

DFG/TFG 660-690

02.11 -

Operating instructions

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DFG 660
DFG 670
DFG 680
DFG 690
DFG S80
DFG S90
TFG 660
TFG 670
TFG 680
TFG 690
TFG S80
TFG S90



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Declaration of Conformity



Jungheinrich AG, Am Stadtrand 35, D-22047 Hamburg
Manufacturer or agent acting in the European Union

Type	Option	Serial no.	Year of manufacture
DFG 660 DFG 670 DFG 680 DFG 690 DFG S80 DFG S90 TFG 660 TFG 670 TFG 680 TFG 690 TFG S80 TFG S90			

Additional information

On behalf of

Date

EU Conformity Declaration

The undersigned hereby declare that the powered industrial truck described below in detail complies with the European Directives 2006/42/EC (Machinery Directive) and 2004/108/EEC (Electromagnetic Compatibility - EMC) including amendments as well as the legislative decree to incorporate the directives in national law. The signatories are in each case individually authorized to compile the technical documents.

Foreword

Notes on the operating instructions

The present ORIGINAL OPERATING INSTRUCTIONS are designed to provide sufficient instruction for the safe operation of the industrial truck. The information is provided clearly and concisely. The chapters are arranged by letter and the pages are numbered continuously.

The operator manual details different industrial truck models. When operating and servicing the industrial truck, make sure that the particular section applies to your truck model.

Our trucks are subject to ongoing development. Jungheinrich reserves the right to alter the design, equipment and technical features of the system. No guarantee of particular features of the truck should therefore be assumed from the present operating instructions.

Safety notices and text mark-ups

Safety instructions and important explanations are indicated by the following graphics:

DANGER!

Indicates an extremely hazardous situation. Failure to comply with this instruction will result in severe irreparable injury and even death.

WARNING!

Indicates an extremely hazardous situation. Failure to comply with this instruction may result in severe irreparable injury and even death.

CAUTION!

Indicates a hazardous situation. Failure to comply with this instruction may result in slight to medium injury.

NOTE

Indicates a material hazard. Failure to comply with this instruction may result in material damage.



Used before notices and explanations.

- Indicates standard equipment
- Indicates optional equipment

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A Correct Use and Application

1 General

The industrial truck described in the present operating instructions is designed for lifting, lowering and transporting load units.

It must be used, operated and serviced in accordance with the present instructions. Any other type of use is beyond the scope of application and can result in damage to personnel, the industrial truck or property.

2 Correct application

NOTE

The maximum load and load distance are indicated on the load chart and must not be exceeded.

The load must rest on the load handler or be lifted by an attachment approved by the manufacturer.

The load must rest on the back of the fork carriage and centrally between the forks.

-
- Lifting and lowering of loads.
 - Transporting lowered loads over short distances.
 - Do not travel with a raised load (>30 cm).
 - Do not carry or lift passengers.
 - Do push or pull load units.
 - Occasional towing of trailer loads.
 - When towing trailer loads the load must be secured on the trailer.
 - The permissible trailer load must not be exceeded.

3 Approved application conditions



DANGER!

Do not exceed the permissible surface and spot load limits on the travel routes.

At blind spots get a second person to assist.

The driver must ensure that the loading dock / ramp cannot move or come loose during loading / unloading.

- Operation in industrial and commercial environments.
- Permissible temperature range -20 to 40°C.
- Operation only on secure, level surfaces with sufficient capacity.
- Operation only on routes that are visible and approved by the proprietor.
- Negotiating inclines up to a maximum of 15 %.
- Do not negotiate inclines crosswise or at an angle. Transporting loads downhill.
- Operation in partially public traffic.
- The truck may only be operated in areas that are clean and free of oil and similar substances.



WARNING!

Extreme conditions

- ▶ Special equipment and authorisation are required if the truck is to be constantly used in extreme conditions, especially in dusty or corrosive atmospheres.
 - ▶ The truck is not authorised for use in areas at risk of explosion.
 - ▶ In adverse weather conditions (thunder, lightning) the industrial truck must not be operated outside or in endangered areas.
-

4 Proprietor responsibilities

For the purposes of the present operating instructions the “proprietor” is defined as any natural or legal person who either uses the industrial truck himself, or on whose behalf it is used. In special cases (e.g. leasing or renting) the proprietor is considered the person who, in accordance with existing contractual agreements between the owner and user of the industrial truck, is charged with operational duties.

The proprietor must ensure that the industrial truck is used only for the purpose for which it is intended and that there is no danger to life and limb of the user and third parties. Furthermore, accident prevention regulations, safety regulations and operating, servicing and repair guidelines must be followed. The proprietor must ensure that all users have read and understood these operating instructions.

NOTE

Failure to comply with the operating instructions shall invalidate the warranty. The same applies if improper work is carried out on the truck by the customer or third parties without the permission of the manufacturer.

5 Adding attachments and/or accessories

Adding accessories

The mounting or installation of additional equipment which affects or enhances the performance of the forklift truck requires the written permission of the manufacturer. Local authority approval may also need to be obtained.

Local authority approval does not however constitute the manufacturer's approval.

B Truck Description

1 Application

The DFG/TFG 660-690 is a four-wheel IC engine sit-down forklift truck. The DFG series are diesel engine trucks, while the TFG series are fitted with a petrol engine for LPG operation.

The DFG/TFG 660-690 is a cantilever counterbalanced truck which can lift, transport and deposit loads using the load handler attached in front.

Closed bottom pallets can also be lifted.

The DFG/TFG 660-690 is equipped with a hydrodynamic drive.

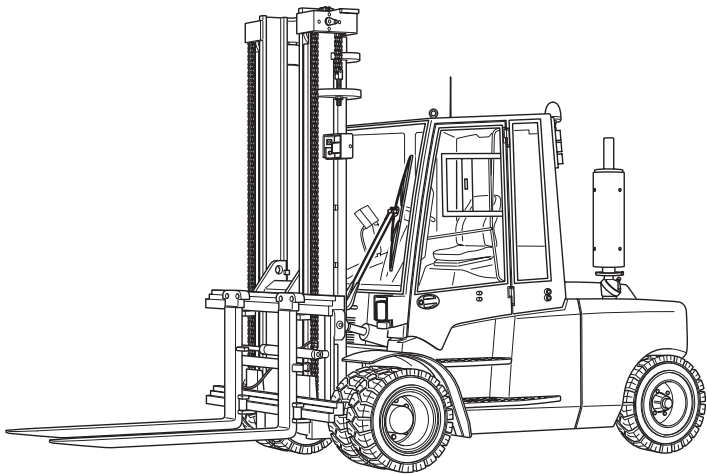
1.1 Truck models and rated capacity

The rated capacity depends on the model. The rated capacity can be derived from the model description.

DFG660

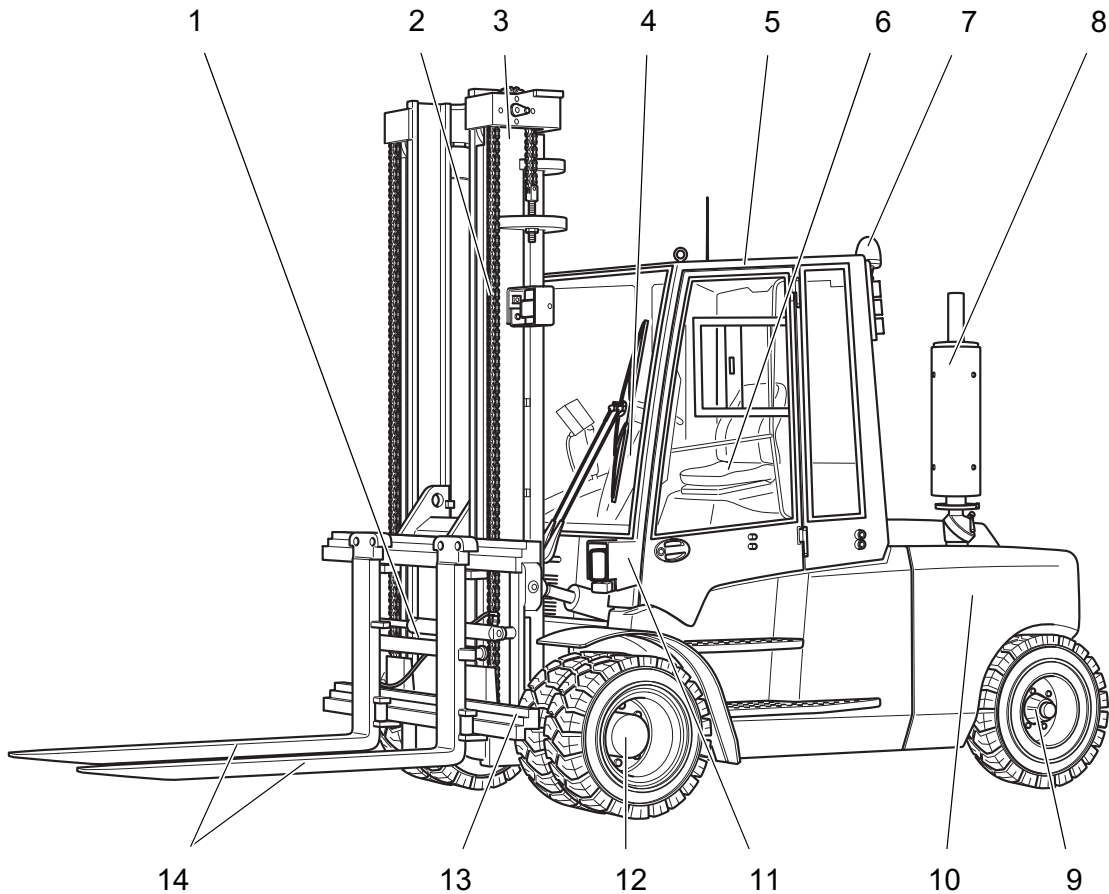
DFG	Model name
6	Series
60	Rated capacity x 100 kg

The rated capacity does not generally match the permissible capacity. The capacity can be found on the load chart attached to the rack.



2 Assemblies and Functional Description

2.1 Assembly Overview



Item	Description	Item	Description
1	○ Fork adjustment	8	● Exhaust pipe
2	● Load chains	9	● Steer axle
3	● Mast	10	● Counterweight
4	● Steering column	11	● Illumination
5	● Cab	12	● Drive
6	● Driver's seat	13	● Fork carriage
7	○ Beacon	14	● Fork tines
● = Standard equipment		○ = Optional equipment	

2.2 Functional Description

Chassis and superstructure

A rigid chassis which protects the units and controls, provides the truck with maximum static safety. A wide opening cab (5) facilitates service and maintenance work. The hydraulic oil reservoir is integrated on the right-hand side and the fuel tank on the opposite side of the chassis. The vertical, free standing front exhaust pipe (8) is positioned much higher than is common. It prevents vibrations and sound waves from being transferred and exhaust gases from penetrating into the operator position.

Operator position

The operator position is articulating, which cushions vibrations and noise. Non-slip steps and a handle on the cab post ensure easy entry and exit. The driver is protected by the cab (5). To adapt the seat position, the driver can adjust the seat and steering head both vertically and horizontally. The accelerator pedal and brake pedal are of "automotive" design.

Steering

The steer cylinder of the hydrostatic steering is integrated in the steer axle (9) and is controlled by the power steering. The steer axle is fully floating in the chassis to ensure excellent grip even on non-level surfaces.

Wheels

All wheels are located within the truck geometry. A choice of pneumatic or superelastic tyres are available.

Diesel engine

Quiet-running, water-cooled diesel engines featuring high performance and low consumption with very clean fuel combustion under all operating conditions ensure soot values are below the limit of visibility. An additional particle filter (○) ensures very low exhaust levels.

LPG engine

Quiet running, water-cooled four-stroke engines featuring high performance and low consumption. Petrol engines with very low residual exhaust levels are used. An additional 3-way catalytic converter (○) ensures very low exhaust levels.

Electrical system

12 volt system with three-phase alternator. A start block prevents malfunctions when the truck is powered up. For diesel engines, a rapid pre-heat system is installed; LPG motors have an electronic ignition system for rapid and trouble-free engine starting. The key switch is used to stop the engine.

Drive system

A power shift gear with radiator and torque converter is directly flanged to the engine. This transfers the force to the drive axle (12).

The travel direction lever on the steering column, on the multi-task lever or on the pedal controller (○) controls forward/reverse travel and the neutral position.

Brakes

The brake pedal activates the laminated brakes hydraulically. The parking brake is switched on and off by pressing the parking brake button in the multifunction display. It acts mechanically on the brake disc of the cardan shaft.

Hydraulic System

All operations can be performed sensitively, proportionally and simultaneously. Hydraulic functions are controlled by a servo hydraulic controller. Control is possible via single lever (SOLO-PILOT) or multi-task lever (MULTI-PILOT).

Mast

Two or three-stage masts, optionally with free lift function; narrow mast sections ensure excellent visibility of the fork tines and attachments. Fork carriages and lift frames run on lubricating support rollers.

Attachments

The trucks can be optionally fitted with mechanical and hydraulic attachments.

3 Technical Specifications

All technical details refer to standard trucks.

Values indicated with *) may vary, depending on the types of equipment used (e.g. mast, cabin, tyres etc.).



Technical data specified in accordance with VDI 2198.
Technical modifications and additions reserved.

3.1 Performance data

DFG 660-690

	Description	660	670	680	690	
Q	Capacity ¹⁾	6000	7000	8000	9000	kg
C	Load centre distance	600	600	600	600	mm
	Travel speed* with / without load	22.4/22.5	22.4/22.6	22.4/22.5	22.4/22.6	km/h
	Lift speed with / without load	0.50/0.60	0.40/0.60	0.40/0.60	0.40/0.60	m/s
	Lowering speed with / without load	0.60/0.36	0.60/0.36	0.60/0.36	0.60/0.36	m/s
	Gradeability ²⁾ with / without load	30.3/32.0	28.7/31.0	27.1/31.0	24.6/28.0	%
	Tow force with / without load	49.5/49.5	49.5/49.5	49.5/49.5	49.5/49.5	kN
	Acceleration* with / without load to 15 m	6.0/5.0	6.0/5.0	6.0/5.0	7.0/6.0	s
	Working pressure for attachments	160	160	160	160	bar
	Oil volume for attachments	80	80	80	80	l/min

¹⁾ for vertical mast.

²⁾ The values shown represent the maximum gradeability to overcome short differences in height and surface unevenness (surface edges). The truck must not operate on inclines of more than 15%.

DFG S80-S90

	Description	S80	S90	
Q	Capacity ¹⁾	8000	9000	kg
C	Load centre distance	900	900	mm
	Travel speed* with / without load	22.3/22.6	22.3/22.6	km/h
	Lift speed with / without load	0.40/0.60	0.40/0.60	m/s
	Lowering speed with / without load	0.60/0.36	0.60/0.36	m/s
	Gradeability ²⁾ with / without load	21.5/25.0	20.9/24.0	%
	Tow force with / without load	49.5/49.5	52.9/52.9	kN
	Acceleration* with / without load to 15 m	7.0/6.0	7.0/6.0	s
	Working pressure for attachments	160	160	bar
	Oil volume for attachments	80	80	l/min

¹⁾ for vertical mast.

²⁾ The values shown represent the maximum gradeability to overcome short differences in height and surface unevenness (surface edges). The truck must not operate on inclines of more than 15%.

TFG 660-690

	Description	660	670	680	690	
Q	Capacity ⁽¹⁾	6000	7000	8000	9000	kg
C	Load centre distance	600	600	600	600	mm
	Travel speed* with / without load	22.4/22.6	22.4/22.6	22.4/22.6	22.4/22.6	km/h
	Lift speed with / without load	0.40/0.48	0.40/0.48	0.40/0.48	0.40/0.48	m/s
	Lowering speed with / without load	0.60/0.48	0.60/0.36	0.60/0.36	0.60/0.36	m/s
	Gradeability ⁽²⁾ with / without load	27.5/30.0	27.5/30.0	26.5/30.0	23.0/27.0	%
	Tow force with / without load	45.6/45.6	45.6/45.6	45.6/45.6	45.6/45.6	kN
	Acceleration* with / without load to 15 m	6.0/5.0	6.0/5.0	6.0/5.0	7.0/6.0	s
	Working pressure for attachments	160	160	160	160	bar
	Oil volume for attachments	80	80	80	80	l/min

¹⁾ for vertical mast.

²⁾ The values shown represent the maximum gradeability to overcome short differences in height and surface unevenness (surface edges). The truck must not operate on inclines of more than 15%.

TFG S80-S90

	Description	S80	S90	
Q	Capacity	8000	9000	kg
C	Load centre distance	900	900	mm
	Travel speed* with / without load	22.4/22.6	22.4/22.6	km/h
	Lift speed with / without load	0.40/0.48	0.40/0.48	m/s
	Lowering speed with / without load	0.60/0.36	0.60/0.36	m/s
	Gradeability* with / without load	20.2/23.0	17.6/20.0	%
	Tow force with / without load	45.6/45.6	45.6/45.6	kN
	Acceleration* with / without load to 15 m	7.0/6.0	7.0/6.0	s
	Working pressure for attachments	160	160	bar
	Oil volume for attachments	80	80	l/min

1) for vertical mast.

2) The values shown represent the maximum gradeability to overcome short differences in height and surface unevenness (surface edges). The truck must not operate on inclines of more than 15%.

3.2 Dimensions

DFG 660-690

	Description	660	670	680	690	
a/2	Safety distance	100	100	100	100	mm
h ₁	Mast height retracted*	2710	2710	3010	3160	mm
h ₃	Lift*	3600	3600	3600	3600	mm
h ₄	Mast height extended*	4510	4510	4810	4960	mm
h ₆	Overhead guard height*	2705	2705	2705	2705	mm
h ₇	Seat height*	1600	1600	1600	1600	mm
h ₁₀	Coupling height	500	500	500	500	mm
α	Mast tilt, forward*	6	6	6	6	°
β	Mast tilt, back*	9	9	9	9	°
l ₁	Length, including forks*	4760	4770	4880	5035	mm
l ₂	Length, including fork shank*	3560	3570	3680	3835	mm
b ₁	Overall width*	1820	1820	2002	2002	mm
s/e/l	Fork dimensions*	50/150/ 1200	60/150/ 1200	60/150/ 1200	65/150/ 1200	mm
m ₁	Floor clearance with load below mast*	250	250	250	250	mm
m ₂	Floor clearance centre wheel base*	250	250	250	250	mm
	Fork carriage ISO 2328 class / type A, B	4 A	4 A	4 A	4 A	mm
b ₃	Fork carriage width	1800	1800	2000	2000	mm
Ast	Working aisle width for pallets 800 x 1200 longitud.	5320	5330	5440	5745	mm
Ast	Working aisle width for pallets 1000 x 1200 traverse	5120	5130	5240	5545	mm
Wa	Turning radius	3250	3250	3350	3650	mm
b ₁₃	Smallest turning radius	1270	1270	1320	1390	mm
x	Load distance*	670	680	690	695	mm
c	Load centre of gravity	600	600	600	600	mm
y	Wheel base	2295	2295	2395	2545	mm

*) The data listed in the table corresponds to the standard version.

DFG S80-S90

	Description	S80	S90	
a/2	Safety distance	100	100	mm
h ₁	Mast height retracted*	3160	3310	mm
h ₃	Lift*	3600	3600	mm
h ₄	Mast height extended*	4960	5110	mm
h ₆	Overhead guard height*	2705	2705	mm
h ₇	Seat height*	1600	1600	mm
h ₁₀	Coupling height	500	500	mm
α	Mast tilt, forward*	6	6	°
β	Mast tilt, back*	9	9	°
l ₁	Length, including forks*	5640	5840	mm
l ₂	Length, including fork shank*	3840	4040	mm
b ₁	Overall width*	2150	2150	mm
s/e/l	Fork dimensions*	70/180/ 1800	70/180/ 1800	mm
m ₁	Floor clearance with load below mast*	250	250	mm
m ₂	Floor clearance centre wheel base*	250	250	mm
	Fork carriage ISO 2328 class / type A, B	4 A	4 A	mm
b ₃	Fork carriage width	2100	2100	mm
Ast	Working aisle width for pallets 800 x 1200 longitud.	5745	5995	mm
Ast	Working aisle width for pallets 1000 x 1200 traverse	5545	5795	mm
Wa	Turning radius	3900	3900	mm
b ₁₃	Smallest turning radius	1490	1490	mm
x	Load distance*	700	700	mm
c	Load centre of gravity	900	900	mm
y	Wheel base	2545	2745	mm

*) The data listed in the table corresponds to the standard version.

TFG 660-690

	Description	660	670	680	690	
a/2	Safety distance	100	100	100	100	mm
h ₁	Mast height retracted*	2710	2710	3010	3160	mm

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TFG 660-690

	Description	660	670	680	690	
h ₃	Lift*	3600	3600	3600	3600	mm
h ₄	Mast height extended*	4510	4510	4810	4960	mm
h ₆	Overhead guard height*	2705	2705	2705	2705	mm
h ₇	Seat height*	1600	1600	1600	1600	mm
h ₁₀	Coupling height	500	500	500	500	mm
α	Mast tilt, forward*	6	6	6	6	°
β	Mast tilt, back*	9	9	9	9	°
l ₁	Length, including forks*	4860	4870	4980	5135	mm
l ₂	Length, including fork shank*	3660	3670	3780	3935	mm
b ₁	Overall width*	1820	1820	2002	2002	mm
s/e/l	Fork dimensions*	50/150/ 1200	60/150/ 1200	60/150/ 1200	65/150/ 1200	mm
m ₁	Floor clearance with load below mast*	250	250	250	250	mm
m ₂	Floor clearance centre wheel base*	250	250	250	250	mm
	Fork carriage ISO 2328 class / type A, B	4 A	4 A	4 A	4 A	mm
b ₃	Fork carriage width	1800	1800	2000	2000	mm
Ast	Working aisle width for pallets 800 x 1200 longit.	5420	5430	5640	5895	mm
Ast	Working aisle width for pallets 1000 x 1200 traverse	5220	5230	5440	5695	mm
Wa	Turning radius	3350	3350	3550	3800	mm
b ₁₃	Smallest turning radius	1320	1320	1370	1440	mm
x	Load distance*	670	680	690	695	mm
c	Load centre of gravity	600	600	600	600	mm
y	Wheel base	2395	2395	2495	2645	mm

*) The data listed in the table corresponds to the standard version.

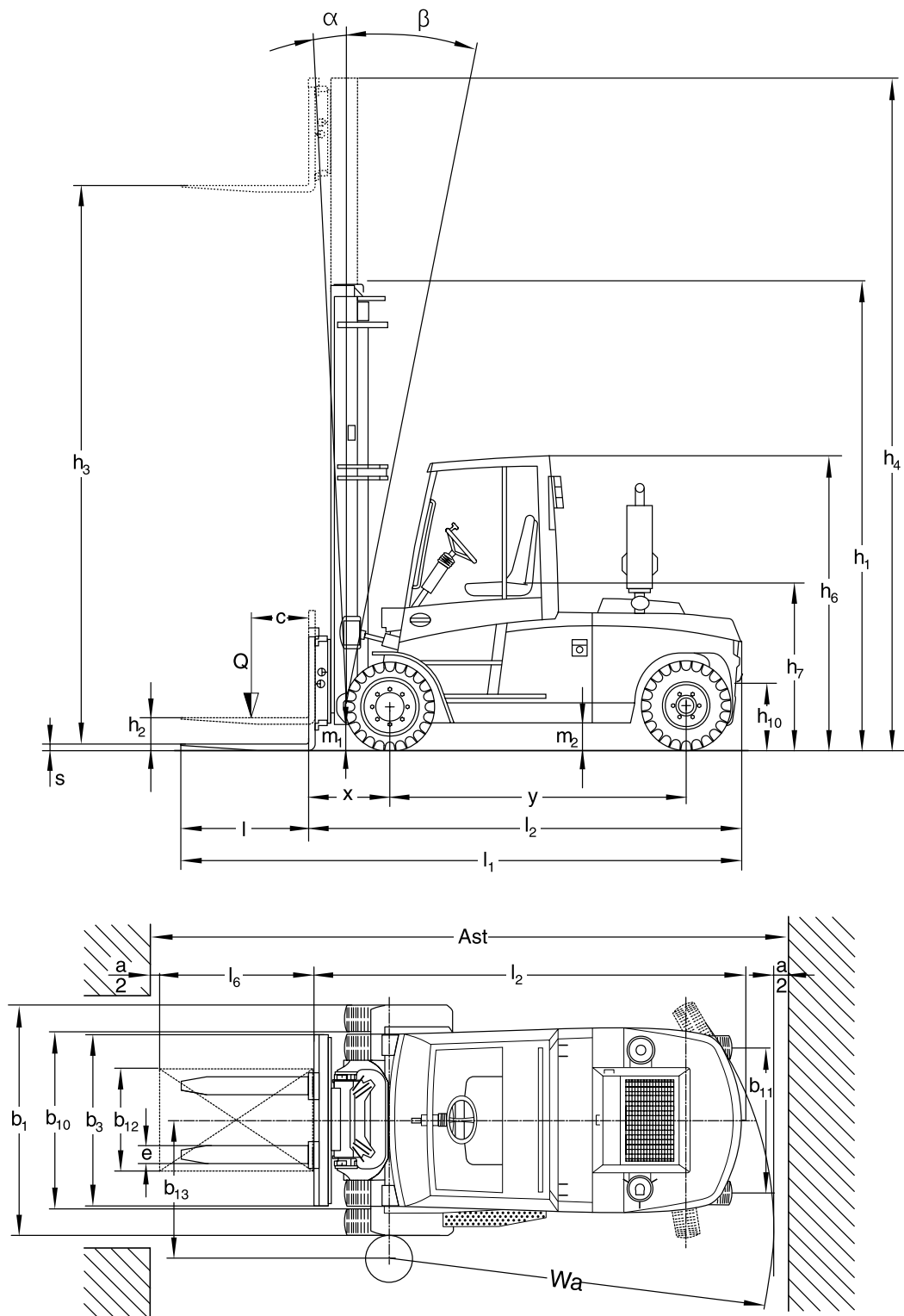
TFG S80-S90

	Description	S80	S90	
a/2	Safety distance	100	100	mm
h ₁	Mast height retracted*	3160	3310	mm
h ₃	Lift*	3600	3600	mm
h ₄	Mast height extended*	4960	5110	mm

TFG S80-S90

	Description	S80	S90	
h_6	Overhead guard height*	2705	2720	mm
h_7	Seat height*	1600	1600	mm
h_{10}	Coupling height	500	500	mm
α	Mast tilt, forward*	6	6	°
β	Mast tilt, back*	9	9	°
l_1	Length, including forks*	5740	5740	mm
l_2	Length, including fork shank*	3940	3940	mm
b_1	Overall width*	2150	2150	mm
s/e/l	Fork dimensions*	70/180/ 1800	70/180/ 1800	mm
m_1	Floor clearance with load below mast*	250	250	mm
m_2	Floor clearance centre wheel base*	250	250	mm
	Fork carriage ISO 2328 class / type A, B	4 A	4 A	mm
b_3	Fork carriage width	2100	2100	mm
Ast	Working aisle width for pallets 800 x 1200 longitud.	5895	5895	mm
Ast	Working aisle width for pallets 1000 x 1200 traverse	5695	5695	mm
Wa	Turning radius	3800	3800	mm
b_{13}	Smallest turning radius	1440	1440	mm
x	Load distance*	700	700	mm
c	Load centre of gravity	900	900	mm
y	Wheel base	2645	2645	mm

*) The data listed in the table corresponds to the standard version.



3.3 Weights



All dimensions in kg.

DFG 660-690

	660	670	680	690
Net weight*	10500	10800	11700	12500
Axle load w.o. load front / rear*	5500/5000	5500/5300	6000/5700	6000/6500
Axle load with load front / rear*	14900/1600	16000/1800	17700/2000	19000/2500

*) The data listed in the table corresponds to the standard version.

DFG S80-S90

	S80	S90
Net weight*	14400	15500
Axle load w.o. load front / rear*	7400/7000	8200/7300
Axle load with load front / rear*	20400/2000	22500/2000

*) The data listed in the table corresponds to the standard version.

TFG 660-690

	660	670	680	690
Net weight*	10970	10970	11900	13000
Axle load w.o. load front / rear*	5610/5360	5610/5360	5900/6000	6000/7000
Axle load with load front / rear*	14810/2160	16350/1620	17900/2000	19500/2500

*) The data listed in the table corresponds to the standard version.

TFG S80-S90

	S80	S90
Net weight*	14600	15000
Axle load w.o. load front / rear*	7000/7600	7200/7800
Axle load with load front / rear*	20100/2500	22000/2000

*) The data listed in the table corresponds to the standard version.

3.4 Mast versions



All dimensions in mm

DFG/TFG 660-680

Mast table						
VDI3596 Description	Lift h_3	Free lift h_2	Retracted height h_1		Extended height h_4	
			660/670	680	660/670	680
ZT	3600	0	2710	3010	4510	4810
	4000	0	2910	3210	4910	5210
	4500	0	3160	3460	5410	5710
	5000	0	3410	3710	5910	6210
	5500	0	3660	3960	6410	6710
	6000	0	3910	4210	6910	7210
	6500	0	4160	4460	7410	7710
ZZ	3600	1800	2875	3025	4675	4825
	4000	2000	3075	3225	5075	5225
	4500	2250	3325	3475	5675	5725
	5000	2500	3575	3725	6075	6225
	5500	2750	3825	3975	6575	6725
	6000	3000	4075	4225	7075	7225
	6500	3300	4325	4475	7575	7725
DZ	4500	1500	-	2735	-	5736
	5000	1667	2752	2902	6086	6236
	5500	1833	2918	3068	6586	6736
	6000	2000	3085	3235	7086	7236
	6500	2167	3252	3402	7586	7736
	7000	2333	3418	3568	8086	8236
	7500	2500	3585	3735	8586	8736
	8000	2667	3752	3902	9086	9236

Special trucks are not included in this overview.

DFG/TFG 690-S90

Mast table						
VDI3596 Description	Lift h_3	Free lift h_2	Retracted height h_1		Extended height h_4	
			690-S80	S90	690-S80	S90
ZT	3600	0	3160	3310	4960	5110
	4000	0	3360	3510	5360	5510
	4500	0	3610	3760	5860	6010
	5000	0	3860	4010	6360	6510
	5500	0	4110	4260	6860	7010
	6000	0	4360	4510	7360	7510
	6500	0	4610	4760	7860	8010
ZZ	3600	1800	3175	3325	4975	5125
	4000	2000	3375	3525	5375	5525
	4500	2250	3625	3775	5875	6025
	5000	2500	3875	4025	6375	6525
	5500	2750	4125	4275	6875	7025
	6000	3000	4375	4525	7375	7525
	6500	3300	4625	4775	7875	8025
DZ	4500	1500	2885	3035	5886	6036
	5000	1667	3052	3202	6386	6536
	5500	1833	3218	3368	6886	7036
	6000	2000	3385	3535	7386	7536
	6500	2167	3552	3702	7886	8036
	7000	2333	3718	3868	8386	8536
	7500	2500	3885	4035	8886	9036
	8000	2667	4052	4202	9386	9536

Special trucks are not included in this overview.

3.5 Tyre type

NOTE

When replacing tyres/rims fitted at the factory, always use original spare parts or tyres approved by the manufacturer. Otherwise the manufacturer's specification cannot be guaranteed.

If you have any queries please contact the manufacturer's customer service department.

DFG/TFG 660-690

Description		DFG/TFG			
		660	670	680	690
Front tyres	SE*	355/65 - 15	355/65 - 15	8.25 - 15	8.25 - 15
	Pneumatic*	355/65 - 15 18 PR	355/65 - 15 18 PR	8.25 - 15 18 PR	8.25 - 15 18 PR
	Tyre pressure bar	10	10	10	10
	Torque Nm	450	450	450	450
Rear tyres	SE*	8.25 - 15	8.25 - 15	8.25 - 15	300 - 15
	Pneumatic*	8.25 - 15 18 PR	8.25 - 15 18 PR	8.25 - 15 18 PR	300 - 15 18 PR
	Tyre pressure bar	10	10	10	10
	Torque Nm	290	290	290	450

DFG/TFG S80-S90

Description		DFG/TFG	
		S80	S90
Front tyres	SE*	300 - 15	300 - 15
	Pneumatic*	300 - 15 18 PR	300 - 15 18 PR
	Tyre pressure bar	10	10
	Torque Nm	450	450
Rear tyres	SE*	300 - 15	300 - 15
	Pneumatic*	300 - 15 18 PR	300 - 15 18 PR
	Tyre pressure bar	10	10
	Torque Nm	290 DFG 450	450

*) The models listed in the table correspond to the standard version. Other tyres can be used depending on the truck's equipment.

3.6 Engine Data

DFG 660-680

Description	DFG 660	DFG 670	DFG 680	
Cylinders/cubic capacity	4/4400	4/4400	4/4400	cm ³
Rated speed (without load)	2200	2200	2200	rpm
Idle speed	850	850	850	rpm
Motor output	91	91	91	kW
Fuel consumption 60 VDI duty cycles/h	7.9	8.3	8.7	l/h [kg/h]

DFG 690-S90

Description	DFG 690	DFG S80	DFG S90	
Cylinders/cubic capacity	4/4400	4/4400	6/6600	cm ³
Rated speed (without load)	2200	2200	2200	rpm
Idle speed	850	850	850	rpm
Motor output	91	91	90	kW
Fuel consumption 60 VDI duty cycles/h	9	9	10.5	l/h [kg/h]

TFG 660-680

Description	TFG 660	TFG 670	TFG 680	
Cylinders/cubic capacity	8/5700	8/5700	8/5700	cm ³
Rated speed (without load)	2200	2200	2200	rpm
Idle speed	850	850	850	rpm
Motor output	85	85	85	kW
Fuel consumption 60 VDI duty cycles/h	8.4	8.9	9.3	l/h [kg/h]

TFG 690-S90

Description	TFG 690	TFG S80	TFG S90	
Cylinders/cubic capacity	8/5700	8/5700	8/5700	cm ³
Rated speed (without load)	2200	2200	2200	rpm
Idle speed	850	850	850	rpm
Motor output	85	85	85	kW
Fuel consumption 60 VDI duty cycles/h	10.6	10.6	11.1	l/h [kg/h]

3.7 EN norms

Noise emission level

- DFG 660-690, S80: 78 dB (A)*
- DFG S90: 70 dB (A)*
- TFG: 78 dB(A)*

*+/- 4 dB(A) depending on the truck's equipment

in accordance with EN 12053 as harmonised with ISO 4871.

- The noise emission level is calculated in accordance with standard procedures and takes into account the noise level when travelling, lifting and when idle. The noise level is measured at the level of the driver's ear.

Vibration

in accordance with EN 13059.

- The vibration acceleration acting on the body in the operating position is, in accordance with standard procedures, the linearly integrated, weighted acceleration in the vertical direction. It is calculated when travelling over bumps at constant speed. These recordings were taken on a single occasion and must not be confused with the human vibrations of the "2002/44/EC/Vibrations" operator directive. The manufacturer offers a special service to measure these human vibrations, (see "Human vibration measurement" on page 195).

Whole-body vibration		
Motor type	Vibration a_{wz}	Uncertainty
TFG	1.5 m/s ²	0.2 m/s ²
DFG S90	0.9 m/s ²	0.1 m/s ²
DFG 660-690, S80	0.7 m/s ²	0.2 m/s ²

Hand/arm vibration	
Vibration	<2.5 m/s ²

- The vibration that is characteristic for vibrations of the body cannot be used to determine the actual load caused by vibrations during operation. That depends on the operating conditions (condition of the travel routes, method of operation, etc.) and should therefore be determined on site at a suitable location. Hand/arm vibration must always be determined without exception, even if the values do not indicate any hazard at all, as in this case.

Electromagnetic compatibility (EMC)

The manufacturer confirms that the truck adheres to the limits for electromagnetic emissions and resistance as well as the static electricity discharge test in accordance with EN 12895 as well as the standardised instructions contained therein.



No changes to electric or electronic components or their arrangement may be made without the written agreement of the manufacturer.



WARNING!

Medical equipment can be damaged by non-ionised radiation

Electrical equipment on the truck emitting non-ionised radiation (e.g. wireless data transmission) can affect operators' medical equipment (pacemakers, hearing aids etc.) and result in malfunctions. Consult with a doctor or the medical equipment manufacturer to clarify whether it can be used near the industrial truck.

3.8 Conditions of use

Ambient temperature

– operating at -20 to 40°C



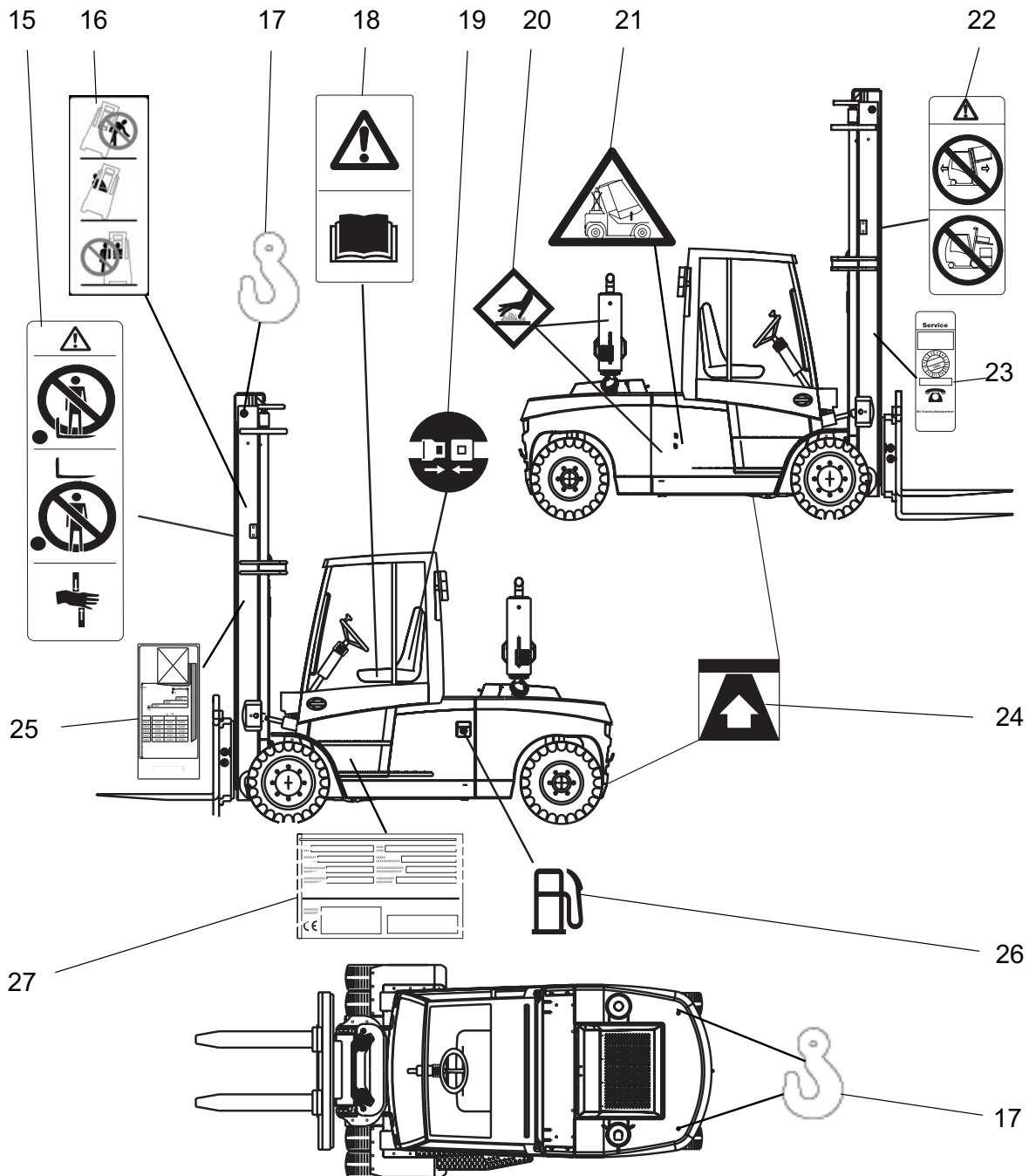
Special equipment and authorisation are required if the truck is to be constantly used in conditions of extreme temperature or air humidity fluctuations.

3.9 Electrical requirements

The manufacturer certifies compliance with the requirements for the design and manufacture of electrical equipment, according to EN 1175 "Industrial Truck Safety - Electrical Requirements", provided the truck is used according to its purpose.

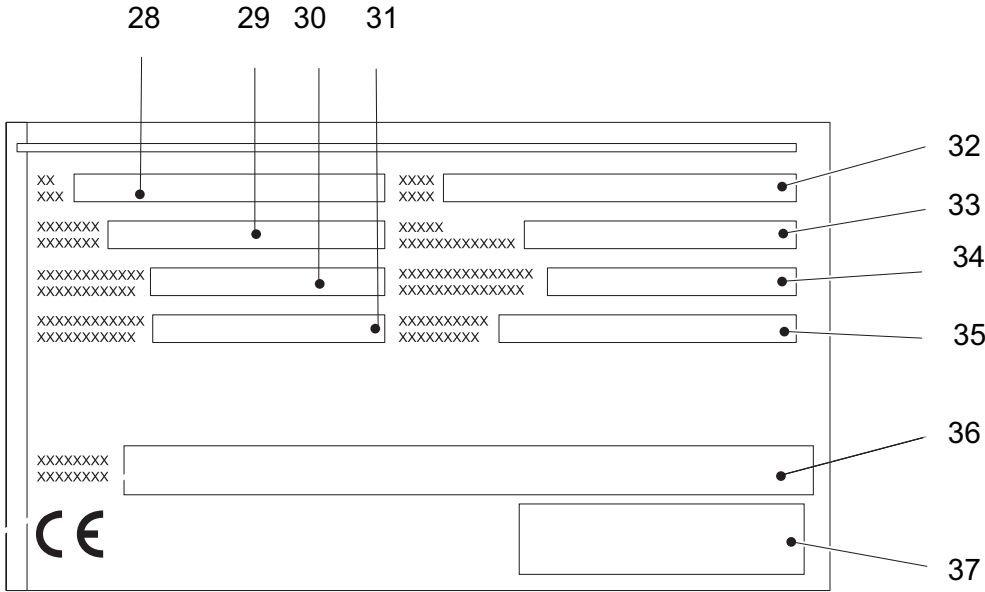
4 Identification points and data plates

- Warnings and notices such as capacity charts, strap points and data plates must be legible at all times. Replace if necessary.



Item	Description
15	Do not stand on load handler / Do not stand under load handler / Risk of trapping when mast extended
16	Tipover caution, no passengers
17	Attachment points for loading by crane (○)
18	Read operating instructions
19	Putting on the seat belt
20	Hot surface warning
21	Turn the exhaust pipe back before tilting the cab
22	Do not drive or tilt the mast forward with a load raised
23	Test plaque (○)
24	Jack attachment point
25	Capacity plate
26	Fuel
27	Truck data plate

4.1 Data plate



Item	Description	Item	Description
28	Type	33	Year of manufacture
29	Serial number	34	Load centre (mm)
30	Rated capacity (kg)	31	Output
31	Output	36	Manufacturer
35	Net weight in kg	37	Manufacturer's logo
32	Option		



For queries regarding the truck or ordering spare parts always quote the truck serial number (29).

4.2 Truck capacity plate

CAUTION!

Accident risk from fork replacement

If you replace the forks with ones that differ from the originals, the capacity will change.

- When replacing the forks you must attach an additional capacity plate to the truck.
- Trucks supplied without forks are given a capacity plate for standard forks (length: 1150 mm).

The capacity plate (25) gives the capacity (Q in kg) of the truck for a vertical mast. The maximum capacity is shown as a table with a given load centre D (in mm) and the required lift height H (in mm).

The capacity plate (25) of the truck indicates the truck's capacity with the forks as originally supplied.

Example of how to calculate the maximum capacity:

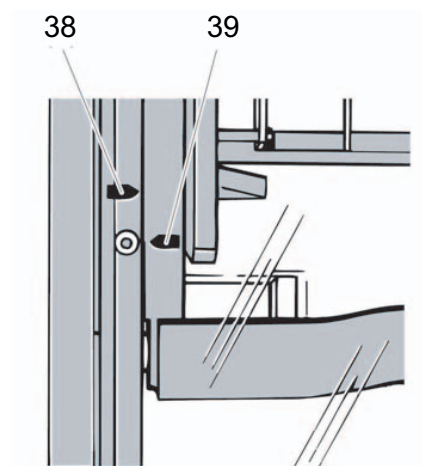
With a load centre distance D of 700 mm and a maximum lift height h_3 of 5000 mm. the max. capacity Q is 6940 kg.

25

Nr.			
Q (kg)			
h3 (mm)	6000	6460	5660
5000	7470	6940	6080
4000	8340	7740	6770
D (mm)	600	700	900

Lift height restriction

The arrow shape markings (38 and 39) on the inner and outer masts show the driver when the prescribed lift limits have been reached.



4.3 Attachment capacity plate

The attachment capacity plate is next to the truck's capacity plate and gives the truck's capacity Q (in kg) in conjunction with the respective attachment. The serial number for the attachment indicated on the capacity plate must match the data plate of the attachment.



For loads with a centre of gravity above 600 mm upward, the capacities are reduced by the difference of the altered centre of gravity.

4.4 Jack attachment point

The "Jack contact point" decal (24) indicates where the truck may be lifted and jacked up.



24

5 Stability

The truck's stability has been tested according to latest technological standards. These take into account the dynamic and static tipover forces that can occur if used correctly.

Stability can also be affected by the following factors:

- Tyre type
- Mast
- Attachment
- Transported load (size, weight and centre of gravity)



WARNING!

Loss of stability can cause accidents

Changing the components can alter the stability.

C Transport and Commissioning

1 Transport

Transport can be carried out in two different ways, depending on the height of the mast and the local conditions.

- Vertically, with the mast assembled (for low heights)
- Vertically, with the mast dismantled (for large heights), all mechanical connections and hydraulic lines between the basic truck and the mast separated.

2 Truck laden

2.1 Centre of gravity of the truck

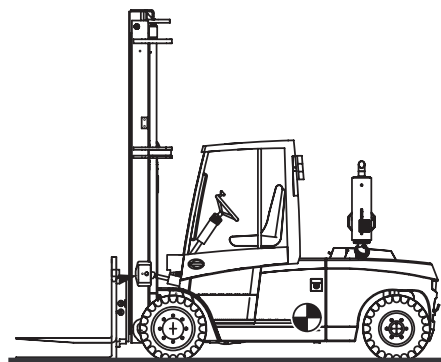
WARNING!

Altering the centre of gravity can be hazardous

The overall centre of gravity can vary depending on the truck's equipment (especially the mast version).

- For masts with a low height the centre of gravity will move towards the counterweight.
- For masts with a greater height the centre of gravity will move towards the centre of the truck.

The picture shows the approximate centre of gravity location.



2.2 Lifting the truck by crane

CAUTION!

The mast can get damaged

- ▶ Loading by crane is only intended for the initial transport before the truck is used for the first time.
- ▶ Loading must be carried out by specially trained staff in accordance with recommendations contained in Guidelines VDI 2700 and VDI 2703

DANGER!

Crane slings can tear, resulting in accidents

- ▶ Only use crane lifting gear with sufficient capacity.
- ▶ Loading weight = Net weight of truck (+ battery weight for electric trucks).
- ▶ The mast must be tilted back fully.
- ▶ The crane lifting gear on the mast must have a minimum clear length of 2 m.
- ▶ Crane slings should be fastened in such a way that they do not come into contact with any attachments or the overhead guard when lifting.
- ▶ Do not stand under a swaying load.

 Truck net weight: (see "Data plate" on page 38).

Lifting the truck by crane

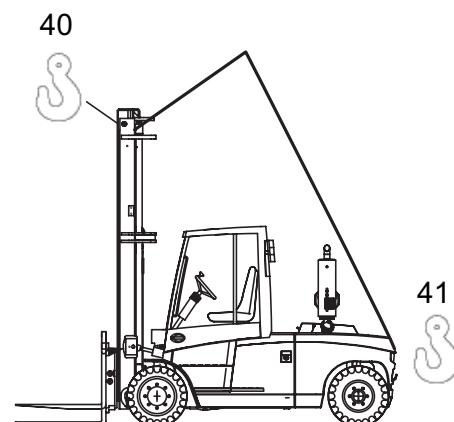
Requirements

- Park the truck securely, (see "Parking the truck securely" on page 100).

Procedure

- Secure the crane slings to the attachment points (40) and (41).
- Raise and load the truck.
- Lower and deposit the truck carefully ((see "Parking the truck securely" on page 100)).
- Secure the truck with wedges to prevent it from rolling away.

This concludes the loading by crane.



2.3 Loading with another industrial truck

DANGER!

Slipping can cause accidents

- ▶ Do not use another Industrial truck to load the truck!

3 Securing the truck during transport

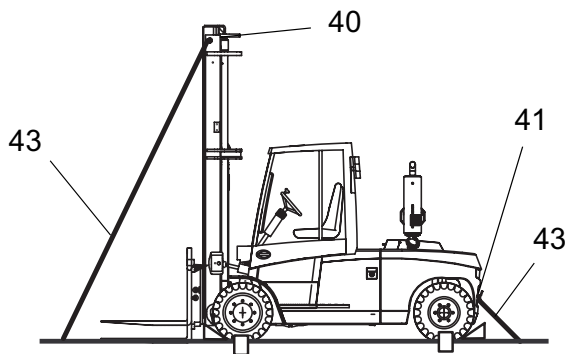
WARNING!

Accidental movement during transport

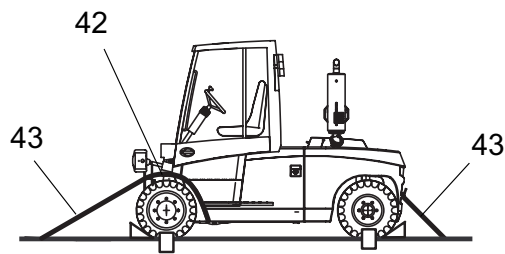
Improper fastening of the truck and mast during transport can result in serious accidents.

- ▶ Loading must be carried out by specially trained staff in accordance with recommendations contained in Guidelines VDI 2700 and VDI 2703. In each case correct measurements must be made and appropriate safety measures adopted.
- ▶ The truck must be securely fastened when transported on a lorry or a trailer.
- ▶ The loading area must have clamp rings and a wooden floor to secure the retaining wedges.
- ▶ Use wedges to prevent the truck from moving.
- ▶ Use only tensioning belts or tie-down straps or with sufficient strength.

Securing with a mast



Securing without a mast



Securing the truck for transport

Requirements

- Position the truck securely on a lorry or trailer, (see "Parking the truck securely" on page 100).

Tools and Material Required

- 2 tensioning belts with tensioner
- Retaining wedges.

Procedure

- Secure the truck with the tensioning belt (43) at the top cross member of the mast (40) and the trailer coupling (41) or over the front axle cross member (42) and the trailer coupling (41).
- Tighten the tensioning belts (43) with the tensioner.

The truck is now secured for transport.

4 Using the Truck for the First Time

Safety Instructions for Assembly and Commissioning



WARNING!

Accident risk from incorrect assembly

The assembly of the truck at the application site, commissioning and driver training must only be performed by the manufacturer's customer service representatives who have been specially trained for these tasks.

- ▶ The hydraulic lines may only be connected to the basic truck / mast interface when the mast has been properly assembled.
- ▶ Only then can the truck be started.
- ▶ If several trucks have been delivered, make sure that the serial numbers of the load handlers, masts and basic trucks always match.

Preparing the truck for operation after delivery or transport

Procedure

- Check the equipment is complete.
- Check the engine oil level.
- Check the hydraulic oil level. Check the transmission oil level (only on trucks with hydrodynamic drives).
- Check the brake fluid level (only on trucks with hydrodynamic drives).
- Test the battery connections.
- Check the battery acid level (not for maintenance-free batteries).

The truck can now be started, (see "Preparing the Truck for Operation" on page 84).

D Fuelling the Truck

1 General

1.1 Safety regulations for handling diesel fuel and LPG

WARNING!

An unsecured industrial truck can cause accidents

The truck can suddenly start to move.

- ▶ Before filling up or replacing the LPG bottle, park the truck securely, (see "Parking the truck securely" on page 100)

WARNING!

Accident risk from ignition

- ▶ Fuels and liquefied petroleum gas can ignite.
- ▶ Smoking, naked flames and other ignition sources are strictly prohibited in the immediate vicinity when handling fuels and LPG.
- ▶ Labels indicating the hazard are must be positioned where they are clearly visible.
- ▶ Do not store flammable materials in this area.
- ▶ Powder fire extinguisher must be provided within easy reach of the filling area.
- ▶ Use only category A, B or C type powder fire extinguishers to fight LPG fires.
- ▶ Bring any unsealed LPG bottles immediately outside, attach visible markings and notify the supplier.

Storage and Transport

The diesel and LPG storage and transport devices must comply with statutory requirements.

If there is no filling point available, the fuel must be stored and transported in clean, approved containers.

The contents must be clearly indicated on the container.

NOTE

Fuel can cause environmental damage

- ▶ Bind any spilled diesel fuel with suitable methods.
 - ▶ Then dispose of the diesel and fuel filter in accordance with environmental regulations.
-

Fuel filling and LPG bottle replacement personnel

Personnel filling the trucks or replacing LPG bottles must have sufficient knowledge of the nature of fuels to ensure safe operation.



CAUTION!

Liquid gas can cause frostbite

- ▶ Liquid gas produces frostbite when it comes into contact with bare skin.
 - ▶ Avoid direct contact with the skin.
 - ▶ Wear gloves.
-

Filling up LPG containers

LPG containers remain attached to the truck and are filled up at LPG stations. Always follow the instructions of the tank system and LPG container manufacturer as well as statutory and local regulations when filling up.

NOTE

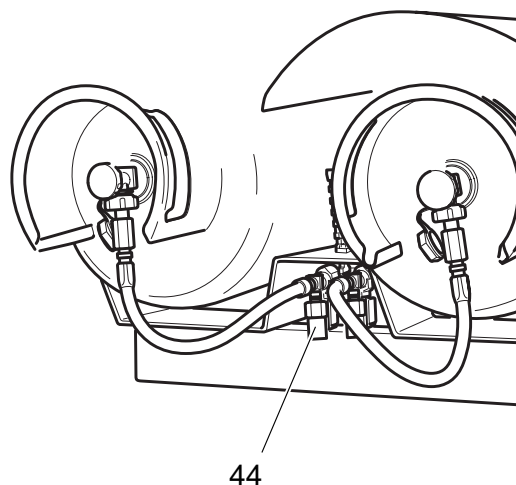
Instructions for the safe operation of LPG systems

- ▶ All maintenance and repair work on LPG systems and containers should be carried out by qualified personnel who have been trained to work on LPG systems.
 - ▶ The owner must comply with all legal requirements, technical standards and health and safety regulations applicable to liquid gas.
 - ▶ Before starting work, the driver must check that all accessible components of the LPG system are in good working order, in accordance with the regulations of the country of use.
 - ▶ Do not operate the truck if there is any damage, corrosion, wear or degradation to individual components of the LPG system.
-

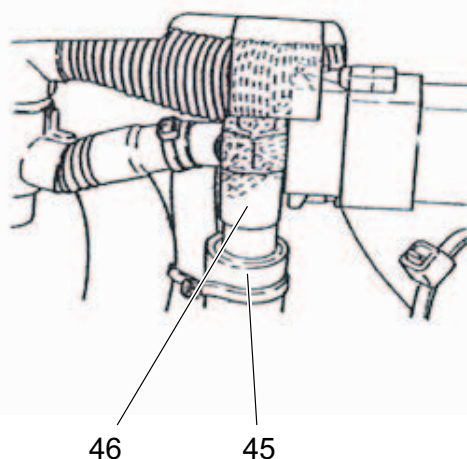
1.2 LPG system relief valve

LPG powered trucks are fitted with a relief valve. This is located on the rear cover next to the gas bottle.

- In the event of a fault the pressure in the gas system is restricted to a maximum level. The relief valve is fitted with a plastic cover (44).
- When the valve is activated the plastic cover comes off, thereby clearly indicating a fault in the gas system.
- In this event the truck must not be operated.
- The gas system must be checked by suitably qualified and trained personnel.
- The user must check that the plastic cover is present each time he uses the truck.



- Models with a liquid gas tank have the relief valve (46) in the drive compartment. The relief valve is fitted with a hose (45) that diverts the LPG if the relief valve is opened.
- When the valve is activated the plastic cover comes off, thereby clearly indicating a fault in the gas system.
- In this event the truck must not be operated.
- The gas system must be checked by suitably qualified and trained personnel.
- The user must check that the plastic cover is present each time he uses the truck.



DANGER!

Danger from escaping liquid gas.

Liquid gas can escape from faulty gas hoses.

- Use only gas bottles with an integrated line break safety valve.
- The gas bottle connection is also fitted with a line break safety valve which prevents the gas from escaping accidentally during operation.
- When replacing, always use a gas bottle connection with an integrated line break safety valve.

2 Adding diesel

CAUTION!

Air in the fuel system will result in malfunctions.

- ▶ Never allow the fuel tank to run dry.

2.1 Fuelling

WARNING!

Diesel fuel can be hazardous

- ▶ Diesel fuel can cause irritation if it comes into contact with the skin. Rinse any affected areas thoroughly.
- ▶ If it comes into contact with the eyes rinse them immediately with flowing water and call for a doctor.
- ▶ Wear safety gloves when handling diesel fuels.

NOTE

Fuelling must always be performed in designated areas by trained and authorised personnel.

NOTE

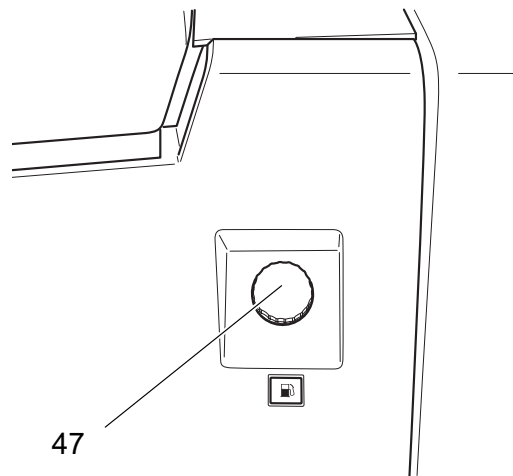
- ▶ Capacity: DFG 660-690 = 125 l.
- ▶ Use only diesel in accordance with DIN 590 or DIN 51628 with a cetane rating above 51.

2.1.1 Fuelling the tank system

Procedure

- Park the truck securely before fuelling, (see "Parking the truck securely" on page 100)
- Unscrew the tank cap (47).
- Insert the tap into the open tank filler neck.
- Add the fuel.
- Do not overfill the tank.
- Tighten the cap (47) back on after fuelling.

Fuelling is now complete.



The fuel gauge (48) indicates the fuel level.

NOTE

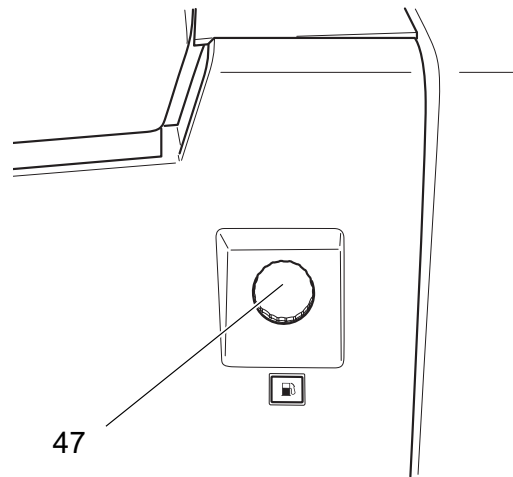
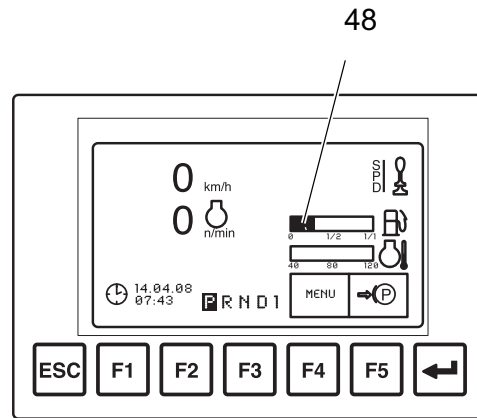
- Never allow the fuel tank to run dry. Air in the fuel system will result in malfunctions.

2.2 Fuelling with fuel containers

Procedure

- Unscrew the tank cap (47) and open the fuel container.
- Fit the outlet pipe onto the fuel container.
- Insert the outlet pipe into the open tank filler neck.
- Make sure the fuel container and outlet pipe are connected tightly to each other.
- Raise the fuel container carefully and slowly add the diesel.
- Do not overfill the tank.
- Tighten the cap (47) back on after fuelling.

Fuelling is now complete.



3 LPG containers

- Only use liquid gas that complies with DIN 51622 or comparable national regulations.

3.1 LPG bottles

DANGER!

Risk of explosion

- ▶ The LPG bottle must only be replaced at designated areas by trained and authorised personnel.

CAUTION!

Using unsuitable LPG bottles can cause accidents.

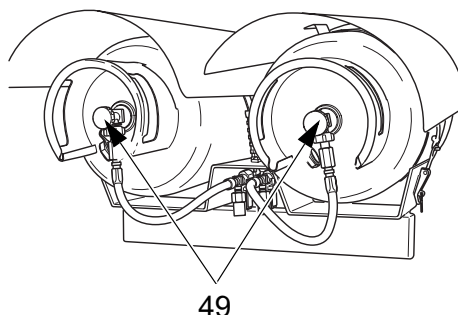
- ▶ Use only approved LPG bottles.
- ▶ The LPG bottle must always rest on an engaged bottle holder so that the hose connection of the shutoff valve is facing vertically down.
- ▶ For bottle types of other countries note the national regulations.
- ▶ Note the indications and markings on the LPG bottle.

3.1.1 Using an LPG bottle

Replace the LPG bottle

Procedure

- Park the truck securely before replacing the LPG bottle, (see "Parking the truck securely" on page 100)
- Close the shut-off valves (49) securely.
- Start the motor and allow the LPG system to run empty in neutral.



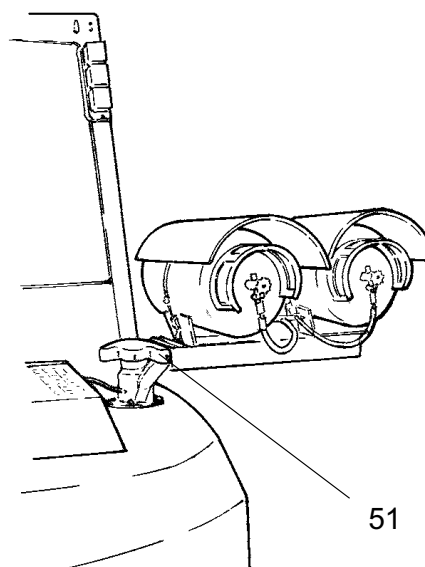
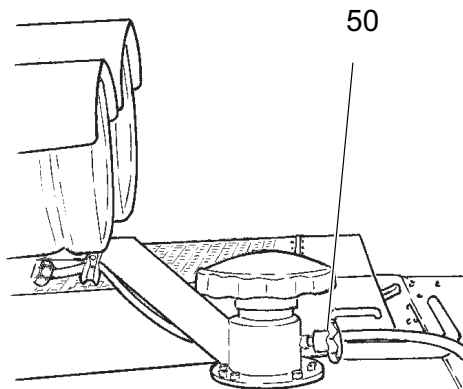
Remove the LPG bottle

CAUTION!

The connection has a left thread

Procedure

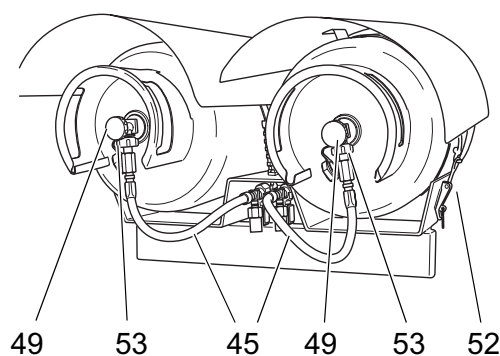
- The LPG bottle console is released with the finger screw (50).
- Unfold the console (51) as far as the stop.
- Unscrew the union nut (53).
- Remove the hose (45) and immediately screw the valve cap onto the empty LPG bottle.
- Loosen the toggle-type fastener with the handle (52).
- Carefully remove the LPG bottle from the bracket and place it down securely.



Inserting a new LPG bottle

Procedure

- Insert the LPG bottle into the bracket
- Align the hose connection downwards.
- Clamp the toggle-type fastener with the handle (52).
- Unscrew the valve cap.
- Fit the hose (45) in accordance with instructions.
- Carefully open the shut-off valve (49).
- Check the hose connection for leaks using a foam-forming agent.

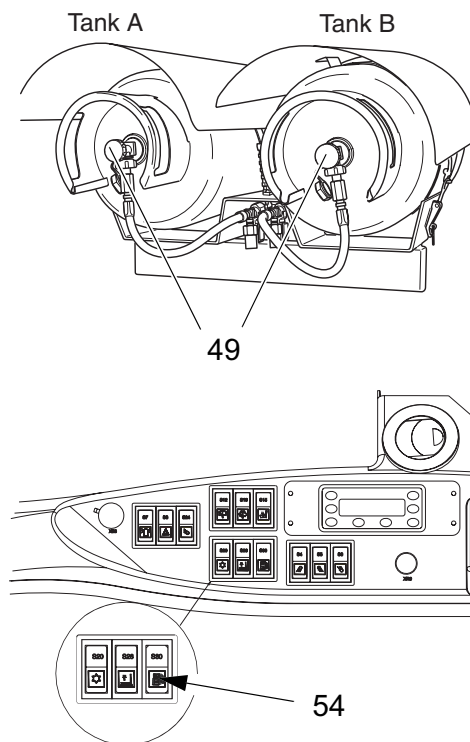


The replacement is now complete.

3.1.2 Operating the twin bottle system and liquid gas tank

Note the following when switching the LPG gas supply:

- The switch (54) controls the release of the LPG bottle or liquid gas tank.
- Open the shut-off valves (49) of both LPG bottles by turning anticlockwise.
- Enable LPG bottle A or B with the middle position (tank A) or the lower position (tank B) of the switch (54).
- The upper position of the switch (54) disables both LPG bottles and opens the liquid gas tank.



3.2 Liquid gas tank

The filling valve (55) is located on the left side of the truck.

Filling refillable liquid gas tanks

⚠ DANGER!

Risk of explosion

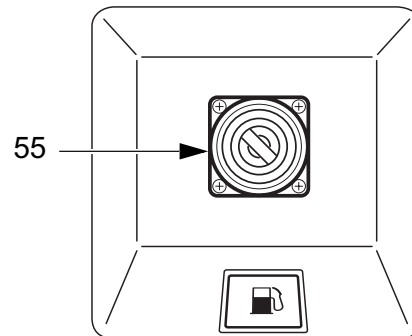
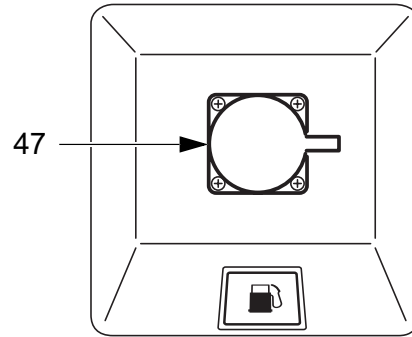
- Fuelling must always be performed in designated areas by trained and authorised personnel.

Requirements

- Park the truck securely ((see "Parking the truck securely" on page 100)).
- Note all guidelines and regulations concerning the filling of LPG bottles on the LPG pump.

Procedure

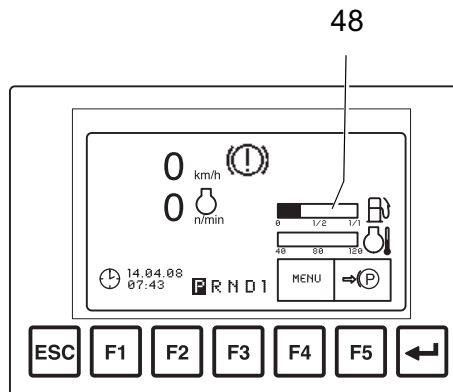
- Unscrew the tank cap (47).
 - Lock the filling adapter of the tank system in place on the filling valve (55).
 - Enabling filling on the tank system
- ➔ The integrated filling stop valve prevents the tank from overfilling.
- When the filling process is complete, release the filling adapter of the filling system from the filling valve (55).
 - Screw on the tank cap (47).
- ➔ The level of the tank is shown by the fuel indicator.



4 Fuel level indicator

4.1 Display unit

The level indicator (48) shows the capacity of the tank.



E Operation

1 Safety Regulations for the Operation of the Forklift Truck

Driver authorisation

The truck may only be used by suitably trained personnel, who have demonstrated to the proprietor or his representative that they can drive and handle loads and have been authorised to operate the truck by the proprietor or his representative.

Driver's rights, obligations and responsibilities

The driver must be informed of his duties and responsibilities and be instructed in the operation of the truck and shall be familiar with the operating instructions. The driver shall be afforded all due rights. Safety shoes must be worn for pedestrian operated trucks.

Unauthorised use of truck

The driver is responsible for the truck during the time it is in use. The driver must prevent unauthorised persons from driving or operating the truck. Do not carry passengers or lift other people.

Damage and faults

The supervisor must be immediately informed of any damage or faults to the truck or attachment. Trucks which are unsafe for operation (e.g. wheel or brake problems) must not be used until they have been rectified.

Repairs

The driver must not carry out any repairs or alterations to the truck without the necessary training and authorisation to do so. The driver must never disable or adjust safety mechanisms or switches.

Hazardous area



WARNING!

Risk of accidents / injury in the hazardous area of the truck

The hazardous area is defined as the area in which a person is at risk due to truck movement, lifting operations, the load handler (e.g. forks or attachments) or the load itself. This also includes areas which can be reached by falling loads or lowering operating equipment.

- ▶ Instruct unauthorised people to leave the hazardous area.
 - ▶ Give a warning signal with plenty of time for people to leave.
 - ▶ If unauthorised personnel are still within the hazardous area stop the truck immediately.
-



DANGER!

Accident risk

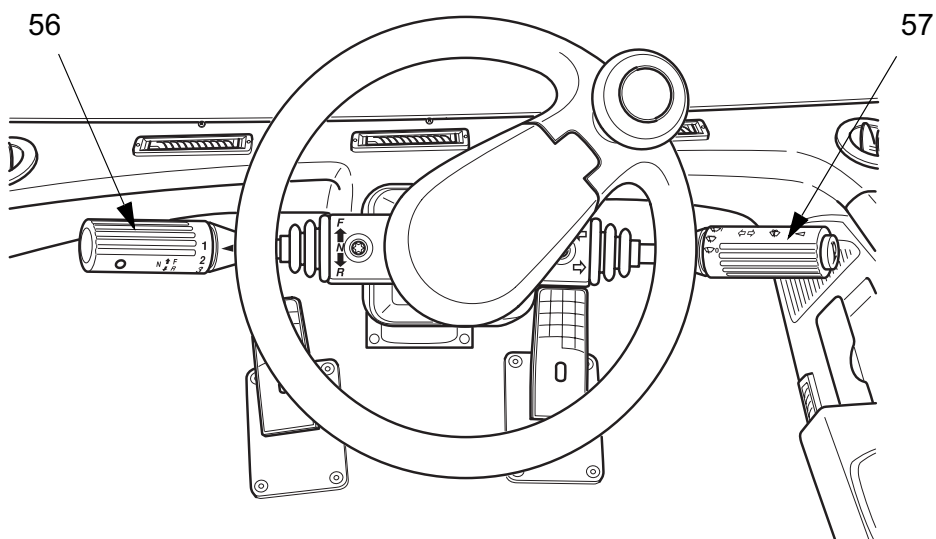
- ▶ The driver must remain within the protected area of the overhead guard while the truck is being operated.
-

Safety devices and warning labels

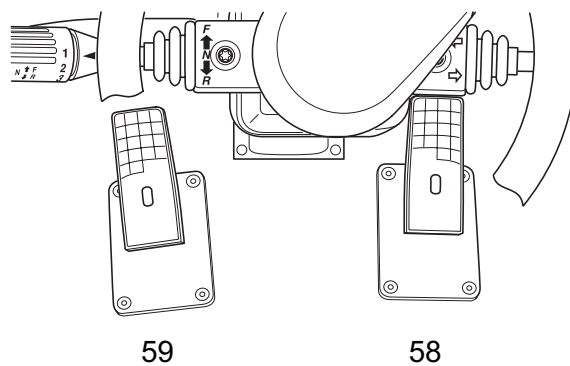
Safety devices, warning signs ((see "Identification points and data plates" on page 36)) and warning instructions in the present operating instructions must be strictly observed.

2 Displays and Controls

2.1 Multi-task switch



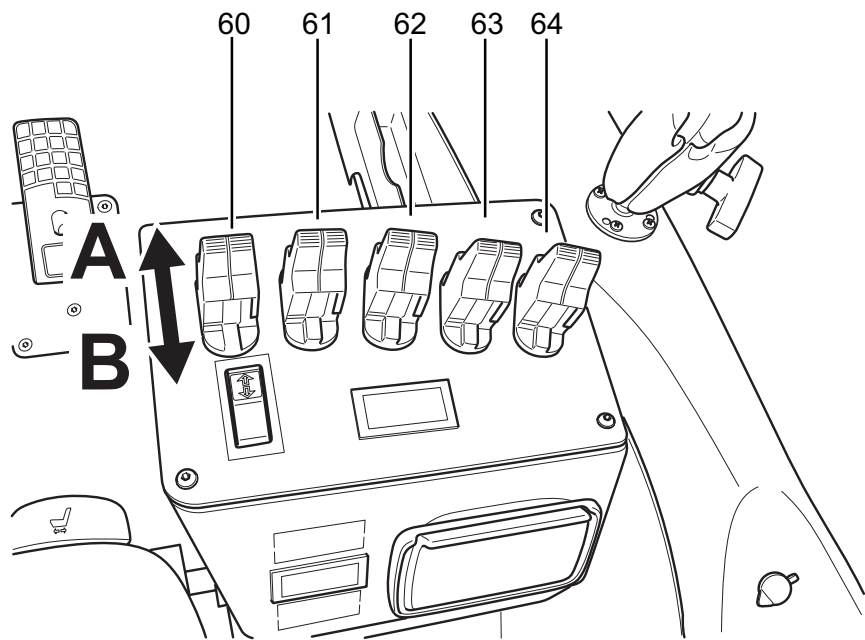
Einzelpedalsteuerung



Item	Control / display		Function
56	Multi-task switch – Travel function switch – Travel direction switch	●	– Adjusts automatic aisle switching – Selects travel direction / neutral position
● = Standard equipment		○ = Optional equipment	

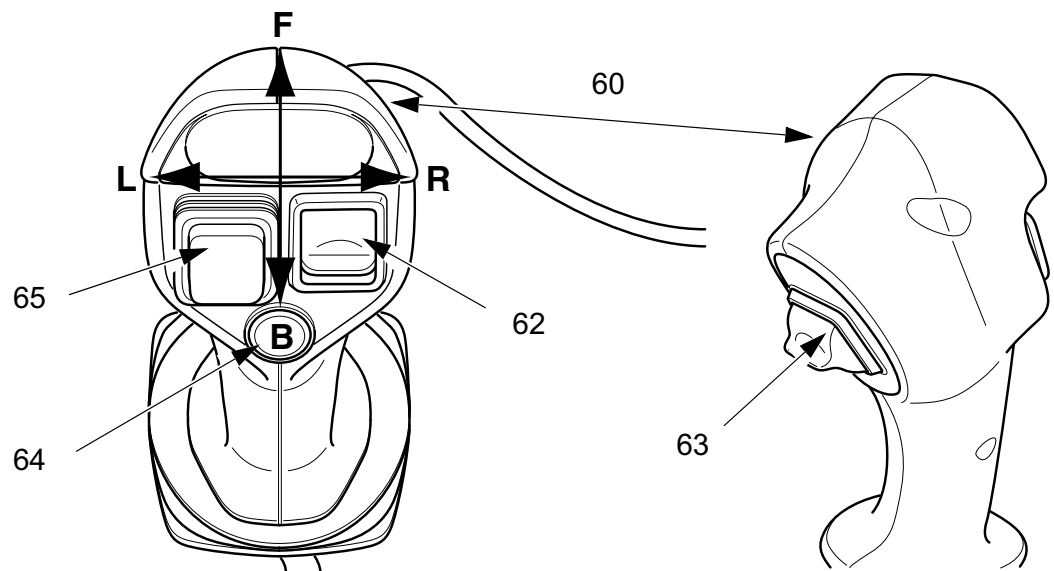
Item	Control / display		Function
57	Multi-task switch – Travel direction display – Dipped lights/main beam – Wiper – Window washer system – Horn	●	– Switches the travel direction indicator on and off – Switch spot lights from dipped lights to main beam – Switches the window wiper on and off – Switches interval speed on and off – Switches window washer system on and off – Activates an audible warning
59	Brake pedal	●	Upon activation, the truck brakes to a standstill immediately.
58	Accelerator pedal	●	Infinitely variable travel speed control.
● = Standard equipment		○ = Optional equipment	

2.2 SOLO-PILOT



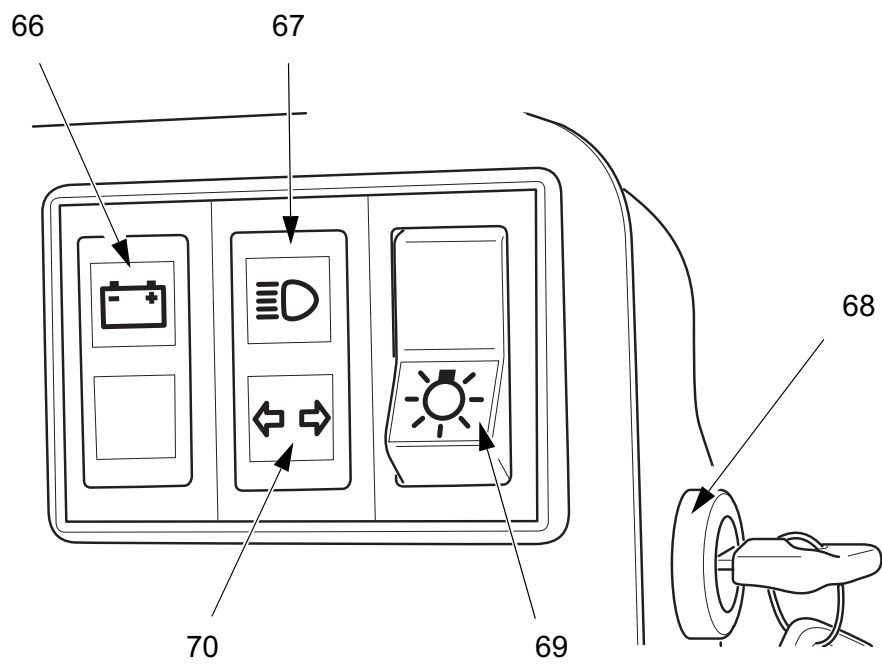
Item	Control / display		Function
60	Lever	●	Raise / lower load lifting
61	Lever	●	Mast forward / reverse tilt
62	Auxiliary hydraulics lever 1	○	Activate 1st attachment
63	Auxiliary hydraulics lever 2	○	Activate 2nd attachment
64	Auxiliary hydraulics lever 3	○	Activate 3rd attachment
● = Standard equipment		○ = Optional equipment	

2.3 MULTI-PILOT



Item	Control / display		Function
60	MULTI-PILOT (F+B) MULTI-PILOT (L+R)	●	Raise / lower load lifting Mast forward / reverse tilt
65	Travel direction switch	○	Selects travel direction / neutral position
62	Auxiliary hydraulics 1 switch	○	Activate 1st attachment
63	Auxiliary hydraulics 2 switch	○	Activate 2nd attachment
64	Auxiliary hydraulics 3 switch	○	Activate 3rd attachment
● = Standard equipment		○ = Optional equipment	

2.4 Controls

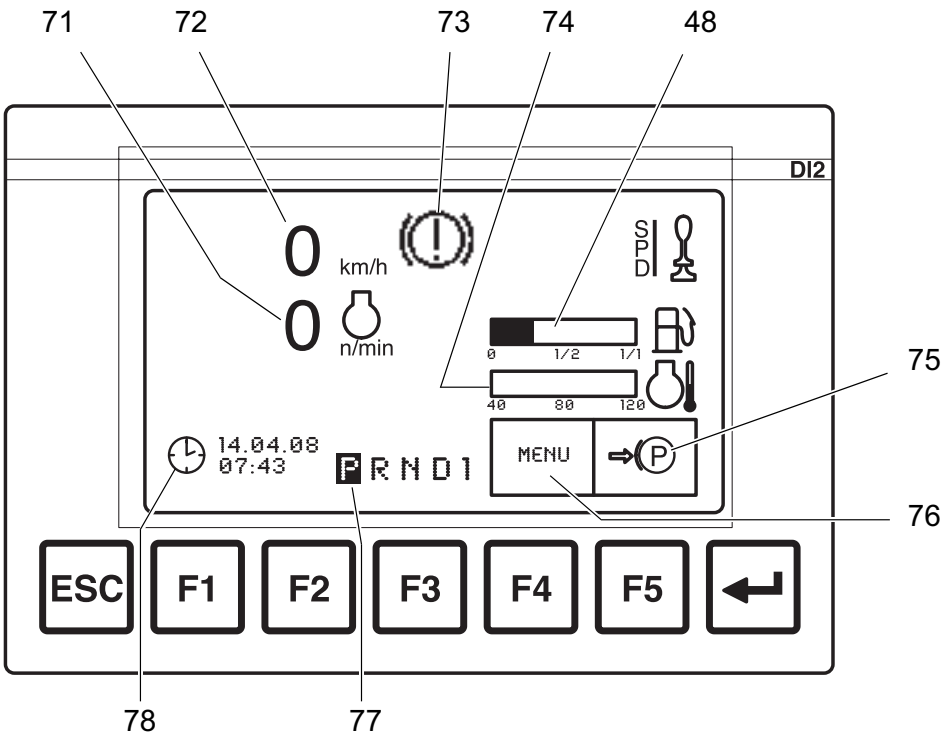


Item	Control / display		Function
66	Battery indicator lamp	●	Lit to indicate errors in the power supply
67	Main beam indicator lamp	●	Lit when the main beam is switched on
68	Key switch	●	Switches the power supply on and off Starts and stops the engine
69	Interior lighting switch	●	Switches the interior lighting on and off
70	Hazard warning lights indicator lamp	●	Flashes when the hazard warning lights are activated
● = Standard equipment		○ = Optional equipment	

2.4.1 Switch variants

Symbol	Switch/display		Function
	Switch Rear work lights	●	Switches the rear work lights on and off
	Switch Front work lights	●	Switches the front work lights on and off.
	Switch Rear window wiper	●	Switches the rear window wiper on and off
	Air conditioning system switch	○	Switches the air conditioning system on and off
	Fan 1 switch	●	Switches the cab fan on and off
	Switch Beacon	○	Switches the beacon on and off
	Switch Warning indicator	●	Switches warning indicator lights on and off
● = Standard equipment		○ = Optional equipment	

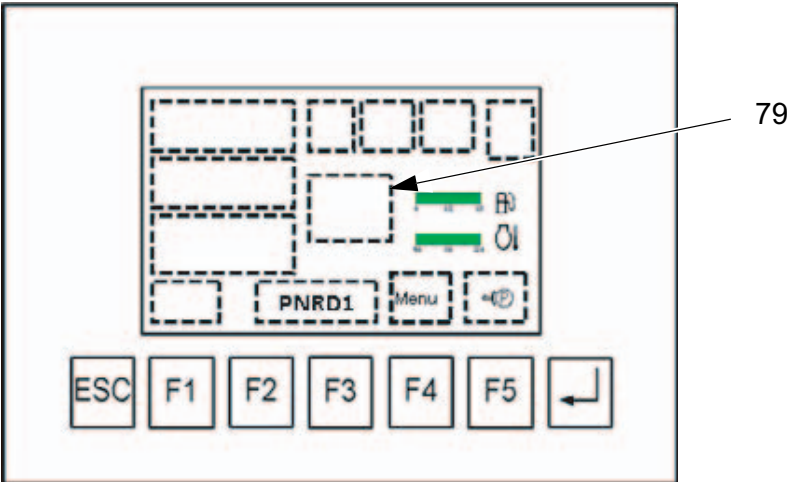
2.5 Multifunction display



Item	Control / display		Function
48	Level indicator	●	Remaining fuel quantity
71	Motor speed	●	Current speed of the motor
72	Speed	●	Current speed
73	Warning indicator	●	Current warnings (variable)
74	Temperature display	●	Current motor temperature
75	Parking brake display	●	Position of the parking brake
76	Menu	●	Access to the configuration menu
77	Gear lever display	●	Current travel stage
78	Clock	●	Shows the time and date
● = Standard equipment		○ = Optional equipment	

2.5.1 Warnings

This field (79) shows information related to operation.



Symbol	Display
	Motor is switched off automatically
	Motor is switched off automatically
	Motor is preheated
	Switch all travel direction switches to neutral position immediately
	No driver in the truck
	Service interval has expired Contact Customer Service
	Flashes to indicate an error in the brake system. Park the truck securely. Contact the manufacturer's customer service department
	Information from the transmission controller: Incorrect driving behaviour recorded

Symbol	Display
LIMP HOME	Emergency mode activated
	Swivel seat (○)

2.5.2 Warning indicators

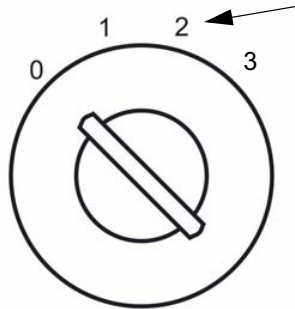
Symbol	Switch/display		Function
	Display Hydraulic oil	○	Hydraulic oil level too low
	Display Transmission flashing	●	Transmission oil temperature too high Park the truck immediately
	Display Engine oil flashing Flashing with "Stop"	●	Engine oil pressure too low Motor switches off.
	Display Exhaust gas pressure	●	Exhaust gas pressure too high Clean particle filter
	Display Brake pressure	●	No brake pressure present
	Display Air filter	●	Clean air filter
	Display Main control unit	●	Error in the main control unit (CVC)
	Display Transmission	●	Error in the transmission controller
	Display Hydraulic oil flashing	○	Hydraulic oil temperature too low (below +5° C) Hydraulic oil temperature too high (above +85° C) Park the truck immediately
	Display Motor	●	Motor has an error
	Display Pilot valve	●	Control valve has an error
	Preheat display	●	Motor is preheated
	"Stop" display	●	Motor is switched off automatically
● = Standard equipment		○ = Optional equipment	

Symbol	Switch/display		Function
	Display Intake temperature flashing	●	Air filter must be cleaned immediately Park the truck immediately
	Display MULTI-PILOT	●	MULTI-PILOT has an error
	Display Motor temperature flashing Flashing with "Stop"	●	Motor temperature too high. Motor switches off
● = Standard equipment		○ = Optional equipment	

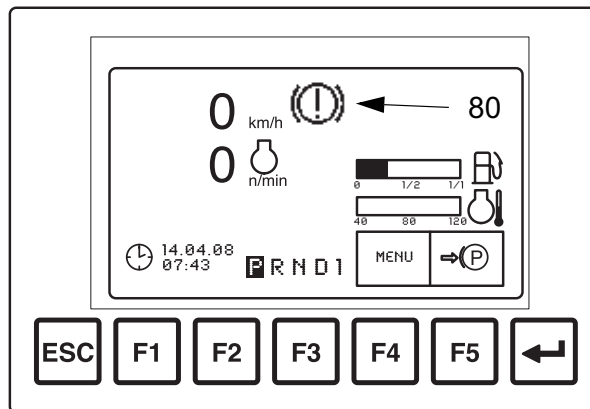
2.6 Operation of the multifunction display

Procedure

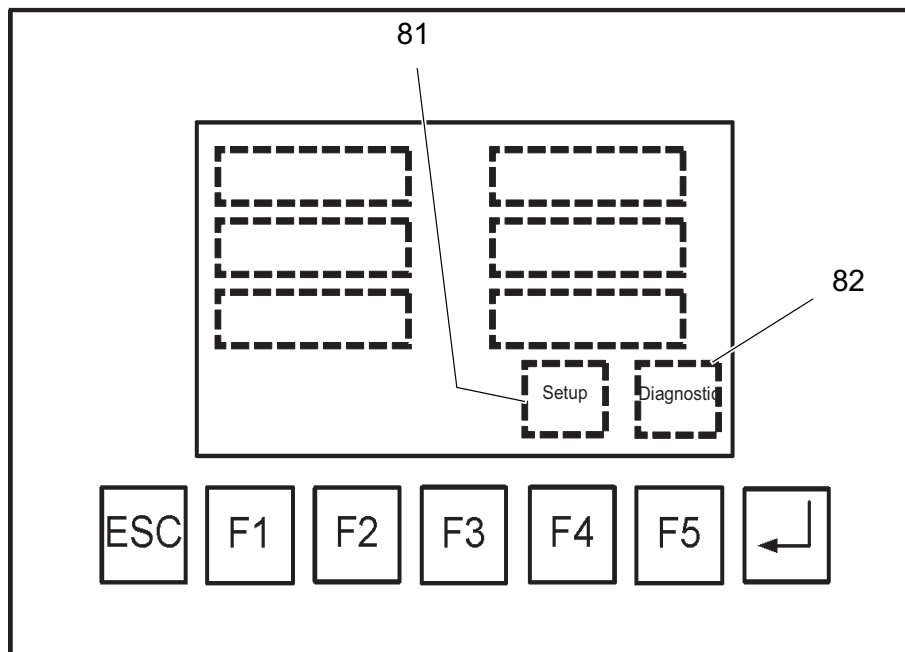
- Turn the key switch to stage "2" with the key.



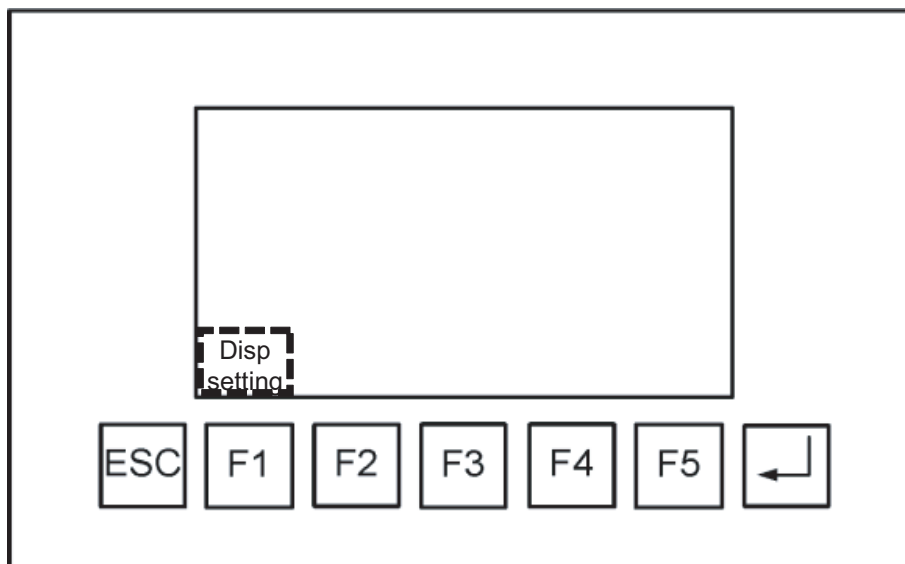
Operating data as well as Errors and information are shown in the multifunction display. Pictograms in the top section of the display act as warning indicators (80). The function keys (lower row) are lit. Areas inside borders in the display are directly assigned to these via function keys. Press the "ESC" key to exit the current menu item. Press the "Enter" key to go one step back.



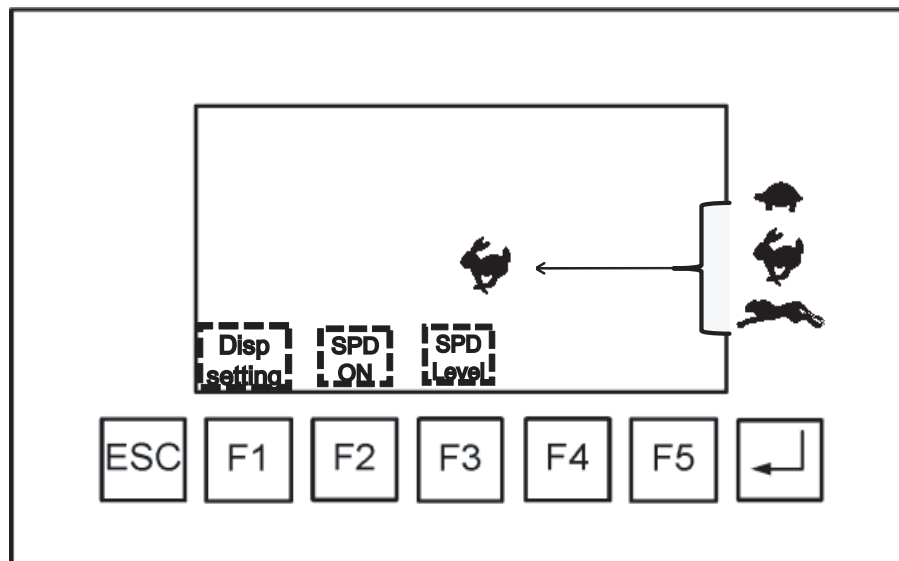
Press the "F4" key to go to the "SETUP" (81) and "Diagnostics" (82) areas.



Press the "F4" key (SETUP) to open the adjustment range for the display.



It is also optionally possible to adjust travel stages here (single pedal drive)



Press the "F1" key to open the adjustment range for the standard values of the truck.

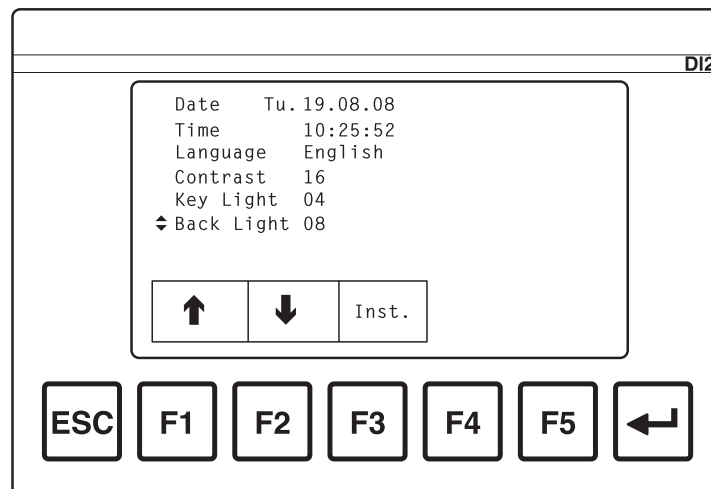
2.6.1 Setting Default Values

After the adjustment range is opened, you can set default values by pressing the "F1" and "F2" keys plus the "Enter" key.

Example 1:

Procedure

- Select a range with the "F1" or "F2" key.
- Confirm the selected range with the "Enter" key.
- Make the settings.
- Press the "ESC" button to exit the current menu range.
- Press the "F3" button to open further setting options (example 2).



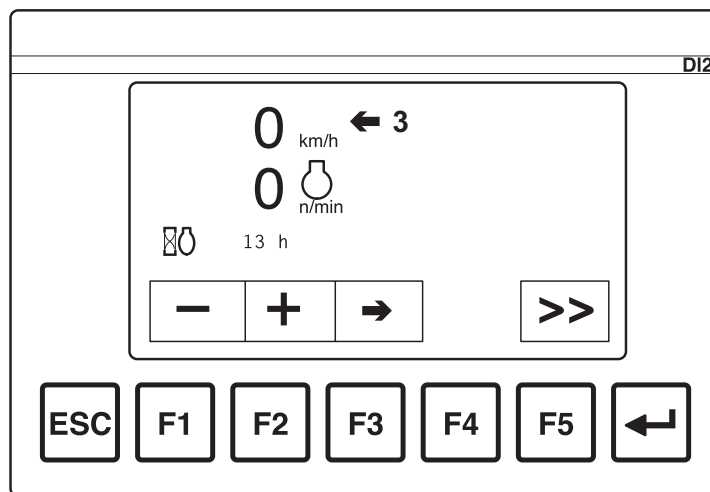
Example 2:

The display can be adapted to individual needs in this adjustment range.

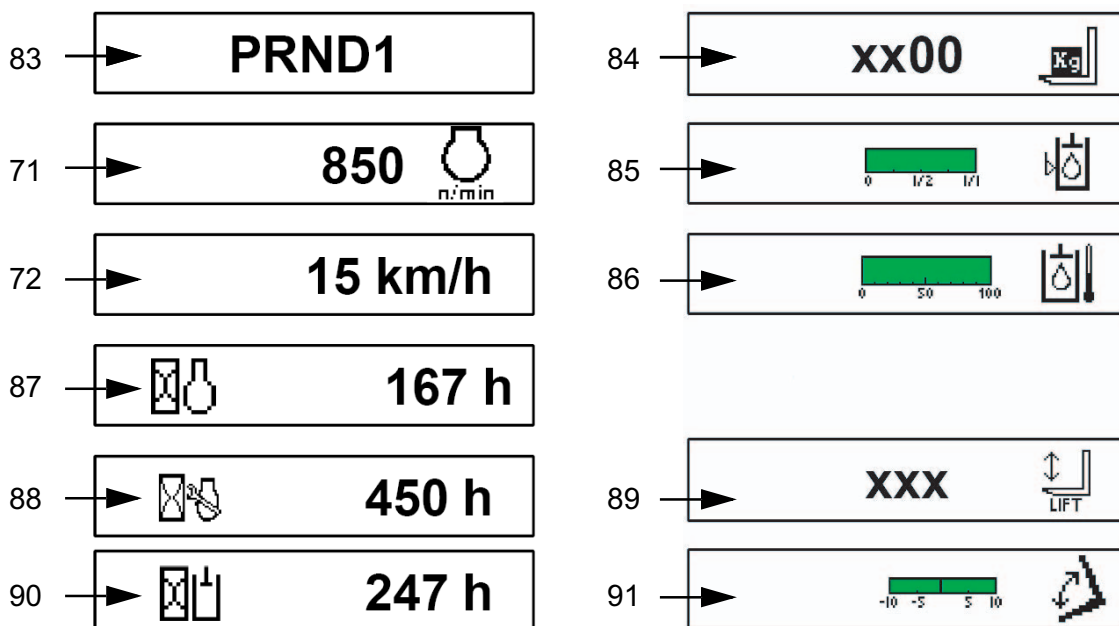
The arrow (3) designates the range in the display to be changed.

Procedure

- Make the settings with the "F1" and "F2" keys.
- Press the "F3" button to change to another range.
- Press the "F5" button to change to the next adjustment range.
- Press the "ESC" button to exit the current menu range.



Adjustment options

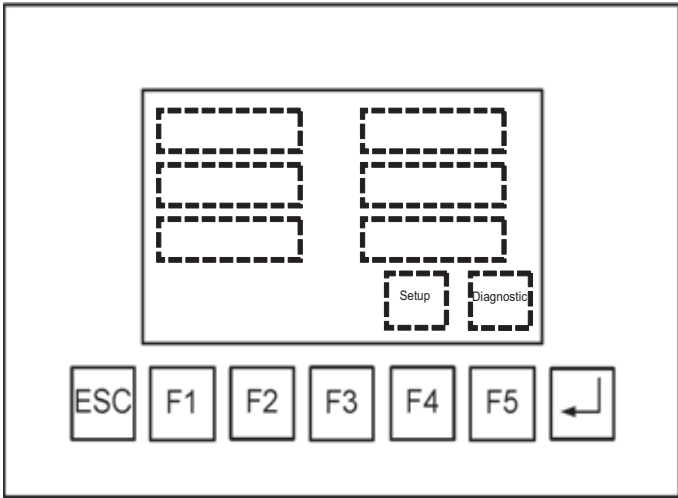


71	Motor speed (●)
72	Speed display (●)
83	Transmission status (●)
84	Weigher system (○)
85	Hydraulic oil reservoir capacity (○)
86	Hydraulic oil temperature (measurement in the tank) (○)
87	Motor operating hours (●)
88	Time until next service (●)
89	Lift height (○)
90	Hydraulic system operating hours (●)
91	Tilt angle (○)

● = Standard equipment	○ = Optional equipment
------------------------	------------------------

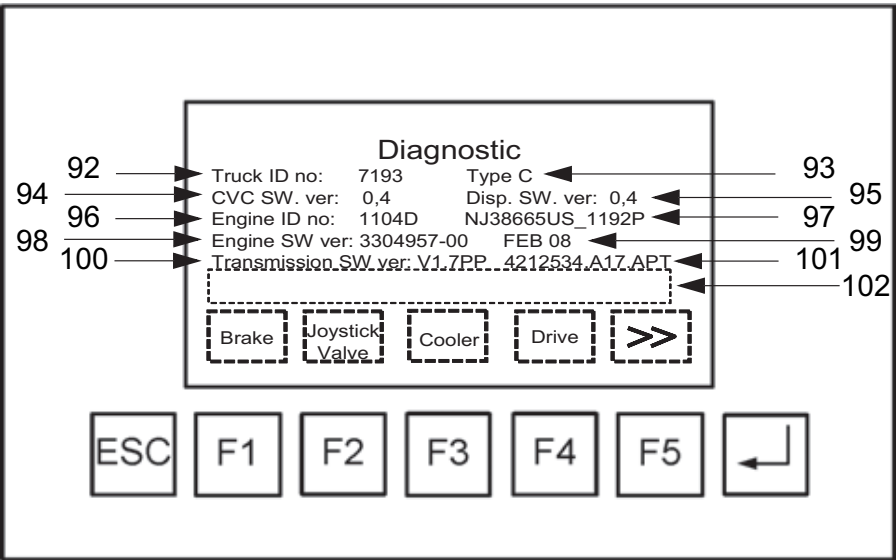
2.6.2 Diagnostics

Press the "F5" button to open the diagnostics area.



All default values of the truck can be seen here.

92	Serial number	98	Motor software version
93	Truck type (A or C)	99	Date of the motor software version
94	CVC firmware version	100	Transmission software version
95	Display firmware version	101	Transmission parameter no.
96	Motor variant	102	Information area for optional components
97	Motor type list number		

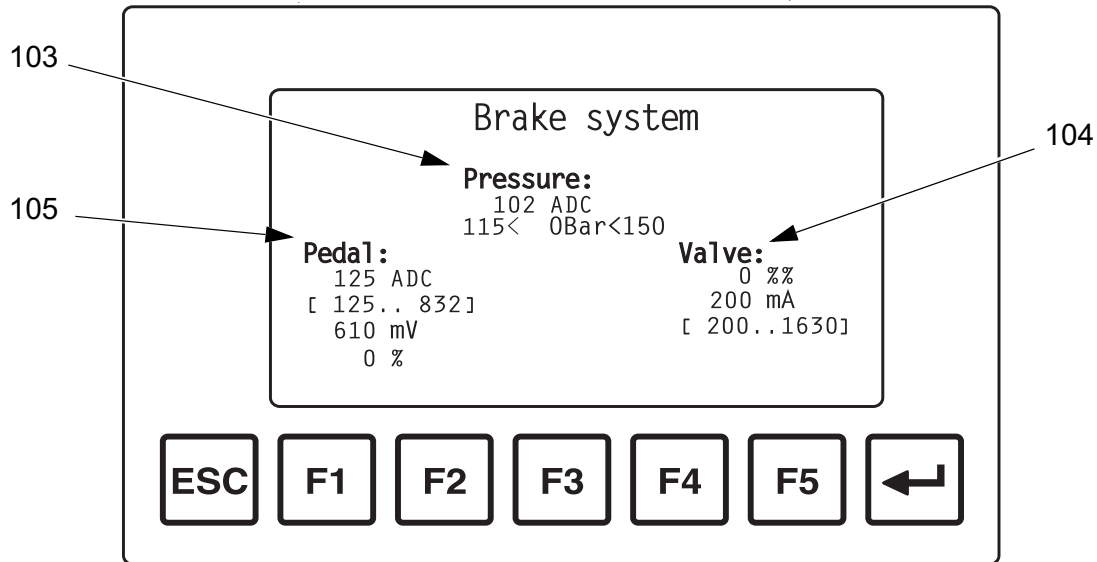


Reading Current Values

The "F1" to "F4" buttons open the lower level menu ranges.

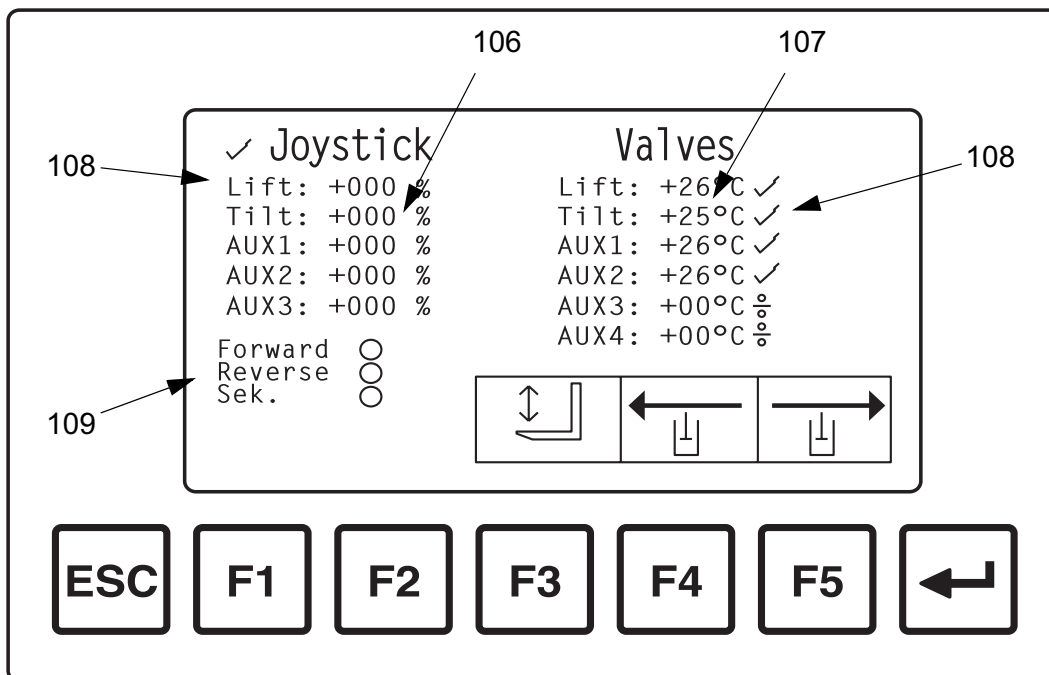
"F1" button - brake system:

The current values for the brake pressure (103), pedal position (105) and the valve (104) can be seen here.



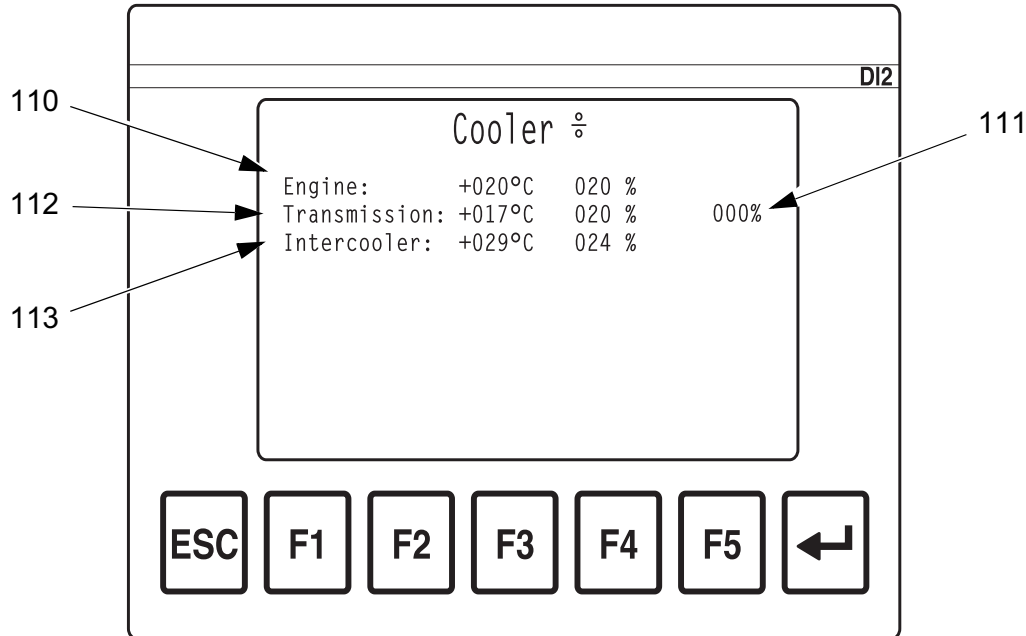
"F2" key - hydraulic controller.

- Activated ranges are identified by a checkmark (108).
- Range (106) indicates the position of the control lever(s):
 - Minus = forward
 - Plus = back
- Range (107) indicates the current temperature of the control module:
- Range (109) indicates the current setting of the travel direction:
 - (●) activated
 - (○) not activated
- Press the "F3" button to switch to another hydraulic range.
- The "F4" and "F5" buttons activate the selected hydraulic range



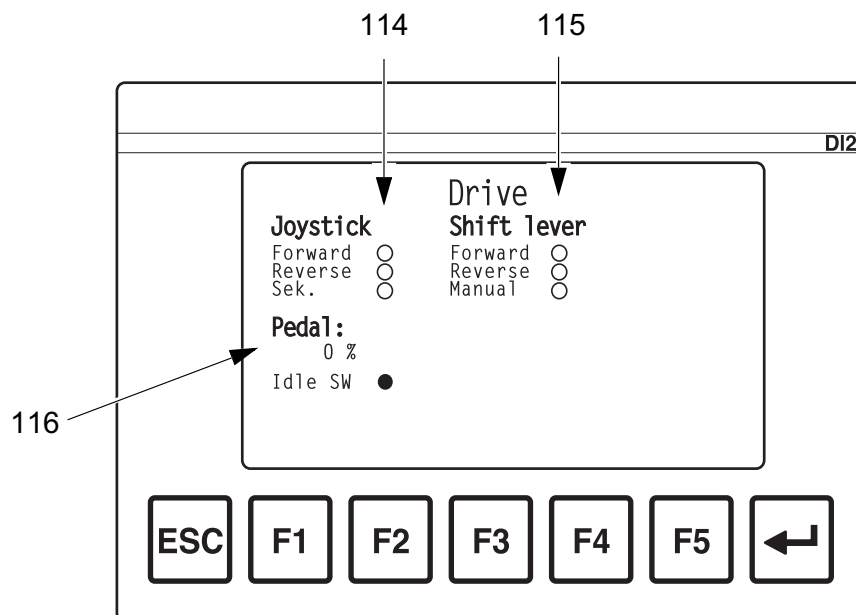
"F3" button - cooling

- Pressing this button provides information about the coolant temperature in "°C" and the air speed as a "%" for the motor (110), transmission (112) and charge air cooler (113) an.
- The speed of the cooler fan (111) is shown as a "%".



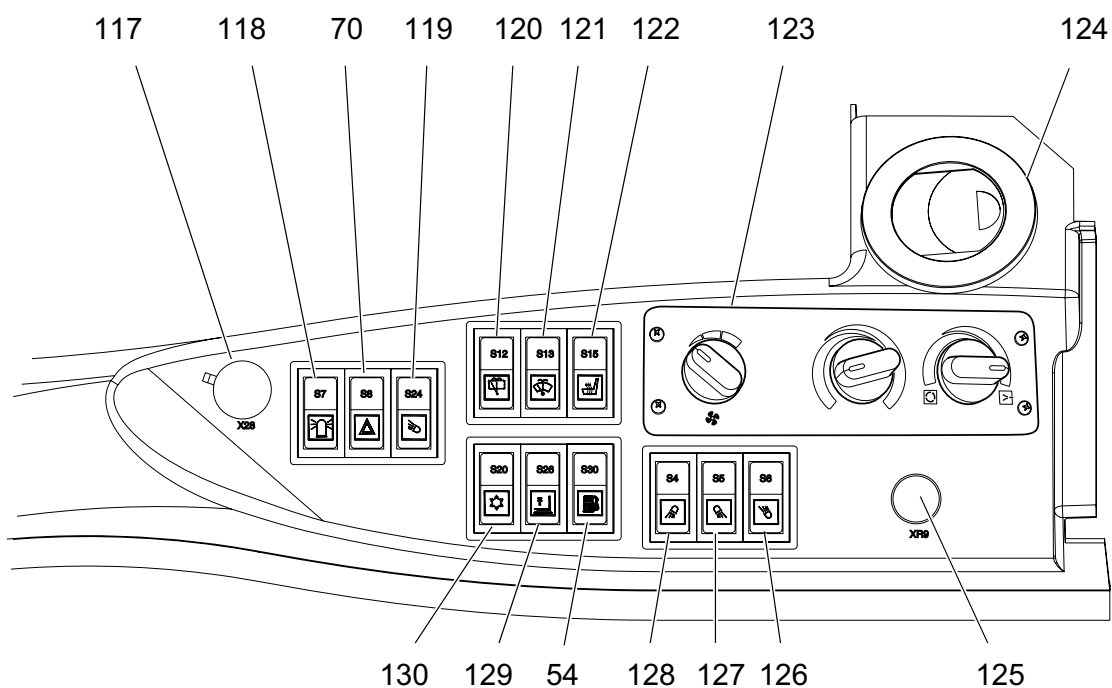
"F4" button - travel switch

- Indicates the current state of the travel direction (114), control lever(s) (115) and accelerator pedal (116).
- (●) activated
- (○) not activated

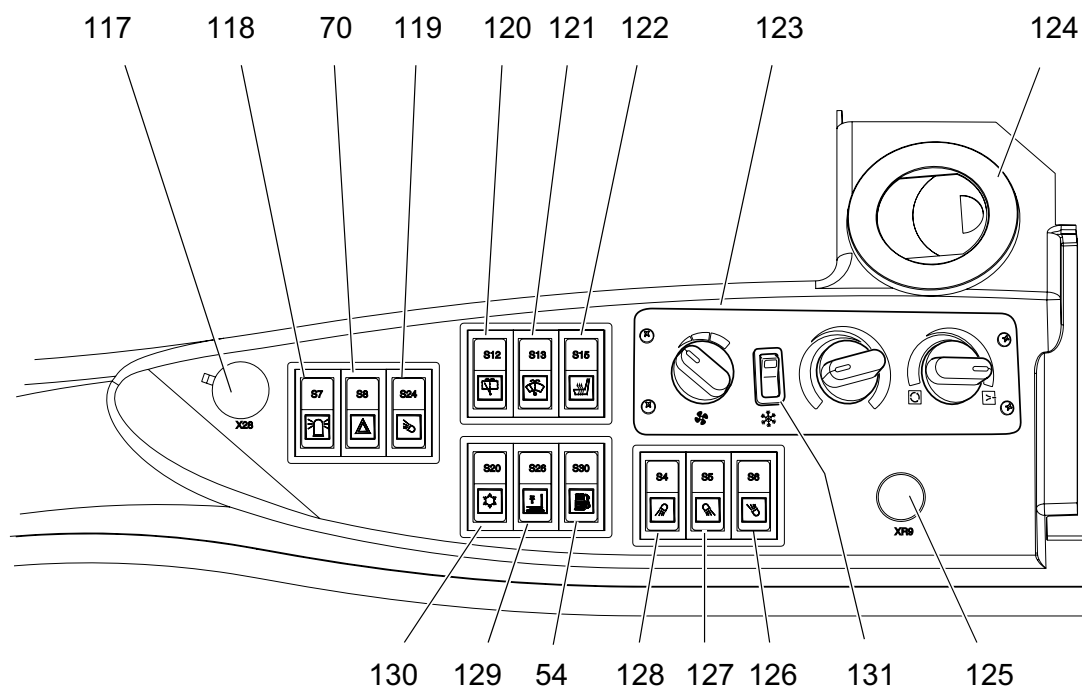


3 Dashboard

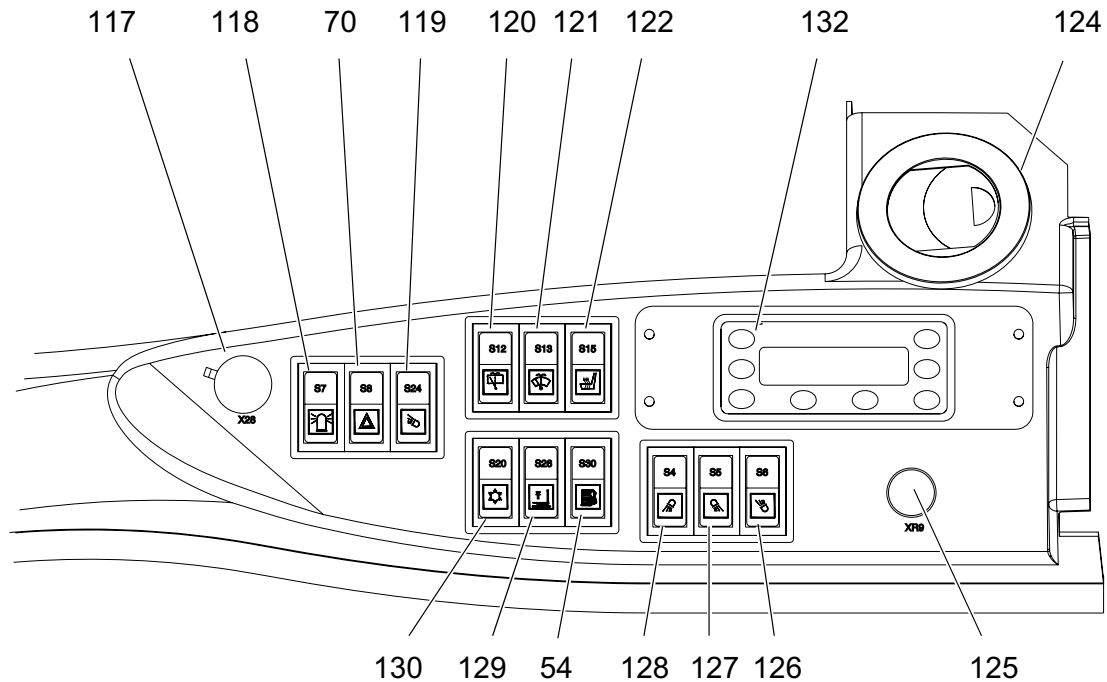
3.1 Without air conditioning system



3.2 With air conditioning system



3.3 With automatic air conditioning



Item	Description
70	Hazard warning lights switch
117	Socket
118	Beacon
119	Work lights
120	Window wiper / window washer system (rear window) (○)
121	Window wiper / window washer system (roof window) (○)
122	Seat heating (○)
123	Heater + air conditioning controller (○) (manual)
124	Nozzle (heater)
125	Cigarette lighter
126	Spot lights
127	Spot light (rear)
128	Spot light (front)
54	LPG bottle switch (TFG only)
129	Load damping
130	Air conditioning system (○)
131	Air conditioning system switch
132	Heater + air conditioning controller (○) (automatic)

4 Heater, fan, air conditioning system

4.1 Heater

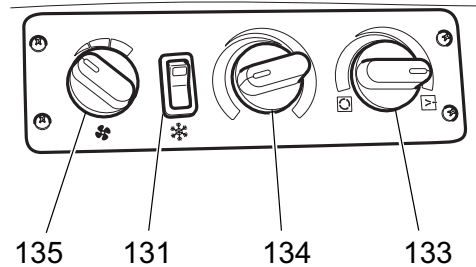
Cab heating is controlled by the temperature selector (134).

Procedure

- Turn to the right - higher temperature
- Turn to the left - lower temperature

Fan

- The fan is controlled with the (135) switch.



4.2 Air conditioning system (○)

- Keep doors and windows closed when the air conditioning system is on – this ensures the maximum cooling performance when the air circulation flap is fully opened. The air is continuously filtered both in heating and in air conditioning mode.

⚠ CAUTION!

Extreme temperature differences can affect your health.

- The difference in temperature from the outside air should not exceed 5° - 6° C in air conditioning mode.

4.2.1 Air Conditioning Mode

⚠ CAUTION!

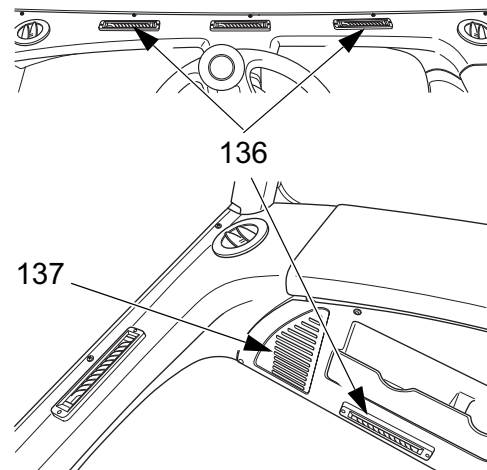
Never aim the nozzles directly at other people.

- The discharge should always be directed to prevent any draft effect.

Starting the truck

Procedure

- The fan switch (135) and rocker switch (131) turn the air conditioning system on and off (green indicator lamp in the rocker switch (131) is lit during operation).
- The air flow of the air conditioning system is controlled by discharge jets (136) and an intake nozzle (137) in the legroom (recirculated air) and by drawing in outside air.



⚠ CAUTION!

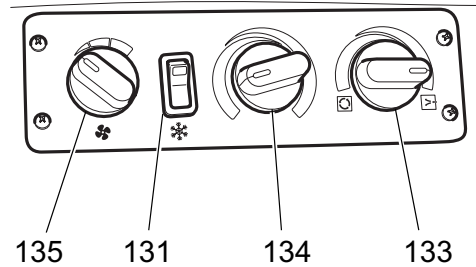
- The intake nozzle (137) must always be unobstructed

The air flow in the cab is set via the discharge jets.

4.2.2 Function of the controls

Procedure

- Switch (133) to the left: Recirculated air
- Switch (133) to the right: Outside air
- Centre position of the switch (133): Combination of recirculated air / outside air
- Switch (134) provides additional temperature control.
- The air flow is controlled by switch (135).



- ➔ Switch off the entire system before parking the truck. To switch off the entire system, turn the fan switch (135) all the way to the left and press the rocker switch (the green lamp goes out).

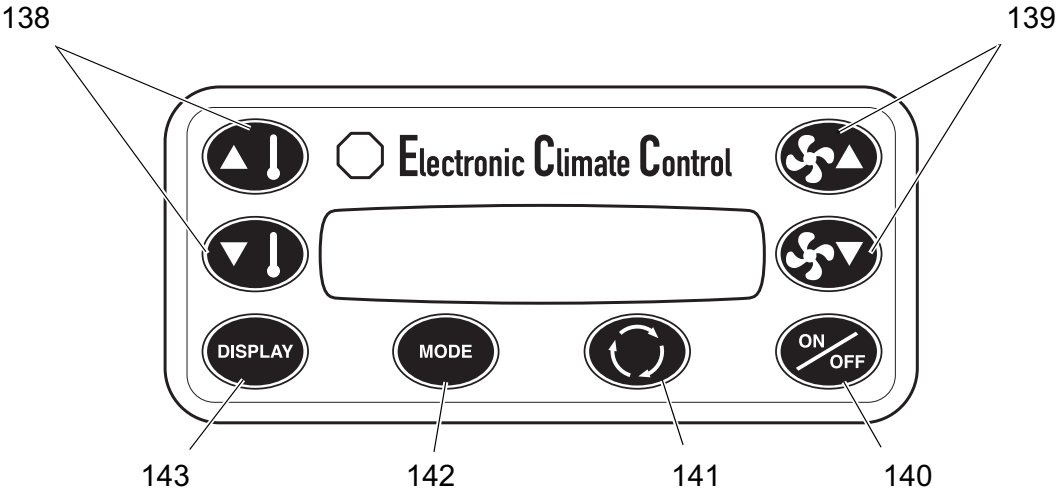
4.2.3 Air conditioning operation notes

- ➔ If there is a high level of air humidity in the truck, switch on the air conditioning system. To distribute air evenly to all the discharge jets, set the fan switch (135) to the highest level, set the temperature selector (134) as required and open the side sliding window a notch. When the humidity has been removed from the interior of the truck close the windows again and set the required air flow.
- ➔ To cool off the interior quickly, turn on the air conditioning system. To distribute air evenly, open all the discharge jets. Set the fan switch (135) to the highest level and open the side sliding window a notch. When the desired temperature has been reached, close the windows again and set the required air flow.
- ➔ To guarantee maximum operation of the air conditioning system it must be switched on in the cold season at least once a month for about 10 minutes (refrigerant needs to be recirculated).
- ➔ When the air conditioning system is operating, condensation water may be visible underneath the truck. This happens during the air dehumidification process, in particular at high external temperatures and high air humidity.

CAUTION!

Regular servicing of the air conditioning system is required to ensure it can work at a consistently high level, (see "Maintenance checklist" on page 144).

4.2.4 Automatic air conditioning

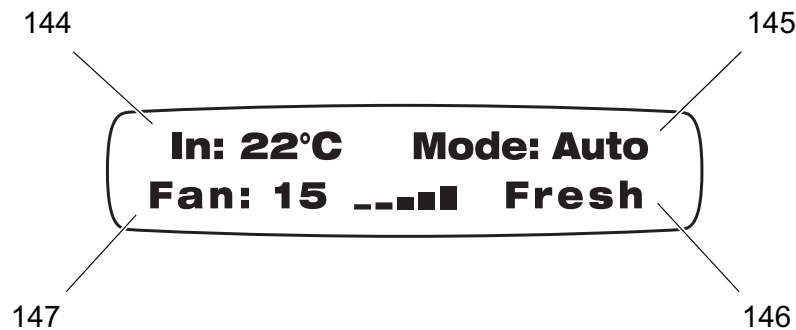


Item	Description	Description
138	Internal temperature setpoint	Setting for the desired internal temperature. The adjustment range is between 16°C (60°F) and 28°C (82°F). The setting should be no more than 5° - 6°C below the current outside temperature.
139	Fan	The fan speed can be adjusted up and down with the Up/Down buttons. The display is shown as a percentage.
140	ON / OFF	Turn the system on and off.
141	Air mix control	Setting of the outside and inside air. The setting can range from outside air to completely recirculated air.
142	Mode	Setting for the work mode of automatic air conditioning (automatic, heating, cooling, defrosting, fuel preheating (○)).
143	Display	Display of inside or outside temperature.



When the setting for completely recirculated air is selected, the supply of outside air is shut off.

4.2.5 Displays



144	Display of inside or outside temperature
145	Current operating mode
146	Current air supply (Fresh = fresh air, Rec = recirculated air)
147	Current fan output

4.2.6 Notes on automatic air conditioning operation

- Automatic mode:
The set internal temperature is maintained automatically.
- Heater mode:
The cab is heated. The air conditioning compressor is switched off.
- Cooling mode:
The cab is cooled. The air conditioning compressor is switched on at an external temperature 10 °C and switched off at an external temperature of 8 °C. Fan output is controlled automatically.
- Defrosting mode:
The cab windows are defrosted. All air jets under the windows must be opened. The heater is activated. Fan output is at the highest stage.
- Fuel preheating (○)
All other functions are deactivated.

CAUTION!

Regular servicing of the air conditioning system is required to ensure it can work at a consistently high level, (see "Maintenance checklist" on page 144)

5 Preparing the Truck for Operation

5.1 Checks and operations to be performed before starting daily operation

WARNING!

Damage and other truck or attachment (special equipment) defects can result in accidents.

If damage or other truck or attachment (special equipment) defects are discovered during the following checks, the truck must be taken out of service until it has been repaired.

- ▶ Report any defects immediately to your supervisor.
- ▶ Tag out and decommission a faulty lift truck.
- ▶ Only return the truck to service when you have identified and rectified the fault.

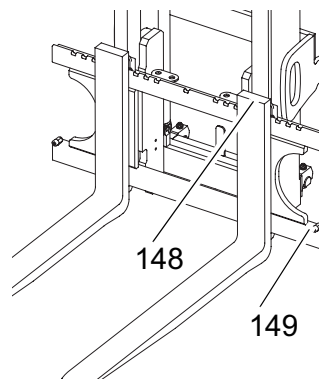
WARNING!

Before the truck can be started or operated or a load can be lifted, the driver must ensure that there is nobody within the hazardous area.

CAUTION!

Checking the accelerator pedal

- ▶ The accelerator pedal should only be checked when the parking brake is applied and the engine is idle.



Checks before daily operation

Procedure

- Visually inspect the entire truck (in particular the wheels, wheel bolts and load handler) for damage.
- Check the fork stop (148) and fork tine retainer (149).
- Visually inspect the hydraulic system in the visible area for damage and leaks.
- Check the driver's seat has been adjusted to the correct position.
- Test the horn and reversing buzzer (○) where applicable.
- Check that the load chart and warning labels are legible.
- Test the controls and displays.
- Test the steering.
- Make sure the load chains are evenly tensioned.
- Test the seat belt. (The belt should jam if extracted suddenly.)
- Test the seat switch. When the driver's seat is vacated it should not be possible to activate the working hydraulics.
- Test the restraint system (○),
- Test the lift/lower, tilt and if applicable the attachment hydraulic control functions.
- Check the accelerator pedal can move freely by pressing it several times.

- Test the service brake and parking brake: Start driving carefully and test the effectiveness of the brake pedal.
- Check the fuel supply.
- Check the fluid level of the window washer system (○), (see "Adding Window Washer System Fluid" on page 176).
- Check the LPG system is working correctly, (see "LPG containers" on page 50)
- Attachment: Visually inspect bearing points, guides and stops for wear and damage and lubricate these components.
- Visually inspect battery and battery components.
- Check that the battery cable is positioned securely.
- Engine oil check.
- Checking the coolant level.
- Check hydraulic oil level and top up if necessary.
- Check wheels and tyres for damage.
- Test lighting.
- Check radiator and clean if necessary.

TFG only

Procedure

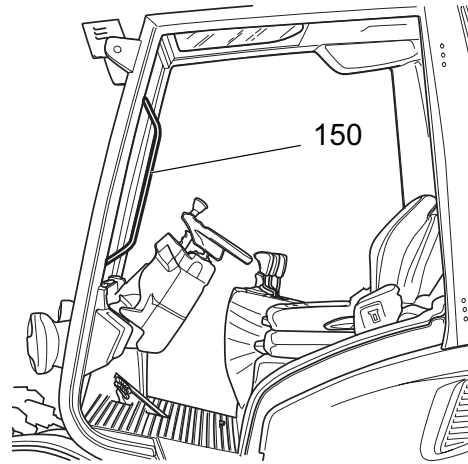
- Check the gas system is working correctly, (see "LPG containers" on page 50)
- Leak test (smell of gas?).
- Leak test after bottle replacement.
- Check gas hoses for damage (visual inspection).
- Check that the gas line connection are secure.
- Test the entire gas system for leaks using a leakage spray.

5.2 Entry and exit

Procedure

- Open the cab door (○)
- To enter and exit the cab, hold onto the handle (150).

➞ An additional step is provided for the driver position extension (○)



5.3 Setting up the operator position

WARNING!

Accident risk

- ▶ Do not adjust the driver's seat while travelling.
-

Procedure

- Before starting to travel, adjust the driver's seat, steering column and armrest (if necessary) so that all the controls are within reach and can be applied without having to strain.
- Adjust the visibility aid equipment (mirrors, camera systems etc.) so that the working environment can be clearly seen.

5.3.1 Adjusting the driver's seat

WARNING!

Risk of accidents and damage to health

An incorrectly adjusted driver's seat can result in accidents and damage to health.

- ▶ Do not adjust the driver's seat while travelling.
 - ▶ The driver's seat should lock in position after adjustment.
 - ▶ Check and adjust the individual driver's seat setting before starting to use the truck.
 - ▶ Hold the weight setting lever (152) only by the recess, do not reach through underneath the lever.
-

Adjusting the driver's weight

NOTE

To achieve optimal seat cushioning the driver's seat must be adapted to the driver's weight.

Set the driver's weight when the seat is occupied.

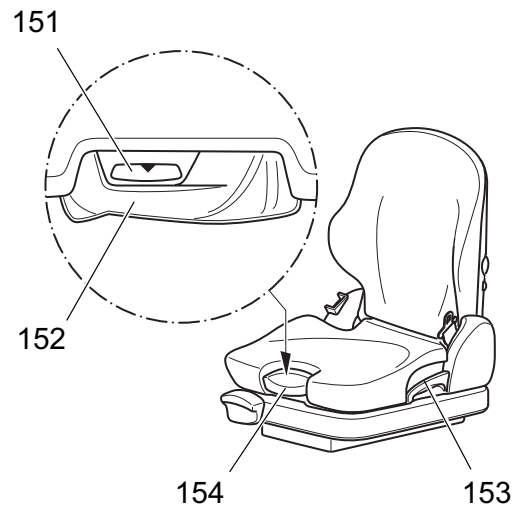
Procedure

- Move the lever (152) as far as it will go in the arrow direction until you reach the required weight on the scales.
- Move the weight adjustment lever (152) up and down to set the seat to a higher weight.
- Move the weight adjustment lever (152) up and down to set the seat to a lower weight.

→ The driver's weight is correct when the arrow is in the middle of the display window (151). The minimum or maximum weight setting is reached when you can feel a return stroke on the lever.

- After setting the weight, move the lever (152) back in full.

The driver's weight is now set.



Adjusting the backrest

Procedure

- Sit on the driver's seat.
- Pull the lever (153) to adjust the backrest.
- Adjust the backrest tilt.
- Release the lever (153) again. The backrest is locked.

The backrest is now set.

→ Hold the weight setting lever (152) only by the recess, never reach through underneath the lever.

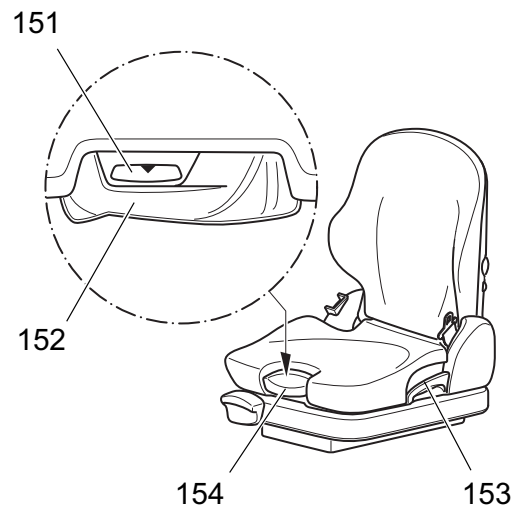
Adjusting the seat position

CAUTION!

An unsecured driver's seat can cause injury

An unsecured driver's seat can slide out of its guide during travel, resulting in accidents.

- The driver's seat must be locked in position.
- Do not adjust the driver's seat while travelling.



Procedure

- Sit on the driver's seat.
- Pull up the driver's seat locking lever 154 in the direction of the arrow.
- Push the driver's seat forwards or backwards to the desired position
- Engage the driver's seat locking lever (154) in position.

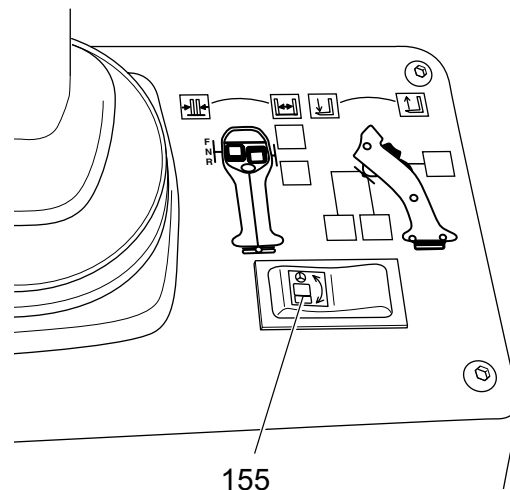
The seat position is now correctly set.

5.3.2 Rotating Driver'S Seat

Functional Description

The driver's seat is turned by means of an electric motor. The motor is located under the cab.

The truck is equipped with two sets of driving and reverse lights. The spot lights can be activated to match the selected travel direction. After the seat has been turned, the main controller switches the steering, travel direction indicator and spot lights to the opposite direction. The following rule applies to spot lights on the mast: If the spot light is set to stage 1, the spot light is lit if the driver's seat is turned forward, and extinguished if the driver's seat is turned to the rear. If the spot light is set to stage 2, the spot light is lit regardless of the direction of the driver's seat.



The truck cannot be moved while the direction is being changed.

The (155) button for activating the rotating driver's seat must be pressed and held down during the entire turning process. As soon as the button is released, the turning process stops. It is also possible to change the direction of rotation.

Rotating the Driver'S Seat

DANGER!

- ▶ The driver must be seated on driver's seat during the rotation process with both feet placed on the rotating panel.
- ▶ No other persons are permitted in the cab.
- ▶ The door must remain closed.

Requirements

- The driver's seat is facing forward.
- The truck starts to move.

Procedure

- As soon as the travel speed falls below 1 km/h, button (155) is enabled to rotate the seat. Press and hold button (155).

The seat brake is released.

The driving brake is activated and transfer of force is switched to the neutral position. This ensures that the truck remains stopped while the driver's seat is being rotated. The rotation process begins.

When the seat has left the front driver's seat position sensor (default setting), the seat turns at maximum speed. The "Driver's seat turning process active" icon appears in the display.

When the seat has almost reached the driver's seat position sensor (90-degree setting (○)), the turning speed is reduced. The "Driver's seat turning process active" icon goes out.

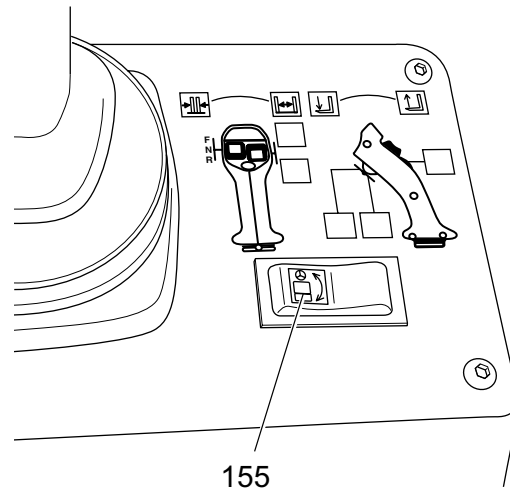
When button (155) is released, operation of the truck is permitted. The steering, travel direction indicator and spot lights have not been switched to the opposite direction.

If the user continues to hold down button (155), the seat continues turning at maximum speed. The "Driver's seat turning process active" icon is lit again.

When the seat has almost reached the rear driver's seat position sensor (180-degree setting), the turning speed is reduced. The turning motion ends as soon as the end position is reached. The "Driver's seat turning process active" icon goes out. The direction of the spotlights and steering is changed to match the travel direction.

As soon as the seat has reached the rear position (180-degree position) and a travel direction is set on a travel direction switch, the "N!" icon appears in the display. The travel direction lever must be moved to the neutral position before another selection of the travel direction can be made.

The driver's seat is rotated.



5.3.3 Adjusting the steering wheel / steering column



Do not adjust the steering wheel while travelling

Individual steering wheel position

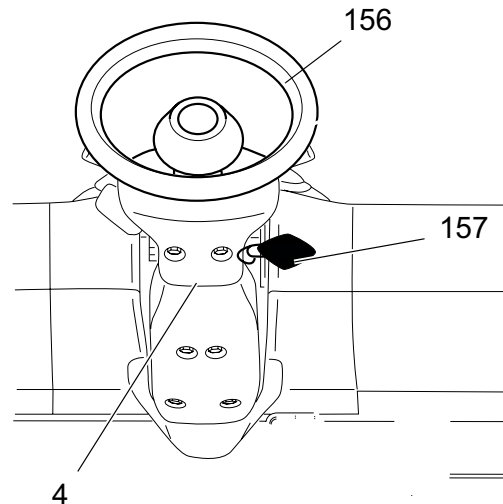
- The steering wheel can be height- and tilt-adjusted to suit the operator.

Adjusting the Tilt

Procedure

- Pull up on the adjusting lever (157).
- Tilt the steering wheel (156) forward or backward as required.
- Push the adjusting lever into the centre position.

The steering column tilt is adjusted.



Adjusting the Height

Procedure

- Push down on the adjusting lever (157).
- Adjust the steering column (4) to the required height.
- Pull the adjusting lever (157) into the centre position.

The steering column height is adjusted.

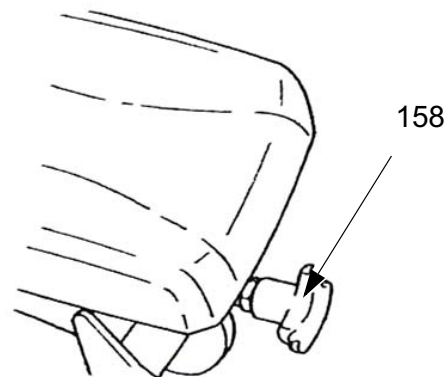
5.3.4 Adjusting the Armrest

The height and angle of the armrest can be adjusted with the screw (158).

Procedure

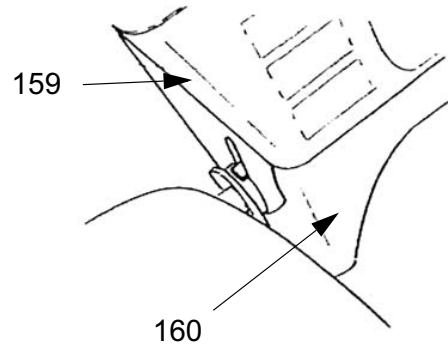
- Turn the screw clockwise - the armrest is raised.
- Turn the screw anti-clockwise - the armrest is lowered.

The armrest is adjusted.



5.3.5 Adjusting the Control Panel

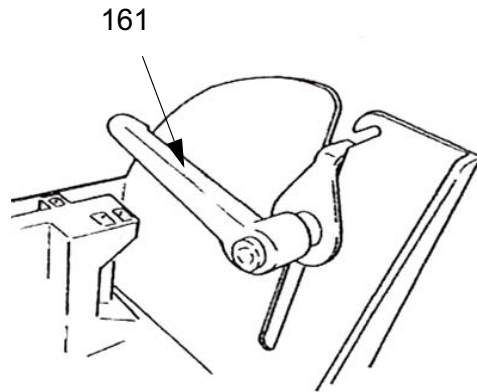
The height and tilt of the control panel (159) can be changed. This makes it possible to adjust the armrest (160) and control panel optimally to each other.



Procedure

- Release the lever (161).
- Move the control panel to the required position.
- Pull the lever tight again.

The control panel is adjusted.



5.4 Seat Belt



Travelling without a seat belt increases the risk of injury.

If the seat belt is not worn or is modified, personal injury can result.

- ▶ Always put on the seat belt before starting the industrial truck.
 - ▶ Do not modify the seat belt.
 - ▶ Damaged or non-operational seat belts must be replaced by trained personnel.
 - ▶ Seat belts must always be replaced after an accident.
 - ▶ Only original spare parts must be used for retrofits or repairs.
-



Protect the seat belt from contamination (e.g. cover it when the truck is idle) and clean it regularly. Frozen belt locks or pulleys must be thawed out and dried to prevent them from freezing up again.

The temperature of the warm air should not exceed +60 °C!

Starting the industrial truck on steep slopes

The automatic blocking system locks the belt in the retractor when the truck is positioned on a steep slope. This prevents the belt from being pulled out of the retractor.



Carefully drive the truck off the slope and then put on the belt.

6 Industrial Truck Operation

6.1 Safety regulations for truck operation

Travel routes and work areas

Only use lanes and routes specifically designated for truck traffic. Unauthorised third parties must stay away from work areas. Loads must only be stored in places specially designated for this purpose.

The truck must only be operated in work areas with sufficient lighting to avoid danger to personnel and materials. Additional equipment is necessary to operate the truck in areas of insufficient lighting.



DANGER!

Do not exceed the permissible surface and spot load limits on the travel routes.

At blind spots get a second person to assist.

The driver must ensure that the loading dock / ramp cannot move or come loose during loading / unloading.

NOTE

Loads must not be deposited on travel or escape routes, in front of safety mechanisms or operating equipment that must be accessible at all times.

Travel conduct

The driver must adapt the travel speed to local conditions. The truck must be driven at slow speed when negotiating bends or narrow passageways, when passing through swing doors and at blind spots. The driver must always observe an adequate braking distance between the forklift truck and the vehicle in front and must be in control of the truck at all times. Abrupt stopping (except in emergencies), rapid U turns and overtaking at dangerous or blind spots are not permitted. Do not lean out or reach beyond the working and operating area.

Hazardous situations

If the truck is about to tip over, do not loosen the seat belt. The driver must not jump off the truck. The driver must lean his upper body over the steering wheel and hold on with both hands. Tilt your body in the opposite direction of fall.

Travel visibility

The driver must look in the direction of travel and must always have a clear view of the route ahead. Loads that affect visibility must be positioned at the rear of the truck. If this is not possible, a second person must walk alongside the truck as a lookout to observe the travel route while maintaining eye contact with the driver. Proceed only at walking pace and with particular care. Stop the truck as soon as you lose eye contact.

Negotiating slopes and inclines

Negotiating slopes or inclines up to 15% is only permitted if they are specifically designed as travel routes, are clean and have a non-slip surface and providing they can be safely travelled along in accordance with the truck's technical specifications. The truck must always be driven with the load unit facing uphill. The industrial truck must not be turned, operated at an angle or parked on inclines or slopes. Inclines must only be negotiated at slow speed, with the driver ready to brake at any moment. Particular care is required when travelling near slopes and quay walls.

Negotiating lifts and docks

Lifts may only be entered if they have sufficient capacity, are suitable for driving on and authorised for truck traffic by the owner. The driver must satisfy himself of the above before entering these areas. The truck must enter lifts with the load in front and must take up a position which does not allow it to come into contact with the walls of the lift shaft. People travelling in the lift with the forklift truck must only enter the lift after the truck has come to a halt and must exit the lift before the truck. The driver must ensure that the loading ramp / bridge cannot move or come loose during loading / unloading.

Type of loads to be carried

The operator must make sure that the load is in a satisfactory condition. Loads must always be positioned safely and carefully. Use suitable precautions to prevent parts of the load from tipping or falling down. Prevent liquid loads from sloshing out.

Inflammable liquids (e.g. fused metal etc.) may only be transported with suitable auxiliary equipment. Contact your authorized Jungheinrich customer adviser.



For safety instructions on the nature of loads to be carried with attachments, (see "Lifting, transporting and depositing loads" on page 109).

Towing trailers

The truck may only be used occasionally to tow trailers, (see "Towing trailers" on page 123)



DANGER!

Exhaust emissions can be fatal

- ▶ The truck must only be operated in well ventilated areas. If the truck is operated in enclosed areas, this can lead to a build-up of harmful exhaust emissions, resulting in dizziness, tiredness and even death.
 - ▶ The user must comply with legal requirements, technical standards and health and safety regulations when operating an IC motor powered lift truck in closed rooms.
-

6.2 Preparing the truck for operation

Before starting the truck

- The truck should only be operated from the driver's seat. Do not run up the engine in idle. The engine soon reaches operating temperature at a moderate charge and when the speed alternates. Only fully charge the engine once it has reached operating temperature.

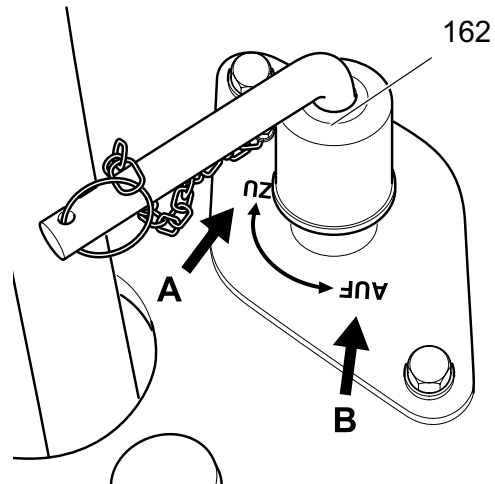
Requirements

- Checks and operations to be performed before starting daily operation, (see "Checks and operations to be performed before starting daily operation" on page 84).

Switching on the truck

Procedure

- Turn the battery isolator (162) to position "A".
- Set the travel direction switch to neutral position N.
- Parking brake is activated.
- Perform the appropriate starting procedure depending on the type of motor; see 6.2.1 "Starting procedure for the DFG" or 6.2.2 "Starting procedure for the TFG".



6.2.1 Starting procedure for the DFG

Procedure

- Insert the key in the key switch (68) and turn it to the "2" position.
- The pre-heat indicator lamp lights up and goes out automatically as soon as the required pre-heat time (approx. 4 seconds) has been reached.
- All the indicators light up briefly to test operation.



All the indicators except for the engine oil pressure display, parking brake indicator, indicator lamp for neutral position and charge current indicator (163) should go out after a short while. If not, stop the start-up process and rectify the fault.

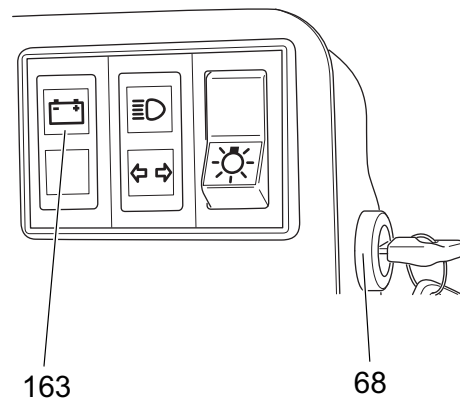
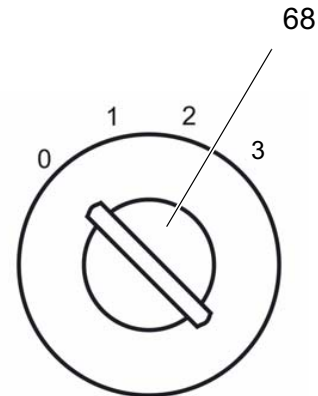


- Turn the key to position "3".
- Only apply the starter for a maximum of 15 seconds without interruption. The truck is equipped with an immobiliser which prevents it from starting again while the engine is running.
- Release the key as soon as the engine starts. The key automatically reverts to the "2" position.



All indicators lights except for neutral position and parking brake should go out as soon as the engine starts. If not, stop the engine immediately and rectify the fault.

Truck ready for operation.



6.2.2 Starting procedure for the TFG

DANGER!

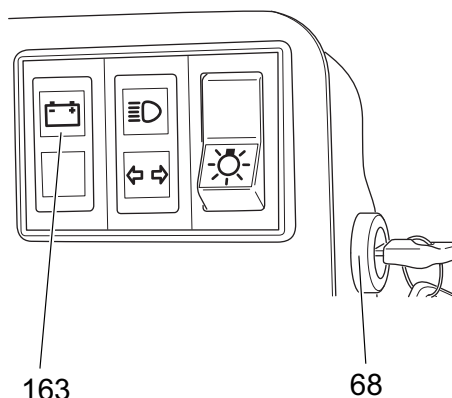
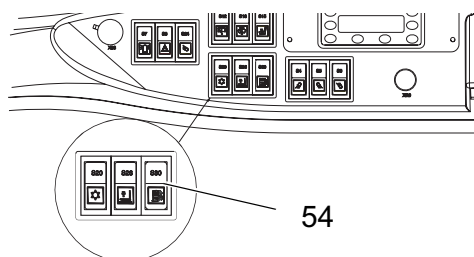
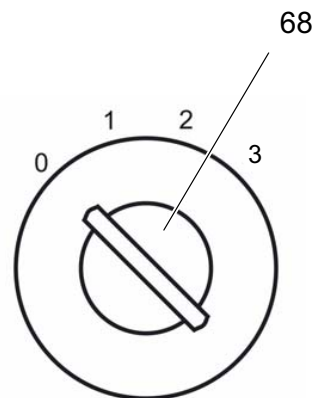
Risk of escaping liquid gas if the truck does not start

- ▶ Note the safety regulations governing the handling of liquid gas ((see "Safety regulations for handling diesel fuel and LPG" on page 45))
- ▶ Close the gas bottle shut-off valve.
- ▶ Set the key switch to "O"
- ▶ Notify your superior.

Procedure

- Slowly open the shut-off valve on the LPG bottles.
- Insert the key in the key switch (68) and turn it to the "2" position.
- All the indicators light up briefly to test operation.
- ➔ All the indicators except for the engine oil pressure display, parking brake indicator, indicator lamp for neutral position and charge current indicator (163) should go out after a short while. If not, stop the start-up process and rectify the fault.
- Select LPG bottle 1 or 2. To do this move switch (54) for LPG bottle 1 to the centre position and for LPG bottle 2 to the lowest position.
- ➔ In the highest position of the switch both LPG bottles are disabled.
- Turn the key to position "3".
- ➔ Only apply the starter for a maximum of 15 seconds without interruption. The truck is equipped with an immobiliser which prevents it from starting again while the engine is running.
- Release the key as soon as the engine starts. The key automatically reverts to the "2" position.
- ➔ All indicators lights except for neutral position and parking brake should go out as soon as the engine starts. If not, stop the engine immediately and rectify the fault.

Truck ready for operation.



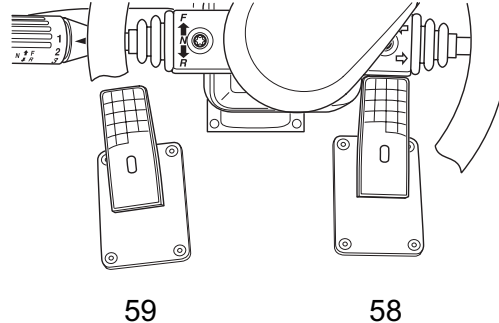
6.3 Operational Checks

DANGER!

After starting the motor, perform the following operational checks:

Procedure

- Check whether the parking brake is locked in place.
- Turn the steering wheel as far as it will go in both directions and test the steering.
- Test the lift/lower, tilt and if applicable the attachment hydraulic control functions.
- Test the horn.
- Test the motor speed with the accelerator pedal (58) over a range of speeds while checking the freedom of movement of the pedal.
- Release the parking brake. Start driving carefully and press the parking brake (59) to test it.
- Press the "F5" to lock the parking brake.



-  If all operational checks were carried out with no problems, the truck is ready for operation.

WARNING!

Do not run up the motor in idle. The engine soon reaches operating temperature at a moderate charge and when the speed alternates. Do not fully load the engine until it has reached operating temperature.

6.4 Parking the truck securely

DANGER!

Risk of explosion

- ▶ LPG trucks may only be parked in ground level rooms or higher and providing they are adequately ventilated. They must not be parked near to cellar doors and entry points, hollows, drains, drain inlets or other recesses below the parked truck.

WARNING!

An unsecured truck can cause accidents

Parking the truck on an incline, without the brakes applied or with a raised load / load handler is dangerous and is strictly prohibited.

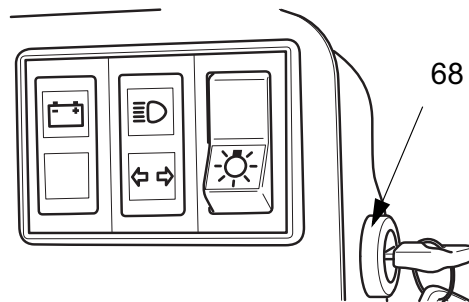
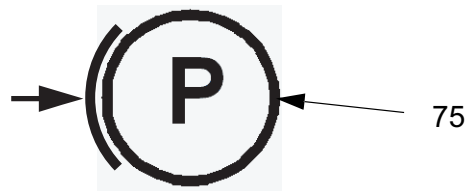
- ▶ Always park the truck on a level surface. In special cases the truck may need to be secured with wedges.
- ▶ Always fully lower the mast and load handler.
- ▶ Tilt the mast forward.
- ▶ Select a place to park where no other people are at risk of injury from lowering forks.
- ▶ Do not park and abandon the truck on an incline.

Parking the Truck Securely (DFG)

When you exit the truck it must be securely parked even if you only intend to leave it for a short time.

Procedure

- Turn the travel direction switch to idle (centre position).
- Press the "F5" button in the display: The brake shoe that appears in the "parking brake" icon (75) changes its position to the right.
- Lower the load completely and position it horizontally.



WARNING!

- ▶ Do not switch the engine off from full charge. Instead, let it run for a short while to allow the temperature to compensate.

- Turn the key in the key switch (68) to the "0" position and remove the key.

Parking the Truck Securely (TFG)

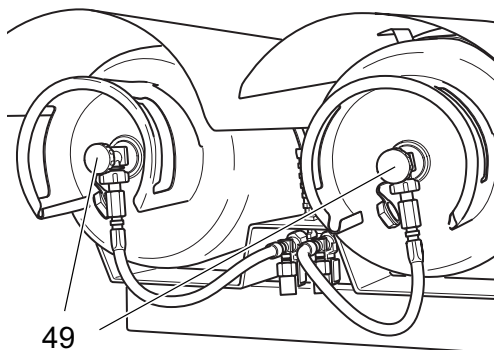
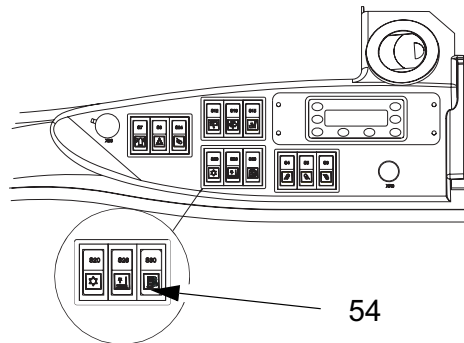
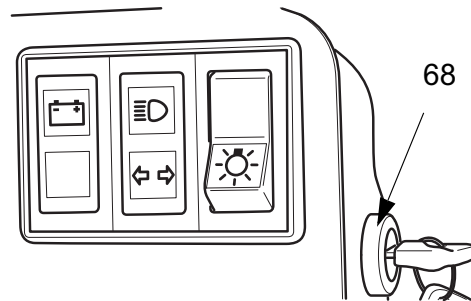
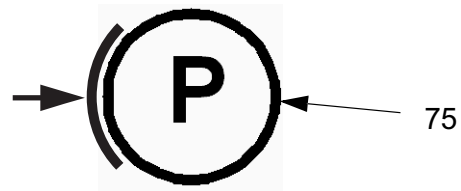
Procedure

- Turn the travel direction switch to idle (centre position).
- Press the "F5" button in the display. The brake shoe that appears in the "parking brake" icon (75) changes its position to the right.
- Lower the load completely and position it horizontally.

WARNING!

- ▶ Do not switch the engine off from full charge. Instead, let it run for a short while to allow the temperature to compensate.
-
- Set the travel direction switch to neutral position.
 - Turn the switch (54) to the upper position to close the electrical shut-off valves of the LPG bottles.
 - Turn the key in the key switch (68) to the "0" position.
 - Wait until the motor stops.
 - Close the shut-off valves (49) of the LPG bottle securely.

-  After the motor is turned off, it continues running briefly for safety reasons. This uses up the remaining amount of LPG between the motor and the shut-off valve of the LPG system.



6.5 Emergency Disconnect

Procedure

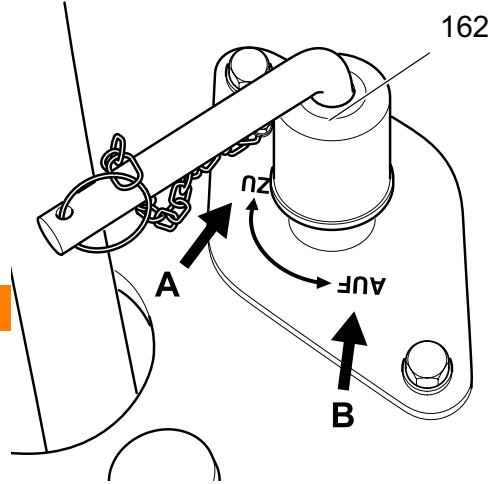
- Turn the ignition key to position "0" and remove the key.
- Tilt the cab and remove the terminal clip from the battery terminal.

This disconnects the battery from the on-board supply network and switches off all electrical functions.

6.5.1 Battery Isolator

Procedure

- Move the battery isolator (162) to position "A". All electrical functions are enabled.
- Move the battery isolator (162) to position "B" and remove it is appropriate: All electrical functions are deactivated.



6.6 Travel

WARNING!

Improper travel can result in accidents

- ▶ Do not get up from the driver's seat during travel.
- ▶ Do not drive the truck unless you are wearing a seat belt and the panels and doors are properly locked.
- ▶ Make sure that the travel area is clear.
- ▶ Adapt the travel speed to the conditions of the route, the work area and the load.
- ▶ Tilt the mast back and raise the fork carriage approx. 200 mm.
- ▶ Make sure you have enough visibility when reversing.

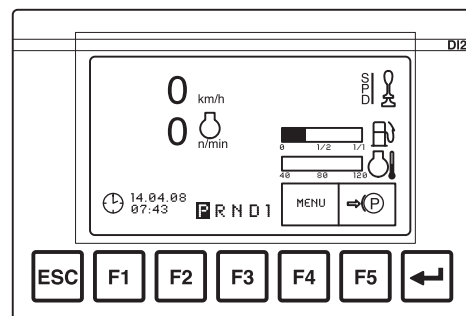
Travel

Requirements

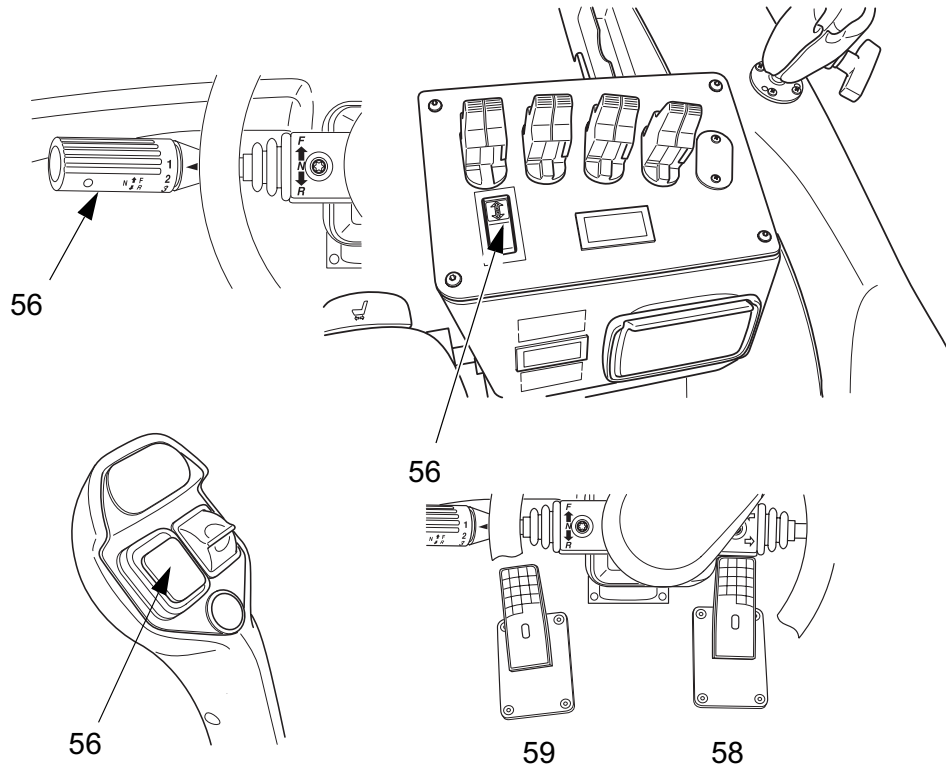
- Truck prepared for operation, (see "Preparing the truck for operation" on page 96).

Procedure

- Release the parking brake. To do this press the parking brake button F5.
- Choose the travel direction with the travel direction switch (56).
- Raise the fork carriage approx. 200 mm.
- Tilt the mast back.
- Apply the accelerator pedal (58). The travel speed is governed by the accelerator (58).



The truck travels in the selected travel direction.



- Adjust the automatic gearshift with the rotary button on the lever (56).
- Stage "1": transmission does not switch into 2nd gear.
 - Stage "2": the truck starts in 1st gear and automatically switches to 2nd gear as soon as the truck reaches a speed of 7-8 km/h.
- As soon as the speed is more than 3 - 4 km/h, the travel direction can no longer be changed. The reversing disable makes it impossible to change the travel direction from forward to reverse at high speed.
- As soon as the speed is more than 8 km/h, it is not possible to switch from 2nd gear to first gear.

Changing Travel Direction

Press the pedal (59) to bring the truck to a standstill. Change the travel direction with the travel direction switch. Resume travel.

Neutral locking

If the driver leaves the truck without taking it out of gear, the truck will automatically be set to neutral. To resume travel (sitting on the truck) all controls must be deactivated, the travel direction switch must be set to neutral "N" and then the required direction selected.

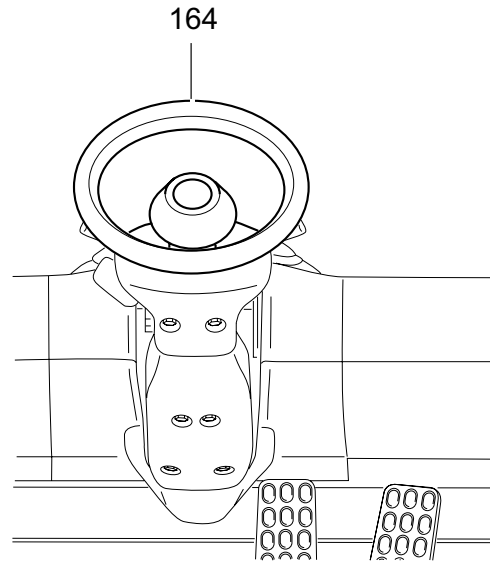
6.7 Steering

Steering

Procedure

- ➔ Very little steering effort is required; you should therefore turn the steering wheel (164) sensitively.
- To negotiate a right-hand bend: Turn the steering wheel clockwise according to the required steering radius.
 - To negotiate a left-hand bend: Turn the steering wheel anti-clockwise according to the required steering radius.

The truck travels in the direction selected.



6.8 Brakes

WARNING!

Accident risk

The brake pattern of the truck depends largely on the ground conditions.

- ▶ The driver must be aware of travel route conditions and them into account when braking.
- ▶ Brake with care to prevent the load from slipping.
- ▶ Allow for increased braking distance when travelling with an attached load.
- ▶ Use the service brake in emergencies.

There are two ways of braking:

- Service brake (59)

and for secure parking:

- Parking brake ("F5" button)

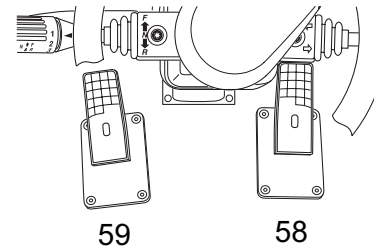
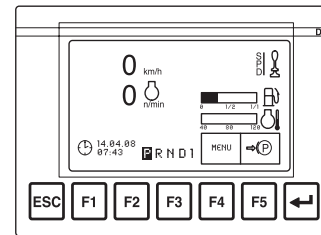
The truck has two brake systems that work independently of each other, a service brake and a parking brake.

6.8.1 Service brake

The drive coupling is deactivated in the first half of the pedal path. The tow force of the truck is reduced proportionately to how far the brake pedal is depressed (59).

The service brake is activated in the last half of the pedal path. If the pedal is depressed further, the truck is brought to a stop. The brake force is proportional to the pedal path.

To allow the truck to move slowly, first step on the brake pedal (59). Then press the accelerator pedal (58). Carefully release the brake pedal (59). The truck begins to move slowly.



6.8.2 Parking brake

DANGER!

Accident risk

- ▶ The parking brake will hold the truck with maximum load on a clean ground surface, on inclines of up to 15%.
- ▶ Do not park and abandon the truck on an incline.
- ▶ Applying the parking brake during travel will cause the truck to brake to a standstill. This may cause the load to slide off the fork tines. There is an increased risk of accidents and injury!

 The parking brake can be used as an emergency brake.

Procedure

- To activate the parking brake, press the "F5" button (165). The arrow that appears in the "parking brake" icon (75) changes its position to the right.

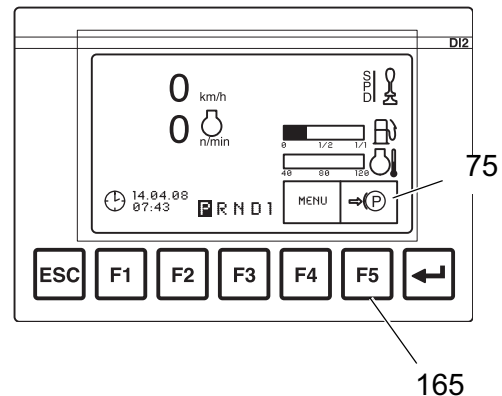
CAUTION!

The parking brake is automatically activated when the driver's position is vacated.

DANGER!

If there is reason to suspect an error in the brake system, it is not possible to continue driving.

- ▶ Please contact the manufacturer's service department.



6.9 Adjusting the forks

WARNING!

Trapping hazard

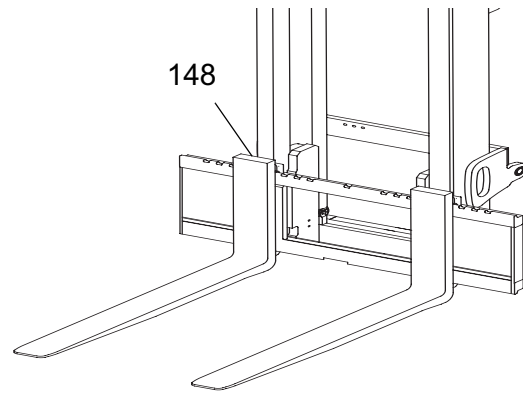
There is a trapping hazard when you perform this operation.

- ▶ Wear work gloves and safety shoes.

WARNING!

Unsecured and incorrectly adjusted fork tines can cause accidents

- ▶ Adjust the two fork tines so that they are equidistant from the outside edge of the fork carriage.
- ▶ Engage the locking pin in a groove to prevent the fork tines from moving accidentally.
- ▶ The load centre of gravity must be located centrally between the fork tines.



Adjusting the forks

Requirements

- Park the truck securely, (see "Parking the truck securely" on page 100).

Procedure

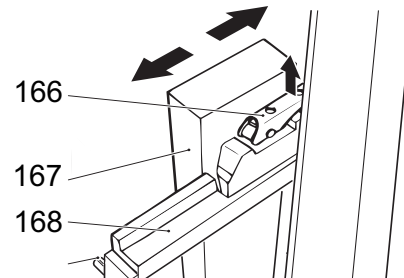
- Lift up the locking lever (166).
- Push the forks (167) into the correct position on the fork carriage (168).



To lift the load securely, the forks (167) must be spread as far apart as possible and positioned centrally with respect to the fork carriage. The load centre of gravity must be centrally aligned between the forks (167).

- Lift the locking lever down (166) and move the forks until the locking pin engages in a slot.

The forks are now adjusted.



6.10 Replacing the forks

WARNING!

Unsecured fork tines can cause injury

You can injure your legs when replacing the fork tines.

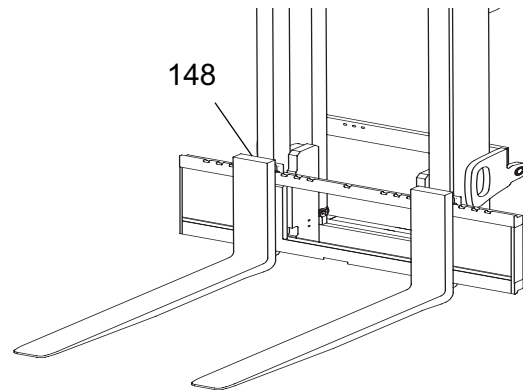
- ▶ Never pull the fork tines towards your body.
- ▶ Always push the fork tines away from your body.
- ▶ Secure heavy fork tines with lifting slings and a crane before pushing them down from the fork carriage.

WARNING!

Trapping hazard

There is a trapping hazard when you perform this operation.

- ▶ Wear work gloves and safety shoes.



Replacing the fork tines

Requirements

- Load handler lowered and fork tines not touching the ground.

Procedure

- Loosen the fork stop (148).
- Carefully push the fork tines to the centre of the fork carriage and remove them.

The fork tines are now dismantled from the fork carriage and can be replaced.

6.11 Lifting, transporting and depositing loads

WARNING!

Unsecured and incorrectly positioned loads can cause accidents

Before lifting a load unit the driver must make sure that it has been correctly palletised and does not exceed the truck's capacity.

- ▶ Instruct other people to move out of the hazardous area of the truck. Stop working with the truck if people do not leave the hazardous area.
- ▶ Only carry loads that have been correctly secured and positioned. Use suitable precautions to prevent parts of the load from tipping or falling down.
- ▶ Do not transport loads other than on the authorised load handler.
- ▶ Damaged loads must not be transported.
- ▶ If the stacked load obscures forward visibility, then you must reverse the truck.
- ▶ Make sure you have enough visibility when reversing.
- ▶ Never exceed the maximum loads specified in the capacity chart.
- ▶ Never stand underneath a raised load handler.
- ▶ Do not stand on the load handler.
- ▶ Do not lift other people on the load handler.
- ▶ Do not reach through the mast.
- ▶ Check the fork spread before lifting the load and adjust if necessary.
- ▶ Insert the forks as far as possible underneath the load.

Lifting load units

Requirements

- Load unit correctly palletised.
- Fork spread for the pallet checked and adjusted if necessary.
- Load unit weight matches the truck's capacity.
- Forks evenly loaded for heavy loads.

Procedure

- Drive the truck carefully up to the pallet.
- Set the mast vertical.
- Slowly insert the forks into the pallet until the fork shank touches the pallet.
- Raise the load handler.
- Reverse carefully and slowly until the load unit is outside the storage area. Make sure you have enough clear space to reverse into.

NOTE

Loads must not be deposited on travel or escape routes, in front of safety mechanisms or operating equipment that must be accessible at all times.

Transporting load units

Requirements

- Load unit correctly lifted.
- Load handler lowered for transport (approx. 150 - 200 mm above the ground).
- Mast tilted back fully.

Procedure

- Accelerate and decelerate gradually.
- Adapt your travel speed to the conditions of the route and the load you are transporting.
- Watch out for other traffic at crossings and passageways.
- Always travel with a lookout at blind spots.
- On slopes and inclines always carry the load facing uphill, never approach at an angle or turn.

Depositing load units

Requirements

- Warehouse location suitable for storing the load.

Procedure

- Set the mast vertical.
- Drive carefully up to the storage location.
- Carefully lower the load handler so that the forks are clear of the load.
- ➔ Avoid depositing the load to avoid damaging the load and the load handler.
- Lower the load handler.
- Carefully remove the forks from the pallet.

The load unit is lowered.

6.12 Operating the lift mechanism and integrated attachments

WARNING!

Accident risk when operating the lifting device and integrated attachments

Other people can be injured in the truck's hazardous area.

The hazardous area is defined as the area in which people are at risk from the truck movement, the load handler, attachments etc. This also includes areas which can be reached by falling loads or lowering operating equipment.

Apart from the operator (in the normal operating position) there should be no other people in the truck's hazardous area.

- ▶ Instruct other people to move out of the hazardous area of the truck. Stop working with the truck if people do not leave the hazardous area.
- ▶ The truck must be prevented from being used by unauthorised people if people do not leave the hazardous area despite the warning.
- ▶ Only carry loads that have been correctly secured and positioned. Use suitable protection measure to prevent parts of the load from tipping or falling down.
- ▶ Never exceed the maximum loads specified in the capacity chart.
- ▶ Never stand underneath a raised load handler.
- ▶ Do not stand on the load handler.
- ▶ Do not lift other people on the load handler.
- ▶ Do not reach through the mast.
- ▶ The controls should only be operated from the driver's seat, and never suddenly.
- ▶ The driver must be instructed in how to operate the lifting device and the attachments.

6.12.1 Operating the lifting device with the SOLO-PILOT

Lifting and lowering

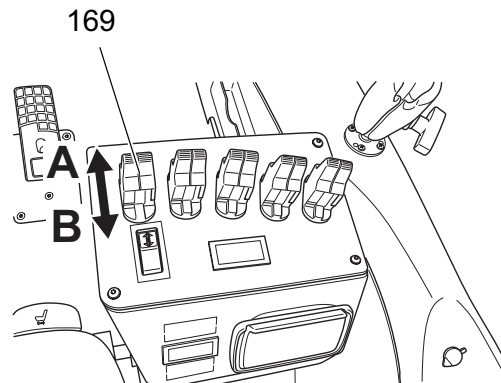
Requirements

- Truck prepared for operation, (see "Preparing the truck for operation" on page 96).

Procedure

- Pull back on the lever (169). The load is raised.
- Press forward on the lever (169). The load is lowered.

The load is now raised or lowered.



When the end stop for the operation has been reached (there will be a noise from the pressure limitation valve) release the lever. The lever will revert automatically to the neutral position.

Tilting the mast forward / backward

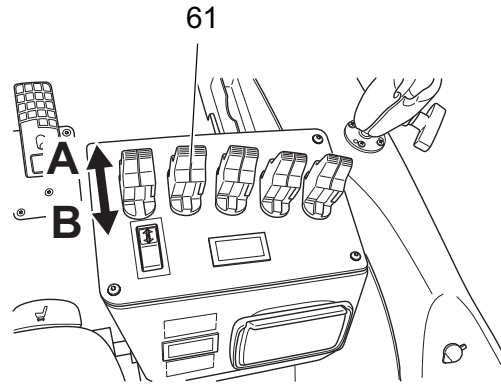
Requirements

- Truck prepared for operation, (see "Preparing the truck for operation" on page 96).

Procedure

- Pull back on the lever (61). The mast tilts back.
- Push forward on the lever (61). The mast tilts forward.

The mast is now tilted back or forward.



- When the end stop for the operation has been reached (there will be a noise from the pressure limitation valve) release the lever. The lever will revert automatically to the neutral position.

Depositing a load unit (SOLO-PILOT)

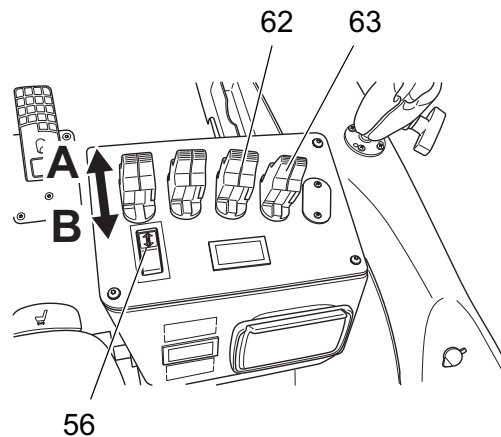
Procedure

- To place the load in a horizontal position: Press the lever (61) in direction (A).
 - To position the load at the correct height: Press the lever (169) in direction (A or B).
 - To lower the load: Press the lever (169) in direction (A).
- When you reach the limit position return the control lever to its home position.

Fork adjustment (SOLO-PILOT)

Procedure

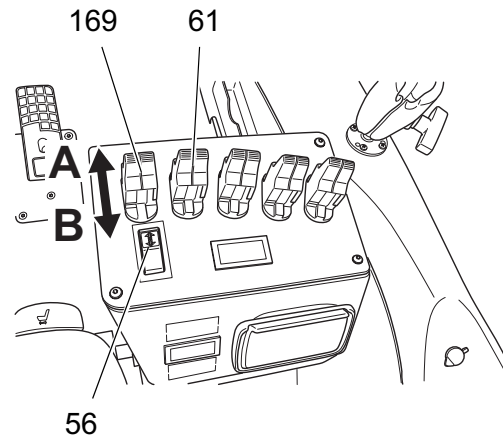
- To adjust the fork to the width of the load:
 - Wider fork spread: Press the lever (62) in direction (A).
 - Narrower fork spread: Pull the lever (62) in direction (B).
- To move both fork tines at the same time:
 - Right: Press the lever (63) in direction (A)
 - Left: Pull the lever (63) in direction (B)



Sideshifter (SOLO-PILOT)

Procedure

- Push the lever (62) in direction (A). The fork tines are shifted to the right (as seen by the driver).
- Pull the lever (62) in direction (B). The fork tines are shifted to the left (as seen by the driver).



6.12.2 Operating the lift mechanism with the Multi Pilot

Lifting and lowering

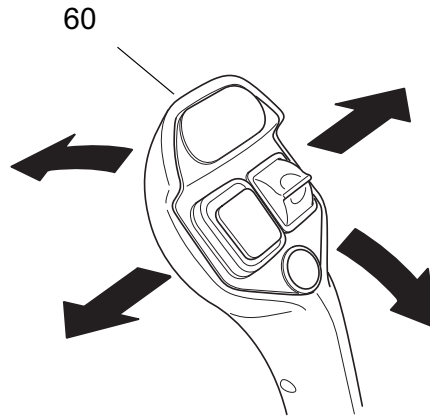
Requirements

- Truck prepared for operation, (see "Preparing the truck for operation" on page 96).

Procedure

- Pull back on MULTI-PILOT (60). The load is raised.
- Push MULTI-PILOT (60) forward. The load is lowered.

The load is now raised or lowered.



- When the end stop for the operation has been reached (there will be a noise from the pressure limitation valve) release MULTI-PILOT. MULTI-PILOT will revert automatically to the neutral position.

Tilting the mast forward / backward

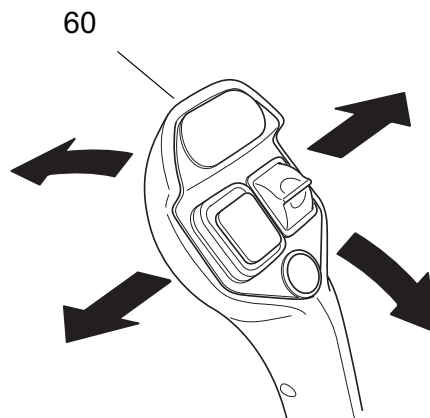
Requirements

- Truck prepared for operation, (see "Preparing the truck for operation" on page 96).

Procedure

- Push MULTI-PILOT (60) to the left. The mast tilts back.
- Push MULTI-PILOT (60) to the right. The mast tilts forward.

The mast is now tilted back or forward.



- When the end stop for the operation has been reached (there will be a noise from the pressure limitation valve) release MULTI-PILOT. MULTI-PILOT will revert automatically to the neutral position.

Twin operation

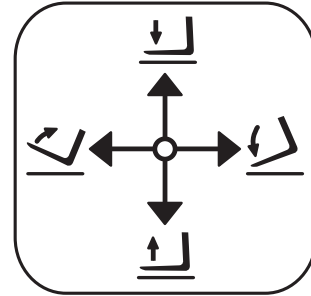
Requirements

- To prepare the truck for operation, (see "Preparing the truck for operation" on page 96)

Procedure

- To lower the load handler and tilt the mast forward at the same time, push the Multi Pilot forward and to the right.
- To lift the load handler and tilt the mast back at the same time, push the Multi Pilot back and to the left.
- To lower the load handler and tilt the mast back at the same time, push the Multi Pilot forward and to the left.

The mast is now tilted back / forward.



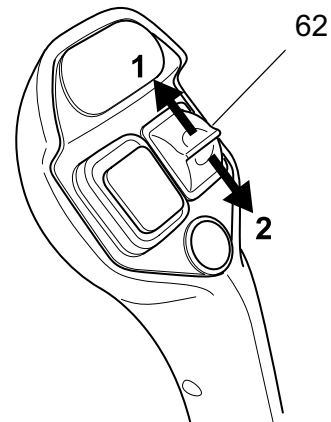
⚠ CAUTION!

- To raise the load safely, set the fork tines as far apart from each other as possible and centrally to the truck. The load centre of gravity must lie centrally between the fork tines.

Fork adjustment (MULTI-PILOT)

Procedure

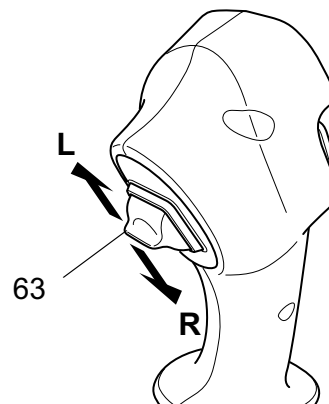
- Adjusting the fork makes it possible to set the fork for the width of the load.
Wider fork spread: Press the control button (62) in direction (2).
Narrower fork spread: Press the control button (62) in direction (1).



Sideshifter (MULTI-PILOT)

Procedure

- ➔ The references to left and right are based on load lifting as viewed from the operator's position.
- Sideshifter left: Press the control button (63) in direction (L).
 - Sideshifter right: Press the control button (63) in direction (R).
- With MULTI-PILOT control, adjusting and reaching are simultaneous



6.13 Safety instructions for operating additional attachments

- Optionally, trucks can be fitted with one or more auxiliary hydraulic functions to operate attachments. The auxiliary hydraulics are referenced ZH1, ZH2 and ZH3. Auxiliary hydraulic functions for exchangeable equipment are fitted with replacement couplings on the fork carriage.

DANGER!

Attaching exchangeable equipment can result in accidents.

Other people can be damaged by attaching exchangeable equipment. Use only exchangeable equipment which has been deemed safe after a risk analysis carried out by the owner.

- ▶ Only use attachments with a CE mark.
- ▶ Only use attachments that have been designed by the attachment manufacturer for use with the respective industrial truck.
- ▶ Only use attachments that have been fitted for the purpose by the owner.
- ▶ Make sure the operator has been instructed in the use of the attachment and that he uses it for its correct purpose.
- ▶ Re-assess the residual capacity of the truck and if it has been altered, attach an additional capacity plate to the truck.
- ▶ Note the attachment manufacturer's operating instructions.
- ▶ Only use attachments that do not restrict visibility in the travel direction.

-
- If visibility in the travel direction is impaired, the owner must carry out a risk analysis to assess whether the truck needs to be fitted with auxiliary equipment such as a camera system or mirrors. If such equipment is used, spend sufficient time practicing travelling with them.

Safety instructions for sideshifter and fork adjuster attachments

WARNING!

When using multi fork adjusters (multi pallet clamps), restricted visibility and reduced lateral tilt resistance can result in accidents.

- ▶ Adapt the travel speeds to the visibility and load.
 - ▶ Make sure you have enough visibility when reversing.
-

Safety instructions for clamping attachments (e.g. baling clamps, barrel clamps, grabs etc.)

WARNING!

Falling loads can cause accidents

This can result in malfunctions and the load can fall accidentally.

- ▶ Clamping attachments may only be added to trucks which have a button to enable additional hydraulic functions.
 - ▶ Clamping attachments must only be operated on trucks with auxiliary hydraulics HF4 or HF5.
 - ▶ When connecting the attachment make sure that the hydraulic lines of the attachment are connected to the right ports, (see "Fitting additional attachments" on page 122).
-

Safety instructions for rotary attachments

WARNING!

A non-centred centre of gravity can result in accidents

When using rotary devices and non-centred loads, the centre of gravity can be displaced from the centre with a high risk of accidents.

- ▶ Adapt the travel speed to the load.
 - ▶ Lift the load from the centre.
-

Safety instructions for telescopic attachments

WARNING!

Accident risk from increased tipover hazard and reduced residual capacity

There is a greater tipover risk with extended telescopic attachments (e.g. reach carriages, telescopic forks, telescopic crane booms).

- ▶ Only use the telescopic function for stacking and retrieving.
 - ▶ Always retract the attachment fully during transport.
 - ▶ Adapt the travel speed to changed load centre of gravity.
-

Safety instructions for attachments when transporting suspended loads

WARNING!

Swinging loads and a reduced residual capacity can result in accidents

- ▶ Adapt the travel speed to the load, less than walking pace.
 - ▶ Secure swinging loads for example with lifting slings.
 - ▶ Reduce the residual capacity and have it certified by a expert.
-

Safety instructions for using loading buckets as attachments

WARNING!

Greater mast loading can cause accidents.

- ▶ When carrying out the daily checks and operations before starting, (see "Checks and operations to be performed before starting daily operation" on page 84), in particular attention check the fork carriage, mast rails and mast rollers for damage.
-

Safety instructions for fork extensions:

WARNING!

Unsecured and excessive fork extensions can cause accidents.

- ▶ For fork extensions with an open cross sectional area, only carry loads that are resting along the entire length of the fork extension.
 - ▶ Only use fork extensions with the same fork cross section and minimum fork length of the truck and which comply with the details on the fork extension data plate.
 - ▶ The basic fork length must be at least 60% of the length of the fork extension.
 - ▶ Lock the fork extensions onto the basic forks.
 - ▶ When carrying out the daily checks and operations before starting, (see "Checks and operations to be performed before starting daily operation" on page 84), also check the fork extension lock.
 - ▶ Mark any fork extensions with an incomplete or faulty lock and take them out of service.
 - ▶ Do not use trucks with an incomplete or faulty fork extension lock. Replace the fork extension.
 - ▶ Only restore the fork extension to service when the fault has been rectified.
 - ▶ Use only fork extensions which have no dirt or foreign bodies near the entry opening point. Clean the fork extensions as required.
-

6.14 Operating additional attachments for the SOLO-PILOT

WARNING!

Incorrect symbols can cause accidents

Symbols on controls that do not depict the function of the attachments can cause accidents.

- ▶ Mark the controls with symbols that indicate their function.
- ▶ Specify the attachments' direction of movement in accordance with ISO 3691-1 so that they match the controls' direction of movement.

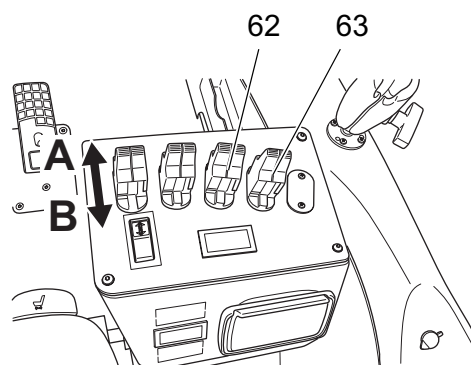
6.14.1 Solo Pilot with control of ZH1 and ZH2 hydraulic ports

- Functions are assigned to the levers (62, 63) depending on the attachments used. Levers that are not required are void. For connections (see "Fitting additional attachments" on page 122).

Procedure

- Operating hydraulic port ZH1:
Move the lever (62) in direction A or B.
- Operating hydraulic port ZH2:
Move the lever (63) in direction A or B.

The attachment performs its operation.



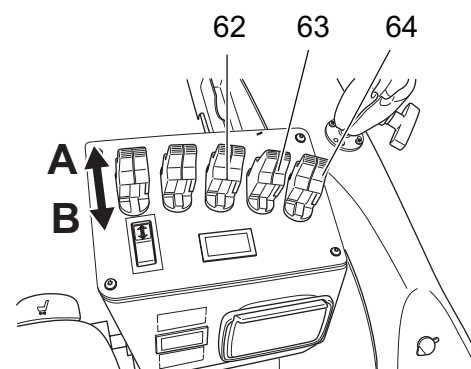
6.14.2 Solo Pilot with control of ZH1, ZH2 and ZH3 hydraulic ports

- Functions are assigned to the levers (62, 63, 64) depending on the attachments used. Levers that are not required are void. For connections (see "Fitting additional attachments" on page 122).

Procedure

- Operating hydraulic port ZH1:
Move the lever (62) in direction A or B.
- Operating hydraulic port ZH2:
Move the lever (63) in direction A or B.
- Operating the hydraulic port ZH3:
Move the lever (64) in direction A or B.

The attachment performs its operation.



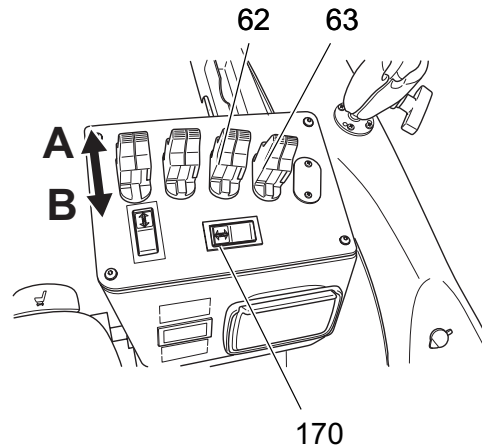
6.14.3 SOLO-PILOT with control of hydraulic ports ZH1, ZH2 and ZH3 with an extra button

- Functions are assigned to the levers (62, 63, 170) depending on the attachments used. Levers that are not required are void. For connections (see "Fitting additional attachments" on page 122).

Procedure

- Operating hydraulic port ZH1:
Move the lever (62) in direction A or B.
- Operating hydraulic port ZH2:
Move the lever (63) in direction A or B.
- Operating the hydraulic port ZH3:
Press the toggle switch (170) and at the same time move the lever (63) in direction A or B.

The attachment performs its operation.



6.15 Operating additional attachments for the Multi Pilot

WARNING!

Incorrect symbols can cause accidents

Symbols on controls that do not depict the function of the attachments can cause accidents.

- ▶ Mark the controls with symbols that indicate their function.
- ▶ Specify the attachments' direction of movement in accordance with ISO 3691-1 so that they match the controls' direction of movement.

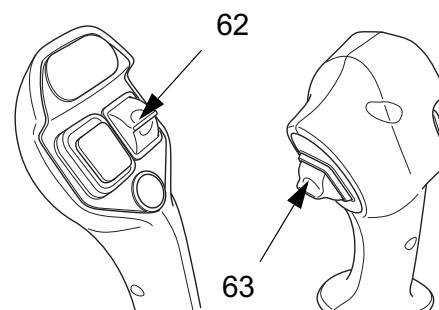
6.15.1 Multi Pilot with control of ZH1 and ZH2 hydraulic ports

- Functions are assigned to the levers (62, 63) depending on the attachments used. Levers that are not required are void. For connections (see "Fitting additional attachments" on page 122).

Procedure

- Operating hydraulic port ZH1:
Press the button (62).
- Operating hydraulic port ZH2:
Press the button (63).

The attachment performs its operation.



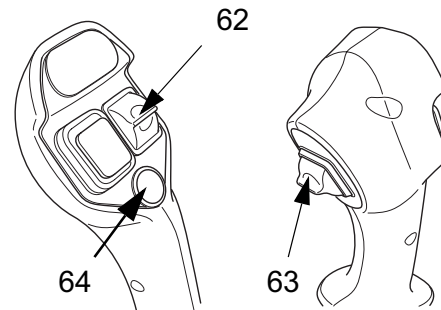
6.15.2 Multi Pilot with control of ZH1, ZH2 and ZH3 hydraulic ports

- Functions are assigned to the levers (62, 63, 64) depending on the attachments used. Levers that are not required are void. For connections (see "Fitting additional attachments" on page 122).

Procedure

- Operating hydraulic port ZH1:
Press the button (62).
- Operating hydraulic port ZH2:
Press the button (63).
- Operating hydraulic port ZH3:
Press button (62) or button (63) and simultaneously button (64).

The attachment performs its operation.



6.16 Fitting additional attachments

CAUTION!

Incorrectly connected attachments can cause accidents.

Attachments with incorrectly connected hydraulic attachments can result in accidents.

- ▶ Attachments must only be assembled and commissioned by trained, specialist personnel.
- ▶ Note the attachment manufacturer's operating instructions.
- ▶ Before commissioning, check the fasteners are positioned correctly and securely and make sure they are complete.
- ▶ Before commissioning, make sure the attachment is working correctly.

Hydraulic ports

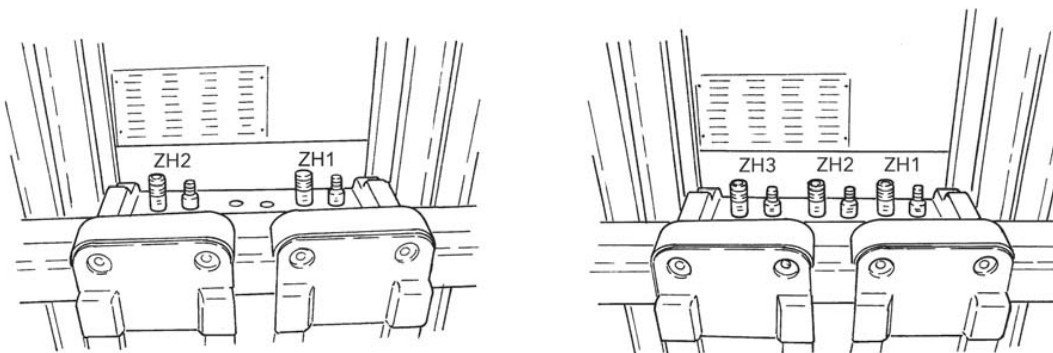
Requirements

- Non-pressurised hydraulic hoses.
- Attachment directions of movement defined to match the controls' direction of movement.

Procedure

- Non-pressurised hydraulic hoses
- Switch off the truck and wait a few minutes.
- Attach the plug connector and engage it in position.
- Mark the controls with symbols that indicate the function of the attachment.

The attachment is hydraulically connected.



Spilled hydraulic oil must be set using a suitable agent and disposed of in accordance with environmental regulations.

If hydraulic oil comes into contact with the skin, wash it off immediately with soap and water. If it comes into contact with the eyes rinse them immediately with flowing water and call for a doctor.

7 Towing trailers

DANGER!

Inappropriate speeds and excessive trailer loads can be dangerous

If you do not adapt your speed and / or use an excessive trailer load, the truck can pull apart when cornering and braking.

- ▶ The truck should only be used occasionally to tow trailers.
 - ▶ The overall weight of the trailer should not exceed the capacity indicated on the capacity plate, (see "Identification points and data plates" on page 36). If a load is also transported on the forks, the trailer load must be reduced by the same amount.
 - ▶ Do not exceed the maximum speed of 5 km/h km/h.
 - ▶ A truck must not be continually operated with trailers.
 - ▶ Do not use supporting loads.
 - ▶ Towing must only be performed on level, secure travel routes.
 - ▶ The owner must test trailer operation with the permissible tow load by means of a trial run under the applicable operating conditions on site.
-

Attaching the trailer

CAUTION!

Trapping hazard

There is a trapping risk when you attach a trailer.

- ▶ Follow the instructions of the coupling manufacturer if using special trailer couplings.
 - ▶ Secure the trailer to prevent it from rolling away before coupling it.
 - ▶ Do not get caught between the truck and the tiller when coupling the trailer.
 - ▶ The tiller must be horizontal, tilted down by no more than 10° and never facing up.
-

Attaching the trailer

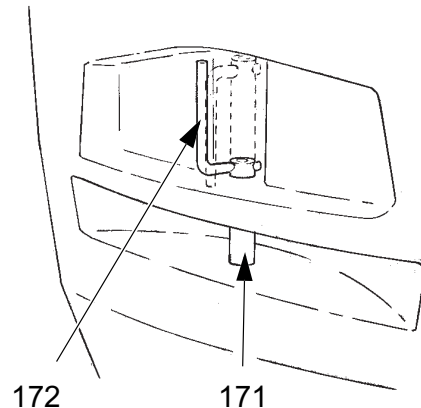
Requirements

- Truck and trailer are on a level surface.
- Trailer prevented from rolling away.

Procedure

- The handle (172) is moved to a horizontal position and the bolt (171) is raised so that the coupling fork becomes free. Then position the handle (172) vertically so that the bolt (171) remains in place.
- Insert the trailer tiller into the opening.
- Move the handle (172) to a horizontal position let down the bolt (171), thereby locking the handle (172) in a vertical position.

The trailer is now attached to the truck.



8 Optional equipment

8.1 Sliding windows

CAUTION!

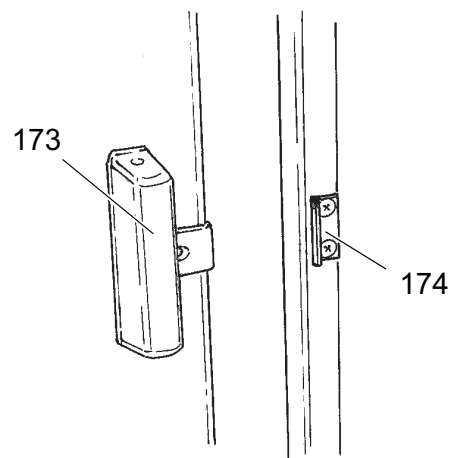
An unlocked sliding window can cause accidents

► The sliding windows must be locked at all times.

Opening and closing the windows

Procedure

- Push the lock (173) up.
- Move the window forward or back.
- Insert the lock in the stop (174).



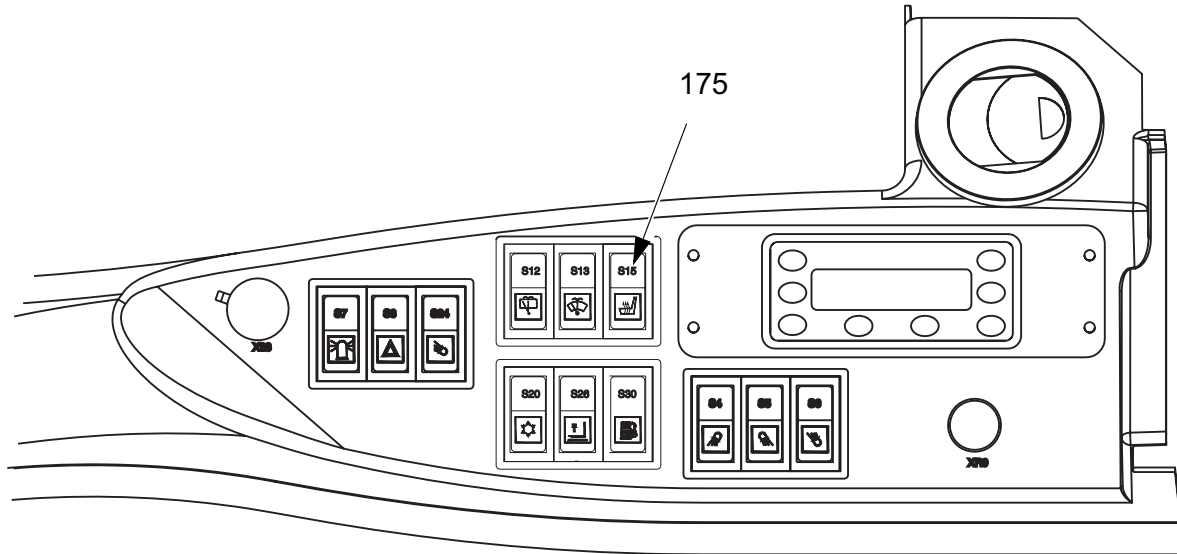
8.2 Emergency Exit

If a locking pin in the closing mechanism is removed, the right side window can be used as an emergency exit.

Procedure

- Open the window to its normal open position
- Use the upper ring to pull the locking pin out of the closing mechanism.
- Open the window all the way.

8.3 Driver'S Seat Heater



Switching the seat heating on and off (optional equipment)

Procedure

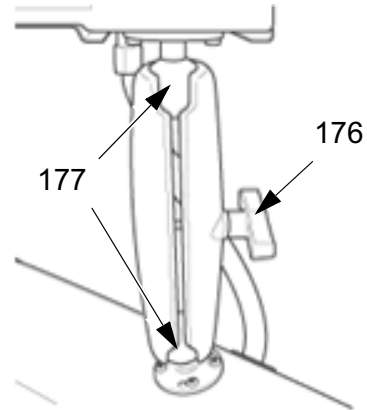
- Press the seat heating switch (175).
Switch setting 1 = Seat heating on.
Switch setting 0 = Seat heating off.

8.4 Adjusting the Multifunction Display

To ensure an optimum view of the multifunction display, it can be individually adjusted.

Procedure

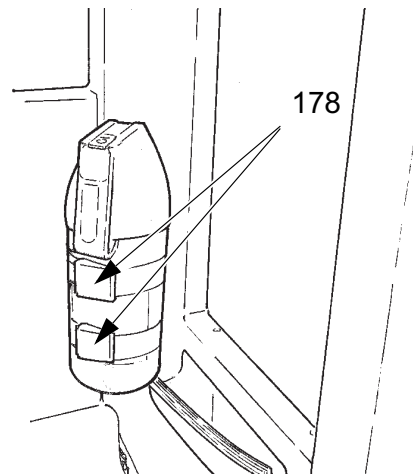
- Sit on the driver's seat.
- Adjust the seat to its optimum position.
- Loosen the central wing screw (176) of the display holder just enough so that the two ball joints (177) can be moved freely in the holder.
- Move the display to the desired position and retighten the central wing screw (176).



8.5 Fire Extinguisher

Procedure

- Open the fasteners (178)
 - Pull the fire extinguish out of its bracket
- ➔ To operate, refer to the illustrations on the fire extinguisher



8.6 Rockinger Coupling with Hand Lever

➔ Refer to the instructions for towing trailers, (see "Towing trailers" on page 123).

CAUTION!

Incorrectly coupled trailers can cause accidents

- ▶ Make sure the coupling is engaged securely before starting the truck.
- ▶ The contro pin (181) must be flush with the control sleeve (179).

Rockinger Coupling Operation

Attaching a trailer

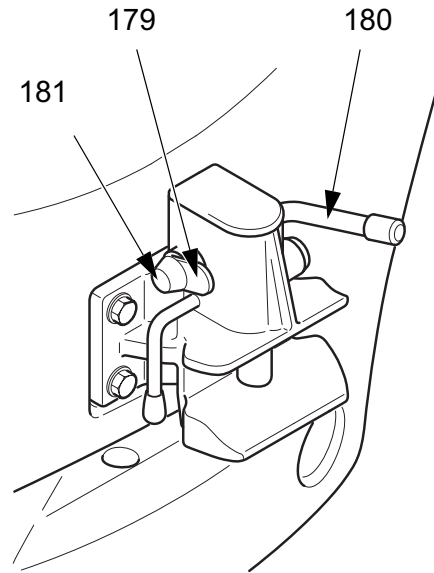
Procedure

- Prevent the trailer from rolling away.
- Adjust the trailer pull rod to the height of the coupling.
- Pull up on the hand lever (180).
- Slowly reverse the truck until the coupling engages.
- Press down on the hand lever (180).

Disconnecting a trailer

Procedure

- Prevent the trailer from rolling away.
- Pull up on the hand lever (180).
- Drive the truck forward.
- Press down on the hand lever (180).



9 Troubleshooting

9.1 Automatic Emergency Brake

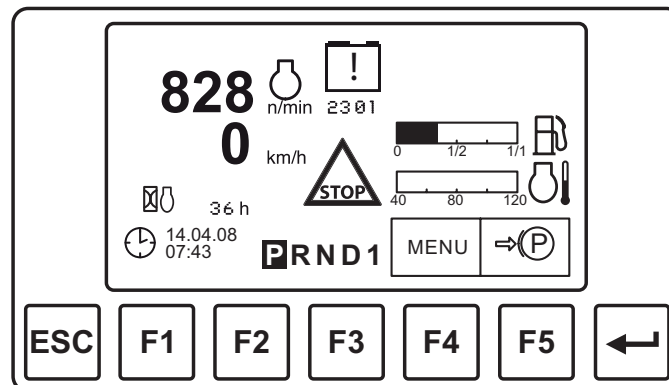
The automatic emergency brake is activated if an error occurs in one of the following components during operation:

- Brake pedal
- Pressure sensor in the brake system
- Magnetic coil in the service brake or parking brake

Emergency braking initiates the following sequence:

- The brakes are activated and the truck decelerates sharply
- STOP flashes on the multifunction display
- An error code appears in the multifunction display

If the emergency brake is activated, the truck can be moved to a safe location by activating emergency mode (see Activating Emergency Mode on page 124 and Driving in Emergency Mode on page 125). This not not apply, however, if the error is in the magnetic coil for the parking brake, in the earth connection for the brake pedal or in the pressure sensor. If one of these components is faulty, the truck cannot be driven and must be repaired by a qualified specialist as soon as possible.



Activation of Emergency Mode

Requirements

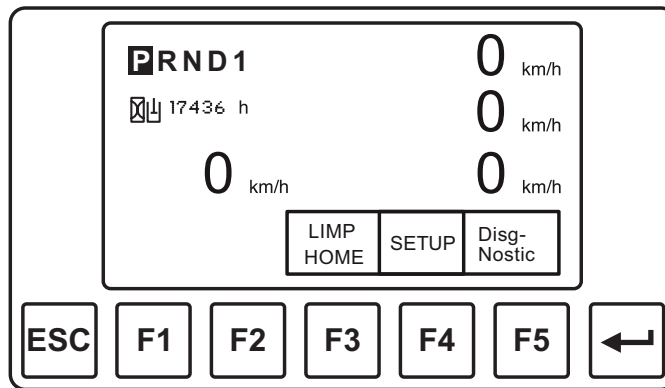
- The automatic emergency brake is activated due to a serious error (see Automatic Emergency Brake on page 123).



Emergency mode cannot be activated for certain serious errors.

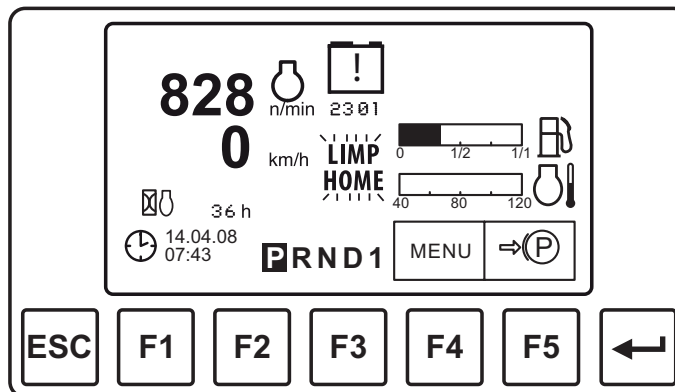
Procedure

- Press the "F4" button until the multifunction display shows LIMP HOME (emergency mode).
- Activate emergency mode with the "F3" button. When emergency mode is activated, the menu disappears over the row of function keys.



Procedure

- Press the "ESC" key to exit the current menu area and return to the travel mask. LIMP HOME flashes on the multifunction display.



Procedure

- Choose the travel direction with the travel direction switch.
The parking brake can now be deactivated ((see "Parking brake" on page 106)).
The truck can now travel at max. 1200 rpm. Error messages continue to appear in the display.

CAUTION!

The braking pattern deteriorates when driving in emergency mode. In some cases the brakes may not work. There is a higher risk of accidents and injury.

CAUTION!

Emergency mode must only be used to move the truck to a location where it can be securely parked. Then the truck must be repaired as soon as possible by a qualified specialist. Never use emergency mode for normal work with the truck!

9.2 Troubleshooting

This chapter enables the user to identify and rectify basic faults and the effects of incorrect operation. When trying to locate a fault, proceed in the order shown in the table.



If, after carrying out the following remedial action, the truck cannot be restored to operation or if a fault in the electronics system is displayed with a corresponding error code, contact the manufacturer's service department.

Additional troubleshooting must only be performed by the manufacturer's specialist service engineers. The manufacturer's customer service department is specially trained to carry out these operations.

In order for customer services to react quickly and specifically to the fault, the following information is essential:

- Truck serial number
- Error number on the display unit (if applicable)
- Error description
- Current location of truck

Fault	Possible cause	Remedy
Starter motor is not working	Battery isolator is not switched on	Switch on the battery isolator
	Faulty fuse	Check fuses
	Battery charge too low	Check battery charge, charge battery if necessary
	Battery terminal cable loose or terminals oxidized	Clean and grease terminals, tighten battery terminal cable
Motor does not start	Air filter contaminated	Clean / replace air filter
	Fuel filter clogged	Replace the fuel filter
Gear oil temperature indicator flashing	Gear oil too hot	Motor speed is automatically reduced
Motor running but truck does not travel	Travel direction lever in neutral position	Set travel direction lever to the required travel direction
	Parking brake applied	Release the parking brake
Lift speed too low	Hydraulic reservoir oil level too low	Check hydraulic oil, top up if necessary
	Hydraulic reservoir discharge system contaminated or clogged	Clean / replace hydraulic reservoir discharge system
Load cannot be raised to max. height	Hydraulic reservoir oil level too low	Check hydraulic oil, top up if necessary
Excessive steering play	Air in steering system	Check hydraulic oil level and top up if necessary, then turn the steering wheel several times from one end stop to the other.

9.3 Operating the truck without its own drive system

9.3.1 Towing the truck

WARNING!

Accident risk

Other people can be injured if the truck is towed incorrectly.

- ▶ Only use vehicles to tow the truck which have sufficient tow and brake forces for the trailer load without its own braking system.
- ▶ Always use a pull rod to tow.
- ▶ Always tow the truck at walking pace.
- ▶ Do not park the truck with the parking brake released.
- ▶ One person must be seated in the recovery truck to steer it and one person must be seated on the towed truck.

The brake system is designed so that the parking brake is automatically activated when the truck comes to rest. It must therefore be released for towing as described below.

DANGER!

- ▶ Prevent the truck from rolling away.

Emergency release of the parking brake

Procedure

- If the pressure supply fails, the parking brake can be released mechanically as follows:

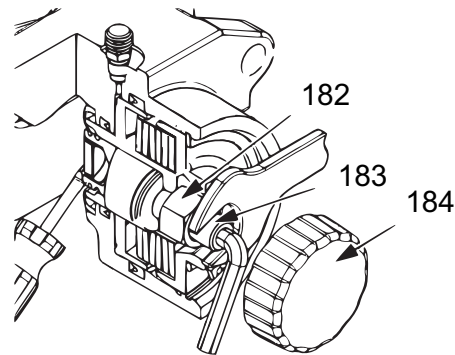
Park the truck on a level surface and prevent it from rolling away.

- Loosen and unscrew the screw cap (184).
- Loosen the retaining nut (182). Manually turn the adjusting screw (183) anti-clockwise with the Allen key until the brake disk is clear.



A torque of at least 40 Nm (SW8) / 70 Nm (SW10) on the adjusting screw is required for emergency releasing.

- Counter-fix the retaining nut (182) manually. Fit the screw cap to protect against contamination and insert it by several threads.



DANGER!

- ▶ The parking brake is non-operational in this condition. Use other methods to prevent the truck from rolling away.
- ▶ Adjust the parking brake before starting up the truck again.



The brake must be set to default after emergency release, repair work, fitting new brake lining support or brake disk, and if there is insufficient brake force.



DANGER!

- The default setting must normally be set by the manufacturer's Customer Service.
-

Towing the Truck

Procedure

- Attach the tow bar to the trailer coupling of the recovery vehicle and the truck to be recovered.
- Remove the device to prevent the truck from rolling away.
- Tow the truck at max. 2 km/h.



DANGER!

- One person must be seated in the towed truck to steer it.
-



As the power steering does not work when the truck is being towed, it takes considerably more effort to steer it.

9.3.2 Emergency lowering



The mast can be lowered manually if a fault occurs in the hydraulic system.



WARNING!

Lowering the mast can result in injuries

- ▶ Instruct other people to move out of the hazardous area of the truck during emergency lowering.
- ▶ Never stand underneath a raised load handler.
- ▶ Only operate the emergency lowering valve when standing next to the truck.
- ▶ Emergency lowering of the mast cannot be applied when the load handler is in the rack.
- ▶ Report any defects immediately to your supervisor.
- ▶ Tag out and decommission a faulty lift truck.
- ▶ Only return the truck to service when you have identified and rectified the fault.

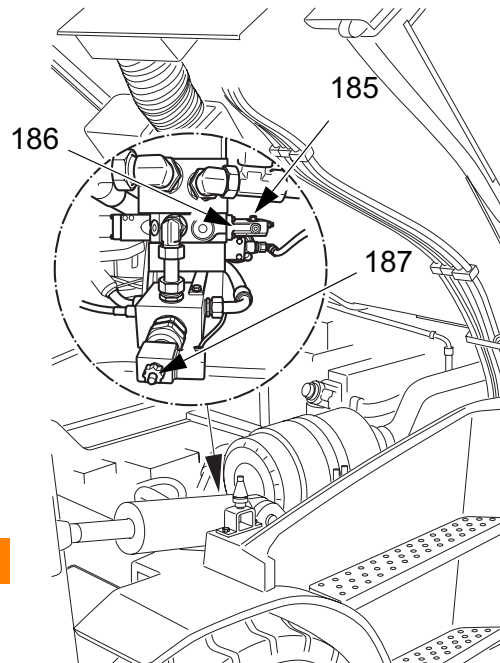
Procedure

- Turn key switch to "0".
- Loosen the red cap (187) on the solenoid valve on the valve block somewhat.
- Carefully loosen the nut (185) on the emergency lowering valve (186).
- The mast lowers slowly.
- Control the lowering speed with the nut (185).
- When the mast and the load handler have been lowered, torque the nut (185) to 2.5 - 3.0 Nm. Tighten the red cap (187) finger tight again.



WARNING!

Only return the truck to service when you have identified and rectified the fault.



9.3.3 Starting aid

WARNING!

Danger from overheating

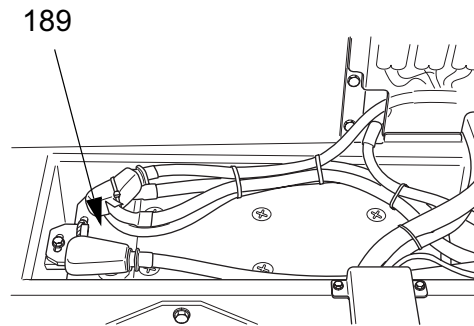
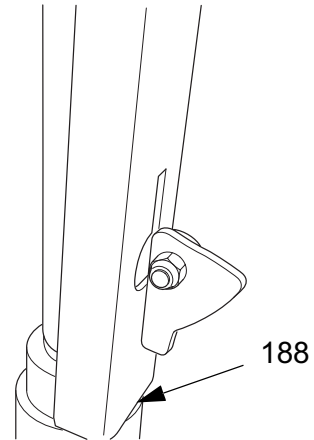
- Only use an ISO 6722 battery jump lead with fully insulated terminal pliers and a lead diameter of at least 50 mm².

Procedure

- Open the right side window completely.
- Tilt the cab of the truck until the retaining device (188) is locked in position
- First connect the positive terminal of the feeder battery to the positive terminal of the truck battery (189) with the red lead.
- Connect the negative terminal of the feeder battery and the earth point of the crane eye on the engine with the black lead.
- Use a ladder to change the truck height and reach through the open side window to start the truck motor with the ignition key with the cab fully tilted.
- Start the motor as normal.
- When the motor has started first remove the negative lead followed by the positive lead



If the starter motor does not switch on the motor after connecting the battery terminals, check that the battery terminal clips are positioned correctly.



F Industrial Truck Maintenance

1 Operational Safety and Environmental Protection

The checks and servicing operations contained in this chapter must be performed in accordance with the intervals as indicated in the servicing checklists.

WARNING!

Risk of accidents and damage to components

Any modification to the truck, in particular the safety mechanisms, is prohibited. Do not alter the truck's operating speeds under any circumstances.
Do not bond the front window with adhesive.

Exception: Owners should only make changes or have changes made to powered industrial trucks if the truck manufacturer is no longer operating in the field and there is no successor to the business; owners must however:

- Ensure that the changes to be made are planned, tested and performed by a specialist engineer in industrial trucks taking safety into account.
- keep permanent graphic records of the plans, tests and completion of the changes
- carry out and have authorised the respective changes to the capacity data plates, decals and stickers as well as the operator and service manuals.
- attach permanent and clearly visible marking to the truck indicating the types of changes made, the date of the changes and the name and address of the organisation responsible for the work.

NOTE

Only original spare parts have been certified by our quality assurance department. To ensure safe and reliable operation of the truck, use only the manufacturer's spare parts.

For safety reasons, only components which have been specially agreed by the manufacturer for this truck may be installed near the computer, controllers and wire guidance sensors (antennae). These components (computers, controllers, wire guidance sensors (antennae)) must therefore not be replaced either by similar components from other trucks of the same series.



On completion of inspection and service work, carry out the operations listed in the "Recommissioning the truck after cleaning or maintenance work" section ((see "Restoring the truck to service after maintenance and repairs" on page 190)).

2 Maintenance Safety Regulations

Maintenance and repair personnel

Truck maintenance and repair work must only be carried out by specially trained personnel. A maintenance contract with the manufacturer will ensure trouble-free operation. The manufacturer's service department has customer service technicians specially trained for these tasks.

Lifting and Jacking up



WARNING!

Lifting and jacking up the truck safely

When raising the truck, the lifting gear must only be secured to the points specially provided for this purpose.

You may only work under a raised load handler / cab if they have been secured with a sufficiently strong chain or the fastening bolt.

In order to raise and jack up the truck safely, proceed as follows:

- ▶ Jack up the truck only on a level surface and prevent it from moving accidentally.
 - ▶ Always use a jack with sufficient capacity. When jacking up the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).
 - ▶ When raising the truck, the lifting slings must only be secured to the points specially provided for this purpose, (see "Identification points and data plates" on page 36).
 - ▶ When jacking up the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).
-

Cleaning

CAUTION!

Fire hazard

Do not use flammable liquids to clean the industrial truck.

- ▶ Always disconnect the battery before starting cleaning work.
 - ▶ Carry out all necessary safety measures to prevent sparking before cleaning (e.g. by short-circuiting).
-

CAUTION!

Risk of electrical system damage

The electrical system can be damaged if it is cleaning with water. It is prohibited to clean the electrical system with water.

- ▶ Do not clean the electrical system with water.
 - ▶ Clean the electrical system with weak suction or compressed air (use a compressor with a water trap) and not a conductive, anti-static brush.
-

CAUTION!

Risk of component damage when cleaning the truck

If the truck is to be cleaned with a water jet or a high-pressure cleaner, all electrical and electronic components must be carefully covered beforehand as moisture can cause malfunctions. Do not clean with pressurised water.



After cleaning, carry out the operations detailed in "Recommissioning the truck after cleaning or maintenance work" ((see "Restoring the truck to service after maintenance and repairs" on page 190)).

Electrical system

CAUTION!

Accident risk from Electrical system:

- ▶ Only trained personnel may work on the electrical system.
 - ▶ Before working on the electrical system, all precautionary measures must be taken to avoid electrical accidents.
 - ▶ The connecting leads on the starter battery must be disassembled to disable it.
-

WARNING!

Electric currents can cause accidents

Make sure the electrical system is voltage-free before starting work on it. Before starting maintenance on the electrical system:

- ▶ Park the truck securely ((see "Parking the truck securely" on page 100)).
 - ▶ Press the Emergency Disconnect.
 - ▶ Disconnect the battery.
 - ▶ Remove any rings or metal bracelets etc. before working on electrical components.
-

Consumables and used parts

CAUTION!

Consumables and used parts are an environmental hazard

Used parts, oils and fuels must be disposed of in accordance with the relevant environmental protection regulations. To change the oil contact the manufacturer's customer service department, who have been specially trained for this task.

- ▶ Note the safety regulations when handling these materials.
-

Welding

Remove electrical and electronic components from the truck before performing welding operations, to avoid damage.

Settings

When repairing or replacing hydraulic, electric or electronic components or assemblies, always note the truck-specific settings.

Tyre type



WARNING!

The use of tyres that do not match the manufacturer's specifications can result in accidents.

The quality of tyres affects the stability and performance of the truck.

Uneven wear affects the truck's stability and increases the stopping distance.

- ▶ When replacing tyres make sure the truck is not skewed.
- ▶ Always replace tyres in pairs, i.e. left and right at the same time.



When replacing rims and tyres fitted at the factory, only use the manufacturer's original spare parts. Otherwise the manufacturer's specifications cannot be ensured.

Lift chains



WARNING!

Non-lubricated and incorrectly cleaned lift chains can cause accidents

Lift chains are safety-critical parts. They must not contain any serious contamination. Lift chains and pivot pins must always be clean and well lubricated.

- ▶ Lift chains should only be cleaned with paraffin derivatives e.g. petroleum or diesel fuels.
- ▶ Never clean lift chains with steam jet high pressure cleaners, cold or chemical cleaning agents.
- ▶ Immediately after cleaning, dry the lift chain with compressed air and apply a chain spray.
- ▶ Always lubricate a lift chain when it is discharged.
- ▶ Lubricate a lift chain with particular care around the pulleys.



WARNING!

Diesel fuel can be hazardous

- ▶ Diesel fuel can cause irritation if it comes into contact with the skin. Rinse any affected areas thoroughly.
- ▶ If it comes into contact with the eyes rinse them immediately with flowing water and call for a doctor.
- ▶ Wear safety gloves when handling diesel fuels.

Hydraulic hoses

WARNING!

Brittle hydraulic hose lines can cause accidents

The hoses must be replaced every six years. The manufacturer's customer service department is specially trained to carry out these operations.

- ▶ Comply with the safety regulations for hydraulic hose lines in accordance with BGR 237.
-

WARNING!

Hydraulic line leaks can cause accidents

Hydraulic oil can escape from leaky and faulty hydraulic lines.

- ▶ Report any defects immediately to your supervisor.
 - ▶ Tag out and decommission a faulty lift truck.
 - ▶ Only return the truck to service when you have identified and rectified the fault.
 - ▶ Spilled fluids must be removed immediately with an appropriate bonding agent. The bonding agent / consumable mixture must be disposed of in accordance with regulations.
-

WARNING!

Hairline cracks in the hydraulic lines can cause injury and infection

Pressurised hydraulic oil can penetrate the skin through fine holes or hairline cracks in the hydraulic lines, causing severe injury.

- ▶ Call for a doctor immediately if you are injured.
 - ▶ Do not touch pressurised hydraulic lines.
 - ▶ Report any defects immediately to your supervisor.
 - ▶ Tag out and decommission a faulty lift truck.
 - ▶ Only return the truck to service when you have identified and rectified the fault.
 - ▶ Spilled fluids must be removed immediately with an appropriate bonding agent. The bonding agent / consumable mixture must be disposed of in accordance with regulations.
-

WARNING!

Danger from hot fluids and components!

- ▶ Consumables (hydraulic oil, engine oil, coolant) and power train components (engine, manifold, exhaust system, turbo charger etc.) get very hot during operation.
 - ▶ When carrying out maintenance and repairs wear suitable protective clothing (gloves etc.) to avoid getting burned.
-

3 Servicing and Inspection

Thorough and expert servicing is one of the most important requirements for the safe operation of the industrial truck. Failure to perform regular servicing can lead to truck failure and poses a potential hazard to personnel and equipment.

WARNING!

The application conditions of an industrial truck have a considerable impact on the wear of the service components.

We recommend that a Jungheinrich customer service adviser carries out an application analysis on site to work out specific service intervals to prevent damage due to wear.

The service intervals stated are based on single shift operation under normal operating conditions. They must be reduced accordingly if the truck is to be used in conditions of extreme dust, temperature fluctuations or multiple shifts.

The following servicing checklist indicates the operations to be performed and the respective intervals to be observed. Maintenance intervals are defined as:

- W = Every 50 service hours, at least weekly
- A = Every 500 service hours
- B = Every 1000 service hours, or at least annually
- C = Every 2000 service hours, or at least annually
- = Standard maintenance interval
- * = Cold store maintenance interval (in addition to standard maintenance interval)

 W maintenance intervals must be performed by the owner.

During the run-in period – after approx. 100 service hours – the owner must check the wheel nuts / bolts and re-tighten if necessary.

4 Maintenance checklist

4.1 Maintenance checklist DFG

Brakes		W	A	B	C
1	Test brakes.	●			
2	Test brakes.			●	
3	Check the brake lining on the parking brake.			●	
4	Check connections and lines for leaks.			●	

Electrical System		W	A	B	C
1	Test warning and safety devices in accordance with operating instructions.	●			
2	Test warning and safety devices in accordance with operating instructions.			●	
3	Test displays and controls.			●	
4	Test the main switch / isolator.		●		
5	Check contactors and/or relays.			●	
6	Check fuse ratings.			●	
7	Check electric wiring for damage [insulation damage, connections]. Make sure wire connections are secure.			●	

Power Supply		W	A	B	C
1	Check the fuel system, tank and lines for leaks and damage.			●	
2	Check the battery cable connections are secure, grease terminals if necessary.	●			
3	Check the battery cable connections are secure, grease terminals if necessary.			●	
4	Check the battery and battery components.	●			
5	Check the battery and battery components.			●	
6	Check battery voltage.			●	

Travel		W	A	B	C
1	Replace transmission oil filter.				●
2	Check transmission oil level or grease filling of the transmission and top up if necessary.			●	
3	Replace the axle return filter.			●	
4	Test exhaust system and check for leaks and damage.			●	
5	Test anti-freeze, top up if necessary.			●	
6	Replace radiator fluid and anti-freeze.				●
7	Check cooling system for leaks.			●	
8	Check coolant level and top up if necessary.	●			
9	Check coolant level and top up if necessary.			●	
10	Test hydraulic fans and check for leaks.			●	

Travel		W	A	B	C
11	Clean the engine oil cooler.			●	
12	Check and clean radiator.		●		
13	Check transmission for noise and leakage.			●	
14	Replace gear oil.				●
15	Check tyre air pressure and top up if necessary.	●			
16	Check tyre air pressure and top up if necessary.			●	
17	Check wheels for wear and damage.	●			
18	Check wheels for wear and damage.			●	
19	Check wheel bearing and attachment.			●	
20	Test starter motor and generator, check wires and attachment.			●	
21	Replace the motor discharge filter.		●		
22	Replace fuel filter.		●		
23	Replace the fuel pre-filter.			●	
24	Replace engine oil filter.		●		
25	Check V belt / multi-V belt is tensioned and check for damage.			●	
26	Replace air filter.			●	
27	Check air filter, replace if necessary.		●		
28	Check motor for noise and leakage.			●	
29	Replace engine oil.		●		
30	Check engine oil level, top up if necessary.	●			
31	Check valve setting and adjust if necessary			●	
32	Check engine suspension.			●	
33	Test water pump and the fans.			●	
34	Check glow plugs.			●	
35	Check fuel/water separator and discharge if necessary.		●		
36	Replace drive axle oil.				●

Chassis and superstructure		W	A	B	C
1	Check chassis and screw connections for damage.			●	
2	Check the doors and covers.	●			
3	Check the doors and covers.			●	
4	Check labels are legible and complete.	●			
5	Check labels are legible and complete.			●	
6	Check attachment and setting function of the driver's seat.			●	
7	Check condition of the driver's seat.			●	
8	Check the motor compartment for contamination and clean if necessary.	●			
9	Check the motor compartment for contamination and clean if necessary.		●		
10	Check attachment of the counterweight.			●	
11	Check mast attachment / mounting.			●	
12	Check trailer coupling or tow mechanism stop.			●	

Chassis and superstructure		W	A	B	C
13	Check the overhead guard and / or cab are secure and check for damage.	●			
14	Check the overhead guard and / or cab are secure and check for damage.			●	
15	Check operator mat and steps are non-slip and damage-free.			●	
16	Test driver's seat restraint system and check for damage.	●			
17	Test driver's seat restraint system and check for damage.			●	

Hydraulic Operation		W	A	B	C
1	Test the "hydraulic" controls and make sure the labels are present, legible and complete.			●	
2	Test hydraulic controls and check they are assigned to the correct functions.			●	
3	Check cylinders and piston rods for damage and leaks, and make sure they are secure.			●	
4	Check the running surfaces of the integral sideshifter and / or integral fork adjuster for wear and damage, and lubricate if necessary.		●		
5	Check settings and wear levels of sliding pieces and stops and adjust the sliding pieces if necessary.			●	
6	Check load chain setting and tension if necessary.			●	
7	Check load chain lubrication and lubricate if necessary.	●			
8	Check load chain lubrication and lubricate if necessary.		●		
9	Check lateral clearance of the mast connections and the fork carriage.			●	
10	Visually inspect the mast rollers. Check the wear on the running surfaces.			●	
11	Check the running surfaces of the mast for wear and damage, and lubricate if necessary.		●		
12	Test hydraulic system.	●			
13	Test hydraulic system.			●	
14	Replace hydraulic reservoir discharge paper filter.			●	
15	Replace hydraulic oil filter.				●
16	Check that hydraulic ports, hose and pipe lines are secure, check for leaks and damage.			●	
17	Test emergency lowering system.			●	
18	Check hydraulic oil level and top up if necessary.	●			
19	Check hydraulic oil level and top up if necessary.			●	
20	Test pressure limitation valve and adjust if necessary.			●	
21	Replace hydraulic oil.				●
22	Check fork tines or load handler for wear and damage.	●			

Hydraulic Operation		W	A	B	C
23	Check fork tines or load handler for wear and damage.			●	
24	Check mast tilt.			●	
25	Check piston rod screw depth and counter fixing / clamp. Where two tilt cylinders with the same stroke length are used, check their setting in respect of each other.			●	
26	Check tilt cylinders and mounting.			●	
27	Test lift and lowering speeds.			●	

Agreed performance levels		W	A	B	C
1	Carry out a test run with rated load, if necessary with a customer-specific load.			●	
2	Demonstration after servicing.			●	
3	Lubricate the truck according to the lubrication schedule.			●	

Steering		W	A	B	C
1	Test hydraulic steering and its components.			●	
2	Test the hydraulic steering for leaks.			●	
3	Check steer axle and stub axle for wear and damage.			●	
4	Check the stub axle and adjust if necessary.			●	
5	Grease the steer axle.		●		
6	Check mechanical parts of steering column.			●	

4.2 Maintenance checklist TFG

Brakes		W	A	B	C
1	Test brakes.	●			
2	Test brakes.			●	
3	Check the brake lining on the parking brake.			●	
4	Check connections and lines for leaks.			●	

Electrical System		W	A	B	C
1	Test warning and safety devices in accordance with operating instructions.	●			
2	Test warning and safety devices in accordance with operating instructions.			●	
3	Test displays and controls.			●	
4	Test the main switch / isolator.		●		
5	Check contactors and/or relays.			●	
6	Check fuse ratings.			●	
7	Check electric wiring for damage [insulation damage, connections]. Make sure wire connections are secure.			●	

Power Supply		W	A	B	C
1	Final adjustments to the LPG system.			●	
2	Check the battery cable connections are secure, grease terminals if necessary.	●			
3	Check the battery cable connections are secure, grease terminals if necessary.			●	
4	Check the battery and battery components.	●			
5	Check the battery and battery components.			●	
6	Check battery voltage.			●	
7	Check the exhaust levels and adjust if necessary.		●		
8	Note: The LPG system may only be inspected by LPG system experts.				
9	Test the LPG system and check for leaks and damage.			●	
10	Replace the LPG filter.			●	

Travel		W	A	B	C
1	Replace transmission oil filter.				●
2	Check transmission oil level or grease filling of the transmission and top up if necessary.			●	
3	Replace the axle return filter.			●	
4	Test exhaust system and check for leaks and damage.			●	
5	Test anti-freeze, top up if necessary.			●	
6	Replace radiator fluid and anti-freeze.				●
7	Check cooling system for leaks.			●	
8	Check coolant level and top up if necessary.	●			
9	Check coolant level and top up if necessary.			●	
10	Test hydraulic fans and check for leaks.			●	
11	Clean the engine oil cooler.			●	
12	Check and clean radiator.		●		
13	Check transmission for noise and leakage.			●	
14	Replace gear oil.				●
15	Check tyre air pressure and top up if necessary.	●			
16	Check tyre air pressure and top up if necessary.			●	
17	Check wheels for wear and damage.	●			
18	Check wheels for wear and damage.			●	
19	Check wheel bearing and attachment.			●	
20	Test starter motor and generator, check wires and attachment.			●	
21	Replace engine oil filter.		●		
22	Check V belt / multi-V belt is tensioned and check for damage.			●	
23	Replace air filter.			●	
24	Check air filter, replace if necessary.		●		
25	Check motor for noise and leakage.			●	
26	Replace engine oil.		●		

Travel		W	A	B	C
27	Check engine oil level, top up if necessary.	●			
28	Check engine suspension.			●	
29	Test water pump and the fans.			●	
30	Replace the spark plugs.			●	
31	Replace drive axle oil.				●

Chassis and superstructure		W	A	B	C
1	Check chassis and screw connections for damage.			●	
2	Check the doors and covers.	●			
3	Check the doors and covers.			●	
4	Check labels are legible and complete.	●			
5	Check labels are legible and complete.			●	
6	Check attachment and setting function of the driver's seat.			●	
7	Check condition of the driver's seat.			●	
8	Check the motor compartment for contamination and clean if necessary.	●			
9	Check the motor compartment for contamination and clean if necessary.		●		
10	Check attachment of the counterweight.			●	
11	Check mast attachment / mounting.			●	
12	Check trailer coupling or tow mechanism stop.			●	
13	Check the overhead guard and / or cab are secure and check for damage.	●			
14	Check the overhead guard and / or cab are secure and check for damage.			●	
15	Check operator mat and steps are non-slip and damage-free.			●	
16	Test driver's seat restraint system and check for damage.	●			
17	Test driver's seat restraint system and check for damage.			●	

Hydraulic Operation		W	A	B	C
1	Test the "hydraulic" controls and make sure the labels are present, legible and complete.			●	
2	Test hydraulic controls and check they are assigned to the correct functions.			●	
3	Check cylinders and piston rods for damage and leaks, and make sure they are secure.			●	
4	Check the running surfaces of the integral sideshifter and / or integral fork adjuster for wear and damage, and lubricate if necessary.		●		
5	Check settings and wear levels of sliding pieces and stops and adjust the sliding pieces if necessary.			●	
6	Check load chain setting and tension if necessary.			●	
7	Check load chain lubrication and lubricate if necessary.	●			
8	Check load chain lubrication and lubricate if necessary.		●		

Hydraulic Operation		W	A	B	C
9	Check lateral clearance of the mast connections and the fork carriage.			●	
10	Visually inspect the mast rollers. Check the wear on the running surfaces.			●	
11	Check the running surfaces of the mast for wear and damage, and lubricate if necessary.		●		
12	Test hydraulic system.	●			
13	Test hydraulic system.			●	
14	Replace hydraulic reservoir discharge paper filter.			●	
15	Replace hydraulic oil filter.				●
16	Check that hydraulic ports, hose and pipe lines are secure, check for leaks and damage.			●	
17	Test emergency lowering system.			●	
18	Check hydraulic oil level and top up if necessary.	●			
19	Check hydraulic oil level and top up if necessary.			●	
20	Test pressure limitation valve and adjust if necessary.			●	
21	Replace hydraulic oil.				●
22	Check fork tines or load handler for wear and damage.	●			
23	Check fork tines or load handler for wear and damage.			●	
24	Check mast tilt.			●	
25	Check piston rod screw depth and counter fixing / clamp. Where two tilt cylinders with the same stroke length are used, check their setting in respect of each other.			●	
26	Check tilt cylinders and mounting.			●	
27	Test lift and lowering speeds.			●	

Agreed performance levels		W	A	B	C
1	Carry out a test run with rated load, if necessary with a customer-specific load.			●	
2	Demonstration after servicing.			●	
3	Lubricate the truck according to the lubrication schedule.			●	

Steering		W	A	B	C
1	Test hydraulic steering and its components.			●	
2	Test the hydraulic steering for leaks.			●	
3	Check steer axle and stub axle for wear and damage.			●	
4	Check the stub axle and adjust if necessary.			●	
5	Grease the steer axle.		●		
6	Check mechanical parts of steering column.			●	

4.3 DFG/TFG Options Maintenance Checklist

Particle filter (○)

Particle filter		W	A	B	C
1	Measure the soot index according to the manufacturer's specifications or national regulations.			●	
2	Note: All work carried out on the particle filter system must only be performed by specialist personnel.				
3	Particle filter: clean the filter in accordance with the manufacturer's instructions.				
4	Particle filter system: check and clean the components in accordance with the manufacturer's instructions.				

Work platform (○)

Work platform		W	A	B	C
1	Check the attachment is properly secured to the truck and the supporting elements.			●	

Clamping device (○)

Clamping device		W	A	B	C
1	Test the hose reel and check for leaks and damage.			●	
2	Attachment: check bearing points, guides and stops for wear and damage, grease and clean these components.			●	
3	Attachment: clean and lubricate.	●			
4	Attachment: clean and lubricate.		●		
5	Check the axial play of the front and rear rollers and adjust if necessary.			●	
6	Check the attachment is properly secured to the truck and the supporting elements.			●	
7	Test the operation and setting of the attachment. Check the attachment for damage.			●	
8	Check the sliding blocks are complete.			●	
9	Check the hydraulic ports and tighten if necessary.			●	
10	Check the cylinder seals.			●	
11	Check the cylinder piston rods and bushings.			●	

Crane hook (○)

Crane hook		W	A	B	C
1	Check the attachment is properly secured to the truck and the supporting elements.			●	

Load backrest (○)

Load backrest		W	A	B	C
1	Check the attachment is properly secured to the truck and the supporting elements.			●	

Sideshifter (○)

Sideshifter		W	A	B	C
1	Test the hose guide and check for leaks and damage.			●	
2	Attachment: check bearing points, guides and stops for wear and damage, grease and clean these components.			●	
3	Attachment: clean and lubricate.	●			
4	Attachment: clean and lubricate.		●		
5	Check axial play of the front and rear rollers and adjust if necessary.			●	
6	Check attachment is properly secured to the truck and the supporting elements.			●	
7	Test operation and setting of the attachment. Check the attachment for damage.			●	
8	Check sliding blocks are complete.			●	
9	Check hydraulic ports and tighten if necessary.			●	
10	Test the sideshifter, check settings and check for damage.			●	
11	Check cylinder seals.			●	
12	Check cylinder piston rods and bushings.			●	

Boom (carpet boom) (○)

Boom (carpet boom)		W	A	B	C
1	Check the attachment is properly secured to the truck and the supporting elements.			●	

Fork adjuster (○)

Fork adjuster		W	A	B	C
1	Test the hose reel and check for leaks and damage.			●	
2	Attachment: check bearing points, guides and stops for wear and damage, grease and clean these components.			●	
3	Attachment: clean and lubricate.	●			
4	Attachment: clean and lubricate.		●		
5	Check the axial play of the front and rear rollers and adjust if necessary.			●	
6	Check the attachment is properly secured to the truck and the supporting elements.			●	
7	Test the operation and setting of the attachment. Check the attachment for damage.			●	

Fork adjuster		W	A	B	C
8	Check the sliding blocks are complete.			●	
9	Check the hydraulic ports and tighten if necessary.			●	
10	Test the fork adjuster, check the settings and check for damage.			●	
11	Check the cylinder seals.			●	
12	Check the cylinder piston rods and bushings.			●	

Discharge strap (○)

Discharge strap		W	A	B	C
1	Check the anti-static discharge strap is present and not damaged.			●	

Audible warning device (○)

Audible warning devices		W	A	B	C
1	Test the buzzer / warning alarm, check for damage and make sure it is secure.			●	

Strobe light / beacon (○)

Strobe light/beacon		W	A	B	C
1	Test the strobe light/beacon, check for damage and make sure it is secure.	●			
2	Test the strobe light/beacon, check for damage and make sure it is secure.			●	

Work lights (○)

Work lights		W	A	B	C
1	Test the lights.	●			
2	Test the lights.			●	

Road traffic approval (StVZO) (○)

Road traffic approval (StVZO)		W	A	B	C
1	Test the lights.	●			
2	Test the lights.			●	

Hose reel (○)

Hose reel		W	A	B	C
1	Test the hose reel and check for leaks and damage.			●	

Truck Management Information System "ISM" (○)

Truck Management Information System "ISM"		W	A	B	C
1	Test access module, check for damage and make sure it is secure.			●	
2	Check impact sensor is secure and check for damage.			●	
3	Check data recorder is secure and check for damage.			●	

Heating (coolant water) (○)

Heating (coolant water)		W	A	B	C
1	Test the heating.	●			
2	Test the heating.			●	
3	Replace the heating breather			●	
4	Check the hoses for leaks and damage and make sure they are secure.			●	

Air conditioning system (○)

Air conditioning system		W	A	B	C
1	Note: service the air conditioning system every two years or 2000 service hours. The air conditioning system should only be serviced by specialist personnel.				
2	Air conditioning system: Test the air conditioning system and its settings and check its components for damage.			●	
3	Air conditioning system: Visually inspect the filter and replace if necessary.			●	
4	Air conditioning system: Check temperature reading at the outlet of the ventilation nozzles against manufacturer's ratings.			●	

Wiper/washer system (○)

Wiper/washer system		W	A	B	C
1	Check the wiper water container for leaks and check the volume, top up if necessary.	●			
2	Check the wiper water container for leaks and check the volume, top up if necessary.			●	
3	Test the windscreen wipers and check for damage, replace if necessary.			●	

Trailer coupling (○)

Trailer coupling		W	A	B	C
1	Check the trailer coupling or tow mechanism stop.			●	

Belt lock control (○)

Belt lock control		W	A	B	C
1	Test the belt lock control and check for damage.			●	

Seat heating (○)

Seat heating		W	A	B	C
1	Check the electric wiring for damage [insulation damage, connections]. Make sure the wire connections are secure.			●	

Weigher sensors / switches (○)

Weigher sensors / switches		W	A	B	C
1	Test weigher and check for damage.			●	

Electrical optional equipment (○)

Electrical optional equipment		W	A	B	C
1	Test the electrical optional equipment and check for damage.			●	

Fire extinguisher (○)

Fire extinguisher		W	A	B	C
1	Check the fire extinguisher is present, secure and check the test interval.				●

Optional equipment (reference) (○)

Optional equipment		W	A	B	C
1	Check that optional equipment such as mirrors, storage compartments, grips, windscreen wipers and washing systems etc. are working correctly and check for damage.	●			
2	Check that optional equipment such as mirrors, storage compartments, grips, windscreen wipers and washing systems etc. are working correctly and check for damage.			●	

5 Lubricants and Lubrication Schedule

5.1 Handling consumables safely

Handling consumables

Consumables must always be handled correctly. Follow the manufacturer's instructions.

WARNING!

Improper handling is hazardous to health, life and the environment

Consumables can be flammable.

- ▶ Keep consumables away from hot components and naked flames.
 - ▶ Always keep consumables in prescribed containers.
 - ▶ Always fill consumables in clean containers.
 - ▶ Do not mix up different grades of consumable. The only exception to this is when mixing is expressly stipulated in the operating instructions.
-

CAUTION!

Spilled liquids can cause slipping and endanger the environment

Risk of slipping from spilled liquids. The risk is greater when combined with water.

- ▶ Do not spill fluids.
 - ▶ Spilled fluids must be removed immediately with an appropriate bonding agent.
 - ▶ The bonding agent / consumable mixture must be disposed of in accordance with regulations.
-

WARNING!

Oils (chain spray / hydraulic oil) are flammable and poisonous.

- ▶ Dispose of used oils in accordance with regulations. Store used oil safely until it can be disposed of in accordance with regulations.
 - ▶ Do not spill oil.
 - ▶ Spilled fluids must be removed immediately with an appropriate bonding agent.
 - ▶ The bonding agent / consumable mixture must be disposed of in accordance with regulations.
 - ▶ Observe national regulations when handling oils.
 - ▶ Wear safety gloves when handling oils.
 - ▶ Prevent oil from coming into contact with hot motor parts.
 - ▶ Do not smoke when handling oil.
 - ▶ Avoid contact and digestion. If you swallow oil do not induce vomiting but call for a doctor immediately.
 - ▶ Seek fresh air after breathing in oil fumes or vapours.
 - ▶ If oil has come into contact with your skin, rinse your skin with water.
 - ▶ If oil has come into contact with your eyes, rinse them with water and call for a doctor immediately.
 - ▶ Replace oil-soaked clothing and shoes immediately.
-

Consumables and used parts

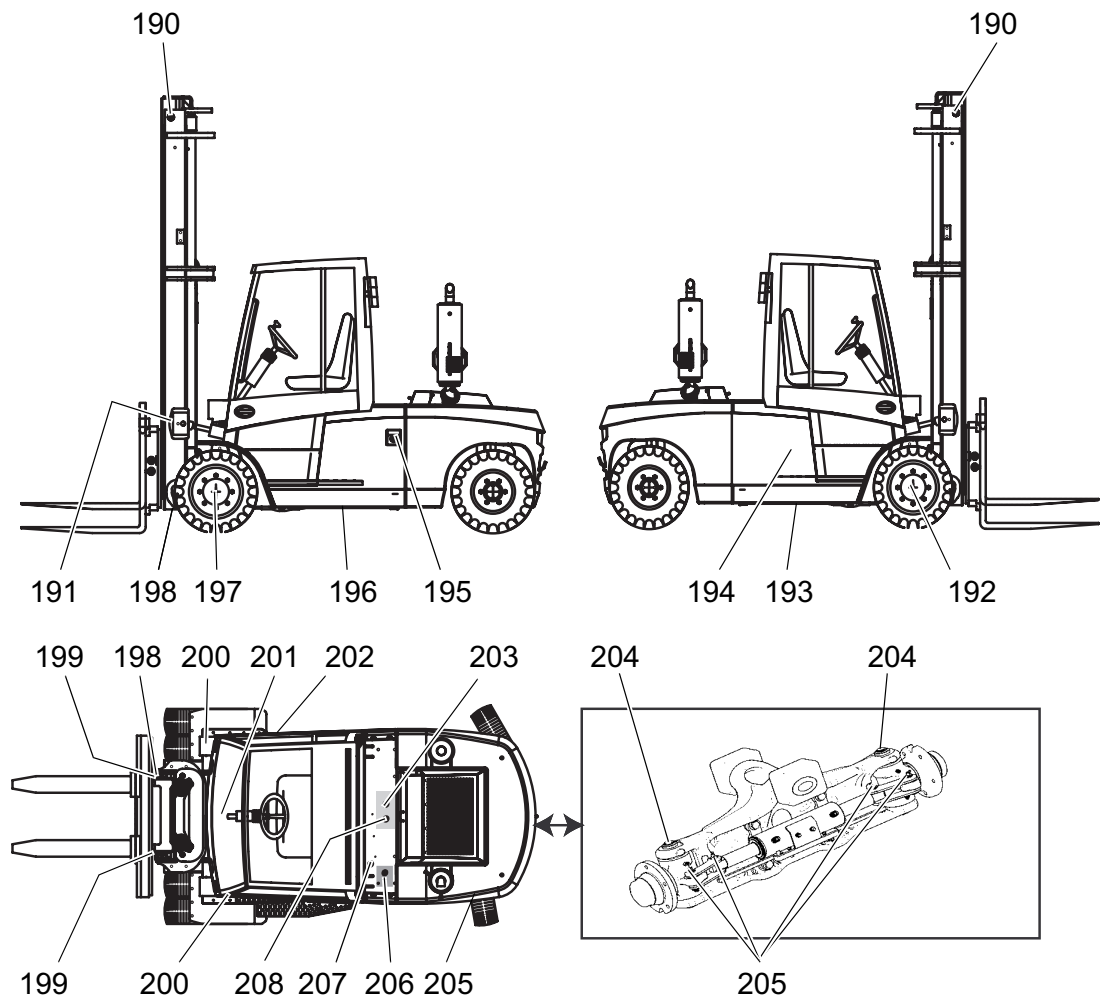
CAUTION!

Consumables and used parts are an environmental hazard

Used parts, oils and fuels must be disposed of in accordance with the relevant environmental protection regulations. To change the oil contact the manufacturer's customer service department, who have been specially trained for this task.

► Note the safety regulations when handling these materials.

5.2 Lubrication Schedule



Grease nipple

		Number
190	Chain sprocket	2/4
198	Mast, suspension	2
191	Tilt cylinder front bearing	2
199	Mast rollers	8/10/12
200	Tilt cylinder rear bearing	2
201	Cardan shaft	2
204	Stub axle pins	4
205	Track rod	4

Dipstick and filling points

193	Hydraulic oil filler plug (in the motor compartment)
195	Fuel filler neck

Dipstick and filling points

202	Battery (in the motor compartment)
203	Engine oil filler neck
206	Coolant tank
207	Engine oil dipstick
208	Filler neck for window washer system

Lowering points

192	Wheel hub, right
194	Hydraulic oil (right tank)
196	Fuel (left tank)
197	Wheel hub, left

5.3 Consumables

DFG/TFG 660-S90

Item	Order no.	Quantity	Description	Used for
199	14038650		Lithium w. MOS NLGI 2	Grease lubrication
206	51118018	16 l	Fricofin G12 Plus	Mix coolant with water 1:1
193	52017728	4 cylinders 150 6 cylinders 190 8 cylinders 170 	HVLP 46	Hydraulics
203	51094056	4 cylinders 7 l 6 cylinders 15 l 8 cylinders 6.5 l	DHD 1 API CH-4, CI 4 SAE 10W40	Motor

Item	Order no.	Quantity	Description	Used for
	51170122	25 l	JD 20 C Textran TDH Premium	Transmission
	51050011	2 x 0.9	API GL 5 MIL-L-2105 D SAE 85W-90	Reducing gear
	51050011	9 l	API GL 5 MIL-L-2105 D	Drive shaft Single
	51050011	12 l	API GL 5 MIL-L-2105 D	Drive shaft Wide/twin

* The coolant consists of a 1:1 mixture ratio of Fricofin S and water

→ The volumes indicated are approximate.

WARNING!

Using incorrect hydraulic oil can be dangerous

► Do not use hydraulic oils with a different specification or viscosity and do not mix with additives.

5.4 Coolant specification

Coolant specification

The quality of the coolant used can have a major impact on the efficiency and service life of the cooling circuit. The recommendations listed below are useful for servicing a good cooling circuit with anti-freeze and/or anti-corrosion.

- ➔ Always use clean, soft water. Do not use distilled water.

NOTE

Anti-freeze/water mixture ratio:

- ▶ 1: 1 (anti-freeze to -35°C)
- ▶ Never mix different types of anti-freeze.

NOTE

Corrosion damage

- ▶ Even if the coolant cannot freeze up due to the application conditions, you must still use anti-freeze. The anti-freeze provides protection against corrosion and raises the boiling point of the coolant.

The quality of the anti-freeze must be checked at least annually, e.g. at the start of the cold season.

If the correct procedures are not applied, the manufacturer cannot be held liable for frost or corrosion damage.

DANGER!

Anti-freeze is poisonous

- ▶ Anti-freeze contains ethylene glycol and other components which can result in poisoning if ingested.
- ▶ Ingression into the human body can also result if poisonous quantities come into contact with the skin for long or repeated periods.
- ▶ Note the manufacturer's safety instructions.

6 Maintenance and repairs

6.1 Preparing the truck for maintenance and repairs

All necessary safety measures must be taken to avoid accidents when carrying out maintenance and repairs. The following preparations must be made:

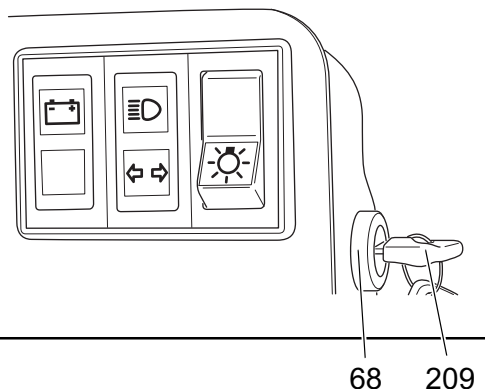
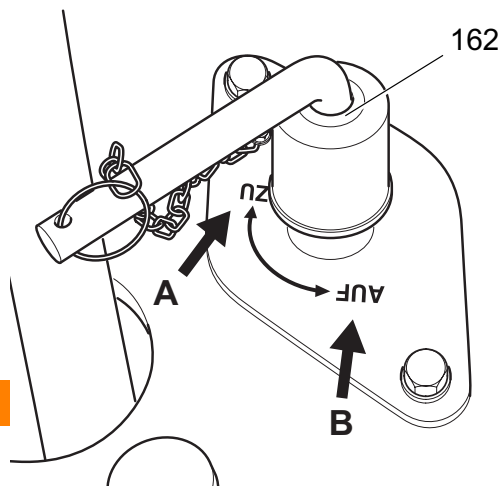
Procedure

- Park the truck securely, (see "Parking the truck securely" on page 100).
- Fully lower the load handler.
- Remove the key (209) from the key switch (68) to prevent the truck from being switched on accidentally.
- Turn the battery isolator (162) to position "B".

WARNING!

Risk of accidents when working under the load handler, driver's cab and lift truck

- ▶ When working under a raised load handler, driver's cab or a raised truck, secure them to prevent the truck from lowering, tipping or sliding away.
- ▶ When raising the truck, follow the instructions, (see "Transport and Commissioning" on page 41). When working on the parking brake, prevent the truck from accidentally rolling away (e.g. with wedges).



6.2 Opening the Service Panel

There is a service panel between the cab and the cooler (210). The coolant level and engine oil can be checked here and coolant engine oil and cleaning agent for the window washer system can be added.

Opening the Service Panel

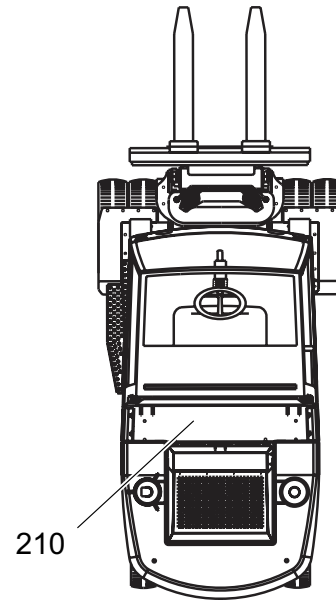
Requirements

- Prepare the truck for maintenance and repairs ((see "Preparing the truck for maintenance and repairs" on page 162)).

Procedure

- Raise the service panel (210).

The rear panel is now open.



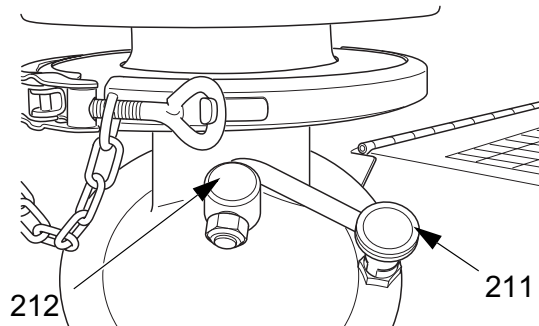
6.3 Tilting the Cab

DANGER!

- Before tilting the cab, allow the motor and muffler to cool off. Unlock the muffler and tilt it back.

Procedure

- To do this release the lever (212) and unlock the button (211). The muffler can be carefully turned back as far as the stop.
- After the cab is lowered, move the muffler back to its vertical position and lock it in place.



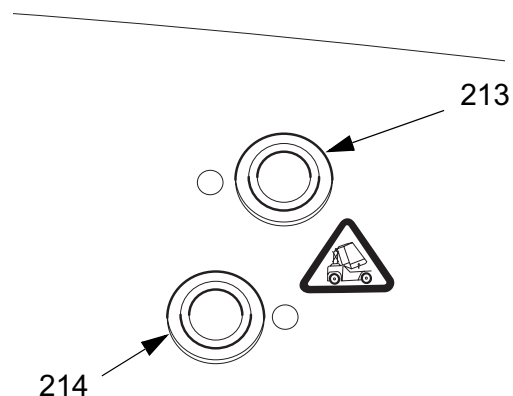
6.3.1 Raising the Cab Manually

Procedure

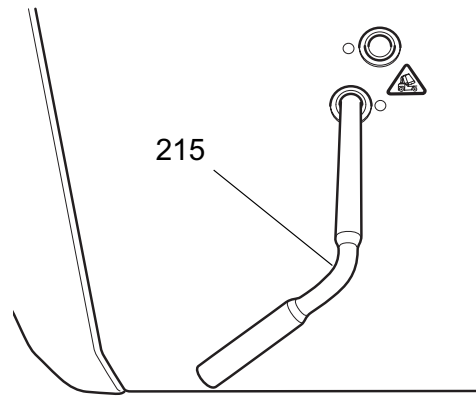
- Remove the pump rod (215) from the holder behind the driver's seat.
- The lift pump is fed into the chassis on the right side of the truck (213 = lift; 214 = lower)

CAUTION!

Before activating the lift pump always close the lowering valve.



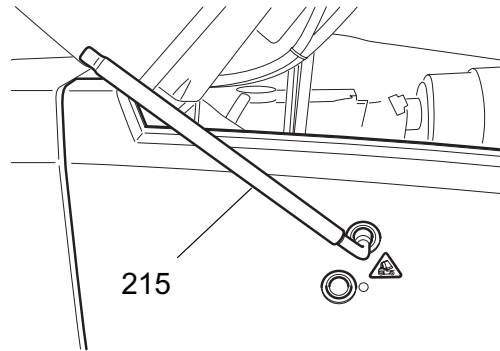
- To close, insert the long side of the pump rod through the infeed (214) onto the hexagon of the lowering valve and turn clockwise as far as the stop.



Lifting

Procedure

- To lift the cab, insert the short side of the pump rod (215) through the infeed (213) onto the pump drive and activate. Tilt the cab back manually until the cab locking device engages in the motor compartment.



6.3.2 Lowering the Cab

- The cab cannot be lowered electrically.

Procedure

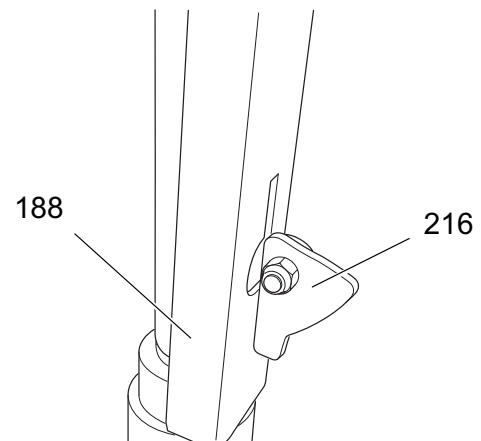
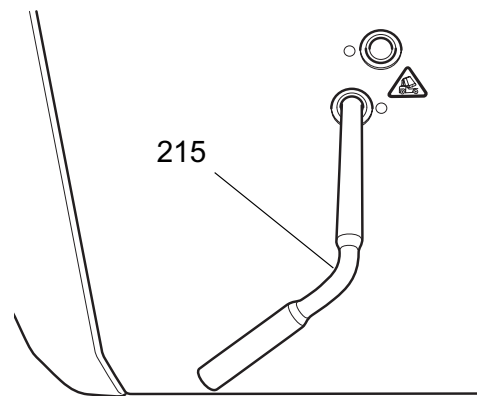
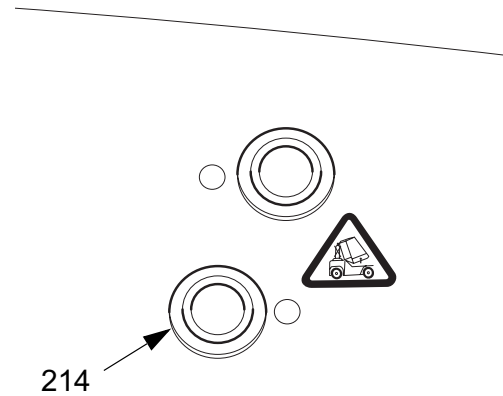
- To lower the cab, use the lever (216) to release the locking device (188) and lower the cab.

- To lower the cab, insert the long side of the pump rod (215) through the infeed (214) onto the hexagon of the lowering valve and carefully turn the lowering valve anti-clockwise to open it.

⚠ DANGER!

No persons are permitted in the area around the cab while it is being lowered.

- After the cab is lowered, return the muffler to the vertical position.



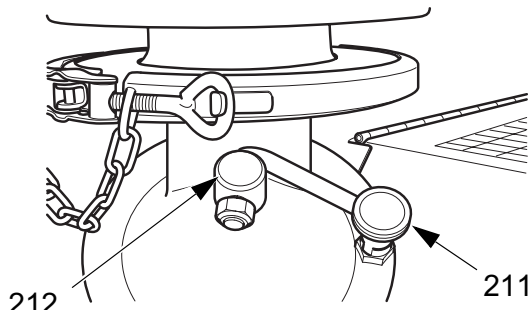
6.3.3 Raising the Cab Electrically (○)

DANGER!

- Before tilting the cab, allow the motor and muffler to cool off. Unlock the muffler and tilt it back.

Procedure

- To do this release the lever (212) and unlock the button (211). The exhaust purifier can be carefully turned back as far as the stop.



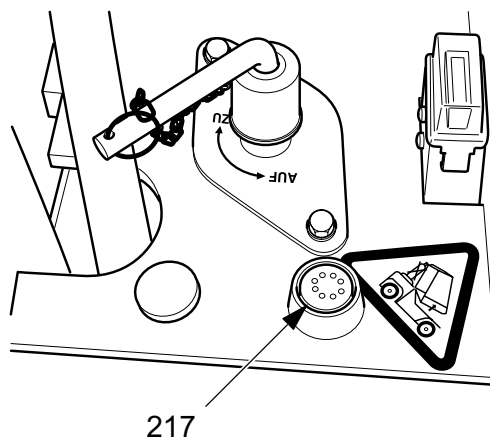
CAUTION!

- Before activating the lift pump always close the lowering valve.
- To close, insert the long side of the pump rod through the infeed (214) onto the hexagon of the lowering valve and turn clockwise as far as the stop.

Lifting

Procedure

- Press switch (217) on the service panel. The cab is tilted back electrically until the cab locking device (188) engages.



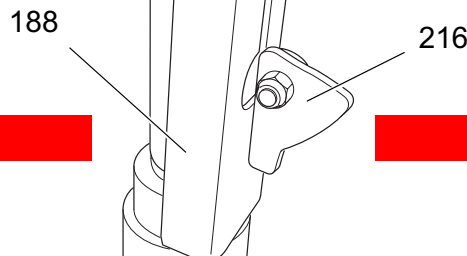
- After the locking device (188) engages, it must also be secured in place with the lever (216).

6.3.4 Lowering the Cab

see section (see "Lowering the Cab" on page 165).

DANGER!

No persons are permitted in the area around the cab while it is being lowered.



6.4 Checking the wheel attachments.

WARNING!

Using different tyres can cause accidents

The quality of tyres affects the stability and performance of the truck.

- ▶ The diameter of the wheels must differ by no more than 15 mm.
- ▶ Always replace tyres in pairs. After replacing the tyres check the wheel nuts are secure after 10 service hours.
- ▶ Always use tyres of the same make, model and profile.

Checking the wheel attachment

Requirements

- Prepare the truck for maintenance and repairs ((see "Preparing the truck for maintenance and repairs" on page 162)).

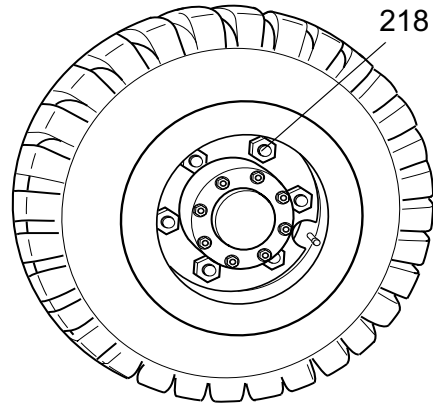
Tools and Material Required

- Torque wrench

Procedure

- Torque the wheel nuts (218) crosswise with a torque wrench, for torques (see "Tyre type" on page 31).

The wheel attachment is now checked.



-  When using pneumatic tyres check the air pressure, for the air pressure (see "Tyre type" on page 31)

6.5 Hydraulic system

CAUTION!

The hydraulic oil is pressurised during operation and is a hazard to health and to the environment.

- ▶ Do not touch pressurised hydraulic lines.
 - ▶ Dispose of used oil in accordance with regulations. Store used oil safely until it can be disposed of in accordance with regulations.
 - ▶ Do not spill hydraulic oil.
 - ▶ Spilled fluids must be removed immediately with an appropriate bonding agent.
 - ▶ The bonding agent / consumable mixture must be disposed of in accordance with regulations.
 - ▶ Observe national regulations when handling hydraulic oil.
 - ▶ Wear safety gloves when handling hydraulic oil.
 - ▶ Prevent hydraulic oil from coming into contact with hot motor parts.
 - ▶ Do not smoke when handling hydraulic oil.
 - ▶ Avoid contact and digestion. If you swallow oil do not induce vomiting but call for a doctor immediately.
 - ▶ Seek fresh air after breathing in oil fumes or vapours.
 - ▶ If oil has come into contact with your skin, rinse your skin with water.
 - ▶ If oil has come into contact with your eyes, rinse them with water and call for a doctor immediately.
 - ▶ Replace oil-soaked clothing and shoes immediately.
-

CAUTION!

Consumables and used parts are an environmental hazard

Used parts, oils and fuels must be disposed of in accordance with the relevant environmental protection regulations. To change the oil contact the manufacturer's customer service department, who have been specially trained for this task.

- ▶ Note the safety regulations when handling these materials.
-

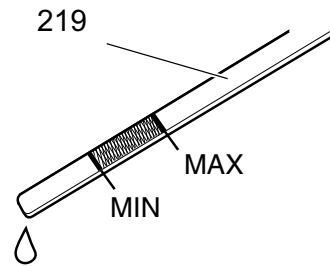
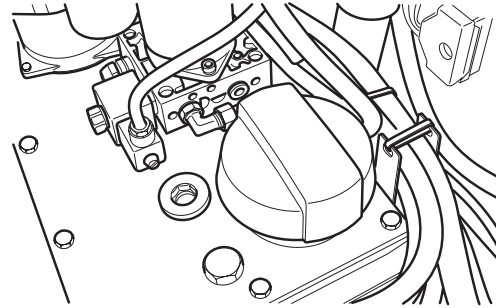
6.5.1 Checking the hydraulic oil level

Requirements

- Park the truck on a level surface.
- Start the motor and fully raise and lower the mast once.
- Switch off the motor.

Procedure

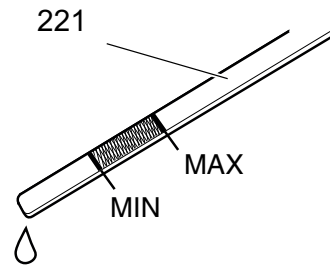
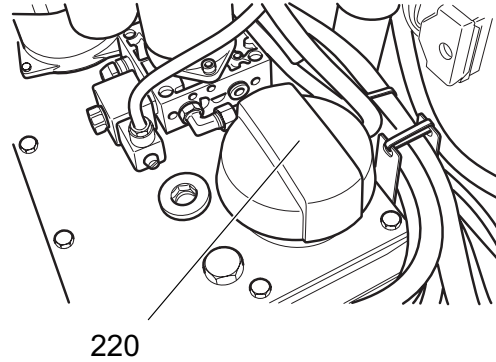
- Remove the hydraulic oil dipstick (219) from the hole, wipe it with a clean cloth and insert it fully again.
- Remove the hydraulic oil dipstick and check the level of the hydraulic oil.
- ➔ For cold oil: The oil level should lie between the “Min.” and “Max.” levels.
For hot oil: The hydraulic oil should lie just above the MAX marking.
- The difference between MIN and MAX is about 10 litres.
- Add hydraulic oil if necessary.
- Repeat the test.
- When the oil level is correct, fully insert the hydraulic oil dipstick (219) again.



6.5.2 Adding hydraulic oil

Procedure

- Unscrew the lid (220) of the hydraulic filter
- Add hydraulic oil to the MAX mark on the hydraulic oil dipstick (221).
- ➔ Use only approved hydraulic oil (see consumables table).
- Check the hydraulic oil level with the dipstick and top up as required.
- Screw the lid back on.
- Insert the dipstick back in fully.



6.6 Engine maintenance



A running engine can be dangerous.

- ▶ There is a high risk of injury when the cover is open and the engine running.
 - ▶ Do not reach into moving parts (e.g. fan, belt drive).
 - ▶ Truck maintenance and repair work must only be carried out by specially trained personnel who have been authorised by the owner.
 - ▶ There must be nobody present in the danger zone.
-

6.6.1 DFG engine maintenance

NOTE

Used oil contaminates the environment

- Dispose of used oil and used engine oil filters in accordance with environmental regulations.



CAUTION!

Risk of scalding through hot oil.

- Wear appropriate safety gloves when replacing the oil and oil filter.

NOTE

When the engine is cold the engine oil can be viscous.

- Only change the engine oil when the engine is at operating temperature and the industrial truck is horizontal. Always replace the engine oil and engine oil filter together.

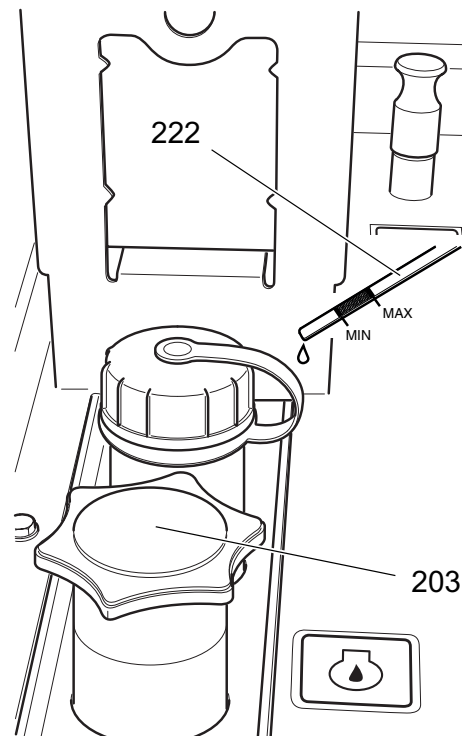
Checking the engine oil level

Requirements

- Park the truck on a level surface (see "Parking the truck securely" on page 100)

Procedure

- Prepare the truck for maintenance and repairs.
- The engine oil dipstick (222) is located under the service panel behind the cab.
- Remove the oil dipstick.
- Check the oil level with the dipstick.
- Check the oil level while the motor is cold. If the motor is at operating temperature, it must stand for at least 2 minutes before the oil level can be read correctly.
- Add the correct grade of engine oil as required through the filler neck (203) when the oil level reaches the minimum range. The difference between minimum and maximum is about 0.75 litres.



The engine oil level has now been checked.

6.6.2 Cooling System

NOTE

Lack of coolant can cause malfunctions

- ▶ The coolant level should be between the “MIN” and “MAX” markings on the expansion vessel.
- ▶ If the coolant is below the MIN marking, this indicates possible leakage in the radiator system.
- ▶ Do not continue using the truck.
- ▶ The truck may only be started again once the cause has been removed.

CAUTION!

Hot coolant can cause injury

- ▶ Allow the engine to cool down sufficiently to prevent hot gases/liquids from escaping when the filler cap is opened.

Checking the coolant level

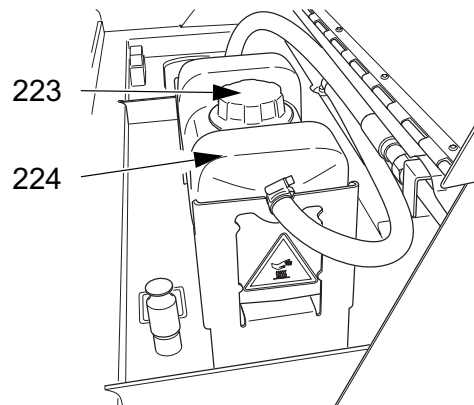
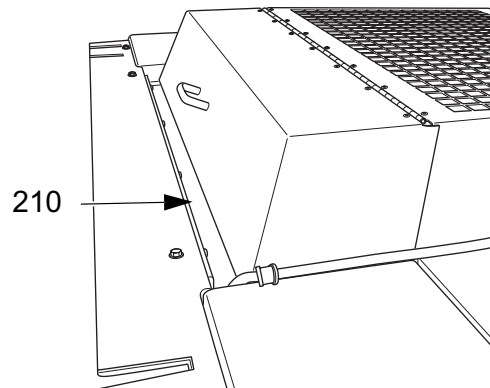
Procedure

- ➔ The cooling system compensation tank is located on the left side of the truck in travel direction on the service panel.
- Park the truck securely on a level surface.
 - Open the service panel cover (210).
 - Check the coolant level on the expansion vessel (224).
 - Close the service panel cover.

NOTE

The incorrect coolant can cause malfunctions

- ▶ To prevent the build up of lime as well as front and corrosion damage in the radiator system, and to raise the boiling point temperature of the coolant, the cooling circuit must be filled each year with a mixture of water and anti-freeze with anti-corrosion additives.
- ▶ Coolant can only be checked and added by experts.



Check the coolant concentrate

Tools and Material Required

- Anti-freeze tester for coolants

Procedure

- Slowly unscrew the filler cap (223) from the expansion vessel (224).
- Check the anti-freeze content of the coolant with an anti-freeze tester.

NOTE

Incorrect coolant concentration can cause malfunctions

- ▶ If there is insufficient anti-freeze content arrange for trained personnel to restore the correct mix ratio.

-
- Screw the filler cap back on.
 - Fit the rear bonnet again and snap it back into position.

Check the cooler and fan and clean if necessary

Procedure



The cooling unit is located under the service panel (210).

- Open the service panel (210) completely.
- Clean the cooling unit carefully using compressed air without touching the cooling multi-plates.
- Close the service panel.



CAUTION!

A damaged cooler and fan can be dangerous

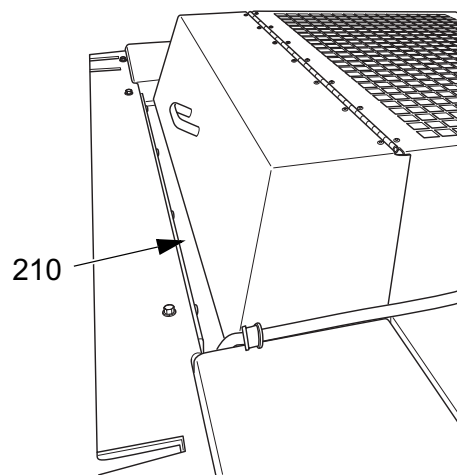
- ▶ Check the cooler and fan for damage. If the radiator or fan are damaged, do not operate the truck until the damage has been rectified.



CAUTION!

A broken fan can be dangerous

- ▶ Using a suitable tool, check and make sure that the fan can move freely.
- ▶ The fan must not touch the deflector.
- ▶ Only start the motor when the cover is closed.



6.6.3 Cleaning and Replacing the Air Filter Cartridge

DANGER!

A running motor can be dangerous

- ▶ Carry out all maintenance work with the motor switched off.
- ▶ Do not start the motor if the air filter cartridge is removed.

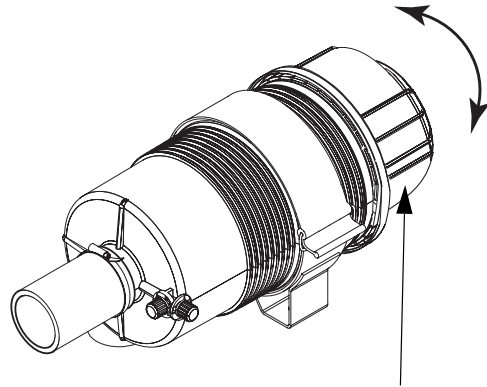
Replace air filter cartridge

Procedure

- Undo the end cap (225) and remove the dust collector pot.
- Carefully remove the air filter cartridge from the filter housing.

Cleaning the filter housing

Procedure



NOTE

225

A faulty motor can cause malfunctions

- ▶ Do not clean the air filter housing with compressed air.
- ▶ Always use a clean cloth to clean the air filter housing.

- Remove the air filter cartridge.
- Thoroughly clean the dust collector pot. To do this remove the dust extraction valve.
- Carefully clean the air filter housing with a clean cloth.
- There must be no residue from the cloth in the air filter housing.
- Insert the air filter cartridges back in the filter housing.
- Take care not to damage the air filter cartridges when assembling.
- Fit the dust extraction valve back into the dust collector pot.
- Insert the dust collector pot and fasten the end cap (225) in place.

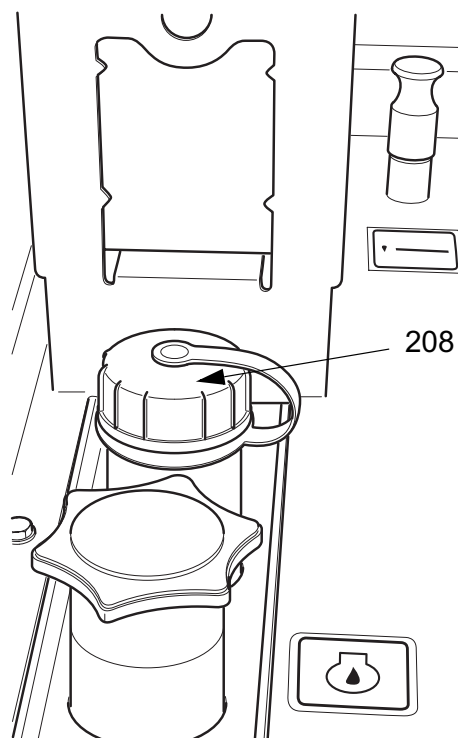
6.6.4 Adding Window Washer System Fluid

Procedure

- Open the service panel.
- Unscrew the cover (208) and add window washing fluid.
- If necessary top up with anti-freeze.



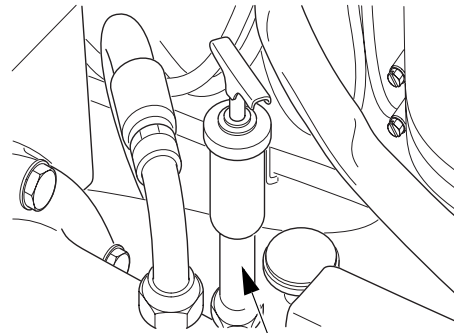
The capacity of the tank is 5 litres.



6.7 Check the transmission oil level

Procedure

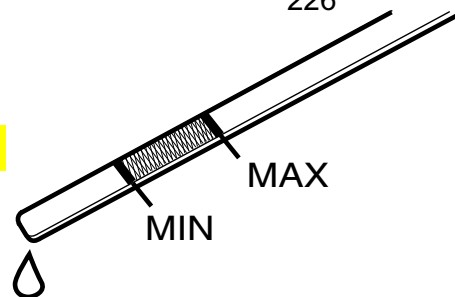
- Prepare the truck for maintenance and repairs.
 - Check the oil level with the dipstick (226). Slowly insert the dipstick into the transmission to prevent false measurements.
- Check the oil level for the transmission while the motor is at idle. The oil must be at operating temperature.
- Add the correct grade of transmission oil through the filler neck as required.



6.8 Performing Other Maintenance Work

⚠ CAUTION!

- Special knowledge and in some cases special tools are required to perform other maintenance work (especially changing oil and filters) according to the maintenance checklist (section 4 "Maintenance checklist"). These tasks should therefore only be performed by the manufacturer's customer service department.



- If service intervals are not observed as specified by the maintenance checklist (see "Maintenance checklist" on page 144), the manufacturer's warranty will become void.

6.9 Closing the Motor Compartment

Procedure

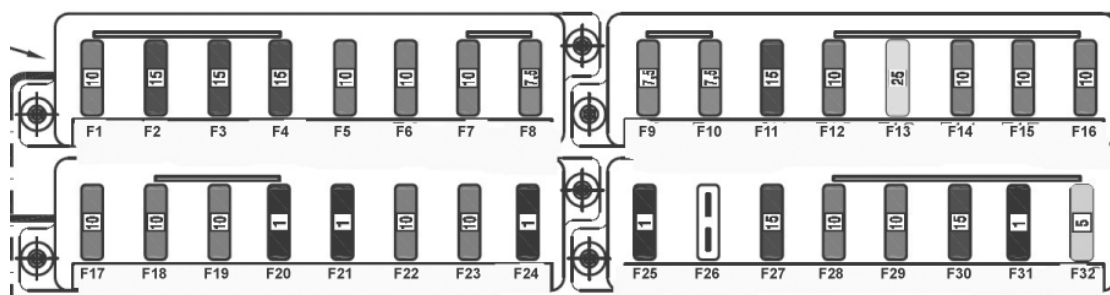
- Remove tools and other objects from the motor compartment.

⚠ DANGER!

No persons are permitted in the area around the cab while it is being lowered.

6.10 Checking electrical fuses

6.10.1 Standard Fuse Strip



Checking electrical fuses

Requirements

- Prepare the truck for maintenance and repairs ((see "Preparing the truck for maintenance and repairs" on page 162)).

Procedure

- ➔ The main fuse box is located in the dashboard to the right of the driver's seat in the cab.
- Remove the electrical system cap.
- Check condition and rating of the fuses in accordance with the table.
- Replace any damaged fuses in accordance with the table.
- Close the electrical system cap.

The electrical fuses are now checked.

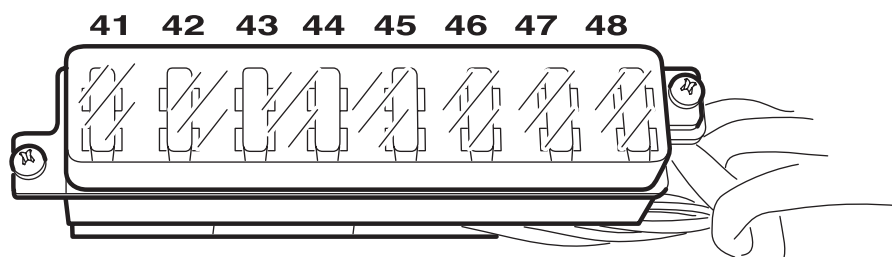
Description	Electric circuit		Rating (A)
F1	Parking light	●	10
F2	Dipped lights	●	15
F3	Main beam	●	15
F4	Rear work lights / tail light (roof panel)	○	15
F5	Indicator	●	10
F6	Hazard warning lights	●	10
F7	Beacon	●	10
F8	Front window wiper + horn	●	7.5
F9	Rear window wiper	●	7.5
F10	Roof window wiper	●	7.5
F11	Front / top work lights	●	15
F12	Option	●	10
F13	Fan / air conditioning system	●	25
F14	Steering column switch, dipped lights	○	15
F15	Workplace illumination / swivel seat valve	●	10

Description	Electric circuit		Rating (A)
F16	Compressor for air-sprung seat	○	10
F17	Seat heating	○	10
F18	12V + 30 for option	○	10
F19	Reading light	●	10
F20	Display	●	1
F21	Travel direction switch	●	1
F22	Radio	○	10
F23	+30 radio, cab lighting	○	10
F24	Ignition switch 15	●	1
F25	Ignition switch 50	●	1
F26	Swivel seat	○	
F27	Front work lights	○	15
F28	Cigarette lighter	●	10
F29	Air conditioning system	●	10
F30	Load damping	○	15
F31	Brake pedal	○	1
F32	TFG only	○	5

● = Standard equipment	○ = Optional equipment
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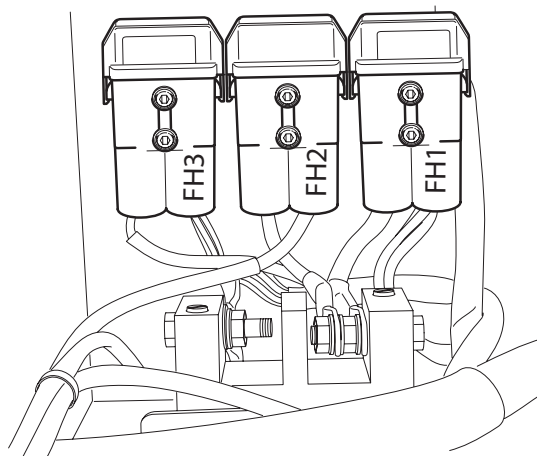
6.10.2 Fuse ratings in motor compartment for 4 + 6 cylinder diesel

- All fuses (section 6.10.2 + 6.10.3) are located on the right side of the motor compartment as seen in travel direction behind a Plexiglas window above the hydraulic reservoir.



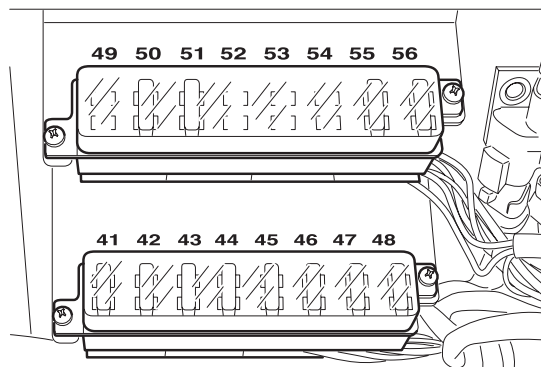
Description	Power circuit		Rating (A)
F41	Front work lights on mast		15
F42	Transmission controller +30		10
F43	Truck controller		15
F44	Option +15		10
F45	Particle filter alarm		5
F46	Pilot valve		10
F47	Engine controller +30		5
F48	Transmission controller +15		2

Main fuses in the motor compartment



Description	Power circuit		Rating (A)
FH1	Cab		80
FH2	Preheat relay +30		50
FH3	Engine controller +30		30

6.10.3 Fuse strip in motor compartment for LPG motor



Description	Power circuit	Rating (A)
F41	Front work lights on mast	15
F42	Transmission controller +30	10
F43	Truck controller	15
F44	Option +15 (X27:4)	10
F45	Option +15 (X27:1)	5
F46	Pilot valve	10
F47	Option +15 (X26:7)	5
F48	Transmission controller +15	2
F49	Option +15	10
F50	Fan motor for LPG tank	15
F51	Engine controller +15	7.5
F52	Option	
F53	Option	
F54	Option	
F55	Engine controller +15	20
F56	Engine controller +30	10

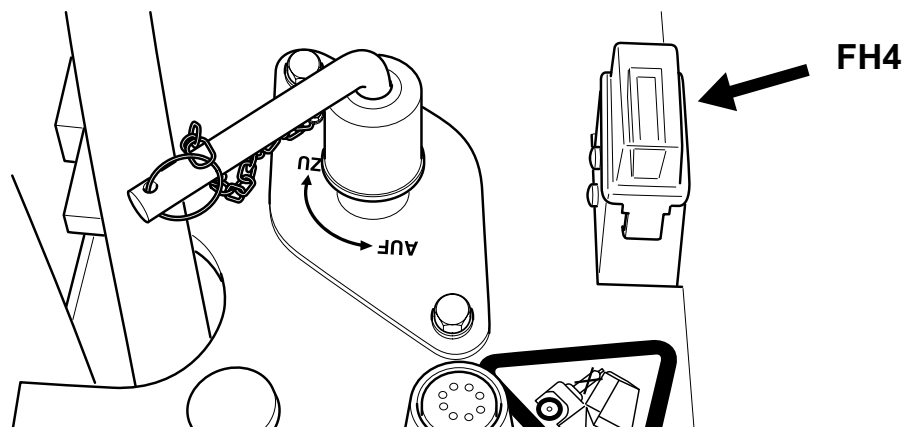
Main fuses in the motor compartment

Description	Power circuit	Rating (A)
FH1	Cab	80



The fuses are located on the right side of the motor compartment as seen in travel direction behind a Plexiglas window.

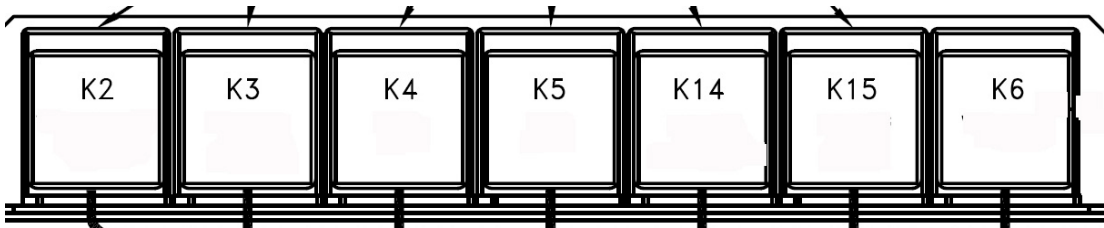
6.10.4 Cab lift fuse



Description	Power circuit		Rating (A)
FH4	Electric cab lift main fuse	○	80

6.10.5 Checking the Electric Relays (DFG)

- ➔ The main fuse box with the relays is located in the dashboard to the right of the driver's seat in the cab.



K2	Work lights / rear
K3	Beacon / strobe light
K4	Main beam
K5	Dipped lights
K14	Front / top work lights
K15	Front / bottom work lights
K6	Window wiper

 WARNING!

To avoid damaging the electrical system, only use fuses with the correct ratings.

6.11 Starter battery

Checking the battery condition, acid level* and acid density*

- *not for maintenance-free batteries

CAUTION!

Battery acid can be dangerous

- ▶ Battery acid is highly corrosive.
- ▶ Therefore it is essential to avoid contact with battery acid.
- ▶ If clothing, skin or eyes have nevertheless come into contact with battery acid, immediately rinse the affected parts with water.
- ▶ If the eyes have been affected, immediately seek medical attention.
- ▶ Neutralise spilled battery acid immediately.

Check battery

Procedure

- Check the battery housing for cracks and any spilled acid. Remove any oxidation remains from the battery terminals. Lubricate the battery terminals with an acid-free grease. Check the acid level.

- The acid should lie between the top and bottom markings.

Checking the acid density

Procedure

- Clean the area around the inspection plugs. If necessary, add distilled water to the top mark. Check the acid density.
- If the battery is charged sufficiently, the acid density should be 1.24 to 1.28 kg/l.
- Recharge the battery if necessary. Fit the drain plug back on.

Battery disposal

Batteries may only be disposed of in accordance with national environmental protection regulations or disposal laws. The manufacturer's disposal instructions must be followed.

6.12 Exhaust system

NOTE

Check emissions at regular intervals

- ▶ Check the combustion engine exhaust emissions at regular intervals in accordance with national regulations.
- ▶ Black or blue exhaust smoke is an indicator of high emission levels resulting from combustion engine damage or wear.
- ▶ In this case the truck must be examined by specialist personnel.

Check the exhaust system regularly for leaks.

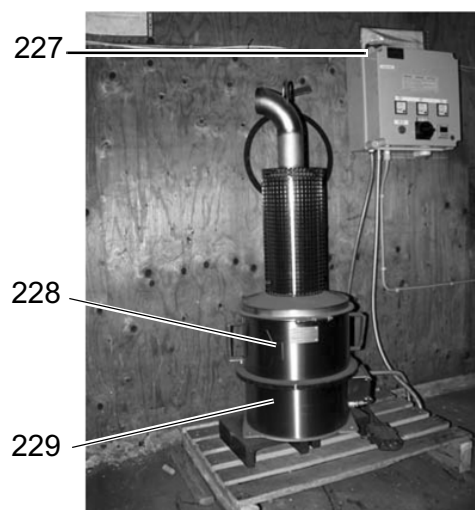
Procedure

- Open the engine cover.
- Start the engine when the engine cover is open.
- Check for any rising smell of exhaust and altered engine noise level.
- If you detect a rising smell of exhaust and altered engine noise level arrange for the exhaust system to be inspected by specialist personnel.

The exhaust system has now been checked for leaks.

6.12.1 Particle filter (○)

Item	Component
227	Control device
228	Particle filter
229	Regeneration unit



During travel

Procedure

- Be aware of the "High counter pressure" display light. The light may flash with high motor speeds and heavy loads.
- If the display light flashes continuously at a high motor speed, the filter must be regenerated as quickly as possible.
- If the filter system is working normally and the regeneration intervals have been observed, the display light will not light up during operation.

227



Regeneration



The filter must be regenerated daily, or at the latest after 8 operating hours (sooner if the engine is used less frequently).

CAUTION!

► The regeneration process must not be interrupted!

Procedure

- Connect the electrical wires and air hose to the truck (standard system only).
- Switch the control device on.
- Check with the ammeters whether the system is working, All three instruments must show an amplitude simultaneously. The regeneration is complete after 40 minutes. The ammeters show 0 amps and the green lamp is lit.
- Switch off the control device.
- Disconnect the electrical wires and air hose from the truck (standard system only).

6.12.2 Maintenance

- The diesel engine must be regularly maintained to ensure proper function of the particle filter. The maximum recommended smoke value without particle filter is 2.5 Bosch units.

At regular intervals

Block the exhaust pipe and check whether the “High counter pressure” display lamp is lit. If the lamp is not lit, clean the connection pipe to the pressure switch.

As required

- Clean the residue of fuel and oil from the particle filter at least once a year or after 1500 operating hours.

Procedure

- Regenerate the particle filter.
- Allow the particle filter to cool for 3 to 4 hours.
- Loosen the tensioning belt on the particle filter and remove the middle section.
- Set the particle filter upright and clean it from the output side with warm water (do not use high pressure!).
- Allow the particle filter to drip off well.
- Install the particle filter with new seals.

6.12.3 Troubleshooting

Procedure

- Connect the electrical wires and air hose to the filter system.
- Turn on the main switch and check the following assemblies.

Electrical radiator

Filter model	Current rating
S9	13.0 A (at 400V)

If the current intensity differs on the ammeter, check the following items:

Procedure

- Check the connection according to the circuit diagram. The circuit diagram and information about the connections can be found in the assembly instructions, which came with the truck.
- Check fuse ratings and functionality.

➞ If these items are in order, the radiator or alternatively the entire input section must be replaced.

Thermostatic control

Procedure

- Check the thermostat setting (800°C).

➞ The set temperature should be reached after 10 minutes.

Air inlet

Procedure

- Check the air supply for leaks.

Air supply with pump

Procedure

- Check whether air is being supplied through the hose. Check the hose for leaks.

Timer Setting

Procedure

- Check the timer setting.

Troubleshooting with counter pressure too high

If the combustion time is too short and/or the counter pressure is too high, check the following items.

Procedure

- Check the function and setting of the radiators, air supply and timer.
- Check the voltage during regeneration (at least 380V).
- Make certain the input side on the particle filter is free of soot.
- Make certain the motor is maintained and the maximum smoke value without particle filter is 2.5 Bosch units.
- Make certain the filter is flushed out every 1500 operating hours.

6.13 Seat belt maintenance

Check the safety restraint belt

Procedure

- Pull out the belt completely and check for fraying
- Test the belt buckle and make sure the belt returns correctly into the retractor.
- Check the cover for damage.

Testing the automatic blocking system

Procedure

- Park the truck on a level surface.
- Pull out the seat belt with a jerk



The interlock must prevent the belt from coming out.

The seat belt service is now complete.



DANGER!

A faulty seat belt can cause injury

Using a faulty seat belt can result in injury.

- ▶ Only operate the truck with the seat belt intact. A faulty seat belt should be replaced immediately.
 - ▶ The truck must remain decommissioned until a functional seat belt has been fitted.
-

6.14 Restoring the truck to service after maintenance and repairs

Procedure

- Thoroughly clean the truck.
 - Lubricate the truck according to the lubrication schedule, (see "Lubrication Schedule" on page 158).
 - Clean the battery, grease the terminals and connect the battery.
 - Check the transmission oil for condensation water and replace if necessary (hydrostatic trucks only).
 - Check the hydraulic oil for condensation water and replace if necessary.
- ➔ The manufacturer's customer service department is specially trained to carry out these operations.

WARNING!

Faulty brakes can cause accidents

As soon as the truck has been started, test the brakes several times.

- ▶ Report any defects immediately to your supervisor.
- ▶ Tag out and decommission a faulty lift truck.
- ▶ Only return the truck to service when you have identified and rectified the fault.

-
- Start up the truck, (see "Preparing the Truck for Operation" on page 84).
- ➔ If there are switching problems in the electrical system, apply contact spray to the exposed contacts and remove any oxide layers on the contacts of the controls by applying them repeatedly.

7 Decommissioning the industrial truck



If the truck is to be out of service for more than a month, e.g. for commercial reasons, it must be stored in a frost-free and dry room. All necessary measures must be taken before, during and after decommissioning as described hereafter.



WARNING!

Lifting and jacking up the truck safely

In order to raise the truck, the lifting gear must only be secured to the points specially provided for this purpose.

You may only work under a raised load handler / raised cab if they have been secured with a sufficiently strong chain or the fastening bolt.

In order to raise and jack up the truck safely, proceed as follows:

- ▶ Jack up the truck only on a level surface and prevent it from moving accidentally.
- ▶ Only use a jack with sufficient capacity. When jacking up the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).
- ▶ In order to raise the truck, the lifting gear must only be secured to the points specially provided for this purpose. (see "Transport" on page 41).
- ▶ When jacking up the truck, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).

When the truck is out of service it must be jacked up so that all the wheels are clear of the ground. This is the only way of ensuring that the wheels and wheel bearings are not damaged.

If the truck is to be out of service for more than 6 months, agree further measures with the manufacturer's customer service department.

7.1 Prior to decommissioning

Procedure

- Thoroughly clean the truck.
 - Test the brakes.
 - Check the hydraulic oil level and replenish if necessary, (see "Checking the hydraulic oil level" on page 169).
 - Apply a thin layer of oil or grease to any non-painted mechanical components.
 - Lubricate the truck according to the lubrication schedule, (see "Lubrication Schedule" on page 158).
 - Disconnect the battery, clean it and grease the terminals.
-  In addition, follow the battery manufacturer's instructions.
- Spray all exposed electrical contacts with a suitable contact spray.

7.2 During decommissioning

NOTE

Full discharge can damage the battery

Self-discharge can cause the battery to fully discharge. Full discharge shortens the useful life of the battery.

► Charge the battery at least every 2 months.

7.3 Restoring the truck to service after decommissioning

Procedure

- Thoroughly clean the truck.
- Lubricate the truck according to the lubrication schedule, (see "Lubrication Schedule" on page 158).
- Clean the battery, grease the terminals and connect the battery.
- Charge the battery, (see "Starter battery" on page 183).
- Check the transmission oil for condensation water and replace if necessary (hydrostatic trucks only).
- Check the engine oil for condensation water and replace if necessary.
- Check the hydraulic oil for condensation water and replace if necessary.



The manufacturer's customer service department is specially trained to carry out these operations.



WARNING!

Faulty brakes can cause accidents

As soon as the truck has been started, test the brakes several times.

- ▶ Report any defects immediately to your supervisor.
- ▶ Tag out and decommission a faulty lift truck.
- ▶ Only return the truck to service when you have identified and rectified the fault.



- Start up the truck, (see "Preparing the Truck for Operation" on page 84).
- If there are switching problems in the electrical system, apply contact spray to the exposed contacts and remove any oxide layers on the contacts of the controls by applying them repeatedly.

8 Safety tests to be performed at intervals and after unusual incidents

- ➔ Perform a safety check in accordance with national regulations. Jungheinrich recommends the truck be checked to FEM guideline 4.004. The Jungheinrich safety department has trained personnel who are able to carry out inspections.

The truck must be inspected at least annually or after any unusual event by a qualified inspector (be sure to comply with national regulations). The inspector shall assess the condition of the truck from purely a safety viewpoint, without regard to operational or economic circumstances. The inspector shall be sufficiently instructed and experienced to be able to assess the condition of the truck and the effectiveness of the safety mechanisms based on the technical regulations and principles governing the inspection of forklift trucks.

A thorough test of the truck must be undertaken with regard to its technical condition from a safety aspect. The truck must also be examined for damage caused by possible improper use. A test report shall be provided. The test results must be kept for at least the next 2 inspections.

The owner is responsible for ensuring that faults are rectified immediately.

- ➔ A test plate is attached to the truck as proof that it has passed the safety inspection. This plate indicates the due date for the next inspection.

9 Final de-commissioning, disposal

- Final de-commissioning or disposal of the truck must be performed in accordance with the regulations of the country of use. In particular, regulations governing the disposal of batteries, fuels and electronic and electrical systems must be observed.

The truck must only be disassembled by trained personnel in accordance with the procedures as specified by the manufacturer. Note the manufacturer's safety instructions as specified in the service documentation.

10 Human vibration measurement

- Vibrations that affect the driver during operation over the course of the day are known as human vibrations. Excessive human vibrations will cause the driver long term health problems. The European "2002/44/EC/Vibration" operator directive has therefore been established to protect drivers.
To help operators to assess the application situation, the manufacturer offers a service of measuring these human vibrations.