AHLMANN

OPERATING INSTRUCTIONS

SWING SHOVEL LOADER AS 7C AS 7CS

Ahlmann-Maschinenbau GmbH · D 2370 Büdelsdorf
Telefon 0 43 31 / 3 51-0 · Teletex 433 111 · Telefax 351 444

PREFACE

The operating instructions contain a general description, technical data, specifications for commissioning/operation, as well as for service and maintenance.

We recommend to read the operating instructions carefully and to observe the instructions. Repairs of a larger extent should be carried out by authorized after-sales service departments or by the manufacturer.

Please observe the accident prevention regulations and particularly the regulations of the relevant brochure of the employer's liability insurance association of civil engineering "ACCIDENT PREVENTION REGULATIONS FOR EXCAVATORS, LOADERS, DOZERS, SCRAPERS AND SPECIAL MACHINES FOR EXCAVATION WORK".
(Earth-moving machinery VBG 40)

The swing shovel loader AS7C/CS has been tested by the quality assurance department.

Ahlmann-Maschinenbau GmbH
Am Friedrichsbrunnen 2

2370 Büdelsdorf

Telephone: (04331) 3510 collective number
(04331) 351 - 242 Spare parts service
(04331) 351 - 279 Technical consulting department
(04331) 351 - 225 After-sales service

Teletex - 433 111
Telefax - 351 444

AS7C/CS
Edition 04.1987

from Chassis No. 12551010 D and 12551010 P

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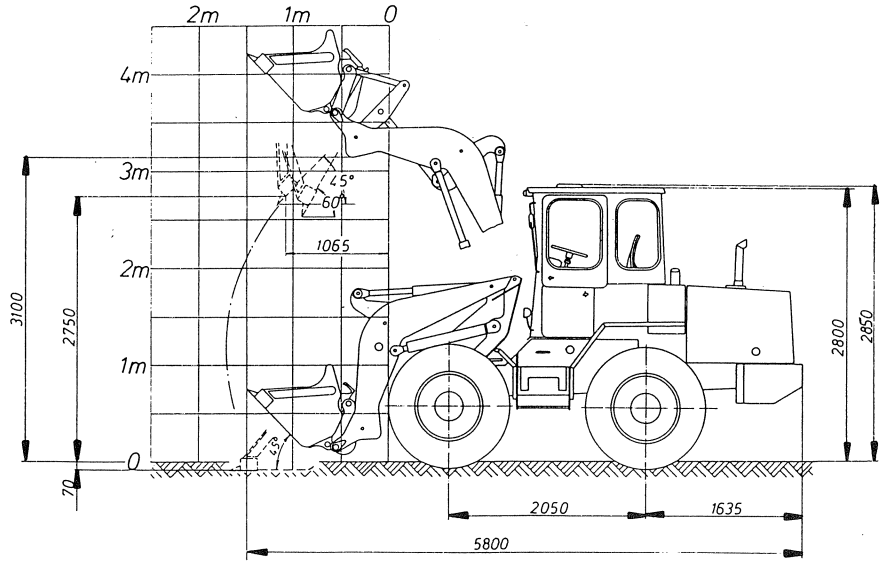


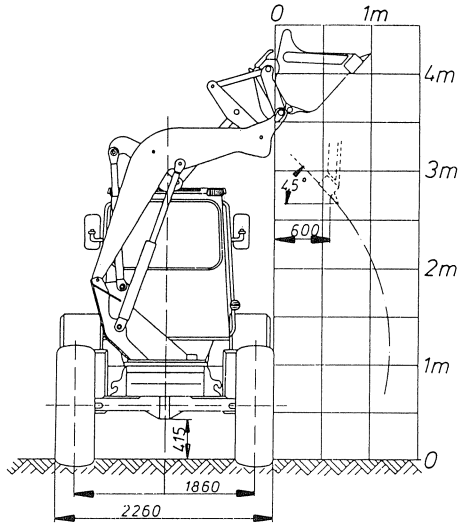


Diagram of reach with shovel 1.0 m³

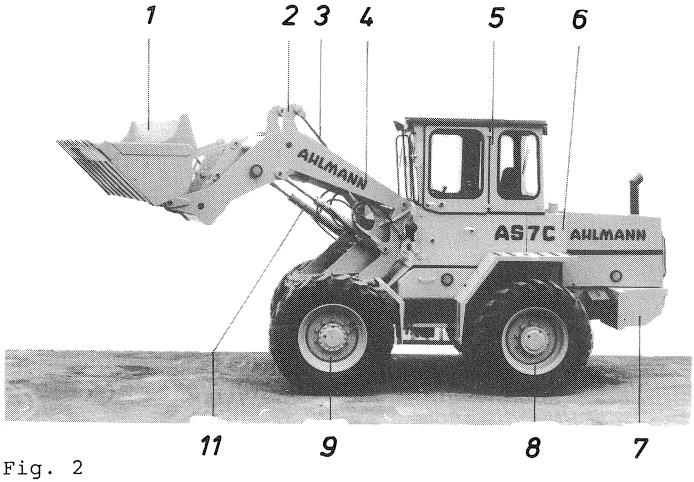


Fig. 2

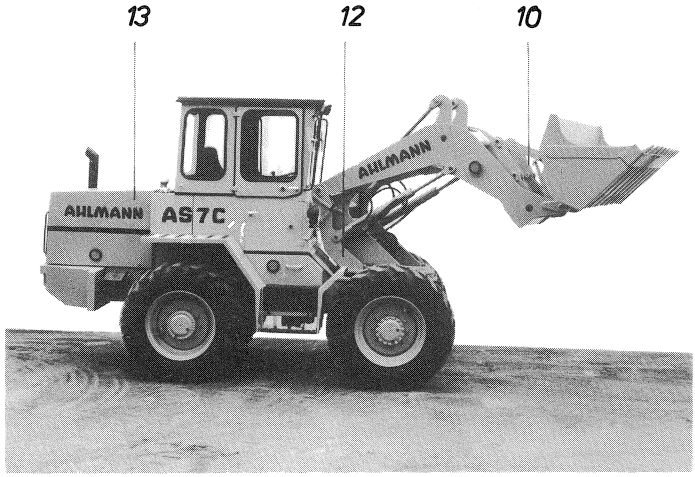


Fig. 3

1 Shovel
2 Reversing lever
3 Tilt cylinder
4 Shovel arm
5 Driver's cab
6 Fuel/hydr. oil tank
7 Counterweight
8 Rear axle
9 Front axle
10 Quick-changing frame
11 Lift cylinder
12 Swivel chair
13 Engine hood

Fig. 4 Swing shovel loader with grab

Fig. 5 Backhoe loader

Fig. 6 Swing shovel loader with crane hook

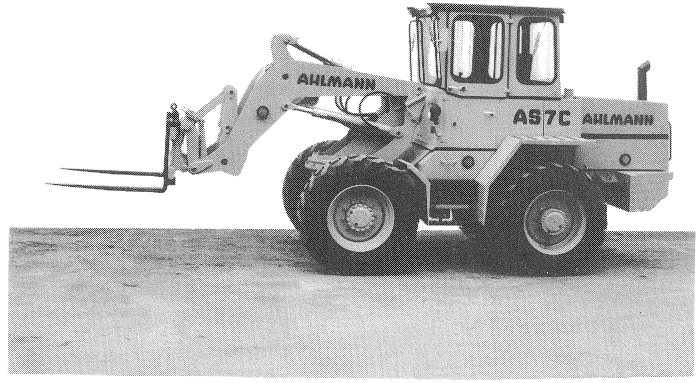


Fig. 7 Swing shovel loader with fork-lift attachment

1.1.1 General instructions

- The term "right-hand" or "left-hand" means viewed from the driver's seat.
- Design modifications reserved.
- Chassis No. ..... (D) for air-cooled engines
- Chassis No. ..... (P) for water-cooled engines

1.2 Technical data

Engines

1) Air-cooled diesel engine Klöckner-Humboldt-Deutz AG, type F 4 L 913, 4 cylinders, 4-stroke cycle, direct injection, volumetric displacement 4086 cm^3, output 59 kW at 2500 r.p.m. according to DIN 70020, max. torque 255 Nm at 1550 r.p.m.. Fuel consumption: 230 g/kW/h at max. torque.

2) Water-cooled diesel engine Perkins, type 4.248 Pr, 4 cylinders, 4-stroke cycle, direct injection, volumetric displacement 4070 cm^3, output, 60.5 kW at 2500 r.p.m. according to DIN 70020, max. torque 260 Nm at 1400 r.p.m.. Fuel consumption: 242 g/kW/h at max. torque.

Starter

4.0 kW, 24 V for both engines.

Filter systems

Dry air filter systems for both engines.

Transmission
- Combustion engine
- Axial piston pump is flanged to combustion engine.
- Axial piston engine is flanged to transfer gear-box.
- Transfer gear-box with switched steps, working and driving speed, neutral position.
- Maximum operating pressure of the driving hydraulics is 410 + 20 bar.
- Further transmission of torque by means of one cardan shaft to the front axle and one to the rear axle.
- The front axle is equipped with planetary gears and a limited slip differential.
- The rear axle is equipped with planetary gears. If desired, the rear axle can also be equipped with a limited slip differential.

NOTE

The limit effect of the limited slip differential is changed by wear.

TYRES

- Tyres 15.5 - 25 / 8 PR
- Tubeless
- Inflation pressure 2 bar
- All tyres may be filled with a water/magnesium chloride mixture (no standard). Tyres filled with water/magnesium chloride are frost-proof up to -25 °C.
- Mixed tyre equipment is to be avoided
- Tyre nuts are tightened at a tightening torque 500 - 600 Nm.

Driving speeds, axle loads, weights

Swing shovel loader - type "C"

Working speed	0 - 13 km/h optional	0 - 10.5 km/h
Transport/road speed	0 - 25 km/h optional	0 - 20 km/h

Noise abatement: corresponds to the presently valid regulations.

Swing shovel loader - type "CS"

Working speed	0 - 13 km/h
Transport/road speed	0 - 35 km/h

Noise abatement: corresponds to the presently valid regulations.

Date corresponding to all types of swing shovel loaders

Thrust on dry concrete ground	55 kN
Climbing ability with load	2000 kp = 65 %
Minimum turn: external	R = 5.85 m
internal	R = 3.25 m
Pendulum travel of the steering axle	11 ° up and down = 400 mm
Ford depth	0.8 m (on request)

Axle loads:

Front) empty weight with		28 kN
Rear) shovel		44 kN
Allowable axle load, front)	at max.	36 kN
Allowable axle load, rear)	driving speed acc. to StVZO	49 kN

Dumping load:

In the front	41 kN
Horizontal swing 90 °	40 kN

Weight:

Basic unit with quick-changing frame and with shovel	7 200 kg
Basic unit without quick-changing frame and without shovel	6 700 kg

Steering mechanism

The hydrostatic steering mechanism is fed by the gear pump 38 cm³/rev. by means of a priority valve. With low expenditure of force at the steering wheel the oil is led into the steering cylinders by a servo valve.

Max. steering pressure 120 bars.

Emergency steering mechanism

The hydrostatic steering system may also be used at failure of the combustion engine. In this case the expenditure of force at the steering wheel is considerably higher. In case the swing shovel loader is to be towed, the speed is to be adopted to the emergency steering mechanism.

CAUTION

The unit is equipped with a rear axle steering mechanism. The steering characteristics are not equal to that of a passenger car.

Brake systems

1. **Service brake:** Foot operated hydraulic single-circuit brake system acting on 3 brake disks. The brake disks are mounted to the cardan shaft flange of the power divider and front axle.

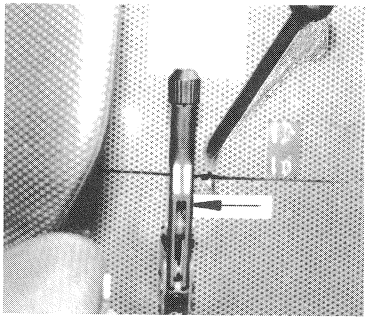


Fig. 8

2. **Parking brake:**
   The swing shovel loader is equipped with a parking brake operated by hand force. The parking brake is actuated by a hand lever (Fig. 8/arrow) arranged on the right-hand side of the driver's seat, operating the brake tongs at the disk brake by means of a Bowden cable.

3. **Permanent brake:** (Hydrostatic braking ratio)
During normal operation of the swing shovel loader it is sufficient to take the foot from the accelerator. Owing to the hydrostatic drive the travelling speed is reduced to standstill.

ATTENTION

This hydrostatic brake does not replace the parking brake.

CAUTION

Prior to leaving the driver's cab, the direction switch has to be in neutral position and the parking brake has to be applied.

Electric systems

Voltage 24 V
2 accumulators 88 Ah/12 V
Three-phase generator 28 V/27 A
2 headlights, front
2 working headlights, front
1 working headlight, rear
Warning flasher
Direction indicators
Stop and taillight
The lighting system meets the StVZO.
Flashing alarm lamp
(no standard equipment)

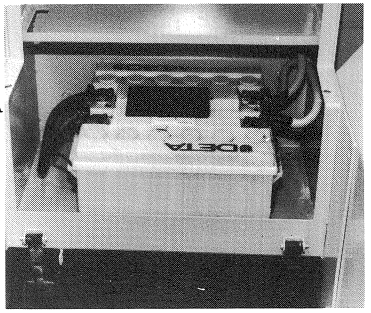


Fig. 9

Accumulator

2 maintenance-free accumulators (Fig. 9) in accordance with DIN with increased cold start performance are installed in the swing shovel loader. No water is refilled throughout the whole service life.

The accumulator is to be kept in clean and dry condition.

Slightly grease the terminals with acid-free and acid-resisting grease. The grease must not be in contact with the casting compound.

ATTENTION!

Welding work carried out on the swing shovel loader with electric welding devices may only be performed when the accumulator terminals have been disconnected before.

Fuel supply systems

1 Fuel tank 135 l
2 Filling pipe
3 Shut-off valve for engine fuel
4 Diesel engine
5 Injection nozzle
6 Injection pump
7 Fuel feed pump
8 Fuel filter for engine supply
9 Fuel filter for heater supply
10 Fuel dosing pump
11 Heating unit

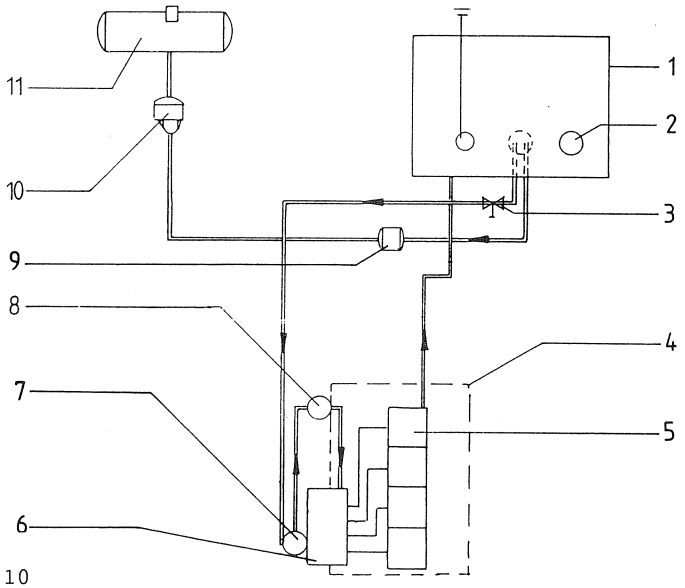


Fig. 10

The fuel tank with a capacity of approx. 135 l is located behind the driver's cab. The fuel tank is used for supplying fuel to the diesel engine and heating unit.

The tank content is controlled by a fuel gauge in the driver's cab.

The shut-off valve for the diesel engine is arranged below the fuel tank.

Lifting and dumping device

A tandem gear pump with a volume flow of 28 + 16 cm^3/rev. is flanged to the axial piston pump. It feeds through a quadruple control valve.

2 lift cylinders and)
) 80/55, double acting
2 tilt cylinders)

The volume flow of the gear pump 16 cm^3/rev. is led into the main circuit by means of a high-pressure overhead line arranged at the single swivel valve, increasing the lifting and dumping speeds.

All motions are controlled from the driver's seat by means of pilot valves. The pilot valves permit continuous control from very slow to full speed.

Shovel from 1.0 to 1.5 m^3 (according to SAE), special shovels on request.

Excavating depth with horizontal shovel position 70 mm
Excavating depth with shovel tilted by 5 ° 160 mm

Shovel position

- Tilting angle 45 °
- Dumping angle 60 ° (at highest position)

Lifting and clearing forces:

Lifting force 42.0 kN
Tilting force at shovel edge 54.5 kN

Working speed:
Lifting 5.0 s
Lowering 3.0 s
Dumping 1.5 s
Tilting 1.2 s

Operating pressure 200 ± 5 bars

Slewing gear and axle support

The gear pump with a discharge capacity of 16 cm^3/rev. feeds the 2 single-acting slewing cylinders (ϕ 100/55) through a single control valve. The slewing motion can be performed simultaneously with the lifting motion of the shovel arm. The single-layer ball slewing ring is mounted on one side to a machined twist-free plate of the frame and on the other side is connected with the swivel chair.

The swivel chair with the shovel arm is slewed by 90° to each side by means of 2 single-charged slewing cylinders and a chain gear. An automatically acting support device is actuated during slewing of the shovel arm. The support cylinder at the load side acting on the pendulum axle is thereby admitted with pressure by the load pressure by means of the supporting valve and acts against the slewed load.

Operating pressure in the slewing cylinders 180 ± 5 bars.

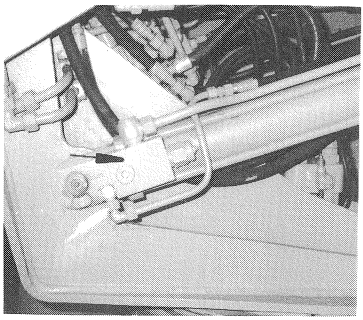


Fig. 11

Pipe-break safety device
(no standard equipment)

A pipe-break safety device is installed at the bottom of each of the two lift cylinders (Fig. 11/arrow). In case of pipe or hose breakage in the lifting device, movements are blocked until the damage is repaired.

In connection with the pipe-break safety valves a choker valve can be additionally installed in the piping to the lift cylinder bottom, if required. This choker valve is used to adjust the lowering speed of the shovel arm.

The lowering speed is to be adjusted in a manner to obtain the stipulated lowering speed and not to generate noises (fluttering of valves) of the pipe-break safety valves.

Limit of lift
(no standard equipment)

A device limiting the lifting range of the shovel arm between 1200 mm and maximum adjustment, is mounted at the joint shovel arm/swivel chair (measured at the pivot of the shovel in the shovel arm).

The desired lifting height is adjusted by means of trip cam (Fig. 12/1).

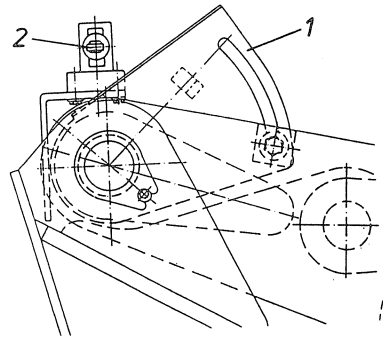


Fig. 12

Adjustment:

- Lift the shovel arm to the desired height,
- Unscrew hexagon bolt of the trip cam (Fig. 12/1) and shift the trip cam until the slide of the valve (Fig. 12/2) is impressed,
- Tighten hexagon bolt of the trip cam.

CAUTION!

Carry out functional check before work with limit of lift is performed and watch it from the driver's seat during operation.

Equipment

Comfortable driver's seat:

Suspension with weight counterbalance and hydraulic shock absorber, adjustable to front and back, adjustable back-rest, height adjustment, adjustment of tilt.

Clearly arranged dashboard:

Combi-instrument with electric working hour meter, fuel gauge, engine temperature indicator.

Set of tools with shovel arm support and wheel chock

Heating and ventilation system

Driver's cab:

Roll-proof all-steel design, split side doors, easy access from both sides, front and rear windscreen wipers, sunshade, lighting and defroster nozzle for front windscreen, good allround sight, dismountable upper part of driver's cab.

Special equipment:

Flashing alarm lamp
Radio
Rockfall protection grating
Special tyres resistant to rocks

NOTE

The supplied accessories are adopted to the general scope of supply. The user has to complete the equipment according to the local and customary extent.

On delivery of the device, the fuel volume is limited to a minimum according to the forwarding regulations.

2 Driving on public roads

1. The driver is to hold a driver's licence class 4 (or class 3 for devices with a travelling speed exceeding 35 km/h) and carry the licence as well as the operating permission (original or copy).

2. The following safety precautions have to be taken before driving on public roads:

   - Lower the shovel arm so that the lowest point of the shovel arm or shovel is at least 30 cm (12") above the pavement. The shovel is to be empty and pulled in completely.

   - In the position of the shovel arm as described above, both ball valves are to be closed. The ball valves are installed in the working hydraulic pipings in the swivel chair (Fig. 13/1 and 2). The red hand levers of the ball valves are then positioned transverse to the direction of flow. Thereby, lowering of shovel arm or shovel is prevented during driving.

   - The shovel edge and the shovel teeth are to be covered by the shovel protecting device. The flashing side marker lamps on the shovel protective device are connected with the socket at the front of the driver's cab on the right-hand side by the cable connector. The lighting system is to be checked.

   - Lock the shovel arm against unintentional slewing by means of the blocking wedge (Fig. 14/1). The blocking wedge is arranged in the holder (Fig. 14/2) at the frame.

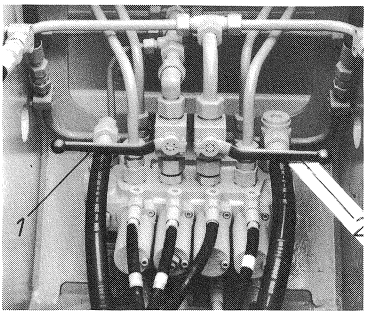


Fig. 13

Fig. 14

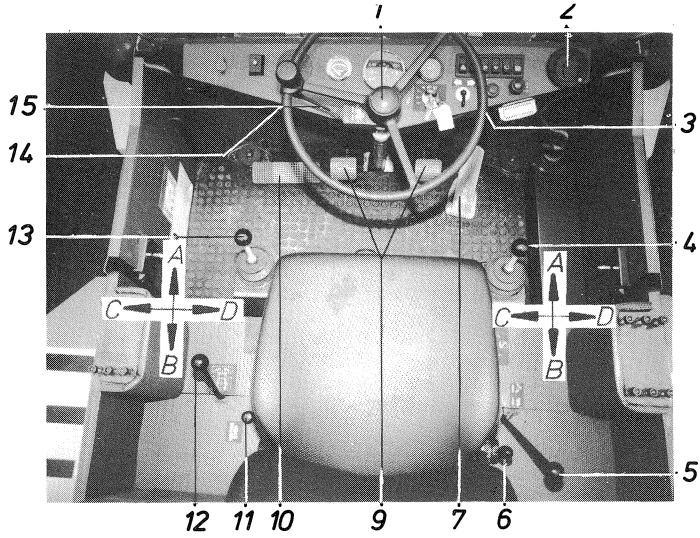


Fig. 15

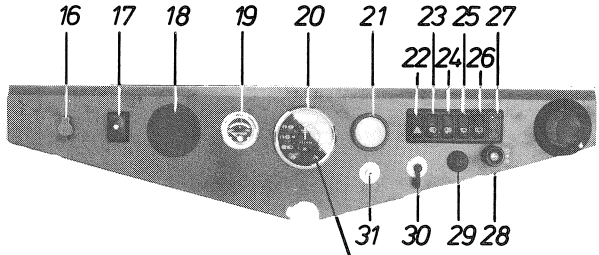


Fig. 16

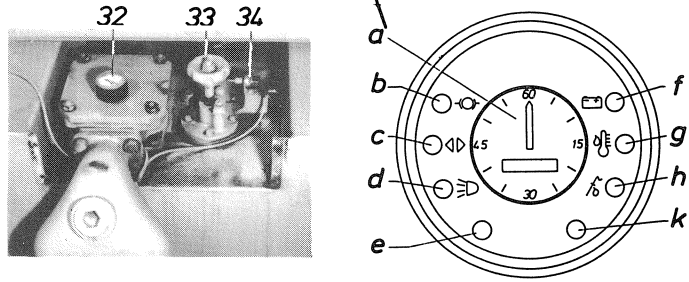


Fig. 17 outside the driver's cab

3 Operating and control elements on the dashboard and in the driver's cab

1 Push-button signal horn
2 Adjustable heating nozzle
3 Fuse box (refer also to it. 14 and 17)
4 Pilot valve for working hydraulics
5 Hand lever for gear shifting
6 Hand lever for parking brake
7 Accelerator
8 Compensation tank for brake fluid
9 Brake pedals (mechanically connected)
10 Swivel pedal (mechanically connected to it. 12)
11 Pull switch "engine stop"
12 Hand lever for swivel operation (mechanically connected to it. 10)
13 Pilot valve for attachments
14 Fuse box (refer also to it. 3 and 17)
15 Commutator switch "forward - reverse"

16 Socket 24 V
17 Fuse box - drive
18 Speedometer (no standard equipment)
19 Fuel indicator
20 Combi-instrument

a)	Working hour meter		
b)	Parking brake	red	)
c)	Direction flasher	green	)
d)	Main beam	blue	)
e)	Warning light for crane hook	red	) Pilot
f)	Load control	red	) lights
g)	Not connected		)
h)	Oil pressure	red	)
k)	Hydraulic oil tank plug	red	)

21 Engine temperature indicator
22 Toggle switch for warning signal flasher
23 Toggle switch for working headlights, front
24 Toggle switch for working headlights, rear
25 Toggle switch for windscreen wipers, front
26 Toggle switch for windscreen wipers, rear
27 Toggle switch for flashing alarm lamp (no standard equipment)
28 Turn switch for heater/fan
29 Push-button "start" for KHD-engine; pull switch for Perkins engine
30 Direction indicator (flashlight)
31 Ignition-light switch
32 Differential pressure gauge for filter/ hydraulic oil)
33 Shut-off valve for suction basket hydraulic oil tank) outside driver's
34 Control switch for shut-off valve (interruption of drive)) cab rear
35 Vacuum indicator (at the air filter of the diesel engine)

Operation of shovel or attachments

Working with mounted shovel

Pilot valve (15/4) in direction A = lowering of shovel arm
Pilot valve (15/4) in direction B = lifting of shovel arm
Pilot valve (15/4) in direction C = tilting of shovel arm
Pilot valve (15/4) in direction D = dumping of shovel arm

Working with mounted crane hook

Pilot valve (15/4) in direction A = lowering of shovel arm
Pilot valve (15/4) in direction B = lifting of shovel arm
Pilot valve (15/4) in direction C = pulling of crane hook
Pilot valve (15/4) in direction D = tipping of crane hook

Working with mounted fork-lift attachment

Pilot valve (15/4) in direction A = lowering of shovel arm
Pilot valve (15/4) in direction B = lifting of shovel arm
Pilot valve (15/4) in direction C = tilting of fork-lift attachment (prongs)
Pilot valve (15/4) in direction D = tipping of fork-lift attachment (prongs)

Working with mounted grab

Pilot valve (15/4) in direction A = lowering of shovel arm
Pilot valve (15/4) in direction B = lifting of shovel arm
Pilot valve (15/4) in direction C = lifting of shovel arm extension
Pilot valve (15/4) in direction D = lowering of shovel arm extension

Pilot valve (15/13)
for attachment in direction A = opening of grab

Pilot valve (15/13)
for attachment in direction B = closing of grab

Pilot valve (15/13)
for attachment in direction C = turning of grab around the vertical axis to the left

Pilot valve (15/13)
for attachment in direction D = turning of grab around the vertical axis to the right

Working with mounted hoe

Pilot valve (15/4) in direction A = lowering of shovel arm
Pilot valve (15/4) in direction B = lifting of shovel arm
Pilot valve (15/4) in direction C = lifting of boom
Pilot valve (15/4) in direction A = lowering of boom

Pilot valve (15/13)
for attachment in direction A = pulling in of shaft

Pilot valve (15/13)
for attachment in direction B = extension of shaft

Pilot valve (15/13)
for attachment in direction C = tilting of hoe
Pilot valve (15/13)
for attachment in direction A = dumping of hoe

Working with mounted multi-purpose shovel

Pilot valve (15/4) in direction A = lowering of shovel arm
Pilot valve (15/4) in direction B = lifting of shovel arm
Pilot valve (15/4) in direction A = tilting of shovel
Pilot valve (15/4) in direction A = dumping of shovel
Pilot valve (15/4) in direction A = opening of shovel bottom
Pilot valve (15/4) in direction A = closing of shovel bottom

Swivelling of shovel arm

Swivel pedal (15/10) to the left = shovel arm swings to the left
Swivel pedal (15/10) to the right = shovel arm swings to the right

NOTE
Combined motions are possible; e.g. simultaneous lifting and swivelling.
The shovel unit may also be swivelled by operating the swivel lever (15/12) with the left hand, in case the left foot is used to brake or stop the swing shovel loader at the flank of a hill.

In case the swing shovel loader is not continuously moved during operations with the grab or hoe, the parking brake (15/6) is to be applied during operation.
When work is interrupted, the shovel or the attachment is to be lowered to the ground and the parking brake applied.

3.1 Commissioning

3.2 Starting of the diesel engine (KHD-engine)

(1) Put hand lever for parking brake (Fig. 15/6) in position "locked".

(2) Put direction switch (Fig. 15/15) in neutral position.

(3) Insert ignition key into ignition/light switch (Fig. 16/31) and turn it to the right into position "1" (generator warning lamp and warning lamp for engine oil pressure will light up).

(4) Kick down accelerator (Fig. 15/7) for about 1/3 of its travel.

(5) Press push-button "start" (Fig. 16/29). As soon as the engine ignites, release push-button and put accelerator to low speed position. Warning lamps for generator and engine oil pressure are extinguished.

ATTENTION
The maximum operating time of the starter is 10 s. If the engine does not start, repeat starting process after 1 minute.

3.3 Starting of the diesel engine with starting aid (Perkins engine)

(1) Start the diesel engine as described in section 3.2 point 1 - 4.

(2) Pull pull switch "start" (Fig. 16/29) up to the first catch (heating unit operated). Maintain temperatures below 0 °C for abt. 30 s and then pull out the switch up to the limit stop (starting process). At temperatures above 0 °C the heating process can be deleted.

3.4 Heating and ventilation system for KHD-engine

Technical data:
- Eberspächer D 1 L
- Diesel fuel abt. 0.3 l/h
- Voltage 24 V
- Heating capacity abt. 7530 kJ/h (1800 W)

The unit may be used as heating as well as ventilation system.

Commissioning:

(1) Turn the turn switch (Fig. 18)
- Position = fresh air supply
- Position = fan with heating (red field)

The pilot lamp in the turn switch (arrow) lights up in both positions.

(2) The hot or fresh air may be lead against the front windscreen through the defroster nozzle or simultaneously to the foot space. Adjust the defroster nozzle accordingly.

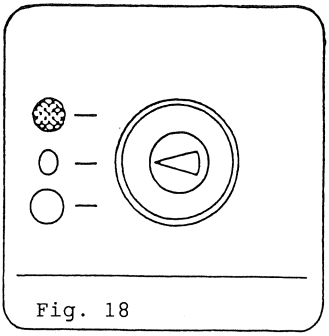


Fig. 18

Failures of the heating or fresh air unit may be removed by repeated commissioning as described above.

In case the heater does not ignite, check the fuse at the heating unit below the protecting cap or replace it, if necessary.

Putting out of operation

The unit is put out of operation when the turn switch (Fig. 18) is set to position "0".

NOTE
Maintain current supply for about 3 minutes when putting the unit out of operation. Do not interrupt current supply from accumulator.

CAUTION
Do not operate heating unit in closed rooms or during refueling.

3.5 Heating and ventilation system of Perkins-engine

Technical data:
- Aurora cab heating
- DK 242/255
- Voltage 24 V
- Heating capacity 7530 kJ/h (1800 W)

Commissioning:

Open shut-off valve (19/1). Hot cooling water of the engine passes the heater. Pull the pull switch (19/2). The fan feeds the hot air through the defroster nozzle to the front windscreen or simultaneously to the foot space through the air flap (Fig. 19/3).

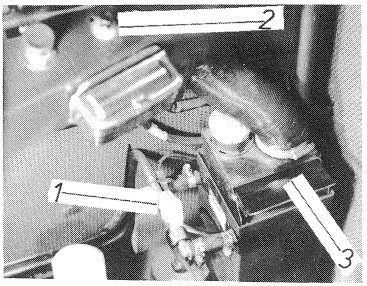


Fig. 19

3.6 Lighting system

The lighting system is switched by means of the ignition key inserted into the ignition/light switch (Fig. 16/31).

Position P = parking position - parking light switched on
Position O = Off
Position I = Electric system switched on
Position II = Position "I" and parking light switched on
Position III = Position "I", "II" and low beam switched on
Position IV = Position "I", "II", "III" and main beam switched on

The working headlights are switched by toggle switch (Fig. 16/23 and 16/24).

Electric fuses

Fig. 20

A - 1 Taillight, left
2 Taillight, right
3 Side marker lamp, left (parking light)
4 Side marker lamp, right
5 Low beam, left
6 Low beam, right
7 Main beam, left
8 Main beam, right

B - 1 Warning signal flasher
2 Flashlight
3 -
4 Signal horn
5 Instrument and indicator lamp
6 Heater
7 Windscreen wiper
8 Brake light

3.7 Operations for driving with the swing shovel loader

(1) Diesel engine is initiated as described in item 3.2 or 3.3,
(2) Preselect travelling direction (Fig. 15/15),
(3) Release parking brake (Fig. 15/6),
(4) Insert working or transport speed (Fig. 15/5),
(5) Operate accelerator (Fig. 15/7).

Swing shovel loader starts. Travelling speed is determined by the position of the accelerator.

NOTE

The direction switch may be operated during travelling. It is recommended not to switch from "forward" to "reverse" at high travelling speeds.

3.8 Operations for working with the swing shovel loader

Driving with the swing shovel loader is not problematic. The swing shovel loader may be used at working speed and at travelling speed from standstill to maximum speed. The gear is chosen in dependence of the operation.

ATTENTION

The gear shift must be used at standstill only.

The driving speed or the propulsive force of the gear inserted is achieved by kicking down the accelerator only. If a slope is to be climbed, the speed decreases to the benefit of the propulsive force despite of full throttle. The highest propulsive force is achieved with working speed at a travelling speed of nearly "0 km/h".

Propulsive forces and driving speeds are equal for "forward" and "reverse" motion.

CAUTION

If in special cases driving with slewed shovel arm is unavoidable for short distances, keep shovel or attachment directly above the tyre.

If a wheel is lifted from the ground by reason of relief, the shovel arm has to be slewed into the driving direction temporarily to stop the blocking of the axle. Subsequently the shovel arm can be slewed again.

Driving with load

In order to utilize the full driving capacity of the unit, the filled shovel or the attachment is kept closely above the ground and in frontal position of the shovel arm during driving.

Scraping/grading

The shovel arm is to be completely lowered for scraping. Depending on the nature of the ground, the position of the shovel is adjusted by the driver.

Scraping/grading may be carried out at working speed as well as at travelling speed. The gear is selected in accordance with the nature of the ground. Generally, grading is performed on the way back with shovel adjusted accordingly.

4 Shovel designs, shovel sizes

Basically, there are two shovel designs, namely:

- directly attached to the shovel arm
- connected with the shovel arm by means of quick-changing frame.

The size of the shovels is 1.0 m^3 to 1.5 m^3 according to SAE (2600 mm wide), other sizes on request.

The standard safety factor 2 according to the accident prevention regulations is applicable, regardless of the shovel size or attachment.

4.1 Dismounting and mounting of the multi-purpose shovel

(1) Put shovel arm in lowest position and tilt quick-changing frame (Fig. 21).

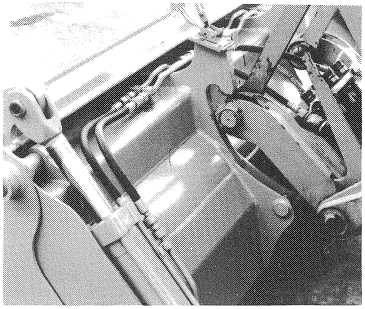


Fig. 21

(2) Take up shovel from the ground by means of the quick-changing frame and tilt the quick-changing frame with shovel to such an extent that the quick-changing frame is in contact with the back of the shovel and the clamping lever can be pushed to the front (Fig. 22).

ATTENTION
Check correct suspension.

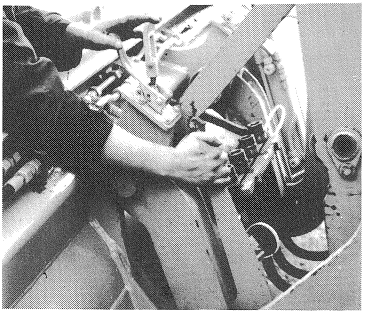


Fig. 22

(3) Insert lug of the tension jack into clamping lever and tense. Put locking pin into tension jack (Fig. 23).

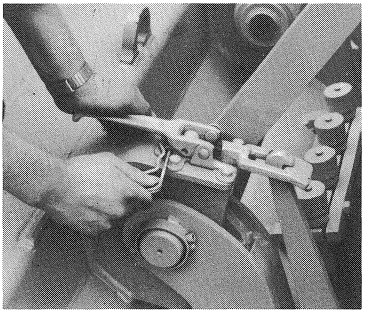


Fig. 23

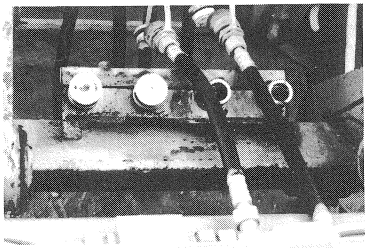


Fig. 24

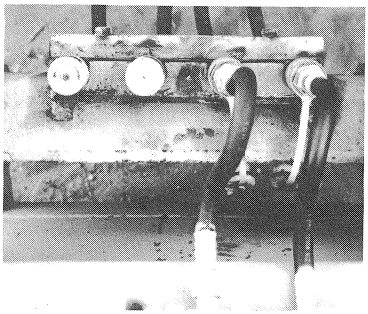


Fig. 25

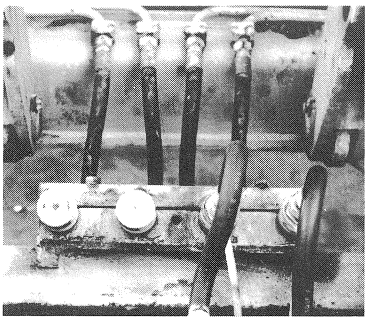


Fig. 26

(4) Remove dust caps from rapid-action couplings (Fig. 24).

(5) Connect the hoses of the shovel with the rapid action couplings in the shovel arm (Fig. 25). Pay attention to colour marking.

ATTENTION

- The rapid-action couplings are to be protected against contamination; screw on dust caps (Fig. 26).
- When the hoses are connected with the shovel arm care is to be taken that the connection is clean and tight.

NOTE

Standard shovels are mounted as shown in Fig. 21, 22 and 23.

4.2 Attachments

Front hoe

The front hoe may only be used in connection with the quick-changing frame.

Lubricate all lubrication points prior to each application or every ten hours at continuous operation.

Bucket sizes:

300 mm wide = 0.09 m³ capacity
450 mm wide = 0.14 m³ capacity
600 mm wide = 0.18 m³ capacity

The break out force at the bucket edge is 35.2 kN.

Diagram of reach

1) Dumping load: front 1700 kp
side 1200 kp

2) Lateral excavation curve

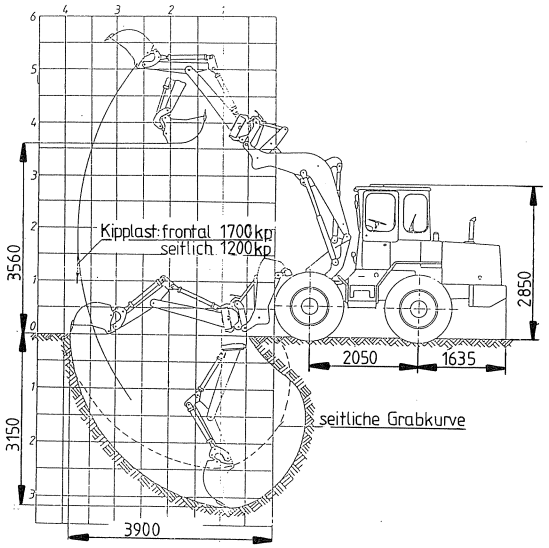


Fig. 27

Hydraulic grab

The hydraulic grab may only be used in connection with the quick-changing frame.

The hydraulic turning head enables turning of the grab cage by 90 ° to the left and to the right.

An installed pendulum brake prevents excessive oscillation of the grab cage. In case the braking effect is reduced, the pendulum brake is to be reset. Tighten nut (Fig. 28/arrow).

Lubricate all lubricating points prior to each use or every ten hours at continuous operation.

Cage sizes:

300 mm = 0.150 m³ capacity
450 mm = 0.225 m³ capacity
600 mm = 0.300 m³ capacity

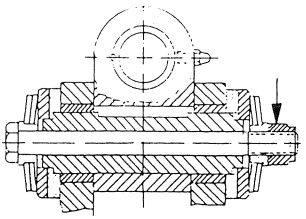


Fig. 28

The closing force is 31 kN

Diagram of reach

1) Tilt load: front 1800 kp
   side 1300 kp
2) Lateral excavation curve
3) Excavation curve in direction of travel

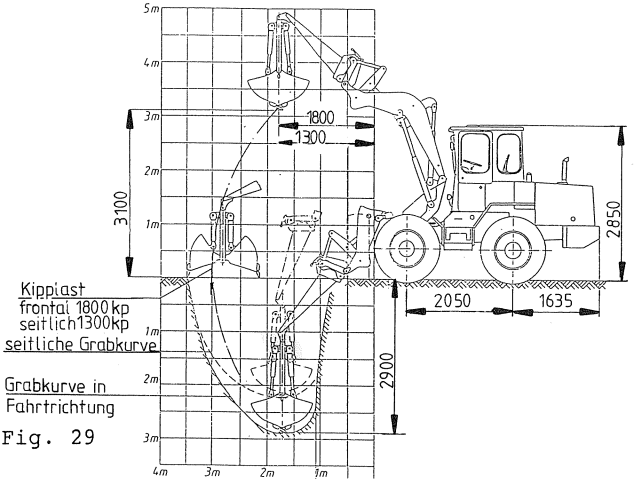


Fig. 29

Adjustable fork-lift attachments (Fig. 30)

The fork-lift attachments may only be used in connection with the quick-changing frame.

The standard length of the 2 prongs is 1200 mm. Both prongs can be adjusted continuously, the max. width is 1200 mm.

After having taken up load, the fork lift attachment has to be tipped against the mechanical stop to prevent the load from falling down during lifting and driving movements.

Diagram of reach

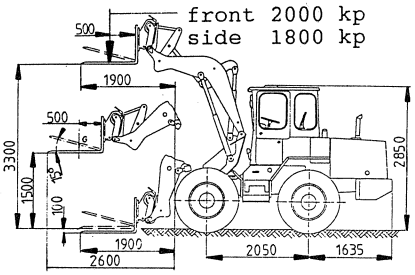


Fig. 30

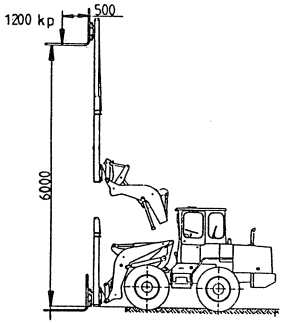


Fig. 31

Lift mast (Fig. 31)

The lift mast may only be used in connection with the quick-changing frame and the tilt cylinder lock. Mounting and dismounting is carried out in accordance with Fig. 31. Lateral adjustment of the prongs is possible. Adjust both prongs at the same distance to the centre. Take up the load centrally and on both prongs.

Min. distance between prongs:	216 mm	Locking groove distance acc. to DIN 15173
Max. distance between prongs:	1054 mm	Carrying capacity class 2, line 2, measured in the middle of the prongs.

NOTE
The tilt cylinder locking device prevents unintended dumping. It is automatically switched on through a stop screw during mounting of the lift mast. It can be unlocked by pressing the push-button switch at the pilot valve lever (Fig. 15/4). Carry out performance check.

Crane hook

The crane hook may only be used in connection with the quick-changing frame.

The crane hook is suspended cardanically and rotatably.

The payload is 20 kN and may continuously be checked by an electromechanic overload alarm. Overload due to excessive payload or excessive jib length is automatically indicated in the driver's cab. The warning lamp (Fig. 15/20) lights up.

ATTENTION

Before using the crane hook take care that the electric cable of the crane hook is connected to the socket in the shovel arm. The socket is arranged at the lower crossbar of the shovel arm. Perform functional check.

Lubricate all lubricating points prior to any application or every ten hours at continuous operation.

Diagram of reach

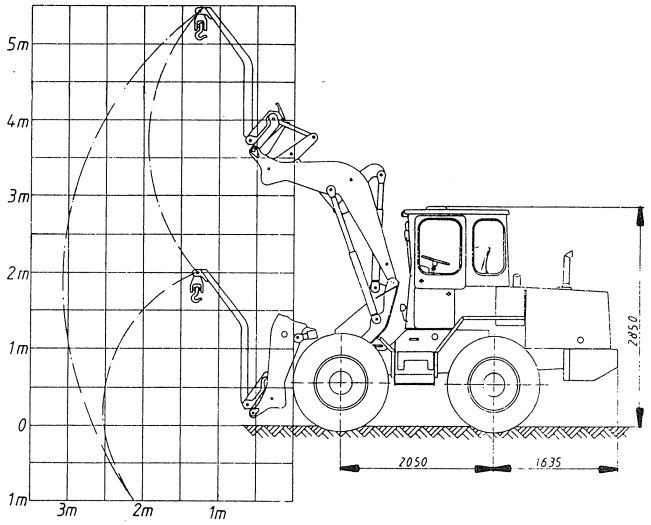


Fig. 32

Hydraulic hammer

The hydraulic hammer may only be used in connection with the quick-changing frame.

In order to extend the working range within the cinematics of the shovel arm, the hydraulic hammer turned by 180° can be mounted at the intermediate plate in front of the quick-changing frame.

The working tools include:

- Pointed punch (working length 500 mm)
- Flat chisel
- Square chisel
- Other tools on request

Lubricate all lubricating points prior to each application or every ten hours at continuous operation.

Diagram of reach

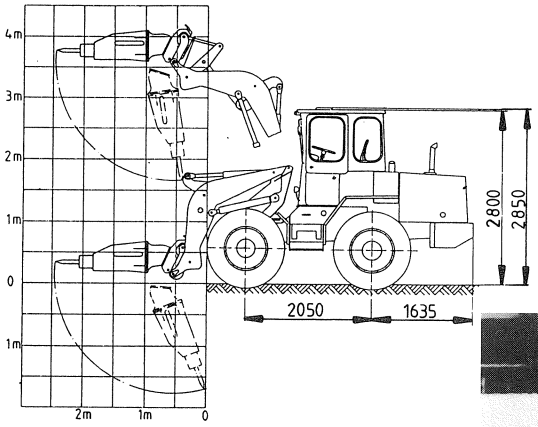


Fig. 33

ATTENTION

The reversing connection for the hydraulic hammer is located at the upper crossbar of the shovel arm.

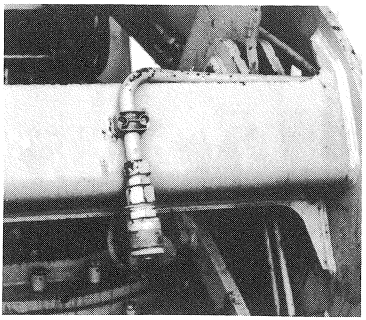


Fig. 34

The optimum efficiency of the hydraulic hammer is obtained at an engine speed of abt. 1400 r.p.m.. The speed range can be adjusted by means of a throttle hand lever (no standard equipment) (Fig. 35).

Adjustment:

(1) Lock pulling device in steps.

(2) Fine adjustment within the steps by turning the pulling knob (Fig. 35).

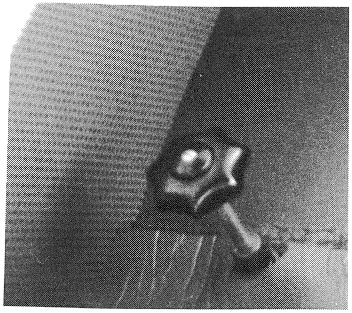


Fig. 35

NOTE

For further details on optimum use and service of the hydraulic hammer please refer to the separate operating instructions.

Multi-purpose bucket

The multi-purpose bucket can be used for scraping and stripping or may be used as grab or bucket. Lubricate all lubricating points prior to any application or every ten hours at continuous operation.

Diagram of reach

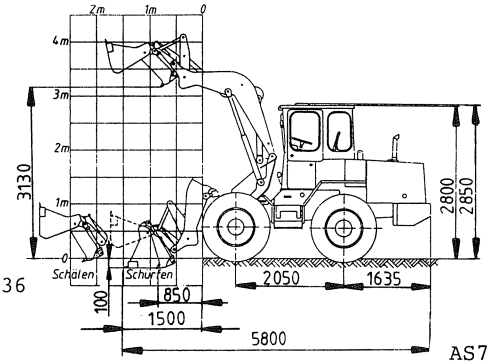


Fig. 36

4.3 Mounting and dismounting of attachments

All attachments are mounted as described for mounting of the shovel (section 4.1). In addition, the hydraulic lines are connected, if any.

(1) Remove dust caps from the rapid-action couplings in the shovel arm.

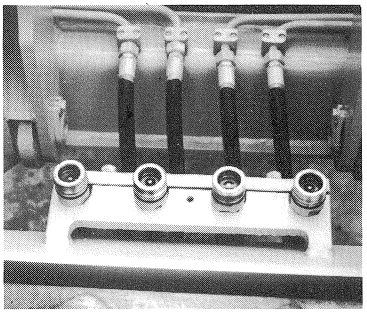


Fig. 37

(2) Remove dust protecting caps from the rapid-action couplings. Connect rapid actions couplings of the hoses with the rapid-action couplings in the shovel arm (Fig. 38). Pay attention to colour marking.

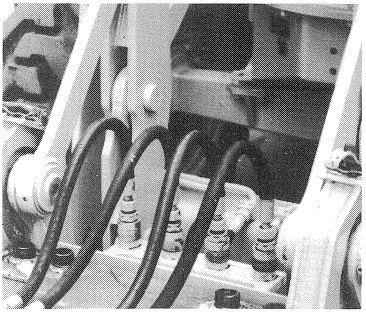


Fig. 38

ATTENTION

Take care of absolute cleanliness and tight connections during coupling.

NOTE

In case not all of the 4 available connections are needed, those which are not used will be kept closed (Fig. 39).

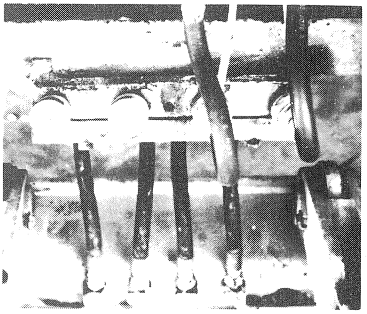


Fig. 39

5 Putting the swing shovel loader out of operation

(1) Park swing shovel loader on firm ground, but not on slopes, if possible.

(2) Set down shovel or attachment frontally to the ground.

(3) Set direction switch to neutral position.

(4) Set hand lever for parking brake to "applied".

ATTENTION

When the swing shovel loader is parked on a slope, the wheel chocks are to be put in front of the wheels of the rigid axle.

(5) Pull out pull switch "engine stop" until the engine comes to a standstill.

If the engine is intensively heated, let it run at idle speed for 2 or 3 minutes for temperature compensation prior to putting out of operation.

(6) Turn ignition key to the left up to position "0" and pull it out.

6 Towing of the swing shovel loader

(1) The swing shovel loader is prepared in accordance with section 2. Additionally the shovel arm has to be lifted by the height required for free motion of the tow-rod.

(2) Close ball valves for lifting and tilting; lock slewing gear with blocking wedge.

(3) Set hand lever for gear shift into neutral position between working and travelling speed so that it is locked.

(4) Set the hand lever for the parking brake to position "released".

(5) Set direction switch to neutral position.

(6) Adjust towing speed to emergency steering.

NOTE
If towing as described above should not be possible due to gear failure, remove both cardan shafts (from power divider to the axles).

7 Service and maintenance

All required service and maintenance work is to be taken from the maintenance plan. We point out that damage due to failure of complying with maintenance plan are not repaired within the scope of guarantee.

CAUTION
- Observe accident prevention regulation.
- Insert shovel arm support (Fig. 40/arrow).
- The diesel engine has to be at standstill prior to service and maintenance work.
- Secure swing shovel loader against rolling away.

Oil check/oil change/ filter change
Collect leaking oil during oil checks and changes. Do not use it again.

Oil checks
Remove the plug (Fig. 41/1) from the center axle gear by means of an Allan key. The oil level has to come up to the bore of the inspection plug (Fig. 41/1).

Turn plug (Fig. 42/1) out of the planetary gear by means of an Allan key. The oil level has to come up to the bore of the inspection plug (Fig. 42/1).

NOTE
The oil inspection plug is to be in horizontal position (Fig. 42/1).

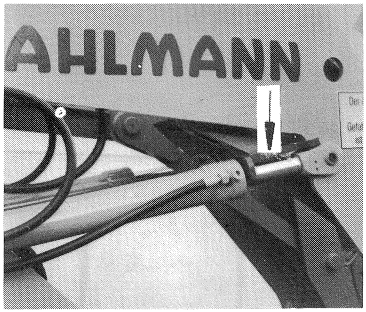


Fig. 40

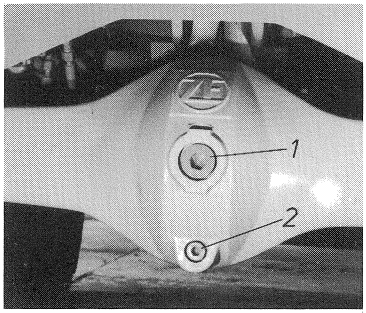


Fig. 41

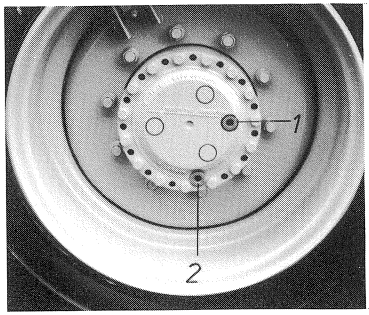
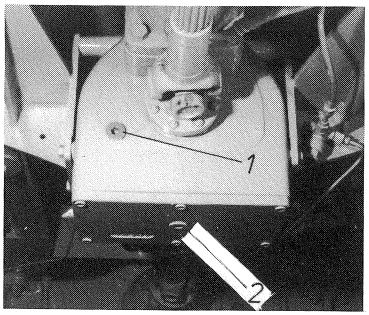


Fig. 42



Power divider

Screw plug out of gear-box by means of an Allan key. The oil level is to come up to the bore of the inspection plug (Fig. 43/1).

Fig. 43

Oil change

Center axle gear

Remove plug (Fig. 41/1 and Fig. 41/2) and drain the oil. Screw in the plug (Fig. 41(2) with new seal. Fill in the oil and screw in plug with new seal (Fig. 41/1).

Planetary gear

Remove plug (Fig. 42/1 and Fig. 42/2) and drain the oil. Screw in plug (Fig. 42/2) with new seal. Fill in the oil and screw in plug with new seal (Fig. 42/7).

Power divider

Remove the plug (Fig. 43/2) in the bottom of the gear box, remove the plug (Fig. 43/1) and drain the oil. Screw in plug (Fig. 43/2) with new seal. Fill in the oil and screw in plug (Fig. 43/1) with new seal.

NOTE

After oil change the oil lever has to come up to the bore of the inspection plug.

Combustion engine

A "Bochumer-plug" is screwed into the engine oil sump. Unscrew sealing cap from the plug for changing the oil. Screw transition piece with extension hose (tool kit) onto the "Bochumer-plug" and hold hose clamp in a tank. The "Bochumer-plug" opens and closes automatically when the transition piece with hose is screwed on or unscrewed.

Hydraulic oil tank 110 l

The oil level is checked at the oil level gauges.

Fig. 44/1 = max. indication
Fig. 44/2 = min. indication

NOTE

The oil is checked with the shovel arm completely lowered.

ATTENTION

Hydraulic oil free of foreign matter of prescribed quality is to be used only. Filter cap (Fig. 44/3).

A return filter is installed in the hydraulic oil tank (Fig. 44/5).

Changing of filter cartridges:

- Screw off filter cover.
- Pull up filter cartridges complete with casing bottom (Fig. 45/arrow) and carry out other operation outside the swing shovel loader.
- Remove filter cartridges (2 pieces) from the casing bottom (Fig. 46) and replace them by new ones.

NOTE

- Wet O-rings with oil.

- Install casing bottom complete with filter cartridges and close with filter cover.

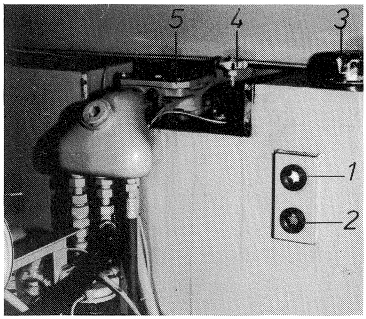


Fig. 44

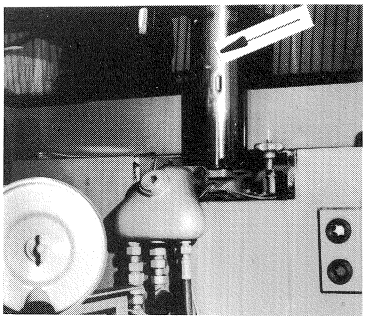


Fig. 45

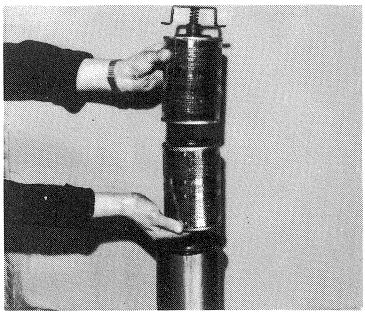


Fig. 46

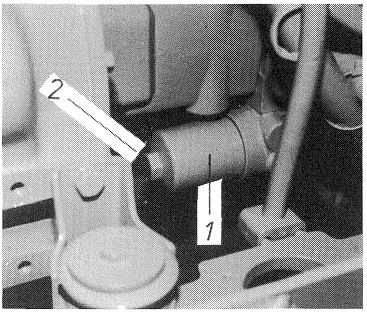


Fig. 47

A pressure filter is located between hydraulic oil tank and axial piston pump (Fig. 47/1).

Changing of filter cartridge:

- Place collecting vessel under the filter.
- Unscrew the filter cartridge by means of a spanner (Fig. 47/2).
- Replace filter element and screw on filter cartridge.

NOTE

The complete suction cage may be closed by a shut-off valve arranged on the hydraulic oil tank (Fig. 44/4).

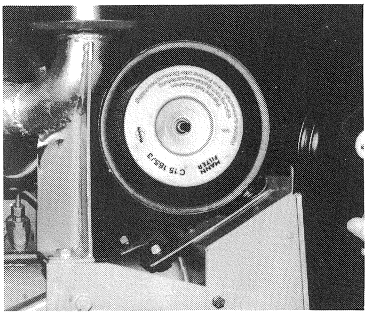


Fig. 48

Maintenance of air filter

Unscrew cover with discharge valve (KHD-engine, Fig. 48).

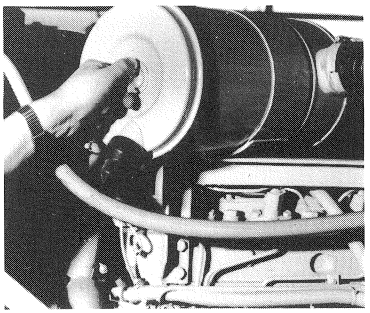


Fig. 49

Unscrew cover with discharge valve (Perkins-engine, Fig. 49)

Unscrew hexagon nut and pull out filter element (Fig. 50/1). Blow with compressed air from the inside to outside, not exceeding 6 bars. Replace the filter element in case it is very dirty.

If necessary, the safety cartridge is to be replaced, too (Fig. 50/2).

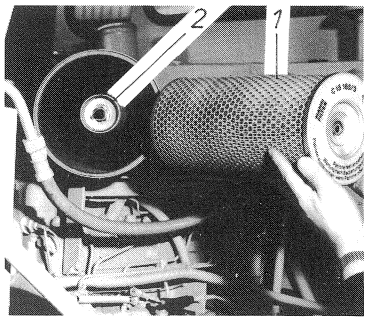


Fig. 50

ATTENTION

- Prior to removal of the safety cartridge the filter casing is to be free of impurities.

- Before the filter cartridge is mounted, check the seals for damage and press in the releasing button of the vacuum indicator (Fig. 51/arrow); the red "service field" becomes transparent.

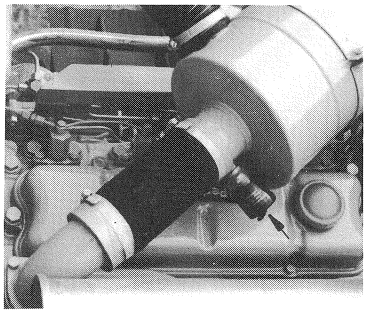


Fig. 51

NOTE

Mount the cover with discharge valve in such a manner that the discharge valve is directed downwards.

Check the water of the Perkins-engine

Check the cooling water level with cold engine only (Fig. 52). Water level is to be visible in the compensating space. Every time after refilling check the anti-freezing limit. Quantity of cooling water abt. 15 l.

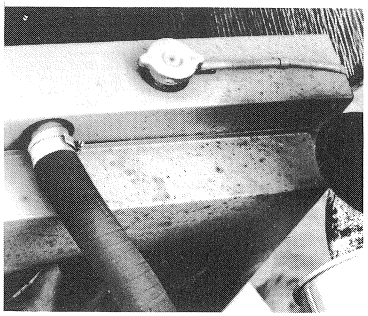


Fig. 52

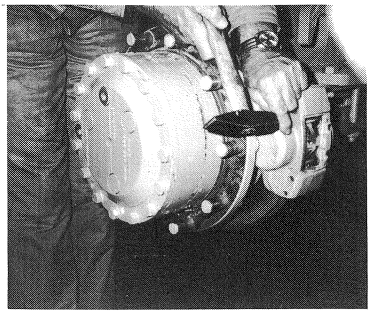


Fig. 53

Changing of brake pads

Service brake

(1) Dismount the wheel.

(2) Remove cover plate from caliper.

(3) Expel upper locking pin by means of a drift (Fig. 53).

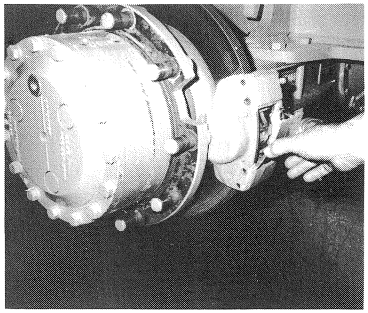


Fig. 54

(4) Remove locking spring (Fig. 54) and expel lower locking pin by means of the drift.

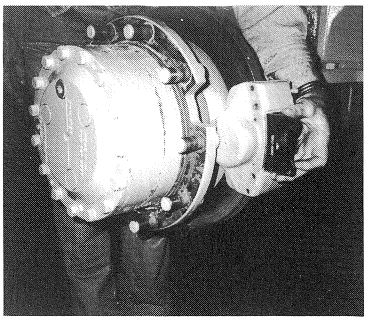


Fig. 55

(5) Draw out brake pads laterally (Fig. 55).

NOTE

The caliper is to be completely unscrewed to change the brake pads at the power divider.

Parking brake

- Replace the brake pads,
- Adjustment

(1) Release parking brake.
(2) Remove the locking springs from the brake pad by means of mounting spoon (Fig. 56/arrow).
(3) Draw out brake pad to the top (Fig. 57/arrow).

The parking brake is adjusted at the rotary handle of the hand lever (Fig. 8/arrow).

Adjustment:

- Put the hand lever in its relieving position (Fig. 8/) (horizontal position).
- Adjust the initial tension by means of the rotary handle.
- Adjustment of the initial tension is correct when it is possible to bring the lever out of the horizontal position without great expenditure of force beyond the point of its self-locking (vertical position).
- Carry out a brake test. The braking effect is to be so high that the unit is held fast at road speed and with the throttle fully open.
- In case adjustment at the rotary handle is not possible because the setting distance is too high, the brake tongs is to be roughly adjusted first of all. Loosen counternut (Fig. 58/1) and screw in shaft (Fig. 58/2) of the lever. Lock the shaft with counternut.

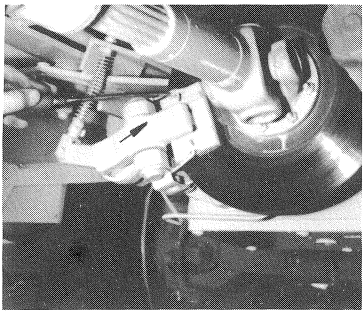


Fig. 56

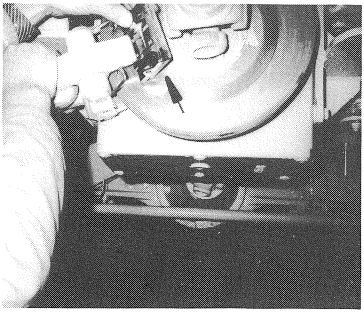


Fig. 57

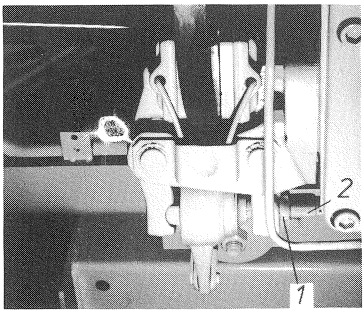


Fig. 58

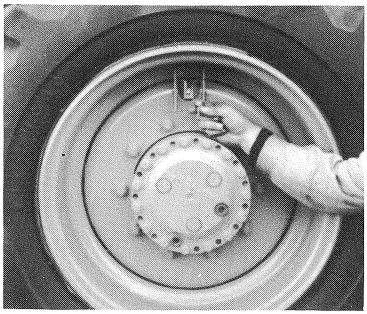


Fig. 59

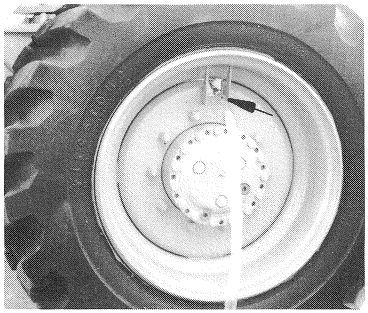


Fig. 60

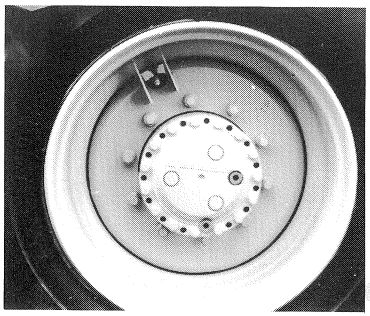


Fig. 61

Tyre filling

The tyres are filled with prepared solution as follows:

1. Turn the tyre until valve is in uppermost position.
2. Screw out valve insert and screw in connecting nut (Fig. 59)
3. Screw tyre filling valve onto connecting nut.
4. Let the solution flow from higher vessel into the tyre.
5. Operate vent knob at the tyre filling valve from time to time (Fig. 60/arrow).
6. Unscrew tyre filling valve. Screw in valve insert and inflate the tyre at a pressure of 2 bars.
7. Check the filling:
   Turn the tyre until the valve is in position shown in Fig. 61).
   In this position, liquid is to flow out when the valve is operated.

   Mixture:
   130 l water
   100 kg magnesium chloride frost-proof up to -25 °C.

CAUTION

- Add magnesium chloride to the water, never reversely. Avoid contact of the solution with eyes, skin or clothing.
- An injury of the eyes might be caused by penetrating liquid. Take head out of spraying direction.

Lubrication and Maintenance

The **first relubrication** of the raceway and the gear has to take place immediately after installation. For every subsequent lubrication, acidfree, non-resinous, water-repellant and non-ageing greases with adequate heat resistance properties must be used exclusively, see Table 3.

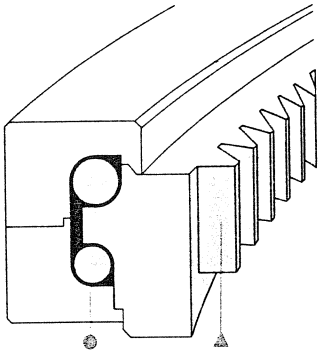
The order in which the lubricants are listed is not in order of recommendation.

The filling is to reduce friction, to seal and to protect against corrosion. Always grease liberally until a collar of fresh grease forms at the bearing gaps and seals around the entire circumference. The bearing should be rotated during relubrication.

Lubricant

Questions relating to lubricants should be clarified with the lubricant manufacturer. When automatic lubricating devices are used, pumpability must be confirmed by the lubricant manufacturer.

Applications at sub-zero temperatures will require special lubricants, for instance Molykote TTF 52



Raceway Gear

Table 3

ARAL	●	Aralub HLP 2	248 K to 403 K (-25°C to +130°C)
	▲	Aralub LFZ 1	253 K to 523 K (-25°C to +250°C)
BP	●	Energrease LS-EP 2	248 K to 403 K (-25°C to +130°C)
	▲	Energol WRL	273 K to 353 K (-0°C to +80°C)
Castrol	●	Spheerol EPL 2	253 K to 393 K (-20°C to +120°C)
	▲	Grippa 33 S	253 K to 353 K (-20°C to +80°C)
elf	●	EPEXA 2	243 K to 393 K (-30°C to +120°C)
	▲	CARDREXA DC 1	253 K to 393 K (-20°C to +120°C)
Esso	●	BEACON EP 2	248 K to 403 K (-25°C to +130°C)
	▲	SURETT FLUID 4 k	253 K to 373 K (-20°C to +100°C)
	●	CENTOPLEX 2 EP	238 K to 393 K (-35°C to +120°C)
	▲	GRAFLOSCON CA 901	253 K to 423 K (-20°C to +150°C)
Mobil	●	Mobilux EP 2	253 K to 393 K (-20°C to +120°C)
	▲	Mobiltac 81	243 K to 393 K (-30°C to +120°C)
	●	Stabyl LEP 2	253 K to 393 K (-20°C to +120°C)
	▲	Ceplattyn KG 10	243 K to 523 K (-30°C to +250°C)
SHELL	●	Calithia EP Fett T 2	248 K to 403 K (-25°C to +130°C)
	▲	Cardium Fluid C	243 K to 333 K (-30°C to +60°C)
TEXACO	●	Multifak EP 2	243 K to 403 K (-30°C to +130°C)
	▲	Crater 2 X Fluid	253 K to 393 K (-20°C to +120°C)
Fritz Manke Inh. A. Pfalz Worringer Str. 78 4000 Dusseldorf	●	—	—
	▲	Voler Compound 2000 E	243 K to 343 K (-30°C to +70°C)

Lubrication intervals are to be selected according to the operating conditions; generally every 100 operating hours, roller bearings every 50 operating hours. Shorter greasing intervals in tropical regions must be used in the presence of high humidity, dust or dirt, strong temperature fluctuations, and for continuous rotation.

Bogie bearings for rail and road vehicles are treated in a different manner (ask for special details).

Before and after prolonged stoppage of the equipment, relubrication is absolutely necessary. This is especially important after a winter shutdown. When cleaning the equipment, care must be taken to prevent cleaning agents from damaging the seals, penetrating into the raceways.

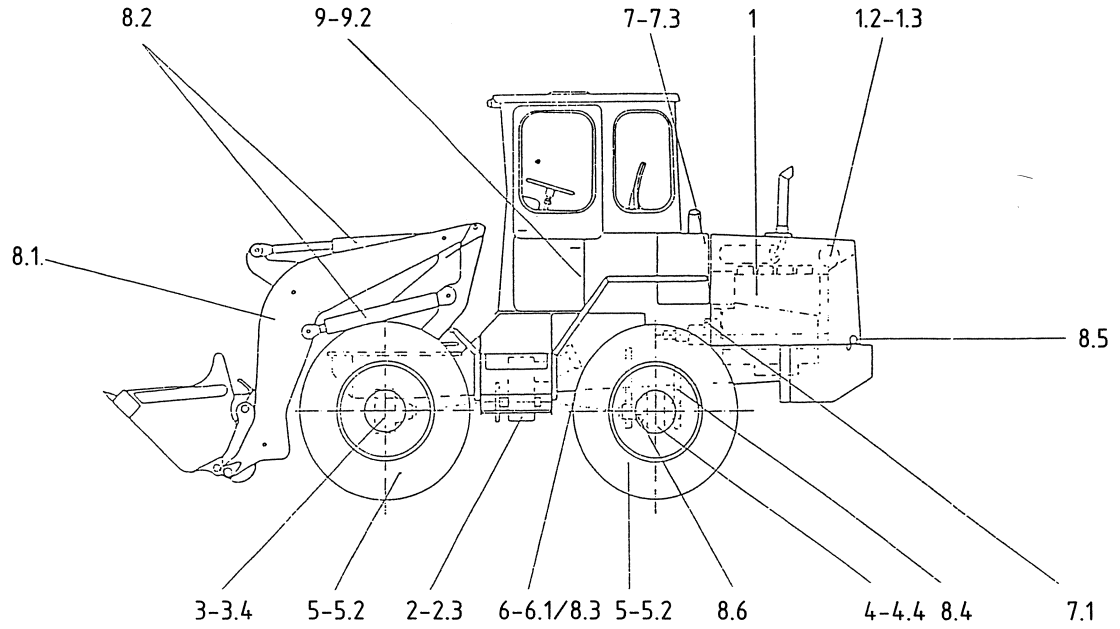
Checking of bolts

To compensate for settling phenomena, it is necessary to retighten the bolts with the specified tightening torque. During this operation the bolted connection must be relieved of all tensile stresses coming from external loads. This should be checked after approximately 100 operating hours at the latest. Thereafter, checking should be repeated about every 600 operating hours or every 3 months.

Under special operating conditions, or if specific test instructions so require, the interval between checks should be changed correspondingly.

Checking of the raceway systems

In their delivered condition large-diameter antifriction bearings have clearances which guarantee good operating conditions and functional safety. After a prolonged operating time bearing clearances will increase. It is, therefore, necessary to check the clearance at certain intervals. See page 43 Roth Erde main catalogue.



Item	Designation	Specification	Quantity of filling
1	Engine oil viscosity acc. to manufacturer's specification	MIL-L-2104C	First filling abt. 11 l. Oil change abt. 9,5l.
2.3	Gear oil SAE 90	MIL-L-2105B	abt. 5 l.
3.2	Gear oil SAE 90	MIL-L-2105B	abt. 6,5 l.
3.4	Gear oil SAE 90	MIL-L-2105B	abt. 1,7 l. for each planetary gear
4.2	Gear oil SAE 90	MIL-L-2105B	abt. 7 l.
4.4	Gear oil SAE 90	MIL-L-2105B	abt. 2 l. for each planetary gear
7.3	Hydraulic oil	HLP-oil acc. to ISO-VG 46 with VI exceeding 180	abt. 120 l.
8	Multi-purose lubricating grease	DIN 51502 K2K	as required
9	Distilled water		as required
10.2	Brake fluid		as required

Legend

△ - First oil change or first filter change or first check

○ - Check or lubrication

◆ - Change at 1000 working hours or yearly

CAUTION

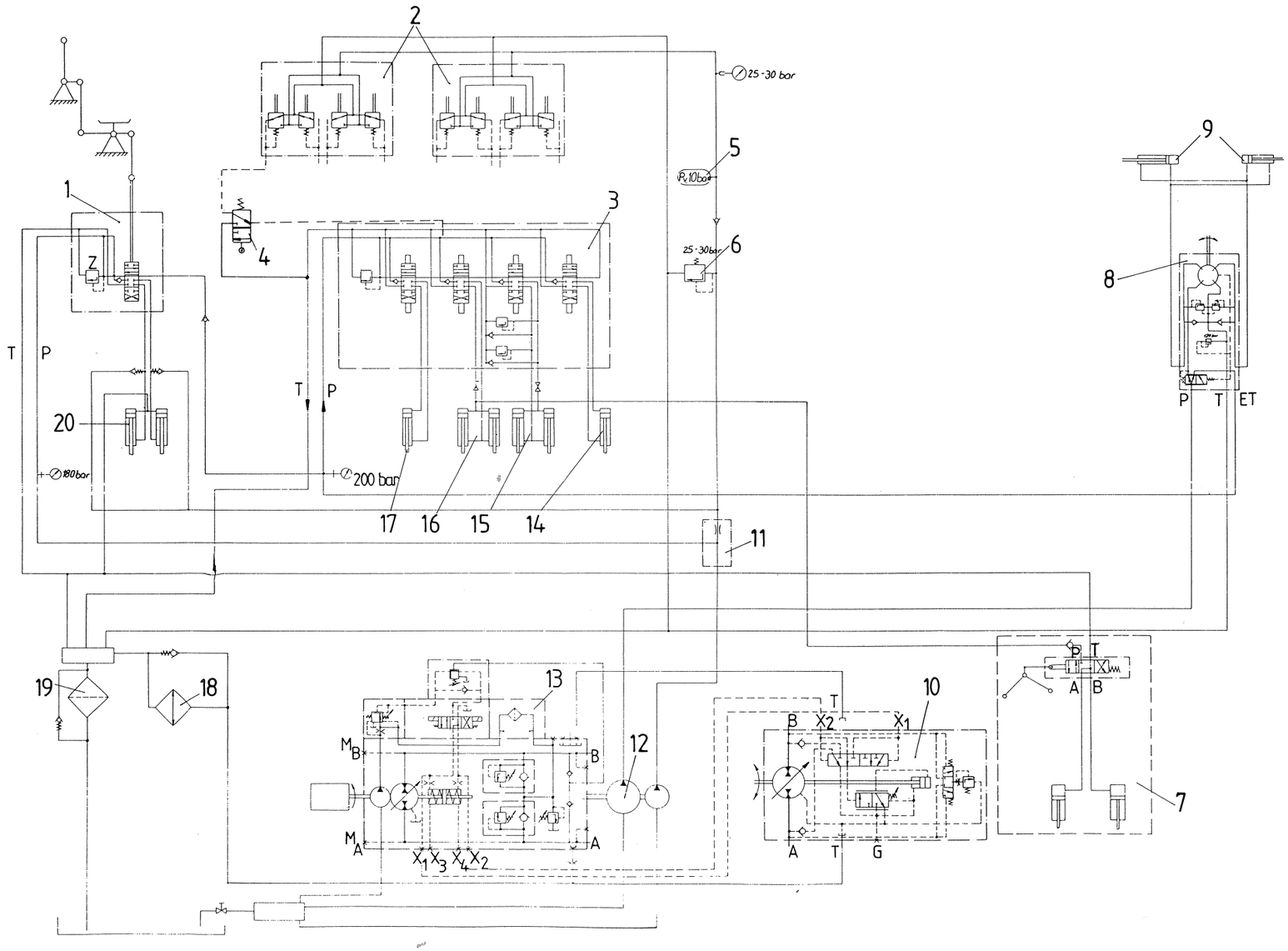
Observe the accident prevention regulations when maintenance work is carried out.

as from chassis no. 12551010

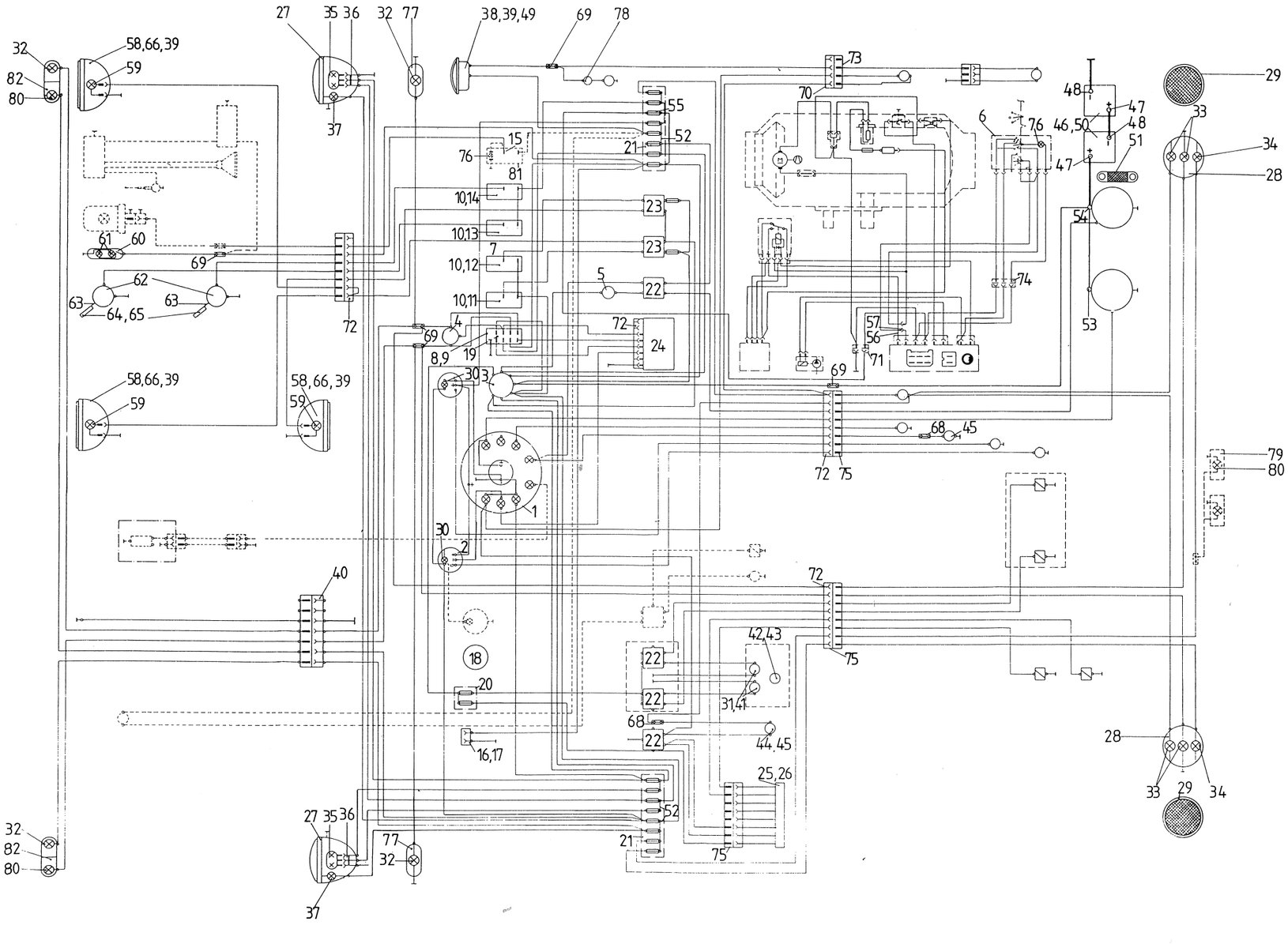
Time interval hours

10	50	100	200	1000	item	MAINTENANCE POINTS
					1	Engine
					1.1	Maintenance acc. to manufacturer's specification
					1.2	Dry air filter Observe clogging indicator during operation. Replace filter element when clogging indicator shows red.
	○				1.3	Clean dust box.
					2	Power divider
	○				2.1	Check parking brake (readjust)
			○		2.2	Oil check (check screw)
	△			◆	2.3	Oil change
					3	Front axle
			○		3.1	Axle gear, oil check (check screw)
	△			◆	3.2	Axle gear, oil change
			○		3.3	Planetary gear, oil check (check screw)
	△			◆	3.4	Planetary gear, oil change
					4	Steering axle
			○		4.1	Axle gear, oil check (check screw)
	△		*	◆	4.2	Axle gear, oil change
			○		4.3	Planetary gear, oil check (check screw)
	△			◆	4.4	Planetary gear, oil change
					5	Wheels and tyres
	○				5.1	Check air pressure
△			○		5.2	Check wheel nuts
					6	Cardan shafts
			○		6.1	Check fastening
					7	Hydraulic systems
	△			◆	7.1	Replace filter elements — observe
○					7.2	Oil check — clogging
				◆	7.3	Oil change — indicator
					8	Lubrication points
○					8.1	Shovel unit/outfit
	○				8.2	Hydraulic cylinder
	○				8.3	Cardan shafts
○					8.4	Pendulum bridge
	○				8.5	Articulated flange/engine hood
	○				8.6	Tie rod ends
					9	Brake system
○					9.1	Visual check/functioal check
		○			9.2	Check/refill liquid level

1 Swivelling valve
2 Pilot valves
3 Main control valve
4 Limit of lift (no standard equipment)
5 Accumulator for pilot valves
6 Accumulator for pilot valves
7 Supporting system
8 Power steering with priority valve
9 Steering cylinder
10 Hydraulic engine - travelling mechanism
11 Flow divider
12 Tandem working hydraulic pump
13 Axial piston pump - travelling mechanism
14 Possible connections for accessories
15 Tilt cylinder
16 Lift cylinder
17 Possible connections for accessories
18 Oil cooler
19 Reversing filter
20 Slewing cylinder



1 Combi-instrument
2 Fuel indicator
3 Light-igntion switch
4 Flasher switch
5 Pressure switch
6 Universal switch
7 Frame, 6-fold
8 Warning signal flasher switch
9 Symbol, warning signal flasher switch
10 Toggle switch
11 Symbol, working headlights, front
12 Symbol, working headlights, rear
13 Symbol, windscreen wiper, front
14 Symbol, windscreen wiper, rear
15 Screen
16 Socket
17 Cover for socket
18 Drain plug
19 Coupling plug housing
20 Fuse box, 2-pole
21 Fuse box, 8-pole
22 Relay change-over contact
23 Remote switching relay
24 Warning signal flasher
25 Steering column switch
26 Tension ring half
27 H4 mounted headlights
28 Tail-brake flashlight
29 Rear reflector
30 Bulb 24V 3W
31 Holder - magnetic switch
32 Soffitten bulb 24V 15W
33 Ball lamp 24V 18W
34 Ball lamp 24V 5W
35 Halogen bulb
36 Socket for lamp base
37 Ball lamp 24V 4W
38 Signal horn
39 Rubber feed-through 8 mm
40 Mounting socket, 7-pole
41 Magnetic switch
42 Switching magnet
43 Countersunk screw M 4x20 DIN 963, galvanized
44 Coupling
45 Reversing light switch
46 Accumulators 12V 88Ah
47 Accumulator terminal +
48 Accumulator terminal -
49 Distance bush
50 Pad
51 Earthing strap
52 Connection bar
53 Protective cap 10 mm²
54 Protective cap 70 mm²
55 Fuse 16A, 6x25
56 Round plug
57 Round plug bushing
58 Halogen bulb
59 Halogen bulb
60 Internal light
61 Soffitten bulb
62 Wiper motor
63 Wiper arm
64 Wiper blade
65 Tab
66 Distance bush
67
68 Cable connector 6 mm²
69 Cable connector 10 mm²
70 Receptacle housing, 4-pole
71 Receptacle housing, 2-pole
72 Receptacle housing, 8-pole
73 Flat plug housing, 4-pole
74 Flat plug housing, 3-pole
75 Flat plug housing, 8-pole
76 Wedge base bulb 5W/1.2W
77 Flashlight, yellow
78 Carbon holder
79 Number plate lamp
80 Soffitten bulb 24V 5W
81 Toggle switch for flashing alarm lamp
82 Position flashlight



8 Failures, cause and remedy

Failure	Probable cause	Remedy
Engine	-	See special operating instructions for engine.
	Electric switch next to the shut-off valve on the hydraulic oil tank is jammed (Fig. 17/34).	Repair or replace electric switch.
Shovel arm cannot be lifted or lowered.	Ball valve at swivel chair not open.	Open ball valve.
	Pressure relief valve in the control valve is open.	Screw out complete pressure relief valve, clean and readjust (2000 bars).
	Pilot pressure not available or too low.	Pressure relief valve in the control line is open; clean and readjust (25-30 bars).
	Failure of diesel engine.	It is possible to set the shovel arm in its lowest position by storage pressure. Not applicable to installed pipe-break safety device.
Slewing gear does not slew.	Blocking wedge locks slewing operation.	Remove blocking wedge and keep it in the holder.
	Pressure relief valve in the control valve is open.	Screw out and clean complete pressure relief valve and readjust it (180 bars).

Failure of support.	Connection of the support valve below swivel chair is jammed.	Bring shovel arm in direction of travel, repair the rods.
Support fails when shovel arm is lowered in swivelled condition.	Non-return valve in the discharge line is open.	Bring shovel arm in direction of travel, dismount and clean non-turn valve.
Failure of driving and working hydraulics.	Shut-off valve at hydraulic tank is closed after repair. Filter clogging. Lack of oil in the hydraulic oil tank. Electric connections at the axial piston pump loose, totally disconnected or oxidized. Failure of fuses.	Open shut-off valve. Replace filter elements. Refill oil. Join the connections acc. to the electric diagram or clean them. Replace fuse, fuse for travelling gear is located in the dashboard.
Failures of brake system.	Parking brake does not hold. Service brake operated irregularly. Air in the system.	Check or reset adjustment, replace brake linings, if necessary. Check storage tank for brake fluid and refill, if necessary. Bleed the brake system.
Generator does not charge.	Electric connections are loose. V-belt torn. Generator speed too low.	Tighten connections. Replace V-belt. Check tension of V-belt and readjust, if necessary.

Failure of heating system.	Fuse in fuse box or heating unit is defective.	Replace fuse.
	Control device switches off.	Set rotary switch to position "0" and repeat starting process.
Hose couplings of attachments cannot be connected.	Increased pressure due to heat effect on the attachment.	Carefully loosen screwed connection at the rapid-action coupling, oil sprays off, the increased pressure breaks down. Tighten screwed connection.
	Increased pressure in the basic unit.	Depressurize lines by moving the pilot valve back and forth.

9 General instructions

The following is supplied together with the unit:

- Operating instructions for the engine. Please take all details regarding the engine from these operating instructions.
- Industrial leaflet "earth-moving machinery" of the employer's liability insurance association for civil engineering.
- Spare parts list - basic unit.