List of contents

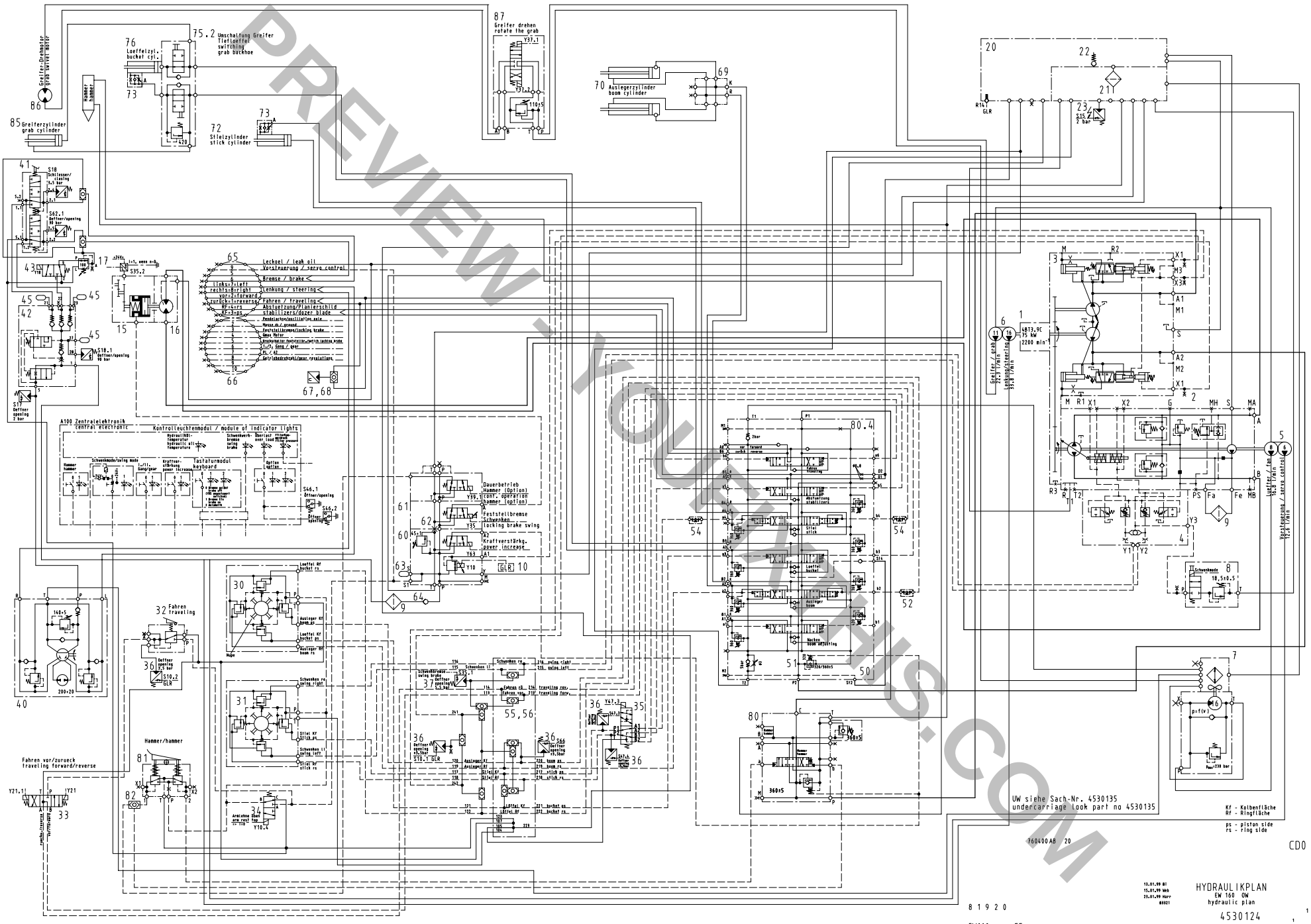
Spalte X: eine automatisch erzeugte Seite wurde manuell nachbearbeitet

WUP1205D / 28.Mai.1993

Sheet	Discription	Remark	Date	Written	X
1	List of contents		01.Jun.1999	Semlin	
1a	List of contents		01.Jun.1999	Semlin	
2	STARTER-ENGINE / START RELAY		01.Jun.1999	Semlin	
3	POWER-SYSTEM		01.Jun.1999	Semlin	
4	SWITCH / INITIATOR		01.Jun.1999	Semlin	
5	SPEED ADJUSTING ACTUATOR		01.Jun.1999	Semlin	
6	OPERATOR'S SEAT - FUELLING SYSTEM		01.Jun.1999	Semlin	
7	OPERATOR'S CAB (X12)		01.Jun.1999	Semlin	
8	LIGHTING		01.Jun.1999	Semlin	
9	DIRECTION REVERSER		01.Jun.1999	Semlin	
10	HANDLE RIGHT - GRAB - RADIO		01.Jun.1999	Semlin	
11	VALVES		01.Jun.1999	Semlin	
12	1. + 2.GEAR - SWING AXLE - BRAKE		01.Jun.1999	Semlin	
13	OVERLOAD - TACHO - OPTIONAL		01.Jun.1999	Semlin	
14	HAMMER/SHEARS/FREQUENCY (OPTIONAL)		01.Jun.1999	Semlin	
15	HANDLE LEFT - SUPPORT / STICK		01.Jun.1999	Semlin	
16	AIR CONDITIONER / BACK-UP ALARM		01.Jun.1999	Semlin	
17	X12 - X21		01.Jun.1999	Semlin	
18	X17 - X18		01.Jun.1999	Semlin	
19	X67.1 - X72 - X99		01.Jun.1999	Semlin	
20	XF - XF13 - XF20 - A7.1X1		01.Jun.1999	Semlin	
21	A100X1 - A100X2		01.Jun.1999	Semlin	
22	A100X3 - A10X1		01.Jun.1999	Semlin	
23	X100 - X101		01.Jun.1999	Semlin	
24	X102 - X103		01.Jun.1999	Semlin	
25	X104 - X105		01.Jun.1999	Semlin	
26	X106 - X107		01.Jun.1999	Semlin	
27	X108 - X109		01.Jun.1999	Semlin	
28	X115 - X116		01.Jun.1999	Semlin	
29	X117 - X118		01.Jun.1999	Semlin	

30 = Zeilen/Seite 1 = Richtung (senkrecht) 1 = Spaltenabstand 7 = Zeilenabstand in mm 1 = Spaltenanzahl

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Undercarriage components

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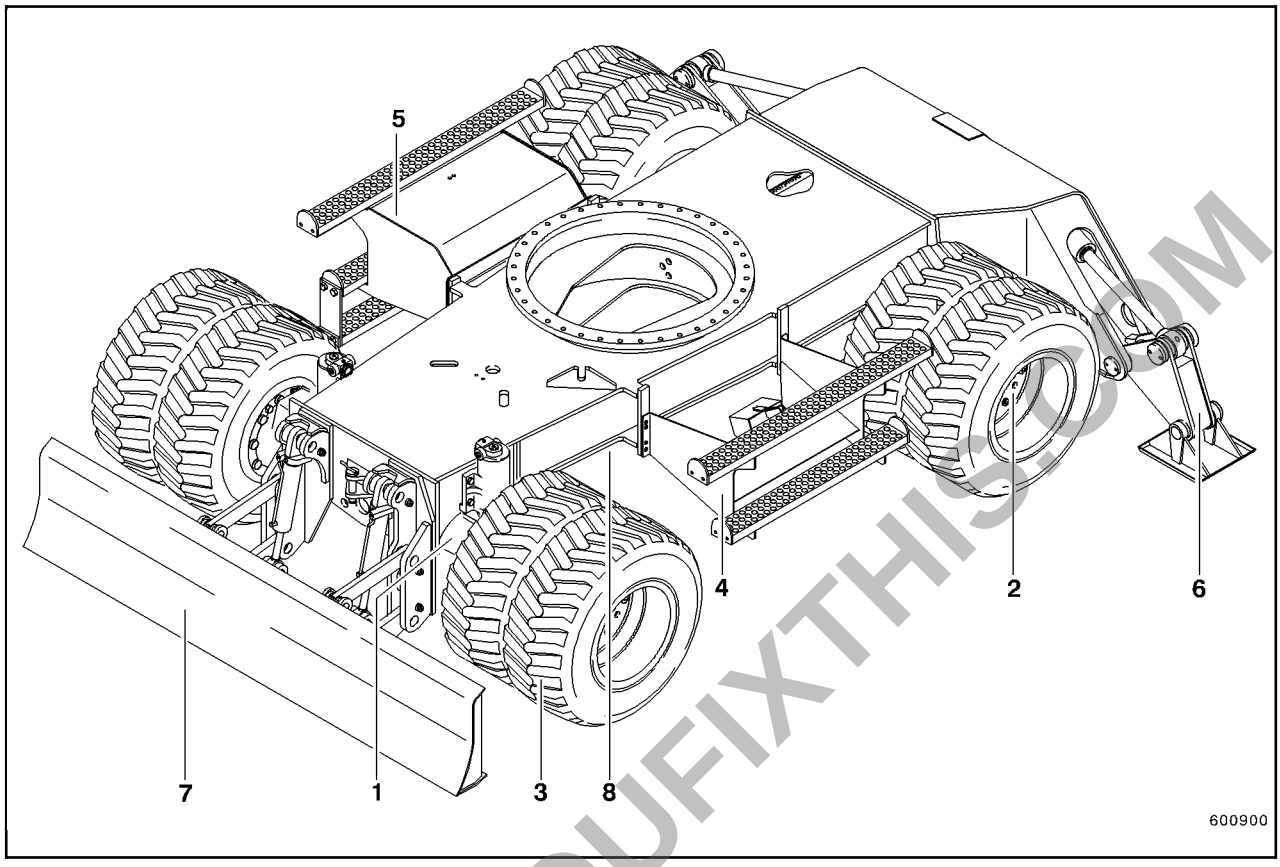


Fig. 1

Table of components in Fig. 1

Item	Quan.	Description	Weight kg / lb	Torque				
				Thread size	Material grade	Wrench size mm	M_A Nm	Torque lbft.
1	1	Steering swing axle	641 / 1412					
2	1	Rear axle with gear and motor	635 / 1399					
3	8	Wheels	105 / 232					
4	1	Steps left-hand	34 / 75					
5	1	Steps right-hand	58 / 128					
6	2	Support						
7	1	Levelling blade	257 / 566					
8	1	Cardan shaft	26 / 58					

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Schrauben mit Regelgewinde nach DIN 13 - 13
Bolts with standard thread DIN 13 - 13

Gewinde-Nenn Ø Thread nominal Ø	Festigkeits-klasse Material quality	Anziehdrehmomente M_A in Nm Tightening torques M_A in Nm		
		gesamt total 0,10[1)]	gesamt total 0,12[2)]	gesamt total 0,16 (L)[3)]
M 5	8.8 10.9 12.9	4,9 7,3 8,5	5,5 8,1 9,5	6,5 9,5 11,2
M 6	8.8 10.9 12.9	8,5 12,5 14,5	9,5 14 16,5	11,2 16,5 19,5
M 8	8.8 10.9 12.9	20,5 30 35	23 34 40	27 40 47
M 10	8.8 10.9 12.9	41 60 71	46 68 79	55 80 94
M 12	8.8 10.9 12.9	71 104 195	79 117 215	94 140 260
M 16	8.8 10.9 12.9	170 250 300	195 280 330	230 340 400
M 20	8.8 10.9 12.9	350 490 580	390 560 650	470 670 780
M 24	8.8 10.9 12.9	600 850 1000	670 960 1120	800 1140 1350
M 30	8.8 10.9 12.9	1190 1700 2000	1350 1900 2250	1600 2300 2700
M 36	8.8 10.9 12.9	2100 3000 3500	2350 3300 3900	2800 4000 4700

[1)] Schraube und/oder Mutter galvanisch verzinkt (A3B).
Screw and/or nut electro-galvanized.

[2)] Schraube schwarz vergütet oder phosphatiert, Gewinde geölt.
Screw black-plated or phosphatized, thread oiled.

[3)] Schrauben mit flüssiger Schraubensicherung z.B. Loctite 242, 243.
Screws with liquid screw fixer, e.g. Loctite 242, 243.

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To evaluate the reported faults and to analyze the amount of damage (spare-parts requirements / scope of repair work), the table below (FAULT CODE) sets out the individual codes and the effect on the machine for servicing purposes.

Most of the faults listed in the table are stored by the ODC automatically after occurrence of the event in a non-volatile memory in the form of text building blocks (see "Fault storage").

FAULT CODE table

Code	Trouble	Fault	Effect
02	engine temperature sensor	cable broken	power loss
04	engine temperature sensor	short-circuit	power loss
05	Centry error	Centry	
08	proportional valve 1, PLC	short-circuit	engine power reduction
09	engine error	engine	
10	proportional valve 1, PLC	cable broken	engine power reduction
200	hydr. temperature sensor	cable broken	power loss
400	hydr. temperature sensor	short circuit	power loss
800	hydraulik temperature	too high	power loss
1000	engine temperature	too high	power loss
2000	speed 0 and DSl active		power loss
8000	internal software error		
10000	sensor E-speed	cable broken	
40000	communication error	control panel	engine power reduction
80000	pressure sensor SLI	cable broken	

PLC = Power-Limiting Control

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Removing the diesel engine

The following aids must be available:

- a crane and lifting tackle with a load-bearing capacity of at least 1000 kg (1,5 tons) for lifting and moving the engine,
- lifting tackle matching the engine (see technical manual issued by engine manufacturer),
- wrench / socket wrench, width across flats 17, 19 mm and 24 mm,
- a torque wrench designed for a tightening torque of 250 Nm (185lbft).

Also needed:

- a container to catch hydraulic oil (min. 200 l/55 gal),
- a container to catch coolant (min. 35 l/10 gal),
- a standard tool kit for dismantling lines at the hydraulic pumps.

⚠ WARNING

Risk of injury from rotating fan blades and V-belts. Stop the engine before opening the engine compartment.

Risk of burns from hot parts of the engine, exhaust system, hydraulic pumps and coolers.

Never start work until all components in the engine compartment have cooled off.

⚠ CAUTION

Escaping consumables such as fuel, hydraulic oil, engine oil or coolant are an environmental hazard.

Put adequately large containers in place to catch them.

Catch drained-off fluids for re-use or discard in accordance with environmental regulations.

Close openings, lines and hoses.
This prevents contaminants from penetrating and damaging the engine and hydraulic system.

- Disconnect the batteries.
- Unscrew the holder for the compression springs of the engine cover and fold the cover back towards the counterweight.
  (Attention: the compression springs are pretensioned).
- Remove the housing plates from below the engine and the pump compartment.
- Clean the engine.
- Mount lifting tackle for the engine (see technical manual issued by engine manufacturer).
- Drain the hydraulic oil out of the hydraulic oil reservoir and combi-cooler.
- Drain the coolant out of the engine and the combi-cooler.
- Disconnect the intake, pressure and control lines from the hydraulic pumps.
- Disconnect the fuel, air and exhaust lines from the engine.
- Disconnect all the electrical connections and grounding wires from the engine.
- Disconnect all the connections to the combi-cooler.
- Remove the bolts (12, Fig. 1) from the engine bearings.
- Lift the engine and cooler out carefully.

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TROUBLESHOOTING

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Troubleshooting, instructions

Faults are often due to the machine not having been correctly operated or serviced.

It is therefore essential to read the corresponding section of the Owner's Manual again each time a fault occurs.

If the cause of the fault cannot be detected or the fault cannot be eliminated, contact the Service Department.

Describe the fault and all symptoms as exactly as possible if you call on the Service Department. Exact data make for rapid troubleshooting.

Never do any work for which you are not qualified.

Comprehensive troubleshooting instructions are set out in the Owner's Manual. □

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Motor
Engine

	Einheit Unit	EW 160 Nr. / No. 591 502 -
Hersteller und Typ Manufacturer and model		4BT 3.9-C
Arbeitsweise Type		Viertakt-Dieselmotor mit Aufladung und Direkteinspritzung Four-stroke Diesel engine with turbocharging and directinjection
Standardleistung SAE J 1349 Standard rated output	kW (HP)	71 (95)
Nenndrehzahl (bei Vollast) Rated speed (at full load)	min $^{-1}$ rpm	2200
Niederer Leerlauf Idling speed	min $^{-1}$ rpm	1000
Hoher Leerlauf High idling speed	min $^{-1}$ rpm	2460
Zündfolge Firing sequence		1-3-4-2
Drehrichtung Direction of rotation		Auf Schwungrad gesehen links Anti-clockwise when looking atflywheel
Ventilspiel Einlaß/Auslaß (bei kaltem Motor) Valve clearance: inlet and exhaust (engine cold)	mm / mm inch / inch	0,25 / 0,51 0.01 / 0.02
Verdichtungsverhältnis Compression ratio		17,5 : 1
Öldruck Oil pressure bei 950 min^{-1} (Mindestdruck) at 950 rpm (Minimum allowable) bei 2200 min^{-1} (Mindestdruck) at 2200 rpm (Minimum allowable)	 bar / psi bar / psi	 0,7 / 10 2,76 / 40
Öffnungsbereich - Thermostat Thermostat at opening range	˚C ˚F	82 - 93 180 - 200

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Betriebsstoffe
Service fluids

	EW 160 Nr. / No. 591 502 -		
	Ca. Füllmenge (Liter) Approx. quantity (gallons)	**Wechsel nach Betriebsstunden 2) Operating hours between changes**	**Qualität 2) Grade Sach-Nr. 2) Part No.**
Dieselmotor (einschl. Filter) Engine (including filter)	11,5[1)] 3.0	250[2)]	SAE 15W-40
Kraftstofftank Fuel tank	250 66.2	siehe "Motor-Betriebsanleitung" see "Engine Instruction Manual"	
Kühlflüssigkeit Coolant	18,5 4.9	2000[3)]	siehe "Motor-Betriebsanleitung" see "Engine Instruction Manual"
Hydraulikanlage / Hydraulic system - Ölbehälter / oil reservoir	250 / 66.1 gal 150 / 39.7 gal[1)]	3000[4)]	Multigrade Hydraulic-Oil 73175843
Schwenkgetriebe Swing gear	3,5[1)] 0.9	3000[4)]	Multigrade Gear-Oil 73175844
Lenkachse ALPP-100 Steering axle ALPP-100	9,8[1)] 2.6	1000[5)]	Sondergetriebeöl Gear-Oil LS-5-90 72182308
Hinterachse ASP-100 Rear axle ASP-100	11,4[1)] 3.02	1000[5)]	Sondergetriebeöl Gear-Oil
Achsnabengetriebe für ALPP-100 Wheel spindle gearbox for ALPP-100	2 x 0,9[1)] 2 x 0.24	1000[5)]	Sondergetriebeöl Gear-Oil LS-5-90
Drehverbindung Swing bearing	6 kg	Bei Neufüllung By newfilling	NLGI-Nr. 2[6)] 73175845[7)] 73171021[8)]

1) Füllmengen beziehen sich auf Ölwechsel, **nicht** auf Erstbefüllung
Filling quantities are valid for oil changes and **not** for first filling

2) Spätestens nach 6 Monaten
After 6 months at the latest

3) Spätestens nach 2 Jahren
After 2 years at the latest

4) Spätestens nach 3 Jahren
After 3 years at the latest

5) Spätestens nach 1 Jahr
After 1 year at the latest

6) Bei Umgebungstemperaturen unter 0˚C Fett NLGI-Nr. 1 oder0 verwenden.
At ambient temperatures below 0˚C use grease NLGI-No. 1 or 0.

7) 1 kg - Gebinde
1 kg - container

8) 0,4 kg - Kartusche
0,4 kg - cartridge

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01 Foreword / Safety instructions

02 Service Data

03 Tools

04 Undercarriage

05 Superstructure

06 Diesel engine

07 Gear boxes / Axles

08 Hydraulic system

09 Electrical system

10 Equipment

11 Fittings, pipes and hoses
Welding for maintenance and repair
Sealing, protective, checking and cleaning agents

12

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⚠ FUNDAMENTAL SAFETY INSTRUCTIONS

Warnings and symbols 2732729

The following signs are used in the manual to designate instructions of particular importance:

⚠ DANGER

Imminent danger involving the risk of death or of severe injuries.

⚠ WARNING

Precautionary rules and measures designed to protect the machine operator and other persons from life-threatening danger or injuries and to prevent extensive damage.

⚠ CAUTION

Information and precautionary measures designed to prevent damage to the machine or other property.

□

Danger in the event of non-observance of the safety instructions

⚠ WARNING

This hydraulic excavator has been built in accordance with state-of-the-art standards and the recognized safety rules.

However, operating the machine if a fault is suspected or has occurred, or carrying out repair work inexpertly may

- **endanger the lives of persons in contact with it**
- **damage the machine and other property.**

The hydraulic excavator must be stopped immediately on any damage being suspected or occurring to ensure that the safety of the operator, of other persons at the place of use or of other material property is not compromised.

All components are carefully co-ordinated. Trouble-free operation and a long service life can only be achieved with original spare parts.

□

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FOREWORD

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This **Technical Handbook (THB)** has been written with **the servicing mechanic** in mind and contains important information required to carry out repair and servicing procedures.

Read through the **Technical Handbook**, but also the **Operating Instructions** for the **hydraulic excavator** before commencing any servicing or repair work. The **Technical Handbook**, as well as the **Operating Instructions** and **Spare Parts List** should be used as a source of reference and assistance - even when the user is well acquainted with the range of excavators.

Using the Technical Handbook allows the experienced mechanic to carry out repair work in a correct manner.

Using the Technical Handbook

The Technical Handbook is divided into main and sub-groups that deal with the machine as actually delivered. Any auxiliary attachments or optional upgrading introduced later are not described.

The main table of contents allows to find the required information quickly.

For the sake of clarity, the illustrations have been simplified and can therefore differ slightly from the actual appearance of the machine.

Servicing and repair

Servicing and repair work should be carried out as soon as possible. This keeps overall servicing & repair costs to a minimum and increases the availabilily of the excavator

During servicing and repair work, always follow the instructions contained in the Technical Handbook and Operating instructions.

Major work that is not described in the Technical Handbook will be gladly undertaken by the **After Sales Service.**

The **After Sales Service** is always available for assistance and advice.

When making any enquiries, please always state the Machine Model and the machine's Serial No.

□

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SERVICE DATA

VORWORT

⚠ WARNUNG

Jede Person, die mit der Inbetriebnahme, Bedienung, Inspektionund Wartung der Baumaschine befaßt ist, muß - bevor sie die ersten Handgriffe ausführt - die "BETRIEBSANLEITUNG" und besonders das Kapitel "GRUNDLEGENDE SICHERHEITSHINWEISE" gelesen und verstanden haben.

Die "Service Daten" enthalten Angaben, die für Kundendienstmitarbeiter wichtig sind. Maschinendaten, die an anderer Stelle der Dokumentation aufgeführt sind, werden hier nicht wiederholt. Zur Dokumentation einer Baumaschine gehören:

- Betriebsanleitung Teil 1 - 5
- Motor-Betriebsanleitung
- Ersatzteilliste für Maschine und Motor
- Maßtabelle oder Maßblatt "Technische Daten" der Baumaschine.

Zur Dokumentation im weiteren Sinne gehören auch "Technische Handbücher" (THB) und "Service Informationen" (si).

In dieser Broschüre sind die Daten der Hilfsaggregate zum Betrieb von Zusatz- oder Sonderausrüstungen sowie Daten von Einzelgeräten nicht aufgeführt.

Die aufgeführten Füllmengen der Betriebsmittel sind ca.-Angaben, die Dispositionshilfe sein sollen. Jedes Aggregat besitzt geeignete Kontrolleinrichtungen, z. B. Peilstab oder Kontrollschrauben, mit denen die exakte Befüllung geprüft wird.

⚠ VORSICHT

Die in den Kapiteln aufgeführten Sach-Nrn. nicht zum Bestellen von Ersatzteilen verwenden. Sie sollen nur dokumentieren, auf welches Bauteil sich die nachstehenden Daten beziehen. Zur Ersatzteilbestellung die zur Maschine gehörende Ersatzteilliste verwenden.

FOREWORD

⚠ WARNING

Anyone involved with commissioning, operating, inspecting and servicing the construction machine must read through and acquaint himself with the "OPERATING MANUAL" - and especially the Section "FUNDAMENTAL SAFETY INSTRUCTIONS" - before starting work.

The "Service Data" contains details which are important to the service staff. Data included in other parts of the general documentation have been left aside. The set of documents for an construction machine includes:

- Operating manual parts 1 - 5
- Operating instructions for engine
- Spare parts list for machine and engine
- Dimension Table or Dimension Sheet "Technical Data".

"Technical Handbooks" (THB) and "Service Information" bulletins (si) are, furthermore, to be considered as supplements to the general documentation.

Data regarding auxiliary units for operating ancillary or special systems, as well as data on machines produced only in small numbers, have not been included.

Filling quantities are only approximate figures intended to help in stockholding the various fluids and agents. Each unit has appropriate checking systems, e.g. dipstick or checking screws, with which the exact filling level can be checked.

⚠ CAUTION

The Part Nos. given in the sections are not to be used when ordering spare parts. They are only intended to identify the component being referred to. When ordering spare parts, use only the Part Nos. given in the spare parts lists.

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SUPERSTRUCTURE

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Foreword

The "Technical Specifications" manual contains important information for personnel servicing the machine. Machine specifications listed elsewhere in the machine documents are not always repeated in this book.

The documentation includes:

- the operating instructions
- the spare-parts list
- the dimension table with the technical data of the machine.

The present brochure does not contain the specifications of auxiliary units for the operation of additional or optional equipment or the specifications of individual machines.

The refilling quantities specified for consumables are approximate quantities which are intended as a help for planning consumable requirements. Each unit is equipped with a suitable checking devices, e.g. dipstick or checking plugs, permitting the operator to check proper filling of the units.

Safety Instructions

Danger in the event of non-obser-vance of the safety instructions

⚠ WARNING

This hydraulic excavator has been built in accordance with state-of-the-art standards and the recognized safety rules.

However, operating the machine when a fault is suspected or has occurred, or carrying out repair work inexpertly may

- **endanger the lives of persons in contact with it**
- **damage the machine and other property.**

The hydraulic excavator must be stopped immediately when any damage is suspected or occurring, to ensure that the safety of the operator, other persons at the place of use or other material property is not compromised.

All components are carefully coordinated. Trouble-free operation and a long service life can only be achieved with original spare parts.

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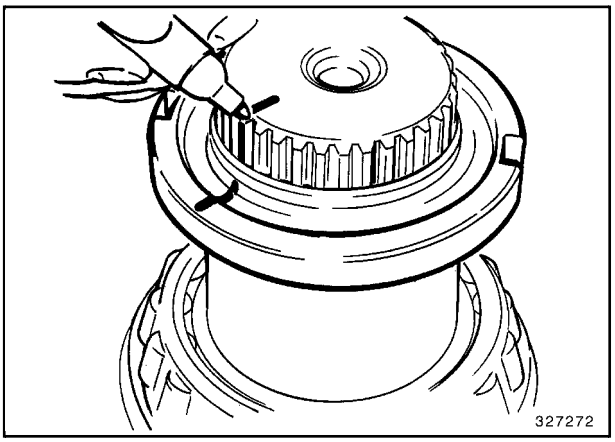


Fig. 13
Screw new grooved nut onto the shank of the pinion shaft to the limit stop.
Mark this position on the multi-spline profile and on the grooved nut.
Screw off the grooved nut.

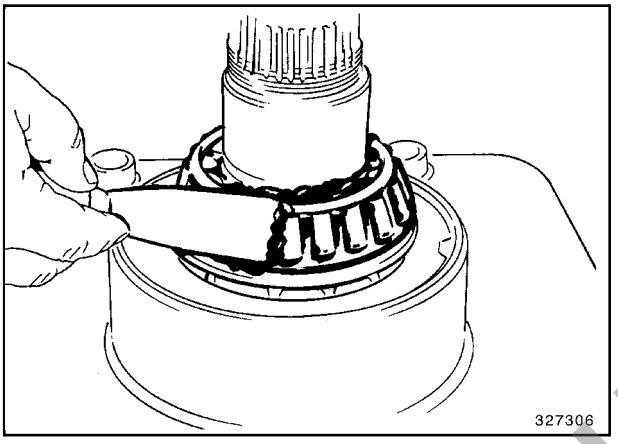


Fig. 14
Apply grease pressing it firmly into the bearing.
Use grease O&K P/N 73176968 only.

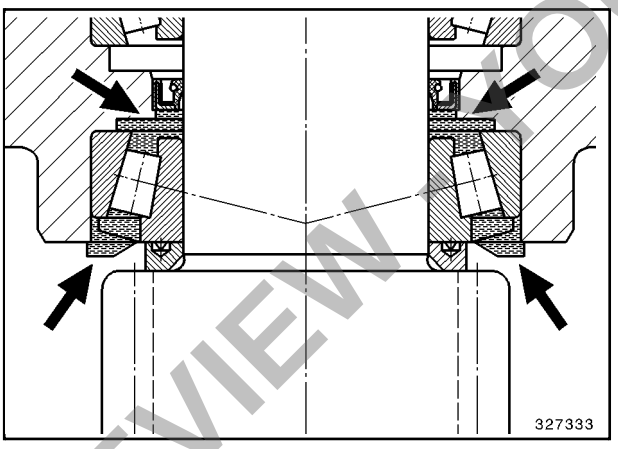


Fig. 15
The empty spaces in the tapered roller bearing and those in the Nilos ring must be **completely** filled with grease. Any excessive grease drops into the gearing of the swing pinion and the swing bearing after fitting of the gearbox.

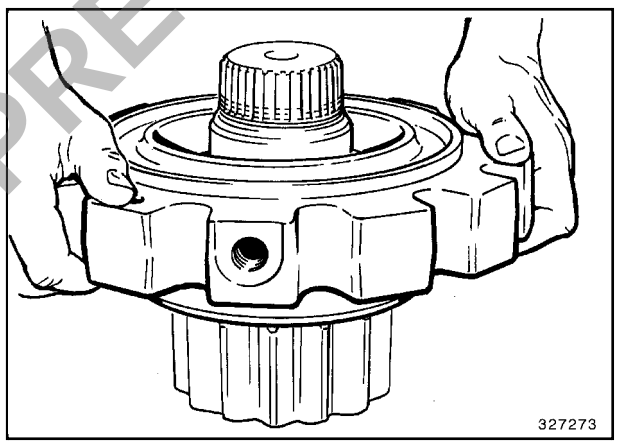


Fig. 16
Fit the housing.

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Steering axle, table of components in Fig. 2

Item	Quan.	Description	Weight lb	Torque				
				Thread size	Material grade	Wrench size mm	M_A Nm	Torque lbft.
1	1	Axle block	227					
2	1	Axle block	126					
3	1	Differential	46					
4	1	Flange						
5	1	Nut		M24x1.5		36	400	295
10	1	Tap. roller bearing						
11	1	Tap. roller bearing						
12	2	Tap. roller bearing						
13	19	Hexagon bolt		M16	10.9	24	280	207
14	2	Screw plug		M24x1.5			70	52
17	1	Rot. shaft lip seal						
18	1	O-Ring 245 x 3 mm						
20	0	Shim ring 90 x 100 x 0.1 mm						
21	0	Shim ring 90 x 100 x 0.15 mm						
22	0	Shim ring 90 x 100 x 0.3 mm						
23	0	Shim ring 90 x 100 x 0.5 mm						
24	0	Shim ring 90 x 100 x 0.1 mm						
25	0	Shim ring 90 x 100 x 0.15 mm						
26	0	Shim ring 90 x 100 x 0.3 mm						
27	0	Shim ring 90 x 100 x 0.5 mm						
28	0	Shim ring 90 x 100 x 1.0 mm						
32	2	Grease nipple						
33	4	Grease nipple						
34	1	Bushing						
35	0	Shim ring 45 x 55 x 0.1 mm						
36	0	Shim ring 45 x 55 x 0.15 mm						
37	0	Shim ring 45 x 55 x 0.3 mm						
38	0	Shim ring 45 x 55 x 0.5 mm						
48	1	Wheel hub, left-hand	265					
49	1	Wheel hub, right-hand	265					
50	4	Pin						
51	4	Bushing						
52	2	Ring						
53	4	Disk						
55	2	Bushing						

[1)] Screws and bolts secured with liquid screw fixer.

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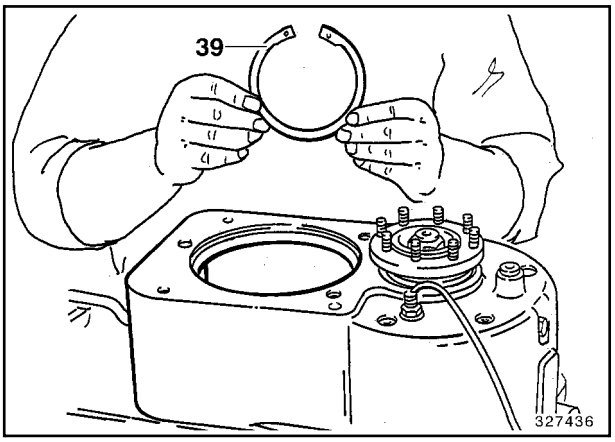


Fig. 33

Place locking ring (39) on bearing (50), however without installing it.

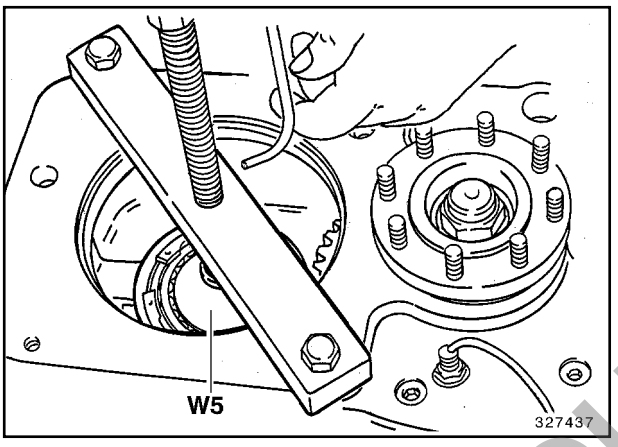


Fig. 34

Apply fitting device (W5) and press multiple-disk clutch together against spring force.

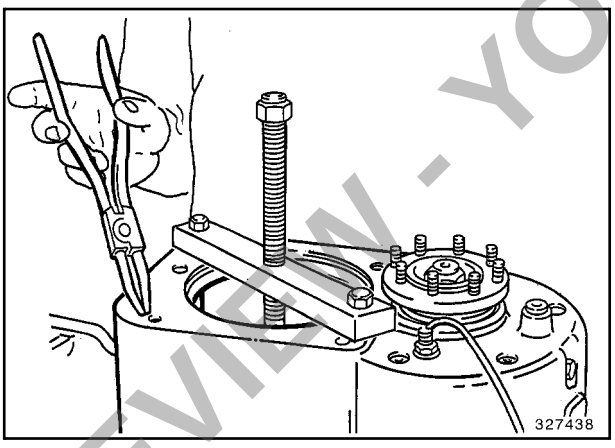


Fig. 35

Snap the locking ring (39) in place.

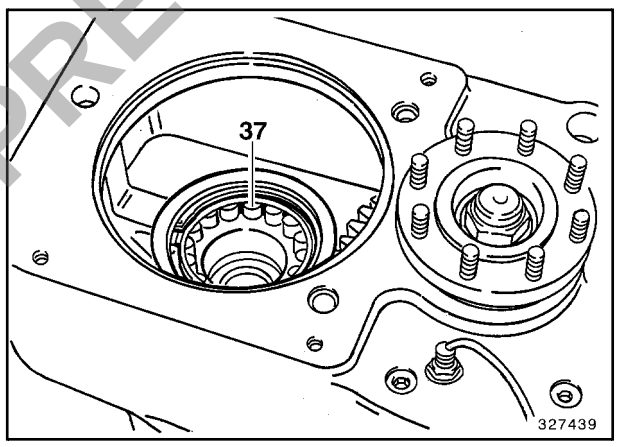


Fig. 36

Remove the fitting device (W5). Install the shell of bearing (37) with a suitable fitting sleeve and a hammer.

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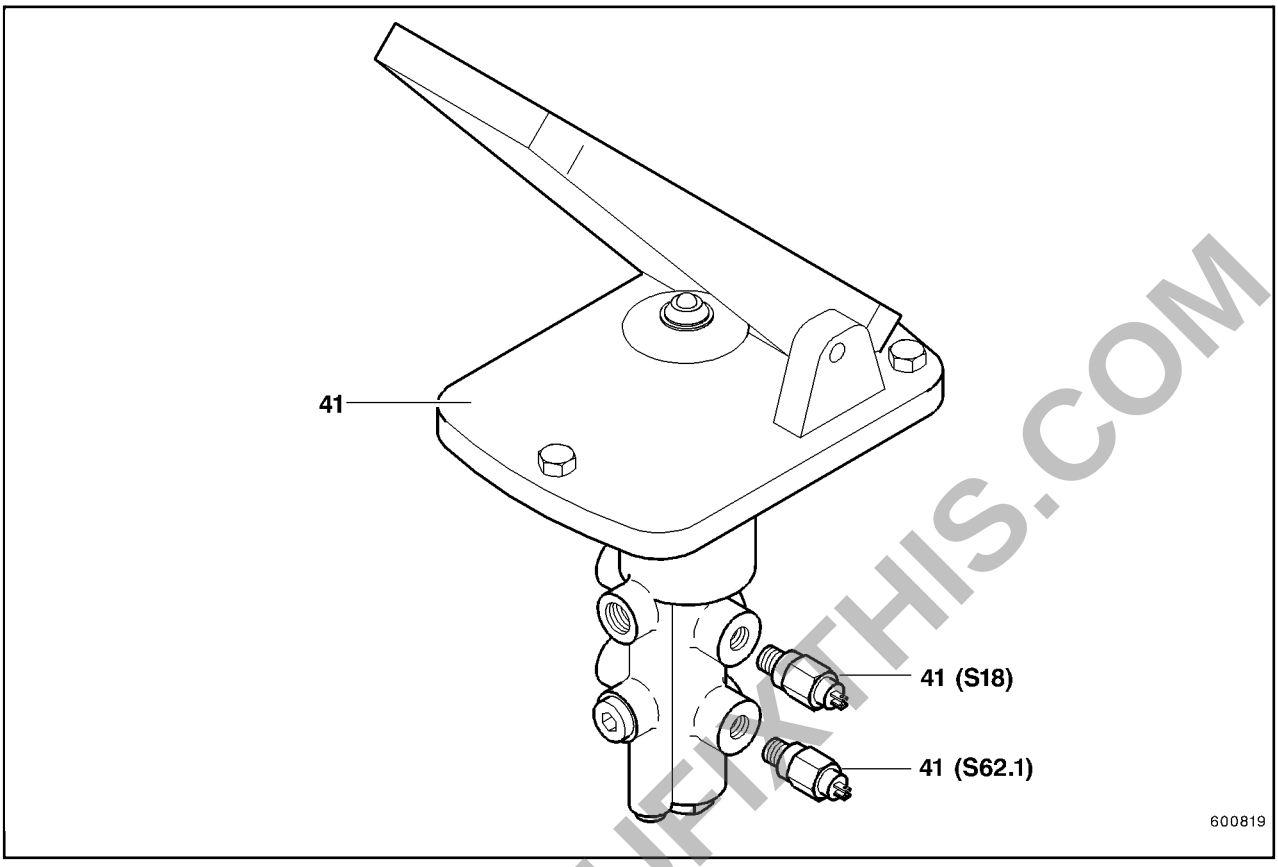


Fig. 13

Pedal-operated brake valve (41, Fig. 13)

The valve is a dual-circuit pedal-operated brake valve.
The accumulated pressure in the diaphragm-type accumulators (45) is available at the valve. De-pressing the pedal creates a braking-pressure proportional to the pedal deflection.

For braking pressures > 3.5 bars, the pressure switch (41, S18) closes and the stoplight is switched on.

For braking pressures > 70 bars, the pressure switch (41, S62.1) opens and thus blocks the floating axle.

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Feed pressure and zero point

- Connect first 600 bar, then 60 bar pressure gauge to both high-pressure measuring ports (9 and 10, Fig. 2) and check 20 bar feed pressure with the engine running.
- Correction of non-uniform pressures:
  Turn setscrew for mechanical zero point (6, Fig. 3) until both pressures are the same.
- Correction of incorrect feed pressure:
  Override permanently set feed pressure valve with spacers.
- Replace the 60 bar pressure gauges again by the 600 bar pressure gauges

Swinging power (swinging mode)

- Connect 60 bar pressure gauge to control pressure measuring port (9).
- Turn in setscrew of pressure cutoff (2) by two turns.
- Set swinging mode key to normal swinging power - LED on.
- Raise boom sensitively and connect full swinging power.

⚠ CAUTION

Max. checking time: 5 seconds.

Risk of overheating.

- Check control pressure at measuring port (9); if necessary, set to 18.5 bars at swinging mode valve, pressure relief (10).
- Then adjust pressure cutoff (2).

High swinging pressure and safety valves

- Activate CW/CCW swinging and check pressure cutoff (2) for 390 bars; adjust if necessary.
- Check opening pressure of safety valves (7 and 8, Fig. 3) for 420 bars by turning up pressure cutoff (2). For setting, see safety valve.

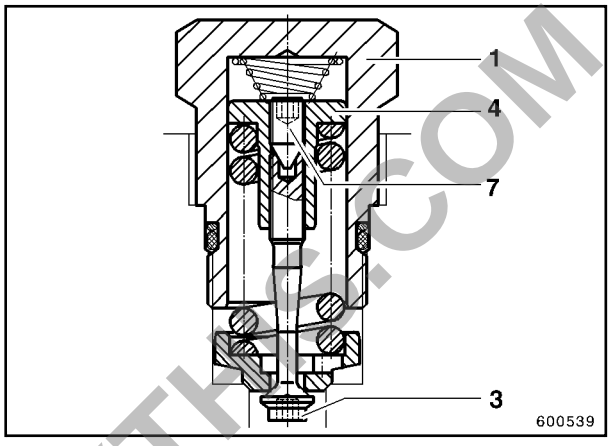


Fig. 4

⚠ CAUTION

Max. checking time: 5 seconds.

Risk of overheating.

- Set pressure cutoff (2) back to 390 bars.

Safety valve

For pressure changes, the safety valve must be removed.

Fig. 4

1 - Housing; tightening torque = 90 Nm

3 - Spindle for changing the pressure setting; 1 turn of spindle = 44 bars; change of set value possible only after loosening lock-screw (7).

4 - Valve disk; the set differential pressure is stamped into the valve disk, e.g. 400 bars.

7 - Lock-screw

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Alternator

The alternator is a self-excited 12-pole synchronous claw-pole alternator with incorporated silicon rectifier diodes. The three-phase winding is in the stator and the exciter winding in the rotor.

The exciter current is supplied from the rectifier via D+, the regulator, two brushes and the slip rings to the exciter winding in the rotor. The stator winding is connected to the silicon rectifier diodes by means of a three-phase bridge circuit.

The rectified current is supplied to the consumers and the battery via the B+ terminal. The D+ terminal must only be loaded with the regulator current, the charging monitor and an additional current of 0.5 A (e.g. start inhibit relay).
In 24 V systems the charge monitoring lamp must be a 2 W type to ensure the appropriate excitation of the alternator. The voltage is regulated by the incorporated electronic field rheostat.

Claw-pole alternator

1 - Slip ring end shield
2 - Rectifier heat-sink
3 - Power diode
4 - Excitation winding (rotor)
5 - Transistor regulator with incorporated carbon brushes
6 Stator with three-phase winding
7 - Rotor with claw poles
8 - Fan
9 - Pulley
10 - Drive end shield with mounting flanges

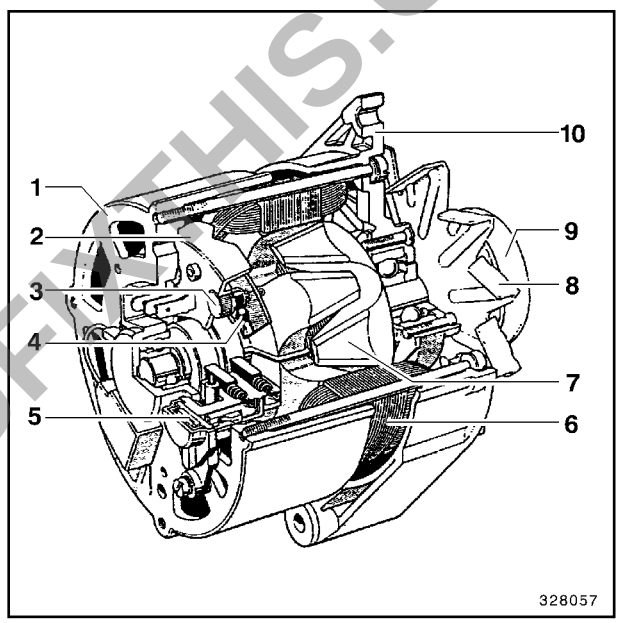


Fig. 5

Maintenance

Alternators installed in modern vehicles are largely maintenance-free. The V-belt tension should be checked once every month depending on the use of the machine.

The carbon brushes should be checked once every year. The slip-rings must also be visually inspected and polished with ultra-fine polishing cloth.

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ANNEX

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Identification of components

(Exerpt from DIN 40719)

Letter	Designation	Examples
A	Assembly group, parts of groups	Control unit, switch unit, magnetic amplifiers, combinations of devices
B	Transformation from non-electrical into electrical magnitudes (and vice versal)	Metering transformers: rev. transmitter, pressure sensor, pressure switch, thermic sensors, photo-electric cells, pulse generator, inclinometers
C	Capacitors	---
D	Binary elements, memories	Digital unit, integrated circuit, impulse counter
E	Miscellaneous	Lights, heaters
F	Safety devices	Fuses, overload guards, interlocks, circuit breakers, safety relays, releases
G	Generator Electrical supplies	Rotary generators, rotary frequency converters, batteries, power supplies, oscillators
H	Monitors	Monitoring lamp, buzzer
K	Relays, contactors	Power contactors, auxiliary contactors, auxiliary relays, blinker relays, time-lag relays
L	Inductive devices	Throttle coils, coils
M	Motors	Fan motor, wiper motor

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Changing the machine start disabling code

In the "Control Panel" menu (Fig. 5), key F2 (Fig. 6) can be used to select the code enabling the start function of the machine from any number between 0 and 15 (Fig. 8).

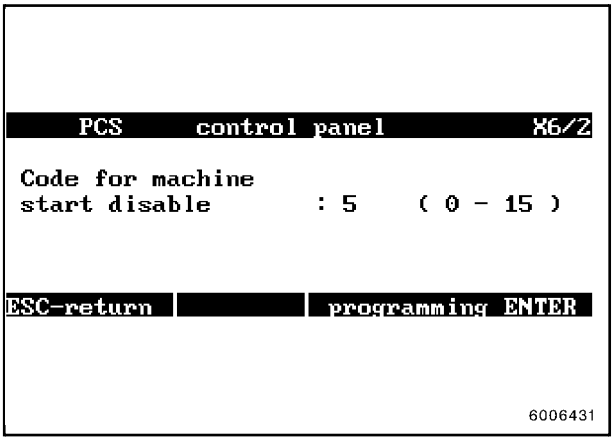


Fig. 8

Entering the new number with the ENTER key and confirming the selection with "1" programs the new code into the system (Fig. 9).

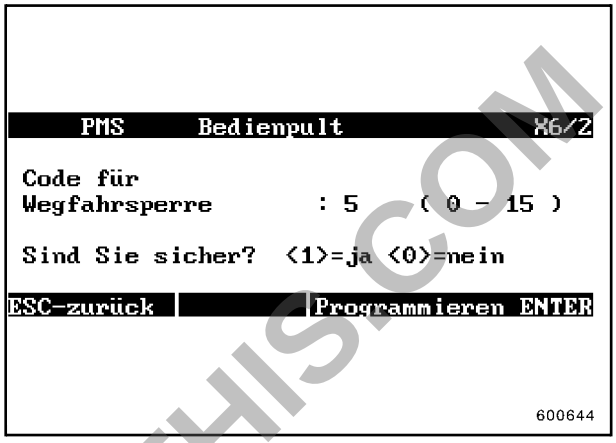


Fig. 9 □

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INTRODUCTION

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The various units of a machine are interconnected by pipe or hose lines so that the transfer of consumables, energy and control commands becomes possible. The hydraulic, brake and fuel supply systems of a machine are just such units.

Numerous line and coupling systems are available, especially in the spheres of hydraulics and pneumatics.

This handbook is intended to give an impression of the pipe and hose lines, as well as their coupling elements. Working directions are also included for servicing procedures which involve the re-routing or changing of such line and coupling systems.

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Mechanical notches lead to stress concentrations (fig. 12).

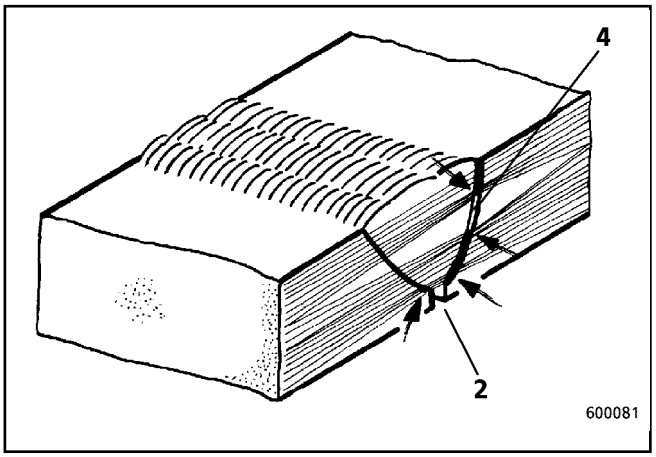


Fig. 12

2 Inadequate penetration of root

4 Incomplete fusion

These, in turn, lead to an enlargement of the notches.
This procedure may repeat itself and eventually lead to fracturing of the component.
Mechanical notches are mainly produced during the manufacture, but later on also during the utilization of the machine (traces resulting from use).
Mechanical notches can be detected by visual inspection or by non-destructive testing and then be repaired.

1.4.2 Metallurgical notches

Metallurgical notches are caused by thermal influence on the material; i.e. always at or around weld deposits (fig. 13).

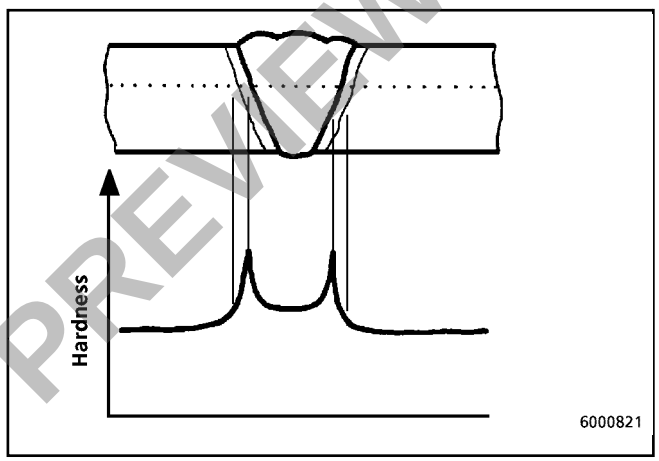


Fig. 13

The heat applied by welding leads to zones presenting different metallurgical and mechano-technological properties depending on their distance to the heat source.

Due to their properties, these areas, however small they may be, show a different behaviour under loading which, in turn, leads to elongation impediments and material constraints.

The occurrence of metallurgical notches can be kept to an acceptably low level by applying optimized welding and heat-treatment techniques.

The effect of existing metallurgical notches, e.g. those produced by improper welding, can also be mitigated by a stress-relieving and annealing procedure.

1.4.3 Shape-induced notches

Shape-induced notches depend on the structural design and lead to stress concentrations caused by the diversion of lines of forces (fig. 14).

In many cases, shape-induced notches are moreover located in heat affected zones with metallurgical notches.
Shape-induced notches can be largely reduced by choosing an appropriate design. For all practical purposes, they have to be reduced to such an extent that the negative influence exerted by them on the endurance strength of the structural element remains insignificant.

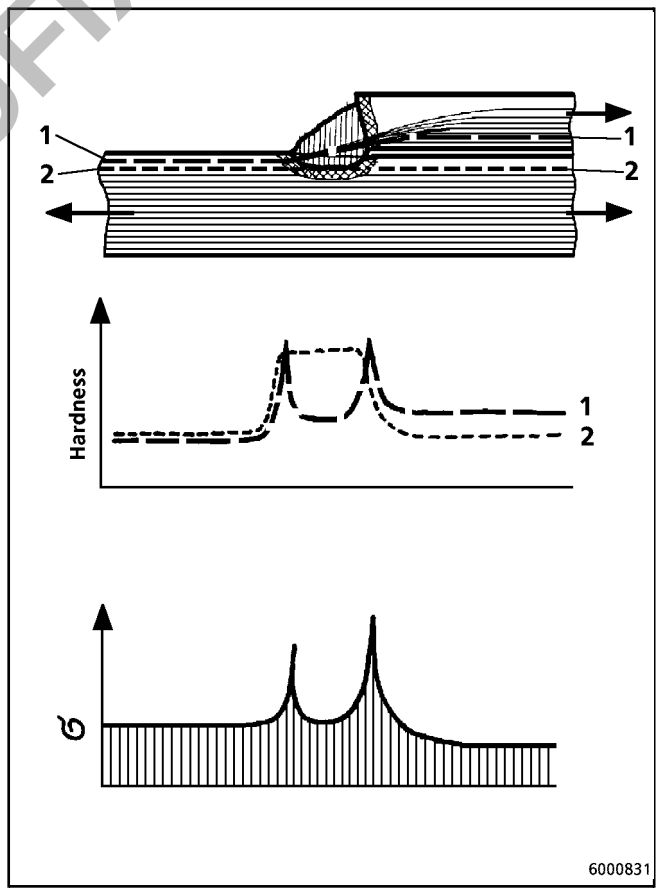


Fig. 14

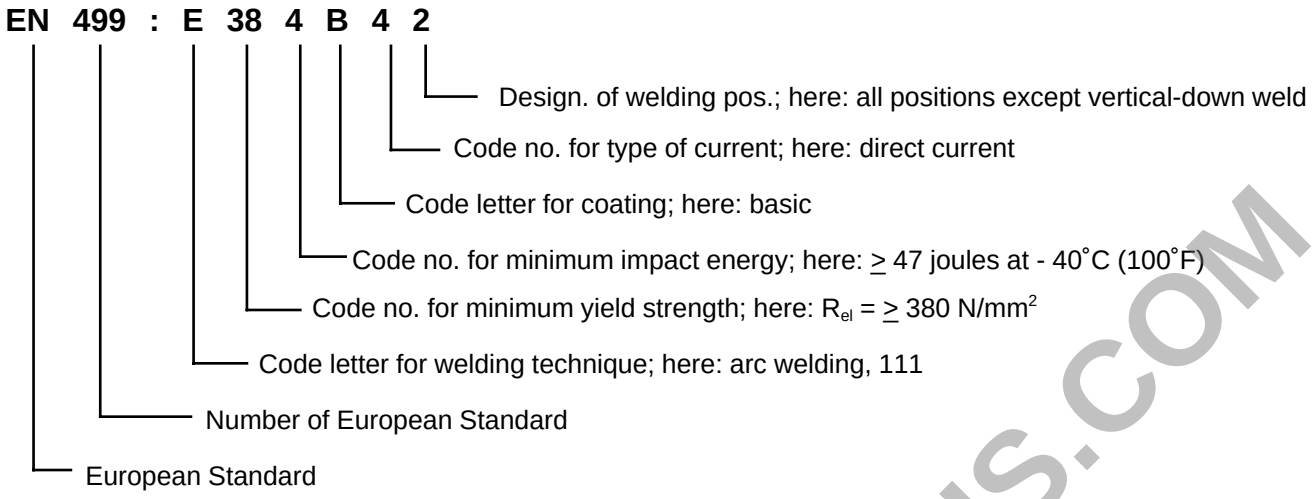
1 + **2** Hardness distribution curve

Shape-induced notches can be subsequently eliminated by changes in shape.

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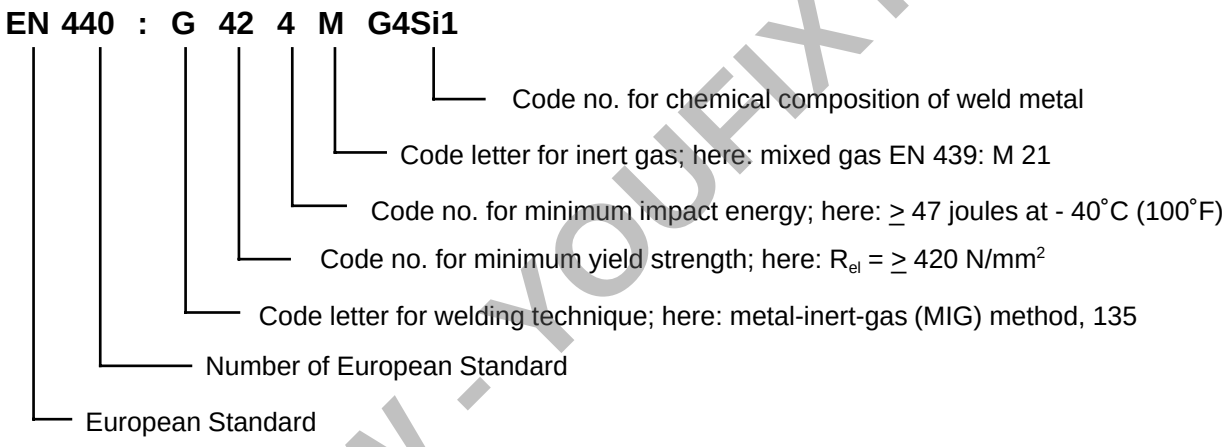
Examples of the meaning of designations of filler metals for welding:

Rod electrode



Former designation: DIN 1913: E 5154 B 10

Welding wire



Former designation: DIN 8559: SG 3

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