

# SCANIA

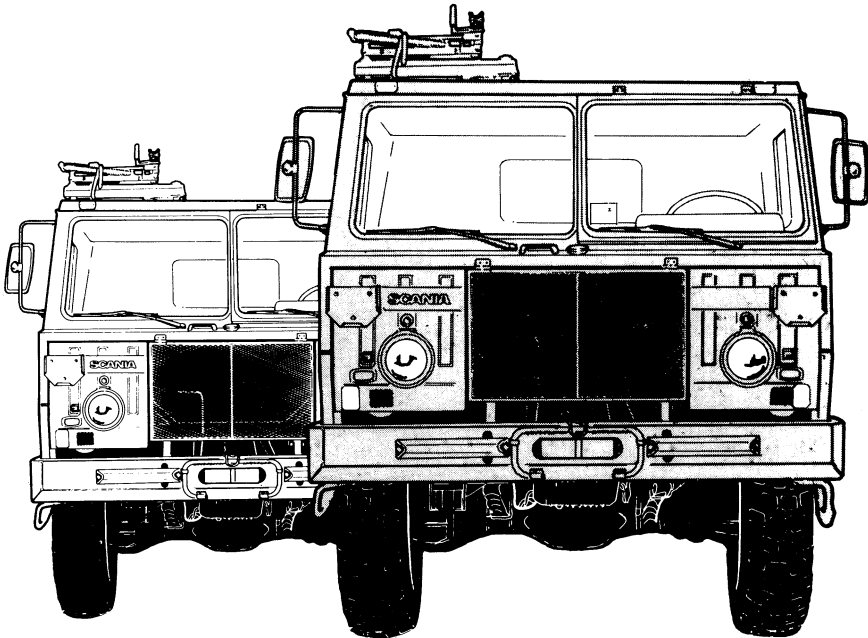
## Cross-Country Truck SBAT 111S 6×6

Operator's manual

**N** EDITION 3170 EN SEPTEMBER 1990  
corrected and updated

**E** PREVIOUS EDITIONS  
(3170, blue and 3170 EN 1987, red)

**W** MUST NOT BE USED



# SCANIA

## SBAT111S 6x6

## SBA111 4x4

### OPERATOR'S MANUAL

#### SBAT111S 6x6

Special

Bulldog

All-wheel-drive

Tandem

11 engine swept volume  
dm<sup>3</sup> (litres)

1 variant

S supercharged (turbo)

6x6 wheel configuration



#### SBA111 4x4

As above but with two axles and naturally aspirated engine.

0:381

## PREFACE

This operator's manual primarily describes the SBAT111S 6x6, its operation and maintenance. The SBA111 4x4 is mainly similar and is only dealt with in general terms.

Södertälje, Sweden, August 1987

**SCANIA**

Marketing Sector  
Service

## ENTER HERE

Chassis type SBAT111S 6x6	No. ....	The plate is located on the B post on the RH side. The number is also stamped on the RH frame member, just behind the front axle.
Engine type DS11 39	No. ....	Located on the RH side of the engine.
Gearbox type GA763	No. ....	Located on top of the gearbox.

## UNITS OF MEASUREMENT

Since 1973, Scania has gradually changed to the international SI system for units of measurement (Système International d'Unités). During a transitional period, some units previously used are given in brackets after the SI units. The following are affected in the manual:

*Power* is given in kilowatt (kW) instead of horsepower (hp).

1 kW = 1.36 hp (metric) = 1.34 hp (UK, US).

*Force* is given in newton (N) instead of kilopond (kp), kilogramme-force (kgf) or pound-force (lbf).

10 N = 1 kp = 1 kgf = 2.25 lbf.

Note that technically, according to the definition: 1 kp = 9.81 N or 10 N = 1.02 kp = 1.02 kgf. In practice, the values used will be 10 N = 1 kp = 1 kgf, which will be found below and in this manual.

*Weight* is given in kilogram (kg).

1 kg = 2.25 lb, 1 000 kg = 1 tonne (metric).

*Torque* is given in newton metre (Nm) instead of kilopond-metre (kpm), kilogramme-force metre (kgf.m) or pound-force foot (lbf.ft).

10 Nm = 1 kpm = 1 kgf.m = 7.23 lbf.ft.

*Volume* is given in cubic decimetre (dm<sup>3</sup>) instead of litre or gallon.

1 dm<sup>3</sup> = 1 litre = 0.220 gal (UK) = 0.264 gal (US).

*Pressure* is mainly given in bar instead of pascal (Pa), kilopond per square centimetre (kp/cm<sup>2</sup>), kilogramme-force per square centimetre (kgf/cm<sup>2</sup>) or pound-force per square inch (lbf/in<sup>2</sup> or p.s.i.).

100 000 Pa = 100 kPa = 1 bar = 1 kp/cm<sup>2</sup> = 1 kgf/cm<sup>2</sup> = 14.5 p.s.i.

# CONTENTS

<b>General</b> .....	4	During driving .....	89
<b>Technical specifications</b> .....	5	After driving .....	90
Dimensional drawings .....	5	Starting the engine .....	91
Weights, kg .....	6	Warming up the engine .....	95
Crew capacity .....	6	Stopping the engine .....	95
Fluid capacities, dm <sup>3</sup> .....	6	Driving .....	96
Oil capacities, dm <sup>3</sup> .....	6	Driving at high altitudes .....	99
General performance .....	7	Braking .....	100
Engine .....	7	Towing .....	102
Injection system .....	7	Changing a wheel .....	104
Electrical system .....	8	Tilting the cab .....	106
Power transmission system .....	9	Opening the	
Brake system .....	10	hinged windscreen .....	108
Steering system .....	10	Using the support for	
Winch (towing vehicles) .....	10	the tailgate .....	109
Loading crane 59 kNm .....	11	Tow hitch (Ringfeder 663) .....	110
Loading crane 15 kNm .....	12	Using the winch	
Wheels .....	13	(towing vehicles) .....	111
Tow hitch .....	13	Operation of loading crane	
<b>Type and notice plates</b> .....	14	59 kNm (5900 kgf m) .....	118
<b>Description</b> .....	20	Operation of loading crane	
Instruments, switches,		15 kNm (1500 kgf m) .....	126
warning lights, controls .....	20	General driving hints .....	131
Explanations .....	22	<b>Maintenance</b> .....	132
Engine .....	34	Running-in maintenance .....	132
Lubrication system .....	36	Periodic maintenance .....	133
Fuel system .....	38	Monthly or every 5000 km .....	134
Intake and exhaust systems .....	40	Lubrication maintenance .....	136
Cooling system .....	42	Additional points .....	136
Electrical system .....	43	Annually or every 10 000 km .....	137
Power transmission system .....	51	Lubricants .....	140
Power take-offs .....	58	Lubrication chart and instruc-	
Brake system .....	59	tions, loading cranes .....	141
Steering system .....	62	Lubrication chart and	
Frame .....	64	instructions, chassi .....	142
Springs .....	64	Maintenance instructions,	
Wheels .....	65	vehicle .....	143
Driver's cab .....	65	Maintenance instructions,	
Platform .....	71	winch .....	167
Winch (towing vehicles) .....	72	Maintenance loading cranes .....	169
Tow hitch .....	73	<b>Checks and adjustments</b> .....	175
Loading cranes .....	74	Brake system .....	175
Tools and spareparts .....	76	Wheels and tyres .....	177
Accessories .....	77	Electrical system .....	177
<b>Operation</b> .....	81	Winch (towing vehicles) .....	182
Running-in .....	81	Simple fault tracing .....	183
Checks before driving,		Loading crane 59 kNm .....	188
Daily maintenance .....	82	Loading crane 15 kNm .....	188

## GENERAL

The Scania SBAT111S 6x6 is a 3-axle cross-country vehicle intended for material and crew transport, as well as being a suitable towing vehicle for artillery guns or other trailer, on or off the road.

The Scania SBA111 4x4 is a 2-axle version with a naturally aspirated engine.

For cold-weather starting, the vehicle may be equipped with an electrically heated, insulated battery box, engine heater, intake air preheater, fuel preheater, jump start connection and jump starting cables.

The vehicle has all-wheel-drive with compressed-air operated differential locks on all axles. Front-wheel-drive is engaged automatically with the terrain (cross-country or low) gear, but can also be engaged manually in road (high) gear, an advantage on slippery ground.

The gearbox is fully automatic, consisting of an electro-hydraulically controlled main section and an electro-pneumatically controlled transfer box with one or two power take-offs.

At the side of the towing vehicles there is a power winch for winching forward or rearward. The other vehicles are prepared for retrofitting of a winch.

The full-air brakes are split into two circuits, a separate trailer brake and a winch brake. There is also a special terrain brake function.

The power steering has a hydraulic steering gear and a mechanical wheel lock indicator.

By means of a hydraulic cab tilting device, the cab can be tilted for maintenance and repairs.

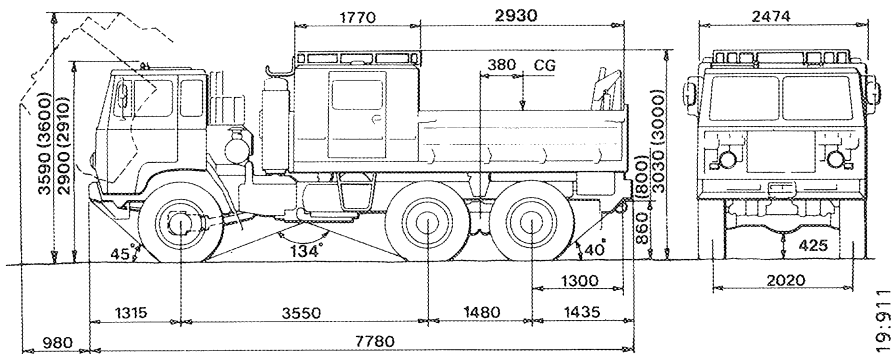
The platform is fixed at four points and can be lifted off. Load securing hooks are provided in the floor for the transport of unitary loads. The platform is equipped with a lifting jib for the spare wheel and ready for fitting a tarpaulin cover.

The towing vehicle has a demountable, isolated crew cab that can seat 10.

On the platform of the towing vehicle a 15 kNm electro-hydraulically controlled loading crane is fitted. Some ammunition trucks may have a 59 kNm crane between the cab and the platform, hydraulically operated from a power take-off on the transfer box.

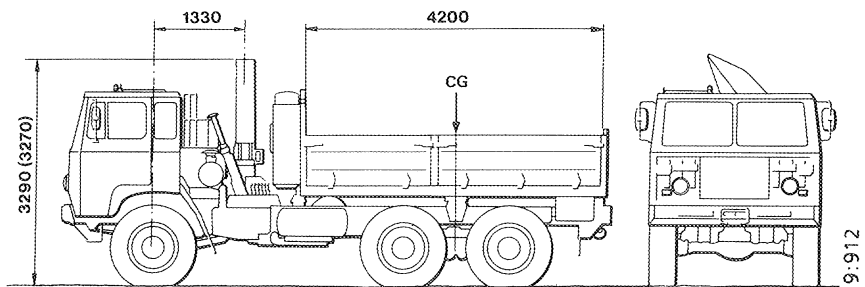
# TECHNICAL SPECIFICATIONS, SBAT111S 6x6

## Dimensional drawings



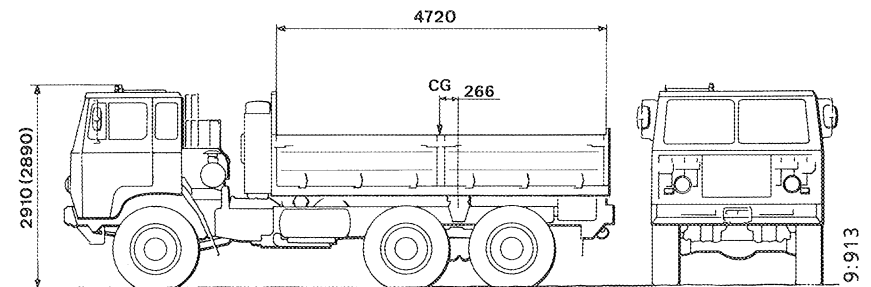
19:911

Towing vehicle SBAT 111 S 6x6  
crew cabin, loading crane 15 kNm (1500 kgf m) winch 100 kN (10 tonnes)



19:912

Ammunition vehicle SBAT 111 S 6x6  
loading crane 59 kNm (5900 kgf m) without winch



19:913

Ammunition vehicle SBAT 111 S 6x6  
without loading crane, without winch

## Weights, (kg)

	<i>Towing vehicle with crew cab, winch and 15 kNm loading crane</i>	<i>Ammunition truck with 59 kNm loading crane</i>	<i>Ammunition truck</i>
<i>At kerb weight:</i>			
Front axle weight .....	5200	5830	5070
Bogie weight .....	5800	5520	5180
Vehicle weight with platform .....	11000	11350	10250
<i>Max. permitted load (* below included)</i>	8000	7650	8750
<i>Gross vehicle weight</i> .....	19000	19000	19000
<i>Max. axle weight:</i>			
Front axle .....	5900	5900	5900
Bogie .....	13200	13200	13200
<i>*Max. permissible vertical load on tow hitch</i> .....	1040	1040	1040
<i>Max. permissible trailer weight:</i>			
terrain, 1-axle trailer .....	12000	12000	12000
on-road, multi-axle trailer ..	30000	30000	30000
<i>Approximate platform weight including loose equipment and spare wheel</i> ..	1775	1475	1675
<i>*Crew cab weight</i> .....	500	-	-
<i>*Crew weight (estimated) with personal equipment</i> .....	1000	-	-

## Crew capacity

Truck cab .....	1 + 2
Crew cab on platform .....	10

## Fluid capacities, dm<sup>3</sup> (litres)

Fuel tank .....	260
Cooling system with heater circuit .....	50 (55 with crew cab)
Container for windscreen washer .....	7

## Oil capacities, dm<sup>3</sup> (litres)

Engine .....	21
Power steering .....	3.8 (2.5 when changing)
Gearbox .....	36 (32 when changing)
Hub reduction gear .....	0.6 (0.4 when changing)
Axle gear (front and rear) .....	4
Winch, worm gear .....	3.5
Winch, jaw coupling .....	0.2
Cab tilting equipment .....	0.7
Loading crane, 59 kNm .....	45
Loading crane, 15 kNm .....	10
Oil recommendations .....	See Lubricants, page 140

## General performance

Gradeability, min. ....	60 % (31°) ( $\mu$ above 0.6)
Gradeability with trailer at G.T.W., min. ....	28 % (16°)
Practical overturning angle, sideways, unladen, static, min. ....	70 % (35°) ( $\mu$ above 0.7)
Max. permitted fording depth ....	800 mm
Turning circle diameter (outer front wheel) ...	20.6 m
Max. speed with gear selector in 2 ....	approx. 30 km/h
Max. speed with gear selector in D ....	approx. 85 km/h

## Engine

6-cylinder direct-injection diesel engine.

Make and type ....	Scania DS11 39
Bore ....	127 mm
Stroke ....	145 mm
Swept volume ....	11 dm <sup>3</sup>
Max. full-load speed ....	2 200 r/min
Output at max. full-load speed as per ISO 2534	224 kW (305 hp)
Max. torque at 1 300 r/min as per ISO 2534 ...	1 187 Nm (119 kgf m)
Compression ratio ....	16:1
Firing order ....	1-5-3-6-2-4
Valve clearances, cold engine	
intake ....	0.45 mm
exhaust ....	0.80 mm
Direction of rotation seen from the front ....	Clockwise
Fuel ....	Diesel fuel
Oil recommendations ....	See Lubricants, page 140

## Injection system

Injection pump with centrifugal governor, make and type ....	Bosch PE6P 110A 720RS 3040 t
Pump setting, before T.D.C. ....	19°
Low idling speed ....	550-600 r/min
High idling speed ....	2 550 r/min
Injectors, make and type ....	Bosch DLLA 150 S916
Turbocharger, make and type ....	Holset 4LGK/295/3.25 T3



## Electrical system

System voltage .....	24 V
Number of batteries .....	2
Battery voltage .....	12 V
Battery capacity .....	152 Ah
Earthing .....	Negative pole
Fuses .....	8 A
Alternator, make and type .....	Bosch 0120 469 643 N1 28 V 10/55 A
max. current at idling/full engine speed .....	10/55 A
max. output .....	1540 W
Regulator (built-in) voltage setting .....	27.6-28.4 V at 10 A current
Starter motor	
make and type .....	Bosch 0001 417 042 KB/24 V
output .....	6.6 kW (9 hp)

Bulbs	Power	Socket	Number of bulbs
Headlights .....	75/70 W	P43t	2
Parking lights, (front) .....	4 W	BA9s	2
Tail lights .....	10 W	BA15s	2
Stop lights .....	21 W	BA15s	2
Riding lights, front edge of cab .....	5 W	SV8.5	2
Direction indicators .....	21 W	BA15s	6
Interior lighting in cab .....	15 W	SV8.5	1
Map-reading lamp .....	5 W	SV8.5	1
Instrument lighting .....	2 W	W2.1 x 9.5d	4
Reversing light .....	25 W	BA15s	1
Blackout lighting, front .....	15 W	SV8.5	2
Blackout lighting, riding lights, rear .....	3 W	SV5.5	2
Blackout lighting, stop lights .....	3 W	SV5.5	2
Warning lights,			
central warning .....	2 W	W2.1x9 5d	1
engine oil pressure .....			1
charge .....			1
brake pressure .....			1
full beam .....			1
truck direction indicators .....			1
trailer direction indicators .....			1
gearbox oil temperature .....			1
coolant temperature .....			1
reversing light .....			1

	Power	Socket	Number of bulbs
parking brake .....	2 W	BA9s	1
interlock valve .....			1
drive wheel disengagement .....			1
differential lock, rear axles .....			1
differential lock, front axle .....			1
front-wheel-drive .....			1
power take-off, winch .....			1
power take-off, crane, 59 kNm .....			1

## Power transmission system

Fully automatic gearbox, with transfer box for all-wheel-drive and terrain (cross-country) gearing. Fully electro/hydraulically controlled main gearbox with manual, electro-pneumatically controlled transfer box.

Make and type designation .....	Scania GA763
Gearing, gearbox ratio	
hydraulic 1st .....	H1 6.3:1
hydraulic 2nd .....	H2 3.6:1
hydraulic 3rd .....	H3 2.5:1
mechanical 1st .....	M1 1.67:1
mechanical 2nd .....	M2 0.94:1
mechanical 3rd .....	M3 0.66:1
hydraulic reverse .....	R 6.3:1
The hydraulic gear ratios are dependent on the output and input torques.	
Gear ratios, transfer box	
road gear .....	1.60:1
terrain gear .....	2.42:1
Hydraulic oil type .....	See Lubricants, page 140.
Central gears, type designation	
front axle .....	RP620
rearmost rear axle .....	RP620
front rear axle .....	RBP620
ratio .....	1.353:1
Hub reduction, type	Planetary gear
ratio .....	4.125:1
Axles, type designations	
front axle .....	AMD78
rearmost rear axle .....	AD78
front rear axle .....	AD78
Transmission oil, type .....	See Lubricants, page 140.

Winch power take-off, EGA763, type .....	Electro-pneumatically controlled jaw coupling
speed .....	Approx. 0.7 x engine speed at moderate power (1 <sup>st</sup> Hydraulic gear selector in D)
permissible power .....	Engine output
direction of rotation .....	Anti-clockwise viewed from the front
Crane power take-off, EGA760	
type .....	Electro-pneumatically controlled jaw coupling
speed .....	0.6 x engine speed (1 <sup>st</sup> Mechanical gear selector in TS)
permissible power .....	Engine output
direction of rotation .....	Clockwise, viewed from the front
The gearbox is prepared for front power take-off, EGA761 (optional extra), type .....	Permanently engaged
speed .....	1.1 x engine speed
permissible power at 1 500 r/min, continuous .....	26 kW (35 hp)
direction of rotation .....	Clockwise, viewed from the front

## Brake system

Service brake, type .....	Dual-circuit, compressed air, direct-acting drum brakes
compressor working pressure .....	6.7-8.0 bar (670-800 kPa)
total air tank capacity .....	110 dm <sup>3</sup> (litres)
Parking brake, type .....	spring brake
safety valve setting .....	9.6 bar (960 kPa)

## Steering system

Make and type .....	ZF 8043
Steering gear, type .....	Hydraulic power steering gear
Hydraulic oil, type .....	See Lubricants, page 140.

## Winch (towing vehicles)

Make and type .....	Sepson 18-08-A-H2
Ratio of worm gear .....	18:1
Rope type .....	199-strand with steel core
Rope length .....	50 m
Rope diameter .....	19 mm
Tractive force, outer turn of rope .....	75 kN (7.5 tonnes)
Tractive force, inner turn of rope .....	100 kN (10 tonnes)
Lubrication oil, type .....	See Lubricants, page 140.

## Loading crane 59 kNm (5900 kgf m) (ammunition vehicles)

Manufacturer .....	HIAB-FOCO
Type designation loader crane .....	HIAB 650/1A
Type designation operating valve .....	HIAB 41
Loader capacity .....	59 kNm (5900 kgf m)
Reach .....	5000 mm
Lifting capacity at: 1700 mm reach .....	3500 kg
2500 mm reach .....	2500 kg
3400 mm reach .....	1750 kg
5000 mm reach .....	1250 kg
Lifting speed at 5000 mm reach and an oil flow of 0,5dm <sup>3</sup> /s (30 litres/min) .....	0,58 m/s
Lifting height above chassis frame .....	7000 mm
Slewing speed .....	22°/s
Hydraulic pump, make and type .....	SUNFAB 58-SR
Pump capacity .....	0,3-0,5 dm <sup>3</sup> /s (20-30 litres/min)
Hydraulic oil .....	See Lubricants, page 140
Working pressure .....	180 kp/cm <sup>2</sup> (18 MPa)
Slewing torque .....	12,7 kNm (1270 kgf m)
Weight, loading crane complete excluding pump equipment and oil .....	1000 kg
Height above chassis frame in folded position .....	1920 mm
Width in folded position .....	2300 mm
Length of support leg from lower surface of loader base .....	min. 727 mm max. 1512 mm
Span between support legs in extended position .....	3250 mm

## Loading crane 15 kNm (1500 kgf m) (towing vehicles)

Manufacturer .....	HIAB-FOCO
Type designation .....	HIAB 130 MATZ
Loader capacity .....	15 kNm (1500 kgf m)
Reach .....	2700 mm
Lifting capacity at: 950 mm reach .....	1500 kg
1400 mm reach .....	1050 kg
1850 mm reach .....	800 kg
2700 mm reach .....	550 kg
Lifting speed at 2700 mm .....	without load: 0,45 m/s with max. load: 0,29 m/s
Lifting height above flatbed .....	3900 m
Slewing speed .....	11,5°/s
Pump capacity .....	0,12-0,08 dm <sup>3</sup> /s (7,0-4,5 litres/min)
Hydraulic oil .....	See lubricants, page 140
Working pressure .....	175 kp/cm <sup>2</sup> (17,5 MPa)
Slewing torque .....	3 kNm (300 kgf m)
Slewing angle .....	330°
Weights:	
Loading crane complete with power pack and oil	200 kg
Power pack with oil .....	32 kg
Voltage .....	24 V
Maximum current consumption .....	130 A
Parking height above flatbed .....	1350 mm

## Wheels

Tyres: make, dimension, type .....	Michelin 1400 R20 XL, tubeless
Rims: make, type, .....	Kronprinz 1290.96-4
dimension .....	10.00 V 20
Weight, complete wheel .....	174.5 kg

## Inflation pressures (cold tyre)

Wheel location	Surface	
	Road and terrain (packed or medium packed)	Loose desert sand * (max. 20 km/h)
Front axle	3.8 bar (380 kPa)	1.7 bar (170 kPa)
Bogie axles	4.5 bar (450 kPa)	1.9 bar (190 kPa)

\* If constantly high speed is required for a distance exceeding 5 km, the pressures must be increased. If not, the tyres may overheat and become severely damaged.

Tyre locks

The wheels are prepared for fitting special tyre locks.

## Tow hitch

Make and type .....	Ringfeder 663
Permissible vertical load .....	1 040 kg

# TYPE AND NOTICE PLATES

## Plates on the truck

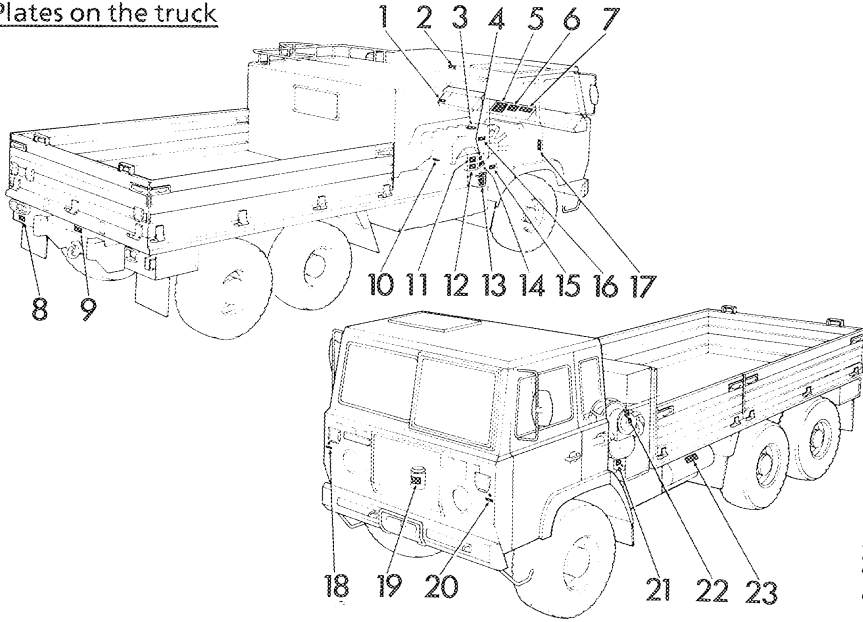
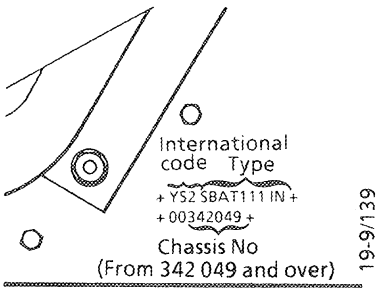


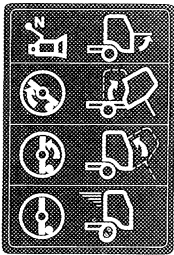
Plate locations on the vehicle. The numbers refer to the plates listed below.



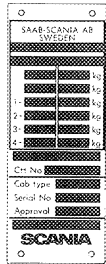
15: On chassis frame behind front wheel



16: On the RH side of the cylinder block.

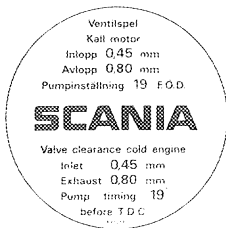


13: On the cab tilt pump

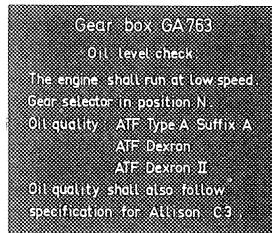


17: On the right-hand B post

01:382



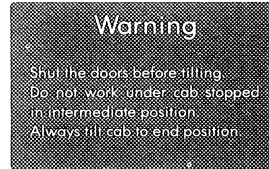
3: On the engine rocker cover



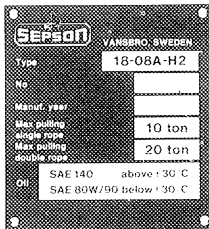
11: Side of engine shield, behind cab



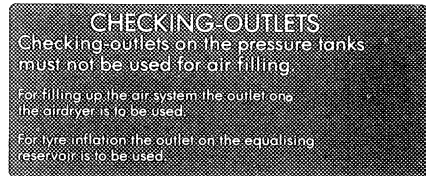
10: On top of the gearbox



12: Side of engine shield, behind cab



22: On end of winch worm gear housing

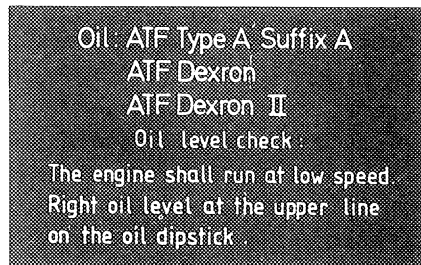


23: On the compressed air tank



18: RH side of cab front

20: LH side of cab front



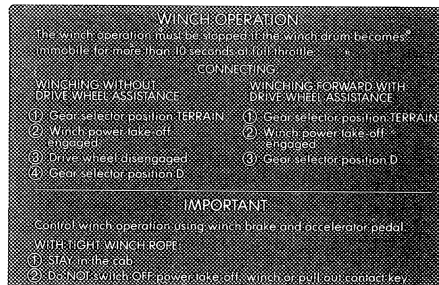
19: On the hydraulic fluid container



9: Trailer connection at the rear  
21: Jump-start connection



1: LH side of the instrument panel  
2: At the top of the rear of the cab  
8: At the LH rear light

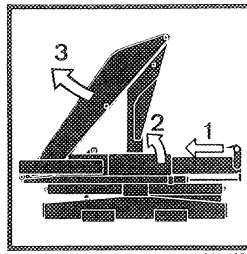


5: On the fuse box cover



**60 kNm CRANE OPERATION**  
Engaging POWER TAKE-OFF

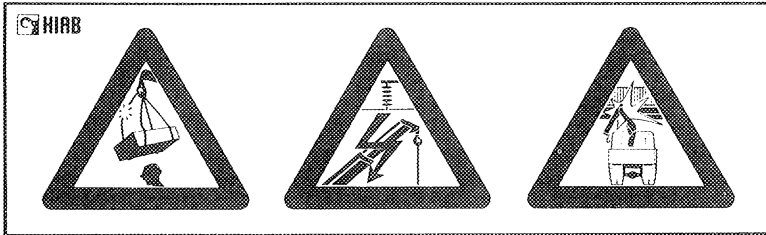
- ① Gear selector ROAD or TERRAIN
- ② Press switch POWER TAKE-OFF CRANE
- ③ Press switch DRIVE WHEEL DISENGAGED
- ④ Set gear selector to TS
- ⑤ Pull hand throttle (GAS) to 1000 r/min



344 6271

6: On the fuse box cover

4: Side of engine shield, behind cab  
(only on vehicles with 59kNm loading crane)

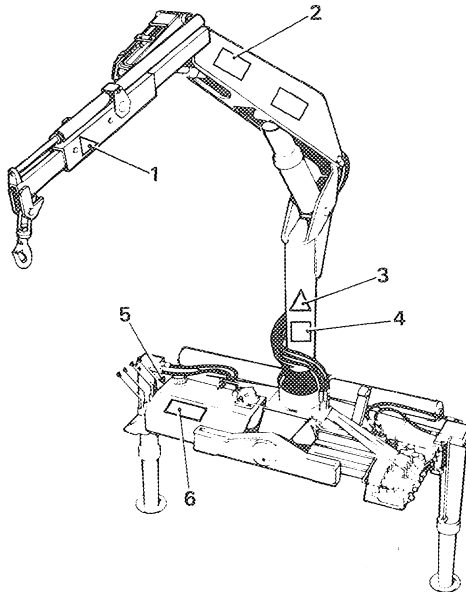


345 5688

7: On the fuse box cover

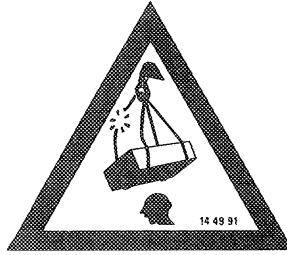
14: Side of engine shield, behind cab  
(only on vehicles with 59kNm loading crane)

Plates on loading crane 59 kNm (5900 kgf m)



0:383

Plates on loading crane 59 kNm ( 5900 kgf m)

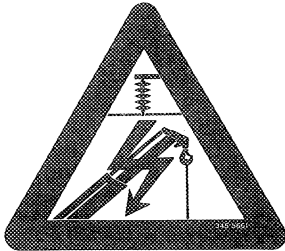


1. Warning plate on left and right hand side of outer boom



	<b>m</b>	<b>1.7</b>	<b>2.4</b>	<b>3.5</b>	<b>4.8</b>
	<b>ft</b>	<b>5'7"</b>	<b>7'10"</b>	<b>11'6"</b>	<b>15'9"</b>
	<b>kg</b>	<b>3500</b>	<b>2500</b>	<b>1700</b>	<b>1250</b>
	<b>lb</b>	<b>7720</b>	<b>5510</b>	<b>3750</b>	<b>2760</b>

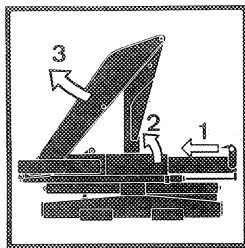
2. Capacity plate on left and right hand side of inner boom



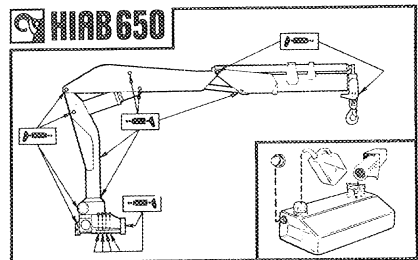
3. Warning plate on left and right hand side of loader body

	<b>HIAB</b>	
TYPE		<input type="text"/>
MANUF. YEAR		<input type="text"/>
MANUF. NO		<input type="text"/>
APPROVAL NO		<input type="text"/>
HIAB-FOCO AB		
<input type="radio"/>	MADE IN SWEDEN	
		344 6263 <input type="radio"/>

4. Type and manufacturing plate on loader body

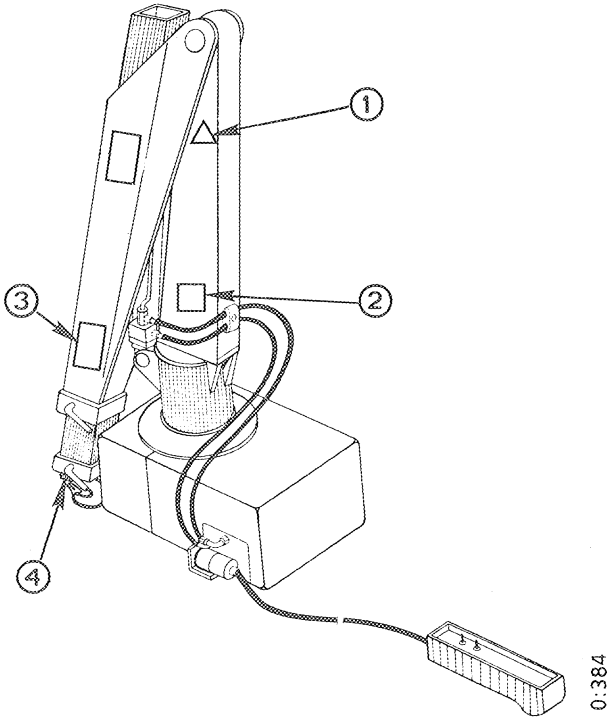


5. Warning and instruction plate on left hand side of oil tank and right hand side of engine cover



6. Lubrication plate on oil tank

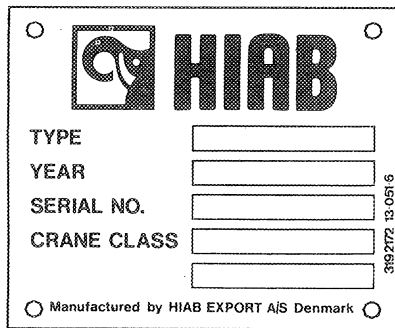
Plates on loading crane 15 kNm (1500 kgf m)



Plates on loading crane 15 kNm (1500 kgf m)

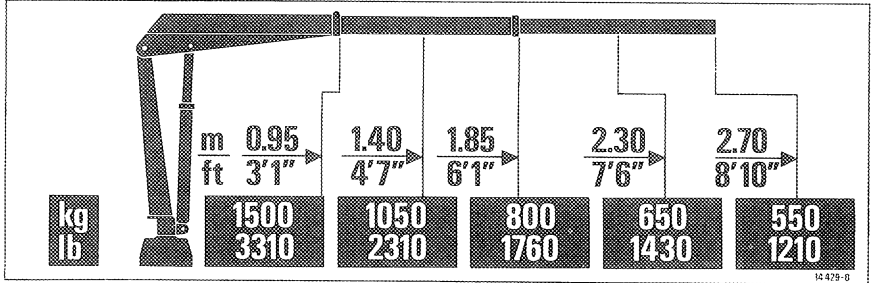


1. Warning plate on left and right hand side of loader body



2. Type and manufacturing plate on loader base

# HIAB 130



3. Capacity plate on left and right hand side of loader boom



4. Warning plate on left and right hand side of loader boom

## Notes

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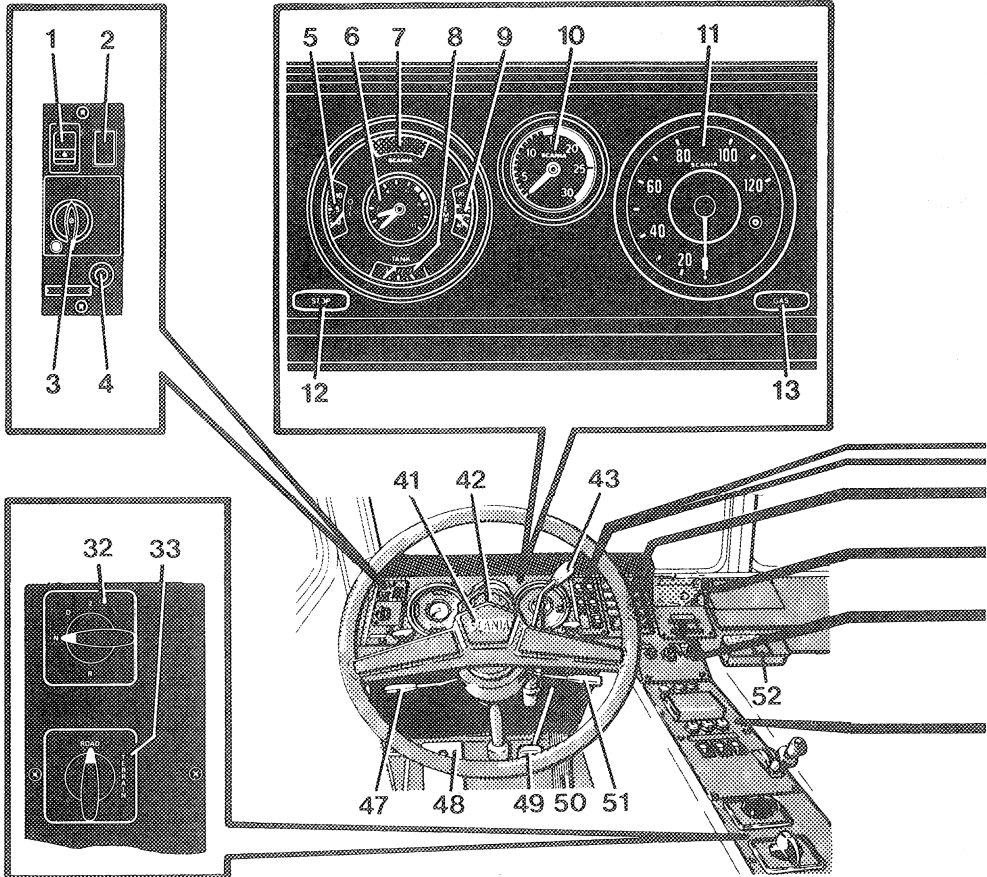
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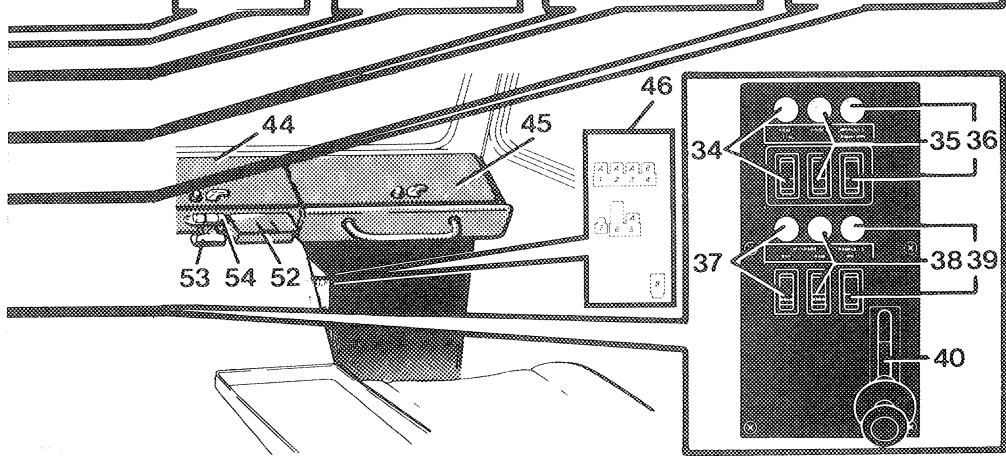
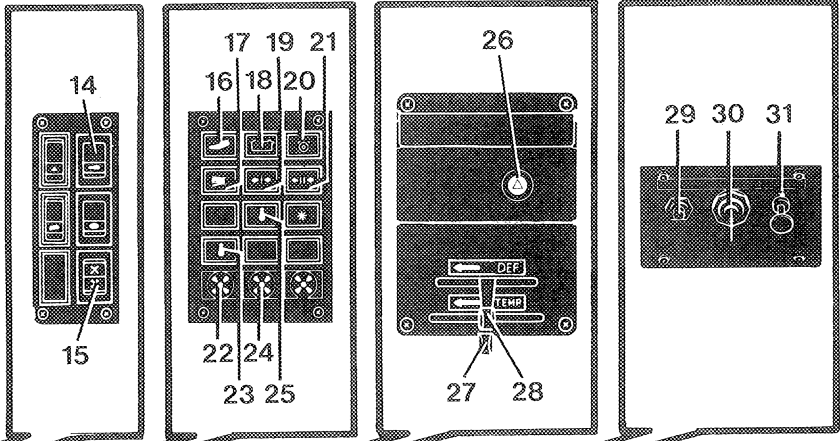
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# DESCRIPTION

## Instruments, Switches, Warning lights, Controls



- |   |  |  |
|---|--|--|
| <ol style="list-style-type: none"> <li>1. Switch, reversing light</li> <li>2. Warning light, reversing light</li> <li>3. Switch, blackout lighting</li> <li>4. 24 V power socket</li> <li>5. Oil pressure gauge</li> <li>6. Brake pressure gauges</li> <li>7. Central warning light</li> <li>8. Fuel gauge</li> <li>9. Coolant temp. gauge</li> <li>10. Tachometer</li> <li>11. Speedometer, odometer and trip meter</li> </ol> | <ol style="list-style-type: none"> <li>12. Stop control</li> <li>13. Hand throttle "GAS"</li> <li>14. Switch, instrument lighting</li> <li>15. Switch, ventilation fans, driver's cab</li> <li>16. Warning light, engine oil pressure</li> <li>17. Warning light, full beam</li> <li>18. Warning light, charge</li> <li>19. Warning light, direction indicator, truck</li> <li>20. Warning light, brake air pressure</li> <li>21. Warning light, direction indicator, trailer</li> </ol> | <ol style="list-style-type: none"> <li>22. Warning light, parking brake</li> <li>23. Warning light, coolant temp.</li> <li>24. Warning light, parking brake interlock valve</li> <li>25. Warning light, gearbox oil temp.</li> <li>26. Switch, hazard warning light</li> <li>27. Heating, driver's cab</li> <li>28. Windscreen defrost</li> <li>29. Starter button</li> <li>30. Contact key (main power supply, instruments and lighting)</li> </ol> |
|---|--|--|



- 31. Parking brake interlock valve control
- 32. Gear selector for main gearbox
- 33. Gear selector for transfer box
- 34. Switch, warning light, crane power take-off
- 35. Switch, warning light, winch power take-off
- 36. Switch, warning light, drive wheel disengagement
- 37. Switch, warning light, rear axle diff-locks.

- 38. Switch, warning light, front axle diff-lock
- 39. Switch, warning light, front-wheel-drive
- 40. Parking brake lever
- 41. Horn
- 42. Wheel lock indicator
- 43. Trailer brake and winch brake control lever
- 44. Fuse box
- 45. Glove box (compartment for Operator's manual and spare bulbs)

- 46. Relay box
- 47. Direction indicator and full beam control stalk
- 48. Switch, engine brake, cross-country brake
- 49. Brake pedal
- 50. Accelerator pedal
- 51. Windscreen and headlight wiper and washer control stalk
- 52. Ashtray
- 53. Document holder
- 54. Map reading light

0:385

## Explanations

(Numbers refer to pages 21-22)

### 1. Switch, reversing light

### 2. Warning light, reversing light

Lights up when the reversing light is switched on.

### 3. Switch, blackout lighting

To enable the switch to be turned, the latch button at the arrow must be depressed, whilst at the same time turning the knob.

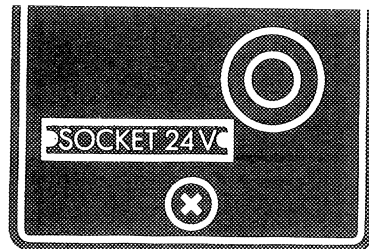
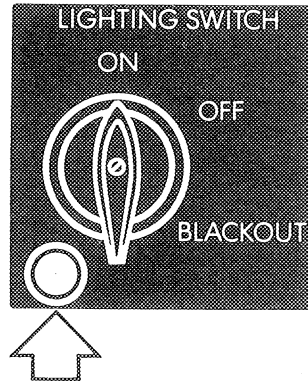
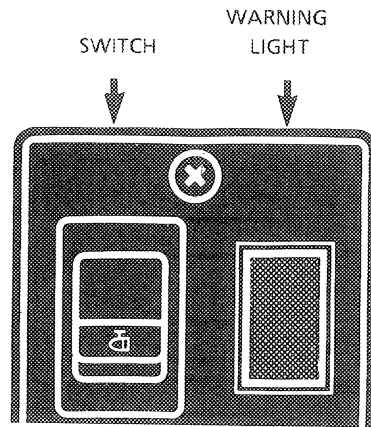
**ON:** The blackout lighting is switched OFF and the ordinary lighting is switched ON.

**OFF:** The blackout lighting, interior lighting and ordinary external lights are switched OFF. The central warning light is inoperative. All other warning lights are operative.

**BLACKOUT:** The blackout lighting is switched ON. The interior lighting and ordinary external lights are switched OFF. The central warning light is inoperative. All other warning lights are operative.

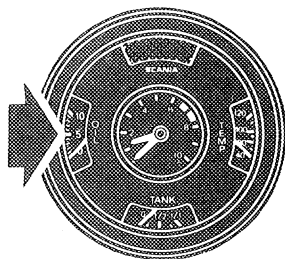
### 4. 24 V power socket (for inspection lamp)

The socket provides 24 V when the contact key is depressed (ON) or the parking lights are switched on (position 1). See page 28, position 30.



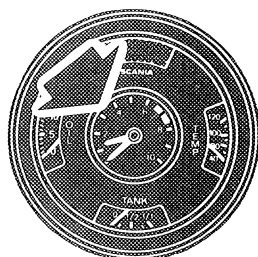
## 5. Oil pressure gauge

When the engine is warm, the oil pressure should be 6.0-1.5 bar. If the oil pressure should drop below 1.0 bar, the warning light for engine oil pressure and the central warning light will come on.



## 6. Brake air pressure gauge

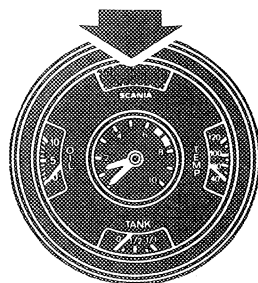
The ORANGE pointer indicates the air pressure in the FRONT circuit, and the WHITE pointer indicates the pressure in the REAR circuit. In normal driving, both pointers should be within the green area. The pressure will then be between 6.7 and 8.0 bar.



## 7. Central warning light

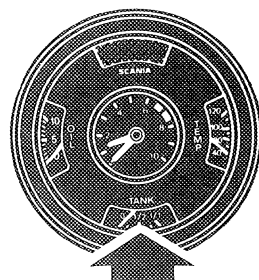
This light warns the driver of low oil pressure in the engine, low air pressure in the compressed air system, high coolant temperature, high hydraulic fluid temperature in the gearbox and loss of battery charging. The light also flashes when the hazard warning flasher is switched on. The warning light for the function which has caused the warning will also come on. Also check the corresponding gauge.

**N.B.** Never drive the truck when the central warning light is flashing repeatedly.



## 8. Fuel gauge

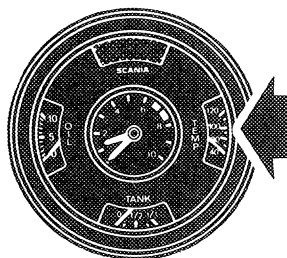
The pointer indicates the fuel available as a proportion of the total tank capacity of 260 dm<sup>3</sup> (litres). Keep an eye on the gauge and avoid running the tank dry.





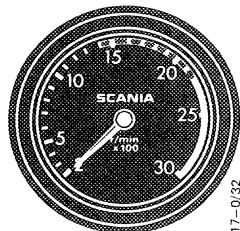
## 9. Coolant temperature gauge

The pointer indicates the temperature of the coolant in the engine. The normal operating temperature is 70-90 °C.



## 10. Tachometer

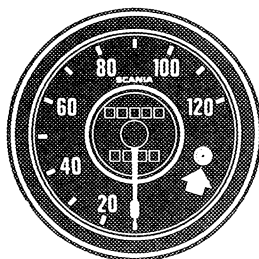
The pointer indicates the engine speed. When driving the truck, the pointer must be within the green area, which also gives the best fuel economy. If the pointer is within the red area, the engine is likely to be damaged by overspeeding.



## 11. Speedometer, odometer and trip meter

The pointer indicates the road speed in km/h. The upper counter indicates the total distance driven.

The lower counter is a trip meter which can be used to measure individual journeys. The trip meter can be zeroed by means of the screw at the arrow.



## 12. Stop control

The engine will be stopped when the handle is pulled out.



## 13. Hand throttle "GAS"

The engine speed can be controlled manually by means of the hand throttle, in addition to the usual pedal control.

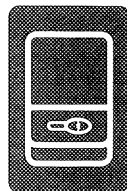


#### 14. Instrument lighting

The instrument lighting is switched on with the interior cab lighting. The brightness of the instrument lighting can be controlled with this switch. The switch has two positions.

Upper position: half intensity

Lower position: full intensity



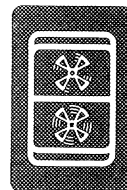
#### 15. Cab ventilation fan

The switch has three positions:

Intermediate: switched off

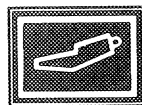
Upper position: slow

Lower position: fast



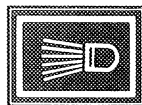
#### 16. Engine oil pressure

The light will come on if the engine oil pressure should drop below 1.0 bar. The central warning light will flash at the same time. If the light should come on when the truck is being driven, the engine must be stopped immediately and the fault must be repaired before restarting the engine.



#### 17. Full beam

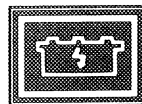
The light will come on when the full beam is switched on.



#### 18. Charge

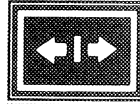
The light will come on as soon as the alternator is not charging. The central warning light will flash at the same time. If the light should come on when the truck is being driven, the fault must be repaired as soon as possible.

If the alternator stops charging, the holding relay 3 for the main battery (master) switch will disconnect.



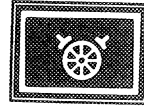
19. Truck direction indicators

The light will flash when the truck direction indicators are flashing.



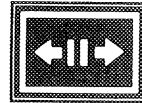
20. Brake air pressure

The light will come on if the pressure in any of the brake circuits should drop too low. At the same time, a warning buzzer will sound and the central warning lamp will flash. If the light should light up when the truck is being driven, stop immediately and repair the fault before restarting.



21. Trailer direction indicators

The light will flash when the direction indicators of the trailer are flashing.



22. Parking brake

The light can be dimmed, and will light up red when the parking brake is applied



23. Engine temperature

The light will come on if the temperature of the coolant in the engine should become excessive (above 96 °C). At the same time, the central warning light will flash.



24. Parking brake interlock valve

The light can be dimmed, and will light up in red when the air pressure in the parking brake circuit has dropped below the level at which the interlock valve is actuated.



## 25. Oil temperature in gearbox

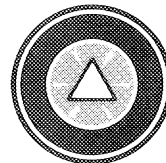
The light will come on if the oil temperature in the gearbox should become excessive (above 135 °C). At the same time, the central warning lamp will flash. If the lamp should light up when the truck is being driven, stop immediately. Check the oil level. If the oil level is between the specified max. and min. levels and the oil does not show any visible changes, run the engine with the gear selector set to N until the lamp has been extinguished, to enable the oil to cool down. If the light still is on, the truck must not be driven.



**N.B.** Driving in ROAD gear (= high gear) on steep slopes with a heavy load might cause temporary overheating. If so, shift down to TERRAIN (low gear) and drive on. In a minute or two the warning light will go out. Otherwise do as instructed above.

## 26. Hazard warning light

When the hazard warning light is switched on, all direction indicators and the central warning light flash.

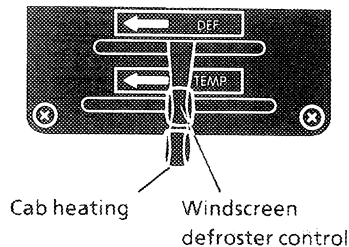


## 27. Heating, driver's cab

The temperature of the air is increased by moving the lever to the left.

## 28. Windscreen defroster

The lever controls the flow of air to the windscreen. The flow will increase when the lever is moved to the left. The fan can be started to increase the air flow further.



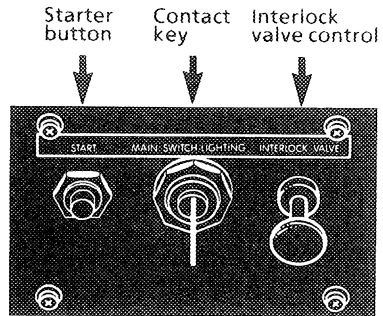
The heat to the floor is controlled by two flaps under the instrument panel.

## 29. Starter button

When the button is depressed, power will be supplied to the starter motor, provided that the contact key has been pushed in.

## 30. Contact key. Main power supply to instruments and lighting

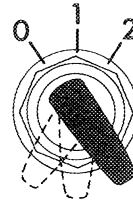
When the contact key is pushed in, the main battery (master) switch will be closed. The lighting is switched on by turning the key to the right.



*Position 0.* All lighting switched off.

*Position 1.* Parking lights and instrument lights switched on. Holding relay 2 for main battery (master) switch is engaged.

*Position 2.* Parking lights, instrument lighting and full or dipped beam switched on. Switching between full beam and dipped beam is carried out by the LH stalk below the steering wheel.



## 31. Parking brake interlock valve control

If the air pressure in the parking brake circuit has dropped, e.g. after the truck has been parked for a long time, the interlock valve will be actuated. This valve prevents involuntary release of the parking brake when the air pressure has risen to the normal value. To reset the valve, keep the control handle pulled out until the warning light is extinguished. The parking brake can then be released.



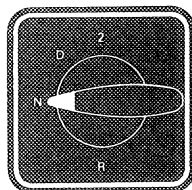
### 32. Gear selector for gearbox

The gear change programme in the gearbox is selected by means of the selector switch.

Selector positions:

- N Neutral
- D Drive (Fully automatic gear change)
- 2 Locked gear (H2)
- TS Tow start
- R Reverse

See also under Driving.

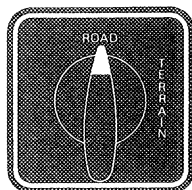


### 33. Gear selector for transfer box

Selector positions:

- ROAD For normal driving on roads
- TERRAIN For cross-country driving or negotiating steep slopes.

Front-wheel-drive is engaged automatically when the TERRAIN gear is engaged.



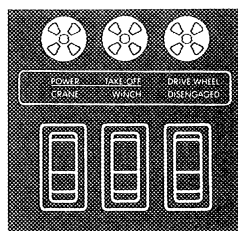
The gear change programmes of the main gearbox are the same for road and terrain gears.

### 34. Switch and warning light, crane power take-off

When the switch is pushed down, the power take-off will be engaged. The warning light will come on at the same time.

### 35. Switch and warning light, winch power take-off

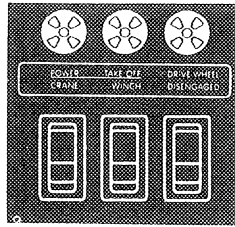
When the switch is pushed down, the winch power take-off will be engaged. The indicating lamp will come on at the same time.



Only with gear selector in TERRAIN position.

36. Drive wheel disengagement, switch and warning lamp

When the switch is pushed down, the transfer box is set to neutral so that winching or operating loading crane (59 kNm) can be carried out without the assistance of the driving wheels. The indicating lamp will light up at the same time.



36

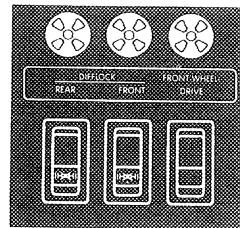
Switches and warning lights:

37. Rear axle differential lock

38. Front axle differential lock

When the switch is pushed in, the differential locks will be engaged. The differential locks of the rear axles are engaged by means of switch 37, independently of the front axle differential lock. The front axle differential lock is engaged by means of switch 38.

To enable the front axle differential lock to be engaged, those on the rear axle(s) must be engaged.



37 38 39

39. Switch and warning light, front-wheel-drive

When switch 39 is pushed down, the front-wheel-drive will be engaged when driving on ROAD gear. The warning light will come on at the same time. The front-wheel-drive is engaged automatically when TERRAIN gear is engaged.

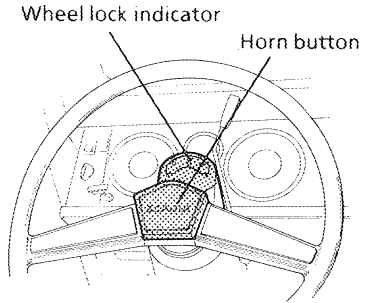
40. Parking brake lever

The brake is applied when the lever is pushed back. To release the brake, the collar on the lever must be lifted before the lever can be pushed forward.



41. Horn

The horn is operated by the button in the centre of the steering wheel. The horn itself is located inside the front cover.



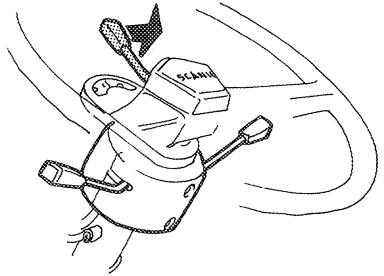
42. Wheel lock indicator

The wheel lock indicator shows the angle of the front wheels, particularly convenient and important when driving cross-country and over obstacles.

43. Trailer brake and winch brake control lever

The trailer can be braked using this control stalk, without braking the towing vehicle. (See also "Braking the trailer" in page 101.)

The control is also used as a brake for the winch when this is engaged. (See also "Using the winch" in page 111.)



44. Fuse box

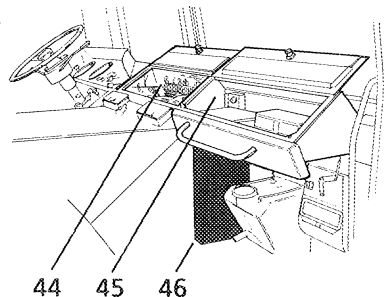
All fuses (8A) for the truck are fitted on a panel in the box. See also page 45.

45. Glove box

Compartment for Operator's manual, spare bulbs, fuses, etc.

46. Relay box

Most of the relays for the truck are located in the box. See also page 46.



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17-9/104

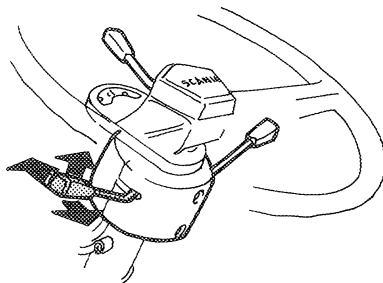
0:387



47. Direction indicator  
Full beam control stalk

The lever has four positions:

- The central position is the neutral position.
- Forward or backward: right-hand or left-hand direction indicator.
- Towards the steering wheel: change-over between full and dipped beam and headlight flasher.

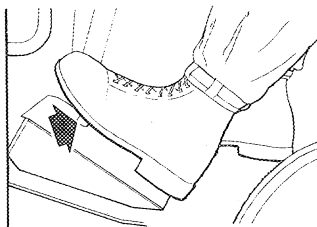


17-9/103

48. Engine brake  
Terrain brake foot switch

The switch has two functions:

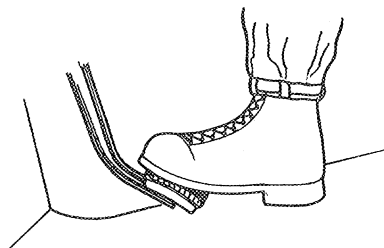
- Engine brake function, when the accelerator pedal is released. Particularly convenient in ROAD gear. (See also "Engine braking" in p. 97.)
- Cross-country brake. With the TERRAIN gear engaged in the transfer box, the foot switch, in addition to the above engine brake function, also electrically actuates a valve which admits air at a preset reduced pressure into the brake cylinders. By lightly applying the brakes the system admits full control over the truck when driving over obstacles. (See also "Using the cross-country brake" in page 100.)



10-9/145

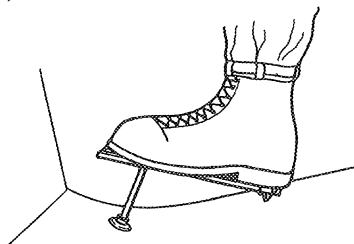
49. Brake pedal

Operates the brakes on all wheels of the truck as well as on the trailer. Also operates the winch brake when the winch is engaged.



50. Accelerator pedal

Besides controlling the engine output and speed in the normal manner, it also operates a switch (inside the front cover) connected to the control system of the automatic gearbox.

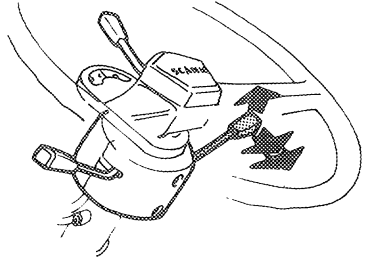


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51. Control stalk, windscreen wipers and washers

The lever has four positions. The upper position is the neutral position.

- 1st position down      windscreen wipers, half speed
- 2nd position down      windscreen wipers, full speed
- Towards steering wheel      windscreen washers, headlamp



17-8/102

52. Ashtray

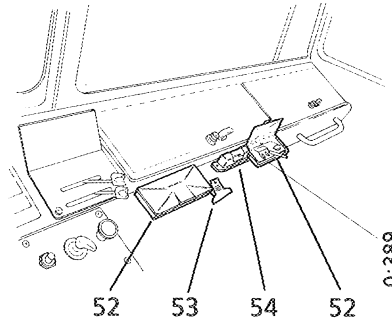
Can be removed for emptying.

53. Document holder

For documents, maps or similar.

54. Map reading light

The lamp will light up when the shade is lifted.



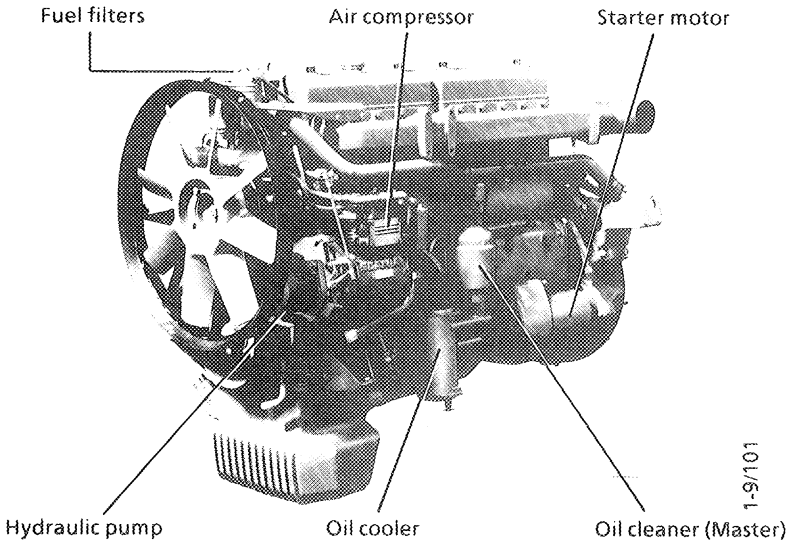
0:389

## Engine

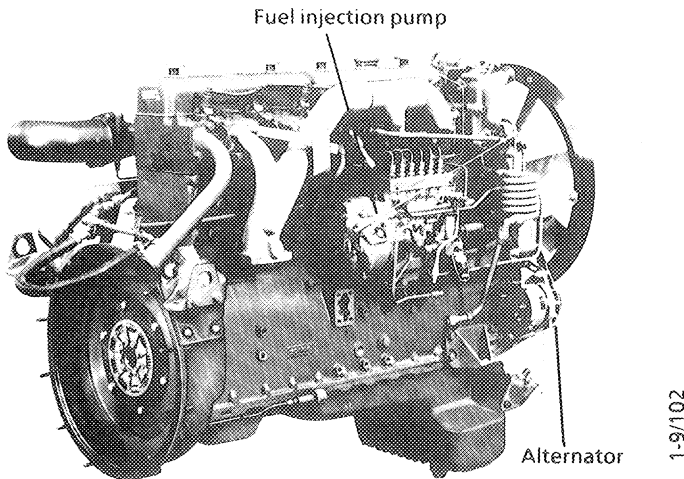
The DN11 (SBA111 4x4) and DS11 (SBAT111S 6x6) are in-line, six-cylinder, four-stroke diesel engines with direct injection.

DN = Diesel, naturally aspirated

DS = Diesel, supercharged (with turbo)



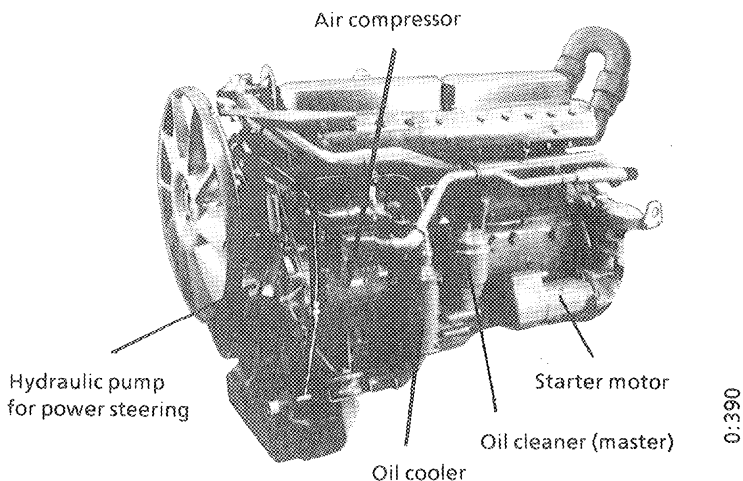
DN11 (SBA111 4x4), left side, viewed from the front



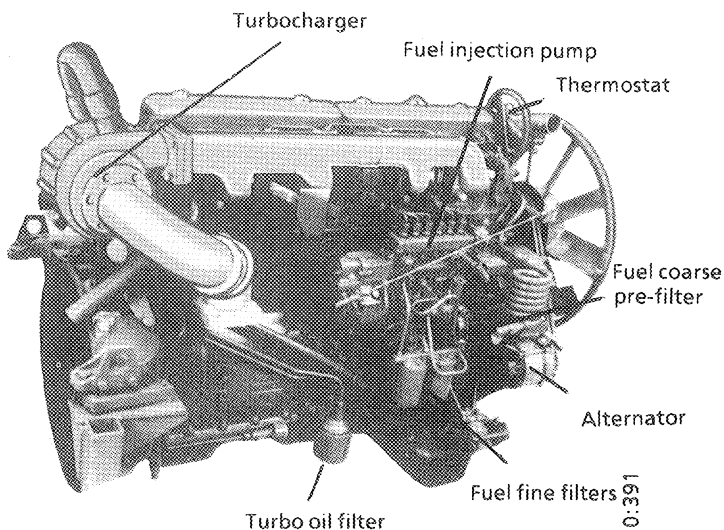
DN11 (SBA111 4x4) right side, viewed from the rear

The basic design is the same, but the DS11 engine differs from the DN11 by being turbocharged, which increases engine output by 40 %.

The engine block and the upper half of the crankcase are cast as one unit. The cylinder liners are of the "wet" type and can be replaced. Each of the two cylinder heads covers three cylinders.



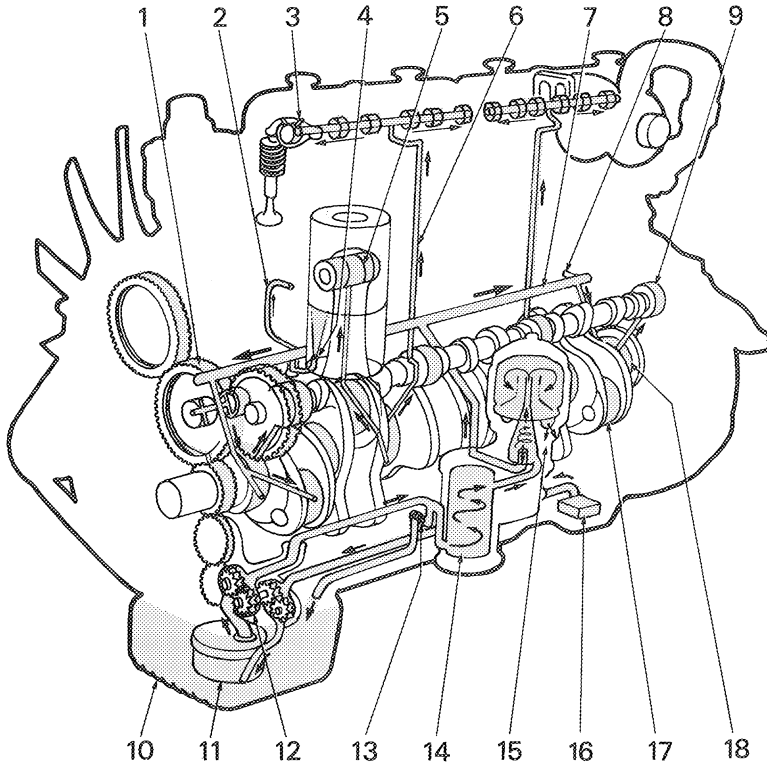
DS11 (SBAT111 6x6), left side, viewed from the front



DS11 (SBAT111S 6x6), right side, viewed from the rear

## Lubrication system

The engine lubrication system includes oil sump, twin oil pump with oil transfer section, oil cleaner, oil cooler and pressure reducing valve.

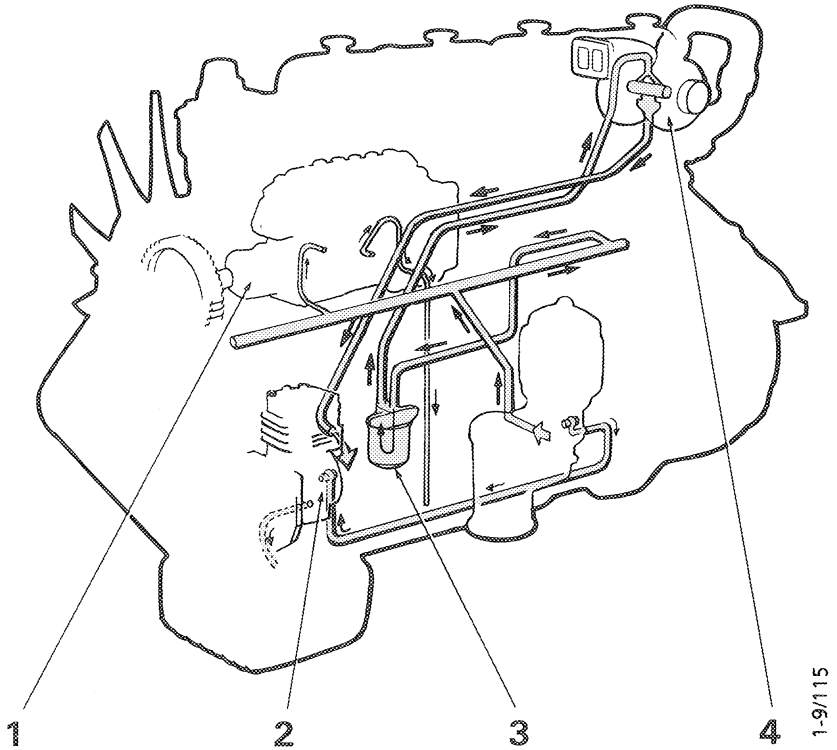


DS11 and DN11 (without turbocharger)

1-9/114

- |  |                          |
|--|--------------------------|
| 1. Timing gears  | 10. Oil sump             |
| 2. Oil passage to the injection pump                       | 11. Oil strainer         |
| 3. Rocker arm mechanism                                    | 12. Twin oil pump        |
| 4. Spray nozzle for piston cooling                         | 13. Reducing valve       |
| 5. Gudgeon pin   | 14. Oil cooler           |
| 6. Oil passage to rocker arm                               | 15. Oil cleaner (Master) |
| 7. Distribution passage                                    | 16. Oil strainer         |
| 8. Tapping for connecting the oil pipe to the turbocharger | 17. Big-end bearing      |
| 9. Camshaft bearing  | 18. Main bearing         |

The fuel injection pump, camshaft, casing and governor, and turbocharger bearings are lubricated by the engine lubrication system. The turbocharger lubricating oil flows through a separate filter located on the right-hand side of the engine.



1. Fuel injection pump
2. Compressor
3. Oil filter
4. Turbocharger

DS11, lubrication system for auxiliaries

### Oil pump

The oil pump, which is of the gear type, is located at the front of the oil sump. It assures lubrication of the engine on gradients of up to 35° in all directions. The pump delivers the oil through the oil cooler and then through the oil cleaner and out to the various lubrication points. The pressure reducing valve maintains the lubricating oil pressure within set value. The transfer pump section feeds oil from the rear to the front of the oil sump

## Oil cleaner

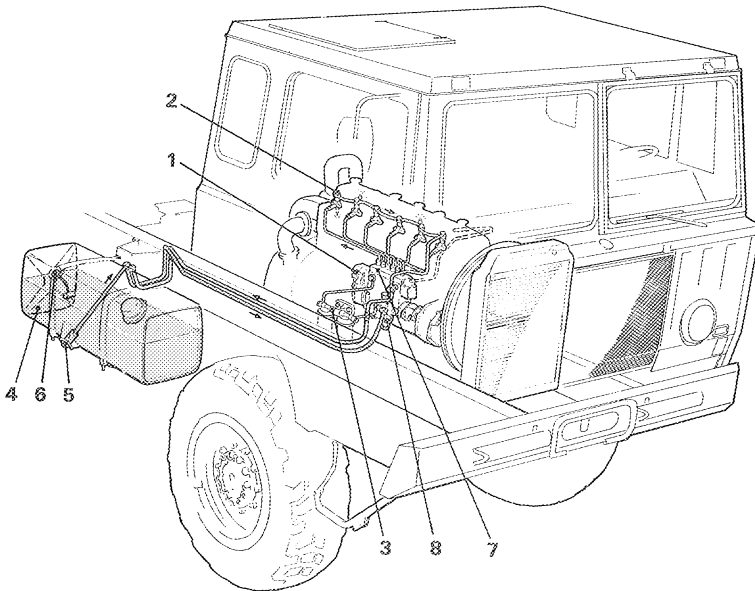
The oil cleaner consists of a cyclone section for coarse purification and a centrifugal section for fine purification. In both sections, the impurities are forced outwards by centrifugal force. They are deposited on the rotor wall in the centrifugal section.

## Oil cooler

The oil cooler is located adjacent to the oil cleaner. The oil is cooled by the coolant flowing from the cooling system.

## Fuel system

The fuel system incorporates the fuel tank and filter, pre-filter, feed pump, fuel preheater (optional extra), fuel filters, injection pump and injectors.



———— Fuel supplied

- - - - - Return fuel

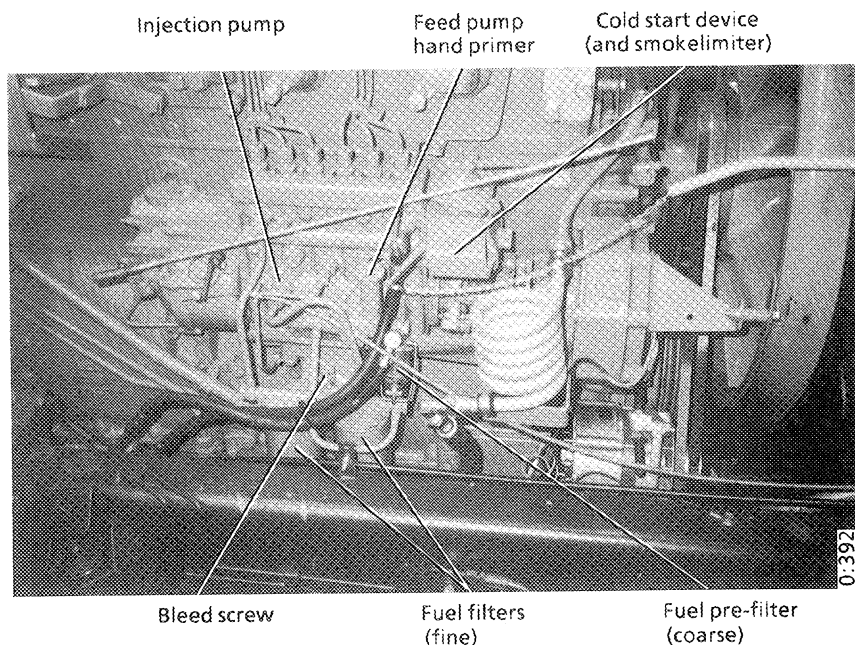
- |                         |                             |
|-------------------------|-----------------------------|
| 1. Governor             | 5. Tank strainer            |
| 2. Injector             | 6. Fuel filters             |
| 3. Fuel tank            | 7. Feed pump and pre-filter |
| 4. Fuel level indicator | 8. Fuel injection pump      |

3-9/101

The feed pump draws fuel from the tank through the pre-filter and delivers it through the fuel preheater and fuel filter to the injection pump, which distributes the fuel to the injectors. The quantity of fuel injected is determined by a governor, which is actuated by the position of the accelerator pedal and by the engine speed.

### Fuel tank with filter

The tank is located on the right-hand side of the truck. The tank filter consists of a strainer which separates coarser impurities.



### Pre-filter

Consists of a nylon strainer.

### Feed pump

The feed pump is a plunger pump driven by the injection pump camshaft. A hand pump is provided for bleeding the fuel system.

### Fuel filters

The fuel filters consist of two paper elements connected in parallel. Final fine filtering of the fuel takes place in these filters.



## Fuel injection pump

The fuel injection pump is provided with a centrifugal governor and is lubricated by the engine lubrication system. It has a high lubricating oil level to counteract gradients of up to 35°. The pump also has a cold-starting device which facilitates starting in cold weather. The DS11 engine incorporates a smoke limiter, which reduces the smoke density of the exhaust gases at low engine speed.

When driving at high altitudes, above 3 000 metres, the control rod of the injection pump should be adjusted in order to reduce the engine output to 75 %. See "Injection pump setting" in page 99.

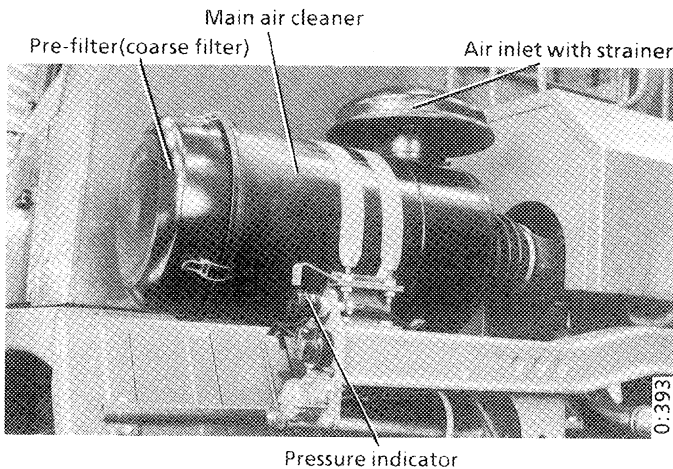
## Injectors

The function of the injectors is to supply the fuel into the cylinders in the form of a fine mist. Excess fuel from the injectors and the injection pump is returned to the tank via a return pipe.

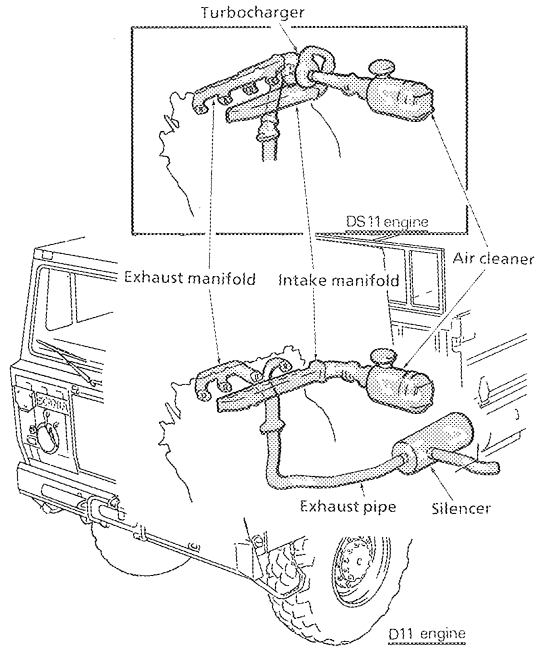
## Intake and exhaust systems

### Air cleaner

The air cleaner is of the dry type and consists of a pre-filter (coarse filter) and filter cartridge. A pressure indicator indicates when the filter cartridge is excessively choked.



In the pre-filter, which constitutes the air filter cover, coarse particles are removed from the air by the air being induced to rotate and the particles being thrown outwards by centrifugal force. The main cleaner consists of a paper element.



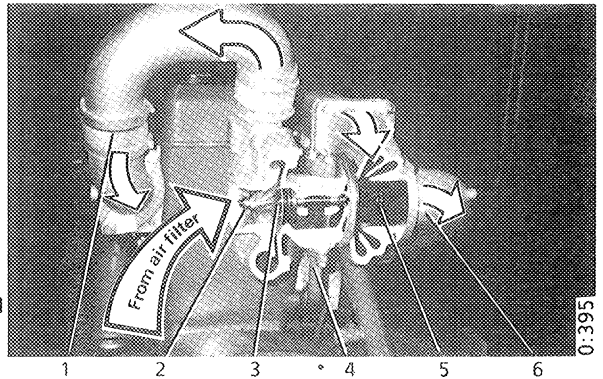
Intake and exhaust systems

0:394

### Turbocharger

DS11 is equipped with a turbocharger. The engine exhaust gases drive a turbine which in turn drives a centrifugal compressor. This compressor increases the air supply to the engine, which allows a higher output to be obtained from the engine.

1. Compressed air intake pipe and manifold
2. Air intake
3. Compressor wheel
4. Lubrication pipes
5. Turbine wheel
6. Exhaust pipe and manifold

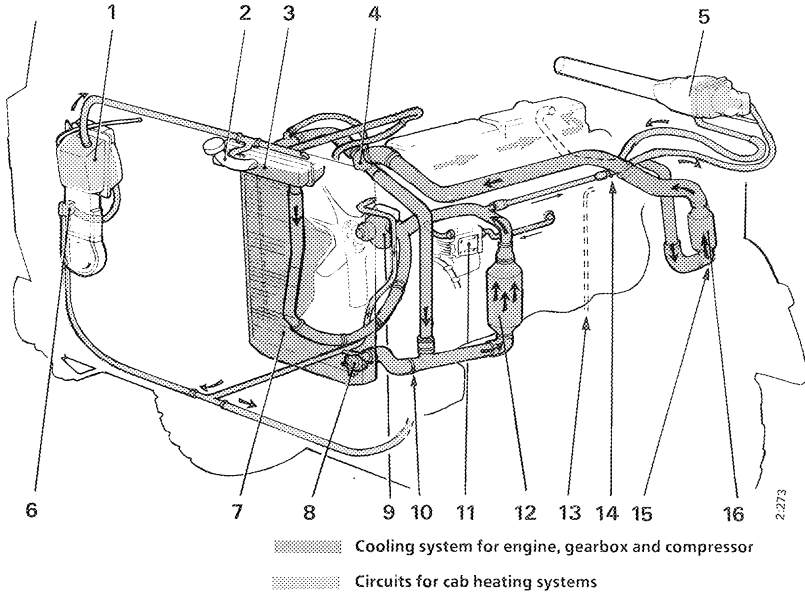


Turbocharger

# Cooling system

The cooling system includes a centrifugal pump, which is driven by V-belts from the crankshaft, a radiator with expansion tank, a fan with fan housing and fan ring and a thermostat in a special housing.

The filler cap has a seal and a spring which permit a raised boiling point of the coolant.



- |  |                         |
|--|-------------------------|
| 1. Heater, driver's cab                  | 9. Coolant pump         |
| 2. Filler pipe                           | 10. Drain plug          |
| 3. Expansion tank                        | 11. Compressor          |
| 4. Thermostat housing                    | 12. Oil cooler, engine  |
| 5. Heater for crew cab (towing vehicles) | 13. Drain tap           |
| 6. Thermostat, RH driver's cab heater    | 14. Shut-off cock       |
| 7. Radiator                              | 15. Drain plug          |
| 8. Drain tap                             | 16. Oil cooler, gearbox |

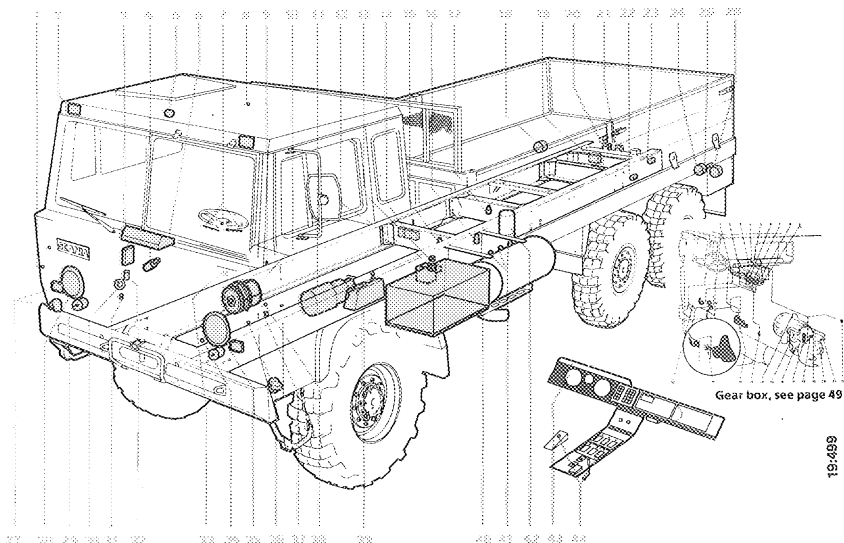
The pump forces the coolant through passages in the engine block and cylinder heads. The direction of flow is shown by the arrows in the figure. The figure also shows that the engine cooling system cools the oil in the automatic transmission as well as the air compressor cylinder heads and the engine lubricating oil. The system is also used to heat the driver's cab and crew cab, if any.

## Electrical system

The electrical system has a 24 volt supply from two 12 V batteries and is provided with an alternator with an integrated charge regulator.

When the contact key is pressed in, the electrical system is connected to the batteries through a main battery (master) switch. This can be kept switched on by three independent holding circuits, each with its own relay. The circuits are energised when 1) the contact key for the main switch is pressed in, 2) the parking lights are on, 3) the alternator is charging.

The fuses (8 A) are all mounted in the fuse box in the centre of the instrument panel.



- |  |  |  |
|--|--|--|
| 1. Socket for blackout light, right  | 16. Brake light switch, trailer circuit                | 32. Washer motor   |
| 2. Position light, right   | 17. Brake light switch, rear circuit                   | 33. Temp. sensor and monitor for coolant                           |
| 3. Relay box   | 18. Rear light, right                                  | 34. Accelerator pedal switch                                       |
| 4. Windscreen wiper motor  | 19. Junction box                                       | 35. Headlight, left  |
| 5. Cab light   | 20. Socket for trailer lights                          | 36. Socket for blackout light, left                                |
| 6. Fuse box  | 21. Socket for tandem-drive equipment on gun           | 37. Oil pressure sensor and monitor for engine                     |
| 7. Switches for horn, direction indicators, full beam, headlight flasher, wipers and washers | 22. Socket for 15 kNm loading crane                    | 38. Door switch for cab light, left                                |
| 8. Socket in rear cab wall   | 23. Socket for rear and brake light fitted on platform | 39. Control box for tandem-drive equipment                         |
| 9. Fuel pick-up unit in tank   | 24. Reversing light                                    | 40. Battery main (master) switch                                   |
| 10. Alternator   | 25. 24 V socket  | 41. Pressure monitors for brake system                             |
| 11. Starter motor  | 26. Rear light, left                                   | 42. Heater coil in air dryer                                       |
| 12. Socket for jump starting   | 27. Direction indicator, right                         | 43. Electric units on instrument panel                             |
| 13. Socket for crew cab  | 28. Headlight, right                                   | 44. Switches and warning lights for gearbox and differential locks |
| 14. Electric/pneumatic valves for difflocks and terrain brake                                | 29. Heater fan motor, right                            |  |
| 15. Brake light switch in front circuit  | 30. Signal horn  |  |
|  | 31. Pressure monitor, interlock valve                  |  |

## Electrical system

Sockets, see also p. 48. Gearbox, see also p. 49.

## Batteries

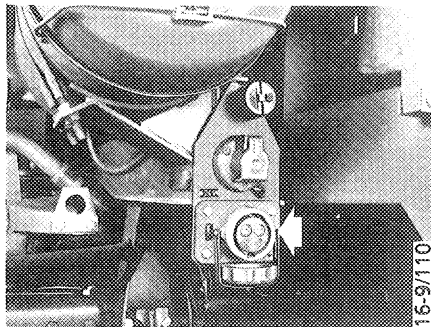
The truck has two 24-volt lead-acid batteries connected in series. As an optional extra, the truck can be equipped with batteries of the cold start type and a battery heater in the insulated battery box.

### Insulated battery box

The box is made of glass fibre reinforced plastic and is of sandwich construction, in which the intermediate layer is thermally insulating. At a battery temperature of +20 °C and an ambient temperature of -20 °C, it takes about 30 hours for the battery temperature to drop to 0 °C. The cooling rate is about 1 °C per hour. Automatically, the box will also insulate against hot air or direct sunshine. Two small openings in the cover gasket will ensure ventilation of the box.

### Jump start connection

A socket for connecting the jump start cable (length 8 metres) is provided on the left-hand side of the truck under the air cleaner. This socket can be used when another vehicle with the same type of socket and the same system voltage (24 V) requires starting assistance or when the battery capacity is insufficient.



Jump start connection

## Alternator

The alternator, which is located at the front on the right-hand side of the engine, has a built-in rectifier and voltage regulator.

## Starter motor

The starter motor is secured to the flywheel housing on the left-hand side of the engine. The motor is controlled by a push-button switch on the instrument panel.

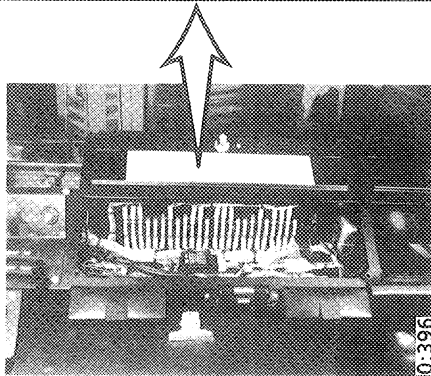
## Fuses

A number of fuses protect the electrical functions of the truck against overloading. The fuses are located in a fuse box underneath the left-hand cover on the instrument panel. A chart of the fuses is also provided. Two of the fuses are reserved for connecting optional extras. All fuses have the rating of 8A.

N.B. Always use the correct fuse rating.

A						B					
1 8A	2 8A	3 8A	4 8A	5 8A	6 8A	7 8A	8 8A	9 8A	10 8A	11 8A	12 8A
Direction indicator lights Crew warning light Stepping relay main light signal	Relay 2 = Parking light main switch	Dipped beam lh	Dipped beam rh	Heater fan motors Tachometer - Buzzer Combustion instr.	Starter motor	Relay 1 = contact key Relay 2 = parking main switch	Diff locks Diff pump general Air dryer	Reserve	Wiperscreen wiper motor Washer motor	Main beam lh Main beam control lamp	Main beam rh
1 8A	2 8A	3 8A	4 8A	5 8A	6 8A	7 8A	8 8A	9 8A	10 8A	11 8A	12 8A
Black out lights	Battery main switch	Traffic warning light (forward)	Reverse light Socket for crew cab	Cab interior light	Horn	Relay 3 = alternator holding of battery main switch	Map reading light Stop light relay (check and replace)	Sockets for inspection lamp	Transmission Warning light for gear box temperature	Parking light lh. - Pos. lights Tail light lh. Instrument lighting	Parking light rh. Tail light rh. Trailer tail end pos. lights

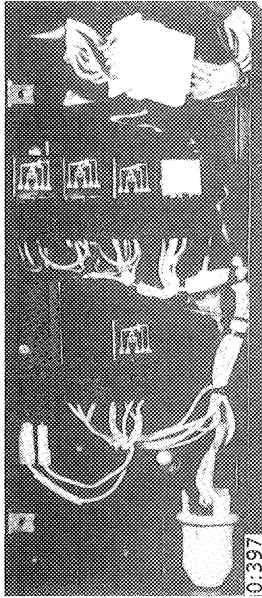
16:500



Fuse box and chart of fuses

## Relays

Most of the relays in the truck are located in a relay box on the right-hand side of the engine casing in the cab. Relays marked with the same letter are interchangeable.



Relay box

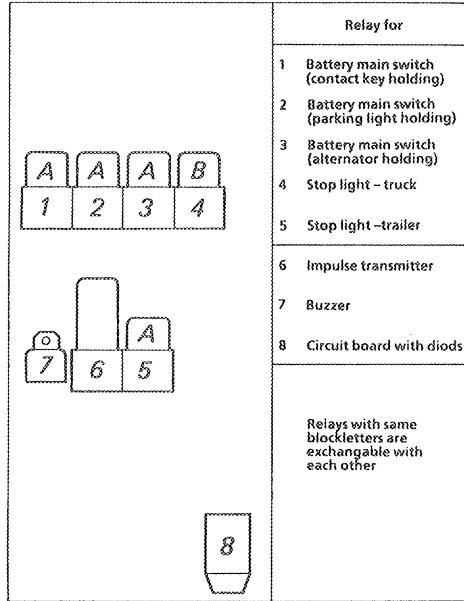
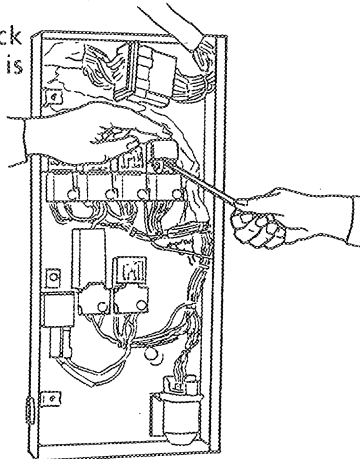


Chart of relays

16:513

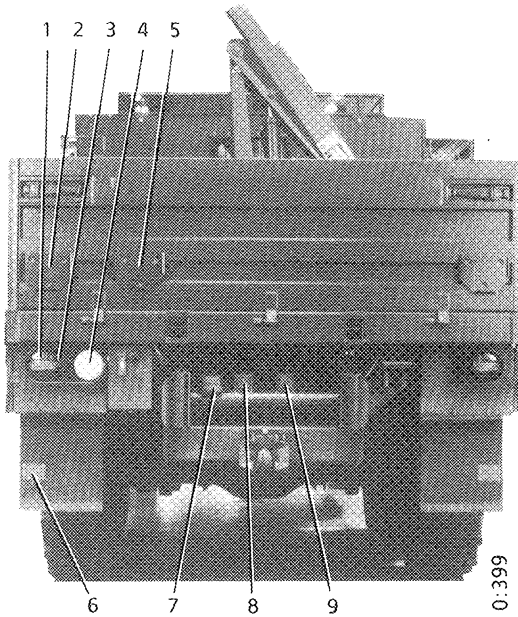
When removing a relay, first check that the master switch (contact key) is not depressed.



Removing a relay

0:398

## Rear lighting arrangements, etc.

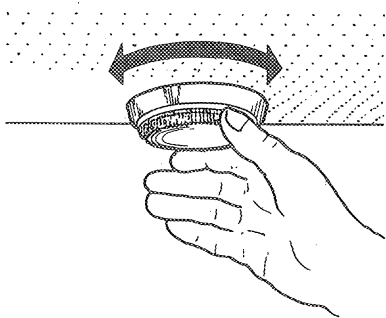


1. Combination light
2. Holder for light plate
3. Socket for inspection lamp
4. Reversing light
5. Holder for unit recognition plate
6. Red reflector
7. Brake coupling (Duo-Matic) for trailer
8. Socket for tandem-drive equipment on gun
9. Socket for electrical connection on trailer

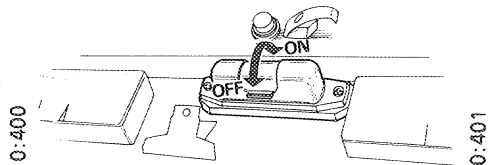
Rear lighting equipment, etc.

The interior lighting consists of the instrument lighting, the interior roof light and a map reading light at the lower edge of the instrument panel.

The interior roof light is switched on by turning the lens clockwise. The map reading light is switched on by pulling up the blind.



Interior roof light



Map reading light



## Sockets

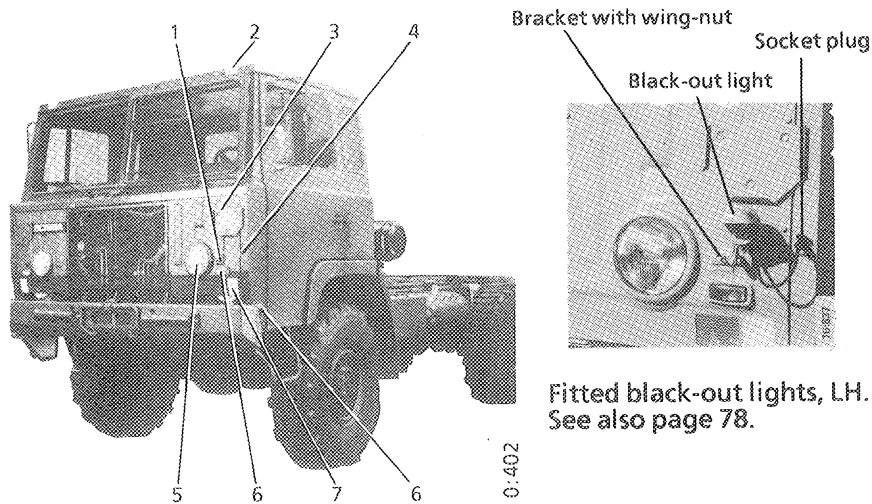
The location of the sockets is shown in the illustration on page 43.

1. 36. Two sockets for the blackout lighting at the front of the vehicle. They can also be used for an inspection light, provided that the switch for the blackout lighting is in position BLACKOUT.
8. Inspection lamp sockets at the top of the rear of the cab.
12. Jump starting socket under the air cleaner.
13. Socket for connecting the crew cab.
20. 21. Socket for electrical connection of trailer. Located on the tubular cross member at the rear.
25. Socket for inspection lamp at the LH rear light.
22. Socket for connection of 15 kNm loading crane. At the rear, inside the LH side member.

There is also a socket for inspection lamp on the LH side of the instrument panel.

## Front lighting arrangements, etc.

The external lighting arrangements are shown in the illustration on page 43. The blackout lights at the front are detachable. When not in use, they should be stored under the passenger seat.

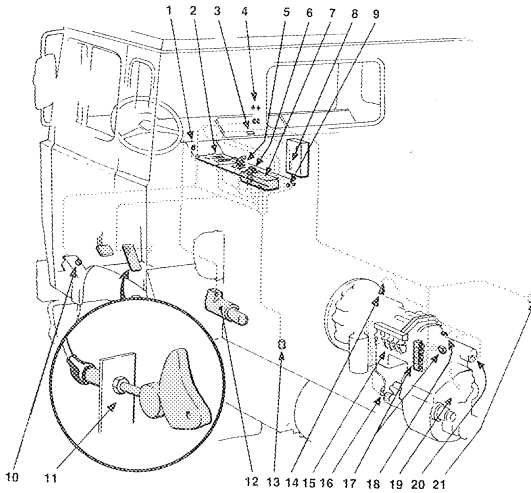


1. Holder for blackout light
2. Position light
3. Holder for light plate. (When using light plates, the unit recognition plates can be fitted in extra holders which are part of the vehicle's equipment.)
4. Socket for blackout light or inspection lamp
5. Headlight
6. Direction indicator
7. White reflector

Front lighting arrangements, etc.

## Electric control system of automatic transmission

All components of the electric control system except the speed sensor obtain power from the truck batteries. The same system controls the main gearbox and the transfer box.

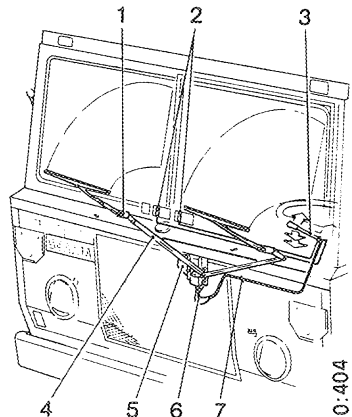


- |   |   |  |
|---|---|--|
| 1. Starter motor switch                               | 9. Protection relay for reverse gear and terrain brake  | 16. End position switch for front-wheel-drive          |
| 2. Switches and warning lights for transfer box       | 10. Switch for engine braking program and terrain brake | 17. Solenoid valve for main gearbox                    |
| 3. Receptacles for connecting wire harness to gearbox | 11. Accelerator pedal switch                            | 18. Speed sensor                                       |
| 4. Fuses  | 12. Starter motor                                       | 19. End position switch for power take-off for crane   |
| 5. Gear selector for main gearbox                     | 13. Solenoid valve for terrain brake                    | 20. End position switches for power take-off for winch |
| 6. Gear selector for transfer box                     | 14. Temperature monitor                                 | 21. Solenoid valves for winch brake                    |
| 7. Automatic gear selector                            | 15. Solenoid valves for transfer box                    |  |
| 8. Relay for brake lights in relay box                |   |  |

## Electrical control system of automatic transmission

### Windscreen wipers

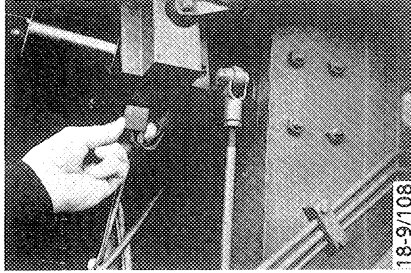
The windscreen wipers are driven by an electric motor located inside the front cover. The motor actuates the windscreen wipers by links. The left-hand link can be disconnected when the left-hand window is to be opened (see "Opening the hinged windscreen").



- |                        |                      |
|------------------------|----------------------|
| 1. Wiper shaft bearing | 5. Wiper motor       |
| 2. Fuses               | 6. Plug              |
| 3. Control stalk       | 7. Electrical cables |
| 4. Crank               |                      |

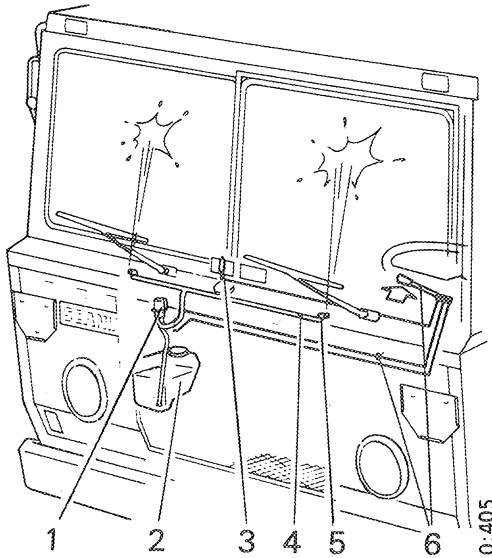
When the electrical system of the truck is live, the supply cable to the windscreen wiper motor is also live, even in the parked position. The electric motor crank can be rotated by hand past the parked position. The motor will then start and rotate one revolution back to the parked position.

**CAUTION!** Turning the wiper motor by hand involves a risk of injury to the hands or damage to tools. Always remove the plug on the wiper motor before commencing work on the wiper equipment.



Removing the plug

### Windscreen washers



- |                     |  |
|---------------------|--|
| 1. Washer motor     | 4. Hoses                               |
| 2. Liquid container | 5. Washer nozzle                       |
| 3. Fuse             | 6. Electrical cables and control stalk |

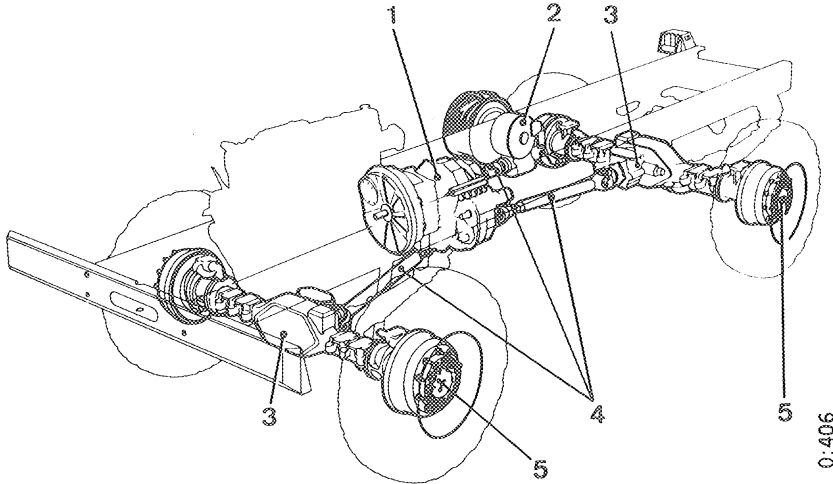
The windscreen washer pump is located behind the front cover on left upper side.

The wipers and washer are controlled by the right-hand stalk below the steering wheel.

### Power transmission system

The SBA111 and SBAT111 have all-wheel-drive. The SBA111 has two axles and the SBAT111 three axles. Each axle has a centrally located axle gear, two hub reduction gears and a manually engaged differential lock. The power transmission also includes the winch drive and drive for the hydraulic equipment, e.g. for trucks provided with a 59 kNm crane. The power to axles, winch and hydraulic equipment is transmitted by means of propeller shafts.

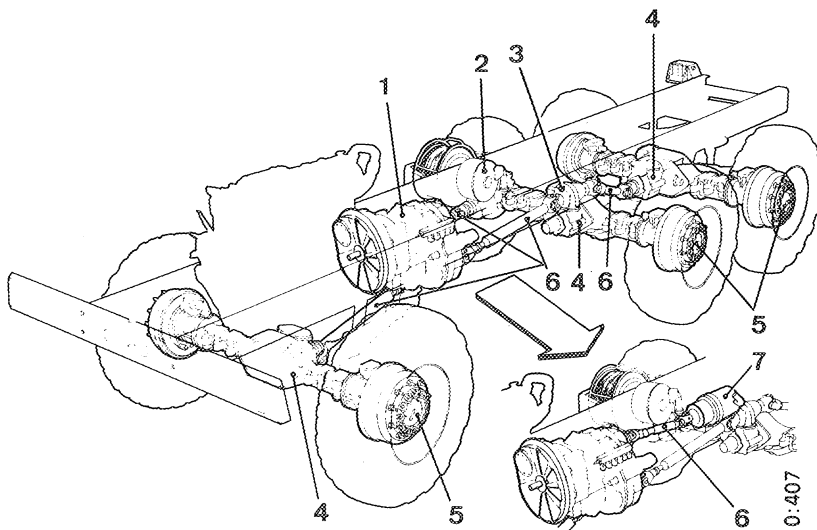
The gearbox consists of a fully automatic, electro-hydraulically controlled gearbox, integral with a manual, electro-pneumatically controlled transfer box.



0.406

- 1. Gearbox
- 2. Winch
- 3. Central gear
- 4. Propeller shaft
- 5. Hub reduction gear

Power transmission system of the SBA111 4x4



- |                            |  |
|----------------------------|--|
| 1. Gearbox                 | 5. Hub reduction gear  |
| 2. Winch (towing vehicles) | 6. Propeller shaft   |
| 3. Bogie transfer gear     | 7. Hydraulic pump for 59 kNm<br>loading crane (certain vehicles) |
| 4. Axle gear               |  |

### Power transmission of the SBA111 6x6

#### Gearboxes

The GA763 gearbox consists of a fully automatic main gearbox with a hydraulic torque converter, six forward ratios and one reverse ratio. At the rear there is a transfer box with two speeds and neutral position, and one or two power take-offs. The torque converter replaces the conventional disc clutch.

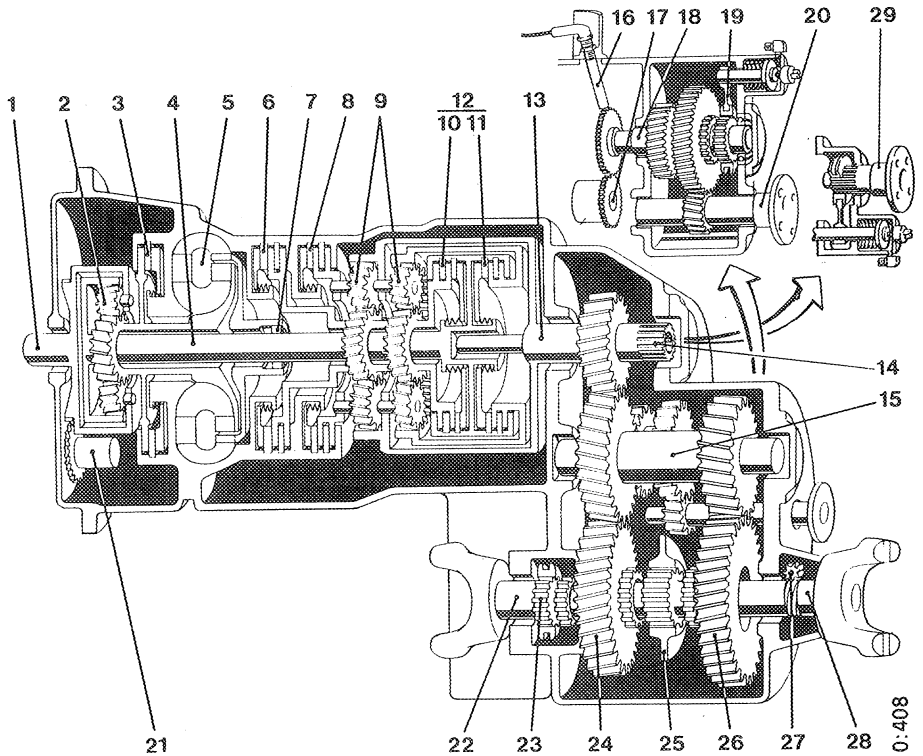
#### Main gearbox

The main gearbox incorporates three different systems, i.e. a mechanical system, a hydraulic system and an electrical system.

- The mechanical system consists of the gearcase, shafts, the front single planetary gear and rear double planetary gear and five hydraulically controlled disc clutches.

The function of this system is to reduce the speed of the engine and to transmit the engine torque to the transfer box.

The different ratios are obtained when the hydraulic disc clutches lock different parts of the planetary gears.



- |  |   |
|--|---|
| 1. Input shaft   | 18. Lateral intermediate shaft  |
| 2. Front planetary gear                                      | 19. Clutch units for Power take-off, for Winch (PW)   |
| 3. Clutch for Mechanical gear (M)                            | 20. Side shaft for Power take-off, for Winch (PW)   |
| 4. Centre shaft  | 21. Front hydraulic oil pump  |
| 5. Hydraulic Torque Converter (H) (TC)                       | 22. Output shaft to front axle  |
| 6. Clutch for 2nd gear                                       | 23. Clutch units for Front-wheel-Drive (FD)   |
| 7. Free-wheel  | 24. Gearwheel for ROAD gear   |
| 8. Clutch for 1st gear                                       | 25. Clutch and synchromesh units for ROAD and TERRAIN gears                                     |
| 9. Rear double planetary gear                                | 26. Gearwheel for TERRAIN gear  |
| 10. Clutch for Reverse gear (R)                              | 27. Worm drive for speedometer  |
| 11. Clutch for Forward gear (F)                              | 28. Output shaft to rear axle   |
| 12. Clutches for 3rd gear (10 + 11)                          | 29. Power take-off, for Crane (PC), shaft and clutch units (Vehicles with 59 kNm loading Crane) |
| 13. Output shaft to transfer box                             |   |
| 14. Connection for Power take-off, for Crane (PC)            |   |
| 15. Intermediate shaft                                       |   |
| 16. Electric frequency transmitter                           |   |
| 17. Rear hydraulic oil pump for Tow Starting the engine (TS) |   |

### Main and transfer gearboxes

- The hydraulic system consists of two hydraulic oil pumps, torque converter, electro-hydraulic solenoid valves, hydraulic cylinders and an oil cooler.

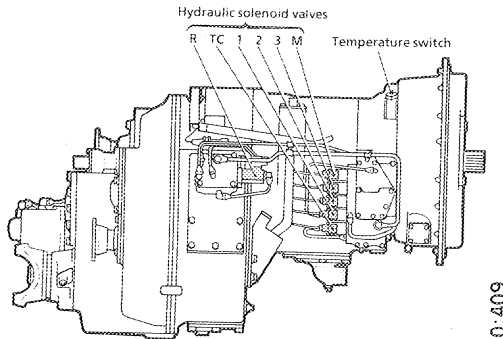
When the engine is running, the front hydraulic oil pump generates a hydraulic pressure which actuates the disc clutches via hydraulic cylinders. The solenoid valves route the oil to the appropriate hydraulic cylinders.

When the engine is to be tow started, the front hydraulic oil pump does not work. Instead, the hydraulic pressure is generated by the rear pump, which rotates together with the propeller shaft when the vehicle is towed.

The torque converter consists of pump impeller, guide vanes and turbine wheel. The pump impeller sets the oil in motion and the energy of the oil is transmitted to the turbine wheel.

The transmission oil is cooled in the oil cooler by the engine coolant.

- The electrical system consists of six electro-hydraulic solenoid valves, automatic control unit and switches.



0:409

The automatic control unit receives signals which indicate the positions of the gear selectors, the accelerator pedal position and speed of the truck by means of a speed sensor. It determines the appropriate gear on the basis of these signals and transmits electrical signals to the solenoid valves, which engage the appropriate gear.

### Main gearbox ratios

The various reduction steps for the forward gears in the gearbox are obtained when the hydraulic disc clutches lock different parts of the rear double planetary gear. This enables three ratios to be obtained. Each such ratio can then be combined either with hydraulic transmission via the torque converter (hydraulic = H) or with a clutch for mechanical gear which disengages the torque converter (mechanical = M).

Even when the torque converter is engaged, two thirds of the torque is transmitted directly, mechanically across the annulus of the front planetary gear to the centre shaft. This splitting of the torque results in lower power losses than if the whole torque were to be transmitted by the torque converter.

If the engine does not have the capacity to drive the wheels despite maximum throttle, all of the engine power is converted to heat in the torque converter. This is known as *stalling*, a condition which must not be sustained for more than 10 seconds to avoid overheating.

The following reduction ratios can be obtained:

Gear	Power path
H1	Across the torque converter and 1st gear
H2	Across the torque converter and 2nd gear
H3	Across the torque converter and 3rd gear
M1	Across the clutch for mechanical reduction and 1st gear
M2	Across the clutch for mechanical reduction and 2nd gear
M3	Across the clutch for mechanical reduction and 3rd gear
N	Neutral, no gear engaged
R	Across the torque converter and reverse gear






H = hydraulic transmission, M = mechanical transmission

In hydraulic gears H1, H2 and H3 a reduction is obtained through the torque converter in addition to the mechanical reductions in the rear planetary gear. In the mechanical gears M1, M2 and M3, step-up is obtained in the front planetary gear.

- With the gear selector in position N, no gear is engaged. Engine can be started.
- In normal driving forward, the gear selector is set to D. The gearbox automatically changes up and down in the normal programme between the four gears H1, H2, H3 and M3. If engine braking is required, the foot switch on the cab floor is depressed. When the speed is reduced and the accelerator pedal is released, the gearbox changes down below about 60 km/h through gears M3 → M2 → M1 → H1. By repressing the accelerator pedal the normal programme will be automatically recalled.
- In position 2, gear H2 is always engaged. This gear locking facility is designed for driving where repeated gear changes up and down are not desirable, e.g. slow driving in convoy.  
N.B. Position D gives a lower ratio and higher tractive effort than position 2 at speeds below 18 km/h.
- In position TS, gear M1 is engaged. This position is intended to enable the engine to be tow-started.
- In position R, the hydraulic reverse gear is engaged.  
N.B. Do not engage reverse gear when truck is moving forwards.



## Summary of main gearbox selector positions

Selector position	Gear changing sequence	Type of driving
 N	Neutral	–
 D D	H1 ⇆ H2 ⇆ H3 ⇆ M3 H1 ← M1 ← M2 ← M3 H1 (no up-change occurs)	Normal driving – Engine braking * – Winching
 2	H2	Slow convoy driving on level roads (no gradients)
 TS	M1	– Tow start – Operating 59 kNm crane
 R	Hydraulic reverse	Reversing

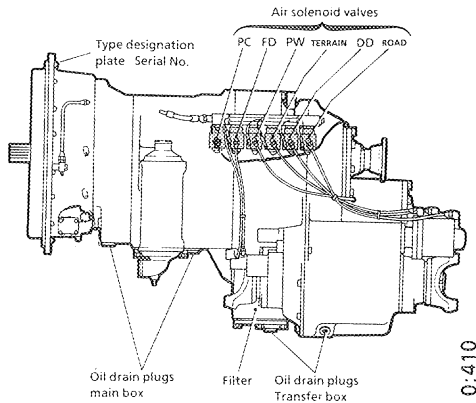
H hydraulic transmission  
M mechanical transmission

\* In either ROAD or TERRAIN gear, the button on the cab floor can be depressed and the accelerator released. In TERRAIN gear, the cross-country brake also comes into operation. See "Driving".

### Transfer box


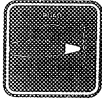
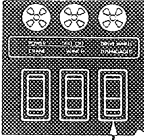
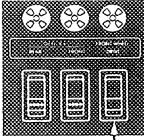
The transfer box incorporates three different systems, i.e. a mechanical system, a pneumatic system and an electrical system.

- The mechanical system consists of three gearwheels, intermediate shafts, shift sleeve for ROAD (high) and TERRAIN (low) gears, coupling sleeve for winch and output shafts forward and to the rear. In neutral position the drive wheels are disengaged. An extra power take-off is connected directly after the input shaft (= output shaft of main gearbox) for driving the hydraulic pump on trucks equipped with 59 kNm loading crane.
- The pneumatic system consists of electro-pneumatic solenoid valves and actuating cylinders. The solenoid valves route the compressed air to the appropriate cylinders.
- The electrical system consists of electro-pneumatic solenoid valves and indicating switches. The solenoid valves consist of solenoids which control the air supply to the cylinders by means of switches in the cab.

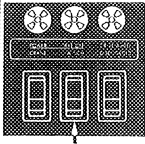
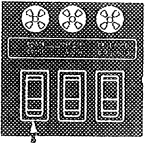


### Compressed air solenoid valves

#### Ratios of the transfer box

Transfer box selector position	Gear changing programme	Type of driving
 <b>ROAD</b>   <b>TERRAIN</b>	<ul style="list-style-type: none"> <li>- Road gear (<u>high gear</u>).</li> <li>- Terrain gear (<u>low gear</u>).</li> <li>- Front-wheel-drive engaged automatically.</li> <li>- Terrain braking available. (foot switch)</li> <li>- Winch possible.</li> <li>- Power take off engagement possible</li> </ul>	<ul style="list-style-type: none"> <li>- Normal on-road driving.</li> <li>- Off-road driving or on exceptionally steep road gradients.</li> <li>- Winching.</li> </ul>
 <b>DD (Drive-wheel disengagement)</b>	<ul style="list-style-type: none"> <li>- Neutral.</li> </ul>	<ul style="list-style-type: none"> <li>- Winching without wheels driving.</li> <li>- Towing the vehicle to workshop</li> <li>- Using the 59 kNm crane, when fitted</li> </ul>
 <b>FD (Front-wheel drive)</b>	<ul style="list-style-type: none"> <li>- Manually engaging the front-wheel-drive clutch.</li> </ul>	<ul style="list-style-type: none"> <li>- Driving in ROAD (high) gear in slippery conditions.</li> </ul>

(continued)

	<p><b>PW</b> (Power take-off for winch)</p>	<ul style="list-style-type: none"> <li>- The winch power take-off can be engaged only in TERRAIN gear.</li> <li>- Winch braking available.</li> </ul>	<ul style="list-style-type: none"> <li>- Winching of the vehicle itself or other vehicle.</li> <li>- Gear selector in D = H1.</li> </ul>
	<p><b>PC</b> (Power take-off for crane only vehicles with 59 kNm crane)</p>	<ul style="list-style-type: none"> <li>- Engagement of the power take-off for the crane.</li> </ul>	<ul style="list-style-type: none"> <li>- Using the 59 kNm crane, when fitted.</li> <li>- Vehicle stationary.</li> <li>- Drive-wheels disengaged.</li> <li>- Gear selector in position TS = M1.</li> </ul>

## Power take-offs

### EGA763 – for winch

This power take-off is intended for driving the winch. The power take-off is incorporated in the right-hand side of the transfer box and is driven by the front gearwheel of the intermediate shaft. The power take-off is controlled electro-pneumatically by means of a switch in the driver's cab and a solenoid valve and compressed air cylinder on the gearbox. An indicating switch on the power take-off is connected to a warning light in the cab.

### EGA760 – for 59 kNm loading crane (certain vehicles)

The power take-off is located centrally at the rear of the transfer box and is driven from the upper shaft of the transfer box through a coupling sleeve. The power take-off is used for driving a hydraulic pump for the crane.

The power take-off is controlled electro-pneumatically by means of a switch in the driver's cab, solenoid valve on the gearbox and a compressed air cylinder on the power take-off. An indicating switch on the power take-off is connected to a warning light in the cab.

## Brake system

The trucks are equipped with direct-acting air brakes. The brake system may be divided into supply system, foot brake, parking brake and trailer brake.

Included in the system are also the terrain brake and the winch brake.

The SBA111 4x4 with two axles instead of three differs mainly in having fewer components.

## Supply system

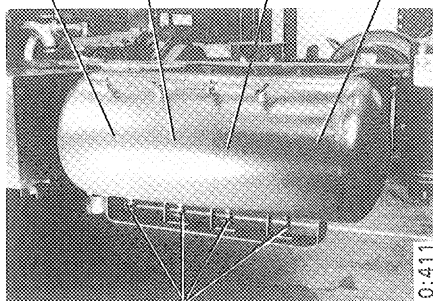
The supply system delivers compressed air to the various functions. The system consists of a compressor driven by the engine, pressure regulator, warning system for low air pressures, air dryer and air pressure tank.

## Air pressure tank

The air pressure tank is divided into four sections. Each section is provided with an instrument tapping and drain cock.

The compressed air system must not be filled from the tappings on the air pressure tank but must be filled from the tapping behind the air dryer. (See Releasing the parking brake under Towing.)

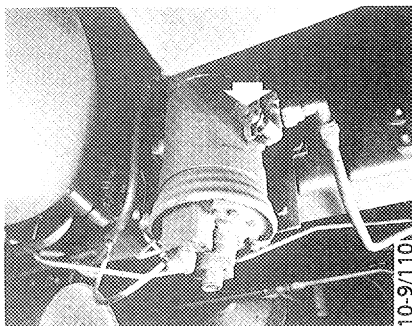
Tank sections and measuring outlets for:  
Parking brake    Front circuit    Equalisation    Rear circuit



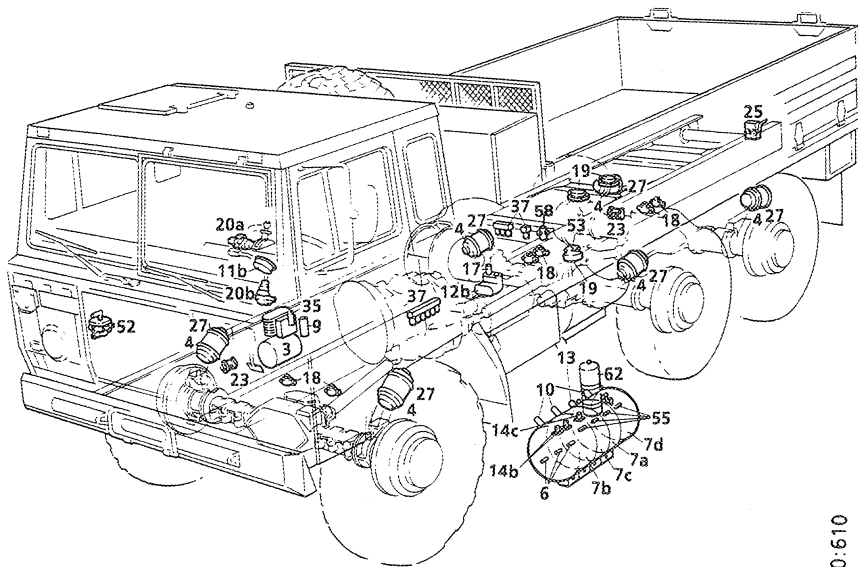
Drain cocks

Air pressure tank

Charging connection for compressed air



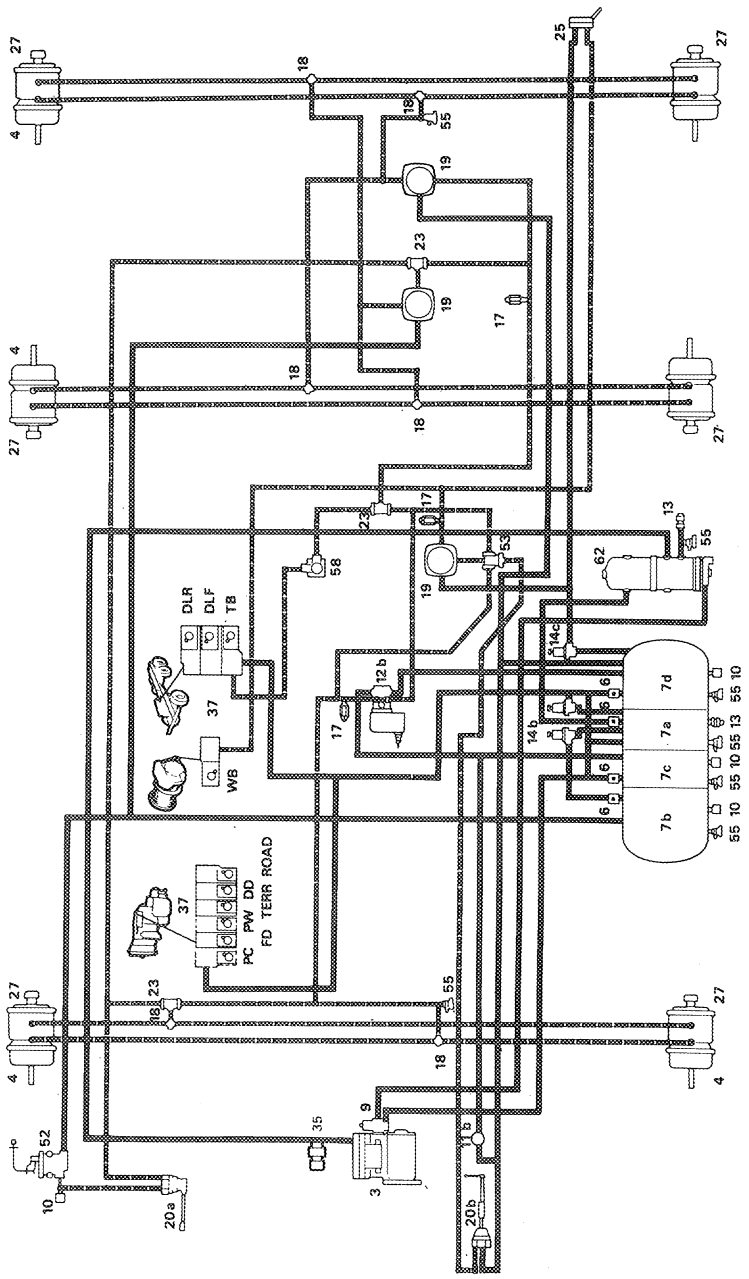
Air dryer





0:610

### Brake system components

- |                                   |                             |
|-----------------------------------|-----------------------------|
| 3. Compressor                     | 18. Quick release valve     |
| 4. Brake chamber                  | 19. Relay valve             |
| 6. Check valve                    | 20a. Parking brake valve    |
| 7. Air pressure tanks             | 20b. Hand control valve for |
| a = for equalisation              | trailer brake and winch     |
| b = for parking brake             | brake, if any               |
| c = for front circuit             | 23. Double check valve      |
| d = for rear circuit              | 25. Trailer coupling        |
| 9. Pressure regulator             | 27. Spring brake cylinder   |
| 10. Low pressure indicator        | 35. Safety valve            |
| 11b. Double air pressure gauge:   | 37. Solenoid valve          |
| orange pointer for front circuit, | 52. Interlock valve         |
| white pointer for rear circuit    | 53. Three-way valve         |
| 12b. Foot brake valve             | 55. Measuring outlet        |
| 13. Safety valve                  | 58. Pressure limiting valve |
| 14. Pressure regulating valve     | 62. Airdryer                |
| 17. Stop light switch             |                             |



 Supply system  
 Control system

Brake system diagram for the SBAT111

0-414

### Foot brake

The foot brake is divided into two independent circuits, operated by the brake pedal. One circuit serves the front wheels, the other the rear wheels. The air for each circuit is stored in separate tanks 7c and 7d. The foot brake also operates a connected trailer, as well as the winch brake, if engaged.

### Parking brake

The parking brake consists of a spring brake for each wheel, i.e. the brake is kept applied by a powerful spring in each spring brake cylinder (27). The brake is released by compressed air supplied from a special tank through the normal control valve (20). An air pressure of about 5 bar is required to release the parking brake.

The parking brake circuit also includes an interlock valve (52), designed to prevent accidental release of the parking brake when the system is being charged, if the hand control valve has been left in the released position. Since the parking brake operates on all wheels it can also be used as an emergency brake.

### Trailer brake

The trailer is connected to the truck brake system by a coupling 25.

The actuating pressure to the trailer is controlled by a relay valve (19) from the foot brake valve (12b). It is also possible to brake the trailer on its own by means of the trailer brake control lever (20) below the steering wheel. It will also operate the winch brake, if engaged.

### Terrain brake

The terrain brake is an extra control system for the foot brake, which is applied at a specific reduced air pressure, 1.7 bar. The terrain brake only operates when the transfer box gear selector is in position TERRAIN. The brake is operated by means of the button on the cab floor (See also "Braking" under "Driving") and is most useful when passing obstacles.

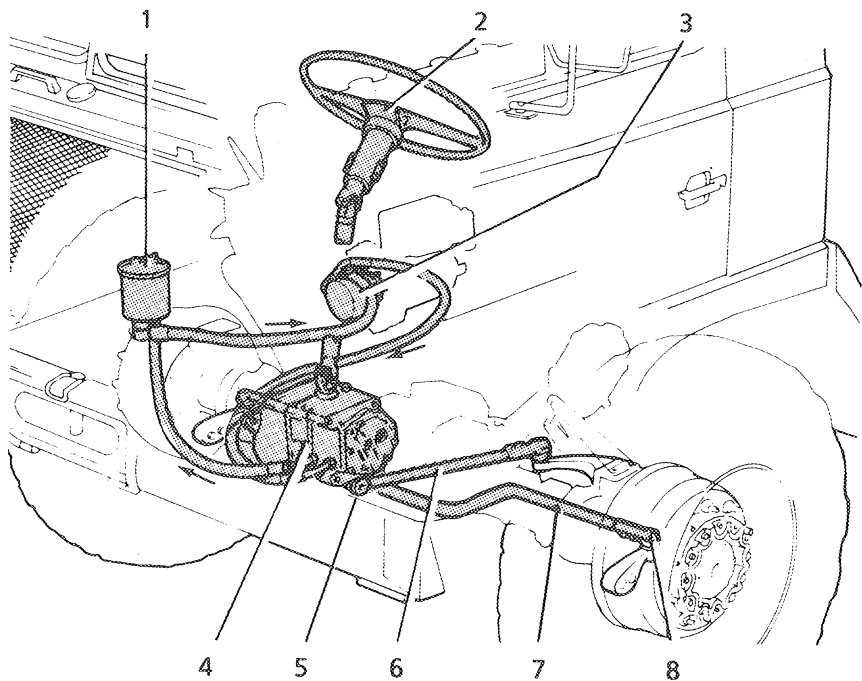
### Winch brake

A winch brake is provided on trucks equipped with a winch. This brake is connected to the truck brake system and can be operated when the POWER TAKE-OFF WINCH is engaged. The brake is operated by the foot brake pedal or trailer brake control lever.

## **Steering system**

The truck is equipped with hydraulic power steering, which considerably reduces the steering wheel effort required.

In the event of a fault in the hydraulic system, the steering gear will act mechanically, but will require a higher effort at the steering wheel.



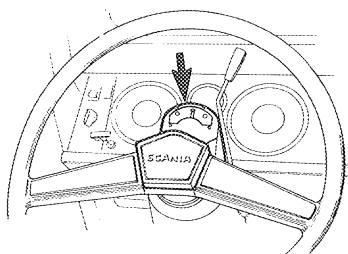
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- |                              |                             |
|------------------------------|-----------------------------|
| 1. Hydraulic fluid container | 5. Steering worm sector arm |
| 2. Wheel alignment indicator | 6. Drag link                |
| 3. Hydraulic pump            | 7. Track rod                |
| 4. Power steering gear       | 8. Ball joint               |

### Steering system

#### Wheel alignment indicator

A wheel lock indicator, which indicates the angle of the front wheels, is provided below the steering wheel.



0:416

#### Wheel alignment indicator



## Frame

The frame consists of two longitudinal channel-section members joined together by cross-members.

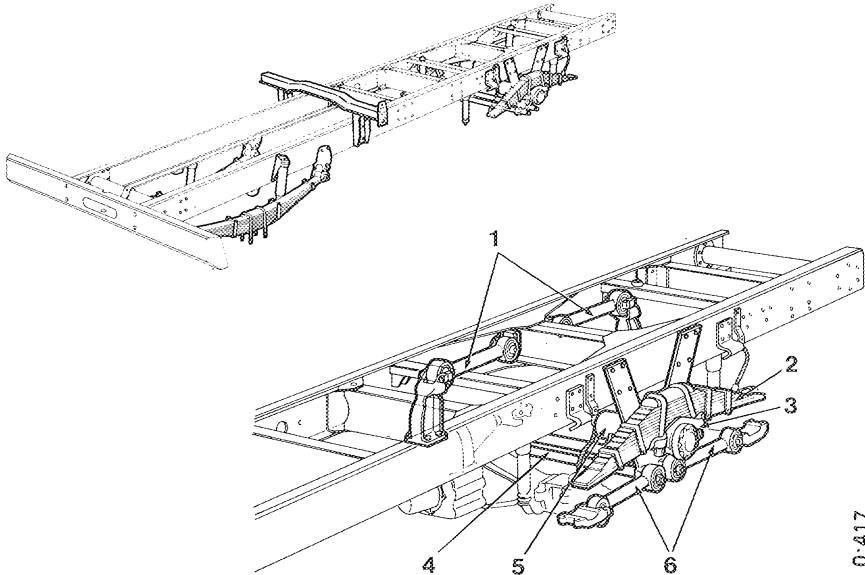
The front and rear cross-members are tubular in section and are extremely robust to give the frame the torsional rigidity and strength required when driving on rough ground.

## Springs

The rear and front springs are all leaf springs. On the SBA111 and on the front of the SBAT111, the front ends of the springs are rigidly suspended in pivot bolts. At the rear, the springs are suspended in spring shackles.

The rear spring system on the SBAT111 is of the balanced bogie type, with one spring on either side. The springs are pivoted at the centre in spring bearings, and at their outer ends absorb the vertical forces from the truck axles.

All axles have double-acting hydraulic shock absorbers.



0.417

- |                           |                          |
|---------------------------|--------------------------|
| 1. Upper reaction struts  | 4. Bar                   |
| 2. Spring                 | 5. Bogie suspension axle |
| 3. Spring bearing housing | 6. Lower reaction struts |

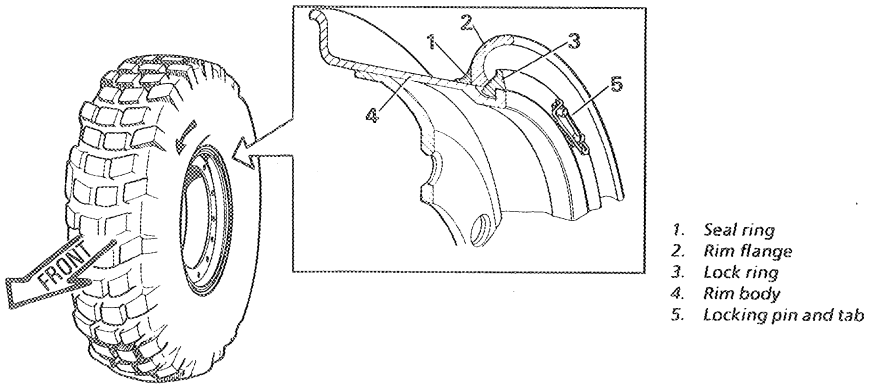
Bogie of the SBAT111

## Wheels

The Scania SBA111 and SBAT111 are fitted with steel disc wheels and tubeless tyres with cross-country treads. All wheels are single and identical.

As an optional extra, the trucks can be fitted with tyre locks which prevent the tyre from sliding off the rim in the event of a puncture. This device makes it possible to drive with a punctured tyre for a long distance, in case of emergency.

**N.B.** The tyre must be fitted in the right direction to give full traction.



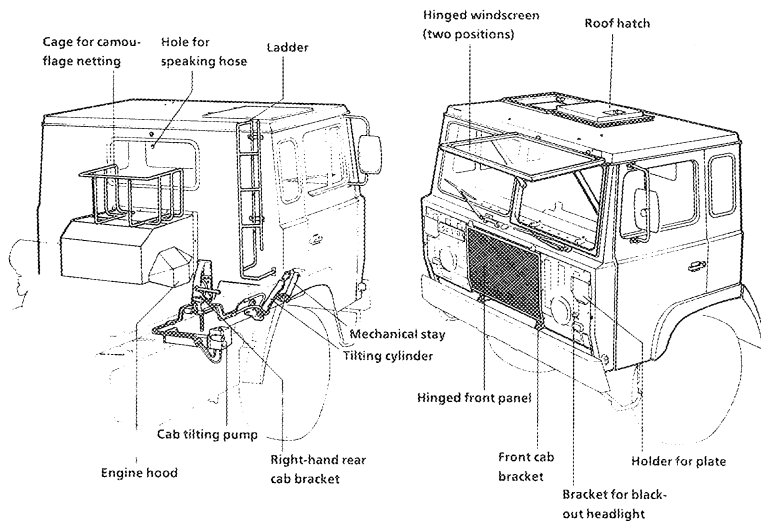
Wheel and rim details

## Driver's cab

The cab can be hydraulically tilted for repair and maintenance access.

The front cover can be opened and the two front plates removed.

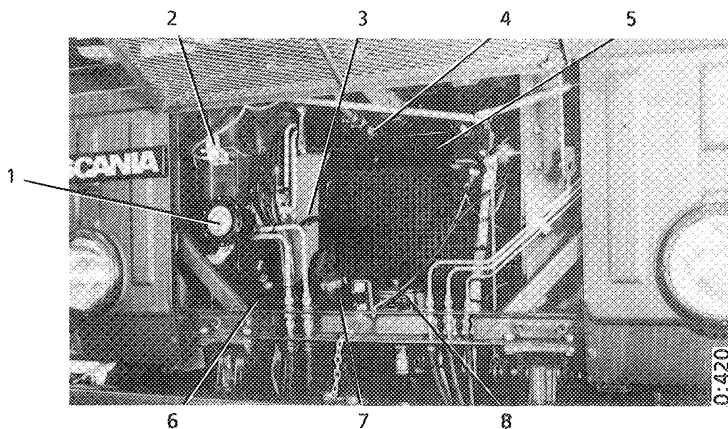
The roof is fitted with a hinged hatch and mounting holes for roof rack.



### Driver's cab

#### Front cover

When the front cover is opened, the parts shown in the figure will be visible.



- |                                    |                                       |
|------------------------------------|---------------------------------------|
| 1. Horn                            | 5. Windscreen wiper motor             |
| 2. Windscreen washer motor         | 6. Engine dipstick                    |
| 3. Chain for cold starting control | 7. Filler pipe for engine oil         |
| 4. Sight glass for coolant level   | 8. Fluid container for power steering |

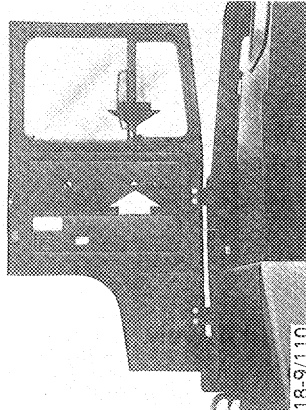
#### Behind the front cover

## Windows

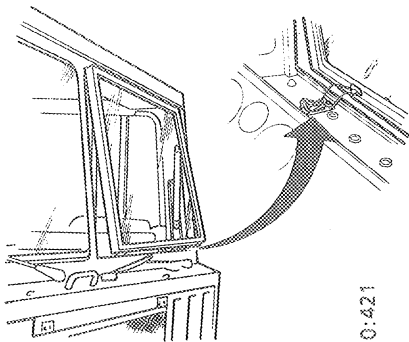
The truck windows are of hardened glass, except for the two windscreens, which are of laminated glass. The door side windows consist of sections, which can be raised and lowered, and pivoted ventilation windows (quarter lights). Each side window can be wound down by means of a handle on the inside of the door. The ventilation windows can be opened after releasing a catch.

The windscreen on the driver's side can be partially or fully opened.

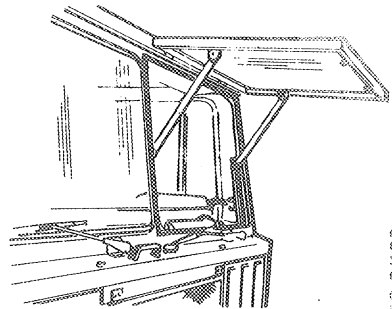
See also: Opening the hinged windscreen.



Door inside



Windscreen partially open  
for ventilation



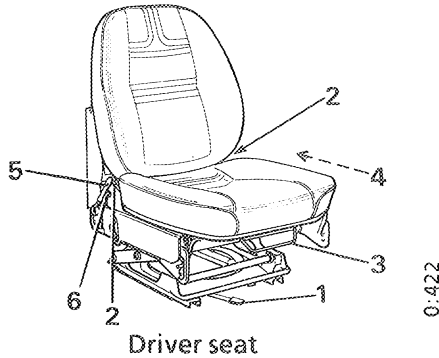
Windscreen fully open to avoid reflec-  
tions when using the blackout lights

### Opening windscreen

## Driver seat

The seat consists of a seat cushion, a backrest and a sprung frame. The frame is mounted on two rails which are secured to distance pieces bolted into the cab floor. The seat suspension is provided by a transverse torsion spring at the rear of the frame. A hydraulic shock absorber prevents the seat from rocking.

The seat can be adjusted to different positions to enable different drivers to obtain a comfortable driving attitude which is very important.



Adjustments available:

1. *Fore-and-aft adjustment*: The seat can be slid along the floor rails. Move the lever to the right.
2. *Backrest rake*: Four positions. Press one of the buttons.
3. *Height adjustment at the front*: Five positions.

*Raising*: Lift the cushion.

*Lowering*: Pull handle 3 forward. Lower to the desired position.

4. *Height adjustment at the rear*: Three positions. Push the seat cushion back and set the desired position.
5. *Suspension stiffness*: The initial preloading of the torsion spring is infinitely variable by means of lever 5, so that the stiffness of the springing can be matched to the weight of the driver.

*To adjust the stiffness*: Pull out the handle on the lever, turn it so that the plus or minus sign ( $\oplus$  stiffer,  $\ominus$  softer) is at the front and then pump the lever up and down.

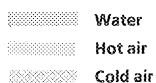
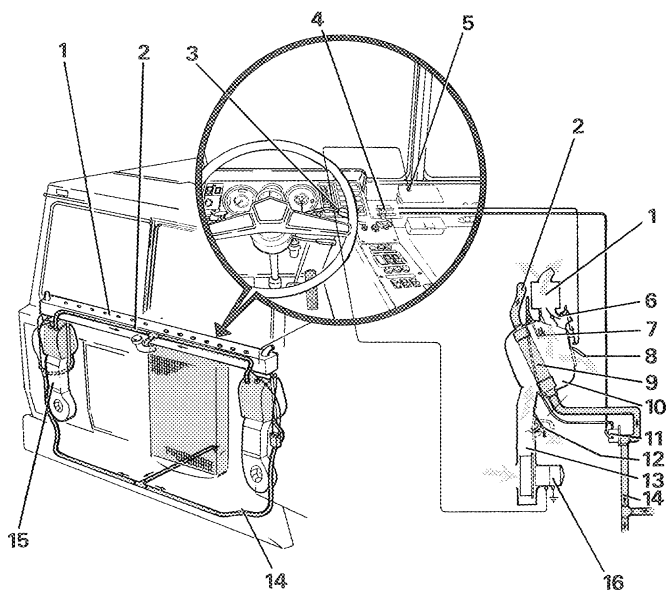
6. *Suspension indicator*: When the correct adjustment has been made, the pointer will be at the same level as the front edge of the seat. If the pointer is outside the edge, the spring force is too high, and if the pointer is inside the edge, the spring force is too low.

When driving on rough ground, it may sometimes be advisable to adjust the suspension so that the springing is rendered inoperative.

## Heating system

Two identical heaters are located in the foot wells of the driver's cab. Fresh air is drawn in through openings in the front and then flows through a coolant-heated radiator in each heater unit.

The temperature of the air is controlled by a thermostat, which is set by means of the TEMP lever on the instrument panel. The thermostat then maintains a constant temperature in the cab. The air flow to the windscreen (defroster) is controlled by the DEF lever.



- |   |                       |
|---|-----------------------|
| 1. Windscreen frame                             | 9. Radiator           |
| 2. Water outlet pipe                            | 10. Matrix            |
| 3. Switch for fan motors                        | 11. Thermostat        |
| 4. Control levers for defroster and temperature | 12. Footwell damper   |
| 5. Fuse for fan motors                          | 13. Lower air duct    |
| 6. Upper air duct with damper                   | 14. Water supply pipe |
| 7. Sensor                                       | 15. Heater unit       |
| 8. Damper                                       | 16. Fan with motor    |

## Heating system

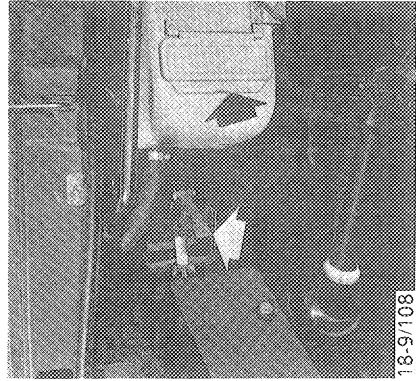
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The air flow is dependent on the speed of the truck and on the speed of the electric fan in each heater. The fan motors have two speeds, which are controlled by switch 18 on the instrument panel.

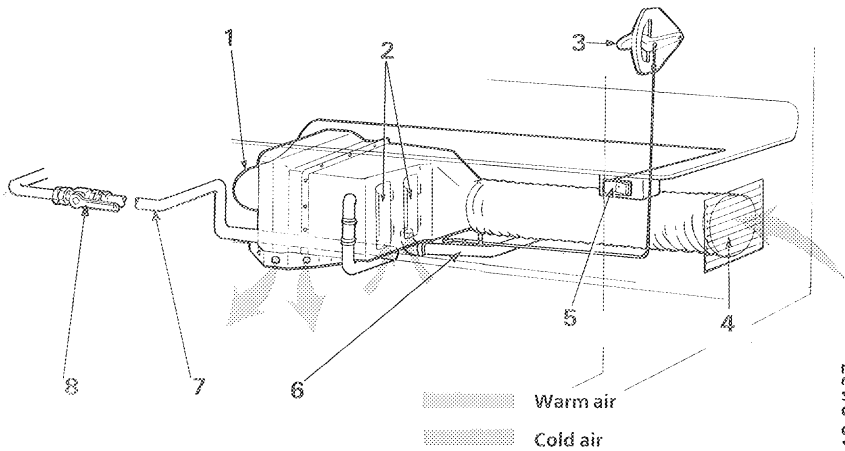
The air flow to the floor is controlled by means of a flap on each hot air matrix under the instrument panel.

Fresh air can also be supplied directly to the footwells by means of a foot-controlled flap, without passing through the heater.

Trucks with crew cabs have an extra heater for heating the cab. Fresh air is taken in through an opening in the side of the cabin. The desired temperature of the hot air is set by the lever on the cab wall. The air flow is controlled by a fan, which is regulated by the switch on the bench. The hot water flow is controlled by a tap under the bench.



Hot and cold air dampers

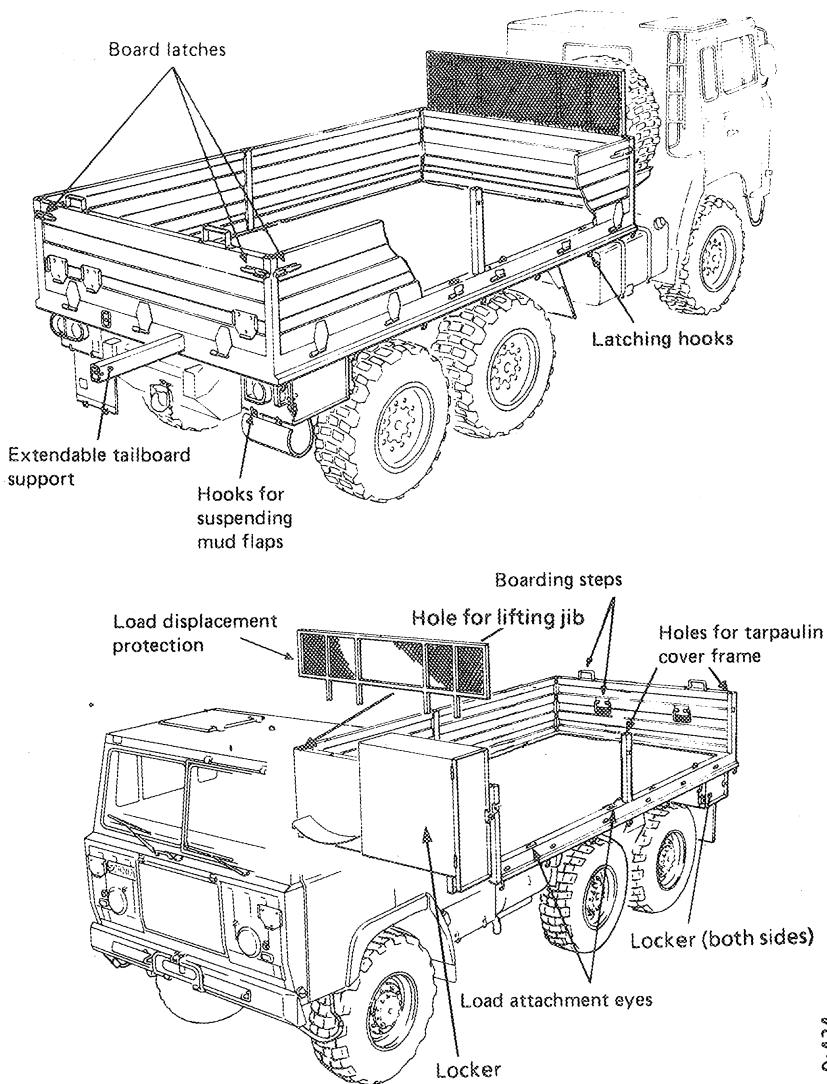


- |  |   |
|--|---|
| 1. Fan motor                           | 5. Switch for fan motor                           |
| 2. Air intake from cab (recirculation) | 6. Water outlet pipe                              |
| 3. Air damper control                  | 7. Water supply pipe                              |
| 4. Outdoor air intake                  | 8. Temperature control tap (closed to fully open) |

Crew cab heating system

# Platform

The platform is mounted at four points, to avoid the twisting movements of the frame to be transmitted to the platform.



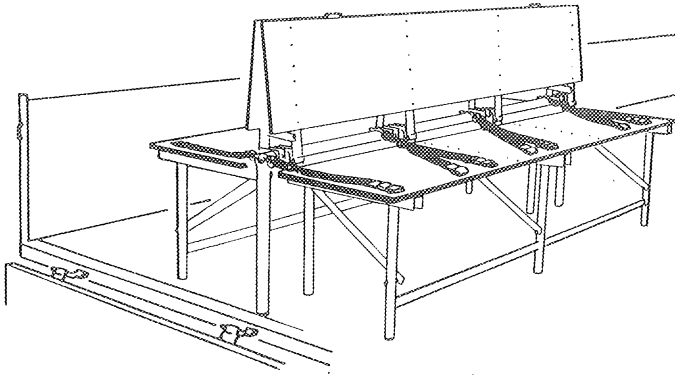
Platform

0:424



### Benches for mounting on the platform (optional extra)

The platform is prepared with special mounting holes for crew cab, 15 kN loader and for securing benches which can accommodate a maximum of 14 people. The benches consist of sections and can be folded up.



0-425

### **Winch (towing vehicles)**

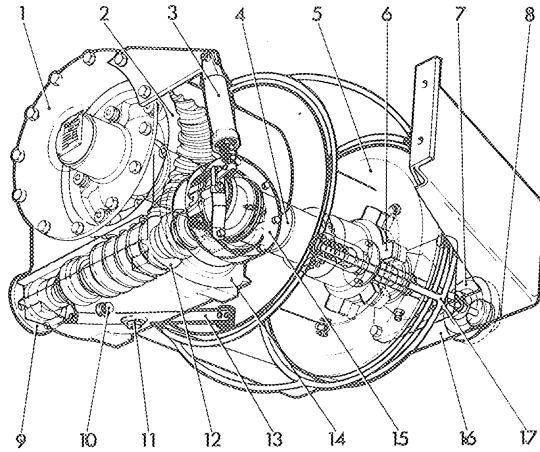
The winch is secured to the right-hand frame member and driven by a propeller shaft from the winch power take-off on the transfer box.

The power take-off is engaged and disengaged by a switch on the instrument panel to the right of the driver and is driven when the gear selector is set to **D** (winching forward and backward), **R** (as an aid when pulling out the winch rope) and the transfer box selector is set to **TERRAIN**.

With the winch power take-off engaged only 1st hydraulic gear (H1) is operative. The automatic gear selector prevents the engagement of any other gear.

The drive shaft is bolted to a flange on the worm gear shaft. From the worm gear, the torque is transmitted to a jaw coupling, one half of which is mounted on the winch drum. The jaw coupling is engaged or disengaged by sliding the coupling handle in or out. A locking button locks the handle in the engaged and withdrawn positions.

A brake drum mounted on the worm shaft extension is applied by means of compressed air. The compressed air flow is controlled by means of the trailer brake stalk under the steering wheel or the foot brake pedal. The winch is automatically prevented from being overloaded by the torque converter. When the turbine wheel is



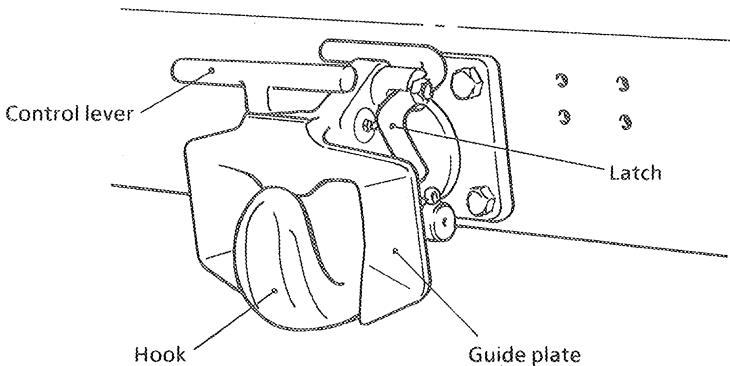
0:426

- |                                       |                                  |
|---------------------------------------|----------------------------------|
| 1. Worm wheel end                     | 9. Driver                        |
| 2. Worm wheel                         | 10. Filler plug                  |
| 3. Brake actuating cylinder           | 11. Drain plug                   |
| 4. Drum shaft                         | 12. Worm                         |
| 5. Rope drum with hand operating ring | 13. Anti-spin brake (adjustable) |
| 6. Jaw coupling                       | 14. Winch gear housing           |
| 7. Jaw coupling handle                | 15. Winch brake                  |
| 8. Locking button                     | 16. Support beam with bearing    |
|                                       | 17. Rope guard                   |

Winch (seen from underneath)

## Tow hitch

The vehicle is equipped with a tow hitch with safety operation.



11-9/102

Tow hitch

## Loading cranes

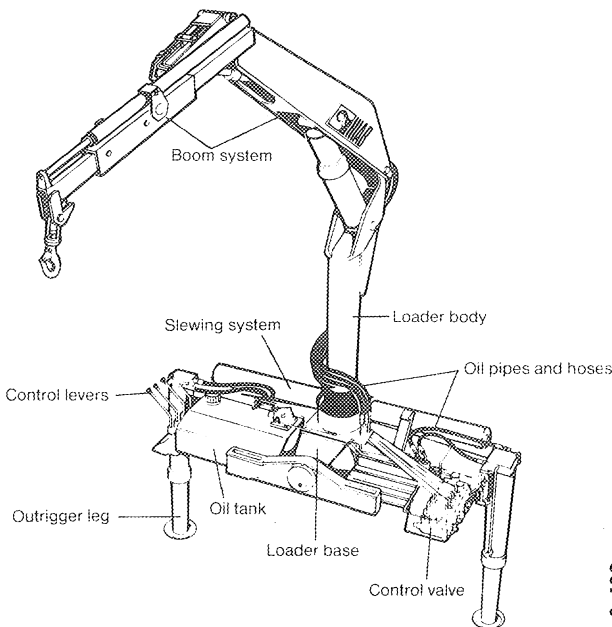
### 59 kNm (5900 kgf m), (ammunition vehicles)

The loading crane is hydraulically operated.

The loader base consists of a welded box incorporating a king post. The king post serves as a bearing for the loader body and the slewing system. The slewing system is operated via a rack and pinion mechanism. The pinion comprises a gear ring which is incorporated into the lower part of the body. The ends of the rack form single acting hydraulic pistons.

The loader is operating by means of a control valve which has six functions. The valve is of the spool type. Relief valves for all functions as well as restriction valves for the slewing function are incorporated into the control valve. The control valve also includes load-holding valves for inner and outer booms.

Separate constant flow valves and hose failure valves are also incorporated.



**Loader crane 59 kNm (5900 kgf m)**

0.428

The arm system consists of inner boom, outer boom and extension boom.

The oil tank comprises a return filter, level indicator, filler cap with strainer, air filter and a drainplug.

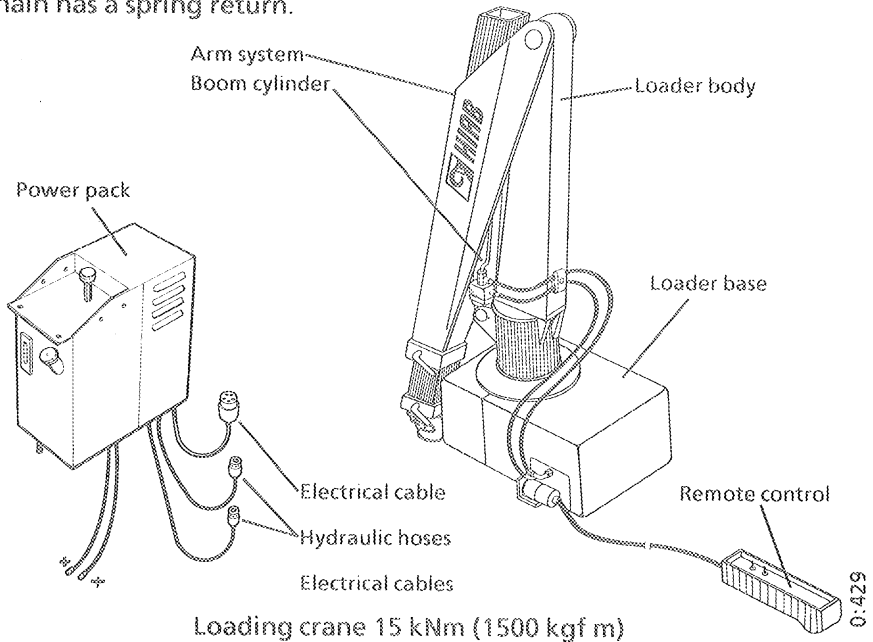
## Loading crane 15 kNm (1500 kgf m), (Towing vehicles)

The HIAB 130 MATZ is a hydraulically operated loading crane attached by bolts to the rear of the flatbed. The loader base incorporates the slewing system and the control valves for the loading crane.

The slewing system consists of a cogwheel rim bolted to the loader body and a worm gear. A hydraulic motor drives the worm gear to slew the loader body.

The loading crane is controlled by means of two electrical switches on the remote control handle. The remote control handle is attached by an electrical cable to a connector on the loader base. When the electrical switches are operated, the power pack starts up and the electro-hydraulic valves are activated at the same time.

The arm system consists of a loader boom with two extendable manual extension booms. A safety hook is attached to a short safety chain that can be extended in relation to the extension booms. The chain has a spring return.



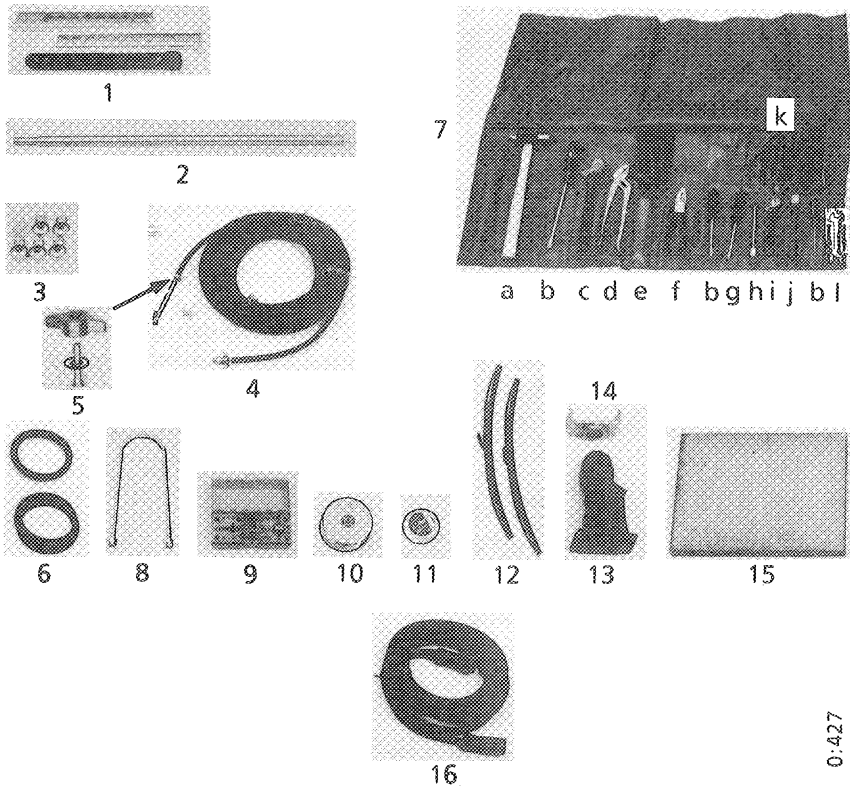
Loading crane 15 kNm (1500 kgf m)

A check valve is fitted into the cylinder bottom to serve as a hose failure valve. A pilot-operated check valve is also included to ensure proper load holding.

The power pack comprises an oil tank, filling strainer, suction strainer, high pressure filter, oil level indicator, draining plug, electrical motor and a hydraulic pump.

The electrical motor is equipped with a safety device that protects against overheating.

## Tools and spare parts



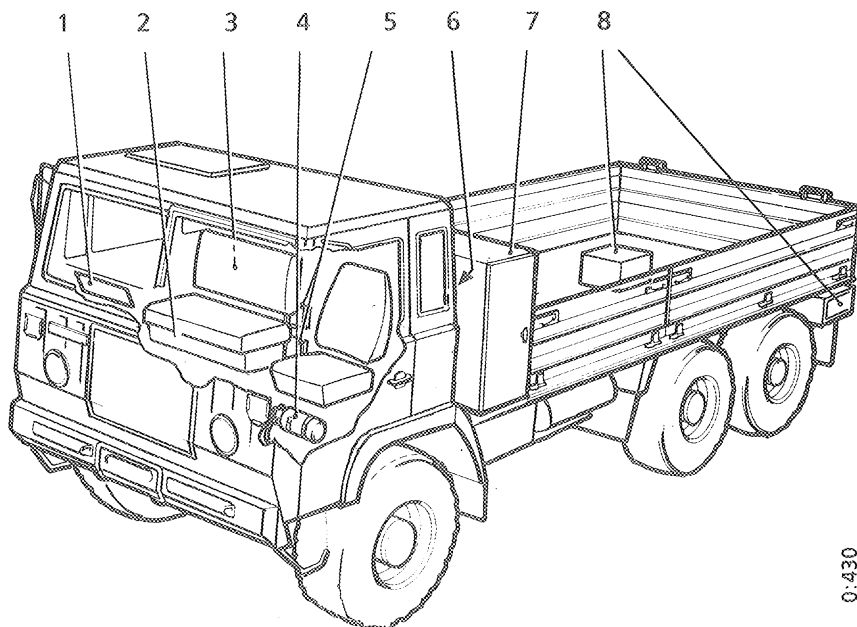
1. Wheelnut spanner and two-parts support
2. Lever for cab tilting pump and wheel nut spanner
3. Pad locks (5 pcs) with equal keys
4. Tyre pumping hose with nozzle
5. Nipple (2 parts and gasket) for tyre pumping hose (in tool bag, for connecting to air tank on other SBAT 111)
6. Fanbelts (2 pcs)
7. Tool bag containing:
  - a) Hammer
  - b) Screw drivers, 3 pcs (Big, Medium and Small)
  - c) 10" adjustable spanner
  - d) Adjustable pliers
  - e) Allan key for oil plug in engine
  - f) Universal pliers
  - g) Philips screw driver
  - h) Tyre gauge (kPa, kgf/cm<sup>3</sup>)
  - i) 6" adjustable spanner
  - j) Chisel
  - k) Extracting screws (3 pcs)
  - l) Wrench 18/19 for fuel pipe nut
8. Spare fuel pipe (in tool bag)
9. Box of bulbs and fuses
10. 1.5 mm steel wire
11. Insulating tape (in tool bag)
12. Wind screen wiper blades (2 pcs)
13. Jack (8 tonnes)
14. Jack guide
15. Jack base plate
16. Jump start cable, 8 m one for every 10 th. vehicle (battery A-kit)

0-427

Tools and parts kit

## Accessories

The accessories are to be stored in the special holders and lockers provided, according to the illustrations below.



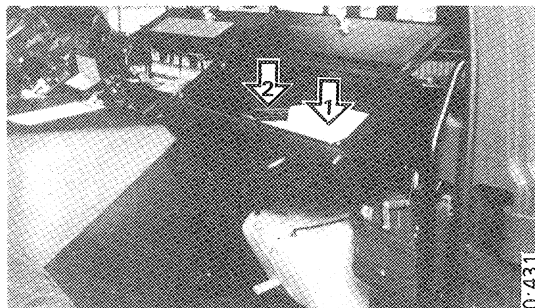
- |                                 |                                |
|---------------------------------|--------------------------------|
| 1. Glove box                    | 5. Holder on rear cab wall     |
| 2. Locker under passenger seat  | 6. Holder on locker            |
| 3. Locker behind passenger seat | 7. Locker on headboard         |
| 4. Holder for fire extinguisher | 8. Locker for anti-skid chains |

0:430

### Location of accessories on SBAT111

#### 1. In the glove box

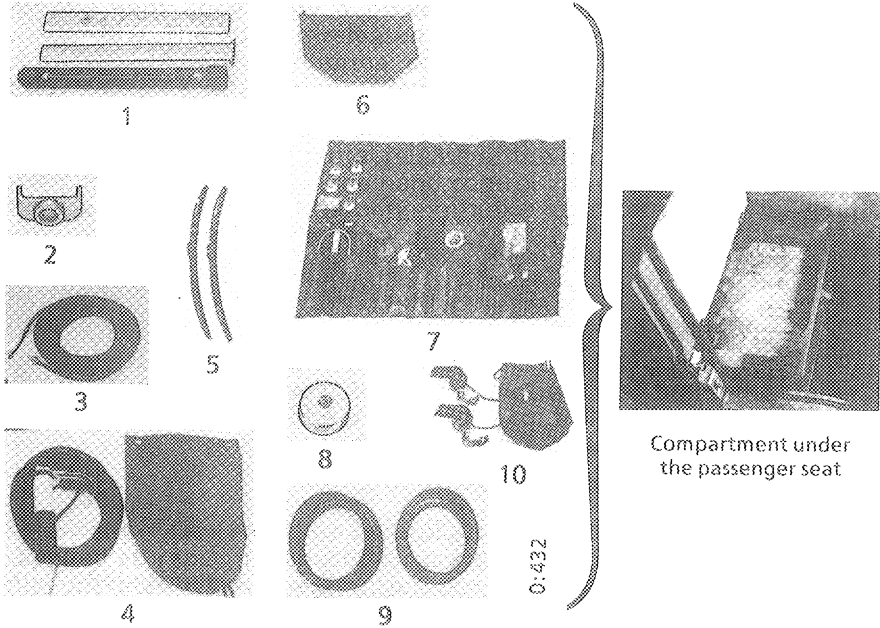
- Bulb and fuse box.
- Operator's manual.



0:431

## 2. Under the passenger seat

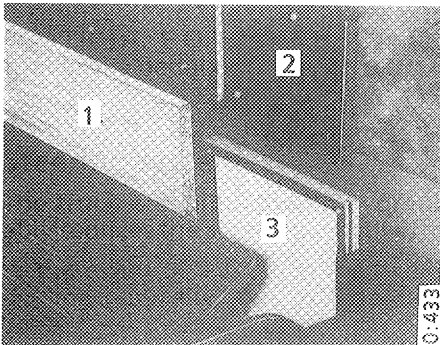
1. Wheel nut spanner and support, two parts (lever behind the driver seat)
2. Jack guide
3. Tyre pumping hose with nozzle
4. Inspection lamp with red lens cover and bag
5. Two wiper blades
6. Holder for unit recognition plate
7. Tool bag with hand tools, insulating tape, tyre pressure gauge, spare pressure pipe and a nipple with gasket for tyre pumping hose (when connecting to other vehicle)
8. 1.5 m m steel wire
9. Two fan belts
10. Two black-out lights with cover.



Compartment under the passenger seat

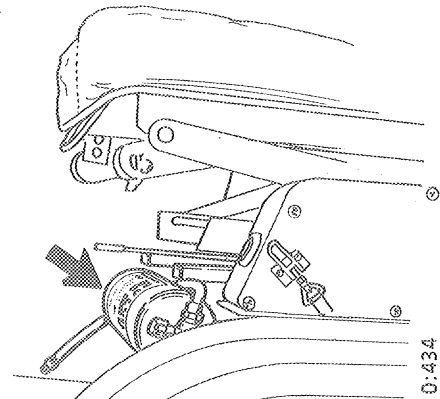
## 3. Behind the passenger seat

1. Jack base plate
2. Extra plate holder for unit plates. plates.
3. Holder for light plates.



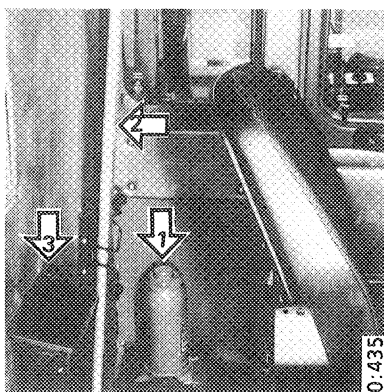
## 4. In front of the driver seat

- Fire extinguisher in holder.



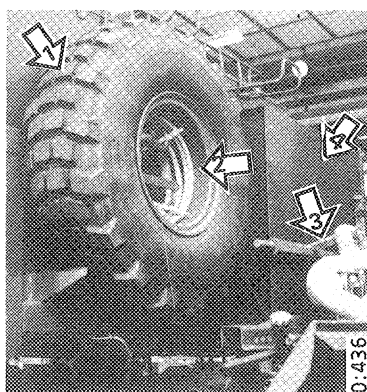
## 5. Behind the driver seat

1. Jack.
2. Lever for jack and cab tilting pump
3. Waste basket



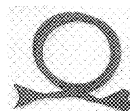
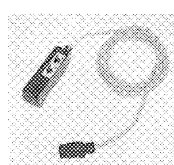
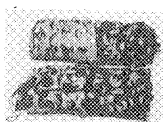
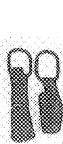
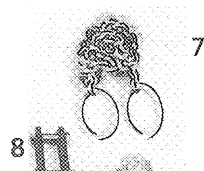
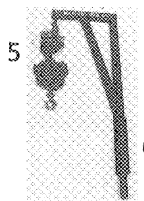
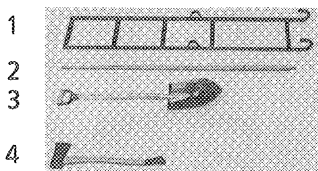
## 6. On the headboard

1. Spare wheel with holder
2. Tow rope with leatherstraps (4 pcs)
3. Lifting jib (item 6 below)
4. Locker



## 7. In, on and under the locker on the headboard

- |  |   |
|--|---|
| 1. Ladder  |   |
| 2. Crow bar  |   |
| 3. Spade   |   |
| 4. Axe   |   |
| 5. Lifting block   |   |
| 6. Lifting jib with eye bolt   |   |
| 7. Anchoring chain   | } Winching equipment<br>(Towing vehicles<br>with winch)   |
| 8. Flat shackle  |   |
| 9. Chain shackle   |   |
| 10. Pulley   |   |
| 11. Lifting sling<br>length 3,8 metres<br>(towing vehicles with<br>15 kNm loading crane) |   |
|  | <ul style="list-style-type: none"> <li>• Lifting sling<br/>length 5,5 metres<br/>(ammunition vehicles with<br/>59 kNm loading crane)</li> </ul> |
|  | 12. Gun stand with empty<br>shell collector   |
|  | 13. Masking nets, 2 pcs (can also<br>be kept in stand by position in<br>the basket behind the cab,<br>see page 66)                              |
|  | 14. Remote control for 15 kNm<br>loading crane (towing<br>vehicles).  |
|  | 15. Speaking hose with horns<br>(towing vehicles).  |



11

12

13

14

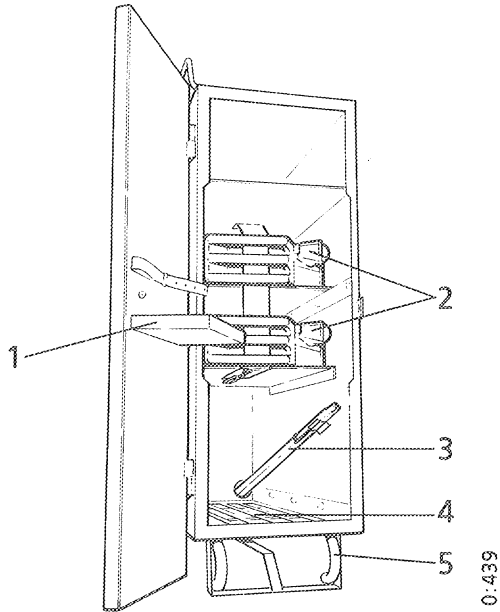
15

0.437



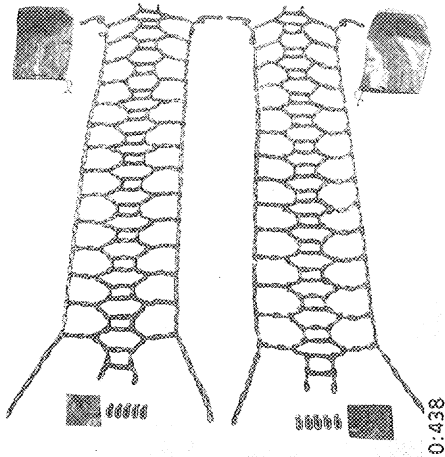
Certain spaces inside the locker on headboard:

1. Space for spare oil, etc.
2. Jerri cans
3. Crow bar
4. Wooden floor-board
5. Ladder



8. In the lockers behind the rear wheels

Room for anti-skid chains, if carried, with repair links (two chains in each locker)



# OPERATION

## Running-in

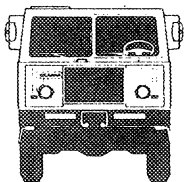
Before the truck leaves the factory, the engine has been bench tested and the finished truck road-tested. In conjunction with delivery of the vehicle, and during the initial period after it has been taken into service (running-in period), a number of inspections and adjustments must be made, in addition to the normal periodic maintenance. One of the reasons for this is that gaskets tend to settle slightly during this initial period. These measures should consequently be undertaken where appropriate, even after one or some of the units in the truck have been reconditioned.

We recommend that certain amount of care be taken during the running-in period and high continuous loads and high speeds should be avoided.

This applies up to 5000 km, although it is always worth-while exercising a certain amount of caution for a further 5000 km.

Carry out the **RUNNING-IN-MAINTENANCE** after the first driven 500 km - 2500 km, although not later than 6 months after delivery from the factory. See "Maintenance" in page 132.

**Don't forget  
in order to avoid  
unnecessary mal-  
function**



**IMPORTANT**

Carry out **RUNNING-IN-MAINTENANCE** after the first driven 500 km-2500 km although not later than **6 MONTHS** after delivery from factory.

**OPERATORS MANUAL** contains further instructions.

**Remove this sticker after the Running-in-maintenance.**

Reminding sticker on the windscreen

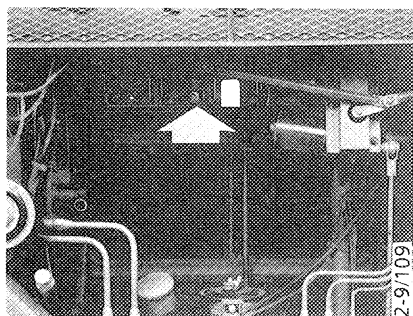
## Checks before driving / Daily maintenance

Before the truck is moved, check whether leakage has occurred. Look under the truck on the ground, on the axle gears, gearbox, engine, winch and crane, if fitted. If any serious leaks are detected, they must be traced and repaired.

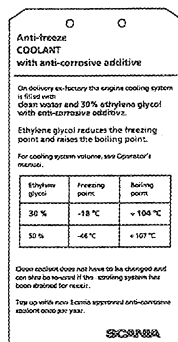
Open the front cover.

Grip the bottom of the radiator grille and pull forward. The front cover is retained in the open position by a catch.

### 1. Coolant level



Sight glass for coolant



Label on the radiator

- Check the coolant level through the sight glass on the expansion tank. The coolant must be visible in the glass when the engine is warm as well as cold. By screwing it anti-clockwise, the sight glass can be removed for cleaning, if necessary. Topping-up should be done with the engine running.

**CAUTION!** Release the filler cap carefully if the engine is warm.

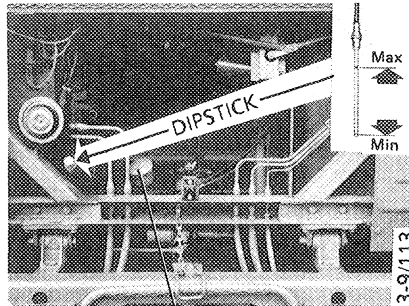
Top up with clean water up to the top of the filler pipe, if necessary.

- Since the coolant contains glycol, a mixture of glycol and water should be used when topping up. The glycol content should be checked at regular intervals. The coolant must contain the correct proportion of anti-corrosive (see section "Maintenance instructions, Cooling system").

**N.B.** Never top up the radiator with water when the engine is hot. The considerable temperature difference may cause cracking.

## 2. Engine oil level

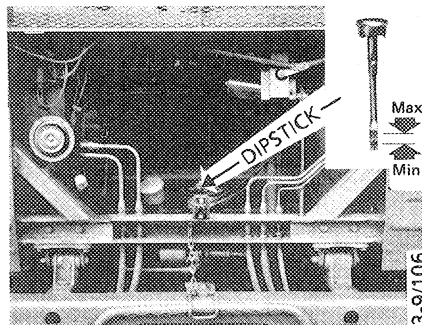
- The level must be between the level marks on the dipstick. If the oil level is below the bottom mark, the engine must be topped up with oil. Always top up with the same grade of oil as that already in the engine (see "Lubricants", page 140).



Dipstick and filler pipe  
for engine oil.

## 3. Power steering hydraulic fluid level

- The level must be between the level marks on the dipstick when the engine is running. When the engine is stationary, the fluid level in the container will be about 20 mm higher.
- Top up with fluid of the same grade as that already in the steering system (see "Lubricants", page 140).



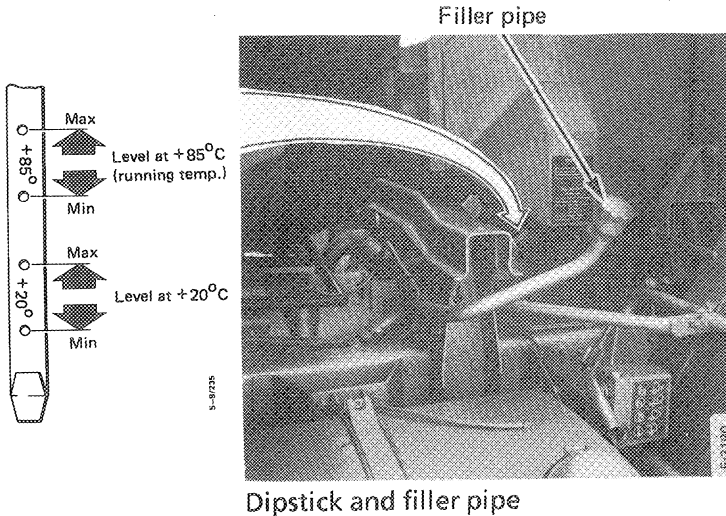
Cover with oil dipstick  
for power steering

#### 4. Fluid level in automatic gearbox

The hydraulic fluid level in the gearbox should be checked while the engine is running, using the dipstick behind the cab on the right-hand side.

The hydraulic fluid expands on heating, so the dipstick is provided with two measurement ranges. One range is for + 20 °C and the other is for normal running temperature at + 85 °C. In the winter, below 0 °C the hydraulic fluid level may not even be visible on the dipstick. The check then has to be carried out after running the truck, when the gearbox is warm. The level must then be within the upper measurement range of the dipstick. Wipe the dipstick before checking the level, e.g. with paper or a clean cloth. Cotton waste must not be used.

1. Start the engine.
2. Set the gear selector to position **R**, then to position **D** and finally to position **N**.
3. Set the engine to an idling speed of about 800 r/min.
4. Check the fluid level.



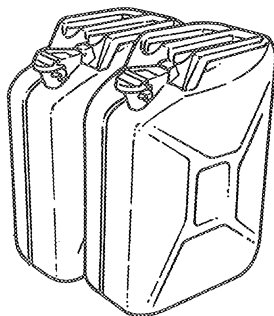
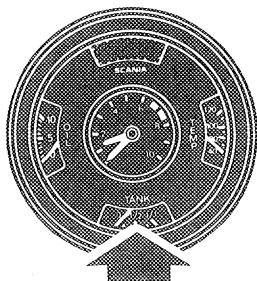
If the level is too high or too low, this may lead to high temperature in the gearbox.

If the level is too low:

Top up with 0.5 dm<sup>3</sup> (litre) of fluid at a time, until the correct level is obtained. Use the same fluid grade that is already in the gearbox (see "Lubricants", page 140).

## 5. Diesel fuel

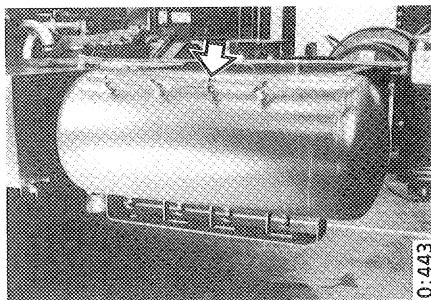
Press in the contact key and check on the fuel gauge in the combination instrument that sufficient fuel remains in the tank. Check that the jerry cans are filled.



0-442

## 6. Tyre pressures

- Check the tyre pressures. Particulars of the recommended tyre pressures are given under "Technical specifications" in page 13. Notice that driving on soft surface e.g. desert sand demands reduced pressure. If the tyres need to be pumped up, connect the tyre pumping hose (located under the passenger seat) to the measuring outlet on the equalising air pressure tank. Start the engine, pull the hand throttle and pump up the tyres.
- Check that there is no external damage to the tyres and that all valves are fitted with valve caps.
- Check that the wheels are not damaged and that none of the wheel nuts are loose.



0-443

Connection for tyre pumping hose

## 7. Windows, mirrors, reflectors, signs and plates, mudguards, driver seat

Check that

- the windows are intact and clean.
- the reflectors are intact and clean.
- the number plates are intact and clean.
- the rear view mirrors are intact and correctly adjusted.
- the mudguards are intact.
- the driver seat is adjusted to suit the driver.

## 8. Instruments, warning lamps, controls

Check the operation of warning lights for:

- Engine oil pressure.
- Charge.
- Brake pressure.
- Interlock valve.
- Parking brake.
- Battery heater.
- Engine temperature.
- Engine heater circulation pump.
- Gearbox oil temperature.
- Direction indicators.
- Full beam.
- Hazard warning lights (central warning light).

Check that the warning lights for engine and transmission oil pressures light up and that the charge lamp lights up when the contact key is pushed in. If any one of these lights is on, the central warning light must flash. The lights must go out when the engine is started and runs at idling speed. When the brake pressure is below 4.9 bar, the warning light for low brake pressure must come on, the central warning light flash and the warning buzzer sound.

**N.B.** Never drive the truck when the central warning light is flashing.

## 9. Lights

- Check that the headlight glasses are intact and clean, and that the lighting is operating correctly.
- Check that the tail, stop, side riding and black-out lights are clean and operating correctly.
- Check that the direction indicators are working correctly and are intact and clean.

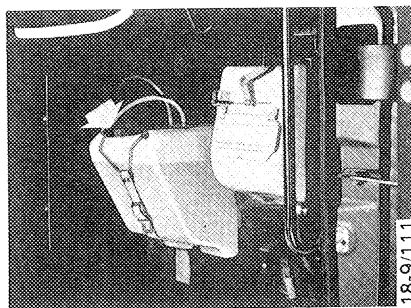
For bulb changing, see Maintenance instructions, page 180.

## 10. Horn, washers and wipers

Check that

- the horn is working.
- the windscreen wipers are working and wiper blades are intact and lie firmly against the windscreen throughout their lengths.
- the windscreen washers are working and liquid container is full.

Top up the liquid container with water, if necessary. In cold weather, ethyl alcohol must be added to the washing water to prevent freezing. If more than 40 % alcohol is added, there is risk of damaging the paintwork. A small amount of washing detergent might be added to the water.



Washer liquid container

## 11. Windows, mirrors, reflectors, signs and plates, mudguards

Check that

- the windows are intact and clean.
- the reflectors are intact and clean.
- the number plates are intact and clean.
- the rear view mirrors are intact and correctly adjusted.
- the mudguards are intact.

## 12. Winch (towing vehicles)

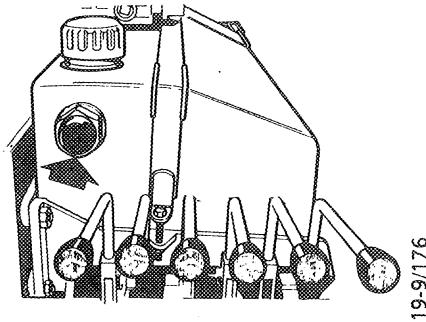
Check that

- the winch rope is in correct position.
- the winch drum is released when not in use in order to avoid accidents.
- the winch is operative and the winch brake is in order.



13. Loading crane 59 kNm (5900 kgf m)  
(ammunition vehicles)

- Check oil level in oil tank. The truck should be standing on firm and level ground. The crane and support legs must be in their transport position. Ensure that the area around the filler cap is clean. Top up the tank with hydraulic fluid if necessary. Use a funnel with a strainer when topping up with hydraulic fluid.
- Use the same oil grade as is already in the crane. See "Lubricants" in page 140.

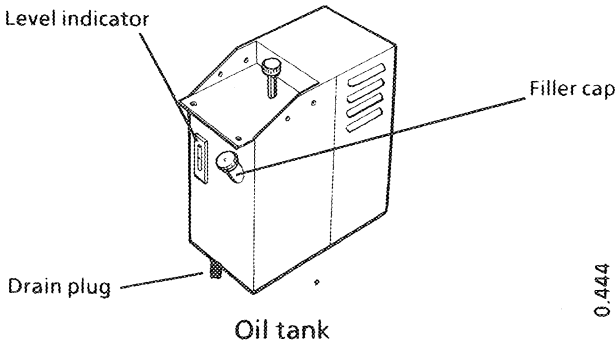


Oil tank with level indicator

- With the engine stopped, check that the operating levers are easy to move and that they automatically return to their neutral position.

14. Loading crane 15 kNm (1500 kgf m)  
(towing vehicles)

- Check the oil level in the tank. The vehicle should be in as horizontal a position as possible and the crane should be in transport position.
- Ensure that the area around the filler cap is clean.
- Fill oil if needed. Use a funnel with a strainer. Use the same oil grade as for loading crane 59 kNm above.



## 15. Tow hitch

Check that

- the tow hitch is undamaged.
- the tow hitch is latched. The latch should be in locked position.

If there is a trailer, check that

- the trailer is properly attached to the towing vehicle.
- the lines between towing vehicle and trailer are undamaged and correctly connected.

## 16. Equipment, load, tools

Check that

- equipment, load and tools are well stowed, secured and correctly placed.
- the tools have been put back where they are normally stowed.
- the log book is carried in the vehicle.
- all passengers use seat belts and the latter are correctly adjusted.

## 17. Brakes

- Check the operation of the air dryer by draining the equalising tank. Moisture indicates that the air dryer is not working properly.
- Drive the truck and perform a brake test. Check that the brakes apply evenly and do not pull to either side.
- Check the parking brake by driving the vehicle at low speed and applying the parking brake. The vehicle should stop in a few metres without pulling to either side. These checks also apply to a connected trailer.

**N.B.** Check behind when carrying out the brake test.

## **During driving**

While driving, continuously check that

- the coolant temperature is normal, i.e. 70-90 °C.
- the oil pressure warning light does not light up.
- the charge warning light does not light up.
- the gearbox oil temperature light does not light up.
- the low brake pressure warning light does not light up.
- the fuel quantity is sufficient.
- the driver sits comfortably. Readjust the driver seat, if necessary. An uncomfortable driving position leads to greater driver fatigue and reduced concentration and attention.

## After driving

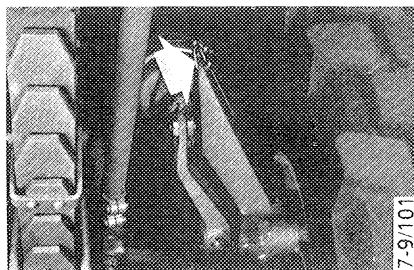
### 1. Checks according to items 1-5 under "Checks before driving"

### 2. Cleaning, lubrication and maintenance

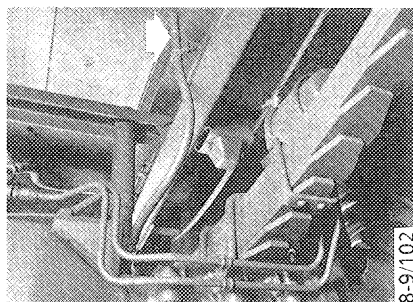
- Carry out the necessary cleaning and tidying-up of the vehicle and clean the tools and other equipment that have been used.
- After high-pressure washing of the underside of the vehicle, the universal joints and steering joints should be lubricated.
- In dusty conditions, clean the coarse separator in the air cleaner.

### 3. After cross-country driving or fording

- Check that no vital parts underneath the vehicle have been damaged, e.g. drop arm, track rod and brake lines.
- Carry out a brake test.
- Immediately report suspected defects.
- After fording for a long time or after high-pressure washing, the universal joints and steering joints should be lubricated.
- If, during fording, the maximum permitted fording depth has been exceeded, check that no water has entered the venting pipes of the axle gears and the front wheel hubs. Drain or suck up oil from each gear. Should the oil contain water, the oil should be changed.
- Check that the venting pipes of axle gears and hub gears are undamaged.



Front axle, both sides



Off the centre of the axle gears

### 4. Log book

- Enter all information about lubrication, oil changes, filter changes, etc. in the log book.
- In conjunction with repairs, check that necessary data are entered in the repair journal.
- All the faults discovered should be reported and, if possible, remedied immediately. Replace faulty fuses, bulbs, etc.

### 5. Preparations for the next drive

- Prepare cold starting while the engine is hot if cold weather (below 0 °C) is expected at the next start. See "Starting a cold engine, below 0 °C", page 92.

## Starting the engine

The starting procedure varies depending on the temperature of the engine and the ambient temperature.

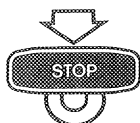
**N.B.** The DS11 engine of the SBAT1115 6x6 is equipped with a turbo-charger. The engine speed must not exceed 1 000 r/min during the first 30 seconds. This will ensure that the turbocharger will receive adequate lubrication before being accelerated to a high speed.

### Before starting

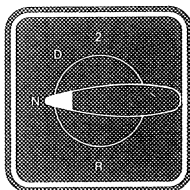
If the fuel tank has been run dry or if the engine has not been running for an extended period of time, the fuel system must be bled before a starting attempt is made. See "Bleeding" under "Fuel system" in page 152.

### Starting a hot engine and starting above 0 °C

1. Check that the stop control is pushed in.



2. Check that the gear selector is in the neutral position **N**.



3. Push in the contact key and check that the warning lamps for charge and oil pressure light up.
4. Depress the accelerator pedal fully.
5. Press the starter button.
6. Release the starter button and the accelerator pedal when the engine has started.
7. Warm up the engine if cold. See "Warming up the engine" in page 95.

## Starting a cold engine below 0 °C

The cold starting device of the fuel injection pump should be engaged. The injection pump control rod will then be at the front limit of its stroke, which provides an extra amount of fuel for starting. During cold weather, engagement may be rendered difficult by the lubricating oil being thick in the fuel injection pump.

**N.B.** The operations must be carried out in the correct order, since the risk is otherwise involved that the control rod will never reach the cold-starting position.

**N.B.** Prepare for cold starting in accordance with points 1-3 below while the engine is warm if the weather is expected to be cold during the next starting attempt.

At temperatures below  $-10^{\circ}\text{C}$  or if the batteries are not fully charged, there is a risk of the battery power only being sufficient for one attempt to start the engine. Prepare this attempt carefully.

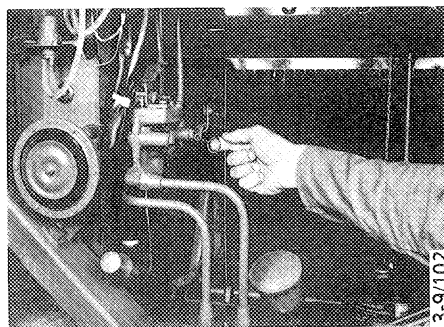
1. Check that the stop control is pushed in.



2. Depress the accelerator pedal fully. Pull out the hand throttle fully and then release the accelerator pedal.

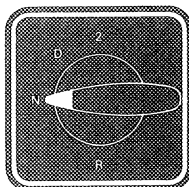


- Pull the chain of the cold-starting device several times at a gentle pace. In spite of the oil being thick, the control rod of the pump is then certain to reach its end position.



Chain for cold starting device

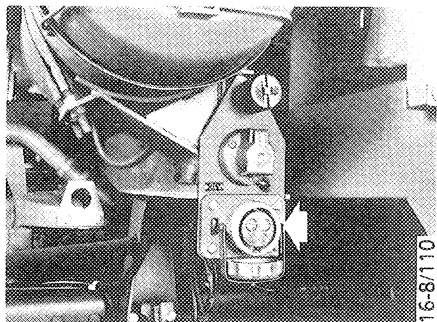
- Check that the gear selector is in the neutral position **N**.



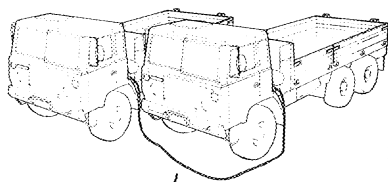
- Push in the contact key and check that the warning lights for charge and oil pressure light up.
- Press the accelerator pedal down fully and keep it in this position.
- Press the starter button. Keep it depressed without interruption (max 1 minute) until the engine starts and is rotating by itself. If the batteries are not fully charged, any interruption may spoil the possibility of a second attempt.

## Using jump starter cables

If the starting capacity of the batteries is low, extra batteries (24 V) may be connected to the electrical system of the truck at the socket underneath the air cleaner. Cables may also be drawn from another vehicle with the same type of socket and the same system voltage (24 V). Employ the usual starting procedure. One 8-metre special cable will be available in the parts and tool kit A (one for each gun-battery).



Jump starting socket



Jump start cable

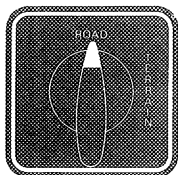
## Tow-starting the engine

**N.B.** When tow-starting, always use a rigid tow-bar, since when the engine is stationary, the compressor does not supply the brake system with compressed air.

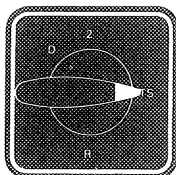
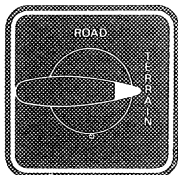
**N.B.** When the engine is not running, there is no power assistance in the steering gear. The necessary steering wheel effort is then considerably higher than usual.

If there is no pressure in the brake system, the parking brake can be released according to the instructions under "Towing" in page 102.

1. Make preparations for starting in accordance with the instructions under Starting the engine.
2. Set the transfer box selector to ROAD or TERRAIN. In position TERRAIN, starting will take place at a lower road speed than in position ROAD. If the compressed air system is not pressurised, the transfer box will not change gear.



Or



3. Set the gearbox selector to TS.
4. Press the accelerator pedal and begin towing.

- When sufficient speed (about 20 km/h with the gear selector in position ROAD and about 15 km/h in position TERRAIN) has been attained, the engine will rotate.
- When the engine has started, immediately turn the gear selector to N.

**N.B.** If this is not done quickly enough, there is a risk that the tow bar or the vehicles will be damaged or the engine will stop again when slowing down as the driving wheels are mechanically coupled to the engine.

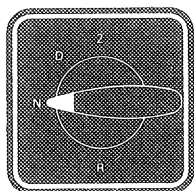
## Warming up the engine

You may drive off immediately after starting the engine, but preferably with a light load and at a moderate speed until the engine has reached its normal operating temperature.

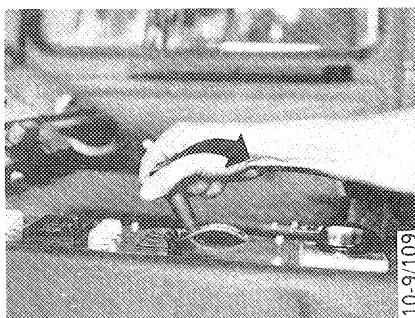
Moderate loading of a cold engine provides better combustion and faster warming up than warming up at idling speed. If the brake pressure is too low, however, the engine may have to be driven at idling speed to allow the compressor to build up pressure in the compressed air system. Particularly in cold weather, the engine must then be run at low speed (600-800 r/min). At low speed, combustion is better and the amount of white smoke produced is substantially reduced.

## Stopping the engine

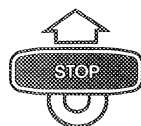
- Set the gear selector to neutral.
- Apply the parking brake.
- Pull out the stop control. Then push in the stop control.



1



2



3

**N.B.** Turbocharged engines (DS11) must not be "revved up" before being stopped. There is a risk that the turbocharger will be damaged due to lack of lubrication.

**N.B.** Prepare a cold start while the engine is warm if the weather is expected to be cold during the next starting attempt.



## Driving

**N.B.** The truck must never be driven while the buzzer (low brake air pressure) is sounding or the central warning lamp is flashing.

If full lock has been reached, or if the wheels are prevented from being turned further by a solid obstruction, the hydraulic assisting force in the steering gear will be fully utilised if an attempt is made to turn the steering wheel further. In this case, the hydraulic pump will operate at maximum pressure and this will lead to excessive hydraulic fluid temperature.

Therefore, avoid holding the steering wheel at either stop for a long period or forcing the wheels round when they are blocked by an obstruction.

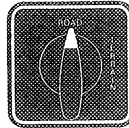
If a fault should occur so that the power assistance is not available, the steering gear will operate mechanically, but the steering wheel effort will be higher.

After being stationary for a long time, the gearbox systems may be drained of oil. It may then take a while before the truck can be driven after starting the engine. Set the gear selector to N and keep the engine speed at 1 000 r/min for 10 seconds.

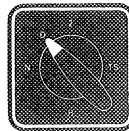
- The engine can only be started if the gear selector is in position **N**. This position must also be used when the truck is stationary for an extended period with the engine running.

### Driving on roads

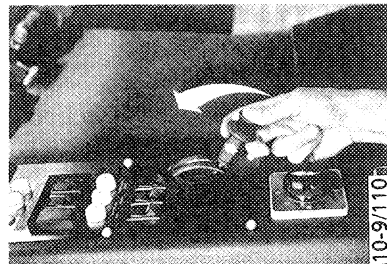
- Set the transfer box selector to **ROAD** (high) gear.



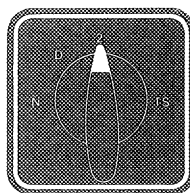
- Set the gearbox selector to **D**.



- Release the parking brake.
- Depress the accelerator pedal. The automatic gear changing mechanism will ensure that the correct gear is always engaged.

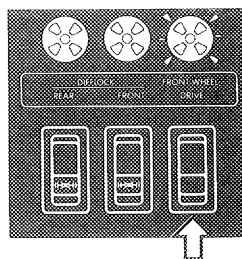


- Set the gearbox selector to 2 at speeds of around 0-30 km/h when repeated changes up and down are not required e.g. for convoy driving.



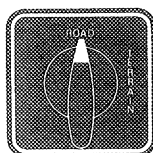
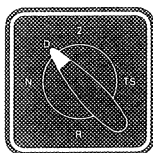
- Drive normally with the drive only on the rear wheels.

**N.B.** Use the front-wheel-drive (switched on manually) when driving on slippery surfaces. This will increase the traction and braking performance.

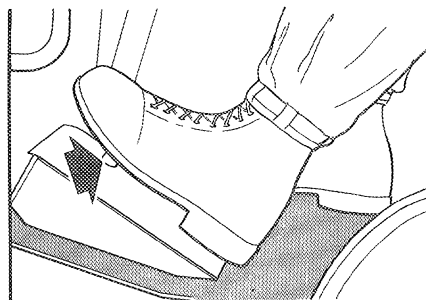
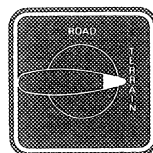


### Engine braking

- The gearbox engine braking programme is selected by releasing the accelerator pedal and depressing the switch on the cab floor. The button need not be kept depressed.



or



- The engine braking programme is operative until the accelerator pedal is again depressed, and the ordinary gearbox programme will then be operative.

- When driving on the ordinary gear-changing programme, the mechanical gear **M3** is automatically disengaged when the brake pedal is depressed, so that the engine will be prevented from stopping if the wheels should lock on a slippery surface. However, when the engine braking programme is switched on (by means of the button on the cab floor), the brake pedal will not disengage the mechanical gear, since the engine braking and braking with the foot brake must be able to operate simultaneously.

**N.B.** Therefore, avoid engine braking on a slippery surface but as described in **DRIVING ON ROADS** the traction will be better with **FRONT-WHEEL-DRIVE** engaged.

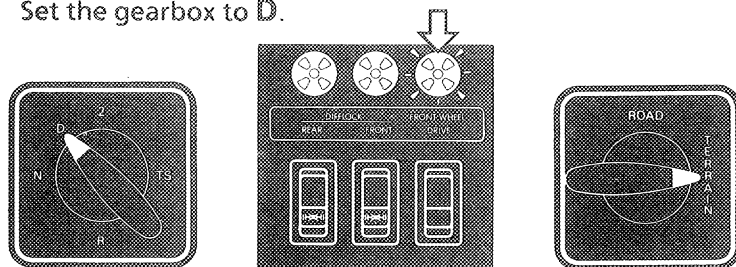
### Driving in terrain

- Set the transfer box selector to **TERRAIN** (= low gear).

The automatic gear selector will by a built-in electronic overspeed protection prevent changing to cross-country gear at speeds above 18 km/h.

**FRONT-WHEEL-DRIVE** will be automatically engaged.

- Set the gearbox to **D**.



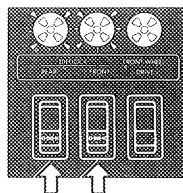
The terrain gear can therefore be preselected as follows:

- Set the transfer box selector to **TERRAIN** in good time before driving off the road.
- Release the accelerator pedal, brake the truck and drive out onto the rough terrain.
- The gearbox gear positions are used in the same way as when driving on a good road.
- The angle of the front wheels can be read off on the wheel lock indicator in front of the steering column which is most useful when passing obstacles.

**N.B.** Plan your driving by looking ahead. Drive around the obstacles if you are uncertain whether you can pass them.

## Using the differential locks

The differential locks must be used when the surface is such that there is a risk of the wheels spinning.



**N.B.** The differential locks must not be used when the wheels have good traction.

**N.B.** The differential locks must not be engaged if any of the driving wheels are spinning. Release the accelerator pedal before engaging the differential locks.

- The differential locks may be engaged while the truck is running.
- Engage the differential locks in time before difficult passages.
- Use primarily the rear axle differential locks but in some cases, it may be necessary also to engage that on the front axle.
- The differential lock of the front axle alone cannot be engaged, but can be preselected and thus be engaged at the same time as the differential locks of the rear axles.
- The differential locks make it difficult to drive round bends and should therefore be disengaged, if possible, before approaching sharp bends.
  - When the truck is halfway round a bend, stresses in the jaw couplings of the differential locks may cause them to remain engaged even though the switches are in the off positions.
  - Then make a short opposite turn with the steering wheel to enable the jaw coupling to disengage.

## **Driving at high altitudes**

Cooling system:

- The radiator cap has a spring that raises the cooling system pressure 0.5 bar over the sea-level pressure. The boiling point will thus also be raised but will drop at higher altitudes. Therefore make extra checks on the temperature gauge as well as on the coolant level, when driving at high altitudes and with heavy load on the truck.

Injection pump setting:

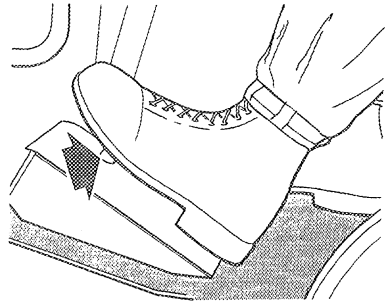
- In order to avoid overspeeding the turbocharger when driving on high altitudes the control rod of the injection pump should be adjusted down to 75 % of full engine output at altitudes above 3 000 m. That must be done by a workshop according to the Workshop Manual instructions. Readjust when permanently driving below 3 000 m.

## Braking

### Using the cross-country brake

Use the cross-country brake when passing obstructions, mainly when driving away from obstructions, but also use it to obtain a smooth run when driving up onto stones, stumps or the like. The cross-country brake should not be used on long uphill gradients.

Keep the button on the cab floor depressed and depress the accelerator pedal until the braking effort is overcome. When driving downhill, it may be necessary to use the foot brake as well, depending on the slope and the vehicle weight.



Foot switch

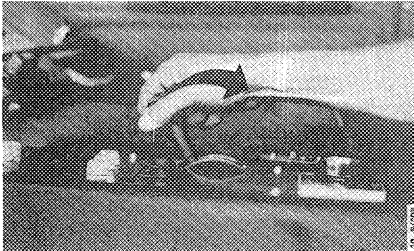
Always use the cross country brake with discretion. Unnecessary use will increase the fuel consumption and the brake wear. Do not pump the button when using it. This will only waste the compressed air.

### Foot brake

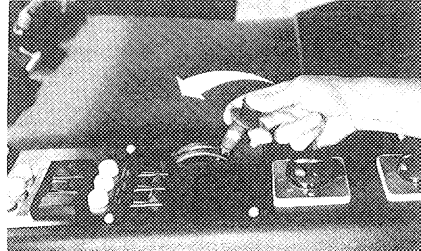
To achieve smooth but at the same time effective braking, the brake pedal must be depressed most forcefully at the beginning of braking. When the truck speed is reduced, the brake pedal can be gradually released. When the truck has stopped, the brake pedal must only be pressed down sufficiently for the truck to be kept stationary. Do not waste compressed air – avoid pumping the pedal.

### Parking brake

- *To apply:* Push the lever to the rear to the latched position.
- *To release:* Lift the latch on the lever, then push the lever forward.



Applying

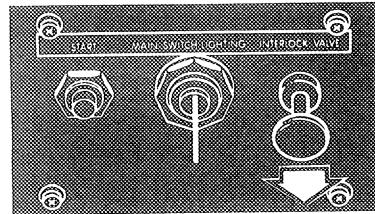


Releasing

## Interlock valve

If the air pressure in the parking brake system has dropped, e.g. if the truck has been parked for a long time, the parking brake is automatically blocked by the interlock valve and cannot be released until the air pressure has exceeded about 5 bar. The pressure of the parking brake system is not indicated on the compressed air gauge of the central instrument. When the brake has been blocked, the warning lamp for the interlock valve will light up. To release the parking brake, the blocking must first be cleared.

- Pull out the interlock valve control until the warning lamp is extinguished.
- Release the parking brake.



Interlock valve control

## Braking with the engine

See under "Driving on roads".

## Braking the trailer

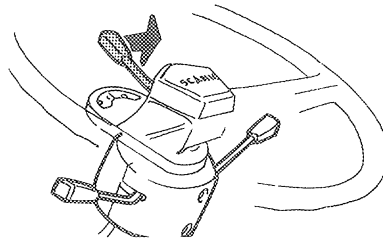
The hand control for the trailer brake only works on the trailer and should not normally be used when driving on main roads.

Braking of the trailer only requires extreme caution and a good knowledge of the characteristics of the vehicle when braking.

The manual control must not be used as a parking brake.

**CAUTION!** Incorrect handling may cause accidents.

The lever is also used to control the winch brake.



Operating lever for trailer brake and winch brake

## Towing

**N.B.** A rigid tow bar must be used when towing the truck with a de-pressurised brake system.

If the suspected cause of the truck having to be towed is a fault in the gearbox or its control system, the propeller shafts must be disconnected before the vehicle is towed. Otherwise do as follows:

- Press the switch for DRIVE WHEEL DISENGAGEMENT. To ensure gear changing in the transfer box, the electrical system in the truck must be live and the compressed air system must be pressurised.
- In the event of a dead electrical system: Draw current from another vehicle by means of the jump start cable and press the switch for DRIVE WHEEL DISENGAGEMENT.
- If the compressed air system is not pressurised: Fill the compressed air system of the truck by connecting a hose (included in the loose truck equipment, see page 74, item 5) from another vehicle to the tapping behind the air dryer. Press the switch for DRIVE WHEEL DISENGAGEMENT.

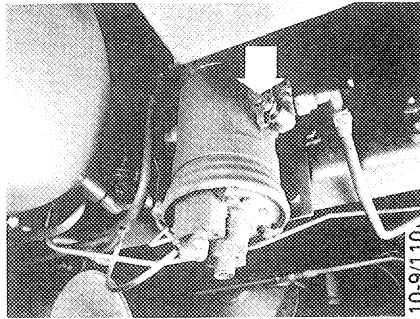
### Releasing the parking brake

If the parking brake system is not pressurised and the engine is not running, the parking brake can be released in two ways.

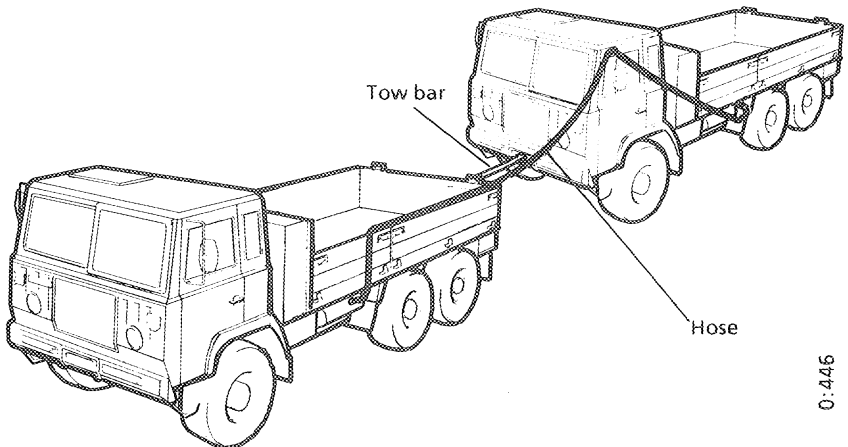
#### 1. Releasing with compressed air:

**N.B.** If the towing goes on for a long time without the engine running, the pressure in the parking brake circuit may drop to the extent that the brakes are applied. Ensure that the pressure remains at normal working level by filling the parking brake circuit. The brake pressure gauge does not show the pressure in this circuit.

- Connect a tow bar to the towing vehicle.
- Push the parking brake lever forward to released position.
- Fill the compressed air system by connecting a hose (included in the loose truck equipment see page 74, item 5) from the equalisation tank on another vehicle to the tapping on the air dryer. When the bottom valve on the air dryer "blows", the system is full.
- Suspend the hose and tie it up so it will not be damaged during the towing.



Filler tap for compressed air



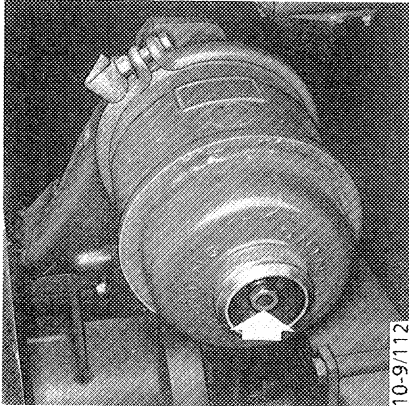
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## 2. Releasing mechanically

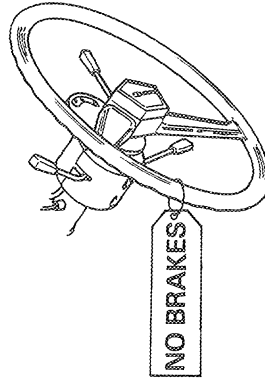
- Connect a tow bar to the towing vehicle.
- Remove the covers on all the spring brake cylinders.
- Unscrew the trip screws until they can be turned easily.

**CAUTION!** - Place the covers in a clearly visible place in the cab.  
- When the truck is left, the wheels must be blocked so that the vehicle will not roll away.  
- Attach a note to the steering wheel stating that the brakes are inoperative.



Trip screw

10-9/112



Note: **NO BRAKES!**

0-447

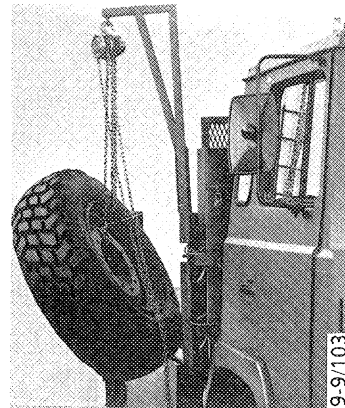
## Changing a wheel

### Using the lifting jib

(attached to the front of the head-board locker)

N.B. Max load of the jib: 200 kg.

1. Secure the lifting jib in the hole on the platform corner or crew cab wall (towing vehicles).
2. Release the spare wheel.
3. Secure the lifting block in the spare wheel.
4. Lower the wheel down onto the ground. Hoist the other wheel up in the reverse order to lowering.

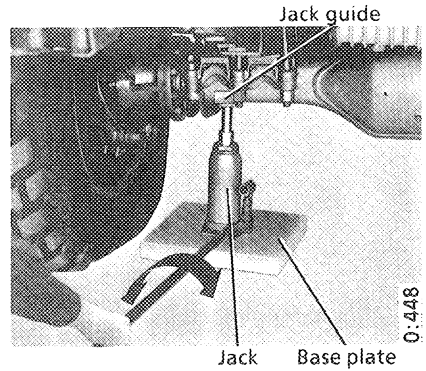


Lifting jib and block

9-9/103

## Using the jack

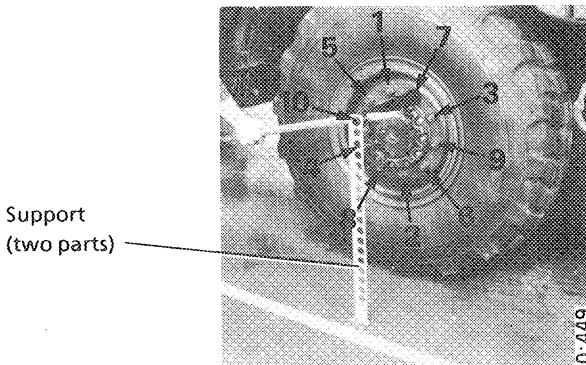
1. Check that the parking brake is on.
2. Place the jack on a baseplate as shown in the figure. Fit the jack guide and screw up the adjusting screw so that the guide rests against the axle housing.
3. Check that the valve is closed (turn clockwise).
4. Pump the jack until the wheel is clear of the ground.



Positing the jack and operating the valve

## Changing a wheel

1. Slacken the wheel nuts with the wheel nut spanner and its support, and lift off the wheel.
2. Clean the wheel studs.
3. Lift on the spare wheel.
4. Place the wheel nuts in position and tighten them with a torque of 500 Nm (50 kgf.m) in the order shown in the figure.
5. Lower the truck by opening the jack valve (turn anti-clockwise).

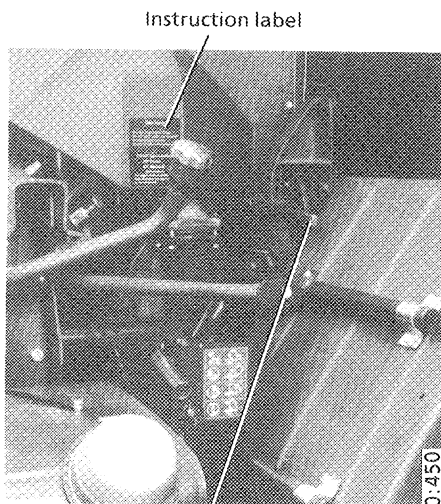


Tightening the wheel nuts

## Tilting the cab

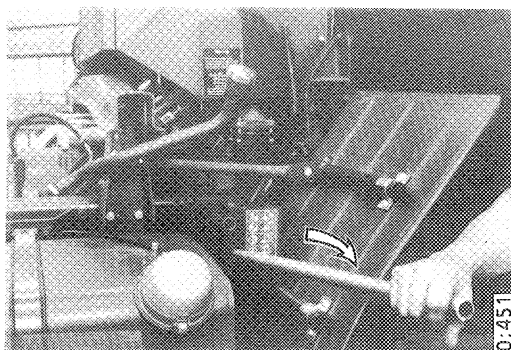
### Tilting

1. Apply the parking brake.
2. Check that there are no loose parts in the cab which may be damaged or may damage the interior of the cab.
3. Check that there is sufficient space above and in front of the truck so that the cab will move freely when tipped up.
4. Close the doors.
5. Release the locking shackles on the rear edge of the cab (one on each side).



Locking shackle

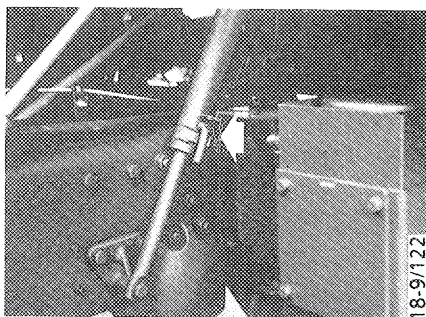
6. Close the valve on the pump by turning to the right by means of the pump rod.
7. Pump until the cab has passed its top equilibrium position. It will then drop down towards its front limit position by its own weight or with the assistance of gentle pumpstrokes. In extreme cold, the hydraulic fluid in the system will be thick and pumping may therefore be sluggish. Pump slowly, otherwise there is a risk that air may be drawn into the system.



Closing the valve

(8.) Tilting the cab on a slope:

- Lock the cab in the raised position by inserting the locking pin into the mechanical cab support.

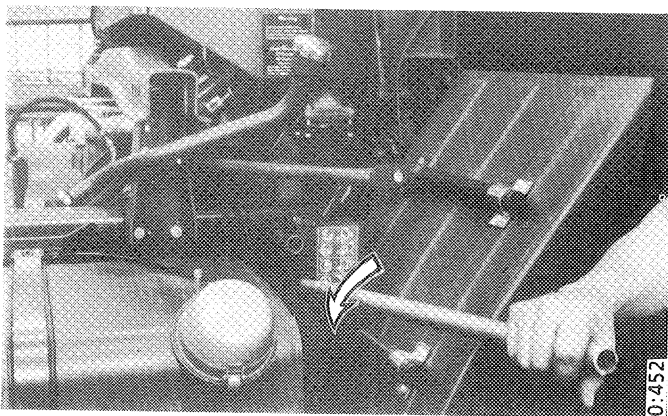


Cab support

**CAUTION!** Never lean under a raised cab without it being properly locked

Lowering

1. **N.B.** Remove the locking pin if inserted in the cab support.
2. Turn the valve on the pump to the left.
3. Pump back the cab.
4. **N.B.** Lock the cab with both the locking shackles.



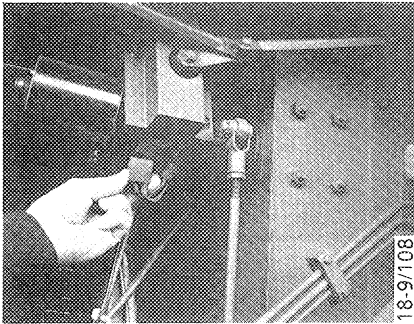
Opening the valve

## Opening the hinged windscreen

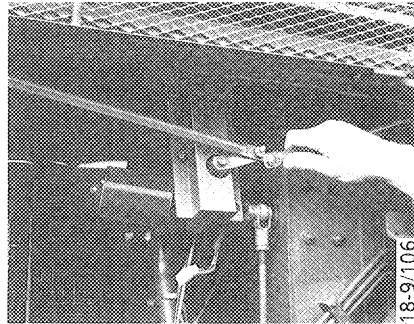
1. Remove the electrical connector on the wiper motor, located on the inside of the radiator grille.

**N.B.** If this is not done, there is risk of your hands being injured or tools being damaged. See also "Electrical System".

2. Unhook the link rod for the left-hand windscreen wiper from the motor lever.
3. Move down the wiper arm from the windscreen.

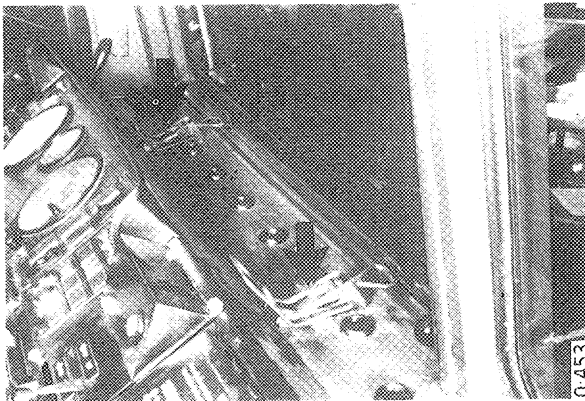


Removing the plug



Unhooking the link rod

4. Release the fasteners in front of the instrument panel.

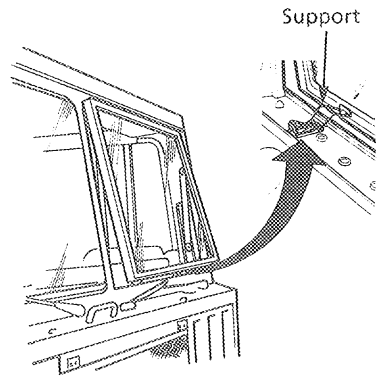


Fasteners and supports

### Partially open windscreen

(for ventilation)

5. Open the windscreen and fit the supports as in the picture. The supports may be bent to provide different ventilation openings.

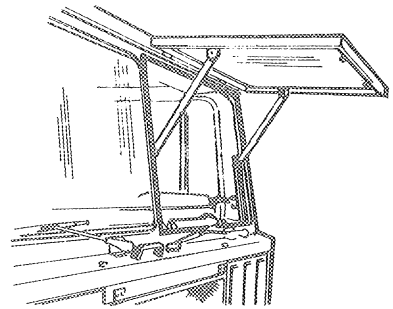


Windscreen partially open

### Fully open windscreen

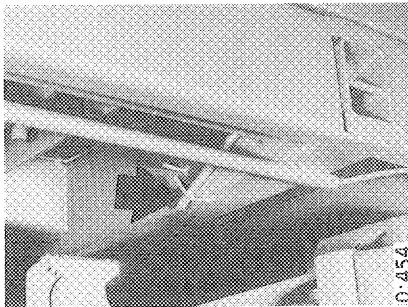
(for clear sight with blackout lights in the dark)

6. Grab the two knobs for the locking pins and pull them sideways. Open the window to fully open and press the locking pins into the locking holes in the cab frame.

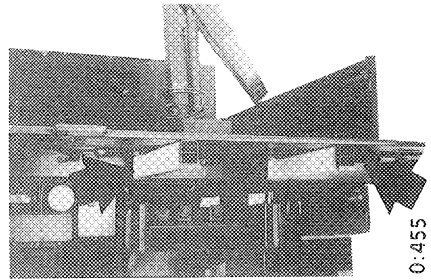


Windscreen fully open to avoid reflections in the dark

### Using the supports for the tailgate



Locking pin (locked position)



Tailgate resting on the tailgate support

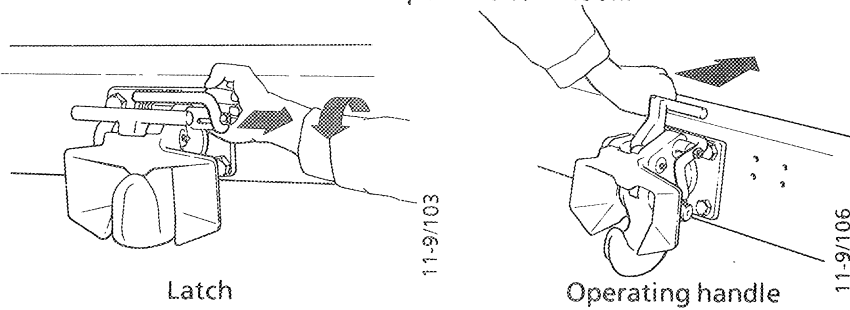
The supports may be used when transporting long loads, when the tailgate cannot be raised.

1. Turn and pull out the locking pins.
2. Withdraw the tailgate supports and lower the tailgate.

## Tow hitch (Ringfeder 663)

### Opening the tow hook

1. Pull out the latch and lock it by turning a quarter of a turn anti-clockwise.
2. Push the handle forward to open the tow hook.



### Connecting the tow lug

1. Hold the tow lug at the same height as the tow hitch.
2. Reverse the truck. The tow hitch will be engaged and locked automatically when the lug enters the tow hook opening.
3. If the tow hitch does not lock automatically because of incorrect position of the tow bar, the operating handle can be pulled back manually until the latch moves into the locked position.

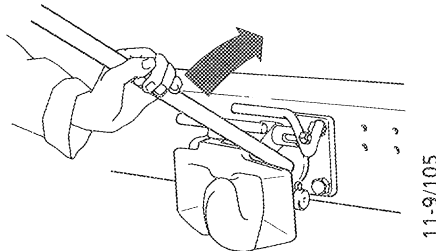
**CAUTION!** Always check that the tow hitch is locked.

### Disengaging the tow lug

1. Pull out the latch and turn it a quarter of a turn anti-clockwise.
2. Push the operating handle forward.

**CAUTION!** When the tow hook is opened, the tow bar will drop down. Keep your feet away.

3. If the operating handle binds because the tow hook is loaded, it can be released by prising it with a crowbar or the like.



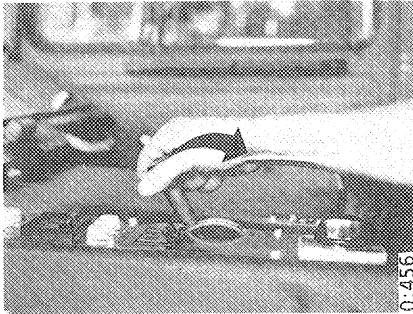
Opening with the hook loaded

## Using the winch (towing vehicles)

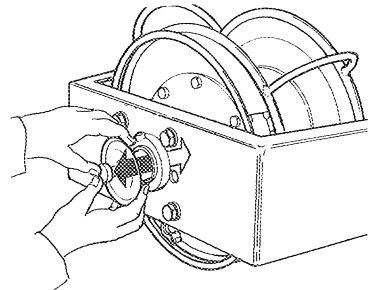
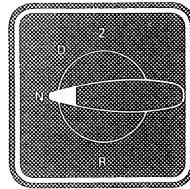
- CAUTION!**
- With a tight winch rope the driver must stay in the cab in order to keep full control of the operation.
  - When handling the winch, the wheel brakes and winch brake must always be applied, except during winching.
  - If the contact key is withdrawn or the electric power supply is otherwise interrupted, the winch brake will be released.

### Preparation for self-recovery and recovery of other vehicle

1. Apply the parking brake.
2. Set the gear selector to **N**.



Applying parking brake



Engaging and releasing the rope drum

3. Check that the rope drum is released by pressing the latch button and pulling out the jaw coupling handle.

4. Pull out the rope by hand and check that it is running correctly through guide rollers and rope guides, see figure on next page.

When attached to an anchor, the winch rope can also be pulled out in one of the following manners, according to the situation:

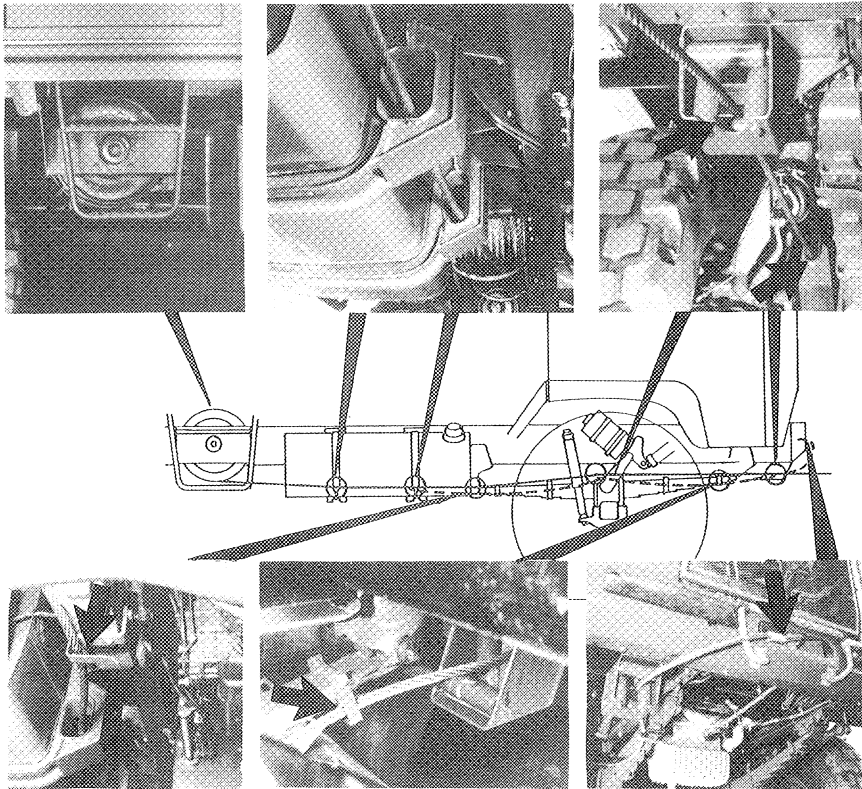
- a) *Reversing under caution:* Drive wheels engaged, winch drum released and reverse gear.
- b) *Supporting the pulling out:* Drive wheels disengaged, winch drum engaged, reverse gear, low engine speed. Always keep one observer watching the winch drum and with eye contact with the driver.



## 5. Winching forwards:

Normally the winch rope will be fully pulled in, wound up on the winch drum and hooked up. If cross-country driving is predicted and a need of the winch is expected it is recommended to keep the winch rope in stand-by position as shown in the figures below. Release the rope from the hooks before winching.

### Winching position



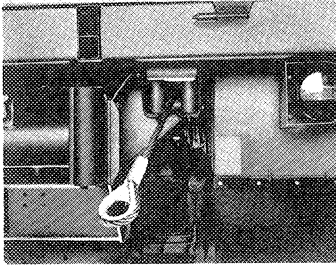
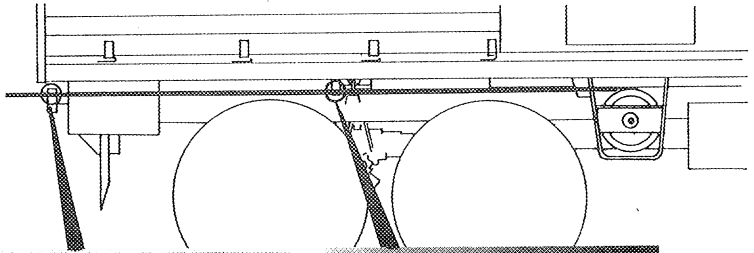
### Stand by position

- ===== Rope in stand-by position
- Rope in winching position

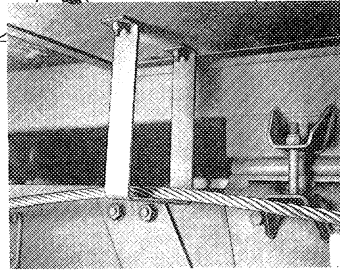
### Running the winch rope forward

## 6. Winching backwards:

To winch the vehicle backwards it is necessary to re-run the winch rope under the platform.



Guide rollers, rear



Rear rope guide under platform

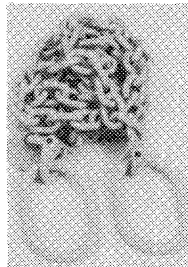
0-458

Pull out the winch rope through the rope guide under the platform and the guide rollers at the rear. Follow the instructions for winching forwards.

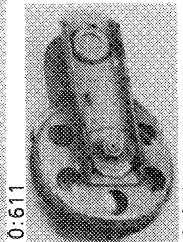
N.B. The winch drum rotates clockwise when winding in the rope, just as when winching forwards.

## 7. Take out the winching equipment from its locker.

- Use anchor chain and chain shackle when winching with a single rope.
- Use anchor chain and guide pulley when winching with a double rope (double forces).
- The flat shackle can be used for joining two chains.



Anchor chain



Guide pulley



Flat shackle

0-613



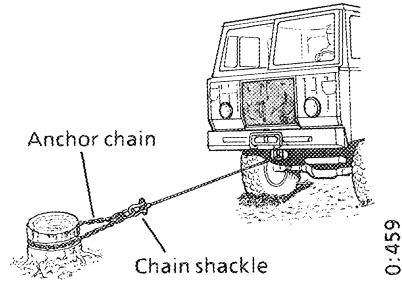
Chain shackle

0-614

8. Anchoring the winch rope:

The point of anchorage may be a tree, a stump, a sturdy rock or another truck. Remember that it must be sturdy enough to withstand the strain when winching. If a tree which is alive is used, you should protect the bark.

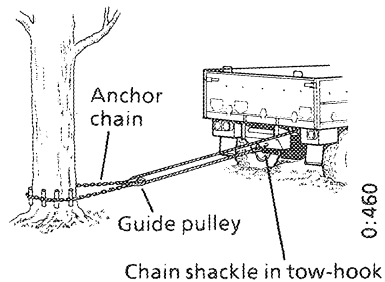
When requiring two chains they can be joined together with the flatshackle.



Anchoring when winching with a double rope for double force forwards and backwards.

Decide the location of the anchorage and how to attach the winch rope. What determines the location is that the vehicle and the front wheels should mainly be directed towards the point of anchorage.

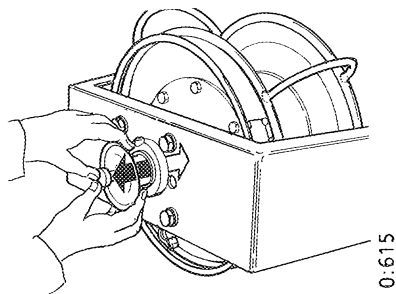
Make certain that no persons are unnecessarily standing nearby if the rope should brake.



Anchoring when winching with a singel rope for-wards or backwards.

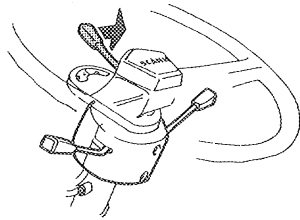
9. Winching of own vehicle, other vehicle or load forwards or backwards:

- Drive wheels disengaged.
- Engage the winch drum (opposite way to releasing). To find an engaging position for the jaw coupling it may be necessary to move the winch drum to and fro. Use the hand-ring on the winch drum.



10. Open the righ-hand side window. An assistant should have the winch under supervision and should call to the driver if, for example, the rope starts to become entangled.

11.
  - Start engine (applied parking brake).
  - Engage WINCH BRAKE by pull-ing operating lever clockwise.
  - Set the selector for the transfer box to position TERRAIN.
  - Engage the winch by pressing the switch POWER TAKE-OFF/WINCH. (A)



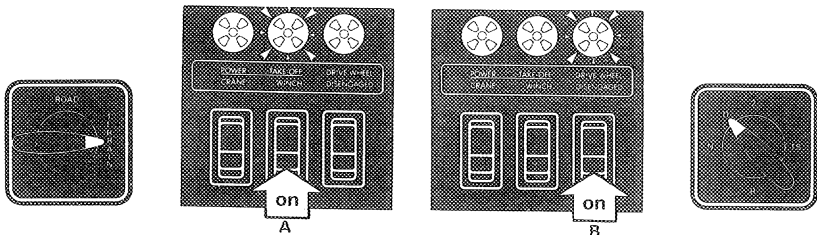
Winch brake operating lever

17-9/104

- Press the switch DRIVE WHEEL DISENGAGEMENT. (B)

12a. Winching without drive wheel assistens.

- Set the gear selector to position **D** (winching forward and backward).
- Gently release the winch brake to tension the rope.



Winching-in own vehicle:

- Release the parking brake.
- Adjust the winching speed and effort with the accelerator pedal.

Winching other vehicle or load:

- Do not release parking brake.
- Adjust winching speed and effort with accelerator pedal.

**N.B.** The foot brake pedal must not be used during winching. When the brake pedal is depressed, the winch brake will be applied,. Winching with the winch brake applied will damage the brake.

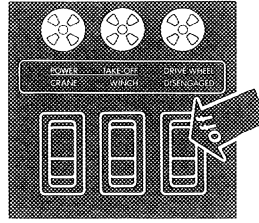
Owing to the torque converter, the transmission automatically protects against overloading of the winch. Full effort is obtained when the torque converter stalls, i.e. the turbine wheel is stationary and all of the engine output is converted to heat. If full effort on a single rope is not sufficient, double the rope.

**N.B.** Stalling is only permissible for a short duration (about 10 seconds), to prevent the oil in the torque converter from overheating.

12b. Winching the own vehicle with drive wheel assistance:

If the own vehicle has got stuck in deep mud or sand, the best method is to keep the wheels driving.

When winching with drive wheel assistance, the switch for DRIVE WHEEL DISENGAGEMENT must be off. Notice that front wheel drive is automatically engaged on TERRAIN gear.



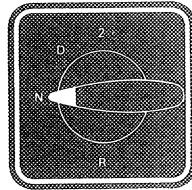
**N.B** Winching with driving wheel assistance should only be carried out in exceptional cases.

The truck will catch up with the winch rope if the driving wheels do not skid. A slack rope will easily become entangled and kinked in the rope drum. Therefore, avoid winching with drive wheel assistance when not required.

Winching-out own vehicle:

Winching-out other vehicle/load:

Set the gearbox gear selector to **N**.



Release the parking brake and the winch brake. Adjust the winching-out speed with the brake pedal or trailer brake control.

Check that the parking brake is applied. Adjust the winching-out speed with the brake pedal or trailer brake control.

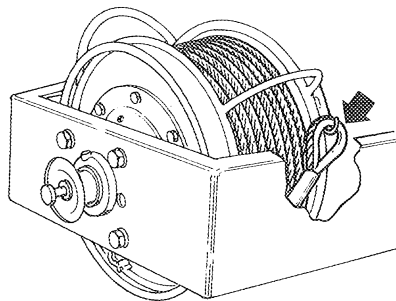
Winching with driving wheel assistance is not possible backwards because of opposite rotation between winchdrum and driving wheels.

**N.B.** At heavy load or poor winch brake operation the winching-out speed may be regulated with the gear selector in position D and with the accelerator pedal.

When winching out own vehicle and the slope is not sufficient for pulling out the winch rope, that can be done with disengaged winch power take-off or released winch drum and gear selector in position R, see description under PREPARATION p. 118 item 4.

## After winching

1. Apply the winch brake with the trailer brake control.
2. Apply the parking brake.
3. Set the gearbox selector to **N**.
4. Release the rope at the anchor point.
5. Tension the rope with the aid of an assistant.
6. Set the gearbox selector to **D**.
7. Wind up the rope onto the rope drum. Engine idling speed is often sufficient. Control the speed with the trailer brake control. Stop when there is about 2 m of rope left and engage the winch brake.
8. Disengage the winch power take-off.
9. Stop the engine and show the assistant "hands off the controls" in order to avoid accidents.
10. Disengage the rope drum by pulling the jaw coupling handle.
11. Wind up the last section of rope by hand.
12. Hook the rope end onto the hook on the winch or keep the rope in stand-by position as shown in page 112 or 113, according to the situation.
13. **Important**  
Keep the winch drum released to avoid damages if by mistake the winch controls in the cab should be operated.



0.461

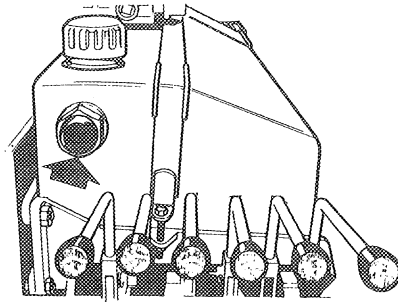
Suspension of rope end

## Operation of loading crane 59 kNm (5900 kgf m)

(ammunition vehicles)

Before use:

1. Drain away condensewater from the oiltank on cranes operating in humid environments. The drainplug is placed on the underside of the oiltank. See page 169.
2. \*Check oil level in the tank. The truck should be standing on firm and level ground. The crane and support legs must be in their transport position.
  - \*Ensure that the area around filler cap is clean.
  - \*Top up the tank with hydraulic fluid if necessary.
  - \*Use a funnel with strainer when topping up with

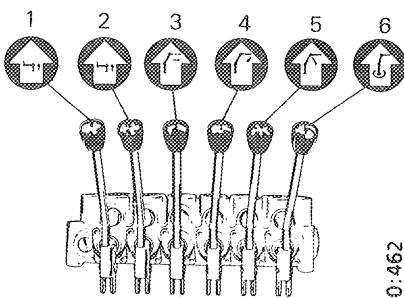


Oil tank with level indicator

2. With the engine stopped, check that the operating levers are easy to move and that they automatically return to their neutral position.

### Operation of loading crane

The loading crane is operated by six levers on the left- and the right-hand side of the loading crane.



Control levers

0:462

1. Operates right hand support leg
2. Operates left hand support leg
3. Operates extension boom
4. Operates outer boom
5. Operates inner boom
6. Operates slewing function

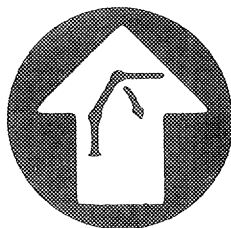
Levers 1 and 2 for the supporting legs can be identified from the others by their shorter length.

Levers 1-5 (support and lifting) have black handles and lever 6 (slewing) a red handle.

#### NOTICE

When lever 5 is moved downward, inner boom moves upwards.

When lever 5 is moved upward, inner boom moves downwards.



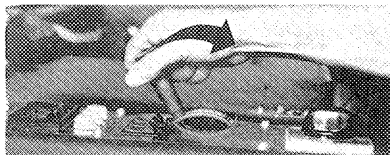
0:463

Symbol sign, inner boom

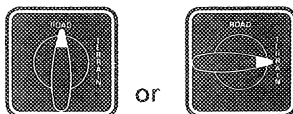
#### Unfolding into working position

1. Apply parking brake

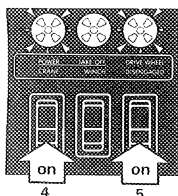
2. Start engine



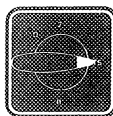
3. Gear selector position  
ROAD or TERRAIN



4. Press switch  
POWER TAKE-OFF CRANE



5. Press switch  
DRIVE WHEEL DISENGAGED



6. Set gear selector to position TS  
(engaging gear M1)

7. Set engine speed 1000 r/min.  
with hand throttle control (GAS)



1000 r/min.

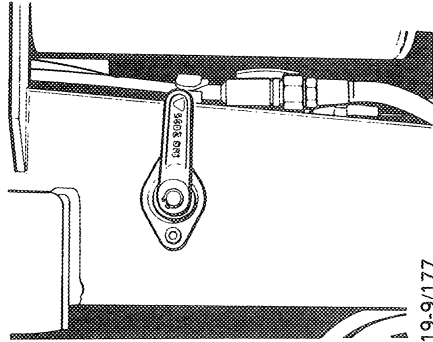


The hydraulic pump for the loading crane is now operating properly.



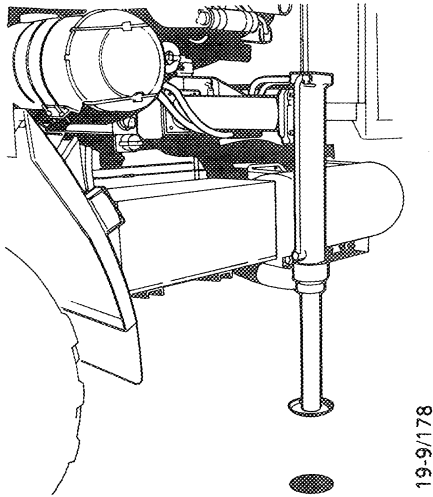
Locate the support legs into their working position as follows:

- 8 Release the lock and pull out support leg beam extension slightly. Reposition the lock into its "locked" position. Turn the support leg down to its vertical position.



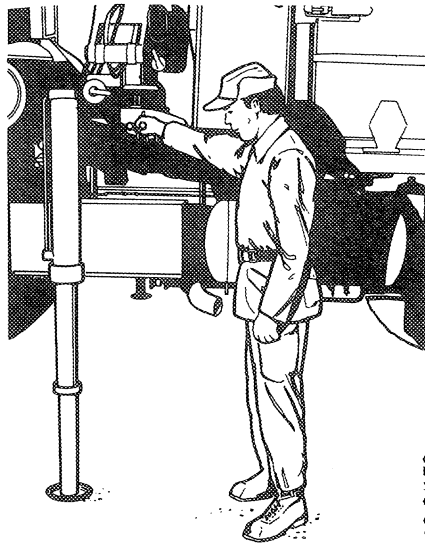
Support beam extension. Locking handle, open position

- 9 Pull out the support leg extension, ensuring that the locking handle goes into its locked position.



Support leg extension in its pulled out position

10. Position the support legs such as they touch onto the ground. Support legs are operated by the two shorter levers.



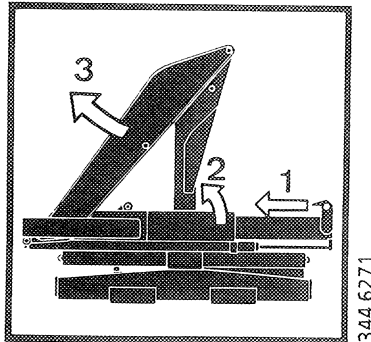
19-9/179

Operating the support legs

**Note:** The support legs must not be pressed too hard onto the ground. They are only intended to stabilize the truck from rocking motions during loading. Do not load the arm system when operating the support legs. Gradually, as the truck is being loaded, the support legs should be raised slightly to ensure that the truck's spring system takes the load and not the support legs.

Unfold the loader boom into its working position as follows:  
See also folding, page 124.

11. Retract the extension boom as far as possible (1). Move number 3 lever downwards.
12. Fold outer boom fully until relief valve opens (2). Move number 4 lever upwards.
13. Then unfold the inner boom (3). Move number 5 lever downwards.



Unfolding crane into working position

### Loading and unloading

Before using the crane check for:

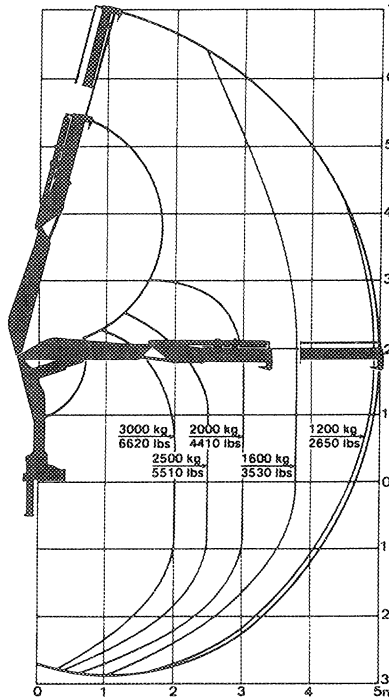
- Hydraulic leaks
- Noises and jerky movements when operating the crane

#### Warning!

- Ensure that no unauthorized persons are within the working range of the loader.
- Do not stand below hanging loads.
- It is prohibited to load and unload in the vicinity of electrical cables and wires.

When loading and unloading, all instructions regarding the loader's capacity must be followed. The lifting capacity of the crane is stated on the loader boom and in the diagram below.

To the left of the load lines, the given load can be handled by any of the boom functions, i.e. inner boom, outer boom or extension boom.



19-9/196

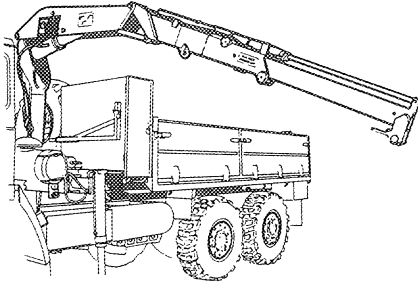
Loading diagram

**Warning!**  
All lifting shall be carried out with a slight angle between inner - and outer boom

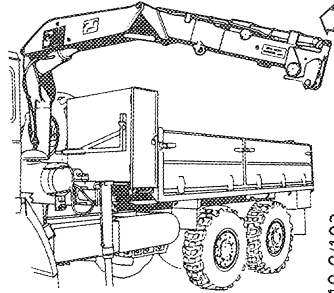
## Returning to the transport position

Note! When loading or unloading has been finished the loader must always be returned into its transport position.

1. Rotate (slew) crane until the loader boom is at 90° to the front-to-rear axis of the vehicle.
2. Retract the extension boom.



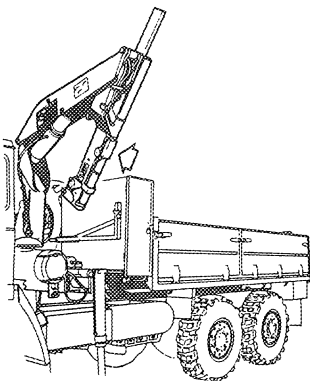
19-9/181



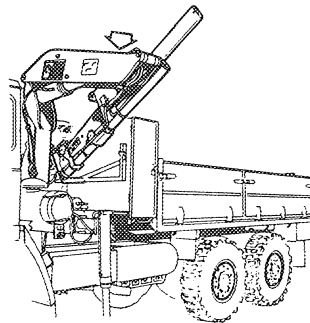
19-9/182

Loading boom 90° to the vehicle    Retracting the extension boom

3. Fold the outer boom fully.
4. Lower the inner boom to its lowest position. Be careful when the tip of the boom is close to the loader body. Adjust the loader's slew position if necessary.



19-9/183

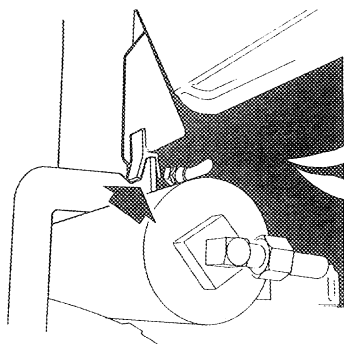


19-9/184

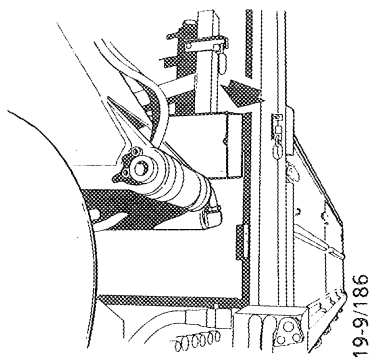
Folding of outer boom

Lowering of inner boom

- Carefully move the outer boom towards the support on the loader base.
- Adjust the extension boom, to ensure that the boom is inside the vehicle's width.



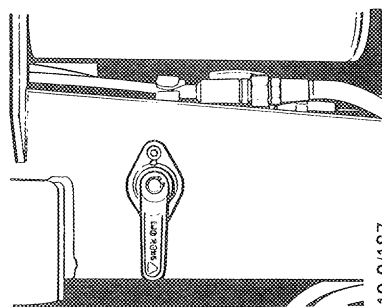
Support for outer boom



Adjustment of extension boom

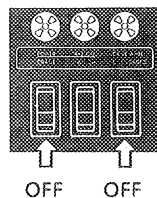
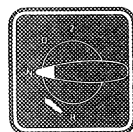
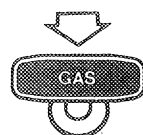
- Raise the support legs. Release the lock for the support leg beam extension and push the extension inwards.

Rotate the support legs into their transport position. Make sure that the lock goes into its locked position.



Support leg beam extension  
Locking handle, locked position

- Push hand throttle (GAS) and set engine idling
- Reset gear selector to position N
- Switch off DRIVE WHEEL DISENGAGED and POWER TAKE-OFF CRANE



The truck is now ready for driving.

## Check list after use of loading crane

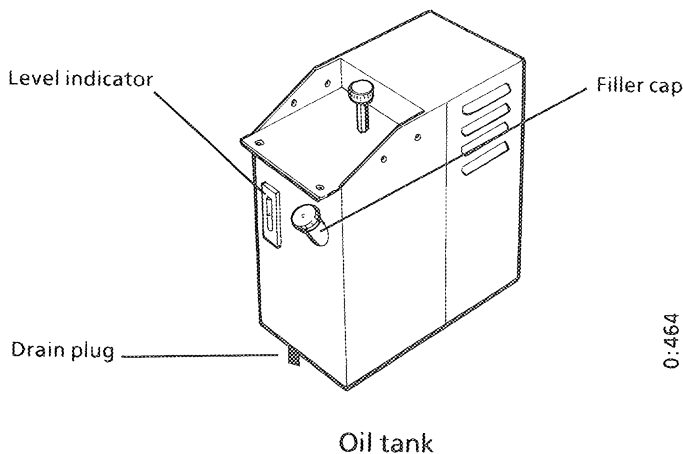
1. Check that the loader isn't damaged.
2. Take necessary steps to clean the loader, tools and other accessories. Wash the loader when necessary. Do not spray water directly onto the filler cap of the oil tank, as water may penetrate into the oil tank through the air-breathing holes in the filler cap.

## Operation of loading crane 15 kNm (1500 kgf m)

(Towing vehicles)

Before use:

1. Check oil level in the oil tank. The truck should be standing on firm and level ground. Top up the tank with oil if necessary. Ensure that the area around filler cap is clean. Use a funnel with strainer when topping up with hydraulic fluid.



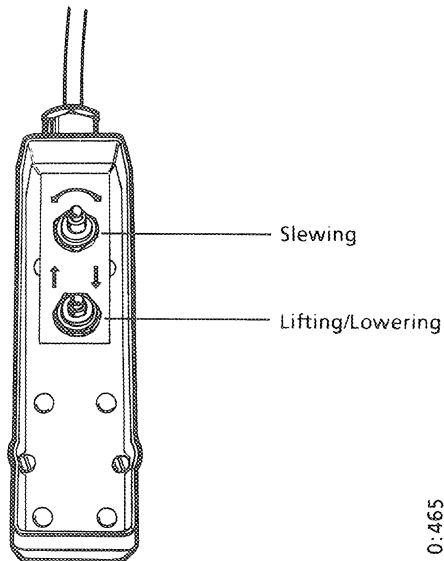
2. Drain any water that has accumulated in the oil tank. Open the drain plug and close it when oil emerges.
3. Check hydraulic and electrical cables for leaks and damage.
4. Connect the remote control handle to loader base.

## Operation of loading crane

The loader is operated by means of two electrical switches on the remote control handle.

The upper switch is used for the loader slewing (rotating). When the switch is pushed to the left the loader rotates counterclockwise; when pushed to the right the loader rotates clockwise.

The lower switch controls the raising and lowering of the loader boom. When the switch is pushed to the left the loader boom is moved downwards, when pushed to the right the boom is moved upwards.



Remote control handle

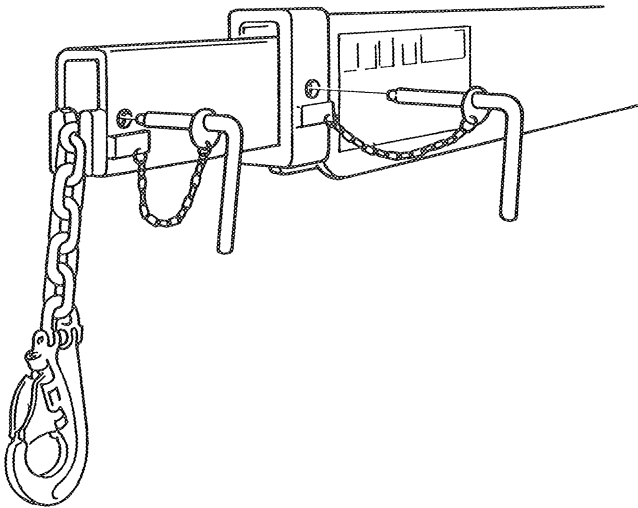
Note: The electrical motor in the power pack is equipped with a safety device, which automatically turns the motor off if there is a risk that it will overheat while running. After the motor has cooled off the safety device resets itself, restoring the motor to a fully operational state.

0:465



## Adjustment of hook chain and extension booms

1. Raise the loader boom to a horizontal position.
2. Pull out the locking pins for the extension booms. Warning! Hold onto the extension booms to ensure that they do not move outwards uncontrollably.
3. Adjust the arm extension to its proper length in accordance with the load sign.
4. Pull out the locking pin for the hook-chain.
5. Lift the hook chain out of its recess in the end of the extension boom.
6. Pull the chain out to its proper length.
7. Put a chain link into the recess in the end of the extension boom.
8. Replace the locking pin for the hook chain.
9. Replace the locking pins for the extension booms.



Adjustment of hook chain and extension boom

9-9/247

## Loading and unloading

Before using the crane check for:

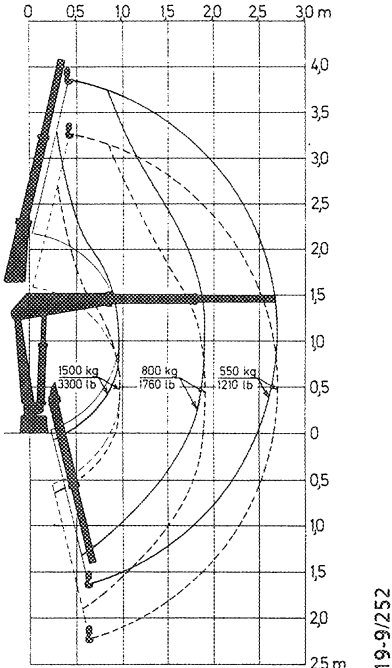
- Hydraulic leaks
- Noises and jerky movements when operating the crane

**Warning!**

- Ensure that no unauthorized persons are within the working range of the loader.
- Do not stand below hanging loads.
- It is prohibited to load and unload in the vicinity of electrical cables and wires.

When loading and unloading, all instructions regarding the loader's capacity must be followed. The capacity of the crane is stated on the loader boom and in the diagram below.

Warning! Never adjust the arm extension with a load hanging in the crane's hook!



Loading diagram

- with the hook-chain in its inner position
- - - - - with the hook-chain in its outer position

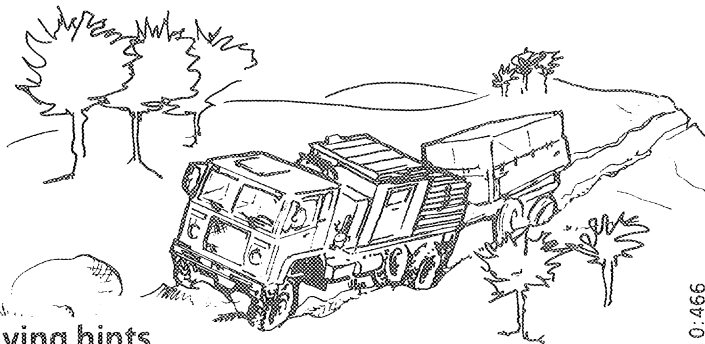
19-9/252

### Returning to the transport position

1. Raise the boom to a horizontal position.
2. Pull out the locking-pins.
3. Push the outer extension boom into its innermost position and the inner extension boom into its second innermost position. Guide the hook-chain into the extension booms.
4. Replace the locking-pins.
5. Lower the loader boom to it's parked position.
6. Disconnect remote control cable from its connector on the loader base. Put the remote control into the truck cab.

### Check list after using the loading crane

1. Check that the loader isn't damaged.
2. Take necessary steps to clean the loader, tools and other accessories. Wash the loader when necessary. Warning! Do not spray water directly onto the air filter on the oil tank, or onto cooling flanges on the motor cap. Water under pressure could penetrate into the oil tank and/or motor.



0:466

## General driving hints

1. PLAN AHEAD.
2. When driving in ROAD gear in slippery conditions, use all-wheel-drive on the road as well – uphill and downhill.
3. Never engage all-wheel-drive or difflocks while the wheels are spinning – ease off the accelerator first.
4. Preselect TERRAIN gear before leaving the road and concentrate on looking ahead.
5. Use engine braking on the road (ROAD gear).  
Use engine braking and terrain brake off road (TERRAIN gear).
6. Do not waste compressed air for the brakes by “pumping” the brake foot switch.
7. Keep the winch rope ready, suspended on the hooks and released rope drum before entering an off-road passage.
8. Keep other winching equipment and chains at hand.
9. If uncertain to force the obstacle – drive around it.
10. When certain, be decisive when tackling a difficulty – keep the vehicle on the move.
11. Drive on top of high obstacles instead of straddling over them.
12. If possible, drive on the horizontal section of an obstacle.
13. Steer well clear of trees if the vehicle is likely to lean sideways.
14. Cross trenches diagonally, then straighten up.
15. Avoid driving with sideways inclination on a soft or slippery surface.
16. Do not interrupt the electrical power supply with the contact key or winch power-take off when the winch is being used.
17. Check that the rope is running correctly when rewinding the winch.
18. LUBRICATE universal joints for propeller shafts and steering bearings after deep wading or high pressure washing.
19. When using loading cranes, keep the truck in horizontal position, and do not overload.
20. Keep the load well secured.
21. Read gear selector positions as  
ROAD gear = HIGH gear (6×4 or 6×6. Front wheel drive can be manually engaged.)  
TERRAIN gear = LOW gear (6×6. Front wheel drive will be automatically engaged.)  
Use always TERRAIN gear in hilly areas, also on roads. (= LOW gear and all wheel drive)

# MAINTENANCE

Under every title is described the various maintenance points. Due to time and driving distance, the maintenance can with good planning be carried out by combination.

## Running-in maintenance

**N.B.** In addition to the periodic maintenance, running-in maintenance must be done during running-in period after 500 km, but before 2 500 km, though not later than 6 months after delivery ex-factory.

This work is best carried out by means of certain special tools, and should therefore be executed by the workshop. The running-in maintenance required is listed below:

- Change the engine oil.
- Clean centrifugal oil cleaner.
- Change the turbocharger filter.
- Check oil sump retaining bolts and lubricating oil cleaner intermediate piece.
- Change oil in automatic gearbox.
- Change oil in axle gears and hub reduction gears. After that there are no change intervals.
- Drain condensation water that may occur in 15 and 59 kNm cranes. (ammunition vehicles)
- Adjust valve clearances (see workshop Manual, sect. 2, Engine).
- Look for possible water, oil and fuel leakage.
- Tighten bolts (nuts) on intake and exhaust manifolds and side covers of the engine.
- Tighten hose clips on hoses in cooling, heating and intake systems.
- Tighten mounting bolts of the compressor, injection pump and injection pump drive coupling.
- Tighten power steering gear mountings at the bracket and frame.
- Adjust V-belt tension.
- Tighten mountingbolts (nuts) of engine, gearbox, flywheel housing and axle gear housings.  
Notice: Retighten the two hexagon screws inside front boggieaxle gear housing. Remove the transferbox in order to reach.
- Tighten bolted joints of tubular cross-members (front and rear).
- Tighten nuts of spring clamps.
- Check compressed air system for leaks in accordance with this operator's manual.
- Check strokes of brake cylinder push-rods.
- Check toe-in (see workshop Manual, sect. 6, Steering).
- Tighten wheel nuts with the specified torque.
- Tighten bogie suspension axle mountings.
- Tighten bogie transverse bars in bogie suspension axle mounting.
- Tighten reaction stay mounting in axle housing and cross-member of frame.
- Carry out a functional check.
- Lubricate chassis grease points.

## Periodic maintenance

To enable the truck to operate satisfactorily, it must receive maintenance.

The period maintenance is divided into:

- lubrication
- condition maintenance

Lubrication and some checks are dependent on the mileage covered and is carried out *every year or every 5 000 km\**.

Besides lubrication according to the lubrication chart, some other checks must also be made. Particulars of lubrication are given under the heading Lubrication. Note that several additional points are required *every 4th year or every 30 000 km\**

*\*whichever occurs first.*

Condition maintenance is dependent on time and is carried out

- daily
- monthly
- annually

Intervals of change only applies for vehicles driving with high quality fuel under fair conditions.

Condition maintenance is carried out at these intervals regardless of the distance driven. The monthly and annual maintenance is specified under the headings "Monthly or every 5000 km" and "Annual or every 10 000 km" respectively. The daily maintenance is specified under "Operation", "Checks before driving", "During driving" and "After driving".

A detailed description of the maintenance points in the various maintenance schedules is given for each unit under "Maintenance instructions".

Notice that the batteries might need some extra charge capacity checks between the intervals mentioned above. Use a hydro-meter. Recharge batteries which are half-charged or less. If the vehicle will stand for a long period – remove the batteries, store them dark, chilled if possible and fully charged to avoid damage by self-discharge.

### Check for leakage

The maintenance always includes visual checks of the different systems for leakage and retightening or repair if needed.

Carry out maintenance as stated in the main points below.

Detailed instructions under "Maintenance instructions" and in the lubrication chart.

## Monthly or every 5 000 km together with lubrication

### Engine

- Check the intake and exhaust manifold retaining nuts, check that the turbocharger is firmly secured and that the pipes are intact.
- Check the gaskets, joints and connections in the exhaust system for leaks. Feel with the hand and listen.
- Check that the exhaust pipe and silencer are properly secured and that there is no external damage.
- Check the mountings of the cooling system components.
- Check the radiator, cooling system hoses, pipes, connections and cocks for leakage.
- Check the condition of the cooling system hoses (cracks, wear, burns or damage due to oil).
- Measure the freezing point of the coolant if the temperature is liable to drop below 0 °C. Check the content of anti-corrosive.
- Check that the heaters and controls are working properly.
- Check the lubrication system for leakage at the oil filter, oil sump, oil cooler, rocker covers and oil pipes (engine running).
- Check the operation of the centrifugal oil cleaner.
- Check the mountings of the fuel system components, i.e. fuel tank, pipes, injection pump, delivery pipes and injectors, and that they are not damaged.
- Check the fuel system for leaks.
- Check that the warranty or official seals are intact.
- Check the operation of the accelerator pedal, hand throttle, stop control and cold starting device.
- Check the pressure indicator on the air cleaner. Clean the filter cartridge as necessary.
- Check that the V-belts are intact and adequately tightened.
- Clean the coarse separator on the air cleaner. Check the filter cartridge and clean if dirty.

### Electrical system and instrumentation

- Clean the batteries, battery holder and terminals, as necessary, and smear the terminals with petroleum jelly.
- Check battery charge with a hydrometer. Recharge if needed. See page 178.
- Check that the terminals and batteries are secured.
- Check the battery electrolyte level and top up with distilled water as necessary. At the same time, check that the cell caps are intact and that the vent holes are clean.

### Power transmission system

- Check that there is no external damage to cables and air hoses.
- Check the gearbox, axle gears and hub reduction gears for leakage.
- Check that the propeller shafts are not damaged.
- Drain condensation water that may occur in the gearbox on trucks driving in humid environment.

## Brake System

- Check the tightness of the compressed air system.
- Check the operation of the air dryer by draining the air pressure tanks.
- Check the operation of the air dryer heater.
- Check that the air pressure tanks, drain cocks and pipe connections are not damaged.
- Check operation of the trailer coupling and ensure that it is not damaged.
- Check the thickness of the brake linings.
- Check the stroke of the brake cylinder push rods. Adjust the brake levers.

## Steering system

- Check that none of the links and rods is bent or otherwise damaged.
- Check the power steering system for leakage (engine running).

## Frame, springs, wheels

- Check that there are not cracks in the frame side members and cross members.
- Check that none of the spring leaves is broken or displaced.
- Check the shock absorbers for leakage.

## Cab and body

- Check that all doors and covers are intact and locked and that all the loose equipment is secured
- Check that doors, locks, door stops, hinges and weather strips are intact and work satisfactorily
- Check that window regulators are working properly
- Check that the cab securing device is working properly
- Check that the bumper and mud flaps are secure and undamaged

## Winch (towing vehicles)

- Check that the controls and brake are operating satisfactorily.
- Clean and inspect the winch rope and rope guides.
- Check for oil leaks.

Loading crane 59 kNm (ammunition vehicles)

Loading crane 15 kNm (towing vehicles)

} Change of oil shall be done annually and is not depending on driven distance.

- Drain condensation water that may occur in the hydraulic oil container. Specially on trucks driving in humid environments.
- Check that the crane operates satisfactorily.
- Check for oil leakages.
- Lubricate the operating levers on loading crane 59 kNm.



## **Lubrication maintenance: every year or every 5 000 km**

### **Engine**

- Change the engine oil.
- Dismantle and clean the centrifugal oil cleaner.
- Change the turbocharger oil filter.
- Clean the fuel pre-filter.
- Clean the filter cartridge in the air cleaner.
- Clean the coarse separator in the air cleaner.

### **Power transmission system**

- Check the oil level in the axle gears and hub reduction gears.
- Check the oil level in the gearbox.

### **Winch (towing vehicles)**

- Check the oil level in the winch worm gear.
- Fill with oil in the winch jaw coupling.
- Inspect, clean and lubricate winch rope. A damaged rope should be changed.

### **Loading cranes 59 kNm and 15 kNm (if fitted)**

- Change the hydraulic oil and fill new oil to correct level.

### **Brake system**

- Check the function of the air dryer by draining the equalising tank. Moisture indicates that the air dryer need attention, e.g. changing the filter insert.

### **Steering system**

- Check the hydraulic fluid level.

### **Frame, springs**

- Check the oil level in the spring bearings of the bogie springs.

### **Wheels**

- Check the tyre pressures with a gauge.
- Check condition of the tyres (pattern, damages).

### **Chassis**

- Lubricate the chassis grease points.

## **Additional points: every 4th year or every 30 000 km**

### **Engine**

- Change the fuel fine-filter.
- Drain and clean the fuel tank.

### **Power transmission system**

- Change the hydraulic fluid in the gearbox.

### **Power steering**

- Change the hydraulic fluid and filter cartridge.

## Annually or every 10 000 km together with lubrication

### Engine

(see Workshop Manual, section 2)

- Adjust the valve clearances.
- Tighten the connections of the oil pipes to the turbocharger and ensure that they are secure. Check for leaks.
- Tighten the hose clips on the hoses in the cooling, heating and intake systems.
- Check the cooling system for leakage if possible using a pressure testing unit and check the operation of the relief valve.
- Tighten the connections of the fuel pipes and the retaining bolts for the tank fittings and tank filter.
- Check the threaded connections of the fuel pipes and the banjo coupling screws of the pre-filter and fuel filter. Check for damage, wear, leaks and corrosion on pipes, hoses, tank and other components in the fuel system.
- Measure the high and low idling speeds using the tachometer, and check the warranty and official seals of the fuel injection pump.
- Check that the injection pump setting is correct, using the markings on the pump coupling and flywheel.
- Tighten the bolted joints of the injection pump drive coupling.
- Tighten the retaining bolts for the exhaust pipe and the bolts of the rubber mountings of the exhaust pipe.

### Electrical system and instrumentation

(see Workshop Manual, section 3)

- Check the battery charge capacity and acid content.
- Tighten the retaining bolts and check all cable connections on the starter motor, alternator and voltage regulator.
- Adjust the headlamp setting, if necessary.

### Power transmission system

(see Workshop Manual, section 4)

- Check gear change speeds and stalling speed by road testing.
- Check the propeller shaft, universal joints and power take-off shafts for play or damage.

### Brake system

(see Workshop Manual section 5)

- Check pressure distribution between front and rear circuits, check valves, pressure control valve and safety valve.
- Check braking effort of foot brake and parking brake when driving.
- Check braking effort of the cross-country brake.

### Steering system

- Change filter cartridge.
- Check the tyre wear. Measure the toe-in if the tyre wear is considered abnormal.

**N.B.** If damage is suspected on any component of the front assembly or front axle mounting, the axle spacing on the right-hand and left-hand sides must also be measured and compared.

- Check that the ball joints in the front assembly are free from play and that there is no damage to the track rod, drag link and associated arms.
- Tighten the power steering gear mounting bolts and check the hydraulic hoses for cracks and wear.
- Check and, if necessary, adjust power steering tooth clearances.
- Check the operation of the power steering gear.

### Frame, springs, wheels

- Check for loose bolts and rivets, cracking and damage to chassis frame.
- Retighten the nuts on the spring clamps and check the spring leaves and spring clamps for damage.
- Tighten the shock absorber bolts and check for leaks.
- Measure bearing clearance at the wheel hub, using a dial indicator.
- Check the tyres and wheels for damage.

### Cab and body

- Check the cab mountings and test the cab latches.
- Test the operation of door locks, door hinges and window regulators, and the closing mechanism of the windscreen.
- Check that the mudguards and mud flaps are secure.
- Check that the rear-view mirrors are secure and that their adjustment is maintained when driving the truck on uneven road surfaces.
- Check the operation of cab tilting device and check for leaks.

### Tow hitch

- Check that the tow hitch is secure. Check for damage and cracks. If cracks are suspected, crack detection must be carried out.

### Winch (towing vehicles)

- Check that the winch is secure.

### Loading crane 59 kNm (ammunition vehicles)

### Loading crane 15 kNm (towing vehicles)

- Check operation and check for damages and leak.

Road test with functional checks on:

- Engine brake – cross-country brake
- Brake system
- Gear-change points
- Steering system
- Instruments
- Warning lamps
- All controls
- Windscreen washers and wipers

Notes

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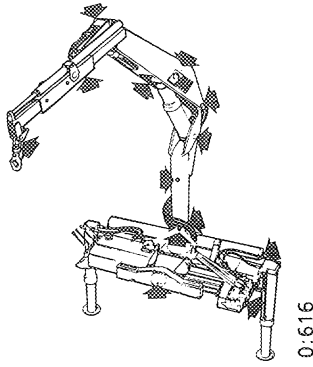
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Lubricant recommendations for SBAT 111S									
UNIT	Volume dm <sup>3</sup> (l)		*Change intervals	Type of lubricant	Trade denomination	Manufacturer and/or supplier	Supplier in India	International specification	Remarks
	Total	at change							
1) Engine	21	21	500 km or every year	Engine oil	Eso XD3 Shell Rimulia X	Exxon Shell	Hindustan Petroleum Corp. Ballad Estate Bombay	MIL-L-2104C MIL-L-46152 API CD +	Viscosity SAE 10W/30 below + 30°C SAE 15W/40 above + 30°C
	36	32	30 000 km or every 4th year	Automatic Transmission Fluid	Eso ATF Dexron II Shell Donax TM Shell ATF Dexron II	Exxon Shell	See above	ATF Type A Suffix A + C-3 or ATF Dexron/II + Allison C-3	For power steering can be used also Eso Univis HP46 if full change. Do not mix with ATF oil.
Power steering gear	3.8	2.5	30 000 km or every 4th year						
	0,6	0,4	-	Trans-mission oil	Eso Gear oil GX Shell Spirax HD	Exxon Shell	See above	MIL-L-2105 B/C API GL5	Viscosity SAE 80W/90 below + 30°C SAE 140 temp above + 30°C
Cab tilt equipment	4	4	-						
	3.5	3.5	-						
Loading crane 59 kNm (6.0 tonm)	0.2	0.2	-						
	45	45	every year	Hydraulic oil	Eso Univis HP46	Exxon	See above	ISO-VG 46, VI	Viscosity min 150 Zinc anti-wear additives not allowed
Loading crane 15 kNm	10	10	every year						
	1 kg		5000 km or every year every month	Chassis grease	Staburags NBU 12 MF	Klöber Lubrication München	Ajay Metachem 784 Deccan Ghyrkana opp Kamala Nehru Park		Fulfill several norms but not tested according to MIL-standards
Loading crane 15 kNm worm gear			every month	Worm gear grease	Molub Alloy 936 heavy TEXCLAD 2	Molub Alloy Texaco/Caltex	Imkemex India Ltd, Bombay Caltex, Bombay		

1) Oil change and chassis lubrication at RUNNING IN MAINTENANCE at 500-2500 km or at latest 6 months after delivery from factory  
 2) In extremely humid environment more frequent changes of oil are necessary to avoid damage. This is to be decided locally by technical staff.

# Lubrication chart and instructions, loading cranes

Loading crane 59 kNm (5900 kgf m)  
(ammunition vehicle)

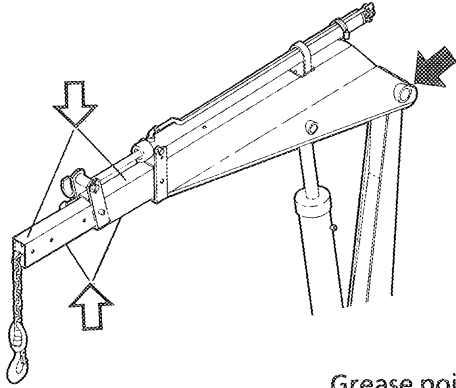


Grease nipples

← = Use chassis grease (see recommended lubricants, page 140)

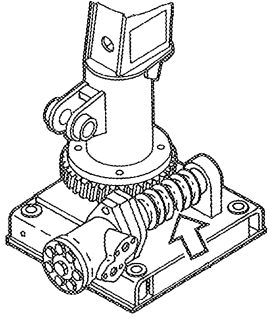
Loading crane 15 kNm (1500 kgf m)  
(towing vehicle)

1. Locate the grease nipple. Apply grease until it penetrates. The worm gear must be greased at least once a month. Use special grease for this purpose (see recommended lubricants, page 140). Pull out the boom extensions and grease them on the top and on the bottom. Use the same special grease as for the worm gear.



Grease points

- ← = Use chassis grease (see recommended lubricants, page 140)
- ↶ = Use special worm gear grease (see recommended lubricants, page 140)



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# Lubrication chart and instructions, chassi

## Every year or every 5 000 km

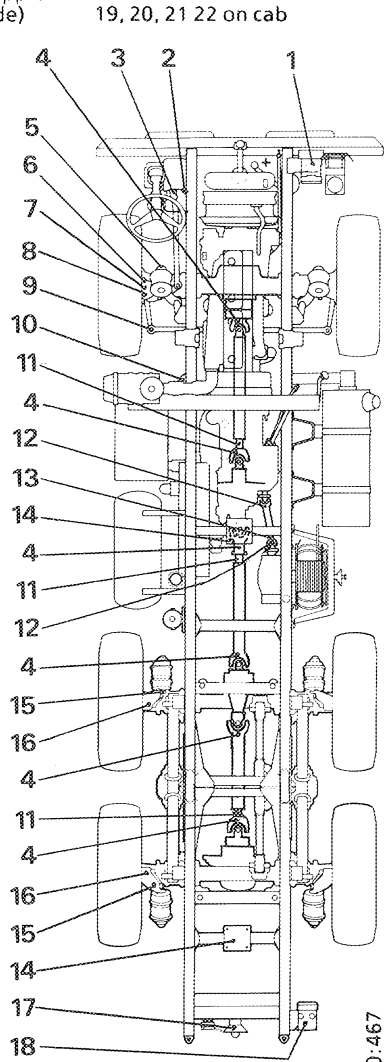
Lubricate the following points with universal grease. Detailed instructions are given under Maintenance instructions in page 143.

	Total number of nipples (and on each side)	19, 20, 21 22 on cab
1. Front guide rollers <sup>1)</sup> .....	4	
2. Front spring bolts .....	2 (1)	4
3. Ball joints in drag link ...	2	3
4. Universal joints .....	6	2
5. Front brake levers .....	2 (1)	1
6. Drive shaft universal joints (front) .....	4 (2)	
7. Kingpins .....	4 (2)	
8. Front brake eccentric shafts	2 (1)	
9. Ball joints on track rod ...	2 (1)	
10. Front spring shackles ....	4 (2)	
11. Spline couplings .....	3	
12. Universal joints for winch drive <sup>1)</sup> and hydraulic pump drive <sup>2)</sup> .....	2	
13. Spline coupling for winch drive <sup>1)</sup> and hydraulic pump drive <sup>2)</sup> .....	1	
14. Platform mountings .....	2	
15. Rear brake levers .....	2 (1)	
16. Rear brake eccentric shafts	2 (1)	
17. Tow hitch .....	4	
18. Rear guide rollers .....	4	
19. Front cover hinges .....	2	
20. Windscreen hinges .....	2	
21. Roof hatch hinges .....	2	
22. Door hinges .....	4 (2)	

- 1) Only vehicles with winch
- 2) Only vehicles with loading crane 59 kNm

### Lubricate with an oil can:

- Winch disengagement coupling
- Driver seat springing and adjustment controls
- Brake pedal bearings
- Accelerator pedal bearings
- Linkage for accelerator control
- Foot brake linkage
- Interlock valve (behind front cover)
- Accelerator pedal switch (behind front cover)
- Front and rear cab attachments



**N.B.** If immersed in water, or following pressure washing, the universal joints, the spline couplings for the drive shafts (front axle), the propeller shafts and the kingpins must be lubricated.

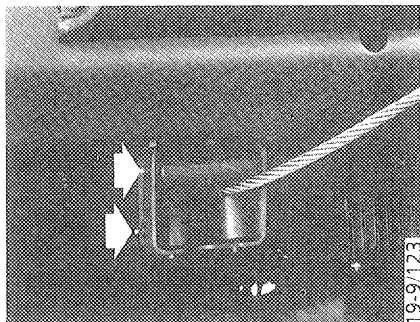
## Maintenance instructions, vehicle

### Lubricate grease nipples

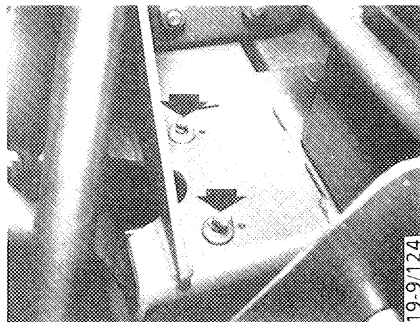
See Lubrication chart in page 142.

#### 1. Front guide rollers 4 nipples

Lubricate until grease seeps out. Check that the rollers rotate freely.



Horizontal rollers

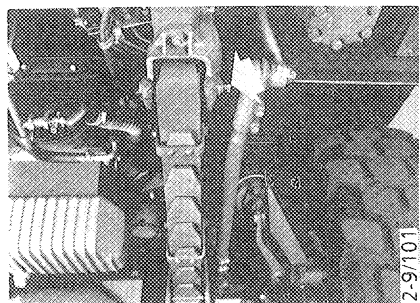


Vertical rollers

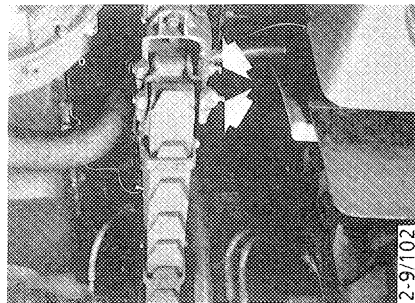
#### 2. Front spring bolts 2 nipples

#### 10. Front spring shackles 4 nipples

One at the front and two at the rear of each spring.  
If possible lubricate with the front axle jacked up.



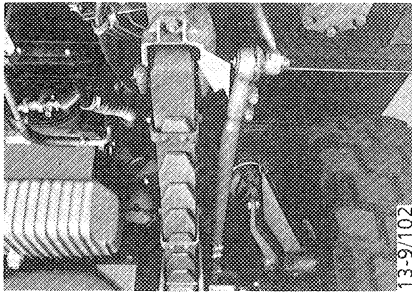
Front spring bolt



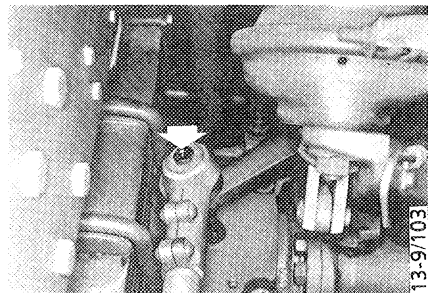
Front spring shackle



3. Ball joints in the drag link 2 nipples  
One at each end. Lubricate until grease seeps out.

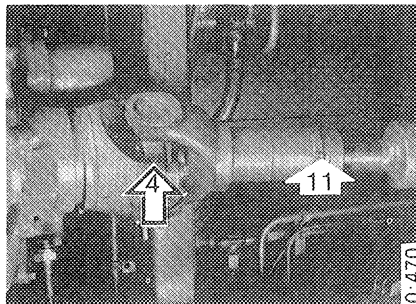


Steering link, front joint



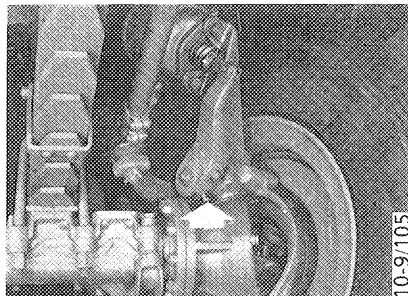
Steering link, rear joint

4. Universal joints 6 nipples  
11. Spline couplings 3 nipples  
There are three main propeller shafts (one front and two rear). Each of them has three nipples divided into two universal joints and one spline coupling. Lubricate until grease seeps out.



Universal joint

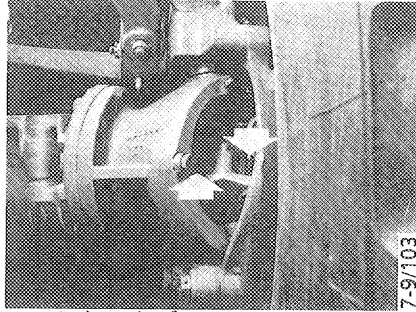
5. Front brake levers 2 nipples  
One on each wheel. Lubricate until grease seeps out.



Front brake lever

6. Drive shaft universal joints 4 nipples

Two in each drive shaft universal joint. Lubricate until grease seeps out.



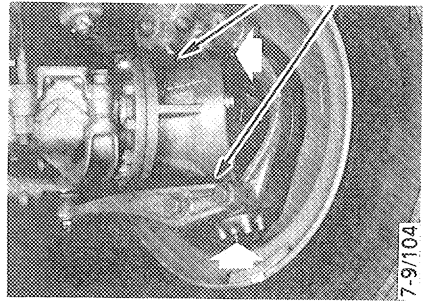
Drive shaft universal joint

7. Kingpins 2 (3) nipples

Jack up the axle

Two (three) on each front wheel. The upper kingpins have two grease nipples which can be used optionally, depending on which is most easily accessible. Turn the wheels to full lock and lubricate until grease seeps out of the drain hole.

Excessive grease

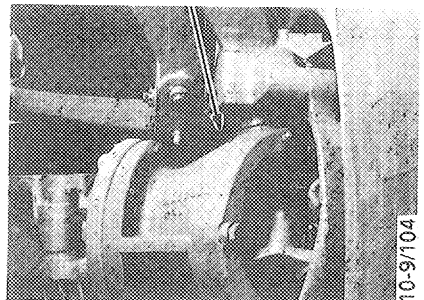


Kingpin grease nipples

8. Front brake eccentric shafts 2 nipples

One on each front wheel. Lubricate until grease seeps out of the drain hole. Lubricate carefully so as not to damage the eccentric shaft seals.

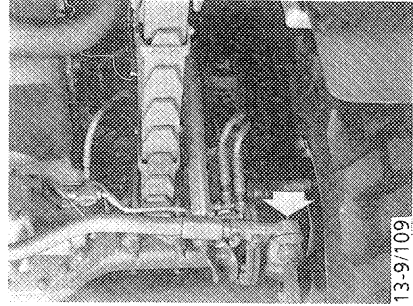
Excessive grease



Front brake eccentric shaft

9. Ball joints on track rod  
2 nipples

One in each ball joint. Lubricate until grease seeps out.



Ball joint on track rod

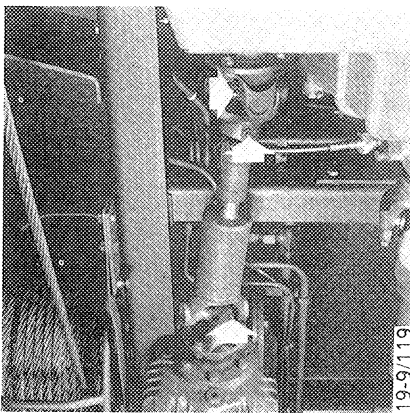
10. Front spring shackles, see item 2

11. Spline couplings, see item 4

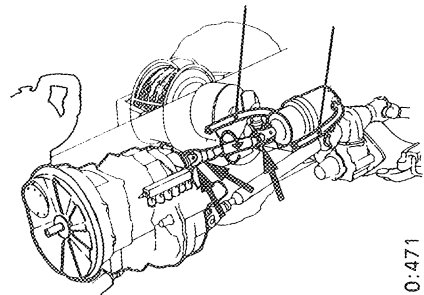
- 12,13 Universal joints and spline couplings.  
Winch drive (if fitted) 3 nipples

- 12,13 Hydraulic pump driving 59 kNm loading crane,  
(if fitted) 3 nipples

One nipple on each of the two universal joints and one on the spline coupling. Lubricate until grease seeps out.

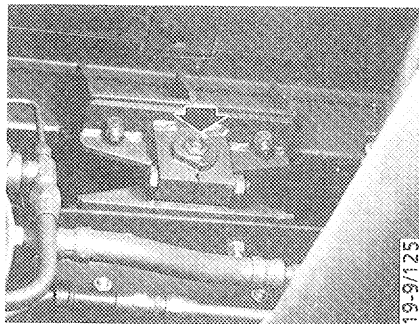


Winch drive



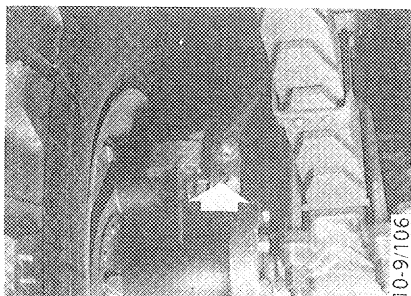
Hydraulic pump drive

14. Platform mountings 2 nipples  
One in front and one in rear platform bracket. Lubricate until grease seeps out.



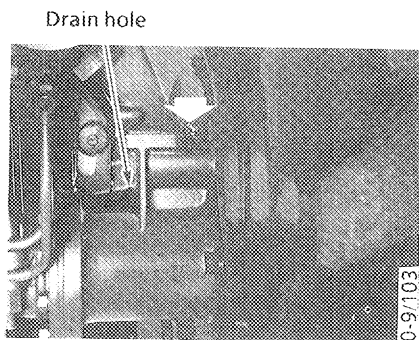
Platform mounting

15. Rear brake levers 4 nipples  
One on each lever (each side of the two rear axles). Lubricate until grease seeps out.



Rear brake lever

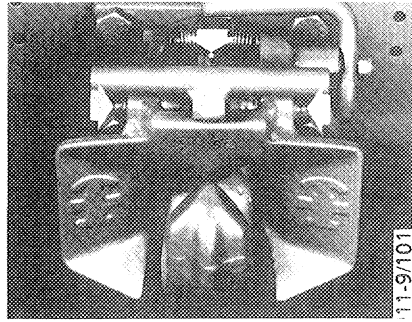
16. Rear brake eccentric shafts 4 nipples  
One on each shaft, (each side of the two rear axles). Lubricate until grease seeps out.



Rear brake eccentric shaft

- 17. Tow hitch  
4 nipples

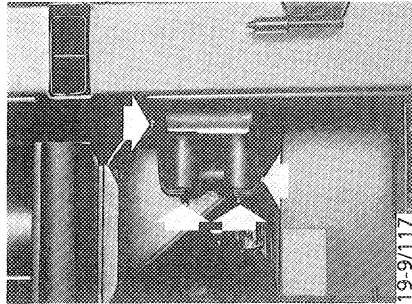
Lubricate until grease seeps out.



Tow hitch

- 18. Rear guide rollers (only trucks fitted with winch) 4 nipples

Lubricate until grease seeps out. Check that the rollers rotate freely.

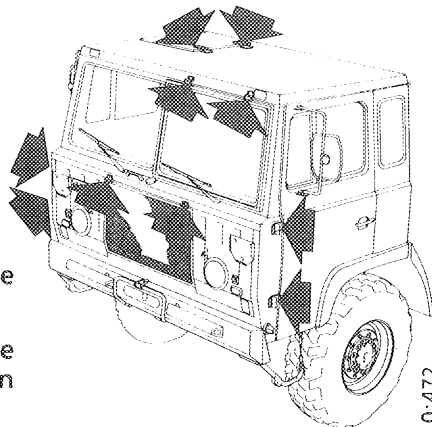


Rear guide rollers

- 19. Front cover hinges 2 nipples
- 20. Windscreen hinges 2 nipples
- 21. Roof hatch hinges 2 nipples
- 22. Door hinges 4 nipples

Lubricate sparingly until grease seeps out. Wipe clean.

Check other fitted and loose equipment and lubricate when needed.



Grease nipples on cab

## Engine

Change oil every year or every 5 000 km.

Engines with a turbocharger (DS11 engines) must be lubricated with an oil which meets the requirements of American specification MIL-L-2104C (API CD +), see Lubricants in page 140.

### Viscosity

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SAE 10W/30 at ambient temperatures below + 30 °C

SAE 15W/40 at ambient temperatures above + 30 °C

---

N.B. Never use flushing oil in the engine.

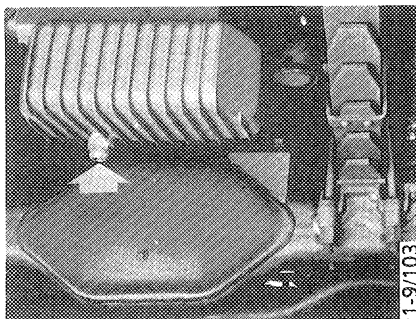
Volume: 21 dm<sup>3</sup> (litres)

### Oil change:

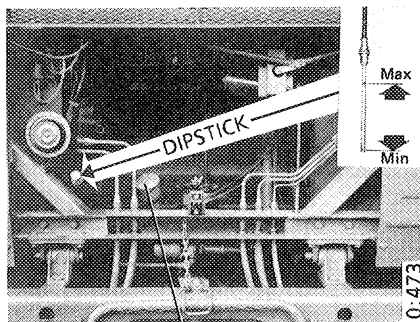
Drain the oil through the drain hole at the bottom of the oil sump. It is advantageous if the oil is drained when the engine is hot, since it then flows easily. The drain plug is fitted with a magnet which must be cleaned whenever the oil is changed.

### Oil level check:

The level should be at the upper mark on the dipstick.



Drain plug for the engine oil



Filling up

Dipstick and filler pipe for engine oil

## Oil cleaner

Every year or every 5 000 km (at oil change).

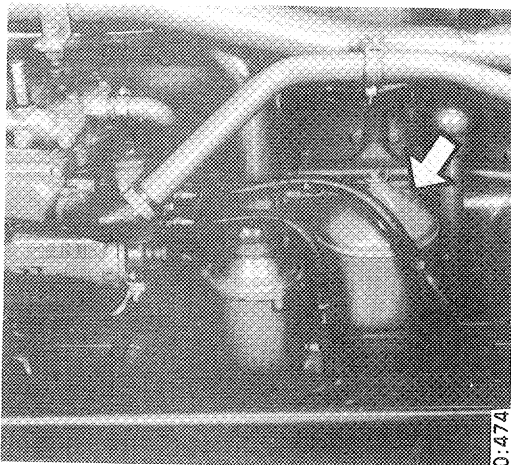
During routine cleaning, the centrifugal cleaner should contain a certain amount of dirt in the rotor. If not, this indicates that the cleaner is not working properly. The reason must be established immediately. If the deposit exceeds the maximum permissible thickness of 20 mm when cleaning at the recommended intervals, the lubricating oil cleaner must be cleaned more frequently.

Dismantling:

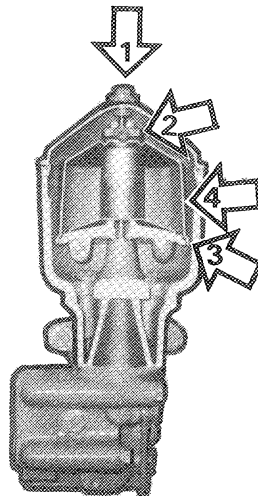
1. Remove the cover by removing nut 1.
2. Lift out the rotor section 4, unscrew nut 2 about three turns (to protect the upper bearing). If the nut is difficult to unscrew, turn the rotor upside down and clamp the nut in a vice. Rotate the rotor anti-clockwise by hand or by using a screwdriver between the outlet ports.

**N.B.** The rotor itself must not be clamped in a vice.

3. Grip the outside of the rotor and lightly tap the nut with the hand or a plastic mallet so that the rotor bowl is released from the bottom plate.
4. Remove the funnel-shaped metal strainer resting on the central section. If the strainer is stuck, carefully prise with a knife at the lower edge at 3, between the central section and the strainer.



Oil cleaner location



Oil cleaner components

0-475

0-474

### Cleaning:

1. Scrape off the dirt deposits on the walls of the rotor bowl, using a knife or similar implement. If the layer of dirt is more than 20 mm thick on cleaning, the cleaner must be cleaned more frequently.
2. Wash the parts in diesel oil.

### Reassembly:

1. Fit O-ring 4 in position in the rotor casing. Make sure that the ring is undamaged. Replace the ring if at all damaged.
2. Assemble the rotor parts and tighten rotor nut 2 firmly by hand. Make sure that the steel washer under the nut is correctly in position.
3. Put back the rotor and check that it rotates freely by spinning it by hand.
4. Fit the cover and tighten nut 1 firmly by hand. If tightening with a spanner the rotor shaft might break.

### Functional check:

The rotor runs at a fairly high speed about 10 000 r/min. It will therefore normally continue rotating for about a minute after the engine has stopped, provided that the lubricating oil has reached normal operating temperature. During part of this subsequent rotation, a humming sound should normally be heard from the rotor. Slight vibration can also be felt by the hand on the cleaner casing.

Operation of the cleaner can be checked as follows:

1. Start the engine.
2. Check for leakage.
3. Stop the engine after it has run for a while and listen for the humming sound of the rotor, which indicates that the rotor is running normally. If no humming sound is heard or no vibration is felt in the casing, the cleaner should be dismantled for checking.

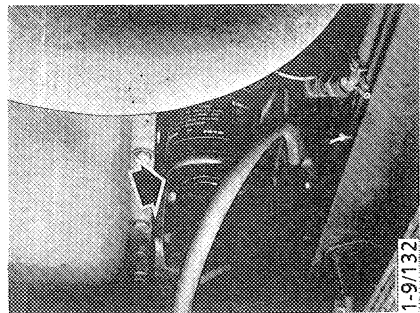
## Turbocharger

### Changing the oil filter:

Every year or every 5 000 km

Remove the old filter, discard it and fit a new filter as follows:

1. Oil the rubber gasket of the filter.
2. Tighten the filter by hand until the gasket is firmly down.
3. Tighten a further half turn.
4. Start the engine and check that there are no leaks.



Turbocharger filter



## Fuel system

When using high quality fuel, clean the pre-filter every 5000 km. In other cases, more frequent intervals of cleaning are required.

1. Unscrew the knurled nut.
2. Move the spring clamp forward and remove the filter bowl downwards.
3. Wash the nylon gauze in petrol (gasoline) or diesel oil.
4. Check the gasket. If it has become hard or damaged it must be replaced.
5. Reassemble the filter.
6. Start the engine and check the gasket for leakage.

Changing the fuel filters every 4th year or every 30 000 km :

When changing the filters or carrying out any other work on the fuel system, extreme cleanliness must be observed to prevent dirt from entering into the injection equipment and causing breakdowns.

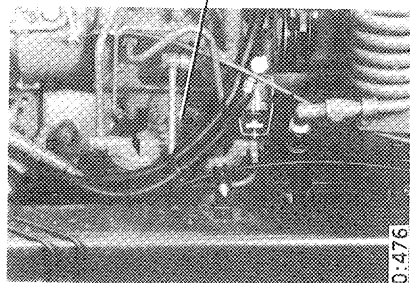
1. Wash the outside of the filters before unscrewing and discarding the cartridges.
2. Screw on the new filters by hand until the gasket is firmly down and then tighten them a further half turn.
3. Bleed the fuel system as described below.
4. Start the engine and check that the gaskets seal properly.

Bleeding:

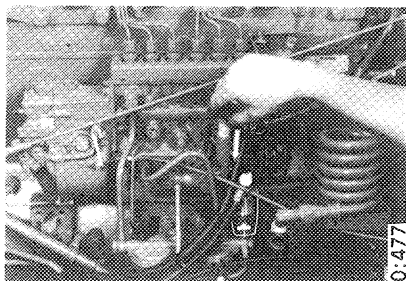
1. Open the bleed screw on the fuel filters.
2. Unscrew the knurled handle of the feed pump to enable the plunger to be pulled up.
3. Pump until fuel free from air flows from the bleed screw.
4. Close the bleed screw and screw down the manual pump plunger.

Bleeding can be carried out without opening the bleed screws, but will then take longer.

Bleed screw



Fuel pre-filter and fuel filters



Manual pump

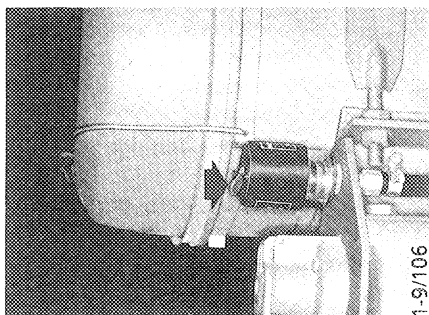
## Air cleaner

Check that the pressure indicator underneath the air cleaner does not show a red area in the indicator glass. When the red area of the plunger is fully visible, the air cleaner cartridge must be cleaned or replaced. Then reset the indicator plunger by pressing the button at the arrow.

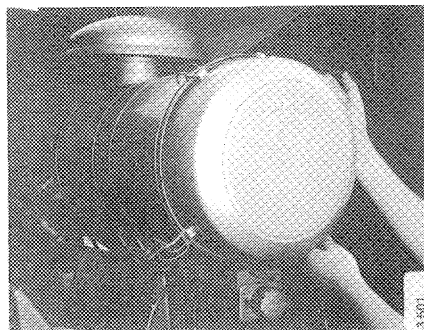
Cleaning the coarse separator every day in very dusty conditions otherwise every month or every 5 000 km:.

The coarse separator forms the air cleaner cover.

1. Open the retaining clamps.
2. Remove the cover.

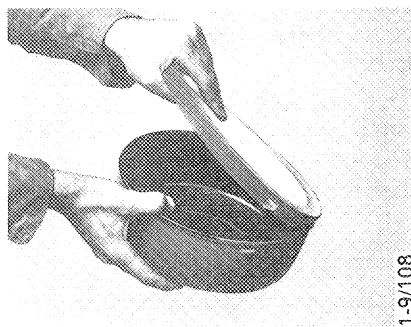


Pressure indicator



Removing the coarse

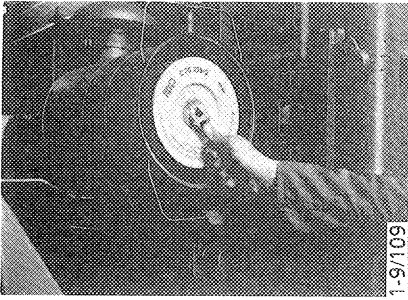
3. Remove the plastic cover.
  4. Wipe clean.
  5. Reassemble in reverse order.
- N.B.** The arrow on the cover must point upwards.



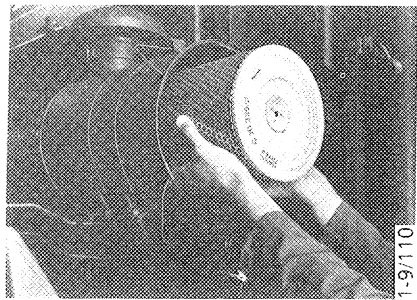
Coarse separator

Cleaning the filter cartridge every month in dusty conditions, otherwise every year:

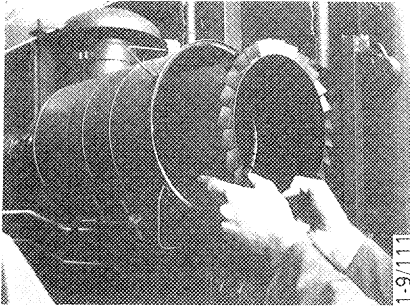
1. Remove the nut.
2. Withdraw the filter cartridge carefully so as not to damage it.
3. Withdraw the guide vane cylinder and clean it.



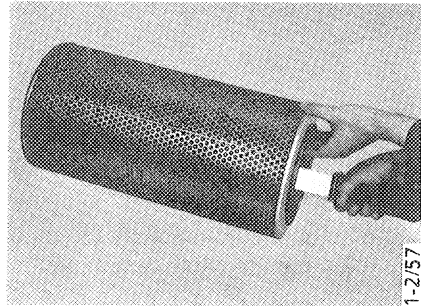
Nut for the filter cartridge



Filter cartridge



Guide vane cylinder



Checking the filter cartridge

The cartridge can be cleaned about 4 times before being replaced. Air or water can be used for cleaning, depending on the type or degree of fouling.

Cleaning with compressed air:

Blow clean the filter cartridge with dry compressed air from the inside. Direct air nozzle diagonally towards the filter cartridge.

Cleaning with water:

1. Immerse the cartridge in a mixture of lukewarm water and detergent.
2. Move the cartridge backwards and forwards several times.
3. Rinse thoroughly with clean water.
4. Allow the filter to dry.
5. Check that the filter cartridge is undamaged by inserting a lamp and inspecting the outside.
6. Fit the filter cartridge and the coarse separator in the reverse order to dismantling.

If necessary, also clean the cover of the air cleaner intake.

Release the clamp and remove the cover.

Wash the cover or blow it clean.

## Cooling system

Coolant with anti-corrosive:

Volume: 50 dm<sup>3</sup> (litres). 55 dm<sup>3</sup> (litres) when fitted crew cab.

The coolant consists of water, anti-corrosive and glycol, if sub-zero temperatures are expected. Anti-corrosive protects the metal components of the engine from attack by the coolant. Glycol prevents the coolant from freezing at temperatures below 0 °C and raises the boiling point, an advantage in hot climates or at high altitudes.

On delivery from the factory, the engine cooling system contains clean water and 30 % ethylene glycol with anti-corrosive additive.

Ethylene glycol	Freezing point	Boiling point
30 %	-18 °C	+ 104 °C
50 %	-46 °C	+ 107 °C

The boiling points given are at atmospheric pressure. The radiator cap has a seal and a spring which increases the radiator pressure 0.5 bar, which, in turn, raises the boiling point.

The warning system for coolant temperature will alert at 103 °C ± 3 °C. When driving at high altitudes, e.g. 4 000 m, clean water will start boiling at + 93 °C. Be particularly observant on the gauge then!

**Water:**

Dirty water will increase the risk of engine overheating. Therefore always use clean water. Fresh water always contains a certain amount of oxygen, which accelerates the corrosion. After some time it disappears.

It is therefore preferable to keep the coolant in the system as long as it is clean, and to re-use it if the system is drained.

○ ○

**Anti-freeze  
COOLANT**  
with anti-corrosive additive

---

On delivery ex-factory the engine cooling system is filled with clean water and 30% ethylene glycol with anti-corrosive additive.

Ethylene glycol reduces the freezing point and raises the boiling point.

For cooling system volume, see Operator's manual.

Ethylene glycol	Freezing point	Boiling point
30 %	-18 °C	+104 °C
50 %	-46 °C	+ 107 °C

Clean coolant does not have to be changed and can also be re-used if the cooling system has been drained for repair.

Top up with new Scania approved anti-corrosive coolant once per year.

**SCANIA**

Label suspended on the radiator behind the front cover

0:47B

## Glycol:

If there is a risk of freezing, the freezing point of the coolant must be checked at regular intervals. The frost protection is improved by topping-up with glycol.

Remember that the anti-corrosive contained in the glycol is gradually used up. A mixture of water and pure glycol is very aggressive and can quickly lead to major damage to the cooling system.

If "Scania anti-corrosive" is not added according to the above recommendations, the glycol mixture must be changed every year.

Scania anti-corrosive or other agent approved by Scania:

The corrosion inhibitors present in the coolant on delivery are eventually used up and it is therefore necessary for anti-corrosion agent to be added at regular intervals. "Scania anti-corrosive" should be added every year at the rate of 1 dm<sup>3</sup> (litre). When changing the coolant, 1.5 dm<sup>3</sup> (litre) of "Scania anti-corrosive" must be added to the fresh coolant. Then add 1 dm<sup>3</sup> (litre) every year. The "Scania anti-corrosive" is alkaline and must therefore be handled carefully in concentrated form. Follow the instructions on the pack. Rinse thoroughly with water if the liquid should come into contact with you skin or eyes.

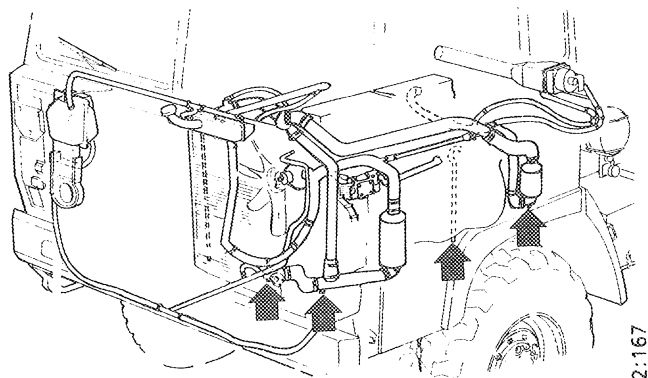


2:2

Scania Anti-corrosive  
in 1 dm<sup>3</sup> (litre) bottle

## Changing the coolant:

Regular addition of "Scania anti-corrosive" according to the instructions will ensure that the coolant can generally be used for several years without having to be changed. However, if the coolant appears to be contaminated, i.e. sludgy and cloudy, it must be changed. The simplest way to check the cleanliness of the coolant is to open a drain cock and allow a little coolant to flow into a collecting vessel. The coolant should be clear and transparent.



Drainage points

## Draining the cooling system:

1. Remove the filler cap carefully if the engine is hot. Hot water and steam may spray out through the filler opening.
2. Open the drain cocks and plugs.

## Flushing the cooling system:

Flush the cooling system through until clean water flows through the drain cocks.

Topping up with coolant:

1. Close the drain cocks and plugs.
2. Top up with coolant (clean water, glycol, anti-corrosive) until the level reaches the filler opening.
3. Start the engine and run it at idling speed for about 10 minutes.
4. Top up until the level reaches the filler opening.

**N.B.** Before truck is driven, cooling system must be completely full.

Check the freezing point of the coolant regularly if there is a risk of sub-zero temperatures.

Change the coolant if it is contaminated.

### Gearbox

Automatic Transmission Fluid:

Change the fluid every 4th year or every 30 000 km.

The hydraulic fluid must meet one of the specifications below (see Lubricants in page 140).

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ATF Type A Suffix A + Allison C-3 specification

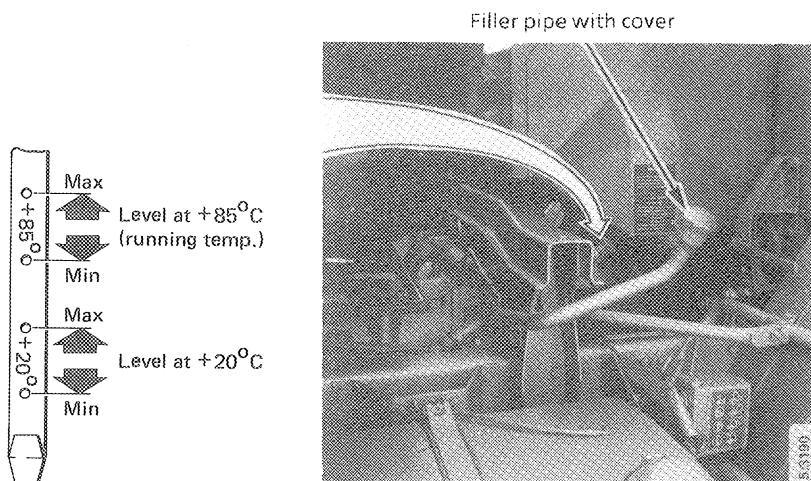
ATF Dexron/II + Allison C-3 specification

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Volume: 36 dm<sup>3</sup> (litres). At change: 32 dm<sup>3</sup> (litres).

## Checking the level:

The hydraulic fluid level in the gearbox should be checked while the engine is running, using the dipstick behind the cab on the right-hand side.



Oil dipstick and filler pipe

The hydraulic fluid expands on heating, so the dipstick has two measurement ranges. One range is for +20°C and the other is for running temperature, normally +85°C. In the winter, below 0°C, the hydraulic fluid level may not even be visible on the dipstick. The check must then be carried out after running, when the gearbox is warm. The level must then be within the upper measurement range of the dipstick. Wipe the dipstick before checking the level, e.g. with paper or a clean cloth. Cotton waste must not be used.

1. Start the engine.
2. Set the gear selector to position **R**, then to position **D** and finally to position **N**.
3. Set the engine to an idling speed of about 800 r/min.
4. Check the oil level



If the level is too high or too low, this may lead to excessive temperatures in the gearbox.

If the level is too low, top up with 0.5 dm<sup>3</sup> (litre) of oil at a time, until the correct level is obtained.

### Changing the hydraulic fluid:

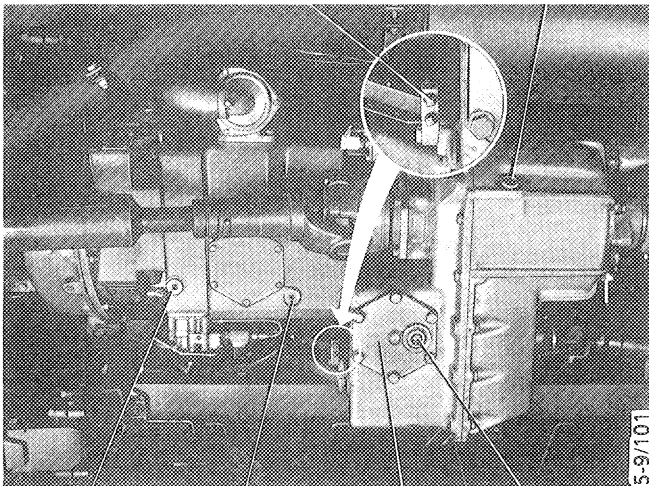
The hydraulic fluid must be changed every 4th year or every 30 000 km. Observe maximum cleanliness.

### Draining:

Drain off the fluid while the engine is at rest (4 drain plugs). Draining should be carried out immediately after a run, while the hydraulic fluid is still hot and will drain easily. Excess fluid can be drained but this is normally not necessary.

Draining plug for excess fluid

1



2

3

4

5

- |                     |                          |
|---------------------|--------------------------|
| 1. Transfer box     | 4. Filter cover          |
| 2. Torque converter | 5. Transfer box oil sump |
| 3. Main gearbox     |                          |

### Gearbox drain plugs

1. Remove the four drain plugs and allow the hydraulic fluid to drain out. Burnt and discoloured fluid indicates hot running, which may have been caused by incorrect fluid level, low hydraulic pressure and slipping clutches.
2. Remove the filter cap gently.
3. Clean the filter thoroughly by washing with kerosene, and blow it clean. Be careful not to damage the filter. Do not use any tools when cleaning. The presence of metal chips or swarf indicates damage to the gearbox. A small amount of smooth metal powder on the magnets is normal and does not indicate damage.

#### Topping up:

1. Fit the drain plugs.
2. Pour the hydraulic fluid through the filler pipe.
3. Start the engine and run it for a few minutes.
4. Check the level according to the description. Adjust if necessary by topping up or draining, so that the level will reach the upper mark on the dipstick.

#### Draining excess fluid:

1. Start the engine.
2. Set the gear selector to **D**.
3. Remove the plug 4 as shown in the figure entitled Gearbox drain plugs and drain out the required amount of fluid.

#### Front and rear axles

**N.B.** After the oil change at the running-in maintenance, no oil change is required, unless total mileage exceeds 100 000 km.

#### Lubrication:

The axles must be lubricated with a transmission oil to the American specification MIL-L-2105 B. API GL5.

See Lubricants in page 140.

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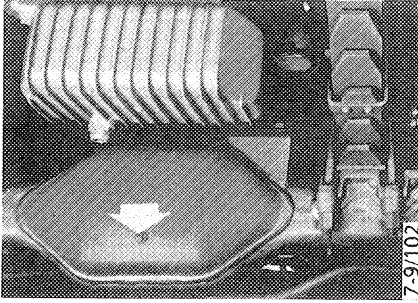
SAE 80 W/90	at ambient temperatures below $-10^{\circ}\text{C}$
SAE 140	at ambient temperatures above $+30^{\circ}\text{C}$

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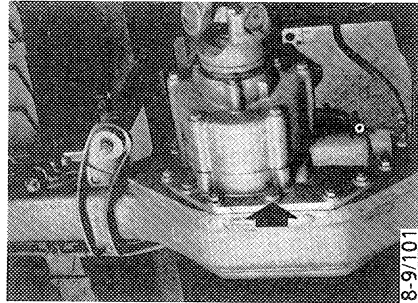
#### Volumes:

Front/rear axle gear	4.0 dm <sup>3</sup> (litres)
Hub reduction gear	0.6 dm <sup>3</sup> (litres), 0.4 dm <sup>3</sup> (litres) at oil change

## Front and rear axle gears



Front and rear axle gear,  
level plug



Front and rear axle gear,  
drain plug

Checking the oil level:

The oil must be up to the level of the filler hole.

Changing the oil:

1. Remove the combined level and filler plug.
2. Remove the drain plug and drain out the oil.
3. Apply some sealing compound to the drain plug and put it back.
4. Top up oil until it reaches the level of the filler hole.
5. Apply some sealing compound to the filler plug and refit it. Do not overtighten.

## Hub reduction gear

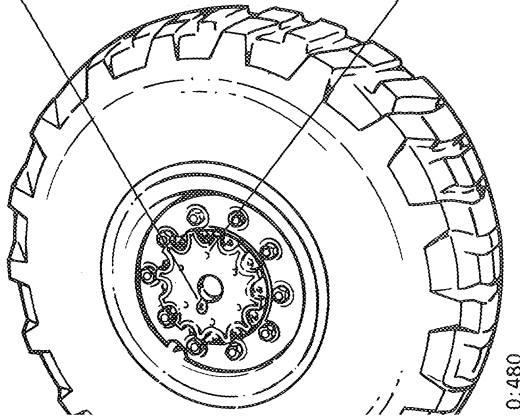
Checking the oil level:

1. Remove the level plug and clean it.
2. Set the level and filler hole to the lowest position. The oil must be up to the level hole.

3. Top up with oil as necessary.

Level/filling plug

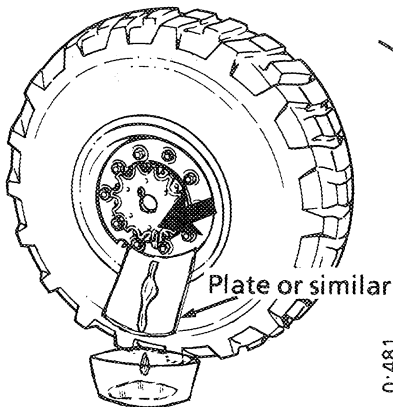
Draining plug (any cover plug)



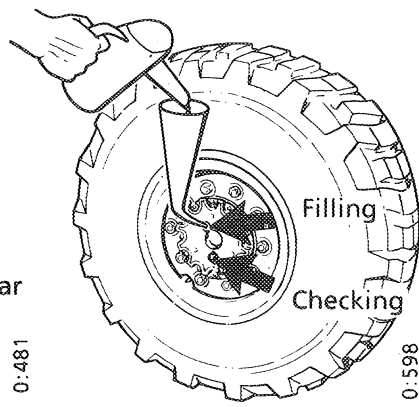
Hub reduction gear, checking position

#### Changing the oil:

1. Remove one of the cover bolts (draining plug).
2. Set the hole to the lowest position and allow the oil to flow out. The oil can also be drawn up with a pump through the combined level and filler hole.



Draining position



Filling and checking position

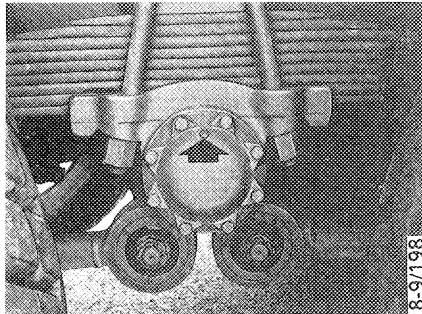
4. Top up with the correct volume of oil, pouring it through the combined level and filler hole. To make filling easier and avoid overflowing, turn the filling hole to top position. Fill 0.4 dm<sup>3</sup> (litres) of oil. Then turn the filler hole to bottom (checking) position and adjust the level up to the hole.
5. Fit the combined level and drain plug.

### Spring bearings

Checking the level:

No change intervals.

- The oil must be up to the combined level and filler hole. Use axle gear oil.



Spring bearing

### Power steering gear

Hydraulic fluid = Automatic Transmission Fluid:

Change fluid every 4th year or every 30 000 km.

The hydraulic fluid must meet one of the specifications below, as in the gearbox. See Lubricants in page 140.

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ATF Type A Suffix A + Allison C-3 specifications.

ATF Dexron II + Allison C-3 specifications.

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Avoid mixing hydraulic fluids of different specifications.

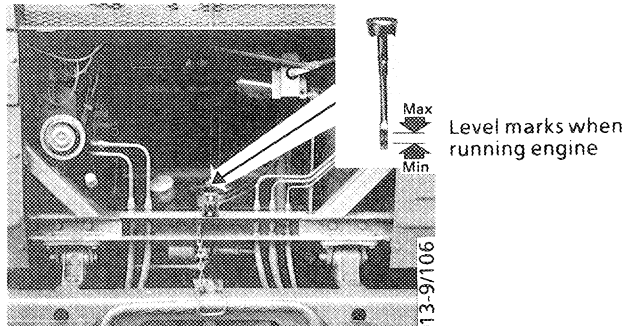
Hydraulic fluid volume: Approx. 3.8 dm<sup>3</sup>, at change 2.5 dm<sup>3</sup> (litres).

If above oils are not available, hydraulic oil as used for e.g. loading cranes may be used. See Lubricants in page 140.

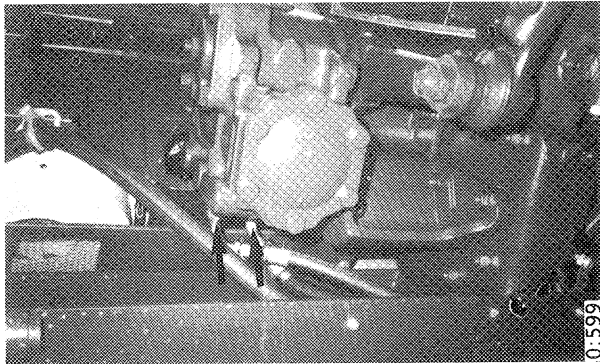
### Checking the level:

The oil level should be checked when the engine is running and must be between the level marks on the dipstick. When the engine is at rest, the level will be about 2 cm higher.

**N.B.** Observe the utmost cleanliness, to prevent dirt or foreign matter falling into the container.



Dipstick



Connections on steering gear seen from underneath

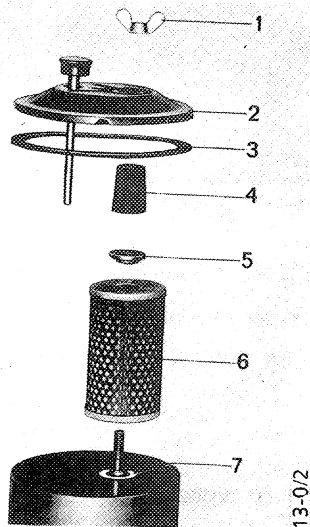
### Changing the hydraulic fluid and filter:

The filter must be changed when changing the fluid.

1. Block the front axle up and place an oil collecting vessel under the power steering gear.
2. Remove the drain plug.

3. Turn the steering wheel to the right lock and run the engine on the starter motor for a short while (stop control pulled out), so that the hydraulic fluid will be pumped into the vessel.
4. Turn the steering wheel from lock to lock until more hydraulic fluid flows out.
5. Remove wing nut 1 retaining the container cover 2.
6. Lift up the cover so that filter cartridge 6 is accessible.
7. Remove sleeve 4, centre ring 5 and filter cartridge. If steel washer 7 under the filter cartridge has also been lifted up, it must be put back in position.
8. Insert the new filter cartridge, centre ring and sleeve in the order listed. Check cover gasket 3 and place it on the cover.
9. Fill the hydraulic fluid container with hydraulic fluid.
10. Run the engine on the starter motor for a few revolutions (stop control pulled out).
11. Top up the hydraulic fluid in the container.
12. Start the engine and run it at idling speed.

**N.B.** Observe the hydraulic fluid level. The container must be kept roughly half full. (Check occasionally with the dipstick.)

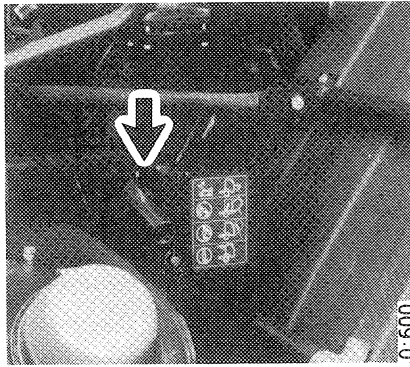


Components of the hydraulic fluid container.

### Cab tilting device

Checking and topping up the hydraulic fluid:

Unscrew the filler plug at the top of the pump. The hydraulic fluid should come up to the lower edge of the filler hole. If the fluid level is too low, top up with the same type of hydraulic fluid as that used for the power steering gear.



Filler hole

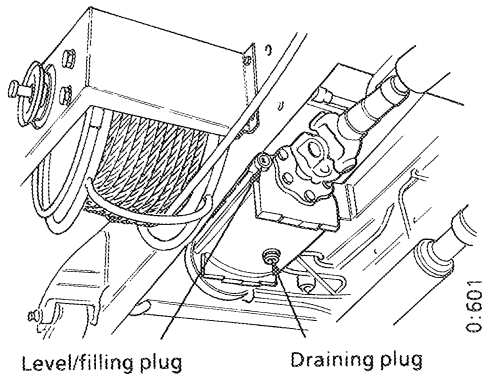
### **Maintenance winch (towing vehicles)**

Lubrication:

- No change intervals. Topping up and changing oil at repairs as below.
- The winch must be lubricated with the same type of oil as the rear and front axles. See Lubricants in page 140.

Volumes:

Worm gear	3.5 dm <sup>3</sup> (litres)
Jaw coupling	0.2 dm <sup>3</sup> (litres)



Level/filling plug

Draining plug

### **Worm gear**

Checking the level in the worm gear:

Remove the plug and check the oil level. The oil should be up to the combined level and filler hole.

Changing the oil in the worm gear (at repairs):

Drain the oil through the drain hole and fill with fresh oil in the level/filling hole.



### Changing oil in jaw coupling (at repair):

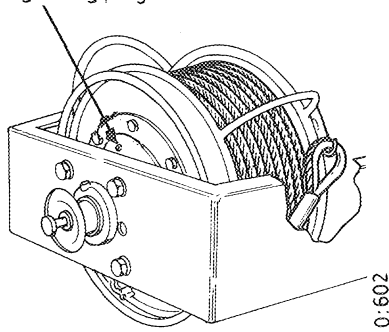
Remove the plug and rotate the winch drum so that the filler and drain hole is at the top. Allow the oil to drain out into a collecting vessel. Rotate the drum so that the hole is at the top. Fill 0.2 dm<sup>3</sup> (litres) of oil.

### Topping up with oil in jaw coupling:

Once every year.

Rotate the drum so that the hole is at the top. Remove the plug and fill with 0.05 dm<sup>3</sup> (55 cm<sup>3</sup>) oil.

Draining/Filling plug

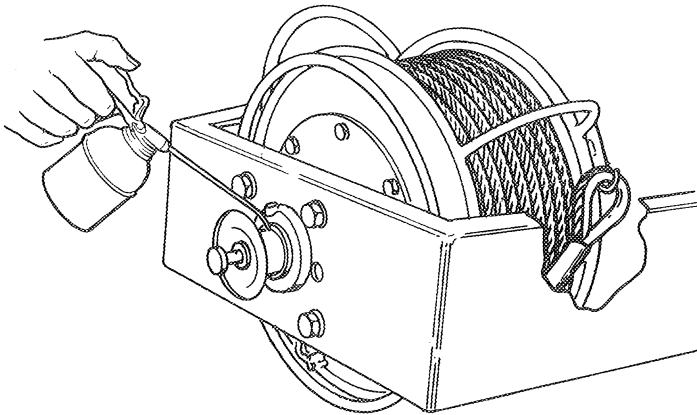


Jaw coupling

0:602

### Lubrication of the disengagement mechanism:

Pull the jaw coupling handle out fully. There is a nipple with check valve fitted in the lubricating hole. Force oil into the nipple with an oil can. Oil the shaft with a few drops of oil in the lubricating hole. Move the handle back and forth a few times so that the oil will run down.



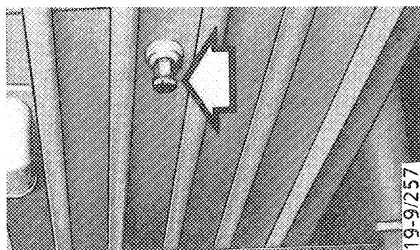
Disengagement mechanism

0:603

## Maintenance loading cranes

### Loading crane 59 kNm (5900 kgf m), general (ammunition vehicles)

1. Drain any water that has accumulated in the oil tank. Open the drain plug and close it when oil emerges.



Drain plug

2. Operating levers: Check that the levers operate easily and that they automatically return to their neutral position when released.  
Check that cotter-pins and nuts at all linkages are properly attached.  
Check that all markings of the levers, symbols and text are easily visible and indicate the proper movement.
3. Check that load carrying parts such as the hook, hook attachment, chains and additional tools used with the crane are undamaged and in good working condition.
4. Check that the loader's attachment bolts and nuts are properly torqued and locked where necessary. Check that axles, stop screws and locking pins in the booms are all functioning properly.
5. Check that steel parts of the crane and attachment parts have no visible cracks or show any deformation.
6. Check that all locks for support legs, booms etc. work properly.

7. Check that there are no oil leaks at any of the seals, connections and fittings, and that all hoses and pipes are undamaged. Check that the hydraulic pump, including its driveshaft, joints and attachments, are undamaged and that there are no leaks. Check also that there is sufficient oil in the oil tank and top it up if necessary.

### Loading crane 59 kNm (5900 kgf m), hydraulic fluid

Interval, specification, volume:

Change the oil every year.

The hydraulic fluid must comply with the specification ISO-VG 46, IV (see Lubricants, page 140).

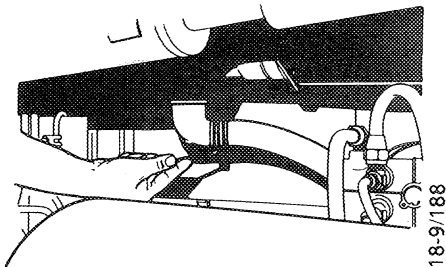
Volume: 45 dm<sup>3</sup> (litres)

#### Oil change

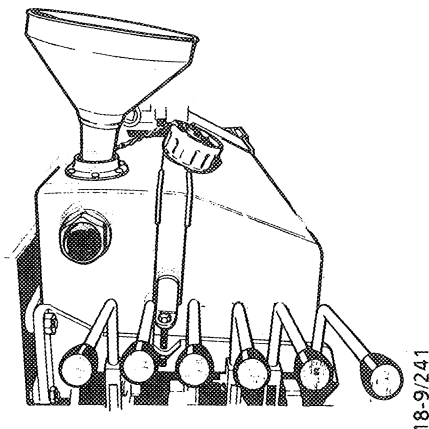
1. Disconnect the suction hose at the hydraulic pump.
2. Open the drain plug and empty the old hydraulic fluid into a bucket.
3. Clean the area around the filler cap.
4. Close the drain plug.
5. Fill the tank with recommended lubricant. Use a clean funnel with a strainer.

#### Filter change

This operation should be carried out by a skilled mechanic.



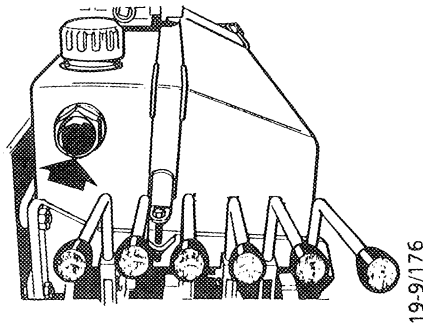
Disconnecting the suction hose



Filling with hydraulic fluid

## Checking the oil level

The nominal oil level is checked by examining a level indicator on the oil tank. The vehicle should be resting on firm level ground. The loading crane and the support legs should be located in their transport position.



Level indicator

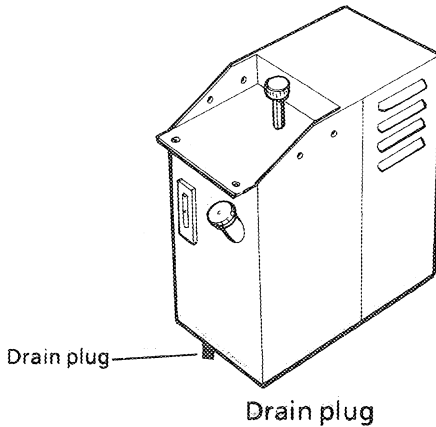
### Loading crane 59 kNm (5900 kgf m), hydraulic pump

Maintenance operation should be carried out by a skilled mechanic.

### Loading crane 15 kNm (1 500 kgf m)

(Towing vehicles)

1. Drain any water that has accumulated in the oil tank. Open the drain plug, and close it when oil emerges.



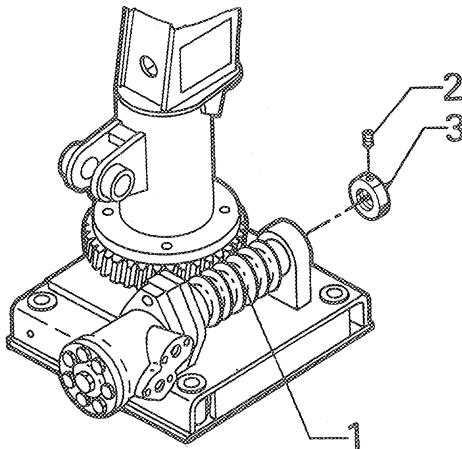
Drain plug

2. Remote control: Check that the remote control is easy to operate and that the switches automatically return to their neutral position when released.

Switches: Check the markings. Symbols shall be easily readable and indicate the proper movements.

Cable: Check that the cable covering is undamaged and that the attachment to the connector and control handle are satisfactory.

3. Check that the hook, hook chain, locking pins, loader attachment and tools used with the loading crane are undamaged and in good working condition.
4. Check that attachment bolts for the loader and the power pack are correctly torqued and that axles and locking pins are functioning properly.
5. Check that steel parts of the loader and power pack and their attachment arrangements have no visible cracks or show any deformation.
6. Check that locking pins for the hook chain and arm extensions work properly.
7. Check for play in the slewing system drive mechanism. No play is permitted between the worm gear and the cogwheel rim on the loader body (1). This can be checked when the inner boom is positioned horizontally by manually moving the boom from side to side. If play exists, remove it by first loosening the safety bolt (2) before torquing the nut (3).

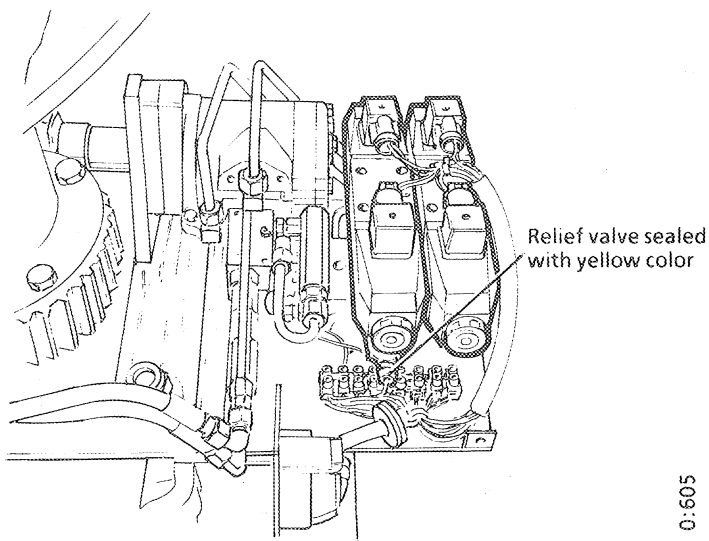


Slewing system

0:604

To obtain correct operation of slewing function, the worm gear must be axially secured. This should be checked regularly, preferably when lubricating the loader.

8. Check that there are no oil leaks at any of the seals, connections and fittings, and that all hoses and pipes are undamaged. Also check the electric motor attachments and its electrical connections. Check the attachment between the hydraulic pump and the electric motor, and the pump's hydraulic connections. Check that there are no leaks in the power pack and that the oil tank is filled with a sufficient quantity of oil. If necessary, top it up with more oil.
9. Check that the main relief valve is properly adjusted and sealed by color. If the seal is broken the valve should be set to its proper pressure setting by a skilled mechanic.



Relief valve sealing

0:605

## Loading crane 15 kNm (1500 kgf m), hydraulic fluid

Interval, specification, volume:

Change the oil every year.

The hydraulic fluid must comply with the specification ISO-VG 46, IV (see Lubricants, page 140).

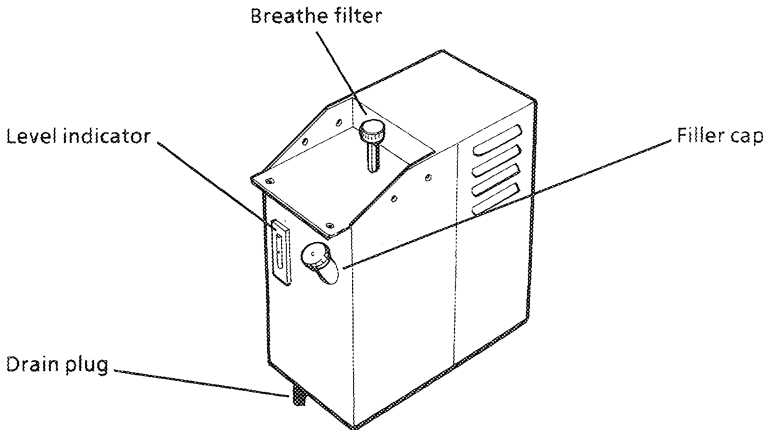
Volume: 10 dm<sup>3</sup> (litres)

### Checking the oil level

The vehicle should be resting on firm level ground and the loading crane should be located in its transport position.

### Oil change

1. Open the drain plug and empty the old hydraulic fluid into a bucket.
2. Clean the area around the filler cap.
3. Close the drain plug.
4. Fill the tank with the recommended lubricant. Use a clean funnel with a strainer.



Oil tank

## Loading crane 15 kNm (1500 kgf m), high pressure filter

Check and cleaning should be carried out by a skilled mechanic.

# CHECKS AND ADJUSTMENTS

## Brake system

Checking the pressure regulator:

1. Check that the regulator cuts out the compressor at a pressure of about 8.0 bar (pressure gauge on the instrument panel).
2. Depress and release the brake pedal repeatedly and check on the pressure gauge that the regulator cuts the compressor back in when the pressure has dropped to about 6.7 bar in one of the brake circuits.

Checking the compressed air system for leaks:

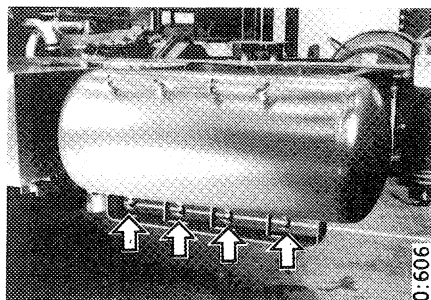
1. Stop the engine when the pressure has risen to about 7 bar. Depress the brake pedal. Then check the pressure drop on the gauge on the instrument panel while the pedal is depressed. A pressure drop in excess of 1 bar over a period of 5 minutes indicates abnormal leakage and should be investigated and corrected.

Checking the air dryer:

1. Drain the air pressure tanks and check whether water is running out. Very small quantities of water may be present. The presence of larger quantities of water indicates that the air dryer is not working.
2. Check the operation of the heating element as follows (winter):

Preferably check when the truck has been standing outdoors and the temperature of the air dryer has dropped to below + 12 °C.

Press the contact key and feel with the hand that the bottom of the air dryer begins to warm up within one minute. The temperature of the air dryer should rise to about + 30 °C.

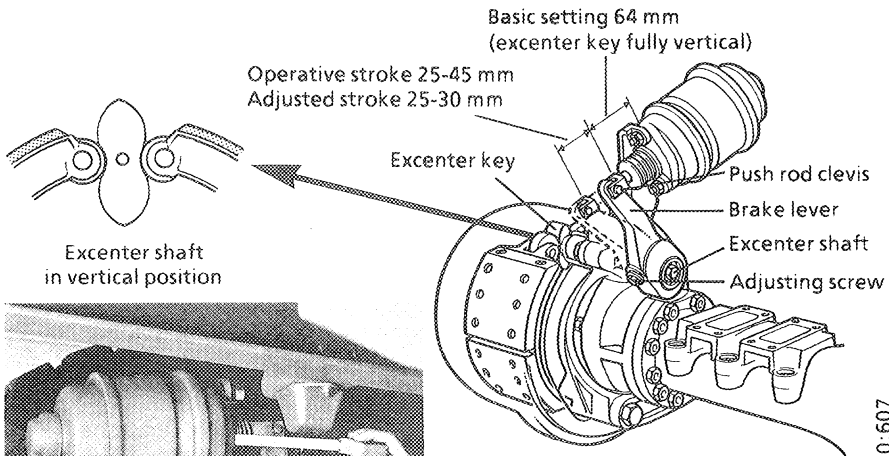


Drain cocks



## Checking the stroke and brake lining wear:

Normally the wear is small but a big stroke on the push rods depending on bad adjustment of the levers will waste the compressed air. A well adjusted lever will give a stroke of 25-30 mm measured on the push rod. If the stroke exceeds 45 mm the effort will be reduced.



Checking the stroke

### Components and measures:

N.B. When measuring, push the lever by hand against the cylinder (Bottom position) to ensure correct measuring. If basic setting is not correct must push rod clevis be loosened and adjusted on the push rod. That is sufficient when the brake lever is correctly fitted on the excenter shaft.

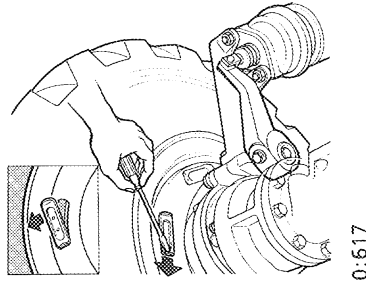
## Adjusting manual brake levers:

Before the upper limit of stroke is reached, the brakes must be adjusted. All brake adjustments must be carried out very carefully, to enable the shortest permissible stroke to be obtained, 25-30 mm. Simultaneous braking of both wheels on a given axle requires the same stroke of the brake cylinders on both wheels. Adjustment is made on the brake levers. Each brake lever incorporates a worm gear with which the excenter shaft can be rotated in relation to the lever. The worm in this gear is provided with a hexagonal head. Push the locking sleeve in with a socket spanner and turn the worm until the correct stroke of the brake cylinder push rod is obtained.

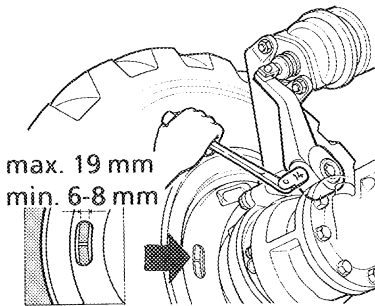
N.B. The worm on the lever should be turned clockwise or anti-clockwise depending on which side of the truck the lever is fitted to.

A new brake lining has a thickness of 19 mm and may be worn to a remaining thickness of 6-8 mm.

Here follows an easy way of adjusting the brake levers and checking linings without jacking up the wheel. The brakes on each axel must be adjusted in pairs.



1. Remove one inspection cover. (Middle position)

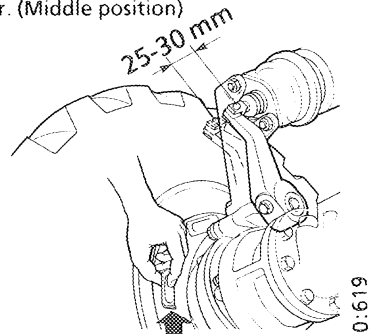


max. 19 mm  
min. 6-8 mm

2. Check brake lining thickness. Min. thickness before change is 6-8 mm.
3. Fit a 14 mm socket spanner on adjusting screw and use it to press in lock sleeve. To loosen a sticking lock sleeve, tap lightly with a plastic mallet on the socket spanner.
4. Turn the adjusting screw until lining will hit brake drum.

Note: The excenter shaft shall move in the same direction as when applying brake.

5. Turn adjusting screw 1/8 of a turn in opposit direction to enable lining to get the right clearance to brake drum.



6. Apply brake with service brake pedal or parking brake. Check that stroke is 25-30 mm.
7. Fit inspection cover.

## Wheels and tyres

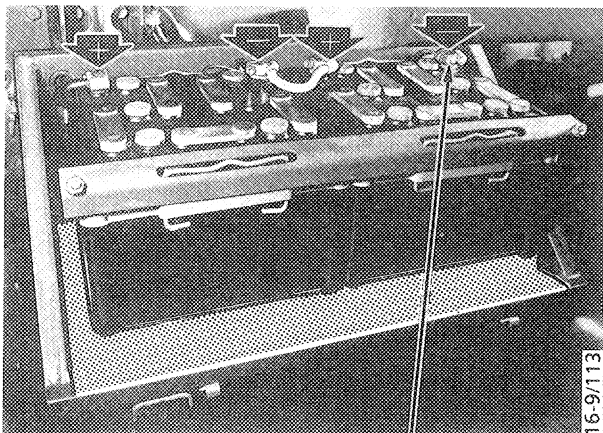
The useful life of the tyres may vary considerably, depending on the maintenance and the way the truck is driven. Incorrect wheel alignment, low tyre pressure, unbalanced wheels, overloading, etc. all result in quicker tyre wear. Check the tread depth regularly and remove stones and other hard objects jammed in the tyre tread.

For tyre pressures, see "Technical specifications" in page 13.  
Changing the wheels, see page 104.

## Electrical system

### Batteries, cables, starter motor, alternator

When carrying out work on the electrical system, first disconnect the earth connection to prevent short-circuiting.



Earth connection

### Battery terminals

When carrying out welding work on the truck, the positive and negative cables must be disconnected. Connect the welding unit near the point of welding and to the part which is to be welded.

- Clean the batteries, battery holder and terminals.
- Smear the terminals with petroleum jelly.
- Check that the terminals and batteries are secure.
- Check that the cell covers are intact and the vent holes are clean.
- Check that the electrolyte level is 10-15 mm above the electrode plates. Top up with distilled water as necessary.
- Connect the batteries with the correct polarity. If the polarity is incorrect, the electrical system will be dead.
- Battery chargers must be connected with the correct polarity.
- If the battery capacity is insufficient, starting current may also be obtained by connecting a cable between the starting assistance sockets of two vehicles. See jump-starting the engine in page 94.

### Checking the battery charge

Check the battery charge by means of a hydrometer. The density of the electrolyte in a fully charged battery should be 1.28. If it has dropped down to 1.20, the battery must be recharged at a service station. However, the alternator will generally keep the batteries sufficiently charged.

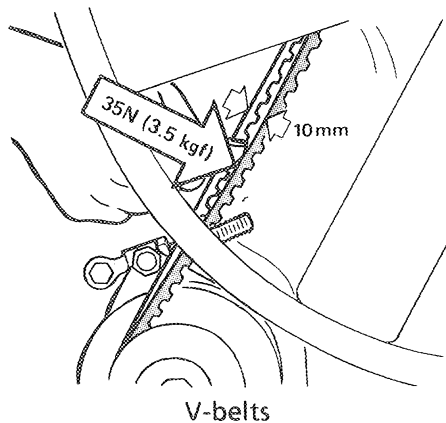
In the winter, take particular care to ensure that the batteries do not become discharged. The electrolyte in a flat battery will freeze at about  $-5^{\circ}\text{C}$  and the battery will be ruined.

Checking the tension of the V-belts:

Apply a force of about 35 N (3.5 kgf) to the belt.

The belt should then deflect 10 mm.

Check that the belts are intact and check by feel that there is no play in the fan shaft.



0:120

Adjusting the V-belts:

1. If necessary, slacken the alternator retaining bolts and the tensioning screw.
2. Move the alternator as far as necessary to obtain the correct belt tension.
3. Tighten the alternator.
4. Check the belt tension as above.

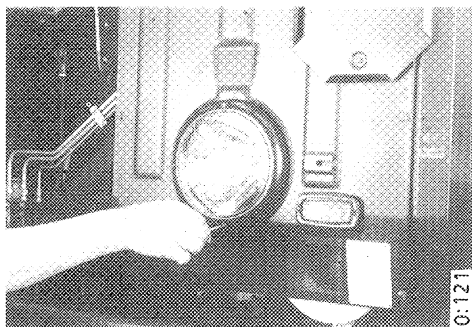
## Bulbs

### Changing the bulbs:

When changing bulbs, avoid touching the new bulbs with your fingers. Always wear gloves or use the bulb carton or other protection when fitting a new bulb. Scrape off any oxide on the bulb holder, contact springs, etc. to ensure good contact.

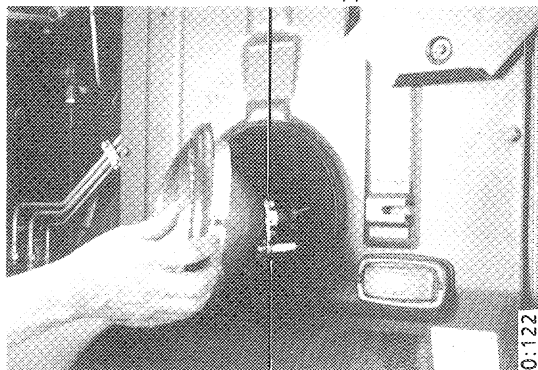
### Headlights:

1. Undo the headlight retaining screw and unhook the headlight.
2. Undo the electrical connection to the lamp.
3. Remove the bulb.
4. Fit the new bulb. Hold the bulb holder. Do not touch the reflector or bulb with your fingers. Put the headlamp back in the reverse order to removal. Check the rubber gasket of the headlight.



Retaining screw

Connection for full and dipped beams

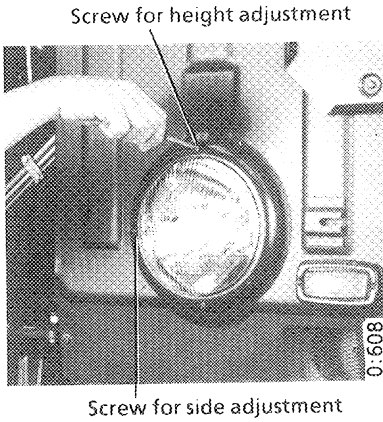


Connection for parking light

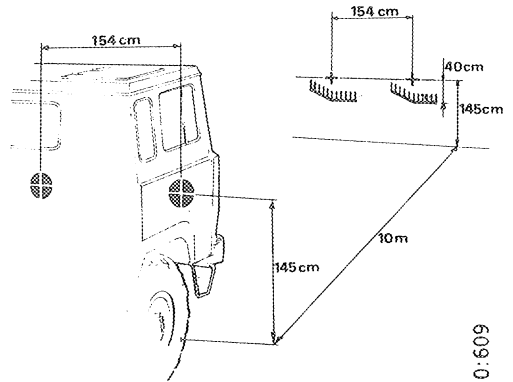
Removing the headlamp

## Adjusting the headlamps:

The headlamps can be adjusted by means of the adjusting screws. The adjustment should be carried out by a mechanic, using headlamp setting equipment. The setting can also be carried out using a measuring stick, a light house wall and the truck standing in straight angle and on flat ground as shown below.



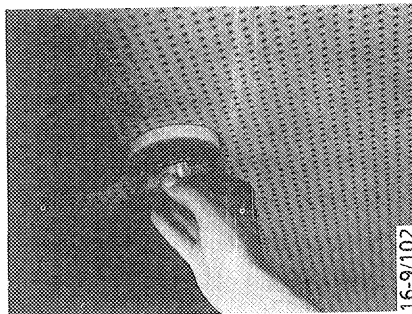
Headlamp adjusting screws



Headlight setting using house wall or similar

## Cab lighting:

Push in the glass while turning it anti-clockwise.



Cab lighting

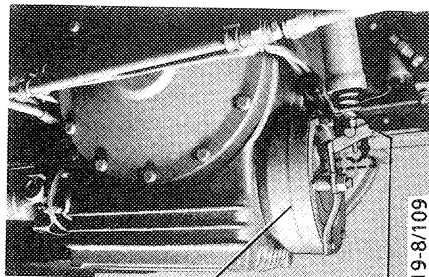
## Winch (towing vehicles)

### Checking the winch:

- Check that the winch controls and brakes (according to separate instructions below) are working properly.
- Clean and check the winch rope and rope guides.
- Check that there are no oil leaks. Tapping up, see Lubricants in page 140.

### Checking the winch brake:

1. Disengage the rope drum.
2. Push in the contact key. If necessary, start the engine and let the air pressure rise.
3. Set the transfer box selector to TERRAIN.
4. Engage the POWER TAKE OFF WINCH with the switch.
5. Press the switch DRIVE WHEEL DISENGAGED.
6. Get an assistant to check that the winch brake push rod moves when the brake pedal is depressed. Repeat the procedure with the trailer brake lever instead.
7. Check that the winch brake is not applied by rotating the propeller shaft by hand when the brake pedal and the trailer brake lever are not engaged.
8. Pull out the winch rope (released winch drum) and connect it to another vehicle.
9. Engage the winch drum again.
10. Engage the winch brake and parking brake.
11. Let the other vehicle try to pull out more of the winch rope. A winch brake in working order will not permit the rope to be pulled out.  
If the rope can be pulled out, the brake drum of the winch must be opened and the brake linings checked and cleaned, as well as the brake drum.  
Assemble, adjust and then check again.
12. Finally check the winch operation by pulling the other vehicle while applying the brakes.



Winch brake drum

Push rod

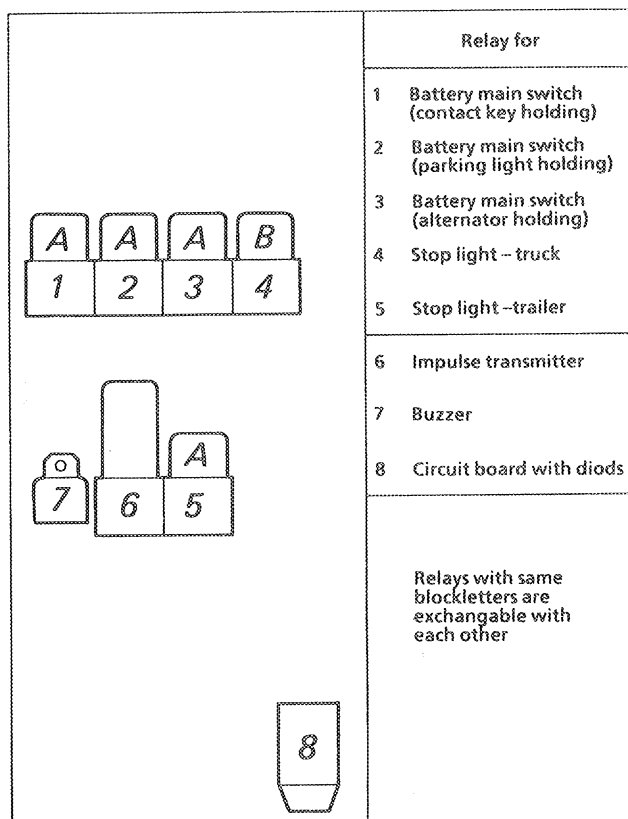
Winch brake

## SIMPLE FAULT-TRACING

With some fault-tracing assistance, the remedy is not necessarily hard to find. A blown fuse or loose connections in the fuse box or any other electrical connection is enough to make a function out of order.

Always start the fault-tracing by studying the symptoms, thus by-and-by identifying the defective part. If your guess is an electrical fault, first change the fuse in question and check the relays. The fuses are located on two panels, A and B, in the fuse box. The fuses are numbered.

The relay box in the cab on the RH side of the engine hood contains the relays and some other components which become accessible when the cover is removed.



16:513

All relays marked A are compatible and can be used as replacements for each other.

See also page 46.

Components in the relay box



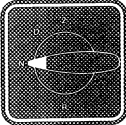
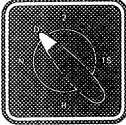
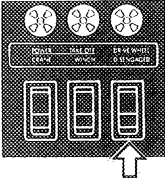
						A						
1 8A	2 8A	3 8A	4 8A	5 8A	6 8A	7 8A	8 8A	9 8A	10 8A	11 8A	12 8A	
Direction indicator lights Central warning system Stepping relay main light signal	Relay 2 = Parking light holding of battery main switch	Dipped beam Lh	Dipped beam Rh	Heater fan motors Tachometer - Buzzer Combination instr	Starter motor	Relay 1 = contact key holding of battery main switch	Diff locks Control lamps general Air dryer	Reserve	Windscreen wiper motor Washer motor	Main beam Lh Main beam control lamp	Main beam Rh	

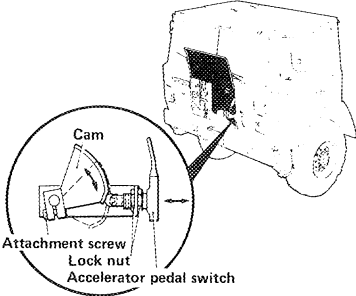
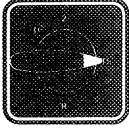
Fuse panel A, fuses 1 – 12


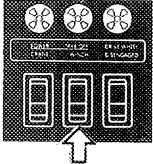
						B						
1 8A	2 8A	3 8A	4 8A	5 8A	6 8A	7 8A	8 8A	9 8A	10 8A	11 8A	12 8A	
Black out lights	Battery main switch	Traffic warning light (hazard)	Cab interior light Reverse light Socket for crew cab	Horn	Relay 3 = alternator holding of battery main switch	Map reading light Stop light relay (truck and trailer)	Sockets for inspection lamp	Transferbox Warning light for gear box temperature	Main gear box	Parking lights Lh - Pos lights Tail light Rh * Tail light Rh Trailer tail and pos lights	Parking lights Lh - Pos lights Tail light Rh Instrument lighting	

Fuse panel B, fuses 1 – 12

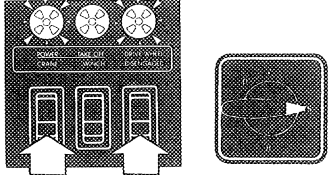

Symptom	Remedy
<p>1. No power when the contact key is pushed in.</p> <p>The power is cut off immediately after the key is pushed in.</p>	<ul style="list-style-type: none"> <li>● Check fuse B2 for the battery main switch (master).</li> <li>● Check the battery condition and charge, as well as the terminals. Very low battery capacity will show up in this way.</li> </ul>
<p>2. The power is cut off when the key is released after pushing it in, before the engine is started.</p>	<ul style="list-style-type: none"> <li>● First check fuse A7, then relay 1 for the battery main switch (master) holding circuit.</li> </ul>

Symptom	Remedy
<p>3. If the power is cut off according to the previous item, the two additional holding circuits can be checked.</p>	<ul style="list-style-type: none"> <li>● Fuse A2 and relay 2 are for the parking light holding circuit of the battery main switch (master). Turn the contact key to position 1.</li> <li>● Fuse B6 and relay 3 are for the alternator holding circuit of the battery main switch (master).</li> </ul> <p>Some circuits on the truck will be powered on when the engine starts and the alternator is charging.</p>
<p>4. The starter motor does not operate when the starter button is depressed, while the rest of the vehicle is powered on.</p>	<ul style="list-style-type: none"> <li>● Check that the gear selector is in <b>N</b> position.</li> </ul>  <ul style="list-style-type: none"> <li>● Check fuse A6.</li> </ul>
<p>5. The engine is running but the vehicle does not move.</p>	<ul style="list-style-type: none"> <li>● Check that the gear selector is in <b>D</b> position.</li> </ul>  <ul style="list-style-type: none"> <li>● Check that the drive wheels have not been disengaged.</li> </ul>  <ul style="list-style-type: none"> <li>● Check fuses B10 and B9.</li> </ul>

Symptom	Remedy
<p>6. The tractive power of the vehicle is low. Check that the accelerator pedal switch is actuated by the pedal. Correctly adjusted, this switch should be engaged and thus make at 600-650 r/min, as read from the tachometer on the instrument panel.</p>	 <p style="text-align: right;">14-9/101</p>
<p>7. The vehicle does not pull at all, but no electrical fault has been discovered.</p>	<ul style="list-style-type: none"> <li>● Engage tow start position <b>TS</b> with the vehicle stationary.           <div style="display: inline-block; vertical-align: middle; margin-left: 10px;">  </div> <p>If the engine stops, this is quite normal, and probably no mechanical or electrical defect in the gearbox. Keep on looking for electrical faults, e.g. by removing the gear selector panel and checking the connections.</p> </li> <li>● Also check the connections in the fuse box, in particular the red and blue multi-connectors, which both belong to the control system of the gearbox.</li> <li>● If the engine does not stop as described above, check the gearbox oil level with the engine running.</li> <li>● Then stop the engine and check again after a minute or two. The level should now be higher. If not, there is a hydraulic or mechanical fault in the gearbox.</li> </ul>

Symptom	Remedy
<p data-bbox="188 164 575 225">8. The main gearbox does not change up.</p> <div data-bbox="180 300 584 644" style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p data-bbox="191 328 306 357"><b>NOTICE</b></p> <p data-bbox="191 379 546 472">Check that the fuel filters are not clogged because of dirty fuel.</p> <p data-bbox="191 493 566 619">Clogged filters make the engine unable to reach sufficient speed for automatic changing up.</p> </div>	<ul style="list-style-type: none"> <li data-bbox="620 164 804 284">● Check that the gear selector is in <b>D</b> position.</li> </ul> <div data-bbox="848 161 983 288" style="text-align: center;">  </div> <ul style="list-style-type: none"> <li data-bbox="620 316 1012 608">● Check that the <b>POWER TAKE-OFF WINCH</b> is not engaged (applies only for gear selector position <b>TERRAIN</b>, since the power take-off is automatically disengaged in selector position <b>ROAD</b>).</li> </ul> <div data-bbox="841 300 994 464" style="text-align: center;">  </div> <ul style="list-style-type: none"> <li data-bbox="620 639 1020 751">● Check the electrical connections of the hydraulic solenoid valves on the RH side of the gearbox.</li> <li data-bbox="620 783 1003 895">● Check the connections of the frequency transmitter at the top of the RH side of the gearbox.</li> <li data-bbox="620 927 1023 1078">● Replace the automatic gear selector unit by that of another vehicle (the aluminium 'box' underneath the gear selector panel in the cab).</li> </ul>
<p data-bbox="188 1126 598 1302">9. The engine braking programme does not work. At the same time, gear changing in the transfer box is not possible (when selecting <b>TERRAIN</b>, only below 18 km/h).</p>	<ul style="list-style-type: none"> <li data-bbox="620 1126 1012 1182">● The accelerator pedal has not returned completely.</li> <li data-bbox="620 1214 1028 1326">● The accelerator pedal switch is badly adjusted (see item 6) and does not break when the pedal is released.</li> </ul>

## Loading crane 59 kNm (5900 kgf m)

Symptom	Remedy
<p>1. The loading crane does not function.</p>	<ul style="list-style-type: none"> <li>● Are the POWER TAKE-OFF CRANE and DRIVE WHEEL DISENGAGED switches pressed and is the correct gear selected (TS) to drive the hydraulic pump?</li> </ul>  <p>If the hydraulic pump operates:</p> <ul style="list-style-type: none"> <li>● Ensure by the drainplug that the oiltank has no condensation water.</li> <li>● Ensure that the oil tank is topped up with hydraulic oil.</li> </ul>
<p>2. The crane operates to slowly.</p>	<ul style="list-style-type: none"> <li>● Is the engine speed set to 1000 r/min.?</li> </ul> 

## Loading crane 15 kNm (1500 kgf m)

Symptom	Remedy
<p>1. The loading crane does not function.</p>	<ul style="list-style-type: none"> <li>● Is the contact key pressed to supply power to the socket for 15 kNm loading crane? (Item 22, page 43)</li> <li>● Is the crane plug connected to the socket as above?</li> <li>● Is the plug for the remote control properly connected to the socket on the loading crane's loader base?</li> <li>● Ensure by the drainplug that the oiltank has no condensation water.</li> <li>● Ensure that the oil tank is topped up with hydraulic oil.</li> </ul>

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