HOLDER

Park 70
Park 70 A

Betriebsanleitung
mit Anbaugeräte

Operating Manual
including implements

Bestell-Nr. / Ref. No. 125 674

Gebrüder Holder GmbH & Co.

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Contents

Before taking the machine into use read operation instructions and safety rules very carefully and pay strict attention to them. If no operation manual is included order it at once!

Warning triangle

All paragraphs in this operation manual dealing with your safety have been marked with the warning triangle. The safety rules must be passed on to all users of the machine.

Intended purpose

The Holder tractor has been exclusively designed for normal use in agriculture, forestry, maintenance of public parks and gardens, and for winter service (intended purpose).

Any other application is regarded not intended. The manufacturer does not hold himself liable for any damages resulting from the use of the machine for non-intended purposes. In such a case the risk lies solely with the user.

Intended use also takes for granted that manufacturer's instructions for operation, service and maintenance are strictly followed.

The tractor, including attached implements, must not be operated by any other persons than those familiar with its handling and informed about possible dangers.

All local safety regulations must be strictly complied with.

The manufacturer is not liable for any damages resulting as a consequence of unauthorized modifications carried out on the machine.

General rules for safety and for accident prevention

1. Beside the instructions contained in this manual pay attention to official, locally applicable rules for safety and accident prevention!
2. Adolescents under 16 years are not allowed to drive or operate the vehicle.
3. When driving on public roads pay attention to local rules and traffic regulations.
4. Before taking the machine into use the operator must familiarize himself with all equipment, operation elements, and functions. He must see to it that all protections are properly assembled. It's too late to think of this once work has been started!
5. The operator is responsible for persons within the operation range of the machine!
6. Keep clear of the danger zone of the machine!
7. Do not start the engine from any other place than the driver seat. Never start the engine by short-cutting the electrical cables of the starter because the tractor will move at once!
8. Before starting examine the vicinity of the tractor (playing children)! Make sure to get a sufficiently wide view.
9. Never let the engine run in enclosed space!
10. The operator must not wear any loose garments, but close-fitting ones, along with heavy shoes!
11. Handle fuel very carefully - danger of fire! Never fill in fuel in the vicinity of open flames, ignitable sparks, and hot engine parts. Whilst refuelling smoking is prohibited!
12. Before refuelling shut-off engine and remove the ignition key!
    Never top-up in enclosed space! Take care not to spill the fuel (use suitable filling aids).
13. Keep the machine clear to avoid fire!
14. Be careful when handling brake fluids and battery acids (poisonous and corrosive)!

Transporting persons, driver's mate, operators

1. Unless a suitable seat is available, a driver's mate must not be transported.
2. The transport of any other person beside the driver's mate, is strictly prohibited!

Driving

1. When the engine is started tractor and implement transmissions must be disengaged.
2. The driving speed must always be adjusted to surroundings and load. When driving uphill or downhill, or diagonally across slopes, avoid sudden bends. Always disengage the diff-lock when taking bends. Never unclutch or shift gears when driving downhill!
3. Pay attention to assembly instructions and safety rules when attaching trailers and implements. Implements, trailers, ballast weights and loaded transport containers (grass bin) influence the road behaviour of the tractor (driving, steering, overturning). Therefore be careful of sufficient steering and braking capacity.
4. Pay attention to permissible axle loads, trailer loads, and total weights.
5. When taking bends with trailed or mounted implements consider overhang and centrifugal force!

Leaving the tractor

1. When leaving the tractor secure it from rolling off, and from unauthorized use by locking the parking brake, and using wedges under the wheels. Shut-off the engine, engage group gear and gear. Remove the ignition key and lock the cab!
2. Never leave the tractor without supervision whilst the engine is running!
3. Never leave the driver seat whilst the tractor is still in motion!
4. When leaving the tractor lower the implement to the ground.
5. When shutting off the engine close the fuel cock!

Implements (only applicable to carried implements - not single-purpose machines)

1. Attach implements and trailers only by means of the specified devices!
2. Be specially careful when coupling trailers and implements on the tractor!
3. Secure trailers and implements from rolling off!
4. Never take the implement into operation before all guards and protections have been installed in their proper positions!

P.T.O. transmission (if applicable)

1. Shut-off the engine for fitting and for removing the cardan shaft!
2. Persons must stand clear of turning P.T.O. or cardan shafts!
3. Cardan shaft and P.T.O. shaft guards must be fitted as prescibed!
4. Because of their centrifugal force P.T.O.-driven implements may continue running for a while after the P.T.O. has been shut-off. Therefore keep clear of the implement until it stands completely still!
5. As soon as the cardan shaft has been taken off protect the P.T.O. shaft with its guard!

Maintenance

1. Pressurized liquids, such as fuel, hydraulic oil, may penetrate the skin and cause heavy injuries. If this is the case see a doctor at once (danger of infection)!
2. Take care to dispose properly, and separately, of used oils, fuels, batteries, brake fluids, coolants, and filters!
3. It is not permitted to weld, saw, or grind supporting sections of the tractor, and safety installations, such as rollover bars, frames, axles, trailer hitches etc.
4. Mounting the tyres requires sufficient skill and the necessary tools.
5. Tighten wheel nuts after 20 hours of operation.
6. Before working on the electrical system take care to remove the mass cable of the battery.
7. Use only original spare parts, or commercial parts of identical quality!

Handling the jack
When using the jack take care that the tractor is safely parked and secured from rolling off (wedges). The weights of the unit to be removed must not exceed that of the jack.

Opening point of the jack
Front: On the transverse connection tube of the front lift as shown on (1 Ill. 37).
Rear: Underneath the gearbox as shown on (1 Ill. 38).

For repairs the jacked-up tractor must be additionally secured with assembly blocks (3 Ill. 37 resp. 38) on both sides by the axles.

Instructions for driving with trailers

1. The permissible supporting load on the tractor trailer hitch is 400 kg. Pay attention to this when driving with single-axle trailers.
2. The supporting load on the hitch of the single-axle tractor must, on the coupling point, not be less than 4 % of the trailed load (min. 25 kg). If, on public roads, the supporting load comes below 25 kg during the process of unloading (i.e. with dung distributors, sand distributors etc.) the load must be shifted so that the supporting load will be again 25 kg.
3. The following trailer combinations are possible:
   a) Tractor with single-axle trailer, braked or unbraked
   b) Tractor with single-axle trailer, braked or unbraked, followed by a single or double-axle trailer with over-running brake.
   c) Tractor with double-axle trailer, braked, followed by a single or double-axle trailer with overrunning brake.
   d) Tractor with two single or double-axle trailers with overrunning brake.
   e) Tractor with implement and attached to the implement a double-axle trailer with overrunning brake, or movable brake lever provided the total weight of the trailer is not higher than 1,25 times the permissible weight of the tractor.

      For P 70 = 2000 kg x 1,25 = 2.500 kg
      For P 70 A = 2100 kg x 1,25 = 2.625 kg.
      Trailers needing no registration must not be driven faster than 25 km/h. They must be marked with a blade - 25 km - . The overall length - tractor with trailer - must not exceed 18 meters.

4. According to para. 41 of the German Road Regulations the following trailer loads are permitted:

a) **Single-axle trailers, unbraked**

are permitted 1. if the axle load of the trailer is not higher than half the empty weight of the tractor.

Example: Empty weight of the P 70 / P 70 A - depending on tyres and equipment - 1330-1520 kg x 0,5 results in a permissible axle load on the trailer of **655-760 kg.**

2. The braking deceleration of the tractor with attached trailer is at least 1,5 m/sec.^{2}

b) **Single and multi-axle trailers are permitted:**

1. **Trailers with a permissible total weight up to 2 tons** provided the trailer brake can be handled from the tractor driver seat by means of a lever on the hitch.
2. **Trailers with a permissible total weight up to 4 tons** provided a movable brake lever for the trailer is handy for operation beside the driver seat.
3. **Trailers with a permissible total weight of 8 tons** with overrunning brake.
   For safety's sake **we recommend to use trailers with a permissible total weight of max. 3 tons.** Multi-axle trailers must be equipped with an operation braking system, as well as a parking and pull-off braking system.

c) **Agricultural or Forestry Implements**

Single-axle without brake	Single-axle, without springs without brake		with movable hand brake lever	with overrunning brake	
0,5 x empty weight of tractor (1300-1520 kg)	1,0 x empty weight of tractor	for „safety's sake" we recommend			for „safety's sake" we recommend
Axle load of implement 655 - 760 kg	Empty weight of implement 1330-1520 kg	Permissible total weight P 70: 2000 kg P 70 A; 2100 kg	Permissible total weight 3000 kg	Permissible total weight 8000 kg	Permissible total weight 4000 kg

A) General Information

1. Take warranty file card out of this manual, complete it, have it signed by customer and return it without delay to Gebr. Holder GmbH. & Co., 7430 Metzingen/Württ., Postfach 1555.
2. Its worth its while to read this manual carefully. If you follow its instructions conscientiously your tractor will be ready for service at any time. Pay particular attention to the service intervals. Your tractor will pay you for good treatment with a long service life.
3. **Service**
   Have all services, listed in the attached Service Chart, carried out regularly through your Holder Dealers (Service Workshop). Have them confirmed in this manual by stamp and signature.
   Product liability and warranty are excluded if the regular service jobs have not been carried out.
4. **Tractor data**
   In case of inquiries made in writing or over the phone please state the following data which will make it easier for us to reply fast:

   a) Type of tractor ..... e.g. P 70
   b) Engine serial No.: ..... e.g. V1700-4250
   c) Chassis No.: ..... e.g. 469 59 557
   d) Date of sale: ..... e.g. 2.04.1991
   e) Tractormeter reading: ..... e.g. 500 hours of operation

   The **chassis number** is embossed on the **type plate** and on the front frame (Ill. 2) at righthand side as viewed in driving direction. The **engine number** is visible above the regulator housing, righthand beside the injection pump (Ill. 1). **The coefficient of emission** (exhaust gas) is to be found on the type plate.

   Technical data, illustrations and dimensions in this manual are non-obligatory. No claims can be derived from them. We reserve the right to make technical improvements of the tractor without changing this manual.

B) Technical data

Engine in	P 70	P 70 A
Manufacturers:	Kubota, Osaka/Japan	Kubota, Osaka/Japan
Type:	V 1702-B	V 1902-B
Design:	in-line, vertical	in-line, vertical
Mode of operation:	four-stroke, diesel	four-stroke, diesel
Method of injection:	Tolerance-chamber spherical combustion chamber	
Number of cylinders:	4	4
Cylinder bore:	82 mm	85 mm
Stroke:	82 mm	82 mm
Piston displacement:	1720 cm^3	1848 cm^3
Compression ratio:	21 : 1	21 : 1
Compression pressure:	23 - 25 bar	23 - 25 bar
Valve tolerance (cold):	0,18 - 0,22 mm	0,18- 0,22 mm
Fuel consumption:	242 g/kWh at n = 1400 rpm	245 g/kWh at n = 1700 rpm
Cooling:	Water circulation cooling with pump and thermostat	
Air filter:	MANN dry-air filter with optical warning system	
Lubrication system:	Force-feed lubrication with Trochoid vane pump	
Oil filter:	Change cartridge in main flow	Change cartridge in main flow
Oil pressure at n = 2000 rpm:	3,0 - 4,5 bar	3,0 - 4,5 bar
Rated speed:	2800 rpm	2800 rpm
Max. idling speed:	3000 rpm	3000 rpm
Min. idling speed:	800 rpm	800 rpm
Max. torque:	107 Nm at 1400 rpm	118 Nm at 1700 rpm
Capacity (after DIN 70020) at n = 2800 rpm:	26 kW - 35 PS - 38 HP	29 kW - 40 PS - 43 HP
Power transmission:	hydrostatic	hydrostatic
Variable capacity hydraulic pump:	Hydromatic A4V (40 cc per rev)	Hydromatic A4V (40 cc per rev)
Constant motor:	Hydromatic A2F (28 cc per rev)	Hydromatic A2F (28 cc per rev)
Wheel motors, front	—	Bucher 2XBB 100 (100 cc per rev)
Fuel system:		
Injection pump:	ND-PFR 4M55/2 ND 182	ND-PFR 4M55/2 ND 182
Governor:	Kubota flyweight governor	Kubota flyweight governor
Injection nozzle:	DN 12 SD 12	DN 12 SD 12
Injection pressure:	137 bar	137 bar
Fuel filter:	Change filter Bosch No. 1457434062, Holder No. 023 264	
*Injection timing: (Commencement of fuel injection)	25° bTDC (before top dead centre)	25° bTDC (before top dead centre)

Weight P 70 with tyres (front 185/70 R 13)

	28x9.00-15	10.0/75-15.3	31x10.50-15	31x11.50-15	31x15.50-15	400-15.5	33x12.50 R 15
Empty weight (w. driver 75 kg) Total: kg	1355	1380	1365	1375	1390	1430	1400
Front: kg	570	570	570	570	570	570	570
Rear: kg	785	810	795	805	820	860	820

Weight P 70 A with tyres (front 185/70 R 13)

	31x11.50-15	31x15.50-15	400-15.5	33x12.50 R 15
Empty weight (w. driver 75 kg) Total: kg	1455	1470	1510	1480
Front: kg	620	620	620	620
Rear: kg	835	850	890	860

	P 70	P 70 A
Permissible total weight:	**2000 kg**	**2100 kg**
Permissible load on front axle:	**850 kg**	**950 kg**
Permissible load on rear axle:	**1400 kg**	**1400 kg**

Permissible supporting load on trailer hitch:

P 70: 400 kg

P 70 A: 400 kg

Noise levels:

Measured on the working place (on driver's ear) at a rated engine speed of 2800 rpm and with 7,25 km/h driving speed'

Cab	Shut	Open
P 70	83 dBA	87 dBA
P 70 A	82 dBA	84 dBA

Tyres – Air pressure – Wheel weights

	Tyres	Ply	Profile	Tubes	Air pressure	Wheel weights Type	Weight
Rear	28 x 9.00-15 *	6	Lawn	no	1,8 bar °	4134-2	appr. 43 kg
	10.0/75-15.3	8	Lawn	yes	2,3 bar °	4134-2	appr. 43 kg
	31 x 10.50 R 15	4	M+S	no	1,5 bar °	4134-2	appr. 43 kg
	31 x 11,50-15	4	Wrangler XT	no	1,0 bar °	4134-2	appr. 43 kg
	31 x 15,50-15	4	XTRA-Trac	yes	1,0 bar °	4134-2	appr. 43 kg
	400-15.5 Trelleborg	6	404	yes	1,0 bar °	4134-2	appr. 43 kg
	33 x 12.50 R 15	4	M+S	no	1,5 bar °	4134-2	appr. 43 kg
Front	23 x 8.50-12	4	Lawn	no	1,5 bar °	–	–
	185/70 R 13	SR	M+S	no	1,5 bar °	–	–
	23 x 10.50 - 12	4	Lawn	no	1,4 bar °	–	–

° With permissible load on axle and when driving on public roads, the prescribed tyre pressure must be maintained.

* In connection with tyres 28 x 9.00-15 Type 4361-6 wheel flaps type 4634-1 are necessary.

The front wheels 185/70 R 13 are suitable for all rear tyres.

The front wheels 23 x 8.5-12 are recommended for the tyre size 28-9.00-15, 31x15.50-15 and 10.0/75-15,3 but not possible with P 70 four-wheel drive.

Instructions for the use of snow chains

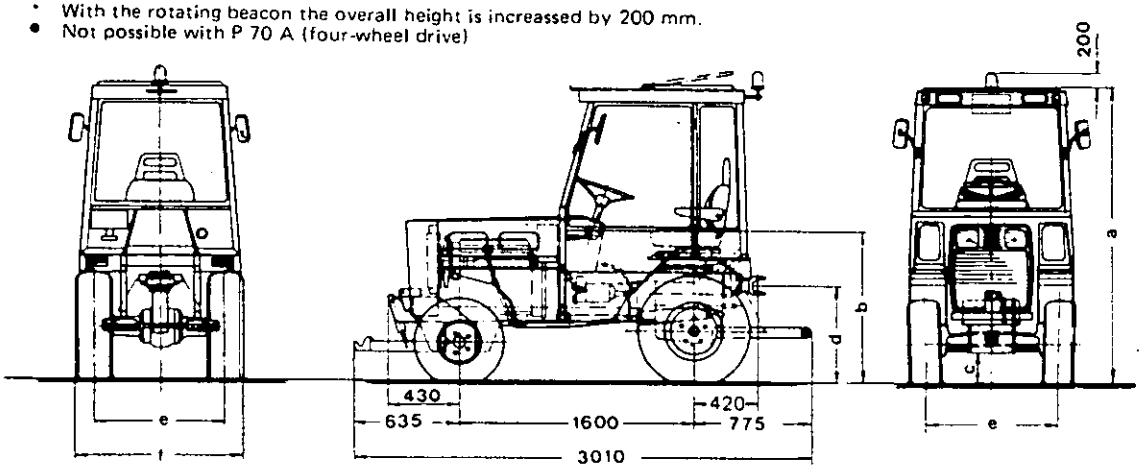
Which chains for which tyres: (no other chains must be used).

	Tyres	RUD chains Ref. No.	
Rear	28 x 9.00-15	22 531	
	31 x 10,50-15	22 141	
	31 x 11.50 R 15	22 539	(for wide track only)
	31 x 15,50-15	22 548	(for wide track only)
	400-15,5 Trelleborg	22 173	
	33 x 12.50 R 15	22 167	
Front	23x8,50-12 / 23x10,50-12	22 521	
	185/70 R 13	46 120	

Tractor dimensions P 70/P 70 A

Tyres		Type	Overall height a	Medium seat b	Ground clearance c	Trailer hitch Low position d	Trailer hitch High position d
			mm	mm	mm	mm	mm
rear	28 x 9.00-15	4131-4	* 2010	970	210	630	670
	10.0/75-15.3	4631-5	* 2015	975	210	650	690
	31 x 10,50-15	4631-7	* 2030	990	210	665	705
	31 x 11,50-15	4631-9 *	* 2040	1000	210	675	715
	31 x 15.50-15	4131-8	* 2020	980	210	655	695
	400-15.5 Trelleborg	4131-6	* 2055	1015	210	690	730
	33 x 12.50 R 15	4131-16	* 2045	1005	210	680	720
front	185/70 R 13 185/70 R 13	4632-2 4632-10	– –	– –	– –	– –	– –
	23 x 8.50 - 12	4631-3	–	–	–	–	–
	23 x 10.50 - 12	4631-11	–	–	–	–	–
•	23 x 10.50 - 12	4631-12	–	–	–	–	–

* With the rotating beacon the overall height is increassed by 200 mm.
• Not possible with P 70 A (four-wheel drive)



Min. inner turning radius after DIN 70 020 (measured at the most extreme point of the vehicle)	Track width and overall width			
	Track width e		Overall width f	
m	mm	mm	mm	mm
6,50	850	1046	1084 x	1280
6,50	–	992	–	1260
6,50	902	998	1165	1275
6,50	902	998	1189 x	1300
6,50	–	1032	–	1400
6,50	–	1032	–	1440
6,50	–	992	–	1302
– –	– –	914 1006	– –	1100 1192
–	–	904	–	1120
–	–	1014	–	1278
–	–	904	–	1168

x The measurements have been taken on the outerwheel edges.
Here, the actual overall width is 1210 mm (cab).

Filling quantities (for refilling)	P 70	P 70 A
Engine (incl. change of filter):	9,00 ltrs. (HD oil for diesel engines)	9,00 ltrs. (HD oil for diesel engines)
Hydraulic system (tank capacity):	16,00 ltrs. (hydraulic oil Mobil DTE 16)	18,00 ltrs. (hydraulic oil Mobil DTE 16)
	Note: Pay attention to list of recommended hydraulic oils, resp. instructions on page 117.	
Rear gearbox:	14.00 ltr. (SAE 80 gear oil)	14,00 ltrs. (SAE 80 gear oil)
Fuel tank:	33,00 ltrs. (diesel oil)	33,00 ltrs. (diesel oil)
Cooling system (total quantity):	8,70 ltrs. (water plus anti-freeze agent)	8,70 ltrs. (water plus anti-freeze agent)
Glysantin effective to -30^{o} C filled in by the manufacturers all the year round:	3,70 ltrs. (Glysantin)	3,70 ltrs. (Glysantin)
Brake fluid:	0,25 ltrs. N-DOT 3	0,25 ltrs. N-DOT 3

The correct oil level can be checked on the marks of the oil diprods, control screws, and oil sight glasses.

Transmission P 70 and P 70 A

a) **Gearbox:**	Hydrostatic drive transmission with infinite adjustment of the driving speed via the accelerator pedal, and adjustment of a constant driving speed by means of a hand lever.
Variable capacity hydraulic pump:	Hydromatik A4V 40 cc per rev.
Constant motor:	Hydromatik A2F 28 cc per rev.
Wheel motors, front:	Bucher 2XBB 100 cc per rev.
b) **Tractormeter:**	Tractormeter combined with hour meter, rev. counter, and standard P.T.O. speed reading.
c) **Speedometer:**	Version I with sticker 25 = for all tyre sizes.

Theoretical driving speeds of P 70 / P 70 A (at a rated engine speed of 2800 rpm)

With tyres	Forward No four-wheel drive	Four-wheel drive	Reverse No four-wheel drive	Four-wheel drive
28x9.00-15	0 - 23,34 km/h	0 - 14,50 km/h	0 - 11,60 km/h	0 - 7,25 km/h
10.0/75-15.3	0 - 24,41 km/h	0 - 15,15 km/h	0 - 12,60 km/h	0 - 7,50 km/h
31x10.50 R 15	0 - 25,34 km/h	0 - 15,73 km/h	0 - 12,60 km/h	0 - 7,80 km/h
31x11.50-15	0 - 26,83 km/h	0 - 16,65 km/h	0 - 13,40 km/h	0 - 8,30 km/h
31x15.50-15	0 - 25,62 km/h	0 - 15,90 km/h	0 - 12,80 km/h	0 - 7,95 km/h
400-15.5 Trelleborg	0 - 29,00 km/h	0 - 18,00 km/h	0 - 14,50 km/h	0 - 9,00 km/h
33x12.50 R 15	0 - 27,90 km/h	0 - 17,30 km/h	0 - 14,00 km/h	0 - 8,65 km/h

d) **Diff-lock:** Handlever operated, acting mechanically on the rear axle.

e) **P.T.O. shafts:**

Type: P 70 — 4600-2; P 70 A — 4600-7

Life P.T.O. and front P.T.O. shifting under load

Direction of revolution: front anti-clockwise, rear clockwise

rear 540 rpm at n = 2200 rpm engine speed

front, resp. centre 1000 rpm at n = 2250 rpm engine speed

P.T.O. connection: 1 3/8" splined profile after DIN 9611

P.T.O. clutch

Design: service-free multi-plate wet clutch

Actuation: by hand lever

f) **Steering:**

Design: Hydrostatic T-steering with one working cylinder

Type: Danfoss-Orbitrol

Toe-in: 3 – 6 mm on outer contour of wheel rim

g) Brakes:	3 braking systems, independent of each other
Operation brake:	Hydraulically operated drum brakes in front wheels. Hydrostatic driving brake actuated through the INCH pedal.
Parking brake:	Mechanically operated drum brake in rear wheels.
h) Trailer hitch Type:	Adjustable for height and revolving. With pistoltype handle grip. Rockinger or Cramer
i) Hydraulic system:	Holder single-cylinder rear hydraulics (single-acting) Holder single-cylinder front hydraulics (double-acting)
Hydraulic pump:	Kubota gear pump
Capacity:	8,85 cc per rev = 24 l/min. at a rated engine speed of 2800 rpm
Operation pressure:	175 bar (atm.)
Filter:	Suction filter in hydraulic tank (fineness of filter 100 µm) Passage filter in pressure pipe (fineness of filter 25 µm) Passage filter in variable capacity hydraulic pump for hydrostatic drive transmission (fineness of filter 10 µm)
Hydraulic oil supply tank:	Assembled in front RH fender P 70: = 16 ltrs. hydraulic oil Mobil DTE 16 P 70 A: = 18 ltrs. hydraulic oil Mobil DTE 16 For temperatures below -10° C Mobil DTE 13 resp. oils recommended in the list of hydraulic oils on page 117.
Control valves:	**Bucher control valves** consisting of:

Inlet plate with pressure limitation plate	LA 06 PB-M06
Rear hydraulic cylinder, single-acting 3/3-way valve	LA 06 P3BAM06
Front hydraulic cylinder, double-acting 4/4-way valve	LA 06 P4LKM06
4 hydraulic connections front 2 pieces 4/3-way valve (plug sockets)	LA 06P4FAM06
1 hydraulic connection rear 3/3-way valve (plug socket)	LA 06P3BA-M06
End plate	LA 06 PU

k) Implement lift:

rear: Standard Cat. I three-point linkage, (single-acting)
front: Holder three-point linkage with instant coupling, (double-acting)

Lifting capacity:

rear:	10 000 N (1000 kp)	measured in lower link arm on the
front:	8 000 N (800 kp)	field bar

l) Electrical system:

P 70 / P 70 A

Battery:
capacity 12 V / 55 Ah
optionally: capacity 12 V / 88 Ah
rated voltage 12 V

Three-phase generator with transistorized regulator:
rated voltage 12 V
electric current 35 A

Starter:
(pre-engaged drive starting motor)
Capacity 1,4 kW (1,91 HP)
Rated voltage 12 V

Bulbs

Headlights	35 W/35 W	Warning light switch	3 W
Front traffic light	21 W	Remote thermometer engine	3 W
Rear traffic light	21 W	Remote thermometer hydraulic oil	3 W
Rear reflector	10 W	Fuel supply indicator	3 W
Licence plate light	5 W	Control lights	3 W
Brake light	21 W	Position lights	5 W
Tractor meter light	3 W	Interior light	5 W
Tractormeter	3 W	Rotating beacon (Special accessory)	45 W

C) Function of operation and control units

Ignition and lighting switch (14 Ill. 3)
The ignition and lighting switch has 5 positions actuated by the ignition key.
P = Parking light
0 = Everything switched off
1 = Engine ready for starting
2 = Dim light
3 = Headlight (dimming light) } Dashboard lighting on

Glow starting switch (15 Ill. 3)
The starting switch has two switching positions:
1st position (notch) = preglow system switched on (cold-starting device)
(preglowing is completed when the starting control lamp (7 Ill. 3) lights up)
2nd position (stop) = starter is actuated

Fuel supply indicator (11 Ill. 3)
The indicator shows the fuel quantity in the tank. (Never run the tank entirely empty).

Tractormeter (10 Ill. 3)
Scale = engine speed
Figures = hour meter
Marking = P.T.O. speed 540 rpm (front P.T.O. = 1000 rpm)
(1 operation hour relates to an engine speed of 1950 rpm).

Speedometer (30 Ill. 3)
Scale = Driving speed

Remote thermometer for engine temperature (31 Ill. 3)
The remote thermometer has 3 colour ranges:
White (40° – 65° C) = engine temperature too low
Green (65° – 105° C) = normal operation temperature
Red (105° – 120° C) = engine overheats. Shut-off at once, look for cause and remedy the fault.

Remote thermometer for temperature of hydraulic oil (9 Ill. 3)
The remote thermometer has 2 colour scales:

Green (0^{o} – 85^{o} C)	=	normal operation temperature
Red (85^{o} – 100^{o} C)	=	hydraulic oil overheated. Shut-off engine at once, look for cause and remedy.

Warning light switch (29 Ill. 3)
When the warning light is switched on, all flashing lights (including those of the trailer) light up simultaneously in certain intervals.
When using the warning lights, pay attention to your local regulations.

Pilot light panel (Ill. 3)

1 = Pilot lamp for tractor flashlight	5 = Pilot lamp for battery
2 = Pilot lamp for trailer flashlight	6 = Pilot lamp for engine oil
3 = Pilot lamp for headlight	7 = Pilot lamp for preglowing
4 = Pilot lamp for air filter service	8 = Pilot lamp for parking brake

Socket (12 Ill. 3)
The socket serves to connect a 12 Volt consumer.

Manual speed regulator (13 Ill. 3)
The manual speed regulator serves to adjust the engine speed to a constant driving speed, or P.T.O. speed.

Shut-Off knob (16 Ill. 3)
For shutting-off the engine pull out the shut-off knob.

Foot pedal speed regulation (20 Ill. 3)
When driving on the road, the speed is adjusted with the foot plate.

Multi-purpose switch (28 Ill. 3)
The multi-purpose switch serves to switch on the traffic indicator, the horn, and the headlight.

Lever forward (R)	=	flashlight right
Lever rearwards (L)	=	flashlight left

Lever upwards	(F)	=	headlights on
Key	(S)	=	Horn

Fuse box (2 III. 4) **for tractor**
8 pieces (8 amp) (arrangement according to wiring diagram III. 37)

Fuse box (3 III. 8) **for cab.**
4 pieces (8 amp) (arrangement according to wiring diagram III. 37)

Rocker switch panel (III. 7)
1 = Switch for rotating beacon
2 = Switch for windscreen wiper
3 = Switch for heating - fan
4 = Switch for head beams (switch only on if front-mounted implements will limit the effect of the normal headlights).

Window washing device
The tank (19 III. 3) for the window washing device becomes accessible by removing the cover (17 III. 3). The washing device is actuated by pressing button (18 III. 3).

Sunshade (4 III. 8)

Interior lighting with switch (6 III. 8)

Adjustable heating nozzles (6 III. 7)
4 fresh-air nozzles (6 III. 7) top, front for windscreen and side windows
2 fresh-air nozzles (33 III. 3) bottom, front for foot space.

Twist-knob shut-off valve for heating (5 III. 8)

A	=	on
Z	=	off.

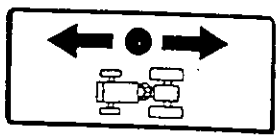
The feed of warm cooling agent is controlled by means of the twist-button, whereby the heating capacity is either reduced or increased.

Clothes peg (5 III. 7)

Ventilation flap and emergency exit in roof
To open pull latch forward (1 III. 8). To shut grip the knob (2 III. 8) and give a strong downward pull to the flap until the latch will catch.

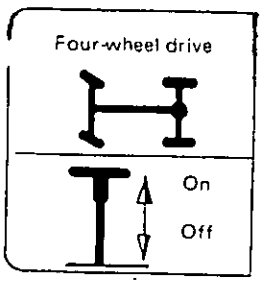
Selector lever for driving forward and for reversing (34 Ill. 3)
The selector lever for forward and reverse drive is correspondingly arranged.

Lever forwards	=	Driving forward
Lever rearwards	=	Reversing

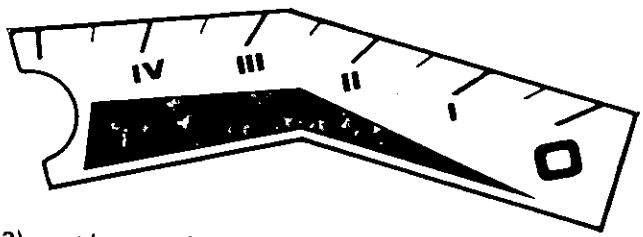


Selector lever for four-wheel drive (4 Ill. 5)
Whilst driving under load the four-wheel drive can be engaged or disengaged.

Selector lever upwards	=	four-wheel drive engaged
Selector lever downwards	=	four-wheel drive disengaged



Operation lever for infinitely variable driving speed (32 Ill. 3)
This lever serves to adjust the desired constant driving speed which can be read off the speedometer (30 Ill. 3). Any driving speed can thus be matched with a certain P.T.O. speed.

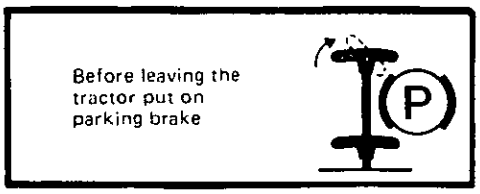


Note: For starting the engine, the hand lever (39 Ill. 3) must be moved to 0-position.

INCH pedal (27 Ill. 3)
By means of this foot pedal, the driving speed, adjusted with operation lever (32 Ill. 3) is infinitely variable as far as down to zero.
(Hydrostatic driving brake). When letting go of the INCH pedal, the originally adjusted driving speed is obtained and retained.

Driving brake (21 III. 3)
Through the brake pedal, the driving brake acts directly on the front wheels. It is hydraulically actuated.

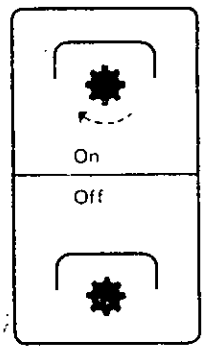
Parking brake (37 III. 3)
The parking brake is locked by pulling the hand lever (37 III. 3) upwards. It is opened by turning the brake lever to the right.



⚠ **Never forget to lock the parking brake when leaving the machine.**

Independent P.T.O. clutch (life P.T.O.) shifting under load
Thanks to the independant P.T.O. clutch, the P.T.O. can be actuated whether the tractor moves, or stands. Operation by means of clutch lever (35 III.3 resp. 10 III.6)

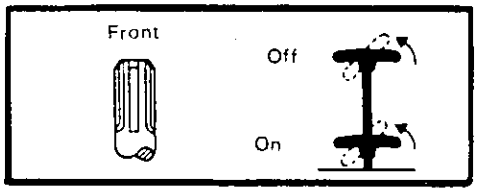
Lever downwards = P.T.O. disengaged
Lever upwards = P.T.O. engaged

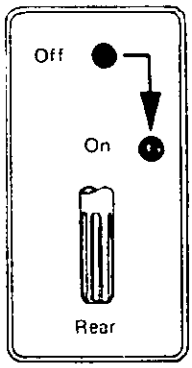


Only with running engine:
If the P.T.O. driven implement is to be cut off for a short while, use the clutch lever. If the P.T.O.-driven implement is to be shut-off for some time, e. g. when driving on public roads, the P.T.O. must be disconnected with the P.T.O. selector lever after the drive has been decoupled with the **clutch lever.**

Actuation of front and rear P.T.O. shafts
Decoupling – Pull the clutch lever (35 III. 3) upwards to off „AUS" position. Then, by means of the corresponding P.T.O. selector lever (36 III.3) engage front and centre P.T.O. shaft.

Coupling – Smoothly engage clutch lever (35 III. 3) („EIN").

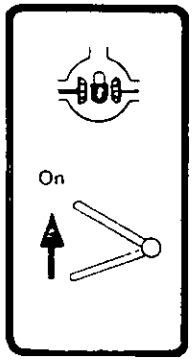




Note: For coupling, resp. decoupling, the P.T.O. selector lever must be turned through 90° to the left, before it is moved upwards or downwards.

Attention! When coupling move clutch lever (35 III. 3) to on („EIN") direction until the pressure point can be distinctly felt to have been overcome.

- Never operate the P.T.O. without its guard assembled.
- Take care that the cardan shaft principally matches the used implement.
- Never engage the P.T.O. if the engine is shut-off.
- Before removing P.T.O. driven implements shut-off the engine and disengage the P.T.O.
- Before engaging the P.T.O. make sure that nobody stands within the danger zone of the implement and the turning cardan shaft.



Diff-lock

For power transmission through both rear wheels on soft, slippery ground, the differential gear can be locked. This applies to traction work, as well as to braking. The diff-lock is mechanically operated by pulling up the hand lever (1 Ill. 5). The lock will automatically unlock if the hand lever is released.

The diff-lock must be only used when driving straight ahead.

Hydraulic selector lever with locking device

Hydraulic lever (22 Ill. 3)	for rear hydraulics, single-acting	**Position**
Hydraulic lever (23 Ill. 3)	for hydraulic coupling, rear, single-acting	H = Lift
Hydraulic lever (24 Ill. 3)	for hydraulic coupling, front, double-acting	S = Lower (floating position)
Hydraulic lever (25 Ill. 3)	for hydraulic coupling, front double-acting	D = Press
Hydraulic lever (26 Ill. 3)	for front hydraulic double-acting	0 = Neutral
Locking device (3 Ill. 4)	to the right:	only lever (22 Ill. 3) for rear hydraulics is locked.
Locking device (3 Ill. 4)	to the left:	All hydraulic levers are locked
Locking device (3 Ill. 4)	in centre position:	All hydraulic levers are free.

Driver seat (1 Ill. 6)
The seat is adjustable for height, lengthwise, and for weight.
The height of the seat can be adjusted to 3 different positions:
by pulling it up on both sides (7 Ill. 6). If, in its upper position, the seat is pulled up once more, it will go back and lock in its lowest position.

The backrest is adjusted on the notched knob (4 Ill. 6).
Lengthwise adjustment is obtained by pulling lever (5 Ill. 6) upwards.
The springing is adjusted with the adjustment lever (6 Ill. 6) i. e. the driver's weight can be read off the sightglass (3 Ill. 5) in front

Soft springing = Turn lever to the left
Hard springing = Turn lever to the right


Never adjust the seat whilst driving (danger of accidents).

D) Preparations for taking tractor into service

During the first 20 hours of operation, the engine should neither run without any load on it, nor under full load.

Before each use, check your tractor for traffic and operation safety. Check up on the following:

a) Read off fuel supply on indicator (11 Ill. 3)
b) Engine oil level (K_1 Ill. 16)
(Filler opening E_1 Ill. 13)

} Never run tank and oil sump dry.
(Before opening the tank for refilling thoroughly clean cover and around it.

Quality grades of engine oils

High-grade HD engine oils must be used for engine lubrication. Commonly used are the API specifications MIL-L-2104C. Approved oils: API CD/SE, or CD/SF.

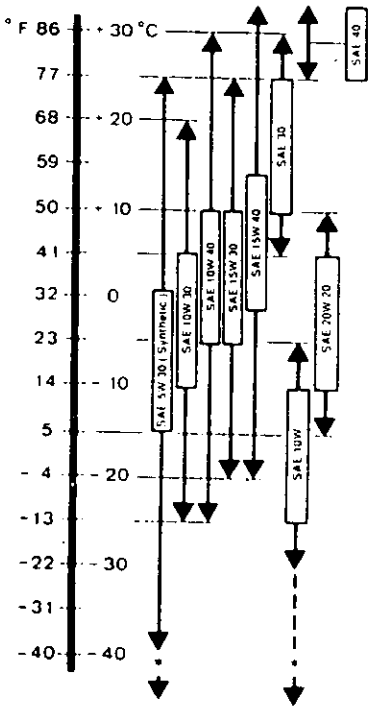
As the viscosity of lube oil is greatly influenced by the temperature, the choice of SAE-grade should be governed by the ambient temperature at engine site. Optimum operating behaviour will be attained if you take as a guide the oil viscosity diagram appearing alongside.

Should temperatures temporarily fall below the limits of SAE-grade selected, this will merely affect the starting performance, but cause no damage to the engine. The application limits should not be exceeded over a prolonged period,in order to keep wear down to a minimum.

Oil changes dictated by the time of year can be avoided by using multi-grade oils. Multi-grade oils - particularly light-flowing oils - also tend to reduce fuel consumption.

List of recommended oils see on page 116.

To avoid damages by inferior lube oils we recommend to only use oil brands of the reknown oil companies, and to stick to the initially chosen brand.



* with engine pre-heating only

Diesel fuels

a) **Quality-grade of diesel fuels**

Always use branded grades of diesel fuel having a sulphur content of 0,5 %. In case of a higher sulphur content, the periods between oil changes must be shortened.

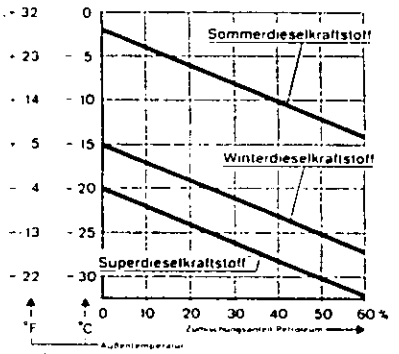
The following fuel specifications are approved:

- DIN 51601
- NATO Codes F 54, F 75 and F 76
- BS 2869 A 1 and A 2
  (in case of A 2, note sulphur content)
- ASTM D 975-81: 1-D and 2-D
- W-F-800a: DF-1 and DF-2

b) **Winter fuel**

At low temperatures waxing may occur and clog the fuel system, thus causing operational troubles. In the case of ambient temperatures below 0° C use winter-grade diesel fuel (down to −15° C). Normally this is offered at filling stations in good time before the cold season starts. Diesel fuel with additives („Super diesel") is frequently also on sale for use at temperatures down to −20°.

- At temperatures as low as −15° C to −20° C, kerosene should be mixed with the diesel fuel.
  The necessary percentages for admixing are to be seen in the diagram at right.



If summer diesel fuel has to be used at temperatures below 0° C, up to 60 % kerosene can be admixed (see diagram).

In most cases, adequate resistance to cold is also attained by adding a flow improver (fuel additive).

Prepare the blend in the tank itself! Fill in the necessary amount of kerosene first, then add diesel fuel.

c) Unscrew the radiator cover (E_W Ill. 13) in order to check the cooling water level.
d) All tyres must have the prescribed pressure (see page 77).
e) Check lighting system.
f) Check trailer hitch.

Be careful when engine is warm. Cooling liquid is pressurized.
Slacken radiator lid at first slightly to release pressure.
Danger of explosion if the air pressure of the tyres is too high.

During a short trial run check:
a) Steering system, resp. the high-pressure hoses from steering to steering cylinder.
b) Driving and parking brakes.
Remedy any fault at once!

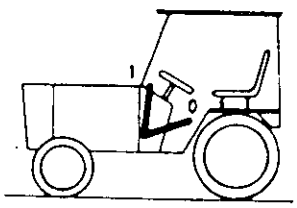
Instructions for the use of

a) **Yellow flashlight (rotating beacon · special accessory)**
Pay attention to your local regulations. Generally, the use of the yellow flashlight is only permissible when cleaning streets or working in immediate vicinity of streets and roads.

b) **Headbeam (supplementary headlight)**
These beams must only be used if the effect of the normal headlights is limited by front-mounted implements.
Rear beams must not be used when driving on public roads.

E) Taking the tractor into service

1. Preparation
Move the regulation lever for driving speed (1 III. 4) to neutral (0) position (lowest position).



Before starting the engine move hand lever to „0" position.

General instructions for starting
The starter button must never be used for more than 10 seconds.
Never actuate the starter with running engine.
Wait 5–10 seconds before repeating the starting procedure.

⚠ **Never let the tractor run in enclosed space!** (Danger of poisoning).

Starting with **normal temperatures**

a) Move manual speed regulator (13 III. 3) to approx. half load.
b) Put ignition key into ignition lock (14 III. 3) and turn to the right, position 1, until charging control lamp (5 III. 3) and oil pressure control lamp (6 III. 3) will light up.
c) Pull out knob of glow starter switch (15 III. 3) as far as stop.
Note: the driving speed regulator lever (1 III. 4) must be in neutral positon (0), otherwise the engine cannot be started. As soon as the engine springs to life, release the glow starter switch. Charging control lamp and oil pressure control lamp must go out as soon as the engine runs.
d) Adjust the desired engine speed with the manual speed regulator (13 III. 3) resp. with the foot pedal speed regulator (20 III. 3).

Starting with low temperatures

a) Move manual speed regulator to approx. half load.

b) Put ignition key into ignition lock, and turn to the right, position 1, until the charging control lamp (5 Ill. 3) and the oil pressure control lamp (6 Ill. 3) will light up.

c) Pull out knob of glow starter switch to 1st notch and hold (preglow) for approx. 1 minute, i. e. until the starter pilot lamp (7 Ill. 3) lights up, then entirely pull out button as far as stop.
Note: The driving speed regulator lever must be in neutral position (0), otherwise the engine cannot be started. The engine is turned through the starter. As soon as engine springs to life, release glow starter switch. Charging control lamp and oil pressure control lamp must go out as soon as the engine runs. Adjust the desired engine speed by means of the manual speed regulator, resp. with the speed regulator foot pedal.

d) Adjust the desired engine speed with the manual speed regulator (13 Ill. 3) resp. with the foot pedal speed regulator (20 Ill. 3).

2. Driving

Before starting and operating the tractor adjust outside mirror to get a clear view forward and rear.

Starting and driving

a) Move speed regulator to neutral position.

b) Move selector lever for forward/reverse drive (34 Ill. 3) to forward driving position.

c) By means of the speed regulator lever (32 Ill. 3) adjust the desired speed.
Driving on the road = push lever entirely forward (regulate the driving speed with the foot pedal – automatic regulation)
For working = adjust the lever until, with the right engine speed, resp. P.T.O. speed, the desired driving speed is obtained.

d) Engage four-wheel drive when necessary.

e) Increase engine speed, resp. regulate with the manual regulator, or by means of the foot pedal.

Attention: With the INCH pedal (27 Ill. 3) the driving speed can be reduced down to emergency stop.

Instructions for starting on slopes

Pay attention to points a – c above, increase engine speed, then open the parking brake (37 Ill. 3). The hand brake pilot light (8 Ill. 3) must go out.

Stopping the tractor
Throttle the engine down to idling speed.
Entirely depress the INCH pedal (27 Ill. 3). If necessary, use the driving brake (21 Ill. 3) in addition to the INCH pedal. Move the speed regulator lever (32 Ill. 3) to position 0 (neutral).
Actuate parking, resp. hand brake (37 Ill. 3). Hand brake pilot light (8 Ill. 3) lights up.

Shutting-off the engine
Move manual speed regulator (13 Ill. 3) to neutral position. Pull button (16 Ill. 3) until the engine shuts down. Move ignition key to neutral (0) position and remove.
If the engine has been under extreme load let it idle for 1—2 minutes before shutting it off (for temperature regulation).

⚠ Secure the tractor from rolling off. On slopes use wedges under the wheels.

Instructions for taking the tractor in tow
1. The front frame is provided with a towing hook.
2. Remove the plastic cover (4 Ill. 4) (on left side as viewed in driving direction).
3. Move driving direction lever (34 Ill. 3) to forward position.
4. Unhook Bowden cable on reversing lever.
5. Use a socket wrench to slacken with approx. 2 turns on the hexagon the high-pressure valves for forward drive (1 Ill. 33), and for reversing (2 Ill. 33). (If no socket wrench is available, the highpressure valve can be soackened from below with a straight 22 mm ring socket).
   By this procedure the drive axle is uncoupled.
6. Since the engine is shut-off, steering needs more force.

Attention: Take care to retighten the high-pressure valves with the torque wrench set to break at 70 Nm (7,0 mkp) before taking the machine back to service.

Driving on slopes
Driving on slopes requires increased attention, and all safety precautions must be carefully observed.

⚠ **Never shut-off the engine for driving downhill.**

Adjustment of the track width
Adjustment of the track width see on pages 78/79.
The arrow on the tyres must always point in forward driving direction. Track widths, air pressure, wheel weights see page 77.
Check the wheel nuts regularly, specially after each change of wheels.

Stationary operation
If used stationary for some longer time, e. g. for driving a water pump, take care that the machine stands on level ground.

Adjustment of the track width
Track width adjustment see on page 78. The arrow on the tyre must always point in driving direction. Adjustment ranges for air pressure and wheel weights see on page 79. Regularly check wheel nuts for tightness, specially after each wheel change.

- When working on the wheels take care that the tractor is in a safe position and has been secured from rolling off.
- When working underneath the hitched-up tractor no persons must sit on the machine.
- Tyres must be principally repaired by skilled persons and with suitable tools.

Hydraulic power lift, front and rear
Hydraulic selector lever (26 Ill. 3) for operation of front hydraulics
Hydraulic selector lever (22 Ill. 3) for operation of rear hydraulics
Position H = Lift
Position 0 = Neutral (implement remains locked in instant height)
Position S = Lower (floating position)
Position D = Press

Rear power lift
Horizontal adjustment on the adjustable drawbar (1 Ill. 12). The handle nut (2 Ill. 12) prevents unintional twisting. The length of the upper link arm (8 Ill. 12) can be changed. Here the handle nut also serves to prevent twisting. The lateral range of swing is adjusted on the buckle of the tension chains (10 Ill. 12).

- Before mounting implements on the three-point linkage move the hydraulic selector levers (26 III. 3 and 22 III. 3) to „0" position.
- Be careful when attaching implements. Danger of accidents.
- For driging on roads tighten the chains. Implements must be in lifted position and secured against lowering by means of the control valve of the mechanical lock. Before leaving the tractor lower the implements to the ground. Remove the ignition key!
- Persons must not stand between tractor and implement before having made sure that the tractor has been secured from rolling off!
- When taking bends with trailed or mounted implements, consider overhand and swing of the implement.

Note: Operate the hydraulic system only of the oil is warm. If necessary let the engine run for a few moments. Otherwise the system may not correctly function.

- **During working breaks prncipally release the hydraulic cylinder, i.e. lower the implements to the ground. (Danger of accidents).**
- **The hydraulic pump continuously running, the lever must be only used for moving implements.**
- **When using implements pay attention to your local safety regulat-ons.**
- For transport the mechanical locking device must be engaged (3 III. 4).
- Whilst dirving 4 litres hydraulic oil can be taken from the hydraulic tank.

During stationary operation 11 litres can be taken (e. g. for operating an hydraulic dumper.

Note: Prior to driving again with the machine check the frunction of the hydrostatic steering by turning the steering wheel several times in both directions. (Thereby the system is automatically entilated).

Note: Before fitting hydraulic clutches plug and coupling must be cleaned.

- When mounting rear or front implements make sure that the axle load is sufficient. Steering and braking ability must be maintained.
- Fit ballast weights (wheel weights) in the wheel rims!
- Select front, rear and wheel weights so that the permissible axle loads and the permissible total weight, including the implement, are not exceeded.

F) Service and Maintenance

(See also attached Service Chart).

Please remenber:

Good service will pay! Oil change and lubrication carried out in time is cheaper than consequential repairs! Before lubricating, take care to clean lubrication nipples, oil filler, and oil drain screws and their vicinity.

- Before starting service and repair jobs shut-off the engine.
- When working on the engine principally disconnect the battery minus pole, and remove the ignition key.
- Secure the stationary tractor from rolling of.
- Repair and maintenance jobs completed refit all protections.

Service kit, Ref. No. 117 361

comprising: Ref. No.	Description	
019 468	Replacement filter for engine	
117 363	Gasket	
023 264	Replacement filter for fuel tank	
116 849	Suction filter for hydraulic tank	
116 837	Gasket for hydraulic tank	
110 248	Filter cartridge for pressure filter	
154 096	Filter cartridge (adjustment plate)	(Ø45 x 90 up to production No. 199 67 39)
157 468	Filter cartridge (adjustment plate)	(Ø47 x 84 up to production No. 199 67 40)
023 280	V-belt	
020 606	Filter cartridge (air filter)	

1. Engine

Check the oil level daily with engine off and tractor standing on level ground. Before measuring wipe the diprod (K1 Ill. 16) with a clean cloth. The correct oil level is between minimum and maximum mark. Top-up at once if the oil level has reached minimum mark. **Attention!** Never fill in more oil then prescribed.

a) Oil change

For the first time after 20 hours of operation, thereafter every 150 hours. With the tractor standing on level ground, open oil drain screw (A1 Ill. 19). Drain oil. (To ensure easy draining of the old oil, the engine should be still warm. Clean oil drain screw.

Be careful when draining hot oil-danger of burning.

Replacing filter cartridge (6 Ill. 14)
Unscrew worn filter and throw it away. For loosening tight filter use an aid. Remove any remnants of gaskets from the connection plate. Oil gasket of the new filter and firmly screw it in **by hand.**

Attention! With every oil change replace the filter cartridge.
Part Ref. No. of replacement filter cartridge: **019 468 (M & H. W 920)**

Refit oil drain screw (A_1 Ill. 19) in oil sump and tighten well. Then fill in fresh oil through the oil filler plug (E_1 Ill. 13). (Make sure everything is absolutely clean)! After the oil change make a short trial run. Thereby observe oil pressure pilot light (6 Ill. 3). Check filter for tightness. Then check oil level with the engine off.

Filling quantity

P 70 P 70 A 9,0 Litres (incl. filter)	Use only clean HD oil for diesel engines of the right grade and viscosity. List of recommended engine oils see on page 116			
	Below -10^{o} C	HD SAE 10 W oil	or	SAE 10-W 30
	Up to $+25^{o}$ C	HD SAE 20 oil	or	SAE 10-W 30
	Above $+25^{o}$ C	HD SAE 30 oil	or	SAE 10-W 30

b) **Dry-air filter with electrical service indicator** (1 Ill. 18)
The dry-air filter consists of a cyclone preselector and a micro-filter cartridge forming, in one housing, a highly effective unit. Guide blades between filter cartridge and casing cause the sucked in dust air to swirl and to be led around the filter cartridge so that, along the wall of the housing, the dust is carried out through a dust outlet valve.

SERVICE
Dust outlet valve (2 Ill. 18)
Remove baked dust by pressing the valve together now and then.

Filter cartridge
Servicing time: The filter cartridge must be serviced if it is blocked up to the maximum permissible value which is indicated by the pilot lamp (4 Ill. 3) lighting up.

Replacement of filter cartridge:
Shutt-off the engine. Slacken the 2 screws M8 (2 Ill. 25) and remove the cover (1 Ill. 25). Slacken wing nut (3 Ill. 18). Turn out hexagon nut (1 Ill. 20) and take off dirty cartridge. Use a wet cloth to clean the filter housing. Specially the contact surface of the cartridge. Be careful not to let any dust enter the engine via the clean-air duct!

Fastest and cleanest service is to replace the dirty cartridge by a new one.

Ref. No. of MANN-micro-top-cartridge:	C 13 114/4
Holder Ref. No.:	020 606

Assemble the new, or the cleaned filter cartridge, in reverse order.

Attention! The dust outlet valve must point outwards (2 Ill. 18).

Cleaning of the filter cartridge
If necessary the air filter cartridge can be cleaned.

a) **By blowing out with compressed air**
For this purpose, the compressed air pistol should be provided with a tube with a 90° bent at its end. The tube should reach down to the filter bottom. By moving the tube up and down in the cartridge blow it out with compressed air from inside out until there will be no dust left.

b) **By washing**
The filter cartridges can be washed up to 6 times. For washing air filter cartridges of paper we recommend the MANN detergent 053.
This detergent has proved ideal for the cleaning of filter cartridges because it will remove any kind of dirt, such as soot etc. Instead of the MANN 053 detergent, we can also recommend the comparable industrial detergent P3RST.

Washing solution
Mix approx. 20 g detergent 053 (approx. 3 spoons full) with 1 litre water (1:50). Put the detergent into the water and stir.

Since the detergent may have an adverse effect on your skin we recommend to wear rubber gloves when cleaning the filter cartridge. At least, protect your hands with a lotion. Should the solution get into your eyes wash them out with clear water at once.

Washing

Note: If the dirt in the cartridge consists of loose dust we recommend to blow it out as described above before washing it.

1. Soak cartridge for ten minutes in handwarm washing solution (approx. 40° C).
2. Move it in the washing solution for 5 minutes.
3. Rinse it in clear water (also under the tab, or with a hose, but not with a sharp jet) until the water comes off clean.
4. Thoroughly shake the cartridge, put it in a dust-free room and let it dry with the clean-air side covered up. Never let the cartridge dry in temperatures of more than 60° C. When re-using the cartridge it must be absolutely dry.

c) Provisionally by beating

Only in emergency cases where blowing out or washing is not possible.
With its front side, put the cartridge on a firm base and beat it until the dust will come off.
Use no force. Avoid damages to the cartridge.

⚠ Never use petrol or easily inflammable detergents for cleaning the air filter. A fire or explosion might be the consequence.

Caution: Never let the engine run without air filter. (Premature wear)!

Every time the filter cartridge has been cleaned, before reassembly check it for damages of the paper bellows. To do so insert a lamp into the centre tube of the cartridge. The bellows is damaged if light shines through. Cartridges with damaged paper bellows or gaskets must not be re-used, but must be replaced by new ones.

We recommend not to wash filter cartridges of paper more than three times.
At any rate they should be replaced after two years.

Cooling system

Check cooling water level daily when the engine is cold.

⚠ Be careful if engine is still warm. Open radiator cover (E_W Ill. 13) only as far as stop to release excess pressure. Only then open cover entirely.

The cooling agent thermometer has 3 colour fields.
White: Engine temperature too low. **Green:** Normal operation temperature. **Red:** Engine overheats, must be shut-off at once.

Overheating of the cooling water may have the following reasons: radiator dirty, insufficient cooling water, defective water pump, thermostat does not respond, V-belt loose or torn.
In danger of frost add anti-freeze agent, resp. have cooling concentration checked. The anti-freeze agent „Glysantin" (effective up to -30^{o} C -22^{o} F - is filled in from the manufacturers all the year round.

Cleaning the radiator
Remove insects and dust deposits by blowing with compressed air through the radiator shutter from the engine side. For coarse cleaning remove the front grate by opening the two sealing screws (3 Ill. 10) and sweep the front of the radiator shutter.

Cleaning the oil cooler (2 Ill. 24)
Daily, before use, remove the radiator shutter and check oil cooler (2 Ill. 24) for contamination. If the oil cooler cores are dirty, the cooler must be cleaned under any circumstances.

In special cases where the radiator will get dirty fast (e. g. with a frontmounted grass cutter) the plastic radiator shutter can be removed by opening the 2 screws (3 Ill. 10) for replacement by a punched metal shutter (2 Ill. 34). In case of clogging the metal shutter can be cleaned easily and fast.

Draining the cooling water open drain cock (Aw Ill. 14) on engine.

V-belt
The V-belt (4 Ill. 15) has the right tension if it can be pressed in with a finger approx. 7 mm between the two belt pulleys of the fan and the dynamo (2 Ill. 15). To retighten slacken screw (3 Ill. 15) on the adjustment bracket, and the screw of the dynamo fixture. Press dynamo outwards until the V-belt has the right tension. Retighten the screws. V-belts which are too tight will cause premature wear of the bearings. Loose V-belts will cause the belt pulleys and the bearings to run hot. Besides, the dynamo capacity will be insufficient.

Note: New V-belts tend to get loose after a few hours of operation. We therefore recommend to check the V-belt tension after only a few hours, and to retighten if necessary.

Valve tolerance (Have principally adjusted by a skilled mechanic)!
After the first 20 hours of operation check the valve tolerance with a feeler gauge (in cold condition for inlet and exhaust valve 0,18 – 0,22 mm), thereafter, under normal operation conditions, every 300 hours.

Adjustment of the valve tolerance

To adjust the valves remove the valve cover (3 Ill. 17) by slackening the 4 fixing nuts (1 Ill. 15).
The sequence of the cylinders as listed is as viewed from the radiator side. Direction of revolution of the engine is clockwise, as viewed on the V-belt pulley of the crankshaft.
Adjustment is carried out in the sequence of their ignition, resp. the piston must be in top dead centre at the end of the compression stroke.
Sequence of ignitions:
P 70 engine type V 1702 B / V 1902 B = 1 3 4 2

V 1702 B / V 1902 B

Adjusting cylinder I valves: at intersection of cylinder 4 exhaust and inlet valve.
Adjusting cylinder II valves: at intersection of cylinder 3 exhaust and inlet valve.
Adjusting cylinder III valves: at intersection of cylinder 2 exhaust and inlet valve.
Adjusting cylinder IV valves: at intersection of cylinder 1 exhaust and inlet valve.

It must be possible to „only just" insert the feeler gauge (F Ill. 17) in the gap between rocker arm and valve on outlet, as well as on exhaust valve. If this gap is too narrow, or too wide, slacken counter nut (1 Ill. 17) and reset the adjustment screw (2 Ill. 17) so that, with the counter nut retightened, the feeler gauge can be pulled out without resistance.

Injection nozzles (5 Ill. 15)
After every 600 hours of operation dismantle, clean, and have checked with a Bosch test device (test pressure 137 bar).

Replacing the fuel filter (1 Ill. 22)
The fuel filter cannot be cleaned.
Part Ref. No. of the filter insert: 023 264 (Bosch No. 14574 34062).
Depending on the degree of dirt, the fuel filter, assembled between engine and radiator, must be replaced after approx. 300 hours of operation.

Note: To open the fuel filter, we recommend to use a filter spanner.

Note: For better demonstration, the photo was made without the water hose fitted.

Ventilating the fuel system

Ventilating the fuel system is necessary:

a) after the fuel tank has been run empty,

b) if the fuel pipes have been slackened, or dismantled, i. e. if air has entered the pipes on the suction chamber of the fuel injection pump (e. g. by running the fuel tank empty).

Ventilation after tank was run empty

Open ventilation cock (5 Ill. 14). Use your left hand to pull, through the side window of the right door, the starter knob (15 Ill. 3), and with your right hand, press decompression lever (11 Ill. 14) upwards. Let engine turn through the starter for approx. 30 seconds, then release decompression lever (11 Ill. 14). Then the engine will start at once. Shut ventilation cock (5 Ill. 14).

c) **When changing the fuel filter** (The fuel tank must be entirely full)
Slacken ventilation screw (2 Ill. 22) on upper section of fuel filter, and open ventilation cock (5 Ill. 14) of fuel injection pump. If fuel comes out free from bubbles, shut the ventilation screw.

Gearbox

Lubrication nipple

Grease all lubrication nipples (S) after every 150 hours of operation, resp. every month.
Under unfavourable operation conditions, and in tropical areas, the nipples should be greased in shorter intervals.

Note: The lubrication grease must contain no resin, no acid, or other detrimental agents. Ball bearing grease must not be used for lubrication. We recommend lithium-saponified multi-purpose grease with a penetration rate of 260 to 290.

Examples:

SKF	MOBIL	BP	ESSO	ELF	ARAL	SHELL	VALVOLINE	TEXACO
Wälzerol FM	Mobil grease MP	BP Energrease LS 2	EXXON Multi-purpose grease BEACON 2	ELF Multi 2 ELF Rolexa 2 ELF Epexa 2	Multi-purpose grease Longtime grease H	SHELL Retinax A	VALVOLINE LB - 2	Multifak 20

Instructions for oil change
For every oil change the oil must have operation temperature, and the tractor must stand on level ground.

Gearbox rear axles
Change the oil for the first time after 150 hours of operation, thereafter every 1500 hours. Unscrew the drain screws (A_2 Ill. 12), and clean in diesel oil, then drain the oil. Then refit screw and take care that sealing is correct.
Turn out filler screw (E_2 Ill. 30) and pour in 14 litres SAE 80 gear oil.
(Fit filler screw so that its ventilation bore will point forward in driving direction.
Control the oil level on sight glass (K_2 Ill. 31).

Attention when filling!
The filling quantity of 14 litres **must** be maintained.

If the tractor is used stationary for some time (e. g. to drive a water pump) the machine must be put on level ground.

Hydraulic system

Variable capacity hydraulic pump and hydro motor (constant motor)
The variable capacity hydraulic pump, and the hydro motor are service-free.

Service work concentrates itself on the system, where the oil must be changed and the filter replaced in order to keep the system clean.
If the system is carefully supervised, and regularly serviced, premature failures and repairs can be avoided.

- The hydraulic system is under high pressure. When searching for leakage points use a suitable aid so as to avoid being hurt.
- When working on the hydraulic system it is a must to shut-off the engine and to secure the tractor from rolling off.
- Before working on the hydraulic system release the pressure and lower mounted implements.
- When connecting hydraulic cylinders and motors pay attention to correct connection of the hydraulic hoses!
  Interchanged hoses will cause reverse function (e. g. lifting/lowering). Danger of accidents!
- Regularly check the hydraulic hoses for damages and age. If necessary replace.

Oil level in the hydraulic system
Check, resp. fill in oil only with shut-off engine, and with retracted piston rods of the working cylinder. After removing the filling screw (E_H Ill. 25) the oil level must be up to the bottom of the filling strainer. For checking – remove the filling strainer.

Hydraulic oil change
1. Hydraulic oil change after **500** hours of operation.
2. Hydraulic oil change after **1500** hours.
3. Thereafter every 1500 hours, or once a year, independent of operation hours. With the tractor on level ground, unscrew oil drain screw (A_H Ill. 20). (Change the oil whilst the tractor is still warm from operation. Before refilling, clean the oil tank of oil deposits.
   Clean oil drain screw, refit, and tighten well.
   Attention: With every hydraulic oil change replace the suction filter (2 Ill. 27).

Filling quantity: **P 70 = 16 litres**
P 70 A = 18 litres
List of recommended hydraulic oils see on page 117.

Dismantling the suction filter (2 Ill. 27)
1. The hydraulic system must be pressureless, and the lift arms lowered.
2. Disconnect hydraulic hoses from hydraulic coupling (1 Ill. 26).
3. Unscrew cover (1 Ill. 27) by slackening the 12 screws (2 Ill. 26).

4. Use an SW 19 spanner to unscrew suction filter (2 Ill. 27) on the hexagon of (3 Ill. 27).
5. Remove suction filter (2 Ill. 27) from hexagon, and throw it away.

Part Ref. No. of suction filter: 116 849.

Reassembling suction filter

1. Assemble new filter insert on hexagon.
2. Screw filter with hexagon screw into hydraulic system and tighten with SW 19 spanner.
3. If the gasket has not been damaged in assembly, refit cover (1 Ill. 27). (Otherwise replace gasket).
4. Wash ventilation filter, resp. filler screw (4 Ill. 27) in diesel oil.
5. Pour in through filler socket (EH Ill. 25) hydraulic oil Mobil DTE 16, or, in temperatures of -10^{o} C Mobil DTE 13. (See list of recommended hydraulic oils on page 117.
   Filling quantity P 70 = 16,0 litres / P 70 A = 18,0 litres.

Passage filter (5 Ill. 13)

Replace the passage filter for the first time after 30 hours of operation, thereafter every 300 hours.

Dismantling the passage filter

1. The hydraulic system must be pressureless, and the lift arms lowered.
2. Use an SW 19 spanner to unscrew the filter housing (1 Ill. 28) from the quadrant.
   To facilitate dismantling and reassembly of the filter we recommend to unhook the gas rods from the ES bolt (near 3 Ill. 14):.
3. Pull off paper insert (2 Ill. 28) downwards, and throw it away.
4. Wash filter housing in diesel fuel.
5. Check O-ring and shim of upper section, and, if damaged, replace.

Part Ref. No. of filter element: 110 248.

Reassembling the passage filter

1. Slide new paper insert onto the outlet socket.
2. Slide filter housing carefully over the paper insert, screw it into the upper section as far as stop, and tighten it with spanner SW 19.
3. Start engine and let it idle to check the filter for tightness. Then, if necessary, top-up to bottom of filler strainer (E4 Ill. 25) with hydraulic oil Mobil DTE 16. (Consult list of recommended oils on page 114).

Hydraulic filter and variable capacity hydraulic pump (1 Ill. 29)

Change the filter element for the first time after 20 hours of operation.
Change the filter element for the second time after 500 hours of operation
Thereafter with every oil change.

In addition replace the filter element as soon as, with the gearbox warm from operation, a low pressure of less then 0,8 bar develops.

Note: Use only filter elements with a filter fineness of 10 µm.

Removing the filter element

1. The engine must be shut-off.
2. Use an SW 27 spanner to unscrew the filter housing (1 Ill. 29) from the hexagon.
3. Pull paper insert off to the rear and throw it away.
4. Wash the filter housing in diesel oil.
5. Check whether O-ring and shim of the upper section are in order (replace damaged parts).

Part Ref. No. of filter element: 154 096.

Reassembling the filter element

1. Slide new paper insert onto the outlet socket.
2. Slide filter housing carefully over the paper insert, screw it into upper section as far as stop, and tighten with spanner SW 24.
3. Start engine, let it idle, and check filter for tightness.
   Then, if necessary, on filler plug (E_4 Ill. 25) top-up to the bottom of the filling strainer with hydraulic oil Mobil DTE 16 (see list of recommended oils page 116).

Brakes

- Before each use check function of the brakes.
- The braking systems must regularly undergo a thorough inspection.
- The braking system can only be repaired and adjusted by accredited workshops, or brake service stations.

After the first 20 hours of operation check the function of the brakes and, if necessary, readjust. Thereafter, check function of the brakes every time before taking the vehicle into use, and readjust if necessary. The brakes should be principally adjusted by an accredited workshop. The parking brake must be adjusted on both sides of the wheels by means of setnut (32 Ill. 31). The driving brake is adjusted by means of setnut (1 Ill. 32), also on both wheel sides.

Note: For readjusting the brake, the corresponding wheel must be lifted with a jack. Turn the adjustment screws so that the wheel can still be slightly turned.

Check the brake fluid every 150 hours of operation
(The brake fluid container (EB III. 13) must always be full to upper mark).

- **Use only recommended brake fluids - renew every 2 years!**
- Be very careful when handling brake fluids (poisonous and caustic)!
- Never spill the brake fluid, but put it properly away.

Checking and adjusting the toe-in
When carrying out the services at 20, resp. 300 operation hours, check the toe-in for 3–6 mm and, if necessary, have it adjusted in the workshop.

Lighting (electrical system)
Have the lighting system, including the pilot lamps on the dashboard, checked by a skilled mechanic every 150 hours of operation. (Wiring diagram III. 39).

Lighting of front- and rear-mounted implements
Pay attention to your local regulations for the lighting of implements.
III. 40 shows which set of lamps is required in connection with rear-mounted implements:
(1) 3-piece set of lamps
(2) Set of position lamps (3-piece lamp set must be available).
If the headlights are covered by front-mounted implements, the auxiliary pair of headlights (8 III. 9) must be put on.

Note for removing the battery
Slacken 2 hexagon nuts SW 13 (1 III. 35) and slide battery to the left (as viewed in driving direction) as far as stop.

Battery maintenance
Regular control of battery and acid level is very important. The acid level must be approx. 15 mm above the plates. Vaporization will cause the acid level to sink so that it must be regularly refilled (with distilled water).
Check every 4, during the warm seasons every 2 weeks. At that occasion we also recommend to check battery and connection terminals for tight fit. Specially for the sake of the starter there must be a good, grease and oxidation-free connection between battery terminals and pole bands so that there will be sufficient flow of current. To avoid oxidation thoroughly clean the terminals, particularly their lower sides, and grease them with anti-acid grease.

Starting in winter necessitates an entirely loaded battery because cold starting in winter requires much more energy than starting in the warm season.
If the tractor is used for short periods only, charging the battery with the generator is insufficient, and it should be recharged with a charging unit from time to time.

Attention! To avoid short circuits, which may cause the battery to be destroyed, take care to always disconnect first the ground cable from the minus pole. When reconnecting, first connect the positive lead with the positive pole.

- When working on the electrical system principally disconnect battery negative pole!
- Make sure to connect accurately. First positive pole, then negative pole. For disconnecting proceed vice versa.
- Be careful with battery gases. Explosive!
- Avoid sparks and open flames in the viciinity of the battery!
- For changing the battery remove battery cover to aoid accumulation of highly explosive gas !
- Be careful when handling battery acids - caustic!
- Use only recommended fuses. The electrical system will be destroyed if too strong fuses are used. Danger of fire!
- Always cover up the positive pole. Danger of explosion in case of mass connection!

Instructions for three-phase generators

1. The generator must not be actuated before all terminals have been connected. Otherwise the rectifiers will be damaged.
2. If built-in batteries are charged, first disconnect the battery cables.
3. Never carry out any welding jobs on engine and tractor before having disconnected the generator (damages of the rectifiers).
4. Always disconnect the battery before connecting or disconnecting any test units.
5. Never start the engine (generator) before having connected the battery.

Danfoss-Orbitrol Steering

a) After every 150 hours of operation (under extreme operation conditions daily) check the high-pressure hoses of the steering cylinder for damage (e. g. friction). If necessary replace. Steering cylinder and mechanical connection elements should also be controlled.
Attention! The high-pressure hoses have been tested with a pressure of 510 bar (5 times their operation pressure). Therefore it is important to replace them by original ones.

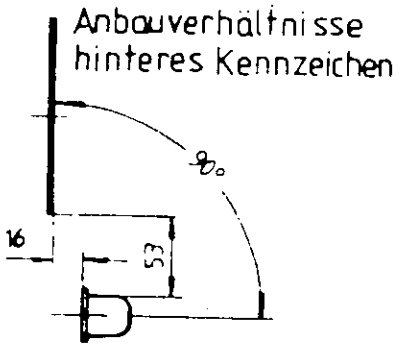
b) In case of oil leak, look for the leakage point and remedy the damage. At any rete check hoses and connection armatures. Repairs of the hydrostatic steering system must be left to the skilled mechanics of Danfoss, or specially trained staff.

If the hydraulic pump fails the steering can still be operated for a short time, however needs increased steering force. Have failure at once repaired by an accredited workshop!

Cleaning the fresh-air filter (1 Ill. 11)
The intervals for cleaning the fresh-air filter depend on dust development.
However, it should be cleaned at least once a year. Slacken hexagon nut (3 Ill. 11). Remove filter cover (1 Ill. 11) with filter insert. Blow out filter, or if very dirty, wash it. Refit the filter.

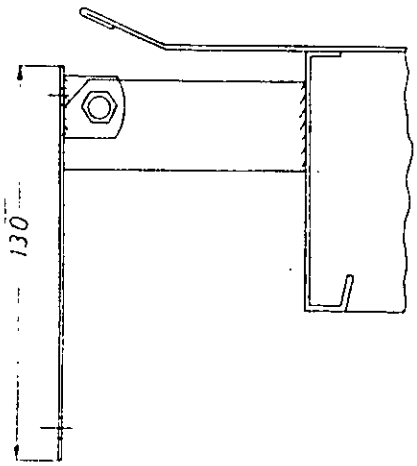
G) Assembly position for rear licence plate

The illustration shows how the rear licence plate must be fitted in order to comply with German regulations.



Assembly position for front licence plate

The illustration shows how the front licence plate must be fitted in order to comply with German regulations.



H) Transporting persons

For transporting persons the tractor must be provided with suitable seats. Pay attention to your local regulations for transporting persons.

I) How to value a tractor

Motorcars are normally valued by driven kilometers, and their age. Tractors are valued by operation hours, and age with the following guiding principles:

1 hour of operation	= 50 driven kilometers	300 hours of operation	= 15000 driven kilometers
10 hours of operation	= 500 driven kilometers	600 hours of operation	= 30000 driven kilometers
150 hours of operation	= 7500 driven kilometers	1500 hours of operation	= 75000 driven kilometers.

K) Tightening torques for screw connections

Hex. screws and studs	M 6	M 8	M 10	M 12	M 14	M 16	M 18	M 20
Unmarked screws	8,5 Nm (0,85 mkp)	19,5 Nm (1,95 mkp)	42 Nm (4,2 mkp)	70 Nm (7,0 mkp)	120 Nm (12,0 mkp)	185 Nm (18,5 mkp)	270 Nm (27,0 mkp)	380 Nm (38,0 mkp)
Screw quality 8.8 resp.7	10,5 Nm (1,0 mkp)	25 Nm (2,5 mkp)	49 Nm (4,9 mkp)	86 Nm (8,6 mkp)	135 Nm (13,5 mkp)	210 Nm (21,0 mkp)	300 Nm (30,0 mkp)	425 Nm (42,5 mkp)
Screw quality 10.9 resp. 9	13,2 Nm (1,32 mkp)	39 Nm (3,9 mkp)	69 Nm (6,9 mkp)	117 Nm (11,7 mkp)	190 Nm (19,0 mkp)	295 Nm (29,5 mkp)	430 Nm (43,0 mkp)	610 Nm (61,0 mkp)

In the engine the screw quality is marked with 7 and with 9.

Cylinder head screws	=	76 Nm (7,6 mkp)
High-pressure valves	=	70 Nm (7,0 mkp)
Hexagon screws M 10 (servostat on steering support)	=	49 Nm (4,9 mkp)
Tension screws for hydraulic control valves	=	25 Nm (2,5 mkp)
Axles on gearbox M 10	=	49 Nm (4,9 mkp)
Attachment rail for trailer hitch M 14	=	135 Nm (13,5 mkp)
Front wheel bearings	=	50 Nm (5,0 mkp)
Wheel fixture front and rear	=	215 Nm (21,5 mkp)

L) Special accessories

Front shutter (punched)
Part Ref. No. 117 680

Arm rests
Part Ref. No. 117 210

Backrest elongation
Part Ref. No. 117 209

Front P.T.O.
Type 4662-60.

Rear working lights
Type 5234-88

Rotating beacon
Type 4634-72

Frontloader (detachable)

Type 4629-1	=	Frontloader with 2 single-acting lift cylinders
Type 4628-2	=	Frontloader with 2 double-acting lift cylinders
Type 4628-74	=	Snow blade (1200 mm wide)
Type 4628-75	=	Earth blade (1000 mm wide)

Additionally required: rear weight of approx. 300 kg

Technical data:

Lifting height:	approx. 2500 mm on the edge of the lifter arm
Lifting capacity:	approx. 3000 N (300 kg)

Operation:

The frontloader is operated via the control valves (24 and 25 Ill. 3) of the front hydraulic couplings.

Operation lever for frontloader arm	=	lever (24 Ill. 3)
Operation lever for tilting device	=	lever (25 Ill. 3)

Transport lock (3 Ill. 3)

Lock (3 Ill. 4) to the right:	Locks only lever (22 Ill. 3) for rear hydraulics
Lock (3 Ill. 4) to the left:	Locks all hydraulic levers
Lock (3 Ill. 4) in centre position:	All hydraulic levers unlocked

Detaching the frontloader:

The frontloader arms with accessories can be easily and fast detached without the aid of tools.

1. Put the loader arms on level ground and lower them with the hydraulic lever (24 Ill. 3).
2. Take the props (3 Ill. 36a) out of their fixture (4 Ill. 36a) and put them on the ground. Thereby use locking resp. adjustment lever (5 Ill. 36a).
   By pushing the adjustment lever (5 Ill. 36a) the height of the props can be accurately adjusted.
3. Remove the mounting pins (1 Ill. 36a) of the mounting plate on both sides.
4. By means of the hydraulic lever (24 Ill. 3) lift the frontloader arms from the mounting support (4 Ill. 36b) so that the tractor can be reversed.
   Attention! Do not yet reverse! Shut-off engine.
5. Using the adjustment lever (2 Ill. 36b), readjust the props (2 Ill. 36b) so that they will touch ground on both sides.

6. Disconnect the hydraulic pipes (2 Ill. 36a) on the left and right tear-off couplings and put them on the loader arms so that they will not get damaged when the tractor is reversed. (See 3 Ill. 36b).
7. Remove the tractor from the frontloader by reversing. (See Ill. 36c)
8. Assemble the frontloader on the tractor in reverse order.

When driving and working with the front loader pay attention to the following:

1. Use a ballast weight or an implement in the 3-point linkage.
   This will increase stability and take the load off the front axle.
2. **With lifted load** do not sharply reverse or brake - never drive faster than circumstances will permit.
   When driving on slopes and when taking bends lower the load and drive slowly.
3. Never use loads to one side of the loader arm in order to prevent the unit from turning over sideways.
4. **For work with the frontloader put the tractor on widest possible track.**
   This will further increase stability.
5. For driving on public roads the loader implement must be empty, the loader arms must be in entirely lifted position, and the lever of the control valve must be secured. Unintentional lowering of the front-loader can have severe consequences.
6. Do not operate the front loader whilst persons are within its range.
7. When interrupting work, lower the implement.
8. For repairs of implement or hydraulic system lower the loader completely so that it will be pressure-less, and shut-off the engine.
9. Never use the frontloader as an „assembly platform", or for transporting persons.
10. Before starting the engine when the front loader is lowered, take care to put the control valve to neutral position.

Service

Grease the lubrication nipples (S Ill. 36a) of the bearing points once a week.

M) List of recommended engine oils and Lubricants

Brands of oil which comply with the US. Military Specification MIL-2104C after API quality CD/SE.

	Single-grade oils	Multi-grade oils	Lubricants
	MIL-L-2104C API CD/SE	MIL-L-2104C API CD/SE - CE/SF/SG	Penetrationszahl 260 - 290
ARAL	Aral Turboral Motor Oel	Aral Multi Turboral SAE 15 W-40	Mehrzweckfett Langzeitfett H
BAYWA	BAYWA HD Superior	BAYWA Super 2000 CD BAYWA HDC 1540	Mehrzweckfett Spezialfett FLM
BP	BP Vanellus C3	BP Vanellus Multigrad SAE 15 W-40	BP Energrease LS 2 Mehrzweckfett LS
CASTROL	CASTROL Deusol CRD	CASTROL Deusol RX Super	CASTROL Spheerol AP 2
ESSO	Essolube XD 3 +	ESSOLUBE XD3 + 15 W-40 Multigrade MOTORENÖL MHC 15 W-40	EXXON Mehrzweckfett BEACON 2
ELF	ELF Performance 3 C	ELF Multi Performance 3 C 15 W-40 ELF Presti Diesel	ELF Multi 2 ELF Rolexa 2 ELF Epexa 2
FINA	Fina Kappa Plus	Fina Kappa Plus Multigrade Motor Oil SAE 15 W-40	Marson L 2
FUCHS	Renolin HD Superior Titan Universal HD	Titan Universal HD 1540 Renolin HD Superior 1540	Renolit MP, Renolit Adhesiv 2 Renolit FLM 2
MOBIL	Mobil Delvac 1310, 1320, 1330, 1350	Mobil Delvac Super 15 W-40	Mobilgrease MP
SHELL	Shell Rimula X	Shell Myrina, Shell Myrina T Shell Rimula X Multigrad	SHELL Retinax A
TEXACO	Ursa Super LA	Ursa Super LA Multigrade SAE 15 W-40	Multifak 20
VALVOLINE	Valvoline HDS Topflite C-3	Valvoline HDS Topflite XRC	VALVOLINE LB 2
VEEDOL	Veedol Cadol HD Ultra	Veedol Dieselstar SAE 15 W-40	–

We de not claim this list to be complete. Oils of other companies can be used too, provided they comply with our regulations.

N) List of recommended hydraulic and gear oils

HYDRAULIC OILS:			GEAR OILS:
	below -10^{o} C	-10^{o} C + 40^{o} C	MIL-L2105 resp. API-GL4
ISO-Viscosity class HLP (HM) HV	VG 32 HV	VG 68 HV	SAE 80
ARAL	Vitam HF 32	–	EP SAE 80
AVIA	AVILUB HVI 32	AVILUB HVI 68	–
BP	BP Bartran HV 32	BP Bartran HV 68	EP SAE 80
CASTROL	HYSPIN AWH 32	HYSPIN AWH 68	HYPOY 80
CHEVRON	EP Hydr. Oil 32 HV	EP Hydr. Oil 68 HV	–
ESSO	UNIVIS J 32	UNIVIS N 56	GP-D 80
ELF	Hydrelf 32	Hydrelf 68	Tranself EP
FINA	HYDRAN HV 32	HYDRAN HV 68	PONTONIC N SAE 80 W
FUCHS	RENOLIN MR 520	RENOLIN MR 1030	RENOGEAR MP 80
OPTIMOL	HYDO MV 5035	HYDO MV 5065	–
MOBIL	DTE 13	DTE 16	MOBILUBE GX 80 W-A
SHELL 2)	Tellus Öl T 32	Tellus Öl T 68	Spirax MA 80 W
TEXACO	Rando Oil HD AZ-32	Rando Oil HD CZ-68	Geartex EP-A SAE 80 W
VALVOLINE	VALVOLINE ETC-25	VALVOLINE ETC-35	VALVOLINE X-18 SAE 80
HD Engine oils1)	SAE 10 W 30 can be used all year round.		

1) after API-CC resp. MIL-L-2104B and MIL-L-46152.

Note: For temperatures over 0^{o} C only oils of ISO viscosity class „VG 68" are permitted.

O) Trouble-shooting engine

Failure	Possible Cause	Remedy
Engine does not start	Fuel tank empty	Fill tank and bleed fuel pipes
	Fuel filter clogged - in winter because of paraffin.	Replace fuel filter. Use winter fuel.
	Fuel pipes leaking	Check all pipe connections for tightness and tighten screw unions
Engine starts badly	Battery capacity insufficient, battery terminals loose and oxydize. Starter turns slowly. In winter: engine oil not sufficiently viscous.	Have battery checked. Clean battery terminals, tighten them, and treat them with an acid-free grease. Use an engine oil which is in conformity with outside temperatures.
	Fuel feed insufficient. Fuel system blocked-up by paraffin.	Replace fuel filter. Check pipe connections for tightness and tighten screw unions. If required by outside temperatures use winter fuel.
	Coarse leaks on piston and cylinder head.	Have checked by a skilled mechanic.
Engine works irregularly and performs badly	Fuel feed insufficient.	Replace fuel filter. Check pipe connections for tightness and tighten screw unions.
	Air filter system dirty.	Clean air filter system.
	Relief valve of fuel injection pump not correctly responding.	Have checked by a skilled mechanic.
	Valve tolerance not in order.	Have valve tolerance adjusted.
	Valve spring broken.	Have valve spring replaced
	Nozzle needle jammed	Have checked by a skilled mechanic.
Exhaus smokes heavily light (oil smoke) dark (fuel)	Oil level in engine too high	Drain oil to upper dipstick mark.
	Bad combustion owing to burnt or broken combustion rings, or incorrect valve adjustment.	Have combustion rings and pistons checked by a skilled mechanic. Adjust valve tolerance correctly.
	Injection incorrectly timed.	Have checked by a skilled mechanic.
	Air filter system dirty.	Clean air filter system.

Failure	Possible Cause	Remedy
Engine overheats	V-belt loose or torn	Check V-belt tension. Replace V-belts.
	Radiator fins blocked	Clean radiator fins with compressed air (from inside out)
	Thermostat defective	Replace thermostat
	Air filter dirty	Clean air filter
	Injection nozzles defective	Have checked by a skilled mechanic
	Fuel pump delivery not accurately adjusted	Have correctly adjusted by a skilled mechanic
No oil pressure in engine. Oil pressure pilot lamp lights up	Leaks in the lubrication system.	Check unions of oil pipe and lubrication oil filter for tightness, and tighten.
	Crankshaft bearings have too much tolerance.	Otherwise, consult a skilled mechanic.
	Oil pressure switch defective, or fault of the electric cables.	
Charging control lamp lights up during operation	V-belt loose or torn.	Check V-belt tension, replace V-belt.
	Battery not charged by generator.	Have checked by a skilled mechanic.
Charging control lamp does not light up before starting	Bad cable connection, bulbs defective, battery discharged	Tighten battery terminals Check cable connections Have battery checked
Oil pressure control lamp does not light up before starting	see above, or oil pressure switch possibly defective.	see above

P) Trouble-shooting - Hydrostatic Drive

Failure	Possible Cause	Remedy
1.1 No forward drive, no reverse drive	a) Pump adjustment lever loose on adjustment bolt of HW control valve. (Shifting does not function).	Tighten clamping screw of pump adjustment lever and adjust selector rods.
	b) Pump adjustment lever does not swing out. Draw spring of driving speed selector lever (forward/reverse shift) broken.	Assemble new draw spring in driving direction lever (forward/reverse shift).
	c) Oil level in hydraulic tank too low.	Top-up hydraulic oil.
	d) Suction pipe bent or blocked-up.	Check arrangement of suction pipe and whether it is blocked-up.
	e) Suction filter very dirty.	Wash suction filter of the tank.
	f) Oil motor defective (too much leak oil).	Replace oil motor.
	g) Drive from oil motor to differential interrupted.	Check rear gearbox drive.
	h) High-pressure limitation valves in tow position.	Turn in high-pressure limitation valves so that they will tightly fit.
	i) Drive from diesel engine to variable capacity hydraulic pump interrupted.	Check drive.
1.2 Drive functions only in one direction	a) The pump adjustment lever functions in one direction only.	Check selector rods. (For basic adjustment see Instructions No. 117681)
	b) High-pressure valve for forward or reverse drive dirty, or incorrectly adjusted.	Check the high-pressure valves for forward and reverse drive, resp. replace the corresponding valve.
1.3 Tractor starts only with a high engine speed, or stops in neutral.	a) DAcontrol cartridge dirty, or incorrectly adjusted.	Adjust or, if necessary replace DA control cartridge.
	b) Oil foams heavily.	Insufficient, or incorrect oil in hydraulic tank.
	c) Suction pipe not airtight.	Check suction pipe.
	d) Suction filter dirty.	Wash suction filter of tank.
	e) Oil insufficiently viscous, hence overheating of the oil.	Change hydraulic oil. (See list of recommended oils page 117).

Failure	Possible Cause	Remedy
1.4 Insuffient tractive power in both directions, or bad acceleration.	a) High-pressure valves dirty, or incorrectly adjusted.	Check high-pressure valves. (If, after adjustment, or replacement of the high-pressure valves, a pressure of 300-400 bar is not reached, check supply pump pressure valve.
	b) Supply pump pressure valve dirty.	Check, resp. replace supply pump pressure valve.
	c) Speed of diesel engine too low, or capacity insufficient.	Check diesel engine.
	d) Oil temperature too high	Pay attention to paragraph 1.5, oil temperature.
	e) Oil motor defective (too much leak oil)	Replace oil motor.
	f) Speed of diesel engine sinks under load.	Check diesel engine.
	g) Supply pump defective.	Replace supply pump, or complete variable capacity hydraulic pump.
	h) Insufficient flow in suction filter and suction pipe.	Check suction filter and suction pipe.
1.5 Heating of the oil, or noise in the hydraulic system	a) Oil level too low.	Top-up hydraulic oil.
	b) Wrong hydraulic oil.	Use only recommended hydraulic oils. See list of recommended hydraulic oils page 117.
	c) Cooling fins of oil cooler dirty.	Clean oil cooler.
	d) Bypass valve of the hydraulic tank not closing. Oil not passing the oil cooler.	Check bypass valve.
	e) Oil motor defective (too much leak oil).	Replace oil motor.
	f) Air sucked in by suction pipe.	Check suction pipe and seal it.
	g) Drive is overcharged (uphill with too heavy trailer load) so that the oil passes the high-pressure limitation valves.	Do not overload machine.
	h) Suction filter dirty.	Wash suction filter of tank.
	i) Suction pipe blocked-up.	Check suction pipe.
1.6 Indicated driving speed is not reached, or exceeded when reversing.	a) Selector rods incorrectly adjusted.	Check adjustment of selector rods.
	b) Reversing speed too high.	Check stop buffers for reverse drive. The max. speed of 15 km/h must not be exceeded.

Q) Trouble-shooting - Hydraulic system and steering

Failure	Possible cause	Remedy
Power lift or hydraulic cylinder not responding even though the selector valve can be normally moved: no pressure building up. (Steering works normal)	Pressure limitation valve jammed by foreign body.	Dismantle pressure limitation plate LA 06 PB-M06 and clean it. Do not change the pressure adjustment!
Insufficient lift of hydraulics	Pressure adjustment insufficient. Lack of oil.	Use pressure gauge to adjust pressure (175 bar) Top-up with recommended brand of oil.
Operation pressure is only reached with high speed.	Pump defective.	Replace pump
Manual control valve jammed	Distortions Dirt	Tension screws tightened unevenly, or too much. Torque wrench set to break at 25 Nm (2,5 mkp). Dismantle valve and clean
Oil overheats fast - system fights excess pressure (engine under load)	Selector valve distorted. Selector lever remains locked in working position (does not return to neutral automatically) Cylinder on stop Implement not connected, but selector lever in working position (Hydraulic coupling).	Remove distortions, as above. Move valve to neutral (free circulation) Move valve to neutral (free circulation)
Oil foams	Leak in suction range.	Check pipe connections and, if necessary, seal them.
Hydraulic system performs too slow, whistling noise.	Insufficient oil. Too low temperatures.	Top-up as prescribed. Use the proper oil (Hydraulic oil Mobil DTE 16
Steering does not work	Flow distributor dirty Pressure relief valve in hydraulic steering not closing	Dismantle flow distributor of steering and clean. Have dismantled and cleaned by an accredited workshop
Lost motion of steering when counter-steering fast	Leak in return flow hose of steering.	Seal return flow hose.

These instructions only apply to valve arrangements which comply with our diagrams, or those agreed upon with Messrs. Bucher.

R) Illustrations - figures - description

Ill.	Figure	Description
1		Engine number
2		Chassis number and type plate
3	1	Pilot lamp for tractor flashlight
	2	Pilot lamp for trailer flashlight
	3	Pilot lamp for headlight
	4	Pilot light for air filter service
	5	Pilot light for battery
	6	Pilot light for engine oil
	7	Pilot light for preglow
	8	Pilot light for parking brake
	9	Remote thermometer for hydraulic oil
	10	Tractormeter with hour meter
	11	Fuel supply indicator
	12	Socket
	13	Manual speed regulator
	14	Ignition switch
	15	Glow starter switch
	16	Engine shut-off knob
	17	Cover for window-cleaning device
	18	Knob for window-cleaning device
	19	Tank for window cleaning device
	20	Foot pedal for speed adjustment
	21	Pedal for driving brake
	22	Selector lever for rear hydraulics
	23	Selector lever for control valve, single-acting rear
	24	Selector lever for control valve, double-acting, front
	25	Selector lever for hydraulic control valve, front, double-acting
	26	Selector lever for front hydraulic, double-acting
	27	INCH pedal
	28	Multi-purpose switch (flashlights, horn, headlight)
	29	Warning light switch
	30	Speedometer
	31	Remote thermometer for engine temperature
	32	Adjustment lever for driving speed
3	33	Heating and ventilation nozzles
	34	Selector lever for forward and reverse drive
	35	Clutch lever for P.T.O. clutch shifting under load
	36	P.T.O. selector lever for front or centre P.T.O.
	37	Hand brake lever
4	1	Adjustment lever for driving speed
	2	Fuses in tractor:
	a	Fuse-warning light switch
	b	Fuse-parking light RH/instrument panel lighting
	c	Fuse-parking light LH
	d	Fuse-dimming light/auxiliary headlights
	e	Fuse-headlights
	f	Fuse-regulator switch, horn, speedometer, remote thermometer, air filter pilot light, hydr. remote thermometer, battery pilot light, fuel supply indicator, parking brake pilot light
	g	Flashlight
	h	Brake light/Window cleaning device
	3	Locking device for hydraulic lever
	4	Plastic bushing (access to high-pressure valves)
5	1	Control lever for diff-lock
	2	Selector lever for rear P.T.O.
	3	Sight glass for driver weight adjustment
6	1	Driver seat
	2	Armrests } special equipment
	3	Backrest elongation } special equipment
	4	Lever for backrest adjustment
	5	Lever for lengthwise adjustment of seat
	6	Driver seat adjustment lever
	7	Height adjustment
	8	Fixture for traffic warning sign
	9	Tool box
	10	P.T.O. clutch lever

Ill.	Figure	Description
7	1	Switch for rotating beacon
	2	Switch for windscreen wiper
	3	Switch for heating fan
	4	Switch for auxiliary pair of headlights
	5	Cloth peg
	6	Heating and ventilation nozzles
8	1	Locking device for roof ventilation flap
	2	Knob for roof ventilation flap
	3	Fuses - cab
	a	Rotating beacon
	b	Windscreen wiper
	c	Heating fan
	d	Interior lighting
	4	Sunshade
	5	Twist button shut-off valve for heating
	6	Interior lighting
9	1	Lift arms for instant coupling of front lift
	2	Mounting bracket for upper lift arm
	3	Headlights
	4	Knurl screw for engine bonnet
	5	Spray nozzle for window washing device
	6	Outside mirror
	7	Limitation and flashlights
	8	Auxiliary pair of headlights
	9	Headlights
	E_W	Filler opening for cooling water
	E_H	Filler opening for hydraulic oil
10	1	Front P.T.O.
	2	Hydraulic cylinder for front lift
	3	Knurl screw for radiator handle
	4	Headlight shade
	5	Lubrication nipple
11	1	Suction filter for heating and ventilation fan
	2	Rotating beacon
12	1	Adjustable drawrod
	2	Handle nut
	3	Rear reflector
	4	Three-chamber rear light

Ill.	Figure	Description
12	5	Plug for trailer lighting
	6	Plug for hydraulic oil, double-acting
	7	Trailer hitch
	8	Upper link arm
	9	Licence plate retainer
	10	Licence plate light
	11	Rear P.T.O.
	12	Rigid drawbar
	13	Tension chain with turnbuckle
	14	Cat. I lower link arm
	15	Field bar
	A_2	Oil drain screw for gearbox and axles
13	1	Hydraulic coupling, double-acting
	2	Hydraulic coupling, double-acting
	3	Fuel supply indicator
	4	Battery
	5	Hydraulic pressure filter
	6	Regulator
	E_1	Filling opening for engine oil
	E_W	Filling opening for cooling water
	E_D	Filling opening for diesel fuel
	E_H	Filling opening for hydraulic oil
	E_B	Brake fluid
14	1	Hydraulic pump
	2	Fuel injection pump
	3	Gas rods resp. ES-bolt
	4	Fuel hose
	5	Fuel-ventilation screw
	6	Engine oil filter
	7	Horn
	8	Regulator for injection pump
	9	Cooling water thermostat
	10	Glow plugs
	11	Decompression lever
15	1	Lock nuts for valve cover
	2	Three-phase generator
	3	Screw for adjustment bracket
	4	V-belt
	5	Injection nozzles

Ill.	Figure	Description
16	K_1	Oil diprod for engine oil
17	1	Counter nut
	2	Set screw for valve tolerance
	3	Valve cover
	F	Feeler gauge
	MW	Assembly tool
18	1	Air filter
	2	Outlet valve
	3	Wing nut
	A_H	Drain plug-hydraulic oil
19	1	Steering cylinder
	2	Toe rod
	3	Clamping clips for toe rod
	4	Front P.T.O.
	A_1	Drain plug for engine oil
	S	Lubrication nipple
20	1	Hexagon nut
	2	Filter cartridge,
	A_H	Oil drain screw for hydraulic oil
21	1	Cover
	2	Filter cartridge
22	1	Fuel filter
	2	Ventilation screw for fuel
	3	Brake light switch
23	1	Fuel filter
24	1	Headlight adjustment screws
	2	Oil cooler for hydraulic oil
25	1	Cover
	2	Screws for air filter cover
	3	Air induction elbow
	4	Connection hose air filter-intake manifold
	5	Hydraulic coupling, double-acting
	E_H	Filler opening and ventilation for hydraulic oil
26	1	Hydraulic hose
	2	M8 screws
27	1	Filling cover for hydraulic oil
	2	Suction filter for hydraulic oil
	3	Hexagon screw
	4	Sealing cover with ventilation

Ill.	Figure	Description
28	1	Filter housing for pressure filter-hydraulics
	2	Filter element for pressure filter-hydraulics
29	1	Hydraulic filter for variable capacity hydraulic pump
30	E_2	Filler opening for gear oil
31	1	Constant motor
	2	Adjustment nut for handbrake
	K_2	Sightglass for gear oil
32	1	Adjustment screw for operation brake
	2	Assembly tool
33	1	High-pressure valve for forward drive
	2	High-pressure valve for reverse drive
	3	Hexagon nut
34	1	Knurl screw for radiator shutter
	2	Strainer
35	1	Fixing screws for battery
	2	Fuel supply indicator
	3	Oil pressure control switch
	E_D	Filler opening - diesel fuel
36		
36a	1	Mounting pin for frontloader arm
	2	Hydraulic pipe for frontloader arm
	3	Prop for front loader arm
	4	Fixture for prop
	5	Adjustment lever for prop
	S	Grease nipple
36b	1	Prop
	2	Adjustment lever
	3	Hydraulic pipes
	4	Frontloader arm with mounting plate
	5	Front loader support
36c		Frontloader, detached
37	1	Opening point
	2	Jack
	3	Assembly support
38	1	Opening point
	2	Jack
39		Wiring diagram
40		Examples for the lighting of implements

Ill.	Figure	Description
43	1-8	Inter-axle attachment parts Type 4669-76
44	1	Limit stop
	2	Hook
	3	Fixing point for P 70 four-wheel drive
	4	Fixing point for P 70 without four-wheel drive
45	1	Edge guard
	2	Hexagon screw
	3	Fixing plate
	4	Hexagon screw M12x30
	5	Hexagon screw M16x50
	6	Mounting frame
	7	Rubber buffer
	8	Hexagon nut
46	1	Fixture
	2	Bent screw
	3	Frame
	4	Rubber buffer
	5	Hexagon nut
	6	Cardan shaft half
47	1	Fixing screw
	2	Wheel
	3	Cardan shaft half
48	1	Assembly aid
	2	Round iron
49	1	Bolt
	2	Frame
	3	Instant coupling
	4	Safety lever
50	1	Ring screw
	2	Transverse steering arm
	3	Fixture
	4	Depth limitation chain
	5	Hexagon screw
	6	Hexagon nut
51	1	Stop screw
	2	Wheel
	3	Spacer ring
	4	Dowel pin
53	1	Hydraulic hose
	2	Connection screw
	3	Throttle valve
54	1	Cardan shaft Type 4662-62
	2-18	Front attachment part Type 4669-72

Ill.	Figure	Description
55	1-11	Attachment of front-mounted mower Type 4669-5
	S	Lubrication nipple
57	1	Assembly aid (wood)
	2	Spanner
	3	Studs
	S	Edge cutter
58		Lower side of rear-dischraging mower Type 4663-14
59	1	Tension chain
and	2	Draw spring
60	3	Tension screw of draw spring
	4	Tension screw of draw spring
	5	Carrier plate
	6	Hexagon screw
	7	V-belt
	8	V-belt
	9	Cover plate
	E u.K	Filler and control screw for gear oil
	S	Lubrication nipole
61	1	Front P.T.O. Type 4662-60
62	1	Instant coupling
	2	Upper steering arm
	3	Crank for height adjustment of broom
	4	Hexagon nut
	5	End shim
	6	Spray nozzles
	7	Selector lever for broom speed
	I	Slow speed (100 min^{-1})
	II	Fast speed (300 min^{-1})
63	1	Instant coupling
	2	Upper link arm
	3	Deflectors (2 pieces)
	4	Gas pressure cylinder
	5	Height adjustment crank for slide shoes
	6	Mounting bracket of gas pressure cylinder
64	22	Hydraulic selector lever for rear hydraulics
	23	Hydraulic selector lever for rear control valve
	24	Hydraulic selector lever for front control valve
	25	Hydraulic selector lever for front control valve
	26	Hydraulic lever for front lift
	34	Selector lever forward and reverse
	35	P.T.O. operation lever
	36	Operation lever for front P.T.O.

for all other operation and control elements see text under Ill. 3

Explanation of positions on wiring diagram III. 39

1 Headlight right
2 Headlight left
3 Three-phase generator
4 Regulator switch
5 Glow plugs
6 Temperature indicator for hydrostat oil
7 Air filter pilot, switch
8 Battery
9 Cooling water-temperature indicator
10 Oil pressure indicator
11 Starter
12 Horn
13 Starter safety switch
14 Filling unit
15 Wiper motor
16 Auxiliary headlight left
17 Position flashlight left
18 Flasher pilot light
19 Electric remote thermometer
20 Flasher pilot light f. trailer
21 Headlight pilot light
22 Speedometer
23 Air filter pilot light
24 Tractormeter
25 Battery pilot light
26 Engine oil pilot light
27 Preglow pilot light
28 Fuel supply indicator
29 Parking brake pilot light
30 2-pole socket
31 Auxiliary headlight right
32 Position flaslight right
33 Resistor
34 Ignition switch
35 Glow starter switch
36 Fuse box - tractor
37 Signal switch dimming-flaslight
38 Warning light switch
39 Heating fan motor
40 Traffic light
41 Inductive pick-up
42 Brake rear light left
43 Licence plate light
44 Rotating beacon
45 Control switch-parking brake
46 Socket, 7-pole
47 Brake light switch
48 Fuse bos - cab
49 Switch for rotating beacon
50 Switch for windscreen wiper
51 Switch for heating fan motor
52 Change-over switch - Dimming light/auxil. headlights
53 Brake-rear-flaslight right
54 Hydraulic remote thermometer
55 Pump for windscreen washing dev.
56 Switch for windscreen washing dev.
57 Interior lighting - cab

Functions of the verous fuses

Tractor:

Fuse 1 = Warning light switch
Fuse 2 = Parking light right/instrument lighting
Fuse 3 = Parking light left
Fuse 4 = Dimming light (Auxiliary headlights)
Fuse 5 = Headlight
Fuse 6 = Horn, regulator switch, tachometer, remote thermometer, battery pilot light, engine oil pilot light, parking brake control light, fuel supply indicator
Fuse 7 = Flashlight
Fuse 8 = Brake light/window washing device, 2-pole socket

Cab:

Fuse 1 = Rotating beacon
Fuse 2 =Windscreen wiper
Fuse 3 = Heating fan
Fuse 4 = Interior lighting

Beispiele:

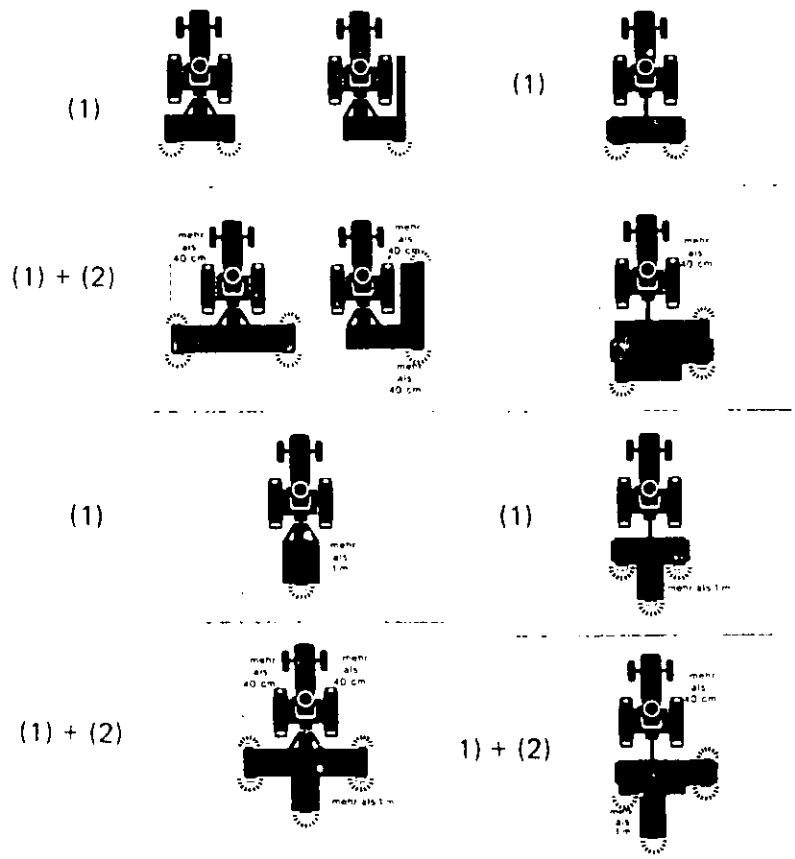


Abb. 40

S) Attachment of inter-axle and front-mounted mowers

Scythe-lawn mower Type 4669-5 (basic unit with side discharge for inter-axle and front-mounting)

Scythe-lawn mower Type 4669-14 (basic unit with rear discharge for front-mounting only)

Technical data:
Working width of scythe-lawn mower 1,50 m (overall width 1,70 m)

Engine speed	P.T.O. speed	Propeller knife speed	Rotating speed
2250 rpm	1000 rpm	2460 rpm	69 m/s

Oil in gearbox: 0,35 l SAE 80 gear oil

Mowing capacity at 1,5 m working width:

Driving speed	Mowing capacity
5 km/h	6100 m^2/h
8 km/h	10000 m^2/h

Since practical conditions have not been considered in the table, the mowing capacity results from working width multiplied with driving speed. 20 % have been deducted for overlapping and turning.

Inter-axle mounting of scythe-lawn mower
Equipment:
Type 4669-5 scythe-lawn mower (side discharge)
Type 4669-74 inter-axle mounting parts

Note: Inter-axle mounting of the scythe-lawn mower is not possible in connection with Trelleborg tyres 4.00-15,5 Type 4136-6.

ENGLISH

Ill. 43

The Inter-axle mounting kit type 4669-79 comprises the following parts:

Ill. No.	Description	Size	Pcs.	Ref. No.	Remarks
1	Cardan shaft	Lz 280 mm	1	117551	
2	Attachment frame	Welded part	1	126523	
	Hook, right	Welded part	1	126526	
	Hook, left	Welded part	1	126516	**Assembly:**
	Pressure spring	9,5 x 27 x 1,6	2	014447	For P 70 A: 3x Ill. 44
	Latch ass.	Welded part	2	117496	For P 70 without
	Cylindrical stud	10 M 6 x 28	2	010321	4WD: 4x Ill. 44
	Tension pin DIN 1481	10 x 32	2	010613	
	Hexagon screw DIN 933	M14 x 40	4	011554	
	Lock washer	B14	4	010066	
	Stop	20 x 20 x 155	2	126518	
	Hexagon screw DIN 933	M10 x 35	4	011531	Can be omitted for P 70
	Lock washer DIN 137	B10 x 18	4	010064	without 4WD
3	Buffer	50 x 17 (M10)	2	014822	
	Hexagon nut DIN 934	M10	2	011585	Adjust buffers so that
4	Hexagon screw DIN 933	M16 x 50	2	011 564	the mower is horizontal
	Shim DIN 125	A17	2	010 048	in lifted position.
	Bush	22 x 3 x 27	2	024292	
5	Fixing plate left		1	126519	For assembling the fixing
	Fixing plate right		1	126520	plates (5 Ill. 43) the
	Hexagon srew DIN 933	M12 x 30	4	011540	edge guard (1 Ill. 45) of
	Shim DIN 125		4	010047	the cover plate must be
	Lock washer DIN 127	A12	4	010057	shortened by 175 mm.
6	Transv. steering arm with chain		1	126512	
	Ring screw		1	120645	
	Hexagon nut DIN 934	M12	2	011590	
	Shims DIN 125	A13	2	010047	Assemble on RH
	Fixture	Welded part	1	126513	tractor frame (Ill. 46)
	Buffer	50 x 17 (M10)	1	014822	
	Hexagon nut DIN 934	M10	1	011585	
	Bent screw	M12	1	026656	

Ill. No.	Dexcription	Size	Pcs.	Ref. No.	Remarks
	Shim DIN 125	A13	1	010047	
	Hexagon nut DIN 934	M12	1	011590	
6	Hexagon screw	M10 x 25	1	011527	
	Hexagon nut	M10	1	011585	Assemble on RH tractor frame (Ill. 46)
	Shim DIN 125	A10.5	1	010046	
	Dowel pin		2	010467	
	Shackle DIN 82101	Size 0.25	1	012043	
	Hexagon screw DIN 933	M10 x 30	1	011530	
	Shim DIN 125	A 10,5	4	010046	Assemble on scythe lawn mover
	Hexagon nut DIN 934	M 10	1	011585	
7	Fixture f. transp. lock	Welded part	2	120639	
	Spacer ring	Rubber 25x6x17	2	014175	
	Shim	20 x 45 x 4	2	015663	
	Lock washer DIN137	B 16	2	010067	
	Dowel pin	DIN 11023	2	010467	
8	Throttle valve	0,8 mm	1	024294	Standard equipment from chassis No. 460 50 424

Assembling the inter-axle attachment parts Type 4669-76 on scythe lawn mower Type 4669-5

1. Pre-assemble mounting frame as shown on Ill. 43 and 44.

   a) Assemble in the hook the cylindrical pin, pressure spring and tension pin.

   b) Screw the complete catch hook (instant coupling) to mounting frame as follows:

   P 70 without 4WD = screw catch hook into upper bore at 4 on Ill. 44

   P 70 with 4WD = screw catch hook into lower bore at 3 Ill. 44
   In case of P 70 A one limit stop each (1 Ill. 44) must be fitted together with hexagon screws M10 x 35 and lock washers as shown on Ill. 44.

c) Turn rubber buffer (3 Ill. 43) with hexagon nut M10 into the frame as shown on Ill. 43. After adjustment secure with hexagon nut. Make the adjustment so that the mower is horizontal in lifted position.

2. Remove cover plate in order to shorten edge guard (1 Ill. 45) by 175 mm on both sides in the region of the fixing plates (3 Ill. 45).
3. Remove hexagon screw (2 Ill. 45) of gearbox fixture. As shown on Ill. 45 assemble fixing plates (3 Ill. 45) with both sides on the gearbox fixture using 2 each screws M12 x 30 (4 Ill. 45), shims and lock washers. Refit and tighten the 2 hexagon screws (2 Ill. 45).
4. Use one each hexagon screw (5 Ill. 45), M16 x 50, shim A 12 and bush 22 x 3x27 to screw the premounted frame (6 Ill. 45) lefthand and righthand to the fixing plate.
5. Instead of the available screw, assemble ring screw (1 Ill. 50) with 2 hexagon screws (6 Ill. 50) M12 and 2 shims A 13 as shown on Ill. 50. Hook transverse steering arm (2 Ill. 50) into the ring screw and secure with dowel pin.
6. Assemble hexagon screw M10 x 30 (5 Ill. 50) in existing bore of mower housing, using 4 shims M12 and 2 shims A13 as shown on Ill. 50.
   Then hook depth limitation chain (4 Ill. 50) into shackle and secure.
7. As shown on Ill. 46, assemble on RH tractor frame the fixture (1 Ill. 46), with assembled rubber buffer and hexagon screw, for the transverse link arm, using screw (2 Ill. 46), shim A13 and hexagon nut M12. In addition, fit the fixture in the upper bore by means of hexagon screw M10 x 25 (3 Ill. 46), shim, and hexagon nut.
8. Fit cardan shaft half (6 Ill. 46) on tractor side.

Attachment of the inter-axle scythe-lawn mower on the tractor

1. Support front lift with a piece of wood (1 Ill. 48), or round iron (2 Ill. 48) or similar (as shown on Ill. 48).
2. Lift front section of tractor by means of front hydraulics. **Shut-off engine and lock hydraulic valve.**
3. Turn front wheels first to the right, then to the left (Ill. 47).

4. From one side push the mower between the axles of the P 70 (Ill. 47 and 48).
   Note: Lock screws (1 Ill. 47) must be slackened in order to permit all 4 wheels (2 Ill. 47) to swivel.
5. First slide the cardan shaft half onto the other half, already mounted on the tractor side, then slide it onto the mower side until the slide pin will catch. Sling retaining chain around the tractor frame, or other suitable place, and secure.
6. Operate front lift to lower the tractor, remove assembly aid (1 Ill. 48) and, with running engine, entirely lift the front hydraulic by means of the control valve.
7. Shut-off the engine. Use your right hand to pull up the attachment frame(2 Ill. 49) and, use your left hand, to simultaneously position the mower so that the instant coupling (3 Ill. 49) can be hooked into the mounting pin (1 Ill. 49). Then secure instant coupling with the safety lever (4 Ill. 49).
8. Bring rear mower wheels (1 Ill. 5) in forward position (as shown on Ill. 51) and tighten lock screw (2 Ill. 51).

Assembling the transport device

1. Fit safety lever (1 Ill. 52) on existing mounting pin of the tractor frame.
2. Also fit rubber spacer ring (2 Ill. 52) and shim 20 x 45 x 4 (3 Ill. 52) and secure with dowel pin (4 Ill. 52).
   Note: The supplied lock washers B 16 are only used if the elasticity of the rubber spacer ring is insufficient, i. e. if the transport safety lever will not remain in its upper position.

Locking the inter-axle mower, resp. applying the safety lock

1. Entirely lift inter-axle mower
2. Push locking lever downwards and let it catch in the lifting device of the mower.

Operation of the inter-axle mower

Lifting and lowering of the inter-axle mower

Lift, resp. lower the scythe lawn mower by means of the hydraulic lever (26 Ill. 64). Whilst mowing retain the hydraulic lever in position S III.64 (floating position).

Engaging the inter-axle mower

1. Pull clutch lever (10 Ill. 65) upwards = „AUS" (off).
2. Push in P.T.O. selector lever (36 Ill. 64) for front P.T.O.
3. Press clutch lever (10 Ill. 65) smoothly downwards = „EIN" (on).
   Pay attention to instructions for engaging the P.T.O. on page 88.

Adjusting of the cutting height

The cutting height is adjusted by using spacer shims (3 Ill. 51) on the 4 mower wheels.

Attachment of front-mounted scythe lawn mower

Version:	Scythe lawn mower	Type 4669-14	(rear discharge)
or	Scythe lawn mower	Type 4669-5	(side discharge)
	Front attachment parts	Type 4669-72	
	Cardan shaft	Type 4662-62	

Tractor must be equipped with:

Front P.T.O.	Type 4662-60.	

Ill. 54

The front mounting kit Type 4669-72 and cardan shaft Type 4662-62 comprise the following parts:

Ill. No.	Description	Size	Pcs.	Ref. No.	Remarks
1	Cardan shaft		1	117553	T. 4662-62
2	Mounting plate		2	117501	
3	Hexagon screw DIN 933	M12 x 25	8	011539	
4	Lock washers DIN 137	B12	8	010065	
5	Hexagon nut DIN 934	M12	4	011590	
6	Frame	Welded part	1	117504	
7	Dowel pin	DIN 11023	2	010468	
8	Bolt	30 x 135	1	177508	
9	Pin ass.		1	116513	
10	Hexagon nut DIN 934	M16	2	011597	
11	Shim DIN 125	A17	1	010048	
12	Rod ass.		1	117509	
13	Split pin DIN 94	6,3 x 32	1	011328	
14	Plate	Welded part	1	117511	
15	Hex. screw DIN 933	M12 x 25	2	011539	For fixing the attachment plate (9 Ill. 55)
	Hex. nut DIN 934	M12	2	011590	
	Lock washer DIN 137	B12	2	010065	
16	P.T.O. guard	400/185x1,5	1	117517	
17	Hex. screw DIN 933	M8 x 16	4	011509	
	Hex. nut DIN 934	M8	4	011579	
	Lock washer DIN137	B8	4	010063	
18	Feeler ass.		1	117552	
	Hex. screw DIN 933	M12 x 20	4	011537	
	Lock washer DIN 137	B12	4	010065	

Assembling the front P.T.O. Type 4662-60

The front P.T.O. (1 Ill. 61) is necessary for all P.T.O.-driven, front-mounted implements. Simply fit the front P.T.O. on the P.T.O. shaft end between front and rear axle (see Ill. 61) and let slide pins of cardan shaft catch.

Assembling the front attachment parts Type 4669-72 on the scythe lawn mowers Type 4669-14 or 4669-5

1. Screw right, resp. left mounting plate (2 Ill. 54) onto the scythe lawn mower as shown on 11 Ill. 56, using hexagon screws M12 x 25 (3 Ill. 54), lock washers B12, and 2 hexagon nuts M12. Slide attachment frame (6 Ill. 54) into the assembled mounting plate. Thereafter assemble the second mounting plate.
2. On the gearbox fixture, front LH side, assemble plate (14 Ill. 54) using 2 hexagon screws M12 x 25, lock washers and hexagon nuts (see 9 Ill. 55 and 56).
3. Fit rod (12 Ill. 54) with bolt (8 Ill. 54) in attachment frame (7 Ill. 55), and on plate (9 Ill. 55) and secure with split pin (13 Ill. 54). Assemble shim (11 Ill. 54) and hexagon nuts (10 Ill. 54) on drawrod.
4. On gearbox fixture assemble P.T.O. guard (16 Ill. 54) using hexagon screws M8 x 16, lock washers and hexagon nuts (17 Ill. 54) as shown on Ill. 55.

Cardan shaft (1 Ill. 54)	Assemble on mower drive
Retaining chain (10 Ill. 55)	Sling around attachment frame and secure

5. Screw feeler onto front of the sycthe lawn mower (12 Ill. 55) using 4 hexagon screws M12 x 20.

Note: For front attachment the rear wheel supports can be assembled with their bends either inwards, or outwards. For front attachment we recommend to assemble the wheel supports with their bend inwards.

Attachment of the front-mounted mowers Type 4669-14 and 4669-5 on the tractor

1. Lower front hydraulics by means of the operation lever.
2. Mowe tractor to the wrist points
3. Lift front hydraulics until instant coupling (1 Ill. 55 resp. 56) will catch.

Note: Do not yet lift the implement. Fit on tractor and on mower 4 upper link arms, short (4 Ill. 55 resp. 56). Normally the hexagon nuts (5 Ill. 55 resp. 56) are adjusted to leave a tolerance of approx. 20 - 30 mm if the attachment device (7 Ill. 55 resp. 56) is in vertical position on level ground.

5. Assemble cardan shaft (2 Ill. 55) resp. 56 on tractor side. Sling retaining chain (10 Ill. 55 resp. 56) round attachment frame and secure.

Operation of the front-mounted mower

The front-mounted mower is lifted and lowered by means of the hydraulic lever (26 Ill. 64). Whilst mowing the hydraulic lever must remain locked in position S Ill. 64 (floating position) so that the mower adapts to irregularities of the soil.
The front-mounted mower is engaged and disengaged in the same manner as the inter-axle mower (see page 154).

Adjustment of the cutting height

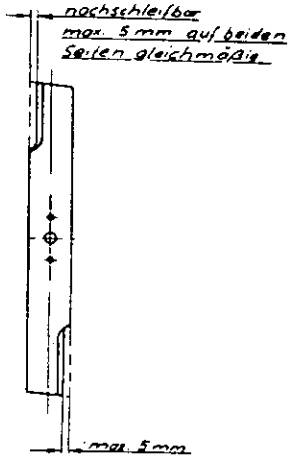
To adjust the cutting height use spacer rings (Ill. 65) on all 4 wheels

⚠ Some rules for accident prevention when using scythe lawn mowers

a) Youngsters under 16 years of age are not permitted to operate the mower.
b) Within the operation range of the mower, the operator is responsible for third persons.
c) Persons must not be transported on the mower unless the necessary seats are provided.
d) Before mowing remove any foreign body from the lawn and pay attention to these whilst mowing.
e) Take care to wear heavy shoes or boots when mowing.
f) When driving outside lawns disengage the mower and, if necessary, lift it in transport position.
g) Before leaving the mower shut-off the engine and remove the ignition keys.
h) For servicing and cleaning the mower, and for adjusting the cutting height, also when removing the safety protections and the grass collector, principally shut-off the engine, disengage the mower knives,and remove the ignition key.
i) Be particularly careful when mowing on slopes and when using fuel.
k) When mowing with open discharge use a guard, such as grass collector, or deflector blade.
l) Before leaving the mower shut-off the cutter knives and wait until the mower has come to a standstill.
m) Never let a motor mower run in enclosed space.

Front-mounted and inter-axle mounted mower

Service and Maintenance



The mower knives must be reground on both sides correctly and in time so that they will not get unbalanced. Grind max. 5 mm on both sides - **not more** (see III.)
The mower must be checked by a skilled mechanic after a sudden impact e. g. by hitting an obstacle. Protections must not be removed.
Accurately sharpened knives are a prerequisite for a clean cut. For regrinding shut-off the engine. Dismantle the mower from the machine and put it up as shown on Ill. 57. Clamp a piece of wood between propeller knife and housing wall to serve as a back-stop (1 Ill. 57). Use an SW 30 spanner to slacken the hexagon nut and remove the propeller knife. Regrind with the hand grinding machine or with the abrasive plate. Take care that the knives are uniformly reground on both sides. (See drawing). At the same time check the knives for damages, specially haircracks, and if necessary replace.

Attention when assembling the propeller knives
When reassembling the propeller knives take care that the cutting edges (S III. 57) are positioned anti-clockwise. The knives are taken up by the two locating pins (3 III. 57). Do not omit the lock washers below the hexagon nuts. Tighten the hexagon nuts. To do so use a piece of wood (la III. 57) to serve as a back-stop. (1a III. 57). From time to time check the hexagon nuts for tight fit.

V-belt tension
The V-belts are automatically tightened with the draw springs (1 and 2 III. 59 resp. 60) which guarantees a uniform tension - even if the V-belt has been elongated.
(The tension screw must be tight and is only slackened for changing the V-belt).

Changing the V-belts
The scythe lawn mower has 2 V-belts, a long belt for the two outer knives, and a short belt for the centre knife. This protects the drive from a sudden impact when hitting an obstacle (stone protection).

Replacing the V-belts

For replacing the V-belts the mower must be detached and the cardan shaft removed.

1. Remove right and left cover plate (9 Ill. 59) by removing 2 each nuts M8.
2. Slacken the tension screw (3 Ill. 59 resp. 60) of upper, resp. long V-belt, unhock draw spring (2 Ill. 59 resp. 60).
3. By slackening the M12 screws (6 Ill. 59 and 13 Ill. 56) remove upwards the carrier plate with gearbox.
4. Remove the V-belt (7 Ill. 59 resp. 60).
5. Slacken tension screw (4 Ill. 59) and unhook the draw spring (1 Ill. 59) of lower resp. short V-belt.

Note: The scythe lawn mowers Type 4669-14 (rear discharge) are not provided with a tension screw for the lower, short V-belt.
Hooking and unhooking of the draw spring is facilitated by pressing the reversing lever against the spring power by means of an assembly lever. The new V-belts are fitted in reverse order. Ill. 59 and 60 show the arrangement of the V-belts. **Never work without guard.**

Attention! The V-belts are a special, reinforced version.
Commercially available belts are not suitable.

Ref.No. for long V-belt	210 255 (17 x 11 x 2650)
Ref.No. for short V-belt	211 336 (17 x 11 x 1483)
	for mower T. 4667-5/-14 (side and rear discharge)

Service and maintenance

- For service, maintenance and repair jobs principally shut-off transmission and engine! Remove the ignition key.
- When servicing the lifted implement secure with suitable props!
- Regularly check screws and nuts for tight fit!

Lubrication and oil change

If the mower is continuously used grease the joints of the cardan shaft daily, in case of occasional use once a week.
Grease slide profiles and slide pins.
Grease all lubrication nipples S at least once a week. Under continuous operation check the oil level in the gearbox daily, (E + K Ill. 59 resp. 60 - oil diprod. Change the oil for the first time after 50 hours of operation, then after 500 hours, resp. once a year.
Fill in 0,350 litres SAE80 gear oil.

Front Sweeping Machine Type 4691-1 (WIMA 829)

Technical data:

Width of sweeping machine:		1,60 m
in diagonal position:		1,40 m
Weight, approx.:		135 kg
Input speed:		1000 rpm, anti-clockwise
Brooms:		451 mm dia.
Broom speed:	for snow, approx.	300 rpm
	for dirt, approx.	100 rpm

Equipment:

Front sweeping machine:	Type 4691-1
Broom for dirt:	Type 4591-71
Broom for snow	Type 4591-72

The tractor must be provided with:

Front P.T.O.	Type 4662-60

Mounting

Lower front hydraulics on the operation lever. Move tractor towards the linkage points, lift front hydraulics until instant coupling (1 IN. 62) will catch.

Note: Do not lift the implement!

Fit **short** upper link arms so that, in working position, the sweeping machine is level with the ground. Mount cardan shaft on tractor side. Fit retaining chain of cardan shaft as shown on Ill. 62, and secure. Connect hydraulic hoses, for swinging the broom sideways, with available couplings (tear-off couplings).

Operation of the Front Sweeping Machine

With the hydraulic selector lever (26 III.64) lift, resp. lower the front sweeping machine. Whilst sweeping fix the hydraulic lever in position S (floating position) as shown on Ill. 64. Thus the sweeping machine will adapt itself to the unevenness of the ground.

Side adjustment
The diagonal adjustment of the sweeping machine is effected on the hydraulic selector lever (25 resp. 24 Ill. 64).

On and off
1. Press the clutch lever (35 Ill. 64) downwards = „AUS" (off).
2. Engage selector lever (36 Ill. 64) for front P.T.O.
3. Pull clutch lever (35 Ill. 64) smoothly upwards = „EIN" (on).
   Pay attention to instructions for engaging P.T.O. (page 88) .

Adjusting the sweeping machine
The height of the broom is adjusted with the crank (3 Ill. 62) on the two support wheels. The broom should be adjusted so that approx. 1 cm of its bristles touch ground.

Note: With this adjustment the best cleaning effect and the least wear can be obtained. The sweeping machine has a pendulum suspension for standard equipment.

Exchanging the broom
Both brooms are held by a pitman. Slacken hexagon nut (4 Ill. 62), remove end plate (5 Ill. 62). Now the brooms can be removed. Refit the brooms in reverse order.

Using the different brooms
For normal sweeping jobs use the 16-row broom with plastic bristles.
For snow sweeping we recommend the 8-row broom with perlon bristles.
However, the snow sweeping broom requires a higher speed.

Changing the broom speed
The **slow** speed (100 rpm) is obtained by moving the selector lever (7 Ill. 62) to „**vorne I**" (forward I) position. For the **fast** speed (300 rpm) for snow sweeping move the selector lever (7 Ill. 62) to position „**hinten II**" (rear II).
Change the speed only whilst the machine is immobile.

Notes for operation
Principally lift the machine when reversing.
When driving with attached sweeping machine without sweeping, shut-off the P.T.O. drive.

Storing the detached sweeping machine
For storing put the sweeping machine on the support wheel so that it will not press down on the broom.

Mounting the sprinkling device Type 4691-70 (100 ltr.)

1. Fit the water tank in the three-point linkage.
2. Assemble spray nozzles (6 Ill. 62) on the front sweeping machine.
3. Lead the water hose from water tank resp. pump forward to the spray nozzles and fit it in suitable places of the tractor with leather belts, or the like.
4. Put the electrical plug into the socket on the instrument panel.
   The sprinkling device is put on and shut-off on the electric switch.

Snow clearing blade Type 4628-20 (Make Kugelmann)

Technical data:

Blade width:	1,50 m
Working width in diagonal position:	approx. 1,35 m
Blade height:	approx. 670 mm
Weight:	approx. 165 kg
Recommended tractor equipment:	Rear ballast or mounted sand distributor of approx. 150 kg, snow chains

Attachment
Lower the front hydraulics by means of its operation lever. Approach the wrist points with the tractor. Lift front hydraulics until instant coupling (1 Ill. 63) locks.

Note: Do not lift implemt. Fix upper steering arm, long (Ill. 63). As shown on Ill. 63 connect hydraulic hoses for side movement with existing hydraulic couplings (tear-off couplings).

Note: Adjust the upper link arm according to snow conditions. The height is adjusted with the adjustment spindles (5 Ill. 63) on both sides.

Operation of the snow clearing blade

Lift resp. lower the hydraulic with the hydraulic selector lever (26 Ill. 64). During work lock the hydraulic selector lever in position S Ill. 64 (floating position) thus permitting the snow clearing blade to adapt to irregularities of the soil.

Note: The front lift is provided with a double-acting hydraulic cylinder. By pressing the hydraulic operation lever for a short moment in position D even a hard cover of snow can be properly cleared.

Side adjustment

For side adjustment use the hydraulic lever (26 Ill. 64).

Adjustment of the flaps (3 Ill. 63)

The flaps can be adjusted according to snow and clearing conditions.

Top mounting bracket (6 Ill. 63) (flaps in vertical position)	=	Clearing of uneven roads e.g. sewer lids, or paving stones, and little snow
Lower mounting bracket (6 Ill. 63) (flaps in forward position, hence less thrust)	=	Clearing of roads and streets without obstacles under extreme snow conditions.

All flaps must be in line. In case of unevenness the flaps can be corrected by readjusting the gas pressure cylinder (4 Ill. 63).

The flaps must never be blocked.

Adjusting the gas pressure spring of snow clearing blades

After some time of operation the originaly adjusted spring resilience may slacken, or a different spring resilience may be desired. In both cases the desired condition can be obtained by refilling or draining gas.

To do so the following is necessary:

1. „Corgon" gas (also used for welding jobs)

Never use compressed air or oxygen

2. Filling/draining device Type 4134-72 with screw connection, pipe, three-way cock, and pressure gauge.

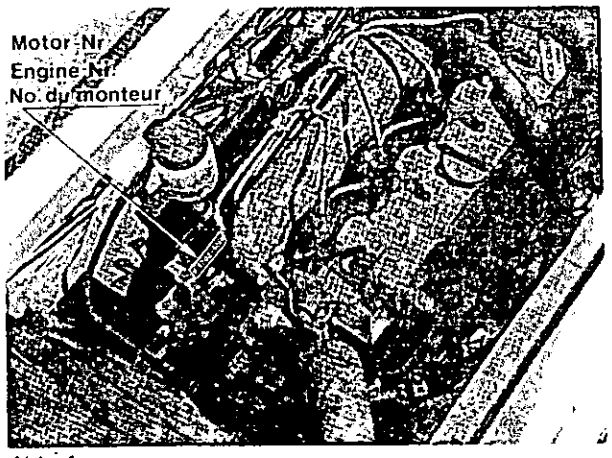
Note: For refilling or draining gas we recommend to take off the gas cylinder.

Description of the filling procedure

- The max. filling pressure must not exceed 100 bar.
  Cylinders with a piston rod of 250 mm and 80 bar are standard equipment.
- In horizontal position of the gas pressure cylinder bring screw connection to lowest position (see Ill. 1).
- Remove blanking plug of connection socket.
- Connect filler hose with Corgon gas bottle and gas pressure spring.
- Shut drain valve of the filler pipe.
- Slowly open the valve of the Corgon gas bottle and observe the pressure gauge.
- Filling is completed if the pressure gauge shows the desired pressure + 20 bar.
- Shut the bottle valve and open the drain valve of the filler device. Now the pressure in the pipe goes to the filling device and the oil filling seals the ball valve. The additional 20 bar will be gone until the valve will be entirely shut.
- Remove the filling equipment from the cylinder and immediately close the connection part with the blanking plug.

Description of the gas draining procedure:

- Move screw connection of the gas pressure cylinder to lowest position (Ill. 1).
- Unscrew sealing plug.
- Connect filling equipment
- To open the ball valve of the gas pressure cylinder slowly open the bottle valve. Thereby observe the pressure gauge so that max. pressure of 100 bar + 20 bar will not be exceeded. The check valve opens and floats in the oil filling.
- Now move screw connection of gas pressure cylinder to top position (Ill. 2).
- The screw connection must now be moved to lowest position so that the check valve will close (Ill. 1).
- Open drain valve. Check valve now floats back to the screw connection, sealing the oil and gas filling.
- Remove filling, resp. draining device and close connection socket with blanking plug.



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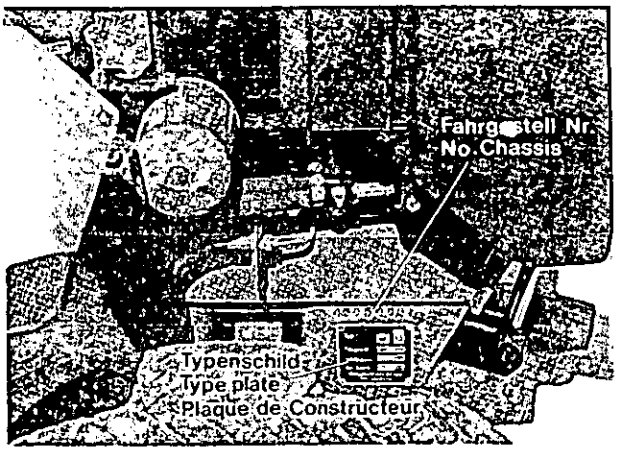

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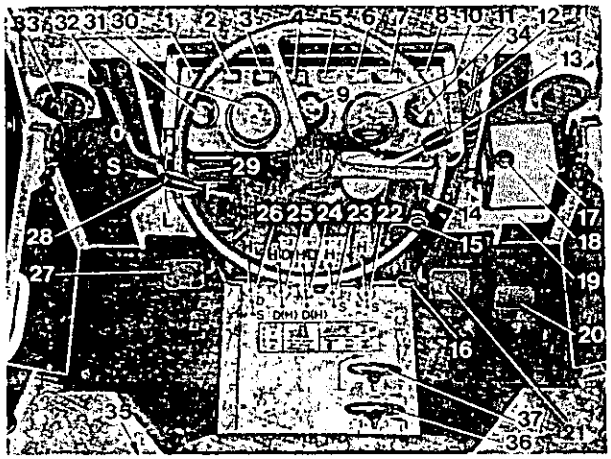

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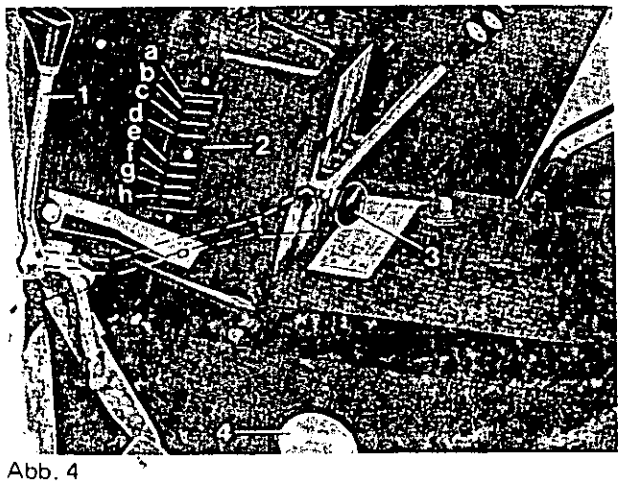

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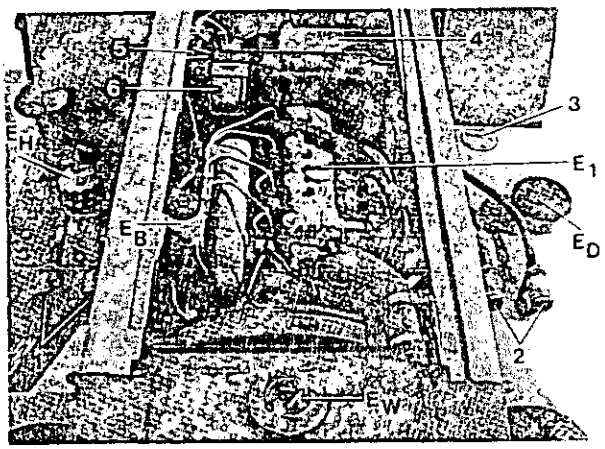

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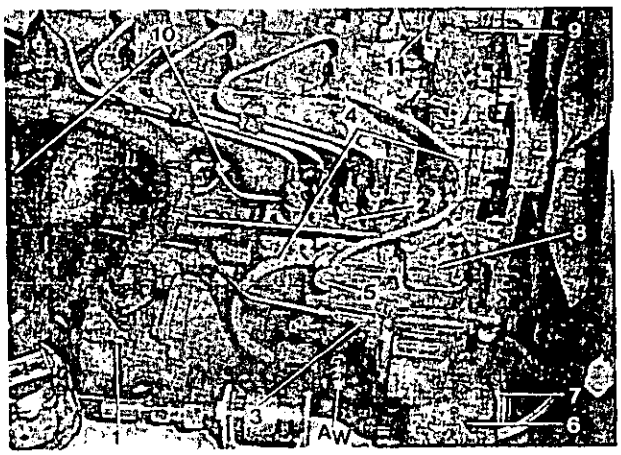

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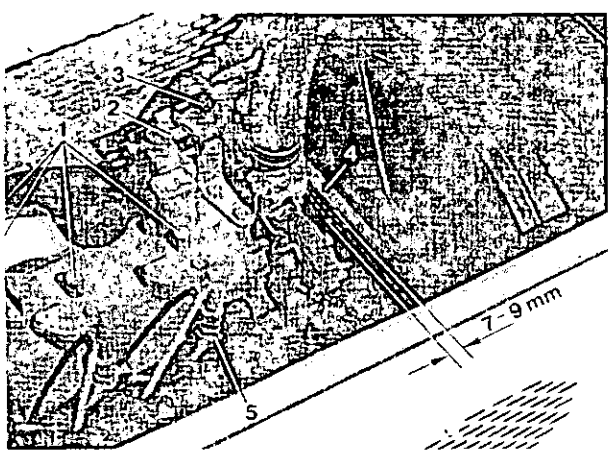

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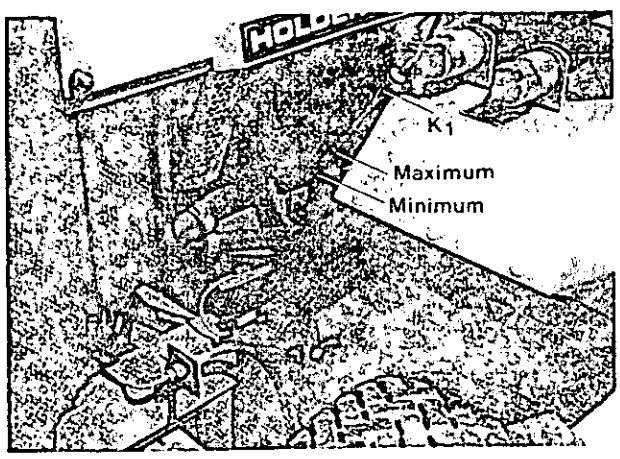

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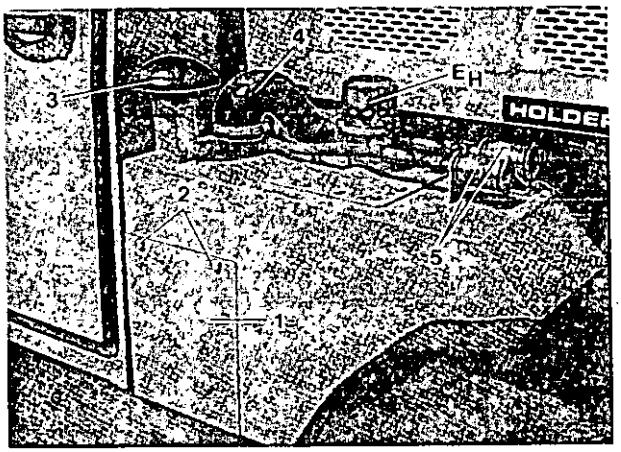

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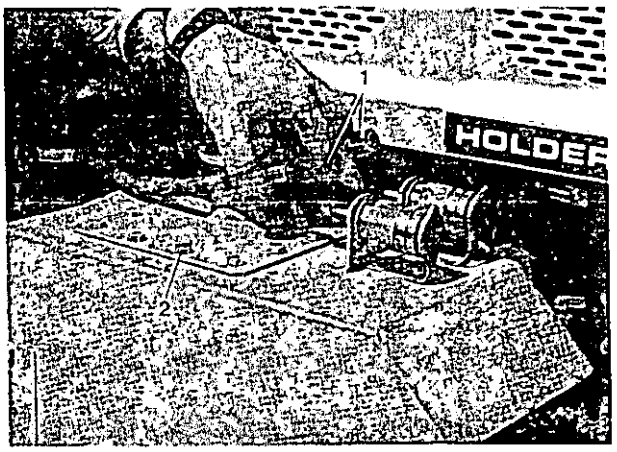
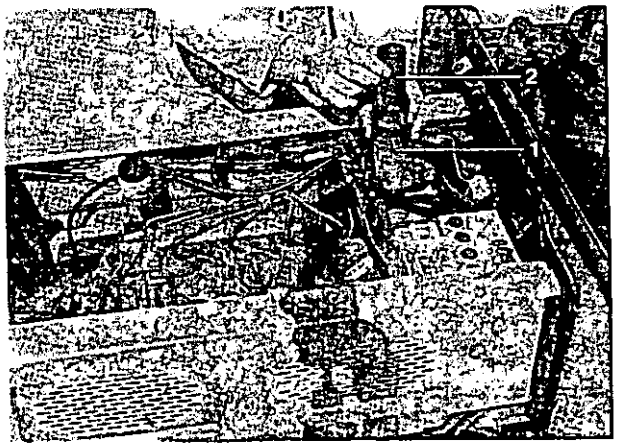


Abb. 26

Abb. 27



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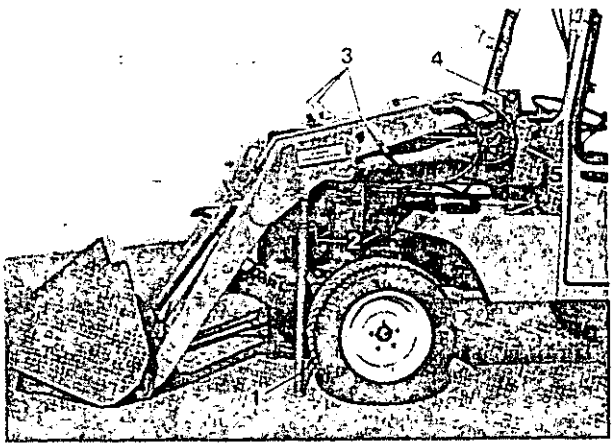

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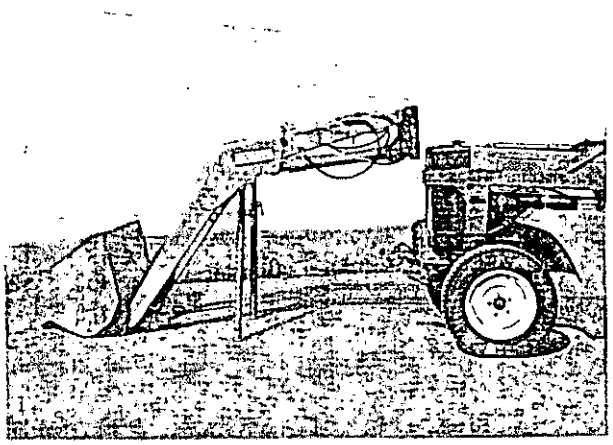
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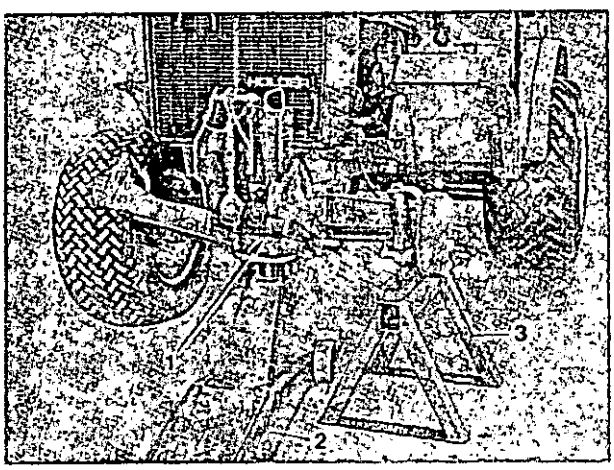

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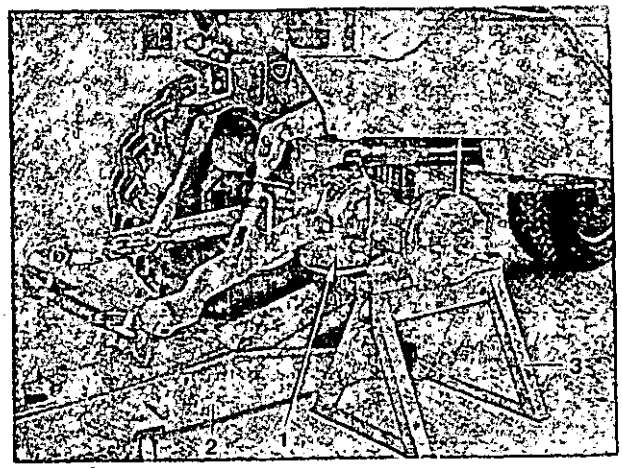


Abb. 38

HOLDER — Maintenance and Inspection Chart for Tractor Models P 70 / P 70 A

We recommend to have the following paid services carried out by an accredited Holder Service Station.
Details regarding the maintenance jobs are contained in the Operation manual under the heading „Service and Maintenance".

	When received by the dealer	When handing tractor over to custom.	Daily	After the first 20 hours of operation	After every 150 hours of operation	After every 300 hours of operation	After every 500 hours of operation	After every 1500 hours of operation
Instructions according to operation manual		●						
1. Engine								
a) Check oil level	●	●	●					
Engine oil change (clean sealing cover)				●	●			
Replace lubrication filter cartridge				●	●			
b) Check air filter system, if necessary clean		●4	acc. to indicator					
c) Check cooling system * if necessary clean radiator fins	●	●	●5	●	●			
d) Check V-belt tension and condition, if nec. readjust		●		●	●			
e) Check valve tolerance, if nec. readjust				●		●		
f) Check injection nozzles - 137 bar (atm.)							●	
g) Replace fuel filter cartridge						●		
h) Check compression pressure (23-25 bar (atm.)								●
2. Gearbox								
a) Check oil level in rear gearbox	●	●			●			
b) Change gear oil „rear gearbox"					●1			●
3. Hydraulic system and steering system								
a) Check hydraulic oil level	●	●		●	●			
b) Hydraulic oil change							●2	●
c) Replace hydraulic suction filter							●2	●
d) Replace hydraulic oil filter of variable capacity hydraulic pump				●			●3	●
e) Replace hydraulic oil filter for impl. lift				●		●		
f) Clean ventilation filter				●		●		
g) Check hydr. pressure hoses from steering to steering cylinder		●			●			
h) Check steering cyl. and servostat for loss of oil and for mechanical damages						●		
4. Brakes								
a) Check braking system and, if nec. readjust (shop work)	●	●		●	●			
b) Check brake fluid for hydr. operation brake, correct if nec., change brake fluid every 2 years	●	●		●	●			
5. Lubrication, lubrication nipples Lubricate all grease nipples (S)	●			●	●			
6. Screw unions								
a) Retighten cylinder head screw with 76 Nm				●				
b) Retighten all screw-unions according to torque wrench setting				●	●			
c) Retighten all wheel nuts				●	●			
7. Electrical System								
a) Check electrical system	●	●			●			
b) Check battery	●	●			●			
c) Preglow system - check function before cold season sets in	●	●						
8. Check heating system and warm water hoses.					●			
9. Clean fresh-air filter of cab		●4						
10. Check and adjust the toe-in				●		●		
11. Check air pressure of tyres		●	●	●				
12. Test run engine and check function of tractor		●	●					
13. Complete warranty file card and return to Holder		●						
14. Give practical instruction of attachments		●						
15. Hand over operation manual to customer		●						

Explanation of signs:

- * = In danger of frost check cooling water concentration.
- ●1 = For the first time after 150 hours of operation, thereafter every 1500 hours.
- ●2 = For the first time after every 500 operation hours, thereafter every 1500 operation hours, or annually.
- ●3 = Replace the filter for the first time after 20 hours of operation, for the 2nd time after 500 hours, thereafter every 1500 hours.
- ●4 = Clean whenever necessary.
- ●5 = Daily check oil cooler (2, III, 24) for contamination. If the cooler fins are dirty, clean the oil cooler.

List of recommended engine oils and lubricants

Brands of oil which comply with the US. Military Specification MIL-2104C after API quality CD/SE

For heavy operation conditions

	Single-grade oils	Multi-grade oils	Lubricants
	MIL-L-2104C API CD/SE	MIL-L-2104C API CC/SE/SF API CD/SE/SF	Penetrationszahl 260 – 290
ARAL	Aral Turboral Motor Oel	Aral Multi Turboral SAE 15 W-40	Mehrzweckfett Langzeitfett H
BAYWA	BAYWA HD Superior	BAYWA Super 2000 CD BAYWA HDC 1540	Mehrzweckfett Spezialfett FLM
BP	BP Vanellus C3	BP Vanellus Multigrad SAE 15 W-40	BP Energrease LS 2 Mehrzweckfett L2
CASTROL	Castrol Deusol CRD	Castrol Deusol RX Super	Castrol Spheerol AP2
ESSO	ESSOLUBE XD-3 +	ESSOLUBE XD-3 + 15 W-40 Multigrade, MOTORENÖL MHC 15 W-40	EXXON MEHRZWECK-FETT, BEACON 2
ELF	ELF Performance 3 C	ELF Multi Performance 3 C 15 W-40 ELF Presti Diesel	ELF Multi 2 ELF Rolexa 2 ELF Epexa 2
FINA	Fina Kappa Plus Motor Oil	Fina Kappa Plus Multigrade Motor Oil SAE 15 W-40	Marson L 2
FUCHS	Renolin HD Superior Titan Universal HD	Titan Universal HD 1540 Renolin HD Superior 1540	Renolit MP, Renolit Adhesiv 2 Renolit FLM 2
MOBIL	Mobil Delvac 1310,1320 1330,1350	Mobil Delvac Super 15 W-40	Mobilgrease MP
SHELL	Shell Rimula X	Shell Myrina, Shell Myrina T Shell Rimula X Multigrad	Shell Retinax A
TEXACO	Ursa Super LA	Ursa Super LA Multigrade SAE 15 W-40	Multifak 20
VALVOLINE	Valvoline HDS Topflite C 3	Valvoline HDS Topflite XRC	VALVOLINE LB-2
VEEDOL	Veedol Cadol HD Uttra	Veedol Dieselstar SAE 15 W-40	–

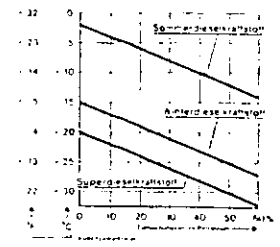
We do not claim this list to be complete. Oils of other companies can be used too, provided they comply with our regulations.

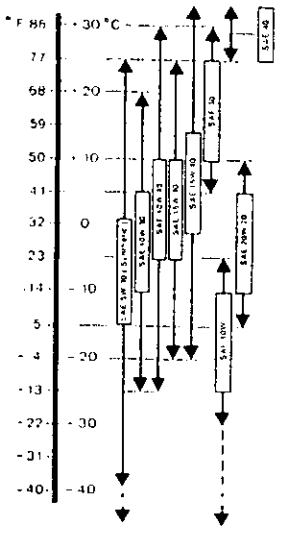
List of recommended hydraulic and gear oils

HYDRAULIC OILS:	below – 10°C	– 10°C bis + 40°C	GEAR OILS: MIL-L2105 resp. API-Gl.4
ISO-Viscosity HLP (HM) HV	VG 32 HV	VG 68 HV	SAE 80
ARAL	Vitam HF 32	–	EP SAE 80
AVIA	AVILUB HVI 32	AVILUB HVI 68	–
BP	BP Bartran HV 32	BP Bartran HV 68	EP SAE 80
CASTROL	HYSPIN AWH 32	HYSPIN AWH 68	HYPOY 80
CHEVRON	EP Hydr. Oil 32 HV	EP Hydr. Oil 68 HV	–
ESSO	UNIVIS J 32	UNIVIS N 56	GP-D 80
ELF	Hydrelf 32	Hydrelf 68	Tranself EP
FINA	HYDRAN HV 32	HYDRAN HV 68	PONTONIC N SAE 80 W
FUCHS	RENOLIN MR 520	RENOLIN MR 1030	RENOGEAR MP 80
OPTIMOL	HYDRO MV 5035	HYDRO MV 5065	–
MOBIL	DTE 13	DTE 16	MOBILUBE GX 80 W-A
SHELL 2)	Tellus Öl T 32	Tellus Öl T 68	Spirax MA 80 W
TEXACO	Rando Oil HD AZ-32	Rando Oil HD CZ-68	Geartex EP-A SAE 80 W
VALVOLINE	VALVOLINE ETC-25	VALVOLINE ETC-35	VALVOLINE X-18 SAE 80
HD Engine oils 1)	SAE 10 W 30 can be used all year round.		

1) after API-CC resp. MIL-L-2104B und MIL-L-46152

Note: For temperatures over 0°C only oils of ISO viscosity class „VG 68" are permitted.





* with preheated engine only.

Fuel
Make sure to use branded Diesel fuels having a sulphur content below 0,5 %. In case of a higher sulphur content the periods between oil changes must be shortened.
The following fuel specifications are approved:

- DIN 51601
- ASTM D 975-81: 1-D u. 2-D
- Nato Codes F 54, F 75 and F 76
- VV-F-800 a: DF-A, DF-1 u. DF-2
- BS 2869: A 1 and A 2 (in case of A 2 note sulphur content)

Attention! To avoid problems we recommend to procure winter fuel in time.

Oil viscosity
As the viscosity of the lube oil is greatly influenced by the temperature, the choice of SAE-grade should be governed by the ambient temperature at engine site.
Optimum operating behaviour will be attained if you take as guide the oil viscosity diagram appearing alongside.
Should temperatures temporarily fall below the limits of SAE-grade selected, this will merely affect the starting performance, but cause no damage to the engine. Exceeding the application limits should not be over a prolonged period, in order to keep wear dowm to a minimum.
Oil changes dictated by the time of the year can be avoided by using multi-grade oils. Multi-grade oils, particularly light-flowing oils – also tend to reduce consumption.

Valve tolerance with cold engine:
Intake valve = 0,18 – 0,22 mm
Exhaust valve = 0,18 – 0,22 mm

Filling quantities

(Refilling)	P 70	P 70 A
Engine with filter change:	9,00 ltrs.	9,00 ltrs.
Hydraulic system (tank filling):	16,00 ltrs.	18,00 ltrs. hydr. oil Mobil DTE 16
Rear gearbox:	14,00 ltrs.	14,00 ltrs. SAE 80 gear oil
Fuel tank:	33,00 ltrs.	33,00 ltrs.
Cooling system (total quantity):	8,70 ltrs.	8,70 ltrs. water + antifreeze mixture
Glysantine (effective to – 30° C):	3,70 ltrs.	3,70 ltrs. filled in by the manufacturers all year round
Brake fluid of hydr. brake:	0,25 ltrs.	0,25 ltrs. brake fluid N DOT 3

Change the brake fluid every 2 years.

The markings of the corresponding oil diprods or control screws are valid for the correct oil level.

We recommend lithium-saponified multi-purpose grease with a penetration ratio of 260 to 290.

If the operation hours, prescribed for the various oil changing intervals, are not reached, change the oil at least once a year.

Torque wrench settings for screw connections

Hexagon screws and studs	M 6	M 8	M 10	M 12
Screws without any marks	8,5 Nm (0,85 mkp)	19,5 Nm (1,95 mkp)	42 Nm (4,2 mkp)	70 Nm (7,0 mkp)
Screw quality 8.8 resp. 7 *	10,5 Nm (1,0 mkp)	25 Nm (2,5 mkp)	49 Nm (4,9 mkp)	86 Nm (8,6 mkp)
Screw quality 10.9 resp. 9 *	13,2 Nm (1,32 mkp)	39 Nm (3,9 mkp)	69 Nm (6,9 mkp)	117 Nm (11,7 mkp)

Hexagon screws and studs	M 14	M 16	M 18	M 20
Screws without any marks	120 Nm (12,0 mkp)	185 Nm (18,5 mkp)	270 Nm (27,0 mkp)	380 Nm (38,0 mkp)
Screw quality 8.8 resp. 7 *	135 Nm (13,5 mkp)	210 Nm (21 mkp)	300 Nm (30 mkp)	425 Nm (42,5 mkp)
Screw quality 10.9 resp. 9 *	190 Nm (19 mkp)	295 Nm (29,5 mkp)	430 Nm (43 mkp)	610 Nm (61 mkp)

* Screw quality 7 and 9 is stated on the engine.

Cylinder screws	= 76 Nm (7,6 mkp)
High-pressure valves	= 70 Nm (7,0 mkp)
Hexagon screws M 10 (Servostat on steering support)	= 49 Nm (4,9 mkp)
Tension screws for hydraulic control valves	= 25 Nm (2,5 mkp)
Axles on gearbox M 10	= 49 Nm (4,9 mkp)
Attachment rail for trailer hitch M 14	= 135 Nm (13,5 mkp)
Front wheel carriers	= 50 Nm (5,0 mkp)
Wheels, front and rear	= 215 Nm (21,5 mkp)

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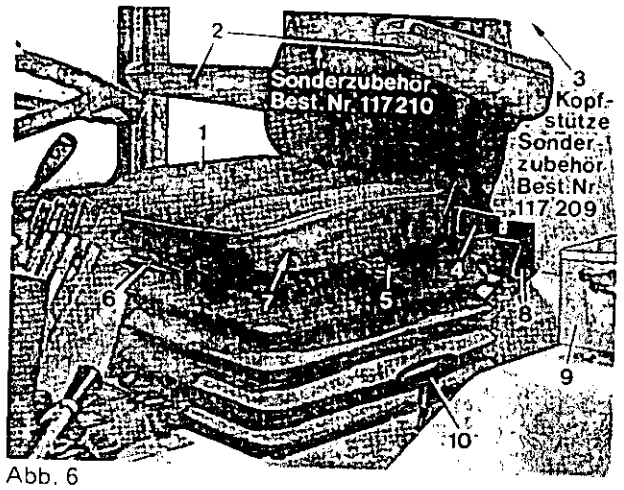

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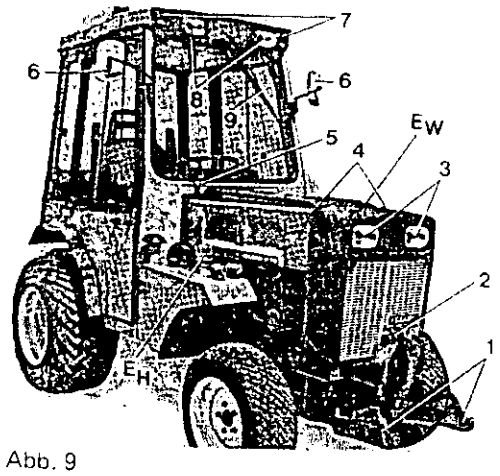

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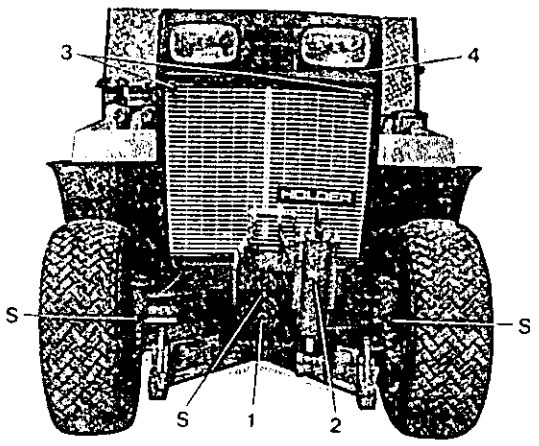
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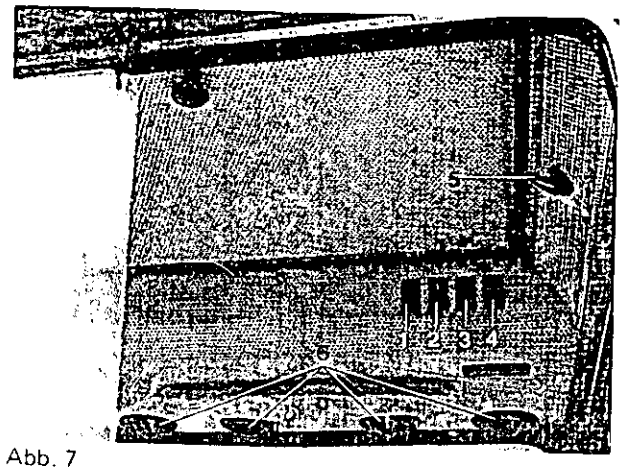
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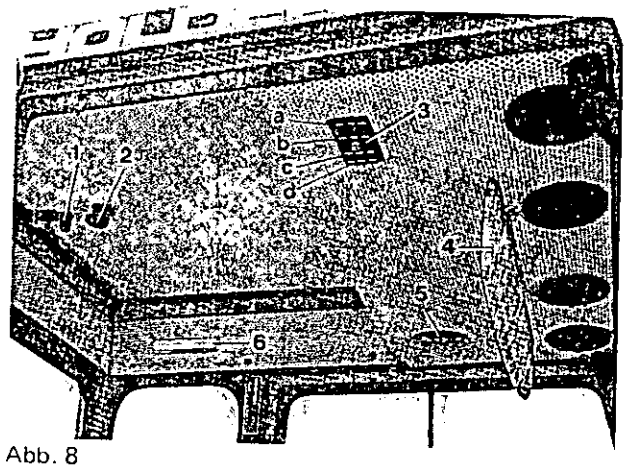
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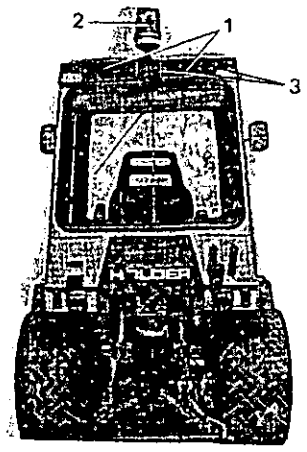
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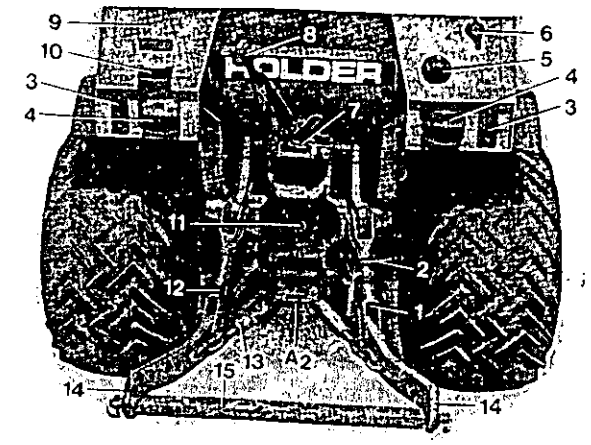
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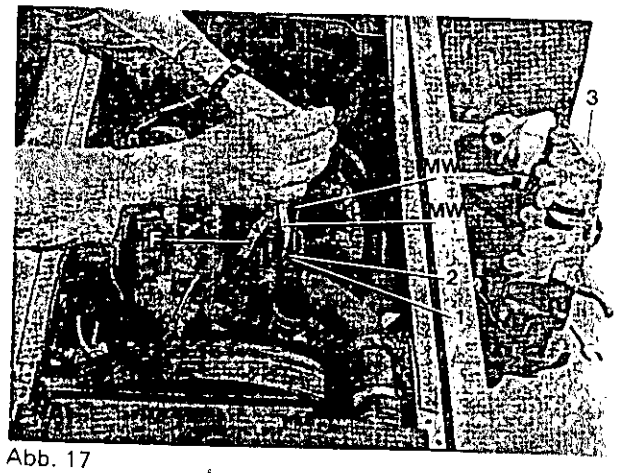
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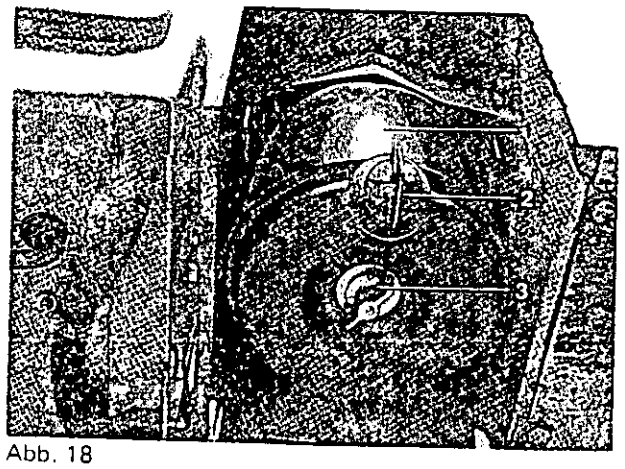
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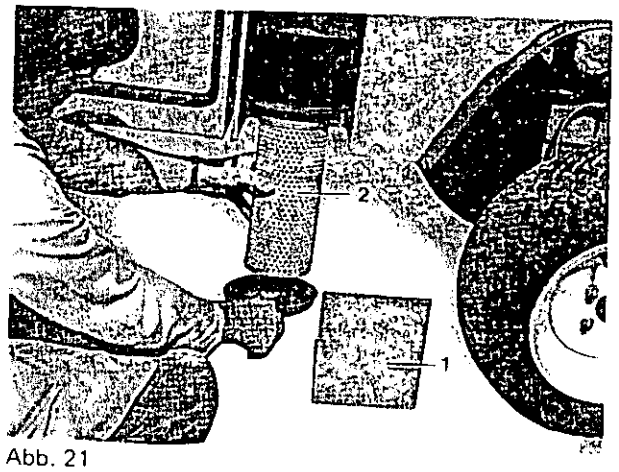
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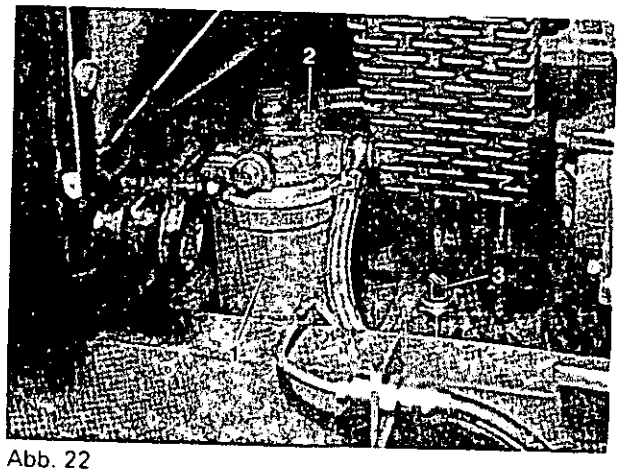
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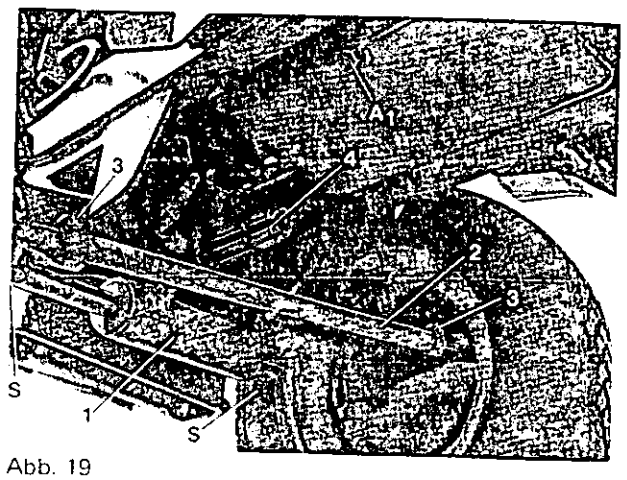
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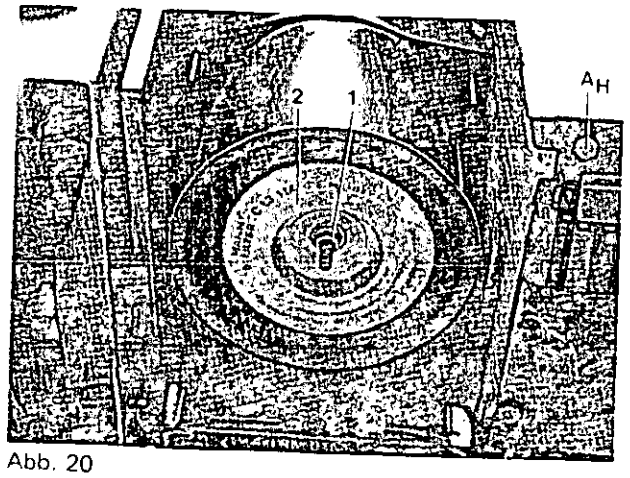
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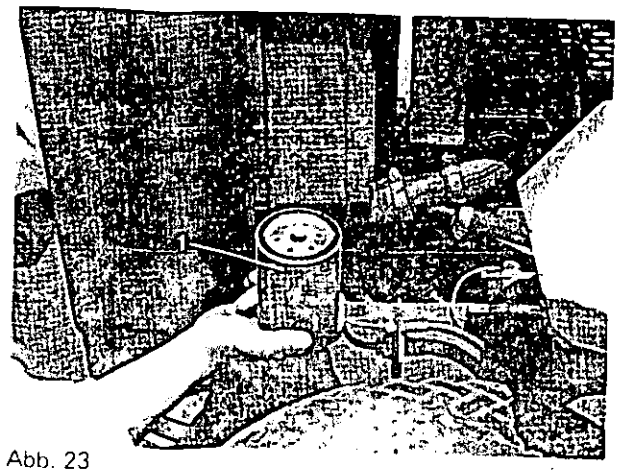
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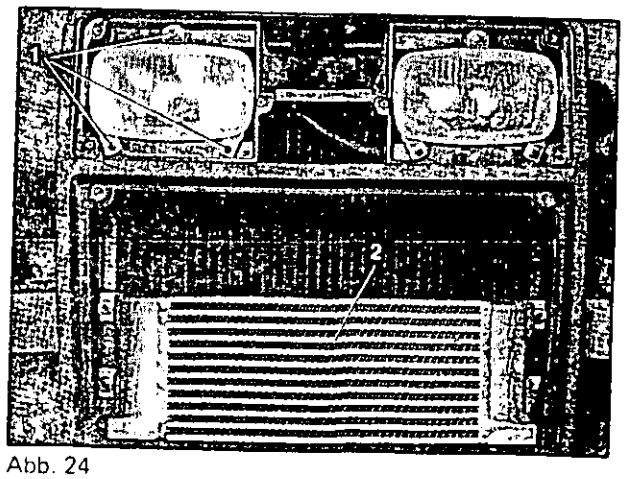
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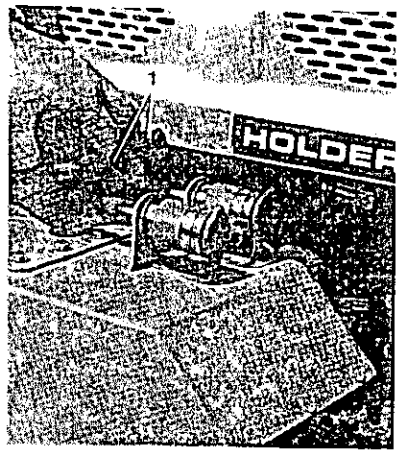

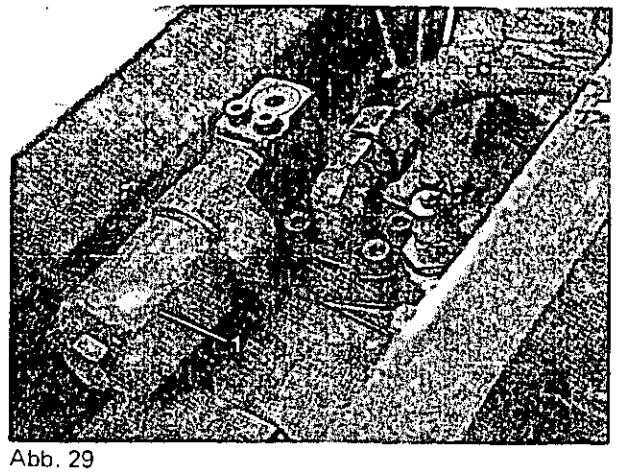

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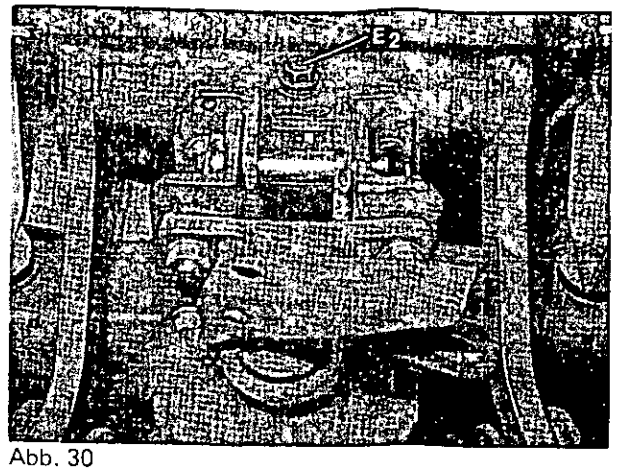

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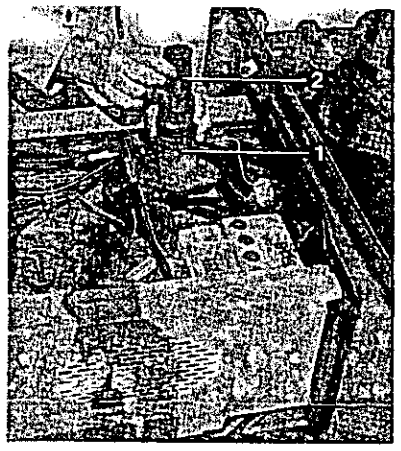

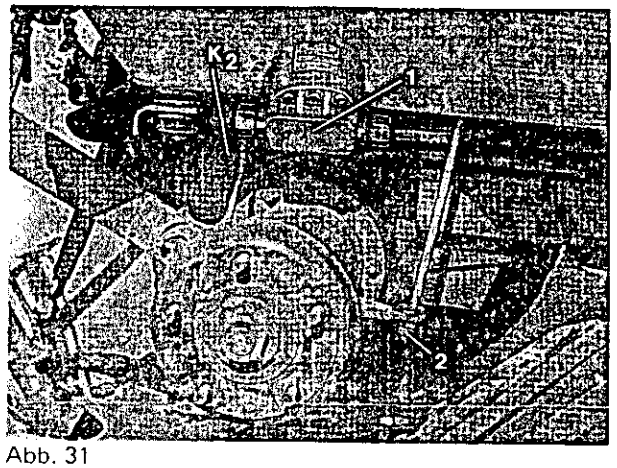

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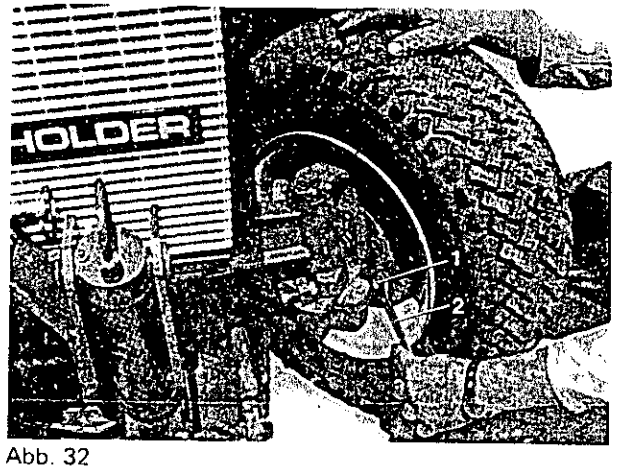

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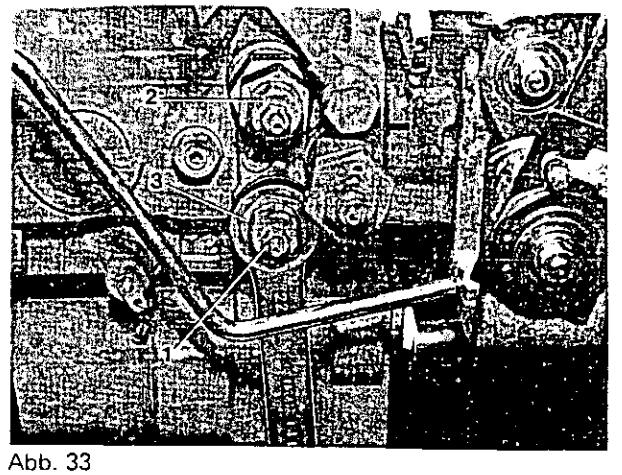

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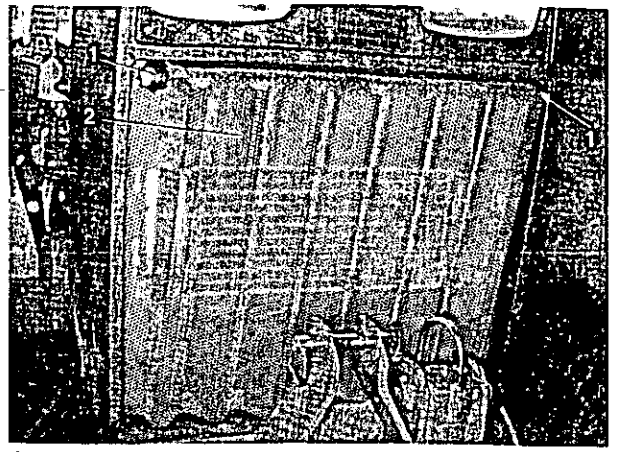

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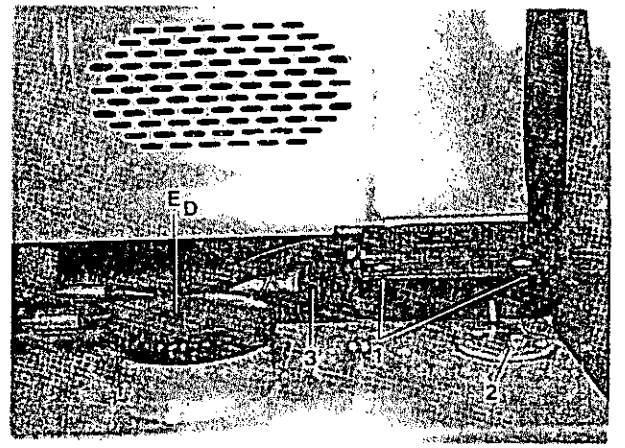

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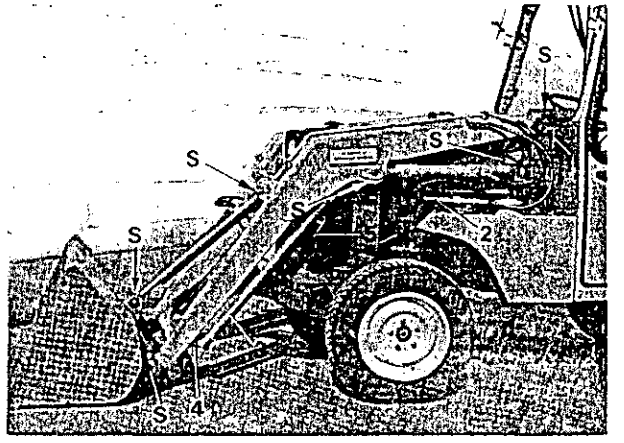

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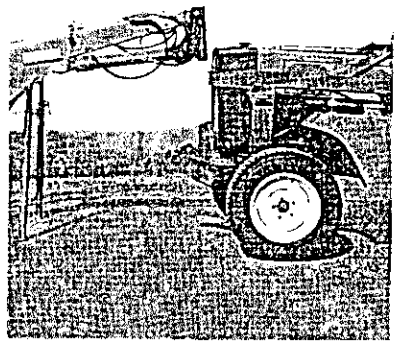

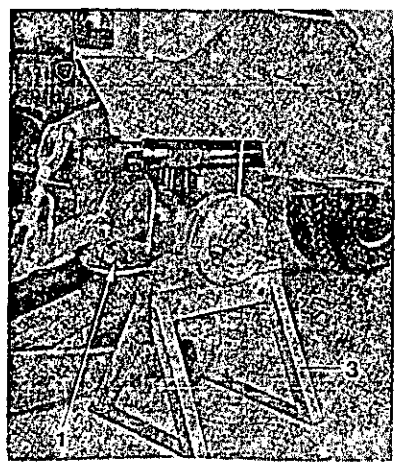

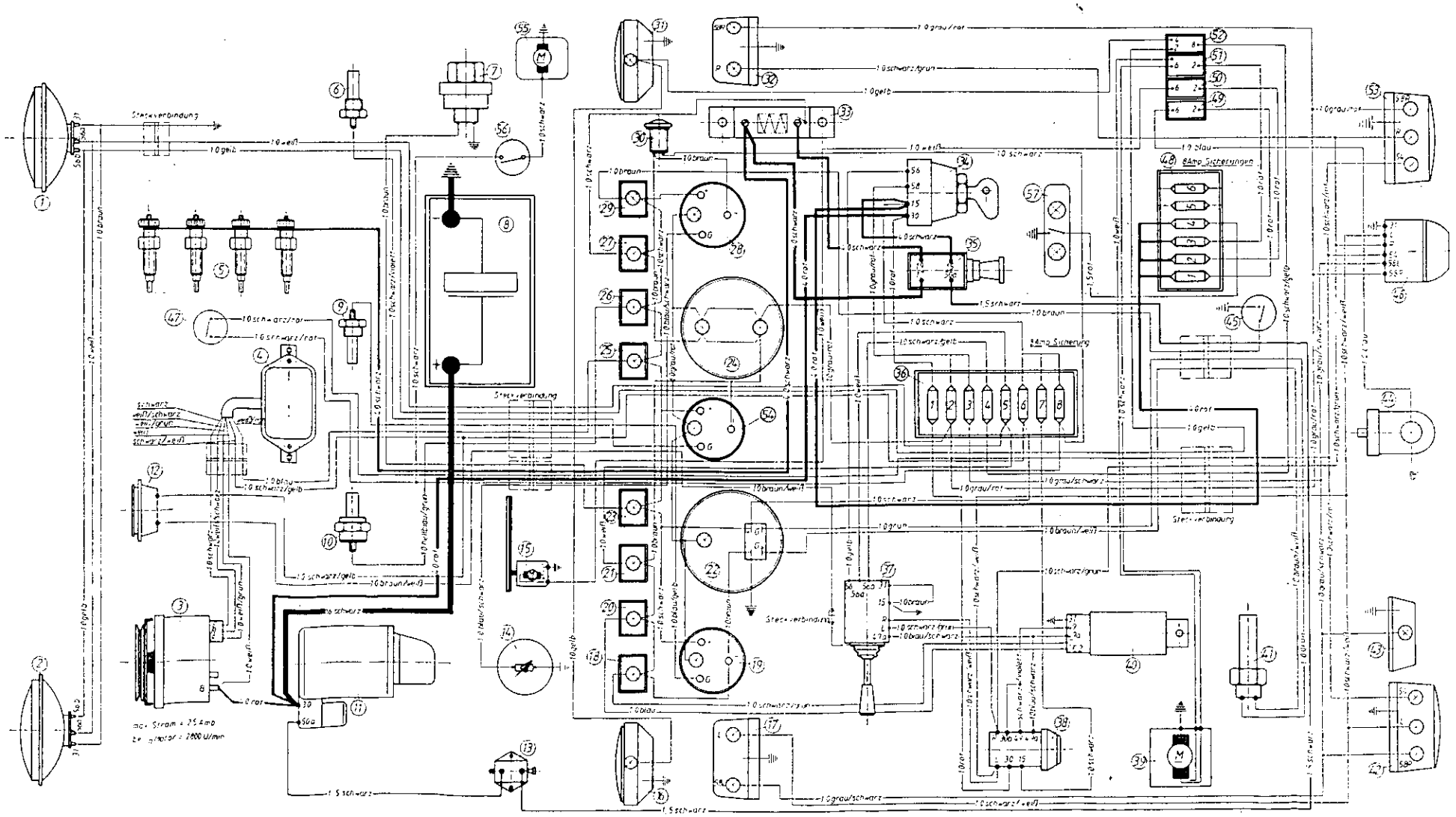

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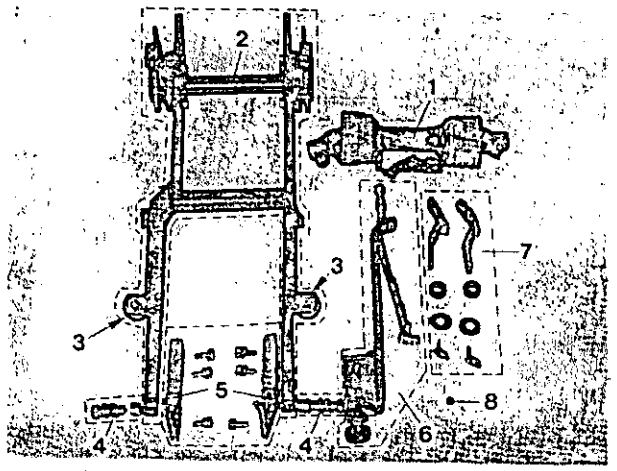

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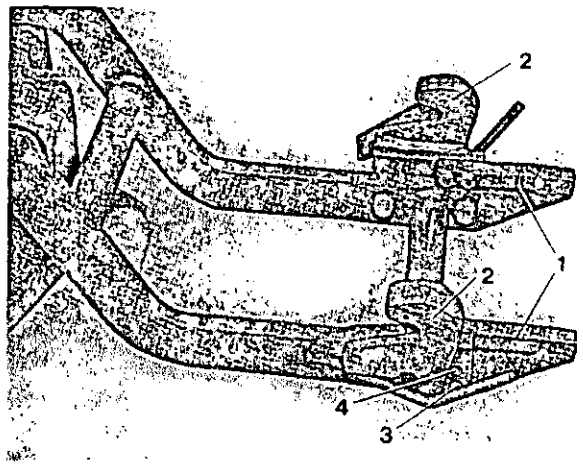

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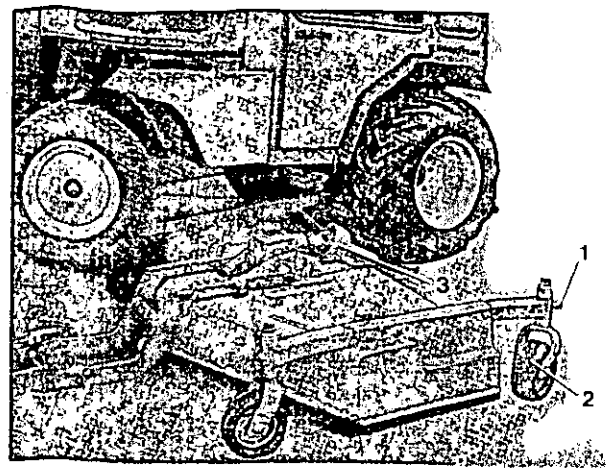

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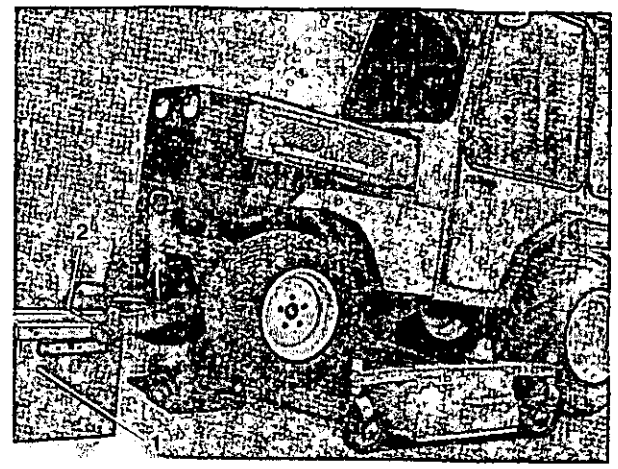

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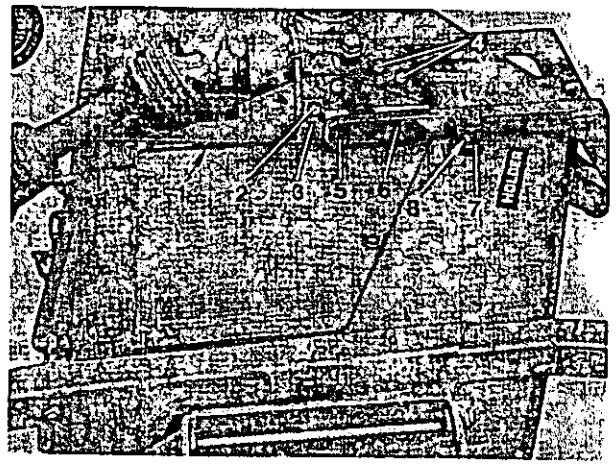

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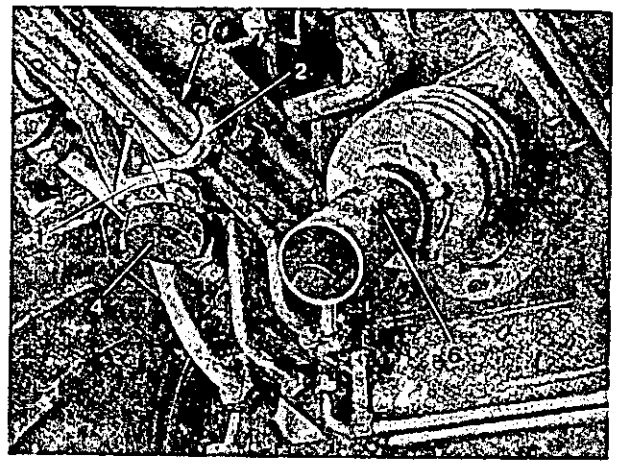

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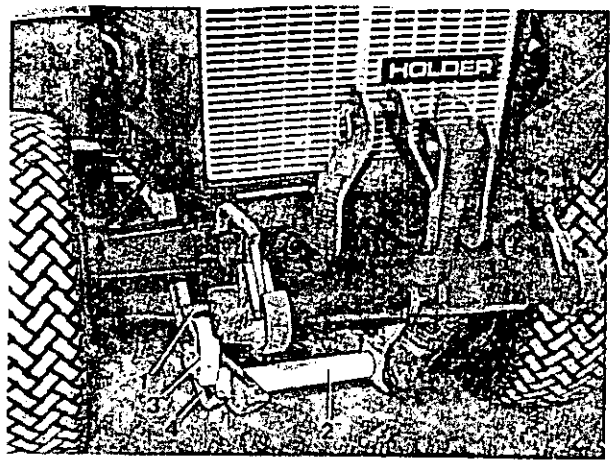

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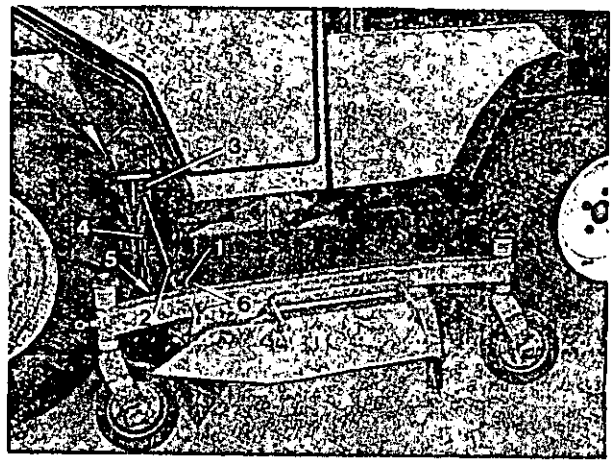

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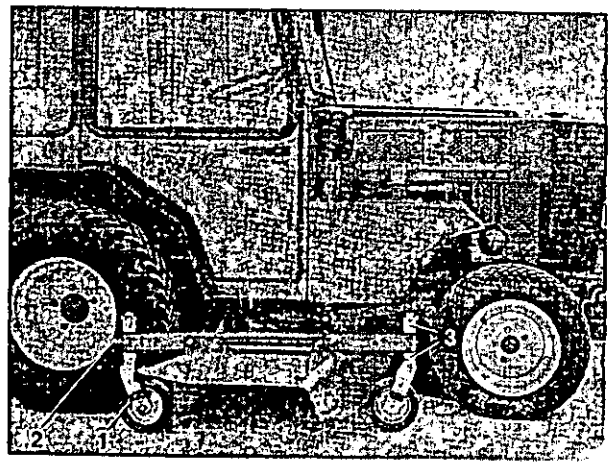

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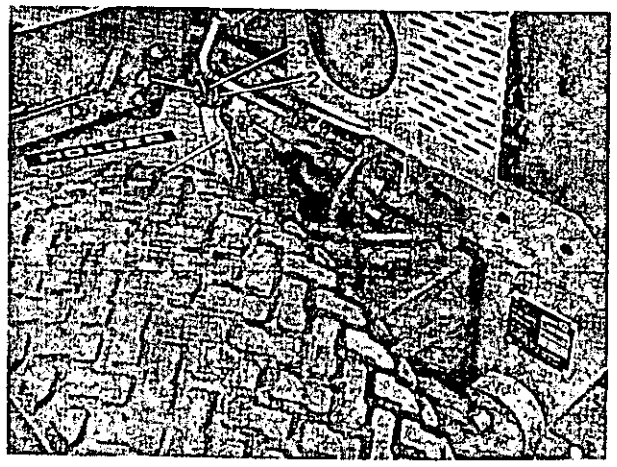
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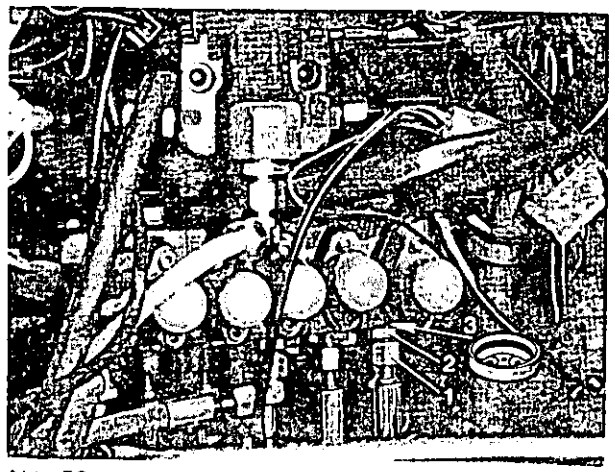


Abb. 53

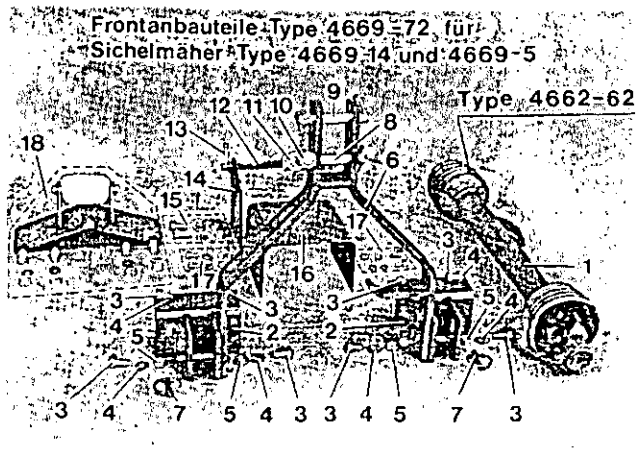


Abb. 54

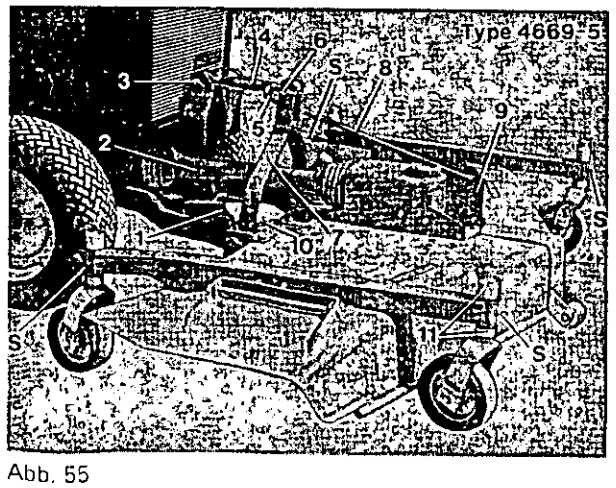


Abb. 55

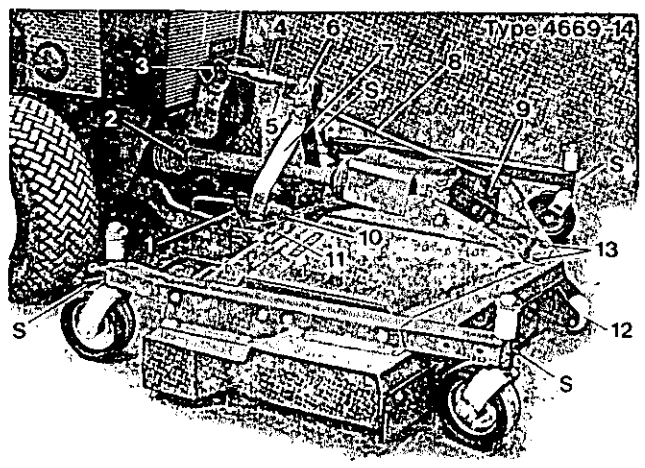


Abb. 56

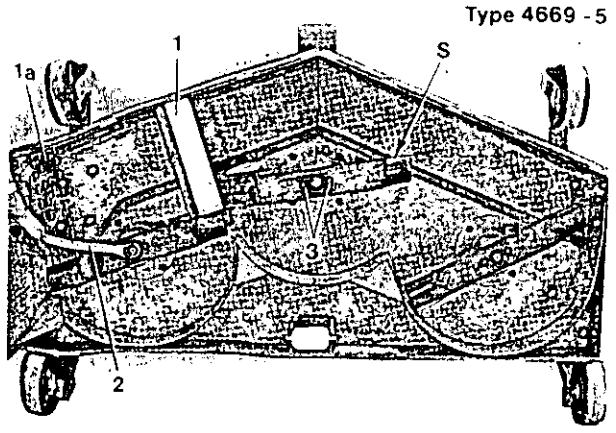
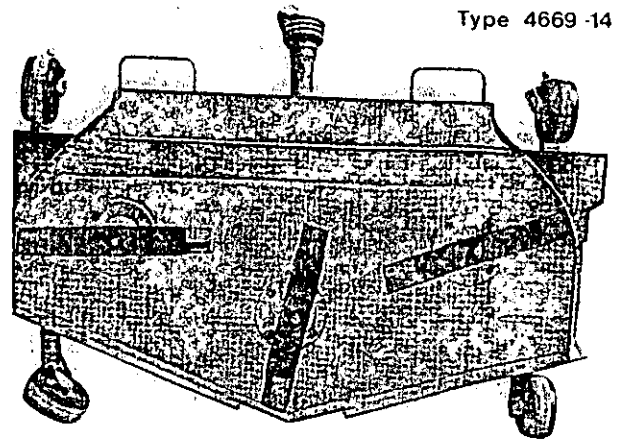


Abb. 57



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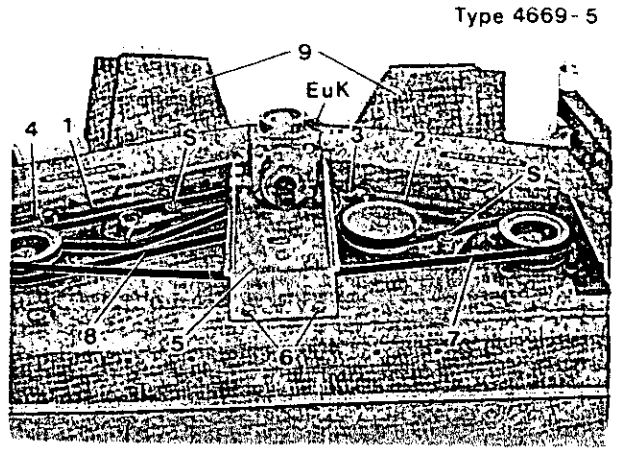

Abb. 59

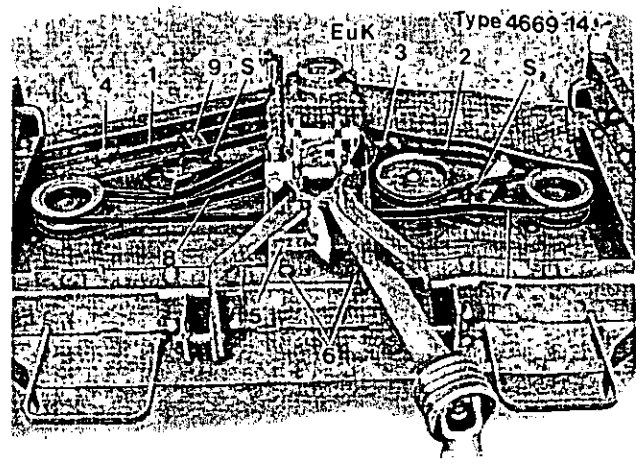

Abb. 60

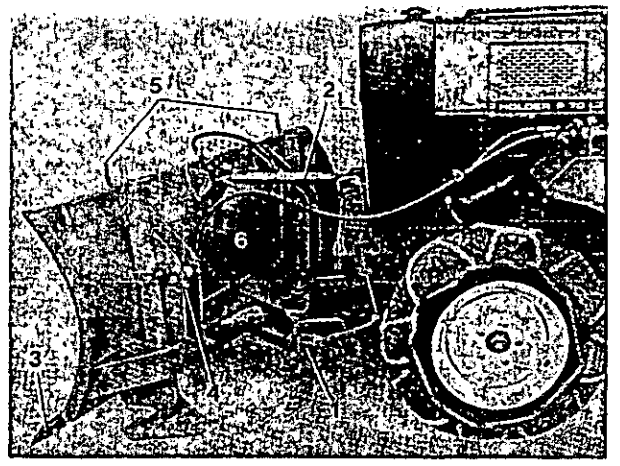

Abb. 63

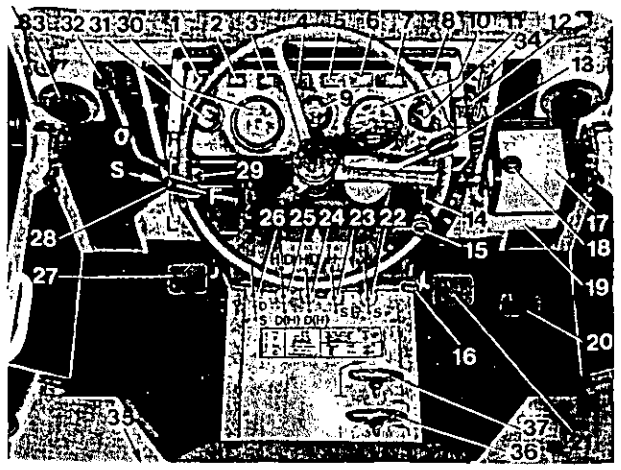

Abb. 64

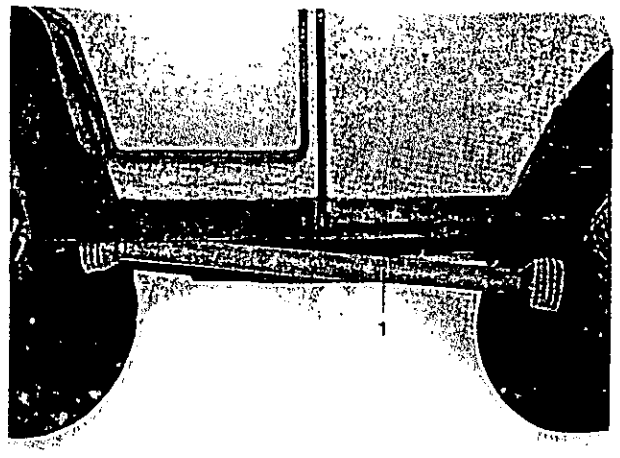

Abb. 61

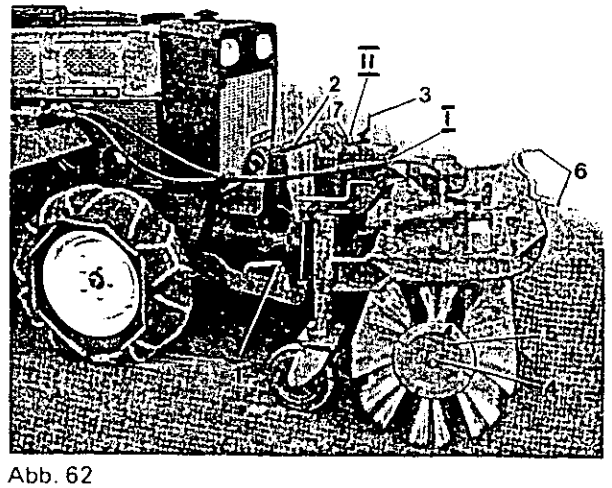

Abb. 62

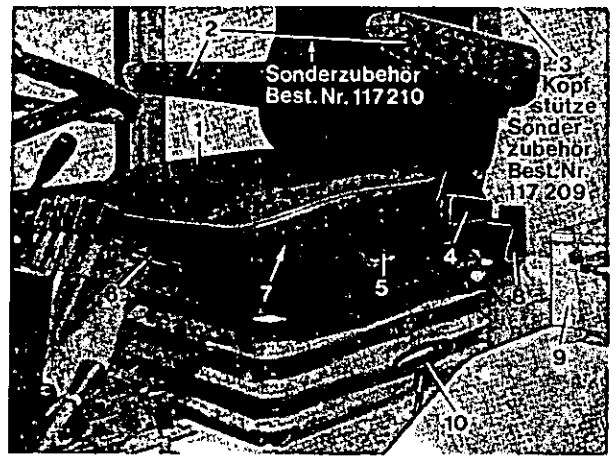

Abb. 65