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WX145
WX165
WX185

HYDRAULIC EXCAVATOR

Service manual

Print No. 9-91221 English

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THIS ALERT SYMBOL SIGNALS IMPORTANT MESSAGES INVOLVING YOUR SAFETY.

Read and heed carefully the safety instructions listed and follow the precautions recommended to avoid potential risks and to safeguard your health and your safety.

You will find this symbol in the text of this Manual referred to the following key words:

***WARNING* - Cautions directed to avoid improper repair interventions involving potential consequences for the safety of the personnel performing the repairs.**

***DANGER* - These warnings qualify specifically potential dangers for the safety of the operator or other persons directly or indirectly involved.**

IMPORTANT NOTICE

All maintenance and repair interventions explained in this Manual **must be performed exclusively by the Service Organisation of the Manufacturer**, observing strictly the instructions explained using, whenever necessary, the recommended specific tools.
Whoever performs the operations reported without following exactly the precautions is responsible on his own, for the damages that may result.

Neither the Factory nor any Organisations in its Distribution Network, including but not limited to national, regional or local distributors, are responsible for any liability arising from any damage resulting from defects caused by parts and/or components not approved by the Factory for use in maintaining and/or repairing products manufactured or merchandised by the Factory.
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SUMMARY

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SAFETY INSTRUCTIONS	SECTION 1
TECHNICAL DATA AND SPECIAL TOOLS	SECTION 2
MACHINE STRUCTURE	SECTION 3
ELECTRICAL SYSTEM	SECTION 4
ELECTRONICS	SECTION 5
HYDRAULICS	SECTION 6
TROUBLESHOOTING AND REPAIR	SECTION 7
REPAIR INSTRUCTIONS	SECTION 8

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Warnings and symbols

The following signs are used in the Technical Manual to designate exceptionally important information:



Precautionary rules and measures designed to protect the operator and other persons from life-threatening hazards or injury and to prevent extensive damage to property.



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

□

Risks resulting from failure to observe the safety instructions



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

Nevertheless, its use may constitute a risk if it continues to be operated despite damage being suspected or having occurred, or if it is inexpertly repaired.

There is then a risk of

- **life-threatening injury**
- **irreparable damage to the machine and other assets.**

The hydraulic excavator must be stopped immediately if suspected damage or damage that has occurred affects the safety of the operator, other persons at the excavator deployment site, or other assets. All components are carefully coordinated. Trouble-free operation and a long service life are assured only if original spare parts are used.

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Data sheet for cylinders WX145

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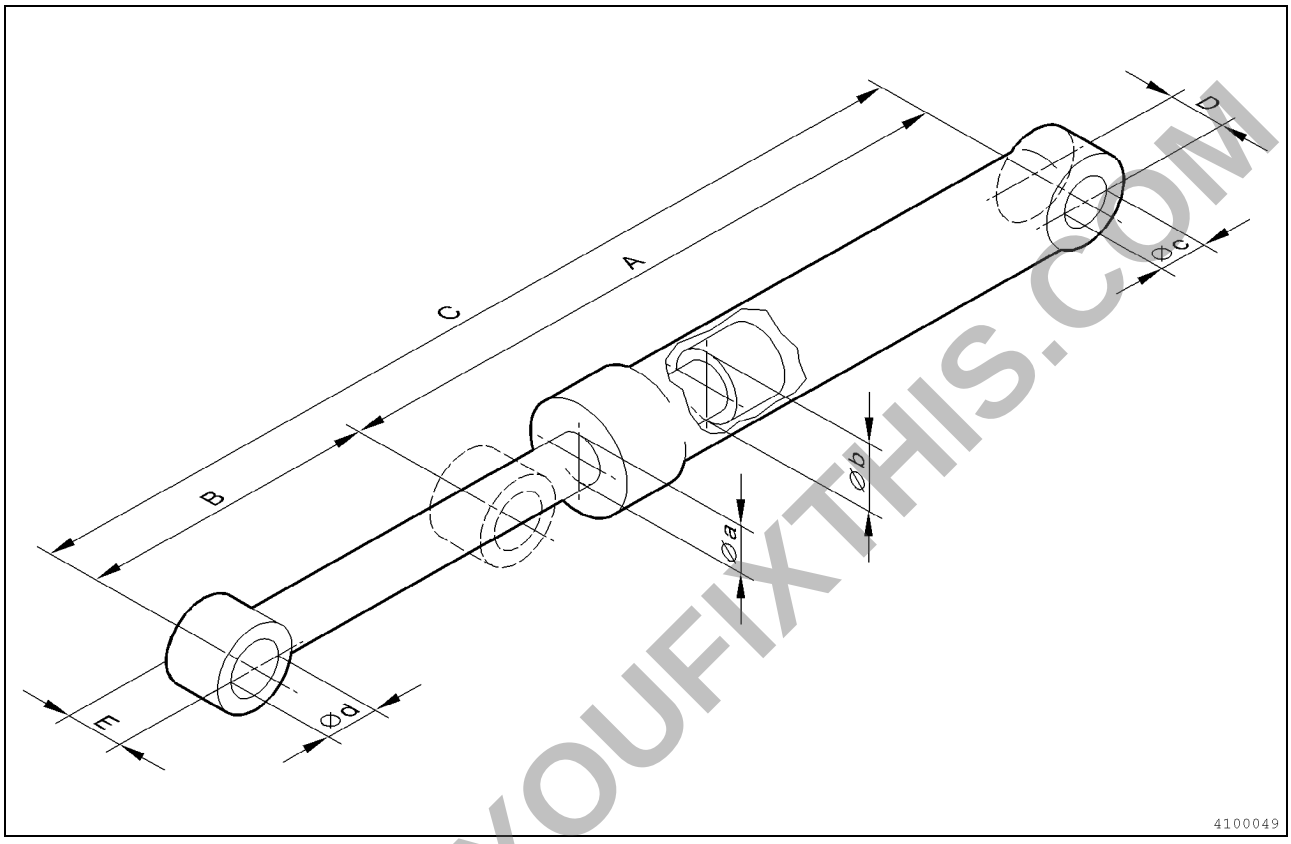


Fig. 1

WX145	P/N	Piston	Piston rod	Length	Stroke	Length	Cylinder barrel		Piston rod	
							Eye	Width	Eye	Width
		∅ b	∅ a	A	B	C	∅ c	D	∅ d	E
Monoblock boom	7211 4625	105	75	1542±1,8	1041±1,8	2583±3,6	$80^{+0,25}_{+0,05}$	$96^{0}_{-0,5}$	$80^{+0,25}_{+0,05}$	$96^{0}_{-0,5}$
Boom adjusting	7211 3972	105	75	1524±1,8	1023±1,8	2547±3,6	$80^{+0,25}_{+0,05}$	$96^{0}_{-0,5}$	$80^{+0,25}_{+0,05}$	$96^{0}_{-0,5}$
Stick cylinder	7211 4000	105	75	1676±1,8	1176±1,8	2852±3,6	$70^{+0,25}_{+0,05}$	$100^{0}_{-0,5}$	$70^{+0,25}_{+0,05}$	$100^{0}_{-0,5}$
Bucket cylinder	7211 4020	100	70	1355±1,8	870±1,8	2225±3,6	$70^{+0,25}_{+0,05}$	$100^{0}_{-0,5}$	$70^{+0,25}_{+0,05}$	$100^{0}_{-0,5}$
Neck	33 27 557	150	90	1342	762	2104	$90^{+0,135}_{+0,076}$	116±1,2	$90^{+0,135}_{+0,076}$	116±1,2

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Tightening Torques

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General information

The following tables contain the tightening torques for screws with a DIN 13 - 13 metric thread.

The construction dept. may specify in certain cases tightening torques other than those set out in the standard. **The values set out in the tables are therefore applicable unless otherwise specified in the "Inspection and servicing" chapter of the operating instructions, the Technical Handbook or the drawings.**

The tightening torques specified do not only depend on the screw grade, but also on the friction at the thread and the bearing face of the screw head. Therefore, different friction coefficients (total) depending on the type and condition of the screws used must be applied when calculating tightening torques.

1. Friction coefficient total = 0.10:
   screw and/or nut electro-galvanized (surface protection A3B).
2. Friction coefficient total = 0.12:
   screw black-plated or phosphatized
   nut bright
   thread oiled
3. Friction coefficient total = 0.16:
   screws with liquid screw fixer, e.g. Loctite 242, 243, in acc. with application instructions.
   The corresponding column is marked in the tables with an "L".

The three figures given are mean friction coefficients.

The calculated tightening torques M_A are valid for tightening of the screws by hand.

Units of measurement

The tightening torques specified in the tables are expressed in Nm (newtonmeter). If older torque wrenches are used for tightening, the Nm values must be converted to the formerly used kpm (kilopondmeter) unit. The conversion is simple since 1 kpm is almost exactly the same as 10 Nm (exact coversion factor: 1 kpm = 9.81 Nm). The small difference can be ignored so that for conversion purposes the Nm value must only be divided by 10.

Exaple:

$$1840Nm = \frac{1840}{10} = 184kpm$$

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Power supply, starter/engine, WX145

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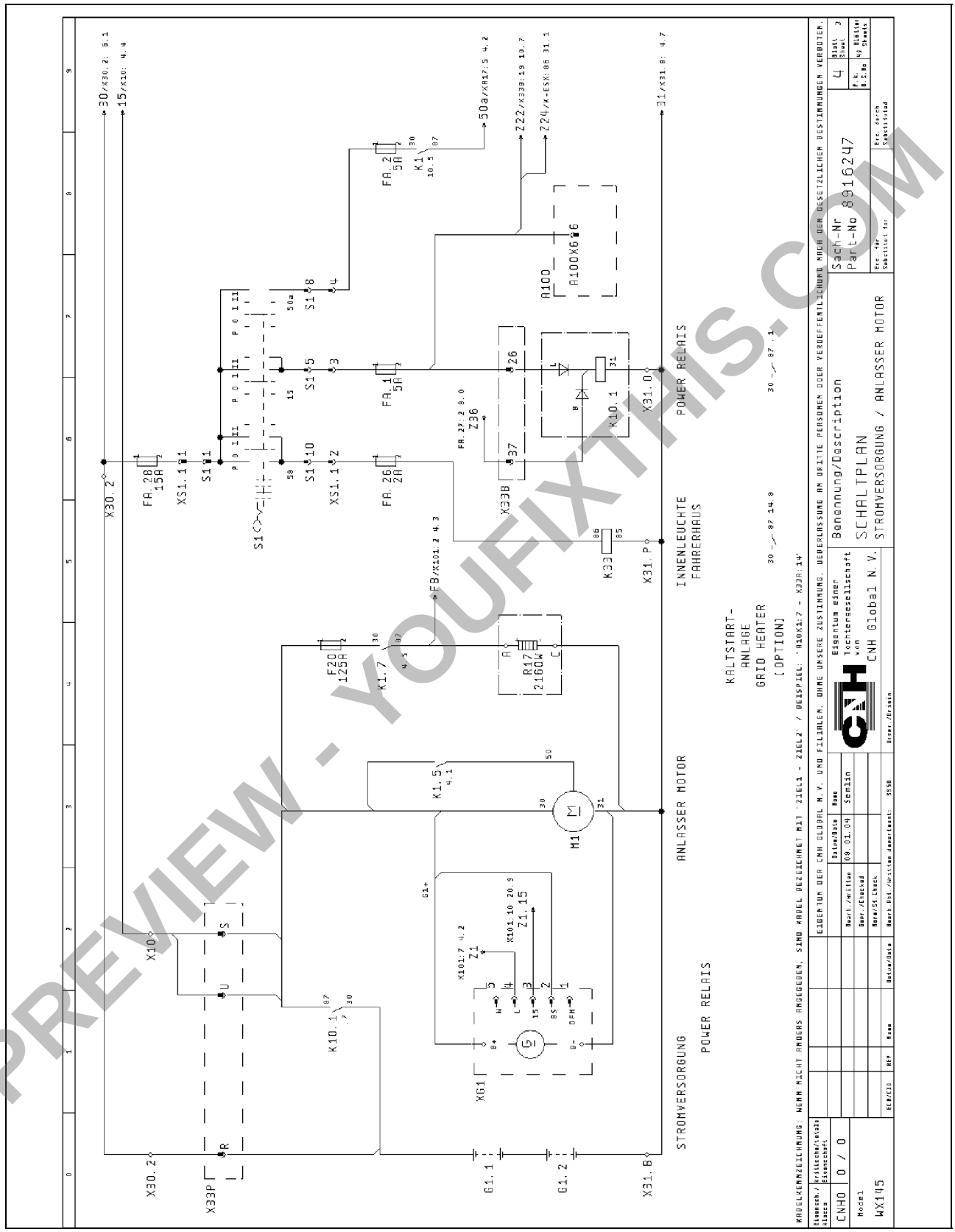


Fig. 3

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Hydraulic circuit diagram WX145 boom adjusting equipment

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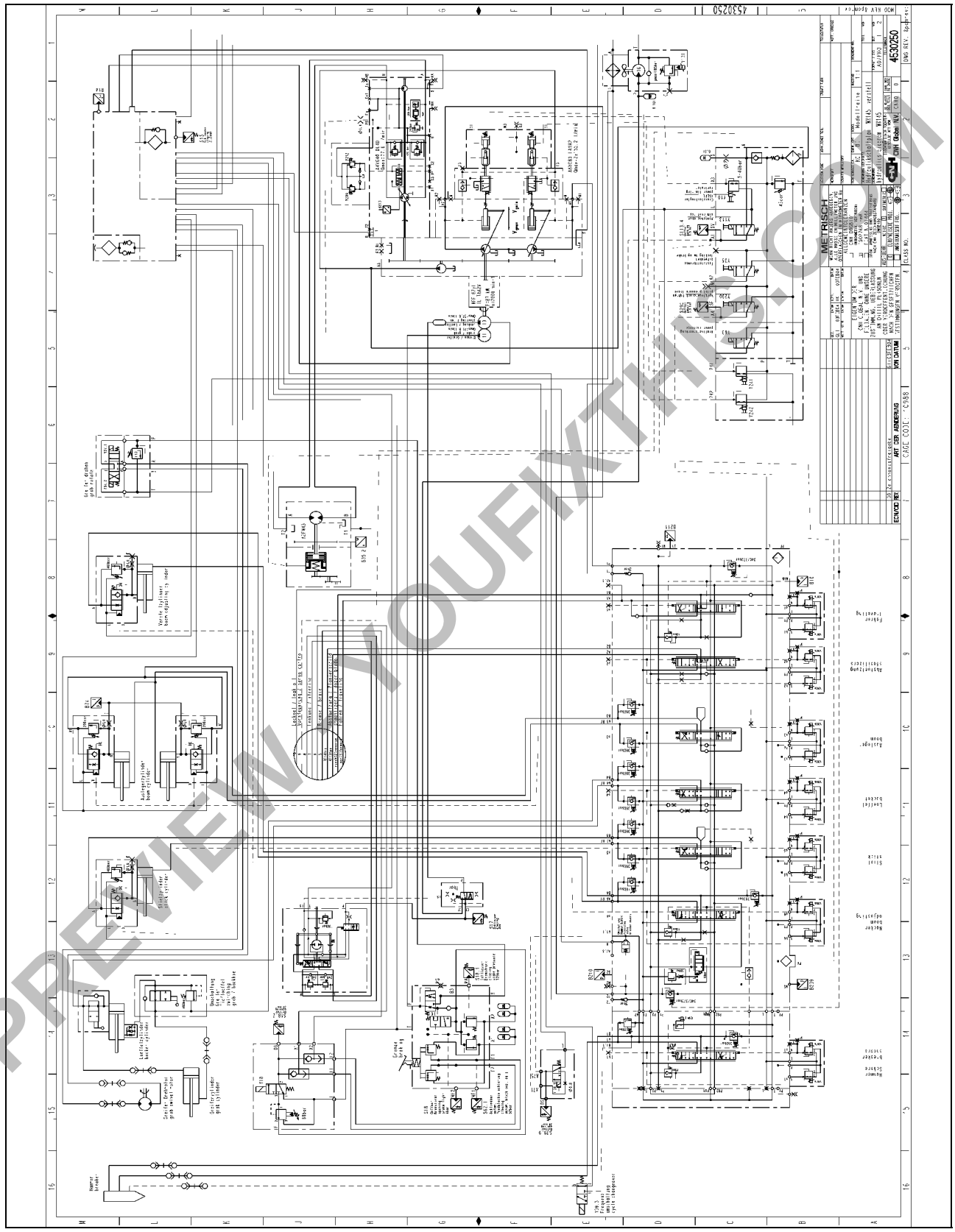


Fig. 1

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Boom cylinder, components

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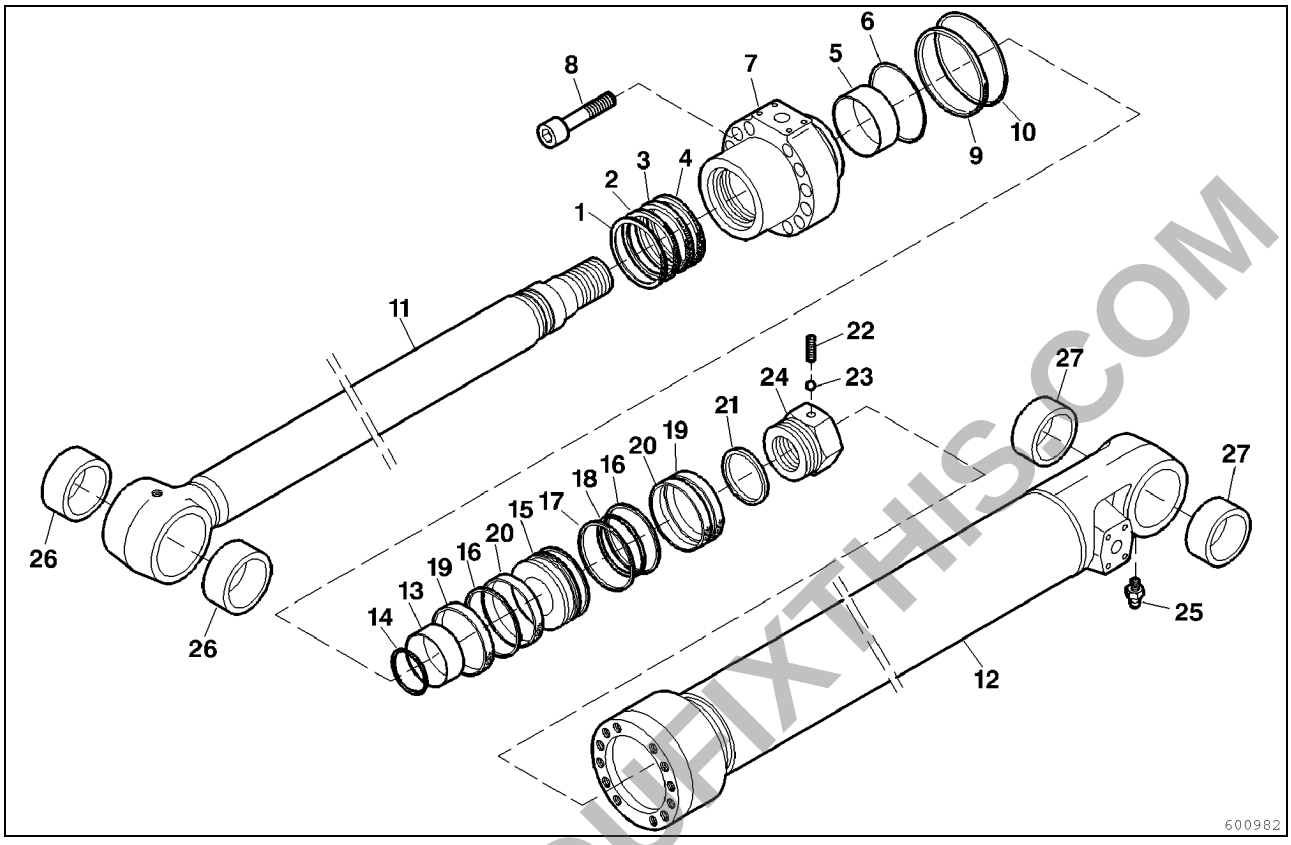


Fig. 1

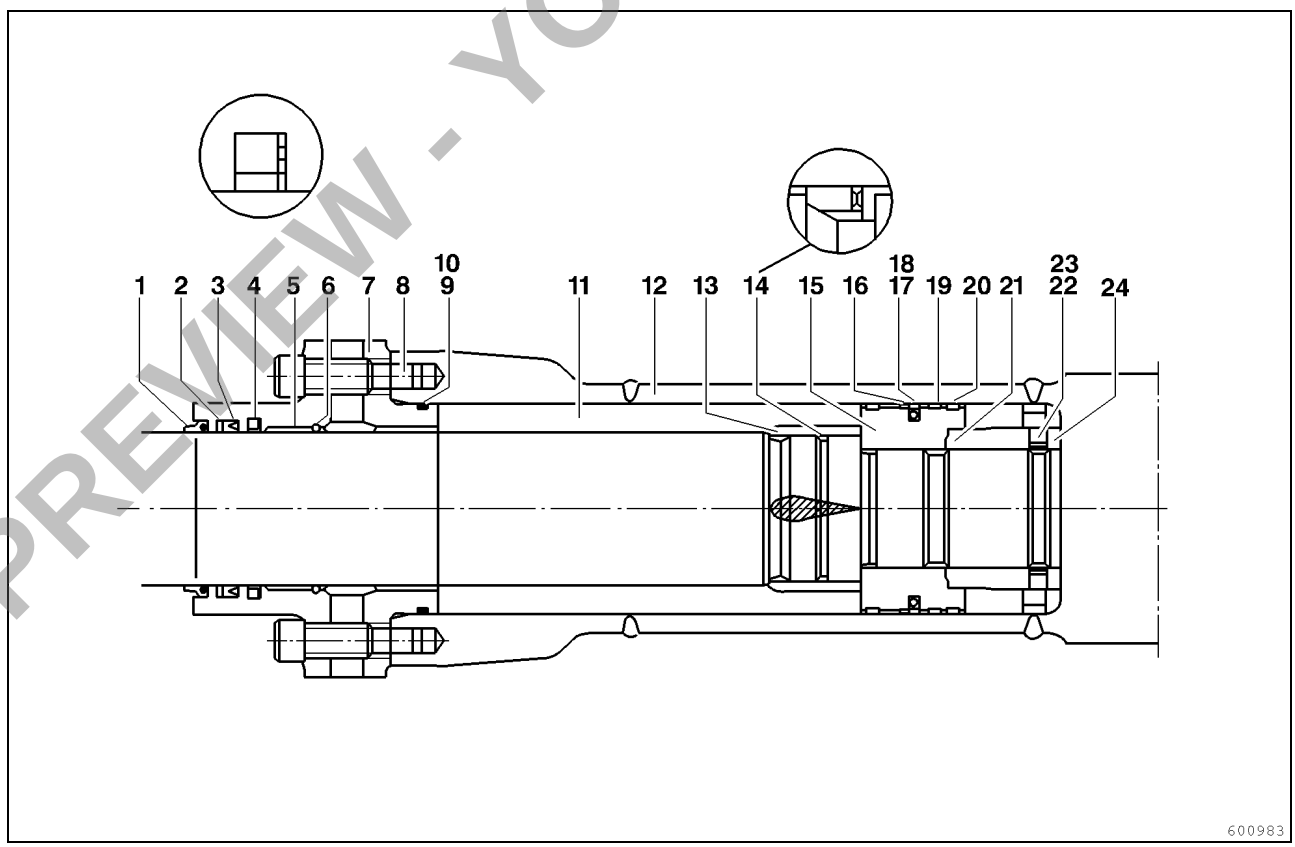


Fig. 2

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Connector pin assignment table for connector X33A für WX145/165/185

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<-INTERN CU EXTERN MASCHINE->

Bemerkung	Ziel 2	Ziel 1	Kennzeichg.	PIN	Stecker	PIN	Kennzeichg.	Ziel 1	Ziel 2	Bemerkung
Zentralektronik		A100X3a:7	A100X3a:7 - X33A:1	1	X33A	1	X33A:1 - Y63:1	Y63:1		Hubkraftverstärker
ESX	XESX:24	X33D:18	X33A:2 - X33D:18	2	X33A	2	X33A:2 - Y35:1	Y35:1		Schwenkbremse
Frequenzumschaltung	S39.3:1	X12A:15	X12A:15 - X33A:3	3	X33A	3	X33A:3 - Y39.3:1	Y39.3:1		Frequenzumschaltung
Sicherungsleiste FA	X10	FA.6:2	FA.6:2 - X33A:4	4	X33A	4	X33A:4 - S290:1	S290:1	X33A:5	Druckschalter Vorsteuerdruck Fahren
ESX	XESX:41	X33D:29	X33A:5 - X33D:29	5	X33A	5	X33A:5 - S290:2	S290:2	X33A:4	Druckschalter Vorsteuerdruck Fahren
Grenzlastregler		A10X1:2	A10X1:2 - X33A:6	6	X33A	6	X33A:6 - Y10:1	Y10:1	X31.O2	Proportionalventil
ESX	XESX:63	X33D:38	X33A:7 - X33D:38	7	X33A	7	X33A:7 - Y113:1	Y113:1		Abschaltung Vorsteuerung Arbeitshydraulik
ESX	XESX:62	X33D:30	X33D:30 - X33A:8	8	X33A	8	X33A:8 - Y290:1	Y290:1		Abschaltung Vorsteuerung Fahren
ESX	XESX:18	X33D:39	X33A:9 - X33D:39	9	X33A	9	X33A:9 - S113.4:1	S113.4:1	X33A:12	Druckschalter Vorsteuerdruck Arbeitshydraulik
ESX	XESX:47	X33D:37	X33A:10 - X33D:37	10	X33A	10	X33A:10 - Y242:1	Y242:1		Proportionalventil Pumpe 2
ESX	XESX:46	X33D:36	X33D:36 - X33A:11	11	X33A	11	X33A:11 - Y241:1	Y241:1		Proportionalventil Pumpe 1
Sicherungsleiste FA	X10	FA.6:2	FA.6:2 - X33A:12	12	X33A	12	X33A:12 - S113.4:2	S113.4:2	X33A:9	Druckschalter Vorsteuerdruck Arbeitshydraulik
Zentralektronik		A100X6:8	A100X6:8 - X33A:13	13	X33A	13	X33A:13 - X52.1:3	X52.1:3		Schmierpumpe
Grenzlastregler		A10X1:7	A10X1:7 - X33A:14	14	X33A	14	X33A:14 - R14:1	R14:1	X31.O2	Temperatur Hydrauliköl
Zentralektronik		A100X2a:2	A100X2a:2 - X33A:15	15	X33A	15	X33A:15 - S15:1	S15:1		Hydrauliköl Filter
Sicherungsleiste FA	X10	FA.16:2	FA.16:2 - X33A:16	16	X33A	16	X33A:16 - X52.1:1	X52.1:1		Schmierpumpe
Zentralektronik	A100X6:14	Splice 2	Splice 2 - X33A:17	17	X33A	17	X33A:17 - B35.2:1	B35.2:1		Initiator Schwenkbremse
ESX	XESX:14	X33D:28	X33A:18 - X33D:28	18	X33A	18	X33A:18 - B35.2:4	B35.2:4		Initiator Schwenkbremse
ESX	XESX:36	X33D:35	X33A:19 - X33D:35	19	X33A	19	X33A:19 - B35.2:3	B35.2:3		Initiator Schwenkbremse
Zentralektronik		A100X1:13	A100X1:9 - X33A:20	20	X33A	20	X33A:20 - XE3:1	XE3:1	X31.A	Arbeitsscheinwerfer Ausleger
Tanksensor	A100X6:14	V67.1:K	V67.1:K - X33A:21	21	X33A	21	X33A:21 - XB2:1	XB2:1		Tanksensor
Zentralektronik		A100X2a:13	A100X2a:13 - X33A:22	22	X33A	22	X33A:22 - XB2:3	XB2:3		Tanksensor
Sicherungsleiste FA	X10	FA.5:2	FA.5:2 - X33A:23	23	X33A	23	X33A:23 - X67.1:2	X67.1:2	K67:87	Betankungsanlage
Tanksensor	A100X6:14	V67.1:K	V67.1:K - X33A:24	24	X33A	24	X33A:24 - X67.1:3	X67.1:3	V67.2:K	Betankungsanlage
Reserve		A100X2a	Reserve 1	25	X33A	25				
Reserve		A100X2a	Reserve 2	26	X33A	26				
ESX	XESX:3	X33D:33	X33A:27 - X33D:33	27	X33A	27	X33A:27 - Y37.1:1	Y37.1:1	X31.O2	Greiferdrehwerk Links
ESX	XESX:25	X33D:34	X33A:28 - X33D:34	28	X33A	28	X33A:28 - Y37.2:1	Y37.2:1	X31.O2	Greiferdrehwerk Rechts
Schater Rundumleuchte Tank	S36:1	X12A:12	X33A :29 - X12A:12	29	X33A	29	X33A:29 - E36.1:1	E36.1:1	X12.31	Rundumleuchte Tank
Zentralektronik		A100X3a:13	A100X3a:13 - X33A:30	30	X33A	30	X33A:30 - H7:1	H7:1	X31.O2	Horn
				31	X33A	31				
Zentralektronik		A100X3a:1	A100X3a:1 - X33A:32	32	X33A	32	X33A:32 - XE23:1	XE23:1	XE23:2	Blinklicht Rechts Vorn
Zentralektronik	A100X3a:4	Splice 1	Splice 1 - X33A:33	33	X33A	33	X33A:33 - XE2:2	XE2:2	XE2:1	Standlicht Rechts
Sicherungsleiste FA	FA.11:2	K5.1:87	X33A:34 - K5.1:87	34	X33A	34	X33A:34 XE2:4	XE2:4	XE2:1	Fernlicht Rechts
Zentralektronik		A100X1:8	A100X1:8 - X33A:35	35	X33A	35	X33A:35 - XE2:3	XE2:3	XE2:1	Fahrlicht Rechts
Zentralektronik		A100X3a:9	A100X3a:9 - X33A:36	36	X33A	36				
				37	X33A	37				
ESX	XESX:3	X33D:1	X33A:38 - X33D:1	38	X33A	38	XC33A:38 - B35.2:2	B35.2:2		Initiator Schwenkbremse
ESX	XESX:8	X33D:40	X33A:39 - X33D:40	39	X33A	39	X33A:39 - B74:1	B74:1		Sensor Druck Ausleger
Zentralelektronik		A100X7:4	A100X7:4 - X33A:40	40	X33A	40	X33A:40 - B74:3	B74:3		Sensor Druck Ausleger

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PCS: POWER CONTROL SYSTEM

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Function chart and location diagram of components

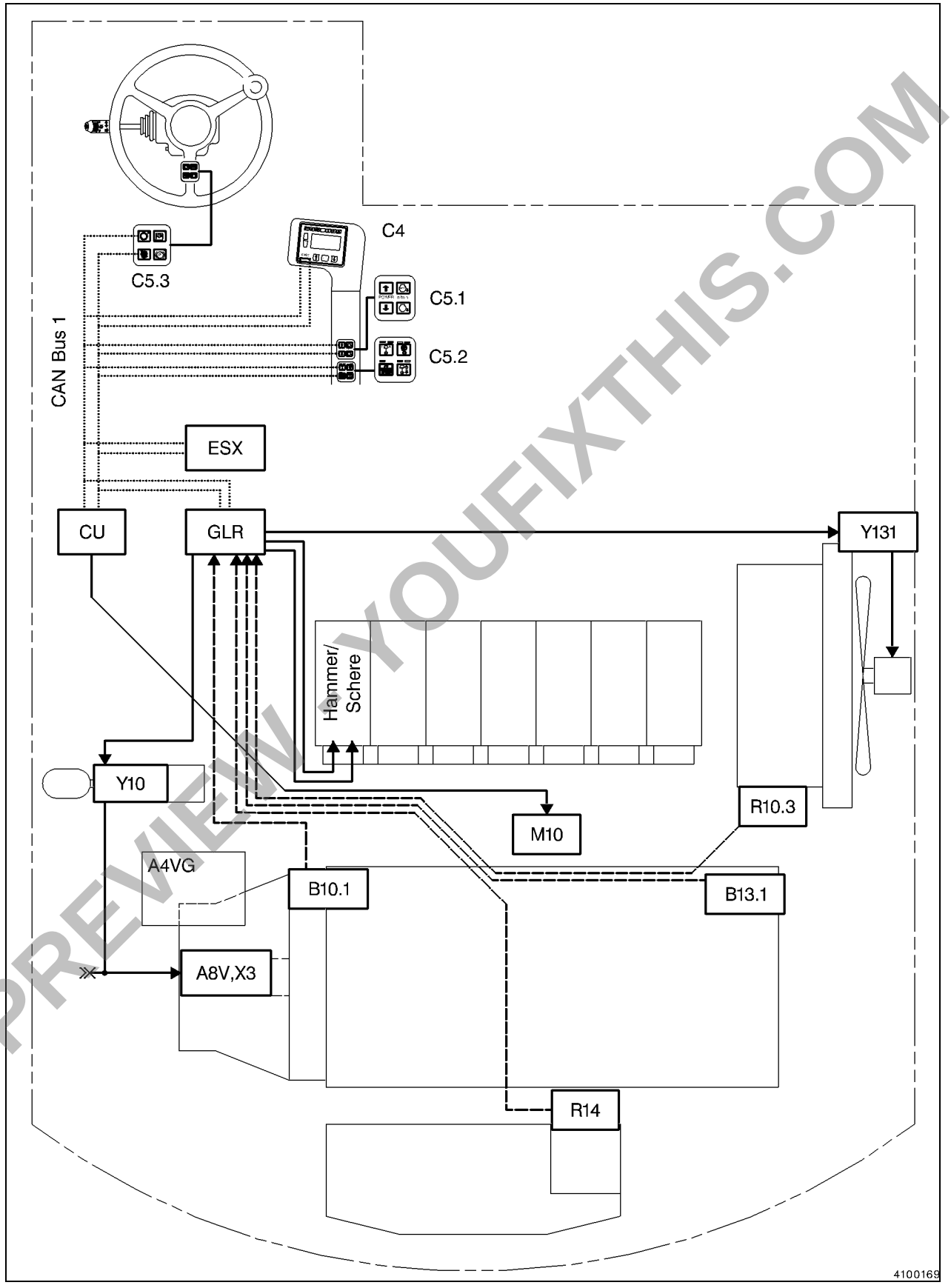


Fig. 1

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Fault codes

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9000 (German)
9011 ESX checksum fault
9012 ESX cutoff fault
9013 SPI communication of ESX defective
9014 SPI bus of ESX reserved
9015 Checksum fault on initialization of ESX system monitoring
9016 Plausibility fault on initialization of ESX system monitoring
9017 ESX reset through user watchdog
9018 ESX reset through system watchdog
9019 ESX hardware fault
9020 Checksum fault during readout of ESX fault memory
9021 Fault in reading of ESX fault memory
9022 ESX value outside valid range
9023 Supply voltage of ESX operation amplifier and multiplexer defective
9024 ESX temperature outside permitted range
9025 Processor configuration faulty due to ESX hardware
9026 Multiplexer or ESX A/D converter defective.
9027 Threshold voltage of ESX inputs faulty
9028 ESX frame potential faulty
9029 Supply voltage of ESX watchdog module defective
9030 Frame potential at BTS module of ESX faulty
9031 ESX relay defective
9032 ESX watchdog module cannot switch off relay
9033 ESX watchdog module defective
9034 CPU of ESX defective
9035 ESX flags cannot be set
9036 ESX flags cannot be scanned
9037 ESX arithmetic unit defective
9038 ESX multiplier defective
9039 Fault in CPU test sequence of ESX
9040 External RAM or ROM of ESX defective
9041 Shadow memory module of ESX defective
9042 Net current measurement on start of ESX faulty
9043 Cyclic net current measurement of ESX faulty
9044 Internal RAM defective on start of ESX
9045 Cyclic internal RAM test of ESX defective
9046 Ignition lock input status of ESX faulty
9047 Cyclic diagnosis of ESX faulty

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Fault codes

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General information on fault codes

The following units of the machine are permanently monitored:

- Central Unit (CU)
- Power-Control-System (PCS)
- Electro-Hydraulic Controller (ESX)
- Multi-function display (C4)
- Joysticks and pedals
- Keypad modules (C5.1; - C3.3)
- Various sensors, pressure switches and solenoid valves

All system states of the machine are moreover constantly checked for plausibilty.

Example:

When the safety valve for switching off of all working movements is activated, the corresponding pressure switch is checked for the presence of the precribed pressure value.
If the pressure is not present or if measuring is still in progress when the safety valve has switched off again, a specific fault code is generated and displayed on the screen.

In the event of a fault, a **fault code** (e.g. N°7004) is diplayed in the upper half of the multi-function display (108, Fig. 1) in combination with two **coloured warning lights** (112 yellow and 113 red, Fig. 1) which will light up individually or together, depending on the type of fault. Depending on the severity of the fault, a special tone signal will be heard in addition.

Meaning of signals:

RED + CONTINUOUS TONE	**Severe fault** The safety of persons and/or the functioning of essential units of the machine is at risk.
	**Severe faults must be rectified immediately.** **Shut off the machine at once.**
YELLOW + SINGLE BEEP	The fault signalled is not relevant to the safety of persons or of the machine. These faults must be rectified as fast as possible. In most of the cases, however, the machine remains fully functional.

(see also "Multi-function display")

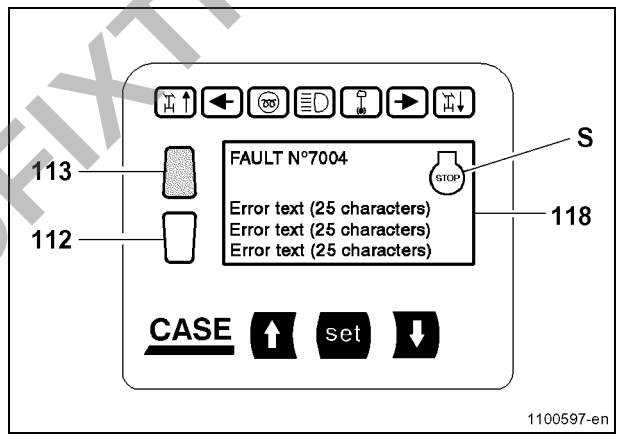


Fig. 1

In addition to the fault code, the lower half of the multi-function display (108, Fig. 1) gives an explanation of the fault code (error text).

In individual cases there is the possibility of several faults occurring at the same time.

The corresponding error codes are then displayed one after another in alternation with the normal display contents as follows:

- If red faults are active, these are displayed and the yellow ones omitted.
- If no red faults are active, the yellow ones will be displayed.

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Replacing the buffers under the cab baseplate

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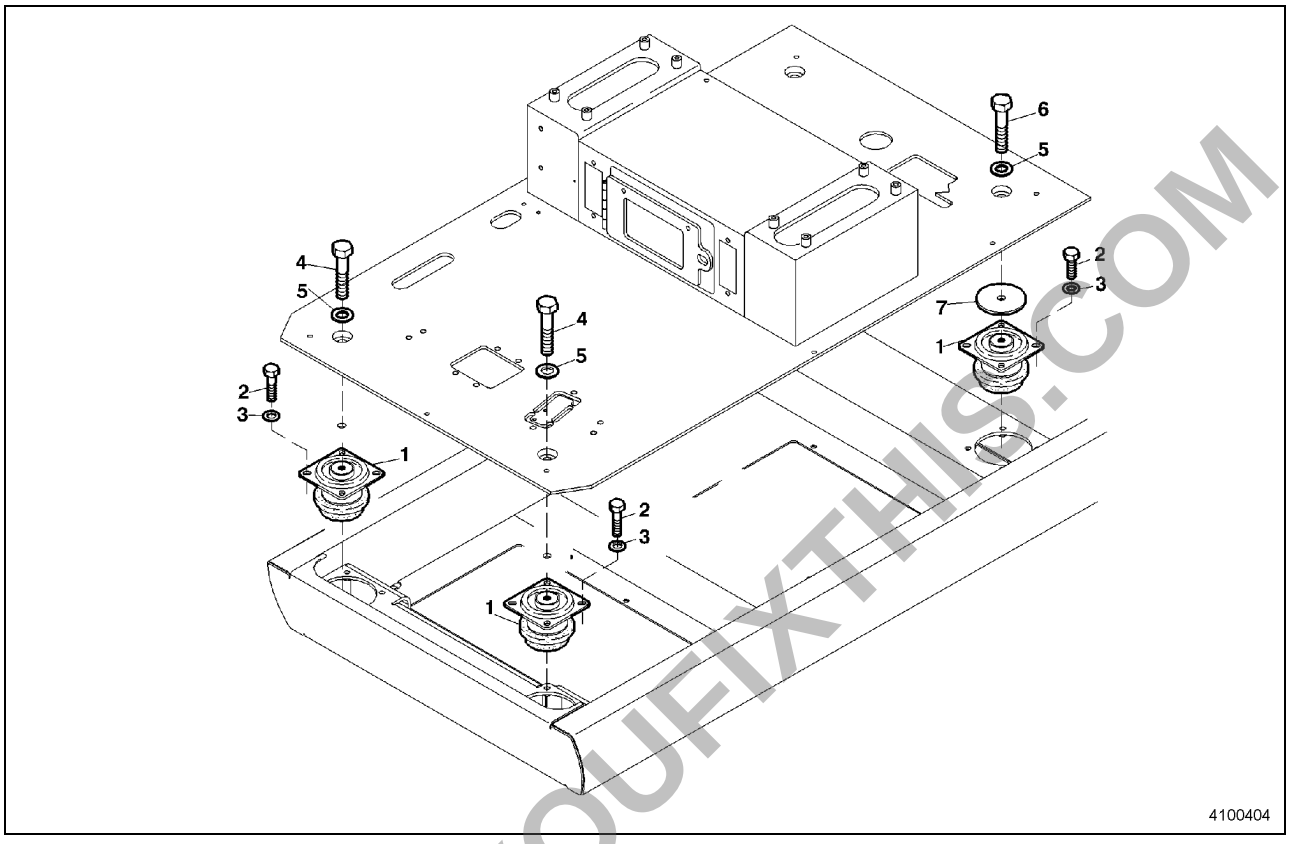


Fig. 1

Legend

1	4	Buffer
2	16	Screw
3	16	Disk
4	2	Screw
5	4	Disk
6	2	Screw
7	2	Disk

Preparations

- Secure the machine as described under 'Securing the machine'.

Front buffers

- Remove the rubber mats over the screws to be loosened.
- Loosen and remove the front screws (4).
- Loosen the rear screws (6), but without removing them.
- Raise the front part of the cab with the baseplate slightly so that the screws of the buffers can be removed.

Place a timber beam between the baseplate and the frame to ensure that the fitting space does not narrow: risk of crushing.

- Loosen and remove the screws (2) and the disks (3) retaining the buffers.
- Lift the buffer out of its housing and replace.
- Fasten the buffer with the screws (2) and the disks (3), remove the safety timber and lower the cab cautiously.
- Fasten the baseplate with the cab using the screws (4) and (5).

Rear buffers

- To replace the rear buffers, observe the same working steps as described for the front buffers.

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Table of fuses

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Pedestal (fuse box on the right behind the driver's seat, Fig. 1)

FA.1	5 A	Power relay (main switch function), central electronics, bias coil engine stop magnet
FA.2	5 A	Start relay, **option**: Grid-Heater-Controller
FA.3	5 A	Automatic braking function
FA.4	2 A	ESX [1] ground for sensors
FA.5	15 A	**Option**: refuelling system
FA.6	5 A	Safety switch electro-hydraulic pilot control, Relay for power supply of central unit, Pilot control working system pressure switch, pilot control travelling pressure switch
FA.7	5 A	Power supply PCS [2] -Box,
FA.8	5 A	Parking brake switch, brake pressure switch (stop-light), Alternator (exciter voltage)
FA.9	10 A	**Option**: driver's seat compressor, auxiliary heating timer
FA.10	5 A	**Option**: stabilizers / levelling blade
FA.11	10 A	Main beam via relay
FA.12	1 A	Power supply for joystick left and right
FA.13	2 A	Power supply (ESX)
FA.14	30 A	Power supply (ESX)
FA.15	1 A	Power supply for travel pedal and keypad module on steering wheel
FA.16	5 A	**Option**: Power supply for greasing pump
FA.17	-	**Option**: auxiliary heating - 15 A
FA.18	-	**Option**: auxiliary heating - 5 A
FA.19	-	**Option**: blower stage 1 for auxiliary heating - 7,5 A
FA.20	-	**Option**: quick-change device - 5 A
FA.21	5 A	**Option**: heating filter relay, Grid-Heater-Controller
FA.22	30 A	**Option**: heating filter
FA.23	25 A	*- no function -*
FA.24	5 A	Diagnosis socket CAN1 and CAN2 [3]
FA.25	10 A	24 V/12 V voltage converter supply Radio and socket, **Option**: conditioner actuator (electrically operated flap for switching between recirculated and fresh air)
FA.26	2 A	Relay for cab interior lighting
FA.27	2 A	Power relay (main switch function)
FA.28	15 A	to ignition/starter switch
FA.29	5 A	Hazard warning signal switch

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[1] **ESX** : Electro-hydraulic Controller

[2] **PCS: P**ower **C**ontrol **S**ystem

[3] **CAN:** Acronym for **C**ontrol **A**rea **N**etwork (2-wire bus)

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Driver's cab, voltage converter, WX165/185

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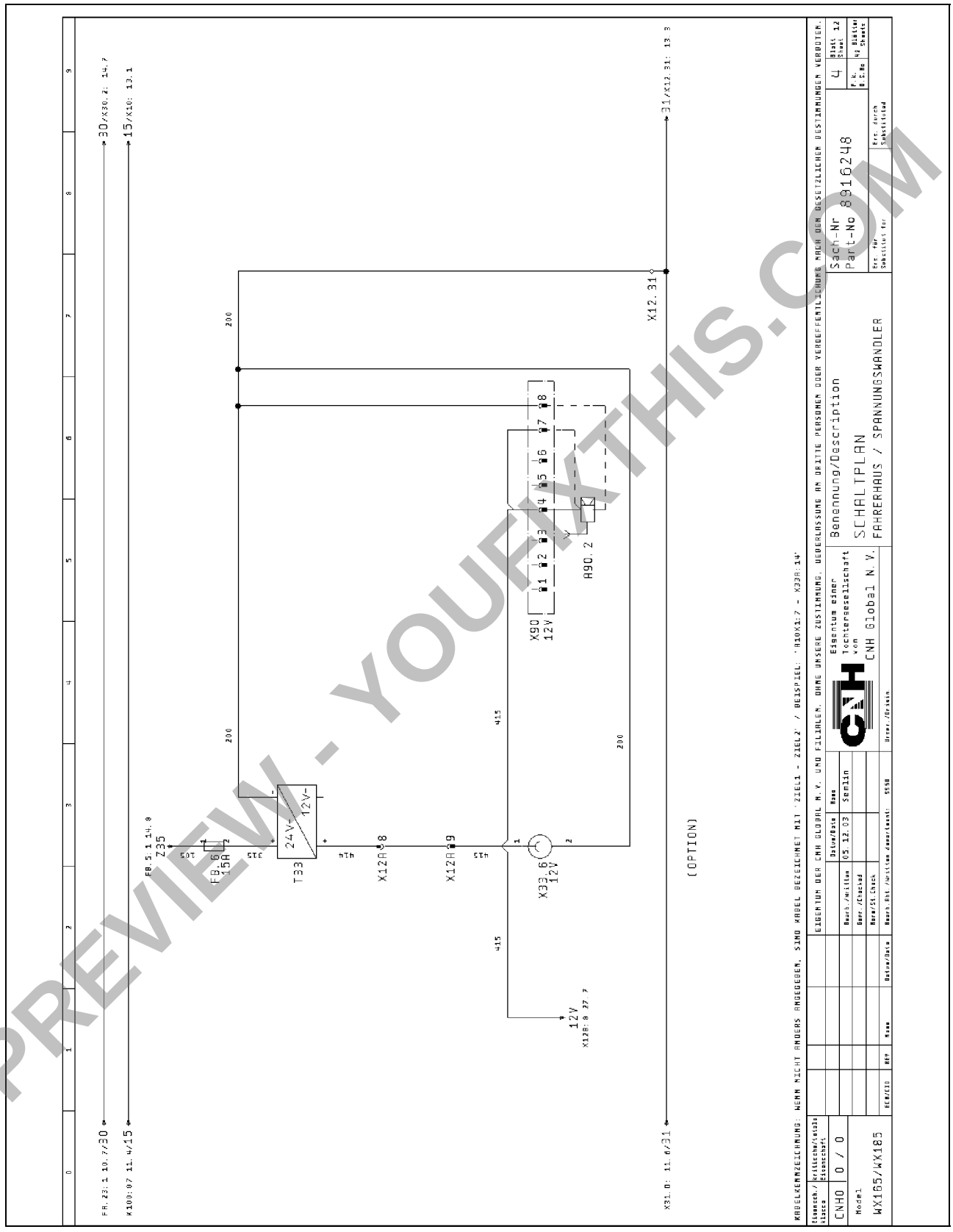


Fig. 12

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Service manual

Section 5 Electronics

CE

WX145 - WX165 - WX185

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SLEWING SYSTEM 182

Schematic diagram 182
Slewing system, description 183

Slewing pump 184
A 4 VG 71 DE4D, (No. 4) 184
Slewing pump 185
Slewing direction 185
Slewing pump type A 4 VG, No.4, description 187

Slewing pump valves 188
Feed-pressure limiting valve (No. 15) 188
Description 188
Secondary valve 188
Description 188
Pressure cut-off valve (18) 189
Description 189

Slewing pump valves 190
Feed-pressure limiting valve (No. 15) 190
Description 190
Sekundärventil 190
Description 190
Pressure cut-off valve (18) 191
Description 191

Slewing pump control unit 192
Slewing pump control unit, description 193
Neutral 193
Slewing 193
Braking 193

Pressure-control valve 194
Description 194

Slewing gearbox (No. 15) 196
Description 197

Oil motor 197

Integrated holding brake 198
Brake applied 198
Brake permanently released 198
Brake in automatic mode of operation 198

Speed sensor B35.2 199
Description 199
Timing diagram 199

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Solenoids Y35 and Y113

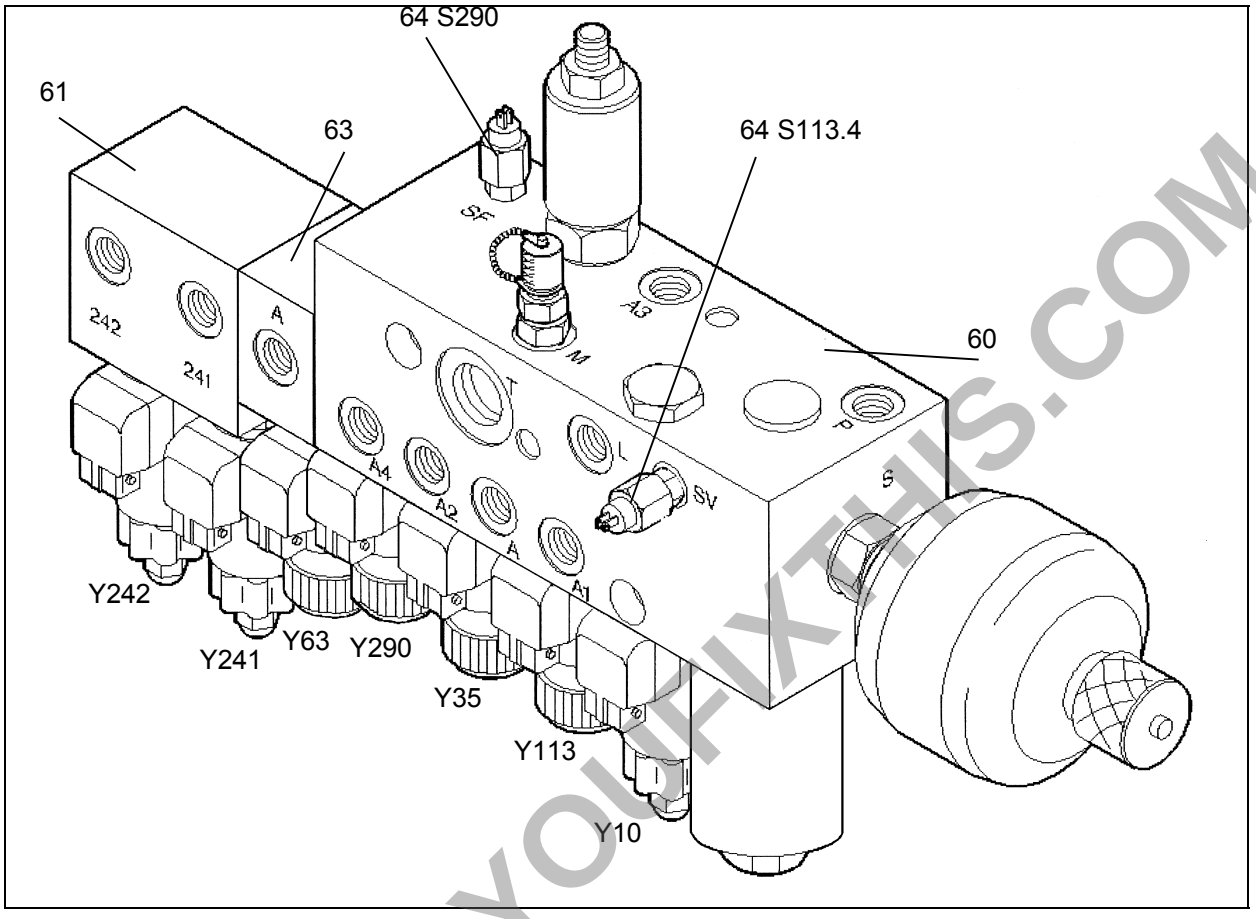


Fig. 3

Solenoid valve Y35 for the superstructure holding brake in the slewing gearbox

Solenoid valve Y35, description

Solenoid valve Y35 actuates the holding brake in the slewing gearbox. In zero position, the holding brake is connected via port A2 to tank port T of the base unit.

The brake is then without pressure and blocked by spring force.

When the solenoid is engergized, the control piston is displaced and the pilot pressure gets to the piston of the multi-disk brake. The piston pushes the springs back and the brake disks are released so that the superstructure can be slewed.

Solenoid valve Y 35 is additionally equipped with a mechanical emergency control device.

In the event of electrical failure, the screw provided can be turned down completely. The control piston is then mechanically displaced so that the pilot pressure can release the brake.

Solenoid valve Y113 for pilot pressure activation and de-activation

Solenoid valve Y113, description

Solenoid valve Y113 switches the pilot pressure for all working functions except travelling.

When the pilot control is off, the valve is in zero position. The flow of pilot pressure oil to the control block and to the slewing pump is then interrupted. In this case, the pilot-control circuit at port A1 is connected to port L from where the oil returns pressureless to the reservoir.

After activation of the pilot control, the solenoid displaces the control piston which lets pilot-control pressure oil flow to the porportional valves on the control block and to the slewing pump.

Valve Y113 is equipped with an emergency control device permitting the adjustment of the control piston in the event of system failure.

Pressure switch S113.4 monitors the pressure build-up on actuation of a working function and the pressure drop after deactivation of the pilot control.

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Description



Fig. 2

The slewing gearbox is a two-stage planetary gearbox engageing in the ball-bearing slewing ring.

The gearbox is designed in such a way that the slewing movement is started and braked by means of the axial-piston motor.

The shaft of the axial-piston motor drives the sun wheel of the first planetary stage. The planetary wheels are in mesh with the toothing of the housing. The planetary carrier of the first stage drives the sun wheel of the second stage. The planetary gears of the second stage are also in mesh with the housing toothing. The planetary carrier of the second stage drives the pinion shaft. The pinion engages in the toothing of the slewing ring.

The slewing oil motor is an axial-piston unit with constant displacement.

The output speed is proportional to the inflowing discharge oil. The torque supplied increases with the pressure differential between high-pressure and low-pressure side.

Oil motor

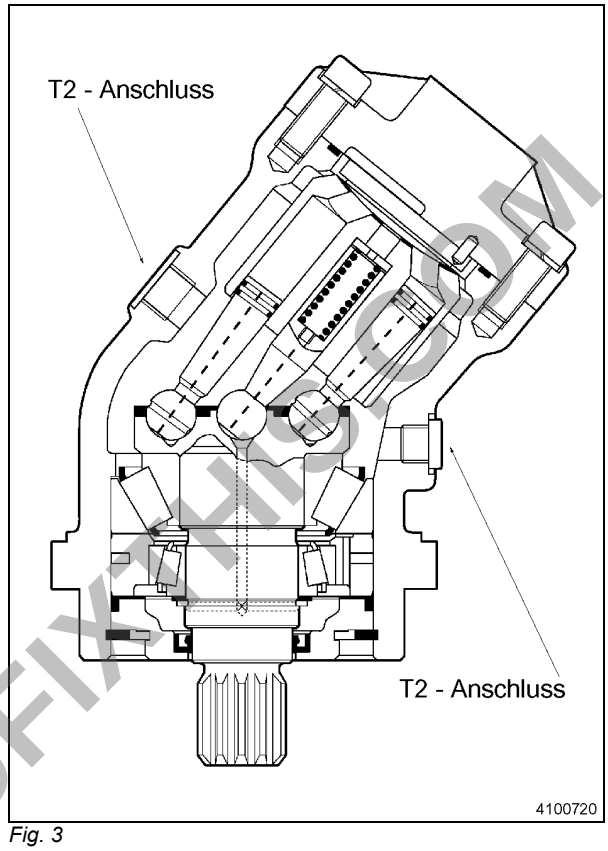


Fig. 3

The oil motor is an axial-piston unit with constant displacement. The output speed is proportional to the inflowing discharge flow from the slewing pump.

The torque supplied increases with the pressure differential between high-pressure and low-pressure side.

The oil motor is operated with transverse flushing for cooling reasons.

The different pressure levels building up during the work in connected tank lines T1 and T2 lead to an oil flow carrying away the heat towards the tank.

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Removing the steering column with the steering valve

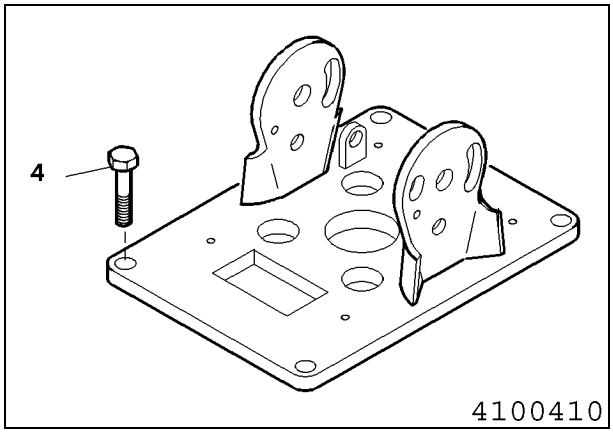


Fig. 2

- Depressurize the hydraulic system, remove all hoses from the steering valve and close the openings of the hoses and of the valve.

Collect any escaping oil in a suitable recipient and discard without polluting the environment.

- Loosen and remove the four screws (4) and withdraw the complete unit.

Refitting the steering column and the steering valve

- Slide the preassembled steering column with the steering valve into the opening provided in the cab floor.
- Fasten the unit with the screws (4).
- Reconnect the cables of the electrical system.
- Refit the panelling.
- Reconnect the hydraulic hoses.
- Bleed the hydraulic circuit before recommissioning.

Removing the steering column

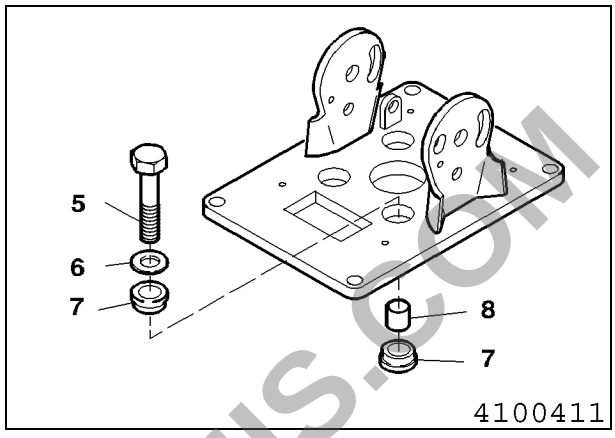


Fig. 3

- Mark the position of the steering column in the steering valve.
- The steering valve is fastened to the steering column with the screws (5). Loosen these screws and remove them together with the disks (6) and the spacers (7) and (8).
- Loosen the screws (4) retaining the steering column in the cab as described before and remove the steering column.

Refitting the steering column

- Slide the steering column into the opening provided in the cab floor and stick the gearing into the steering valve.
- Fasten the steering column with the screws (5) to the steering valve.
- Fasten the complete unit with the screws (4) in the cab.
- Reconnect the connectors of the electrical system.
- Refit the panelling.

□

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Changing a wheel

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Read and observe:

"Tyres and wheels, safety instructions".

- Park the machine on firm and level ground.
- Apply the parking brake.
- Slacken the wheel-nuts by about 1 full turn.
- Raise the axle with the defective wheel until the tyres lose contact with the ground by jacking up the machine with the help of the working equipment or the stabilizers on the respective side of the machine.
- Support the raised axle with squared timber to prevent it from lowering.
- Secure the machine as described under "Securing the machine".
- Deflate the tyres.
- Slacken the wheel-nuts and remove the damaged wheel and the intermediate ring (optional equipment.
  Mark inner and outer wheel. Do not lose centering rings, spring washers and wheel-nuts. Reuse these parts when refitting the wheel.
- Fit new wheels:
  - Inflate both tyres with approx. 1 bar.

Observe the fitting sequence:

- Inner wheel (rim with high-offset dish)
- Intermediate ring (optional equipment)
- Outer wheel (rim with low-offset dish). Observe the fitting sequence. Incorrect mounting of the wheels may result in the total admissible width of the machine being exceeded.
- Observe the information set out in "Wheels, tread position".
- Do not damage the threads of the wheel-studs.
- Center the intermediate ring.
- Make sure there are no foreign objects between tyre and intermediate ring.

- Tighten the wheel-nuts by hand.
- Remove the timber from under the raised axle and lower the axle.
- Tighten the wheel-nuts with the prescribed torque.
- Inflate the tyres with the correct pressure.
- Recheck the wheel-nuts after several hours in operation with a torque wrench for tight fit.

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