

DFG/TFG 425/430/435

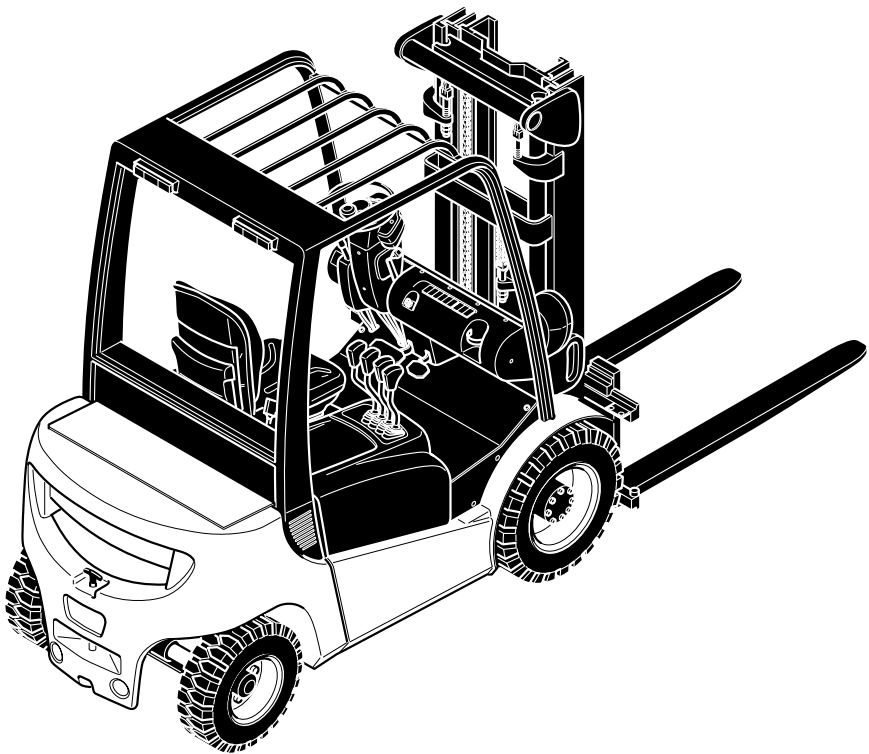
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Operating Instructions



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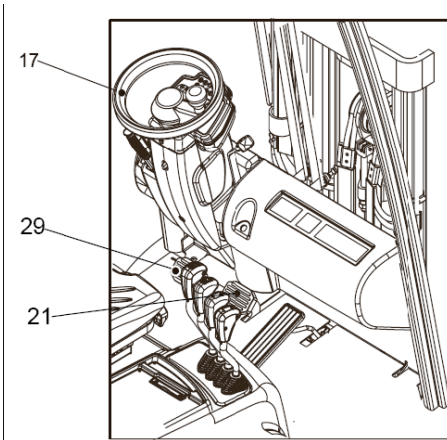
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Supplement: Brake System, Post 09/2007 Trucks

As of 09/2007, DFG/TFG 425-435 series trucks have been fitted with a new service brake system. In future, in addition to the slow travel / brake pedal (29) an additional brake pedal (21) will be available.

The brake pedal (21) hydraulically actuates two drum brakes which are applied to the drive wheels. The drum brakes are also applied to the slow travel / brake pedal. However, this is only designed as a crawl speed aid and should not be used for normal braking purposes. Worn drum brakes are automatically adjusted in case of wear.



Operation

Braking:

- Take your foot off the accelerator pedal.
- Apply the brake pedal (21) to stop the truck

Crawl speed travel with the slow travel / brake pedal:

Sensitive application of the slow travel / brake pedal (29) allows for excellent shunting in confined areas and rapid lifting at a slow travel speed.

- By applying the slow travel / brake pedal, the flow of power in the power shift gear can be reduced in the first stage of the pedal stroke. This means that the motor speed and hence the lift speed can be increased while shunting, without speeding up the truck.
- Further pressing on the pedal allows the truck to brake easily, e.g. during crawl speed operations.

Foreword

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. Each chapter starts with page 1. The page identification consists of a chapter letter and a page number.

For example: Page B 2 is the second page in chapter B.

The operating instructions detail different truck models. When operating and servicing the truck, make sure that the instructions apply to your truck model.

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



Used before safety instructions which must be observed to avoid danger to personnel.



Used before notices which must be observed to avoid material damage.



Used before notices and explanations.



Used to indicate standard equipment.



Used to indicate optional equipment.

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

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A Correct use and application of the truck



The “Guidelines for the Correct Use and Application of Industrial Trucks” (VDMA) are supplied with the truck. The guidelines form part of these operating instructions and must be observed. National regulations apply in full.

The truck described in the present operator manual is an industrial truck designed for lifting 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 truck or property. In particular, avoid overloading the truck with loads which are too heavy or placed on one side. The data plate attached to the truck or the load diagram are binding for the maximum load capacity. The industrial truck must not be used in fire or explosion endangered areas, or areas threatened by corrosion or excessive dust.

Proprietor responsibilities: For the purposes of the present operator manual 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 truck is used only for the purpose it is intended for and that danger to life and limb of the user and third parties are excluded. Furthermore, accident prevention regulations, safety regulations and operating, servicing and repair guidelines must be followed. The proprietor must ensure that all truck users have read and understood this operator manual.



Failure to comply with the operator manual 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’s customer service department.

Attaching accessories: The mounting or installation of additional equipment which affects or supplements the performance of the industrial truck requires the written permission of the manufacturer. In some cases, local authority approval shall be required.

Approval of the local authorities however does not constitute the manufacturer’s approval.

Trailing and towed loads: The truck may only be used for trailing or towed loads for which the truck has been approved.

B Truck Description

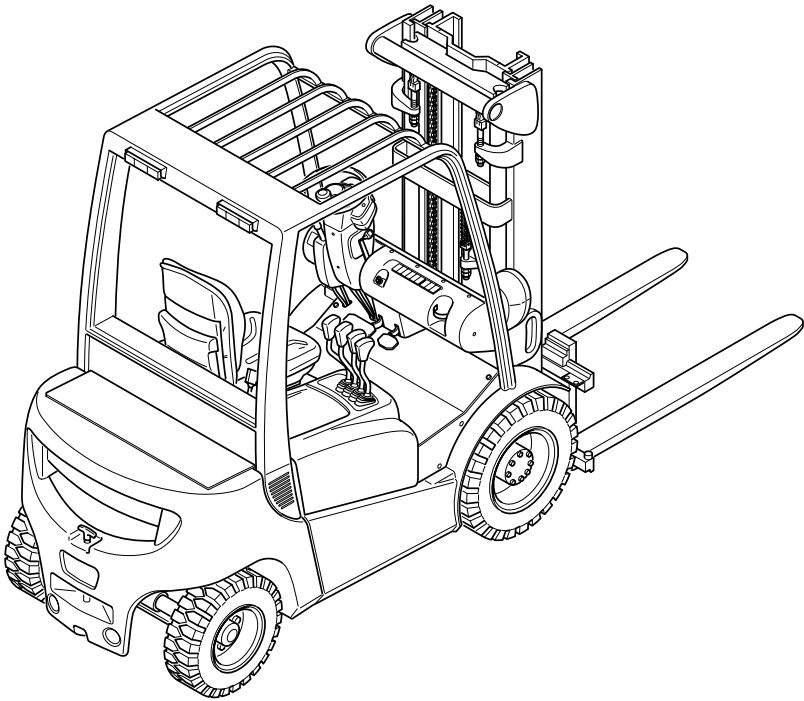
1 Application

The DFG/TFG series are IC motor, 4-wheel rider trucks. The DFG series are diesel motor trucks, while the TFG series are fitted with a petrol motor for LPG operation.

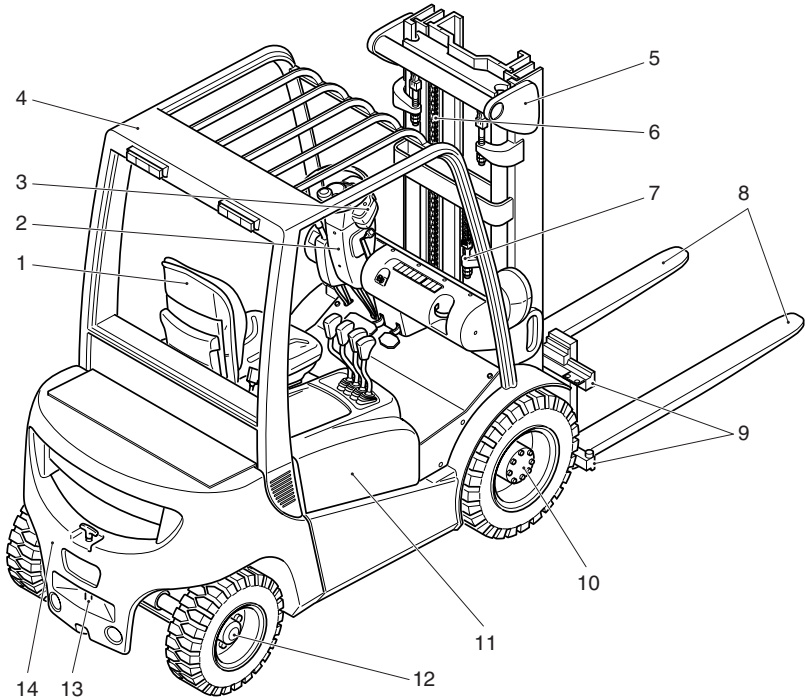
The DFG/TFG 425-435 is equipped with a hydrodynamic drive system. A combined slow travel / brake pedal enables rapid lifting while travelling slowly.

The capacity depends on the model. The type description indicates the maximum load rating. For example, a DFG/TFG 425 can carry loads of up to 2500 kg and a DFG/TFG 435 loads of up to 3500 kg.

Model	Capacity (kg)	Wheel base (mm)
DFG/TFG 425	2500	1685
DFG/TFG 430	3000	1685
DFG/TFG 435	3500	1785



2 Assemblies and Functional Description



Item	Description	Item	Description
1	● Driver's seat	8	● Load fork
2	● Steering column	9	● Fork carriage
3	● Dashboard	10	● Drive axle
4	● Overhead guard	11	● Motor cover
5	● Mast	12	● Steering axle
6	● Load chain	13	● Trailer coupling
7	● Lift cylinder	14	● Counterbalance weight

2.1 Truck

Chassis/Superstructure: A rigid chassis which protects the units and controls, provides the truck with maximum static safety.

Maintenance and servicing are made easy through the wide opening cover and the two side panels of the motor housing (11). The hydraulic oil reservoir is integrated on the right-hand side and the fuel tank for the DFG series on the opposite side in the chassis. The LPG bottle for the TFG series is secured to a bracket on the counterbalance weight (14). The exhaust system prevents exhaust from entering the driver's position.

Driver's position: Non-slip steps and a handle on the posts of the overhead guard provide easy entry and exit. The driver is protected by the overhead guard (4). On the driver's seat the seat cushioning and the seat position are adjustable, while the steering wheel tilt can be set on the steering column (2). Easy operation through ergonomically arranged controls and a practically vibration-proof cab mean that the driver is only subjected to minimum stress. The controls and warning indicators on the control panel (3) provide system monitoring during operation. This results in a very high level of safety.



Before the truck is started, the overhead guard must be inspected for cracks, and if damaged, must be repaired or replaced.

Motor: Silent, water-cooled motors featuring high performance and low consumption. In the DFG series diesel motors are used with very clean fuel combustion under all operating conditions and soot levels below the visibility limit. For the TFG series, petrol motors are used with very low residual exhaust levels.

Drive system: A power shift gear with radiator and torque converter is directly flanged to the motor. This transfers the force to the drive axle (10).

The travel direction switch on the left hydraulic control lever regulates forward/reverse travel and the neutral position.

Steering: Hydrostatic steering with a steering cylinder integrated in the steering axle (12). The steering axle is pivoted in the chassis to ensure excellent grip even on non-level surfaces.

Brakes: The slow travel / brake pedal actuates two drum brakes which are applied to the drive wheels. Worn drum brakes are automatically adjusted. The parking brake operates through mechanical actuation of the parking brake lever on the drum brake via Bowden cables.

Wheels: All wheels are located within the geometry of the truck. The trucks offer a choice of air or superelastic tyres.

Hydraulic system: The gear pump of the hydraulic system is powered by motor through a power take off of the power shift gear. The pump speed and hence the supply volume are controlled by the accelerator pedal through the motor speed.

Hydraulic functions are controlled by the control lever through a multiple control valve.

Electrical System: 12 volt system with starter battery and AC generator with integrated controller. A start repeat block prevents incorrect operation during start-up and a safety switch ensures the motor can only start when the travel direction switch is in neutral. For diesel motors, a rapid pre-heat system is installed, LPG motors have a non-contact electronic ignition system for rapid and trouble-free engine starting. The ignition / start switch is used to stop the motor.

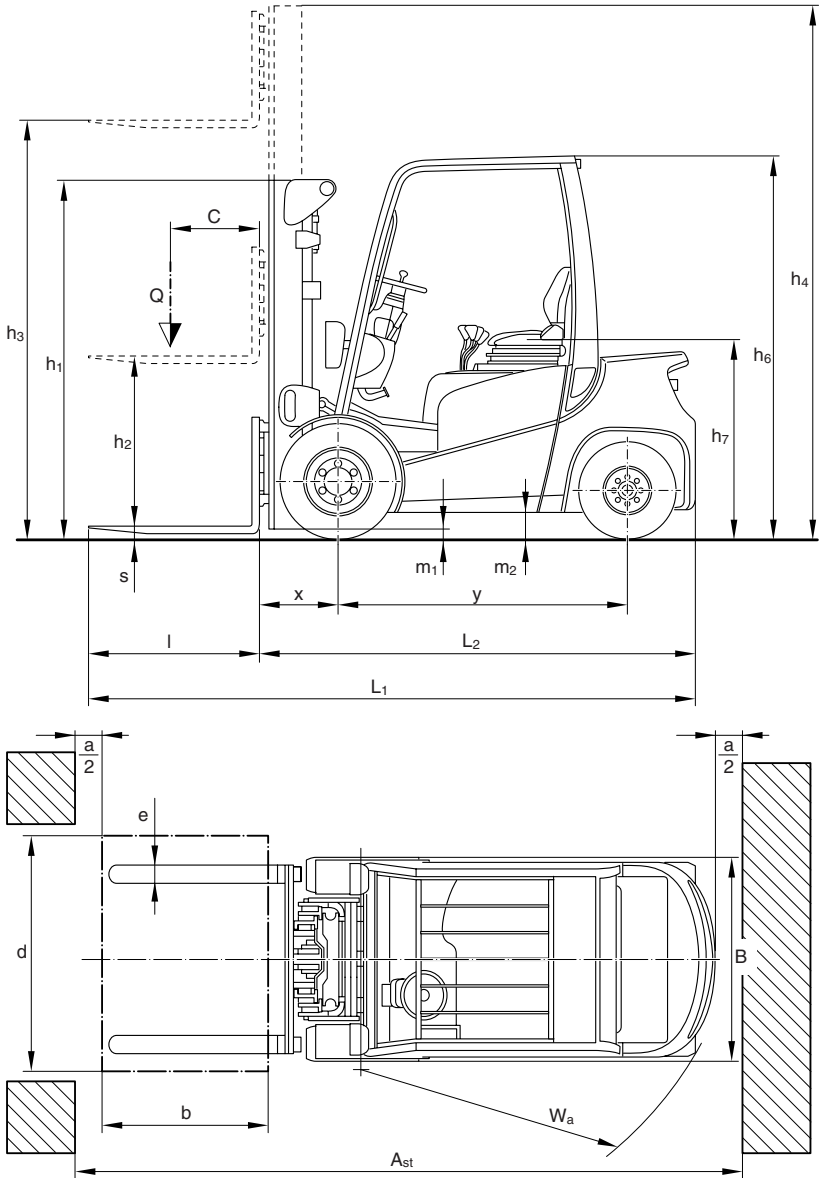
Mast (5): The target has been to maximize visibility. The maximum strength steel section are narrow, allowing for good fork visibility in particular with the three-stage mast. The same standard has been achieved for the fork carriage. The mast and the fork carriage run on permanently-lubricated and hence maintenance-free angled casters.

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

3 Standard Version Specifications



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



3.1 Performance data

	Description	DFG 425	DFG 430	DFG 435	
Q	Capacity (where C = 600 mm)	2500	3000	3500	Kg
C	Load centre of gravity distance	500	500	500	mm
	Travel speed w / w.o. load	17/19	18/19	18/19	km/h
	Lift speed w / w.o. load	0.59/0.60	0.53/0.59	0.49/0.53	m/s
	Lowering speed w / w.o. load	0.55/0.45	0.55/0.45	0.55/0.42	m/s
	Gradeability w / w.o. load	27	23	18	%

	Description	TFG 425	TFG 430	TFG 435	
Q	Capacity (where C = 600 mm)	2500	3000	3500	Kg
C	Load centre of gravity distance	500	500	500	mm
	Travel speed w / w.o. load	17/19	18/19	18/19	km/h
	Lift speed w / w.o. load	0.5/0.6	0.46/0.55	0.41/0.51	m/s
	Lowering speed w / w.o. load	0.55/0.45	0.55/0.45	0.55/0.42	m/s
	Gradeability w / w.o. load	27	23	19	%

3.2 Dimensions

	Description	DFG 425	DFG 430	DFG 435	
a/2	Safety distance	100	100	100	mm
h ₁	Mast height (retracted)	2080	2080	2180	mm
h ₂	Free lift	150	150	150	mm
h ₃	Lift	2900	2900	3100	mm
h ₄	Mast height (extended)	3685	3685	3885	mm
h ₆	Height above overhead guard	2220	2250	2250	mm
h ₇	Seat height	1068	1068	1068	mm
L ₁	Length including forks	3690	3810	3945	mm
L ₂	Headlength	2540	2660	2795	mm
b ₁	Overall width	1174	1300	1300	mm
e	Fork width	120	125	125	mm
m ₁	Ground clearance with load below mast	125	125	125	mm
m ₂	Ground clearance centre wheelbase	130	140	140	mm
Ast	Working aisle width 800 x 1200 longitudinal pallets	4215	4331	4511	mm
Ast	Working aisle width 1200 x 800 transverse pallets	3900	4015	4195	mm
Wa	Turning radius	2290	2370	2550	mm
x	Load distance	473	515	515	mm
y	Wheelbase	1685	1685	1785	mm
	Net weight	4290	4730	5098	Kg

	Description	TFG 425	TFG 430	TFG 435	
a/2	Safety distance	100	100	100	mm
h ₁	Mast height (retracted)	2080	2080	2180	mm
h ₂	Free lift	150	150	150	mm
h ₃	Lift	2900	2900	3100	mm
h ₄	Mast height (extended)	3685	3685	3885	mm
h ₆	Height above overhead guard	2220	2250	2250	mm
h ₇	Seat height	1068	1068	1068	mm
L ₁	Length including forks	3690	3810	3945	mm
L ₂	Headlength	2540	2660	2795	mm
b ₁	Overall width	1174	1300	1300	mm
e	Fork width	120	125	125	mm
m ₁	Ground clearance with load below mast	125	125	125	mm
m ₂	Ground clearance centre wheelbase	130	140	140	mm
Ast	Working aisle width 800 x 1200 longitudinal pallets	4215	4331	4511	mm
Ast	Working aisle width 1200 x 800 transverse pallets	3900	4015	4195	mm
Wa	Turning radius	2290	2370	2550	mm
x	Load distance	473	515	515	mm
y	Wheelbase	1685	1685	1785	mm
	Net weight	4190	4630	4998	Kg

3.3 Motor data

Motor - DFG

Type	S45 four cylinder
Ignition order	1 3 4 2
Capacitance	3331 cc
Control speed	2350 rpm (without load) 680 rpm (idle)
Valve clearance	Inlet and outlet 0.25 mm cold
Tray capacity	10.0 l
Fuel tank capacity	58 l
Coolant capacity	5.5 l + system = 15.0 l

Motor - TFG

Type	2.5 L L4 four cylinder, four stroke, LPG
Ignition order	1 3 4 2
Capacitance	2488 cc
Control speed	2700 ±50 rpm (without load) 850 ±50 rpm (idle)
Spark plug type	NGH FR2A-D
Spark plug electrode distance	0.8 -0.9 mm
Tray capacity	3.8 litres
Coolant capacity	3.5 litre - system = 13 litres

3.4 Tyres

Full rubber SE tyres (=Solid)	DFG/TFG 425	DFG/TFG 430	DFG/TFG 435
Drive axle	7.00x12	28x9-15	250x15
Steering axle	6.50x10	6.50x10	6.50x10

Air tyres (diagonal tyres)	DFG / TFG 425	DFG / TFG 430	DFG / TFG 435
Drive axle	7.00x12 16PR	28x9-15 14PR	250x15 16PR
Steering axle	6.50x10 14PR	6.50x10 14PR	6.50x10 14PR

Tyre pressure	DFG / TFG 425	DFG / TFG 430	DFG / TFG 435
Drive axle	10.0 bar	9.0 bar	8.25 bar
Steering axle	10.0 bar	10.0 bar	10.0 bar



Permissible tyre type forSolid: Solideal Magnum
Air: Solideal ED (Extra Deep)

3.5 Mast Versions

(all dimensions in mm)

DFG/TFG 425/430

Mast table				
VDI 3596 Description	Lift h_3	Free lift h_2	Retracted height h_1	Extended height h_4
ZT	2900	150	2080	3510
	3100	150	2180	3710
	3300	150	2280	3910
	3500	150	2380	4110
	3700	150	2480	4310
	4000	150	2630	4610
	4300	150	2830	4910
	4500	150	2930	5110
	4700	150	3030	5310
	5000	150	3180	5610
	5500	150	3480	6110
	5800	150	3630	6410
6000	150	3730	6610	
ZZ	2900	1480	2080	3500
	3100	1580	2180	3700
	3300	1680	2280	3900
	3500	1780	2380	4100
	3700	1880	2480	4300
	4000	2030	2630	4600
	4300	2230	2830	4900
	4500	2330	2930	5100
DZ	4400	1480	2080	5000
	4700	1580	2180	5300
	5000	1680	2280	5600
	5500	1880	2480	6100
	6000	2080	2680	6600
	6500	2280	2880	7100
	7000	2480	3080	7600

DFG/TFG 435

Mast table				
VDI 3596 Description	Lift h_3	Free lift h_2	Retracted height h_1	Extended height h_4
ZT	3100	150	2180	3870
	3500	150	2380	4270
	4000	150	2630	4770
	4500	150	2930	5270
	5000	150	3180	5770
DZ	4700	1417	2180	5463
	5000	1517	2280	5763
	5500	1717	2480	6263
	6000	1917	2680	6763
	6500	2117	2880	7263

3.6 EN norms

Noise emission: 78 dB(A)

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 driver's ear.

Vibration: 0.73 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.

Electromagnetic compatibility (EMC)

The manufacturer confirms that equipment complies with tolerance levels for electromagnetic emissions and resistance as well as static electricity discharge testing in accordance with EN 12895 including the normative procedures contained therein.

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

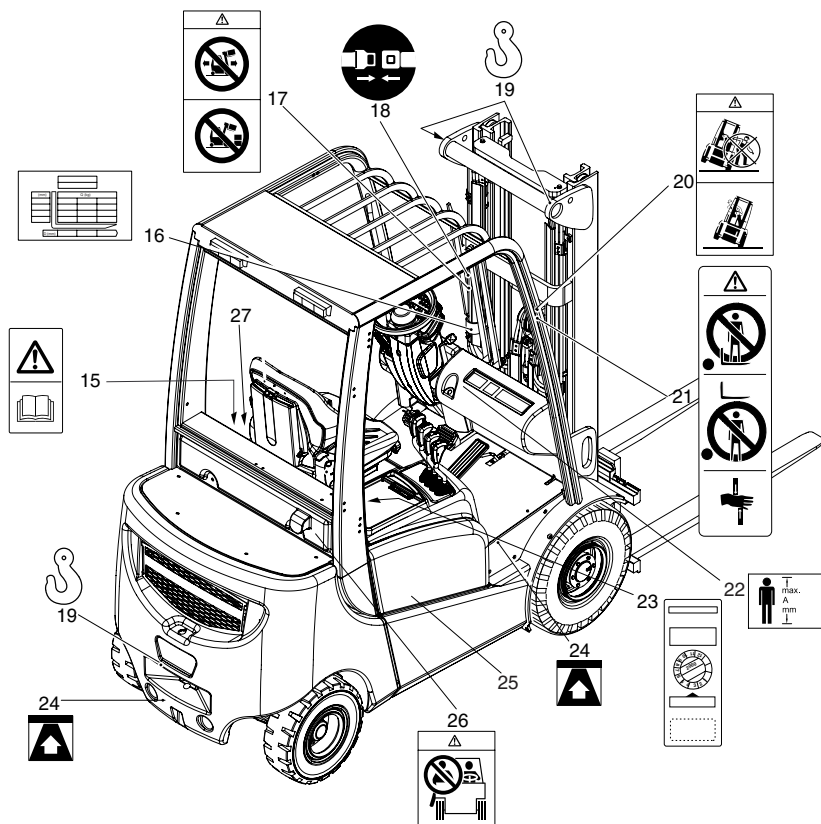
3.7 Conditions of use

Ambient temperature

- operating at -20°C to 40°C

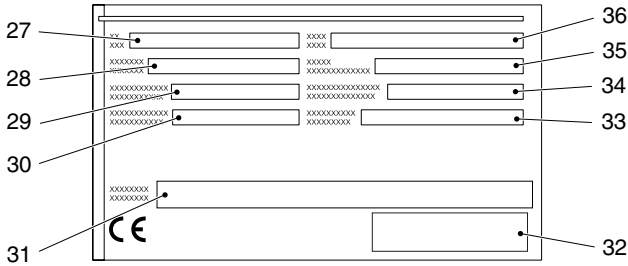
- Special equipment and authorisation are required if the truck is to be constantly used in conditions of extreme temperature or air humidity fluctuations.

4 Identification points and data plates



Item	Description
15	Attention: Read operator manual.
16	Load fork, Capacity / Load Centre of Gravity / Lift Height diagram
17	"Travel with raised load prohibited" / "Mast forward tilt with raised load prohibited" warning
18	"Attach Safety Restraint Belt" decal
19	Strapping points for lifting by crane
20	"Procedure when truck in danger of tipover" notice
21	"Do not stand under load lifting device" / "Do not stand under load lifting device" / "Risk of trapping when mast extended" combined notice
22	"Max. body size" signs
23	UVV test sticker (only (D))
24	Jack contact points
25	"Do not carry passengers" warning
26	Truck data plate

4.1 Truck data plate



Item	Description	Item	Description
27	Type	32	Manufacturer's logo
28	Serial no.	33	Net weight
29	Rated capacity (kg)	34	Load centre of gravity (mm)
30	Output (kW)	35	Year of manufacture
31	Manufacturer	36	Option

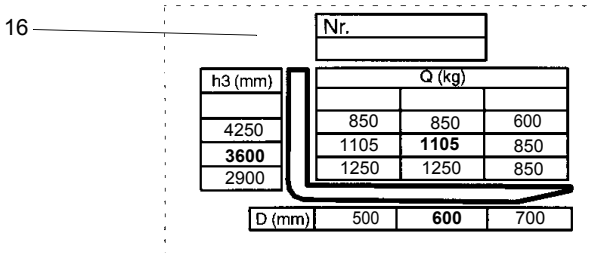


For queries regarding the truck or ordering spare parts please quote the truck serial number (28).

4.2 Truck load diagram

The load diagram (16) gives the capacity (Q) of the truck in kg with a vertical mast. The diagram will differ, depending on the construction of the mast used. 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).

Example:



Example of how to calculate the maximum capacity:

With a load centre of gravity D of 600 mm and a maximum lift height H of 3600 mm. the max. capacity Q is 1105 kg.

4.3 Fork load diagram (basic model)

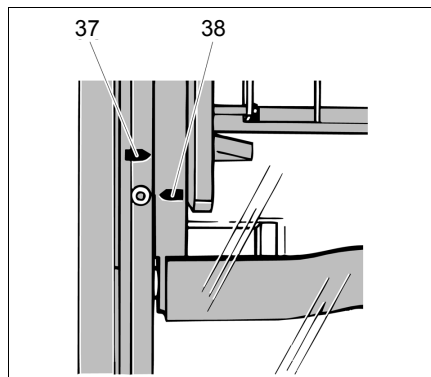
The fork load diagram give the truck's capacity Q in kg. The maximum capacity for the various load centres of gravity (D in mm) is shown in diagram form.

Nr. <input type="text"/>	
h3 (mm)	Q (kg)
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
D (mm)	<input type="text"/>

4.4 Attachment load diagram

The attachment load diagram gives the truck's capacity Q in combination with the respective attachment in kg. The serial number stated in the load diagram must match the data plate of the attachment, as the capacity for each truck is specifically indicated by the manufacturer. It is indicated in the form of the truck's capacity and can be determined accordingly.

The arrow shape markings (37 and 38) on the inner and outer masts show the driver when the prescribed lift limits have been reached.



C Transport and Commissioning

1 Lifting by crane



Only use lifting gear with sufficient capacity (for transport weight see truck data plate).

- Park the truck securely (see Chapter E).
- Attach the crane slings to the cross member of the mast (1) and the trailer coupling (2).



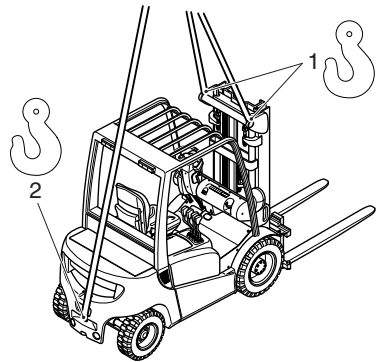
Only suspend crane belts/chains to the top eye of the counterbalance weight and the eyes of the upper cross member (mast).

The mast must be tilted back fully.

The crane belt or the chain on the mast must be at least 2m long.

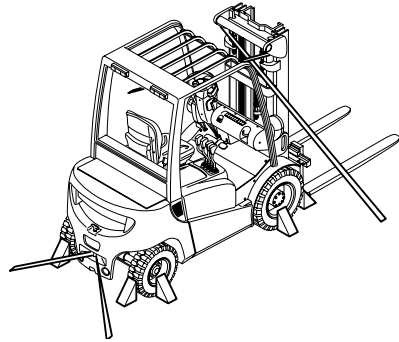


Lifting slings should be fastened to the harness in such a way that they do not come into contact with any attachments or the overhead guard when it is being raised.



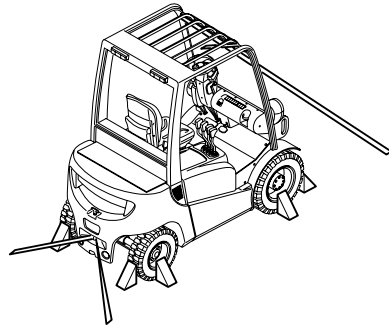
2 Securing the truck during transport

The truck must be securely fastened when being transported on a lorry or a trailer. The lorry / trailer must have fastening rings and a wooden floor. Loading shall be carried out by staff especially trained for that purpose in accordance with recommendations contained in Guidelines VDI 2700 and VDI 2703.



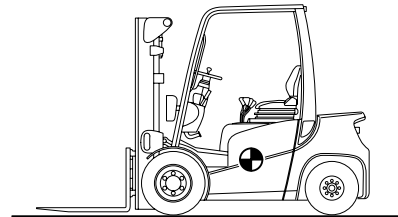
In each case correct measurements shall be determined and appropriate safety measures adopted.

To secure the truck with the mast assembled, use the eyes on the upper cross member of the mast and the trailer pins. See top picture (fastening with mast assembled) and centre picture (fastening without a mast).



If the truck is to be transported without a mast, it must be tied down at the front over the overhead guard. See centre picture.

The lower picture shows the approximate position of the centre of gravity.



3 Commissioning



Commissioning and driver instruction must be performed by trained personnel. If several trucks have been delivered, make sure that always the serial numbers of the load lifting devices, masts and basic trucks match each other.

To prepare the truck after delivery or after transport, proceed as follows:

- Check the truck for completeness and satisfactory condition of the equipment.
- Check motor oil level.
- Check power shift transmission oil level.
- Check brake fluid level
- Check battery terminals and acid level.
- Commission the truck in accordance with instructions (see Chapter E).

4 Towing the truck

- Attach the tow bar / rope to the trailer coupling of the recovery vehicle and the truck to be recovered.
- Release parking brake.



One person must be seated in the towed truck to steer it. Tow the truck at creep speed.



As the steering auxiliary unit is not applied, extra effort is required to steer the truck.

D Filling the Truck with Fuel

1 Safety regulations for handling diesel fuel and LPG

Before filling up or replacing the LPG bottle, first park the truck securely (see Chapter E).

Fire protection: When handling fuels and LPG, smoking, naked flames and other ignition sources are strictly prohibited in the immediate vicinity. Labels indicating the hazard zone must be positioned where they are clearly visible. It is prohibited to store flammable materials in this area. Operational fire equipment must be provided within easy reach of the filling area.



Only use carbon dioxide dry extinguishers or carbon dioxide gas extinguishers for fire protection.

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. Unsealed LPG bottles must be brought immediately into the open air, stored in well ventilated areas and the supplier must be notified. Spilled diesel must be set using a suitable agent and disposed of in accordance with environmental regulations.

Personnel for filling fuel and replacing LPG bottles: Personnel handling LPG must be have sufficient knowledge of the nature of liquid gases to ensure safe operation.

Filling up the LPG tank: LPG tanks remain connected to the truck and are filled up at LPG stations. Always follow the instructions of the tank system and LPG tank manufacturer as well as statutory and local regulations when filling up.



Liquid gas produces frost damage to naked skin.

2 Filling with diesel



The truck must only be filled at locations specifically designed for this purpose.

- Park the truck securely before filling up (see Chapter E).
- Open the cap (1).
- Fill up with clean diesel.



Do not overfill the tank.

Capacity: 58l



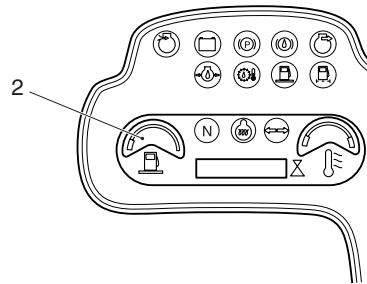
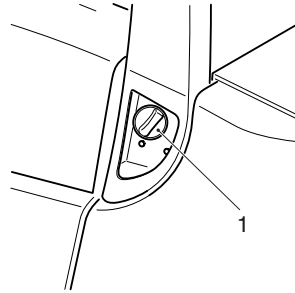
Only use DIN 51601 diesel with a cetane rating below 45.

The fuel gauge (2) indicates the fuel level. If it points to the red zone, fill the tank.



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

- Tighten the cap back on after filling with fuel.

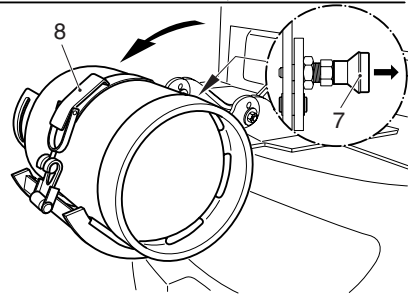
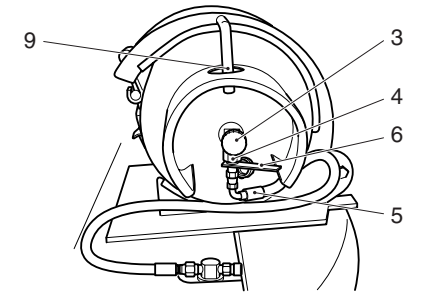


3 Replacing the LPG bottle



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

- Park the truck securely before filling up (see Chapter E).
- Close the shut-off valve (3) securely.
- Start the motor and allow the LPG system to run empty in neutral.
- Unscrew the union nut (4) with an appropriate key while holding against the handle (6).
- Remove the hose (5) and immediately screw the valve cap onto the empty LPG bottle.
- Remove the stop bolt (7) and rotate the LPG bottle and bracket around the handle (9).
- Fold back the lever of the toggle-type fastener (8) and unhook the tensioning pivot from the bracket.
- Remove the tensioning belt.
- Carefully remove the LPG bottle from the bracket and place it down securely.



Only use 18–kg (29 l) LPG replacement bottles.

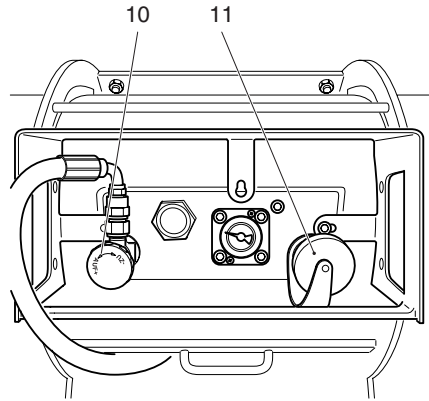
- Insert the new LPG bottle in the bracket and turn it so that the neck of the shut off valve is facing up.
- Fit the tensioning belt around the LPG bottle.
- Hook in the tensioning pivot and tension the belt with the lever (8).
- Rotate the LPG bottle and the bracket around the handle (9).
- Press in the stop bolt (7).
- Refit the hose (5) in accordance with regulations.
- Carefully open the shut off valve and check the connection is sealed using a foam-based agent.

○ **Reusable LPG bottles with central filling device**

The bottle is fitted with a filling stop valve. The discharge valve (10) must be sealed. Remove the seal (11). Insert the nozzle of the liquid gas pump into the filler port. Fill the LPG bottle until you can see on the fluid gauge that the bottle is full. Remove the nozzle and refit the seal (11).



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



E Operation

1 Safety Regulations for the Operation of Forklift Trucks

Driver authorisation: The forklift 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 operator manual. 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. He shall prevent unauthorised persons from driving or operating the truck. It is forbidden to carry passengers or lift personnel.

Damage and Faults: The supervisor must be immediately informed of any damage or faults to the forklift truck. Trucks not safe 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 forklift truck without the necessary training and authorisation to do so. On no account may the driver disable or adjust safety mechanisms or switches.

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

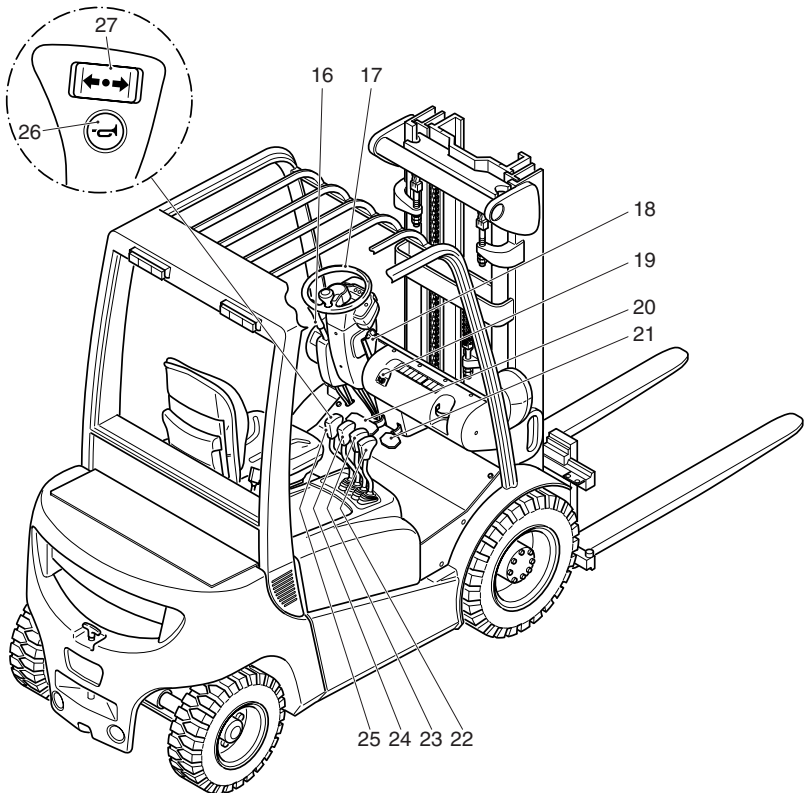
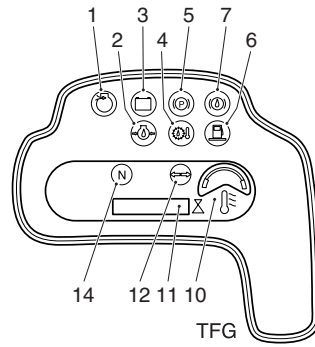
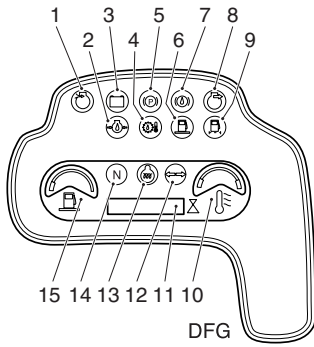


Unauthorised persons must be kept away from the hazardous area. Where there is danger to personnel, a warning must be sounded in good time. If unauthorised personnel are still within the hazardous area the truck shall be brought to a halt immediately.
















Safety Devices and Warning Signs: Safety devices, warning signs and warning instructions shall be strictly observed.

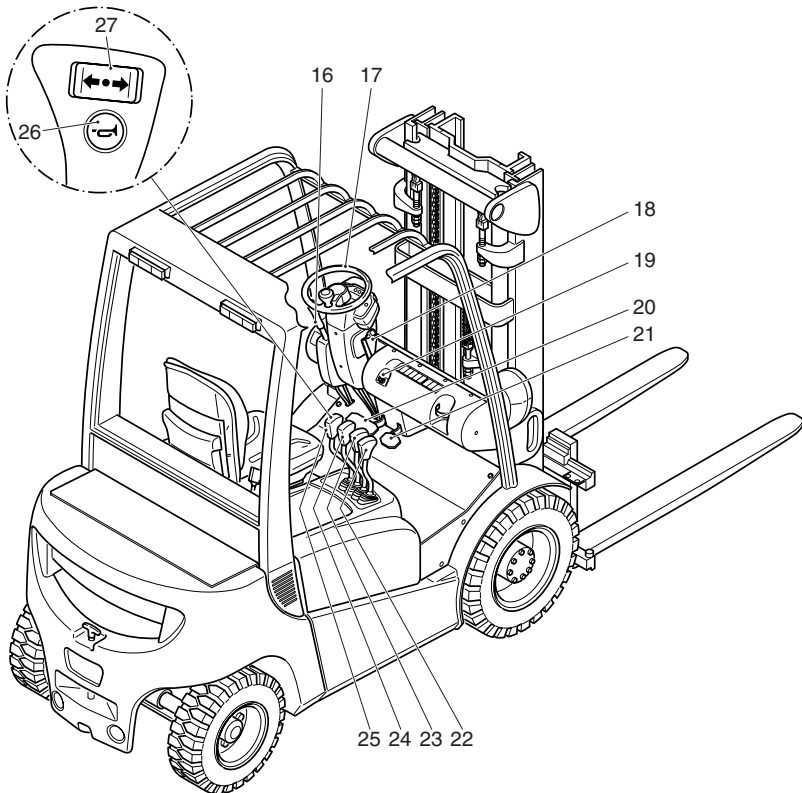
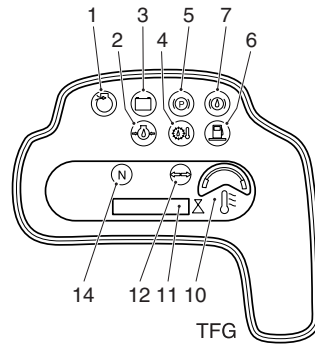
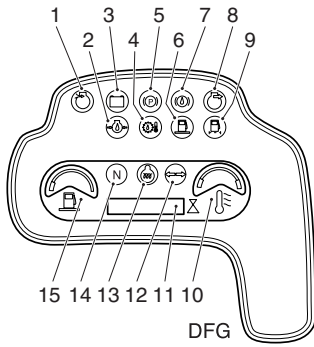


Trucks with reduced headroom are equipped with a warning sign within the driver's line of sight. The max. recommended body size indicated on this sign must be observed.



2 Controls and Displays

Item	Control / Display	Function
1	 Soot filter indicator	● Indicates that the soot filter is contaminated.
2	 Motor oil pressure indicator	● When lit, indicates insufficient motor lubricant oil pressure.
3	 Charging current indicator	● When lit, indicates that the battery is not charged.
4	 Transmission oil temperature indicator	When lit, indicates that the transmission oil temperature is too high.
5	 Parking brake indicator	● When lit, indicates that the parking brake is applied.
6	 Fuel supply indicator (DFG)	● When lit, indicates the fuel supply is too low.
7	 Brake fluid indicator	● When lit, indicates the brake fluid level is too low.
8	 Air filter indicator	● When lit, indicates that the air filter is contaminated.
9	 Diesel filter indicator	● When lit, indicates that the diesel filter is contaminated.
10	 Coolant temperature indicator	● Indicates the coolant temperature.
11	 Time / Service hours display	● Indicates the time or number of service hours operated.
12	 Travel direction display control light	● Indicates the operation of the travel direction display (right/left).
13	 Preheat control light (DFG)	● Indicates the operation of the cold start mechanism.
14	 Neutral position	● When lit, indicates that the travel direction switch is in neutral.
15	 Fuel display (DFG)	● Indicates how much fuel is left in the tank.



Item	Control / Display	Function
16	Parking brake lever	Applies / releases parking brake. To engage, turn switch to position 1. ● To release, turn switch to position 0. Pull up lever to engage. Push lever forward to release.
17	Steering wheel	● Steers truck in desired direction.
18	Steering column adjusting lever	● Adjusts the steering column tilt.
19	Ignition / starter switch	Switches power supply on and off. ● Starts and stops motor. Removing the ignition key prevents the truck from being switched on by unauthorised personnel.
20	Slow travel / brake pedal	● 1. Range: controls slow travel. 2. Range: applies operating brake.
21	Accelerator	● Controls motor speed / travel and lift speed.
22	Auxiliary hydraulics (ZH1) Sideshift	○ Moves the load fork to the right / left.
23	Auxiliary hydraulics (ZH2)	○ Intended for hydraulic attachments.
24	Mast tilt control lever	Tilts the mast forward and backward. To tilt the mast forward: push the lever forward. ● To tilt the mast backward: pull the lever back.
25	Lift/lower control lever	Raises and lowers the fork carriage To raise the fork carriage: pull the lever back. ● To lower the fork carriage: push the lever forward.
26	Warning switch	● Triggers an audible warning.
27	Travel direction switch	● Selects the travel direction.

● **Travel direction switch**

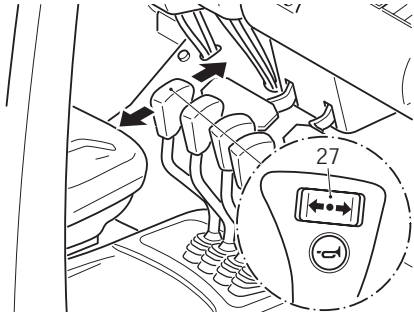


When the travel direction switch (27) is in the central position, the transmission is in idle.

- To select the forward gear, push the switch forward.
- To select the reverse gear, push the switch back.

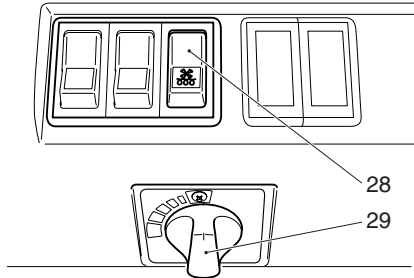


The motor will not start if a travel direction is pre-selected.



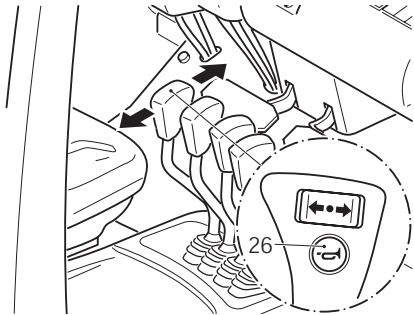
○ **Heating and Fan**

- Turn the thermostat control button (29) anti-clockwise to increase the temperature in the driver's cab.
- Press the switch (28) to activate the fan.



Horn

- To activate the horn press the warning signal switch (26) in the hydraulic lever.



3 Checks and operations to be performed before starting daily work

Truck

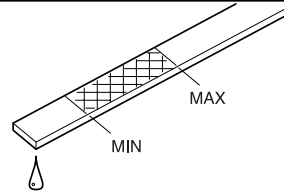
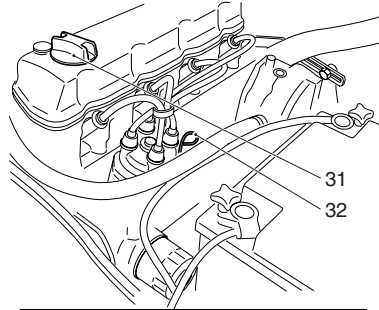
- Visually inspect the whole of the truck (especially the wheels and the lifting device) for obvious signs of damage.



Covers may need to be opened for the inspection.

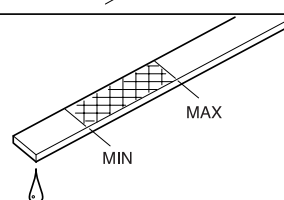
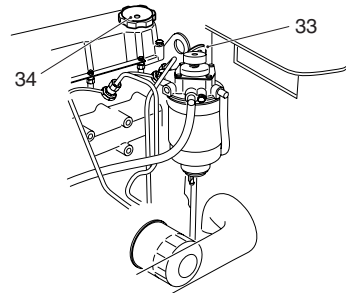
Checking the motor oil - TFG

- Remove the dipstick (32).
- Wipe the dipstick with a lint-free cloth and put in back fully into its port.
- Remove the dipstick again and check whether the oil level is between the MIN and MAX markings.
- If the oil level is below the centre point, remove the fuel cap (31) and add the correct grade of oil to the motor until the oil level has reached the MAX mark on the dipstick.



Checking the motor oil - DFG

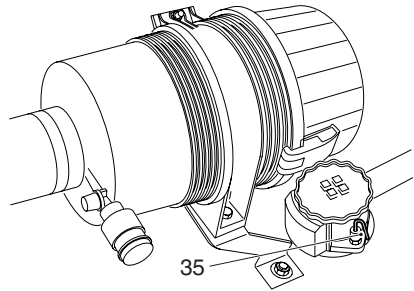
- Remove the dipstick (33).
- Wipe the dipstick with a lint-free cloth and put in back fully into its port.
- Remove the dipstick again and check whether the oil level is between the MIN and MAX markings.
- If the oil level is below the centre point, remove the fuel cap (34) and add the correct grade of oil to the motor until the oil level has reached the MAX mark on the dipstick.



Checking the hydraulic oil level

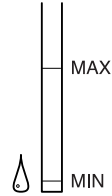
If the oil is cold

- Fully raise and lower the mast in one operation.
- Stop the motor.
- Remove the dipstick (35) and clean it with a clean cloth. Check the hydraulic oil level. It should lie between the MIN and MAX markings on the dipstick. If necessary, top up to the MIN marking on the dipstick.



If the oil is hot

- Fully raise and lower the mast in one operation.
- Stop the motor.
- Remove the dipstick (35) and clean it with a clean cloth. Check the hydraulic oil level. It should lie just above the MAX marking on the dipstick. If necessary, top up to just above the MAX marking on the dipstick.



If the motor cuts out or does not run smoothly when the mast is raised, the mast must be gently lowered before continuing with this procedure.

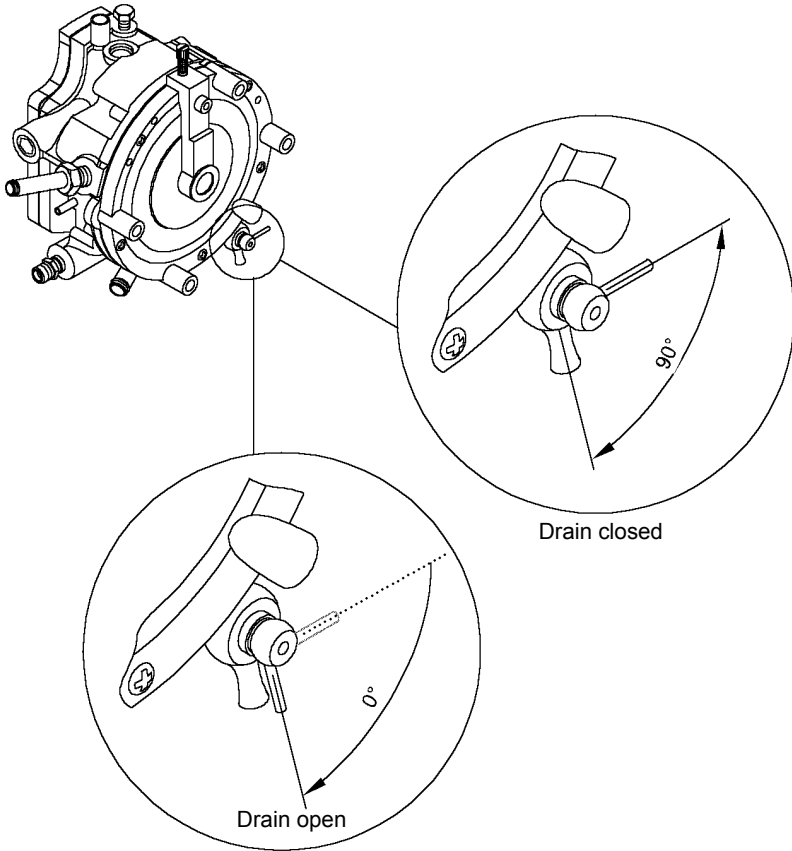
Gas system drain tap



The gas system drain tap must always be closed during operation (it should only be opened by service personnel for maintenance purposes).



If the drain is opened gas may escape!



Checking the coolant level

- Check the coolant level on the reservoir.

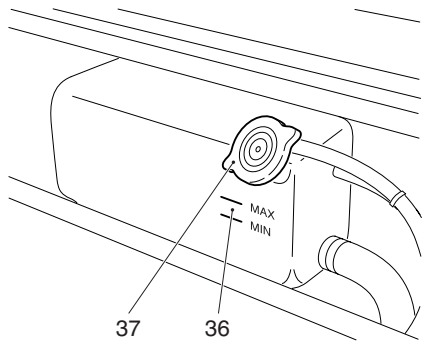
The coolant should lie between the MIN and MAX markings (36).



If the coolant is below the MIN marking, this indicates possible leakage in the radiator system. The truck must only be used once the cause has been removed.



If the motor is hot, the radiator system is pressurised. Only open the expansion vessel (37) lid when the motor has cooled down.



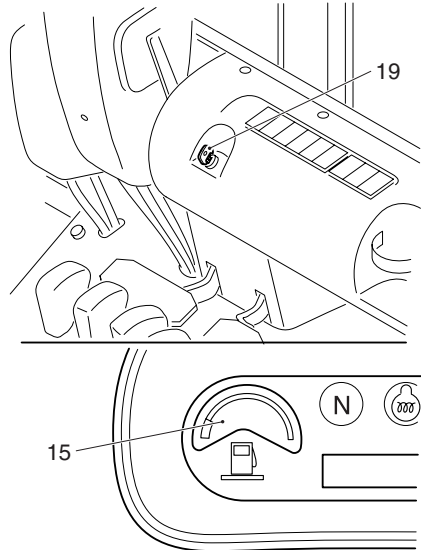
When topping up, add a premixed water and antifreeze solution in equal quantities into the existing solution.

It should be possible to empty the system by opening the drain taps in the radiator and on the side of the cylinder block. The drain plugs may be made of brass. When draining, remove the expansion vessel lid and lay it on the driver's seat as an indicator that the motor does not contain any coolant.

For details on recommended concentrations and safety measures, refer to Chapter F.

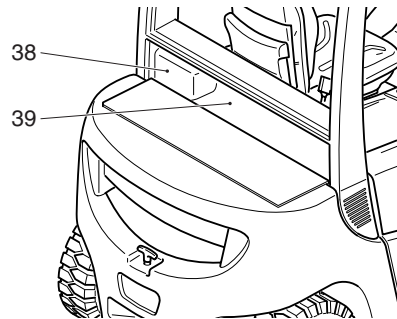
Checking the fuel supply - DFG

- Set the ignition / starter key (19) to the “I” position.
- Read off the fuel supply from the fuel gauge (15).
- If necessary, add diesel (see Chapter D).



○ Testing the windscreen fluid level

- The windscreen fluid container (38) is located behind the cover (39) at the rear of the truck.
- Make sure there is sufficient windscreen fluid in the container. Top up if required.
- Use a windscreen fluid with anti-freeze solution.



Wheels and Tyres

- Check wheels and tyres for wear (see Chapter F). Measure the tyre pressures (air tyres only) (see Chapter B).

4 Starting up the truck



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

4.1 Checks and operations to be performed before starting daily work

- The entire truck (in particular wheels and load lifting devices) must be inspected for damage.
- Make sure the load chains are evenly tensioned.
- Check the operation of the seat belt buckle and the belt returning to the retractor.
For further information see section 4.4.

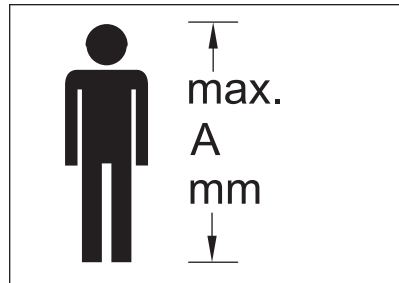
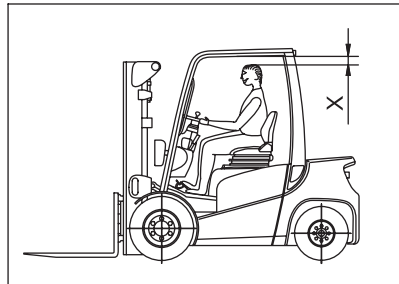
4.2 Trucks with reduced headroom X (○)



Failure to comply with the recommended body size may result in overload and constitute a danger to the driver, possibly resulting in permanent damage caused by an unhealthy posture and excessive physical exertions on the part of the driver.

The owner must ensure that the truck operator does not exceed the maximum body size indicated.

The owner must also check that the drivers can sit normally, in an upright position without having to exert himself.



4.3 Adjusting the driver's seat

Standard seat MSG 20

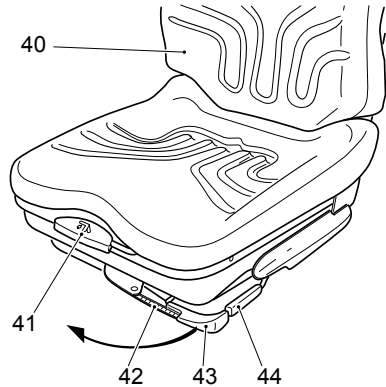
- To achieve optimal seat cushioning the driver's seat must be adjusted according to the driver's weight.
The driver's seat must be adapted to the driver's weight.


Adjusting the seat to the driver's weight:

- Pull the lever (43) in the direction of the arrow as far as the stop and then return it.

- The previous weight setting is reset to the minimum value. The seat suspension can be set from 50 kg to 130 kg.

- Move lever (43) again in the direction of the arrow until the corresponding weight marking is reached on the scale (42). Then finally return the lever.
- Sit on the driver's seat.



-  When adjusting, do not reach between the seat and the motor panel.

Adjusting the backrest:

- Lift up locking lever (41) and adjust the incline of the backrest (40).
- Release locking lever (41) to lock the backrest in position.

Adjusting the seat position:

- Pull up the locking lever (44) of the driver's seat lock in the direction of the arrow and push the seat forwards or backwards to the desired position.
- Engage locking lever (44) in position again.



The driver's seat must be securely located in the desired position. The driver's seat setting must not be changed during travel.



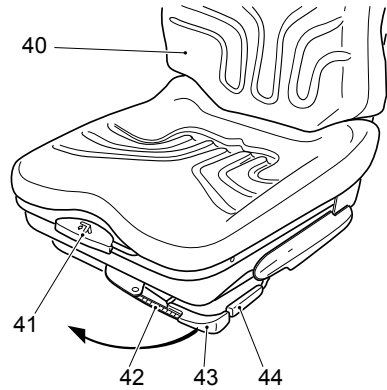
Always put the seat belt on before starting the truck. For further information see section 4.4.



The procedure for adjusting the driver's seat applies to standard models. For other models, follow the manufacturer's adjustment instructions. When adjusting, ensure that all controls are within easy reaching distance.

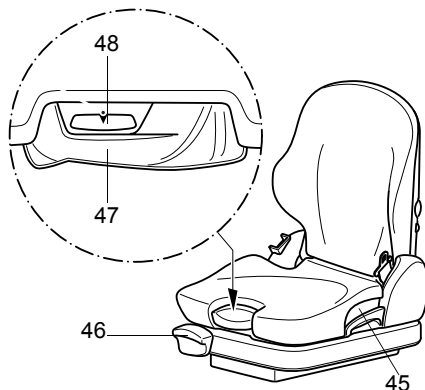


It is essential to set the right weight, as this will reduce the extent of vibration exerted on the driver's body. Some trucks may be fitted with a deadman switch, i.e. the truck only starts when the driver is positioned on the seat.



○ MSG 65 seat

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



Adjusting the seat to the driver's weight:

- Sit on the driver's seat. When the correct weight adjustment has been made, the arrow of the driver weight display (48) will be above the calibration line. If the arrow is facing too far to the left or right, the seat must be adjusted to the driver's weight.
- To do this, move the weight adjustment lever (47) approx. 90° forward.
- To set the seat to a lesser weight, push the weight adjustment lever (47) down.
- To set the seat to a greater weight, push the weight adjustment lever up.
- After adjusting, return the lever to its original position.

Adjusting the backrest incline:

- Sit on the driver's seat.
- Lift up the backrest tilt adjuster (45) and adjust the incline of the backrest.
- Release the backrest tilt adjuster (45) to lock the backrest in position.

Adjusting the seat position:

- Pull up the longitudinal adjuster (46) and push the driver's seat forwards or backwards to the desired position.
- Engage the longitudinal adjuster (46) in position again.



The longitudinal adjuster must be securely located in the desired position. The driver's seat setting must not be changed during travel.

4.4 Safety restraint belt



Put on the safety restraint belt each time before starting the industrial truck. The belt protects against serious injury.

Protect the 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.



Do not alter the belt setting. This will increase the risk of malfunctions.

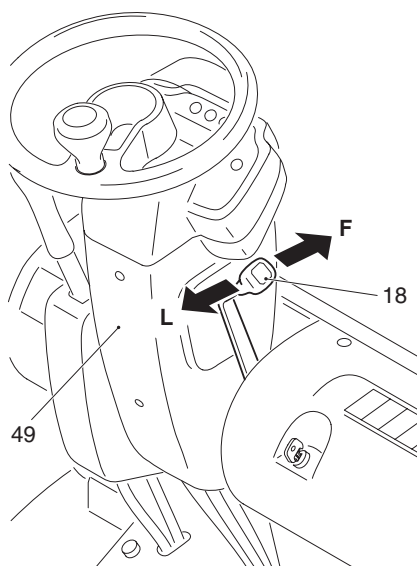
- Always replace the safety restraint belt after an accident.
- Only original spare parts must be used for retrofits or repairs.



Damaged or non-operational belts must only be replaced by contractual dealers or branches.

4.5 Adjusting the steering column

- Release the steering column adjusting lever (18) in the direction of the arrow towards the driver's seat.
- Tilt the steering column (49) forward or backward as required.
- Push the steering column adjusting lever in the direction of the arrow (F).



4.6 Starting the truck

Before starting the truck

If the motor has not run for several weeks or if the oil filter has been changed, start the motor (see section 4.7 or 4.8) and leave it to run in idle for a few minutes before starting.

Start the motor



The truck should only be operated from the driver's seat.

– Apply the parking brake.



Set the travel direction switch (27) to neutral N.



The motor will only start when the travel direction switch is in neutral.

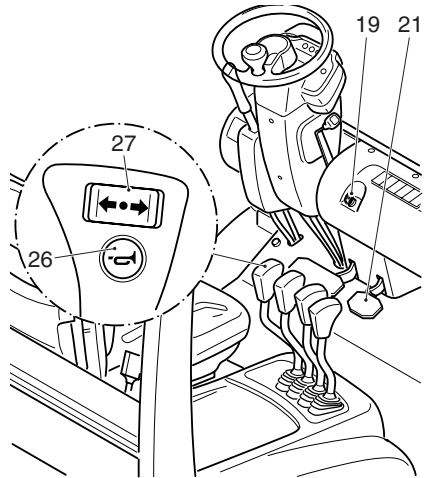


Starting procedure for the TFG (see section 4.7).
Starting procedure for the DFG (see section 4.8).

Key operated ignition

Function:

- O - All main circuits are cut out and the key can be removed.
- I - Controls and instruments are switched on.
- II - Motor preheating (diesel only).
- III - Starting the motor (automatically returns to the II position).



4.7 Starting procedure for the TFG



Note the safety regulations for handling liquid gas (see Chapter D, section 1).

- Slowly open the shutoff valve on the LPG bottle.
- Put the key in the ignition / starter switch (19).
- Set the ignition / starter key (19) to the “I” position.
- Press the warning switch (26) and test the horn.

The charging current (3), motor oil pressure (2), neutral setting (14) and parking brake (5) indicators light up.

- Gently apply the accelerator pedal (21).
- Set the ignition / starter key now to the II position.



Only apply the starter for a maximum of 15 seconds without interruption. Before starting again, wait 30-60 seconds and reset the ignition / starter switch to 0.

- Release the key as soon as the motor starts. It automatically returns to the I position.



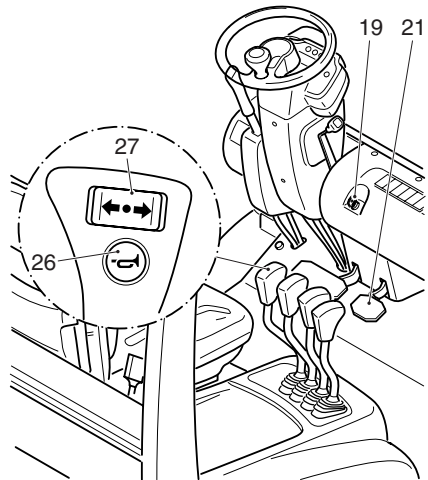
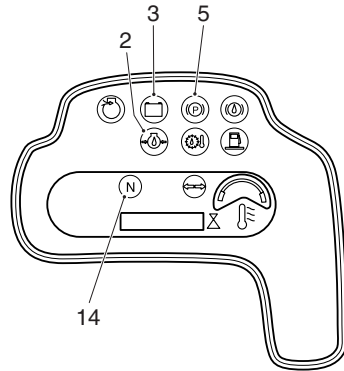
When working with LPG trucks it is essential to always observe the following safety regulations.

If a truck will not start:

- Close the gas bottle shutoff valve.
- Turn off the ignition / starter 0.
- Call for a trained, authorised customer service engineer.

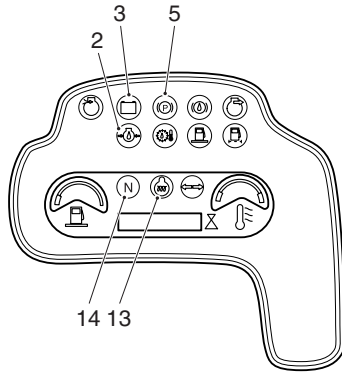


All indicators lights except for neutral setting (14) and parking brake (5) should go out as soon as the motor starts. If not, stop the motor immediately and rectify the fault.



4.8 Starting procedure for the DFG

- Put the key in the ignition / starter switch (19).
- Set the ignition / starter key (19) to the "I" position.
- Press the warning switch (26) and test the horn.
- After setting the ignition / starter (19) to the I position, the charging current (3), motor oil pressure (2), neutral setting (14) and parking brake (5) indicators and the preheat (13) control light light up.
- Apply the accelerator pedal (21) fully and wait until the preheat control light goes out.



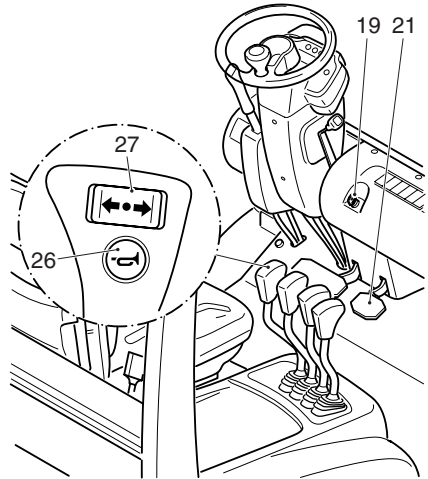
→ The preheat time depends on the motor temperature, but normally lasts approx. 4 seconds.

- Set the ignition / starter key now to the II position.

⚠ Only apply the starter for a maximum of 15 seconds without interruption. Before starting again, wait 30-60 seconds and reset the ignition / starter switch to 0.

- Release the key as soon as the motor starts. It automatically returns to the I position.

⚠ All indicators lights except for neutral setting (14) and parking brake (5) should go out as soon as the motor starts. If not, stop the motor immediately and rectify the fault.





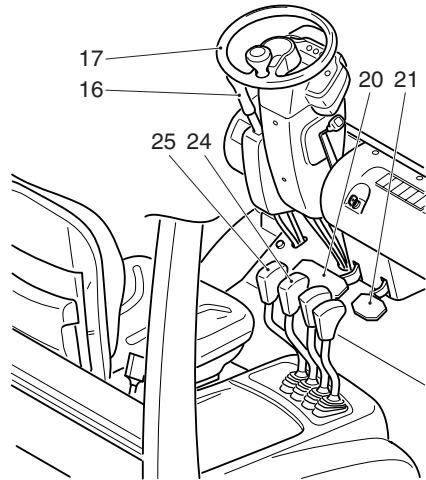
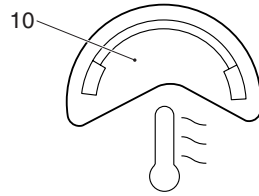
After starting the motor, carry out a test run and check the following functions:

- Braking of the parking brake (16) and the slow travel / brake pedal (20).
- Test the motor speed with the accelerator pedal (21) over a range of speeds while checking the ease of movement of the pedal.
- Test the operation of the raise/lower (25), tilt (24) and if necessary attachment hydraulic control functions.
- Turn the steering wheel (17) as far as it will go in both directions and test the steering.



Do not run up the motor in idle. The motor soon reaches operating temperature at a moderate charge and when the speed alternates. Only fully charge the motor when the motor coolant temperature display (10) shows operating temperature.

The truck is ready for operation once all the functional controls have been satisfactorily performed and operating temperature is reached.



4.9 Operational Fault Displays

When the following indicators are lit:

- Motor oil pressure (2),
- Charging current (3),
- Coolant temperature (10),
- Transmission oil temperature (4),

the motor must be stopped immediately.

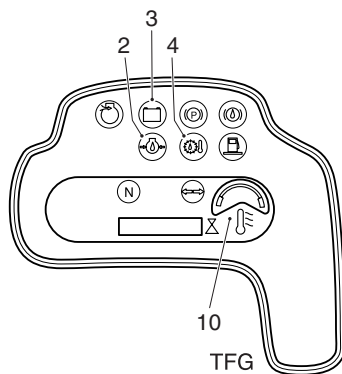
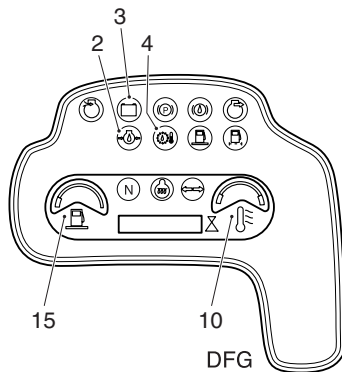


The motor should only be started again once the fault has been removed.



For troubleshooting procedures, see section 6.

Check the fuel display (15, DFG only) during operation.

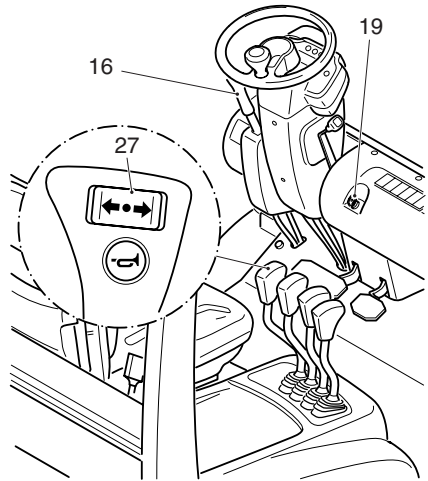


4.10 Stopping the motor



Do not stop the motor from full charge. Instead, let it run for a short while to allow the temperature to compensate.

- Stop the truck.
- Set the travel direction switch (27) to neutral.
- Apply the parking brake (16).
- Set the ignition / starter key (19) to the 0 position.



5 Industrial truck operation

5.1 Safety regulations for truck operation

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

Driving 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. It is forbidden to lean out of or reach beyond the working and operating area.

Visibility when travelling: The driver must look in the direction of travel and must always have a clear view of the route ahead. When carrying loads which affect visibility, these must be stored at the rear of the truck. If this is not possible, a second person must walk in front of the truck as a lookout.

Negotiating slopes and inclines: Negotiating climbs or dips is only permitted if such roads are clean and have a non-slip surface and providing such journeys are safely undertaken in accordance with the technical specifications for that vehicle. The truck must always be driven with the load unit facing uphill. Turning, travelling at an angle and parking the forklift are not allowed on inclines or dips. Inclines must only be negotiated at slow speed, with the driver ready to brake at any moment.

Negotiating lifts and docks: Lifts and docks must only be used 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.

Persons riding in the lift with the forklift truck must only enter the lift after the truck has come to a rest and must leave the lift before the truck.

Nature of loads to be carried: Only carry properly secured loads. Never transport loads stacked higher than the top of the fork carriage or the load guard.

Towing trailers or the truck itself being towed are only permitted occasionally, on secure, level routes, with a maximum deviation of +/- 1% and at a max. speed of 5 km/h. The truck shall not be permanently used with trailers.

There must be no load on the load forks when another vehicle is being pulled.

Do not exceed the maximum trailer load specified for the forklift truck for trailers with or without brakes. The specified trailer load only applies for the auxiliary coupling in the counterbalance of the forklift. If a different trailer coupling is used on the truck, the instructions of the coupling manufacturer must be observed.

After coupling and before starting the driver shall ensure that the trailer coupling cannot become detached.

Forklift trucks pulling a load must be driven such that the trailing vehicle is driven safely and can be stopped at all times.



Exhaust emissions: The forklift 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.

5.2 Travel

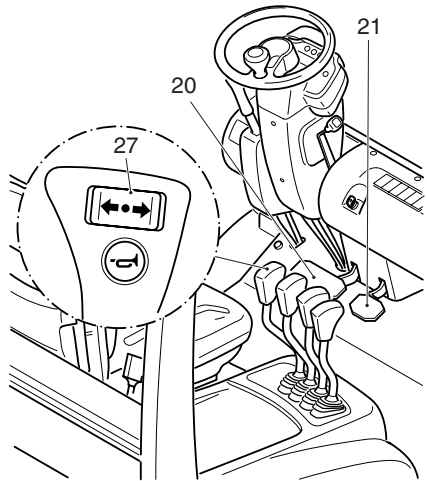


Adapt the travel speed to the conditions of the route, the work area and the load

- Set the travel direction switch (27) to neutral.
- Raise the fork carriage approx. 200 mm so that the load forks are clear of the ground.
- Tilt the mast fully backward.
- Release parking brake.

Forward travel

- Set the travel direction switch (27) forward.
- Slowly apply the accelerator pedal (21) until you reach the required travel speed.



Changing direction



Only change direction when the truck has stopped.

- Set the travel direction switch (27) via neutral to the required direction.
- Slowly apply the accelerator pedal (21) until you reach the required travel speed.

Reversing



Make sure you have sufficient space to reverse into.

- Set the travel direction switch (27) to the rear.

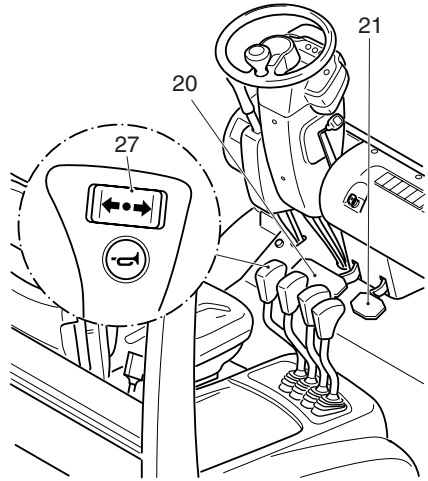
Accelerating

- Slowly apply the accelerator pedal (21) until the truck starts to move.
- Continue to depress the accelerator. The motor and travel speeds increase.

Slowing down the truck



The braking pattern of the truck depends to a large extent on the condition of the ground. The driver must take this into consideration when handling the truck. Carefully brake the truck to prevent the load from slipping.



Braking

- Take your foot off the accelerator pedal (21).
- Gently depress the slow travel / brake pedal (20).

In the first pedal displacement zone, the flow of force is reduced by the torque converter.

- Continue to depress the slow travel / brake pedal (20).

As you continue to depress, the truck automatically comes to a halt.

Slow travel with the slow travel / brake pedal

When shunting in confined areas, in order to travel slowly sensitively apply the slow travel / brake pedal (20).



This operating mode can only be used for max. 5 seconds when the engine is running at high speed.

5.3 Steering



Very little steering force is required for the hydrostatic steering, therefore turn the steering wheel (17) with caution.

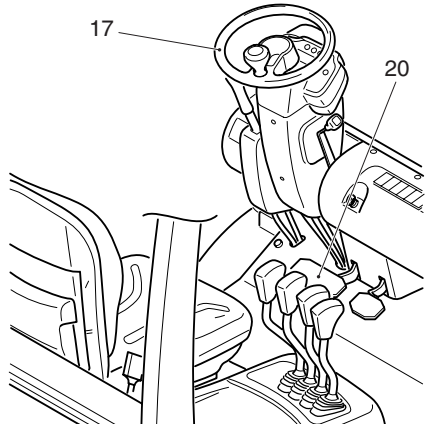
5.4 Braking

Operating Brake

The slow travel / brake pedal hydraulically actuates the drum brakes of the front wheels.

- Apply the slow travel / brake pedal (20) until you notice the brake pressure.

The flow of force is controlled in the power shift transmission in the first pedal displacement zone. As you continue to depress the pedal, the front wheel drums brakes are applied.



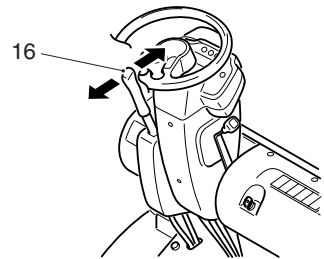
Parking brake

The parking brake lever mechanically actuates the drum brakes of the front wheels.

- Pull back the parking brake lever (16) beyond the pressure point as far as the stop.

The parking brake is engaged and the parking brake lever is locked in this position.

- To release the parking brake, push the parking brake lever forward beyond the pressure point.



5.5 Mast and Attachment Operation

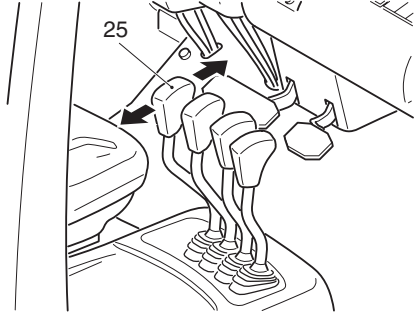


The control levers must only be operated from the driver's seat.

The lifting device is operated from the control levers on the right-hand side of the driver's seat.

Lifting/lowering the fork carriage

- Pull the control lever (25) back to raise the fork carriage.
- Push the control lever (25) forward to lower the fork carriage.

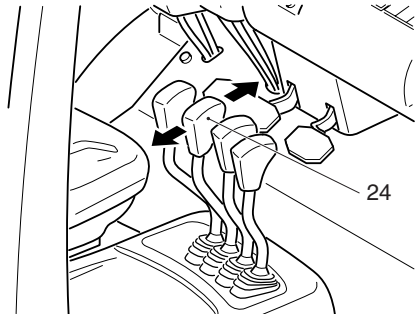


Tilting the mast forward / backward



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

- Pull the control lever (24) back to tilt the mast back.
- Push the control lever (24) forward to tilt the mast forward.

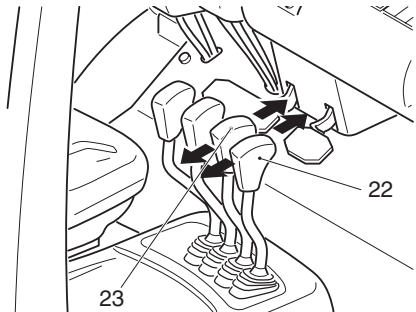


Operating attachments:

Attachments are operated via the control levers (22, 23) to the right of control lever (24) (mast tilt).



Also follow the manufacturer's operating instructions when operating an attachment.



Controlling the speed of the lifting device

Moving the control lever and changing the motor speed governs the operating speed of the hydraulic cylinders.

When the control levers are released (22, 23) they automatically revert to neutral and the lifting device remains in the position it has reached.



Always apply the control lever sensitively, never with a sudden jerk. Release the control lever as soon as you reach the stop.

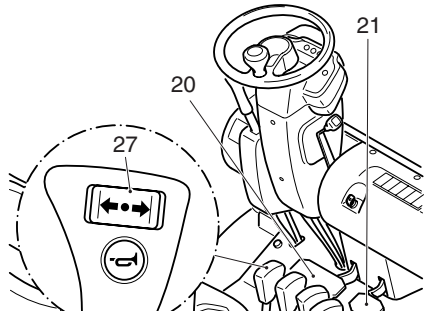
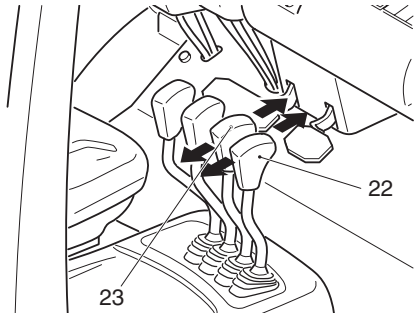
- Set the travel direction switch (27) to neutral.
- Increase the motor speed with the accelerator pedal (21) and
- Continue to move the control lever back to increase the speed of the lifting device.



The motor speed does not affect the lowering speed of the fork carriage.



It is forbidden to lift people with the lifting device.



5.6 Collecting, transporting and depositing loads



The control levers must only be operated from the driver's seat.



Before picking up a load, the driver must ensure that it is correctly palletised and that the capacity of the truck is not exceeded.

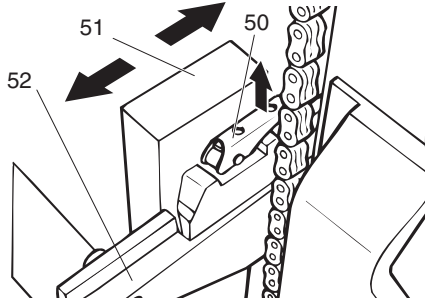
Note the load diagram

Adjusting the load forks



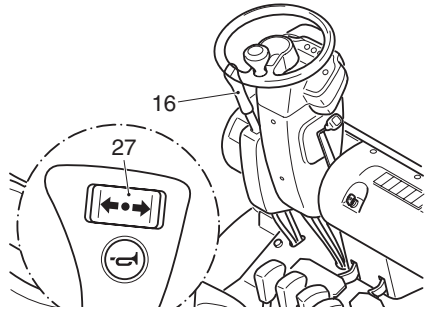
Adjust the load fork in such a way that both forks are at an equal distance from the outer edge of the fork carriage and the load centre of gravity is between the forks.

- Raise the locking lever (50).
- Push the forks (51) to the correct position on the fork carriage (52).
- Turn the locking lever down and move the forks until the locking pin engages in a slot.



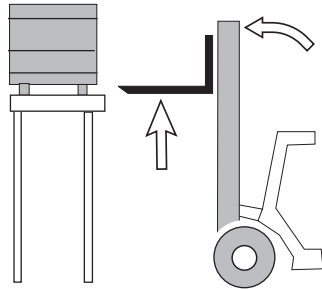
Raising a load

- Carefully approach the load to be raised.
- Set the travel direction switch (27) to neutral.
- Tighten the parking brake lever (16).
- Raise the load fork to the correct height for the load.
- Set the travel direction switch to forward and release the parking brake.
- Carefully enter the load until ideally it touches the fork shank.



At least two thirds of the length of the load fork must extend into the load.

- Set the travel direction switch (27) to neutral and apply the parking brake lever (16).
- Raise the fork carriage until the load is resting freely on the load fork.
- Set the travel direction switch to reverse and release the parking brake.

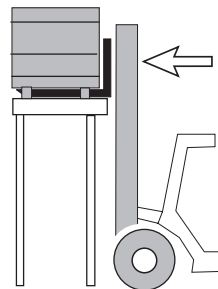


It is forbidden to lift people with the lifting device.



Make sure you have enough free space to reverse.

- Reverse carefully and slowly until the load is outside the storage area.





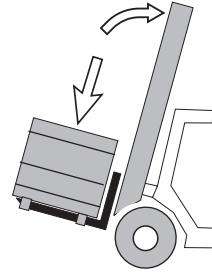
It is forbidden to stand underneath a raised load.



- Tilt the mast fully backward:
- Lower the load as far as is absolutely necessary for transport (ground clearance approx. 150...200 mm).



The higher the load is transported, the less the operating safety of the truck.

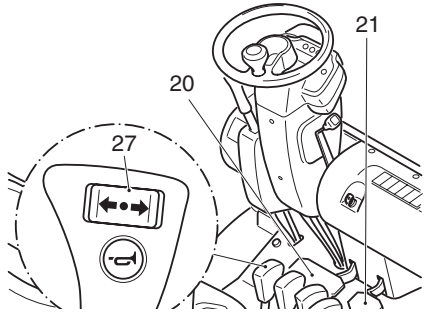


Transporting a load



If the load is stacked up so high that it affects forward visibility, then reverse.

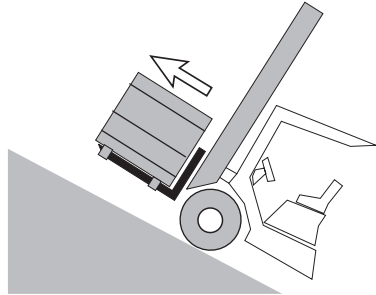
- Gently accelerate with the accelerator pedal (21) and slowly brake with the slow travel / brake pedal (20). Be ready to brake at all times.
- Adapt your travel speed to the conditions of the route and the load you are transporting.
- Watch out for other traffic at crossings and passageways.
- Only drive with a lookout at blindspots.



On slopes and inclines always carry the load facing uphill, never approach at an angle or turn.

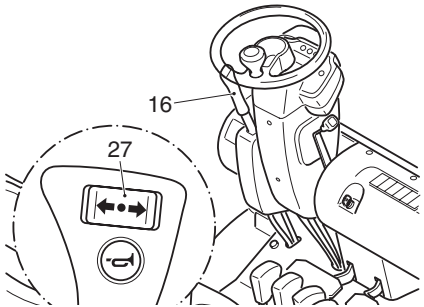


Never reverse at full speed or at just 5 km/h (or less).

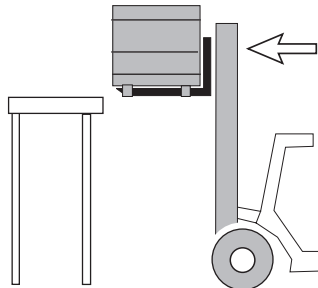


Depositing a load

- Drive the truck carefully up to the rack.
- Set the travel direction switch (27) to neutral.
- Engage the parking brake lever (16).
- Raise the load fork to the correct height for the rack space.
- Set the mast vertical.
- Set the travel direction switch (27) to forward and release the parking brake lever (16).
- Carefully enter the load into the rack space.
- Slowly lower the load until the load fork is free.



Avoid placing the load down suddenly to avoid damaging the load and the load lifting device.



Stack cylindrical loads close to each other and evenly. Place each row on boards and secure each end with wedges.

Cylindrical objects can also be stacked in pyramids. Place wedges on the lowest row of each roller.

Stack boxed pallets level and at right angles to each other. Stack the top row in the opposite direction for extra safety.

Handling individual swaying loads

With forklift trucks which have a hook auxiliary attached to the fork arm (or some other equipment that allows loads to be suspended by a hook), there is a tendency that these destabilizing forces will impact on the truck. With forklift trucks that have been modified for this purpose, the following guidelines must be maintained to improve truck stability.



A truck that has been modified to transport loads by a hook is by definition a crane and hence the corresponding crane regulations apply.

When handling suspended loads, the max. speed (laden) on a level surface must be restricted to 17 km/h.

The forklift truck's capacity is reduced if it has been modified to transport loads from a hook. The following details can be found on the data plate on the auxiliary vehicle or driver's cab.

- Weight of auxiliary vehicle;
- Centre of gravity;
- Rated capacity.



The rated capacity of the truck and the auxiliary vehicle must not be exceeded.

- The hook must not be raised more than 4.5 m above ground height.
- When travelling, the lower section of the load must not be raised more than 300 mm from ground level or the forklift truck (whichever is the lower). The mast must be tilted either almost vertically or backward.
- The forklift truck must only be operated on stable, constant, even and prepared surfaces.
- Only ever transport a single load at a time.



If the forklift truck is not properly operated, it may tip over and result in injury to personnel. If the forklift truck is about to tip over:

- Remain within the truck (do not jump out);
- Hold onto the steering wheel;
- Brace your feet;
- Lean away from the point of contact.

5.7 Using the Seat Belt

If a seat belt is attached, always put it on before starting the truck. The belt must be attached as follows:

- Remove the belt smoothly from the retractor.
- Wrap the belt around you and fit the lock into the buckle. Make sure the belt is not twisted.

The operator should always sit back as far as possible. This is to protect the operator's back as much as possible and the seat belt affords maximum protection.

- If the truck has come to a halt the motor is switched off, undo the automatic safety belt by pressing the red button on the belt buckle. Guide the lock back into the retractor.

If the belt is retracted too quickly, the lock may activate the automatic locking on the compartment due to the collision. If the automatic locking is activated, the belt catch can only be removed with a certain amount of effort. Undo the automatic locking as follows:

- Pull the belt 10 - 15 mm out of its compartment. You may need to apply a certain amount of force to do this
- Allow the belt to run back in.
- It should now be possible to remove the belt in the normal manner.

The automatic locking prevents the belt from being removed from the retractor when the truck is on a sharp incline. The forklift truck must therefore be moved away from the sharp incline before the seat belt can be attached.

Daily inspection and servicing of the seat belt

The operator must inspect the seat belt each day to ensure it is in a good condition and is operating correctly before starting the truck. The following (non-exhaustive) checks should be made:

- Extract the belt in full and make sure it is not twisted.
- Check the operation of the buckle and the belt returning to the retractor.

Check the automatic locking as follows:

- Park the truck on level ground.
- Try to remove the seat belt with a jerk; the automatic locking should prevent the belt from being extracted.



The truck must not be operated with a faulty seat belt. Replace if at all damaged.

If the truck has been involved in an accident, replace the seat belt.

Damaged seat belts that no longer operate correctly must be replaced by trained personnel.

5.8 Parking the truck securely



When you leave the truck it must be securely parked even if you only intend to leave it for a short time. Never park and abandon a truck with a raised load.

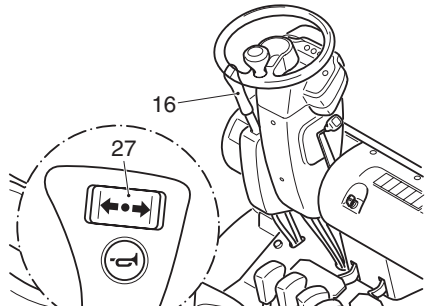
- Drive the truck onto a level surface.



In multi-storey buildings, LPG trucks may only be driven on the lowest levels. Liquid gas is colourless, heavier than air and does not easily dissipate. It tends to sink to the lowest possible level and can collect in pits, drains, basements and other recesses.

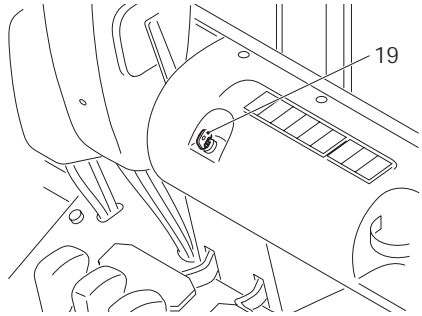
This means that LPG gas can gather in areas far away from the truck and constitutes a hazard for people who are unaware of the potential risks from explosions and frostbite.

- Fully lower the load fork and tilt the mast forward.
- Set the travel direction switch (27) to neutral.
- Apply the parking brake lever (16).



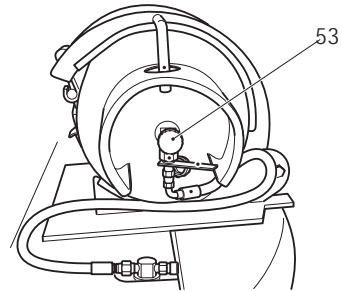
Stopping the motor DFG

- Set the ignition / starter switch (19) to "0".
- Remove the key from the ignition / starter switch (19).



Stopping the motor TFG

- Close the shut-off valve (53) of the LPG bottle securely.
- Wait until the motor comes to a stop.
- Set the ignition / starter switch (19) to "0".
- Remove the key from the ignition / starter switch (19).



5.9 Motor panel

Motor panel

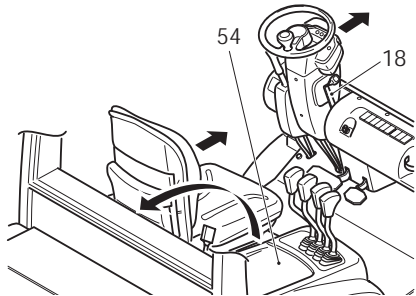


Before opening the motor panel the steering column and the steering column adjustment lever (18) must be pushed forward fully.

Push the driver's seat forward.

The stop bolt on the left hand seat guide rail should engage facing up.

- Press the pushbutton in the leg compartment and raise the motor panel (54) slightly.
- Fully raise the motor panel (54). A gas pressure damper keeps the motor panel in the raised position.



If a forklift truck is equipped with a steel cabin, both cabin doors must be opened before raising the motor panel.

When you close the motor panel, pull the stop bolt down and push the driver's seat back again.

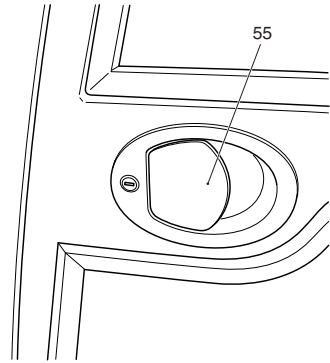


Make sure the motor panel has engaged correctly before operating the truck again.

○ Steel cabin

If a truck is fitted with a steel cabin, both doors can be closed.

- 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 remove the handle (53).



5.10 Towing

As the gear unit of the forklift motor is powered, the transmission is not lubricated and will overheat if a truck has to be towed with the motor switched off. To avoid this, the truck can only be towed at a max. speed of 4 km per hour.

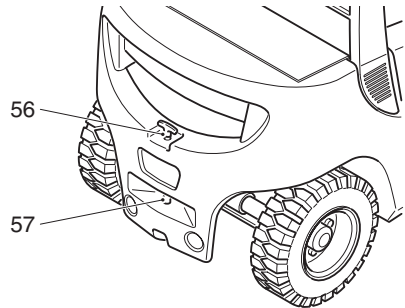
Hitch point

A rigid tow bar must be used for moving a forklift truck.

The tow point of the truck is indicated by (57).

Using the hitch point

- Push the tow pin (56) down and turn it 90 degrees.
- Pull the tow pin up and insert the tow eye or tiller of the trailer vehicle into the opening.
- Insert the tow pin, push it down, turn it 90 degrees and engage it.



Inserting the trailer coupling



Before coupling, the driver must ensure the maximum trailer load is not exceeded.

5.11 Towing trailers

The hitch point can occasionally be used to tow a light trailer on a dry, level and well maintained surface.

For other towing applications, consult the manufacturer or the authorised representative.

5.12 Tow loads

Permissible towed loads for +/- 1° inclines and max. 5 km/h (trailer without brakes).

Truck	Net weight kg	Tow force (N)	Towed load (t)
DFG 425	4290	17300	12.9
DFG 430	4730	17150	14.2
DFG 435	5028	17000	15.1
TFG 425	4190	17100	12.6
TFG 430	4630	16500	13.9
TFG 435	4928	16000	14.8

6 Troubleshooting

This chapter is designed to help the user identify and rectify basic faults or the results of incorrect operation. When locating a fault, proceed in the order shown in the table.



If the fault cannot be rectified after carrying out the remedial procedures, notify the manufacturer's service department, as any further troubleshooting can only be performed by specially trained and qualified service personnel.

Fault	Possible cause	Action
Starter does not turn	<ul style="list-style-type: none"> – Travel direction switch not in neutral. – Battery charge too low – Battery terminal cable loose or terminals oxidized – Starter cable loose or broken – Starter magnetic switch jammed 	<ul style="list-style-type: none"> – Set the travel direction switch to neutral – Check battery charge, charge battery if necessary – Clean and grease terminals, tighten battery terminal cable – Check starter cable, tighten or replace as required – Check if the magnetic switch audibly engages
Motor does not start	<ul style="list-style-type: none"> – Air filter contaminated – Bowden cable faulty or hanging Additional for LPG – LPG bottle shutoff valve closed – LPG bottle empty – Ignition distributor cap damp – Spark plugs damp, oily or loose – Spark plugs faulty Additional for diesel – Fuel tank empty, injection system has suctioned in air – Water in fuel system – Fuel filter contaminated – Paraffin separation from the diesel (flakes forming) 	<ul style="list-style-type: none"> – Clean / replace air filter – Check Bowden cable – Shutoff valve open – Replace the LPG bottle – Ignition distributor cap dry, if necessary apply contact spray – Dry, clean and tighten spark plugs – Replace spark plugs – Fill up with diesel and bleed the injection system – Discharge the fuel system Add fuel Discharge fuel system – Check the flow of fuel, if necessary replace the fuel filter – Park the truck in a warm room and wait until the separation has returned to its original state If necessary replace the fuel filter Fill up with winter diesel

Fault	Possible cause	Action
Motor oil indicator lit during operation	– Motor oil level too low	– Check motor oil level, top up if necessary
Motor temperature display in red zone	– Motor oil level too low – Radiator contaminated – Coolant level too low – Fan V belt slipping	– Check motor oil level, top up if necessary – Clean radiator – Check motor radiator system for leaks, add coolant if necessary – Check V belt tension, tighten or replace as required
Transmission oil indicator lit during operation	– Transmission oil level too low – Radiator contaminated	– Check transmission oil level, top up if necessary – Clean radiator
Motor running but truck does not travel	– Travel direction switch in neutral – Parking brake applied	– Set travel direction switch to required direction – Release parking brake
Truck does not reach max. speed	– Transmission oil level too low	– Check transmission oil level, top up if necessary
Lift speed too low	– Hydraulic reservoir oil level too low – Hydraulic reservoir discharge system contaminated or blocked	– Check hydraulic oil, if necessary top up – Clean / replace hydraulic reservoir discharge system
Load cannot be raised to max. height.	– Hydraulic reservoir oil level too low	– Check hydraulic oil, if necessary top up
Steering is sluggish	– Air pressure in steering axle tyres 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.

F Maintenance of the Forklift Truck

1 Operational Safety and Environmental Protection

The servicing and inspection duties contained in this chapter must be performed in accordance with the intervals indicated in the servicing checklists.



Any modifications to the forklift truck assemblies, in particular the safety mechanisms, is prohibited. The operational speeds of the truck must not be changed under any circumstances.



Only original spare parts have been certified by our quality assurance department. To ensure safe and reliable operation of the forklift truck, use only the manufacturer's spare parts. Used parts, oils and fuels must be disposed of in accordance with the relevant environmental protection regulations. For oil changes, contact the manufacturer's specialist department.

Upon completion of inspection and servicing, the tasks contained in the "Recommissioning" section must be performed (see chapter F).

2 Maintenance Safety Regulations

Maintenance personnel: Industrial trucks must only be serviced and maintained by the manufacturer's trained personnel. The manufacturer's service department has field technicians specially trained for these tasks. We therefore recommend a maintenance contract with the manufacturer's local service centre.

Lifting and jacking up: When an industrial truck is to be lifted, the lifting gear must only be secured to the points specially provided for this purpose. When the truck is to be jacked up, take appropriate measures to prevent the truck from slipping or tipping over (e.g. wedges, wooden blocks). You may only work underneath a raised lifting device if it is supported by a sufficiently strong chain.



Jacking point see chapter B.

Cleaning: Do not use flammable liquids to clean the industrial truck. Prior to cleaning, all safety measures required to prevent sparking (e.g. through short circuits) must be taken. For battery-operated trucks, the battery connector must be removed. Only weak suction or compressed air and non-conductive antistatic brushes may be used for cleaning electric or electronic assemblies.



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 the truck, carry out the activities detailed in the "Recommissioning" section.

Electrical System: Only suitably trained personnel may operate on the truck's electrical system. Before working on the electrical system, take all precautionary measures to avoid electric shocks. For battery-operated trucks, also de-energise the truck by removing the battery connector.

Welding: To avoid damaging electric or electronic components, remove these from the truck before performing welding operations.

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

Tyres: The quality of tyres affects the stability and performance of the truck. When replacing tyres fitted at the factory manufacturer's original spare parts must be used exclusively otherwise the type sheet data cannot be adhered to. When changing wheels and tyres, ensure that the truck does not slew (e.g. when replacing wheels always left and right simultaneously).

Lift chains: Lift chains wear rapidly if not lubricated. The intervals stated in the service checklist apply to normal duty use. More demanding conditions (dust, temperature) require more regular lubrication. The prescribed chain spray must be used in accordance with the instructions. Applying grease externally will not provide sufficient lubrication.

Hydraulic hoses: The hoses must be replaced every six years. When replacing hydraulic components, also replace the hoses in the hydraulic system.

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.



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 maintenance checklist states the tasks and intervals after which they should be carried out. Maintenance intervals are defined as:

- W = Every 50 service hours, at least weekly
- A = Every 500 service hours, or at least annually.
- B = Every 1000 service hours, or at least annually.
- C = Every 2000 service hours, or at least annually.



W service intervals are to be performed by the customer.

In the run-in period - after approx. 100 service hours - or after repair work, the owner must check the wheel nuts/bolts and re-tighten if necessary.

4 DFG/TFG maintenance checklist

			Maintenance Intervals				
			Standard	= ●	W	A	B
Brakes	1.1	Check effectiveness of operating and parking brakes, adjust where necessary and measure braking distance.			●		
	1.2	Check brake lining wear and check brake drum diameter			●		
	1.3	Check brake fluid level in container and top up if necessary			●		
	1.4	Change brake fluid annually, bleed the system if required					●
	1.5	Check connections and lines for leaks			●		
	1.6	Check brake mechanism, adjust and lubricate if necessary			●		
Electrics	2.1	Test operation of instruments, displays and control switches			●		
	2.2	Test warning and safety devices			●		
	2.3	Check fuse ratings			●		
	2.4	Make sure wire connections are secure and check for damage			●		
	2.5	Test lighting			●		
	2.6	Test micro switch setting			●		
	2.7	Test relay			●		
Power supply	3.1	Battery visual inspection			●		
	3.2	Check battery connections are secure, grease terminals if necessary.			●		
	3.3	Check acid density, acid level and battery voltage			●		
Truck Design	4.1	Check mast attachment			●		
	4.2	Check chassis for damage.			●		
	4.3	Check the counterweight is secure.			●		
	4.4	Check the overhead guard / cabin for damage.			●		
	4.5	Check driver's seat and restraint system			●		
	4.6	Check labels			●		
	4.7	Check trailer coupling / tow mechanism			●		

Maintenance Intervals						
Standard	=	●	W	A	B	C

Hydraulic operation	5.1	Check mast bearings			●	
	5.2	Check setting of slide pieces and stops, and adjust if necessary			●	
	5.3	Visually inspect the mast rollers and check contact surface wear level			●	
	5.4	Check lateral clearance of mast connections and of fork carriage			●	
	5.5	Check load chain setting and tighten if necessary			●	
	5.6	Check forks and fork carriage for wear and damage			●	
	5.7	Check mast tilt angle			●	
	5.8	Check position of tilt cylinder, check piston head jam nut is secure and tighten if necessary			●	
	5.9	Test hydraulic system operation			●	
	5.10	Check that hose and pipe lines and their connections are secure, check for leaks and damage, and tighten connections if necessary.			●	
	5.11	Check cylinders and piston rods for damage and leaks, and make sure they are secure			●	
	5.12	Check hydraulic oil level and top up if necessary			●	
	5.13	Replace hydraulic oil (this may have to be performed via a specialist environmental service truck)				●
	5.14	Replace the hydraulic oil filter			●	
	5.15	Replace hydraulic reservoir discharge paper filter			●	
	5.16	Check attachments and auxiliary equipment are secure, test operation and check for damage			●	
Sign off/ Demonstration	6.1	Lubricate truck in accordance with Lubrication Schedule.			●	
	6.2	Test run			●	
	6.3	Demonstration after servicing			●	
Steering system	7.1	Test steering			●	
	7.2	Check mechanical parts of steering column				●
	7.3	Check steering axle and steering knuckle for wear and damage			●	
Fitting times	8.1	Enable servicing and inspection by removing/assembling panels and covers.			●	

5 DFG maintenance checklist

		Maintenance Intervals					
		Standard	= ●	W	A	B	C
Travel	7.1	Check engine for noise and leaks				●	
	7.2	Check engine oil level, top up if necessary	●	●			
	7.3	Replace engine oil			●		
	7.4	Replace engine oil filter			●		
	7.5	Check valve play, adjust if necessary				●	
	7.6	Test glow plugs, electric				●	
	7.7	Check V belt for tension and damage				●	
	7.8	Check maximum speed (without load), adjust if necessary				●	
	7.9	Check coolant level, top up if necessary	●	●			
	7.10	Add anti-freeze to coolant					●
	7.11	Test anti-freeze, top up if necessary				●	
	7.12	Test water pump and fan				●	
	7.13	Check radiator and clean if necessary	●	●			
	7.14	Test starter and generator				●	
	7.15	Check exhaust system for leaks and damage				●	
	7.16	Clean the air filter cartridge			●		
	7.17	Replace air filter cartridge				●	
	7.18	Replace fuel filter				●	
	7.19	Check the fuel/water separator, and discharge if necessary	●				
	7.20	Check fuel tank and lines for leaks and damage				●	
	7.21	Check transmission for noise and leakage				●	
	7.22	Check travel mechanism, adjust and lubricate if necessary				●	
	7.23	Check transmission oil level, top up if necessary				●	
	7.24	Replace transmission oil				●	
	7.25	Clean transmission oil suction filter and discharge				●	
	7.26	Replace transmission oil filter				●	
	7.27	Check drive axle for noise and leakage				●	
	7.28	Check drive axle oil level and top up if necessary				●	
	7.29	Replace drive axle oil					●
	7.30	Check wheels for wear and damage				●	
	7.31	Check wheel bearings and attachments				●	
	7.32	Check tyre air pressure, adjust if necessary	●	●			

6 TFG maintenance checklist

		Maintenance Intervals					
		Standard	= ●	W	A	B	C
Travel	8.1	Check engine for noise and leaks				●	
	8.2	Replace spark plugs					●
	8.3	Check ignition system and ignition point					●
	8.4	Check valve play, adjust if necessary					●
	8.5	Check engine oil level, top up if necessary	●	●			
	8.6	Replace engine oil			●		
	8.7	Replace engine oil filter			●		
	8.8	Check V belt for tension and damage				●	
	8.9	Check maximum speed (without load), adjust if necessary				●	
	8.10	Check coolant level, top up if necessary	●	●			
	8.11	Add anti-freeze to coolant					●
	8.12	Test anti-freeze, top up if necessary				●	
	8.13	Test water pump and fan				●	
	8.14	Check radiator and clean if necessary	●	●			
	8.15	Test starter and generator				●	
	8.16	Check exhaust system for leaks and damage				●	
	8.17	Check exhaust levels, adjust if necessary				●	
	8.18	Clean the air filter cartridge			●		
	8.19	Replace air filter cartridge				●	
	8.20	Test LPG system, check for leaks and damage (to be performed by authorised specialist personnel)				●	
	8.21	Clean LPG filter (to be performed by authorised specialist personnel)				●	
	8.22	Check transmission for noise and leakage				●	
	8.23	Check travel mechanism, adjust and lubricate if necessary				●	
	8.24	Check transmission oil level, top up if necessary				●	
	8.25	Replace transmission oil				●	
	8.26	Clean transmission oil suction filter and discharge				●	
	8.27	Replace transmission oil filter				●	
	8.28	Check drive axle for noise and leakage				●	
	8.29	Check drive axle oil level and top up if necessary				●	
	8.30	Replace drive axle oil					●
	8.31	Check wheels for wear and damage				●	
	8.32	Check wheel suspension and attachments				●	
	8.33	Check tyre air pressure, adjust if necessary	●	●			

7 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.

If anti-freeze is not necessary, it is still advantageous to use an approved anti-freeze mixture as this offers protection against corrosion and increases the boiling point of the coolant. A minimum concentration of 25% anti-freeze is necessary, however we recommend a 50% concentration.

- If an anti-freeze solution is used to prevent frost damage, it must be ethylene-glycol based. An anti-freeze agent below the stated norm or which corresponds to a similar one is acceptable if the pH value ranges from 7.0 - 8.5.

U.S.A. ASTM D4985 or SAE J1941	Ethylene—glycol based motor coolant
--------------------------------	-------------------------------------

- When using an anti-freeze agent, note the correct mixture of anti-freeze and water. The anti-freeze must comply in full with the above standards.

Lowest temperature required for protection	% volume of anti-freeze	Volume ratio of anti-freeze: water
-37°C	50	1:1

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.



Anti-freeze contains ethylene-glycol and other components which are poisonous if swallowed and can be absorbed in poisonous quantities through persistent, repeated contact with the skin.

When handling anti-freeze always observe the following safety measures:

- NEVER swallow anti-freeze. If anti-freeze is accidentally swallowed, seek IMMEDIATE medical attention.
- Avoid prolonged skin contact with anti-freeze.
- Wipe off spray from the skin immediately.
- If anti-freeze is sprayed into the eyes, rinse them immediately.
- Clothing sprayed with anti-freeze must be removed and washed before being worn again.
- Wear protective clothing if you are regularly handling anti-freeze (plastic or rubber gloves, boots and non-permeable overalls or aprons).

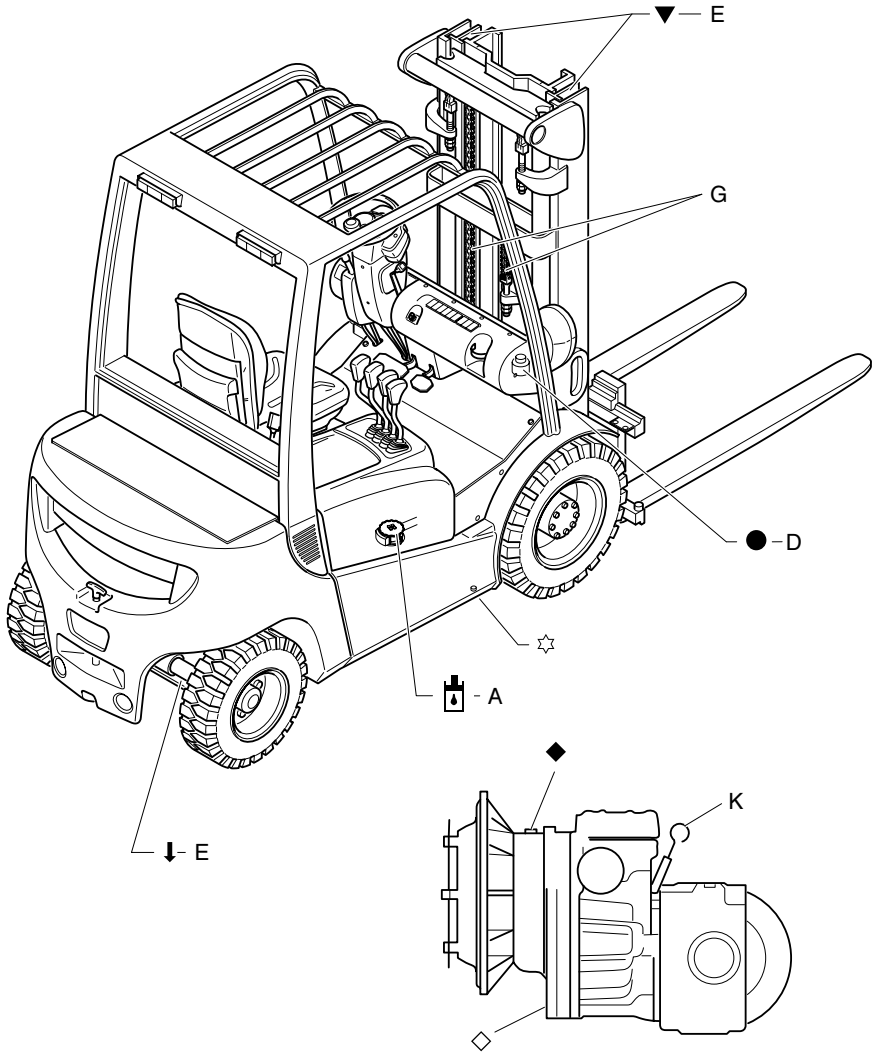


Anti-corrosion solutions contain additives which are poisonous if swallowed and which can be absorbed in poisonous quantities through persistent, repeated contact with the skin. Observe the same safety precautions as for anti-freeze.

8 DFG fuel specifications

Only use DIN 51601 compliant diesel.

9 Lubrication schedule



- | | | | |
|---|---------------------------|---|--|
| ▼ | Contact surfaces | ◆ | Transmission oil filler neck |
| ↓ | Grease nipple | ◇ | Transmission oil drain plug |
| ⊕ | Hydraulic oil filler neck | ● | Mineral oil filler neck for brake system |
| ☆ | Hydraulic oil drain plug | K | Oil dipstick |

9.1 Fuels, coolants and lubricants

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



Improper handling is hazardous to health, life and the environment. Consumables must only be stored in appropriate containers. They may be flammable and must therefore not come into contact with hot components or naked flames.

Only use clean containers when filling up with consumables. Do not mix consumables of different grades. The only exception to this is when mixing is expressly stipulated in the Operating Manual.

Spilled liquids must be removed immediately with suitable bonding agents and the bonding agent / consumable mixture must be disposed of in accordance with regulations.

	Order no.	Quantity	Description	Used for
A	52017728	55 l	HVLP46	Hydraulic System
D	00002832	0.25 l	Brake fluid SAE J 1703	Brake system
E	50055726		K-P-2K grease	
G	29201280		Chain spray	Chains
N	05099205	11 l	ATF Dexron II D	Transmission
	52030273	10 l	Titan Supergaer 80W-90	Axle
	51034915	8l (DFG) 4l (TFG)	Shell Rimula Super FE 10W	Engine oil

Grease guidelines

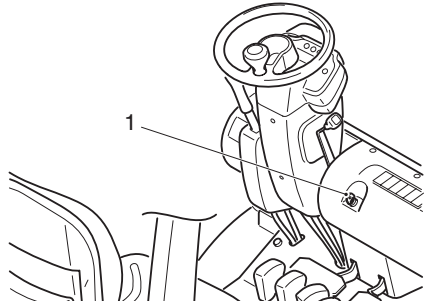
Code	Saponification	Dew point °C	Worked penetration at 25°C	NLG1 class	Applicationtemp erature °C
E	Lithium	185	265-295	2	-35/+120

10 Maintenance and Repairs

10.1 Prepare 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:

- Park the truck securely (see Chapter E).
- Remove the key from the ignition / starter switch (1) to prevent the truck from being switched on accidentally.
- When working under a raised load fork or a raised truck, secure them to prevent them from lowering, tipping or sliding away.



Note the following when raising the forklift truck:



Only use lifting gear with sufficient capacity (for transport weight see truck data plate).

- Park the truck securely (see Chapter E).
- Attach crane slings to the mast at the appropriate points.
- Attach the crane slings to the counterweight of the trailer coupling.



Lifting slings should be fastened to the harness in such a way that they do not come into contact with any attachments or the overhead guard when it is being raised.

10.2 Motor servicing DFG

Replacing the motor oil and motor oil filter



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

Draining the motor oil

- Unscrew the (2) lid.
- Thoroughly clean the oil drain plug (4) and around the drain hole.
- Unscrew the oil drain plug and drain the oil into a suitable container.



Risk of scalding through hot oil.

- Screw in the oil drain plug with a new seal.



Dispose of used oil in accordance with environmental regulations.

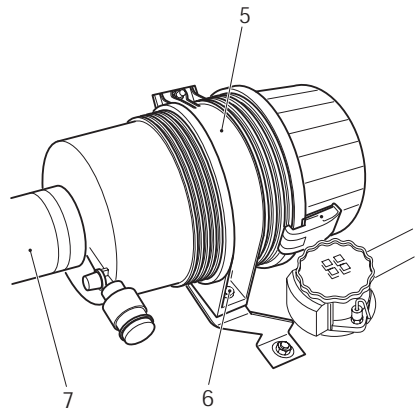
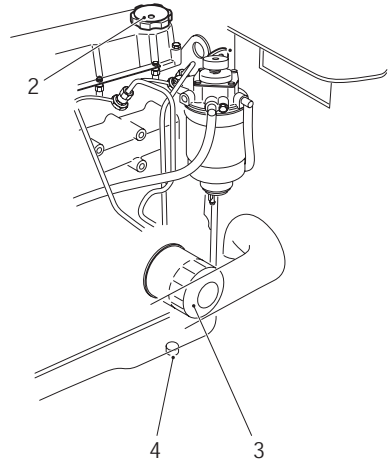
Replacing the motor oil filter

- Undo the hose clamp from the hose (7) and remove the hose.
- Remove the screws (6) from the air filter attachment (5) and place the air filter to one side.
- Undo the oil filter (3) with a filter wrench and manually unscrew it.



Collect any emerging oil and dispose of the oil and oil filter in accordance with environmental regulations.

- Thoroughly clean the raised faces of the oil filter flange.
- Apply a thin layer of fresh motor oil to the seal of the new oil filter.
- Hand-tighten the oil filter.
- Fit the air filter, insert the hoses and tighten with hose clamps.

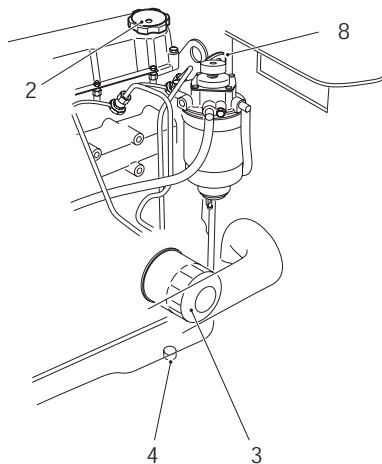


Adding motor oil

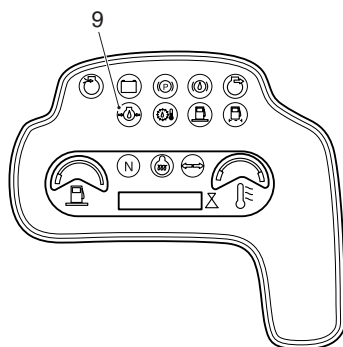
- Add fresh motor oil through the filler port (2) in accordance with the consumables table.

Capacity: 8,0 l

- Check the motor oil level with the dipstick (8) and adjust as necessary (see Chapter E).
- Screw the lid (2) back on.
- Insert the dipstick (8) back fully.



After changing the oil and the oil filter, note the motor oil pressure indicator (9) when running the motor again and check the oil drain plug and oil filter are sealed.



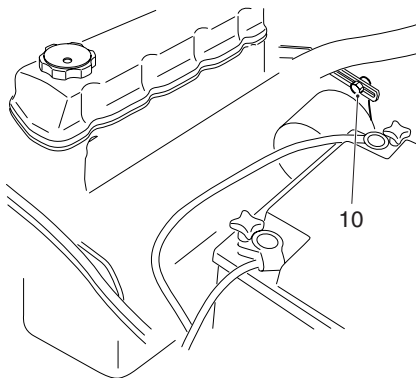
Checking the V belt tension

- Insert the V belt between the fan V belt pulley and the generator V belt pulley using a force of **45 N**.

It should be possible to insert the V belt after approx. **10 mm**.

Adjusting the V belt tension

- Undo the screw (10) and pull the AC generator until the prescribed V belt tension has been reached. Tighten the screws again.
- Check the V belt tension again and repeat the adjustment if necessary.



Replacing the fuel filter

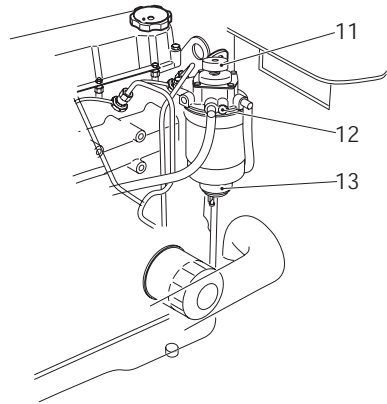
Drain the fuel from the filter into a suitable container.

Undo the fuel filter (13) with a filter wrench and manually unscrew it.



Dispose of the fuel filter and fuel in accordance with environmental regulations.

- Before assembling, apply a thin layer of diesel to the O ring.
- Thoroughly clean the raised faces of the filter flange.
- Apply a thin layer of diesel to the seal of the new fuel filter.
- Manually screw in the fuel filter until the seal contacts the filter flange.
- Tighten the fuel filter another third of a turn.
- Bleed the fuel system



Bleeding the fuel system



Collect any emerging fuel and dispose of it in accordance with environmental regulations.

- Open the discharge screw (12).
- Apply the manual pump lever on the fuel pump (11) until fuel escapes from the discharge screw without bubbles.
- Tighten the discharge screw.
- Set the ignition / starter key to the I position.
- Wait for 10 seconds.
- Repeat the process until the motor starts up.



While running the motor check the fuel filter, the discharge valve and the union nuts of the injection nozzles for leaks.



If the motor does not start up or stops after a short time, repeat the bleeding procedure.

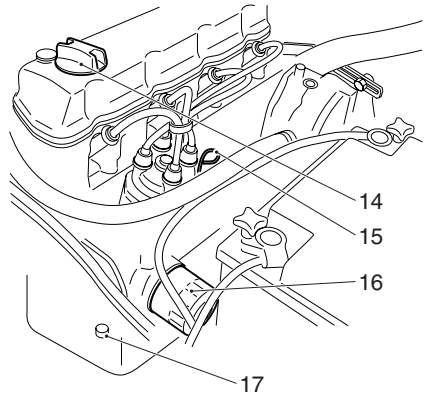
10.3 Motor servicing TFG

Replacing the motor oil and motor oil filter

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

Draining the motor oil

- Unscrew the (14) lid.
- Thoroughly clean the oil drain plug (17) and around the drain hole.
- Unscrew the oil drain plug and drain the oil into a suitable container.



Risk of scalding through hot oil.

- Screw in the oil drain plug with a new seal.



Dispose of used oil in accordance with environmental regulations.

Replacing the motor oil filter

- Undo the oil filter (16) with a filter wrench and manually unscrew it.



Collect any emerging oil and dispose of the oil and oil filter in accordance with environmental regulations.

- Thoroughly clean the raised faces of the oil filter flange.
- Apply a thin layer of fresh motor oil to the seal of the new oil filter.
- Hand-tighten the oil filter.

Adding motor oil

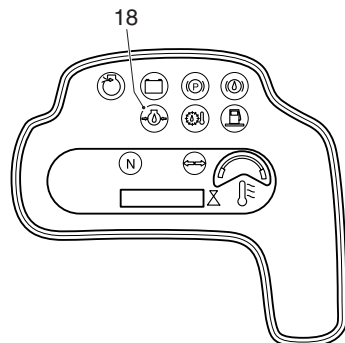
- Add fresh motor oil through the filler port in accordance with the consumables table (see Section 9.1).

Capacity: 4,0 l

- Check the motor oil level with the dipstick (15) and adjust as necessary (see Chapter E).
- Screw the lid back on.
- Insert the dipstick back fully.

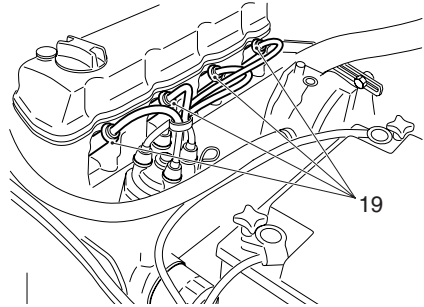


After changing the oil and the oil filter, note the motor oil pressure indicator (18) when running the motor again and check the oil drain plug and oil filter are sealed.



Replacing spark plugs

- Remove spark plug connector (19) .
- 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, and adjust as required.



Rated value: 1.0 mm



Only use original spark plugs.

- Manually screw in the spark plugs and then torque them to **20 Nm**.

Checking the V belt tension

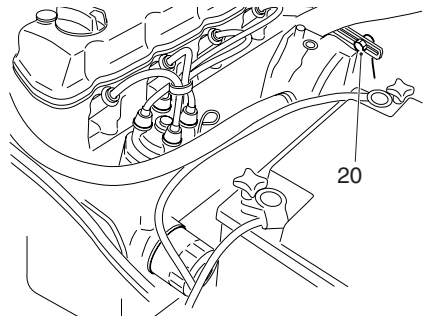
- Insert the V belt between the fan V belt pulley and the generator V belt pulley using a force of **45 N**.

It should be possible to insert the V belt after approx. **11 mm**.

Adjusting the V belt tension

- Undo the screws (20) and pull the AC generator until you reach the prescribed V belt tension.
- Re-tighten the screws.

Check the V belt tension again and repeat the adjustment if necessary.



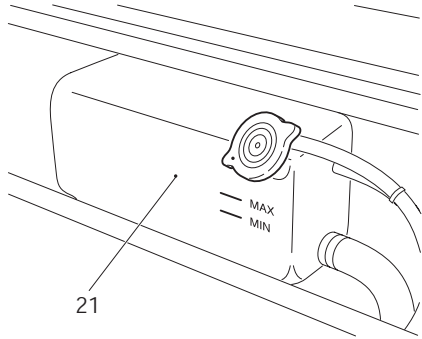
10.4 Checking the coolant concentration



Do not open the radiator lid when the motor is hot.

To prevent the build up of lime as well as front and corrosion damage, and to raise the boiling point temperature, the cooling circuit must be filled each year with a mixture of water and anti-freeze with anti-corrosion additives.

- If there is insufficient anti-freeze, drain the coolant and add anti-freeze to the reservoir (21) until you obtain the correct proportion in the mixture.



Use anti-freeze in accordance with the coolant specifications (see section 7).

The water/anti-freeze mixture proportion and the degree of frost protection to be achieved can be taken from the anti-freeze specifications.

Cooling circuit capacity:

DFG/TFG: **14.0 l**

Filling the cooling circuit



Leave the motor to cool down in order to fill it with coolant. Slowly open the lid; dangerously hot coolant can escape if the coolant circuit is still pressurized. Do not add too much coolant to the circuit. The lid contains a safety valve which opens to let hot coolant dissipate if the fluid level is too high.



If coolant is added in the course of servicing, it must meet the specifications of the original fluid (see Section 7). If you add coolant too quickly or if the truck is not horizontal, air will enter the coolant circuit. Running the motor with air in the coolant circuit will result in excessive operating temperatures and can damage the motor.



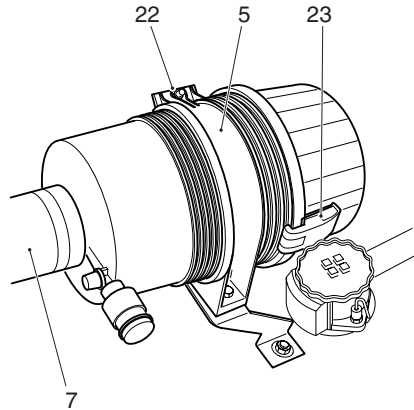
The truck must be horizontal. Slowly open the reservoir lid. Using a funnel, slowly fill the coolant circuit to the level indicated in the manufacturer's manual. The funnel will create the pressure required to force air out of the coolant circuit. Wait until all the air bubbles have escaped and then refit the lid. Start the motor. Switch off the motor when it reaches operating temperature and then let it cool down. Slowly open the reservoir lid and if necessary add coolant in accordance with the manual instructions until you obtain the correct level. Refit the lid.

10.5 Cleaning/replacing the air filter cartridge



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

- Unscrew the clamping screw (22) and lift up the clamp (5).
- Raise the air filter housing.
- Undo the 2 mounting clamps (23) and remove the dust collector pot.
- Carefully remove the internal and external air filter cartridges from the filter housing.
- Apply dry compressed air from the inside of the external cartridge to the outside until no more dust emerges.
- Carefully wipe the internal cartridge with a lint-free cloth.



Do not apply compressed air to the filter housing, instead wipe with a clean cloth.

- Replace any damaged or heavily contaminated air filter cartridges.
- Thoroughly clean the dust collector pot, to do this remove the rubber element.
- Insert the air filter cartridges back in the filter housing and secure them.



Take care not to damage the air filter cartridges when assembling.

- Insert the dust collector pot and secure it with the 2 mounting clamps (23).
- Fit the air filter housing in the assembly position.
- Attach the clamp (5) and screw on the clamping screw (22).

10.6 DFG/TFG transmission:



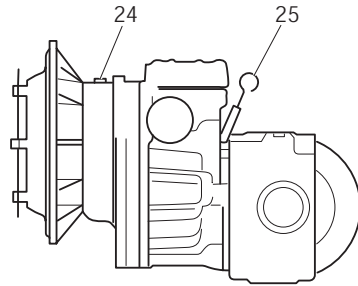
It is important to check the oil level correctly. The oil is a lubricant which also acts as a coolant and operates the clutches. A low oil level will result in loss of transmission and pressure. It also causes overheating and resultant transmission failure.

Checking the transmission oil level



Only use clean, fresh oil from clean containers to fill or top up the transmission. Damage will arise from contamination or water entering the transmission.

You access the transmission oil dipstick on the right-hand side of the transmission (looking in the direction of travel).



- Start the motor and with the parking brake applied, first engage forward gear followed by reverse and wait until the transmission has reached operating temperature.
- When the motor is running in idle, remove the dipstick (25).
- Wipe the dipstick with a lint-free cloth and put in back fully into its port.
- Remove the dipstick again and check whether the oil level is between the MIN and MAX markings.
- If the level is below the centre point, add the right grade of transmission oil through the filler port (24) into the transmission unit, until it reaches the MAX marking on the dipstick.
- Refit the dipstick in the port.

10.7 Brakes

Checking the parking brake

The parking brake (26) must be able to keep the truck plus maximum permissible load on an incline of 15%. If this is not the case, the parking brake must be adjusted.

Checking the brake fluid level

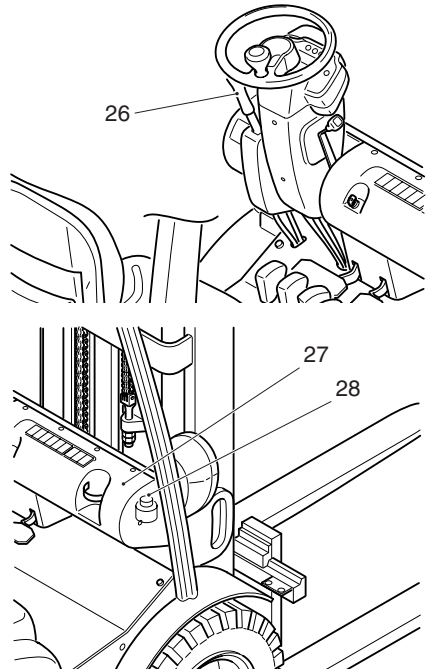
- Undo the screws of the right-hand panel (27).
- Remove the right-handpanel (27).
- Check the brake fluid level on the brake fluid reservoir (28).

The level of the reservoir should lie between the MIN and MAX markings.

- If necessary, add brake fluid.

Capacity: 0,25 l

- After adding brake fluid, refit the panel.



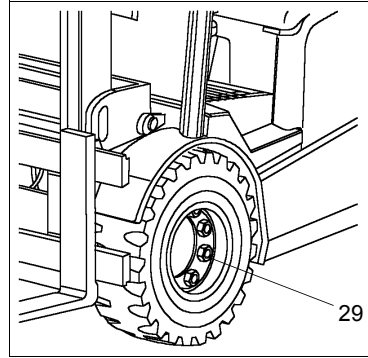
10.8 Checking the wheel attachments.

- Park the truck securely (see Chapter E).
- Tighten the wheel nuts (29) crosswise with a torque wrench.

Torque

Drive wheels: **380 Nm**

Rear wheels: **200 Nm**



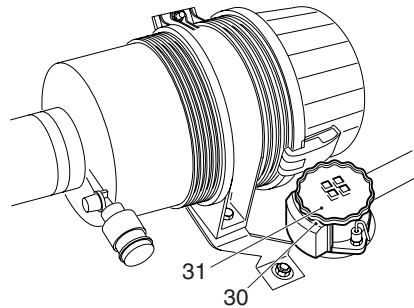
10.9 Hydraulic System

Replacing the hydraulic oil filter

- Unscrew the lid (31).
- Remove the hydraulic oil filter integrated in the lid.
- Insert a new hydraulic oil filter and screw the lid back on.



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



10.10 Bleeding/cleaning/replacing the hydraulic reservoir

- Unscrew the hydraulic reservoir lid (31).
- Lift up the cap (30).
- Remove the filter insert form under the cap.
- Clean the filter insert.



If the contamination cannot be removed by cleaning, replace the filter insert.

10.11 Electrical system:

Checking the battery condition, the acid level and acid density



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 the battery housing for cracks and any spilled acid.
- Remove any oxydation 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.

- Clean the area around the inspection plugs.
- Unscrew the inspectionplugs.
- 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.

- If necessary, re-charge the battery.
- Screw the inspection plugs back on.

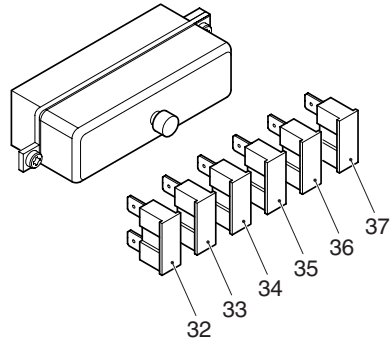


It is not necessary to check the acid level or the acid density in batteries with low maintenance requirements.

Checking electrical fuses

If an error occurs in the electrical system, check the fuses located in the overhead guard below the plastic panel.

- Remove the fuse box panels (103).
- Check the fuse rating and condition in accordance with the table; replace if necessary.
- Fit the panels.



● Standard fuse box (DFG)

Item	Ref.	Protects:	ng
32	2F14	Pre-heat relay, diesel valve	5 A
33	4F1	Air filter control, travel direction valves, seat switch, horn	10 A
34	7F5	Diesel filter control, brake fluid control, handbrake control	5 A
35	4F8	Display unit	5 A
36	F19	12 volt system	10 A
37	9F7	Ignition option relay	10 A

● Standard fuse box (TFG)

Item	Ref.	Protects:	Rati ng
32	2F14	Gas valve, ignition distributor	5 A
33	4F1	Air filter control, travel direction valves, seat switch, horn	10 A
34	7F5	Brake fluid control, handbrake control	5 A
35	4F8	Display unit	5 A
36	F19	12 volt system	10 A
37	9F7	Ignition option relay	10 A

○ Fuse box for optional equipment (DFG/TFG)

Item	Ref.	Protects:	Ratin g
38	4F4	Beacon	7.5 A
39	9F1	Windscreen wiper	7.5 A
40	5F6	Cabin	15 A
41	5F1	Searchlights	25 A
42	5F3	Reversing lights	10 A
43	4F6	Brake lights	15 A



The electrical wiring diagram for the forklift truck is located in the corresponding spare parts catalog or the repair manual.

11 Exhaust system

The exhaust system must be checked for emissions at regular intervals. Black or blue exhaust is a sign of high emission levels and requires the attention of specialist personnel.

12 Recommissioning

The truck may only be recommissioned after cleaning or repair work, once the following operations have been performed.

- Test horn.
- Test main switch operation.
- Test brake.
- Lubricate the truck in accordance with the lubrication schedule.

13 Decommissioning the industrial truck

If the industrial truck is to be decommissioned for more than two months, e.g. for operational reasons, it must be parked in a frost-free and dry location and all necessary measures must be taken before, during and after decommissioning as described.



During decommissioning the truck 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, further measures must be taken in consultation with the manufacturer's service department.

13.1 Prior to decommissioning:

- Thoroughly clean the truck.
- Check the brakes.
- Check the hydraulic oil level and replenish as necessary (see Chapter F).
- Apply a thin layer of oil or grease to any non-painted mechanical components.
- Lubricate the truck in accordance with the lubrication schedule (see Chapter F).
- Charge the battery (see Chapter D).
- 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.

13.2 During decommissioning:

Every 2 months:

- Charge the battery (see Chapter D).



Battery powered trucks:

The battery must be charged at regular intervals to avoid depletion of the battery through self-discharge. The sulfatisation would destroy the battery.

13.3 Restoring the truck to operation after decommissioning

- Thoroughly clean the truck.
- Lubricate the truck in accordance with the lubrication schedule (see Chapter F).
- Clean the battery, grease the terminals and connect the battery.
- Charge the battery (see Chapter D).
- Check transmission oil for condensed water and replace if necessary.
- Check hydraulic oil for condensed water and replace if necessary.
- Start up the truck (see Chapter E).



Battery powered trucks:

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 operating controls by applying them repeatedly.



Perform several brake tests immediately after re-commissioning the truck.

14 Safety tests to be performed at intervals and after unusual events (D): Accident prevention check according to BGV D27)

The truck must be inspected at least annually or after any unusual event by a qualified inspector. 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 complete test must be carried out on the vehicle concerning its engineering condition with regard to safety. 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 immediately rectified.



The manufacturer has a safety department with trained personnel to carry out inspections. 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.