DFG / TFG 425s - 435s

11.09 -

Operating instructions

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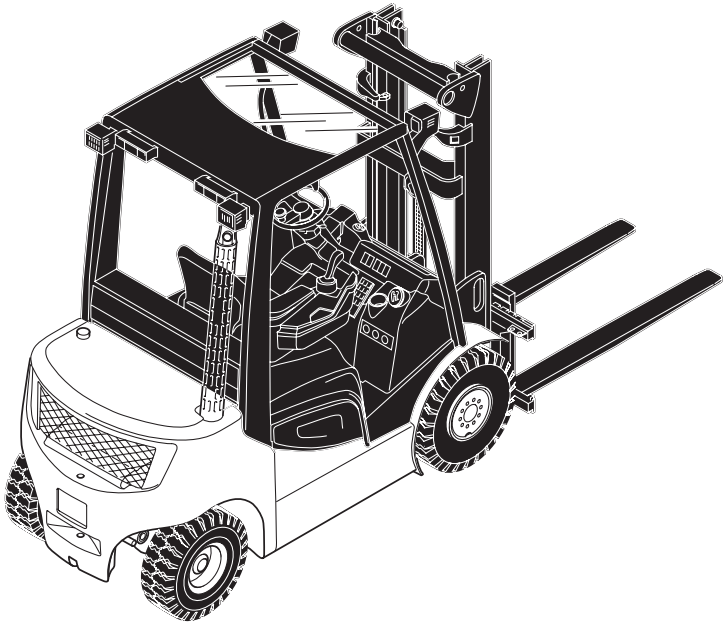
DFG 425s
DFG 430s
DFG 435s
TFG 425s
TFG 430s
TFG 435s



JUNGHEINRICH

Machines. Ideas. Solutions.

Declaration of Conformity

Jungheinrich AG, Am Stadtrand 35, D-22047 Hamburg
Manufacturer or his authorized representative in the Community

Type	Option	Serial No.	Year of construction
DFG 425s DFG 430s DFG 435s TFG 425s TFG 430s TFG 435s			

Additional information

Authorised signatory

Date

(GB) EU Declaration of Conformity

The signatories hereby certify that the specified powered industrial truck conforms to the EU Directive 2006/42/EC (Machine Directive) and 2004/108/EEC (Electro-Magnetic Compatibility, EMC) including their amendments as translated into national legislation of the member countries. The signatories are individually empowered in each case to compile the technical documentation.

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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07.10 EN

Table of Contents

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°C 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.

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 425s - 435s is a four-wheel IC motor 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 425s - 435s 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 425s - 435s is equipped with a hydrostatic drive. The combustion engine drives a high pressure pump for the hydraulic functions and two hydraulic motors to drive wheels.

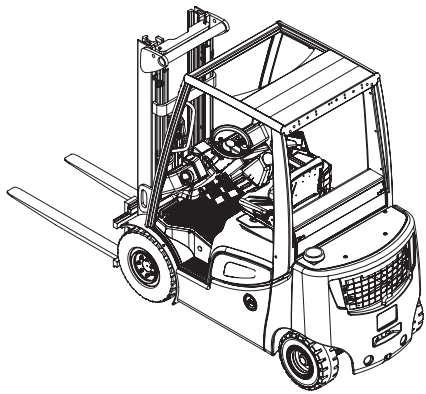
1.1 Truck models and rated capacity

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

DFG425

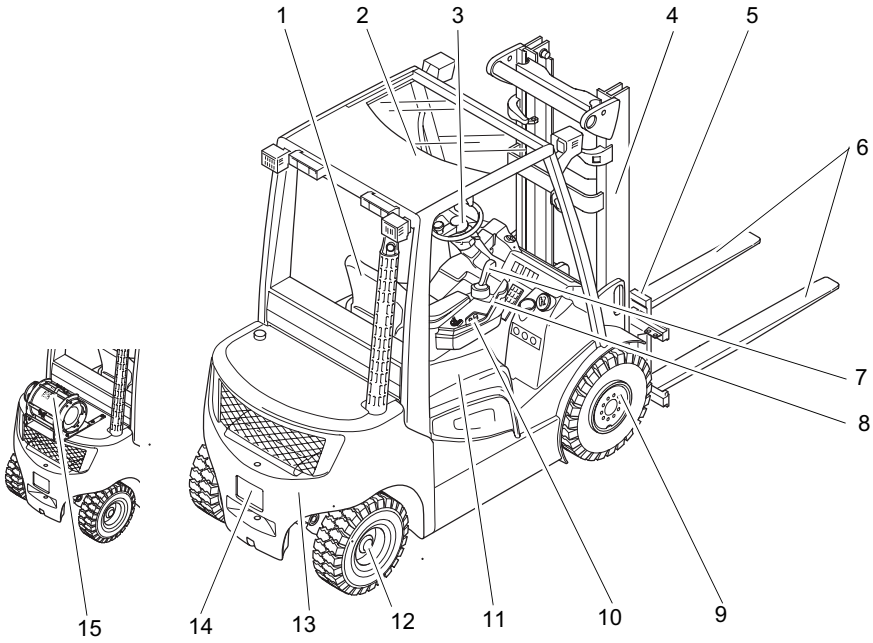
DFG	Model Description
4	Series
25	Rated capacity x 100 kg

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	●	Driver's seat	9	●	Drive
2	●	Overhead guard	10	●	Emergency Disconnect switch
3	●	Steering wheel	11	●	Engine bonnet
4	●	Mast	12	●	Steer axle
5	●	Fork carriage	13	●	Counterweight
6	●	Fork tines	14	●	Trailer coupling
7	●	Lift mechanism control	15	●	LPG bottle (TFG only)
8	●	Control / display unit			
	●= Standard equipment			○= Optional equipment	

2.2 Functional Description

Chassis

The chassis, in conjunction with the counterweight, forms the supporting base structure of the truck. It is used to support the main components.

The hydraulic oil reservoir is integrated on the right-hand side and the fuel tank for the DFG series is on the left side in the chassis.

Operator position and overhead guard

The overhead guard (2) comes in a range of models and protects the driver from falling objects and other external influences.

All the controls are ergonomically arranged. The steering column and driver's seat can be adjusted individually.

The controls and warnings on the display unit (8) enable the system to be monitored during operation, thereby ensuring a very high level of safety.

Steering

The steer cylinder of the hydrostatic steering is integrated in the steer axle (12) 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.

Engine

High performance, water-cooled diesel and LPG engines with long useful lives and low consumption and emission levels.

Electrical system

12 volt system with threephase 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 and brakes

Both drive wheels are powered by individual hydraulic motors which in turn are driven by a hydraulic pump. Forward/reverse or neutral can be set with the travel direction switch on the control panel (7).

The truck brakes to a halt via the hydraulic motors, keeping energy consumption to a minimum. The truck can brake more quickly if you also apply the service brake.

The parking brake is an automatic multi-plate brake that can also be applied manually.

Hydraulic system

A multi-pilot valve allows for sensitive operation of the functions via the controls. A speed-controlled hydraulic pump ensures a proportionate and efficient supply to the hydraulic functions.

Mast

Two or three-stage masts, optionally with free lift function; narrow mast sections ensure excellent visibility of the forks and attachments. Fork carriage and mast run on permanently lubricated and hence maintenance-free 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 425s-435s

	Description	DFG 425s	DFG 430s	DFG 435s	
Q	Capacity (where C = 500 mm) 1)	2500	3000	3500	kg
C	Load centre distance	500	500	500	mm
	Travel speed* with / without load	19.6/19.6	20.8/20.8	20.8/20.8	km/h
	Lift speed, with / without load	0.56/0.56	0.56/0.56	0.48/0.48	m/s
	Lowering speed with / without load	0.56/0.56	0.56/0.56	0.56/0.56	m/s
	Gradeability 2)* with / without load	27	24	21	%
	Acceleration* with / without load to 15 m	4.9/4.4	5.4/4.6	5.4/4.7	s
	Available working pressure for attachments	160	160	160	bar
	Oil flow for attachments	30	30	30	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 425s-435s

	Description	TFG 425s	TFG 430s	TFG 435s	
Q	Capacity (where C = 500 mm) 1)	2500	3000	3500	kg
C	Load centre distance	500	500	500	mm
	Travel speed* with / without load	19.6/19.6	20.8/20.8	20.8/20.8	km/h
	Lift speed, with / without load	0.56/0.56	0.56/0.56	0.48/0.48	m/s
	Lowering speed with / without load	0.56/0.56	0.56/0.56	0.56/0.56	m/s
	Gradeability 2)* with / without load	27	24	21	%
	Acceleration* with / without load to 15 m	5.7/5.0	6.0/5.1	6.1/5.2	s
	Available working pressure for attachments	160	160	160	bar
	Oil flow for attachments	30	30	30	l/min

1) for vertical mast.

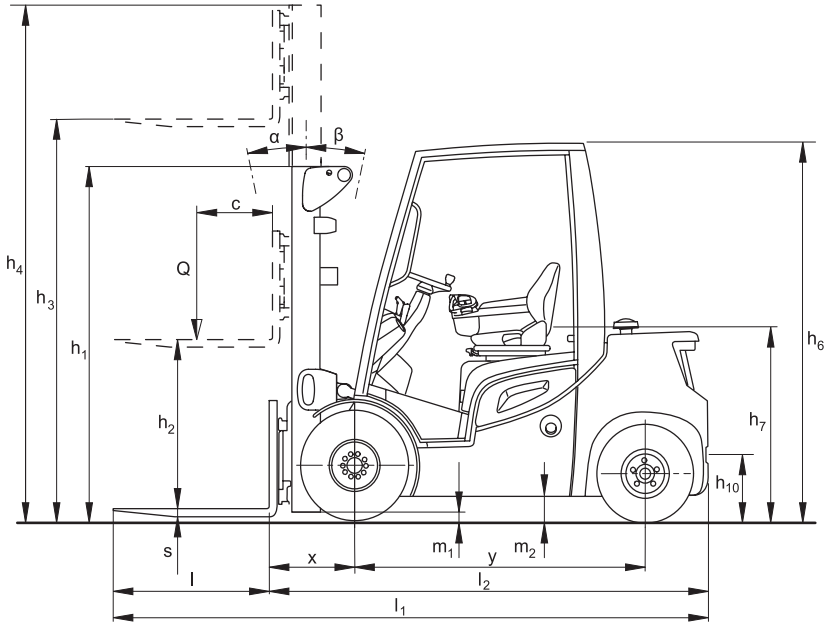
2) The values shown represent the maximum gradeability to overcome short differences in height and surface unevenness (surface edges). The truck must not operate on inclines of more than 15%.

3.2 Dimensions

DFG / TFG 425s-435s

	Description	VFG			
		DFG/TFG 425s	**DFG/TFG 430s**	**DFG/TFG 435s**	
a/2	Safety distance	100	100	100	mm
h_1	Mast height retracted*	2315	2333	2433	mm
h_2	Free lift*	150	150	150	mm
h_3	Lift*	3300	3300	3300	mm
h_4	Mast height extended*	3910	4070	4083	mm
h_6	Overhead guard height*	2220	2238	2238	mm
h_7	Seat height*	1058	1076	1076	mm
h_{10}	Coupling height	380	400	400	mm
α	Mast tilt, fwd.*	6	6	6	°
β	Mast tilt, back*	8	8	8	°
l_1	Overall length, including forks*	3763	3858	3948	mm
l_2	Overall length, including fork shank*	2613	2708	2798	mm
b1	Overall width*	1184	1320	1320	mm
s/e/l	Fork dimensions*	40/120/1150	45/125/1150	50/125/1150	mm
m_1	Ground clearance with load below mast*	125	143	143	mm
m_2	Ground clearance centre wheelbase*	130	148	148	mm
	Fork carriage ISO 2328, class / type A, B	2A	3A	3A	
A_{st}	Working aisle width for pallets 800 x 1200 longit.	4158	4260	4338	mm
A_{st}	Working aisle width for pallets 1000 x 1200 traverse	3958	4060	4138	mm
W_a	Turning radius	2285	2377	2455	mm
b_{13}	Smallest turning radius	617	641	657	mm
x	Load distance*	473	478	483	mm
c	Load centre of gravity	500	500	500	mm
y	Wheelbase	1750	1820	1880	mm

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


α
β
c
Q
h4
h3
h1
h2
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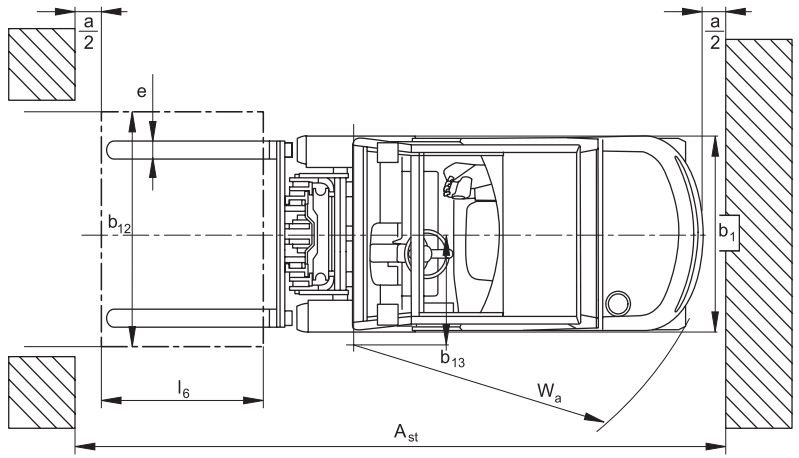

a
2
e
b12
b1
b13
l6
Wa
Ast

3.3 Weights

All dimensions in kg.

	DFG/TFG 425s	DFG/TFG 430s	DFG/TFG 435s
Truck weight*	4080	4376	4821
Axle load w.o. load front / rear*	1943 / 2137	1958 / 2488	2009 / 2812
Axle load with load front / rear*	5833 / 747	6578 / 868	7339 / 982

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

3.4 Mast versions

All dimensions in mm

DFG/TFG 425s/430s

Mast table					
VDI3596 Description	**Lift h_3**	**Free lift h_2 (425s/435s)**	**Retracted height h_1**	**Extended height h_4 (425s/435s)**	**Mast weight (kg)**
ZT	2900	150	2115	3510/3670	700
	3100	150	2215	3710/3870	720
	3300	150	2315	3910/4070	740
	3500	150	2415	4110/4270	760
	3700	150	2515	4310/4470	780
	4000	150	2665	4610/4770	830
	4300	150	2865	4910/5070	865
	4500	150	2965	5110/5270	885
	4700	150	3065	5310/5470	905
	5000	150	3215	5610/5770	935
	5500	150	3515	6110/6270	995
	5800	150	3665	6410/6570	1025
	6000	150	3765	6610/6770	1045
ZZ	2900	1480/1380	2080	3500/3600	735
	3100	1580/1480	2180	3700/3800	755
	3300	1680/1580	2280	3900/4000	780
	3500	1780/1680	2380	4100/4200	800
	3700	1880/1780	2480	4300/4400	820
	4000	2030/1930	2630	4600/4700	850
	4300	2230/2130	2830	4900/5000	904
	4500	2330/2230	2930	5100/5200	930
DZ	4400	1480/1380	2080	5000/5100	920
	4700	1580/1480	2180	5300/5400	950
	5000	1680/1580	2280	5600/5700	980
	5500	1880/1780	2480	6100/6200	1040
	6000	2080/1980	2680	6600/6700	1100
	6500	2280/2180	2880	7100/7200	1175
	7000	2480/2380	3080	7600/7700	1235

DFG/TFG 435s

Mast table					
VDI3596 Description	**Lift h_3**	**Free lift h_2**	**Retracted height h_1**	**Extended height h_4**	**Mast weight (kg)**
ZT	2900	150	2228	3683	700
	3300	150	2428	4083	740
	3800	150	2678	4583	810
	4300	150	2978	5083	875
	4800	150	3228	5583	920
	5000	150	3328	5783	940
DZ	4200	1330	2093	4963	920
	4500	1430	2193	5263	950
	4800	1530	2293	5563	980
	5300	1730	2493	6063	1040
	5800	1930	2693	6563	1100
	6300	2130	2893	7063	1180

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 425s - 435s

Description		**DFG / TFG**		
		425s	**430s**	**435s**
Front tyres	SE*	7.0 - 12	27 x 10-12	27 x 10-12
	Pneumatic*	7.0 - 12-16PR	27 x 10-12-20PR	27 x 10-12-20PR
	Tyre pressure bar	10	9	9
	Torque NM	170	170	170
Rear tyres	SE*	6.50 x 10	6.50 x 10	6.50 x 10
	Pneumatic*	6.50 x 10-10PR	6.50 x 10-10PR	6.50 x 10-10PR
	Tyre pressure bar	7.75	7.75	7.75
	Torque NM	200	200	200

*) 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

Engine - DFG 425 - 435s

Description	DFG 425s	DFG 430s	DFG 435s	
Cylinder/cubic capacity	4 / 1968	4 / 1968	4 / 1968	cm³
Idle speed	900	900	900	rpm
Rated speed	2500	2500	2500	rpm
Engine output	43	43	43	kW
Fuel consumption 60 VDI duty cycles/h	3.2	3.5	3.7	l/h [kg/h]

Engine - TFG 425s - 435s

Description	TFG 425s	TFG 430s	TFG 435s	
Cylinder/cubic capacity	4 /1980	4 / 1980	4 / 1980	cm³
Idle speed	900	900	900	rpm
Rated speed (without load)	2500	2500	2500	rpm
Engine output	38	38	38	kW
Fuel consumption 60 VDI duty cycles/h	2.8	3	3.2	l/h [kg/h]

3.7 EN norms

Noise emission level

– DFG/TFG 425s/430s: 75 dB(A)
– DFG/TFG 435s: 75 dB(A)

*+/- 3 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

– DFG/TFG 425s/430s: 0,50 m/s²
– DFG/TFG 435s: 0,50 m/s²

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 189).

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°C to 40°C

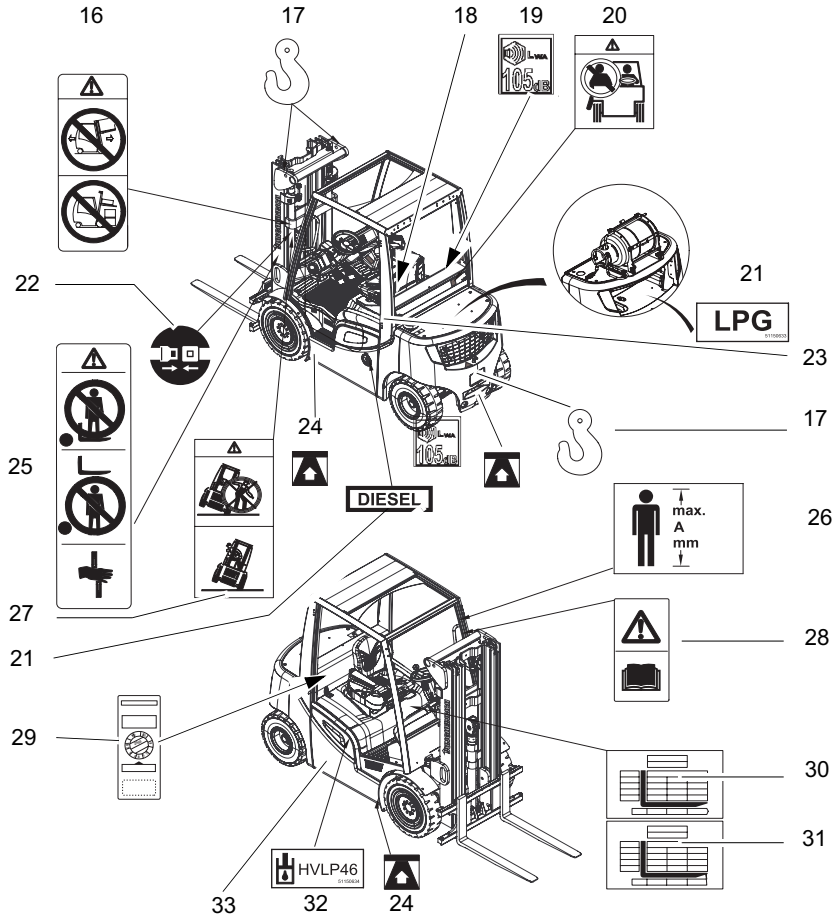
Special equipment and authorisation are required if the truck is to be constantly used in conditions of extreme temperature or air humidity fluctuations.

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.

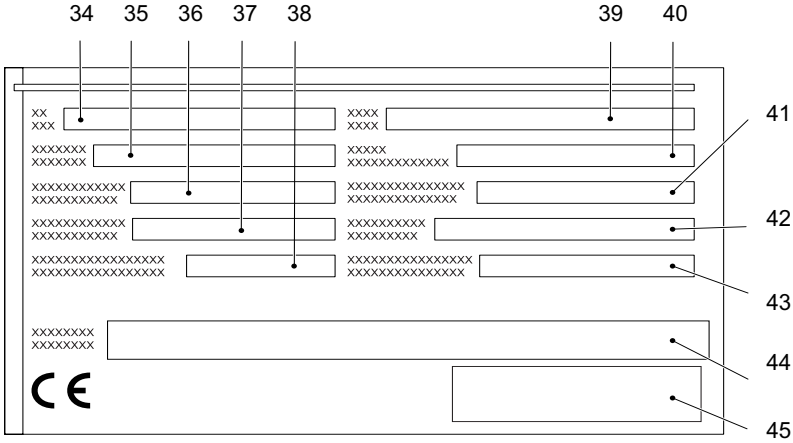
4 Identification points and data plates

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



Item	Description
16	Do not travel with raised load or mast forward tilt with raised load
17	Strap points for crane lifting
18	Data plate
19	Noise level
20	“Do not carry passengers” warning
21	Fuel
22	Wear seat belt
23	Serial number, engraved in chassis below the engine bonnet
24	Jack contact points
25	Do not step onto or beneath the load, risk of trapping with moving mast
26	Maximum body size (○)
27	Risk of tip over
28	Read operating instructions
29	Test plaque (○)
30	Capacity
31	Attachment capacity
32	Hydraulic oil specification
33	Model description

4.1 Data plate



Item	Description	Item	Description
34	Type	40	Year of manufacture
35	Serial number	41	Load centre (mm)
36	Rated capacity (kg)	42	Output
37	Battery voltage (V)	43	Min./max. battery weight (kg)
38	Net weight w.o. battery (kg)	44	Manufacturer
39	Option	45	Manufacturer's logo

For queries regarding the truck or ordering spare parts always quote the truck serial number (35).

4.2 Truck capacity plate

⚠ CAUTION!

Accident risk from fork replacement

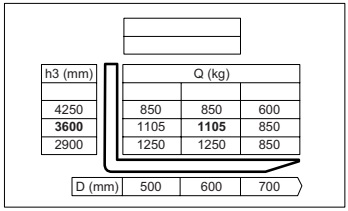
If you replace the forks with ones that differ from the originals, the capacity will change.

- ▶ 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 (31) 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 of gravity D (in mm) and the required lift height H (in mm).

The capacity plate (31) of the truck indicates the truck's capacity with the forks as originally supplied.

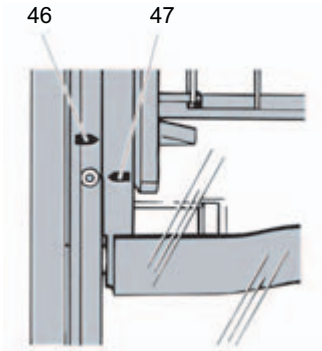
Example of how to calculate the maximum capacity:



For a load cente of gravity D of 600 mm and a maximum lift height h_3 of 3600 mm the maximum capacity is Q 1105 kg.

Lift height restriction

The arrow shape markings (46 and 47) 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 500 mm upward, the capacities are reduced by the difference of the altered centre of gravity.

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!

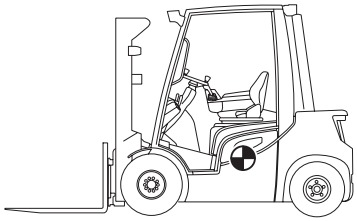
Altering the centre of gravity can be hazardous

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 31).

Lifting the truck by crane

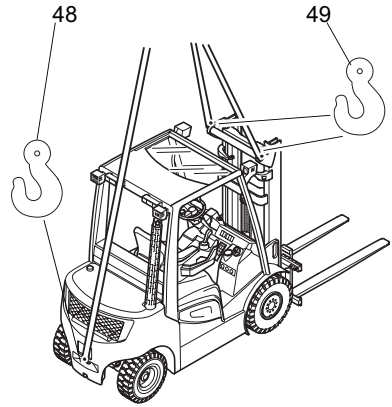
Requirements

– Park the truck securely, (see "Parking the truck securely" on page 78).

Procedure

- Secure the crane slings to the attachment points (49) and (48.
- Raise and load the truck.
- Lower and deposit the truck carefully ((see "Parking the truck securely" on page 78)).
- Secure the truck with wedges to prevent it from rolling away.

This concludes the loading by crane.



2.3 Loading with another industrial truck

⚠ WARNING!

The truck can be damaged

The truck to be loaded can get damaged when loading with another industrial truck.

▶ Only trained specialist personnel should load the truck.
▶ Use only trucks with sufficient capacity for loading.
▶ Only for loading and unloading.
▶ The forks of the second industrial truck must be sufficiently long
▶ Transporting over long distances prohibited.

Loading the truck with a second industrial truck

Requirements

– Park the truck securely, Siehe “Parking the truck securely” auf Seite 78.

Procedure

- Raise the truck with the forks at the side between the axles.
- Raise the truck slightly and make sure it is securely positioned on the forks. If necessary adjust or secure the forks with stops.
- Carefully load/unload the truck, (see "Lifting, transporting and depositing loads" on page 87).
- Lower the truck slowly onto the ground and prevent it from rolling away.

The truck is now loaded.

3 Securing the truck during transport

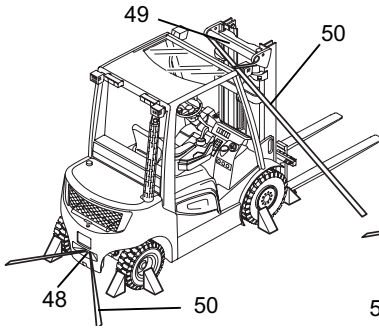
⚠ WARNING!

Accidental movement during transport

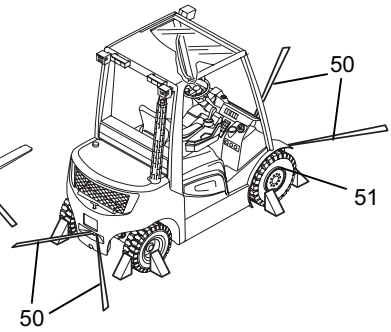
Improper fastening of the truck and mast during transport can result in serious accidents.

- ▶ 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 78).

Tools and Material Required

– 2 tensioning belts with tensioner
– Retaining wedges.

Procedure

- Secure the truck with the tensioning belt (50) at the top cross member of the mast (49) and the trailer coupling (48) or over the front axle cross member (51) and the trailer coupling (48).
- Tighten the tensioning belts (50) 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 63).

D Fuelling the Truck

1 General

1.1 Safety regulations for handling diesel fuel and LPG

⚠ WARNING!

An unsecured truck can cause accidents

The truck can suddenly start to move.

▶ Before filling up or replacing the LPG bottle, park the truck securely, Siehe “Parking the truck securely” auf Seite 78.

⚠ 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

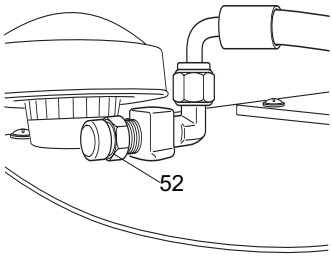
▶ All maintenance and repair work on LPG systems and containers should be carried out by qualified personnel who have been trained to work on LPG systems.

▶ 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 Gas 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 (52).
– 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 check 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

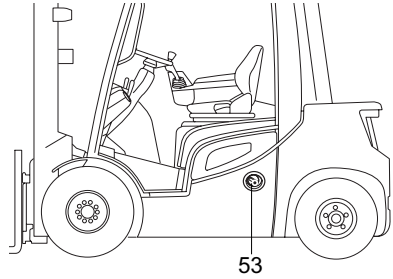
▶ Capacity: DFG 425s-435s = 60 l.

▶ Use only DIN EN 590 diesel with a certain rating above 51.

2.1.1 Fuelling the tank system

Procedure

- Park the truck securely before fuelling, (see "Parking the truck securely" on page 78)
- Unscrew the tank cap (53).
- Insert the tap into the open tank filler neck.
- Add the fuel.
- Do not overfill the tank.
- Tighten the cap (53) back on after fuelling.



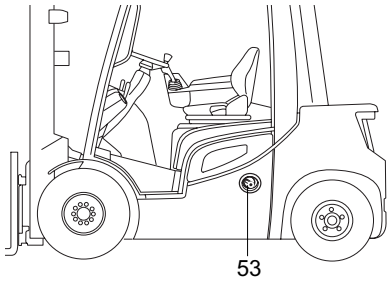
Fuelling is now complete.

2.2 Fuelling with fuel containers

Procedure

- Unscrew the tank cap (53) 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 (53) 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.

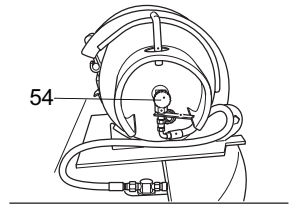
▶ Note the indications and markings on the LPG bottle.

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 78)
- Close the shut-off valves (54) securely.
- Start the motor and allow the LPG system to run empty in neutral.



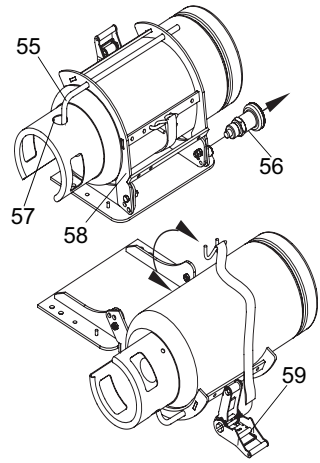
Remove the LPG bottle

⚠ CAUTION!

The connection has a left thread

Procedure

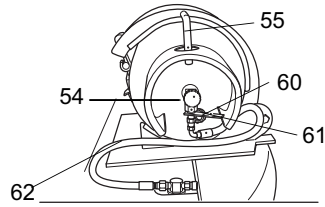
- Unscrew the union nut (60) while holding against the handle (61).
- Remove the hose (62) and immediately screw the valve cap onto the empty LPG bottle.
- Remove the stop bolt (56) and rotate the LPG bottle and bracket around the handle (55).
- Fold back the lever of the toggle-type fastener (59) and remove the tensioning pivot.
- Remove the tensioning belt.
- Carefully remove the LPG bottle from the bracket (58) and place it down securely.



Inserting a new LPG bottle

Procedure

- Insert the LPG bottle into the bracket (58)
- Centre the handle (55) in the hole (57).
- Align the hose connection upwards.
- Fit the tensioning belt around the LPG bottle again and tension it with the toggle-type fastener (59).
- Fit the tensioning pivot and tension the belt with the toggle-type fastener (59).
- Rotate the LPG bottle and the bracket around the handle (55).
- Insert the stop bolt (56).
- Unscrew the valve cap.
- Fit the hose (62) in accordance with instructions.
- Carefully open the shut-off valve (54).
- Check the hose connection for leaks using a foam-forming agent.



The replacement is now complete.

3.1.2 Operating with two LPG bottles

⚠ WARNING!

Visibility is restricted when the truck reverses.

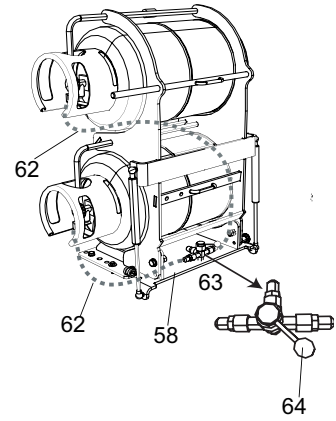
▶When using two LPG bottles the truck must be fitted with a functional camera system for reversing.

▶External mirrors must also be fitted on either side of the truck.

Operating the twin bottle system

NOTE

Use the additional valve (63) on the bracket (58) to change between gas supply. You can tell which bottle is supplying the gas by the gas hose connection on the valve (62) and the routing towards the LPG bottles (e.g. RH side of toggle valve = up, LH side of toggle valve = down).



Procedure

- Use the lever (64) to change between the top and bottom LPG bottles.

Replacing the LPG bottles

Procedure

- (see "Using an LPG bottle" on page 46)

Replace an empty LPG bottle at the earliest opportunity with a full one.

Switching off the gas supply

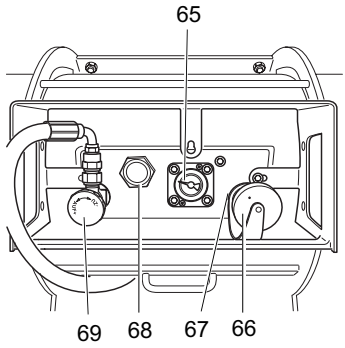
Procedure

- Close both shutoff valves on the gas bottles to interrupt the supply of gas.

3.2 Liquid gas tank

Refillable liquid gas tanks contain a dispensing valve (69), a filling stop valve (67), a relief valve (68) and a display (65).

Filling refillable liquid gas tanks (optional equipment).



Requirements

– Note all guidelines and regulations concerning the filling of LPG bottles on the LPG pump.

Procedure

- Close the dispensing valve (69).
- Unscrew the cap (66) of the filling stop valve (67).
- Screw the filling connection of the liquid gas pump onto the filling stop valve (67).

➔ Fuelling automatically ends when the tank's capacity has been reached.

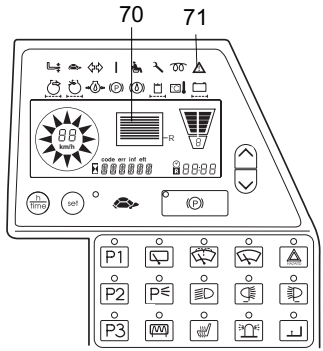
- After fuelling, unscrew the filling connection and screw the cap (66) of the filling stop valve (67) back on.

4 Fuel level indicator

4.1 Display unit

The fuel level indicator (70) shows the fuel level (only on DFG or TFG with gas tank).

If “R” appears in the display (70) the tank must be topped up. The warning light (71) will also flash and a warning sounds.



4.2 Level indicator for LPG bottles (○)

When the fuel indicator (67) and warning light (71) with additional warning sound light up, this indicates that the LPG bottle is empty.

The remaining travel time will be 8 - 12 minutes, depending on the application and ambient conditions.

➔ Fluctuations in the liquid gas level caused by the travel mode can cause the level indicator to light up briefly. Only a permanently lit level indicator means that the LPG bottle is almost empty.

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.

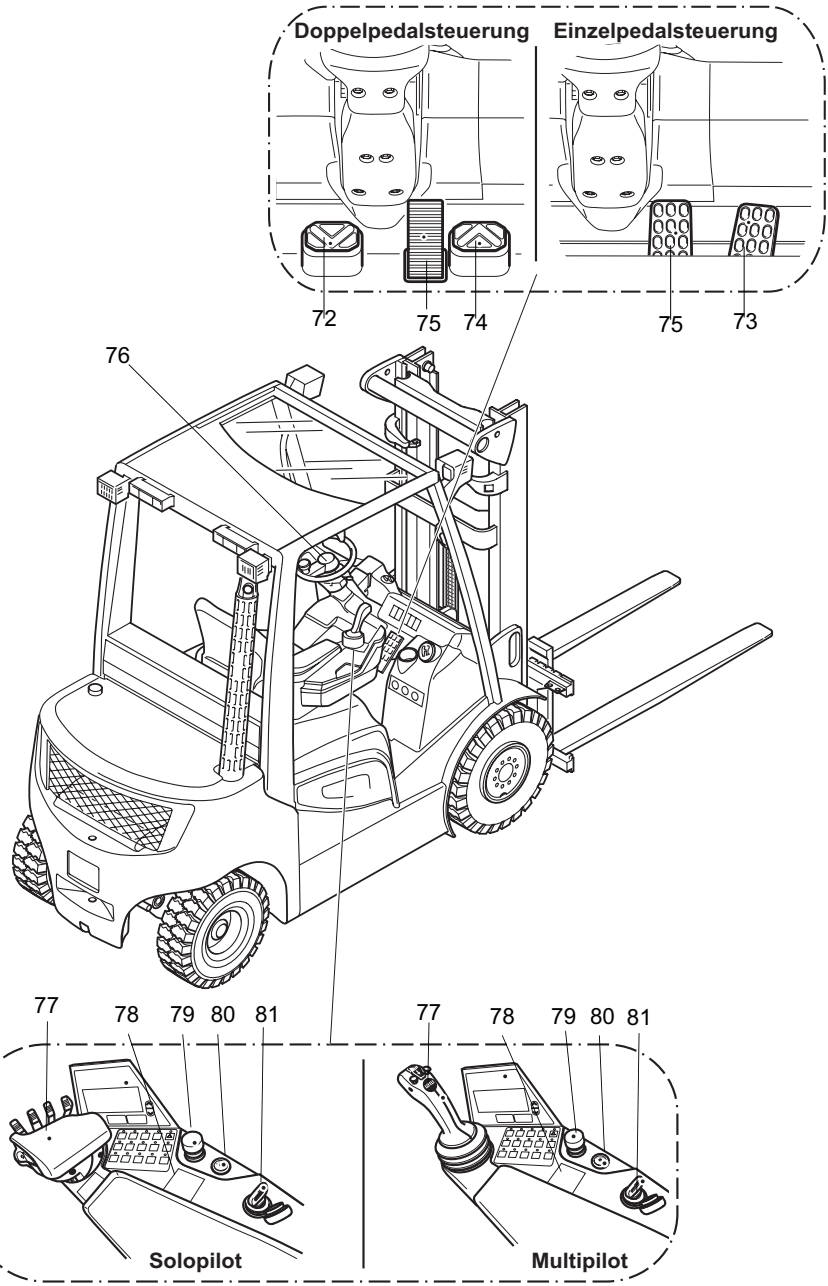
Safety devices and warning labels

Safety devices, warning signs ((see "Identification points and data plates" on page 29)) and warning instructions in the present operating instructions must be strictly observed.

⚠ CAUTION!

Reduced headroom can cause injuries

- ▶ Trucks with reduced headroom are equipped with a warning label within the driver's line of sight. The max. recommended body size indicated on this sign must be observed.
- ▶ The headroom is also reduced when you wear a protective helmet.


Doppelpedalsteuerung
Einzelpedalsteuerung
72
75
74
75
73
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81
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79
80
81
Solopilot
Multipilot

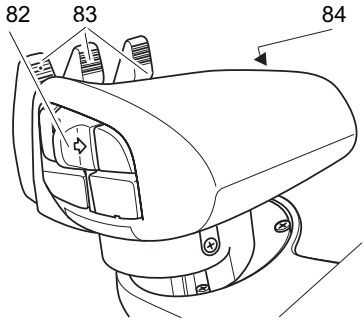
Item	Control / Display		Function
72	“Reverse” accelerator twin pedal control	○	The truck reverses when actuated. Provides infinite control of travel speed.
73	Accelerator pedal	●	Infinite travel speed control.
74	“Forward” accelerator twin pedal control	○	The truck travels forward when actuated. Provides infinite control of travel speed.
75	Brake pedal	●	Upon activation, the truck brakes to a halt immediately.
76	Steering wheel	●	Steers the truck.
77	SOLOPILOT	●	Operates the following functions: – Forward / reverse travel direction (not with dual pedal operation) – Load handler raise / lower – Mast forward / reverse tilt – Horn button – Sideshifter left / right (○) – Auxiliary hydraulics (○)
	MULTIPILOT	○	
78	ISM access module	○	Switches the truck on*
	CANCODE		
79	Emergency Disconnect switch	●	Switches control current on and off in emergencies.
80	Start button	●	Starts the engine when the key switch is on.
81	Key switch	●	Switches control current on and off. Removing the key prevents the truck from being switched on by unauthorized personnel.

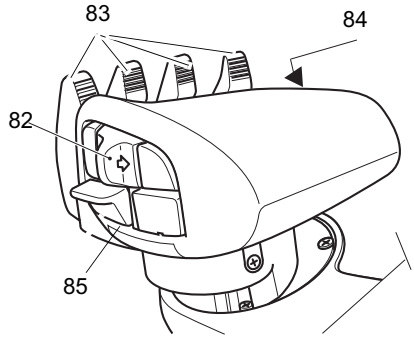
●= Series equipment	○= Optional equipment

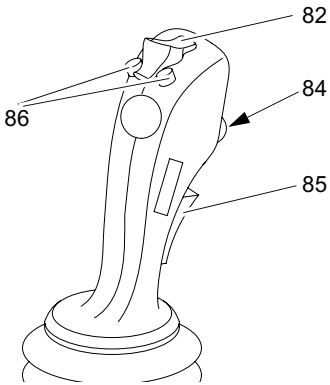
*If the truck is equipped with an ISM access module or Can Code refer to the “ISM Access Module” or "CanCode" operator manuals.

Item	Control / Display		Function
82	Travel direction switch (not available with dual pedal control)	●	Selects travel direction / neutral position.
83	Lever	●	Lever for operating the hydraulic functions.
84	Horn	●	Activates an audible warning.
85	Additional hydraulic function release button	○	Activates the additional hydraulic functions or hydraulics that require acknowledgement.
86	Button	○	Hydraulic auxiliary function control button.

●= Series equipment	○= Optional equipment

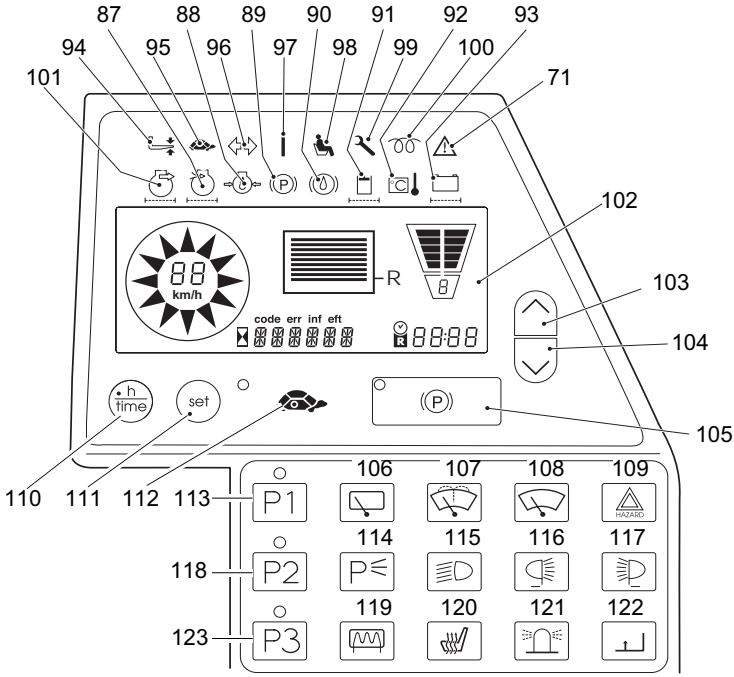






2.1 Control panel with display unit

The control panel display unit shows the operating data, the battery charge, the service hours and error details and information. Pictograms in the left top section of the control panel act as warning indicators.



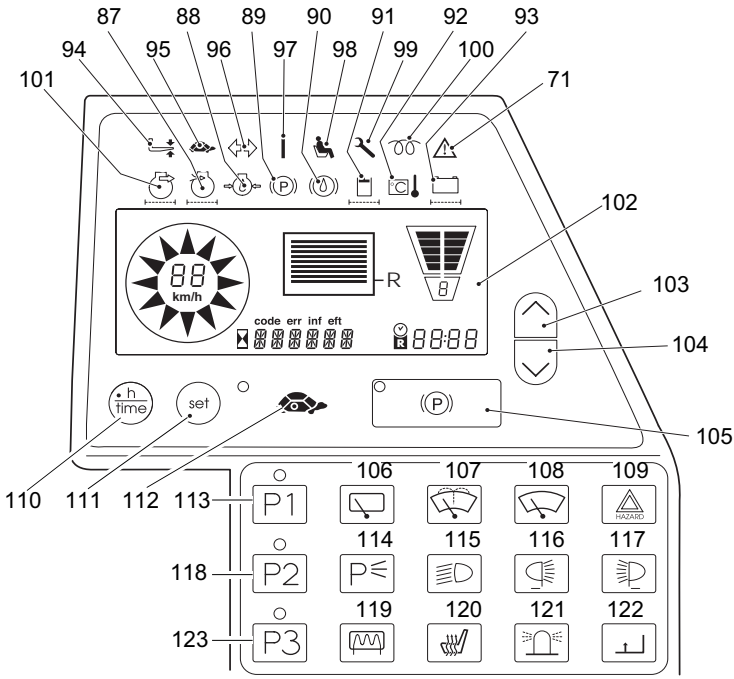
Item		Control / Display		Function
71		WARNING	●	– Lights up a single time to indicate that the fuel supply is too low. Lights up in conjunction with err xx xxx or inf xx xxx to indicate a fault or information. – A warning signal sounds
87		Air filter control	●	– Lights up when the air filter is clogged
88		Engine oil pressure display	●	Lights up to indicate that the engine oil pressure is too low.
89		Parking brake warning indicator	●	Parking brake activated – Truck operational, parking brake applied
90			●	No function
91			●	No function
92		Overtemperature indicator	●	– Hydraulic oil temperature too high. – Coolant temperature too high. – As the temperature rises, the truck's performance is automatically and steadily reduced to 0%.
93		Charge current indicator	●	Battery not charging.
94			●	– No function
95		Crawl speed indicator	●	Slow travel activated (max. travel speed 6 km/h)
96		Flashing indicator	○	Right / left indicator lamps activated
97		Truck operation indicator	●	Lights up to indicate that the key switch is “ON”.
98		Seat switch warning indicator	●	Seat switch not closed – Truck operational, but driver’s seat not occupied Time monitoring expired – Restart the truck
		Seat belt control indicator	○	– Truck is operational – (see "Access Control" on page 106)

Item		Control / Display		Function
99		Service display	●	– Set service interval exceeded (1000 service hours) or carry out FEM test after 12 months (display flashes), must be set by the manufacturer's customer service department.
100		Pre-heat indicator lamp	●	– Engine is preheated (DFG only). – Indicator lamp flashing: Engine controller error
101			●	– No function
102		Display unit	●	Displays the operating data.

●= Series equipment	○= Optional equipment

Troubleshooting (see "Troubleshooting" on page 121).

2.2 Control panel buttons



Item		Control / Display		Function
103		Program selector	●	Moves up a level in the travel program* list.
104		Program selector	●	Moves down a level in the travel program* list.
105		Parking brake	●	Applies/releases the parking brake
106		Rear windscreen wiper	○	– Press 1x > intermittent, – Press 2x > fast, – Press 3x > off; – Press for 2+ seconds > rear windscreen washing system. – After releasing, the previous function is set (interval or fast).
107		Front windscreen washing system	○	Switches the front windscreen wiper system on and off.

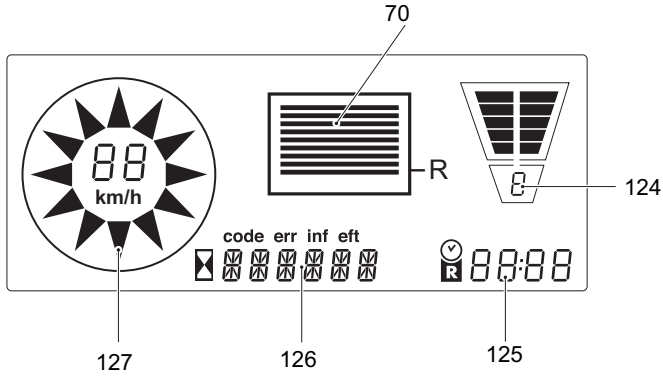
Item		Control / Display		Function
108		Front windscreen wiper	○	– Switches window wipers on and off, interval setting. – Press 1x > intermittent, – Press 2x > fast, – 3x > off
109		Warning indicator system	○	Switches warning indicator system on and off.
110		"Time" function switch	●	Sets the time
111		Set key	●	Pressing this for 2+ seconds stores the current display/travel program settings.
112		Crawl speed button	●	Crawl speed can only be adjusted by Customer Services.
113		"P1" function switch	○	Can be used for auxiliary equipment.
114		Parking light	○	Switches parking light on and off.
115		Dipped lights	○	Switches dipped lights on and off.
116		Rear work lights	○	Switches rear work lights on and off.
117		Front work lights	○	Switches front work lights on and off.
118		"P2" function switch	○	Can be used for auxiliary equipment.
119		Rear window heating	○	Switches rear window heating on and off.
120		Seat heating	○	Activate seat heating (switch seat heating on / off (see "Driver's seat heating / backrest extension" on page 114).
121		Warning indicator	○	Switches the warning indicator on and off.
122		"Lift cutout" override switch	○	Switches the "lift cutout" override switch on and off.
123		"P3" function switch	○	Can be used for auxiliary equipment.

●= Series equipment	○= Optional equipment

*Five operating programs with different performance levels are available to adapt the travel and operating functions to the application at hand. Starting from operating program 1 (limited acceleration and speed together with senstive application of the operating functions), the performance levels increase to program 5 (maximum

performance for high throughput levels). If necessary the operating programs can also be adapted or restricted to suit the customer. Please contact the manufacturer's service department.

2.3 Display



70	DFG fuel supply display	●	Graphic illustration of the fuel supply.
	TFG with gas tank	●	
124	Operating program display	●	Operating program display – Displays the travel program in use
125	Time	●	Shows the time.
126	Service hours / error display:	●	Error display: – If an error (Err) or a warning (Inf) occurs, the error or info code is displayed. – If several errors occur they are displayed alternately at 1.5 second intervals. A warning sounds.
127	Travel direction and speed display	●	Displays the travel direction pre-selected on the travel direction switch (forward or reverse) and the current speed.
	Travel direction, speed and wheel position display	○	Displays the current wheel position and speed.

●= Series equipment	○= Optional equipment

3 Preparing the Truck for Operation

3.1 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.

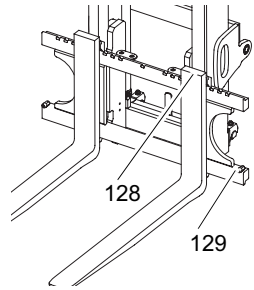
▶ Tag out and decommission a faulty lift truck.

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

⚠ CAUTION!

Checking the accelerator pedal

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



Checks after daily operation

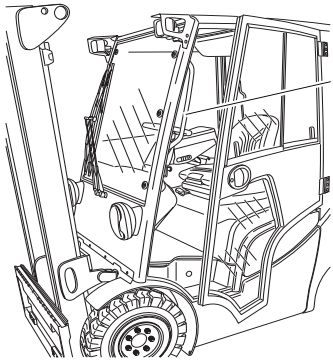
Procedure

- Visually inspect the entire truck (in particular wheels, wheel bolts and load handler) for damage.
- Check the fork stop (128) and fork retainer (129), if necessary tighten the bolts (torque = 85 Nm).
- 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.
- Check the steer angle display (○), turn the steering wheel in both directions as far as the stop and check that the wheel position is displayed on the control panel.
- Make sure the load chains are evenly tensioned.
- Test the seat belt. (The belt should block 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 Drive Control (○):
  - Raise the fork carriage without load beyond the reference point on the mast. The slow travel symbol lights up on the display.
  - Slowly apply the accelerator pedal on a clear route with good visibility. The maximum speed should be reduced to walking pace (approx. 3km/h).
- 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 and parking brakes: Approach carefully and test the effectiveness of the brake pedal.
- Check the fuel supply.
- Check the fluid level of the windscreen washer system (○), (see "Adding window washer system fluid" on page 174).
- Check the gas system is working correctly, (see "LPG containers" on page 46).

3.2 Entry and exit

Procedure

- Open the cab door (○)
- To enter and exit the cab, hold onto the handle (130).



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

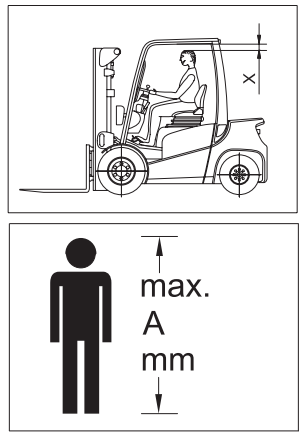
3.3 Trucks with reduced headroom X (○)

⚠ WARNING!

An unsuitable workplace can damage your health

Failure to observe the recommended body size can cause stress and endanger the driver and may lead to lasting ill health due to an unhealthy posture and excessive strain on the driver.

- ▶ The owner must ensure that truck operators do not exceed the maximum body size indicated.
- ▶ The owner must check that the drivers can sit in a normal and upright position without having to strain.



3.4 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.

3.4.1 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.

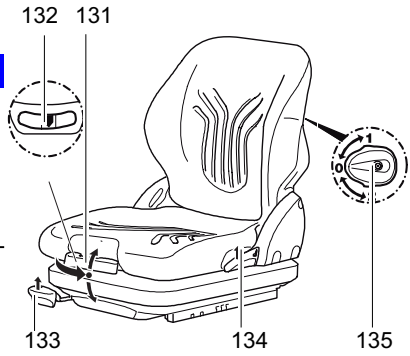
▶ Do not adjust the driver's seat while travelling.

▶ 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 (131) 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 (131) as far as it will go in the arrow direction
  until you reach the required weight on the scales.
- Move the weight adjustment lever (131) up and down to set the seat to a higher weight.
- Move the weight adjustment lever (131) 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 (132). 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 (131) back in full.

The driver's weight is now set.

Adjusting the backrest

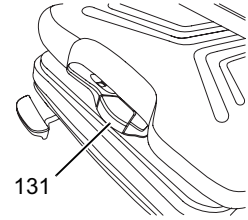
Procedure

- Sit on the driver's seat.
- Pull the lever (134) to adjust the backrest.
- Adjust the backrest tilt.
- Release the lever (134) again. The backrest is locked.

The backrest is now set.

➔ Hold the weight setting lever (131) only by the recess, never reach through underneath the lever.

Driver's seat with pneumatic weight adjustment (MSG 75) (○)



Procedure

- Pull the weight adjustment lever (131) up to set the seat to a higher weight.
- Push the weight adjustment lever (131) 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 (132).

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 lever133 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 (133) in position.

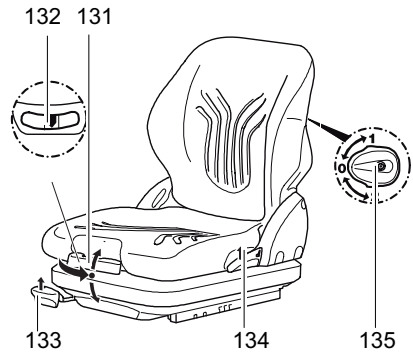
The seat position is now correctly set.

Adjusting the lumbar vertebrae support (○)

Procedure

- Turn the hand wheel (135) to the required position.
  Position 0 = no warping in lumbar vertebrae area.
  Position 1 = increasing warping in upper lumbar vertebrae area.
  Position 2 = increasing warping in lower lumbar vertebrae area.

The lumbar vertebrae support is now set.



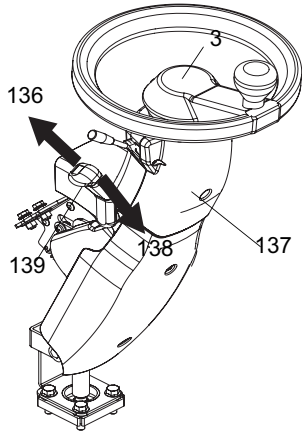
3.4.2 Adjusting the steering wheel / steering column

Individual steering wheel position

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

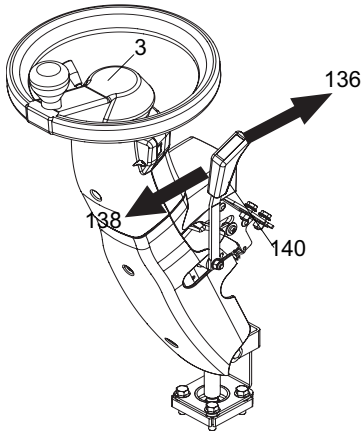
Procedure

- Pull the steering wheel adjusting lever (139) in the direction of the arrow (138).
- Set the steering wheel (3) to the required position (height and tilt).
- Push the steering wheel adjusting lever (136) in the direction of the arrow.



Setting the steering column to the parking position

The steering column can be moved forward to the parking position using the steering column / engine bonnet release lever (140). The individual steering wheel position remains intact.



Procedure

- Hold the steering column (137) against the steering wheel (3).

It will be under spring tension when the steering column / engine bonnet release lever (140) is released.

- Pull the steering column / engine bonnet release lever (140) in the direction of the arrow (138) towards the driver's seat until the steering column moves forward.
- Move the steering column (137) forward as far as the stop and let go of the release lever.
- When resuming work, pull the steering column on the steering wheel in the direction of the arrow (138) towards the driver’s seat until you feel it engage.

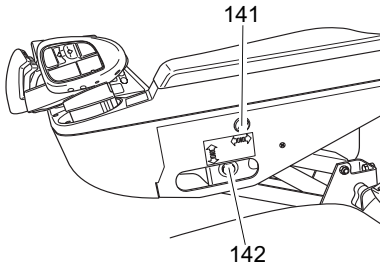
3.4.3 Adjusting the arm rest

Horizontal adjustment:

Procedure

- Undo the clamping screw (141) a few turns.
- The armrest can now be moved forward or back.

When you have reached the required setting, tighten the clamping screw (141) again; this will lock the armrest in place.



Vertical adjustment:

Procedure

- Depress the locking button (142) and hold it in place.
- The armrest can now be adjusted upwards or down.

When you have reached the required setting, release the locking button (142); this will lock the armrest in place.

3.5 Seat Belt

DANGER!

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 dry 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.

4 Industrial Truck Operation

4.1 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 87).

Towing trailers

The truck may only be used occasionally to tow trailers, (see "Towing trailers" on page 104)

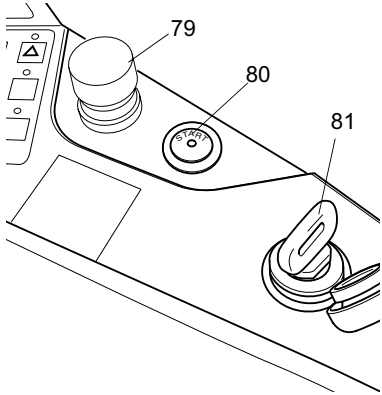
DANGER!

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.

4.2 Preparing the truck for operation

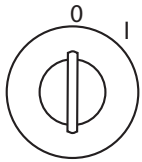
The truck should only be operated from the driver's seat. Do not run up the engine in idle. The engine soon reaches operating temperature at a moderate charge and when the speed alternates. Only fully charge the engine once it has reached operating temperature.



Switching on the truck

Requirements

– For checks and operations to be performed before starting daily operation, (see "Checks and operations to be performed before starting daily operation" on page 63).

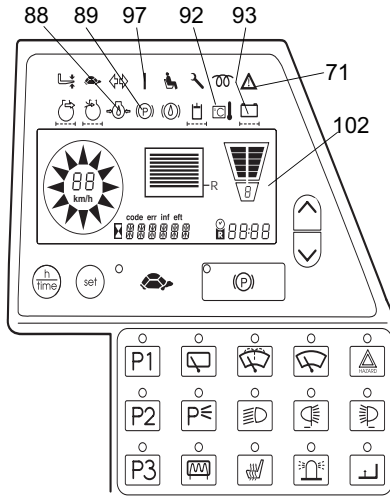


Procedure

- Unlock the Emergency Disconnect switch (79), to do this
  - Turn the rotary button left until the switch unlocks.
- Insert the key in the key switch (81) and turn it clockwise as far as it will go to the "I" position.

4.2.1 Starting procedure for the DFG

Procedure



- Insert the key in the key switch (81). Set the key switch to “I”.
- 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 go on briefly as a function check and the (102) display is activated.

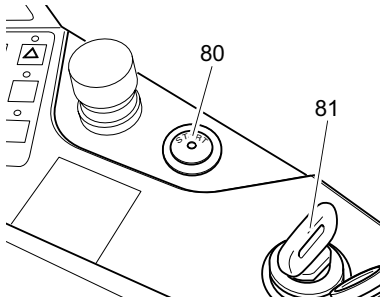
➔ All the warning indicators apart from the engine oil pressure display (88), parking brake (89), truck in operation indicator lamp (102) and charge current warning indicator (93) should go out after a short while. If not, stop the start-up process and rectify the fault.

- Press the start button (80).

➔ 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 start button as soon as the engine starts.
- Test the brake pedal and parking brake.

The truck is now ready for operation.



➔ All indicators except for the parking brake (89) and the truck operational indicator (102) should go out as soon as the engine starts. If not, stop the engine immediately and rectify the fault.

4.2.2 Starting procedure for the TFG

DANGER!

Risk of escaping liquid gas if the truck does not start

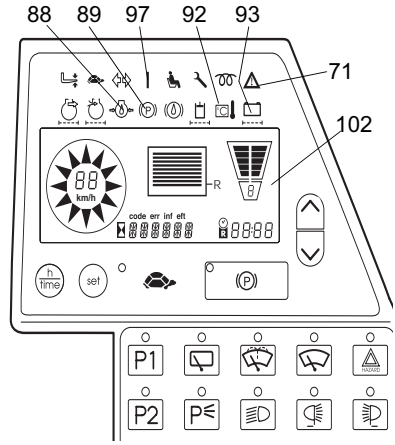
▶ Note the safety regulations governing the handling of liquid gas ((see "Safety regulations for handling diesel fuel and LPG" on page 41))

▶ 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 bottle.
- Insert the key in the key switch (81). Set the key switch to “I”.
- All the indicators go on briefly as a function check and the (102) display is activated.

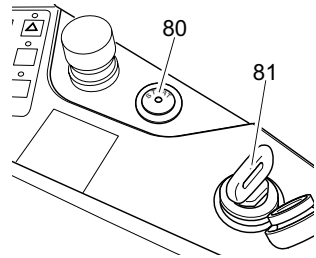
All the indicators except for the engine oil pressure display (88), parking brake (89), truck operation indicator (102) and charge current indicator (93) should go out after a short while. If not, stop the start-up process and rectify the fault.

- Press the start button (80).

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.

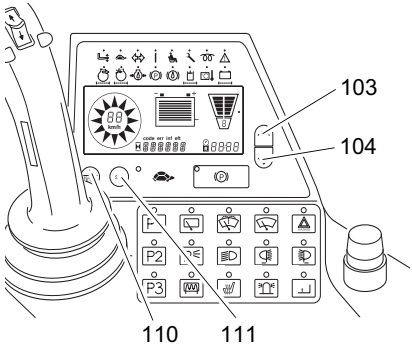
- Release the start button as soon as the engine starts.
- Test the brake pedal and parking brake.

The truck is now ready for operation.



All indicators except for the parking brake (89) and the truck operational indicator (102) should go out as soon as the engine starts. If not, stop the engine immediately and rectify the fault.

4.3 Setting the time



Procedure

- To prepare the truck for operation, (see "Preparing the truck for operation" on page 74)
- Press the “h/time” (110) and "up" (103) keys simultaneously
- The set time appears on the display. The first digit (hour display) will flash.
- Us the "up" (103) and "down" (104) keys to set the reading.
- Press the "Set" key (111) to store the reading.
- The next number (minutes) now flashes. Use the "up" (103) and "down" (104) keys to make the required setting. Confirm with "Set" (111). The settings are transferred.

4.4 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.

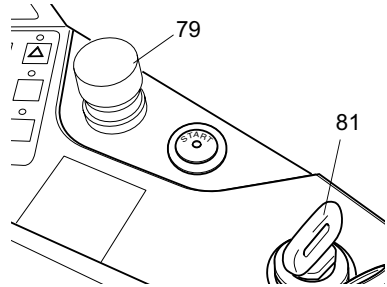
▶ Select a place to park where no other people are at risk of injury from lowering forks.

▶ Do not park and abandon the truck on an incline.

Parking and leaving the truck

Procedure

- Lowers the load handler.
- Turn the key in the key switch (81) to the “0” position.
- Remove the key from the key switch (81).
- Press the Emergency Disconnect switch (79) down.
- Close the gas bottle (TFG only).



TFG only: If the ignition key is set to “0” while the engine is running, the engine will continue to run for a short time. This ensures that the remaining gas in the lines between the engine and the automatic shutoff valve of the gas system is used up. If the engine has accidentally switched off, start up the engine and switch it off again in the correct manner at the end of the journey.

4.5 Emergency Disconnect

⚠ CAUTION!

Accident risk

Applying the Emergency Disconnect switch during travel will cause the truck to brake to a halt at maximum force. This may cause the load to slide off the forks. There is a higher risk of accidents and injury!

The operation of the Emergency Disconnect button must not be affected by any objects placed in its way.

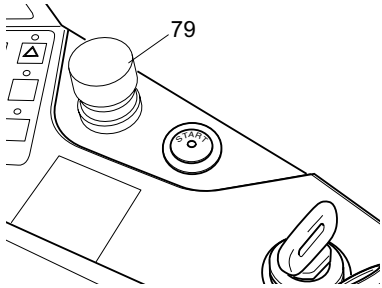
Applying the Emergency Disconnect

Procedure

➔ Do not use the Emergency Disconnect (79) as a service brake.

- Press the Emergency Disconnect (79) down.

All electrical functions are deactivated. The truck brakes to a halt.



4.6 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 your 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.

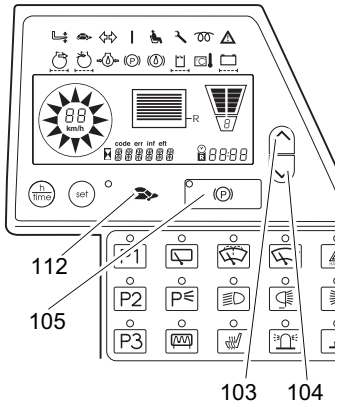
▶ Tilt the mast back and raise the fork carriage approx. 200 mm.

▶ Make sure you have enough visibility when reversing.

Travel

Requirements

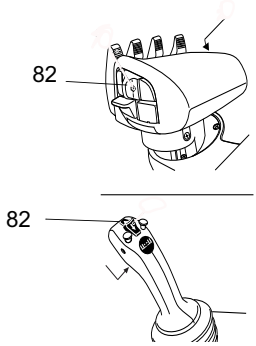
– Truck prepared for operation, (see "Preparing the truck for operation" on page 74).

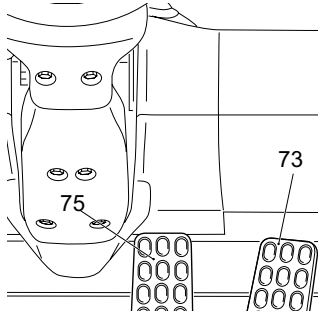


Procedure

- Release the parking brake, to do this press the parking brake button (105).
- Select the travel direction with the travel direction switch (82).
- Select the travel speed if necessary, to do this press the slow travel button (112) or the program select button (104/103).
- Raise the fork carriage approx. 200 mm.
- Tilt the mast back.
- Apply the accelerator pedal (73). The travel speed is governed by the accelerator (73).

The truck travels in the direction selected.

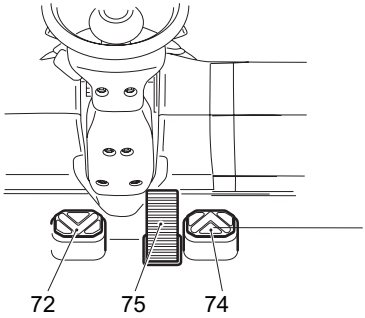




Neutral locking

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. The brake pedal must also be pressed briefly before a command from the accelerator pedal or the operating functions can be accepted.

Dual pedal (optional equipment)



Requirements

– Truck prepared for operation, (see "Preparing the truck for operation" on page 74)

Procedure

➔ For trucks with a dual pedal the travel direction is selected via the accelerator pedals (74;72). When the driver leaves the truck, the truck is automatically set to “Neutral”.

- To activate the accelerator pedal and the operating functions press the brake pedal briefly.
- Release the parking brake, to do this press the parking brake button (105).
- Raise the fork carriage approx. 200 mm.
- Tilt the mast back:
- Apply the accelerator pedal (74) to travel forward. The travel speed is governed by the accelerator (74).
- Apply the accelerator pedal (72) to reverse. The travel speed is governed by the accelerator (72).

The truck travels in the direction selected.

4.7 Steering

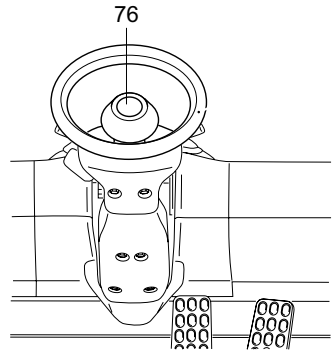
Steering

Procedure

Very little steering effort is required; you should therefore turn the steering wheel (76) 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.



4.8 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.

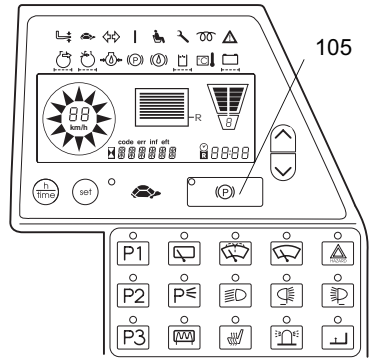
There are two ways of braking:

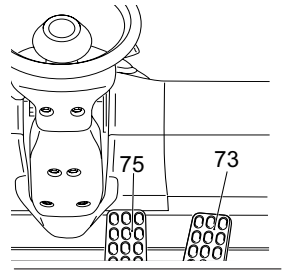
– Service brake

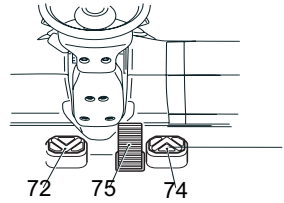
– Auxiliary brake (75)

and for secure parking:

– Parking brake (105)

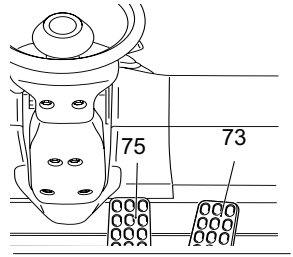






4.8.1 Service brake

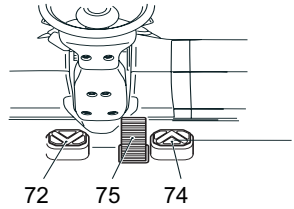
In normal travel mode you brake by throttling back using the accelerator pedal (72,73,74). The truck will brake hydrostatically depending on the travel program. This allows for sensitive metering of the brake force.



The parking brake automatically applies as soon as the truck comes to a halt.

Auxiliary brake:

Apply the brake pedal (75).



⚠ CAUTION!

When you apply the auxiliary brake (75) the full brake force is available.

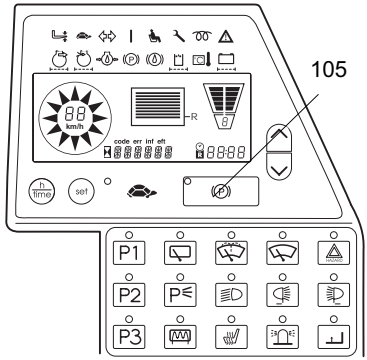
- ▶ The auxiliary brake must only be used for emergency braking.
- ▶ When the brake pedal is applied the truck will brake irrespective of the position of the accelerator pedal.
- ▶ There is a higher risk of accidents and injury.
- ▶ The operator must first familiarise himself with the auxiliary brake without load and at low speed.

4.8.2 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 halt at maximum force. This may cause the load to slide off the forks. There is an increased risk of accidents and injury!



The parking brake can be used as an emergency brake.

Procedure

- Apply the brake button (105).

The truck brakes at maximum hydrostatic force irrespective of the positions of the accelerator / brake pedals. The parking brake applies automatically as soon as the truck comes to a halt. The parking brake cannot be automatically released in this condition; instead the driver must keep pressing the brake button (105).

4.9 Adjusting the forks

⚠ WARNING!

Trapping hazard

There is a trapping hazard when you perform this operation.

▶ Wear work gloves and safety shoes.

⚠ WARNING!

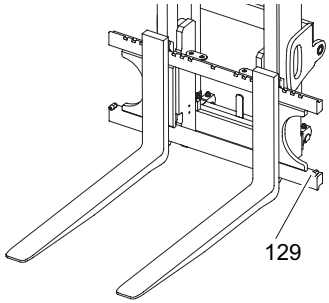
Unsecured and incorrectly adjusted forks can cause accidents

Before adjusting the forks make sure the retaining bolts (129) are fitted.

▶ Adjust the forks so that both forks are equidistant from the outside edge of the fork carriage.

▶ Engage the locking pin in a groove to prevent the forks from moving accidentally.

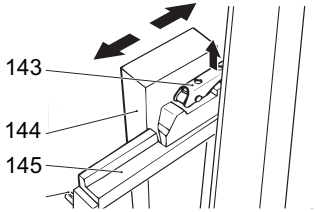
▶ The load centre of gravity must be located centrally between the forks.



Adjusting the forks

Requirements

– Park the truck securely, (see "Parking the truck securely" on page 78).



Procedure

- Lift up the locking lever (143).
- Push the forks (144) into the correct position on the fork carriage (145).

To lift the load securely, the forks (144) 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 (144).

- Lift the locking lever down (143) and move the forks until the locking pin engages in a slot.

The forks are now adjusted.

4.10 Replacing the forks

⚠ WARNING!

Risk of injury

You can injure your legs when replacing the forks.

▶ Never pull the forks towards your body.

▶ Always push the forks away from your body.

▶ Secure heavy forks with lifting slings and a crane before pushing them down from the fork carriage.

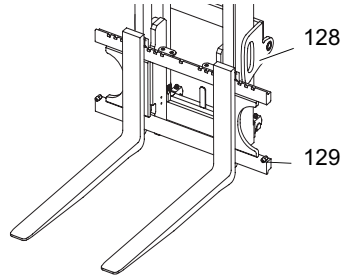
▶ After replacing the forks fit the retaining bolts (129) and make sure the bolts are seated correctly. Retaining bolt torque: 85 Nm.

⚠ WARNING!

Trapping hazard

There is a trapping hazard when you perform this operation.

▶ Wear work gloves and safety shoes.



Replacing the forks

Requirements

– Load handler lowered and forks not touching the ground.

Procedure

- Disassemble the retaining bolts (129).
- Loosen the fork stop (128).
- Carefully push the forks off the fork carriage.

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

4.11 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.

4.12 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.

4.12.1 Operating the lift mechanism with the SOLO PILOT

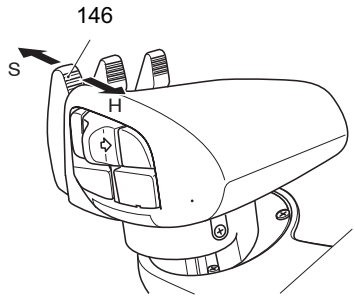
Lifting and lowering

Requirements

– To prepare the truck for operation, (see "Preparing the truck for operation" on page 74)

Procedure

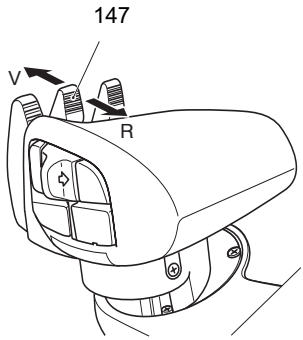
- Pull the Solo-Pilot lever (146) in direction H to raise the load.
- Push the Solo-Pilot lever (146)in direction S to lower the load.



The load is now raised / lowered.

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

Tilting the mast forward / backward



Requirements

– To prepare the truck for operation, (see "Preparing the truck for operation" on page 74)

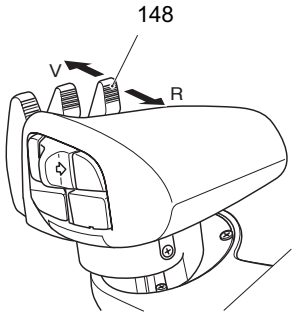
Procedure

- Pull the Solo-Pilot lever (147) in direction R to tilt the mast back.
- Push the Solo-Pilot lever (147) in direction V to tilt the mast forward.

The mast is now tilted back / forward.

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

Positioning the integrated sideshift (option)



Requirements

– To prepare the truck for operation, (see "Preparing the truck for operation" on page 74)

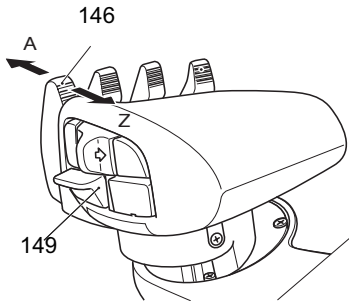
Procedure

- Pull the Solo-Pilot lever (148) in direction R to move the load handler to the right (from the driver's viewpoint).
- Push the Solo-Pilot lever (148) in direction V to move the load handler to the left (from the driver's viewpoint).

The sideshifter is now positioned.

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

Positioning the forks with an integrated fork adjuster (option)



⚠ CAUTION!

Do not use the fork adjuster to clamp loads.

Requirements

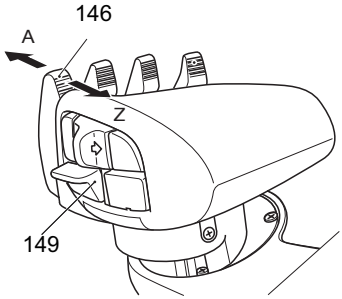
– To prepare the truck for operation, (see "Preparing the truck for operation" on page 74)

Procedure

- Press the toggle switch (149) and at the same time pull the Solo Pilot (146) in direction Z: the forks will move towards each other.
- Press the toggle switch (149) and at the same time push the Solo Pilot (146) in direction A: the forks will spread apart.

The forks are now positioned.

Synchronising the alignment of the forks with an integrated fork adjuster (option)



Requirements

– To prepare the truck for operation, (see "Preparing the truck for operation" on page 74)

– The forks are no longer aligned.

Procedure

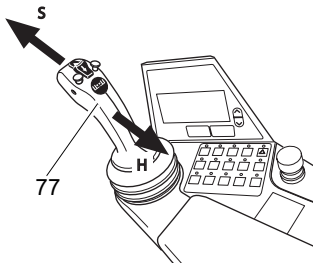
- Press the toggle switch (149) and at the same time push the Solo Pilot (146) in direction A and spread the forks apart as far as they will go.
- Press the toggle switch (149) and at the same time pull the Solo Pilot (146) in direction Z and bring the forks as close to each other as they will go.

The forks are now synchronised.

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

4.12.2 Operating the lift mechanism with the Multi Pilot

Lifting and lowering



Requirements

– To prepare the truck for operation, (see "Preparing the truck for operation" on page 74)

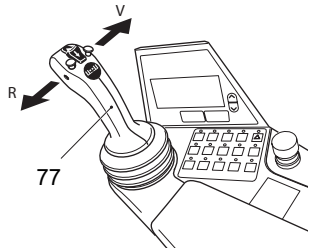
Procedure

- Pull the Multi-Pilot (77) in direction H to raise the load.
- Push the Multi Pilot (77) in direction S to lower the load.

The load is now raised / lowered.

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

Tilting the mast forward / backward



Requirements

– Truck prepared for operation, (see "Preparing the truck for operation" on page 74).

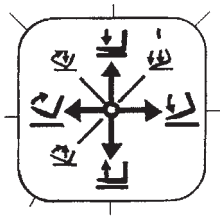
Procedure

- Push the Multi-Pilot lever (77) in direction V to tilt the mast forward.
- Push the Multi-Pilot lever (77) in direction R to tilt the mast back.

The mast is now tilted back / forward.

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

Twin operation



Requirements

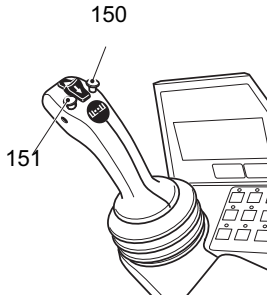
– To prepare the truck for operation, (see "Preparing the truck for operation" on page 74)

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.

Positioning the integrated sideshift (option)



Requirements

– Truck prepared for operation, (see "Preparing the truck for operation" on page 74).

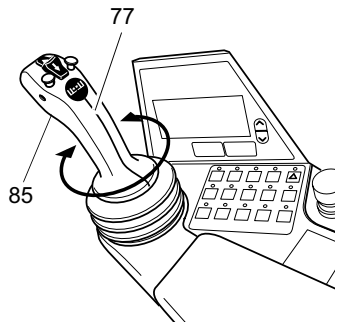
Procedure

- Press the (150) button to move the load handler to the right (from the driver's viewpoint).
- Press the (151) button to move the load handler to the left (from the driver's viewpoint).

The sideshifter is now positioned.

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

Positioning the forks with an integrated fork adjuster (option)



⚠ CAUTION!

Do not use the fork adjuster to clamp loads.

Requirements

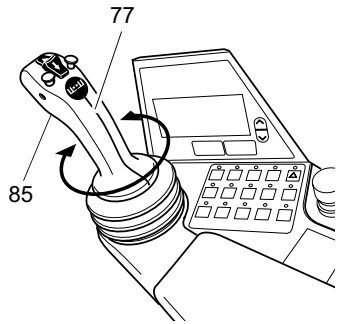
– To prepare the truck for operation, (see "Preparing the truck for operation" on page 74)

Procedure

- Press the (85) button and at the same time turn the Multi Pilot (77) anti-clockwise, the forks will spread apart.
- Press the (85) button and at the same time turn the Multi Pilot (77) anti-clockwise, the forks will move together.

The forks are now positioned.

Synchronising the alignment of the forks with an integrated fork adjuster (option)



Requirements

– To prepare the truck for operation, (see "Preparing the truck for operation" on page 74)

– The forks are no longer aligned.

Procedure

- Press the (85) button and at the same time turn the Multi Pilot (77) anti-clockwise, the forks will spread apart.
- Press the (85) button and at the same time turn the Multi Pilot (77) anti-clockwise, the forks will move together.

The forks are now synchronised.

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

4.13 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 indicated with ZH1 and .
Auxiliary hydraulic functions for exchangeable equipment are fitted with replacement couplings on the fork carriage. To fit exchangeable equipment (see "Fitting additional attachments" on page 102).

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 will auxiliary hydraulics ZH1 or .

▶ 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 102).

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 63), in particular attention check the fork carriage, mast rails and mast rollers for damage.

Safety notices 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 63), 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.

4.14 Operating additional attachments for the SOLO-PILOT

⚠ WARNING!

Incorrect symbols can cause accidents

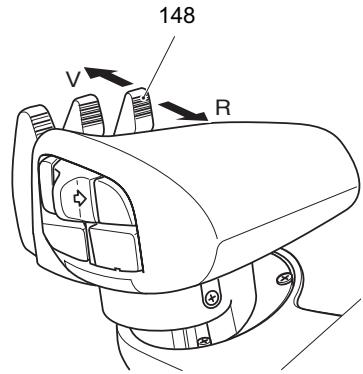
Symbols on controls that do not depict the function of the attachments can cause accidents.

▶ 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.

4.14.1 Solo Pilot with control of ZH1 hydraulic port

Depending on the attachments used the lever (148) is assigned the function of the attachment. Levers that are not required are void. For connections (see "Fitting additional attachments" on page 102).



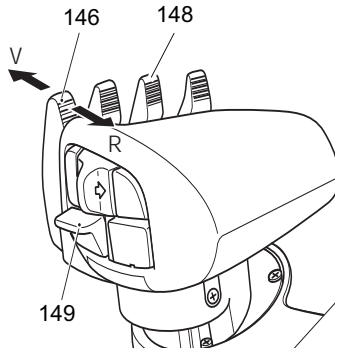
Procedure

- Operating the hydraulic port ZH1:
  Move the lever (148) in direction V or R.

The attachment's function is performed.

4.14.2 Solo Pilot with control of ZH1 and ZH2 hydraulic ports

Depending on the attachments used the lever / button (146, 148, 149) is assigned the function of the attachment. Levers that are not required are void. For connections (see "Fitting additional attachments" on page 102).



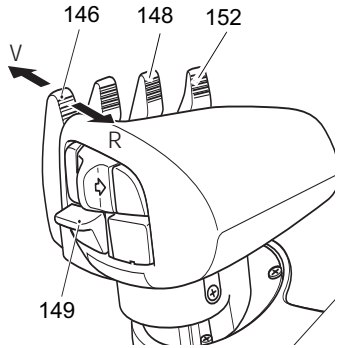
Procedure

- Operating the hydraulic port ZH1:
  Move the lever (148) in direction V or R.
- Operating the hydraulic port ZH2:
  Press the toggle switch (149) and at the same time move the lever (146) in the V or R direction.

The attachment's function is performed.

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

Depending on the attachments used the levers / buttons (146, 148, 149, 152) are assigned the respective functions. Levers that are not required are void. For connections (see "Fitting additional attachments" on page 102).



Procedure

- Operating the hydraulic port ZH1:
  Move the lever (148) in direction V or R.
- Operating the hydraulic port ZH2:
  Move the lever (152) in direction V or R.
- Operating the hydraulic port ZH3:
  Press the toggle switch (149) and at the same time move the lever (146) in the V or R direction.

The attachment's function is performed.

4.15 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.

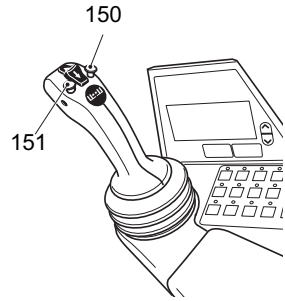
4.15.1 Multi Pilot with control of ZH1 hydraulic port

Depending on the attachments used the buttons (150, 151) are assigned the function of the attachment. Levers that are not required are void. For connections (see "Fitting additional attachments" on page 102).

Procedure

- Operating the hydraulic port ZH1:
  Press button (150) or button (151).

The attachment's function is performed.



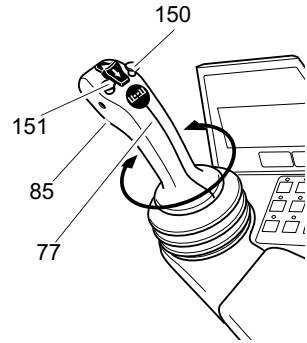
4.15.2 Multi Pilot with control of ZH1 and ZH2 hydraulic ports

Depending on the attachments used the buttons (150, 151) and the lever (77) are assigned the function of the attachment. Levers that are not required are void. For connections (see "Fitting additional attachments" on page 102).

Procedure

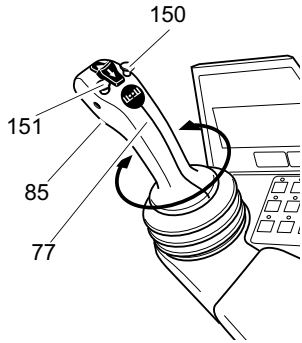
- Operating hydraulic port ZH1:
  Press button (150) or button (151).
- Operating hydraulic port ZH2:
  Set the MULTI-PILOT (77) to neutral and then turn it clockwise or anti-clockwise while at the same time pressing the button (85).

The attachment performs its operation.



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

Depending on the attachments used the buttons (150, 151, 85) and the lever (77) are assigned the function of the attachment. Levers that are not required are void. For connections (see "Fitting additional attachments" on page 102).



Procedure

- Operating the hydraulic port ZH1:
  Press button (150) or button (151).
- Operating the hydraulic port ZH2:
  Turn the Multi Pilot (77) clockwise or anti-clockwise.
- Operating the hydraulic port ZH3:
  Set the Multi Pilot (77) to neutral and then turn it clockwise or anti-clockwise while at the same time pressing the button (85).

The attachment's function is performed.

4.16 Fitting additional attachments

⚠ WARNING!

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.

Connecting attachments hydraulically

Requirements

– Non-pressurised hydraulic hoses.

– The exchange ports on the truck are marked ZH1 and .

– 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 their function.

The attachment is now hydraulically connected.

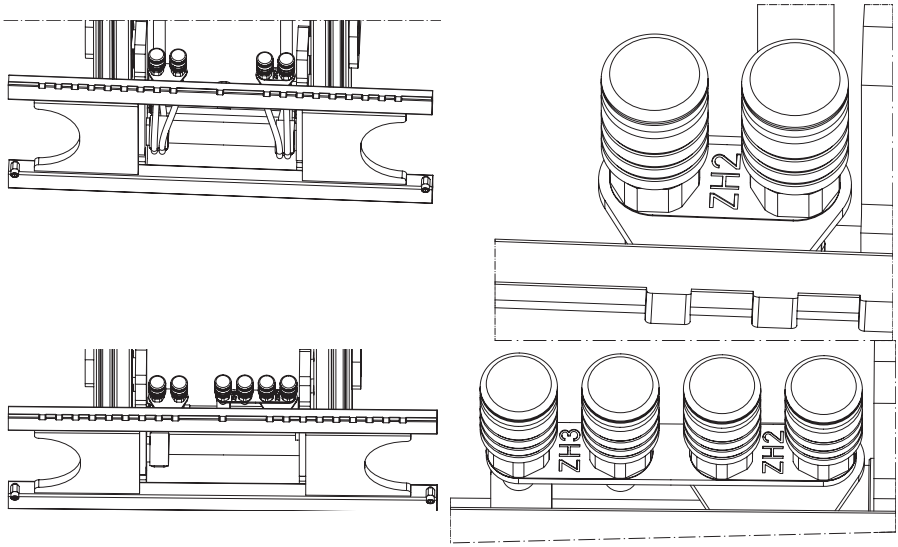
⚠ WARNING!

Hydraulic ports for clamping attachments

▶ Clamping attachments may only be added to trucks which have a button to enable additional hydraulic functions.

▶ On trucks with auxiliary hydraulics ZH2 the clamping function should only be attached to the coupling pair marked ZH2.

▶ On trucks with auxiliary hydraulics ZH3 the clamping function should only be attached to the coupling pair marked ZH3.



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.

5 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 29). 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

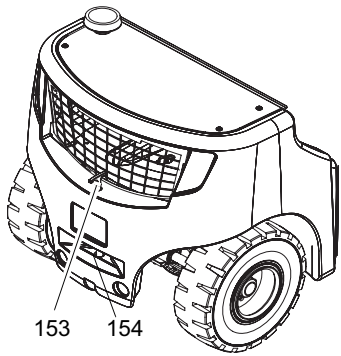
– Truck and trailer are on a level surface.

– Trailer prevented from rolling away.

Procedure

- Push the tow pin (153) down and turn it 90°.
- Pull the tow pin up and insert the tiller of the trailer into the opening.
- Insert the tow pin, push it down, turn it 90 degrees and engage it.

The trailer is now attached to the truck.



To additionally ensure safe operation, the truck can be fitted with an electrical connection for trailers with lighting.

6 Optional equipment

6.1 Assistance systems

The Access, Drive and Lift Control systems help the driver operate the truck with regard to safety regulations, (see "Safety regulations for truck operation" on page 72) " of the present operating instructions.

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.

6.1.1 Access Control

The truck is only released for operation if:

1) The driver is sitting on the seat.
2) The truck is switched on via the key switch (ISM ○ / Can Code ○).
3) He is wearing the seat belt.

➔ If the driver vacates the seat for a short while and the truck is not in the "neutral lock" position ((see "Travel" on page 80)), the truck can be operated again when he returns (seat occupied) and puts the seat belt back on again, without having to apply the key switch again.

➔ If travel is not enabled, the seat switch indicator lights up (98). Items 1 to 3 must be performed again in the order listed.

6.1.2 Drive Control

This option restricts the travel speed of the truck irrespective of the steer angle. Beyond a factory set lift height (approx. 1.50m) the maximum speed is restricted to walking pace (approx. 3 km/h) and the slow travel indicator is activated. When the mast drops below this height again, the travel speed picks up at reduced acceleration level to the speed set by the accelerator pedal to prevent unexpected sudden acceleration when changing from slow travel to normal travel. Normal acceleration is then only activated again when the speed set by the accelerator pedal is achieved or if the accelerator pedal is set to the 0 position.

In addition to the daily checks before starting, (see "Checks and operations to be performed before starting daily operation" on page 63) the driver must carry out the following checks:

– Lift the empty load handler beyond the reference lift height and check if the slow travel display lights up.
– Steering at idle: check if the steering wheel display is working.

6.1.3 Lift Control

This option includes Drive Control and also monitors and controls the mast functions:

Tilt speed reduction as a function of the lift height (from approx. 1.5 m lift height).
– If the load handler is lowered below the limit height, the tilt speed increases up to the level specified by the control lever.

Optional:
– Tilt angle display.

In addition to the daily checks before starting, the driver must carry out the following checks:

Procedure
- Lift the empty load handler beyond the reference lift height and check if the slow travel display lights up and the tilt speed is clearly reduced.
- Steering at idle: check if the steering wheel display is working.
- Check the tilt angle display by tilting forward and back.

6.2 Steel cab

For trucks fitted with a steel cabin, both doors can be closed.

⚠ CAUTION!

An open door can cause accidents (155)

▶ Do not travel with an open door (155). When opening the door make sure there is nobody in the door's swing range.

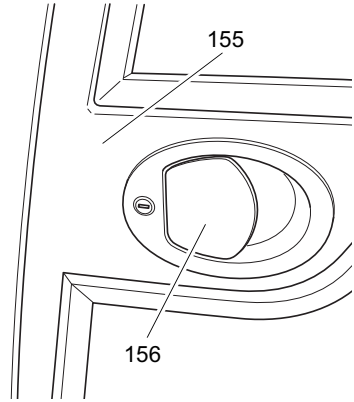
▶ Always close the door tightly and make sure it is locked.

▶ Closing the door does not release the driver from his responsibility to wear a seat belt, (see "Seat Belt" on page 71).

Opening and closing the door

Procedure

- To unlock the cabin door turn the key anti-clockwise.
- To lock the cabin door turn the key clockwise.
- To open the cabin door, unlock the door and pull out the handle (156).



6.3 Sliding windows

⚠ CAUTION!

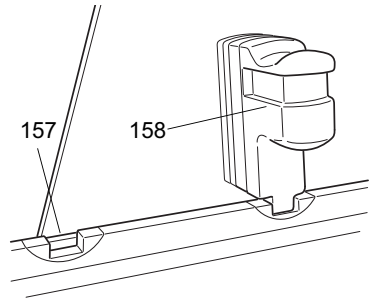
An unlocked sliding window can cause accidents

▶ The sliding windows must be locked at all times.

Opening and closing the windows

Procedure

- Push the lock (158) up.
- Move the window forward or back.
- Insert the lock in the stop (157).

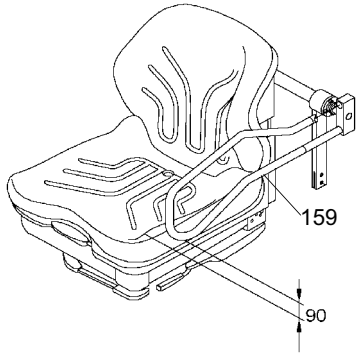


6.4 Automatic / mechanical folding gate

⚠ CAUTION!

A faulty folding gate can cause accidents

- ▶ Never use the truck with a non-functional folding gate. Have the folding gate checked by authorised specialist personnel after an accident. Do not modify the folding gate.
- ▶ Always close the folding gate tightly and make sure it is locked.
- ▶ Closing the folding gate does not release the driver from his responsibility to wear a seat belt, (see "Seat Belt" on page 71).
- ▶ When the driver's seat is occupied, maintain a 90 mm gap between the gate (159) and the seat to ensure safety.



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.

Mechanical folding gate operation

Procedure

- To open, push the left gate in and at the same time lift it up.
- When the gate is released, it automatically moves forward and locks in position.

Automatic folding gate operation

Procedure

- To open, push the left gate in and at the same time lift it up. This prevents the truck from travelling.
- Travel is activated again when the system has been closed.

6.5 Panel door

⚠ CAUTION!

An open door can cause accidents (155)

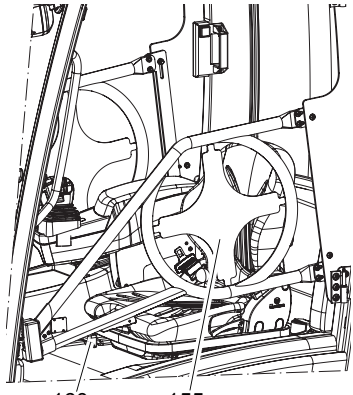
▶ Do not travel with an open door (155). When opening the door make sure there is nobody in the door's swing range.

▶ Always close the door tightly and make sure it is locked.

▶ Closing the door does not release the driver from his responsibility to wear a seat belt, (see "Seat Belt" on page 71).

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.



Requirements

– On trucks with a door monitoring sensor, travel is only enabled when the panel door is closed (○).

Procedure

- Pull the handle (160) towards the operator position, the door swings open.
- Pull the door (155) towards the driver; the door closes.

6.6 Operator position extension

⚠ DANGER!

Altering the tilt resistance can be dangerous

The lateral tilt resistance reduces with a higher truck centre of gravity.

The height above the overhead guardincreases by 300 mm.

▶ Adapt the travel speed, in particular when cornering.

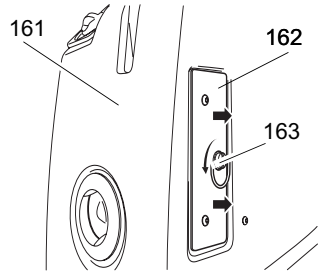
For entry and exit (see "Entry and exit" on page 65).

6.7 Heating and air conditioning system

Replacing the air conditioning filter

Procedure

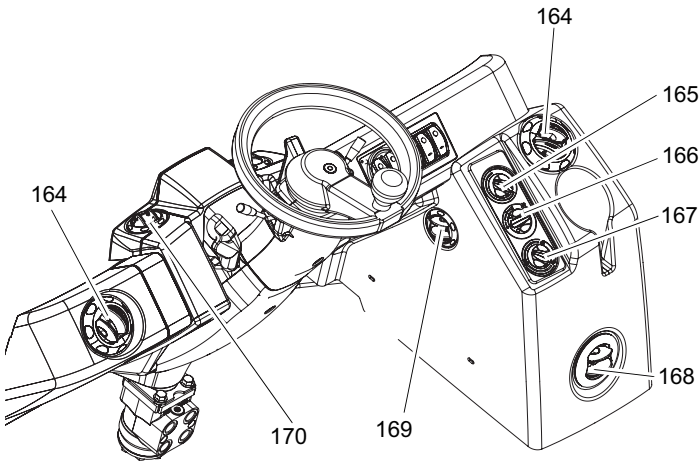
- Turn the twist off knob (163) anti-clockwise.
- Pull the filter cassette (162) out in the direction of the arrow.
- Replace the filter
- Insert the filter cassette (162) into the heating console (161).
- Turn the twist-off knob anti-clockwise.



The filter cassette has been replaced and locked.

➔ Check the filter after 500 service hours and replace it at the latest after 1000 service hours.

6.7.1 Heating



Item	Description	Item	Description
164	Body jets	168	Recirculating air flap: Recirculates the air in the cab
165	Temperature controller	169	Foot compartment jet
166	Fan settings	170	Windscreen jets
167	Air distribution control		

Heating operation

Procedure

- Press the switch (166) to switch on the fan.
- Set the nozzles (169,164 and 170) to the required position.
- Turn the temperature controller (165) to the right to increase the cab temperature.
- Turn the temperature controller (165) to the left to decrease the cab temperature.

➔ The air distribution is governed by the controller (167).

- Controller right – The entire airflow is directed to the front window (defrosting).
- Controller centre = The airflow is directed to the front window and the footwell.
- Controller left = The airflow is directed to the upper body of the operator and the footwell.

➔ At very low outer temperatures the heating level can be increased by opening the recirculating air flap (168).

6.7.2 Air conditioning system

⚠ CAUTION!

Extreme temperature differences can affect your health.

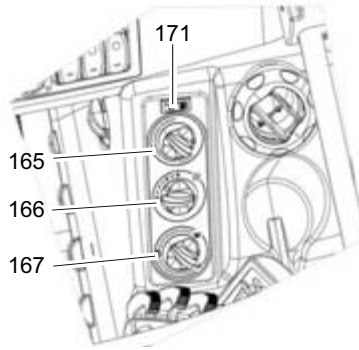
- ▶When using the air conditioning system make sure the temperature is no higher than 6°C more than the outside air temperature.
- ▶Keep the doors and windows closed when the air conditioning system is switched on.
- ▶Do not direct discharge jets at other people.
- ▶There should be no draft effect.

Power On and Off

Procedure

- Turn on the fan switch (166) and press the toggle switch (171) (green indicator goes on).
- To control the airflow ((see "Heating" on page 112)).
- Set the fan switch (166) to “0” and set the toggle switch (171) “OFF” (the green light will be off).

The air conditioning system switches off before the truck is parked.



Using the air conditioning system at high air humidity and temperature levels

Procedure

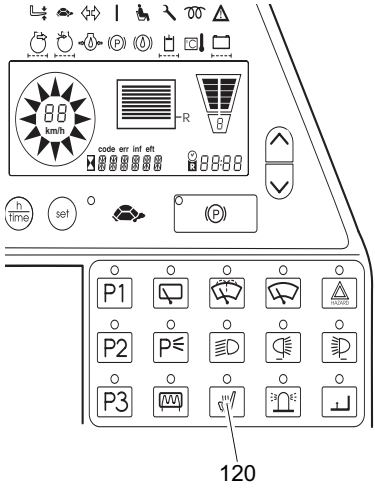
- Press the toggle switch (171).
- Distribute the air evenly through all discharge jets: Switch (167) in centre position.
- Set the fan (166) to its highest level.
- Set the temperature control (165) according to the outside temperature.
- Open the rear sliding window by one notch.
- Close the window again after de-humidifying.
- Set the airflow as required.

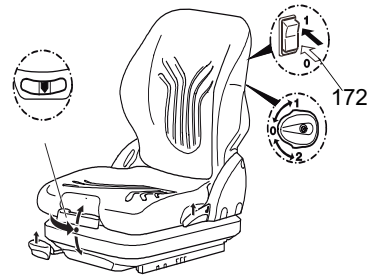
The air conditioning system must be switched on at least once a month for approx. 10 minutes to recirculate the refrigerant.

When the air conditioning system is operating condensation water may be visible underneath the truck.

The air conditioning system must be serviced annually or every 1000 service hours

6.8 Driver's seat heating / backrest extension





Heating the seat

Procedure

- Seat heating button (120).
- Press the switch (172): 1 = seat heating ON; 0 = seat heating OFF.

Adjusting the backrest extension

⚠ CAUTION!

Accident risk when adjusting the backrest during travel

▶Do not adjust the backrest extension while travelling.

Procedure

- The backrest extension height can be adjusted by changing the detent.
- Pull the backrest up and lock it in place to extend the backrest.
- Push the backrest down and lock it in place to shorten the backrest.

6.9 Removable load backrest

⚠ CAUTION!

Trapping hazard and heavy load backrest weight

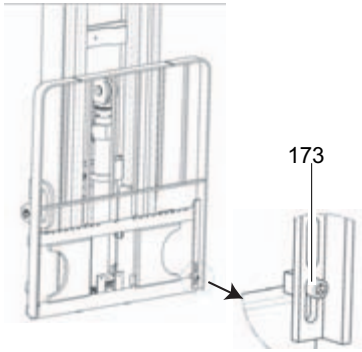
▶Wear safety gloves and safety shoes when carrying out this operation.

▶Two people are required to remove and attach the load backrest.

Load backrest disassembly

Procedure

- Loosen the screws (173)
- Remove the load backrest from the fork carriage and put it down securely.



Load backrest assembly

Procedure

- Attach the load backrest to the top rail of the fork carriage.
- Fit the bolts and tighten them with a torque wrench.

➔ Torque = 85 Nm

6.10 Lift cutout override

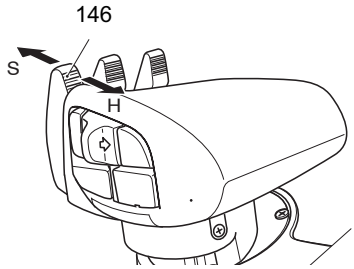
➔ A lift cutout device can be factory fitted when working in areas of restricted height. This interrupts lifting.

To continue lifting:

Procedure

- Press the lift cutout override button ((see "Control panel with display unit" on page 56) or (see "Control panel buttons" on page 59)).
- Pull the control lever (146): Lift cutout is deactivated.

➔ Lift cutout is re-activated each time the mast falls below the lift cutout height.

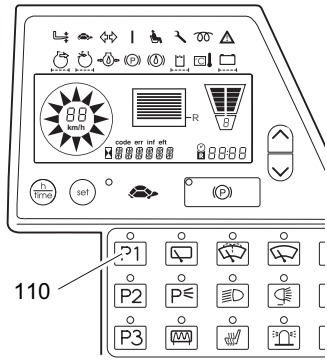


6.11 Sideshifter centre position

Automatic sideshifter centring control

Requirements

– Checks and operations performed before starting daily operation ((see "Checks and operations to be performed before starting daily operation" on page 63)).
– Check automatic sideshifter centring with the function key (110).



Procedure

- Depress the function key (110) and hold it in place. The sideshifter moves to the centre position.

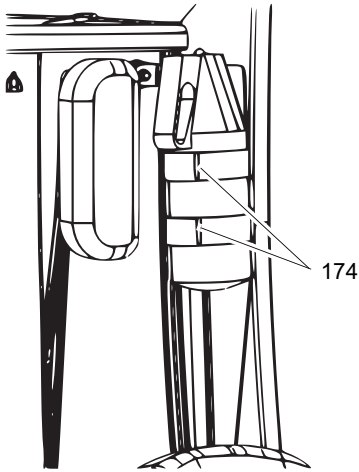
➔ Releasing the key interrupts the load movement.
The sideshifter is centred.

6.12 Fire extinguisher

Procedure

- Open the fasteners (174)
- Pull the fire extinguish out of its bracket

➔ To operate, refer to the illustrations on the fire extinguisher



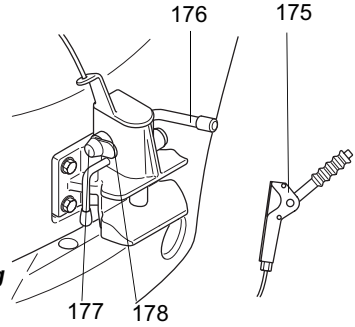
6.13 Rockinger coupling with hand lever or remote control

Refer to the instructions for towing trailers, (see "Towing trailers" on page 104).

⚠ CAUTION!

Incorrectly coupled trailers can cause accidents

- ▶ Make sure the coupling is engaged securely before starting the truck.
- ▶ The contro pin (177) must be flush with the control sleeve (178).



Rockinger coupling operation (attaching trailers)

Procedure

- Prevent the trailer from rolling away.
- Adjusting the trailer pull rod to the height of the coupling.
- Pull the hand lever (176) / remote control (175) (○) up.

The remote control (175) (○) is located in the overhead guard, depending on the truck model.

- Slowly reverse the truck until the coupling engages.
- Push the hand lever (176) / remote control (175) (○) down.

Rockinger coupling operation (disconnecting trailers)

Procedure

- Prevent the trailer from rolling away.
- Pull the hand lever (176) / remote control (175) (○) up.
- Drive the truck forward.
- Push the hand lever (176) / remote control (175) (○) down.

6.14 Camera system

⚠ CAUTION!

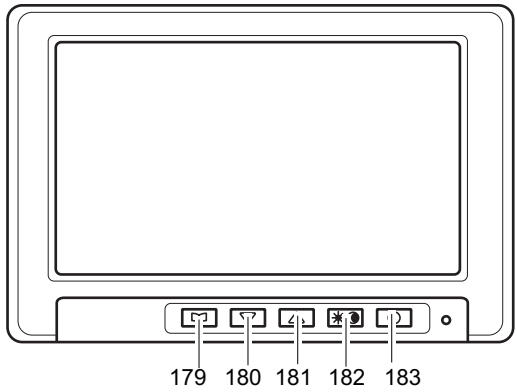
Accident risk from hidden work areas

▶ The camera system acts as an aid to assist safe operation.

▶ Practice travelling and working with the camera system.

▶ Align the camera so that the hidden work area can be seen.

When using the camera to reverse, the monitor automatically switches on when you engage reverse gear.



Using the camera system

– Press the button (183) on the monitor to switch the camera system on or off.
– Press the button (182) to lighten or darken the screen (day / night settings).
– Press the button (179) to open the menu.

Pressing the button several times changes the menu item (contrast, brightness, colour saturation, language, video, light reflection) or quits the menu.

Adjusting the menu items

– Press the button (181) to go one step forward.
– Press the button (180) to go one step back.

Clean a dirty screen or vent slots with a soft cloth or brush.

6.15 Optional equipment for working in dusty environments

When working in areas with high dust levels (lint, splinters) the truck can be fitted with an optional lint filter on the cooler.

⚠ CAUTION!

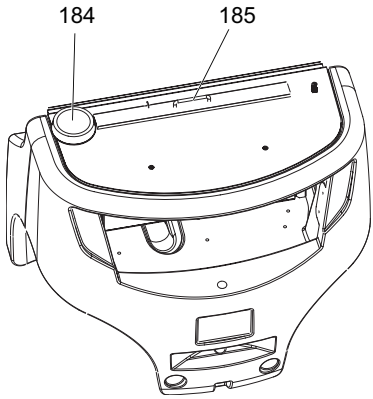
Clogged lint filters can cause fires

▶ The lint filter must be cleaned regularly according to how much it is clogged.

Procedure

- Tilt the gas bottle holder back (TFG only).
- Turn the quick release lock (184) to open it.
- Pull the lint mesh up by the handle (185) and clean it.
- Fit the lint mesh back and lock it.

You can continue travelling.



6.16 Roof window wiper

The roof window wiper is activated by pressing the switch in the dashboard.

Procedure

- Press switch to switch the roof window wiper on.
- Keep pressing the switch to turn the roof window wiper off.

6.17 Control layout “N”

⚠ WARNING!

Ensure there are no other people standing underneath the raised load and driver's cab.

▶ Do not stand on the load handler.

▶ Do not lift other people on the load handler.

▶ Instruct other people to move out of the hazardous area of the truck.

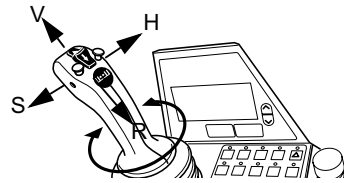
▶ Never stand underneath a raised and unsecured load handler / driver's cab.

With control layout “N”, the lift and tilt functions are swapped compared with the standard operation. The Multipilot must only be operated from the driver’s seat. The driver must be instructed in how to handle the lift mechanism and the attachments!

NOTE

▶ The lift/lower and tilt speeds are determined by the inclination of the Multipilot. Avoid placing the load unit down suddenly to avoid damaging the load and the racking.

Lifting



Procedure

- Push the Multipilot to the right (direction H) to raise the load.
- Push the Multipilot to the left (direction S) to lower the load.

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

Tilting

⚠ CAUTION!

Trapping hazard from inclined mast

▶ When tilting the mast back, keep all parts of your body from between the mast and the front wall.

Procedure

- Push the Multipilot forward (direction V) to tilt the load forward.
- Pull the Multipilot back (direction R) to tilt the load back.

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

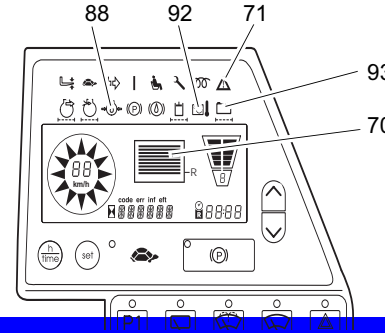
7 Troubleshooting

7.1 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

Operational fault displays



NOTE

When the overtemperature indicator (92) is lit the performance of the truck automatically reduces to 0% at a steady rate from the point of the temperature limit, as the temperature rises. The truck can still be taken to the nearest workshop.

NOTE

When the engine oil pressure display (88) is lit the engine must be switched off immediately.

▶ Tow the truck if necessary, (see "Towing the truck" on page 126).

▶ Contact the manufacturer's customer service department.

▶ The engine should only be started again once the fault has been removed.

Item	Display	Function
70	DFG fuel supply display TFG with gas tank	Graphic illustration of the fuel supply.
71	WARNING	– Lights up a single time to indicate that the fuel supply is too low. Lights up in conjunction with err xx xxx or inf xx xxx to indicate a fault or information. – A warning signal sounds.
88	Engine oil pressure display	– Engine oil pressure too low.
92	Overtemperature indicator	– Hydraulic oil temperature too high. – Coolant temperature too high. – As the temperature rises, the truck's performance is automatically and steadily reduced to 0%.
93	Charge current indicator	– Battery not charging. – The truck can still be taken to the nearest workshop.

Info messages

Display	Meaning
134	Hydraulics zero position on power up – A hydraulic function or the horn applied during power up. – The hydraulic function applied will not be performed.
156	– Recorded speed too high.

Display	Meaning
173	Parking brake released during initialisation – Parking brake must be activated, (see "Release the parking brake." on page 127).
186	Self test interrupted – The truck performs a self-test after the start (tests the controllers and motor). During this time the truck cannot move or lift.
191	Overtemperature – Hydraulic oil temperature too high. – Coolant temperature too high.
193	Anti-stall function active – The engine speed is too high, hydraulic functions will not be performed.

Fault	Possible Cause	Action
Starter does not turn	– Battery charge too low. – Battery connection cable loose or terminals oxidized. – Starter motor cable loose or broken, – Starter motor magnetic switch jammed. – Faulty fuse.	– Check battery charge, charge battery if necessary – Clean and grease terminals, tighten battery connection cable. – Check starter motor cable, tighten or replace as required – Check if the magnetic switch audibly engages. – Check the fuses.
Engine oil pressure indicator lit	– No oil pressure	– Check engine oil level, top up if necessary
Overtemperature indicator lit	– Hydraulic oil level too low – Cooler contaminated. – Coolant level too low.	– Check hydraulic oil, top up if necessary. – Clean radiator – Check engine radiator system for leaks, add coolant if necessary.
Engine running but truck does not travel	– Travel direction switch in neutral. – Parking brake applied.	– Set travel direction switch to required direction – Release the parking brake.
Truck does not reach max. speed	– Hydraulic reservoir oil level too low.	– Check hydraulic oil, top up if necessary.
Lift speed too low	– Hydraulic reservoir oil level too low. – Hydraulic reservoir discharge system contaminated or blocked.	– Check hydraulic oil, top up if necessary – 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.
Steering is sluggish	– Steering axle tyre pressure too low.	– Check tyre air pressure, increase to correct pressure 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 to the other.

Fault	Possible Cause	Action
Engine does not start	– Air filter contaminated.	– Clean / replace air filter.
DFG: Engine does not start	– Fuel tank empty, injection system has suctioned in air. – Water in fuel system – Fuel filter contaminated. – Paraffin separation from the diesel (flakes forming).	– Fill up with diesel and bleed the injection system – Drain the fuel system, fill up the truck and bleed the fuel system. – Check the fuel tank, if necessary replace the fuel filter. – Park the truck in a warm room and wait until the separation has returned to its original state. Replace the fuel filter if necessary. Add winter diesel.
TFG: Engine does not start	– LPG bottle shut-off valve closed – LPG bottle empty. – Spark plugs damp, oily or loose. – Spark plugs faulty	– Shut-off valve open. – Replace the LPG bottle. – Dry, clean and tighten spark plugs. – Replace the spark plugs.

7.2 Operating the truck without its own drive system

7.2.1 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.

Towing the truck

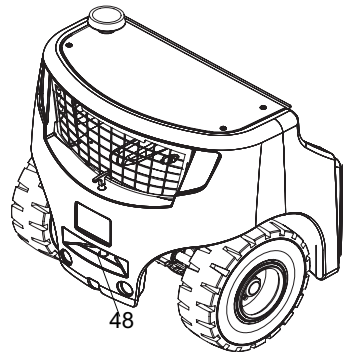
Requirements

– Park the truck securely.

Procedure

- Connect the pull rod to the trailer coupling (48) of the towing truck and attach it to the truck to be towed.
- Release the parking brake, (see "Release the parking brake." on page 127).
- Tow the truck to its destination.
- Apply the parking brake, (see "Release the parking brake." on page 127).
- Undo the tow connection.

The truck has now reached its destination.



7.2.2 Release the parking brake.

⚠ WARNING!

Uncontrolled truck movement

When the brakes are released the truck must be parked securely on a level surface, since the brakes are no longer effective.

▶ Do not release the parking brake on slopes or inclines.

▶ Apply the brake again when you reach your destination.

▶ Do not park the truck with the parking brake released.

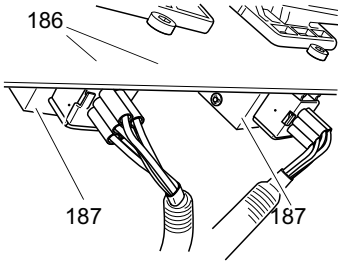
Releasing the Brake

Requirements

– Turn the Emergency Disconnect switch and key switch off.

– Prevent the truck from rolling away.

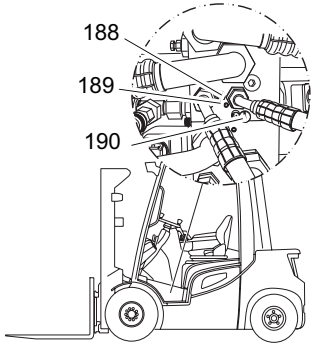
– Open the floor plate (186) by undoing the quick release locks and remove the plug connections (187).



Procedure

- Undo the setscrew on the valve block (188) a maximum of 1.5 turns.
- Fully insert the setscrew (189) (torque 2.5 Nm).
- Turn the steering wheel clockwise.
- Fully insert the setscrew (188) again (Torque 2.5 Nm).
- Turn the steering wheel back until the wheels are facing the required direction.
- Tow the truck to its destination using the pull rod.

The truck has now reached its destination.



Applying the parking brake

Procedure

- Remove the setscrew (189) from the stop of the cheese head screw (190)
- Assemble the floorboard.

Park the truck securely.

7.2.3 Emergency lowering

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

⚠ WARNING!

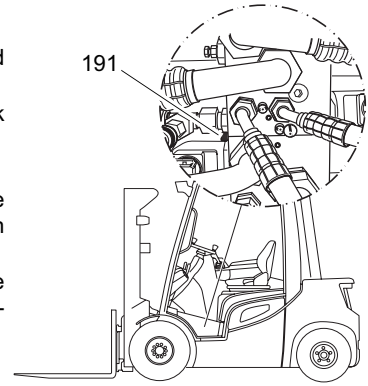
Lowering the mast can result in injuries

- ▶ 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

- Set the Emergency Disconnect switch and the key switch to the "O" position.
- Undo the setscrew (191) on the valve block by a maximum of 1.5 turns.
- The mast and load handler will lower slowly. If necessary the lowering speed can be reduced by turning clockwise or the load can be stopped.
- When the mast and the load handler have been lowered, torque the setscrew to 2.5 - 3.0 Nm.

The mast is now lowered.



⚠ WARNING!

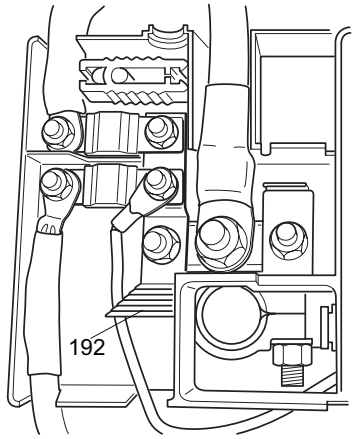
Only return the truck to service when you have identified and rectified the fault.

7.2.4 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 25 mm^2.



The jump start connection (192) is located in the main fuse box on the starter battery.

Procedure

- First connect the positive terminal of the feeder battery to the jump start connection (marked with the label in the engine compartment main fuse box) 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.
- To start the industrial truck switch on the ignition with the engine cover open.
- Press the bonnet switch override button once.
- Start the engine as normal.
- When the engine has started first remove the negative lead followed by the positive lead

If the starter motor does not switch on the engine 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 184)).

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

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 "Identification points and data plates" on page 29).
- ▶ 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

The truck must not be cleaned with flammable fluids.
If flammable materials are not removed from the engine compartment, they can come into contact with hot components and cause a fire.

- ▶ Carry out all necessary safety measures to prevent sparking before cleaning (e.g. by short-circuiting).
- ▶ Remove all deposits / accumulations of flammable materials from the engine compartment.

⚠ 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 184)).

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 78)).

▶ 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 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 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.

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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

➔ W maintenance interval operations are performed by the proprietor.

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

		Maintenance intervals			
		Standard = ●	W	A	B	C
Brakes						
1.1	Test the brakes.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Electrical system						
2.1	Test the warning and safety devices in accordance with operating instructions.				●	
2.2	Test the displays and controls.				●	
2.3	Test the lights.				●	
2.4	Test the panel switch and check for damage.	●				
2.5	Test the Emergency Disconnect switch.				●	
2.6	Check the contactors and/or relays.				●	
2.7	Check the fuse ratings.				●	
2.8	Check the electric wiring for damage [insulation damage, connections]. Make sure the wire connections are secure.				●	
Option						
2.9	Test the electrical auxiliary equipment and check for damage.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Power supply						
3.1	Check the fuel system, tank and lines for leaks and damage.				●	
3.2	Check the battery cable connections are secure, grease terminals if necessary.				●	
3.3	Check the battery and battery components.				●	
3.4	Check the battery voltage.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Travel						
4.1	Test the exhaust system and check for leaks and damage.				●	
4.2	Check the wheel motors and displacement pump for noise and leakage.				●	
4.3	Test the anti-freeze, top up if necessary.				●	
4.4	Replace the radiator fluid and anti-freeze.					●
4.5	Check the cooling system for leaks.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Travel						
4.6	Check the coolant level and top up if necessary.				●	
4.7	Test the hydraulic fans and check for leaks.				●	
4.8	Check and clean the radiator.				●	
4.9	Check the wheel suspension and attachment.				●	
4.10	Check the tyres for wear and damage.		●			
4.11	Check the tyre air pressure and top up if necessary.		●			
4.12	Check the air filter, replace if necessary.			●		
4.13	Replace the air filter.				●	
4.14	Replace the fuel filter.				●	
4.15	Test the fuel system and check for leaks and damage.				●	
4.16	Check the wheel motor attachments.				●	
4.17	Test the starter and generator, check the wires and attachment.				●	
4.18	Check V belt / multi-V belt is tensioned and check for damage.				●	
4.19	Replace the engine oil filter.				●	
4.20	Check the engine for noise and leakage.				●	
4.21	Replace the engine oil.				●	
4.22	Check the toothed belt**.				●	
4.23	Check the engine oil level, top up if necessary.		●			
4.24	Check the engine suspension.				●	
4.25	Check the glow plugs.				●	
4.26	Check the fuel/water separator and discharge if necessary.			●		
4.27	– The particle filter system check must only be performed by specialist personnel. Clean the particle filter in accordance with the manufacturer's instructions. Check and clean the components in accordance with the manufacturer's instructions.				●	
4.28	Check low pressure circuit suction filter			●		

**Attention: Replace the toothed belt every 3000 service hours and replace the water pump as well if necessary. Failure to do so could damage the engine.

		Maintenance intervals			
		Standard = ●	W	A	B	C
Chassis and Superstructure						
5.1	Check chassis and screw connections for damage.				●	
5.2	Check the doors and/or covers.		●			
5.3	Check labels are legible and complete.		●			
5.4	Check the attachment and setting function of the driver's seat.				●	
5.5	Check the engine compartment for contamination and clean if necessary.		●			
5.6	Check mast attachment / mounting.				●	
5.7	Check the trailer coupling or tow mechanism stops.				●	
5.8	Check the overhead guard and / or cab are secure and check for damage.		●			
5.9	Test the driver's seat restraint system and check for damage.				●	
Option						
5.10	Check that optional equipment such as mirrors, storage compartments, grips, windscreen wipers and washing systems etc. are working correctly and check for damage.				●	
5.11	Test the heating.				●	
5.12	Replace the heating breather.				●	
5.13	– The air conditioning system must only be serviced (every two years or 2000 service hours) by specialist personnel. Test the air conditioning and its settings and check its components for damage. Check the temperature reading at the outlet of the ventilation nozzles against manufacturer's ratings. Visually inspect the filter and replace if necessary.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Hydraulic Operation						
6.1	Test the hydraulic control and check it is assigned to the correct function.				●	
6.2	Check the hydraulic unit labels are legible and complete.				●	
6.3	Check the cylinders and piston rods for damage and leaks, and make sure they are secure.				●	
6.4	Check the running surfaces of the integral sideshifter and / or integral fork adjuster for wear and damage, and lubricate if necessary.			●		
6.5	Check the settings and wear levels of slide pieces and stops and adjust the slide pieces if necessary.				●	
6.6	Check the load chain setting and tension if necessary.				●	
6.7	Check the load chain lubrication and lubricate if necessary.		●			
6.8	Visually inspect the mast rollers. Check the wear on the running surfaces.				●	
6.9	Check the lateral clearance of the mast connections and the fork carriage.				●	
6.10	Check the running surfaces of the mast for wear and damage, and lubricate if necessary.		●			
6.11	Test the hydraulic system.				●	
6.12	Replace the hydraulic oil filter.				●	
6.13	Replace the hydraulic reservoir discharge lid.				●	
6.14	Check that hydraulic ports, hose and pipe lines are secure, check for leaks and damage.				●	
6.15	Check the hydraulic oil level and top up if necessary.		●			
6.16	Replace the hydraulic oil.					●
6.17	Test the relief valve and adjust if necessary.				●	
6.18	Check the forks and load handler for wear and damage.		●			
6.19	Test the sideshifter, check the settings and check for damage.				●	
6.20	Check the mast tilt.				●	
6.21	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.				●	
6.22	Check the tilt cylinders and mounting.				●	
6.23	Test the lowering speed.				●	
Option						
6.24	Test the operation and setting of the attachment.				●	
6.25	Check the attachment for damage.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Hydraulic Operation						
6.26	Check the attachment is properly secured to the truck and the supporting elements.				●	
6.27	Check bearing points, guides and stops for wear and damage, grease and clean these components.		●			
6.28	Check the hydraulic ports and tighten if necessary.				●	
6.29	Check the cylinder seals.				●	
6.30	Check the cylinder piston rods and bushings.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Agreed performance levels						
7.1	Carry out a test run with rated load.				●	
7.2	Demonstration after servicing.				●	
7.3	Lubricate the truck according to the lubrication schedule.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Steering						
8.1	Test the hydraulic steering and its components.				●	
8.2	Test the hydraulic steering for leaks.				●	
8.3	Check the steering axle and steering knuckle for wear and damage.				●	
8.4	Check the stub axle and adjust if necessary.				●	
8.5	Grease the steering axle.			●		
8.6	Check the steer axle wheel bearings, adjust if necessary.				●	
8.7	Check the mechanical parts of steering column.				●	

4.2 Maintenance checklist TFG

		Maintenance intervals			
		Standard = ●	W	A	B	C
Brakes						
1.1	Test the brakes.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Electrical system						
2.1	Test the warning and safety devices in accordance with operating instructions.				●	
2.2	Test the displays and controls.				●	
2.3	Test the lights.				●	
2.4	Test the panel switch and check for damage.	●				
2.5	Test the Emergency Disconnect switch.				●	
2.6	Check the contactors and/or relays.				●	
2.7	Check the fuse ratings.				●	
2.8	Check the electric wiring for damage [insulation damage, connections]. Make sure the wire connections are secure.				●	
Option						
2.9	Test the electrical auxiliary equipment and check for damage.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Power supply						
3.1	Check the battery cable connections are secure, grease terminals if necessary.				●	
3.2	Check the battery and battery components.				●	
3.3	Check the battery voltage.				●	
3.4	– The LPG system may only be inspected by LPG system experts. Test the LPG system and check for leaks and damage. Replace the LPG filter. Carry out final adjustments to the LPG system. Check the exhaust levels and adjust if necessary.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Travel						
4.1	Test the exhaust system and check for leaks and damage.				●	
4.2	Check the wheel motors and displacement pump for noise and leakage.				●	
4.3	Test the anti-freeze, top up if necessary.				●	
4.4	Replace the radiator fluid and anti-freeze.					●
4.5	Check the cooling system for leaks.				●	
4.6	Check the coolant level and top up if necessary.				●	
4.7	Test the hydraulic fans and check for leaks.				●	
4.8	Check and clean the radiator.				●	
4.9	Check the wheel suspension and attachment.				●	
4.10	Check the tyres for wear and damage.		●			
4.11	Check the tyre air pressure and top up if necessary.		●			
4.12	Check the air filter, replace if necessary.			●		
4.13	Replace the air filter.				●	
4.14	Check the wheel motor attachments.				●	
4.15	Test the starter and generator, check the wires and attachment.				●	
4.16	Check V belt / multi-V belt is tensioned and check for damage.				●	
4.17	Check the engine for noise and leakage.				●	
4.18	Check the engine suspension.				●	
4.19	Check the engine oil level, top up if necessary.		●			
4.20	Replace the engine oil filter.				●	
4.21	Replace the engine oil.				●	
4.22	Check the toothed belt**.				●	
4.23	Check all hose / pipe connections for damage			●		
4.24	Replace the spark plugs.				●	

**Attention: Replace the toothed belt every 3000 service hours and replace the water pump as well if necessary. Failure to do so could damage the engine.

		Maintenance intervals			
		Standard = ●	W	A	B	C
Chassis and Superstructure						
5.1	Check chassis and screw connections for damage.				●	
5.2	Check the doors and/or covers.		●			
5.3	Check labels are legible and complete.		●			
5.4	Check the attachment and setting function of the driver's seat.				●	
5.5	Check the engine compartment for contamination and clean if necessary.		●			
5.6	Check mast attachment / mounting.				●	
5.7	Check the trailer coupling or tow mechanism stops.				●	
5.8	Check the overhead guard and / or cab are secure and check for damage.		●			
5.9	Test the driver's seat restraint system and check for damage.				●	
Option						
5.10	Check that optional equipment such as mirrors, storage compartments, grips, windscreen wipers and washing systems etc. are working correctly and check for damage.				●	
5.11	Test the heating.				●	
5.12	Replace the heating breather.				●	
5.13	– The air conditioning system must only be serviced (every two years or 2000 service hours) by specialist personnel. Test the air conditioning and its settings and check its components for damage. Check the temperature reading at the outlet of the ventilation nozzles against manufacturer's ratings. Visually inspect the filter and replace if necessary.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Hydraulic Operation						
6.1	Test the hydraulic control and check it is assigned to the correct function.				●	
6.2	Check the hydraulic unit labels are legible and complete.				●	
6.3	Check the cylinders and piston rods for damage and leaks, and make sure they are secure.				●	
6.4	Check the running surfaces of the integral sideshifter and / or integral fork adjuster for wear and damage, and lubricate if necessary.			●		
6.5	Check the settings and wear levels of slide pieces and stops and adjust the slide pieces if necessary.				●	
6.6	Check the load chain setting and tension if necessary.				●	
6.7	Check the load chain lubrication and lubricate if necessary.		●			
6.8	Visually inspect the mast rollers. Check the wear on the running surfaces.				●	
6.9	Check the lateral clearance of the mast connections and the fork carriage.				●	
6.10	Check the running surfaces of the mast for wear and damage, and lubricate if necessary.		●			
6.11	Test the hydraulic system.				●	
6.12	Replace the hydraulic oil filter.				●	
6.13	Replace the hydraulic reservoir discharge lid.				●	
6.14	Check that hydraulic ports, hose and pipe lines are secure, check for leaks and damage.				●	
6.15	Check the hydraulic oil level and top up if necessary.		●			
6.16	Replace the hydraulic oil.					●
6.17	Test the relief valve and adjust if necessary.				●	
6.18	Check the forks and load handler for wear and damage.		●			
6.19	Test the sideshifter, check the settings and check for damage.				●	
6.20	Check the mast tilt.				●	
6.21	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.				●	
6.22	Check the tilt cylinders and mounting.				●	
6.23	Test the lowering speed.				●	
Option						
6.24	Test the operation and setting of the attachment.				●	
6.25	Check the attachment for damage.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Hydraulic Operation						
6.26	Check the attachment is properly secured to the truck and the supporting elements.				●	
6.27	Check bearing points, guides and stops for wear and damage, grease and clean these components.		●			
6.28	Check the hydraulic ports and tighten if necessary.				●	
6.29	Check the cylinder seals.				●	
6.30	Check the cylinder piston rods and bushings.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Agreed performance levels						
7.1	Carry out a test run with rated load.				●	
7.2	Demonstration after servicing.				●	
7.3	Lubricate the truck according to the lubrication schedule.				●	

		Maintenance intervals			
		Standard = ●	W	A	B	C
Steering						
8.1	Test the hydraulic steering and its components.				●	
8.2	Test the hydraulic steering for leaks.				●	
8.3	Check the steering axle and steering knuckle for wear and damage.				●	
8.4	Check the stub axle and adjust if necessary.				●	
8.5	Grease the steering axle.			●		
8.6	Check the steer axle wheel bearings, adjust if necessary.				●	
8.7	Check the mechanical parts of steering column.				●	

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

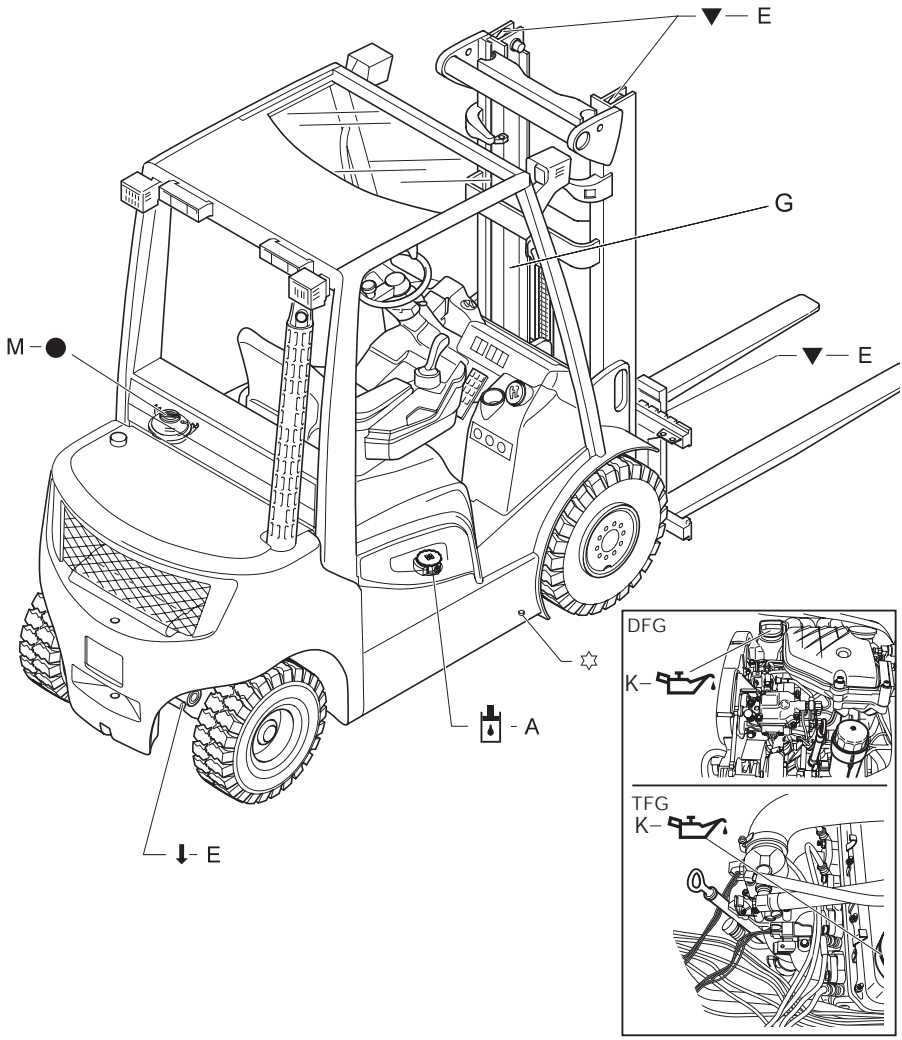
⚠ CAUTION!

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



▼	Contact surfaces	☼	Hydraulic oil drain plug
⬇	Grease nipple	●	Coolant filler cap
⛽	Hydraulic oil filler neck	≅	Engine oil filler neck

5.3 Consumables

Code	Order no.	Quantity	Capacity	Description	Used for
A	51037495 51037499	1 l 5 l	55 l	HVI Renolin B46	Hydraulic system
E	50055726	400 gr		Grease K-P-2K	Mast roller and sideshifter contact surfaces; steering axle
G	29201280	0.4 l		Chain spray	Chains
K	51073093	4.0 l	4.5 l	Titan GT 1 Longlife III SAE 5W-30	Engine oil
M	51118018	1 l	7.0 l	Fricofin G12 Plus	Coolant *

* The coolant consists of a 1:1 mixture ratio of Fricofin G12 Plus 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.

Grease guidelines

Code	Saponification	Dew point °C	Worked penetr. at 25°C	NLG1 class	Application temperature °C
E	Lithium	185	265-295	2	-35/+120

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.

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.

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.

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.

NOTE

Anti-freeze/water mixture ratio:

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

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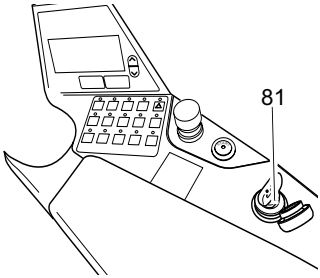
6 Maintenance and repairs

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 78).
- Fully lower the load handler.
- Remove the key from the key switch (81) to prevent the truck from being switched on accidentally.



⚠ 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 from lowering, tipping or sliding away.

▶When raising the truck, follow the instructions, (see "Lifting the truck by crane" on page 36). When working on the parking brake, prevent the truck from accidentally rolling away (e.g. with wedges).

6.2 Opening the rear panel

Opening the panel

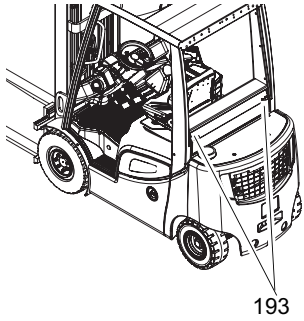
Requirements

– Prepare the truck for maintenance and repairs ((see "Preparing the truck for maintenance and repairs" on page 153)).

Procedure

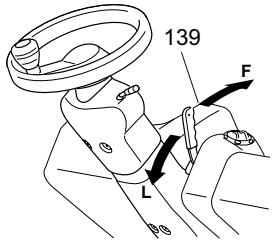
- Undo the two quick release fasteners (193).
  - Pull the rear panel back and remove it

The rear panel is now open. The fuses and other electrical components can now be reached.



6.3 Unlocking the engine bonnet

Unlocking the engine bonnet



Requirements

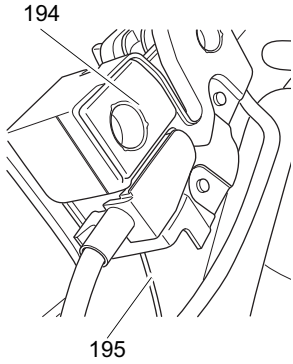
– For trucks with a closed cab open both cabin doors before lifting the engine cover (○).

Procedure

- Set the steering column to the parking position ((see "Adjusting the steering wheel / steering column" on page 69)).
- Tilt the backrest forward, move the driver's seat forward and lock it in position ((see "Adjusting the driver’s seat" on page 66)).
- Pull the lever (139) in the arrow direction (L) until the engine cover is unlocked.

The engine cover is now slightly open.

Engine cover emergency unlocking



Requirements

– The engine cover cannot be unlocked.

Procedure

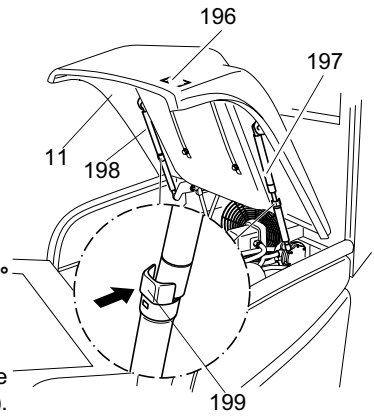
- Open the floor plate by undoing the quick release fasteners.
- Pull the cable (195) on the cover lock (194).
- Raise the engine cover until it engages in the first stage.

6.4 Opening the engine cover

NOTE

Opening the engine cover

▶ The engine panel can be locked in the 50° and 70° positions. The 50° position is locked by gas pressure spring (197) while the 70° position is locked by gas pressure spring (198).



Open the engine cover (11) as far as the 50° stage.

Requirements

– The engine cover is unlocked, (see "Unlocking the engine bonnet" on page 154).

Procedure

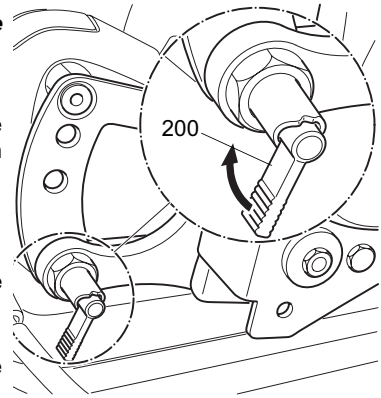
• Pull the engine cover up by the handle (196) and engage it in the lock (199) of the gas pressure spring (197).

The engine cover opens in the first stage.

Open the engine cover (11) as far as the 70° stage.

Requirements

– The engine cover is unlocked, (see "Unlocking the engine bonnet" on page 154).



Procedure

• Fold the backrest down.
• Move the armrest down, to do this pull the locking lever (200).
• Push the driver's seat forward.
• Push the lock (199) of the gas pressure spring (197) and unlock it.
• Pull the engine cover further up and engage it in the lock (199) of the gas pressure spring (198).

The engine cover is now open.

Closing the engine cover

Procedure

- Raise the engine cover slightly and hold it.
- From the 70° stage push in the red lock (199) of the right hand gas pressure spring. The engine cover is unlocked.
- Lower the engine cover as far as the 50° stage.
- Raise the engine cover again slightly.
- From the 50° stage push in the red lock (199) of the left hand gas pressure spring.
- Close the engine cover and make sure it is locked correctly.
- Move the backrest back, move the armrest up, push back and lock the driver’s seat.
- To adjust the seating positoin and steering wheel position to your requirements, (see "Adjusting the driver’s seat" on page 66).

6.5 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

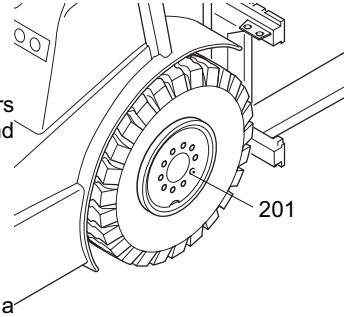
– Prepare the truck for maintenance and repairs ((see "Preparing the truck for maintenance and repairs" on page 153)).

Tools and Material Required

– Torque wrench

Procedure

• Torque the wheel nuts (201) crosswise with a torque wrench, for torques (see "Tyre type" on page 25).



The wheel attachment is now checked.

When using pneumatic tyres check the air pressure, for the air pressure (see "Tyre type" on page 25)

6.6 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

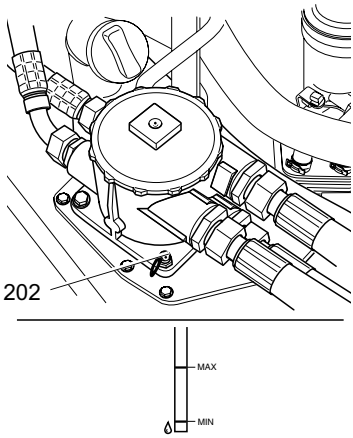
Used parts, oils and fuels must be disposed of in accordance with the relevant environmental protection regulations. To change the oil contact the manufacturer's customer service department, who have been specially trained for this task.

- ▶ Note the safety regulations when handling these materials.

6.6.1 Checking the hydraulic oil level

Requirements

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



Procedure

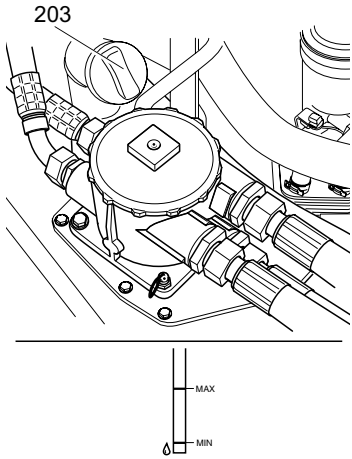
- Remove the hydraulic oil dipstick (202) from the hole wipe it with a clean cloth and insert it fully again.
- Remove the hydraulic oil dipstick and check the level of the hydraulic oil.

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.

- Add hydraulic oil if necessary.
- Repeat the test.
- When the oil level is correct, fully insert the hydraulic oil dipstick (202) again.

6.6.2 Adding hydraulic oil



Procedure

- Unscrew the filler cap (203).
- Add hydraulic oil in small amounts.

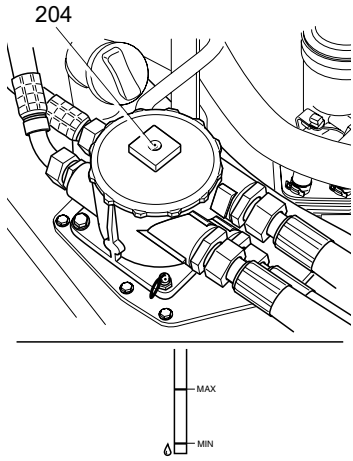
Use only approved hydraulic oil (see consumables table).

- Keep checking the hydraulic oil level with the dipstick until you have reached the correct oil level, (see "Checking the hydraulic oil level" on page 159)
- Screw the filler cap back on.
- Insert the hydraulic oil dipstick back in full.

6.6.3 Replacing the hydraulic oil filter

Procedure

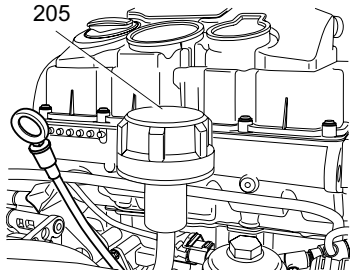
- Unscrew the cap of the hydraulic oil filter (204).
- Remove the filter from the cover.
- Insert a new filter and screw the lid back on.



6.6.4 Replacing the ventilation/discharge filter

Procedure

- Unscrew the ventilation/discharge filter (205).
- Visually inspect the filter.
- If contaminated insert a new filter.
- Screw the ventilation/discharge filter back on.



Collect any spilled hydraulic oil. Dispose of the hydraulic oil and hydraulic oil filter and fuel in accordance with environmental regulations.

6.7 Engine maintenance

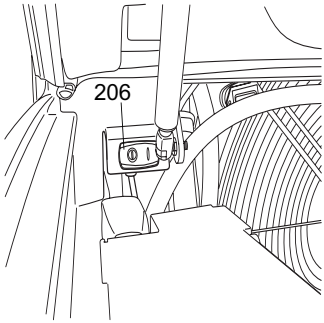
DANGER!

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.

6.7.1 Starting the engine with the cover open

The engine can only be started with the cover open in exceptional circumstances (e.g. jump starting).



Procedure

- Switching on the ignition
- Press the override switch (206) a single time.
- Start the engine (see "Preparing the truck for operation" on page 74).

6.7.2 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

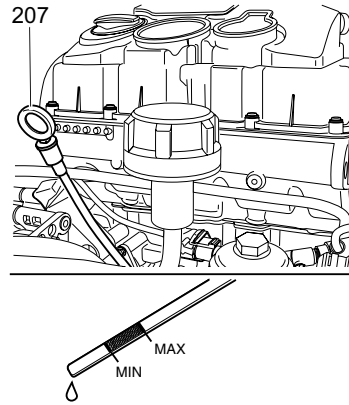
Requirements

– Park the truck on a level surface (see "Parking the truck securely" on page 78)

Procedure

- Remove the dipstick (207).
- Wipe the dipstick with a lint-free cloth and put in back fully into the port.
- Remove the dipstick again and check that the oil level is between the MIN and MAX markings.
- If the engine oil level is below the bottom MIN marking, add engine oil as per the consumables list ((see "Consumables" on page 151)).

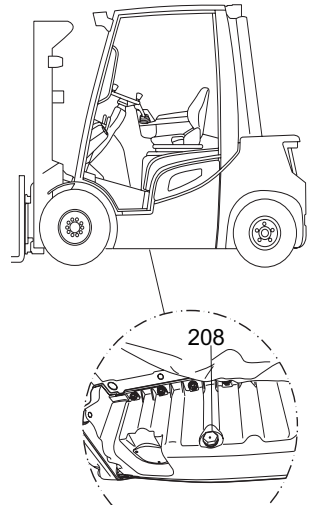
The engine oil has now been checked.



Draining the engine oil

Procedure

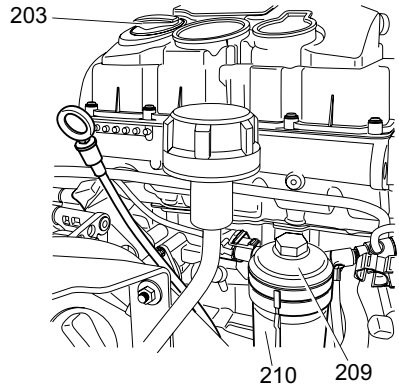
- Remove the floorboard.
- Unscrew the filler cap (203).
- Thoroughly clean the oil drain plug (208) and around the drain hole.
- Unscrew the oil drain plug.
- Collect any oil that emerges.
- Screw in the oil drain plug with a new seal (torque 30 Nm).



Replace the engine oil filter

Procedure

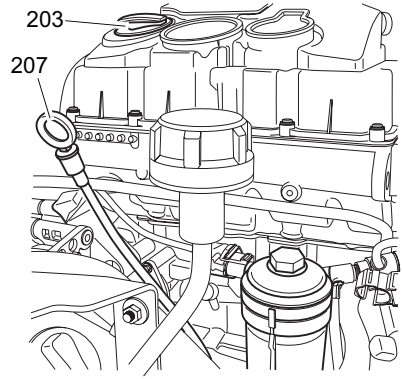
- Unscrew and remove the oil filter lid (209).
- Remove the oil filter from the oil filter housing (210).
- Collect any oil that emerges.
- Thoroughly clean the raised faces of the oil filter housing and oil filter lid.
- Insert a new oil filter in the oil filter housing.
- Apply a thin layer of oil to the seal of the oil filter lid.
- Torque the oil filter lid to 25 Nm.



Adding engine oil

Procedure

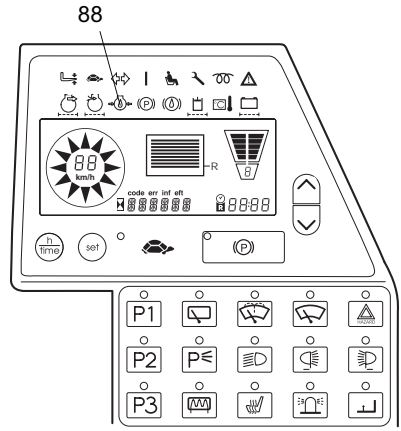
- Add fresh engine oil through the filler port (203) in accordance with the consumables table.
- Check the engine oil level with the dipstick (207) and top up if necessary, (see "Consumables" on page 151).
- Screw the filler cap back on.
- Attach the floor plate.



NOTE

The incorrect amount of oil will damage the engine.

- ▶ After replacing the oil and oil filter carry out a test run and check the oil pressure display (88).
- ▶ Check that the oil drain plug and oil filter housing are tight.



6.7.3 Replacing the fuel filter

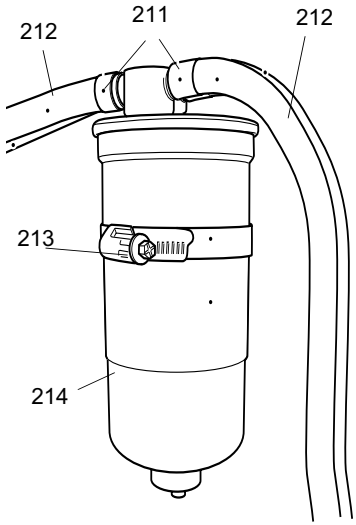
NOTE

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.

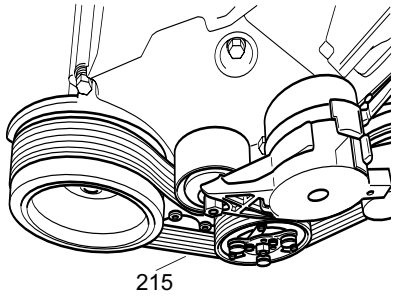
– Mark the fuel hoses (212) and loosen the clamps (211) from the fuel filter. Remove the cotter pin and take off the return lines.
– Slacken the collar screw (213) and take off the fuel filter (214).
– Fill the new fuel filter entirely with clean diesel and fit it with the collar screw (213).
– Reconnect the fuel hoses and tighten them with clamps or the cotter pin.



6.7.4 Check V-belt for damage

Procedure

• Check the V-belt (215) for cracks, deformation and wear.



NOTE

A damaged V-belt will result in malfunctions.

▶ If the V-belt is not in a suitable condition, you must only start to use the truck when the damage has been rectified.

6.7.5 TFG 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.

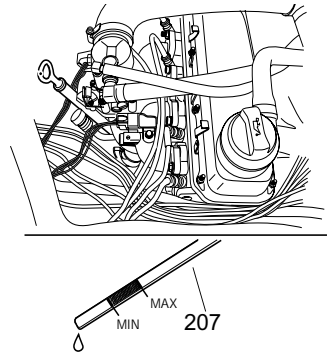
▶ Wear appropriate safety gloves when replacing the oil and oil filter.

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 78)

Procedure

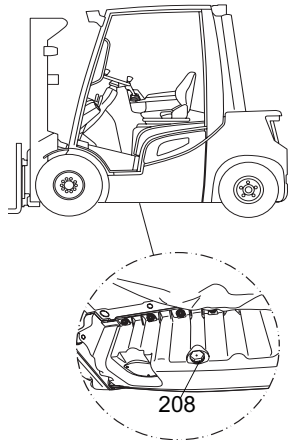
- Remove the dipstick (207).
- Wipe the dipstick with a lint-free cloth and put in back fully into the port.
- Remove the dipstick again and check that the oil level is between the MIN and MAX markings.
- If the engine oil level is below the bottom MIN marking, add engine oil as per the consumables list ((see "Consumables" on page 151)).

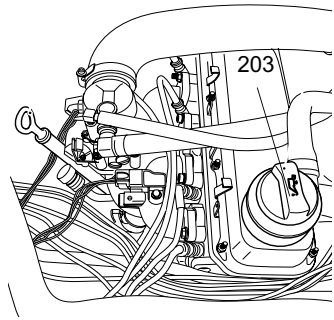
The engine oil has now been checked.

Draining the engine oil

Procedure

- Remove the floorboard.
- Unscrew the filler cap (203).
- Thoroughly clean the oil drain plug (208) and around the drain hole.
- Unscrew the oil drain plug.
- Collect any oil that emerges.
- Screw in the oil drain plug with a new seal (torque 30 Nm).

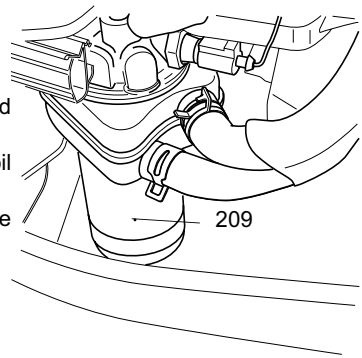




Replace the engine oil filter

Procedure

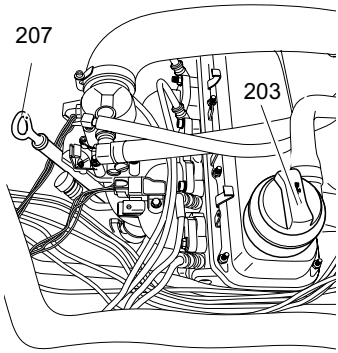
- Undo the oil filter (161) with a filter wrench and manually unscrew it.
- Thoroughly clean the sealing faces of the oil filter flange.
- Apply a thin layer of engine oil to the seal of the new oil filter.
- Hand-tighten the oil filter.



Adding engine oil

Procedure

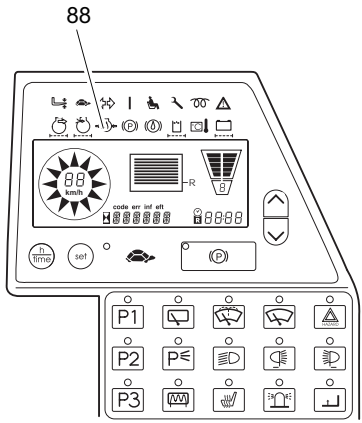
- Add fresh engine oil through the filler port (203) in accordance with the consumables table.
- Check the engine oil level with the dipstick (207) and top up if necessary, (see "Consumables" on page 151).
- Screw the filler cap back on.
- Attach the floor plate.



NOTE

The incorrect amount of oil will damage the engine.

- ▶ After replacing the oil and oil filter carry out a test run and check the oil pressure display (88).
- ▶ Check that the oil drain plug and oil filter housing are tight.

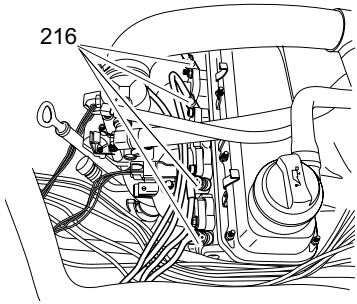


6.7.6 Replacing spark plugs

Procedure

- Remove spark plug connector (216).
- Thoroughly clean around the spark plugs on the cylinder head.
- Unscrew the spark plugs.
- Check the electrode distance of the new spark plugs with a feeler gauge.

  Rated value: 1.0 mm ± 0.1mm.
- Screw in the spark plugs by hand and then torque them to 25 Nm.



6.7.7 Check V-belt for damage

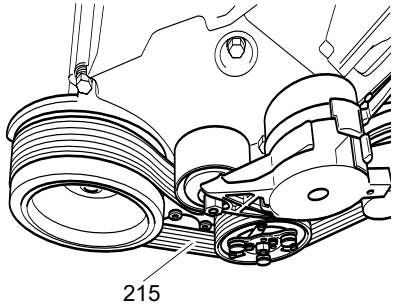
NOTE

A damaged V-belt will result in malfunctions.

▶ If the V-belt (215) is not in good condition, first rectify the damage before using the truck.

Procedure

- Check the V-belt (215) for cracks, deformation and wear.



6.7.8 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!

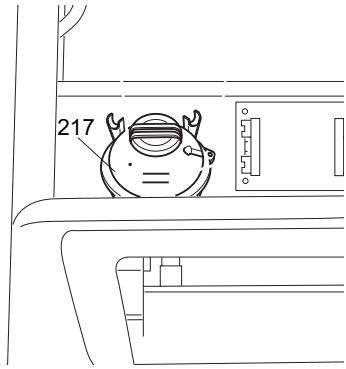
Hot coolant can cause injury

▶ 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

- Park the truck securely on a level surface.
- Open the rear bonnet locks and lift off the rear bonnet, (see "Opening the rear panel" on page 153).
- Check the coolant level on the expansion vessel (217).
- Fit the rear cover (218) and snap it back into position.

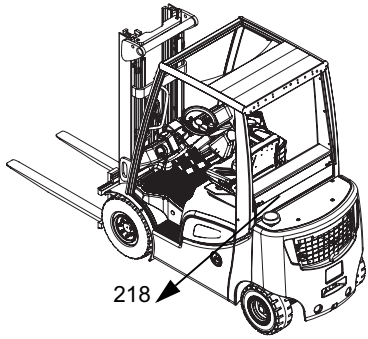


NOTE

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.

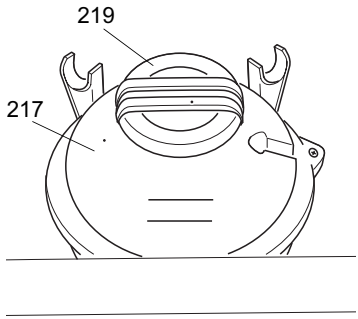
▶ Coolant can only be checked and added by experts.



Check the coolant concentrate

Tools and Material Required

– Anti-freeze tester for coolants



Procedure

- Slowly unscrew the filler cap (219) from the expansion vessel (217).
- Check the anti-freeze content of the coolant with an anti-freeze tester.

NOTE

The incorrect coolant concentration can cause malfunctions

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

- Remove minor contamination from the fan grille (220) with weak suctioned air.

⚠ CAUTION!

Risk of incorrect disassembly/assembly of fan unit

▶ Only trained personnel may remove major cooler contamination.

- Remove the four mounting screws (221) and washers and place the fan unit to the front.

➔ Take care not to bend or strain the fan unit hydraulic hoses in the process.

- Remove any contamination from the radiator and fan with weak suctioned air.
- Take care not to damage the cooler plates and the fan blades.

⚠ CAUTION!

A damaged cooler and fan can be dangerous

▶ Check the radiator and fan for damage.

▶ If the radiator or fan are damaged, only start to use the truck when the damage has been rectified.

Fan unit assembly

Procedure

- Mount the fan unit to its intended place with the four mounting screws.

➔ Make sure that the fan unit is installed centrally.

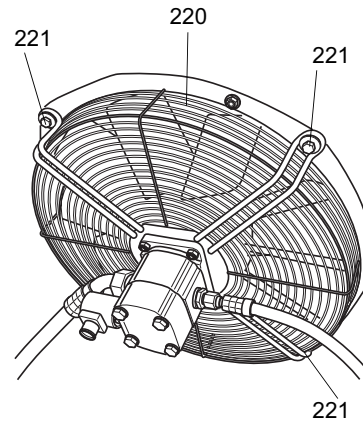
⚠ DANGER!

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 engine when the engine cover is closed.



6.7.9 Replace air filter cartridge

DANGER!

A running engine can be dangerous

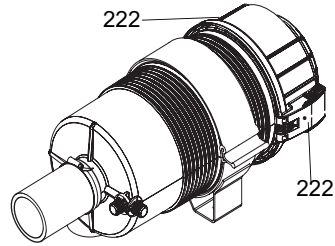
▶ Carry out all maintenance work with the engine switched off.

▶ Do not start the engine if the air filter cartridge is removed.

Replace air filter cartridge

Procedure

- Undo the 2 mounting clamps (222) and remove the dust collector pot.
- Carefully remove the air filter cartridge from the filter housing.



Cleaning the filter housing

Procedure

NOTE

A faulty engine can cause malfunctions

▶ Do not clean the air filter housing with compressed air.

▶ Always use a clean cloth to clean the air filter housing.

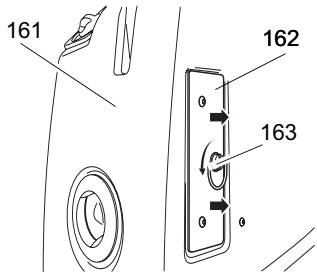
- Remove the air filter cartridge.
- Thoroughly clean the dust collector pot, to do this remove the dust extraction valve.
- Carefully clean the air filter housing with a clean cloth.

  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 rubber element back into the dust collector pot.
- Insert the dust collector pot and secure it with the 2 mounting clamps (222).

6.7.10 Heating and air conditioning system (○)

Replacing the air conditioning filter



Procedure

- Turn the twist off knob (163) anti-clockwise.
- Pull the filter cassette (162) out in the direction of the arrow.
- Replace the filter
- Insert the filter cassette (162) into the heating console (161).
- Turn the twist-off knob anti-clockwise.

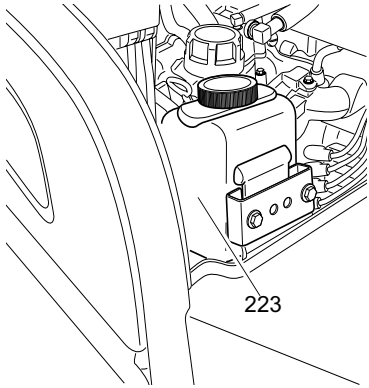
The filter cassette has been replaced and locked.

→ Check the filter after 500 service hours and replace it at the latest after 1000 service hours.

6.7.11 Adding window washer system fluid

Procedure

- Unlock the engine cover, (see "Unlocking the engine bonnet" on page 154).
- Make sure there is sufficient window fluid in the container (223).
- If necessary top up with anti-freeze.



→ Fill with weather-dependent additives.

6.8 Checking electrical fuses

Checking electrical fuses

Requirements

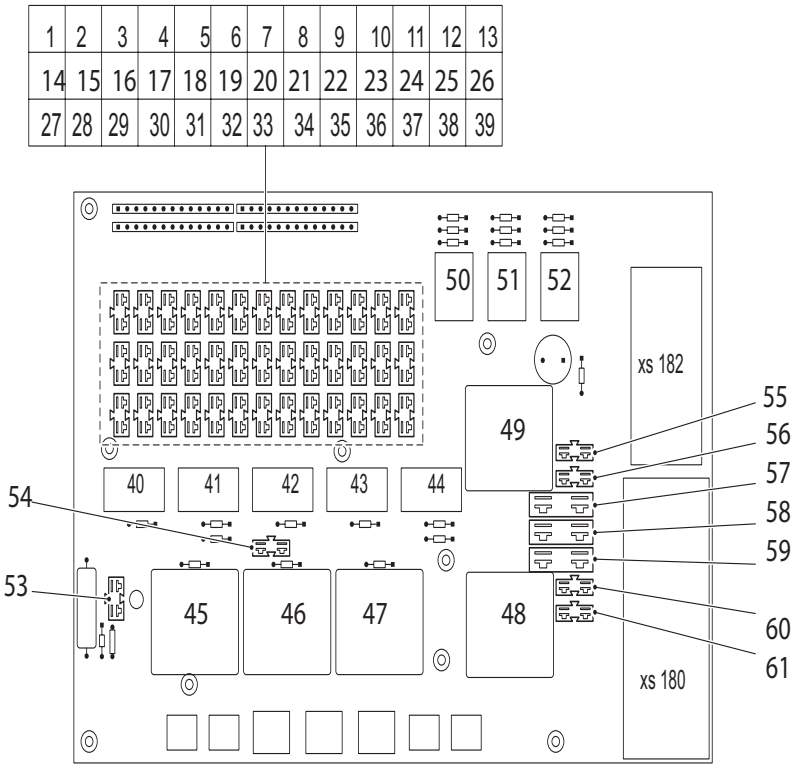
– Prepare the truck for maintenance and repairs ((see "Preparing the truck for maintenance and repairs" on page 153)).

Procedure

- Open the rear cover of the truck, (see "Opening the rear panel" on page 153).
- Remove the electrical system cap.
- Check condition and rating of the fuses in accordance with the table.
  - To do this: Insert the fuse to be check in the fuse socket (53 F21).
  - If the fuse is intact the LED will be lit.
- Replace any damaged fuses in accordance with the table.
- Close the electrical system cap.
- Close the rear cover of the truck.

The electrical fuses are now checked.

6.8.1 Fuse ratings



Item	Description		Electric circuit	Rating (A)
1	4F4	○	Beacon / strobe	7,5
2	9F1	○	Front window wiper	7,5
3	5F5.3	○	RH dipped lights	5
		○	RH dipped lights (set A version)	5 / 3[1]
4	5F3	○	Reversing lights	7,5
5	5F4.1	○	Rear lights, LH parking light	7,5 / 2[1]
6	4F6	○	Brake light	10 / 2[1]
7	5F4	○	Tail light, RH parking light	7,5 / 2[1]
8	4F5.1	○	Left indicator	5 / 3[1]
9	4F5.2	○	Right indicator	5 / 3[1]
10	6F5	○	Road traffic regulations armrest	5
11	4F9	●	E-BOX	2
12	3F5	●	Emergency Disconnect	5
13	9F24	○	Radio, constant current	5
14	2F1	○	Wash pump	5

Item	Description		Electric circuit	Rating (A)
15	5F5.1	○	LH dipped lights	5
		○	LH dipped lights (set A version)	5 / 3[1]
16	9F23	○	not used (pre- 11.09 changeover valve)	(5)
17	4F10	●	Fan	5
18	F1.1	●	Armrest terminal 15	5
19	9F26	●	Socket	2
20		○	Not used	
21	OF1	○	Option relay 1/2K63.1	15
22	9F17.2	○	Option connector XS182/3 engine running.	3
23	OF2	○	Option relay 2 2K63.2	7,5
24	OF3	○	Option relay 3 2K63.3	5
25	9F17.1	○	Option connector XS182/2 engine running.	3
26	9F17	○	Option connector XS182/1 engine running.	3
27	9F5	○	Rear window heating	10
28	5F1	○	Front work lights	10 / 5[1]
29	9F2	○	Seat heating / compressor	10
30	9F14	○	Rear window wiper	7,5
31	5F1.2	○	Rear work lights	10 / 5[1]
32	9F25	●	Air mass meter (DFG only)	5
			Shutoff valve (TFG only)	
33	9F31	●	Charge control generator	5
34	4F1	●	Horn	10
35	4F11	●	ECU terminal 15 engine controller	5
36			Not used	
37	9F17.5	○	Option connector XS182/6 KL30	3
38	9F17.4	○	Option connector XS182/5 KL30	3
39	9F17.3	○	Option connector XS182/4 KL30	3
53	F21	●	Fuse tester	
54	9F2.1	○	Jumper for relay	25
55	9F14.1	○	Option	10
56	5F8	○	Reading light	5
57	F14	○	Heating	30
58	9F30	●	TCU KI30 truck controller	25
59	9F27	●	Engine controller ECU terminal 30 (DFG only)	30
60	9F29	●	Immobiliser (DFG only) Ignition coil (TFG only)	15
61	9F28	●	Pre-heat time control (DFG only) Reservoir valve 3 way control (TFG only)	10

[1] LED optional equipment

●= Series equipment	○= Optional equipment

Relay

Item	Description		To protect:	Rating (A)
40	9K6	○	Rear window heating	
41	9K3.1	●	X contact	
42	9K5	○	Seat heating	
43	4K7	●	Horn	
44	7K5	●	Engine start with bonnet open	
45	9K3	●	Starter relay	
46	9K23	●	Ignition on – engine not running	
47	9K24	●	Ignition on - engine running	
48	9K22	●	Engine main relay	
49	9K16	○	Heating	
50	OF1	○	Option relay 2K63.1	max 15A
51	OF2	○	Option relay 2K63.2	max. 7.5A
52	OF3	○	Option relay 2K63.3	max 5A

●= Series equipment	○= Optional equipment

Check main fuses (engine compartment)

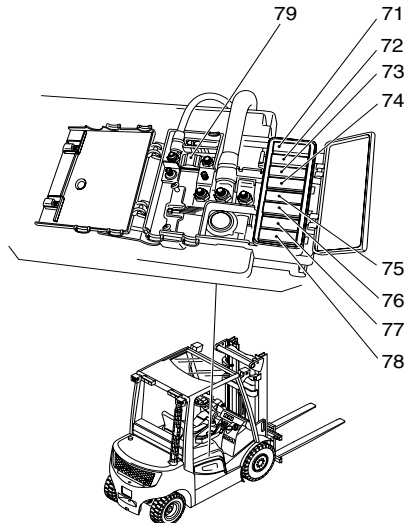
Requirements

– Prepare the truck for maintenance and repairs ((see "Preparing the truck for maintenance and repairs" on page 153)).

Procedure

- Open the engine cover ((see "Unlocking the engine bonnet" on page 154)).
- Open the engine cover ((see "Unlocking the engine bonnet" on page 154)).
- Remove the cover of the main fusebox.
- 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.
- Close the truck’s engine cover.

The main fuses (engine compartment) are now checked.



Item	Description		To protect:	Rating (A)
71	9F18	●	Preheat (DFG only)	50
			ECU engine controller (TFG only)	20
72	6F8	○	Soot particle filter	100
73	F21	●	Engine ignition off	100
74	9F20	○	External air conditioning system	30
75	F22	●	Terminal 30 constant positive	100
76	F19.4	●	Starter relay supply wire	40
77	F19.3	●	Constant positive for engine term. 30	70
78	F21.1	●	Ignition engine running	70
79	9F19	●	Generator 90A	100
			Generator 140A	125

●= Series equipment	○= Optional equipment

6.9 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 oxidisation 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.

6.10 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 (see "Starting the engine with the cover open" on page 161).
- 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.

6.11 Seat belt maintenance

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.

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.

6.12 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 150).
- 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 63).

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 35).
- ▶ 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 159).
- 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 150).
- 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 150).
- Clean the battery, grease the terminals and connect the battery.
- Charge the battery, (see "Starter battery" on page 181).
- 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 63).

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 in 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.