SERVICE MANUAL

Wheel Loaders LW80

NEW HOLLAND
CONSTRUCTION

In conditions of poor visibility and after dark always switch on the lighting system.

Persons accompanying the driver must be seated on the passenger seats provided for this purpose.

When crossing underpasses, bridges and tunnels or when passing under overhead lines always make sure that there is is sufficient clearance.

Always keep at a distance from the edges of building pits and slopes.

Avoid any operation that might be a risk to machine stability.

Never travel across slopes; always keep the working equipment and the load close to the ground, especially when travelling downhill.

On sloping terrain always adapt your travelling speed to the prevailing ground conditions. Never change to a lower gear on a slope but always before reaching it.

Before leaving the driver's seat always secure the machine against inadvertent movement and unauthorized use.

Special work in conjunction with utilization of the machine - maintenance and repairs during operation - disposal of parts and consumables

Observe the adjusting, maintenance and inspection activities and intervals set out in the operating instructions, including information on the replacement of parts and equipment. These activities may be executed by skilled personnel only.

Brief operating personnel before beginning special operations and maintenance work, and appoint a person to supervise the activities.

In any work concerning the operation, conversion or adjustment of the machine and its safety-oriented devices or any work related to maintenance, inspection and repair, always observe the start-up and shut-down procedures set out in the operating instructions and the information on maintenance work.

Ensure that the maintenance area is adequately secured.

If the machine is completely shut down for maintenance and repair work, it must be secured against inadvertent starting by:

- removing the ignition key and
- attaching a warning sign.

Carry out maintenance and repair work only if the machine is positioned on stable and level ground and has been secured against inadvertent movement and buckling.

To avoid the risk of accidents, individual parts and large assemblies being moved for replacement purposes should be carefully attached to lifting tackle and secured. Use only suitable and technically perfect lifting gear and suspension systems with adequate lifting capacity. Never work or stand under suspended loads.

The fastening of loads and the instructing of crane operators should be entrusted to experienced persons only. The marshaller giving the instructions must be within sight or sound of the operator.

SERVICE DATA

LW80

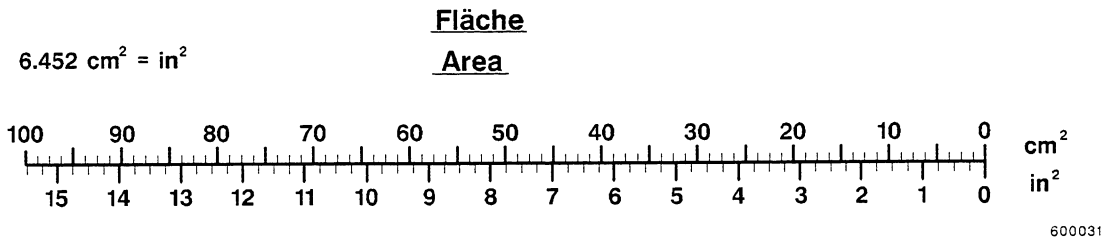
2 800 843.00 en

Variable pump (PAG = Primary unit)

	Unit	W80H No. 513 001 -
Modele		Swashplate pump with over speed control
Model		A4VG71DA1D8/32R (with hydr. inch valve)
Displacement	cc / rev.	71
Power requirement max.	kW	56
Drive		Direct from engine, i = 1.0
Operating speed (= rated speed of engine)	rpm	2200
Oil flow (at operating speed)	l / min.	152
Displacement of the feed pump	cc / rev.	19

Umrechnung von Flächenmaßen
Conversion for units of area

Fläche Area	in^2	ft^2	yd^2	sqmile	acre	cm^2	m^2
1 square inch (Quadratzoll)	1	0,0069				6,4516	
1 square foot (Quadratfuß)	144	1	0,111			929,03	0,0929
1 square yard (Quadratyard)	1 296	9	1		0,00021	8361,3	0,8361
1 square mile (Quadratmeile)				1	640		
1 acre		43 560	4 840	0,00156	1		4 046,9
1 cm^2	0,1550					1	0,0001
1 m^2	1 550,0	10,764	1,1960			10 000	1



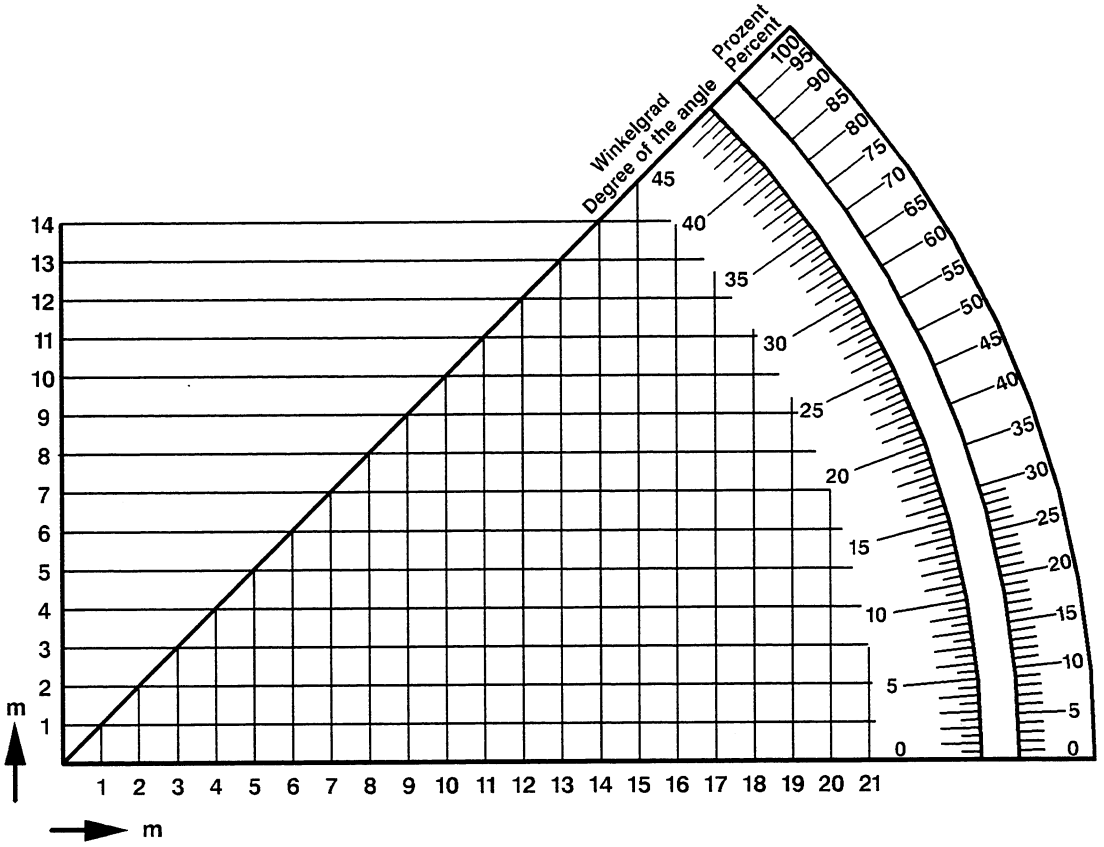
Umrechnungstabelle für Druckeinheiten von Gasen, Dämpfen und Flüssigkeiten
Conversion table for units of pressure in gases, steam and fluids

mit 1 Pa = 1 N/m^2 = $\frac{1}{9,81}$ kp/m^2 = 0,102 kp/m^2

	Pa	bar	kp/m^2	at	atm	Torr
1 Pa (= 1 N/m^2) =	1	10^{-5}	0,102	0,102 x 10^{-4}	0,987 x 10^{-5}	0,0075
1 bar (= 0,1 MPa) =	100 000 = 10^5	1 (= 1000 mbar)	10 200	1,02	0,987	750
1 kp/m^2 =	9,81	9,81 x 10^{-5}	1	10^{-4}	0,968 x 10^{-4}	0,0736
1 at (= 1 kp/cm^2) =	98 100	0,981	10 000	1	0,968	736
1 atm (= 760 Torr) =	101 325	1,013 (= 1013 mbar)	10 330	1,033	1	760
1 Torr (= $\frac{1}{760}$ atm) =	133	0,00133	13,6	0,00136	0,00132	1

BERECHNUNGSBEISPIELE
CALCULATION EXAMPLES

Steigungswinkel
Angles of slope



Fahrgeschwindigkeiten
Travel speeds

$$V = \frac{360}{t}$$

V = km/h
t = Sekunden auf 100 m
Seconds needed for 100 m

Beispiel: Bei einer konstanten Geschwindigkeit werden für eine Strecke von 100 m 18 Sekunden benötigt.

Example: At a constant speed, a travel time of 18 seconds is needed for a distance of 100 meters.

$$V_{(km/h)} = \frac{360}{18} = 20 \text{ km/h}$$

3

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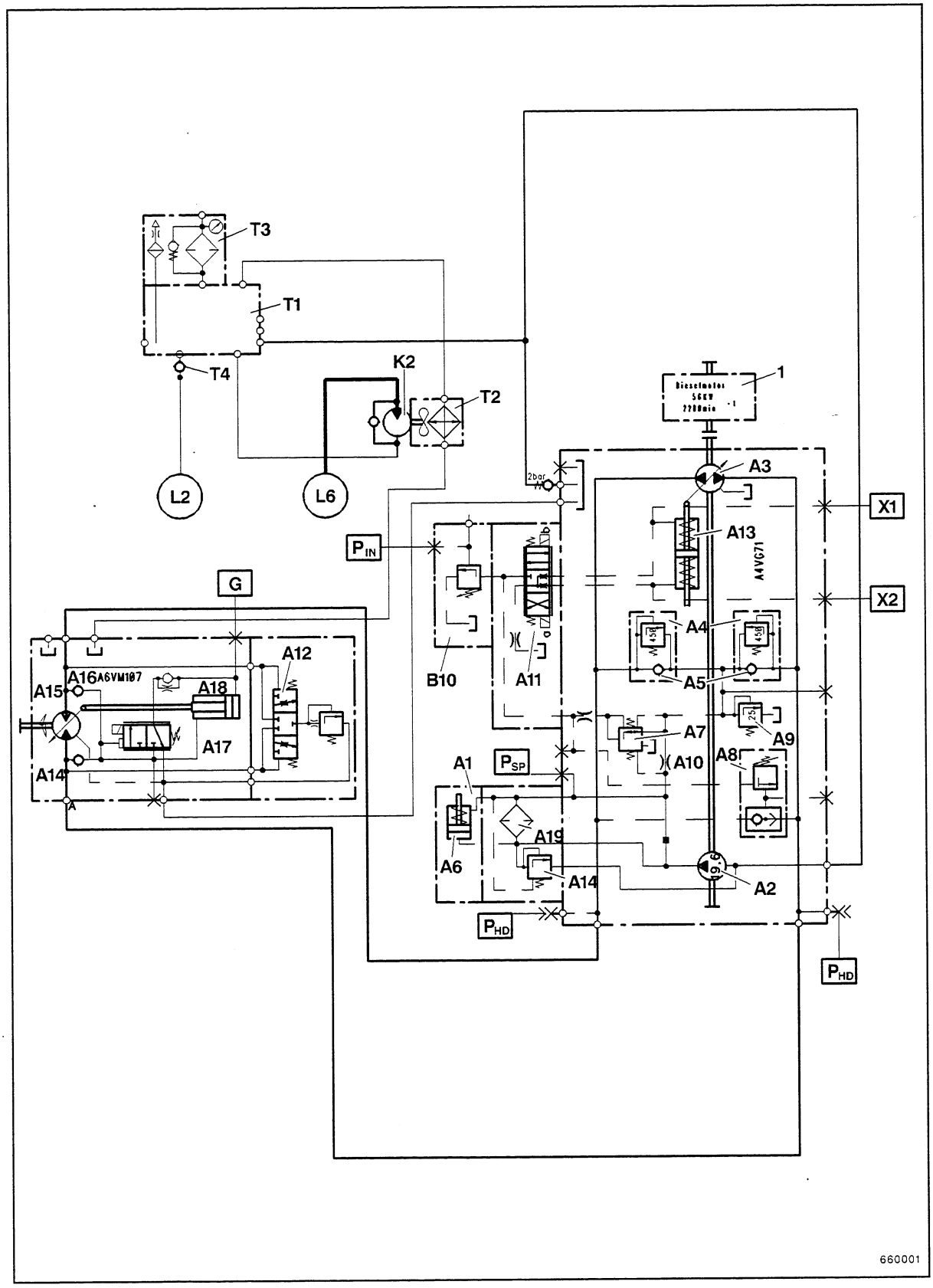

Fig. 3

Feed pressure relief valve (A9)

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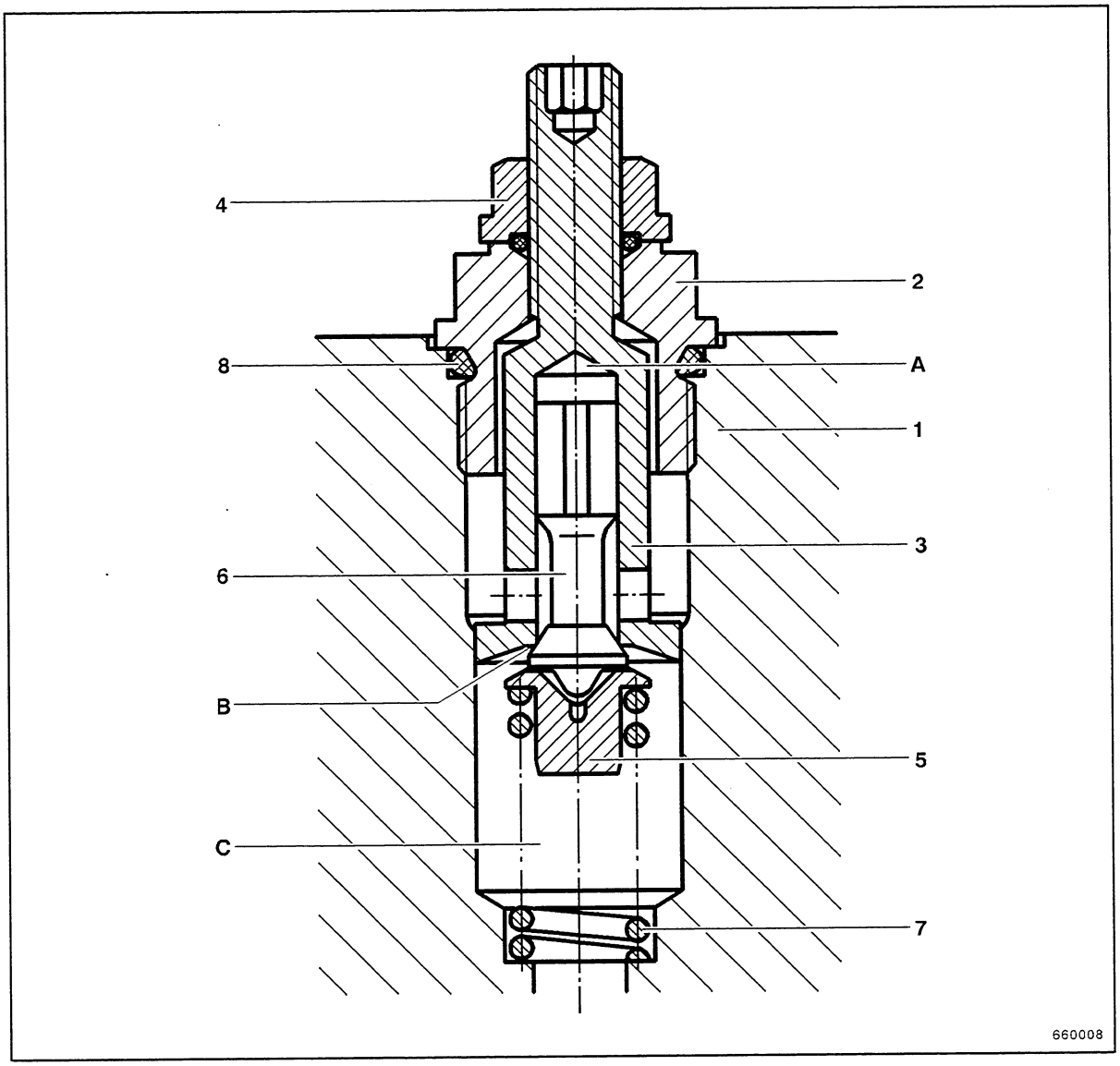


Fig. 10

Parts Fig. 10

1	-	Valve housing or bore in valve plate
2	-	Screw plug
3	-	Adjusting screw
4	-	Lock nut
5	-	Spring plate
6	-	Valve piston
7	-	Compression spring
8	-	O-ring or sealing ring
9	-	Spring pin
A	-	Piston surface
B	-	Sealing edge or control edge
C	-	Tank channel (into pump housing)

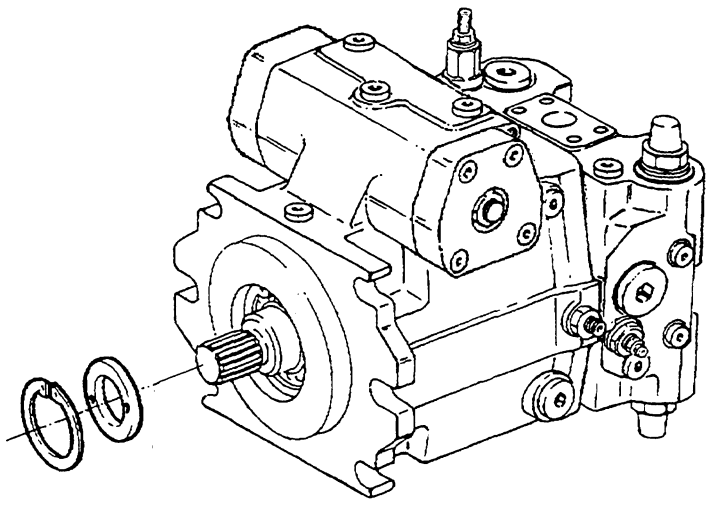
Repair instructions, hydraulic pump

2800486

A 4V G 71DA1D8/32R
Baureihe / Series 32

Repair instructions, hydraulic motor

A6VM107HA1U1/63W
Baureihe / Series 63 □



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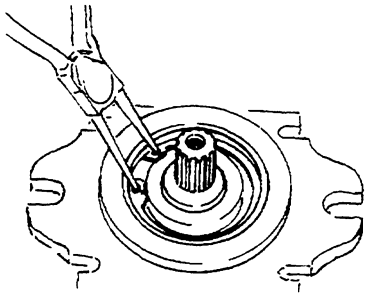
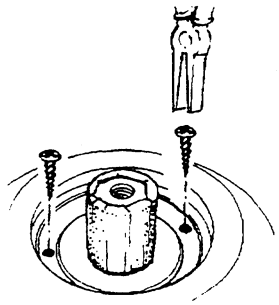


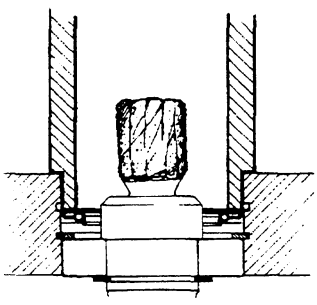
14 Triebwelle abkleben.
Sicherungsring ausbauen.

Protecting the drive shaft.
Remove retaining ring.



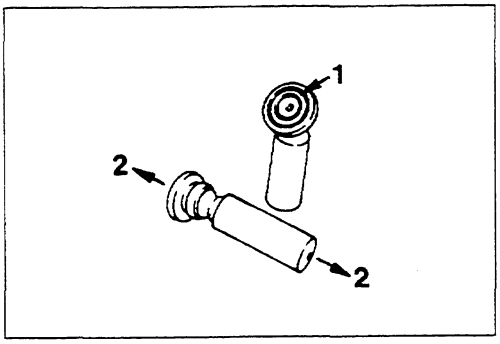
15 Blechschraube in die mit Gummi gefüllten Löcher eindrehen.
Mit Zange WDR herausziehen.

Screw in sheet metal screw into the holes fitted with rubber.
Pull out shaft seal with pliers.



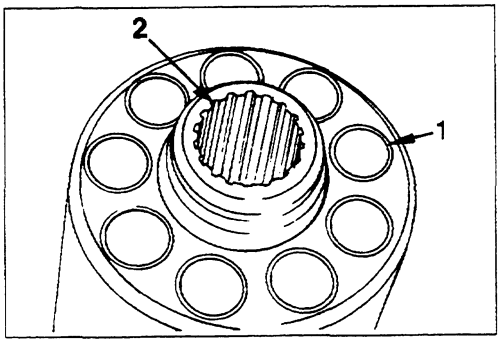
16 Wellendichtring mit Buchse auf Anschlag einpressen.
Sicherungsring einbauen.

Press-in shaft seal with bush to stop.
Assemble retaining ring.



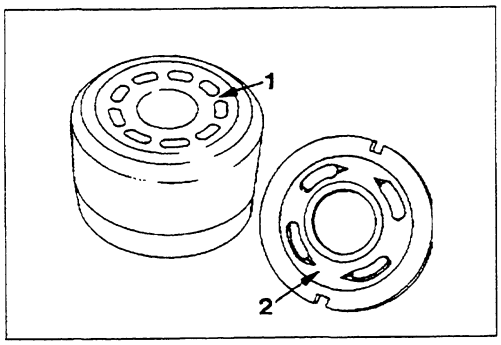
75 Kontrolle!
Lauffläche (1) keine Kratzer, keine Metalleinlagerungen, kein Axialspiel (2), (Kolben nur satzweise tauschen).

Check!
Check that there are no scratches or metal deposits on sliding surface (1), and there is no axial play (2), (otherwise: pistons must be replaced in sets).



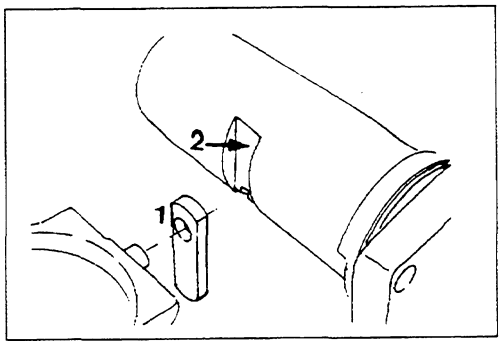
76 Kontrolle!
Zylinderbohrungen (1), Verzahnungen (2).

Check!
Cylinder bores (1), splines (2).



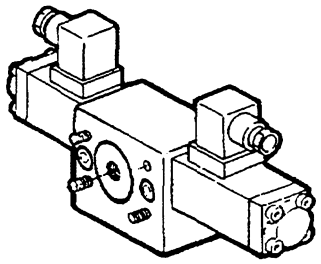
77 Kontrolle!
Zylindergleitfläche (1) riefenfrei.
Steuerplatte (2) nicht riefig.

Check!
Cylinder surface (1) free of scoring.
Control plate (2) without scoring.



78 Kontrolle!
Stellkolben - Schwenkwiegenverbindung
Gleitstein (1), Nut im Stellkolben (2), Stellkolben.

Check!
Positioning piston - cradle linkage
Gliding stone (1), groove at the positioning piston (2).
Positioning piston.



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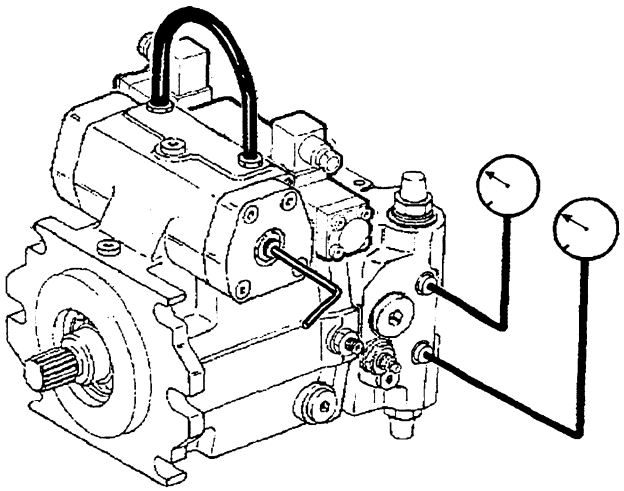


Achtung!
Sicherheitsbestimmungen beachten!
Mit Schlauch NW6 beide Stellkammern verbinden. Vermeidung von Restsignal aus hydraulischer Nullage.
Manometer an M_A und M_B anschließen.
Nullage so einstellen, daß bei blockiertem Antrieb beide Manometer auf gleichem Druckwert stehen.
Hinweis:
Totband der Nullage - vermitteln.

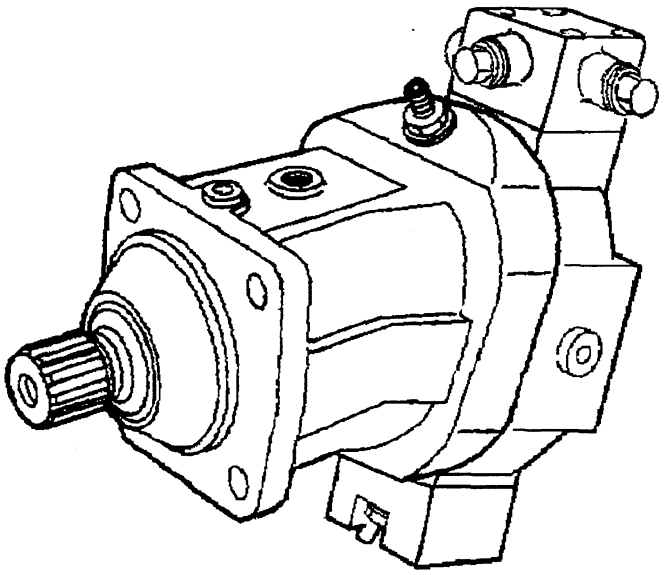
Attention!
Observe safety regulations!
Connect both control chambers with hose NW6. Avoidance of rest signal from hydraulic zero position.
Connect manometer to M_A and M_B. Adjust zero position so that at blocked drive both manometer indicate the same pressure valve.
Note:
Adjust death line of zero position.

106

Reparaturanleitung
Repair Instructions

A6VM 107

Baureihe / Series 63



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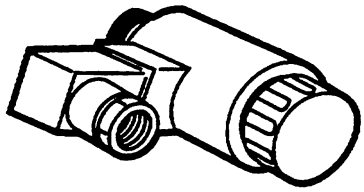
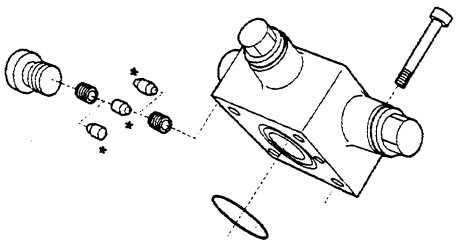


Schaltmagnet

Solenoid

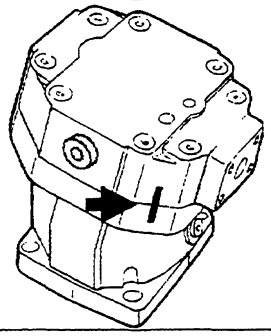
8

9



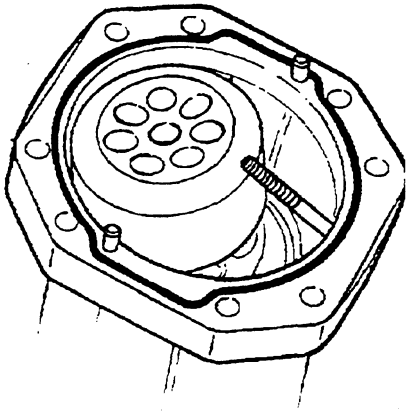
Deckel mit Spül- und Speisedruckventil und * Drosselstift
* Drosselstift "Auftragsbezogen".

Cover with flushing and boost pressure valve and
* throttle pin.
* Throttle pin "as to order requirement".



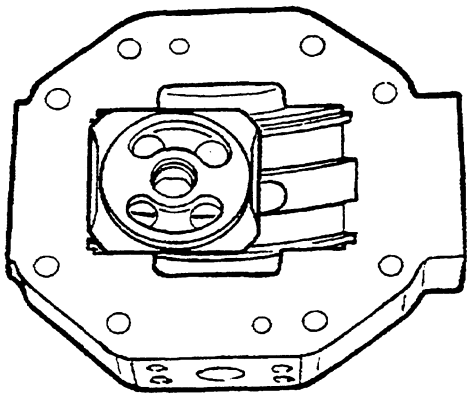
28 Anschlußplatte
Lage markieren. Schrauben lösen.
Abbauen

Port plate
Mark position. Loosen screws.
Removal



29 O-Ring austauschen.
Neuer O-Ring mit etwas Fett einkleben.
⚠ Treibwerk nicht ausschwenken.
Kolbenringe hängen aus der Zylinderbohrung aus.

Check O-ring.
Stick new O-ring with some grease.
⚠ Do not swivel rotary group.
Piston rings to hang out from the cylinder boring.



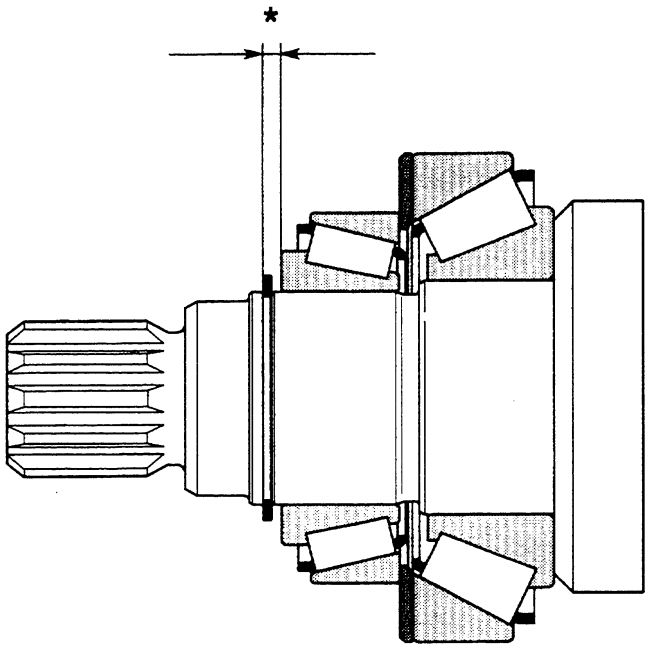
30 ⚠ Steuerlinse in Gleitbahn mit Fett einkleben.
Fertigmontage in umgekehrter Reihenfolge.
Anschlußplatte aufsetzen.

⚠ Triebwerk senkrecht.

⚠ Stick control lens in sliding surface with grease.
Assembly in reversal order.
Mount port plate.

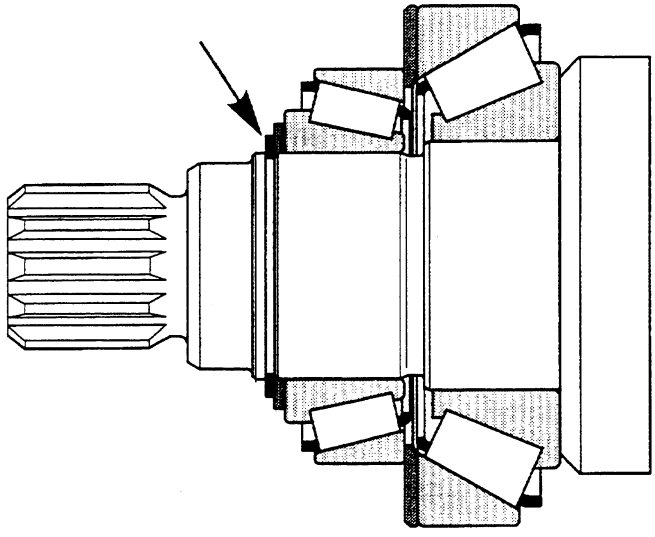
⚠ Rotary group vertical.

Triebwelle: mechanischer Teil
Rotary group: mechanical part



Sicherungsring montieren.
Maß * für Abstimmscheibe mit Endmaßen ermitteln (überkreuz).

Assemble safety ring.
Determine dimension for adjustment disc with final dimensions (crossover).



Abstimmscheibe einbauen.
Sicherungsring montieren.
Triebwelle einbaufertig.

Install adjustment disc.
Assemble safety ring.
Drve shaft ready for assembly.

Survey

Front Axle Components, Screw Qualities, Tightening Torques, Screw Locking

Front Axle

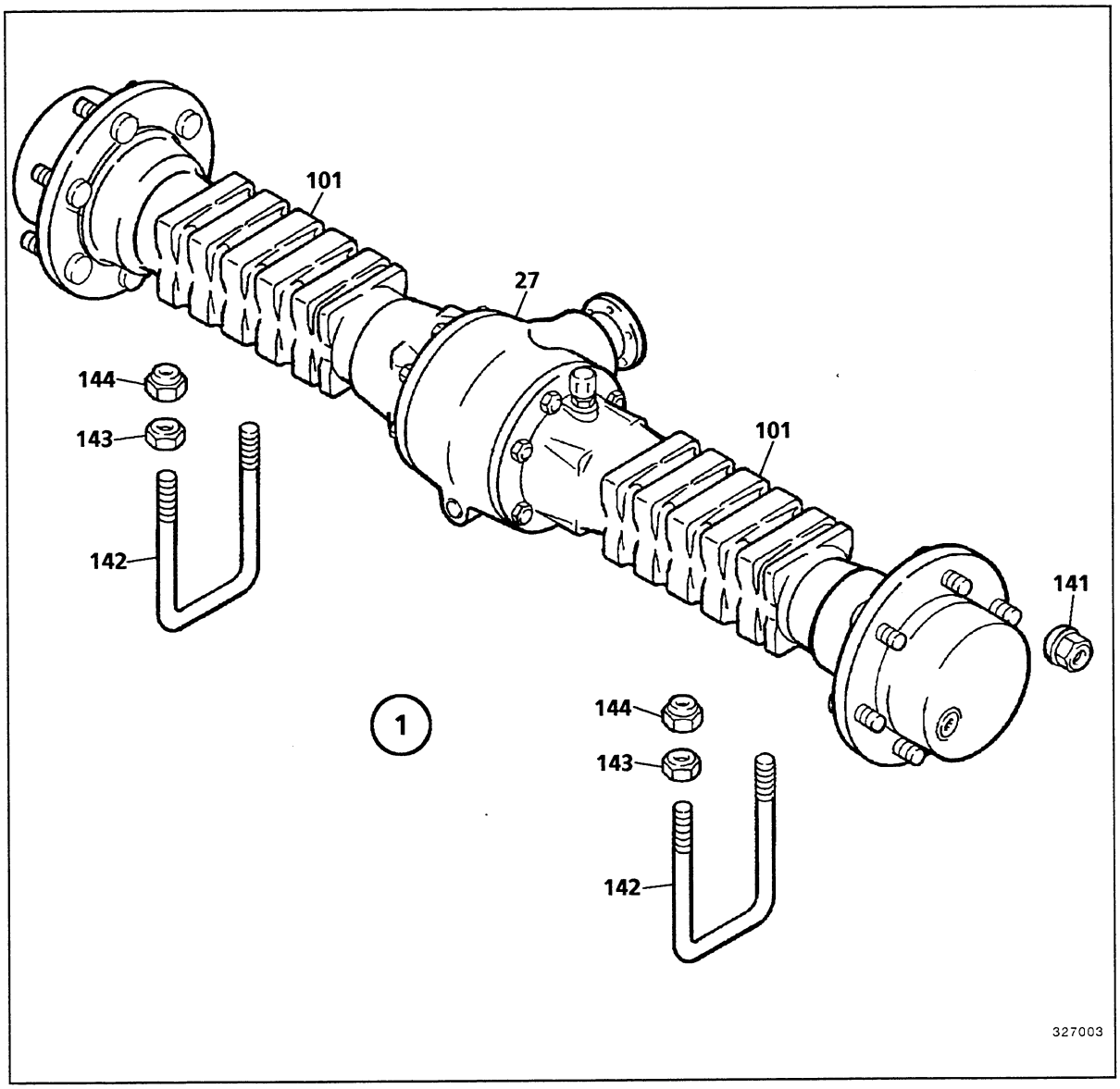


Fig. 1

Brake Assembly

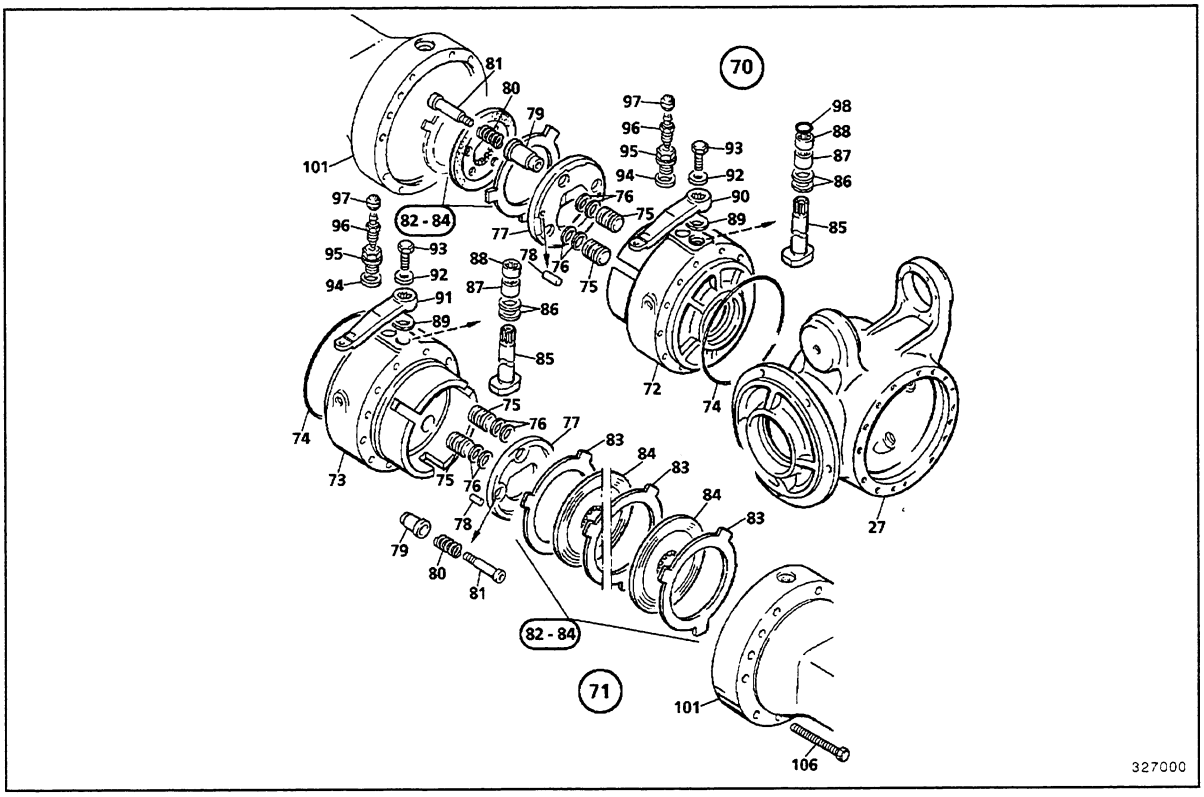


Fig. 7

Axle Drive Assembly

- Dismantle complete axle. Refer to "Dismantling and Reassembling the Axles".
- Bleed oil from wheel hubs and axle
- Mark axle housing (27, Fig. 4) and both axle tubes (101). Place axle in vertical position so that - seen in driving direction - the left-hand axle half is on top. At this position, ring gear (21) is on top. Refer to "Front Axle Drawing". Fix lower axle tube. For holding fixture, refer to "List of Special Tools" chapter.
- Slacken hex screws (106) and lift off axle tube (101). Hub and planetary gear set remain closed.
- Remove O-ring (107).
- Extract drive shaft (108).
- Lift out complete differential assembly with device S28.
- Pull drive shaft (108)out of lower axle tube.
- Arrest flange (50) with crank S27, slacken collar unit (51) and pull off flange (50).
- Lift shaft ring (48).
- Drive pinion shaft (21) into axle housing (27), catch released tapered roller bearing.
- Extract spacing washers (44 - 46), bush (40) and tapered roller bearing (36) from pinion shaft.
- Drive outer rings of tapered roller bearings (36 + 47) out of axle housing if bearings are to be replaced. Remove spacing washers (37 - 39).

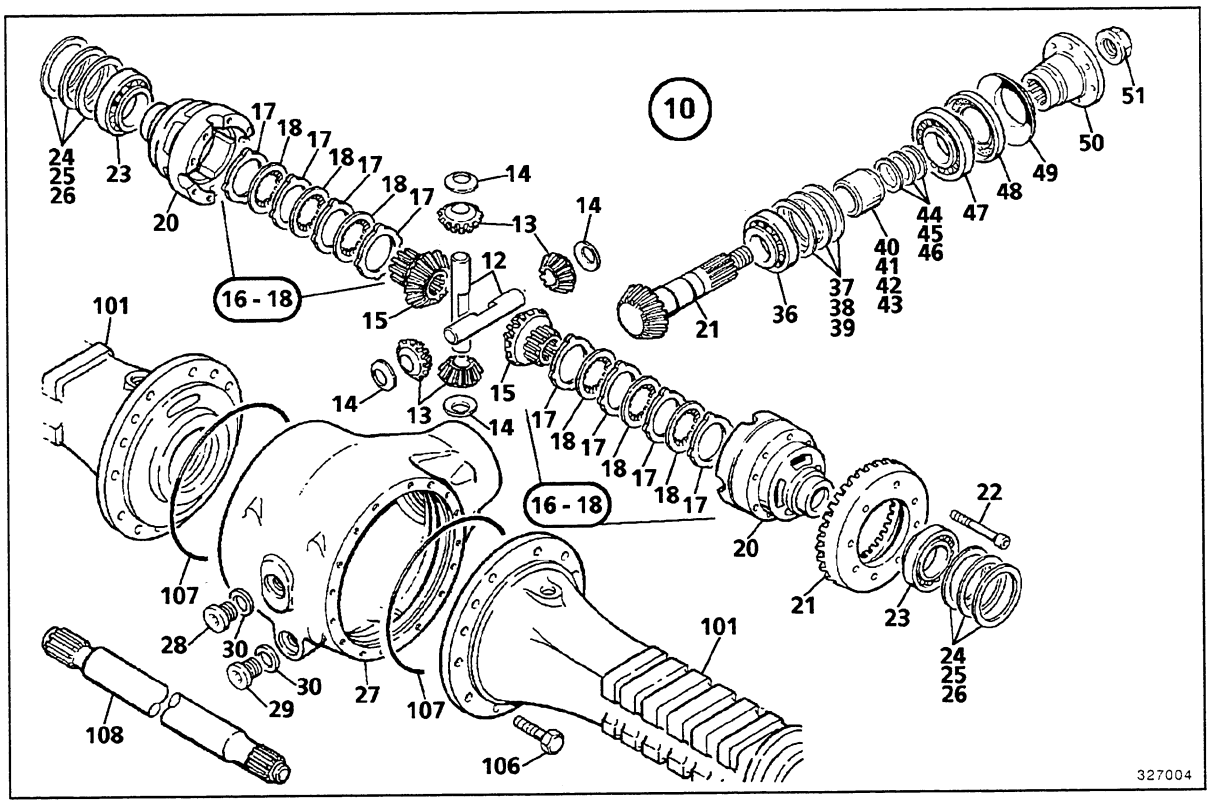


Fig. 4

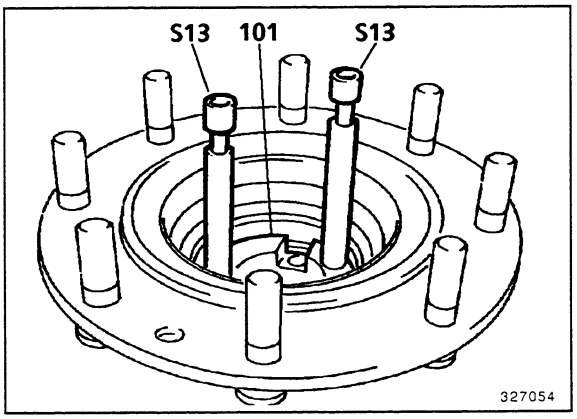


Fig. 12

Screw two pins of mounting fixture (S13) into axle tube (101).

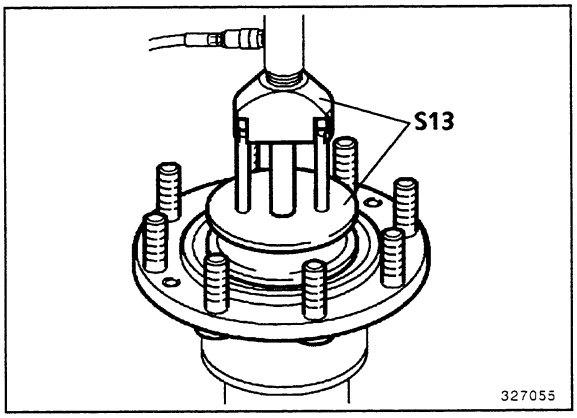


Fig. 13

Apply mounting fixture (S13) with screwed-in cylinder for conventional hydraulic presses (Lukas).

Fully press hub onto axle tube.

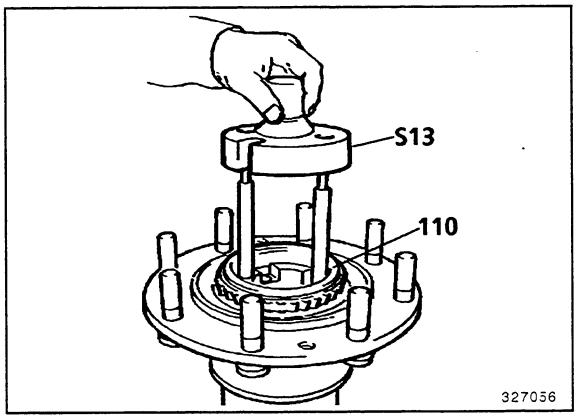


Fig. 14

Insert tapered roller bearing (110).

Apply new die of mounting fixture (S13) to bearing ring.

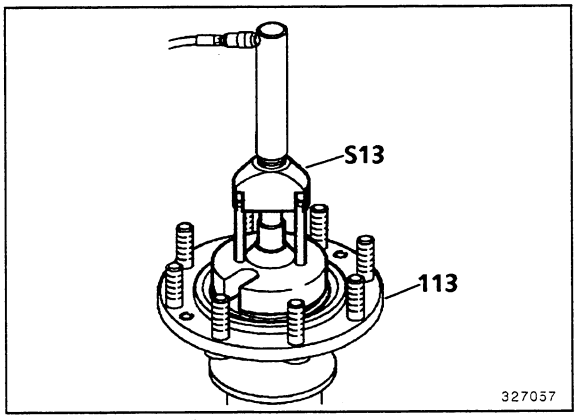


Fig. 15

Increase pressure of hydraulic press to approx. 200 bar. Give hub a few taps with plastic mallet for settling.

Reduce pressure to 50 bar and turn hub (113) by hand. This value yields the axial prestress of 0.05 - 0.15 mm required for new tapered roller bearings (110).

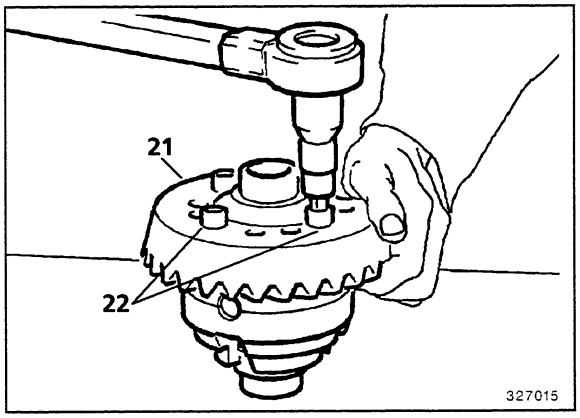


Fig. 47

Attach bevel gear (21). Turn in four fillister-head screws (22) with LOCTITE 243 and slightly tighten crosswise.

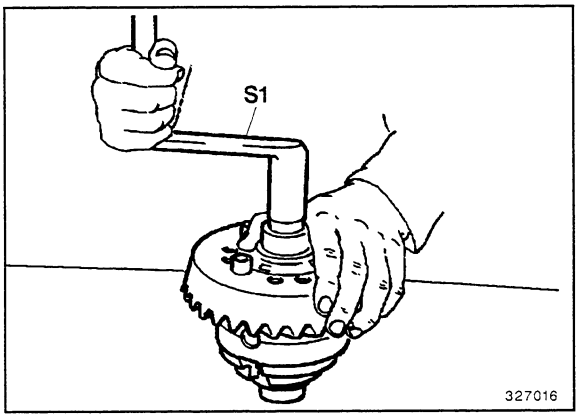


Fig. 48

Slip over hand crank (S1) and turn differential. To make the gears and pins settle give the bevel gear a few taps with a plastic mallet.

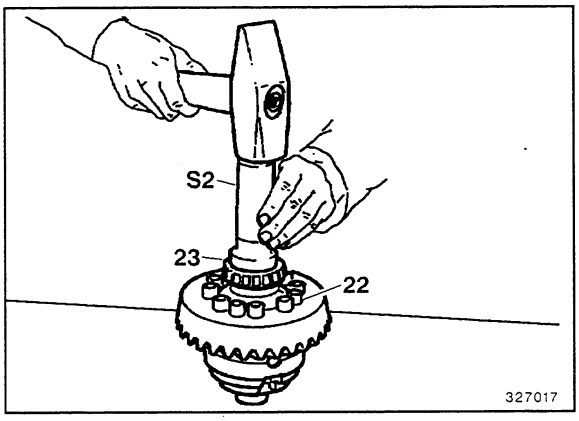


Fig. 49

Turn in remaining fillister-head screws (22) with LOCTITE 243. Tighten all screws.

Tightening torque M_A = 120 Nm.

Drive on tapered roller bearing (23).

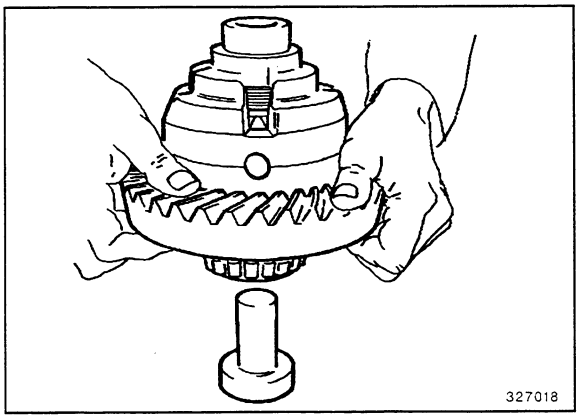


Fig. 50

Turn over differential and put on suitable punch.

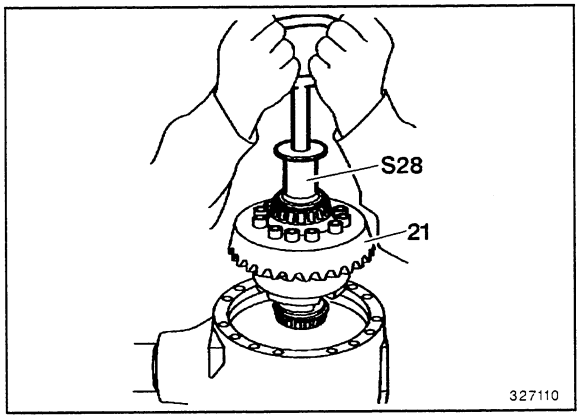


Fig. 80

Apply marking blue to the sides of a few teeth of bevel gear (21).

Insert pre-assembled differential with fixture (S28).

The teeth with the marking blue should be opposite to the pinion shaft.

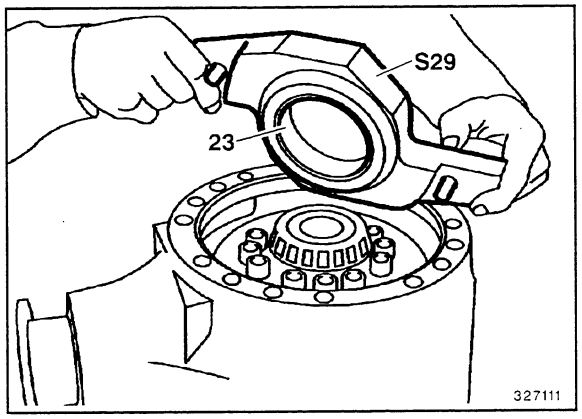


Fig. 81

Push original outer ring of tapered roller bearing (23) into fixture (S29).

Attach fixture and fasten with two screws.

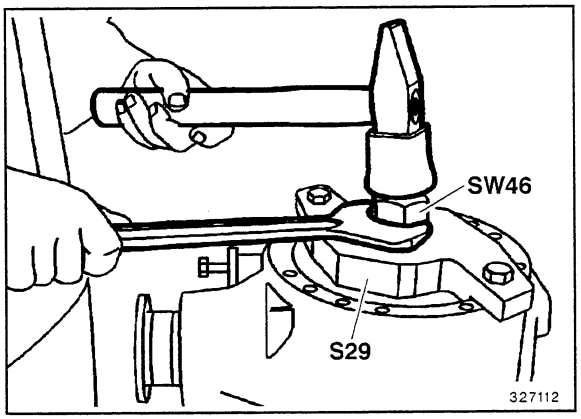


Fig. 82

Tighten 46 size hex screw and strike screw head with a heavy plastic mallet at the same time.

Slacken screw 1/4 turn and slightly re-tighten.

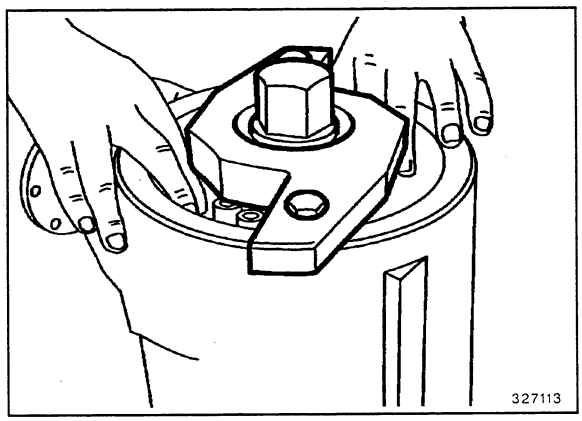


Fig. 83

Move bevel gear by hand.
Check backlash.

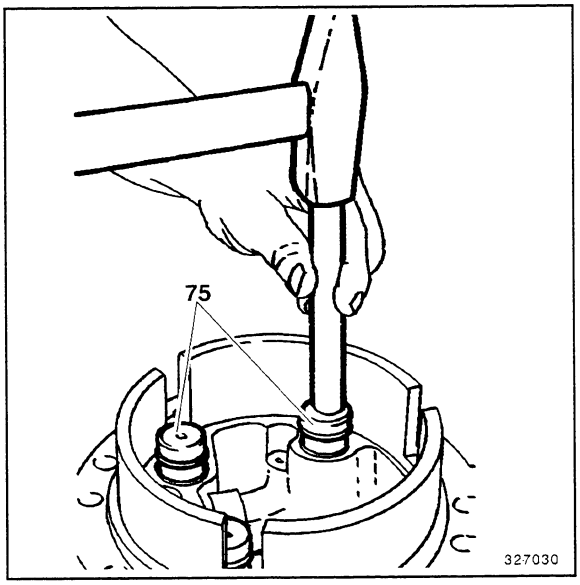


Fig. 12

Carefully drive piston (75) fully into cylindrical bores using a plastic punch.

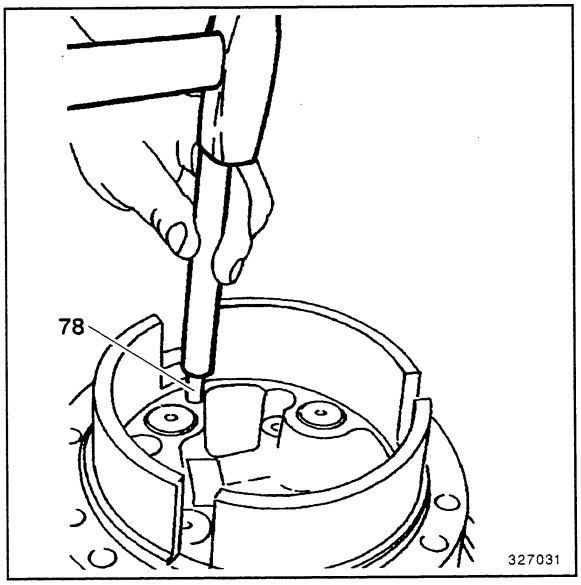


Fig. 13

Insert two guide pins (78).

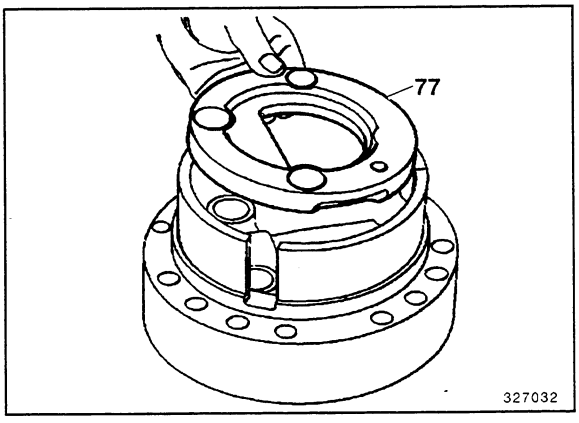


Fig. 14

Insert back-up ring (77).

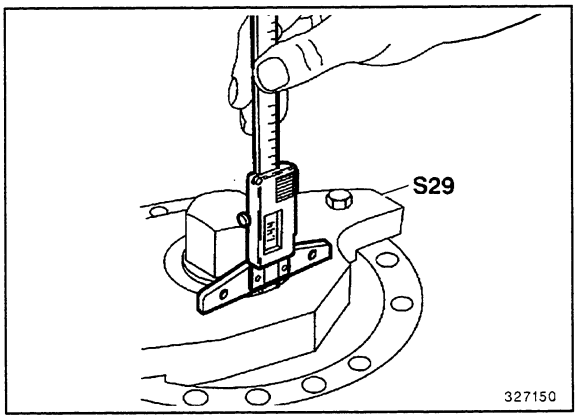


Fig. 44

Measure with respect to outer ring of tapered roller bearing (23), surface (B), with depth gauge through bore in fixture (S29). Refer to Fig. 52.
Difference between A and B = X.
Example: X = 1.60 mm.
Record measured value.

Remove fixture (S29).

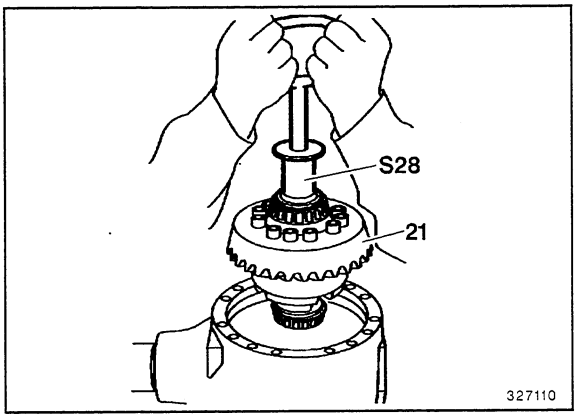


Fig. 45

Lift out differential.
Check surface appearance on bevel gear. Refer to Chapter "GLEASON Toothing Surface Appearances". For major deviations, shift pinion shaft by changing spacing washers (37-39).

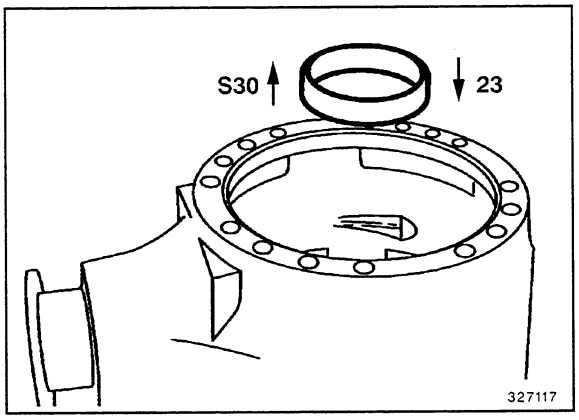


Fig. 46

Remove bearing ring (S30).
Insert original outer ring of tapered roller bearing (23)

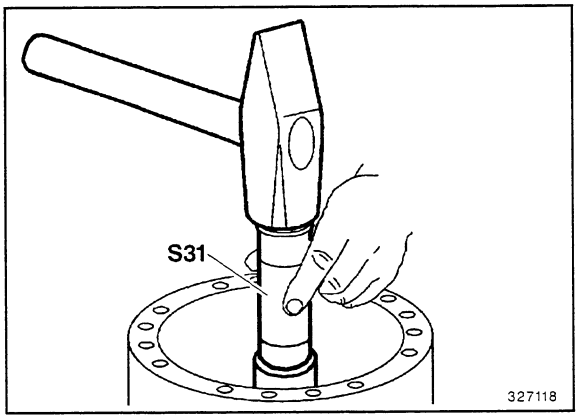


Fig. 47

and drive in with punch (S31).

GLEASON Toothing Surface Appearances

Ideal tooth-contact pattern

Coast side (concave)

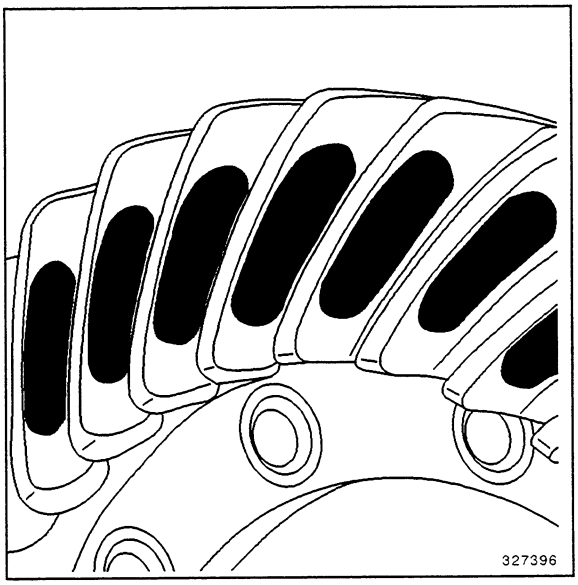


Fig. 1

Drive side (convex)

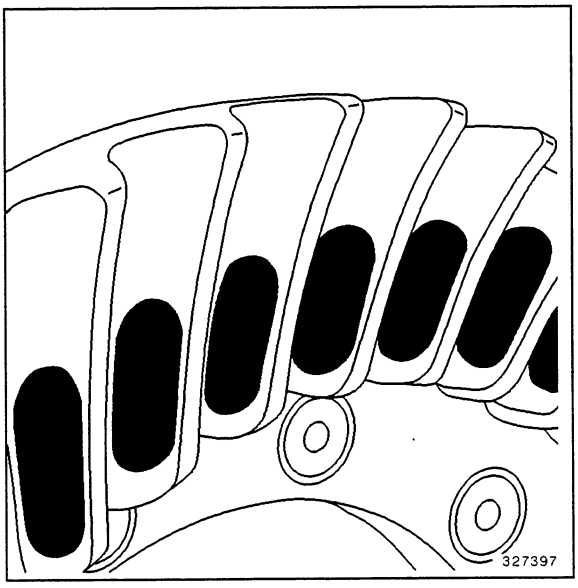


Fig. 2

Steering cylinder (L1)

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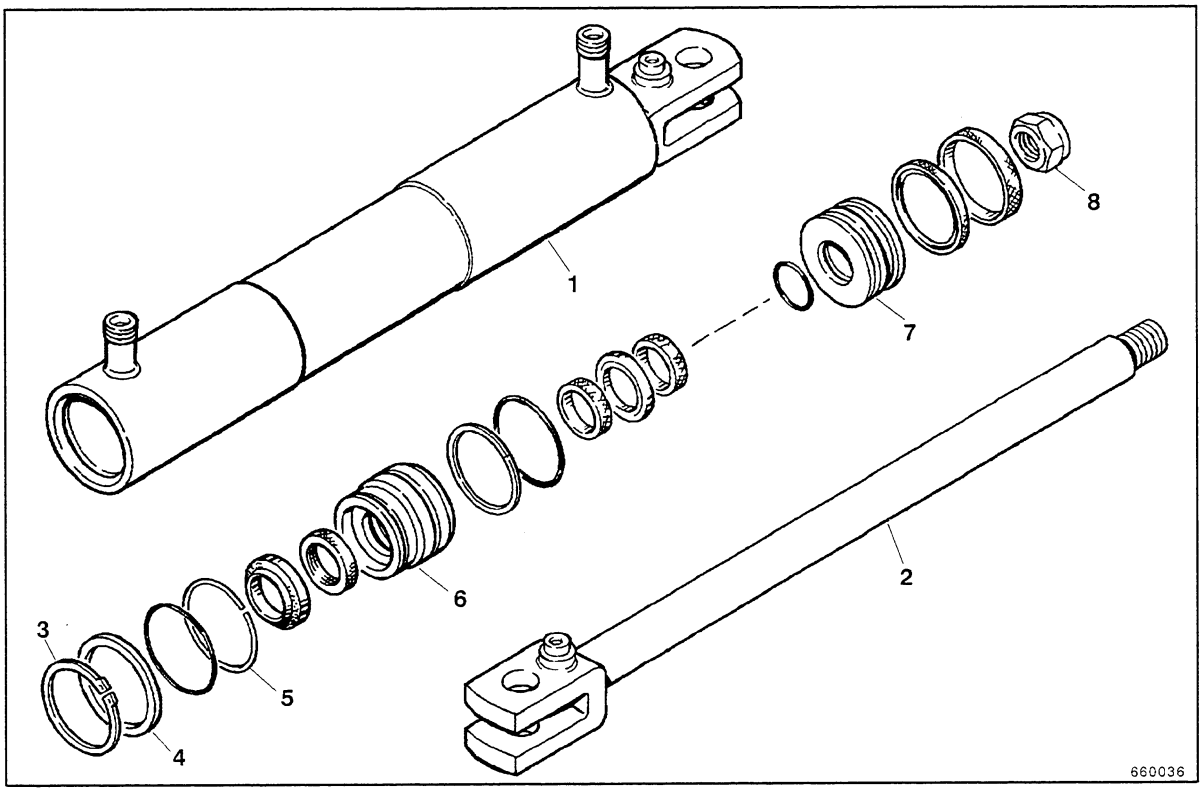

Fig. 6

Positions Fig. 6

1 - Cylinder tube
2 - Piston rod Ø 28 mm
3 - Locking ring
4 - Supporting ring
5 - Locking ring
6 - Guide bush
7 - Piston Ø 60 mm
8 - Hexagon nut

Mounting information

Stroke: 310 mm
Fluid connections: L12W DIN 3 653
Connection thread: M 18 x 1,5 □

7

Accumulator (B4), Technical data

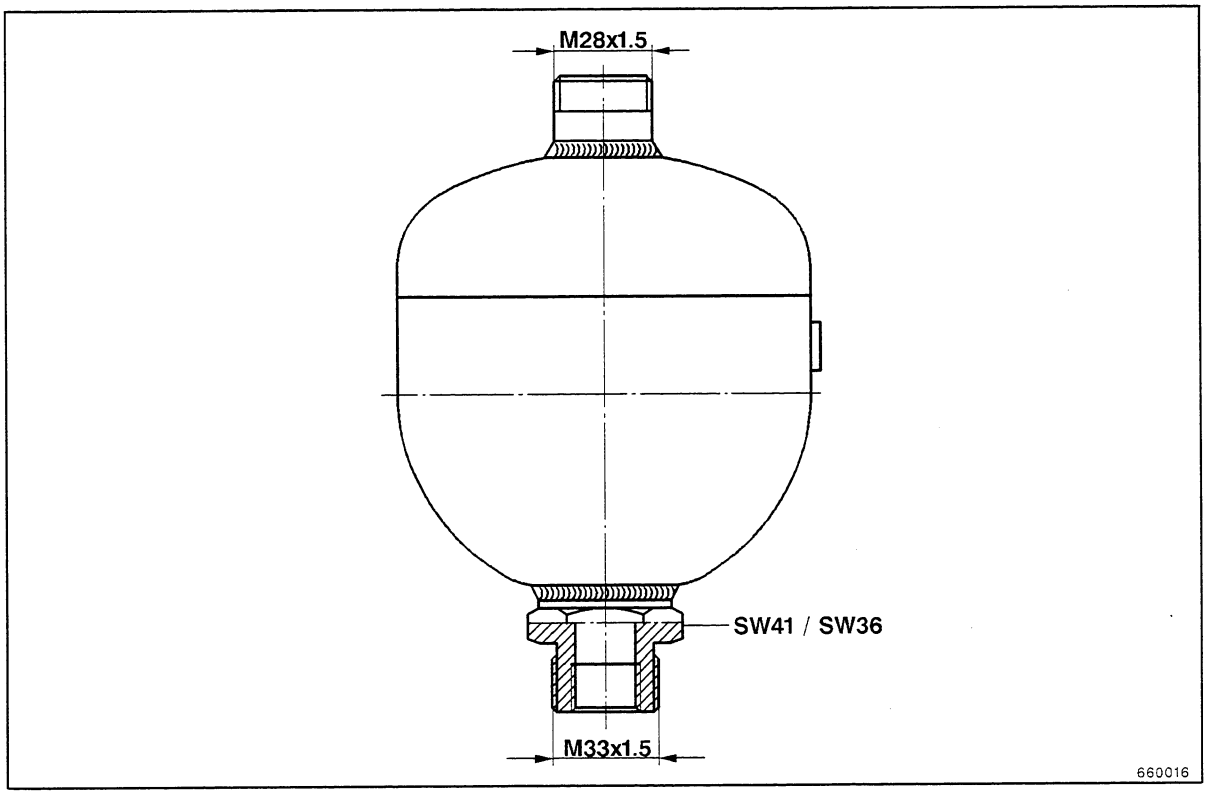

Fig. 5

Capacity:	0.75 l
Admissible operating pressure:	210 bars
Filled gas:	Nitrogen
Filled-gas pressure:	50 bars
Weight:	2.8 kg

Notes

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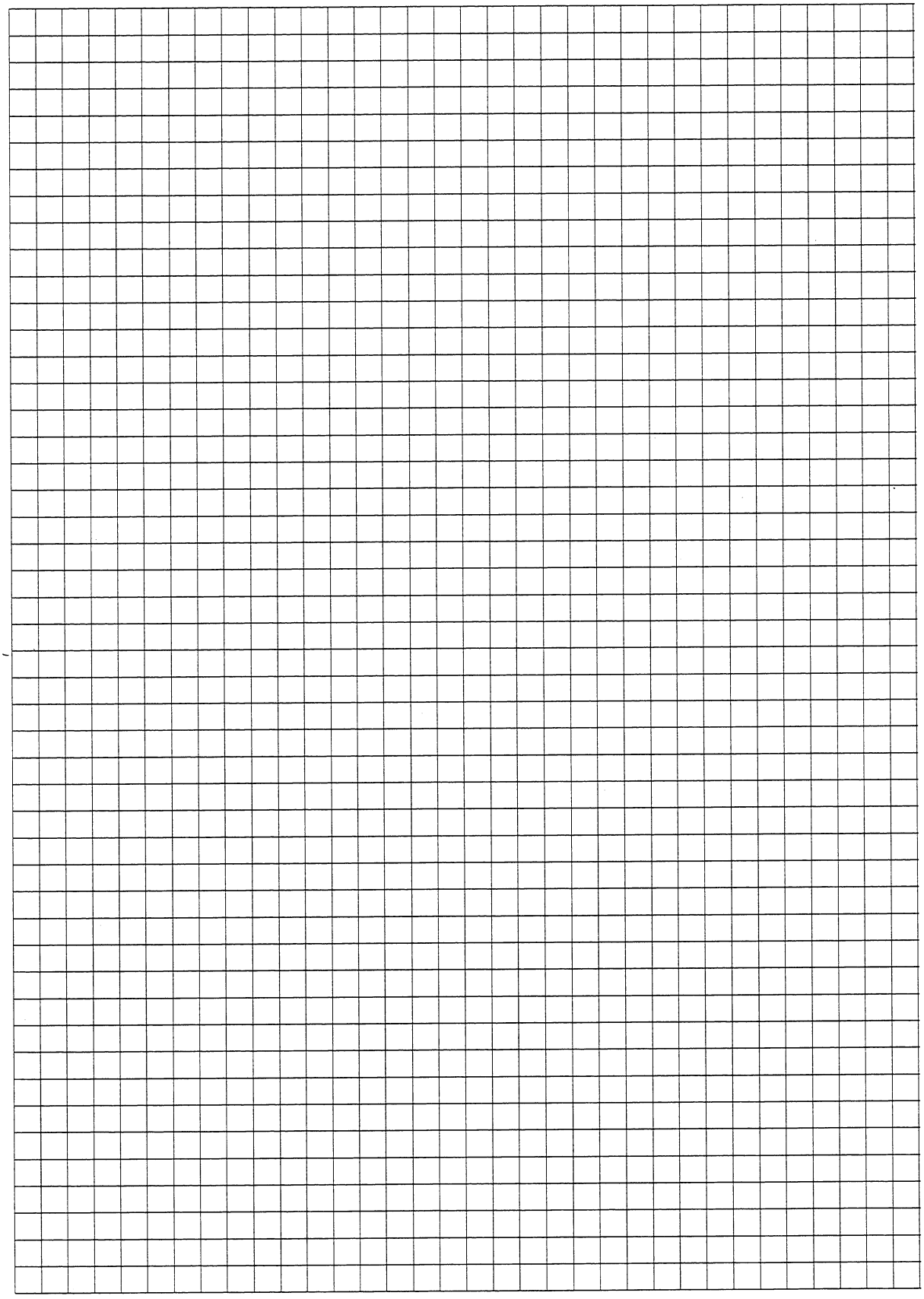

Control block (H6)

Parts Fig. 2

H6 - Control block
H7 - Secondary valve, rearward tilting
H8 - Secondary valve, dumping
H9 - Primary valve
H10 - Replenishing valve
H11 - Pressure-maintaining valve, lifting / lowering
H12 - Pressure-maintaining valve, rearward tilting / dumping
H13 - Pressure-maintaining valve, 3rd function
H14 - Control piston, lifting / lowering
H15 - Control piston, rearward tilting / dumping
H16 - Control piston, 3rd function

Connection designations

Designation at block	Use	Thread
A	Oil to operating equipment / cylinder	M 18 x 1.5
B	Oil to operating equipment / cylinder	M 18 x 1.5
P	Pressure oil from priority valve	M 22 x 1.5
T	Tank reflow via distributor (part T5)	M 26 x 1.5

Testing and adjustment work

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For all testing and adjustment work at the hydraulic system, the temperature of the hydraulic oil must be ca. 60 - 70°C.

Pressure testing and adjustment

An appropriate pressure gauge must be connected at the measuring connection (P_H).
The working hydraulics are moved to the limit stop with the lifting function. The primary pressure of 230 bars must not be read off at the pressure gauge.
The primary pressure is adjusted at the primary valve (H9).

The best way to check the secondary relief valves is the following procedure:

1. Correct a pressure gauge to the ring side of the dump cylinder.
2. Bring the lifting frame in horizontal position.
3. Dump the bucket against block.
4. Lift the lifting frame **without** using the dumping cylinder.
   Now you can read the pressure of the dump relief valve at the pressure gauge.

To check the roll back relief valve, the hoses at the dump cylinder have to be changed. Now the positions 2 - 4 of the procedure have to be done again.

Set what?	How high?	Where?
Primary pressure	230 bars	Primary valve (H9)
Secondary valve, rearward tilting	240 bars	Secondary valve (H7)
Secondary valve, dumping	280 bars	Secondary valve (H8)

Practical testing

The correct setting of the primary and secondary pressure alone is not a confirmation that the hydraulic system is in order.
To be sure of this, the throughput must also be checked. As this is, however, a very complex measurement and the necessary measuring equipment is often not available, the stroke time can be determined as an option.
At top motor speed the stroke time should be ca. 6.7 seconds.

N.B.:

The precondition for this testing is that the drive motor is correctly set:

low idling: see techn. data

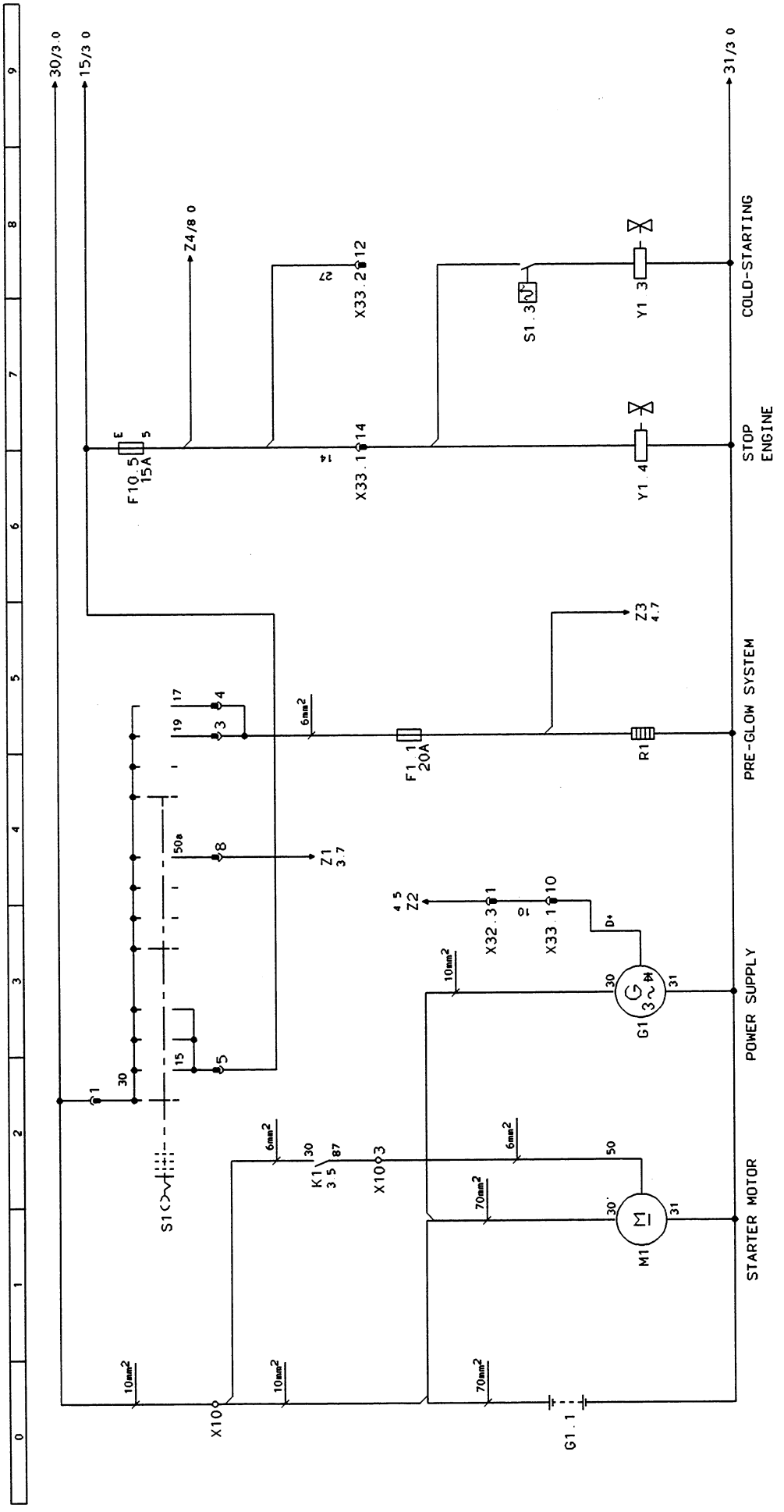
high idling: see techn. data

If the stroke time is clearly exceeded, this may indicate a defective priority valve (L6) or a defective hydraulic pump (H17).

Another test is measuring of the falling-off time. For this purpose the machine must be equipped with a standard bucket and the lifting arm and bucket must be positioned approximately horizontally.
The motor is then switched off.
In 15 minutes, the tip of the bucket may fall by ca. 60 mm. If the falling rate is higher, check whether the fault is in the lifting or in the tilting function.
The lifting cylinders may yield by ca. 15 mm (measured at the piston rod) during this time.

Important:

During these measurements, suitable precautions must be taken to protect third parties and the mechanic taking the measurements from any lifting gear which may drop down.
The safety instructions must be observed.


30/3 0
15/3 0
31/3 0
Z4/8 0
F10.5 15A
X33.2 12
X33.1 14
S1.3
Y1.3
Y1.4
COLD-STARTING
STOP ENGINE
Z3 4.7
F1.1 20A
R1
PRE-GLOW SYSTEM
Z1 3.7
X32.3 11
X33.1 10
Z2
D+
G1
POWER SUPPLY
S1
K1
X10 3
M1
STARTER MOTOR
X10
G1.1
6mm²
10mm²
70mm²

END POINT	CABLE NO.	(mm²	NO.	■ mm²	CABLE NO.	END POINT
S5/1/3	gn	1	1	1	84	K5.86
S5/5	rdgn	1,5	2	1,5	85	30 (B+)
S5/4		1,5	3	1,5	86	X21.3
			4			
S6.1/1/4		1,5	5	88	1,5	F11.2
S6.2/1		1,5	6	1,5	89	F11.2
A2X3.3		1	7	1	21	X33.2.6
P2/G	buwh	1	8	1	49	X33.3.15
S4/5		1,5	9	1,5	39	X33.4.10
P2E	gyrd	1,5	10	1,5	90	F11.1
S81/2	bnbk	1,5	11	1,5	91	K81.2 (87)
S81/1		1,5	12	1,5	92	K81.1 (49)

CONNECTION TABLE PLUG/SOCKET
PANEL X32.4 DEVICE

END POINT	CABLE NO.	(mm²	NO.	■ mm²	CABLE NO.	END POINT
			1			
			2			
K20.1 (48a) / X21.6	95/96	1,5	3	1,5	bkwhgn	S20/5/8/11
X21.5/X33.3.1/X33.1.1	97/98	1,5	4	1,5	bkwh	S20/7
X21.7/X33.3.2/X33.1.2	2/105	1,5	5	1,5	bkgn	S20/4
			6			
			7			
			8			
			9			

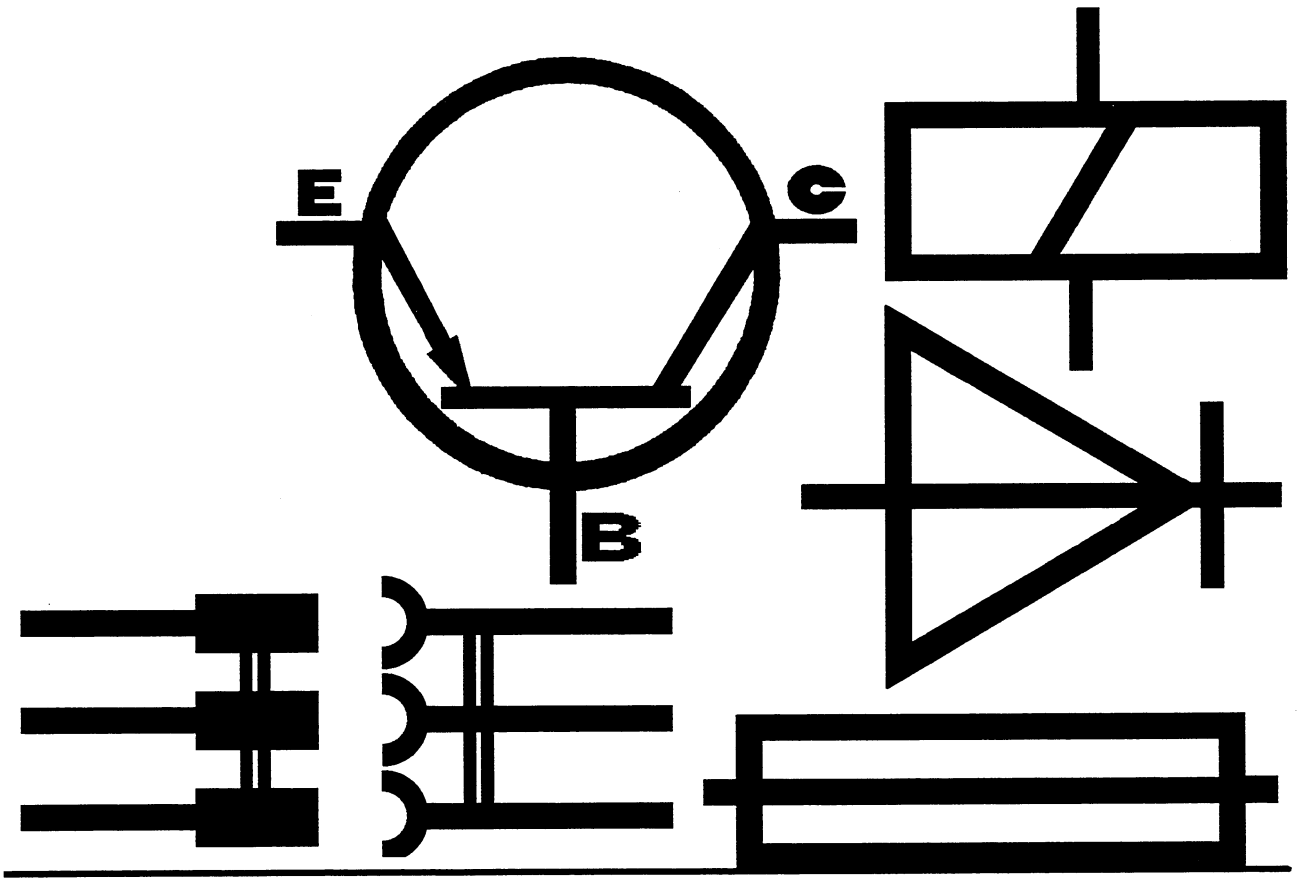
CONNECTION TABLE PLUG/SOCKET
PANEL X32.5 DEVICE

09

13

Technical Handbook

Fundamentals of electrical engineering



2 800 950.00 en

Alternating current diagram

T = Duration of one full cycle (period) in s

f = frequency in Hz (f = 1/T)

$\hat{i}$ = Peak value (amplitude) of the current,

$\hat{u}$ = Peak value (amplitude) of the voltage,

omega = Radian frequency in 1/s (omega = 2pi · f)

phi = Phase shift angle (phase shift means: current and voltage attain their peak value or their zero crossing at different times) between current and voltage.

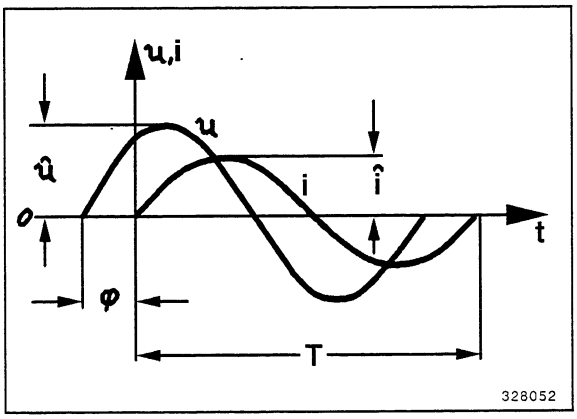


Fig. 7

The type of curve characterising alternating or direct current is known as a sine curve. If current and voltage are in phase, both reach their peak value at the same time. The oscillations in one second are referred to as frequency (f). The number of oscillations per second are stated in Hertz (Hz).

Trouble	Cause	Remedy
6. Insufficient service life of the battery	1. Battery too often and exhaustively discharged	Use battery with greater capacity considering using special "S" type batteries
	2. Battery gets too warm	Install at a better suited loacation
	3. Battery vibrations too heavy	Install at a better suited location
	4. Battery possibly "sulphated"	cf. 5.6
	5. Battery acid containing impurities	Replace the battery
7. Battery charge permanently insufficient	1. Defective alternator, voltage regulator or line connections	Increase alternator capacity or repair resp. replace alternator and voltage regulator; fasten connections properly
	2. V-belt loose	Retension the belt or replace
	3. Too many consumers connected to the battery	Install bigger battery. Consider using a stronger alternator; consult specialized workshops
8. Permanent overcharge	Voltage regulator and possibly alternator defective	Replace voltage regulator or change regulator setting; check alternator
9. Switch contacts in voltage regulator burnt (in case of d.c. generators)	Battery incorrectly connected (wrong polarity)	Connect battery with correct polarity. Replace voltage regulator
10. Rectifier diodes destroyed (in case of alternators)	Battery incorrectly connected (wrong polarity)	Connect battery with correct polarity. Replace rectifier diodes

SERIES AND PARALLEL CONNECTION OF ELECTRICAL COMPONENTS

Batteries

If two or more batteries are connected in series, the voltages of the individual batteries add up to give the total voltage.

If two or more batteries are connected in parallel (the batteries having the same voltage rating, of course), the total voltage remains the same. The battery capacity, however, is the sum of the individual capacities.

Important:
Observe the polarity when connecting batteries to each other.

Resistors

Series connection

If two or more resistors are connected in series, the total resistance (R_{tot}) is the sum of the individual resistances.

Parallel connection

If two or more resistors are connected in parallel, the total resistance (R_{tot}) is less than the smallest of the individual resistances. When connecting two resistors with the same resistance together, the total resistance is half that of the individual resistor.

Capacitors

Series connection

If capacitors are connected in series, the total capacitance (C_{tot}) is less than the smallest individual capacitance.

Parallel connection

If capacitors are connected in parallel, the capacitances add, i.e. the total capacitance (C_{tot}) is the sum of the individual capacitances.

Important:
The results obtained for series or parallel connection are just the opposite of those found for resistors.

Electrolytic capacitors

Electrolytic capacitors have the same behaviour as the above-mentioned capacitors with the exception, however, that their polarity is of importance. The polarity is marked on the capacitor.

Important:
Electrolytic capacitors must never be used with wrong polarity. **Risk of accident.**

Remarks:
Further components or their schematic symbols can be found in section "symbols used in electrical engineering".

FUSES IN MOTOR VEHICLES

Type	Nominal current A	Colour coding
Round fuses	5 8 8	yellow black white
	16 25	red blue
	25	white
Strip fuses	25	white
	30, 50, 100	grey
	125, 150, 250	
	35, 60, 100	grey
Plug-in type fuses	3 4 5 7,5 10 15 20 25 30	violet pink beige / transparent brown red blue yellow neutral / white green
Glas fuses	5 10 15 20 25	red yellow blue green silver
Radio fuses	2	transparent

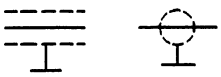
Ground, general

Winding, inductor, general (e.g. chokes)

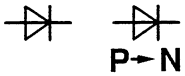
Winding with magnetic core (choke with core)

Transformer, converter, general

Symbol for 3-phase motor with squirrel cage



Shield with ground connection

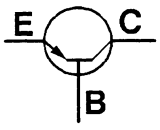


Diode rectifier, forward bias for positive current in the direction of the arrow point

Z diode (suitable for operation at breakdown voltage)

Thyristor

Light-ermitting diode



PNP transistor
E = Ermitter } Switching resp. regulating connections
C = Collector }
B = Base (control connection)

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PREFACE

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Electrical systems for construction machinery have developed far beyond their original applications as starting and lighting devices. The new tasks are essentially monitoring and control functions. This has entailed an inevitable increase in the number of circuits, so that the overall system appears complex and unclear to the non-electrician.

This impression was reinforced by the schematic block diagrams used in the past.

For this reason our company, like the automobile industry, has opted for another type of diagram, the circuit diagram.

This new type of diagram has proved very successful. Our company has now taken a further step in this direction with the decision to establish its documentation by means of a specially developed CAD system.

This has led to some differences between the old and the new circuit diagrams.

The interpretation of these new CAD circuit diagrams and their accompanying documents will be explained in the following description.

The present Technical Handbook applies to automotive electrical systems in construction machinery. The relevant accident prevention rules and the different requirements depending on various operating voltages must always be observed. These rules are not part of the handbook. □

Multimeter

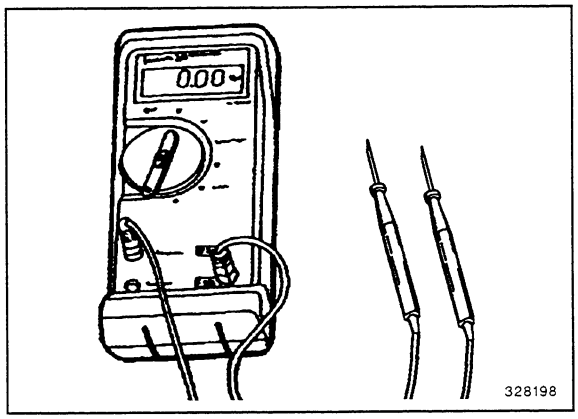

Fig. 3

The following quantities can be measured with multimeters:

- voltage,
- current,
- resistance.

Many multimeters have additional functions, e.g.:

- capacitance measurement,
- diode and transistor testing,
- testing facilities (continuity check).

Measuring instruments display the measured value in two ways:

- as analogue devices with pointer-type instruments and
- as digital devices with numerical read-out (Fig. 3).

Read the operating instructions before using the instruments. These measuring instruments are highly precise but also very sensitive devices which may be damaged if operated incorrectly.

Testers

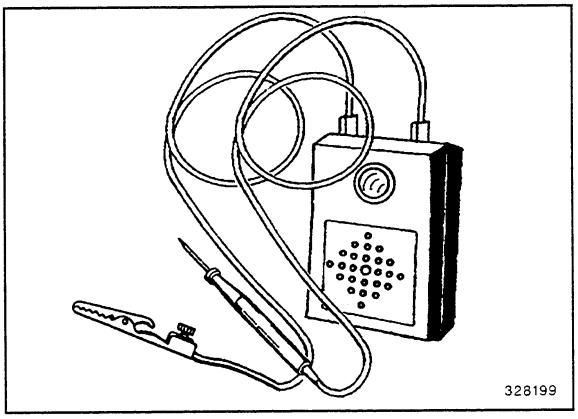

Fig. 4

Important:

Never use the test buzzer for testing on circuit boards equipped with electronic components. Sensitive electronic components may be damaged by the strong current flowing through the test buzzer.

Testers indicate by means of

- optical signals (lamp) and
- acoustical signals (buzzer)

whether a current flows through a component (e.g. cable, fuse, bulb). In this case, we say that the component "lets the current pass".

Acoustical continuity checks have the advantage that the person carrying out the test can concentrate on the test prods. It is not necessary to watch a lamp, so that incorrect measurements due to a displaced testing prod are excluded.

The continuity tester requires batteries for operation (number and type of the battery depend on the type of tester used). □

Letter	Designation	Examples
P	Meters, testers	Indicating, recording and metering instruments, impulse initiators, clocks
R	Resistances	Pre-glow plug, flame-glow plug, shunt, potentiometer
S	Switches, selectors	Buttons, limit switches, control switches, signal ermitters
T	Transformers	Transformers, converters
U	Modulators, converters	Frequency converters, converters, inverters, tansverters, demodulators, reversing converters
V	Semiconductors	Cancelling diodes for solenoid valves, variode
W	Conductive paths, hollow conductors	Switch lines, cables, busbar, antenna
X	Terminals, plug, sockets	Isolating plugs/sockets, test sockets, terminal strips, solder strips
Y	Electrically actuated mechanical devices	Brakes, coupling, valves
Z	Filters	Interference suppression assembly

Fuses

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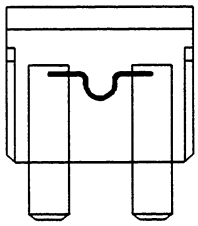
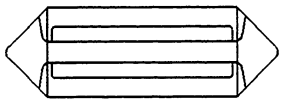
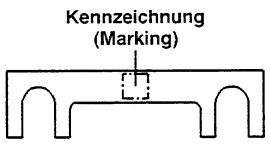
Fuse links (DIN 72 581)

Type	Nominal current, amperes	Colour of fuse insulation
 Fuse link, flat type	3 4 5 7,5 10 15 20 25 30	violet pink lightbrown brown red lightblue yellow white (nature) lightgreen
 Fuse link, round type	5 8 16 25	yellow white red blue

Fuse strips (DIN 72 581)

	Nominal current, amperes
	30 50 80 100

□

Persons accompanying the driver must be seated on the passenger seats provided for this purpose.

When crossing underpasses, bridges and tunnels or when passing under overhead lines always make sure that there is is sufficient clearance.

Always keep at a distance from the edges of building pits and slopes.

Avoid any operation that might be a risk to machine stability.

Never travel across slopes; always keep the working equipment and the load close to the ground, especially when travelling downhill.

On sloping terrain always adapt your travelling speed to the prevailing ground conditions. Never change to a lower gear on a slope but always before reaching it.

Before leaving the driver's seat always secure the machine against inadvertent movement and unauthorized use.

MAINTENANCE SAFETY INSTRUCTIONS

Observe the adjusting, maintenance and inspection activities and intervals set out in the operating instructions, including information on the replacement of parts and equipment. These activities may be executed by skilled personnel only.

Brief operating personnel before beginning special operations and maintenance work, and appoint a person to supervise the activities.

In any work concerning the operation, conversion or adjustment of the machine and its safety-oriented devices or any work related to maintenance, inspection and repair, always observe the start-up and shut-down procedures set out in the operating instructions and the information on maintenance work.

Ensure that the maintenance area is adequately secured.

If the machine is completely shut down for maintenance and repair work, it must be secured against inadvertent starting by:

- removing the ignition key and
- attaching a warning sign.

Carry out maintenance and repair work only if the machine is positioned on stable and level ground and has been secured against inadvertent movement and buckling.

To avoid the risk of accidents, individual parts and large assemblies being moved for replacement purposes should be carefully attached to lifting tackle and secured. Use only suitable and technically perfect lifting gear and suspension systems with adequate lifting capacity. Never work or stand under suspended loads.

The fastening of loads and the instructing of crane operators should be entrusted to experienced persons only. The marshaller giving the instructions must be within sight or sound of the operator.

For carrying out overhead assembly work always use specially designed or otherwise safety-oriented ladders and working platforms. Never use machine parts as a climbing aid.

Hoses

Hoses must be carefully chosen for the application to which they are to be put. Operating pressure, pressure peaks, fluid temperature, hose length, bend angles and radii must be taken into consideration. The hoses must be resistant to mineral oil, water and their emulsions, as well as to gas and air bubbles. Only the manufacturer of a machine is able to determine such demands exactly, e.g. as are made upon EHP hoses in a hydraulic system.

Hoses are delivered ready to be installed. They may have screw couplings (Fig. 1)

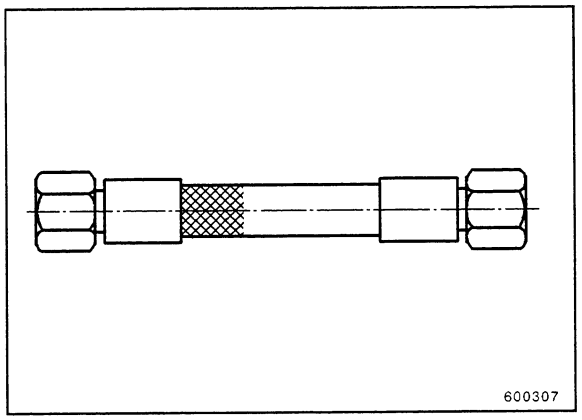


Fig. 1

or SAE flange fittings (Fig. 2) at each end,

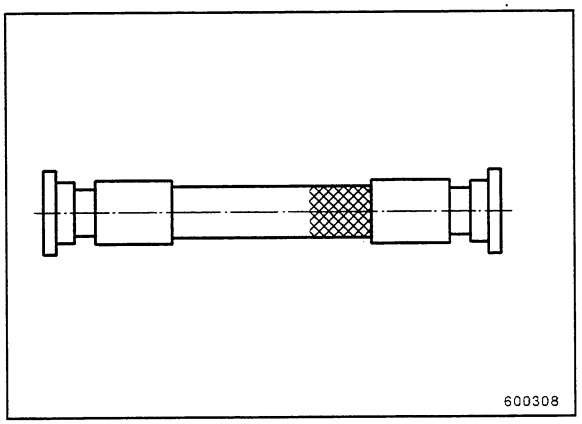


Fig. 2

or may have one screw coupling and one SAE flange fitting (Fig. 3).

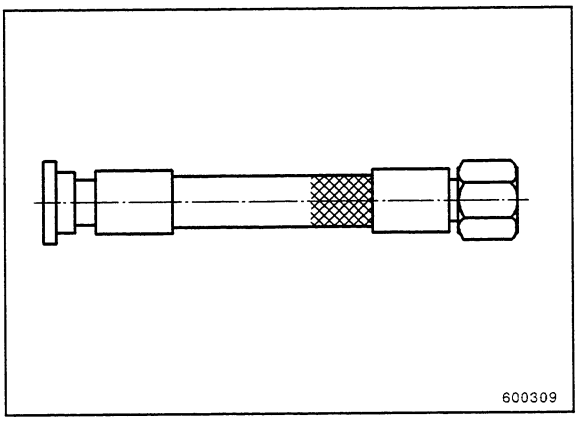


Fig. 3

Hoses may alter their length slightly when subjected to high pressure. Permissible tolerances range from -4 % to +2 %, based on nominal dimension.

Examples for fitting hoses

Hoses must be installed free of tension and kinks. Damage can otherwise occur to the hose itself and to its end couplings. What is more, the restoring torque of a hose installed incorrectly can lead to the coupling loosening and leaking.

Hoses installed in a straight line with both couplings lying at the same level must be allowed to "sag" slightly. Only then is it possible for fluctuations in length - due to pressure and temperature deviation - to be taken up by the hose itself.

Fig. 4 shows examples of correct hose installation.

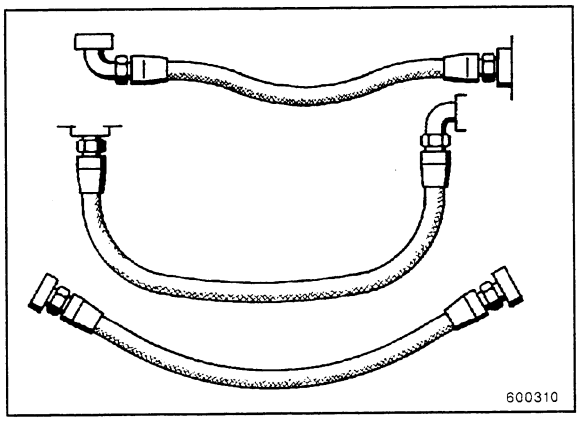


Fig. 4

Swivel couplings

Swivel couplings

Application: in hydraulics for pipes with 25, 30 and 38 mm outside diameter

Swivel coupling with straight male thread acc. to DIN (Fig. 1)

Components:
1 - Coupling body
2 - Union nut
3 - Cutting and wedging ring
4 - Union nut
5 - O-ring
6 - Straight male thread acc. to DIN
7 - Component to be sealed
8 - Retaining ring body/nut

Leakages can be remedied as follows:
In area A; sealed with cutting and wedging ring
as described under "Sealing pipe couplings".

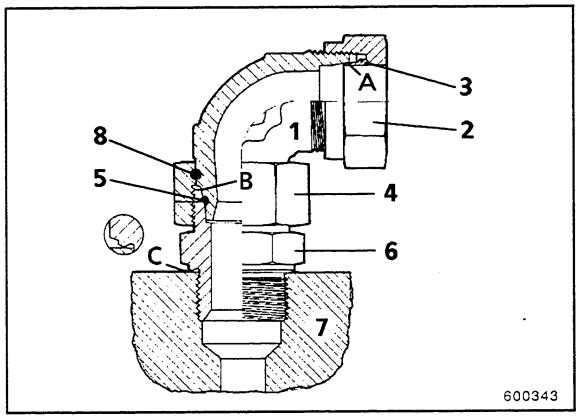


Fig. 1

In area B; sealed with O-ring
tighten up by hand - otherwise change O-ring.

in area C; sealed with sealing edge
tighten male nipple. Should this not help, check sealing surface of main component for pitting, grooving or scoring - rework with a spot facer if necessary. Male nipple to be changed if sealing edge is damaged.

Swivel coupling with long male adaptor (Fig. 2)

The swivel coupling positioned on the adaptor (6, Fig. 2) is made up of the same components as stated under "Swivel coupling with straight male thread acc. to DIN".

Any leakages are to be remedied in the same manner as given under "Swivel coupling with straight male thread acc. to DIN". The coupling is sealed in area "C" with a steel sealing ring (9).

If sealing ring or male adaptor are damaged, they are to be replaced.

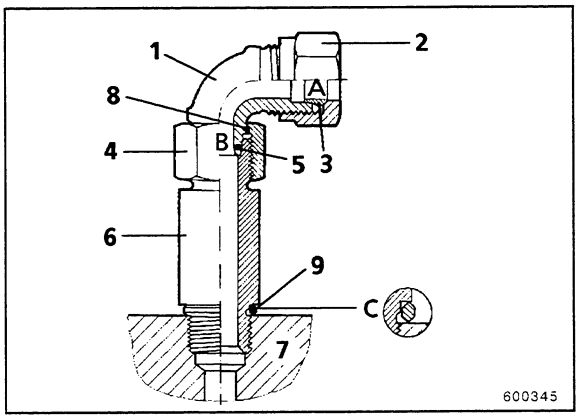


Fig. 2

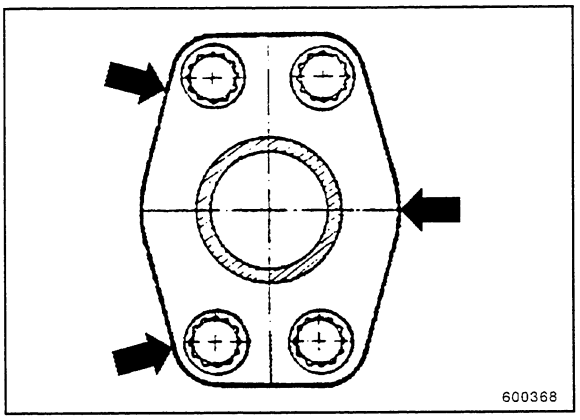


Fig. 4

Check the gap at at least 3 separate points (see arrows). Difference must not be greater than 0.3 mm.

Repeated assembly:

When a coupling is assembled a second (or further) time, the gap must be at least 0.2 mm smaller than the previous one.

Gaps must therefore be measured before couplings are loosened.

A subsequent assembly or installation is not permitted when the gap is smaller than 0.3 mm

In case of leakage:

- Leakage on seal ring (oil leaks between connection surface and flange)
  - Check that gap is parallel and smaller than 2 mm. Re-tighten otherwise.
  - If above measure does not help, check seal ring and connection surface. If necessary, change seal ring. Re-assemble coupling.
  - If coupling still leaks, change pipe, wedge ring and seal ring (gap as for first assembly: $2_{-0.5}$ mm). If gap is smaller than 0.3 mm, replace flange too.
- Leakage between wedge ring and pipe (oil leaks between flange and pipe)
  - Check that gap is parallel and smaller than 2 mm. Re-tighten otherwise.
  - If above measure does not help, tighten bolts by one stage, i.e. reduce existing gap by 0.2 mm. If leakage is only reduced, tighten up a further stage.
  - If coupling still leaks, change pipe, wedge ring and seal ring (gap as for first assembly: $2_{-0.5}$ mm). If gap is smaller than 0.3 mm, replace flange too.

Zako-system

Figs. 5 & 6 show:

1 - Connection surface
2 - Sealring
3 - Z-ring (wedge ring)
4 - Flange
5 - Double-hex bolt
6 - Pipe

Assembly:

1. Pipe prepared for assembly (see "Inserting the Z-ring")
2. Place seal ring (2) into Z-ring
3. Press pipe (6), with Z-ring (3), against the connection surface.

Pipe (6) must be free of tension and at right-angles to surface (1).

4. Push flange (4), with bolts (5), against surface. Tighten up bolts as far as possible by hand.

Flange (4) must be at right-angles to pipe axis and parallel to the connection surface. Permissible deviation from parallel: max. 0.3 mm

Check visually.

5. Tighten bolts (5) diagonally and evenly. Tightening torque: 250 Nm (final torque).

   It is not necessary to check gap dimension.

Notes

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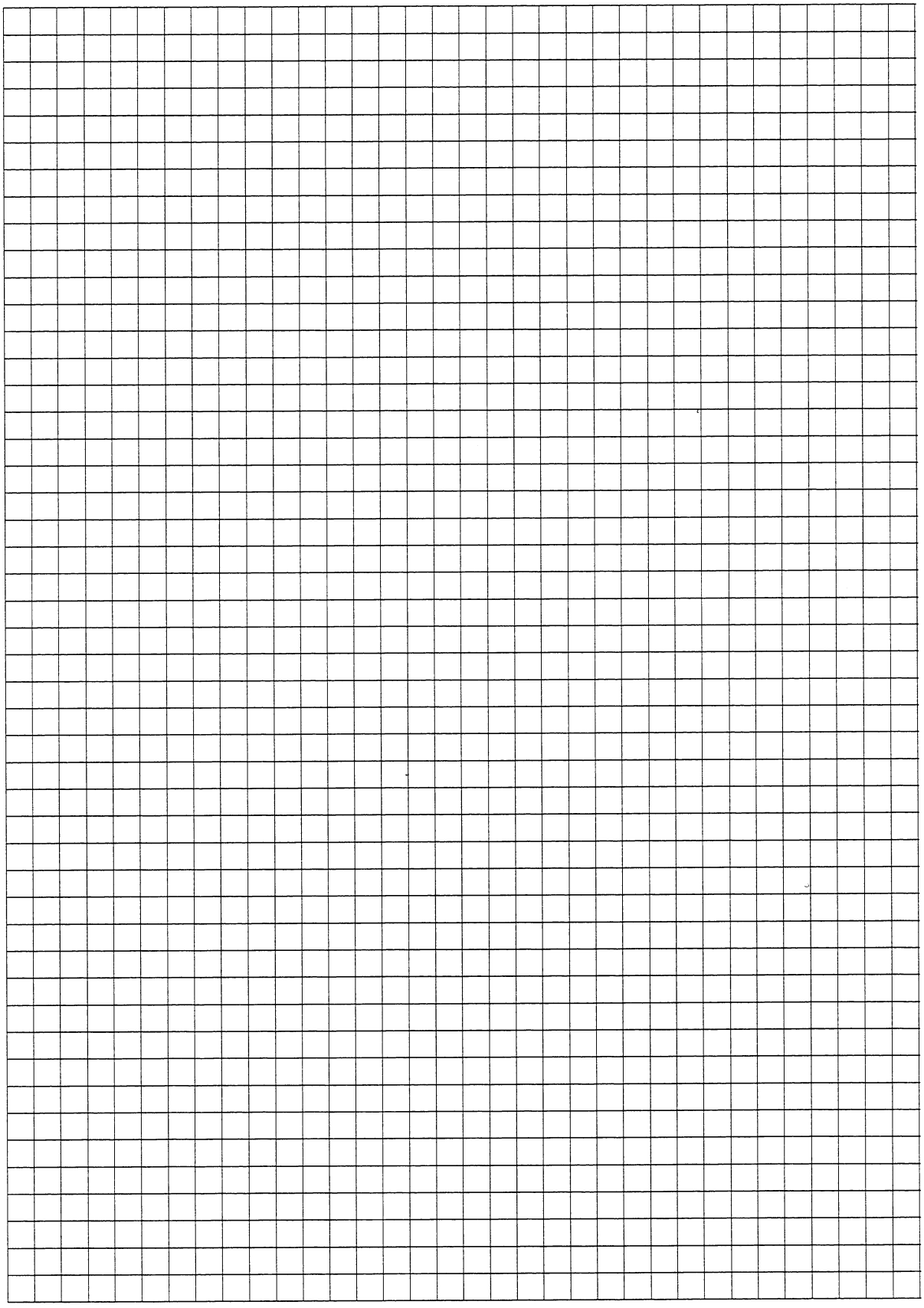

Securing the working equipment

Before carrying out assembly work, the machine and the attachments must be secured against inadvertent and unauthorized starting, e.g. by placing chocks under the wheels or tracks and by resting the working equipment on the ground.

Rest the working equipment on the ground in such a way that no movements can be made when mechanical or hydraulic connections are detached.

Secure any equipment or component which is to be mounted or dismantled or whose position is to be changed using hoists or appropriate slinging/supporting devices to prevent them from moving, slipping or falling inadvertently.

Systems and units (e.g. pipes, accumulators, etc.) must be properly depressurized before being opened.

Protective devices on moving machine parts may be opened or removed only when the drive unit is stationary and protected against inadvertent starting.

Before recommissioning, all protective devices must be refitted.

Sealing, protective, testing and cleaning agents

The safety instructions contained in this Technicel Handbook with respect to accident prevention and those set out on the packing of the above-mentioned agents must be observed.

Hydraulic and lubricating system

Always observe the safety regulations applicable to the product when handling oils, greases and other chemical substances.

Unused but open containers, pipelines and hose connections must be closed in a pressure- tight manner.

Refill collected hydraulic oil back into the hydraulic system only through the return-flow filters.

Dispose of waste oil without polluting the environment.

Observe the correct working sequence when fitting or replacing components or equipment.

The working sequence has been specified and tested by qualified experts.

Replace defective, mechanically prestressed units (e.g. nitrogen accumulators) only as an entirety. Never open them.

In exceptional cases, open only when the system and the operating sequence are precisely known. The Technical Manual contains no information on such work. When the machine is at operating temperature, the consumables are at least at the same temperature. Precautions must therefore be taken to prevent burning or scalding.

Be careful when handling acids, e.g. battery acid. Acid splashes may injure the eyes and the skin.

Do not smoke when handling flammable liquids.

Be careful with open flames and unprotected lighting.

Not only fuel but also other consumables often have a low flash point and catch fire easily.