging outrigger beam.



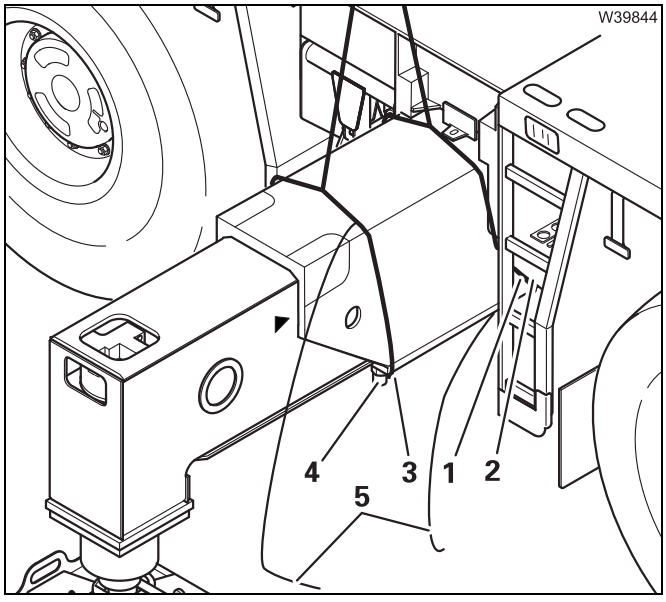
Risk of damage to the piston rod!
When extending and retracting the outrigger beam with the guide ropes, align the beam in such a way that the projecting piston rod is not damaged.



Risk of damage to the spacers!
Check that all spacers have been screwed in completely.
The prevents the spacers from catching and becoming damaged.

Risk of damage to the hoses and cables!
Ensure that the hoses and cables of the hydraulic and electrical connections are not damaged.

Pulling out Follow the safety instructions; ➠ *Notes*, p. 6 - 31.



- Attach one line (**3**) of the lifting gear next to the adjusting screws (**4**).
- Attach a second line (**1**) of the lifting gear at the level of the strutting (**2**).
- Lift the outrigger beam slightly with the auxiliary crane.
- Pull the outrigger beam slightly out and check the horizontal alignment. Correct this if necessary.
- Fasten two guide ropes (**5**).

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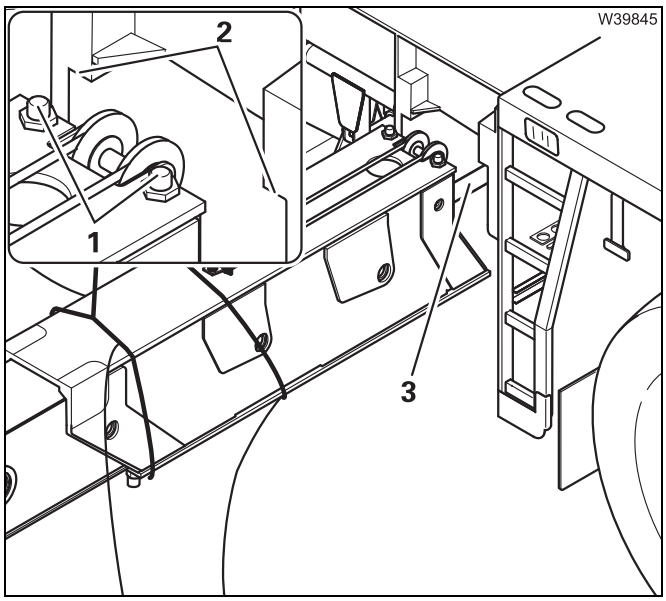
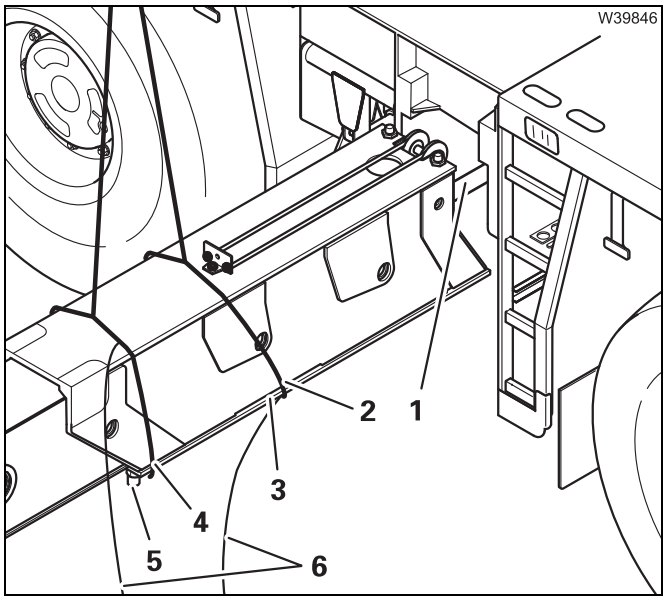


- Extend the outrigger beam so far that the upper spacers (**1**) are located just behind the stops (**2**).
- Lower the outrigger beam until the spacers (**1**) are under the stop (**2**).
- Lift the outrigger beam out of the outrigger box – take care that the piston rod (**3**) is not damaged.

installing

- Follow the safety instructions; ➠ *Notes*, p. 6 - 31.
- Only insert the outrigger beam at the correct installation point. Note the information on the label.



- Attach one line (**4**) of the lifting gear next to the adjusting screws (**5**).
- Attach a second line (**2**) of the lifting gear at the level of the strutting (**3**) to allow the outrigger beam to be raised horizontally.
- Fasten two guide ropes (**6**).
- Lift the outrigger beam out of the outrigger box using the auxiliary crane – take care that the piston rod (**1**) is not damaged.

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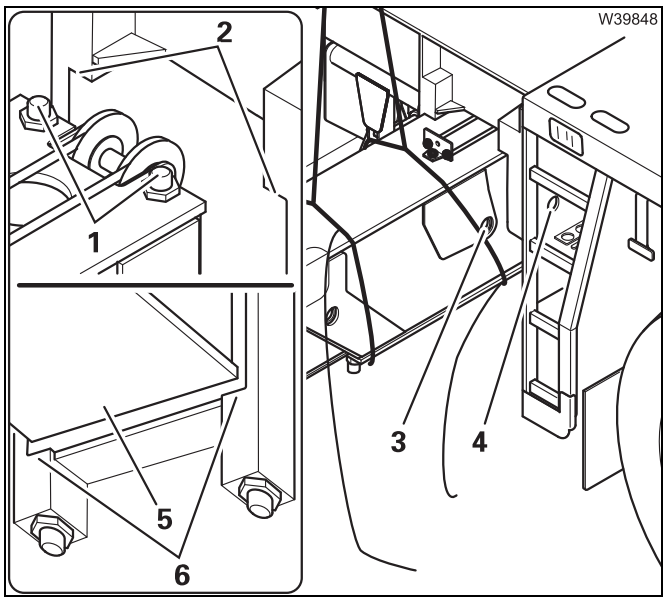
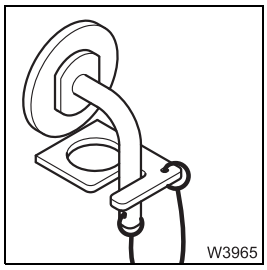


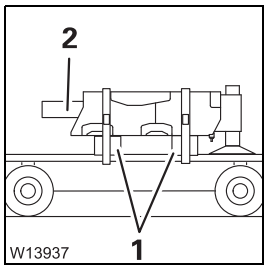
- Lift the outrigger beam with the spacers (**1**) behind the lifting points (**2**).
- Lift the outrigger beam into the outrigger box – adjust the height so that the outrigger beam (**5**) does not damage the spacer (**6**).
- Continue lifting the outrigger beam into the outrigger box until the holes (**3**) and (**4**) are aligned.



- Secure the outrigger beam with the pin.
- Remove the lifting gear from the outrigger beam.

6.4.11 Transporting the outrigger beams

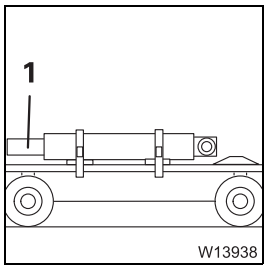
- For transportation, be sure to use a separate vehicle with sufficient load bearing capacity. Transport dimensions and weight; ➠ p. 1 - 10.
- Load the separate vehicle in such a way that the weight is evenly distributed.
- Load the outrigger beam so that it that does not endanger other traffic.



When the outrigger pads are mounted

- Place the outrigger beam onto a suitable fixture (**2**).
- Secure the piston rods with a suitable cover (**1**).
- Secure to the outrigger beams for transport.

Risk of damage to the outrigger beams and outrigger pads!
When outrigger pads are mounted, always use a device to set them down. If you lay the outrigger beams onto the side, connections may tilt and become damaged.



When the outrigger pads are dismounted:

- Lay the outrigger beam onto the side.
- Secure the outrigger beam from slipping.
- Secure the piston rods with a suitable cover (**1**).
- Stow the outrigger pads and secure them for transport.

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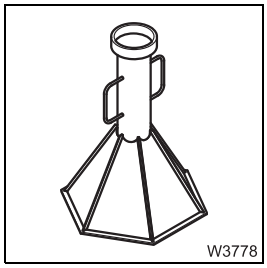
6.5 Mounting/dismounting the rear outriggers

The rear outrigger (ROB = Removable Outrigger Box) consists of the rear outrigger box. For driving on roads, this can be completely dismounted with the outrigger cylinders and outrigger beams.

Risk of overturning when slewing the superstructure!
Support the truck crane with an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) and enter an appropriate RCL code before you slew the superstructure.
Never override the RCL when slewing is switched off;
➠ *Crane movements during the installation and removal procedures*, p. 6 - 41.

Equipment required



– Prop supports

  You need these supports in order to correctly rig the outrigger span 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft).

– Appropriate lifting gear (chain or rope suspension gear) of sufficient lifting capacity and guide ropes
– A separate vehicle of sufficient load bearing capacity with a sufficient loading area.

Dimensions and weights of removable parts;
➠ *Outriggers*, p. 1 - 10,
➠ *Lighting carrier*, p. 1 - 11.

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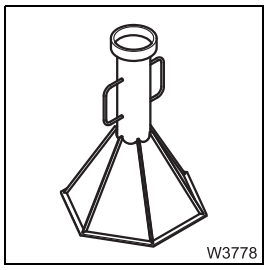
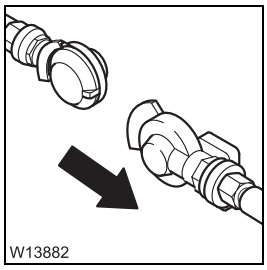
6.5.1 CHECKLIST: Dismount the rear outriggers

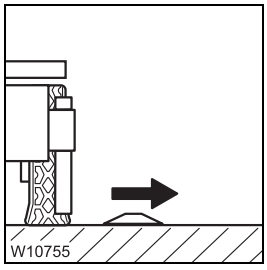
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions specified there!



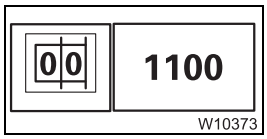
1. Rigging an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft); ➠ p. 6 - 15.



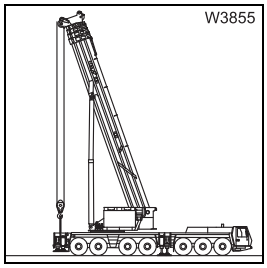
2. Disconnect the pneumatic connections between the carrier and outrigger box; ➠ p. 6 - 46.



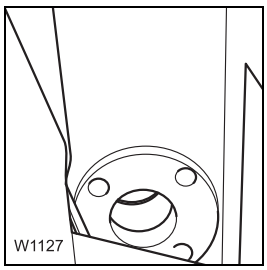
3. Remove the outrigger pads; ➠ p. 6 - 25.



4. With the RCL set accordingly, raise the main boom and slew the superstructure to the rear; ➠ *Crane movements during the installation and removal procedures*, p. 6 - 41.



5. Sling the outrigger box to the truck crane; ➠ *Slinging points of the rear outrigger*, p. 6 - 42.



6. Release the lock between the outrigger box and carrier; ➠ p. 6 - 51.

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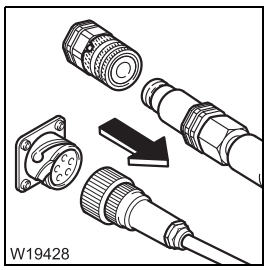
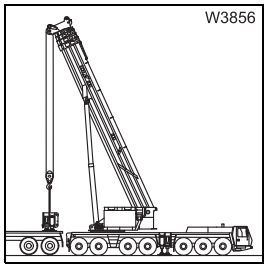
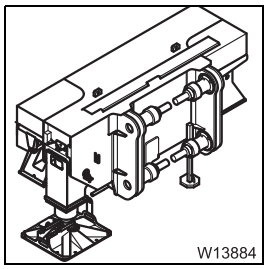


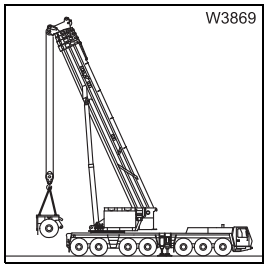
7. – Disconnect the hydraulic connections; ➠ p. 6 - 43.
– Disconnect the electrical connection; ➠ p. 6 - 44.



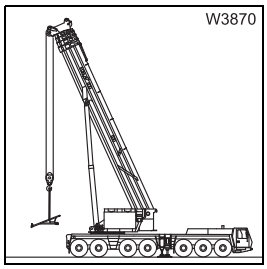
8. If the outrigger box is to be transported:
Lift outrigger box out of the holders on the carrier with the truck crane and place on separate vehicle;
➠ *Lifting/hanging the rear outriggers with the truck crane*, p. 6 - 47,
➠ *Transportation on a separate vehicle*, p. 6 - 53.



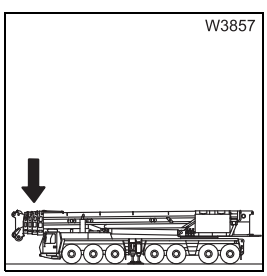
9. If the outrigger box is to be set down:
Use the truck crane to raise the outrigger box out of the brackets on the carrier and set it down onto the support; ➠ p. 6 - 48.



10. Mount the additional axle if necessary; ➠ p. 6 - 89.



11. Mount the lighting carrier if no additional axle has been mounted; ➠ p. 6 - 54.



12. If the main boom is to be set down on the boom rest:
– Mount the lighting carrier; ➠ p. 6 - 54.
– Set the hook block in the lighting carrier and unreeve if necessary; ➠ p. 6 - 58.
– With the RCL set accordingly, slew the superstructure to the front and set down the main boom; ➠ *After removal*, p. 6 - 41.

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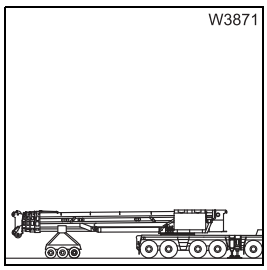
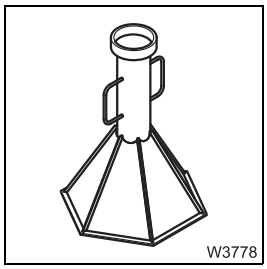
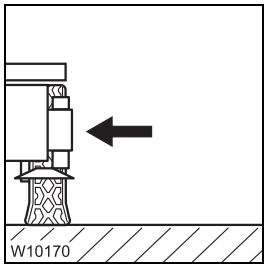


13. If the main boom is to be set down on a dolly:
With the RCL set accordingly, slew the superstructure to the rear and lower the main boom
➠ *Crane movements during the installation and removal procedures*, p. 6 - 41.



14. Remove the supports under the bearings and set down on the separate vehicle; ➠ p. 6 - 17.



15. Retract the front outrigger cylinders and outrigger beams and secure;
➠ *CHECKLIST: Retracting the outriggers*, p. 12 - 33.

16. Secure the outrigger box on the separate vehicle for transportation;
➠ *Transportation on a separate vehicle*, p. 6 - 53.

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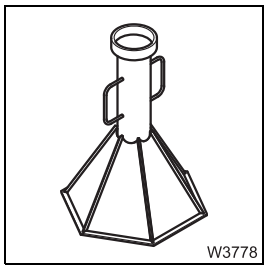
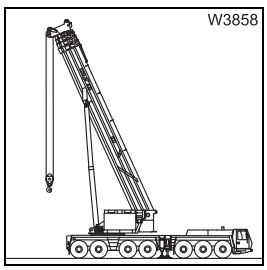
6.5.2 CHECKLIST: Mounting the rear outriggers

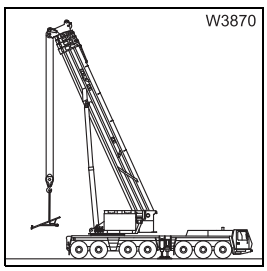
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions specified there!



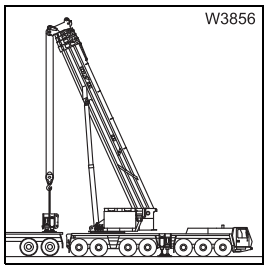
1. Rigging an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft); ➠ p. 6 - 15.



2. With the RCL set accordingly, raise the main boom and slew the superstructure into the position for raising the supporting box; ➠ *Crane movements during the installation and removal procedures*, p. 6 - 41.

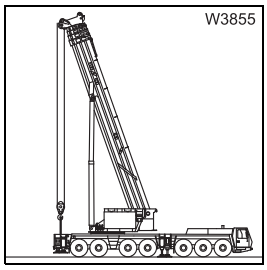


3. If the lighting carrier is installed:
- Pick up the hook block from the lighting carrier, if there is one; ➠ *Hook block in the lighting carrier*, p. 6 - 58.
- Dismount the lighting carrier; ➠ p. 6 - 54.



4. Sling the rear outrigger box to the truck crane and lift it from the separate vehicle or from the support; ➠ *Slinging points of the rear outrigger*, p. 6 - 42

If the outrigger box was placed on the supports:
Push in the support; ➠ p. 6 - 49.



5. Suspend the rear outrigger box in the holders on the carrier; ➠ p. 6 - 47.

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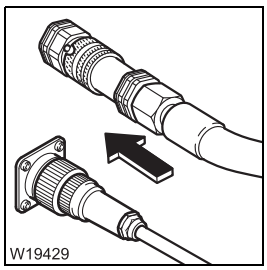
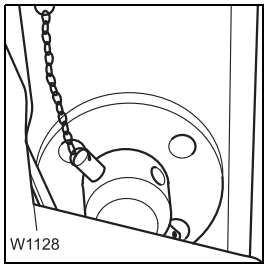
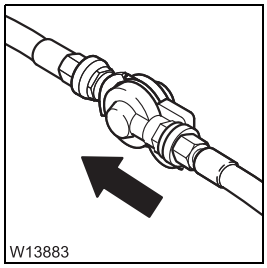


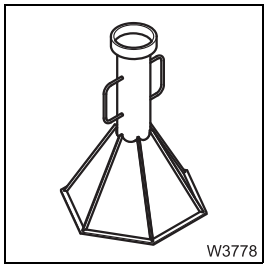
6. – Establishing the hydraulic connection; ➠ p. 6 - 43.
– Establishing the electrical connection; ➠ p. 6 - 44.



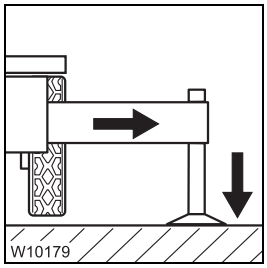
7. Pin the outrigger box to the carrier; ➠ p. 6 - 51.



8. Establish the pneumatic connections between the carrier and outrigger box; ➠ p. 6 - 46.

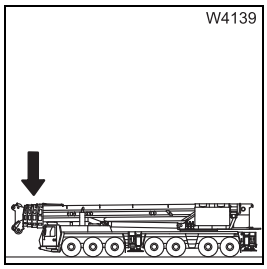


9. Remove the supports under the bearings; ➠ p. 6 - 17.



10. If the truck crane is at the site:

Extend the outrigger beams to the necessary outrigger span, secure them and support the truck crane; ➠ *CHECKLIST: Extending the outriggers*, p. 12 - 31.



11. If the truck crane has to be driven to the site:

With the RCL set accordingly, slew the superstructure to the front and set down the main boom; ➠ *Crane movements during the installation and removal procedures*, p. 6 - 41.

Retract the front outrigger cylinders and outrigger beams and secure; ➠ *CHECKLIST: Retracting the outriggers*, p. 12 - 33.

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6.5.3 Crane movements during the installation and removal procedures

When the rear supporting box is removed, the setting down and raising of the main boom and the slewing of the superstructure is monitored by RCL. There are RCL codes for different working positions for an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft).

Risk of overturning when slewing the superstructure!
Support the truck crane with an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) (supported with supports at the rear) and enter an appropriate RCL code before you slew the superstructure.
Do not override the RCL if slewing is switched off.

Prerequisites

The following prerequisites must be met:

– The counterweight is completely unrigged.
– The truck crane is rigged to an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft); ⇛ p. 6 - 15.
– The truck crane must be level.

Before installation

- Lock the superstructure; ⇛ p. 11 - 13.
- Enter the RCL code for an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) for the current main boom position (code for 0° position to the rear or 180° position to the front).
- Raise the main boom.
- Enter the RCL code for the outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) for the 360° slewing range.
- Unlock the superstructure and slew it to the position for receiving the outrigger box.
- Enter the RCL code for the outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) for the restricted slewing range of ±15° to the rear.

After removal

- Enter the RCL code for the outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) for the 360° slewing range.
- Slew the superstructure into the position for setting down the main boom (0° to the rear, 180° to the front or ±15° to the rear).
- Lock the superstructure; ⇛ p. 11 - 13.
- Enter the RCL code for the outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) for the current main boom position.
- Set down the main boom on the boom rest or on a dolly.

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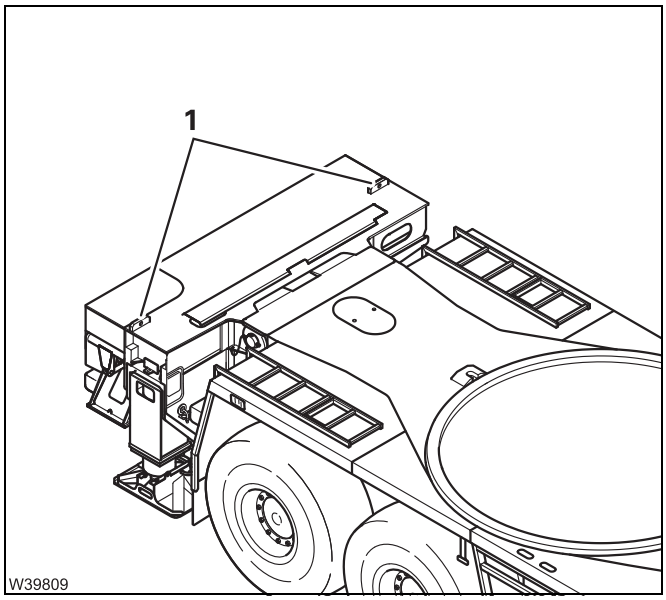
6.5.4 Slinging points of the rear outrigger

Risk of accident if used improperly!
Attach the outrigger box only to the designated points and only use lifting gear of sufficient lifting capacity. Weight of the outrigger box ➠ p. 1 - 10.



At the top of the outrigger box there are two slinging points (**1**).

Use only these slinging points for fastening the lifting gear.

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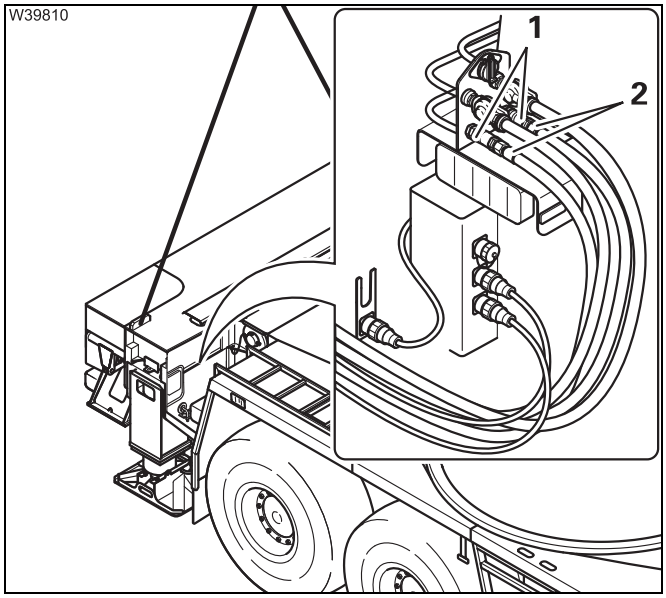
6.5.5 Disconnecting/establishing hydraulic connection

The hydraulic connection between the outrigger box and carrier consists of two hoses with quick couplings.

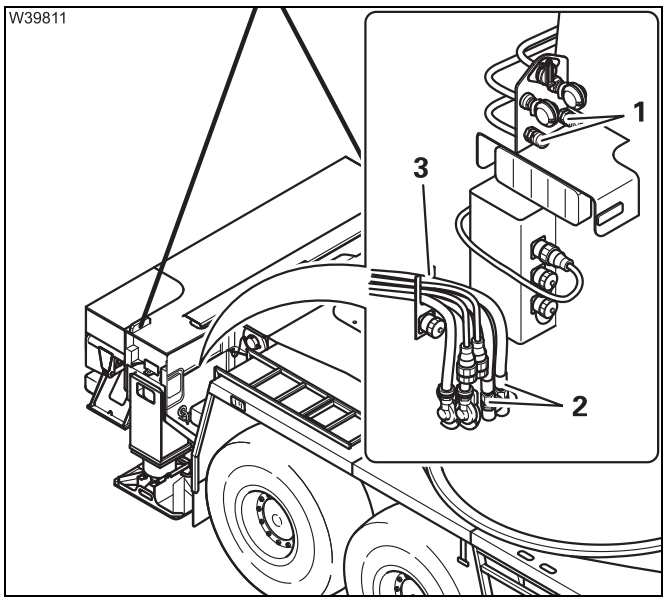
Connecting

Corresponding hoses and ports are labelled.



- Connect the hoses (**2**) to the ports (**1**).

Separating



- Remove the hoses (**2**) from the ports (**1**).
- Close the hoses (**2**) and the ports (**1**) with the caps.
- Attach the hoses in the clamp (**3**).

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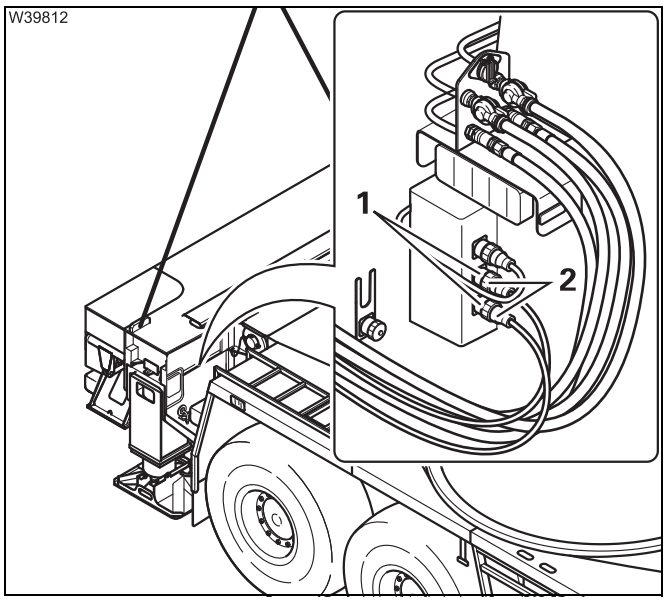
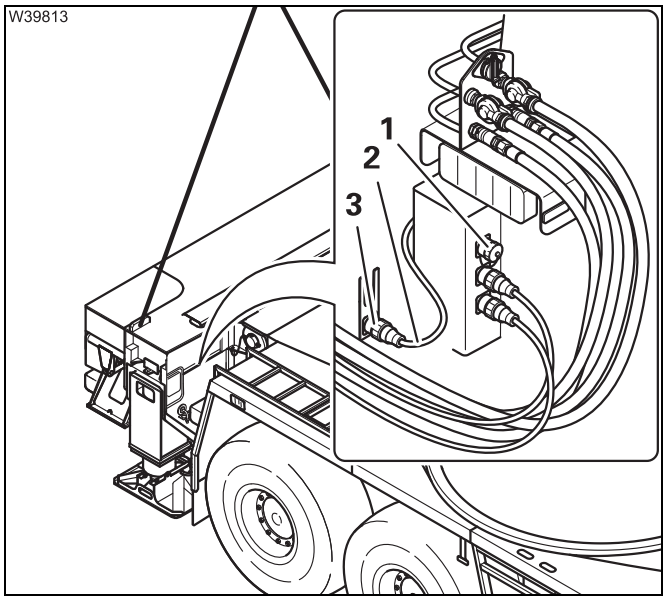
6.5.6 Establishing/disconnecting the electrical connection

Risk of malfunctions in the carrier electronics!
Always turn off the ignition before you establish or break the electrical connection. This prevents malfunctions and error messages in the carrier electronics.

Establishing Corresponding plugs and sockets are labelled.



- Insert the plugs (**2**) into the sockets (**1**).



- Remove the plug (**2**) from the socket (**1**) and plug it into the socket (**3**).
- Cover the socket (**1**) with the cap.

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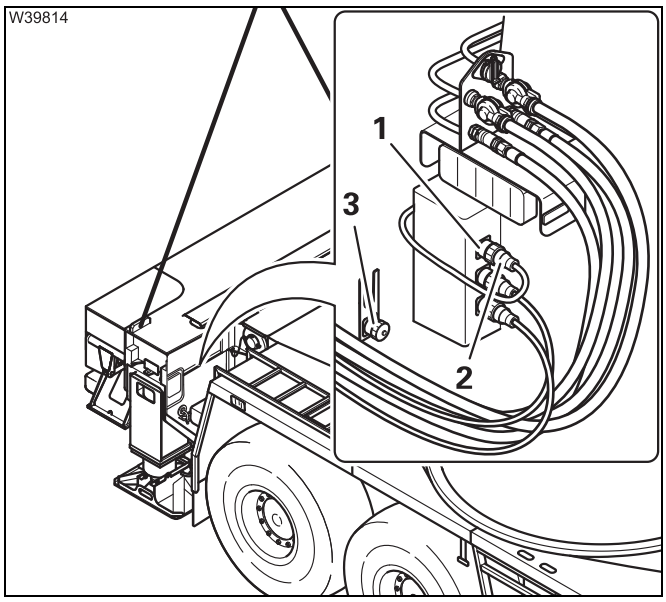
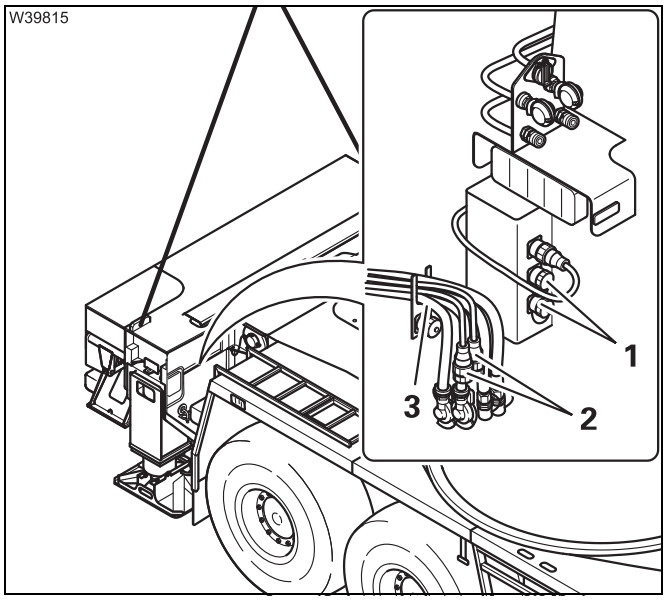
Separating



- Remove the plug (**2**) from the socket (**3**) and plug it into the socket (**1**).
- Cover the socket (**3**) with the cap.



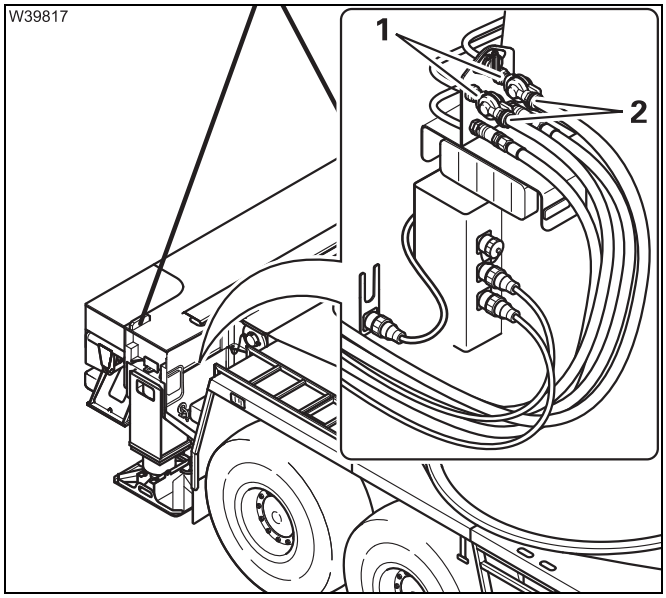
- Remove the plugs (**2**) from the sockets (**1**).
- Close the plugs (**2**) and the sockets (**1**) with the caps.
- Attach the cables of the plugs (**2**) in the clamp (**3**).

6.5.7 Establishing/Disconnecting the pneumatic connection

With additional equipment, the pneumatic connections supply the rear pneumatic ports on the rear outrigger box.

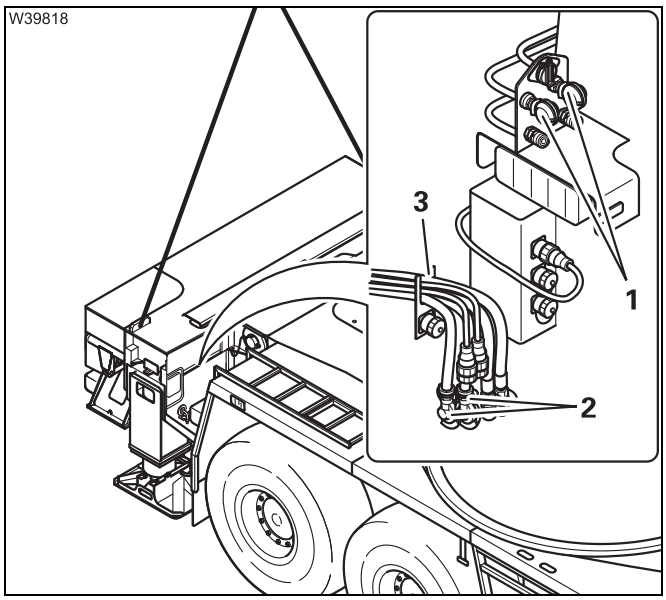
Connecting

Corresponding hoses and ports are labelled.



- Connect the hoses (**2**) to the ports (**1**).

Separating



- Remove the hoses (**2**) from the ports (**1**).
- Close the hoses (**2**) and the ports (**1**) with the caps.
- Attach the hoses in the clamp (**3**).

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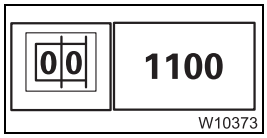
6.5.8 Lifting/hanging the rear outriggers with the truck crane

Prerequisites:



– The RCL code for the outrigger span 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) for the slewing range 360°, as stated in the *Lifting capacity table*, has been entered.

– The mobile crane is supported at the rear with the supports; ➠ p. 6 - 16.

– The truck crane is level; ➠ p. 12 - 43.

– The front outrigger beams are extended to a span of 8.90 m (29.2 ft) and the outrigger pads are lowered to the ground for stabilizing.

– The electrical, hydraulic, and pneumatic connections are disconnected before removing the outrigger box.

Risk of damage to the suspension struts and tyres!
You must support the truck crane on the supports before raising the rear outriggers with the truck crane.
This prevents the suspension struts and tyres from becoming overloaded and damaged.

Risk of overturning with the raised outrigger box!
Always enter an RCL code for the outrigger span 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) with the working position required before lifting the outrigger box with the truck crane and slewing the truck crane. You may not override the RCL even if the RCL goes off at a small working radius! When the working radius increases after RCL shutdown, the stability is no longer guaranteed.

Risk of being crushed when attaching and raising the outrigger box!
Always guide the outrigger box from the rear with guide ropes when attaching and raising it. This will prevent you being crushed between the outrigger box and the carrier.

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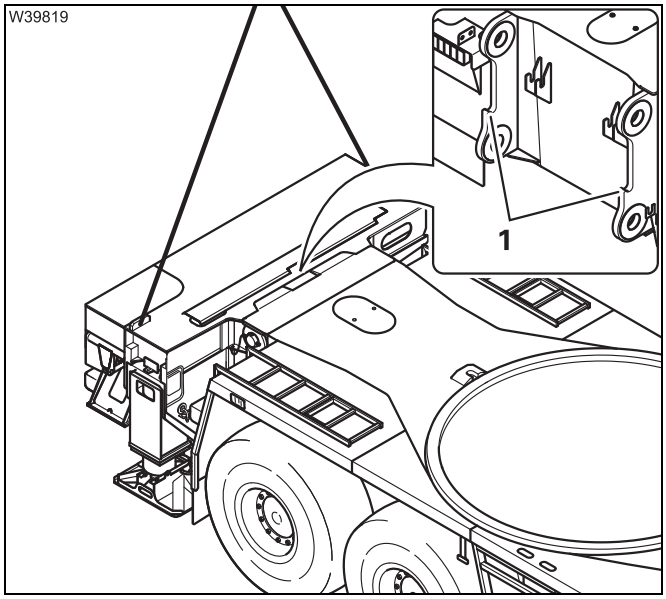
Lifting

- Raise the main boom until you are able lift the outrigger box upwards in an upright position.

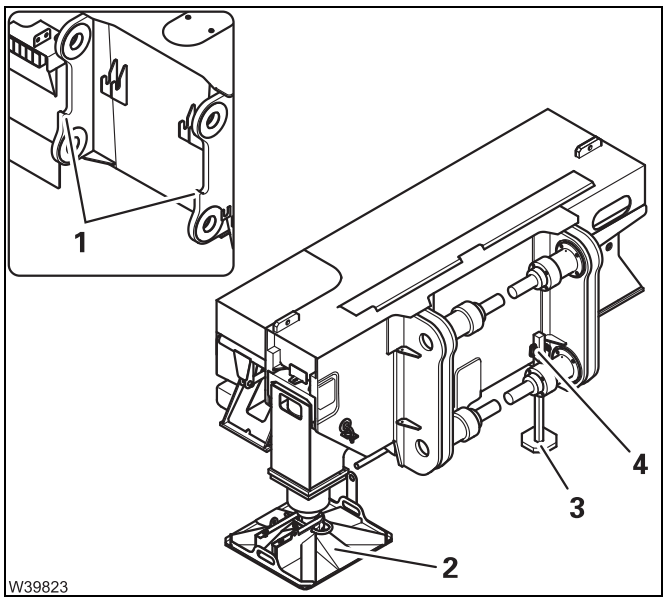


If the outrigger box is to be placed on a separate vehicle:

- Move the separate vehicle up to the truck crane so that you can set down the outrigger box without overriding the RCL.

  Do not override the RCL!

- Lift the outrigger box vertically out of the retainers (**1**) with the truck crane.
- Lower the outrigger box onto the separate vehicle; ➠ *Transportation on a separate vehicle*, p. 6 - 53.



If the outrigger box is to be set down:

Do not override the RCL!

- Lift the outrigger box vertically out of the retainers (**1**) with the truck crane.

The supports must be slid out before placing the box.

- Hold the support (**3**) firmly and remove the retaining pin (**4**).
- Slide out the support.
- Secure the support by inserting the retaining pin into the upper hole.
- Bring the outrigger pads (**2**) to the working position; ➠ p. 12 - 39.
- Place the outrigger box on the support.

The outrigger box is now secured against falling.

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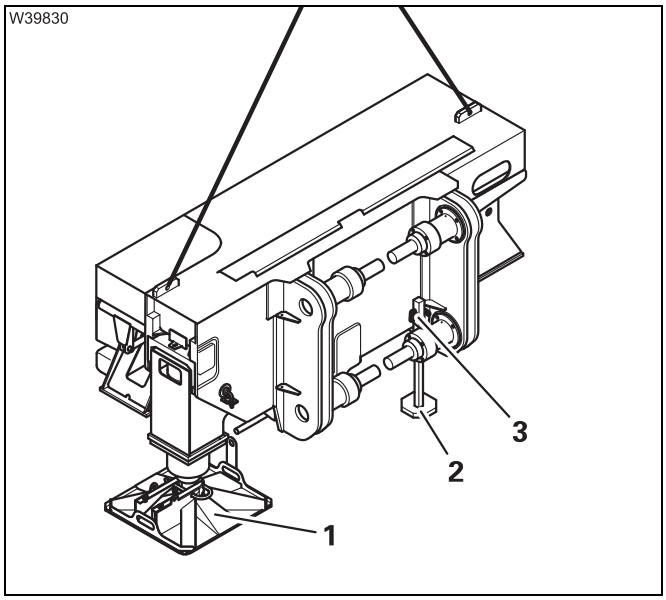
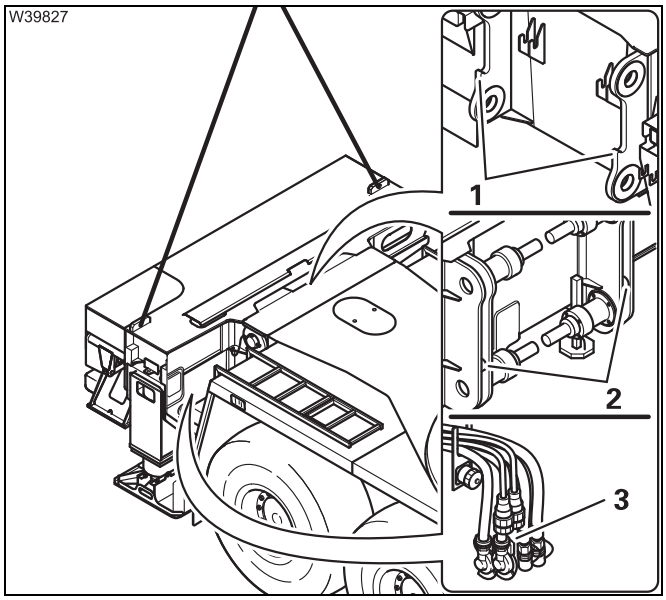
Hanging

To pick up the outrigger box, the separate vehicle must be moved as close as necessary to the truck crane so that you can sling and raise the outrigger box within one of the radii permitted by the RCL.

The supports must be retracted before hanging the box.



- Sling the outrigger box.
- Remove the retaining pins (**3**).
- Push in the support (**2**).
- Secure the support; by inserting the retaining pin into the lower hole.



Do not override the RCL!

- Hoist the outrigger box onto the carrier in such a way that the pins (**2**) on the outrigger box are vertically above the mountings (**1**) on the rear of the vehicle.
- Hang the outrigger box in the mountings (**1**).

  Take care that the cables and hoses (**3**) are not trapped or damaged.

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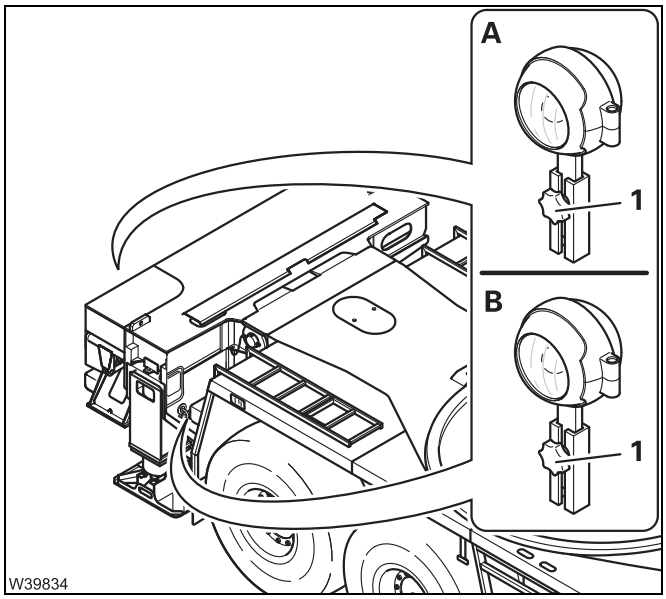
6.5.9 Installing the reverse camera

Depending on the driving mode, you can install the reverse camera on the carrier or the outrigger box.



(A) – On the supporting box

(B) – On the carrier

- Fasten the reverse camera with the bolt (**1**).
- Install and secure the connecting camera so that it safe for use on roads.

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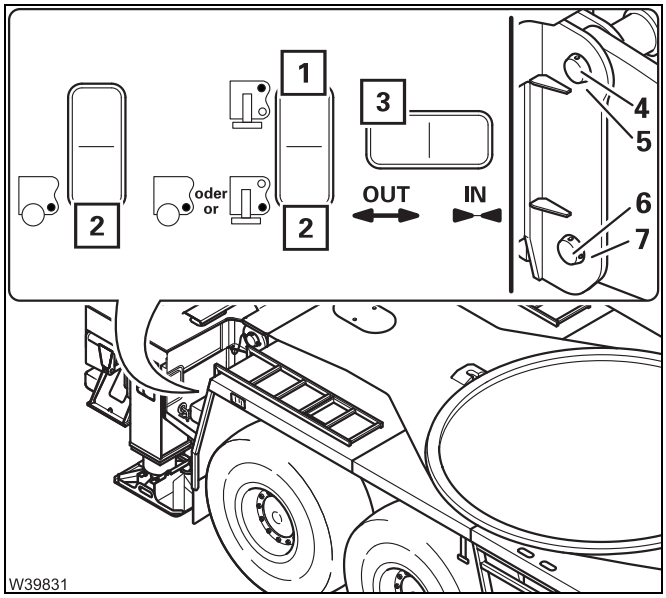
6.5.10 Locking/releasing the supporting box lock

Risk of crushing when extending/retracting the pins!
The pins on both sides are always moved at the same time from the *carrier lock* control unit. Make sure that no-one is in the vicinity of the carrier retainers on the other side of the vehicle when you extend or retract the pins.

Risk of damage to the retaining pins!
Make sure that the retaining pins with the chains are not pushed inwards through the retainers on the carriage. This prevents the chains or the retaining pins being severed when the pins are extended or retracted.

Connecting

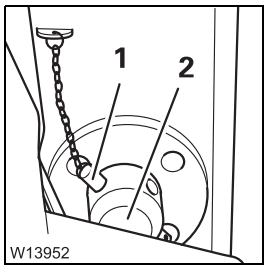


Top pins

- Press button (**1**) upwards and button (**3**) to the left.
- Extend the pins (**4**) completely through the mountings (**5**).

Bottom pins

- Press button (**2**) downwards and button (**3**) to the left.
- Extend the pins (**6**) completely through the mountings (**7**).



- Secure all pins (**2**) using the retaining pins (**1**) The retaining pins must engage.

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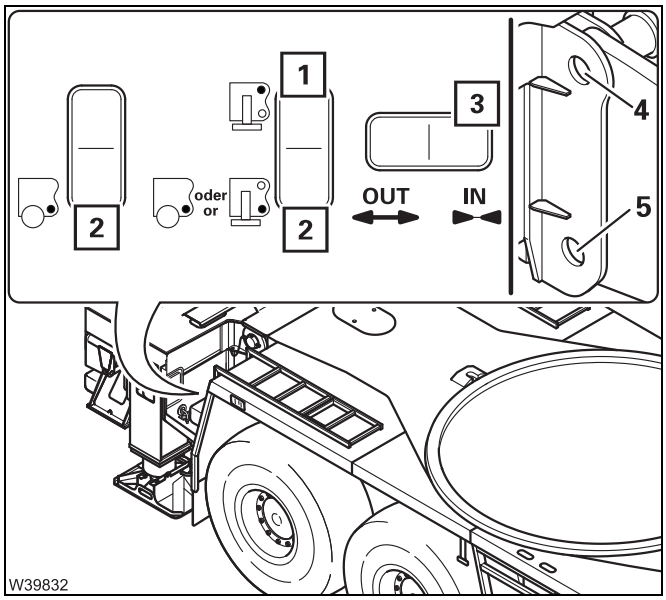
Disconnecting

- Sling the outrigger box before releasing the lock.

- Pull out the retaining pins (**1**) from all fur pins (**2**).



Pulling out the top pins

- Press button (**1**) upwards and button (**3**) to the right.
- Extend the pins completely through the mountings (**4**).

Pulling out the bottom pins

- Press button (**2**) downwards and button (**3**) to the right.
- Extend the pins completely through the mountings (**5**).

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6.5.11 Transportation on a separate vehicle

Risk of damage to add-on parts on the outrigger box and outrigger pads!
Always set down the outrigger box on appropriate mounting equipment for transportation to avoid damage to the add-on parts protruding from under the outrigger box. Always secure the mounting equipment and the outrigger box against slipping and overturning.

- Check that the locking pins are in position to make sure the outrigger beams cannot move out of their own accord during transportation; ➠ p. 12 - 35.
- Load the outrigger box in such a way that other road users are not put at risk.
- Secure the outrigger box and mounting equipment with holding ropes to prevent them from falling from the transport vehicle, slipping or damaging other parts.
- Load the transport vehicle in such a way that the weight is evenly distributed.
- Transport the outrigger box only on a separate vehicle of sufficient lifting capacity.; ➠ *Dimensions and weights of removable parts – Outriggers*, p. 1 - 10.

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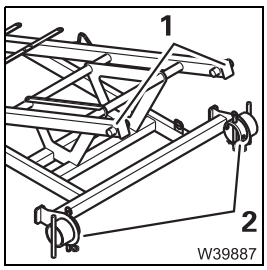
6.5.12 Installing/removing the lighting carrier

When the main boom is resting in the boom rest and the rear outrigger is removed, the crane cab juts out beyond the tail of the truck crane.



In this case, the lighting carrier must be installed. The tail lights of the lighting carrier are located at a point that is equal to the rearmost extent of the crane cab.

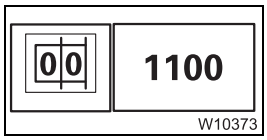
The lighting carrier is attached to the tail of the truck crane with the pegs (**1**) and locked with the pins (**2**).

The lighting protection can also be used for stowing the hook blocks;
➠ *Hook block in the lighting carrier*, p. 6 - 58.

Prerequisites

The following conditions must be met before installing and removing:

– The outrigger span 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) is rigged; the truck crane is supported at the rear by the supports; ➠ p. 6 - 16.



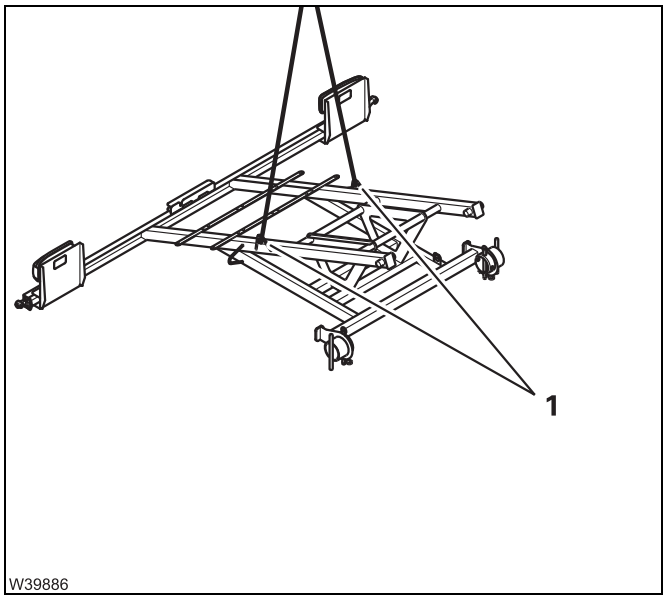
– The RCL code for the outrigger span 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) for the slewing range 360°, as stated in the *Lifting capacity table*, has been entered.

– The truck crane must be level.

– The front outrigger beams are extended to a span of 8.90 m (29.2 ft) and the outrigger pads are lowered to the ground for stabilizing.

Slinging the lighting carrier

• Slew the superstructure into the correct position for lifting the lighting carrier.



Only use lifting gear of sufficient lifting capacity;
➠ *Dimensions and weights of removable parts – Lighting carrier*, p. 1 - 11.

• Fasten the lifting gear to the lifting eyes (1), so that the lighting carrier cannot slip when raised.

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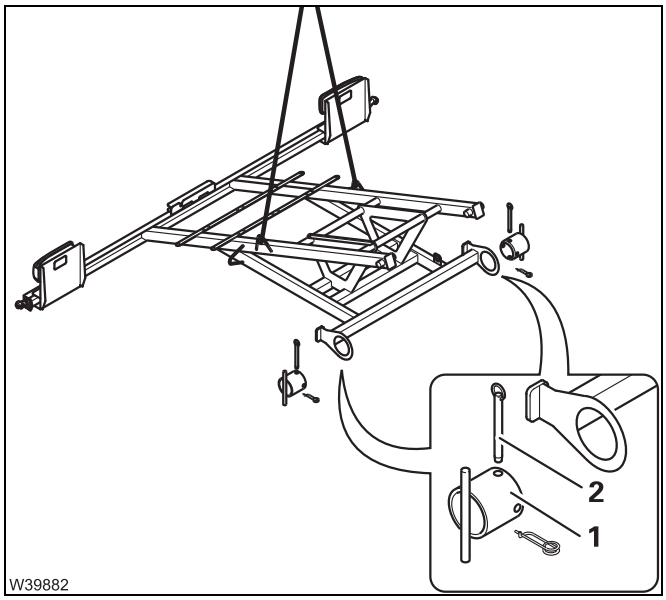
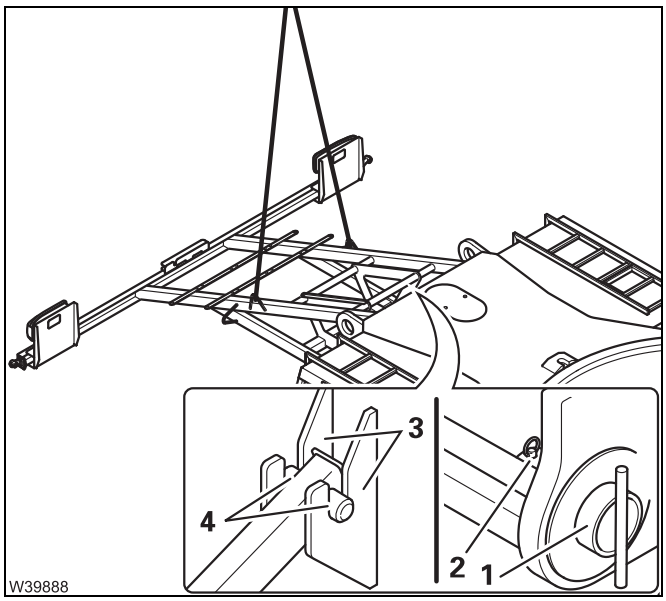
Installing

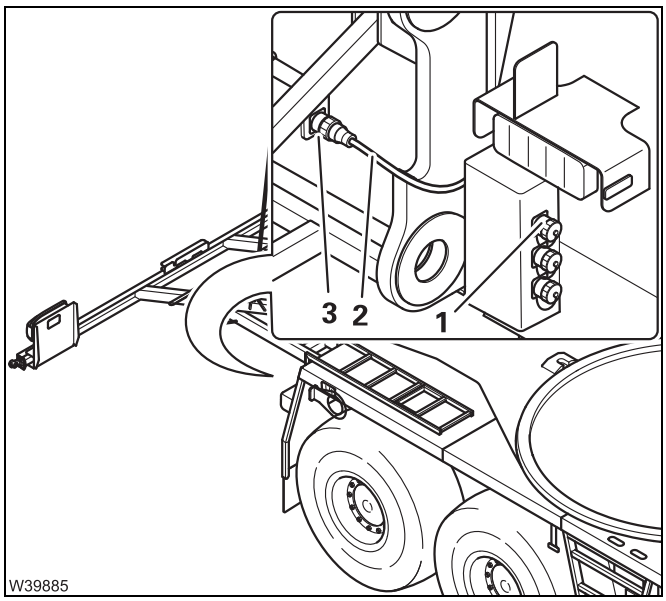
You must install the lighting carrier before driving on public roads with the rear outrigger box removed and the main boom resting in the boom rest.



- Sling the lighting carrier.
- Pull the retaining pins from both pins (**2**).
- Remove the pins (**1**) from the mountings on the lighting carrier.

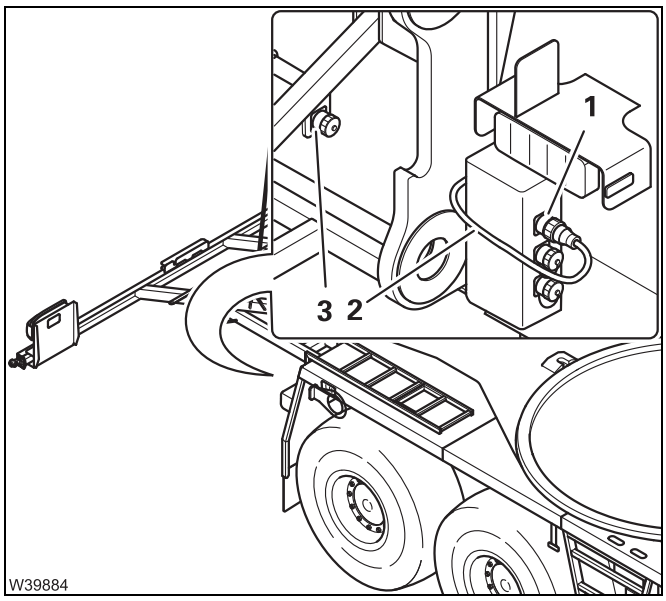


- Raise the lighting carrier onto the rear of the carrier.
- Suspend the lighting carrier in the bearing points (**3**) at the top using the pegs (**4**).
- Secure the lighting carrier to the lower brackets for the rear outrigger using both pins (**1**).
- Secure both pins with the retaining pins (**2**).
- Remove the lifting gear.



- Pull the plug of the cable (**2**) out of the socket (**1**) and connect it to the socket (**3**).
- Cover the socket (**1**) with the cap.

Removing Before installing the rear outrigger, you must remove the lighting carrier.



- Pull the plug of the cable (**2**) out of the socket (**3**) and connect it to the socket (**1**).
- Cover the socket (**1**) with the cap.

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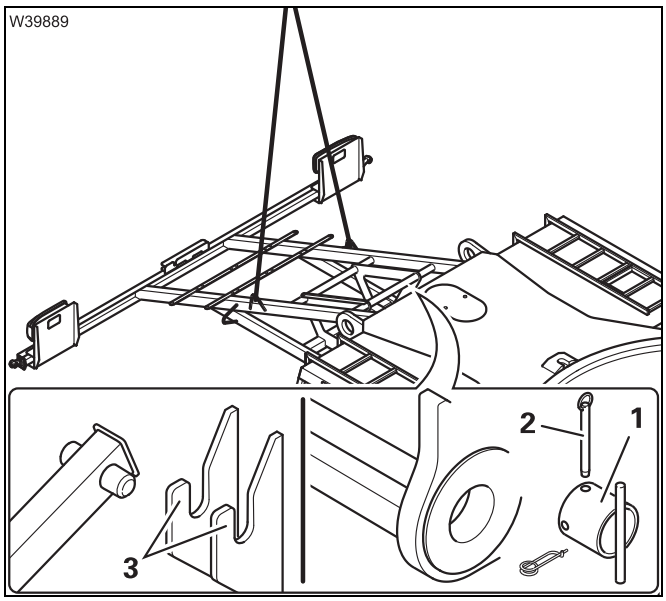
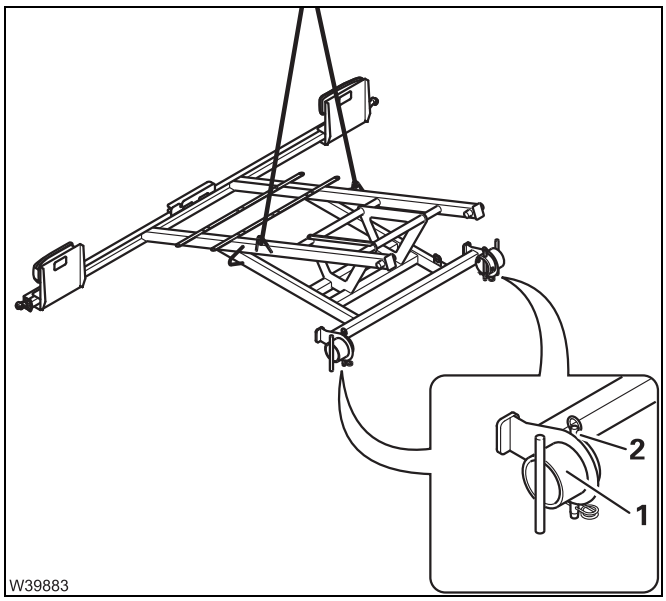


- Sling the lighting carrier.
- Pull the retaining pins (**2**) from both pins (**1**).
- Remove both pins (**1**).
- Lift the lighting carrier out of the bearings (**3**).



- Set down the lighting carrier where it can remain while working with the crane.
- Insert both pins (**1**) into the retainers on the lighting carrier.
- Secure both pins with the retaining pins (**2**).

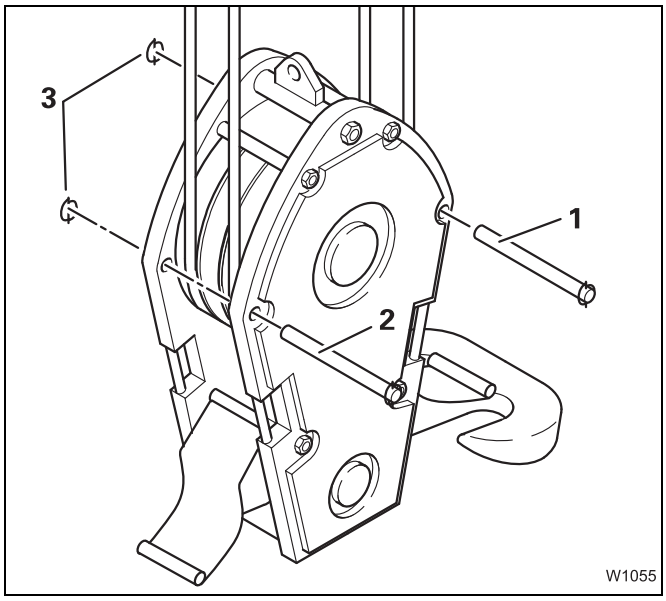
6.5.13 Hook block in the lighting carrier

Once the lighting carrier has been mounted, a hook block with a maximum weight of 680 kg (1,500 lbs) can be transported in the lighting carrier. Observe the axle load regulations applicable in the country where the truck crane is used (driving mode with max. 12 t (26,500 lbs) axle load; ➠ p. 6 - 2).

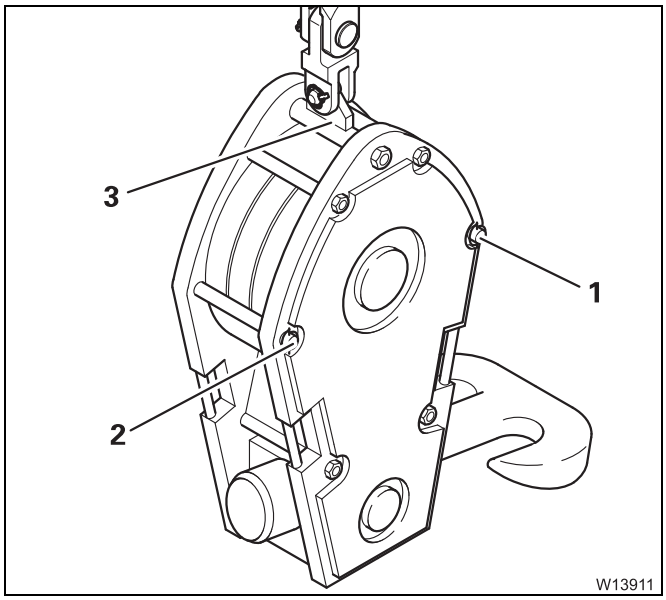
Setting down the hook block

For setting down the hook block, the same regulations apply as for installing/removing the lighting carrier; ➠ p. 6 - 54.

The hook block must be reeved once in order to set it down in the lighting carrier. A hoist rope which is reeved several times cannot be unreeved once the hook block is resting in the lighting carrier.



- Set down the hook block on the ground.
- Undo the spring cotters (**3**) and pull the rods (**1**) and (**2**) out of the holes in the hook block.
- Fold down the mudguards on either side of the hook block.
- Unreeve the hoist rope.



- Fold both guards on the hook block up and insert the rods (**1**) and (**2**) into the holes.
- Secure the rods into place using the spring cotters.
- Secure the cable end clamp to the fixed point (**3**) with the pins.
- Secure the pin with the retaining pin.

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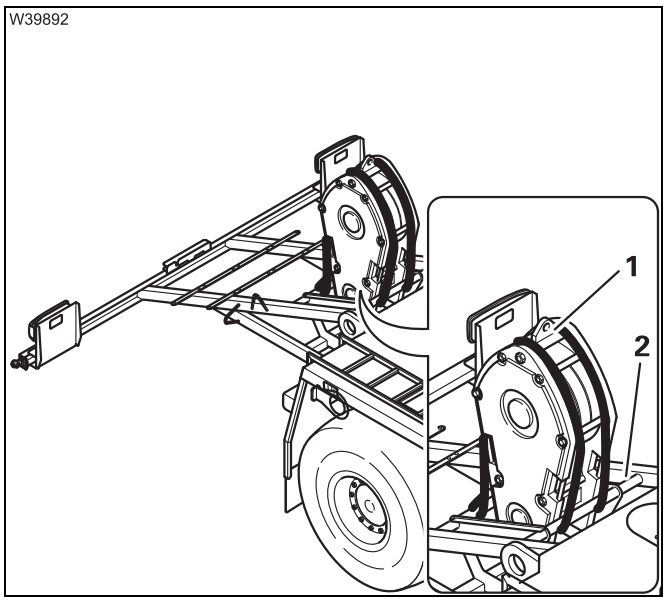
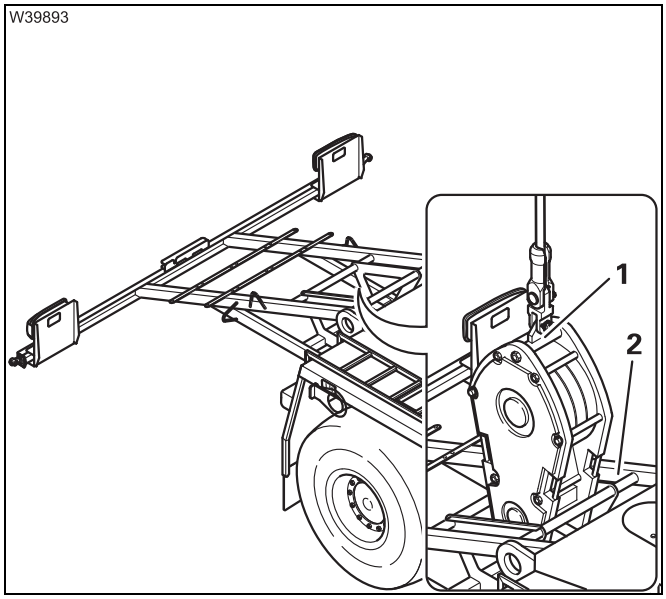


- Raise the hook block above the holder (**2**) on the lighting carrier.
- Slowly lower the hook block until it is resting on the holder (**2**).
- Release the cable end clamp from the fixed point (**1**).
- Lash the hook block to the structure (e.g. using tightening belts).

Risk of accidents if hook block is not secured!
Always secure the hook block in the stowing position with tightening belts or other suitable fastening equipment.
This avoids the hook block from slipping during the journey and damaging parts or from falling down and endangering following traffic.

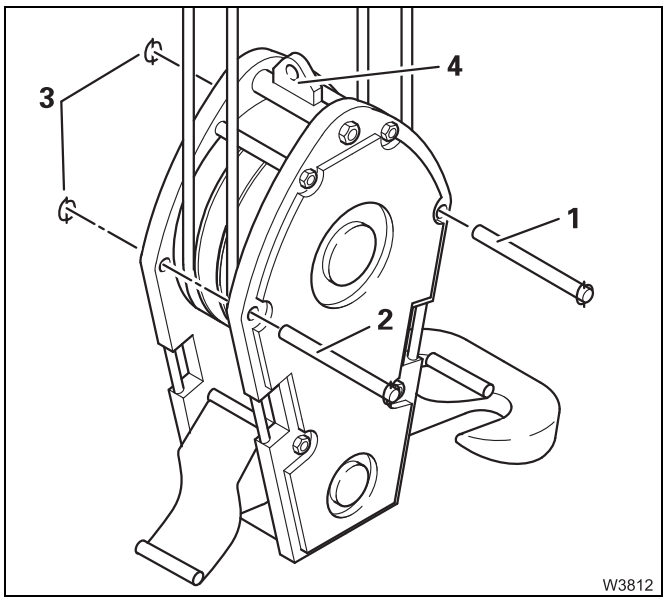
Picking up the hook block

For setting down the hook block, the same regulations apply as for installing/removing the lighting carrier; ➠ p. 6 - 54.

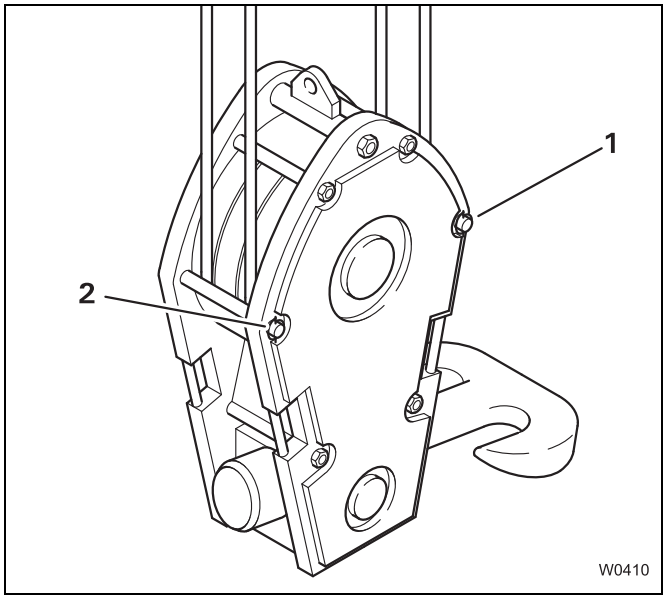


- Remove the tightening belts with which the hook block is fastened.
- Secure the cable end clamp at the fixed point (**1**).
- Lift the hook block out of the holder (**2**).

If the hoist rope for the job must be reeved several times, set down the hook block on the ground.



- Release the cable end clamp from the fixed point (**4**).
- Undo the spring cotters (**3**) and pull the rods (**1**) and (**2**) out of the holes in the hook block.
- Fold down the mudguards on either side of the hook block.
- Reeve the hoist rope with the reeving necessary for the job (possible reevings; ➠ p. 12 - 101).



- Fold up both guards on the hook block and insert the rods (**1**) and (**2**) into the holes.
- Secure the rods into place using the spring cotters.

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6.6 Removing/installing the main boom

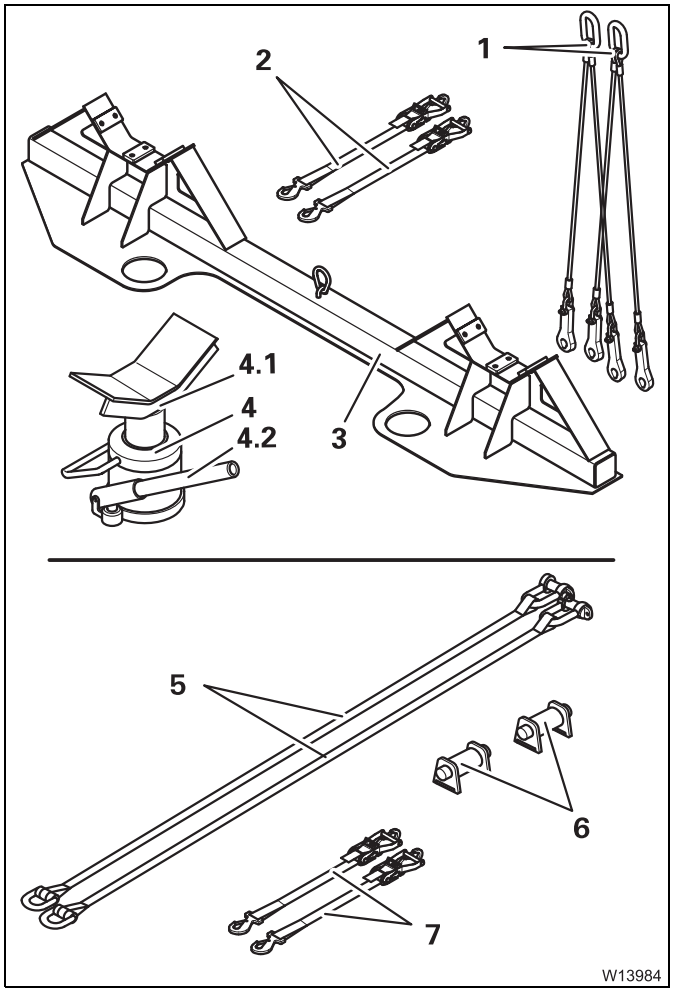
This section applies only to truck crane which are fitted with the pulling devices for removing/mounting the main boom.

Risk of accident when removing/installing the main boom without pulling devices!
Only remove or install the main boom if the truck crane is equipped with the factory-installed pulling devices and with the necessary accessories. Without these factory-installed pulling devices, the main boom may only be removed by **Manitowoc Crane Care**.

With the appropriate additional equipment, you have the option of mounting/removing the main boom in working position *0° to the rear*.

Equipment required

In addition to the pulling devices, you also need the following accessories:



- A derricking cylinder support (**3**)
- Lifting equipment (**4**) with lever (**4.2**) and holder (**4.1**)
- Two tightening belts (**2**) for the derricking cylinder
- Two sets of slinging tackle (**1**) for the main boom.

Additional accessories are required for mounting/dismounting the main boom in the working position 0° *to the rear* (Additional equipment):

- Two sets of slinging tackle (**5**) for the derricking cylinder
- Two deflection sheaves (**6**) for the slinging tackle (**5**) for the derricking cylinder
- Two tightening belts (**7**) for the deflection sheaves (**6**).

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You also need the following equipment:

– An auxiliary crane with sufficient lifting capacity,

– A separate vehicle of sufficient load bearing capacity with a sufficient loading area.

➠ *Dimensions and weights of removable parts – Main boom*, p. 1 - 11.

6.6.1 CHECKLIST: Removing the main boom

This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions specified there!

General prerequisites:

– The counterweight and auxiliary hoist have been removed.

– All telescopic sections are fully retracted and locked.

– The hook block has been unreeved and the hoist rope has been reeled on the drum up to the main hoist.

– The railings for rigging work have been pushed out; ➠ p. 12 - 22.

Prerequisites in terms of the outriggers

– The truck crane is supported with at least an outrigger span of 8.76 x 2.63 m (28.7 x 8.6 ft); ➠ *Permissible outrigger spans*, p. 12 - 34

or

– the truck crane is slewed to the front,

– the parking brake is applied,

– the truck crane has been levelled with the level adjustment system and

– the suspension is locked.

or (when the rear outrigger is dismounted)

– The superstructure is slewed to the rear and it is on outriggers with a span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft).

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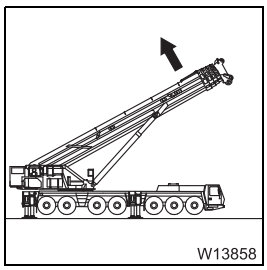
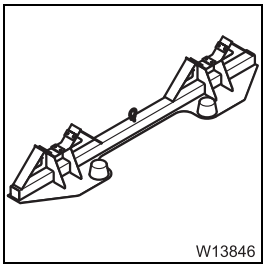
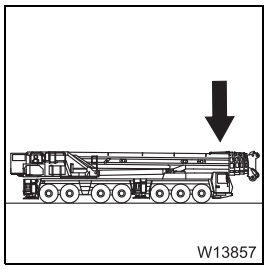


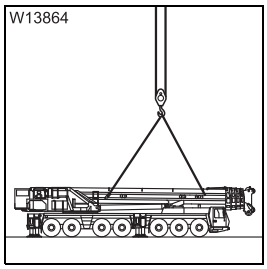
1. Raise the main boom and remove the clamp with the cables and hoses; ➠ p. 6 - 69.



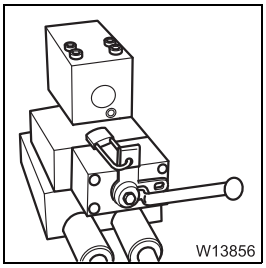
2. Place the derricking cylinder support on the counterweight platform; ➠ p. 6 - 71.



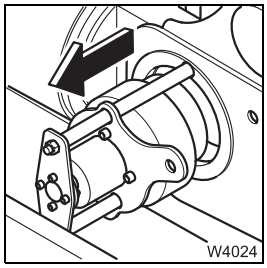
3. Place the main boom on the boom rest.



4. Sling the main boom on an auxiliary crane; ➠ p. 6 - 68



5. Switch on the derricking cylinder pressure relief; ➠ p. 6 - 70.



6. Do the following at each derricking cylinder in succession:

– Take the load off of the head pin
– Release the head pin
– Pull the head pin out;

➠ *Retracting/fitting the derricking cylinder head pin*, p. 6 - 71.

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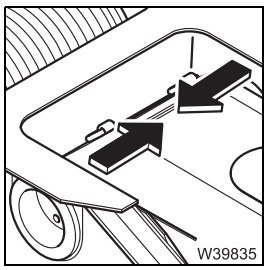
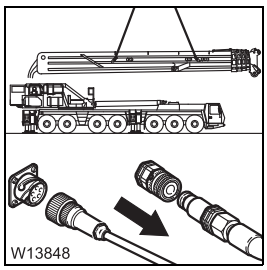
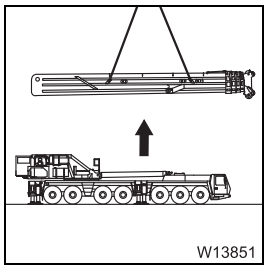


7. On the boom pivot pin:

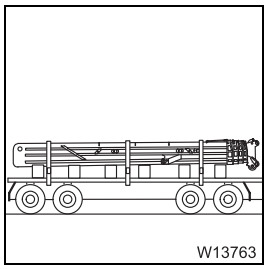
– Release the pivot pin,
– Switch the hydraulic circuit over
– Retract the pivot pin;
➠ *Retracting/extending the boom pivot pin*, p. 6 - 75.



8. Lift the main boom in front of the turntable and separate the hydraulic/ electrical connection; ➠ p. 6 - 77.



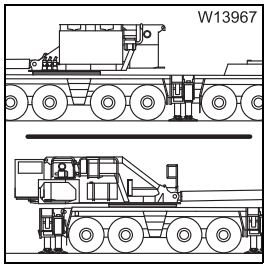
9. Lifting the main boom from the turntable.



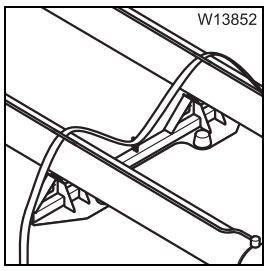
10. – Put the main boom on the separate vehicle and secure for transport.

– Insert the pins for the pivot pin safety device.

➠ p. 6 - 83



11. If necessary, slew the superstructure; ➠ p. 6 - 85.



12. Secure the derricking cylinder with a tightening belt.; ➠ p. 6 - 82.

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6.6.2 CHECKLIST: Installing the main boom

This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions specified there!

Prerequisites

– The truck crane is supported with at least an outrigger span of 8.76 x 2.63 m (28.7 x 8.6 ft) (➠ p. 12 - 34)

or

– the parking brake is applied,

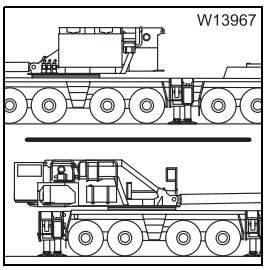
– the truck crane has been levelled with the level adjustment system and

– the suspension is locked.

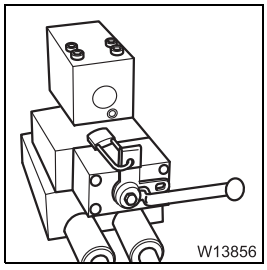
– The superstructure is slewed to the front and the turntable lock is engaged.

or (when the rear outrigger is dismounted)

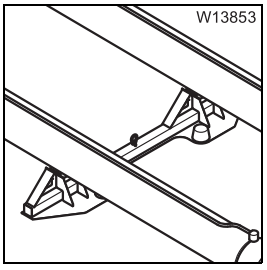
– The superstructure is slewed to the rear and it is on outriggers with a span of at least 7.78 x 8.90/1.22 m (25.5 x 4 ft).



1. If necessary, slew the superstructure; ➠ p. 6 - 85.

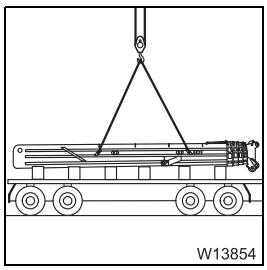


2. Check that the pressure relief for the derricking cylinder is switched on; ➠ p. 6 - 70.



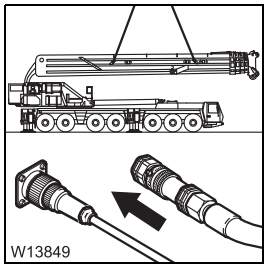
3. Remove the tightening belt from the derricking cylinder; ➠ p. 6 - 82.

23.10.2018

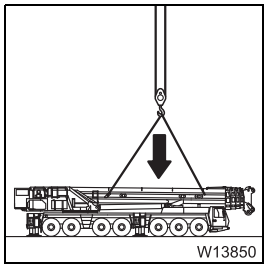


4. – Sling the main boom on an auxiliary crane; ➠ p. 6 - 68.

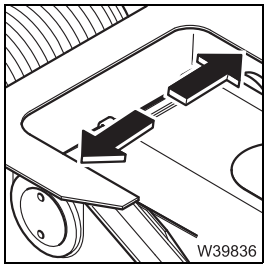
– Pull the pins for the pivot pin safety device. ➠ p. 6 - 75



5. lift the main boom onto the turntable and establish the hydraulic/ electrical connection; ➠ p. 6 - 79.

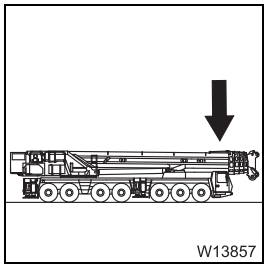


6. Lift the main boom into the turntable and align the connecting points; ➠ p. 6 - 81.

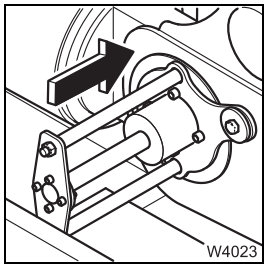


7. On the boom pivot pin:

– Switch the hydraulic circuit over
– Extend the pivot pin
– Secure the pivot pin;
➠ *Retracting/extending the boom pivot pin*, p. 6 - 75.



8. Set down the main boom in the boom rest with the auxiliary crane and remove the sling gear.



9. Do the following at each derricking cylinder in succession:

– Level the derricking cylinder,
– Fit the head pin
– Secure the head pin;
➠ *Retracting/fitting the derricking cylinder head pin*, p. 6 - 71.

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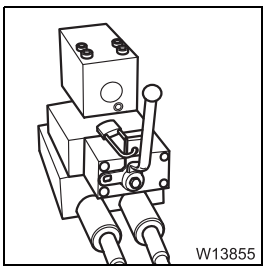
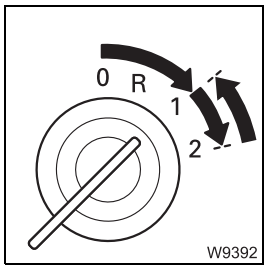
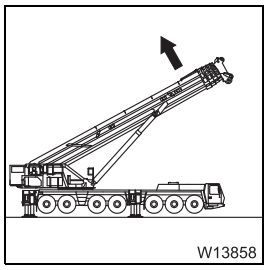


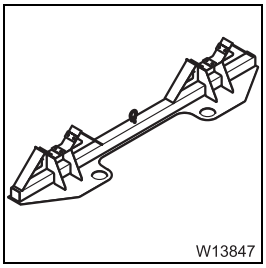
10. Switch off the derricking cylinder pressure relief; ➠ p. 6 - 70.



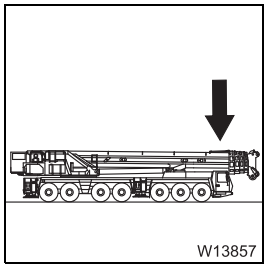
11. When it is possible to turn the crane cab in the *Crane operation* position, start the crane engine from the crane cab;
➠ *Starting the engine*, p. 10 - 13.



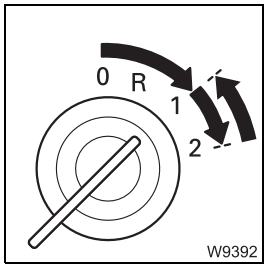
12. Raise the main boom and attach the clamp with the cables and hoses;
➠ p. 6 - 69.



13. Remove the derricking cylinder support from the counterweight platform.



14. Place the main boom on the boom rest.



15. When the main boom was raised with the hand-held control, start the crane engine from the crane cab in order to carry out the following checks; ➠ p. 10 - 13.

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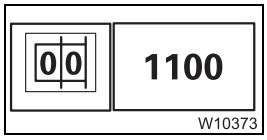
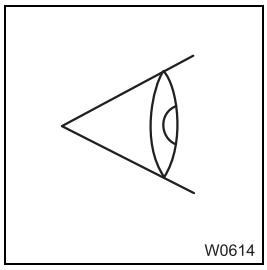
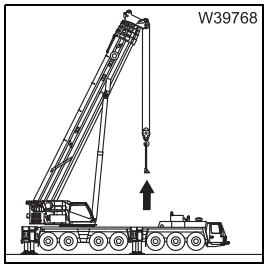


16. Enter an RCL code for 0 t counterweight in accordance with the Lifting capacity table; ➠ *Entering rigging mode*, p. 11 - 23.



17. Carry out the checks with the main boom set down; ➠ p. 6 - 84.

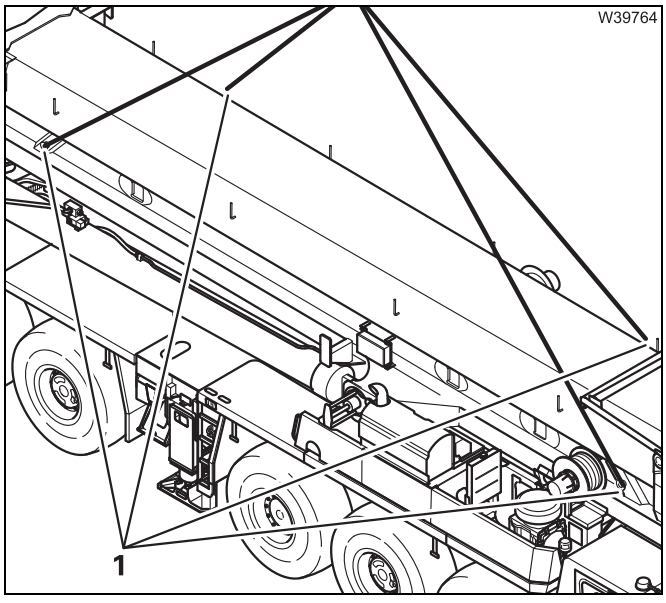


18. Lift the derricking cylinder support from the counterweight platform with the truck crane; ➠ *Derricking cylinder support*, p. 6 - 71.

6.6.3 Main boom slinging points

Slings are fitted to the main boom when rigging and it is lifted with an auxiliary crane. Note the equipment necessary for this; ➠ p. 6 - 61.

Risk of accidents due to incorrect procedure!
Only use the lifting gear included in the delivery and proceed as described in the following section.



- Secure the lifting gear only at the four slinging points (1) on both sides of the main boom.
- Align the auxiliary crane in such a way that the main boom can be raised vertically without swinging.

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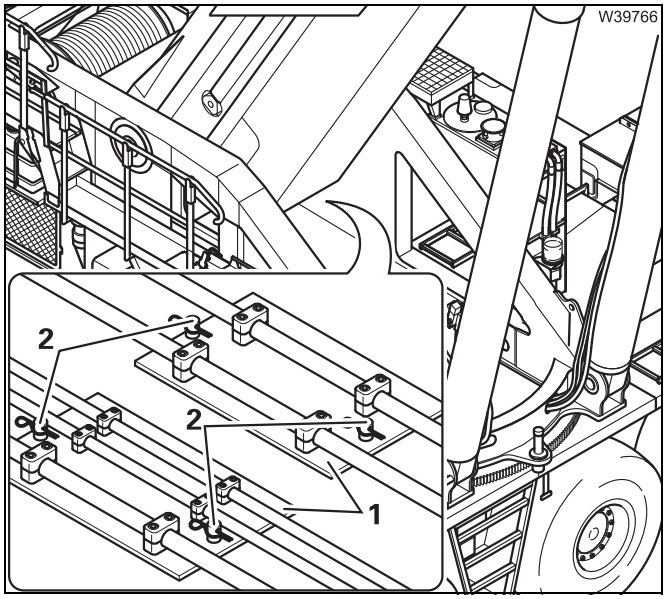
6.6.4 Removing/attaching the clamps

Danger of hands and arms being crushed!
Make sure that the boom pivot pin is bolted before making or removing or attaching the clamp.
By this means you avoid a swinging main boom crushing your arms or hands on the turntable.

The hoses for the hydraulic connection and the cables for the electrical connection are attached in the turntable on clamps.



There are two clamps (**1**) on each side.

Removing the clamp

- Loosen the retaining pins from the pins (**2**).
- Remove the clamp (**1**).

Attaching the clamp

- Insert the clamp (**1**) onto the pins (**2**).
- Secure the clamp using the retaining pins.

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6.6.5 Switching the pressure relief on/off

Pressure relief prevents the derricking cylinder from extending when the engine runs, after the main boom has been removed.

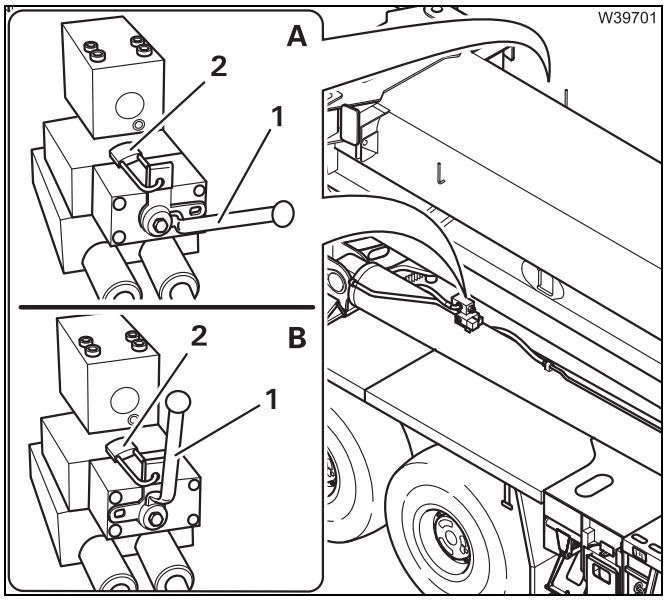
When removing

- Switch the pressure relief on before pulling the derricking cylinder head axle.

When installing

- Only switch off the pressure relief after fitting the derricking cylinder head axle.

Risk of accident from falling boom!
Check to see whether the main boom is in the boom rest before switching off the pressure relief.
This prevents the raised main boom from dropping down.



- Remove the padlock (**2**).

A **Switch on** – Lever (**1**) horizontal.

B **Switch off** – Lever (**1**) vertical

- Secure the lever with the locks (**2**) and remove the keys.

When the pressure relief is switched on, the main boom cannot be raised.

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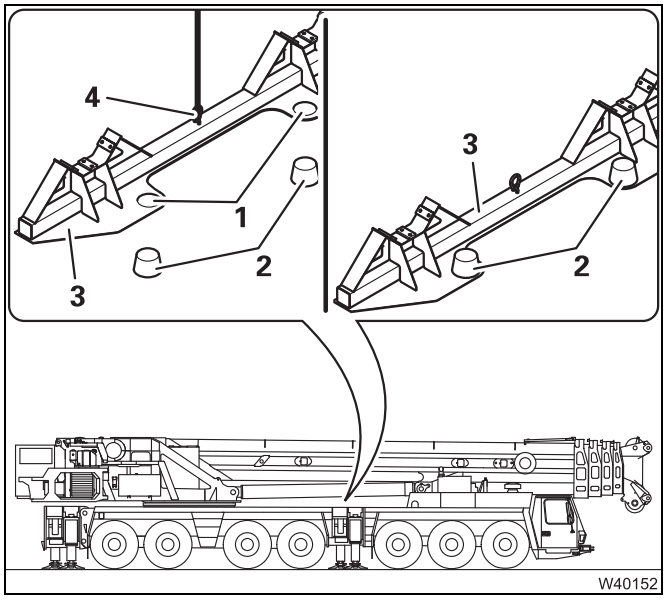
6.6.6 Retracting/fitting the derricking cylinder head pin

The derricking cylinder head axles are retracted and fitted using a pulling device.

To pull and insert the derricking cylinder head axles you must start the engine with the hand-held control;
➠ *Connecting/disconnecting the hand-held control*, p. 12 - 17
➠ *Starting the engine – with the hand-held control*, p. 10 - 19

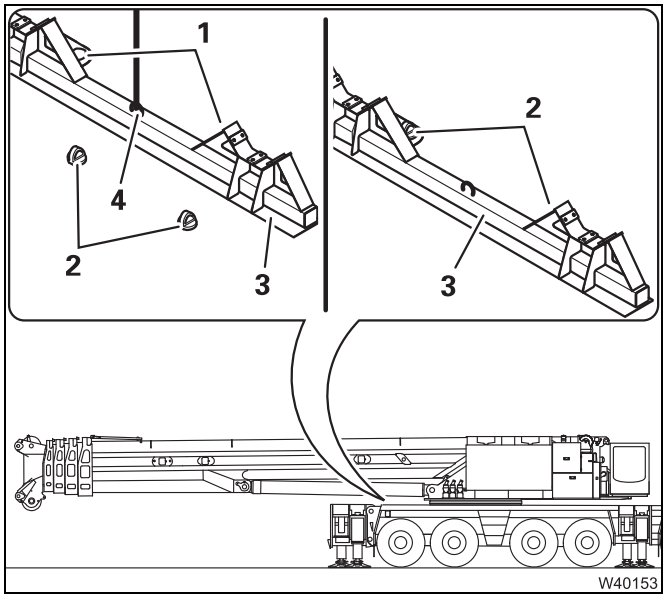
Derricking cylinder support

Dimensions and weight of the derricking cylinder support; ➠ p. 1 - 11.



With the superstructure rotated to the rear

- Sling the support (**3**) at the lifting point (**4**).
- Place the support (**3**), in the brackets (**2**) with the holes (**1**) to the front.
- Remove the lifting gear.



With the superstructure rotated to the rear

- Sling the support (**3**) at the lifting point (**4**).
- Place the support (**3**), in the brackets (**2**) with the holes (**1**) to the front.
- Remove the lifting gear.

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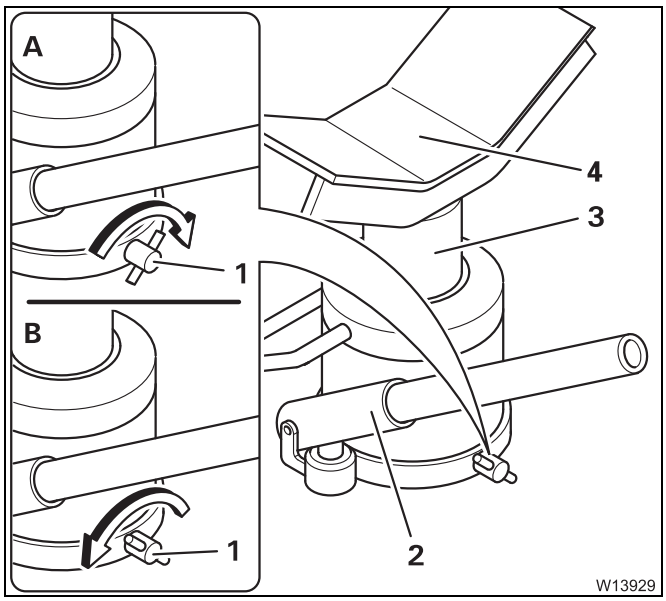
Operating the lifting device

A lifting device is needed in order to relieve and level the derricking cylinder.

Danger from using unsuitable lifting device!
Have the lifting device serviced in time before the maintenance interval specified on the label expires.



- Slide open the compartment (**3**).
- Attach the lever to the holder (**2**).

(A) – Raise

- Close the drain plug (**5**) and pump the lever. The piston rod will extend.

(B) – Lower

- Slowly open the drain plug (**5**). The piston rod will retract.

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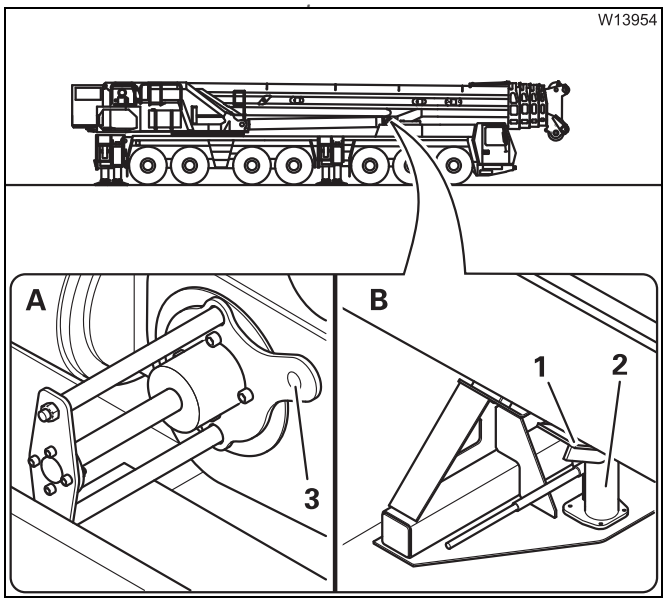
Retracting the derricking cylinder head axle

After you have pulled the head pin, you can not longer raise the main boom.



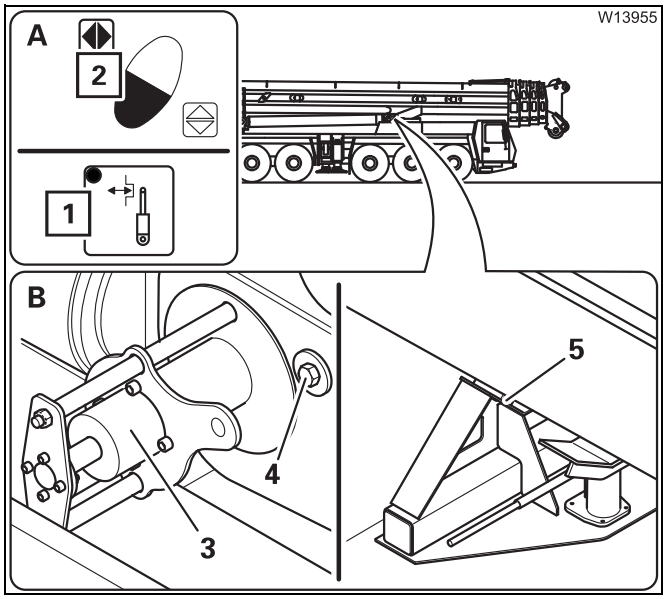
(A) – Releasing the head pin

- Loosen the bolt (**3**) and remove the disc.

(B) – Relieving the head pin

- Place the lifting device (**2**) underneath the middle of the derricking cylinder.
- Carry out the movement *Raise* until the shelf (**1**) is resting firmly on the derricking cylinder.

Risk of accident from falling derricking cylinder!
Always take the load off of the derricking cylinder using the lifting device before retracting the head pin. By doing this, you prevent the derricking cylinder from falling down, injuring people or being damaged while retracting the head pin.



(A), (B) – Retracting the head pin

- Press the button (**1**). The lamp lights up.
- Press the key combination (**2**), until the head pin (**3**) is fully pulled out.
- Carry out the movement *Lower* until the derricking cylinder is in the derricking cylinder support.
- Fasten the disc with the bolt (**4**).
- Pull out the head pin from the other derricking cylinder in the same manner.

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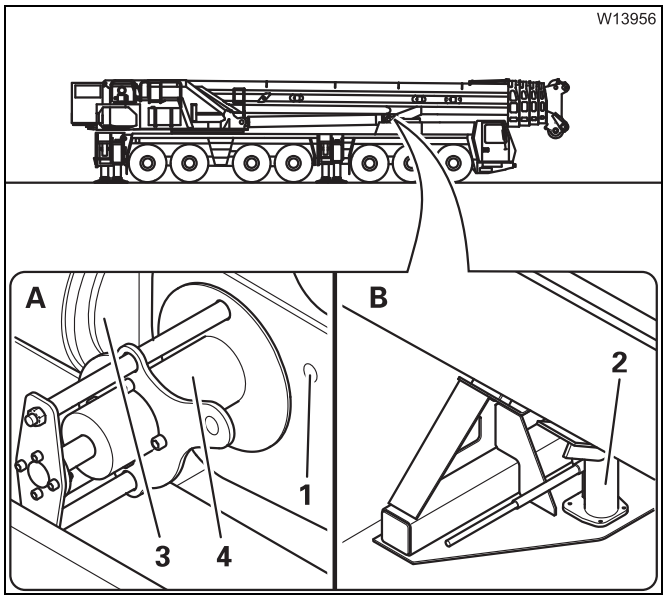
Fitting the derricking cylinder head axle

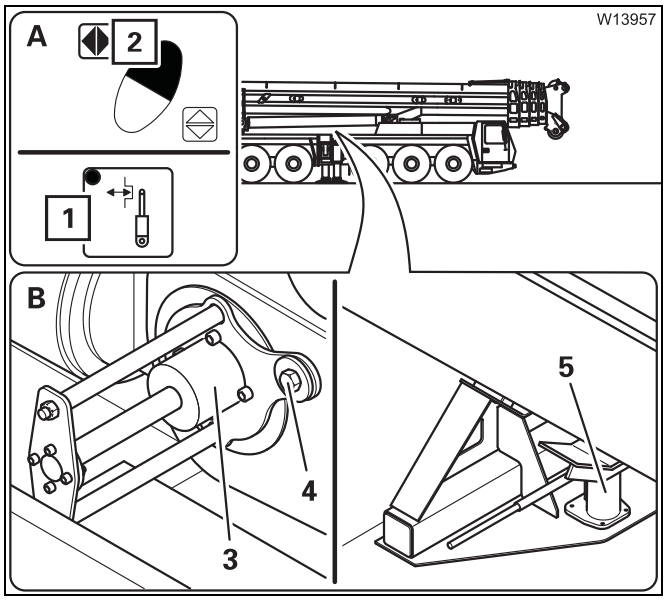
- Check that the tightening belt is removed from the derricking cylinder.



Aligning the derricking cylinder

- (**A**) – Undo the bolt (**1**) and remove the disc.
- Place the lifting device (**2**) underneath the middle of the derricking cylinder.
- (**B**) – Carry out the movement *Raise* until the head pin (**4**) is aligned with the bearing in the derricking cylinder (**3**).

Risk of damage to the bearings in the derricking cylinder head!
Make sure that the bearings in the derricking cylinder are aligned with the head pin before fitting the head pin.
This prevents the head pin from damaging the bearing.



(A) – Insert the head pin

- Press the button (**1**). The lamp lights up.
- Press the key combination (**2**), until the head pin (**3**) is fully inserted.

(B) – Secure the head pin

- Fasten the disc with the bolt (**4**).

(C) – Remove the lifting device

- Perform the *Lower* movement until you can remove the lifting device (**5**).
- Safely stow the lifting device for crane operation.

- Insert the head pin for the other derricking cylinder in the same manner.

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6.6.7 Retracting/extending the boom pivot pin

When dismounting the main boom you must pull in the boom pivot pin, when mounting you must slide it out.

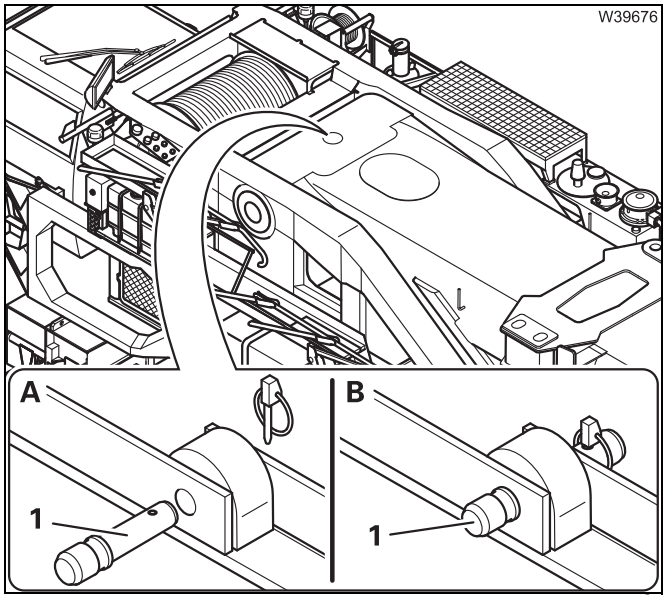
To pull and insert the boom pivot pin you must start the engine with the hand-held control;
➠ *Connecting/disconnecting the hand-held control*, p. 12 - 17
➠ *Starting the engine – with the hand-held control*, p. 10 - 19

Securing/ releasing the main boom pin

A locking pin secures the pivot pin against unintentional operation.

– You must release this before pulling in the boom pivot pin

– You must secure this after pulling in the boom pivot pin.



(A) – Releasing

- Loosen the linchpin and remove the locking pin (**1**).

The pins are inserted again later for transportation purposes; ➠ p. 6 - 83.

(B) – Securing

- Insert the pins (**1**) and secure them with the linchpins.

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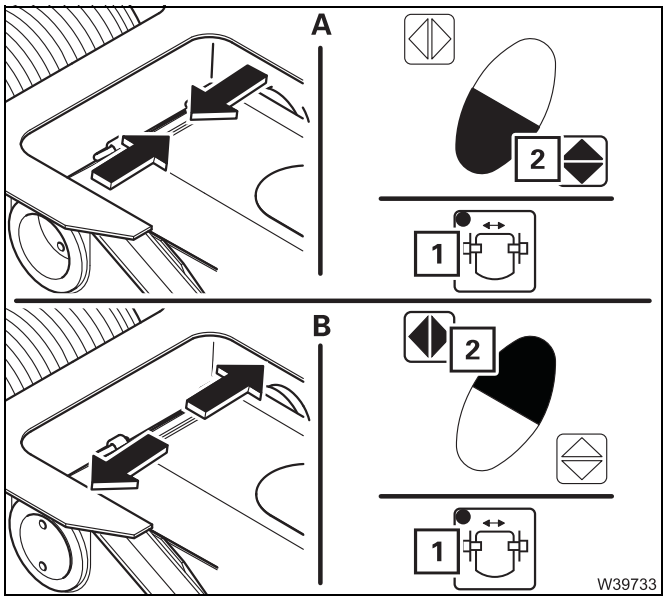
Retracting/ extending the pivot pin

The pulling device is operated using the hand-held control.

Risk of damage to the main boom!
Before **retracting**, the main boom must be slung and all other sling gear must be tightened.
Before **extending**, the bearing points on the turntable must be aligned with the boom pivot pin.



(A) – Retracting

- Press the button (**1**). The lamp lights up.
- Press the key combination (**2**) once.
  The pivot pin is retracted.

(B) – Extending

- Press the button (**1**). The lamp lights up.
- Press the key combination (**2**) once.
  The pivot pin is extended.

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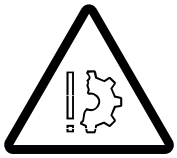
6.6.8 Disconnecting the hydraulic/electrical connections

To disconnect the hydraulic and electrical connections, you must lift the main boom in front of the turntable.

Lifting in front of the turntable

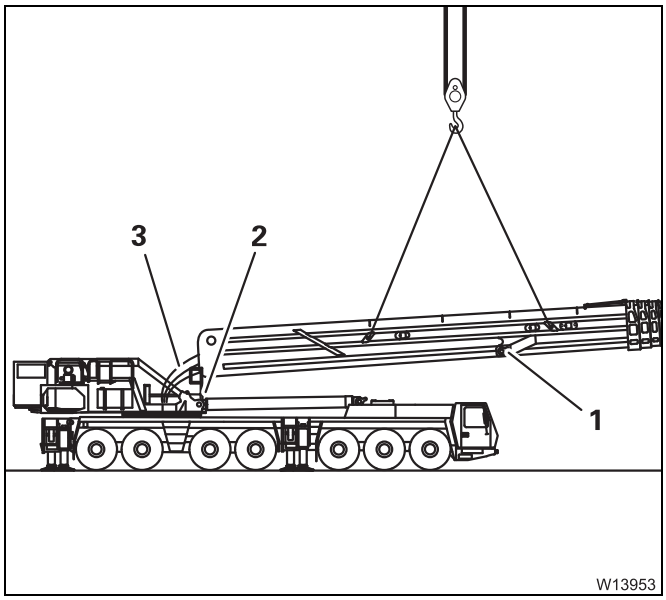
The following prerequisites must be met before the main boom can be raised in front of the turntable:

- The clamps must be removed together with the cables and hoses; ➠ p. 6 - 69.
- The main boom is slung; ➠ p. 6 - 68.
- The derricking cylinder head pin is pulled out; ➠ p. 6 - 71.
- The boom pivot pin is retracted; ➠ p. 6 - 75.



Risk of damage to connection lines and the driver's cab!
Lift the main boom far enough to ensure that the pivot point of the derricking cylinder does not damage the driver's cab.
Only lift the main boom so far in front of the turntable that the cables and hoses do not tear off.

Danger of hands and arms being crushed!
Lift the main boom far enough in front of the turntable to ensure that you are not crushed between the turntable and the main boom.

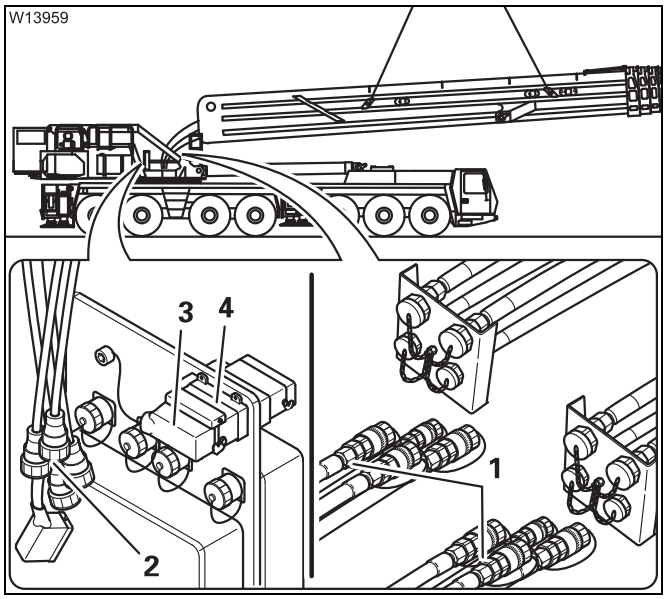


- Hoist the main boom top in front of the turntable. Make sure that:
  - The connection lines (**3**) do not tear off
  - The pivot point (**1**) is higher than the driver's cab,
  - and the main boom is in front of the edge of the turntable (**2**).

Now you can disconnect the electrical and hydraulic connections.

Separating The number of hoses/cables depends on how the truck crane is equipped.

Risk of malfunction in the superstructure electronics!
Always turn off the ignition in the crane cab before you establish or separate the electrical connection. This prevents malfunctions in the electronics and corresponding error messages in the subsequent crane operation.



- Remove all hoses (**1**) from the connections.
- Remove the plugs (**2**) from the sockets.
- Insert the bridging plug (**3**) into the socket (**4**).
- Close all hoses, connections, plugs and sockets.
- Place all the hoses/cables onto the turntable so that they do not get caught when the main boom is raised.

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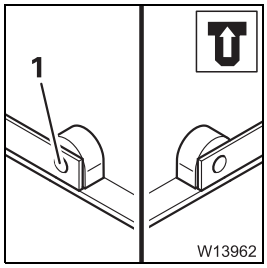
6.6.9 Establishing the hydraulic/electrical connection

To establish the hydraulic and electrical connections, you must lift the main boom onto the turntable so that you can access the separator points safely.

Lifting onto the turntable

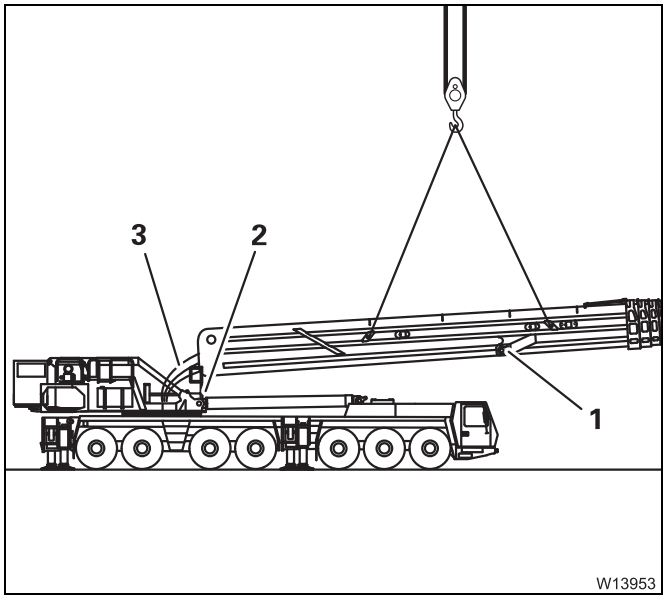
- Sling the main boom; ➠ p. 6 - 68.



- Remove the retaining pins from the holes (**1**).
- Align the auxiliary crane in such a way that the main boom can be raised vertically without swinging.

Risk of damage to driver's cab!
Lift the main boom far enough to ensure that the pivot point of the derricking cylinder does not damage the driver's cab.

Danger of hands and arms being crushed!
Lift the main boom only far enough onto the turntable to ensure that you are not crushed between the turntable and the main boom.

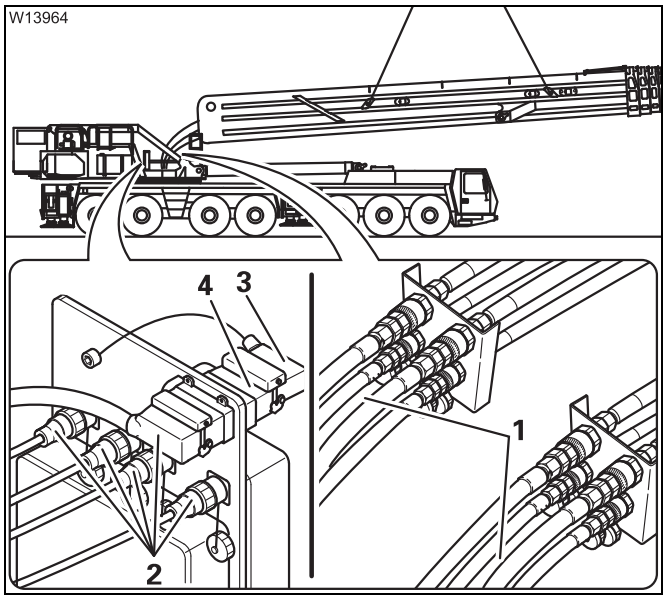


- Lift the main boom onto the turntable so that
  - The connection lines (**3**) reach the separating points
  - The pivot point (**1**) is higher than the driver's cab,
  - The main boom is in front of the edge of the turntable (**2**).

Now you can establish the electrical and hydraulic connections.

Connecting The number of hoses/cables depends on how the truck crane is equipped.

Risk of malfunction in the superstructure electronics!
Always turn off the ignition in the crane cab before you establish or separate the electrical connection. This prevents malfunctions in the electronics and corresponding error messages in the subsequent crane operation.



- Insert the bridging plug (**3**) into the socket (**4**).
- Connect the plugs (**2**) to the sockets.
  The assignment is given by the number of poles and the shape of the plug.
- Connect all hoses (**1**).
  The assignment is specified by the size and colour designations.

Lay the hoses/cables so that they will not be damaged.

Fasten the clamp. ➠ p. 6 - 69.

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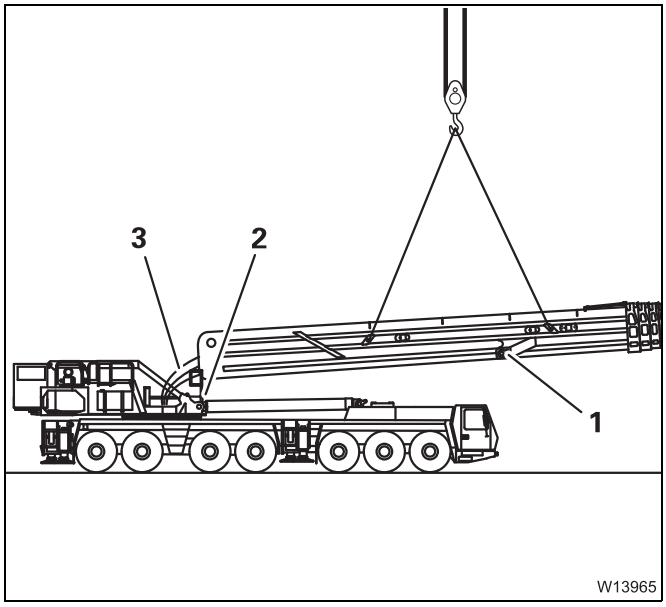
6.6.10 Aligning the connecting points

Risk of damage to the turntable and the connection lines
Make sure that the connection lines are located within the turntable and that the main boom does not swing when you raise it for insertion into the turntable.



Aligning the connecting points

Make sure to not hoist the main boom too far so that the hoses/cables (**1**) are not torn off.

- Lay the hoses/cables (**1**) into the turntable so that they are not damaged during alignment.
- Align the main boom so that the boom pivot pin is aligned with the bearing points (**2**) in the turntable.
- Hold the main boom in this position until the pivot pin is extended.

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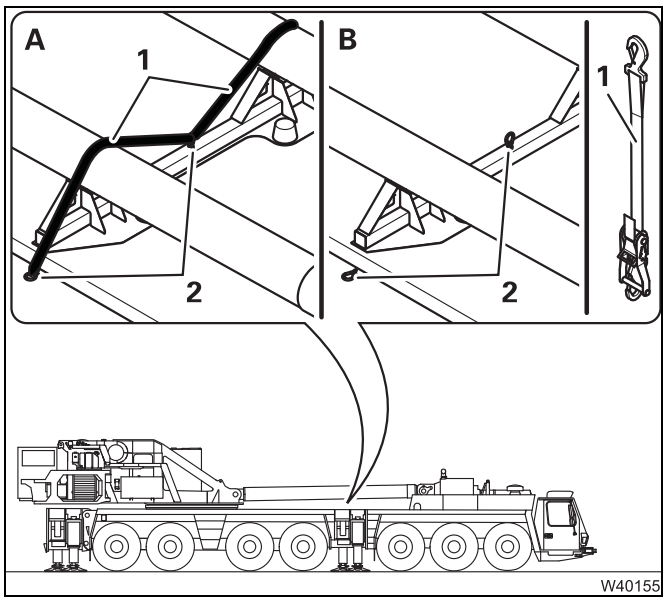
6.6.11 Securing/releasing the derricking cylinder



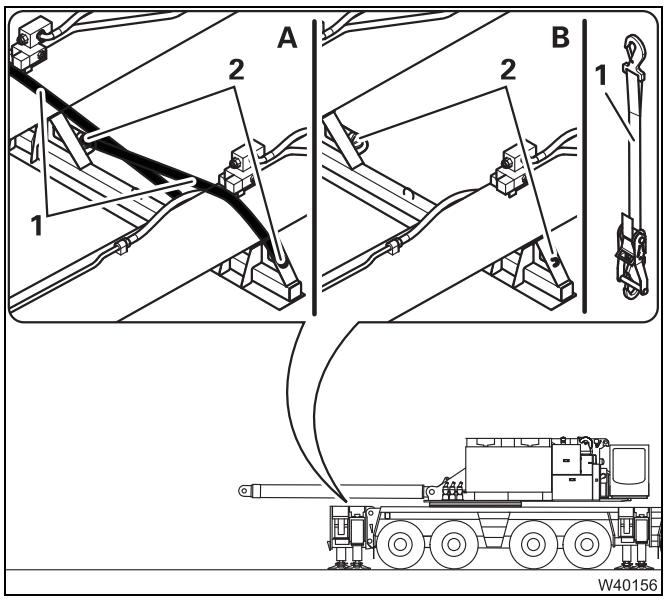
In the position *180° to the front*

(A) – Securing

- Place the tightening belt (**1**) over the derricking cylinder and fasten it onto the holders (**2**).
- Tighten the tightening belt so that the derricking cylinder is secure within the support.

(B) – Releasing

- Loosen the tightening belt (**1**) and remove it from the holders (**2**).
- Stow the tightening belt away.



In the position *0° to the rear*

(A) – Securing

- Place the tightening belt (**1**) over the derricking cylinder and fasten it onto the holders (**2**).
- Tighten the tightening belt so that the derricking cylinder is secure within the support.

(B) – Releasing

- Loosen the tightening belt (**1**) and remove it from the holders (**2**).
- Stow the tightening belt away.

Risk of accidents from protruding derricking cylinder
The derricking cylinders jutting out to the rear must be specially marked before on-road driving (warning signs, signalling lights etc.).
Observe the regulations of the country in which you are working.

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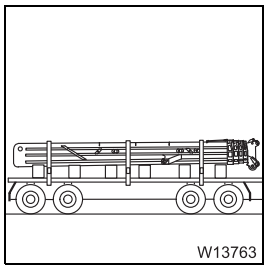
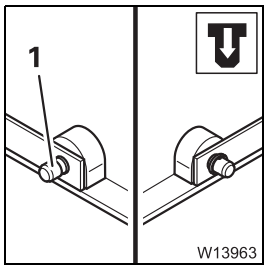
6.6.12 Transporting the main boom

- Transport the main boom only on a separate vehicle which is of sufficient size and has sufficient lifting capacity. Transport dimensions and weight ➠ *Dimensions and weights of removable parts – Main boom*, p. 1 - 11.

Risk of damage to the main boom!
Always place the main boom onto a suitable packing. If you lay the main boom on its side, add-on parts will be damaged.



- Always place the main boom onto a suitable packing.
- Secure the main boom against slipping using the holding ropes.
- Load the main boom in such a way that other road users are not put at risk.
- Load the transport vehicle in such a way that the weight is evenly distributed.
- Secure the connection lines so that they will not slip and be damaged during transport.



- Insert both pins (**1**) into the bore holes and secure them with the linchpins.

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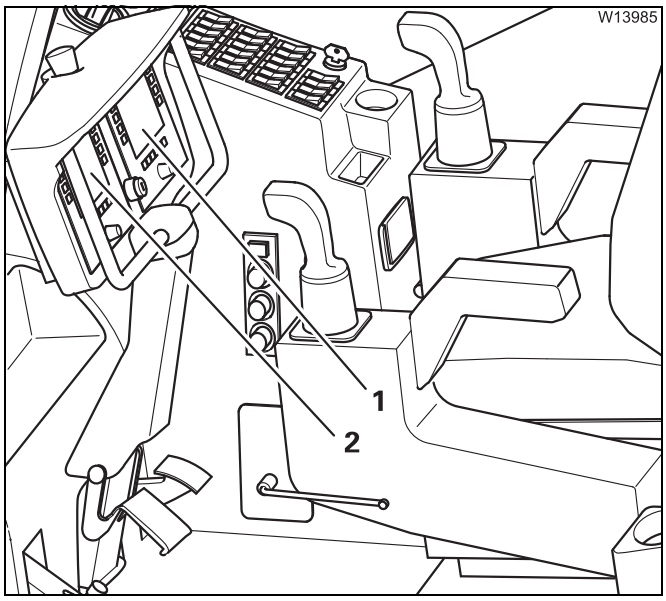
6.6.13 Checks after installing the main boom

Risk of malfunctions during crane operation!
Make absolutely sure you perform the following inspections. This will prevent malfunctions caused by faulty hydraulic or electrical connections.

- Check that the pressure relief is switched off and is secured with the lock; ➠ p. 6 - 70.



- Switch on the ignition.
- Check if the *RCL* control unit (**1**) or *ECOS* (**2**) show an error message.
- If an error message is displayed, check that all electrical connections are established; ➠ p. 6 - 80.

The following requirements must be met for the subsequent inspection:

– The truck crane is supported with an outrigger span of at least 8.76 x 2.63 m (28.7 x 8.6 ft).

– The main boom is resting in the boom rest.

– The current rigging mode is entered on the RCL.

- Telescope the telescopic section approx. 1 m (3.3 ft) out and then retract it again.
- Retract the telescoping cylinder into another telescopic section and mechanically lock it there.
- Check to see if the hydraulic connections in the turntable are sealed.

Before operating for the first time, complete the *Incline lattice extension* movement and check if the corresponding connections in the turntable are sealed.

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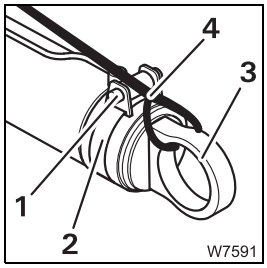
6.6.14 Slewing the superstructure with main boom removed

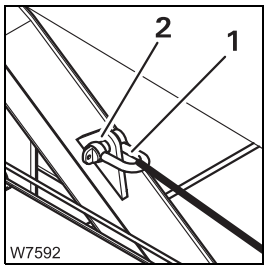
Depending on requirements, with the main boom removed the truck crane can be slewed into the working positions *0° to the front* or *180° to the rear*.

Prerequisite: The removal steps have been performed;
➠ *CHECKLIST: Removing the main boom*, p. 6 - 62.

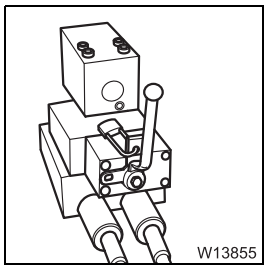
- Prepare the required additional equipment; ➠ *Equipment required*, p. 6 - 61



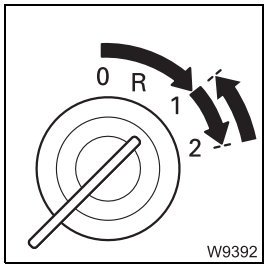
- Fasten the deflection sheave (**1**) to the head end of the derricking cylinder with a tightening belt (**2**).
- Fasten one set of slinging tackle (**4**) to the head eyelet on the derricking cylinder (**3**).



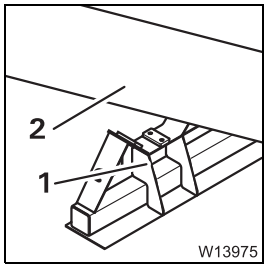
- Attach the other end of the slinging tackle to the holder (**1**) on the turntable with a shackle (**2**).



- Switch off the pressure relief; ➠ p. 6 - 70.



- Start the crane engine.



- Extend the derricking cylinder (**2**) (*Raise* function) far enough so that it will not hit the derricking cylinder support (**1**) when slewing.

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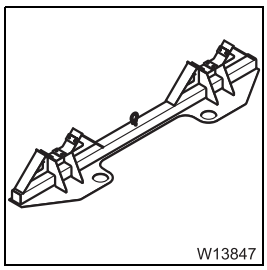
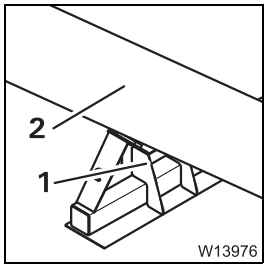
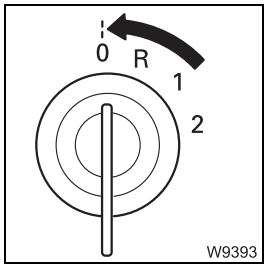


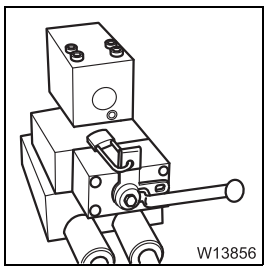
- Slew the superstructure far enough to allow the supports to be offset.
- Slew the superstructure into the working position *0° to the front* or *180° to the rear*.
- Place the support.
- Remove the lifting gear.



- Retract the derricking cylinder (*Lower* function) until it rests on the derricking cylinder support.



- Turn off the crane engine.



- Switch on the pressure relief; p. 6 - 70.

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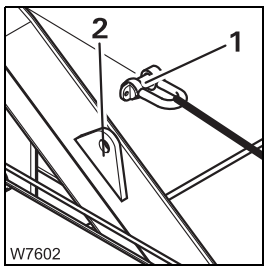
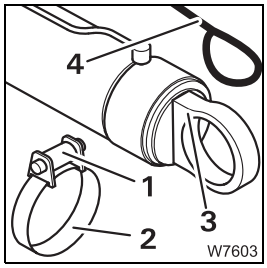


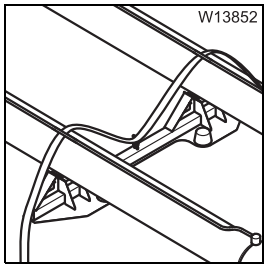
- Undo the shackles (**2**) on both sides of the slinging tackle at the holders (**1**) on the turntable.



- Detach the slinging tackle (**4**) from the derricking cylinder head eyelets (**3**) on both sides.

Detach the tightening belts (**2**) on both sides and remove the deflection sheaves (**1**).

Stow away all slinging tackle, tightening belts and deflection sheaves so that they are secure when driving.



Now apply the transport protection for on-road driving;
➠ *Securing/releasing the derricking cylinder*, p. 6 - 82.

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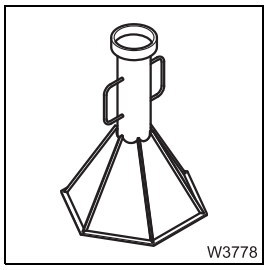
6.7 Installing/removing the additional axle

The additional axle can be mounted instead of the rear outrigger on the truck crane.

Risk of overturning when slewing with the rear outrigger removed
Always support the truck crane with an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) and set the corresponding RCL code before slewing the superstructure with the rear outrigger dismounted.
Do not override the RCL if slewing is switched off;
➠ *Crane movements during the installation and removal procedures*, p. 6 - 41.

Additional equipment required

You can remove and install the additional housing with the truck crane GMK7450 itself.



You need these supports in order to properly rig the outrigger span 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft)

You also require suitable lifting gear.

➠ *Dimensions and weights of removable parts – Additional axle*, p. 1 - 11.

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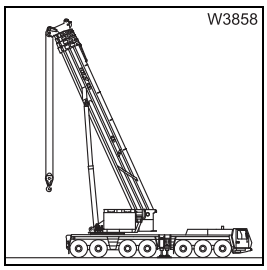
6.7.1 CHECKLIST: Installing the additional axle

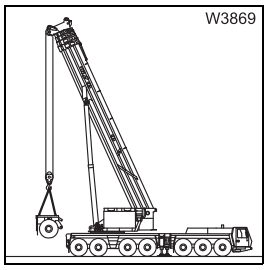
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions specified there!

Prerequisites

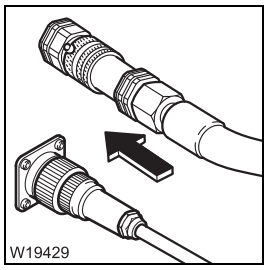
- The outrigger span 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) is rigged; ➠ p. 6 - 15,
- The rear outrigger is removed; ➠ p. 6 - 36,
- The lighting carrier is removed; ➠ p. 6 - 54.



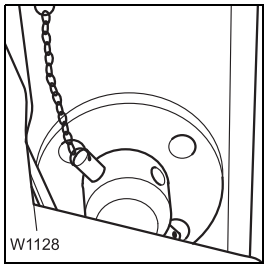
1. With the RCL set accordingly, raise the main boom and slew the superstructure into the position for attaching the additional axle; ➠ *Crane movements during the installation and removal procedures*, p. 6 - 97



2. – Sling the additional axle; ➠ p. 6 - 96.
– Hang the additional axle on the carrier; ➠ p. 6 - 106.
– Push in the support; ➠ p. 6 - 107.



3. – Establish the hydraulic connection for locking; ➠ p. 6 - 98.
– Establish electrical connection for locking; ➠ p. 6 - 101.



4. Bolt the additional axle to the carrier; ➠ p. 6 - 109.

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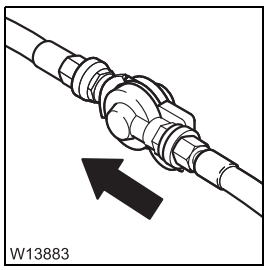
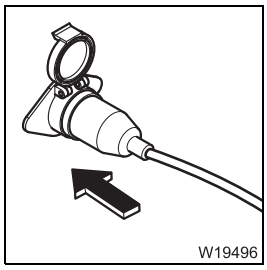
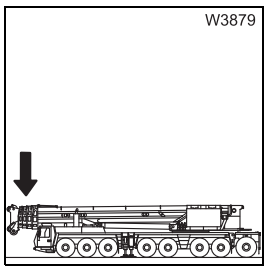


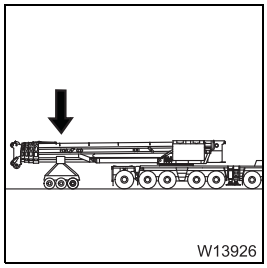
5. Establish the pneumatic connections; ➠ p. 6 - 105.



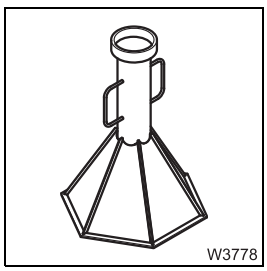
6. Establish electrical connection for the additional axle/dolly; ➠ p. 6 - 102.



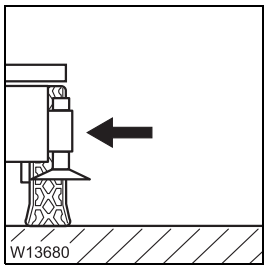
7. **If the main boom is to be set down on the boom rest:**
With the RCL set accordingly, slew the superstructure to the front and set down the main boom; ➠ *Crane movements during the installation and removal procedures*, p. 6 - 97.



8. **If the main boom is to be placed on a dolly:**
With the RCL set accordingly, slew the superstructure to the rear and lower the main boom; ➠ *Crane movements during the installation and removal procedures*, p. 6 - 97.



9. Remove the supports under the bearings; ➠ p. 6 - 17.



10. Retract the front outrigger cylinders and outrigger beams and secure; ➠ *CHECKLIST: Retracting the outriggers*, p. 12 - 33.

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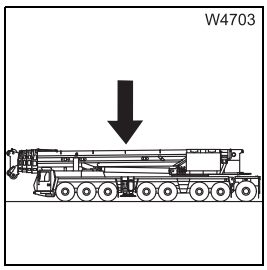
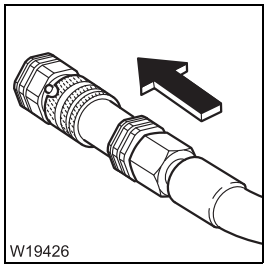
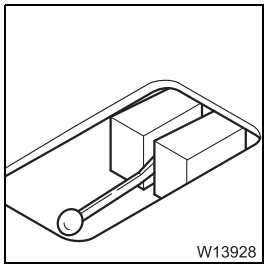


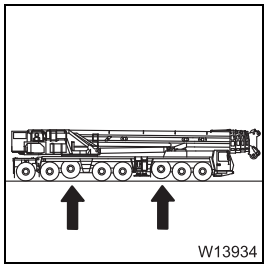
11. Lower the train with the level adjustment system until the wheels of the additional axle lightly touch the ground.



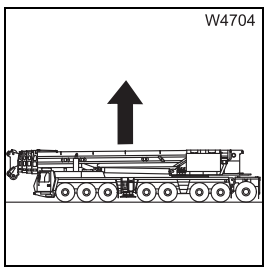
12. Establish the hydraulic connection for the suspension of the additional axle; ➠ p. 6 - 99.



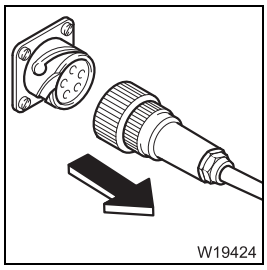
13. Enable the suspension on the additional axle; ➠ p. 6 - 112.



14. If necessary, raise the 3rd and 6th axle lines for on-road driving; ➠ p. 6 - 114.



15. Raise the truck crane to the required driving level.



16. Disconnect the electrical connection for the rear carrier light if necessary; ➠ p. 6 - 103.

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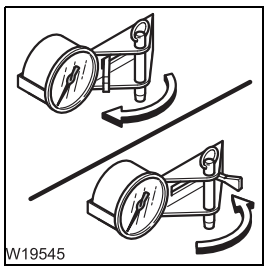
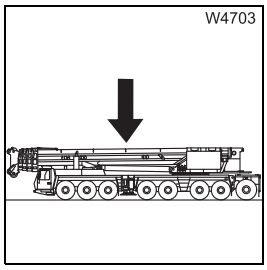


17. – For forward travel, unlock the steering of the additional axle.
– For reverse travel, lock the steering of the additional axle.

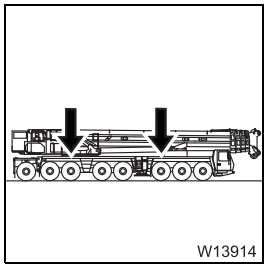
➠ *Unlocking/locking the steering of the additional axle*, p. 6 - 113.

6.7.2 CHECKLIST: Removing the additional axle

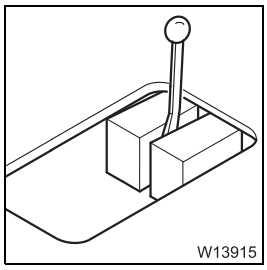
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions specified there!



1. Lower the truck crane as far as possible using the level adjustment system.



2. Lower any raised axle lines; ➠ *Lowering*, p. 6 - 115.



3. Lock the suspension on the additional axle at the lowest level; ➠ p. 6 - 111.

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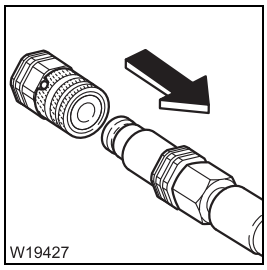
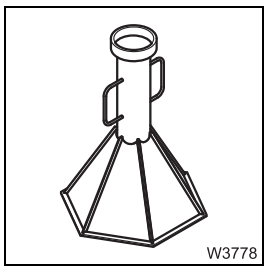
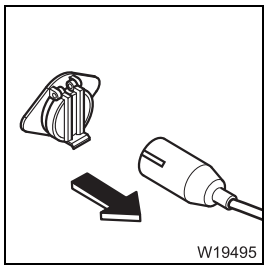


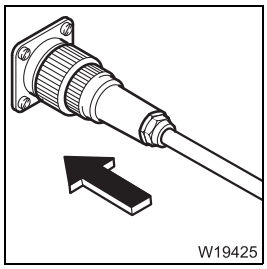
4. Disconnect the hydraulic connection for the suspension of the additional axle; ➠ p. 6 - 99.



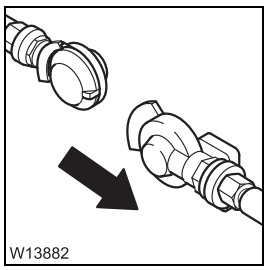
5. Rigging an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft); ➠ p. 6 - 15.



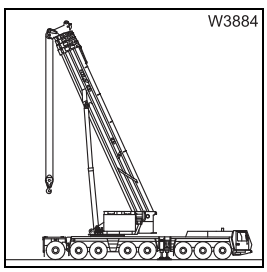
6. Disconnect the electrical connection for the additional axle/dolly; ➠ p. 6 - 102.



7. Establish the electrical connection for the rear carrier light if necessary; ➠ p. 6 - 102.



8. Disconnect the pneumatic connections; ➠ p. 6 - 105.



9. With the RCL set accordingly, raise the main boom and slew the superstructure to the rear; ➠ *Crane movements during the installation and removal procedures*, p. 6 - 97.

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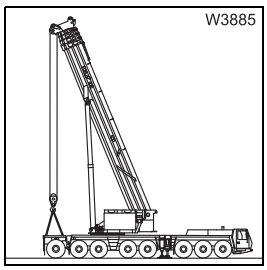
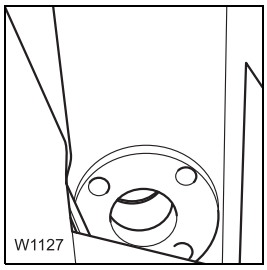
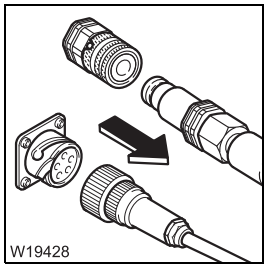


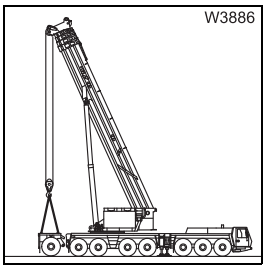
10. Sling the additional axle to the truck crane; ➠ *Slinging points on the additional axle*, p. 6 - 96.



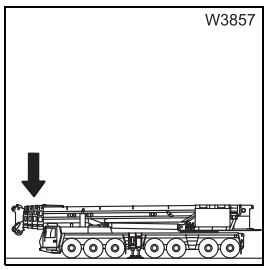
11. Release the lock between the additional axle and carrier; ➠ p. 6 - 109.



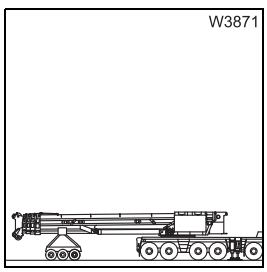
12. – Disconnect the hydraulic connection for the lock; ➠ p. 6 - 98.
– Disconnect electrical connection for the lock; ➠ p. 6 - 101.



13. – Lift the additional axle out of the mounting; ➠ p. 6 - 106.
– Pull out the supports; ➠ p. 6 - 108
– Place the additional axle on the supports.



14. If the main boom is to be set down on the boom rest:
– Mount the lighting carrier; ➠ p. 6 - 54.
– Set the hook block in the lighting carrier and unreeve if necessary; ➠ p. 6 - 58.
– With the RCL set accordingly, slew the superstructure to the front and set down the main boom; ➠ *Crane movements during the installation and removal procedures*, p. 6 - 97.



15. If the main boom is to be placed on a dolly:
With the RCL set accordingly, slew the superstructure to the rear and lower the main boom; ➠ *Crane movements during the installation and removal procedures*, p. 6 - 97.

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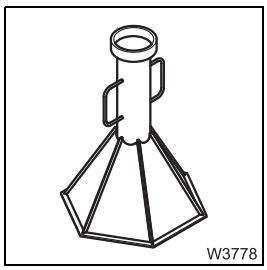
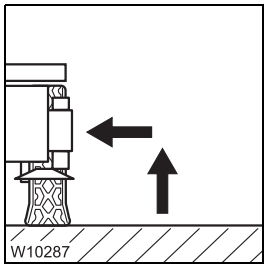


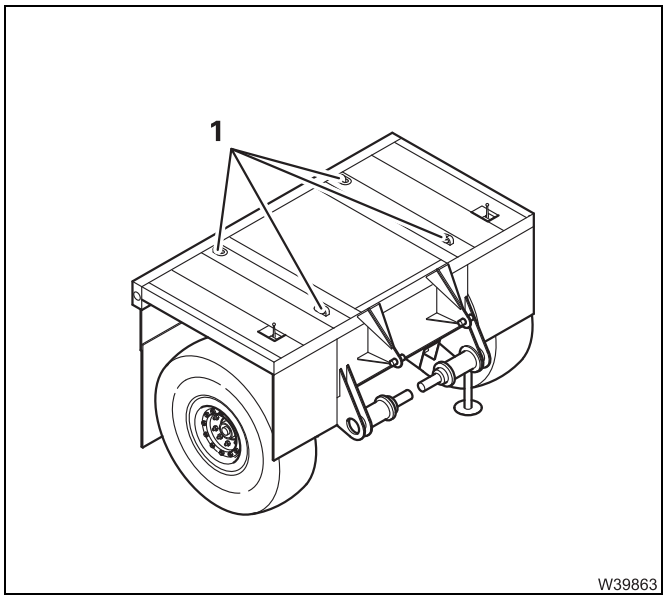
16. Remove the supports under the bearings and set down on the separate vehicle; ➠ p. 6 - 17.



17. Retract the front outrigger cylinders and outrigger beams and secure; ➠ *CHECKLIST: Retracting the outriggers*, p. 12 - 33.

6.7.3 Slinging points on the additional axle

Risk of accident if used improperly!
Sling the additional axle only on the designated points and use only lifting gear with sufficient load bearing capacity. Weight of the additional axle ➠ p. 1 - 11.



Fasten the lifting gear only to these slinging points (**1**), e.g. with shackles.

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6.7.4 Crane movements during the installation and removal procedures

When the rear supporting box is removed, the setting down and raising of the main boom and the slewing of the superstructure is monitored by RCL. There are RCL codes for different working positions for an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft).

Risk of overturning when slewing the superstructure!
Always support the truck crane with an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) and set the corresponding RCL code before slewing the superstructure with the rear outrigger dismounted.
Do not override the RCL if slewing is switched off.

Prerequisites

The following prerequisites must be met:

– The counterweight is completely unrigged.
– The truck crane is supported with an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft); ➠ p. 6 - 15.
– The truck crane must be level.

Before installation

- Lock the superstructure; ➠ p. 11 - 13.
- Enter the RCL code for an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) for the current main boom position (code for 0° position to the rear or 180° position to the front).
- Raise the main boom.
- Enter the RCL code for the outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) for the 360° slewing range.
- Unlock the superstructure and slew it to the position for picking up the additional axle.

After removal

- Slew the superstructure into the position for setting down the main boom (0° to the rear or 180° to the front).
- Lock the superstructure; ➠ p. 11 - 13.
- Enter the RCL code for the outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) for the current main boom position.
- Set down the main boom on the boom rest or on a dolly.

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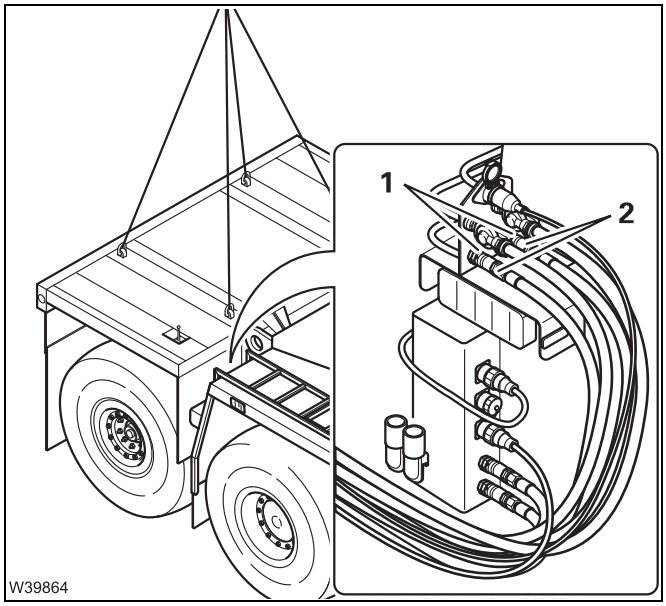
6.7.5 Establish/disconnect hydraulic connections for the lock

The hydraulic connection for moving the locking pins is established and broken at the rear right-hand side of the carrier.

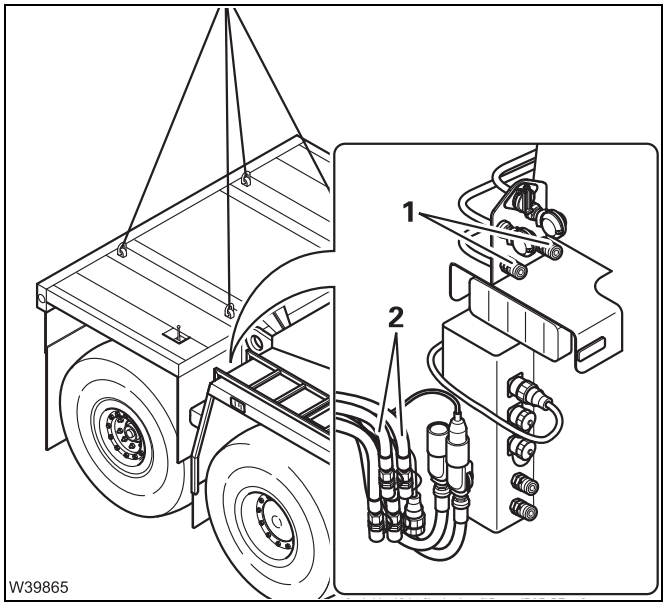
Connecting

Corresponding hoses and ports are labelled.



- Connect the hoses (**2**) to the ports (**1**).

Separating



- Remove the hoses (**2**) from the ports (**1**).
- Close the hoses (**2**) and the ports (**1**) with the caps.

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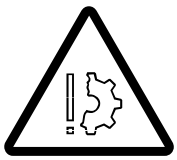
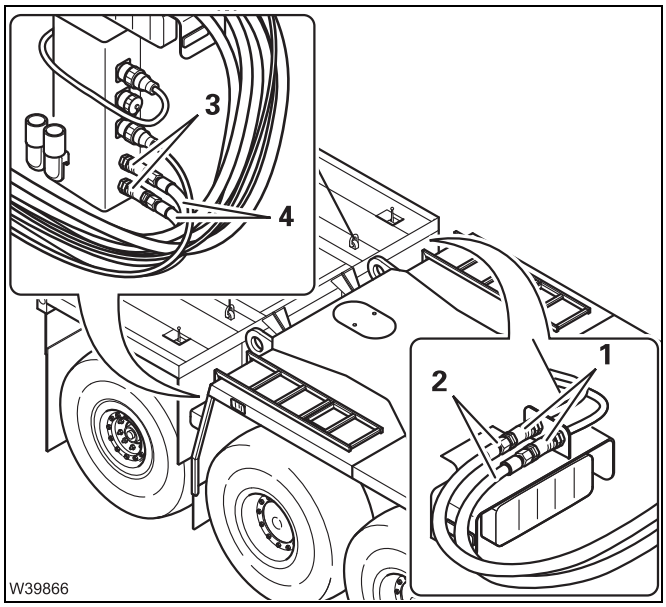
6.7.6 Establish/disconnect hydraulic connections for the additional axle suspension

The hydraulic connection for the suspension of the additional axle is established/disconnected on the rear right and left of carrier.



Danger! Body parts could be crushed when establishing a connection for the suspension.
Only establish a connection for the suspension after
– first locking the suspension with the valves and
– lowering the truck crane until the wheels of the additional axle lightly touch the ground.
This avoids the wheels suddenly being lowered and damaged.

Connecting Corresponding hoses and ports are labelled.



- Connect the hoses (**2**) to the ports (**1**).
- Connect the hoses (**4**) to the ports (**3**).

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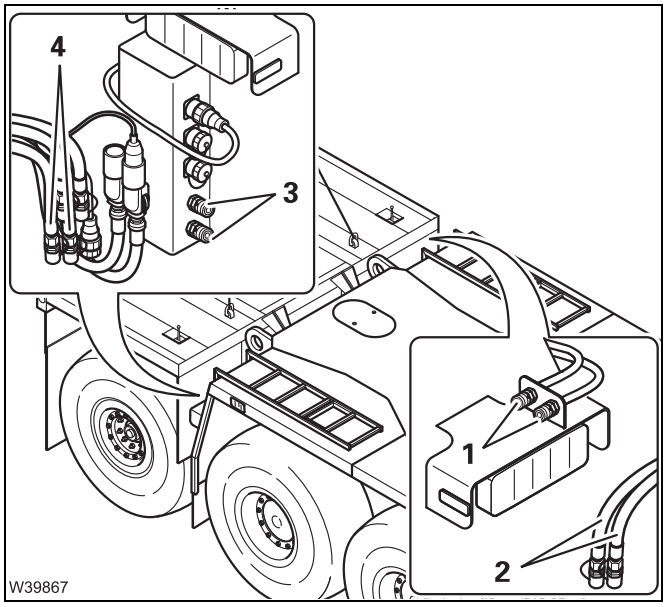
Separating



- Remove the hoses (**2**) from the ports (**1**).
- Close the hoses (**2**) and the ports (**1**) with the caps.
- Remove the hoses (**4**) from the ports (**3**).
- Close the hoses (**4**) and the ports (**3**) with the caps.

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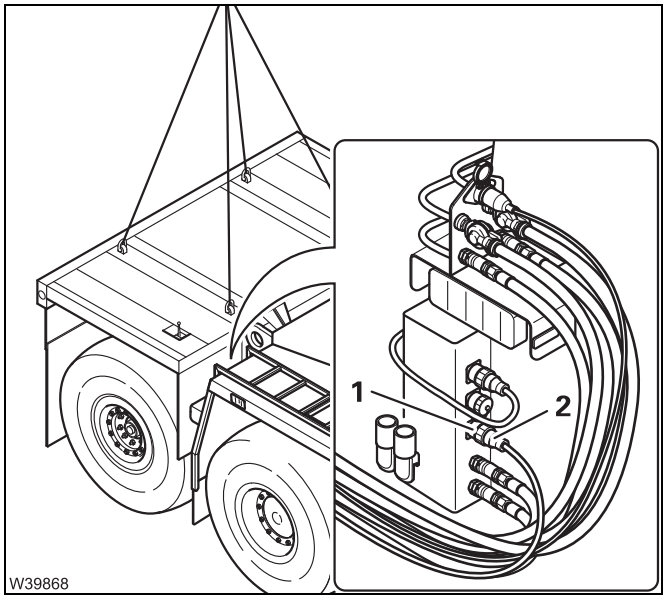
6.7.7 Establishing/disconnecting the electrical connection for the lock

The electrical connection for moving the lock is established and broken at the rear right-hand side of the carrier.

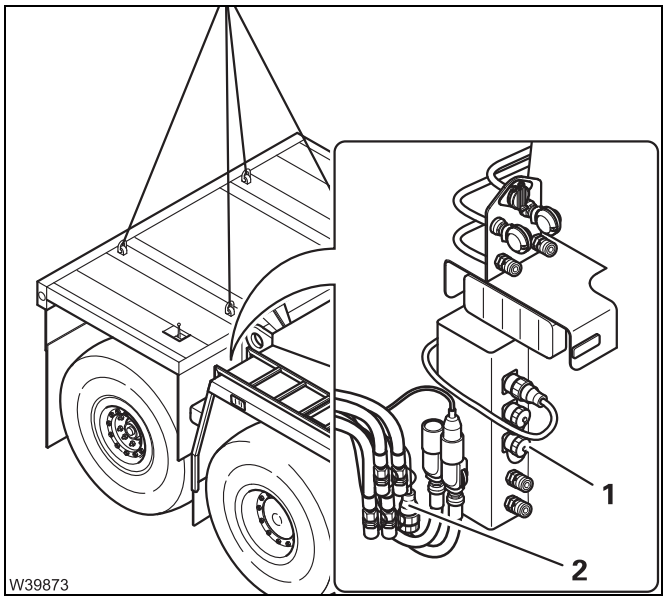
Connecting

Corresponding plugs and sockets are labelled.



- Insert the plug (**2**) in the socket (**1**).

Separating



- Remove the plug (**2**) from the socket (**1**).
- Cover the socket (**1**) and plug (**2**) with the caps.

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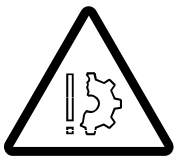
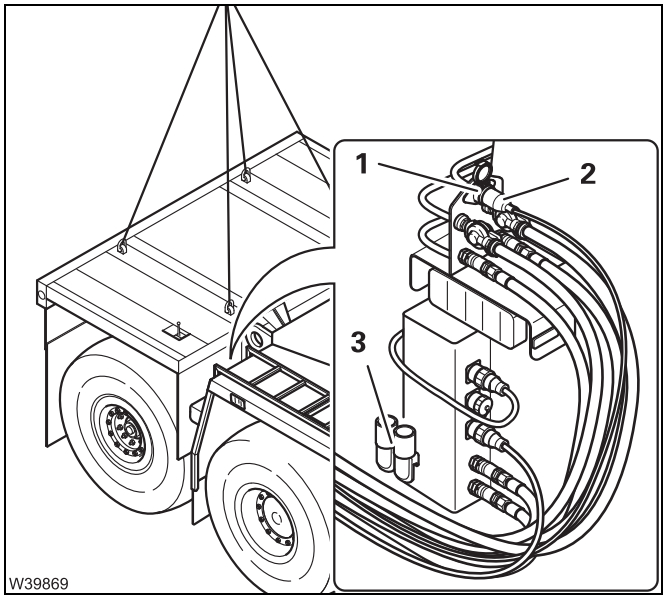
6.7.8 Establishing/disconnecting the electrical connection for the additional axle/dolly

The electrical connection for the additional axle/dolly lighting is established and broken at the rear right-hand side of the carrier.



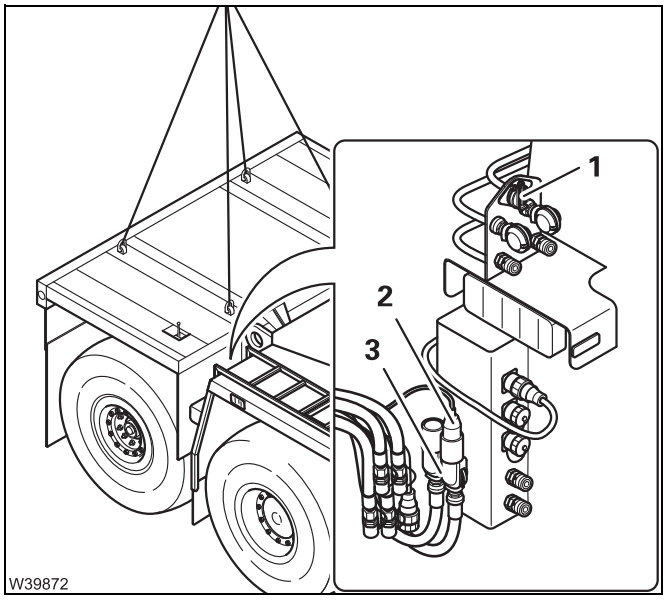
Risk of malfunctions in the carrier electronics!
Always turn off the ignition before you establish or break the electrical connection. This prevents malfunctions and error messages in the carrier electronics.

Connecting



- Take the plug (**2**) out of the holder (**3**) and insert it in the socket (**1**).

Separating



- Remove the plug (**2**) from the socket (**1**).
- Insert the plug (**2**) into the holder (**3**).

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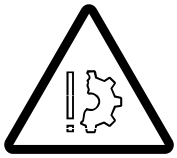
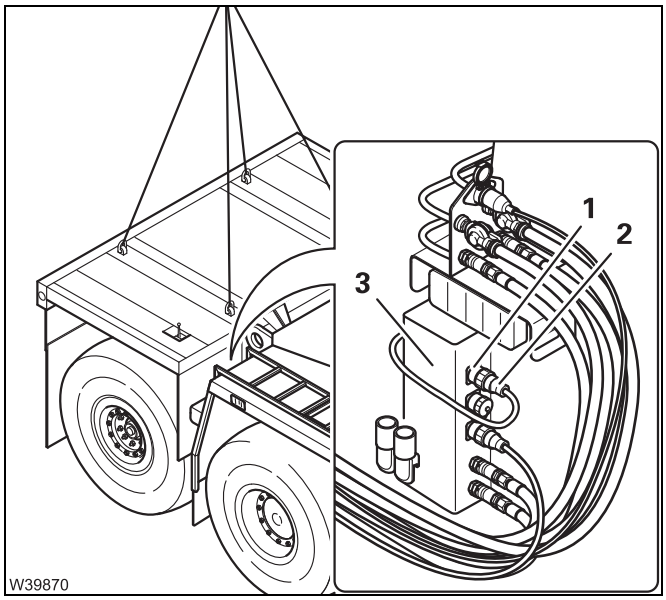
6.7.9 Establishing/disconnecting the electrical connection for the rear carrier light

Depending on national regulations, it may be necessary to establish or disconnect the electrical connection for the rear carrier light, whether the additional axle is removed or installed.



Risk of malfunctions in the carrier electronics!
Always turn off the ignition before you establish or break the electrical connection. This prevents malfunctions and error messages in the carrier electronics.

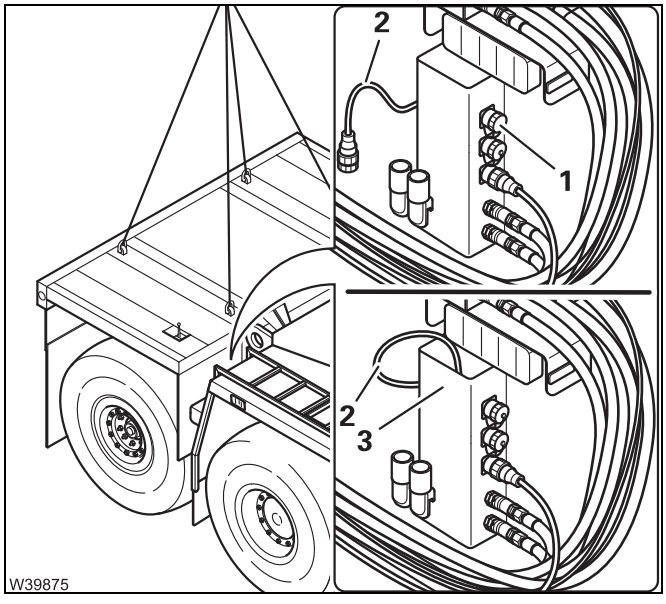
Connecting



- Take the plug (**2**) out of the clamp (**3**) and insert it in the socket (**1**).

When the headlight is switched on, the rear carrier light lights up.

Separating



- Remove the plug (**2**) from the socket (**1**).
- Cover the socket (**1**) and plug (**2**) with the caps.
- Attach the plug (**2**) in the clamp (**3**).

When the headlight is switched on, the rear carrier light **does not** light up.

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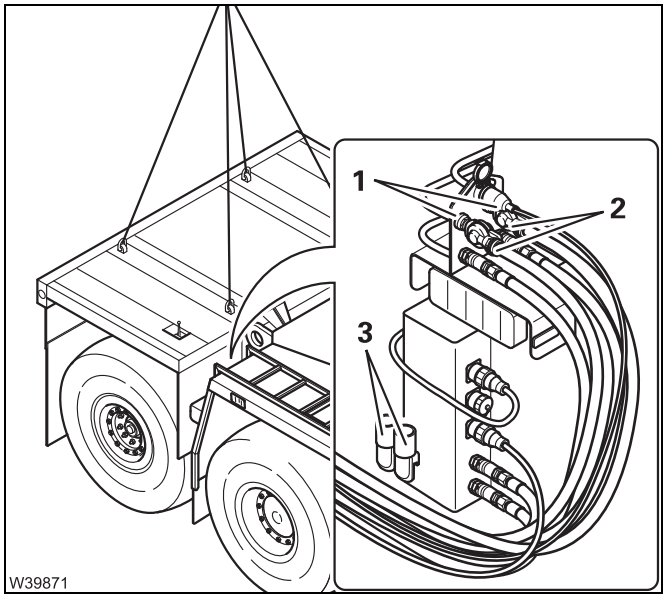
6.7.10 Establishing/Disconnecting the pneumatic connection

The pneumatic connections supply the brakes and the rear pneumatic ports of the additional axle.

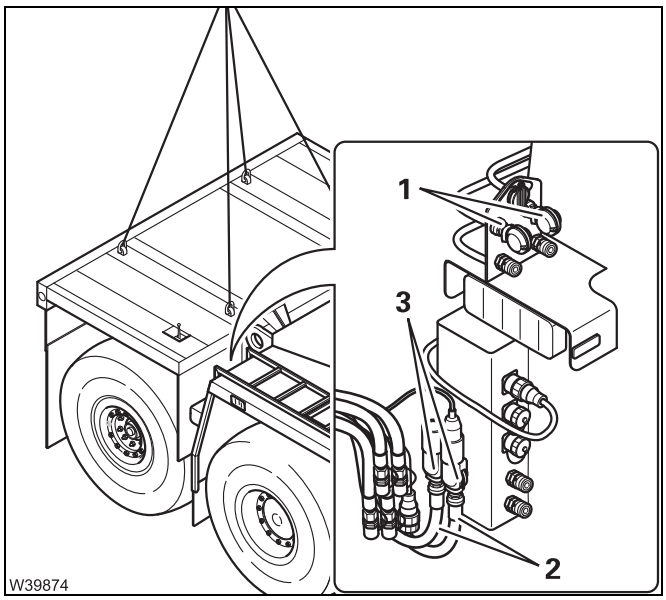
Connecting

Corresponding hoses and ports are labelled.



- Remove the hoses (**2**) from the clamps (**3**) and connect them to the ports (**1**).

Separating



- Remove the hoses (**2**) from the ports (**1**) and connect them to the clamps (**3**).
- Cover the ports (**1**) with the caps.

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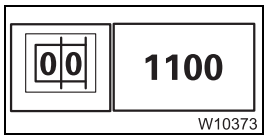
6.7.11 Attaching/removing the additional axle with the truck crane

Prerequisites



– The RCL code for the outrigger span 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) for the slewing range 360°, as stated in the *Lifting capacity table*, has been entered.

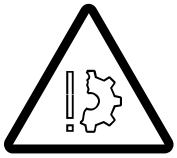
– The mobile crane is supported at the rear with the supports.

– The truck crane must be level.

– The front outrigger beams are extended to a span of 8.90 m (29.2 ft) and the outrigger pads are lowered to the ground for stabilizing.

– The lock between the carrier and the additional axle is released.

– The electrical, hydraulic and pneumatic connections are broken.



Risk of damage to the suspension struts and tyres!
You must support the truck crane on the rear supports before raising the additional axle with the truck crane.
This prevents the suspension struts and tyres from becoming overloaded and damaged.

Danger of overturning with raised additional axle
Always enter an RCL code for the outrigger span 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) with the working position required before lifting the additional axle with the truck crane and slewing the truck crane. You may not override the RCL even if the RCL goes off at a small working radius!
When the working radius increases after RCL shutdown, the stability is no longer guaranteed.

Risk of crushing when attaching and hoisting the additional axle
Always attach and hoist the additional axle from the rear and with guide ropes. This will help prevent you being crushed between the additional axle and the carrier.

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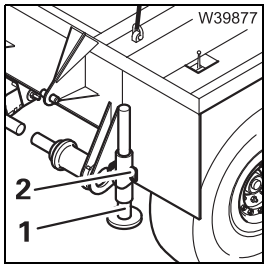
Hanging

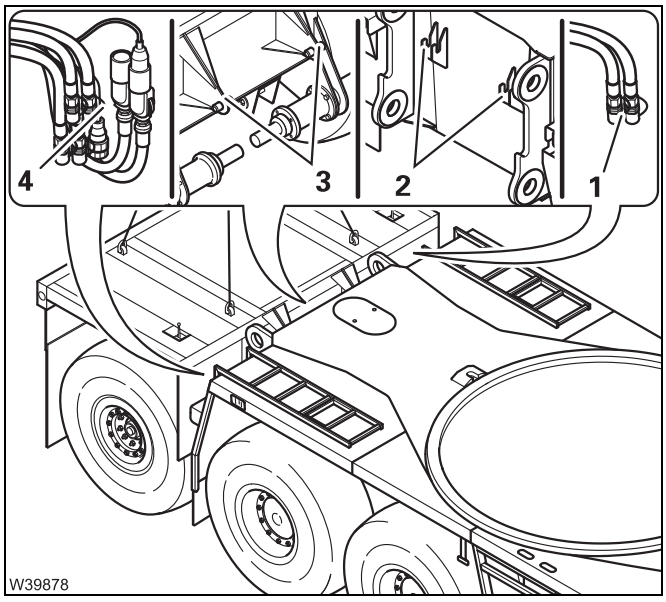
To pick up the additional axle, the separate vehicle must be moved as close as is necessary to the truck crane so that you can sling and raise the additional axle within one of the radii permitted by the RCL.

- Sling the additional axle; ➠ p. 6 - 96.

The supports must be slid in before hanging the additional axle.



- Securely hold the support (**1**), remove the safety pin (**2**) and slide the support downwards.
- Secure the support with a locking pin in the lower hole (**2**).



Do not override the RCL!

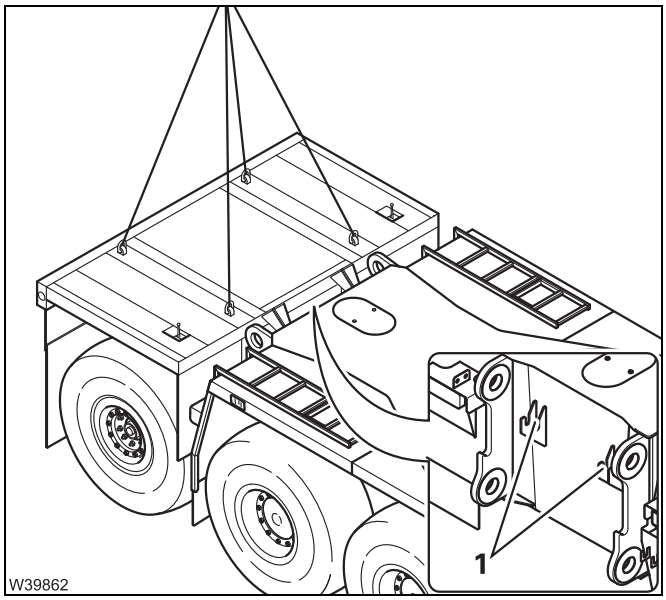
- Raise the additional axle to the tail.
- Suspend the additional axle in the bearing points (**2**) at the top using the pegs (**3**).

  Take care that the cable and the hoses (**1**) and (**4**) are not trapped or damaged.

The additional axle folds down against the tail.

Lifting

- Raise the main boom until you can remove the additional axle by lifting it vertically upwards.



- Sling the additional axle.

  Do not override the RCL!
- Lift the additional axle vertically out of the bearings (**1**).

After removal, the additional axle is placed onto the support.

Risk of accidents if the additional axle is not secured!
Always set down the additional axle on a support. This prevents the additional axle from overturning.

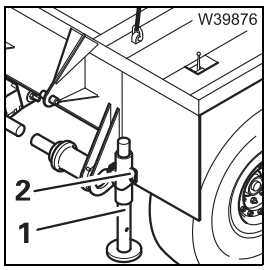
Before crane operation, set down the additional axle where it will not be a hazard during the rigging work to follow or during crane operation. Make sure that:

– The necessary outrigger span can be rigged,

– The separate vehicle with the counterweight is not obstructed,

– The truck crane is not obstructed if it needs to be moved after rigging.

The supports must be slid out before placing the additional axle.



- Hold on to the support (**1**), remove the safety pin (**2**) and slide the support downwards.
- Position the additional axle so that you can secure the support by inserting the safety pin in the upper hole (**2**).
- Place the additional axle.

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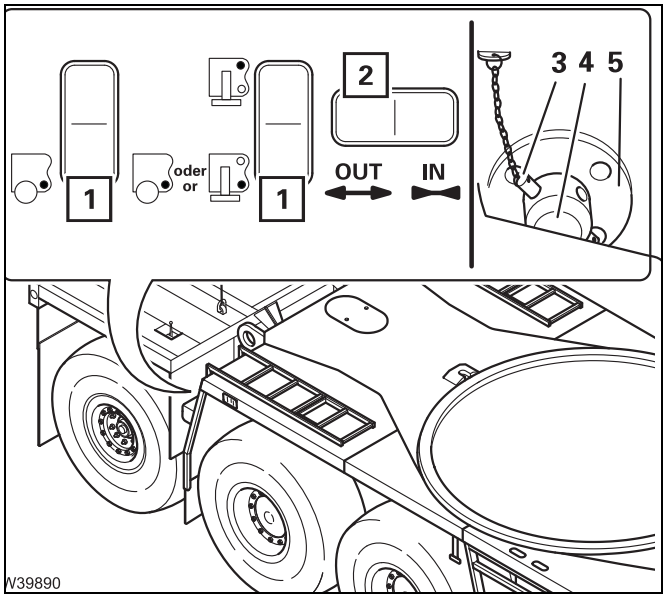
6.7.12 Locking/releasing the additional axle lock

Risk of crushing when extending/retracting the pins!
The pins on both sides are always moved at the same time from the *carrier lock* control unit. Make sure that no-one is in the vicinity of the carrier retainers on the other side of the vehicle when you extend or retract the pins.

Risk of damage to the retaining pins!
Make sure that the retaining pins with the chains are not pushed inwards through the retainers on the carriage. This prevents the chains or the retaining pins being severed when the pins are extended or retracted.

Connecting

When the additional axle is attached to the tail of the carrier, the bolts align with the retainers on the carrier.



- Press button (**1**) downwards and button (**2**) to the left.
- Extend the pins (**4**) on both sides completely through the mountings (**5**).
- Secure all pins (**4**) using the retaining pin (**3**). The retaining pins must engage.

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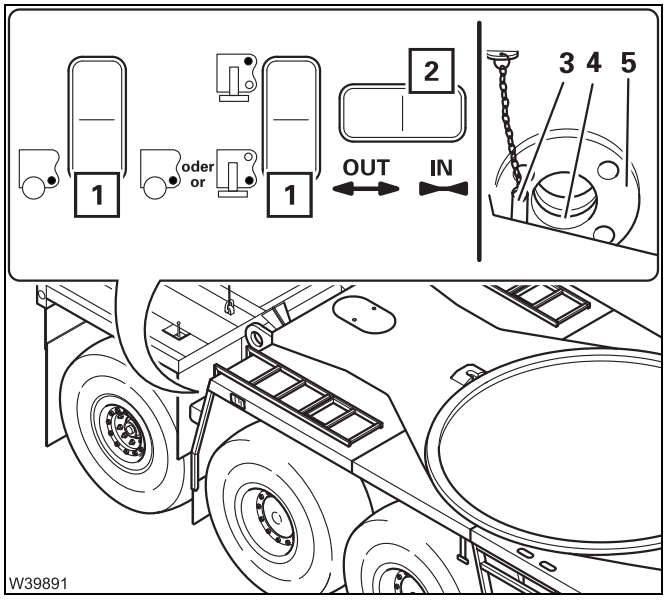
Disconnecting

- Sling the additional axle before releasing the lock.



- Pull out the retaining pins on both sides (**3**).
- Press button (**1**) downwards and button (**2**) to the right.
- Retract the pins (**4**) completely out of the mountings (**5**).

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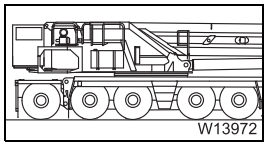
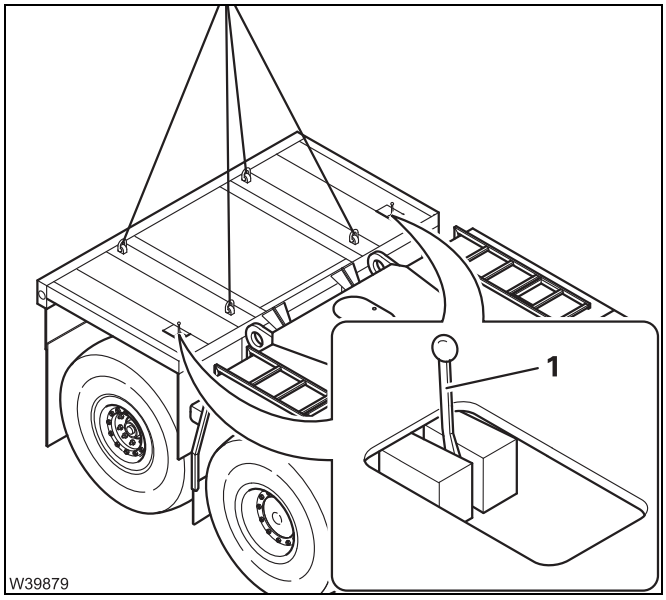
6.7.13 Locking/enabling the suspension on the additional axle

Before removing, you must lock the suspension at the lowest position.
After installing you must release the lock again.

Locking

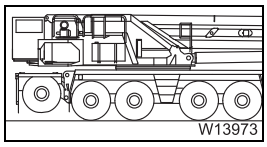


- Lower the boom as far as possible with the level adjustment system.



- Lock the suspension – Lever (**1**) vertical.

When the suspension is locked, the wheels will stay locked in this position and can be raised and relieved with the level adjustment system.

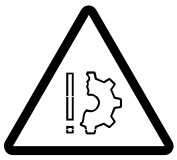


- Raise the truck crane with the level adjustment system until the wheels on the additional axle no longer touch the ground.

In this position you can align the truck crane horizontally and set the span for removal.

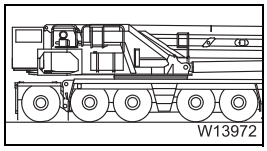
Enabling

When the suspension is locked before removal, you must enable it again after installation.



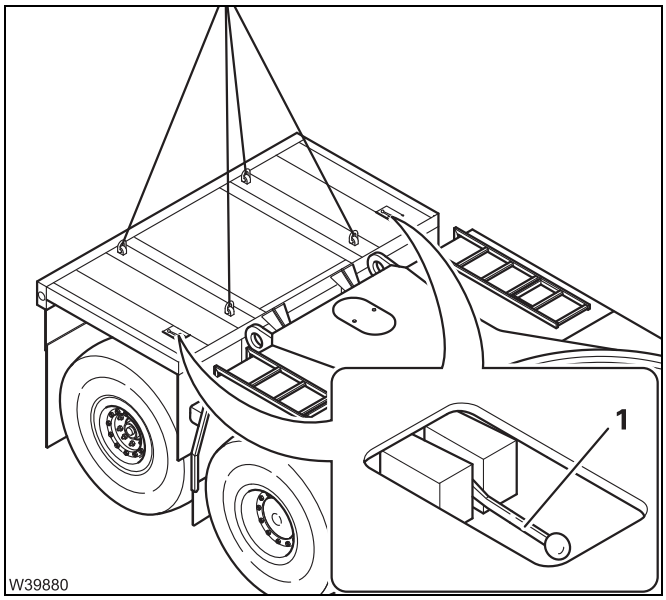
Risk posed by bursting tyres
When the suspension is locked, the suspension on the additional axle remains rigid.
For this reason you should only lower the truck crane far enough for the wheels not to be put under strain. This prevents the tyres from being put under strain and puncturing when the vehicle level is lowered.

Risk of damage to the tyres!
Before lowering the truck crane, check the area under the raised wheels for sharp or pointed objects, and remove these if necessary.
By doing so, you can prevent the tyres from bursting or becoming damaged when the truck crane is lowered.



- Lower the train with the level adjustment system until the wheels of the additional axle lightly touch the ground.

Risk of crushing when enabling the suspension
When the hand valves are opened, the wheels drop down suddenly. For this reason you should lower the truck crane until the wheels are nearly at ground level before opening the hand valves, and ensure that no-one is in the immediate vicinity of the wheels when you release the suspension.



- Enable the suspension – Lever (**1**) in horizontal position.

The wheels will be lowered until they touch the ground.

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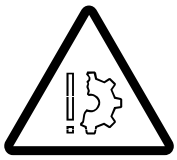
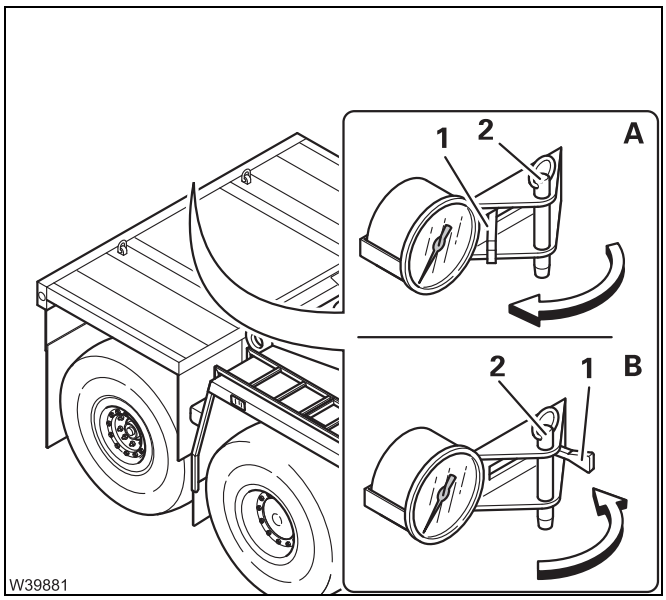
6.7.14 Unlocking/locking the steering of the additional axle

For forward travel you must unlock the steering so that the additional axle can be steered. For reverse travel the steering must be locked.



Risk of damage when driving backwards with unlocked steering!
Before reverse travel, always check whether the steering is locked. This avoids any damage to the additional axle.



(A) – For reverse travel

- Drive the truck crane straight forward until the wheels of the additional axle have no steering angle.
- Pull out the pin (**2**).
- Push the lever (**1**) to the left and secure it with the pin (**2**).

Now the steering is locked.

(B) – For forward travel

- Pull out the pin (**2**).
- Push the lever (**1**) to the right and secure it with the pin (**2**).
- Now the steering is unlocked.

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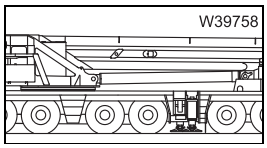
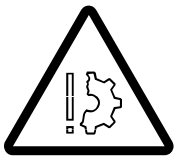
6.7.15 3rd and 6th Raising/lowering axle lines

Depending on the applicable regulations, if an additional axle is mounted it may be necessary to raise the wheels for the 3rd and 6th axle lines for driving on the road.

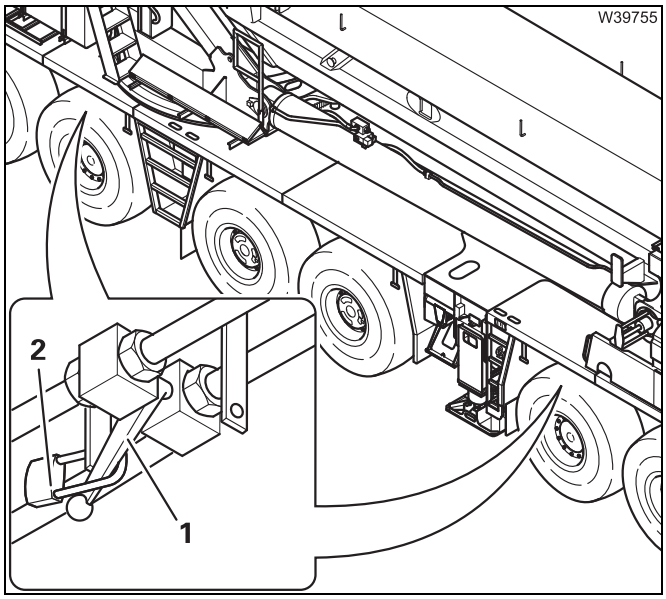
Lifting



- Lower the boom as far as possible with the level adjustment system.



Risk posed by bursting tyres
Always lower the truck crane as far as possible before locking the suspension. When you lock the suspension at a higher level, this level may be undercut later on by lowering. The suspension struts on the locked axle remain rigid and the tyres may come under excessive strain.

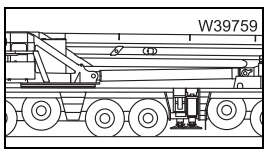


Locking the suspension

- On both sides, switch all levers of all valves to the rear.
- Secure all valves in this position with the locks (**2**).

The suspension circuit for the 3rd and 6th axle lines is now locked. With the suspension locked, the wheels stay in this position.

Risk of accidents from hand valves which are not secured
Always secure the hand valves on the raised axle lines with padlocks. When the hand valves are opened, the raised wheels drop down suddenly and could crush people.



- Raise the truck crane to on-road level with the level adjustment system; the wheels on the locked axle lines will be raised.

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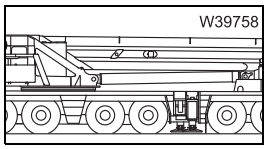
Lowering

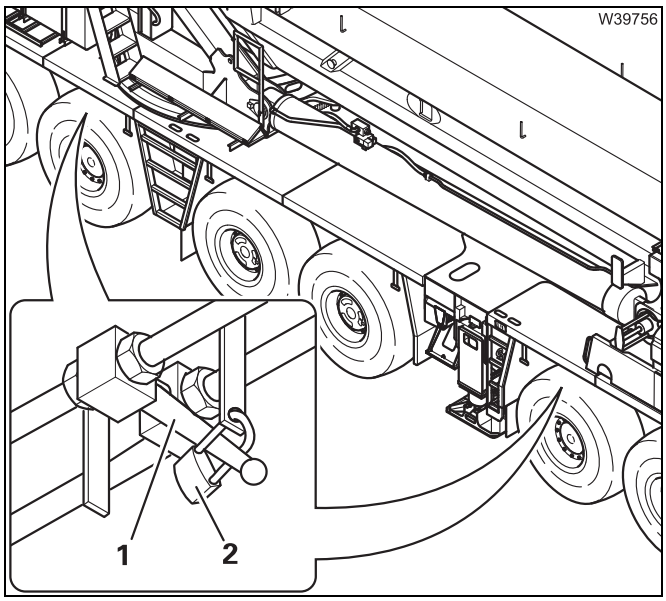
Risk posed by bursting tyres
The suspension struts on the locked axle lines remain rigid.
For this reason you should only lower the truck crane far enough for the wheels not to be put under strain. This prevents the tyres from being put under strain and puncturing when the vehicle level is lowered.

Risk of damage to the tyres!
Before lowering the truck crane, check the area under the raised wheels for sharp or pointed objects, and remove these if necessary.
This prevents the tyres being punctured or damaged when the truck crane is lowered.



- Lower the truck crane with the level adjustment system until the wheels of the additional axle are just above the ground.

Risk of crushing when enabling the suspension
When the hand valves are opened, the wheels drop down suddenly. For this reason you should lower the truck crane until the wheels are nearly at ground level before opening the hand valves, and ensure that no-one is in the immediate vicinity of the wheels when you release the suspension.



Enabling the suspension

Above the 3rd and 6th axle lines are hand valves (**1**) to lock the suspension struts, one on each side.

- Switch the levers on all four hand valves to the front – Position **A**.
- Secure all the hand valves in this position with the padlocks (**2**) and remove the keys.

The suspension circuit for the 3rd and 6th axle lines will also be switched on.

Risk of damage to the tyres!
Always secure the hand valves with the padlocks to prevent unauthorized use. If a valve is closed inadvertently, this axle line will have no suspension during driving and the tyres may be put under excessive strain.

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7 Malfunctions in driving mode

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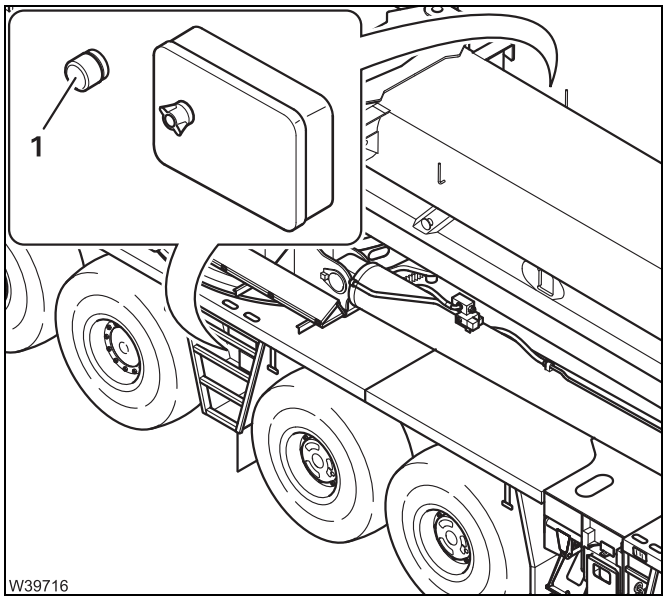
7 Malfunctions in driving mode

7.1 Emergency stop switch



For emergencies an emergency stop switch is located next to each of the *outrigger* control units.

- Press an emergency stop switch (**1**).
  The switch latches.

The engine shuts down.

After activating an emergency stop switch;
➠ *Resetting the emergency stop switch*, p. 4 - 19.

The battery master switch cannot be used as an emergency stop switch for the engine. The engine continues to run after the battery master switch has been switched off.

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7.2 Procedure in the event of a malfunction in road traffic

If the truck crane can no longer be driven due to an accident or another malfunction, observe the following:

- Keep calm!
- Brake the truck crane! Observe the traffic behind you!
- Stop at a place safe for you and for the traffic behind you!

Risk of accidents due to poor visibility!
If possible, do not stop in a tunnel or directly after a curve.

- Secure the truck crane in compliance with the legal regulations applicable in the country in which you are working.

Risk of accidents during repair work in danger areas!
In hazard areas (e.g. tunnels, intersections, motorway bridges), even simple repairs can be dangerous.
When in a hazard area, carry out only the repair work required to leave the danger area.

If you are unable to repair the damage yourself, notify **Manitowoc Crane Care** or have the truck crane towed; ➠ *Towing the truck crane*, p. 7 - 5.

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7.3 Towing the truck crane

Observe the following if the truck crane has to be towed away:

– The truck crane may only be towed away with a tow-rod. Attach the tow-rod to the tow-rod coupling on the front bumper.

– Be sure to observe the statutory regulations of the country in which you are working concerning the overall length of the towing and towed vehicle, including tow-rod.

– If the engine, steering and service brake still work, you can tow the truck crane with a lorry.

– If the engine, steering or service brake no longer function properly, the truck crane must be towed with a special breakdown truck.

The front towing coupling is designed for a maximum tensile force of 10 t (22,000 lbs). Tensile force may be applied only forwards or at an angle of 45° to both sides of the longitudinal axis of the truck crane.

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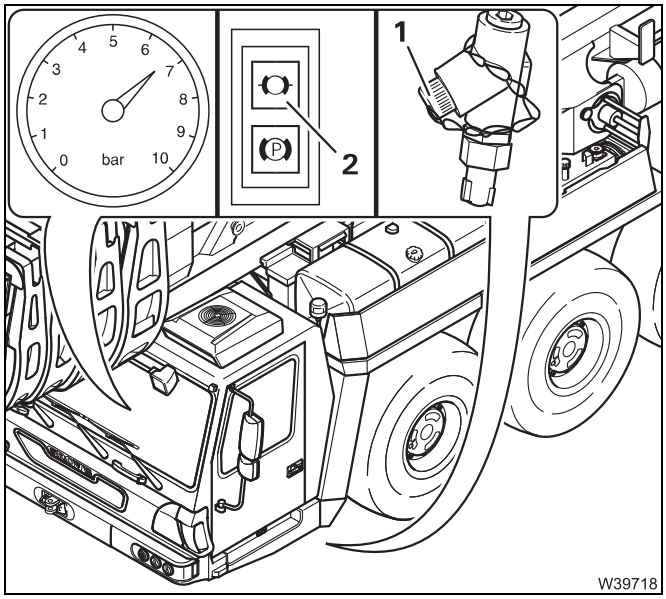
7.3.1 Towing after engine/transmission damage

The following information only applies to towing the truck crane out of the immediate danger area in the event of damage to the engine or transmission.

Risk of accidents and damage when towing the truck crane long distances!
Tow the truck crane at a maximum speed of 7 km/h (4 mph) and for a maximum distance of 300 m (0.18 mi). Additional measures must be taken for longer distances, contact **Manitowoc Crane Care**.

Compressed-air supply

If the engine fails, the truck crane must be supplied with compressed air by the tractor-vehicle so that the brake system is still operable.



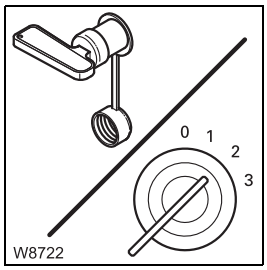
- Connect the filler connection (**1**) with the *Supply* coupling head of the towing vehicle.

When towing, the following must be available in the driver's cab:

– A supply pressure of at least 6 bar (87 psi) must be displayed

– The lamp (**2**) must have gone out.

Electric power supply



- Switch on the battery master switch.
- Switch on the ignition.

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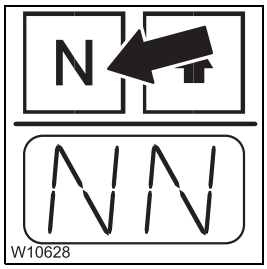
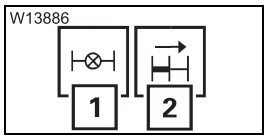
On the transmission



- Select neutral on the transmission; ➠ p. 5 - 22.

Axle drives

- Switch off all differential locks.



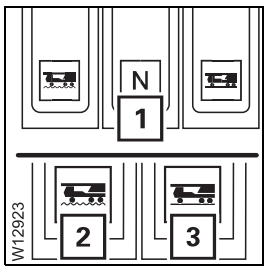
Lamps (**1**) and (**2**) must have gone out.

– Transverse differential locks ➠ p. 5 - 53,

– Longitudinal differential locks; ➠ p. 5 - 52,

Transfer case

Prior to being towed away, you must switch the transfer case into the neutral position.



- Press the button (**1**) once.
  Lamps (**2**) and (**3**) will go out.

To switch off the neutral position, you must switch on the on-road or off-road gear; ➠ p. 5 - 51.

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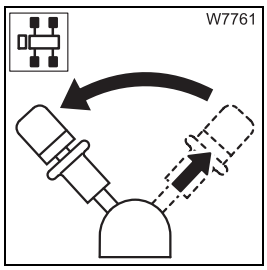
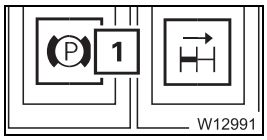
Parking brake



- Release the parking brake.



The lamp (**1**) must go out.

If the lamp (**1**) continues to light up, the supply pressure may be too low. Let the engine of the truck crane or towing vehicle run on the compressed-air supply until the supply pressure has been built up; ➠ *Building up supply pressure*, p. 5 - 10.

If the lamp (**1**) does not go out, there is a malfunction on the parking brake system. Contact **Manitowoc Crane Care**.

Risk of accidents due to faulty brakes!
If the service brake system has been damaged, you may only tow the truck crane from the immediate hazard area after consulting with **Manitowoc Crane Care**.

Towing the truck crane out of the danger area

Once you have made all the adjustments as described in this section, you can tow the truck crane away from the hazard area.

- Ensure that the tractor-vehicle accelerates only slowly.

Risk of damage to the chassis!
Starting jerkily or quickly can damage the chassis!

- Remember that the steering will be sluggish.
  If the engine fails, only the emergency steering pump will be available, which supports the steering only from a speed of at least 2 km/h (1.2 mph).

Risk of accidents due to sluggish steering!
At speeds less than 2 km/h (1.2 mph) the truck crane is barely steerable.

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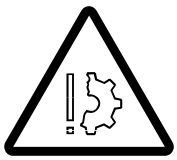
- Tow the truck crane at a **maximum of 7 km/h** (4 mph).
- Ensure that the towing distance does not exceed **300 m** (0.18 mi).

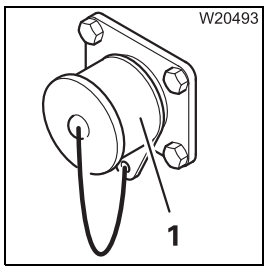


Risk of accidents and damage when towing the truck crane long distances!
Tow the truck crane at a maximum speed of 7 km/h (4 mph) and for a maximum distance of 300 m (0.18 mi). Additional measures must be taken for longer distances, contact **Manitowoc Crane Care**.

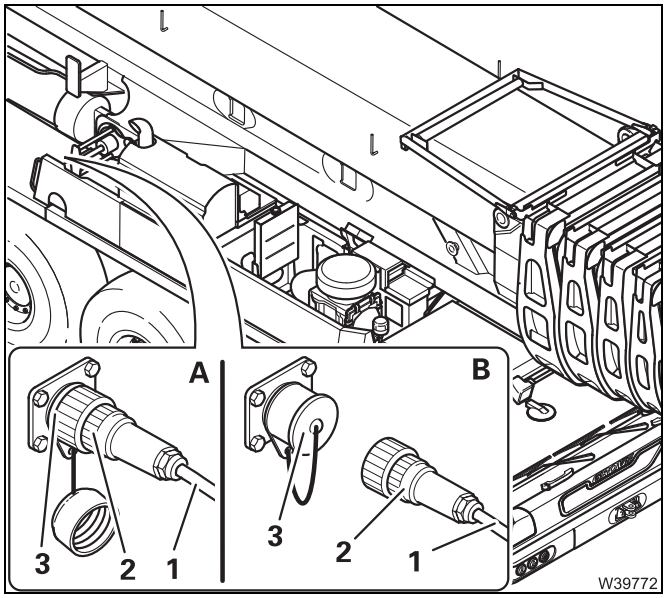
7.3.2 Tow starting

Tow starting is not possible for reasons related to the transmission.

7.3.3 External starting socket



The truck crane is equipped with a socket for external starting (**1**) on the carrier and on the superstructure (➠ p. 14 - 77).
If the batteries are discharged, the power supply (24 V) of an auxiliary vehicle or the socket (**1**) on the superstructure can be used for charging.



- Start the engine of the power source (24 V).
- (**A**) – Connect the cable (**1**) to the power supply.
- Insert the plug (**2**) in the socket (**3**).
- Start the engine for driving.
- (**B**) – Pull out the plug (**2**).
- Close the socket (**3**).
- Remove the cable (**1**) from the vehicle providing the power.

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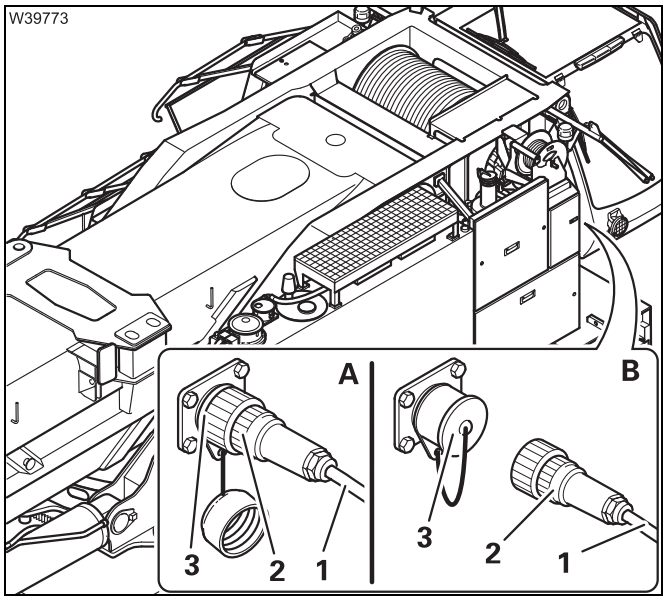
Performing a jump start

The socket (**1**) can also be used to supply power to another vehicle (with a 24 V on-board network).



- Start the engine for driving.
- (**A**) – Insert the plug (**2**) into the socket (**3**) on the carrier.
- Connect the cable (**1**) to the vehicle requiring the power (24 V).
- Start the engine of the vehicle that requires the power.
- (**B**) – Pull out the plug (**2**).
- Close the socket (**3**).
- Remove the cable (**1**) from the vehicle.

7.3.4 Battery charger

Prerequisites

– The engine must not be running and must be secured against unauthorised use.

– An external 230 V mains power supply must be available at the location.

– The location must be well ventilated and protected against moisture.

Risk of explosion when operating the battery charger!
The battery charger may not be operated:
– At service stations and tank farms
– At places where flammable gases or vapours can be found or formed (for example, at places where fuel is stored and in chemical factories)
– At places where explosive dust can be found or formed (e.g. carbon dust, wood dust and grain dust).

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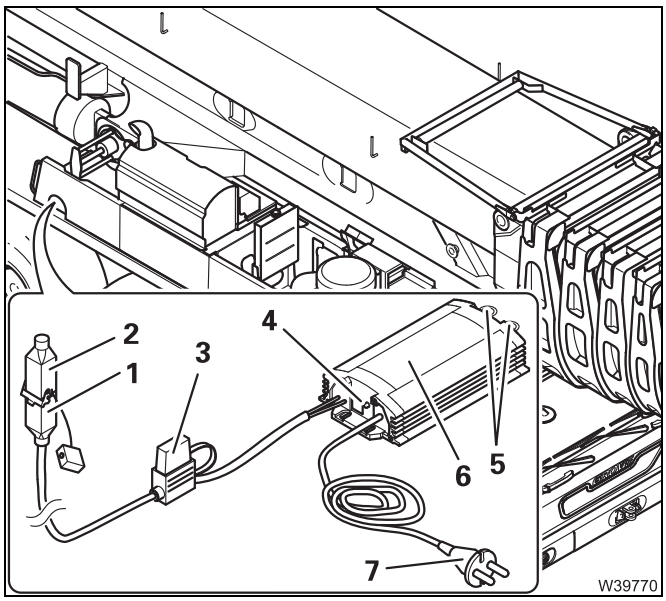

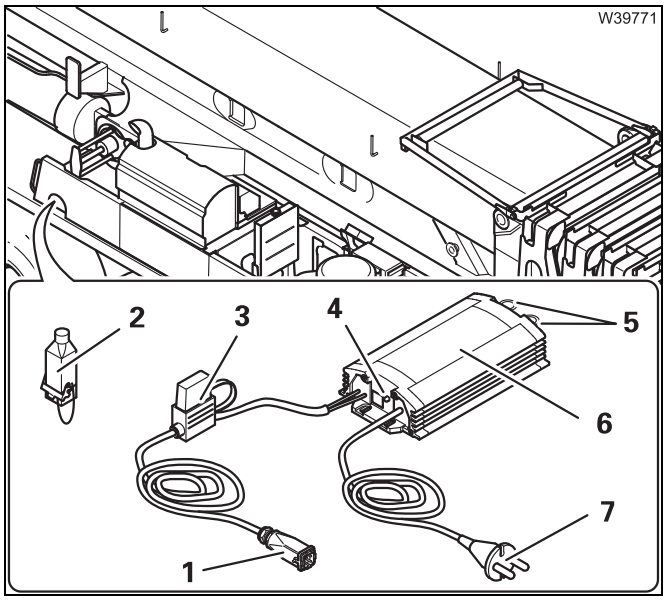

Connecting

- Insert the plug (**1**) in the socket (**2**).
- Place the battery charger (**5**) in a protected place where you can see the indicator lamp (**3**).

  The battery charger can be suspended from the ring eyes (**4**).
- Insert the plug (**6**) into the socket on the mains supply 230 V at the location.

The battery charger switches on. The lamp (**3**) on the battery charger indicates the status:

– **Flashing:** The battery is being charged
– **On:** Charging complete

Separating

- Pull the plug (**3**) out of the socket.
- Pull out the plug (**1**) from the socket (**2**).
- Close the socket (**2**).
- Return the battery charger to the storage compartment in the driver's cab.

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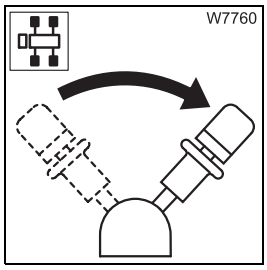
7.4 Wheels and tyres

This section contains all the information about changing a wheel and about using the tyre inflator connection.

7.4.1 Wheel change

- If a puncture occurs while driving, stop the truck crane, taking the following traffic into account, and secure in the way described in the legal regulations stipulated in the country of use.
- Select as flat a place as possible to change the wheel.

Risk of accidents due to a wheel falling over!
If you lean a wheel against the truck crane briefly when changing a wheel, secure it against falling over with a rope!
Move the outriggers only when no wheel is leaning against the truck crane.



- Apply the parking brake.

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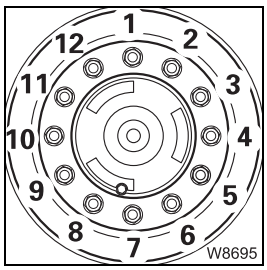
Removing a damaged wheel

- Switch off the suspension; ➠ p. 5 - 15.
- Raise the truck crane with the outriggers until the wheel to be changed just barely leaves the ground.

Risk of accidents due to a wheel falling over!
When unscrewing the final lug nuts, the wheel can slip off the hub and fall toward you. Secure the wheel and step back quickly if the wheel begins to tip.



- Remove the wheel nuts (**1**) to (**12**) and remove the damaged wheel.
- Secure the wheel against falling over if you set it down temporarily.

Lift the wheel

You can use the truck crane to lift the spare wheel.

- If you lift the wheel with the truck crane, then:
  - Support the truck crane and
  - Enter the current rigging mode on the RCL.

Risk of overturning while slewing!
Always check before slewing whether slewing is permitted in the truck crane's current rigging mode (counterweight, outrigger span, working radius).
Correct the rigging mode if necessary; ➠ *Slewing with a rigged counterweight*, p. 12 - 71.

- Lift the spare wheel using only lifting gear with sufficient load bearing capacity; ➠ *Spare wheel*, p. 1 - 10.

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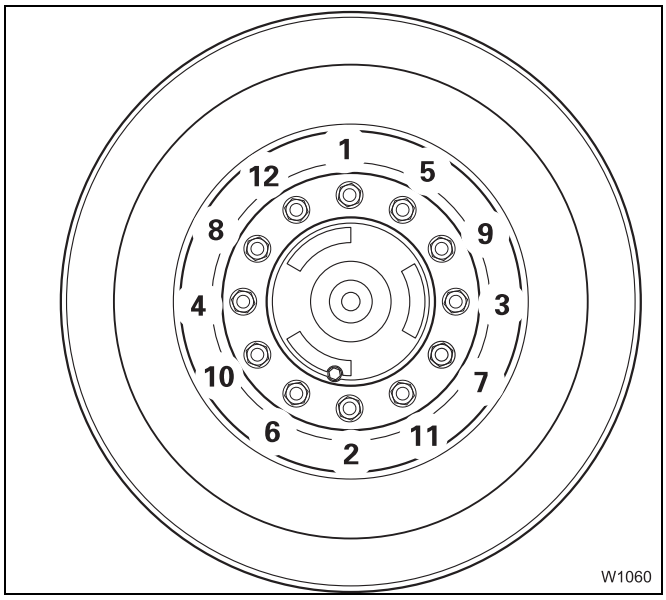
Mounting a wheel

- Check that the bearing surfaces of the wheel rim and hub are clean. (no paint, grease or oil).
- Lightly grease the wheel studs.

Risk of accidents!
Check the wheel rim, tyres, lug nuts and wheel studs for damage before mounting the spare wheel.
Damaged parts may not be mounted!
Mount only the original wheel as listed in the spare parts list or a permitted wheel of the same size and load bearing capacity!

- Place the wheel at the hub in an upright position.
- Extend or retract the outrigger cylinders until the holes in the wheel rims are in line with the wheel studs.
- Push the wheel on to the wheel studs. Make sure the threads of the wheel studs are not damaged.



- Tighten the wheel nuts (**1**) and (**2**) finger-tight to secure the wheel.
- Tighten the remaining wheel nuts finger-tight.
- Always tighten the wheel nuts in the order (**1**) to (**12**).
  - Tighten all wheel nuts first to 200 Nm (150 lbf ft).
  - Then all wheel nuts to 400 Nm (300 lbf ft).
  - Finally tighten all wheel nuts to 650 Nm (480 lbf ft).

After 50 km (30 mi) and 150 km (90 mi) retighten all wheel nuts to 650 Nm (480 lbf ft).

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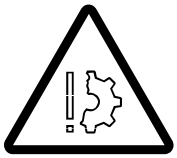
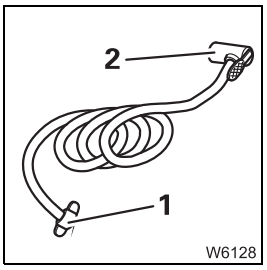
7.4.2 Inflating the tyres yourself

In emergencies you can fill the tyres with the compressed air system of the truck crane if an appropriate filling hose is available.
The tyres can be inflated up to a maximum pressure of about 8 bar (116 psi). This pressure might not correspond to the prescribed tyre pressure, depending on the tyres; ➠ *Tyres*, p. 1 - 15.



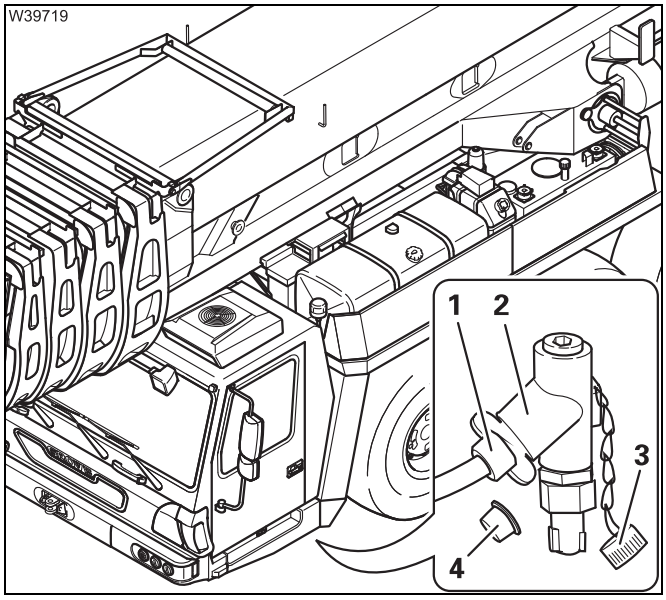
Risk of accidents due to excessive tyre pressure!
If the maximum pressure is above the specified tyre pressure, fill the tyres up to the maximum specified pressure.
This prevents the tyres becoming damaged and bursting while driving.

After you have inflated the tyres yourself, always drive directly to a service station or repair shop and adjust the tyre pressure.



The filling hose has a tyre inflator connection (**2**) and a connection (**1**).

Connecting the filling hose



- Remove the caps (**3**) and (**4**).
- Fasten the connection (**1**) to the filler connection (**2**).

You can now inflate the tyres.

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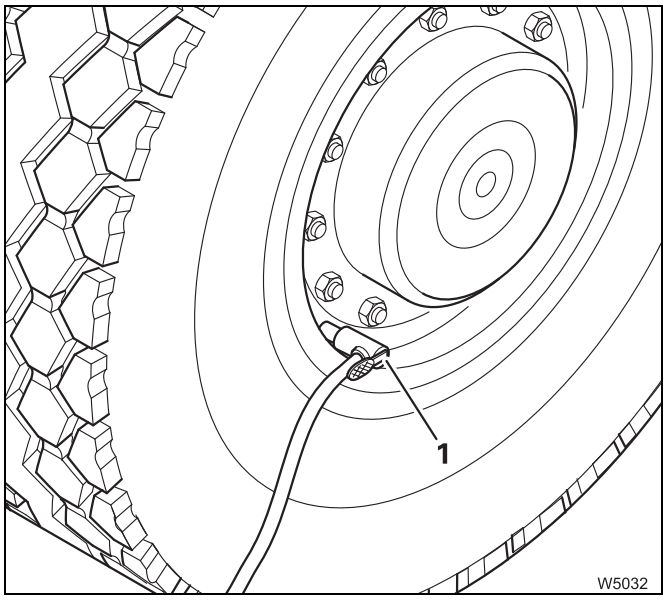
Inflating the tyres

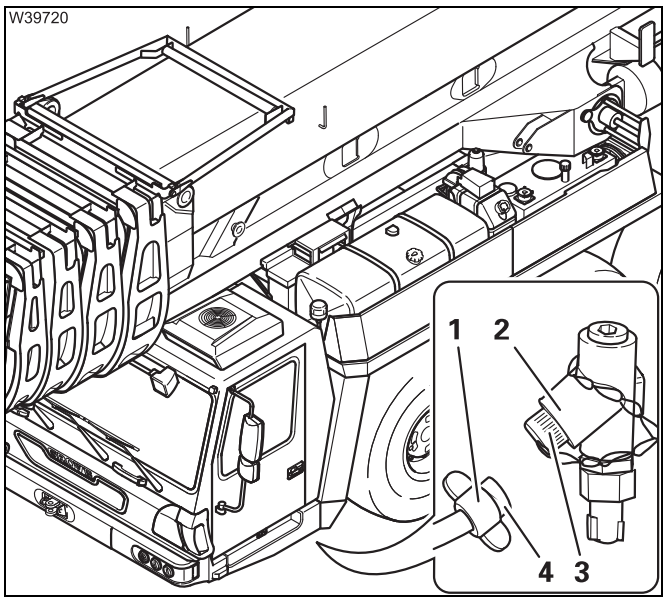
The maximum operation pressure of the compressed air system of 8 bar (116 psi) can only be reached with the engine running.



- Start the engine; ➠ p. 4 - 11.
- Fasten the tyre connection (**1**) to the tyre valve.
- Press the button on the tyre connection and inflate the tyre.
- Disconnect the tyre connection (**1**) from the tyre valve.

Remove the filling hose

Before driving, you must remove the filling hose from the filler connection.



- Remove the connection (**1**) from the filler connection (**2**).
- Close the filler connection and the connection with the caps (**3**) and (**4**).
- Stow the filling hose away.
- Drive to a service station or repair shop and adjust the tyre pressure.

Risk of damage to the compressed air system!
Always close the filler connection with the cap.
This prevents damage to the compressed air system and contamination of it.

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7.5 Fuses

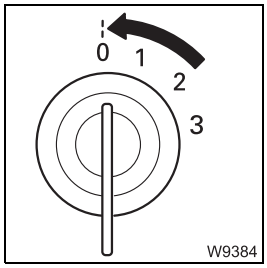
The fuses are divided into the groups. They are located

– In the driver's cab

– In the battery box.

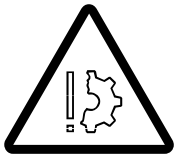
Notes on changing fuses

The positions of the fuses, their designations and which functions are protected by the respective fuses are shown in the following sections.



- Switch off the ignition whenever a fuse has to be replaced.

Risk of damage if the ignition is switched on!
Switch off the ignition whenever a fuse has to be replaced. This prevents the new fuse being blown immediately by the increased starting current after being installed.



Risk of damage by overloading!
Replace blown fuses only with new fuses of the same amperage. This prevents parts being overloaded and damaged or the fuse being immediately blown again.
Notify **Manitowoc Crane Care** if a fuse of the same amperage blows again after turning on the ignition.

Risk of fire!
Never repair a blown fuse with other electrically conductive materials.

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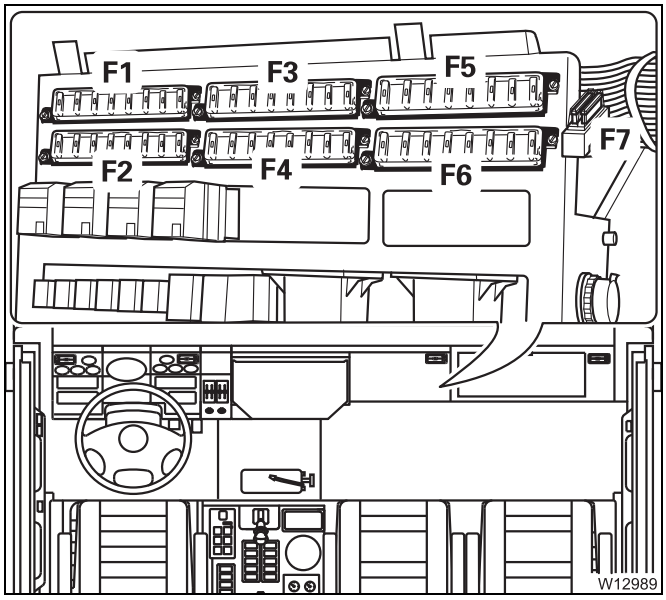
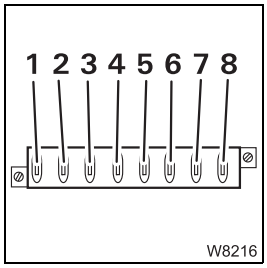
7.5.1 Fuses in the driver's cab



The driver's cab contains fuse groups **F1** to **F7**.

- Remove the cover (**1**).

The following sections show the designations of the individual fuses, including their amperage and function.



The designations 1 to 8 in the tables correspond to their order from left to right (fuse 1 is always the left fuse).

Observe the instructions regarding fuse changes; ➠ p. 7 - 19

Designation	Amperage (A)	Function
F1/1	20	E-control, vehicle engine (PLD)
F1/2	10	Engine electronic system (FMR and ADM), vehicle engine diagnostics plug
F1/3	10	Unassigned
F1/4	15	Left turn signal indicator, hazard warning system, brake lights
F1/5	10	Lighting in driver's cab, cigarette lighter
F1/6	20	Electronic gear system control
F1/7	10	Carrier electronics, Control unit ESX 4
F1/8	10	Unassigned

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Designation	Amperage (A)	Function
F2/1	10	Tachograph (elements in speedometer), radio, voltage transformer 24 V / 12 V
F2/2	15	heating system
F2/3	10	Warning lamp for electronic transmission system,
F2/4	10	Roof ventilator
F2/5	10	Telephone[1)]
F2/6	20	Transmission retarder
F2/7	10	Transfer case
F2/8	10	Unassigned

Designation	Amperage (A)	Function
F3/1	15	Control unit for automatic transmission, rotating beacon
F3/2	10	“Boom not set down“ indicator lamp[1)]
F3/3	10	Heater fan
F3/4	20	Mirror heating, mirror adjustment, electric window winder, air drier
F3/5	15	Auxiliary heater[1)]
F3/6	10	Right turn signal indicator
F3/7	10	Windshield wipers, horn
F3/8	5	suspension locking system

[1)] Additional equipment

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Designation	Amperage (A)	Function
F4/1	10	Speedometer, tachometer, displays for: fuel level, parking brake, brake circuit supply pressure
F4/2	10	Reverse gear audible signal, tail lamps
F4/3	5	separate steering
F4/4	20	Level adjustment system, outrigger pressure indicator
F4/5	20	Air-conditioning system
F4/6	5	Unassigned
F4/7	20	Gear oil cooler (additional equipment), hydraulic oil cooler
F4/8	10	Central lubrication system

Designation	Amperage (A)	Function
F5/1	10	displays for: coolant level, oil pressure, oil filter, vehicle engine oil temperature, battery charge indicator, longitudinal and transverse differential locks, engine electronics
F5/2	5	ECOS speed signal
F5/3	10	Vehicle engine diagnostics plug, electronic gear system diagnostics plug
F5/4	10	Engine electronic system (FMR, ADM, PLD), transmission electronics
F5/5	20	Carrier electronics, input/output boards I/O 1, I/O 2, I/O 3
F5/6	15	Input/output boards I/O 0, I/O 2
F5/7	10	carrier electronics
F5/8	10	Fog headlight, fog tail light

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Designation	Amperage (A)	Function
F6/1	10	Left parking light, left clearance lamps (driver's cab/turntable)
F6/2	10	Right parking light, right clearance lamps (driver's cab/turntable)
F6/3	10	Left side clearance lamps, left trailer light, Tachograph,
F6/4	5	Right side clearance lamps, right trailer light
F6/5	5	Low-beam headlight
F6/6	5	Low-beam headlight
F6/7	5	Full-beam headlight
F6/8	5	Full-beam headlight

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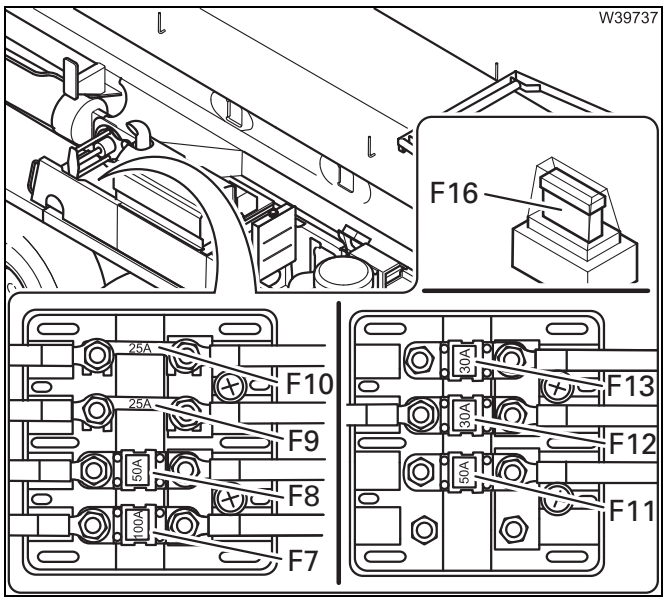
7.5.2 Fuses in the battery box

Danger from lead and lead compounds on batteries!
Battery poles, clamps, and parts of the battery itself contain lead and lead compounds. Wash your hands following work on these parts or in these areas!



Fuses **F7** to **F13** and **F16** are located in the battery box.

- Open the battery box.

The fuses are located to the right of the battery.

- Remove the caps.
- Observe the instructions regarding fuse changes; ➠ p. 7 - 19.

Designation	Amperage (A)	Function
F 7	100	Carrier central fuse
F 8	50	Superstructure ignition
F 9	25	Tachograph, heating, voltage distributor
F 10	25	Tachograph, heating, voltage distributor
F 11	50	Power supply relay, AdBlue dosing unit, AdBlue heating
F 12	30	ECM power supply
F 13	-	Unassigned
F 16	20	Battery charger connection

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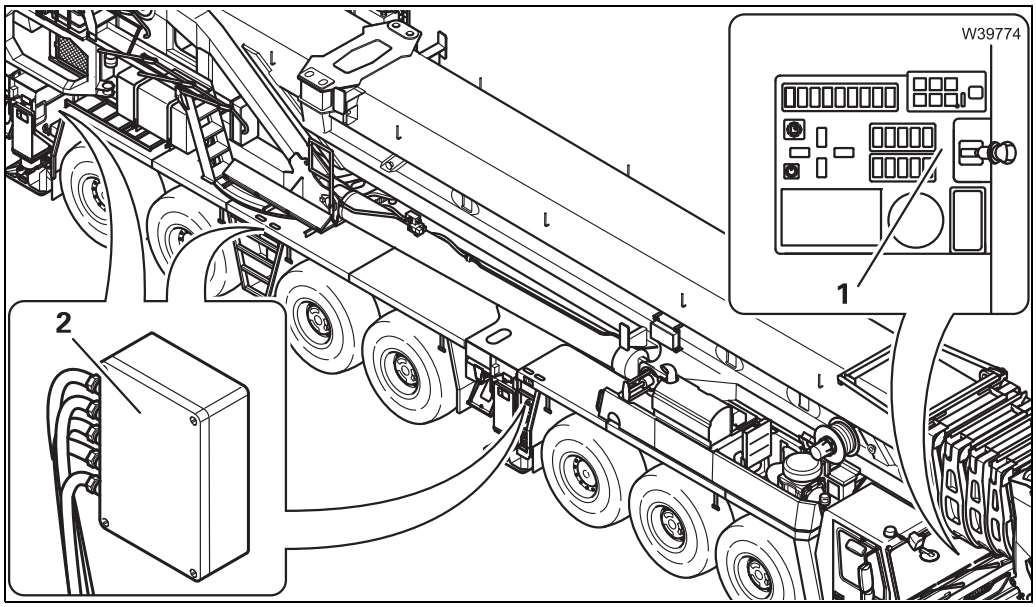
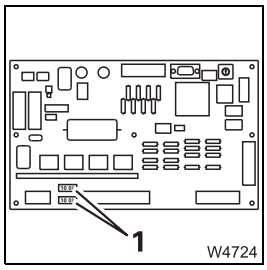
7.5.3 Fuses on circuit boards

There are four circuit boards (I/O) on the carrier:



Designation	Position on the truck crane
I/O 0	Under the cover (**1**) of the side instrument panel.
I/O 1	In the switch box (**2**) behind the transfer case.
I/O 2	In the control box (**2**), at the access ladder.
I/O 3	In the control box (**2**), at the rear of the crane carrier.



All fuses (**1**) on the circuit boards have a strength of **10 amps**.

Depending on the model, one or two fuses may be located on a single circuit board.

- Check the fuses and replace blown ones.

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7.6 Troubleshooting and correction

7.6.1 Engine malfunctions

In addition to this information; ➠ *Separate Betriebsanleitung Motor-Hersteller*.

Malfunction	Cause	Solution
Engine does not start – Starter does not turn	Battery master switch is switched off	Switch on the battery master switch; ➠ p. 4 - 9
	Switch the ignition off	➠ *Switching the ignition on*, p. 4 - 10
	Transmission not in neutral position	➠ *Shifting the transmission to neutral position*, p. 5 - 22
	Parking brake released	Apply the parking brake; ➠ p. 3 - 41
	Fuse F1/1 or F1/2 blown	Replace blown fuses; ➠ p. 7 - 19
	Emergency stop switch pressed	Reset emergency stop switch; ➠ p. 4 - 19
The truck crane drives at a maximum of 20 km/h (12 mph)	Key-operated switch switched on	Switch off the key-operated switch; ➠ p. 3 - 33
	A locking procedure is not yet completed	Lock the differential locks or steering
Engine does not start – Starter turns	Batteries insufficiently charged	Charge the batteries; ➠ *Maintenance manual*
	Fuel tank empty	1. Refuel; ➠ p. 4 - 7
		2. Bleed the fuel system; ➠ *Maintenance manual* ➠ *Separate Betriebsanleitung Motor-Hersteller*
	Air intake inhibitor closed	➠ *Opening the air intake inhibitor*, p. 4 - 20
Lamp does not go on after switching on the ignition if the engine is cold	Fuse F1/1, F1/2, F5/4 blown.	Replace blown fuses; ➠ p. 7 - 19

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Malfunction	Cause	Solution
Lights up 	Air filter clogged	Replace the dry air filter; ➠ *Maintenance manual*
Lights up 	Coolant level too low	Top up coolant; ➠ *Maintenance manual*
Coolant temperature too high	Coolant level too low	Top up coolant; ➠ *Maintenance manual*
	Oil level in the transmission too low	Check the oil level; ➠ *Maintenance manual*
	Outer surface of heat exchanger dirty	Clean the heat exchanger
	V-belt of coolant pump at engine loose	Tighten V-belt; ➠ *Separate Betriebsanleitung Motor-Hersteller*
 **Flashing** 	Engine oil pressure too low because engine oil level is too low	Check the oil level and refill if necessary; ➠ *Maintenance manual*
Engine cannot be switched off using the ignition key	Malfunction in the electronics	Turn off the engine with the emergency stop device; ➠ p. 7 - 1
Motor brake (engine retarder) cannot be switched on	Fuse F2/6 faulty	Replace blown fuses; ➠ p. 7 - 19
Engine/transmission diagnostics plug not working	Fuse F1/2 or F5/3 blown	Replace blown fuses; ➠ p. 7 - 19
The engine performance is reduced	The coolant is too hot or another malfunction. The engine is not switched off in order to drive on to the next place where it is possible to stop	Coolant too hot: Wait until the coolant has cooled down – the performance will increase again Other malfunctions: **Manitowoc Crane Care** must be notified
lights up (red) 	Due to a malfunction, the power is continuously reduced. The engine is not switched off in order to drive on to the next place where it is possible to stop.	**Manitowoc Crane Care** must be notified

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7.6.2 Malfunctions in the transmission

Malfunction	Cause	Solution
lights up (yellow) 	Malfunction to the transmission electronics	➠ *Procedure in the event of transmission malfunctions*, p. 7 - 35
Gear oil temperature too high	Long drive downhill with retarder switched on	Stop until the temperature of the transmission oil has dropped
	Oil level too low	Check the oil level and refill if necessary; ➠ *Maintenance manual*
	Coolant temperature too high	➠ *Engine malfunctions*, p. 7 - 27
Transmission not shifting automatically	Operating mode *Manual* switched on	Change over to *Automatic;* ➠ p. 5 - 23
	Fuse F1/6, F2/3 blown	Replace blown fuses; ➠ p. 7 - 19
Starting gear cannot be engaged	Malfunctions when changing gear from **R** to **D** or vice-versa	Shift the transmission to neutral position, select desired transmission mode
Transmission no longer upshifts at speeds over 20 km/h (12 mph)	A locking procedure is not yet completed	Lock the differential locks or steering
	Off-road gear on	Switch off the off-road gear; ➠ p. 5 - 51
	Level adjustment system switched on	Switch off the level adjustment system; ➠ p. 5 - 50
	Transmission oil colder than -7 °C (20 °F)	Wait until transmission oil temperature rises
Transmission not reacting when pressing buttons on the control unit	Fuse F3/1 blown	Replace blown fuses; ➠ p. 7 - 19
Transmission not downshifting after reducing the highest possible gear	Speed too high, engine speed too high	Brake truck crane until the shift point has been reached; ➠ p. 5 - 26
Transmission will not shift from neutral to transmission mode D while driving	Accelerator is being pressed	Release the accelerator and select transmission mode D
Engine/transmission diagnostics plug not working	Fuse F5/3 blown	Replace blown fuses; ➠ p. 7 - 19

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7.6.3 Service brake malfunctions

Malfunction	Cause	Solution
Lights up while driving or does not go out after the engine is started	The air pressure in one of the two circuits has fallen below 5.5 bar (80 psi)	The vehicle can be driven slowly to the next repair shop
	The air pressure in both circuits has fallen below 5.5 bar (80 psi)	1. Top up the compressed air supply at the filler connection; ➠ p. 7 - 6
		2. Tow the truck crane with the tow-rod; ➠ p. 7 - 6
Parking brake unable to be released **– Does not go out** **– Off**	Supply pressure too low	➠ *Building up supply pressure*, p. 5 - 10
The retarder cannot be engaged	Fuse F2/6 faulty	Replace blown fuses; ➠ p. 7 - 19

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7.6.4 Steering malfunctions

Malfunction	Cause	Solution
Steering wheel hard to turn, grating noises when steering	Oil level in the hydraulic oil tank too low	Check hydraulic oil level; ➠ *Maintenance manual*. Then drive at low speed to the nearest workshop and have the cause checked
 **One of the two symbols is red**	Oil level in the hydraulic oil tank too low	
	Steering circuit failure, for example, pump defective	The vehicle can be driven slowly to the next repair shop
 **Both symbols are red**	Both steering circuits have failed	The truck crane cannot be driven any further, since it can no longer be steered!
Separate steering cannot be activated	Current speed above about 5 km/h (3 mph)	Slow down or stop the truck crane
Separate steering cannot be switched off	Current speed above about 5 km/h (3 mph)	
Separate steering not working	Fuse F4/3 blown	Replace blown fuses; ➠ p. 7 - 19
 **Lights up and separate steering not working**	Malfunction to the carrier electronics	Read out error messages and notify **Manitowoc Crane Care**

7.6.5 Transfer case malfunctions

Malfunction	Cause	Solution
Switching operations are not conducted	Pressure of 5.5 bar (80 psi) has not yet built up in the reservoirs	Build up supply pressure; ➠ p. 5 - 10
	Fuse F2/7 faulty	Replace blown fuses; ➠ p. 7 - 19

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7.6.6 Differential lock malfunctions

Malfunction	Cause	Solution
Differential locks cannot be switched on	Current speed above about 5 km/h (3 mph)	Slow down or stop the truck crane
	Level adjustment not switched on	Switch on the key-operated switch; ➠ p. 3 - 33
	Drive train under tension	Drive truck crane slowly back and forth ➠ p. 5 - 52, ➠ p. 5 - 53
	Compressed air system insufficiently filled	➠ *Building up supply pressure*, p. 5 - 10
	Fuse F 1/7 blown	Replace blown fuses; ➠ p. 7 - 19
	Fuse F 5/1 blown	Replace blown fuses; ➠ p. 7 - 19
Differential locks cannot be switched off	Current speed above about 5 km/h (3 mph)	Slow down or stop the truck crane
	Drive train under tension	Drive truck crane slowly back and forth ➠ p. 5 - 52, ➠ p. 5 - 53

7.6.7 Malfunctions on the suspension

Malfunction	Cause	Solution
Suspension cannot be activated	Compressed air system insufficiently filled	➠ *Building up supply pressure*, p. 5 - 10
Suspension cannot be switched on or off	Fuse F3/8 blown	Replace blown fuses; ➠ p. 7 - 19
	Defective fuse on the I/O 0 circuit board	Replace blown fuses; ➠ p. 7 - 25

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7.6.8 Malfunctions in the hydraulic system/hydraulic oil cooler

Malfunction	Cause	Solution
Hydraulic oil temperature above 80 °C, ventilator in the hydraulic oil cooler	Hydraulic system under extreme strain and ambient temperature very high	Stop the truck crane while taking the traffic situation into account and run the engine until the oil has cooled down
Hydraulic oil temperature above 80 °C, ventilator in the hydraulic oil cooler not running	Fuse F4/7 blown	Stop the truck crane while taking the traffic situation into account, and replace the blown fuse if necessary; ➠ p. 7 - 19.
	Defective temperature sensor in the hydraulic system (error message is displayed)	Have the temperature sensor replaced
Hydraulic oil temperature too high	Oil level in the hydraulic oil tank too low	Check hydraulic oil level; ➠ *Maintenance manual*
	Oil cooler does not switch on, fuse F4/7 blown	Replace blown fuses; ➠ p. 7 - 19
Lights up 	Hydraulic oil return filter dirty	Change hydraulic oil return flow filter; ➠ *Maintenance manual*

7.6.9 Malfunctions of the level adjustment system

Malfunction	Cause	Solution
Level adjustment system not working	Key-operated switch switched off	Switch on the key-operated switch; ➠ p. 3 - 33
	Suspension is switched off	➠ *Switching on the suspension*, p. 5 - 15
	Fuse F4/4 blown	Replace blown fuses; ➠ p. 7 - 19
	Fuse on circuit board I/O 0, I/O 1 or IO 2 is blown	Replace blown fuses; ➠ p. 7 - 25

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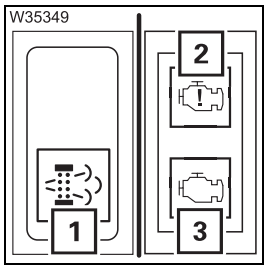
7.6.10 Reading error messages

You can read errors in the engine and exhaust system via a flashing code.

- Switch the engine off.
- Leave the ignition switched on.

This section describes the operating elements in the driver's cab.
The procedures in the crane cab are the same but the positions of the operating elements are different.



Switch on the diagnostic mode.

- Push the button (**1**) down once.

Reading an error code

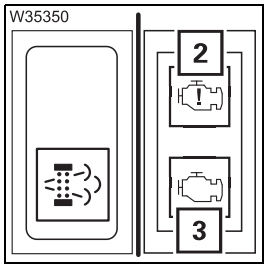
An error code consists of three to four digits, which are indicated by the frequency of the flashing lamp (**2**).

– The lamp (**3**) lights up for a few seconds before the first digit.

– The lamp (**2**) then goes out for a few seconds before each subsequent digit.

– The lamp (**3**) lights up for a few seconds after the last digit.

- Count how often the lamp (**3**) flashes between the brief intervals, and note all the digits:



Example:

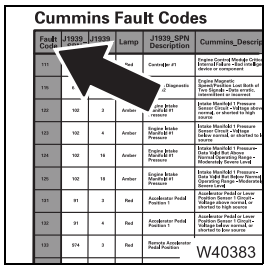
– Lamp (**3**) on for a few seconds

– Lamp (**2**) flashes**: 2x** – off **-3x** – off **-3x** – off **-2x** – off

– Lamp (**3**) on for a few seconds

The error code would be **2. 3. 3. 2**.

If further errors are present then the next error code is displayed after a short pause.



An overview of the error codes is provided as an appendix to these operating instructions; *Cummins Fault Codes*.

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7.7 Procedure in the event of malfunctions

7.7.1 Procedure in the event of transmission malfunctions

There are general transmission malfunctions and transmission malfunctions with warning messages.

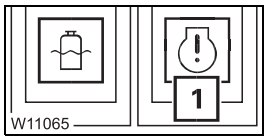
General malfunctions

When a general transmission malfunction occurs, only error codes are stored.
There is no display in the driver's cab.

Check regularly to see if error codes have been stored, e.g. during maintenance work; p. 7 - 36. If necessary, inform **Manitowoc Crane Care**.
This avoid situations where another small error could lead to transmission failure.

Serious malfunction

In the case of a serious malfunctions, error codes are stored and the transmission electronics switches to emergency operation. The display also shows the malfunction via *Transmission* and *Electronic gear system*.



– The warning lamp (**1**) lights up and an audible signal is given for ten seconds.

– The currently selected gear is displayed (e.g. 4th gear) and the transmission is set to locked position.

• Drive in the current gear until you reach the next safe place to stop, and stop the crane.

Switch to neutral position **N** only once you have reached a safe place to stop. You can then no longer select the gear positions **D** or **R**.

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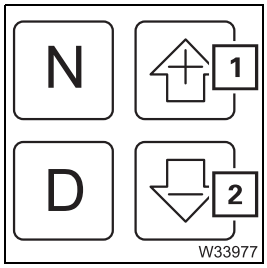
Transmission shift lock

The transmission no longer switches.

- Apply the parking brake.
- Switch to neutral position **N**.
- Read the error codes and contact **Manitowoc Crane Care**.

Reading out error codes

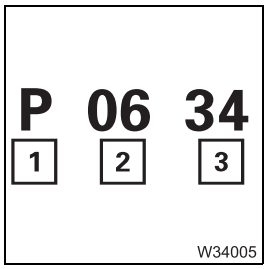
You can display all the stored error codes one after the other.



- Press buttons (**1**) and (**2**) simultaneously twice.

The *Transmission* display shows the first stored error code.

Each error code consists of four displays which are shown continuously in succession.

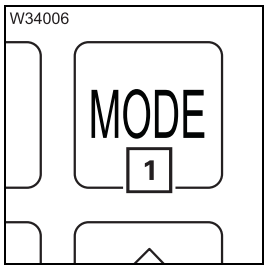


Each error code consists of three displays which are shown continuously in succession.

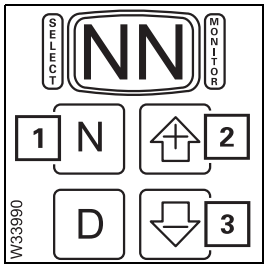
1 Error type

2 Error number, 1st part

3 Error number, 2nd part



- To read further error codes, press button (**1**).
  Each time you press the button, the next error code will be displayed.



- Press button (**1**) once to exit the error display.

or

- Press buttons (**2**) and (**3**) together once.

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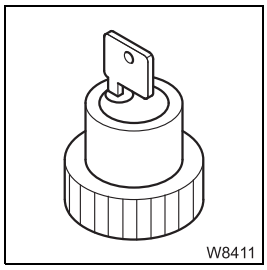
7.7.2 Separate steering emergency operation

When the separate steering shows a malfunction due to a malfunction in the carrier electronic system you can bring the steering back to *on-road drive* using emergency operation.

Bringing the steering into a condition for *on-road driving*

In the event of a malfunction all locking devices are automatically bled and are then subjected to spring force. To produce all the required lock connections for on-road driving, you must bring all axle lines into the straight forward position one after the other.

- Steer the wheels of the **1st to 3rd axle lines** into the straight forward position with the steering wheel.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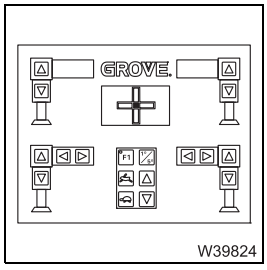
- Switch on the key-operated switch.



W39824

- At an *outrigger* control unit extend an outrigger cylinder or outrigger beam against the stop and keep the button pressed to build up pressure.

Now, using the emergency activation, a second person can:

– First steer the wheels of the **6th/7th axle lines** into the straight forward position, so that the connection to the drag rods of the 3rd and 7th axle lines engage.

– The second person can then steer the wheels of the **4th and 5th axle line** to the straight forward position so that the steering is locked at this axle line.

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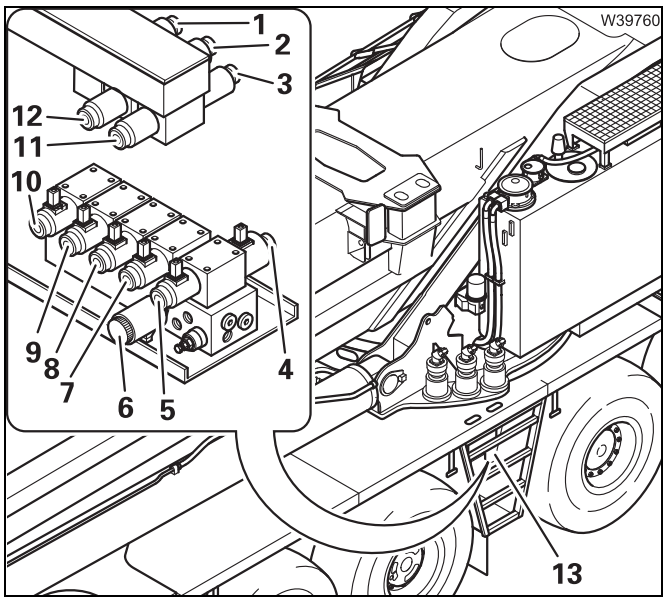


The valves are located behind the metal plate (**13**).

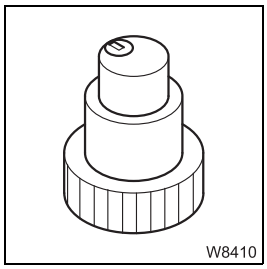
- Actuate the valve Y4710 (**1**) and also the valves for the required steering direction:

6th/7th axle line to the left:	Y4703 (**4**), Y4721 (**10**), Y4722 (**9**)
6th/7th axle line to the right:	Y4702 (**5**), Y4731 (**8**), Y4732 (**7**)
4th axle line to the left:	Y4705 **(2**)
4th axle line to the right:	Y4706 (**12**)
5. axle line to the left:	Y4707 (**3**)
5. axle line to the right:	Y4708 (**11**)

Locking the steering

The wheels of the **1st to 3rd axle lines** must be positioned straight ahead.

- Use the corresponding valves to steer the **6th and 7th axle line** into the straight forward position until the drag rods between the 3rd and 7th axle lines audibly engage.
- Use the corresponding valves to steer the **5th axle line** into the straight forward position. The axle line is locked when it can no longer be steered by pressing the valve.
- Use the corresponding valves to steer the **4th axle line** into the straight forward position. The axle line is locked if it can no longer be steered by pressing the valve.



- Switch off the key-operated switch.

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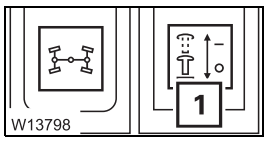

- Check that the steering is locked:
  - All wheels must be in the straight forward position.
  - The lamp (**1**) must be off.
  - The wheels of the 1st, 2nd, and 3rd axle lines must move in the same direction if they are steered with the steering wheel. Steer the axle lines in one direction together. The wheels of the 6th and 7th must simultaneously steer in the opposite direction. The wheels of the 4th and 5th axle lines must remain in the straight forward position.

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Cummins Fault Codes

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
111	629	12	Red	Controller #1	Engine Control Module Critical Internal Failure - Bad intelligent device or component	X	X	X	X	X	X
115	612	2	Red	System Diagnostic Code #2	Engine Magnetic Speed/Position Lost Both of Two Signals - Data erratic, intermittent or incorrect	X	X	X	X	X	X
122	102	3	Amber	Engine Intake Manifold #1 Pressure	Intake Manifold 1 Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
123	102	4	Amber	Engine Intake Manifold #1 Pressure	Intake Manifold 1 Pressure Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
124	102	16	Amber	Engine Intake Manifold #1 Pressure	Intake Manifold 1 Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X			X	
125	102	18	Amber	Engine Intake Manifold #1 Pressure	Intake Manifold 1 Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level			X			X
131	91	3	Red	Accelerator Pedal Position 1	Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
132	91	4	Red	Accelerator Pedal Position 1	Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
133	974	3	Red	Remote Accelerator Pedal Position	Remote Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
134	974	4	Red	Remote Accelerator Pedal Position	Remote Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
135	100	3	Amber	Engine Oil Pressure	Engine Oil Rifle Pressure 1 Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
141	100	4	Amber	Engine Oil Pressure	Engine Oil Rifle Pressure 1 Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
143	100	18	Amber	Engine Oil Pressure	Engine Oil Rifle Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
144	110	3	Amber	Engine Coolant Temperature	Engine Coolant Temperature 1 Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
145	110	4	Amber	Engine Coolant Temperature	Engine Coolant Temperature 1 Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
146	110	16	Amber	Engine Coolant Temperature	Engine Coolant Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
147	91	1	Red	Accelerator Pedal Position 1	Accelerator Pedal or Lever Position 1 Sensor Circuit Frequency - Data valid but below normal operating Range	X	X	X	X	X	X
148	91	0	Red	Accelerator Pedal Position 1	Accelerator Pedal or Lever Position Sensor 1 - Data valid but above normal operational range - Most Severe Level	X	X	X	X	X	X
151	110	0	Red	Engine Coolant Temperature	Engine Coolant Temperature - Data valid but above normal operational range - Most Severe Level	X	X	X	X	X	X
153	105	3	Amber	Engine Intake Manifold 1 Temperature	Intake Manifold 1 Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
154	105	4	Amber	Engine Intake Manifold 1 Temperature	Intake Manifold 1 Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
155	105	0	Red	Engine Intake Manifold 1 Temperature	Intake Manifold 1 Temperature - Data valid but above normal operational range - Most Severe Level	X	X	X	X	X	X
187	3510	4	Amber	Sensor supply voltage 2	Sensor Supply 2 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
193	520199	3	Amber	Cruise Control	Cruise Control (Resistive) Signal Circuit - Voltage above normal, or shorted to high source						
194	520199	4	Amber	Cruise Control	Cruise Control (Resistive) Signal Circuit - Voltage below normal, or shorted to low source						
195	111	3	Amber	Engine Coolant Level	Coolant Level Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
196	111	4	Amber	Engine Coolant Level	Coolant Level Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
197	111	18	Amber	Engine Coolant Level	Coolant Level - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
212	175	3	Amber	Engine Oil Temperature 1	Engine Oil Temperature Sensor 1 Circuit - Voltage above normal, or shorted to high source			X			X
213	175	4	Amber	Engine Oil Temperature 1	Engine Oil Temperature Sensor 1 Circuit - Voltage below normal, or shorted to low source			X			X
214	175	0	Red	Engine Oil Temperature 1	Engine Oil Temperature - Data valid but above normal operational range - Most Severe Level			X			X
221	108	3	Amber	Barometric Pressure	Barometric Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
222	108	4	Amber	Barometric Pressure	Barometric Pressure Sensor Circuit - Voltage above normal, or shorted to low source	X	X	X		X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
227	3510	3	Amber	Sensor supply voltage 2	Sensor Supply 2 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
231	109	3	Amber	Engine Coolant Pressure	Coolant Pressure Sensor Circuit - Voltage above normal, or shorted to high source						
232	109	4	Amber	Engine Coolant Pressure	Coolant Pressure Sensor Circuit - Voltage below normal, or shorted to low source						
233	109	18	Amber	Engine Coolant Pressure	Coolant Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level						
234	190	0	Red	Engine Speed	Engine Crankshaft Speed/Position - Data valid but above normal operational range - Most Severe Level	X	X	X	X	X	X
235	111	1	Red	Engine Coolant Level	Coolant Level - Data valid but below normal operational range - Most Severe Level	X	X	X	X	X	X
237	644	2	Amber	Engine External Speed Command Input	External Speed Command Input (Multiple Unit Synchronization) - Data erratic, intermittent or incorrect				X		X
238	3511	4	Amber	Sensor supply voltage 3	Sensor Supply 3 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
239	3511	3	Amber	Sensor supply voltage 3	Sensor Supply 3 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
241	84	2	Amber	Wheel-Based Vehicle Speed	Wheel-Based Vehicle Speed - Data erratic, intermittent or incorrect	X	X	X	X	X	X
242	84	10	Amber	Wheel-Based Vehicle Speed	Wheel-Based Vehicle Speed Sensor Circuit tampering has been detected - Abnormal rate of change	X	X			X	
245	647	4	Amber	Engine Fan Clutch 1 Output Device Driver	Fan Control Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
249	171	3	Amber	Ambient Air Temperature	Ambient Air Temperature Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X			X	
253	98	1	Red	Engine Oil Level	Engine Oil Level - Data valid but below normal operational range - Most Severe Level						
256	171	4	Amber	Ambient Air Temperature	Ambient Air Temperature Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X			X	
261	174	16	Amber	Engine Fuel Temperature 1	Engine Fuel Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level						
263	174	3	Amber	Engine Fuel Temperature 1	Engine Fuel Temperature Sensor 1 Circuit - Voltage above normal, or shorted to high source						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
265	174	4	Amber	Engine Fuel Temperature 1	Engine Fuel Temperature Sensor 1 Circuit - Voltage below normal, or shorted to low source						
266	174	0	Red	Engine Fuel Temperature 1	Engine Fuel Temperature - Data valid but above normal operational range - Most Severe Level						
269	1195	2	Red	Anti-theft Password Valid Indicator	Antitheft Password Valid Indicator - Data erratic, intermittent or incorrect			X			
271	1347	4	Amber	Engine Fuel Pump Pressurizing Assembly #1	Engine Fuel Pump Pressurizing Assembly 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
272	1347	3	Amber	Engine Fuel Pump Pressurizing Assembly #2	Engine Fuel Pump Pressurizing Assembly 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
281	1347	7	Amber	Engine Fuel Pump Pressurizing Assembly #3	Engine Fuel Pump Pressurizing Assembly 1 - Mechanical system not responding or out of adjustment	X	X	X	X	X	X
285	639	9	Amber	J1939 Network #1, Primary Vehicle Network (previously SAE J1939 Data Link)	SAE J1939 Multiplexing PGN Timeout Error - Abnormal update rate	X	X	X	X	X	X
286	639	13	Amber	J1939 Network #1, Primary Vehicle Network (previously SAE J1939 Data Link)	SAE J1939 Multiplexing Configuration Error - Out of Calibration	X	X	X	X	X	X
288	974	19	Red	Remote Accelerator Pedal Position	SAE J1939 Multiplexing Remote Accelerator Pedal or Lever Position Sensor System - Received Network Data In Error	X	X	X	X	X	X
291	625	9	Red	Proprietary Datalink	Proprietary Datalink Error (OEM/Vehicle Datalink) - Abnormal update rate	X	X	X	X	X	X
292	441	14	Red	Auxiliary Temperature 1	Auxiliary Temperature Sensor Input 1 - Special Instructions	X	X	X	X	X	X
293	441	3	Amber	Auxiliary Temperature 1	Auxiliary Temperature Sensor Input 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
294	441	4	Amber	Auxiliary Temperature 1	Auxiliary Temperature Sensor Input 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
295	108	2	Amber	Barometric Pressure	Barometric Pressure - Data erratic, intermittent or incorrect			X			X
296	1388	14	Red	Auxiliary Pressure #2	Auxiliary Pressure Sensor Input 2 - Special Instructions	X	X	X	X	X	X
297	1388	3	Amber	Auxiliary Pressure #2	Auxiliary Pressure Sensor Input 2 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
298	1388	4	Amber	Auxiliary Pressure #2	Auxiliary Pressure Sensor Input 2 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
319	251	2	Amber (Blinking)	Real Time Clock	Real Time Clock - Data erratic, intermittent or incorrect						X
322	651	5	Amber	Engine Injector Cylinder #01	Injector Solenoid Driver Cylinder 1 Circuit - Current below normal or open circuit	X	X	X	X	X	X
323	655	5	Amber	Engine Injector Cylinder #05	Injector Solenoid Driver Cylinder 5 Circuit - Current below normal or open circuit	X	X	X			X
324	653	5	Amber	Engine Injector Cylinder #03	Injector Solenoid Driver Cylinder 3 Circuit - Current below normal or open circuit	X	X	X	X	X	X
325	656	5	Amber	Engine Injector Cylinder #06	Injector Solenoid Driver Cylinder 6 Circuit - Current below normal or open circuit	X	X	X			X
331	652	5	Amber	Engine Injector Cylinder #02	Injector Solenoid Driver Cylinder 2 Circuit - Current below normal or open circuit	X	X	X	X	X	X
332	654	5	Amber	Engine Injector Cylinder #04	Injector Solenoid Driver Cylinder 4 Circuit - Current below normal or open circuit	X	X	X	X	X	X
334	110	2	Amber	Engine Coolant Temperature	Engine Coolant Temperature - Data erratic, intermittent or incorrect			X			X
338	1267	3	Amber	Idle Shutdown Vehicle Accessories Relay Driver Circuit	Idle Shutdown Vehicle Accessories Relay Driver Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
339	1267	4	Amber	Idle Shutdown Vehicle Accessories Relay Driver Circuit	Idle Shutdown Vehicle Accessories Relay Driver Circuit - Voltage below normal, or shorted to low source	X	X	X		X	X
343	629	12	Amber	Controller #1	Engine Control Module Warning Internal Hardware Failure - Bad intelligent device or component	X	X	X	X	X	X
349	191	16	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X		X	X
351	3597	12	Amber	ECU Power Output Supply Voltage #1	Injector Power Supply - Bad intelligent device or component	X	X	X	X	X	X
352	3509	4	Amber	Sensor supply voltage 1	Sensor Supply 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
386	3509	3	Amber	Sensor supply voltage 1	Sensor Supply 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
415	100	1	Red	Engine Oil Pressure	Engine Oil Rifle Pressure - Data valid but below normal operational range - Most Severe Level	X	X	X	X	X	X
418	97	15	Amber (Blinking)	Water In Fuel Indicator	Water in Fuel Indicator - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	X
421	175	16	Amber	Engine Oil Temperature 1	Engine Oil Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level			X			X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
422	111	2	Amber	Engine Coolant Level	Coolant Level - Data erratic, intermittent or incorrect			X			X
425	175	2	Amber	Engine Oil Temperature 1	Engine Oil Temperature - Data erratic, intermittent or incorrect			X			X
426	639	2	None	J1939 Network #1, Primary Vehicle Network (previously SAE J1939 Data Link)	J1939 Network #1 - Data erratic, intermittent or incorrect						
427	639	9	None	J1939 Network #1, Primary Vehicle Network (previously SAE J1939 Data Link)	SAE J1939 Datalink - Abnormal update rate						
428	97	3	Amber	Water In Fuel Indicator	Water in Fuel Indicator Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
429	97	4	Amber	Water In Fuel Indicator	Water in Fuel Indicator Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
431	558	2	Amber	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch - Data erratic, intermittent or incorrect	X	X	X	X	X	X
432	558	13	Red	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch Circuit - Out of Calibration	X	X	X	X	X	X
435	100	2	Amber	Engine Oil Pressure	Engine Oil Rifle Pressure - Data erratic, intermittent or incorrect	X	X	X	X	X	X
436	105	2	Amber	Engine Intake Manifold 1 Temperature	Intake Manifold 1 Temperature - Data erratic, intermittent or incorrect						X
441	168	18	Amber	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
442	168	16	Amber	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
449	157	0	Red	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data valid but above normal operational range - Most Severe Level	X	X	X	X	X	X
451	157	3	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
452	157	4	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
471	98	17	Amber (Blinking)	Engine Oil Level	Engine Oil Level - Data Valid But Below Normal Operating Range - Least Severe Level						
483	1349	3	Amber	Engine Injector Metering Rail 2 Pressure	Injector Metering Rail 2 Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
484	1349	4	Amber	Engine Injector Metering Rail 2 Pressure	Injector Metering Rail 2 Pressure Sensor Circuit - Voltage below normal, or shorted to low source			X			X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
487	626	18	Amber	Engine Start Enable Device 1	Start Enable Device 1 Canister Empty (Ether Injection) - Data Valid But Below Normal Operating Range						
488	105	16	Amber	Engine Intake Manifold Temperature	Intake Manifold 1 Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
489	191	18	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X		X	X
497	1377	2	Amber	Engine Synchronization Switch	Multiple Unit Synchronization Switch - Data erratic, intermittent or incorrect	X	X	X		X	X
515	3514	3	Amber	Sensor supply voltage 6	Sensor Supply 6 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
516	3514	4	Amber	Sensor supply voltage 6	Sensor Supply 6 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
523	611	2	Amber	System Diagnostic Code #1	Auxiliary Intermediate (PTO) Speed Switch Validation - Data erratic, intermittent or incorrect	X	X	X		X	X
527	702	3	Amber	Auxiliary I/O #02	Auxiliary Input/Output 2 Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
528	93	2	Amber	Engine Net Brake Torque	Auxiliary Alternate Torque Validation Switch - Data erratic, intermittent or incorrect			X			X
529	703	3	Amber	Auxiliary I/O #03	Auxiliary Input/Output 3 Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
535	174	2	Amber	Engine Fuel Temperature 1	Engine Fuel Temperature - Data erratic, intermittent or incorrect						
546	94	3	Amber	Engine Fuel Delivery Pressure	Fuel Delivery Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X	X		X	X	
547	94	4	Amber	Engine Fuel Delivery Pressure	Fuel Delivery Pressure Sensor Circuit - Voltage below normal, or shorted to low source	X	X		X	X	
553	157	16	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
554	157	2	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data erratic, intermittent or incorrect						
555	101	16	Amber	Engine Crankcase Pressure	Crankcase Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X		X
556	101	0	Red	Engine Crankcase Pressure	Crankcase Pressure - Data valid but above normal operational range - Most Severe Level	X	X	X	X		X
559	157	18	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
584	677	3	Amber	Engine Starter Motor Relay	Starter Relay Driver Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
585	677	4	Amber	Engine Starter Motor Relay	Starter Relay Driver Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
595	103	16	Amber	Engine Turbocharger 1 Speed	Turbocharger 1 Speed - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X		X
599	640	14	Red	Engine External Protection Input	Auxiliary Commanded Dual Output Shutdown - Special Instructions	X	X			X	
611	1383	31	None	Engine was Shut Down Hot	Engine Shut Down Hot - Condition Exists						
629	1176	18	Amber	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Data Valid But Below Normal Operating Range - Moderately						
649	1378	31	Amber (Blinking)	Engine Oil Change Interval	Engine Oil Change Interval - Condition Exists	X	X		X	X	
686	103	2	Amber	Engine Turbocharger 1 Speed	Turbocharger 1 Speed - Data erratic, intermittent or incorrect						
687	103	18	Amber	Engine Turbocharger 1 Speed	Turbocharger 1 Speed - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X		X
688	98	0	Red	Engine Oil Level	Engine Oil Level - Data valid but above normal operational range - Most Severe Level						
689	190	2	Amber	Engine Speed	Engine Crankshaft Speed/Position - Data erratic, intermittent or incorrect	X	X	X	X	X	X
691	1172	3	Amber	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
692	1172	4	Amber	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
693	1172	2	Amber	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature - Data erratic, intermittent or incorrect						
697	1136	3	Amber	Engine ECU Temperature	Engine ECU Temperature Sensor Circuit - Voltage above normal, or shorted to high source						
698	1136	4	Amber	Engine ECU Temperature	Engine ECU Temperature Sensor Circuit - Voltage below normal, or shorted to low source						
699	1136	2	Amber	Engine ECU Temperature	Engine ECU Temperature - Data erratic, intermittent or incorrect						X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
731	723	7	Amber	Engine Speed 2	Engine Speed / Position Camshaft and Crankshaft Misalignment - Mechanical system not responding or out of adjustment	X	X	X	X	X	X
741	1176	3	Amber	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
742	1176	4	Amber	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
743	1176	2	Amber	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Data erratic, intermittent or incorrect	X	X	X	X	X	X
755	157	7	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Mechanical system not responding or out of adjustment						
769	597	3	Amber	Brake Switch	Brake Switch Circuit - Voltage above normal, or shorted to high source			X			X
771	597	4	Amber	Brake Switch	Brake Switch Circuit - Voltage below normal, or shorted to low source		X				
778	723	2	Amber	Engine Speed 2	Engine Camshaft Speed / Position Sensor - Data erratic, intermittent or incorrect	X	X	X	X	X	X
784	1590	2	None	Adaptive Cruise Control Mode	Adaptive Cruise Control Mode - Data erratic, intermittent or incorrect						X
1117	3597	2	None	ECU Power Output Supply Voltage #1	Power Supply Lost With Ignition On - Data erratic, intermittent or incorrect	X	X	X	X	X	X
1139	651	7	Amber	Engine Injector Cylinder #01	Injector Solenoid Driver Cylinder 1 - Mechanical system not responding or out of adjustment			X			X
1141	652	7	Amber	Engine Injector Cylinder #02	Injector Solenoid Driver Cylinder 2 - Mechanical system not responding or out of adjustment	X	X	X	X	X	X
1142	653	7	Amber	Engine Injector Cylinder #03	Injector Solenoid Driver Cylinder 3 - Mechanical system not responding or out of adjustment	X	X	X	X	X	X
1143	654	7	Amber	Engine Injector Cylinder #04	Injector Solenoid Driver Cylinder 4 - Mechanical system not responding or out of adjustment	X	X	X	X	X	X
1144	655	7	Amber	Engine Injector Cylinder #05	Injector Solenoid Driver Cylinder 5 - Mechanical system not responding or out of adjustment	X	X	X			X
1145	656	7	Amber	Engine Injector Cylinder #06	Injector Solenoid Driver Cylinder 6 - Mechanical system not responding or out of adjustment	X	X	X			X
1228	27	2	Amber	Engine Exhaust Gas Recirculation 1 Valve Position	EGR Valve Position - Data erratic, intermittent or incorrect						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
1239	2623	3	Amber	Accelerator Pedal #1 Channel 2	Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
1241	2623	4	Amber	Accelerator Pedal #1 Channel 2	Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
1242	91	2	Red	Accelerator Pedal Position 1	Accelerator Pedal or Lever Position Sensor 1 - Data erratic, intermittent or incorrect	X	X	X	X	X	X
1256	1563	2	Amber	Incompatible Monitor/Controller	Control Module Identification Input State Error - Data erratic, intermittent or incorrect			X			X
1257	1563	2	Red	Incompatible Monitor/Controller	Control Module Identification Input State Error - Data erratic, intermittent or incorrect			X			X
1358	91	3	Amber	Accelerator Pedal Position 1	Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
1359	91	4	Amber	Accelerator Pedal Position 1	Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
1427	4185	31	Amber	Overspeed Shutdown Relay Driver	Overspeed Shutdown Relay Driver Diagnostic has detected an error - Condition Exists	X	X		X	X	
1428	4186	31	Amber	Low Oil Pressure Shutdown Relay Driver	Low Oil Pressure (LOP) Shutdown Relay Driver Diagnostic has detected an error - Condition Exists	X	X		X	X	
1429	4187	31	Amber	High Engine Temperature Shutdown Relay Driver	High Engine Temperature (HET) Shutdown Relay Driver Diagnostic has detected an error - Condition Exists	X	X	X	X	X	X
1431	4188	31	Amber	Pre-Low Oil Pressure Indicator Relay Driver	Pre-Low Oil Pressure Warning Relay Driver Diagnostic has detected an error - Condition Exists	X	X		X	X	
1432	4223	31	Amber	Pre-High Engine Temperature Warning Relay Driver	Pre-High Engine Temperature Warning Relay Driver Diagnostic has detected an error - Condition Exists	X	X		X	X	
1515	91	19	Red	Accelerator Pedal Position 1	SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System - Received Network Data In Error	X	X	X	X	X	X
1539	1387	3	Amber	Auxiliary Pressure #1	Auxiliary Pressure Sensor Input 1 Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
1548	657	5	Amber	Engine Injector Cylinder #7	Injector Solenoid Driver Cylinder 7 Circuit - Current below normal or open circuit						
1549	658	5	Amber	Engine Injector Cylinder #8	Injector Solenoid Driver Cylinder 8 Circuit - Current below normal or open circuit						
1551	660	5	Amber	Engine Injector Cylinder #10	Injector Solenoid Driver Cylinder 10 Circuit - Current below normal or open circuit						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
1552	661	5	Amber	Engine Injector Cylinder #11	Injector Solenoid Driver Cylinder 11 Circuit - Current below normal or open circuit						
1553	662	5	Amber	Engine Injector Cylinder #12	Injector Solenoid Driver Cylinder 12 Circuit - Current below normal or open circuit						
1554	663	5	Amber	Engine Injector Cylinder #13	Injector Solenoid Driver Cylinder 13 Circuit - Current below normal or open circuit						
1555	664	5	Amber	Engine Injector Cylinder #14	Injector Solenoid Driver Cylinder 14 Circuit - Current below normal or open circuit						
1556	665	5	Amber	Engine Injector Cylinder #15	Injector Solenoid Driver Cylinder 15 Circuit - Current below normal or open circuit						
1557	666	5	Amber	Engine Injector Cylinder #16	Injector Solenoid Driver Cylinder 16 Circuit - Current below normal or open circuit						
1621	1387	4	Amber	Auxiliary Pressure #1	Auxiliary Pressure Sensor Input 1 Circuit - Voltage below normal, or shorted to low source	X	X	X		X	X
1622	659	5	Amber	Engine Injector Cylinder #9	Injector Solenoid Driver Cylinder 9 Circuit - Current below normal or open circuit						
1654	1323	31	Amber	Engine Misfire Cylinder #1	Engine Misfire Cylinder 1 - Condition Exists	X	X		X	X	
1655	1324	31	Amber	Engine Misfire Cylinder #2	Engine Misfire Cylinder 2 - Condition Exists	X	X		X	X	
1656	1325	31	Amber	Engine Misfire Cylinder #3	Engine Misfire Cylinder 3 - Condition Exists	X	X		X	X	
1657	1326	31	Amber	Engine Misfire Cylinder #4	Engine Misfire Cylinder 4 - Condition Exists	X	X		X	X	
1658	1327	31	Amber	Engine Misfire Cylinder #5	Engine Misfire Cylinder 5 - Condition Exists	X	X				
1659	1328	31	Amber	Engine Misfire Cylinder #6	Engine Misfire Cylinder 6 - Condition Exists	X	X				
1664	4796	31	Amber	Aftertreatment 1 Diesel Oxidation Catalyst Missing	Aftertreatment 1 Diesel Oxidation Catalyst Missing - Condition Exists	X	X	X	X	X DOC+ SCR	X
1668	1761	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
1669	1761	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
1673	1761	1	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level - Data valid but below normal operational range - Most Severe Level	X	X	X	X	X With SCR	X
1677	3031	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
1678	3031	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
1679	3031	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	X
1682	3362	31	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Input Lines	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Input Lines - Condition Exists	X	X	X	X	X With SCR	X
1683	3363	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
1684	3363	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
1685	3364	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
1686	3364	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
1691	5298	18	Amber	Aftertreatment 1 Diesel Oxidation Catalyst Conversion Efficiency	Aftertreatment 1 Diesel Oxidation Catalyst Conversion Efficiency - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X DOC+ SCR	X
1694	3226	2	Amber	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Data erratic, intermittent or incorrect	X	X		X	X With SCR	
1695	3513	3	Amber	Sensor supply voltage 5	Sensor Supply 5 - Voltage above normal, or shorted to high source	X	X	X	X	X	X
1696	3513	4	Amber	Sensor supply voltage 5	Sensor Supply 5 - Voltage below normal, or shorted to low source	X	X	X	X	X	X
1699	1761	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Data erratic, intermittent or incorrect						
1712	3363	18	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
1713	3363	16	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
1714	3364	13	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Out of Calibration	X	X	X	X	X With SCR	X
1715	3364	11	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Root Cause Not Known	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
1718	1322	31	Amber	Engine Misfire for Multiple Cylinders	Engine Misfire for Multiple Cylinders - Condition Exists						
1776	2634	3	Amber	Power Relay	Power Relay Driver Circuit - Voltage above normal, or shorted to high source						X
1777	2634	4	Amber	Power Relay	Power Relay Driver Circuit - Voltage below normal, or shorted to low source						X
1843	101	3	Amber	Engine Crankcase Pressure	Crankcase Pressure Circuit - Voltage above normal, or shorted to high source	X	X	X	X		X
1844	101	4	Amber	Engine Crankcase Pressure	Crankcase Pressure Circuit - Voltage below normal, or shorted to low source	X	X	X	X		X
1847	110	14	Red	Engine Coolant Temperature	Engine Coolant Temperature - Special Instructions						
1852	97	16	Amber	Water In Fuel Indicator	Water in Fuel Indicator - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
1861	3217	2	Amber	Aftertreatment 1 Intake O2	Aftertreatment Intake Oxygen Sensor - Data erratic, intermittent or incorrect						
1866	411	2	Amber	Engine Exhaust Gas Recirculation 1 Differential Pressure	Exhaust Gas Recirculation Differential Pressure - Data erratic, intermittent or incorrect	X	X	X	X	X	
1867	412	2	Amber	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature - Data erratic, intermittent or incorrect			X			
1879	3251	3	Amber	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure Sensor Circuit - Voltage above normal	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
1881	3251	4	Amber	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure Sensor Circuit - Voltage below normal	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
1883	3251	2	Amber	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure Sensor - Data erratic, intermittent or incorrect	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
1885	3216	4	Amber	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
1887	3226	4	Amber	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
1893	2791	9	Amber	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit - Abnormal update rate						
1894	641	9	Amber	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Circuit - Abnormal update rate	X	X	X	X		

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
1896	2791	13	Amber	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Controller - Out of Calibration	X	X	X	X	X	
1898	641	13	Amber	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Controller - Out of Calibration	X	X	X	X		
1921	3251	16	Amber	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure - Data Valid But Above Normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
1922	3251	0	Red	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure - Data valid but above normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
1923	3482	3	Amber	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve Circuit - Voltage above normal, or shorted to high source			X			X
1924	3482	4	Amber	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve Circuit - Voltage below normal, or shorted to low source			X			X
1925	3482	2	Amber	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve - Data erratic, intermittent or incorrect			X			X
1926	3480	2	Amber	Aftertreatment Fuel Pressure	Aftertreatment Fuel Pressure Sensor - Data erratic, intermittent or incorrect			X			X
1927	3480	3	Amber	Aftertreatment Fuel Pressure	Aftertreatment Fuel Pressure Sensor Circuit - Voltage above normal, or shorted to high source			X			X
1928	3480	4	Amber	Aftertreatment Fuel Pressure	Aftertreatment Fuel Pressure Sensor Circuit - Voltage below normal, or shorted to low source			X			X
1932	3556	2	Amber	Aftertreatment Hydrocarbon Doser	Aftertreatment Doser - Data erratic, intermittent or incorrect			X			X
1938	3597	18	Amber	ECU Power Output Supply Voltage #1	ECU Power Output Supply Voltage 1 - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X		X
1939	3597	3	Amber	ECU Power Output Supply Voltage #1	ECU Power Output Supply Voltage 1 - Voltage above normal, or shorted to high source			X			X
1941	3597	4	Amber	ECU Power Output Supply Voltage #1	ECU Power Output Supply Voltage 1 - Voltage below normal, or shorted to low source						
1942	101	2	Amber	Engine Crankcase Pressure	Crankcase Pressure - Data erratic, intermittent or incorrect	X	X	X	X		X
1943	3555	17	None	Ambient Air Density	Ambient Air Density - Data Valid But Below Normal Operating Range - Least Severe Level						X
1961	2791	15	Amber	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit Over Temperature - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
1962	641	15	Amber	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Over Temperature (Calculated) - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X		
1963	3482	7	Amber	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve - Mechanical system not responding or out of adjustment			X			X
1964	3556	7	Amber	Aftertreatment Hydrocarbon Doser	Aftertreatment Doser - Mechanical system not responding or out of adjustment			X			X
1974	101	15	Amber (Blinking)	Engine Crankcase Pressure	Crankcase Pressure - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X		X
1976	641	15	None	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Over Temperature (Calculated) - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	X
1977	3556	5	Amber	Aftertreatment Hydrocarbon Doser	Aftertreatment Doser Circuit - Current below normal or open circuit.			X			X
1981	3936	15	Amber	Aftertreatment Diesel Particulate Filter System	Aftertreatment 1 Diesel Particulate Filter System - Data Valid But Above Normal Operating Range - Level	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
1992	190	16	Red	Engine Speed	Engine Crankshaft Speed/Position - Data Valid But Above Normal Operating Range - Moderately Severe Level						
1993	4795	31	Amber	Aftertreatment 1 Diesel Particulate Filter Missing	Aftertreatment 1 Diesel Particulate Filter Missing - Condition Exists	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
2182	1072	3	Amber	Engine (Compression) Brake Output #1	Engine Brake Actuator Driver 1 Circuit - Voltage above normal, or shorted to high source		X	X			X
2183	1072	4	Amber	Engine (Compression) Brake Output #1	Engine Brake Actuator Driver 1 Circuit - Voltage below normal, or shorted to low source		X	X			X
2185	3512	3	Amber	Sensor supply voltage 4	Sensor Supply 4 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
2186	3512	4	Amber	Sensor supply voltage 4	Sensor Supply 4 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
2198	641	11	Amber	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Circuit - Root Cause Not Known	X	X	X	X		
2215	94	18	Amber	Engine Fuel Delivery Pressure	Fuel Pump Delivery Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level						
2249	157	1	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data valid but below normal operational range - Most Severe Level						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
2261	94	15	Amber (Blinking)	Engine Fuel Delivery Pressure	Fuel Pump Delivery Pressure - Data Valid But Above Normal Operating Range - Least Severe Level						
2262	94	17	Amber (Blinking)	Engine Fuel Delivery Pressure	Fuel Pump Delivery Pressure - Data Valid But Below Normal Operating Range - Least Severe Level						
2263	1800	16	Amber	Battery 1 Temperature	Battery Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level						
2264	1800	18	Amber	Battery 1 Temperature	Battery Temperature - Data Valid But Below Normal Operating Range - Moderately Severe Level						
2265	1075	3	Amber	Engine Electric Lift Pump for Engine Fuel Supply	Electric Lift Pump for Engine Fuel Supply Circuit - Voltage above normal, or shorted to high source		X	X			X
2266	1075	4	Amber	Engine Electric Lift Pump for Engine Fuel Supply	Electric Lift Pump for Engine Fuel Supply Circuit - Voltage below normal, or shorted to low source		X	X			X
2272	27	4	Amber	Engine Exhaust Gas Recirculation 1 Valve Position	EGR Valve Position Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	
2273	411	3	Amber	Engine Exhaust Gas Recirculation 1 Differential Pressure	Exhaust Gas Recirculation Differential Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	
2274	411	4	Amber	Engine Exhaust Gas Recirculation 1 Differential Pressure	Exhaust Gas Recirculation Differential Pressure Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	
2288	103	15	None	Engine Turbocharger 1 Speed	Turbocharger 1 Speed - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X		
2311	633	31	Amber	Engine Fuel Actuator 1 Control Command	Electronic Fuel Injection Control Valve Circuit - Condition Exists	X	X	X	X	X	X
2321	190	2	None	Engine Speed	Engine Crankshaft Speed/Position - Data erratic, intermittent or incorrect	X	X	X	X	X	X
2322	723	2	None	Engine Speed 2	Engine Camshaft Speed / Position Sensor - Data erratic, intermittent or incorrect	X	X	X	X	X	X
2346	2789	15	None	Engine Turbocharger 1 Calculated Turbine Intake Temperature	Turbocharger Turbine Intake Temperature - Data Valid But Above Normal Operating Range - Least Severe	X	X	X	X	X	X
2347	2629	15	None	Engine Turbocharger 1 Compressor Outlet Temperature	Turbocharger Compressor Outlet Temperature (Calculated) - Data Valid But Above Normal Operating Range						
2349	2791	5	Amber	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit - Current below normal or open circuit	X	X	X	X	X	

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
2353	2791	6	Amber	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit - Current above normal or grounded circuit	X	X	X	X	X	
2357	2791	7	Amber	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit - Mechanical system not responding or out of adjustment	X	X	X	X	X	
2363	1073	4	Amber	Engine (Compression) Brake Output #2	Engine Brake Actuator Driver Output 2 Circuit - Voltage below normal, or shorted to low source	X	X	X		X	X
2365	1112	4	Amber	Engine (Compression) Brake Output #3	Engine Brake Actuator Driver Output 3 Circuit - Voltage below normal, or shorted to low source						
2367	1073	3	Amber	Engine (Compression) Brake Output #2	Engine Brake Actuator Driver Output 2 Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
2368	1112	3	Amber	Engine (Compression) Brake Output #3	Engine Brake Actuator Driver 3 Circuit - Voltage above normal, or shorted to high source						
2372	95	16	Amber	Engine Fuel Filter Differential Pressure	Fuel Filter Differential Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
2373	1209	3	Amber	Engine Exhaust Gas Pressure 1	Exhaust Gas Pressure Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
2374	1209	4	Amber	Engine Exhaust Gas Pressure 1	Exhaust Gas Pressure Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
2375	412	3	Amber	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	
2376	412	4	Amber	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	
2377	647	3	Amber	Engine Fan Clutch 1 Output Device Driver	Fan Control Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
2387	641	7	Amber	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Circuit (Motor) - Mechanical system not responding or out of adjustment	X	X	X	X		
2398	171	2	Amber	Ambient Air Temperature	Ambient Air Temperature - Data erratic, intermittent or incorrect						
2448	111	17	Amber (Blinking)	Engine Coolant Level	Coolant Level - Data Valid But Below Normal Operating Range - Least Severe Level	X	X	X	X	X	X
2449	641	13	Red	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Controller - Out of Calibration	X	X	X	X		
2451	2789	16	None	Engine Turbocharger 1 Calculated Turbine Intake Temperature	Turbocharger Turbine Intake Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level						X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
2468	190	16	Amber	Engine Speed	Engine Crankshaft Speed/Position - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X		X
2554	1209	2	Amber	Engine Exhaust Gas Pressure 1	Exhaust Gas Pressure 1 - Data erratic, intermittent or incorrect	X	X	X	X	X	X
2555	729	3	Amber	Engine Intake Air Heater Driver #1	Engine Intake Air Heater 1 Circuit - Voltage above normal, or shorted to high source	X	X		X	X	X
2556	729	4	Amber	Engine Intake Air Heater Driver #1	Engine Intake Air Heater 1 Circuit - Voltage below normal, or shorted to low source	X	X		X	X	X
2557	697	3	Amber	Auxiliary PWM Driver #1	Auxiliary PWM Driver 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
2558	697	4	Amber	Auxiliary PWM Driver #1	Auxiliary PWM Driver 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
2571	2630	3	Amber	Engine Charge Air Cooler 1 Outlet Temperature	Engine Charge Air Cooler Outlet Temperature - Voltage above normal, or shorted to high source	X	X	X		X	X
2572	2630	4	Amber	Engine Charge Air Cooler 1 Outlet Temperature	Engine Charge Air Cooler Outlet Temperature - Voltage below normal, or shorted to low source	X	X	X		X	X
2634	641	12	Red	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Controller - Bad intelligent device or component	X	X	X	X		
2635	641	31	Red	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Circuit - Condition Exists	X	X	X	X		
2636	641	9	Red	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Circuit - Abnormal update rate	X	X	X	X		
2637	5018	11	None	Aftertreatment Diesel Oxidation Catalyst	Aftertreatment 1 Diesel Oxidation Catalyst Face Plugged - Root Cause Not Known	X	X	X	X	X DOC+ SCR	
2638	5298	17	None ---------- Amber QSF3.8	Aftertreatment 1 Diesel Oxidation Catalyst Conversion Efficiency	Aftertreatment 1 Diesel Oxidation Catalyst Conversion Efficiency - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X DOC+ SCR	X
2639	3251	15	None	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure - Data valid but above normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
2646	110	31	Amber	Engine Coolant Temperature	Engine Coolant Temperature - Condition Exists	X	X	X	X	X	X
2659	110	31	None	Engine Coolant Temperature	Engine Coolant Temperature - Condition Exists	X	X		X	X	X
2661	629	31	Red	Controller #1	At Least One Unacknowledged Most Severe Fault - Condition Exists			X			

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
2662	629	31	Amber	Controller #1	At Least One Unacknowledged Moderately Severe Fault - Condition Exists			X			
2683	3227	9	Amber	Aftertreatment 1 Outlet O2	Aftertreatment Outlet Oxygen Sensor Circuit - Abnormal update rate						
2699	520320	7	Amber	Crankcase Depression Valve	Crankcase Depression Valve - Mechanical system not responding or out of adjustment						
2721	599	2	Amber	Cruise Control Set Switch	Cruise Control Set Switch - Data erratic, intermittent or incorrect						
2732	4097	3	Amber	Aftertreatment 1 Fuel Drain Actuator	Aftertreatment Fuel Drain Valve Circuit - Voltage above normal, or shorted to high source			X			X
2733	4097	4	Amber	Aftertreatment 1 Fuel Drain Actuator	Aftertreatment Fuel Drain Valve Circuit - Voltage below normal, or shorted to low source			X			X
2738	626	3	Amber	Engine Start Enable Device 1	Start Enable Device 1 Circuit (Ether Injection) - Voltage above normal, or shorted to high source						
2739	626	4	Amber	Engine Start Enable Device 1	Start Enable Device 1Circuit (Ether Injection) - Voltage below normal, or shorted to low source						
2741	3482	13	Amber	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve Swapped - Out of Calibration						
2742	3249	17	None	Aftertreatment 1 Exhaust Gas Temperature 2	Aftertreatment Exhaust Gas Temperature 2 - Data Valid But Below Normal Operating Range - Least Severe Level					X	
2743	3249	18	Amber	Aftertreatment 1 Exhaust Gas Temperature 2	Aftertreatment Exhaust Gas Temperature 2 - Data Valid But Below Normal Operating Range - Moderately Severe Level					X	
2754	81	16	Amber	Engine Diesel Particulate Filter Intake Pressure	Engine Diesel Particulate Filter Intake Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
2755	520332	3	Amber	Cruise Control	Cruise Control (Resistive) #2 Signal Circuit - Voltage above normal, or shorted to high source						
2756	520332	4	Amber	Cruise Control	Cruise Control (Resistive) #2 Signal Circuit - Voltage below normal, or shorted to low source						
2764	1209	16	Amber	Engine Exhaust Gas Pressure 1	Exhaust Gas Pressure 1 - Data Valid But Above Normal Operating Range - Moderately Severe Level			X			X
2765	2797	13	None	Engine Injector Group 1	Engine Injector Bank 1 Barcodes - Out of Calibration					X	
2771	3226	9	Amber	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Abnormal update rate	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
2777	3703	31	Amber (Blinking)	Diesel Particulate Filter Active Regeneration Inhibited Due to Inhibit Switch	Particulate Trap Active Regeneration Inhibited Due to Inhibit Switch - Condition Exists	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
2778	3481	16	Amber	Aftertreatment 1 Fuel Rate	Aftertreatment Fuel Rate - Data Valid But Above Normal Operating Range - Moderately Severe Level						
2789	110	18	Amber	Engine Coolant Temperature	Engine Coolant Temperature - Data Valid But Below Normal Operating Range - Moderately Severe Level						X
2878	4097	7	Amber	Aftertreatment 1 Fuel Drain Actuator	Aftertreatment Fuel Drain Valve - Mechanical system not responding or out of adjustment			X			X
2881	3480	17	Amber	Aftertreatment Fuel Pressure	Aftertreatment Fuel Pressure Sensor - Data Valid But Below Normal Operating Range - Least Severe Level			X			X
2961	412	15	None	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	
2962	412	16	Amber	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	
2963	110	15	None	Engine Coolant Temperature	Engine Coolant Temperature - Data Valid But Above Normal Operating Range - Least Severe Level						
2964	105	15	None	Engine Intake Manifold #1 Temperature	Intake Manifold 1 Temperature - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	X
2973	102	2	Amber	Engine Intake Manifold #1 Pressure	Intake Manifold 1 Pressure - Data erratic, intermittent or incorrect			X		X	X
2976	3361	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Temperature - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	
2998	1632	14	Amber	Engine Torque Limit Feature	Engine Torque Limit Feature - Special Instructions	X	X	X		X	X
3133	3610	3	Amber	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3134	3610	4	Amber	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure Sensor Circuit - Voltage below normal, or shorted to low source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3135	3610	2	Amber	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure - Data erratic, intermittent or incorrect	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3136	5019	3	Amber	Engine Exhaust Gas Recirculation 1 Outlet Pressure	Engine Exhaust Gas Recirculation Outlet Pressure Sensor Circuit - Voltage above normal, or shorted to high source			X			

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3137	5019	4	Amber	Engine Exhaust Gas Recirculation 1 Outlet Pressure	Engine Exhaust Gas Recirculation Outlet Pressure Sensor Circuit - Voltage below normal, or shorted to low source			X			
3138	5019	2	Amber	Engine Exhaust Gas Recirculation 1 Outlet Pressure	Engine Exhaust Gas Recirculation Outlet Pressure - Data erratic, intermittent or incorrect			X			
3139	3667	3	Amber	Engine Air Shutoff Status	Engine Air Shutoff Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
3141	3667	4	Amber	Engine Air Shutoff Status	Engine Air Shutoff Circuit - Voltage below normal, or shorted to low source	X	X	X		X	X
3142	4360	3	Amber	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
3143	4360	4	Amber	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
3144	4360	2	Amber	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature Sensor - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	X
3146	4363	3	Amber	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
3147	4363	4	Amber	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
3148	4363	2	Amber	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature Sensor - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	X
3151	4794	31	Amber	Aftertreatment 1 SCR Catalyst System	Aftertreatment 1 SCR Catalyst System Missing - Condition Exists	X	X	X	X	X With SCR	X
3152	4809	3	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage above normal						
3153	4809	4	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage below normal						
3154	4809	2	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature - Data erratic, intermittent or incorrect						
3155	4810	3	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature Sensor Circuit - Voltage above normal						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3156	4810	4	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature Sensor Circuit - Voltage below normal						
3157	4810	2	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature - Data erratic, intermittent or incorrect						
3158	4793	31	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst	Aftertreatment Warm Up Diesel Oxidation Catalyst Missing - Condition Exists						
3162	4810	0	Red	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature - Data valid but above normal operating Range –Most Severe level						
3164	4360	15	None	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature - Data Valid But Above Normal Operating Range - Least Severe	X	X	X	X	X With SCR	X
3165	4363	0	Red	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature - Data valid but above normal operational range - Most Severe	X	X	X	X	X With SCR	X
3166	4809	13	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature Sensor Swapped - Out of Calibration						
3167	3556	18	Amber	Aftertreatment Hydrocarbon Doser	Aftertreatment Doser - Data Valid But Below Normal Operating Range - Moderately Severe Level			X			
3169	4810	16	Red	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature - Data Valid But Above Normal Operating Range						
3186	1623	9	Amber	Tachograph output shaft speed	Tachograph Output Shaft Speed - Abnormal update rate	X	X			X	
3213	1623	19	Amber	Tachograph output shaft speed	Tachograph Output Shaft Speed - Received Network Data In Error	X	X			X	
3222	520435	12	Amber	Glow Plug Module	Glow Plug Module - Bad intelligent device or component						
3223	3490	4	Amber	Aftertreatment 1 Purge Air Actuator	Aftertreatment Purge Air Actuator Circuit - Voltage below normal, or shorted to low source						
3224	3490	3	Amber	Aftertreatment 1 Purge Air Actuator	Aftertreatment Purge Air Actuator Circuit - Voltage above normal, or shorted to high source						
3225	3490	7	Amber	Aftertreatment 1 Purge Air Actuator	Aftertreatment Purge Air Actuator - Mechanical system not responding or out of adjustment						
3228	3216	2	Amber	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3229	4360	0	Red	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature - Data valid but above normal operational range - Most Severe Level	X	X	X	X	X With SCR	X
3231	4360	16	Red	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
3232	3216	9	Amber	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Abnormal update rate	X	X	X	X	X With SCR	X
3235	4363	16	Red	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
3237	4340	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
3238	4340	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
3239	4342	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
3241	4342	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
3242	3363	7	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Mechanical system not responding or out of adjustment	X	X	X	X	X With SCR	X
3243	3060	18	Amber	Engine Cooling System Monitor	Engine Cooling System Monitor - Data Valid But Below Normal Operating Range - Moderately Severe Level			X			
3245	3936	7	Amber	Aftertreatment 1 Diesel Particulate Filter System	Aftertreatment 1 Diesel Particulate Filter System - Mechanical system not responding or out of adjustment	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3247	4809	16	Red	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature - Data Valid But Above Normal Operating Range						
3249	4810	15	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature - Data Valid But Above Normal Operating Range						
3251	4765	16	Red	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature - Data Valid But Above Normal Operating Range	X	X	X	X	X DOC + SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3253	3242	16	Red	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Temperature - Data Valid But Above Normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3254	3242	15	Amber	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Temperature - Data Valid But Above Normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3255	3246	16	Red	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature - Data Valid But Above Normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3256	3246	15	Amber	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature - Data Valid But Above Normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3258	4340	5	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Current below normal or open circuit	X	X	X	X	X With SCR	
3261	4342	5	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Current below normal or open circuit	X	X	X	X	X With SCR	
3298	1194	13	Red	Anti-theft Encryption Seed Present Indicator	Anti-theft Encryption Seed - Out of Calibration	X	X	X	X	X	
3311	3242	0	Red	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Temperature - Data valid but above normal operation	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3312	3246	0	Red	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature - Data valid but above normal operation	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3313	4765	4	Amber	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X DOC + SCR	X
3314	4765	3	Amber	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X DOC + SCR	X
3315	4765	2	Amber	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature - Data erratic, intermittent or incorrect	X	X	X	X	X DOC + SCR	X
3316	3242	4	Amber	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3317	3242	3	Amber	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3318	3242	2	Amber	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Temperature - Data erratic, intermittent or incorrect	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3319	3246	3	Amber	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3321	3246	4	Amber	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3322	3246	2	Amber	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature - Data erratic, intermittent or incorrect	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3325	4765	13	Amber	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature Swapped - Out of Calibration						
3326	91	9	Red	Accelerator Pedal Position 1	SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System - Abnormal update rate	X	X	X	X	X	X
3328	191	9	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Abnormal update rate	X	X	X		X	X
3329	1231	2	None	J1939 Network #2	J1939 Network #2 - Data erratic, intermittent or incorrect	X	X	X	X	X	X
3331	1235	2	None	J1939 Network #3	J1939 Network #3 - Data erratic, intermittent or incorrect	X	X	X	X	X	X
3337	5395	16	Amber	Engine Idle Fuel Quantity	Engine Idle Fuel Quantity - Data Valid But Above Normal Operating Range - Moderately Severe Level						
3338	5395	18	Amber	Engine Idle Fuel Quantity	Engine Idle Fuel Quantity - Data Valid But Below Normal Operating Range - Moderately Severe Level						
3341	107	16	Amber	Engine Air Filter 1 Differential Pressure	Engine Air Filter Differential Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
3348	1176	1	Red	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Data valid but below normal operational range - Most Severe Level						
3361	102	10	Amber	Engine Intake Manifold #1 Pressure	Intake Manifold 1 Pressure - Abnormal rate of change						
3366	111	18	None	Engine Coolant Level	Coolant Level - Data Valid But Below Normal Operating Range - Moderately Severe Level						
3367	4490	9	Amber	Specific Humidity	Specific Humidity Sensor - Abnormal update rate						
3368	4490	19	Amber	Specific Humidity	Specific Humidity Sensor - Received Network Data In Error						X
3369	1172	9	Amber	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature Sensor - Abnormal update rate						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3371	1172	19	Amber	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature Sensor - Received Network Data In Error						
3372	1176	9	Amber	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Abnormal update rate						
3373	1176	19	Amber	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Received Network Data In Error						
3374	1818	31	None	ROP Brake Control active	Roll Over Protection Brake Control Active - Condition Exists						
3375	5397	31	Amber	Aftertreatment 1 Diesel Particulate Filter Regeneration too Frequent	Aftertreatment Diesel Particulate Filter Regeneration too Frequent - Condition Exists	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3376	5319	31	Amber	Aftertreatment 1 Diesel Particulate Filter Incomplete Regeneration	Aftertreatment Diesel Particulate Filter Incomplete Regeneration - Condition Exists	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3377	5396	31	Amber	Engine Crankcase Ventilation Hose Disconnected	Engine Crankcase Ventilation Hose Disconnected - Condition Exists						
3385	105	18	Amber	Engine Intake Manifold 1 Temperature	Intake Manifold 1 Temperature - Data Valid But Below Normal Operating Range - Moderately Severe Level			X			X
3396	3750	31	Amber	Diesel Particulate Filter 1 Conditions Not Met for Active Regeneration	Diesel Particulate Filter 1 Conditions Not Met for Active Regeneration - Condition Exists						
3418	191	19	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Received Network Data In Error	X	X	X		X	X
3419	5125	3	Amber	Sensor supply voltage 7	Sensor Supply 7 Circuit - Voltage above normal, or shorted to high source	X	X		X	X	
3421	5125	4	Amber	Sensor supply voltage 7	Sensor Supply 7 Circuit - Voltage below normal, or shorted to low source	X	X		X	X	
3422	4344	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
3423	4344	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
3425	4344	5	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit - Current below normal or open circuit	X	X	X	X	X With SCR	
3478	2630	2	Amber	Engine Charge Air Cooler 1 Outlet Temperature	Engine Charge Air Cooler Outlet Temperature - Data erratic, intermittent or incorrect						
3488	563	9	Amber	Anti-Lock Braking (ABS) Active	Anti-Lock Braking (ABS) Controller - Abnormal update rate	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3494	1081	7	Amber	Engine Wait to Start Lamp	Engine Wait to Start Lamp - Mechanical system not responding or out of adjustment						
3497	1761	17	Amber (Blinking)	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level - Data Valid But Below Normal Operating Range - Least Severe Level	X	X	X	X	X With SCR	X
3498	1761	18	Amber (Blinking)	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
3525	84	19	Amber	Wheel-Based Vehicle Speed	Wheel-Based Vehicle Speed - Received Network Data In Error	X	X	X		X	X
3526	84	9	Amber	Wheel-Based Vehicle Speed	Wheel-Based Vehicle Speed - Abnormal update rate						
3527	558	19	Red	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch - Received Network Data In Error	X	X	X	X	X	X
3528	558	9	Red	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch - Abnormal update rate			X			X
3531	171	9	Amber	Ambient Air Temperature	Ambient Air Temperature - Abnormal update rate	X	X			X	X
3532	171	19	Amber	Ambient Air Temperature	Ambient Air Temperature - Received Network Data In Error						
3535	1213	9	Amber	Malfunction Indicator Lamp	Malfunction Indicator Lamp - Abnormal update rate			X			X
3543	4094	31	Amber	NOx limits exceeded due to Insufficient Diesel Exhaust Fluid Quality	NOx limits exceeded due to Insufficient Reagent Quality - Condition Exists	X	X	X		X With SCR	X
3545	3226	10	Amber	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Abnormal rate of change	X	X	X	X	X With SCR	X
3547	4096	31	Amber	NOx limits exceeded due to Empty Diesel Exhaust Fluid Tank	Aftertreatment Diesel Exhaust Fluid Tank Empty - Condition Exists	X	X	X	X	X With SCR	X
3555	1081	9	Amber	Engine Wait to Start Lamp	Engine Wait to Start Lamp - Abnormal update rate	X	X	X	X	X	X
3556	1081	19	Amber	Engine Wait to Start Lamp	Engine Wait to Start Lamp - Received Network Data In Error						
3558	3361	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
3559	3361	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
3562	5491	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment Diesel Exhaust Fluid Line Heater Relay - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3563	5491	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment Diesel Exhaust Fluid Line Heater Relay - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	
3567	5394	5	Amber	Aftertreatment Diesel Exhaust Fluid Dosing Valve	Aftertreatment Diesel Exhaust Fluid Dosing Valve - Current below normal or open circuit	X	X	X	X	X With SCR	
3568	5394	7	Amber	Aftertreatment Diesel Exhaust Fluid Dosing Valve	Aftertreatment Diesel Exhaust Fluid Dosing Valve - Mechanical system not responding or out of adjustment	X	X	X	X	X With SCR	X
3571	4334	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
3572	4334	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
3574	4334	18	Amber	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Data Valid But Below Normal Operating Range	X	X	X	X	X With SCR	X
3575	4334	16	Amber	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Data Valid But Above Normal Operating Range	X	X	X	X	X With SCR	
3577	4376	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Return Valve	Aftertreatment Diesel Exhaust Fluid Return Valve - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	
3578	4376	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Return Valve	Aftertreatment Diesel Exhaust Fluid Return Valve - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	
3582	4364	18	Amber	Aftertreatment 1 SCR Conversion Efficiency	Aftertreatment SCR Catalyst Conversion Efficiency - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
3583	5031	10	Amber	Aftertreatment 1 Outlet Gas NOx Sensor Heater Ratio	Aftertreatment 1 Outlet NOx Sensor Heater - Abnormal rate of change	X	X	X	X	X With SCR	X
3596	4334	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	
3613	111	9	Amber	Engine Coolant Level	Coolant Level Sensor - Abnormal Update Rate	X	X			X	
3614	111	19	Amber	SAE J1939 Multiplexing PGN Timeout	Coolant Level Sensor - Received Network Data in Error	X	X				
3616	2633	7	None	Engine Variable Geometry Turbocharger (VGT) 1 Nozzle Position	Engine VGT Nozzle Position - Mechanical system not responding or out of adjustment			X			
3633	5484	3	Amber	Engine Fan Clutch 2 Output Device Driver	Engine Fan Clutch 2 Control Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3634	5484	4	Amber	Engine Fan Clutch 2 Output Device Driver	Engine Fan Clutch 2 Control Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
3641	748	9	Amber	Transmission Output Retarder	Transmission Output Retarder - Abnormal update rate	X	X	X	X	X	X
3649	5024	10	Amber	Aftertreatment 1 Intake Gas NOx Sensor Heater Ratio	Aftertreatment 1 Intake NOx Sensor Heater - Abnormal rate of change	X	X	X	X	X With SCR	X
3681	3228	2	Amber	Aftertreatment 1 Outlet Gas Sensor Power Status	Aftertreatment 1 Outlet NOx Sensor Power Supply - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	X
3682	3218	2	Amber	Aftertreatment 1 Intake Gas Sensor Power Status	Aftertreatment 1 Intake NOx Sensor Power Supply - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	X
3683	1127	7	Amber	Engine Turbocharger 1 Boost Pressure	Engine Turbocharger 1 Boost Pressure - Mechanical system not responding or out of adjustment						
3694	4184	4	Amber	Gain Adjust Potentiometer Circuit	Gain Adjust Potentiometer Circuit - Voltage below normal, or shorted to low source						
3695	4182	4	Amber	Generator Output Frequency Adjust Potentiometer Circuit	Generator Output Frequency Adjust Potentiometer Circuit - Voltage below normal, or shorted to low source						
3696	4183	4	Amber	Droop Adjust Potentiometer Circuit	Droop Adjust Potentiometer Circuit - Voltage below normal, or shorted to low source						
3697	630	12	Red	Engine Control Module Calibration Memory	Engine Control Module Calibration Memory - Bad intelligent device or component	X	X	X	X	X	X
3712	5246	0	Red	Aftertreatment SCR Operator Inducement Severity	Aftertreatment SCR Operator Inducement - Data valid but above normal operational range - Most Severe level	X	X	X	X	X With SCR	X
3713	5491	7	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay - Mechanical system not responding or out of adjustment						
3714	1569	31	Amber	Engine Protection Torque Derate	Engine Protection Torque Derate - Condition Exists	X	X	X	X	X	X
3715	188	16	Amber	Engine Speed At Idle, Point 1 (Engine Configuration)	Engine Speed At Idle - Data Valid But Above Normal Operating Range - Moderately Severe Level						
3716	188	18	Amber	Engine Speed At Idle, Point 1 (Engine Configuration)	Engine Speed At Idle - Data Valid But Below Normal Operating Range - Moderately Severe Level						
3717	3226	13	Amber	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Out of Calibration	X	X	X	X	X With SCR	X
3718	3216	13	Amber	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx - Out of Calibration	X	X	X	X	X With SCR	X
3724	168	17	Amber	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Below Normal Operating Range - Least Severe Level	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3725	3216	10	Amber	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Abnormal rate of change	X	X	X	X	X With SCR	X
3727	5571	7	None	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Mechanical system not responding or out of adjustment	X	X	X	X	X	X
3733	862	3	Amber	Crankcase breather Heater Circuit	Crankcase Breather Filter Heater Circuit - Voltage above normal, or shorted to high source			X			X
3734	862	4	Amber	Crankcase breather Heater Circuit	Crankcase Breather Filter Heater Circuit - Voltage below normal, or shorted to low source			X			X
3735	2884	9	None	Engine Auxiliary Governor Switch	Engine Auxiliary Governor Switch - Abnormal update rate						
3737	1675	31	None	Engine Starter Mode	Engine Starter Mode Overcrank Protection - Condition Exists	X	X	X	X	X	X
3741	5571	0	Amber	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Data valid but above normal operational range	X	X	X	X	X	X
3748	3216	20	Amber	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Data not Rational - Drifted High	X	X	X	X	X With SCR	X
3749	3226	20	Amber	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Data not Rational - Drifted High	X	X	X	X	X With SCR	X
3751	4792	7	None	Aftertreatment SCR Catalyst System	Aftertreatment SCR Catalyst System - Mechanical system not responding or out of adjustment	X	X	X	X	X With SCR	X
3753	3713	31	None	Diesel Particulate Filter Active Regeneration Inhibited Due to System Timeout	Diesel Particulate Filter Active Regeneration Inhibited Due to System Timeout - Condition Exists	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3755	5394	2	None	Aftertreatment Diesel Exhaust Fluid Dosing Valve	Aftertreatment Diesel Exhaust Fluid Dosing Valve - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	
3765	442	3	Amber	Auxiliary Temperature 2	Auxiliary Temperature Sensor Input 2 Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
3766	442	4	Amber	Auxiliary Temperature 2	Auxiliary Temperature Sensor Input 2 Circuit - Voltage below normal, or shorted to low source	X	X	X		X	X
3838	2978	9	Amber	Estimated Engine Parasitic Losses - Percent Torque	Estimated Engine Parasitic Losses - Percent Torque - Abnormal update rate						
3839	596	7	Amber	Cruise Control Enable Switch	Cruise Control Enable Switch - Mechanical system not responding or out of adjustment						
3841	596	2	Amber	Cruise Control Enable Switch	Cruise Control Enable Switch - Data erratic, intermittent or incorrect						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3842	596	13	Amber	Cruise Control Enable Switch	Cruise Control Enable Switch - Out of Calibration						
3843	5603	9	None	Cruise Control Disable Command	Cruise Control Disable Command - Abnormal update rate	X	X			X	X
3844	5605	31	None	Cruise Control Pause Command	Cruise Control Pause Command - Condition Exists	X	X			X	
3845	5603	31	None	Cruise Control Disable Command	Cruise Control Disable Command - Condition Exists	X	X			X	
3866	3364	1	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Data valid but below normal operational range - Most Severe Level	X	X	X	X	X With SCR	X
3867	3364	18	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Data Valid But Below Normal Operating Range - Moderate Severe Level	X	X	X	X	X With SCR	X
3868	3364	9	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Abnormal update rate	X	X	X	X	X With SCR	X
3876	3364	7	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality Sensor - Mechanical system not responding or out of adjustment	X	X	X	X	X With SCR	X
3877	3364	12	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality Sensor - Bad intelligent device or component	X	X	X		X With SCR	X
3878	3364	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	X
3917	104	18	Amber	Engine Turbocharger Lube Oil Pressure 1	Engine Turbocharger Lube Oil Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level			X			X
3931	1109	0	Red	Engine Protection System Approaching Shutdown	Engine Protection System Approaching Shutdown - Data valid but above normal operational range - Most						
3988	3265	9	Amber	Aftertreatment 2 Outlet NOx	Aftertreatment 2 Outlet NOx - Abnormal Update Rate						
4143	5741	3	Amber	Aftertreatment 1 Outlet Soot Sensor	Aftertreatment 1 Outlet Soot Sensor - Voltage Above Normal, or Shorted to High Source						
4144	5741	4	Amber	Aftertreatment 1 Outlet Soot Sensor	Aftertreatment 1 Outlet Soot Sensor - Voltage below normal, or shorted to low source						
4145	3255	9	Amber	Aftertreatment 2 Intake NOx	Aftertreatment 2 Intake NOx Sensor - Abnormal update rate						
4151	5742	9	Amber	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Abnormal update rate	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4152	5743	9	Amber	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module - Abnormal update rate	X	X	X	X	X With SCR	X
4153	5747	3	Amber	Aftertreatment 1 Outlet Soot Sensor Heater	Aftertreatment 1 Outlet Soot Sensor Heater - Voltage Above Normal, or Shorted to High Source						
4154	5747	4	Amber	Aftertreatment 1 Outlet Soot Sensor Heater	Aftertreatment 1 Outlet Soot Sensor Heater - Voltage below normal, or shorted to low source						
4155	5746	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay - Voltage Above Normal, or Shorted to high source	X	X	X	X	X With SCR	
4156	5746	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	
4157	4376	7	Amber	Aftertreatment 1 Diesel Exhaust Fluid Return Valve	Aftertreatment Diesel Exhaust Fluid Return Valve - Mechanical system not responding or out of adjust	X	X	X	X	X With SCR	
4158	5742	12	Amber	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Bad intelligent device or component	X	X	X	X	X	X
4159	5743	12	Amber	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module - Bad intelligent device or component	X	X	X	X	X With SCR	X
4161	5742	3	Amber	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Voltage Above Normal, or Shorted to high source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
4162	5742	4	Amber	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Voltage below normal, or shorted to low source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
4163	5742	16	Amber	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module- Data Valid But Above Normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
4164	5743	3	Amber	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module - Voltage Above Normal, or Shorted to high source	X	X	X	X	X With SCR	X
4165	5743	4	Amber	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module - Voltage below normal, or Shorted to low source	X	X	X	X	X With SCR	X
4166	5743	16	Amber	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module - Data Valid But Above Normal	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4168	5745	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater - Voltage Above Normal, or Shorted to High	X	X	X	X	X With SCR	
4169	5745	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	
4171	5745	18	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater - Data Valid But Below Normal Operating Range	X	X	X	X	X	
4174	4337	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature Sensor	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature Sensor - Voltage Above Normal, or Shorted to High Source						X
4175	4337	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature Sensor	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature Sensor - Voltage below normal, or shorted to low source						X
4213	3695	2	Amber	Aftertreatment Regeneration Inhibit Switch	Aftertreatment Regeneration Inhibit Switch - Data erratic, intermittent or incorrect	X	X	X	X	X	X
4215	563	31	None	Anti-Lock Braking (ABS) Active	Anti-Lock Braking (ABS) Active - Condition Exists	X	X	X	X	X	
4233	3515	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Sensor Circuit - Voltage above normal, or shorted to high source			X			X
4234	3515	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Sensor Circuit - Voltage below normal, or shorted to low source			X			X
4235	3521	31	Red	Aftertreatment 1 Diesel Exhaust Fluid Property	Aftertreatment 1 Diesel Exhaust Fluid Property - Condition Exists			X			X
4242	3515	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 - Data erratic, intermittent or incorrect			X			X
4243	3515	10	Amber	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 - Abnormal Rate of Change	X	X	X	X	X With SCR	X
4244	4337	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature - Data erratic, intermittent or incorrect						X
4245	5798	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Temperature	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Temperature - Data erratic, intermittent or incorrect						
4249	4337	10	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature - Abnormal Rate of Change	X	X	X	X	X With SCR	

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4251	5798	10	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Temperature	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Temperature - Abnormal Rate of Change	X	X	X	X	X With SCR	
4252	1081	31	Amber	Engine Wait to Start Lamp	Engine Wait to Start Lamp - Condition Exists						
4253	5797	12	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module - Bad intelligent device						
4254	5797	3	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module - Voltage Above Normal, or shorted to high source						
4255	5797	4	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module - Voltage below normal, or shorted to low source						
4256	5797	16	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module - Data Valid But Above Normal Operating Range – Moderately Severe Level						
4258	5797	11	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module - Root Cause Not Known						
4259	5742	11	Amber	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Root Cause Not Known	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
4261	5743	11	Amber	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module - Root Cause Not Known	X	X	X	X	X With SCR	X
4262	5571	3	Amber	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Voltage Above Normal, or Shorted to High Source	X					
4263	5571	4	Amber	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Voltage below normal, or shorted to low source	X					
4265	5571	11	Amber	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Root Cause Not Known						
4277	3364	10	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Abnormal Rate of Change	X	X	X	X	X With SCR	X
4284	5793	9	Amber	Desired Engine Fueling State	Desired Engine Fueling State - Abnormal Update Rate						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4286	520595	3	Amber	Closed Crankcase Ventilation System Pressure Sensor	Closed Crankcase Ventilation System Pressure Sensor - Voltage Above Normal, or Shorted to High Source						
4287	520595	4	Amber	Closed Crankcase Ventilation System Pressure Sensor	Closed Crankcase Ventilation System Pressure Sensor - Voltage below normal, or shorted to low source						
4288	520595	2	Amber	Closed Crankcase Ventilation System Pressure	Closed Crankcase Ventilation System Pressure - Data erratic, intermittent or incorrect						
4293	5097	3	Amber	Engine Brake Active Lamp Data	Engine Brake Active Lamp - Voltage Above Normal, or Shorted to High Source						
4294	5097	4	Amber	Engine Brake Active Lamp Data	Engine Brake Active Lamp - Voltage below normal, or shorted to low source						
4437	1668	2	None	J1939 Network #4 - Data erratic	J1939 Network #4 - Data erratic, intermittent or incorrect	X	X	X	X	X	X
4449	5747	10	Amber	Aftertreatment 1 Outlet Soot Sensor Heater	Aftertreatment 1 Outlet Soot Sensor Heater - Abnormal rate of change						
4451	5741	2	Amber	Aftertreatment 1 Outlet Soot	Aftertreatment 1 Outlet Soot - Data erratic, intermittent or incorrect						
4452	520668	31	Amber	Aftertreatment 1 Outlet NOx Sensor Closed Loop Operation	Aftertreatment 1 Outlet NOx Sensor Closed Loop Operation - Condition Exists						
4484	3667	7	Red	Engine Air Shutoff	Engine Air Shutoff - Mechanical System Not Responding or Out of Adjustment	X	X				
4485	5838	31	Amber	EGR Valve Malfunction	EGR Valve Malfunction - Condition Exists						
4486	5839	31	Amber	Diesel Exhaust Fluid Consumption Malfunction	Diesel Exhaust Fluid Consumption Malfunction - Condition Exists						
4487	5840	31	Amber	Diesel Exhaust Fluid Dosing Malfunction	Diesel Exhaust Fluid Dosing Malfunction - Condition Exists						
4488	5841	31	Amber	Diesel Exhaust Fluid Quality Malfunction	Diesel Exhaust Fluid Quality Malfunction - Condition Exists						
4489	5842	31	Amber	SCR Monitoring System Malfunction	SCR Monitoring System Malfunction - Condition Exists						
4517	237	13	Amber	Vehicle Identification Number	Vehicle Identification Number - Out of Calibration	X	X	X	X	X	X
4526	521	2	Amber	Brake Pedal Position	Brake Pedal Position - Data erratic, intermittent or incorrect			X			X
4533	4766	3	Amber	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature Sensor Circuit	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X DOC+ SCR	X DOC+ SCR		X		

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4534	4766	4	Amber	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature Sensor Circuit	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X DOC+ SCR	X DOC+ SCR		X		
4568	3482	16	Amber	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve - Data Valid But Above Normal Operating Range - Moderately Severe						
4572	3031	9	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature - Abnormal Update Rate	X	X	X	X	X	X
4573	3826	18	Amber	Aftertreatment 1 Diesel Exhaust Fluid Average Consumption	Aftertreatment 1 Diesel Exhaust Fluid Average Consumption - Data Valid But Below Normal Operating Range						
4584	3936	14	Red	Aftertreatment Diesel Particulate Filter System	Aftertreatment Diesel Particulate Filter System - Special Instructions	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
4585	4792	14	Red	Aftertreatment 1 SCR Catalyst System	Aftertreatment 1 SCR Catalyst System - Special Instructions	X	X	X	X	X With SCR	X
4586	4339	31	Amber	Aftertreatment 1 SCR Feedback Control Status	Aftertreatment 1 SCR Feedback Control Status - Condition Exists						X
4615	94	0	Red	Engine Fuel Delivery Pressure	Engine Fuel Delivery Pressure - Data Valid but Above Normal Operational Range - Most Severe Level						
4658	4331	18	Amber	Aftertreatment 1 Diesel Exhaust Fluid Actual Dosing Quantity	Aftertreatment SCR Actual Dosing Reagent Quantity - Data Valid But Below Normal Operating Range - Mo						
4677	1761	9	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	SAE J1939 Multiplexing PGN Timeout Error - Abnormal update rate	X	X	X	X	X	X
4679	1761	5	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor Circuit - Current below normal or open circuit						
4682	3031	5	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor Circuit - Current below normal or open circuit						X
4688	6301	3	Amber	Water in Fuel Indicator 2 Sensor Circuit	Water in Fuel Indicator 2 Sensor Circuit - Voltage above normal, or shorted to high source						
4689	6301	4	Amber	Water in Fuel Indicator 2 Sensor Circuit	Water in Fuel Indicator 2 Sensor Circuit - Voltage below normal, or shorted to low source						
4691	5585	18	Amber	Engine Injector Metering Rail 1 Cranking Pressure	Engine Injector Metering Rail 1 Cranking Pressure - Data Valid But Below Normal Operating Range - Mo						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4713	5357	31	Amber	Engine Fuel Injection Quantity Error for Multiple Cylinders	Engine Fuel Injection Quantity Error for Multiple Cylinders - Condition Exists						
4721	237	31	Amber	Vehicle Identification Number	Vehicle Identification Number - Condition Exists			X			X
4722	237	2	Amber	Vehicle Identification Number	Vehicle Identification Number - Data erratic, intermittent or incorrect			X			X
4724	702	5	Amber	Auxiliary I/O #02	Auxiliary Input/Output 2 Circuit - Current below normal or open circuit						
4725	702	6	Amber	Auxiliary I/O #02	Auxiliary Input/Output 2 Circuit - Current above normal or grounded circuit						
4726	1239	16	Amber	Engine Fuel Leakage 1	Engine Fuel Leakage - Data Valid But Above Normal Operating Range - Moderately Severe Level						
4727	157	15	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data Valid But Above Normal Operating Range - Least Severe Level						
4731	3031	13	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor - Out of Calibration	X	X			X With SCR	X
4732	1761	13	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Out of Calibration	X	X			X With SCR	X
4734	701	14	Red	Auxiliary I/O #01	Auxiliary Input/Output 1 - Special Instructions	X	X	X	X	X	X
4736	3031	6	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor Circuit - Current above normal or grounded circuit						X
4737	3031	11	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature - Root Cause Not Known	X	X	X		X With SCR	X
4738	1761	6	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor Circuit - Current above normal or grounded circuit						
4739	1761	11	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Root Cause Not Known	X	X	X	X	X With SCR	X
4743	3515	5	Amber	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Sensor Circuit - Current below normal or open circuit	X	X	X	X	X With SCR	X
4744	3515	6	Amber	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Sensor Circuit - Current above normal or grounded	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4745	3515	11	Amber	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 - Root Cause Not Known	X	X	X	X	X With SCR	X
4752	520716	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve 1 Heater - Voltage Above Normal, or Shorted to High Source						X
4753	520716	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve 1 Heater - Voltage Below Normal, or Shorted to Low Source						X
4768	3521	11	Amber	Aftertreatment 1 Diesel Exhaust Fluid Property	Aftertreatment 1 Diesel Exhaust Fluid Property - Root Cause Not Known	X	X	X	X	X With SCR	X
4769	1761	10	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Abnormal Rate of Change	X	X	X	X	X With SCR	X
4789	1639	0	Amber	Fan Speed	Fan Speed - Data Valid but Above Normal Operational Range - Most Severe Level	X	X	X	X	X	X
4791	1639	1	Amber	Fan Speed	Fan Speed - Data Valid but Below Normal Operational Range - Most Severe Level	X	X	X	X	X	X
4841	6653	16	Amber	Cold Start Injector Metering Rail 1 Pressure	Cold Start Injector Metering Rail 1 Pressure - Data Valid But Above Normal Operating Range - Moderate Severe Level						
4842	3364	15	None	Aftertreatment Diesel Exhaust Fluid Quality	Aftertreatment Diesel Exhaust Fluid Quality - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X		X
4863	5245	31	Amber	Aftertreatment Selective Catalytic Reduction Operator Inducement Active	Aftertreatment Diesel Exhaust Fluid Tank Low Level Indicator	X	X	X	X	X With SCR	X
4867	5571	31	Amber	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Condition Exists	X					
4936	5380	11	Amber	Engine Fuel Valve 1	Engine Fuel Valve 1 - Root Cause Not Known						
4937	5380	13	Amber	Engine Fuel Valve 1	Engine Fuel Valve 1 - Out of Calibration						
4951	6655	3	Amber	ECU Power Lamp	Maintain ECU Power Lamp - Voltage Above Normal, or Shorted to High Source	X	X	X		X	X
4952	6655	4	Amber	ECU Power Lamp	Maintain ECU Power Lamp - Voltage Below Normal, or Shorted to Low Source	X	X	X		X	X
4953	3353	3	Amber	Alternator 1 Status	Alternator 1 Status - Voltage Above Normal, or Shorted to High Source						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4954	3353	4	Amber	Alternator 1 Status	Alternator 1 Status - Voltage Below Normal, or Shorted to Low Source						
4956	6713	13	Red	Variable Geometry Turbocharger Actuator	Variable Geometry Turbocharger Actuator Software - Out of Calibration	X	X				
4957	6713	31	Red	Variable Geometry Turbocharger Actuator	Variable Geometry Turbocharger Actuator Software - Condition Exists	X	X				
5133	2006	9	Amber	Source Address 6	Source Address 6 - Abnormal Update Rate						
5167	111	17	Amber	Engine Coolant Level	Coolant Level - Data Valid But Below Normal Operating Range - Least Severe Level						
5177	6713	9	Amber	VGT Actuator Driver Circuit	VGT Actuator Driver Circuit - Abnormal update rate	X	X				
5183	6799	3	Amber	Engine Fan Blade Pitch	Fan Blade Pitch Position Sensor Circuit - Voltage Above Normal, or Shorted to High Source	X	X	X	X	X	X
5184	6799	4	Amber	Engine Fan Blade Pitch	Fan Blade Pitch Position Sensor Circuit - Voltage Below Normal, or Shorted to Low Source	X	X	X	X	X	X
5185	6799	7	Amber	Engine Fan Blade Pitch	Fan Blade Pitch - Mechanical system not responding or out of adjustment	X	X	X	X	X	X
5193	1632	31	Amber	Engine Torque Limit Feature	Engine Torque Limit Feature - Condition Exists			X			X
5215	520791	2	Amber	Engine Boost Curve Selection	Engine Boost Curve Selection - Data erratic, intermittent or incorrect			X			X
5221	3667	2	Red	Engine Air Shutoff Status	Engine Air Shutoff Status - Data erratic, intermittent or incorrect	X	X				
5247	4360	16	Amber	Aftertreatment 1 SCR Intake Temperature	Aftertreatment 1 SCR Intake Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level						
5248	1623	13	Amber	Tachograph Output Shaft Speed	Tachograph Output Shaft Speed - Out of Calibration	X	X	X		X	X
5271	649	3	Amber	Engine Exhaust Back Pressure Regulator Control Circuit	Engine Exhaust Back Pressure Regulator Control Circuit - Voltage Above Normal, or Shorted to High Source					X	
5272	649	4	Amber	Engine Exhaust Back Pressure Regulator Control Circuit	Engine Exhaust Back Pressure Regulator Control Circuit - Voltage Below Normal, or Shorted to Low Source					X	
5273	649	5	Amber	Engine Exhaust Back Pressure Regulator Control Circuit	Engine Exhaust Back Pressure Regulator Control Circuit - Current Below Normal or Open Circuit					X	

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
5274	5625	2	Amber	Engine Exhaust Back Pressure Regulator Position	Engine Exhaust Back Pressure Regulator Position - Data Erratic, Intermittent or Incorrect						
5275	5625	3	Amber	Engine Exhaust Back Pressure Regulator Position Sensor Circuit	Engine Exhaust Back Pressure Regulator Position Sensor Circuit - Voltage Above Normal, or Shorted to High Source					X	
5276	5625	4	Amber	Engine Exhaust Back Pressure Regulator Position Sensor Circuit	Engine Exhaust Back Pressure Regulator Position Sensor Circuit - Voltage Below Normal, or Shorted to Low Source					X	
5277	5626	13	Amber	Engine Exhaust Back Pressure Regulator	Engine Exhaust Back Pressure Regulator - Out of Calibration					X	
5278	6802	31	Amber		Aftertreatment 1 Diesel Exhaust Fluid Dosing System Frozen - Condition Exists	X	X	X	X	X With SCR	X
5291	520808	31	Amber	Engine Emergency Shutdown Switch Actived	Engine Emergency Shutdown Switch Actived - Condition Exists	X	X				
5292	520809	31	Amber	Excessive Time Since Last Engine Air Shutoff Maintenance Test	Excessive Time Since Last Engine Air Shutoff Maintenance Test - Condition Exists	X	X				
5386	4766	2	Amber	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature - Data Erratic, Intermittent, or Incorrect	X DOC+ SCR	X DOC+ SCR		X		
5387	4766	0	Red	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature - Data Valid But Above Normal Operating Range - Most Severe Level	X DOC+ SCR	X DOC+ SCR		X		
5388	4766	16	Red	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	X DOC+ SCR	X DOC+ SCR		X		
5389	4766	15	Amber	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature - Data Valid But Above Normal Operating Range - Least Severe Level	X DOC+ SCR	X DOC+ SCR		X		
5391	6882	9	Amber	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module - Abnormal Update Rate	X DOC+ SCR	X DOC+ SCR		X		
5392	6882	12	Amber	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module - Bad Intelligent Device or Component	X DOC+ SCR	X DOC+ SCR		X		
5393	6882	3	Amber	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module - Voltage Above Normal or Shorted to High Source	X DOC+ SCR	X DOC+ SCR		X		
5394	6882	4	Amber	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module - Voltage Below Normal or Shorted to Low Source	X DOC+ SCR	X DOC+ SCR		X		

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
5395	6882	11	Amber	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module - Root Cause Not Known	X DOC+ SCR	X DOC+ SCR		X		
5396	6882	16	Amber	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module - Data Valid But Above Normal Operating Range - Moderately Severe Level	X DOC+ SCR	X DOC+ SCR		X		
5576	107	15	Amber	Engine Air Filter 1 Differential Pressure	Engine Air Filter Differential Pressure - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	X
5585	5571	15	Amber	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	X
5617	524286	31	Amber	Aftertreatment 1 Diesel Oxidation Catalyst System	Aftertreatment 1 Diesel Oxidation Catalyst System- Special Instruction	X DOC+ SCR	X DOC+ SCR		X	X (DOC + SCR)	
5631	6928	31	None	SCR System Cleaning Inhibited Due to System Timeout	SCR System Cleaning Inhibited Due to System Timeout - Condition Exists	X DOC+ SCR	X DOC+ SCR		X	X With SCR	
5632	6918	31	Mainte nance	SCR System Cleaning Inhibited Due to Inhibit Switch	SCR System Cleaning Inhibited Due to Inhibit Switch - Condition Exists	X DOC+ SCR	X DOC+ SCR		X	X With SCR	
5653	6881	9	Amber	SCR Operator Inducement Override Switch	SCR Operator Inducement Override Switch - Abnormal Update Rate	X	X	X	X	X With SCR	X
5654	6881	13	Amber	SCR Operator Inducement Override Switch	SCR Operator Inducement Override Switch - Out of Calibration	X	X	X	X	X With SCR	X
5866	520953	3	Amber		Aftertreatment Diesel Exhaust Fluid Dosing Unit Relay Feedback- Voltage Above Normal or Shorted to High Source.						X
5867	520953	4	Amber		Aftertreatment Diesel Exhaust Fluid Dosing Unit Relay Feedback- Voltage Below Normal or Shorted to Low Source.						X
5938	3750	14	Amber	Diesel Particulate Filter 1 Conditions Not Met for Active Regeneration	Diesel Particulate Filter 1 Conditions Not Met for Active Regeneration – Condition Exists	X	X	X	X	X With SCR	X
5939	520968	9	Amber		Machine Constrained Operation- Abnormal Update Rate. No Communication or an invalid data transfer rate has been detected on the J1939 data link between the ECM and the machine electronic control unit.	X	X	X	X	X	X
5941	520968	19	None		Machine Constrained Operation- Received Network Data in Error. The received J1939 datalink message was not valid.	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
6256	168	15	None	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	X
6257	168	17	None	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
6258	1075	3	None	Engine Electric Lift Pump for Engine Fuel Supply	Electric Lift Pump for Engine Fuel Supply Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6259	1075	4	None	Engine Electric Lift Pump for Engine Fuel Supply	Electric Lift Pump for Engine Fuel Supply Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6263	647	3	None	Engine Fan Clutch 1 Output Device Driver	Fan Control Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6264	647	4	None	Engine Fan Clutch 1 Output Device Driver	Fan Control Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6265	3936	7	None	Aftertreatment 1 Diesel Particulate Filter System	Aftertreatment 1 Diesel Particulate Filter System - Mechanical system not responding or out of adjustment	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
6336	862	3	None	Crankcase breather Heater Circuit	Crankcase Breather Filter Heater Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6337	862	4	None	Crankcase breather Heater Circuit	Crankcase Breather Filter Heater Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6418	1072	3	None	Engine (Compression) Brake Output #1	Engine Brake Actuator Driver 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6419	1072	4	None	Engine (Compression) Brake Output #1	Engine Brake Actuator Driver 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6421	1073	3	None	Engine (Compression) Brake Output #2	Engine Brake Actuator Driver Output 2 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6422	1073	4	None	Engine (Compression) Brake Output #2	Engine Brake Actuator Driver Output 2 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6456	5484	3	None	Engine Fan Clutch 2 Output Device Driver	Engine Fan Clutch 2 Control Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6457	5484	4	None	Engine Fan Clutch 2 Output Device Driver	Engine Fan Clutch 2 Control Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6458	3216	20	None	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Data not Rational - Drifted High	X	X	X	X	X With SCR	X
6459	3216	21	None	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Data not Rational - Drifted High	X	X	X	X	X With SCR	X
6462	3226	20	None	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Data not Rational - Drifted High	X	X	X	X	X With SCR	X
6463	3226	21	None	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Data not Rational - Drifted High	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
6464	3226	2	None	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Data Erratic, Intermittant, or Incorrect.	X	X	X	X	X With SCR	X
6467	1639	15	None	Fan Speed	Fan Speed - Data Valid but Above Normal Operational Range - Least Severe Level	X	X	X	X	X	X
6468	1639	17	None	Fan Speed	Fan Speed - Data Valid but Below Normal Operational Range - Most Severe Level	X	X	X	X	X	X
6469	1639	2	None	Fan Speed	Fan Speed – Data Erratic, Intermittent, or Incorrect	X	X	X	X	X	X
6471	6799	3	None	Engine Fan Blade Pitch	Fan Blade Pitch Position Sensor Circuit - Voltage Above Normal, or Shorted to High Source	X	X	X	X	X	X
6472	6799	4	None	Engine Fan Blade Pitch	Fan Blade Pitch Position Sensor Circuit - Voltage Below Normal, or Shorted to Low Source	X	X	X	X	X	X
6473	6799	2	None	Engine Fan Blade Pitch	Fan Blade Pitch – Data Erratic, Intermittent, or Incorrect	X	X	X	X	X	X
6475	3363	7	None	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Mechanical system not responding or out of adjustment	X	X	X	X	X With SCR	X
6476	3363	18	None	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
6477	5491	3	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment Diesel Exhaust Fluid Line Heater Relay - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
6478	5491	4	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment Diesel Exhaust Fluid Line Heater Relay - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
6479	3363	3	None	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
6481	3363	4	None	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
6482	4340	5	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Current below normal or open circuit	X	X	X	X	X With SCR	X
6483	4342	5	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Current below normal or open circuit	X	X	X	X	X With SCR	X
6484	4344	5	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit - Current below normal or open circuit	X	X	X	X	X With SCR	X
6493	3464	3	None	Electronic Throttle Control Actuator Driver Circuit	Electronic Throttle Control Actuator Driver Circuit-Voltage above normal, or shorted to high source	X	X	X	X	X	X
6494	3464	4	None	Electronic Throttle Control Actuator Driver Circuit	Electronic Throttle Control Actuator Driver Circuit-Voltage above normal, or shorted to low source	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
6496	3464	5	None	Electronic Throttle Control Actuator Driver Circuit	Electronic Throttle Control Actuator Driver Circuit- Current Below Normal or Open Circuit	X	X	X	X	X	X
6497	51	3	None	Engine Intake Throttle Actuator Position Sensor Circuit	Engine Intake Throttle Actuator Position Sensor Circuit- Voltage above normal, or shorted to high source	X	X	X	X	X	X
6498	51	4	None	Engine Intake Throttle Actuator Position Sensor Circuit	Engine Intake Throttle Actuator Position Sensor Circuit- Voltage above normal, or shorted to low source	X	X	X	X	X	X
6499	3597	17	None	ECU Power Output Supply Voltage #1	ECU Power Output Supply Voltage 1 - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
6511	6655	3	None	ECU Power Lamp	Maintain ECU Power Lamp - Voltage Above Normal, or Shorted to High Source	X	X	X	X	X	X
6512	6655	4	None	ECU Power Lamp	Maintain ECU Power Lamp - Voltage Below Normal, or Shorted to Low Source	X	X	X	X	X	X
6513	5745	17	None	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater - Data Valid But Below Normal Operating Range	X	X	X	X	X With SCR	X
6517	4364	17	None	Aftertreatment 1 SCR Conversion Efficiency	Aftertreatment SCR Catalyst Conversion Efficiency - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
6521	3226	4	None	Aftertreatment Outlet NOx Sensor Circuits	Aftertreatment Outlet NOx Sensor Circuit- Voltage below normal or shorted to low source	X	X	X	X	X With SCR	X
6522	111	3	None	Engine Coolant Level	Coolant Level Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6523	111	4	None	Engine Coolant Level	Coolant Level Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6524	175	3	None	Engine Oil Temperature 1	Engine Oil Temperature Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6525	175	4	None	Engine Oil Temperature 1	Engine Oil Temperature Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6526	1761	13	None	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Out of Calibration	X	X	X	X	X With SCR	X
6527	4376	7	None	Aftertreatment 1 Diesel Exhaust Fluid Return Valve	Aftertreatment Diesel Exhaust Fluid Return Valve - Mechanical system not responding or out of adjust	X	X	X	X	X With SCR	X
6529	5746	3	None	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay - Voltage Above Normal, or Shorted to high source	X	X	X	X	X With SCR	X
6531	4340	3	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
6532	4340	4	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
6533	4342	3	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
6534	4342	4	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
6535	4344	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
6536	4344	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
6537	5491	7	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay - Mechanical system not responding or out of adjustment	X	X	X	X	X With SCR	X
6539	4765	2	None	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature - Data erratic, intermittent or incorrect	X	X	X	X	X DOC + SCR	X
6551	3610	3	None	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
6552	3610	4	None	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure Sensor Circuit - Voltage below normal, or shorted to low source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
6553	3610	2	None	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure - Data erratic, intermittent or incorrect	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
6555	2791	7	None	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit - Mechanical system not responding or out of adjustment	X	X	X	X	X	
6556	729	3	None	Engine Intake Air Heater Driver #1	Engine Intake Air Heater 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6557	729	4	None	Engine Intake Air Heater Driver #1	Engine Intake Air Heater 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6559	3031	4	None	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
6562	1761	11	None	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Root Cause Not Known	X	X	X	X	X With SCR	
6563	976	2	None	PTO Governor State	Auxiliary Intermediate (PTO) Speed Switch Validation - Data erratic, intermittent or incorrect	X	X	X	X	X	X
6565	3226	10	None	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Abnormal rate of change	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
6568	3695	2	None	Aftertreatment Regeneration Inhibit Switch	Aftertreatment Regeneration Inhibit Switch - Data erratic, intermittent or incorrect	X	X	X	X	X	X
6569	4363	3	None	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	
6571	4363	4	None	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	
6581	5031	10	None	Aftertreatment 1 Outlet Gas NOx Sensor Heater Ratio	Aftertreatment 1 Outlet NOx Sensor Heater - Abnormal rate of change	X	X	X	X	X With SCR	X
6582	3228	2	None	Aftertreatment 1 Outlet Gas Sensor Power Status	Aftertreatment 1 Outlet NOx Sensor Power Supply - Data erratic, intermittent or incorrect			X		X With SCR	X
6583	441	14	Amber	Auxiliary Temperature 1	Auxiliary Temperature Sensor Input 1 - Special Instructions			X		X	X
6584	1388	14	Amber	Auxiliary Pressure #2	Auxiliary Pressure Sensor Input 2 - Special Instructions			X		X	X
6596	3713	31	Amber	Diesel Particulate Filter Active Regeneration Inhibited Due to System Timeout	Diesel Particulate Filter Active Regeneration Inhibited Due to System Timeout - Condition Exists	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
6597	6928	31	Amber	SCR System Cleaning Inhibited Due to System Timeout	SCR System Cleaning Inhibited Due to System Timeout - Condition Exists	X DOC+ SCR	X DOC+ SCR		X		
6619	3515	10	None	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 - Abnormal Rate of Change	X	X	X	X	X With SCR	X
6621	3216	10	None	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Abnormal rate of change	X	X	X	X	X With SCR	X
6634	7848	14	Amber	Aftertreatment 1 SCR System Conditions Not Met for Active Cleaning	Aftertreatment 1 SCR System Conditions Not Met for Active Cleaning - Special Instructions	X	X	X	X	X With SCR	X
6726	4796	31	None	Aftertreatment 1 Diesel Oxidation Catalyst Missing	Aftertreatment 1 Diesel Oxidation Catalyst Missing - Condition Exists	X	X	X	X	X DOC+ SCR	X
6752	3364	18	None	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
9491	524286	31	Amber		Reserved for temporary use - Condition Exists						X
9999	524286	31	Amber		Reserved for temporary use - Condition Exists			X			X

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8 Index

To avoid making the index unnecessarily long and unclear, we have not included every single element from the instrument panel.

These elements, such as switches and buttons, lamps and displays are described and named in detail in the overviews of the Chapter 3 and Chapter 9 *Truck Crane Description*.

From there, you are referred, as usual, to more detailed descriptions of these elements.

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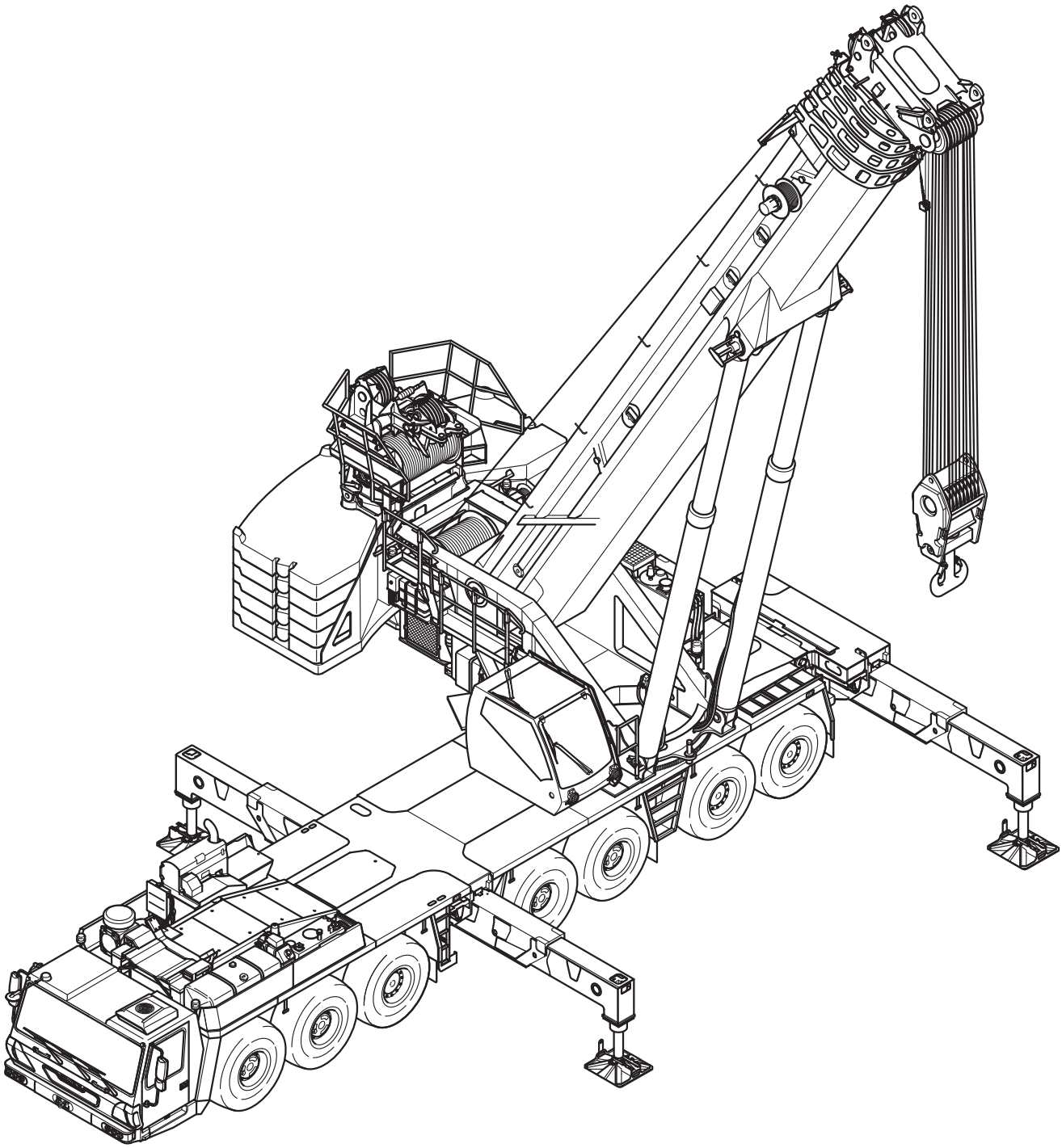
GROVE GMK7450

Operating Manual
Part 2 – Crane Operation



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This operating manual is divided into two parts:

Part 1 – Driving Operation

Part 2 – Crane Operation

Content overview of Part 2:

Chapters 1 to 8 are in Part 1 – Driving Operation

**This section alone does not constitute the entire operating manual.
The basic safety instructions for crane operation
can be found in Part 1, Chapter 2.**

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9 Operating elements for crane operation

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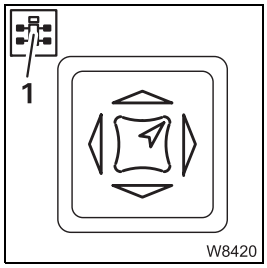
9 Operating elements for crane operation

All operating elements for driving are described in Chapter 3.

9.1 Overview of the operating elements

This section shows the position and designations of the operating elements for crane operation. This also includes display elements such as lights or displays.

Operating elements available only with additional equipment are designated accordingly. These designations are made in this section only and are not repeated in the following sections.



Some figures show details from a different perspective than the general overview. The perspective is indicated in these figures by the symbol (**1**).

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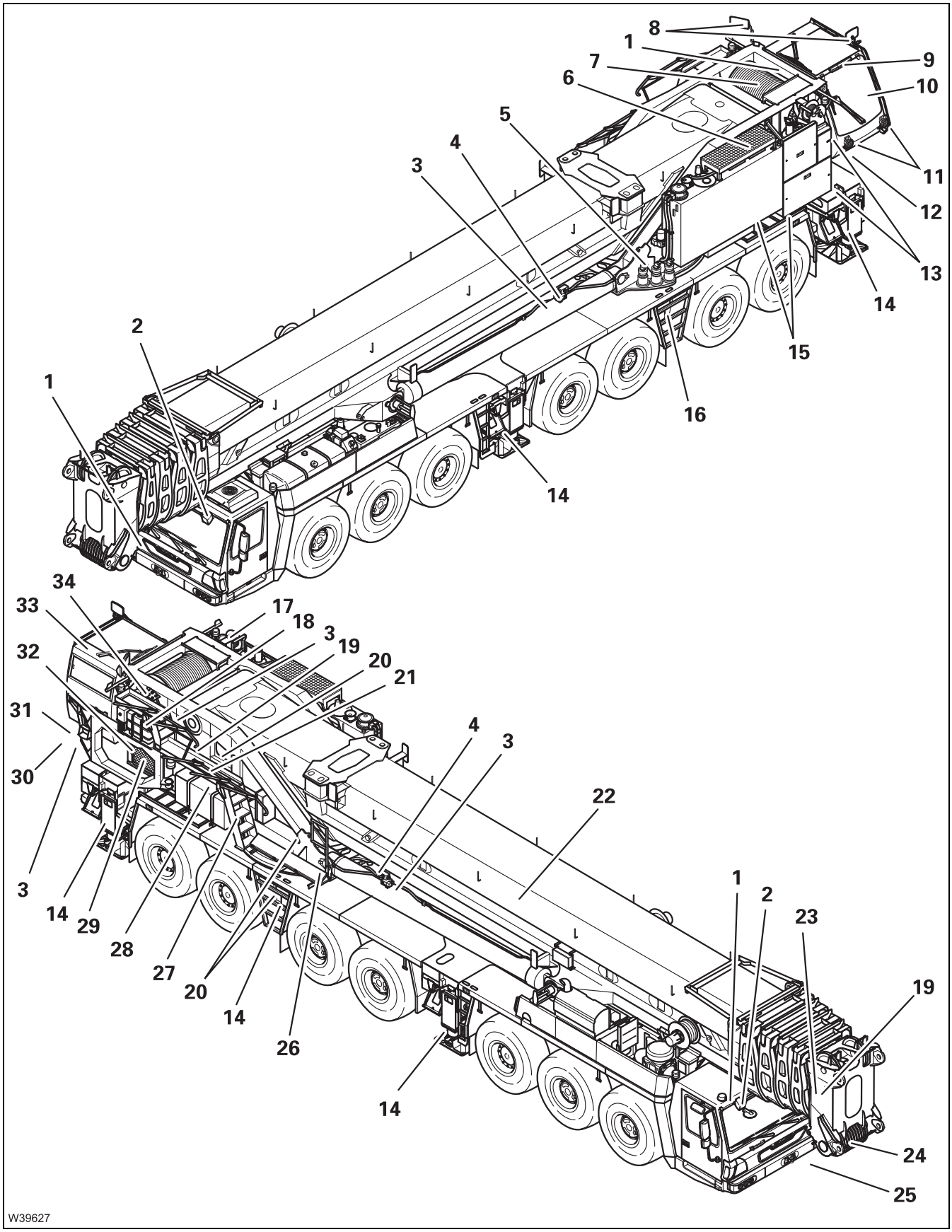
9.1.1 On the outside of the truck crane



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[1)] Additional equipment

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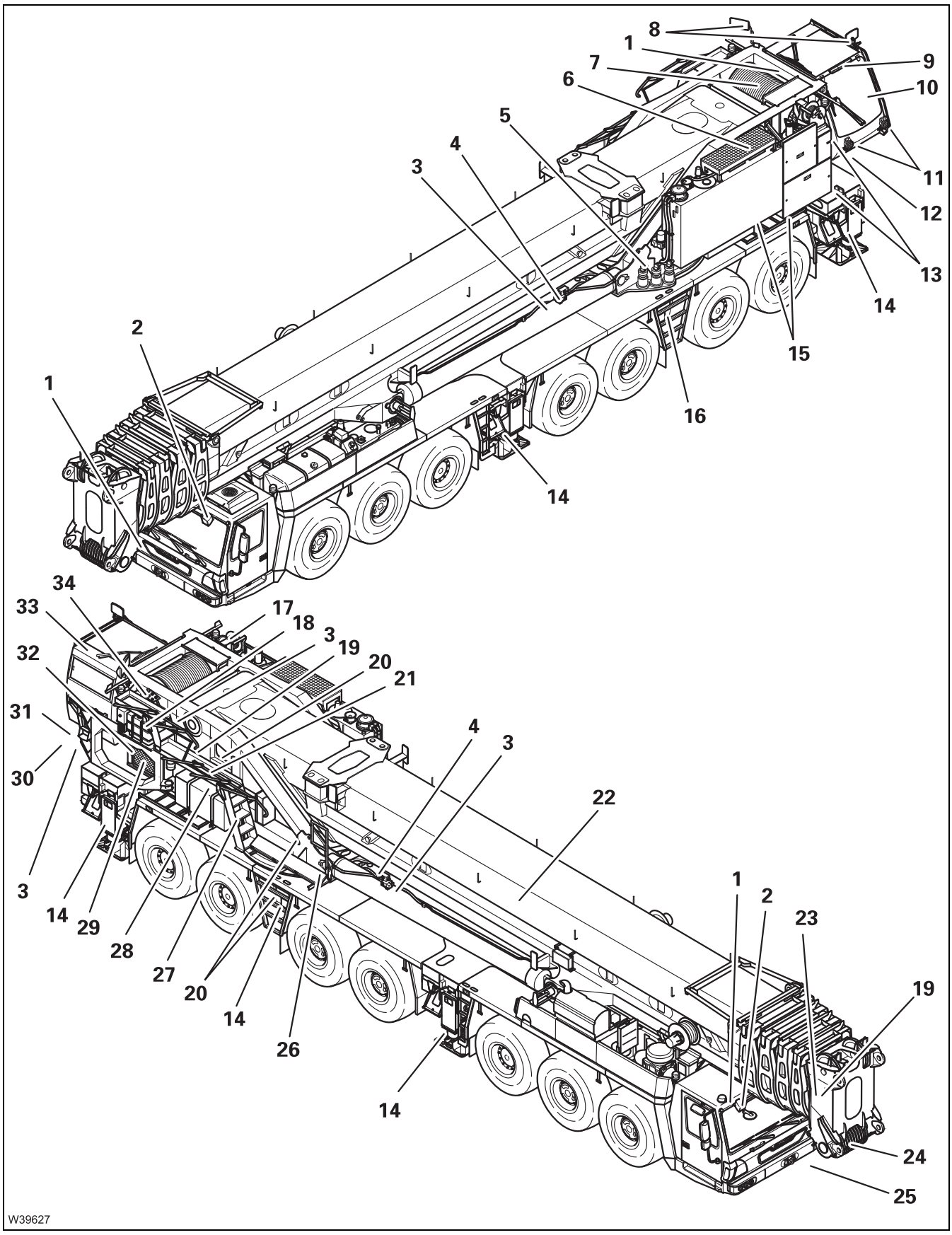
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– Removing/installing ➠ p. 12 - 76

32 Air intake inhibitor ➠ p. 10 - 23

33 CraneSTAR system[1)] ➠ p. 11 - 142

34 Lowering limit switch ➠ p. 11 - 63

[1)] Additional equipment

[2)] ➠ *Separate operating manual*

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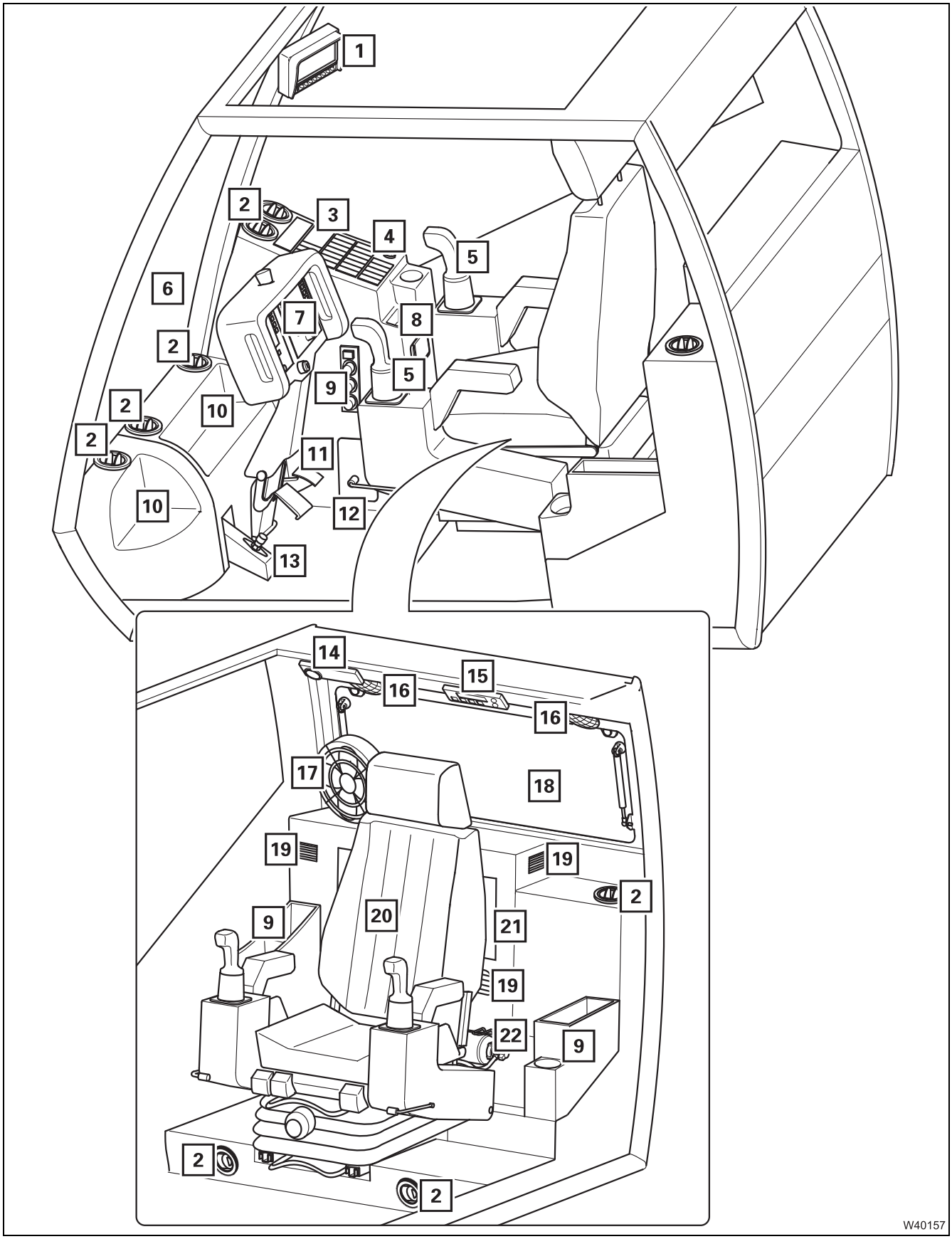
9.1.2 Crane cab



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1	Camera system monitor[1)]	➠ p. 12 - 121
2	Air vents	➠ p. 11 - 132
3	Water or air auxiliary heater[1)] Auxiliary air heater[1)]	➠ p. 9 - 14
4	Side panel, top	➠ p. 9 - 10
5	Control panels	➠ p. 9 - 15
6	Windscreen	➠ p. 9 - 100
7	Front control panel	➠ p. 9 - 8
8	Side panel, bottom	➠ p. 9 - 9
9	Standard heating system	➠ p. 9 - 13
10	Storage compartment	
11	Accelerator pedal	
12	Diagnostics	➠ p. 9 - 99
13	Slewing gear freewheel	➠ p. 9 - 68
14	Cab lighting	➠ p. 9 - 90
15	Radio-USB[1), 3)] Radio CD player[1), 2)]	
16	Loudspeaker[1)]	
17	Fan with switch[1)]	
18	Rear window	➠ p. 9 - 100
19	Intake/air vents	➠ p. 11 - 131
20	Crane cab seat Seat contact switch	➠ p. 11 - 7 ➠ p. 9 - 56
21	Detachable cover with fuses behind it	➠ p. 14 - 8
22	Fire extinguisher[2)]	

[1)] Additional equipment

[2)] ➠ *Maintenance manual*

[3)] ➠ *Separate operating manual*

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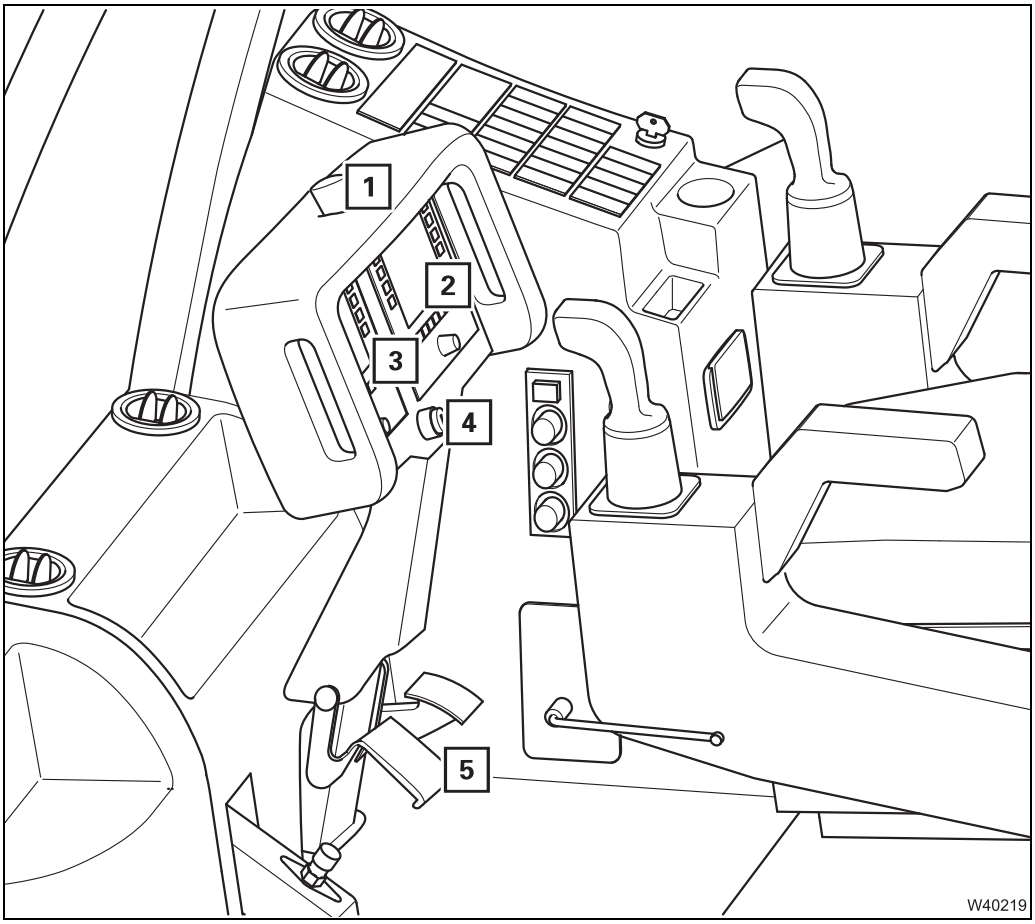
9.1.3 Front control panel



1 Emergency stop switch ➠ p. 9 - 59

2 RCL control unit (**R**ated-**C**apacity-**L**imiter) ➠ p. 9 - 33

3 ECOS control unit ➠ p. 9 - 19

4 Key-operated override switch ➠ p. 9 - 88
– For RCL
– For RCL and lifting limit switch

5 Front control panel ➠ p. 11 - 7

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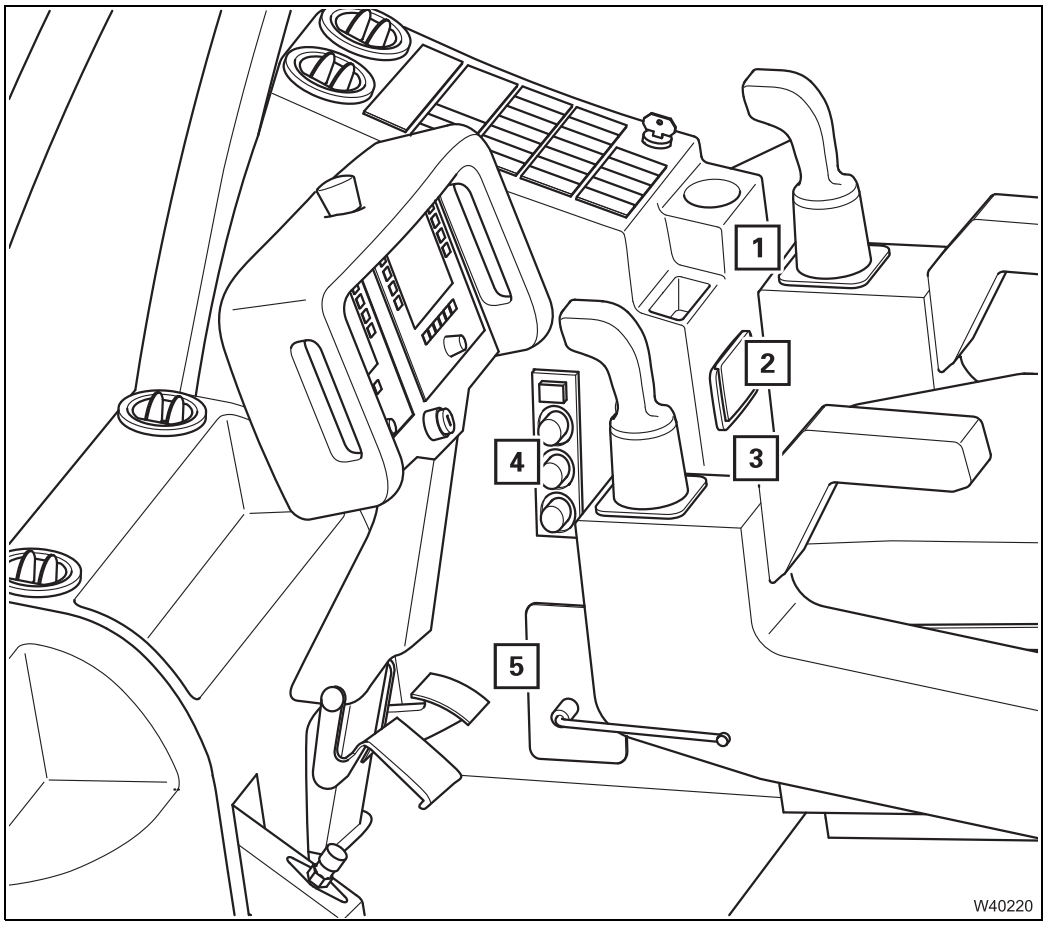
9.1.4 Side panel

Below



1 Cigarette lighter
2 Ashtray
3 12 V socket[1)]
4 Standard heating system ➠ p. 9 - 13
5 Diagnostics (behind cover) ➠ p. 9 - 99

[1)] Additional equipment

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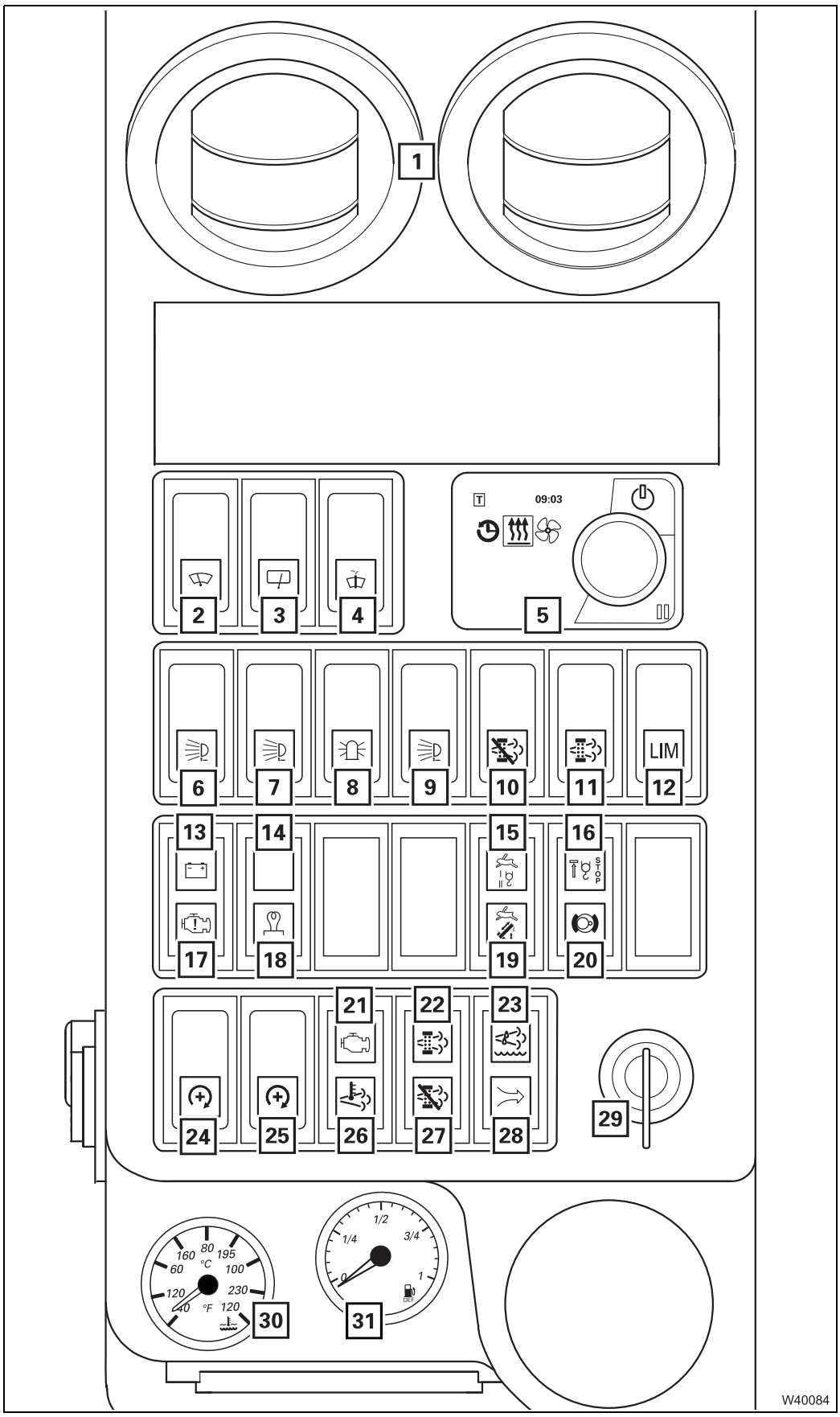
Top



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1	Air vents	➠ p. 11 - 132
2	Windscreen wiper on/off	➠ p. 9 - 91
3	Roof window wiper on/off	➠ p. 9 - 91
4	Windscreen washing system	➠ p. 9 - 91
5	Auxiliary water heater[1)]	➠ p. 11 - 133
6	Spotlight sockets on/off	➠ p. 9 - 89
7	Slewable spotlight on/off[1)]	➠ p. 9 - 90
8	Air traffic control light on/off	➠ p. 9 - 89
9	Swinging the spotlight	➠ p. 9 - 90
10	Disable exhaust system cleaning	➠ p. 10 - 30
11	Manually start exhaust system cleaning Diagnostics display	➠ p. 9 - 54 ➠ p. 9 - 52
12	Overriding torque reduction	➠ p. 9 - 55
13	Voltage monitoring warning	➠ p. 9 - 89
14	Exhaust system run-down	➠ p. 9 - 51
15	High speed monitoring for the hoists	➠ p. 9 - 66
16	Warning for lifting limit switch shutdown	➠ p. 9 - 67
17	Engine malfunction warning	➠ p. 9 - 52
18	Pre-heating on	➠ p. 9 - 51
19	High-speed indicator lamp for derricking gear/ telescoping mechanism	➠ p. 9 - 69
20	Slewing gear brake engaged/released	➠ p. 9 - 68
21	Engine malfunction early warning	➠ p. 9 - 52
22	Exhaust system cleaning required	➠ p. 9 - 54
23	AdBlue warning	➠ p. 9 - 53
24	Setting the idling speed	➠ p. 9 - 51
25	Speed control enable on/off	➠ p. 9 - 50
26	Exhaust system temperature too high	➠ p. 9 - 54
27	Exhaust system cleaning disabled	➠ p. 9 - 54
28	Air intake inhibitor triggered[1)]	➠ p. 9 - 51
29	Ignition lock	➠ p. 9 - 50
30	Coolant temperature display	➠ p. 10 - 16
31	AdBlue level display	➠ p. 9 - 53

[1)] Additional equipment

[2)] ➠ *Separate operating manual*

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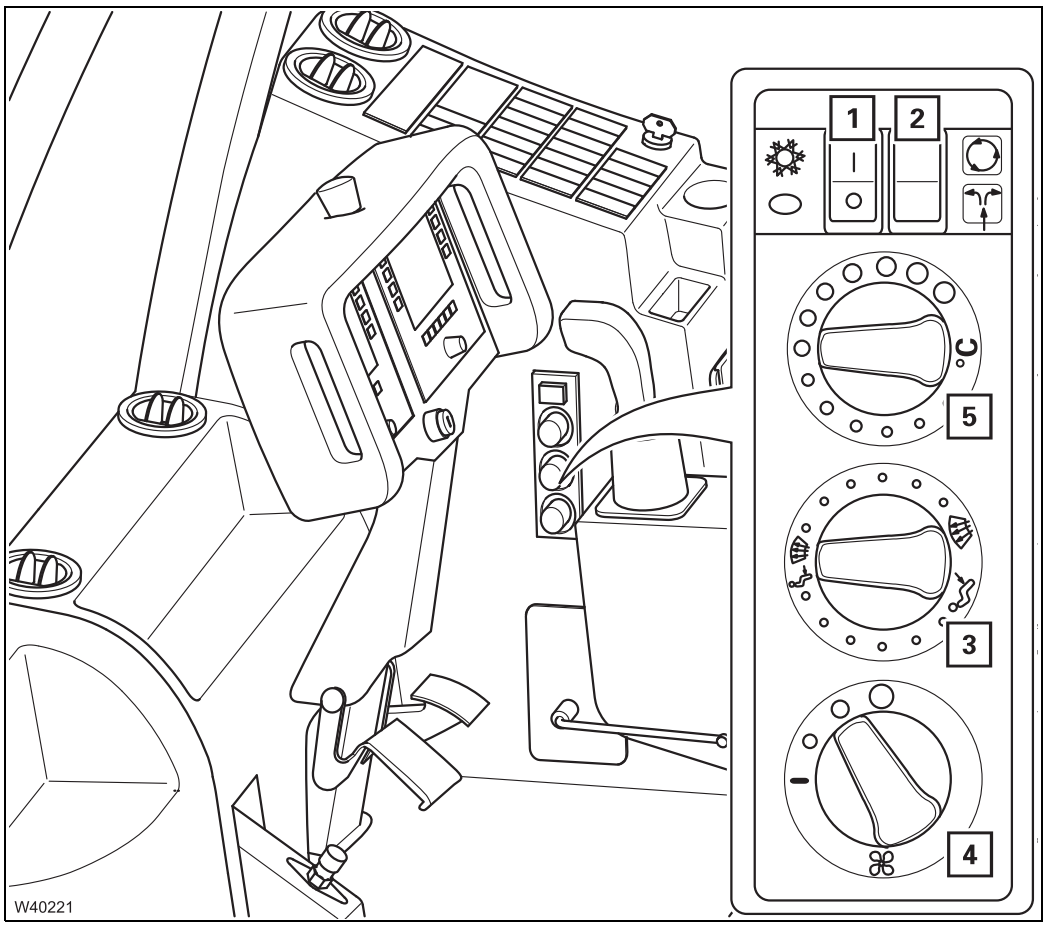
Standard heating system



1 Air-conditioning system[1)] ➠ p. 11 - 140
2 Setting recirculated/fresh air ➠ p. 11 - 131
3 Air distribution ➠ p. 11 - 132
4 Setting the fan ➠ p. 11 - 131
5 Setting the temperature ➠ p. 11 - 131

[1)] Additional equipment

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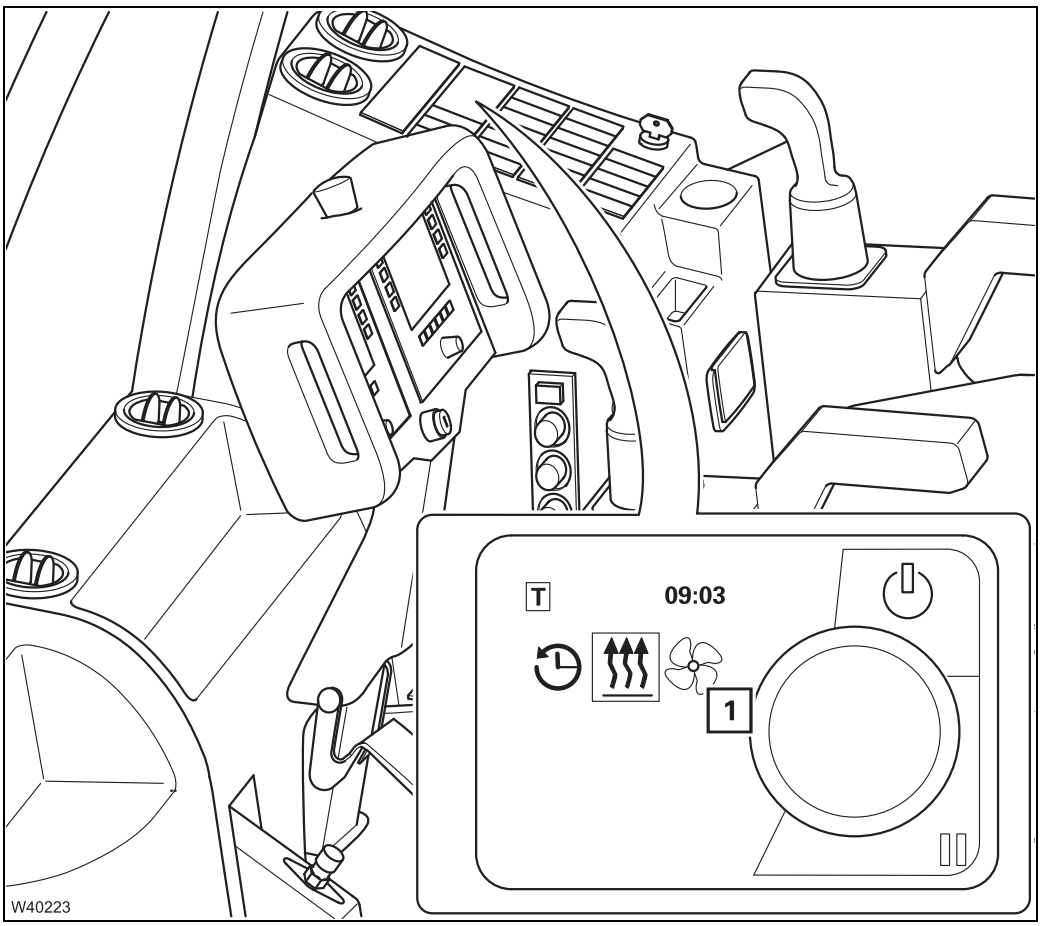
Water or air auxiliary heater



1 Auxiliary water heater[1), 2)] p. 11 - 133
Auxiliary air heater[1), 2)] p. 11 - 139

1) Additional equipment

2) Depending on the version

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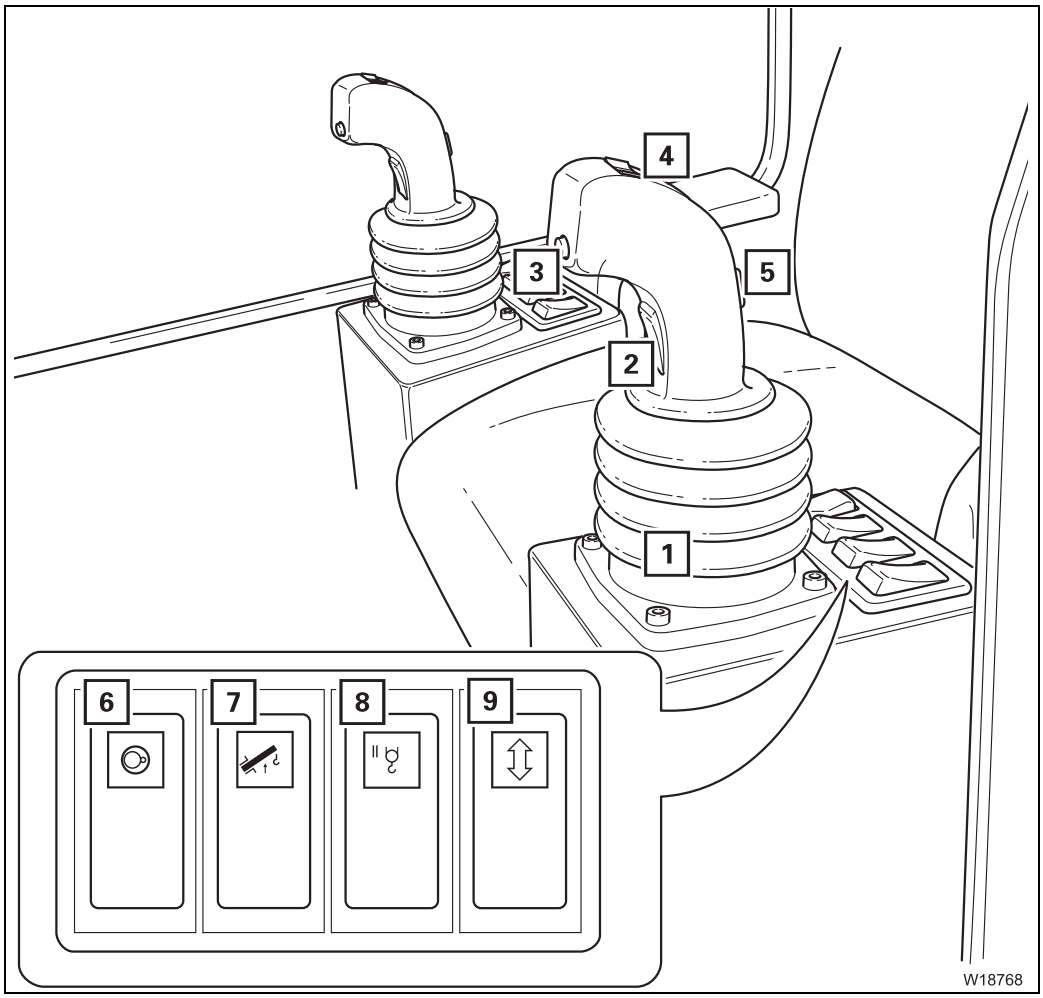
9.1.5 Control panels

Left



1 Left control lever (configuration according to design) ➠ p. 9 - 17

2 Dead man's switch ➠ p. 9 - 56

3 Horn button

4 Derricking gear/telescoping mechanism high-speed mode on/off ➠ p. 9 - 69

5 Auxiliary hoist slewing indicator[1)] ➠ p. 11 - 59

6 Slewing gear on/off ➠ p. 9 - 68

7 Raise after RCL shutdown[2)]

8 Auxiliary hoist on/off ➠ p. 9 - 67

9 Inclining the crane cab ➠ p. 9 - 76

[1)] Additional equipment

[2)] Only when programmed in accordance with EN 13000

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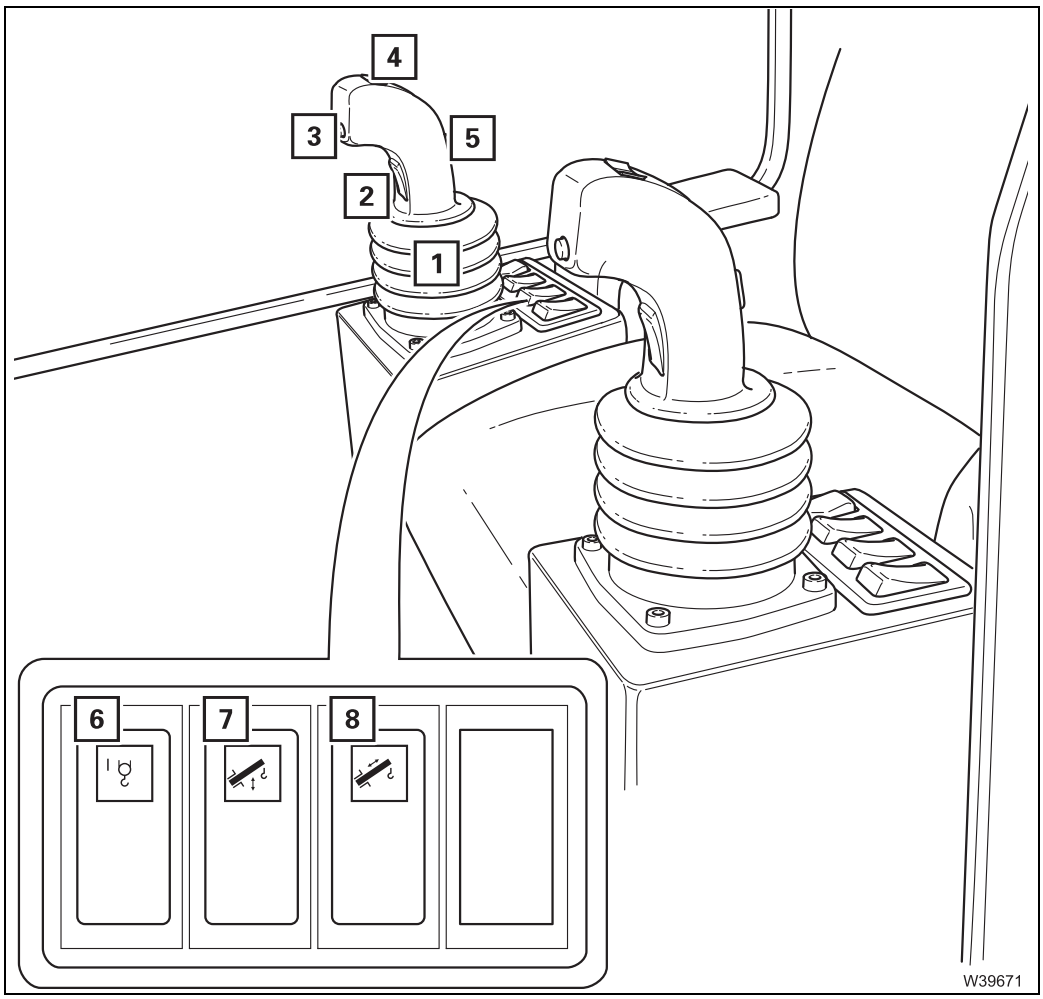
Right



1	Right control lever (configuration according to design)	p. 9 - 17
2	Dead man's switch	p. 9 - 56
3	Horn button	
4	Hoist high-speed mode on/off	p. 9 - 66
5	Main hoist slewing indicator	p. 11 - 56
6	Main hoist on/off	p. 9 - 66
7	Derricking gear on/off	p. 9 - 69
8	Telescoping mechanism on/off	p. 9 - 70

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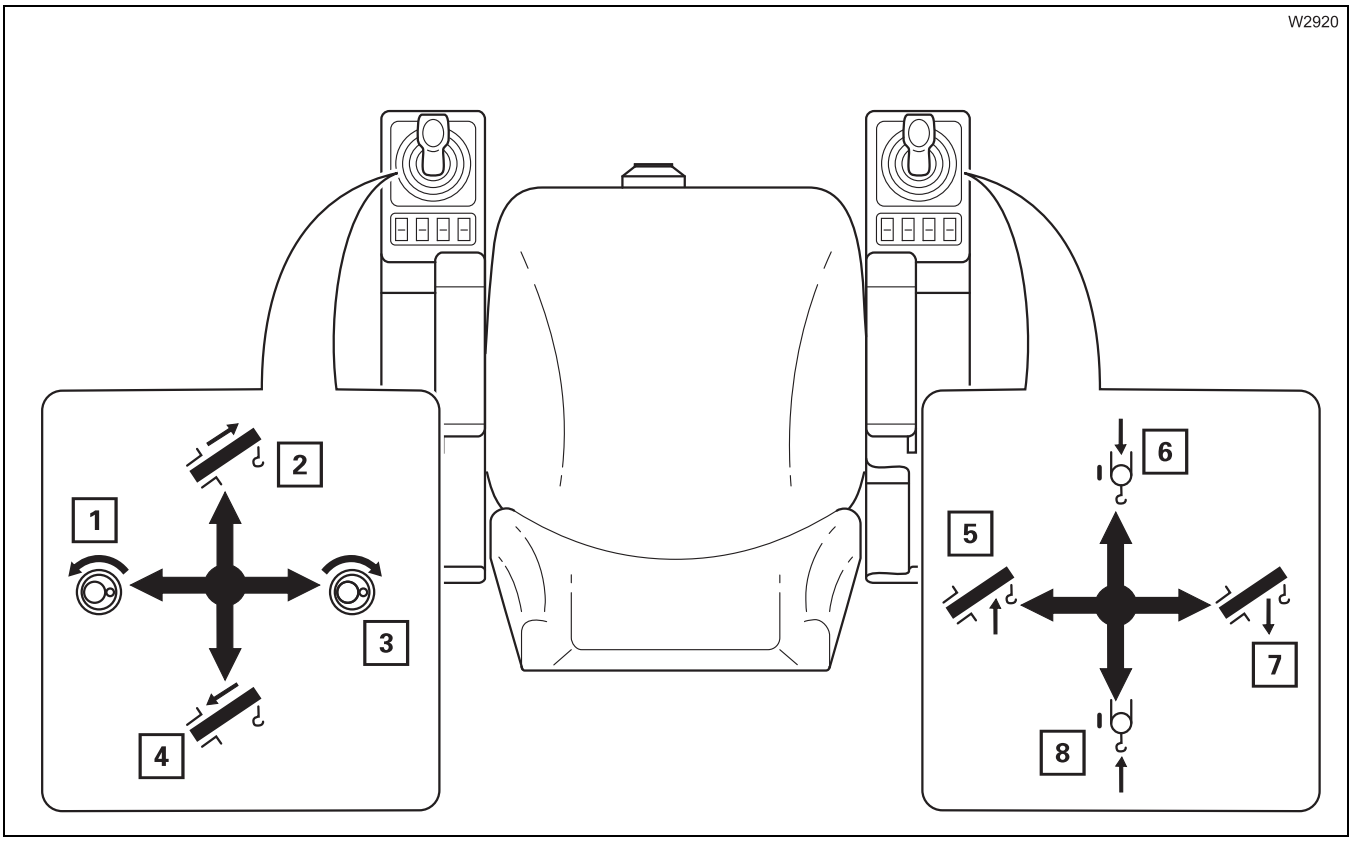
9.1.6 Control lever configuration

The truck crane can be equipped with two different control lever configurations. The current configuration of the control levers is indicated by symbols on the control levers.

Version 1

In version 1, the left control lever is configured with the *Telescope* function.



Left control lever

1 Slewing to the left
3 Slewing to the right
2 Extend
4 Retract

Right control lever

5 Raising
7 Lowering the boom
6 Lower the main hoist
8 Lift the main hoist

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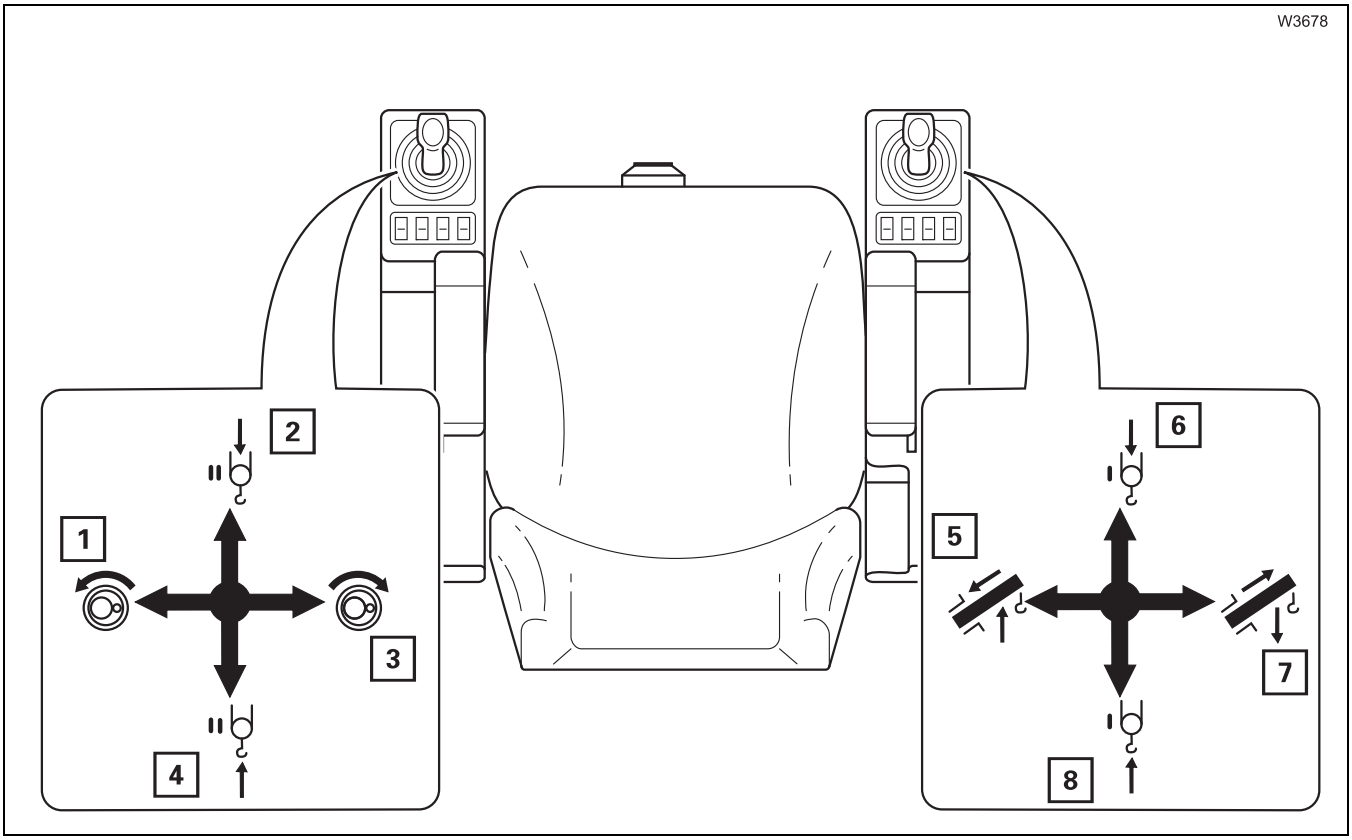
Version 2 In version 2, the right control lever is configured with the *Telescope* function.



Left control lever

1 Slewing to the left

3 Slewing to the right

2 Lower auxiliary hoist[1)]

4 Raise auxiliary hoist[1)]

Right control lever

5 Raising/retracting

7 Lowering/extending

6 Lower the main hoist

8 Lift the main hoist

[1)] Additional equipment

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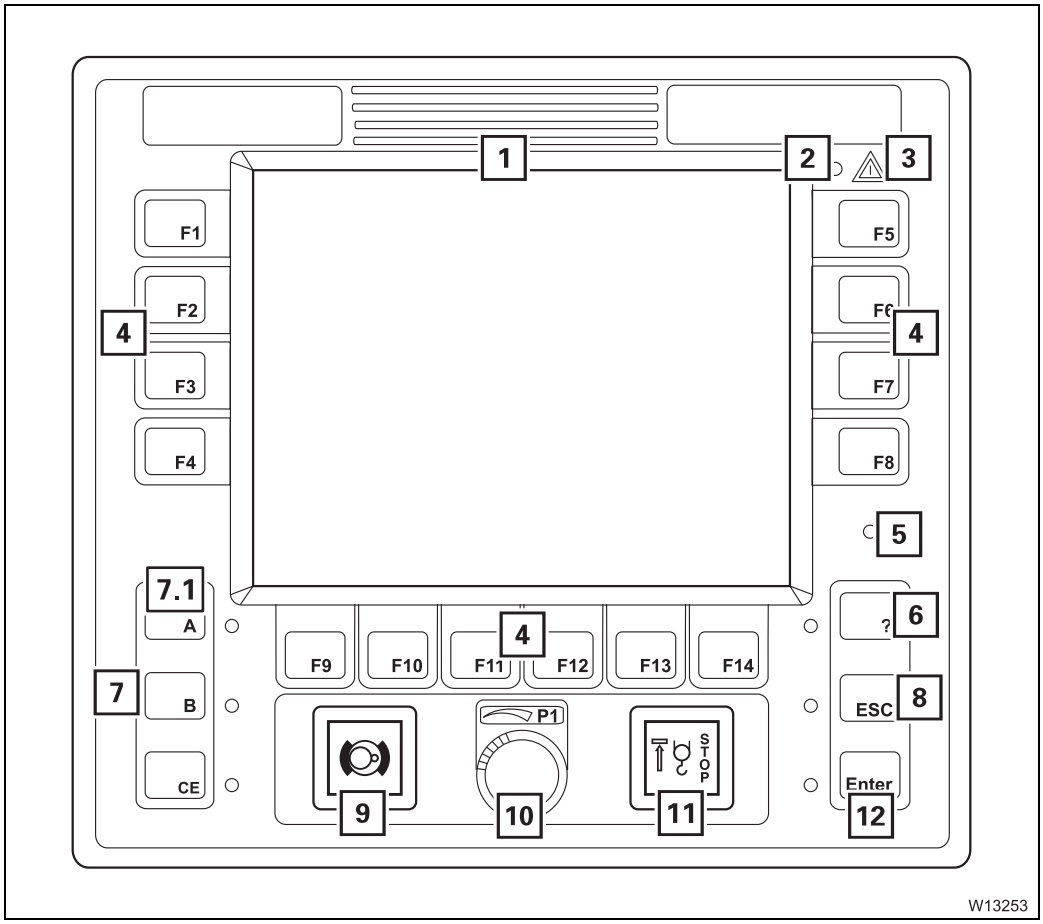
9.1.7 ECOS control unit



1	ECOS display Main menu overview	p. 9 - 59 p. 9 - 21
2	Sensor for brightness[1)]	p. 9 - 59
3	Error/warning message	p. 9 - 57
4	Buttons F 1 to F 14	p. 9 - 57
5	Sensor for brightness[1)]	p. 9 - 59
6	Opening Errors submenu Submenu overview	p. 9 - 57 p. 9 - 31
7	Keycode entry	p. 9 - 58
7.1	Open Warning submenu	p. 9 - 57
8	Exiting submenu/input mode	p. 9 - 58
9	Slewing gear brake engaged/released	p. 9 - 68
10	Entering values	p. 9 - 58
11	Warning for lifting limit switch shutdown	p. 9 - 67
12	Input confirmation	p. 9 - 58

[1)] Either **2** or **5**

Various menus are shown on the *ECOS* display.
The menus are operated using buttons F1 to F14. The individual buttons have a different function in each menu. The functions of the buttons in the displayed menu correspond to the symbols next to or above the buttons; p. 9 - 57.

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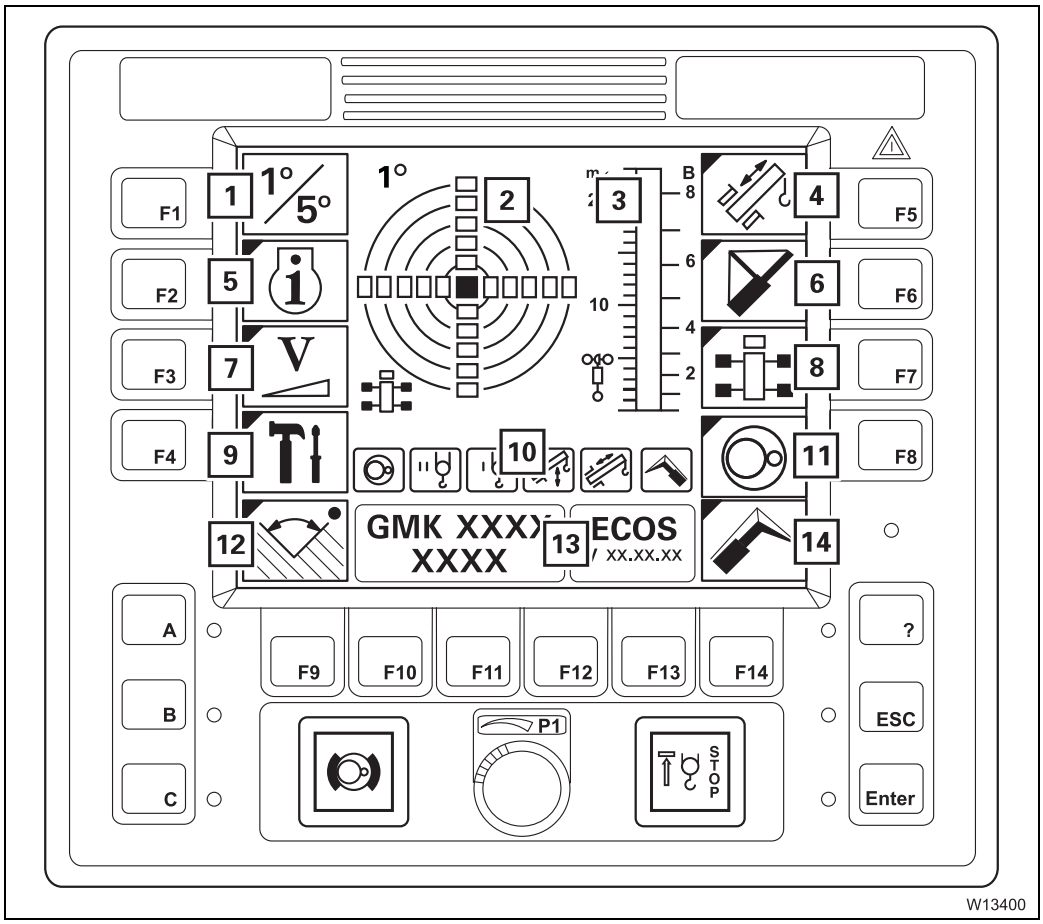
9.1.8 ECOS display – main menu

The main menu displays symbols for further submenus and symbols for current displays.



1 Switching over the measuring range ➠ p. 9 - 62
2 Current inclination display ➠ p. 9 - 62
3 Anemometer display ➠ p. 9 - 63
4 Telescoping submenu ➠ p. 9 - 25
5 Monitoring submenu ➠ p. 9 - 27
6 Mega Wing Lift submenu[1), 2)]
7 Power unit speeds submenu ➠ p. 9 - 26
8 Outriggers submenu ➠ p. 9 - 24
9 Settings submenu ➠ p. 9 - 28
10 Power units display
– Slewing gear ➠ p. 9 - 68
– Auxiliary hoist ➠ p. 9 - 67
– Main hoist ➠ p. 9 - 66
– Derricking gear ➠ p. 9 - 69
– Telescoping mechanism ➠ p. 9 - 70
– Derricking the lattice extension[1), 3)]
11 Superstructure lock submenu[1)] ➠ p. 9 - 23
12 Working range limitation submenu[1)] ➠ p. 9 - 31
13 Serial number and programme version displays ➠ p. 9 - 59
14 Lattice extension submenu[1), 3)]

[1)] Additional equipment
[2)] ➠ *Mega Wing Lift Operating Manual*
[3)] ➠ *Lattice extension operating manual*

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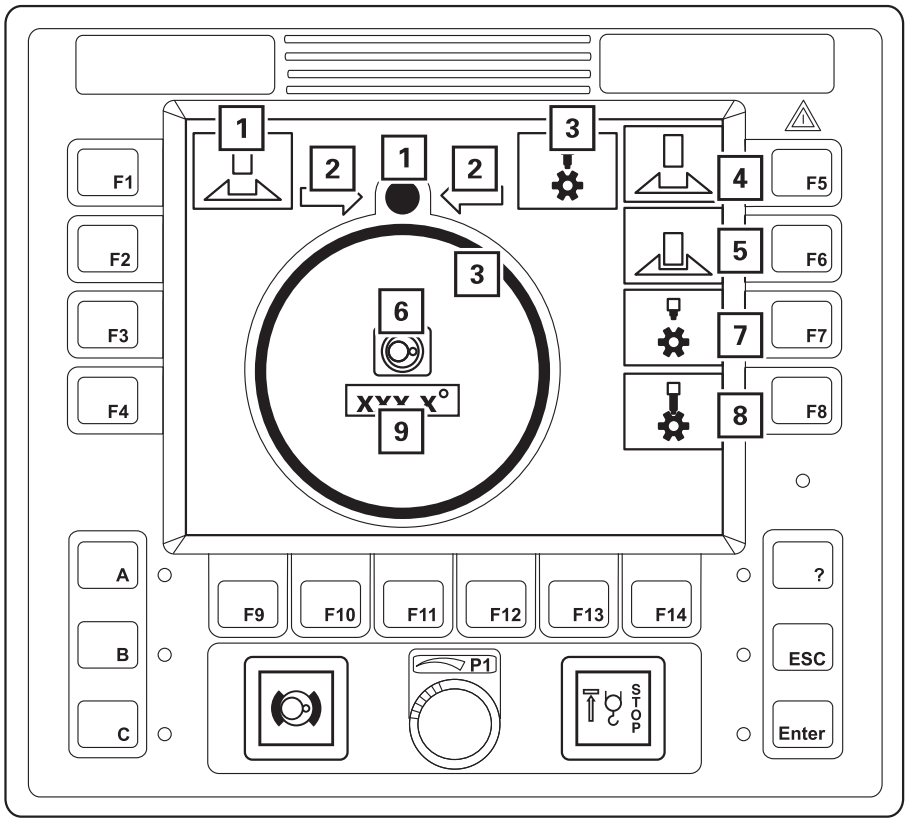
9.1.9 ECOS display – submenus

Superstructure lock submenu



1	Superstructure locking status displays	➠ p. 9 - 64
2	Display slewing direction to 0°/180°	➠ p. 9 - 65
3	Houselock locking status displays[1)]	➠ p. 9 - 65
4	Locking/unlocking the turntable	➠ p. 9 - 64
5	Houselock on/off[1)]	➠ p. 9 - 65
6	Slewing gear display	➠ p. 9 - 64
7	Houselock off	➠ p. 9 - 65
8	Houselock on	➠ p. 9 - 65
9	Current slewing angle display	➠ p. 9 - 65

[1)] Additional equipment

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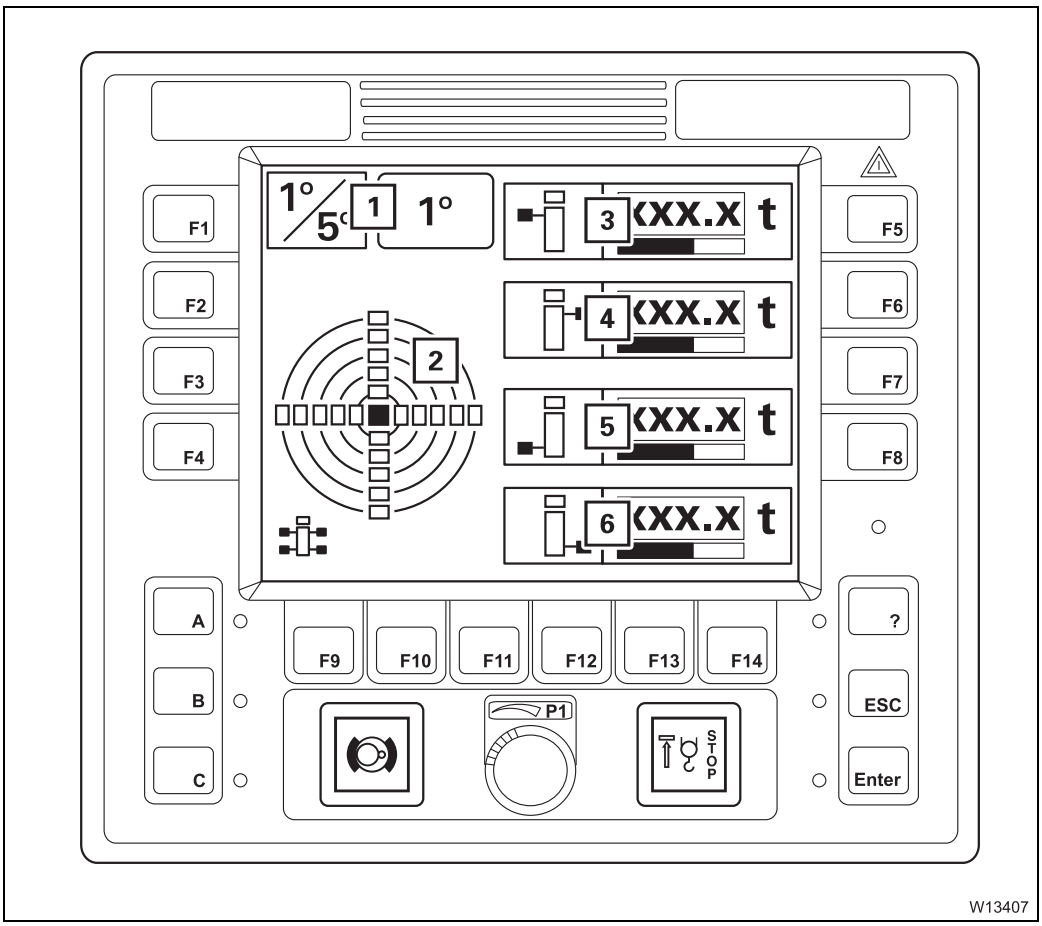
Outriggers submenu



1 Switching over the measuring range p. 9 - 62
2 Current inclination display p. 9 - 62
3 Front left outrigger pressure display p. 9 - 63
4 Front right outrigger pressure display p. 9 - 63
5 Rear left outrigger pressure display p. 9 - 63
6 Rear right outrigger pressure display p. 9 - 63

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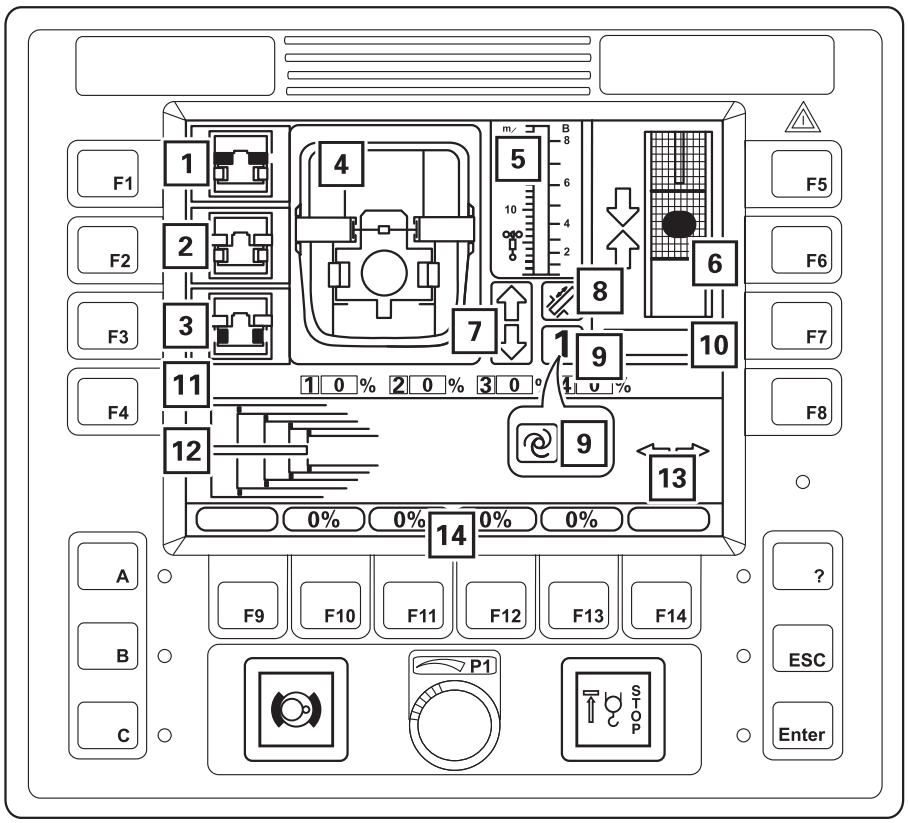
Telescoping submenu



1 Unlock telescopic section selection ➠ p. 9 - 73
2 Lock selection ➠ p. 9 - 73
3 Unlock telescoping cylinder selection ➠ p. 9 - 72
4 Locking status display ➠ p. 9 - 72
5 Anemometer display ➠ p. 9 - 63
6 Locking point display ➠ p. 9 - 74
7 Enable telescoping display ➠ p. 9 - 74
8 Display for telescoping mechanism on/off ➠ p. 9 - 71
9 – Telescoping cylinder in the telescopic section display ➠ p. 9 - 71
– Teleautomation on/off display ➠ p. 9 - 75
10 Telescoping cylinder length display ➠ p. 9 - 73
11 Current telescoping status display ➠ p. 9 - 71
12 Telescope diagram display ➠ p. 9 - 72
13 Teleautomation direction display ➠ p. 9 - 74
14 Entering target value for teleautomation ➠ p. 9 - 74

1) ➠ *Separate operating manual*

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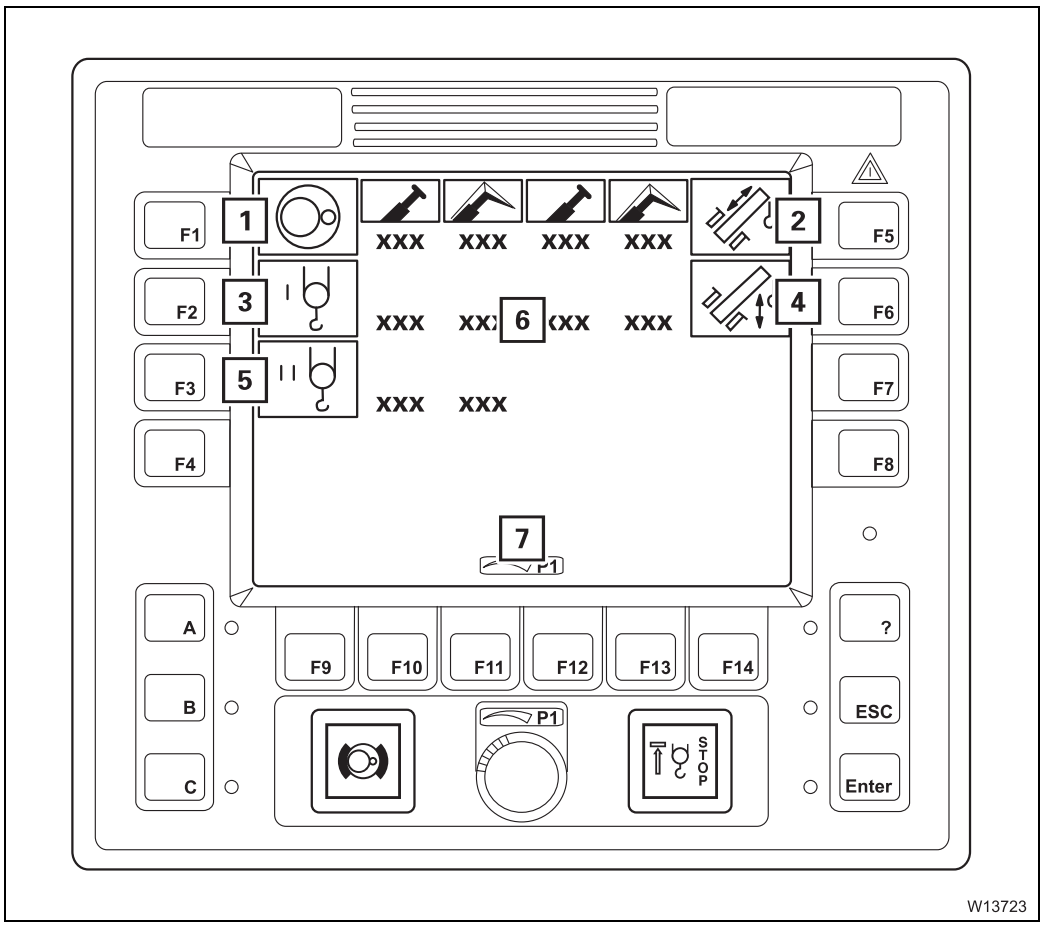
Power unit speeds submenu



1 Enter slewing gear speed p. 11 - 104
2 Enter telescoping mechanism speed p. 11 - 104
3 Enter speed – main hoist p. 11 - 104
4 Enter derricking gear speed p. 11 - 104
5 Enter auxiliary hoist speed[1)] p. 11 - 104
6 Displays of entered speed p. 11 - 104
7 Display for Input mode on

[1)] Additional equipment

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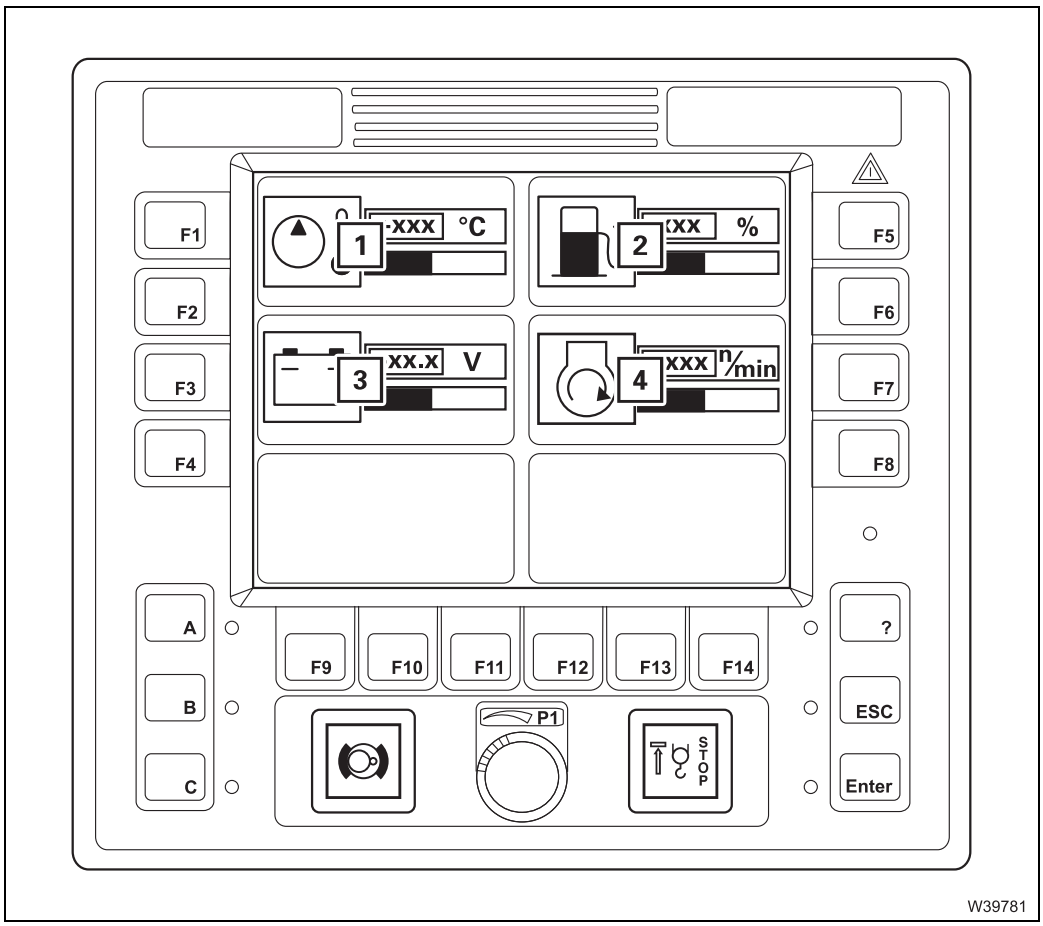
Monitoring submenu



1 Hydraulic oil temperature display p. 10 - 16

2 Fuel level display p. 10 - 16

3 Voltage monitoring display p. 10 - 16

4 Engine speed display p. 10 - 16

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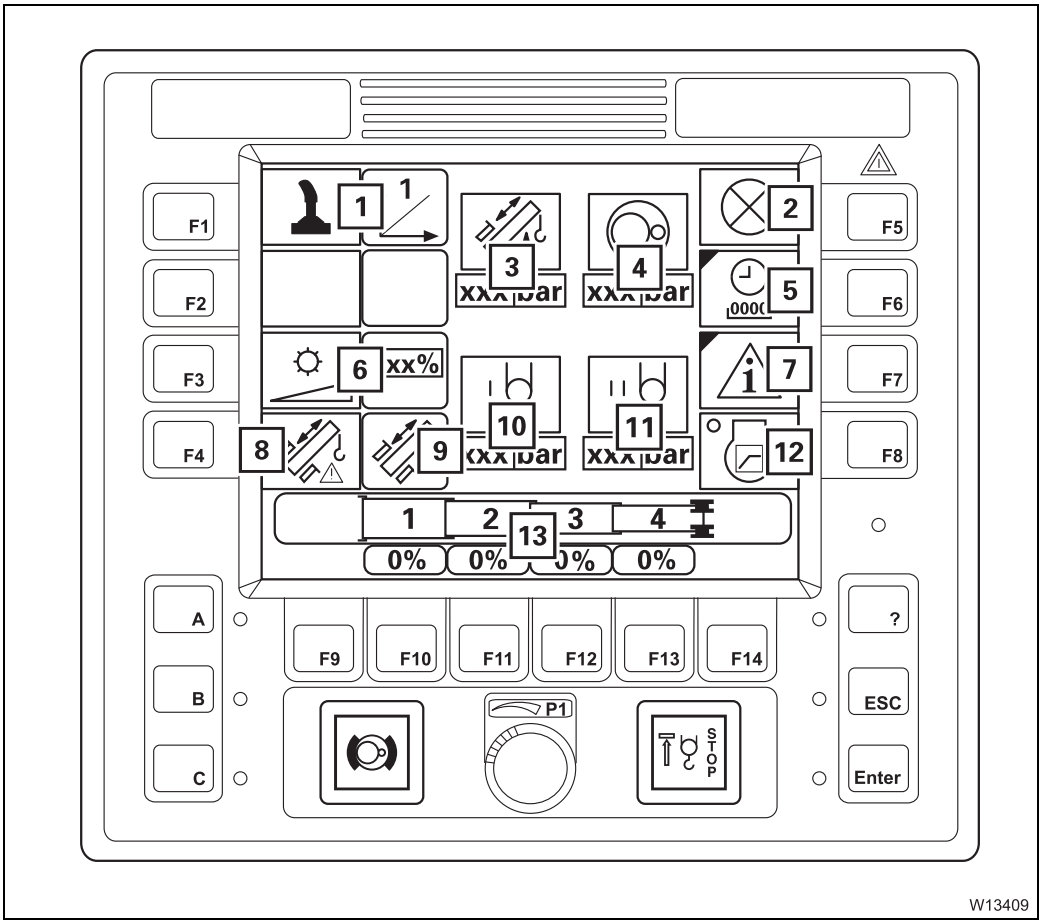
Settings submenu



1	Setting the characteristic curves for the control levers	➠ p. 11 - 106
2	Lamp test	➠ p. 10 - 10
3	Telescoping cylinder pressure display	➠ p. 9 - 76
4	Slewing gear hydraulic circuit pressure display	➠ p. 9 - 76
5	Operating hours submenu	➠ p. 9 - 29
6	Adjusting display brightness	➠ p. 10 - 12
7	Warning submenu	➠ p. 9 - 29
8	Telescoping emergency program access	➠ p. 9 - 75
9	Current telescoping mechanism status display	➠ p. 9 - 75
10	Main hoist pressure display	➠ p. 9 - 76
11	Auxiliary hoist pressure display	➠ p. 9 - 76
12	Critical load control on/off	➠ p. 9 - 76
13	Entering the current telescoping	➠ p. 14 - 57

[1] Additional equipment

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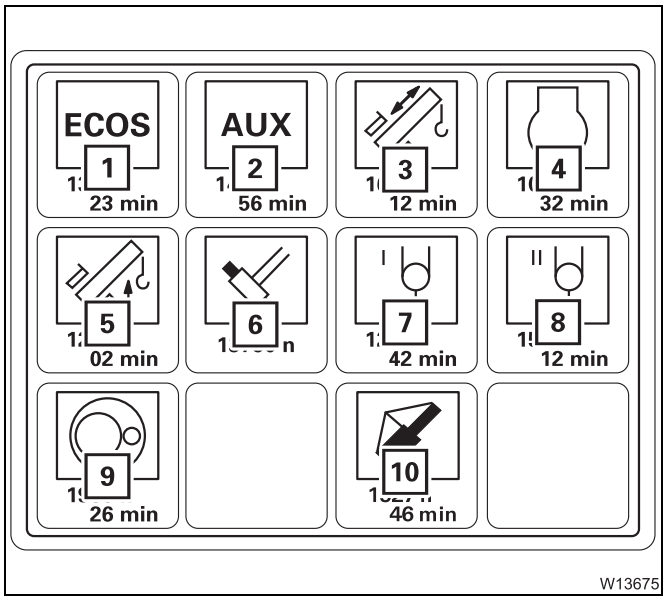
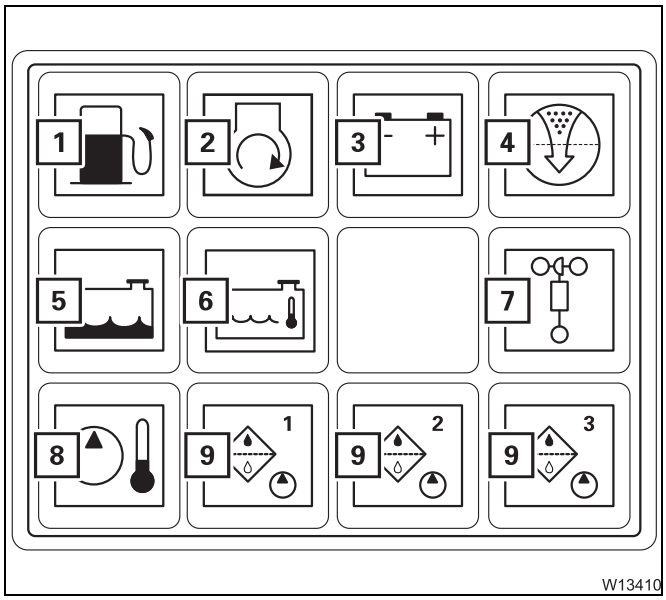
Operating hours submenu Description of the displays; ➠ *Displaying the operating hours*, p. 11 - 109.



1 ECOS
2 Auxiliary drive gears
3 Telescoping mechanism
4 Engine for crane operation
5 Derricking gear
6 Locking system
7 Main hoist
8 Auxiliary hoist[1)]
9 Slewing gear
10 Mega Wing Lift[1, 2)]

[1)] Additional equipment
[2)] Only active with additional equipment; ➠ *Mega Wing Lift Operating Manual*

Warning submenu Description of the displays; ➠ *Warning submenu*, p. 11 - 110.



1 Refuelling
2 Air intake inhibitor triggered[1)]
3 Voltage monitoring
4 Coolant level too low
5 Coolant too hot
6 Anemometer not connected
7 Hydraulic oil too hot
8 Replacing the hydraulic oil filter
9 Replacing the hydraulic oil filter
10 Replacing the hydraulic oil filter

[1)] Additional equipment

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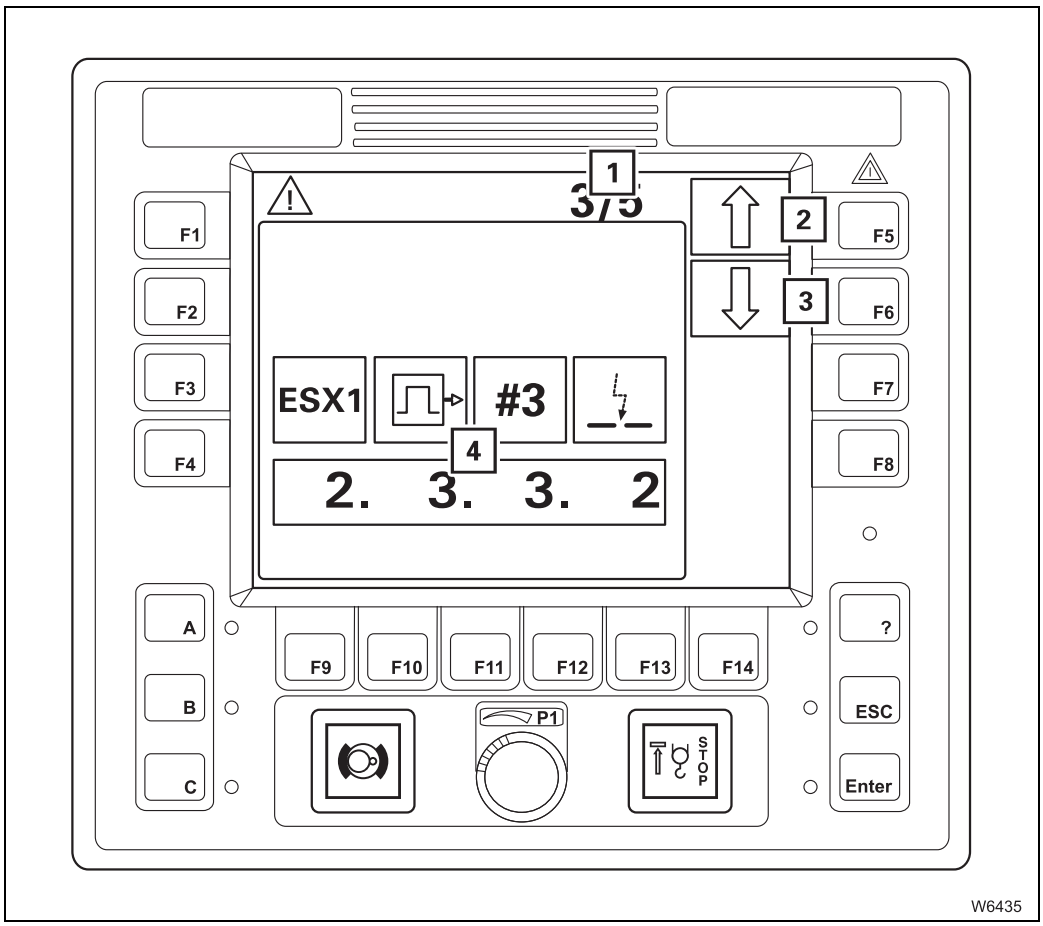
Error submenu



1 Current errors/total errors display ➠ p. 14 - 39

2 Next error ➠ p. 14 - 39

3 Previous error ➠ p. 14 - 39

4 Error display ➠ p. 14 - 39

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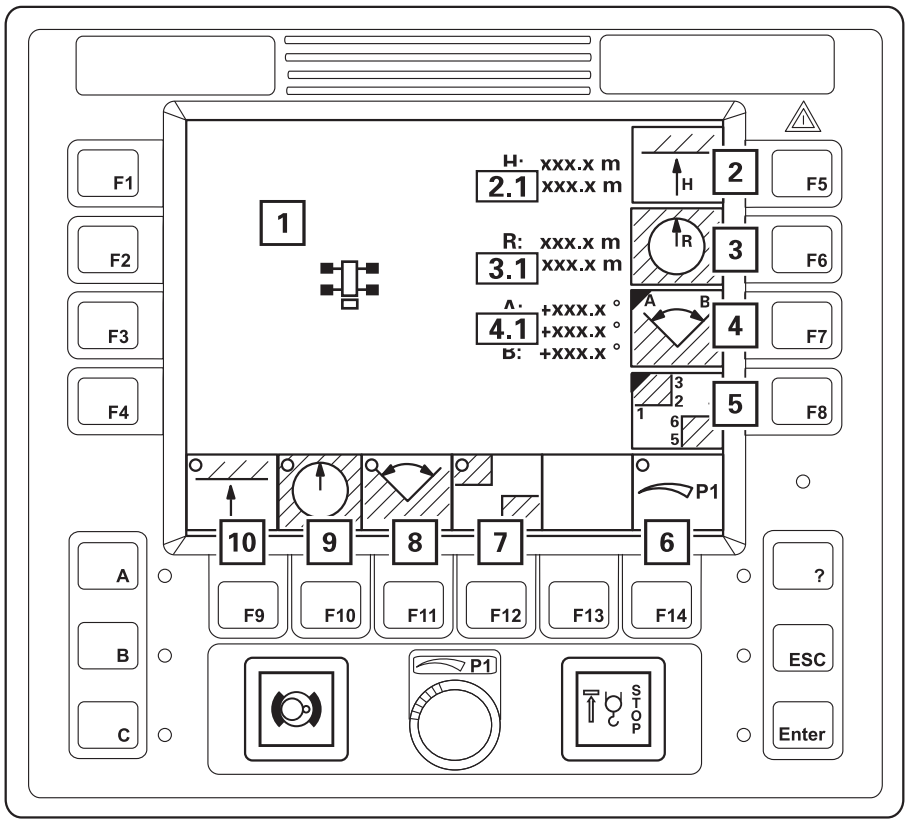
Working range limitation submenu



1	Working range limiter display	➠ p. 11 - 126
2	Input maximum overall height	➠ p. 11 - 118
2.1	Maximum overall height display	➠ p. 11 - 118
3	Input maximum working radius	➠ p. 11 - 118
3.1	Maximum/Current working radius display	➠ p. 11 - 118
4	Enter slewing angle submenu	➠ p. 9 - 32
4.1	Maximum/Current slewing angle display	➠ p. 11 - 119
5	Enter objects submenu	➠ p. 9 - 32
6	Manual input on/off	➠ p. 11 - 124
7	Object monitoring on/off	➠ p. 11 - 126
8	Slewing angle monitoring on/off	➠ p. 11 - 126
9	Working radius monitoring on/off	➠ p. 11 - 126
10	Overall height monitoring on/off	➠ p. 11 - 126

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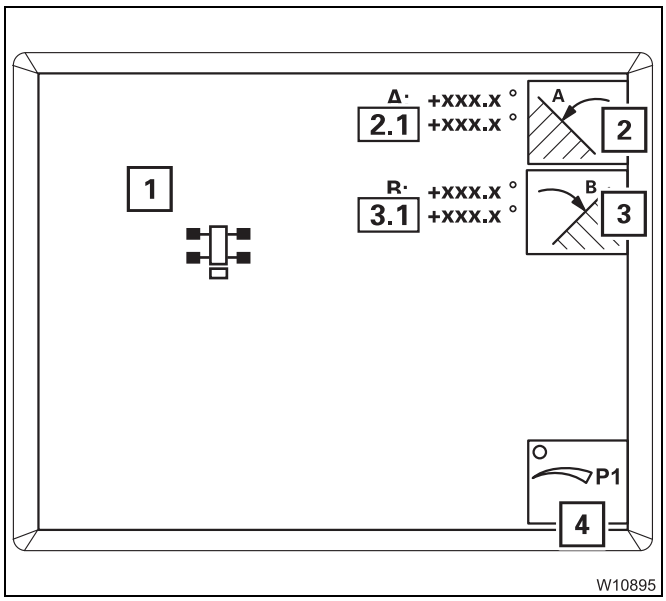


Enter slewing angle submenu

1 Limited slewing angle display

2 Select slewing angle **A**

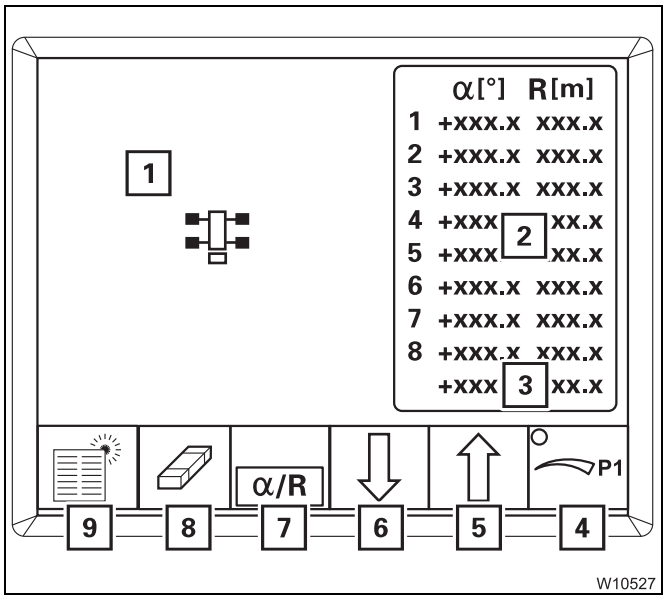
2.1 Display of maximum/current slewing angle **A**

3 Select slewing angle **B**

3.1 Display of maximum/current slewing angle **B**

4 Manual input on/off

Slewing angle, p. 11 - 119.



Enter objects submenu

1 Limitation by object display

2 Point data display

3 Current point data display

4 Manual input on/off

5 Select Previous point

6 Select Next point

7 Select angle/working radius

8 Delete selected point data

9 Delete all point data

Entering objects, p. 11 - 121.

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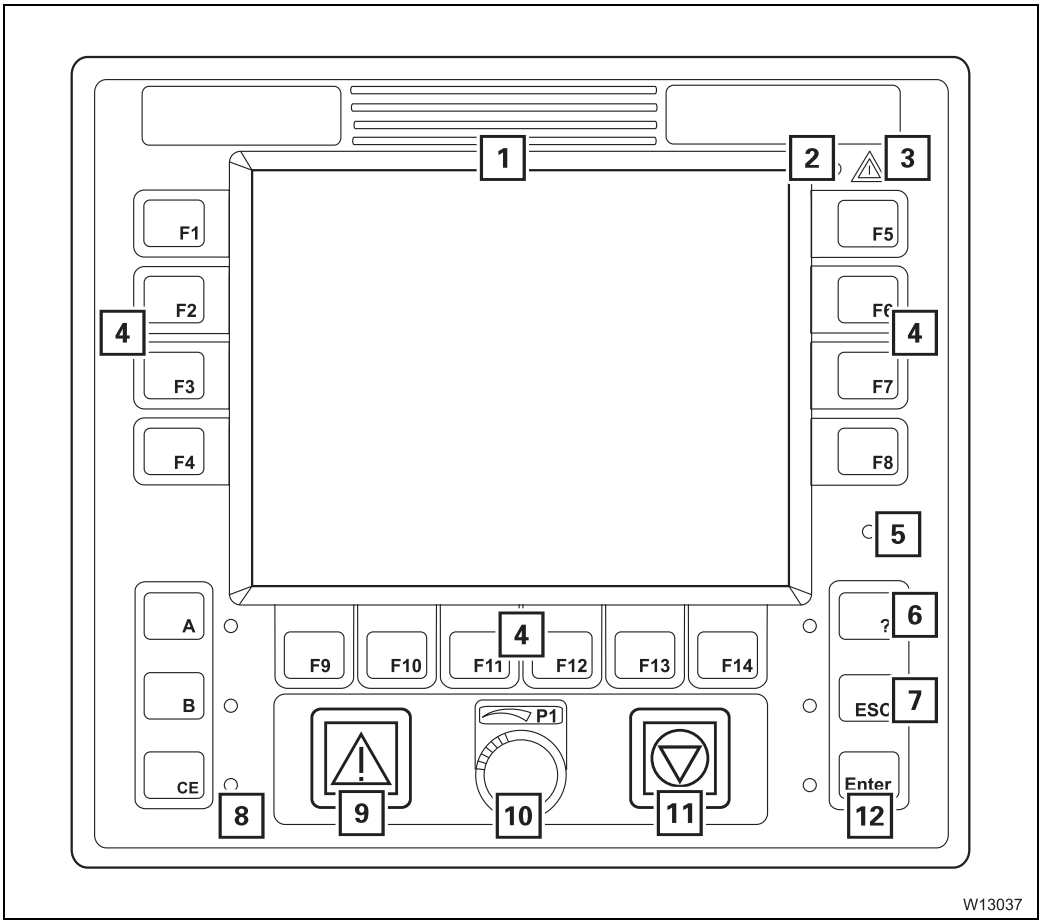
9.1.10 RCL control unit



1	RCL display	p. 9 - 79
	ECOS display – main menu	p. 9 - 21
2	Sensor for brightness	p. 9 - 78
3	Error/warning message	p. 9 - 57
4	Buttons F1 to F14	p. 9 - 57
5	Sensor for brightness	p. 9 - 78
6	Opening Errors submenu	p. 9 - 57
	Submenu overview	p. 9 - 42
7	Exiting submenu/input mode	p. 9 - 58
8	Acknowledging	p. 9 - 78
9	RCL early warning	p. 9 - 78
10	Entering values	p. 9 - 58
11	RCL shutdown	p. 9 - 78
12	Input confirmation	p. 9 - 77

[1)] Either **2** or **5**

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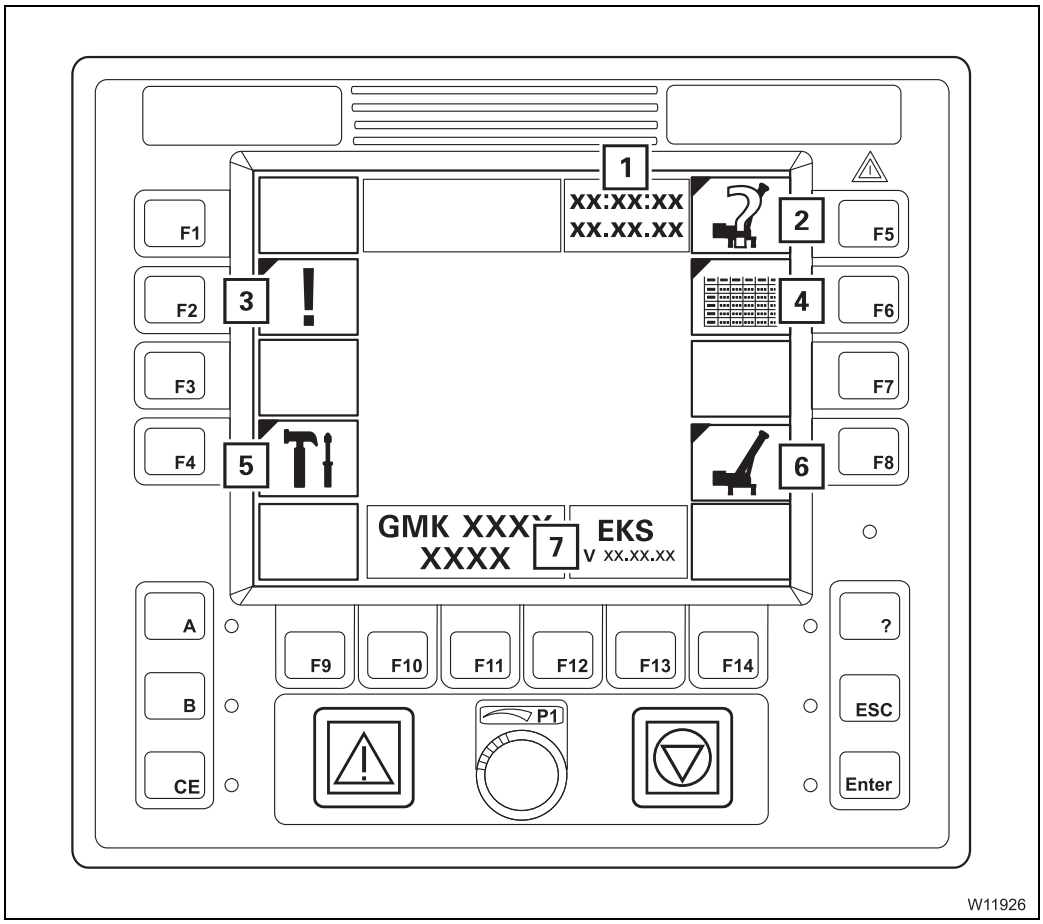
9.1.11 RCL display – main menu

The main menu shows symbols for further submenus and symbols for current displays.



1 Date/time display p. 9 - 79
2 Enter rigging mode submenu p. 9 - 35
3 Error submenu p. 9 - 42
4 Lifting capacity table submenu p. 9 - 40
5 Settings submenu p. 9 - 43
6 Monitoring submenu p. 9 - 37
7 Serial number and programme version displays p. 9 - 59

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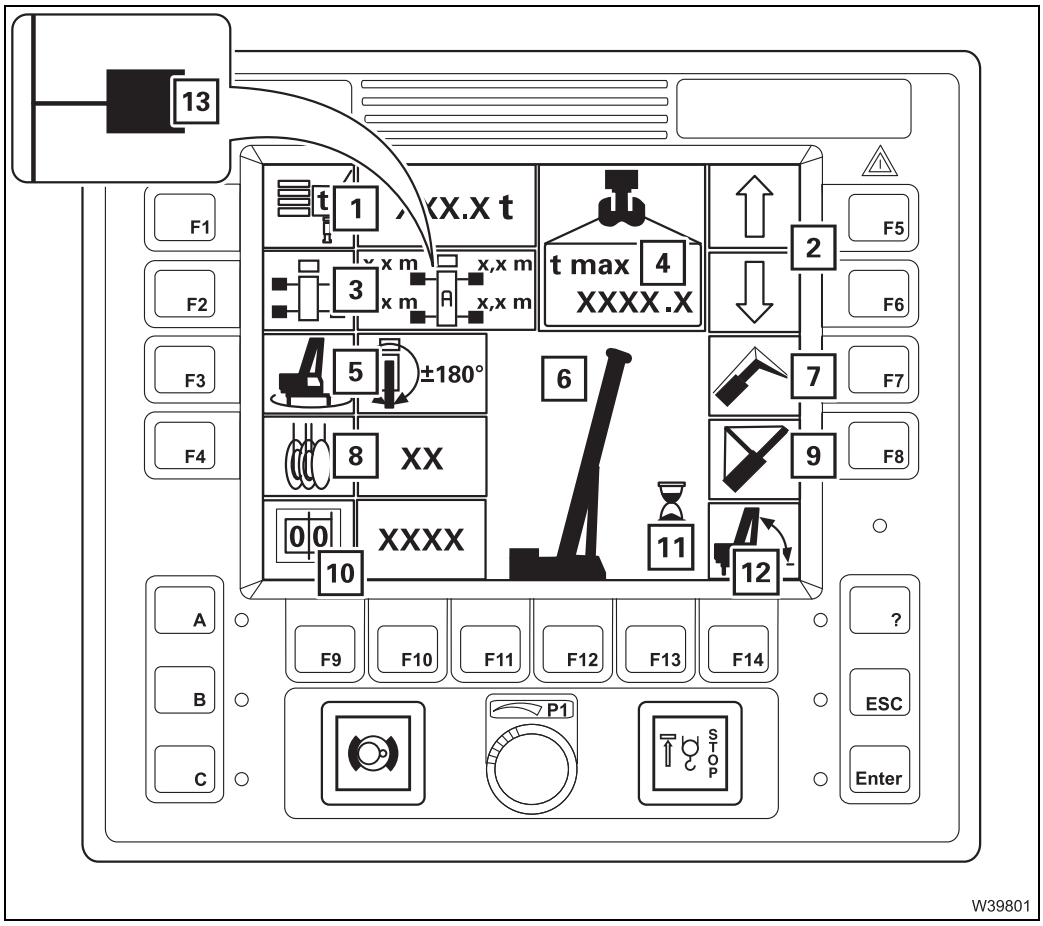
9.1.12 Display RCL – submenus

Enter rigging mode submenu



1	Entering counterweight	➠ p. 9 - 80
2	Selection	➠ p. 9 - 80
3	Enter outrigger span	➠ p. 9 - 81
4	Maximum load display	➠ p. 9 - 82
5	Enter slewing range	➠ p. 9 - 82
6	Boom system entry	➠ p. 9 - 82
7	Boom system entry[1)]	➠ p. 9 - 82
8	Entering reeving	➠ p. 9 - 80
9	Enter Mega Wing Lift[2)]	
10	Enter RCL code	➠ p. 9 - 80
11	Determine the displayed RCL code	➠ p. 9 - 80
12	Enter main boom angle[1)]	
13	Outrigger span monitoring display[1)]	➠ p. 9 - 81

[1)] ➠ *Lattice extension operating manual*

[2)] ➠ *Mega Wing Lift Operating Manual*

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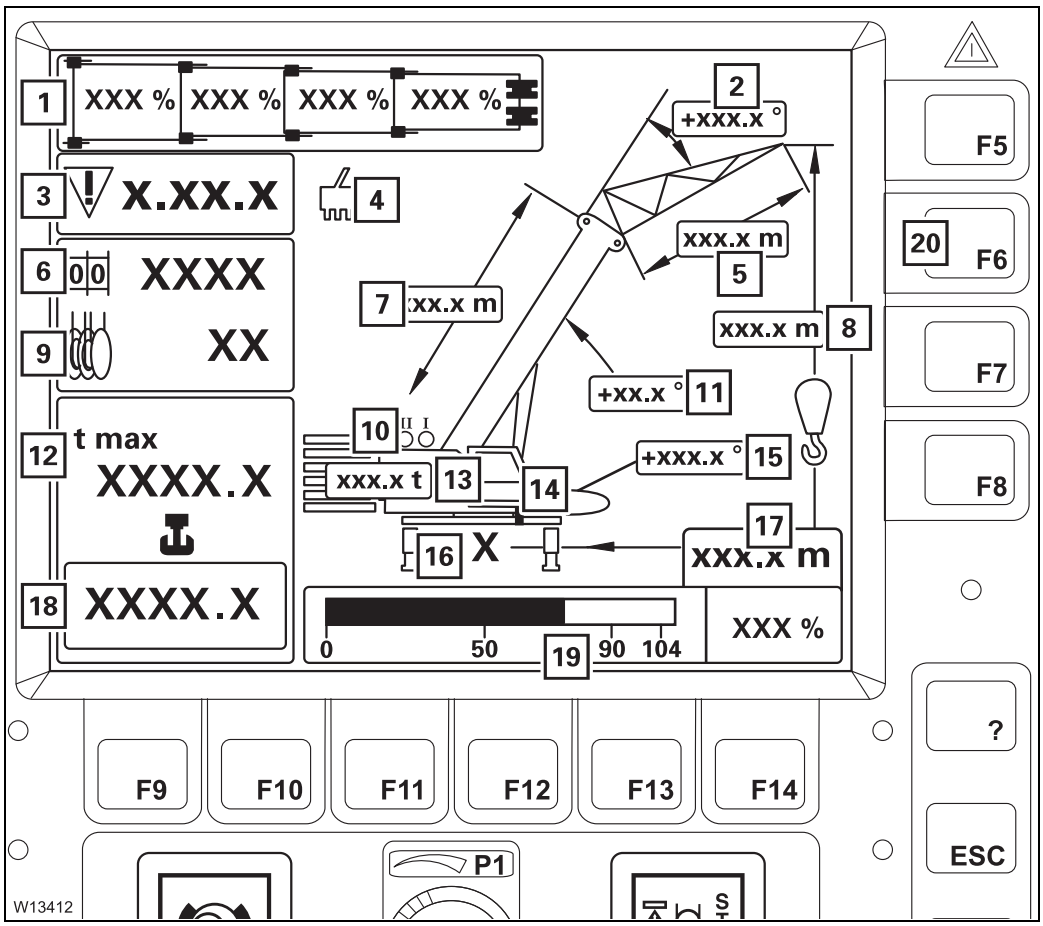
Monitoring submenu



1 Current telescoping status display ➠ p. 9 - 84

2 Lattice extension inclination display[1), 2)]
Lattice extension angle display[1), 2)]

3 Error display ➠ p. 9 - 85

4 Service symbol display ➠ p. 9 - 86

5 Lattice extension length display[1), 2)]

6 Display RCL code ➠ p. 9 - 82

7 Current main boom length ➠ p. 9 - 86

8 Current overall height ➠ p. 9 - 86

9 Reeving display ➠ p. 9 - 83

10 Hoists display ➠ p. 9 - 83

11 Current main boom angle display ➠ p. 9 - 85

12 Maximum load display ➠ p. 9 - 84

13 Counterweight display ➠ p. 9 - 83

14 Turntable lock display ➠ p. 9 - 85

15 Current slewing angle display ➠ p. 9 - 65

16 Outrigger span display ➠ p. 9 - 83

17 Current working radius ➠ p. 9 - 86

18 Current load display ➠ p. 9 - 84

19 Current degree of utilization display ➠ p. 9 - 85

20 Lifting capacity table submenu ➠ p. 9 - 83
Submenu overview ➠ p. 9 - 40

1) Additional equipment

2) ➠ *Lattice extension operating manual*

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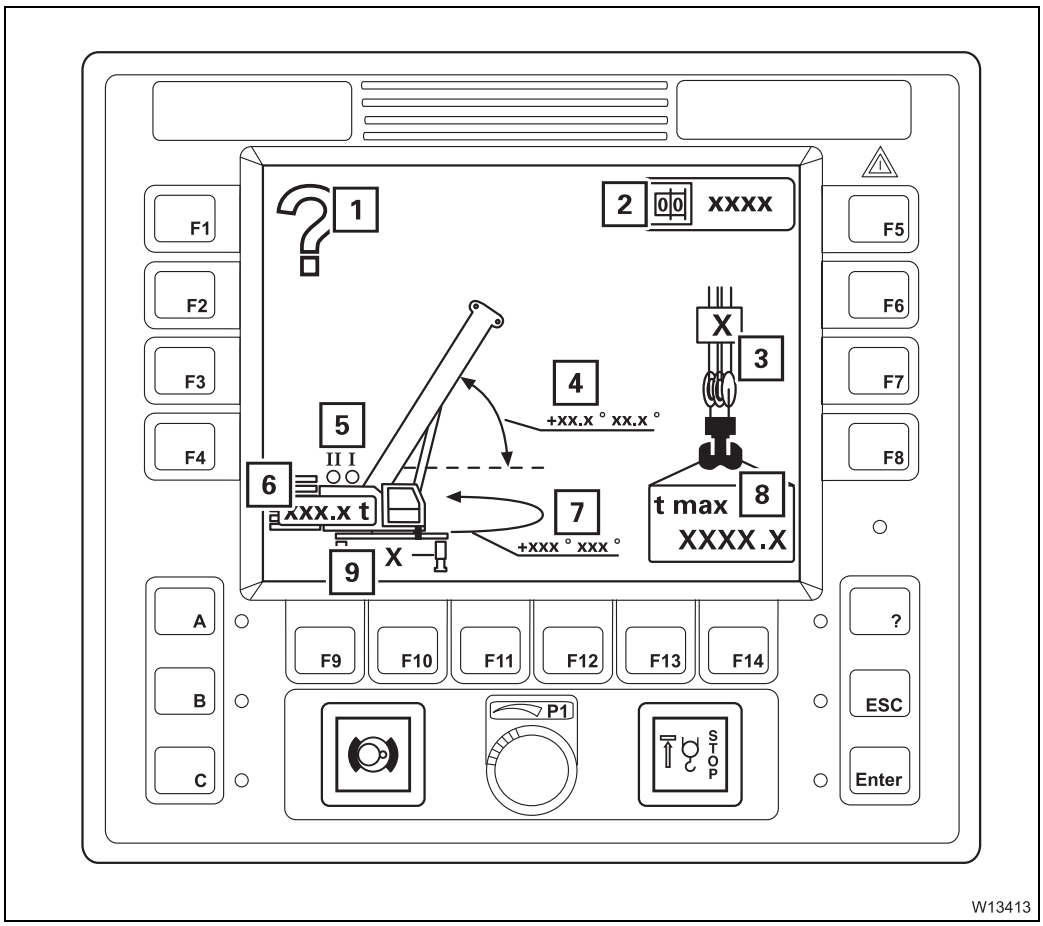
Rigging mode monitoring submenu



1 Query – accept rigging mode?
2 RCL code
3 Reeving
4 Permissible main boom working range
5 Hoists display
6 Counterweight
7 Permissible slewing range
8 Maximum load
9 Outrigger span

➠ *Accepting the rigging mode*, p. 11 - 29

1) Additional equipment

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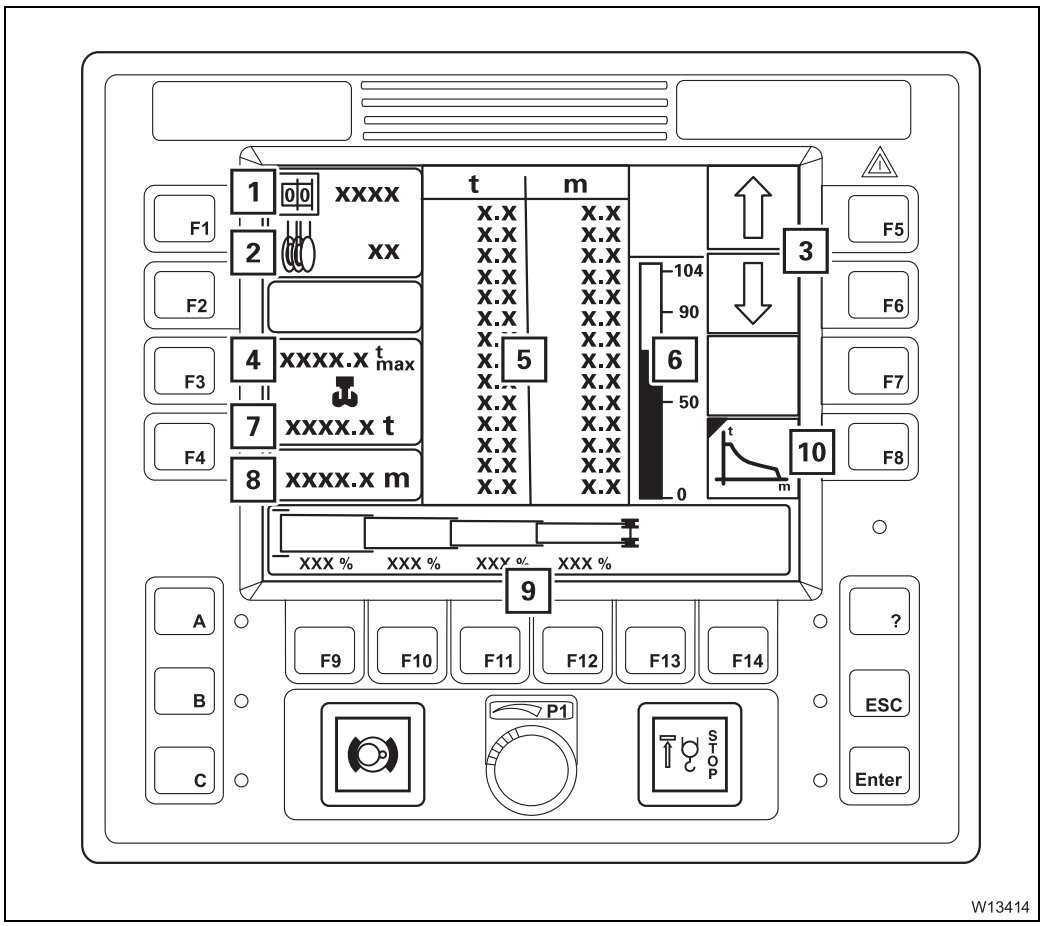
Lifting capacity table submenu



1 Display RCL code ➠ p. 9 - 87
2 Reeving display ➠ p. 9 - 83
3 Selection
4 Maximum load display ➠ p. 9 - 84
5 Lifting capacity table display ➠ p. 9 - 86
6 Current degree of utilization display ➠ p. 9 - 85
7 Current load display ➠ p. 9 - 84
8 Current working radius ➠ p. 9 - 86
9 Telescope status display/input ➠ p. 9 - 86
10 Working range submenu[1)] ➠ p. 9 - 41

[1)] Additional equipment

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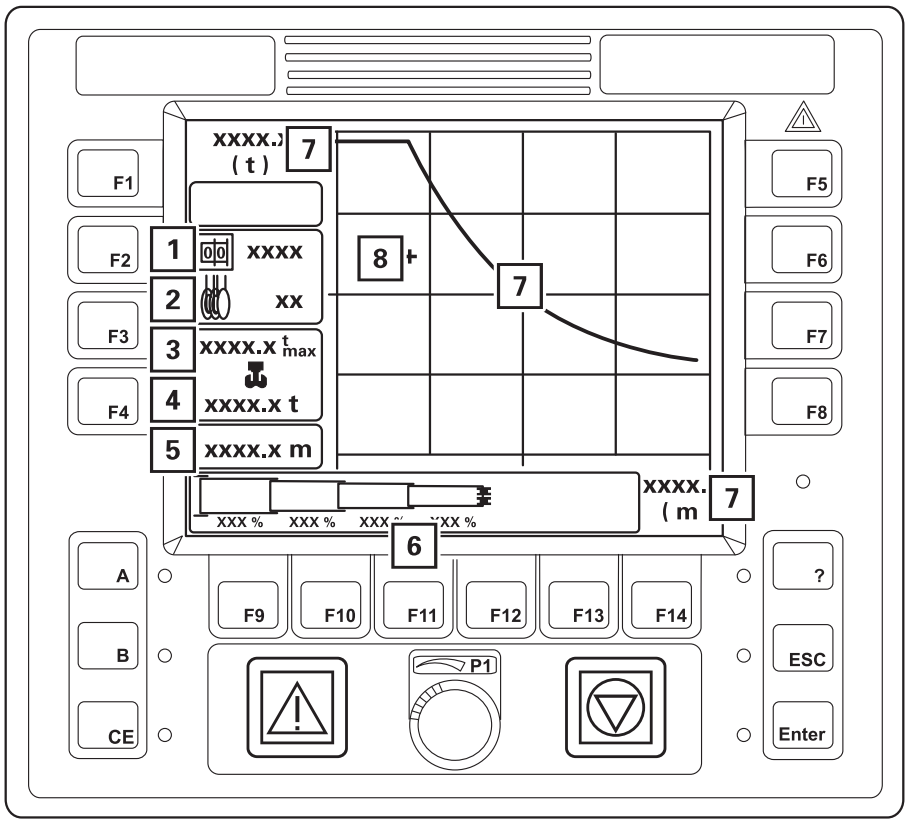
Working range submenu



1 Display RCL code ➠ p. 9 - 88
2 Reeving display ➠ p. 9 - 88
3 Maximum load display ➠ p. 9 - 88
4 Current load display ➠ p. 9 - 88
5 Current working radius display ➠ p. 9 - 88
6 Telescope status display/input ➠ p. 9 - 88
7 Permissible working range display ➠ p. 9 - 86
8 Current position display ➠ p. 9 - 87

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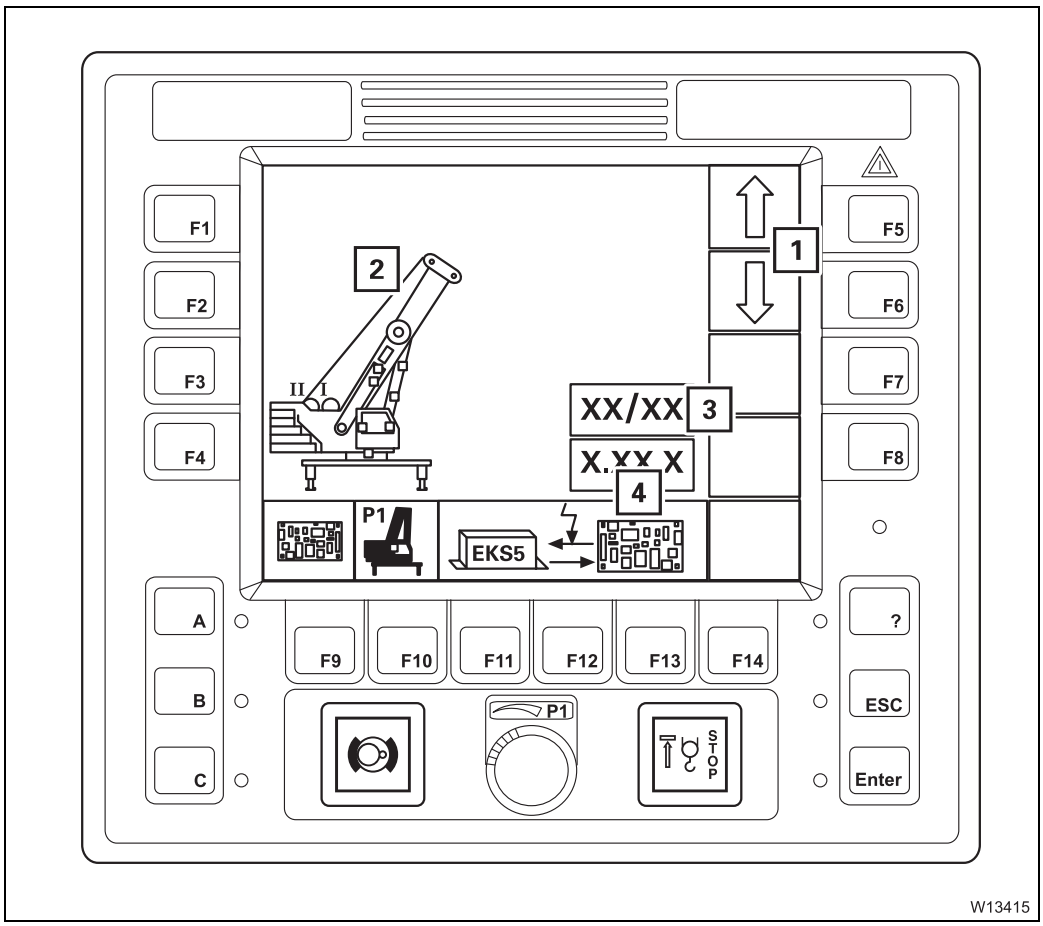
Error submenu



1 Selection p. 14 - 32

2 Display error location p. 14 - 32

3 Current errors/total errors display p. 14 - 32

4 Error display p. 14 - 32

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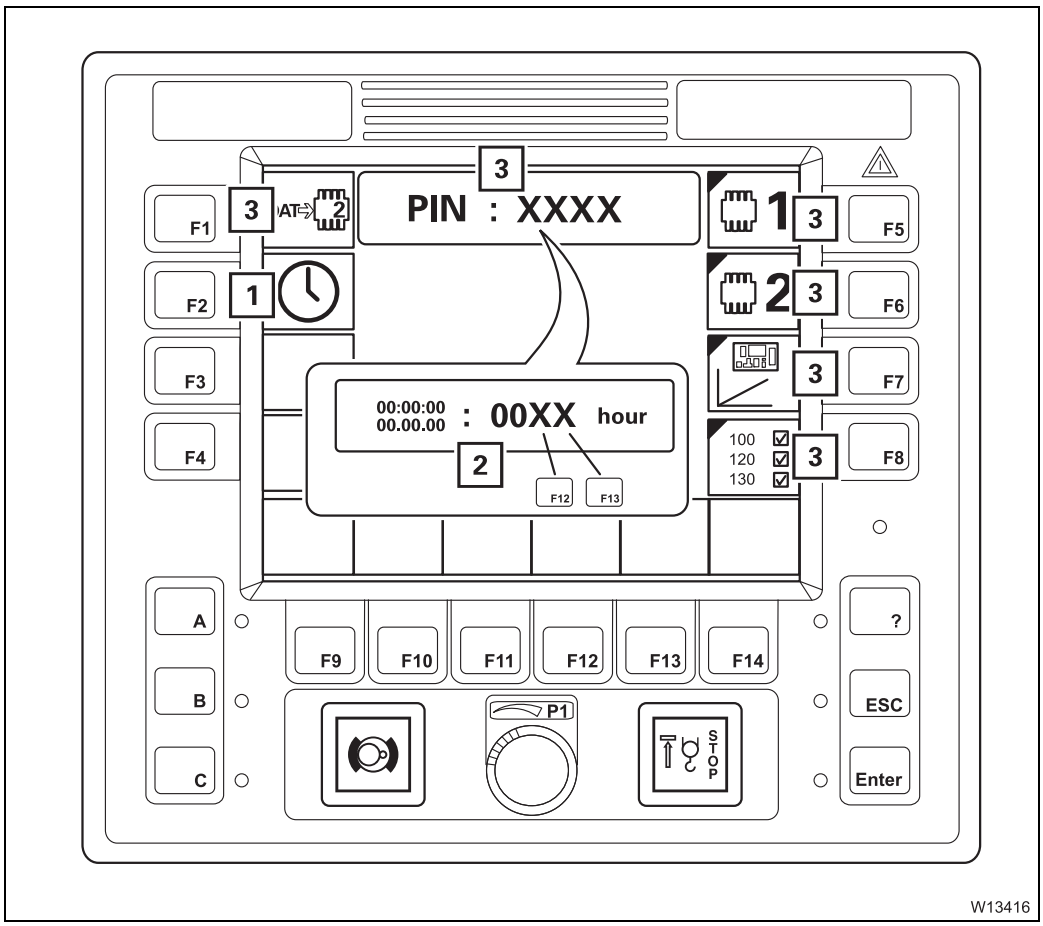
Settings submenu



1 Entering the time/date p. 11 - 49

2 Enter time/date display p. 11 - 49

Buttons/displays (**3**) are only shown if a service device is connected. For this reason, these functions are not described in these operating instructions.

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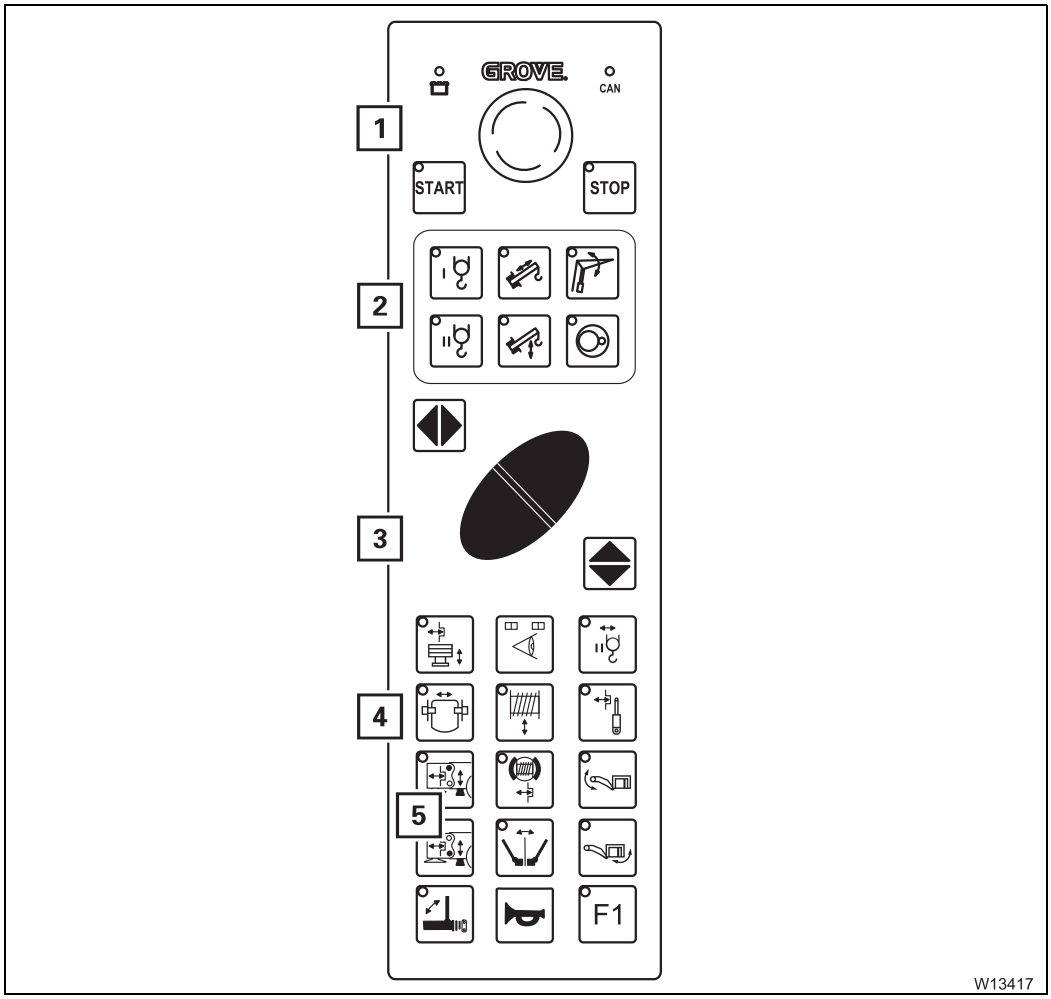
9.1.13 Hand-held control



1 Engine control panel ➠ p. 9 - 93
2 Pre-select emergency operation ➠ p. 9 - 94
3 Function buttons ➠ p. 9 - 94
4 Pre-select rigging ➠ p. 9 - 95
5 No function

Required connections for the different movements; ➠ p. 9 - 92.

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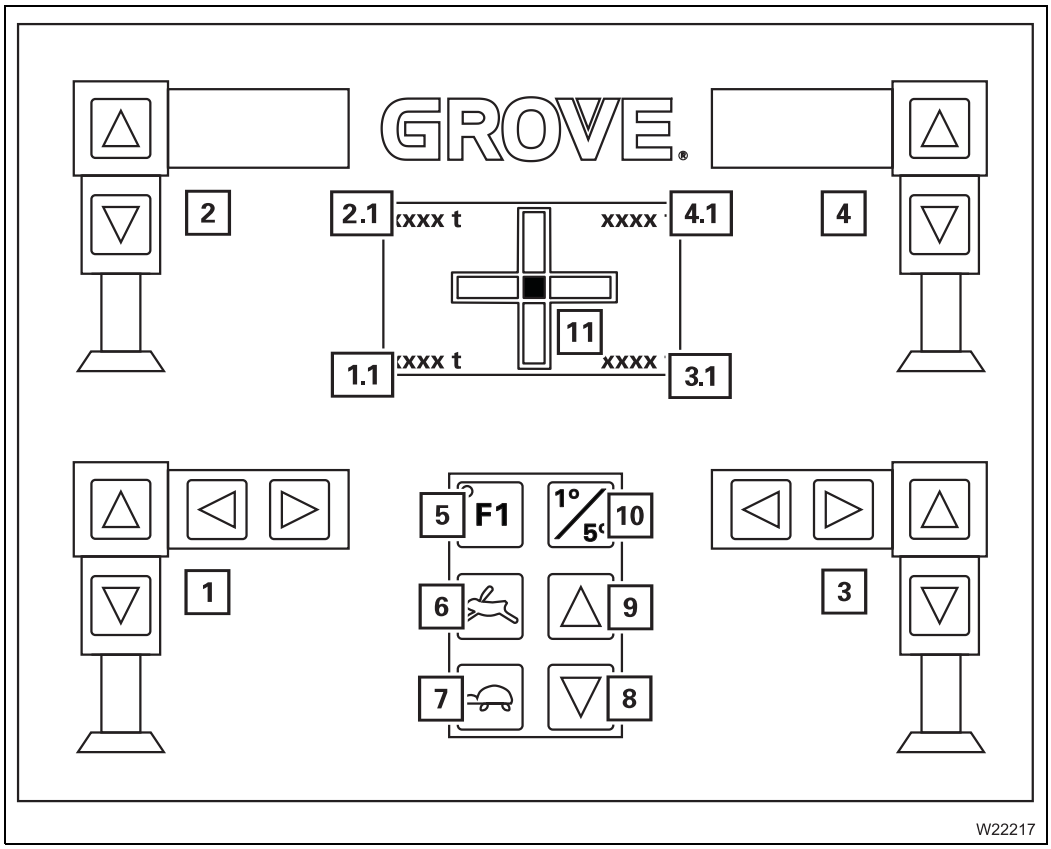
9.1.14 Outrigger control units



Opposite means: on the side of the carrier opposite to the operator when looking at the control unit.

Left and right mean: to the left or the right of the control unit.

Outriggers

1	Operating the left outriggers	p. 9 - 60
2	Operating the left outriggers, opposite side	p. 9 - 60
3	Operating the right outriggers	p. 9 - 61
4	Operating the right outriggers, opposite side	p. 9 - 61
5	Additional function F1 on / Searchlights	p. 9 - 61
6	Pre-select high-speed mode	p. 9 - 60
7	Pre-select normal speed	p. 9 - 60
8	Extending all supporting cylinders	p. 9 - 61
9	Retracting all supporting cylinders	p. 9 - 61

Outrigger pressure display

1.1	Outrigger pressure display[1)] for left-hand outrigger	p. 9 - 63
2.1	Outrigger pressure display[1)] for left-hand outrigger, opposite side	p. 9 - 63
3.1	Outrigger pressure display[1)] for right-hand outrigger	p. 9 - 63
4.1	Outrigger pressure display[1)] for right-hand outrigger, opposite side	p. 9 - 63

[1)] Additional equipment

Inclination indicator

10	Switching over the measuring range	p. 9 - 62
11	Current inclination display	p. 9 - 62

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Blank page

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9.2 Brief description of the operating elements

Risk of accident by operator error!
This section is not a complete operating manual. It only provides a general overview of the functionality of the operating elements.
Before using the operating elements for the first time, read through the following chapters and the safety instructions listed there.

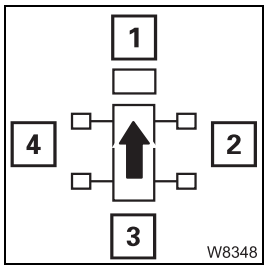
This section does not contain all the requirements that must be fulfilled for several operating elements to be active.
If some operating elements do not work, first read the chapters referred to at the respective places before contacting **Manitowoc Crane Care**.

9.2.1 Definition of direction information

Basic rule

Directions always depend on whether the carrier or the superstructure is being operated.

On the carrier

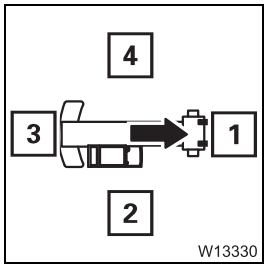


The driver's cab is always at the front, which means that:

1: front **2:** right
3: rear **4:** left

Forwards always means the driver's cab is to the front.
Backwards always means the rear lights on the carrier are to the front.

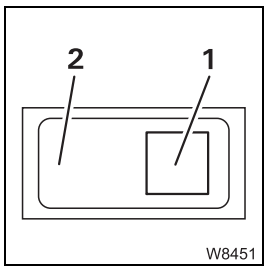
On the superstructure



The main boom head is always at the front, which means that:

1: front **2:** right
3: rear **4:** left

Switches



For switches and buttons, the terms at the **bottom** and **top** are used. Regardless of the fitting position (vertical, horizontal, diagonal, perpendicular or turned), the following always applies:

- **Down:** press (**1**) – next to the symbol
- **Up:** press (**2**) – opposite the symbol

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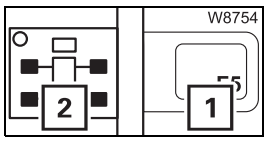
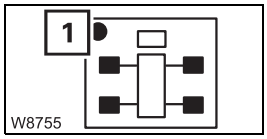
9.2.2 General rules for buttons and symbols on the display

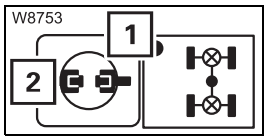
The symbols shown as an example are not present on all crane types.
The following rules apply in all menus:



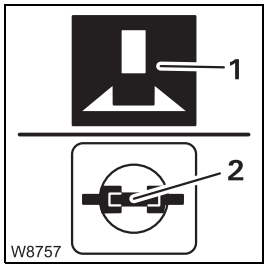
– A button (**1**) is only active when the corresponding symbol (**2**) is black. Buttons next to a grey symbol always have no function.



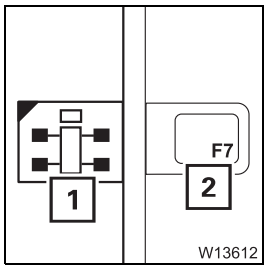
– Some symbols have a dot (**1**). The colour of the dot indicates the current switching state of the button.
  – **Green:** button on – the corresponding gear change is being carried out
  – **Black:** button off – the corresponding gear change is not being carried out



For some elements, the dot (**1**) only indicates that the switching operation has been completed. Here, you will also receive a report on the current gear change on an extra display (**2**).



– When these operating instructions describe colours, e.g. “the symbol is red“, this can mean that the background of a symbol is red (**1**) or only part (**2**) of a symbol is red. This applies to all symbols and all colours.



– If it says in this section, e.g. to “Press the button (**1**)...“, this always refers to the button (**2**) next to or below the symbol (**1**) shown. This applies even when the button itself is not visible in the illustration.

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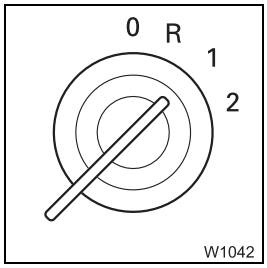
9.2.3 Engine for crane operation

Side panel

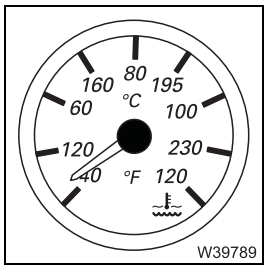
➠ *Starting the engine*, p. 10 - 13.

Ignition lock



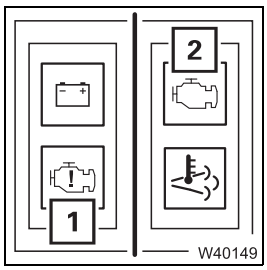
- **0** Ignition off, engine off, key can be removed
- **R, 1** Ignition on and power supply on for:
  Instrument lighting, ECOS, engine control system, RCL
- **2** Starting position

➠ p. 10 - 10



– Coolant temperature

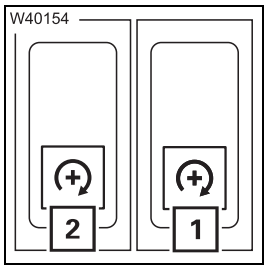
This is displayed in °C; ➠ p. 7 - 27.



Crane engine oil pressure monitoring

- **2 – Lights up:** Information – error code display begins or
  Information – error code display is finished
- **1 – Flashing** Flashing error code for low oil pressure is displayed

➠ *Reading error messages*, p. 14 - 28



Speed control enable on/off

- **1 – In at the bottom:** Enable on – button (**2**) active
- **– In at the top:** Enable off – button (**2**) deactivated
  Engine speed = idling speed – regardless of the previous setting with the button (**2**)

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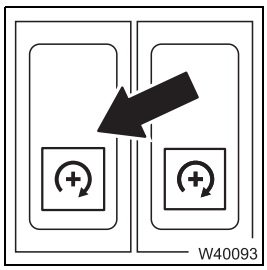
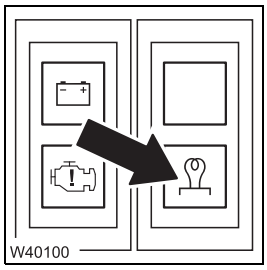


Setting the idling speed

– **Press down:** Increase idling speed

– **Press up:** Decrease idling speed,
after about 6 seconds: engine stop.

p. 10 - 17

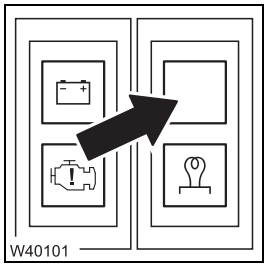


Pre-heating on

– **Lights up:** Engine not ready to start – is being pre-heated

– **Off:** Engine ready to start – pre-heating finished

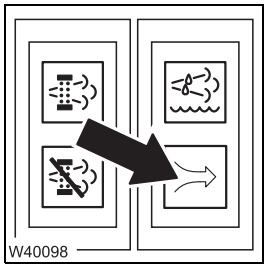
p. 10 - 14



Exhaust system run-down

– **Lights up:** After switching off the engine – the exhaust system runs down for approx. 1 minute
Do not switch off the battery master switch!

– **Off:** Run-down finished – battery master switch can be switched off

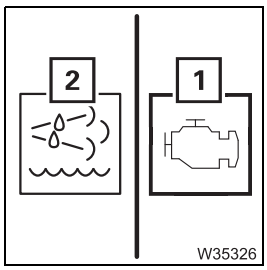


Air intake inhibitor triggered

– **Lights up:** Air intake inhibitor is triggered – flap closed;

Air intake inhibitor, p. 10 - 23

– **Off:** Air intake inhibitor is not triggered – flap open



Engine malfunction early warning

The lamp (**1**) has various different functions.

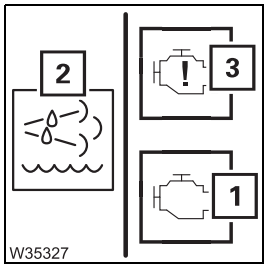
When the diagnostic mode is switched off

– **Lights up alone**
An engine malfunction is present. Read the error message at the next interruption in crane operation; ➠ p. 14 - 28.

– **Lights up together with the lamp (2)**
The torque reduction is active; ➠ p. 10 - 27.

When the diagnostic mode is switched on

➠ *Diagnostics display*, p. 9 - 52



Engine malfunction warning

The lamp (**1**) has various different functions.

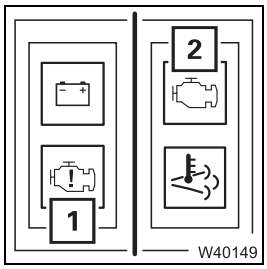
When the diagnostic mode is switched off

– **Lights up alone**
A severe engine malfunction is present.
Set the load down under consideration of the operating circumstances.
Switch off the engine and read the error message; ➠ p. 14 - 28.

– **Lights up together with the lamps (2) and (3)**
The torque reduction is active; ➠ p. 10 - 27.

When the diagnostic mode is switched on

➠ *Diagnostics display*, p. 9 - 52



Diagnostics display

The engine electronics diagnostics are switched on.

2	**– Lights up:**	Information – error code display begins or Information – error code display is finished
	– Off:	Error code is displayed – flashing code on lamp (**1**) or no error present
1	**– Off:**	No error message
	– Flashing	Flashing error code is displayed

➠ *Reading error messages*, p. 14 - 28

ECOS display

There is no short description of the displays in the submenus;
➠ *Monitoring submenu*, p. 10 - 16,
➠ *Warning submenu*, p. 11 - 110.

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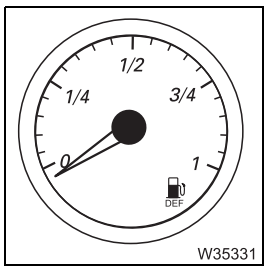
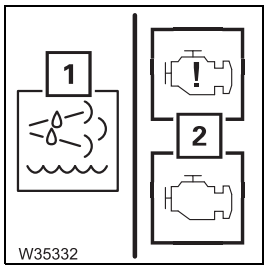
9.2.4 AdBlue exhaust system



AdBlue level display

Shows the current filling level in the AdBlue tank; ➠ *AdBlue*, p. 10 - 7.



AdBlue warning

1 – Lights up: AdBlue supply is used up or malfunction in the exhaust system

– Flashing: Torque reduction advance warning or

Torque reduction active – additional display on lamps (**2**)

– Off: AdBlue supply is sufficient, no malfunction in the exhaust system

➠ *Overriding torque reduction*, p. 10 - 27

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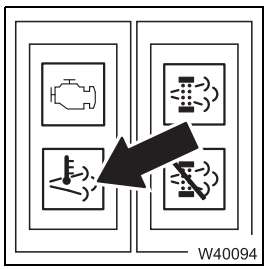
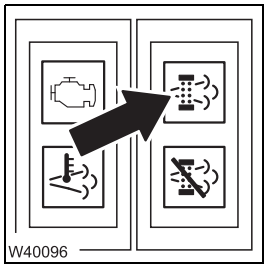


Exhaust system temperature too high

– **Lights up:** Maximum operating temperature exceeded
– **Off:** Maximum operating temperature not reached

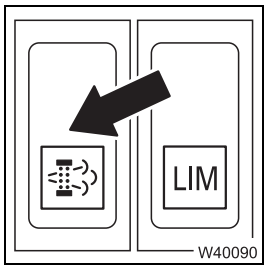
➠ *Cleaning the exhaust system*, p. 10 - 29



Exhaust system cleaning required

1 – **Lights up:** Cleaning required
– **Flashing:** Cleaning procedure running
– **Off:** Cleaning not required

➠ *Cleaning the exhaust system*, p. 10 - 29

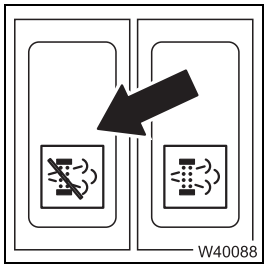


Manually start exhaust system cleaning

The engine must be running.

– **Press down once:** Manual cleaning starts

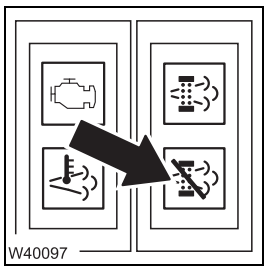
➠ *Cleaning the exhaust system*, p. 10 - 29



Disable exhaust system cleaning

– **In at the bottom:** Disable automatic and manual cleaning
– **In at the top:** Enable automatic and manual cleaning

➠ *Cleaning the exhaust system*, p. 10 - 29



Exhaust system cleaning disabled

– **Lights up:** Cleaning disabled
– **Off:** Enable automatic and manual cleaning

➠ *Cleaning the exhaust system*, p. 10 - 29

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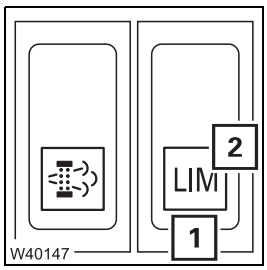

Overriding torque reduction

The torque reduction is active

1 – Press down once: – Lamp (**2**) on
– Torque reduction overridden

after 30 minutes: – Lamp (**2**) goes off
– Torque reduced

– Press down once: Reaction as described above

– Press down once: Reaction as described above

After this, the button has no function until the next time the engine is restarted; ➠ *Torque reduction*, p. 10 - 25

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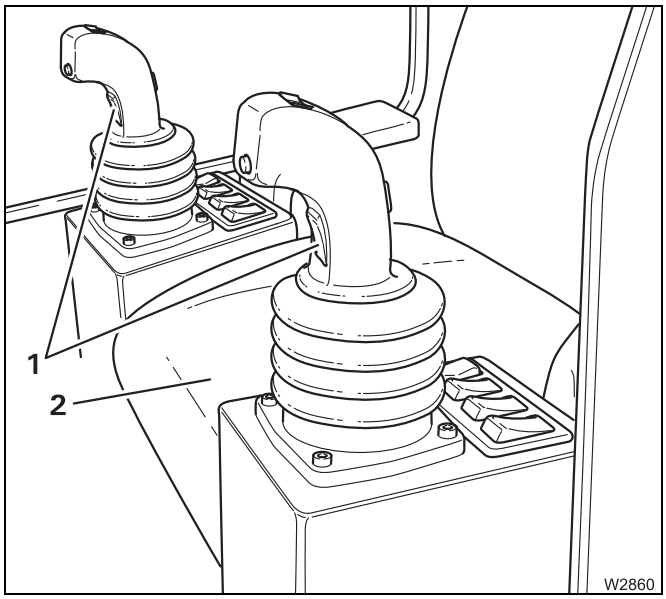
9.2.5 Seat contact switch and dead man's switch

The seat contact switch and the dead man's switch are safety devices for releasing crane functions.



Releasing crane functions

– Sit down – seat contact switch (**2**) on

or

– Press at least one dead man's switch (**1**)

Safety function on

– Stand up – seat contact switch off

and

– Both dead man's switches (**1**) not pressed

All operating elements for crane functions in the crane cab are locked.

Any crane movements are slowed down to standstill within 3 seconds and then locked.

➠ *Seat contact switch and dead man's switch*, p. 11 - 10

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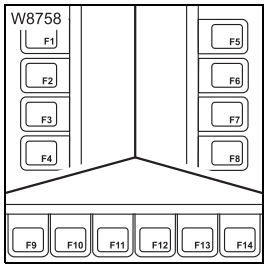
9.2.6 ECOS crane control

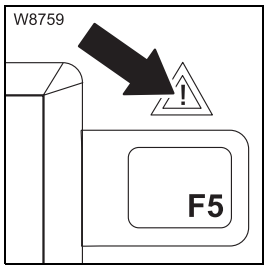
The superstructure of the truck crane GMK7450 is equipped with the **ECOS** electronic crane control system (**E**lectronic **C**rane **O**perating **S**ystem). ECOS includes a control unit in the crane cab and several control units (ESX0, ESX1, ESX2 etc.) and I/O circuit boards (I/O 0, I/O 1 etc.).

This section contains the operating elements that are the same for all menus opened.



Buttons F1 to F14

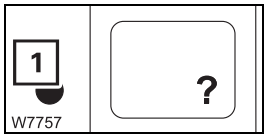
The function of buttons F1 to F14 is shown on the symbol next to or above the button. After the button is pressed, the function displayed is executed provided it has been released.



Error/warning message

- **Flashing:** New warning message or error has occurred
- **Lights up:** Error acknowledged – but still present
- **Off:** No warning message or error present

p. 11 - 113

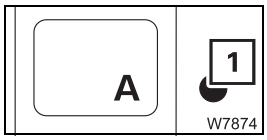


Opening Errors submenu

The lamp (**1**) lights up or flashes.

- **Press the button once:** The *Errors* submenu opens

p. 11 - 113



Open Warning submenu

The lamp (**1**) lights up or flashes.

- **Press the button once:** This opens the *Warning* submenu.

p. 11 - 110

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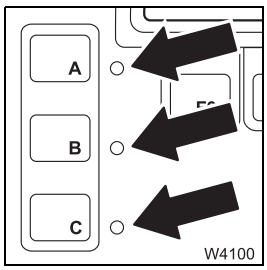
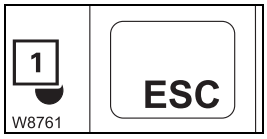


Keycode entry

The lamps next to all three buttons are lit.

– **Enter keycode:** Press buttons in the required sequence and confirm keycode.

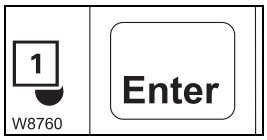
Telescoping emergency program, p. 14 - 47



Exiting submenu/input mode

The lamp (**1**) lights up.

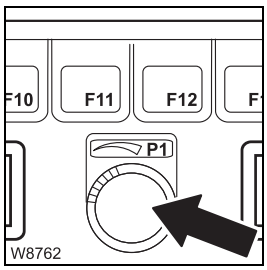
– **Press the button once:** – the opened submenu closes – the menu from the next level up opens.
– Input mode is deactivated.



Input confirmation

The lamp (**1**) lights up.

– **Press the button once:** a newly entered value is stored.



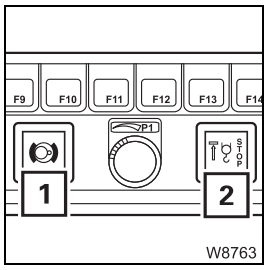
Entering values

Input mode is switched on.

– **To the right:** Increases the value

– **To the left:** Decreases the value

Slowly turning changes the value gradually
Quickly turning changes the value quickly



Other

1 Slewing gear brake indicator lamp; p. 9 - 68

2 Lifting limit switch warning; p. 9 - 67

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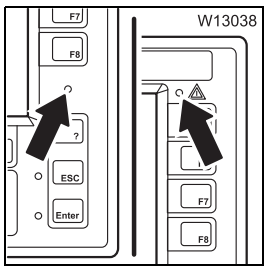
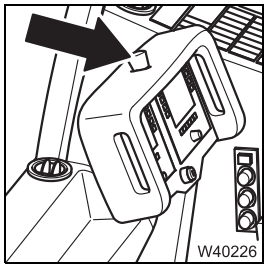


Sensor for brightness

Registers the brightness of the operating environment. The brightness of all displays is automatically adjusted.
Manual input; ➠ p. 10 - 10.



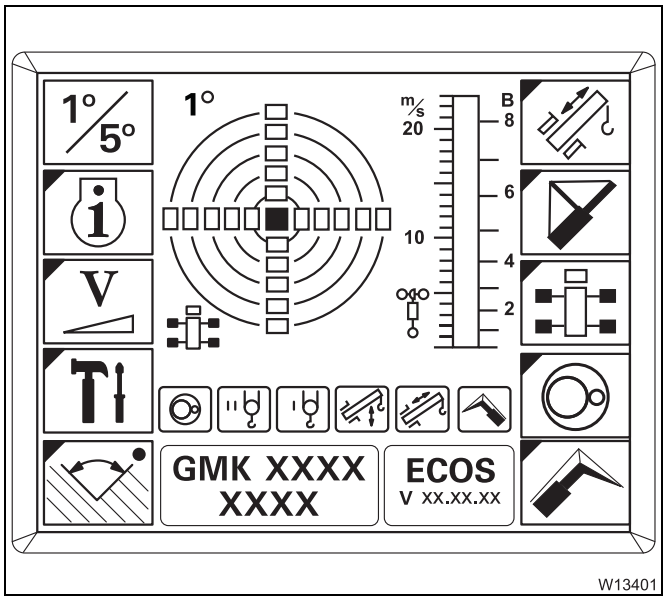
Emergency stop switch

May only be used in an emergency.

– **Press:** Engine off – crane functions stop immediately. Switch latches

– **Turn the latched switch:** Switch returns to initial position – crane functions released

➠ p. 10 - 22

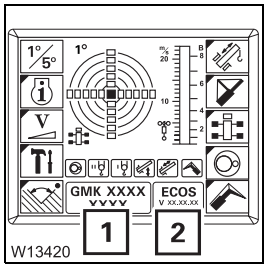


ECOS display

Ignition on – Main menu display

Symbols with blue corner = submenu

Open submenu – Press the button next to the symbol once



Serial number and programme version displays

1 Serial number

2 Current ECOS program version – always state this in the event of malfunctions; ➠ p. 14 - 38.

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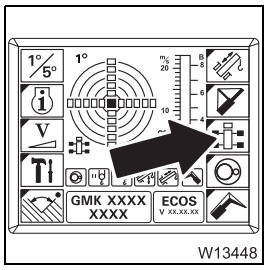
9.2.7 Outriggers

➠ *Extending/retracting outrigger beams*, p. 12 - 37
➠ *Extending/retracting supporting cylinders*, p. 12 - 41

In the Outriggers submenu

All directional information relates to the carrier; ➠ p. 9 - 48.



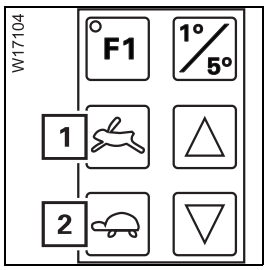
Outriggers submenu

– **Opening:** Press button once – submenu opens

On the Outrigger control units

All directional information relates to the carrier; ➠ p. 9 - 48.

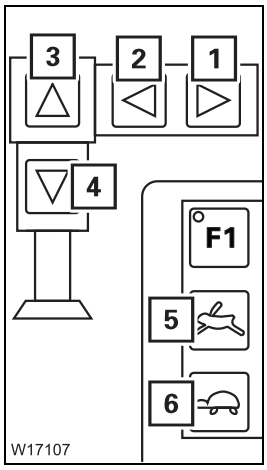
The display fields in the *Settings* submenu need to be switched on to operate in crane mode.



Pre-selecting high-speed/normal speed mode

1 Pre-select: Press button – high-speed mode pre-selection on

2 Pre-select: Press button – normal speed pre-selection on



Operating the left-hand outriggers (next to control unit)

Button (**5**) or (**6**) is pressed.

1 Retract: Press button – outrigger beam retracts[1)]

2 Extend: Press button – outrigger beam extends[1)]

3 Retract: Press button – outrigger cylinder retracts

4 Extend: Press button – outrigger cylinder extends

[1)] only on operator's side

Outrigger beams; ➠ p. 12 - 37
Supporting cylinders; ➠ p. 12 - 41

Movement stops after the button is released, and when an end position is reached.

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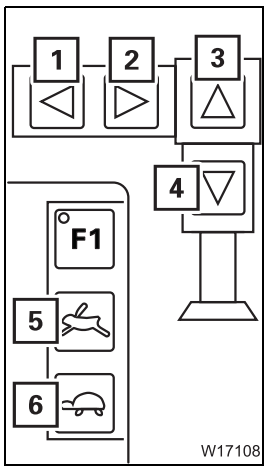
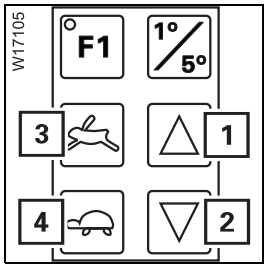


Operating the right outriggers (next to control unit)

Operation of the buttons (**1**) to (**6**) is the same as on the button unit for *Outriggers to the left of the control unit*.



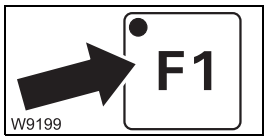
Extending/retracting all supporting cylinders

Button (**3**) or (**4**) is pressed.

1 Retract: Press button – all outrigger cylinders retract

2 Extend: Press button – all outrigger cylinders extend

Movement stops after the button is released, and when an end position is reached; ➠ p. 12 - 41.



Additional function F1 on

Always use in combination with other buttons.

Searchlights

Light up when the ignition is on.

– Display field lighting off: Ignition on and no button activated yet or no button activated within the last 10 seconds

– Display field lighting on: Press any button

➠ p. 12 - 37

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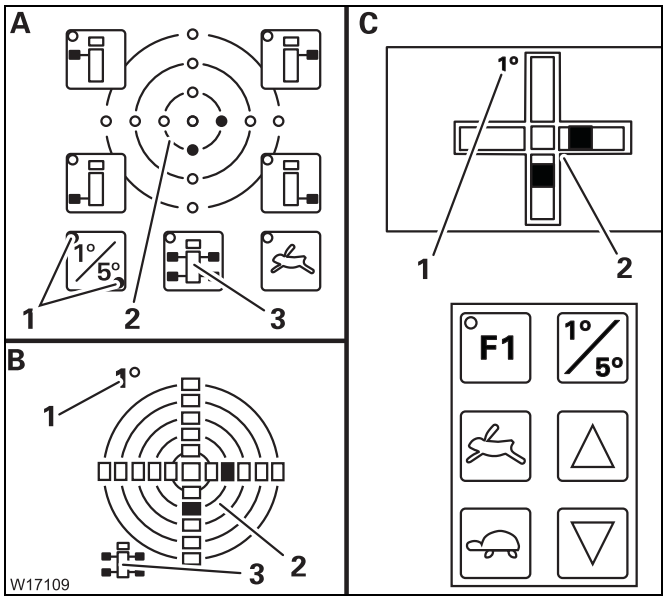
9.2.8 Inclination indicators

➠ *Inclination indicators*, p. 12 - 43



Current inclination display

A On the hand-held control

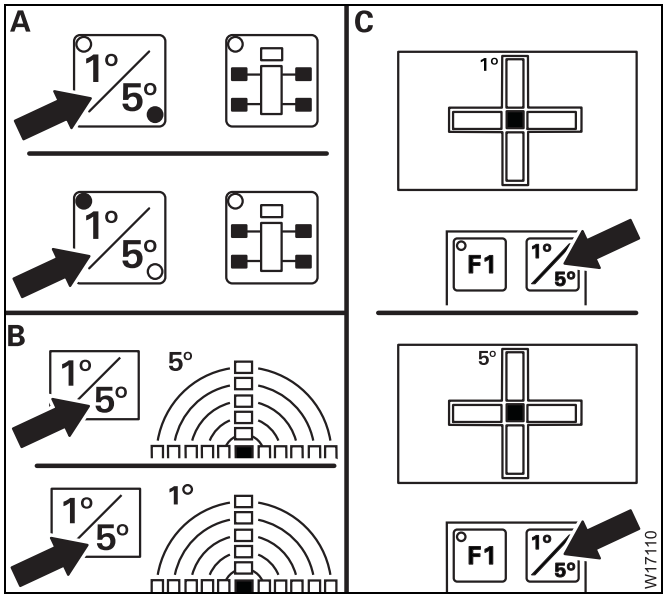
B In the main menu
In the *Outriggers* submenu

C On the *Outrigger* control units

1 Measuring range display

2 Inclination indicator

3 Directional indicator



Switching over the measuring range

A On the hand-held control

Press button once – lamp for current measuring range 1° or 5° lights up

B In the *Outriggers* submenu

C On the *Outrigger* control units

Press button once – the current measuring range 1° or 5° is shown

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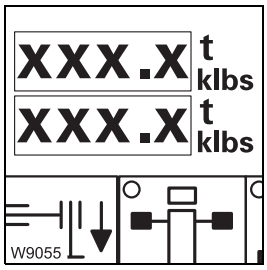
9.2.9 Outrigger pressure displays

Outriggers submenu

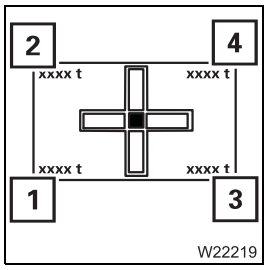


Outrigger pressure display

- **Unit of measurement:** Displayed depending on setting
  - **t** – tons or
  - **klbs –** kilopounds – (1 kilopound = 1,000 lbs)
- **Precision:** One decimal place

➠ p. 12 - 46

Outrigger control units



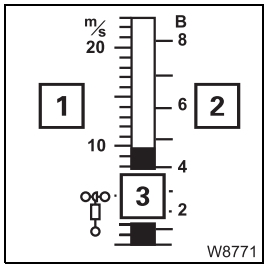
Outrigger pressure display

- **Unit of measurement:** Display (**1**) to (**4**) lights up, depending on setting
  - **t** – tons or
  - **klbs** – kilopounds – (1 kilopound = 1,000 lbs)
- **Precision:** When in **t**, one place of decimals
  When in **klbs**, no places of decimals

➠ p. 12 - 46

9.2.10 Anemometer display

This function is the same in all the menus.
The anemometer is electrically connected.



1 Scale in meters per second (m/sec)

2 Beaufort scale (B)

3 Wind speed display

➠ p. 11 - 52

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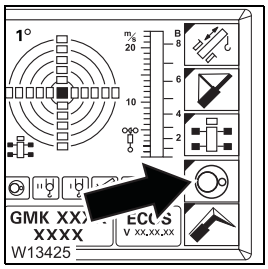
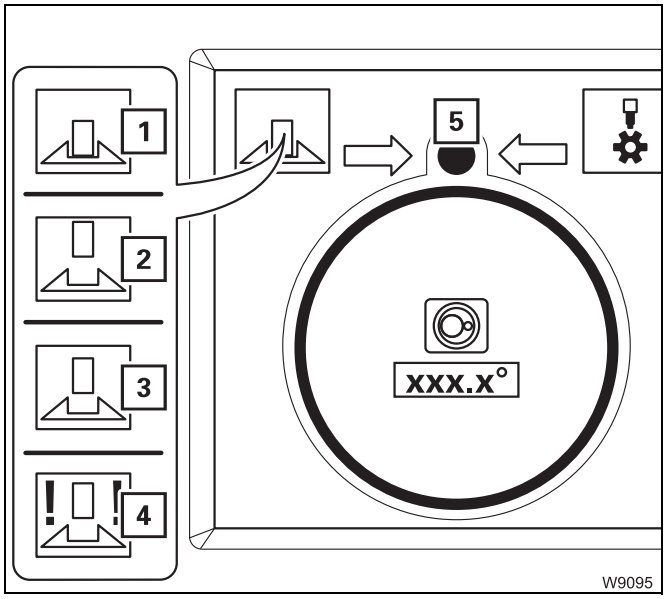
9.2.11 Superstructure lock submenu



Superstructure lock submenu

– **Opening:** Press button once – submenu opens

Turntable lock

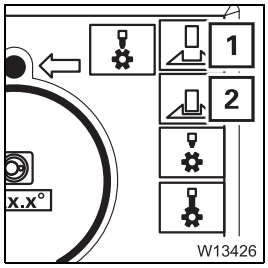


Superstructure locking status displays

The current status of the locking pin is shown by different symbols:

1 and 5	Green – locked
2 and 5	Red – unlocked
3 and 5	Yellow – intermediate position
4 and 5	Violet – error

➠ p. 11 - 14

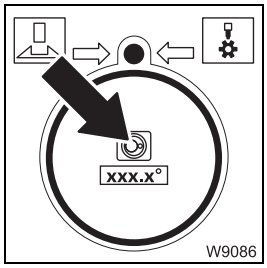


Locking/unlocking the turntable

The superstructure must be in the 0° or 180° position.

1	**To lock:**	Press button – locking pin extends
2	**To unlock:**	Press button – locking pin retracts

➠ p. 11 - 14



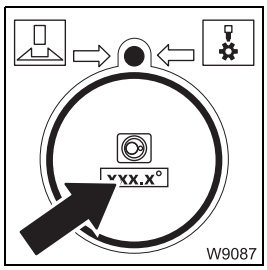
Slewing gear display

– **Green:** Slewing gear switched on

– **Red:** Slewing gear switched off

➠ p. 11 - 97

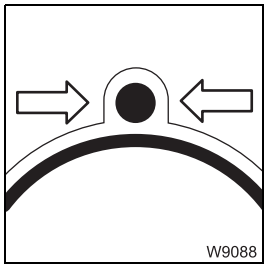
23.10.2018



Current slewing angle display

0°:	Position *0° to the rear* – locking point
180°:	Position *180° to the front* – locking point
+ 0.1 to +180.0°:	Turned to the right from 0°
- 0.1 to -179.9°:	Turned to the left from 0°

➠ p. 11 - 99



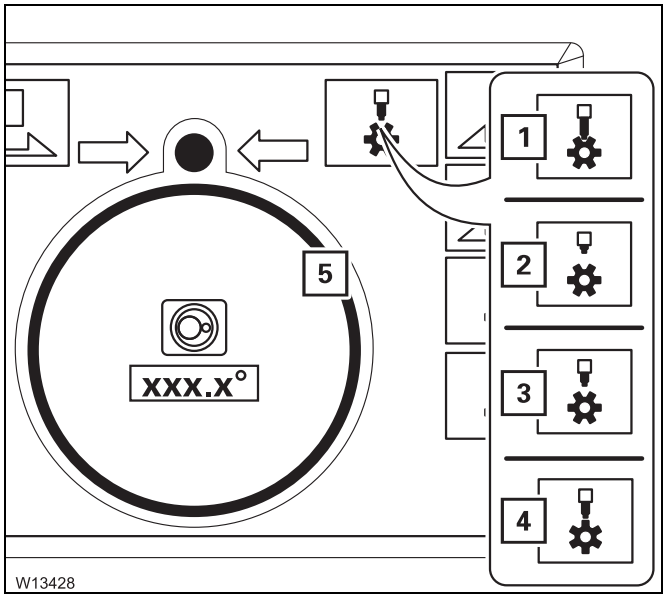
Display slewing direction to 0°/180°

Current position ± 20° in front of the 0° or 180° superstructure position.

- **Both arrows:** 0° or 180° superstructure position reached
- **One arrow:** Arrow direction = slewing direction to reach 0° or 180°

➠ *Locking/unlocking the superstructure*, p. 11 - 13

Houselock ➠ *Switching the houselock on/off*, p. 11 - 15.

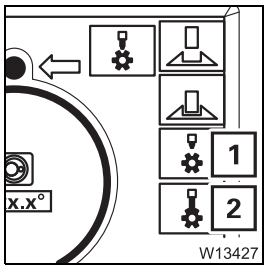


Houselock locking status displays

The current position of the locking pin is shown by different symbols:

1 and 5	**Green:**	Locked
2 and 5	**Red:**	Unlocked
3 and 5	**Yellow:**	Intermediate position
4 and 5	**Yellow/ red:**	Blocked, locking pin in front of a tooth

➠ p. 11 - 15



Houselock on/off

The slewing gear is switched off

1	**Press the button:**	Houselock on
2	**Press the button:**	Houselock off

➠ p. 11 - 15

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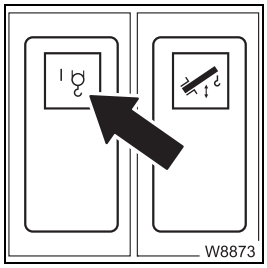
9.2.12 Main hoist

➠ *Main hoist*, p. 11 - 55.

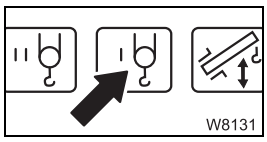


Main hoist on/off

There is a lamp in the button.

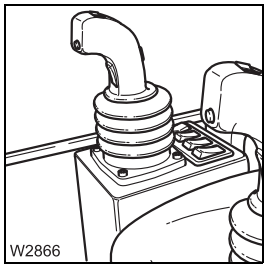
– **Press once** – Lamp bright – main hoist on
– Lamp dim – main hoist off

➠ p. 11 - 56



Power units display

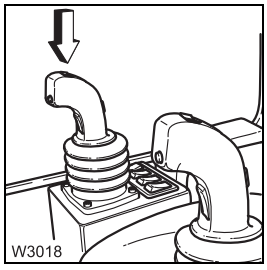
– **Green:** Main hoist on
– **Red:** Main hoist off



Right control lever

– **Back:** Lifting
– **Forward:** Lower

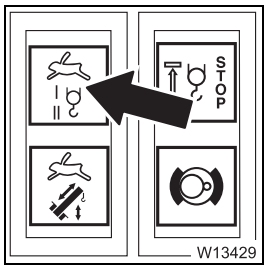
➠ p. 11 - 56



Hoist high-speed mode on/off

– **Left:** High-speed mode on, off when released
– **Once to the right:** High-speed mode on – continuous operation
– **Once to the right or once to the left:** High-speed mode off

➠ p. 11 - 96



High speed monitoring for the hoists

– **Lights up:** High-speed mode on
– **Off:** High-speed mode off

➠ p. 11 - 96

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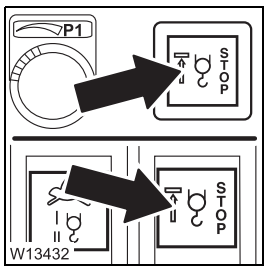


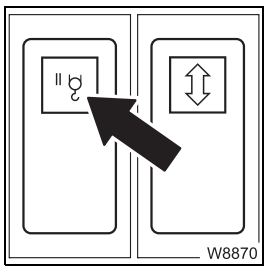
Warning for lifting limit switch shutdown

- **Lights up:** Lifting limit switch triggered – hoist stops
- **Flashing:** Lifting limit switch triggered – shutdown overridden
- **Off:** Lifting limit switch not triggered

p. 11 - 61

9.2.13 Auxiliary hoist

Auxiliary hoist, p. 11 - 58.

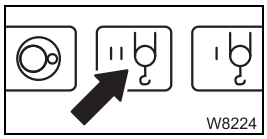


Auxiliary hoist on/off

There is a lamp in the button.

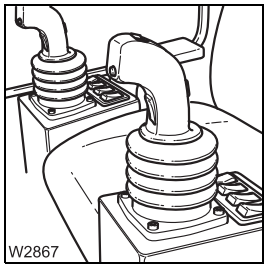
- **Press once** – Lamp bright – auxiliary hoist on
  – Lamp dim – auxiliary hoist off

p. 11 - 58



Power units display

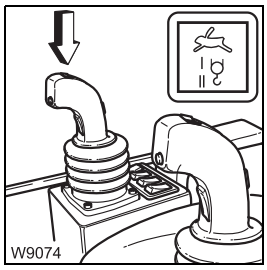
- **Green:** Auxiliary hoist on
- **Red:** Auxiliary hoist off



Left control lever

- **Back:** Lifting
- **Forward:** Lower

p. 11 - 59



Button and lamp for hoist high-speed mode

Brief description with main hoist, p. 9 - 66

Warning lamp for lifting limit switch shutdown

Short description with main hoist

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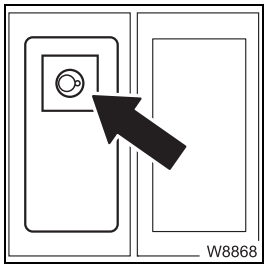
9.2.14 Slewing gear

➠ *Slewing gear*, p. 11 - 97.

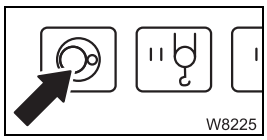


Slewing gear on/off

There is a lamp in the button.

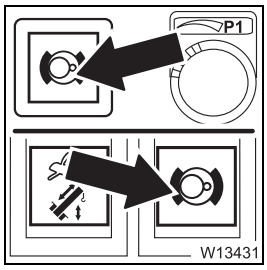
– **Press once** – Lamp bright – slewing gear on
Slewing gear brake released
– Lamp dim – slewing gear off
Slewing gear brake applied

➠ p. 11 - 97



Power units display

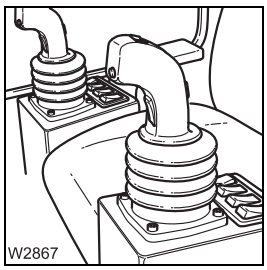
– **Green:** Slewing gear on
– **Red:** Slewing gear off



Slewing gear brake engaged/released

– **Lights up:** Slewing gear brake applied
– **Off:** Slewing gear brake released

➠ p. 11 - 97

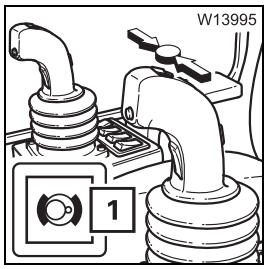


Left control lever

The counterweight lifting cylinders are retracted.

– **To the left:** Slewing to the left
– **To the right:** Slewing to the right

➠ p. 11 - 97



Slewing gear freewheel

Slewing gear is switched on.

– **Switch on:** Move control lever to zero position and press button – slewing gear brake released, lamp (**1**) goes out
– **Switch off:** Release switch – slewing gear brake applied, lamp (**1**) lights up

➠ p. 11 - 100

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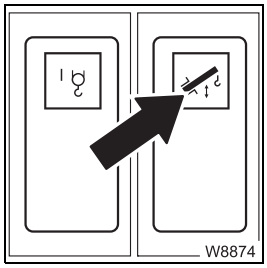
9.2.15 Derricking gear

➠ *Derricking gear*, p. 11 - 64.

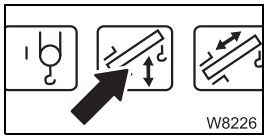


Derricking gear on/off

There is a lamp in the button.

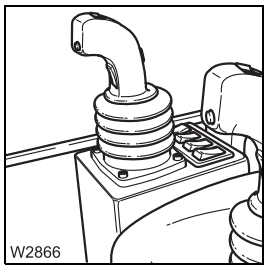
– **Press once** – Lamp bright – derricking gear on,
Power units with the same control lever configuration off
– Lamp dim – derricking gear off

➠ p. 11 - 64



Power units display

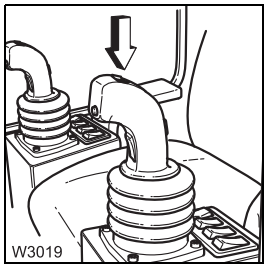
– **Green:** Derricking gear on
– **Red:** Derricking gear off



Right control lever

– **To the left:** Raise – lift main boom
– **To the right:** Lower – lower main boom

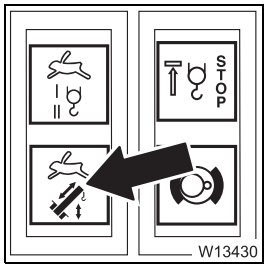
➠ p. 11 - 65



Derricking gear/telescoping mechanism high-speed mode on/off

– **Left:** High-speed mode on, off when released
– **Once to the right:** High-speed mode on – continuous operation
– **Once to the right or once to the left:** High-speed mode off

➠ p. 11 - 95



High-speed indicator lamp for derricking gear/telescoping mechanism

– **Lights up:** High-speed mode on
– **Off:** High-speed mode off

➠ p. 11 - 95

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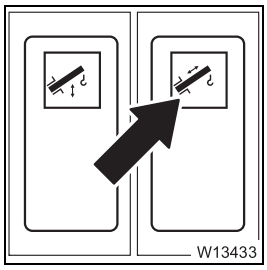
9.2.16 Telescoping mechanism

Control panels ➠ *Telescoping mechanism*, p. 11 - 67.

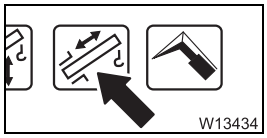


Telescoping mechanism on/off

There is a lamp in the button.

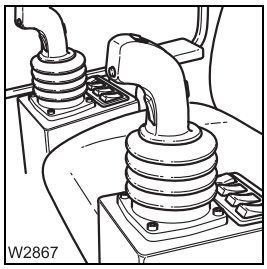
– **Press once** – Lamp bright – telescoping mechanism on,
Power units with the same control lever configuration off
– Lamp dim – telescoping mechanism off

➠ p. 11 - 75



Power units display

– **Green:** Telescoping mechanism on
– **Red:** Telescoping mechanism off

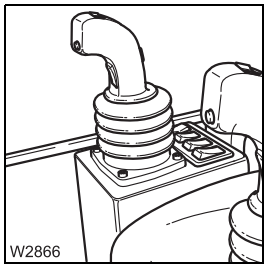


Left control lever

Control lever configuration – version 1

– **Back:** Retract
– **Forward:** Extend

➠ p. 11 - 75

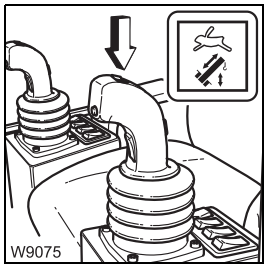


Right control lever

Control lever configuration – version 2

– **To the left:** Retract
– **To the right:** Extend

➠ p. 11 - 75



Button and lamp for derricking gear/telescoping mechanism high-speed mode

Short description with derricking gear; ➠ p. 9 - 69.

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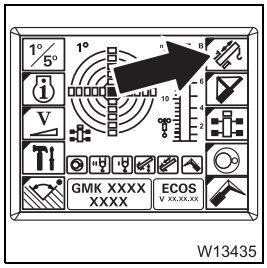
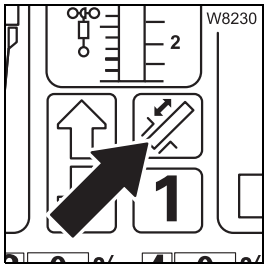
Submenu



Telescoping submenu

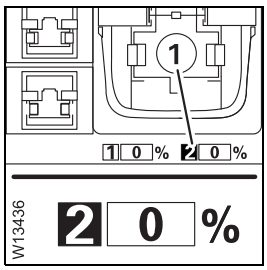
– **Opening:** Press button once



Display for telescoping mechanism on/off

– **Green:** Telescoping mechanism on
– **Red:** Telescoping mechanism off

➠ p. 11 - 78



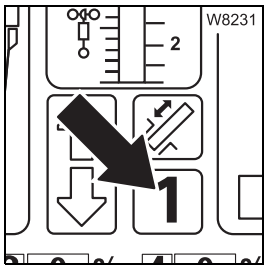
Current telescoping status display

1 Extended length of the telescopic sections in per cent (%)

2 Telescopic section display is green

– **Lights up:** Telescoping cylinder is locked here
– **Flashing:** next possibility for locking telescoping cylinder

➠ p. 11 - 79

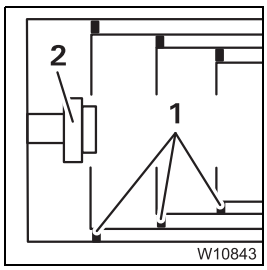


Telescoping cylinder in the telescopic section display

Displayed telescopic section, e.g. telescopic section I:

– **Lights up:** Telescoping cylinder is locked here
– **Flashing:** next possibility for locking telescoping cylinder
– **Off:** Telescoping cylinder in this telescopic section – distance to the locking point larger than 1 m (3.3 ft)
or
Teleautomation on – symbol is displayed

➠ p. 11 - 79



Telescope diagram display

Current relation of the telescopic sections to each other – section of top view.

Locking pin

1 On the telescopic section

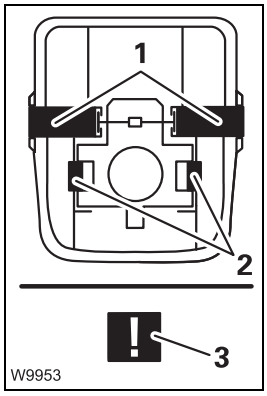
2 On the telescoping cylinder

Display 1 and 2

– **Green:** Locked

– **None:** Unlocked or intermediate position

➠ p. 11 - 79



Locking status display

The locking pins change the position and colour

Locking pin

1 On the telescopic section

2 On the telescoping cylinder

Display 1 and 2

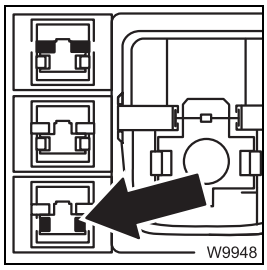
– **Green:** Locked

– **Red:** Unlocked

– **Yellow:** Intermediate position

– **Violet:** Error – symbol (**3**)

➠ p. 11 - 80



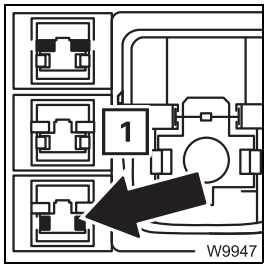
Unlock telescoping cylinder selection

– **Display**

Yellow: Telescoping cylinder unlocked

Grey: Telescoping cylinder locked

Flashing: (yellow/grey) Unlock selected



– **To select:** Press button once

– Telescopic section locked:
Unlock selected – executed after moving the control lever

– Telescopic section unlocked:
Unlock not selected – symbol (**1**) flashes yellow/grey as a prompt to *Lock telescoping cylinder*

➠ p. 11 - 81

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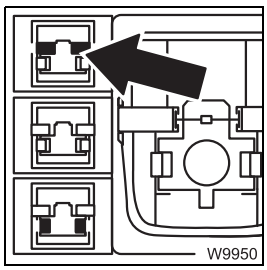
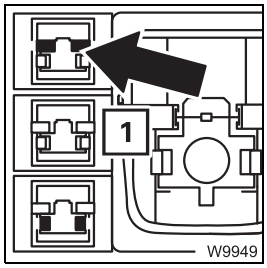


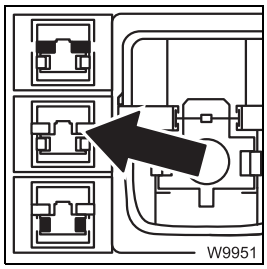
Unlock telescopic section selection

– **Display** **Yellow:** Telescopic section unlocked
Grey: Telescopic section locked
Flashing: (yellow/grey) Unlock selected



– **To select:** Press button once
– Telescoping cylinder locked:
Unlock selected – executed after moving the control lever
– Telescoping cylinder unlocked:
Unlock not selected – symbol (**1**) flashes yellow/grey as a prompt to *Lock telescoping cylinder*

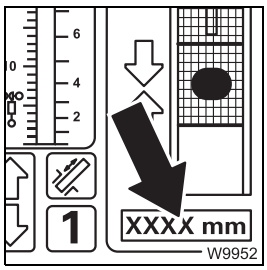
➠ p. 11 - 85



Lock selection

– **Display** **Yellow:** Telescoping cylinder and telescopic section locked
Grey: Telescoping cylinder or telescopic section unlocked
Flashing: (yellow/grey) Lock selected

➠ p. 11 - 84, ➠ p. 11 - 88



Telescoping cylinder length display

– **Display:** Current extended length of the telescoping cylinder

– **Unit of measurement:** Displayed depending on setting, mm (millimetres) or ft (feet)

➠ p. 11 - 83

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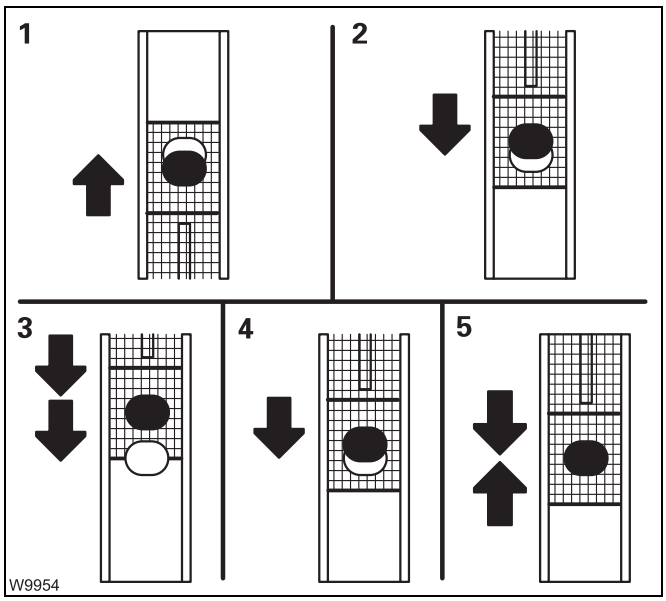
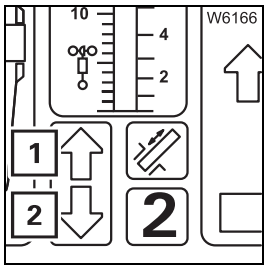


Locking point display

– Direction of travel to the locking point
  1 Extend telescoping cylinder
  2 Retract telescoping cylinder

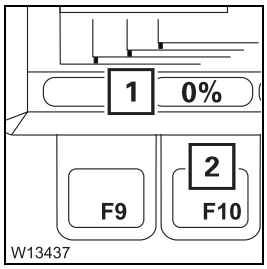
– Distance to the locking point
  3 Yellow: approx. 1 m (3.3 ft)
  4 Yellow Less than 1 m (3.3 ft)
  5 Green: At the locking point



Enable telescoping display

1 Extend
– **Red:** Blocked
– **Green:** Enabled

2 Retract
– **Red:** Blocked
– **Green:** Enabled

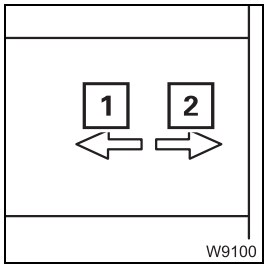


Entering target value for teleautomation

1 – **Red:** Teleautomation off
– **Yellow:** Enter target value
– **Green:** Teleautomation on

2 Press button once – nominal value input on
Press button once – target value to next fixed length

➠ p. 11 - 90



Teleautomation direction display

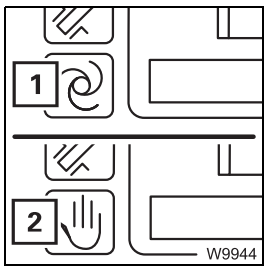
1 Lights up: Start teleautomation with *Extending*

2 Lights up: Start teleautomation with *Retracting*

Flashing = control lever movement incorrect

➠ p. 11 - 91

23.10.2018

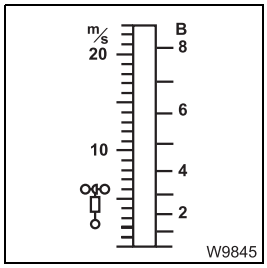


Teleautomation on/off display

1 Teleautomation on

2 Teleautomation off

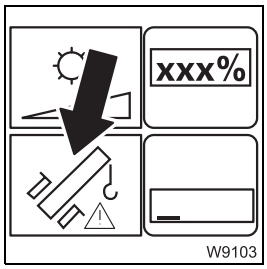
➠ p. 11 - 90



Anemometer display

Same as in main menu; ➠ p. 9 - 63.

In the Settings submenu

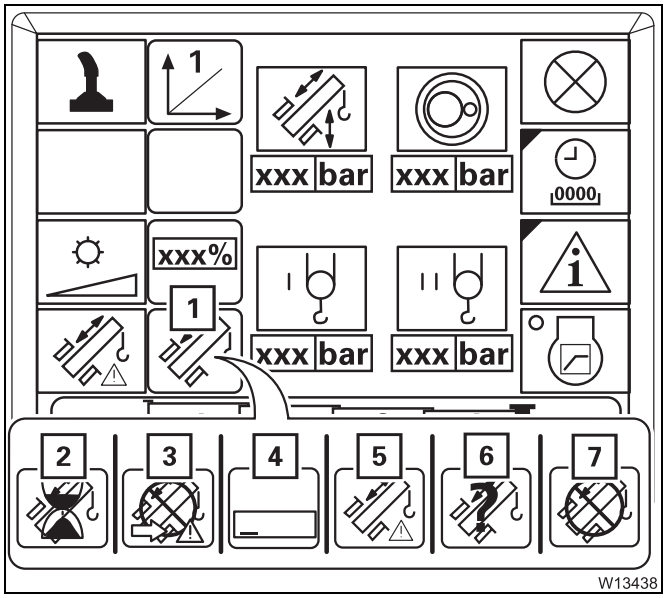


Telescoping emergency program access

The right dead man's switch is pressed.

– **Press the button once:** After entering the keycode, the emergency program *Telescoping* opens

➠ p. 14 - 47



Current telescoping mechanism status display

The current status is shown using different symbols:

1 Normal

2 Waiting

3 Emergency program access

4 Keycode input

5 Emergency program

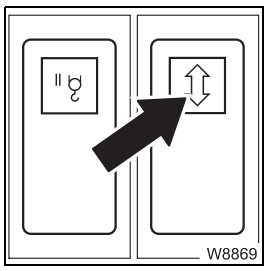
6 Telescope status divergence

7 Inactive

➠ p. 14 - 22

23.10.2018

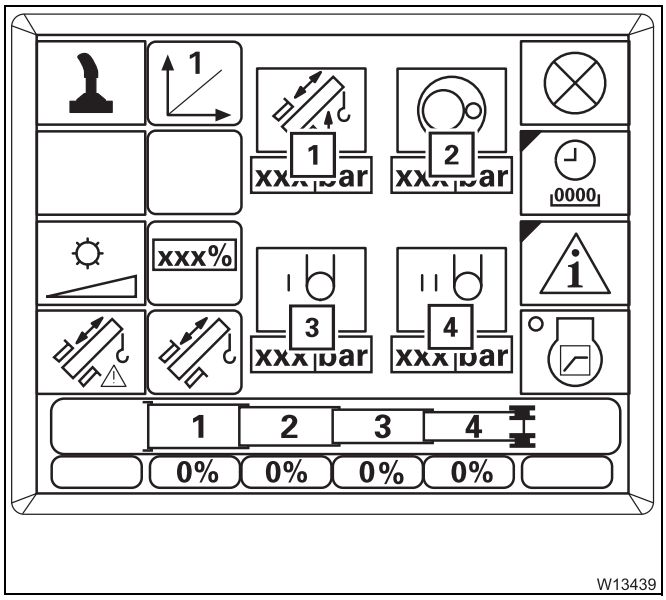
9.2.17 Hydraulic system



Inclining the crane cab

- **Press in at the bottom:** Incline back
- **Press in at the top:** Incline forward

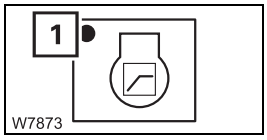
➠ p. 11 - 103



In the *settings* submenu

Current pressure in bar for movements of the

1 Derricking gear/Telescoping mechanism
2 Slewing gear
3 Main hoist
4 Auxiliary hoist



Critical load control

- **Switch on:** Press button until the dot (**1**) turns green
- **Switch off:** Press button until the dot (**1**) turns black

➠ p. 11 - 107

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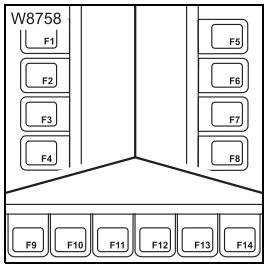
9.2.18 Rated capacity limiter (RCL)

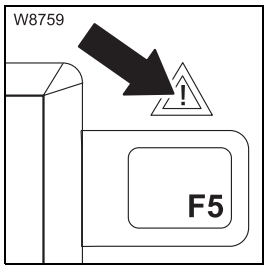
Control unit

This section contains the operating elements that are the same for all menus opened.



Buttons F1 to F14

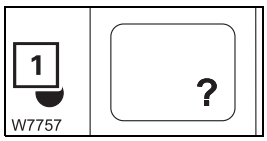
The function of buttons F1 to F14 is shown on the symbol next to or above the button. After the button is pressed, the function displayed is executed provided it has been released.



Error

– **Lights up:** Error has occurred
– **Off:** No errors

➠ p. 11 - 38



Opening Errors submenu

The lamp (**1**) lights up or flashes.

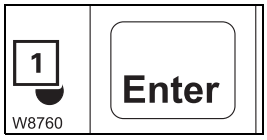
– **Press the button once:** The *Errors* submenu opens

➠ p. 14 - 32

Exiting submenu/input mode

The lamp (**1**) lights up.

– **Press the button once:**
  – The opened submenu closes – the menu from the next higher level is opened
  – Input mode is deactivated



Input confirmation

The lamp (**1**) lights up.

– **In the Rigging mode submenu:** Press button once – *Rigging mode monitoring* submenu opens
– **In the Rigging mode monitoring submenu:** Press button once – rigging mode is accepted, *Monitoring* submenu opens, lamp (**1**) goes out

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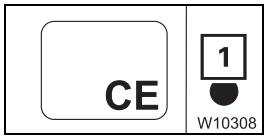
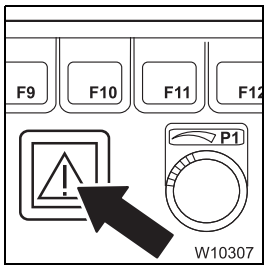


Acknowledging

The lamp (**1**) lights up.

– **Press the button once:** Buzzer tone off, error message acknowledged



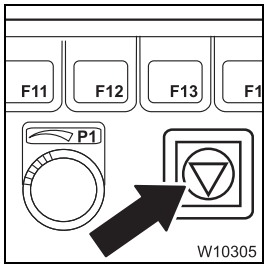
RCL early warning

– **Flashing:** Degree of utilization 90 – 100% – buzzer tone on

– **Lights up:** Degree of utilisation approx. 100% – buzzer tone on – shutdown

– **Off:** Degree of utilisation 0 – 90%

➠ p. 11 - 36

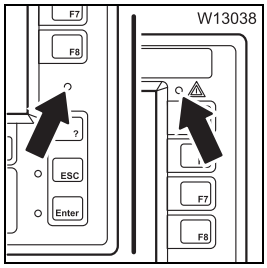


RCL shutdown

– **Lights up:** Shutdown – buzzer tone on
  – Degree of utilisation approx. 100% or
  – Error

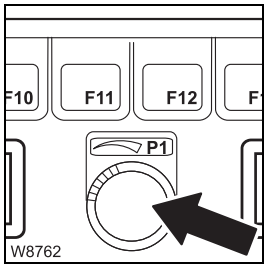
– **Off:** No shutdown

➠ p. 11 - 36



Sensor for brightness

Registers the brightness of the operating environment. The brightness of all displays is automatically adjusted; ➠ p. 11 - 22.



Entering values

The input mode for the RCL code is switched on.

– **To the right:** Next greater value

– **To the left:** Next smaller value

Slowly turning – changes the value gradually
Quickly turning – changes the value quickly

➠ p. 11 - 27

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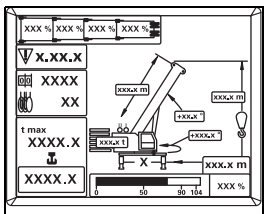
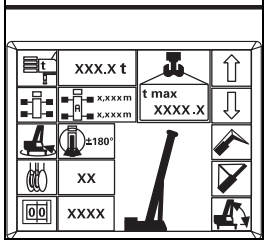


RCL display

– After a standstill of up to 48 hours

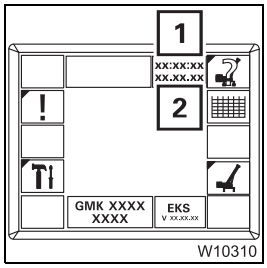
Ignition on – *Monitoring* submenu opens; ➠ p. 11 - 21



– After a standstill of more than 48 hours

Ignition on – *Enter rigging mode* submenu opens; ➠ p. 11 - 22

Main menu

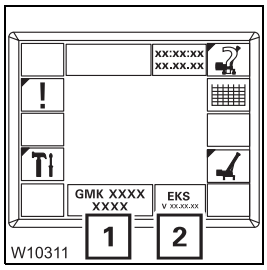


Date/time display

1 Time

2 Date

➠ *Entering the time/date*, p. 11 - 49



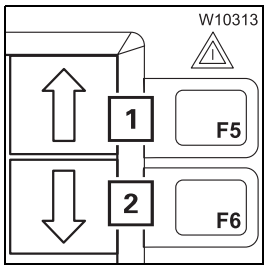
Serial number and programme version displays

1 Truck crane serial number

2 RCL program version – always state in the event of malfunctions; ➠ p. 14 - 29

Enter rigging mode submenu

➠ *Entering rigging mode*, p. 11 - 23

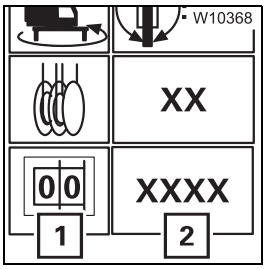


Selection

In input mode

1 Press button once – display next highest value

2 Press button once – display next lowest value

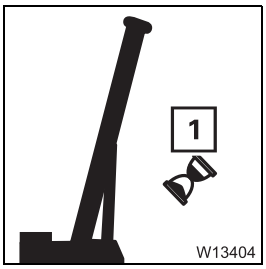


Enter RCL code

– **Input mode on:** Press button (**1**) once – symbol green

– **Input:** In input mode, press buttons ⇧ ⇩ once – next RCL code on display (**2**)

➠ p. 11 - 27

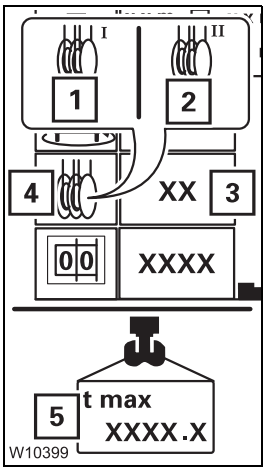


Determine the displayed RCL code

– **Symbol (1):** RCL code is determined after selecting Rigging mode

– **No display:** New RCL code is displayed

➠ p. 11 - 25

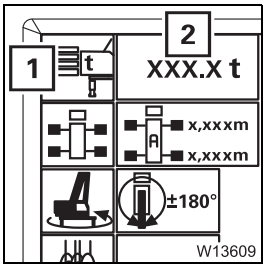


Entering reeving

– **Input mode on:**
  – For main hoist:
    Press button (**4**) until symbol (**1**) is green
  – For auxiliary hoist:
    Press button (**4**) until symbol (**2**) is green

– **Input:** In input mode, press button ⇧ ⇩ once
  – Reeving +1 on display (**3**),
  – Relevant maximum load on display (**5**)

➠ p. 11 - 24



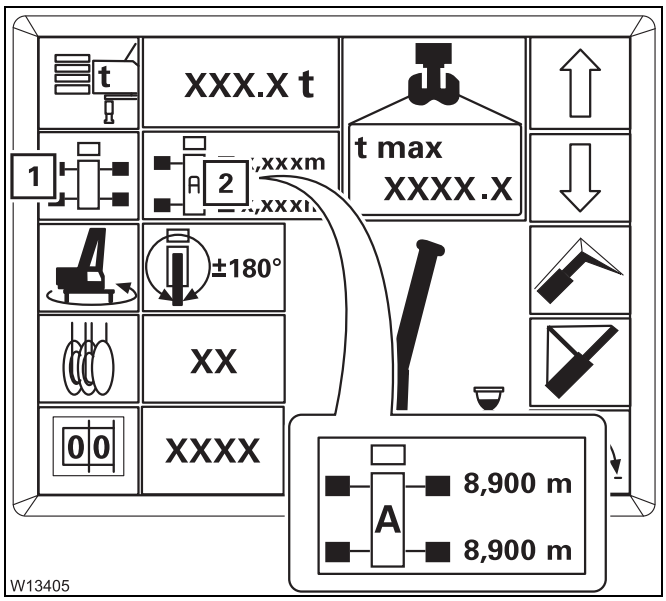
Entering counterweight

– **Input mode on:** Press button (**1**) once – symbol green

– **Input:** In input mode, press button ⇧ ⇩ once – next combination on display (**2**)

➠ p. 11 - 24

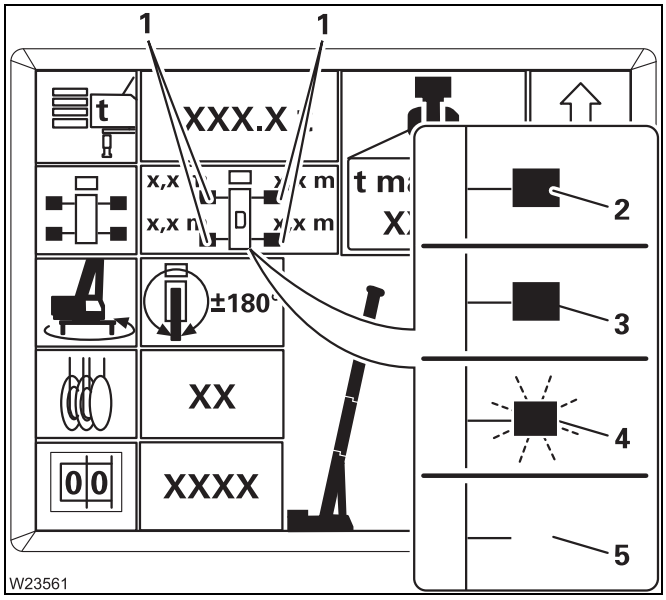
23.10.2018



Enter outrigger span

– **Input mode on**
  Press button (**1**) once – symbol green
– **Input**
  In input mode, press button ⇧ ⇩ once – next outrigger span on display (**2**).
  A 8.76 x 8.90 m (28.7 x 29.2 ft)
  B 8.76 x 6.10 m (28.7 x 20.0 ft)
  M 8.76 x 2.63 m (28.7 x 6.8 ft)
  X 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) Rear outrigger

➠ p. 11 - 24



Outrigger span monitoring display

The display (**1**) is identical for all outrigger beams (**2**).

(**3**) Illuminated – the required outrigger span is rigged

(**4**) Flashes – the required outrigger span is not rigged

(**5**) No display – the current outrigger span is not permitted

With displays (**4**) and (**5**) an error message is displayed after applying the rigging code; ➠ p. 11 - 24.

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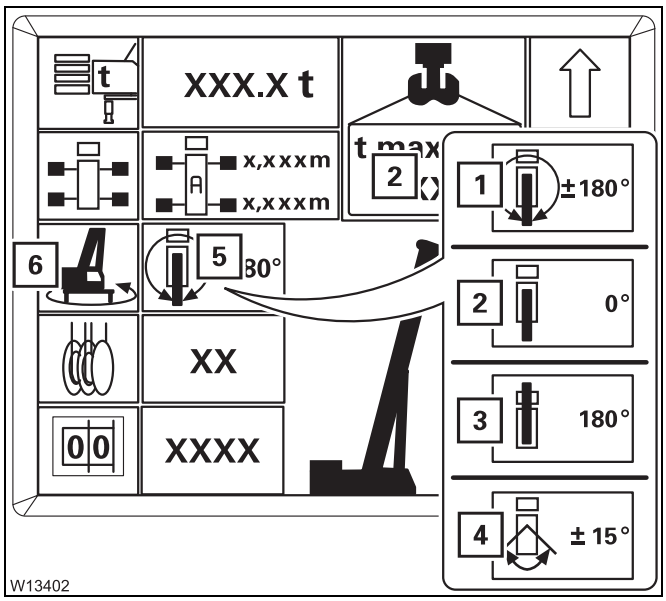


Enter slewing range

– **Input mode on**
Press button (**6**) once – symbol green

– **Input**
In input mode, press button ⇧ ⇩ once – next permissible slewing range on display (**5**)

1 360° slewing range

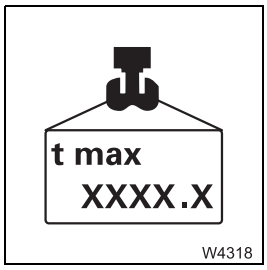
2 Working position 0° to the rear[1)]

3 Working position 180° to the front[1)]

4 Slewing range +/-15° to the rear

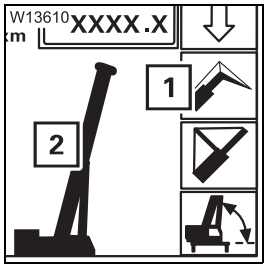
[1)] Lock the superstructure for acceptance

➠ p. 11 - 24



Maximum load display

Short description with *Monitoring*submenu; ➠ p. 9 - 84.



Boom system entry

1 No function in main boom operation – grey

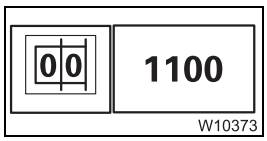
Boom system display

2 Symbol for main boom operation

Function in lattice extension operation ➠ *Lattice extension operating manual*

Monitoring submenu

Displays – depend on rigging mode; ➠ *Checks before operating the crane*, p. 11 - 30.



Display RCL code

RCL code, four digits

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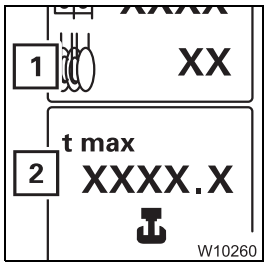
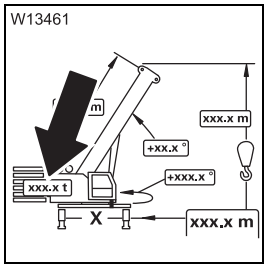


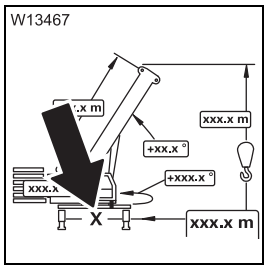
Reeving display

1 Required quantity of reeved ropes for displayed, maximum load (**2**)



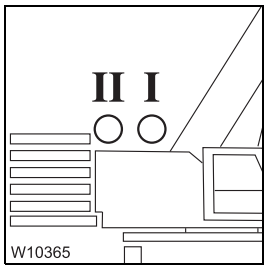
Counterweight display

Required counterweight combination in tons (t) – for displayed RCL code.



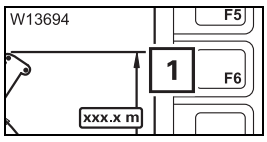
Outrigger span display

Required outrigger span for displayed RCL code – displayed in letters – overview of outrigger spans; ➠ p. 9 - 81.



Hoists display

– I on:	Main hoist switched on first – displayed reeving applies to main hoist
– II on:	Auxiliary hoist switched on first – displayed reeving applies to auxiliary hoist
– I or II flashing:	Corresponding hoist switched on as well – displayed reeving applies to the other hoist
– I or II out:	Corresponding hoist switched off

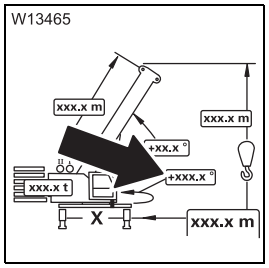


Lifting capacity table submenu

– Press the button once: The submenu opens.

➠ p. 11 - 47

23.10.2018



Current slewing angle display

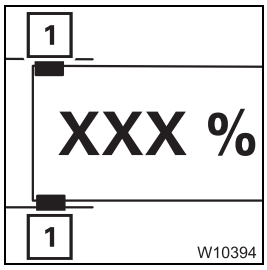
0°: Position *0° to the rear*

180°: Position *180° to the front*

+ 0.1 to +180.0°: Turned to the right from 0°

- 0.1 to -179.9°: Turned to the left from 0°

➠ p. 11 - 34



Current telescoping status display

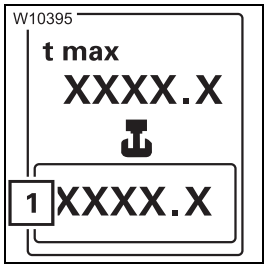
Telescope status of all telescopic sections in per cent – locking pins (**1**):

– **Green:** Fixed length – locked and set down

– **Flashing:** Intermediate length – locked, not set down

– **Black:** Intermediate length – not locked

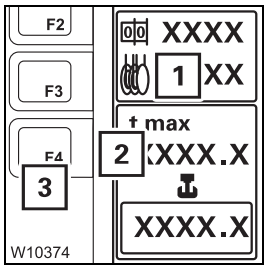
➠ p. 11 - 33



Current load display

– **Display:** Currently raised load in tons (t) or kilopounds (klbs) – accurate to ± 5% of actual load
(Example: 55.2 klbs equals 55,200 lbs)

➠ p. 11 - 35

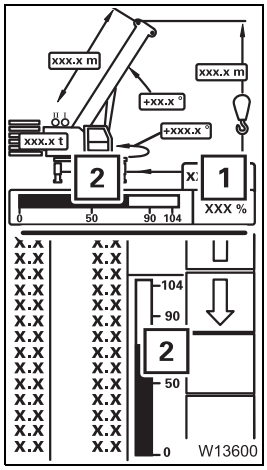


Maximum load display

– **Display:** Maximum load in tons (t) or kilopounds (klbs) for the displayed RCL code
  – Symbol (**1**) is red – maximum load reduced by reeving Press button (**3**) once – display (**2**) briefly shows maximum load for displayed RCL code

➠ p. 11 - 35

23.10.2018



Current degree of utilization display

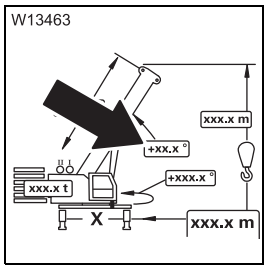
Degree of utilisation = 100 x current load/maximum load

1 Display in percent

2 Colour display:

- **Blue:** 0 - 90%
- **Yellow:** about 90 - 100% – early warning
- **Red:** greater than 100% – shutdown

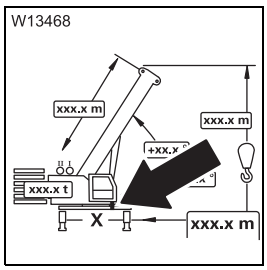
➠ p. 11 - 35



Current main boom angle display

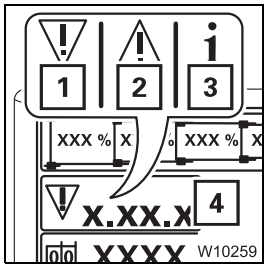
- **Display:** Current angle between main boom and horizontal position in degrees (°)

➠ p. 11 - 34



Turntable lock display

- **Lights up green:** Turntable locked
- **No display:** Turntable unlocked
- **Flashes yellow:** Locking pin in intermediate position
- **Flashing red:** Error code displayed



Error display

1 Error

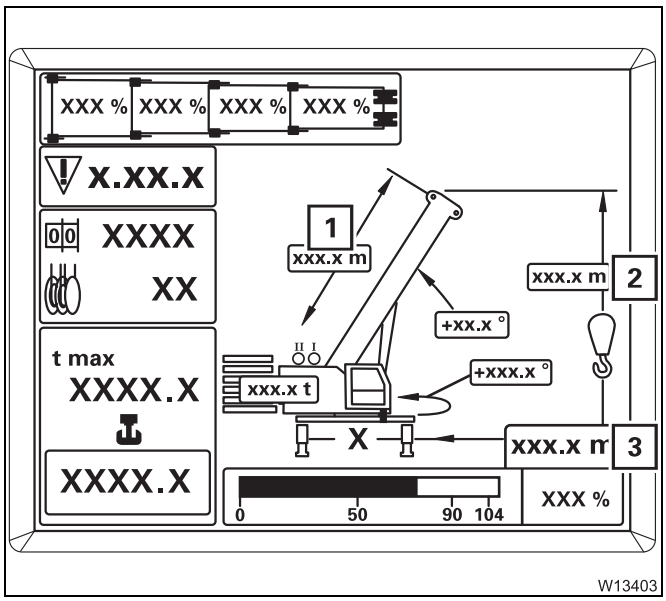
2 Warning

3 Information

4 Corresponding number code,
Press button F2 once – next available number code

➠ p. 11 - 38

23.10.2018



Other displays

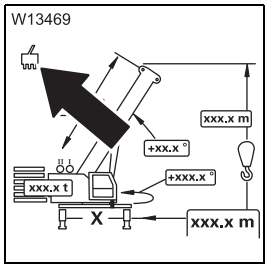
Display in metres (m) or feet (ft)

1 Current main boom length

2 Current overall height

3 Current working radius

➠ p. 11 - 33

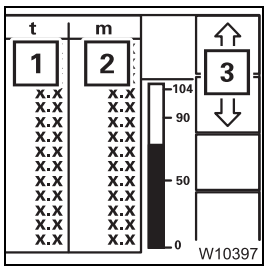


Service symbol display

Symbol displayed – service device connected

Lifting capacity table submenu

➠ *Displaying the lifting capacity tables*, p. 11 - 47



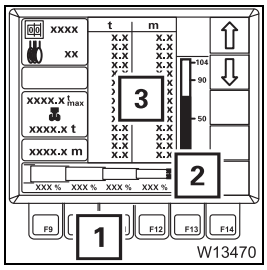
Lifting capacity table display

Values for displayed RCL code and displayed telescope status

1 Lifting capacity in tons (t) or in kilopounds (klbs)

2 Working radius in metres (m) or feet (ft)

3 Show other values given in the table



Telescope status display/input

– **Display:** Telescope status (**2**) in percent

– **Input:** Press button (**1**)
  – New telescope status on display (**2**)
  – Corresponding table on display (**3**)
  or all values 0 = no table available

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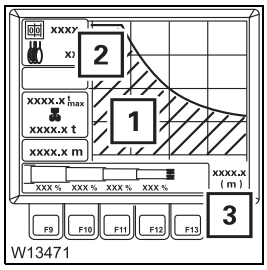
Other displays

Functions in the same manner as the *Monitoring* submenu:

– Display RCL code ➠ p. 9 - 82
– Reeving display ➠ p. 9 - 83
– Maximum load display ➠ p. 9 - 84
– Current load display ➠ p. 9 - 84
– Other displays ➠ p. 9 - 86
– Current degree of utilization display ➠ p. 9 - 85

Working range submenu

➠ *Displaying the lifting capacity tables*, p. 11 - 47



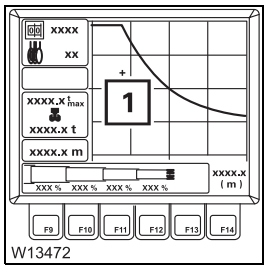
Permissible working range display

Applies for displayed RCL code and displayed telescope status

1 Permissible working range – surface under the curve

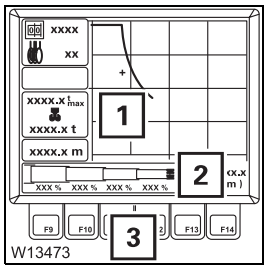
2 Maximum possible load

3 Maximum possible working radius



Current position display

1 Current position – defined by current load and current working radius



Telescope status display/input

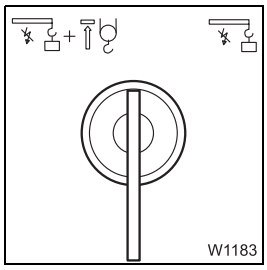
– **Display:** Telescope status (**2**) in percent

– **Input:** Press button (**3**)
  – New telescope status on display (**2**)
  – Corresponding working range on display (**1**)
    or no display = telescope status outside the working range

Other displays

Functions in the same manner as the *Lifting capacity table* submenu

Other



Key-operated override switch

– **Turn to the right:** *RCL* shutdown overridden –
Crane functions released, no more monitoring;
➠ p. 11 - 39

– **Turn to the left:** *RCL* shutdown and *Lifting limit switch* shutdown overridden –
Crane functions released, no more monitoring;
➠ p. 11 - 62.

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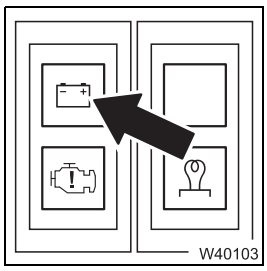
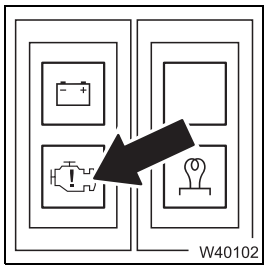
9.2.19 Electrical system



Voltage monitoring warning

- **Lights up:** Engine off – ignition on
  or
  Engine on – power failure – switch off engine
- **Off:** Engine on – no malfunction

p. 10 - 8



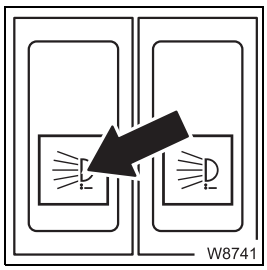
Engine electronic system warning

- **Lights up:** Engine off – ignition on
- **Off:** Engine on – no malfunction

p. 10 - 8

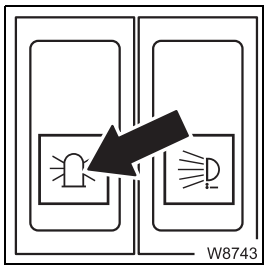
9.2.20 Lighting, windscreen wiper/washing system

Lighting



Spotlight sockets on/off

- **Switch on:** Press in at the bottom – voltage on (both sockets)
- **Switch off:** Press in at the top – voltage off (both sockets)



Air traffic control light on/off

- **Switch on:** Press in at the bottom – voltage on socket switched on
- **Switch off:** Press in at the top – voltage on socket switched off

p. 12 - 118

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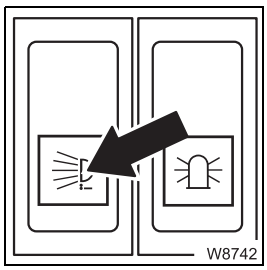
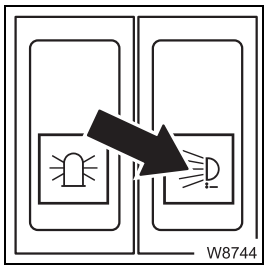


Slewable spotlight on/off

- **Switch on:** Press in at the bottom
- **Switch off:** Press in at the top

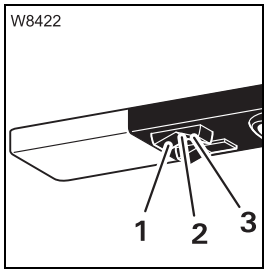
p. 11 - 108



Swinging the spotlight

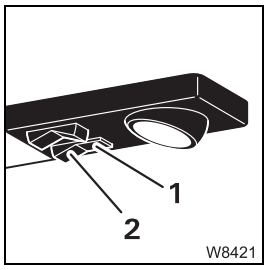
- **Back:** Push down
- **Forward:** Push up

p. 11 - 108



Cab lighting

1 Always on
2 Always off
3 On/off via door contact



Reading lamp

1 On
2 Off

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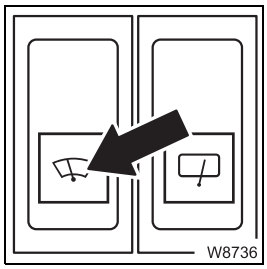
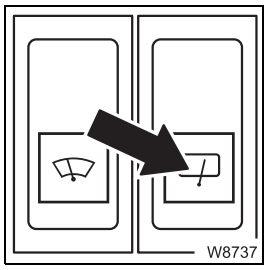
Windscreen wiper/washing system



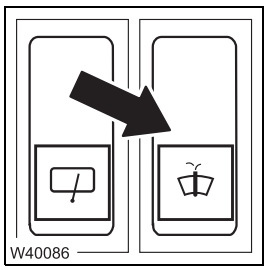
Windscreen wiper on/off

- **Off:** Press in at the top – wiper goes to end position
- **Interval:** Middle position
- **Continuous operation:** Press in at the bottom



Roof window wiper on/off

- **Off:** Press in at the top – wiper goes to end position
- **Interval:** Middle position
- **Continuous operation:** Press in at the bottom



Windscreen washing system

- **Windscreen:** Push down
- **Skylight:** Push up

No additional wiping function is performed

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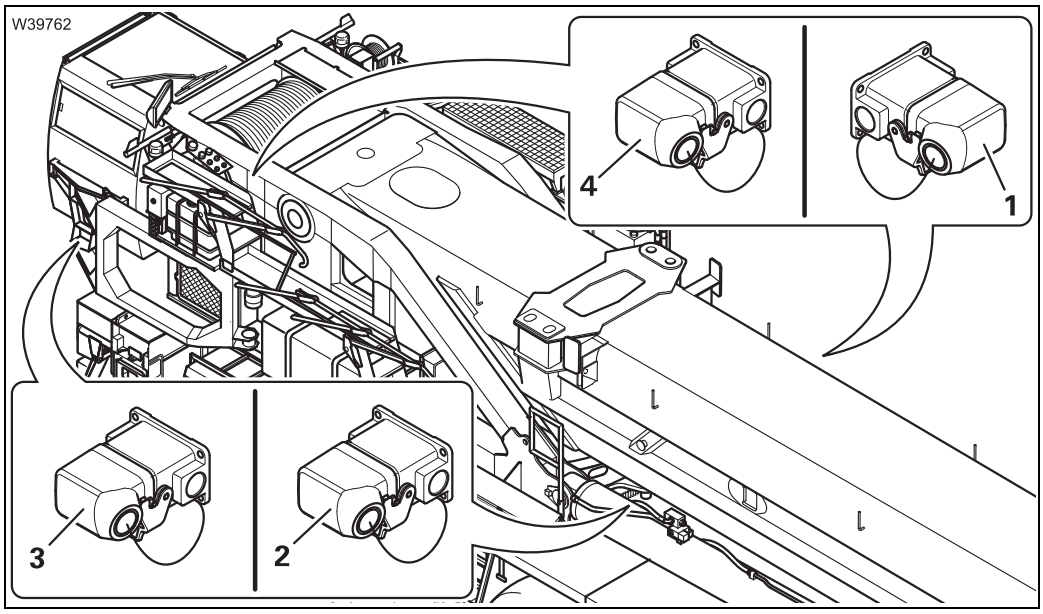
9.2.21 Hand-held control

Sockets for hand-held control

The following applies to all sockets:

- **Pull plug:** Engine off – ignition off
- **Insert plug:** Ignition on

Connecting the hand-held control, p. 12 - 18



Socket		Enabled operations
1 **2**	On the derricking cylinders	– Pulling device for derricking cylinder head pins[1)] – Derricking gear emergency operation
3	On the slewing arm of the crane cab	– Slewing, raising, lowering the crane cab – Slewing the crane cab bracket – Emergency operation for crane movements and turntable lock
4	Back right on the turntable	– Counterweight lifting cylinder – Counterweight lock – Locking, unlocking auxiliary hoist[1)] – Auxiliary hoist, raising/setting down catcher 2[1)] – Pulling device, boom pivot pin[1)] – Emergency operation for slewing gear, turntable lock, main hoist, auxiliary hoist[1)] – Rigging winch[1)]

[1)] Additional equipment

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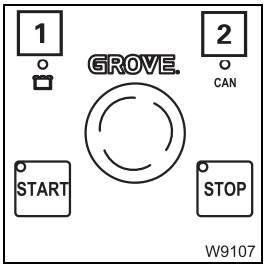
Engine control panel

➠ *Starting the engine – with the hand-held control*, p. 10 - 19

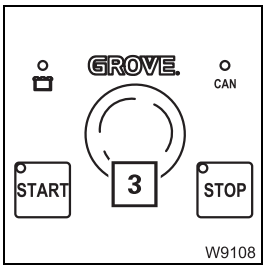


1 Voltage monitoring

- **Lights up:** Ignition on
- **Off:** Switch the ignition off

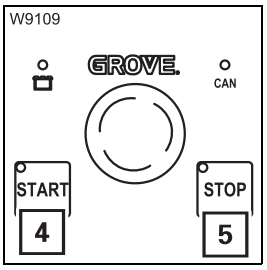
2 CAN monitoring

- **Lights up:** Hand-held control connected – no malfunction – goes out after 20 seconds
- **Flashing:** **Hand-held control connected – malfunction**



3 Emergency stop switch
May only be used in an emergency

- **Press:** Engine off – crane functions stop immediately, Switch latches
- **Turn the latched switch:** Switch returns to initial position – crane functions released



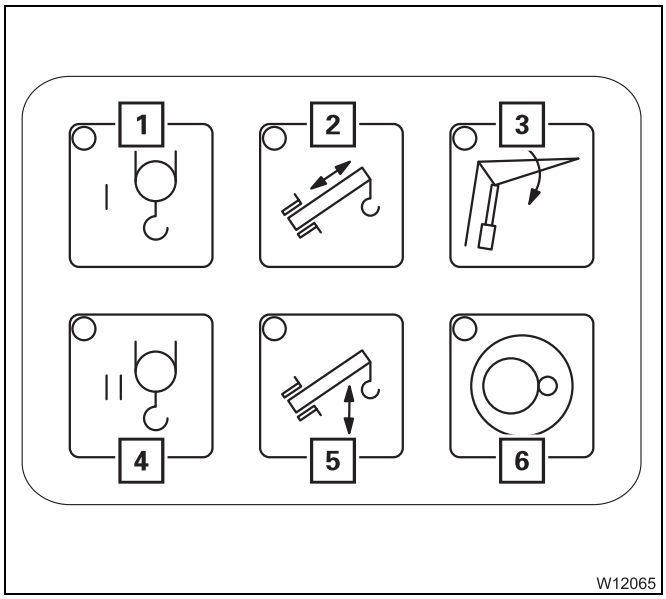
4 START engine

- **Press once:** Engine on

5 STOP engine

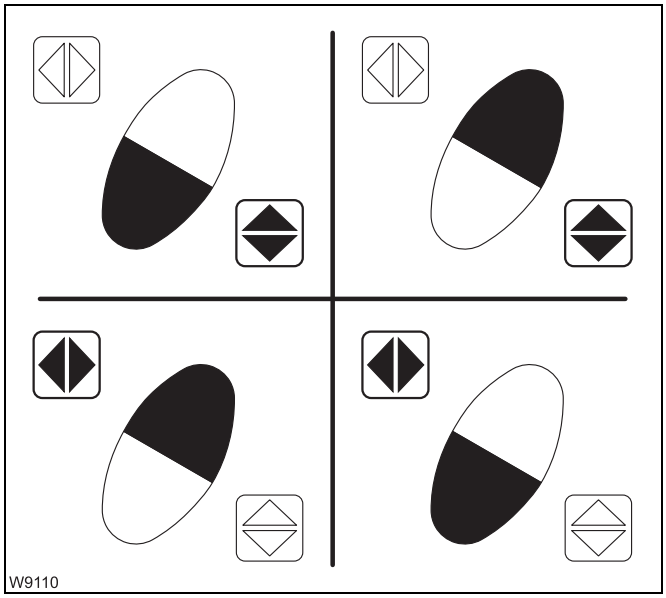
- **Press once:** Engine off

Pre-select emergency operation



1 Main hoist
2 Telescoping mechanism
3 No function
4 Auxiliary hoist[1)]
5 Derricking gear
6 Slewing gear/Turntable lock

[1)] Additional equipment

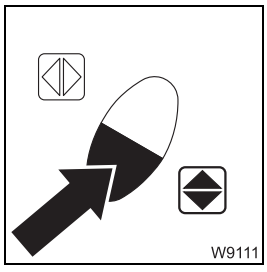


The operations are not monitored by the RCL.

There are four button combinations; activated buttons are shown in black:

– **Pre-selected function on**
  Press the required button combination.
– **Pre-selected function off**
  Release one or both the buttons.

Press a non-assigned button combination – pre-selection off.



– **Faster movement:** Increase pressure on button
– **Slower movement:** Decrease pressure on button

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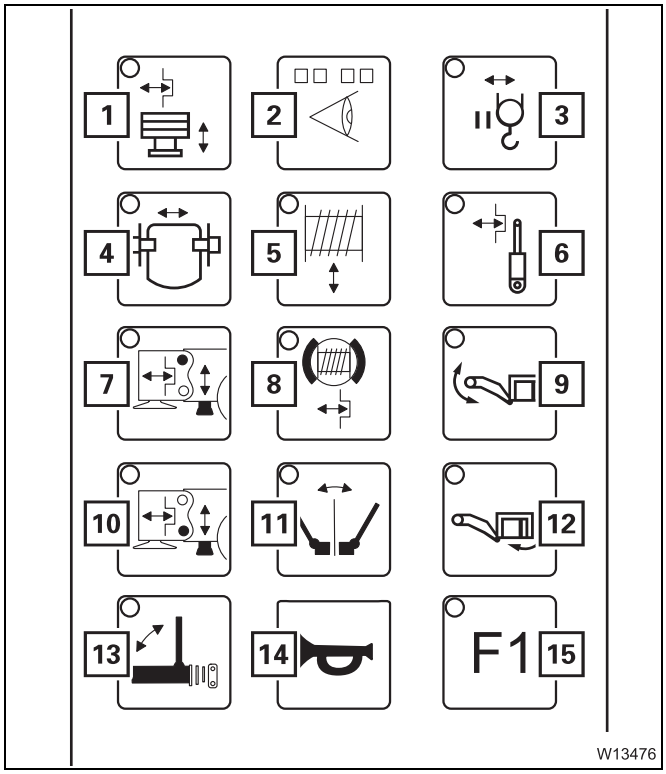
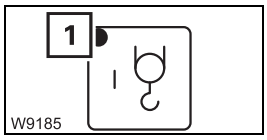
Pre-select rigging



1 Rigging counterweight
2 Locking status
3 Rigging the auxiliary hoist
4 Head pins pulling device
5 Rigging winch[2)]
6 Pivot pin pulling device
7 No function
8 Special function[1)]
9 Swinging the crane cab arm and tilting the crane cab
10 No function
11 Special function[1)]
12 Swinging and tilting the crane cab
13 Special function[1)]
14 Horn
15 Special function[1)]

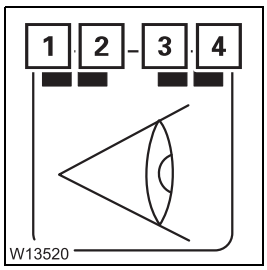
[1)] ➠ *Mega Wing Lift Operating Manual*
[2)] ➠ *Betriebsanleitung Rüstwinde*

Operation



The operation is the same for all buttons:

– **Pre-select:** Press button once – lamp (**1**) lights up – pre-selection on until another pre-selection is made



Locking status lamps

(1), (2) Red lamps

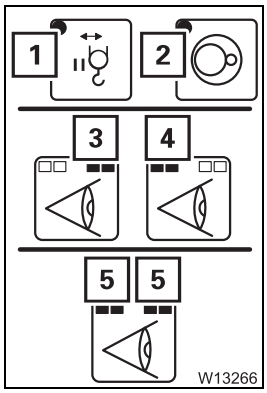
(3), (4) Green lamps

Shows the state of the

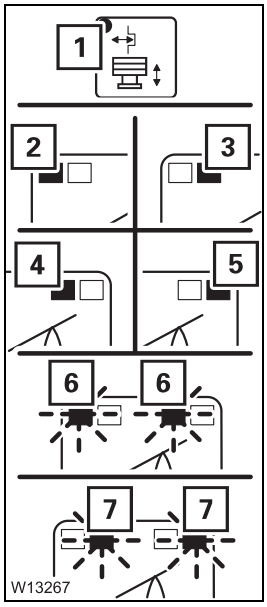
– Auxiliary hoist,

– Turntable locking and

– Counterweight hoist.



1	**Lights up:**	**Auxiliary hoist** active
2	**Lights up:**	**Turntable lock** active
3	**Both lamps light green:**	Locked
4	**Both lamps light red:**	Unlocked
5	**Both lamps blink alternately:**	Intermediate position



1	**Lights up:**	**Counterweight lock** active
2	**left red on:**	left locking cylinder unlocked
3	**right red on:**	right locking cylinder unlocked
4	**left green on:**	left locking cylinder locked
5	**right green on:**	right locking cylinder locked
6	**left red/green blinking alternately:**	left locking cylinder in intermediate position
7	**right red/green blinking alternately:**	right locking cylinder in intermediate position

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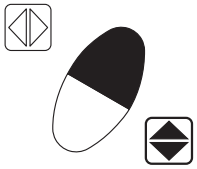
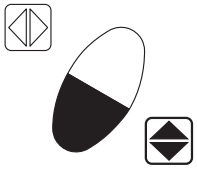
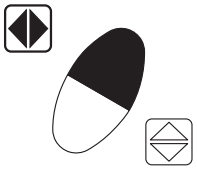
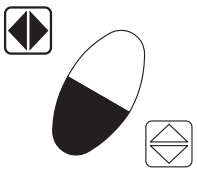
Button combination	Pre-select *rigging*			
	Counterweight	**Auxiliary hoist**	**Pulling device**	**Crane cab**
 W3851	Lifting	Raise catcher	None	Incline forward
 W3850	Lower	Set down the catcher	None	Incline back
 W3849	Lock	Lock	Extend axle (lock)	Slew into *crane mode* position
 W3848	Unlock	Unlock	Retract axle (unlock)	Slew into *driving* position

– Counterweight; ➠ p. 12 - 66
– Auxiliary hoist; ➠ p. 12 - 73
– Pulling devices; ➠ p. 6 - 73, ➠ p. 6 - 76
– Crane cab; ➠ p. 12 - 19

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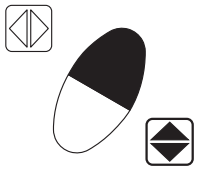
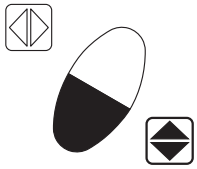
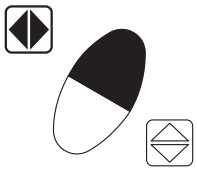
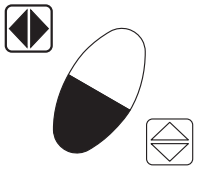
Button combination	Pre-select *emergency operation*			
	Telescoping mechanism	**Derricking gear**	**Turntable lock/ slewing gear**	**Hoists**
 W3851	none[1)]	Lower the boom	Lock	Lower
 W3850	Retract	Raise the boom	Unlock	Lifting
 W3849	None	None	Slew to right	None
 W3848	None	None	Slew to the left	None

[1)] The telescoping cylinder is extended after it has been unlocked.

➠ *Emergency operation with the hand-held control*, p. 14 - 59

Emergency operation of lattice extension ➠ *Lattice extension operating manual.*

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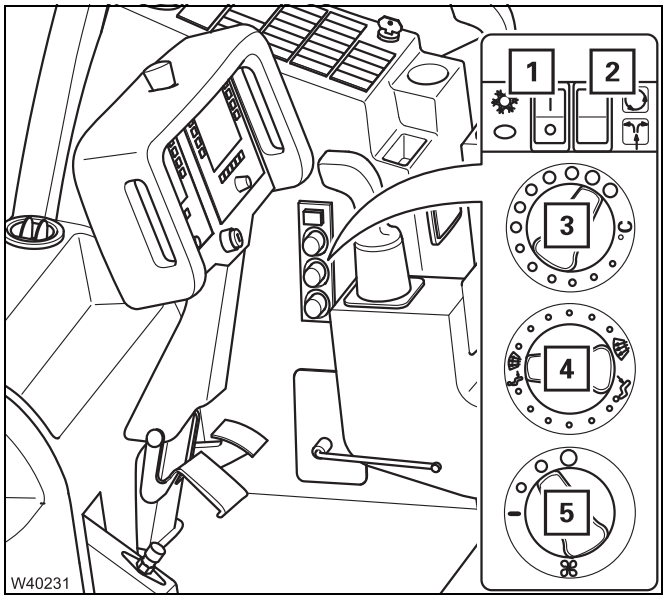
9.2.22 Diagnostics

The diagnostics connections may only be operated by the service personnel.



The following connections are below the cover (**5**).

1 Engine diagnostics
2 ECOS diagnostics
3 RCL diagnostics
4 ECOS diagnostics

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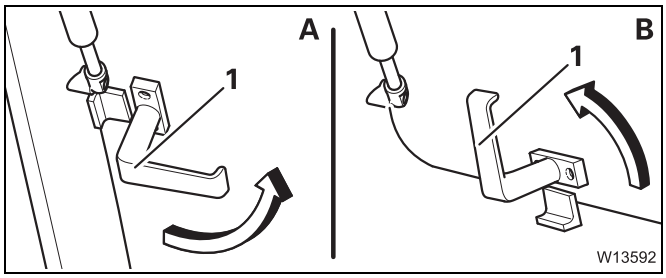
9.2.23 Windows, doors, keys

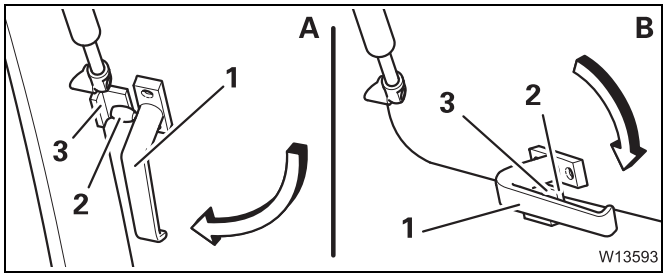
Windows

The handles on the windscreen (**A**) and the rear window (**B**) have the same function.



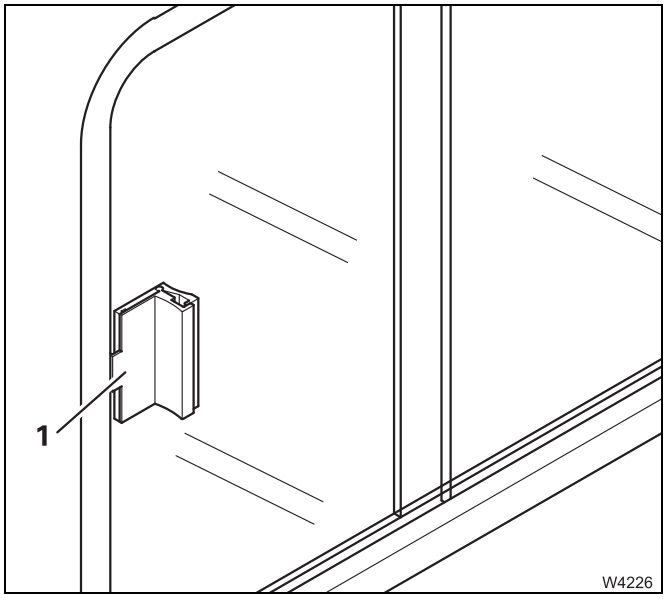
Opening

- Turn both handles (**1**) inward
- Push the window forward



Closing

- Pull the window closed
- Turn both handles down – pegs (**2**) located behind the clamp (**3**)



Right-hand sliding window

On the right-hand side of the crane cab there is a sliding window.

To open the window

- Press the release levers (**1**) together.
- Slide open the window.

To close the window

- Push the window closed using the release lever, as far as possible.

The release lever engages.

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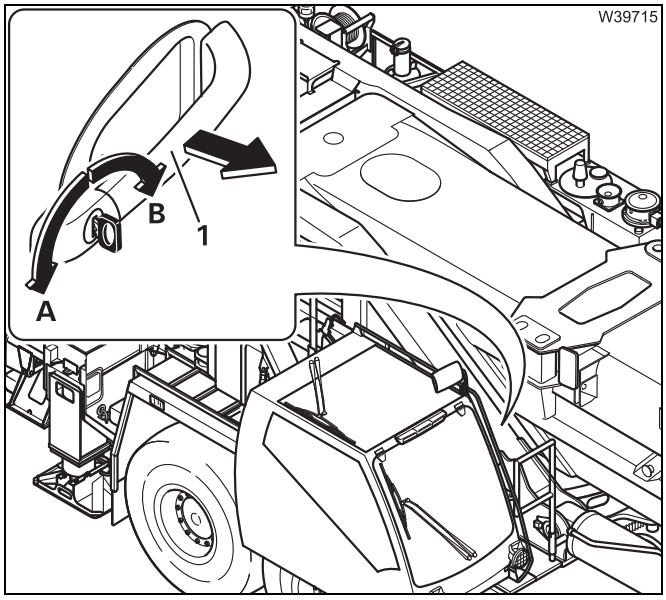
Crane cab door



From outside

Unlocking

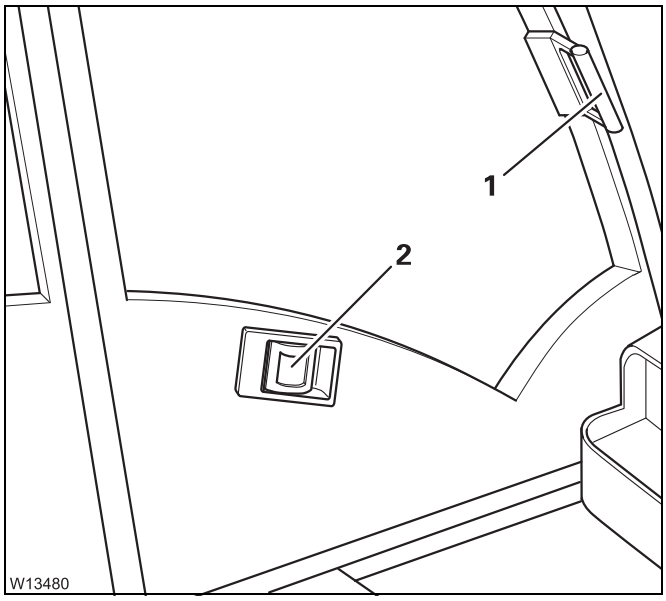
- Turn the key in direction **A**

Locking

- Turn the key in direction **B**

Open/close

- Pull the handle (**1**)
- Slide the door



From inside

Closing

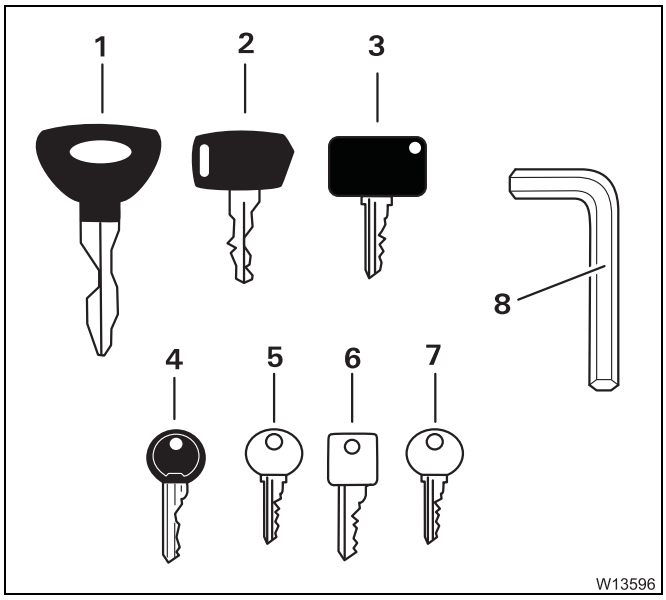
- Slide the door forwards using the handle (**1**) – engages.

  Locking from inside not possible.

Opening

- Pull the release lever (**2**).
- Slide the door backwards using the handle (**1**) – engages.

Keys Different keys are supplied.



1 Crane cab door lock
2 Crane cab ignition lock
3 Key-operated override switch
4 Windscreen washing system reservoir
5 Boom floating position lock[1)]
6 Slewing gear freewheel lock[1)]
7 Tank[1)]
8 Covers

[1)] Additional equipment

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10 Starting/switching off the engine – for crane operation

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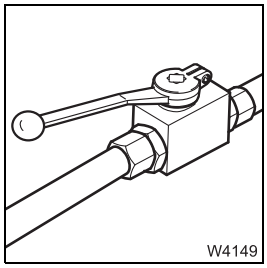
10 Starting/switching off the engine – for crane operation

10.1 Starting the engine – from the crane cab

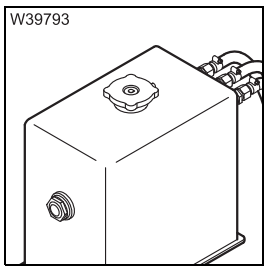
This section describes only how to start the engine from the crane cab. For rigging work, you can also start the engine with the hand-held control; ➠ p. 10 - 19.

10.1.1 CHECKLIST: Starting the engine

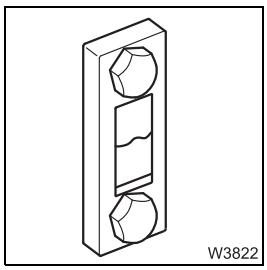
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions there!



1. Check that the valves on the hydraulic tank are open; ➠ p. 10 - 8.



2. Check the coolant level in the engine; ➠ *Maintenance manual*.



3. Check the oil level in the hydraulic system; ➠ *Maintenance manual*.

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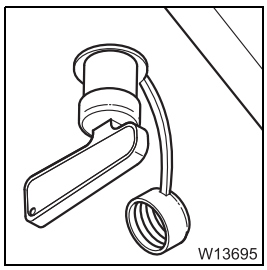
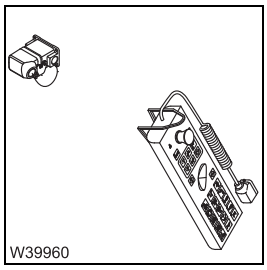
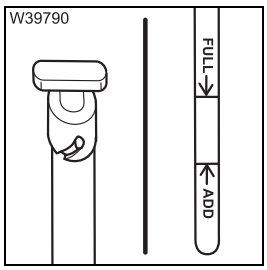


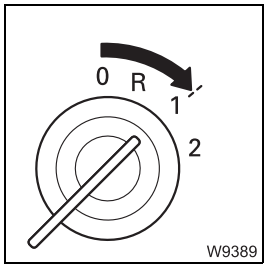
4. Switch on the battery master switch; ➠ p. 10 - 9.



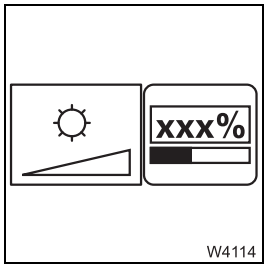
5. If necessary, remove the hand-held control and insert all bridging plugs; ➠ p. 10 - 9.



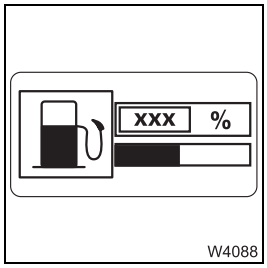
6. Check the oil level in the engine; ➠ *Maintenance manual*.



7. Switch on the ignition and check the instruments and displays; ➠ p. 10 - 10.



8. Adjust the brightness of the *ECOS* display as required; ➠ p. 10 - 12.



9. Check the fuel level; ➠ p. 10 - 5.

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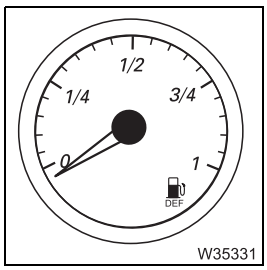
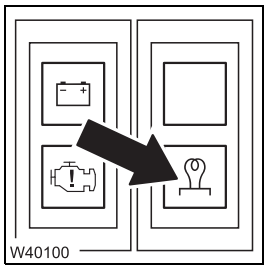
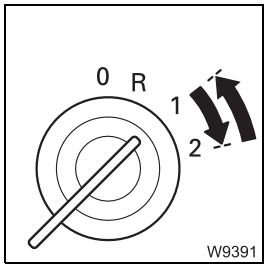


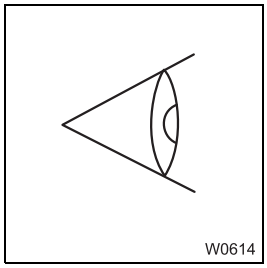
10. Check the AdBlue level; ➠ p. 10 - 7.



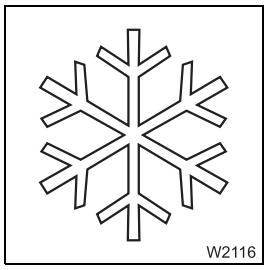
11. If the truck crane has a flame start system, wait until the lamp goes out; ➠ p. 10 - 14.



12. Start the engine; ➠ p. 10 - 13.



13. Check the instruments and displays with the engine running; ➠ p. 10 - 15.



14. In the event of low outside temperatures; ➠ *CHECKLIST: At low temperatures*, p. 10 - 4.

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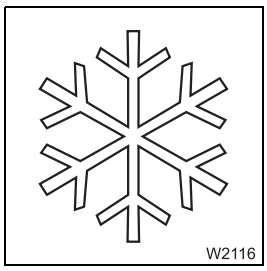
10.1.2 CHECKLIST: At low temperatures



You must also observe the following points when operating the truck crane at low outside temperatures:

1. The fuel and engine oil must be suitable for use at the respective outside temperature; ➠ *Separate engine manufacture´s operating manual*.
2. The engine coolant must contain sufficient antifreeze; ➠ *Separate engine manufacture´s operating manual*.
3. The windscreen washing system must contain sufficient antifreeze; ➠ *Maintenance manual*.
4. The hydraulic oil must be preheated; ➠ *Preheating the hydraulic oil*, p. 11 - 12.

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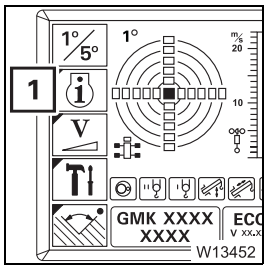
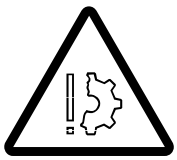
10.1.3 Refuelling



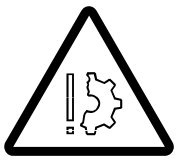
- If necessary, open the main menu Esc and press the button (**1**) once. This opens the *Monitoring* submenu.

Risk of accidents if the tank is not closed!
Close the tank each time you have refilled it.
In this way you can prevent other vehicles from being endangered by the cap falling off or consumables escaping.



Risk of damage to the engine and catalytic converter!
Unauthorised consumables can damage the engine and catalytic converter and void the warranty. Only use consumables approved by the engine manufacturer.

Risk of injury from ammonia vapours!
Ammonia vapours can escape if the *AdBlue* tank is opened at high outside temperatures. Ammonia vapours can irritate mucous membranes, skin and eyes.
Ensure that there is adequate fresh air supply and do not breathe in the escaping ammonia vapours.



Risk of damage to painted or aluminium surfaces!
AdBlue can cause corrosion of these surfaces. Clean up spilled *AdBlue* with water immediately.

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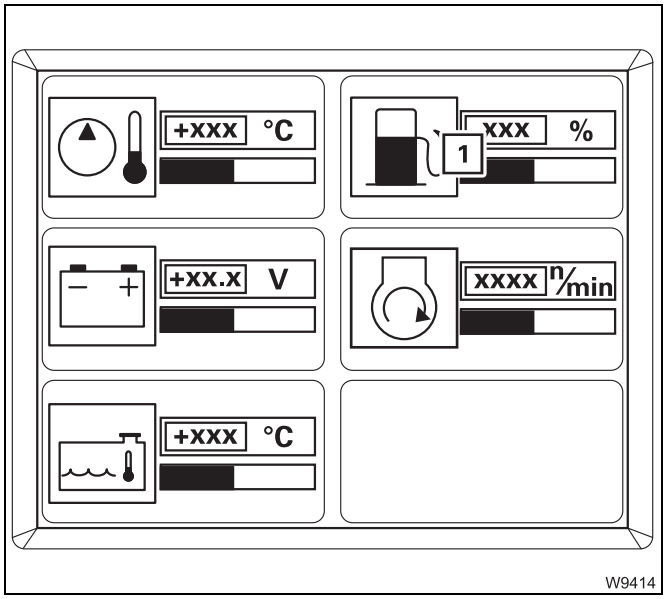
Fuel

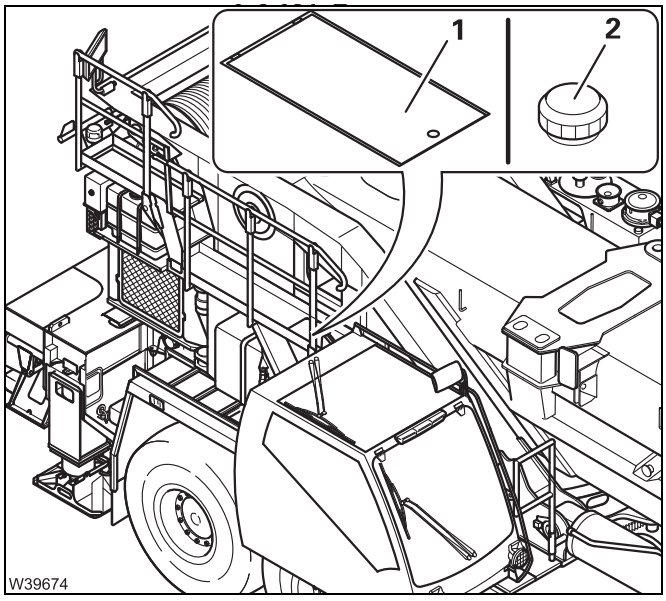


The display (**1**) indicates the current filling level in per cent. 100% corresponds to approx. 300 l (80 gal).

The level indicator below the display changes its colour depending on the level:

Green:	Over 10% – over 30 l (8 gal)
Yellow:	5 to 10% – 15 to 30 l (4 to 8 gal)
Red:	Below 5% – less than 15 l (4 gal)

Danger of fire due to inflammable gases!
Turn off the engine, crane cab heater and all auxiliary heaters before refuelling.



Information on the prescribed fuel specification ➠ *Separate engine manufacture´s operating manual*.

- Fold out the railing on the superstructure; ➠ p. 12 - 23.
- Open the cover (**1**).
- Fill in the diesel through the filler neck (**2**). Leave sufficient space for the fuel to expand.
- Screw the cap onto the filler neck after refuelling.
- Fold in the railing on the superstructure; ➠ p. 12 - 24.

Risk of accidents if the fuel tank is not closed!
Screw the cap back onto the filler neck each time after refuelling.
In this way you can prevent other vehicles from being endangered by the cap falling off or fuel escaping.

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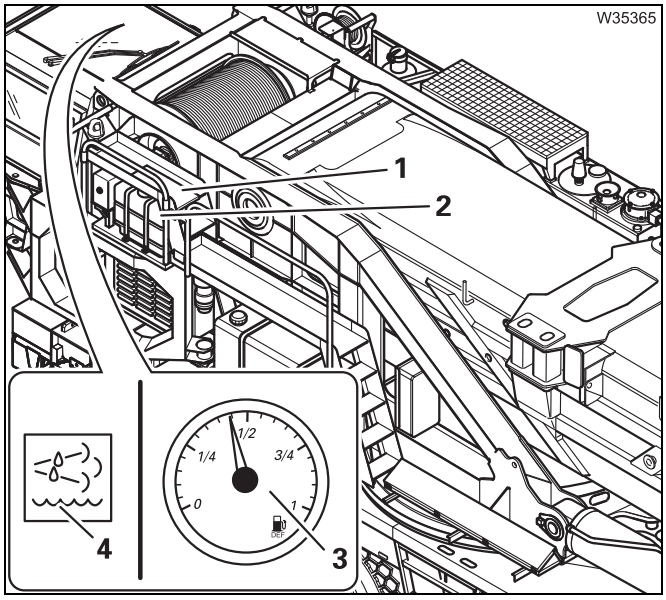
AdBlue



The display (**3**) shows the current filling level.

¼ – approx. 8.4 l (2.2 gal)

½ – approx. 16.8 l (4,4 gal)

¾ – approx. 25.2 l (6.6 gal)

1 – approx. 33.5 l (8.9 gal)

The AdBlue tank (**2**) can be filled using a hose through an opening in the catwalk (**1**).

- Refill the AdBlue tank (**2**)in good time and seal it using the cap.

The lamp (**4**) lights up when the AdBlue tank is empty.

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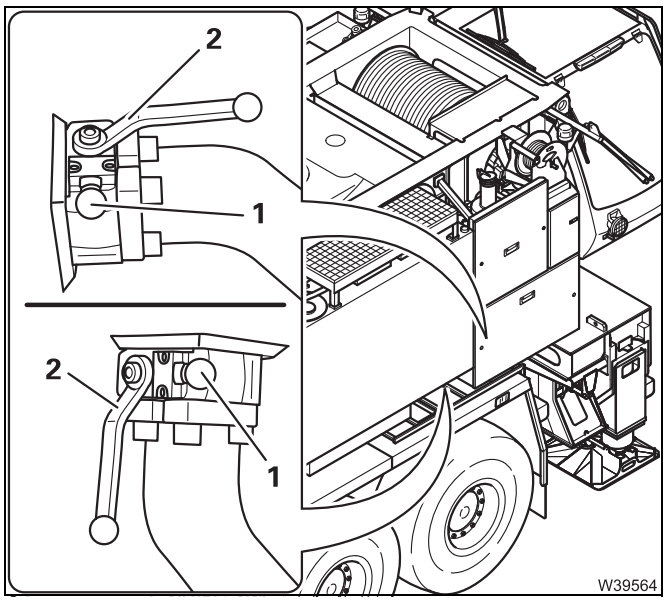
10.1.4 Checks before starting the engine

At the hydraulic tank

Before you start the engine, all valves on the hydraulic tank must be open.

Risk of damage to hydraulic pumps!
You may only start the engine when the valves on the hydraulic tank are open.



- Check that the valves are open – lever (**1**) parallel to the line.
- Open the closed valves.

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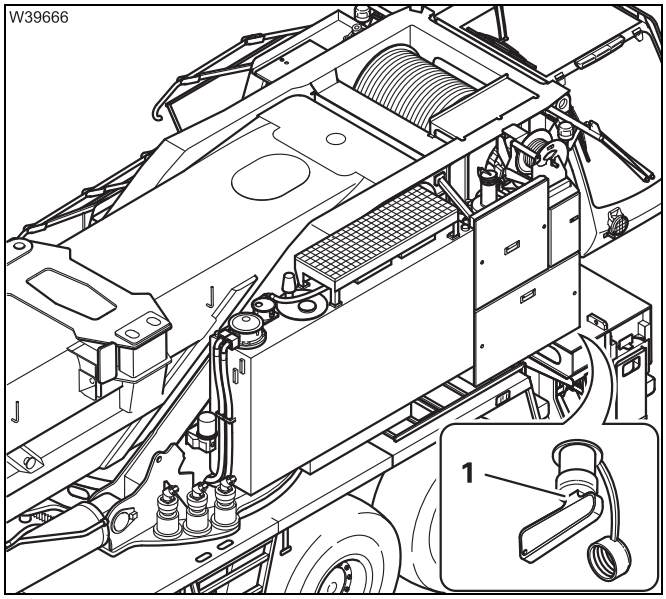
Battery master switch

You can only start the engine when the battery master switch is switched on.

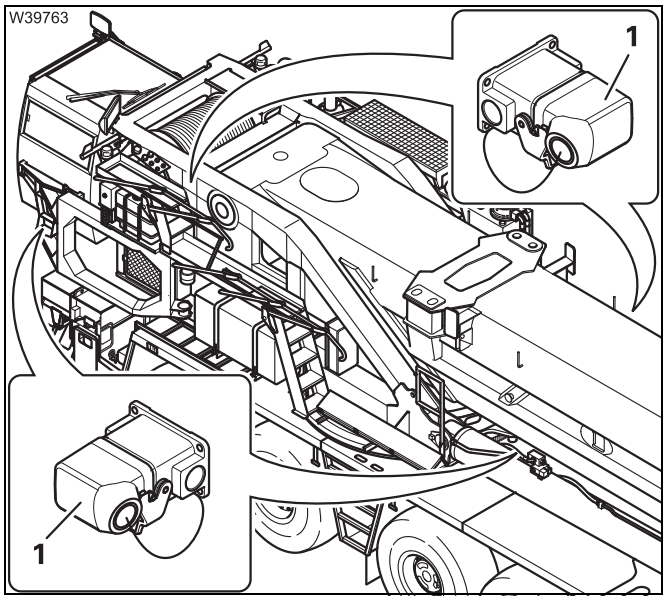


- Switch on the battery master switch (**1**).

The battery master switch is activated when the selector handle cannot be removed.

Checking the hand-held control

The hand-held control must be removed for crane operation from the crane cab.



- Check that the bridging plugs (**1**) are inserted in all the sockets; ➠ p. 12 - 18.

You can start the engine from the crane cab, but if the hand-held control is connected, the operating elements for crane operation are disabled.

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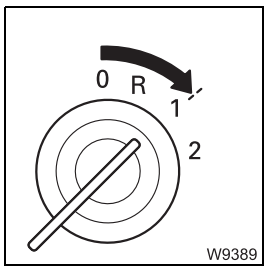
10.1.5 Switching the ignition on



- Insert the ignition key into the ignition lock and turn the key to position **1**.

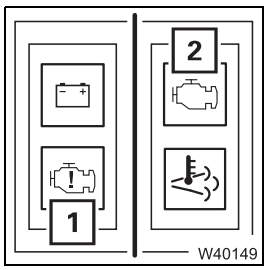
After on the ignition, a lamp test is performed and switching states are aligned; ➠ p. 10 - 10.

10.1.6 Lamp test

Lamp test

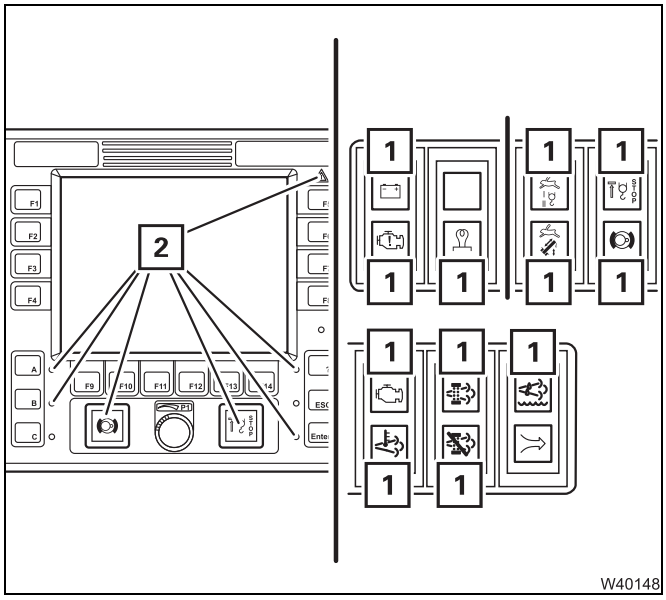
After the ignition has been switched on, a lamp test is performed.

Risk of accident from faulty lamps!
The lamps that are used to provide warnings and information during operation light up for control purposes whenever the ignition is switched on. Always perform the following lamp tests and immediately replace faulty lamps or have them replaced!
In this way, you will avoid accidents and damage that occur when malfunctions are not identified in time.



- Check that the lamps (**1**) and (**2**) light up briefly.

If the specified time is insufficient, switch on the ignition again.



- Check that the lamps (**1**) and (**2**) light up briefly.

If one or more lamps do not light up, contact **Manitowoc Crane Care**.

If the specified time is insufficient, you can carry out the lamp test again as follows:

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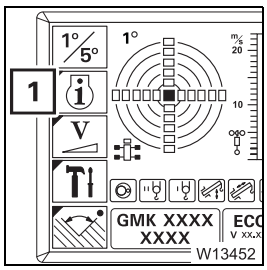
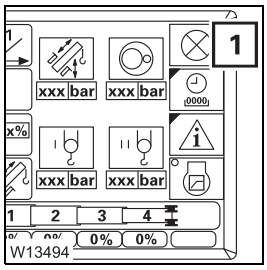


Performing lamp test

- If necessary, open the main menu Esc and press the button (**1**) once.
  This opens the *Settings* submenu.



- Press the button (**1**).
  The above lamps light up until you let go of the button again.

If necessary, you can set the minimum brightness of the display;
➠ p. 10 - 12.

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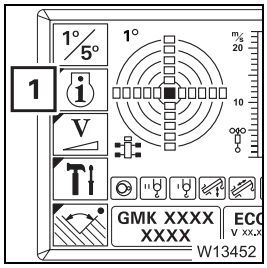
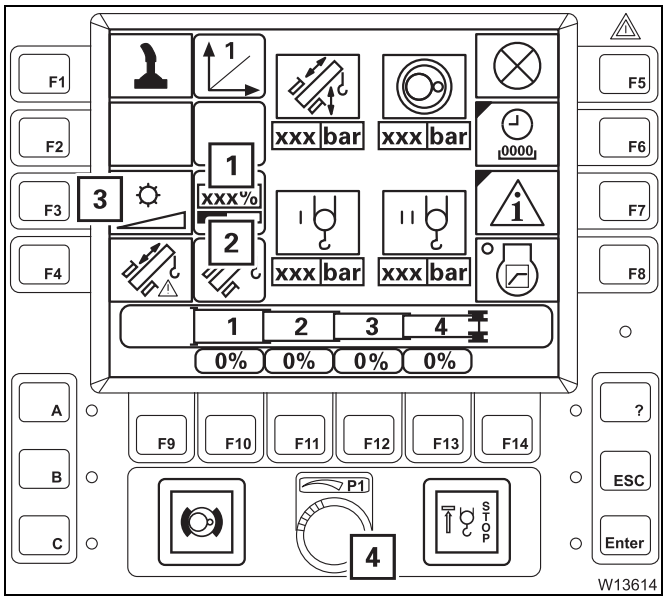
10.1.7 Adjusting display brightness

The brightness of the displays is automatically regulated by the *ECOS* and the *RCL* displays and depends on the brightness of the operating environment. You can manually set a common minimum brightness for the *ECOS* and the *RCL* displays.



- If necessary, open the main menu Esc and press the button (**1**) once. This opens the *Settings* submenu.



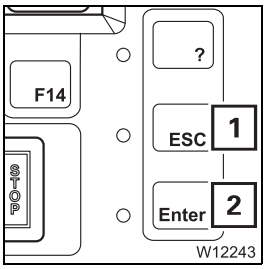
- Press the button (**3**) once.

A red bar (**2**) appears below the display (**1**).

- Set the desired minimum brightness with the switch (**4**).

The brightness of the display changes while setting and you can view the set value (0 to 100%) on the display (**1**).
The brightness set here is the minimum value for automatic regulation.

There is no automatic regulation if you set the brightness to 100%.
The displays then always show maximum brightness.



You can cancel the entry at any time using button (**1**). The settings are then reset.

- Apply the entered **minimum brightness** – press the button (**2**) once. The red bar below the display disappears. The brightness is automatically regulated between the newly set value and 100%.

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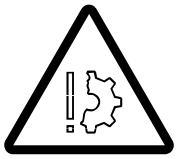
10.1.8 Starting the engine

Refer to the separate operating manual provided by the engine manufacturer for operating the engine. The engine can only be started when the bridging plugs have been inserted into all sockets for hand-held control; ➠ p. 12 - 18.

If the engine is equipped with a flame start system; ➠ *With flame start system*, p. 10 - 14.

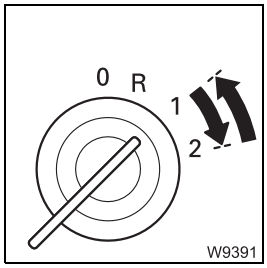
Without flame start system

This section pertains to starting a warm and cold engine.



Danger of explosion when using starter fuel!
The engine may never be started with the aid of starter fuel. The starter fuel sprayed into the intake manifold can ignite.

- Do not press the accelerator.
- Turn the ignition key to position **2** and hold it there until the engine starts.
- Release the ignition key after the engine starts.



If the engine does not start, release the ignition key after about 15 seconds and wait one minute before trying again.

If the engine does not start after several attempts; ➠ *Engine malfunctions*, p. 14 - 15.

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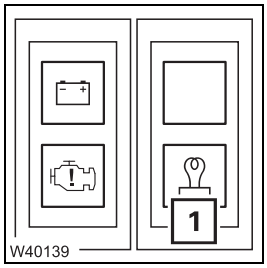
With flame start system

The flame start system warms the suction air of the engine.

This section pertains to starting a warm and cold engine.

Danger of explosion when using starter fuel!
The engine may never be started with the aid of starter fuel. The starter fuel sprayed into the intake manifold can ignite.

The flame start system is activated each time the ignition is turned on:



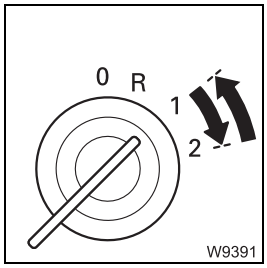
– **When the engine is warm**, the lamp (**1**) will light up only briefly (2 to 3 seconds).
– **When the engine is cold**, the lamp (**1**) goes out as soon as the engine is preheated (duration of up to 20 seconds).

- Wait until the lamp (**1**) goes out.

If the lamp (**1**) does not go out; ➠ *Engine malfunctions*, p. 14 - 15.

Start the engine within the next 30 seconds; otherwise, you must switch on the ignition again and wait until the lamp goes out.

- Do not press the accelerator.



- Turn the ignition key to position **2** and hold it there until the engine starts.
- Release the ignition key after the engine starts.

If the engine does not start, release the ignition key after about 15 seconds and wait one minute before trying again.

If the engine does not start after several attempts; ➠ *Engine malfunctions*, p. 14 - 15.

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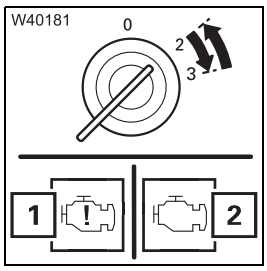
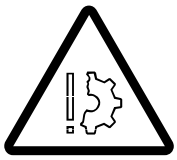
10.1.9 Checks after starting the engine

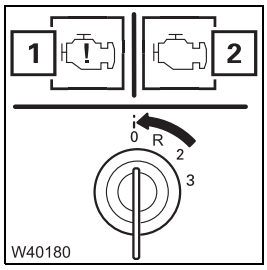


- Watch the lamps (**1**) and (**2**) immediately after starting the engine. They must not flash after starting the engine.

Switch off the engine immediately if the lamps (**1**) and (**2**) do not go out.



Risk of damage to the engine if the oil pressure is too low!
The oil pressure may be too low if the lamps (**1**) and (**2**) do not go out after 10 seconds. Switch the crane engine off and look for the cause;
➠ *Reading error messages*, p. 14 - 28.



Turn the key-operated switch to position 0 if lamps (**1**) and (**2**) do not go out;
➠ *Reading error messages*, p. 14 - 28.

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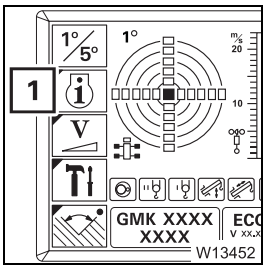
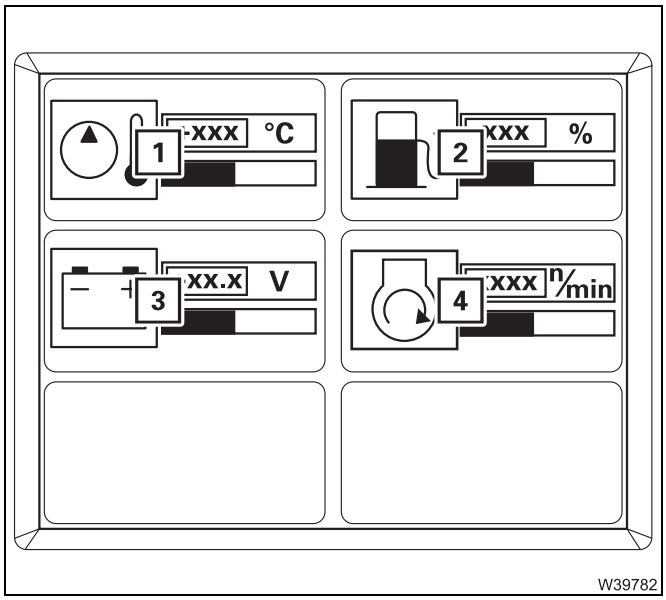
10.1.10 Monitoring submenu

The *Monitoring* submenu shows the most important measured values.



- If necessary, open the main menu Esc and press the button (**1**) once.



This opens the *Monitoring* submenu.

The following values are displayed:

1 The hydraulic oil temperature in °C (°F)

2 Fuel supply in percent

3 Voltage in volts

4 The engine speed in rpm

The colour of the bar below the values indicates in which area the value can be found.

Green:	Value OK.
Yellow:	Limit value almost reached
Red:	Limit value exceeded (or not reached) – warning message; p. 11 - 110.

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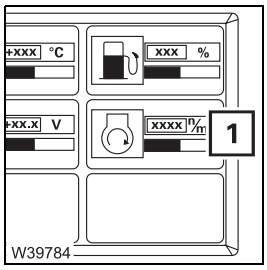
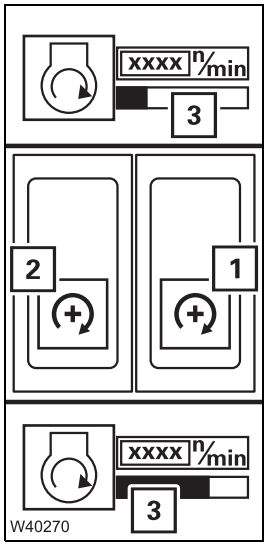
10.1.11 Setting the idling speed

- Start the engine; ➠ p. 10 - 13.



The display (**1**) shows the current engine speed; ➠ p. 10 - 16.

You can increase the idling speed for crane operation.
Release the accelerator in order to be able to view the settings below the current engine speed.



Increasing/reducing the idling speed

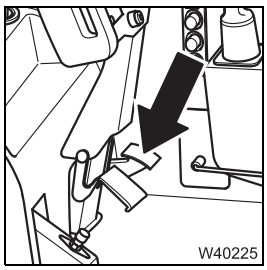
- Press the switch (**1**) in at the bottom – symbol (**2**) grey.
- Press the button (**2**) in at the top/bottom until the required engine speed has been reached. When reducing engine speed, the idling speed corresponds to the standard value after about three seconds.

or

- Press the button in at the top/bottom once. The idling speed (**2**) increases/reduces by one level.

or

- Set the required idle speed with the accelerator pedal and then press the button in at the top once. The idle speed (**3**) is adopted.
- Press the switch (**1**) in at the top – the lamp (**2**) lights up.



Exceeding the idling speed

You can exceed the idling speed at any time using the accelerator.
Once you release the accelerator the engine speed reduces to the pre-set idling speed.

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10.2 Starting the engine – with the hand-held control

Prerequisites

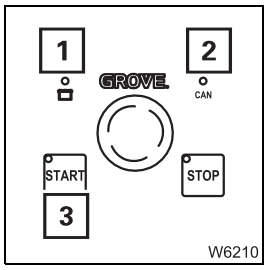
You can only start the engine for crane operation if

– The bridging plug (➠ p. 12 - 17) is inserted in all unused sockets and

– the ignition of the engine for crane operation is switched on.

Starting the engine

All checks required before starting the engine must be carried out; ➠ *CHECKLIST: Starting the engine*, p. 10 - 1.



• Wait until the lamps (**1**) and (**2**) light up.

If the lamp (**2**) does not light up or flash after about 20 seconds, there is a malfunction; ➠ p. 14 - 26.

• Press the button (**3**) – the engine starts.

If the hand-held control is connected, you cannot drive the power units from the crane cab.

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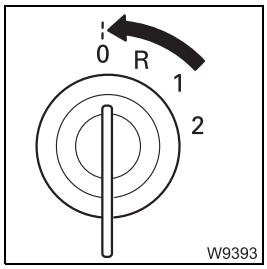
10.3 Switching off the engine

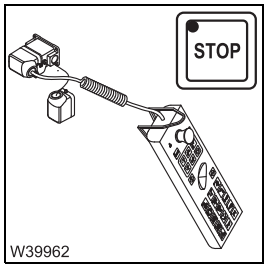
10.3.1 Normally with the ignition lock/with the hand-held control

Risk of accident by suspended loads!
Never switch off the engine while a load is suspended. You must have the control levers at hand in order to intervene at any time.
Always set down the load before you leave the crane cab.



If the hand-held control is not connected:

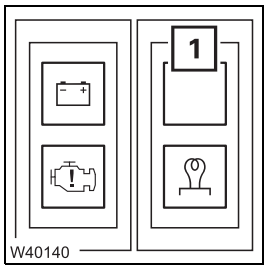
- Turn the ignition key to position **0** – the engine will stop.



If the hand-held control is connected:

- Press the button once – the engine will switch off.

In this case it is not possible to switch the engine off via the ignition lock.



Exhaust system run-down

After shutting down the engine – the lamp lights up:

- Do not switch off the battery master switch. The exhaust system runs down for approx. 1 minute.

  Run-down is finished when the lamp goes out – the battery master switch can be switched off.

After turning off

Observe the notes in the appropriate sections;
➠ *In case of short work breaks*, p. 11 - 129,
➠ *In case of work breaks longer than 8 hours*, p. 11 - 130.

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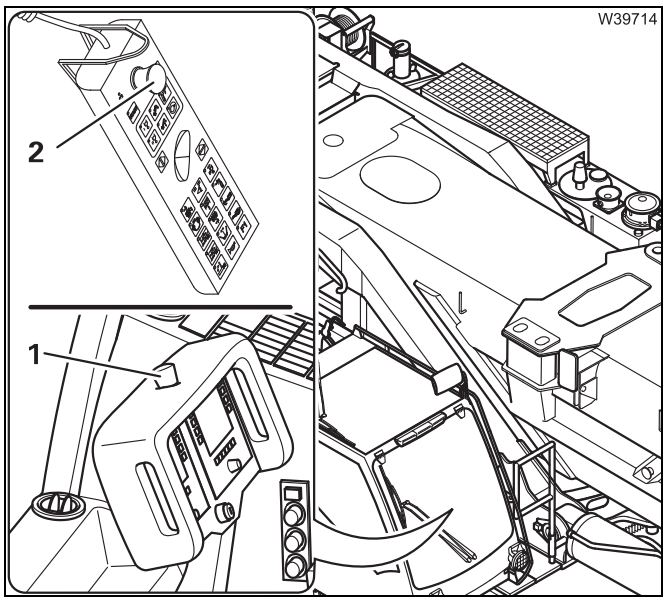
10.3.2 In emergencies, with the emergency stop switches

Risk of overloading if used improperly!
Use the emergency stop switches only in an emergency, i.e. if the crane functions no longer respond to the control levers.
Stopping crane movements suddenly may cause the truck crane to become overloaded under unfavourable conditions.



Two emergency stop switches are provided for an emergency:

1 In the crane cab

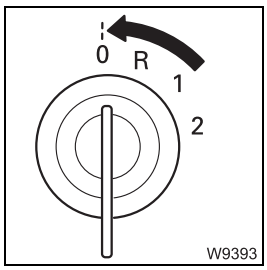
2 On the hand-held control

- Press one of the emergency switches (**1**) or (**2**).

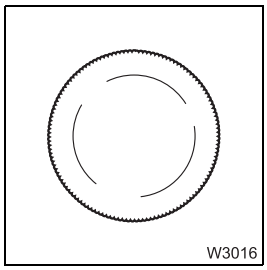
The switch engages and the engine stops.

Resetting the emergency stop switch

You can restart the engine only after you have reset the emergency stop switch.



- Turn off the ignition.



- Turn the actuated emergency-stop switch until it disengages.

If air intake inhibitors are fitted, they must be released;
➠ *Releasing the air intake inhibitor*, p. 10 - 23.

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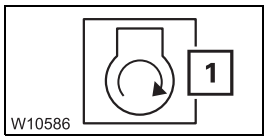
10.4 Air intake inhibitor

If the air intake inhibitor is triggered, a flap in the air intake line will close and the engine will stop running. The air intake inhibitor is triggered,

– if an emergency stop switch is actuated or



– when the maximum permissible engine speed is exceeded. In this case, the symbol (**1**) will turn **red** in the *Warning* submenu. The symbol stays red until the ignition has been switched off.

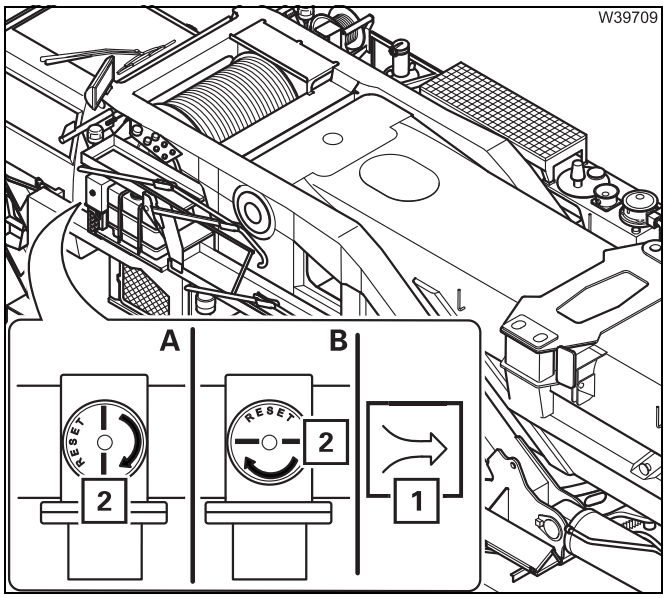
The engine can be restarted only after the air intake inhibitor has been released.

Releasing the air intake inhibitor

The following requirements must be met in order to release the air intake inhibitor:

– The ignition must be switched off.

– The emergency stop switch must be reset.



A marking (**2**) on the flap displays the current state.

(**A**) – If the flap is closed, the marking (**2**) is diagonal to the pipe. The lamp (**1**) lights up.

- Turn the flap in the direction of the arrow until it engages.

(**B**) – If the flap is open, the marking (**2**) is parallel to the pipe and the light (**1**) goes out.

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10.5 Torque reduction

Torque reduction can occur for various different reasons.

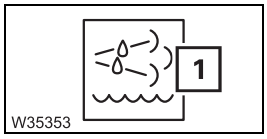
– The AdBlue tank is empty.

– A system malfunction has been detected.

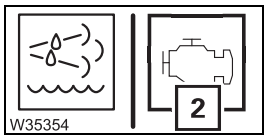
The torque reduction occurs automatically and can be overridden for a short period of time.

AdBlue tank level

- Check the AdBlue supply before and during crane operation and be sure to refill with AdBlue in time.



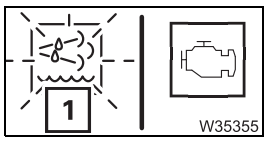
The lamp (**1**) lights up when the AdBlue tank reaches the reserve level.



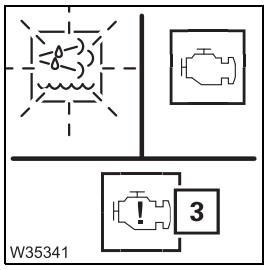
The yellow lamp (**2**) lights up if AdBlue usage continues.

The torque reduction is automatically switched to level 1 – reduction by 25%.

The torque reduction can be overridden for a short period of time during levels 1 and 2; ➠ p. 10 - 27.



The lamp (**1**) starts flashing if AdBlue usage continues.
The torque reduction is increased to level 2 – reduction by 50%.



After approx. 30 minutes the red lamp (**3**) also lights up – level 3 is active.
The torque reduction can no longer be overridden and a currently active override is switched off.
After 2 minutes the torque is slowly reduced further until the engine speed reaches the idling speed.

- Refill the AdBlue tank as soon as possible.

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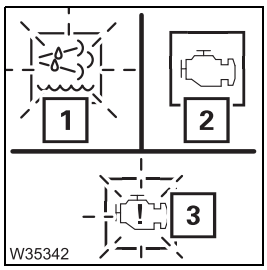
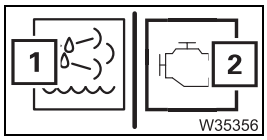


After refilling the AdBlue tank

- Start the engine – the lamp (**1**) goes out immediately.
- Actuate the accelerator or parking brake – the lamp (**3**) goes out immediately and the lamp (**2**) then goes out approx. 10 minutes later.

System malfunctions

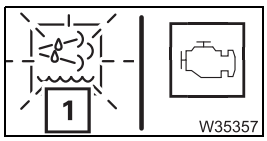
System malfunctions can be caused by poor-quality AdBlue, technical defects and electronic malfunctions.



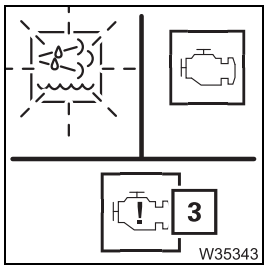
If the exhaust gas system detects a fault then the lamps (**1**) and (**2**) light up.

If operation continues, the torque reduction is switched to level 1 – reduction by 25%.

The torque reduction can be overridden for a short period of time during levels 1 and 2; ➠ p. 10 - 27.

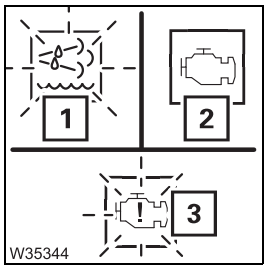


After approx. 75 minutes of further operation the lamp (**1**) starts to flash. The torque reduction is increased to level 2 – reduction by 50%.



After approx. 15 minutes of further operation the red lamp (**3**) also lights up – level 3 is active. The torque reduction can no longer be overridden and a currently active override is switched off.
After 2 minutes the torque is slowly reduced further until the engine speed reaches the idling speed.

- Stop at the next opportunity.
- Read out the error messages; ➠ p. 7 - 34.
- Have the fault corrected.



When the fault has been corrected

- Start the engine – the lamp (**1**) goes out immediately.
- Actuate the accelerator or parking brake – the lamp (**3**) goes out immediately and the lamp (**2**) then goes out approx. 10 minutes later.

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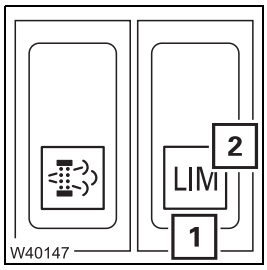
10.5.1 Overriding torque reduction

You can override the torque reduction for a limited time during operation so that the full motor output is available (e.g. for setting down the load).



- Push the button (**1**) down once.

The lamp (**2**) lights up – the torque reduction is overridden.

After 30 minutes the (**2**) light goes out – the torque is automatically reduced again.

You can override the reduction three times, after this the button (**1**) will become inactive until the engine is restarted.

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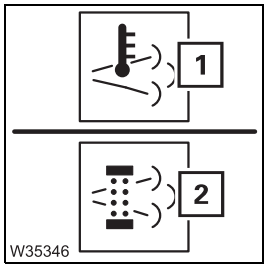
10.6 Cleaning the exhaust system

Risk of burns during the cleaning procedure!
The exhaust system can heat to over 600 °C (1,110 °F) during automatic and manual cleaning.
Keep away from the exhaust system and ensure that no persons on the carrier are in the region of the exhaust system or exhaust pipe. This will prevent severe burns.

Risk of fire!
Ensure that no inflammable materials or liquids are in the vicinity of the exhaust system or exhaust pipe before performing a cleaning procedure. Also observe all information in the enclosed engine manufacturer's operating instructions.

Automatic cleaning

The exhaust system cleaning procedure usually runs automatically, unless it has been manually disabled; ➠ *Disabling cleaning*, p. 10 - 30.



The lamp (**1**) lights up during automatic cleaning.

The lamp (**2**) lights up if automatic cleaning is not performed in time. In this case you can drive with an increased load for approx. 20 minutes. Perform a manual cleaning if this is not possible or the light does not go out afterwards.

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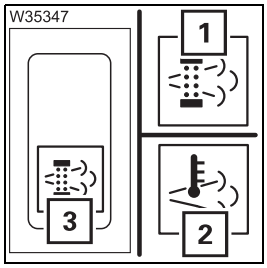
Manual cleaning

Manual cleaning is only performed when all prerequisites specified here have been fulfilled.

– The engine runs at idling speed – the idling speed must not be exceeded by more than 50 rpm during the cleaning procedure.
– The accelerator pedal is not actuated.
– The service brake is not actuated.
– The parking brake is engaged.

• Ensure that all prerequisites remain satisfied during the entire cleaning procedure.



• Push the button (**3**) down once.

The cleaning procedure begins.
– The lamp (**1**) lights up.
– The lamp (**2**) flashes.

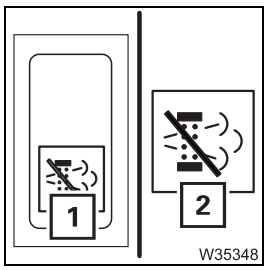
The lamp (**2**) goes out when the cleaning procedure has finished.
The lamp (**1**) goes out once the exhaust system has cooled to the operating temperature.

If the idling speed is exceeded by more than 50 rpm then the manual cleaning procedure is interrupted and automatic cleaning can start, depending on the degree of soiling.

Disabling cleaning

Automatic cleaning cannot be performed and manual cleaning cannot be started when cleaning is disabled. This function is for sites where an exhaust temperature greater than 600 °C (1,110 °F) presents a danger.

In normal operation, automatic cleaning is performed without interrupting operation and is the best solution for the exhaust system. Therefore, only disable cleaning when the site makes this necessary. Take care to ensure that cleaning is enabled again when the truck crane is outside the danger area.



Disabling cleaning

• Press the button (**1**) in at the bottom – the lamp (**2**) lights up.

Enabling cleaning

• Press the button (**1**) in at the top – the lamp (**2**) goes out.

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11 Crane operation

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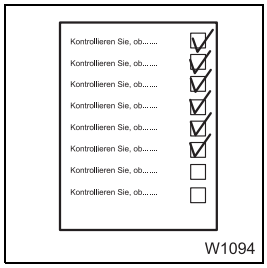
11 Crane operation

11.1 Before operating the crane

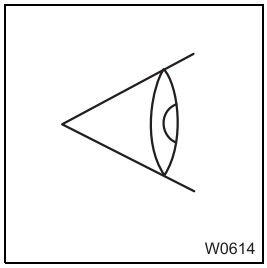
11.1.1 CHECKLIST: Checks before operating the crane

This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions there.

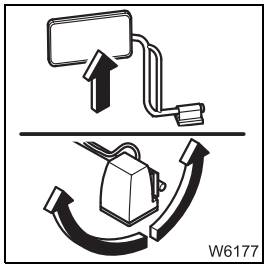
This checklist only applies to working with a rigged truck crane (supported and rigged with counterweight). If the truck crane is not yet rigged;
➠ *CHECKLIST: Rigging*, p. 12 - 1.



1. The truck crane has been rigged for the operation to be carried out as described in the *CHECKLIST: Rigging*; ➠ p. 12 - 1.



2. Inspect the truck crane, looking out in particular for any leaking fluids (oil, fuel or water).



3. – Adjust the mirrors for crane operation; ➠ p. 12 - 25.
– Adjust the slewable spotlights if necessary; ➠ p. 11 - 108.

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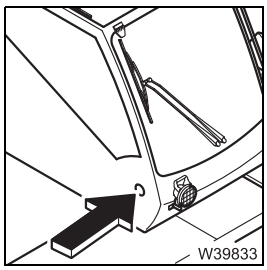
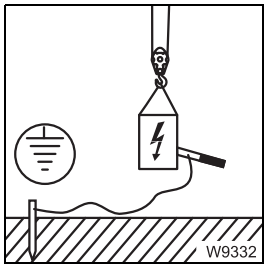
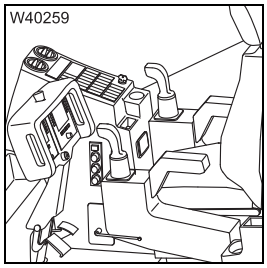


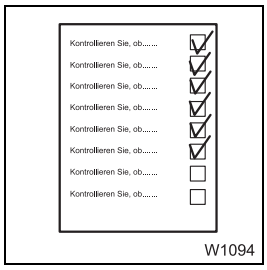
4. Windscreen washing system – check the filling level;
➠ *Maintenance manual*.



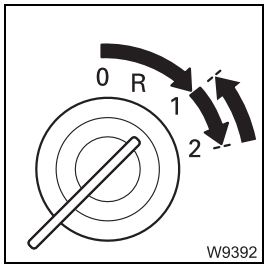
5. Earth the load, if necessary; ➠ p. 11 - 11.



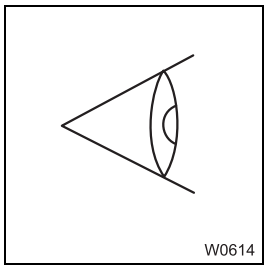
6. Adjust crane cab seat and front panel;
➠ *Front control panel*, p. 11 - 7,
➠ *Front control panel*, p. 11 - 7.



7. All activities and inspections required to start the crane engine have been performed; ➠ *CHECKLIST: Starting the engine*, p. 10 - 1.



8. Start the engine; ➠ p. 10 - 13.



9. Check
– RCL,
– lifting limit switch,
– seat contact switch and dead man's switch,
– emergency stop switch,
for correct operation. Have faulty units repaired; ➠ p. 11 - 8.

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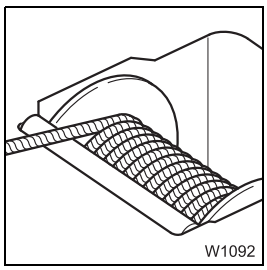
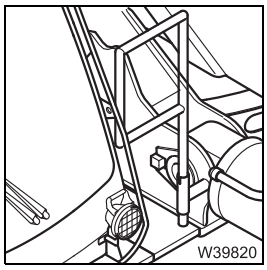
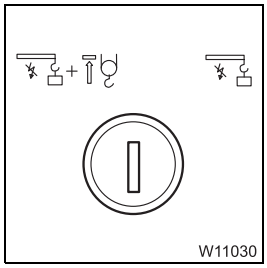


10. Check the position of the hoist ropes; ➠ p. 11 - 6.

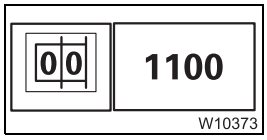


11. The railing on the step plate beside the crane cab is closed; ➠ *Fixed ladders, tread grid, ladder, railings*, p. 12 - 22.



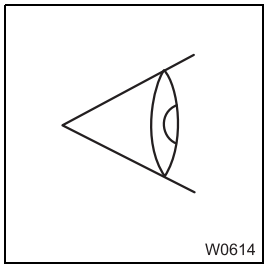
12. Remove key from the key-operated *Override* switch; ➠ p. 11 - 39.

13. Perform lamp test on the RCL; ➠ p. 11 - 20.



14. Compare current rigging mode to display on RCL – enter current rigging mode, if necessary; ➠ p. 11 - 23.

15. Compare current reeving of hoist used against the display on the RCL – enter current reeving, if necessary; ➠ p. 11 - 28.



16. Check telescoping; ➠ *Checks before starting work*, p. 11 - 74.

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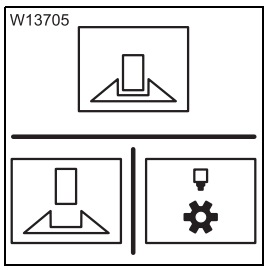
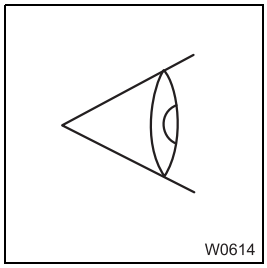
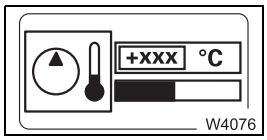


17. – For the working positions 0° or 180° the turntable is locked;
➠ *Locking the superstructure*, p. 11 - 14.

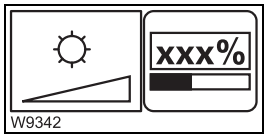
– For other working positions the turntable is unlocked and the house lock is switched off;
➠ *Locking/unlocking the superstructure*, p. 11 - 13,
➠ *Switching off the houselock*, p. 11 - 17.



18. Check the electrical system for correct operation; ➠ p. 11 - 6.



19. Check temperature of the hydraulic oil – preheat hydraulic oil, if necessary; ➠ *Preheating the hydraulic oil*, p. 11 - 12.



20. Adjust the brightness on the *ECOS* and *RCL* displays as required;
➠ p. 10 - 12.

Additional information on inspections during crane operation, on permissible working positions and on how to operate the individual power units;
➠ *Crane operation with main boom*, p. 11 - 51.

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11.1.2 Check the condition of the truck crane

Visual inspection Walk around the truck crane and look out in particular for leaking oil, fuel or coolant.

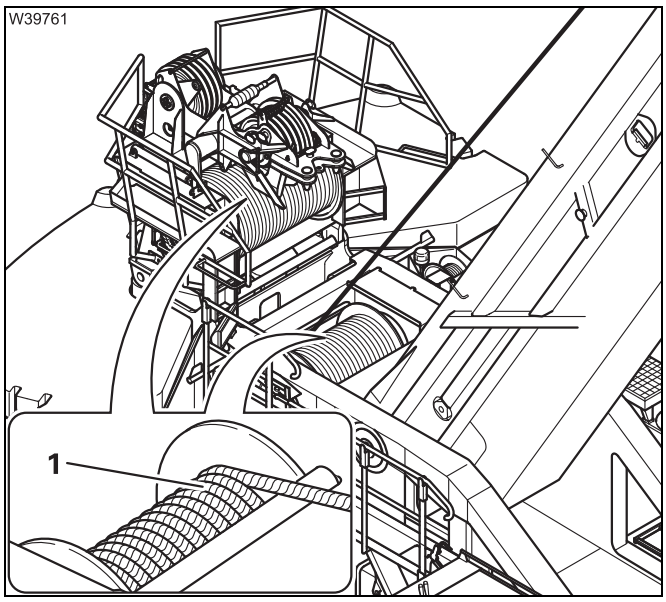
Danger if the crane cannot be unrigged!
In the event of loss of oil, you may no longer be able to perform crane movements (even in emergency operation).

Risk of environmental damage due to leaking consumables!
Immediately repair or have repaired oil, fuel and coolant leakages. This prevents oil or fuel seeping into the ground or polluting waters.

Checking the position of the hoist ropes

The hoist mirrors must be folded out; ➠ p. 12 - 25.

Risk of crushing due to turning rope drum!
Keep away from the rope drum while it is turning.
This will prevent your limbs being drawn in or crushed.



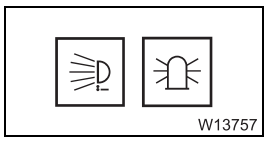
Check the position of the hoist ropes (**1**) for at least one full turn of the rope drum.

- Slowly carry out the *Lowering* movement and check the rope:
  - The hoist rope must be evenly wound.
  - The rope turns on the drum must be evenly spaced, 0 to 2 mm (0 to 0.08 in) apart.
  - The cross-over points[1)] must be at an angle of about 180°.

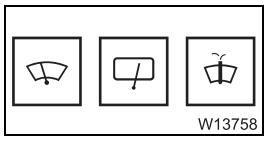
[1)] The top rope lines are laid over the next lower rope lines at the cross-over points.

Checking the electrical system

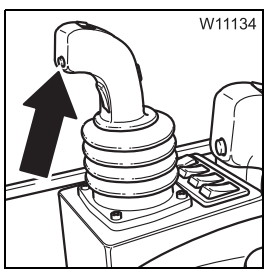
- Check the following functions and have faulty parts repaired.



  - Working area spotlight, air traffic control light,



  - Windscreen wipers, windscreen washing system,



  - Horn.

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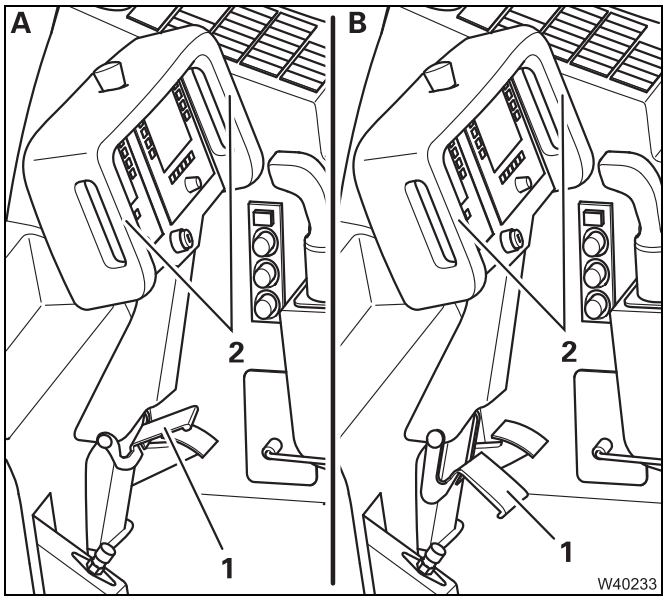
11.1.3 Adjusting the front control panel and crane cab seat

Front control panel

You can adjust the height of the front control panel.

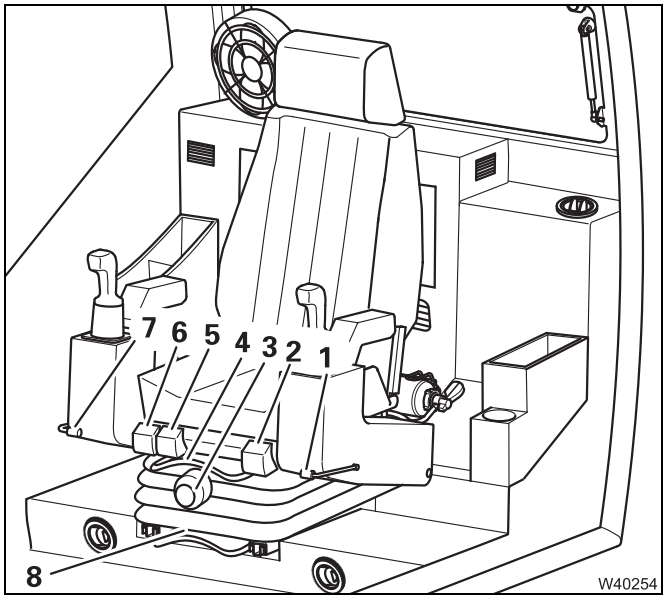


- (**A**) – Hold the front control panel by the handle (**2**).
- Fold the pedal (**1**) upwards.
- (**B**) – Adjust the front panel to the desired height and inclination.
- Fold the pedal (**1**) downwards. The front panel is locked.

Risk of damage to the front control panel!
Do not use the handle on the front control panel as an aid for entering or climbing the crane. This prevents damage to the front control panel bracket. Use the handle on the crane cab for entering or climbing the crane.

Adjusting the crane cab seat

You can adjust the crane cab seat to suit your height and weight.



1 Control panel left – height
2 Back rest – inclination
3 Body weight in kg
4 Seat – length adjustment, Without control panels
5 Seat front – inclination
6 Seat rear – inclination
7 Control panel right – height
8 Seat – length adjustment, With control panels

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11.1.4 Checking the safety equipment

Risk of accidents when working with faulty safety devices!
It is prohibited to operate the crane with safety devices that are faulty, overridden or out of service!
Have faulty safety devices repaired immediately by **Manitowoc Crane Care**.

Rated capacity limiter

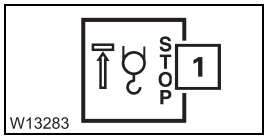
- Switch on the rated capacity limiter, perform all checks and enter the current rigging mode; ➠ *Switching on the RCL*, p. 11 - 20.

The RCL is working correctly at this point in time if no error message is pending and if crane movements have been enabled.

If the RCL is not working correctly, do not start work with the crane but notify **Manitowoc Crane Care**.

Lifting limit switch

- Raise the main boom until the hook block is lifted off the ground.
- Slowly perform the *Raise* movement until the hook block lifts the lifting limit switch weight.



- Now check that the *Raise* movement is switched off and lamp (**1**) lights up.
- Check that the *Lower* and *Extend* movements are also switched off.

The lifting limit switch is working correctly at this point in time if the lamp (**1**) lights up and the *Raise*, *Lower* and *Extend* movements are switched off.

If the lift limit switch is not working correctly, do not start work with the crane but notify **Manitowoc Crane Care**.

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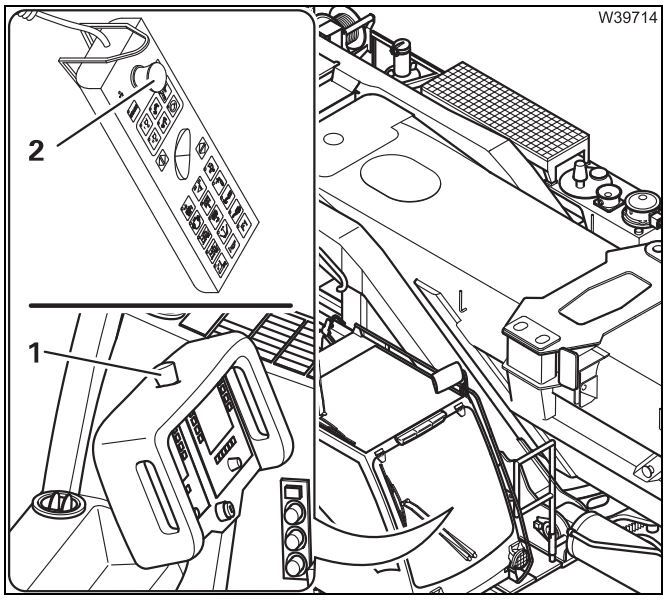
Emergency stop switch

- Set down the load and let go of both control levers.



- Press the emergency stop switch (**1**) so that it engages.
- Check whether the engine stops.
- Turn the emergency stop switch until it disengages again.
- Release the air intake inhibitor if required; ➠ *Air intake inhibitor*, p. 4 - 20.
- Repeat the check with the emergency stop switch (**2**) on the hand-held control.

If the emergency off switch is not working correctly, do not start work with the crane but notify **Manitowoc Crane Care**.

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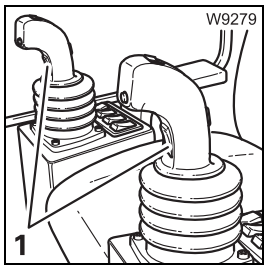
Seat contact switch and dead man's switch

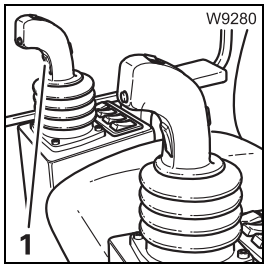
Danger of accident if the seat contact switch is faulty!
Always stand inside the crane cab when you do this check.
If you stand next to the crane cab, you may be pushed off the carrier if the superstructure slews as a result of a faulty dead man's switch.

Checks during standstill



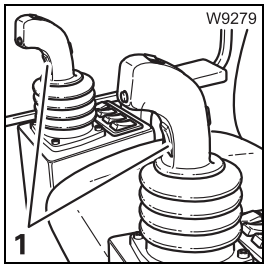
- Do not sit down on the crane cab seat.
- Do not press any dead man's switch (**1**).
- Move the control levers one after the other for all the crane movements and check whether all the crane movements are switched off.

Checks during operation



– Dead man's switch

- Do not sit down on the crane cab seat.
- Press the right dead man's switch (**1**) and slowly lift the hook block.
- With the control lever actuated, let go of the right dead man's switch and check whether the crane movement comes to a standstill within about 3 seconds.
- Repeat the check with the dead man's switch on the left control lever.



– Seat contact switch

- Do not press any dead man's switch (**1**).
- Sit down on the crane cab seat and slowly lift the hook block.
- With the control lever actuated, stand up and check whether the crane movement comes to a standstill within about 3 seconds.

If the dead man's switch system is not working correctly, do not start work with the crane but notify **Manitowoc Crane Care**.

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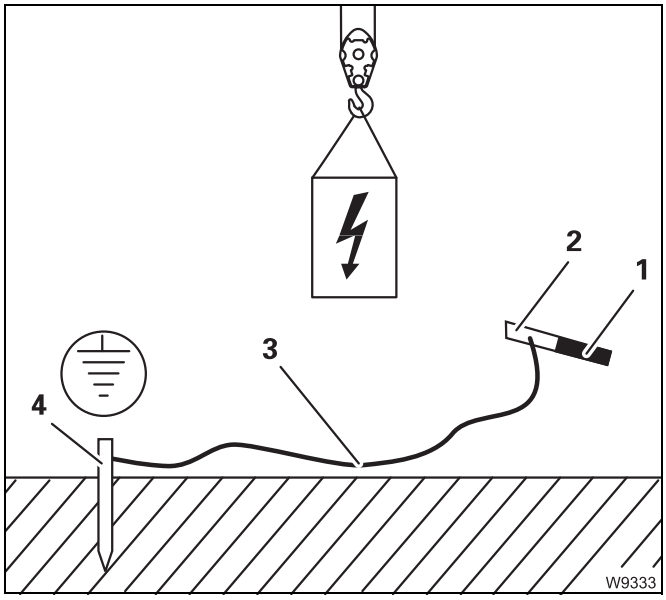
11.1.5 Earthing the load

Event when the truck crane is already earthed (➠ p. 12 - 14), the load can still become electrostatically charged, e.g. if you use a hook block with synthetic sheaves or non-conducting sling gear.

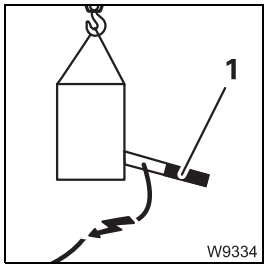
Risk of accident due to electric shock!
Always earth the load before operating the crane
– Near strong transmitters (radio transmitters, radio stations, etc.)
– Near high-frequency switchgear
– If a thunder storm is forecast
If the load is charged with static electricity, you must always earth the load before touching it.



Use electrically conducting material for earthing.

- Hammer a metal rod (**4**) (length of about 2.0 m (6.6 ft)) at least 1.5 m (5 ft) into the ground.
- For better conductivity, dampen the soil around the metal rod (**4**).
- Clamp an insulated cable (**3**) to the metal rod (**4**) (cross-section of at least 16 mm^2 (0.025 in^2)).
- Clamp the other end of the cable (**3**) to a metal rod (**2**) with an insulated handle (**1**).

Risk of accident due to electric shock!
Ensure that the connections between the cable and the metal rods are electrically conductive. When earthing, hold the metal rod only by the insulated handle and keep a sufficient distance to the metal rod in the ground.



- Hold the metal rod firmly by its insulated handle (**1**).
- To earth, touch the load with the metal rod.

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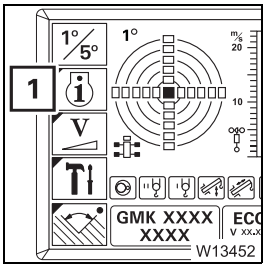
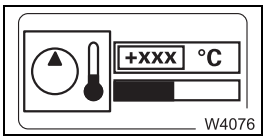
11.1.6 Preheating the hydraulic oil

The hydraulic oil must be preheated before beginning crane work if the truck crane is operated at a temperature below 0 °C (32 °F).

The following work is done with a running crane motor;
➠ *CHECKLIST: Starting the engine*, p. 10 - 1.



- If necessary, open the main menu Esc and press the button (**1**) once. This opens the *Monitoring* submenu.



The current hydraulic oil temperature is displayed.

At an oil temperature of between -15 °C and 0 °C (5 °F and 32 °F):

You can operate the crane without loads at an average engine speed and average operating speed in normal operation mode.

- Only increase the engine speed and the operating speed when the oil temperature is at least 10 °C (50 °F).

For oil temperatures below -15 °C (5 °F):

- In the *Power unit speed* submenu, set a maximum speed of 30% for the derricking gear; ➠ *Limiting the power unit speeds*, p. 11 - 104.
- Have the crane engine run at average speed and raise the main boom to the steepest position.
- Move the *Raise* crane function towards the end position until the oil temperature display shows an oil temperature of at least 10 °C (50 °F).

  Preheating can take up to 20 minutes depending on the starting temperature.
- Operate all crane functions at least twice after heating the oil in order to remove the cold oil from all parts of the hydraulic system.

It may take some time for the solenoid valves to be switched or the power units may be started abruptly if the oil is cold.

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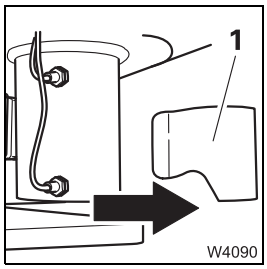
11.1.7 Locking/unlocking the superstructure

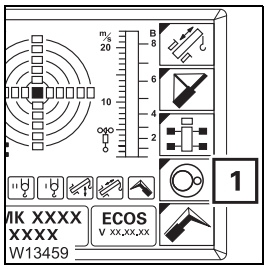
To lock, a pin can extend on the turntable and engage in two locking points on the carrier.



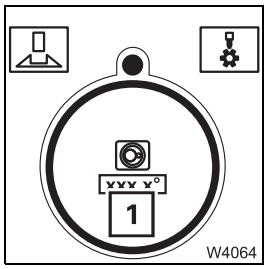
After driving with a dolly, check whether the cover (**1**) has been removed. Remove the cover if it has not already been removed.

Locking points

The locking points are at 0° and at 180 °C.



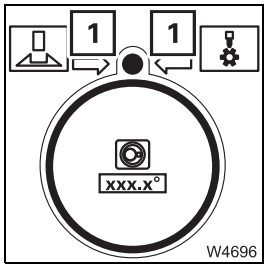
- If necessary, open the main menu Esc and press the button (**1**) once. The *Superstructure lock* submenu will open.



The display (**1**) shows the current superstructure position.

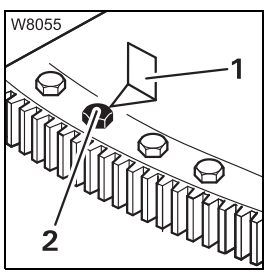
- Slew to locking point at **0°** or **180°**.

The display (**1**) shows positive and negative values. For an overview; ➠ p. 11 - 99.



At the locking point, both arrows (**1**) are shown.

In the range of ± 20° around the locking point, an arrow indicates the slewing direction that leads to the locking point.



Outside the crane cab, the arrow (**1**) points to the marked bolt (**2**) at the locking point.

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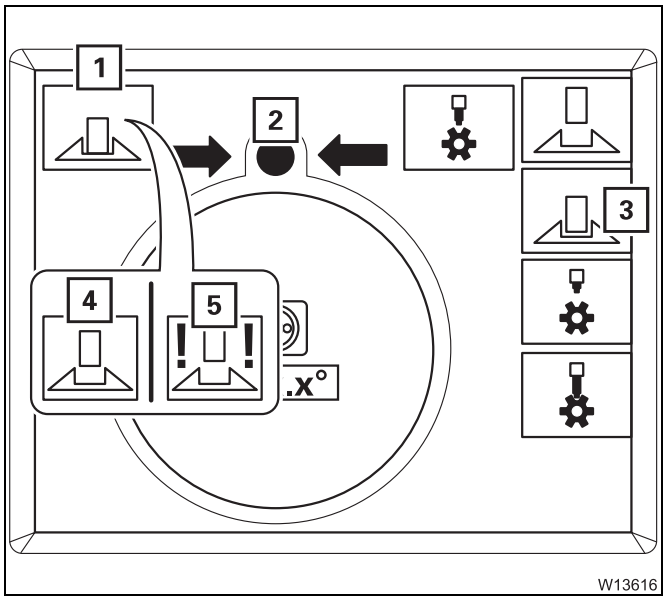
Locking the superstructure

The superstructure needs to be at one of the locking points (0° or 180°).



- Press button (**3**) until symbol (**1**) turns **green**.

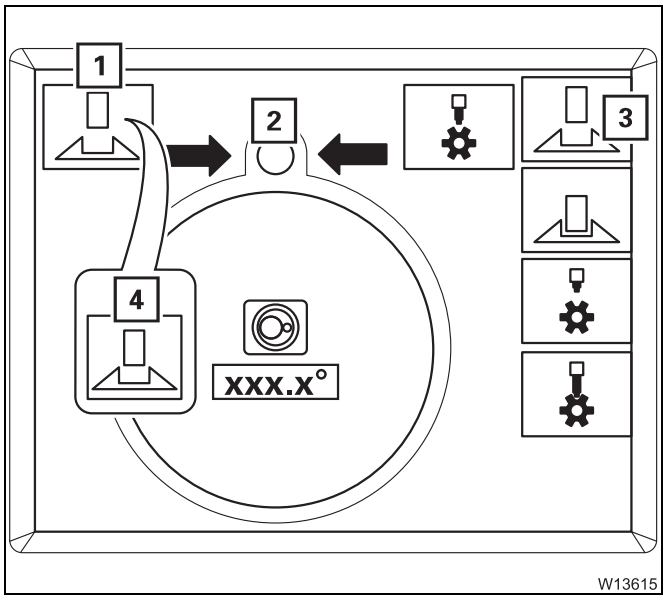
The display will first show symbol (**4**) in **yellow** and when the turntable is locked, it will show symbol (**1**) in **green**.

The locking pin bolt (**2**) always has the same colour as the displayed symbol (**1**).

If the error symbol (**5**) is displayed, contact **Manitowoc Crane Care**; ➠ p. 14 - 27.

Unlocking the superstructure

The RCL shutdown procedure will be triggered and slewing disabled if you unlock the superstructure when an RCL code for 0° to the rear has been entered. To acknowledge the shutdown procedure, you must either lock the superstructure or set down the load and enter an RCL code for a working range of 360°.



- Press button (**3**) until symbol (**1**) turns **red**.

The display will first show symbol (**4**) in **yellow** and when the turntable is unlocked, it will show symbol (**1**) in **red**.

The locking pin bolt (**2**) always has the same colour as the displayed symbol (**1**).

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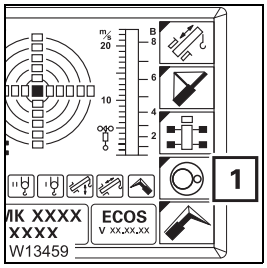
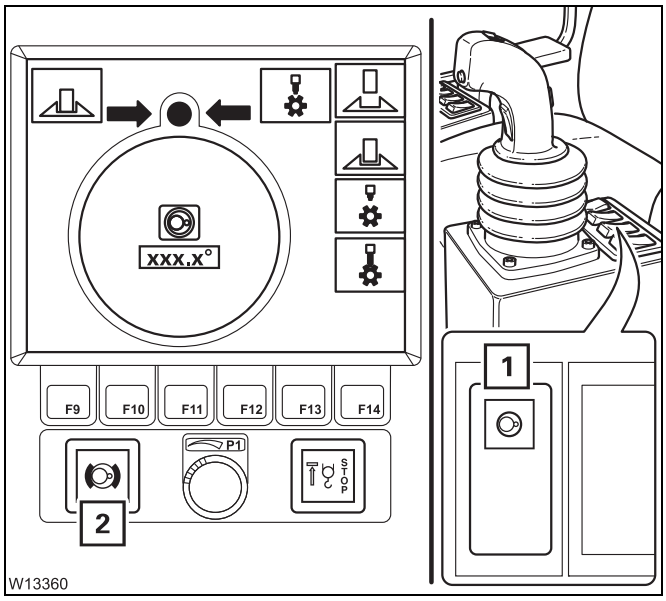
11.1.8 Switching the houselock on/off

If the truck crane is equipped with a houselock, the turntable can be locked in the entire slewing range. For locking, a pin extends and blocks the slewing gear.

Switching on the houselock

- Slew the superstructure to the position in which it is to be locked and then stop the slewing movement.
- If necessary, open the main menu Esc and press the button (**1**) once. The *Superstructure lock* submenu will open.





Switching off the slewing gear

The slewing gear must be switched off when operating the houselock.

- Press the button (**1**) once.

The slewing gear will be switched off and the slewing gear brake applied.

– Symbol (**3**) is **red**.

– The lamp (**2**) lights up.

Risk of damage during slewing!
Always switch off the slewing gear before you operate the houselock. The system will be damaged if the superstructure is slewed during the locking procedure.

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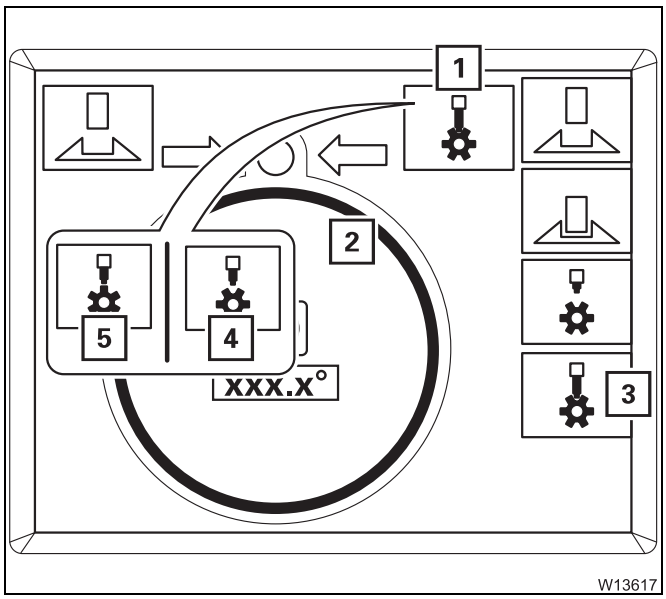


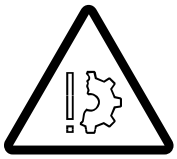
- Press the button (**3**) until the symbols (**1**) and (**2**) turn **green**.

The display first shows the symbols (**4**) and (**2**) in **yellow** and, when the house lock is switched on, the symbols (**1**) and (**2**) in **green**.

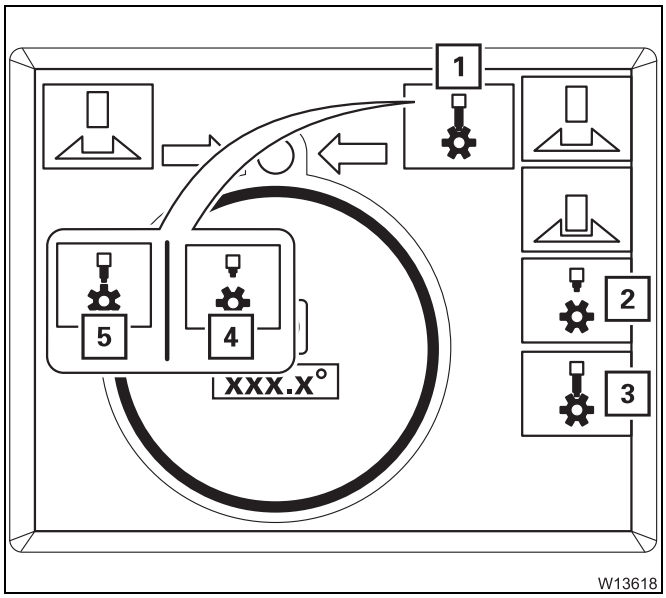
When the symbols (**5**) and (**2**) are **red/green**:

- Release the button (**3**).

  The lock is blocked and you need to correct the position of the superstructure as follows.



Risk of damage due to slewing with blocked lock!
Before slewing, make sure the symbol is displayed in **red** (houselock off). Otherwise the system will be damaged during slewing.



- Switch the houselock off – press the button (**2**) until the symbols (**4**) and (**2**) turn **red**.
- Apply the slewing gear brake.
- Switch on the slewing gear and slew the superstructure a little further (minimally).
- Switch off the slewing gear.
- Press the button (**3**) until the symbols (**1**) and (**2**) turn **green**.

If symbol (**5**) is still shown, you must again correct the position of the superstructure.

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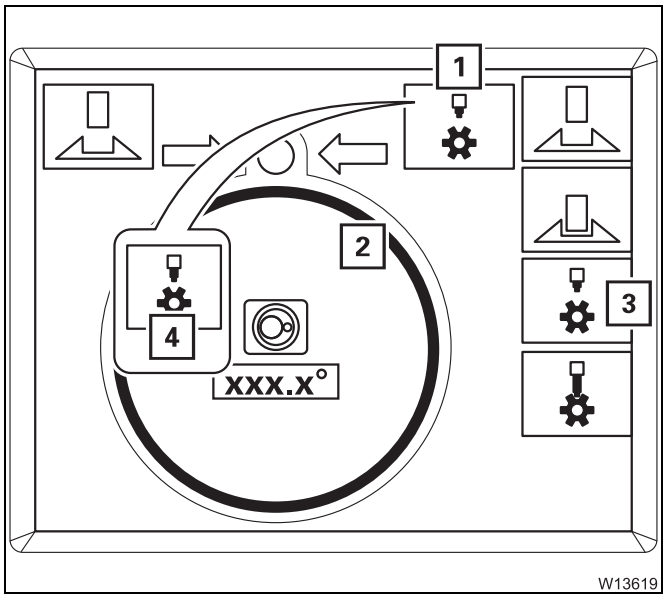
Switching off the houselock

The slewing gear must be turned off; ➠ *Switching off the slewing gear*, p. 11 - 100.

Risk of damage during slewing!
Always switch off the slewing gear before you operate the houselock. The system will be damaged if the superstructure is slewed during the locking procedure.



- Press the button (**3**) until the symbols (**1**) and (**2**) turn **red**.

The display first shows the symbols (**4**) and (**2**) in **yellow** and, when the house lock is switched off, the symbols (**1**) and (**2**) in **red**.

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11.2 Operation of the rated capacity limiter

The rated capacity limiter is abbreviated to RCL (**R**ated-**C**apacity-**L**imiter) in these operating instructions.

If the truck crane's current rigging mode is registered properly, the RCL will prevent the permissible lifting capacity being exceeded and the truck crane being overloaded.

Risk of accidents due to an incorrectly set RCL!
Ensure that the current rigging mode is correctly entered Before starting crane operation. An incorrect entry will give you a false sense of security. This will overload the truck crane and cause an accident!

The current rigging mode is based on measured values and manually entered values.

Registered based on measured values	Registered based on manually entered values
– Main boom length	– Outrigger span
– Main boom angle	– Counterweight
– Current load	– Reeving
– Outrigger span[1)]	– Outrigger span[2)]

[1)] For versions with outrigger span monitoring

[2)] For versions without outrigger span monitoring

During the operation of the crane, a visual and acoustic early warning is issued before the load limit is reached and then the functions are shut down that would lead into the overload range.

Risk of accidents due to overridden or faulty RCL!
The RCL must never be overridden.
It is prohibited to work if the RCL is switched off, overridden, out of service or faulty!

Danger of overturning in two-hook operation!
The rated capacity limiter only ensures safety for single hook operation! Two-hook operation is not permitted.

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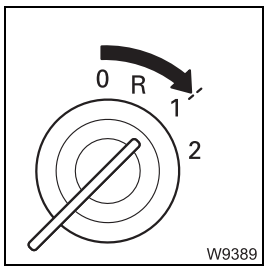
11.2.1 Switching on the RCL

The RCL will not be switched off if you turn the ignition key to position **R** instead of position **0** to restart the engine. This means that the test program will not run and you will not have to acknowledge the settings again.

Switching on

The RCL is switched on together with the ignition.

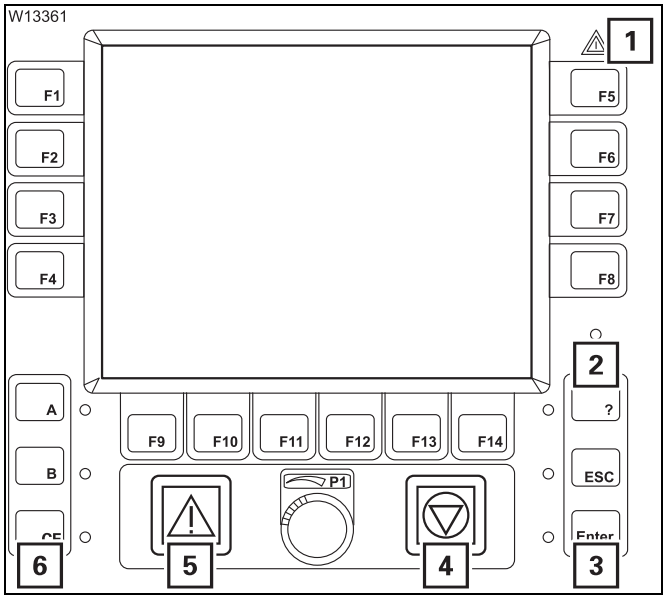


- Switch on the ignition.

A test program runs after switching on the ignition. A continuous buzzer tone sounds for approx. 2 seconds and a lamp test is performed.

- Check whether you can hear a buzzer tone.

Risk of accidents in the event of faulty safety devices!
If the lamps or buzzer fail, notify **Manitowoc Crane Care** and have the error corrected.
In the meantime, pay particular attention to the lamps in the event of a failure of the buzzer tone and vice versa.



Lamp test

- Check that the lamps (**1**) to (**6**) go on briefly after turning on the ignition.

If the specified time is insufficient, switch on the ignition again.

If one or more lamps do not light up, contact **Manitowoc Crane Care**.

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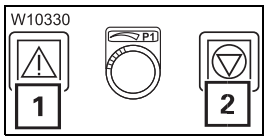
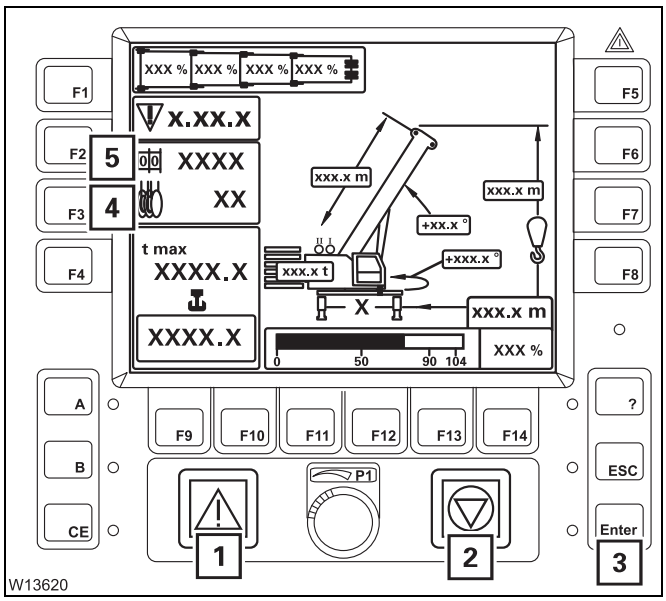


After completing the test program:
– the lamps (**1**) and (**2**) light up,
– all power units are disabled.

The current display depends on whether the RCL either:
– was switched off for up to 48 hours, or
– was switched off for more than 48 hours.



After a standstill of up to 48 hours

The *Monitoring* submenu opens.

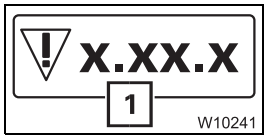
The last set rigging mode will be displayed, and symbols (**4**) and (**5**) will be green and flash.

You can accept the displayed values if they correspond to the current rigging mode:

- Press button (**3**) once – symbols (**4**) and (**5**) will stop flashing.

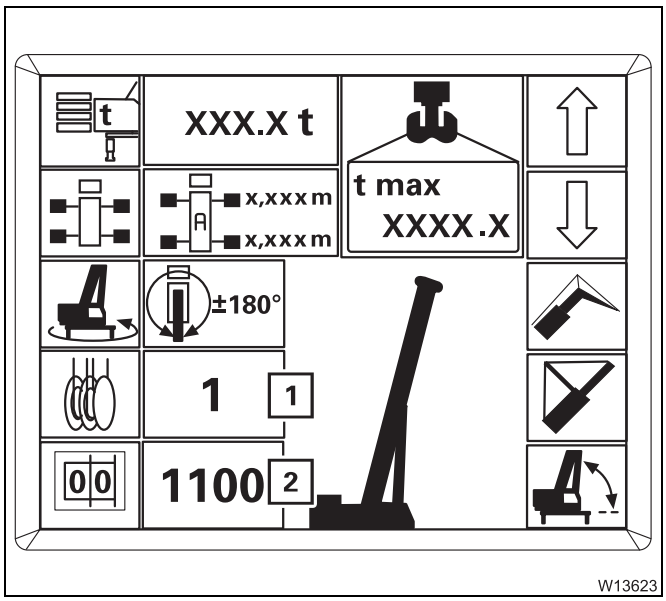
Lamps (**1**) and (**2**) will go out. The RCL code has been applied.

If no error message is displayed, the RCL is set for crane operation and crane movements are enabled; ➠ *Checks before operating the crane*, p. 11 - 30.



Any pending errors are indicated on the display (**1**); ➠ *Display in the event of errors*, p. 11 - 38.

You must re-enter the current rigging mode if the displayed values do not correspond to the current rigging mode of the truck crane; ➠ *Entering rigging mode*, p. 11 - 23.



After a standstill of more than 48 hours

The *Enter rigging mode* submenu opens.

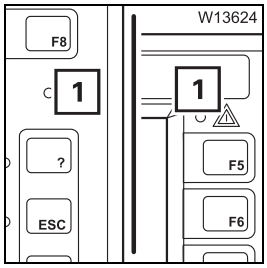
Display (**2**) will show RCL code **1100** – the corresponding rigging mode will be displayed.

The display (**1**) shows the last reeving entered, e.g. **1**.

- Enter the current rigging mode;
  ➠ p. 11 - 23.

Brightness of the displays

The brightness of the *RCL* display will adjust automatically to the ambient lighting after turning on the ignition.



Do not cover sensor (**1**) and keep it clean to avoid contamination that can affect the brightness adjustment.

You can also adjust the brightness manually; ➠ *Adjusting display brightness*, p. 10 - 12.

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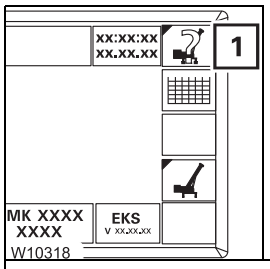
11.2.2 Entering rigging mode

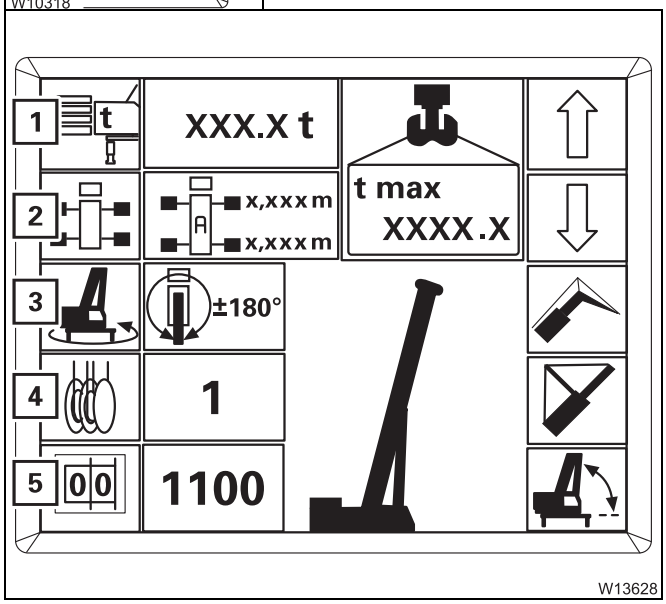
For a complete rigging mode input, you must enter, confirm and accept the rigging mode and the reeving.



Opening the submenu

- If necessary, open the main menu Esc and press the button (**1**) once.

The Esc button is only active if all crane movements have been stopped.



The *Enter rigging mode* submenu opens.

There are two ways of entering the current rigging mode.

– **Either** enter the individual components (**1**) to (**4**) one after the other,

– **Or** enter the RCL code (**5**) and the reeving (**4**).

Then you must confirm and accept the newly entered rigging mode.

The following section describes the input procedure based on the individual components. If you want to enter the rigging mode based on the RCL code; ➠ *Entering the RCL code*, p. 11 - 27.

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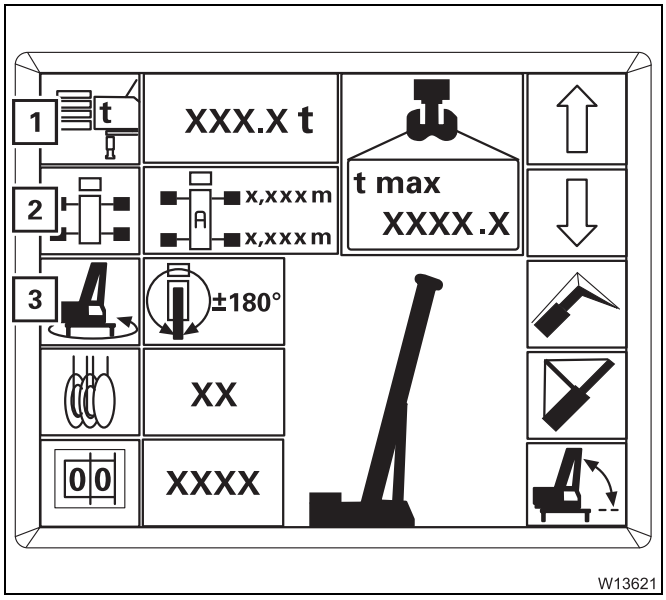
Entering individual components

With this type of input, select all the components of the rigging mode one after the other.

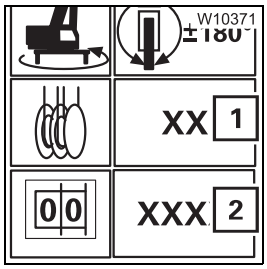
Danger of overturning due to incorrectly set rigging mode!
Values which have already been set may change when entering individual components. For this reason, you should always compare the displayed rigging mode with the current rigging mode of the truck crane after making the entry. This prevents the RCL calculating with incorrectly set components and the truck crane becoming overloaded or overturning.



When re-entering the entire rigging mode, by making the entries in the following order you can prevent entered components being changed:

– Counterweight (**1**)
– Outrigger span (**2**)
– Slewing range (**3**)

In this order, the values that can be selected for the current entry are always restricted by the previous entry. As a result, already entered values do not change.



When entering the components, the corresponding RCL code (**2**) is displayed at the same time.

Then you must enter the current reeving (**1**) and accept the indicated rigging mode.

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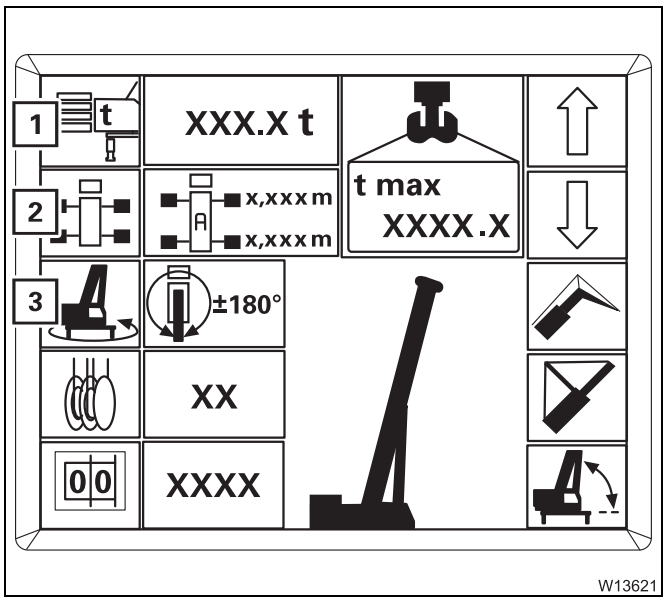
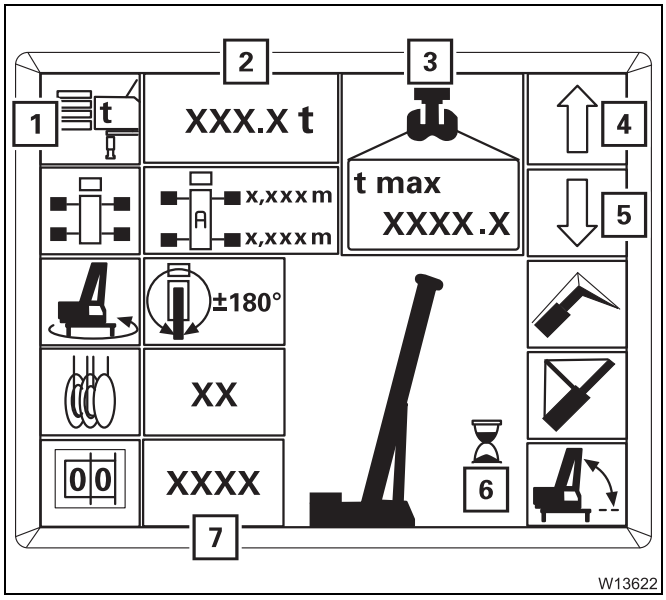


Switching on input mode

- Press one of buttons (**1**) to (**4**) for the desired component.

  The symbol turns **green** – input mode is switched on.



Selecting values
With the input mode switched on, you can select values that are permissible according to the *Lifting capacity table*.

The procedure for selecting is described based on the example of the counterweight – symbol (**1**) green.

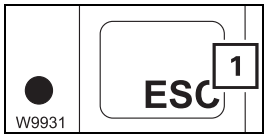
- Press button (**4**) or (**5**) repeatedly until display (**2**) shows the rigged counterweight version.

  4 Larger combinations

  5 Smaller combinations

The display (**7**) shows the corresponding RCL code – the symbol (**6**) is shown while the RCL code is being determined.

The display (**3**) indicates the maximum load for the displayed rigging mode and the displayed reeving.



You can **Cancel** the input at any time. Press the button (**1**).
The main menu opens.

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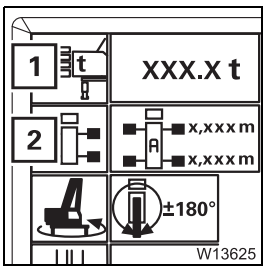
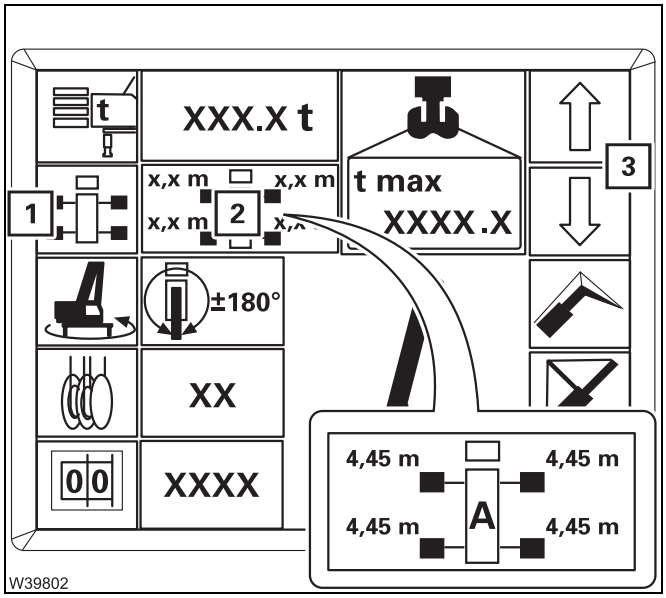


After the selection procedure, there are three options:

– Switching off the input mode
  • Press button (**1**) once – symbol is grey.
– Switching over the input mode
  • Press the button for the next component once, e.g. button (**2**) – symbol is green.
– Accept the displayed rigging mode; ➠ *Accepting the rigging mode*, p. 11 - 29.

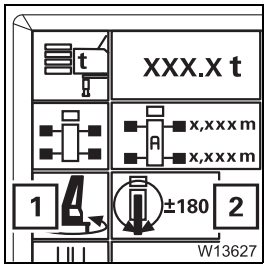
Enter the other components of the current rigging mode in the same way.



– Outrigger span – without outrigger span monitoring

Symbol (**1**) is green. Press the buttons (**3**) repeatedly until the display (**2**) indicates the current outrigger span, e.g. outrigger span **A**.

The display indicates half the outrigger span each on the left and right, e.g. 4.45 m. (14.6 ft) for an outrigger span of 8.90 m. (29.2 ft) in the case of outrigger span **A**.



– Slewing range

Symbol (**1**) is green. Press buttons ⇧ ⇩ repeatedly until the display (**2**) indicates the required slewing range, e.g. 360°.

You can only confirm rigging modes for slewing ranges other than 360°:
– if the turntable is locked in the *0°/180°* working position.
– if the superstructure is in the entered slewing range. If necessary, first enter the 360° slewing range and slew the superstructure into the required position.

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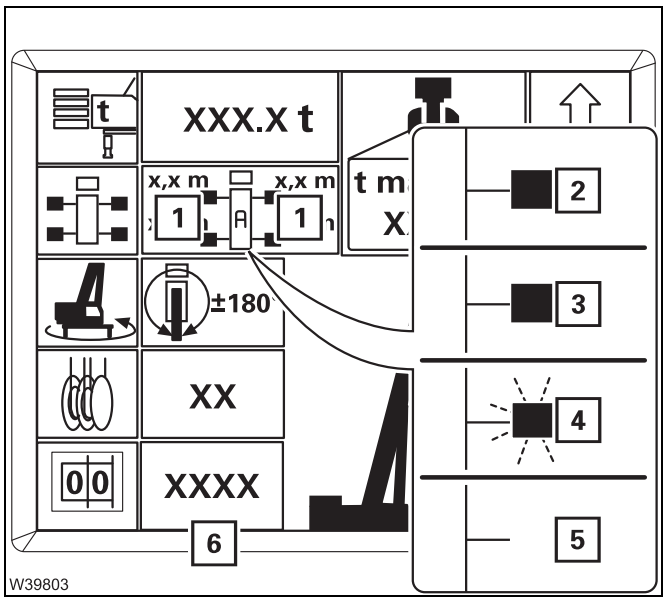


– Outrigger span – with outrigger span monitoring

The display (**1**) indicates that the outrigger span corresponding to the RCL code (**6**) is rigged.

The display is identical for all outrigger beams (**2**).

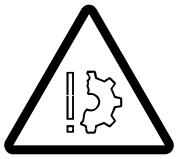
(**3**) Illuminated – the required outrigger span is rigged

(**4**) Flashes – the required outrigger span is not rigged

(**5**) No display – the current outrigger span is not permitted

- Check that the correct RCL code (**6**) for the planned operation is displayed.
- Check display (**1**).

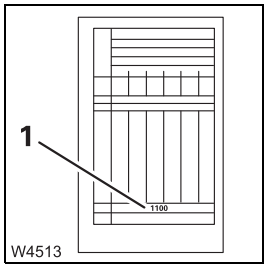
If an incorrect or impermissible outrigger span is rigged then you must rig the correct outrigger span that is required. Otherwise an error message is displayed after applying the rigging code; ➠ p. 14 - 34.



Risk of accident due to incorrectly supported truck crane!
A shutdown is not initiated as standard when an outrigger span monitoring error message is issued. When an error message is displayed, compare the rigged outrigger span with the required outrigger span and rig the required outrigger span.
This prevents the truck crane from tilting due to an inadequate outrigger span.

The error message can be supplemented by the shutdown as necessary.

Entering the RCL code



You must enter the RCL code for the rigging mode according to the *Lifting capacity table*.

- Refer to the *Lifting capacity table* for the current rigging mode. The corresponding RCL code (**1**) is specified at the bottom of the table (e.g. **1100**).

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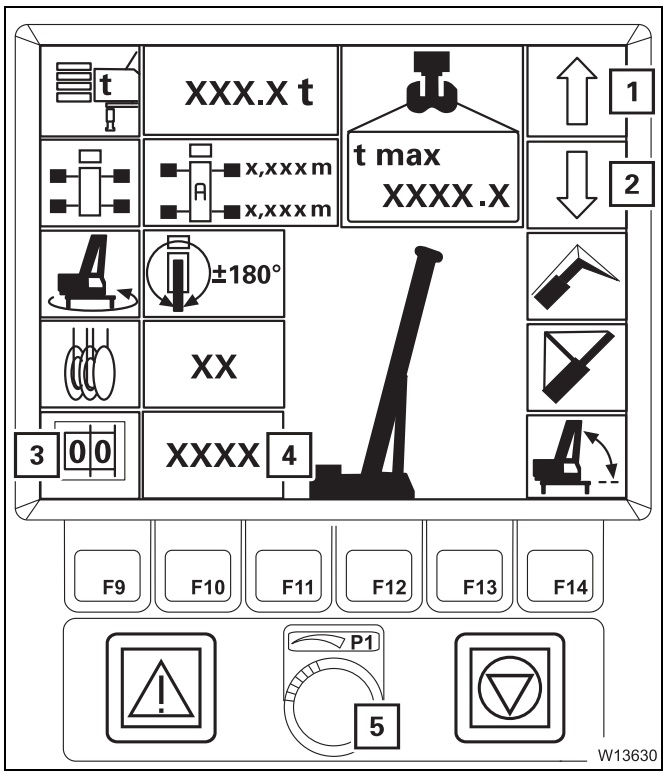


- Press button (**3**) once – symbol is **green**.
- Press button (**1**) or (**2**) repeatedly until display (**4**) shows the required RCL code.

or

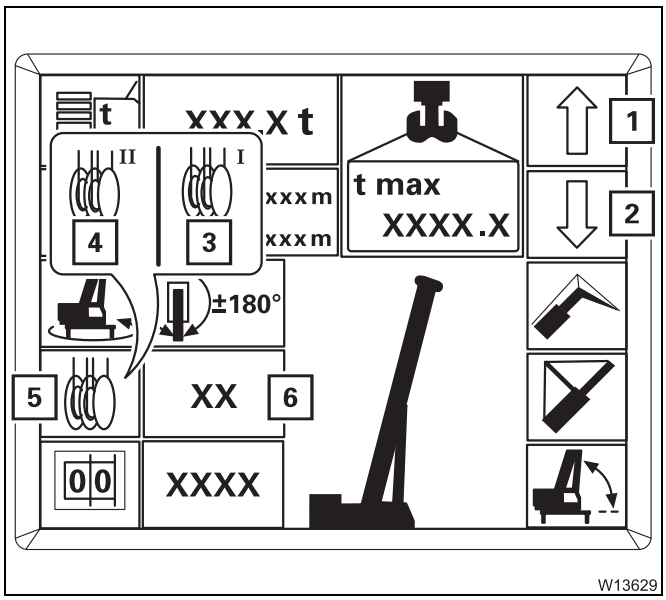
- Select the RCL code with the switch (**5**).

The other displays will show the corresponding rigging mode.

Now you can enter the reeving and accept the rigging mode.

Entering the reeving

Entering the reeving does not have an effect on any other component that has already been entered.



- Press button (**5**) repeatedly until the symbol for the hoist with which you want to lift the load has turned **green**.

  3 Symbol for main hoist

  4 Symbol for auxiliary hoist

- Press button (**1**) or (**2**) repeatedly until display (**6**) shows the number of currently reeved rope lines.

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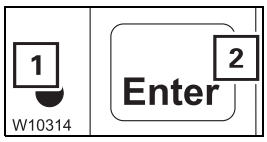
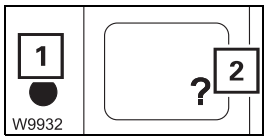
Accepting the rigging mode

Prior to crane operation, you must confirm and accept the newly entered rigging mode.



Confirming the rigging mode

- Press the button (**2**) once.
  - If the rigging mode is permissible, lamp (**1**) will go out. The *Rigging mode monitoring* submenu will open and you can accept the rigging mode.

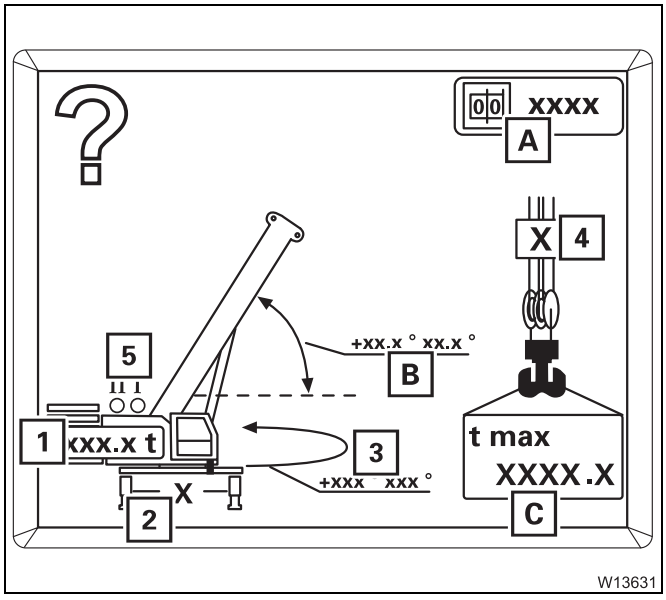


  - If the rigging mode is not permissible, the lamp (**1**) lights up. Press button (**2**) once to display the error codes; ➠ p. 14 - 34.

Accepting the rigging mode

- Check that the current rigging mode of the truck crane corresponds to the displayed rigging mode.

Risk of accidents due to an incorrectly set RCL!
If the current rigging mode varies from the displayed rigging mode, the maximum load displayed by the RCL will not correspond to the actually permissible lifting capacity according to the *Lifting capacity table*. Overloading and accidents will certainly be the result.



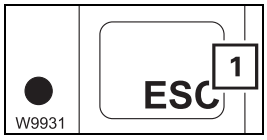
- Check:
  - **1** The rigged counterweight
  - **2** The rigged outrigger span
  - **3** The slewing range for the planned job
  - **4** The number of reeved hoist rope lines
  - **5** The hoist that is switched on – switch hoists over; ➠ p. 11 - 31

For the rigging mode, the following is displayed:

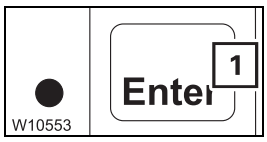
A The RCL code

B The permissible working range of the main boom

C The maximum load



- If you need to correct some values, press the button (**1**).
  The *Enter rigging mode* submenu opens.



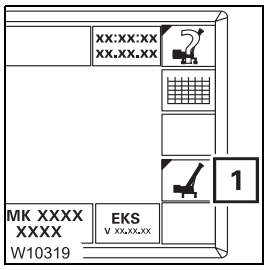
If the current rigging mode is displayed, press the button (**1**). The *Monitoring* submenu opens and the crane movements are enabled provided no error is pending; ➠ p. 11 - 30.

11.2.3 Checks before operating the crane

Open the *Monitoring* submenu

Crane operation is only enabled when the *Monitoring* submenu is open.

After a standstill of less than 48 hours and after accepting a rigging mode, the *Monitoring* submenu will open automatically.



You can also open the submenu manually.

- If necessary, open the main menu Esc and press the button (**1**) once.

The *Monitoring* submenu opens.

You can only quit the *RCL monitoring* submenu when all crane movements have stopped – control lever in zero position.

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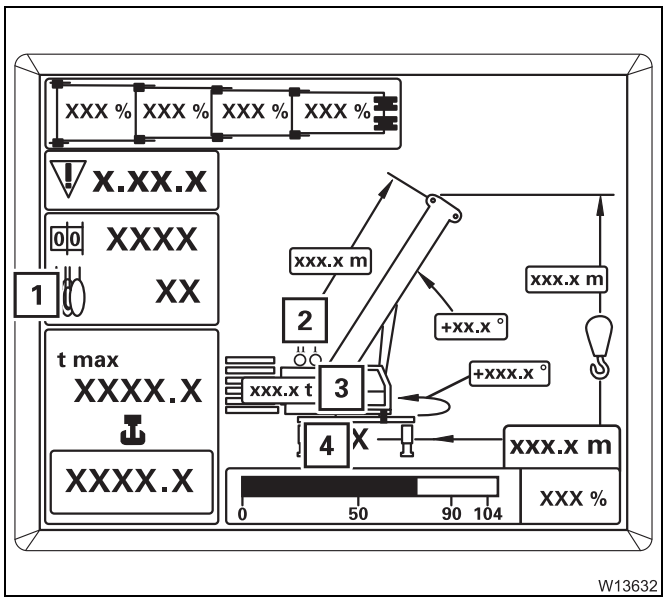
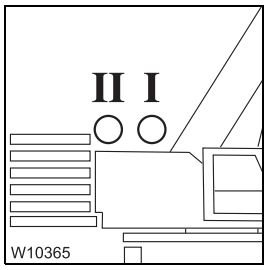
checks

- Check that the current rigging mode of the truck crane corresponds to the displayed rigging mode.

Risk of accidents due to an incorrectly set RCL!
If the current rigging mode varies from the displayed rigging mode, the maximum load displayed by the RCL will not correspond to the actually permissible lifting capacity according to the *Lifting capacity table*.
Overloading and accidents will certainly be the result.



- Check:
  - **1** The number of reeved hoist rope lines
  - **2** The hoist that is switched on
  - **3** The rigged counterweight
  - **4** The rigged outrigger span



Hoists display

The lamp that lights up must always be for the hoist with which the load is to be lifted:

Lamp I: Must go on if the load is to be raised with the main hoist.

Lamp II: Must go on if the load is to be raised with the auxiliary hoist.

- Switch over the display if necessary; ➠ *Example of how to switch over the display*, p. 11 - 32.

- If you need to correct values, press the button (**1**) and open the *Enter rigging mode* submenu.

You can start working with the crane if the current rigging mode of the truck crane is displayed.

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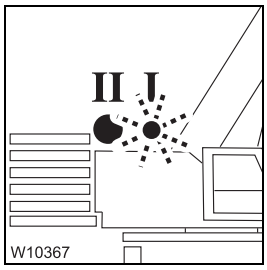
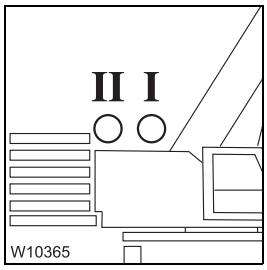


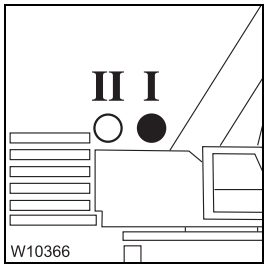
Example of how to switch over the display

The load should be raised with the main hoist, for example. However, lamp **II** for the auxiliary hoist lights up and lamp **I** for the main hoist flashes.

Switch over the display as follows:

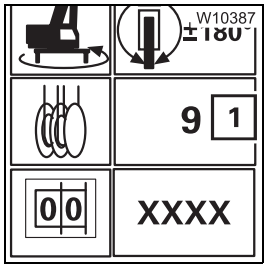


- Switch off both hoists. The lamps **I** and **II** go out.



- Switch on the main hoist.

Now the lamp **I** for the main hoist is on.



The display (**1**) shows the last entered reeving value for the main hoist, e.g. **9**.

If no reeving has been entered yet, the RCL selects reeving **1**.

- If necessary, enter the current reeving; ➠ p. 11 - 28.

Risk of accidents due to an incorrectly set RCL!
After switching over the hoists, always check whether the displayed reeving value corresponds to the current reeving value of the displayed hoist and, if necessary, enter the current reeving value.
In this way, you prevent the RCL making calculations based on an incorrect reeving value and the truck crane becoming overloaded or overturning.

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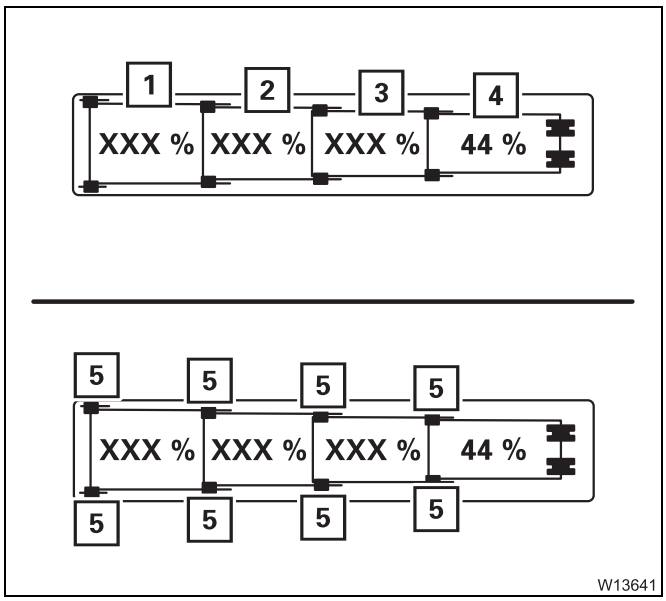
11.2.4 Display during the crane operation

The following information is constantly displayed in addition to the displays of the rigging mode:

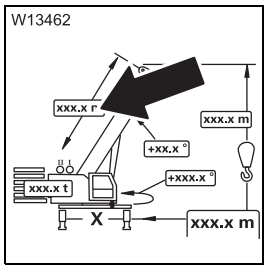


The current telescoping

The displays (**1**) to (**4**) show the current telescoping of the telescopic sections I to V in percent, e.g. **44%.**

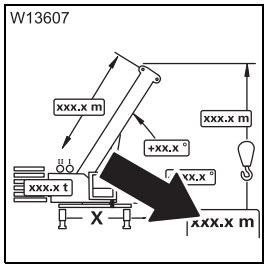
Fixed and intermediate lengths differ in the locking pins (**6**)

5 – Green: Fixed length
– Black: Intermediate length
– Flashing: Telescopic section at fixed length not set down or unlocked



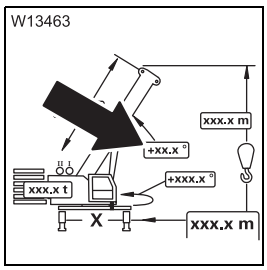
The current main boom length

Shows the current main boom length in metres (m) or feet (ft).



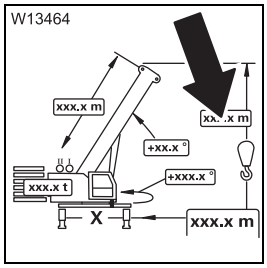
The current working radius

Shows the current working radius = horizontal distance between the turntable axis and the hook block axis.
The displayed value is calculated on the basis of the telescoping and the main boom angle.
The value is displayed either in metres (m) or feet (ft), depending on the setting.



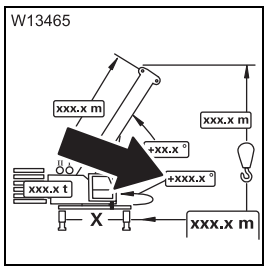
The current main boom angle

Shows the current main boom angle in relation to the horizontal. Angles below the horizontal are displayed with a minus sign, e.g. -3°.



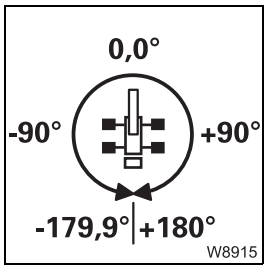
The current overall height

Overall height = vertical distance between the lower edge of the outrigger pad and the highest point of the main boom. The displayed value applies to fully extended outrigger cylinders on the largest outrigger span.
The value is displayed either in metres (m) or in feet (ft), depending on the setting.



The current slewing angle

Shows the angle of the current superstructure position.
0° means that the superstructure is slewed to the rear.



A full turn from this working position is divided into two semi-circles.

– Angles in the **right-hand semi-circle** are displayed as **positive** values (0° to 180.0°).

– Angles in the **left-hand semi-circle** are displayed as **negative** values (0° to -179.9°).

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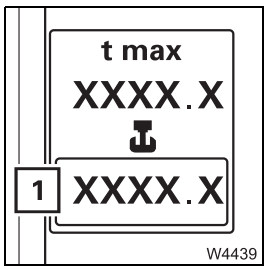
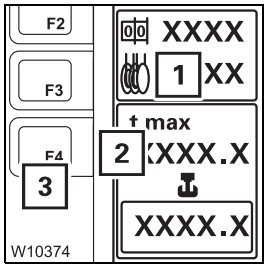


The currently raised load

The display (**1**) shows the sum of the payload + lifting gear + hook block.



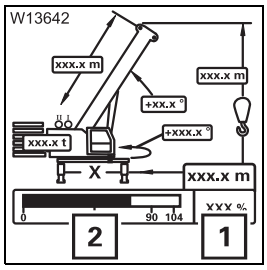
The maximum load

Display (**2**) shows the maximum load that can be lifted in the current rigging mode with the current working radius.

If the maximum load is reduced due to the reeving entered, symbol (**1**) will be red.

In this case, you can have the maximum possible load displayed briefly.

- Press the button (**3**) once.
  Display (**2**) shows the maximum possible load that can be lifted with sufficient reeving according to the *Lifting capacity table*.



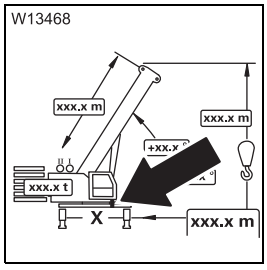
The degree of utilisation

The degree of utilisation shows the weight of the current load as a percentage of the maximum possible load. Display (**1**) shows the percentage value. Display (**2**) shows the ranges in different colours:

Blue: 0 – 90%

Yellow: approx. 90 -100%

Red: greater than 100%



The turntable lock

Description; ➠ p. 9 - 64

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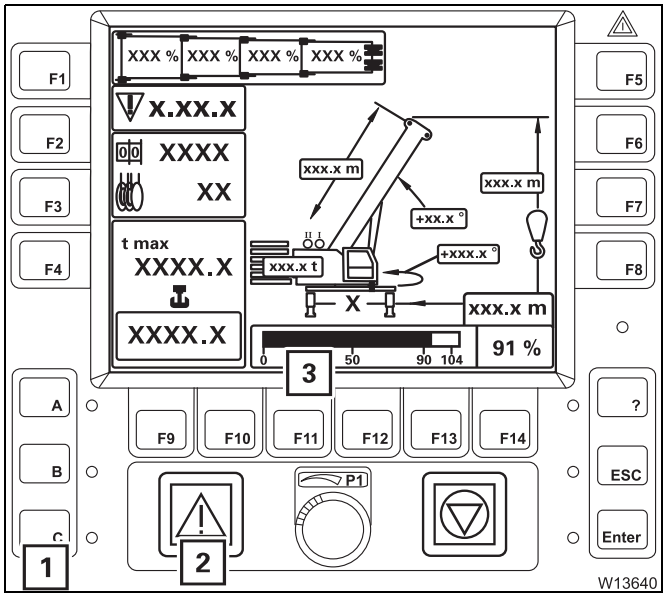
11.2.5 RCL early warning



If about 90% of the maximum permissible load is exceeded, an RCL early warning will be issued.

– An intermittent buzzer tone will sound. After five seconds, you can switch off the buzzer tone using button (**1**).

– The lamp (**2**) lights up.

– Display (**3**) shows the current degree of utilisation, e.g. 91%; the bar is **yellow**.

If the current crane continues to move in the same direction, there will be an RCL shutdown.

11.2.6 RCL shutdown

There are different types of RCL shutdown:

– Shutdown due to overload

– Shutdown due to an error; ➠ *Error message with shutdown*, p. 14 - 31.

Shutdown due to overload

If about 100% of the maximum permissible load is exceeded, shutdown will occur due to overload.

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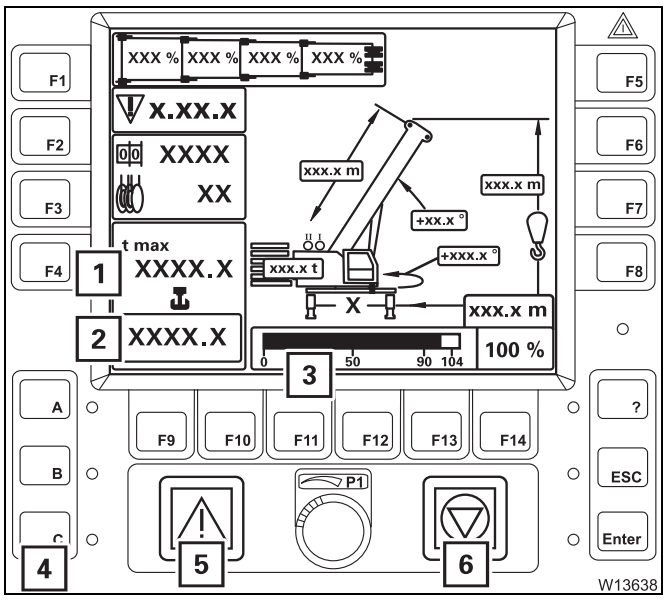
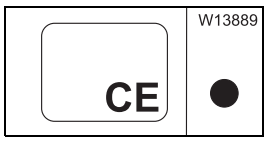


– All crane movements which increase the load moment will be switched off.
– A continuous buzzer tone will sound. After five seconds, you can switch off the buzzer tone using button (**4**).
– Lamps (**5**) and (**6**) light up.
– Display (**3**) shows the current degree of utilisation, e.g. 100%; the bar is **red**.
– The value on display (**2**) is equal to or greater than the value on display (**1**).

Cancelling a shutdown

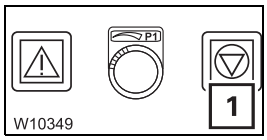


• Turn off the buzzer tone if necessary.

• Leave the shutdown range by moving the crane according to the following table.

Switched off crane movements	Permitted crane movements
Lift loads	Lower loads
Lower the main boom	Raising the main boom
Extend the main boom	Retracting the main boom[1)]
Slewing to the left	Slewing to the right
Slewing to the right	Slewing to the left

[1)] In some cases the RCL also switches off boom retracting. In this case, leave the shutdown range by raising the boom. If this is not possible, set down the load, telescope to the next fixed length and raise the load again.



If you have left the shutdown range, the lamp (**1**) goes out.
After pressing button CE the crane movements will be enabled.

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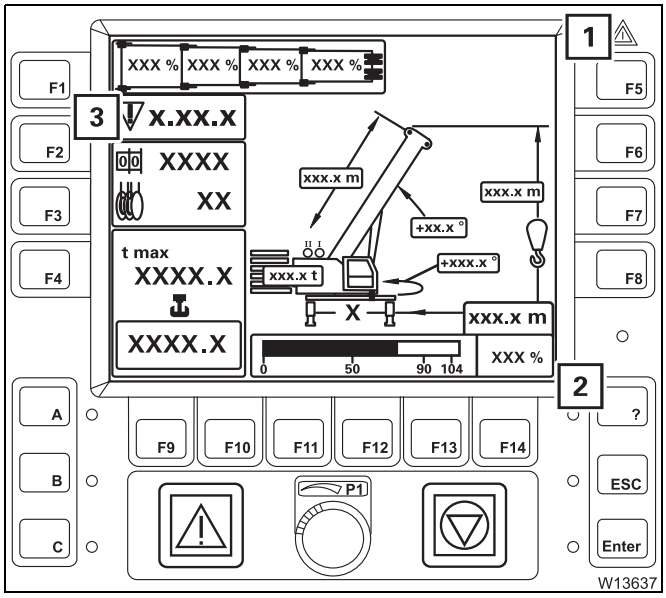
11.2.7 Display in the event of errors



If an error occurs, it will be displayed as follows.

– Depending on the type of error, the buzzer tone sounds once or as a continuous buzzer tone.
– Lamps (**1**) and (**2**) light up.
– Display (**3**) shows an error code and the associated symbol flashes.

Further indications depend on the type of error; ➠ *Error messages in the Monitoring submenu*, p. 14 - 30.

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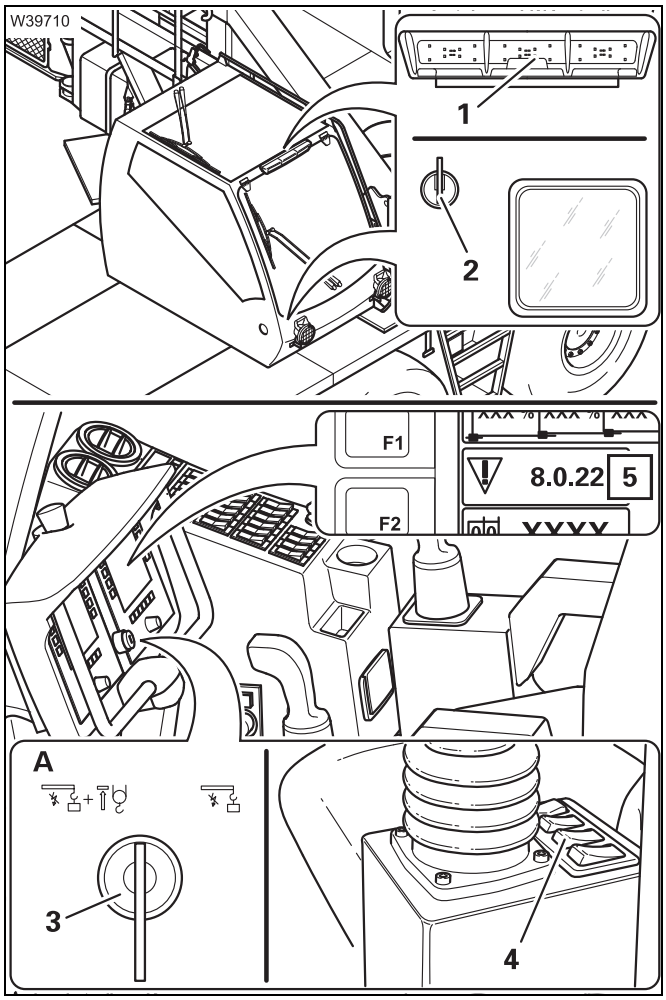
11.2.8 RCL override

There are two types of RCL override, depending on the version.

Risk of accidents due to overridden or faulty RCL!
It is not permitted to work with an overridden or faulty RCL!
Set down the load immediately and stop operating the crane if the RCL is faulty!
You may override the RCL only if it becomes absolutely necessary to do so in the event of an emergency. This is to put the truck crane into a safe state in the event of a malfunction. In this case, do not perform any movements that would increase the load moment.



RCL override – symbol (A)

The operating elements (**1**), (**2**) and (**4**) have not been assigned functions.

- Insert the key into the key-operated switch (**3**).
- Turn the key to the right and hold it in this position.

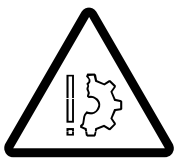
The display (**5**) shows the error message **8022**.

Cancelling the override

- Let go of the key-operated switch (**3**).
- Remove the key.
- Press button CE once; the error message is acknowledged.

If additional equipment is used, the status display (**1**) indicates this in the same way as the RCL display in the crane cab:

Green: 0-90%
Yellow: about 90-100%
Red: greater than 100%



Risk of accidents due to unintentional override!
The key must not remain in the key-operated switch while the crane is operating!
This prevents the RCL from overriding unintentionally.

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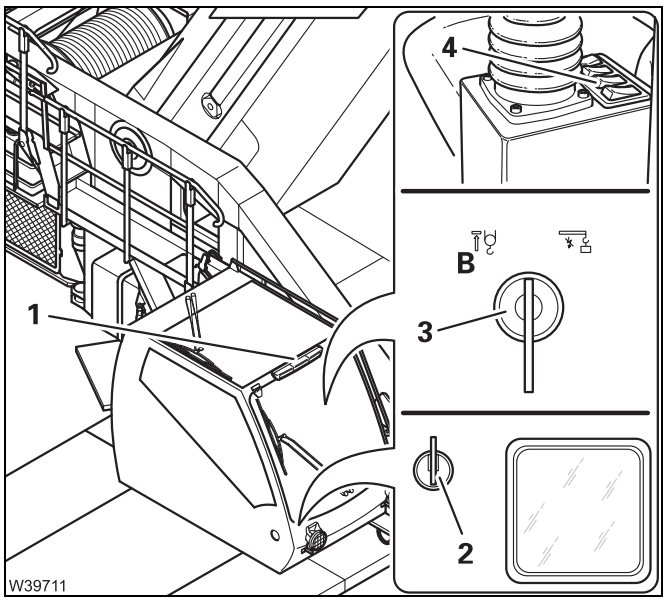


RCL override – symbol (B)

The status display (**1**) is active.

The following operating elements can be used to override the RCL:

2 Key-operated RCL override switch

3 Key-operated rigging switch

4 Raise switch

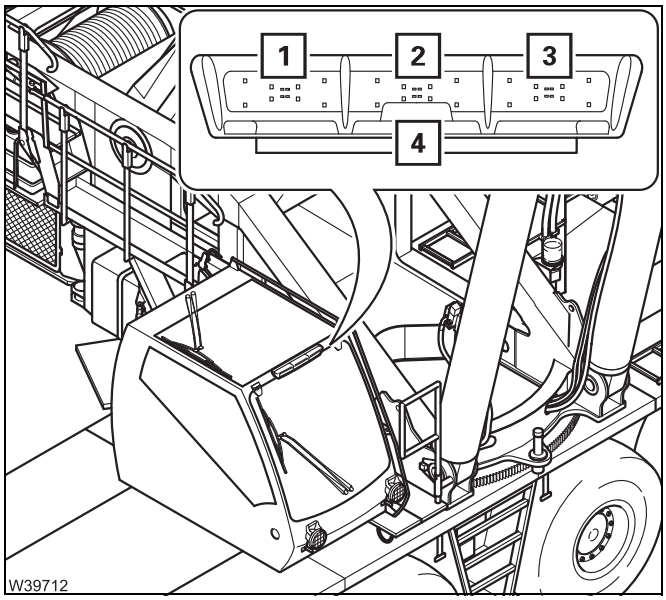
Status display

The status display informs people in the danger area of the truck crane:

– About the current degree of utilisation

– In case of an RCL shutdown or early warning

– When the RCL has been overridden.



The warning will be visual and, in part, audible.

1 Loudspeaker (warning signal)

2 Lamp, green

3 Lamp, yellow

4 Lamp, red

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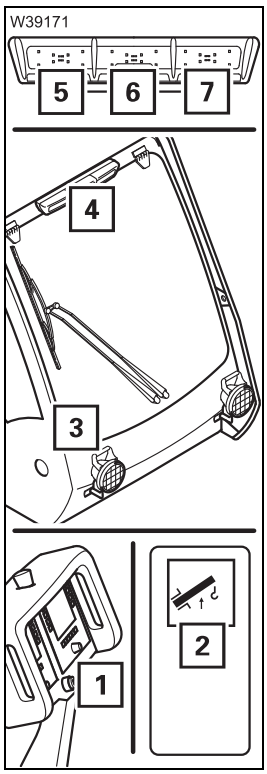


The lamps of the status display light up or flash depending on the RCL degree of utilisation and operation of the switches.

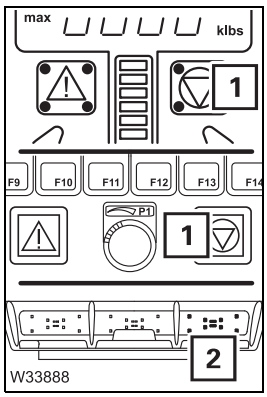
Switch pressed	Degree of utilisation		
	0-90%	about 90-100%	greater than 100%
No switch (normal operation)	Display (**5**) **green**	Display (**6**) **Yellow**	Display (**7**) **Red**
Key-operated rigging switch (**1**)	Display (**5**) **green**	Display (**6**) **Yellow**	Display (**6**) **yellow**, flashing
Button (**2**) Raising	Display (**5**) **green**	Display (**6**) **Yellow**	Display (**5**) **green**, flashing
Key-operated RCL override switch (**3**)	Display (**7**) **red**, flashing	Display (**7**) **red**, flashing	Display (**7**) **red**, flashing

RCL shutdown

There are different types of RCL shutdown:

– Shutdown due to overload, approx. 100% of the maximum permissible load is exceeded

– Shutdown due to an error



If the RCL has shut down the crane movements, then:

– Depending on the version, lamp (**1**) lights up

– The status display (**2**) lights up **red**,

– a continuous buzzer tone sounds.

Now you can:

➠ *Raising after RCL shutdown*, p. 11 - 42,

➠ *Overriding RCL or lifting limit switch for rigging work*, p. 11 - 43,

➠ *Overriding the RCL in an emergency*, p. 11 - 44

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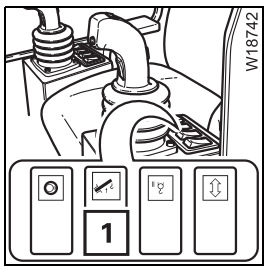
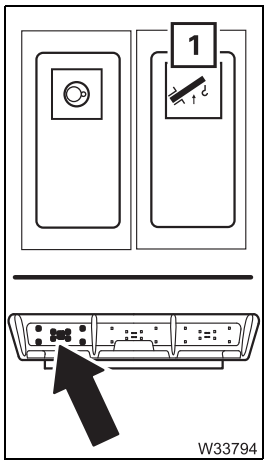


Raising after RCL shutdown

You can re-enable raising with the switch (**1**) in order to leave the shutdown range.
The speed will then be reduced to 50%.

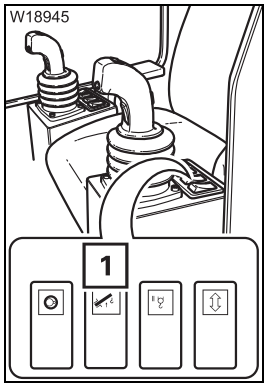


Raising the main boom

- Push the button (**1**) in at the top once.
  - Raising is enabled.
    The RCL will show an information code; ➠ p. 11 - 46.
  - The status display will flash green.
- Raise the main boom with the control lever until the degree of utilisation is less than 100%.

  The crane movements will then be enabled again.

The raising of the main boom will be shut down if the main boom angle is too great. Then all you can do is set the load down.



If the degree of utilisation is over 100%, you can cancel the function by:

– Press button (**1**) in at the top again, or

– switch off the ignition.

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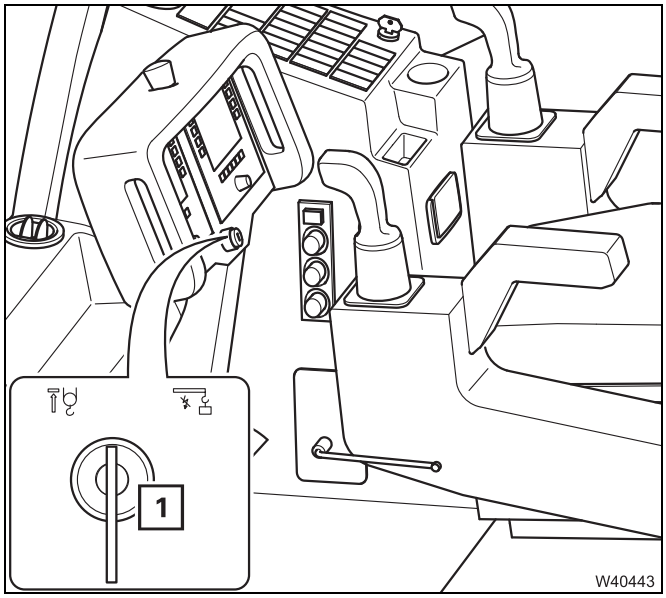
Overriding RCL or lifting limit switch for rigging work

For rigging work, you can:
– Override the lifting limit switch
– Override the RCL and thus enable a degree of utilisation of up to 110%.

For both overrides the speed of the movements which increase the load moment is reduced to 15%.
The speed of the movements which increase the load moment is not reduced.



Overriding the lifting limit switch

- Turn the key-operated switch (**1**) once anticlockwise.

Once the lifting limit switch has been activated, the crane movement will only be stopped **once** and will then no longer be monitored.

RCL override

- Turn the key-operated switch (**1**) once clockwise.

Now a degree of utilisation of up to 110% is enabled.

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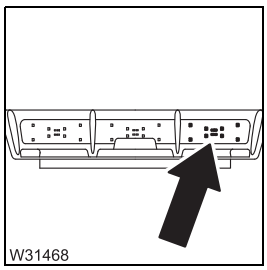


After overriding

– The status indicator will light up **red**.

– The RCL will show an information code; ➠ p. 11 - 46.

If you do not trigger a control lever movement within 10 seconds, you must press the key-operated switch again.

Cancelling the override

The override will be cancelled when you:

– press the key-operated switch again, or

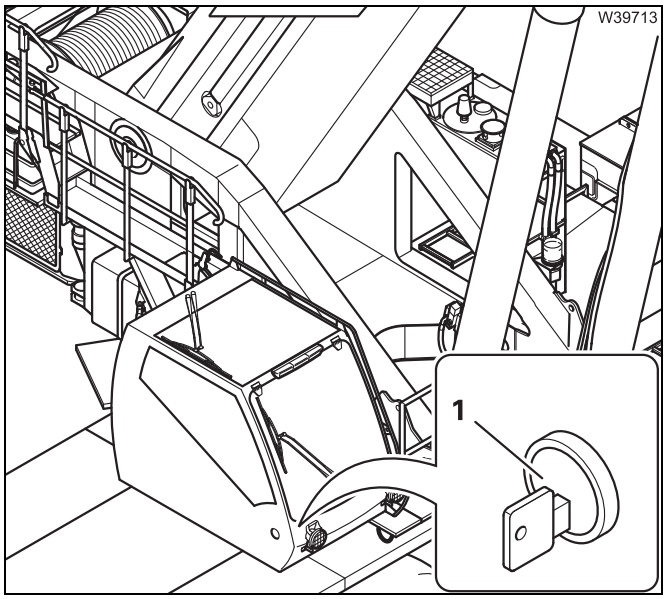
– do not activate the control lever for 10 seconds, or

– switch off the ignition.

Risk of accidents due to unintentional override!
The key must not remain in the key-operated switch while the crane is operating!
This prevents the RCL from overriding unintentionally.

Overriding the RCL in an emergency

Risk of accidents due to overridden or faulty RCL!
It is not permitted to work with an overridden or faulty RCL!
Set down the load immediately and stop operating the crane if the RCL is faulty!
You may override the RCL only if it becomes absolutely necessary to do so in the event of an emergency. This is to put the truck crane into a safe state in the event of a malfunction. In this case, do not perform any movements that would increase the load moment.



If the RCL has shut down all crane movements, you can cancel the shutdown with the key-operated switch (**1**).

Once the shutdown is cancelled, the crane operation is no longer monitored and the switched off crane movements are enabled again.

The power unit speeds are reduced to 15%.

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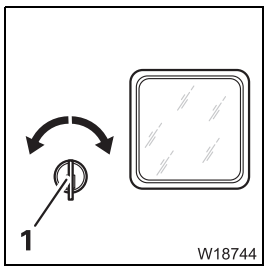
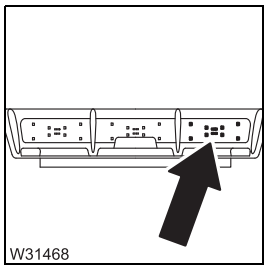


Cancelling a shutdown

- Turn the key-operated switch (**1**) to the left or right once.
  – Now all crane movements will be enabled for 30 minutes.
  The crane movements will no longer be monitored by the RCL.
  – The RCL will show an information code; ➠ p. 11 - 46.



The status display will flash **red**.
At a degree of utilisation over 110% the warning signal will sound; ➠ p. 11 - 41.

Cancelling the override

The override will be cancelled when you:

– Switch off the ignition

– Press the key-operated switch again.

The override will automatically be cancelled 30 minutes after the key-operated switch has been pressed.

Risk of accidents due to unintentional override!
The key must not remain in the key-operated switch while the crane is operating!
This prevents the RCL from overriding unintentionally.

Table – error/ information codes

The following table contains error and information codes, their causes and possible solutions.

Error code			Cause	Solution
8	**04**	**4**	Key-operated rigging switch pressed, no override effective	– Start the engine; – Reduce degree of utilisation to less than 110% – Move the control lever within 10 seconds after operation
8	**05**	**4**	Raise switch pressed, no override effective	– Start the engine; – Press switch again
8	**06**	**4**	Key-operated RCL override switch pressed, no override effective	– Start the engine; – Press switch again
8	**04**	**5**	**Information code**: Key-operated rigging switch pressed, override effective	No measures required.
8	**05**	**5**	**Information code**: Raise switch pressed, override effective	
8	**06**	**5**	**Information code**: Override RCL switch pressed, override effective	

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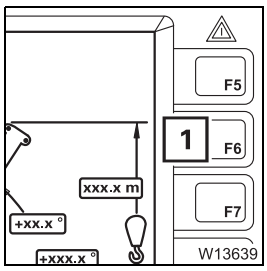
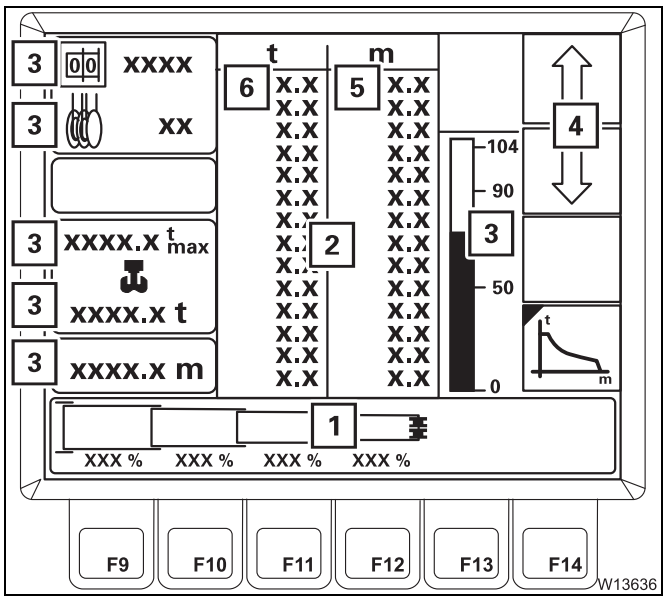
11.2.9 Displaying the lifting capacity tables



Opening the submenu

- In the main menu or *Monitoring* or submenu, press button (**1**) once.

The *Lifting capacity table* submenu opens.



Displaying tables

The displays (**3**) show the current status.

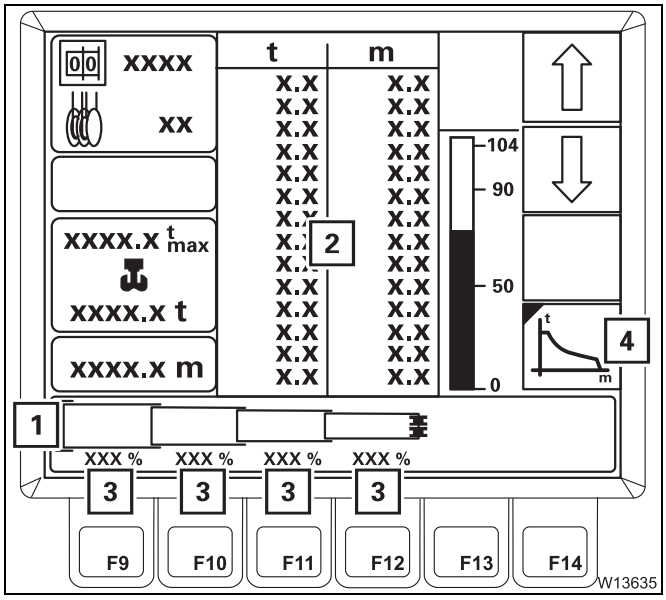
The lifting capacity table (**2**) applies to

– the entered RCL code and

– The displayed telescoping (**1**) – first the current telescoping is displayed.

The maximum load (**6**) applies to working radius (**5**).

For longer tables, press buttons (**4**) to display more values.



You can have the lifting capacity tables displayed for all permissible telescoping statuses:

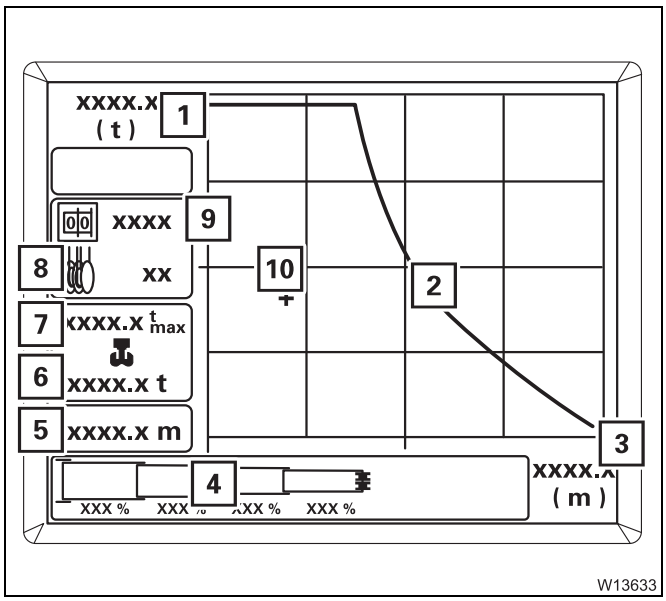
- Enter the desired telescoping status (**1**) with the buttons (**3**).

The corresponding lifting capacity table (**2**) will be displayed.
In the event of impermissible telescoping statuses, all values in the lifting capacity table are 0.

Displaying the working range

- Press the button (**4**) once.

The *Working range* submenu will open.

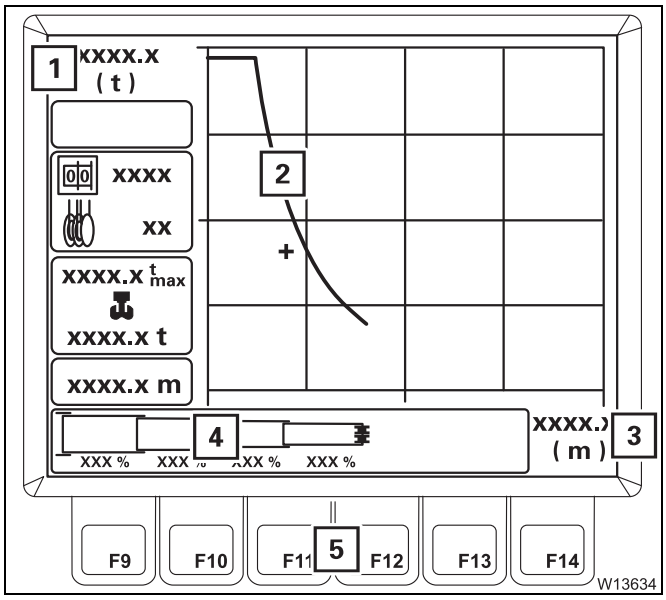


Curve (**2**) shows the permissible working range for the entered RCL code (**9**) and the telescope status (**4**).

The working range ends at the maximum possible working radius (**3**). Reduction of the working radius increases the enabled load along the curve (**2**) up to the maximum possible load (**1**). There has to be enough reeving for this load.

The maximum load (**7**) applies to the current reeving (**8**).

The cross (**10**) indicates the position in the working range for the current load (**6**) and the current working radius (**5**).



The working range for all permissible telescope statuses can be displayed:

- Enter the desired telescoping status (**4**) with the buttons (**5**).

The displays (**1**), (**2**) and (**3**) show the respective permissible working range.

If the telescoping status is not within the working range:

– the displays (**1**) and (**3**) will show the value **0**,

– no curve (**2**) will be shown.

Exiting the submenu

- Press button (**1**) once – the previously displayed menu opens.

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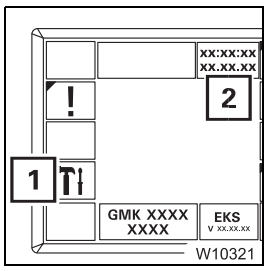
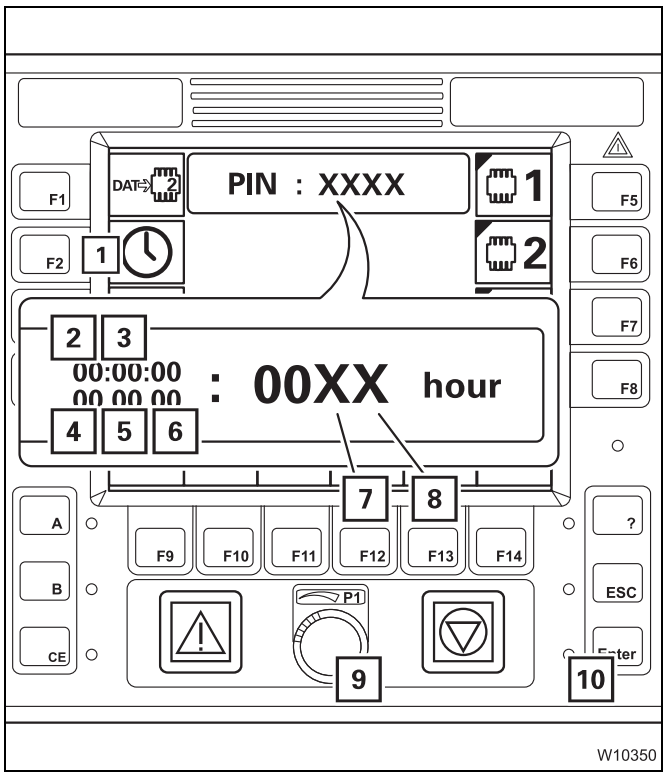
11.2.10 Entering the time/date



You can enter the time and date for the display (**2**).

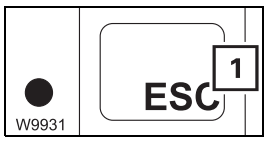
- Press the button (**1**) once.

This opens the *Settings* submenu



- Press button (**1**) repeatedly until the desired value flashes.
  - **2** Hours
  - **3** Minutes
  - **4** Day
  - **5** Month
  - **6** Year
- Enter the new value with the buttons (**7**) and (**8**) or with the switch (**9**).
- Enter all the required values.
- Press button (**10**) once – the newly entered values will be accepted and displayed in the main menu.

Illogical values (e.g. 77 minutes) will not be accepted and the display will continue to flash.



You can **Cancel** the input at any time. Press the button (**1**).
None of the values will be changed.

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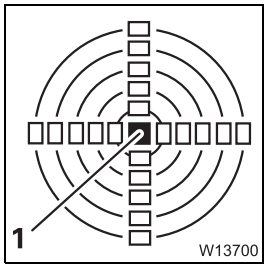
11.3 Crane operation with main boom

11.3.1 Checks during crane operation

Horizontal alignment

During crane operation, the truck crane may tilt if the ground gives way due to varying loads.

Risk of accidents if the truck crane is not level!
The RCL calculates the working radius from the length and angle of the main boom. The actual working radius changes and there is a danger of the crane overturning if the truck crane is not level!



- Check the horizontal alignment of the truck crane during crane operation on the display (**1**); ➠ p. 12 - 43.

Due to deformation of the frame, the horizontal alignment can change by up to 2° when the superstructure is turned from the 0° or 180° position.
If the truck crane does not return to the horizontal position after being turned back to the 0° or 180° position, you must immediately determine the cause and eliminate it and, if necessary, realign the crane. Observe the position of the superstructure when doing so; ➠ *Levelling the truck crane*, p. 12 - 43.

Safe distances

During crane operation, always ensure that the truck crane and the load are at a sufficiently large distance to objects and persons. Pay particular attention to objects that pose a direct danger (for example, gas containers or scaffolding).

Keep a safe distance away from electrical lines; ➠ *Safe distance from overhead power lines*, p. 12 - 15.

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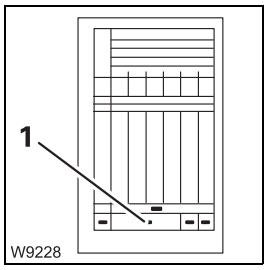
Checking the wind speed

Strong winds can result in the truck crane becoming overloaded.

- Prior to and during crane operation, check whether the current wind speed is lower than the maximum permissible wind speed.

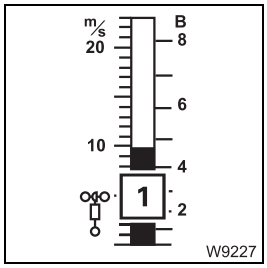


Maximum permissible wind speed

The maximum permissible wind speed (**1**) for the current rigging mode is specified at the bottom of the corresponding *Tragfähigkeitstabelle*.

In certain cases, the specified permissible wind speed must be reduced; ➠ *Tragfähigkeitstabelle*.

Current wind speed



The current wind speed is displayed in the main menu and in the *Telescoping* submenu. The colour of the bar (**1**) changes depending on the displayed range:

0 to 6 m/s:	Green bar
6 to 12 m/s:	Yellow bar
Over 12 m/s:	Red bar

The colour of the bar only depends on the value of the current wind speed. The maximum permissible wind speed does not affect the colour of the bar.

If an anemometer is not available, or in the event of a fault, you can find out which speeds are forecast by contacting the relevant weather stations.

The *lifting capacity table* contains an overview of the wind strengths, wind speeds and their effects.

If the maximum permissible wind speed is exceeded

No automatic shutdown occurs if the maximum permissible wind speed is exceeded.

- Immediately cease crane operation.
- Put the truck crane into the rigging mode specified for the current wind speed in the *lifting capacity* table.

Risk of accidents at excessively high wind speeds!
If the current wind speed is higher that the maximum permissible wind speed, stop crane operation immediately and set up an appropriate rigging mode.
This will prevent the truck crane overturning due to overload.

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Deformation of the main boom due to direct sunlight

One-sided direct sunshine can lead to a temperature difference between the left and the right main boom side. This results in a different length extension. A lateral deformation of the main boom is the result. The degree of deformation depends on the actual temperature difference and the current main boom length.

Assuming a temperature difference of 30° (86 °F) and a system length of 60 m (196.85 ft), a deformation without load of up to 1 m can occur. This would be a deformation of 1.7%.

Risk of accidents due to overloading the truck crane!
An excessively deformed main boom can be overloaded or suffer from invisible damage which can lead to overloading of the main boom on subsequent lifts with permissible deformation or reduce the life span of the main boom.
Make sure that the maximum permissible values for lateral deformation are not exceeded.

Preventive measures

- If possible, turn the superstructure to a (park) position where both main boom sides are heated evenly to prevent deformation.

Before any lift with deformed main boom

The main boom must be telescoped out to the length required for the lift. The maximum permissible lateral deformation of the **unloaded** main boom (with reeved hook block) is 1% of the main boom length.

- Check the deformation before the lift.
- Only lift the load if the current deformation is permissible.

For any lift with deformed main boom

The maximum permissible lateral deformation of the loaded main boom is 3% of the current boom length.

- Check the deformation during the lift.
- Put the load down before the maximum permissible deformation is exceeded.
- Reduce additional, dynamic influences by wind.
- Carry out crane movements with minimal speed.

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11.3.2 Permissible slewing ranges and working positions

The following ranges are permissible for crane operation according to the *Lifting capacity table*:

360° slewing range

- Support the truck crane with the outrigger span required according to the *Lifting capacity table*.
- Enter an RCL code for the 360° slewing range according to the *Lifting capacity table*; ➠ *Entering rigging mode*, p. 11 - 23.
- Rig a counterweight combination that is no larger than that permitted for the rigged outrigger span. Slewing with a rigged counterweight is not permitted with all outrigger spans; ➠ *Slewing with a rigged counterweight*, p. 12 - 71.

Slewing range ±15°

- Support the truck crane with the outrigger span required according to the *Lifting capacity table*.
- Slew over the slewing range of ±15°.
- Enter an RCL code for the ±15° slewing range according to the *Lifting capacity table*; ➠ *Entering rigging mode*, p. 11 - 23.

If the RCL code has been entered for the ±15° slewing range, then:

– if the slewing speed is limited to 10%,

– an RCL shutdown occurs when leaving the slewing range. Slewing in the opposite direction is still enabled.

Working position 0°/180°

- Support the truck crane with the outrigger span required according to the *Lifting capacity table*.
- Slew the superstructure backwards into the 0° position or forwards into the 180° position.
- Lock the turntable; ➠ p. 11 - 14.
- Enter an RCL code for the corresponding working position according to the *Lifting capacity table*; ➠ *Entering rigging mode*, p. 11 - 23.

All slewing operations are disabled if an RCL code is entered for the 0°/180° working position. An RCL shutdown is triggered by unlocking the turntable. To acknowledge the shutdown, you must:

– either lock the superstructure

– or, if slewing is permissible with the rigged counterweight (➠ p. 12 - 71), set down the load and enter an RCL code for the 360° slewing range.

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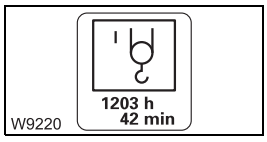
11.3.3 Main hoist

Risk of accidents from accidentally operating a hoist!
Always switch off the hoist that is not in use!
Never operate the hoist if the hook block is unreeled and the hoist rope is completely wound onto the drum.
- The rope will slacken in the course of the *Lower* movement. Rope loops will form, which can cause the load to slip and damage the hoist rope.
- The switch-off point of the lowering limit switch shifts in the course of the *Raise* movement. The lowering limit switch will lose its function as a safety device.

Risk of accidents when raising loads at an angle!
Loads can cause the main boom to bend, resulting in the hoist rope no longer being aligned in a vertical position. Compensate for the bend by lowering the boom so that the load will be lifted vertically. In this way, you can prevent the load dragging and helpers being injured.
Inform all helpers about this issue.

Danger due to slack rope!
Only use hook blocks and sling gear of the minimum weight prescribed in the *Lifting capacity table*, depending on the reeving and boom length. This prevents slack rope developing at large heights when lifting without a load. This can result in the load slipping during subsequent lifting procedures.



You can display the operating hours of the hoist; ➠ p. 11 - 109.

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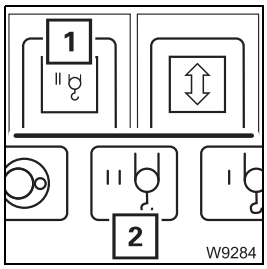
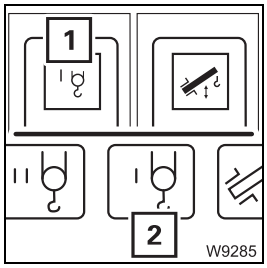
Switching on the main hoist

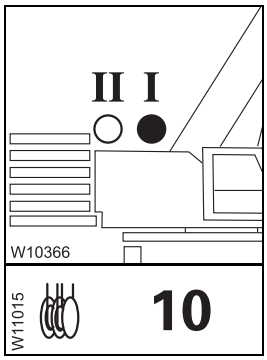
After the ignition is switched on, all of the power units will be switched off and the lamps in the corresponding buttons will light up only dimly.



- Check whether the auxiliary hoist is switched off.
  - The lamp in button (**1**) should light up only dimly.
  - Symbol (**2**) must be **red**.



- Press the button (**1**) once.
  - The lamp in button (**1**) will light up brightly.
  - Symbol (**2**) is **green** when the main hoist is switched on.



- Check that the lamp **I** on the RCL **lights up**.
  If lamp **I** **flashes**, switch over the display; ➠ p. 11 - 32.

- Check that the current reeving of the main hoist is displayed, for example, **10**. Correct the reeving if necessary; ➠ p. 11 - 28.

Lifting and lowering

You can adjust the sensitivity of the control levers to suit the operating conditions; ➠ *Setting the characteristic curves for the control levers*, p. 11 - 106.

Risk of accidents due to incomplete monitoring!
Operation of the hoist will only be monitored fully if:
– The lifting limit switch is correctly rigged; ➠ p. 12 - 112
– the lifting limit switch is not overridden;
– The lowering limit switch is correctly set; ➠ p. 11 - 63.

Risk of accident by suspended loads!
Never switch off the engine while a load is suspended. You must have the control levers at hand in order to intervene at any time.
Always set down the load before you leave the crane cab.

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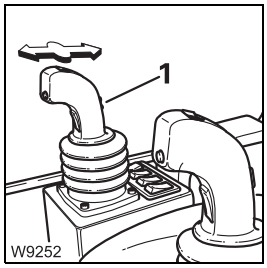
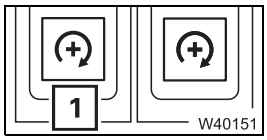


Lifting: • Pull the control lever backwards.

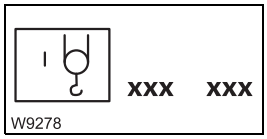
Lowering: • Push the control lever forwards.

When the hoist drum is turning, you will notice a pulse on the slewing indicator (**1**).

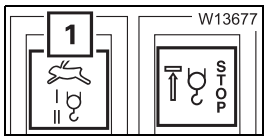
You can regulate the speed by moving the control lever and changing the engine speed with the accelerator.



You can adjust the desired engine speed (idling speed) with button (**1**); ➠ p. 10 - 17.



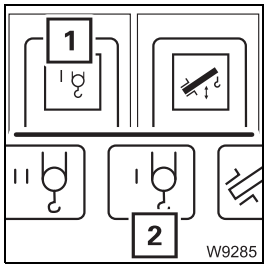
You can limit the maximum hoist speed; ➠ p. 11 - 104.



You can switch on the high-speed mode for a higher speed; ➠ p. 11 - 95.

Switching off the main hoist

If you no longer require the main hoist, you should switch it off to avoid unintentional use.



- Press the button (**1**) once.
  - The lamp in the button (**1**) will light up dimly.
  - Symbol (**2**) is **red** when the main hoist is switched off.

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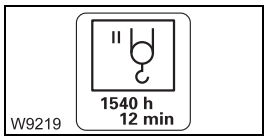
11.3.4 Auxiliary hoist

Risk of accidents when operating the auxiliary hoist!
Read and observe all of the safety instructions in the section titled *Main hoist*, p. 11 - 55 before operating the auxiliary hoist.
All safety instructions for the operation of the main hoist also apply to the auxiliary hoist, along with the information in this section.

Risk of accidents due to a damaged hoist rope!
If you reeve the auxiliary hoist rope in addition to the main hoist rope, make sure the hoist ropes do not rub against each other and that the auxiliary hoist rope does not touch the rotating flanged wheel of the main hoist during subsequent operation. Raise the main boom to at least 20° before lifting loads.
This prevents damage to the hoist ropes that results in the ropes tearing.

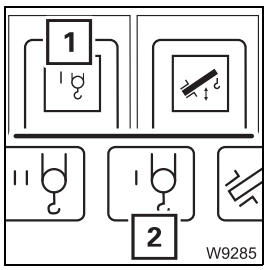
If you run the auxiliary hoist rope over the left head sheave, the current boom length must be at least 21 m (69 ft) before you raise a load. Otherwise, the rope angle would exceed the maximum permissible value.



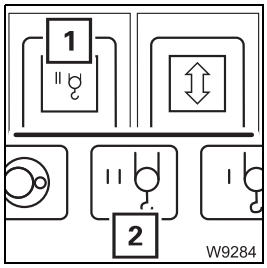
You can display the operating hours of the hoist; ➠ p. 11 - 109.

Switching on the auxiliary hoist

After the ignition is switched on, all of the power units will be switched off and the lamps in the corresponding buttons will light up only dimly.



- Check that the main hoist is switched off.
  - The lamp in button (**1**) should light up only dimly.
  - Symbol (**2**) must be **red**.



- Press the button (**1**) once.
  - The lamp in button (**1**) will light up brightly.
  - Symbol (**2**) is **green** when the auxiliary hoist is switched on.

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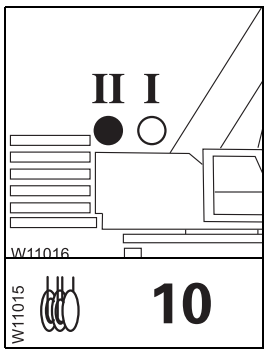


- Check that the lamp **II** on the RCL **lights up**.

  If lamp **II** **flashes**, switch over the display; ➠ p. 11 - 32.

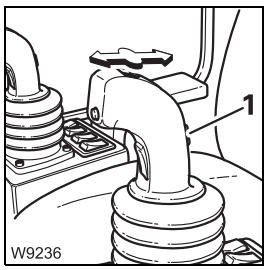
- Check whether the current reeving of the auxiliary hoist is displayed, for example, **10**. Correct the reeving if necessary; ➠ p. 11 - 28.

Lifting and lowering

You can adjust the sensitivity of the control levers to suit the operating conditions; ➠ *Setting the characteristic curves for the control levers*, p. 11 - 106.

Risk of accidents due to incomplete monitoring!
Operation of the hoist will only be monitored fully if:
– The lifting limit switch is correctly installed; ➠ p. 12 - 112
– The lifting limit switch is not overridden;
– The lowering limit switch is correctly set; ➠ p. 11 - 63.

Risk of accident by suspended loads!
Never switch off the engine while a load is suspended. You must have the control levers at hand in order to intervene at any time.
Always set down the load before you leave the crane cab.

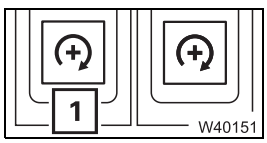


Lifting: • Pull the control lever backwards.

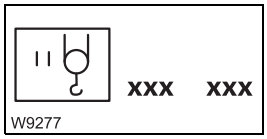
Lowering: • Push the control lever forwards.

When the hoist drum is turning, you will notice a pulse on the slewing indicator (**1**).

You can regulate the speed by moving the control lever and changing the engine speed with the accelerator.



You can adjust the desired engine speed (idling speed) with button (**1**); ➠ p. 10 - 17.



You can limit the maximum hoist speed; ➠ p. 11 - 104.

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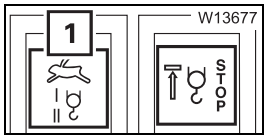
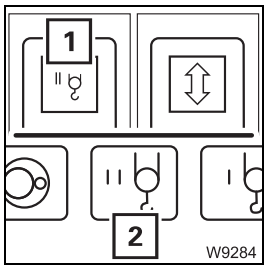


You can switch on the high-speed mode for a higher speed; ➠ p. 11 - 95.

Switching off the auxiliary hoist

If the auxiliary hoist is not required, it should be switched off to avoid unintentional use.



- Press the button (**1**) once.
  - The lamp in the button (**1**) will light up dimly.
  - Symbol (**2**) is **red** when the auxiliary hoist is switched off.

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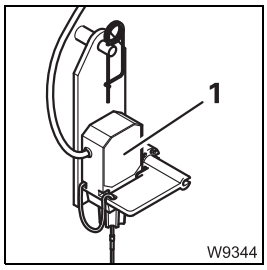
11.3.5 Lifting limit switch and lowering limit switch

Lifting limit switch

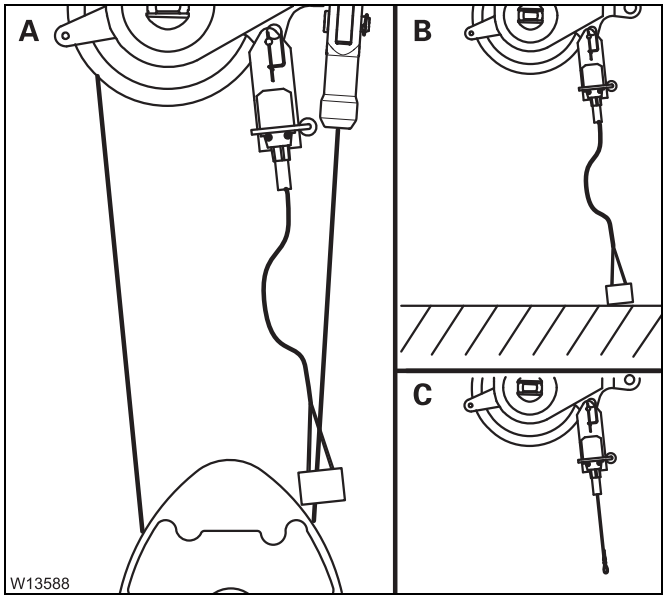
To install/remove the lifting limit switch; ➠ p. 12 - 112.



The lifting limit switch (**1**) prevents the hook block from being lifted up to the main boom head and damaging it.

The lifting limit switch only works if it has been unlocked; ➠ p. 12 - 117.

Risk of accidents due to intentionally triggering the lifting limit switch!
Always complete the hoisting operation (and extending) before raising the lifting limit switch weight. If the lifting limit switch is lifted at too great a speed, the hook block may swing into the main boom head and damage the head sheaves and the hoist rope.



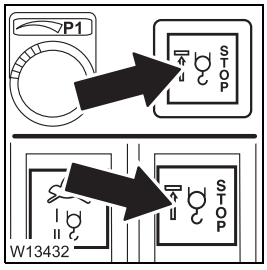
The lifting limit switch will be triggered if:

(**A**) – the hook block raises the lifting limit switch weight or

(**B**) – the lifting limit switch weight touches the ground upon lowering or

(**C**) – the lifting limit switch weight is not attached.

The lifting limit switch will not trigger if it is locked.



The lamp (**1**) will light up if the lifting limit switch has been triggered. At the same time all load moment increasing movements are switched off – *lifting*, *raising/lowering* and *extending the telescopic section*.

To cancel the shutdown, leave the shutdown range by performing a different crane movement or by setting down the load.

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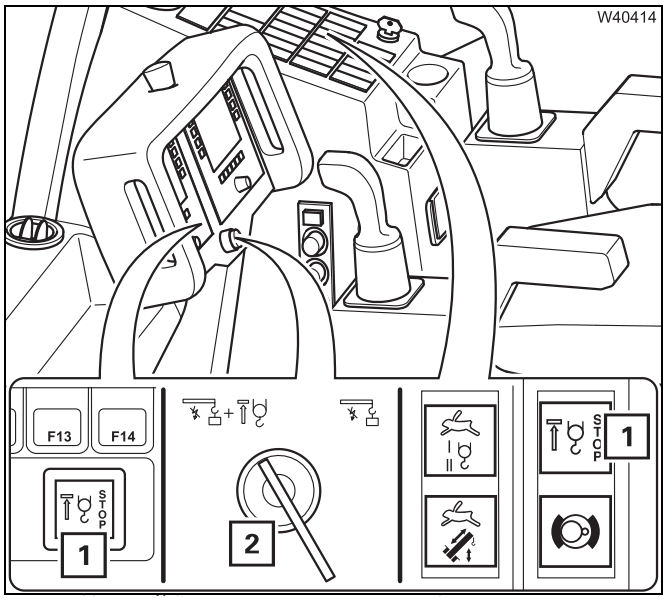
Overriding the lifting limit switch

When overriding, the shutdown of the lifting limit switch is cancelled and the crane operation is no longer completely monitored.
You can override the lifting limit switch only in conjunction with the RCL.

Risk of accidents if the lifting limit switch is overridden!
You may override the lifting limit switch only if this is specified in the operating instructions for carrying out maintenance or rigging work.
With the lifting limit switch overridden, you may drive only at the minimum speed and without a load.

Risk of accidents due to incomplete monitoring!
If the lifting limit switch is overridden, crane operation is no longer completely monitored.
When hoisting the lifting limit switch weight, the crane movement will be stopped once. After moving the control lever again, the crane movement will again be enabled and will not be switched off again.

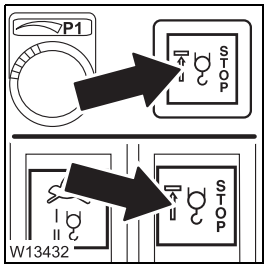


- Insert the key into the key-operated switch (**2**).
- Turn the key to the left.
  The lifting limit switch and the RCL are overridden until you let go of the key.

If the lifting limit switch is triggered now, the crane movement is stopped **once** and the lamp (**1**) flashes.

The stopped crane movement is enabled again if you bring the control lever to zero position and then move it again.

This crane movement will now not be stopped again.



The lamp (**1**) goes out,

– if you let go of the key-operated switch (override cancelled) or

– if you leave the shutdown range.

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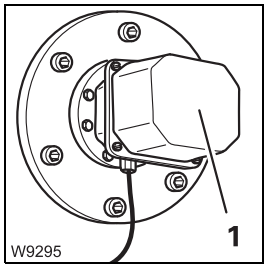
Lowering limit switch



The lowering limit switch (**1**) prevents the hoist rope from being reeled completely off the drum.

The lowering limit switch works only if the switch-off point is set correctly (for example, after changing a hoist rope); ➠ *Maintenance manual*.

Risk of accidents due to incorrect setting or intended triggering!
Prior to operating the crane, ensure that the lowering limit switch is set correctly and always complete the lowering operation before the lowering limit switch is triggered.
This prevents the hoist rope becoming damaged due to complete unreeling or switching off at high speeds, and the load being dropped as a result.

Risk of accidents due to adjustments made to the lowering limit switch!
Always re-adjust the lowering limit switch if you unreel hoist rope from the stationary rope drum. The lowering limit switch does not record the number of these winds.
This prevents the lowering limit switch switching off too late or not switching off at all, the hoist rope being damaged and the load being dropped.

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11.3.6 Derricking gear

You can raise and lower the main boom.

Depending on the size of the load and the rigging mode, the RCL switches off the lowering process of the boom as soon as the working area specified in the *Lifting capacity table* is left.

To lower the boom out of the working range; ➠ *Lowering the main boom to a horizontal position*, p. 11 - 66.

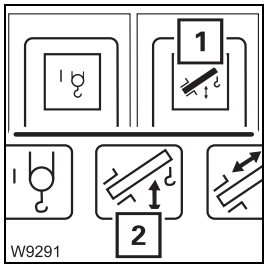
Danger of overturning when lifting loads!
It is prohibited to lift loads by raising the boom, since the RCL does not monitor this procedure!

Raising the boom is a movement that reduces the load moment and that is not switched off by the RCL. However, raising the boom is the movement which can cause the truck crane to overturn if the load lifted is too heavy.

You can display the operating hours of the derricking gear; ➠ p. 11 - 109.

Switching on the derricking gear

After the ignition is switched on, all of the power units will be switched off and the lamps in the corresponding buttons will light up only dimly.



- Press the button (**1**) once.
  - The lamp in button (**1**) will light up brightly.
  - Symbol (**2**) will be **green** if the derricking gear is switched on.

If the control lever is assigned more than one function, all other power units which are assigned the same control lever movement are switched off; ➠ *Control lever configuration*, p. 9 - 17.

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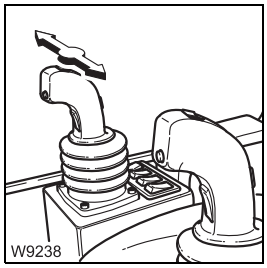
Raising and lowering

You can adjust the sensitivity of the control levers to suit the operating conditions; ➠ *Setting the characteristic curves for the control levers*, p. 11 - 106.

Risk of accident due to unexpected crane movements!
If assigned more than one function, check whether the *Derricking* control lever function is switched on before you move the control lever for derricking.
This prevents accidents due to unexpected crane movements.

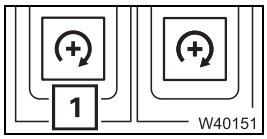


Lowering: • Push the control lever to the right – the main boom is lowered.

Raising: • Push the control lever to the left – the main boom is raised.

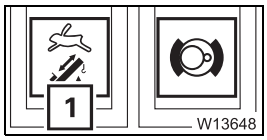
You can regulate the speed by moving the control lever and changing the engine speed with the accelerator.

The maximum derricking speed is automatically reduced as the system length (= main boom length) is increased. If you now reduce the working radius (for example, by retracting the telescoping), the derricking speed will automatically be increased again.



You can adjust the desired engine speed (idling speed) with button (**1**); ➠ p. 10 - 17.

You can limit the maximum derricking speed; ➠ p. 11 - 104.



You can switch on the high-speed mode for a higher speed; ➠ p. 11 - 95.

If the fully retracted boom is in the steepest position and you would like to lower the boom without a load, you can switch to high-speed mode so that the derricking gear can overcome the dead centre more quickly.
For further information on high-speed mode; ➠ p. 11 - 95.

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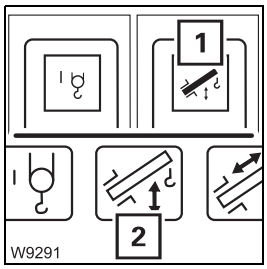
Switching off the derricking gear

If the derricking gear is not required, it should be switched off to avoid unintentional use.



- Press the button (**1**) once.
  - The lamp in the button (**1**) will light up dimly.
  - Symbol (**2**) will be **red** if the derricking gear is switched off.

If the control lever is assigned more than one function, the derricking gear will also be switched off if you switch on another power unit which is assigned to the same control lever movement; ➠ *Control lever configuration*, p. 9 - 17.

Lowering the main boom to a horizontal position

Lowering the boom out of the working range is only released without a load and if there is a rigging table for the current rigging mode.
Enabling is automatic, the rigging tables cannot be entered manually.
The same rigging tables apply to raising outside of the working range.

- Set down the load.

Risk of overturning if the RCL is overridden!
Do not under any circumstances override the RCL. If the RCL shuts down the lowering procedure, the truck crane is in a condition in which the main boom may not be lowered beyond the working range (e.g. the load or working radius is too large).
The truck crane will overturn if you continue to lower the boom with the RCL overridden.

- Lower the main boom.

The RCL switches off the lowering procedure at about 10 – 15° if there are no rigging tables for the current rigging mode. In this case, you must bring the crane into a rigging mode for which a rigging table exists (e.g. retracting, setting down the load, other superstructure position).
All rigging modes for which rigging tables exist can be found in the *Lifting capacity tables*.

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11.3.7 Telescoping mechanism

A telescoping process requires locking and unlocking processes in the main boom. You can telescope the main boom in two ways.

- **Manual telescoping**
  For manual telescoping, you must initiate all locking and unlocking processes at the right time.
- **Telescoping with teleautomation**
  When telescoping with teleautomation, you enter a telescoping value and ECOS controls all the locking and unlocking processes automatically. You may then need to manually telescope to an intermediate length.

With both ways, control is possible on the *ECOS* control unit in addition to the control levers. Here you initiate processes, receive feedback and can monitor the telescoping process.

The *ECOS* display shows various sectional views of the main boom. To make you familiar with these representations more quickly, the following section begins with an overview of the telescoping mechanism and a telescoping process.

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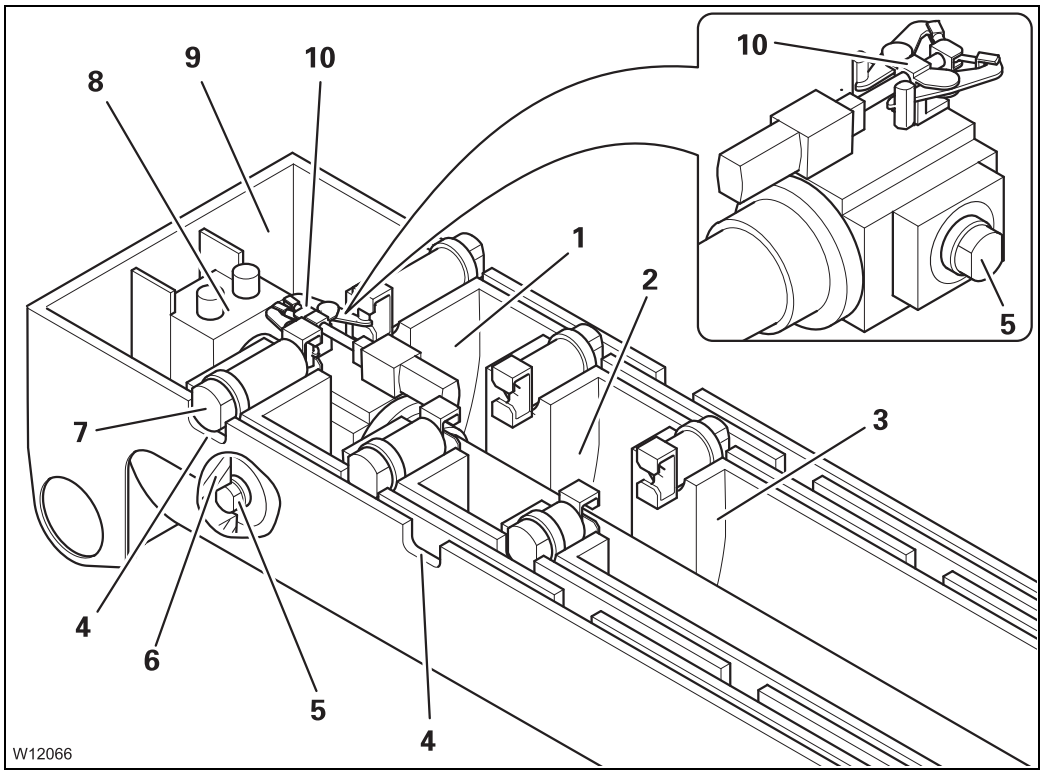
Overview

This illustration shows the completely retracted main boom with the basic section (**9**) and the first three telescopic sections I to III (**1**) to (**3**).



Each telescopic section is equipped with two locking pins (**7**) which are extended by spring force.

The locking pins (**7**) are pushed into the cutouts (**4**) of the telescopic section above at the locking points – the telescopic section is locked.

The telescoping cylinder is attached to the basic section (**9**) via the piston rod (**8**). The telescoping cylinder has two locking pins (**5**) at the bottom and a mechanism at the top (**10**).

When the telescoping cylinder is positioned at a locking point:

– Then the locking pins (**5**) can be extended into the cutouts (**6**) – the telescoping cylinder is locked.
– Then the mechanism (**10**) engages into the locking pins (**7**) and can retract them – the telescopic section is unlocked.

Telescoping process

This state should be the starting point for a telescoping process.
A telescoping processes consist of 4 steps:

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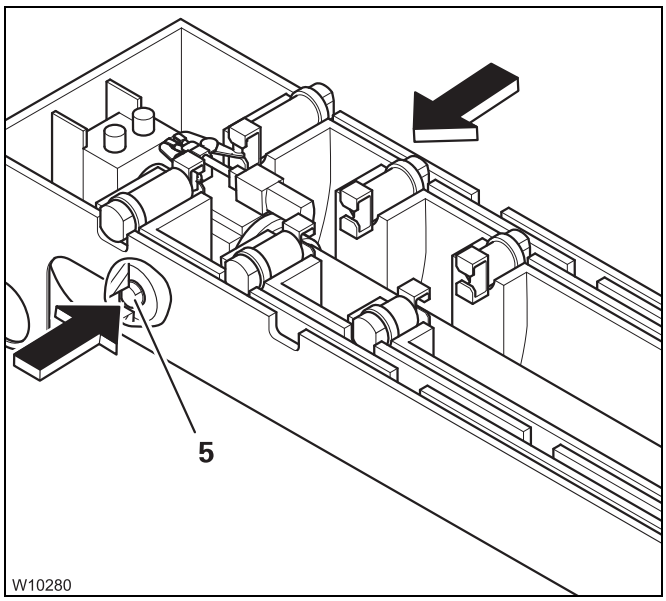
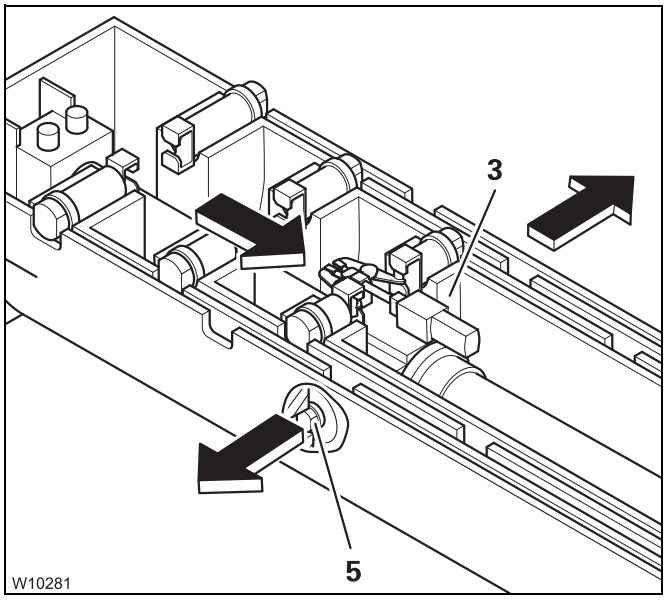


1. unlocking the telescoping cylinder

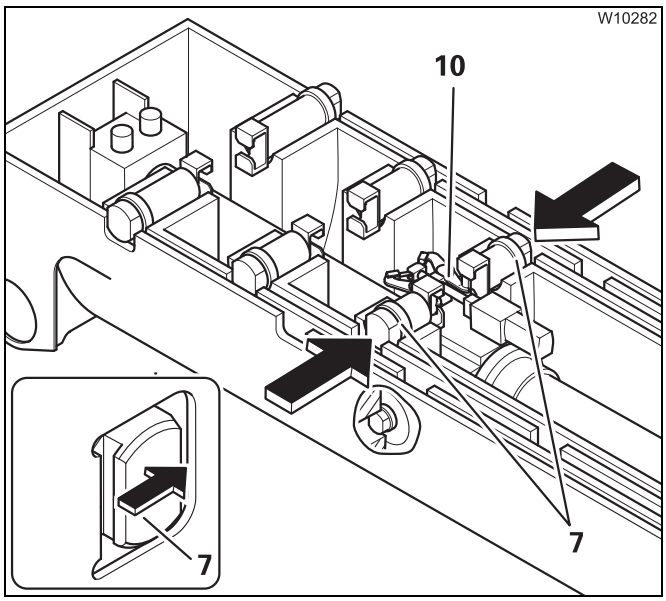
The locking pins (**5**) retract – the telescoping cylinder is unlocked.



2. Moving and locking the telescoping cylinder

The telescoping cylinder moves into the section to be telescoped, for example, telescopic section III (**3**).

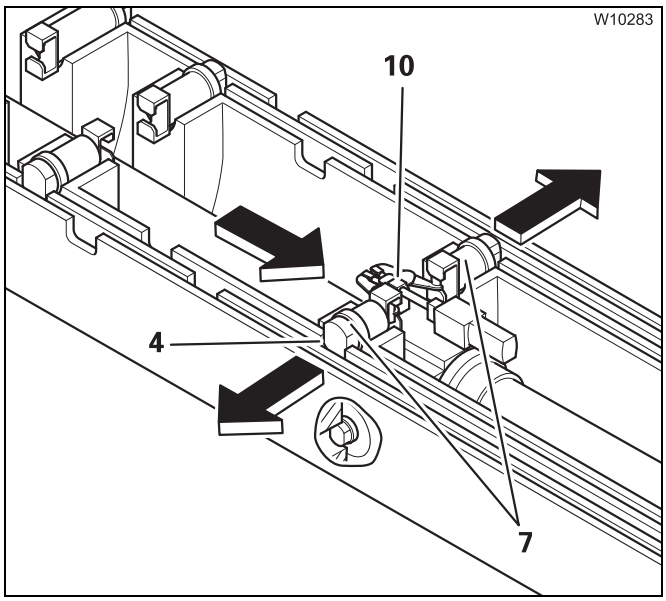
The locking pins (**5**) extend – the telescoping cylinder is locked.



3. Unlocking the telescopic section

The telescoping cylinder extends until the locking pins (**7**) are clear.

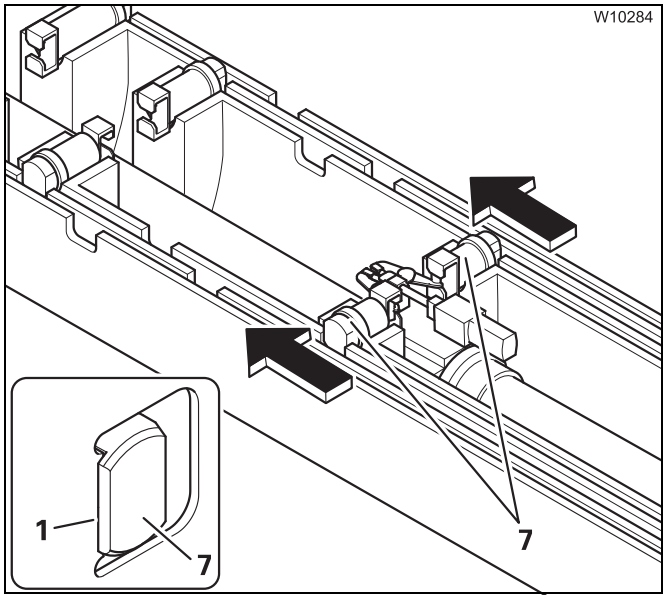
The mechanism (**10**) retracts the locking pins (**7**) – the telescopic section is unlocked.



4. Telescoping, locking and setting down a telescopic section

The telescoping cylinder pushes the telescopic section to a locking point.

The weight is taken off the mechanism (**10**). The locking pins (**7**) extend into the cutouts (**4**).



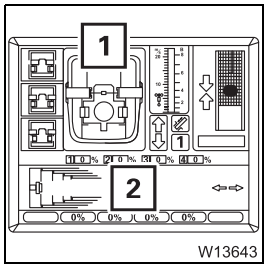
The telescopic section is automatically set down.

The telescoping cylinder retracts until the locking pins (**7**) are positioned on the above telescopic section (**1**).

The weight of the load is now on the telescopic sections and not on the telescoping cylinder.

Assignment for display

The *Telescoping* submenu of the *ECOS* display shows two sectional views of the main boom.



1 Sectional view from the rear

2 Sectional view from above

The following elements are displayed.

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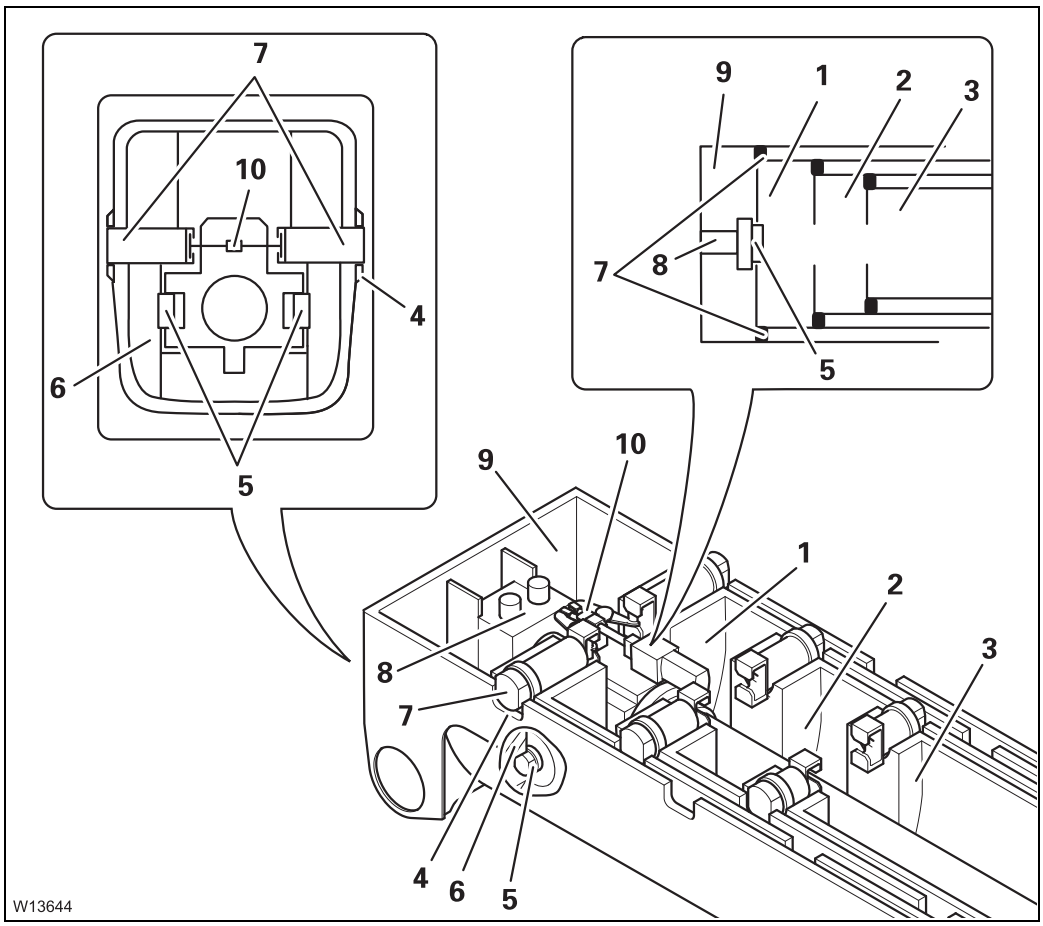

1 Telescopic section I
2 Telescopic section II
3 Telescopic section III
4 Cutouts
5 Locking pins on the telescoping cylinder
6 Cutouts
7 Locking pin on the telescopic section
8 Telescoping cylinder (piston rod)
9 Basic section
10 Mechanism

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Fixed length, intermediate length, telescoping length

There are lifting capacity tables for main boom fixed lengths, main boom intermediate lengths and main boom telescoping lengths.
The lengths are automatically detected by the RCL, and the corresponding lifting capacities according to the *Lifting capacity tables* are enabled and displayed automatically.

Main boom fixed length

Main boom fixed lengths have the greatest lifting capacity. A main boom fixed length is reached if:
– All telescopic sections are locked to a fixed length
– All telescopic sections are set down.

Main boom intermediate length

A main boom intermediate length is reached if not all telescopic sections are locked to fixed lengths.
Extend the main boom to the required length before hoisting the load!
You cannot telescope the boom with the specified lifting capacities for main boom intermediate lengths.

Main boom telescoping length

The main boom is at a telescoping length if it is extended to an intermediate length and may be telescoped with the current load. The size of the load that can be telescoped depends on the angle of inclination and on the degree of lubrication of the main boom.

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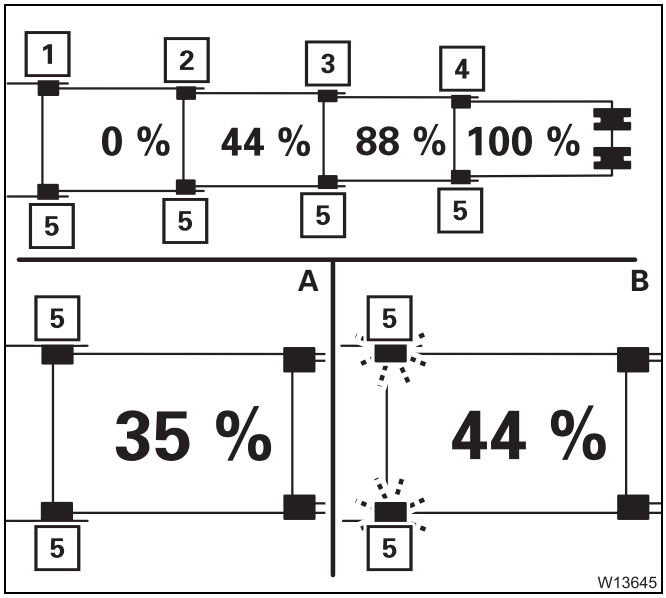
Telescoping

The position of the telescopic sections, i.e. which telescopic section is extended to what extent, is referred to as telescoping.

This section only deals with the displays on the RCL. The telescoping is also shown on the *ECOS* display; ➠ p. 11 - 87.

The RCL displays main boom fixed lengths and main boom intermediate/ telescoping lengths in different ways.



Fixed lengths

Possible fixed lengths are 0%, 44%, 88% and 100%.

The locking pins (**5**) are green.

Intermediate lengths

A Locking pins (**5**) are black – e.g. at 35%.

B Locking pins (**5**) are flashing – e.g. at 44% and the telescopic section is
– unlocked or
– not set down.

Telescoping sequence

The telescopic sections can only be telescoped individually, one after the other.

When **extending** you must always extend the telescopic section with the highest numbering first, then the telescopic section with the next lower numbering, etc. (e.g. IV, III, II, I).

The telescopic sections are always **retracted** in the reverse order of extending.

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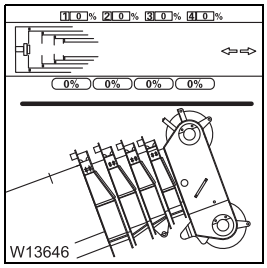
Checks before starting work

When the ignition is turned on, ECOS registers the displayed telescoping status from the current status of the telescoping mechanism and the previously saved locking and unlocking procedures.

Normally, ECOS detects differences between the current and the displayed telescoping and displays the corresponding error message; ➠ *Telescoping mechanism error messages*, p. 14 - 22.

If a **malfunction** results in values being deleted, ECOS can no longer calculate the current telescoping and will not issue an error message.

Risk of damage to the telescoping mechanism!
Before telescoping the first boom, always check whether the *ECOS* display indicates the current telescoping.
This prevents the telescoping mechanism being damaged when telescoping.



- Before telescoping the first boom, compare the telescoping shown on the *ECOS* display with the current telescoping

If the current telescope status is not correctly displayed, enter the current telescope status; ➠ *Entering the current telescoping*, p. 14 - 57.

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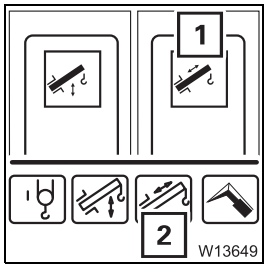
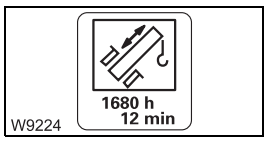
Switching on the telescoping mechanism

After the ignition is switched on, all of the power units will be switched off and the lamps in the corresponding buttons will light up only dimly.



- Press the button (**1**) once.
  - The lamp in button (**1**) will light up brightly.
  - The symbol (**2**) will be **green** if the telescoping mechanism is switched on.

If the control lever is assigned more than one function, all other power units which are assigned the same control lever movement are switched off; ➠ *Control lever configuration*, p. 9 - 17.



You can display the operating hours of the telescoping mechanism; ➠ p. 11 - 109.

Function of the control lever

This section only describes the function of the control lever. Before telescoping, a number of prerequisites need to be fulfilled as well:

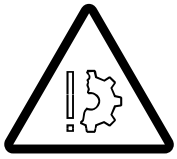
– Before manual telescoping; ➠ p. 11 - 78.

– Before telescoping with teleautomation; ➠ p. 11 - 89.

You can adjust the sensitivity of the control levers to suit the operating conditions; ➠ *Setting the characteristic curves for the control levers*, p. 11 - 106.

Risk of accident due to unexpected crane movements!
In the case of multiple configuration, check that the control lever *Telescoping* function is switched on before you move the control lever for telescoping. This prevents accidents caused by unexpected derricking!

Risk of accidents due to incomplete monitoring!
Boom extension will only be monitored completely if
– The lifting limit switch is correctly rigged; ➠ p. 12 - 112
– The lifting limit switch is not overridden; ➠ p. 11 - 61.



Risk of damage to the hoist rope
The rope can become slack if the hook block touches the ground during retraction operations. Rope loops will form, which can cause the load to slip and damage the hoist rope.

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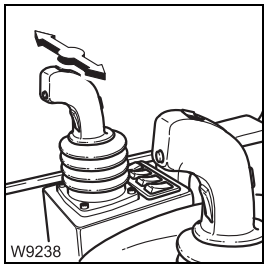
The distance between the hook block and the boom head changes during telescoping. Ensure that the hook block does not trigger the lifting limit switch or touch the ground.

- Additionally carry out the following movements
  - *Lower hoist* when extending and
  - the *Raise hoist* movement when retracting.

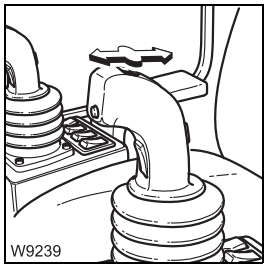
The control lever movements for telescoping vary depending on the configuration.



– With telescopic extension on the right-hand side

To extend: • Push the control lever to the right.

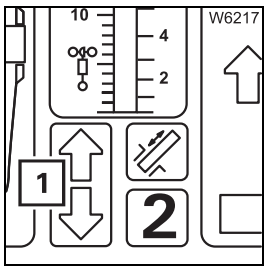
To retract: • Push the control lever to the left.



– With telescopic extension on the left-hand side

To extend: • Push the control lever forwards.

To retract: • Pull the control lever backwards.



Telescoping starts only if the arrow (**1**) for the selected telescoping direction is **green**.
If the arrow is red, extension operations are disabled in the indicated direction. This may have different causes, e.g. the telescopic section being in final position, a lifting limit switch shutdown, a malfunction etc.

You can regulate the speed by moving the control lever and changing the engine speed with the accelerator.

With certain telescoping states, the RCL will switch telescoping off, e.g. when you leave the telescoping lengths or when the working range limit has been reached; ➠ *RCL shutdown*, p. 11 - 36.

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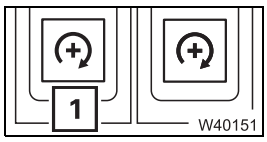
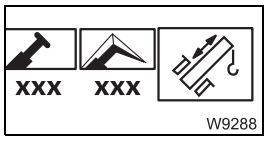
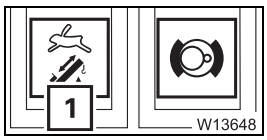


You can adjust the desired engine speed (idling speed) with button (**1**); ➠ p. 10 - 17.



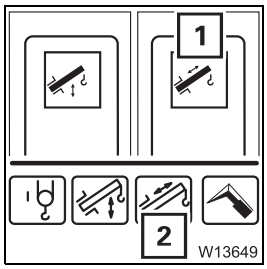
You can limit the maximum telescoping speed in the *Power unit speeds* submenu; ➠ p. 11 - 104.



You can switch on the high-speed mode for a higher speed; ➠ p. 11 - 95.

Switching off the telescoping mechanism

If the telescoping mechanism is not required, it should be switched off to avoid unintentional use.



- Press the button (**1**) once.
  - The lamp in the button (**1**) will light up dimly.
  - The symbol (**2**) **red** if the telescoping mechanism is switched off.

If the control lever is assigned more than one function, the telescoping mechanism will also be switched off if you switch on another power unit which is assigned to the same control lever movement; ➠ *Control lever configuration*, p. 9 - 17.

Manual telescoping

To telescope manually, you must initiate all locking and unlocking processes. The locking and unlocking processes are carried out automatically.

The following sections describe the operating procedures:

– Checking the initial position

– Unlocking the telescoping cylinder; ➠ p. 11 - 81

– Moving the telescoping cylinder (without telescopic section); ➠ p. 11 - 83

– Locking the telescoping cylinder; ➠ p. 11 - 84

– Unlocking a telescopic section; ➠ p. 11 - 85,

– Telescoping a telescopic section; ➠ p. 11 - 87

– Locking a telescopic section; ➠ p. 11 - 88

The operating order depends on the current initial position. For an overview of a telescoping process (example); ➠ p. 11 - 68.

The lengths given in the following illustrations are purely sample values, and may differ from the current display.

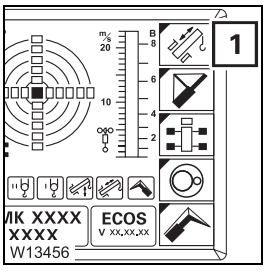
Checking the initial position

Before telescoping, you must check the following statuses:

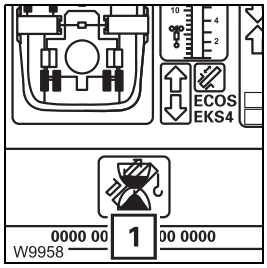
– **Current telescope status**

– **Position of the telescoping cylinder**

– **Position of the locking pins**



• If necessary, open the main menu Esc and press the button (**1**) once.



The *Telescoping* submenu opens.

If an "error" (**1**) is indicated, all operating elements will be disabled; ➠ *Telescoping mechanism error messages*, p. 14 - 22.

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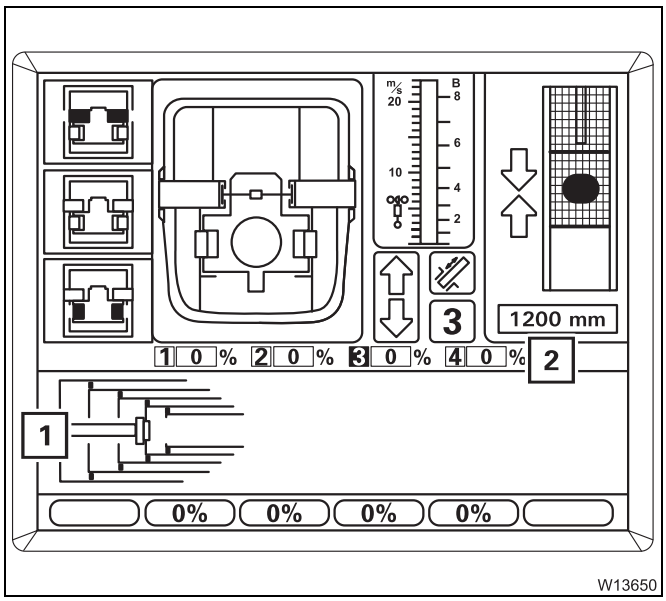
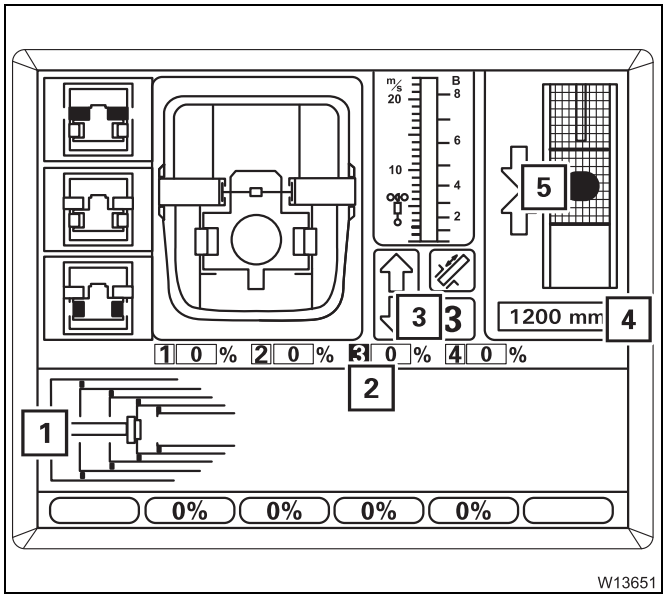


Current telescoping

The display (**2**) shows the current telescoping in per cent for each telescopic section.

The display (**1**) shows a diagram of the current telescope state.



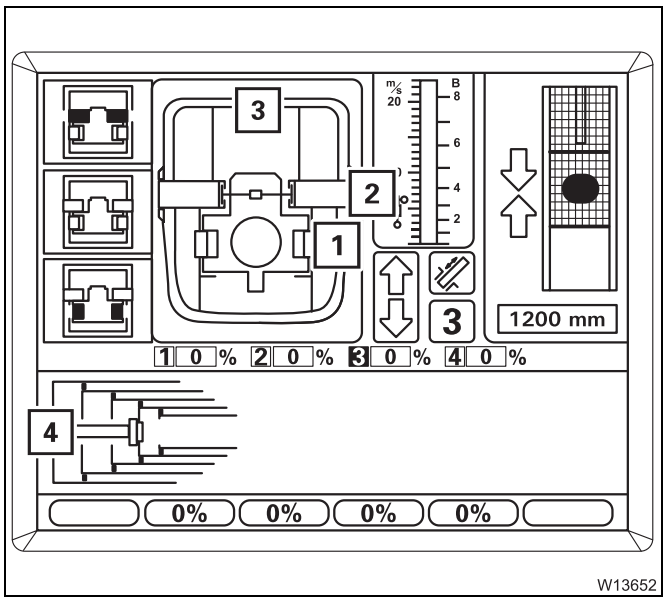
Position of the telescoping cylinder

The display (**4**) shows how far the telescoping cylinder is extended, e.g. 1,200 mm (3.93 ft).

If the telescoping cylinder is near a locking point:

– The display (**3**) shows the corresponding telescopic section, e.g. telescopic section III.
– The display (**2**) shows the corresponding telescopic section – number is **green**,
– The display (**5**) shows one or two arrows, depending on the distance to the locking point.

The display (**1**) shows a top view of the current position.



Position of the locking pins

The display (**3**) shows the current positions of the locking pins

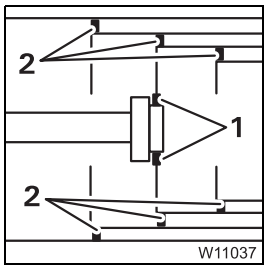
1 On the telescoping cylinder

2 On the telescopic section.

The current settings are shown in different colours.

– **Red:** Unlocked
– **Green:** Locked
– **Yellow:** Intermediate position

The display (**4**) shows the same settings:



1 Locking pins on the telescoping cylinder

2 Locking pins on the telescopic sections

The settings are shown as follows:

– **Green:** Locked
– **No display:** Unlocked or intermediate position

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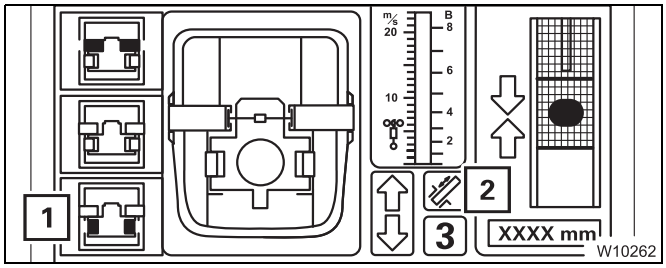
Unlocking the telescoping cylinder

Unlocking the telescoping cylinder is required for the telescoping cylinder to be moved separately (without telescopic section).

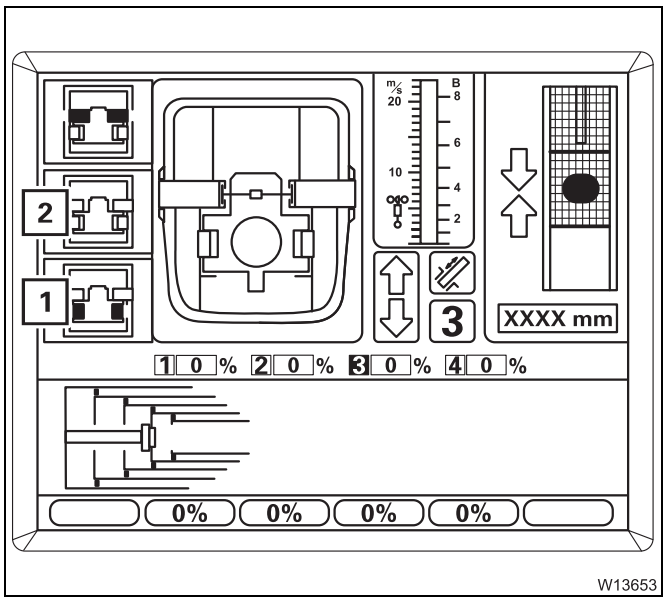
The telescoping cylinder and the telescopic section cannot be unlocked simultaneously.



Prerequisites

– Telescoping mechanism on – symbol (**2**) is green

– Telescoping cylinder locked – symbol (**1**) is grey



To select unlock

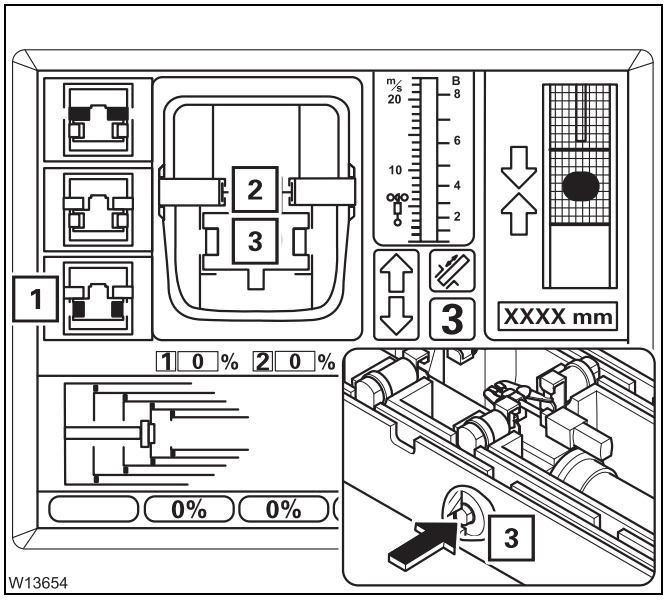
• Press the button (**1**) once.

– If the telescopic section is locked: Symbol (**1**) will flash – *Unlock telescoping cylinder* is selected.

– If the telescopic section is unlocked: Symbol (**2**) will flash – the following is selected:

1. *Locking the telescopic section*
2. *unlocking the telescoping cylinder*

In the next step, both selections are carried out one directly after the other.



Unlocking the telescoping cylinder

• Move the control lever for telescoping.

If required, extend the locking pins (**2**) first.

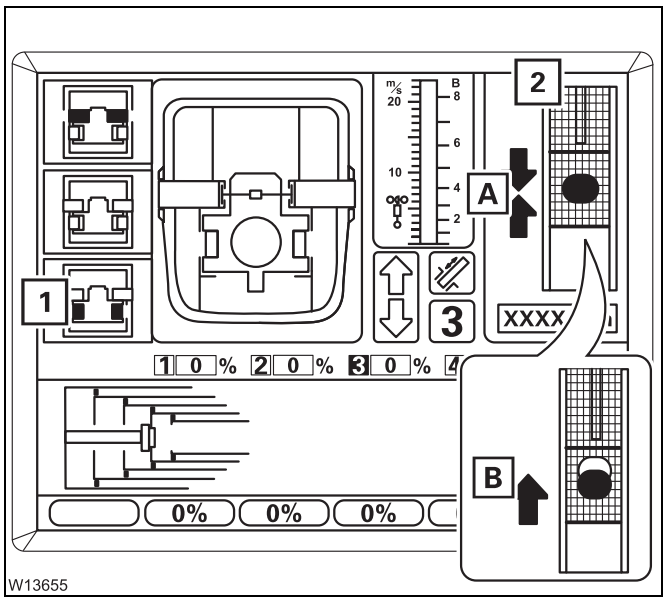
The locking pins (**3**) retract.

– **Yellow:** Intermediate position

– **Red:** Unlocked

In the *Unlocked* position, symbol (**1**) will be yellow.

If the control lever is moved, the telescoping cylinder will move immediately.



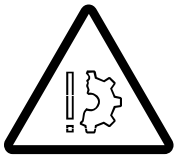
If symbol (**1**) is still flashing after approx. 10 seconds, this means that the locking pins are under load.

- Release the control lever.

The display (**2**) shows which movement you need to carry out to take the load off:

– **A:** Retract

– **B:** Extend



Risk of damage to the boom system!
If extending and retracting several times does not lead to the lock being released, you must not telescope any further against the stop.

If removing the load does not cause the lock to be released, you must lock the telescoping cylinder (➠ p. 11 - 84) and then restart unlocking.

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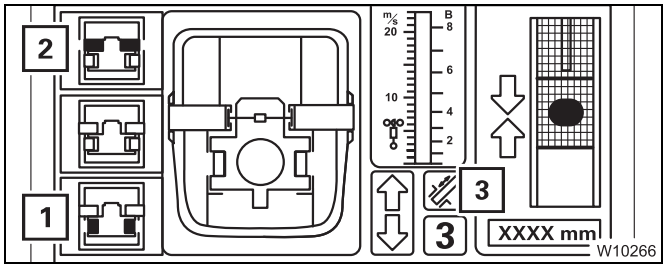
Extending/ retracting the telescoping cylinder

Operating the telescoping cylinder (without telescopic section) is required when the telescoping cylinder needs to be moved into a different telescopic section.

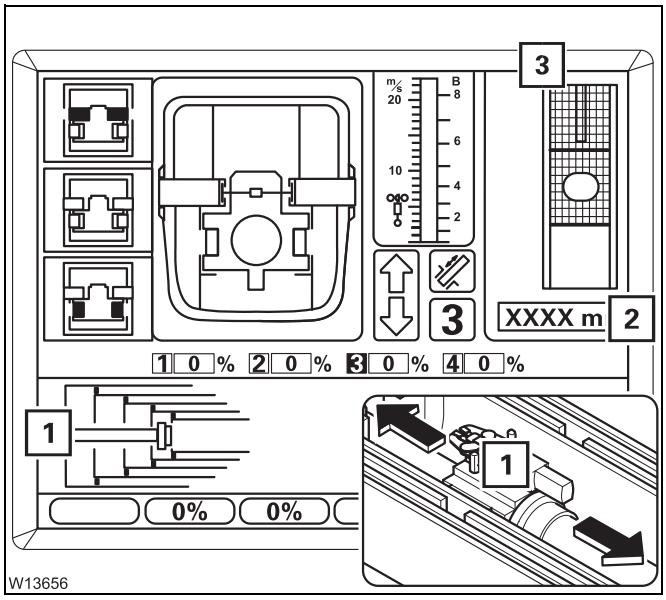


Prerequisites

– Telescoping mechanism on – symbol (**3**) is green

– Telescopic section locked – symbol (**2**) is grey

– Telescoping cylinder unlocked – symbol (**1**) is yellow



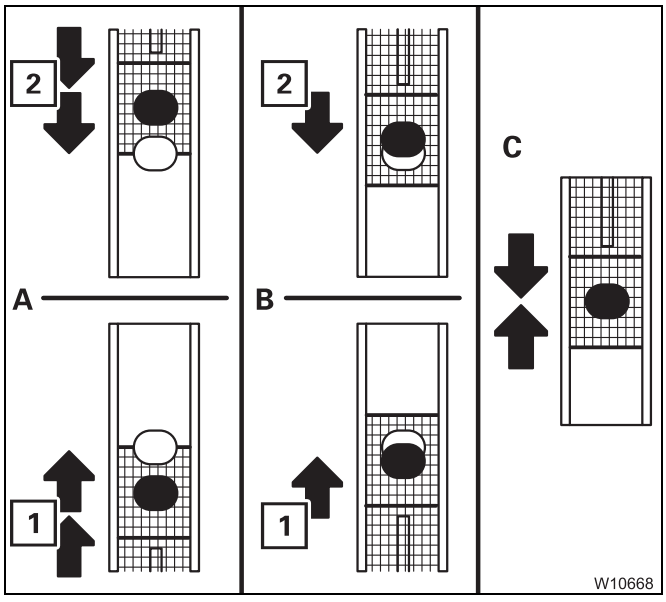
Extend/Retract

- Move the control lever in the corresponding telescoping direction:
  - **Extend:** Extend
  - **Retract:** Retract

The telescoping cylinder (**1**) extends/retracts.

The display (**2**) shows the currently extended length, e.g. 1,500 mm (4.92 ft).

Near a locking point, the display (**3**) shows:



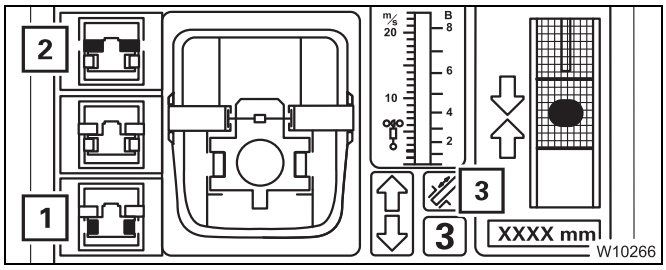
– The distance to the locking point
  - **A** Yellow: approx. 1 m (3.3 ft)
  - **B** Yellow Less than 1 m (3.3 ft)
  - **C** Green: At the locking point

and

– The direction of travel to the locking point:
  - **1** Extending
  - **2** Retracting

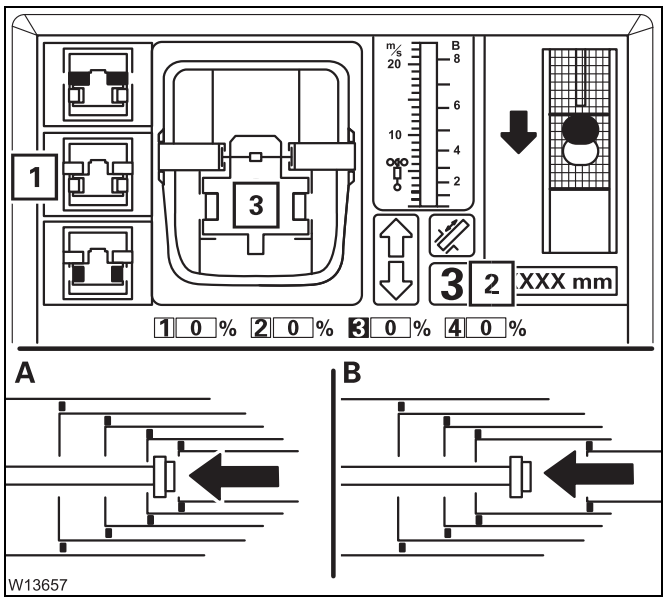
Locking the telescoping cylinder

The telescoping cylinder must be locked to a telescopic section so that the telescopic section can be telescoped.



Prerequisites

– Telescoping mechanism on – symbol (**3**) is green
– Telescopic section locked – symbol (**2**) is grey
– Telescoping cylinder unlocked – symbol (**1**) is yellow



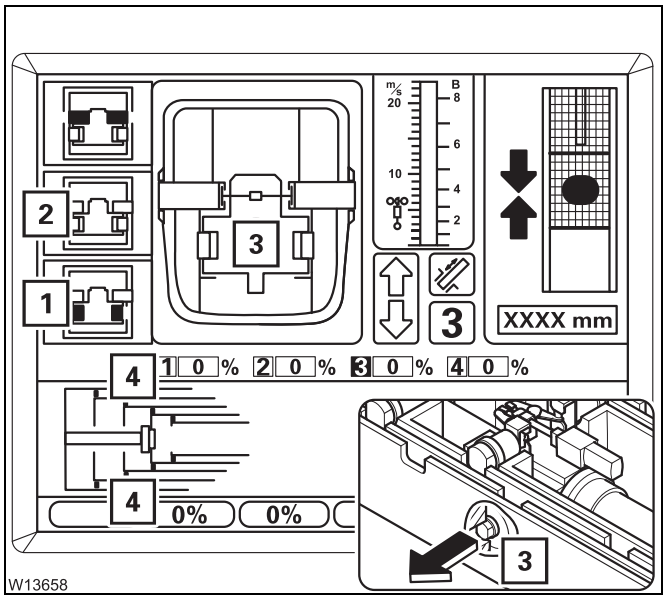
To select lock

• Move the telescoping cylinder to the desired locking point, e.g. to telescopic section III.

Wait until the display (**2**):

– (**A**) shows the desired telescopic section
– (**B**) shows no telescopic section and the desired locking point is reached next

• Press the button (**1**) once.
Symbol (**1**) will flash – *Lock telescoping cylinder* is selected.



Locking the telescoping cylinder

• Move the control lever until locking is complete.

The locking pins (**3**) extend at the locking point.

– **Yellow:** Intermediate position
– **Green:** Locked

In *Locked* position:

– Symbol (**1**) is yellow
– Symbol (**2**) is grey
– The locking pins (**4**) are green.

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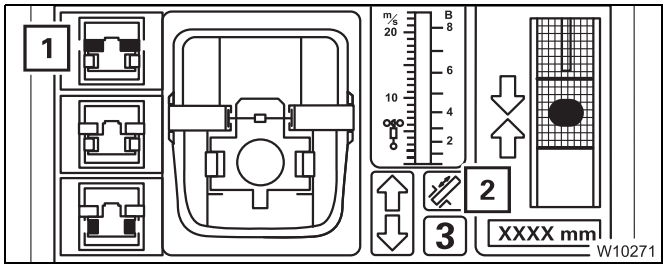
Unlocking the telescopic section

Unlocking a telescopic section is required for the telescopic section to be telescoped.

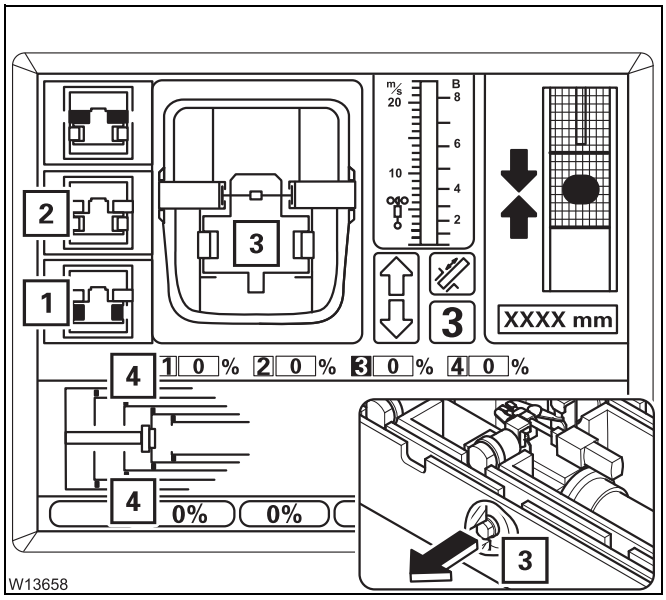
The telescoping cylinder and the telescopic section cannot be unlocked simultaneously.



Prerequisites

– Telescoping mechanism on – symbol (**2**) is green

– Telescopic section locked – symbol (**1**) is grey



To select unlock

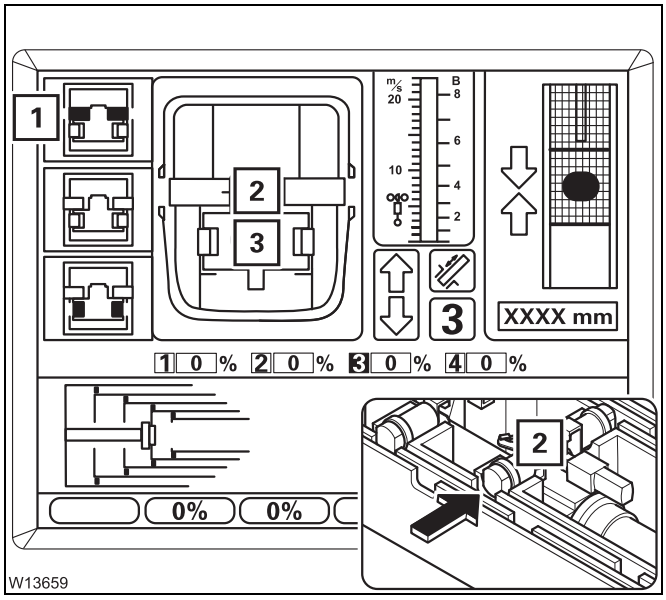
• Press the button (**1**) once.

– If the telescoping cylinder is locked: Symbol (**1**) will flash – *Unlock telescopic section* is selected.

– If the telescoping cylinder is unlocked: Symbol (**2**) will flash – the following is selected:

1. *Locking the telescoping cylinder*
2. *Unlocking the telescopic section*

In the next step, both selections are carried out one directly after the other.



Unlocking the telescopic section

• Move the control lever for telescoping.

If required, extend the locking pins (**3**) first.

The locking pins (**2**) retract.

– **Yellow:** Intermediate position

– **Red:** Unlocked

In the *Unlocked* position, symbol (**1**) will be yellow.

If the control lever is moved, the telescopic section will immediately be telescoped.

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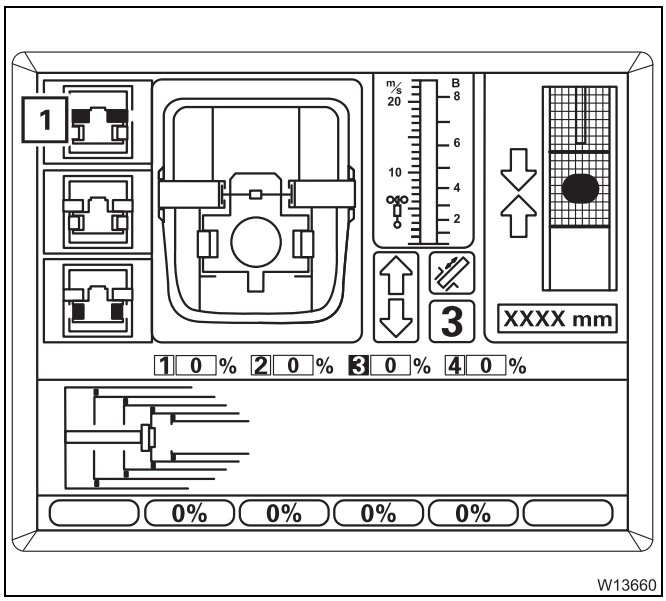

If symbol (**1**) is still flashing after approx. 10 seconds, this means that the locking pins are under load.

- Release the control lever.

To relieve the load, carefully retract and extend a little bit.

Risk of damage to the boom system!
If extending and retracting several times does not lead to the lock being released, you must not telescope any further against the stop.

If removing the load does not cause unlocking, you must lock the telescopic section (➠ p. 11 - 88) and restart unlocking.

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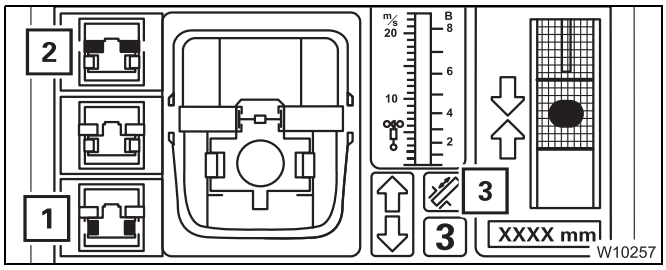
Telescoping the telescopic section

You can telescope the telescopic section once it is unlocked.

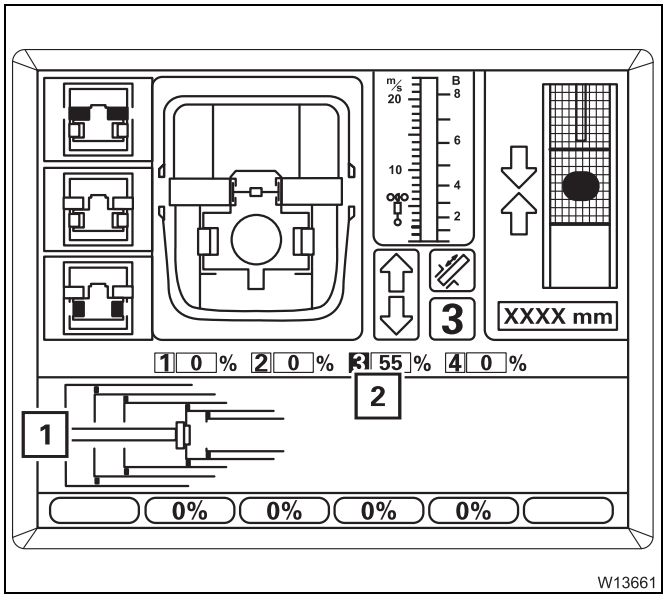


Prerequisites

– Telescoping mechanism on – symbol (**3**) is green

– Telescoping cylinder locked – symbol (**1**) is grey

– Telescopic section unlocked – symbol (**2**) is yellow



Telescoping

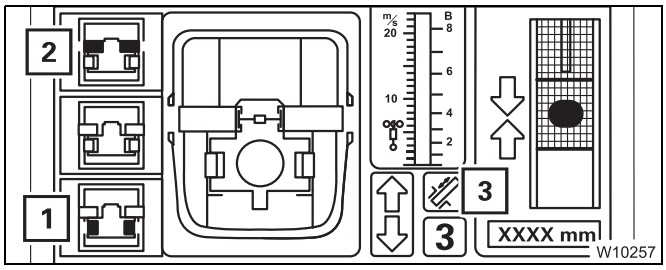
• Move the control lever in the desired telescoping direction.

The display (**2**) shows the currently extended length (telescoping), e.g. 55% for telescopic section III.

The current telescope diagram on the display (**1**) will change continually.

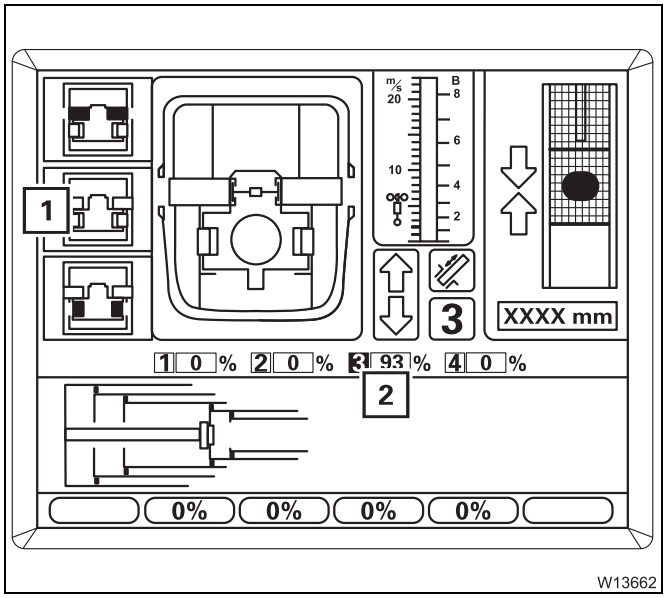
Locking the telescopic section

Every telescopic section can be locked at the fixed lengths – fixed lengths; ➠ p. 11 - 72.



Prerequisites

– Telescoping mechanism on – symbol (**3**) is green
– Telescopic section unlocked – symbol (**2**) is yellow
– Telescoping cylinder locked – symbol (**1**) is grey.

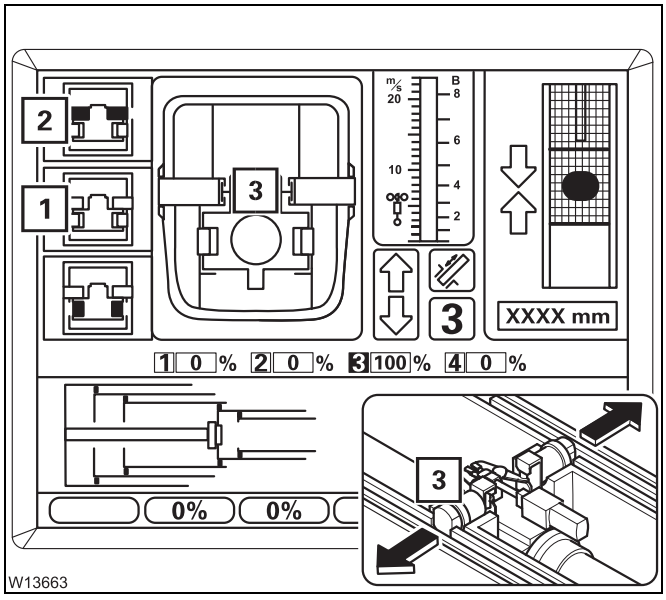


To select lock

• Telescope to the desired fixed length, e.g. telescopic section III to 100%.

If necessary, wait until the telescopic section moves past a non-desired fixed length by approx. 5%, e.g. at 93% – display (**2**).

• Press the button (**1**) once.
Symbol (**1**) flashes – *Lock telescopic section* is selected.



Locking the telescopic section

• Move the control lever until locking is complete.

The locking pins (**3**) extend at the locking point.

– **Yellow**: Intermediate position
– **Green**: Locked

The telescopic section is set down; ➠ p. 11 - 70.

In *Locked* position:

– Symbol (**1**) is yellow
– Symbol (**2**) is grey.

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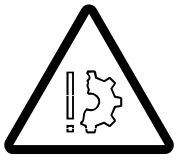

Risk of damage to the telescoping cylinder!
Move the control lever until the telescopic section is locked **and set down** – the symbol ▣ must be yellow.
This prevents the load from exerting pressure on the telescoping cylinder and allow the load to be enabled for fixed lengths.

Locking the telescopic section for on-road driving

Once you have retracted the main boom for on-road driving, you must lock the telescoping cylinder in telescopic section I so that the axle loads are in accordance with the values in the *Driving mode* table; ➠ *Driving modes*, p. 6 - 1.

If telescopic section I was the last telescopic section to be retracted, you can select locking directly.

If another telescopic section was retracted last, you must do the following before selecting locking:
– Unlock the telescoping cylinder; ➠ p. 11 - 81,
– Move the telescoping cylinder into telescopic section I; ➠ p. 11 - 83 and
– lock the telescoping cylinder; ➠ p. 11 - 84.

Telescoping with teleautomation

When telescoping with teleautomation, you enter the desired fixed lengths and then move the control lever in the required direction. Switching between the telescopic sections is carried out automatically by ECOS.

If the desired telescoping status is not a fixed length, you can first telescope to the next closest fixed length with the teleautomation and then telescope further to the desired length manually.

- Switch the telescoping mechanism on and open the *Telescoping* submenu; ➠ p. 11 - 75.

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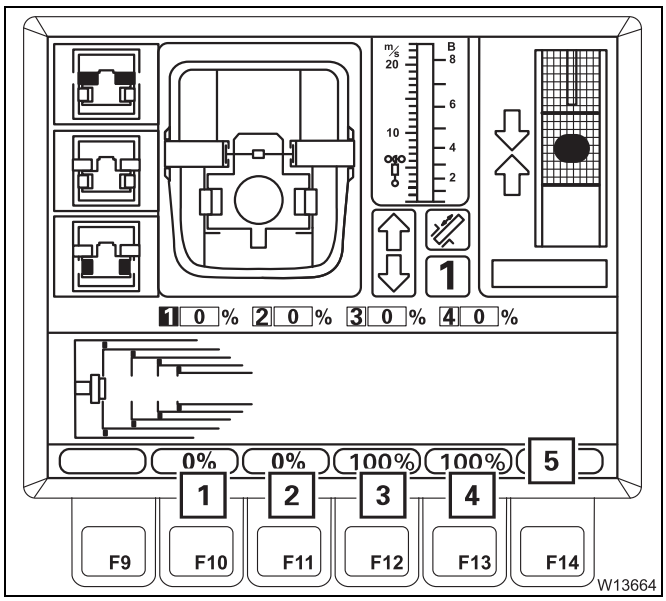


Switching on input mode

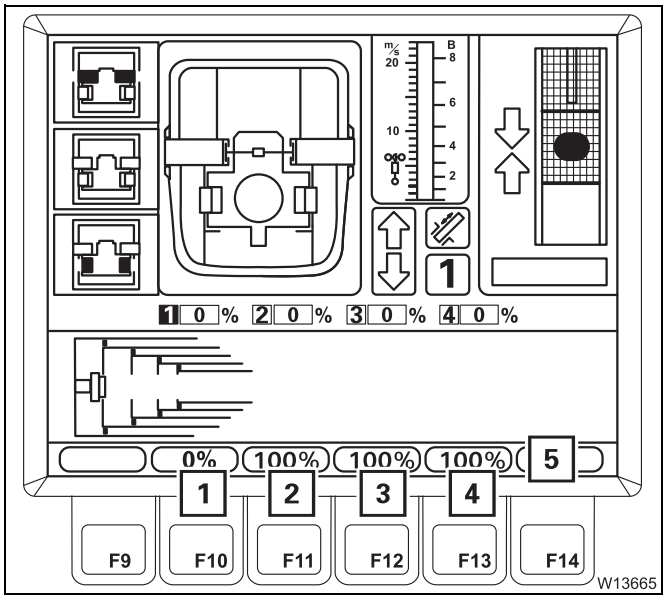
The display (**6**) shows the set values for all telescopic sections.
The values are displayed in **red** if teleautomation is switched off.
No values are shown if the teleautomation is disabled.

- Press one of the buttons (**1**) to (**4**).

The values in the display (**5**) turn **yellow**.

Input mode is now switched on.

You can exit the input mode with the button Esc.
The values in the display (**5**) turn **red**.

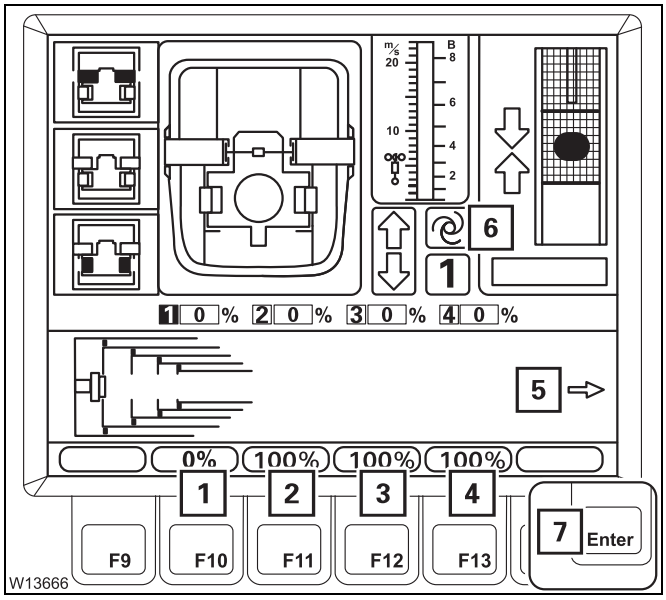


Entering target values

- Press one of the buttons (**1**) to (**4**).

Each time you press a button, the corresponding value in the display (**5**) switches continuously between the fixed lengths.

- Enter the desired set values for all telescopic sections, e.g. 0%, 100%, 100%, 100%.
- Press button Enter once.
  The entered set values are confirmed.



If the entered set values are **not permissible**, the values on the display (**3**) turn **red**.
Teleautomation remains switched off.

If the entered set values are **permissible**, the values on the display (**3**) turn **green**.

– The symbol (**1**) is displayed and teleautomation is switched on.
– The display (**2**) shows the telescoping direction for the teleautomation start, e.g. the arrow pointing to the right, for *Extending*.

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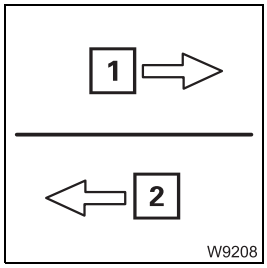
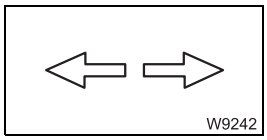
Telescoping

- Move the control lever for the displayed telescoping direction.



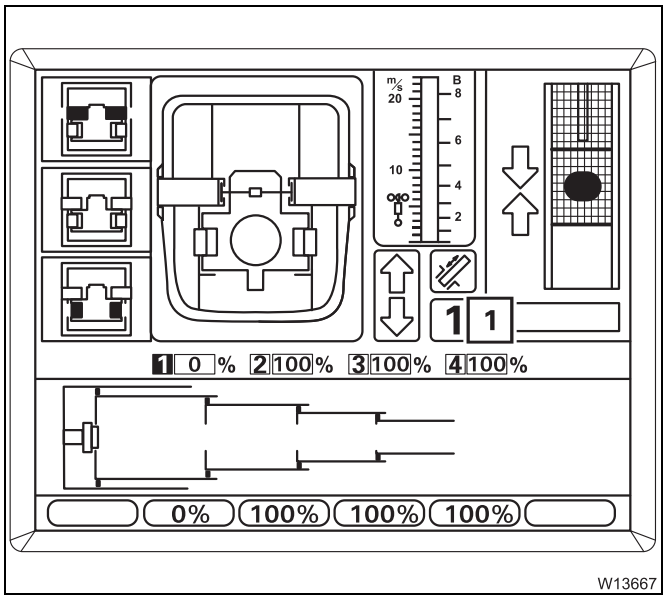
– The arrow (**1**) for the indicated telescoping direction flashes if you move the control lever in the wrong direction.

– If you move the control lever in the correct direction, ECOS telescopes automatically until the direction has to be changed. Then the arrow (**2**) for the new telescoping direction is indicated, e.g. for *Retracting*.



– In the case of empty trips of the telescoping cylinder (without telescopic section), both arrows are displayed. Empty trips are automatically performed in both directions, irrespective of the control lever movement.

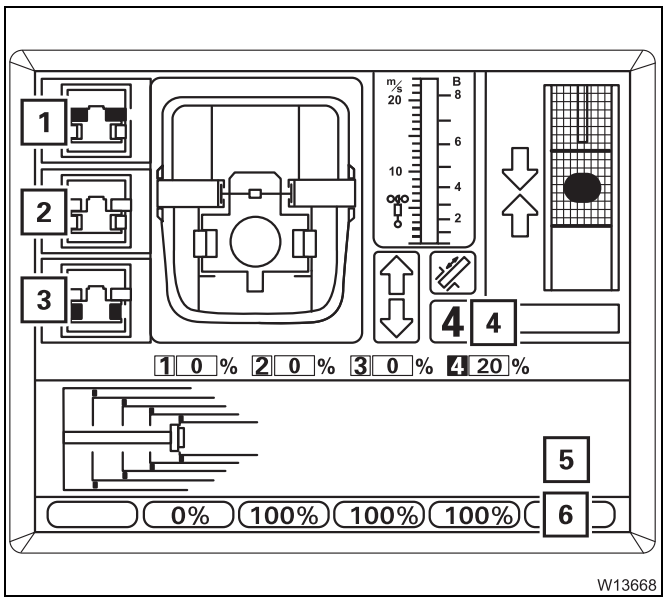
You can regulate the speed for telescoping in the same way as for manual telescoping.



The telescoping process stops when the entered set values are reached.

- Move the control lever to its initial position.

The display (**1**) appears. Teleautomation is switched off.



Cancelling teleautomation

- Press one of the buttons (**1**), (**2**) or (**3**) once.

The telescoping process is stopped:

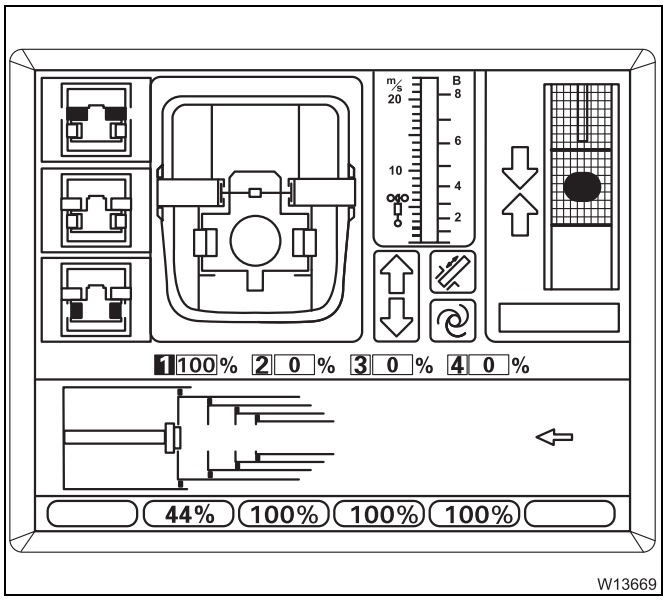
– The display (**5**) goes out,

– the display (**4**) appears,

– The values in the display (**6**) are **red**.

Teleautomation is now switched off.

Example of telescoping with teleautomation



Assuming the current telescoping is 100/0/0/0 and the telescoping cylinder is locked in telescopic section I.
The desired telescoping status should be 44/100/100/100.
The display should correspond to the opposite diagram once you have entered the desired telescope status and confirmed it.

ECOS will calculate the following telescoping sequence:

– Telescopic section I	Retract	to 0%
– Telescopic section IV	extend	to 100%
– Telescopic section III	extend	to 100%
– Telescopic section II	extend	to 100%
– Telescopic section I	extend	to 44%

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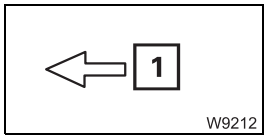
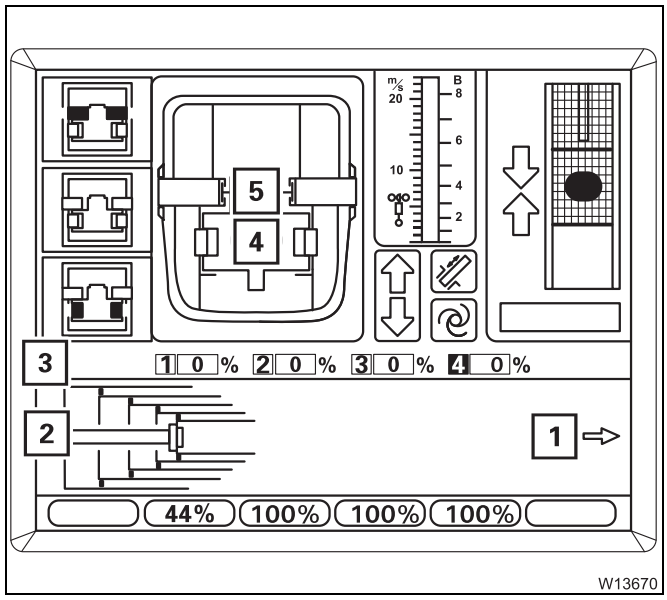


Since the first step is retracting, the arrow (**1**) points to the left.

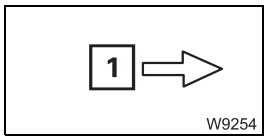
- Move the control lever to retract and hold it.

Telescopic section I is fully retracted. The following processes are carried out automatically for this.



1. Retract telescopic section I – display (**3**) 0%
2. Lock telescopic section I – pins (**5**) green
3. Unlock telescoping cylinder – pins (**4**) are red
4. The telescoping cylinder moves into telescopic section IV – display (**2**)
5. Lock telescoping cylinder – pins (**4**) are green

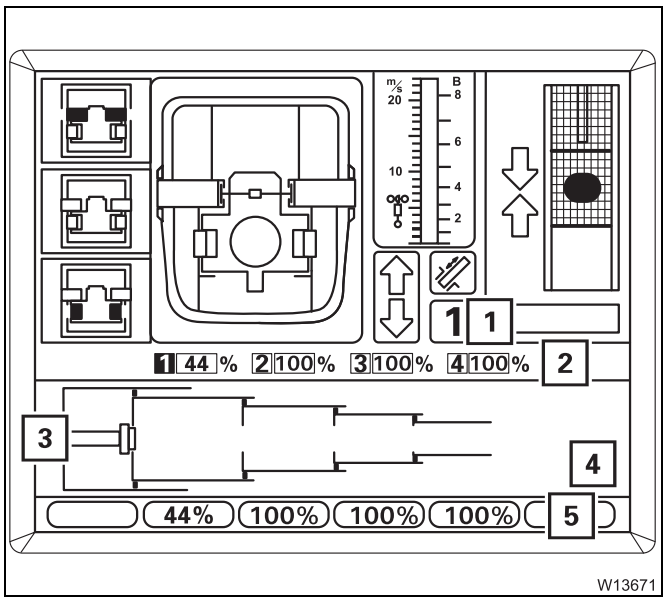
The arrow (**1**) shows the new telescoping direction – extending.



The arrow (**1**) flashes as long as you are still holding the control lever to retract.

- Move the control lever for extending and hold it there.

ECOS now automatically telescopes telescopic sections IV, III and II to the full extent and stops when telescopic section I reaches the set value of 44%.



- Move the control lever to its initial position.

– The display (**4**) goes out.

– The display (**1**) is active again.

– The values in the display (**5**) are **red**.

– The display (**2**) shows the current telescoping, e.g. 44/100/100/100.

– The display (**3**) shows the current telescoping.

Teleautomation is switched off.

To extend telescopic section I to 60%, for example, you can now further extend this telescopic section manually.

Telescoping the main boom when horizontal

- Lower the main boom into a horizontal position; ➠ p. 11 - 66.

The RCL will automatically switch to the corresponding rigging table. This table specifies the maximum permissible telescoping at which extending will be switched off (shutdown values ➠ *Lifting capacity table*).

- Set down the load.
- Extend the main boom only until the RCL switches off the extension procedure.

If you continue to extend the main boom after an RCL shutdown, you may enter ranges in which you can neither perform retraction operations nor raise the boom.

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11.3.8 High-speed mode

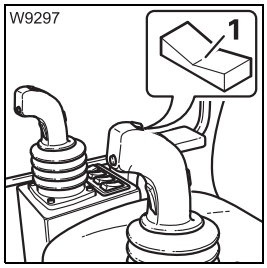
The slewing gear cannot be operated in high-speed mode.

You can switch on the high-speed mode for a higher speed.

Risk of accidents due to suddenly accelerating movements!
Reduce the engine speed before starting high-speed mode.
This will prevent movements becoming excessively accelerated, which may result in the truck crane starting to sway and overturning.

Derricking gear/ telescoping mechanism

High-speed mode is always switched on and off for the derricking gear and the telescoping mechanism at the same time.

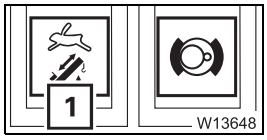


To switch on briefly

- Press button (**1**) down on the right – inwards.
  High-speed mode will be active until you release the button.

Continuous operation

- Press button (**1**) down on the left – outwards.
  High-speed mode will be enabled until you press the button again.



The lamp (**1**) indicates the current status:

On:	High-speed mode switched on
Off:	High-speed mode switched off

When lowering the boom, high-speed mode only supports the start of the derricking procedure from steep boom positions. It does not increase the derricking speed.

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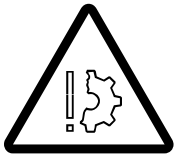
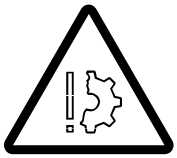
Hoists

The main hoist and auxiliary hoist are always switched simultaneously to high-speed mode.

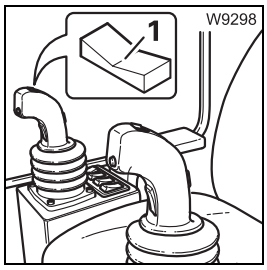
Risk of accidents due to overloading!
Make sure the lifted load is no more than 50% of the maximum load according to the *Lifting capacity table* (maximum degree of utilisation of 50%) before operating the hoisting gears in high-speed mode.



Danger of slack rope with a lightweight hook block!
If you switch on high-speed mode at high speeds, a light hook block will not be able to keep the hoist rope taut if it is hoisted up high with a small number of reevings and a large boom length.



Danger of slack rope with large number of reevings
If you switch on high-speed mode with a large number of reevings and without a load, slack rope may form because the hook block is lowered too slowly due to the high degree of friction.

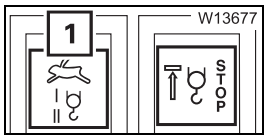


To switch on briefly

- Press button (**1**) down on the left – inwards.
  High-speed mode will be active until you release the button.

Continuous operation

- Press button (**1**) down on the right – outwards.
  High-speed mode will be enabled until you press the button again.



The lamp (**1**) indicates the current status:

On:	High-speed mode switched on
Off:	High-speed mode switched off

The speed of the hoists will only be significantly increased by switching to high-speed mode if you have deflected the control lever by more than 70%.

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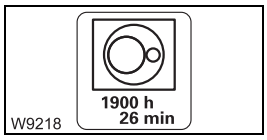
11.3.9 Slewing gear

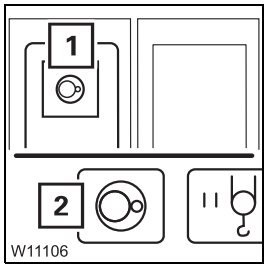
Danger of overturning when slewing with a rigged counterweight!
Always check before slewing whether slewing is permitted in the truck crane's current rigging mode (counterweight, outrigger span, working radius).
Correct the rigging mode if necessary; ➠ *Slewing with a rigged counterweight*, p. 12 - 71.



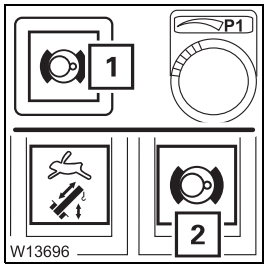
You can display the operating hours of the slewing gear; ➠ p. 11 - 109.

Switching on the slewing gear

After the ignition is switched on, all of the power units will be switched off and the lamps in the corresponding buttons will light up only dimly.



- Press the button (**1**) once.
  - The lamp in button (**1**) will light up brightly.
  - Symbol (**2**) is **green** if the slewing gear is switched on.



– Lamps (**1**) and (**2**) are on – slewing gear brake engaged.

Slewing

The following requirements must be fulfilled before slewing:

– Houselock is switched off; ➠ p. 11 - 15.
– The turntable is unlocked; ➠ p. 11 - 13.
– The counterweight lifting cylinders are fully retracted.
– Slewing is permissible with the current rigging mode; ➠ p. 12 - 71.
– The current rigging mode is entered on the RCL.

If slewing is not permissible with the current rigging mode, the slewing gear will be locked.

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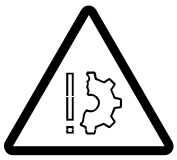
Danger of overturning when slewing with an incorrectly set RCL!
Before slewing, always check that the RCL code valid for the current rigging mode is displayed.
This prevents slewing operations from being enabled within the impermissible ranges, which would cause the truck crane to overturn.

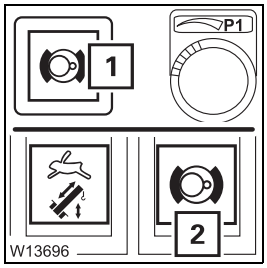
Risk of crushing during slewing!
Before slewing, operate the horn and ensure there are no persons in the slewing range.
This prevents persons being crushed between the superstructure and the carrier or between the superstructure and other parts.



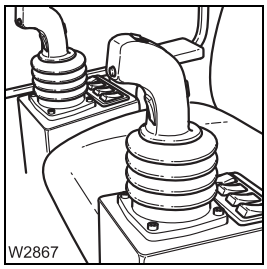
Risk of the main boom buckling!
Do not accelerate the slewing speed to such a degree that the load starts swinging.

Danger of damage to add-on parts!
Raise the main boom to at least 15° before slewing the superstructure from -160° to +20°.
This prevents the main boom from damaging add-on parts of the carrier, e.g. the exhaust system or air filter.

You can adjust the sensitivity of the control levers to suit the operating conditions; ➠ *Setting the characteristic curves for the control levers*, p. 11 - 106.



As soon as you move the control lever, the slewing gear brake is released and the lamps (**1**) and (**2**) go out.



Slewing to the left: • Push the left-hand control lever to the left.

Slewing to the right: • Push the left-hand control lever to the right.

You can regulate the speed by moving the control lever and changing the engine speed with the accelerator.

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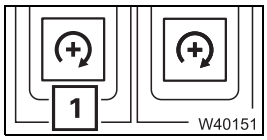
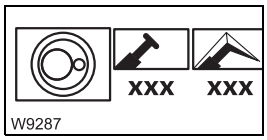
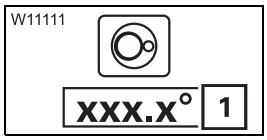
The maximum slewing speed is automatically reduced as the working radius is increased. If you now reduce the working radius (e.g. by retracting the boom), the slewing speed is automatically increased again.



You can adjust the desired engine speed (idling speed) with button (**1**); ➠ p. 10 - 17.

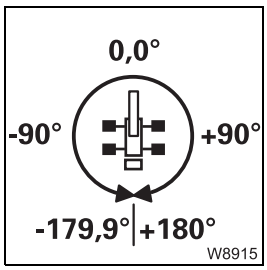


You can limit the maximum slewing speed; ➠ p. 11 - 104.



Viewing the slewing angle

The display (**1**) in the *Superstructure lock* submenu indicates the current position.



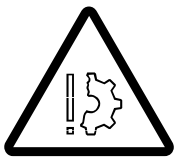
0° means that the superstructure is slewed to the rear.

– Angles in the **right-hand semi-circle** are displayed as **positive** values (0° to +180.0°).

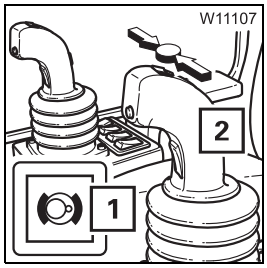
– Angles in the **left-hand semi-circle** are displayed as **negative** values (0° to -179.9°).

Braking the slewing movement

You may only brake the slewing movement with the slewing gear brake.



Risk of the main boom buckling!
Do not under any circumstances switch off the slewing gear to brake it. Only switch off the slewing gear after the superstructure has stopped turning.



- Move the control lever (**2**) towards its initial position – the slewing movement will be stopped.

At the initial position, the slewing movement will be stopped. At the same time the slewing gear brake will be applied, and lamp (**1**) will light up.

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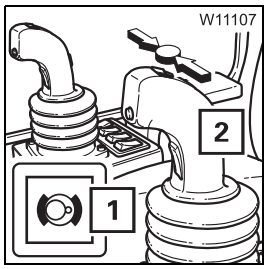
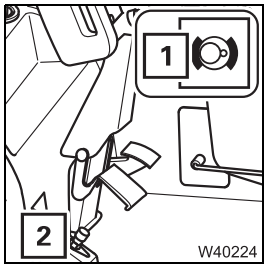
Slewing gear freewheel

The slewing gear freewheel is required if the slewing gear needs to be slewed by means of external forces, e.g. when operating with two cranes.



- Switch on the slewing gear.
- Shift the control lever (**2**) to its initial position.

  The lamp (**1**) lights up.

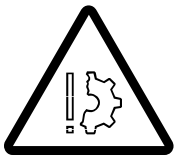


- Press the button (**2**).

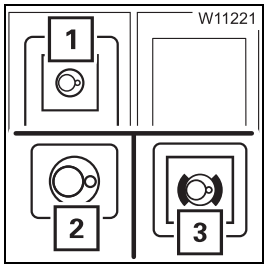
  Lamp (**1**) goes out – the slewing gear brake is released

Switching off the slewing gear

If the slewing gear is not required, it should be switched off to avoid unintentional use.



Risk of damage to the main boom!
Brake the slewing movement down to a standstill before you switch off the slewing gear. The slewing gear brake is automatically applied when the slewing gear is switched off.
This prevents excessive lateral forces affecting the main boom due to heavy deceleration or swinging loads.



- Press the button (**1**) once.
  - The lamp in the button (**1**) will light up dimly.
  - Symbol (**2**) will be **red** if the slewing gear is switched off.
  - The slewing gear brake is applied – lamp (**3**) lights up.

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11.3.10 Possible movement combinations

All listed power units can be moved in all combinations:

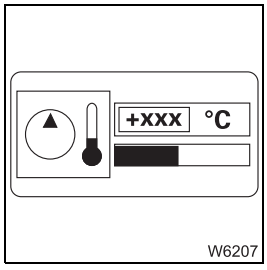
- Main hoist
- Telescoping mechanism or derricking gear
  It is not permitted to move the derricking gear and the telescoping mechanism simultaneously.
- Slewing gear
- Auxiliary hoist
- Auxiliary power units (superstructure lock, incline crane cab function or counterweight hoist unit)

Certain movement combinations can reduce the speed in high-speed mode.

11.3.11 Hydraulic oil cooler

Depending on the truck crane version, there are one or two hydraulic oil coolers that regulate the hydraulic oil temperature automatically.

- In addition to this, you should ensure that the maximum permissible hydraulic oil temperature of 80 °C (176 °F) is not exceeded.



The current hydraulic oil temperature is displayed in the *Monitoring* submenu. If the maximum permissible temperature has been reached, the bar below the display will turn **red**. A warning message is issued additionally;
➠ *Warning submenu*, p. 11 - 110.

If the hydraulic oil temperature reaches 80 °C (176 °F):

- Stop operating the crane.
- Let the hydraulic oil cool down while the engine is running.

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11.4 Settings and displays for crane operation

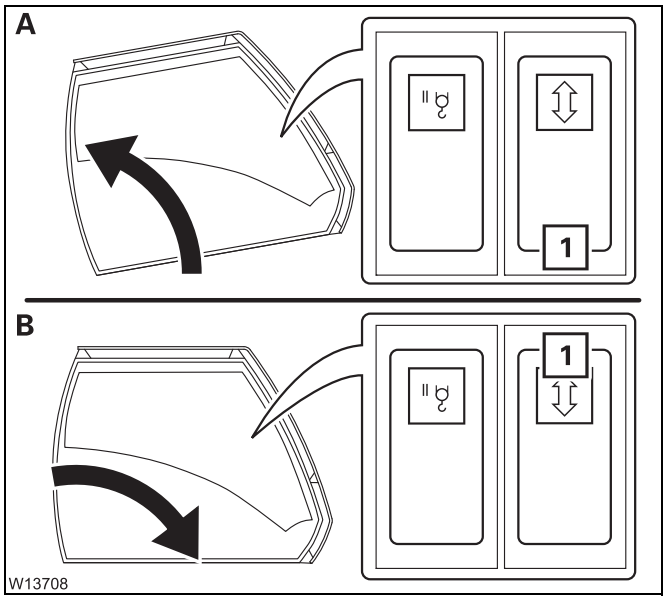
This section only describes settings and displays needed during crane operation. Operating elements that can be assigned to other procedures are described with the corresponding procedures.

11.4.1 Inclining the crane cab

You can incline the crane cab to the rear in order to attain a better sitting position when working at great heights.

Danger of accidents when entering and leaving the crane cab while it is tilted!
Always bring the crane cab into the end position to the front before leaving it. This prevents you slipping between the cab and the stepping grid and injuring yourself.

Risk of accidents due to objects overturning in the crane cab!
Close the crane cab door before inclining and remove all loose objects (for example, bottles) from the crane cab.
This prevents objects tipping over, the crane cab door opening by itself, and unintended operational accidents caused by fright.



(A) – Incline to the rear

- Close the crane cab door.
- Push the button (**1**) in at the bottom.

(B) – Incline to the front

- Close the crane cab door.
- Press the button (**1**) in at the top.

The crane cab will tilt as long as you hold the button down or until its end position is reached.

When rigging, you can tilt the crane cab with the hand-held control;
➠ *Slewing the crane cab*, p. 12 - 19.

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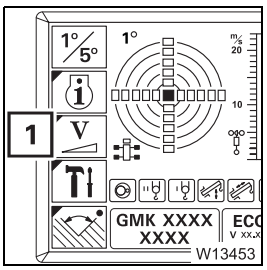
11.4.2 Setting the idling speed

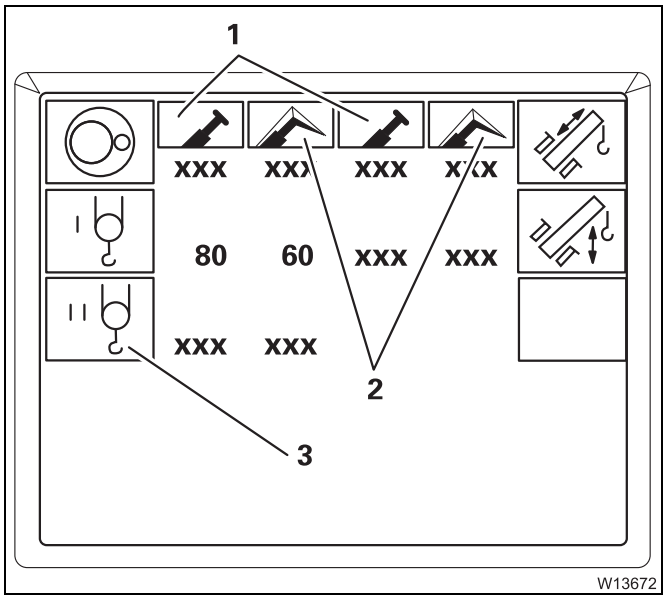
➠ *Setting the idling speed*, p. 10 - 17.

11.4.3 Limiting the power unit speeds

You can enter what percentage of the maximum speed should be enabled for each power unit.



- If necessary, open the main menu Esc and press the button (**1**) once. The *Power unit speeds* submenu opens.



Symbols (**1**) or (**2**) for the current operation are **green**.

1 Main boom operation

2 Working with the lattice extension

The values below the green symbols will be used, e.g. 80% for the main hoist in main boom operation.

The values for the slewing gear and derricking gear only apply if they are lower than the automatically limited values. The automatically limited values are not displayed.

Button (**3**) will only be active if the auxiliary hoist is connected.

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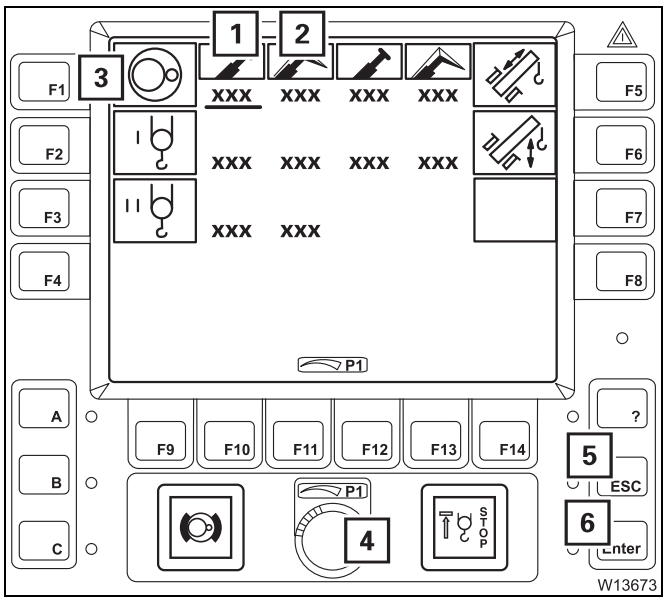

Changing values

- Repeatedly press, for example, button (**3**) for the slewing gear until the bar under the desired value is at (**1**) or (**2**) – input on.

To cancel the input – press button (**5**) once.

- Change the value using switch (**4**).
- If necessary, change the values for other power units in the same way.
- Confirm the changed values – press button (**6**) once. All changed values will be accepted.

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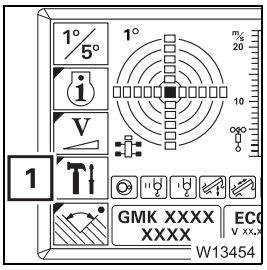
11.4.4 Setting the characteristic curves for the control levers

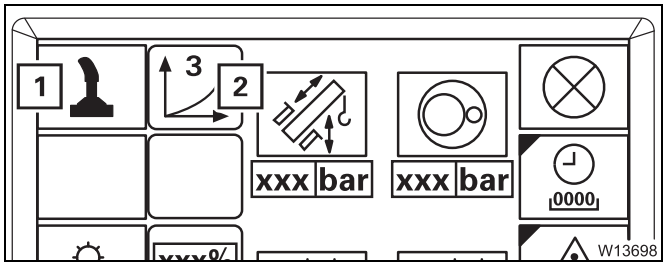
The control lever characteristic curve determines how high the power unit speed should be for a particular control lever movement.

The set control lever characteristic curve always applies to both control levers and to all power units moved with the control levers.



- If necessary, open the main menu Esc and press the button (**1**) once.

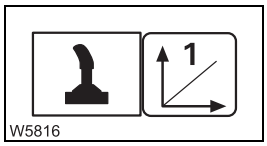
This opens the *Settings* submenu.



The set characteristic curve will be shown on the display (**2**).

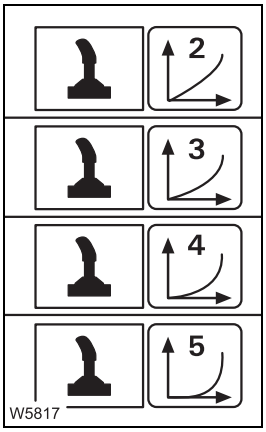
- Repeatedly press button (**1**) until the desired characteristic curve is displayed, e.g. characteristic curve (**3**).

There are five characteristic curves:



Linear characteristic curve (1)

The deflection of the control levers evenly increases the speed. Even small movements of the control lever will produce a high speed.



Progressive characteristic curves (2) to (5)

The speed is kept lower in the front range of the movement than with characteristic curve (**1**) and increases only with larger movements.

The higher the number of the characteristic curve, the further the control lever must be moved to get a clear increase in speed.

With characteristic curve (**5**), you can work particularly sensitively with the control lever.

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11.4.5 Critical load control

Function

The critical load control prevents the engine from stalling at low engine speeds.

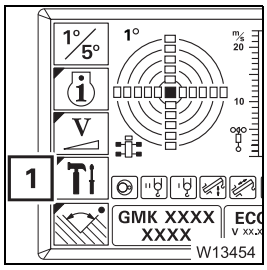
ECOS registers the currently available motor output and the hydraulic performance currently required by the power units.

If the required hydraulic performance is above the current motor output (e.g. when connecting an additional crane movement), the critical load control automatically reduces the hydraulic performance of the power units. Here, the control lever movement is taken into account so that the power unit speeds remain equal.

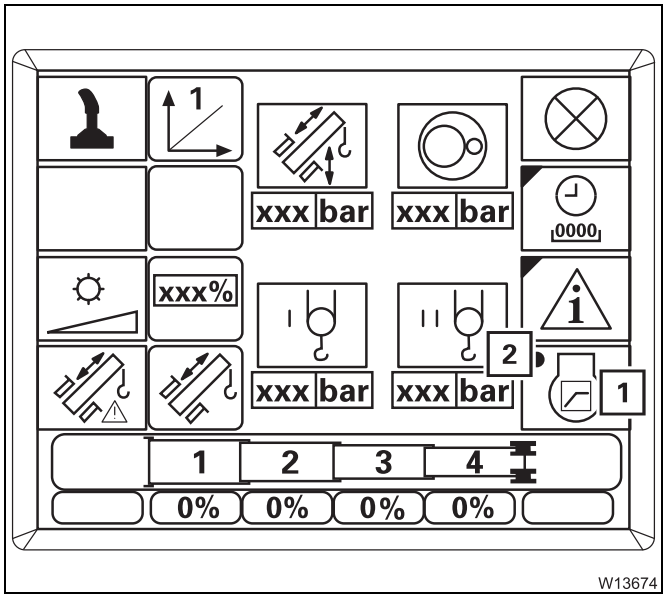
The slewing gear is not influenced by the critical load control.

Switching on and off

The critical load control is switched on together with the ignition.
You should only switch off the critical load control if it is faulty (engine stalls or individual power units can no longer be controlled).



- If necessary, open the main menu Esc and press the button (**1**) once.



This opens the *Settings* submenu.

To switch off the critical load control

- Press the button (**1**) repeatedly until dot (**2**) **is black**.

To switch on the critical load control

- Press the button (**1**) repeatedly until dot (**2**) **is green**.

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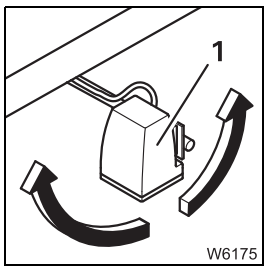
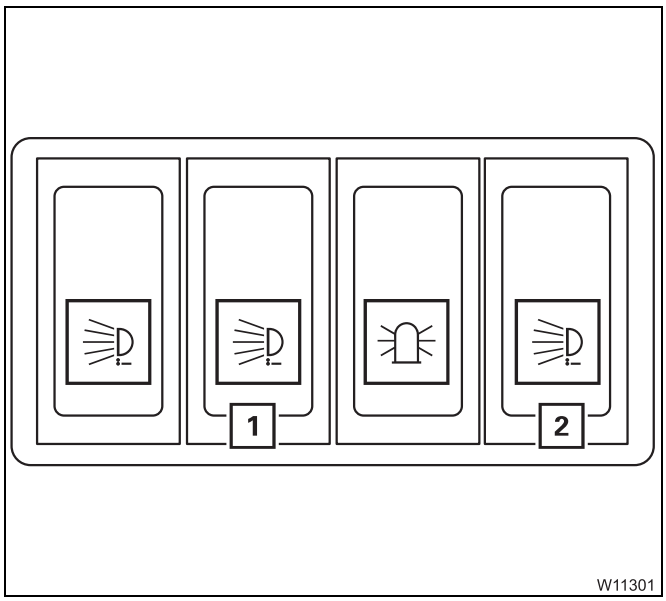
11.4.6 Slewable spotlights



With the relevant equipment, the slewable spotlights (**1**) are located on the main boom. They are controlled from the crane cab.

Risk of accidents due to dazzling during on-road driving!
When driving on the road, always direct the spotlight in such a way that the reflector points downwards. In this way, you can prevent yourself and other drivers being dazzled and causing accidents.



Switching on
- Press switch (**1**) in at the bottom.

Switching off
- Press switch (**1**) in at the top.

To direct the spotlights forwards
- Press the button (**2**) in at the top.

To direct the spotlights backwards
- Push the button (**2**) in at the bottom.

The direction of the spotlights will be adjusted until you let go of the button or they reach their end position.

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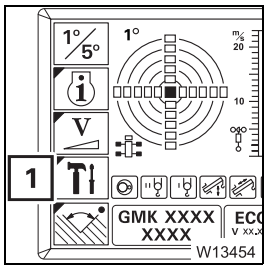
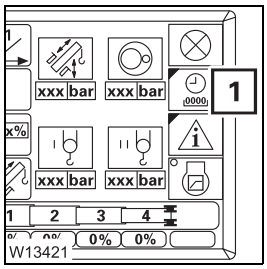
11.4.7 Displaying the operating hours



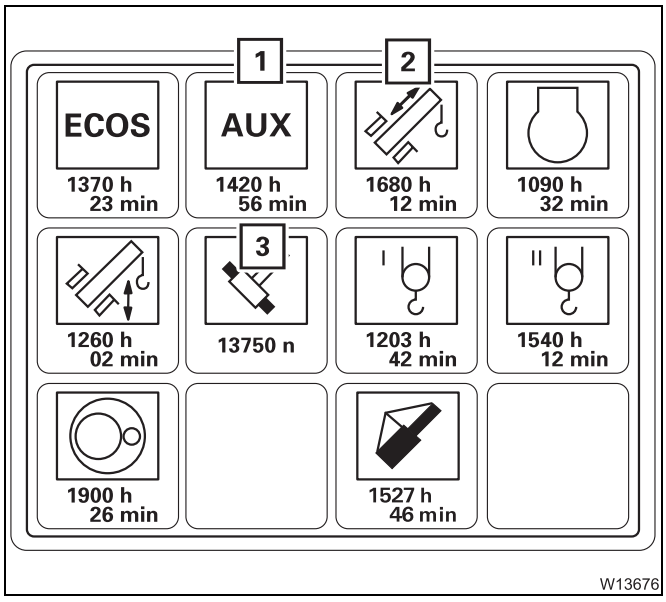
If necessary, open the main menu Esc and press the button (**1**) once.



This opens the *Settings* submenu.

- Press the button (**1**) once.

The *Operating hours* submenu opens.



The operating hours are displayed below the symbols, e.g. 1,680 hours and 12 minutes for the telescoping mechanism (**2**).

Exception: The value below the symbol (**3**) indicates how often the cycle *Unlock telescopic section* has been operated, e.g. 13,750 times.

Auxiliary power units (**1**) include:

– Counterweight hoist unit
– Crane cab inclination,
– Locking of turntable,
– Rigging winch

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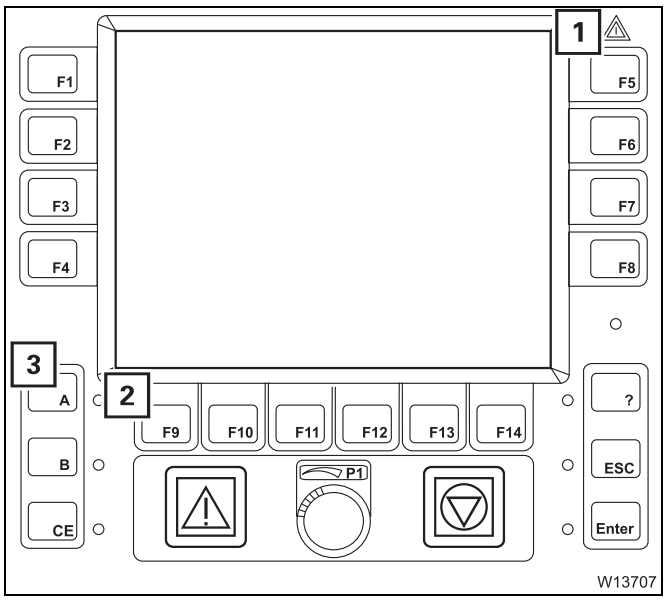
11.4.8 Warning submenu

ECOS differentiates between warning messages and error messages (error messages ➠ p. 11 - 113). A warning message indicates that certain values do not correspond to a target value.



In the event of an error message the lamps (**1**) and (**2**) flash.

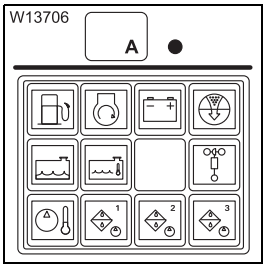
For more information

- Press button (**3**) next to the flashing lamp (**2**) once – the corresponding *Warning* submenu will be opened.

The warning message has been acknowledged – the lamp (**1**) lights up (no longer flashes).

Meaning of the symbols

The colour of the symbols indicates whether a warning message is active in the corresponding area.



– Symbol is **grey** – no warning message.

– Symbol **red** – warning message.

If a symbol is displayed in **red** perform the following checks.

Risk of damage if warning messages are not observed!
Observe the following information in good time and take the appropriate remedial measures if a warning message appears. This prevents these malfunctions causing defects in the truck crane.

All warning messages which relate to the engine apply to the engine for crane operation.

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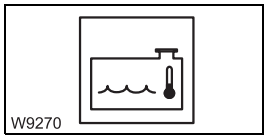
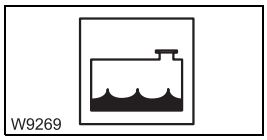


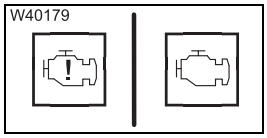
Coolant too hot

The engine coolant is hotter than approx. 95 °C (205 °F).
Display of the current temperature; ➠ p. 10 - 16.
Possible cause and remedy; ➠ p. 14 - 15.



Coolant level too low

- Immediately top up the coolant so that the engine does not overheat; ➠ *Maintenance manual*.

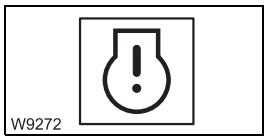


Oil pressure too low

A warning buzzer sounds at the same time.

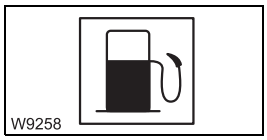
- Set down the load as soon as possible and turn off the engine.
- Read out the error message; ➠ p. 14 - 28.
- Check the oil level; ➠ *Maintenance manual*.
- Add oil if necessary. If the error message is still displayed, contact **Manitowoc Crane Care**.

Risk of damage to the engine if the oil pressure drops!
Switch off the engine as soon as possible and look for the cause if the lamp lights up or the warning buzzer sounds!
Never restart the engine before you have found the cause and eliminated the problem! ➠ p. 14 - 15



Engine electronic system

Malfunction in the engine electronics; ➠ p. 14 - 15.

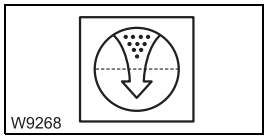


Refuelling

The fuel tank is filled only to a level of about 5%.

- Refuel before the fuel is used up; ➠ p. 10 - 5.

If the fuel tank is almost empty, air will be sucked in and you will have to bleed the fuel system; ➠ *Maintenance manual*.



Replacing the air filter

- Replace the air filter as soon as possible; ➠ *Maintenance manual*.

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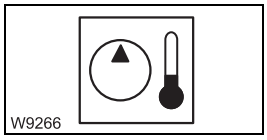
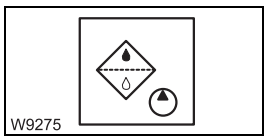


Hydraulic oil too hot

The hydraulic oil temperature is higher than 80 °C (176 °F).
Display of the current temperature; ➠ p. 10 - 16.
Possible cause and remedy; ➠ p. 14 - 24.

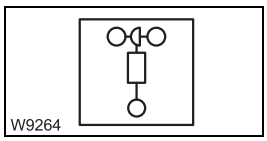
Risk of overheating!

There is a fault if the hydraulic oil temperature exceeds 80 °C (176 °F).
Set down the load as soon as possible and try to find the cause.
Set down the load as soon as possible and turn off the engine if the temperature of the hydraulic oil exceeds 100 °C (176 °F)!



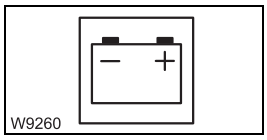
Replacing the hydraulic oil filter

- Replace the corresponding hydraulic oil filter as soon as possible; ➠ *Maintenance manual*.



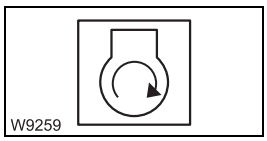
Anemometer not connected

- Connect the anemometer to the electrical power supply; ➠ p. 12 - 118.



Voltage monitoring

The voltage in the superstructure electrical system is too high or too low.
Actual voltage display; ➠ p. 10 - 16.



Air intake inhibitor triggered

The air intake inhibitor was triggered because the maximum permissible engine speed was exceeded. It is only possible to start the engine after the air intake inhibitor has been released manually; ➠ p. 10 - 23.

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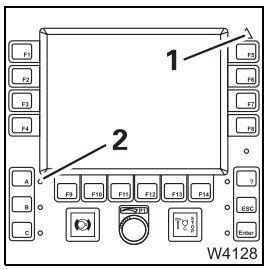
Exiting the submenu

You can exit the submenu at any time.

- Press the button (**1**) once.
  The same menu opens which was open before the *Warning* submenu opened.



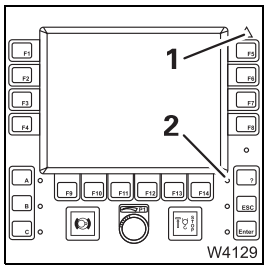
If the same warning messages are still present, the lamps (**1**) and (**2**) light up.

If no warning message is present, both lamps will go out.

Both lamps start flashing again as soon as a new warning message occurs.

11.4.9 Error submenu

ECOS differentiates between error messages and warning messages (warning messages ➠ p. 11 - 110).



In the event of an error message the lamps (**1**) and (**2**) flash.

More information on error messages; ➠ *Error messages*, p. 14 - 39.

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Blank page

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11.5 Working range limiter

You can set and monitor four different limits in the working range limiter submenus:

– A maximum overall height

– A maximum working radius

– A maximum slewing angle,

– Objects in the working range.

The monitoring of the programmed limits can be switched on and off separately.

Risk of accidents due to situations which cannot be monitored!
The working range limiter only serves as an additional safety device. Brake the crane movement before contact with the obstacle becomes imminent. Do not deliberately move into the shutdown range. You, the crane operator, are still responsible for monitoring the working range, so that you can react appropriately if situations arise which cannot be monitored electronically.

Risk of accidents due to limits set too low!
When entering the limit values, bear in mind that, even after switching off the engine, movements can still occur that would bring the load into the shutdown area, e.g. due to the load swinging or the boom bending. For this reason, always enter the limit values with sufficient safety distance to the object.

Risk of accident due to insufficient safe distances!
Always observe all safety distances in accordance with the national legal regulations (for example, concerning overhead power lines) even if the working range limiter is switched on.

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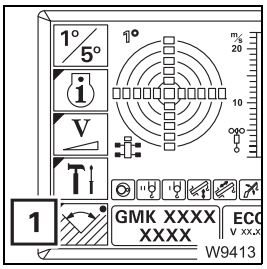
11.5.1 Opening the working range limiter submenu



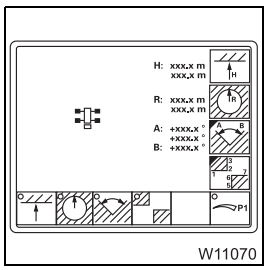
- If necessary, open the main menu Esc.

The dot in symbol (**1**) indicates if limit values are being monitored:

– **Dot is black:** Monitoring switched off

– **Dot is green:** Monitoring switched on

- Press the button (**1**) once.

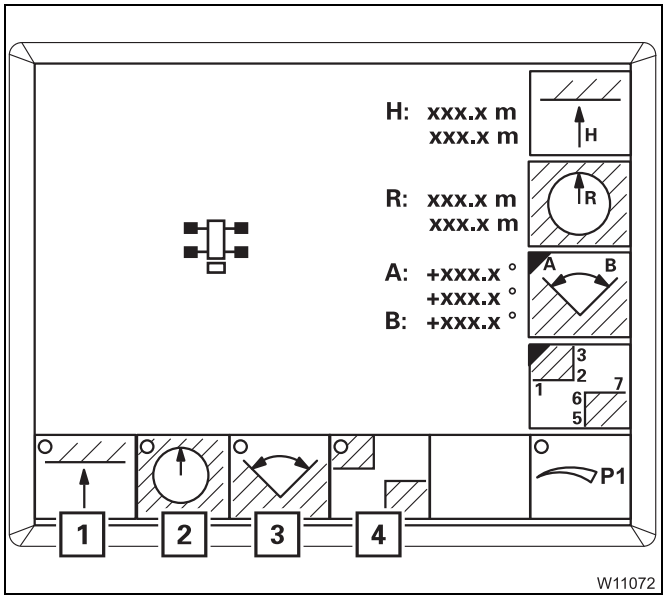


The *Working range limiter* submenu opens.

Units of measurement are displayed – metres (m) or feet (ft).

11.5.2 Viewing current settings

The *Working range limiter* submenu shows switched on monitoring functions, the limits entered and current values.



Monitoring on/off

The dots in the symbols (**1**) to (**4**) indicate the current status.

1 Overall height monitoring

2 Working radius monitoring

3 Slewing angle monitoring

4 Object monitoring

– **Dot is black:**
Monitoring switched off

– **Dot is green:**
Monitoring switched on, the monitored area is displayed; ➠ p. 11 - 126.

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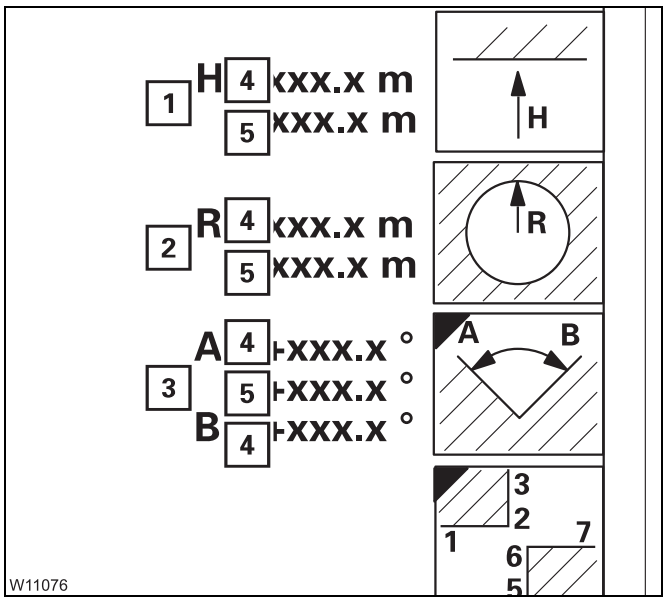


Limit values/current values

The displays (**1**) to (**3**) indicate values for:

1 Overall height

2 Working radius

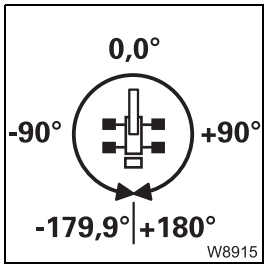
3 Slewing angle

Every display shows the following values:

4 Limit value – red

5 Actual value – blue

In case of manual and switched on input, display (**5**) changes; ➠ p. 11 - 124.



The following applies to the slewing angle display:

0° means that the superstructure is slewed to the rear.

– Angles in the **right-hand semi-circle** are displayed as **positive** values (0° to +180.0°).

– Angles in the **left-hand semi-circle** are displayed as **negative** values (0° to -179.9°).

Viewing the limit values for object monitoring; ➠ *Objects*, p. 11 - 125.

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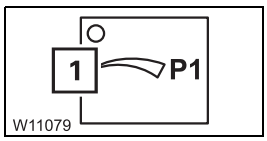
11.5.3 Entering limit values

This section describes how to enter unknown limit values by moving to the shutdown points.

You can enter known limit values directly; ➠ *Entering limit values/objects manually*, p. 11 - 124.

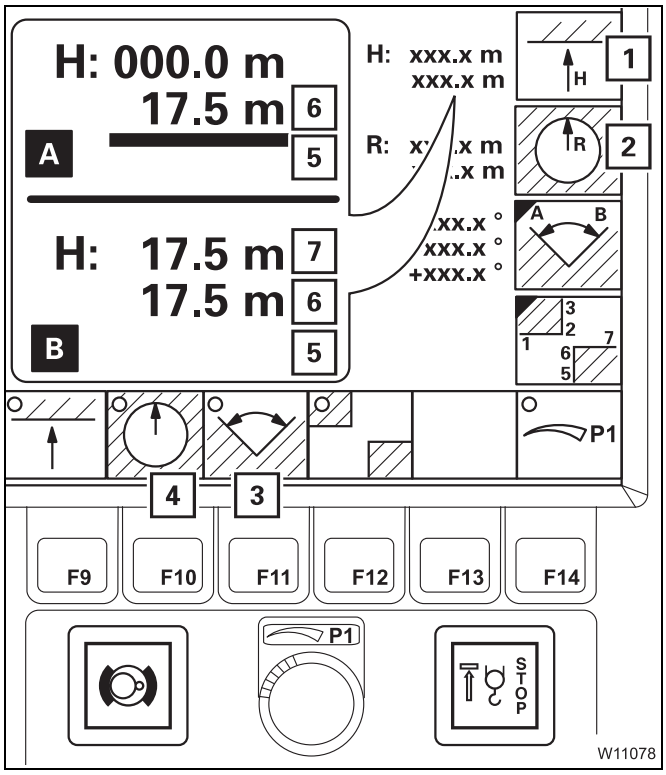


Prerequisite
Manual input must be switched off.
- Press button (**1**) repeatedly until the dot turns **black**.

Risk of accidents due to limits set too low!
When entering the limit values, bear in mind that, even after switching off the engine, movements can still occur that would bring the load into the shutdown area, e.g. due to the load swinging or the boom bending. For this reason, always enter the limit values with sufficient safety distance to the object.

Overall height/ Working radius

The limit values for the overall height and the working radius are entered in the same way.



The associated monitoring function (**3**) or (**4**) must be switched off – dot **black**; ➠ p. 11 - 126.

- Press the button once:
  - **1** For the overall height
  - **2** For the working radius.

  Bar (**5**) is red – input on. Cancel input – press button Esc once.
- (**A**) – Move the main boom head to just before the shutdown point without a load, e.g. at 17.5 m – value (**6**).
- (**B**) – Press button Enter once.
  - – The current value (**6**) will be accepted as the limit value (**7**).
  - – The bar (**5**) goes out.
- Switch on monitoring; ➠ p. 11 - 126.

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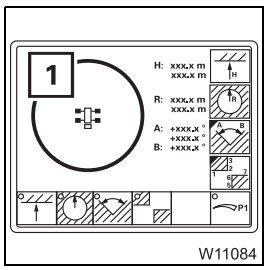
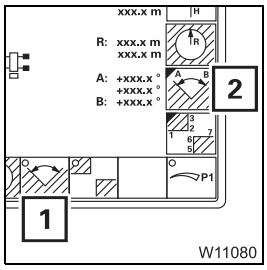


The limit value for the working radius affects the representation of defined objects.
Only points that are within the limit value (**1**) will be displayed.

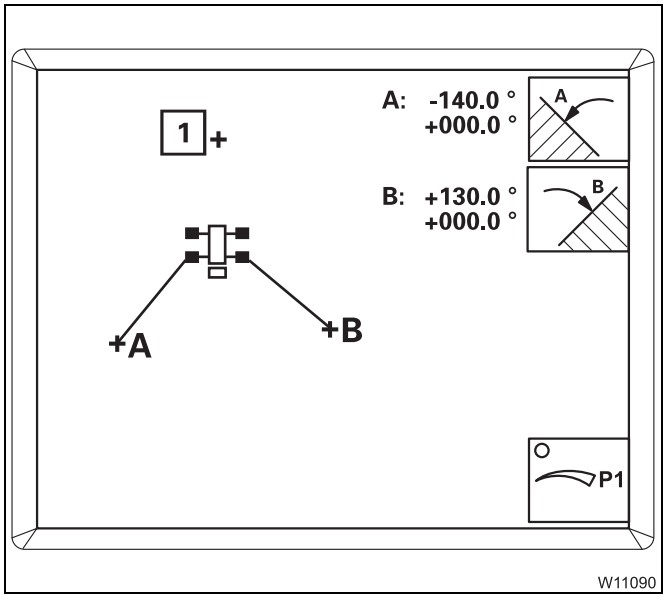
Slewing angle

Slewing angles are entered in a submenu.



Before entering values, monitoring (**1**) must be switched off – dot is **black**; p. 11 - 126.

- Press the button (**2**) once.
  The *Enter slewing angle* submenu will open.

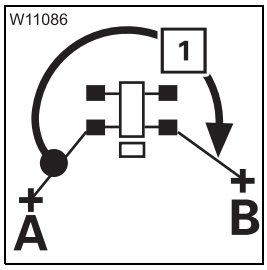


Display of the slewing angles

The cross (**1**) shows the current position of the main boom.

– The slewing angle **A** limits slewing to the left.

– The slewing angle **B** limits slewing to the right.



The permissible slewing range is represented by the angle going clockwise from **A** to **B**.
Approx. 270° in this illustration – arrow (**1**).

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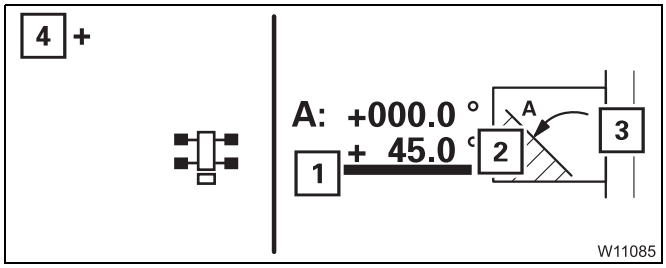
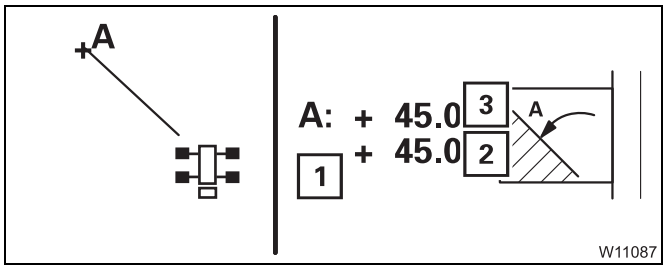
Entering the permissible slewing range

You must enter the slewing angles **A** and **B** separately.

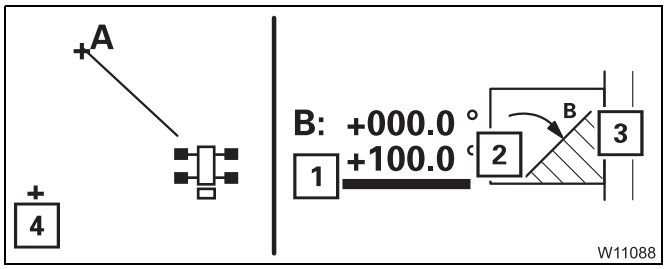
Risk of accident due to incorrectly set slewing angles!
Always slew the main boom to the shutdown point from the right with slewing angle **A** and from the left with slewing angle **B**.
This prevents slewing into the impermissible range from being enabled.

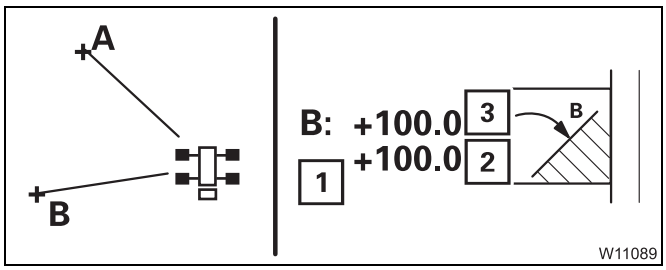




Slewing angle **A**:

- Press the button (**3**) once.
  Bar (**1**) is red – input on. Cancel input – press button Esc once.
- Slew the main boom (**4**) to the shutdown point from the right, e.g. value (**2**) 45°.
- Press button Enter once.
  - The slewing angle **A** will be displayed.
  - The value (**2**) will be accepted as the limit (**3**).
  - The bar (**1**) goes out.





Slewing angle **B**:

- Press the button (**3**) once.
  Bar (**1**) is red – input on. Cancel input – press button Esc once.
- Slew the main boom (**4**) to the shutdown point from the left, e.g. value (**2**) 100°.
- Press button Enter once.
  - The slewing angle **B** will be displayed.
  - The value (**2**) will be accepted as the limit (**3**).
  - The bar (**1**) goes out.

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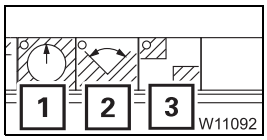
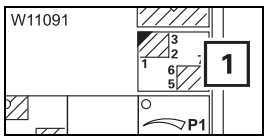
Entering objects

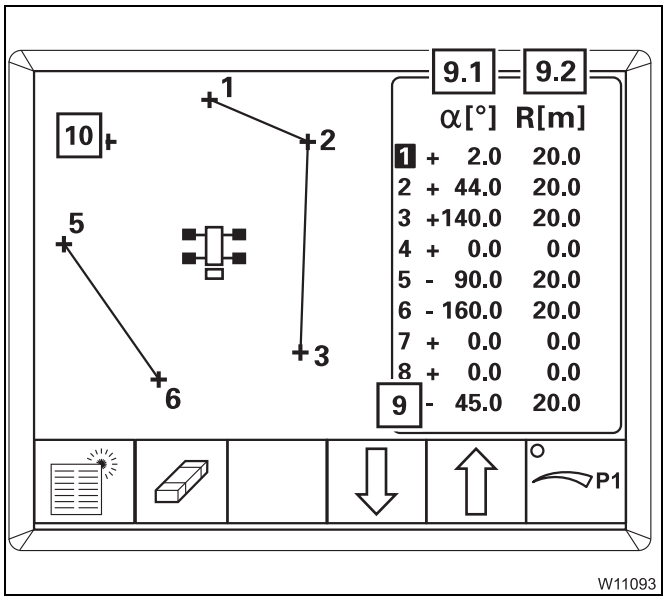
Objects are entered in a submenu.



Before entering values, the monitoring functions (**1**) to (**3**) must be switched off – dot is **black**; ➠ p. 11 - 126.



- Press the button (**1**) once.
  The *Enter objects* submenu will open.



Representation of points and objects

Each point shown is numbered and defined by the point data *slewing angle* (**9.1**) and *working radius* (**9.2**) – **red**.

An object is made up of points that are connected by lines, e.g. the points **1** to **3** and the points **5** and **6**.

The cross (**10**) and the point data (**9**) show the current position of the main boom – **blue**.

Only those points are displayed that are located within the entered, maximum working radius. You may need to enlarge the maximum working radius in order to display the point; ➠ p. 11 - 124.

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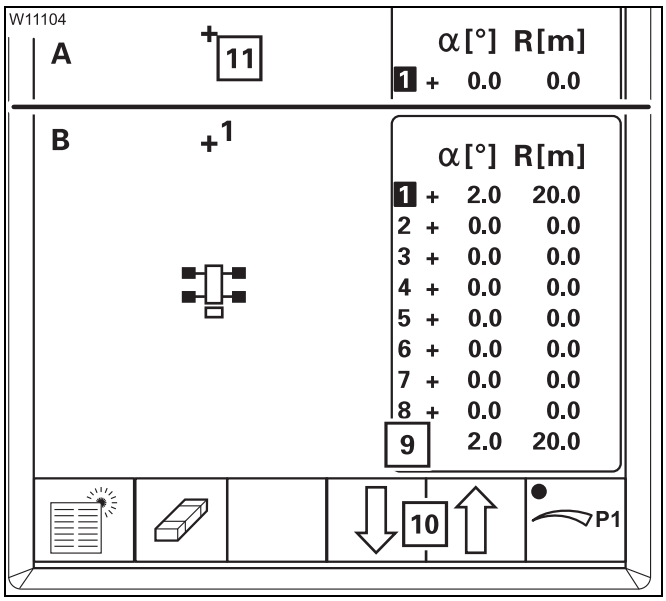
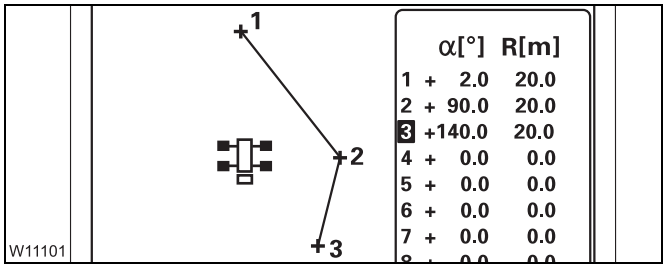


Entering objects

- (**A**) – With the buttons (**10**), select the first point, e.g. point (**1**) – blue.
- Move the main boom head (**11**) to just before the first point of the object.

- (**B**) – Press button Enter once.
  - The point (**1**) will be displayed.
  - The current point data (**9**) will be accepted for point (**1**), e.g. 2° and 20 m.

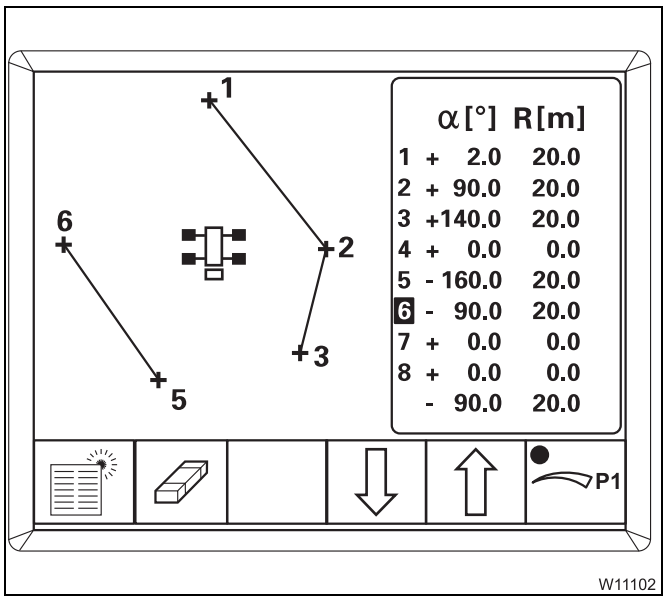
The first point has now been entered.



- Enter the next point (**2**) in the same manner, e.g. +90° and 20 m.

The point is connected with point (**1**) – an object has been entered.

To enlarge the object, you can enter subsequent points 3 to 8, e.g. point (**3**).



You can also add objects:

- Delete the subsequent point, e.g. point (**4**) – point data 0.0; p. 11 - 123.
- Enter the next point, e.g. point (**5**) at -160° and 20 m.

This point (**5**) will be the first point for the new object. The following point will be added to this object, e.g. point (**6**).

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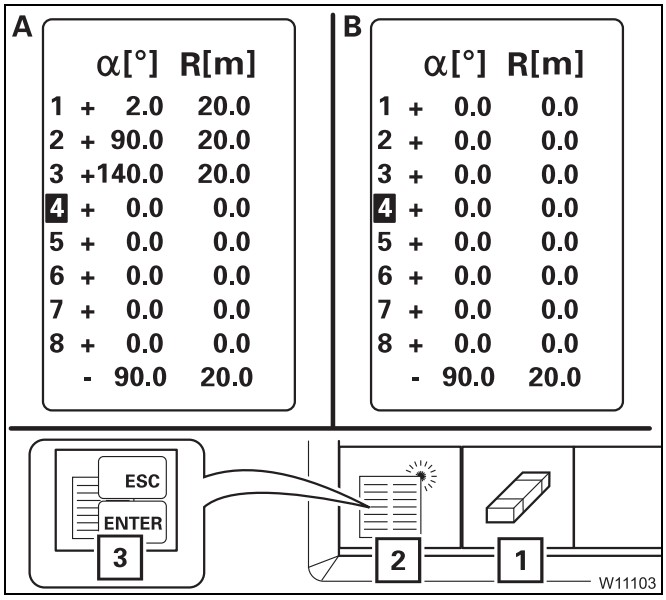
Deleting points

You can delete selected, individual points or delete all points at once.



(A) – Selected points

- Press the button (**1**) once.

The selected point will be deleted, e.g. point (**4**) – point data 0.0.

(B) – All points

- Press button (**2**) once – symbol (**3**) will appear.

You can cancel the process with the Esc button.

- Press button Enter once – all points will be deleted.

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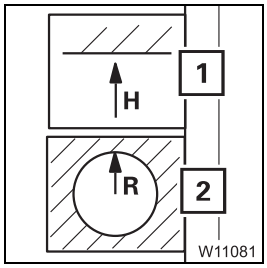
11.5.4 Entering limit values/objects manually

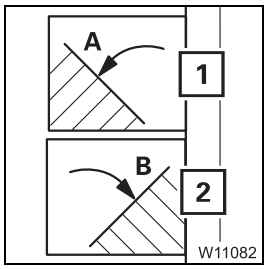
Limit values

The limit values for the overall height, the working radius, and the slewing angle are entered in the same way.



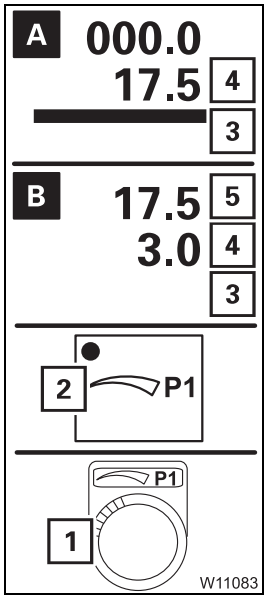
– For overall height/working radius

- Press the button once:
  - **1** For the overall height
  - **2** For the working radius.



– For slewing angles

- Open the *Enter slewing angle* submenu
- Press the button once:
  - **1** For slewing angle A
  - **2** For slewing angle B.



Entering a limit value

The bar (**3**) is red – input on.
To cancel the input – press button Esc once.

- Press button (**2**) once – the dot will turn **green**, manual input on.
- (**A**) – Enter the new limit value, e.g. 17.5, with the switch (**1**) on display (**4**)
- (**B**) – Press button Enter once.
  - Display (**5**) = new limit value
  - Display (**4**) = current value, e.g. 3.0
  - Bar (**3**) goes out
  - Dot (**2**) is **black**, manual input off.

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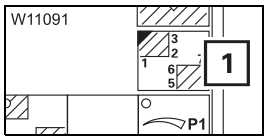
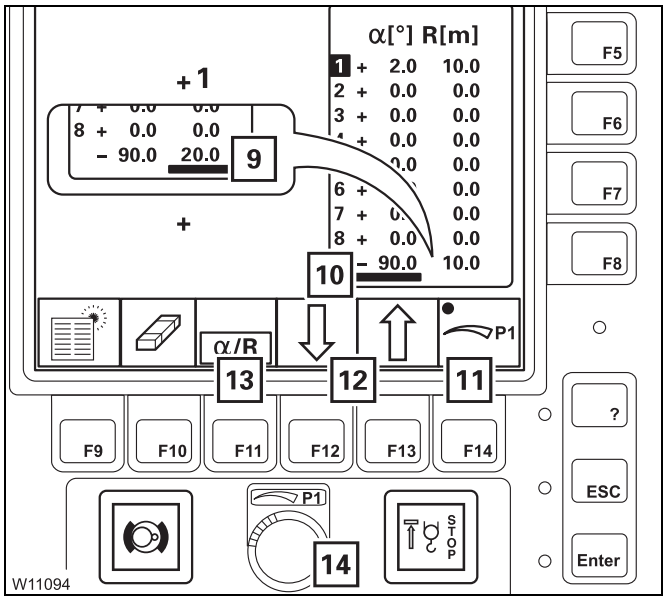
Objects

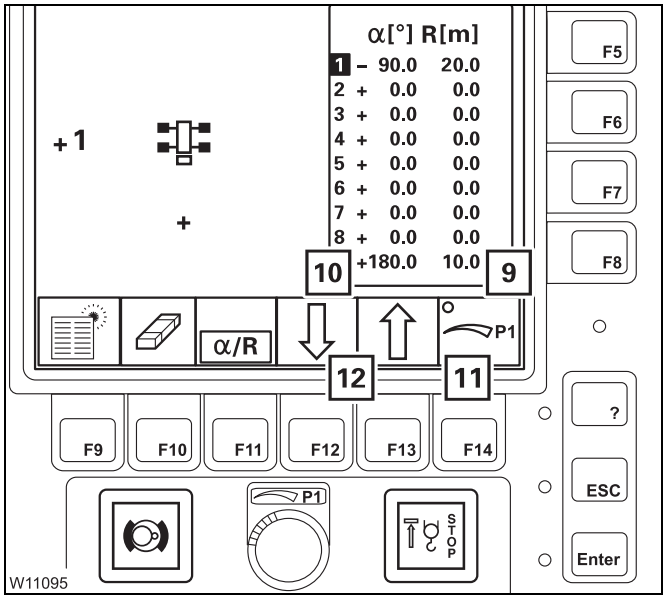
Objects are entered in a submenu.



- Press the button (**1**) once.
  The *Enter objects* submenu will open.



- Select the desired point using the buttons (**12**), e.g. point (**1**) – blue.
- Press button (**11**) once – the dot will turn **green**, manual input on.
- With button (**13**) select one of the following:
  – the slewing angle – bar (**10**) is red, or
  – the working radius – bar (**9**) is red.
  Input on. Cancel input – press button Esc once.
- Enter the new values, e.g. -90.0° and 20.0 m with switch (**14**).



- Press button Enter once.
  The new values for point (**1**) will be accepted.

You can enter additional points in the same way – button (**12**).

- To end your input, press the Enter button once.
  – Bar (**9**) or (**10**) goes out – display = current main boom position
  – Dot (**11**) is **black** – manual input off

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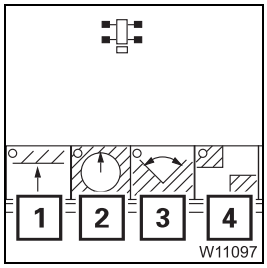
11.5.5 Switching monitoring functions on/off

After turning on the ignition, all monitoring functions are switched on that were on before the ignition was turned off.



- Press the buttons for the required monitoring functions once.

1 Overall height **2** Working radius

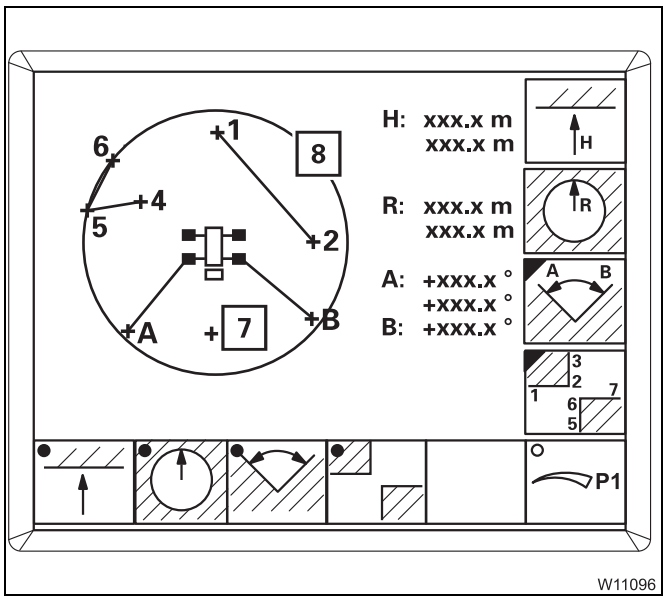
3 Slewing angle **4** Objects

Dot is green: Monitoring switched on

Dot is black: Monitoring switched off

Risk of accident due to incorrectly set limit values!
After switching on the monitoring function, slowly approach all limits and check that the system switches off in time.
If necessary, enter new values with larger safety distances.

With monitoring switched on, the speed of all power units is limited to 50%. Limits below 50% continue to be active. We recommended limiting the slewing gear speed to between 30% and 50%.



The monitored area will be displayed:

– **Working radius**
Circle (**8**) – red.

– **Permissible slewing angle**
Circle sector, clockwise from **A** to **B**.

– **Objects**
Points and lines, e.g. **1** to **2** and **4** to **6**.

– **Overall height**
No display.

The current main boom position (**7**) is always displayed.

It is impossible to move behind a defined object whenever a monitoring function is switched on.

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11.5.6 Shutdown by working range limiter

If a limit value is reached, an RCL shutdown occurs. All movements that would go closer to the limit value will be disabled. Shutdown will remain active even if you switch off the monitoring function.

Shutdown point reached for	Disabled movements
Overall height	– Raising – Extend – Lowering the hoist
Working radius	– Lowering the boom – Extend – Lifting the hoist
Slewing angle **A**	– Slewing to the left
Slewing angle **B**	– Slewing to the right
Objects	– Depending on the position of the object: – Slewing to the left or right – Lowering the boom – Extend – Lifting the hoist

The RCL also shows an error message. To enable the movements, you must leave the shutdown range and acknowledge the error message;
➠ *Table of error codes*, p. 14 - 34.

Risk of accidents due to overriding shutdown procedures!
Only override RCL if it is absolutely necessary and you have a clear view of the danger area. Bear in mind that, due to the boom bending for example, the overall height is increased if you set down the load.

If you override the RCL, the shutdown will be overridden and all movements enabled.

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Blank page

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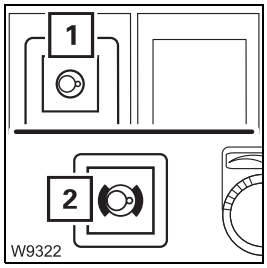
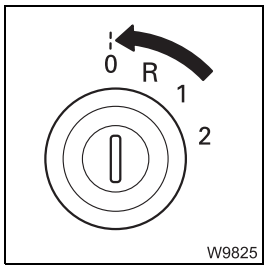
11.6 Work break

11.6.1 In case of short work breaks

Risk of accident by suspended loads!
Never switch off the engine while a load is suspended. You must have the control levers at hand in order to intervene at any time.
Always set down the load before you leave the crane cab.



- Switch off the slewing gear.
  - The lamp in the button (**1**) must be dimly lit.
  - Lamp (**2**) must light up – slewing gear brake applied.



Switch the engine off, turn the ignition key to position **0** and remove it.

Ensure that no unauthorised persons can operate the truck crane;
➠ *To secure the truck crane*, p. 11 - 130.

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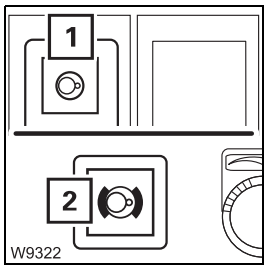
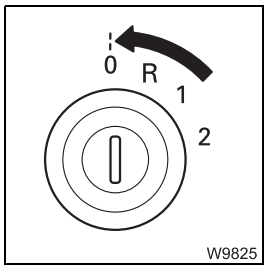
11.6.2 In case of work breaks longer than 8 hours

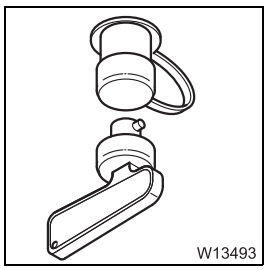
- Retract all telescopic sections.
- Set down the main boom on the boom rest.



- Switch off the slewing gear.
  - The lamp in the button (**1**) must be dimly lit.
  - Lamp (**2**) must light up – slewing gear brake applied.



- Switch the engine off, turn the ignition key to position **0** and remove it.
- Switch off all current consumers.



- Switch off the battery master switch. This will not interrupt the run-down period of the heater.

To secure the truck crane

- Secure the truck crane against unauthorised use by:
  - Stowing away the hand-held control in the crane cab
  - Removing the ignition key and
  - Locking the crane cab

Danger due to unauthorised use!
Always lock the hand-held controller before you leave the truck crane. In this way you can prevent unauthorised persons from starting the engine with the hand-held control.

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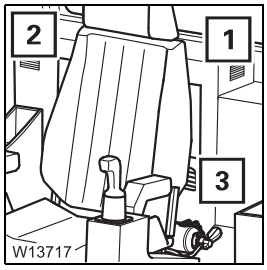
11.7 Heating and air-conditioning system



- Do not cover the grilles (**1**), (**2**) and (**3**).
  - Air is drawn in through grilles (**2**) and (**3**).
  - The grille (**1**) is used to ventilate the electronics.

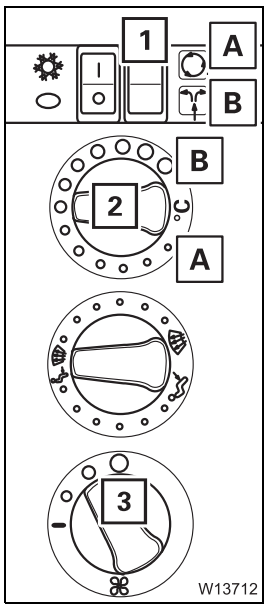
11.7.1 Standard heating system

Switching on

- Start the engine. Heating is only available when the engine is running.

Heating

You must set the fan, fresh air/recirculated air and the temperature.



Setting the fan

- Turn switch (**3**) to the required level **1** to **3**, depending on the desired air quantity.

Setting the temperature

- Turn switch (**2**) in the required direction
  - **A** Colder
  - **B** Warmer

Setting recirculated/fresh air

You can set the air to be sucked in by the fan.

- Press the switch (**1**) to the position for
  - **A** Recirculated air – air is sucked out of the crane cab.
    Change to fresh air often to ensure that oxygen is supplied.
  - **B** Fresh air – outdoor air is sucked in.

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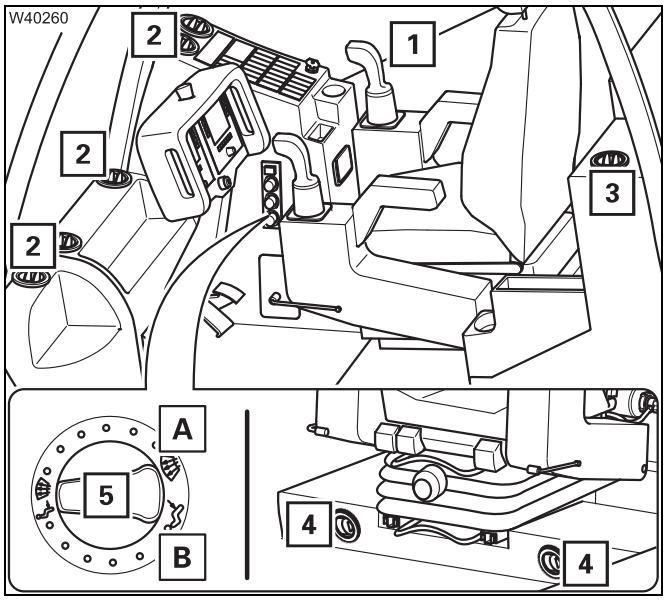
Air distribution You can direct the air to flow out of various air vents.

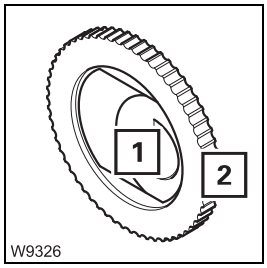


- Turn the switch (**5**) to the position for the required air vents.

  A Air vents (**1**) to (**4**)

  B Air vents(**3**), (**4**)

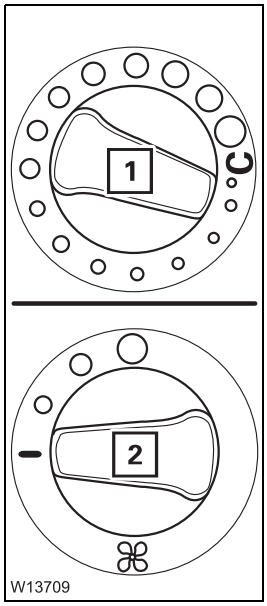
You can adjust the air vents (**2**) to (**4**).



Adjusting the air vents

1	– To open:	Press in and position lengthwise
	– To close:	Position crosswise
	– To direct the air flow:	In intermediate position
2	– To direct the air flow:	Slewing

Switching off



Switching off the heater

- Turn the switch (**1**) as far as it will go in a counter-clockwise direction, to *Cold*.

To switch off the fan

- Turn the switch (**2**) to the *Fan off* position.

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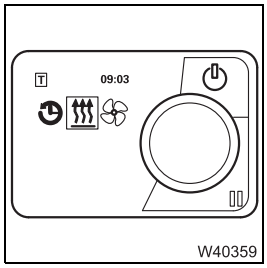
11.7.2 Auxiliary water heater

The batteries will be drained if you operate the auxiliary heater with the engine switched off. You must recharge the batteries at shorter intervals if you use the auxiliary heater frequently!

Further information on the operation of the auxiliary water heating system is provided at the address *Webasto.com*.

You can also scan the following QR code.



You can use the auxiliary water heater to:

– preheat the engine or

– the engine and the crane cab.

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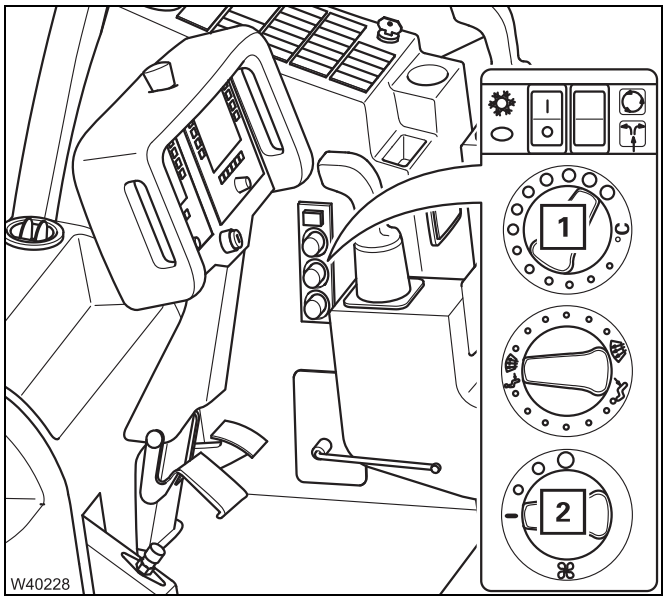
Preheating the engine

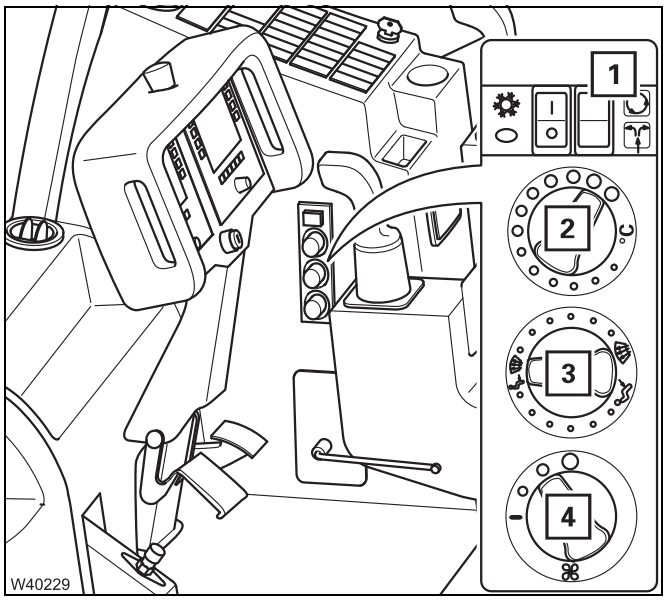
If only the engine is to be preheated, adjust the heating system as follows:



– Switch (**1**) to position *Warm*.
– Switch (**2**) to position *Fan off*.

Preheating the crane cab

If the crane cab is to be preheated in addition to the engine, adjust the heating system as follows:



– Switch (**2**) to position *Warm*.
– Switch (**1**) to the *Recirculated air* symbol.
– Switch (**4**) to the required fan level.
– Set switch (**3**) to the desired air vents.
– Open the air vents; ➠ p. 11 - 132

The amount of time required to preheat the engine will be increased significantly by simultaneously heating the crane cab.

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Switching on

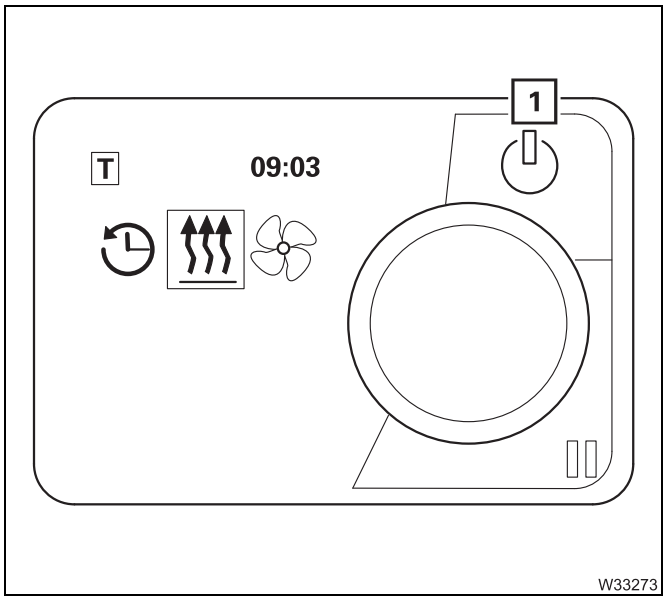
- Check whether the auxiliary heater is allowed to be operated at the current site of the truck crane before switching it on. Find out whether there are any possible sources of danger that could result in an explosion.

Risk of explosion when operating the auxiliary heater!
The auxiliary heater is not allowed to be operated:
– At service stations and tank farms
– At places where flammable gases or vapours can be found or formed (for example, at places where fuel is stored and in chemical factories)
– At places where explosive dust can be found or formed (e.g. carbon dust, wood dust and grain dust)

Danger of suffocation when operating the auxiliary heater!
Do not use the auxiliary heater in closed spaces (for example, garage).

This section describes how to switch on manually. The auxiliary heater can also be switched on automatically; ➠ *Storing the heating start*, p. 11 - 137.

- Switch on the ignition; ➠ *Switching the ignition on*, p. 10 - 10.



- Press the button (**1**) once. The auxiliary heater is switched on and the control panel and buttons are illuminated.

The status of the auxiliary water heating system is indicated by the coloured light on the button (**1**):

Lights up green:	Heater operating
Lights up blue:	Fan operating
Lights up white:	Heater off – controls on
flashing red:	Error
flashing green:	Heater operation programmed
Flashing blue:	Fan operation programmed

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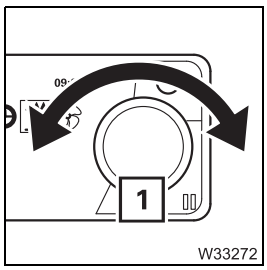
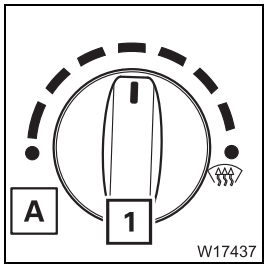


Menu control

The jog-dial (rotary push button) (**1**):

– turn to select,

– press to confirm.



Setting the temperature

• Turn switch (**1**) to the desired temperature.

If the switch (**1**) is turned as far as possible **A** (*Cold*), the auxiliary heater is not switched on.

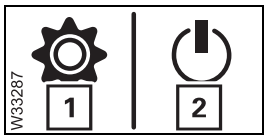
The auxiliary heater only supports the heating capacity of the standard heating system as long as the engine is cold. If the engine is warm, the heater is switched off. However, the pump for the auxiliary heater continues to run until you switch the auxiliary heater off.

Always switch the auxiliary heater off if you switch off the truck crane while the battery master switch is switched on. In this way, you prevent the auxiliary heater from restarting and the batteries from running down after the engine has cooled down.

Setting the date and time

The error code **TEB** is shown in the display if the power supply has been interrupted for more than 8 minutes. You must reset the date and time.

Always set the current time and current day of the week. These settings are required for the correct activation point of the automatic heating start.



• Select and confirm the symbol *Settings* (**1**) – display symbol *Immediate start* (**2**).

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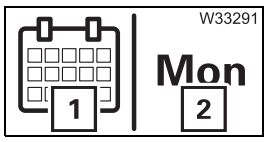
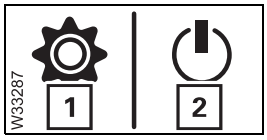
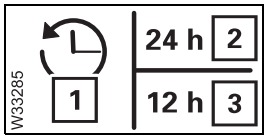


- Select and confirm the symbol *Day of the week* (**1**) – display symbol (**2**), e.g. **MON** for Monday.
- Select and confirm the desired day of the week.



- Select and confirm the symbol *Settings* (**1**) – display symbol *Immediate start* (**2**).



- Select and confirm the symbol Time *Time* (**1**) – display symbol *Time format*.
- Select and confirm the desired time format (**2**) or (**3**).

The *Time* display flashes.

- At the flashing display, set the hours and confirm the selection.

- Set the minutes at the flashing display and confirm the selection.

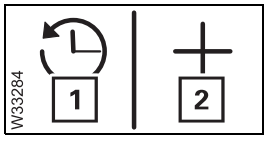
The time and day of the week have now been set.

Storing the heating start

Heating is started automatically on schedule only if the time and the day of the week have been correctly set; ➠ *Setting the date and time*, p. 11 - 136.

You can set three different automatic heating starts – up to seven days in advance.

If you call up values in order to change them during the following setting process, they flash for 5 seconds. The entry must be made within this period. The value stops flashing after 5 seconds and is saved as the new value.



- Select and confirm the symbol *Timer* (**1**) – display symbol *Add timer* (**2**).
- Select and confirm the symbol *Add timer* (**2**).

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- Select and confirm the desired day of the week, e.g. **MON** for Monday.

The *Switch-on time* display flashes.

- At the flashing display, set the hours and confirm the selection.

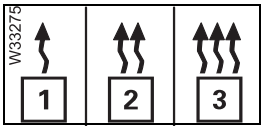
- Set the minutes at the flashing display and confirm the selection.

The switch-on time is now set.
Next you must set the switch-off time.

The *Switch-off time* display flashes.

- At the flashing display, set the hours and confirm the selection.

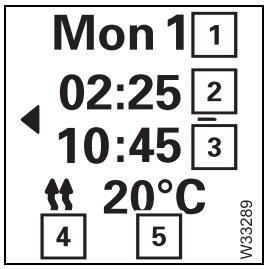
- Set the minutes at the flashing display and confirm the selection.



- Select and confirm the desired heating mode:
  - economical (**1**)
  - comfortable (**2**)
  - quick (**3**)

- Select and confirm the desired temperature.

After the desired temperature has been input, the set values are saved and shown in the display:



- Day (**1**)
- Switch-on time (**2**)
- Switch-off time (**3**)
- Heating mode (**4**)
- Temperature (**5**)

- Confirm the set values.

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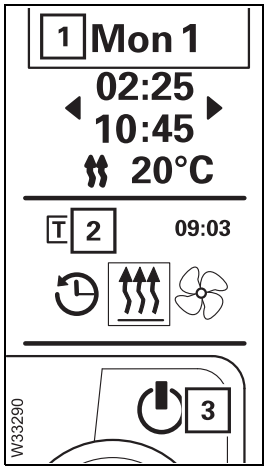
- Confirm the *Activate* symbol.



A heating start that is activated is shown by:

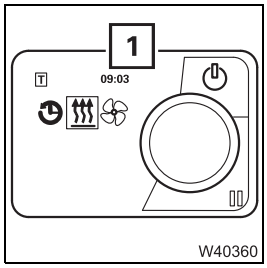
– A white marking (**1**)

– The symbol *T* (**2**) in the main menu

– If the display is switched off, the button (**3**) flashes **green**.

11.7.3 Auxiliary air heater

With additional equipment, the crane cab can be heated via an auxiliary air heater.



The auxiliary air heater is operated via the control unit (**1**).

You can set an automatic start time and duration for the heating.

It is operated in the same way as the auxiliary heating system;
➠ *Storing the heating start*, p. 11 - 137.

Risk of damage to the auxiliary heater!
Do not switch on the auxiliary air heater and the standard heater fan at the same time. This prevents the auxiliary air heater from overheating.

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11.7.4 Air-conditioning system

You can use the air-conditioning system to cool and dry the air in the crane cab.

Notes

Do not cool the air in the crane cab too much.
The difference between the outside temperature and the inside temperature should be at the most 10 °C to 14 °C (18 °F to 25 °F).
If the cooling is too severe, you may frequently feel physically uncomfortable, albeit mostly only after you leave the cool environment.

Avoid having cold air blowing directly on to your body.

When using recirculated air, you should switch over to fresh air mode to ensure a fresh supply of oxygen at the same time. Adjust the cooling output to your actual needs:

If the truck crane has been exposed to strong sunlight for a long period of time, for example, the air-conditioning system should initially be operated at the highest blower level with the engine running.
The door or at least the windows should be left open for a short while to thoroughly air the cab. The cooling-down procedure can be accelerated by increasing the engine speed.

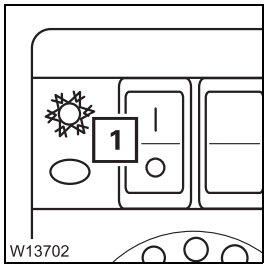
If the air-conditioning system is operated continuously, close the windows and doors to ensure sufficient cooling.

Once the inside temperature has reached the desired temperature, set the fan to a lower level.

Switching on/off

- Start the engine. The air-conditioning system only functions when the engine is running.
- Switch off the auxiliary heaters.

– ➠ *Auxiliary water heater*, p. 11 - 133,
– ➠ *Auxiliary air heater*, p. 11 - 139



– **Switch on:** • Press switch (**1**) in at the top.
– **Switch off:** • Press switch (**1**) in at the bottom.

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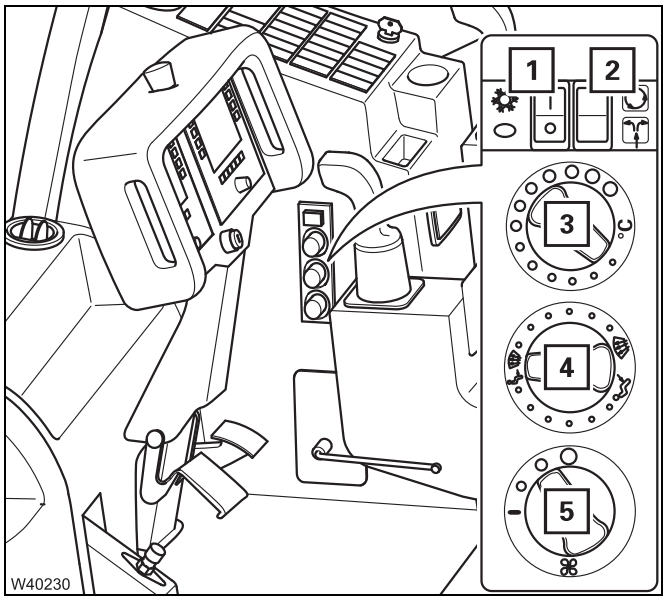
Cooling

The illustration shows only a sample setting. Always adjust the setting to the current conditions.

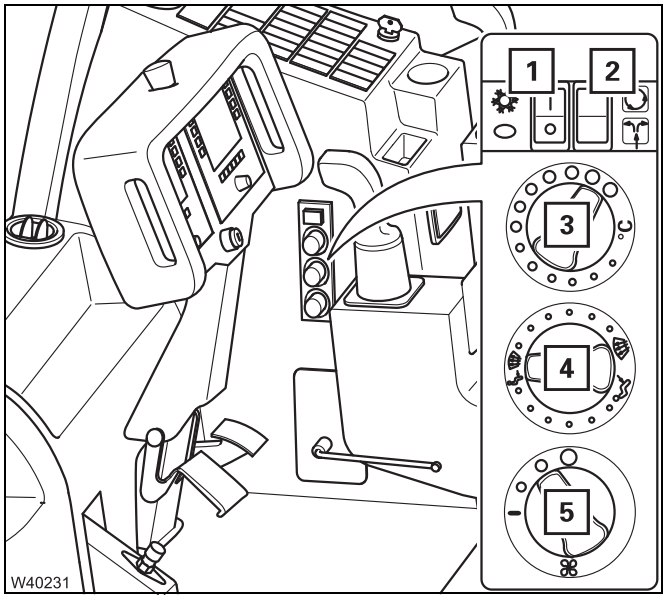


- Press the switch next to symbol (**1**).
- Turn the switch (**3**) as far as it will go, to *Cold*.
- Turn switch (**5**) to the required level.
- Set the air distribution with switch (**4**) – open the air vents if necessary.

If switch (**2**) is set to recirculated air, cooling will be quicker. There will be no fresh air supplied, however.

Drying the air

You can dry the air in the crane cab.
Here however, no heating or only a small amount will be produced.



- Press the switch next to symbol (**1**).
- Turn the switch (**3**) as far as it will go, to *Warm*.
- Turn switch (**5**) to the required level.
- Adjust the setting for fresh air/recirculated air to the current conditions (humidity and temperature of the outer air) using switch (**2**).
- Set the air distribution with switch (**4**) – open the air vents if necessary.

When drying, the air-conditioning system and the heating system work against each other. After drying, switch off the device that you do not require.

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11.8 CraneSTAR system

11.8.1 Overview

Your truck crane is equipped with the CraneSTAR system.
The CraneSTAR system is used to transmit crane data via mobile phone, thus allowing remote diagnostics and localisation of the truck crane.

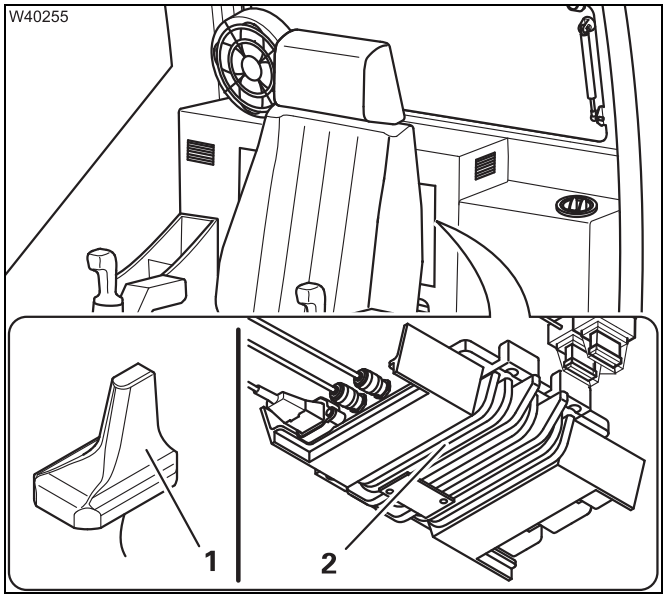
The CraneSTAR system works automatically, no controls must be operated. This sections shows only the location of the associated components.

The CraneSTAR system will be activated only at the request of the crane operator.
Information on viewing the transmitted data in the Internet can be found in the separate *CraneSTAR Operating instructions* and at:

www.cranestar.net – here, you will find all the information about activating the CraneSTAR system.

11.8.2 Position of the components

The CraneSTAR system includes an antenna and a *TCU* control unit (**T**elematic **C**ontrol **U**nit = data transfer control unit).



The antenna (**1**) is a combined GSM/GPS antenna for transmission via mobile phone (GSM) and for receiving positioning data (GPS).

The antenna is connected to the *TCU* (**2**) control unit.

When a malfunction occurs; ➠ p. 14 - 38.

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12 Rigging work

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12 Rigging work

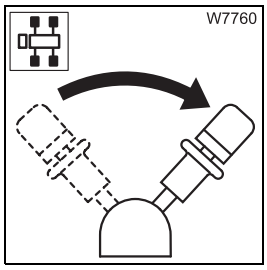
If the truck crane on the site has already been rigged, proceed according to the *CHECKLIST: Checks before operating the crane*, p. 11 - 1.

12.1 Rigging work checklists for crane operation with the main boom

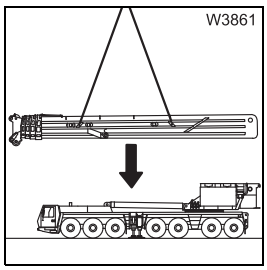
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions there!

12.1.1 CHECKLIST: Rigging

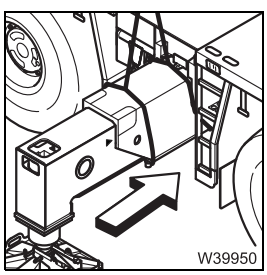
1. Choose a suitable site; ➠ *Selecting the suitable site*, p. 12 - 11.



2. Check that the parking brake is engaged – if necessary, engage the parking brake.



3. Install the main boom if necessary; ➠ *CHECKLIST: Installing the main boom*, p. 6 - 65.



4. Install the front outrigger beam if necessary; ➠ *CHECKLIST: Installing the outrigger beams*, p. 6 - 22.

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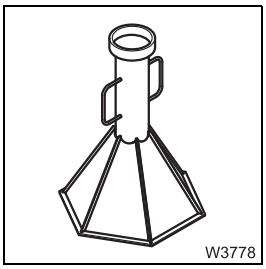
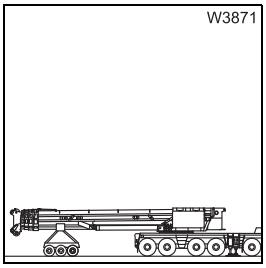


5. Rig an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft);
➠ p. 6 - 15.

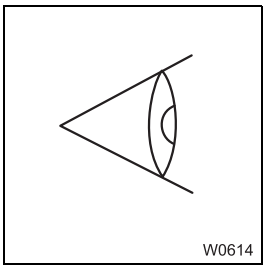


6. If the main boom is resting on a dolly:

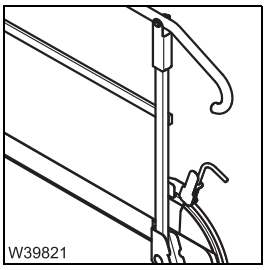
– Switch off the boom floating position; ➠ p. 12 - 29,

– Switch off slewing gear freewheel ➠ p. 12 - 27,

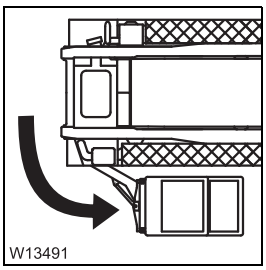
– Switch off boom pre-tensioning, if necessary; ➠ p. 12 - 30.



7. Inspect the truck crane, while looking out in particular for any leaking fluids (oil, fuel or water).

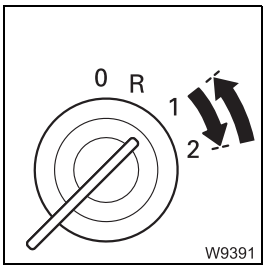


8. Extend the railing at the access ladder and fold out hoist mirror;
➠ *Access ladder railing*, p. 12 - 23,
➠ *Mirrors*, p. 12 - 25.



9. – Slew the crane cab into the *crane operation* position; ➠ p. 12 - 19.

– Bring the tread grid, ladder and railings into the *crane operation* position; ➠ p. 12 - 23.



10. Start the engine for crane operation; ➠ p. 10 - 13.

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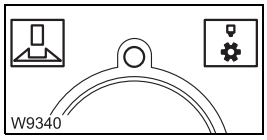
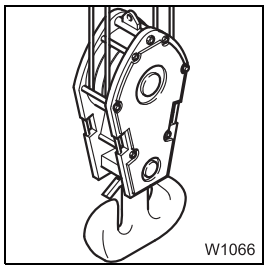
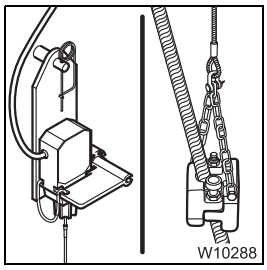


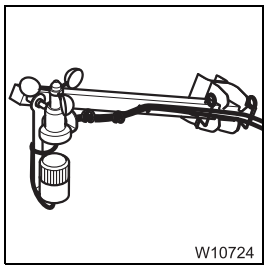
11. Unlock the turntable and if necessary switch off the houselock;
➠ *Locking/unlocking the superstructure*, p. 11 - 13,
➠ *Switching the houselock on/off*, p. 11 - 15.



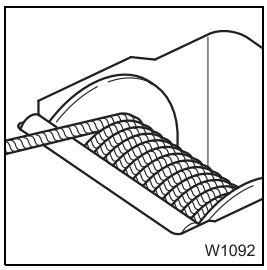
12. Pick up the hook block;
➠ *Picking up the hook block*, p. 12 - 94,
➠ *Picking up the hook block from the bumper*, p. 12 - 91,
➠ *Hook block in the lighting carrier*, p. 6 - 58.



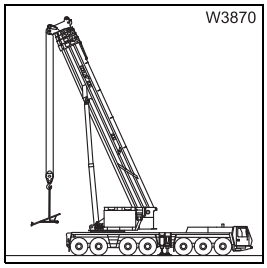
13. Install the lifting limit switch; ➠ *Installing the lifting limit switch*, p. 12 - 112.



14. Install anemometer and if necessary the air traffic control light;
➠ *Anemometer and air traffic control light*, p. 12 - 118.



15. Check the position of the hoist ropes; ➠ *Checking the position of the hoist ropes*, p. 11 - 6.



16. With the RCL set accordingly, remove the lighting carrier; or additional axle, if necessary;
➠ *Removing*, p. 6 - 56
➠ *CHECKLIST: Removing the additional axle*, p. 6 - 93.

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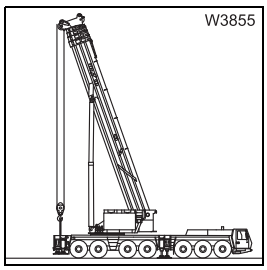
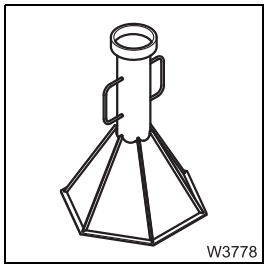
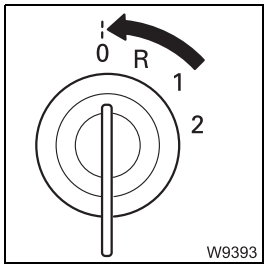


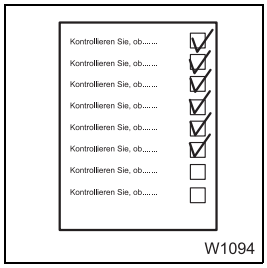
17. With the RCL set correspondingly, install the rear outrigger beam; ➠ *CHECKLIST: Mounting the rear outriggers*, p. 6 - 39.



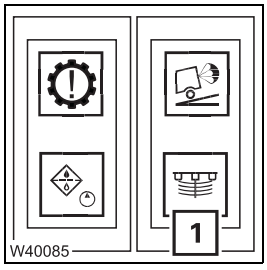
18. Remove the supports under the bearings; ➠ p. 6 - 17.



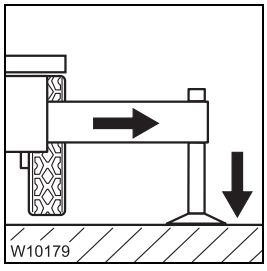
19. Switch off the engine for crane operation; ➠ p. 10 - 21.



20. Start the engine for driving; ➠ *CHECKLIST: Starting the engine*, p. 4 - 1.



21. Switch off (lock) the suspension.
The lamp (**1**) must light up; ➠ p. 5 - 15.



22. Support the truck crane with the outrigger span required for the job according to the *lifting capacity table* and raise until none of the wheels is touching the ground; ➠ *Rigging/unrigging the outriggers*, p. 12 - 31.

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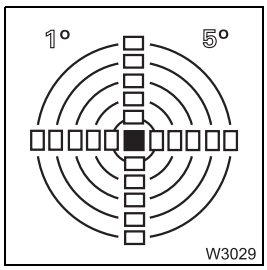
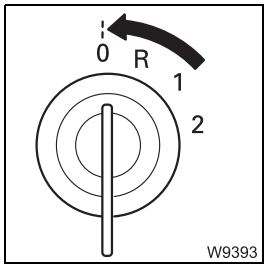
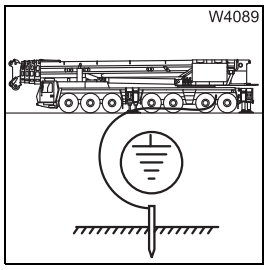


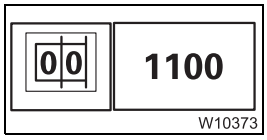
23. Align the truck crane horizontally.; ➠ p. 12 - 43.



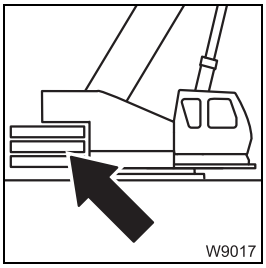
24. Switch off the engine for crane operation; ➠ *Switching off the engine*, p. 10 - 21.



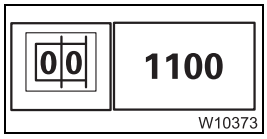
25. Earth the truck crane, if necessary; ➠ *Earthing the truck crane*, p. 12 - 14.



26. Enter the current rigging mode on the RCL; ➠ *Entering rigging mode*, p. 11 - 23.



27. With the RCL adjusted accordingly, rig the counterweight combination required for the operation according to *Tragfähigkeitstabelle*; ➠ *CHECKLIST: Rigging the counterweight*, p. 12 - 53.



28. Enter the current rigging mode with the newly rigged counterweight combination on the RCL; ➠ *Entering rigging mode*, p. 11 - 23.

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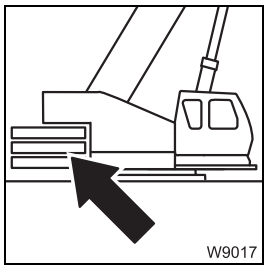
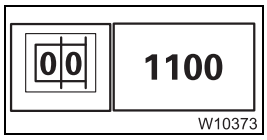
12.1.2 CHECKLIST: Unrigging

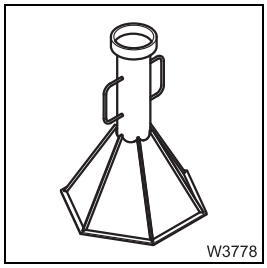
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions there!



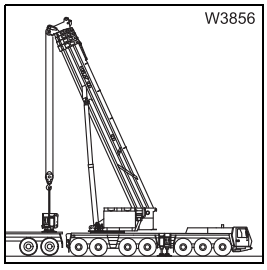
1. With the RCL set correspondingly, unrig the counterweight;
➠ *CHECKLIST: Unrigging the counterweight*, p. 12 - 55.



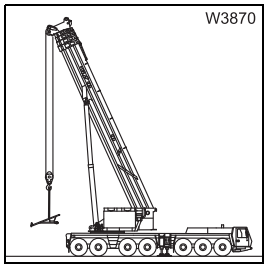
2. Enter the RCL code according to the *Lifting capacity table* for the current rigging status of the truck crane with the newly rigged counterweight combination;
➠ *Entering rigging mode*, p. 11 - 23.



3. Rig an outrigger span of 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft);
➠ p. 6 - 15.



4. With the RCL set correspondingly, unrig the rear outrigger beam;
➠ *CHECKLIST: Dismount the rear outriggers*, p. 6 - 36.



5. Depending on the planned driving mode, with the RCL set correspondingly:
   – mount the lighting carrier;
➠ *Installing/removing the lighting carrier*, p. 6 - 54,
   – or mount the additional axle if there is one;
➠ *CHECKLIST: Installing the additional axle*, p. 6 - 90.

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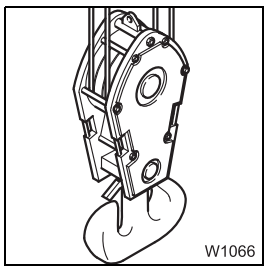
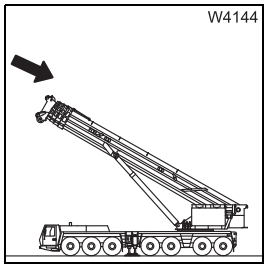
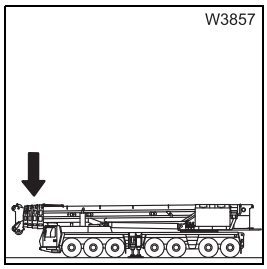


6. Depending on transport:
➠ *Setting down the hook block*, p. 12 - 94,
➠ *Attaching the hook block to the bumper*, p. 12 - 92,
➠ *Hook block in the lighting carrier*, p. 6 - 58.



7. Retract main boom, lock telescopic sections and lock telescoping cylinder with telescopic section I for on-road driving; ➠ *Locking the telescopic section for on-road driving*, p. 11 - 89.

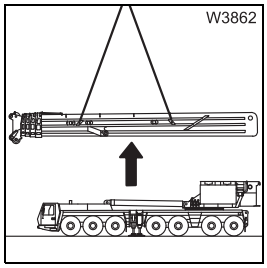


8. For on-road driving without dolly or for main boom removal:

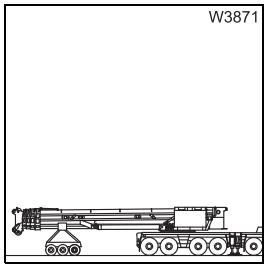
– Turn the superstructure to the 180° position to the front with the RCL adjusted accordingly,

– Set down the main boom on the boom rest,

– Lock the superstructure; ➠ p. 11 - 13.



9. Remove the main boom if necessary; ➠ *CHECKLIST: Removing the main boom*, p. 6 - 62.



10. For on-road driving with a dolly:

– Slew superstructure into 0° position with the RCL set accordingly and set down main boom on a dolly.

– Switch on the boom floating position; ➠ p. 6 - 8,

– Switch on slewing gear freewheel; ➠ p. 6 - 5

– If necessary, switch on the boom pre-tensioning; ➠ p. 6 - 9,

– Do **not** lock the superstructure; ➠ p. 11 - 13,
Switch off the houselock; ➠ p. 11 - 15.

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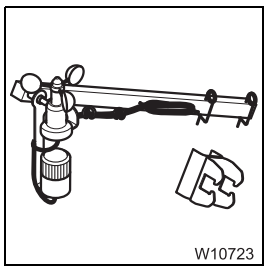
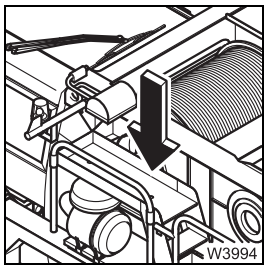
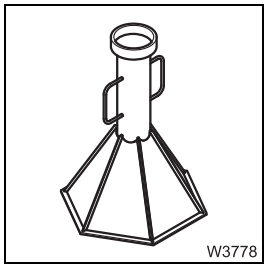


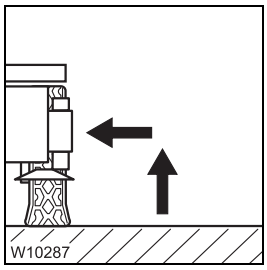
11. Remove anemometer and the air traffic control light;
➠ *Anemometer and air traffic control light*, p. 12 - 118.



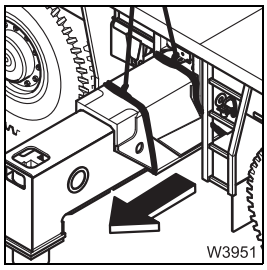
12. Fold in the hoist mirror and slide in the access ladder railing;
➠ *Mirrors*, p. 12 - 25
➠ *Access ladder railing*, p. 12 - 24.



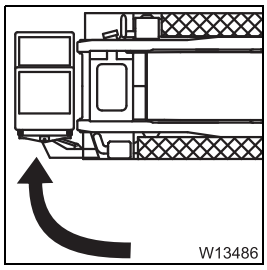
13. Remove the supports under the bearings and set down on the separate vehicle; ➠ p. 6 - 17.



14. Retract the front outriggers; ➠ *CHECKLIST: Retracting the outriggers*, p. 12 - 33.



15. Dismount the front outrigger beam if necessary; ➠ *CHECKLIST: Removing the outrigger beams*, p. 6 - 20.



16. – Bring the ladder, tread grid and railings into the *Driving mode* position; ➠ p. 12 - 22.

– Slew the crane cab into *Driving mode* position; ➠ p. 12 - 19.

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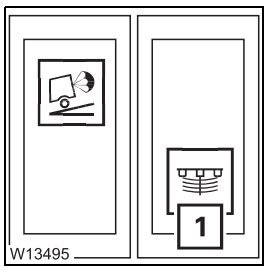
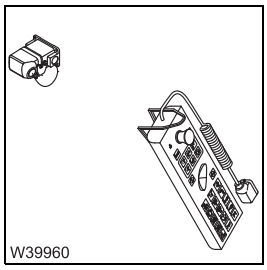
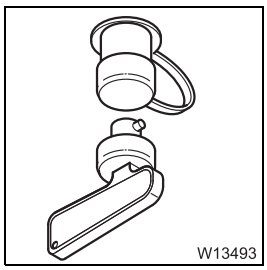


17. Activate the suspension (release locking).
Light (**1**) is off: ➠ p. 5 - 15.



18. Turn off the crane engine and stow the hand-held control in the driver's cab; ➠ *Removing the hand-held control*, p. 12 - 18.



19. When the truck crane is no longer being used; ➠ *In case of work breaks longer than 8 hours*, p. 11 - 130.

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12.2 Selecting the suitable site

Choose the position of your truck crane at the site with care. Observe the following aspects:

- Check that the ground has sufficient load bearing capacity. You may need to enlarge the load-bearing area; ➠ p. 12 - 11.
- Observe the required safe distances to slopes and pits; ➠ p. 12 - 13.
- If there is a danger of it becoming charged with static electricity, earth the truck crane; ➠ p. 12 - 14.
- Keep a safe distance away from electrical lines; ➠ p. 12 - 14.
- Choose the site such that the unevenness of the ground can be compensated for by adjusting the outrigger cylinders. Maximum stroke of the outrigger cylinders; ➠ p. 1 - 16.
- Choose a location where it is possible to keep the working radius to a minimum and where no obstacles are within the slewing range of the crane.

12.2.1 Determining the required load-bearing area

The stability of the truck crane depends in the first instance on the load bearing capacity of the ground. The load bearing capacity of the ground and the occurring outrigger pressure determine the load-bearing area required for the operation.

$$\text{Load-bearing area } (m^2) = \frac{\text{Outrigger pressure (t)}}{\text{Load bearing capacity of the ground } \left(\frac{t}{m^2}\right)}$$

Outrigger pressure

- Determine the outrigger pressure for the operation planned using the *Outrigger pressure table*.

Load bearing capacity of the ground

- Find the load bearing capacity of the ground using the table.

APPROXIMATE VALUES FOR THE LOAD BEARING CAPACITY OF THE GROUND		Load bearing capacity in t/m^2 (lbs/ft^2)
Backfilled, not artificially compacted ground:		0 to 10 (0 to 2,050)
Natural, apparently undisturbed ground:		
Mud, peat, marsh		0
Non-cohesive ground which is sufficiently firm:	Fine to medium sand	15 (3,070)
	Coarse sand to gravel	20 (4,100)
Cohesive ground:	Mushy	0
	Soft	4 (820)
	Stiff	10 (2,050)
	Semi-solid	20 (4,100)
	Hard	40 (8,200)
Rock with minimal fissures in sound, unweathered condition and with favourable strata:	In a compact succession of beds	150 (30,700)
	In massive or columnar formation	300 (61,400)

If you are unsure about the load bearing capacity of the ground, have the ground tested.

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Load-bearing area

- Now calculate the required load-bearing area.
- Check that the surface of the outrigger pad (➠ p. 1 - 16) is larger than the calculated load-bearing area. If the surface of the outrigger pad is smaller, you will need to enlarge the load-bearing area.

Danger of overturning if the load-bearing area is too small!
Ensure that the actual load-bearing area is at least as large as specified in the table.
This prevents the ground giving way and the truck crane overturning.

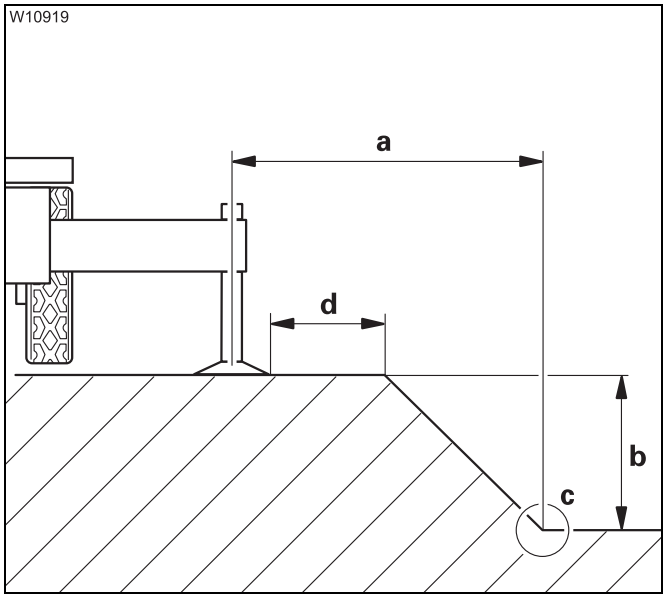
Example for calculating the required load-bearing area:

If the outrigger pressure is 25 t and the ground has a load bearing capacity of 40 t/m^2. Then the required ground bearing area for this supporting cylinder is 0.625 m^2 (= 6,250 cm^2).

If the outrigger pad has a surface of 2,000 cm^2 – you would need to enlarge the load-bearing area by placing packing under the outrigger pad; ➠ p. 12 - 40.

12.2.2 Safe distance from slopes and pits

Erect the crane at a safe distance from slopes and pits. The distance also depends on the type of ground if the slopes and pits are not supported.



Rule of thumb:

If you are working on *Non-cohesive* or *Filled-in* ground, the safety distance (**a**) must be twice as large as the pit depth (**b**).

a = 2 x b

If you are working on *Cohesive*, *Undisturbed* ground, the safe distance (**a**) must be as great as the depth of the pit (**b**).

a = 1 x b

The safe distance is measured from the base of the pit (**c**).

In addition to this the safe distance (**d**) between the pads and the pit border must always be more than 2.00 m (6.6 ft).

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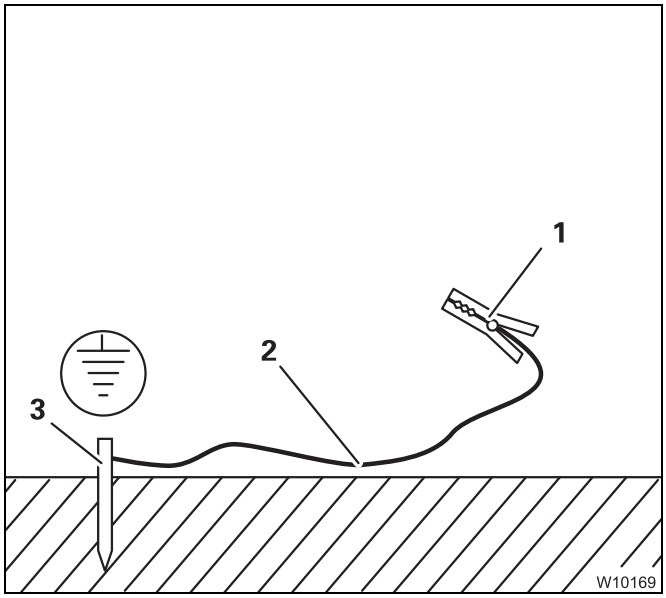
12.2.3 Earthing the truck crane

The truck crane may become charged with static electricity. This may occur especially when using outrigger pads made of plastic or when the outrigger pads are packed with insulating material (e.g. wooden planks).

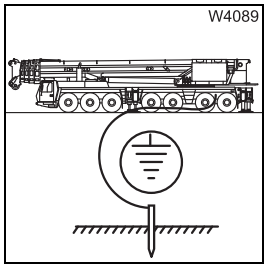
Risk of accident due to electric shock!
Earth the truck crane before you start to work with it
– Near strong transmitters (radio transmitters, radio stations, etc.)
– Near high-frequency switchgear
– If a thunder storm is forecast



Use electrically conducting material for earthing.

- Hammer a metal rod (**3**) (length about 2.0 m (6,6 ft)) at least 1.5 m (5 ft) into the ground.
- For better conductivity, dampen the soil around the metal rod (**3**).
- Clamp an insulated cable (**2**) to the metal rod (**3**) (cross-section of at least 16 mm^2 (0.025 $inches^2$)).
- Connect the free end of the cable using a clamp (**1**).

Risk of accident due to electric shock!
Ensure that the connections between the cable and the clamp are electrically conductive.
Do not attach the clamp to parts that are bolted on, such as valves, cover plates or similar parts.



- Fasten the terminal to an electrically-conducting position on the main boom or the superstructure.

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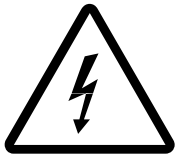
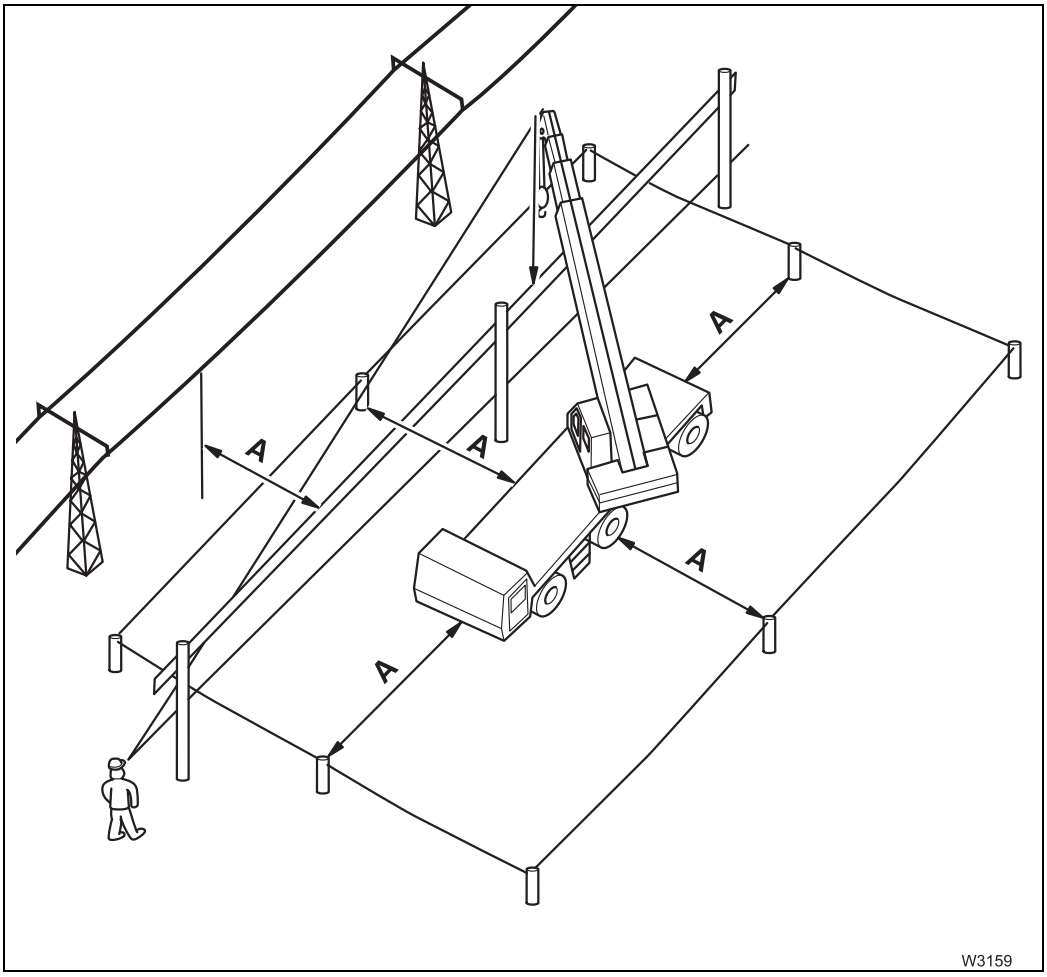
12.2.4 Safe distance from overhead power lines

Always observe the regulations in the country in which you are working when working in the vicinity of overhead power lines.



Risk of accident due to electric shock!
The truck crane is not insulated.
If the truck crane, its equipment, its load/lifting tackle or the guide ropes touch an overhead power line this will cause serious injury or even death.

If there are overhead power lines within the working range of the truck crane, have these overhead power lines de-energised if possible.



If this is not possible, you must at least observe the prescribed safe distance (**A**).

Different safe distances are recommended by the respective national regulations:

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For example, according to DIN VDE 0105

Voltage	Safe distance (A)
Up to 1,000 V	1 m (3.3 ft)
over 1,000 V to 110,000 V	3 m (9.8 ft)
over 110,000 V up to 220,000 V	4 m (13.1 ft)
over 220,000 V to 380,000 V	5 m (16.4 ft)

For example as per ASME B 30.5 (USA)

Voltage	Safe distance (A)
Up to 50,000 V	3.05 m (10 ft)
over 50,000 V up to 200,000 V	4.60 m (15 ft)
over 200,00 V to 350,000 V	6.10 m (20 ft)
over 350,000 V to 500,000 V	7.62 m (25 ft)
over 500,000 V to 750,000 V	10.67 m (35 ft)
over 750,000 V to 1,000,000 V	13.72 m (45 ft)

- Erect an obstacle at the minimum safe distance (**A**) from the overhead power line. This will keep the equipment of the truck crane and load/lifting tackle away from the power line. Make allowance for the possibility the load or the cable may swing.
- Cordon off the area around the truck crane at the safe distance (**A**). This increases the safety area in case the power line is touched.
- Have banksmen in visual or radio contact with you; check that you are observing the safe distance (**A**).
- If the load has to be guided, use only guide ropes of non-conductive material.

If you do touch the overhead power cable:

- Keep calm!
- Do not leave the crane cab!
- Tell anyone standing outside not to touch the truck crane, the load or the lifting tackle!
- Move the main boom out of the hazard area!

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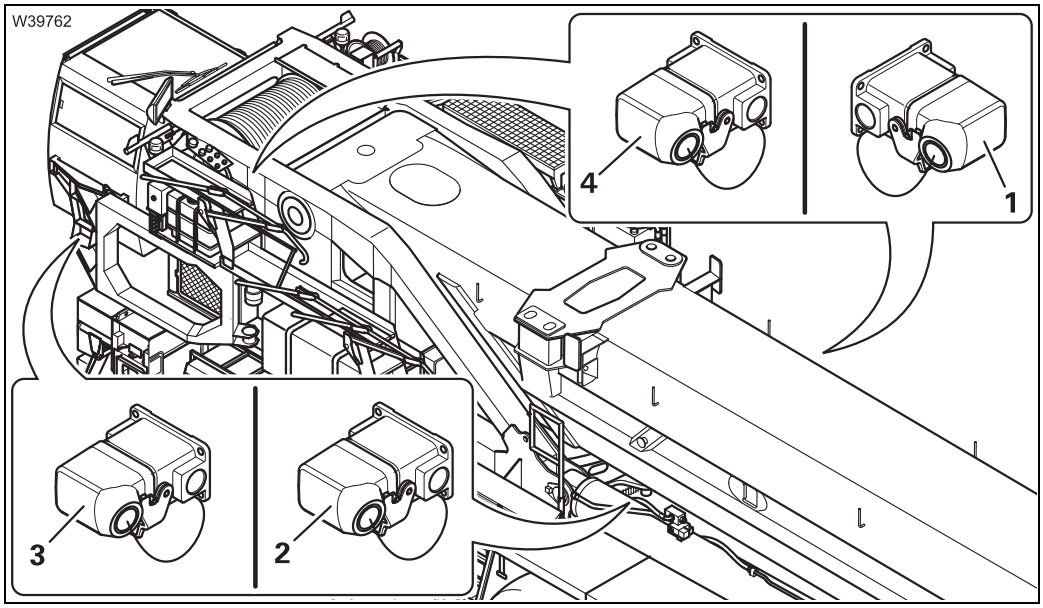
12.3 Connecting/disconnecting the hand-held control

Functionality of the sockets



Socket		Enabled operations
1 **2**	On the derricking cylinders	– Pulling device for derricking cylinder head pins – Derricking gear emergency operation
3	On the crane cab bracket	– Slewing, raising, lowering the crane cab – Slewing the crane cab bracket – Emergency operation for crane movements and turntable lock
4	Back right on the turntable	– Counterweight lifting cylinder – Counterweight lock – Locking, unlocking auxiliary hoist – Raising/setting down auxiliary hoist, catcher 2 – Pulling device, main boom pivot pin – Emergency operation for slewing gear, turntable lock, main hoist, auxiliary hoist – Rigging winch

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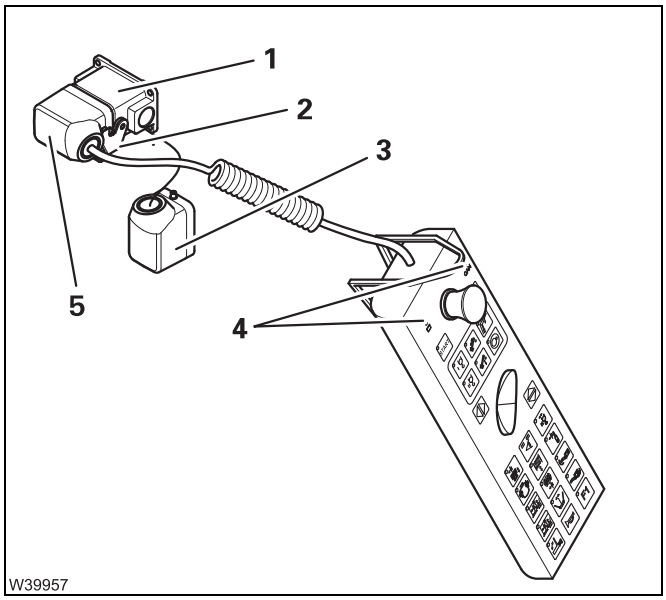
Switch off the engine for crane operation. Pulling a bridging plug will make the engines go out, but this action is only designed for emergencies.
The ignition can be switched on or off.

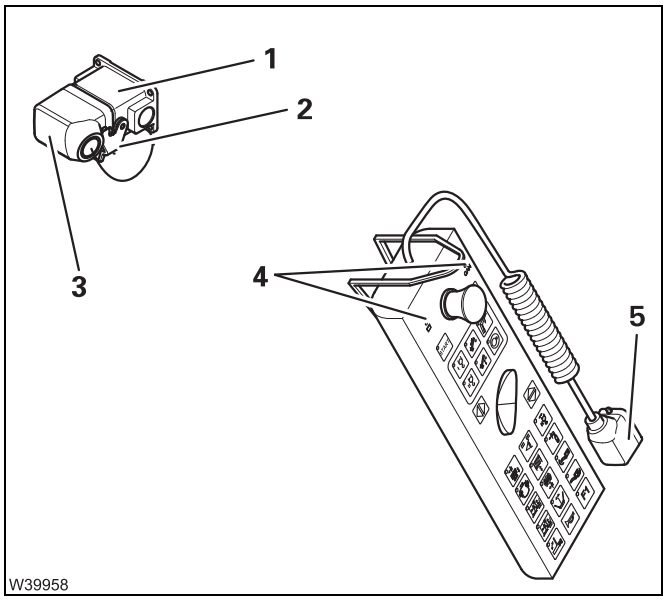


Connecting the hand-held control

- Open the cap (**2**) and pull the bridging plug (**3**) out of the socket (**1**).
- Insert the plug (**5**) into the socket (**1**) and secure it with the cap (**2**).
- After about 20 seconds, the lamps (**4**) light up – the ignition is now switched on.

There is a malfunction if one of the lamps (**4**) does not light up or flash; ➠ p. 14 - 26.

Danger due to unauthorised use!
Always stow the hand-held control in the crane cab before you leave the crane, and lock the doors.
This way you can prevent unauthorised persons starting the engine.



Removing the hand-held control

Turn off the ignition.

- Open the cap (**2**).
- Pull the plug (**5**) out of the socket (**1**) – the lamps (**4**) will go out.
- Insert the bridging plug (**3**) into the socket (**1**) and secure it with the cap (**2**).

The ignition is turned off, unless it is switched on at the ignition lock.

If necessary, stow the hand-held control in the driver's cab or the crane cab.

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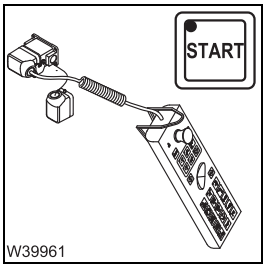
12.4 Rigging for crane operation/driving

12.4.1 Slewing the crane cab

Risk of injury due to slewing!
Ensure that no persons or obstacles are in the slewing range when you slew the crane cab or the crane cab arm.

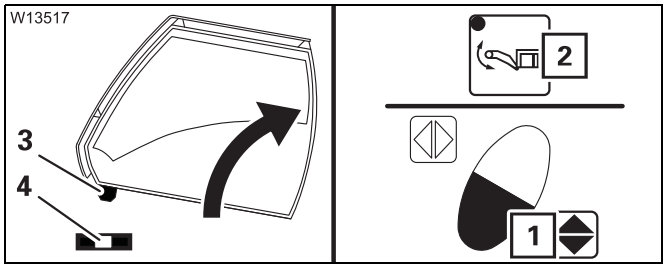
Risk of damage when slewing the crane cab!
Check that the rear access ladder has been removed. This prevents the ladder from being jammed and damaged.



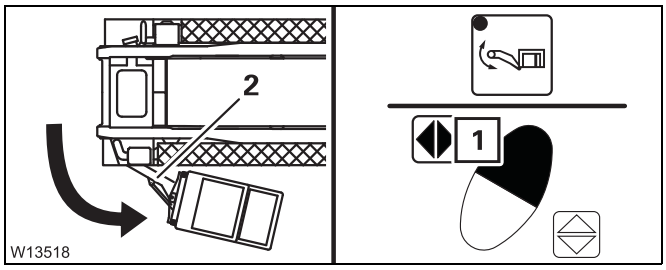
- Connect the hand-held control to the crane cab arm and start the engine;
  Connecting/disconnecting the hand-held control, p. 12 - 17.
  Starting the engine – with the hand-held control, p. 10 - 19

Crane operation **position**

Follow the safety instructions for slewing and inclining!



- Select *Slew crane cab arm* – the lamp in the button (**2**) lights up.
- Press the key combination (**1**), until the bracket (**3**) is pulled out of the holder (**4**).



- Press the key combination (**1**), until the crane cab arm (**2**) is in the *Crane mode* position.

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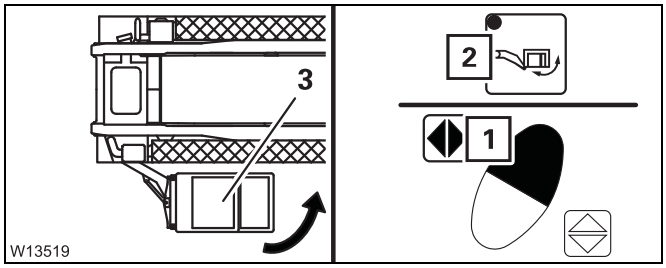
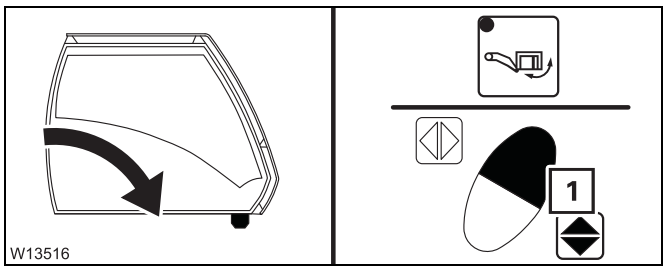
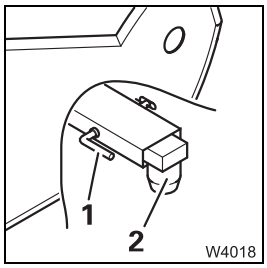


- Select *Slew crane cab* – the lamp in the button (**2**) lights up.
- Press the key combination (**1**), until the crane cab (**3**) is in the *Crane mode* position.



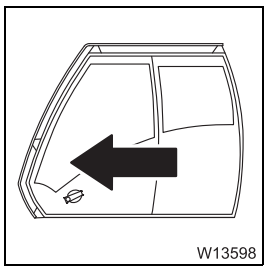
- Press the key combination (**1**), until the crane cab is inclined forwards as far as it will go.



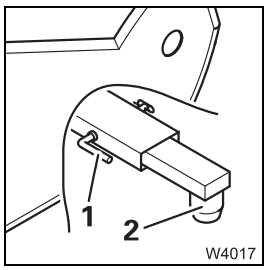
- Pull the pin (**1**).
- Push in the spring latch (**2**).
- Insert the pin (**1**) and secure it with the retaining pin.

Driving mode **position**

Follow the safety instructions for slewing and inclining (➠ p. 12 - 19)!



- Remove all loose objects from the crane cab and close the crane cab doors.



- Pull the pin (**1**).
- Pull out the retainer (**2**).
- Insert the pin (**1**) and secure it with the retaining pin.

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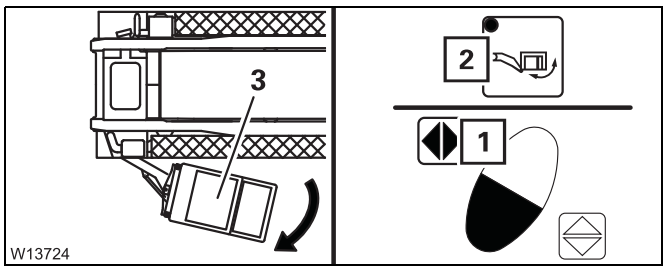
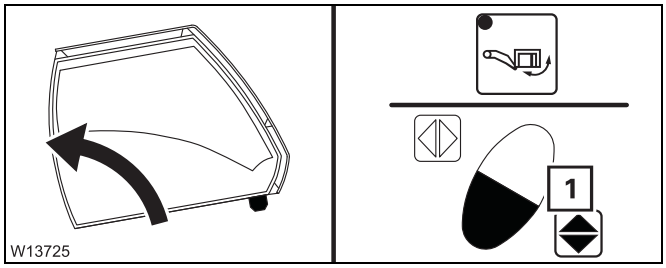
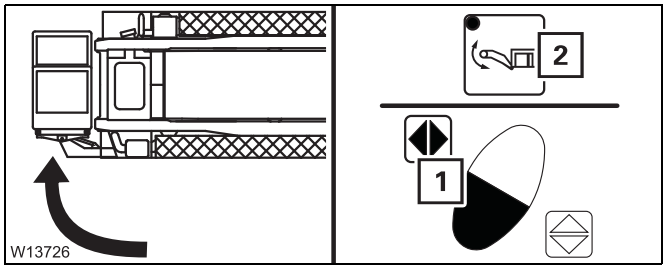


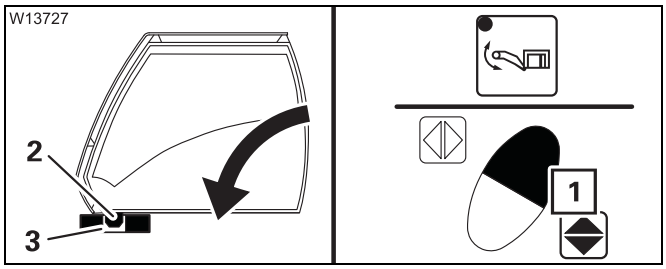
- Select *Slew crane cab* – the lamp in the button (**2**) lights up.
- Press the key combination (**1**), until the crane cab (**3**) is in the *Driving mode* position.



- Press the key combination (**1**), until the crane cab is inclined backwards as far as it will go.



- Select *Slew crane cab arm* – the lamp in the button (**2**) lights up.
- Press the key combination (**1**), until the crane cab arm is in the *Driving mode* position.



- Press the key combination (**1**), until the crane cab is tilted forward as far as it will go – the holder (**2**) must be inserted into the receptacle (**3**).

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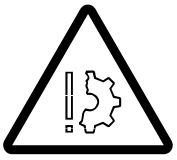
12.4.2 Fixed ladders, tread grid, ladder, railings

For the tread grid, two railings and a ladder there is a position for driving and a position for crane operation.

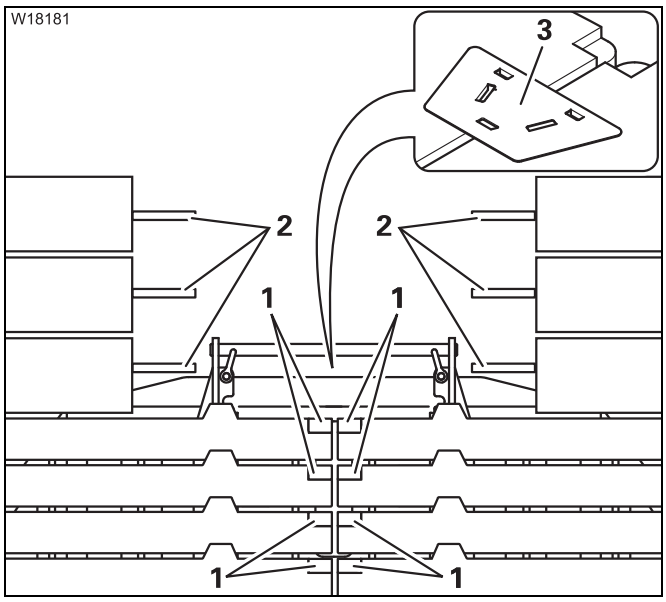
Risk of falling when railing is open!
Always close the railing on the tread grid prior to any crane operation. This avoids them falling from the tread grid when this is no longer above the carrier.



Risk of falling when railing is not pushed out!
Slide in the access railings only once you have finished all rigging work where you must stand on the turntable. When the railings are slid in they do not provide you with good support.

Risk of accidents by exceeding total permissible height!
Always slide in the access railings before driving. When the railings are unfolded, the overall height specified for on-road driving is exceeded.

Access ladder



The steps (**1**) and the tread (**2**) are on the counterweight.

With the cover (**3**) the space between the slinging points is covered to reduce the risk of accidents; handling ➠ *Assembling the counterweight version*, p. 12 - 58.

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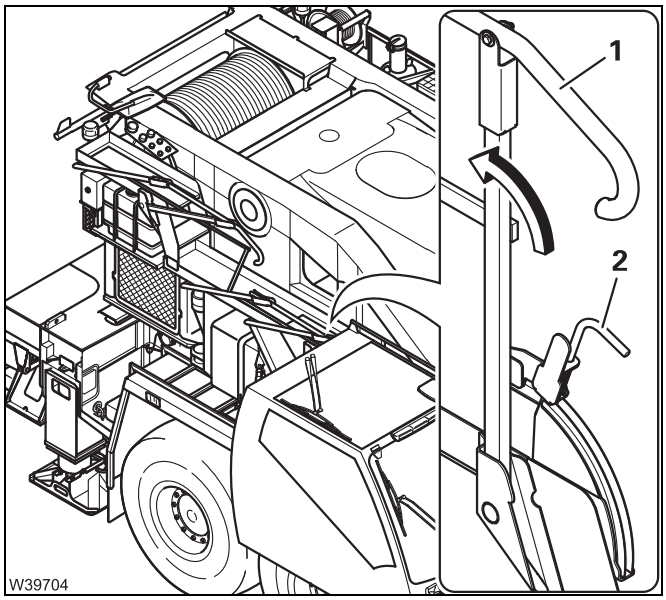
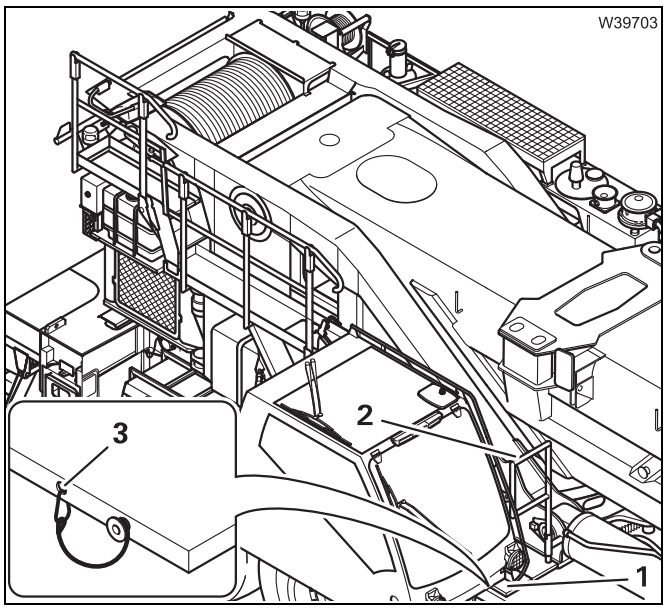
Crane operation
position



Access ladder railing

- Pull out the handle (**2**).
- Fold the handrail (**1**) out and allow the handle (**2**) to latch into place.



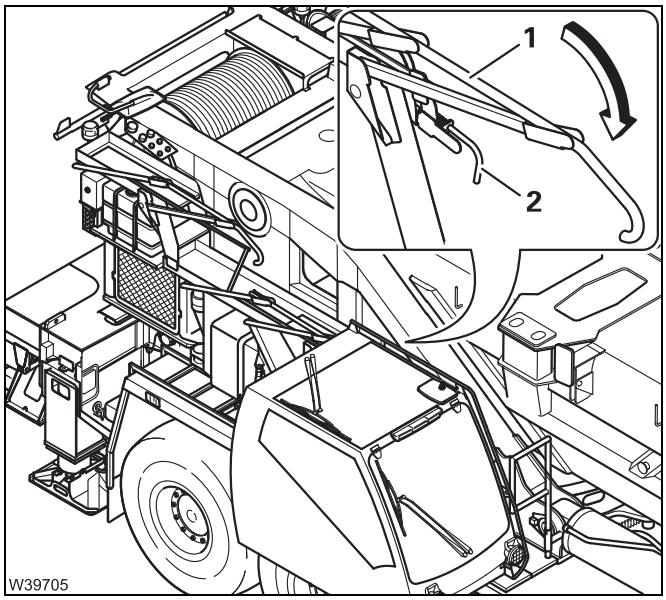
Tread grid

- Release the rope (**3**).
- Fold out the tread grid (**1**).
- Fasten the rope (**3**) to the tread grid.

Railing by tread grid

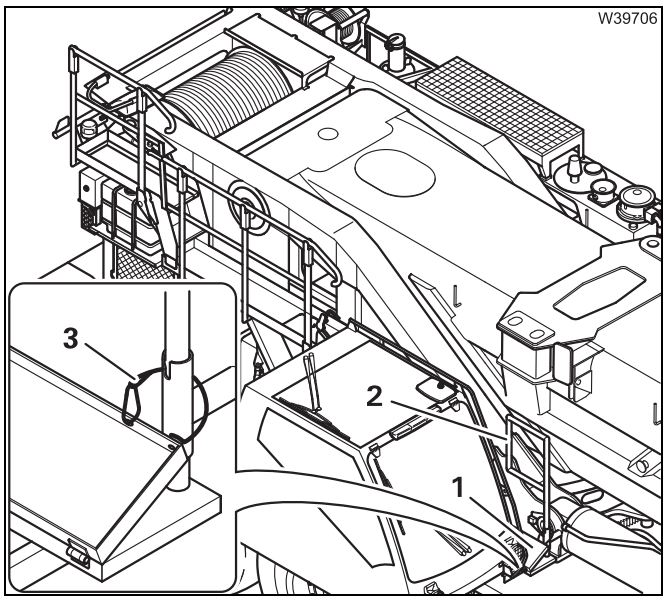
- Turn the railing (**2**) to the front until it engages.

Driving mode
position



Access ladder railing

- Pull out the handle (**2**).
- Fold the handrail (**1**) in and allow the handle (**2**) to latch into place.



Tread grid

- Fold in the tread grid (**1**) and secure it with the rope (**3**).

Railing by tread grid

- Raise the railing (**2**) and turn it to the rear as far as it will go.

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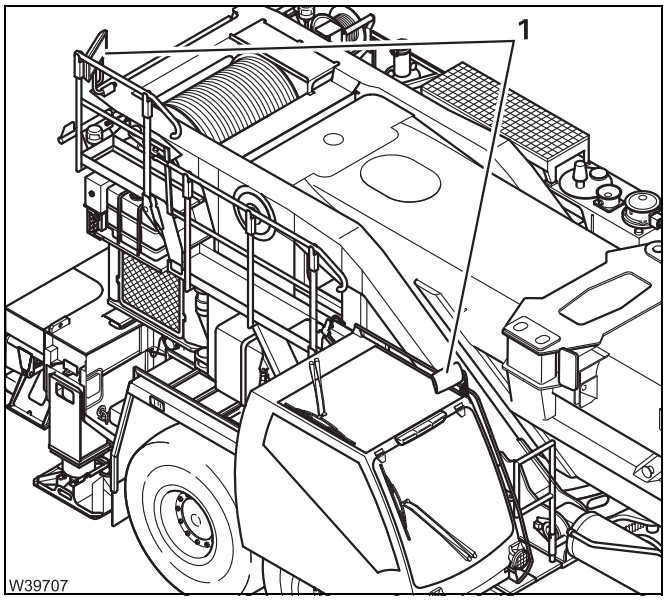
12.4.3 Mirrors

For crane operation you must adjust the mirrors. For transportation you must fold in the mirrors.

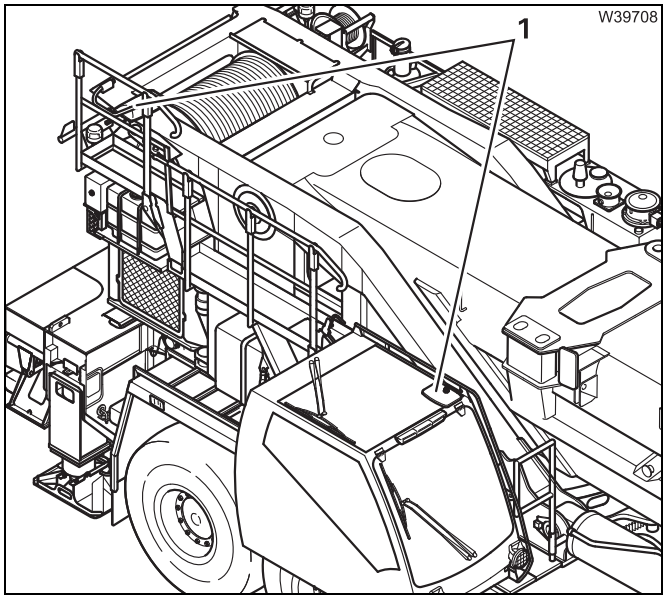
Risk of accidents due to exceeding the permissible dimensions!
Fold the necessary mirrors in for driving. With the mirrors folded out, the specified overall height at on-road level and the specified overall width for driving on roads is exceeded.

The railings at the access point must be slid out; ➠ p. 12 - 22.



Crane operation **position**

- Adjust the mirrors (**1**) in such a way that you have a clear view of the rope running on the hoisting gears.



Driving mode **position**

- Fold the mirrors (**1**) downwards.

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12.5 Rigging work after driving with a dolly

If the main boom was resting on a dolly while driving the truck crane, you must perform the following before working with the crane

– Switch off the slewing gear freewheel; p. 12 - 27

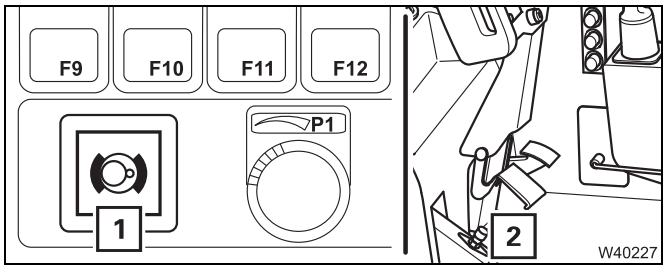
– Switch off the boom floating position; p. 12 - 29

– Switch off boom pre-tensioning, if necessary; p. 12 - 30.

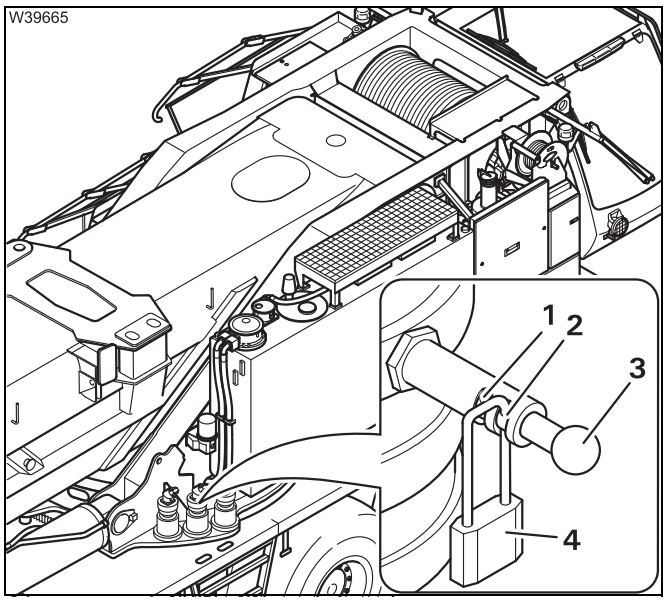
12.5.1 Switching off the slewing gear freewheel

If the slewing gear freewheel is switched on, switch it off prior to working with the crane.

Risk of accidents with the slewing gear freewheel switched on!
Switch off the slewing gear freewheel before working with the crane. If it is not switched off, the slewing gear brake does not work and you cannot stop slewing movements in time.



Prerequisites
– The engine for crane operation must be running.
– The foot-operated switch (**2**) n the crane cab is activated and the lamp (**1**) is out; p. 11 - 97.



- Remove the lock (**4**) from the hole (**1**).
- Pull the pin (**3**) out as far as possible.
- Secure the pin with the padlock in the bore (**2**) and remove the key.

Now the slewing gear freewheel is switched off and secured.

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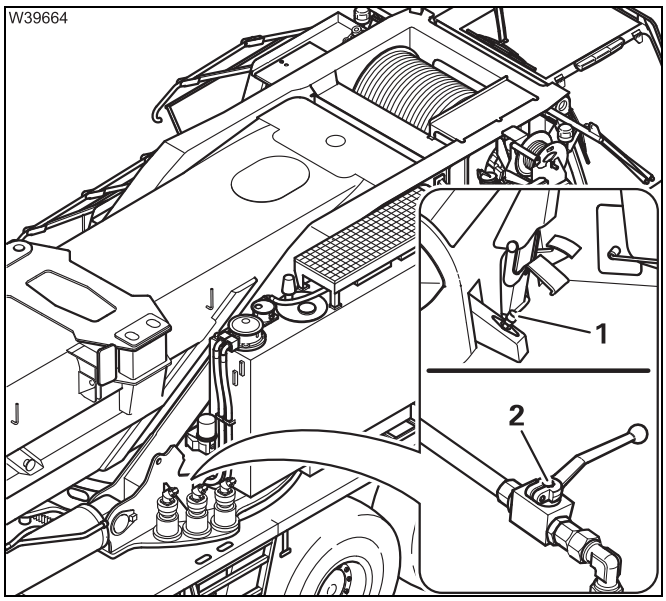
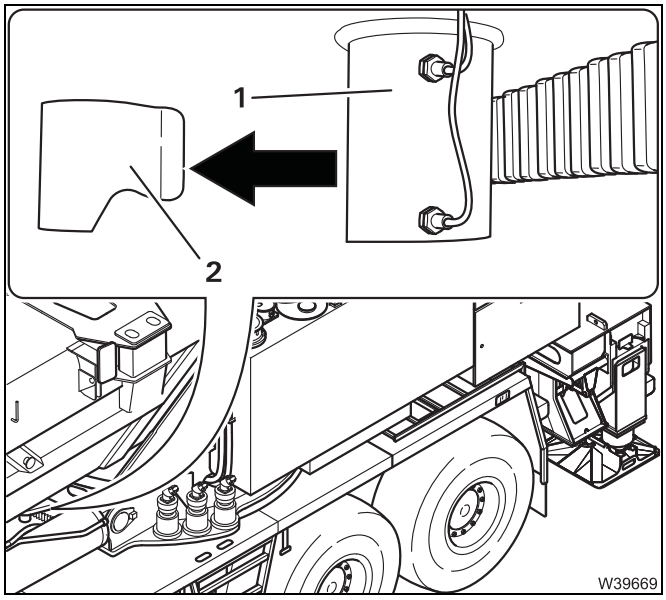


- Release the foot-operated switch (**1**).

For crane operation you must hydraulically separate the supply and return lines.

- Close the valve – lever (**2**) at right angles to the line.



- Remove the cover (**2**) from the turntable lock.

Before slewing

- Support the truck crane with an outrigger span of at least 8.76 x 2.63 m (28.7 x 6.8 ft), enter the corresponding RCL code and derrick the main boom to an angle permissible within the working range.

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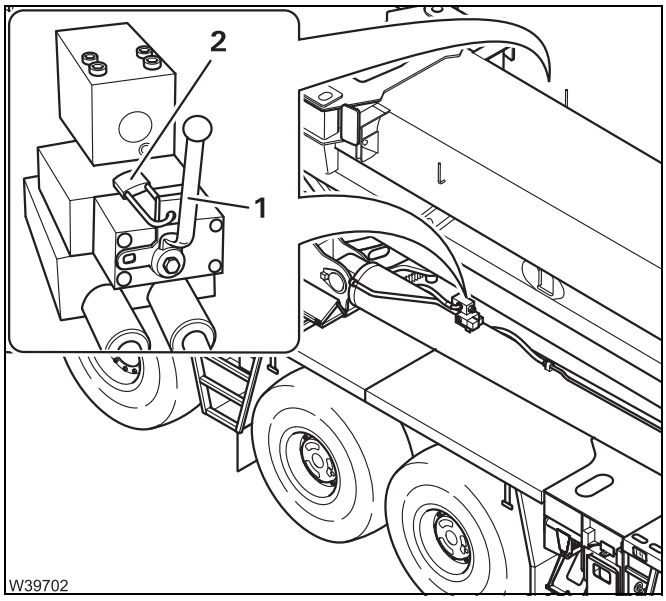
12.5.2 Switching off the boom floating position

You must switch off the boom floating position before you raise the main boom off the dolly.

Risk of accidents from the main boom dropping down!
Always secure the lever with the padlock after switching off the boom floating position.
This prevents the raised main boom falling down when the lever is actuated.



- Remove the padlock (**2**).
- Switch over valve I – lever (**1**) vertical.
- Secure the lever (**1**) with the padlock (**2**).
- Deactivate the boom floating position on the other derricking cylinder as well.

The boom floating position is now switched off.

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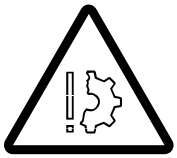
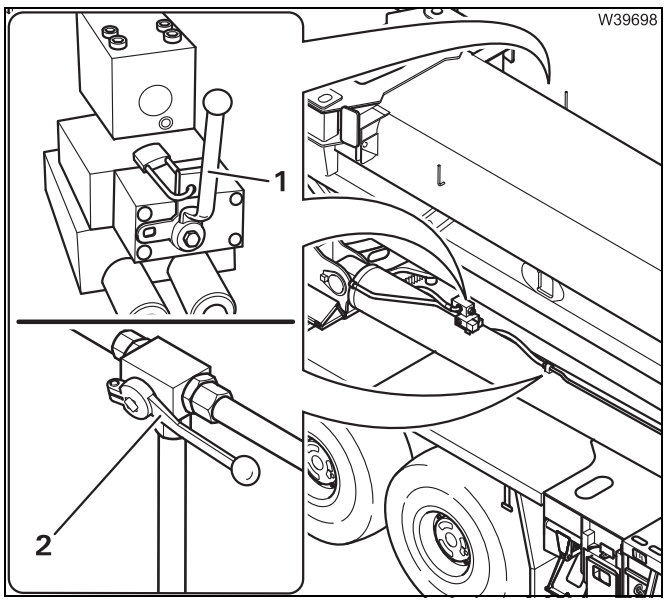
12.5.3 Switching off boom pre-tensioning

You must switch off the boom pre-tensioning before you raise the main boom off the dolly.

To switch off boom pre-tensioning, you must bring the valves I to IV into the required positions, which will empty the pressure accumulator.

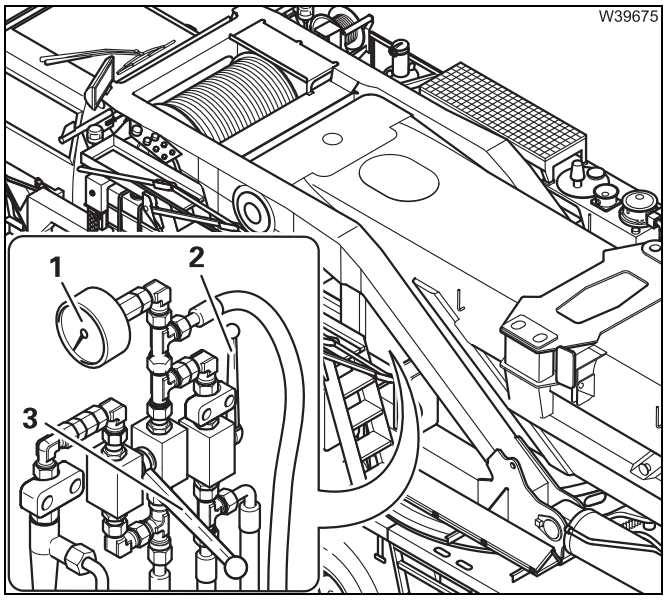


Danger of the hydraulic oil overheating!
Always switch the valve IV over (lever in horizontal position) before operating the crane.
This prevents the pressure in the hydraulic circuit from rising and the hydraulic oil from exceeding the permissible temperature of 80 °C (176 °F).



The boom floating position is switched off – levers (**1**) of the valves IR and IL are vertical.

- Switch valve IV over – lever (**2**) in horizontal position.



- Open valve II – the lever (**2**) is vertical.

The pressure accumulator is emptied. The pressure at the pressure gauge (**1**) must drop to 0 bar (0 psi).

Valve III stays closed – the lever (**3**) points downwards.

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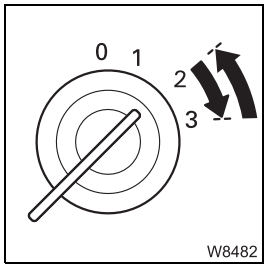
12.6 Rigging/unrigging the outriggers

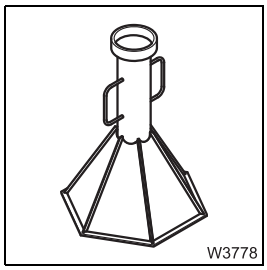
Danger of crushing by extending outrigger beams!
You may only activate the outriggers if you yourself or a banksman with whom you are in visual contact have an unobstructed view of their movements.

12.6.1 CHECKLIST: Extending the outriggers

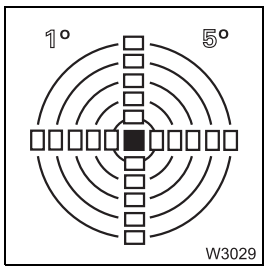
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions there!



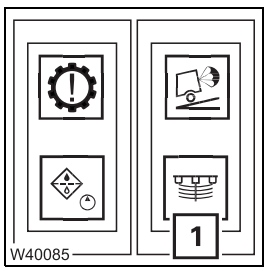
1. Start the engine for driving; p. 4 - 1.



2. Check that the supports under the bearings on the rear have been removed; p. 6 - 17.



3. Level the truck crane with the level adjustment system and lower it as far as possible; p. 5 - 54.



4. Switch off (lock) the suspension.
The lamp (**1**) must light up; p. 5 - 15.

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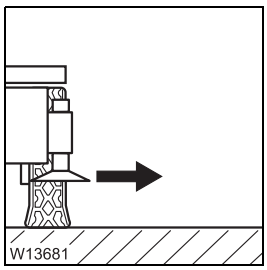
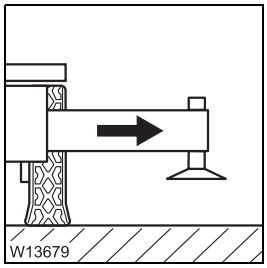
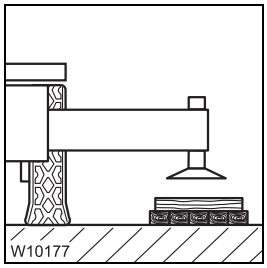


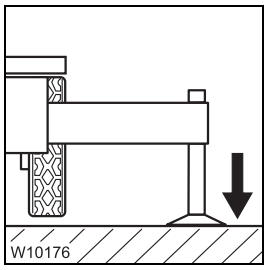
5. Move the outrigger pads into the working position and secure them;
➠ p. 12 - 39.



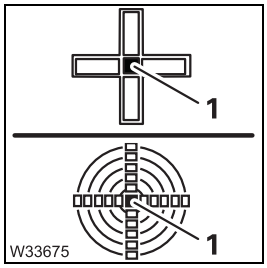
6. Extend all outrigger beams to the required span;
➠ *Permissible outrigger spans*, p. 12 - 34,
➠ *Setting the outrigger spans*, p. 12 - 35,
➠ *Extending/retracting outrigger beams*, p. 12 - 37.



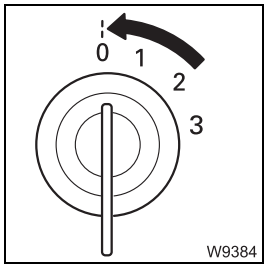
7. Enlarge the ground bearing area if necessary;
➠ *Determining the required load-bearing area*, p. 12 - 11,
➠ *Enlarging the load-bearing area*, p. 12 - 40.



8. Extend the supporting cylinders until none of the wheels is touching the ground;
➠ p. 12 - 41.



9. Level the truck crane with the outriggers; ➠ p. 12 - 43.



10. Switch off the engine; ➠ p. 4 - 18

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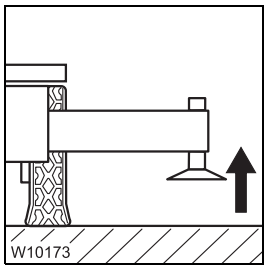
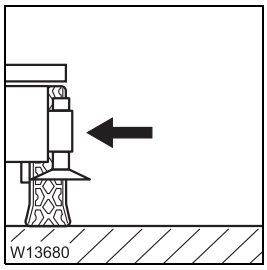
12.6.2 CHECKLIST: Retracting the outriggers

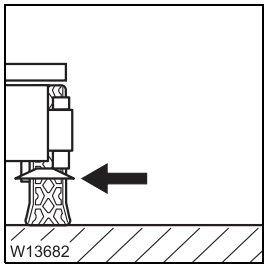
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions there!



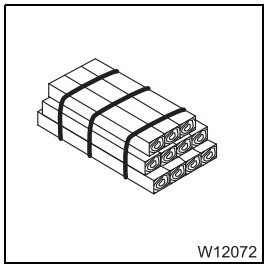
1. Retract the outrigger cylinders as far as possible; ➠ p. 12 - 41.



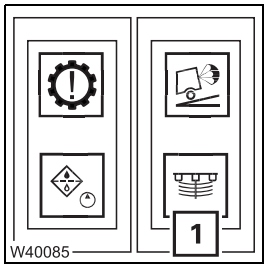
2. Fully retract and secure all outrigger beams;
➠ p. 12 - 37.



3. Move the outrigger pads into the driving position and secure them;
➠ p. 12 - 39.



4. Stow away packing material safely, if applicable.



5. Switch on the suspension.
The lamp (**1**) goes out; ➠ p. 5 - 15.

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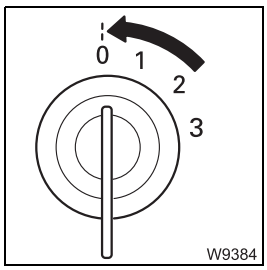
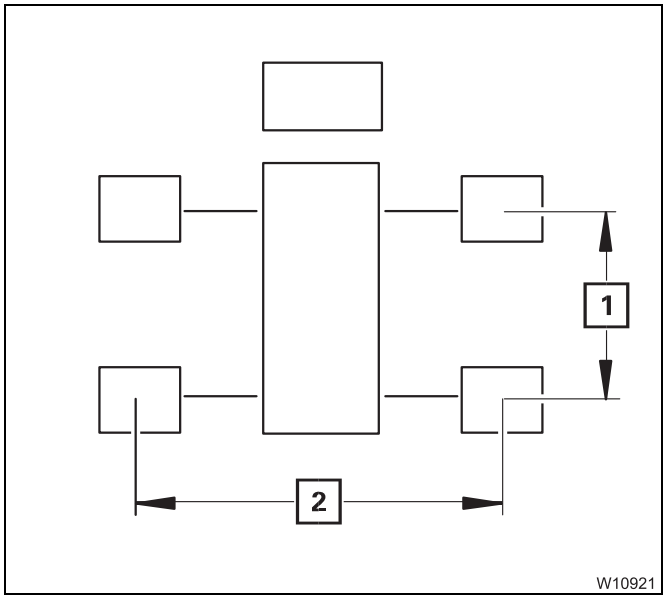


6. Switch off the engine;

12.6.3 Permissible outrigger spans

Risk of overturning when slewing the superstructure!
Support the truck crane with the required outrigger span.
For all outrigger spans, slewing is only permissible with certain counterweight versions and boom positions; ➠ *Slewing with a rigged counterweight*, p. 12 - 71.



8.76 x 8.90 m (28.7 x 29.2 ft)

8.76 x 6.10 m (28.7 x 20.0 ft)

8.76 x 2.63 m (28.7 x 6.8 ft)

7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft)
(rear outriggers)

The first value represents the outrigger length (**1**), e.g. 8.76 m (28.7 ft).

The second value specifies the required outrigger span (**2**), e.g. 8.90 m (28.7 x 29.2 ft).

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12.6.4 Preparing the truck crane

In the driver's cab

Levelling the truck crane

- Align the truck crane horizontally with the level adjustment system; ➠ *Operating the level adjustment system*, p. 5 - 54.

Locking the suspension

- Switch off the suspension; ➠ p. 5 - 15.

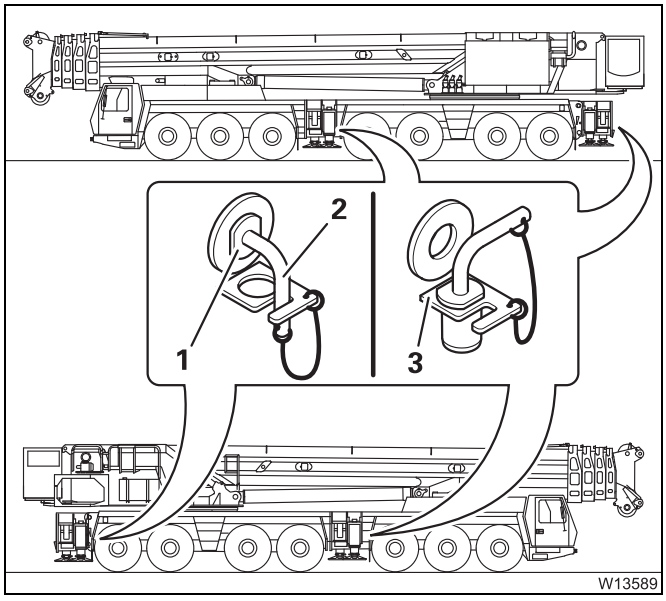
If the suspension is switched off, the wheels are lifted when the crane is put on outriggers.

12.6.5 Setting the outrigger spans

Extend the outrigger beams only as far as the permissible spans.

Danger of overturning if the outrigger beams are not correctly extended!
Always extend **all** outrigger beams to the required outrigger span even if you are only working on one side. Otherwise the rear stability for the rigging mode according to the RCL code is no longer guaranteed.

This section describes how to release and secure the outrigger beams, as well as the markers for the outrigger spans.



Release the outrigger beams

- Turn the pin (**1**) to the side and pull it out.

Securing the outrigger beams

- Insert the pin as far as possible into the hole (**1**).
- Turn the pin so that the handle (**2**) points down and is secured in the retaining plate (**3**).

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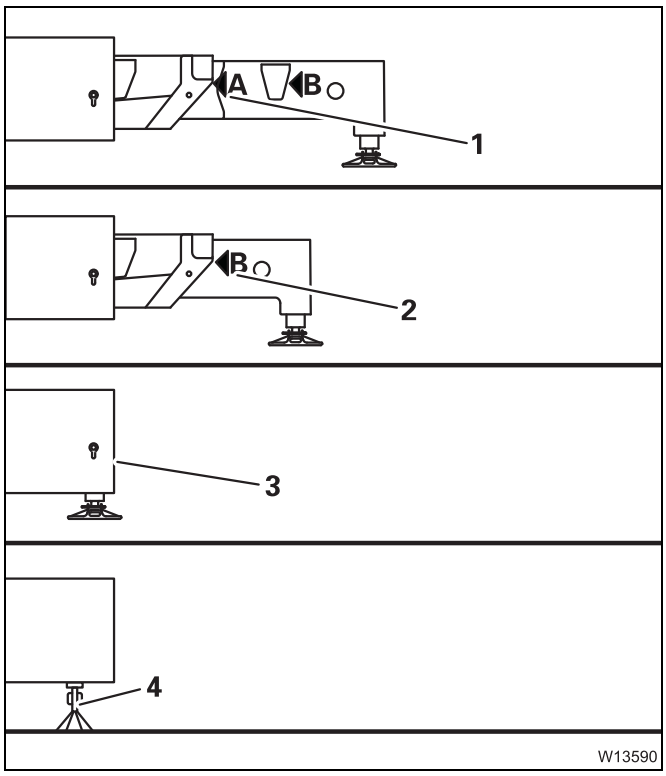

Setting the outrigger spans

- Release the outrigger beam.
- Extend or retract the outrigger beam up to the marker for the required outrigger span.
  - **1** 8.76 x 8.90 m (28.7 x 29.2 ft)[1)]
  - **2** 8.76 x 6.10 m (28.7 x 20.0 ft)
  - **3** 8.76 x 2.63 m (28.7 x 6.8 ft)
- Secure the outrigger beam.
- Set the outrigger spans on the other outrigger beams in the same way.

For the outrigger span 7.78 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) only the front outrigger beams are extended. The truck crane is propped up at the rear with supports (**4**); ➠ p. 6 - 15.

For on-road driving

- Fully retract all the outrigger beams and secure them with the pins.
- Bring all the outrigger pads into driving position; ➠ p. 12 - 39.

Risk of accidents due to outrigger beams sliding out!
Completely retract all outrigger beams and secure them. This prevents the outrigger beams sliding out when driving around corners and causing serious accidents.

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12.6.6 Extending/retracting outrigger beams

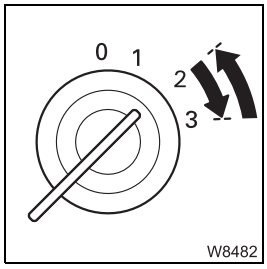
Risk of accidents if outrigger beams cannot be seen!
Cordon off the area where you intend to extend and retract the outrigger beams. Nobody is allowed to be in this area.
Observe the moving outrigger beams or have them observed by a banksman who is in visual contact with you.

Danger of overturning if improperly supported!
Always extend **all** the outrigger beams, and always extend them to the spans corresponding to the RCL code.
This also applies if you are working on one side only, since it ensures that the truck crane is stable at the rear.

Risk of damage to the outriggers!
Before extending the outrigger beams, always check whether they have been released.

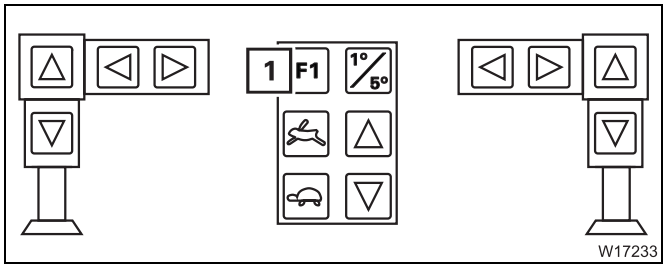
- Check that the outrigger beams are released; ➠ p. 12 - 35.

The outrigger beams are moved using the *Outrigger* control units.



Starting the engine

- Start the engine; ➠ p. 4 - 11.



Switching on the lighting

Only the lamp (**1**) lights up after opening the door.

- Press any button.

The lights are switched on.

Moving the outrigger beams

You can only operate the outrigger beams to the left and right of the control unit on the operator's side.

- Observe the safety instructions for operating the outrigger beams; ➠ p. 12 - 37.

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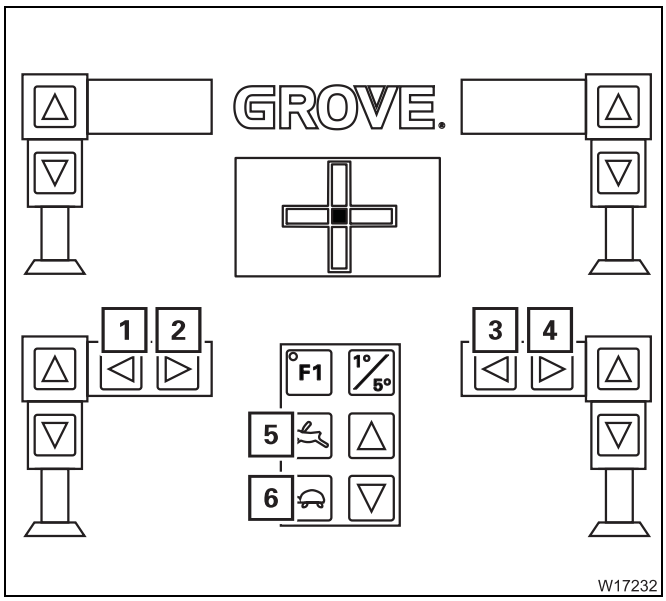

- Press the button
  - **5** For high-speed mode
  - **6** For normal speed.
- Additionally press the button for the desired outrigger beam.
  - **1** Extend left
  - **2** Retract left
  - **3** Retract right
  - **4** Extend right
  - **1 + 4** Extend both
  - **2 + 3** Retract both

The outrigger beams move until you let go of the respective button or until the respective end position has been reached.

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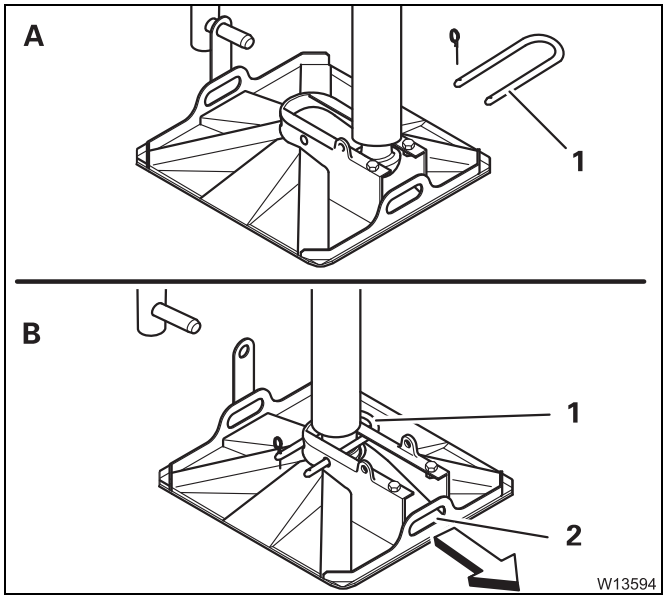
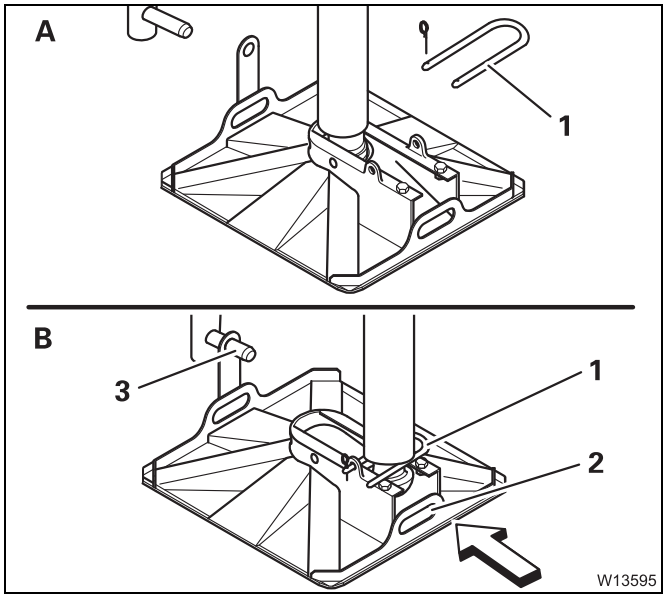
12.6.7 Moving the outrigger pads into working/driving position



Moving them into working position

- (**A**) – Pull out the bracket (**1**).
- (**B**) – Pull the outrigger pad outwards by the handle (**2**).
- Secure the outrigger pad with the bracket (**1**) in both rear holes.
- Secure the bracket (**1**) with the retaining pin.
- Move the other outrigger pads into operating position in the same way.



Moving into the driving position

- (**A**) – Pull out the bracket (**1**).
- (**B**) – Pull the outrigger pad by the handle (**2**) onto the holder (**3**).
- Secure the outrigger pad with the bracket (**1**).
- Secure bracket (**1**).
- Move the other outrigger pads into driving position in the same way.

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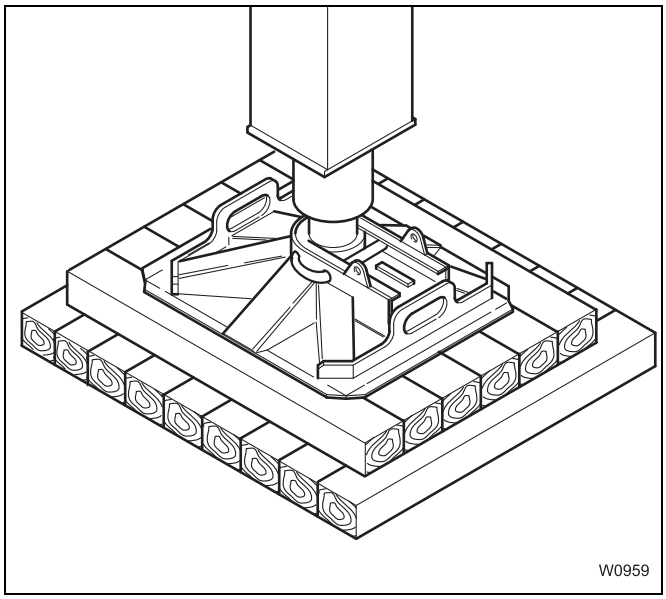
12.6.8 Enlarging the load-bearing area

If the surface of the outrigger pads is too small, you must enlarge the load-bearing area by packing the outrigger pads; ➠ *Determining the required load-bearing area*, p. 12 - 11.

For packing, use only suitable materials that will withstand the outrigger pressure, e.g. straight hardwood of similar cross-sections or steel plates with welded-on strips that will keep the outrigger pads in position.

Risk of accidents if the packing is insufficient!
Only use materials of sufficient strength.
This will prevent the packing giving way and causing the truck crane to tilt and overturn.

Danger of overturning if the packing or truck crane is at an angle!
Level the packing and the truck crane.
This prevents the outrigger pads slipping off the inclined packing and causing the truck crane to overturn.



Level the packing; the outrigger pad must not be at an angle.

Ensure that the outrigger pressure is evenly distributed over the packing:

- The outrigger pad must be positioned in the centre of the packing.
- The outrigger pad must cover all the wooden planks.
- If the packing has several layers, each layer must be placed below the other offset by 90°.

Consult your supervisor if you are in doubt.

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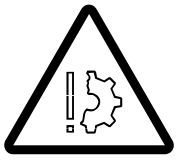
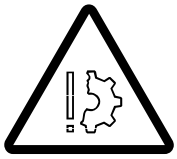
12.6.9 Extending/retracting supporting cylinders

Danger of overturning due to insufficient load bearing capacity of the ground!
Enlarge the load-bearing area if the ground cannot withstand the resulting outrigger pressure.
This prevents the ground under the outrigger pad giving way and causing the truck crane to tilt and overturn.

Risk of accidents if the supporting cylinders are out of sight!
No one is allowed to be in the area of the supporting cylinders.
Observe the moving supporting cylinders or have them observed by a banksman who is in visual contact with you.



Risk of damage to the supporting cylinders!
Move the outriggers as uniformly as possible on all four support points.
This prevents the supporting cylinders being damaged due to one-sided pressure.



Risk of damage to the tyres!
Before retracting the supporting cylinders, remove any sharp-edged and pointed materials from below the tyres.
This prevents the tyres being punctured or damaged when the truck crane is lowered.

Do not extend the supporting cylinders to their absolute limit. The supporting cylinders must have a remaining stroke of at least 25 mm (1 in) in order to carry out alignment corrections.

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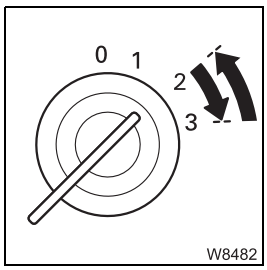
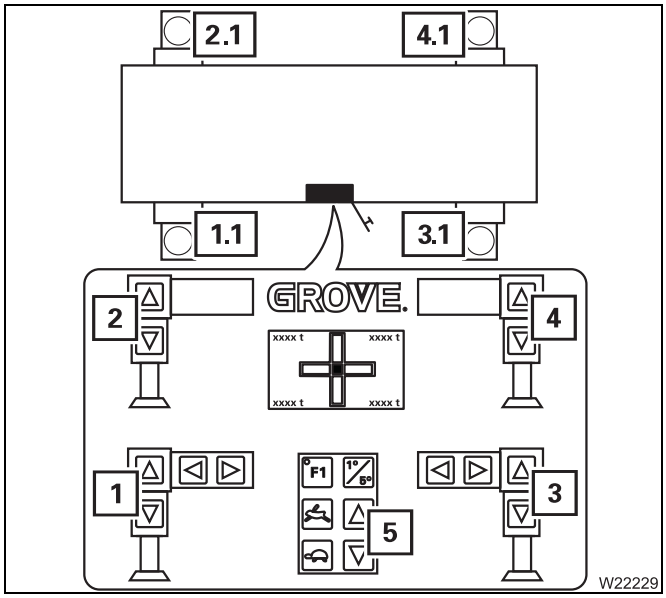


Starting the engine

- Start the engine for driving; ➠ p. 4 - 11.



Moving the supporting cylinders

Assignment of buttons:

1 Supporting cylinder **1.1**

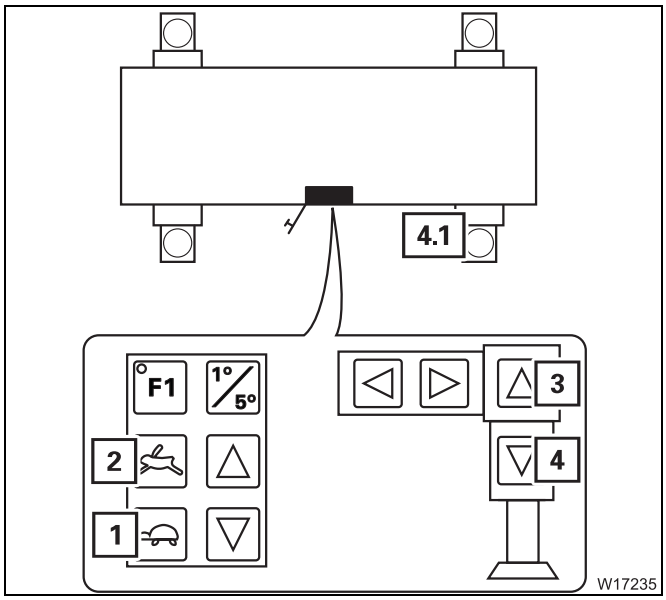
2 Supporting cylinder **2.1**

3 Supporting cylinder **3.1**

4 Supporting cylinder **4.1**

5 All supporting cylinders (**1.1**) to (**4.1**)

- Observe the safety instructions for operating the supporting cylinders; ➠ p. 12 - 41.



The operation is the same for all supporting cylinders.

- Press the button
  - **1** For normal speed
  - **2** For high-speed mode.

- Also press the button for the desired supporting cylinder, e.g. for **4.1**.
  - **3** For retracting
  - **4** For extending

You can also operate several supporting cylinders at the same time.

The outrigger beams move until you let go of the respective button or until the respective end position has been reached.

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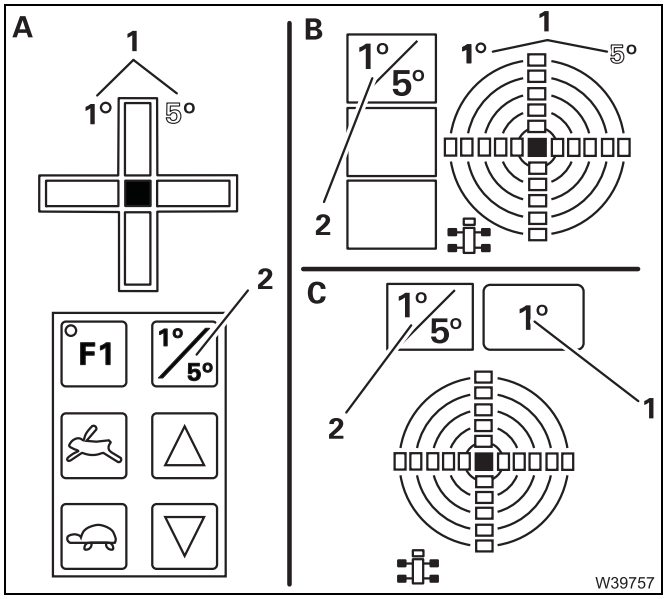
12.6.10 Levelling the truck crane

Inclination indicators

After switching on the ignition, two different inclination indicators display the current alignment.



A On the *Outrigger* control units

On the *ECOS* display:

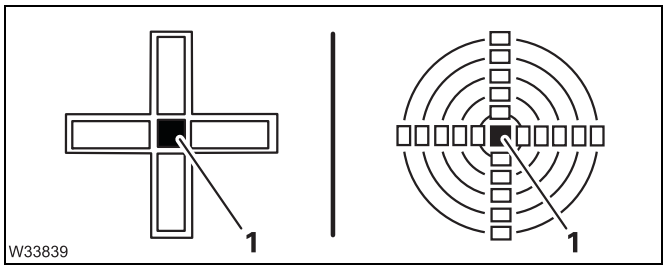
B In the main menu

C In the *Outriggers* submenu

Switching over the measuring range

You can change the measuring range between 1° and 5°.

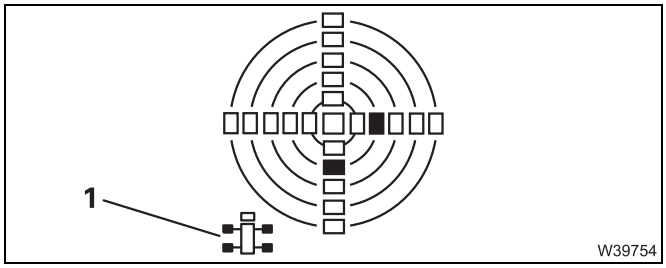
- Press the button (**2**) once.
  The current measuring range (**1**) is displayed.



Read the display

Only the lamp (**1**) at the centre is on if the truck crane is level.

The other lamps show the sides of the truck crane which are higher.



– *ECOS* display

The assignment to the carrier is given by the directional indicator (**1**).

In this example, the carrier would be standing higher to the rear on the right hand side.

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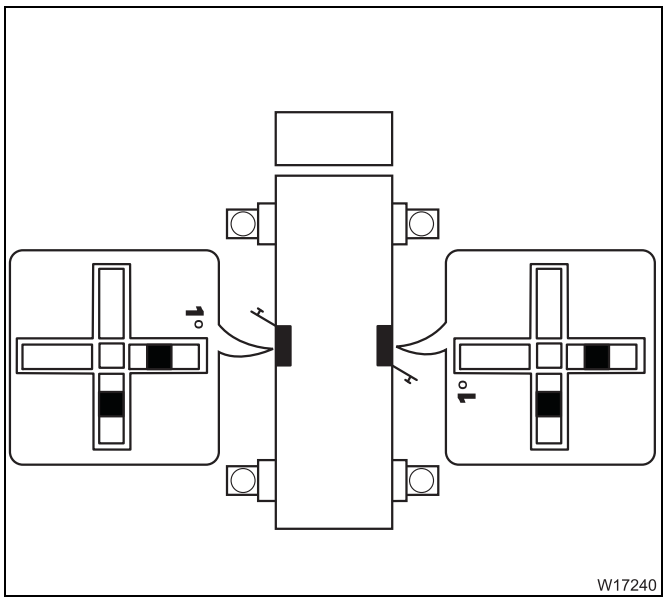


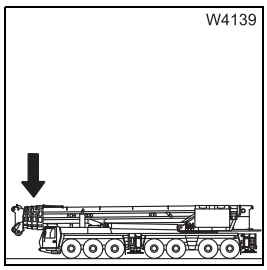
– Read the *Outrigger* control units

  The assignment to the carrier corresponds to the top view.

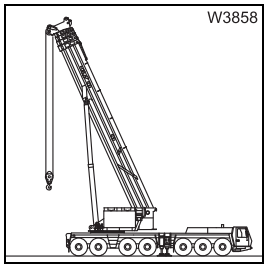
  Due to the position of the control units, the displays on both sides differ.

  In this example, the carrier would be standing higher to the rear on the right hand side.

Prerequisite



The main boom must be resting on the boom rest.



or

– The main boom must be raised **and**
– the load must have been set down **and**
– the superstructure must be in the 0° or 180° position.

Risk of overloading the main boom!
Always slew the superstructure to the 0° or 180° position and set down the load before levelling the truck crane.
In other positions, the deformation of the carrier will create incorrect results for the inclination and the truck crane will be at an angle. This could cause the boom to become overloaded during crane operation.

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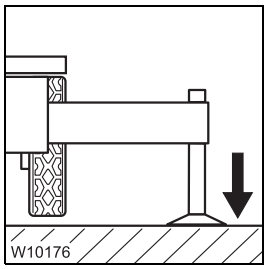
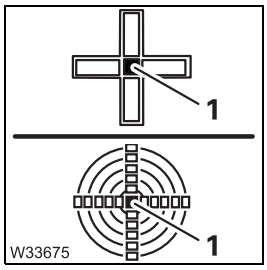
Aligning

- Check that the prerequisites are met; ➠ p. 12 - 44.



- Extend all supporting cylinders until none of the wheels is touching the ground.



- Level the truck crane with the supporting cylinders until the lamp (**1**) is the only one lighting up in the measuring range **1°**; ➠ p. 12 - 43.
- Only lift the truck crane as far as necessary.

Checks to be performed after levelling

During levelling, the ground may give way and the packing may slip.

Risk of accidents due to incorrectly supported truck crane!
Perform the following checks each time you have levelled the truck crane and correct any misalignments.
Otherwise the truck crane may overturn even when lifting a load allowed by the RCL.

- After you have levelled the truck crane, check:
  - whether all the wheels are lifted off the ground,
  - whether the ground under one of the outrigger pads has given way,
  - that the packing is correct for the enlarged load-bearing area.

If slewing is permissible in the current rigging mode:

- Slew the superstructure within the permissible slewing range.
- Perform the specified checks again.
- Check the horizontal alignment on the inclination indicator.

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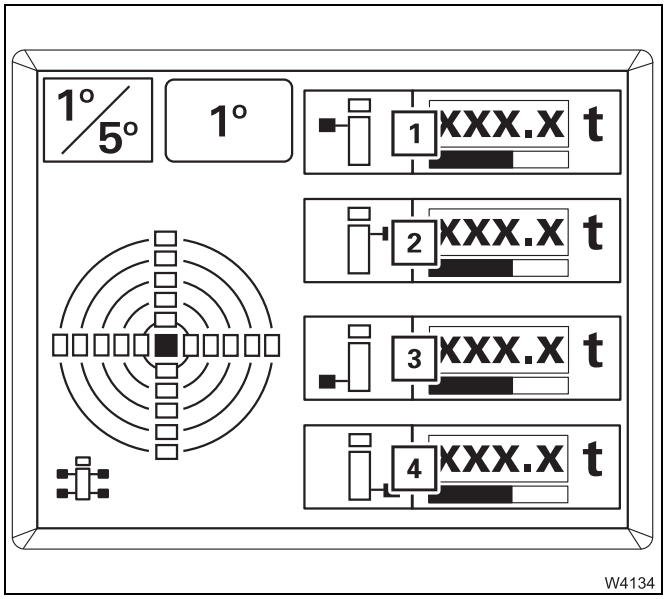
12.6.11 Outrigger pressure display

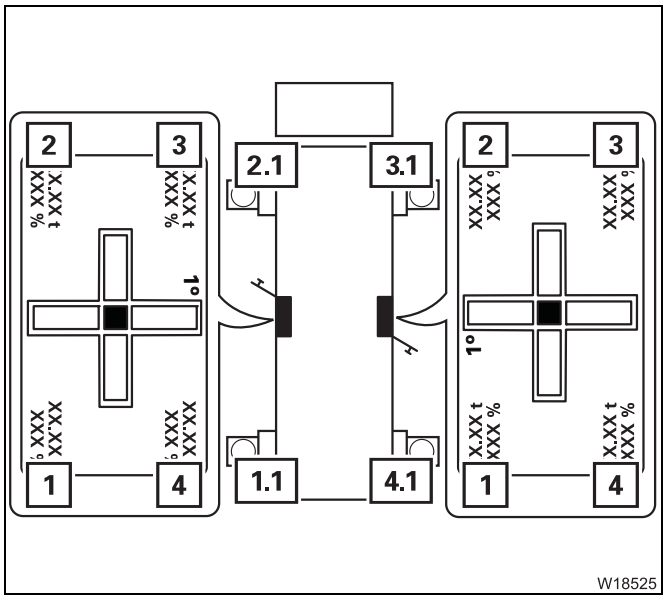
After switching on the ignition, the outrigger pressure displays indicate the current outrigger pressure for all supporting cylinders.
The set unit (t or klbs) is shown next to the displays.

Outrigger cylinders retracted or extended as far as possible will lead to an incorrect outrigger pressure display.
The display will show the most accurate reading if the movement performed last was *Extend outrigger cylinders*.



In the Outrigger submenu

1. Front left outrigger pressure
2. Front right outrigger pressure
3. Rear left outrigger pressure
4. Rear right outrigger pressure



On the outrigger control units

The assignment of the displays to the carrier corresponds to the top view.

1. Display for the supporting cylinder **1.1**
2. Display for the supporting cylinder **2.1**
3. Display for the supporting cylinder **3.1**
4. Display for the supporting cylinder **4.1**

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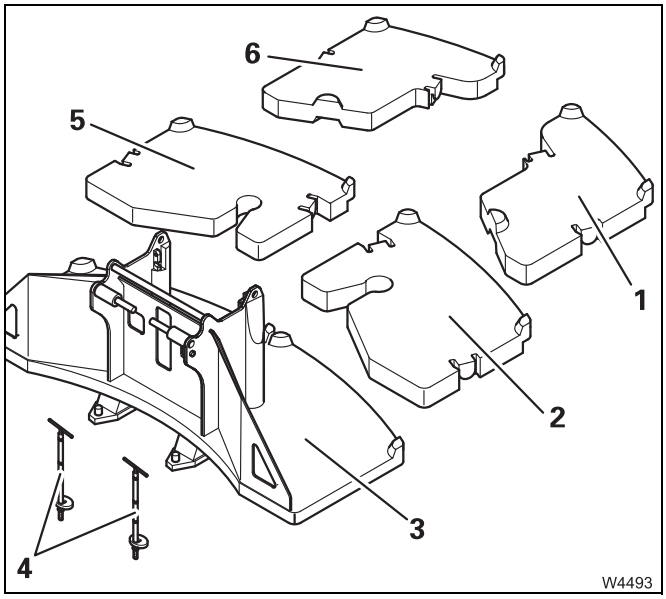
12.7 Counterweight

There are counterweight masses of 20.0 t (44,100 lbs) to 160.0 t (352,700 lbs) available for the GMK7450.

12.7.1 Counterweight parts and identification

Counterweight parts



The counterweight consists of:

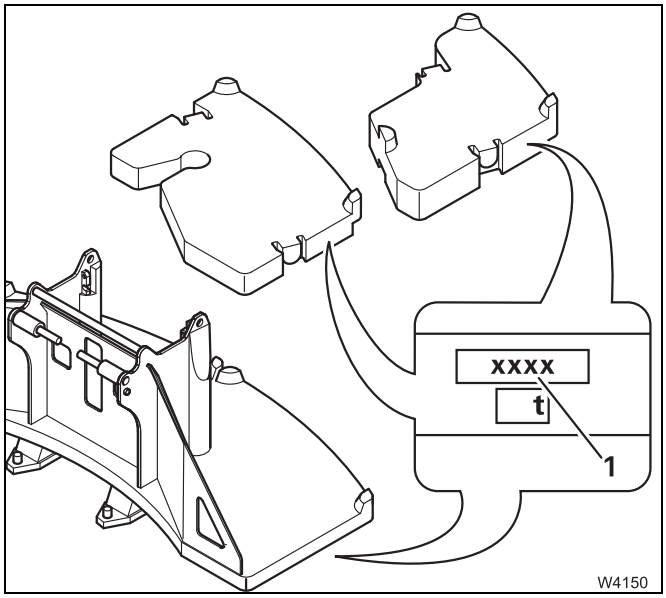
- one 20 t base plate (**3**) with two lifting cylinders,
- four 10 t blocks (**5**) for the right-hand side and
  four 10 t blocks (**2**) for the left-hand side.
- one block (**6**) for the right-hand side and one block (**1**) for the left-hand side.

  With additional equipment, also:
  two blocks (**6**) for the right side and
  two blocks (**1**) for the left side.
- two tension rods with washers (**4**).

Identification

The truck crane and its corresponding counterweight parts are labelled with the same serial number.

Danger if counterweight parts are interchanged!
Use only counterweight parts that belong to your truck crane. The truck crane and counterweight parts are labelled with the same serial number. Other or additional counterweight parts may not be rigged.



The serial number (**1**) is situated above the weight specification on all counterweight sections and counterweight blocks.

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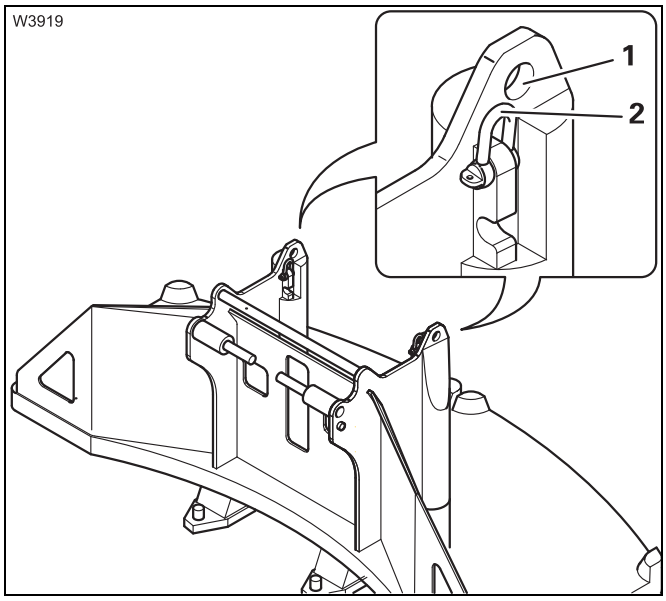
12.7.2 Slinging points on the counterweight parts

Risk of accident if used improperly!
Sling the counterweight parts only on the designated points and use only lifting gear with sufficient load bearing capacity.
Before lifting plates which are lying on top of each other, make note of the permitted weights.

Only use lifting gear of sufficient load bearing capacity;
➠ *Counterweight parts*, p. 1 - 13.

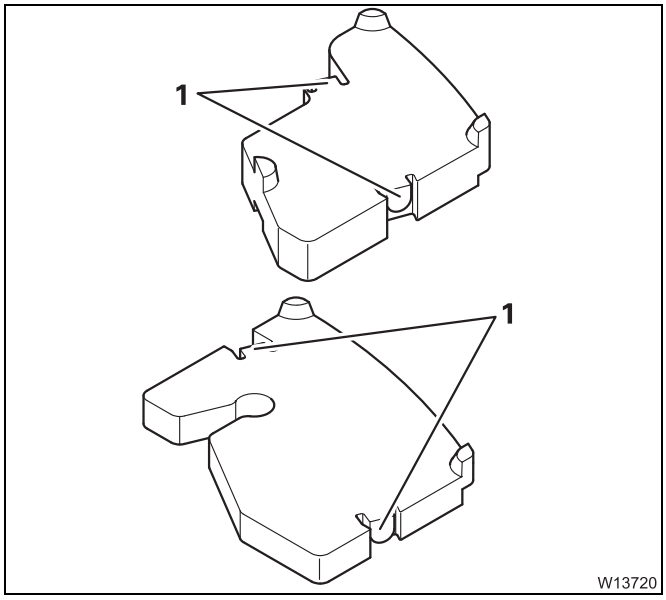


There are two shackles (**2**) on the 20 t base plate.

When no lifting gear is attached to the shackles then fold them in.

Do not attach the sling gear to the mounting (**1**). These are only designed for locking the auxiliary hoist.

Risk of damage to the mountings of the auxiliary hoists!
Do not attach the sling gear to the mountings for the auxiliary hoist. This way you prevent these from getting damaged and malfunctions occurring when rigging the auxiliary hoist.



The 10 t plates and the 10 t blocks have slinging points (**1**).

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12.7.3 Counterweight combinations

Risk of overturning due to a counterweight combination that is not permitted!
Combine the counterweights with each other only in the way prescribed in this chapter and in the *Lifting capacity table*. Other combinations are not permitted.
If other versions are assembled, the truck crane is no longer protected against overloading by the RCL.

Danger of overturning when slewing with a rigged counterweight!
You may only slew the superstructure with a rigged counterweight if an outrigger span of sufficient size is rigged. For the required outrigger span, refer to the table in the section *Slewing with a rigged counterweight*, p. 12 - 71, and support the truck crane accordingly before you slew the superstructure. In this way you prevent the truck crane tipping to the rear when slewing the superstructure.

The counterweight parts of the GMK7450 truck crane can be assembled in six different counterweight versions (in eight different versions with additional equipment).

Risk of accidents!
Use the steps in the 10.0 t plates and the treads on the 10.0 t counterweight blocks to climb up onto the counterweight. In this way, you avoid falling from the counterweight.

Cover the recesses of the slinging points with the lids provided. In this way you avoid stepping into the recesses and injuring yourself.

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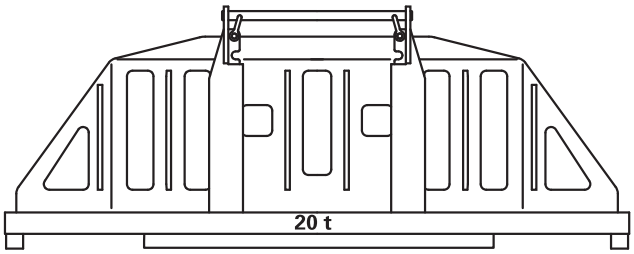
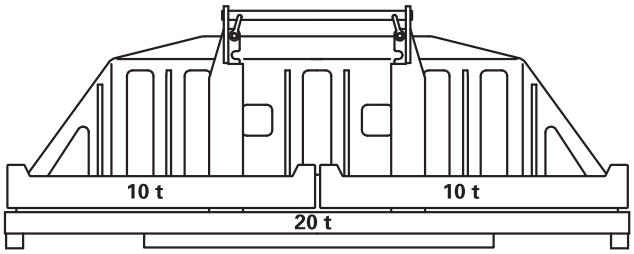


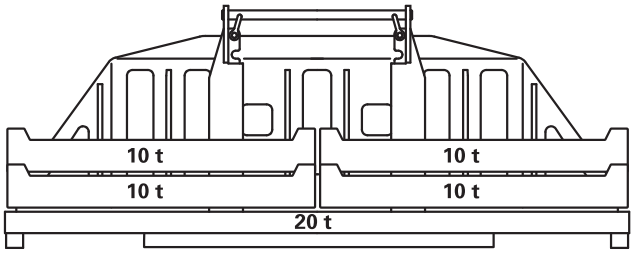
20.0 t (44,100 lbs)

20.0 t base plate



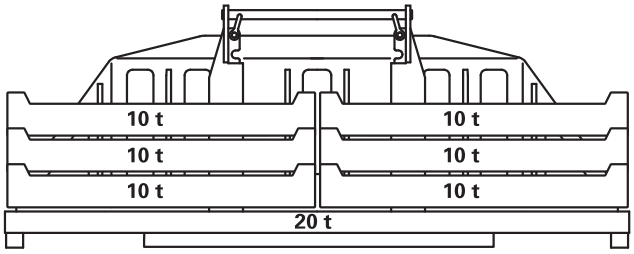
40.0 t (88,200 lbs)

2 x 10.0 t sections
20.0 t base plate



60.0 t (132,300 lbs)

2 x 10.0 t sections
2 x 10.0 t sections
20.0 t base plate



80.0 t (176,400 lbs)

2 x 10.0 t sections
2 x 10.0 t sections
2 x 10.0 t sections
20.0 t base plate

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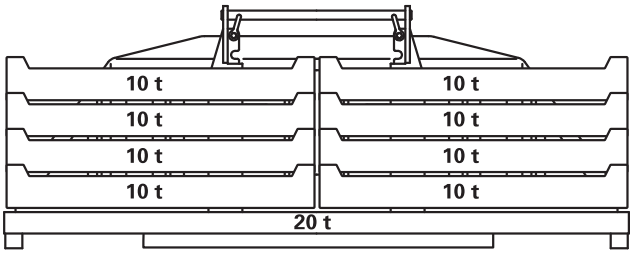
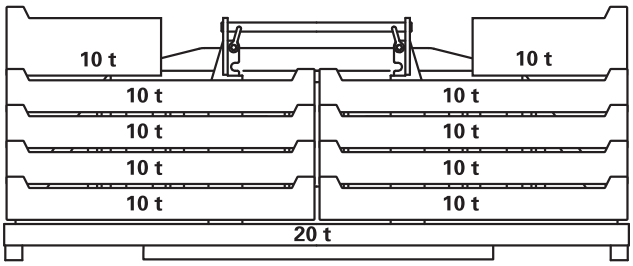


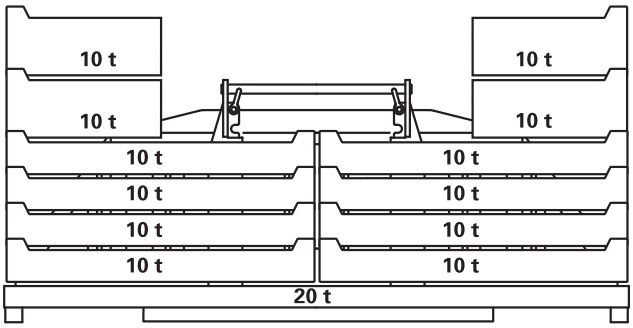
100.0 t (220,500 lbs)

2 x 10.0 t sections
2 x 10.0 t sections
2 x 10.0 t sections
2 x 10.0 t sections
20.0 t base plate



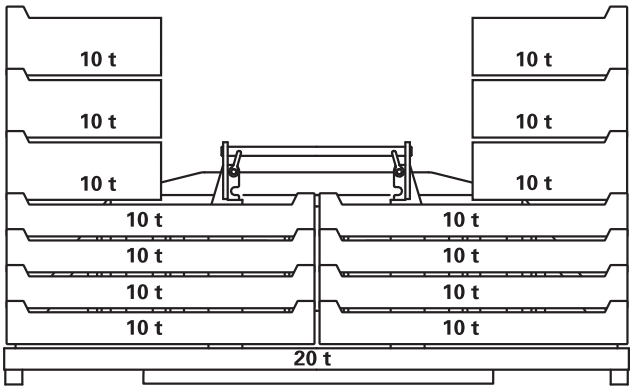
120.0 t (264,200 lbs)

2 x 10.0 t counterweight block
2 x 10.0 t sections
2 x 10.0 t sections
2 x 10.0 t sections
2 x 10.0 t sections
20.0 t base plate



140.0 t[1)] (308,600 lbs)

2 x 10.0 t counterweight block
2 x 10.0 t counterweight block
2 x 10.0 t sections
2 x 10.0 t sections
2 x 10.0 t sections
2 x 10.0 t sections
20.0 t base plate



160.0 t[1)] (352,700 lbs)

2 x 10.0 t counterweight block
2 x 10.0 t counterweight block
2 x 10.0 t counterweight block
2 x 10.0 t sections
2 x 10.0 t sections
2 x 10.0 t sections
2 x 10.0 t sections
20.0 t base plate

W3920

[1)] Additional equipment

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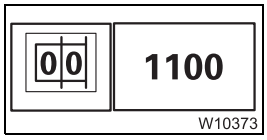
12.7.4 CHECKLIST: Rigging the counterweight

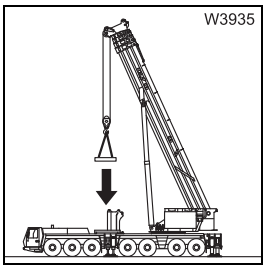
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions there!

Danger of overturning when slewing with a rigged counterweight!
Always check before slewing whether slewing is permitted in the truck crane's current rigging mode (counterweight, outrigger span, working radius).
Correct the rigging mode if necessary; ➠ *Slewing with a rigged counterweight*, p. 12 - 71.

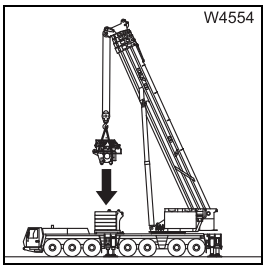
1. Check that the truck crane is supported with the required outrigger span as specified in the *Lifting capacity table*; ➠ *Permissible outrigger spans*, p. 12 - 34.



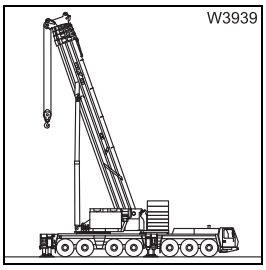
2. Enter the current rigging mode on the RCL; ➠ *Entering rigging mode*, p. 11 - 23.



3. Assemble the required counterweight combination and fold in the slinging points on the 20 t base plate;
➠ *Slinging points on the counterweight parts*, p. 12 - 49
➠ *Assembling the counterweight version*, p. 12 - 58,



4. If the auxiliary hoist is to be rigged: ➠ *Auxiliary hoist*, p. 12 - 73



5. Turn the superstructure to the rear and lock it in place;
➠ *Locking/unlocking the superstructure*, p. 11 - 13.

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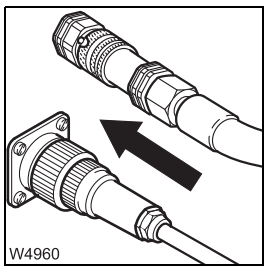
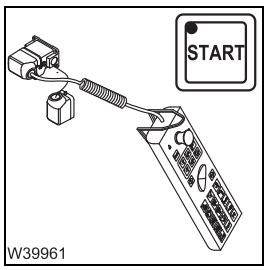
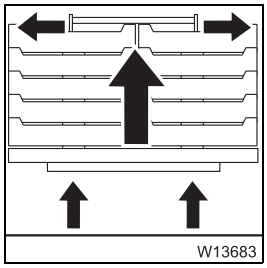


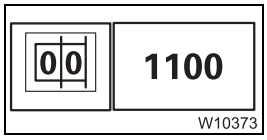
6. Establish the hydraulic and electrical connections between the 20 t base plate and the turntable;
   ➠ *Establishing/disconnecting the hydraulic connection*, p. 12 - 63.
   ➠ *Establishing/disconnecting the electrical connection*, p. 12 - 64



7. Connect the hand-held control to the rear right of the turntable and start the crane engine; ➠ *Rig counterweight*, p. 12 - 65.

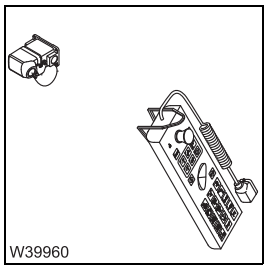


8. Lift the counterweight onto the turntable, lock it and retract the lifting cylinder; ➠ *Rigging the counterweight*, p. 12 - 66.



9. Select the current rigging mode with the newly rigged counterweight version at the RCL or enter the corresponding RCL code;
   ➠ *Entering rigging mode*, p. 11 - 23.

10. Only unlock the superstructure if slewing is permissible for the current outrigger span.



11. Remove the hand-held control; ➠ p. 12 - 18.

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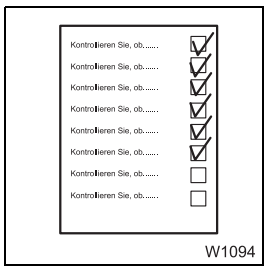
12.7.5 CHECKLIST: Unrigging the counterweight

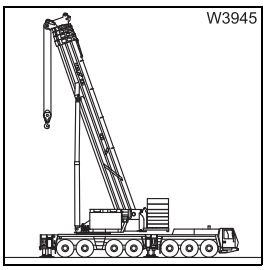
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions there!

Prerequisites

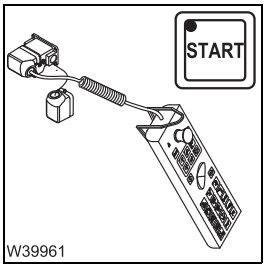
- The truck crane is supported with the outrigger span required for working with the crane according to the *Lifting capacity table*; ➠ *Permissible outrigger spans*, p. 12 - 34.
- The RCL is set to the current rigging mode with the currently rigged counterweight; ➠ *Entering rigging mode*, p. 11 - 23.
- The hydraulic and electrical connections between the 20 t base plate and the turntable or, as the case may be, between the auxiliary hoist and the turntable have been established;
  ➠ *Establishing/disconnecting the hydraulic connection*, p. 12 - 63,
  ➠ *Establishing/disconnecting the electrical connection*, p. 12 - 64.
- When the auxiliary hoist is rigged, the upper hook block must either be secured in the catcher (and the main hoist rope released from the upper hook block) or the auxiliary hoist rope must be unreeved and rolled onto the drum.



1. Start the engine for crane operation; ➠ *CHECKLIST: Starting the engine*, p. 10 - 1.



2. Slew the superstructure to the rear and lock, with the appropriate RCL setting; ➠ p. 11 - 13.



3. Connect the hand-held control to the rear right of the turntable and start the crane engine; ➠ p. 12 - 17.

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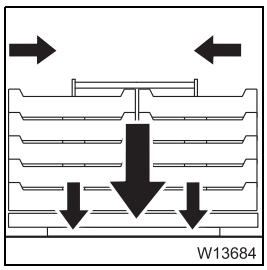
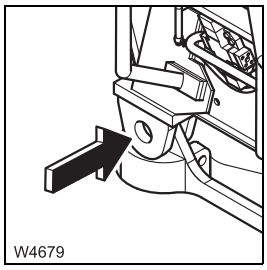
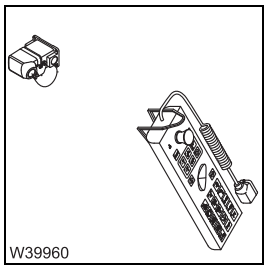


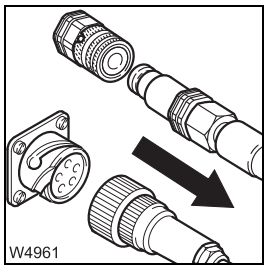
4. Extend the lifting cylinder, unlock the counterweight and lower the counterweight onto the counterweight platform;
➠ *Unrigging the counterweight*, p. 12 - 67.



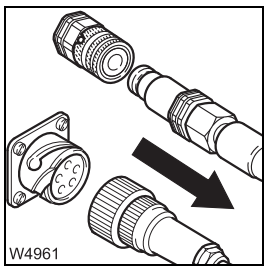
5. When dismounting the auxiliary hoist, continue as in;
➠ *CHECKLIST: Removing the auxiliary hoist*, p. 12 - 78, point **6.**



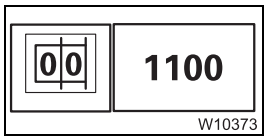
6. Remove the hand-held control; ➠ p. 12 - 18.



7. Remove the hydraulic and electrical connections between the 20 t base plate and the turntable;
➠ *Establishing/disconnecting the hydraulic connection*, p. 12 - 63.
➠ *Establishing/disconnecting the electrical connection*, p. 12 - 64.



8. If necessary, disconnect the hydraulic and electrical connections between the auxiliary hoist and the turntable; ➠ *Auxiliary hoist*, p. 12 - 73.



9. On the RCL select the current rigging mode with a 0 t counterweight or enter the corresponding RCL code; ➠ *Entering rigging mode*, p. 11 - 23.

10. Unlock the superstructure; ➠ p. 11 - 13.

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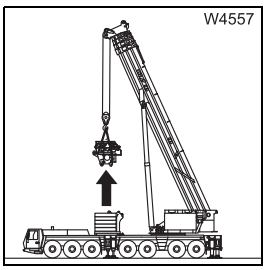
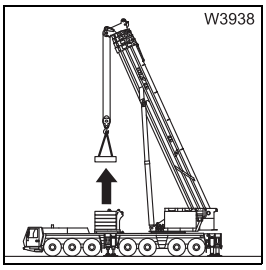


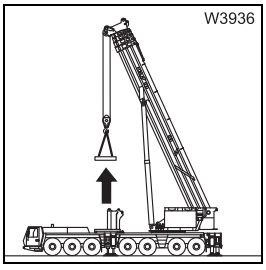
11. If necessary, lift the auxiliary hoist from the 20 t base plate;
➠ *Auxiliary hoist*, p. 12 - 73.



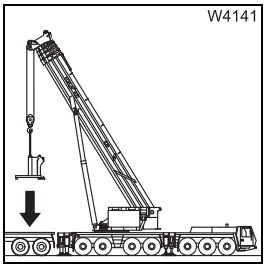
12. If the counterweight versions over 100 t have been rigged:

– Unlock the10 t counterweight/blocks; ➠ p. 12 - 62

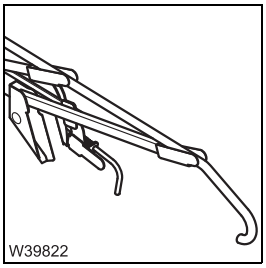
– Always alternatively lift a 10 t counterweight block on the left and on the right; ➠ *Assembling the counterweight version*, p. 12 - 58.



13. Always alternatively lift off a single 10 t counterweight section from the left and from the right until only the 20 t base plate remains on the counterweight platform; ➠ *Assembling the counterweight version*, p. 12 - 58.



14. Place the 20 t base plate onto the separate vehicle with the truck crane;
➠ *Assembling the counterweight version*, p. 12 - 58.



15. Retract the railing at the access ladder and fold in the hoist mirror;
➠ *Access ladder railing*, p. 12 - 24,
➠ *Mirrors*, p. 12 - 25.

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12.7.6 Assembling the counterweight version

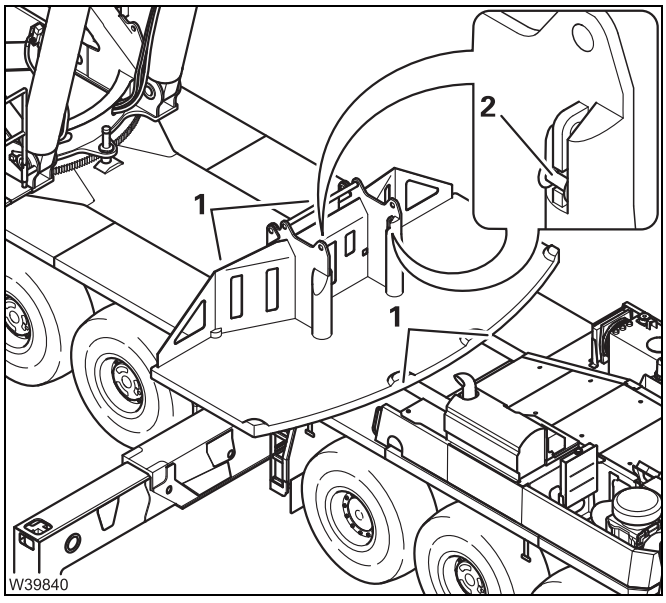
Setting down the 20 t base plate

Danger of overturning if the truck crane is free-standing!
Support the truck crane with the required outrigger span before lifting the counterweight section onto the carrier; ➠ *Slewing with a rigged counterweight*, p. 12 - 71.

Danger of crushing when setting down the counterweight section!
Ensure that helpers maintain sufficient clearance from the 20.0 t base plate with all parts of their bodies during placement and that no objects are on the counterweight platform.

Risk of crushing when slewing the superstructure!
Ensure that nobody is within slewing range of the superstructure while you lift counterweight sections from the separate vehicle onto the carrier.

Risk of accidents due to falling counterweight parts!
Only attach the counterweight parts to the appropriate slinging points and use lifting gear of sufficient load bearing capacity. Lift the sections only one at a time; ➠ *Slinging points on the counterweight parts*, p. 12 - 49.



- Place the 20 t base plate so that it fits into the guides (**1**).
- Fold up the shackles (**3**).

When assembling the counterweight combinations, additional plates are set onto the 20 t base plate.

Risk of damage when slinging point is folded out!
Always fold up the shackles. This avoids malfunctions when rigging the auxiliary hoist.

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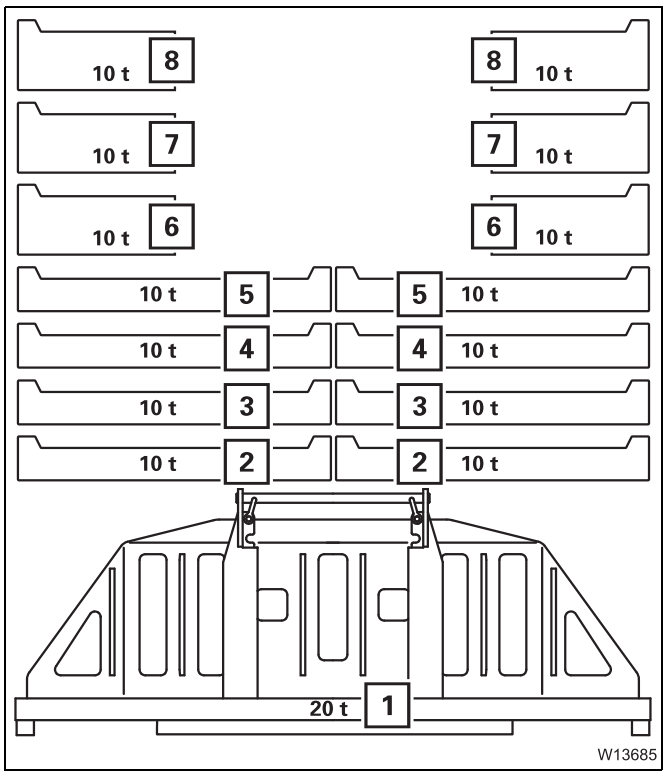
Placing the 10 t plates/blocks

Risk of overturning if counterweight rigging sequence is incorrect!
When rigging, always place/raise the 10 t sections and 10 t blocks alternately at the left and right sides. Otherwise the truck crane will be overloaded at one side or the counterweight may fall from the carrier.

All the sections for the right side are interchangeable between themselves and all the sections for the left side are interchangeable between themselves. This also applies to the counterweight blocks.

When rigging with an installed auxiliary hoist you require special lifting gear; ➠ *Lifting and lowering counterweight parts with mounted auxiliary hoist*, p. 12 - 70.

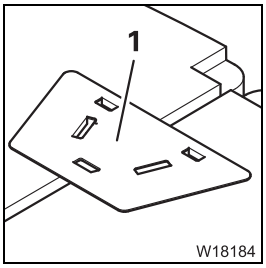


- Always place the 10 t sections and 10 t blocks alternately at the left and right sides.

Counterweight	Counterweight part
20 t	1
40 t	1 and 2
60 t	1 to 3
80 t	1 to 4
100 t	1 to 5
120 t [2)]	1 to 6
140 t [1), 2)]	1 to 7
160 t [1), 2)]	1 to 8

[1)] Additional equipment

[2)] ➠ *Securing 10 t blocks*, p. 12 - 61.



To lower the risk of accidents, the space between the slinging points is covered over with the cover (**1**); handling when rigging and unrigging ➠ p. 12 - 60.

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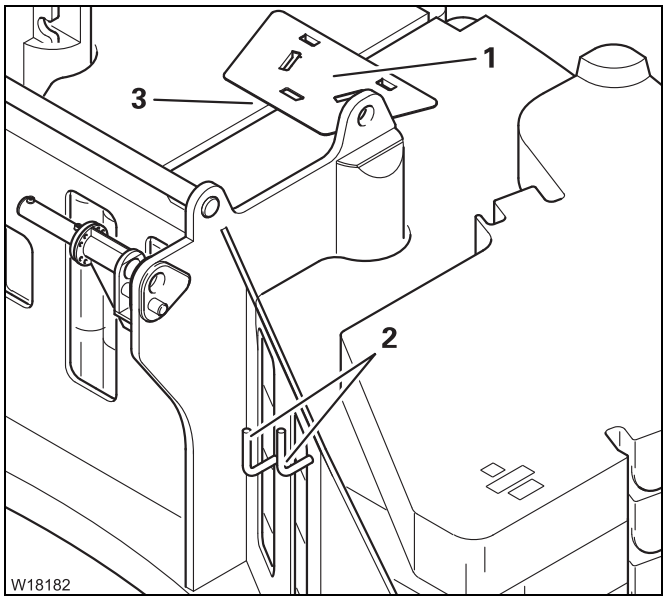
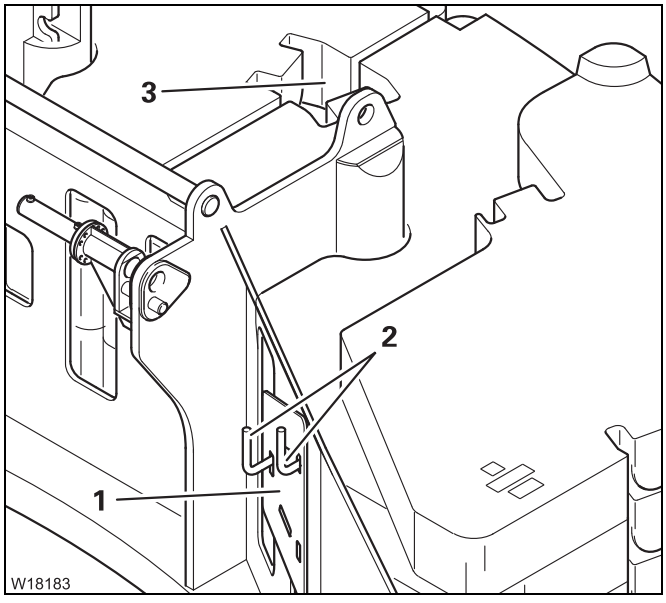
When rigging

Risk of accident due to uncovered openings!
Cover the recesses of the slinging points with the covers provided. In this way you avoid stepping into the recesses and injuring yourself.
Do not just place the cover on the last pair of 10 t plates. When you place a cover onto every pair of right and left 10 t plates, then there is no danger of tripping when unrigging.



- Take the cover (**1**) out of the holder (**2**).
- Place the cover (**1**) on the recesses of the slinging points (**3**) such that it does not slip.
- If necessary, place more 10 t plates onto the cover (**1**).

When unrigging



- Remove the cover (**1**) from the recesses (**3**) of the slinging points.
- Place the covers (**1**) into the holders (**2**) and secure them.
- If necessary, remove the 10 t plates.

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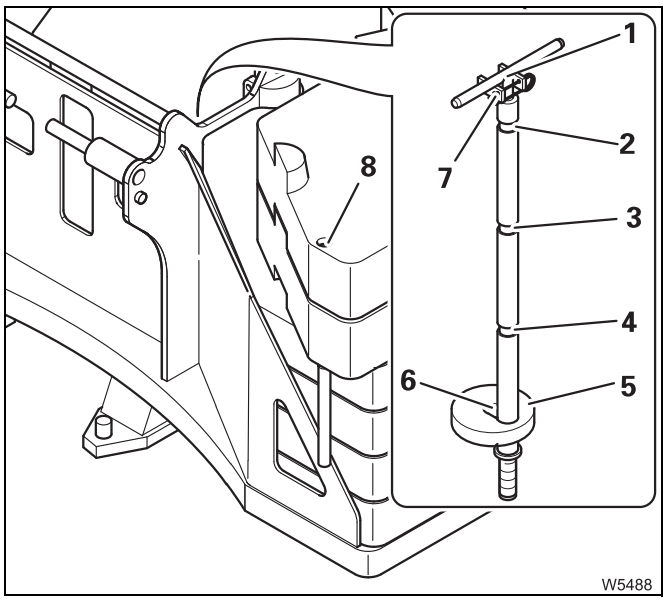
12.7.7 Securing/releasing 10 t blocks

Risk of accident from falling counterweight blocks!
Secure the 10 t blocks with the tension rods.
This prevents the blocks from slipping or falling down and injuring someone.

Securing 10 t blocks



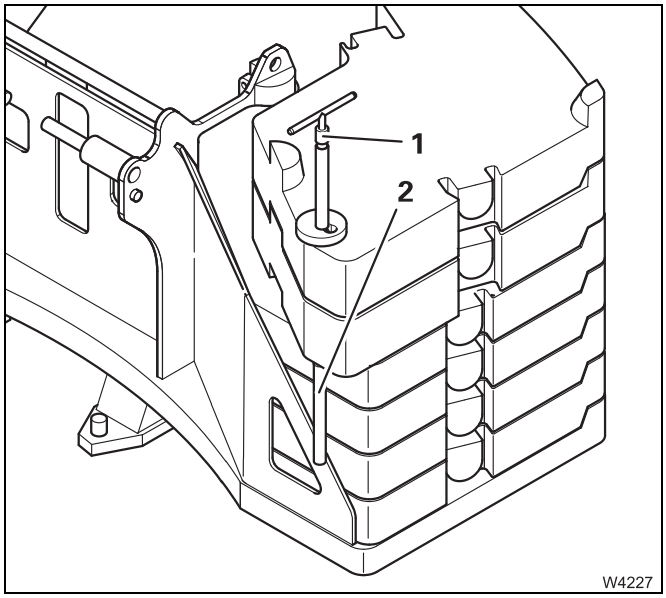
- Remove the retaining pin and pull the tension rod (**1**) out of the holder (**7**).
- Insert the retaining pin into the holder (**7**).
- Depending on the counterweight combination, fasten the disc (**5**) with the groove (**6**) in the recess:

  (**4**) 120 t

  (**3**) 140 t

  (**2**) 160 t

- Insert the tension rod into the bore hole (**8**).



The tension rod (**1**) slides though the bore hole until it reaches the bracket (**2**) at the 20 t base plate.

- Tighten the holding rod in the clockwise direction.

The 10 t counterweight block is now secured.

- Secure the blocks on the other side in the same way.

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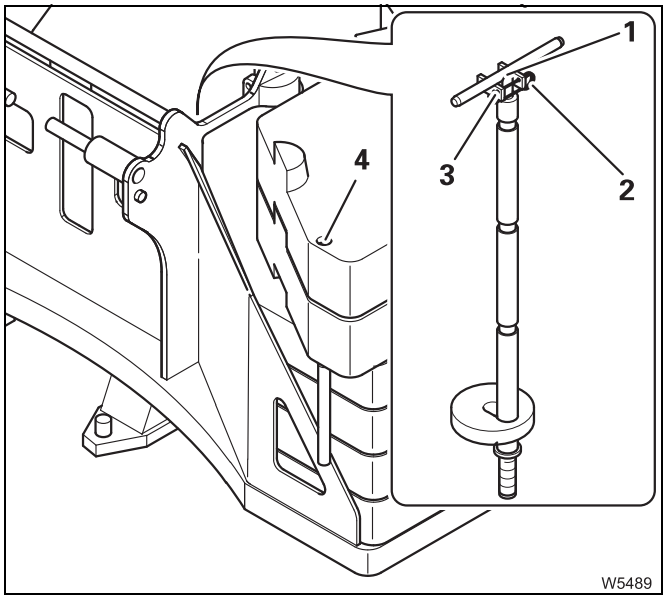
Releasing the 10 t blocks

Before you can lift the blocks, you must release them.

Risk of accident due to damage to the lifting gear and the slinging points!
Release the blocks before lifting. Otherwise the tension rods, the lifting gear or the slinging points may be overloaded and damaged.
This can cause the blocks to slip or unexpectedly fall down, through damage that cannot be externally seen.



- Release the tension rod (**1**) (turn anticlockwise) and pull it out of the hole (**4**).
- Remove the retaining pin (**2**) from the bracket (**3**).
- Attach the tension rod to the 20 t base plate in the holder (**3**).
- Secure the tension rod using the retaining pin (**2**).
- Release the blocks on the other side in the same way.

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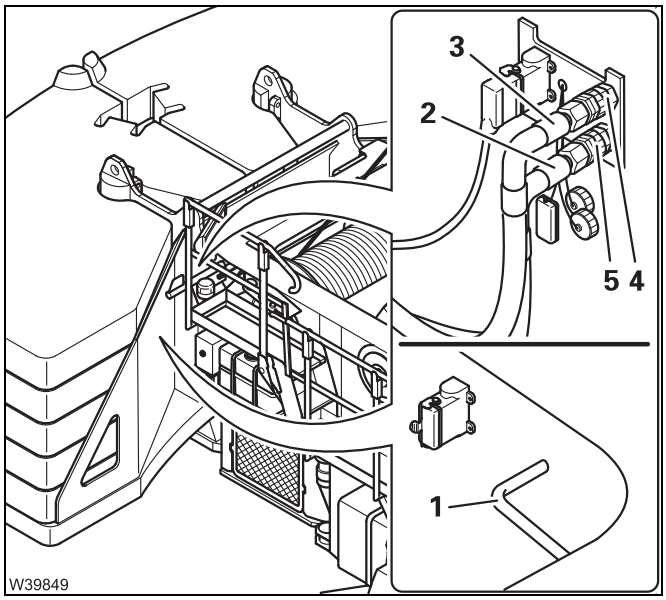
12.7.8 Establishing/disconnecting the hydraulic connection

Establishing the connection

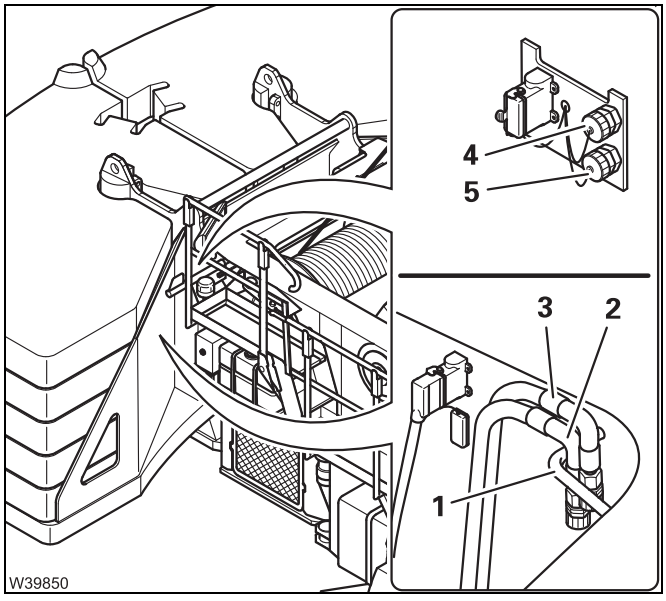


- Remove the hoses (**2**) and (**3**) from the holder (**1**).
- Connect both hoses (**2**) and (**3**) at the connections (**4**) and (**5**) (pay attention to colour marking).

The hydraulic connection has now been established.

Disconnecting the connection

You have to disconnect the hydraulic connection before you lift the 20 t base plate from the turntable.



- Remove the hoses (**2**) and (**3**) from the connections (**4**) and (**5**).
- Close off the hoses and connections with the caps.
- Insert the hoses (**2**) and (**3**) into the holder (**1**).

The hydraulic connection has now been disconnected.

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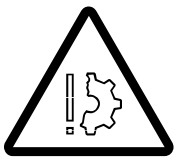
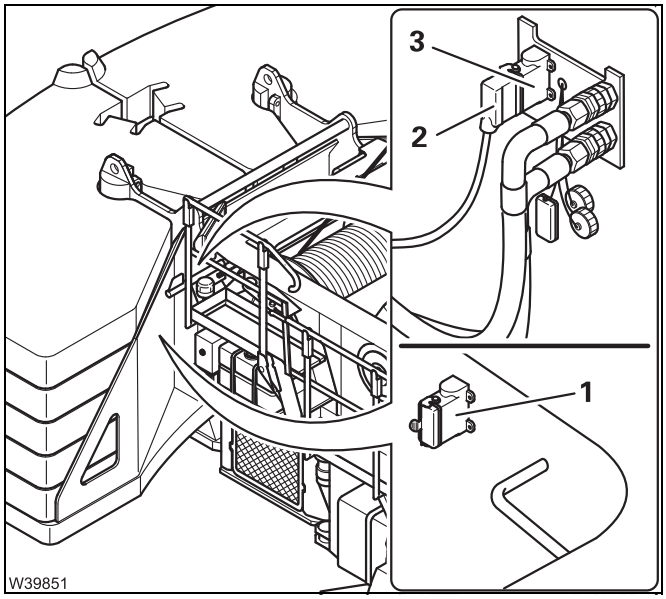
12.7.9 Establishing/disconnecting the electrical connection



Risk of malfunction in the superstructure electronics!
Always turn off the ignition in the crane cab before you establish or break the electrical connection. This prevents malfunctions and error messages in the superstructure electronics.

Establishing the connection

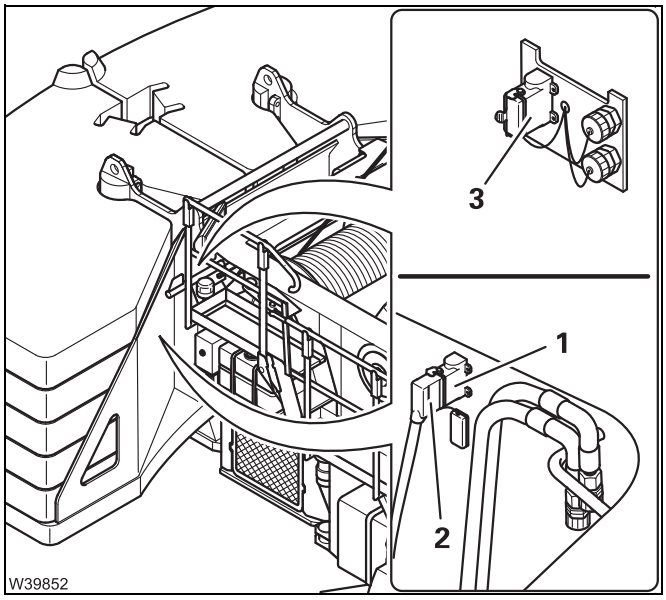


- Remove the plug (**2**) from the dummy socket (**1**).
- Close the dummy socket with the cap.
- Insert the plug (**2**) into the socket (**3**) and secure it with the hinged bow.

The electrical connection has now been established.

Disconnecting the connection

You have to disconnect the electrical connection before you lift the 20 t base plate from the turntable.



- Remove the plug (**2**) from the socket (**3**).
- Cover the socket (**3**) with the cap.
- Open the dummy socket (**1**).
- Insert the plug (**2**) into the socket (**1**) and secure it with the hinged bow.

The electrical connection has now been disconnected.

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12.7.10 Rig counterweight

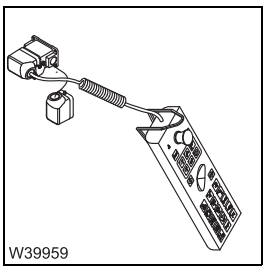
Risk of crushing when raising and lowering!
Make sure nobody is on the counterweight platform while the counterweight is being lifted or lowered.
Before raising and lowering, remove all objects that could become jammed or crushed.

Risk of accident from falling counterweight!
When the counterweight is locked to the turntable, always check that the safety valve is closed before moving the lifting cylinder; ➠ *Counterweight safety valve*, p. 12 - 69.
This prevents the counterweight from being inadvertently unlocked and falling due to getting the switches mixed up.

Hand-held control

You need the hand-held control to rig the counterweight.

Risk of accident due to falling counterweight parts!
Only leave the hand-held control connected as long as it is needed for rigging the counterweight.
The counterweight could fall off while the cane is being operated and lead to damage and injuries.



- Connect the hand-held control; ➠ *Connecting/disconnecting the hand-held control*, p. 12 - 17.

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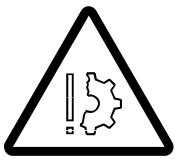
Rigging the counterweight

To rig the counterweight, you must extend the lifting cylinder in order to raise the counterweight. Then you must lock the counterweight on the superstructure and then extend the lifting cylinder into the 20 t base plate.

Extending the lifting cylinders

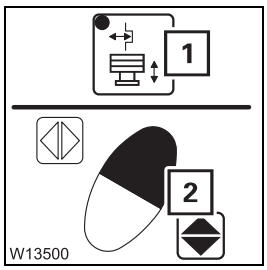
- Check that the lamp (**1**) lights up (locking cylinders are unlocked).



Risk of damage when raising the counterweight!

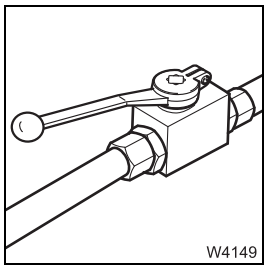
Always check that the two red lamps are lit before lifting the counterweight with the lifting cylinder.

If the green lamps are lit then the locking cylinders are extended. These would be pressed against the mountings on the turntable and damage them.

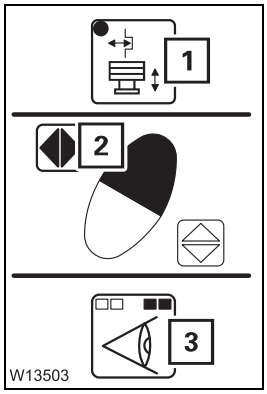


- Press the button (**1**). The lamp lights up.
- Press the key combination (**2**) until the counterweight is fully raised.

Locking the counterweight



- Open the safety valve; p. 12 - 69.



- Press the button (**1**). The lamp lights up.
- Press the key combination (**2**), until the lamps (**3**) are lit.

  The counterweight is now locked at the turntable.

If a locking pin has not yet reached the *Locked* end position, the corresponding lamp will flash.

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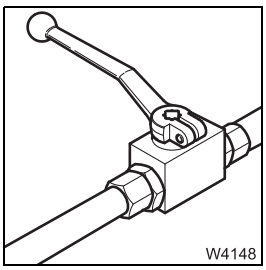
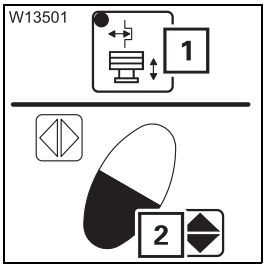


- Close the safety valve; ➠ p. 12 - 69.

Risk of accident from falling counterweight!
Always close the safety valve if the counterweight is locked to the turntable. This prevents the locking pins, for example, from being unintentionally retracted because a button is erroneously pushed, causing the entire counterweight to fall down.

Retracting the lifting cylinders



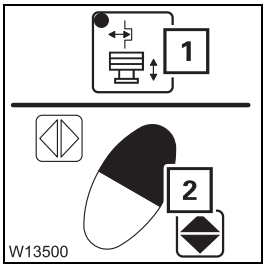
- Press the button (**1**). The lamp lights up.
- Press the key combination (**2**) until the lifting cylinder is fully retracted.

The counterweight is now completely unrigged.

Unrigging the counterweight

To unrig the counterweight, you must extend the lifting cylinder in order to secure the counterweight against falling down. Then you must unlock the counterweight on the turntable and then extend the lifting cylinder into the 20 t base plate in order to lower the counterweight onto the counterweight platform.

Extending the lifting cylinders



- Press the button (**1**). The lamp lights up.
- Press the key combination (**2**), until the lifting cylinders are extended into the cylinder mounts on the counterweight platform.

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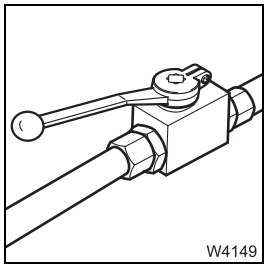
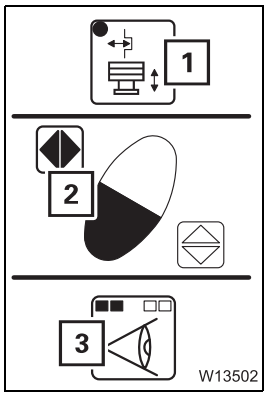
Risk of accident from falling counterweight!
Also make sure that the hydraulic cylinders are fully extended into the cylinder mounts on the counterweight platform. This prevents the counterweight from falling when the locking pins are retracted.

Unlocking the counterweight

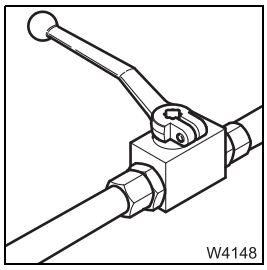


- Open the safety valve; ➠ p. 12 - 69.



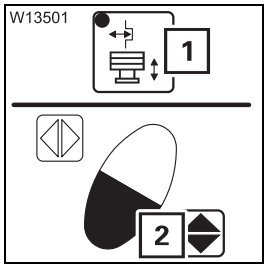
- Press the button (**1**). The lamp lights up.
- Press the key combination (**2**), until the lamps (**3**) are lit.

If a locking pin has not yet reached the *Unlocked* end position, the corresponding lamp will flash.



- Close the safety valve; ➠ p. 12 - 69.

Retracting the lifting cylinders



- Press the button (**1**). The lamp lights up.
- Press the key combination (**2**) until the lifting cylinder is fully retracted.

The counterweight is now lowered onto the counterweight platform.

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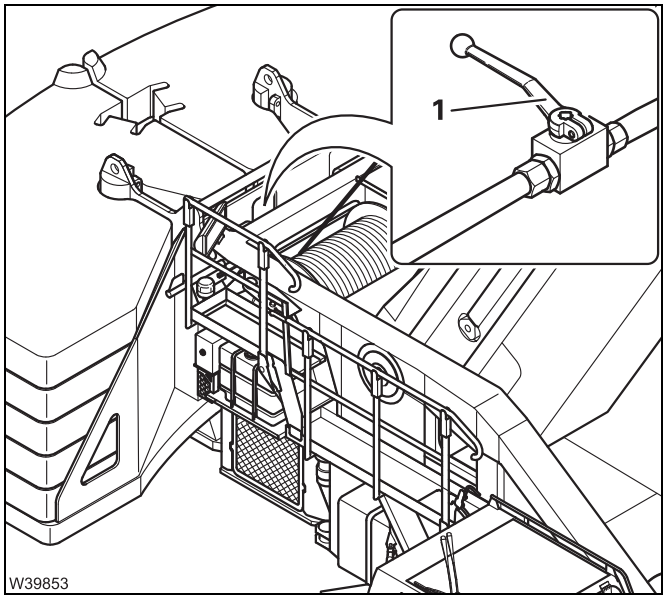
Counterweight safety valve

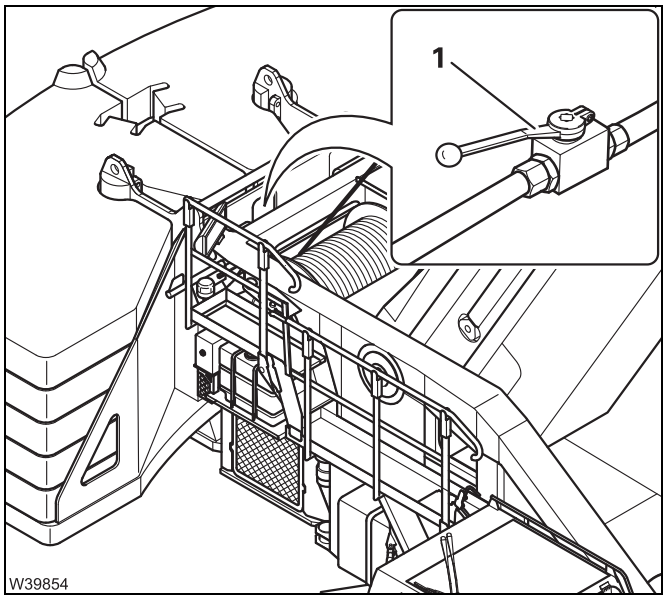


Close safety valve

After you have locked the counterweight on the turntable:

- Close the valve – lever (**1**) at right angles to the line.

The locking pins are secured against accidental activation.



Opening the safety valve

Before extending or retracting the locking pins:

- Open the valve – lever (**1**) parallel to the line.

The locking pins can now be moved using the hand-held control.

- Close the safety valve after extending the locking pins.

Risk of accident when the safety valve is open!
Always close the safety valve if the counterweight is locked to the turntable. This prevents the counterweight from falling down due to unintentional actuation of the locking pins.

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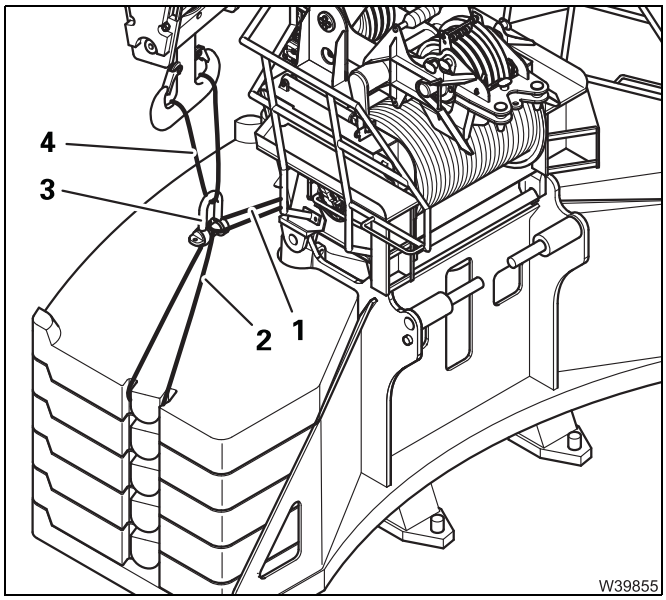
12.7.11 Lifting and lowering counterweight parts with mounted auxiliary hoist

Risk of damaging the railing of the hoist!
Raise and lower the plates with mounted auxiliary hoist only as described in this section. This prevents the railing of the auxiliary hoist being damaged by the hook block or by the lifting gear.
Only use lifting gear of sufficient lifting capacity!

To lift and place the plates you require three lifting slings with a length of 2 metres.

If your truck crane was delivered with a lattice extension as additional equipment, you can use the red slinging belt supplied. This lifting gear has the right length, if you attach it in a two-fall pattern.



- Fasten each lifting gear (**1**) and (**2**) to the prescribed slinging points of the plates.
- Hang both lifting gears in a shackle (**3**).
- Fasten the third lifting gear (**4**) to the shackle and guide it upwards, to the height over the hoist railing.
- Attach the lifting gear into the hook block.
- Hoist the plate only so far so that it does not hit under the auxiliary hoist.

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12.7.12 Slewing with a rigged counterweight

Slewing with a rigged counterweight is only permissible when:
- The necessary outrigger span is rigged
- the respective RCL code is shown, and
- The permissible working radius according to *Tragfähigkeitstabelle* is maintained.

Danger of overturning when slewing with an incorrectly set RCL!
Always check before slewing whether the RCL code valid for the current rigging mode is displayed.
This prevents slewing operations from being enabled within the impermissible ranges, which would cause the truck crane to overturn.

Risk of overturning when operating with the hand-held control!
When operating with the hand-held control, there is no monitoring by the RCL. Before slewing, always use the following table to check if slewing is permitted.
This prevents the truck crane tipping when slewing.

Rigged counterweight	Rigged outrigger span: 8.76 x 2.63 m (28.7 x 8.6 ft)	8.76 x 6.10 m (28.7 x 20.0 ft)	8.76 x 8.90 m (28.7 x 29.2 ft)	8.76 x 8.90/1.22 m (25.5 x 29.2/4.0 ft) (rear outriggers)
0 t	Slewing permitted	Slewing permitted	Slewing permitted	Slewing permitted[1)]
20 t	Rigging modes not permitted, slewing not permitted			Rigging modes not permissible, slewing not permissible
40 t				
60 t		Slewing not permitted[2)]		
80 t				
100 t				
120 t				
140 t				
160 t				

[1)] The mobile crane must be supported at the rear with the supports. Raising and lowering the boom below the inclination permitted for the working area is only allowed by the RCL
- in the position 0° to the rear or
- in the position 180° to the front, when the superstructure is locked.

[2)] The superstructure must be locked in the working position 0° to the rear.

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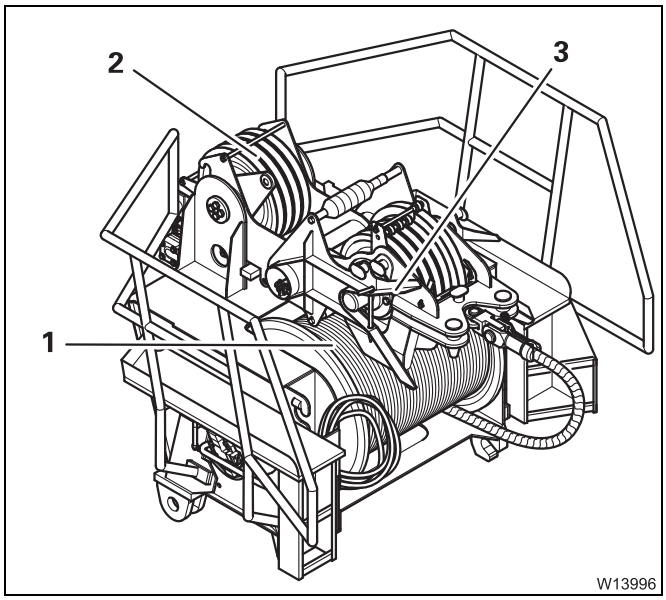
12.8 Auxiliary hoist

This chapter describes rigging the auxiliary hoist with the truck crane. The auxiliary hoist can also be rigged with an auxiliary crane.

The auxiliary hoist must be removed for on-road driving with a maximum of 12 t axle load.

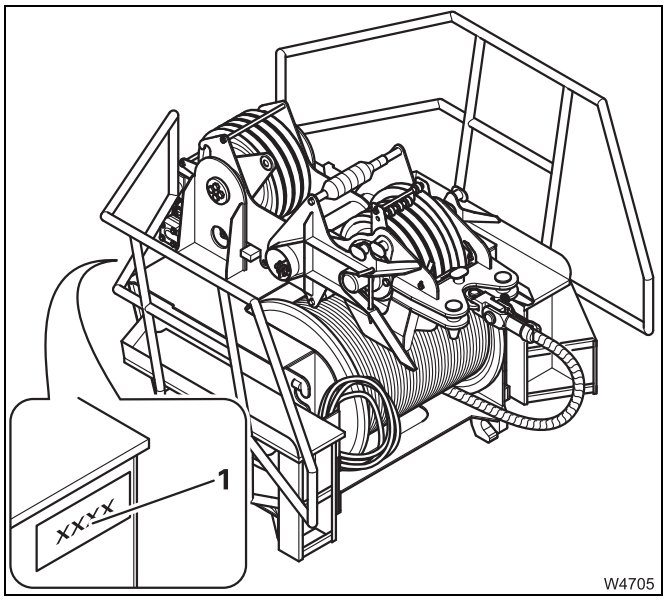


Scope of delivery

- Auxiliary hoist (**1**) with rope,
- Lower hook block (**2**),
- Upper hook block (**3**)
- Lifting limit switch

12.8.1 Identification

The auxiliary hoist may only be operated together with a GROVE truck crane GMK7450 whose serial number is identical with the serial number of the auxiliary hoist.



The serial number (**1**) of the hoist is located on right rear of the hoist frame.

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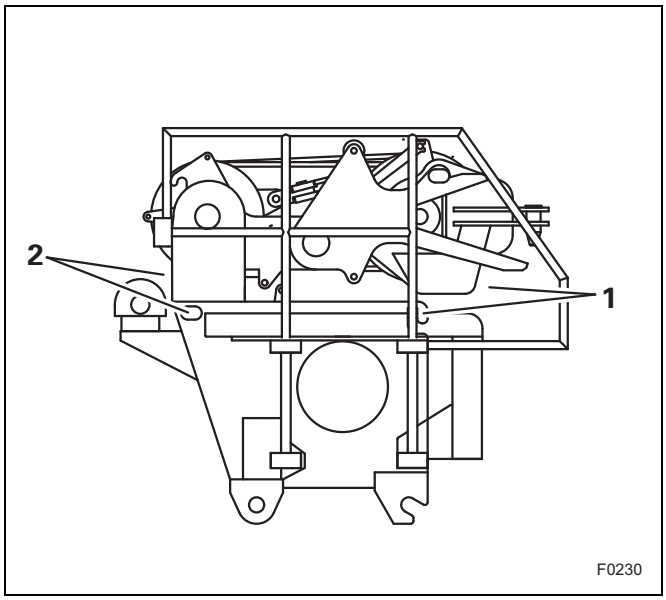
12.8.2 Slinging points and transport

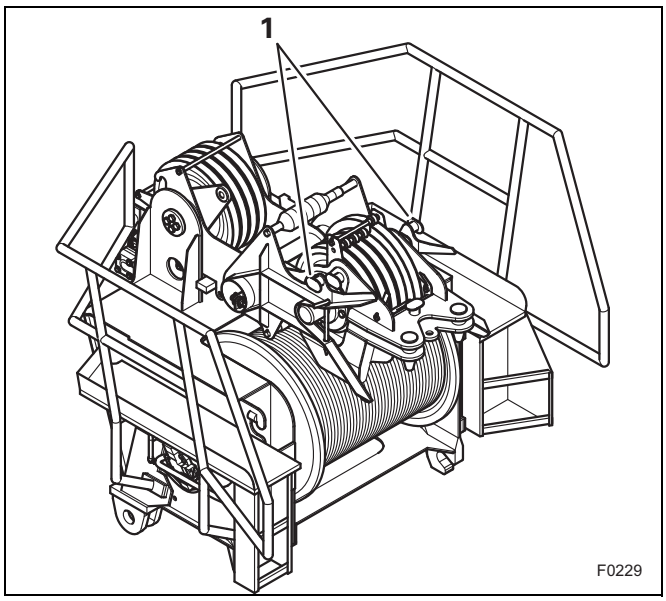
Slinging points

Risk of accident if used improperly!
Only sling the auxiliary hoist at the slinging points provided. Always use lifting gear with sufficient load bearing capacity; ➠ *Dimensions and weights of removable parts – Auxiliary hoist*, p. 1 - 12.



The auxiliary hoist is equipped with four slinging points (**1, 2**).

- Sling the auxiliary hoist at on the slinging points (**1, 2**).



The catcher is fitted with two slinging points (**1**), on which the catcher is slung together with the upper hook block.

- Sling the catcher only at the slinging points (**1**).

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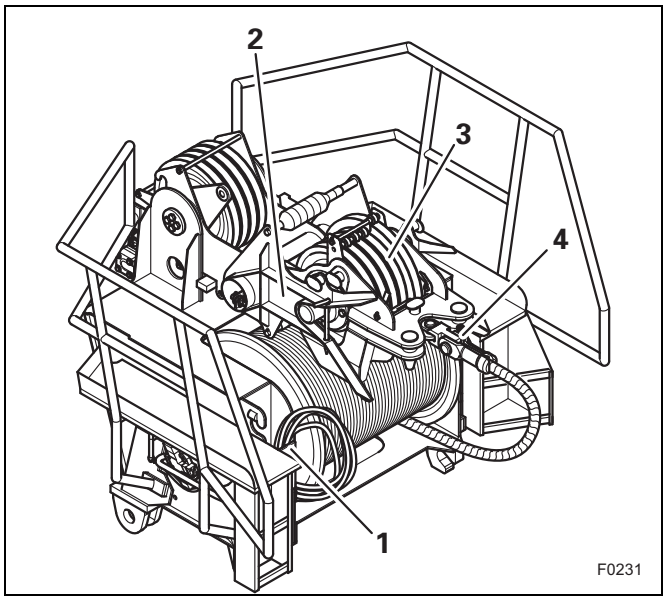
Transportation

Risk of damage to the auxiliary hoist!
Attach the auxiliary hoist on the separate vehicle so that it cannot slip off. Insert the hydraulic hoses and the electric cable into the specially designed shaft.

Risk of accident from damaged auxiliary hoist rope!
Ensure that the hoist rope is not damaged when loading the auxiliary hoist. This prevents loads from falling during crane work with an auxiliary hoist.



- Put the auxiliary hoist into the following transport position:

– The hydraulic hoses and connections are inserted into the assigned shaft (**1**); p. 12 - 82.

– The electric cable is also plugged into the assigned shaft (**1**); p. 12 - 83.

– The catcher (**2**) has been set down; p. 12 - 81.

– If necessary, the upper hook block (**3**) is secured in the catcher; p. 12 - 88.

– The auxiliary hoist rope is fastened to the holder (**4**).

Be aware of the dimensions and weight of the auxiliary hoist when transporting; p. 1 - 12.

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12.8.3 CHECKLIST: Mounting the auxiliary hoist

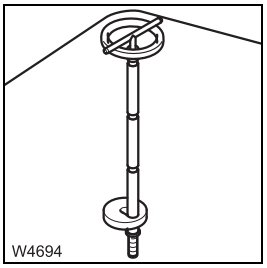
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions there!

Prerequisites

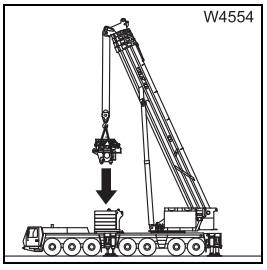
– The truck crane is supported with the outrigger span required for crane work according to the *Lifting capacity table.*; ➠ *Permissible outrigger spans*, p. 12 - 34

– The required counterweight version is assembled on the counterweight platform and is connected electrically and hydraulically;
➠ *CHECKLIST: Rigging the counterweight*, p. 12 - 53.

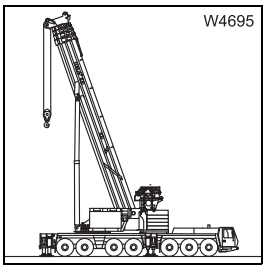
– The current rigging code of the truck crane is entered in the RCL;
➠ *Entering rigging mode*, p. 11 - 23.



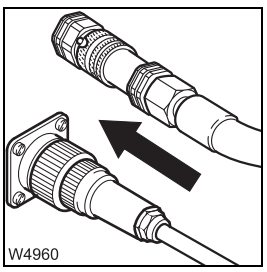
1. If, after rigging the auxiliary hoist, more than 100 t of counterweight is to be rigged, you must first remove the tension rods for the blocks from the mounting; ➠ *Securing/releasing 10 t blocks*, p. 12 - 61.



2. Sling the auxiliary hoist to the truck crane and lift up to the 20 t base plate;
➠ *Slinging points and transport*, p. 12 - 74,
➠ *Hoisting the auxiliary hoist onto the 20 t base plate.*, p. 12 - 80



3. Slew the superstructure to the rear and lock the superstructure.



4. – Establish the hydraulic connection to the auxiliary hoist; ➠ p. 12 - 82.
– Establish the electrical connection to the auxiliary hoist; ➠ p. 12 - 83.

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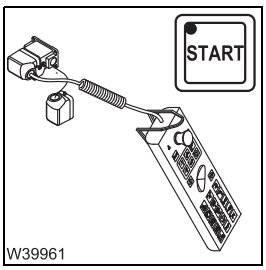
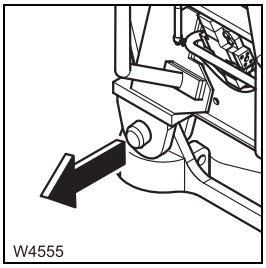
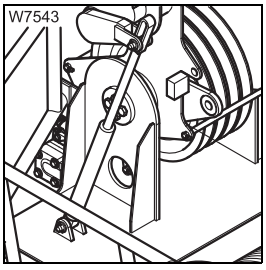


5. Connect the hand-held control to the rear right of the turntable and start the crane engine; ➠ p. 12 - 17.

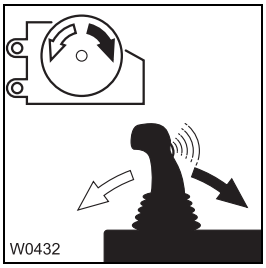


6. Bolt the 20 t base plate to the auxiliary hoist; ➠ p. 12 - 84.

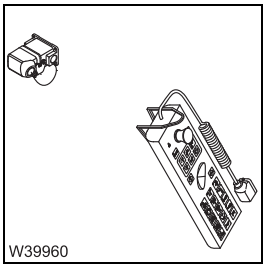
7. Continue rigging the counterweight; ➠ *CHECKLIST: Rigging the counterweight*, p. 12 - 53, from point **8.** to point **10.**



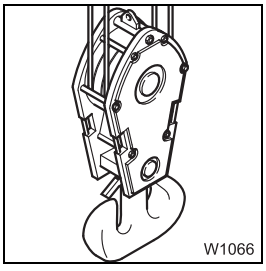
8. Raise the catcher and block it with the support; ➠ p. 12 - 81.



9. Checking the auxiliary hoist for correct functioning; ➠ p. 12 - 87.



10. Remove the hand-held control; ➠ p. 12 - 18.



11. Reeve the hoist rope and connect the lifting limit switch; ➠ *Reeving and unreeving the hoist rope*, p. 12 - 96.

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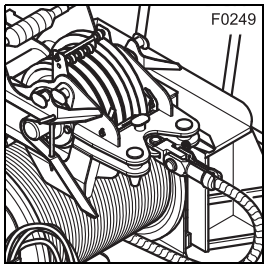
12.8.4 CHECKLIST: Removing the auxiliary hoist

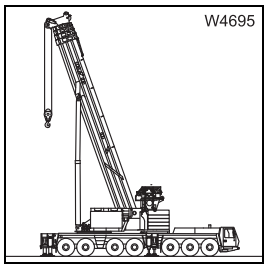
This checklist is not a complete operating manual. There are accompanying operating instructions which are indicated by cross-references.
Observe the warnings and safety instructions there!

Prerequisites

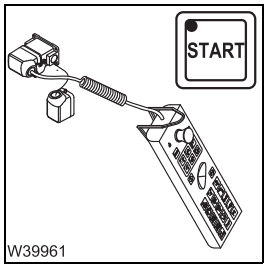
- The truck crane is supported with the outrigger span required for crane work according to the *Lifting capacity table.*; ➠ *Permissible outrigger spans*, p. 12 - 34
- The counterweight and the auxiliary hoist are connected electrically and hydraulically; ➠ p. 12 - 63, ➠ p. 12 - 82.
- The current rigging code of the truck crane is entered in the RCL; ➠ *Entering rigging mode*, p. 11 - 23.



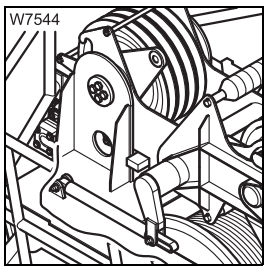
1. Unreeve the auxiliary hoist rope, roll onto the reel and fasten it to the auxiliary hoist



2. Slew the superstructure to the rear and lock the superstructure.



3. Connect the hand-held control to the rear right of the turntable and start the crane engine; ➠ p. 12 - 17.



4. Lower the catcher; ➠ p. 12 - 81.

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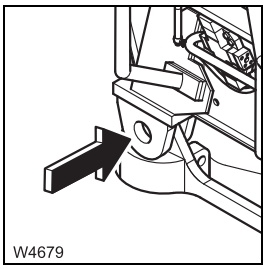
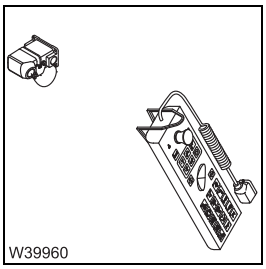
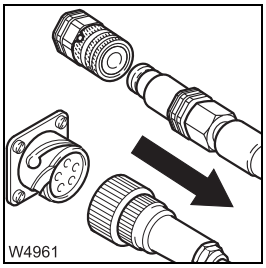
5. Continue unrigging the counterweight; ➠ *CHECKLIST: Unrigging the counterweight*, p. 12 - 55, from point **4.** to point **10.**



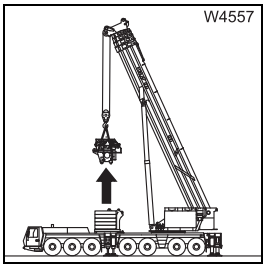
6. Release the locking pin between the auxiliary hoist and the 20 t base plate using the hand-held control; ➠ *Locking/unlocking the auxiliary hoist*, p. 12 - 84.



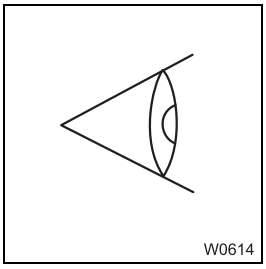
7. Remove the hand-held control; ➠ p. 12 - 18.



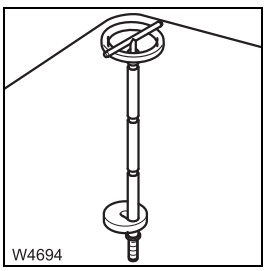
8. – Detach the electrical connection to the auxiliary hoist; ➠ p. 12 - 83.
– Detach the hydraulic connection to the auxiliary hoist; ➠ p. 12 - 82



9. Sling the auxiliary hoist and place it on the separate vehicle; ➠ *Slinging points and transport*, p. 12 - 74.



10. Check the transport position of the auxiliary hoist; ➠ *Transportation*, p. 12 - 75.



11. If necessary, insert the tension rods for the counterweight blocks into the holders; ➠ *Securing/releasing 10 t blocks*, p. 12 - 61.

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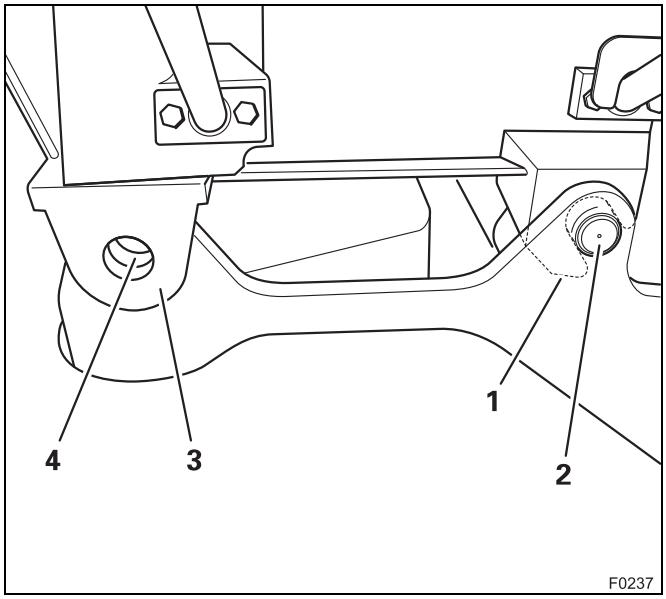
12.8.5 Hoisting the auxiliary hoist onto the 20 t base plate.



- Sling the auxiliary hoist; ➠ *Slinging points*, p. 12 - 74.
- Hoist the auxiliary hoist onto the 20 t base plate. When doing this, ensure that:
  – Both hooks (**1**) grip round the holders (**2**)
  – The fork elements on both sides (**3**) align with the eyes (**4**)

Now the auxiliary hoist is in the correct position for locking.

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12.8.6 Raising/setting down the catcher

When operating the auxiliary hoist, the catcher must be raised so that the cable run is not impeded by the upper hook block.

To raise and lower the catcher you must:

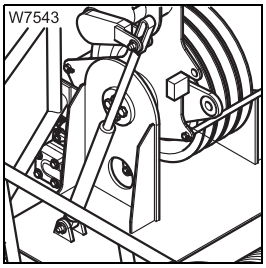
– Connect the hand-held control; p. 12 - 17

– Check that the upper hook block is secured when it lies in the catcher; p. 12 - 88

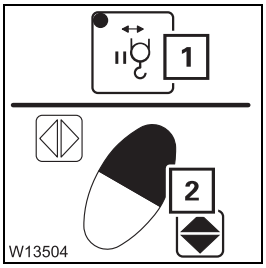
Raising

• Connect the hand-held control; p. 12 - 17.

When the upper hook block lies in the catcher:



• Check that the upper hook block is secured; p. 12 - 88



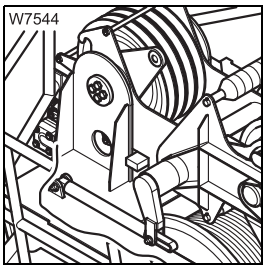
• Press the button (**1**). The lamp lights up.

• Press the key combination (**2**) until the catcher is fully raised

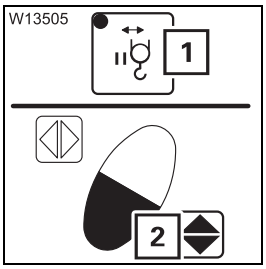
Setting down

• Connect the hand-held control; p. 12 - 17.

When the upper hook block lies in the catcher:



• Check that the upper hook block is secured; p. 12 - 88



• Press the button (**1**). The lamp lights up.

• Press the key combination (**2**) until the catcher is fully set down

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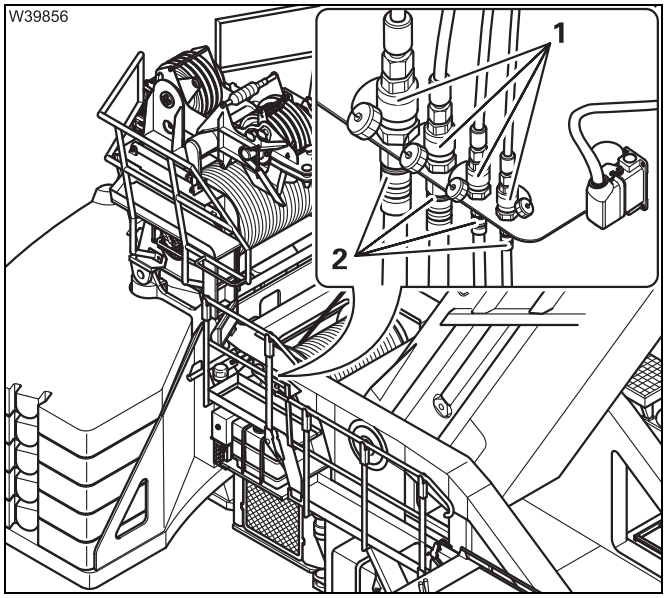
12.8.7 Establishing/disconnecting the hydraulic connection

The hydraulic connection is on the right side at the rear of the turntable.

Establishing

The connection must be established before the auxiliary hoist can be locked and operated.



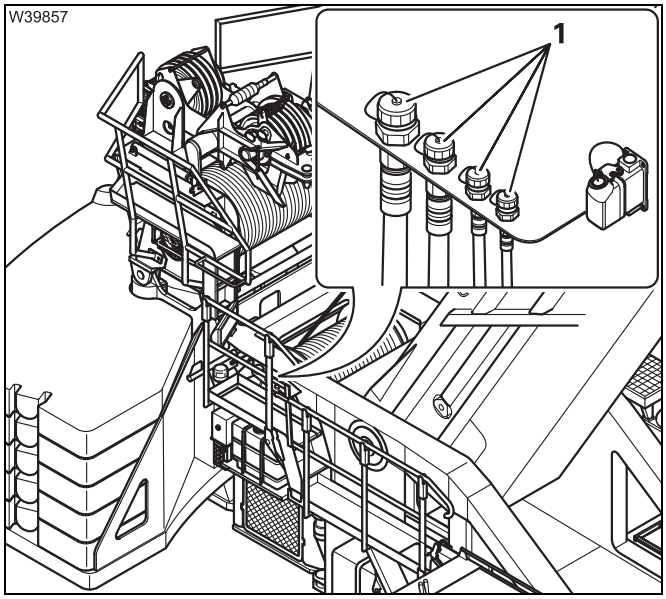
- Pull the hoses (**1**) out of the shaft next to the access ladder on the auxiliary hoist

Corresponding hoses and ports are labelled.

- Connect the quick release fittings on the hoses with the connections (**2**) on the main hoist

Separating

The connection must be disconnected before the auxiliary hoist is hoisted from the 20 t base plate.



- Loosen the quick release fittings on the hoses at the connections (**1**) on the main hoist
- Insert the hoses into the shaft

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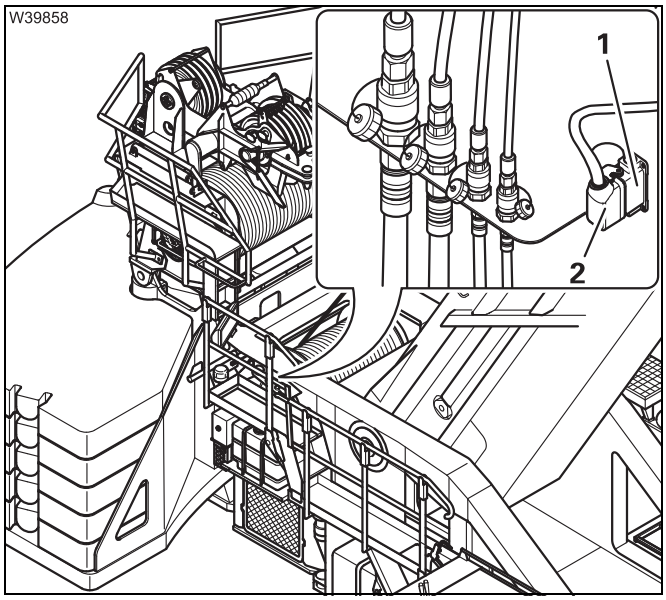
12.8.8 Establishing/disconnecting the electrical connection

The electrical connection is established and broken at the rear right-hand side of the turntable.

Establishing

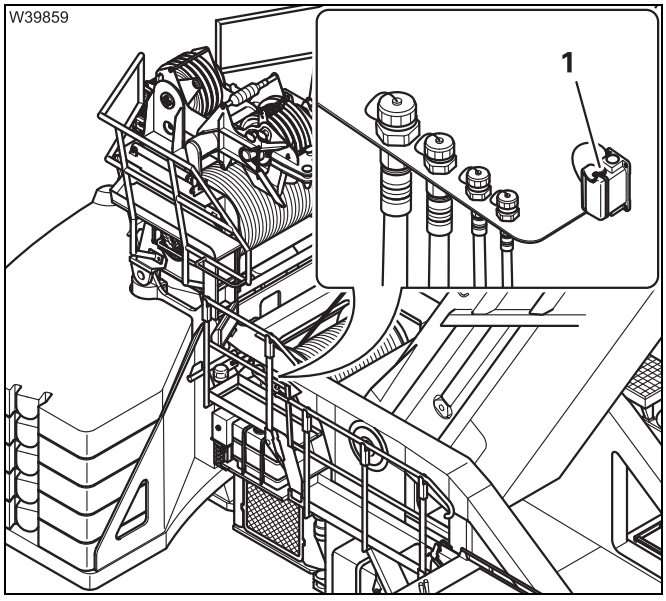
The connection must be established before the auxiliary hoist can be locked and operated.



- Pull out the plug (**2**) from the dummy socket. This is located on the cable duct next to the access ladder on the auxiliary hoist
- Connect the cover to the dummy socket
- Open the cover on the socket (**1**)
- Insert the plug (**2**) in the socket (**1**).

Disconnecting

The connection must be disconnected before the auxiliary hoist is hoisted from the 20 t base plate.



- Pull the plug from the socket (**1**)
- Connect the cover to the socket (**1**)
- Open the cover on the dummy socket. This is located on the cable duct next to the access ladder on the auxiliary hoist
- Insert the plug into the dummy socket

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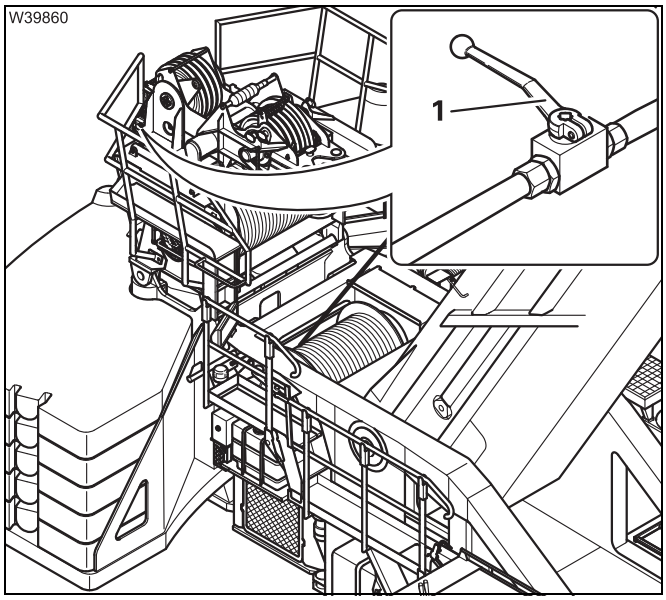
12.8.9 Locking/unlocking the auxiliary hoist

Auxiliary hoist safety valve

The hydraulic cylinders of the locking pins are blocked with a safety valve. The valve is located on the rear right-hand side of the auxiliary hoist, at the same height as the tread grid.

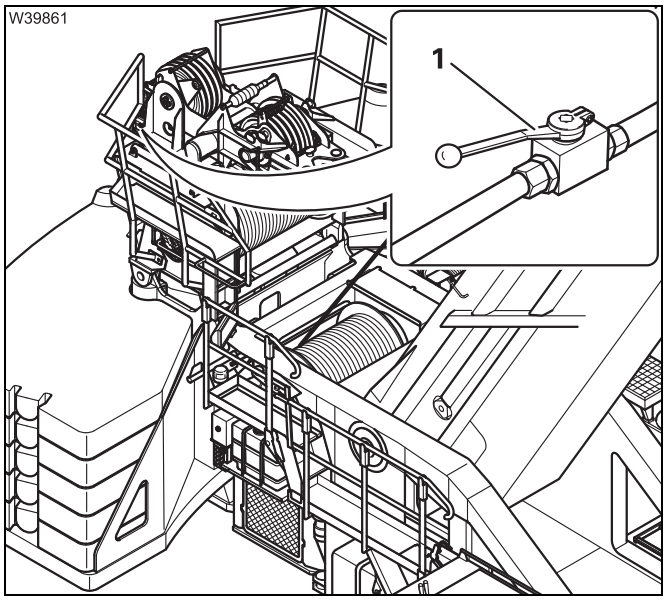


Closing the valve

Always close the valve after you have locked the auxiliary hoist on the 20 t base plate.

- Close the valve – handle (**1**) at right angles to the line

The pins are secured against accidental activation.



Opening the valve

Before the locking pins are extended or retracted, you have to open the safety valve.

- Open the valve – handle (**1**) parallel to the line

The pins can now be moved using the hand-held control.

- Close the valve after extending the pins

Risk of accident when the safety valve is open!
Always close the safety valve when the auxiliary hoist on the 20 t base plate is locked. This prevents the auxiliary hoist from being unlocked due to unintentional actuation and from being lifted off the base plate.

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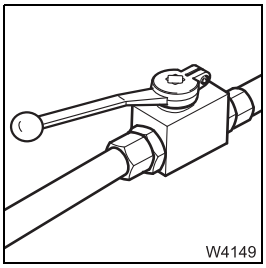
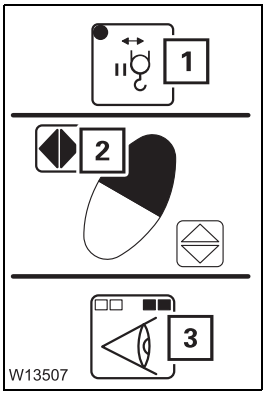
Locking



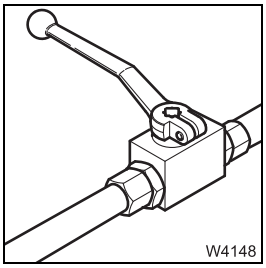
Open the safety valve; ➠ p. 12 - 84.



- Press the button (**1**). The lamp lights up.
- Press the key combination (**2**), until the lamps (**3**) are lit.

  The counterweight is now locked at the turntable.

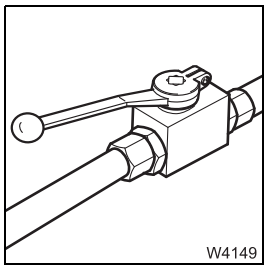
If a locking pin has not yet reached the *Locked* end position, the corresponding lamp will flash.



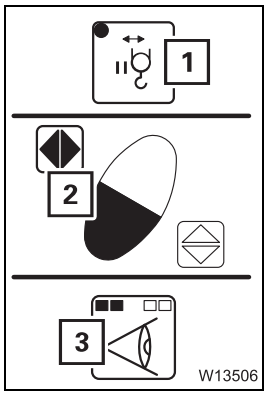
- Close the safety valve; ➠ p. 12 - 84.

Risk of accident from falling counterweight!
Always close the safety valve when the auxiliary hoist is locked to the counterweight. This prevents the locking pins, for example, from being unintentionally retracted because a button is erroneously pushed, causing the entire auxiliary hoist to fall down.

Releasing the locking pin

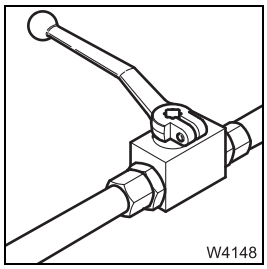


- Open the safety valve; ➠ p. 12 - 84.



- Press the button (**1**). The lamp lights up.
- Press the key combination (**2**), until the lamps (**3**) are lit.

If a locking pin has not yet reached the *Unlocked* end position, the corresponding lamp will flash.



- Close the safety valve for the transport; ➠ p. 12 - 84.

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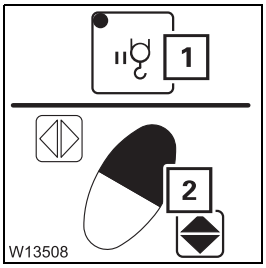
12.8.10 Checking the auxiliary hoist for correct functioning

After mounting the auxiliary hoist you must check that it functions properly when the control lever is extended and check the functioning of the slewing indicator.

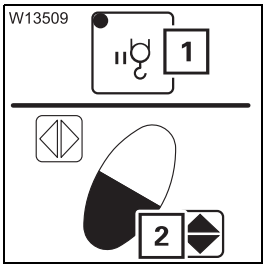
You can carry out a test to check whether the auxiliary hoist is correctly connected using the hand-held control as well as in the crane cab. You can only carry out the test on the control levers in the crane cab.

With the hand-held control



- Press the button (**1**). The lamp lights up.
- Press the key combination (**2**) once.

The hoist must now unreel the rope.

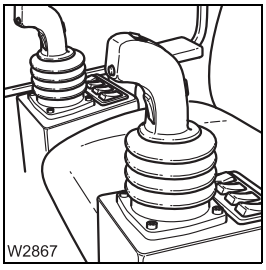


- Press the button (**1**). The lamp lights up.
- Press the key combination (**2**) once.

The hoist must now reel up the rope.

In the crane cab

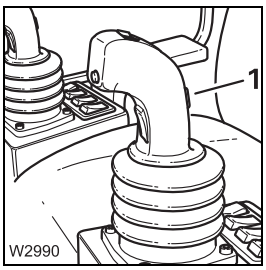
- Switch on the auxiliary hoist; ➠ p. 11 - 58.



- Move the left-hand control lever forward and then back, letting the auxiliary hoist run for about one half revolution in each direction
- Check whether the direction of rotation for the particular control lever position corresponds with the following specifications

Shift the control lever to the rear	The auxiliary hoist rope is reeled **onto** the cable drum
Shift the control lever forwards	The auxiliary hoist rope is reeled **off** the cable drum

- While checking, ensure that the rope does not slacken.



- Check the function of the slewing indicator. You must feel a pulse on the slewing indicator (**1**) when the auxiliary hoist is rotating.

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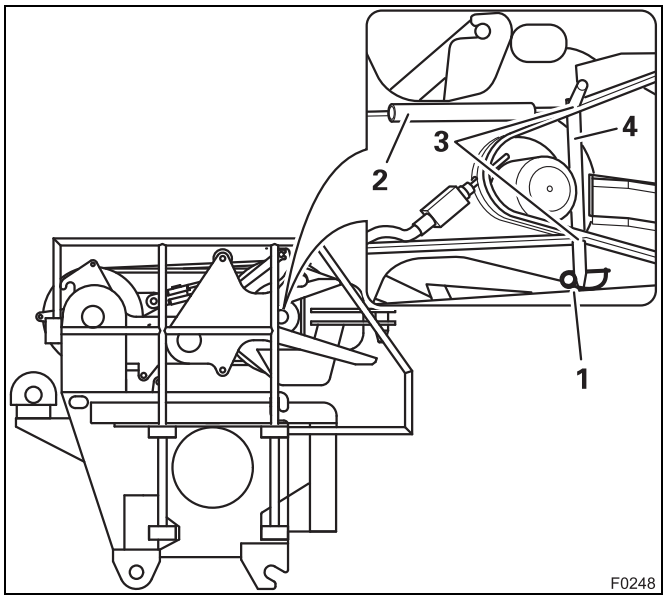
12.8.11 Securing the upper hook block in the catcher

If the upper hook block remains in the catcher during transport or during operation, it must be secured there.



- Check that the pins (**4**) are inserted and secured with retaining pins on both sides

If the upper hook block is not secured, secure it as follows:

- Remove the retaining pins (**1**) from both sides and pull the pins (**4**) out of the holders (**2**)
- Insert the locking pins on both sides into the holders (**3**)
- Secure the pins using the retaining pins.

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12.8.12 Permissible applications for the auxiliary hoist

The auxiliary hoist may be used:

– As a replacement for the main hoist; ➠ p. 12 - 89,

– During alternating operation with main hoist and auxiliary hoist on the main boom; ➠ p. 12 - 90,

– For permissible work with the lattice extension; ➠ *Lattice extension operating manual*

The following use of the auxiliary hoist is not permitted:

– Two-hook operation on the main boom head is not permitted

– Impermissible work with the lattice extension; ➠ *Lattice extension operating manual*.

Replacement for the main hoist

The auxiliary hoist may be used as a replacement for the main hoist:

– For main boom operation

– For operation with the lattice extension; ➠ *Lattice extension operating manual*

- To do so, reeve the auxiliary hoist rope in the same way as the main hoist rope;
  ➠ *Reeving and unreeving the hoist rope*.
- Attach the lifting limit switch and the lifting limit switch weight exactly as for operation with the main hoist; ➠ *Installing/removing the lifting limit switch*, p. 12 - 112.

The auxiliary hoist is designed for a lower rope pull (104 kN/ 10.6 t (23,370 lbs)) than the main hoist (110 KN/11.2 t (27,600 lbs)).

This means that a correspondingly high number of falls must be reeved, so that the same load can be lifted as with the main hoist.

If you run the auxiliary hoist rope over the left head sheave (Additional equipment), you must extend the main boom to a total length of at least 21 m (69 ft) before lifting a load. Otherwise, the rope angle would exceed the maximum permissible value.

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Alternating operation with the main and the auxiliary hoist

For equipment having a second head sheave (Additional equipment) on the main boom, you can simultaneously reeve the main and auxiliary hoist ropes and alternately work with both hoists. To do this, you must install the second lifting limit switch.

Risk of accident during two-hook operation
During alternating operation the load must always hang on only one hook block. If you sling the load on both hook blocks but lift it with only one of the blocks, you are already in the non-permissible two-hook mode which is no longer secured by the RCL.

- Install both lifting limit switches and the associated lifting limit switch weights; ➠ *Installing the lifting limit switch*, p. 12 - 112.
- Enter the current reeving for both hoists at the RCL;
  ➠ *Entering the reeving*, p. 11 - 28.
- Switch on the hoist with which you wish to lift the load;
  ➠ *Hoists display*, p. 11 - 31.

The correct hoist is now set on the RCL and crane operation is secured by the RCL. The maximum loads are reduced by the value of the weight of the second hook block.

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12.9 Rigging work on the main boom

12.9.1 Hook block on the bumper

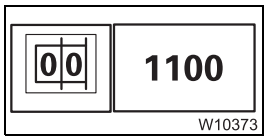
The hook block can be transported on a separate vehicle, attached to the front bumper, or hung inside the lighting carrier;
➠ *Hook block on a separate vehicle*, p. 12 - 93.
➠ *Hook block in the lighting carrier*, p. 6 - 58.

Picking up the hook block from the bumper

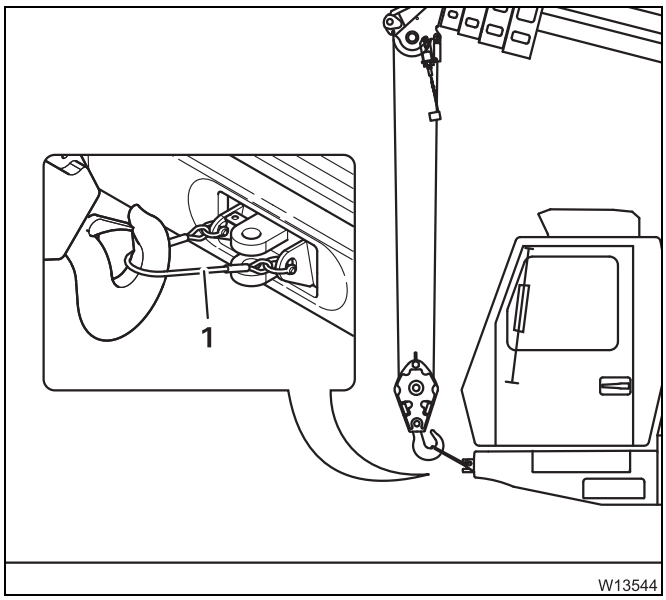
Depending on the driving mode, you must pick up the 1-sheave hook block from the front bumper; ➠ *Driving modes*, p. 6 - 1.

Risk of accidents if the view is obstructed!
Have someone guide you when detaching the hook block from the holding rope since the view of the hook block is obstructed by the driver's cab.

The main boom must be fully retracted.



- Enter the RCL rigging code for the current rigging mode of the truck crane.



- Slacken the hoist rope and raise the main boom simultaneously.
- Raise the main boom until the boom head is in a vertical position above the hook block.
- Detach the hook block from the retaining rope (**1**).

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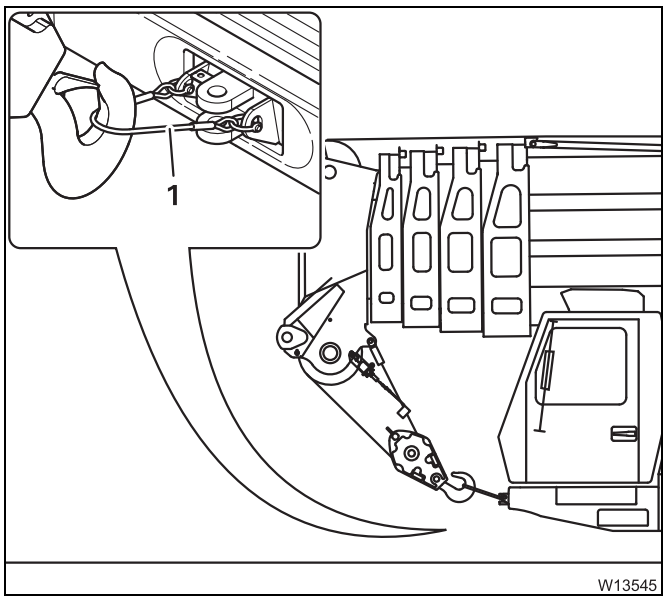
Attaching the hook block to the bumper

Depending on the driving mode, you can attach the 1-sheave hook block to the front bumper; ➠ *Driving modes*, p. 6 - 1.

Risk of accidents if the view is obstructed!
The reeved rope lines obstruct the view of the runway. The number of legally permissible rope lines can vary depending on the country in which you are working. According to EU regulations, the hook block may be reeved no more than 4 times when driving on the road.

Risk of accidents from the hook block swinging unexpectedly!
The hook block will suddenly swing **forward** if the retaining rope for the hook block tears when tightening the hoist rope.
Therefore ensure that the banksman or other persons always stand at a safe distance **to the side** of the hook block.

Do not attach the rope end clamp to the front towing coupling! The towing coupling must be free for a tow-rod in emergencies.



- Raise the hook block vertically above the retaining rope (**1**).
- Lower the hook block and attach the hook block to the retaining rope (**1**).
- Set down the main boom onto the boom rest and pull the hoist rope tight only to the extent that the hook block is stabilised in its position.

If the lifting limit switch is deactivated while you tighten the hoist rope, you can override the shutdown of the lifting limit switch; ➠ p. 11 - 62.

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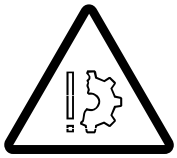
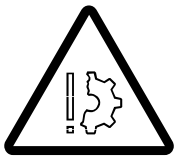
12.9.2 Hook block on a separate vehicle

Risk of overturning while slewing!
Before slewing, always check that slewing is permitted in the current rigging mode. Correct the rigging mode if necessary;
➠ *Slewing with a rigged counterweight*, p. 12 - 71.

Danger of overturning when slewing with an overridden RCL!
Do not override the RCL before slewing the superstructure.
Enter an RCL code for the 360° working range if the slewing operation is not released.
This prevents slewing into impermissible areas and the truck crane tipping over as a result.



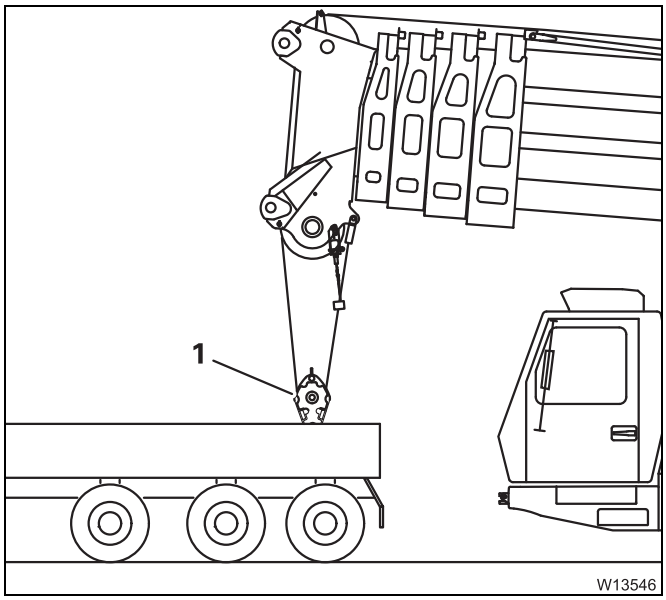
Risk of damage to the separate vehicle!
Raise the hook block from the separate vehicle only when the main boom head is directly above the hook block!
This prevents the hook block swinging and damaging the separate vehicle.



Risk of damage to the hoist rope
To prevent slack rope, do not ease down too much hoist rope when picking up and reeving the hook block!
Slack rope causes rope loops on the hoist drum, which can result in the load slipping and the hoist rope being damaged!

Picking up the hook block

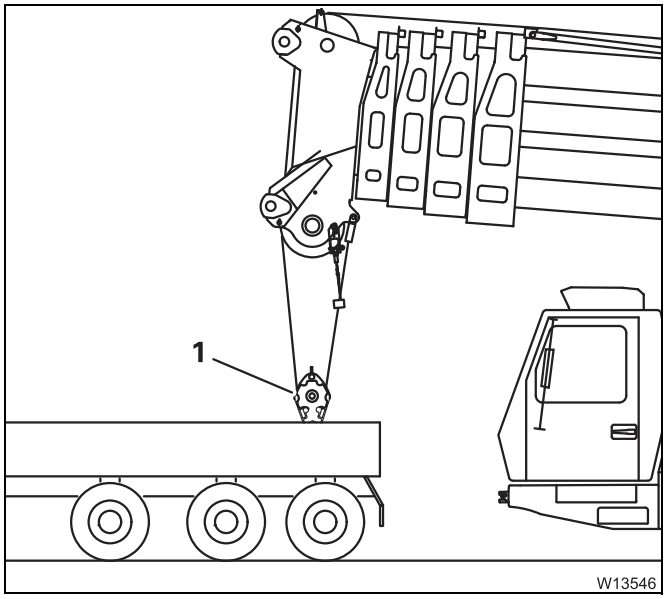
Depending on the driving mode, the hook block can be placed on a separate vehicle for on-road driving; ➠ *Driving modes*, p. 6 - 1.



- If the respective setting has been made in the RCL, slew the superstructure and lower the main boom until the boom head is directly above the hook block (**1**).
- Unreel the hoist rope.
- Reeve the hoist rope; ➠ *Reeving and unreeving the hoist rope*, p. 12 - 96.
- Raise the hook block (**1**) from the separate vehicle.

Setting down the hook block

Depending on the driving mode, the hook block can be placed on a separate vehicle for on-road driving; ➠ *Driving modes*, p. 6 - 1.



- With the RCL set accordingly, fully retract the main boom.
- Raise the hook block until it is about 1 m (3.3 ft) below the main boom.
- Lower the main boom and set the hook block (**1**) down on the separate vehicle.

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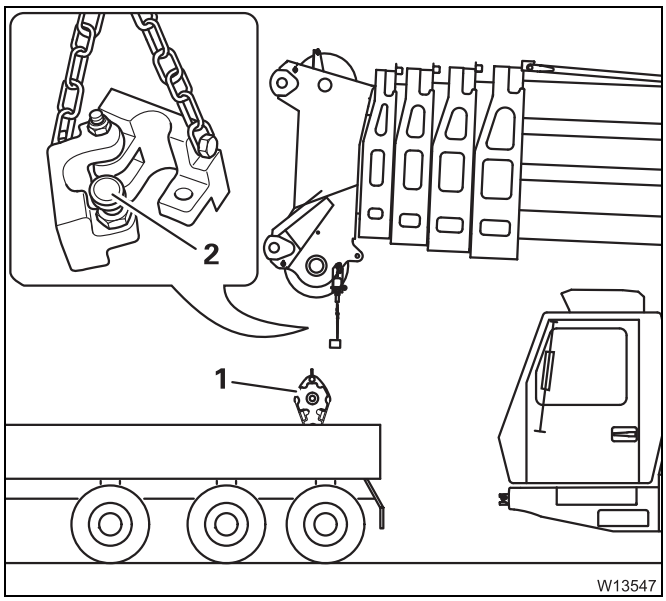
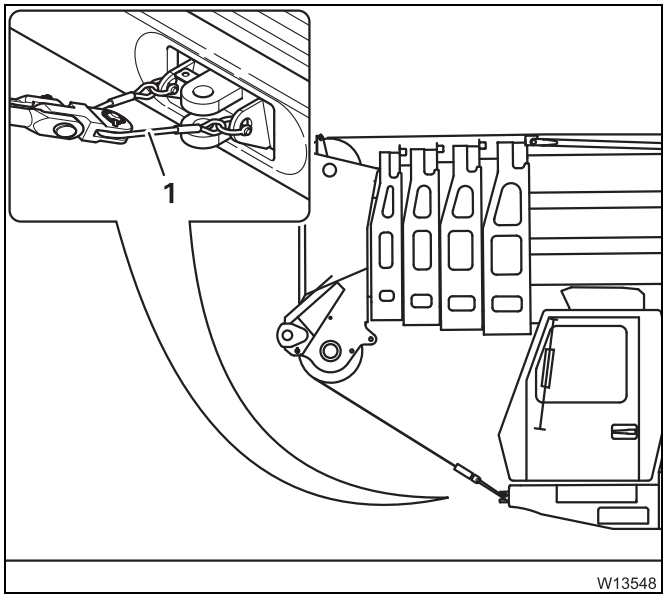


- Detach the lifting limit switch weight (**2**) from the hoist rope; p. 12 - 115.
- Unreeve the hoist rope; p. 12 - 100.
- Secure the hook block (**1**) for transport.
- Set down the main boom on the boom rest.

Fastening the hoist rope to the bumper

Do not attach the rope end clamp to the front towing coupling! The towing coupling must be free for a tow-rod in emergencies.



- Attach the rope end clamp to the retaining rope (**1**).
- Pull the hoist rope slightly taut.
- Fasten the lifting limit switch weight to the hoist rope.

The hoist rope and lifting limit switch weight are now secured for driving.

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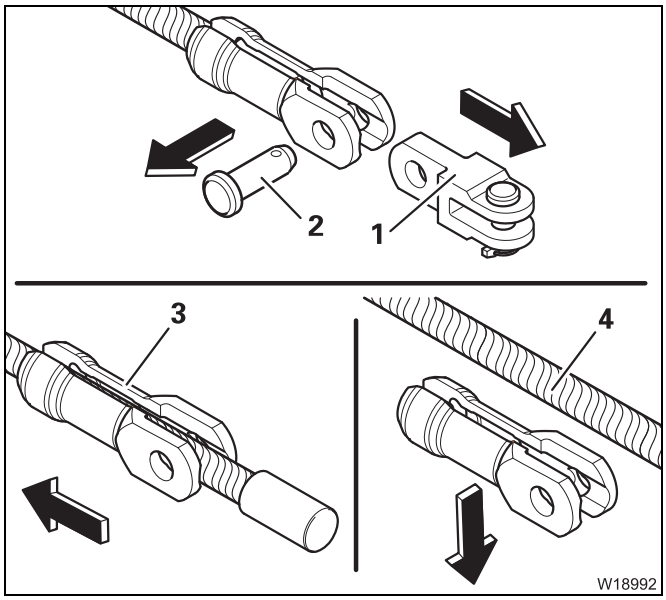
12.9.3 Reeving and unreeving the hoist rope

You must reeve a certain number of rope lines, depending on the required load bearing capacity. Four reeved rope lines correspond, for example, to 4-fall reeving.

Possible reevings and the corresponding lifting capacities; ➠ p. 12 - 101.

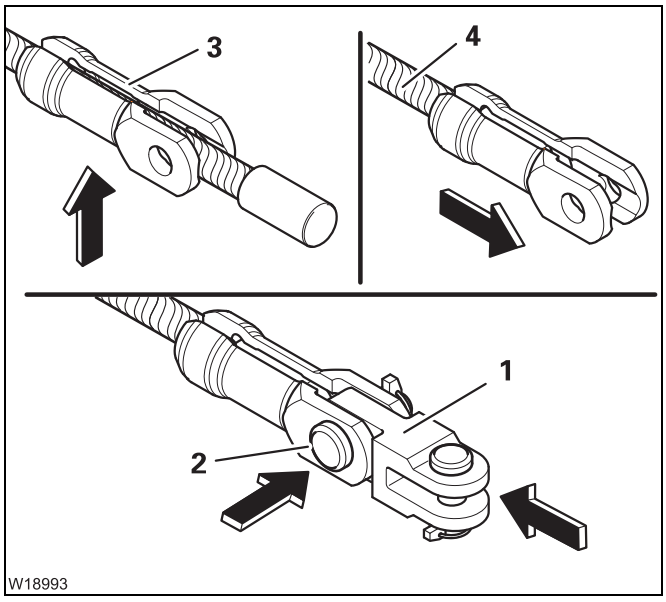
Rope end fitting

To reeve and unreeve the hoisting rope, you must remove the rope end fitting.
After reeving you must reattach the rope end fitting.



Removing the rope end fitting

- Pull the pin (**2**) and remove the fork element (**1**).
- Slide the holder (**3**) back and remove it from the hoist rope (**4**).



Reattaching the rope end fitting

- Plug the holder (**3**) and slide it onto the hoist rope as far as it will go (**4**).
- Fasten the fork element (**1**) using the pin (**2**).
- Secure the pin using the linchpin.

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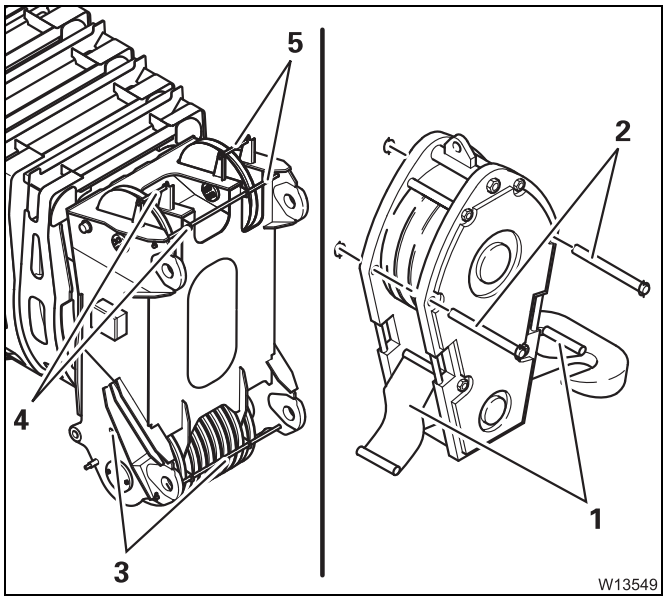
Reeving

Reeving is also possible when the rope end clamp is fastened.

Danger due to slack rope!
Only use hook blocks and lifting gear of the minimum weight prescribed in the *Tragfähigkeitstabelle*, depending on the reeving and boom length. This prevents slack rope forming at large heights when lifting without a load. This can result in the load slipping.

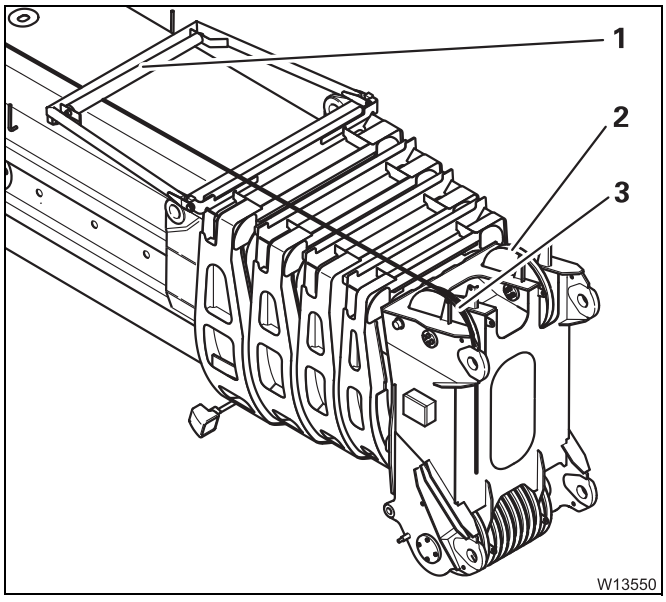


Opening the hook block

- Pull out the rods (**2**).
- Fold down the plates (**1**).

Positioning the hoist rope

- Pull out the rods (**3**).
- Pull out the rods (**4**) for the **main hoist rope**.
- Pull out the rods (**5**) for the **auxiliary hoist rope**.



- Guide the hoist rope through under the rope grab (**1**).

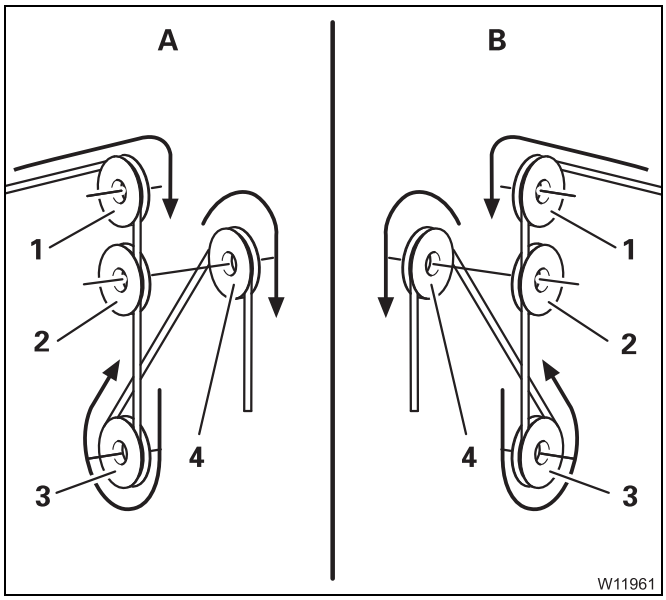
If two hoist ropes are reeved, you must feed the auxiliary hoist rope **over** the rope grab.

- Feed the main hoist rope to the head sheave (**3**).
- Feed the auxiliary hoist rope to the head sheave (**2**).

Use the rope grab also when working with the lattice extension.

Hoist rope, reeving

Risk of damage to the hoist rope
Always guide the hoist rope via the right head sheave (**A**) in order to keep within the maximum permissible rope angle.
If you run the auxiliary hoist rope over the left head sheave (**B**), you must extend the main boom to a total length of at least 21 m (69 ft) before lifting a load.
In such a way you prevent the hoist rope being damaged and thus reducing the lifting capacity by exceeding the maximum permissible rope angle.

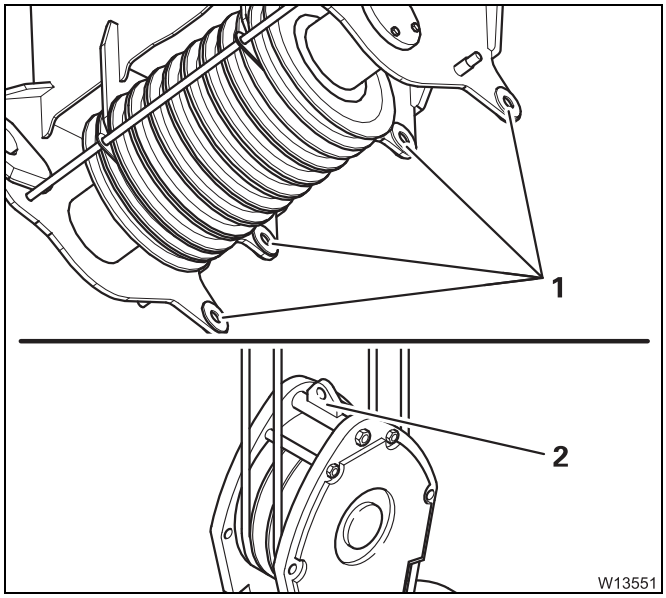


(A) – Forone hoisting rope

(**B**) – for a second hoist rope

- Guide the hoist rope over the upper head sheave (**1**) to the outer head sheave (**2**).
- Guide the hoist rope from the front around the outer pulley (**3**) of the hook block, upwards to the main boom head.
- Guide the hoist rope from the rear over the next required head sheave (**4**), etc.
- Reeve the hoist rope with the required number of lines.

Possible reevings; ➠ p. 12 - 101.



Fastening the hoist rope

The fixed point used depends on the number of reeved rope lines.

– **Fixed point for an even number of lines**
The rope end clamp is fastened to the fixed point (**1**) with 2-fall, 4-fall, 6-fall etc. reevings.

– **Fixed point for an odd number of lines**
The rope end clamp is fastened to the fixed point (**3**) for 1-fall, 2-fall, 5-fall reevings etc.

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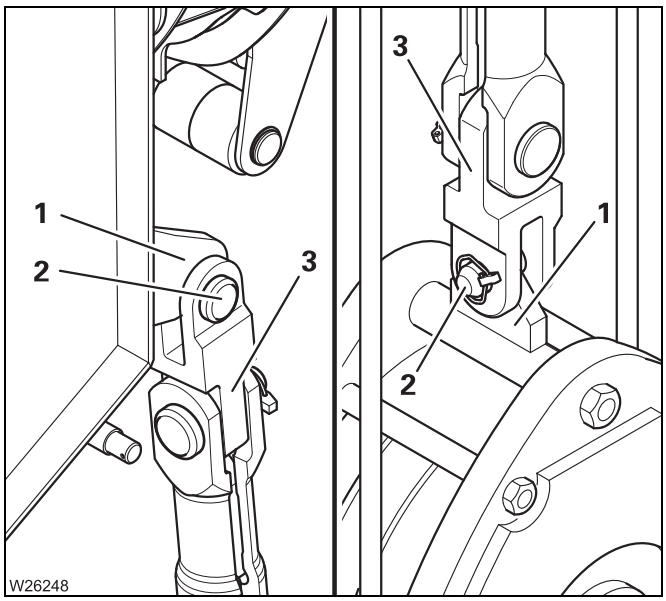
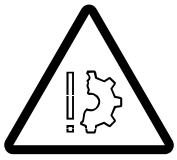
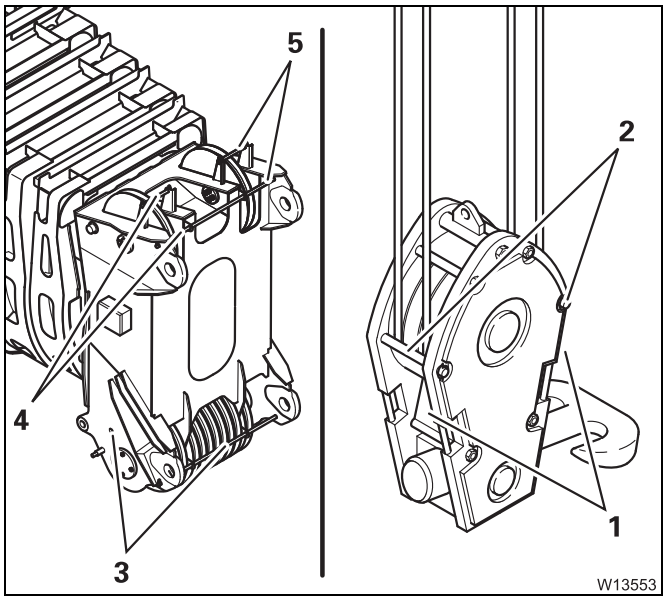


- Fit the rope end clamp (**3**) onto the fixed point (**1**). When the number of lines is even, the cutout (**4**) must point to the front.
- Attach the rope end clamp with the pin (**2**).
- Secure the pin using the linchpin.

Securing the hoist rope



Risk of damage to the hoist rope
Insert the rods (**2**) and (**3**) into the **rear** holes (**7**).
If the rope safety rods are inserted into the front bores, the hoist rope runs in an impermissible angle and could cause damage causing the load to fall.



Securing the hoist rope

- Insert the rods (**3**), (**4**) and (**5**).
- Secure all rods using the retaining pins.

Closing the hook block

- Fold up the plates (**1**) on both sides.
- Insert the rods (**2**) and secure them with the linchpins.

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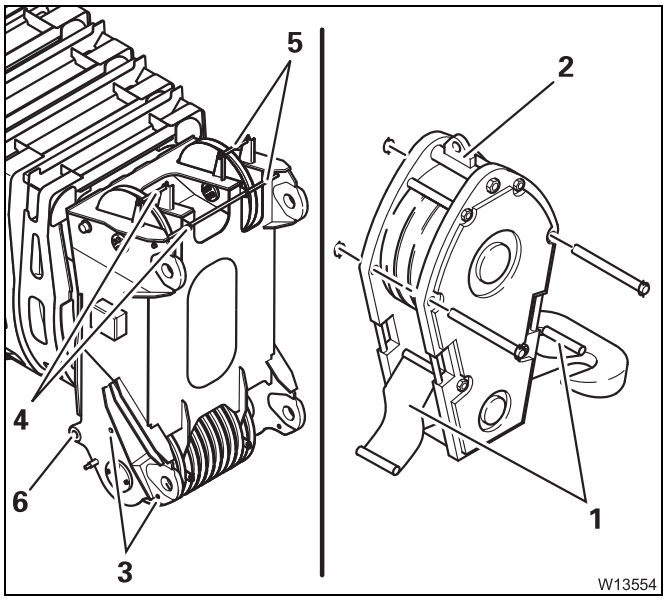
Unreeving



- Remove the retaining pins and pull out the rods (**3**).
- Fold down the plates (**1**); ➠ p. 12 - 97.
- Remove the rope end clamp from the fixed point (**2**) or (**6**).
- Unreeve the hoist rope.

Depending on the driving mode, you can:

– Fasten the hoist rope to the bumper; ➠ p. 12 - 95 or

– Pull out the rods (**4**) and (**5**) and roll the hoist rope onto the drum.

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12.9.4 Possible reeving methods on the main boom

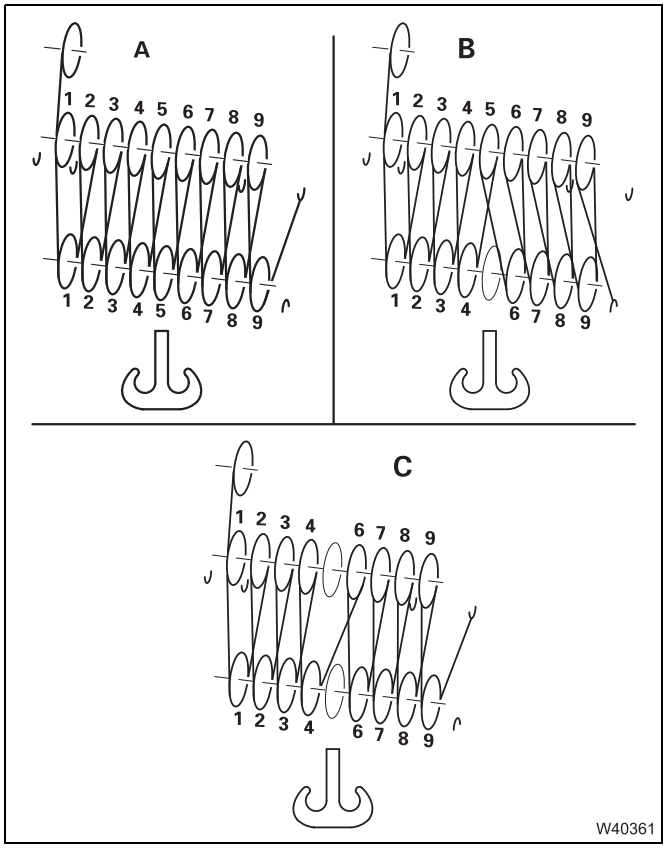
Possible reeving on lattice extensions; ➠ *Lattice extension operating manual.*

Please note that the maximum load bearing capacities already include the weight of the hook block and the lifting gear. You must subtract these weights in order to obtain the actual payload.

The maximum lifting capacity of individual hook blocks does not correspond to the maximum lifting capacity of the GMK7450 together with this hook block. The lifting capacity of the GMK7450 depends upon the rope pull, the reeving and friction forces; it is less than the lifting capacity of the hook block.

The indicated lifting capacities apply to the wire cable of the main hoist. When using the auxiliary hoist, you have to increase the reeving for the same lifting capacity due to the reduced wire cable (wire cable of the hoists; ➠ p. 1 - 19).

With 9 head sheaves



9 sheave hook block

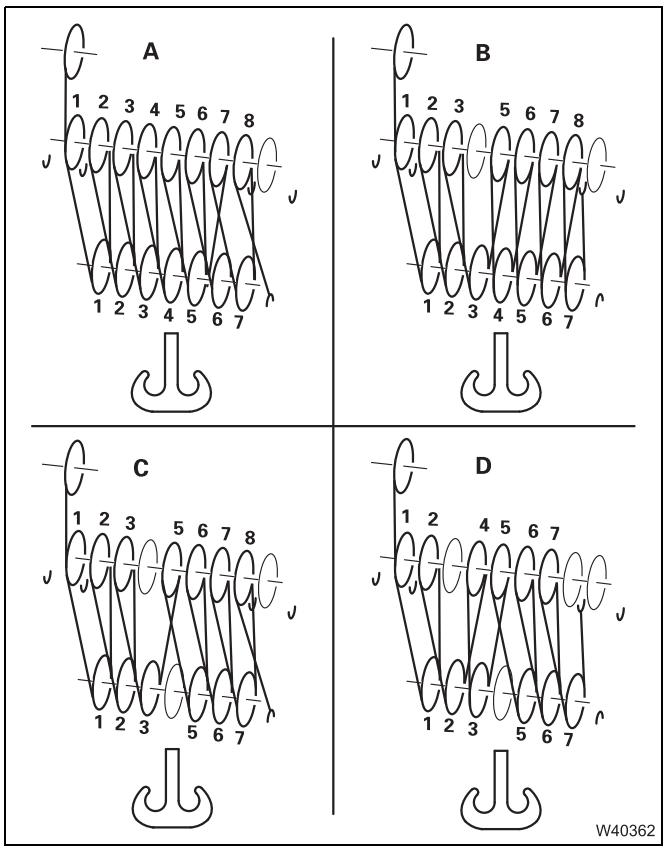
Reeving

A 18-fall

B 17-fall

C 16-fall

23.10.2018



7 sheave hook block

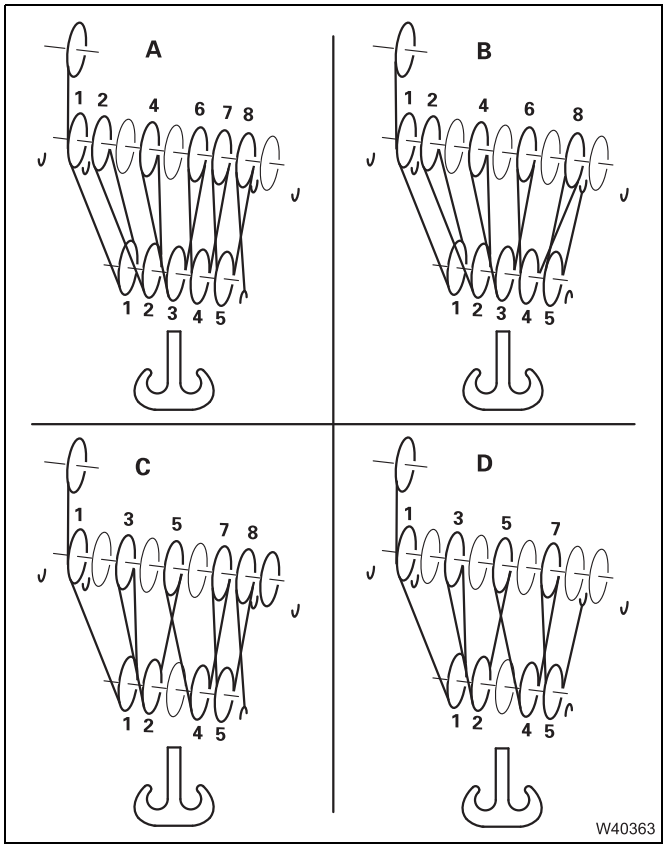
Reeving

A 15-fall

B 14-fall

C 13-fall

D 12-fall



5 sheave hook block

Reeving

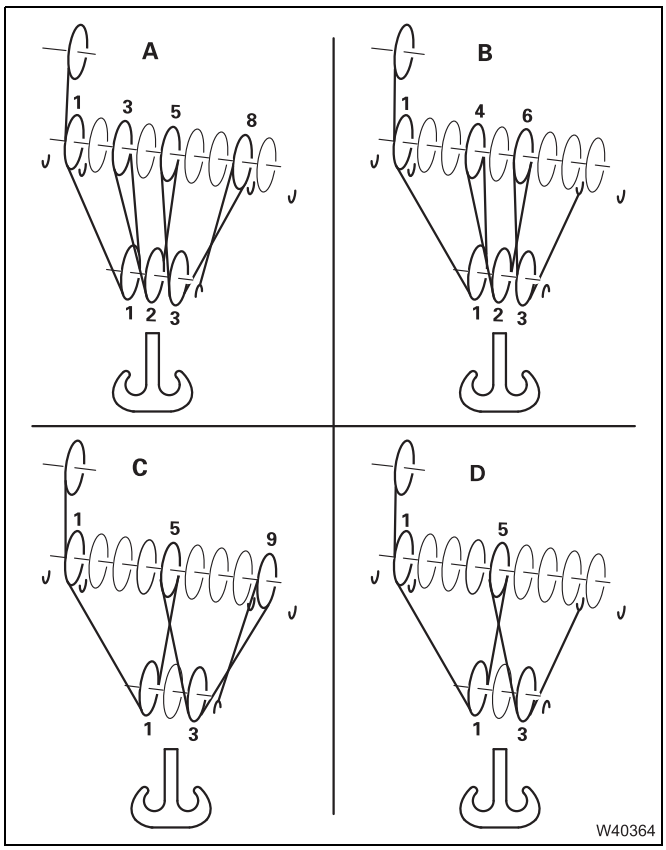
A 11-fall

B 10-fall

C 9-fall

D 8-fall

23.10.2018



3 sheave hook block

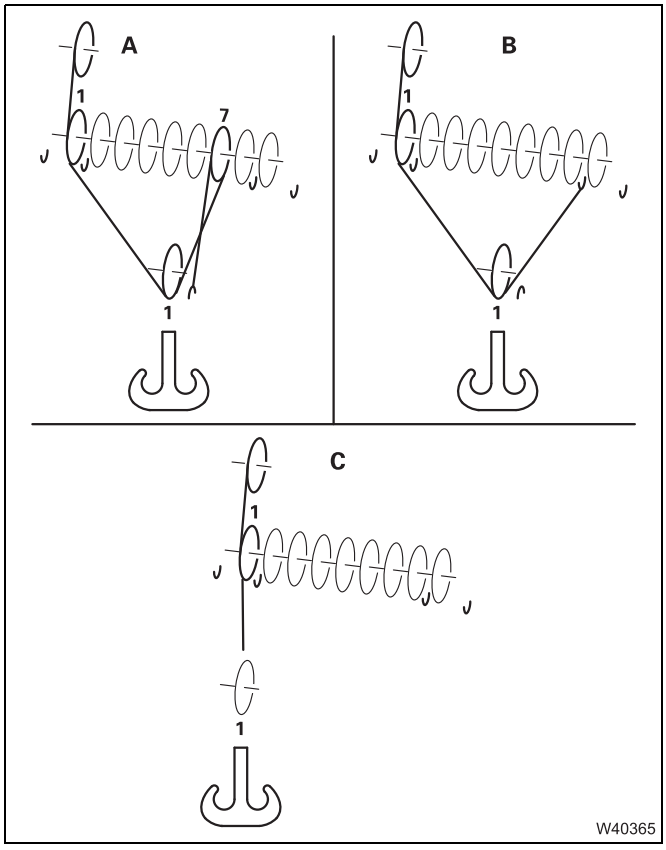
Reeving

A 7-fall

B 6-fall

C 5-fall

D 4-fall



1 sheave hook block

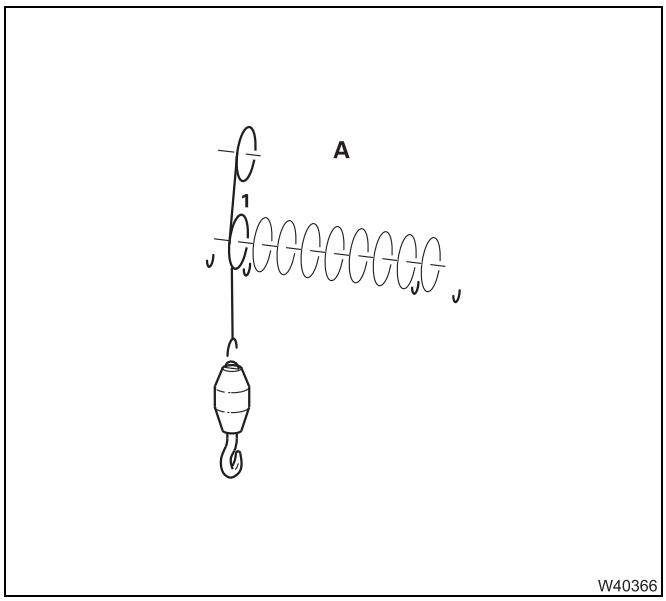
Reeving

A 3-fall

B 2-fall

C 1-fall

23.10.2018

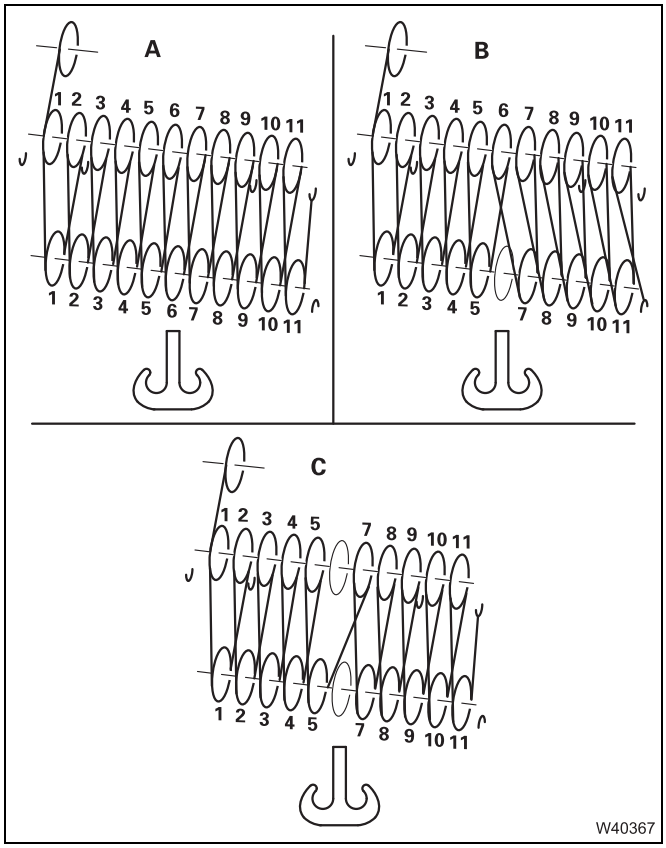


Hook tackle

Reeving

A 1-fall

With 11 head sheaves The version with 11 head sheaves is additional equipment.



11 sheave hook block

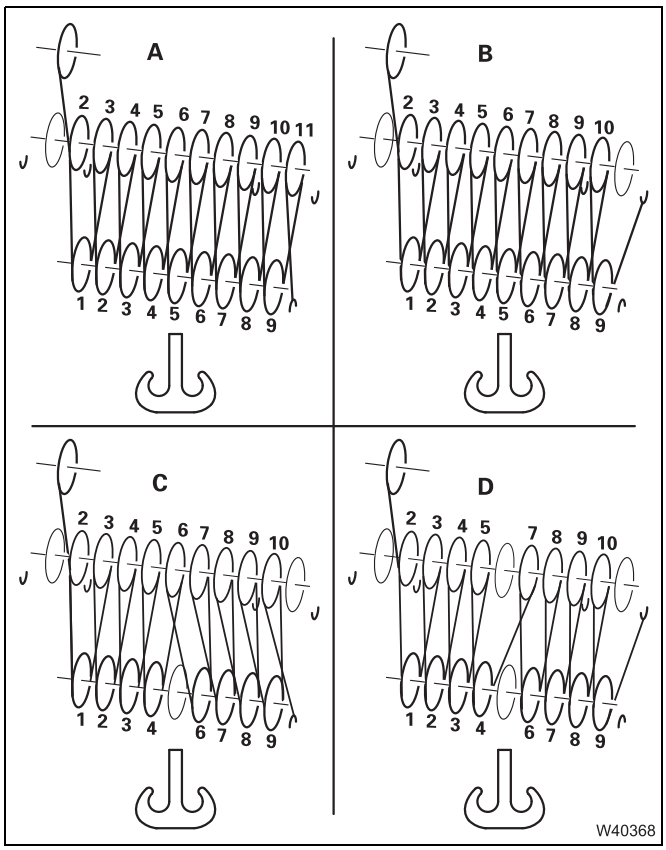
Reeving

A 22-fall

B 21-fall

C 20-fall

23.10.2018



9 sheave hook block

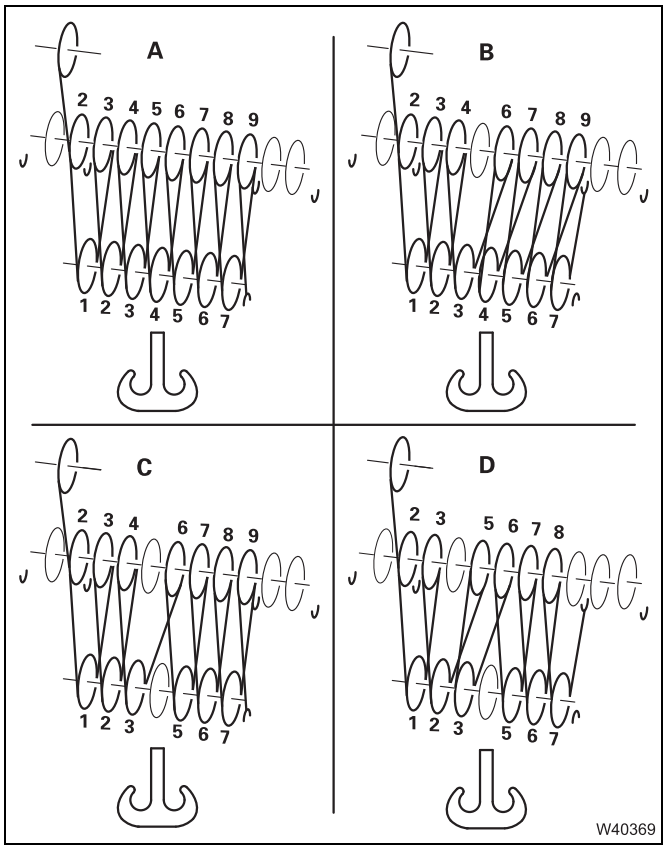
Reeving

A 19-fall

B 18-fall

C 17-fall

D 16-fall



7 sheave hook block

Reeving

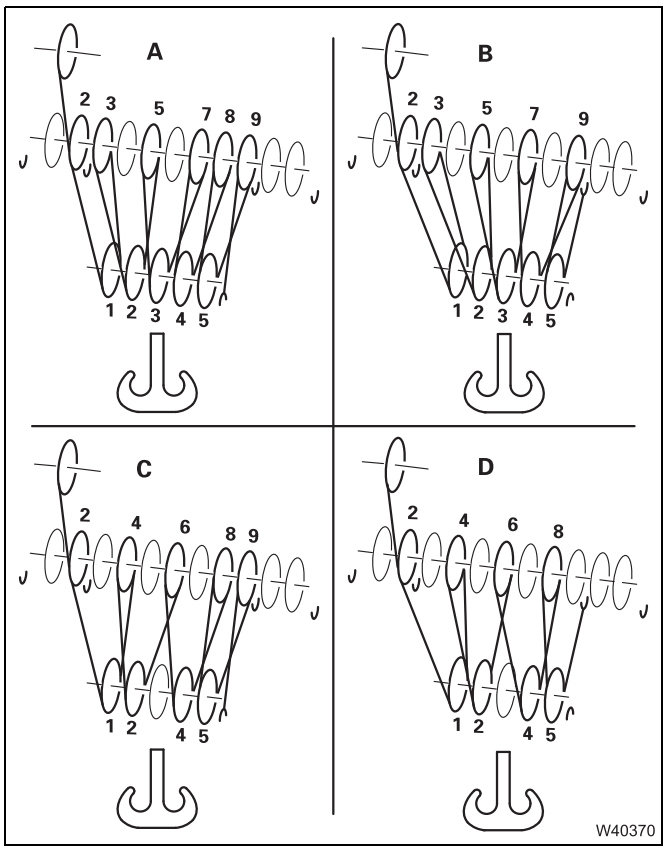
A 15-fall

B 14-fall

C 13-fall

D 12-fall

23.10.2018



5 sheave hook block

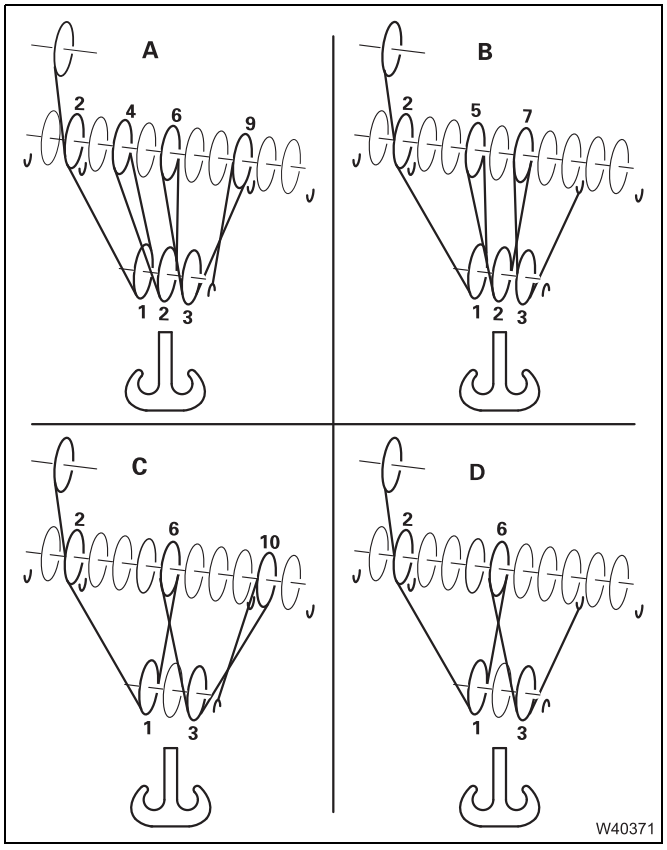
Reeving

A 11-fall

B 10-fall

C 9-fall

D 8-fall



3 sheave hook block

Reeving

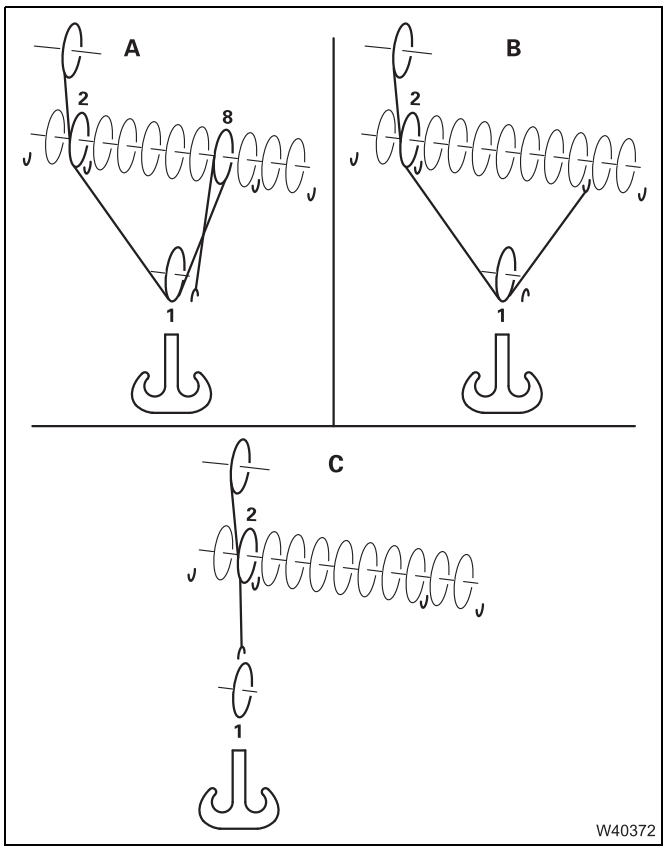
A 7-fall

B 6-fall

C 5-fall

D 4-fall

23.10.2018



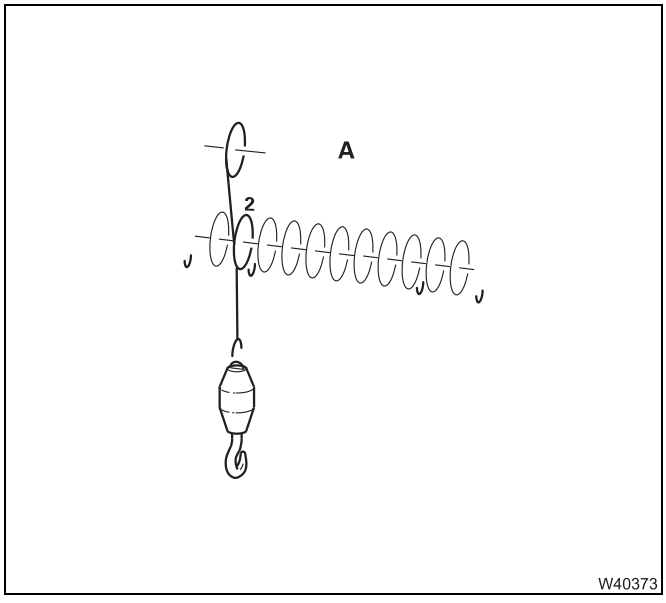
1 sheave hook block

Reeving

A 3-fall

B 2-fall

C 1-fall



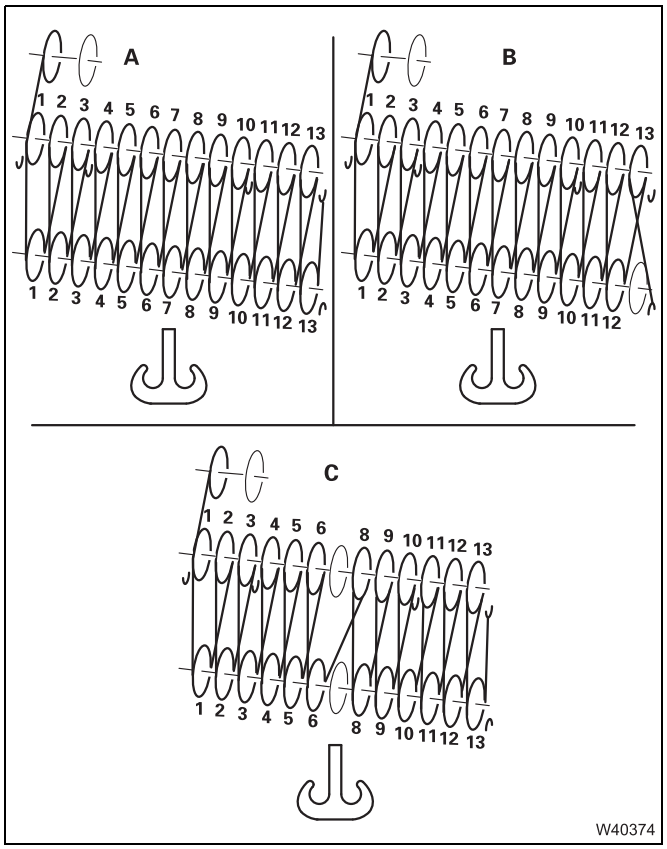
Hook tackle

Reeving

A 1-fall

With 13 head sheaves

The version with 13 head sheaves is additional equipment.



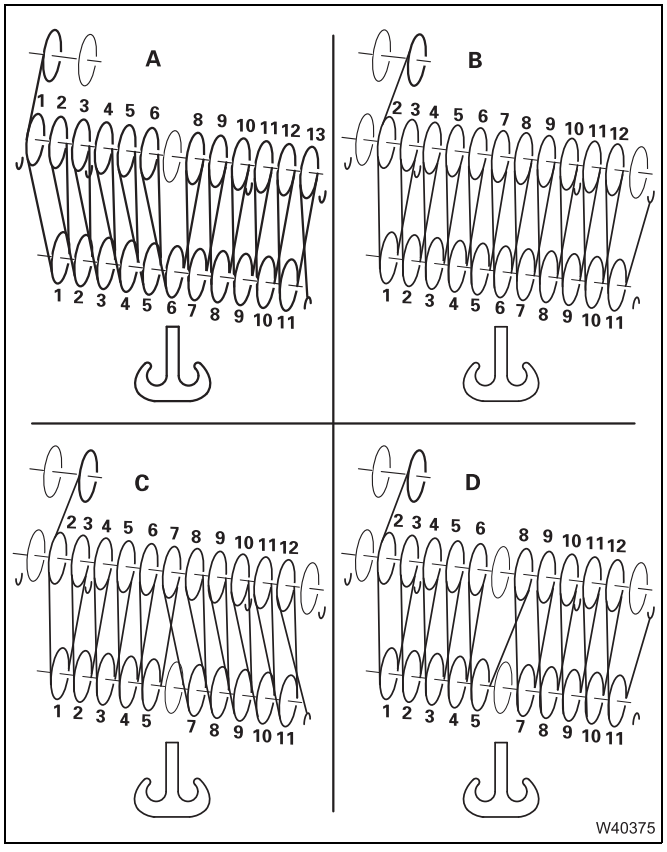
13 sheave hook block

Reeving

A 26-fall

B 25-fall

C 24-fall



11 sheave hook block

Reeving

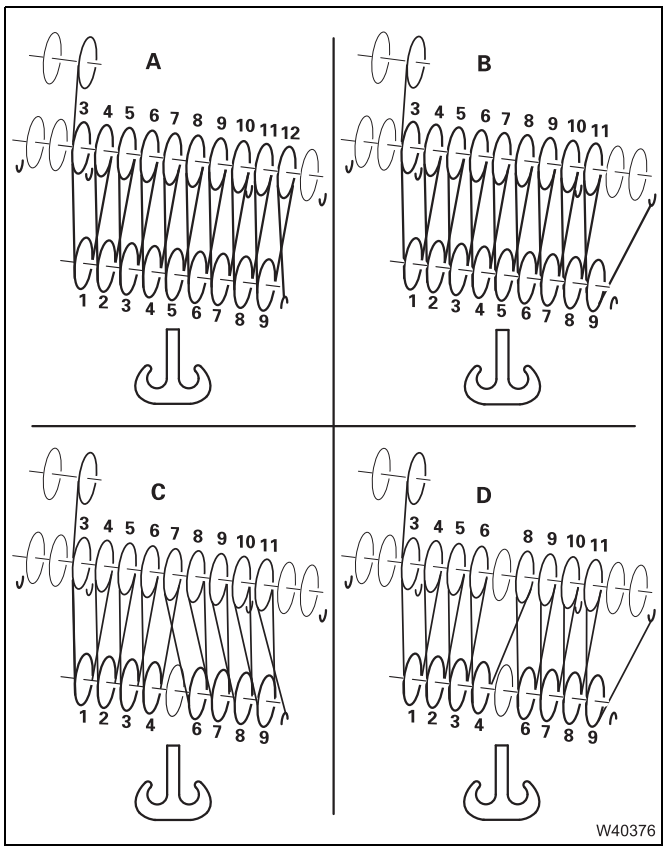
A 23-fall

B 22-fall

C 21-fall

D 20-fall

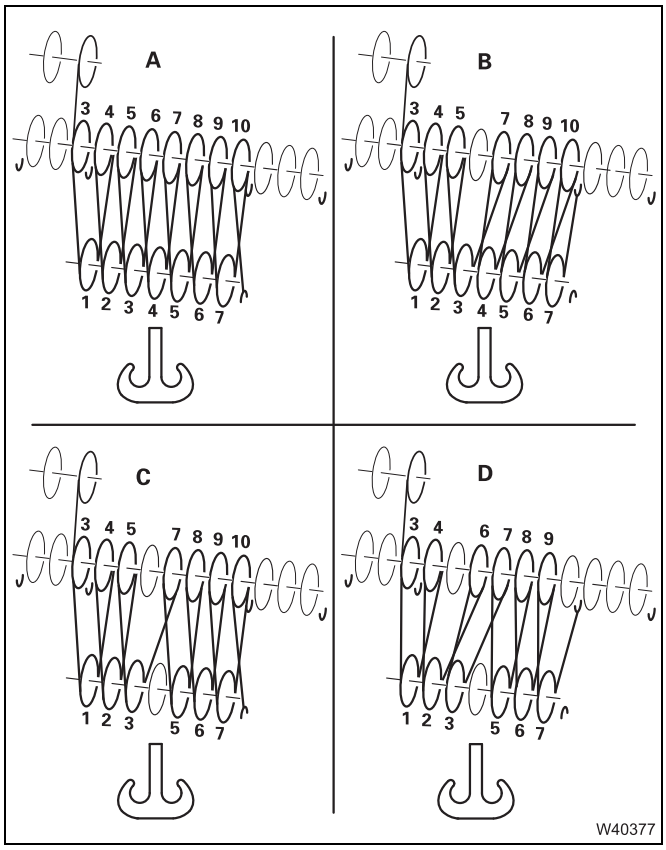
23.10.2018



9 sheave hook block

Reeving

A 19-fall
B 18-fall
C 17-fall
D 16-fall



7 sheave hook block

Reeving

A 15-fall
B 14-fall
C 13-fall
D 12-fall

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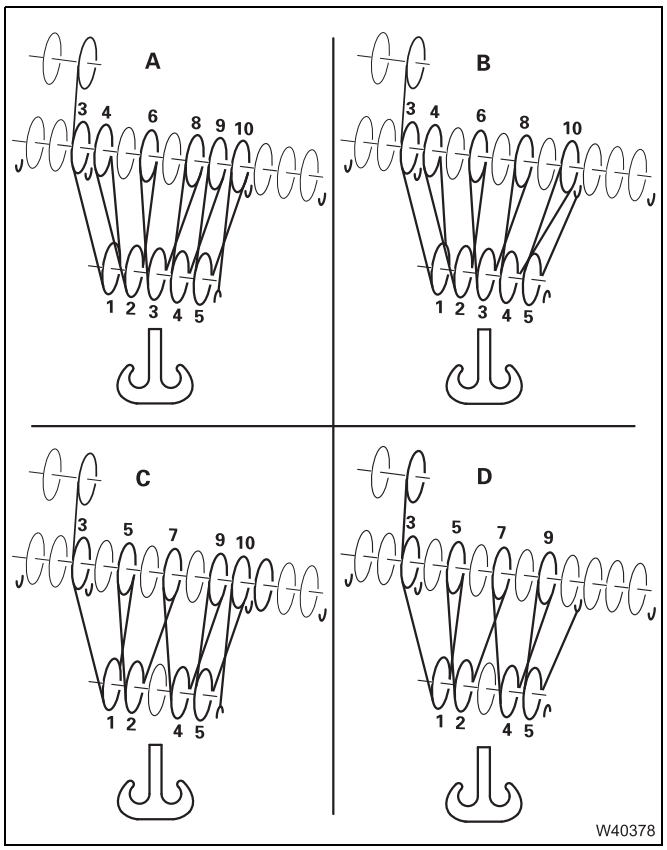


5 sheave hook block

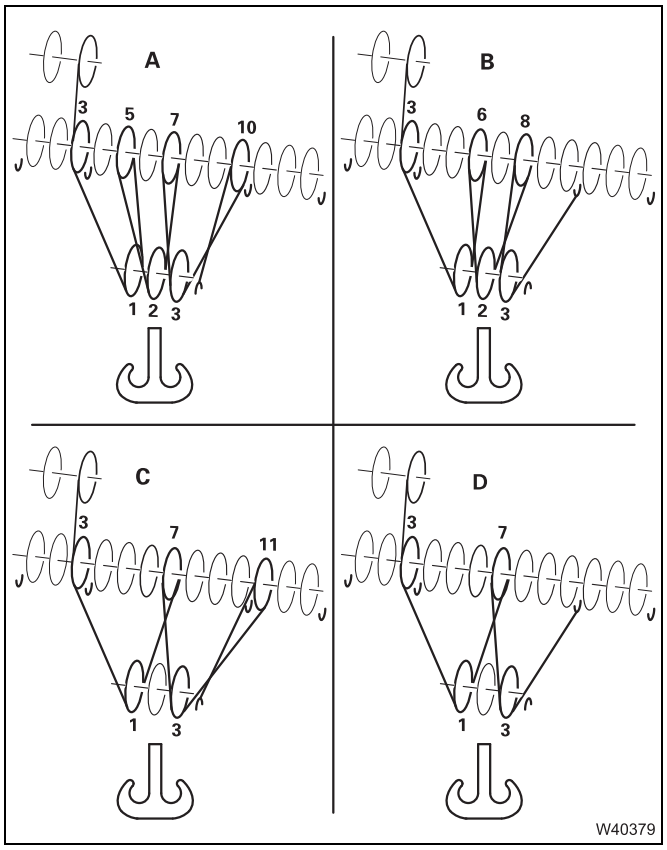
Reeving

A 11-fall

B 10-fall

C 9-fall

D 8-fall



3 sheave hook block

Reeving

A 7-fall

B 6-fall

C 5-fall

D 4-fall

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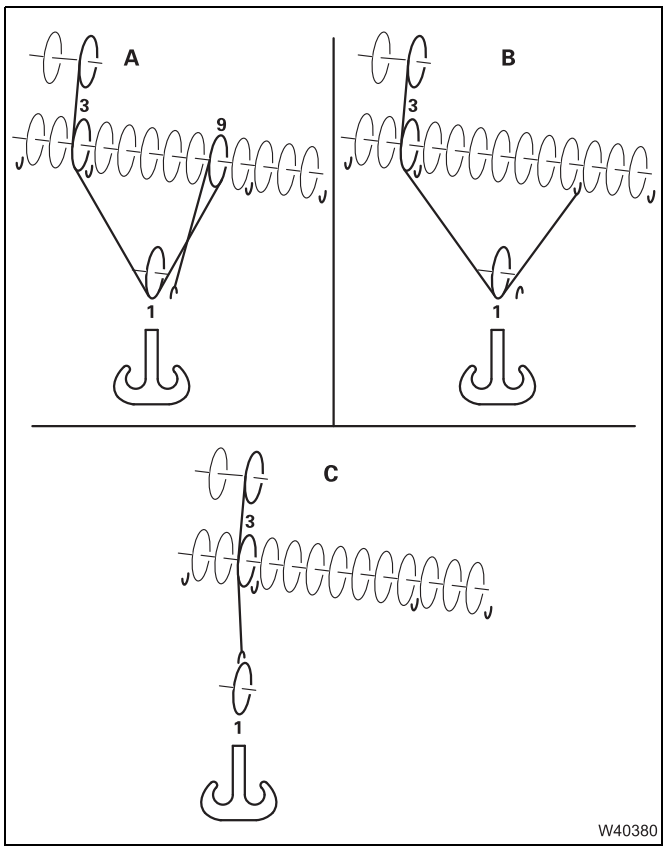


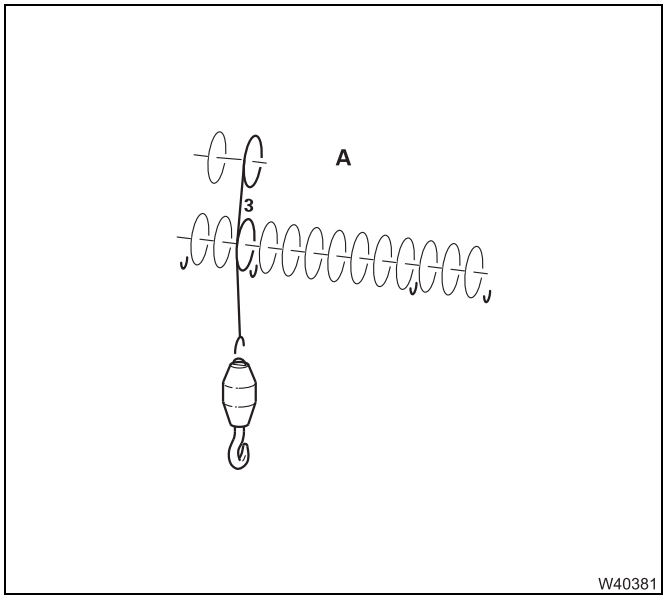
1 sheave hook block

Reeving

A 3-fall

B 2-fall

C 1-fall



Hook tackle

Reeving

A 1-fall

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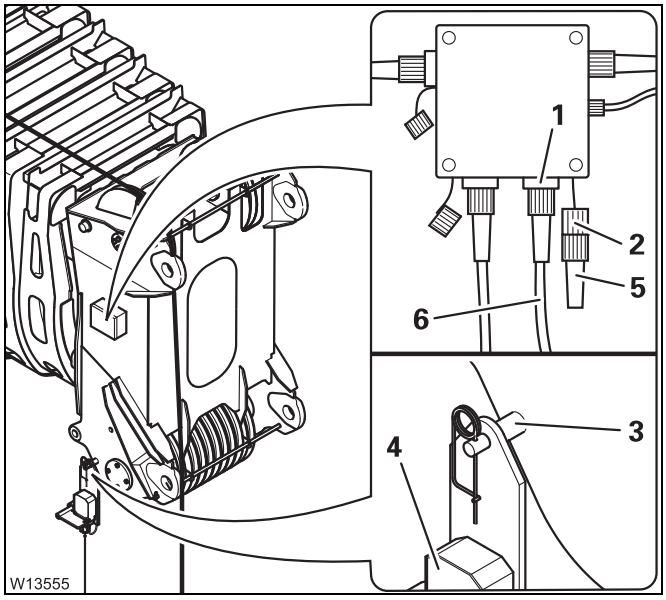
12.9.5 Installing/removing the lifting limit switch

If the truck crane is supplied with an auxiliary hoist, two lifting limit switches are included in the scope of delivery.
For every reeved hoist rope, you have to install a lifting limit switch, attach a lifting limit switch weight and place it around the hoist rope.

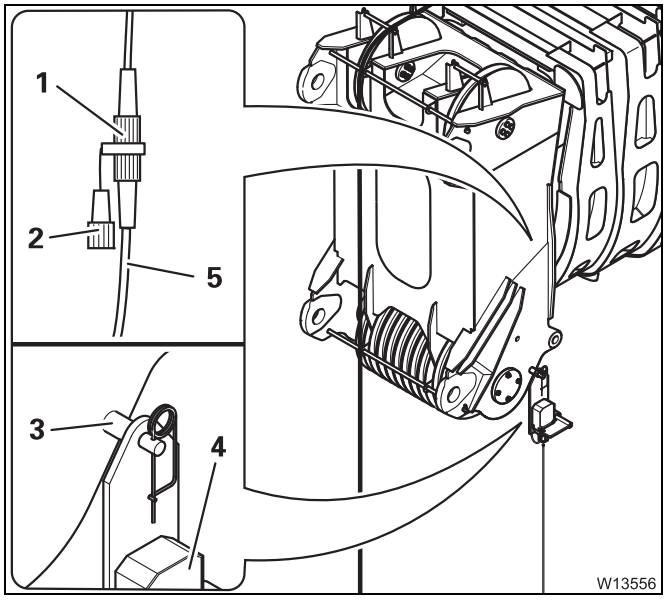
Installing the lifting limit switch

You can install lifting limit switch either on the right side or the left side of the main boom head. Install the switch on the side that is closer to the last rope line leading upwards. There can also be one lifting limit switch installed on each side.



On the right side

- Plug the lifting limit switch (**4**) onto the bracket (**3**) and secure it with the retaining pin.
- Remove the bridging plug (**2**) from the socket (**1**) and plug it into the dummy socket (**5**).
- Lay the cable (**6**) so that it will not be damaged during crane operation, and insert the lifting limit switch into the socket (**1**).



On the left side

- Plug the lifting limit switch (**4**) onto the bracket (**3**) and secure it with the retaining pin.
- Remove the bridging plug (**2**) from the socket (**1**).
- Lay the cable (**5**) so that it will not be damaged during crane operation, and insert the lifting limit switch into the socket (**1**).

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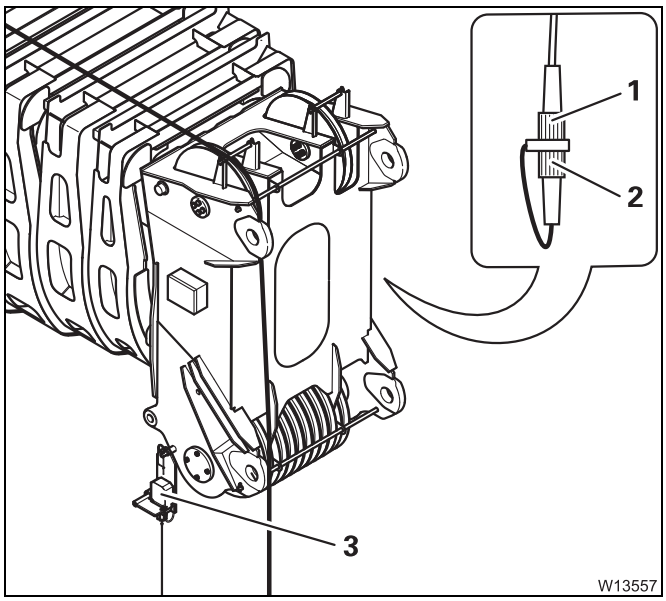


If one lifting limit switch has been installed

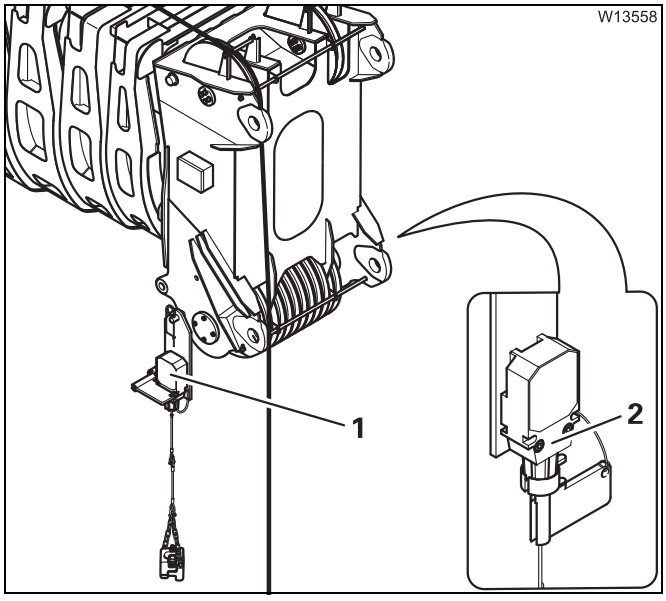
- Check whether the bridging plug is in the socket that is not being used.

If, for example, the lifting limit switch (**3**) is installed on the right, the bridging plug (**2**) must be inserted on the left in the socket (**1**).

Otherwise the movements *Raise hosting gear*, *Telescope out* and *Lower the boom* will be locked.

- Check that the lock on the lifting limit switch is released; ➠ *Unblocking*, p. 12 - 117.

Risk of damage if the lifting limit switch is locked!
The lifting limit switch must not be locked. Remove the lock, if necessary. If the lifting limit switch is locked, the hook block could hit the bottom of the main boom head during the lifting procedure, resulting in damage to the hook block, main boom head and hoist rope.



If two lifting limit switches have been installed

- Lock the lifting limit switch to which no lifting limit switch weight has been attached.

If the lifting limit switch weight is attached e.g. on the right lifting limit switch (**1**), then you have to lock the left lifting limit switch (**2**); ➠ *Locking*, p. 12 - 116.

Otherwise the movements *Raise hosting gear*, *Telescope out* and *Lower the boom* will be locked.

If two hoist ropes are reeved, you must also use two lifting limit switch weights. In this case, both lifting limit switches must be unlocked; ➠ *Unblocking*, p. 12 - 117.

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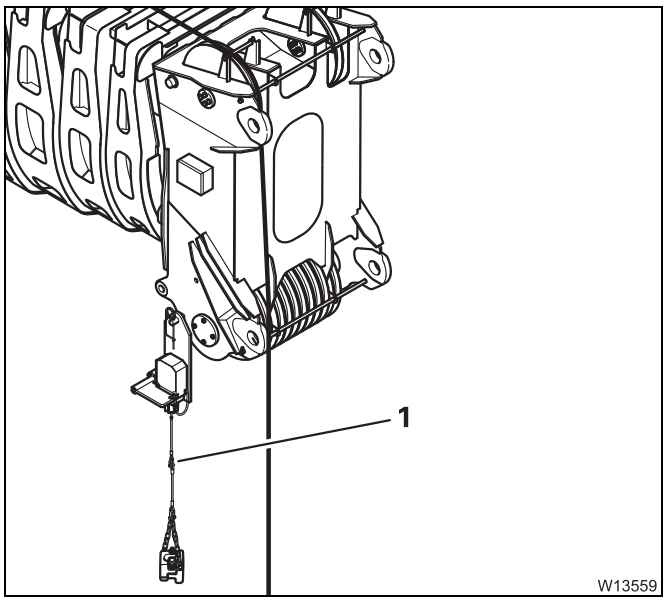
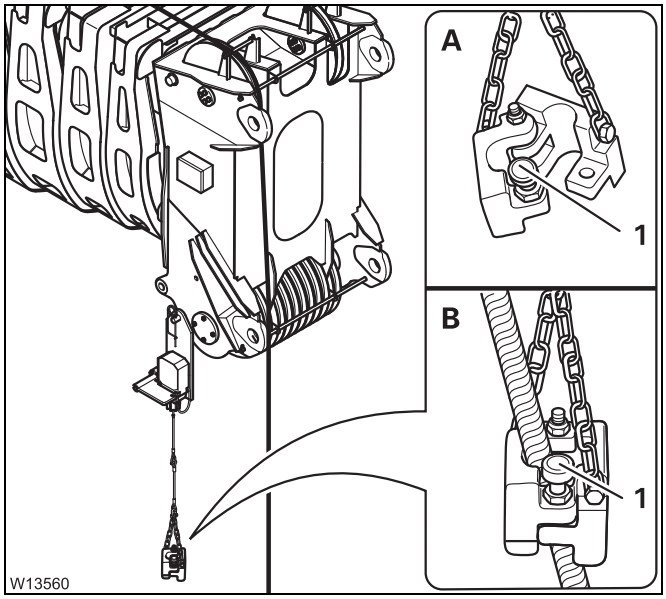


Attaching the lifting limit switch weight

- Attach the lifting limit switch weight to the shackle (**1**).

If two hoist ropes are reeved, you must attach a lifting limit switch weight to each of the two lifting limit switches.

This lifting limit switch must not be locked;
➠ *Unblocking*, p. 12 - 117.



Placing a lifting limit switch weight around the hoist rope

- (**A**) – Pull the safety pin (**1**) out and fold the two halves of the weight apart.
- (**B**) – Place the two halves of the weight around the last rope line leading upwards.
- Pull the safety pin (**1**) out and fold the two halves of the weight back together.
- Make sure the safety pin locks into place and the two halves of the weight are securely attached to each other.

If two hoist ropes are reeved, you must also place a lifting limit switch weight around the second hoist rope.

If you place the lifting limit switch weight around the last rope line leading upwards, less rope will run through the lifting limit switch weight, especially if there is a high number of reevings per lifting operation. This rope line will even be at a standstill if the number of rope lines is even.
This allows you to reduce the wear of the hoist rope and lifting limit switch weight and prevent unintentional deactivation procedures that may be caused by the running hoist rope lifting the lifting limit switch weight.

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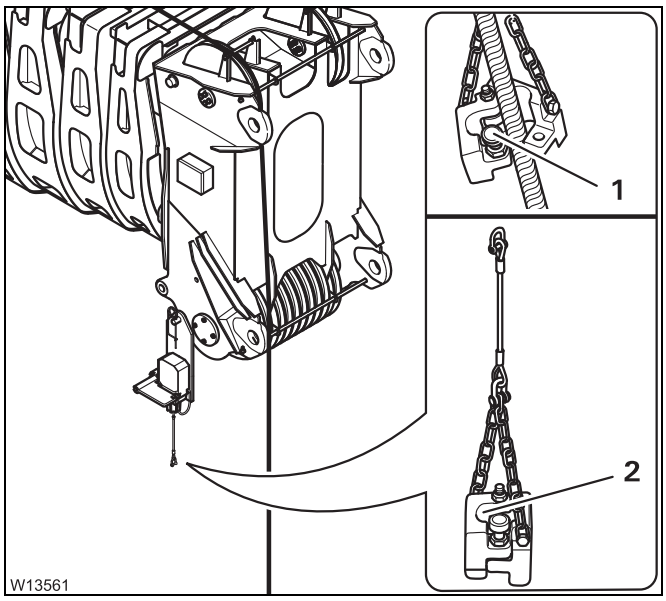
Removing the lifting limit switch

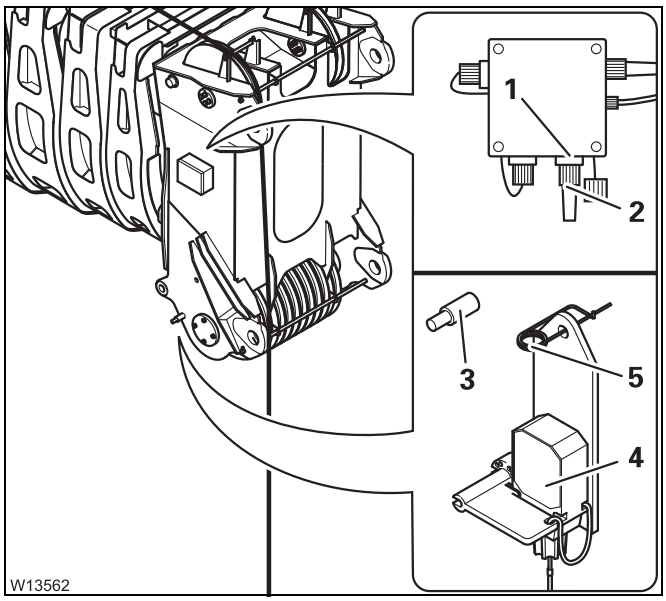
This section describes complete removal.

If the hook block is to be attached to the bumper at a later point, you will need to detach the lifting limit switch weight from the hoist rope, so that you can unreeve or reeve when unrigging the hoist rope. You can place the lifting limit switch weight around the hoist rope again before driving.



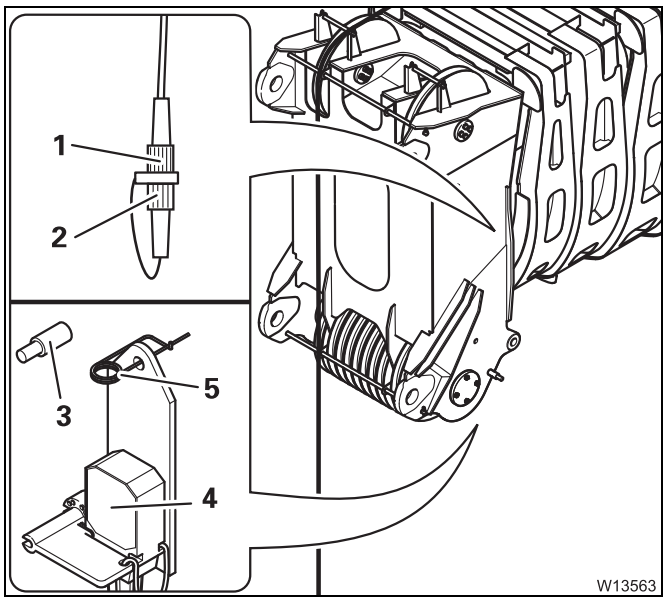
Removing the lifting limit switch weight

- Pull the safety pin (**1**) out and fold the two halves of the weight apart.
- Remove the halves of the weight from the rope line.
- Pull the safety pin (**1**) out, fold the two halves of the weight back together and let the safety pin engage.
- Remove the lifting limit switch weight (**2**).
- Remove the lifting limit switch weight on the other side too, if necessary.



Removing the right lifting limit switch

- Pull the plug from the socket (**1**).
- Remove the plug (**2**) from the dummy socket (**5**) and plug it into the socket (**1**).
- Remove the lifting limit switch (**4**) from the bracket (**3**)
- Fasten the retaining pin on the lifting limit switch.



Removing the left lifting limit switch

- Pull the plug from the socket (**1**).
- Insert the bridging plug (**2**) into the socket (**1**).
- Remove the lifting limit switch (**4**) from the bracket (**3**)
- Attach the retaining pin (**5**) to the lifting limit switch.

12.9.6 Locking/unlocking the lifting limit switch

Locking

If a hoist rope has been reeved and two lifting limit switches are installed, you must lock the lifting limit switch not used in order to enable all crane operations.

Risk of damage if the lifting limit switch is locked!
The lifting limit switch to which the lifting limit switch weight is attached may under no circumstances be locked when operating the crane.
If the lifting limit switch is locked, release the lock.
This prevents the hook block hitting the main boom head, causing damage to the hook block, main boom head and hoist rope.

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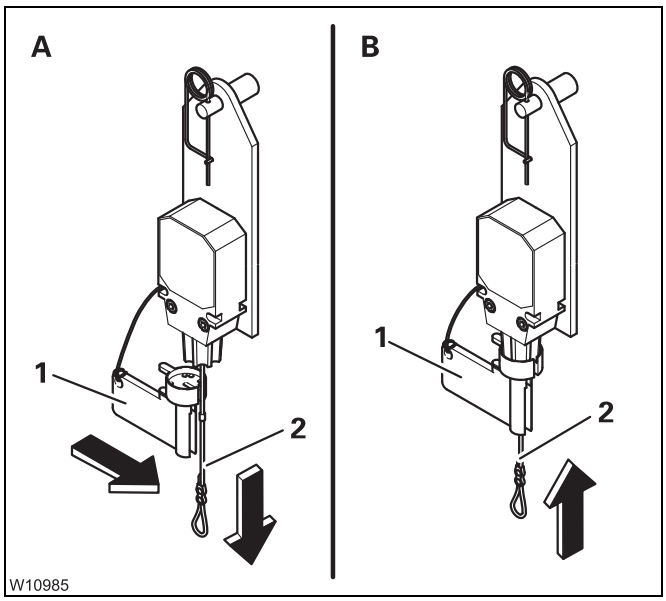
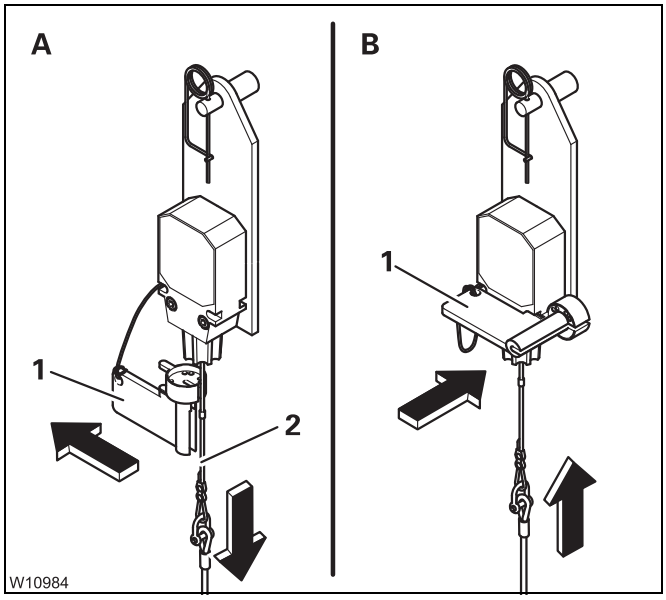


- Remove the lifting limit switch weight.
- (**A**) – Remove the cap (**1**).
- Pull down the rope (**2**).
- (**B**) – Secure the rope (**2**) in this position using the cap (**1**) – the lifting limit switch is locked and can no longer be triggered.

Unblocking

You must always release the locking before you place a lifting limit switch weight around the hoist rope.



- (**A**) – Pull the rope (**2**) down and take off the cap (**1**) – the locking is released.
- (**B**) – Fit the cap (**1**) onto the lifting limit switch.

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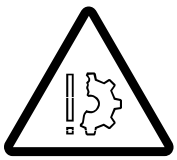
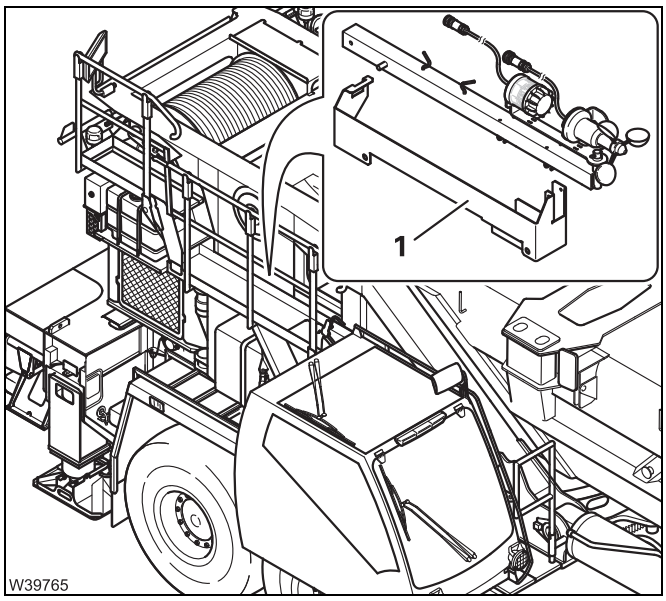
12.9.7 Anemometer and air traffic control light



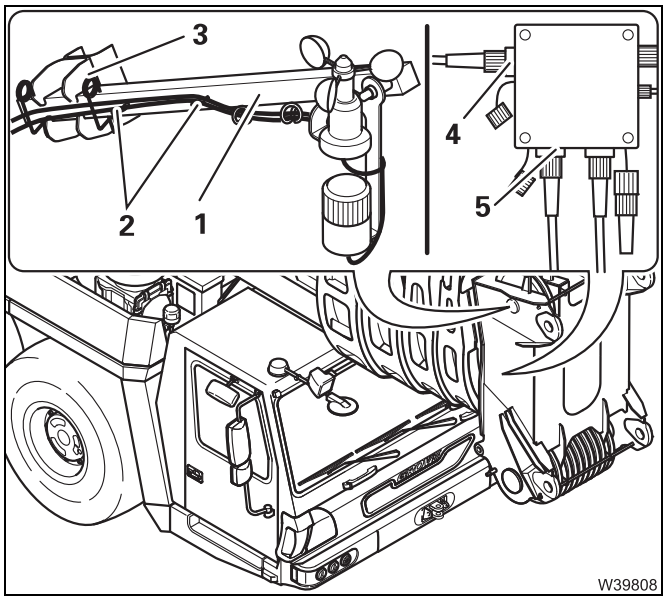
Risk of damage during on-road driving
Always remove the anemometer and air traffic control light before on-road driving.
This prevents the specified overall height from being exceeded at on-road level, and the anemometer from being damaged due to unfavourable air currents.

Installing

The anemometer and the air traffic control light – if provided – are located on the same rod.



- If necessary, remove the rod from the holder (**1**).



- Insert the rod (**1**) into the clamp (**3**) and secure it with the retaining pins.
- Remove the cables from the holders (**2**) and connect:
  - The anemometer to the socket (**4**)
  - The air traffic control light to the socket (**5**)
- Lay the cables in such a way that they will not be damaged during crane operation
- Check that the anemometer is able to swing so that it hangs vertically even when the main boom is raised.

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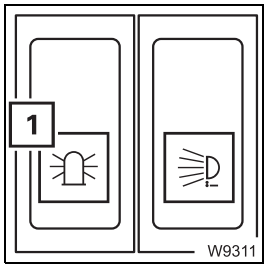
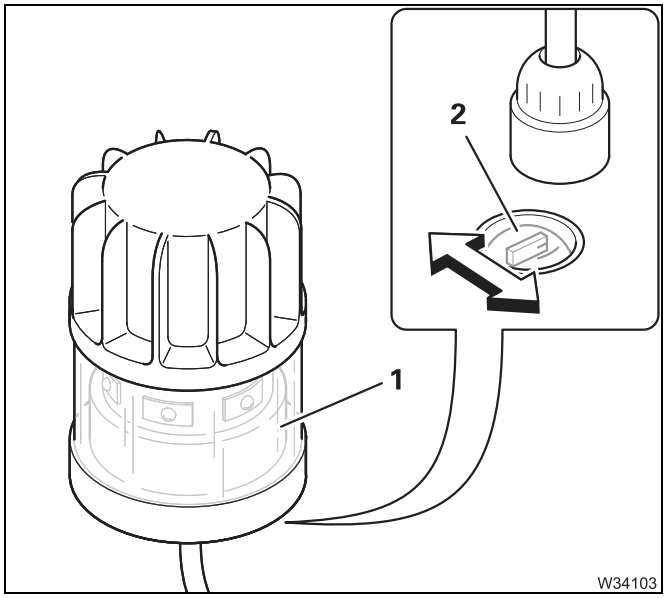


Switching the air traffic control light on and off:

Switching on: Press switch (**1**) in at the bottom

Switching off: Press switch (**1**) in at the top

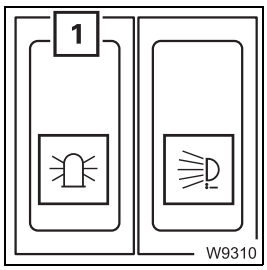


The air traffic control light (**1**) provided as additional equipment can be operated in the lighting modes *flashing light* and *constant light*.

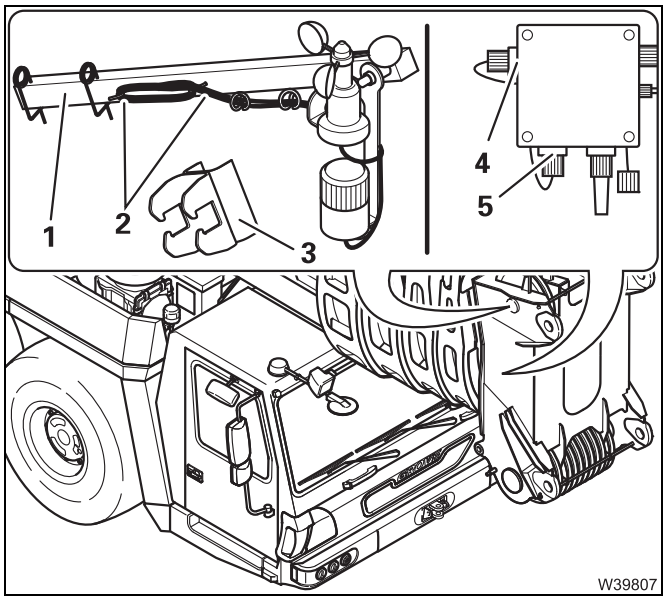
- Select the desired lighting mode using the switch (**2**).

Removing

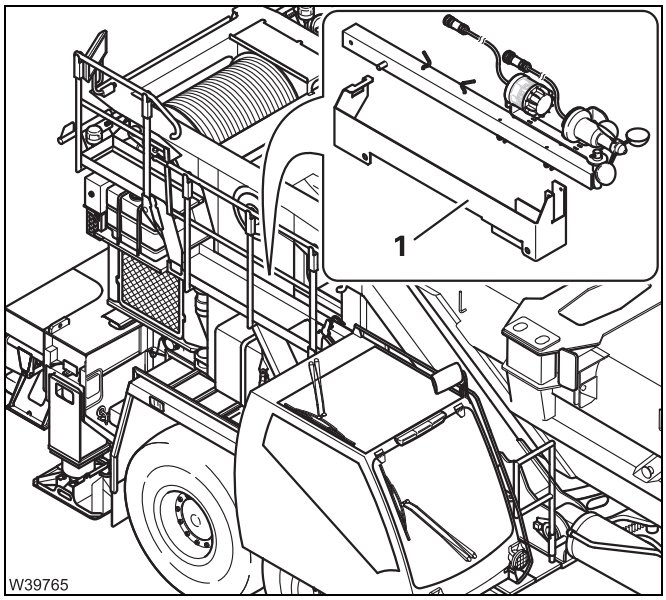
You must remove the rod with the anemometer/air traffic control light before driving on the road. ➠ p. 12 - 118



- Switch off the air traffic control light – press the switch (**1**) in at the top.



- Remove the plug and close the sockets (**4**) and (**5**) with the protective caps.
- Wind the cables on to the clamps (**2**).
- Remove the rod (**1**) from the clamp (**3**).
- For transportation, fasten the retaining pins to the rod (**1**).



- If necessary, store the rod in the storage compartment (**1**).

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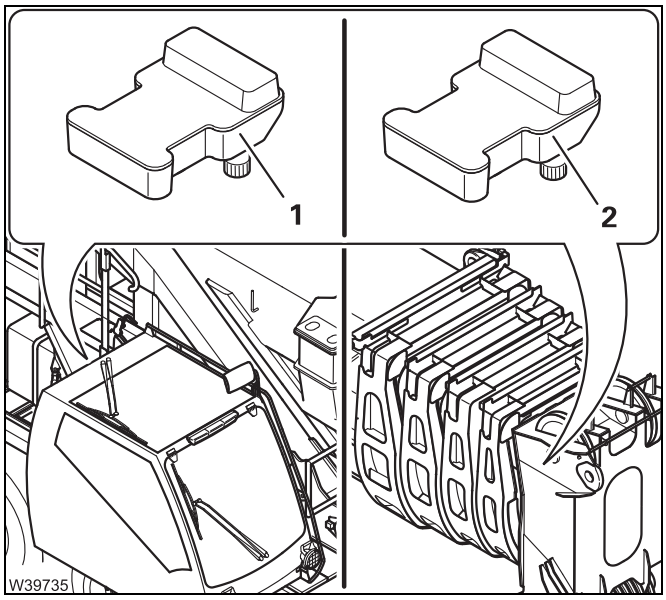
12.9.8 Cameras for crane operation

Camera on main boom

For crane operation you have to install the camera and switch it on.
For on-road driving, you have to switch the camera off again and remove it.

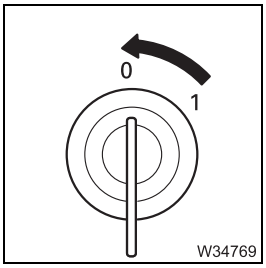


The transmitter (**1**) and the associated receiver (**2**) are matched to each other and are identified by the same number on the model plates.

Neither the transmitter nor the receiver should be removed or installed; they remain together on the truck crane at all times.

In the event of a defect, both transmitter and receiver must always be replaced, even if only one part is defective. When spare parts are ordered both transmitter and receiver are always delivered together.

Risk of accidents if an incorrect transmitter or receiver is used
In the event of a defect, do not under any circumstances use a transmitter or receiver from another truck crane.
This is to avoid the wrong image appearing on the monitor of your crane or the monitor of a neighbouring crane.



- Switch off the ignition in the crane cab

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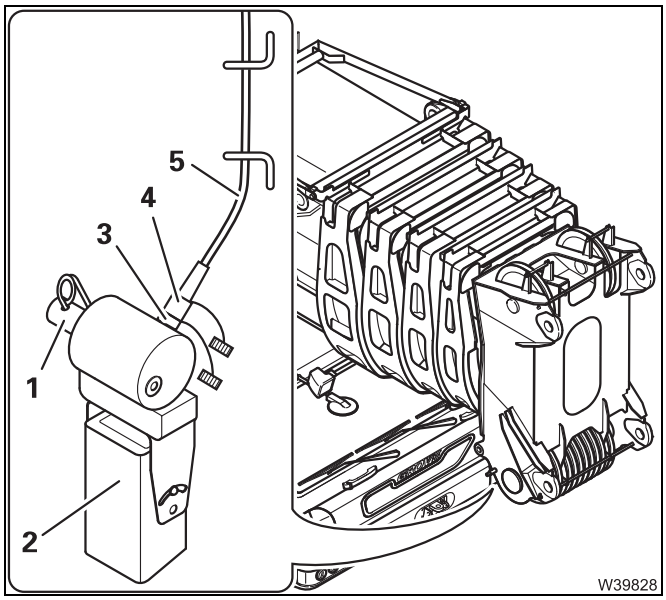
You will need the respective connecting cable to connect the camera to a lattice extension. This means certain pre-conditions are applicable to installation and removal.

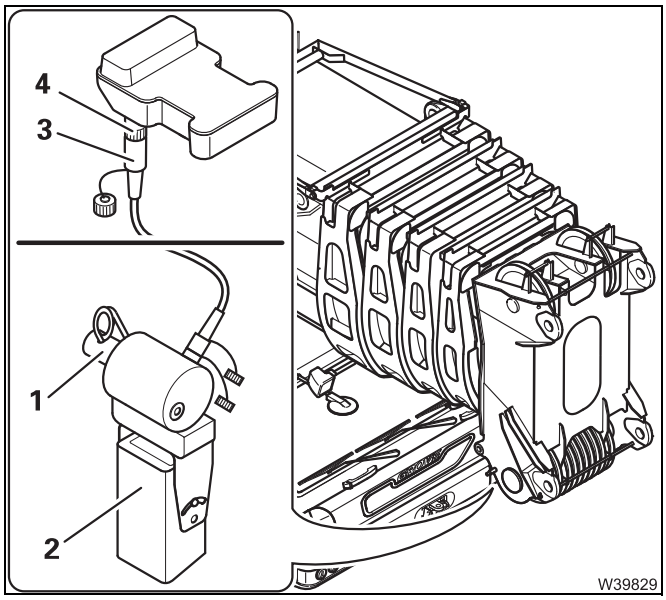
Risk of accidents due to falling camera!
Always use a retaining pin to hold the camera in the clamp.
This prevents the camera falling down and injuring someone.



Installing

– Only the camera

- Insert the camera (**2**) into the clamp (**1**) and secure it with the retaining pin.
- Insert the plug (**4**) in the socket (**3**).
- Lay the cable (**5**) so that it will not be damaged.



– The camera and the connecting cable

- Insert the camera (**2**) into the clamp (**1**) and secure it with the retaining pin.
- Insert the plug (**3**) in the socket (**4**).
- Lay the cable (**5**) so that it will not be damaged.

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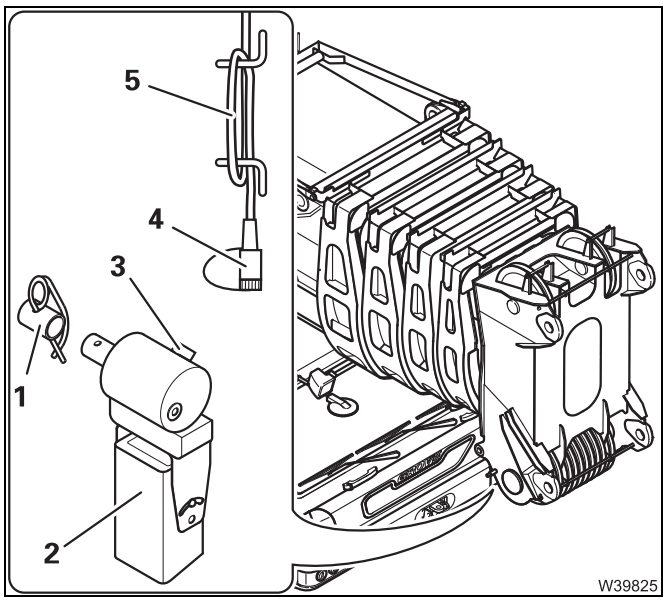
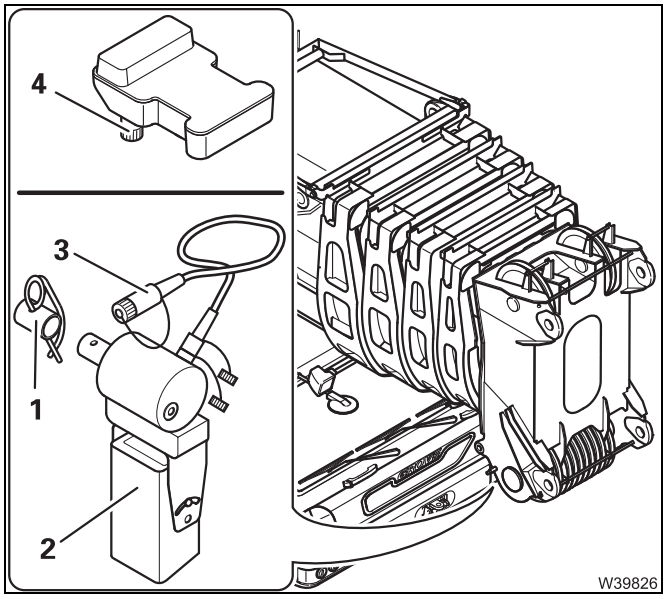


Removing

– Only the camera

- Withdraw the plug (**4**) from the socket (**3**) and close it with the cap.
- Remove the camera (**2**) from the clamp (**1**) and put the retaining pin in the holder (**1**).
- Wind the cable (**5**) on to the clamp.



– The camera and the connecting cable

- Withdraw the plug (**3**) from the socket (**4**) and close it with the cap.
- Remove the camera (**2**) from the clamp (**1**) and put the retaining pin in the holder (**1**).
- Wind the cable (**5**) on to the clamp.

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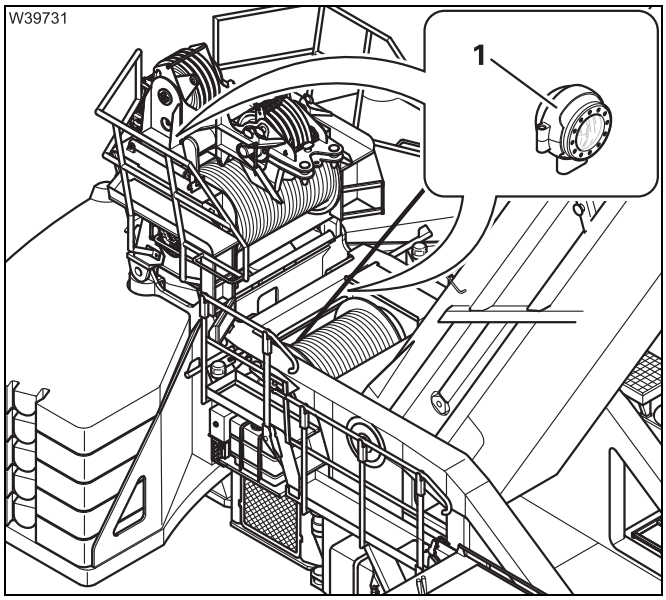
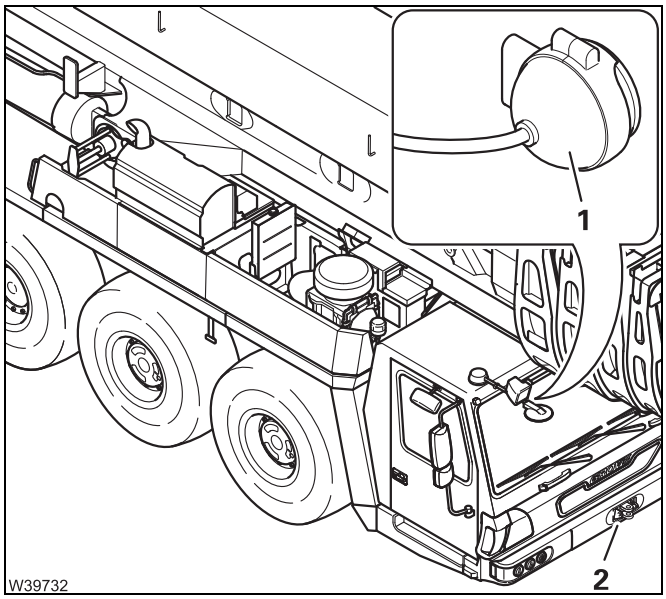
Camera on the hoists



Each camera (**1**) transmits an image of the main and auxiliary hoists to a separate monitor in the crane cab.

Camera on the driver's cab



A camera (**1**) allows viewing of the non-visible area in front of the driver's cab.

The camera image is shown on a separate monitor.

- Adjust the camera (**1**) to show the area (**2**) in front of the bumper on the monitor.

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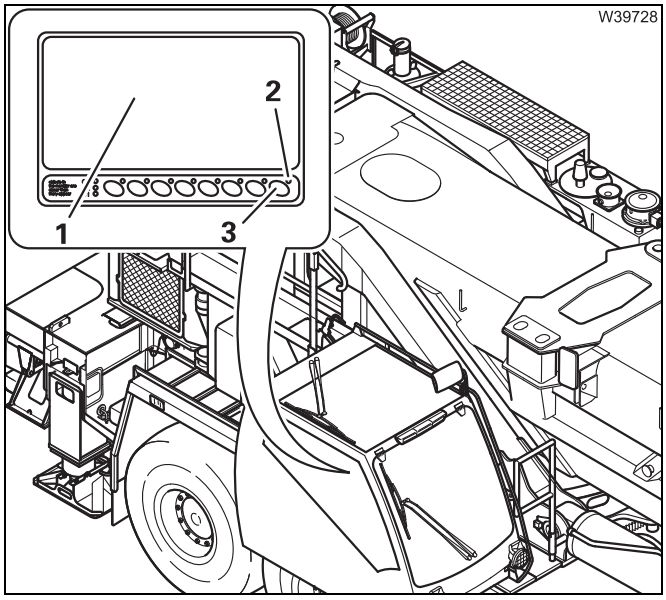
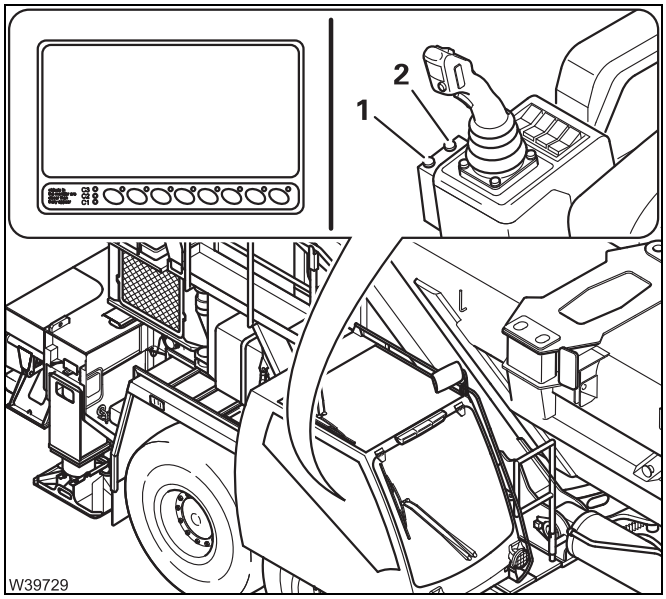
Operating the camera



Switching on

- Switch on the ignition.
- Press the button (**3**) once. The lamp (**2**) lights up.

The image appears on the display (**1**) after a few seconds.



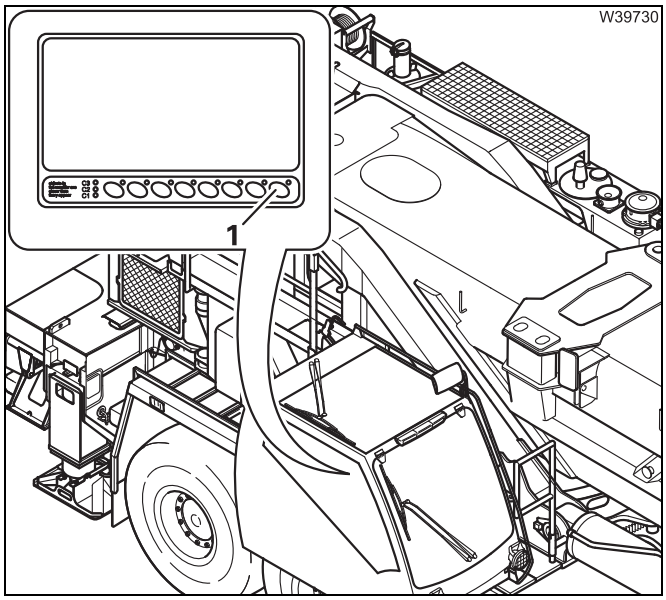
Switching the representation

with the + or – buttons.

If no image appears; ➠ p. 14 - 8.

Zoom function (with additional equipment)

1 – Zoom in
2 – Zoom out



Switching off

- Press the button (**1**) once.

The image will disappear.

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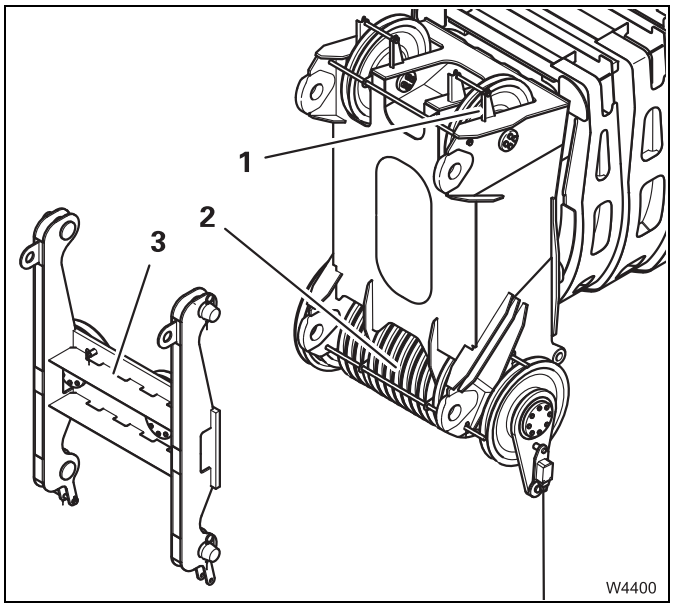
12.9.9 Rigging heavy duty equipment

With heavy duty equipment (Additional equipment) the hoist rope can be reeved up to 32 times at the most. To do so, you will need hook block with at least 16 sheaves and sufficient lifting capacity.

The heavy duty equipment is only intended for main boom operation.

Additional equipment required

If the truck crane has heavy duty equipment, it is supplied with the following parts.



Mounted parts

1 Left-hand head sheave

2 Head sheave axle with 16 sheaves

Supplied parts

3 Adapter with pins

Equipment required

You will also need an auxiliary crane and suitable sling gear with sufficient lifting capacity. Transport dimensions and weight ➠ *Dimensions and weights of removable parts – Heavy duty equipment*, p. 1 - 12.

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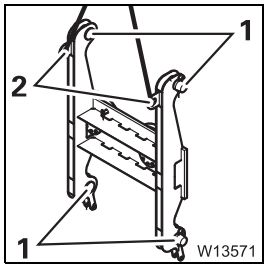
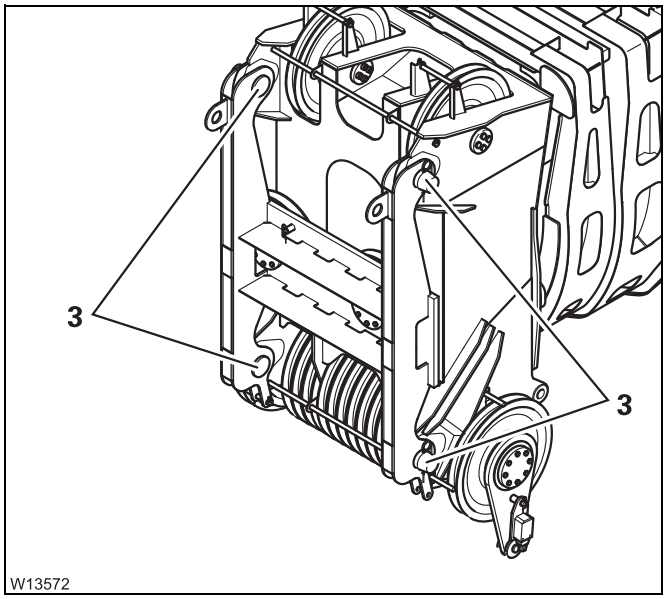
Installing

- Support the truck crane with the outrigger span specified in the *lifting capacity table* for the job to be performed.
- Unreeve the required hoist rope and set down to the left of the main boom.

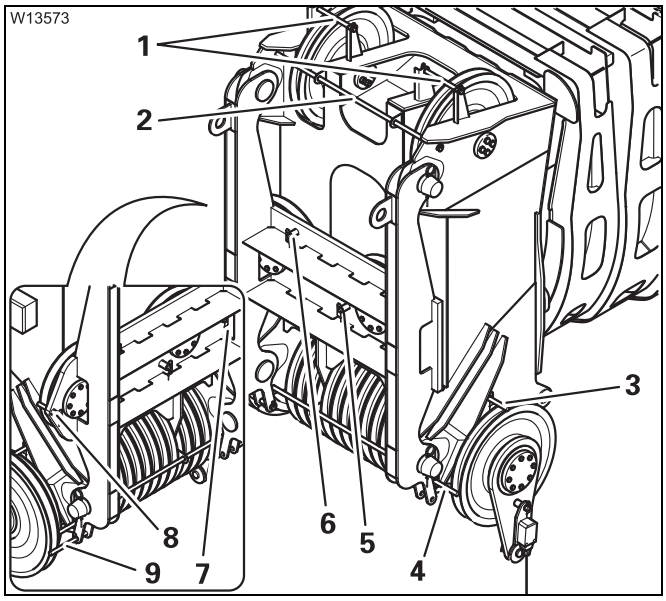


Attaching the adapter

- Remove the pins (**1**).
- Sling the adapter at the slinging point (**2**); ➠ *Dimensions and weights of removable parts – Heavy duty equipment*, p. 1 - 12.



- Lift the adapter in front of the main boom head and make the connecting points (**3**) flush.
- Always insert the pins into the connecting points (**3**) from the inside. This makes it easier to lay the hoisting rope.
- Secure the pins using the retaining pins.
- Remove the lifting gear.



Positioning the hoist rope

- Remove the retaining pins and pull out the rods (**1**) to (**9**).

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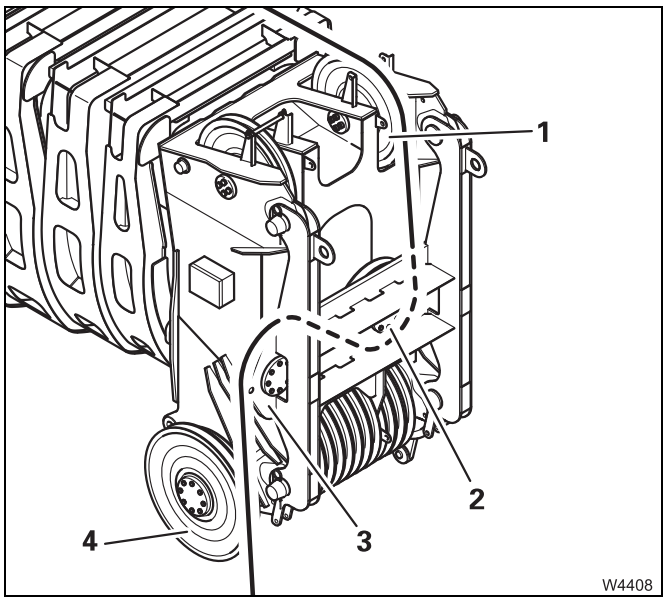
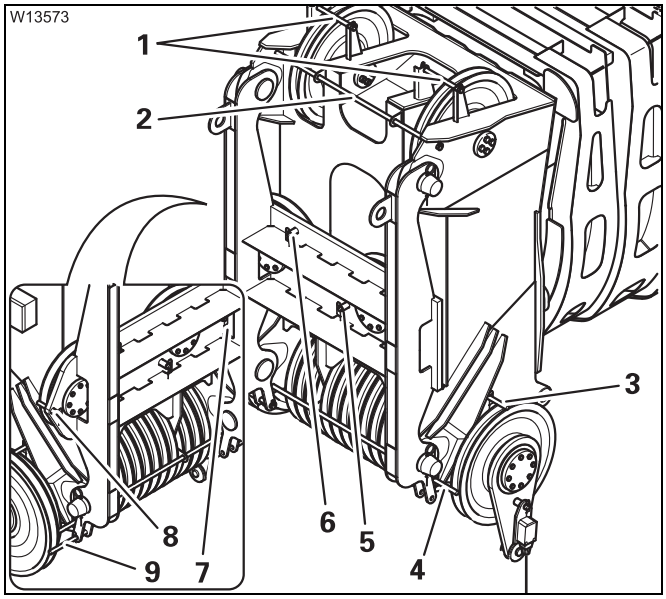


- Guide the hoist rope over the left head sheave (**1**) to the deflection sheave (**2**).
- Feed the hoist rope under the deflection sheave (**2**) and over the deflection sheave (**3**).
- Feed the hoist rope down, over the head sheave (**4**).
- Reeve the hoist rope; ➠ *Maximum reeving*, p. 12 - 129.



The rods (**3**) and (**4**) can only be inserted from the left side.

- Insert rope holding rods (**1**) to (**9**).
- Secure all safety bolts into place using the retaining pins.

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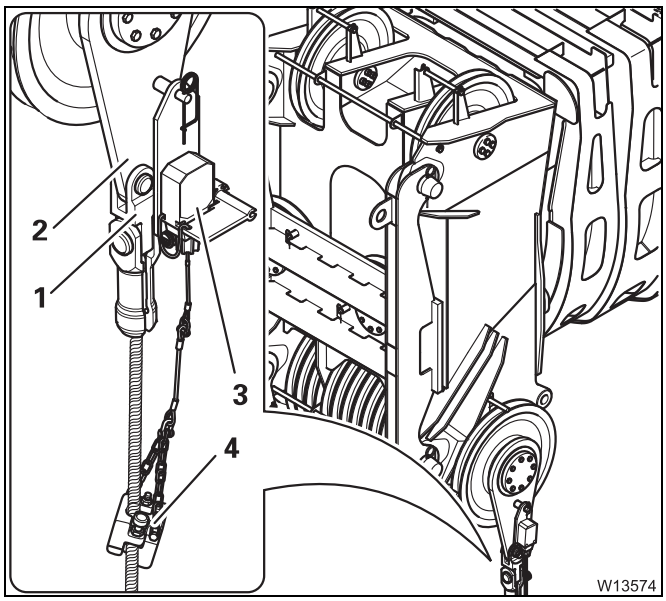


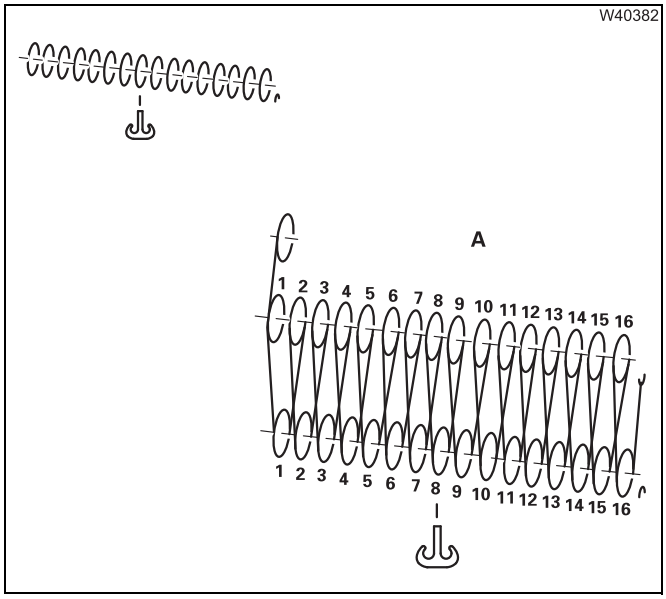
- Replace the rope end attachment and fasten the fork element (**1**) to the fixed point for rope (**2**) if there is an even number of runs.

Installing the lifting limit switch

- Install the lifting limit switch (**3**) and the lifting limit switch weight (**4**); p. 12 - 112.
- Remove the lock, if necessary; p. 12 - 117.

Maximum reeving

Please note that the maximum load bearing capacities already include the weight of the hook block and the lifting gear. You must subtract these weights in order to obtain the actual payload.



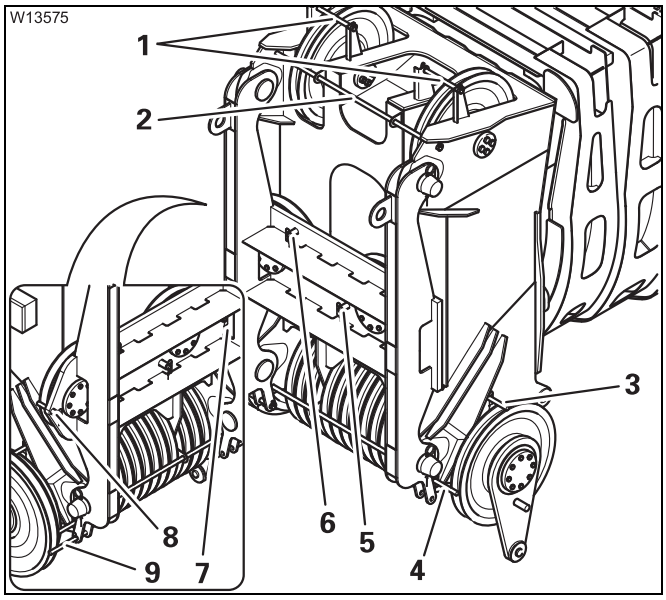
16 sheave hook block

Reeving

A 32-fall

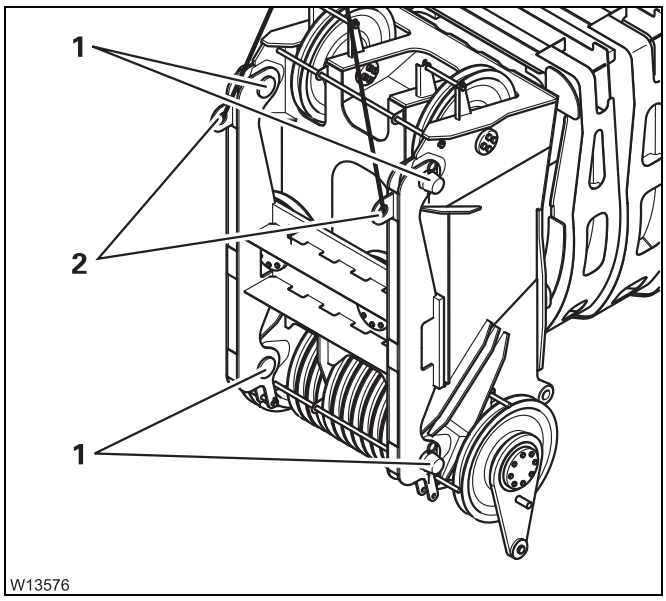
Removing

- Unreeve the hoist rope from the hook block.
- Fully retract the main boom and set it down on the boom rest.



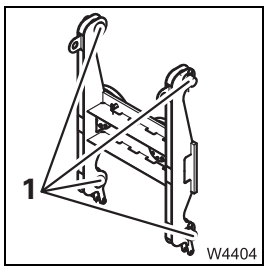
Removing the hoist rope

- Remove the lifting limit switch weight and the lifting limit switch; p. 12 - 115.
- Pull out the rods (**1**) to (**9**).
- Remove the hoist rope.
- Insert the rods (**1**) to (**9**).
- Secure all rods using the retaining pins.



Removing the adapter

- Sling the adapter to the slinging points (**2**).
- Raise the adapter until the load has been removed from the pins (**1**).
- Remove the pins (**1**).



- Lower the adapter and remove the lifting gear.
- Insert the pins (**1**) and secure them with the retaining pins.

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13 Driving with a rigged truck crane

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13 Driving with a rigged truck crane

This section describes driving the truck crane with the counterweight rigged. If a lattice extension is also rigged; ➠ *Lattice extension operating manual*.

Risk of accidents due to partially obstructed view of the truck crane!
When driving the truck crane, always stay in visual or radio contact with a banksman who can observe the parts you are unable to see, for example, the raised main boom in the *0° to the rear* position.

Risk of overturning by slewing superstructure!
When driving the rigged truck crane, the slewing gear must be switched off – slewing gear brake engaged. The turntable must be locked.

Risk of accidents when driving with a lifted load!
Driving the truck crane with a load lifted is prohibited. Always set down the load prior to driving the truck crane and secure the hook block so it cannot swing.

Risk of accidents when driving on public roads!
Driving on public roads is permissible only if all requirements listed in the *CHECKLIST: checks before on-road driving* are met; ➠ p. 5 - 1.
Driving on public roads with a rigged truck crane is not permitted.

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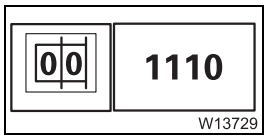
13.1 Permissible rigging modes and axle loads

Depending on the counterweight rigged, you must bring the superstructure and the main boom into certain positions so that the permissible axle loads are not exceeded.

Risk of damage to the axle lines!
Only bring the superstructure and the main boom into the specified positions. This prevents excessive strain on the axle lines.



- Enter the RCL code for the actual rigging mode of the truck crane in accordance with the *Lifting capacity table*. For example **1110**, with 20.0 t (41,100 lbs) of counterweight and an outrigger span of 8.76 x 8.90 m (28.7 x 29.2 ft).

Risk of accidents if the RCL is overridden!
Always enter the RCL code for the current rigging mode. The specified positions are within the monitored operating ranges.
If the RCL is overridden, the truck crane may overturn even if you move it into the positions specified.

- Bring the superstructure and the main boom into a position that is indicated in the following table for the specified counterweight rigged.
- Tie down the hook block so that it cannot swing around.

Axle load table

All axle loads specified apply to 445/95 R25 tyres and a 14 x 8 x 14 drive, with a reeved single-pulley hook block (weight 850 kg (1,874 lbs)) without an auxiliary hoist.

Counter-weight in t (lbs)	Telescoping I/II/III/IV	Main boom Angle in °	Superstructure position[1)]	Maximum axle load [2)] in t (x 1,000 lbs)	
				front	rear
0 (0)	0 / 0 / 0 / 0	0	front	12.0 26.5	14.0 30.9
20 (44,100)	44 / 0 / 0 / 0	5	front	13.0 28.7	19.0 41.9
	0 / 0 / 0 / 0	82	rear	9.0 19.9	21.5 47.4
40 (88,200)	44 / 44 / 44 / 0	5	front	13.5 29.8	23.0 50.7
	0 / 0 / 0 / 0	82	rear	13.5 29.8	23.0 50.7
60 (132,300)	0 / 0 / 0 / 0	82	rear	17.5 38.6	25.0 55.2
80 (176,400)	0 / 0 / 0 / 0	82	rear	22.0 48.5	27.0 59.5
over 80 (176,400)	Driving with rigged truck crane **not permitted** Unrig the counterweight combination to 80 t (176,400 lbs)				

1) Rear: Display, slewing angle 0°
Front: Display, slewing angle 180°

2) Front: On each of the 1st, 2nd and 3rd axle lines
Rear On each of the 4th, 5th, 6th and 7th axle lines

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13.2 Driving distance

The driving distance to be driven must be level. Uneven surfaces **cannot** be compensated with the level adjustment system.

The entire driving distance must be level. The rigging modes and axle loads specified in this chapter only for routes which are free of inclines in longitudinal and lateral direction.

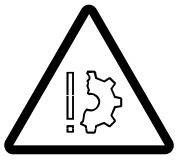
The ground must be stable enough to bear the axle loads.

If the surface pressure of the tyres exceeds the permissible load on the ground, the surface area of the tyres must be increased by laying stable material (e.g. wooden planks) on it.

13.3 Before driving

13.3.1 Checking tyre pressure and wind speed

- Ensure that all the tyres are at the prescribed pressure levels; ➠ *Tyres*, p. 1 - 15.



Risk of damage to the tyres!
You may only drive the truck crane if the tyres are at the prescribed pressure level.
Never reduce the tyre pressure in order to increase the bearing surface of the tyres!

The same maximum permissible wind speeds for working with the crane apply to driving the truck crane.

- Check the wind speed; ➠ p. 11 - 52.

Risk of accidents at excessively high wind speeds!
You may not drive the rigged truck crane if the wind speed exceeds the maximum permissible values specified in the *Lifting capacity table*. In this case, you must bring the truck crane into a secure state.

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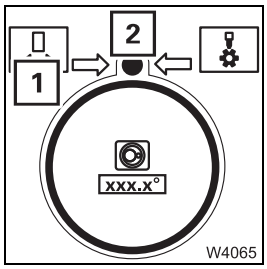
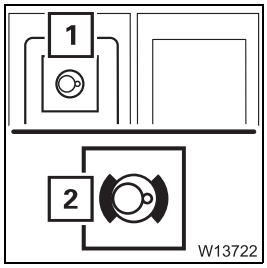
13.3.2 Secure the superstructure against slewing

Danger of overturning by the superstructure slewing while driving the truck crane!
Always secure the superstructure before driving the rigged truck crane to prevent it slewing. Slewing the superstructure while driving the truck crane increases the risk of overturning.!



- Lock the turntable – the symbols (**1**) and (**2**) must be **green**



- Switch off the slewing gear.
  - The lamp in the button (**1**) must be dimly lit.
  - The lamp (**2**) must light up – slewing gear brake engaged.

➠ *Locking/unlocking the superstructure*, p. 11 - 13.

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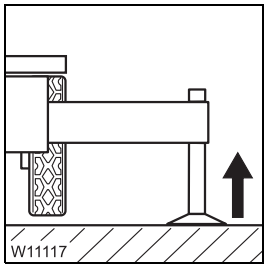
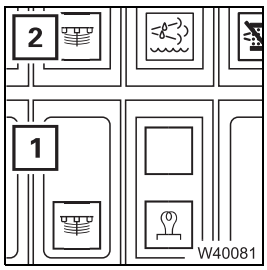
13.3.3 Putting the truck crane on the wheels

Danger of overturning if the supporting cylinders are retracted unevenly!
Retract the supporting cylinders evenly! This prevents the truck crane overturning while retracting individual outrigger cylinders.



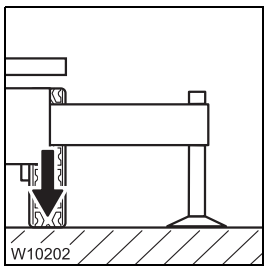
- Retract the supporting cylinders until all wheels are just above the ground.

Danger of overturning when switching on the suspension!
You may under no circumstances switch on the suspension while the rigged truck crane is on wheels. Switching on the suspension would cause the suspension struts to be suddenly collapsed and damaged, and the truck crane could overturn.

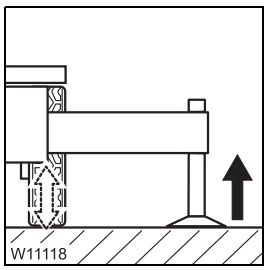


Switching on the suspension

- Press switch (**1**) in at the top.
  The lamp (**2**) goes out if the suspension is switched on.

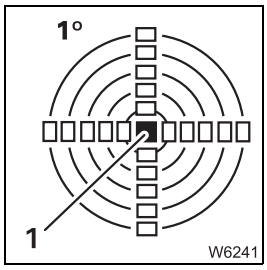


All wheels are now lowered to the ground

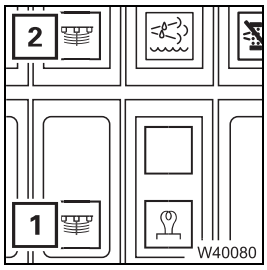


Levelling the truck crane

- Retract the supporting cylinders evenly. Lower the truck crane only to the extent that the suspension struts still have enough play for alignment.

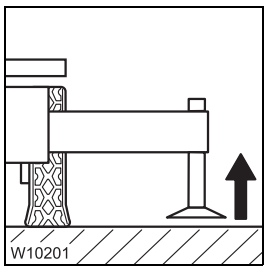


- Level the truck crane with the outriggers until only lamp (**1**) is illuminated in the measuring range **1°**.



Switching off the suspension

- Press switch (**1**) in at the bottom.
  The lamp goes on (**2**) if the suspension is switched off.



To secure the truck crane

- Retract the supporting cylinders until the outrigger pads are approx. 5 to 10 cm (2 to 4 in) above the ground. Leave the outrigger beams extended.

Danger of overturning if outriggers are retracted!
Always leave the outrigger beams extended and the outrigger pads just above the ground to secure the truck crane against overturning.

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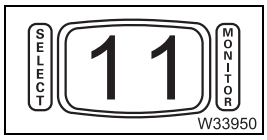
13.3.4 Preparing to drive

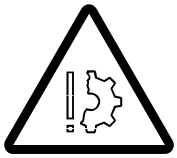
Transmission



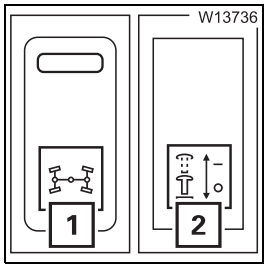
Select gear **1** as the highest gear; ➠ p. 5 - 25.
In this way you prevent the gears changing up and ensure that the speed is kept to a minimum.

Switching on separate steering

When driving the rigged truck crane, the separate steering must be switched on.



Risk of damage to the steering linkage!
Always switch on separate steering before driving the rigged truck crane and steer the truck crane only when it is rolling.
The steering linkage can be damaged if separate steering is switched off or if you steer the vehicle while it is stationary.



- Switch on the key-operated switch.
- Press switch (**1**) in at the bottom.
  When the separate steering is switched on, the lamp (**2**) lights up.

➠ *Switching to separate steering*, p. 5 - 60.

Connections

If necessary, you can switch in the longitudinal and transverse differential locks; ➠ p. 5 - 52, p. 5 - 53.

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13.4 While driving

- Drive only at the slowest possible speed and do not change gears.
- Use the greatest possible turning radius when you are driving around corners!
- Steer the truck crane when it is moving, and avoid sudden steering movements!

Risk of damage to the steering linkage!
The steering linkage can be damaged if the steering wheel is moved while the vehicle is stationary.

Danger of overturning by switching on the suspension!
The suspension must be deactivated (locked) while the rigged truck crane is on wheels.
Switching on the suspension would cause the suspension cylinders to be suddenly pressed together and damaged, and the truck crane could overturn.

Never level the truck crane with the level adjustment system if the ground is uneven.
In this case you must raise the truck crane with the outrigger cylinders, level it and lower it again, as described in the section *Putting the truck crane on the wheels*; ➠ p. 13 - 7.

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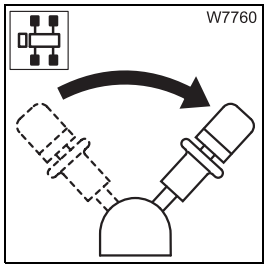
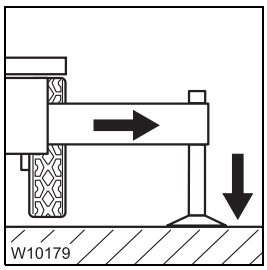
13.5 After driving

- Restore the original condition:
  - Switch off the longitudinal differential locks; ➠ p. 5 - 52,
  - Switch off the transverse differential locks; ➠ p. 5 - 53,
  - Switch off separate steering; ➠ p. 5 - 62.



- Apply the parking brake.



- Support the truck crane with the outrigger span required for the job according to the *Lifting capacity table* and raise until none of the wheels touches the ground.

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14 Malfunctions during crane operation

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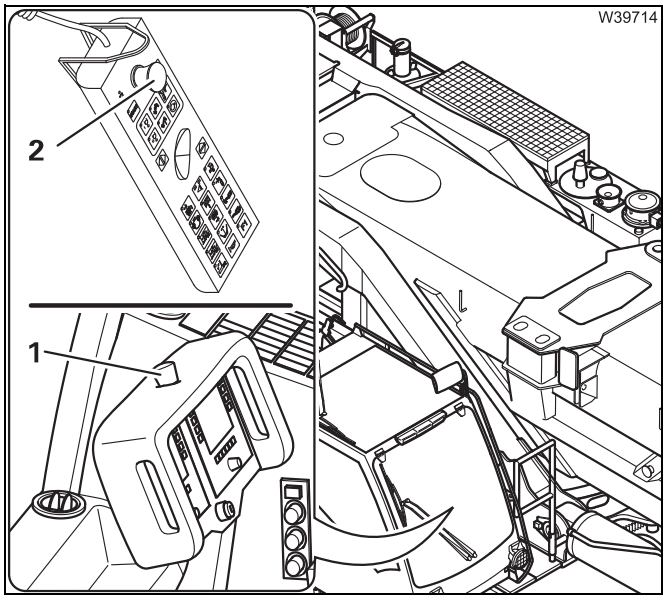
14 Malfunctions during crane operation

14.1 Emergency stop switch

Risk of overloading if used improperly!
Press the emergency stop switch only if it is no longer possible to stop the crane movements with the normal operating elements.
The emergency stop switch stops the crane movements suddenly. This may overload the truck crane, e.g. in the event of high working speeds and large working radii.



- Stop all crane movements.

Two emergency stop switches are provided for an emergency:

1 In the crane cab

2 On the hand-held control

- Press an emergency stop switch. The switch latches.

  The engine shuts down.

After activating an emergency stop switch;
➠ *Resetting the emergency stop switch*, p. 10 - 22.

The battery master switch cannot be used as an emergency stop switch for the engine. The engine continues to run after the battery master switch has been switched off.

Risk of accident by suspended loads!
If a load is suspended from the hook after actuating emergency stop, make sure no-one enters the danger area under the suspended load. If necessary, secure the danger zone if the fault cannot be remedied quickly and you leave the worksite.

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14.2 What to do when malfunctions occur during crane operation

Pay attention to the following points if a malfunction occurs:

- Keep calm!

Risk of accidents when carrying out repairs with loads lifted!
Repairs must not be carried out as long as a load is lifted.
Always try to lower the load before carrying out repairs.
Only properly qualified personnel may perform crane movements with the solenoid valves.

The load can be set down

- Set down the load. Retract the main boom completely and set it down on the main boom rest.

If it becomes necessary to override the RCL, first observe all the information in Section *RCL override*; ➠ p. 11 - 39.

Risk of accidents due to overridden or faulty RCL!
You may override the RCL only if it becomes absolutely necessary to do so in the event of an emergency. This is to put the truck crane into a safe state in the event of a malfunction. In this case, do not perform any movements that would increase the load moment.

If it is no longer possible to operate the crane from the crane cab, you can use the emergency activation, if necessary;
➠ *Emergency operation with the hand-held control*, p. 14 - 59,
➠ *Telescoping emergency program*, p. 14 - 47

- Lock the truck crane to prevent unauthorised use. Remove the ignition key and lock away the hand-held control.
- Inform your supervisor.
- Try to eliminate the malfunction. Notify **Manitowoc Crane Care** if you cannot correct the malfunction.

Load cannot be set down

- Secure the danger area using cordons and warning signs.
- Notify **Manitowoc Crane Care**.

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14.3 Fuses

The fuses are located in different places on the superstructure:

– On the turntable; ➠ p. 14 - 6,

– In the crane cab; ➠ p. 14 - 8,

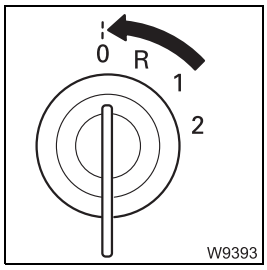
– In the battery box; ➠ p. 14 - 10,

– On the crane cab bracket; ➠ p. 14 - 11,

– On input/output circuit boards; ➠ p. 14 - 12

– At the RCL; ➠ p. 14 - 13.

Notes on changing fuses



• Switch off the ignition whenever a fuse has to be replaced.

Risk of damage if the ignition is switched on!
Switch off the ignition whenever a fuse has to be replaced. This prevents the new fuse being blown immediately by the increased starting current after being installed.

Risk of damage by overloading!
Replace blown fuses only with new fuses of the same amperage. This prevents parts being overloaded and damaged or the fuse being immediately blown again.
Notify **Manitowoc Crane Care** if a fuse with the same amperage blows again when the ignition is switched on.

Risk of fire!
Never repair a blown fuse with other electrically conductive materials.

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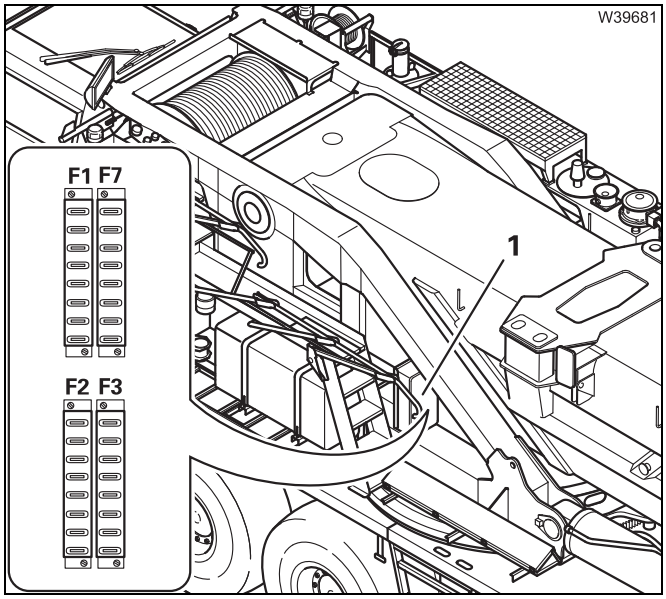
14.3.1 Fuses on the turntable



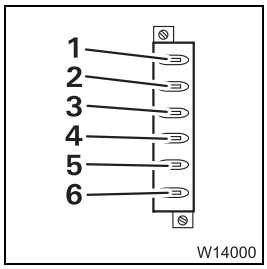
- Loosen the retaining bolts and take off the cover from the distributor box (**1**).

The fuse groups **F 1, F 2, F 3** and **F 7** each consist of six fuses.

The fuse group **F 7** is available only with additional equipment with Mega Wing Lift.

Close the distributor box after checking.

The following tables show the designations of the individual fuses, including their amperage and functions.



The designations 1 to 6 in the tables correspond to the order from top to bottom (fuse 1 is the top fuse).

- Observe the instructions regarding fuse changes; ➠ p. 14 - 5.

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Designation	Amperage (A)	Function
F1/1	20	Control unit ESX 0/ I/O-6 circuit board
F1/2	3	Control unit ESX 0/ Hand-held control emergency stop
F1/3	2	Control unit ESX 0
F1/4	3	Control unit ESX 0/ I/O-6 circuit board
F1/5	10	Hydraulic oil filter display, Coolant level
F1/6	10	Central lubrication

Designation	Amperage (A)	Function
F2/1	20	Control unit ESX 1/ I/O-5 circuit board
F2/2	3	Control unit ESX 1
F2/3	2	Control unit ESX 1
F2/4	5	Control unit ESX 1/ I/O-5 circuit board Proximity switch for locking pin counter-weight and auxiliary lifting gear
F2/5	20	Hydraulic oil cooler
F2/6	20	Hydraulic oil cooler

Designation	Amperage (A)	Function
F3/1	20	Control unit ESX 2
F3/2	3	Control unit ESX 2
F3/3	2	Control unit ESX 2
F3/4	5	Control unit ESX 2/ Locking pin lattice extension
F3/5	10	Motor for crane operation E control (PLD), Engine electronic system (ADM)/ Charge indicator
F3/6	20	Motor for crane operation E control (PLD), Engine electronic system (ADM)

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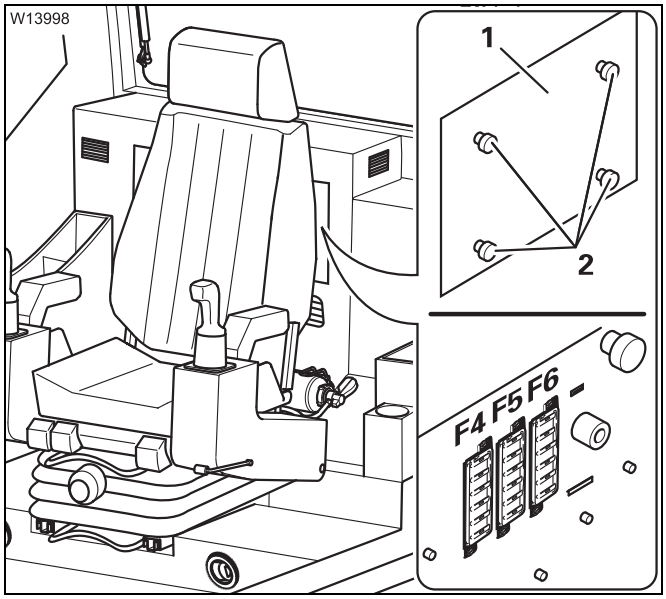
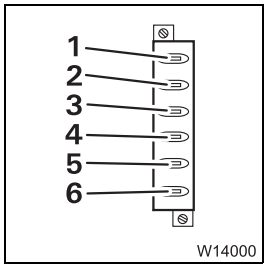
14.3.2 Fuses in the crane cab



- Loosen the bolts (**2**) and remove the cover (**1**).

The fuse groups **F 4, F 5** and **F 6** each consist of six fuses.

The following tables show the designations of the individual fuses, including their amperage and functions.



The designations 1 to 6 in the tables correspond to the order from top to bottom (fuse 1 is the top fuse).

- Observe the instructions regarding fuse changes; ➠ p. 14 - 5.

Designation	Amperage (A)	Function
F4/1	20	Control unit ESX 3
F4/2	3	Control unit ESX 3/ ECOS display power supply
F4/3	2	Control unit ESX 3
F4/4	3	Control unit ESX 3/ ECOS display power supply
F4/5	10	Control unit ESX 3/ Horn button, button for high-speed I/O-4 circuit board
F4/6	10	*RCL* rated capacity limiter and display power supply

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Designation	Amperage (A)	Function
F5/1	10	Diagnostic plug for crane operation engine/ Flame start system (Additional equipment)
F5/2	10	24 V/12 V voltage transformer Crane cab lighting
F5/3	10	Heater fan
F5/4	30	Unassigned
F5/5	10	Unassigned
F5/6	20	heating system

Designation	Amperage (A)	Function
F6/1	15	Spotlight
F6/2	10	Diagnostic plug for crane operation engine/ Flame start system (Additional equipment)
F6/3	15	Windshield wipers, windshield washer, cigarette lighter
F6/4	10	heating system
F6/5	5	Constant engine speed
F6/6	5	Instrument panel lighting

Designation	Amperage (A)	Function
F7/1	20	Control unit ESX 5
F7/2	3	Control unit ESX 5
F7/3	2	Unassigned
F7/4	5	Control unit ESX 5/ Left/right winch rotary transducer power supply
F7/5	10	Unassigned
F7/6	20	Unassigned

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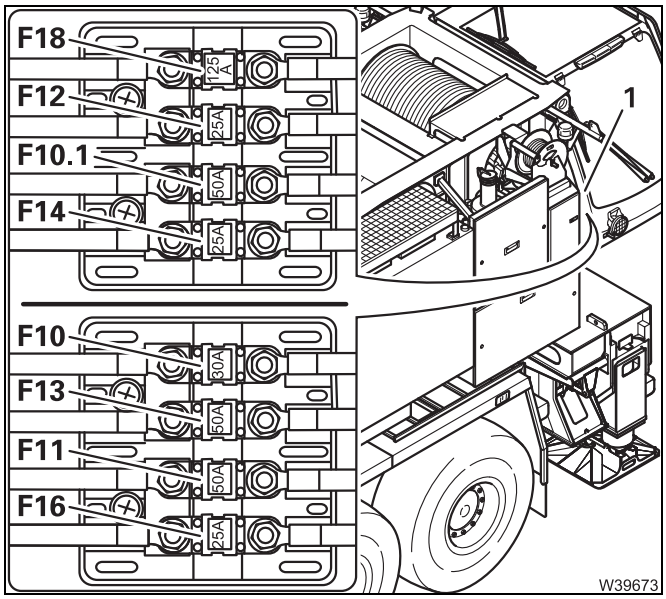
14.3.3 Fuses in the battery box

The fuses **F 10** to **F 18** are next to the batteries in a terminal box.

Danger from lead and lead compounds on batteries!
Battery poles, battery terminals and parts of the battery itself contain lead and lead compounds. Wash your hands after working on these parts or in these areas!



- Open the cover of the battery box (**1**).
- Remove the covers from the terminal boxes.
- Observe the instructions regarding fuse changes; ➠ p. 14 - 5.

Designation	Amperage (A)	Function
F 10	50	Control units on the carrier which are needed during operation of the crane
F 10.1	50	Auxiliary water heater[1)]
F 11	50	Superstructure central fuse
F 12	25	Heating and time switch for the heating system[1)], Radio
F 13	50	Main fuse for the oil cooler and the air-conditioning system, Power supply diagnostic
F 14	25	Starter, Alternator
F 16	25	Battery charger connection[1)]
F 18	125	Heating system

[1)] Additional equipment

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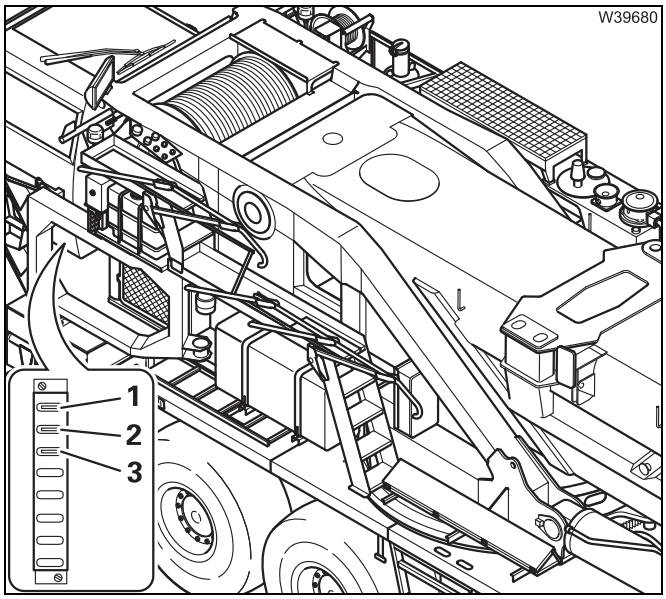
14.3.4 Fuses on the crane cab bracket

The fuses **F 1, F 2** and **F 3** are located in a distributor box on the crane cab bracket.



- Open the lid of the distribution box (**4**).

  1 F 1

  2 F 2

  3 F 3

- Observe the instructions regarding fuse changes; ➠ p. 14 - 5.

Designation in the electric circuit diagram:	Amperage (A)	Function
F 1	25	Crane cab air-conditioning system
F 2	25	
F 3	7.5	

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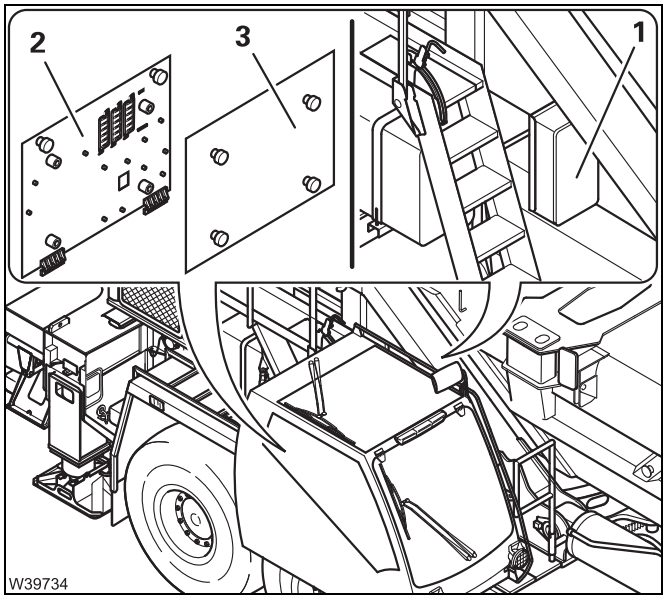
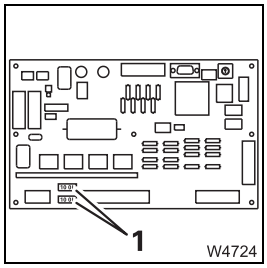
14.3.5 Fuses on I/O circuit boards



On the superstructure there are three I/O circuit boards:

Designation	Position on the truck crane
I/O 4	In the crane cab, under the cover (**3**), behind the plate (**2**)
I/O 5	In the distributor box (**1**), bottom left
I/O 6	In the distributor box on the telescoping cylinder, only for servicing



All fuses (**1**) on the circuit boards have a strength of **10 amps**.

- Check the fuses and replace blown ones.
- Observe the instructions regarding fuse changes; ➠ p. 14 - 5.

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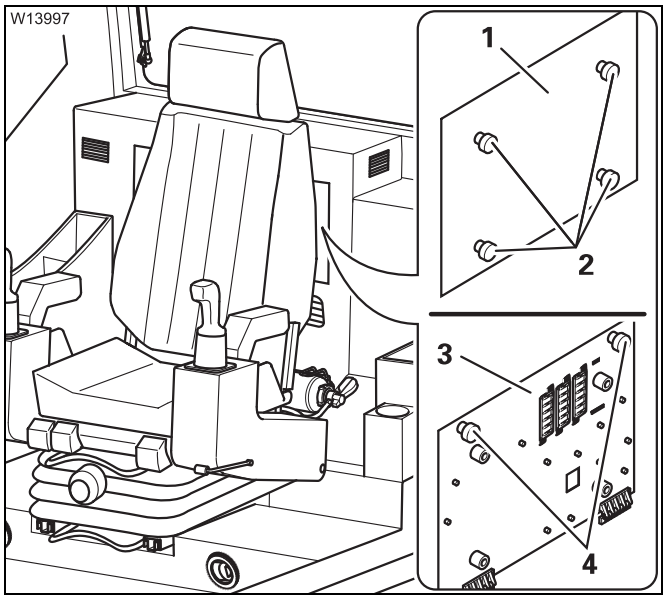
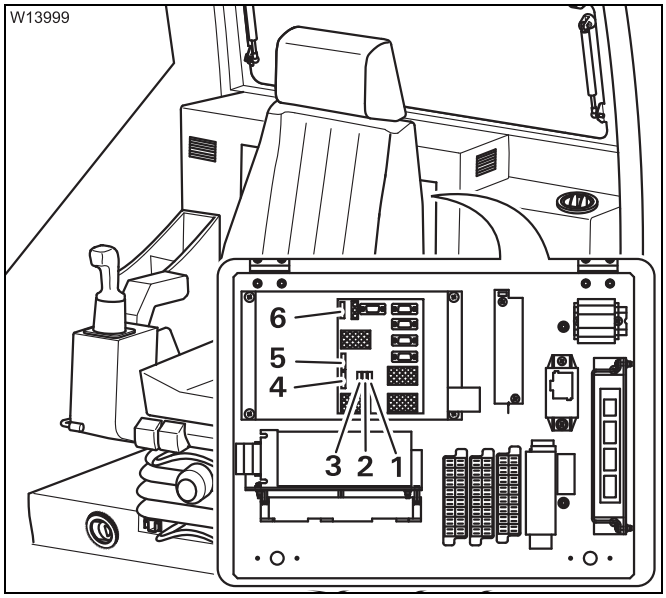
14.3.6 RCL fuses

When a fuse is blown, a corresponding error code is displayed;
➠ *Table of error codes*, p. 14 - 34.



- Loosen the bolts (**2**) and remove the cover (**1**).
- Loosen the screws (**4**) and fold down the plate (**3**) to the front.
- Observe the instructions regarding fuse changes; ➠ p. 14 - 5.



The RCL control unit is at the bottom left on the back of the plate.

Arrangement of the fuses on the RCL:

1 RCL F 1
2 RCL F 2
3 RCL F 3
4 RCL F 11
5 RCL F 12
6 RCL F 6

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Designation in the *Error message* submenu	**Amperage (A)**	**Function**
F 1	5	For internal main relay
F 2	5	Display for external RCL shutdown (Additional equipment)
F 3	5	Power supply for movements of all power units at connection 0
F 6	5	RCL power supply
F 11	5	Display for external RCL pre-warning (Additional equipment)
F 12	5	Unassigned

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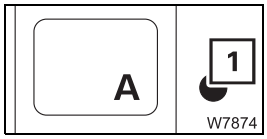
14.4 Troubleshooting and correction



This section does not include all malfunctions. If the lamp (**1**) is lit; ➠ *Warning submenu*, p. 11 - 110.

14.4.1 Engine malfunctions

Malfunction	Cause	Solution
Engine not starting – starter does not turn	Battery master switch is switched off	Switch on the battery master switch; ➠ p. 10 - 9
	Switch the ignition off	➠ *Switching the ignition on*, p. 10 - 10.
	Fuse F 3/5 or F 3/6 defective	Replace blown fuses; ➠ p. 14 - 8.
	Hand-held control connected or bridging plug not inserted	Disconnect hand-held control or insert bridging plug; ➠ p. 12 - 17.
	Emergency stop switch actuated	➠ *Resetting the emergency stop switch*, p. 10 - 22
Engine not starting – starter turning	Batteries insufficiently charged	Charge batteries
	Fuel tank empty	1. Refuel; ➠ p. 10 - 5. 2. Bleed the fuel system; ➠ *Maintenance manual* ➠ *Separate Betriebsanleitung Motor-Hersteller*
	Air intake inhibitor closed	➠ *Releasing the air intake inhibitor*, p. 10 - 23.
Lamp does not go on after switching on the ignition if the engine is cold	Fuse F 5/1 or F 6/2 blown	Replace blown fuses; ➠ p. 14 - 8.
Symbol is red	Air filter clogged	Replace the dry-type air filter; ➠ *Maintenance manual.*

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Malfunction	Cause	Solution
 **Symbol is red**	Coolant level too low	Top up coolant; ➠ *Maintenance manual*.
 **Symbol is red**	Coolant level too low	Top up coolant; ➠ *Maintenance manual*.
	Outer surface of heat exchanger dirty	Clean outer surface of heat exchanger.
	V-belt of coolant pump at engine loose	Tighten V-belt; ➠ *Separate Betriebsanleitung Motor-Hersteller.*
  **In the submenu *Warning* the symbols *Air filter crane engine* or *Coolant level crane engine* are not marked in red although the air filter is dirty or the coolant level is too low.**	One or both fuses on input-output circuit board I/O-4 defective	Replace blown fuses; ➠ p. 14 - 12.
  **Flashing**	Engine oil pressure too low because engine oil level is too low	Check oil level, top up if necessary; ➠ *Maintenance manual*. Read out the error messages; ➠ p. 14 - 28
 **Lamp does not go out after switching on ignition**	Report the malfunction in the flame start system	**Manitowoc Crane Care** and have the flame start system checked.
Lamp lights up when the crane engine is running		
Engine cannot be switched off using the ignition key	Malfunction in the electronics	Emergency stop switch; ➠ p. 10 - 22.
Vehicle engine diagnostics plug not working	Fuse F 5/1 or F 6/2 blown	Replace blown fuses; ➠ p. 14 - 8.
 **Light does not go out when the engine is running**	Malfunction in the engine electronics	Switch off the engine and notify **Manitowoc Crane Care**.
The engine output has dropped and the engine coolant temperature has increased	The motor output is reduced due to an increase in the coolant temperature.  The lamp lights up when the maximum temperature is exceeded.	Wait until the coolant has cooled down – the engine performance will increase again.

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Malfunction	Cause	Solution
 **Symbol red, the engine power drops continuously**	Engine malfunction – the engine is not switched off however, to ensure the load can be lowered and the truck crane can be unrigged	**Manitowoc Crane Care** must be notified.

14.4.2 Malfunctions of the hoists

Malfunction	Cause	Solution
No *hoisting gear* operation or a malfunction (*hoist*, *lower* or *high-speed mode not working*)	Hoist off, lamp in button lights up dimly	Switch on the hoist; ➠ *Switching on the main hoist*, p. 11 - 56, ➠ *Switching on the auxiliary hoist*, p. 11 - 58.
	Dead man's switch not actuated	Press dead man's switch.
	Emergency stop switch pressed in	➠ *Resetting the emergency stop switch*, p. 10 - 22.
	Fuse F 1/1, F 1/2, F 1/3 or F 1/4 defective	Replace blown fuses; ➠ p. 14 - 6.
	Fuse F 4/1, F 4/2, F 4/3 or F 4/4 defective	Replace blown fuses; ➠ p. 14 - 8.
	Control unit faulty, error message is displayed	Acknowledge the error message once; ➠ p. 14 - 39. Inform **Manitowoc Crane Care** if the error message recurs.
Only the *lifting* function works	Lowering limit switch approached	Leave the shutdown range and raise the hoist.
Only the *lowering* function works	 Lifting limit switch approached, lamp lights up	Leave the shutdown range and lower the main hoist.
	 RCL shutdown, lamp lights up	Leave the shutdown range; ➠ p. 11 - 36.
	Fuse F4/6 blown	Replace blown fuses; ➠ p. 14 - 8.

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Malfunction	Cause	Solution
***Lifting*, *lowering* or *high-speed mode* function not working**	Function disabled by ECOS	If required, acknowledge error message once (➠ p. 14 - 39) and briefly turn off the ignition – it if occurs again, notify **Manitowoc Crane Care**
	Fuse F4/5 for high-speed button defective	Replace blown fuses; ➠ p. 14 - 8.
	One or both fuses on input-output circuit board I/O-4 defective	Replace blown fuses; ➠ p. 14 - 12.
No *lifting* function	Fuse RCL F6 faulty	Replace blown fuses; ➠ p. 14 - 13.
Lifting or lowering is either not possible at all or only at a very low speed	Speed limited	Increase limit; ➠ p. 11 - 104.
***Lifting* or *lowering* function cannot be deactivated**	ECOS malfunction	Emergency stop switch; ➠ p. 10 - 22.
No response to control lever movements	ECOS malfunction concerning operating elements in the crane cab	Unrig using hand-held control; ➠ p. 14 - 59.

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14.4.3 Malfunctions on the derricking gear

Malfunction	Cause	Solution
Derricking gear **not working or malfunctioning**	Derricking gear off, lamp in button lights up dimly	Switch on the derricking gear; ➠ p. 11 - 64.
	Emergency stop button pressed	➠ *Resetting the emergency stop switch*, p. 10 - 22.
	Dead man's switch not actuated	Press dead man's switch.
	Fuse F 1/1, F 1/2, F 1/3 or F 1/4 defective	Replace blown fuse; ➠ p. 14 - 6.
	Fuse F 2/1, F 2/2, F 2/3 or F 2/4 defective	
	Fuse F 4/1, F 4/2, F 4/3 or F 4/4 for ECOS defective	Replace blown fuse; ➠ p. 14 - 8.
	Control unit faulty – error message displayed	Acknowledge error message once (➠ p. 14 - 39) and briefly switch off the ignition. Inform **Manitowoc Crane Care** if the error message recurs.
No *high-speed* **function**	Fuse F4/5 blown	Replace blown fuses; ➠ p. 14 - 8.
	One or both fuses on circuit board I/O-4 defective.	Check fuses, replace if necessary; ➠ p. 14 - 12.
Lowering **not functioning**	 Lifting limit switch approached, lamp lights up	Leave the shutdown range and raise the boom.
	 RCL shutdown, lamp lights up	Leave the shutdown range; ➠ p. 11 - 36.
	Fuse F4/6 blown	Replace blown fuses; ➠ p. 14 - 8.
Derricking **function not working**	Function disabled by ECOS	If required, acknowledge error message once and briefly turn off the ignition – it if occurs again, notify **Manitowoc Crane Care**
	Fuse F6 blown	Replace blown fuses; ➠ p. 14 - 8.
Derricking not possible, or only at low speed	Speed limited	Increase limit; ➠ p. 11 - 104.

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Malfunction	Cause	Solution
Derricking cannot be switched off	ECOS malfunction	Emergency stop switch; ➠ p. 10 - 22.
No response to control lever movements	ECOS malfunction concerning operating elements in the crane cab	Unrig using hand-held control; ➠ p. 14 - 59.

14.4.4 Malfunctions in the telescoping mechanism

Malfunction	Cause	Solution
Telescoping mechanism **not working or malfunctioning**	Telescoping mechanism off, lamp in button lights up dimly	Switch on the telescoping mechanism; ➠ p. 11 - 75.
	Dead man's switch system not actuated	Press dead man's switch.
	Emergency stop switch engaged	➠ *Resetting the emergency stop switch*, p. 10 - 22.
	Fuse F 1/1, F 1/2, F 1/3 or F1/4 defective	Replace blown fuses; ➠ p. 14 - 6.
	Fuse F 2/1, F 2/2, F 2/3 or F 2/4 defective	
	Control unit faulty – error message displayed	Acknowledge the error message once; ➠ p. 14 - 39. Inform **Manitowoc Crane Care** if the error message recurs.
No *high-speed* **function**	Fuse F4/5 for high-speed button defective	Replace blown fuses; ➠ p. 14 - 8.
	One or both fuses on input-output circuit board I/O-4 defective	Replace blown fuses; ➠ p. 14 - 12.
Telescopic sections **and** *Telescoping cylinder locking/ unlocking* **not working**	Faulty valve	Note the error code ➠ p. 14 - 38 and notify **Manitowoc Crane Care**.
Extending **not functioning**	 RCL shutdown, lamp lights up	Leave the shutdown range; ➠ p. 11 - 36.
	Fuse F4/6 blown	Replace blown fuses; ➠ p. 14 - 8.
	 Lifting limit switch approached, lamp lights up	Leave the shutdown range, retract boom

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Malfunction	Cause	Solution
Retracting **not functioning**	Insufficient lubrication	Lubricate main boom, ➠ *Maintenance manual.*
	Main boom is not steep enough	Leave the shutdown range and raise the boom
Telescopic section cannot be operated by moving the control lever	Telescopic section locked	➠ *Unlocking the telescopic section*, p. 11 - 85.
	Telescoping cylinder unlocked	➠ *Locking the telescoping cylinder*, p. 11 - 84.
Telescopic section/telescoping cylinder locking function not working	Fault in hydraulics/electrical system	Note the error codes ➠ p. 14 - 22, ➠ p. 14 - 38 and notify **Manitowoc Crane Care**.
Telescoping mechanism **or** *high-speed mode* **not working**	Function disabled by ECOS	If required, acknowledge error message once and briefly turn off the ignition – it if occurs again, notify **Manitowoc Crane Care**
	Fuse F6 blown	Replace blown fuses; ➠ p. 14 - 13.
Telescoping not possible, or only at low speed	Speed limited	Increase limit; ➠ p. 11 - 104.
Telescoping cannot be switched off	ECOS malfunction	Emergency stop switch; ➠ p. 10 - 22.
The main boom can no longer be telescoped; the telescoping cylinder can no longer be moved	Hydraulic supply interrupted	Retract the telescopic section by means of mechanical emergency operation; ➠ p. 14 - 44.
No response to control lever movements	ECOS malfunction concerning operating elements in the crane cab	Unrig using hand-held control; ➠ p. 14 - 59

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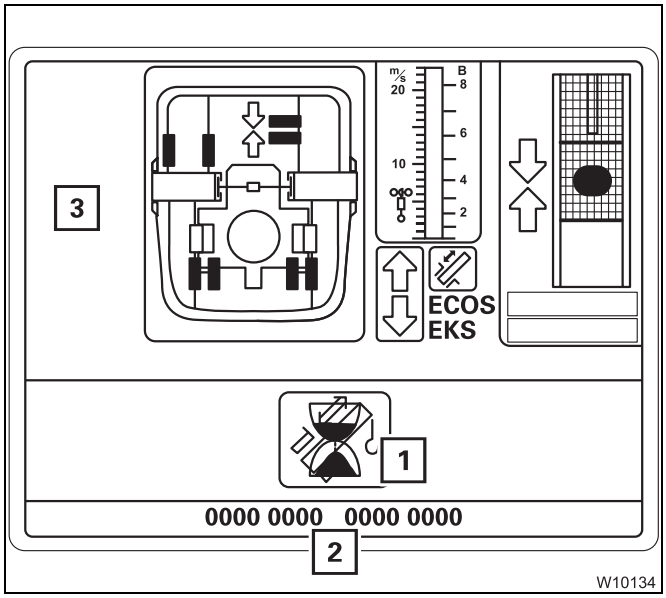
Telescoping mechanism error messages

If ECOS disables the telescoping mechanism, the following display is shown in the *Telescoping* submenu.

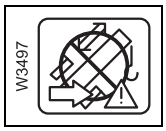


– All the symbols (**3**) for operation disappear – the corresponding buttons are disabled.
– The display (**1**) appears.
– An error code (**2**) is displayed.
• Always note this error code before contacting **Manitowoc Crane Care**.

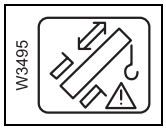
The display (**1**) shows the symbol for the current status:

Waiting
The symbol usually disappears shortly after switching on the ignition. If the symbol does not go out or is displayed while operating the crane, this may be due to an RCL shutdown or blown F1/2 fuse. Contact **Manitowoc Crane Care** if none of these are the cause.

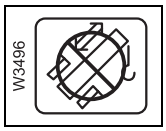
Telescope status divergence
ECOS has detected a difference between the displayed and the current telescope status. Enter the current telescope status; p. 14 - 57.



Emergency program access
The telescoping mechanism can only be operated with the emergency programme; p. 14 - 47.



Emergency program
The *Telescoping* emergency program is open; p. 14 - 47.



Inactive
Contact **Manitowoc Crane Care** if this status is still displayed after repeatedly switching on the ignition.

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14.4.5 Malfunctions on the slewing gear

Malfunction	Cause	Solution
slewing gear **not functioning**	Slewing gear off, lamp in button lights up dimly	Switch on the slewing gear; ➠ p. 11 - 97.
	Mechanical turntable lock engaged	Unlock the superstructure; ➠ p. 11 - 13.
	Dead man's switch system not actuated	Press dead man's switch.
	Emergency stop switch pressed in	➠ *Resetting the emergency stop switch*, p. 10 - 22.
	Fuse F 1/1, F 1/2, F 1/3 or F1/4 for ECOS blown	Replace blown fuses; ➠ p. 14 - 6.
	Fuse F 3/1, F 3/2, F 3/3 or F 3/3 for ECOS defective	
	Control unit faulty – error message displayed	Acknowledge error message once; ➠ p. 14 - 39 – if error recurs, notify **Manitowoc Crane Care**.
	Fuse F6 at the RCL control system is blown	Replace blown fuses; ➠ p. 14 - 13.
Slewing function **not working**	An RCL code has been entered for the 0° or 180° position	Enter RCL code for a slewing range; ➠ p. 11 - 26.
	Function disabled by ECOS	If required, acknowledge error message once and briefly turn off the ignition – it if occurs again, notify **Manitowoc Crane Care**
	Shutdown angle of a limited slewing range reached	Rotate in the opposite direction to leave the shutdown angle.
Slewing only possible in one direction	Shutdown angle of a limited slewing range reached	Enter the RCL code for a slewing range of 360° or slew in the opposite direction to leave the shutdown angle.

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Malfunction	Cause	Solution
Slewing not possible or only at a very low speed	Speed limited	Increase limit; ➠ p. 11 - 104.
Slewing gear no longer responds to the control lever movement	ECOS malfunction	Unrig using hand-held control; ➠ p. 14 - 59
The free movement of the slewing gear cannot be switched on	One or both fuses on input-output circuit board I/O-4 defective	Replace blown fuses; ➠ p. 14 - 12.
 **Lamp does not light up with the turntable switched off**	One or both fuses on input-output circuit board I/O-4 blown or Acknowledgements for the switch setting and the lamp are faulty	Check fuses, replace if necessary; ➠ p. 14 - 12. If the fuse is OK, **Manitowoc Crane Care** must be notified
Slewing **function cannot be switched off**	ECOS malfunction	Emergency stop switch; ➠ p. 10 - 22.

14.4.6 Malfunctions in the hydraulic system/hydraulic oil cooler

Malfunction	Cause	Solution
Hydraulic oil temperature above 80 °C (176 °F), fan in the hydraulic oil cooler running	Hydraulic system is heavily loaded	Stop work and leave the crane engine on until the oil has cooled down.
Hydraulic oil temperature above 80 °C (176 °F), fan in the hydraulic oil cooler not running	Fuse F 2/5 or F 2/6 defective	Stop crane operation and replace blown fuse(s); ➠ p. 14 - 6.
	Faulty temperature sensor in the circuit of the hydraulic system, error message is displayed	Have the temperature sensor replaced.
 **Symbol is red**	Corresponding hydraulic oil filter soiled	Change hydraulic oil filter; ➠ *Maintenance manual*.

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14.4.7 Malfunctions on the counterweight hoist unit

Malfunction	Cause	Solution
No *Counterweight hoist unit* function	Emergency stop switch on	➠ *Resetting the emergency stop switch*, p. 10 - 22.
	Hydraulic connection not established on the 20 t base plate	➠ *Establishing/disconnecting the hydraulic connection*, p. 12 - 63.
	Electrical connection on the 20 t base plate not established	➠ *Establishing/disconnecting the electrical connection*, p. 12 - 64
	Function is not selected on the hand-held control	Press required pre-selection button on the hand-held control
	Function disabled by ECOS	If required, acknowledge error message once and briefly turn off the ignition – it if occurs again, notify **Manitowoc Crane Care**
	Fuse F 1/1, F 1/2, F 1/3 or F 1/4 blown	Replace blown fuses; ➠ p. 14 - 6.
	Control unit faulty – error message displayed	Acknowledge error message once; ➠ p. 14 - 39 – if error recurs, notify **Manitowoc Crane Care**.
Lamps for *lifting cylinder extended/retracted* or indicator and warning lamps for *locking/ unlocking* do not display	Fuse F 2/4 for circuit board I/O-5 blown	Replace blown fuses; ➠ p. 14 - 6.
	One or both fuses on input-output circuit board I/O-5 defective	Replace blown fuses; ➠ p. 14 - 12.
***Counterweight hoist unit locking/unlocking* function not working**	Safety valve closed	➠ *Opening the safety valve*, p. 12 - 69.

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14.4.8 Malfunctions with movements of the crane cab

Malfunction	Cause	Solution
No function *Crane cab inclination*, *Crane cab slewing* **or** *crane cab bracket slewing*	Fuse F 1/1, F 1/2, F 1/3 or F 1/4 defective	Replace blown fuse; ➠ p. 14 - 6.
	Fuse F 3/1, F 3/2, F 3/3 or F 3/4 defective	
No function *Tilt crane cab* **with the rocker switch in the crane cab**	Fuse F 4/5 for circuit board I/O-4 blown	Replace blown fuse; ➠ p. 14 - 8.
	One or both fuses on input-output circuit board I/O-4 defective	Replace blown fuse; ➠ p. 14 - 12.

14.4.9 Malfunctions when operating with the hand-held control

Malfunction	Cause	Solution
CAN indicator lamp flashes or stays off after connecting the hand-held control	A bridging plug has been pulled out of another socket.	Insert the bridging plug and secure it with the cap
	Malfunction in the control system	**Manitowoc Crane Care.**
	Fuse F 2/3 blown	Replace blown fuses; ➠ p. 14 - 6.
	Emergency stop switch pressed in	➠ *Resetting the emergency stop switch*, p. 10 - 22.
Pre-selected function cannot be performed	Another function has been pre-selected	Pre-select the desired function.
Operation not possible	Malfunction in the control system	**Manitowoc Crane Care.**

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14.4.10 Malfunctions of the superstructure lock

Malfunction	Cause	Solution
No function *Lock turntable*	Fuse F 1/1, F 1/2, F 1/3 or F 1/4 blown.	Replace blown fuses; ➠ p. 14 - 6.
	Fuse F 3/1, F 3/2, F 3/3 or F 3/4 blown.	
	Fuse F 2/4 for circuit board I/O-5 blown	Replace blown fuses; ➠ p. 14 - 6.
	One or both fuses on circuit board I/O-5 defective.	Replace blown fuses; ➠ p. 14 - 12.

14.4.11 Malfunctions on the outriggers

Malfunction	Cause	Solution
Outrigger cylinders and beams can neither be extended nor retracted and the inclination indicator does not work	Driver's cab: fuses A2F3, A3F3, A3F14	Replace blown fuses; ➠ p. 7 - 20.
None of the specified causes apply	Solenoid valves are not switching electrically	**Manitowoc Crane Care** must be notified

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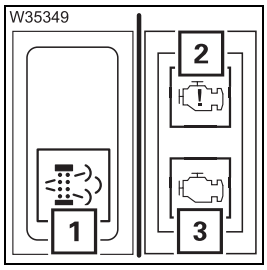
14.4.12 Reading error messages

You can read errors in the engine and exhaust system via a flashing code.

- Switch the engine off.
- Leave the ignition switched on.

This section describes the operating elements in the driver's cab. The procedures in the crane cab are the same but the positions of the operating elements are different.



Switch on the diagnostic mode.

- Push the button (**1**) down once.

Reading an error code

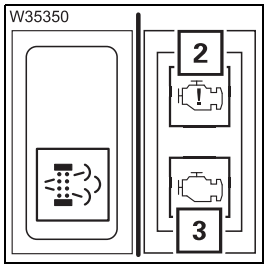
An error code consists of three to four digits, which are indicated by the frequency of the flashing lamp (**2**).

– The lamp (**3**) lights up for a few seconds before the first digit.

– The lamp (**2**) then goes out for a few seconds before each subsequent digit.

– The lamp (**3**) lights up for a few seconds after the last digit.

- Count how often the lamp (**3**) flashes between the brief intervals, and note all the digits:



Example:

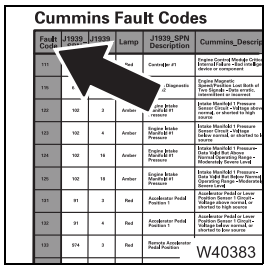
– Lamp (**3**) on for a few seconds

– Lamp (**2**) flashes**: 2x** – off **-3x** – off **-3x** – off **-2x** – off

– Lamp (**3**) on for a few seconds

The error code would be **2. 3. 3. 2**.

If further errors are present then the next error code is displayed after a short pause.



An overview of the error codes is provided as an appendix to these operating instructions; *Cummins Fault Codes*.

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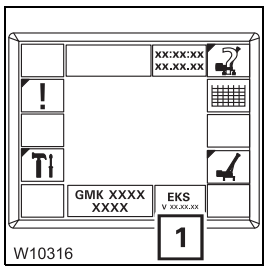
14.4.13 Troubleshooting the RCL

This section contains general malfunctions which are not displayed on the *RCL* control unit as well as malfunctions which prompt an error display on the *RCL* control unit.

Risk of accidents!
Immediately stop operating the crane if an error message is displayed!
The RCL may be repaired only by qualified personnel.

Risk of accidents due to overridden or faulty RCL!
In the event of a faulty RCL, first try to correct the error with the information in this section. Only override the RCL if it becomes absolutely necessary in order to lower the load in the event of an emergency.
Do not carry out any movements which increase the load moment in the event of a faulty or overridden RCL.
If the RCL is overridden, the crane operations are not monitored and no shutdown procedures are initiated when leaving the working range.



RCL program version

Always note down the number of the program version after a malfunction occurs and before notifying **Manitowoc Crane Care**.

- If necessary, open the main menu Esc.

The display (**1**) shows the program version.

General malfunctions

Malfunction	Cause	Solution
RCL not working (dark displays, no buzzer signal)	**Power supply not switched on**	**Switching the ignition on**
	Fuse F4/6 blown	Replace blown fuses; ➠ p. 14 - 8.
	Fuse F6 at the RCL control system is blown	Replace blown fuses; ➠ p. 14 - 13.
Key-operated switch RCL override no function	Fuse F 4/5 for circuit board I/O-4 blown	Replace blown fuses; ➠ p. 14 - 8.
	One or both fuses on circuit board I/O-4 defective.	Replace blown fuses; ➠ p. 14 - 12.

Error messages in the Monitoring submenu

If the rated capacity limiter detects an error, an error message is shown on the *RCL* control unit.

There are different types of error messages:

– Error messages without shutdown

– Error messages with shutdown

Risk of accidents!
Immediately stop operating the crane if an error message is displayed!
The RCL may be repaired only by qualified personnel.

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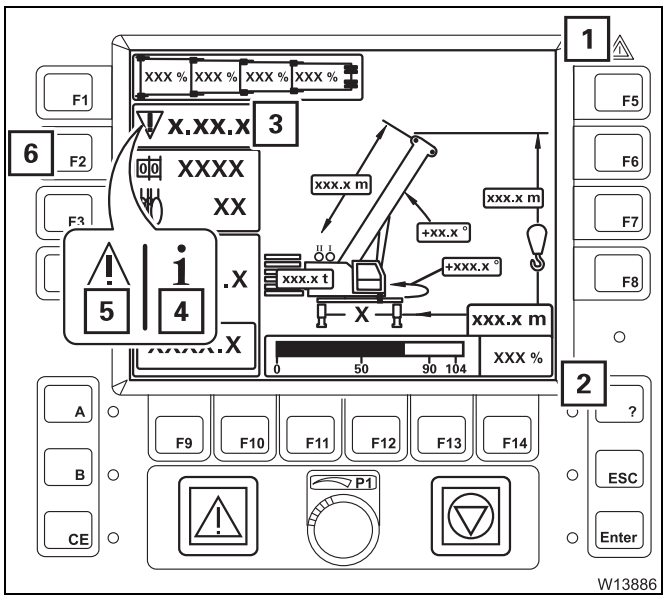


Error message without shutdown
The error message is displayed either as a warning or information.

– The buzzer tone sounds once.

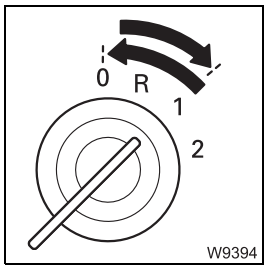
– Lamps (**1**) and (**2**) light up.

– Display (**3**) shows an error code and the associated symbol flashes.

4 Information symbol

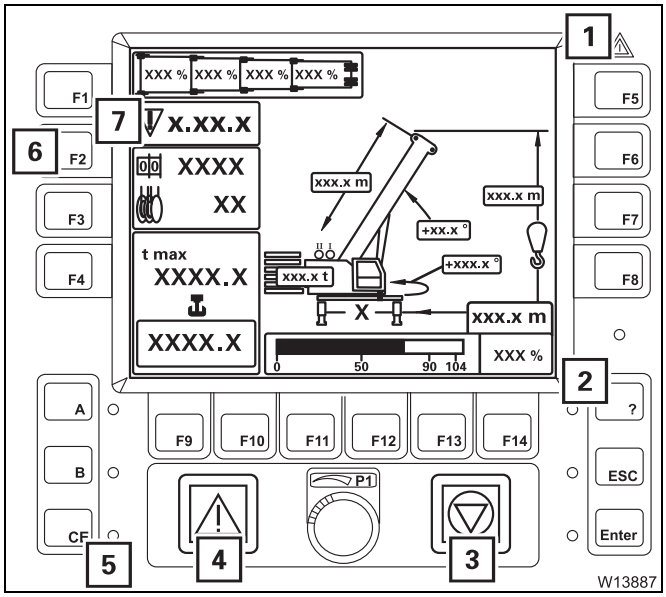
5 Warning symbol

You can have all existing error messages displayed by repeatedly pressing the button (**6**).



Try to remedy the error by turning off the ignition and turning it on again after about 15 seconds.

If the error is displayed again, check whether the error code is contained in the *Error codes* tables. This is where you will find information on how to remedy errors; ➠ p. 14 - 34.



Error message with shutdown
– All crane movements not required for the correction of the error are disabled.

– A continuous buzzer tone sounds.
After five seconds, you can switch off the buzzer tone using button (**5**).

– Lamps (**1**) and (**2**) light up.

– Lamps (**3**) and (**4**) light up.

Display (**7**) shows an error code and the error symbol flashes.

You can have all existing error messages displayed by repeatedly pressing the button (**6**).

Check whether the *Error codes* tables contain the error. This is where you will find information on how to remedy errors; ➠ p. 14 - 34.

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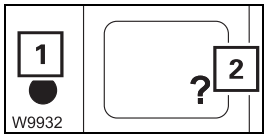
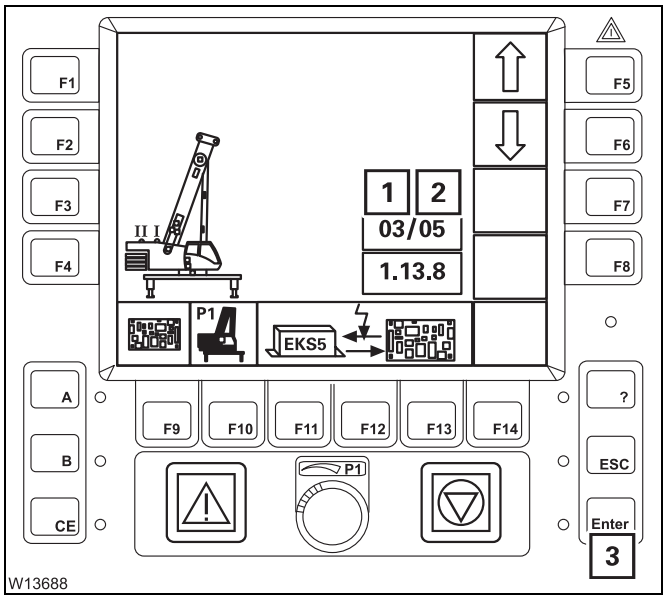
Displays in the Error submenu

- Stop all crane movements and bring both control levers into initial position.



- Press the button (**2**) once. The button is only active when the lamp (**1**) flashes or lights up.



This opens the *Errors* submenu.

Display (**2**) shows the error total, and display (**1**) shows which error is displayed.

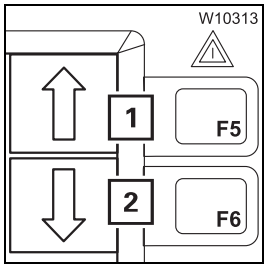
3/5, for example, means:
– Error **3** is shown
– A total of **5** errors are pending.

If the error shown is not acknowledged, the lamp next to the button (**3**) lights up.

Acknowledging the error

- Press the button (**3**) once.

The next, pending error is displayed and can be acknowledged.



- You can call up all current errors with the buttons (**1**) and (**2**).

  1 Display errors in ascending order

  2 Display errors in descending order

Every time you press the button, the next error will be displayed.
When you keep the button pressed, all errors are shown one after the other continuously.

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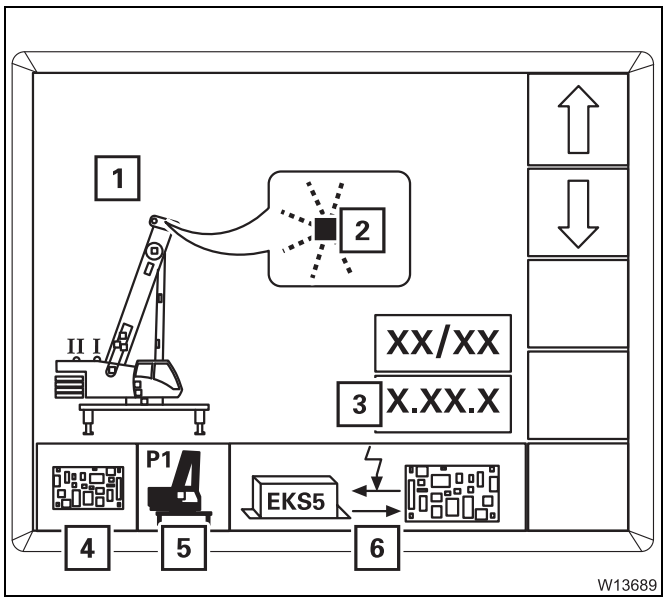

Error message display

For each error the display shows:

– The error code (**3**)

– the symbols for

4 the error group

5 the faulty component

6 the error type

– Possibly the error location (**1**) – the respective places (**2**) flash in red.

• Check whether the *Error codes* tables contain the error. This is where you will find information on how to remedy errors;
p. 14 - 34.

Exiting the submenu

You can exit the *Errors* submenu at any time.

• Press the button (**1**) once.

The same menu opens that was open before the *Error* submenu opened.

All errors remain saved until you switch off the ignition, even errors that have since been resolved. All existing errors are treated as new errors and displayed again after turning on the ignition.

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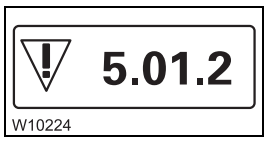
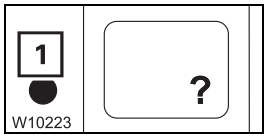
Table of error codes

The following table contains a number of error codes, their causes and possible remedies.



An error code consists, from left to right, of a one-digit number (e.g. **5**), a two-digit number (e.g. **01)** and a one-digit number (e.g. **2**).

- Check whether the table contains the displayed error code. If the information in the table does not help to resolve the error, note the error code(s) and contact **Manitowoc Crane Care.**



When all errors are remedied, the lamp in the button (**1**) goes out.

Error code			Cause	Solution
1	**01**	**1 - 7**	Error pressure sensor 1 Lower chamber	Switch off pressure sensor 1; ➠ p. 14 - 37
1	**01**	**8**	Pressure sensor 1 switched off	Have malfunction corrected
1	**02**	**1 - 7**	Error pressure sensor 2 Lower chamber	Switch off pressure sensor 2; ➠ p. 14 - 37
1	**02**	**8**	Pressure sensor 2 switched off	Have malfunction corrected
1	**03**	**1 - 7**	Error pressure sensor 3 Upper chamber	Switch off pressure sensor 3; ➠ p. 14 - 37
1	**03**	**8**	Pressure sensor 3 switched off	Have malfunction corrected
1	**04**	**1 - 7**	Error angle sensor 1, Main boom	Switch off pressure sensor 1; ➠ p. 14 - 37
1	**04**	**8**	Angle sensor 1 switched off	Have malfunction corrected
1	**05**	**1 - 7**	Error angle sensor 2, Main boom	Switch off pressure sensor 2; ➠ p. 14 - 37
1	**05**	**8**	Angle sensor 2 switched off	Have malfunction corrected
1	**13 to 18**	**1**	➠ *Lattice extension operating manual*	
1	**19 to 20**	**1 ... 8**	➠ *Lattice extension operating manual*	
1	**25 to 28**	**1, 2, 6**	➠ *Mega Wing Lift Operating Manual*	

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Error code			Cause	Solution
3	**03**	**3**	Comparison of telescoping diagram between crane control and RCL resulted in differences	Compare the actual telescoping status with the values on the *ECOS* display and, if necessary, re-enter the telescoping status. Accept the ECOS telescoping position data if an incorrect telescoping position is displayed on the RCL: 1. Press the F1 button once and the RCL shows the new values 2. Acknowledging the error
5	**01**	**1**	There is no capacity diagram available for the entered rigging mode	Re-enter the current rigging mode. If the error is displayed again, check whether the current rigging mode is permissible.
5	**01**	**2**	Main boom angle too small (not steep enough)	Raising the main boom
5	**01**	**3**	Main boom angle too large (too steep)	Lower the main boom
5	**02**	**4**	Lattice extension inclination is too small	Raise the lattice extension
5	**02**	**5**	Lattice extension inclination is too large	Lower the lattice extension
5	**02**	**6**	Current load greater than derricking load – *Lower lattice extension* movement is disabled	1. Raise the lattice extension 2. Press button CE once 3. If necessary, increase the working radius using the *Lower main boom* movement.
5	**04**	**4**	Maximum permissible slewing angle exceeded	Slew into a permissible working range.
5	**05**	**5**	Minimum load value not reached	When the main boom is set down, raise main boom and acknowledge the error. Notify **Manitowoc Crane Care** if the error cannot be acknowledged.
5	**06**	**6**	Mega Wing Lift Rope force too high	➠ *Mega Wing Lift Operating Manual*

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Error code			Cause	Solution
6	**02**	**1**	Fuse F1 blown	Replace blown fuse; ➠ p. 14 - 13.
6	**02**	**2**	Fuse F2 blown	
6	**02**	**3**	Fuse F3 blown	
6	**02**	**4**	Fuse F11 blown	
6	**02**	**5**	Fuse F12 blown	
6	**03**	**1**	RCL Control unit temperature too high	Improve ventilation
8	**01**	**1**	Rigging state not confirmed	➠ *Confirming the rigging mode*, p. 11 - 29.
8	**02**	**2**	RCL is overridden	Cancel override; ➠ p. 11 - 39.
8	**03**	**3**	Turntable unlocked with RCL code for working position *0°* or *180°*	Lock turntable
8	**14**	**1**	Maximum permissible overall height exceeded[1)]	Retract or lower.
8	**14**	**2**	Maximum permissible overall working radius exceeded[1)]	Retract or raise the main boom.
8	**14**	**3**	Maximum permissible overall slewing range exceeded[1)]	Slew into a permissible working range.
8	**14**	**4**	Shutdown range of a monitored object reached[1)]	Move into a permissible working range.
8	**15**	**1**	Data logger Storage card missing	Insert the storage card
8	**16**	**1**	➠ *Mega Wing Lift Operating Manual*	
8	**22**	**1**	➠ *Lattice extension operating manual*	

[1)] With working range limiter switched on

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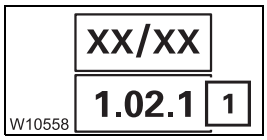
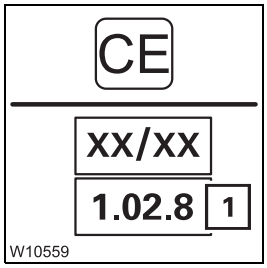
Switching off the sensor/ tachogenerator

For values measured twice, you can switch off the faulty sensor/tachogenerator in the case of an error and continue working with one sensor/tachogenerator for a short time.

Danger due to RCL failure
Have the error resolved before the next crane job.
This allows the crane to still be unrigged without RCL monitoring if the second sensor/tachogenerator fails.



- Call up the error (**1**) for the faulty sensor/tachogenerator in the *Errors* submenu, e.g. **1.02.1** for pressure sensor 2.



- Press button CE once.

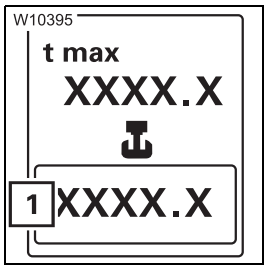
The faulty sensor/tachogenerator is switched off and the corresponding error (**1**) is displayed, e.g. **1.02.8** for pressure sensor 2.

When the ignition is switched on again, the shutdown is cancelled and the error occurs again, possibly with a different last digit, e.g. 1.02.5.

After switching off the faulty sensor/tachogenerator, you should check whether the other sensor/tachogenerator is functioning correctly.

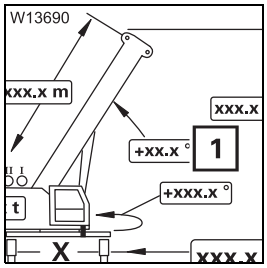
Risk of accident from faulty functioning!
After switching off the faulty sensor/tachogenerator, begin crane operation only if the display of the remaining sensor/tachogenerator is correct.
This prevents the RCL from not switching off when leaving the working range and the truck crane overturning as a result.

Checking the pressure sensor function



- Lift the hook block without a load.
- Check that the display (**1**) indicates the approximate weight of the hook block.

Checking the angle sensor function



- Set down the main boom on the boom rest.
- Check whether the display (**1**) shows an angle of 0°.

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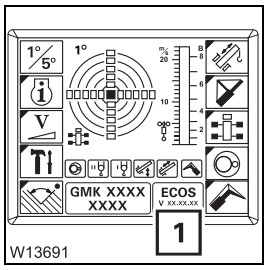
14.4.14 ECOS malfunctions

This section contains general malfunctions and malfunctions that generate an “error“ display.

ECOS programme version

Always note down the number of the program version before notifying **Manitowoc Crane Care** in the event of a malfunction.



- If necessary, open the main menu Esc.

The display (**1**) shows the number of the current programme version.

General malfunctions

The following table contains information on troubleshooting and possible solutions.

Malfunction	Cause	Solution
The *ECOS* display remains dark although the ignition is switched on	Fuse F 1/1, F 1/2, F 1/3 or F 1/4 blown.	Replace blown fuses; ➠ p. 14 - 6
	Fuse F 2/1, F 2/2, F 2/3 or F 2/4 blown.	
	Fuse F 3/1, F 3/2, F 3/3 or F 3/4 blown.	
	Fuse F 4/1, F 4/2, F 4/3 or F 4/4 blown.	

Other malfunctions on the ECOS generate corresponding error messages.

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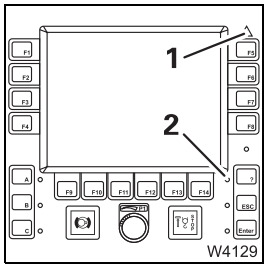
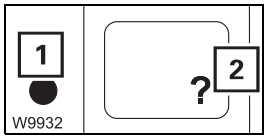
Error messages

If ECOS detects an error, an error message is shown:

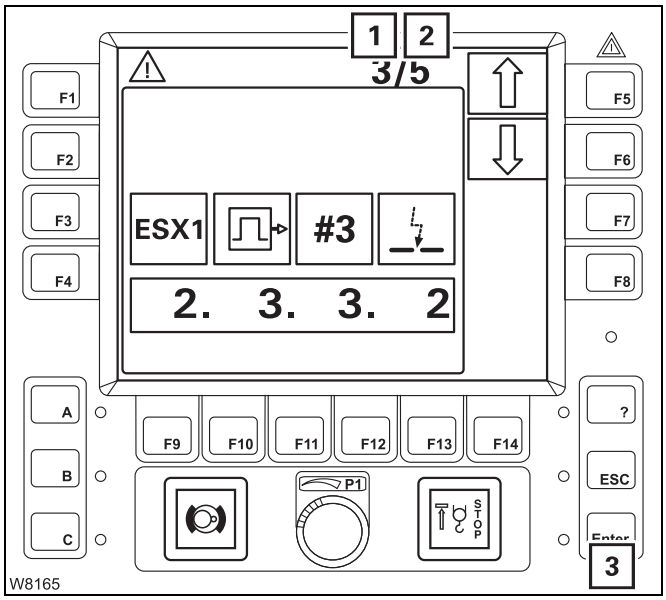


The lamps (**1**) and (**2**) are flashing.

Open the *Errors* submenu for more information.



- Press the button (**2**) once. The button is only active when the lamp (**1**) flashes or lights up.



This opens the *Errors* submenu.

Display (**2**) shows the error total, and display (**1**) shows which error is displayed.

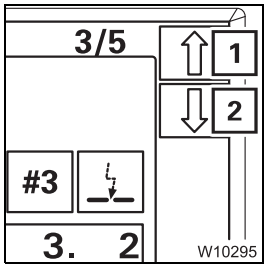
3/5, for example, means:
– Error **3** is shown
– A total of **5** errors are pending.

If the error shown is not acknowledged, the lamp next to the button (**3**) lights up.

Acknowledging the error

- Press the button (**3**) once.

If there are further errors, the next error is displayed and can be acknowledged.



- When all errors have been acknowledged, you can retrieve any pending errors using the buttons next to the symbols (**1**) and (**2**).

  1 Next error

  2 Previous error

Every time you press the button, the next error will be displayed.
When you keep the button pressed, all errors are shown one after the other continuously.

If not all errors have been acknowledged, the buttons 8 and 9 have no function – the symbols are grey.

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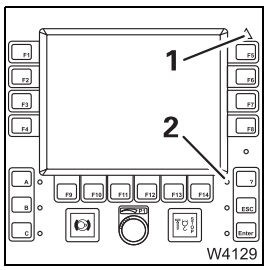
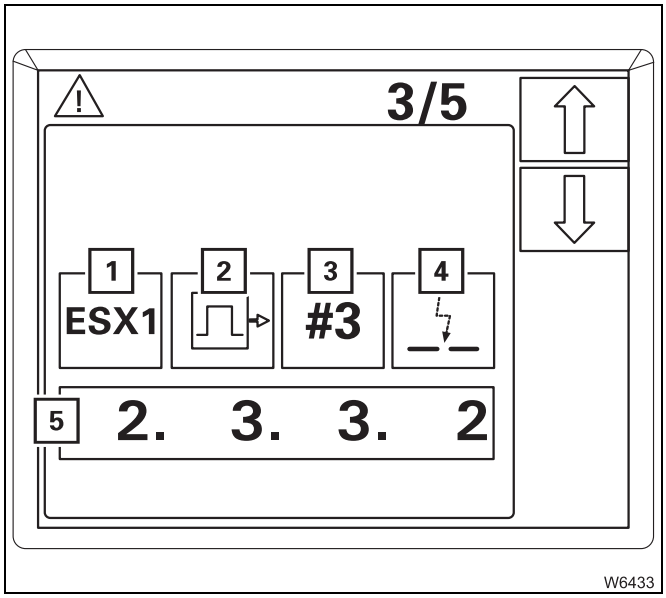


When all error messages have been acknowledged, the displays change:

Lamps (**1**) and (**2**) light up.

Both displays start to flash again as soon as a new error occurs.



Error message display

Each error is defined by an error code (**5**) and the symbols (**1**) to (**4**).

The symbols stand for:

1 the faulty device

2 the error group

3 the index within the group

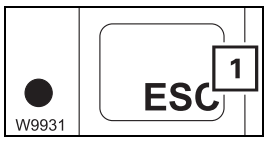
4 the error type

The error code (**5**) consists of 4 digits, e.g. **2332**.

- Always note the error code before contacting **Manitowoc Crane Care**.

Exiting the submenu

You can exit the *Errors* submenu at any time.



- Press the button (**1**) once.

The same menu opens that was open before the *Error* submenu opened.

All errors remain saved until you switch off the ignition, even errors that have since been resolved. All existing errors are treated as new errors and displayed again after turning on the ignition.

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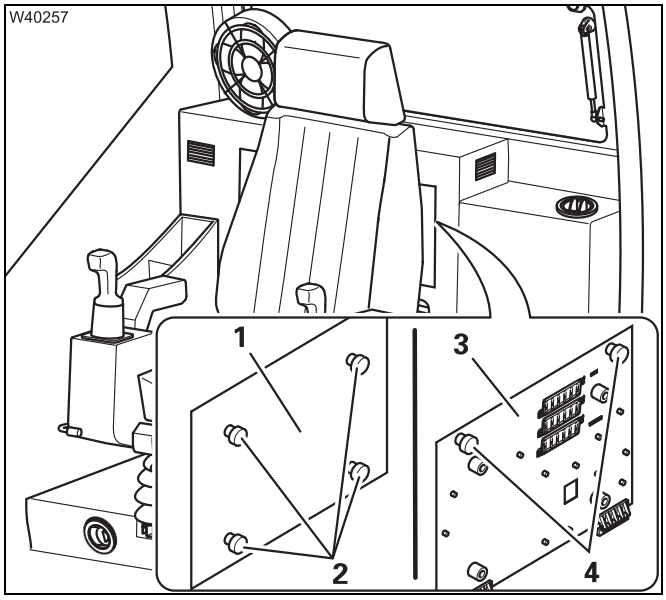
14.4.15 Malfunctions on CraneSTAR system

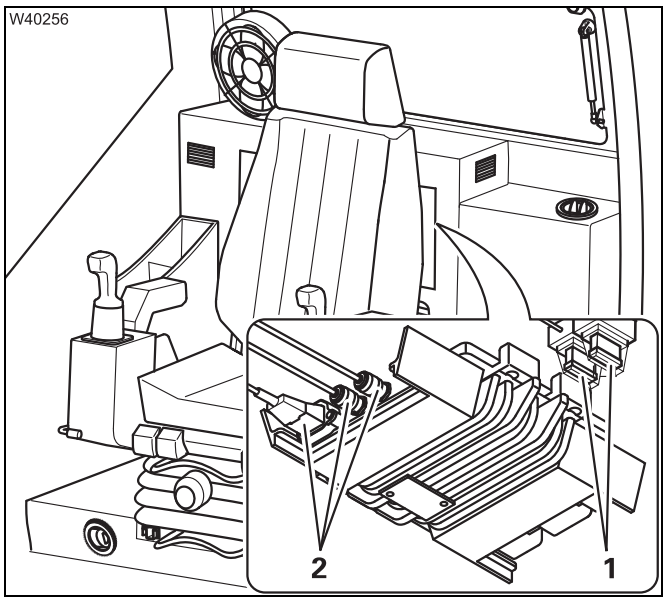
If an error is present then check the fuses and antenna plug on the *TCU* control unit.

Risk of damage if procedure is incorrect!
Observe the following notes to avoid malfunctions and damage.
– Switch off the ignition whenever a fuse has to be replaced.
– Replace blown fuses only with new fuses of the same amperage.



Fuses

- Loosen the bolts (**2**) and remove the cover (**1**).
- Check the associated fuse on the plate (**3**) and replace it if necessary: *Fuses in the crane cab*, p. 14 - 8.
- Loosen the screws (**4**) and fold down the plate (**3**) to the front.



- Check the fuses (**1**) and replace them if necessary.

Designation	Amperage
F3401	5 A
F3402	5 A

Antenna plugs

- Check whether the plugs (**2**) are plugged in:

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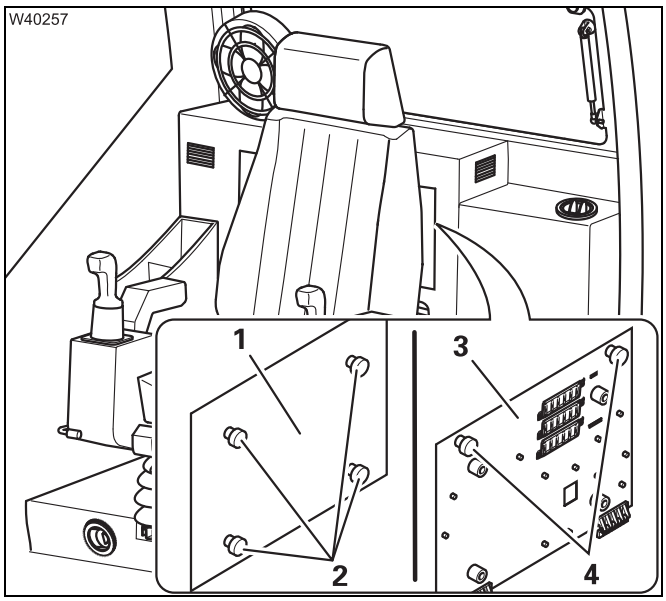

After troubleshooting

- Fold the plate (**3**) up and secure it with the screws (**4**).
- Fasten the cover (**1**) using the bolts (**2**).

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14.5 Emergency operations and programs

This section contains all the information about possible emergency operations and emergency programs. The following are available:

– Mechanical emergency operation for retracting the main boom; ➠ p. 14 - 44

– *Telescoping emergency program* submenu; ➠ p. 14 - 47

– Entering of the telescope status after an emergency operation; ➠ p. 14 - 57

– Operation of the power units with the hand-held control; ➠ p. 14 - 59.

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14.5.1 Emergency operation for retraction of the telescoping

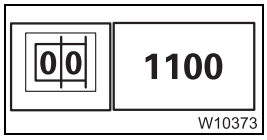
If you can no longer lock and unlock the telescopic sections from within the crane cab because of a malfunction, you can do so manually by performing mechanical emergency activation.

In this case you need one or two auxiliary cranes.
In the worst case, emergency operation must be performed by properly qualified personnel, because incorrect operation poses the risk of injury and damage to the main boom.

Always check the following option first:

Prior to the emergency operation, check

Check first whether the main boom is allowed to be lowered into the horizontal position with the current telescoping status and current rigging mode of the truck crane. Proceed as follows:



Enter the current rigging mode on the RCL. The corresponding RCL code according to the *Lifting capacity table* must be displayed.

- Lower the main boom.

– **If the RCL allows the boom to be lowered into a horizontal position**
You can reach the locking points with a ladder and need only one auxiliary crane to telescope the unlocked telescopic sections.

– **If the RCL is deactivated prior to reaching the horizontal position**
In order to reach the locking points, you need an auxiliary crane with licensed passenger transportation and a second auxiliary crane to secure and telescope the unlocked telescopic sections.

If it is possible to lower but there is not sufficient space, you can check whether the truck crane can be driven in the current rigging mode;
p. 13 - 3.

Procedure

The best suitable retracting procedures in your particular case depend on the conditions on site and on the crane functions that are still available.

Select the procedure best suited to your particular case and consult **Manitowoc Crane Care.**

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Mechanical emergency operation

The following requirements must be met before unlocking manually:

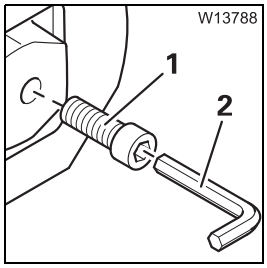
– The main boom must be lowered to the horizontal position so that the telescopic section cannot retract by itself.

or

– The telescopic section to be unlocked is secured against retracting by itself by using an auxiliary crane. Telescoping is done with the auxiliary crane.

Risk of accidents due to sudden retraction of a telescopic section!
Before unlocking the telescopic section, secure it against automatic retraction. This prevents the retracting telescopic section severing one of your limbs or the truck crane being damaged or overturned by the telescopic section suddenly retracting.

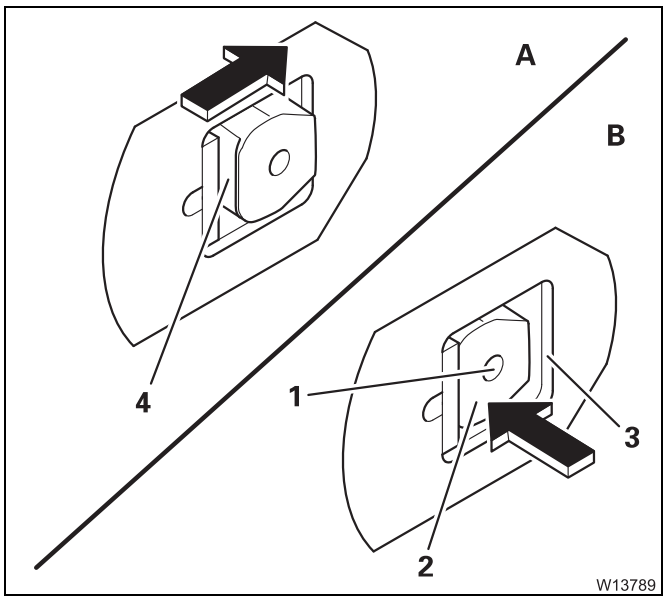
If the telescoping cylinder is positioned at a locking point, the corresponding telescopic section cannot be locked or unlocked manually.



Each telescopic section has two M 16 bolts (**1**) – Length 100 mm (3.9 in).

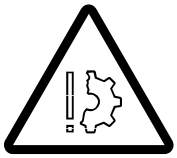
– To unlock, the screws are screwed in.
– To lock, the screws are screwed out.

To do this, you need a suitable socket wrench (**2**) 14 mm, approx. 350 mm (14 in) long.

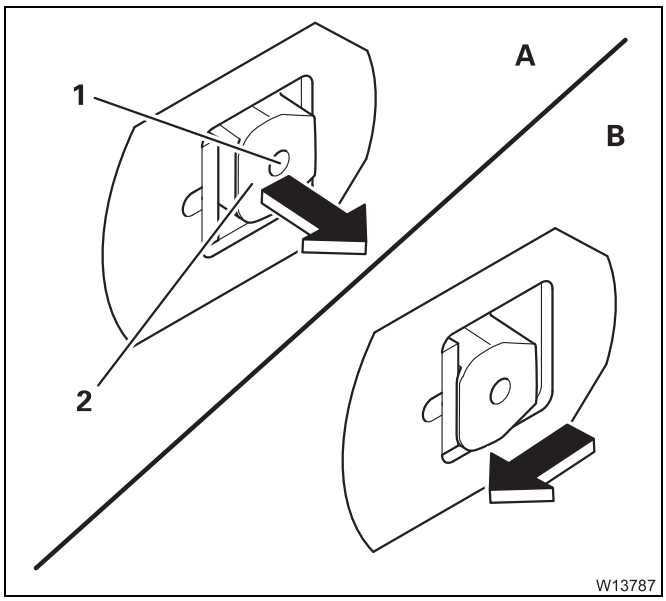


Releasing the lock

- (**A**) – Extend about 25 mm (0.08 ft), so that the cutout (**4**) is accessible.
- (**B**) – Screw a bolt into the bore (**1**). The locking pins (**2**) must retract behind the telescopic section (**3**).
  If necessary, give the locking pin (**2**) a slight knock to help this procedure.
- Unlock the other side of the telescopic section as well.



Risk of damage due to a mechanically released lock!
Under no circumstances may you operate the telescoping cylinder if the lock is mechanically released. Screw all set screws out of the bore holes immediately after finishing the repair work.
This prevents damage to the telescoping cylinder and the locking system.



Locking the telescopic section

- (**A**) – Retract the telescoping until the locking pin (**2**) is in the middle of the opening.
- Remove the bolt from the bore hole (**1**) until the locking pin is extended completely.
- Remove the bolt from the bore hole.
- (**B**) – Retract the telescoping further until the telescopic section is set down.
- Also lock the telescopic section on the other side.

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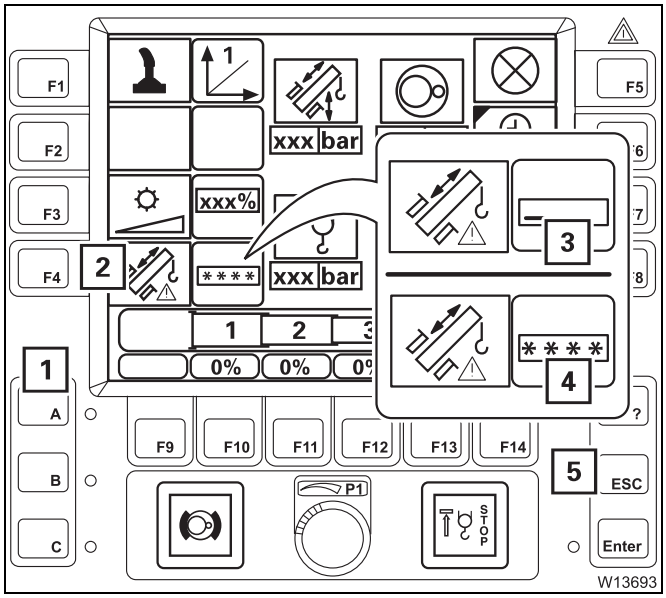
14.5.2 Telescoping emergency program

In the event of a malfunction in the telescoping mechanism, you can retract the main boom with the *Telescoping* emergency programme.
The emergency program is not intended for crane operation and is therefore restricted to a certain amount of time.

Starting the emergency program

Only start the emergency program when the symbol is displayed;
➠ *Telescoping mechanism error messages*, p. 14 - 22.



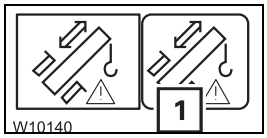
- Press the right dead man's switch.
- Also press button (**2**) once – symbol (**3**) appears.
- Press the buttons (**1**) in the following order:

B A B C

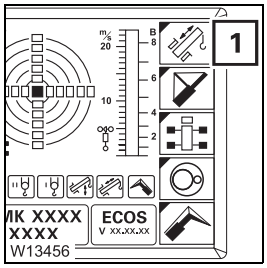
The symbols (**4**) confirm the entry.

If your input was incorrect, all symbols (**4**) go out and you need to re-enter.

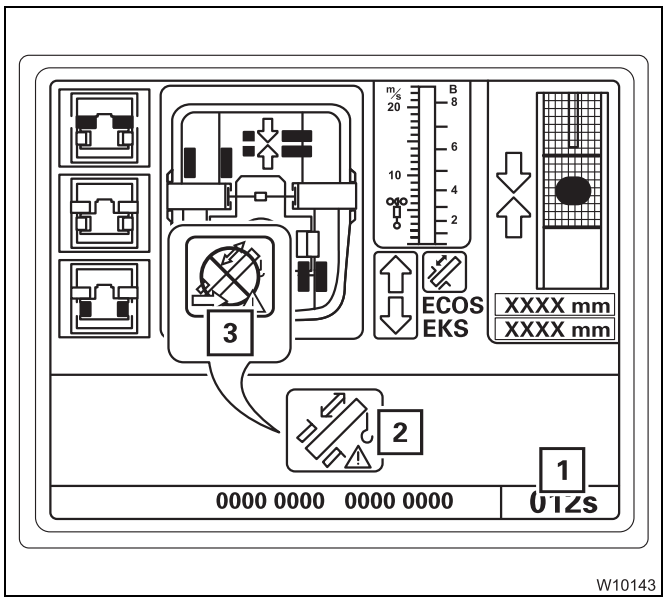
You can cancel the entry at any time using button (**5**).



After correct input, the symbol (**1**) is displayed – the emergency programme *Telescoping* starts.



- Open the main menu Esc and press the button (**1**) once.
  The *Telescoping* submenu opens.



The emergency program is active if:

– The symbol (**2**) is displayed

– The display (**1**) is shown for approx. 360 seconds.

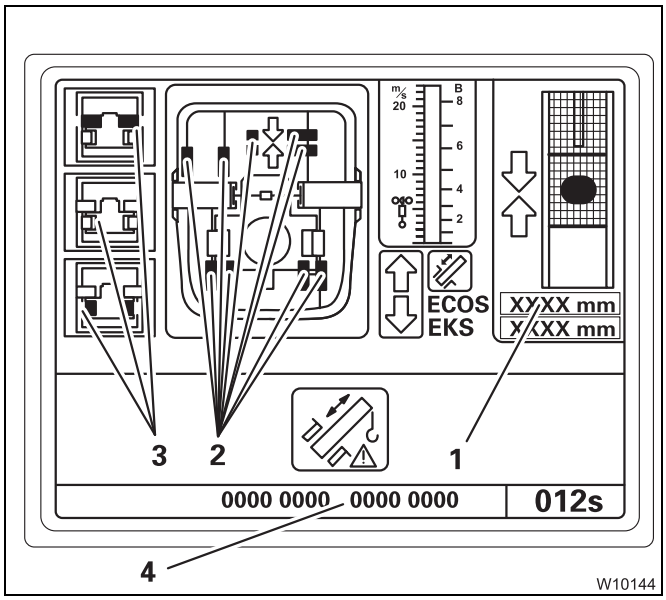
Within this time, you can operate the telescoping mechanism using the emergency program.

After this time has elapsed, the symbol (**3**) appears and you need to restart the emergency programme.

Determining the error type

- Check which emergency program procedure is suitable for the current error:

Risk of damage to the telescoping mechanism!
Ensure that you always have an overview of the current status of the telescoping mechanism before you initiate locking or unlocking.
In emergency mode, there is no monitoring of prerequisites – the function is performed **immediately** after pressing the button.



– If the display (**1**) shows no value, there is an error on the length indicator.

– If a symbol (**2**) is violet, there is an error on the proximity switch.

The buttons next to the symbols (**3**) are active. After pressing the button, locking or unlocking is performed **immediately**.

- Note the error code (**4**) first if you intend to contact **Manitowoc Crane Care** before executing the emergency program.

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Risk of damage to the main boom!
Never telescope the main boom if at the same time there is an error at both the length indicator and the proximity switch.
It would then not be possible for you to monitor operations, and components in the main boom could be damaged, or a situation could arise in which the main boom can no longer be extended or retracted.

In the *Telescoping* emergency programme, all functions for retracting the main boom remain enabled as long as there are no other errors (hydraulic or mechanical).

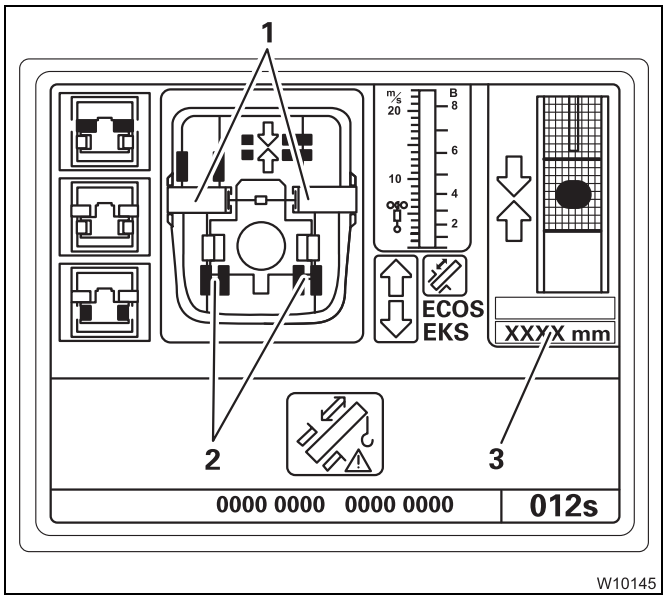
The speed is restricted to about 30% of the maximum speed.

– When an error occurs on the proximity switch; ➠ p. 14 - 53.

– If there is an error on the length indicator; ➠ next section.

In the case of an error at the length indicator

First register the current status of the telescoping mechanism.



- Check the positions of the locking pins as usual, i.e. on the displays (**1**) and (**2**)
- Check that the display (**3**) shows the RCL measured value for the extended length of the telescoping cylinder.
- Check the telescoping on the RCL.

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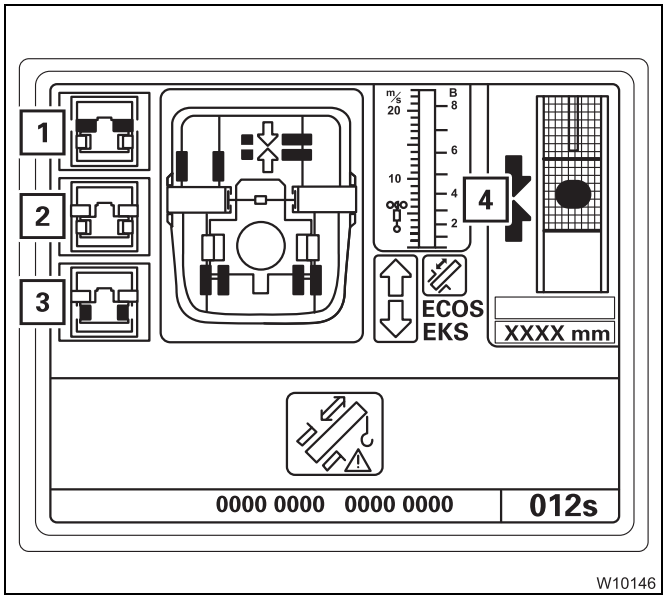
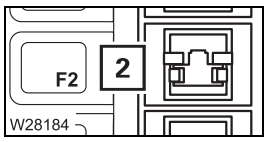
Checks before telescoping

- Before telescoping, check that the following conditions are met:

Risk of accidents from sudden retraction of a telescopic section!
Press the button for unlocking the telescopic section **not more than twice**. If this does not start the unlocking procedure, contact **Manitowoc Crane Care.**

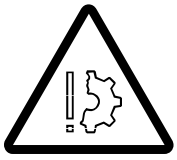


– The telescoping cylinder is locked, symbol (**3**) is **grey**.
– The telescopic section is unlocked (**press not more than twice**), symbol (**1**) is **yellow**.
– Locking is not selected, symbol (**2**) is **grey**.
– The telescoping cylinder is at the locking point, the arrows (**4**) are green.



Retracting and locking a telescopic section

During telescoping you may **not** select Lock. Under **no** circumstances should you press the button (**2**).



Risk of damage to the main boom!
If you select Lock during telescoping, the locking pins on the telescopic section are slid out immediately and they can damage or tear the electrical or hydraulic components in the main boom.

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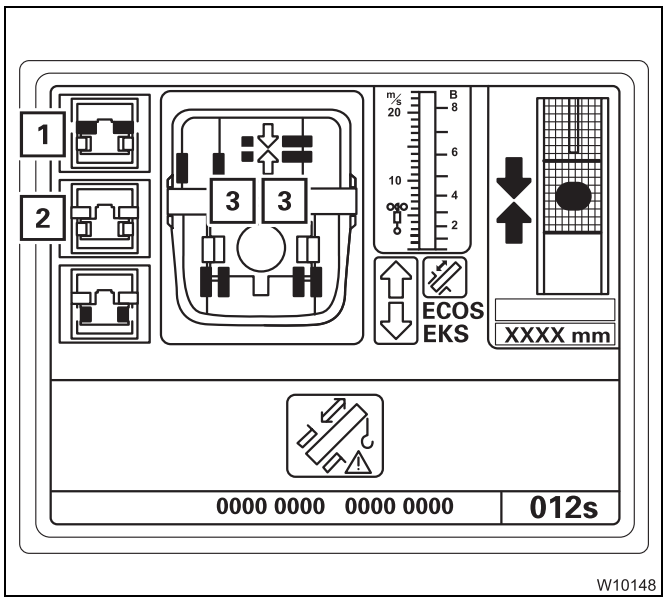


- Retract the telescopic section slowly and as far as possible.
- Press the button (**2**) once.
- Extend to about 25 mm (0.08 ft).

The telescopic section is now locked.

In *Locked* position:

– the locking pins (**3**) are **green**,

– the symbol (**1**) is **grey**,

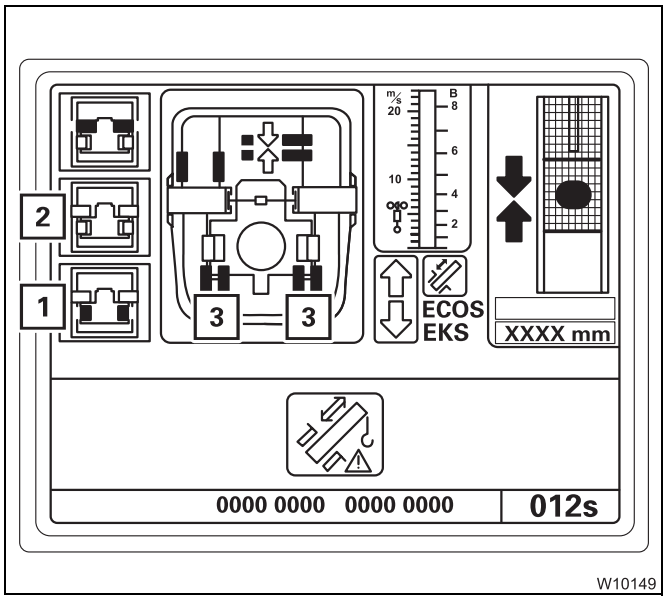
– the symbol (**2**) is **yellow**.

- Set down the telescopic section, retracting it as far as it will go.

Unlocking the telescoping cylinder

If the telescopic section is locked, you can now unlock the telescoping cylinder.

Risk of accidents from sudden retraction of a telescopic section!
Press the button for unlocking the telescopic section **not more than twice**. If this does not start the unlocking procedure, contact **Manitowoc Crane Care**.



- Press the button (**1**) once (**at the most twice**).

The telescoping cylinder is now unlocked.
In *Unlocked* position:

– The locking pins (**3**) are **red**

– Symbol (**1**) is **yellow**

– Symbol (**2**) is **grey**.

You can now move the telescoping cylinder into the next telescopic section.

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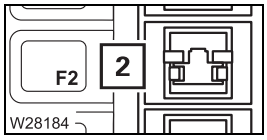
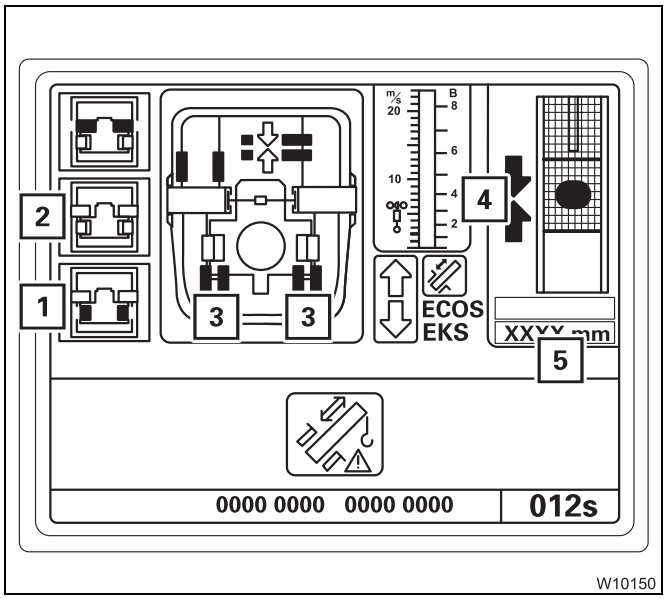


Extending and locking the telescoping cylinder

You may **not** select Lock while the telescoping cylinder is retracting or extending. Under **no** circumstances should you press the button (**2**).

Risk of damage to the main boom!
If you select Lock while the telescoping cylinder is moving, the locking pins on the telescopic section are slid out immediately and they can damage or tear the electrical or hydraulic components in the main boom.

- Slowly move the telescoping cylinder into the next extended telescopic section.



At the locking point:

– the arrows (**4**) are green,

– the display (**5**) shows the length for the current locking point; ➠ p. 14 - 55.

- Press the button (**2**) once.

The telescoping cylinder is now locked.
In *Locked* position:

– the locking pins (**3**) are **green**,

– the symbol (**1**) is **grey**,

– the symbol (**2**) is **yellow**.

- You can now retract this telescopic section; ➠ p. 14 - 50.

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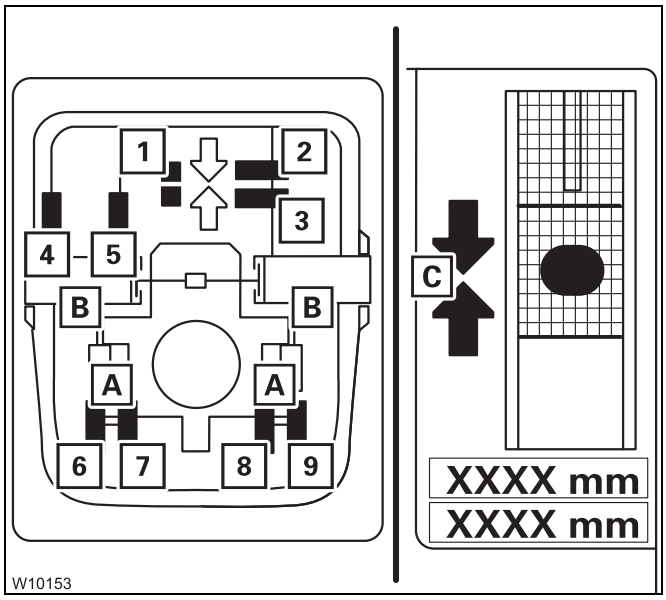
If there is an error at a proximity switch

Faulty proximity switches are shown in violet.
The displays (**A**), (**B**) and (**C**) only show the current positions when **all** the corresponding proximity switches are free of error.



Several proximity switches are related to the displays (**A**), (**B**) and (**C**).

For **A**: Proximity switches (**6**) to (**9**)

For **B**: Proximity switches (**4**) and (**5**)

For **C**: Proximity switches (**1**) to (**3**)

When a proximity switch is faulty (violet), then

– the corresponding locking pins on the displays (**A**) and (**B**) are always yellow.

– the corresponding arrows are not shown on the display (**C**).

When an error occurs, you can determine the current position more precisely based on the other, fault-free proximity switches. The proximity switches show the following positions:

– Display (C) – Telescoping cylinder at the locking point

1 At the locking point

2 Behind the locking point

3 In front of the locking point

– Display (B) – Telescopic section locked

4 Locked

5 Unlocked

– Display (A) – Telescoping cylinder locked

6 Locked left

7 Unlocked left

8 Unlocked right

9 Locked right

For fault-free proximity switches, the following applies:

– **Green:** Position reached

– **Red:** Position not reached

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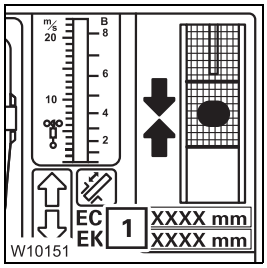


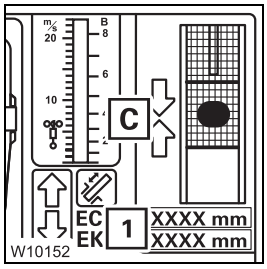
Required checks

When the *Locked* position can no longer be shown, always conduct the following checks before unlocking:

• Carefully retract and extend the telescoping cylinder or telescopic section. In the *Locked* position, the length shown on the displays (**1**) should vary only slightly, i.e. by the play of the locking pins.

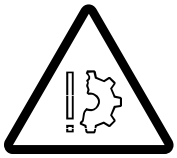
Retraction

The steps for retracting are the same when an error occurs on the proximity switch as for an error on the length indicator.



– When the display (C) fails

- Calculate the telescoping cylinder length for the locking point; ➠ *Tables for approaching the locking points*, p. 14 - 55.
- Move the telescoping cylinder to the required length – display (**1**).



Risk of damage if the length specifications are not observed!
Extend the telescoping cylinder (without telescopic section) only to the specified length.
This prevents the piston rod from becoming damaged if the telescoping cylinder slides out of the telescopic section.

Terminating the emergency program

The emergency programme is terminated:

– if the displayed time has expired, or

– when the ignition is turned off.

The current telescoping status does not correspond to the telescoping status last saved by ECOS if the *Telescoping* emergency programme was open. You must enter the current telescoping after terminating the emergency program; ➠ *Entering the current telescoping*, p. 14 - 57.

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Tables for approaching the locking points

The extent to which the telescoping cylinder has to be extended in order to reach a locking point depends on whether you want to lock:

– the telescoping cylinder or

– a telescopic section.

The following table shows the extended length for locking the telescoping cylinder.

Telescopic section	Locking point at fixed length in %	Extended length of the telescoping cylinder in mm	(in ft)
Telescopic section I	0	0	(0)
	44	4,825	(15.83)
	88	9,650	(31.66)
	100	10,975	(36.01)
Telescopic section II	0	565	(1.85)
	44	5,390	(17.68)
	88	10,215	(33.52)
	100	11,590	(38.02)
Telescopic section III	0	1,080	(3.54)
	44	5,905	(19.37)
	88	10,730	(35.20)
	100	12,155	(39.88)
Telescopic section IV	0	1,565	(5.13)
	44	6,390	(20.96)
	88	11,215	(36.79)
	100	12,465	(40.90)

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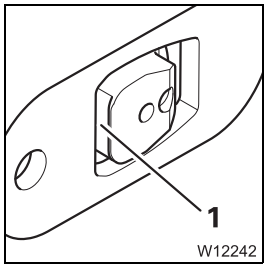

Locking points for the telescopic sections

The telescopic section must not be set down for locking or unlocking.

The cutout (**1**) must be clear. That is why you have to extend the telescoping cylinder 25 mm (0.08 ft) further than with a return run.

The following table shows the extended length for locking and unlocking the telescopic sections.

Telescopic section	Locking point at fixed length	Extended length of the telescoping cylinder	
	in %	in mm	(in ft)
Telescopic section I	0	0	(0)
	44	4,850	(15.91)
	88	9,675	(31.74)
	100	11,000	(36.09)
Telescopic section II	0	590	(1.93)
	44	5,415	(17.76)
	88	10,240	(33.60)
	100	11,615	(38.10)
Telescopic section III	0	1,105	(3.62)
	44	5,930	(19.45)
	88	10,755	(35.28)
	100	12,180	(39.96)
Telescopic section IV	0	1,590	(5.21)
	44	6,415	(21.04)
	88	11,240	(36.87)
	100	12,490	(40.98)

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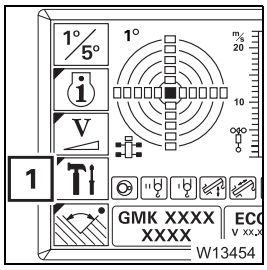
14.5.3 Entering the current telescoping

ECOS no longer displays the current telescoping:

– if you telescoped in emergency mode, or

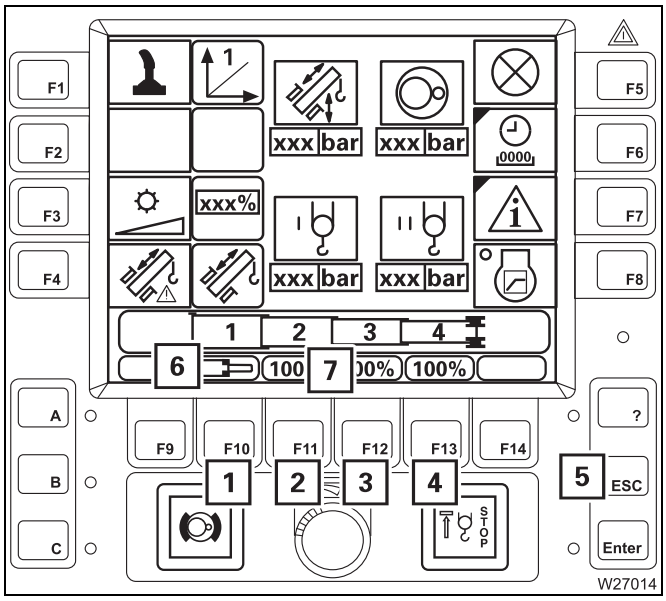
– if the power supply was interrupted in the course of saving data.

In these cases, you must enter the current telescoping, e.g. the values from the RCL display.



• If necessary, open the main menu Esc and press the button (**1**) once.

This opens the *Settings* submenu.



Entering target values

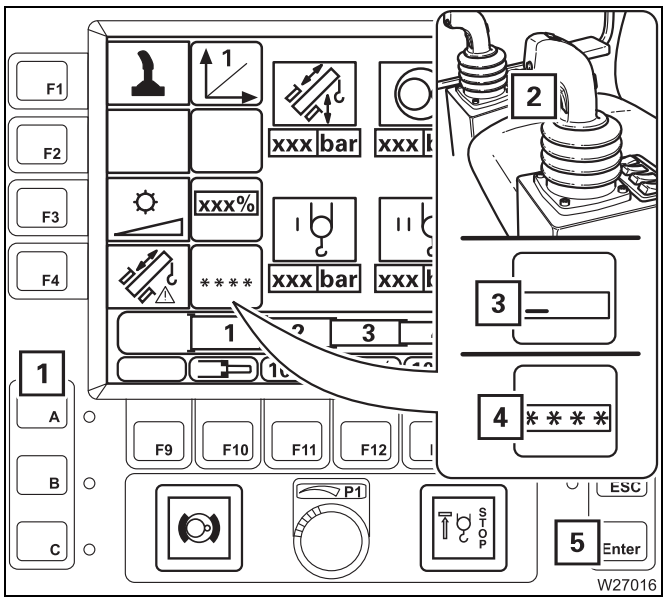
The display (**7**) shows the values for telescopic sections I to IV.

• Press one of the buttons (**1**) to (**4**) – the values in the display (**7**) turn yellow.

Each time you press a button, the corresponding value in the display (**7**) switches continuously between the fixed lengths and the symbol (**6**) for *Unlocked*.

• Enter the desired set values for all telescopic sections, e.g. unlocked, 100%, 100%, 100%, 100%.

You can cancel the entry at any time using button (**5**).



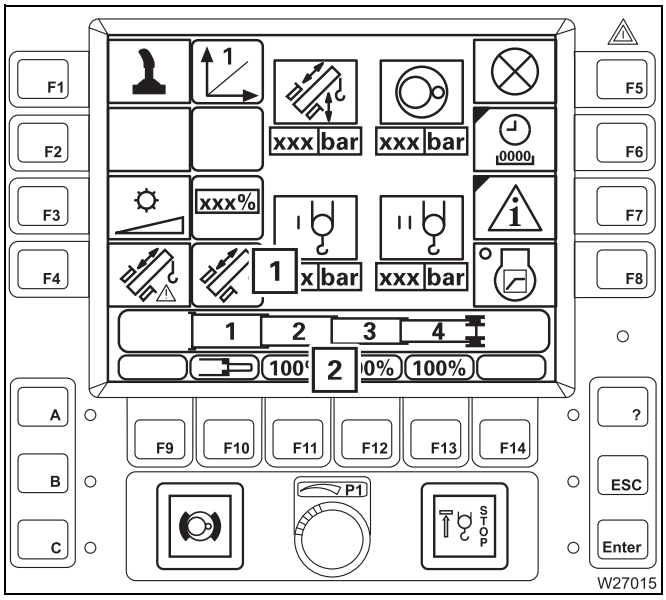
Applying values

- Press the left dead man's switch (**2**).
- Also press button (**5**) once – symbol (**3**) appears.
- Press the buttons (**1**) in the following order:

A	B	A	C

The symbols (**4**) confirm the entry.

If your input was incorrect, all the symbols (**4**) go out and you need to repeat the input.



If the set values entered are not **permissible**, the values on the display (**2**) turn **red**.

If the set values entered are **permissible**, the values on the display (**2) turn green**.

The display (**1)** shows the symbol for the current status.

Risk of damage due to incorrect input!
Before working with the crane, check whether ECOS indicates the current telescoping and correct if this is not the case.
Entering incorrect values causes malfunctions and may result in damage to the telescoping mechanism.

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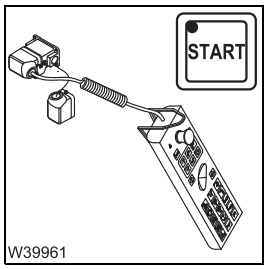
14.5.4 Emergency operation with the hand-held control

If the power units no longer respond to the operating elements in the crane cab, you can operate the power units with the hand-held control.

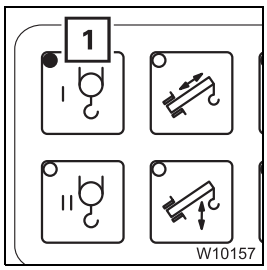
Operating them with the hand-held control is intended for emergencies only and for bringing the truck crane into a safe state or to shut it down.

Danger of overturning due to deactivated monitoring function!
The **RCL is switched off** and the crane operations are not monitored when operating with the hand-held control. If you move into a critical range, the truck crane will overturn.

Proceed as follows for emergency operation:



- Connect the hand-held control; ➠ p. 12 - 17.
- Start the engine; ➠ p. 10 - 19.



- Select the required drive unit, e.g. the main hoist. Press the button (**1**) once.

  When the function is enabled, the lamp in the button lights up.

With the telescoping mechanism, teleautomation with the target 0/0/0/0 is always selected at the same time – fully retract.
The extension function is disabled in emergency mode.

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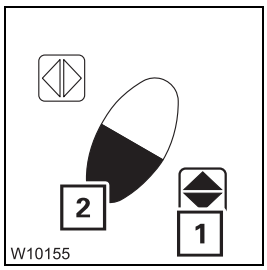
Operating a power unit

All the safety instructions contained in the sections on the individual power units also apply to operation with the hand-held control.

Danger of overturning when moving into the shutdown ranges!
Avoid lowering the boom. If you cannot avoid lowering, try to set down the load beforehand and ensure that the maximum permissible working radius is not exceeded for the rigging mode as specified in the *Tragfähigkeitstabelle*.
Before slewing, always check that this is permissible in the current rigging mode; ➠ *Slewing with a rigged counterweight*, p. 12 - 71.

Risk of accidents when operating the slewing gear!
Set down in the crane cab to operate the slewing gear. This prevents you being pushed off the carrier or being crushed by the carrier as a result of slewing.
Lay the connecting cable of the hand-held control so that it will not catch on anything.



- Press the required function buttons one after the other, e.g. for *Lift main hoist*, press function button (**1**) first, and then also button (**2**).

The further you press button (**2**), the quicker the movement. The maximum speed is limited to about 50% for all power units.

The following table shows the key combinations required for all crane operations.

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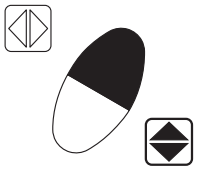
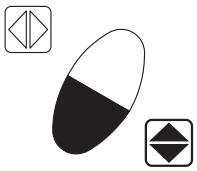
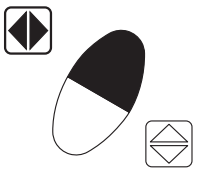
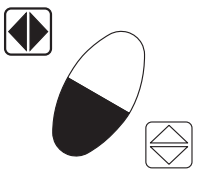
Button combination	telescoping mechanism	Derricking gear	Slewing gear/ Turntable locking	Hoists
 W3851	None[1)]	Lowering the boom	Locking the superstructure	Lowering
 W3850	Retraction	Raising the boom	Unlocking the superstructure	Lifting
 W3849	None	None	Slew to the right	None
 W3848	None	None	Slew to the left	None

[1)] The telescoping cylinder is extended after it has been unlocked.

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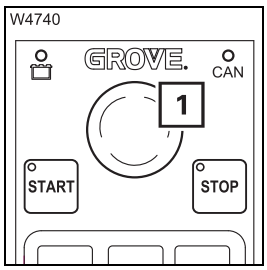
Stopping movements

The movement continues until you let go of the function button or the end position is reached.

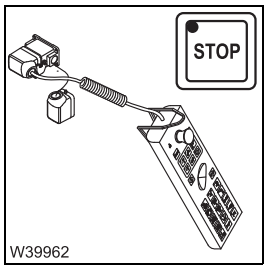
Stopping movements in emergencies



If the motion does not stop after releasing the Function button, you can stop the motion with the *Emergency stop switch* (**1**); ➠ p. 10 - 22.

Switch off the engine

You can switch off the engine only by using the hand-held control.
In this case it is not possible to switch the engine off via the ignition lock.



- Stop all crane movements.
- Press the button – the engine will switch off.

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14.6 Hydraulic emergency operation

With this additional equipment, the truck crane is equipped with an hydraulic emergency bleed valve in accordance with DGUV. This allows small loads to be transported in case of emergency, e.g. in the event of an engine failure.

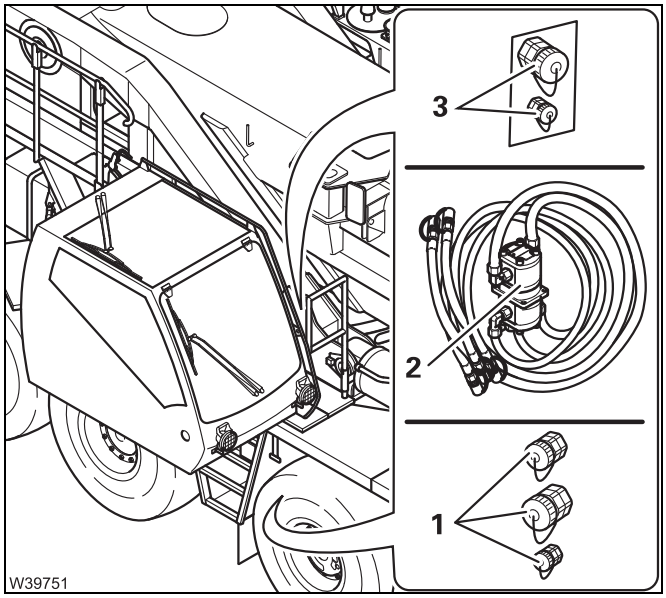
Risk of accidents due to improper use!
Use hydraulic emergency operation only to transport small loads in emergencies. Have the malfunction rectified as soon as possible. Crane operation in hydraulic emergency operation is prohibited since it is not monitored by the RCL.

14.6.1 Operating principle

The hydraulic emergency operation DGUV enables:

– **Emergency operation** of the main hoist, derricking gear, and slewing gear

– **Emergency supply** of another truck crane that also has a hydraulic emergency operation DGUV.



Emergency operation

For emergency operation, you also need a hydraulic transformer (**2**).

– One side of the transformer is powered by the carrier's hydraulic system, for example, and connected to connections (**1**) for this purpose.

– The other side of the transformer is connected to the connections (**3**) and pumps the oil of the superstructure's hydraulic system.

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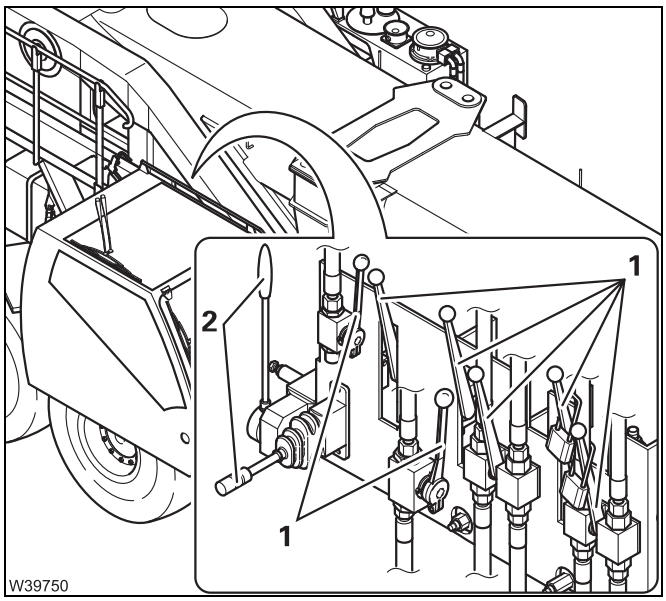
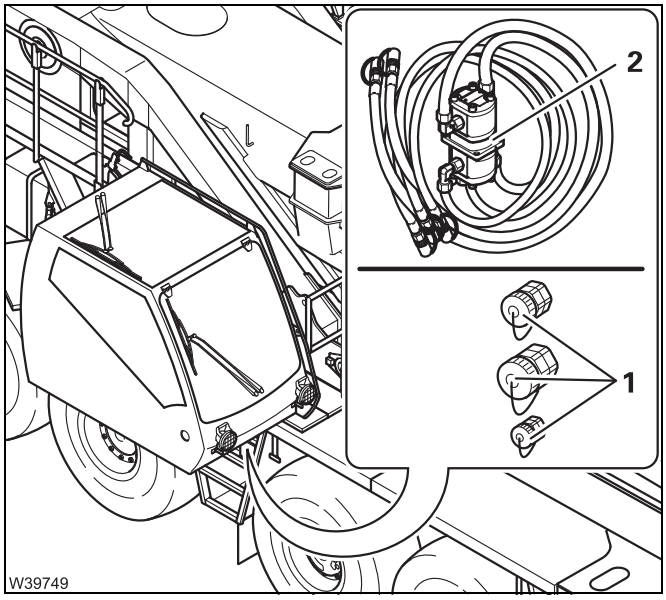


The hydraulic circuits are switched via the valves (**1**).

The control levers (**2**) are used to control the direction of movement and the speed.



Emergency supply

With an emergency supply, the connections (**1**) feed a transformer (**2**) which is connected to the hydraulic system of another crane; ➠ *Emergency supply of another crane*, p. 14 - 74.

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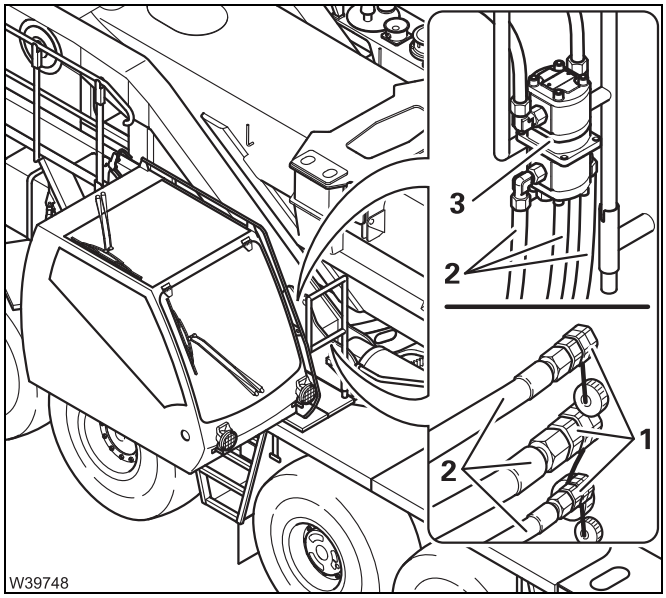
14.6.2 Connecting/disconnecting hoses

- Turn off the engine for driving and for crane operation.

Establishing connections

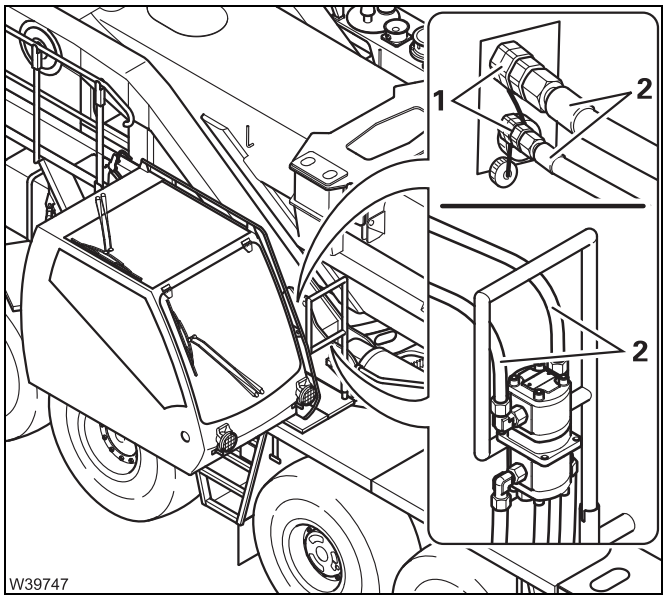
The hoses are assigned according to the various diameters.



On the carrier

- Attach the transformer (**3**) to the superstructure.
- Connect the hoses (**2**) to the ports (**1**).

Risk of damage to the hoses!
Lay the hoses in such a manner that they can be moved freely, so as to prevent them being crushed or torn or becoming caught during subsequent crane movements.



On the superstructure

- Connect the hoses (**2**) to the ports (**1**).

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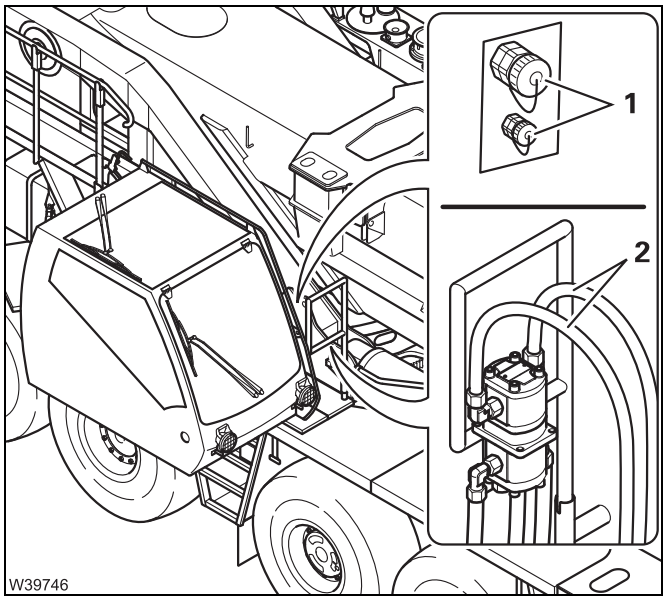
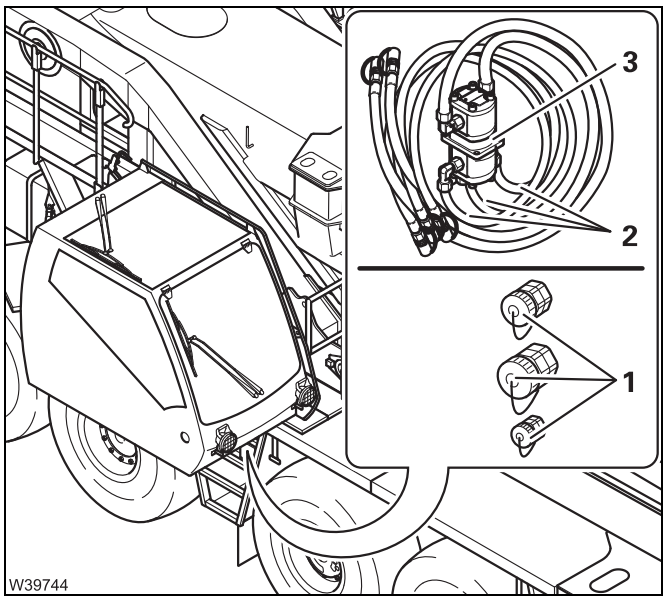
Disconnecting connections

After the emergency operation, you must disconnect the hoses and the transformer.



On the superstructure

- Remove the hoses (**2**) from the ports (**1**).
- Close off the hoses and connections with the caps.



On the carrier

- Remove the hoses (**2**) from the ports (**1**).
- Close off the hoses and connections with the caps.
- Remove the transformer (**3**).

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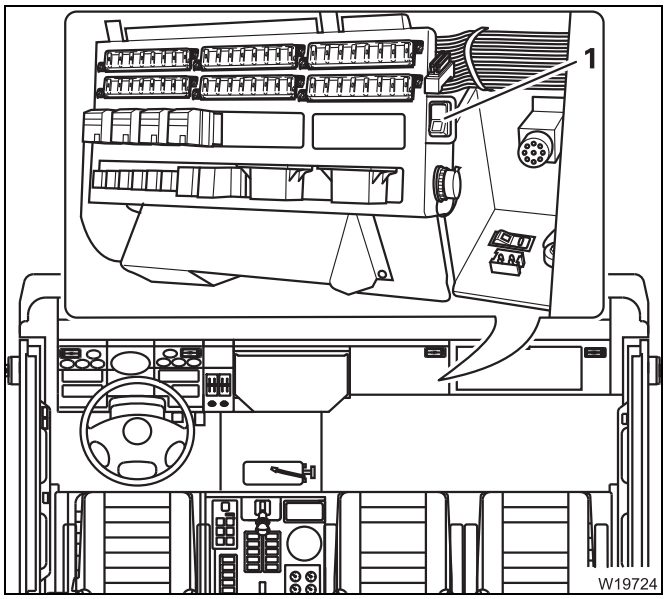
14.6.3 Switching emergency operation on/off

The emergency operation (or emergency supply of another crane) is switched on and off in the driver's cab.



- Remove the cover (**1**).
- Start the engine for driving.

Switching on:	Press switch (**1**) up
Switching off:	Press switch (**1**) down

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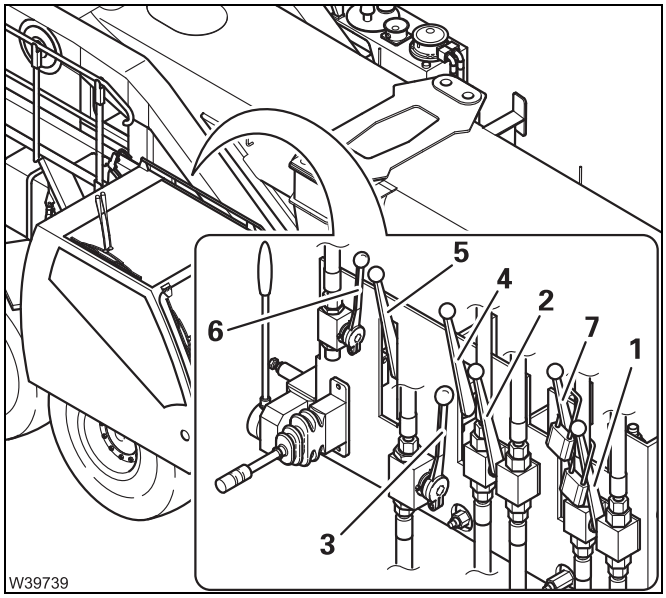
14.6.4 Establishing the hydraulic circuits required

You must switch over the necessary valves to establish a hydraulic circuit.

Switching over valves

The valve **1** to **7** are labelled with their respective numbers.



For crane operation

- Switch the valves **1** to **7 up** diagonally.
- Secure each of the valves **1** and **7** with a padlock to prevent unauthorised use.

Danger from mutual interference of the power units!
For crane operation always switch **all** the valves **1** to **7** up diagonally. This prevents the power units suddenly starting to move.

Danger due to the load falling!
If the valves **1** or **7** are actuated during crane operation, this can cause loads to fall. Therefore, secure the valves **1** and **7** with a padlock each when they are switched up diagonally.

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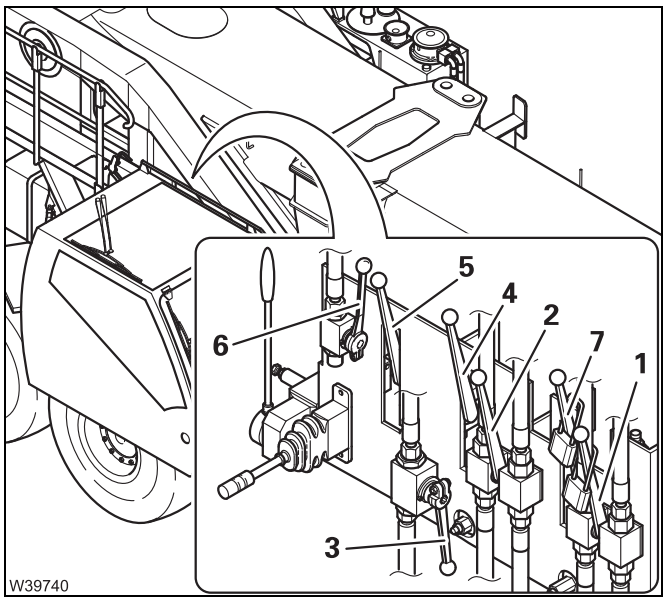

For emergency operation

- Switch the valve **1** to **7** to the positions for the required crane movement – as shown in the following table.
  - If necessary, remove the padlocks on the valves **1** and **7**.

To raise the boom, for example, you must switch the valve **3** down diagonally. The valves **1**, **2**, **4**, **5**, **6** and **7** must already be switched up diagonally.

Danger from mutual interference of the power units!
Always switch valves for **one** crane movement down diagonally at a time. This prevents wrong crane movements being performed and several movements being performed unintentionally at the same time.

Emergency operation for crane movements	Valves diagonally up (crane operation)	Valves diagonally down (emergency operation)
Lifting or lowering	**2, 3, 4, 6**	**1, 5, 7**
Raising the boom	**1, 2, 4, 5, 6, 7**	**3**
Lowering the boom	**1, 2, 3, 4, 5, 7**	**6**
Slewing to the left or right	**1, 3, 5, 6, 7**	**2, 4**

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14.6.5 Carrying out emergency operation

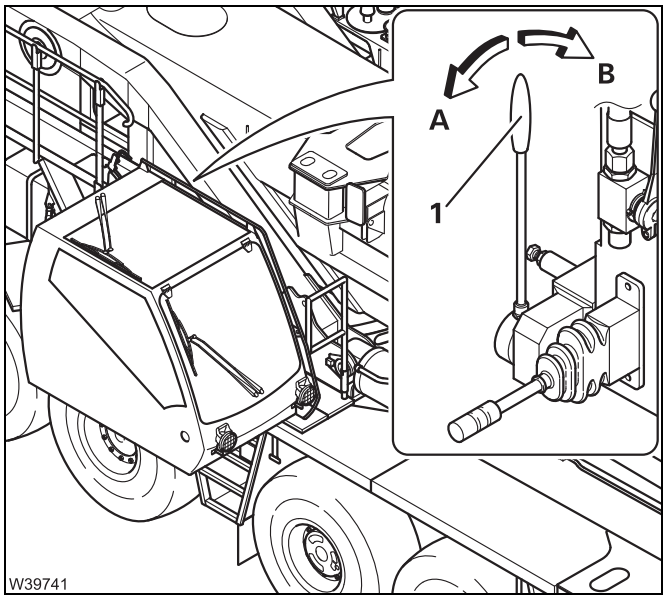
If the required hydraulic circuit has been established, you can make the corresponding crane movement. There are two control levers provided for this on the control panel.

You can control the speed of all power units with the control lever.
You can increase the speed by increasing the speed of the engine that drives the hydraulic power source.

Lifting/Lowering in emergency operation

For these crane movements, you only need the large control lever.

- Establish the required hydraulic circuit; *For emergency operation*, p. 14 - 69.



- Move the control lever (**1**) in the required direction:
  - **A:** Lowering
  - **B:** Lifting

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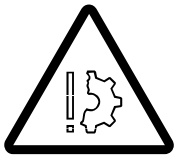
Slewing in emergency operation

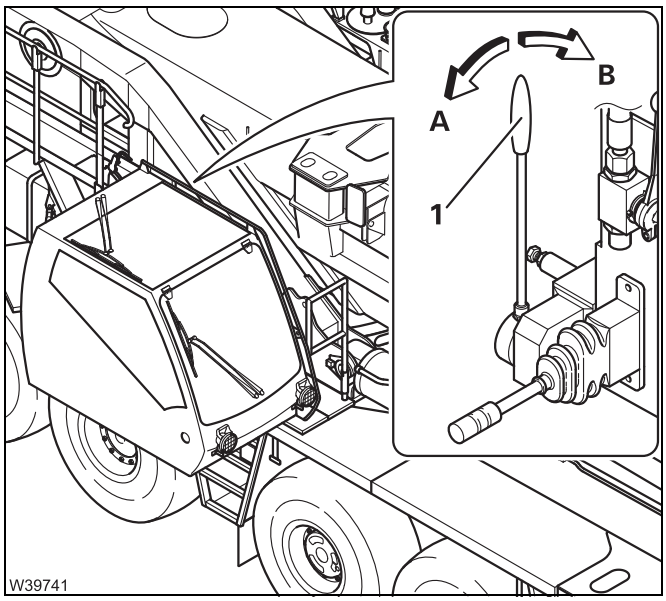
It is not possible to control the slewing movements with the control lever for emergency operation with the same degree of sensitivity as with the control lever in the crane cab.

Risk of accidents during slewing!
Do not stand on the carrier. This prevents you being pushed off the carrier or being crushed by the carrier during slewing.



Risk of damage to the hoses and transformer!
Make sure the hoses do not get caught and torn off while performing slewing operations.

- Establish the required hydraulic circuit; ➠ *For emergency operation*, p. 14 - 69.



- Slowly move the control lever (**1**) in the required direction:
  - **A:** Slewing to the left
  - **B:** Slewing to the right

Raising/Lowering the boom in emergency operation

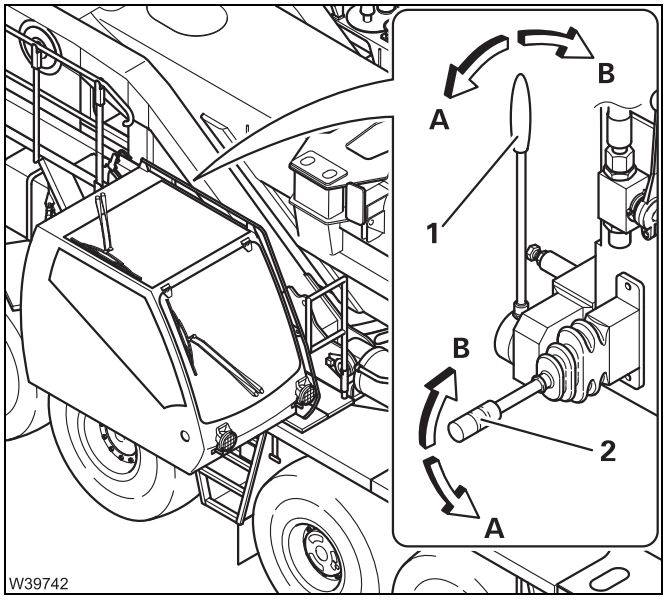
Before lowering

- Determine the maximum permissible working radius for the current rigging mode using the *Lifting capacity tables*.

Danger due to unexpected changes in the direction of movement!
Only operate the small control lever to lower the boom. The direction of movement is changed and the main boom is raised if you additionally operate the large control lever.

Danger of overturning if the working radius is too large when lowering the boom!
In emergency operation, operations are not shut down by the RCL. This also applies if the RCL displays are still active after switching on the ignition. The truck crane will overturn if you exceed the maximum permissible working radius for the current rigging mode as specified in the *Lifting capacity table* when lowering the boom.

- Establish the required hydraulic circuit; ➠ *For emergency operation*, p. 14 - 69.



Lowering the boom

- Observe the maximum permissible working radius specified in the *Lifting capacity table* – if necessary by using a measuring tape to check.
- Move the control lever (**2**) towards **B**.

Raising the boom

- Move the control lever (**1**) towards **B**.

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14.6.6 After emergency operation

You must restore the truck crane to its original state after finishing emergency operation.

Switching off emergency operation

- Switch off emergency operation; ➠ p. 14 - 67.
- Switch off the engine for driving.

Switching over to crane operation

After every emergency operation

- Switch valves **1** to **7** to crane operation; ➠ p. 14 - 68.
- Secure each of the valves **1** and **7** with a padlock to prevent unauthorised use.

Disconnecting the hoses

- Disconnect the hoses between the transformer
  - and the superstructure
  - and the carrier or the hydraulic power source.
- Close all the connections and hoses with the caps.
- Remove the transformer, close all the hoses with caps and stow away the transformer.

➠ *Disconnecting connections*, p. 14 - 66.

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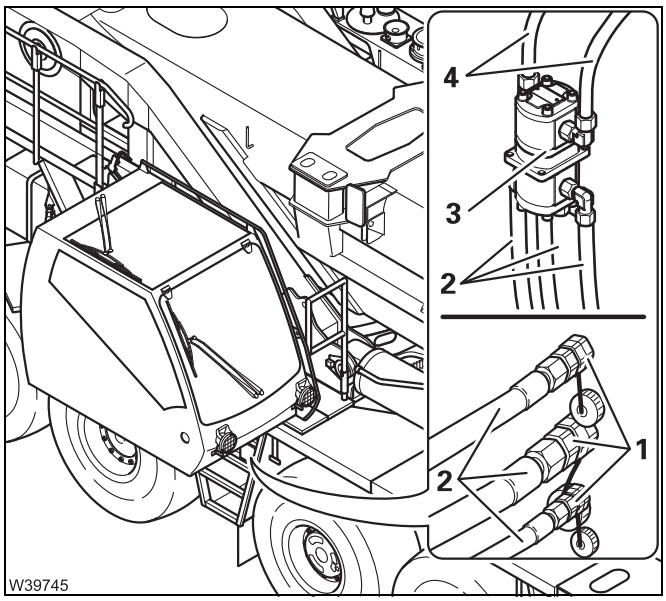
14.6.7 Emergency supply of another crane

For emergency supply

- Switch off the engine for driving.

The hoses are assigned according to the various diameters.



On the GMK7450

- Connect the hoses (**2**) to the ports (**1**).

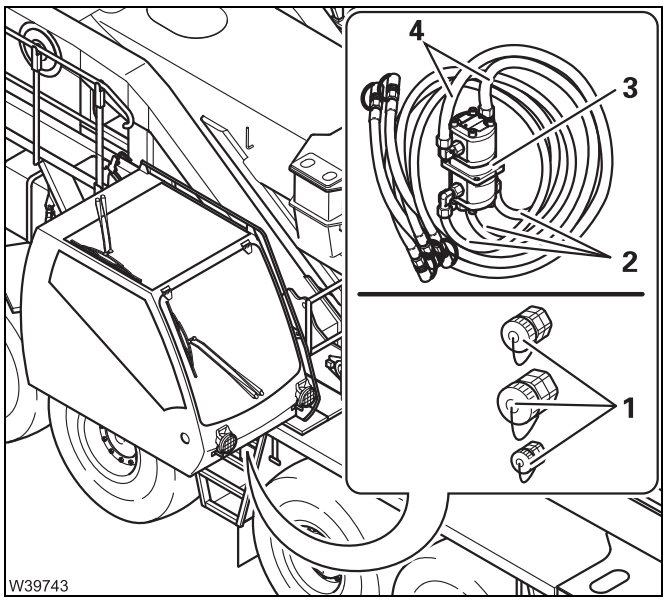
On the crane to be supplied

- Attach the transformer (**3**).
- Connect the hoses (**4**) to the connections provided. Observe the information in the operating manual of the other crane.

- Switch on the hydraulic emergency operation; ➠ p. 14 - 67.

After emergency supply

- Switch off the hydraulic emergency operation; ➠ p. 14 - 67.



On the GMK7450

- Remove the hoses (**2**) from the ports (**1**).

On the crane to be supplied

- Disconnect the hoses (**4**).
- Close all the hoses and connections with the caps.
- Remove the transformer (**3**).

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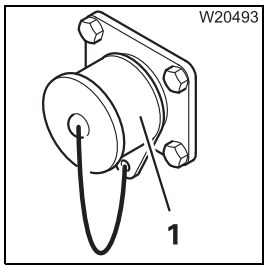
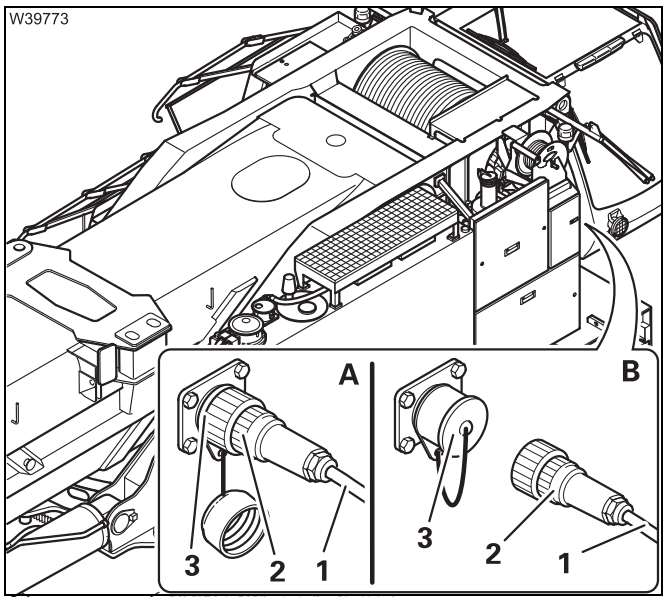
14.6.8 Other emergency operations

14.6.9 External starting socket



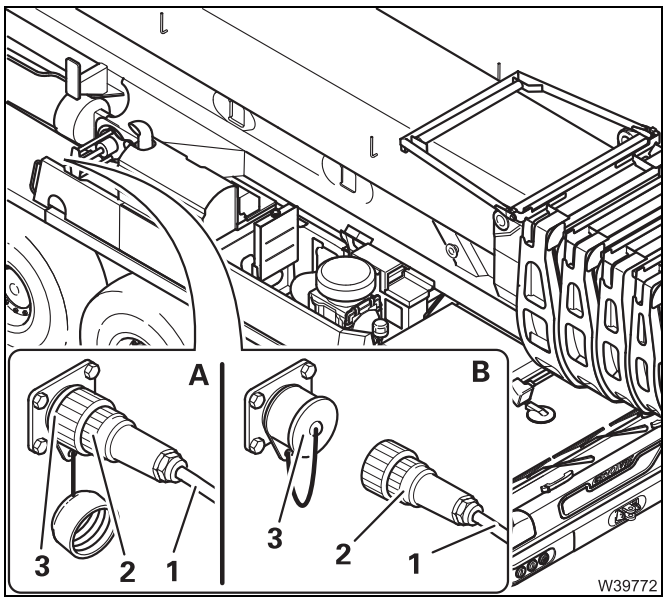
The truck crane is equipped with a socket for external starting (**1**) on the carrier and on the superstructure (➠ p. 14 - 77).
If the batteries are discharged, the power supply (24 V) of an auxiliary vehicle or the socket (**1**) on the superstructure can be used for charging.



- Start the engine of the power source (24 V).
- (**A**) – Connect the cable (**1**) to the power supply.
- Insert the plug (**2**) in the socket (**3**).
- Start the engine for driving.
- (**B**) – Pull out the plug (**2**).
- Close the socket (**3**).
- Remove the cable (**1**) from the power supply.

Performing a jump start

The socket (**1**) can also be used to supply power to another vehicle (with a 24 V on-board network).



- Start the engine for driving.
- (**A**) – Insert the plug (**2**) into the socket (**3**) on the carrier.
- Connect the cable (**1**) to the vehicle requiring the power (24 V).
- Start the engine of the vehicle that requires the power.
- (**B**) – Pull out the plug (**2**).
- Close the socket (**3**).
- Remove the cable (**1**) from the vehicle.

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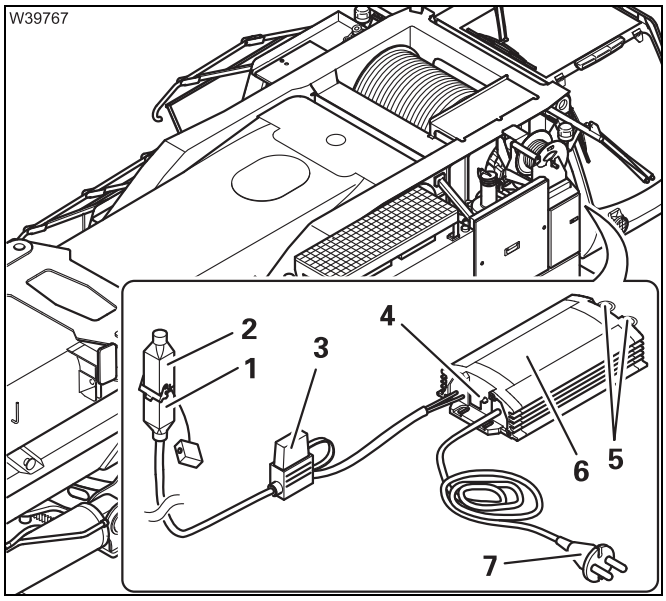
14.6.10 Battery charger

Prerequisites

- The engine must not be running and must be secured against unauthorised use.
- An external 230 V mains power supply must be available at the location.
- The location must be well ventilated and protected against moisture.

Risk of explosion when operating the battery charger!
The battery charger may not be operated:
- At service stations and tank farms
- At places where flammable gases or vapours can be found or formed (for example, at places where fuel is stored and in chemical factories)
- At places where explosive dust can be found or formed (e.g. carbon dust, wood dust and grain dust).



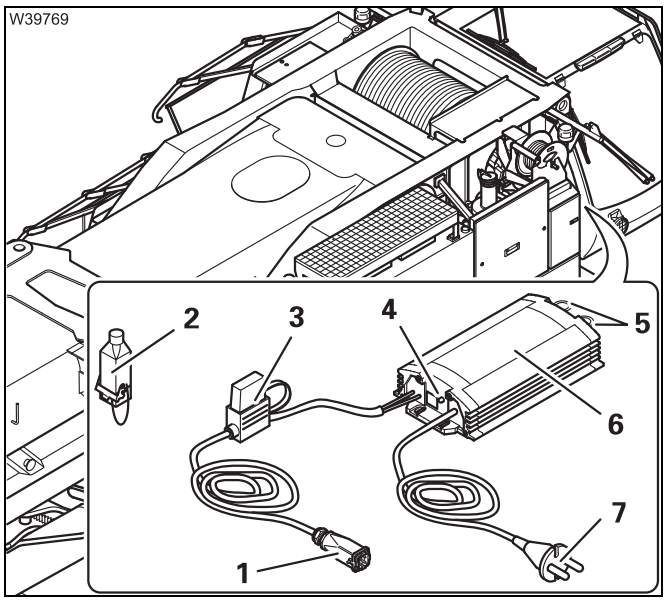
Connecting

- Insert the plug (**1**) in the socket (**2**).
- Place the battery charger (**5**) in a protected place where you can see the indicator lamp (**3**).

  The battery charger can be suspended from the ring eyes (**4**).
- Insert the plug (**6**) into the socket on the mains supply 230 V at the location.

The battery charger switches on. The lamp (**3**) on the battery charger indicates the status:

- **Flashing:** The battery is being charged
- **On:** Charging complete



Separating

- Pull the plug (**3**) out of the socket.
- Pull out the plug (**1**) from the socket (**2**).
- Close the socket (**2**).
- Return the battery charger to the storage compartment in the driver's cab.

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Cummins Fault Codes

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
111	629	12	Red	Controller #1	Engine Control Module Critical Internal Failure - Bad intelligent device or component	X	X	X	X	X	X
115	612	2	Red	System Diagnostic Code #2	Engine Magnetic Speed/Position Lost Both of Two Signals - Data erratic, intermittent or incorrect	X	X	X	X	X	X
122	102	3	Amber	Engine Intake Manifold #1 Pressure	Intake Manifold 1 Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
123	102	4	Amber	Engine Intake Manifold #1 Pressure	Intake Manifold 1 Pressure Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
124	102	16	Amber	Engine Intake Manifold #1 Pressure	Intake Manifold 1 Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X			X	
125	102	18	Amber	Engine Intake Manifold #1 Pressure	Intake Manifold 1 Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level			X			X
131	91	3	Red	Accelerator Pedal Position 1	Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
132	91	4	Red	Accelerator Pedal Position 1	Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
133	974	3	Red	Remote Accelerator Pedal Position	Remote Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
134	974	4	Red	Remote Accelerator Pedal Position	Remote Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
135	100	3	Amber	Engine Oil Pressure	Engine Oil Rifle Pressure 1 Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
141	100	4	Amber	Engine Oil Pressure	Engine Oil Rifle Pressure 1 Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
143	100	18	Amber	Engine Oil Pressure	Engine Oil Rifle Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
144	110	3	Amber	Engine Coolant Temperature	Engine Coolant Temperature 1 Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
145	110	4	Amber	Engine Coolant Temperature	Engine Coolant Temperature 1 Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
146	110	16	Amber	Engine Coolant Temperature	Engine Coolant Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
147	91	1	Red	Accelerator Pedal Position 1	Accelerator Pedal or Lever Position 1 Sensor Circuit Frequency - Data valid but below normal operating Range	X	X	X	X	X	X
148	91	0	Red	Accelerator Pedal Position 1	Accelerator Pedal or Lever Position Sensor 1 - Data valid but above normal operational range - Most Severe Level	X	X	X	X	X	X
151	110	0	Red	Engine Coolant Temperature	Engine Coolant Temperature - Data valid but above normal operational range - Most Severe Level	X	X	X	X	X	X
153	105	3	Amber	Engine Intake Manifold 1 Temperature	Intake Manifold 1 Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
154	105	4	Amber	Engine Intake Manifold 1 Temperature	Intake Manifold 1 Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
155	105	0	Red	Engine Intake Manifold 1 Temperature	Intake Manifold 1 Temperature - Data valid but above normal operational range - Most Severe Level	X	X	X	X	X	X
187	3510	4	Amber	Sensor supply voltage 2	Sensor Supply 2 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
193	520199	3	Amber	Cruise Control	Cruise Control (Resistive) Signal Circuit - Voltage above normal, or shorted to high source						
194	520199	4	Amber	Cruise Control	Cruise Control (Resistive) Signal Circuit - Voltage below normal, or shorted to low source						
195	111	3	Amber	Engine Coolant Level	Coolant Level Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
196	111	4	Amber	Engine Coolant Level	Coolant Level Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
197	111	18	Amber	Engine Coolant Level	Coolant Level - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
212	175	3	Amber	Engine Oil Temperature 1	Engine Oil Temperature Sensor 1 Circuit - Voltage above normal, or shorted to high source			X			X
213	175	4	Amber	Engine Oil Temperature 1	Engine Oil Temperature Sensor 1 Circuit - Voltage below normal, or shorted to low source			X			X
214	175	0	Red	Engine Oil Temperature 1	Engine Oil Temperature - Data valid but above normal operational range - Most Severe Level			X			X
221	108	3	Amber	Barometric Pressure	Barometric Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
222	108	4	Amber	Barometric Pressure	Barometric Pressure Sensor Circuit - Voltage above normal, or shorted to low source	X	X	X		X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
227	3510	3	Amber	Sensor supply voltage 2	Sensor Supply 2 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
231	109	3	Amber	Engine Coolant Pressure	Coolant Pressure Sensor Circuit - Voltage above normal, or shorted to high source						
232	109	4	Amber	Engine Coolant Pressure	Coolant Pressure Sensor Circuit - Voltage below normal, or shorted to low source						
233	109	18	Amber	Engine Coolant Pressure	Coolant Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level						
234	190	0	Red	Engine Speed	Engine Crankshaft Speed/Position - Data valid but above normal operational range - Most Severe Level	X	X	X	X	X	X
235	111	1	Red	Engine Coolant Level	Coolant Level - Data valid but below normal operational range - Most Severe Level	X	X	X	X	X	X
237	644	2	Amber	Engine External Speed Command Input	External Speed Command Input (Multiple Unit Synchronization) - Data erratic, intermittent or incorrect				X		X
238	3511	4	Amber	Sensor supply voltage 3	Sensor Supply 3 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
239	3511	3	Amber	Sensor supply voltage 3	Sensor Supply 3 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
241	84	2	Amber	Wheel-Based Vehicle Speed	Wheel-Based Vehicle Speed - Data erratic, intermittent or incorrect	X	X	X	X	X	X
242	84	10	Amber	Wheel-Based Vehicle Speed	Wheel-Based Vehicle Speed Sensor Circuit tampering has been detected - Abnormal rate of change	X	X			X	
245	647	4	Amber	Engine Fan Clutch 1 Output Device Driver	Fan Control Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
249	171	3	Amber	Ambient Air Temperature	Ambient Air Temperature Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X			X	
253	98	1	Red	Engine Oil Level	Engine Oil Level - Data valid but below normal operational range - Most Severe Level						
256	171	4	Amber	Ambient Air Temperature	Ambient Air Temperature Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X			X	
261	174	16	Amber	Engine Fuel Temperature 1	Engine Fuel Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level						
263	174	3	Amber	Engine Fuel Temperature 1	Engine Fuel Temperature Sensor 1 Circuit - Voltage above normal, or shorted to high source						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
265	174	4	Amber	Engine Fuel Temperature 1	Engine Fuel Temperature Sensor 1 Circuit - Voltage below normal, or shorted to low source						
266	174	0	Red	Engine Fuel Temperature 1	Engine Fuel Temperature - Data valid but above normal operational range - Most Severe Level						
269	1195	2	Red	Anti-theft Password Valid Indicator	Antitheft Password Valid Indicator - Data erratic, intermittent or incorrect			X			
271	1347	4	Amber	Engine Fuel Pump Pressurizing Assembly #1	Engine Fuel Pump Pressurizing Assembly 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
272	1347	3	Amber	Engine Fuel Pump Pressurizing Assembly #2	Engine Fuel Pump Pressurizing Assembly 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
281	1347	7	Amber	Engine Fuel Pump Pressurizing Assembly #3	Engine Fuel Pump Pressurizing Assembly 1 - Mechanical system not responding or out of adjustment	X	X	X	X	X	X
285	639	9	Amber	J1939 Network #1, Primary Vehicle Network (previously SAE J1939 Data Link)	SAE J1939 Multiplexing PGN Timeout Error - Abnormal update rate	X	X	X	X	X	X
286	639	13	Amber	J1939 Network #1, Primary Vehicle Network (previously SAE J1939 Data Link)	SAE J1939 Multiplexing Configuration Error - Out of Calibration	X	X	X	X	X	X
288	974	19	Red	Remote Accelerator Pedal Position	SAE J1939 Multiplexing Remote Accelerator Pedal or Lever Position Sensor System - Received Network Data In Error	X	X	X	X	X	X
291	625	9	Red	Proprietary Datalink	Proprietary Datalink Error (OEM/Vehicle Datalink) - Abnormal update rate	X	X	X	X	X	X
292	441	14	Red	Auxiliary Temperature 1	Auxiliary Temperature Sensor Input 1 - Special Instructions	X	X	X	X	X	X
293	441	3	Amber	Auxiliary Temperature 1	Auxiliary Temperature Sensor Input 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
294	441	4	Amber	Auxiliary Temperature 1	Auxiliary Temperature Sensor Input 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
295	108	2	Amber	Barometric Pressure	Barometric Pressure - Data erratic, intermittent or incorrect			X			X
296	1388	14	Red	Auxiliary Pressure #2	Auxiliary Pressure Sensor Input 2 - Special Instructions	X	X	X	X	X	X
297	1388	3	Amber	Auxiliary Pressure #2	Auxiliary Pressure Sensor Input 2 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
298	1388	4	Amber	Auxiliary Pressure #2	Auxiliary Pressure Sensor Input 2 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
319	251	2	Amber (Blinking)	Real Time Clock	Real Time Clock - Data erratic, intermittent or incorrect						X
322	651	5	Amber	Engine Injector Cylinder #01	Injector Solenoid Driver Cylinder 1 Circuit - Current below normal or open circuit	X	X	X	X	X	X
323	655	5	Amber	Engine Injector Cylinder #05	Injector Solenoid Driver Cylinder 5 Circuit - Current below normal or open circuit	X	X	X			X
324	653	5	Amber	Engine Injector Cylinder #03	Injector Solenoid Driver Cylinder 3 Circuit - Current below normal or open circuit	X	X	X	X	X	X
325	656	5	Amber	Engine Injector Cylinder #06	Injector Solenoid Driver Cylinder 6 Circuit - Current below normal or open circuit	X	X	X			X
331	652	5	Amber	Engine Injector Cylinder #02	Injector Solenoid Driver Cylinder 2 Circuit - Current below normal or open circuit	X	X	X	X	X	X
332	654	5	Amber	Engine Injector Cylinder #04	Injector Solenoid Driver Cylinder 4 Circuit - Current below normal or open circuit	X	X	X	X	X	X
334	110	2	Amber	Engine Coolant Temperature	Engine Coolant Temperature - Data erratic, intermittent or incorrect			X			X
338	1267	3	Amber	Idle Shutdown Vehicle Accessories Relay Driver Circuit	Idle Shutdown Vehicle Accessories Relay Driver Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
339	1267	4	Amber	Idle Shutdown Vehicle Accessories Relay Driver Circuit	Idle Shutdown Vehicle Accessories Relay Driver Circuit - Voltage below normal, or shorted to low source	X	X	X		X	X
343	629	12	Amber	Controller #1	Engine Control Module Warning Internal Hardware Failure - Bad intelligent device or component	X	X	X	X	X	X
349	191	16	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X		X	X
351	3597	12	Amber	ECU Power Output Supply Voltage #1	Injector Power Supply - Bad intelligent device or component	X	X	X	X	X	X
352	3509	4	Amber	Sensor supply voltage 1	Sensor Supply 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
386	3509	3	Amber	Sensor supply voltage 1	Sensor Supply 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
415	100	1	Red	Engine Oil Pressure	Engine Oil Rifle Pressure - Data valid but below normal operational range - Most Severe Level	X	X	X	X	X	X
418	97	15	Amber (Blinking)	Water In Fuel Indicator	Water in Fuel Indicator - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	X
421	175	16	Amber	Engine Oil Temperature 1	Engine Oil Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level			X			X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
422	111	2	Amber	Engine Coolant Level	Coolant Level - Data erratic, intermittent or incorrect			X			X
425	175	2	Amber	Engine Oil Temperature 1	Engine Oil Temperature - Data erratic, intermittent or incorrect			X			X
426	639	2	None	J1939 Network #1, Primary Vehicle Network (previously SAE J1939 Data Link)	J1939 Network #1 - Data erratic, intermittent or incorrect						
427	639	9	None	J1939 Network #1, Primary Vehicle Network (previously SAE J1939 Data Link)	SAE J1939 Datalink - Abnormal update rate						
428	97	3	Amber	Water In Fuel Indicator	Water in Fuel Indicator Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
429	97	4	Amber	Water In Fuel Indicator	Water in Fuel Indicator Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
431	558	2	Amber	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch - Data erratic, intermittent or incorrect	X	X	X	X	X	X
432	558	13	Red	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch Circuit - Out of Calibration	X	X	X	X	X	X
435	100	2	Amber	Engine Oil Pressure	Engine Oil Rifle Pressure - Data erratic, intermittent or incorrect	X	X	X	X	X	X
436	105	2	Amber	Engine Intake Manifold 1 Temperature	Intake Manifold 1 Temperature - Data erratic, intermittent or incorrect						X
441	168	18	Amber	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
442	168	16	Amber	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
449	157	0	Red	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data valid but above normal operational range - Most Severe Level	X	X	X	X	X	X
451	157	3	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
452	157	4	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
471	98	17	Amber (Blinking)	Engine Oil Level	Engine Oil Level - Data Valid But Below Normal Operating Range - Least Severe Level						
483	1349	3	Amber	Engine Injector Metering Rail 2 Pressure	Injector Metering Rail 2 Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
484	1349	4	Amber	Engine Injector Metering Rail 2 Pressure	Injector Metering Rail 2 Pressure Sensor Circuit - Voltage below normal, or shorted to low source			X			X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
487	626	18	Amber	Engine Start Enable Device 1	Start Enable Device 1 Canister Empty (Ether Injection) - Data Valid But Below Normal Operating Range						
488	105	16	Amber	Engine Intake Manifold Temperature	Intake Manifold 1 Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
489	191	18	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X		X	X
497	1377	2	Amber	Engine Synchronization Switch	Multiple Unit Synchronization Switch - Data erratic, intermittent or incorrect	X	X	X		X	X
515	3514	3	Amber	Sensor supply voltage 6	Sensor Supply 6 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
516	3514	4	Amber	Sensor supply voltage 6	Sensor Supply 6 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
523	611	2	Amber	System Diagnostic Code #1	Auxiliary Intermediate (PTO) Speed Switch Validation - Data erratic, intermittent or incorrect	X	X	X		X	X
527	702	3	Amber	Auxiliary I/O #02	Auxiliary Input/Output 2 Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
528	93	2	Amber	Engine Net Brake Torque	Auxiliary Alternate Torque Validation Switch - Data erratic, intermittent or incorrect			X			X
529	703	3	Amber	Auxiliary I/O #03	Auxiliary Input/Output 3 Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
535	174	2	Amber	Engine Fuel Temperature 1	Engine Fuel Temperature - Data erratic, intermittent or incorrect						
546	94	3	Amber	Engine Fuel Delivery Pressure	Fuel Delivery Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X	X		X	X	
547	94	4	Amber	Engine Fuel Delivery Pressure	Fuel Delivery Pressure Sensor Circuit - Voltage below normal, or shorted to low source	X	X		X	X	
553	157	16	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
554	157	2	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data erratic, intermittent or incorrect						
555	101	16	Amber	Engine Crankcase Pressure	Crankcase Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X		X
556	101	0	Red	Engine Crankcase Pressure	Crankcase Pressure - Data valid but above normal operational range - Most Severe Level	X	X	X	X		X
559	157	18	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
584	677	3	Amber	Engine Starter Motor Relay	Starter Relay Driver Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
585	677	4	Amber	Engine Starter Motor Relay	Starter Relay Driver Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
595	103	16	Amber	Engine Turbocharger 1 Speed	Turbocharger 1 Speed - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X		X
599	640	14	Red	Engine External Protection Input	Auxiliary Commanded Dual Output Shutdown - Special Instructions	X	X			X	
611	1383	31	None	Engine was Shut Down Hot	Engine Shut Down Hot - Condition Exists						
629	1176	18	Amber	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Data Valid But Below Normal Operating Range - Moderately						
649	1378	31	Amber (Blinking)	Engine Oil Change Interval	Engine Oil Change Interval - Condition Exists	X	X		X	X	
686	103	2	Amber	Engine Turbocharger 1 Speed	Turbocharger 1 Speed - Data erratic, intermittent or incorrect						
687	103	18	Amber	Engine Turbocharger 1 Speed	Turbocharger 1 Speed - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X		X
688	98	0	Red	Engine Oil Level	Engine Oil Level - Data valid but above normal operational range - Most Severe Level						
689	190	2	Amber	Engine Speed	Engine Crankshaft Speed/Position - Data erratic, intermittent or incorrect	X	X	X	X	X	X
691	1172	3	Amber	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
692	1172	4	Amber	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
693	1172	2	Amber	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature - Data erratic, intermittent or incorrect						
697	1136	3	Amber	Engine ECU Temperature	Engine ECU Temperature Sensor Circuit - Voltage above normal, or shorted to high source						
698	1136	4	Amber	Engine ECU Temperature	Engine ECU Temperature Sensor Circuit - Voltage below normal, or shorted to low source						
699	1136	2	Amber	Engine ECU Temperature	Engine ECU Temperature - Data erratic, intermittent or incorrect						X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
731	723	7	Amber	Engine Speed 2	Engine Speed / Position Camshaft and Crankshaft Misalignment - Mechanical system not responding or out of adjustment	X	X	X	X	X	X
741	1176	3	Amber	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
742	1176	4	Amber	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
743	1176	2	Amber	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Data erratic, intermittent or incorrect	X	X	X	X	X	X
755	157	7	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Mechanical system not responding or out of adjustment						
769	597	3	Amber	Brake Switch	Brake Switch Circuit - Voltage above normal, or shorted to high source			X			X
771	597	4	Amber	Brake Switch	Brake Switch Circuit - Voltage below normal, or shorted to low source		X				
778	723	2	Amber	Engine Speed 2	Engine Camshaft Speed / Position Sensor - Data erratic, intermittent or incorrect	X	X	X	X	X	X
784	1590	2	None	Adaptive Cruise Control Mode	Adaptive Cruise Control Mode - Data erratic, intermittent or incorrect						X
1117	3597	2	None	ECU Power Output Supply Voltage #1	Power Supply Lost With Ignition On - Data erratic, intermittent or incorrect	X	X	X	X	X	X
1139	651	7	Amber	Engine Injector Cylinder #01	Injector Solenoid Driver Cylinder 1 - Mechanical system not responding or out of adjustment			X			X
1141	652	7	Amber	Engine Injector Cylinder #02	Injector Solenoid Driver Cylinder 2 - Mechanical system not responding or out of adjustment	X	X	X	X	X	X
1142	653	7	Amber	Engine Injector Cylinder #03	Injector Solenoid Driver Cylinder 3 - Mechanical system not responding or out of adjustment	X	X	X	X	X	X
1143	654	7	Amber	Engine Injector Cylinder #04	Injector Solenoid Driver Cylinder 4 - Mechanical system not responding or out of adjustment	X	X	X	X	X	X
1144	655	7	Amber	Engine Injector Cylinder #05	Injector Solenoid Driver Cylinder 5 - Mechanical system not responding or out of adjustment	X	X	X			X
1145	656	7	Amber	Engine Injector Cylinder #06	Injector Solenoid Driver Cylinder 6 - Mechanical system not responding or out of adjustment	X	X	X			X
1228	27	2	Amber	Engine Exhaust Gas Recirculation 1 Valve Position	EGR Valve Position - Data erratic, intermittent or incorrect						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
1239	2623	3	Amber	Accelerator Pedal #1 Channel 2	Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
1241	2623	4	Amber	Accelerator Pedal #1 Channel 2	Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
1242	91	2	Red	Accelerator Pedal Position 1	Accelerator Pedal or Lever Position Sensor 1 - Data erratic, intermittent or incorrect	X	X	X	X	X	X
1256	1563	2	Amber	Incompatible Monitor/Controller	Control Module Identification Input State Error - Data erratic, intermittent or incorrect			X			X
1257	1563	2	Red	Incompatible Monitor/Controller	Control Module Identification Input State Error - Data erratic, intermittent or incorrect			X			X
1358	91	3	Amber	Accelerator Pedal Position 1	Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
1359	91	4	Amber	Accelerator Pedal Position 1	Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
1427	4185	31	Amber	Overspeed Shutdown Relay Driver	Overspeed Shutdown Relay Driver Diagnostic has detected an error - Condition Exists	X	X		X	X	
1428	4186	31	Amber	Low Oil Pressure Shutdown Relay Driver	Low Oil Pressure (LOP) Shutdown Relay Driver Diagnostic has detected an error - Condition Exists	X	X		X	X	
1429	4187	31	Amber	High Engine Temperature Shutdown Relay Driver	High Engine Temperature (HET) Shutdown Relay Driver Diagnostic has detected an error - Condition Exists	X	X	X	X	X	X
1431	4188	31	Amber	Pre-Low Oil Pressure Indicator Relay Driver	Pre-Low Oil Pressure Warning Relay Driver Diagnostic has detected an error - Condition Exists	X	X		X	X	
1432	4223	31	Amber	Pre-High Engine Temperature Warning Relay Driver	Pre-High Engine Temperature Warning Relay Driver Diagnostic has detected an error - Condition Exists	X	X		X	X	
1515	91	19	Red	Accelerator Pedal Position 1	SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System - Received Network Data In Error	X	X	X	X	X	X
1539	1387	3	Amber	Auxiliary Pressure #1	Auxiliary Pressure Sensor Input 1 Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
1548	657	5	Amber	Engine Injector Cylinder #7	Injector Solenoid Driver Cylinder 7 Circuit - Current below normal or open circuit						
1549	658	5	Amber	Engine Injector Cylinder #8	Injector Solenoid Driver Cylinder 8 Circuit - Current below normal or open circuit						
1551	660	5	Amber	Engine Injector Cylinder #10	Injector Solenoid Driver Cylinder 10 Circuit - Current below normal or open circuit						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
1552	661	5	Amber	Engine Injector Cylinder #11	Injector Solenoid Driver Cylinder 11 Circuit - Current below normal or open circuit						
1553	662	5	Amber	Engine Injector Cylinder #12	Injector Solenoid Driver Cylinder 12 Circuit - Current below normal or open circuit						
1554	663	5	Amber	Engine Injector Cylinder #13	Injector Solenoid Driver Cylinder 13 Circuit - Current below normal or open circuit						
1555	664	5	Amber	Engine Injector Cylinder #14	Injector Solenoid Driver Cylinder 14 Circuit - Current below normal or open circuit						
1556	665	5	Amber	Engine Injector Cylinder #15	Injector Solenoid Driver Cylinder 15 Circuit - Current below normal or open circuit						
1557	666	5	Amber	Engine Injector Cylinder #16	Injector Solenoid Driver Cylinder 16 Circuit - Current below normal or open circuit						
1621	1387	4	Amber	Auxiliary Pressure #1	Auxiliary Pressure Sensor Input 1 Circuit - Voltage below normal, or shorted to low source	X	X	X		X	X
1622	659	5	Amber	Engine Injector Cylinder #9	Injector Solenoid Driver Cylinder 9 Circuit - Current below normal or open circuit						
1654	1323	31	Amber	Engine Misfire Cylinder #1	Engine Misfire Cylinder 1 - Condition Exists	X	X		X	X	
1655	1324	31	Amber	Engine Misfire Cylinder #2	Engine Misfire Cylinder 2 - Condition Exists	X	X		X	X	
1656	1325	31	Amber	Engine Misfire Cylinder #3	Engine Misfire Cylinder 3 - Condition Exists	X	X		X	X	
1657	1326	31	Amber	Engine Misfire Cylinder #4	Engine Misfire Cylinder 4 - Condition Exists	X	X		X	X	
1658	1327	31	Amber	Engine Misfire Cylinder #5	Engine Misfire Cylinder 5 - Condition Exists	X	X				
1659	1328	31	Amber	Engine Misfire Cylinder #6	Engine Misfire Cylinder 6 - Condition Exists	X	X				
1664	4796	31	Amber	Aftertreatment 1 Diesel Oxidation Catalyst Missing	Aftertreatment 1 Diesel Oxidation Catalyst Missing - Condition Exists	X	X	X	X	X DOC+ SCR	X
1668	1761	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
1669	1761	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
1673	1761	1	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level - Data valid but below normal operational range - Most Severe Level	X	X	X	X	X With SCR	X
1677	3031	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
1678	3031	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
1679	3031	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	X
1682	3362	31	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Input Lines	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Input Lines - Condition Exists	X	X	X	X	X With SCR	X
1683	3363	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
1684	3363	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
1685	3364	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
1686	3364	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
1691	5298	18	Amber	Aftertreatment 1 Diesel Oxidation Catalyst Conversion Efficiency	Aftertreatment 1 Diesel Oxidation Catalyst Conversion Efficiency - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X DOC+ SCR	X
1694	3226	2	Amber	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Data erratic, intermittent or incorrect	X	X		X	X With SCR	
1695	3513	3	Amber	Sensor supply voltage 5	Sensor Supply 5 - Voltage above normal, or shorted to high source	X	X	X	X	X	X
1696	3513	4	Amber	Sensor supply voltage 5	Sensor Supply 5 - Voltage below normal, or shorted to low source	X	X	X	X	X	X
1699	1761	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Data erratic, intermittent or incorrect						
1712	3363	18	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
1713	3363	16	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
1714	3364	13	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Out of Calibration	X	X	X	X	X With SCR	X
1715	3364	11	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Root Cause Not Known	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
1718	1322	31	Amber	Engine Misfire for Multiple Cylinders	Engine Misfire for Multiple Cylinders - Condition Exists						
1776	2634	3	Amber	Power Relay	Power Relay Driver Circuit - Voltage above normal, or shorted to high source						X
1777	2634	4	Amber	Power Relay	Power Relay Driver Circuit - Voltage below normal, or shorted to low source						X
1843	101	3	Amber	Engine Crankcase Pressure	Crankcase Pressure Circuit - Voltage above normal, or shorted to high source	X	X	X	X		X
1844	101	4	Amber	Engine Crankcase Pressure	Crankcase Pressure Circuit - Voltage below normal, or shorted to low source	X	X	X	X		X
1847	110	14	Red	Engine Coolant Temperature	Engine Coolant Temperature - Special Instructions						
1852	97	16	Amber	Water In Fuel Indicator	Water in Fuel Indicator - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
1861	3217	2	Amber	Aftertreatment 1 Intake O2	Aftertreatment Intake Oxygen Sensor - Data erratic, intermittent or incorrect						
1866	411	2	Amber	Engine Exhaust Gas Recirculation 1 Differential Pressure	Exhaust Gas Recirculation Differential Pressure - Data erratic, intermittent or incorrect	X	X	X	X	X	
1867	412	2	Amber	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature - Data erratic, intermittent or incorrect			X			
1879	3251	3	Amber	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure Sensor Circuit - Voltage above normal	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
1881	3251	4	Amber	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure Sensor Circuit - Voltage below normal	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
1883	3251	2	Amber	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure Sensor - Data erratic, intermittent or incorrect	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
1885	3216	4	Amber	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
1887	3226	4	Amber	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
1893	2791	9	Amber	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit - Abnormal update rate						
1894	641	9	Amber	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Circuit - Abnormal update rate	X	X	X	X		

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
1896	2791	13	Amber	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Controller - Out of Calibration	X	X	X	X	X	
1898	641	13	Amber	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Controller - Out of Calibration	X	X	X	X		
1921	3251	16	Amber	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure - Data Valid But Above Normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
1922	3251	0	Red	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure - Data valid but above normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
1923	3482	3	Amber	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve Circuit - Voltage above normal, or shorted to high source			X			X
1924	3482	4	Amber	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve Circuit - Voltage below normal, or shorted to low source			X			X
1925	3482	2	Amber	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve - Data erratic, intermittent or incorrect			X			X
1926	3480	2	Amber	Aftertreatment Fuel Pressure	Aftertreatment Fuel Pressure Sensor - Data erratic, intermittent or incorrect			X			X
1927	3480	3	Amber	Aftertreatment Fuel Pressure	Aftertreatment Fuel Pressure Sensor Circuit - Voltage above normal, or shorted to high source			X			X
1928	3480	4	Amber	Aftertreatment Fuel Pressure	Aftertreatment Fuel Pressure Sensor Circuit - Voltage below normal, or shorted to low source			X			X
1932	3556	2	Amber	Aftertreatment Hydrocarbon Doser	Aftertreatment Doser - Data erratic, intermittent or incorrect			X			X
1938	3597	18	Amber	ECU Power Output Supply Voltage #1	ECU Power Output Supply Voltage 1 - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X		X
1939	3597	3	Amber	ECU Power Output Supply Voltage #1	ECU Power Output Supply Voltage 1 - Voltage above normal, or shorted to high source			X			X
1941	3597	4	Amber	ECU Power Output Supply Voltage #1	ECU Power Output Supply Voltage 1 - Voltage below normal, or shorted to low source						
1942	101	2	Amber	Engine Crankcase Pressure	Crankcase Pressure - Data erratic, intermittent or incorrect	X	X	X	X		X
1943	3555	17	None	Ambient Air Density	Ambient Air Density - Data Valid But Below Normal Operating Range - Least Severe Level						X
1961	2791	15	Amber	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit Over Temperature - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
1962	641	15	Amber	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Over Temperature (Calculated) - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X		
1963	3482	7	Amber	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve - Mechanical system not responding or out of adjustment			X			X
1964	3556	7	Amber	Aftertreatment Hydrocarbon Doser	Aftertreatment Doser - Mechanical system not responding or out of adjustment			X			X
1974	101	15	Amber (Blinking)	Engine Crankcase Pressure	Crankcase Pressure - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X		X
1976	641	15	None	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Over Temperature (Calculated) - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	X
1977	3556	5	Amber	Aftertreatment Hydrocarbon Doser	Aftertreatment Doser Circuit - Current below normal or open circuit.			X			X
1981	3936	15	Amber	Aftertreatment Diesel Particulate Filter System	Aftertreatment 1 Diesel Particulate Filter System - Data Valid But Above Normal Operating Range - Level	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
1992	190	16	Red	Engine Speed	Engine Crankshaft Speed/Position - Data Valid But Above Normal Operating Range - Moderately Severe Level						
1993	4795	31	Amber	Aftertreatment 1 Diesel Particulate Filter Missing	Aftertreatment 1 Diesel Particulate Filter Missing - Condition Exists	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
2182	1072	3	Amber	Engine (Compression) Brake Output #1	Engine Brake Actuator Driver 1 Circuit - Voltage above normal, or shorted to high source		X	X			X
2183	1072	4	Amber	Engine (Compression) Brake Output #1	Engine Brake Actuator Driver 1 Circuit - Voltage below normal, or shorted to low source		X	X			X
2185	3512	3	Amber	Sensor supply voltage 4	Sensor Supply 4 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
2186	3512	4	Amber	Sensor supply voltage 4	Sensor Supply 4 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
2198	641	11	Amber	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Circuit - Root Cause Not Known	X	X	X	X		
2215	94	18	Amber	Engine Fuel Delivery Pressure	Fuel Pump Delivery Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level						
2249	157	1	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data valid but below normal operational range - Most Severe Level						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
2261	94	15	Amber (Blinking)	Engine Fuel Delivery Pressure	Fuel Pump Delivery Pressure - Data Valid But Above Normal Operating Range - Least Severe Level						
2262	94	17	Amber (Blinking)	Engine Fuel Delivery Pressure	Fuel Pump Delivery Pressure - Data Valid But Below Normal Operating Range - Least Severe Level						
2263	1800	16	Amber	Battery 1 Temperature	Battery Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level						
2264	1800	18	Amber	Battery 1 Temperature	Battery Temperature - Data Valid But Below Normal Operating Range - Moderately Severe Level						
2265	1075	3	Amber	Engine Electric Lift Pump for Engine Fuel Supply	Electric Lift Pump for Engine Fuel Supply Circuit - Voltage above normal, or shorted to high source		X	X			X
2266	1075	4	Amber	Engine Electric Lift Pump for Engine Fuel Supply	Electric Lift Pump for Engine Fuel Supply Circuit - Voltage below normal, or shorted to low source		X	X			X
2272	27	4	Amber	Engine Exhaust Gas Recirculation 1 Valve Position	EGR Valve Position Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	
2273	411	3	Amber	Engine Exhaust Gas Recirculation 1 Differential Pressure	Exhaust Gas Recirculation Differential Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	
2274	411	4	Amber	Engine Exhaust Gas Recirculation 1 Differential Pressure	Exhaust Gas Recirculation Differential Pressure Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	
2288	103	15	None	Engine Turbocharger 1 Speed	Turbocharger 1 Speed - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X		
2311	633	31	Amber	Engine Fuel Actuator 1 Control Command	Electronic Fuel Injection Control Valve Circuit - Condition Exists	X	X	X	X	X	X
2321	190	2	None	Engine Speed	Engine Crankshaft Speed/Position - Data erratic, intermittent or incorrect	X	X	X	X	X	X
2322	723	2	None	Engine Speed 2	Engine Camshaft Speed / Position Sensor - Data erratic, intermittent or incorrect	X	X	X	X	X	X
2346	2789	15	None	Engine Turbocharger 1 Calculated Turbine Intake Temperature	Turbocharger Turbine Intake Temperature - Data Valid But Above Normal Operating Range - Least Severe	X	X	X	X	X	X
2347	2629	15	None	Engine Turbocharger 1 Compressor Outlet Temperature	Turbocharger Compressor Outlet Temperature (Calculated) - Data Valid But Above Normal Operating Range						
2349	2791	5	Amber	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit - Current below normal or open circuit	X	X	X	X	X	

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
2353	2791	6	Amber	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit - Current above normal or grounded circuit	X	X	X	X	X	
2357	2791	7	Amber	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit - Mechanical system not responding or out of adjustment	X	X	X	X	X	
2363	1073	4	Amber	Engine (Compression) Brake Output #2	Engine Brake Actuator Driver Output 2 Circuit - Voltage below normal, or shorted to low source	X	X	X		X	X
2365	1112	4	Amber	Engine (Compression) Brake Output #3	Engine Brake Actuator Driver Output 3 Circuit - Voltage below normal, or shorted to low source						
2367	1073	3	Amber	Engine (Compression) Brake Output #2	Engine Brake Actuator Driver Output 2 Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
2368	1112	3	Amber	Engine (Compression) Brake Output #3	Engine Brake Actuator Driver 3 Circuit - Voltage above normal, or shorted to high source						
2372	95	16	Amber	Engine Fuel Filter Differential Pressure	Fuel Filter Differential Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
2373	1209	3	Amber	Engine Exhaust Gas Pressure 1	Exhaust Gas Pressure Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
2374	1209	4	Amber	Engine Exhaust Gas Pressure 1	Exhaust Gas Pressure Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
2375	412	3	Amber	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	
2376	412	4	Amber	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	
2377	647	3	Amber	Engine Fan Clutch 1 Output Device Driver	Fan Control Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
2387	641	7	Amber	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Circuit (Motor) - Mechanical system not responding or out of adjustment	X	X	X	X		
2398	171	2	Amber	Ambient Air Temperature	Ambient Air Temperature - Data erratic, intermittent or incorrect						
2448	111	17	Amber (Blinking)	Engine Coolant Level	Coolant Level - Data Valid But Below Normal Operating Range - Least Severe Level	X	X	X	X	X	X
2449	641	13	Red	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Controller - Out of Calibration	X	X	X	X		
2451	2789	16	None	Engine Turbocharger 1 Calculated Turbine Intake Temperature	Turbocharger Turbine Intake Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level						X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
2468	190	16	Amber	Engine Speed	Engine Crankshaft Speed/Position - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X		X
2554	1209	2	Amber	Engine Exhaust Gas Pressure 1	Exhaust Gas Pressure 1 - Data erratic, intermittent or incorrect	X	X	X	X	X	X
2555	729	3	Amber	Engine Intake Air Heater Driver #1	Engine Intake Air Heater 1 Circuit - Voltage above normal, or shorted to high source	X	X		X	X	X
2556	729	4	Amber	Engine Intake Air Heater Driver #1	Engine Intake Air Heater 1 Circuit - Voltage below normal, or shorted to low source	X	X		X	X	X
2557	697	3	Amber	Auxiliary PWM Driver #1	Auxiliary PWM Driver 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
2558	697	4	Amber	Auxiliary PWM Driver #1	Auxiliary PWM Driver 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
2571	2630	3	Amber	Engine Charge Air Cooler 1 Outlet Temperature	Engine Charge Air Cooler Outlet Temperature - Voltage above normal, or shorted to high source	X	X	X		X	X
2572	2630	4	Amber	Engine Charge Air Cooler 1 Outlet Temperature	Engine Charge Air Cooler Outlet Temperature - Voltage below normal, or shorted to low source	X	X	X		X	X
2634	641	12	Red	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Controller - Bad intelligent device or component	X	X	X	X		
2635	641	31	Red	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Circuit - Condition Exists	X	X	X	X		
2636	641	9	Red	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Circuit - Abnormal update rate	X	X	X	X		
2637	5018	11	None	Aftertreatment Diesel Oxidation Catalyst	Aftertreatment 1 Diesel Oxidation Catalyst Face Plugged - Root Cause Not Known	X	X	X	X	X DOC+ SCR	
2638	5298	17	None ---------- Amber QSF3.8	Aftertreatment 1 Diesel Oxidation Catalyst Conversion Efficiency	Aftertreatment 1 Diesel Oxidation Catalyst Conversion Efficiency - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X DOC+ SCR	X
2639	3251	15	None	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure - Data valid but above normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
2646	110	31	Amber	Engine Coolant Temperature	Engine Coolant Temperature - Condition Exists	X	X	X	X	X	X
2659	110	31	None	Engine Coolant Temperature	Engine Coolant Temperature - Condition Exists	X	X		X	X	X
2661	629	31	Red	Controller #1	At Least One Unacknowledged Most Severe Fault - Condition Exists			X			

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
2662	629	31	Amber	Controller #1	At Least One Unacknowledged Moderately Severe Fault - Condition Exists			X			
2683	3227	9	Amber	Aftertreatment 1 Outlet O2	Aftertreatment Outlet Oxygen Sensor Circuit - Abnormal update rate						
2699	520320	7	Amber	Crankcase Depression Valve	Crankcase Depression Valve - Mechanical system not responding or out of adjustment						
2721	599	2	Amber	Cruise Control Set Switch	Cruise Control Set Switch - Data erratic, intermittent or incorrect						
2732	4097	3	Amber	Aftertreatment 1 Fuel Drain Actuator	Aftertreatment Fuel Drain Valve Circuit - Voltage above normal, or shorted to high source			X			X
2733	4097	4	Amber	Aftertreatment 1 Fuel Drain Actuator	Aftertreatment Fuel Drain Valve Circuit - Voltage below normal, or shorted to low source			X			X
2738	626	3	Amber	Engine Start Enable Device 1	Start Enable Device 1 Circuit (Ether Injection) - Voltage above normal, or shorted to high source						
2739	626	4	Amber	Engine Start Enable Device 1	Start Enable Device 1Circuit (Ether Injection) - Voltage below normal, or shorted to low source						
2741	3482	13	Amber	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve Swapped - Out of Calibration						
2742	3249	17	None	Aftertreatment 1 Exhaust Gas Temperature 2	Aftertreatment Exhaust Gas Temperature 2 - Data Valid But Below Normal Operating Range - Least Severe Level					X	
2743	3249	18	Amber	Aftertreatment 1 Exhaust Gas Temperature 2	Aftertreatment Exhaust Gas Temperature 2 - Data Valid But Below Normal Operating Range - Moderately Severe Level					X	
2754	81	16	Amber	Engine Diesel Particulate Filter Intake Pressure	Engine Diesel Particulate Filter Intake Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
2755	520332	3	Amber	Cruise Control	Cruise Control (Resistive) #2 Signal Circuit - Voltage above normal, or shorted to high source						
2756	520332	4	Amber	Cruise Control	Cruise Control (Resistive) #2 Signal Circuit - Voltage below normal, or shorted to low source						
2764	1209	16	Amber	Engine Exhaust Gas Pressure 1	Exhaust Gas Pressure 1 - Data Valid But Above Normal Operating Range - Moderately Severe Level			X			X
2765	2797	13	None	Engine Injector Group 1	Engine Injector Bank 1 Barcodes - Out of Calibration					X	
2771	3226	9	Amber	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Abnormal update rate	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
2777	3703	31	Amber (Blinking)	Diesel Particulate Filter Active Regeneration Inhibited Due to Inhibit Switch	Particulate Trap Active Regeneration Inhibited Due to Inhibit Switch - Condition Exists	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
2778	3481	16	Amber	Aftertreatment 1 Fuel Rate	Aftertreatment Fuel Rate - Data Valid But Above Normal Operating Range - Moderately Severe Level						
2789	110	18	Amber	Engine Coolant Temperature	Engine Coolant Temperature - Data Valid But Below Normal Operating Range - Moderately Severe Level						X
2878	4097	7	Amber	Aftertreatment 1 Fuel Drain Actuator	Aftertreatment Fuel Drain Valve - Mechanical system not responding or out of adjustment			X			X
2881	3480	17	Amber	Aftertreatment Fuel Pressure	Aftertreatment Fuel Pressure Sensor - Data Valid But Below Normal Operating Range - Least Severe Level			X			X
2961	412	15	None	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	
2962	412	16	Amber	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	
2963	110	15	None	Engine Coolant Temperature	Engine Coolant Temperature - Data Valid But Above Normal Operating Range - Least Severe Level						
2964	105	15	None	Engine Intake Manifold #1 Temperature	Intake Manifold 1 Temperature - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	X
2973	102	2	Amber	Engine Intake Manifold #1 Pressure	Intake Manifold 1 Pressure - Data erratic, intermittent or incorrect			X		X	X
2976	3361	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Temperature - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	
2998	1632	14	Amber	Engine Torque Limit Feature	Engine Torque Limit Feature - Special Instructions	X	X	X		X	X
3133	3610	3	Amber	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3134	3610	4	Amber	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure Sensor Circuit - Voltage below normal, or shorted to low source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3135	3610	2	Amber	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure - Data erratic, intermittent or incorrect	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3136	5019	3	Amber	Engine Exhaust Gas Recirculation 1 Outlet Pressure	Engine Exhaust Gas Recirculation Outlet Pressure Sensor Circuit - Voltage above normal, or shorted to high source			X			

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3137	5019	4	Amber	Engine Exhaust Gas Recirculation 1 Outlet Pressure	Engine Exhaust Gas Recirculation Outlet Pressure Sensor Circuit - Voltage below normal, or shorted to low source			X			
3138	5019	2	Amber	Engine Exhaust Gas Recirculation 1 Outlet Pressure	Engine Exhaust Gas Recirculation Outlet Pressure - Data erratic, intermittent or incorrect			X			
3139	3667	3	Amber	Engine Air Shutoff Status	Engine Air Shutoff Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
3141	3667	4	Amber	Engine Air Shutoff Status	Engine Air Shutoff Circuit - Voltage below normal, or shorted to low source	X	X	X		X	X
3142	4360	3	Amber	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
3143	4360	4	Amber	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
3144	4360	2	Amber	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature Sensor - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	X
3146	4363	3	Amber	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
3147	4363	4	Amber	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
3148	4363	2	Amber	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature Sensor - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	X
3151	4794	31	Amber	Aftertreatment 1 SCR Catalyst System	Aftertreatment 1 SCR Catalyst System Missing - Condition Exists	X	X	X	X	X With SCR	X
3152	4809	3	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage above normal						
3153	4809	4	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage below normal						
3154	4809	2	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature - Data erratic, intermittent or incorrect						
3155	4810	3	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature Sensor Circuit - Voltage above normal						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3156	4810	4	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature Sensor Circuit - Voltage below normal						
3157	4810	2	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature - Data erratic, intermittent or incorrect						
3158	4793	31	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst	Aftertreatment Warm Up Diesel Oxidation Catalyst Missing - Condition Exists						
3162	4810	0	Red	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature - Data valid but above normal operating Range –Most Severe level						
3164	4360	15	None	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature - Data Valid But Above Normal Operating Range - Least Severe	X	X	X	X	X With SCR	X
3165	4363	0	Red	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature - Data valid but above normal operational range - Most Severe	X	X	X	X	X With SCR	X
3166	4809	13	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature Sensor Swapped - Out of Calibration						
3167	3556	18	Amber	Aftertreatment Hydrocarbon Doser	Aftertreatment Doser - Data Valid But Below Normal Operating Range - Moderately Severe Level			X			
3169	4810	16	Red	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature - Data Valid But Above Normal Operating Range						
3186	1623	9	Amber	Tachograph output shaft speed	Tachograph Output Shaft Speed - Abnormal update rate	X	X			X	
3213	1623	19	Amber	Tachograph output shaft speed	Tachograph Output Shaft Speed - Received Network Data In Error	X	X			X	
3222	520435	12	Amber	Glow Plug Module	Glow Plug Module - Bad intelligent device or component						
3223	3490	4	Amber	Aftertreatment 1 Purge Air Actuator	Aftertreatment Purge Air Actuator Circuit - Voltage below normal, or shorted to low source						
3224	3490	3	Amber	Aftertreatment 1 Purge Air Actuator	Aftertreatment Purge Air Actuator Circuit - Voltage above normal, or shorted to high source						
3225	3490	7	Amber	Aftertreatment 1 Purge Air Actuator	Aftertreatment Purge Air Actuator - Mechanical system not responding or out of adjustment						
3228	3216	2	Amber	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3229	4360	0	Red	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature - Data valid but above normal operational range - Most Severe Level	X	X	X	X	X With SCR	X
3231	4360	16	Red	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
3232	3216	9	Amber	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Abnormal update rate	X	X	X	X	X With SCR	X
3235	4363	16	Red	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
3237	4340	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
3238	4340	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
3239	4342	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
3241	4342	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
3242	3363	7	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Mechanical system not responding or out of adjustment	X	X	X	X	X With SCR	X
3243	3060	18	Amber	Engine Cooling System Monitor	Engine Cooling System Monitor - Data Valid But Below Normal Operating Range - Moderately Severe Level			X			
3245	3936	7	Amber	Aftertreatment 1 Diesel Particulate Filter System	Aftertreatment 1 Diesel Particulate Filter System - Mechanical system not responding or out of adjustment	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3247	4809	16	Red	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature - Data Valid But Above Normal Operating Range						
3249	4810	15	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature - Data Valid But Above Normal Operating Range						
3251	4765	16	Red	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature - Data Valid But Above Normal Operating Range	X	X	X	X	X DOC + SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3253	3242	16	Red	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Temperature - Data Valid But Above Normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3254	3242	15	Amber	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Temperature - Data Valid But Above Normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3255	3246	16	Red	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature - Data Valid But Above Normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3256	3246	15	Amber	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature - Data Valid But Above Normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3258	4340	5	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Current below normal or open circuit	X	X	X	X	X With SCR	
3261	4342	5	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Current below normal or open circuit	X	X	X	X	X With SCR	
3298	1194	13	Red	Anti-theft Encryption Seed Present Indicator	Anti-theft Encryption Seed - Out of Calibration	X	X	X	X	X	
3311	3242	0	Red	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Temperature - Data valid but above normal operation	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3312	3246	0	Red	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature - Data valid but above normal operation	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3313	4765	4	Amber	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X DOC + SCR	X
3314	4765	3	Amber	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X DOC + SCR	X
3315	4765	2	Amber	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature - Data erratic, intermittent or incorrect	X	X	X	X	X DOC + SCR	X
3316	3242	4	Amber	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3317	3242	3	Amber	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3318	3242	2	Amber	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Temperature - Data erratic, intermittent or incorrect	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3319	3246	3	Amber	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3321	3246	4	Amber	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3322	3246	2	Amber	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Temperature - Data erratic, intermittent or incorrect	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3325	4765	13	Amber	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature Swapped - Out of Calibration						
3326	91	9	Red	Accelerator Pedal Position 1	SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System - Abnormal update rate	X	X	X	X	X	X
3328	191	9	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Abnormal update rate	X	X	X		X	X
3329	1231	2	None	J1939 Network #2	J1939 Network #2 - Data erratic, intermittent or incorrect	X	X	X	X	X	X
3331	1235	2	None	J1939 Network #3	J1939 Network #3 - Data erratic, intermittent or incorrect	X	X	X	X	X	X
3337	5395	16	Amber	Engine Idle Fuel Quantity	Engine Idle Fuel Quantity - Data Valid But Above Normal Operating Range - Moderately Severe Level						
3338	5395	18	Amber	Engine Idle Fuel Quantity	Engine Idle Fuel Quantity - Data Valid But Below Normal Operating Range - Moderately Severe Level						
3341	107	16	Amber	Engine Air Filter 1 Differential Pressure	Engine Air Filter Differential Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
3348	1176	1	Red	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Data valid but below normal operational range - Most Severe Level						
3361	102	10	Amber	Engine Intake Manifold #1 Pressure	Intake Manifold 1 Pressure - Abnormal rate of change						
3366	111	18	None	Engine Coolant Level	Coolant Level - Data Valid But Below Normal Operating Range - Moderately Severe Level						
3367	4490	9	Amber	Specific Humidity	Specific Humidity Sensor - Abnormal update rate						
3368	4490	19	Amber	Specific Humidity	Specific Humidity Sensor - Received Network Data In Error						X
3369	1172	9	Amber	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature Sensor - Abnormal update rate						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3371	1172	19	Amber	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature Sensor - Received Network Data In Error						
3372	1176	9	Amber	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Abnormal update rate						
3373	1176	19	Amber	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Received Network Data In Error						
3374	1818	31	None	ROP Brake Control active	Roll Over Protection Brake Control Active - Condition Exists						
3375	5397	31	Amber	Aftertreatment 1 Diesel Particulate Filter Regeneration too Frequent	Aftertreatment Diesel Particulate Filter Regeneration too Frequent - Condition Exists	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3376	5319	31	Amber	Aftertreatment 1 Diesel Particulate Filter Incomplete Regeneration	Aftertreatment Diesel Particulate Filter Incomplete Regeneration - Condition Exists	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3377	5396	31	Amber	Engine Crankcase Ventilation Hose Disconnected	Engine Crankcase Ventilation Hose Disconnected - Condition Exists						
3385	105	18	Amber	Engine Intake Manifold 1 Temperature	Intake Manifold 1 Temperature - Data Valid But Below Normal Operating Range - Moderately Severe Level			X			X
3396	3750	31	Amber	Diesel Particulate Filter 1 Conditions Not Met for Active Regeneration	Diesel Particulate Filter 1 Conditions Not Met for Active Regeneration - Condition Exists						
3418	191	19	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Received Network Data In Error	X	X	X		X	X
3419	5125	3	Amber	Sensor supply voltage 7	Sensor Supply 7 Circuit - Voltage above normal, or shorted to high source	X	X		X	X	
3421	5125	4	Amber	Sensor supply voltage 7	Sensor Supply 7 Circuit - Voltage below normal, or shorted to low source	X	X		X	X	
3422	4344	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
3423	4344	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
3425	4344	5	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit - Current below normal or open circuit	X	X	X	X	X With SCR	
3478	2630	2	Amber	Engine Charge Air Cooler 1 Outlet Temperature	Engine Charge Air Cooler Outlet Temperature - Data erratic, intermittent or incorrect						
3488	563	9	Amber	Anti-Lock Braking (ABS) Active	Anti-Lock Braking (ABS) Controller - Abnormal update rate	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3494	1081	7	Amber	Engine Wait to Start Lamp	Engine Wait to Start Lamp - Mechanical system not responding or out of adjustment						
3497	1761	17	Amber (Blinking)	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level - Data Valid But Below Normal Operating Range - Least Severe Level	X	X	X	X	X With SCR	X
3498	1761	18	Amber (Blinking)	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
3525	84	19	Amber	Wheel-Based Vehicle Speed	Wheel-Based Vehicle Speed - Received Network Data In Error	X	X	X		X	X
3526	84	9	Amber	Wheel-Based Vehicle Speed	Wheel-Based Vehicle Speed - Abnormal update rate						
3527	558	19	Red	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch - Received Network Data In Error	X	X	X	X	X	X
3528	558	9	Red	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch - Abnormal update rate			X			X
3531	171	9	Amber	Ambient Air Temperature	Ambient Air Temperature - Abnormal update rate	X	X			X	X
3532	171	19	Amber	Ambient Air Temperature	Ambient Air Temperature - Received Network Data In Error						
3535	1213	9	Amber	Malfunction Indicator Lamp	Malfunction Indicator Lamp - Abnormal update rate			X			X
3543	4094	31	Amber	NOx limits exceeded due to Insufficient Diesel Exhaust Fluid Quality	NOx limits exceeded due to Insufficient Reagent Quality - Condition Exists	X	X	X		X With SCR	X
3545	3226	10	Amber	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Abnormal rate of change	X	X	X	X	X With SCR	X
3547	4096	31	Amber	NOx limits exceeded due to Empty Diesel Exhaust Fluid Tank	Aftertreatment Diesel Exhaust Fluid Tank Empty - Condition Exists	X	X	X	X	X With SCR	X
3555	1081	9	Amber	Engine Wait to Start Lamp	Engine Wait to Start Lamp - Abnormal update rate	X	X	X	X	X	X
3556	1081	19	Amber	Engine Wait to Start Lamp	Engine Wait to Start Lamp - Received Network Data In Error						
3558	3361	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
3559	3361	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
3562	5491	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment Diesel Exhaust Fluid Line Heater Relay - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3563	5491	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment Diesel Exhaust Fluid Line Heater Relay - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	
3567	5394	5	Amber	Aftertreatment Diesel Exhaust Fluid Dosing Valve	Aftertreatment Diesel Exhaust Fluid Dosing Valve - Current below normal or open circuit	X	X	X	X	X With SCR	
3568	5394	7	Amber	Aftertreatment Diesel Exhaust Fluid Dosing Valve	Aftertreatment Diesel Exhaust Fluid Dosing Valve - Mechanical system not responding or out of adjustment	X	X	X	X	X With SCR	X
3571	4334	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
3572	4334	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
3574	4334	18	Amber	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Data Valid But Below Normal Operating Range	X	X	X	X	X With SCR	X
3575	4334	16	Amber	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Data Valid But Above Normal Operating Range	X	X	X	X	X With SCR	
3577	4376	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Return Valve	Aftertreatment Diesel Exhaust Fluid Return Valve - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	
3578	4376	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Return Valve	Aftertreatment Diesel Exhaust Fluid Return Valve - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	
3582	4364	18	Amber	Aftertreatment 1 SCR Conversion Efficiency	Aftertreatment SCR Catalyst Conversion Efficiency - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
3583	5031	10	Amber	Aftertreatment 1 Outlet Gas NOx Sensor Heater Ratio	Aftertreatment 1 Outlet NOx Sensor Heater - Abnormal rate of change	X	X	X	X	X With SCR	X
3596	4334	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	
3613	111	9	Amber	Engine Coolant Level	Coolant Level Sensor - Abnormal Update Rate	X	X			X	
3614	111	19	Amber	SAE J1939 Multiplexing PGN Timeout	Coolant Level Sensor - Received Network Data in Error	X	X				
3616	2633	7	None	Engine Variable Geometry Turbocharger (VGT) 1 Nozzle Position	Engine VGT Nozzle Position - Mechanical system not responding or out of adjustment			X			
3633	5484	3	Amber	Engine Fan Clutch 2 Output Device Driver	Engine Fan Clutch 2 Control Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3634	5484	4	Amber	Engine Fan Clutch 2 Output Device Driver	Engine Fan Clutch 2 Control Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
3641	748	9	Amber	Transmission Output Retarder	Transmission Output Retarder - Abnormal update rate	X	X	X	X	X	X
3649	5024	10	Amber	Aftertreatment 1 Intake Gas NOx Sensor Heater Ratio	Aftertreatment 1 Intake NOx Sensor Heater - Abnormal rate of change	X	X	X	X	X With SCR	X
3681	3228	2	Amber	Aftertreatment 1 Outlet Gas Sensor Power Status	Aftertreatment 1 Outlet NOx Sensor Power Supply - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	X
3682	3218	2	Amber	Aftertreatment 1 Intake Gas Sensor Power Status	Aftertreatment 1 Intake NOx Sensor Power Supply - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	X
3683	1127	7	Amber	Engine Turbocharger 1 Boost Pressure	Engine Turbocharger 1 Boost Pressure - Mechanical system not responding or out of adjustment						
3694	4184	4	Amber	Gain Adjust Potentiometer Circuit	Gain Adjust Potentiometer Circuit - Voltage below normal, or shorted to low source						
3695	4182	4	Amber	Generator Output Frequency Adjust Potentiometer Circuit	Generator Output Frequency Adjust Potentiometer Circuit - Voltage below normal, or shorted to low source						
3696	4183	4	Amber	Droop Adjust Potentiometer Circuit	Droop Adjust Potentiometer Circuit - Voltage below normal, or shorted to low source						
3697	630	12	Red	Engine Control Module Calibration Memory	Engine Control Module Calibration Memory - Bad intelligent device or component	X	X	X	X	X	X
3712	5246	0	Red	Aftertreatment SCR Operator Inducement Severity	Aftertreatment SCR Operator Inducement - Data valid but above normal operational range - Most Severe level	X	X	X	X	X With SCR	X
3713	5491	7	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay - Mechanical system not responding or out of adjustment						
3714	1569	31	Amber	Engine Protection Torque Derate	Engine Protection Torque Derate - Condition Exists	X	X	X	X	X	X
3715	188	16	Amber	Engine Speed At Idle, Point 1 (Engine Configuration)	Engine Speed At Idle - Data Valid But Above Normal Operating Range - Moderately Severe Level						
3716	188	18	Amber	Engine Speed At Idle, Point 1 (Engine Configuration)	Engine Speed At Idle - Data Valid But Below Normal Operating Range - Moderately Severe Level						
3717	3226	13	Amber	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Out of Calibration	X	X	X	X	X With SCR	X
3718	3216	13	Amber	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx - Out of Calibration	X	X	X	X	X With SCR	X
3724	168	17	Amber	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Below Normal Operating Range - Least Severe Level	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3725	3216	10	Amber	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Abnormal rate of change	X	X	X	X	X With SCR	X
3727	5571	7	None	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Mechanical system not responding or out of adjustment	X	X	X	X	X	X
3733	862	3	Amber	Crankcase breather Heater Circuit	Crankcase Breather Filter Heater Circuit - Voltage above normal, or shorted to high source			X			X
3734	862	4	Amber	Crankcase breather Heater Circuit	Crankcase Breather Filter Heater Circuit - Voltage below normal, or shorted to low source			X			X
3735	2884	9	None	Engine Auxiliary Governor Switch	Engine Auxiliary Governor Switch - Abnormal update rate						
3737	1675	31	None	Engine Starter Mode	Engine Starter Mode Overcrank Protection - Condition Exists	X	X	X	X	X	X
3741	5571	0	Amber	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Data valid but above normal operational range	X	X	X	X	X	X
3748	3216	20	Amber	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Data not Rational - Drifted High	X	X	X	X	X With SCR	X
3749	3226	20	Amber	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Data not Rational - Drifted High	X	X	X	X	X With SCR	X
3751	4792	7	None	Aftertreatment SCR Catalyst System	Aftertreatment SCR Catalyst System - Mechanical system not responding or out of adjustment	X	X	X	X	X With SCR	X
3753	3713	31	None	Diesel Particulate Filter Active Regeneration Inhibited Due to System Timeout	Diesel Particulate Filter Active Regeneration Inhibited Due to System Timeout - Condition Exists	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
3755	5394	2	None	Aftertreatment Diesel Exhaust Fluid Dosing Valve	Aftertreatment Diesel Exhaust Fluid Dosing Valve - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	
3765	442	3	Amber	Auxiliary Temperature 2	Auxiliary Temperature Sensor Input 2 Circuit - Voltage above normal, or shorted to high source	X	X	X		X	X
3766	442	4	Amber	Auxiliary Temperature 2	Auxiliary Temperature Sensor Input 2 Circuit - Voltage below normal, or shorted to low source	X	X	X		X	X
3838	2978	9	Amber	Estimated Engine Parasitic Losses - Percent Torque	Estimated Engine Parasitic Losses - Percent Torque - Abnormal update rate						
3839	596	7	Amber	Cruise Control Enable Switch	Cruise Control Enable Switch - Mechanical system not responding or out of adjustment						
3841	596	2	Amber	Cruise Control Enable Switch	Cruise Control Enable Switch - Data erratic, intermittent or incorrect						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
3842	596	13	Amber	Cruise Control Enable Switch	Cruise Control Enable Switch - Out of Calibration						
3843	5603	9	None	Cruise Control Disable Command	Cruise Control Disable Command - Abnormal update rate	X	X			X	X
3844	5605	31	None	Cruise Control Pause Command	Cruise Control Pause Command - Condition Exists	X	X			X	
3845	5603	31	None	Cruise Control Disable Command	Cruise Control Disable Command - Condition Exists	X	X			X	
3866	3364	1	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Data valid but below normal operational range - Most Severe Level	X	X	X	X	X With SCR	X
3867	3364	18	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Data Valid But Below Normal Operating Range - Moderate Severe Level	X	X	X	X	X With SCR	X
3868	3364	9	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Abnormal update rate	X	X	X	X	X With SCR	X
3876	3364	7	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality Sensor - Mechanical system not responding or out of adjustment	X	X	X	X	X With SCR	X
3877	3364	12	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality Sensor - Bad intelligent device or component	X	X	X		X With SCR	X
3878	3364	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Data erratic, intermittent or incorrect	X	X	X	X	X With SCR	X
3917	104	18	Amber	Engine Turbocharger Lube Oil Pressure 1	Engine Turbocharger Lube Oil Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level			X			X
3931	1109	0	Red	Engine Protection System Approaching Shutdown	Engine Protection System Approaching Shutdown - Data valid but above normal operational range - Most						
3988	3265	9	Amber	Aftertreatment 2 Outlet NOx	Aftertreatment 2 Outlet NOx - Abnormal Update Rate						
4143	5741	3	Amber	Aftertreatment 1 Outlet Soot Sensor	Aftertreatment 1 Outlet Soot Sensor - Voltage Above Normal, or Shorted to High Source						
4144	5741	4	Amber	Aftertreatment 1 Outlet Soot Sensor	Aftertreatment 1 Outlet Soot Sensor - Voltage below normal, or shorted to low source						
4145	3255	9	Amber	Aftertreatment 2 Intake NOx	Aftertreatment 2 Intake NOx Sensor - Abnormal update rate						
4151	5742	9	Amber	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Abnormal update rate	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4152	5743	9	Amber	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module - Abnormal update rate	X	X	X	X	X With SCR	X
4153	5747	3	Amber	Aftertreatment 1 Outlet Soot Sensor Heater	Aftertreatment 1 Outlet Soot Sensor Heater - Voltage Above Normal, or Shorted to High Source						
4154	5747	4	Amber	Aftertreatment 1 Outlet Soot Sensor Heater	Aftertreatment 1 Outlet Soot Sensor Heater - Voltage below normal, or shorted to low source						
4155	5746	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay - Voltage Above Normal, or Shorted to high source	X	X	X	X	X With SCR	
4156	5746	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	
4157	4376	7	Amber	Aftertreatment 1 Diesel Exhaust Fluid Return Valve	Aftertreatment Diesel Exhaust Fluid Return Valve - Mechanical system not responding or out of adjust	X	X	X	X	X With SCR	
4158	5742	12	Amber	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Bad intelligent device or component	X	X	X	X	X	X
4159	5743	12	Amber	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module - Bad intelligent device or component	X	X	X	X	X With SCR	X
4161	5742	3	Amber	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Voltage Above Normal, or Shorted to high source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
4162	5742	4	Amber	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Voltage below normal, or shorted to low source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
4163	5742	16	Amber	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module- Data Valid But Above Normal Operating Range	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
4164	5743	3	Amber	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module - Voltage Above Normal, or Shorted to high source	X	X	X	X	X With SCR	X
4165	5743	4	Amber	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module - Voltage below normal, or Shorted to low source	X	X	X	X	X With SCR	X
4166	5743	16	Amber	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module - Data Valid But Above Normal	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4168	5745	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater - Voltage Above Normal, or Shorted to High	X	X	X	X	X With SCR	
4169	5745	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	
4171	5745	18	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater - Data Valid But Below Normal Operating Range	X	X	X	X	X	
4174	4337	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature Sensor	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature Sensor - Voltage Above Normal, or Shorted to High Source						X
4175	4337	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature Sensor	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature Sensor - Voltage below normal, or shorted to low source						X
4213	3695	2	Amber	Aftertreatment Regeneration Inhibit Switch	Aftertreatment Regeneration Inhibit Switch - Data erratic, intermittent or incorrect	X	X	X	X	X	X
4215	563	31	None	Anti-Lock Braking (ABS) Active	Anti-Lock Braking (ABS) Active - Condition Exists	X	X	X	X	X	
4233	3515	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Sensor Circuit - Voltage above normal, or shorted to high source			X			X
4234	3515	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Sensor Circuit - Voltage below normal, or shorted to low source			X			X
4235	3521	31	Red	Aftertreatment 1 Diesel Exhaust Fluid Property	Aftertreatment 1 Diesel Exhaust Fluid Property - Condition Exists			X			X
4242	3515	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 - Data erratic, intermittent or incorrect			X			X
4243	3515	10	Amber	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 - Abnormal Rate of Change	X	X	X	X	X With SCR	X
4244	4337	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature - Data erratic, intermittent or incorrect						X
4245	5798	2	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Temperature	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Temperature - Data erratic, intermittent or incorrect						
4249	4337	10	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature - Abnormal Rate of Change	X	X	X	X	X With SCR	

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4251	5798	10	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Temperature	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Temperature - Abnormal Rate of Change	X	X	X	X	X With SCR	
4252	1081	31	Amber	Engine Wait to Start Lamp	Engine Wait to Start Lamp - Condition Exists						
4253	5797	12	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module - Bad intelligent device						
4254	5797	3	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module - Voltage Above Normal, or shorted to high source						
4255	5797	4	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module - Voltage below normal, or shorted to low source						
4256	5797	16	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module - Data Valid But Above Normal Operating Range – Moderately Severe Level						
4258	5797	11	Amber	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module - Root Cause Not Known						
4259	5742	11	Amber	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Root Cause Not Known	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
4261	5743	11	Amber	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module - Root Cause Not Known	X	X	X	X	X With SCR	X
4262	5571	3	Amber	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Voltage Above Normal, or Shorted to High Source	X					
4263	5571	4	Amber	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Voltage below normal, or shorted to low source	X					
4265	5571	11	Amber	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Root Cause Not Known						
4277	3364	10	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Abnormal Rate of Change	X	X	X	X	X With SCR	X
4284	5793	9	Amber	Desired Engine Fueling State	Desired Engine Fueling State - Abnormal Update Rate						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4286	520595	3	Amber	Closed Crankcase Ventilation System Pressure Sensor	Closed Crankcase Ventilation System Pressure Sensor - Voltage Above Normal, or Shorted to High Source						
4287	520595	4	Amber	Closed Crankcase Ventilation System Pressure Sensor	Closed Crankcase Ventilation System Pressure Sensor - Voltage below normal, or shorted to low source						
4288	520595	2	Amber	Closed Crankcase Ventilation System Pressure	Closed Crankcase Ventilation System Pressure - Data erratic, intermittent or incorrect						
4293	5097	3	Amber	Engine Brake Active Lamp Data	Engine Brake Active Lamp - Voltage Above Normal, or Shorted to High Source						
4294	5097	4	Amber	Engine Brake Active Lamp Data	Engine Brake Active Lamp - Voltage below normal, or shorted to low source						
4437	1668	2	None	J1939 Network #4 - Data erratic	J1939 Network #4 - Data erratic, intermittent or incorrect	X	X	X	X	X	X
4449	5747	10	Amber	Aftertreatment 1 Outlet Soot Sensor Heater	Aftertreatment 1 Outlet Soot Sensor Heater - Abnormal rate of change						
4451	5741	2	Amber	Aftertreatment 1 Outlet Soot	Aftertreatment 1 Outlet Soot - Data erratic, intermittent or incorrect						
4452	520668	31	Amber	Aftertreatment 1 Outlet NOx Sensor Closed Loop Operation	Aftertreatment 1 Outlet NOx Sensor Closed Loop Operation - Condition Exists						
4484	3667	7	Red	Engine Air Shutoff	Engine Air Shutoff - Mechanical System Not Responding or Out of Adjustment	X	X				
4485	5838	31	Amber	EGR Valve Malfunction	EGR Valve Malfunction - Condition Exists						
4486	5839	31	Amber	Diesel Exhaust Fluid Consumption Malfunction	Diesel Exhaust Fluid Consumption Malfunction - Condition Exists						
4487	5840	31	Amber	Diesel Exhaust Fluid Dosing Malfunction	Diesel Exhaust Fluid Dosing Malfunction - Condition Exists						
4488	5841	31	Amber	Diesel Exhaust Fluid Quality Malfunction	Diesel Exhaust Fluid Quality Malfunction - Condition Exists						
4489	5842	31	Amber	SCR Monitoring System Malfunction	SCR Monitoring System Malfunction - Condition Exists						
4517	237	13	Amber	Vehicle Identification Number	Vehicle Identification Number - Out of Calibration	X	X	X	X	X	X
4526	521	2	Amber	Brake Pedal Position	Brake Pedal Position - Data erratic, intermittent or incorrect			X			X
4533	4766	3	Amber	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature Sensor Circuit	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X DOC+ SCR	X DOC+ SCR		X		

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4534	4766	4	Amber	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature Sensor Circuit	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X DOC+ SCR	X DOC+ SCR		X		
4568	3482	16	Amber	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve - Data Valid But Above Normal Operating Range - Moderately Severe						
4572	3031	9	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature - Abnormal Update Rate	X	X	X	X	X	X
4573	3826	18	Amber	Aftertreatment 1 Diesel Exhaust Fluid Average Consumption	Aftertreatment 1 Diesel Exhaust Fluid Average Consumption - Data Valid But Below Normal Operating Range						
4584	3936	14	Red	Aftertreatment Diesel Particulate Filter System	Aftertreatment Diesel Particulate Filter System - Special Instructions	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
4585	4792	14	Red	Aftertreatment 1 SCR Catalyst System	Aftertreatment 1 SCR Catalyst System - Special Instructions	X	X	X	X	X With SCR	X
4586	4339	31	Amber	Aftertreatment 1 SCR Feedback Control Status	Aftertreatment 1 SCR Feedback Control Status - Condition Exists						X
4615	94	0	Red	Engine Fuel Delivery Pressure	Engine Fuel Delivery Pressure - Data Valid but Above Normal Operational Range - Most Severe Level						
4658	4331	18	Amber	Aftertreatment 1 Diesel Exhaust Fluid Actual Dosing Quantity	Aftertreatment SCR Actual Dosing Reagent Quantity - Data Valid But Below Normal Operating Range - Mo						
4677	1761	9	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	SAE J1939 Multiplexing PGN Timeout Error - Abnormal update rate	X	X	X	X	X	X
4679	1761	5	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor Circuit - Current below normal or open circuit						
4682	3031	5	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor Circuit - Current below normal or open circuit						X
4688	6301	3	Amber	Water in Fuel Indicator 2 Sensor Circuit	Water in Fuel Indicator 2 Sensor Circuit - Voltage above normal, or shorted to high source						
4689	6301	4	Amber	Water in Fuel Indicator 2 Sensor Circuit	Water in Fuel Indicator 2 Sensor Circuit - Voltage below normal, or shorted to low source						
4691	5585	18	Amber	Engine Injector Metering Rail 1 Cranking Pressure	Engine Injector Metering Rail 1 Cranking Pressure - Data Valid But Below Normal Operating Range - Mo						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4713	5357	31	Amber	Engine Fuel Injection Quantity Error for Multiple Cylinders	Engine Fuel Injection Quantity Error for Multiple Cylinders - Condition Exists						
4721	237	31	Amber	Vehicle Identification Number	Vehicle Identification Number - Condition Exists			X			X
4722	237	2	Amber	Vehicle Identification Number	Vehicle Identification Number - Data erratic, intermittent or incorrect			X			X
4724	702	5	Amber	Auxiliary I/O #02	Auxiliary Input/Output 2 Circuit - Current below normal or open circuit						
4725	702	6	Amber	Auxiliary I/O #02	Auxiliary Input/Output 2 Circuit - Current above normal or grounded circuit						
4726	1239	16	Amber	Engine Fuel Leakage 1	Engine Fuel Leakage - Data Valid But Above Normal Operating Range - Moderately Severe Level						
4727	157	15	Amber	Engine Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data Valid But Above Normal Operating Range - Least Severe Level						
4731	3031	13	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor - Out of Calibration	X	X			X With SCR	X
4732	1761	13	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Out of Calibration	X	X			X With SCR	X
4734	701	14	Red	Auxiliary I/O #01	Auxiliary Input/Output 1 - Special Instructions	X	X	X	X	X	X
4736	3031	6	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor Circuit - Current above normal or grounded circuit						X
4737	3031	11	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature - Root Cause Not Known	X	X	X		X With SCR	X
4738	1761	6	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor Circuit - Current above normal or grounded circuit						
4739	1761	11	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Root Cause Not Known	X	X	X	X	X With SCR	X
4743	3515	5	Amber	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Sensor Circuit - Current below normal or open circuit	X	X	X	X	X With SCR	X
4744	3515	6	Amber	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Sensor Circuit - Current above normal or grounded	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4745	3515	11	Amber	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 - Root Cause Not Known	X	X	X	X	X With SCR	X
4752	520716	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve 1 Heater - Voltage Above Normal, or Shorted to High Source						X
4753	520716	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve 1 Heater - Voltage Below Normal, or Shorted to Low Source						X
4768	3521	11	Amber	Aftertreatment 1 Diesel Exhaust Fluid Property	Aftertreatment 1 Diesel Exhaust Fluid Property - Root Cause Not Known	X	X	X	X	X With SCR	X
4769	1761	10	Amber	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Abnormal Rate of Change	X	X	X	X	X With SCR	X
4789	1639	0	Amber	Fan Speed	Fan Speed - Data Valid but Above Normal Operational Range - Most Severe Level	X	X	X	X	X	X
4791	1639	1	Amber	Fan Speed	Fan Speed - Data Valid but Below Normal Operational Range - Most Severe Level	X	X	X	X	X	X
4841	6653	16	Amber	Cold Start Injector Metering Rail 1 Pressure	Cold Start Injector Metering Rail 1 Pressure - Data Valid But Above Normal Operating Range - Moderate Severe Level						
4842	3364	15	None	Aftertreatment Diesel Exhaust Fluid Quality	Aftertreatment Diesel Exhaust Fluid Quality - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X		X
4863	5245	31	Amber	Aftertreatment Selective Catalytic Reduction Operator Inducement Active	Aftertreatment Diesel Exhaust Fluid Tank Low Level Indicator	X	X	X	X	X With SCR	X
4867	5571	31	Amber	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Condition Exists	X					
4936	5380	11	Amber	Engine Fuel Valve 1	Engine Fuel Valve 1 - Root Cause Not Known						
4937	5380	13	Amber	Engine Fuel Valve 1	Engine Fuel Valve 1 - Out of Calibration						
4951	6655	3	Amber	ECU Power Lamp	Maintain ECU Power Lamp - Voltage Above Normal, or Shorted to High Source	X	X	X		X	X
4952	6655	4	Amber	ECU Power Lamp	Maintain ECU Power Lamp - Voltage Below Normal, or Shorted to Low Source	X	X	X		X	X
4953	3353	3	Amber	Alternator 1 Status	Alternator 1 Status - Voltage Above Normal, or Shorted to High Source						

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
4954	3353	4	Amber	Alternator 1 Status	Alternator 1 Status - Voltage Below Normal, or Shorted to Low Source						
4956	6713	13	Red	Variable Geometry Turbocharger Actuator	Variable Geometry Turbocharger Actuator Software - Out of Calibration	X	X				
4957	6713	31	Red	Variable Geometry Turbocharger Actuator	Variable Geometry Turbocharger Actuator Software - Condition Exists	X	X				
5133	2006	9	Amber	Source Address 6	Source Address 6 - Abnormal Update Rate						
5167	111	17	Amber	Engine Coolant Level	Coolant Level - Data Valid But Below Normal Operating Range - Least Severe Level						
5177	6713	9	Amber	VGT Actuator Driver Circuit	VGT Actuator Driver Circuit - Abnormal update rate	X	X				
5183	6799	3	Amber	Engine Fan Blade Pitch	Fan Blade Pitch Position Sensor Circuit - Voltage Above Normal, or Shorted to High Source	X	X	X	X	X	X
5184	6799	4	Amber	Engine Fan Blade Pitch	Fan Blade Pitch Position Sensor Circuit - Voltage Below Normal, or Shorted to Low Source	X	X	X	X	X	X
5185	6799	7	Amber	Engine Fan Blade Pitch	Fan Blade Pitch - Mechanical system not responding or out of adjustment	X	X	X	X	X	X
5193	1632	31	Amber	Engine Torque Limit Feature	Engine Torque Limit Feature - Condition Exists			X			X
5215	520791	2	Amber	Engine Boost Curve Selection	Engine Boost Curve Selection - Data erratic, intermittent or incorrect			X			X
5221	3667	2	Red	Engine Air Shutoff Status	Engine Air Shutoff Status - Data erratic, intermittent or incorrect	X	X				
5247	4360	16	Amber	Aftertreatment 1 SCR Intake Temperature	Aftertreatment 1 SCR Intake Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level						
5248	1623	13	Amber	Tachograph Output Shaft Speed	Tachograph Output Shaft Speed - Out of Calibration	X	X	X		X	X
5271	649	3	Amber	Engine Exhaust Back Pressure Regulator Control Circuit	Engine Exhaust Back Pressure Regulator Control Circuit - Voltage Above Normal, or Shorted to High Source					X	
5272	649	4	Amber	Engine Exhaust Back Pressure Regulator Control Circuit	Engine Exhaust Back Pressure Regulator Control Circuit - Voltage Below Normal, or Shorted to Low Source					X	
5273	649	5	Amber	Engine Exhaust Back Pressure Regulator Control Circuit	Engine Exhaust Back Pressure Regulator Control Circuit - Current Below Normal or Open Circuit					X	

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
5274	5625	2	Amber	Engine Exhaust Back Pressure Regulator Position	Engine Exhaust Back Pressure Regulator Position - Data Erratic, Intermittent or Incorrect						
5275	5625	3	Amber	Engine Exhaust Back Pressure Regulator Position Sensor Circuit	Engine Exhaust Back Pressure Regulator Position Sensor Circuit - Voltage Above Normal, or Shorted to High Source					X	
5276	5625	4	Amber	Engine Exhaust Back Pressure Regulator Position Sensor Circuit	Engine Exhaust Back Pressure Regulator Position Sensor Circuit - Voltage Below Normal, or Shorted to Low Source					X	
5277	5626	13	Amber	Engine Exhaust Back Pressure Regulator	Engine Exhaust Back Pressure Regulator - Out of Calibration					X	
5278	6802	31	Amber		Aftertreatment 1 Diesel Exhaust Fluid Dosing System Frozen - Condition Exists	X	X	X	X	X With SCR	X
5291	520808	31	Amber	Engine Emergency Shutdown Switch Actived	Engine Emergency Shutdown Switch Actived - Condition Exists	X	X				
5292	520809	31	Amber	Excessive Time Since Last Engine Air Shutoff Maintenance Test	Excessive Time Since Last Engine Air Shutoff Maintenance Test - Condition Exists	X	X				
5386	4766	2	Amber	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature - Data Erratic, Intermittent, or Incorrect	X DOC+ SCR	X DOC+ SCR		X		
5387	4766	0	Red	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature - Data Valid But Above Normal Operating Range - Most Severe Level	X DOC+ SCR	X DOC+ SCR		X		
5388	4766	16	Red	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	X DOC+ SCR	X DOC+ SCR		X		
5389	4766	15	Amber	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature - Data Valid But Above Normal Operating Range - Least Severe Level	X DOC+ SCR	X DOC+ SCR		X		
5391	6882	9	Amber	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module - Abnormal Update Rate	X DOC+ SCR	X DOC+ SCR		X		
5392	6882	12	Amber	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module - Bad Intelligent Device or Component	X DOC+ SCR	X DOC+ SCR		X		
5393	6882	3	Amber	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module - Voltage Above Normal or Shorted to High Source	X DOC+ SCR	X DOC+ SCR		X		
5394	6882	4	Amber	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module - Voltage Below Normal or Shorted to Low Source	X DOC+ SCR	X DOC+ SCR		X		

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
5395	6882	11	Amber	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module - Root Cause Not Known	X DOC+ SCR	X DOC+ SCR		X		
5396	6882	16	Amber	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module - Data Valid But Above Normal Operating Range - Moderately Severe Level	X DOC+ SCR	X DOC+ SCR		X		
5576	107	15	Amber	Engine Air Filter 1 Differential Pressure	Engine Air Filter Differential Pressure - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	X
5585	5571	15	Amber	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	X
5617	524286	31	Amber	Aftertreatment 1 Diesel Oxidation Catalyst System	Aftertreatment 1 Diesel Oxidation Catalyst System- Special Instruction	X DOC+ SCR	X DOC+ SCR		X	X (DOC + SCR)	
5631	6928	31	None	SCR System Cleaning Inhibited Due to System Timeout	SCR System Cleaning Inhibited Due to System Timeout - Condition Exists	X DOC+ SCR	X DOC+ SCR		X	X With SCR	
5632	6918	31	Mainte nance	SCR System Cleaning Inhibited Due to Inhibit Switch	SCR System Cleaning Inhibited Due to Inhibit Switch - Condition Exists	X DOC+ SCR	X DOC+ SCR		X	X With SCR	
5653	6881	9	Amber	SCR Operator Inducement Override Switch	SCR Operator Inducement Override Switch - Abnormal Update Rate	X	X	X	X	X With SCR	X
5654	6881	13	Amber	SCR Operator Inducement Override Switch	SCR Operator Inducement Override Switch - Out of Calibration	X	X	X	X	X With SCR	X
5866	520953	3	Amber		Aftertreatment Diesel Exhaust Fluid Dosing Unit Relay Feedback- Voltage Above Normal or Shorted to High Source.						X
5867	520953	4	Amber		Aftertreatment Diesel Exhaust Fluid Dosing Unit Relay Feedback- Voltage Below Normal or Shorted to Low Source.						X
5938	3750	14	Amber	Diesel Particulate Filter 1 Conditions Not Met for Active Regeneration	Diesel Particulate Filter 1 Conditions Not Met for Active Regeneration – Condition Exists	X	X	X	X	X With SCR	X
5939	520968	9	Amber		Machine Constrained Operation- Abnormal Update Rate. No Communication or an invalid data transfer rate has been detected on the J1939 data link between the ECM and the machine electronic control unit.	X	X	X	X	X	X
5941	520968	19	None		Machine Constrained Operation- Received Network Data in Error. The received J1939 datalink message was not valid.	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
6256	168	15	None	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Above Normal Operating Range - Least Severe Level	X	X	X	X	X	X
6257	168	17	None	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
6258	1075	3	None	Engine Electric Lift Pump for Engine Fuel Supply	Electric Lift Pump for Engine Fuel Supply Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6259	1075	4	None	Engine Electric Lift Pump for Engine Fuel Supply	Electric Lift Pump for Engine Fuel Supply Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6263	647	3	None	Engine Fan Clutch 1 Output Device Driver	Fan Control Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6264	647	4	None	Engine Fan Clutch 1 Output Device Driver	Fan Control Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6265	3936	7	None	Aftertreatment 1 Diesel Particulate Filter System	Aftertreatment 1 Diesel Particulate Filter System - Mechanical system not responding or out of adjustment	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
6336	862	3	None	Crankcase breather Heater Circuit	Crankcase Breather Filter Heater Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6337	862	4	None	Crankcase breather Heater Circuit	Crankcase Breather Filter Heater Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6418	1072	3	None	Engine (Compression) Brake Output #1	Engine Brake Actuator Driver 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6419	1072	4	None	Engine (Compression) Brake Output #1	Engine Brake Actuator Driver 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6421	1073	3	None	Engine (Compression) Brake Output #2	Engine Brake Actuator Driver Output 2 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6422	1073	4	None	Engine (Compression) Brake Output #2	Engine Brake Actuator Driver Output 2 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6456	5484	3	None	Engine Fan Clutch 2 Output Device Driver	Engine Fan Clutch 2 Control Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6457	5484	4	None	Engine Fan Clutch 2 Output Device Driver	Engine Fan Clutch 2 Control Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6458	3216	20	None	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Data not Rational - Drifted High	X	X	X	X	X With SCR	X
6459	3216	21	None	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Data not Rational - Drifted High	X	X	X	X	X With SCR	X
6462	3226	20	None	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Data not Rational - Drifted High	X	X	X	X	X With SCR	X
6463	3226	21	None	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Data not Rational - Drifted High	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
6464	3226	2	None	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Data Erratic, Intermittant, or Incorrect.	X	X	X	X	X With SCR	X
6467	1639	15	None	Fan Speed	Fan Speed - Data Valid but Above Normal Operational Range - Least Severe Level	X	X	X	X	X	X
6468	1639	17	None	Fan Speed	Fan Speed - Data Valid but Below Normal Operational Range - Most Severe Level	X	X	X	X	X	X
6469	1639	2	None	Fan Speed	Fan Speed – Data Erratic, Intermittent, or Incorrect	X	X	X	X	X	X
6471	6799	3	None	Engine Fan Blade Pitch	Fan Blade Pitch Position Sensor Circuit - Voltage Above Normal, or Shorted to High Source	X	X	X	X	X	X
6472	6799	4	None	Engine Fan Blade Pitch	Fan Blade Pitch Position Sensor Circuit - Voltage Below Normal, or Shorted to Low Source	X	X	X	X	X	X
6473	6799	2	None	Engine Fan Blade Pitch	Fan Blade Pitch – Data Erratic, Intermittent, or Incorrect	X	X	X	X	X	X
6475	3363	7	None	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Mechanical system not responding or out of adjustment	X	X	X	X	X With SCR	X
6476	3363	18	None	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
6477	5491	3	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment Diesel Exhaust Fluid Line Heater Relay - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
6478	5491	4	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment Diesel Exhaust Fluid Line Heater Relay - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
6479	3363	3	None	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
6481	3363	4	None	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
6482	4340	5	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Current below normal or open circuit	X	X	X	X	X With SCR	X
6483	4342	5	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Current below normal or open circuit	X	X	X	X	X With SCR	X
6484	4344	5	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit - Current below normal or open circuit	X	X	X	X	X With SCR	X
6493	3464	3	None	Electronic Throttle Control Actuator Driver Circuit	Electronic Throttle Control Actuator Driver Circuit-Voltage above normal, or shorted to high source	X	X	X	X	X	X
6494	3464	4	None	Electronic Throttle Control Actuator Driver Circuit	Electronic Throttle Control Actuator Driver Circuit-Voltage above normal, or shorted to low source	X	X	X	X	X	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
6496	3464	5	None	Electronic Throttle Control Actuator Driver Circuit	Electronic Throttle Control Actuator Driver Circuit- Current Below Normal or Open Circuit	X	X	X	X	X	X
6497	51	3	None	Engine Intake Throttle Actuator Position Sensor Circuit	Engine Intake Throttle Actuator Position Sensor Circuit- Voltage above normal, or shorted to high source	X	X	X	X	X	X
6498	51	4	None	Engine Intake Throttle Actuator Position Sensor Circuit	Engine Intake Throttle Actuator Position Sensor Circuit- Voltage above normal, or shorted to low source	X	X	X	X	X	X
6499	3597	17	None	ECU Power Output Supply Voltage #1	ECU Power Output Supply Voltage 1 - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X	X
6511	6655	3	None	ECU Power Lamp	Maintain ECU Power Lamp - Voltage Above Normal, or Shorted to High Source	X	X	X	X	X	X
6512	6655	4	None	ECU Power Lamp	Maintain ECU Power Lamp - Voltage Below Normal, or Shorted to Low Source	X	X	X	X	X	X
6513	5745	17	None	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater - Data Valid But Below Normal Operating Range	X	X	X	X	X With SCR	X
6517	4364	17	None	Aftertreatment 1 SCR Conversion Efficiency	Aftertreatment SCR Catalyst Conversion Efficiency - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
6521	3226	4	None	Aftertreatment Outlet NOx Sensor Circuits	Aftertreatment Outlet NOx Sensor Circuit- Voltage below normal or shorted to low source	X	X	X	X	X With SCR	X
6522	111	3	None	Engine Coolant Level	Coolant Level Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6523	111	4	None	Engine Coolant Level	Coolant Level Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6524	175	3	None	Engine Oil Temperature 1	Engine Oil Temperature Sensor 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6525	175	4	None	Engine Oil Temperature 1	Engine Oil Temperature Sensor 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6526	1761	13	None	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Out of Calibration	X	X	X	X	X With SCR	X
6527	4376	7	None	Aftertreatment 1 Diesel Exhaust Fluid Return Valve	Aftertreatment Diesel Exhaust Fluid Return Valve - Mechanical system not responding or out of adjust	X	X	X	X	X With SCR	X
6529	5746	3	None	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay - Voltage Above Normal, or Shorted to high source	X	X	X	X	X With SCR	X
6531	4340	3	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
6532	4340	4	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
6533	4342	3	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
6534	4342	4	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
6535	4344	3	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	X
6536	4344	4	Amber	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
6537	5491	7	None	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay - Mechanical system not responding or out of adjustment	X	X	X	X	X With SCR	X
6539	4765	2	None	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature - Data erratic, intermittent or incorrect	X	X	X	X	X DOC + SCR	X
6551	3610	3	None	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure Sensor Circuit - Voltage above normal, or shorted to high source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
6552	3610	4	None	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure Sensor Circuit - Voltage below normal, or shorted to low source	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
6553	3610	2	None	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure - Data erratic, intermittent or incorrect	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
6555	2791	7	None	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit - Mechanical system not responding or out of adjustment	X	X	X	X	X	
6556	729	3	None	Engine Intake Air Heater Driver #1	Engine Intake Air Heater 1 Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X	X
6557	729	4	None	Engine Intake Air Heater Driver #1	Engine Intake Air Heater 1 Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X	X
6559	3031	4	None	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	X
6562	1761	11	None	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Root Cause Not Known	X	X	X	X	X With SCR	
6563	976	2	None	PTO Governor State	Auxiliary Intermediate (PTO) Speed Switch Validation - Data erratic, intermittent or incorrect	X	X	X	X	X	X
6565	3226	10	None	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Abnormal rate of change	X	X	X	X	X With SCR	X

Fault Code	J1939_ SPN	J1939_ FMI	Lamp	J1939_SPN Description	Cummins_Description	QSB 6.7	QSL 9	QSX 15	QSB 4.5	QSF 3.8	QSG 12
6568	3695	2	None	Aftertreatment Regeneration Inhibit Switch	Aftertreatment Regeneration Inhibit Switch - Data erratic, intermittent or incorrect	X	X	X	X	X	X
6569	4363	3	None	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature Sensor Circuit - Voltage above normal, or shorted to high source	X	X	X	X	X With SCR	
6571	4363	4	None	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature Sensor Circuit - Voltage below normal, or shorted to low source	X	X	X	X	X With SCR	
6581	5031	10	None	Aftertreatment 1 Outlet Gas NOx Sensor Heater Ratio	Aftertreatment 1 Outlet NOx Sensor Heater - Abnormal rate of change	X	X	X	X	X With SCR	X
6582	3228	2	None	Aftertreatment 1 Outlet Gas Sensor Power Status	Aftertreatment 1 Outlet NOx Sensor Power Supply - Data erratic, intermittent or incorrect			X		X With SCR	X
6583	441	14	Amber	Auxiliary Temperature 1	Auxiliary Temperature Sensor Input 1 - Special Instructions			X		X	X
6584	1388	14	Amber	Auxiliary Pressure #2	Auxiliary Pressure Sensor Input 2 - Special Instructions			X		X	X
6596	3713	31	Amber	Diesel Particulate Filter Active Regeneration Inhibited Due to System Timeout	Diesel Particulate Filter Active Regeneration Inhibited Due to System Timeout - Condition Exists	X DOC/ DPF+ SCR	X DOC/ DPF+ SCR	X			X
6597	6928	31	Amber	SCR System Cleaning Inhibited Due to System Timeout	SCR System Cleaning Inhibited Due to System Timeout - Condition Exists	X DOC+ SCR	X DOC+ SCR		X		
6619	3515	10	None	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 - Abnormal Rate of Change	X	X	X	X	X With SCR	X
6621	3216	10	None	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Abnormal rate of change	X	X	X	X	X With SCR	X
6634	7848	14	Amber	Aftertreatment 1 SCR System Conditions Not Met for Active Cleaning	Aftertreatment 1 SCR System Conditions Not Met for Active Cleaning - Special Instructions	X	X	X	X	X With SCR	X
6726	4796	31	None	Aftertreatment 1 Diesel Oxidation Catalyst Missing	Aftertreatment 1 Diesel Oxidation Catalyst Missing - Condition Exists	X	X	X	X	X DOC+ SCR	X
6752	3364	18	None	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Data Valid But Below Normal Operating Range - Moderately Severe Level	X	X	X	X	X With SCR	X
9491	524286	31	Amber		Reserved for temporary use - Condition Exists						X
9999	524286	31	Amber		Reserved for temporary use - Condition Exists			X			X

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To avoid making the index unnecessarily long and unclear, we have not included every single element from the instrument panel.

These elements, such as switches and buttons, lamps and displays are described and named in detail in the overviews of the Chapter 3 and Chapter 9 *Truck Crane Description*.

From there, you are referred, as usual, to more detailed descriptions of these elements.

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