DFG/TFG 316-550

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Operating instructions

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JUNGHEINRICH

Machines. Ideas. Solutions.

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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Contents

F Truck Maintenance

A Correct Use and Application of the Truck

The "Guidelines for the Correct Use and Application of Industrial Trucks" (VDMA) is included in the scope of delivery for this truck. The guidelines are part of these operating instructions and must always be heeded. National regulations are fully applicable.

The forklift truck described in these operating instructions is a truck that is suitable for lifting and transporting loads. It must be used, operated and maintained according to the information in these operating instructions. Any other uses are outside the design envelope and can lead to injury to persons or damage to equipment and property. Above all, overloading caused by excessively heavy or unbalanced loads must be avoided. The max. admissible load to be picked up can be seen from the identification plate or load diagram label shown on the truck. The fork-lift truck must not be operated in spaces subject to fire or explosion hazards, or in spaces where corrosive or very dusty atmospheres prevail.

Duties of the user: User within the meaning of these operating instructions is any natural person or legal person who either uses the fork-lift truck himself, or on whose behalf it is used. In special cases (e.g. leasing or renting), the user is considered the person, who, in accordance with existing contractual agreements between the owner and the user of the fork-lift truck, is charged with the observance of the operating duties.

The user must ensure that the truck is not abused and only used within its design limits and that all danger to life and limb of the operator, or third parties, is avoided. In addition to this, it must be ensured that the relevant accident prevention regulations and other safety-related provisions, as well as the operating, servicing and maintenance guidelines, are observed. The user must also ensure that all persons operating the truck have read and understood these operating instructions.

If these Operating Instructions are not observed the warranty becomes void. The same applies if improper work is carried out on the device by the customer and/or third parties without permission of our Customer Service.

Mounting of attachments: The mounting or installation of any attachments which will interfere with, or supplement, the functions of the truck is permitted only after written approval by the manufacturer has been obtained. If necessary, the approval of local authorities has to be obtained. Any approval obtained from local authorities does not, however, make the approval by the manufacturer unnecessary.

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

B Description of Truck

1 Description of Use

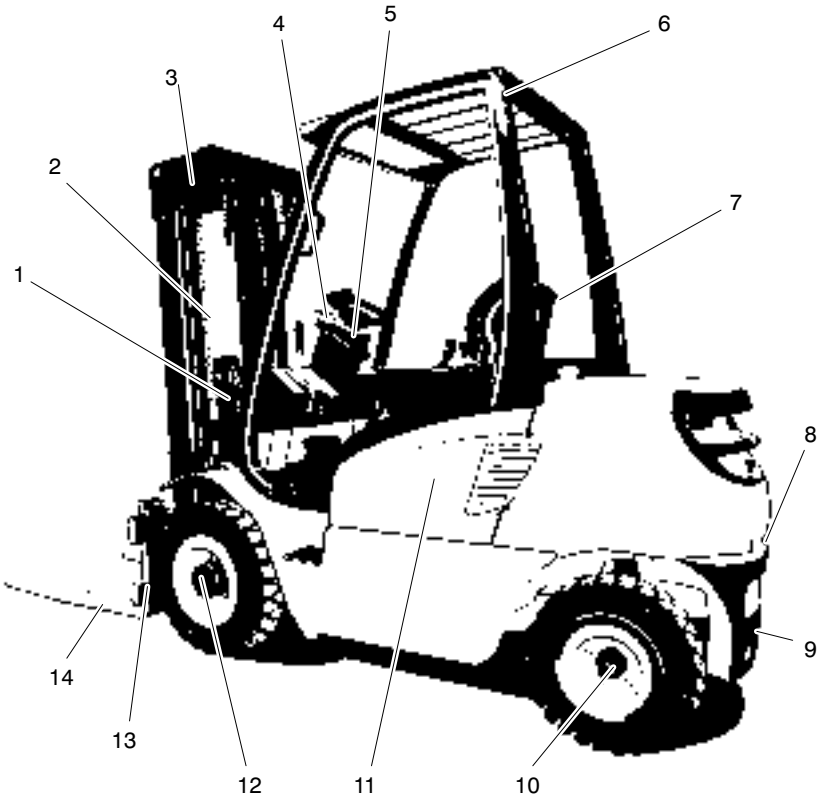
Forklift trucks to series DFG/TFG are driver's cab forklifts with 4 wheel construction and combustion engine. Trucks to series DFG have diesel engines, trucks of series TFG a liquid petroleum gas engine.

The DFG/TFG 316-550 has a hydrodynamic drive. A combined creep/brake pedal allows rapid lifting during creep running.

As of Februry 2007 the DFG/TFG 540-550 is equippd with an additional pedal. The left pedal is a combination of crawl speed and brake pedal, and activates the rapid lift function during slow travel. The middle pedal is a standard brake as well as emergency brake pedal.

The load-bearing capacity depends on type. The type description indicates the maximum permitted load. A DFG/TFG 316 can lift, transport and stack loads up to 1600 kg, and a DFG/TFG 320 loads up to 2000 kg.

Model	Load Capacity (kg)	Wheel Base (mm)
DFG/TFG 316	1600	1400
DFG/TFG 320	2000	1400
DFG/TFG 420	2000	1685
DFG/TFG 425	2500	1685
DFG/TFG 430	3000	1685
DFG/TFG 540	4000	1985
DFG/TFG 545	4500	1985
DFG/TFG 550	5000	1985



Item		Description	Item		Description
1	●	Lift cylinder	8	●	Towing coupling
2	●	Lift chain	9	●	Counterweight
3	●	Mast assembly	10	●	Steer axle
4	●	Instrument panel	11	●	Engine cover
5	●	Steering column	12	●	Drive axle
6	●	Driver's loadguard	13	●	Carriage
7	●	Driver's seat	14	●	Fork

2.1 Truck

Frame and Superstructure: A stable, torsionally rigid frame in which the equipment and controls are installed protected, gives the truck a high static safety. The driver's cab is spring-mounted to dampen vibrations and noise.

A wide-opening top and two side panels on the engine cover (11) allow easy maintenance and service. The hydraulic oil tank is side integrated into the frame on the right and the fuel tank for the DFG series on the opposite side. The gas bottles for the TFG series are attached to the counterweight (9) in a holder. The vertical free-standing exhaust pipe which opens high above the machine prevents the transmission of vibration and sound waves and the penetration of exhaust gases into the driver's cab.

Driver's Cab: Non-slip steps and a handle on the roof pillar ensure easy entrance and exit. The driver is protected by the roof (6). On the driver's seat (7), the seat cushioning and position are adjustable, and on the steering column (5) the angle of the steering wheel can be modified. Simple operation by ergonomically arranged controls and a virtually vibration-free driver's cab means that minimum load is exerted on the driver. The control and warning displays on the instrument panel (4) allow monitoring of the systems during operation. As a result, the safety standard is very high.

The driver's overhead guard must be checked prior to starting the truck for cracks, and if damaged, must be repaired or replaced.

Engine: A silent water-cooled engine with high power and low fuel consumption. The DFG series are fitted with diesel engines with very clean combustion under all operating conditions and with low soot output. In the TFG series, liquid petroleum gas engines are fitted with a very low residual exhaust value.

Drive: A load gearbox with gear oil cooler and torque converter is flanged directly onto the engine. This transfers the power to the drive axle (12).

The direction lever on the operating console selects forwards/reverse or neutral.

Steering: Hydrostatic steering with a steering cylinder integrated into the steering axle (10). The steering axle is fully floating in the frame to ensure good ground holding even on uneven surfaces.

Brakes: The creep/brake pedal operates two hydraulic drum brakes acting on the drive wheels. The drum brakes adjust automatically for wear. The parking brake acts mechanically via Bowden cables on the drum brakes when the parking brake lever is operated.

Wheels: All wheels are within the truck contour. The tyres are either pneumatic or super-elastic tyres.

Hydraulic System: The hydraulic system gear pump is driven by the engine via the secondary take-off from the load gears. The pump speed and hence the transport volume is controlled by the engine speed via the accelerator pedal.

The hydraulic functions are controlled by the control lever via a multiple control valve.

Electrical System: 12 Volt system with starter battery and 3-phase alternator with integral regulator. The starting repeat block prevents incorrect operation during starting and a safety circuit allows the engine to start only when the direction lever is in neutral. For diesel engines, a fast preglow system is fitted, whereas LPG engines have a contactless electronic ignition system for fast easy starting of the engine. The engine is turned off using the ignition/starter switch.

2.2 Mast

Mast: The trucks are fitted with tilting telescopic clear-view masts. Lifting cylinders (1) arranged behind the profile of the mast (3) raise the inner mast. The load chains (2) with pulley deflection raise the carriage (13) at the same time. The fork (14) is adjustably mounted on the carriage. Adjustable side rollers and sliders absorb the lateral pressure on the carriage from an unbalanced load.

In the double telescopic mast (ZT), lift is achieved by extending the inner mast only. For double twin-lift masts (ZZ) and triple twin-lift masts (DZ), first the carriage with load chains is raised via a short centrally-mounted cylinder and thus the first lift is possible without altering the truck height (special clearance lift). Only then is the inner mast extended.

Attachments: Mechanical and hydraulic attachments can be fitted (optional equipment).

2.3 Changes in operational requirements

Should the operation of your frontlift change so that additional features such as lights, cab or auxiliary hydraulics, sideshift etc. are required, only officially approved attachments or ancillary equipment may be used. Consult your nearest Depot or Distributor for advice regarding any changes in operating or load handling procedures, which would necessitate alterations to the truck or ancillary equipment.

Under no circumstances should any unauthorised addition or modification be made to the truck, mast or attachment as originally supplied.

IMPORTANT

If the frontlift is modified or used with attachments other than those originally supplied, new rating plates must be affixed in the cab and in the European Economic Area (EEA) countries the truck must be re-certified for conformity to the Machinery Directive 98/37/EEC as amended.

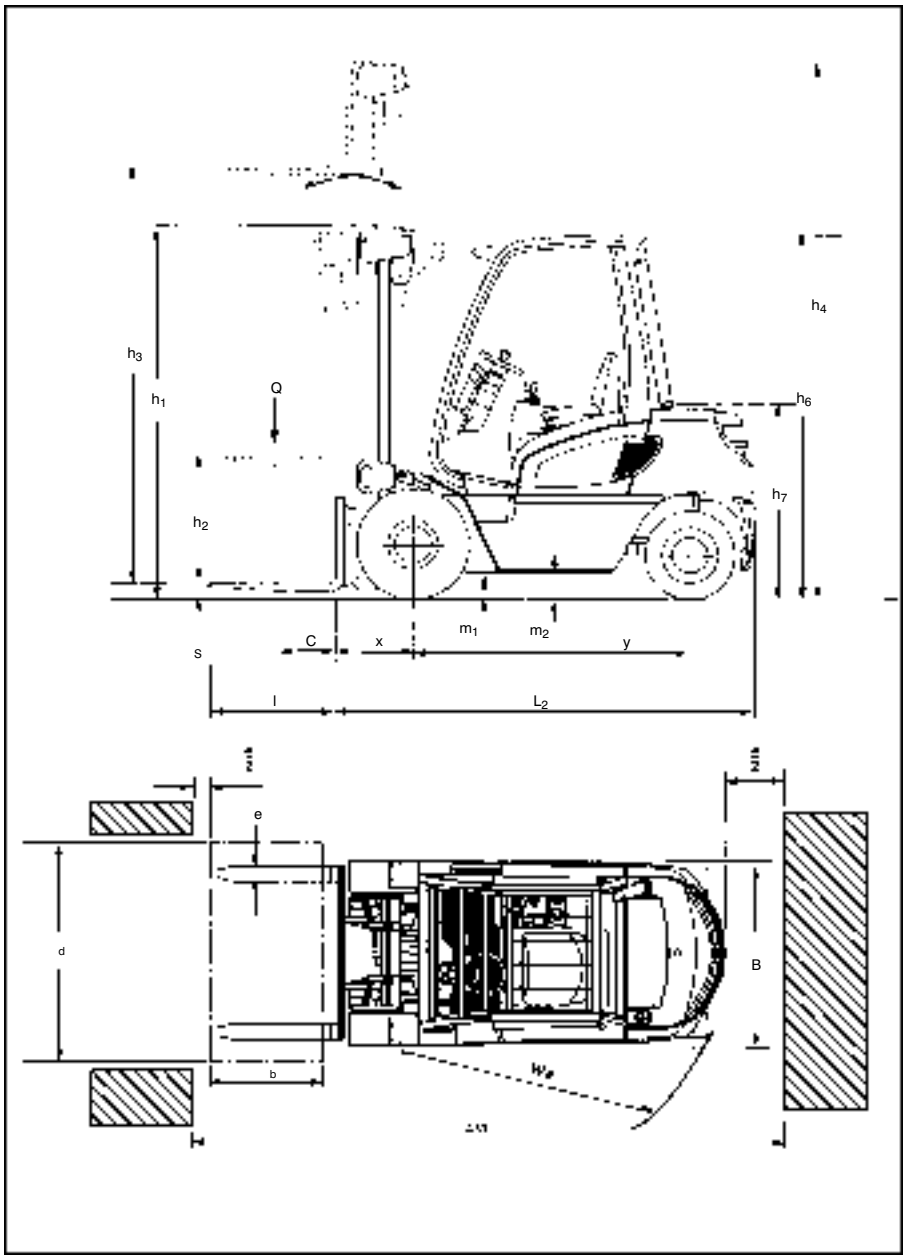
2.4 Safety devices

In addition to the driver's overhead guard , the battery isolation switch and key operated ignition switch are classed as safety devices.

Battery isolation switch: The battery is connected and the truck is ready to run when the battery isolation switch is raised. The battery is isolated when the battery isolation switch is in the depressed position.

Key operated ignition switch: The removal of an ignition key by an authorized driver upon leaving the truck, will prevent the truck from being operated by any unauthorized person. The driver may not give the ignition key to another person without authorization.

Data to VDI 2198, subject to technical alterations and supplements



Specification sheet for lift trucks DFG 316-320

	No.	Description	Code (Unit)	AX-J	
Specification	1.	Manufacturer		Jungheinrich	Jungheinrich
	1.2	Model Name		DFG 316	DFG 320
	1.3	Drive: Electric, Diesel, Gasolene, LPG, other		Diesel	Diesel
	1.4	Steering: Hand, Pedestrian, Standing, Seated, Order Picking		Seated	Seated
	1.5	Load Capacity	Q(t)	1,6	2,0
	1.6	Load Centre	c(mm)	500	500
	1.8	Load Distance	x(mm)	395	395
	1.9	Wheel Base	y(mm)	1400	1400
Weight	2.1	Weight-unladen	(kg)	3020	3270
	2.2	Axle Loading laden, front/rear	(kg)	4000/620	4600/670
	2.3	Axle Loading unladen, front/rear	(kg)	1320/1700	1240/2030
		Longitudinal stability		1,66	1,59
Wheels/Chassis	3.1	Tyre type: Cushion, Super Elastic, Pneumatic, Polyurethan		SE(L)/SE(L)	SE(L)/SE(L)
	3.2	Tyre Size: front		6.50-10 (14PR)	6.50-10 (14PR)
	3.3	Tyre Size: rear		18x7-8 (16PR)	18x7-8 (16PR)
	3.5	Wheels, Numbers front/rear (x=traction)		2x/2	2x/2
	3.6	Track width, front	b10(mm)	895	895
	3.7	Track width, rear	b11(mm)	870 (offset)	870 (offset)
Dimensions	4.1	Tilt of Mast/Carriage, forward/backward	Grad.	7/10	7/10
	4.2	Mast Height, lowered	h_1(mm)	2080	2080
	4.3	Free Lift	h_2(mm)	100	100
	4.4	Lift Height	h_3(mm)	3090	3090
	4.5	Height of extended mast	h_4(mm)	3670	3670
	4.7	Height of overhead guard (Cabin)	h_6(mm)	2130	2130
	4.8	Seat Height / Head clearance (SIP 100mm)	h_7(mm)	1005/1065	1005/1065
	4.12	Coupling height	h_{10}(mm)	375/545	375/545
	4.19	Overall Length	l_1(mm)	3245	3300
	4.20	Length to Fork Face	l_2(mm)	2245	2300
	4.21	Overall Width	b_1/b_2(mm)	1070	1070
	4.22	Fork Dimension	s/e/l(mm)	40/100/1000	40/100/1000
	4.23	Carriage DIN 15173, ISO 2328, Class/Form A,B		ISO 2A	ISO 2A
	4.24	Fork Carriage width / outside forks	b_3(mm)	1000/849	1000/849
	4.31	Ground Clearance laden under mast	m_1(mm)	115	115
	4.32	Ground Clearance at the centre of Wheel Base	m_2(mm)	135	135
	4.33	Aisle width with pallet 1000x1200 transverse	Ast(mm)	3570	3615
	4.34	Aisle width with pallet 800x1200 Pallet longitudinal	Ast(mm)	3770	3815
	4.35	Turning Radius	Wa(mm)	1975	2020
Performance	5.1	Travel Speed laden/unladen	(km/h)	18,7/19,0	18,4/18,7
	5.2	Lifting Speed laden/unladen	(m/s)	0,61/0,65	0,60/0,65
	5.3	Lowering Speed laden/unladen	(m/s)	0,56/0,48	0,57/0,48
	5.5	Draw-bar-pull laden/unladen	(kN)	12,7/9,0	12,6/8,2
	5.7	Gradeability laden/unladen	(%)	26/23	23/21
	5.9	Acceleration time, laden/unladen	s	5,0/4,5	5,1/4,4
	5.10	Service brake type		mech./hydr.	mech./hydr.
Engine	7.1	Engine Manufacturer/Model		404C.22	404C.22
	7.2	Engine Output to ISO 1585	(kw)	34,1	34,1
	7.3	Rated Rotation	(1/min)	2400	2400
	7.4	Nº of Cylinders/Displacement	(/cm^3)	4/2216	4/2216
		max. torque	Nm/rpm	143/1800	135/1900
Others	8.1	Type of Drive Control		hydrodyn.	hydrodyn.
	8.2	Hydraulic Oil Pressure for Attachments	(bar)	160	160
	8.3	Oil flow for attachments	l/min	45	45
	8.4	Noise Level at Operator's Ear	dB(A)	<80	<80

Specification sheet for lift trucks TFG 316/320

	No.	Description	Code (Unit)	AX-J	
Specification	1.	Manufacturer		Jungheinrich	Jungheinrich
	1.2	Model Name		TFG 316	TFG 320
	1.3	Drive: Electric, Diesel, Gasolene, LPG, other		LPG	LPG
	1.4	Steering: Hand, Pedestrian, Standing, Seated, Order Picking		Seated	Seated
	1.5	Load Capacity	Q(t)	1,6	2,0
	1.6	Load Centre	c(mm)	500	500
	1.8	Load Distance	x(mm)	395	395
	1.9	Wheel Base	y(mm)	1400	1400
Weight	2.1	Weight-unladen	(kg)	3000	3250
	2.2	Axle Loading laden, front/rear	(kg)	4030/570	4630/620
	2.3	Axle Loading unladen, front/rear	(kg)	1270/1730	1190/2060
		Longitudinal stability		1,69	1,61
Wheels/Chassis	3.1	Tyre type: Cushion, Super Elastic, Pneumatic, Polyurethan		SE(L)/SE(L)	SE(L)/SE(L)
	3.2	Tyre Size: front		6.50-10 (14PR)	6.50-10 (14PR)
	3.3	Tyre Size: rear		18x7-8 (16PR)	18x7-8 (16PR)
	3.5	Wheels, Numbers front/rear (x=traction)		2x/2	2x/2
	3.6	Track width, front	b10(mm)	895	895
	3.7	Track width, rear	b11(mm)	870 (offset)	870 (offset)
Dimensions	4.1	Tilt of Mast/Carriage, forward/backward	Grad.	7/10	7/10
	4.2	Mast Height, lowered	h_1(mm)	2080	2080
	4.3	Free Lift	h_2(mm)	100	100
	4.4	Lift Height	h_3(mm)	3090	3090
	4.5	Height of extended mast	h_4(mm)	3670	3670
	4.7	Height of overhead guard (Cabin)	h_6(mm)	2130	2130
	4.8	Seat Height / Head clearance (SIP 100mm)	h_7(mm)	1005/1065	1005/1065
	4.12	Coupling height	h_{10}(mm)	375/545	375/545
	4.19	Overall Length	l_1(mm)	3245	3300
	4.20	Length to Fork Face	l_2(mm)	2245	2300
	4.21	Overall Width	b_1/b_2(mm)	1070	1070
	4.22	Fork Dimension	s/e/l(mm)	40/100/1000	40/100/1000
	4.23	Carriage DIN 15173, ISO 2328, Class/Form A,B		ISO 2A	ISO 2A
	4.24	Fork Carriage width / outside forks	b_3(mm)	1000/849	1000/849
	4.31	Ground Clearance laden under mast	m_1(mm)	115	115
	4.32	Ground Clearance at the centre of Wheel Base	m_2(mm)	135	135
	4.33	Aisle width with pallet 1000x1200 transverse	Ast(mm)	3570	3615
	4.34	Aisle width with pallet 800x1200 Pallet longitudinal	Ast(mm)	3770	3815
	4.35	Turning Radius	Wa(mm)	1975	2020
Performance	5.1	Travel Speed laden/unladen	(km/h)	18,5/19,5	18/19
	5.2	Lifting Speed laden/unladen	(m/s)	0,56/0,65	0,55/0,65
	5.3	Lowering Speed laden/unladen	(m/s)	0,56/0,48	0,57/0,48
	5.5	Draw-bar-pull laden/unladen	(kN)	10,1/8,6	9,8/7,8
	5.7	Gradeability laden/unladen	(%)	24/22	22/20
	5.9	Acceleration time, laden/unladen	s	5,2/4,6	5,4/4,7
	5.10	Service brake type		mech./hydr.	mech./hydr.
Engine	7.1	Engine Manufacturer/Model		FE	FE
	7.2	Engine Output to ISO 1585	(kw)	26,0	26,0
	7.3	Rated Rotation	(1/min)	2400	2400
	7.4	Nº of Cylinders/Displacement	(/cm^3)	4/1988	4/1988
		max. torque	Nm/rpm	120/1600	120/1600
Others	8.1	Type of Drive Control		hydrodyn.	hydrodyn.
	8.2	Hydraulic Oil Pressure for Attachments	(bar)	160	160
	8.3	Oil flow for attachments	l/min	45	45
	8.4	Noise Level at Operator's Ear	dB(A)	<80	<80

Specification sheet for lift trucks DFG 420-430

	No.	Description	Code (Unit)	BX-J		
Specification	1.	Manufacturer		Jungheinrich	Jungheinrich	Jungheinrich
	1.2	Model Name		DFG 420	DFG 425	DFG 430
	1.3	Drive: Electric, Diesel, Gasolene, LPG, other		Diesel	Diesel	Diesel
	1.4	Steering: Hand, Pedestrian, Standing, Seated, Order Picking		Seated	Seated	Seated
	1.5	Load Capacity	Q(t)	2,0	2,5	3,0
	1.6	Load Centre	c(mm)	500	500	500
	1.8	Load Distance	x(mm)	450	450	480
	1.9	Wheel Base	y(mm)	1685	1685	1685
Weight	2.1	Weight-unladen	(kg)	3760	4190	4540
	2.2	Axle Loading laden, front/rear	(kg)	5220/540	5820/870	6680/860
	2.3	Axle Loading unladen, front/rear	(kg)	2000/1760	1840/2350	1850/2690
		Longitudinal stability		1,54	1,65	1,48
Wheels/Chassis	3.1	Tyre type: Cushion, Super Elastic, Pneumatic, Polyurethan		SE(L)/SE(L)	SE(L)/SE(L)	SE(L)/SE(L)
	3.2	Tyre Size: front		7.00-12 (12PR)	7.00-12 (12PR)	27x10-12 (14PR)
	3.3	Tyre Size: rear		6.50-10 (10PR)	6.50-10 (10PR)	6.50-10 (10PR)
	3.5	Wheels, Numbers front/rear (x=traction)		2x/2	2x/2	2x/2
	3.6	Track width, front	b10(mm)	990	990	1045
	3.7	Track width, rear	b11(mm)	938 (offset)	938 (offset)	938
Dimensions	4.1	Tilt of Mast/Carriage, forward/backward	Grad.	6/6	6/6	6/6
	4.2	Mast Height, lowered	h_1(mm)	2300	2300	2300
	4.3	Free Lift	h_2(mm)	150	150	150
	4.4	Lift Height	h_3(mm)	3300	3300	3300
	4.5	Height of extended mast	h_4(mm)	3896	3896	3896
	4.7	Height of overhead guard (Cabin)	h_6(mm)	2220	2220	2220
	4.8	Seat Height / Head clearance (SIP 100mm)	h_7(mm)	1095/1065	1095/1065	1095/1065
	4.12	Coupling height	h_{10}(mm)	440/615	440/615	440/615
	4.19	Overall Length	l_1(mm)	3515	3525	3640
	4.20	Length to Fork Face	l_2(mm)	2515	2525	2640
	4.21	Overall Width	b_1/b_2(mm)	1170	1170	1285
	4.22	Fork Dimension	s/e/l(mm)	40/100/1000	40/100/1000	50/125/1000
	4.23	Carriage DIN 15173, ISO 2328, Class/Form A,B		ISO 2A	ISO 2A	ISO 3A
	4.31	Ground Clearance laden under mast	m_1(mm)	125	125	125
	4.32	Ground Clearance at the centre of Wheel Base	m_2(mm)	132	132	142
	4.33	Aisle width with pallet 1000x1200 transverse	Ast(mm)	3925	3935	4050
	4.34	Aisle width with pallet 800x1200 Pallet longitudinal	Ast(mm)	4125	4135	4250
	4.35	Turning Radius	Wa(mm)	2265	2275	2360
Performance	5.1	Travel Speed laden/unladen	(km/h)	18,7/18,9	18,5/18,7	18,6/18,8
	5.2	Lifting Speed laden/unladen	(m/s)	0,56/0,60	0,56/0,60	0,55/0,60
	5.3	Lowering Speed laden/unladen	(m/s)	0,53/0,55	0,53/0,55	0,55/0,52
	5.5	Draw-bar-pull laden/unladen	(kN)	16,9/11,8	16,7/10,8	16,6/12,2
	5.7	Gradeability laden/unladen	(%)	31/31	26/25	22/27
	5.9	Acceleration time, laden/unladen	s	5,0/4,6	5,12/4,50	5,5/4,7
	5.10	Service brake type		mech./hydr.	mech./hydr.	mech./hydr.
Engine	7.1	Engine Manufacturer/Model		704.30/704.26 (12.03 an later)	704.30/704.26 (12.03 an later)	704.30/704.26 (12.03 an later)
	7.2	Engine Output to ISO 1585	(kw)	40	40	40
	7.3	Rated Rotation	(1/min)	2100	2100	2100
	7.4	Nº of Cylinders/Displacement	(/cm^3)	4/2955	4/2955	4/2955
		max. torque	Nm/rpm	190/1600	190/1600	190/1600
Others	8.1	Type of Drive Control		hydrodyn.	hydrodyn.	hydrodyn.
	8.2	Hydraulic Oil Pressure for Attachments	(bar)	160	160	160
	8.3	Oil flow for attachments	l/min	60	60	60
	8.4	Noise Level at Operator's Ear	dB(A)	<80	<80	<80

Specification sheet for lift trucks TFG 420-430

	No.	Description	Code (Unit)	BX-J		
Specification	1.	Manufacturer		Jungheinrich	Jungheinrich	Jungheinrich
	1.2	Model Name		TFG 420	TFG 425	TFG 430
	1.3	Drive: Electric, Diesel, Gasolene, LPG, other		LPG	LPG	LPG
	1.4	Steering: Hand, Pedestrian, Standing, Seated, Order Picking		Seated	Seated	Seated
	1.5	Load Capacity	Q(t)	2,0	2,5	3,0
	1.6	Load Centre	c(mm)	500	500	500
	1.8	Load Distance	x(mm)	450	450	480
	1.9	Wheel Base	y(mm)	1685	1685	1685
Weight	2.1	Weight-unladen	(kg)	3730	4160	4510
	2.2	Axle Loading laden, front/rear	(kg)	5200/530	5800/860	6660/850
	2.3	Axle Loading unladen, front/rear	(kg)	1980/1750	1820/2340	1830/2680
		Longitudinal stability		1,54	1,65	1,48
Wheels/Chassis	3.1	Tyre type: Cushion, Super Elastic, Pneumatic, Polyurethan		SE(L)/SE(L)	SE(L)/SE(L)	SE(L)/SE(L)
	3.2	Tyre Size: front		7.00-12 (12PR)	7.00-12 (12PR)	27x10-12 (14PR)
	3.3	Tyre Size: rear		6.50-10 (10PR)	6.50-10 (10PR)	6.50-10 (10PR)
	3.5	Wheels, Numbers front/rear (x=traction)		2x/2	2x/2	2x/2
	3.6	Track width, front	b10(mm)	990	990	1045
	3.7	Track width, rear	b11(mm)	938 (offset)	938 (offset)	938
Dimensions	4.1	Tilt of Mast/Carriage, forward/backward	Grad.	6/6	6/6	6/6
	4.2	Mast Height, lowered	h_1(mm)	2300	2300	2300
	4.3	Free Lift	h_2(mm)	150	150	150
	4.4	Lift Height	h_3(mm)	3300	3300	3300
	4.5	Height of extended mast	h_4(mm)	3896	3896	3896
	4.7	Height of overhead guard (Cabin)	h_6(mm)	2220	2220	2220
	4.8	Seat Height / Head clearance (SIP 100mm)	h_7(mm)	1095/1065	1095/1065	1095/1065
	4.12	Coupling height	h_{10}(mm)	440/615	440/615	440/615
	4.19	Overall Length	l_1(mm)	3515	3525	3640
	4.20	Length to Fork Face	l_2(mm)	2515	2525	2640
	4.21	Overall Width	b_1/b_2(mm)	1170	1170	1285
	4.22	Fork Dimension	s/e/l(mm)	40/100/1000	40/100/1000	50/125/1000
	4.23	Carriage DIN 15173, ISO 2328, Class/Form A,B		ISO 2A	ISO 2A	ISO 3A
	4.31	Ground Clearance laden under mast	m_1(mm)	125	125	125
	4.32	Ground Clearance at the centre of Wheel Base	m_2(mm)	132	132	142
	4.33	Aisle width with pallet 1000x1200 transverse	Ast(mm)	3925	3935	4050
	4.34	Aisle width with pallet 800x1200 Pallet longitudinal	Ast(mm)	4125	4135	4250
	4.35	Turning Radius	Wa(mm)	2265	2275	2360
Performance	5.1	Travel Speed laden/unladen	(km/h)	18,7/18,9	18,5/18,7	18,6/18,8
	5.2	Lifting Speed laden/unladen	(m/s)	0,56/0,60	0,56/0,60	0,55/0,60
	5.3	Lowering Speed laden/unladen	(m/s)	0,53/0,55	0,53/0,55	0,55/0,52
	5.5	Draw-bar-pull laden/unladen	(kN)	16,4/11,7	16,2/10,8	16,1/12,1
	5.7	Gradeability laden/unladen	(%)	30/31	26/25	22/27
	5.9	Acceleration time, laden/unladen	s	5,15/4,80	5,31/4,50	6,3/5,3
	5.10	Service brake type		mech.hydr.	mech.hydr.	mech.hydr.
Engine	7.1	Engine Manufacturer/Model		3.0 L4	3.0 L4	3.0 L4
	7.2	Engine Output to ISO 1585	(kw)	44	44	44
	7.3	Rated Rotation	(1/min)	2200	2200	2200
	7.4	Nº of Cylinders/Displacement	(/cm^3)	4/2966	4/2966	4/2966
		max. torque	Nm/rpm	196/1600	196/1600	196/1600
Others	8.1	Type of Drive Control		hydrodyn.	hydrodyn.	hydrodyn.
	8.2	Hydraulic Oil Pressure for Attachments	(bar)	160	160	160
	8.3	Oil flow for attachments	l/min	60	60	60
	8.4	Noise Level at Operator's Ear	dB(A)	<80	<80	<80

Specification sheet for lift trucks DFG 540-550

	No.	Description	Code (Unit)	CX-J		
Specification	1.	Manufacturer		Jungheinrich	Jungheinrich	Jungheinrich
	1.2	Model Name		DFG 540	DFG 545	DFG 550
	1.3	Drive: Electric, Diesel, Gasolene, LPG, other		Diesel	Diesel	Diesel
	1.4	Steering: Hand, Pedestrian, Standing, Seated		Seated	Seated	Seated
	1.5	Load Capacity	Q(t)	4,0	4,5	5,0
	1.6	Load Centre	c(mm)	500	500	600
	1.8	Load Distance	x(mm)	564	564	579
	1.9	Wheel Base	y(mm)	1985	1985	1985
Weight	2.1	Weight-unladen	(kg)	6140	6540	7080
	2.2	Axle Loading laden, front/rear	(kg)	9100/1040	9980/1060	10700/1380
	2.3	Axle Loading unladen, front/rear	(kg)	2860/3280	2980/3560	2840/4240
		Longitudinal stability				
Wheels/Chassis	3.1	Tyre type: Cushion, Super Elastic, Pneu., Polyurethan		SE(L)/SE(L)	SE(L)/SE(L)	SE(L)/SE(L)
	3.2	Tyre Size: front		8.25-15 (18PR)	8.25-15 (18PR)	3.00-15 (18PR)
	3.3	Tyre Size: rear		7.00-12 (12PR)	7.00-12 (12PR)	7.00-12 (12PR)
	3.5	Wheels, Numbers front/rear (x=traction)		2x/2	2x/2	2x/2
	3.6	Track width, front	b10(mm)	1165	1165	1165
	3.7	Track width, rear	b11(mm)	1163	1163	1163
Dimensions	4.1	Tilt of Mast/Carriage, forward/backward	Grad.	7/11	7/11	7/11
	4.2	Mast Height, lowered	h_1(mm)	2540	2540	2540
	4.3	Free Lift	h_2(mm)	150	150	150
	4.4	Lift Height	h_3(mm)	3500	3500	3500
	4.5	Height of extended mast	h_4(mm)	4200	4200	4350
	4.7	Height of overhead guard (Cabin)	h_6(mm)	2350	2350	2350
	4.8	Seat Height / Head clearance (SIP 100mm)	h_7(mm)	1225	1225	1225
	4.12	Coupling height	h_{10}(mm)	535/700	535/700	535/700
	4.19	Overall Length	l_1(mm)	4140	4140	4240
	4.20	Length to Fork Face	l_2(mm)	2990	2990	2990
	4.21	Overall Width	b_1/b_2(mm)	1400	1400	1400
	4.22	Fork Dimension	s/e/l(mm)	50/125/1150	50/125/1150	60/150/1150
	4.23	Carriage DIN 15173, ISO 2328, Class/Form A,B		ISO 3A	ISO 3A	ISO 4A
	4.24	Fork Carriage Width	b_3	1260	1260	1260
	4.31	Ground Clearance laden under mast	m_1(mm)	190	190	190
	4.32	Ground Clearance at the centre of Wheel Base	m_2(mm)	230	230	230
	4.33	Aisle width with pallet 1000x1200 transverse	Ast(mm)	4440	4440	4555
	4.34	Aisle width with pallet 800x1200 Pallet longitudinal	Ast(mm)	4640	4640	4755
	4.35	Turning Radius	Wa(mm)	2650	2650	2750
	4.36	Smallest Distance to Pivot Point	b_{13}	900	900	900
Performance	5.1	Travel Speed laden/unladen	(km/h)	24,5/25,4	23,5/24,8	22,3/24,3
	5.2	Lifting Speed laden/unladen	(m/s)	0,52/0,55	0,51/0,55	0,50/0,55
	5.3	Lowering Speed laden/unladen	(m/s)	0,52/0,38	0,52/0,38	0,52/0,38
	5.5	Draw-bar-pull laden/unladen	(kN)	34,00/16,50	34,00/16,5	34,00/16,5
	5.7	Gradeability laden/unladen	(%)	33,5/26,8	30,7/25,2	28/23,3
	5.9	Acceleration time, laden/unladen	s	4,8/4,7	4,9/4,8	6,0/5,6
	5.10	Service brake type		mech./hydr.	mech./hydr.	mech./hydr.
Engine	7.1	Engine Manufacturer/Model		1004.4 2	1004.4 2	1004.4 2
	7.2	Engine Output to ISO 1585	(kw)	60	60	60
	7.3	Rated Rotation	(1/min)	2200	2200	2200
	7.4	Nº of Cylinders/Displacement	(/cm^3)	4/4230	4/4230	4/4230
		max. torque	Nm/rpm			
Others	8.1	Type of Drive Control		hydrodyn.	hydrodyn.	hydrodyn.
	8.2	Hydraulic Oil Pressure for Attachments	(bar)	160	160	160
	8.3	Oil flow for attachments	l/min	30	30	30
	8.4	Noise Level at Operator's Ear	dB(A)	78	78	78
	8.5	Trailer Coupling Type / DIN Type		15170 / type h	15170 / type h	15170 / type h

Specification sheet for lift trucks DFG 540-550 (09/03 and later)

	No.	Description	Code (Unit)	CX-J		
Specification	1.	Manufacturer		Jungheinrich	Jungheinrich	Jungheinrich
	1.2	Model Name		DFG 540	DFG 545	DFG 550
	1.3	Drive: Electric, Diesel, Gasolene, LPG, other		Diesel	Diesel	Diesel
	1.4	Steering: Hand, Pedestrian, Standing, Seated		Seated	Seated	Seated
	1.5	Load Capacity	Q(t)	4,0	4,5	5,0
	1.6	Load Centre	c(mm)	500	500	600
	1.8	Load Distance	x(mm)	564	564	579
	1.9	Wheel Base	y(mm)	1985	1985	1985
Weight	2.1	Weight-unladen	(kg)	6279	6669	7434
	2.2	Axle Loading laden, front/rear	(kg)	8954/1325	9869/1300	10762/1673
	2.3	Axle Loading unladen, front/rear	(kg)	2810/3469	2937/3732	2795/4639
		Longitudinal stability				
Wheels/Chassis	3.1	Tyre type: Cushion, Super Elastic, Pneu., Polyurethan		SE(L)/SE(L)	SE(L)/SE(L)	SE(L)/SE(L)
	3.2	Tyre Size: front		3.00-15 (18PR)	3.00-15 (18PR)	3.00-15 (18PR)
	3.3	Tyre Size: rear		28 x 9 - 15	28 x 9 - 15	28 x 9 - 15
	3.5	Wheels, Numbers front/rear (x=traction)		2x/2	2x/2	2x/2
	3.6	Track width, front	b10(mm)	1180	1180	1170
	3.7	Track width, rear	b11(mm)	1160	1160	1160
Dimensions	4.1	Tilt of Mast/Carriage, forward/backward	Grad.	7/11	7/11	7/11
	4.2	Mast Height, lowered	h_1(mm)	2540	2540	2540
	4.3	Free Lift	h_2(mm)	150	150	150
	4.4	Lift Height	h_3(mm)	3500	3500	3500
	4.5	Height of extended mast	h_4(mm)	4200	4200	4350
	4.7	Height of overhead guard (Cabin)	h_6(mm)	2370	2370	2370
	4.8	Seat Height / Head clearance (SIP 100mm)	h_7(mm)	1255/1010	1255/1010	1255/1010
	4.12	Coupling height	h_{10}(mm)	535/700	535/700	535/700
	4.19	Overall Length	l_1(mm)	4145	4145	4260
	4.20	Length to Fork Face	l_2(mm)	2995	2995	3110
	4.21	Overall Width	b_1/b_2(mm)	1450	1450	1450
	4.22	Fork Dimension	s/e/l(mm)	50/125/1150	50/125/1150	60/150/1150
	4.23	Carriage DIN 15173, ISO 2328, Class/Form A,B		ISO 3A	ISO 3A	ISO 4A
	4.24	Fork Carriage Width	b_3	1260	1260	1260
	4.31	Ground Clearance laden under mast	m_1(mm)	190	190	190
	4.32	Ground Clearance at the centre of Wheel Base	m_2(mm)	230	230	230
	4.33	Aisle width with pallet 1000x1200 transverse	Ast(mm)	4419	4419	4569
	4.34	Aisle width with pallet 800x1200 Pallet longitudinal	Ast(mm)	4619	4619	4769
	4.35	Turning Radius	Wa(mm)	2655	2655	2790
	4.36	Smallest Distance to Pivot Point	b_{13}	900	900	900
Performance	5.1	Travel Speed laden/unladen	(km/h)	25,3/25,5	24,5/25,5	24,8/25,5
	5.2	Lifting Speed laden/unladen	(m/s)	0,52/0,53	0,51/0,53	0,50/0,53
	5.3	Lowering Speed laden/unladen	(m/s)	0,51/0,49	0,51/0,49	0,51/0,49
	5.5	Draw-bar-pull laden/unladen	(kN)	41,20/23,50	40,97/24,47	33,50/21,10
	5.7	Gradeability laden/unladen	(%)	36/34	34/33	25,5/25,7
	5.9	Acceleration time, laden/unladen	s	5/4,5	5/4,5	5,1/4,5
	5.10	Service brake type		mech./hydr.	mech./hydr.	mech./hydr.
Engine	7.1	Engine Manufacturer/Model		1104C-44	1104C-44	1104C-44
	7.2	Engine Output to ISO 1585	(kw)	61,5	61,5	61,5
	7.3	Rated Rotation	(1/min)	2200	2200	2200
	7.4	Nº of Cylinders/Displacement	(/cm^3)	4/4400	4/4400	4/4400
		max. torque	Nm/rpm	302/1400	302/1400	302/1400
Others	8.1	Type of Drive Control		hydrodyn.	hydrodyn.	hydrodyn.
	8.2	Hydraulic Oil Pressure for Attachments	(bar)	160	160	160
	8.3	Oil flow for attachments	l/min	30	30	30
	8.4	Noise Level at Operator's Ear	dB(A)	78	78	78
	8.5	Trailer Coupling Type / DIN Type		15170 / type h	15170 / type h	15170 / type h

Specification sheet for lift trucks TFG 540-550

	No.	Description	Code (Unit)	CX-J		
Specification	1.	Manufacturer		Jungheinrich	Jungheinrich	Jungheinrich
	1.2	Model Name		TFG 540	TFG 545	TFG 550
	1.3	Drive: Electric, Diesel, Gasolene, LPG, other		LPG	LPG	LPG
	1.4	Steering: Hand, Pedestrian, Standing, Seated		Seated	Seated	Seated
	1.5	Load Capacity	Q(t)	4,0	4,5	5,0
	1.6	Load Centre	c(mm)	500	500	600
	1.8	Load Distance	x(mm)	564	564	579
	1.9	Wheel Base	y(mm)	1985	1985	1985
Weight	2.1	Weight-unladen	(kg)	6140	6540	7080
	2.2	Axle Loading laden, front/rear	(kg)	9100/1040	9980/1060	10720/1360
	2.3	Axle Loading unladen, front/rear	(kg)	2860/3280	2980/3560	2840/4240
		Longitudinal stability				
Wheels/Chassis	3.1	Tyre type: Cushion, Super Elastic, Pneu., Polyurethan		SE(L)/SE(L)	SE(L)/SE(L)	SE(L)/SE(L)
	3.2	Tyre Size: front		8.25-15 (18PR)	8.25-15 (18PR)	3.00-15 (18PR)
	3.3	Tyre Size: rear		7.00-12 (12PR)	7.00-12 (12PR)	7.00-12 (12PR)
	3.5	Wheels, Numbers front/rear (x=traction)		2x/2	2x/2	2x/2
	3.6	Track width, front	b10(mm)	1165	1165	1165
	3.7	Track width, rear	b11(mm)	1163	1163	1163
Dimensions	4.1	Tilt of Mast/Carriage, forward/backward	Grad.	7/11	7/11	7/11
	4.2	Mast Height, lowered	h_1(mm)	2540	2540	2540
	4.3	Free Lift	h_2(mm)	150	150	150
	4.4	Lift Height	h_3(mm)	3500	3500	3500
	4.5	Height of extended mast	h_4(mm)	4200	4200	4350
	4.7	Height of overhead guard (Cabin)	h_6(mm)	2350	2350	2350
	4.8	Seat Height / Head clearance (SIP 100mm)	h_7(mm)	1225	1225	1225
	4.12	Coupling height	h_{10}(mm)	535/700	535/700	535/700
	4.19	Overall Length	l_1(mm)	4140	4140	4240
	4.20	Length to Fork Face	l_2(mm)	2900	2900	3090
	4.21	Overall Width	b_1/b_2(mm)	1400	1400	1400
	4.22	Fork Dimension	s/e/l(mm)	50/125/1150	50/125/1150	60/150/1150
	4.23	Carriage DIN 15173, ISO 2328, Class/Form A,B		ISO 3A	ISO 3A	ISO 4A
	4.24	Fork Carriage Width	b_3	1260	1260	1260
	4.31	Ground Clearance laden under mast	m_1(mm)	190	190	190
	4.32	Ground Clearance at the centre of Wheel Base	m_2(mm)	230	230	230
	4.33	Aisle width with pallet 1000x1200 transverse	Ast(mm)	4440	4440	4555
	4.34	Aisle width with pallet 800x1200 Pallet longitudinal	Ast(mm)	4640	4640	4755
	4.35	Turning Radius	Wa(mm)	2650	2650	2750
	4.36	Smallest Distance to Pivot Point	b_{13}	900	900	900
Performance	5.1	Travel Speed laden/unladen	(km/h)	24,5/25,4	23,8/24,8	22,3/24,3
	5.2	Lifting Speed laden/unladen	(m/s)	0,52/0,55	0,51/0,55	0,50/0,55
	5.3	Lowering Speed laden/unladen	(m/s)	0,52/0,38	0,52/0,38	0,52/0,38
	5.5	Draw-bar-pull laden/unladen	(kN)	32,0/16,0	32,0/16,0	32,0/16,0
	5.7	Gradeability laden/unladen	(%)	33,5/26	30,7/24,5	28/22,6
	5.9	Acceleration time, laden/unladen	s	5,6/4,5	5,7/4,7	6,3/4,8
	5.10	Service brake type		mech./hydr.	mech./hydr.	mech./hydr.
Engine	7.1	Engine Manufacturer/Model		4.3 V6	4.3 V6	4.3 V6
	7.2	Engine Output to ISO 1585	(kw)	67	67	67
	7.3	Rated Rotation	(1/min)	2200	2200	2200
	7.4	Nº of Cylinders/Displacement	(/cm^3)	6/4294	6/4294	6/4294
		max. torque	Nm/rpm			
Others	8.1	Type of Drive Control		hydrodyn.	hydrodyn.	hydrodyn.
	8.2	Hydraulic Oil Pressure for Attachments	(bar)	160	160	160
	8.3	Oil flow for attachments	l/min	30	30	30
	8.4	Noise Level at Operator's Ear	dB(A)	78	78	78
	8.5	Trailer Coupling Type / DIN Type		15170 / type h	15170 / type h	15170 / type h

Specification sheet for lift trucks TFG 540-550 (09/03 and later)

	No.	Description	Code (Unit)	CX-J		
Specification	1.	Manufacturer		Jungheinrich	Jungheinrich	Jungheinrich
	1.2	Model Name		TFG 540	TFG 545	TFG 550
	1.3	Drive: Electric, Diesel, Gasolene, LPG, other		LPG	LPG	LPG
	1.4	Steering: Hand, Pedestrian, Standing, Seated		Seated	Seated	Seated
	1.5	Load Capacity	Q(t)	4,0	4,5	5,0
	1.6	Load Centre	c(mm)	500	500	600
	1.8	Load Distance	x(mm)	564	564	579
	1.9	Wheel Base	y(mm)	1985	1985	1985
Weight	2.1	Weight-unladen	(kg)	6279	6669	7434
	2.2	Axle Loading laden, front/rear	(kg)	8954/1325	9869/1300	10762/1673
	2.3	Axle Loading unladen, front/rear	(kg)	2810/3469	2937/3732	2795/4639
		Longitudinal stability				
Wheels/Chassis	3.1	Tyre type: Cushion, Super Elastic, Pneu., Polyurethan		SE(L)/SE(L)	SE(L)/SE(L)	SE(L)/SE(L)
	3.2	Tyre Size: front		3.00-15 (18PR)	3.00-15 (18PR)	3.00-15 (18PR)
	3.3	Tyre Size: rear		28 x 9 - 15	28 x 9 - 15	28 x 9 - 15
	3.5	Wheels, Numbers front/rear (x=traction)		2x/2	2x/2	2x/2
	3.6	Track width, front	b10(mm)	1180	1180	1170
	3.7	Track width, rear	b11(mm)	1160	1160	1160
Dimensions	4.1	Tilt of Mast/Carriage, forward/backward	Grad.	7/11	7/11	7/11
	4.2	Mast Height, lowered	h_1(mm)	2540	2540	2540
	4.3	Free Lift	h_2(mm)	150	150	150
	4.4	Lift Height	h_3(mm)	3500	3500	3500
	4.5	Height of extended mast	h_4(mm)	4200	4200	4350
	4.7	Height of overhead guard (Cabin)	h_6(mm)	2370	2370	2370
	4.8	Seat Height / Head clearance (SIP 100mm)	h_7(mm)	1255/1010	1255/1010	1255/1010
	4.12	Coupling height	h_{10}(mm)	535/700	535/700	535/700
	4.19	Overall Length	l_1(mm)	4145	4145	4260
	4.20	Length to Fork Face	l_2(mm)	2995	2995	3110
	4.21	Overall Width	b_1/b_2(mm)	1400	1400	1400
	4.22	Fork Dimension	s/e/l(mm)	50/125/1150	50/125/1150	60/150/1150
	4.23	Carriage DIN 15173, ISO 2328, Class/Form A,B		ISO 3A	ISO 3A	ISO 4A
	4.24	Fork Carriage Width	b_3	1260	1260	1260
	4.31	Ground Clearance laden under mast	m_1(mm)	190	190	190
	4.32	Ground Clearance at the centre of Wheel Base	m_2(mm)	230	230	230
	4.33	Aisle width with pallet 1000x1200 transverse	Ast(mm)	4419	4419	4569
	4.34	Aisle width with pallet 800x1200 Pallet longitudinal	Ast(mm)	4619	4619	4769
	4.35	Turning Radius	Wa(mm)	2655	2655	2790
	4.36	Smallest Distance to Pivot Point	b_{13}	900	900	900
Performance	5.1	Travel Speed laden/unladen	(km/h)	24,4/25,8	23,8/25,8	22,3/25,8
	5.2	Lifting Speed laden/unladen	(m/s)	0,52/0,53	0,51/0,53	0,50/0,53
	5.3	Lowering Speed laden/unladen	(m/s)	0,51/0,49	0,51/0,49	0,51/0,49
	5.5	Draw-bar-pull laden/unladen	(kN)	38,40/19,40	38,10/20,40	31,00/16,50
	5.7	Gradeability laden/unladen	(%)	35,9/31	34/30	24,9/22
	5.9	Acceleration time, laden/unladen	s	4,8/4,2	5,0/4,5	5,5/4,5
	5.10	Service brake type		mech./hydr.	mech./hydr.	mech./hydr.
Engine	7.1	Engine Manufacturer/Model		4.3 V6	4.3 V6	4.3 V6
	7.2	Engine Output to ISO 1585	(kw)	67	67	67
	7.3	Rated Rotation	(1/min)	2200	2200	2200
	7.4	Nº of Cylinders/Displacement	(/cm^3)	6/4294	6/4294	6/4294
		max. torque	Nm/rpm			
Others	8.1	Type of Drive Control		hydrodyn.	hydrodyn.	hydrodyn.
	8.2	Hydraulic Oil Pressure for Attachments	(bar)	160	160	160
	8.3	Oil flow for attachments	l/min	30	30	30
	8.4	Noise Level at Operator's Ear	dB(A)	78	78	78
	8.5	Trailer Coupling Type / DIN Type		15170 / type h	15170 / type h	15170 / type h

3.1 Data tables - DFG/TFG 316/320

Steer system

TYPE	Full Hydrostatic
PUMP	As Main Hydraulic System
HAND PUMP	Type OSPB 70
NUMBER OF TURNS LOCK TO LOCK	5

Drive axle

TYPE	Transaxle single speed
REDUCTION RATIO	Axle 13.59 : 1
LUBRICANT CAPACITY	5 litres (8.8 imp. pints)

Transmission

TYPE	Transaxle Single Speed
REDUCTION RATIO	Axle: 13.59 : 1 Torque Converter: 2.545 : 1
OIL CAPACITY	7 litres (12.3 imp. pints) Oil Change:- 5 litres (8.8 imp. pints)

Engine - DFG 316/320

TYPE	404C-22 In-line four cylinder.
FIRING ORDER	1 3 4 2
GOVERNED SPEED	2590 rpm (no load), 825 rpm (idle)
VALVE CLEARANCE	0.20mm (0.008in) Cold
OIL PRESSURE	4.5 bar (65 lbf in^2) @ 2300rpm
SUMP CAPACITY	8.9 litre (15.6 imp. pints)
FUEL TANK CAPACITY	42 litre (74 imp. pints)
COOLANT CAPACITY	7.0 litre (12 imp. pints)

Engine - TFG 316/320

TYPE	FE 2.0 In-line four cylinder
FIRING ORDER	1 3 4 2
CAPACITY	1998cc
GOVERNED SPEED	3100 rpm (no load) 830 rpm (idle)
OIL PRESSURE	3.0 bar (44 lbf in^2) @ 2300rpm
SPARK PLUG TYPE	NGK BPR 2E or DENSO W9EXR-U
SPARK PLUG ELECTRODE GAP	0.80mm (0.031 in)
CONTACT BREAKER GAP	Not Applicable (electronic ignition)
SUMP CAPACITY	4.3 litre (7.5 imp. pints)
FUEL TANK CAPACITY	Not Applicable
COOLANT CAPACITY	9.0 litre (16 imp. pints)

Air cleaner

TYPE	Cyclopac - Dry Element

Brake system

TYPE	Hydraulically operated brakes on drive axle
PARKING BRAKE	Mechanical, acting through cable and linkages
FLUID CAPACITY	0.45 Litre (0.79 imp. pints)

Wheels and tyres

TYRE SIZE	See Spec. Sheet

TYRE PRESSURES	Model	Drive - bar (lbf in^2)	Steer - bar (lbf in^2)
	DFG/TFG 316/320	7.75 (112)	9.0 (131)

WHEEL NUT TORQUE	Model	Drive - Nm (lbf ft)	Steer - Nm (lbf ft)
	DFG/TFG 316/320	235 (173)	176 (130)

Tyres

APPLICATION	TYRE SIZE	CONSTRUCTION	MODEL
Drive	6.50x10 PR	Pneumatic Crossply	DFG/TFG 316/320
Steer	18x7 PR		
Drive	6.50x10	Pneumatic Profile Solid	DFG/TFG 316/320
Steer	18x7		
Drive	23x9x10 PR	Pneumatic Crossply	DFG/TFG 316/320
Steer	18x7 PR		
Drive	23x9x10	Pneumatic Profile Solid	DFG/TFG 316/320
Steer	18x7		

Tyres not conforming to the original technical specification should not be fitted.

Noise

PERSISTENT SOUND PRESSURE LEVEL to EN 12053 in accordance with ISO 4871.	<80 dB (A) The persistent sound pressure level is a value determined according to the standard and takes into account the sound pressure level during driving, lifting and on idle. The sound pressure level is measured at the driver's ear.

Vibration

AVERAGE WHOLE BODY VIBRATION VALUE to Document EN 13059	0,57 m/s^2 The vibration acceleration acting on the body in its operating position is the linear integrated weighted acceleration in the vertical according to the standard. It is determined when passing thresholds at a constant speed.

Electrical system

SYSTEM	12 Volt Negative Earth
ELECTROMAGNETIC COMPATIBILITY (EMC)	Observation of the following limit values to product standard "Industrial Trucks Electromagnetic Compatibility (9/95)". • Interference emissions (EN 50081-1) • Interference resistance (EN 50 082-2) • Electrostatic discharge (EN 61000-4-2)

Hydraulic system

HYDRAULIC PUMP	1PX Series
CONTROL VALVE	5000 Series
STEERING PRESSURE	106 bar (1537 lbf in^2)
MAIN PRESSURE	215 bar (3118 lbf in^2)
TANK CAPACITY	46 litre (81 imp. pints)
HYDRAULIC SYSTEM CAPACITY	51 litre (29 imp. pints)

Conditions of Use

AMBIENT TEMPERATURE • in operation	 –15°C to +40°C

For constant use below 0° C, it is recommended that the hydraulic system be fitted with frost-resistant oil to the manufacturer's specification.
For use in refrigerated areas or for extreme temperature and humidity changes, special equipment and a licence are required for industrial trucks.

3.2 Data tables - DFG/TFG 420-430

Steer system

TYPE	Full Hydrostatic
PUMP	As Main Hydraulic System
HAND PUMP	Type OSPC 70-LS
NUMBER OF TURNS LOCK TO LOCK	4.75

Drive axle

TYPE	Double Reduction
REDUCTION RATIO	10.736 : 1
LUBRICANT CAPACITY	Diff Unit: 3.5 litres (6 imp. pints). Hubs: 1.0 litre (1.76 imp. pints)

Transmission

TYPE	Transaxle Single Speed
REDUCTION RATIO	Axle 15.42 : 1
OIL CAPACITY	12 Litres (21.1 Imp. Pints) Oil Change:- 5 Litres (8.8 Imp. Pints)

Engine - DFG 420-430

TYPE	704.30 / 704.26 (12/03 and later) four cylinder direct injection
FIRING ORDER	1 3 4 2
CAPACITY	2955 cc (704.30) / 2555 cc (704.26)
GOVERNED SPEED	2400 rpm (Type 704.30 no load) 2650 rpm (Type 704.26 no load) 680 rpm (idle 704.30) 800 rpm (idle 704.26)
VALVE CLEARANCE	Inlet & Exhaust 0.35mm (0.014in) cold
OIL CAPACITY	8.0 litres (14 imp. pints)
FUEL TANK CAPACITY	58 litres (102 imp. pints)
COOLANT CAPACITY	10.7 litres (19 imp. pints)

Engine - TFG 420-430

TYPE	3.0L L4 four cylinder four stroke LPG
CAPACITY	2966cc
FIRING ORDER	1 3 4 2
GOVERNED SPEED	2400 rpm (no load) 800 rpm (idle)
SPARK PLUG TYPE	AC Delco R46TS
SPARK PLUG ELECTRODE GAP	1.0mm (0.040 in)
CONTACT BREAKER GAP	Not Applicable (electronic ignition)
OIL CAPACITY	4.73 litres (8.3 imp. pints)
FUEL TANK CAPACITY	Not Applicable
COOLANT CAPACITY	9.2 litres (16 imp. pints)

Air cleaner

TYPE	Cyclopac - Dry Element

Brake system

TYPE	Hydraulically operated brakes on drive axle
PARKING BRAKE	Mechanical, acting through cable and linkages
FLUID CAPACITY	0.5 Litre (0.88 imp. pints)

Wheels and tyres

TYRE SIZE	See Spec. Sheet

	Model	Drive bar (lbf in^2)	Steer bar (lbf in^2)
TYRE PRESSURES	DFG/TFG 420/425	8.5 (123)	8.5 (123)
	DFG/TFG 430	8.5 (123)	7.5 (109)

	Model	Drive Nm (lbf ft)	Steer Nm (lbf ft)
WHEEL NUT TORQUE	DFG/TFG 420-430	235 (173)	165 (122)

Tyres

APPLICATION	TYRE SIZE	CONSTRUCTION	MODEL
Drive	7.00x12x12 PR	Pneumatic Crossply	DFG/TFG 420/425
Steer	6.50x10x10 PR		
Drive	27x10x12 PR	Pneumatic Crossply	DFG/TFG 430
Steer	6.50x10x10 PR		
Drive	7.00x12	Pneumatic Profile Solid	DFG/TFG 420/425
Steer	6.50x10		
Drive	27x10x12	Pneumatic Profile Solid	DFG/TFG 430
Steer	6.50x10		
Drive	7.00x12	Pneumatic Crossply	DFG/TFG 420/425
Steer	6.50x10		

APPLICATION	TYRE SIZE	CONSTRUCTION	MODEL
Drive	27x10x12	Pneumatic Crossply	DFG/TFG 430
Steer	6.50x10		
Drive	27x10x12	Pneumatic Profile Solid	DFG/TFG 430
Steer	6.50x10		

Tyres not conforming to the original technical specification should not be fitted.

Noise

PERSISTENT SOUND PRESSURE LEVEL to EN 12053 in accordance with ISO 4871.	<80 dB (A) The persistent sound pressure level is a value determined according to the standard and takes into account the sound pressure level during driving, lifting and on idle. The sound pressure level is measured at the driver's ear.

Vibration

AVERAGE WHOLE BODY VIBRATION VALUE to Document EN 13059	0,72 m/s^2 The vibration acceleration acting on the body in its operating position is the linear integrated weighted acceleration in the vertical according to the standard. It is determined when passing thresholds at a constant speed.

Electrical system

SYSTEM	12 Volt Negative Earth
ELECTROMAGNETIC COMPATIBILITY (EMC)	Observation of the following limit values to product standard "Industrial Trucks Electromagnetic Compatibility (9/95)". • Interference emissions (EN 50081-1) • Interference resistance (EN 50 082-2) • Electrostatic discharge (EN 61000-4-2)

Hydraulic system

HYDRAULIC PUMP	1PX Series
CONTROL VALVE	5000 Series
STEERING PRESSURE	90 bar (1305 lbf in^2)
MAIN PRESSURE	215 bar (3118 lbf in^2)
TANK CAPACITY	53 litre (93 imp. pints)
HYDRAULIC SYSTEM CAPACITY	58 litre (102 imp. pints)

Conditions of Use

AMBIENT TEMPERATURE • in operation	 -15°C to +40°C

For constant use below 0°C, it is recommended that the hydraulic system be fitted with frost-resistant oil to the manufacturer's specification.
For use in refrigerated areas or for extreme temperature and humidity changes, special equipment and a licence are required for industrial trucks.

3.3 Data tables - DFG/TFG 540-550

Steer system

TYPE	Full Hydrostatic
PUMP	As Main Hydraulic System
HAND PUMP	Type OSPC-150-LS
NUMBER OF TURNS LOCK TO LOCK	4,75

Drive axle - DFG/TFG 540-550

TYPE	Double Reduction
REDUCTION RATIO PST2	10.736 : 1 - Single & Twin Drive Wheels
LUBRICANT CAPACITY	
Diff Unit	3.5 litres (6 imp. pints) - Single Drive Wheels 4.5 litres (7.92 imp. pints) - Twin Drive Wheels
Hubs	1.0 litre (1.76 imp pints)

Drive coupling - DFG/TFG 540-550

PROPSHAFT	Mechanic Type

Transmission - PST2 - DFG/TFG 540-550

TYPE	PST2 : 2 Speed Fully Reversing Powershift
TORQUE MULTIPLICATION	2.86 : 1
GEAR RATIO	High - 1.241 : 1 Forward and Reverse Low - 2.55 : 1 Forward and Reverse
OPERATING TEMPERATURE (Normal)	80-100˚C (176-212˚F
MAXIMUM TEMPERATURE (Intermittent)	120˚c (248˚F)

INTERNAL PRESSURES	**Bar**	**(lbf in^{2})**
MAIN REGULATING	8.5-9.5	123-138
CLUTCHES	8-9	116-131
CONVERTER CHARGE	4-5	58-73
CONVERTER OUTLET	2-3	29-44

OIL CAPACITY	12.5 litres (22 Imp. Pints) Approx. check dipstick

Engine - DFG 540-550

TYPE	1004.4 2 / 11C-44 (09.03 and later) four cylinder direct injection.
FIRING ORDER	1 3 4 2
GOVERNED SPEED	2350 rpm (Type 1004.4-2 no load) 2350 rpm (Type 1104C-44 no load) 680 rpm (idle 1004.4-2) 800 rpm (idle 1104C-44)
VALVE CLEARANCE	Inlet 0.20mm (0.008in) Cold Exhaust 0.45mm (0.018in) Cold.
OIL PRESSURE	2.75-4.5 bar (40-65 lbf in^{2})
SUMP CAPACITY	6.9 litre (12 imp. pints) approx. check dipstick.
FUEL TANK CAPACITY	70 litre (123 imp. pints)
COOLANT CAPACITY	16 litre (29 imp. pints)

Engine - TFG 540-550

TYPE	4.3L V6 six cylinder four stroke LPG
CAPACITY	4294cc
FIRING ORDER	1 6 5 4 3 2
GOVERNED SPEED	2500 rpm (no load) 750 rpm (idle)
SPARK PLUG TYPE	AC Delco 41-932
SPARK PLUG ELECTRODE GAP	1.6mm (0.063 in)
CONTACT BREAKER GAP	Not Applicable (electronic ignition)
OIL CAPACITY	4.7 litres (8.3 imp. pints)
FUEL TANK CAPACITY	Not Applicable
COOLANT CAPACITY (engine only)	7.3 litres (13 imp. pints)

Air cleaner

TYPE	Cyclopac - Dry Element

Brake system - DFG/TFG 540-550

TYPE	Hydraulically Operated With Servo Assistance from February 2007: hydraulically operated with hydraulic reinforcement via an integral pump
PARKING BRAKE	Mechanical, acting through cable and linkages
FLUID CAPACITY	0.29 litre (0.5 imp. pints)

Wheels and tyres

TYRE SIZE	See Spec. Sheet

TYRE PRESSURES	Model	Drive bar (lbf in^2)	Steer bar (lbf in^2)
	All	8.5 (123)	8.5 (123)

WHEEL NUT TORQUE	Model	Drive Nm (lbf ft)	Steer Nm (lbf ft)
WHEEL NUT TORQUE	DFG/TFG 540-550	600 (444)	500-520 (370/383)

Tyres

APPLICATION	TYRE SIZE	CONSTRUCTION	MODEL
Drive	8.25x15	Pneumatic Profile Solid	DFG/TFG 540/545
Steer	7.00x12		
Drive (Twin)	7.50x15	Pneumatic Profile Solid	DFG/TFG 540/545
Steer	7.00x12		
Drive (Twin)	7.50x15	Pneumatic Profile Solid	DFG/TFG 550
Steer	7.00x12		
Drive	300x15	Pneumatic Profile Solid	DFG/TFG 550
Steer	7.00x12		

Tyres (09/03 and later)

APPLICATION	TYRE SIZE	CONSTRUCTION	MODEL
Drive	3.00x15	Pneumatic Profile Solid	DFG/TFG 540/545
Steer	28 x 9 – 15		
Drive (Twin)	7.50x15	Pneumatic Profile Solid	DFG/TFG 540/545
Steer	28 x 9 – 15		
Drive (Twin)	7.50x15	Pneumatic Profile Solid	DFG/TFG 550
Steer	28 x 9 – 15		
Drive	3.00x15	Pneumatic Profile Solid	DFG/TFG 550
Steer	28 x 9 – 15		

Tyres not conforming to the original technical specification should not be fitted.

Noise

PERSISTENT SOUND PRESSURE LEVEL to EN 12053 in accordance with ISO 4871.	<80 dB (A) The persistent sound pressure level is a value determined according to the standard and takes into account the sound pressure level during driving, lifting and on idle. The sound pressure level is measured at the driver's ear.

Vibration

AVERAGE WHOLE BODY VIBRATION VALUE to Document EN 13059	0,60 m/s^2 The vibration acceleration acting on the body in its operating position is the linear integrated weighted acceleration in the vertical according to the standard. It is determined when passing thresholds at a constant speed.
The vibration values acting on the operator's body in the x, y, z directions:	
Permitted values	Actual values
x = 90 cm/s^2	x = 38.9 cm/s^2
y = 45 cm/s^2	y = 22.8 cm/s^2
z = 63 cm/s^2	z = 59.7 cm/s^2

Electrical system

SYSTEM	12 Volt Negative Earth
ELECTROMAGNETIC COMPATIBILITY (EMC)	Observation of the following limit values to product standard "Industrial Trucks Electromagnetic Compatibility (9/95)". • Interference emissions (EN 50081-1) • Interference resistance (EN 50 082-2) • Electrostatic discharge (EN 61000-4-2)

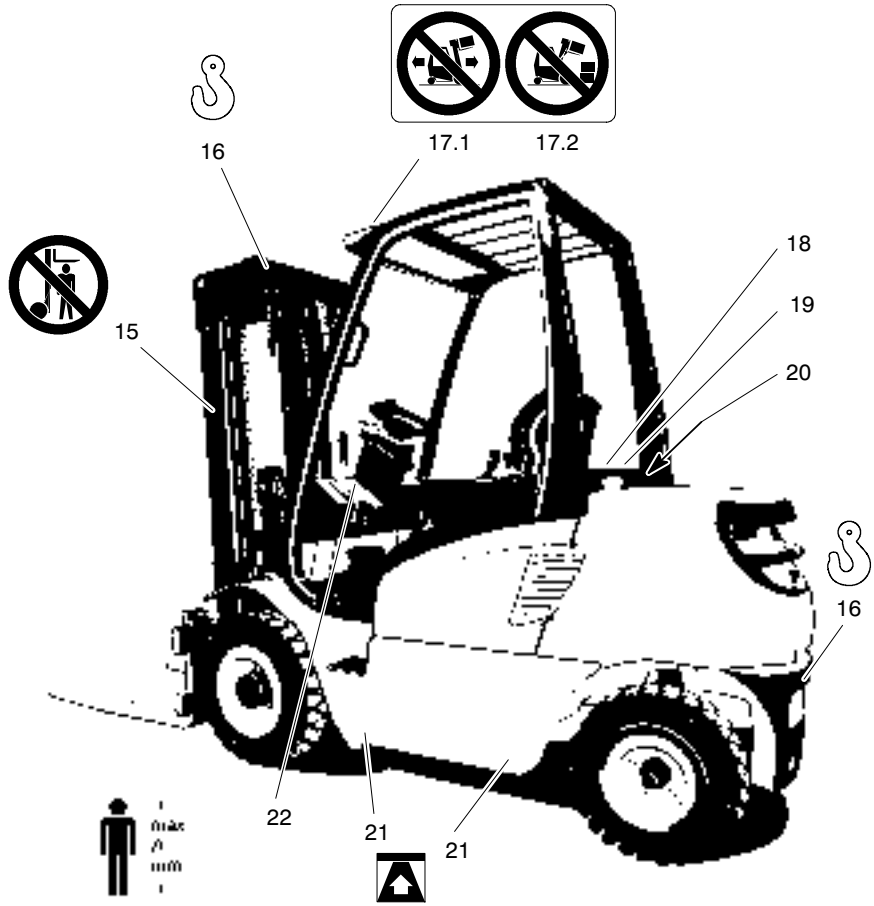
Hydraulic system

HYDRAULIC PUMP	2PX Series
CONTROL VALVE	5000 Series
STEERING PRESSURE	105 bar (1526 lbf in^2)
MAIN PRESSURE	215 bar (3118 lbf in^2)
TANK CAPACITY	70 litre (123 imp. pints)
HYDRAULIC SYSTEM CAPACITY	80 litre (141 imp. pints)

Conditions of Use

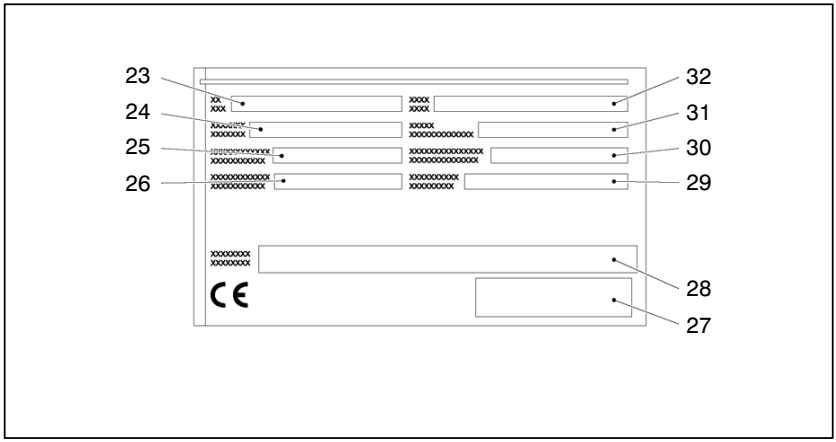
AMBIENT TEMPERATURE	
• in operation	-15°C to +40°C

For constant use below 0°C, it is recommended that the hydraulic system be fitted with frost-resistant oil to the manufacturer's specification.
For use in refrigerated areas or for extreme temperature and humidity changes, special equipment and a licence are required for industrial trucks.



Item.	Description
15	Prohibition plate “No standing under load platform”
16	Attachment points for crane loading
17.1	Prohibition plate “No driving with load raised”
17.2	Prohibition plate “No tilting mast forwards with raised load”
18	Load diagram, load forks, load-bearing capacity/centre of gravity/lifting height
19	Load diagram, side loaders, load-bearing capacity/centre of gravity/lifting height
20	Truck rating plate
21	Plate for truck jacking points
22	Plate ”Max. body size”

4.1 Truck Rating Plate



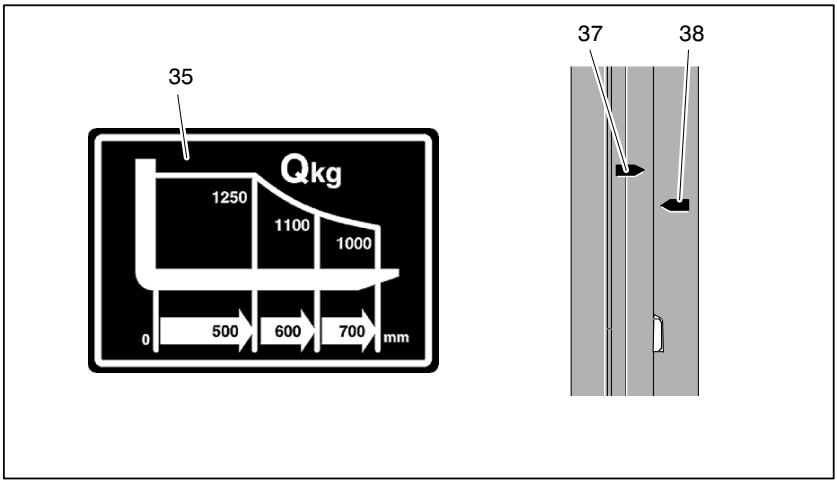
Item	Description	Item	Description
23	Model	28	Manufacturer
24	Serial number	29	Dead weight in kg
25	Rated capacity in kg	30	Centre of gravity interval in mm
26	Rated drive power in kW	31	Year of construction
27	Manufacturer logo	32	Option

For queries on the truck or for ordering spare parts, please quote the serial number (24).

4.2 Load diagrams

Load Diagram Load Forks (Load-Bearing Capacity, Centre of Gravity, Lifting Height)

The load forks load diagram (35) gives the load-bearing capacity Q of the load forks in kg. It is given in table form and is dependent on the load centre of gravity D (in mm) and required lift height H (in mm). Arrow markings (37 and 38) on the inner and outer mast show the driver when he has reached the lifting height limits given in the load diagram.

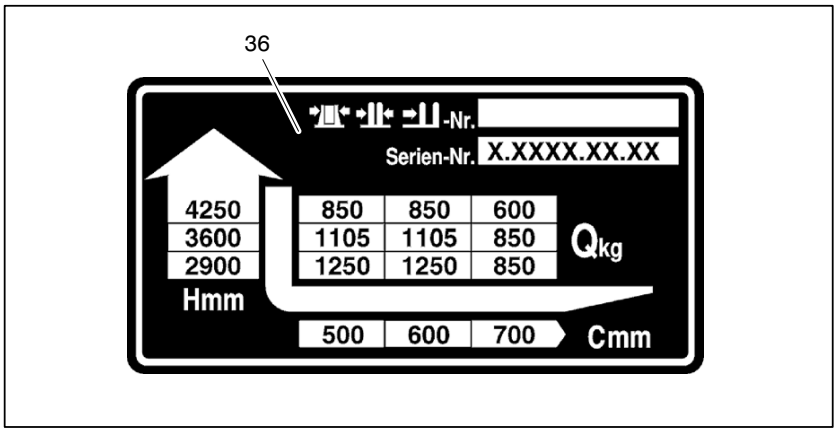


Example for Determining Maximum Load-bearing Capacity:

For a load centre of gravity D of 600 mm and a maximum lifting height H of 1100 mm, the maximum load-bearing capacity Q is 1490 kg.

Load Diagram (Load-bearing Capacity, Load Centre of Gravity, Lifting Height)

The load diagram (36) gives the load-bearing capacity Q of the side loader in kg. It is shown in the same form as the load-bearing capacity of the forks and should be determined accordingly.



C Transportation and Commissioning

1 Transportation

Dimensions

For truck dimensions, refer to the Standard Specifications Sheet(s).

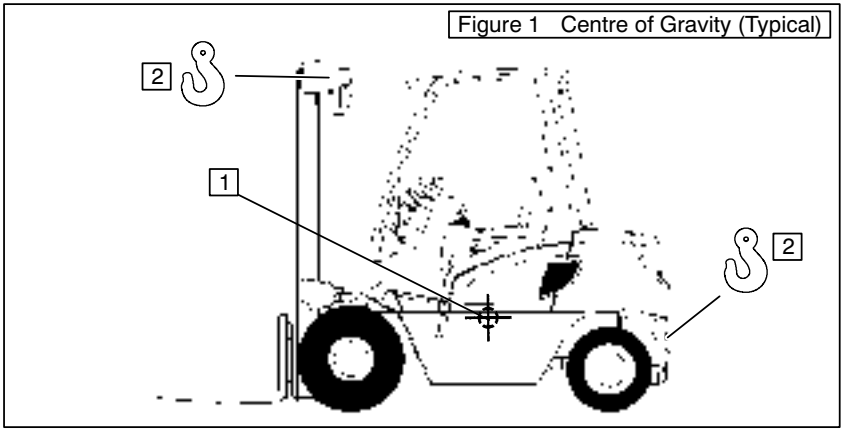
Weights

For truck weight refer to the Standard Specification Sheet(s).

Centre of gravity

Refer to (1) for the centre of gravity of the Frontlift truck. For further information or advice regarding centre of gravity, contact the manufacturer or trained manufacturer representative. Refer to (2) for truck lifting points.

Figure 1 Centre of Gravity (Typical)



Securing the truck

It is recommended that the transporting of the truck by road, rail or sea, may only be undertaken by an authorized transport company.

All trucks being transported by road, rail, or sea have a common method of stowage, which reduces the possibility of damage to the truck and paintwork.

A typical method of securing the truck to the deck of the lorry, rail truck or ship is to:

- secure the rear of the truck by means of a chain from the towing point in the counterweight to a convenient deck bolt.
- apply a strap across the floor plate of the truck to a convenient deck bolt.

Ensure that the strap and chain are under tension, see Figure 2.

The chassis will be secured with the mast tilt in the fully back position.

Generally, trucks are transported complete, i.e. with the forks and mast mounted on the truck. For trucks with mast and forks removed, the following guidelines may be followed. If in doubt, consult your authorised transport company.

Securing of Mast.

Where machines are being transported with the mast fitted into the truck, no action is required.

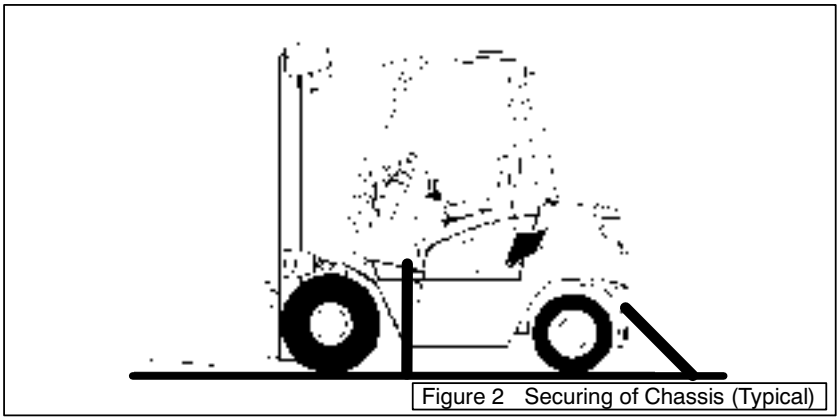


Figure 2 Securing of Chassis (Typical)

Where it is necessary to remove the mast during transportation the following procedure will be undertaken:-

- Remove forks from carriage and action, as securing of forks below.
- Remove mast and carriage assembly from truck.
- Weld securing bar (3) across bottom of mast and carriage, to prevent movement of mast and carriage assembly or where holes are available, fit bolt (2) through masts and carriage, and retain with a nut (4).
- Where possible, and in particular with high lift masts, the lift chain is to be lightly banded to the lift cylinder, at not less than 1 metre intervals to ensure that the chain does not slap during transportation.

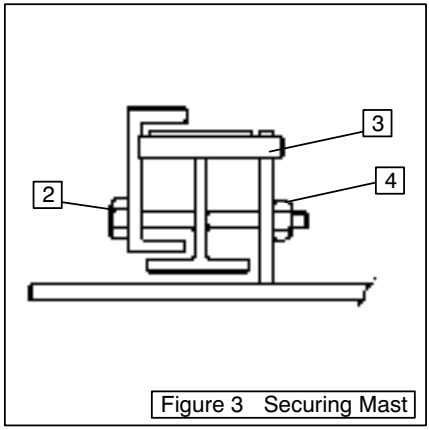


Figure 3 Securing Mast

- Thick card or rubber is to be laid between the chain and the lift cylinder, and all around the cylinder where banding is taking place, to protect the paintwork.

Where it is impracticable to retain the chain as above, the free end is to be wired to a suitable position, and care taken to ensure paintwork is not damaged during transportation.

Other than the welding specified in Figure 3 above, no welding is to take place on the carriage stiles and the mast channels.

Securing Forks.

Each pair of forks will be securely banded together using banding material as shown in Figure 4.

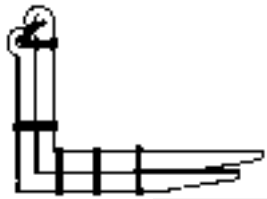


Figure 4 Forks

Securing Forks - Mast Assembly in Truck.

The forks having been banded together will be offered up to the mast/carriage assembly and laid on the fork stowage brackets which would have been previously hooked onto the carriage. The assembly will then be securely banded to the carriage, see Figure 5.

Securing Forks - Mast Assembly Out of Truck.

The forks having been banded together will be offered up to the mast/carriage assembly. Banding material is passed under the mast channels and over the forks, and securely connected, see Figure 6.

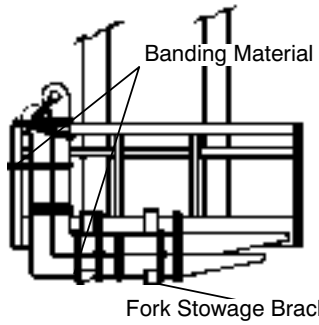


Figure 5 Securing Forks

Electrical and hydraulic connections

All electrical connections which are left disconnected are to be capped, while disconnected hydraulic connections are to be plugged.

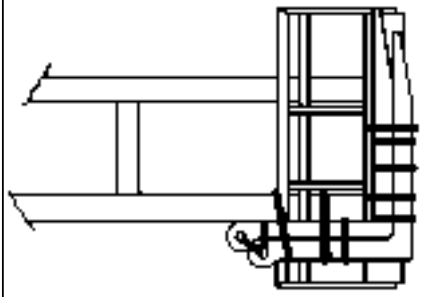


Figure 6 Securing Forks

Slinging

Some of the suitable lifting points for the truck are indicated by the crane hook label shown in Figure 7; these lifting points are situated on the mast and counterweight.

For further information or advice regarding suitable lift points for the truck contact the manufacturer or their authorised representative.

Figure 7 Crane Hook Label

Ensure that all lifting tackle has a S.W.L. suitable for the truck unladen weight.

Before any lifting attempt is made, check that the mast is in the vertical position.

Lifting the truck.

Attach suitable lifting tackle to the trucks lifting points (2).

- Place packing material to avoid damage to truck finish, where lifting tackle is likely to contact truck.
- Take up the slack and stand clear of the truck.
- Make a test lift, just clear of the ground, to ensure that the lift is square and even, if not lower to ground and adjust lifting tackle as required.
- If the above are all correct then proceed with the lifting of the truck to the required position, with slow and definite movements.
- Lower to the required position and remove lifting tackle.

2 Commissioning

Commissioning of the truck may only be carried out by the manufacturer or trained manufacturer representative.

Lifting equipment required

Chains and shackles capable of handling the weight of the truck – refer to specification sheet for weight of truck.

Crane or hoist capable of handling the weight of the truck – refer to specification sheet for weight of truck.

Commissioning

Commissioning of the truck may only be carried out by a competent engineer. Commissioning usually takes the form of performing static and functional checks.

Static and functional checks

Static and functional checks are to be carried out by a competent engineer upon delivery of truck. The checks to be made fall into two broad groups i.e. static and functional.

Static Checks.

Static checks to be made are as follows:	
o 1. Conforms to ordered specification.	□
o 2. No transport damage.	□
o 3. Check paintwork-no corrosion evident.	□
o 4. Coolant level.	□
o 5. Oil level-engine.	□
o 6. Oil level-transmission.	□
o 7. Oil level-hydraulic tank.	□
o 8. Oil level-drive axle hubs/differential.	□
o 9. Oil level-brake/inching master cylinder.	□
o 10. Air filter and trunking.	□
o 11. Breather-hydraulic tank.	□
o 12. Adjustment-fan belt/alternator belt.	□
o 13. Adjustment and lubrication of lift chains.	□
o 14. Check-axle mounting bolts.	□
o 15. Check tightness-wheel nuts.	□
o 16. Check all tyre pressures.	□
o 17. Manuals-tools received.	□

Functional Checks.

The functional checks must be carried out by the competent engineer with the truck under load, these include:

- Move the truck forward at low speed, change to reverse, and change to forward again to verify that the direction change mechanism operates effectively.
- Drive the truck forward and rearward through all speed ranges to the maximum speed, and check that range changing and service brakes operate in both directions.
- Complete several circuits in a figure-of-eight, at approximately one third maximum speed, in both forward and reverse directions.
- Raise the test load from ground level and elevate it to maximum height. Lower test load to ground level at maximum speed, making several stops during descent and deposit load on the ground.

D Truck Refuelling

1 Safety Conditions for Handling Diesel Fuel and Liquid Petroleum Gas

Before filling up or changing the gas bottle, the truck must be safely parked (see Chapter E, Section 5.8).

Fire Protection Measures: When dealing with fuels and liquid gas, no smoking, naked flames or other sources of ignition are permitted within the vicinity of the tank. Signs indicating the risk zone must be arranged to be clearly visible. Storage of highly flammable materials in this area is not permitted. Functioning fire extinguishers must be available to hand in the filling area at all times.

To prevent liquid gas burns, use only carbon dioxide dry extinguishers or carbon dioxide gas extinguishers.

Storage and Transport: The equipment for storing and transporting diesel fuel and liquid gas must comply with legal requirements. If no supply point is available, the fuel must be stored and transported in clean approved vessels. The content must be clearly marked on the container. Leaking gas bottles must immediately be moved to the open air, stored in well-ventilated locations and reported to the supplier. Escaping diesel fuel must be absorbed by suitable agents and disposed of in accordance with the relevant environmental protection laws.

Staff for Filling Up and Changing Gas Bottles: Staff dealing with liquid petroleum gas are obliged to have appropriate knowledge on the properties of liquid gas to ensure safe performance of the work.

Filling Liquid Gas Tanks: Gas tanks remain connected to the truck and are filled at gas filling points. During filling, the regulations of the filling station and tank manufacturers and the legal and local conditions must be observed.

Liquid gas causes frost wounds on exposed skin.

2 Filling with Diesel Fuel

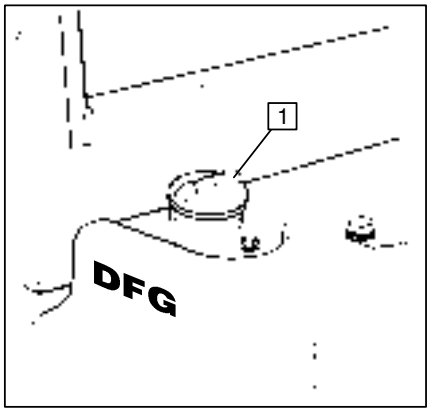
The truck may be filled only at the specified locations.

- Park the truck securely before filling (see Chapter E, Section 5.8).
- Open the filler cap (1).
- Fill with clean diesel fuel.

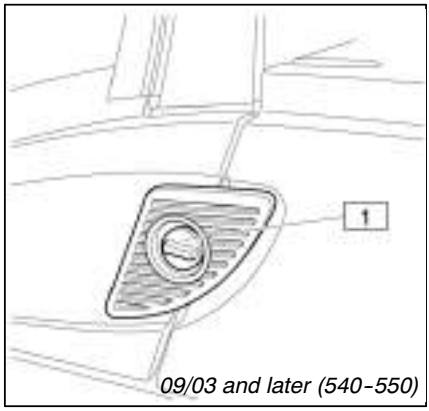
Do not overfill the tank.

Filling quantity:

DFG 316/320:	**42 litres.**
DFG 420-430:	**58 litres.**
DFG 540-550:	**70 litres.**



Use only diesel fuel DIN 51601 with a cetene number under 45.

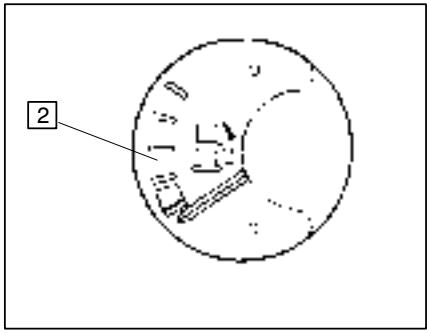


09/03 and later (540-550)

The fuel level display (2) indicates the fuel level. When the indicator enters the red, the tank must be filled up.

Never the run the fuel tank empty. Air in the fuel system can cause operating faults.

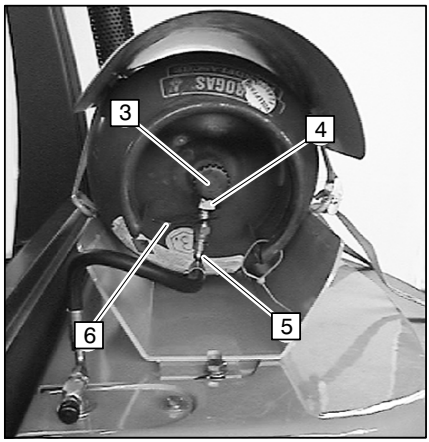
- Close the filler cap again firmly after filling up.



3 Changing the Gas Bottle

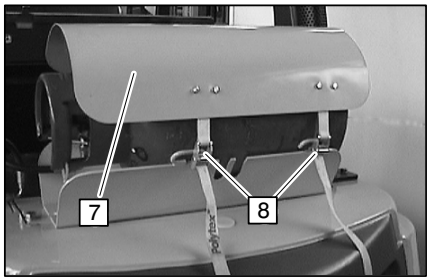
The gas bottle may be changed only at the specified locations by trained and authorised persons.

- Park truck securely before filling (see Chapter E, Section 5.8).
- Close shut-off valve (3) tightly.
- Start engine and run gas system until empty in neutral.
- Unscrew nut (4) with a suitable wrench, holding with the handle (6).
- Remove hose (5) and immediately screw the valve cover cap onto the empty gas bottle.
- Release the straps (8) and remove the cover panel (7).
- Carefully remove the gas bottle from its holder and deposit securely.



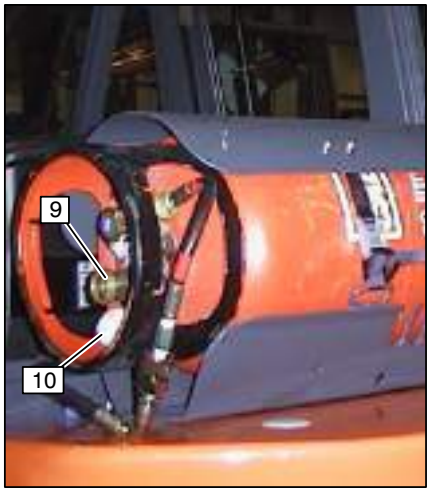
Only 18 kg (29 litres) gas bottles should be used.

- Place the new gas bottle in the holder and turn until the connections on the shut-off valve point downwards.
- Attach the gas bottles securely with the straps.
- Re-attach the hose as specified.
- Carefully open the shut-off valve and test the connection for leaks using a foaming agent.



○ **Refillable liquid petroleum gas bottles**

The refillable L.P. Gas bottles are available in two forms – 'end fill' and 'centre fill'. Both types of bottle are fitted with an automatic fill stop valve to prevent the bottle from being over filled.



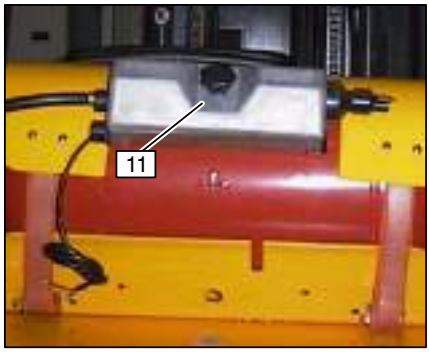
Refill the L.P. Gas bottles as follows:

End fill L.P. Gas bottle

Unscrew cap (9). Insert nozzle from L.P. Gas pump into the fill connector (10). Fill the L.P. Gas bottle until the liquid level gauge indicates the bottle is full. Remove nozzle and refit cap (9).

Centre fill L.P. Gas bottle

Remove cover (11). Unscrew cap (12). Insert nozzle from L.P. Gas pump into the fill connector. Fill the L.P. Gas bottle until the liquid level gauge indicates the bottle is full. Remove nozzle and refit cap (12).



STOP *OBSERVE ANY GUIDELINES/REGULATIONS RELATED TO THE FILLING OF L.P. GAS BOTTLES THAT MAY BE FOUND AT THE L.P. GAS PUMP.*

4 Trucks fitted with Twin-Gas Bottles

Trucks fitted with twin-gas bottle arrangement have a lock-valve which can be used in one of two ways:

- With both LPG cylinder supply valves open, this will increase the overall fuel capacity.
- With one LPG cylinder supply closed to provide a reserve cylinder.

The following points must be noted to ensure safe operation:

- At no time should the system operate with either of the cylinders disconnected.
- The plastic dust cover on the hydrostatic relief valve should be kept on during service to keep out contaminants, and inspected regularly.
- If the second cylinder is to be used as a reserve, it must be turned off at the valve and manually turned on when the service cylinder becomes exhausted.
- For safety reasons, when the service cylinder has exhausted and the reserve opened, the valve on the exhausted cylinder should then be closed.
- If both cylinders are to be used simultaneously and the cylinder pressures are unequal, the connector will draw LP-Gas from the cylinder with the higher pressure until both cylinder pressures equalise. Then the gas will be drawn from both cylinders.
- If the hose from one of the cylinders were to burst, the connector stops the flow of gas from the **other** cylinder, (which prevents both cylinders from emptying).

E Operation

1 Safety Regulations Governing the Operation of the Forklift Truck

Driving permission: The forklift truck must only be operated by persons who have been trained in the operation of trucks, who have demonstrated to the user or his representative their capability of moving and handling loads, and who have expressly been charged by the user or his representative with the operation of the truck.

Rights, duties and conduct of the driver: The driver must be: informed of his rights and duties; trained in the operation of the forklift truck; and familiar with the contents of these operating instructions. All necessary rights must be granted to him.
For industrial trucks used in busy areas, safety shoes must be worn during operation.

Prohibition of unauthorized use: The driver is responsible for the forklift truck during working time. He must forbid unauthorized persons to drive or operate the forklift truck. The transport or lifting of persons is forbidden.

Damage and defects: Damage or defects noted on the forklift truck or on the attachments must immediately be brought to the notice of the person in charge. Forklift trucks that cannot be safely operated (e.g. due to worn tyres or defective brakes) must not be used until they have been properly repaired.

Repairs: Without specific training and express authorization the driver is not allowed to perform any repairs or modifications on the forklift truck. Under no circumstances must the driver change the setting of switches or safety installations, or render them ineffective.

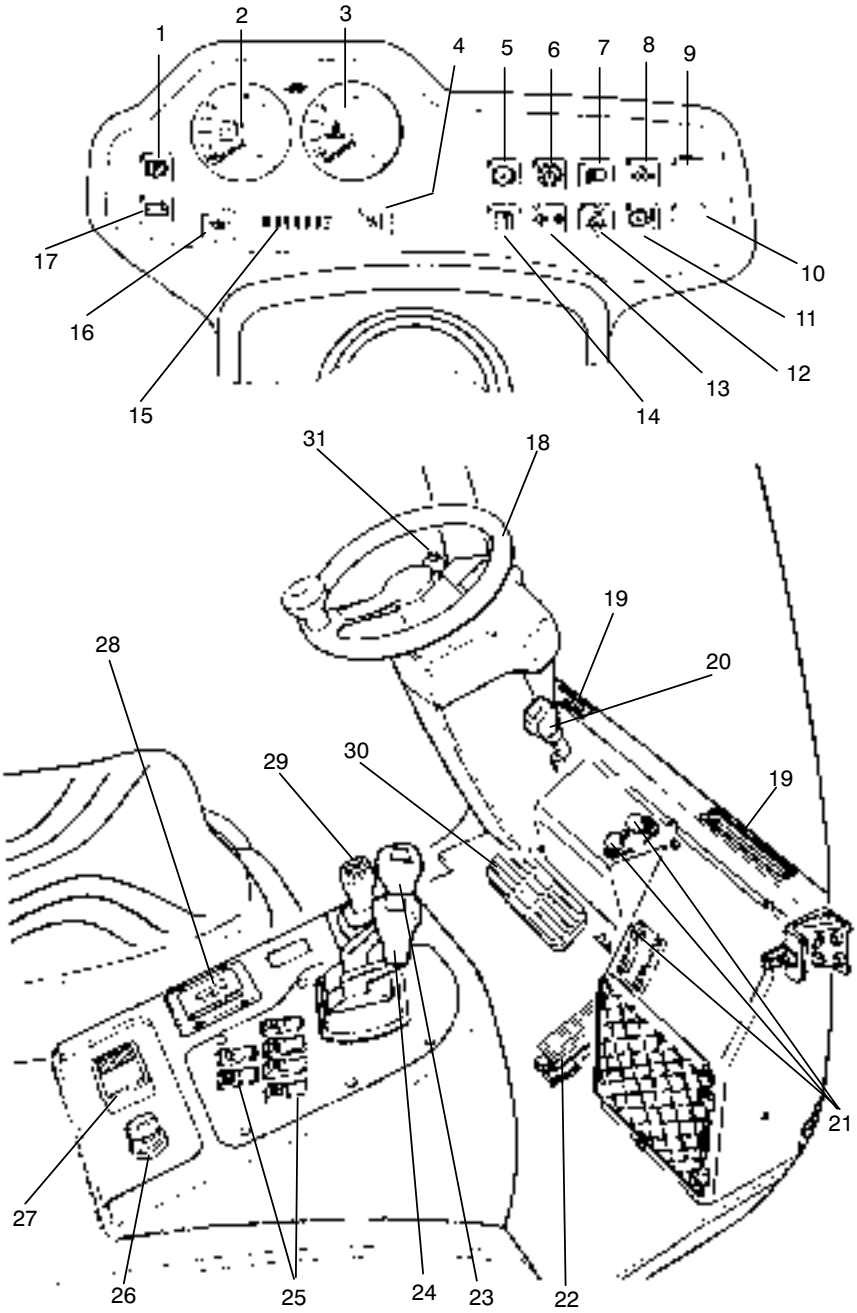
Danger area: The danger area is considered the area within which persons are endangered by the travelling or lifting movements of the forklift truck or its load lifting devices (e.g. fork or attachments), or by the loads being transported. This includes also the area within reach of dropping loads or dropping truck attachments.

Unauthorized persons must be asked to leave the danger area. The driver must give a warning signal, whenever a situation presenting danger to persons might develop. The forklift truck must immediately be brought to a standstill, if persons, although asked, do not leave the danger area.

Safety devices and warning labels: The safety devices, warning labels and warning notes described in the present operating instructions must always be heeded.

Before operating the truck, the operator must be fully conversant with the arrangement of the gauges and controls.

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.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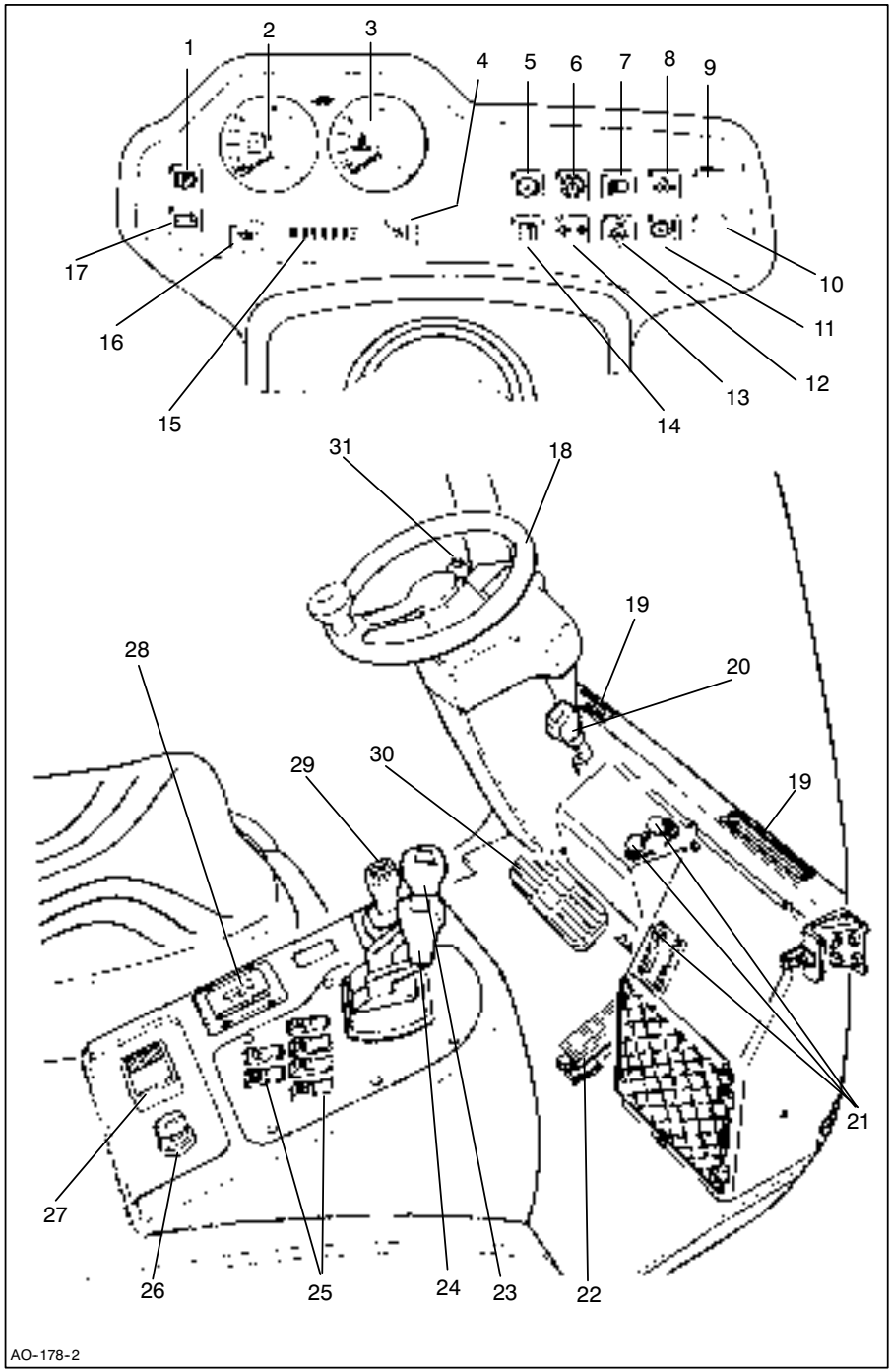
AO-178-2

2 Description of Drivers Controls and Display Elements

Item		Control or Display Element		Function
1		Parking brake warning light	●	When lit indicates that the parking brake is operated
2		Fuel gauge (DFG)	●	Shows the fuel left in the tank
3		Coolant temperature gauge	●	Shows the coolant temperature
4		Neutral	●	When lit indicates that the direction switch is in neutral
5		Brake fluid warning light	○	When lit indicates that the brake fluid level is too low
6		Not used on Hydrokinetic trucks		
7		Lights	○	Shows that the front headlights are switched on
8		Engine oil pressure warning light	●	When lit indicates insufficient oil pressure in the engine
9		Blank	○	
10		Blank	○	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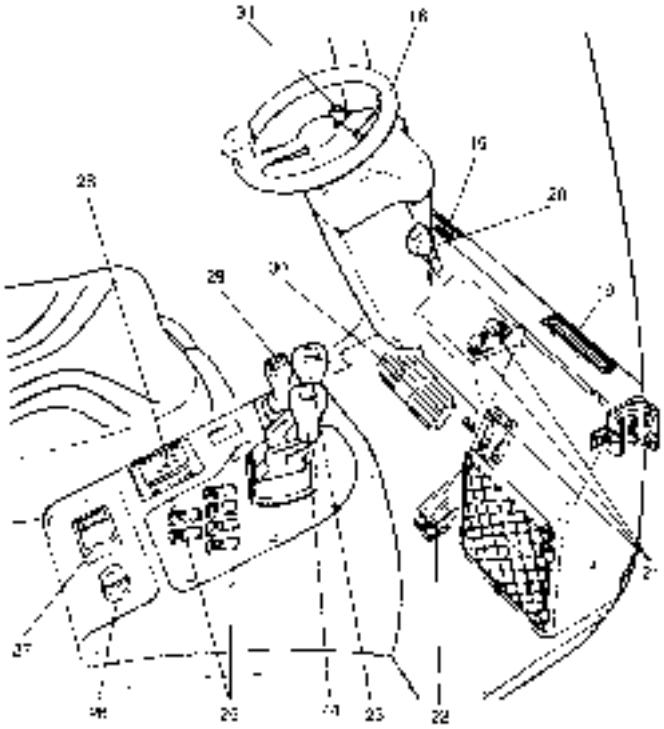
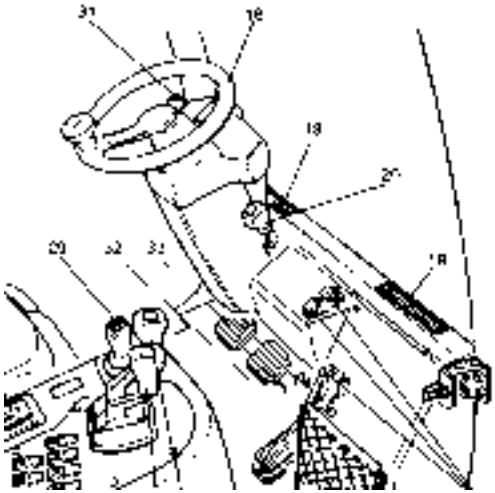
AO-178-2

Item		Control or Display Element		Function
11		Converter temperature warning light	●	When lit indicates that the oil temperature in the load gears is too high
12		Safety belt warning light	○	When lit indicates that the safety belt is not properly fastened
13		Direction indicator LED	○	Shows the function of the right/left direc-tion indicator
14		Fuel warning light (DFG)	●	Indicates low fuel level when lit
15		Time/operating hours display	●	Shows the time or operating hours worked.
16		Preglow control light (DFG)	●	Shows the function of the cold start device
17		Charge current warning light	●	When lit indicates that the battery is not charged
18		Steering wheel	●	Steers truck in required direction
19		Heating/air outlets	○	
20		Steering column adjustment lever	●	Adjusts steering column angle



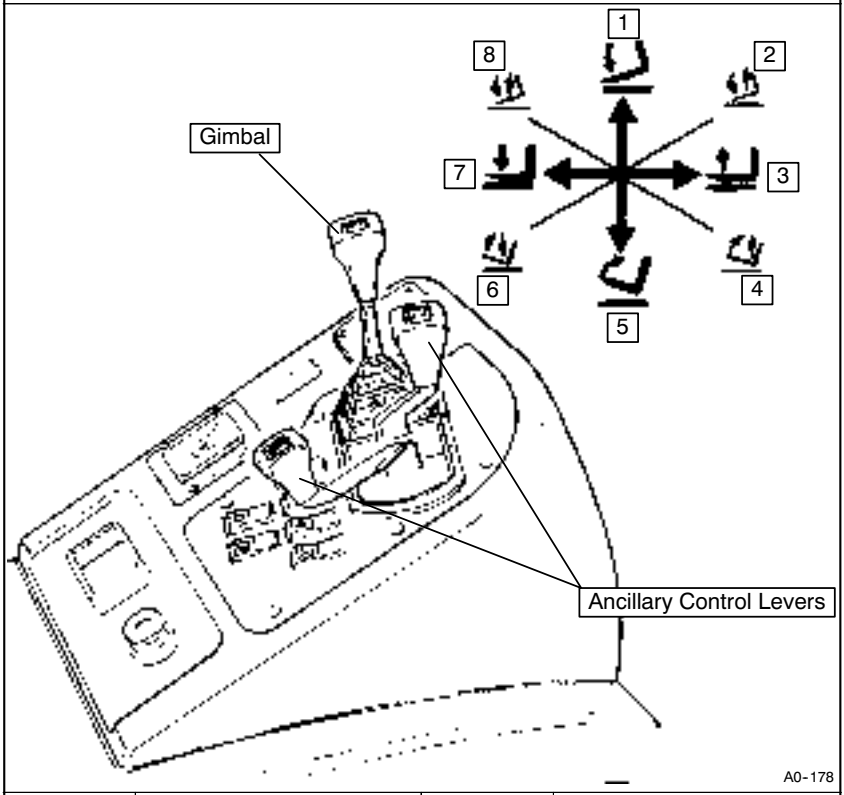


DFG/TFG 540-550

Item		Control or Display Element		Function
21		Cab heater Controls	○	
22		Accelerator pedal	●	Controls engine speed or drive and travel speed
23		Raise/lower control lever	●	Raises or lowers fork carriers. Raise fork carrier: pull lever back. Lower fork carrier: push lever forwards.
24		Mast tilt control lever	●	Tilt mast forwards or backwards. Tilt mast forwards: push lever forwards. Tilt mast backwards: pull lever backwards.
25		Switch(es)	○	Lights, demister etc.
26		Ignition/starter switch	●	Connects and disconnects the power supply. Starts and stops engine. When the ignition key is removed, the truck is protected from use by unauthorised persons.
27		Battery isolation switch (emergency off)	●	The main power circuit is cut, all electrical functions are disconnected. The truck rolls to a stop This switch should only be used to stop in an emergency or for isolation purposes. If switch is activated, reset clock (20) and (21). Under normal conditions the stopping instructions on page E 24 must be followed.
28		Warning signal button	●	Triggers an acoustic warning signal
29		Direction lever	●	Selects direction of travel
30		Creep/brake pedal (From 02/07 DFG/TFG 316–430 only)	●	1st range: controls creep drive 2nd range: activates operating brake
31		Parking brake lever (09/03 and later: to the steering wheel right in the 540–550 series)	●	Applies or releases the parking brake: Pull lever to engage. Push lever forwards to release.
32		Brake pedal (from 02/07 DFG/TFG 540–550 only)	●	The truck's brake is applied.
33		Slow travel / brake pedal (from 02/07 DFG/TFG 540–550 only)	●	1st range: controls creep drive 2nd range: activates operating brake

○ **Gimbal - lift and tilt**

Gimbal functions



Symbol	Purpose	Symbol	Purpose
	1. To tilt the mast forward.		5. To tilt the mast backward.
	2. To lift the fork tines and tilt the mast forward.		6. To lower the fork tines and tilt the mast backward.
	3. To lift the fork tines.		7. To lower the fork tines.
	4. To lift the fork tines and tilt the mast backward.		8. To lower the fork tines and tilt the mast forward.

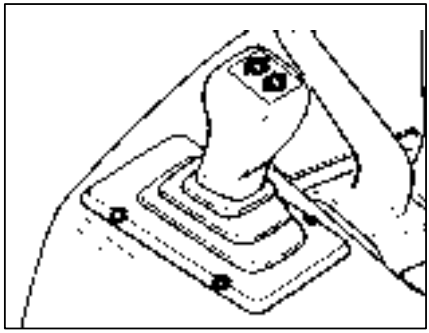
On some models, these functions may be disabled.

● **Gear selector**

With the gearshift lever in the central position, the transmission is in neutral.

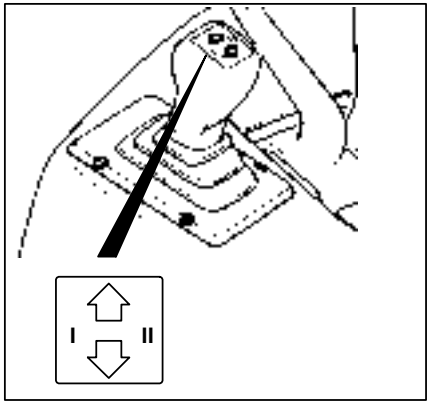
- To select forward gear, push lever forwards.
- To select reverse gear, pull lever backwards.

The engine will not start if the truck is in gear.



● **Two speed gear selector – DFG/TFG 540-550**

Gear selection is operated manually, press 'I' to select a lower gear when climbing or descending an incline.



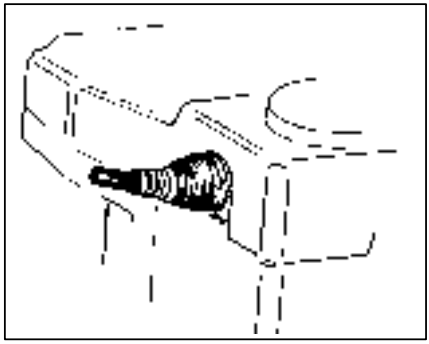
○ **Column mounted gear selector**

On trucks fitted with a gimbal lever (refer to page E 8), the standard gear selector fitted to the right of the driver's seat is replaced by a column mounted gear selector.

With the gearshift lever in the central position, the transmission is in neutral.

- To select forward gear, push lever forwards.
- To select reverse gear, pull lever backwards.

The engine will not start if the truck is in gear.



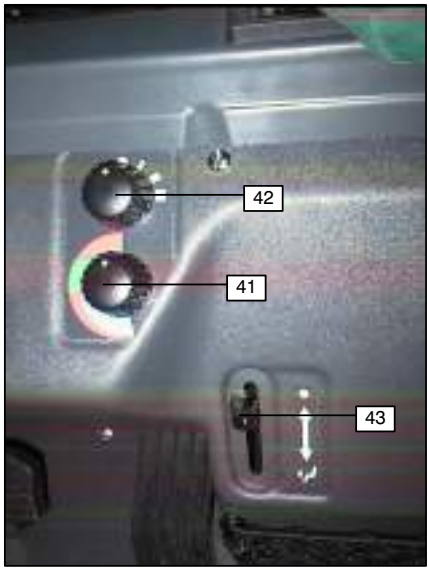
○ **Gear Interlock System - TFG/DFG 540-550**

The Gear Interlock System is an option preventing the operator to drive the truck from a standstill position if the truck is in gear. The System will also prevent the operator from changing direction if the truck is in second gear.

It is important to note that while the truck may coast during gear changing, braking is still available.

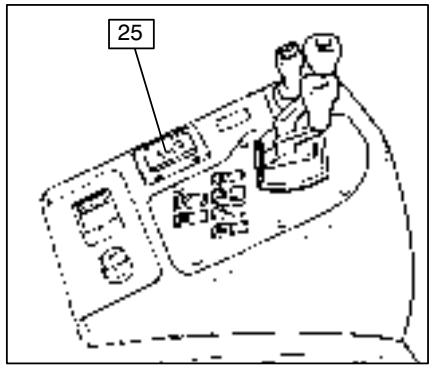
○ **Cab Heater controls**

- Turn the thermostat control knob (41) anti-clockwise to progressively to lower the cab temperature.
- Turn the fan control knob (42) clockwise to regulate the fan air flow. To switch off, turn the fan control knob fully anti-clockwise.
- Slide the air flow direction lever (43) down to its lowest position to direct air flow to the cab floor. Slide the air flow direction lever (43) to its upper position to cut off the air flow to the cab floor. The air flow to the front screen is controlled independently of this lever by the vents in the plastic ducting along the bottom of the screen.



Horn

- Press button (25) to sound the horn.



3 Checks and Activities Before Daily Use

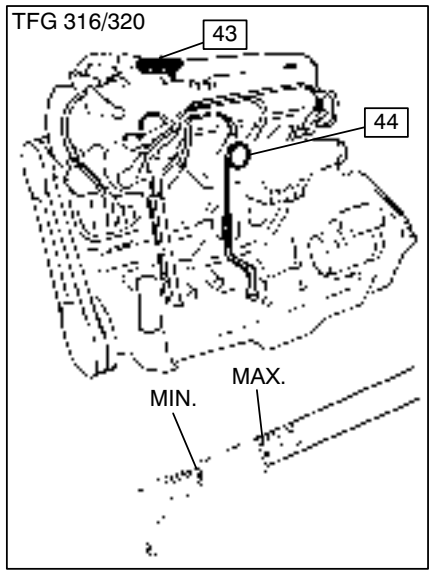
Truck

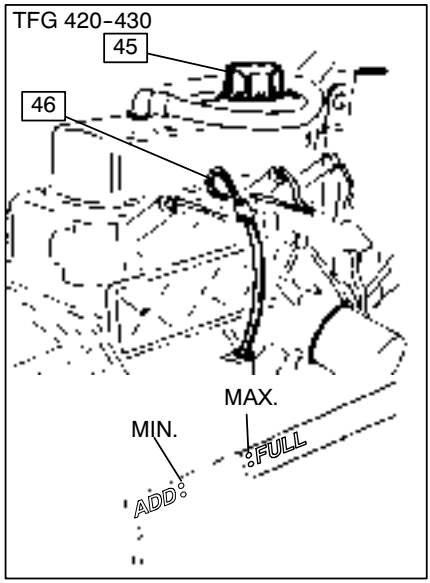
- Check complete truck (in particular wheels and load-carrying means) for visible damage.

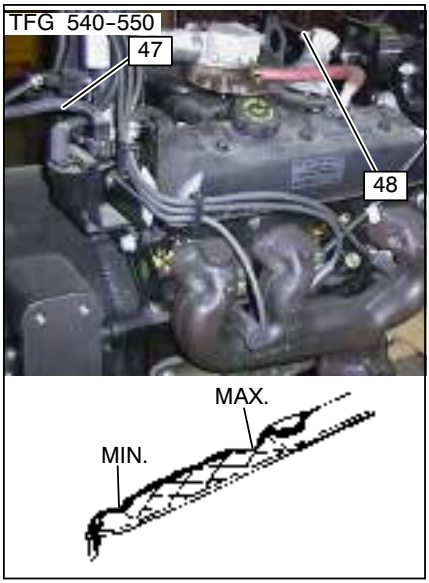
With exception of 'checking the windscreen washer level', all checks will require the opening of the service doors and covers: refer to page E 43 Engine Housing.

Checking engine oil level - TFG

- Withdraw dipstick (44 or 46 or 48).
- Wipe the dipstick with a lint-free cloth and re-insert into the hole to its fullest extent.
- Withdraw the dipstick again and check the oil level is between the MIN and MAX marks.
- If below mid point, remove filler cap (43 or 45 or 47) and add the correct type of oil to the engine until the level is indicated at the MAX mark on the dipstick.

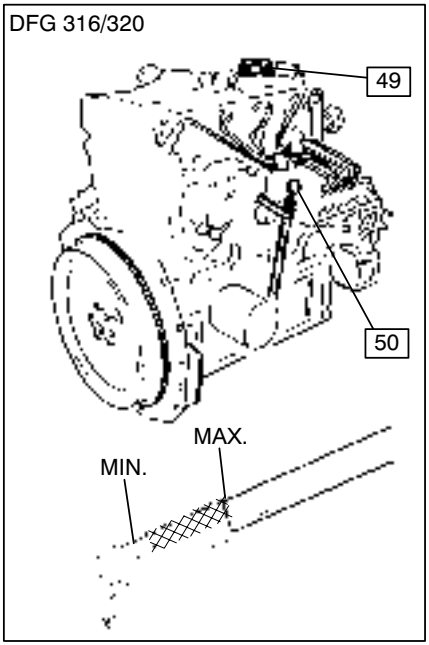




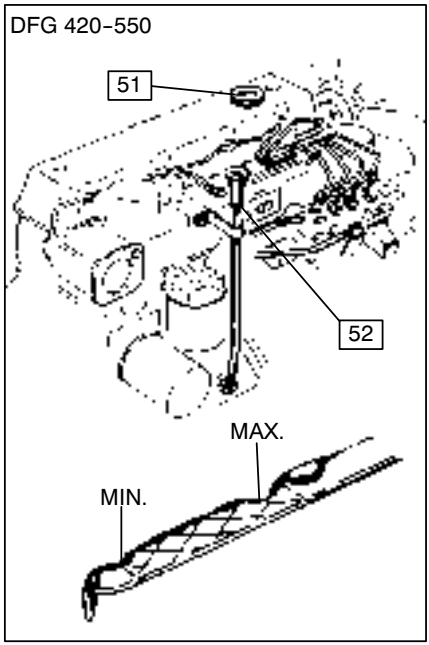


Checking engine oil level - DFG

- Withdraw dipstick (50 or 52).
- Wipe the dipstick with a lint-free cloth and re-insert into the hole to its fullest extent.



Withdraw the dipstick again and check the oil level is between the MIN and MAX marks.

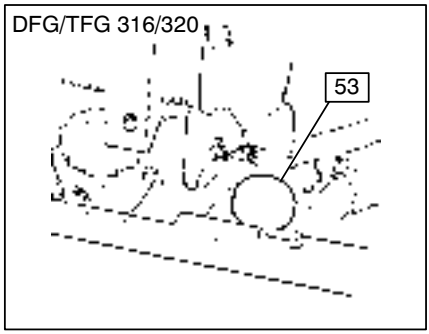


- If below mid point, remove filler cap (49 or 51) and add the correct type of oil to the engine until the level is indicated at the MAX mark on the dipstick.

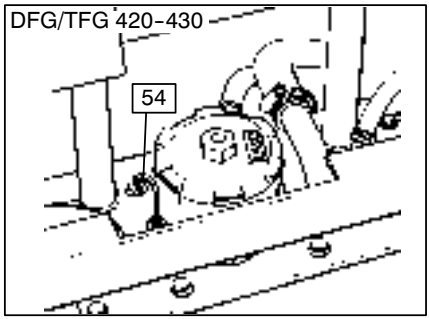
Checking the hydraulic oil level

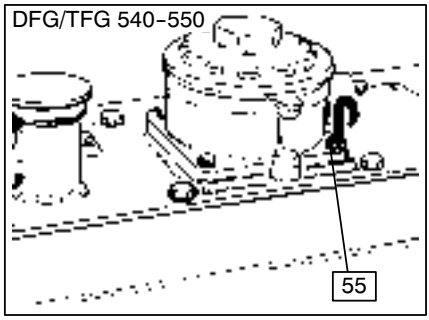
If oil is cold

- Operate mast by fully raising and lowering, once.
- Switch off engine.



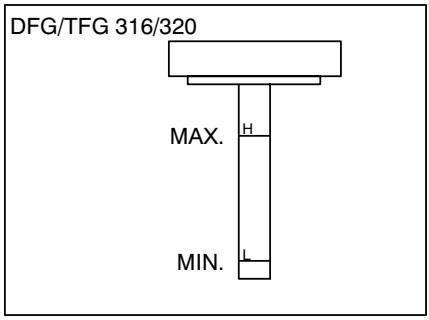
- Withdraw the dipstick (53 or 54 or 55) and clean it using a clean cloth. Check hydraulic oil level. The level must be between the minimum and maximum marks on the dipstick. Top up, if necessary, to the MINIMUM mark on the dipstick.



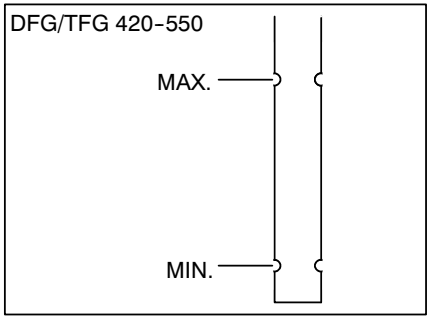


If oil is hot

- Operate mast by fully raising and lowering, once.
- Switch off engine.
- Withdraw the dipstick (53 or 54 or 55) and clean it using a clean cloth. Check hydraulic oil level. The level should be just above the maximum mark on the dipstick. Top up, if necessary, to just above the MAXIMUM mark on the dipstick.



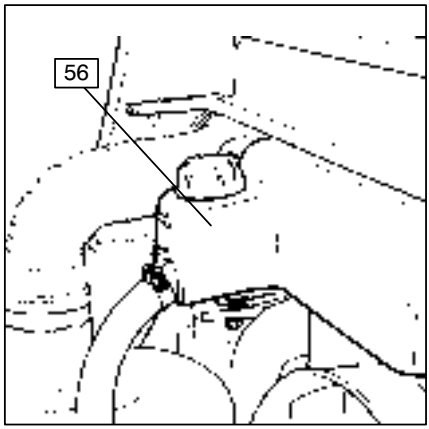
In the event of the engine stalling or cutting out with the mast raised, lower the mast slowly before continuing with the procedure.



Checking the coolant level

- Check the coolant level in the expansion tank (56).

The coolant level must be between the 'MIN' and 'MAX' marks.



If the coolant level has dropped below the 'MIN' mark*, this is a sign that the cooling system is leaking. The truck must only be operated again, after the fault has been rectified.*

WHEN THE ENGINE IS HOT THE COOLANT SYSTEM IS PRESSURISED AND THE EXPANSION TANK CAP SHOULD BE OPENED SLOWLY, UNTIL ALL PRESSURE IS RELEASED.

When replenishing, add a pre-mixed solution of water and anti-freeze of the same proportions as that already in the system.

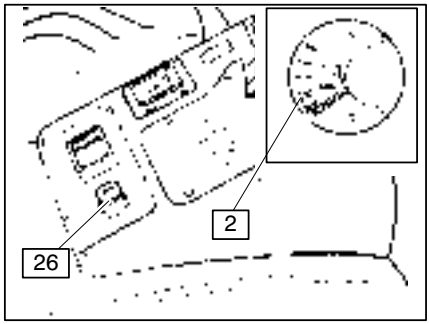
The system should be drained by opening the drain cock in the radiator and on the side of the cylinder block. These may be brass type plugs. Remove the expansion tank cap when draining and put the cap on the driver's seat as a warning that the engine contains no coolant.

Where anti-freeze is not used, a suitable corrosion inhibitor must be mixed into the coolant.

For recommended concentrations and safety precautions refer to Para. 7 Chapter F.

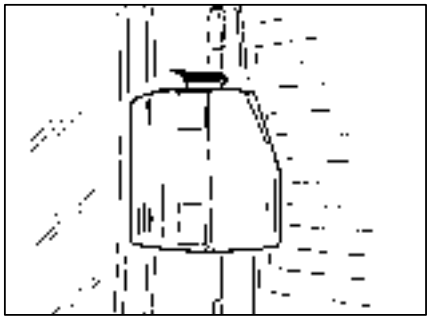
Checking the fuel level - (DFG)

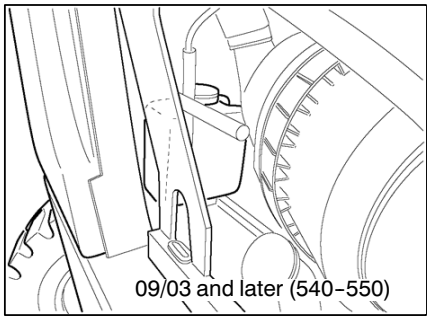
- Turn ignition/starter switch (26) to position 1.
- Establish fuel supply on the fuel supply display (2).
- If necessary fill up with diesel fuel (see Chapter D, Section 2).



Checking the windscreen washer level

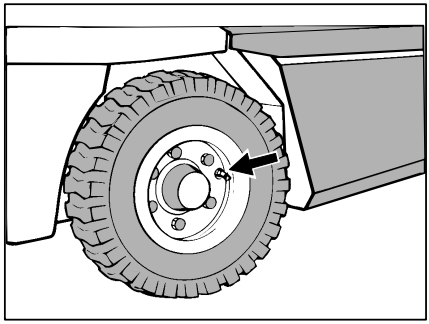
- Check that there is sufficient windscreen washer fluid in the bottle; refill if necessary.
- Use anti-freeze windscreen washer fluid, eg. methylated spirits.





Wheels and tyres

- Check wheels and tyres for wear (refer to chapter F). Check tyre pressures (pneumatic tyres only), – refer to technical data, chapter B.



4 Using the Truck

Before using the truck for the first time or before lifting a load, the driver must ensure that no one is standing in the risk area.

Checks and Activities Before Daily Use

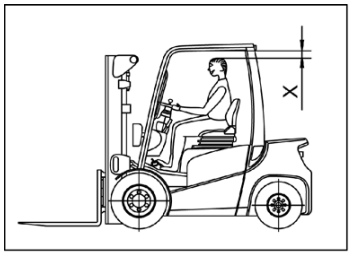
- Check the complete truck (in particular wheels and load carriers) for damage.
- Check that the load chains are evenly tensioned.
- Check the action of the restraint belt buckle and the retraction of the belt into the retractor: refer to para 5.7 for further information.

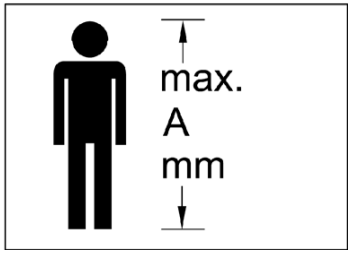
Adjust Driver's Seat

To achieve optimum seat damping, the driver's seat must be set to the driver's weight. The driver's seat must be unloaded when set to the driver's weight.

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.



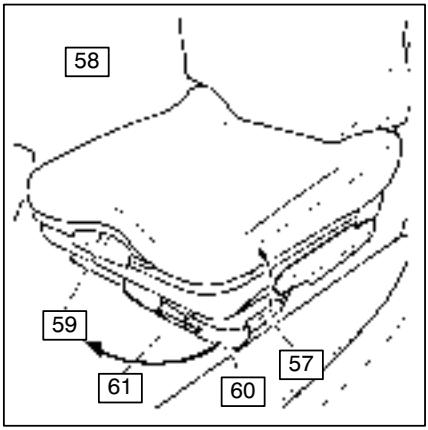


Set Driver's Weight:

- Pull lever (60) in the direction of the arrow as far as the stop and return.

The previous weight setting is returned to minimum. Adjustment range of seat damping 50 kg to 130 kg.

- Pull lever (60) in the direction of the arrow again up to the corresponding weight marking on the scale (61). Then return the lever.
- Sit on the driver's seat.



During adjustment, do not reach between the seat and the engine cover.

Adjust the Backrest:

- Pull locking lever (59) and adjust the angle of the seat backrest (58).
- Release locking lever (59) again, this seat backrest is now locked.

Adjust Seating Position:

- Pull locking lever (57) for seat lock up in the direction of the arrows and move the seat to the correct position by sliding forwards or backwards.
- Allow the locking lever to lock again (57).

The driver's seat catch must be securely locked in the set position. The driver's seat position must not be changed during use.

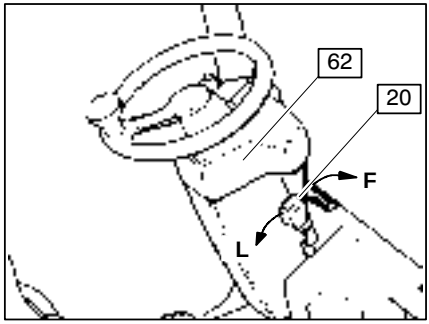
The restraint belt should be fastened before the truck is started: refer to para 5.7 for further information.

The seat adjustment described refers to the standard design. The adjustment instructions of the manufacturer must be used for alternative versions. During adjustment ensure that all controls are easily accessible.

It is essential that the correct weight is selected as this will reduce the amount of vibration acting upon the driver's body.
Some trucks may be fitted with a dead man's switch, i.e. the truck will not start unless the driver is on the seat.

Steering Column Adjustment.

- Pull the steering column control lever (20) in the direction of the arrow (L) towards the driver's seat.
- Move the steering column (62) forwards or backwards to the required angle.
- Push the steering column adjustment lever in the direction of arrow (F).



Starting the Truck

Pre-Start Precautions.

If an engine has been standing for a month or more, lubricate the rocker shaft, tappets and valve stems with engine oil and bleed the fuel system.

If the engine has not been run for several weeks, or if the oil filter has been changed, start the engine, (refer to para 4.1 or 4.2), and let it run at idle speed for a few minutes before use.

Start Engine

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

- Apply the parking brake.

Move direction lever (29) to neutral N.

The engine can be started only when the direction lever is in neutral.

For start process TFG, see Section 4.1.
For start process DFG, see Section 4.2.

Key Operated Ignition Switch

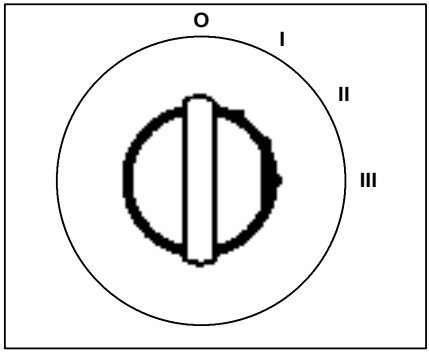
Function:

O – all power circuits off, the key can be removed.

I – controls and instruments on.

II – engine pre-heating (diesel only).

III – start engine (automatic return to position **II**).

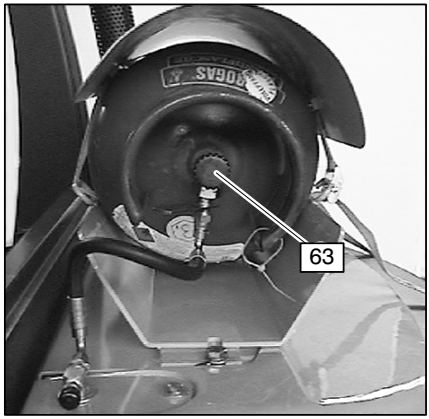


4.1 Start Process TFG

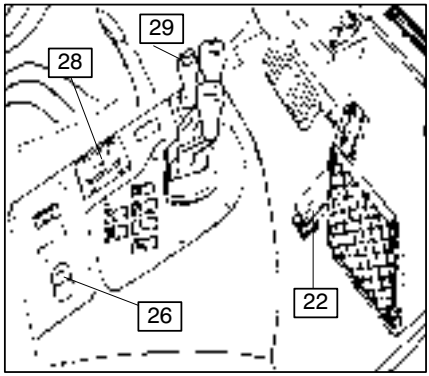
Note safety conditions when dealing with LPG (see Chapter D, Section 1).

- Slowly open shut-off valve (63) on the gas bottle.
- Insert key in ignition/starter switch (26).
- Turn ignition/starter switch to position **I**.
- Activate warning signal button (28) and check horn for function.

The warning lights for charge current (17) engine oil pressure (8), neutral (4) and parking brake (1) light up.



- Press the accelerator pedal (22) lightly.
- Turn the starter/ignition switch to position **II**.



*Only operate the starter for max 15 seconds at a time. Before repeating the start process, return the ignition/starter switch to position **0** and wait 30 to 60 seconds.*

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

It is important to observe the following safety conditions when dealing with LPG Trucks.

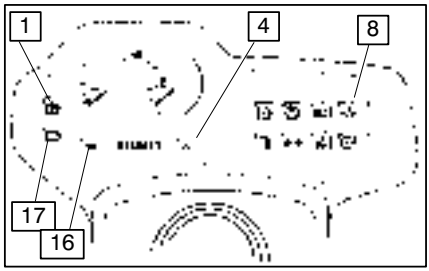
If LPG truck does not start:

- Close shut-off valve for gas bottle.
- Turn ignition/starter switch to **O**.
- Call a trained competent Service Engineer for technical assistance.
- **DO NOT** remove the plastic cover on the LPG vaporiser.
- **DO NOT** depress the fuel primer button.

The removal of the plastic cover and the depressing of the fuel primer button must only be carried out by a trained competent Service Engineer.

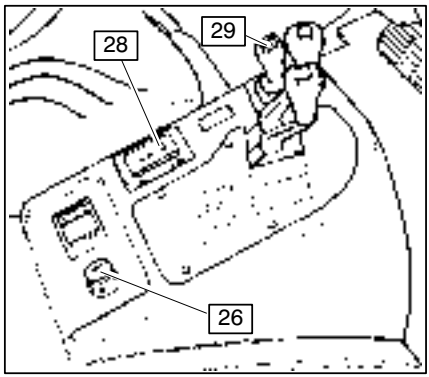
Depressing the fuel primer button repeatedly will cause excess fuel to be injected into the system, thus increasing the risk of fire or explosion!

All warning lights except for neutral (4) and parking brake (1) must go out as soon as the engine starts. If this is not the case, switch off the engine and repair the fault.



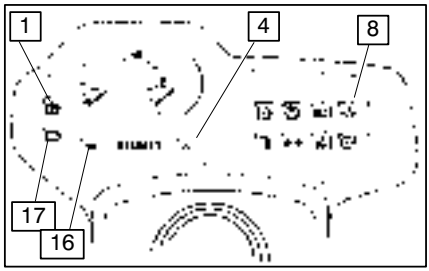
4.2 Start Process DFG

- Insert key in ignition/starter switch (26).
- Turn ignition/starter switch to position **I**.
- Activate warning signal button (28) and test horn for function.
- When the ignition/starter switch (26) has been moved to position **I**, the warning lights for charge current (17), engine oil pressure (8), neutral position (4) and parking brake (1), and the control light for preglow (16) light up.
- Press the accelerator pedal (22) fully and wait for the preglow light to go out.



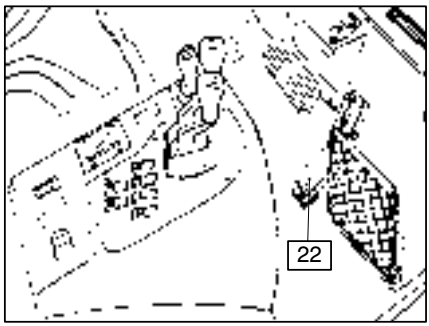
The preglow time depends on the engine temperature and is usually around 4 seconds.

*On DFG 316/320 models, the preglow light does not extinguish, hence, after 4 seconds, turn starter/ignition switch to position **II**.*



- Turn the starter/ignition switch to position **II**.

*Only operate the starter for max 15 seconds at a time. Before repeating the start process, return the ignition/starter switch to position **0** and wait 30 to 60 seconds.*

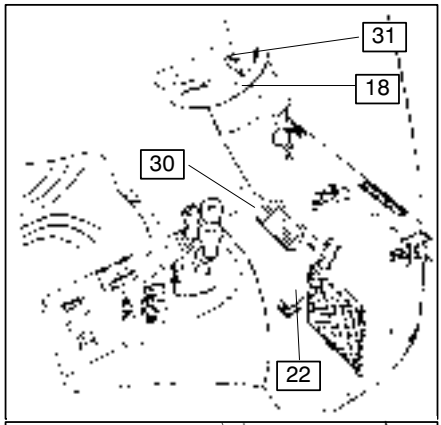


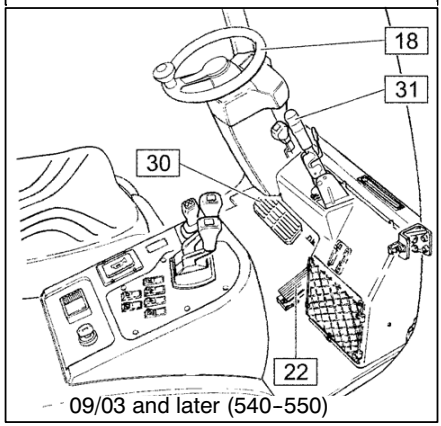
- Release the key as soon as the engine has started. It automatically returns to position **I**.

All warning lights except for neutral (4) and parking brake (1) must go out as soon as the engine starts. If this is not the case turn off the engine immediately and repair the fault.

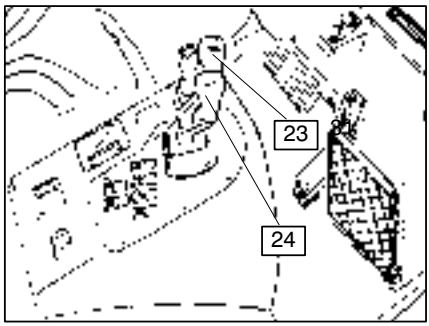
After the engine has started, carry out a test run and the following functions checks:

- Test brake effect of parking brake (31) and operating brake (30).
- Control the engine speed with the accelerator (22) in various ranges, checking for free movement of the pedal.
- Check hydraulic control functions for raise/lower (23), tilt (24) and where applicable the attachments for smooth function.
- Turn steering wheel (18) to both end positions and check steering for function.



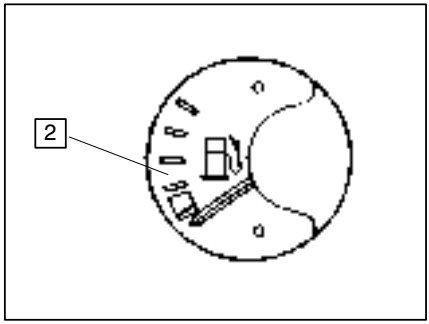


09/03 and later (540–550)



Do not run the engine to warm on idle. The engine quickly reaches its operating temperature under moderate load and at varying speeds.
Only apply full load to the engine when the engine coolant temperature (2) shows the operating temperature.

When all function tests have been carried out perfectly and operating temperature has been reached, the truck is ready for use.

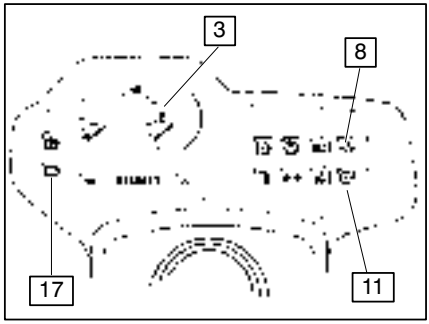


4.3 Fault Displays during Operation

If the warning lights for:

- engine oil pressure (8),
- charge current (17),
- coolant temperature (3),
- converter temperature (11),

come on, the engine must be switched off immediately.



The engine may not be started again until the fault has been repaired.

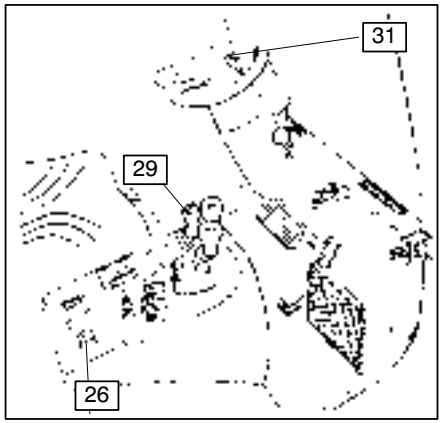
For fault search and remedies, see Section 6.

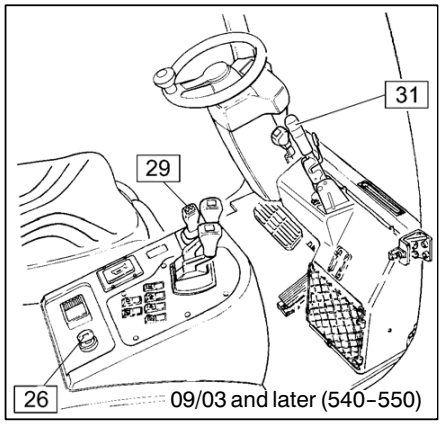
Check fuel tank display (2, DFG only) during operation.

Switch Off Engine

Do not switch off the engine from full load but allow to run for a short time to adjust temperature.

- Stop the truck.
- Move the direction lever (29) to neutral.
- Activate the parking lever (31).
- Turn the ignition/starter switch (26) to position **0**.





09/03 and later (540–550)

5 Operation of the Forklift Truck

5.1 Safety regulations applicable when operating the truck

Driving lanes and work areas: Only such lanes and routes that are specially allocated for truck traffic must be used. Unauthorized persons must stay away from work areas. Loads must only be stored at places specially provided for this purpose.

Driving conduct: The travelling speed must be adapted to the prevailing local conditions. The truck must be driven at slow speed when negotiating bends or narrow passages, when passing through swing doors and at blind spots. The driver must always observe an adequate braking distance between the fork-lift truck and the truck in front and he must be in control of his truck at all times. Sudden stopping (except in emergencies), rapid U-turns and overtaking at dangerous or blind spots is not permitted. It is forbidden to lean out of or reach beyond the working and operating area.

Visibility: The driver must look in the direction of travel and must always have a clear view of the route ahead. When loads blocking the view are carried, the fork-lift truck must be driven with the load at the rear. If this is not possible, a second person must walk in front of the fork-lift truck to give suitable warnings.

Negotiating slopes and inclines: Negotiating of slopes and inclines is permitted only, when they are recognized lanes, when they are clean and non-slipping, and when the technical specification of the truck permits safe driving on such slopes or inclines. Loads must always be carried at that end of the truck facing uphill. U-turns, cutting obliquely over slopes or inclines and parking of the fork-lift truck on slopes or inclines is not permitted. Inclines must only be negotiated at slow speed with the driver ready to brake at any moment.

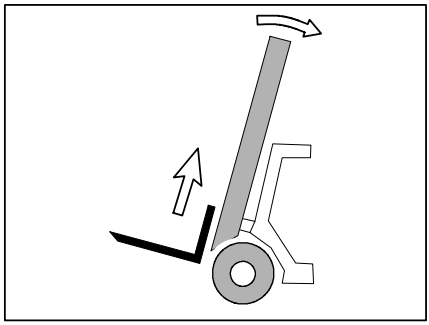
Use of lifts and driving on load platforms: Lifts and loading platforms must only be used, if they are of adequate load bearing capacity, if suitable for driving on, and if authorized by the user of the truck for truck traffic. The fork-lift truck driver has to satisfy himself accordingly before driving into lifts or on to loading platforms. 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 together with the fork-lift truck must only enter the lift after the fork-lift truck has come safely to a standstill, and must leave the lift before the fork-lift truck.

Nature of the load carried: Only loads that have been safely and correctly secured must be carried. Never transport loads stacked higher than the top of the fork carriage, or stacked higher than the guard grille.

Towing of trailers or other vehicles is only allowed occasionally and on paved, level driveways with a maximum deviation of +/-1% and a maximum speed of 5 km/h. Permanent trailer operation is not permitted.
While towing, loads are not allowed on the forks.
The maximum trailer load given for the fork lift truck for braked and/or unbraked trailers must not be exceeded. The indicated trailer load is only valid for the auxiliary coupling at the fork lift truck counterweight. Also heed the instructions of the coupling manufacturer if the genuine trailer coupling is replaced by another make.
After attaching the trailer but before starting driving, the driver must check that the trailer coupling is secured against detaching. Towing fork lift trucks must be operated in such a manner that safe driving and braking of the truck and the trailer is guaranteed for all driving movements.

Exhaust emissions: *Only operate the truck in well ventilated areas. Operating the truck in confined areas may lead to a build up of harmful exhaust emissions, which may cause dizziness, drowsiness or even death!*

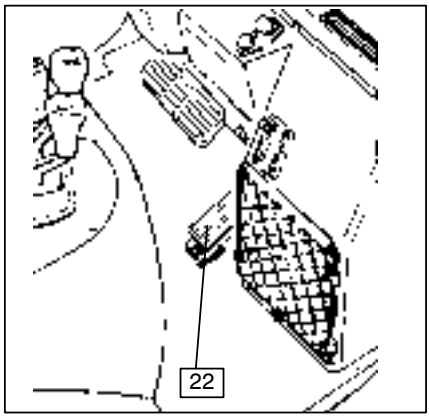
5.2 Driving



Adjust the driving speed to the situation of the road, working area and load.

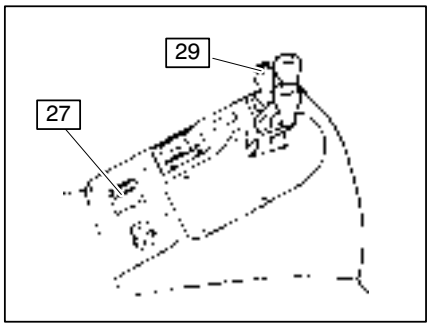
- Move the direction lever (29) to neutral.
- Raise the fork carrier approximately 200 mm so that the load forks are clear of the ground.
- Tilt the lifting frame fully back.
- Release the parking brake.

Driving Forwards



- Move the direction lever (29) forwards.
- Press the accelerator pedal (22) slowly until the required speed is reached.

Change Direction of Travel



Only change direction of travel when the truck has stopped.

- Move the direction lever (29) through neutral to the required direction of travel.
- Press the accelerator pedal (22) slowly until the required speed has been reached.

Reversing

Ensure that the driving area behind you is clear.

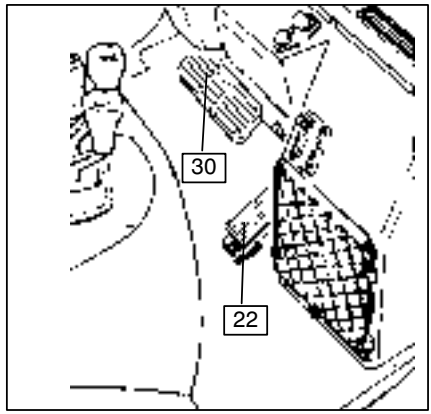
- Move the direction lever (29) backwards.

Accelerate Truck

- Slowly press the accelerator (22) until the truck begins to move.
- Press the accelerator further.
  The engine speed and drive speed increase.

Stopping the truck

The braking behaviour of the truck mainly depends on the ground surface. The driver must take this into account in his driving behaviour. Brake the truck carefully to ensure that the load does not slip.



Braking

- Remove foot from accelerator (22).
- Lightly press the creep/brake pedal (30).

In the first range of the pedal travel, the force via the torque converter is reduced.

- Press the creep/brake pedal (30) further.

When pressed further, the truck is braked to a standstill using the drum brake.

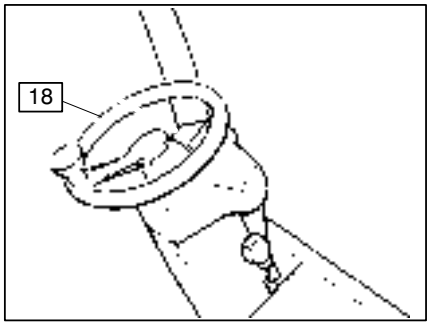
Creep Drive with Creep/Brake Pedal

When manoeuvring in tight spaces for slow movement, operate the creep/brake pedal (30) delicately.

This operating mode is permitted for maximum 5 seconds at a high engine speed.

5.3 Steering

The steering force to be applied is very low because of the hydrostatic steering, so turn the steering wheel (18) delicately.

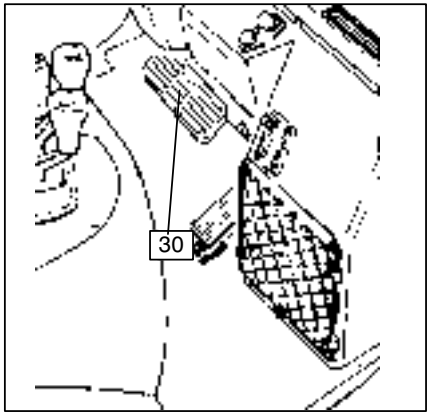


5.4 Braking

Service brakes

The drum brakes on the front wheels are controlled hydraulically via the creep/brake pedal.

- Press the creep/brake pedal (30) until there is perceptible braking pressure. The first range of the pedal travel controls the force flow in the gears. When the pedal is pressed further, the drum brakes on the front wheels are applied.



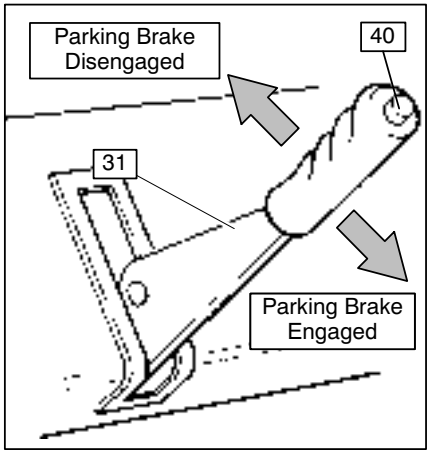
Parking brake

The parking brake lever mechanically operates the drum brakes on the front wheels.

- Pull the parking brake lever (31) beyond the pressure point to the stop.

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

- Depress button (40) and briefly pull lever backward to disengage from ratchet. Push the brake lever forward over the pressure point to release the brake.
  The brake lever is also locked in the released position.



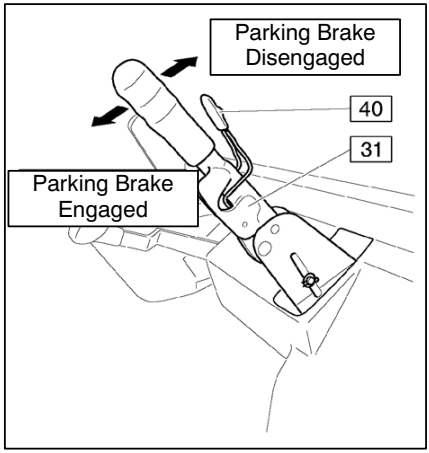
Parking brake (09/03 and later (540-550))

The parking brake lever mechanically operates the drum brakes on the front wheels.

- Pull the parking brake lever (31) beyond the pressure point to the stop.

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

- Pull the release lever (40) towards the brake lever and briefly pull the locking lever (31) to the rear to disengage it. Push the brake lever forward over the pressure point to release the brake.
  The brake lever is also locked in the released position.



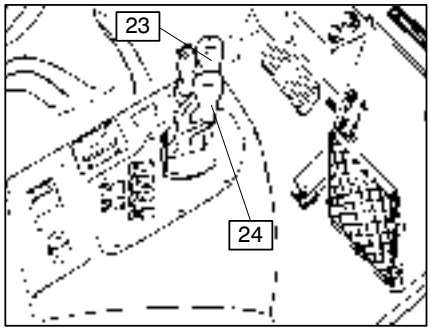
Always apply the parking brake and switch off the engine before leaving the truck.

The parking brake will hold the truck at its maximum permitted load on a clean concrete surface on a slope of 15%.

5.5 Operating the Mast and Attachments

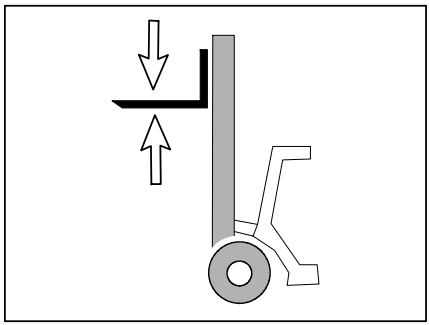
The control lever may only be operated from the driver's seat.

The lifting gear is operated with the control levers to the right of the driver's seat.



Raise/Lower Fork Carriage

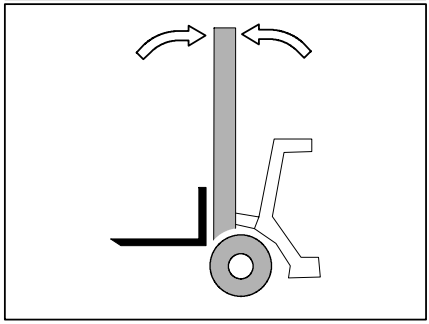
- Pull the control lever (23) back to raise the fork carriage.
- Push the control lever (23) forwards to lower the fork carriage.



Tilt Mast Forwards/Backwards

When the mast is tilted back, do not insert any body parts between the mast and the front wall.

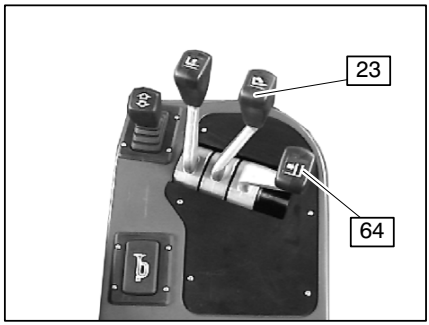
- Pull the control lever (24) back to tilt the mast back.
- Push the control lever (24) forwards to tilt the mast forwards.



○ Operating an Attachment

Attachments are operated using the control lever (64) on the right next to control lever (23) (tilt mast).

When operating an attachment, observe the manufacturer's operating instructions.



Control Machine Speed

The working speed of the hydraulic cylinders is controlled by the extent of movement of the control levers and the engine speed.

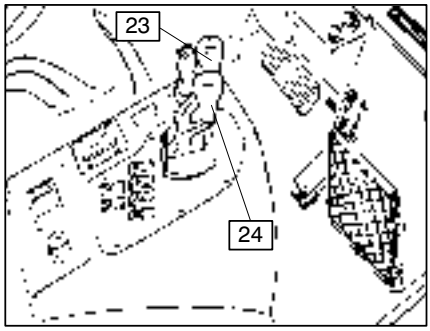
When the control levers are released they automatically return to neutral and the machine locks in the position set.

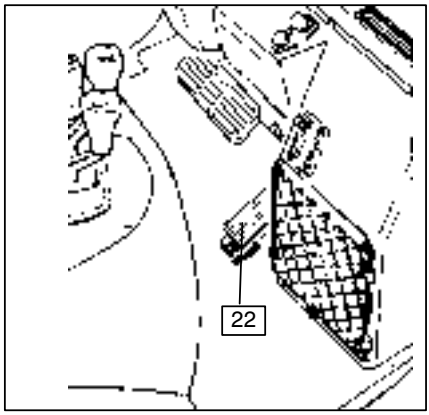
Always operate the control levers smoothly and carefully. When reaching the end stop, release the control levers immediately.

- Increase engine speed with accelerator (22) and
- Move the control lever further back to increase the speed of the machine.

The engine speed has no effect on the lowering speed of the fork carrier.

Lifting of persons with the lifting gear is prohibited.

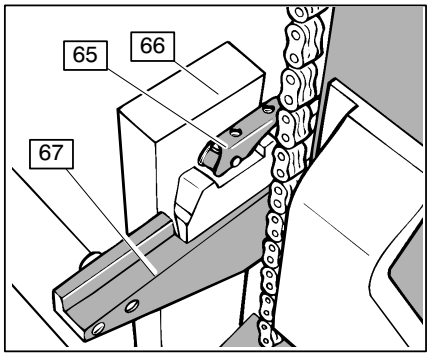




5.6 Picking Up, Transporting and Setting Down Load Units

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

Before picking up a load unit, the driver must ensure that it is properly palleted and the permitted load-bearing capacity of the truck is not exceeded. ***Note load diagram!***



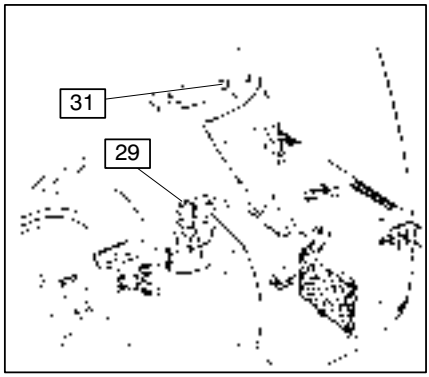
Adjust Load Forks

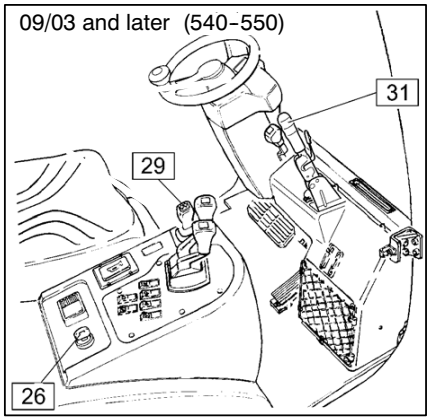
The load forks should be adjusted so that the two arms are at the same distance from the outer edges of the fork carrier and the centre of gravity of the load lies in the centre between the fork arms.

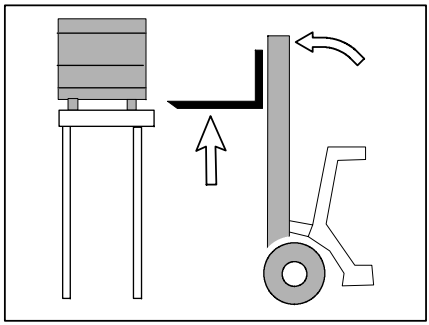
- Swivel locking lever (65) upwards.
- Slide fork arm (66) on the fork carriage (67) into the correct position.
- Slide locking lever down and move the fork arm until it engages in a groove.

Picking Up the Load

- Carefully approach the load to be picked up.
- Switch the direction lever (29) to neutral.
- Apply the parking brake (31).
- Raise the forks to the correct height for the load.
- Move the direction of travel lever to forwards and release the parking brake.
- Carefully move the forks under the load, if possible until it lies on the back of the forks.

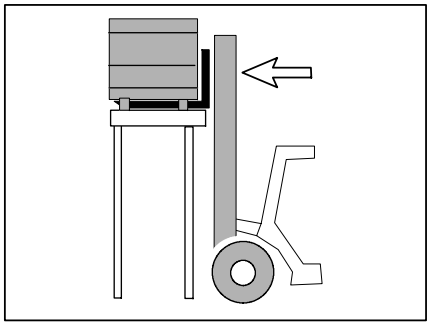






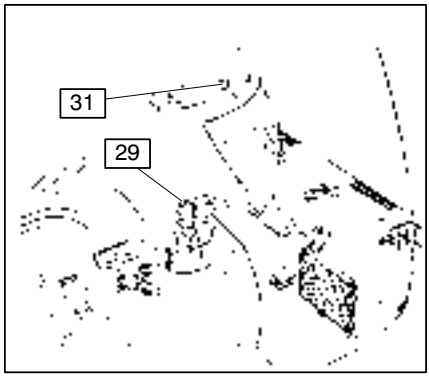
The load forks must have at least 2/3 of their length under the load.

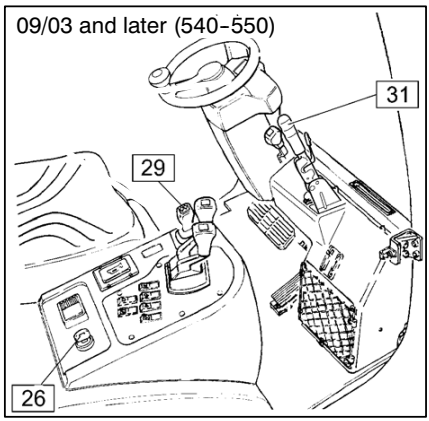
- Move the direction lever (29) to neutral and apply the parking brake (31).
- Raise the fork carriers until the load lies freely on the load forks.
- Switch the direction lever to reverse and release the parking brake.



Ensure the path is clear behind you.

- Carefully and slowly reverse until the load is outside the storage area.

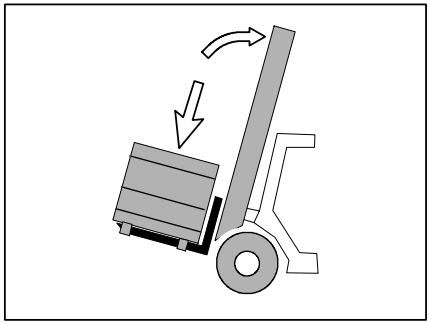




It is prohibited to stand below the raised load.

- Lower the load as far as possible for transport (ground clearance approx. 150 to 200 mm).

The higher the load is transported, the lower the stability.



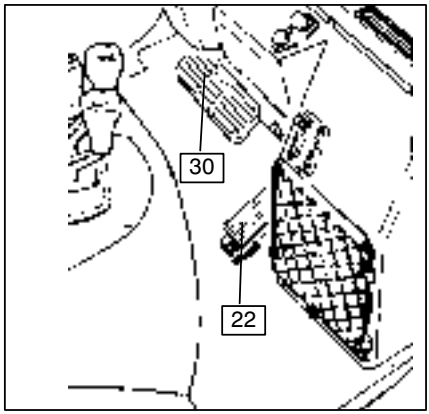
Transporting Loads

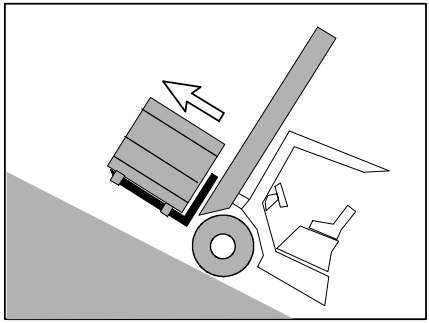
If the load is packed so high that visibility forwards is blocked, drive backwards.

- Carefully accelerate the truck using the accelerator pedal (22) and brake carefully using the creep/brake pedal (30). Always be ready to brake.
- Adapt the drive speed to the composition of the road surface and the load to be transported.
- Look for other traffic at intersections and crossings.
- If visibility is not clear, only move when there is someone to give signals.

On slopes, always transport the load uphill of the truck and never travel across slopes or turn.

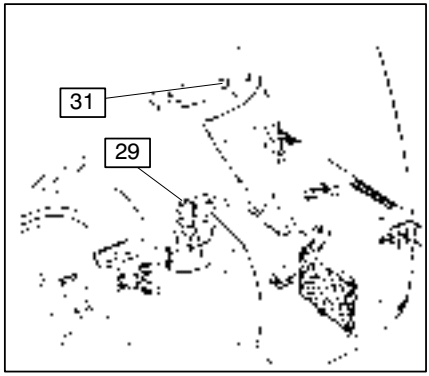
Never reverse the truck at full speed or only at 5 km/h (or less).





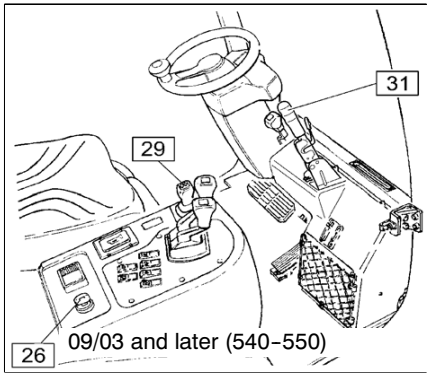
Depositing the load

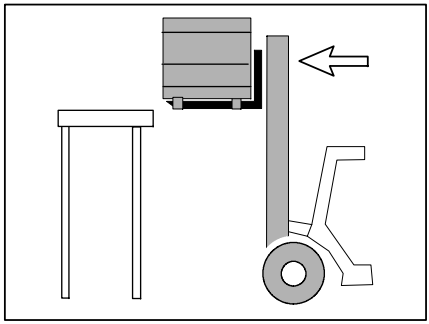
- Carefully bring the truck to the shelf.
- Move the direction lever (29) to neutral.
- Apply the parking brake (31).



- Raise the forks to the correct height for the shelf place.
- Set the lifting frame to vertical.
- Move the direction lever to forwards and release the parking brake.
- Carefully move the load into the shelf space.
- Lower the load slowly until the load forks are free.

Avoid a sudden dropping of the load in order to prevent damage to the load and the load carriers.





Stack cylindrical loads tightly together and level.

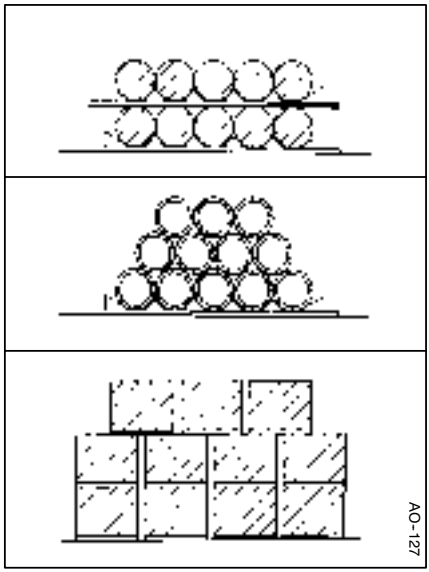
Place each row on boards and place wedges at each end.

Cylindrical objects can also be pyramid stacked.

Place wedges against each roll in the bottom row.

Stack pallets loaded with cases straight and square to each other.

Stagger the top row to provide extra security.



Handling of single swinging loads

For fork lift trucks fitted with a fork arm mounted hook attachment, (or any other device which allows loads to be suspended from a hook), are prone to additional destabilising forces acting upon the truck. For trucks adapted for such duties, the following guidelines must be followed to increase truck stability.

A fork lift truck adapted to carry loads suspended from a hook, is deemed to be a crane and will be subject to relevant crane legislation.

When handling suspended loads, the maximum laden speed on level ground shall be restricted to 17 Km/h (10 mph).

The capacity of the truck is reduced when adapted to carry loads from a hook. Refer to the identification plate fitted to the attachment and/or cab for:

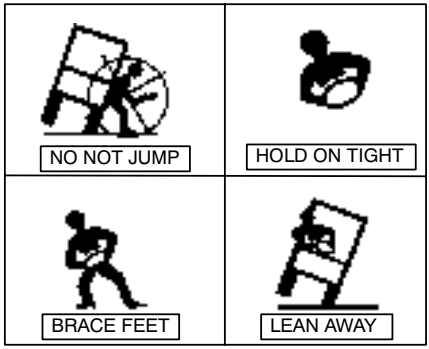
- Weight of attachment;
- Centre of gravity;
- Rated load capacity.

DO NOT EXCEED THE RATED LOAD CAPACITY FOR THE TRUCK AND ATTACHMENT.

- The hook should not be raised more than 4500mm above ground level.
- In the travelling mode, the bottom of the load shall not be higher than 300mm from ground level or truck structure – whichever is the least. The mast must be either substantially vertical or tilted backwards.
- The truck shall be operated only on substantially firm, smooth, level and prepared surfaces.
- A single load shall be carried at any one time.

Tipping may occur if the truck is improperly operated, which may lead to injury. If your truck is about to tip over:

- Stay with the truck (do not jump clear);
- Hold onto the steering wheel firmly;
- Brace your feet;
- Lean away from the point of impact.



5.7 Instructions for the use of restraint belts

The restraint belt, if fitted, should be fastened before the truck is started. Fasten the restraint belt as follows:

- Withdraw restraint belt from the retractor without jerking it.
- Fasten the belt closely over the lap and insert the buckle latch into the buckle: ensure the belt is not twisted.

The operator should always sit back as far as possible. This will ensure that the operators back is supported and the restraint belt affords the greatest protection.

- Once the truck has come to rest, and the engine stopped, release the retractor belt by pressing the red button on the belt buckle. Guide the buckle latch back to the retractor.

A belt strap which runs in too fast can actuate the automatic locking device due to the impact of the buckle latch on the casing. Once the automatic locking device has been actuated, the belt stop can not be withdrawn without undue effort. Release the automatic locking device as follows:

- Pull the belt strap out of the casing by 10–15mm – some effort may be required!
- Allow the belt strap to run-in.
- It should now be possible to withdraw the belt strap as usual.

The automatic locking device prevents the belt strap from being withdrawn from the retractor when the truck is on a steep slope. The truck must therefore be driven off the steep slope before the restraint belt can be applied.

Daily checks/maintenance of the restraint belt

The operator should check the restraint belt on a daily basis to ensure it's good condition and correct working order before using the truck. The checks must include the following:

- Withdraw the restraint belt completely and check for unravelling.
- Check the action of the belt buckle and the retraction of the restraint belt into the retractor.

Test the automatic locking device as follows:

- Park the truck on level ground
- Withdraw the belt with a jerk – the automatic locking device must stop the withdrawal of the restraint belt.

Do not operate the truck with a defective restraint belt.
Have it replaced immediately.

If the truck has been involved in an accident, the restraint belt must be replaced.

Damaged restraint belts or belts which no longer function properly, must be replaced by a trained competent person.

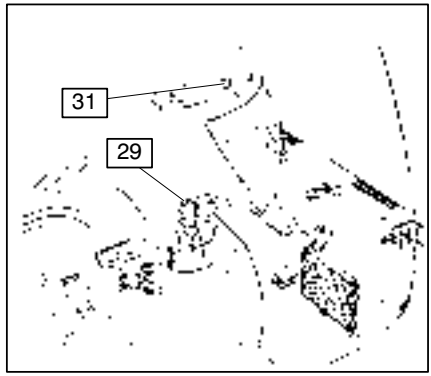
5.8 Parking the Truck Safely

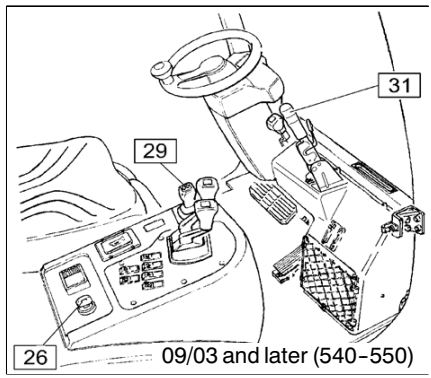
When leaving the truck, it must be safely parked even if the absence will only be brief.
Never leave the truck with the load raised.

- Drive the truck onto flat ground.

L.P. Gas trucks should not be parked or driven above ground level in multi-story buildings or on ground level above basements.
L.P. Gas is colourless, heavier than air and does not disperse easily. It will tend to sink to the lowest possible level and may accumulate in pits, drains, basements or other depressions.
Hence, an accumulation of L.P. Gas may occur in areas away from the truck, posing a danger to personnel who are unaware of the potential problems of explosion or frost bite.

- Lower the load forks completely and tilt the lifting frame forwards.
- Move the direction lever (29) to neutral.
- Apply parking brake (31).





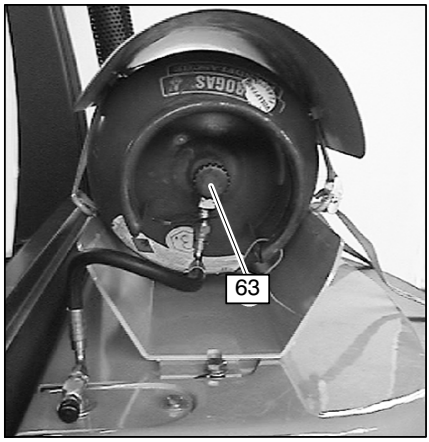
09/03 and later (540–550)

Turn Off Engine DFG

- Turn ignition/starter switch (26) to position **0**.
- Remove key from ignition/starter switch (26).

Turn Off Engine TFG

- Close shut-off valve (63) for gas bottle.
- Wait until the engine stops.
- Turn ignition/starter switch (26) to **0**.
- Remove key from ignition/starter switch (26).



5.9 Engine housing and service covers

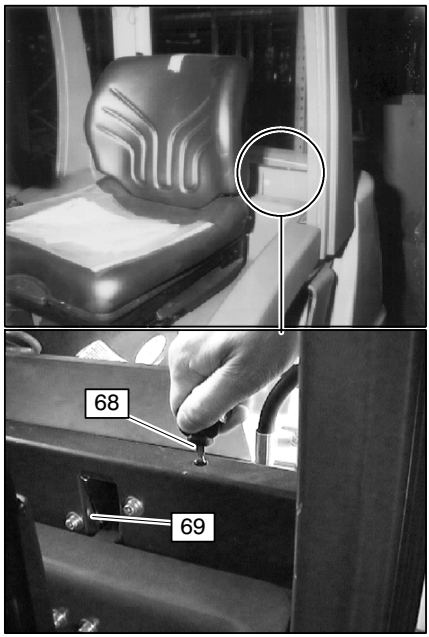
Engine housing

Prior to opening the engine housing, the steering column must be fully forward and the seat fully back on its runners.

- To open the engine housing, insert a suitable implement (68) through the access hole and depress the engine housing catch (69).
- Lift the engine housing to its full extent; a gas strut will keep the housing in the raised position.

When a truck is fitted with steel cabin, both cabin doors must be opened prior to lifting engine housing.

Ensure the engine housing is correctly engaged prior to operating the truck.

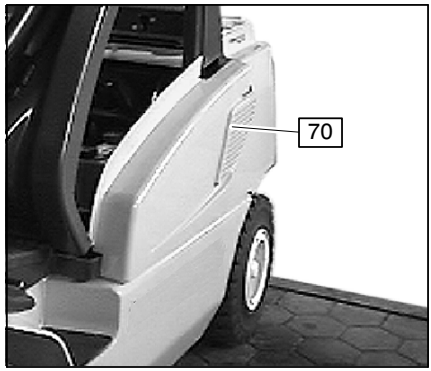


Truck shown without protective plate for clarity.

Service covers

Once the engine housing has been opened, the service covers (70) may be removed as follows:

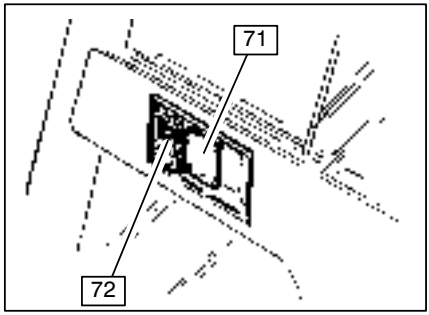
- Tilt upper part of cover panel away from the truck. Lift service cover clear of truck.
- Replace service cover lugs into the cab/loadguard. Press the upper part of the service cover towards the truck until it locks into place.

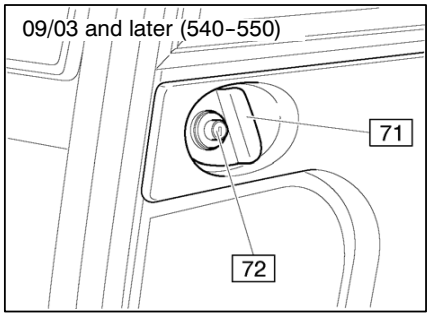


○ **Steel cabin**

On trucks fitted with a steel cabin, both cabin doors are lockable.

- To unlock the cabin door, turn key anti-clockwise.
- To lock the cabin door, turn key clockwise.
- To open the cabin door unlock the door and pull out the handle (71) or push in the button (72) (09/03 and later (540–550)).





5.10 Towing

Because the transmission is driven by the truck engine, should a truck with an inoperative engine be towed, then the transmission will not be lubricated and will therefore overheat. To prevent this, the truck must only be towed for a maximum distance of 5Km, and at a maximum speed of 4Km per hour.

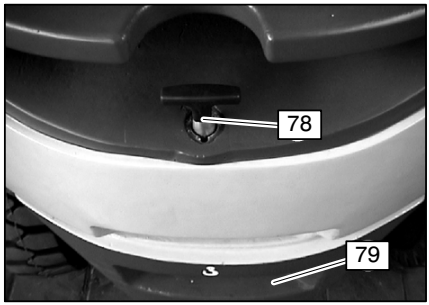
Truck Towing Point

A rigid towing bar should be used when towing a truck, particularly if brake system pressure is not available.

The towing point of the truck is indicated by (73).

Using Towing Point

- Press tow bolt (78) down and rotate through 90°.
- Pull tow bolt up and insert towing eye or trailer towing bar into the opening (79).
- Insert towing bolt, press down, rotate through 90° and lock.



Fitting the trailer coupling

Before coupling, the driver should ensure that the maximum towing force is not exceeded.

5.11 Towing Trailers

The towing point may occasionally be used to tow a trailer on a dry, even and well maintained surface.

Refer to ”Using Towing Point” when you hitch a trailer.

5.12 Trailer loads

The driver must make sure not to exceed the maximum permissible trailer load prior to coupling the trailer.

Maximum trailer load

Truck	Dead weight	Pulling force	Trailer loads
	(kg)	(N)	(kg)
DFG 316	3020	9000	780
DFG 320	3270	8200	710
TFG 316	3000	8600	745
TFG 320	3250	7800	675
DFG 420	3760	13900	1200
DFG 425	4190	13900	1200
DFG 430	4540	13900	1200
TFG 420	3730	11700	1015
TFG 425	4160	10800	935
TFG 430	4510	12100	1050
DFG 540	6279	23500	2035
DFG 545	6669	24470	2120
DFG 550	7434	21100	1830
TFG 540	6279	19400	1680
TFG 545	6669	20400	1770
TFG 550	7434	16500	1430

6 Fault Locating Operations

This chapter enables the user to locate and to remedy simple faults, or the consequences of operating errors. Fault locating operations should be performed in the order as set out in the table below.

If it was not possible to eliminate the fault by performing the remedial actions indicated below, please inform the JUNGHEINRICH Service, as more intricate faults can only be rectified by specially trained and qualified service staff.

Fault	Possible cause	Remedial action
Starter does not turn	• Travelling direction lever not in neutral position	• Set the travelling direction lever to its neutral position.
	• Battery excessively depleted	• Check battery charging condition and recharge, if required.
	• Battery connecting cable loose, or pole terminals oxidised	• Clean and grease the pole terminals. Tighten the battery connecting cable.
	• Starter cable loose or broken	• Check the starter cable. Tighten or replace, as required
	• Starter solenoid switch binding	• Check, whether the solenoid switch functions audibly.
Engine does not start	• Air filter contaminated	• Clean or replace the air filter.
	• Bowden cable defective or disengaging	• Check the Bowden cable (Hydrokinetic trucks only).
	Further causes in the case of L.P.G. trucks	
	• Stop valve of fuel gas cylinder closed	• Open the stop valve.
	• Fuel gas cylinder empty	• Replace the fuel gas cylinder.
	• Ignition distributor cap damp	• Dry the ignition distributor cap or spray with contact spray.
	• Spark plugs damp, oily or loose	• Dry, clean or tighten the spark plugs.
	• Spark plugs defective	• Replace the spark plugs.
	Further causes in the case of Diesel trucks	
	• Fuel tank empty, injection system has aspirated air	• Refuel the truck and bleed the injection system
	• Water in the fuel system	• Empty the fuel system. Refuel the truck. Bleed the fuel system.

Fault	Possible cause	Remedial action
Engine does not start (cont'd)	• Fuel filter clogged up	• Check the fuel flow and check the fuel filter, if required.
	• Flocculation of diesel fuel	• Park the truck in a warm location and wait until the flocculation has disappeared. Replace the fuel filter, if necessary. Fill up with winter fuel.
Engine oil pressure warning lamp alight during truck operation	• Engine oil level low	• Check engine oil level and top up, if required.
Engine temperature indicator moves into red sector	• Engine oil level low	• Check engine oil level and top up, if required.
	• Radiator contaminated	• Clean the radiator.
	• Coolant level low	• Check the engine cooling system for leaks, or top up with coolant, if required.
	• Slipping ventilator V-belt	• Check the V-belt tension and retighten or replace, as required.
Transmission oil temperature warning lamp alight during truck operation	• Transmission oil level low	• Check the transmission oil level and top up, if required.
	• Oil cooler contaminated	• Clean the oil cooler.
Engine running, but truck does not move	• Travelling direction lever in neutral position	• Set the travelling direction lever to the required position.
	• Parking brake applied	• Release the parking brake.
Truck does not reach its max. speed	• Transmission oil level low	• Check the transmission oil level and top up, if required.
Lifting speed too slow	• Oil level in hydraulic reservoir low	• Check the hydraulic oil level and top up, if required.
	• Hydr. aeration cap contaminated or clogged up	• Replace or clean the hydr. aeration cap.
Load cannot be raised to max. height	• Oil level in hydraulic reservoir low	• Check the hydraulic oil level and top up, if required.
Steering binding	• Tyre inflation pressure of steered axle tyres too low	• Check the tyre inflation pressure and correct, as required.
Steering play excessive	• Air in steering system	• Check the hydraulic oil level and top up, if required. Following this, turn the steering wheel several times from end stop to end stop.

F Truck Maintenance

1 Operational Safety and Environmental Protection

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

Modifications of forklift truck assemblies, especially of the safety installations, are not permitted. On no account must the operational speeds of the truck be changed.

Only original spare parts have been passed by our quality assurance service. To ensure safe and reliable operation of the forklift truck, only spare parts of the manufacturer must be used. Old parts, oils and fuels must be disposed of in accordance with the applicable environmental protection regulations. For oil changes, the oil service of the manufacturer is available to you.

Upon completion of any checking, cleaning or servicing activities, the operations contained in section 14 “First inspection and inspection after major repairs or changes” must be performed.

2 Safety Regulations Applicable to Truck Maintenance

Servicing and maintenance personnel: The fork-lift truck must only be serviced and maintained by trained personnel of the manufacturer. The service organization of the manufacturer has external technicians trained especially for these assignments. We thus recommend signing a maintenance contract with the relevant service location of the manufacturer.

Lifting and jacking up: When a fork-lift 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, suitable measures must be taken to prevent the truck from slipping or tipping over (use of wedges, wooden blocks). Work underneath the raised load lifting device must only be carried out when the fork is immobilised and supported by a chain of adequate strength.

Jacking point see chapter B.

Cleaning operations: No inflammable liquids must be used when cleaning the fork-lift truck. Prior to the commencement of cleaning operations, all safety measures have to be taken as are required to prevent sparking (e.g. by short-circuits). For battery-operated fork-lift trucks, the battery plug must be removed. Only weak indraft, weak compressed air and non-conducting, antistatic brushes must be used for the cleaning of electric or electronic assemblies.

If the fork-lift truck is to be cleaned using a water jet or a high-pressure cleaner, all electric and electronic components must be carefully covered beforehand because moisture can lead to incorrect functioning.
Cleaning by means of a steam jet is not admissible.

Switch off the engine and remove the ignition key, before opening any doors or hoods, or before removing any covers. Servicing and repair operations must only be performed after the engine has cooled down.

Work on the electric system: Work on the electric system of the truck must only be performed by staff specially trained for such operations. Before commencing any work on the electric system, all measures required to prevent electric shocks have to be taken.

Welding operations: To prevent any damage to electric or electronic components, disconnect the battery(ies) and alternator before any welding operations are undertaken. For hydrostatic trucks, disconnect the computer control system. Welding on the truck must only be performed by staff specially trained for such operations.

Settings: When repairing or replacing hydraulic, electric or electronic components or assemblies, all truck-specific settings have to be retained.

Tyres: The quality of the tyres greatly affects the stability and the driving behaviour of the fork-lift truck. Changes must only be made following consultations with the maker. When replacing wheels or tyres, it must be ensured that the fork-lift truck remains level (tyres and wheels must always be replaced in pairs, i.e. left and right together).

Lift chains: The lift chains wear rapidly if not lubricated. The intervals in the service checklist apply to normal duty. If requirements are higher (dust, temperature), lubrication is required more often. The specified chain spray must be used as specified. The external application of grease does not provide sufficient lubrication.

Hydraulic hoses: The hoses must be renewed every six years. When replacing hydraulic components, also renew the hoses in this hydraulic system.

3 Servicing and Inspection

Thorough and expert servicing is one of the most important preconditions for safe operation of the forklift truck. The neglect of regular servicing intervals can lead to forklift truck failure and constitutes a potential hazard to personnel and equipment.

The application conditions of an industrial truck considerably affect the wear levels of the service components.
We recommend an application analysis carried out on site by a Jungheinrich customer adviser to establish specific maintenance intervals in order to restrict damage caused by wear.
The indicated servicing intervals are based on single-shift operation under normal operating conditions. For applications in dusty environments, or involving large temperature fluctuations or multiple-shift operation, the servicing intervals must be shortened accordingly.

The operator should check the restraint belt, if fitted, on a daily basis to ensure the good condition and correct working order before using the truck.

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

W = Every 50 service hours, at least weekly
A = Every 500 operating hours
B = Every 1000 operating hours, or at least annually
C = Every 2000 operating 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 Maintenance Check-list DFG/TFG

Maintenance intervals

			standard = ● cold store = ✻	W	A	B	C
Chassis and superstruct.:	1.1	Check all load bearing elements for damage			●		
	1.2	Check all bolted connections			●		
	1.3	Check driver's protective roof and load guard for secure fastening			●		
	1.4	Check the trailer coupling			●		
Drive unit:	2.1	Internal combustion engine – Refer to separate checklist					
	2.2	Check the transmission for noises and leakage			●		
	2.3	Check the mechanical pedal linkage, adjust and grease, if necessary			●		
	2.4	Check the transmission oil level			●		
	2.5	Change the transmission oil					●
	2.6	Clean the transmission oil suction screen and ventilation system				●	
	2.7	Replace the transmission oil filter					●
	2.8	Check driving axle for noise and leakage			●		
	2.9	Drive axle – Check the oil level (hydrokinetic only)			●		
	2.10	Drive axle – Change the oil (hydrokinetic only)					●
	2.11	Check the switching mechanism on the switch lever for wear and grease the sliding areas (hydrokinetic only)				●	
	2.12	Grease drive axle / mast mounting pivots (hydrokinetic only).			●		
Brake system:	3.1	Performance and adjustment check			●		
	3.2	Check the brake linings for wear (hydrokinetic only)			●		
	3.3	Check the brake linkage, adjust and grease, if necessary (hydrokinetic only)			●		
	3.4	Check the brake lines, connections and brake fluid level (hydrokinetic only)			●		
	3.5	Change the brake fluid (hydrokinetic only)					●
Wheels:	4.1	Check for wear and damage			●		
	4.2	Check the wheel bearings and ensure secure fastening of wheels			●		
	4.3	Check the tyre pressure		●			
Steering:	5.1	Check the steering wheel play			●		
	5.2	Check mechanical parts of steering column and grease, if required			●		
	5.3	Check steering axle, king pins and limit stops for wear and deformation					●
	5.4	Check the hydraulic assemblies for correct functioning and leakage			●		
Hoist frame:	6.1	Check the mast anchorage			●		
	6.2	Check and grease the hoist gear support			●		
	6.3	Performance and adjustment check			●		
	6.4	Perform sight check of rollers, sliding elements, and stops			●		
	6.5	Check lifting chains and chain guides for wear, adjust and grease			●		
	6.6	Check the mast sections for lateral play and parallelism					●
	6.7	Check fork tines and fork carrier for wear and damage			●		
	6.8	Check the protective equipment for fastening and damage			●		
	6.9	Check support and attachment of tilt cylinder			●		
	6.10	Check the tilt angle of mast					●

Maintenance intervals

			standard = ● cold store = ✻	W	A	B	C
Hydraulic system:	7.1	Performance check			●		
	7.2	Check all connections for leakage and damage			●		
	7.3	Check hydraulic cylinders for leakage, damage and secure attachment			●		
	7.4	Check the oil level			●		
	7.5	Change the hydraulic oil					●
	7.6	Change the filter cartridge				●	
	7.7	Clean the hydraulic oil suction screen and the ventilation system				●	
	7.8	Check the pressure relief valves for correct functioning					●
	7.9	Check the hose run for correct functioning and damage			●		
Electrical system:	8.1	Performance check			●		
	8.2	Check all cables for secure connection and damage			●		
	8.3	Check the warning installation for correct functioning			●		
	8.4	Check the instruments and displays for correct function			●		
Battery:	9.1	Check acid density, acid level and battery voltage			●		
	9.2	Check the terminals for secure attachment and apply grease			●		
	9.3	Check the battery cables for damage, renew, if necessary			●		
Mounted implement:	10.1	Performance check			●		
	10.2	Check the attachment to the truck and all load bearing elements			●		
	10.3	Check bearings, guide elements, and stops for wear and damage, grease			●		
Lubrication:	11.1	Grease the truck in accordance with the lubrication schedule			●		
General measure-ments:	12.1	Check the driving speed and braking distance					●
	12.2	Check lifting speed and lowering speed					●
	12.3	Check safety and shutdown devices			●		
Demonstra-tion:	13.1	Perform a trial run under nominal load			●		
	13.2	Upon completion of servicing operations demonstrate the truck to the person responsible			●		

5 Maintenance Check-list DFG

Maintenance intervals

			standard = ● cold store = ✳	W	A	B	C
Engine:	1.1	Check engine for noise and leaks			●		
	1.2	Check and, if necessary, adjust begin of delivery of the injection pump					●
	1.3	Check and , if necessary, adjust pressure of injection nozzles			●		
	1.4	Retighten socket-head cap screws					●
	1.5	Check and, if necessary, adjust valve clearance			●		
	1.6	Check oil level of engine, top up, if necessary		●			
	1.7	Change engine oil			●		
	1.8	Change engine oil filter			●		
	1.9	Check V-belt for correct tension and damage			●		
	1.10	Check max. speed (without load), adjust, if necessary			●		
Cooling agent:	2.1	Check cooling agent level, top up, if necessary d)		●			
	2.2	Check proportion of anti-freeze mixture, top up, if necessary					●
Exhaust:	3.1	Check exhaust system for leaks and damage					●
	3.2	Check and, if necessary, correct exhaust gas values					●
Air filter:	4.1	Clean air filter cartridge			●		
	4.2	Change air filter cartridge				●	
Hydraulics:	5.1	Check and lubricate drive of hydraulic pump			●		
Fuel system:	6.1	Change fuel filter			●		
	6.2	Check and, if necessary, discharge fuel/water separator			●		
	6.3	Check fuel reservoir and lines for leaks and damage			●		

d) Replace cooling agent once a year.

6 Maintenance Check-list TFG

Maintenance intervals

		standard = ● cold store = ✳	W	A	B	C
Engine:	1.1	Check engine for noise and leaks		●		
	1.2	Check and, if necessary, replace spark plugs		●		
	1.3	Check and , if necessary, adjust ignition point		●		
	1.4	Check ignition distributor for proper adjustment, readjust, if necessary		●		
	1.5	Check and, if necessary, adjust valve clearance		●		
	1.6	Check oil level of engine, top up, if necessary	●			
	1.7	Change engine oil		●		
	1.8	Change engine oil filter		●		
	1.9	Check V-belt for correct tension and damage		●		
	1.10	Check max. speed (without load), adjust, if necessary		●		
Cooling agent:	2.1	Check cooling agent level, top up, if necessary d)	●			
	2.2	Check proportion of anti-freeze mixture, top up, if necessary				●
Exhaust:	3.1	Check exhaust system for leaks and damage				●
	3.2	Check and, if necessary, correct exhaust gas values				●
Air filter:	4.1	Clean air filter cartridge		●		
	4.2	Change air filter cartridge			●	
Hydraulics:	5.1	Check and lubricate drive of hydraulic pump		●		
L.P.G. system:	6.1	Check L.P.G. system for leaks and damage		●		
	6.2	Change L.P.G. filter by an expert		●		
	6.3	Check L.P.G. system by an expert				●
	6.4	The toxic substances in the emission are to be checked by a qualified inspector and are to be reduced to the lowest possible level.			●	
	6.5	Check and service Impco Units				●

d) Replace cooling agent once a year.

7 Coolant Specification

The quality of the coolant used can have a large effect on the efficiency and life of the cooling system. The recommendations given below can be of assistance in the maintenance of a good cooling system with frost and/or corrosion protection.

Where possible, use clean soft water.

When frost protection is not necessary, it is still an advantage to use an approved antifreeze mixture as this gives a protection against corrosion and also raises the boiling point of the coolant. A minimum concentration of 25% by volume of antifreeze is necessary, but it is our recommendation that 33% concentration by volume is used.

If an antifreeze is not used, add a correct corrosion inhibitor mixture to the water. The mixture of additives given below has been found to give good results.

Corrosion Inhibitor	Mixture
Sodium Benzoate	10–15 gramme/litre
Sodium Nitrite	1–2 gramme/litre
Benzotriazole pH (acid/alkaline) Control Additive	0.5 gramme/litre

Change the water/corrosion inhibitor mixture every six months or check according to the inhibitor manufacturer's recommendations.

Some corrosion inhibitor mixtures contain soluble oil which can have an adverse effect on some types of water hose.

- If an antifreeze mixture is used to prevent frost damage, it must have an ethylene glycol (ethanediol) base. An antifreeze that is to one of the standards given below or to an equal standard is acceptable if the pH value is kept within the range of 7.0–8.5 when diluted.

U.K.BS 6580:1992	Corrosion Inhibiting Engine Coolant Concentrate (Antifreeze)
U.S.A. ASTM D4985 or SAE J1941	'Ethylene Glycol Base Engine Coolant'.

- When Antifreeze is used, the correct mixtures of antifreeze and water are as given below. Antifreeze must fully pass the standards given above.

Lowest Temperature of Protection Needed	% Volume of Antifreeze	Volume Ratio Antifreeze : Water
-37°C (-34°F)	50	1 : 1

The quality of the antifreeze coolant must be checked at least once a year, for example at the start of the cold period.

If the correct procedures are not used, the manufacturers cannot be held responsible for any frost or corrosion damage.

ANTI-FREEZE CONTAINS ETHYLENE GLYCOL AND OTHER CONSTITUENTS WHICH ARE TOXIC IF TAKEN INTERNALLY AND CAN BE ABSORBED IN TOXIC AMOUNTS THROUGH PROLONGED OR REPEATED SKIN CONTACT.

Always take the following precautions when handling anti-freeze.

- Anti-freeze must NEVER be taken internally. If anti-freeze is swallowed accidentally, seek medical advice IMMEDIATELY.
- Avoid prolonged skin contact with anti-freeze.
- Wash-off any accidental splashes from the skin as soon as practicable.
- If splashes of anti-freeze enter the eyes, irrigate immediately.
- Clothing splashed with anti-freeze must be removed and washed before being worn again.
- For regular and frequent handling of anti-freeze, protective clothing must be worn (plastic or rubber gloves, boots and impervious overalls or aprons).

CORROSION INHIBITOR MIXTURES CONTAIN ADDITIVES WHICH ARE TOXIC IF TAKEN INTERNALLY AND CAN BE ABSORBED IN TOXIC AMOUNTS THROUGH PROLONGED OR REPEATED SKIN CONTACT AND THE SAME PRECAUTIONS SHOULD BE TAKEN AS WHEN HANDLING ANTI-FREEZE.

8 Lubricant Specifications

LUBRICATION POINT	SPECIFICATION	-20°c to -5°c (cold)	-5°c to +30° (temperate)	+30°c to +50°c (tropical)
1. STEERING GEAR	Full Hydrostatic - from hydraulic system.			
2. DRIVE AXLE	EP Mineral Oil API-GL5 Class	SAE 80	SAE 90	SAE 140
3. ENGINE				
a. **DFG 316/320** 404C.22	API CH4 or ACEA E5	SAE 5W/20	SAE 10W/30	SAE 15 W/40
b. **TFG 316/320** 2.0L FE5F 02 000	API CC	SAE 10W	SAE 10W/30	SAE 40W
c. **DFG 420-430** 704.30	API CD/SE	SAE 10W	SAE 10W/30	SAE 40W
704.26	API CD/SE	SAE 5W/20	SAE 10W/30	SAE 15 W/40
d. **TFG 420-430** 3.0L L4	API SG/SH	SAE 15 W/40	SAE 10W/30	SAE 40W
e. **DFG 540-550**	API CD/SE	SAE 10W	SAE 20/20W	SAE 30
1004.4 2	API CG4/CH4 or ACEA E3/E5	SAE 5W/20	SAE 10W/30	SAE 15 W/40
f. **TFG 540-550** 4.3L V6	**API SG/SH**	**SAE 15 W/40**	**SAE 10W/30**	**SAE 40W**
4. TORQUE CONVERTER TRANSMISSION				
a. **Transaxle** TXL15, TXL30, PST2	MIL-L2104C and API CC or MIL-L2104D and API CD	SAE 10W/20	SAE 10W/20	SAE 10W20
5. HYDRAULIC SYSTEM	Anti-wear type hydraulic oil, with anti oxidant and anti foam additives meeting ISO viscosity classifications	HV 46	HV 46	HV 68
	or Meeting API SC, SD or SE	SAE10	SAE10	SAE20/20W
6. GREASE Hub bearing, Nipples and Rollers	Lithium Base Roller Bearing Grease NLG - No 2			
7. LIFT CHAINS	Emulsification resistant oil. SAE 30 Engine Oil			
8. MAST CHANNEL	Oily Cloth to prevent rusting			
9. LINKAGES, HINGES AND CLEVIS PINS	Oil can			
10. BRAKE SYSTEM - FLUID	SAE Spec J1703A DOT3 or DOT4			
11. BRAKE ADJUSTERS AND SHOE PIVOT	Girling Brake Grease			
12. BATTERY TERMINALS	Petroleum Jelly			

Recommended lubricants -20°c to -5°c (Cold)

LUBRICATION POINT	Castrol	Shell	B.P.	Esso
1. STEERING GEAR	Full Hydrostatic - from hydraulic system.			
2. DRIVE AXLE	Hypoy Light EP80W	Spirax HD80w/90	Energear Hypo 90 or 80w/90	Esso Gear Oil GX80W
3. ENGINE				
a. **DFG 316/320** 404C.22	Deusol CRX 10/30 or CRI 10W/30	Rimula X10W	Vanellus 5W/30 C8 Ultima	Essolube XD3+10W
b. **TFG 316/320** 2.0L FE5F LPG	CRX 10W/30	Rimula X10W	Vanellus C3 10W	Essolube XD3+10W
c. **DFG 420-430** 704.30 704.26	Deusol CRX 10/30 or CRI 10W/30	Rimula X10W	Vanellus C3 10-30 or Vanellus C3 10W Vanellus 5W/30 C8 Ultima	Essolube XD3+10W
d. **TFG 420-430** 3.0L L4	CRX 10W/30	Rimula X10W	Vanellus C5 Global 15 W/40	Essolube XD3+10W
e. **DFG 540-550** 1004.4-2 1104C.44	CRX 10/30 or CRI 10W/30	Rimula X10W	Vanellus C3 10W Vanellus 5W/30 C8 Ultima	Essolube XD3+10W
f. **TFG 540-550** 4.3L V6	CRX 10W/30	Rimula X10W	Vanellus C5 Global 15 W/40	Essolube XD3+10W
4. TORQUE CONVERTER TRANSMISSION				
a. **Transaxle** TXL15, TXL30PST2	Castrol TQD or CRH-10W	Donax TM	Vanellus C3 Mono 10	Essolube XD3+10W
5. HYDRAULIC SYSTEM	Hyspin AWS 22 or CRH 10W	Tellus Oil 22	Energol SHF-HV 46	Nuto H Plus 22
6. GREASE Hub bearing, Nipples and Rollers	Spheerol L-EP2	Retinax LX2	Energrease L2	Beacon EP2

Lubrication Point	Specification
7. LIFT CHAINS	Acheson HI LOAD Forklift Chain Lubricant or Rocol Lift Truck Chain Spray
8. MAST CHANNEL	Oily Cloth to prevent rusting
9. LINKAGES, HINGES AND CLEVIS PINS	Oil can
10. BRAKE SYSTEM / INCHING CONTROL	Castrol Girling Universal Brake and Clutch Fluid Crimson
11. BRAKE ADJUSTERS AND SHOE PIVOT	Castrol Girling Brake Grease
12. BATTERY TERMINALS	Petroleum Jelly

Recommended lubricants -5°c to +30°c (Temperate)

LUBRICATION POINT	Castrol	Shell	B.P.	Esso
1. STEERING GEAR	Full Hydrostatic - from hydraulic system.			
2. DRIVE AXLE	Hypoy EP90	Spirax HD85W/90	Energear Hypo 90 or 80w/90	Esso Gear Oil GX85W-90
3. ENGINE				
a. **DFG 316/320** 104.22 404C.22	Deusol CRX10W/30 or CRI 20W/30	Rimula 15W/40 or Rimula X20/20W	Vanellus C3 20-50 or Vanellus C3 20W Vanellus C6 Global Plus 10W/40	Essolube XD3+20W
b. **TFG 316/320** 2.0L FE5F LPG	Deusol CRX 10W/30 or CRX 15W/40	Rimula X15W/40	Vanellus C6 Global Plus 10W/40	Essolube XD3+20W
c. **DFG 420-430** 704.30 704.26	Deusol CRX10W/30 or CRI 20W/30	Rimula 15W/40 or Rimula X20/20W	Vanellus C3 20-50 or Vanellus C3 20W Vanellus C6 Global Plus 10W/40	Essolube XD3+20W
d. **TFG 420-430** 3.0L L4	Deusol CRX 10W/30 or CRX 15W/40	Rimula X15W/40	Vanellus C6 Global Plus 10W/40	Essolube XD3+20W
e. **DFG 540-550** 1004.4-2 1104C.44	Deusol CRX 10W/30 or CRI 20W/30	Rimula 15W/40 or Rimula X20/20W	Vanellus C3 20-50 Vanellus C6 Global Plus 10W/40	Essolube XD3+20W
f. **TFG 540-550** 4.3L V6	Deusol CRX 10W/30 or CRX 15W/40	Rimula X15W/40	Vanellus C6 Global Plus 10W/40	Essolube XD3+20W
4. TORQUE CONVERTER TRANSMISSION				
a. **Transaxle** TXL15, TXL30PST2	Castrol TQD or CRH-10W	Donax TM	Vanellus C3 Mono 10	Essolube XD3+10W
5. HYDRAULIC SYSTEM	Hyspin AWS 32 or CRH-10W	Tellus Oil 37	Energol SHF-HV 46	Nuto H Plus 32
6. GREASE Hub bearing, Nipples and Rollers	Spheerol L-EP2	Retinax LX2	Energrease L2	Beacon EP2

Lubrication Point	Specification
7. LIFT CHAINS	Acheson HI LOAD Forklift Chain Lubricant or Rocol Lift Truck Chain Spray
8. MAST CHANNEL	Oily Cloth to prevent rusting
9. LINKAGES, HINGES AND CLEVIS PINS	Oil can
10. BRAKE SYSTEM / INCHING CONTROL	Castrol Girling Universal Brake and Clutch Fluid Crimson
11. BRAKE ADJUSTERS AND SHOE PIVOT	Castrol Girling Brake Grease
12. BATTERY TERMINALS	Petroleum Jelly

Recommended lubricants +30°c to +50°c (Tropical)

LUBRICATION POINT	Castrol	Shell	B.P.	Esso
1. STEERING GEAR	Full Hydrostatic - from hydraulic system.			
2. DRIVE AXLE	Castrol EPX 85W/140	Spirax HD85w/140	Energear Hypo 90 or 80w/90	Esso Gear Oil GX85W-140
3. ENGINE				
a. **DFG 316/320** 104.22 404C.22	Deusol CRX10W/30	Rimula X15W/40	Vanellus C3 15W-40 Vanellus C3 30	Essolube XD3+30W
	Deusol CRI 20W/30	Rimula X30	Vanellus C5 Global 15W/40	
b. **TFG 316/320** 2.0L FE5F LPG	CRX 15W/40	Rimula X10W/40	SAE 40W	Essolube MHX 15W-40
c. **DFG 420-430** 704.30 704.26	Deusol CRX10W/30	Rimula X15W/40	Vanellus C3 15W-40 Vanellus C3 30	Essolube XD3+30W
	Deusol CRI 20W/30	Rimula X30	Vanellus C5 Global 15W/40	
d. **TFG 420-430** 3.0L L4	CRX 15W/40	Rimula X10W/40	Vanellus C3 Mono 40	Essolube MHX 15W-40
e. **DFG 540-550** 1004.4-2 1104C.44	Deusol CRX 10W/30 or Deusol CRI 20W/30	Rimula X15W/40 or Rimula X30	Vanellus C3 15W-40 or Vanellus C3 30	Essolube XD3+30W
			Vanellus C5 Global 15W/40	Essolube XD3+30W
f. **TFG 540-550** 4.3L V6	CRX 15W/40	Rimula X10W/40	Vanellus C3 Mono 40	Essolube MHX 15W-40
4. TORQUE CONVERTER TRANSMISSION				
a. **Transaxle** TXL15, TXL30PST2	Castrol TQD or CRH-10W	Donax TM	Vanellus C3 Mono 10	Essolube XD3+10W
5. HYDRAULIC SYSTEM	Hyspin AWS 68 or CRH 20W/20	Tellus Oil 68	Bartran HV 68	Nuto H Plus 68
6. GREASE Hub bearing, Nipples and Rollers	Spheerol L-EP2	Retinax LX2	Energrease L2	Beacon EP2

Lubrication Point	Specification
7. LIFT CHAINS	Acheson HI LOAD Forklift Chain Lubricant or Rocol Lift Truck Chain Spray
8. MAST CHANNEL	Oily Cloth to prevent rusting
9. LINKAGES, HINGES AND CLEVIS PINS	Oil can
10. BRAKE SYSTEM / INCHING CONTROL	Castrol Girling Universal Brake and Clutch Fluid Crimson
11. BRAKE ADJUSTERS AND SHOE PIVOT	Castrol Girling Brake Grease
12. BATTERY TERMINALS	Petroleum Jelly

Recommended lubricants

Grade	Part Nº	Capacity	Unit of issue	Application
Engine Oil 15W/40	50302947	25 l drum	Litres*	All diesel engines
Engine Oil 15W/40	14088020	5 l container	Litres*	All diesel engines
Engine Oil 10W/30	50302948	20 l drum	Litres*	LPG/Petrol engines
Grease	14038650	400 g	Grams	
Antifreeze and Summer Coolant	14295090	5 l container	Litres*	
Brake Fluid HD	29201570	5 l container	Litres*	
Transmission Oil 10W	50302949	20 l drum	Litres*	All non automatic transmissions
Engine Oil 15W/40	50302950	205 l container	Litres*	All diesel engines

*When ordering items marked *, please order by the litre.*

The capacity designates the minimum quantity supplied. Please order in multiples of capacity stated.
e.g. Engine Oil 50302947 order 25 Litres = 25 on picking ticket = 1 drum supplied.

DO NOT MIX OILS OF DIFFERENT BRANDS WITHIN THE SAME LUBRICATION POINT.

9 Fuel specification - DFG

Only diesel fuel conforming to DIN 51601 may be used.

10 Lubrication Chart

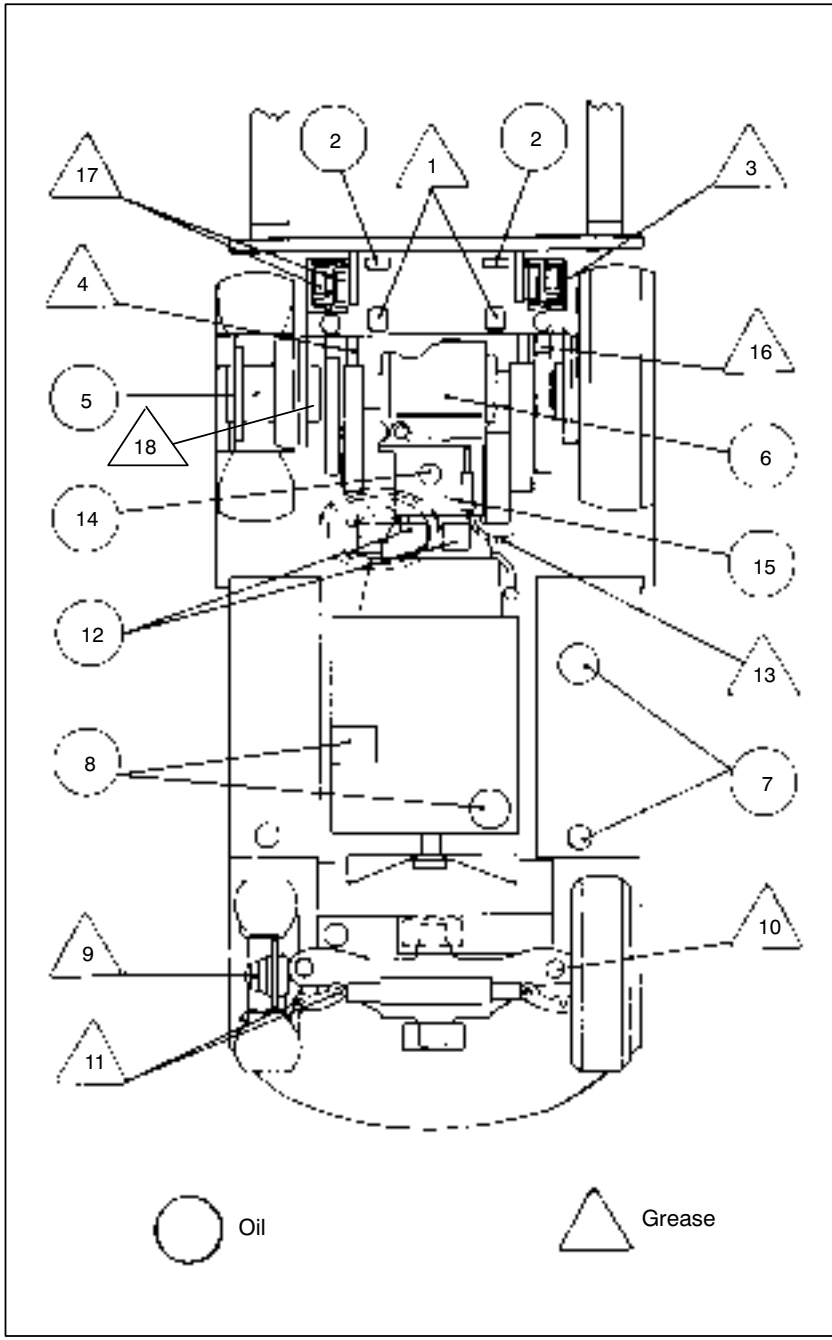
Key to 10.1 Lubrication Diagram - DFG/TFG 316-430

Item	Description	Item	Description
1.	Chain Rollers	10.	Swivel Pins
2.	Lift Chains	11.	Link Pins
3.	Mast Channels	12.	Drivers Controls
4.	Tilt Cylinder Pivots	13.	Parking Brake Cable
5.	Drive Axle Hubs	14.	Brake Reservoir (Brake Fluid)
6.	Differential	15.	Transmission Oil and Filter
7.	Hydraulic Oil and Filter	16.	Mast Pivots
8.	Engine Oil and Filter	17.	Mast Rollers
9.	Steer Axle Hubs	18.	Drive Axle / Mast Mounting Pivots

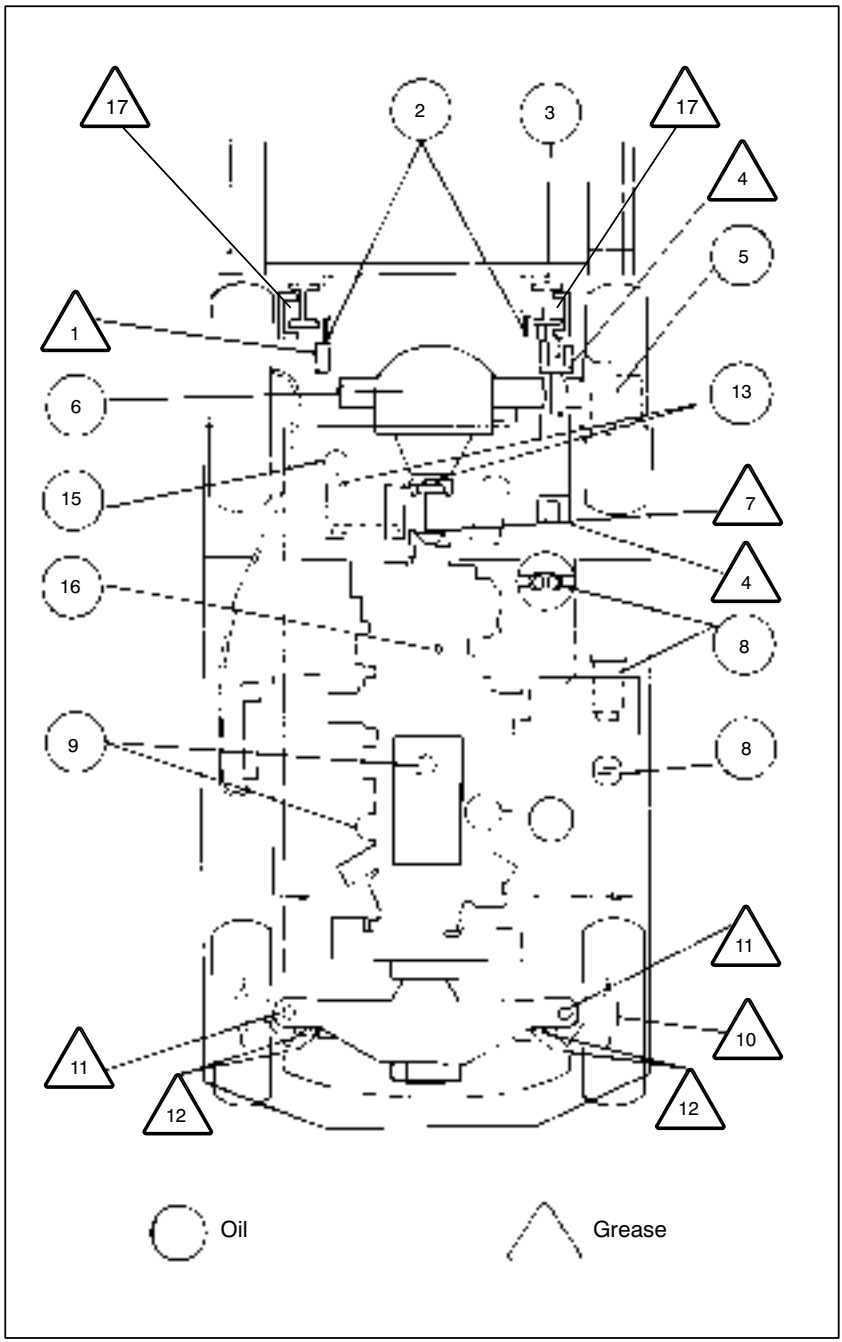
Key to 10.2 Lubrication Diagram - DFG/TFG 540-550

Item	Description	Item	Description
1.	Chain Rollers	10.	Steer Axle Hubs
2.	Lift Chains	11.	Swivel Pins
3.	Mast Channels	12.	Link Pins
4.	Tilt Cylinder Pivots	13.	Drivers Controls
5.	Drive Axle Hubs	14.	Parking Brake Cable
6.	Differential	15.	Brake Reservoir (Brake Fluid)
7.	Drive Shaft Couplings	16.	Transmission Oil and Filter
8.	Hydraulic Oil and Filter	17.	Mast Rollers
9.	Engine Oil and Filter		

10.1 Lubrication Diagram - DFG/TFG 316-430



10.2 Lubrication Diagram - DFG/TFG 540-550

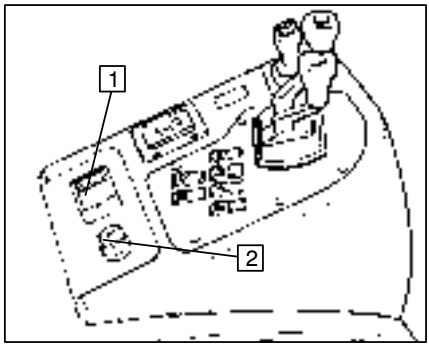


11 Description of Maintenance and Repair Work

11.1 Preparing the Truck for Maintenance and Repair Work

To prevent accidents during maintenance and repair work, all necessary safety measures must be taken. The following conditions must be created:

- Park the truck securely (see Chapter E, Section 5.8).
- Remove key from ignition/starter switch (2) thus protecting the truck against undesirable use.
- Push down battery isolation switch (1).
- When working below the raised load forks or raised truck, these must be secured to prevent lowering, tilting or slipping is excluded.



When raising the truck, observe the following:

Use only lifting gear with adequate load-bearing capacity (see truck rating plate for loading weight).

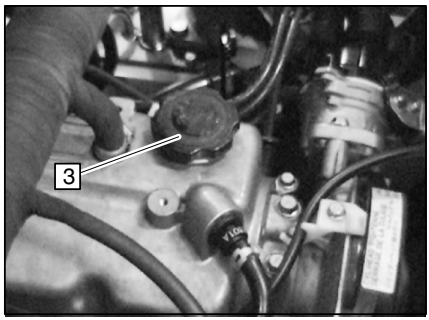
- Park the truck securely (see Chapter E, section 5.7).
- Attach the crane chains to the lifting mast at the points marked.
- Attach the crane chains to the counterweight with the attachment coupling.

The crane chain stops must be fitted so that they do not touch any attachments or the cab roof during lifting.

11.2 Engine Maintenance TFG 316/320

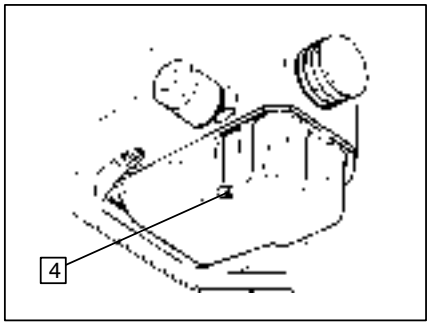
Change Engine Oil and Oil Filter

Only change the engine oil when the engine is warm and the truck is parked horizontal. The engine oil and filter must always be changed together.



Drain Engine Oil

- Unscrew cap (3).
- Clean oil drain screw (4) and area surrounding the drain hole thoroughly.
- Unscrew oil drain screw and drain oil into suitable container.



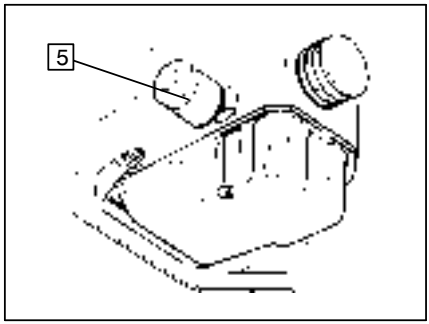
Risk of scalding from hot oil.

- Replace the oil drain screw with a new seal.

Dispose of old oil properly.

Change Engine Oil Filter

- Release the oil filter (5) using a filter wrench and unscrew by hand.



Catch any escaping oil, dispose of oil filter and oil properly.

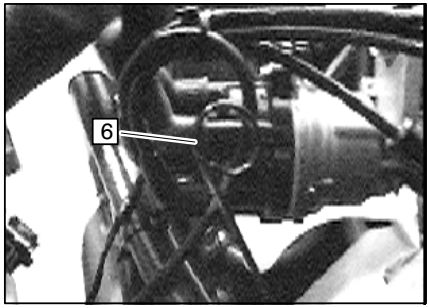
- Clean sealing surfaces on the oil filter flange thoroughly.
- Lightly grease the new oil filter seal with fresh engine oil.
- Tighten the oil filter by hand.

Adding Engine Oil

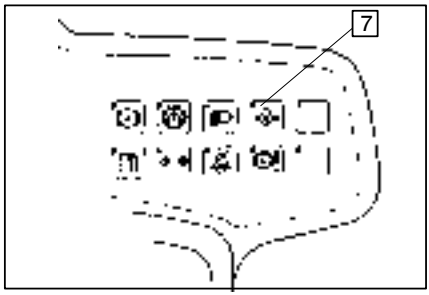
- Into the opening pour fresh engine oil according to the lubrication specification charts (see Section 8).

Fill Quantity: 4.3 l

- Test oil level with the dipstick (6), adjust if necessary (see Chapter E, section 3).
- Replace cover.
- Replace oil dipstick.



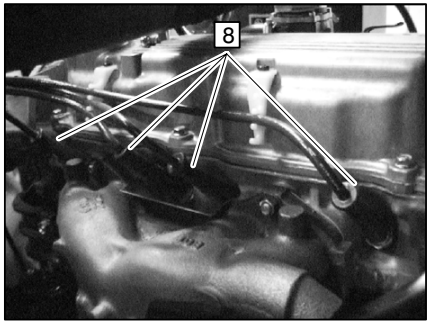
After changing the oil and filter, monitor the engine oil pressure warning light (7) during a test drive and check for leaks at the oil drain screw and filter.



Change Spark Plugs

- Remove spark plugs connection (8).
- Clean the area around the spark plugs on the cylinder head thoroughly.
- Unscrew spark plugs.
- Test electrode gap on the new plugs with feeler gauges, adjust if necessary.

Nominal value: 0.8 mm.



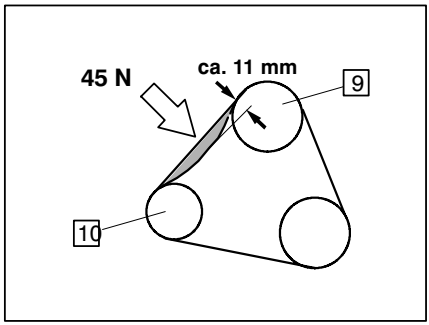
Only use original spark plugs.

- Screw in spark plugs by hand then tighten to a torque of **20 Nm.**

Test V-Belt Tension

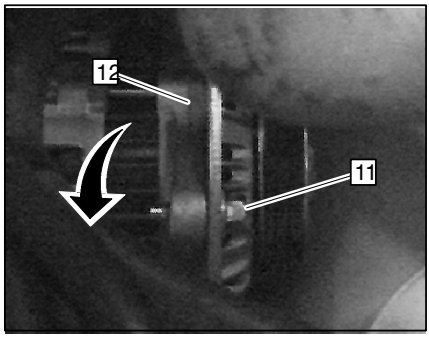
- Press V-belt between fan belt pulley (9) and alternator pulley (10) with a force of **45 N.**

The belt should move approx. **11 mm.**



Adjust V-Belt Tension

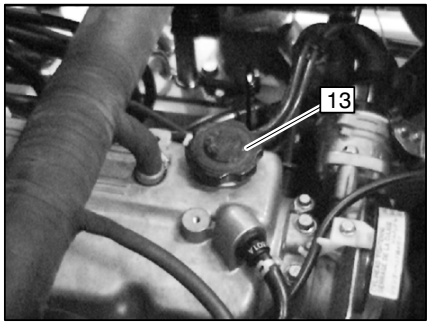
- Undo bolt (11) and pull alternator (12) in direction of arrow until specified tension has been achieved
- Tighten bolt again.
- Test belt tension again, repeat adjustment process if necessary.



11.3 Engine Maintenance DFG 316/320

Change Engine Oil and Oil Filter

Only change the engine oil when the engine is warm and the truck is parked horizontal. The engine oil and filter must always be changed together.



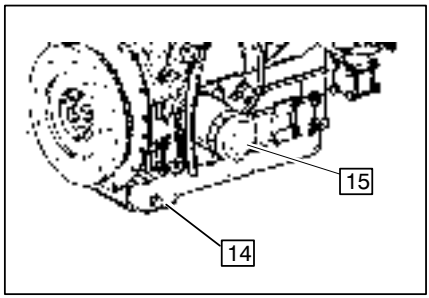
Drain Engine Oil

- Unscrew cap (13).
- Clean oil drain screw (14) and area surrounding the drain hole thoroughly.
- Unscrew oil drain screw and drain oil into suitable container.

STOP *Risk of scalding from hot oil.*

- Replace the oil drain screw with a new seal.

STOP *Dispose of old oil properly.*



Change Engine Oil Filter

- Release the oil filter (15) using a filter wrench and unscrew by hand.

STOP *Catch any escaping oil, dispose of oil filter and oil properly.*

- Clean sealing surfaces on the oil filter flange thoroughly.
- Lightly grease the new oil filter seal with fresh engine oil.
- Tighten the oil filter by hand.

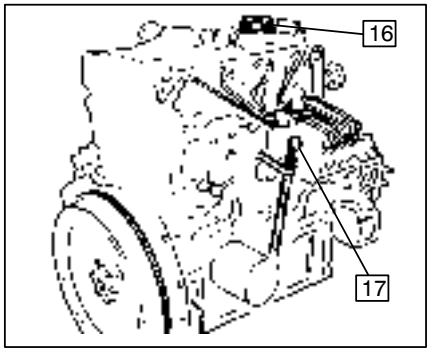
Adding Engine Oil

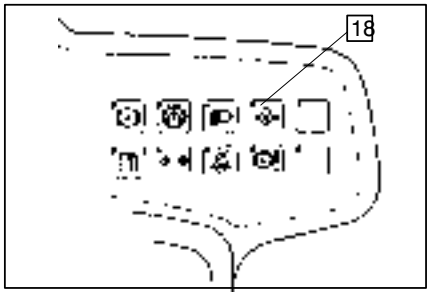
- Into the opening (16) pour fresh engine oil according to the lubrication specification charts (see Section 8).

Fill Quantity: 8.2 l

- Test oil level with the dipstick (17), adjust if necessary (see Chapter E, section 3).
- Replace cover.
- Replace oil dipstick.

After changing the oil and filter, monitor the engine oil pressure warning light (18) during a test drive and check for leaks at the oil drain screw and filter.

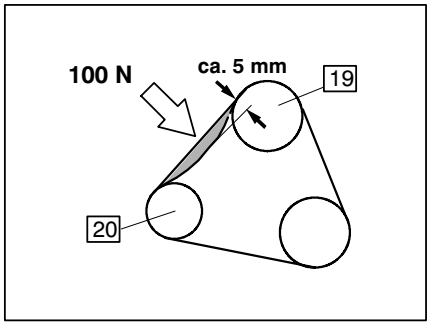




Test V-Belt Tension

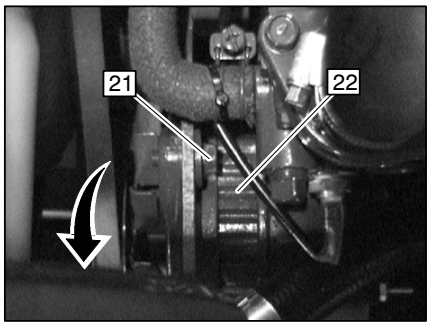
- Press V-belt between fan belt pulley (19) and alternator pulley (20) with a force of **100 N.**

The belt should move approx. **5 mm.**



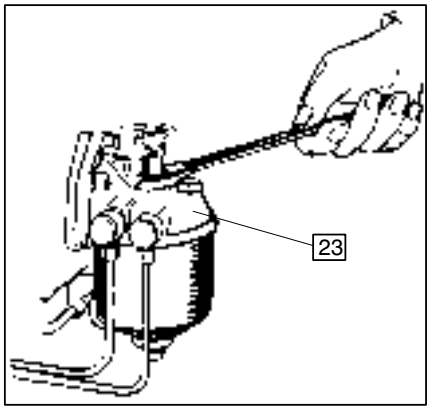
Adjust V-Belt Tension

- Undo bolt (21) and pull alternator (22) in direction of arrow until specified tension has been achieved.
- Tighten bolt again.
- Test belt tension again, repeat adjustment process if necessary.



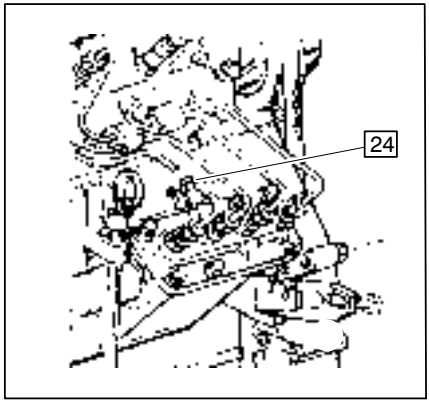
Change Fuel Filter

- Drain fuel from the filter into a suitable container.
- Release fuel filter (23) with filter wrench and unscrew by hand.



Dispose of fuel filter and fuel properly.

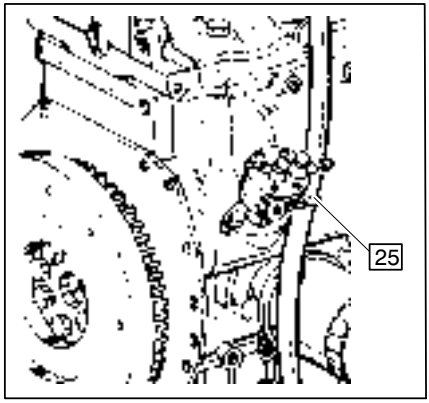
- Screw fuel filter with a new O-ring into the new container.
- Lubricate the O-ring slightly with diesel fuel before fitting.
- Thoroughly clean the contact surfaces on the filter flange.
- Lightly moisten the seal on the new fuel filter with diesel fuel.
- Screw in the fuel filter by hand until the seal lies on the filter flange.
- Tighten the fuel filter a further one-third of a turn.
- Bleed the fuel system.



Bleed Fuel System

Catch any escaping fuel and dispose of properly.

- Open bleed screw (24).
- Activate hand pump lever on fuel pump (25) until fuel emerges from the bleed screw without bubbles.
- Tighten bleed screw.
- Hold ignition/starter switch in position **I** for around 10 seconds.
- Wait 10 seconds.
- Repeat process until the engine starts.



During an engine test, check for leaks on fuel filter, at the overflow valve and at the nuts on the injector nozzles.

If the engine does not start or stops again after a short time, repeat the bleed process.

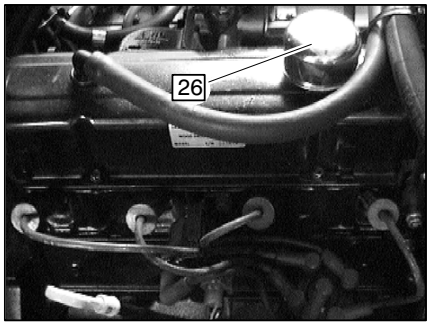
11.4 Engine Maintenance TFG 420-430

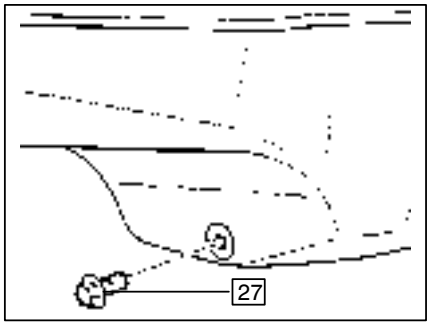
Change Engine Oil and Oil Filter

Only change the engine oil when the engine is warm and the truck is parked horizontal. The engine oil and filter must always be changed together.

Drain Engine Oil

- Unscrew cap (26).
- Clean oil drain screw (27) and area surrounding the drain hole thoroughly.
- Unscrew oil drain screw and drain oil into suitable container.





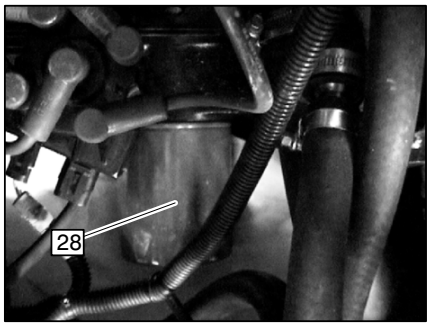
STOP *Risk of scalding from hot oil.*

- Replace the oil drain screw with a new seal.

STOP *Dispose of old oil properly.*

Change Engine Oil Filter

- Release the oil filter (28) using a filter wrench and unscrew by hand.



STOP *Catch any escaping oil, dispose of oil filter and oil properly.*

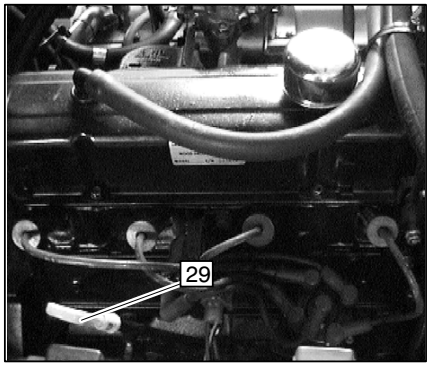
- Clean sealing surfaces on the oil filter flange thoroughly.
- Lightly grease the new oil filter seal with fresh engine oil.
- Tighten the oil filter by hand.

Adding Engine Oil

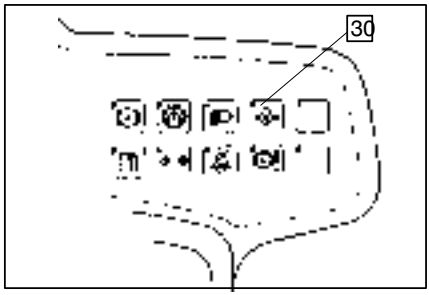
- Into the opening pour fresh engine oil according to the lubrication specification charts (see Section 8).

Fill Quantity: 4,73 l

- Test oil level with the dipstick (29), adjust if necessary (see Chapter E, section 3).
- Replace cover.
- Replace oil dipstick.



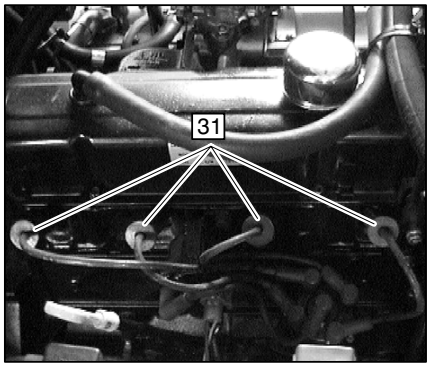
After changing the oil and filter, monitor the engine oil pressure warning light (30) during a test drive and check for leaks at the oil drain screw and filter.



Change Spark Plugs

- Remove spark plugs connection (31).
- Clean the area around the spark plugs on the cylinder head thoroughly.
- Unscrew spark plugs.
- Test electrode gap on the new plugs with feeler gauges, adjust if necessary.

Nominal value: 1,0 mm



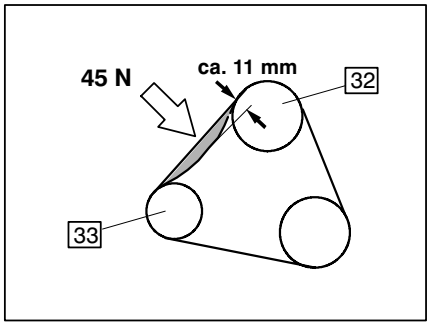
Only use original spark plugs.

- Screw in spark plugs by hand then tighten to a torque of **20 Nm.**

Test V-Belt Tension

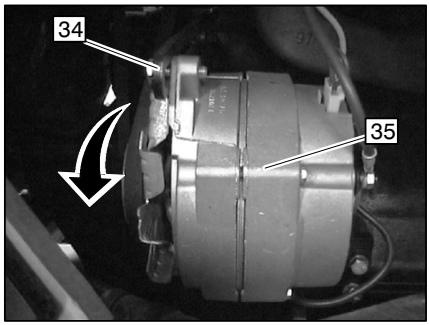
- Press V-belt between fan belt pulley (32) and alternator pulley (33) with a force of **45 N.**

The belt should move approx. **11 mm.**



Adjust V-Belt Tension

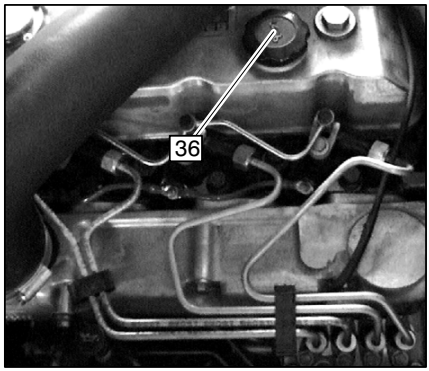
- Undo bolt (34) and pull alternator (35) in direction of arrow until specified tension has been achieved
- Tighten bolt again.
- Test belt tension again, repeat adjustment process if necessary.



11.5 Engine Maintenance DFG 420-430

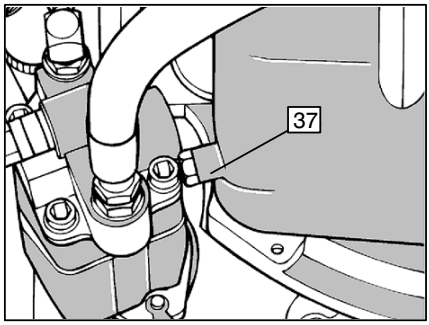
Change Engine Oil and Oil Filter

Only change the engine oil when the engine is warm and the truck is parked horizontal. The engine oil and filter must always be changed together.



Drain Engine Oil

- Unscrew cap (36).
- Clean oil drain screw (37) and area surrounding the drain hole thoroughly.
- Unscrew oil drain screw and drain oil into suitable container.



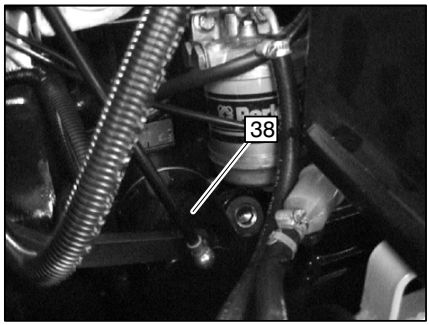
STOP *Risk of scalding from hot oil.*

- Replace the oil drain screw with a new seal.

STOP *Dispose of old oil properly.*

Change Engine Oil Filter

- Release the oil filter (38) using a filter wrench and unscrew by hand.



STOP *Catch any escaping oil, dispose of oil filter and oil properly.*

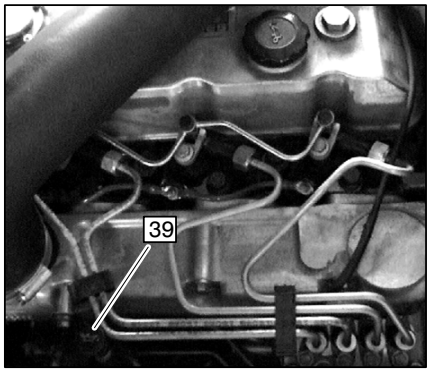
- Clean sealing surfaces on the oil filter flange thoroughly.
- Lightly grease the new oil filter seal with fresh engine oil.
- Tighten the oil filter by hand.

Adding Engine Oil

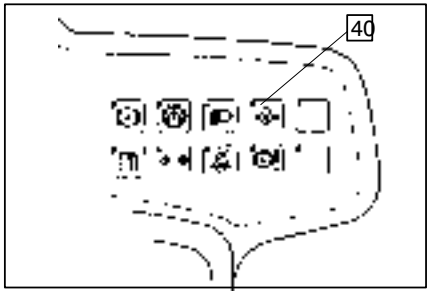
- Into the opening (36) pour fresh engine oil according to the lubrication specification charts (see Section 8).

Fill Quantity: 8,0l

- Test oil level with the dipstick (39), adjust if necessary (see Chapter E, section 3).
- Replace cover.
- Replace oil dipstick.



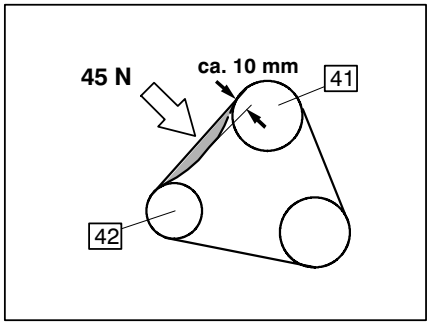
After changing the oil and filter, monitor the engine oil pressure warning light (40) during a test drive and check for leaks at the oil drain screw and filter.



Test V-Belt Tension

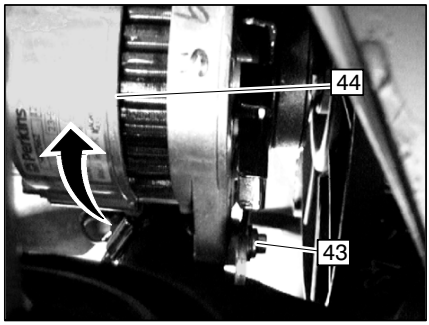
- Press V-belt between fan belt pulley (41) and alternator pulley (42) with a force of **45 N.**

The belt should move approx. **10 mm.**



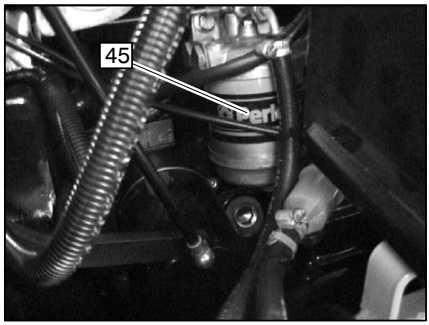
Adjust V-Belt Tension

- Undo bolt (43) and pull alternator (44) in direction of arrow until specified tension has been achieved.
- Tighten bolt again.
- Test belt tension again, repeat adjustment process if necessary.



Change Fuel Filter

- Drain fuel from the filter into a suitable container.
- Release fuel filter (45) with filter wrench and unscrew by hand.



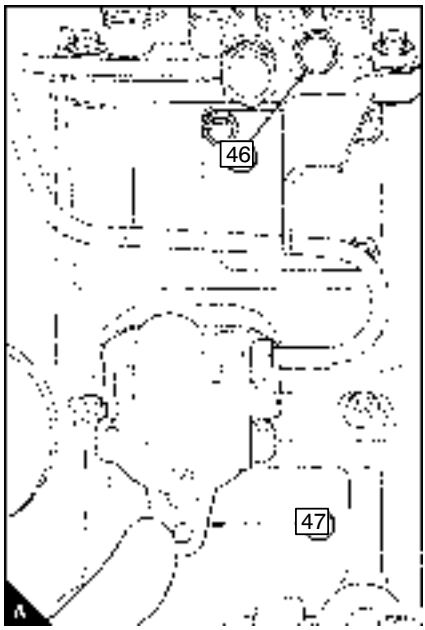
Dispose of fuel filter and fuel properly.

- Screw fuel filter with a new O-ring into the new container.
- Lubricate the O-ring slightly with diesel fuel before fitting.
- Thoroughly clean the contact surfaces on the filter flange.
- Lightly moisten the seal on the new fuel filter with diesel fuel.
- Screw in the fuel filter by hand until the seal lies on the filter flange.
- Tighten the fuel filter a further one-third of a turn.
- Bleed the fuel system.

Bleed Fuel System

Catch any escaping fuel and dispose of properly.

- Open bleed screw (46).
- Activate hand pump lever on fuel pump (47) until fuel emerges from the bleed screw without bubbles.
- Tighten bleed screw.
- Hold ignition/starter switch in position **I** for around 10 seconds.
- Wait 10 seconds.
- Repeat process until the engine starts.



During an engine test, check for leaks on fuel filter, at the overflow valve and at the nuts on the injector nozzles.

If the engine does not start or stops again after a short time, repeat the bleed process.

11.6 Engine Maintenance TFG 540-550

Change Engine Oil and Oil Filter

Only change the engine oil when the engine is warm and the truck is parked horizontal. The engine oil and filter must always be changed together.

Drain Engine Oil

- Unscrew cap (48).
- Clean oil drain screw (49) and area surrounding the drain hole thoroughly.
- Unscrew oil drain screw and drain oil into suitable container.

STOP *Risk of scalding from hot oil.*

- Replace the oil drain screw with a new seal.

STOP *Dispose of old oil properly.*

Change Engine Oil Filter

- Release the oil filter (50) using a filter wrench and unscrew by hand.

STOP *Catch any escaping oil, dispose of oil filter and oil properly.*

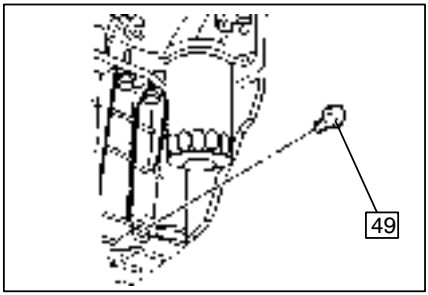
- Clean sealing surfaces on the oil filter flange thoroughly.
- Lightly grease the new oil filter seal with fresh engine oil.
- Tighten the oil filter by hand.

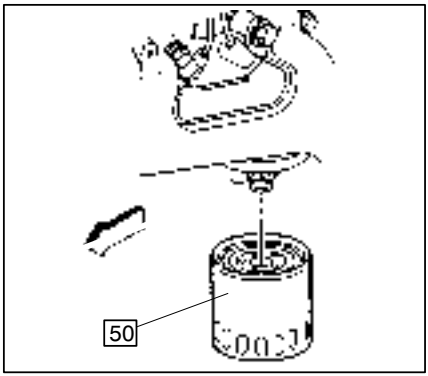
Adding Engine Oil

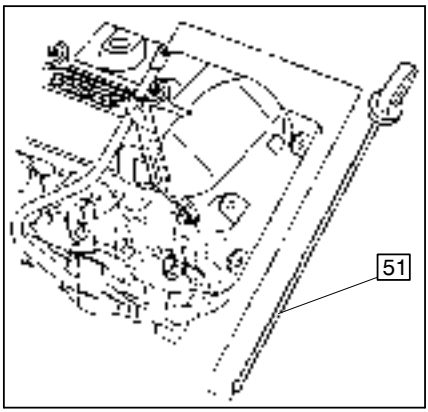
- Into the opening pour fresh engine oil according to the lubrication specification charts (see Section 8).

Fill Quantity: 4,7l

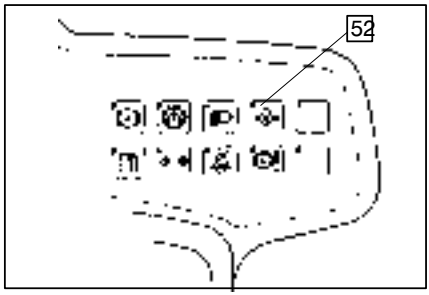
- Test oil level with the dipstick (51), adjust if necessary (see Chapter E, section 3).
- Replace cover.
- Replace oil dipstick.







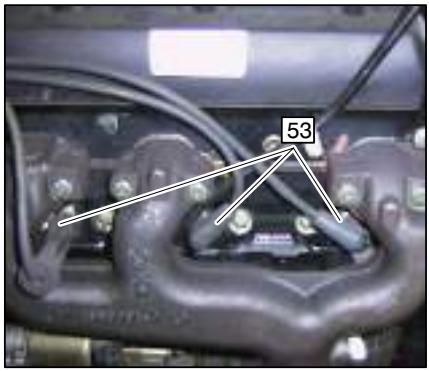
After changing the oil and filter, monitor the engine oil pressure warning light (52) during a test drive and check for leaks at the oil drain screw and filter.



Change Spark Plugs

- Remove spark plugs connection (53).
- Clean the area around the spark plugs on the cylinder head thoroughly.
- Unscrew spark plugs.
- Test electrode gap on the new plugs with feeler gauges, adjust if necessary.

Nominal value: 1,6 mm



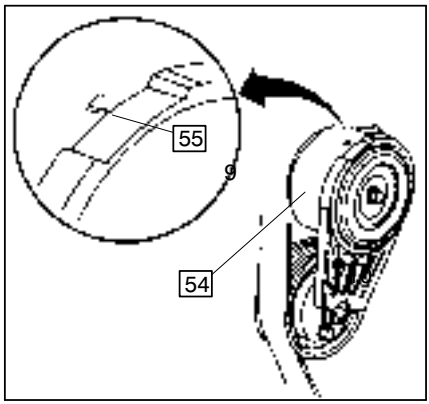
Only use original spark plugs.

- Screw in spark plugs by hand then tighten to a torque of **20 Nm.**

Test V-Belt Tension

V-Belt tension is maintained by an automatic belt tensioner unit (54). No manual adjustment is necessary.

If location of the fix pointer (55) is outside the index mark, a new belt should be fitted.



Proper V-belt routing is essential. Belts should be replaced by trained and authorised persons.

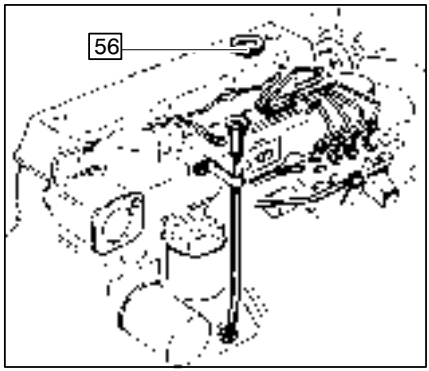
11.7 Engine Maintenance DFG 540-550

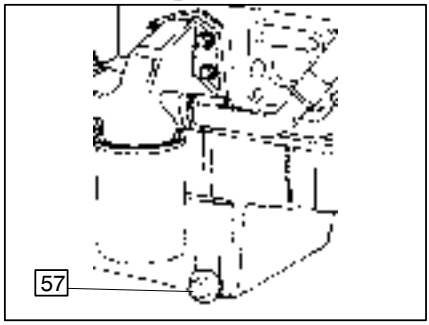
Change Engine Oil and Oil Filter

Only change the engine oil when the engine is warm and the truck is parked horizontal. The engine oil and filter must always be changed together.

Drain Engine Oil

- Unscrew cap (56).
- Clean oil drain screw (57) and area surrounding the drain hole thoroughly.
- Unscrew oil drain screw and drain oil into suitable container.





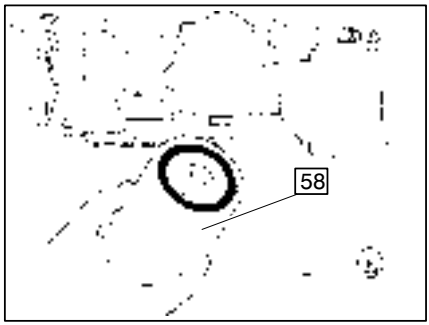
Risk of scalding from hot oil.

- Replace the oil drain screw with a new seal.

Dispose of old oil properly.

Change Engine Oil Filter

- Release the oil filter (58) using a filter wrench and unscrew by hand.



Catch any escaping oil, dispose of oil filter and oil properly.

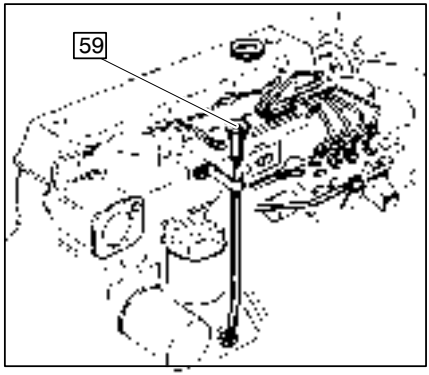
- Clean sealing surfaces on the oil filter flange thoroughly.
- Lightly grease the new oil filter seal with fresh engine oil.
- Tighten the oil filter by hand.

Adding Engine Oil

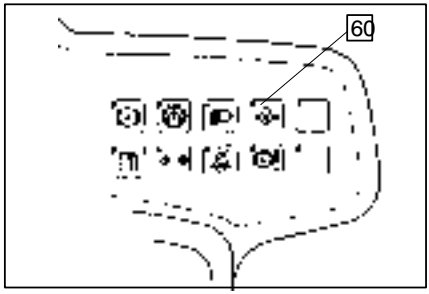
- Into the opening (56) pour fresh engine oil according to the lubrication specification charts (see Section 8).

Fill Quantity: 6,9l

- Test oil level with the dipstick (59), adjust if necessary (see Chapter E, section 3).
- Replace cover.
- Replace oil dipstick.



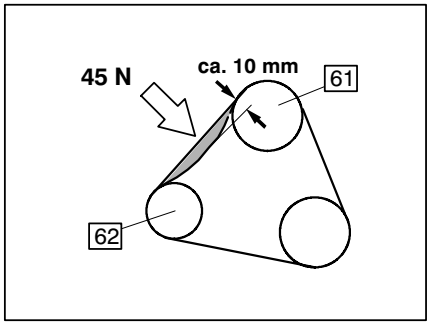
After changing the oil and filter, monitor the engine oil pressure warning light (60) during a test drive and check for leaks at the oil drain screw and filter.



Test V-Belt Tension

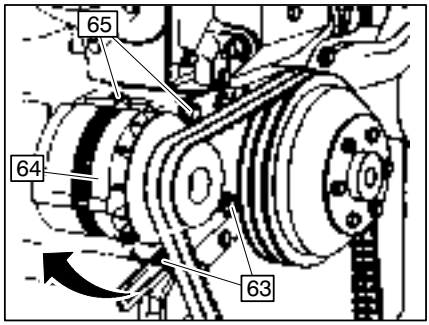
- Press V-belt between fan belt pulley (61) and alternator pulley (62) with a force of **45 N.**

The belt should move approx. **10 mm.**



Adjust V-Belt Tension

- Undo bolt (63) and pull alternator (64) in direction of arrow until specified tension has been achieved.
- Tighten bolt again.
- Test belt tension again, repeat adjustment process if necessary.



Change Fuel Filter

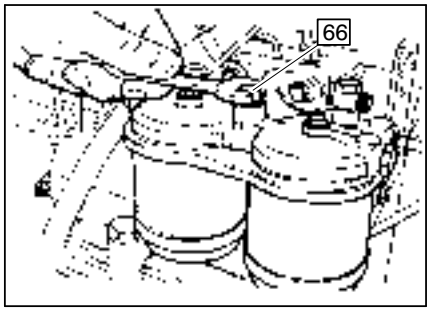
- Drain fuel from the filter into a suitable container.
- Release fuel filter (65) with filter wrench and unscrew by hand.

Dispose of fuel filter and fuel properly.

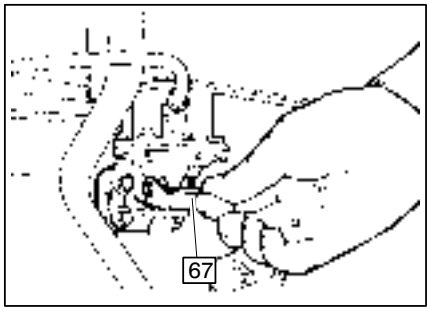
- Screw fuel filter with a new O-ring into the new container.
- Lubricate the O-ring slightly with diesel fuel before fitting.
- Thoroughly clean the contact surfaces on the filter flange.
- Lightly moisten the seal on the new fuel filter with diesel fuel.
- Screw in the fuel filter by hand until the seal lies on the filter flange.
- Tighten the fuel filter a further one-third of a turn.
- Bleed the fuel system.

Bleed Fuel System

Catch any escaping fuel and dispose of properly.



- Open bleed screw (66).
- Activate hand pump lever on fuel pump (67) until fuel emerges from the bleed screw without bubbles.
- Tighten bleed screw.
- Hold ignition/starter switch in position **I** for around 10 seconds.
- Wait 10 seconds.
- Repeat process until the engine starts.



During an engine test, check for leaks on fuel filter, at the overflow valve and at the nuts on the injector nozzles.

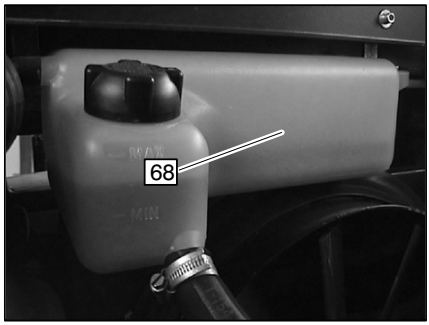
If the engine does not start or stops again after a short time, repeat the bleed process.

11.8 Check Coolant Concentration

Do not open the coolant cap while the engine is hot.

To avoid a build-up of lime, frost and corrosion damage, and to increase the boiling temperature, the cooling system must be filled with a mixture of water and anti-freeze with corrosion protective additives all year round.

- If the frost protection is not adequate, drain the coolant and add sufficient anti-freeze to the expansion tank (68) until the correct mixing ratio is achieved.



Use anti-freeze and corrosion protection oil according to the operating media table (see Section 7).

The water/anti-freeze ratio and the frost protection achieved are given in the anti-freeze data.

Fill Quantities for Coolant System:

DFG 316/320:	**10,0 l**
TFG 316/320:	**8,5 l**
DFG 420-430:	**10,7 l**
TFG 420-430:	**10,7 l**
DFG 540-550:	**16,0 l**
TFG 540-550:	**16,0 l**

To Fill Cooling System

If coolant is to be added to the system during service, allow the engine to cool before the coolant is added. Remove the filler cap slowly; dangerous hot coolant could be discharged if the cooling system is still under pressure. Do not put too much coolant in the cooling system. There is a relief valve in the filler cap which will open and release hot coolant if too much coolant is added.

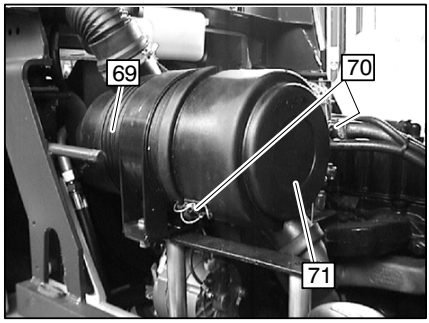
If coolant is added to the system during service, it must be of the same specification as the original that was used to fill the system (see Section 7). Air will remain in the system if coolant is added too quickly, or if the coolant is added when the machine is not on a horizontal surface. If the engine is operated with air in the system, the temperature of operation will be too high and the engine will be damaged.

Ensure that the machine is on a horizontal surface. Slowly remove the filler cap of the header tank. With the aid of a funnel, slowly fill the cooling system to the correct level as shown in the manufacturers handbook for the application. The funnel will provide the required amount of pressure to encourage any air to be displaced from the cooling system. Allow time for air bubbles to be released from the system and fit the cap. Start the engine. When it has reached its normal temperature of operation, stop the engine and allow it to cool.
Slowly remove the filler cap of the header tank and if necessary add coolant to the correct level as shown in the manufacturers handbook for the application. Fit the filler cap.

11.9 Clean/Change Air Filter Cartridge

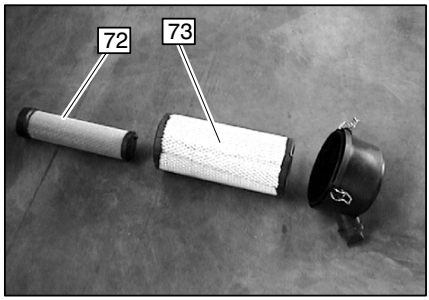
Carry out all maintenance work only with the engine stopped. Do not start the engine without the air filter cartridge fitted.

- Release the 2 fixing clamps (70) and remove the dust collection pot (71).
- Carefully withdraw the inner (72) and outer (73) air filter cartridges from the filter housing (69).
- Blow out the outer cartridge (73) from the inside to the outside with dry compressed air until no more dust emerges.
- Carefully wipe the inner cartridge (72) with a lint-free cloth.



Do not blow the filter housing out with compressed air but wipe with a clean cloth.

- Replace damaged or heavily soiled filter cartridges.
- Thoroughly clean the dust collection pot after removing the rubber element.
- Replace the air filter cartridge in the filter housing and tighten.



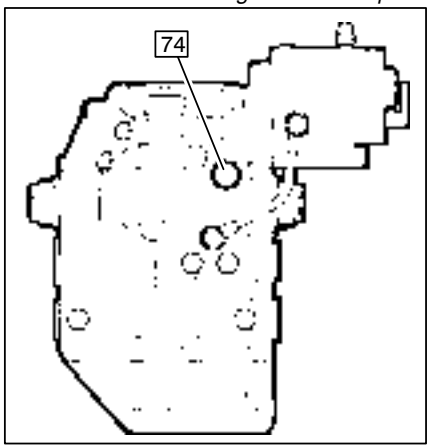
Do not damage the air filter cartridge when fitting.

- Fit the dust collection pot and attach with the 2 fixing clamps.

On some models, only the outer air filter cartridge (73) is fitted.

11.10 Transmission unit - DFG/TFG 316/320

It is important to check the oil level correctly. The oil is a lubricant which also acts as a cooling medium and operates the clutches. Low oil level results in loss of transmission and loss of pressure. It also causes overheating and consequent transmission failure.



(74) shows the running-in filter, that on a new transmission must be removed and not replaced after about 60 to 80 hours operation. The filter is designed to trap particles rubbed off during the running-in period. If it is not removed, and the filter clogs, the clutch plates may malfunction and even be damaged.

To remove filter, first raise the mast and remove the floor plate. Loosen and remove the plug, and take out the filter and spring from the front. Re-fit the plug to the distributor cover.

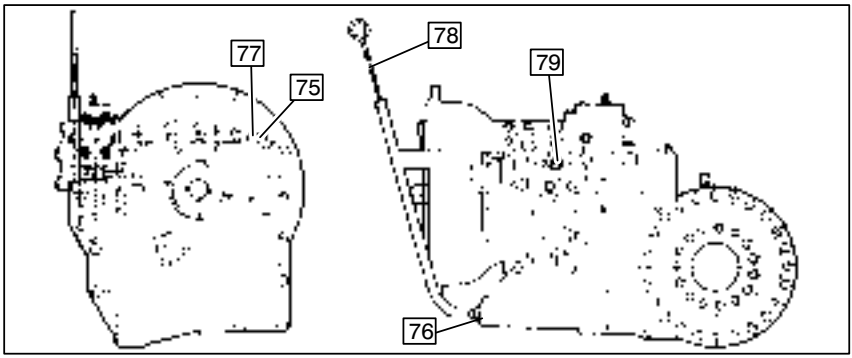
Checking the transmission oil level

For topping up or filling the transmission, use only clean, fresh oil, handled in clean containers. If dirt or water is allowed to enter the transmission damage may ensue.

- Start the engine and, with parking brake applied, select forward and then reverse gear and allow the transmission to reach operating temperature.
- With the engine idling and neutral selected, remove dipstick, wipe with lint free cloth and check dipstick reading. Add oil as necessary, through filler hole until the oil level is indicated at the 'max' mark on the dipstick.

Access to the dipstick is gained by opening the engine housing: refer to page E 43.

DO NOT ATTEMPT TO FILL OR TOP-UP THE TRANSMISSION THROUGH THE DIPSTICK TUBE.



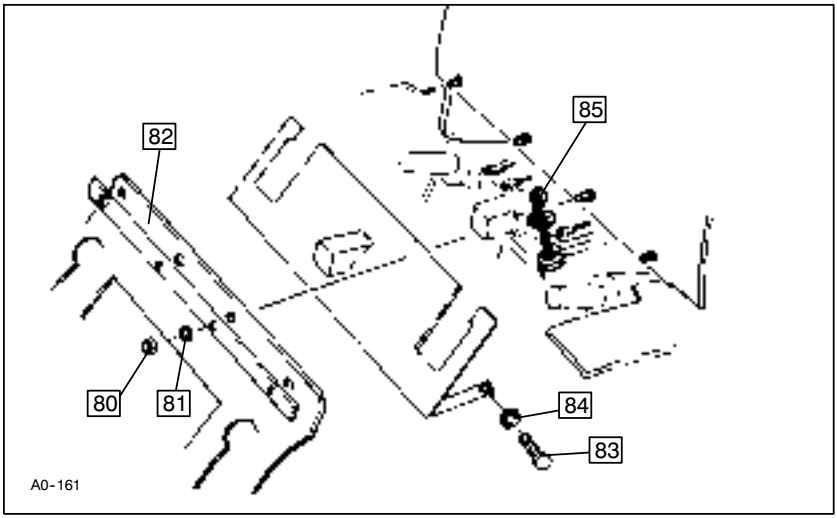
Item	Description	Item	Description
75	Filler Plug	78	Dipstick
76	Drain Plug	79	Running-in Filter
77	Filter - Screen		

11.11 Transmission unit - DFG/TFG 420-430

It is important to check the oil level correctly. The oil is a lubricant which also acts as a cooling medium and operates the clutches. Low oil level results in loss of transmission and loss of pressure. It also causes overheating and consequent transmission failure.

Checking the transmission oil level

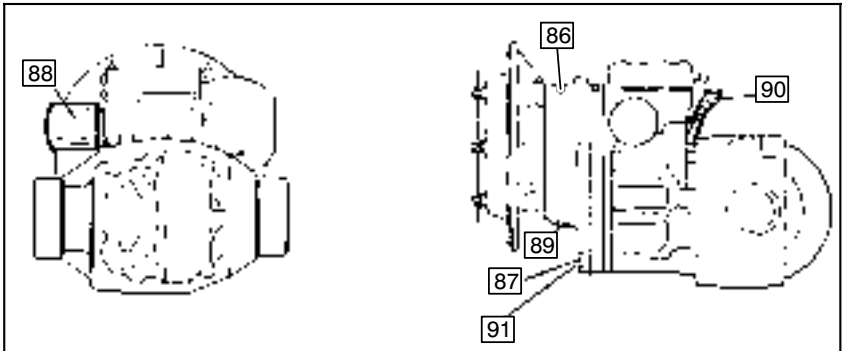
For topping up or filling the transmission, use only clean, fresh oil, handled in clean containers. If dirt or water is allowed to enter the transmission damage may ensue.



- Access to the transmission dipstick is between the mast and loadguard/cab. Remove the four nuts (80) and washers (81) retaining the rubber apron (82) in position.
- Remove the cover assembly by removing the bolt (83) and washer (84) located under each wheel arch. Lift cover assembly clear from the truck. Clean the surrounding area.

The rubber apron and cover assembly are not fitted on trucks operating in high ambient climates.

- Start the engine and, with parking brake applied, select forward and then reverse gear and allow the transmission to reach operating temperature.
- With the engine idling and neutral selected, remove dipstick (85).
- Wipe the dipstick with a lint free cloth and reinsert into the hole to its fullest extent.
- Again withdraw the dipstick and check for depth of oil between MIN and MAX marks.
- If below mid point, add the correct type of transmission oil to the transmission unit, through filler hole (86) until the oil level is indicated at the MAX mark on the dipstick.
- Replace the dipstick, cover and rubber apron.



Item	Description	Item	Description
86	Filler Plug	89	Drain Plug (P.T.O.)
87	Drain Plug	90	Dipstick
88	Filter	91	Filter Screen

11.12 Transmission unit - DFG/TFG 540-550

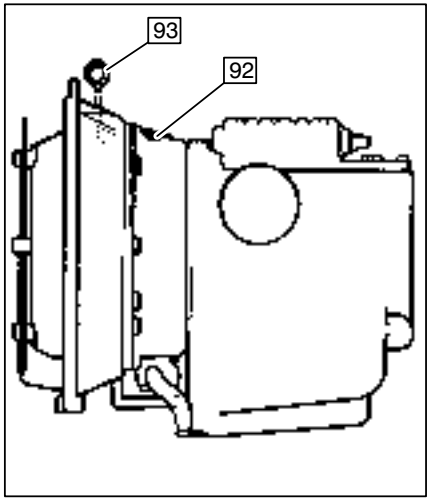
It is important to check the oil level correctly. The oil is a lubricant which also acts as a cooling medium and operates the clutches. Low oil level results in loss of transmission and loss of pressure. It also causes overheating and consequent transmission failure.

Checking the transmission oil level

For topping up or filling the transmission, use only clean, fresh oil, handled in clean containers. If dirt or water is allowed to enter the transmission damage may ensue.

The upper marks on the transmission dipstick indicate the oil level when engine is static and are only a guide for initial filling. The lower marks indicate the correct operating oil level with the engine running and transmission hot.

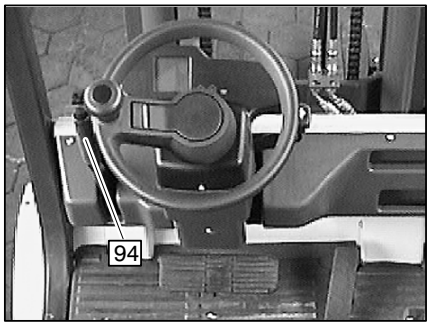
- Clean the area and remove the filler plug (92). Pour in a sufficient quantity of clean, fresh oil, through the filler orifice, to bring the level to between the upper ‘min’ and ‘max’ marks on the dipstick (93); ensure no dust or other matter enters the transmission.
- Refit filler plug (92) and dipstick (93) then start engine and, with parking brake applied, pass the gear selector through all positions and allow transmission to reach operating temperature.
- With engine idling and neutral selected, remove dipstick (93), wipe with lint free cloth and check dipstick reading. Add oil, as required, through the filler orifice until the required oil level is indicated at the lower ‘max’ mark on the dipstick.

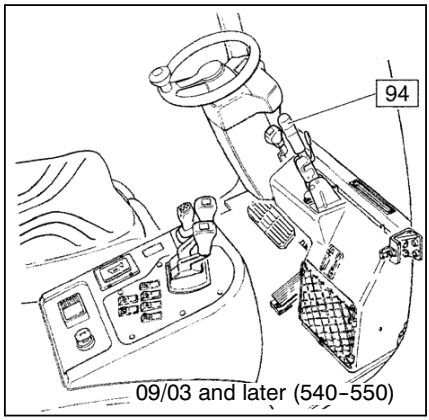


11.13 Brakes

Test Parking Brake

The parking brake (94) must hold the truck with the permitted maximum load on a slope of 15%. If this is not the case, the parking brake must be adjusted.





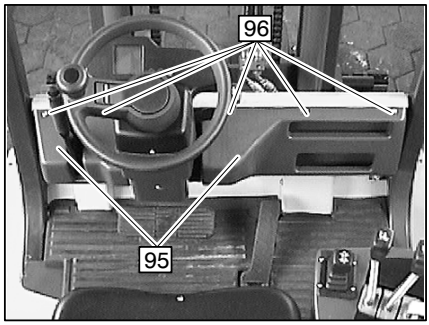
Checking the brake fluid level

- Remove panel retaining screws (96).
- Remove panel (95).

- Check the fluid level in the reservoir (97).

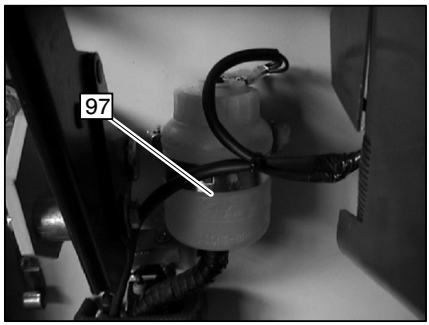
The reservoir must be ¾ full.

- Add brake fluid if necessary.



Fluid capacity

DFG/TFG 316/320:	**0,45 l**
DFG/TFG 420-430:	**0,50 l**
DFG/TFG 540-550:	**1,20 l**



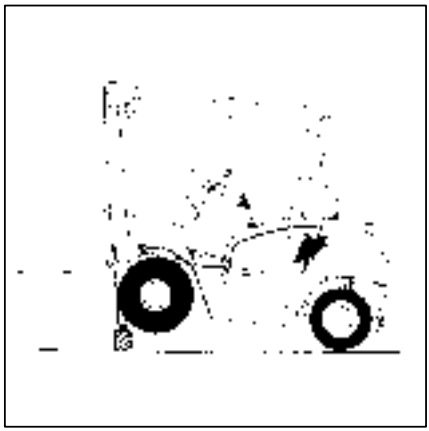
11.14 Change Wheels

On split rims with pneumatic tyres, never release the fixing bolts of the rim sections between the wheel nuts when the tyres are under pressure.

- Jack up the truck at the jacking points marked until the wheels are clear of the ground.
- Secure the truck by applying wooden blocks.
- Due to the high ground clearance of the 540-550 range of trucks, it may not be possible to raise the truck using a standard scissor jack, hence the following jacking procedure may be used:

- **Method one**

The front of the truck can be raised by placing blocks under the mast sections and then tilting the mast forward.

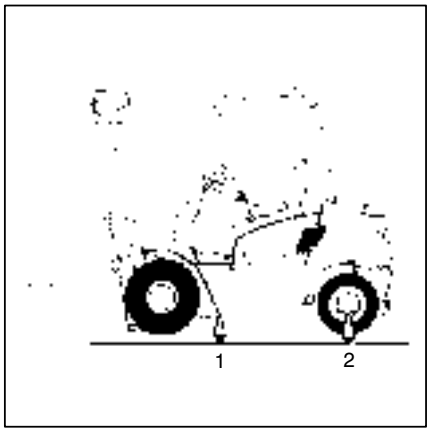


This method is not recommended when the truck hydraulic system is being worked on, unless the chassis is more securely supported.

- **Method two**

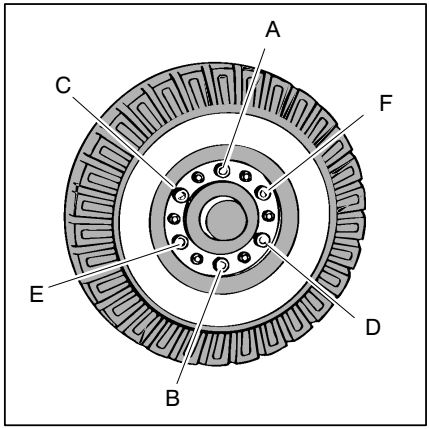
This method is recommended when the truck is fitted with under tray's. The jacking points are as follows:

- Jacking Point (1) is under the mud wing as close to the chassis side plate as possible.
- Jacking Point (2) is under the steer axle at the centre line of truck.



See Chapter C, Section 1.

- Unscrew wheel nuts.
- Remove wheels.
- Attach new wheels.
- Tighten wheel nuts by hand.
- Tighten wheel nuts in the sequence shown in the figure, starting at A, at reduced torque.
- Tighten wheel nuts in the same sequence to the prescribed torque.



Wheel nut torque

Drive wheels (316-430)	**235 Nm**
Drive wheels (540-550)	**520-620 Nm**
Rear wheels (316-430)	**176 Nm**
Rear wheels (540-550)	**500-520 Nm**

11.15 Hydraulic System

Change Hydraulic Oil Filter

- Open cover on hydraulic oil filter (98).
- Remove hydraulic oil filter and change.
- Insert hydraulic oil filter and re-attach cover.

Catch any escaping hydraulic oil. Dispose of hydraulic oil and filter correctly.

Clean/Change Hydraulic Tank Vent

- Unscrew the hydraulic tank vent (99) from the hydraulic oil filler nozzle.
- Clean the hydraulic tank vent.

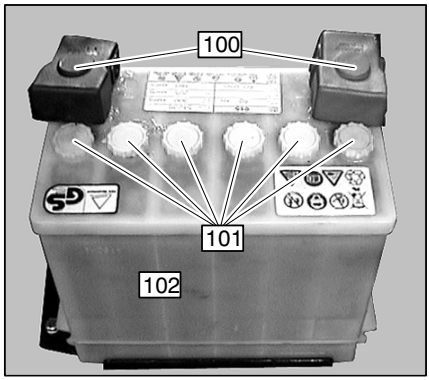
If the dirt cannot be removed by cleaning, change the hydraulic tank vent.

11.16 Electrical System

Check Battery Condition, Acid Level and Density

Battery acid is highly corrosive, so all contact with battery acid should be avoided. If battery acid comes into contact with clothing, skin or eyes, rinse affected parts immediately with water. If contact is made with the eyes, consult a doctor immediately. Neutralize the spilled battery acid immediately.

- Check battery housing (102) for cracks and leaking acid.
- Eliminate oxidation residue on the battery terminals (100).
- Grease battery terminals with acid-free grease.
- Test acid level.



The acid should be between the upper and lower marks.

- Unscrew plug caps (101).
- If necessary add distilled water to the upper mark.
- Test acid density with a hydrometer.

The acid density for an adequately charged battery is 1.24 to 1.28 kg/l.

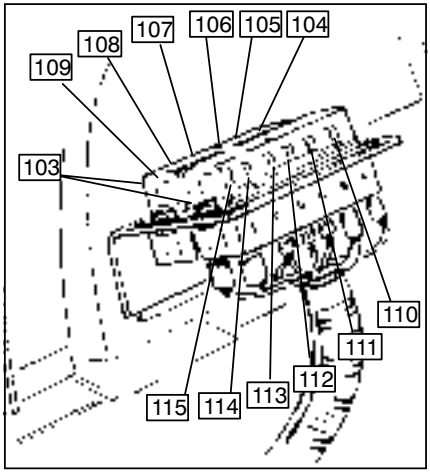
- Charge battery if necessary.
- Replace plug caps.

There is no need to test the acid level and density in low-maintenance batteries.

Checking the electric fuses

In the event of faults in the electric system check the fuses located under the engine housing.

- Open the engine housing and remove the fuse box cover (103).
- Check the fuses for damage and correct rating and replace, if necessary.
- Fit the cover.



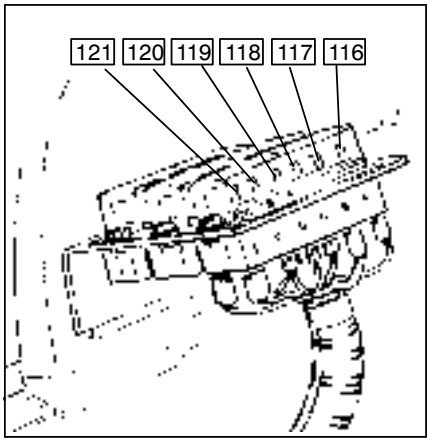
● **Standard fuse box (black)**

Pos.	Protection of:	Rating
104 (A)	Working lights	20 A
105 (B)	Gear shift, Beacon	10 A
106 (C)	Head lamps, brake lights, rear lights	20 A
107 (D)	Hour counter, computer instrument panel	20 A
108 (E)	Horn, ignition, rear working light	15 A
109 (F)	Hour counter and clock	15 A

○ **Options Fuse Box (red) - German Road Regulations**

Pos.	Protection of:	Rating
110 (A)	Flashers	15 A
111 (B)	Main Fuse. Fuse D&E, Rear Optional Spot & Hazard Lights	15 A
112 (C)	Head lights	15 A
113 (D)	Front Side & Rear Right Lights	5 A
114 (E)	Front Side & Rear Left Lights	5 A
115 (F)	Brake lights	5 A

○ **Options Fuse Box 3 (green) - Cab Only**



Pos.	Protection of:	Rating
116 (A)	Cab heater	15 A
117 (B)	Front wiper motor	15 A
118 (C)	Rear wiper	15 A
119 (D)	Rear washer motor	5 A
120 (E)	Roof wiper and washer	5 A
121 (F)	Screen heater	5 A

The electrical wiring diagram for the truck may be found in the relevant Spare Parts Catalogue or Repair Manual.

12 Exhaust System

The exhaust system should be inspected at periodic intervals for emissions. Black or blue exhaust smoke is an indication of emission deterioration and expert advice should be sought.

13 Decommissioning

Decommissioning of the truck may only be carried out by the manufacturer or trained manufacturer representative.

General

Decommissioning – work carried out by the competent engineer to prepare the truck for transportation.

Lifting equipment required

Chains and shackles capable of handling the weight of the truck – refer to specification sheet for weight of truck.

Crane or hoist capable of handling the weight of the truck – refer to specification sheet for weight of truck.

Dismantling of truck

Dismantling/decommissioning of the truck must only be carried out by competent engineer, however, for information purposes the dismantling procedures is as follows:–

- Drain truck of diesel fuel, if applicable.
- Drain truck of hydraulic oil into a suitable container.
- Remove L.P. Gas bottles, if applicable.
- Remove accessories e.g. fixed lights etc.
- Remove mast from truck.
- Remove tilt cylinders from truck.
- Crate truck subassemblies.

During decommissioning, care must be observed to ensure components removed from the frontlift truck are protected against contamination for example:

- Clean all components, connections and surrounding area before removal.
- Upon component removal, blank all open connections.

14 Inspection

General

In order to ensure safe operation of the truck, its safe working and operational condition shall be maintained. It is therefore necessary to monitor the truck by means of inspections and tests. The inspections and tests shall be arranged by the user and performed by persons as specified in “Definitions of inspectors”.

Evidence of testing is to be recorded in a truck log book.

It is required of the Inspector that the tests be conducted objectively and the issue or non-issue of a test certificate is not influenced by operational or administrative considerations.

Adjustments or repairs as may be required, must be carried out immediately.

Accident Prevention Regulations are Statutory Regulations which are legally binding on the contractor (i.e. truck operator). Non-compliance may be in breach of civil and criminal law.

Definitions of inspectors

Routine inspector: A person with a working knowledge of the specific truck sufficient to identify obvious defects.

Experienced technician: Person who, due to his vocational background and experience, has sufficient knowledge in the specific truck type and is sufficiently familiar with the relevant regulations to determine deviations from the proper condition (specially trained Persons).

Expert engineer: Engineer with adequate knowledge in the design, construction and maintenance of the specific truck type as well as relevant regulations and standards and is in a position to judge the safe order to ensure further safe operation.

First inspection and inspection after major repairs or changes

Before a new or extensively repaired or changed truck is put into operation it has to be inspected and tested. This inspection which includes a check of the documentation, consists of a visual examination and a verification of the functions and effectiveness.

The inspection and testing includes:

- check of the identification of the truck, including labelling;
- check of the components and equipment with reference to damage, corrosions or any other defects;
- functional test of mechanisms;
- check of safety equipment, clearances, absence of jamming risks etc.;
- test loading, either with rated capacity or actual capacity in accordance with relevant national legal requirements;
- attachments.

Inspection prior to operation

Prior to operation, the truck shall be checked by a routine inspector. In general, this inspection is a functional test of the truck, a visual inspection for obvious defects and the inspection of all attachments.

14.1 Safety checks to be performed at regular intervals and following any untoward incidents (D: Accident prevention check according to BGV D27)

At least once yearly, or after any untoward incident, the forklift truck has to be checked by a qualified inspector. The inspector must assess the condition of the truck from a standpoint purely concerned with safety aspects, uninfluenced by any company or economic circumstances. The inspector must be adequately informed and experienced to be able to assess the condition of the forklift truck and the effectiveness of the safety installations based on the technical rules and principles governing the inspection of forklift trucks.

The inspection must comprise a comprehensive check of the technical condition of the forklift truck with regard to accident prevention aspects. Apart from this, the forklift truck must be thoroughly inspected for damage possibly caused by incorrect use of the forklift truck. The inspection results must be recorded in an inspection report which has to be kept available for a period spanning at least the next two inspection intervals.

The user has to ensure that all defects are eliminated without delay.

The manufacturer has set up a special safety service with specially qualified staff. As visual proof that the forklift truck has passed the safety inspection, a plaque will be affixed to it. This plaque indicates in which month of which year the next test will be due.

Example for D:

Results of inspections

The results of the regular inspections shall be recorded by the personnel carrying out the inspection.

Reports by experienced technicians shall detail what was observed. Reports by expert engineers shall contain the conclusions drawn from his observations.

If during an inspection, any fault, wear or damage is observed that can cause a safety hazard, effective measures for correction shall be taken before the truck is placed into operation again.

A scheduled preventative maintenance, lubrication and inspection procedure should be followed. Those records determined to be necessary (or required by national authority) shall be maintained.

15 Storage

Long term storage of trucks

General

In the event of the truck(s) being stored for four weeks or more, preservatives should be applied. All preservatives to be applied by spray or aerosol to ensure maximum cover.

Before protection processes are carried out, it is important to ensure that the following precautions have been undertaken:

- Any damage by way of marks, scratches etc., on fully painted trucks, attachments etc., must be touched in.
- Unpainted components to have the area to be protected free from rust, scale, weld slag, paint and moisture.
- Areas for treatment will be exposed to give maximum possible access for preservative.

Preservatives.

Categories of Protection.

Individual components or areas will need to be protected by different preparations. The categories below, list a general use for particular preparations.

Category A: Basic rust protection of components that will have some movement during the period of storage or shipment.

Category B: Basic electrical equipment, connections etc.

Category C: For use on areas or components that remain in a static condition for storage and shipment.

Recommended Preservative (chemical family)	Category
A waxy solvent deposited film that will displace moisture and perform as a “non-fling” lubricant	A
A protective lubricating film which is non-conductive and remains operational even at severe sub-zero temperatures	B
A solvent deposited, water displacing, wax film corrosion preventative	C

Preparing Trucks for Storage.

Mast Assembly.

- Fully lower mast.
- Spray the following components using category A preservatives:
- Chain, chain anchors, chain rollers, mast mounting pins, free lift slide, exposed lift cylinder rod, roller track inside mast and fork pins.

Steer Axle Assembly.

- Spray the following components using category A preservatives.
- Exposed cylinder rod, connecting link pins and bearings, wheel nuts.
- Ensure all grease nipples are fully greased, e.g. king pins, hubs etc., using a grease gun.

Drive Axle Assembly.

- Ensure protective caps are fitted over brake nipples.
- Spray the following components using category A preservatives.
- Parking brake connecting linkage, wheel nuts, all keyte eye end assemblies, chassis tilt cylinders.

Controls and Linkages.

- Spray the following components using category A preservatives:
- Hydraulic control valve operating linkage and shaft, exposed tops of valve spools, gear change linkage and pivot points, footbrake shaft and linkages, accelerator pivot and linkages, stop cable linkages, brake cable and accelerator inner cable exposed ends. Flexible control cable ends.

Electrical.

- Disconnect the battery and liberally coat battery terminals with petroleum jelly.
- Spray the following components using category B preservatives:
- All exposed bare metal on alternator, alternator terminals, starter motor terminals, horn terminals, vacuum switch terminals, console terminals and connectors on underside of bonnet. Microswitches. Auxiliary electrics such as stop/tail spot and floodlights etc. All connectors, control panel.

Seat and instrument panel.

- Spray seat runners and mechanism using category A preservatives.
- Cover seat and instrument panel in polythene and securely tape up with adhesive tape: key to be left exposed.

Exhaust.

- Touch up silencer and exhaust pipe with black heat resistant paint.

Cab.

- Spray, with category A preservatives, door catches, door hinges, and door slider mechanism.
- Spray, with category B preservatives, the windscreen wiper motor and terminals.

Miscellaneous.

- Spray, using category A preservatives, bonnet hinge pins, bonnet catches, and truck data plate.

Tyres.

- Support truck on stands to prevent localised tyre damage.

Use of the truck after a long inoperative period.

- Remove, where fitted, protective caps, polythene, etc., used to prepare truck(s) for storage.
- Before starting up the truck the driver must satisfy himself that it is good working order.

Short term storage of trucks

Short term storage in dry conditions does not require any special actions.

Protection of a engine not in service

General.

Short Term Storage.

- Up to seven days – no action is necessary.
- Up to three months – each week, run the engine until normal operating temperature is reached. If the engine cannot be run, turn the crankshaft by hand a minimum of three revolutions.

Long Term Storage.

The recommendations given below are to ensure that damage is prevented when an engine is removed from service for an extended period (three months or more). Use these procedures immediately the engine is removed from service. The instructions for the use of POWERPART products are given on the outside of each container. POWERPART products, or its equivalents, may be obtained from your nearest dealer or distributor.

Instructions.

- Thoroughly clean the outside of the engine.
- Where a preservative fuel is to be used, drain the fuel system and fill with the preservative fuel. POWERPART Lay-Up 1 can be added to the normal fuel to change it to a preservative fuel. If preservative fuel is not used, the system can be kept charge with normal fuel but this will have to be drained and discarded at the end of the storage period together with the fuel filter.
- Run the engine until it is warm. Correct any fuel, lubricating oil or air leakage. Stop the engine and drain the lubricating oil sump.
- Renew the lubricating oil filter canister.
- Fill the sump to the full mark on the dipstick with clean new lubricating oil or with a correct preservative fluid. POWERPART Lay-Up 2 can be added to the lubricating oil to give protection against corrosion during the period in storage. If a preservative fluid is used, this must be drained and normal lubricating oil used when the engine is returned to service.
- Drain the cooling system. To give protection against corrosion, it is better to fill the cooling system with a coolant that has a corrosion inhibitor. If frost protection is needed, use an antifreeze mixture. If no frost protection is needed, use water with an approved corrosion inhibitor mixture.
- Run the engine for a short period to send the lubricating oil and coolant around the engine.
- Clean out the engine breather pipe and seal the end of the pipe.
- Remove the atomisers and spray POWERPART Lay-Up 2 into each cylinder bore. If this is not available, clean engine lubricating oil will give a degree of protection.

Spray into the cylinder bores 140ml (¼ pint) of lubricating oil divided evenly between the cylinders.

- Slowly turn the crankshaft one revolution and then install the atomisers complete with new seat washers.
- Remove the air filter and any pipe installed between the air filter and induction manifold. Spray POWERPART Lay-Up 2 into the induction manifold. Seal the manifold with waterproof tape.
- Remove the exhaust pipe. Spray POWERPART Lay-Up 2 into the exhaust manifold. Seal the manifold with waterproof tape.
- Remove the lubricating oil filler cap. Spray POWERPART Lay-Up 2 around the rocker shaft assembly. Fit the filler cap.
- Disconnect the battery and put it into safe storage in a fully charge condition. Before the battery is put into storage, give the battery terminals a protection against corrosion. POWERPART Lay-Up 3 can be used on the terminals.
- Seal the vent pipe of the fuel tank or the fuel filler cap with waterproof tape.
- Remove the fan belt and put it into storage.
- To prevent corrosion, spray the engine with POWERPART Lay-Up 3. Do not spray inside the alternator cooling fan area.

Before the engine is started after a period in storage, operate the starter motor with the engine stop control in the 'off' position until oil pressure shows on the oil pressure gauge or the oil warning light goes out. If a solenoid stop control is used, this will have to be disconnected for this operation.

- Affix a label in a prominent position on the engine stating the dates on which the engine was inhibited and will require re-inhibiting.

If the engine is to remain in storage for more than one year, the above procedure must be carried out at the end of each twelve month period.

Composition / chemical family of Powerpart products	
Lay-up 1	Comprises a blend of corrosion inhibitors, non-ionic emulsifiers and highly refined mineral oils
Lay-up 2	Comprises a blend of corrosion inhibitors in mineral oil. The mineral oil is a severely hydrotreated napthenic oil from which polynuclear aromatic hydrocarbons have been removed
Lay-up 3	A solvent deposited, water displacing, wax film corrosion preventative

Reinstating the truck

- Check that all water-proof tape, wrappings and sealing blanks have been removed.
- If the engine has been stored or laid-up for a period exceeding one month, the fuel injection pump, governor and turbocharger (if fitted) must be primed with clean engine oil. Clean atomisers of preservative oil.
- Where a preservative fuel has been used, drain the fuel system and fill with the correct grade of fuel. Bleed the fuel system of air.
- Before starting up the truck the driver must satisfy himself that it is in good working order, and safety devices are checked to ensure their operation.

16 Disposal

Disposal of the truck may only be carried out by the manufacturer or trained manufacturer representative.

Prior to flame cutting the truck for disposal, the following precautions are to be adhered to:

- Remove batteries from truck as these can become explosive.
- Drain diesel fuel into a suitable container: remove diesel tank from truck. Remove L.P. Gas bottles if applicable.
- Drain hydraulic oil into a suitable container.
- Ensure a fire extinguisher is on hand.
- DO NOT flame cut truck components that are under tension as these could “spring out”.
- Support the truck whilst flame cutting.
- Remove, or tie back, hydraulic hoses and electrical cables from areas where flame cutting is to be applied.

Dispose of waste material and consumables in a safe and responsible manner. Advice on waste disposal can be obtained from your nearest Health and Safety Executive or licensed waste disposal company.

Appendix for Diesel Engine Exhaust Gas Filter - STX Type

1 Introduction

The STX Diesel soot filter unit provides effective removal of particle matter from Diesel exhaust.

The filter functions through effective trapping of soot particles within a series of ceramic fibre wound cartridges, contained inside a stainless steel canister.

An “On Board” Electronic Control Unit (ECU) monitors the build up of soot within the filter unit. After a period of 6–10 operating hours it will indicate by both visual and audible methods that the filter requires cleaning (regeneration).

The visual signal comprises a dash mounted red warning light. This is the first level of alarm. This indicates that the soot filter should be cleaned if it convenient to do so.

The second level of alarm is an audible sounder (98 dbA) which must not be ignored under any circumstances. At this alarm level the soot filter **MUST** be regenerated.

Failure to regenerate the filter at the second level alarm **WILL INVALIDATE** all warranty for the system.

The cleaning, or regeneration process is effected through the use of a wall mounted Regeneration Power Unit. This unit provides both the heat and air required for effective regeneration of the soot filter. The regeneration process will only take 14 minutes to complete.

The STX soot filter is a unique product in that it can be regenerated at any time to suit the operation of the truck. Should it be convenient the filter can be regenerated at the start or end of every working shift, irrespective of whether the filter is empty, part or totally full. More frequent regeneration will **NOT** damage the unit.

2 Regeneration

Regenerate the STX soot filter as follows:

- After 6–10 hours of engine operation since the last regeneration the red light on the dash panel will illuminate.
- Finish the job in hand, but **DO NOT DELAY**. If the RED light is ignored the audible alarm will sound.
- Drive to the Regeneration Power Unit (RPU).
- Park the truck safely within reach of the harnesses (Figure 1) and remove the ignition key.

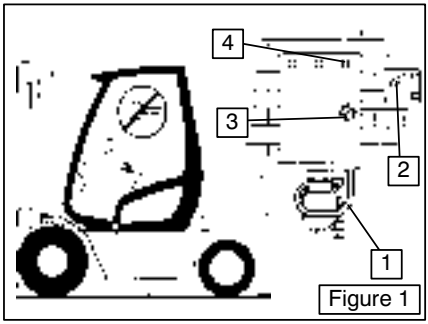


Figure 1

- Remove the dust cap, connect the air hose from the RPU. Secure the levers.

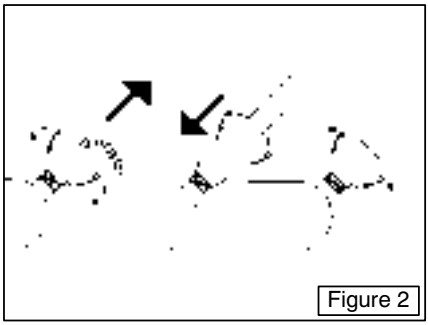


Figure 2

- Connect the electrical harnesses – pushing the grey connectors securely together.
- Turn the mains supply (2 Figure 1) to ON.
- Turn the RPU power supply switch (3 Figure 1) to ON.

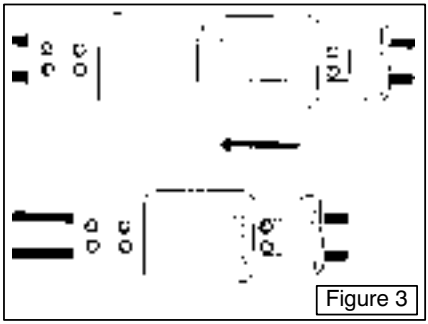


Figure 3

- The green “power” light on the RPU (4 Figure 1) will be illuminated, and the green dash light will flash. This indicates that the STX unit is ready for regeneration.
- Depress the start button on the truck dash panel.

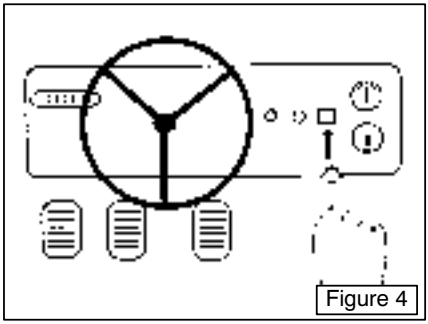


Figure 4

- The regeneration process will now take place. It will take 14 minutes to complete.
- During the regeneration process, “Power” and “Regen” lights on the RPU will illuminate and both the green and red dash panel mounted lights will flash.

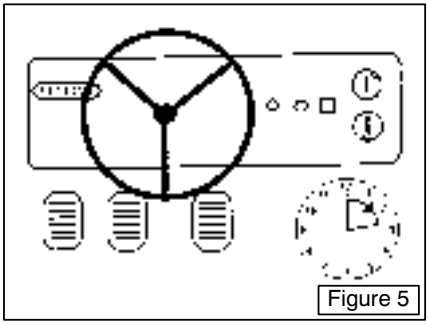


Figure 5

- When the regeneration process is complete, only the green dash panel light and RPU power light will be illuminated.

DO NOT DRIVE AWAY FROM THE RPU.

- Turn the RPU power supply switch (3 Figure 1) to OFF.
- Turn the mains power supply switch (2 Figure 1) to OFF.

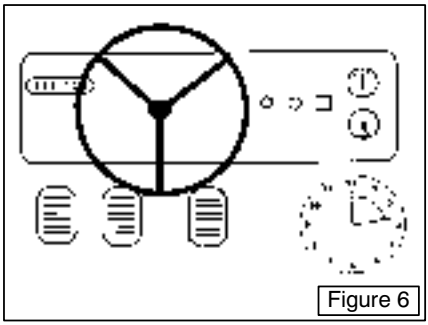


Figure 6

- Disconnect the grey power harness connection.

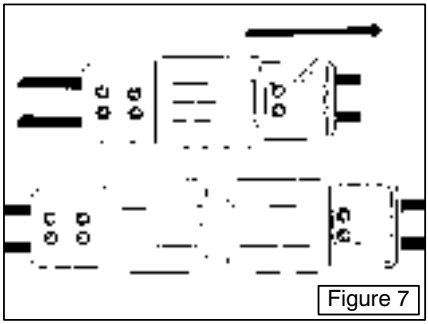


Figure 7

- Disconnect the air hose connection and replace the dustcap.

IT IS VITAL THAT THE DUSTCAP IS REPLACED FOR OPERATION OF THE STX SOOT FILTER.

- Return the air hose and power harness to the RPU bracket.
- The truck is now ready for work.

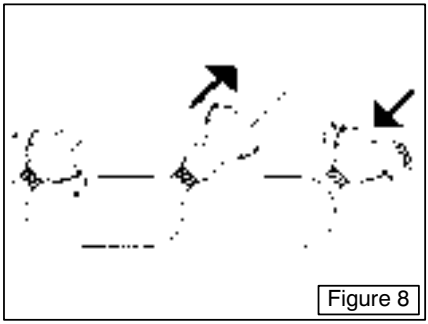


Figure 8