General

- Before removing or disassembling parts, assemblies, components or hoses mark these parts for easier assembly.
- Before assembling and installing parts, assemblies or components oil or grease all movable parts or surfaces as required and in compliance with the compatibility of materials.

Electrics

General

Due to the fast technical development electric and electronic vehicle systems become more intelligent and more comprehensive day by day, and can hardly be dispensed with in hydraulic and mechanical vehicle systems.

Diagnostics according to plan

Well structured trouble shooting procedures can save time and money.

Random tests have revealed that purely electronic components or control units only very rarely are the actual cause of failures:

- In approx. 10 % of the examined cases the problems were caused by control units.
- In approx. 15 % sensors and actuators were the cause of the problems.

By far the highest proportion of all faults could be traced back to wiring and connections (plugs, etc.).

General:

- Before changing any expensive components, such as control units, you should run a systematic trouble shooting session to eliminate any other possible fault sources. Knowledge in basic electrics is required for this purpose. If a fault was diagnosed without having pulled the plug of the control unit or inspected the wiring, this should be done before changing any parts.
- Check for good cable and ground contacts, therefore keep all mechanical transition points between electric conductors (terminals, plugs) free of oxide and dirt, as far as this is possible.
- Always use the machine related wiring diagram for testing. If one or more faults were detected, these should be corrected immediately.
- Do not disconnect or connect battery or generator while the engine is running.
- Do not operate the main battery switch under load.
- Do not use jump leads after the battery has been removed.
- Sensors and electric actuators on control units must never be connected individually or between external power sources for the purpose of testing, but only in connection with the control unit in question.
- It is not permitted to pull plugs off while the voltage supply is switched on (terminal 15 "ON")! Switch the voltage supply "OFF" first and pull out the plug.
- Even with an existing polarity reversal protection incorrect polarity must be strictly avoided. Incorrect polarity can cause damage to control units!

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Error code SERDIA	Component / Location	Description (Error location)	Defined for DCR	Defined for DMV	ID	Blink code	SPN	FMI	Self-curing[1]
11	Air filter condition	Pressure loss above target range with system reaction	●	●	AirFltSysReac	1-3-6	107	0, 11	●
12	Accelerator pedal	Cable break or short circuit, signal implausible compared to signal of idle sensor (analog pedal)	●	●	APP1	2-2-6	91	2, 3, 4, 11	
14	Accelerator pedal	Cable break or short circuit, bad PWM signal range or frequency (digital pedal)	●	●	APPPwm	2-2-2	91	2, 8	●
15	Accelerator pedal	Bad PWM pulse-width repetition rate (digital pedal)	●	●	APPPwmPer	2-2-2	91	8, 11	●
16	ECU internal error	Ambient pressure sensor defective	●	●	APSCD	2-9-2	108	2, 3, 4, 11	●
17	Air heater relay	Cable break or short circuit	●	●	ArHt1	2-6-3	729	3, 4, 5, 11	●
18	Air heater magnetic valve	Cable break or short circuit	●	●	ArHt2	2-6-3	730	3, 4, 5, 11	●
19	Air heater relay	Cable break or wrong connection	●	●	ArHtCD_NoLd	2-6-3	676	4, 11	
20	Air heater relay	Inoperable during shut-off	●	●	ArHtCD_RlyErr	2-6-3	676	2, 5, 11	
22	Battery	Voltage below target range	●	●	BattCD	3-1-8	168	0, 1, 11	●
23	Battery voltage	Above target range with system reaction	●	●	BattCDSysReac	3-1-8	168	2, 11	●
24	Begin of injection period	Outside target range or missing (cylinder 1)		●	BIPCyl1	5-3-1	523561	2	●
25	Begin of injection period	Outside target range or missing (cylinder 2)		●	BIPCyl2	5-3-2	523562	2	●
26	Begin of injection period	Outside target range or missing (cylinder 3)		●	BIPCyl3	5-3-3	523563	2	●
27	Begin of injection period	Outside target range or missing (cylinder 4)		●	BIPCyl4	5-3-4	523564	2	●
28	Begin of injection period	Outside target range or missing (cylinder 5)		●	BIPCyl5	5-3-5	523565	2	●
29	Begin of injection period	Outside target range or missing (cylinder 6)		●	BIPCyl6	5-3-6	523566	2	●
30	Begin of injection period	Outside target range or missing (cylinder 7)		●	BIPCyl7	5-3-7	523567	2	●
31	Begin of injection period	Outside target range or missing (cylinder 8)		●	BIPCyl8	5-3-8	523568	2	●
32	Charge air pressure sensor	Cable break or short circuit	●	●	BPSCD	2-2-3	102	2, 3, 4	●
33	Charge air pressure	Outside target range with system reaction	●	●	BPSCDSysReac	2-2-3	102	2, 11	●
37	Coolant level	Outside target range with system reaction	●	●	CLSCDSysReac	2-3-5	111	1, 11	
38	Single cylinder	Misfire detected (cylinder 1)	●	●	CmbChbMisfire1	2-4-1	1323	11, 12	
39	Single cylinder	Misfire detected (cylinder 2)	●	●	CmbChbMisfire2	2-4-1	1324	11, 12	
40	Single cylinder	Misfire detected (cylinder 3)	●	●	CmbChbMisfire3	2-4-1	1325	11, 12	
41	Single cylinder	Misfire detected (cylinder 4)	●	●	CmbChbMisfire4	2-4-1	1326	11, 12	
42	Single cylinder	Misfire detected (cylinder 5)	●	●	CmbChbMisfire5	2-4-1	1327	11, 12	
43	Single cylinder	Misfire detected (cylinder 6)	●	●	CmbChbMisfire6	2-4-1	1328	11, 12	
44	Single cylinder	Misfire detected (cylinder 7)		●	CmbChbMisfire7	2-4-1	1450	11, 12	
45	Single cylinder	Misfire detected (cylinder 8)		●	CmbChbMisfire8	2-4-1	1451	11, 12	
46	Multiple cylinders	Misfire detected	●	●	CmbChbMisfireMul	2-4-1	1322	11, 12	
47	Misfire	Misfire detected with system reaction	●		CmbChbSysReac	2-4-1	1346	0, 11	

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14.2 Wiring diagram 930,107 70

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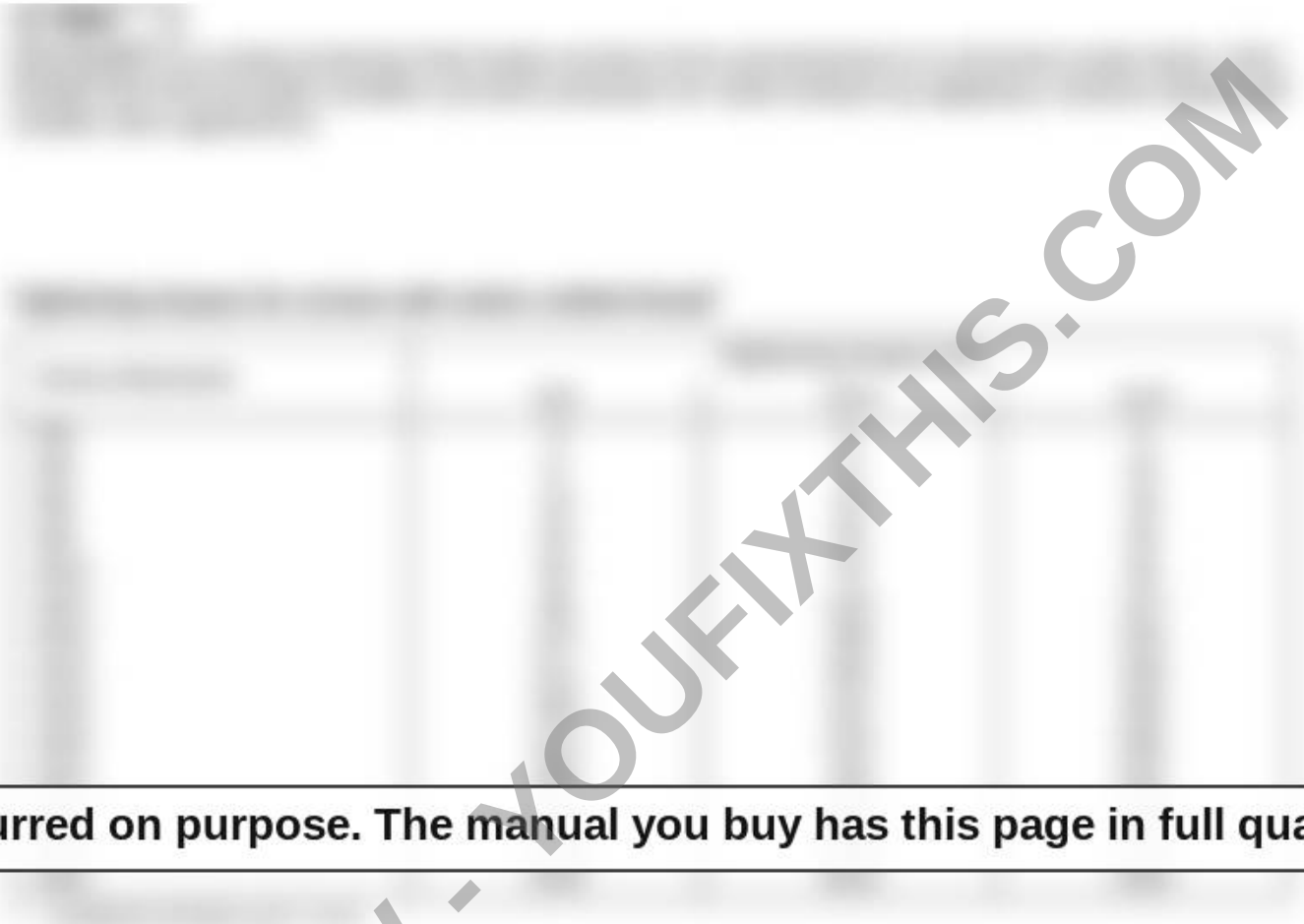
14.1 Hydraulic diagram 930,108 40

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The values specified in the table apply for screws:

- black oiled
- with surface protection A4C
- with surface protection DACROMET





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Steering		
Type of steering	Oscill.-articul.	Oscill.-articul.
Steering operation	hydraulic	hydraulic
Steering angle	± 35°	± 35°
Oscillation angle	± 15°	± 15°
Inner track radius	3891 mm	153.2 in
Dozer blade		
Height adjustment above ground level	1200 mm	47.2 in
Height adjustment below ground level	120 mm	4.7 in
Dozer blade capacity acc. to SAE J 1265	11 m^3	671261 in^3
Filling capacities		
Fuel (diesel)	375 l	99 gal us

i Note

Subject to technical alterations.

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Sensors TCD 2012/2013

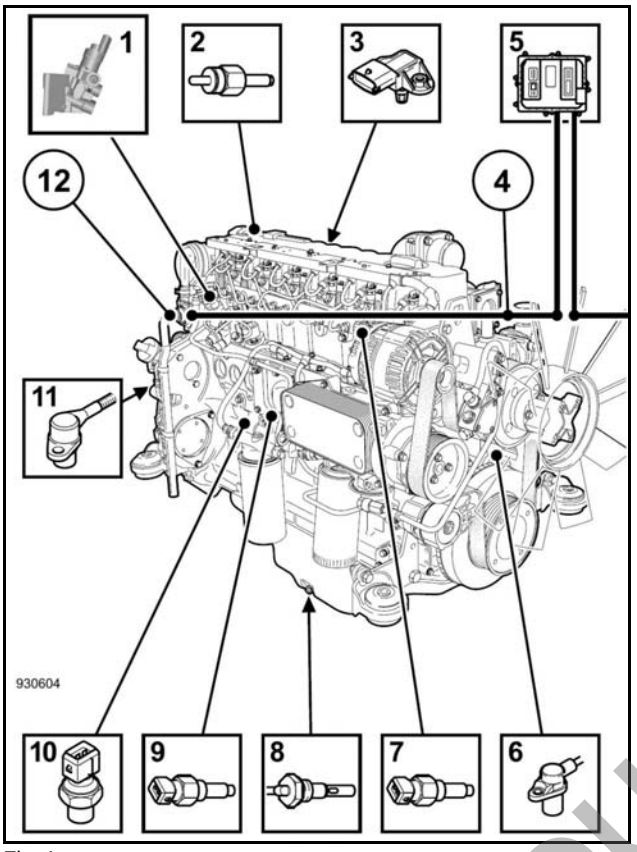


Fig. 1

1 Fuel control unit FCU
2 Coolant temperature sensor
3 Sensor for charge air temperature and charge air pressure
4 Wiring loom connecting cable
5 Engine control unit
6 Crankshaft speed sensor
7 Rail pressure sensor
8 Oil level sensor, option
9 Oil pressure sensor
10 Fuel pressure sensor
11 Camshaft speed sensor
12 Central plug

Sensors TCD 2015

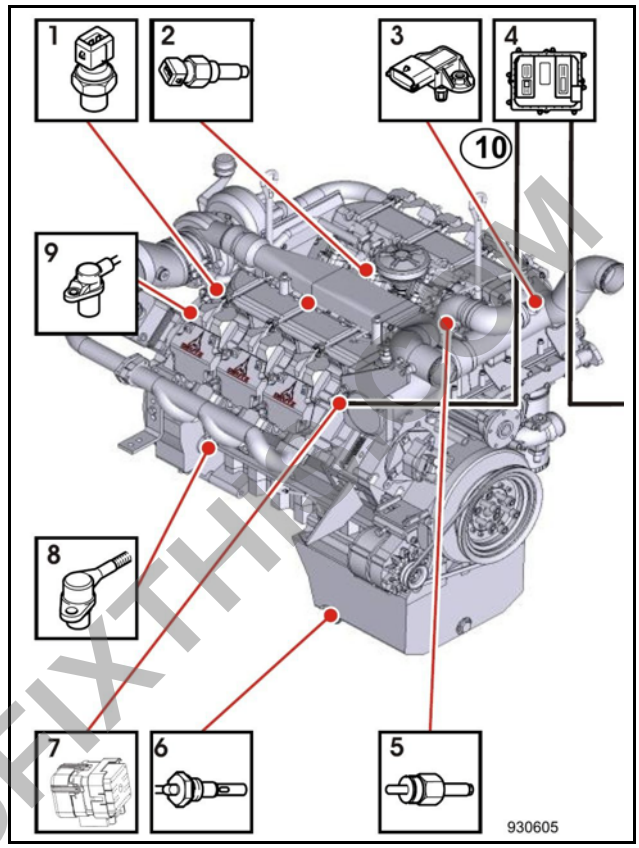


Fig. 1

1 Oil pressure sensor
2 Fuel temperature sensor
3 Sensor for charge air temperature and charge air pressure
4 Engine control unit
5 Coolant temperature sensor
6 Oil level sensor, option
7 Central plug
8 Crankshaft speed sensor
9 Camshaft speed sensor
10 Wiring loom connecting cable

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Error code SERDIA	Component / Location	Description (Error location)	Defined for DCR	Defined for DMV	ID	Blink code	SPN	FMI	Self-curing[1]
192	CAN bus off-state	Cable break or short circuit, off-state (CAN bus A)	●	●	NetMngCANAOff	2-7-1	639	11, 14	●
193	CAN bus off-state	Cable break or short circuit, off-state (CAN bus B)	●	●	NetMngCANBOff	2-7-1	1231	11, 14	●
194	CAN bus off-state	Cable break or short circuit, off-state (CAN bus C)	●	●	NetMngCANCOff	2-7-1	1235	11, 14	●
195	Oil pressure warning lamp	Cable break or short circuit	●	●	OPLpCD	1-3-5	705	2, 3, 4, 5	
196	Oil pressure sensor	Cable break or short circuit	●	●	OPSCD	2-2-4	100	0, 2, 3, 4	●
197	Oil pressure sensor	Pressure value implausible low	●	●	OPSCD1	2-3-1	100	1, 11	●
198	Oil pressure	Above target range	●	●	OPSCDSysReacHi	2-3-1	100	0, 11	●
199	Oil pressure	Below target range	●	●	OPSCDSysReacLo	2-3-1	100	1, 11	●
200	Override switch	Switch hangs	●	●	OSwCD	1-4-5	1237	2, 11	●
201	Oil temperature sensor	Cable break or short circuit	●	●	OTSCD	1-4-4	175	2, 3, 4	●
203	Oil temperature	Below target range with system reaction	●	●	OTSCDSysReac	1-4-4	175	0, 11	●
208	Rail pressure limiting valve	Opening failure	●		PRVMon	1-4-6	523470	2, 11, 12, 14	
209	Rail pressure sensor	Cable break or short circuit	●		RailCD	1-4-7	157	3, 4, 11	
210	Rail pressure sensor	Deviation of signal during start or after-run above target range	●		RailCDOfsTst	1-4-7	157	0, 1, 11	●
211	Rail pressure	Positive deviation (speed dependent) outside target range	●		RailMeUn0	1-3-4	523613	0, 11	●
212	Rail pressure	Positive deviation (flow dependent) outside target range (⇨ leakage!)	●		RailMeUn1	1-3-4	523613	0, 11	●
213	Rail pressure	Negative deviation (flow dependent) outside target range	●		RailMeUn2	1-3-4	523613	0, 11	●
214	Rail pressure	Negative deviation (speed dependent) outside target range	●		RailMeUn3	1-3-4	523613	1, 11	●
215	Rail pressure	Pressure above target range	●		RailMeUn4	1-3-4	523613	0, 11	●
216	Rail pressure	Implausible (leakage, injector needle blocked in open position)	●		RailMeUn7	1-3-4	523613	2, 11	●
218	ECU internal error	Redundant shut-off conditions detected	●	●	SOPTst	1-4-9	523490	3, 4, 11, 12	
219	ECU internal error	Wrong voltage of internal 5V reference source 1	●	●	SSpMon1	2-8-2	1079	3, 4, 11	●
221	ECU internal error	Wrong voltage of internal 5V reference source 2	●	●	SSpMon2	2-8-2	1080	3, 4, 11	●
222	ECU internal error	Wrong voltage of internal 5V reference source 3	●	●	SSpMon3	2-8-2	523601	3, 4, 11	●
223	Start relay	Start relay (high side): short circuit	●	●	StrtCDHS	5-1-2	677	3, 4, 11	
224	Start relay	Start relay (low side): cable break or short circuit, disabled by ECU	●	●	StrtCDLS	5-1-2	677	3, 4, 5, 11	
225	Diagnostic lamp	Cable break or short circuit, disabled by ECU	●	●	SysLamp	5-1-3	624	2, 3, 4, 5	
226	Terminal 15	Ignition ON not detected	●	●	T15CD	5-1-4	158	11, 12	
227	Terminal 50	Engine start switch hangs	●	●	T50CD	5-1-5	523550	11, 12	
228	ECU internal error	Time processing unit (TPU) defective	●	●	TPUMon	5-5-5	523550	2, 11	
232	Vehicle speed signal	Speed above target range, signal missing or implausible	●	●	VSSCD1	5-2-1	84	0, 8, 12, 14	●
235	ECU internal error	Serial communication interface defective	●	●	WdCom	5-5-5	523600	11, 12	
236	Rail pressure limiting valve	Opening failure with system reaction	●		PRVMonSysReac	1-4-6	523470	11, 12	

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169 / 656 / InjVlvCyl6A

Error description INJECTOR 6
Injector 6: the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 169
BlinkCode (short-long-short): 1 - 6 - 3
SPN: 656
possible FMI:
3: Voltage to high or short circuit to +Ubatt
13: out of calibrated range
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit (cylinder 6), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

170 / 656 / InjVlvCyl6B

Error description INJECTOR 6
Injector 6: the current drain measured by ECU is underneath the target range

Error codes
DEUTZ-Errorcode: 170
BlinkCode (short-long-short): 1 - 6 - 3
SPN: 656
possible FMI:
13: out of calibrated range
13: out of calibrated range
5: current to low or broken wire
13: out of calibrated range

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Cable break (cylinder 6), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 3
Measurement @ errortime: actual value

171 / 657 / InjVlvCyl7A

Error description INJECTOR 7
Injector 7: the current drain measured by ECU is above the target range

Error codes
DEUTZ-Errorcode: 171
BlinkCode (short-long-short): 1 - 6 - 4
SPN: 657
possible FMI:
3: Voltage to high or short circuit to +Ubatt
13: out of calibrated range
4: Voltage to low or short circuit to -Ubatt
12. Errormode not identifiable

Errordetection
Errorlamp shows permanent light. Entry in errormemory.

Possible reason for error
Short circuit (cylinder 7), injector defective, connection cable demaged

Take actions for error repair
Check cabling, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it

other error properties
System reaction: Warning, fuel injection failed, shut off wenn the number of active cylinders below minimum
Behaviour error lamp: permanent light
Selfhealing: yes
Signal Priority: 4
Measurement @ errortime: actual value

008 923 55
BOMAG
167
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Continuity test for the magnetic switch

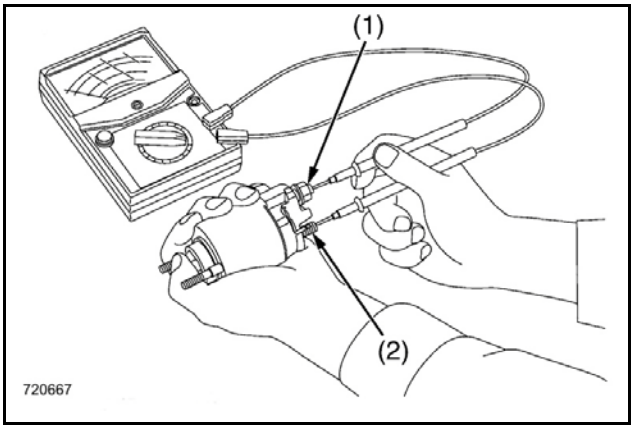


Fig. 36

- Use a continuity tester to check for continuity between terminal (1) and terminal (29 while holding the pin depressed.
- Replace the magnetic switch if no continuity is detected.

Removing and assembling the starter

Removing the starter

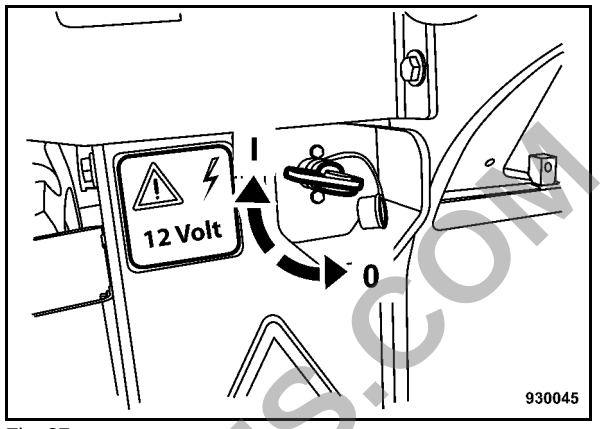


Fig. 37

- Switch the main battery switch to position "0" (Fig. 37).

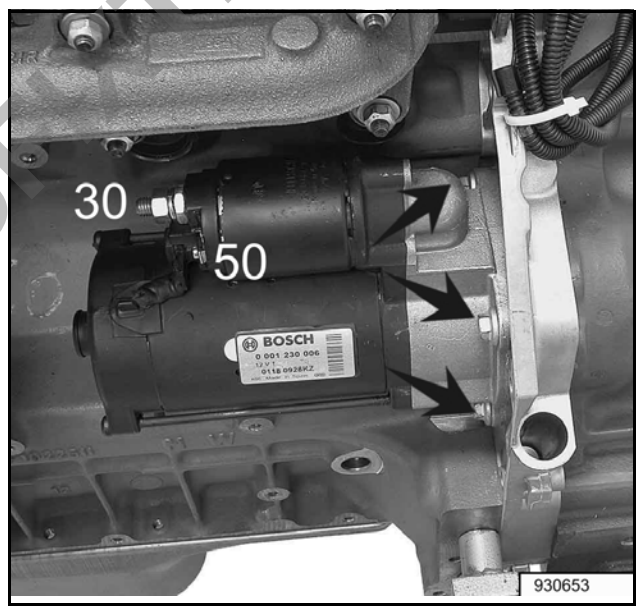


Fig. 38

- Disconnect the cable connections (terminal 30 and 50).
- Unscrew the screws (arrows) (Fig. 38).
- Take off the starter.

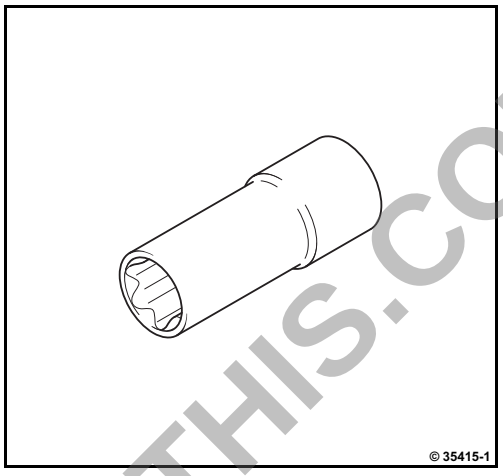
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DEUTZ

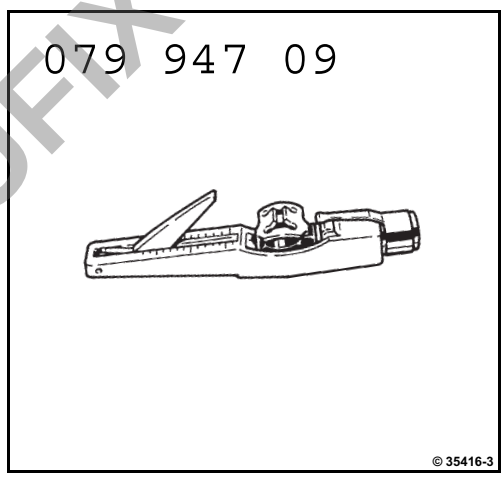
TCD 2013 2V — Standard tools

8114
Socket wrench insert
Torx - E 20



8115
V-belt tension measuring device
150 to 600 N
for checking the V-belt tension

079 947 09



8189
Torx tool set
Contents of case:
- Double-ended ring spanner E6/E8
- Double-ended ring spanner E10/E12
Socket wrench insert E8 and E10 (1/4 inch)
- Socket wrench insert E10 and E12 (3/8 inch)
- Socket wrench insert E18 (1/2 inch)

079 947 01



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Pressure gauge with saturation temperature scale

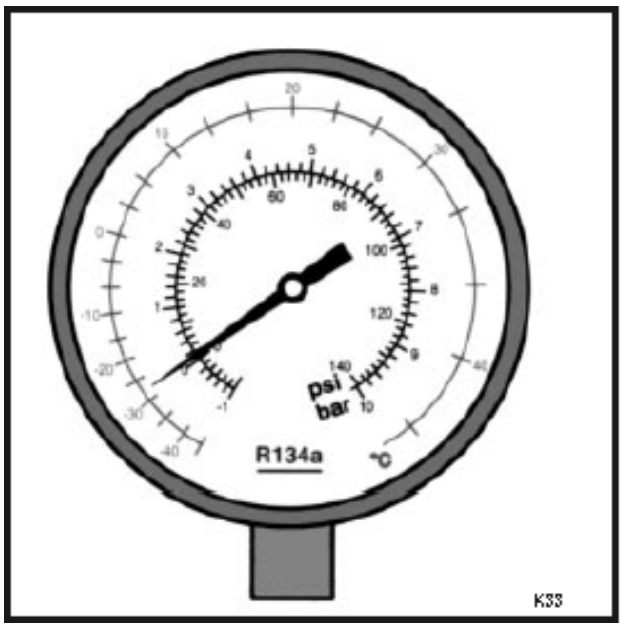


Fig. 3 Absolute pressure gauge

Temperature scales on the pressure gauges always refer to the absolute pressures Pabs. Please note that it is not possible to measure a temperature directly with a pressure gauge. The indicated temperatures are just reference values. Only the saturation temperature is assigned to the measured pressure.

If the refrigerant is fluid, the temperature is below the saturation temperature.

If the refrigerant is gaseous, the temperature is above the saturation temperature.

Pressure gauges must indicate 0 bar when not connected to the system.

Low pressure gauges have a blue, high pressure gauges a red border.

Thermometer

The thermometers used are normally digital thermometers with surface or attachment sensors. Good heat insulation of the measuring location must be assured, especially in case of big temperature differences. An economical use of heat-conduction paste is recommended. If the measuring location is excessively contaminated, it needs to be cleaned and possibly treated with a fine emery cloth. Only the temperature of the sensor is measured. Temperature differences between the measured and the actual values of a few degree Kelvin may be caused by missing heat insulation and by insulating oxide layers on the cable.

Overheating

Due to its design a refrigerant compressor can only deliver gaseous or vaporous substances. Fluids are not compressible and must therefore not enter into the compression chamber of the compressor.

If the suction condition of the compressor is directly on the dew line, an e.g. incorrect evaporator load can cause "wet suction". This can lead to two processes, which are destructive for the compressor. The liquid refrigerant washes off the lubricating film between piston and cylinder wall, and insufficient lubrication will cause extreme wear. Liquid refrigerant remaining in the cylinder causes a direct energy transfer from piston to cylinder cover during compression. The valve plate may then be damaged by so-called fluid strokes.

Apart from protecting the compressor against fluid, overheating has further advantages. Since the fluid proportions in the drawn in steam reduces the flow rate of the compressor, it may be increased by a overheating. Overheating also improves the oil recirculation.

Common overheating values

The optimal overheating value is approx. 5 - 8 Kelvin. With this overheating the maximum system power is reached. However, the thermostatic expansion valve is unable to regulate this value exactly. Depending on design and operating conditions overheating fluctuates within a range between 4 and 12 Kelvin. The influence of the ambient air on the suction line causes an additional overheating effect.

Overheating is calculated as follows:

$\Delta\, t_{o2h} = t_{o2h} - t_o$

$\Delta\, t_{o2h}$, overheating at evaporator outlet in K

t_{o2h}, temperature at evaporator outlet in °C

t_o, evaporation temperature in °C

"$_h$" represents "overheated"

Supercooling

It is the function of the expansion valve to reduce the refrigerant to a lower pressure level (evaporation pressure) after it has been liquefied. For an optimal function of the valve pure fluid must be applied to its inlet port.

The refrigerant must "squeeze" (literally speaking) through a throttle gap inside the expansion valve. When comparing a certain mass of refrigerant in liquid and vaporous condition (under constant pressure), the vaporous refrigerant requires a much higher volume. That's why the vaporous refrigerant needs a much longer time to "squeeze" through the throttle gap.

Vaporous refrigerant in front of the expansion valve reduces the flow rate and results in an undersupply of the evaporator with refrigerant. Evaporation pressure and evaporator power will drop.

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10.1 Hydraulic circuit

Open circuit

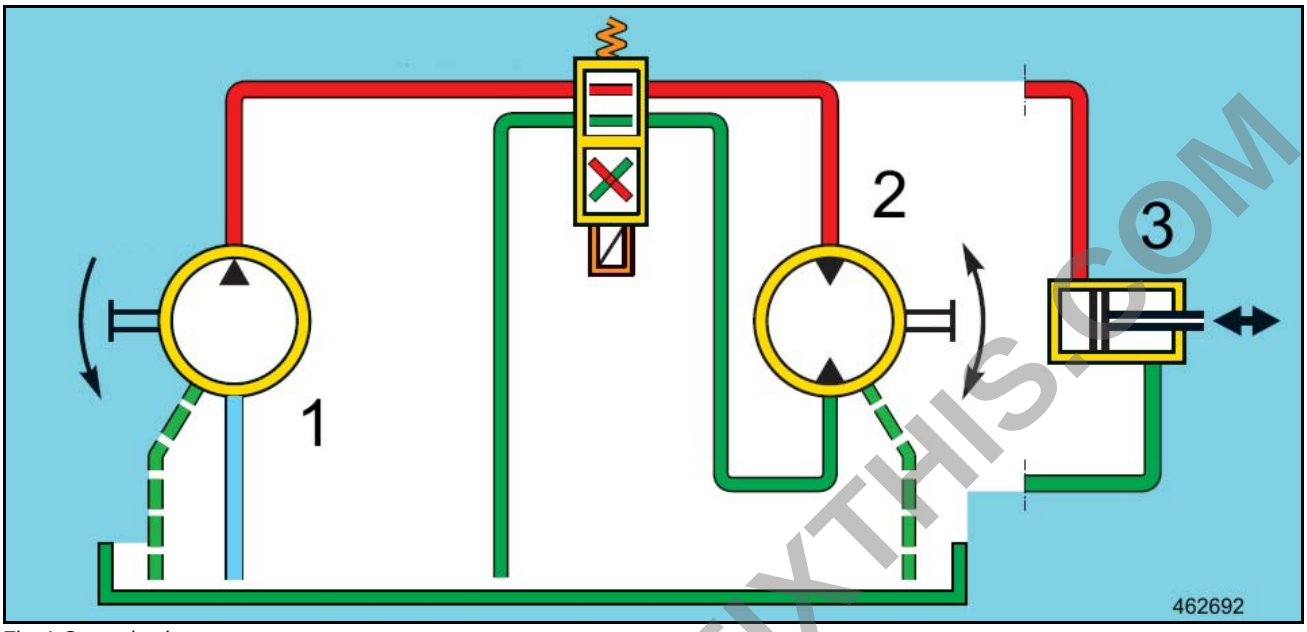


Fig. 1 Open circuit

Open in this case means that the suction line of a **pump**) (Fig. 1) normally is situated below the fluid level, the surface of which is in open contact with atmospheric pressure. Reliable equalization of pressure between the air in the hydraulic oil tank and the ambient air ensures problem free suction of the pump.

In an open circuit the hydraulic fluid is fed to the **consumer** (2 or 3) and also returned to the tank through way valves.

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10.11Towing the machine

⚠ Danger

Danger of accident! Danger of injury!

Before releasing the parking brake secure the machine against unintended rolling by using appropriate means (e.g. metal wheel chocks).

Use a towing vehicle with sufficient traction and braking power for the unbraked towed load.

Use a tow bar.

The machine cannot be steered.

Do not touch hot engine parts.

⚠ Caution

Only tow the machine with the parking brake released and the travel pump short-circuited.

Towing speed 1 km/h, max. towing distance: only out of the immediate danger zone as the travel pump may be destroyed due to inadmissible heat and insufficient lubrication.

The closed hydraulic circuit empties during the towing process. Therefore, the hydraulic circuit needs to be filled and bled after towing. To do this, operate the starter without starting the engine.

Preparing for towing

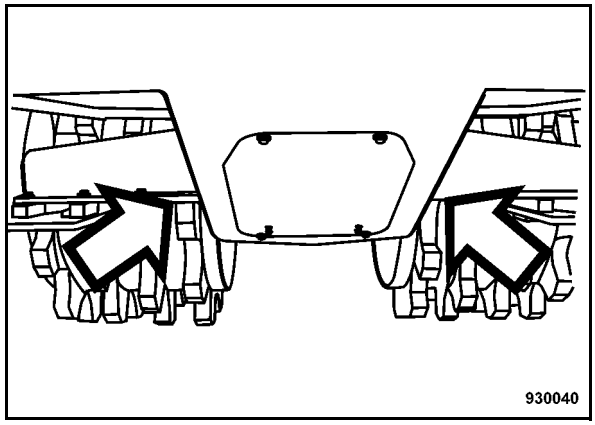
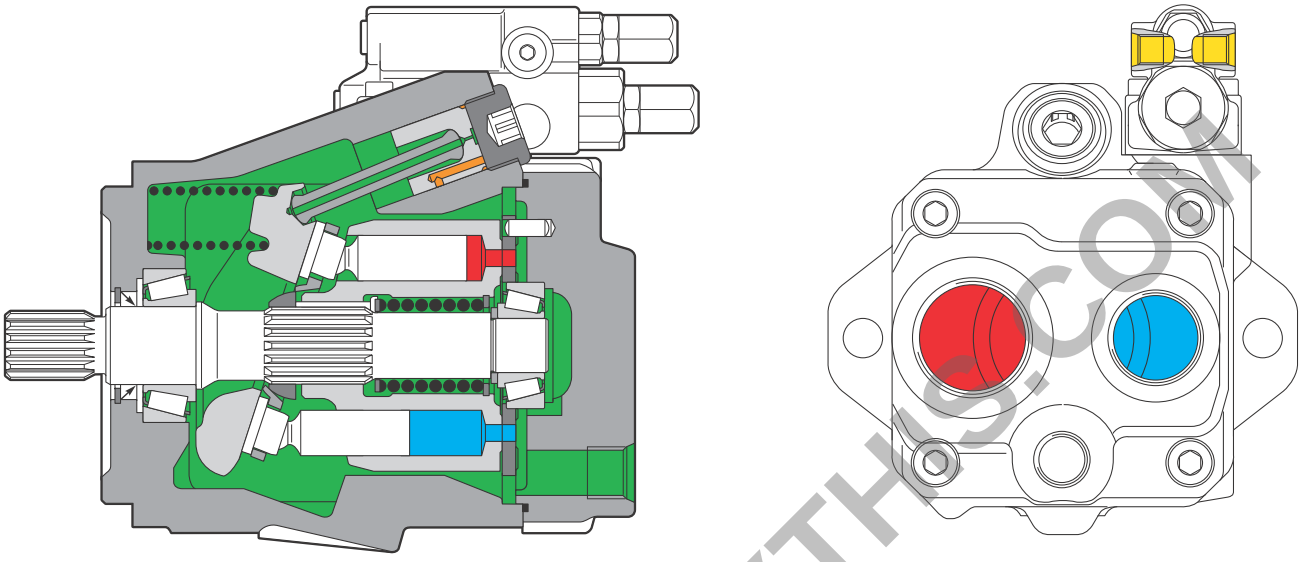


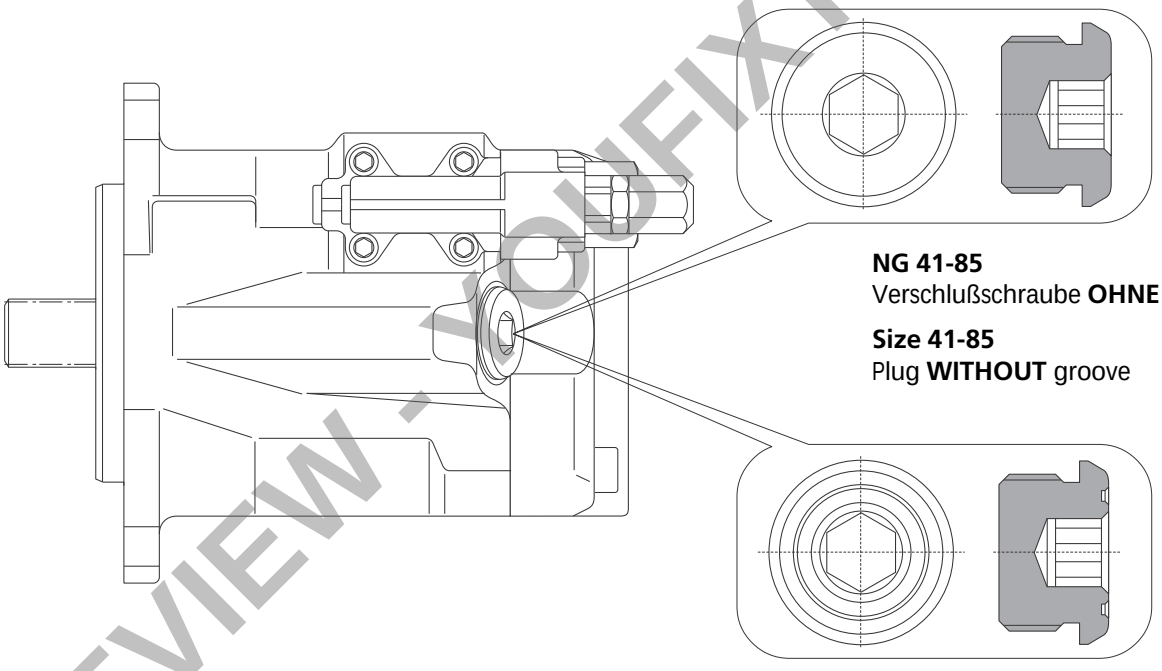
Fig. 44

- Shut down the engine.
- Fasten the towing device to the towing eyes (Fig. 44).

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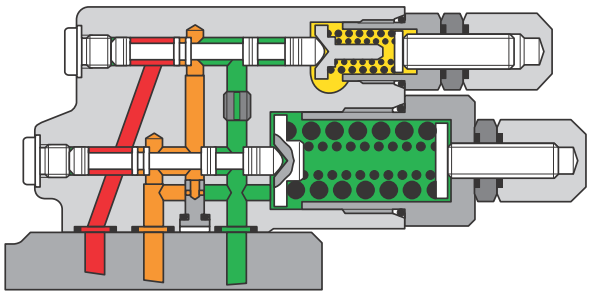


NG 41-85
Verschlußschraube **OHNE** Ringnut

Size 41-85
Plug **WITHOUT** groove

NG 25
Verschlußschraube **MIT** Ringnut

Size 25
Plug **WITH** groove



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Elenco olii consigliati a Norme SAE 80W/90 e SAE 85W/140 con caratteristiche API GL5
Lubricant oils suggested according SAE 80W/90 and SAE 85W/140 API GL5 grade

Temperatura ambiente *Ambient temperature* **Viscosità olio / *Oil viscosity***	**-10°C / +30°C SAE 80W/90**	**+20°C / +45°C SAE 85W/140**
Produttori / *Manufacturers*	**Tipo olio / *Oil Brand***	
SHELL	**SPIRAX HD**	**SPIRAX HD**
AGIP	ROTRA MP	ROTRA MP
ARAL	GETRIEBEOL HYP	GETRIEBEOL HYP
BP-MACH	HYPOGEAR EP	HYPOGEAR EP
CASTROL	HYPOY	HYPOY
CHEVRON	UNIVERSAL GEAR LUBRICANTE	UNIVERSAL GEAR LUBRICANTE
ELF	TRANSELF B	TRANSELF B
ESSO	GEAR OIL GX PONTONIC MP	GEAR OIL GX PONTONIC MP
I.P.	PONTIAX HD	PONTIAX HD
MOBIL	MOBILUBE HD	MOBILUBE HD
TOTAL	TRASMISSION TM	TRASMISSION TM

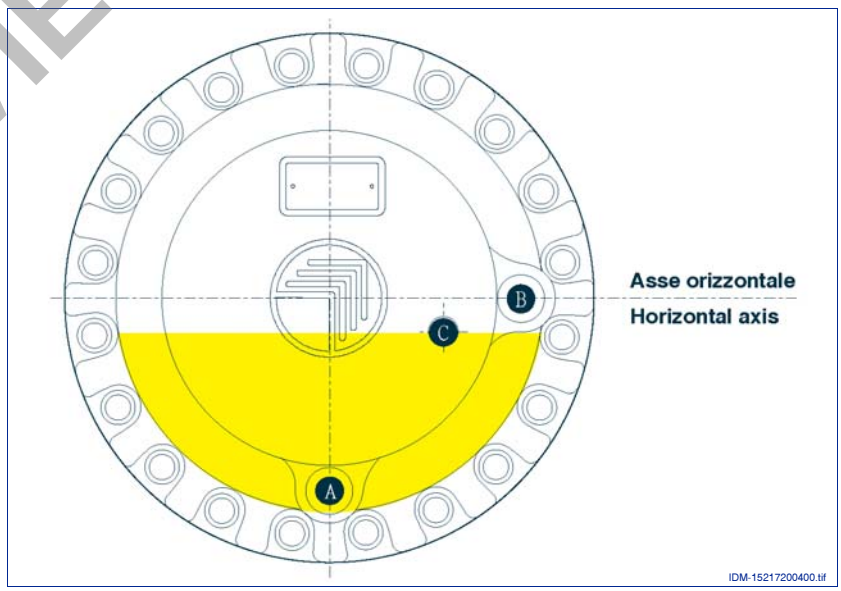
Informazioni

Non mescolare oli di marca o caratteristiche diverse.

Il riduttore viene fornito privo di olio ma predisposto con tappi di carico, scarico e livello. Prima della messa in funzione occorre eseguire il riempimento.

Eseguire questa operazione come di seguito indicato.

1. Con l'asse del riduttore in orizzontale, ruotare il corpo fino a che il tappo di scarico (**A**) si trovi in basso sull'asse verticale del coperchio di chiusura.
2. Svitare i tappi di carico e livello olio (**B-C**).
3. Riempire dal foro (**B**) fino a che l'olio lubrificante non fuoriesca dal foro (**C**).



Information

Do not mix together oils of different brands or characteristics.

The gearbox is supplied without oil; anyway it has filling, draining and oil level plugs. Before putting the gearbox into operation, it is necessary to fill it with oil.

This procedure is undertaken following the indications given below.

1. *Check that the gearbox axis is horizontal. Rotate the gearbox housing until the drain plug (**A**) is on the bottom of the vertical axis of the end cover.*
2. *Unscrew the fill and level oil plugs (**B-C**).*
3. *Fill from the hole (**B**) until the lubricant oil flows out from the hole (**C**).*

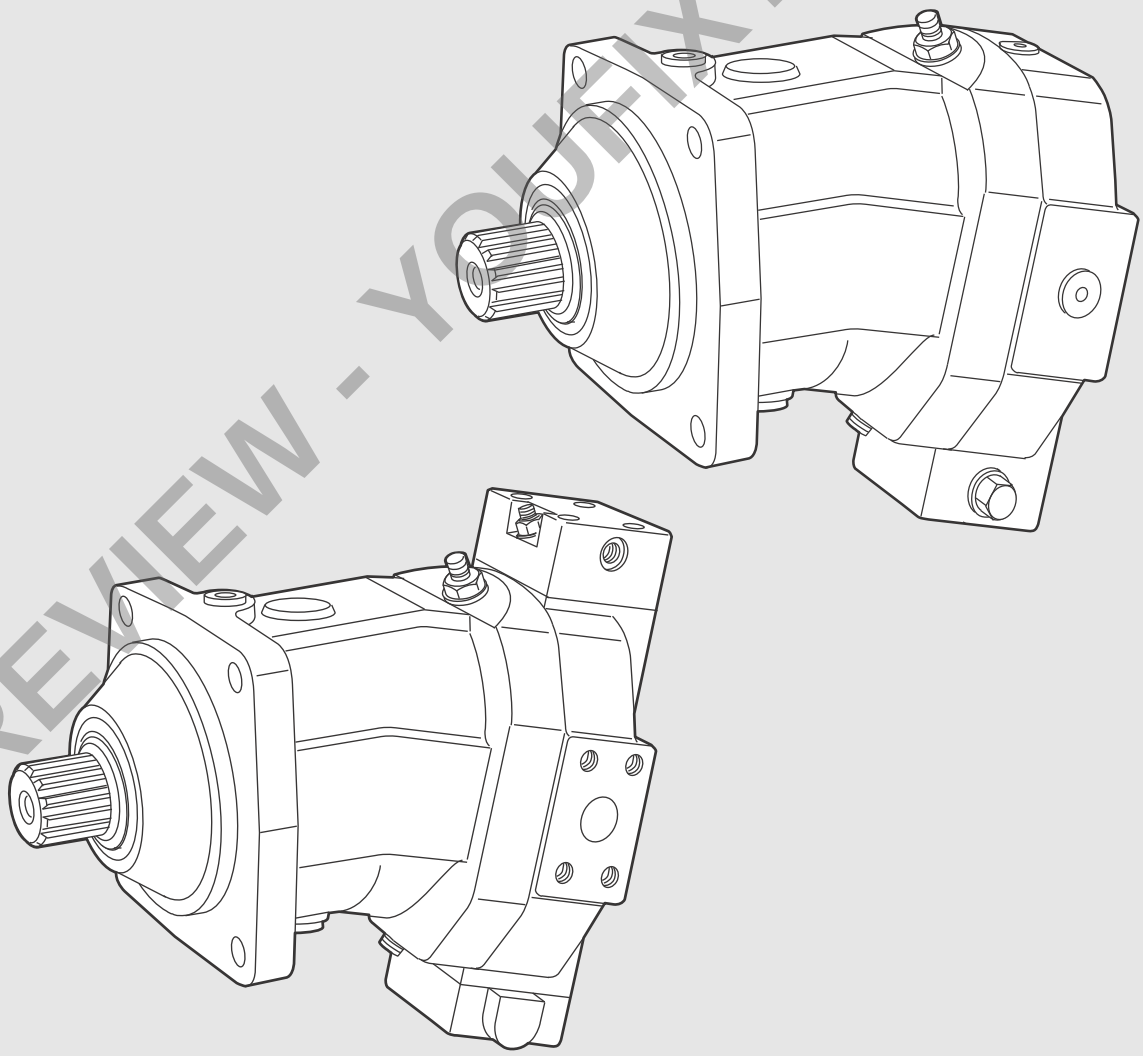
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Rexroth
Bosch Group

Verstellmotor A6VM 28...200
Variable Displ. Motor A6VM 28...200

RDE 91 604-01-R/03.03
ersetzt/replaces 08.01

Reparaturanleitung / Repair Instructions



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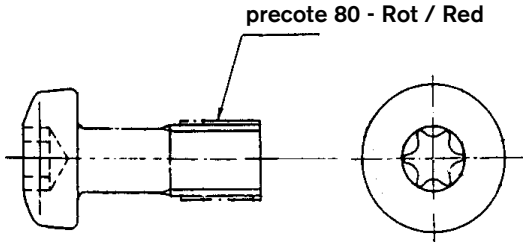
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Montageanweisung für Anziehdrehmomente
Assembly guidelines for tightening torques

6. Linsenschrauben mit Innen-TORX, Gewindevorbeschichtung mit "precote"

6. Oval head screw with inner TORX, thread precoated with "precote"

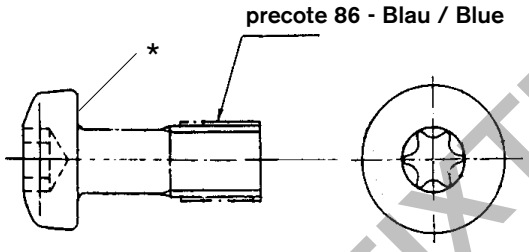
Standard / Standard



Variante / Variant

I **2602493 M5 x 16**
I **2602395 M6 x 20**

siehe Stückliste / as to parts list



* mit Unterkopfbeschichtung - farblos

* with head bottom coating - colorless

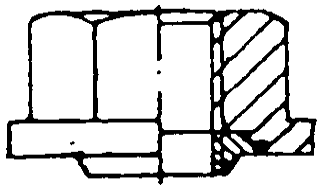
Gewinde / Thread	Festigkeitsklassen / Tensile strength class
	10.9
	Anziehdrehmoment / Tightening torque M_A in Nm
M3	2,1
M4	4,7
M5	9,1
M6	15,8
M8	37,7

---

7. SEAL-LOCK-Dichtmuttern (nach N 02.100)

7. SEAL-LOCK - sealing nuts (to N 02.100)

Gewinde / Thread	Anziehdrehmoment M_A in Nm Tightening torque M_A in Nm
M6	10
M6 x 0,5	11
M8	22
M8 x 1	24
M10	40
M10 x 1	44
M12	69
M12 x 1,5	72
M14	110
M14 x 1,5	120
M16	170
M16 x 1,5	180



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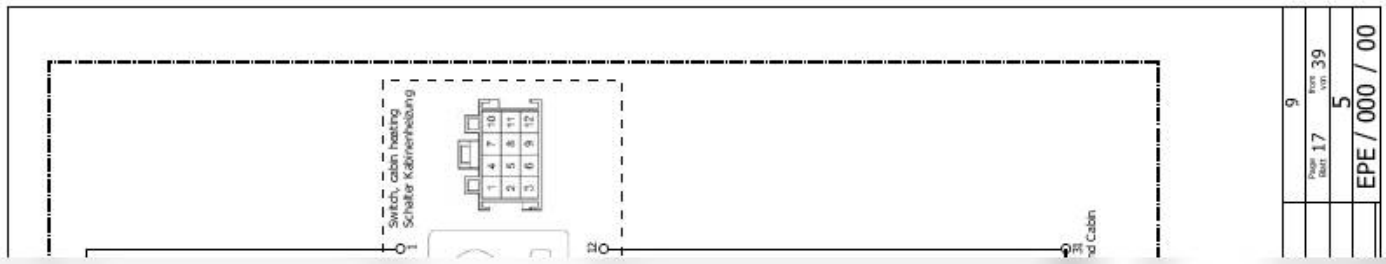
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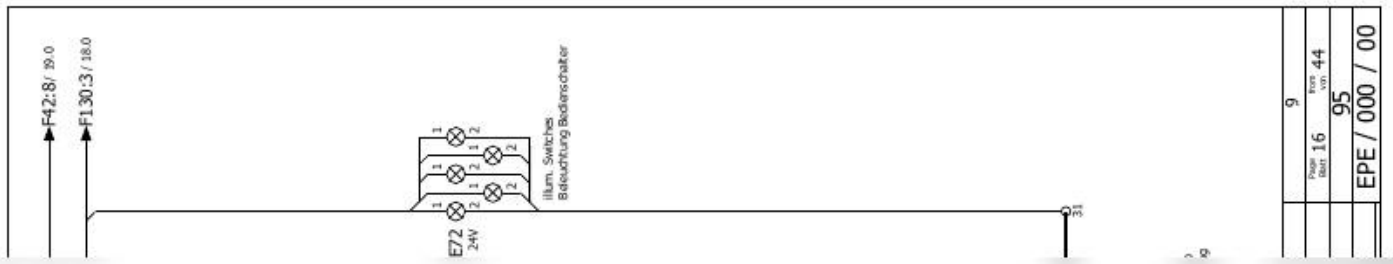
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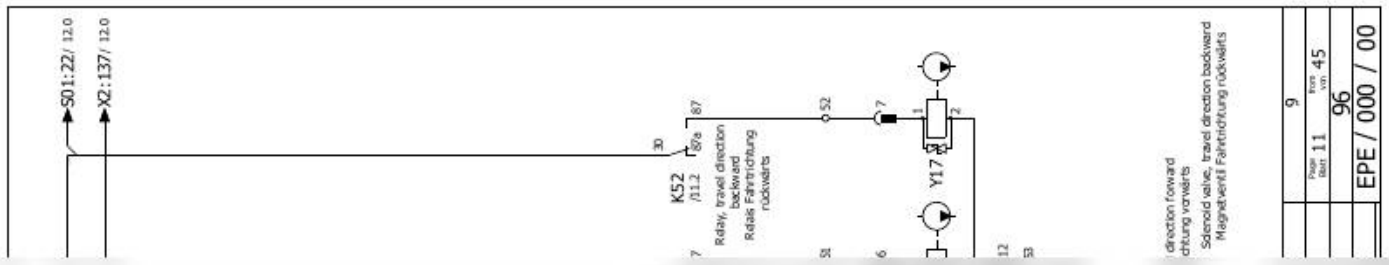
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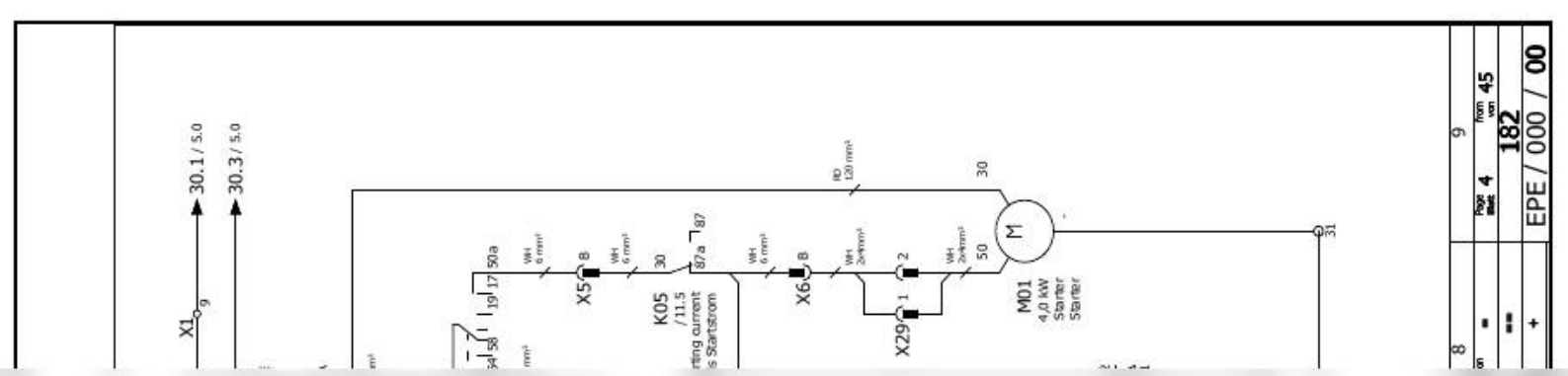
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