1.20: Tightening torques

1 Tightening torques for screws with metric coarse and fine thread (Liebherr Standard WN 4037)

The assembly preloads FM given in the table, show a 90% utilisation of the screw extension limit $\sigma(0,2)$. The tightening torques MA are calculated from FM.

Involved screws are those with the following surface finish:

- black-chrome finished or phosphatised
- galvanized
- DAKROMET 500
- Screws and nut without rework or surface treatment and ungreased, for mean friction factor μ=0,12.

Metric coarse thread				Metric fine thread			
Thread	Class	Assembly preloads FM in N	Tightening torques MA in Nm	Thread	Class	Assembly preloads FM in N	Tightening torques MA in Nm
M4	8.8 10.9 12.9	4050 6000 7000	2,8 4,1 4,8				
M5	8.8 10.9 12.9	6600 9700 11400	5,5 8,1 9,5				
M6	8.8 10.9 12.9	9400 13700 16100	9,5 14,0 16,5				
M7	8.8 10.9 12.9	13700 20100 23500	15,5 23,0 27,0				
M8	8.8 10.9 12.9	17200 25000 29500	23,0 34,0 40,0	**M8×1**	8.8 10.9 12.9	18800 27500 32500	24,5 36 43
				M9×1	8.8 10.9 12.9	24800 36500 42500	36 53 62
M10	8.8 10.9 12.9	27500 40000 47000	46,0 68,0 79,0	**M10×1**	8.8 10.9 12.9	31500 46500 54000	52 76 89
				M10×1,25	8.8 10.9 12.9	29500 43000 51000	49 72 84
M12	8.8 10.9 12.9	40000 59000 69000	79,0 117,0 135,0	**M12×1,25**	8.8 10.9 12.9	45000 66000 73000	87 125 150
				M12×1,5	8.8 10.9 12.9	42500 62000 73000	83 122 145
M14	8.8 10.9 12.9	55000 80000 94000	125,0 185,0 215,0	**M14×1,5**	8.8 10.9 12.9	61000 89000 104000	135 200 235

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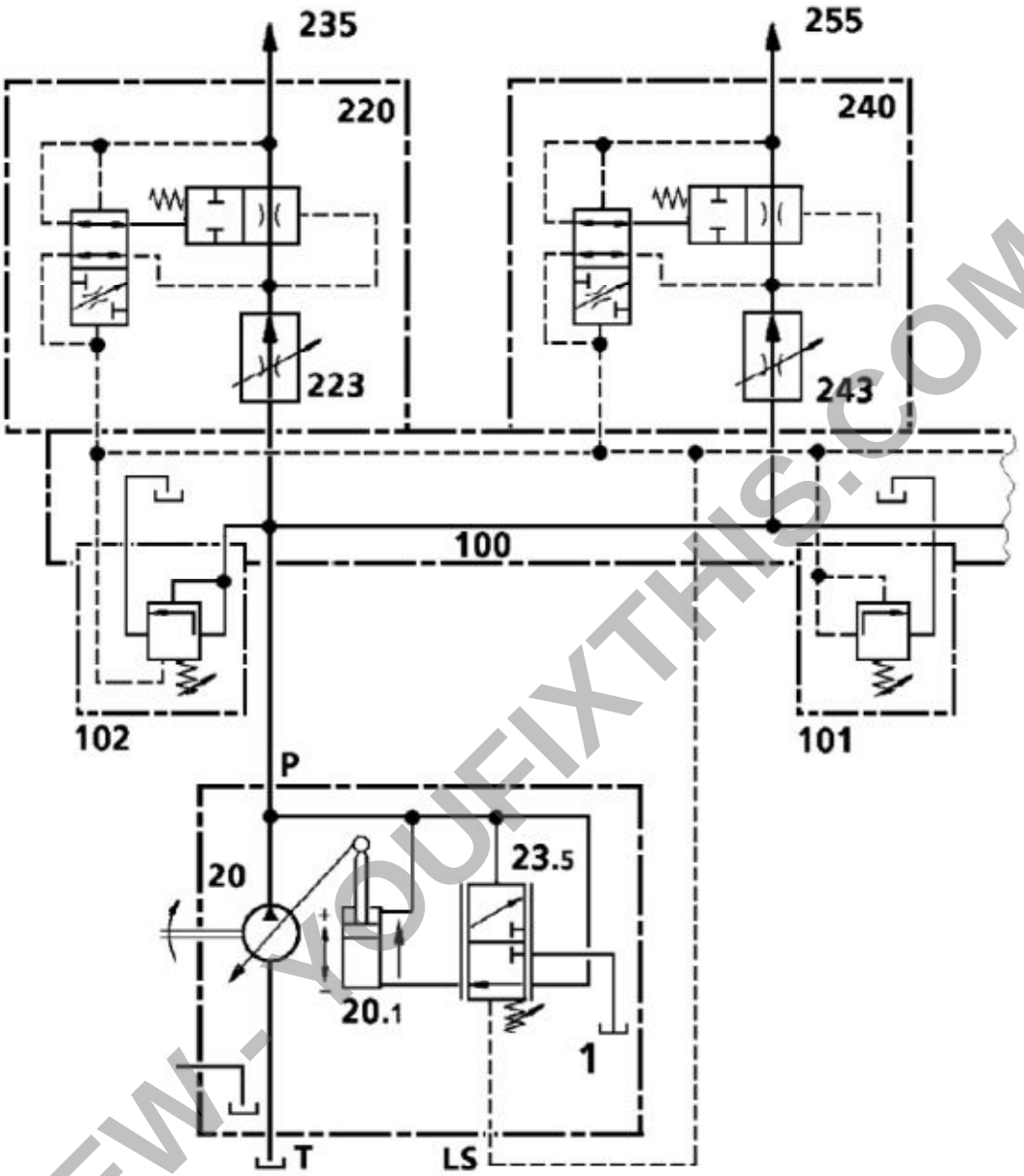


Fig. 3 *Pump swivelling out*

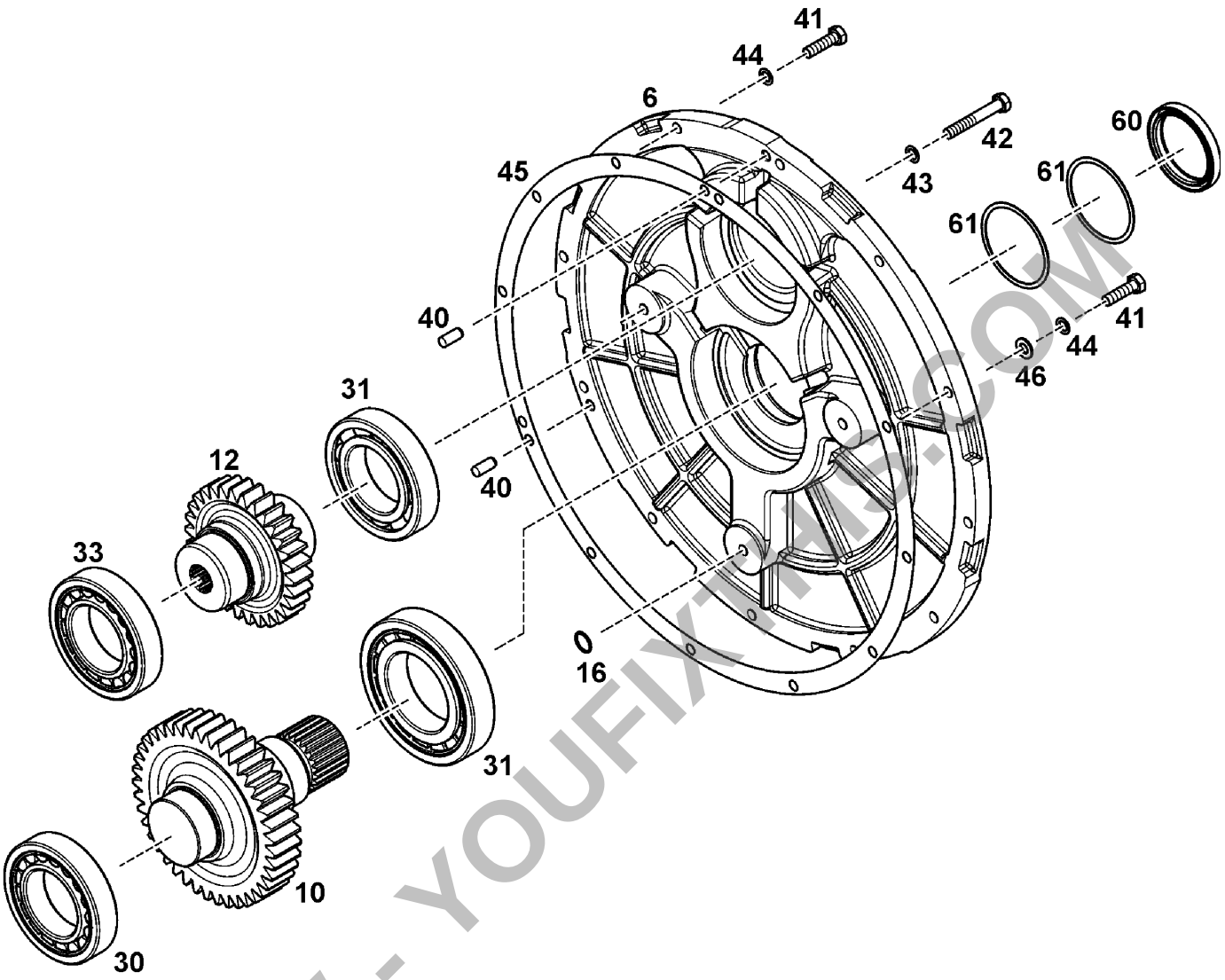
The oil flow via the bores inside the control pistons **223 / 224** is equivalent with the flow thourgh an orifice gauge. When the flow quantity to the user increases, the pressure drop at this throttling increases too.

The system will come to balance when the pressure loss in the control spool is equal to the preadjusted $\triangle \mathbf{p}$ value (pump pressure - user pressure in **LS**-line) adjusted in the **LS** regulator.

The cross section of each control valve is determined so that the pressure loss in the valve spool corresponds to the pressure difference $\triangle \mathbf{p}_{(LS)}$ adjusted at the regulator, when the nominal oil flow is reached, and with the valve spool fully actuated.

When the control valve **223** is shifted back into an intermediate position, the cross section of the orifice gauge is reduced and the pressure loss $\triangle \mathbf{p}_{(LS)}$ is reached already for a smaller oil flow. Since the pump is attempting ti maintain the pressure difference constant, the pump will swivel back.

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6	Splitterbox	**41**	Hexagonal head screws
7	Pumps housing	**42**	Hexagonal head screws
10	Drive shaft	**43**	Lock Washer
12	Spur gear - cooler fan pump	**44**	Lock Washer
16	O-ring	**45**	Seal
25	O-ring	**46**	Lock Washer
30	Roller bearing	**60**	Lip seal
31	Roller bearing	**61**	Shim ring
33	Roller bearing	**82**	Drain valve
34	Dipstick	**83**	Sealing ring
40	Stud bolt		

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Codage plug X42 OK

This symbol appears wenn the codage plug is tested and that it is OK (see sub-group 8.74).

4 Error code charts



Danger!
When switching over to emergency operation, the speed can no longer be changed using the arrow keys on the monitoring screen. The servo control, parking brake and slewing gear brake can no longer be activated.

▶ Please also note the subheading “Emergency operations” in the chapter “Operating the machine” in this regard.

4.1 Sensors

Error code	EDC code	Effects	Causes	Measures / Solutions
E 001	3011	Engine oil pessure signal to high.	Oil level Oil pump state Oil viscosity Defective sensor cabling Programmed characterisitic	Check engine oil level, consult LIEBHERR customer service.
E 003	3021	Engine oil pessure signal to low.		
E 004		Coolant level not being monitored.	Short circuit to earth	Check coolant level, consult LIEBHERR customer service.
E 005			Short circuit + 24 V	
E 006			Cable break	
E 009	3018	Coolant temperature not being monitored.	Temperature sensor of Defective sensor cabling	Check radiator encrustation, consult LIEBHERR customer service.
E 010		Hydraulic oil level not being monitored.	Short circuit to earth	Check hydraulic oil level, consult LIEBHERR customer service.
E 011			Short circuit + 24 V	
E 012			Cable break	
E 013		Hydraulic oil temperature not being monitored.	Short circuit to earth	Check coolant for contamination, consult LIEBHERR customer service.
E 014			Short circuit + 24 V	
E 015			Cable break	
E 016		Transmission oil temperature not being monitored. (from R954)	Short circuit to earth	Check oil level,, consult LIEBHERR customer service.
E 017			Short circuit + 24 V	
E 018			Cable break	
E 022		Diesel engine speed not being monitored, diesel engine speed cannot be adjusted using keypad, reduced hydraulic power.	Short circuit to earth	Switch to emergency control speed adjustment **S71** and **S72** and emergency operation work pumps **Y50**, consult LIEBHERR customer service.
E 023			Short circuit + 24 V	
E 024			Cable break	

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3 Removal and installation of the torsional vibration damper

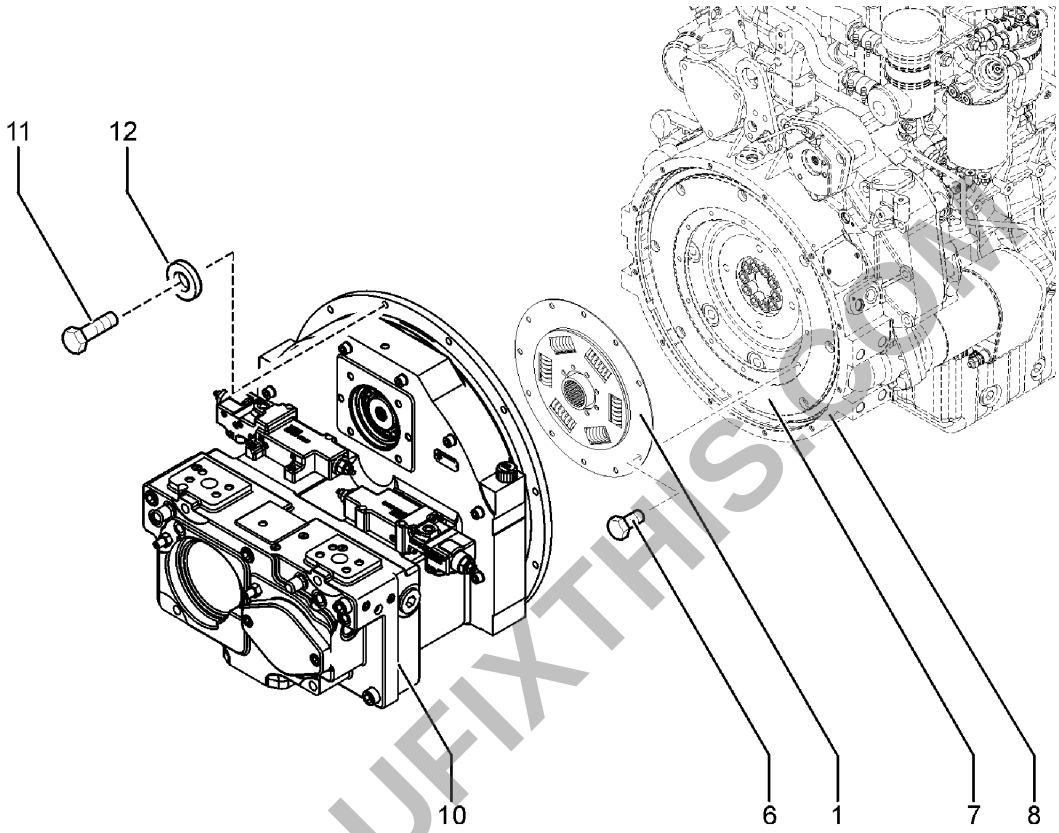


Fig. 3 *Coupling removal and installation*

1	Elastic coupling	**10**	Splitterbox
6	Hexagonal screw	**11**	Hexagonal screw
7	Flywheel	**12**	Washer
8	Flywheel housing (SAE)		

3.1 Removal

- ▶ Attach the splitterbox with a sling.
- ▶ Unscrew the screw **11**.
- ▶ Remove the splitterbox **10** from the flywheel housing **8** on the diesel engine and remove from the elastic coupling **1**.

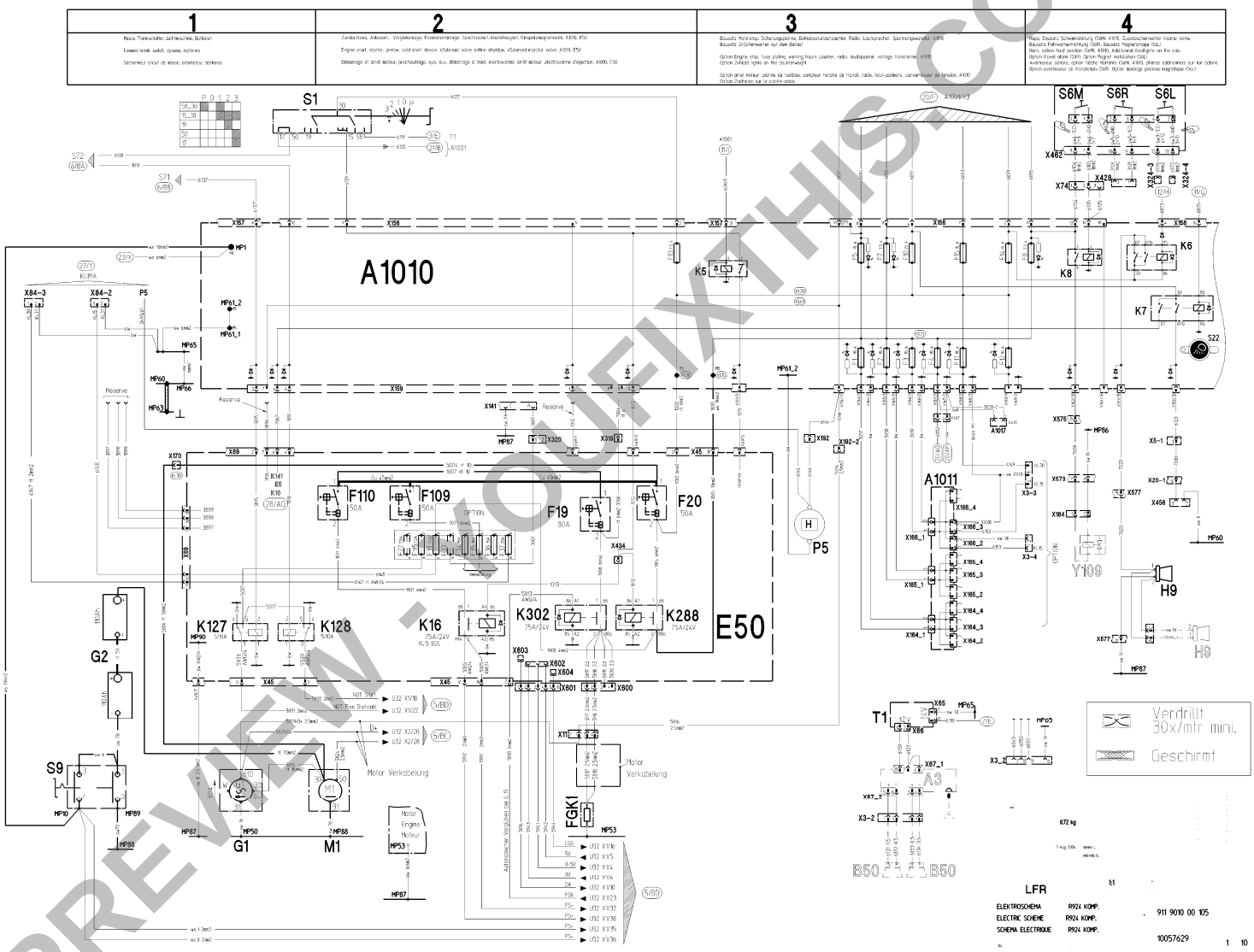
Caution
Note the installation position of elastic coupling **1**.

- ▶ Remove mounting screws **6**.
- ▶ Remove the elastic coupling **1** from the flywheel on the diesel engine.

3.2 Installation

- ▶ Set the complete elastic coupling **1** onto the flywheel.

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Tightening torques for screws with metric coarse and fine thread (Liebherr Standard WN 4037)

Metric coarse thread				Metric fine thread			
M16	8.8 10.9 12.9	75000 111000 130000	195,0 280,0 330,0	**M16×1,5**	8.8 10.9 12.9	82000 121000 141000	205 300 360
M18	8,8 10,9 12,9	94000 135000 157000	280 390 460	**M18×1,5**	8,8 10,9 12,9	110000 157000 184000	310 440 520
				M18×2	8,8 10,9 12,9	102000 146000 170000	290 420 490
M20	8,8 10,9 12,9	121000 173000 202000	390 560 650	**M20×1,5**	8,8 10,9 12,9	139000 199000 232000	430 620 720
M22	8,8 10,9 12,9	152000 216000 250000	530 750 880	**M22×1,5**	8,8 10,9 12,9	171000 245000 285000	580 820 960
M24	8,8 10,9 12,9	175000 249000 290000	670 960 1120	**M24×1,5**	8,8 10,9 12,9	207000 295000 346000	760 1090 1270
				M24×2	8,8 10,9 12,9	196000 280000 325000	730 1040 1220
M27	8,8 10,9 12,9	230000 330000 385000	1000 1400 1650	**M27×1,5**	8,8 10,9 12,9	267000 381000 445000	1110 1580 1850
				M27×2	8,8 10,9 12,9	255000 365000 425000	1070 1500 1800
M30	8,8 10,9 12,9	280000 400000 465000	1350 1900 2250	**M30×1,5**	8,8 10,9 12,9	335000 477000 558000	1540 2190 2560
				M30×2	8,8 10,9 12,9	321000 457000 534000	1490 2120 2480
M33	8,8 10,9 12,9	350000 495000 580000	1850 2600 3000	**M33×1,5**	8,8 10,9 12,9	410000 584000 683000	2050 2920 3420
				M33×2	8,8 10,9 12,9	395000 560000 660000	2000 2800 3300
M36	8,8 10,9 12,9	410000 580000 680000	2350 3300 3900	**M36×1,5**	8,8 10,9 12,9	492000 701000 820000	2680 3820 4470
				M36×3	8,8 10,9 12,9	440000 630000 740000	2500 3500 4100
M39	8,8 10,9 12,9	490000 700000 820000	3000 4300 5100	**M39×1,5**	8,8 10,9 12,9	582000 830000 971000	3430 4890 5720
				M39×3	8,8 10,9 12,9	530000 750000 880000	3200 4600 5300

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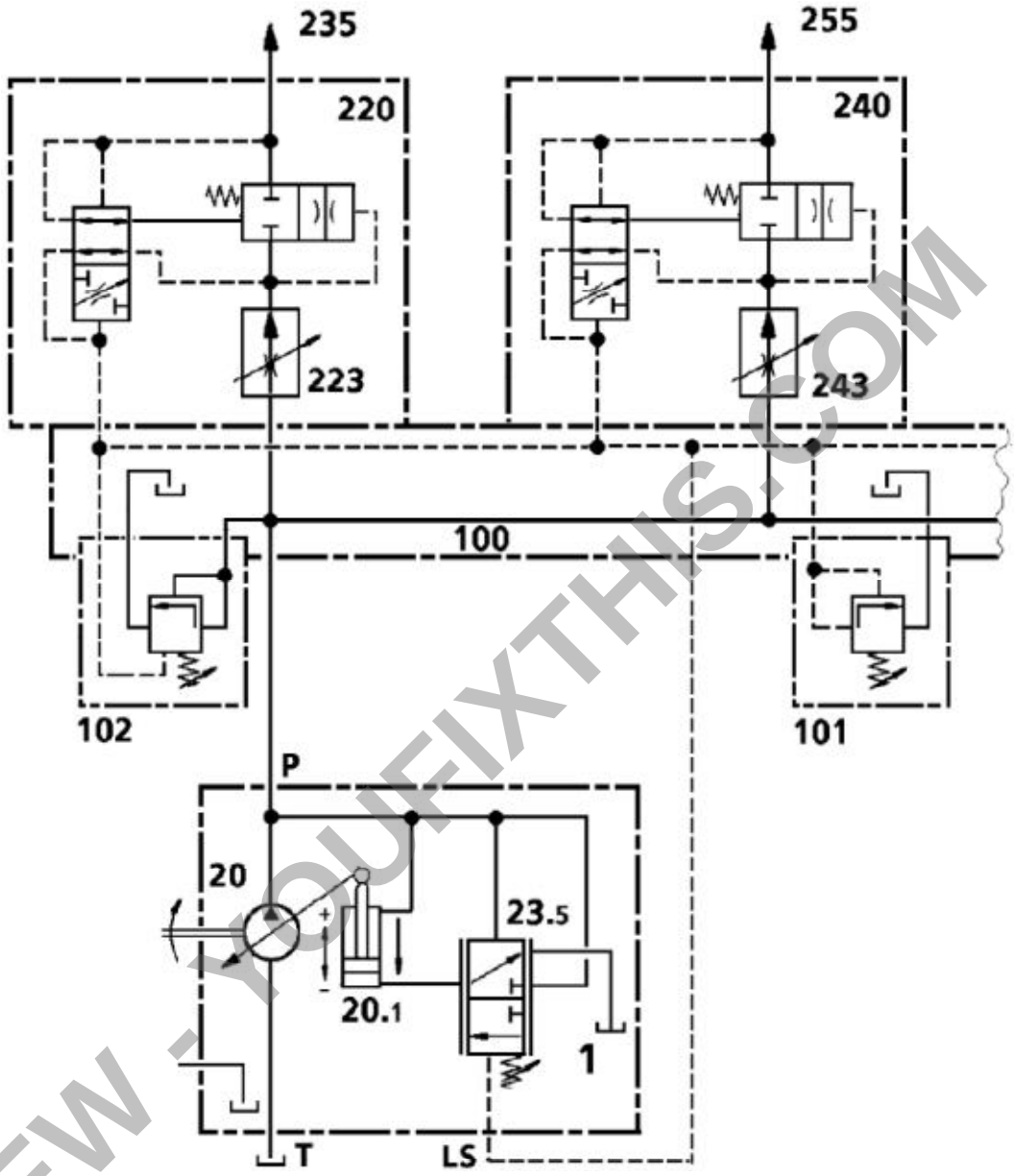


Fig. 4 Pump swivelling out

If several control valves are actuated at the same time, the oil flow necessary for the different users will exceed the maximum possible delivery of the pump. The value of $\triangle \mathbf{p}_{(LS)}$ is by the fact reduced, but seeing that this value is the same for all the actuated users, all the oil flows will be reduced in the same proportion.

4 Flow quantity upon regulating solenoid valve Y51 for flow limitation

4.1 Operating speed and precision control

The solenoid valve **Y51** is solicited by the control pressure (**pst**), which, via the %-regulation preselectioned by the **BST**, and the **pMLS**, will counter the spring force of the flow regulator (**LS**) and also reduce $\triangle \mathbf{P}$.

This means that the pression difference $\triangle \mathbf{P}$ is smaller and that the pump can maintain this reduced difference $\triangle \mathbf{P}$ with a lower oil volume.

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4 Exploded view

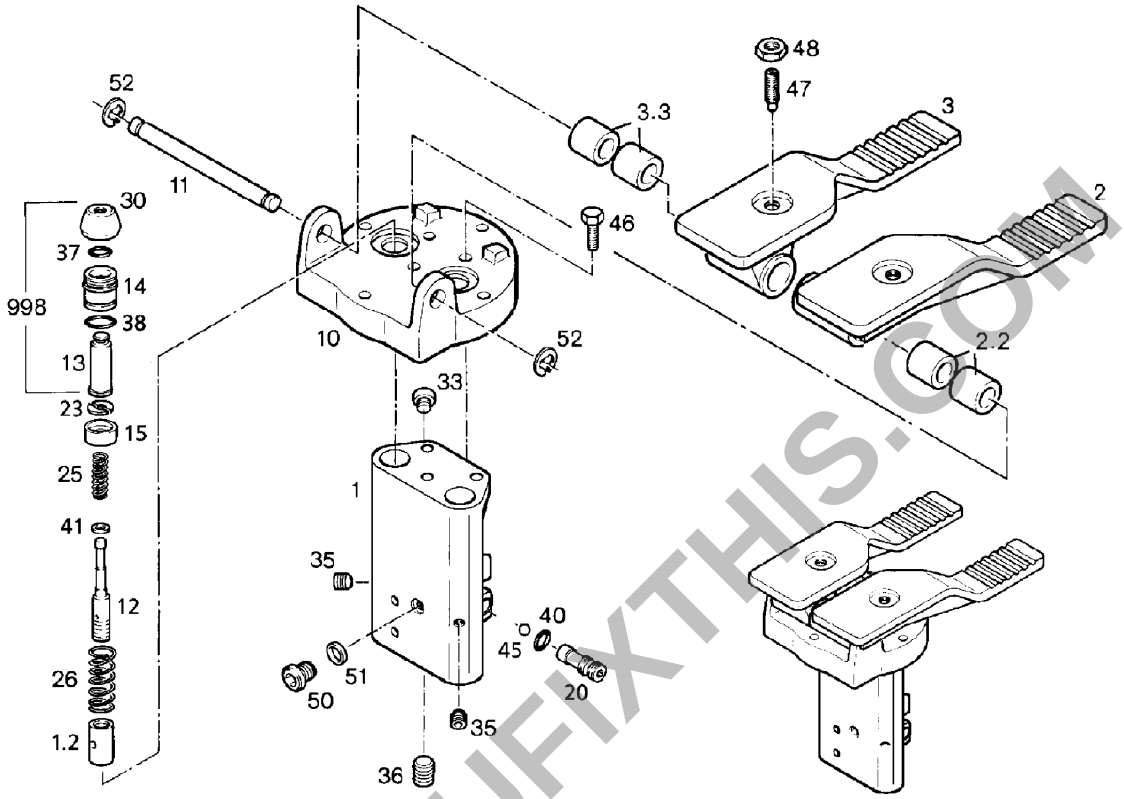


Fig. 3 *Exploded drawing of servo control*

1	Housing	**40**	Sealing ring
2	Left-hand step plate	**41**	Flat washer
2.1	Bushing	**42**	Flat washer
3	Right-hand step plate	**45**	Ball
3.1	Bushing	**46**	Hexagon nut
10	Plate	**47**	Threaded pin
11	Pin	**48**	Hexagon nut
12	Regulating piston	**50**	Screw plug
13	Press-fitted bushing	**51**	Sealing ring
15	Spring retainer	**52**	Circlip
16	Bushing	**98**	Repair kit
20	Valve insert	**98.1**	Tappet
23	Washer	**98.2**	Bushing
25	Pressure spring (governing spring)	**98.3**	PDF-seal
26	Pressure spring (return spring)	**98.4**	O-ring
33	Screw plug	**98.5**	Protective cap

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4.2 Regulating circuit

Error code	EDC code	Effects	Causes	Measures / Solutions
E 027		Faulty hydraulic power	LR cable error at output stage for power control of hydraulic pump	Switch to emergency control speed adjustment **S71** and **S72** and emergency operation work pumps **Y50**, consult LIEBHERR customer service.
E 030		Quantity reduction for hydraulic add-on units not being carried out. (for Linde only)	EV 4 cable error at the output stage for quantity regulation of hydraulic pump	Do not operate quantity reduced add-on units, consult LIEBHERR customer service
E 033	3009	Maximum fan speed	EV 5 cable error at output stage of electric valve for hydraulic fan control	Consult LIEBHERR customer service.
E 036		Quantity reduction for hydraulic add-on units not being carried out.	EV 1 cable error at the output stage for quantity regulation of hydraulic pump	Do not operate quantity reduced add-on units, consult LIEBHERR customer service.
E 039		Quantity reduction for hydraulic add-on units not being carried out. (only A954, optional extra)	EV 2 cable error at the output stage for quantity regulation of second hydraulic pump	Do not operate quantity reduced add-on units, consult LIEBHERR customer service.
E 042		Quantity reduction for hydraulic add-on units not being carried out.	EV 3 cable error at output stage of fan shift valve	Do not operate quantity reduced add-on units, consult LIEBHERR customer service.
E 045		Pressure reduction for hydraulic equipment not being carried out.	EV6 cable error at the output stage for pressure regulation of the hydraulic circuit.	Do not operate pressure reduced equipment, consult LIEBHERR customer service.
E 046		SWF engine defective	SWF motor cable faulty.	Check out cable, consult LIEBHERR customer service.
E 063 E 065	3019 3029	Temperature sensor - air admission not being carried out	Short circuit to earth / cable break	Check out cable, consult LIEBHERR customer service.
			Short circuit + 24 V	
E 071 E 073	3012 3022	Pressure sensor - air admission not being carried out	Short circuit to earth / cable break	Check out cable, consult LIEBHERR customer service.
			Short circuit + 24 V	
E 074	3008	Motor starter hesitate	ignition time too long	Consult LIEBHERR customer service.
E 075			Defective starter	
E 076	3059	Motor perturbation due to regulator of injection pump	ajustement of positioning part error	Consult LIEBHERR customer service.
E 077	3058		EDC Regulator circuit - regulztor defective	
E 078		EDC motor regulator	Hardware error	Consult LIEBHERR customer service.
E 079			Software error	
E 080	3053	Motor perturbation due to regulator of injection pump	Difference between thorical and mesured values of regulator stroke	Consult LIEBHERR customer service.

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Note
Use the note made during the removal to position the elastic coupling.

- ▶ Remove mounting screws **6***.
- ▶ Lightly lubricate the gear on the splitterbox drive shaft and hub (preferably with «Optimol White T» ident Nr 8500307)
- ▶ Push the input shaft of the splitterbox **10** into the hub **4.**
- ▶ Remove the splitterbox **10** on the flywheel housing **8** with the mounting screws **11***.

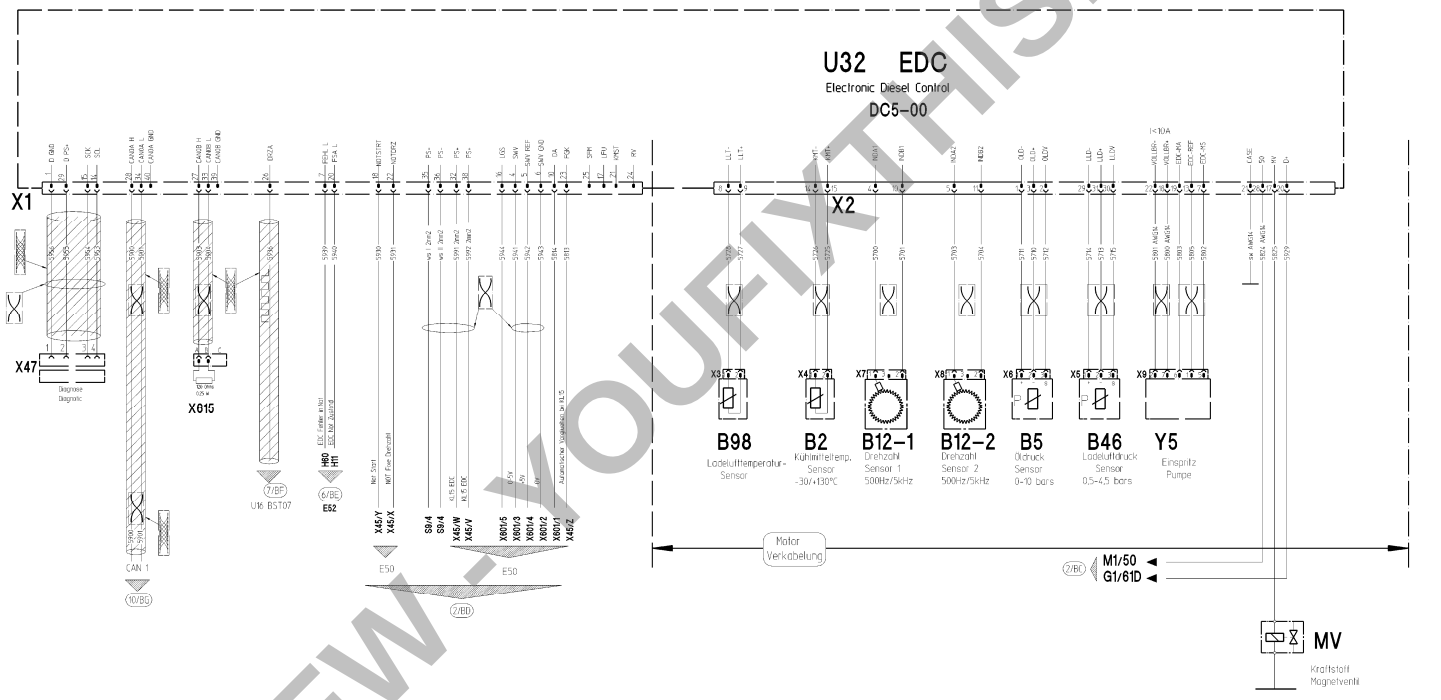
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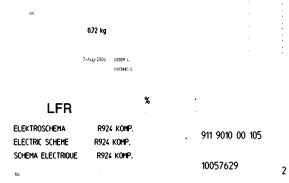
Diesel Motor Steuerung

Diesel engine control

Commande moteur diesel







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2 Tightening torques of screw-in studs (Ermeto)

Mating material: steel (grease well before inserting!)

Type with sealing edge			Type with EOLASTIC seal		
Type	Thread M or G	Tightening torques (Nm)	Type	Thread M or G	Tightening torques (Nm)
Light-duty series L					
GE 06 LM A 3 C	M 10×1	18	GE 06 LM ED A 3 C	M 10×1	18
GE 06 LR A 3 C	G 1/8 A	18	GE 06 LR ED A 3 C	G 1/8 A	18
GE 08 LM A 3 C	M 12×1,5	30	GE 08 LM ED A 3 C	M 12×1,5	25
GE 08 LR A 3 C	G 1/4 A	35	GE 08 LR ED A 3 C	G 1/4 A	35
GE 10 LM A 3 C	M 14×1,5	45	GE 10 LM ED A 3 C	M 14×1,5	45
GE 10 LR A 3 C	G 1/4 A	35	GE 10 LR ED A 3 C	G 1/4 A	35
GE 12 LM A 3 C	M 16×1,5	65	GE 12 LM ED A 3 C	M 16×1,5	55
GE 12 LR A 3 C	G 3/8 A	70	GE 12 LR ED A 3 C	G 3/8 A	70
GE 15 LM A 3 C	M 18×1,5	80	GE 15 LM ED A 3 C	M 18×1,5	70
GE 15 LR A 3 C	G 1/2 A	140	GE 15 LR ED A 3 C	G 1/2 A	90
GE 18 LM A 3 C	M 22×1,5	140	GE 18 LM ED A 3 C	M 22×1,5	125
GE 18 LM A 3 C	M 22×1,5	140	GE 18 LM ED A 3 C	M 22×1,5	125
GE 18 LR A 3 C	G 1/2 A	100	GE 18 LR ED A 3 C	G 1/2 A	90
GE 22 LM A 3 C	M 22×1,5	140	GE 22 LM ED A 3 C	M 26×1,5	180
GE 22 LR A 3 C	G 3/4 A	180	GE 22 LR ED A 3 C	G 3/4 A	180
GE 28 LM A 3 C	M 33×2,0	340	GE 28 LM ED A 3 C	M 33 x 2,0	310
GE 28 LR A 3 C	G 1 A	330	GE 28 LR ED A 3 C	G 1 A	310
GE 35 LM A 3 C	M 42×2,0	500	GE 35 LM ED A 3 C	M 42×2,0	450
GE 35 LR A 3 C	G 1 1/4 A	540	GE 35 LR ED A 3 C	G 1 1/4 A	450
GE 42 LM A 3 C	M 48×2,0	630	GE 42 LM ED A 3 C	M 48×2,0	540
GE 42 LR A 3 C	G 1 1/2 A	630	GE 42 LR ED A 3 C	G 1 1/2 A	540
Heavy-duty series S					
GE 06 SM A 3 C	M 12×1,5	35	GE 06 SM ED A 3 C	M 12×1,5	35
GE 06 SR A 3 C	G 1/4 A	55	GE 06 SR ED A 3 C	G 1/4 A	55
GE 08 SM A 3 C	M 14×1,5	55	GE 08 SM ED A 3 C	M 14×1,5	55
GE 08 SR A 3 C	G 1/4 A	55	GE 08 SR ED A 3 C	G 1/4 A	55
GE 10 SM A 3 C	M 16×1,5	70	GE 10 SM ED A 3 C	M 16×1,5	70
GE 10 SR A 3 C	G 3/8 A	90	GE 10 SR ED A 3 C	G 3/8 A	80
GE 12 SM A 3 C	M 18×1,5	110	GE 12 SM ED A 3 C	M 18×1,5	90
GE 12 SR A 3 C	G 3/8 A	90	GE 12 SR ED A 3 C	G 3/8 A	80
GE 14 SM A 3 C	M 20×1,5	150	GE 14 SM ED A 3 C	M 20×1,5	125
GE 14 SR A 3 C	G 1/2 A	150	GE 14 SR ED A 3 C	G 1/2 A	115
GE 16 SM A 3 C	M 22×1,5	170	GE 16 SM ED A 3 C	M 22×1,5	135
GE 16 SR A 3 C	G 1/2 A	130	GE 16 SR ED A 3 C	G 1/2 A	115
GE 20 SM A 3 C	M 27×2,0	270	GE 20 SM ED A 3 C	M 27×2,0	180
GE 20 SR A 3 C	G 3/4 A	270	GE 20 SR ED A 3 C	G 3/4 A	180
GE 25 SM A 3 C	M 33×2,0	410	GE 25 SM ED A 3 C	M 33×2,0	310
GE 25 SR A 3 C	G 1 A	340	GE 25 SR ED A 3 C	G 1 A	310

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The pump only pivots until the flow at the pump output is reached.

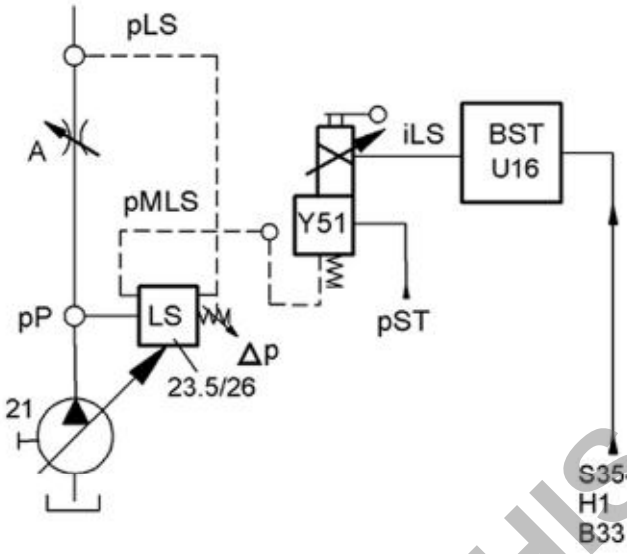


Fig. 5 *Flow quantity regulation in LSC-system*

21	Pump splitterbox	**H1**	Display
23.5	Flow quantity regulator	**S354**	Switch (SF)
B33	Geber	**Y51**	Solenoid valve (△**p** lowering)

4.2 Adaptation of the flow quantity reduction to the working conditions

Flow quantity reduction	Display	Switch	Setting
SF: Driver's setting	SF = M8	S354 (SF)	Set SF
External: setting depending on the user	I1 - I4 (Opt.1-4)	B33-2/I...	Set pump
Internal: setting depending on the excavator	M1 - M7	B33-1 /M...	Set data / set pump

Reduction of the pump flow quantity:

I_{Ls} < 300 mA = pMLS = 0 bar (tank pressure) △**p =** basic setting

Note!
The working speeds can be tested, via SF-interface activated, with the joysticks.

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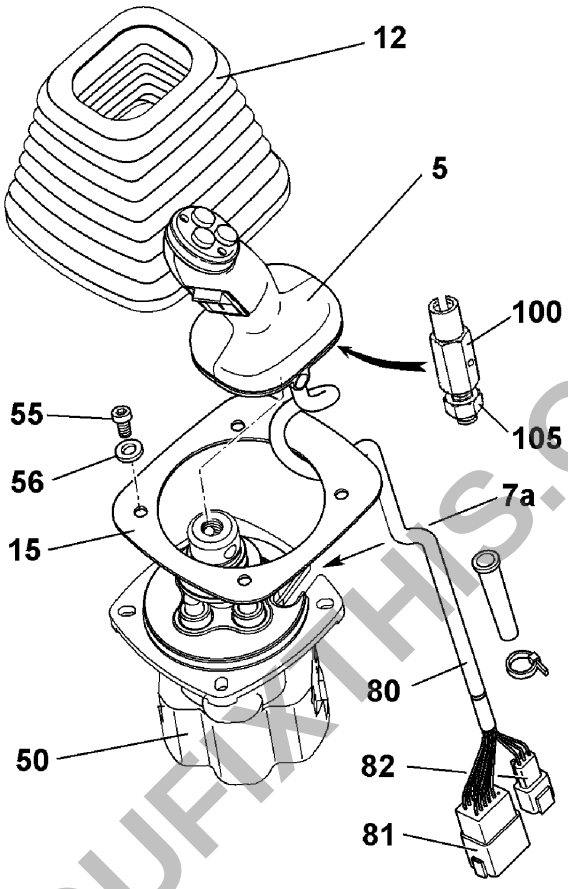


Fig. 3 *Servo control with electric components*

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Error code	EDC code	Effects	Causes	Measures / Solutions
E 081	3001	Wrong display of diesel engine RPM value	Tachometer B12-1 defective	Check out cable, consult LIEBHERR customer service
E 082	3002		Tachometer B12-2 defective	
E 083	3050 3056	Motor perturbation due to regulator of injection pump	Dysfonction au retour du régulateur.	Consult LIEBHERR customer service.
E 084	3006	Preheat perturbation of diesel engine	Weak tension of the preheating	Consult LIEBHERR customer service.
E 085	3006		Weak current of the preheating	
E 086	3007	Engine perturbation due to fuel solenoid valve	Defective connection of the solenoid valve	Check out cable, consult LIEBHERR customer service
E 087	3003	Engine RPM not being monitored.	The values registered by the transmitters B12-1 and B12-2 are different.	Switch to emergency control speed adjustment **S71** and **S72** and emergency operation work pumps **Y50**, consult LIEBHERR customer service.
E 088	3069	Atmospheric pressure not being monitored.	Pressure under inferior threshold tolerance	Consult LIEBHERR customer service.
	3089		Pressure above superior threshold tolerance	

4.3 Keypad

Error codes	Effects	Causes	Measures / Solutions
E 302	No entry possible using keypad	No coding plug	Consult LIEBHERR customer service.
E 303	Diesel engine RPM cannot be regulated using keypad, hydraulic power reduced.	No CAN 1 bus connection between keypad and bus arbiter board (message also appears if bus arbiter not operating, e g. if no power supply is present).	Switch to emergency control speed adjustment **S71** and **S72** and emergency operation work pumps **Y50**, consult LIEBHERR customer service.
E 305	Malfunctions, e g. slewing gear brake, servo control	No CAN 2 bus connection between keypad and ESP01 board (message also appears if ESP01 not operating).	Switch to emergency switching of servo pressure circuits **S73**, consult LIEBHERR customer service.
E 307	Malfunctions , e g. diesel engine functioning	No communication with EDC.	Consult LIEBHERR customer service.

4.4 Display

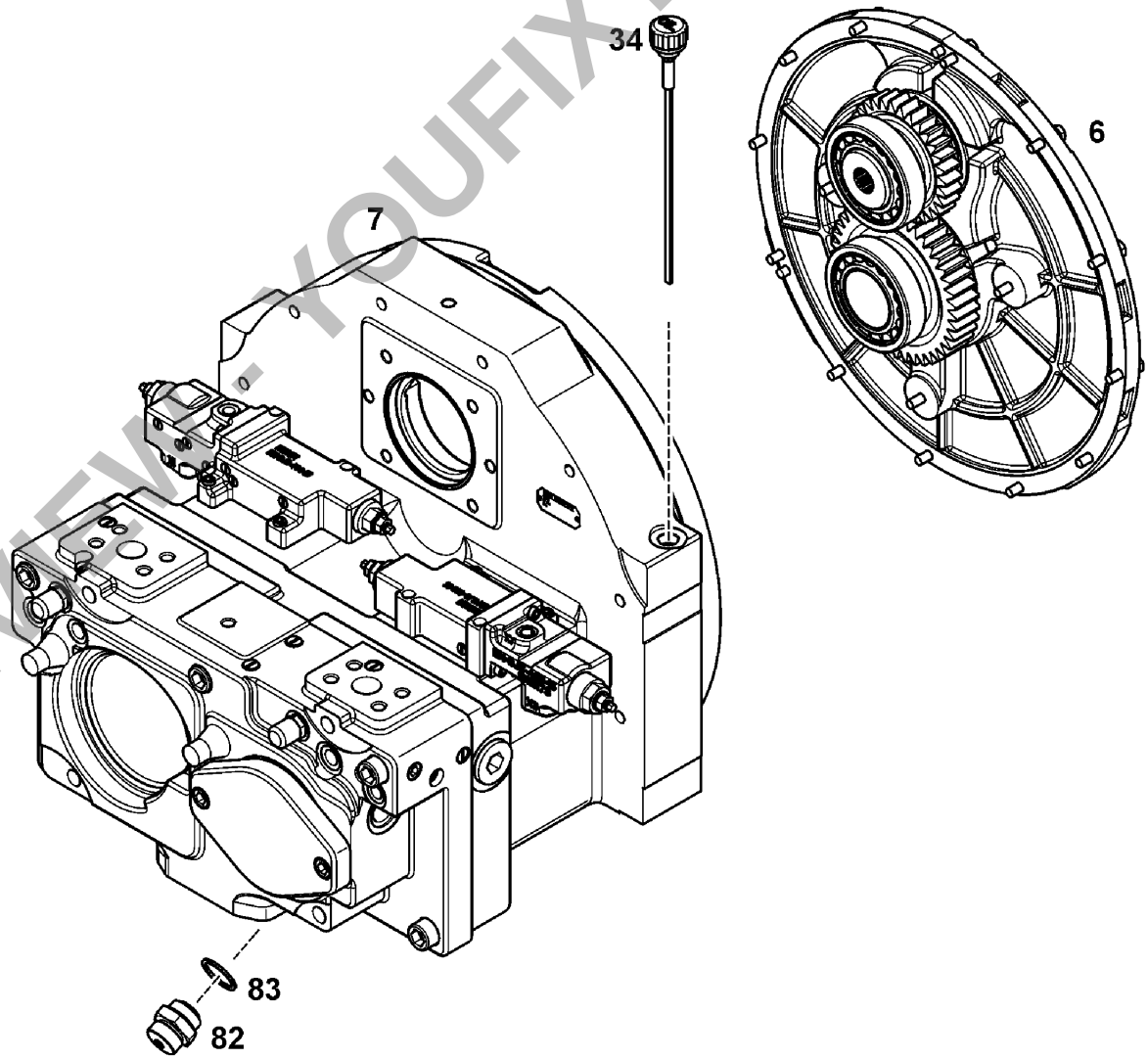
Error codes	Effects	Causes	Measures / Solutions
E 308	No display or incorrect display on screen	No connection keypad / screen or keypad not operating	Consult LIEBHERR customer service.
E 601	Functioning default, e g. slewing gear brake, servo contro	ESP01 board defective	Consult LIEBHERR customer service.

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5.30: Remove, disassembly, assembly and installation of splitterbox

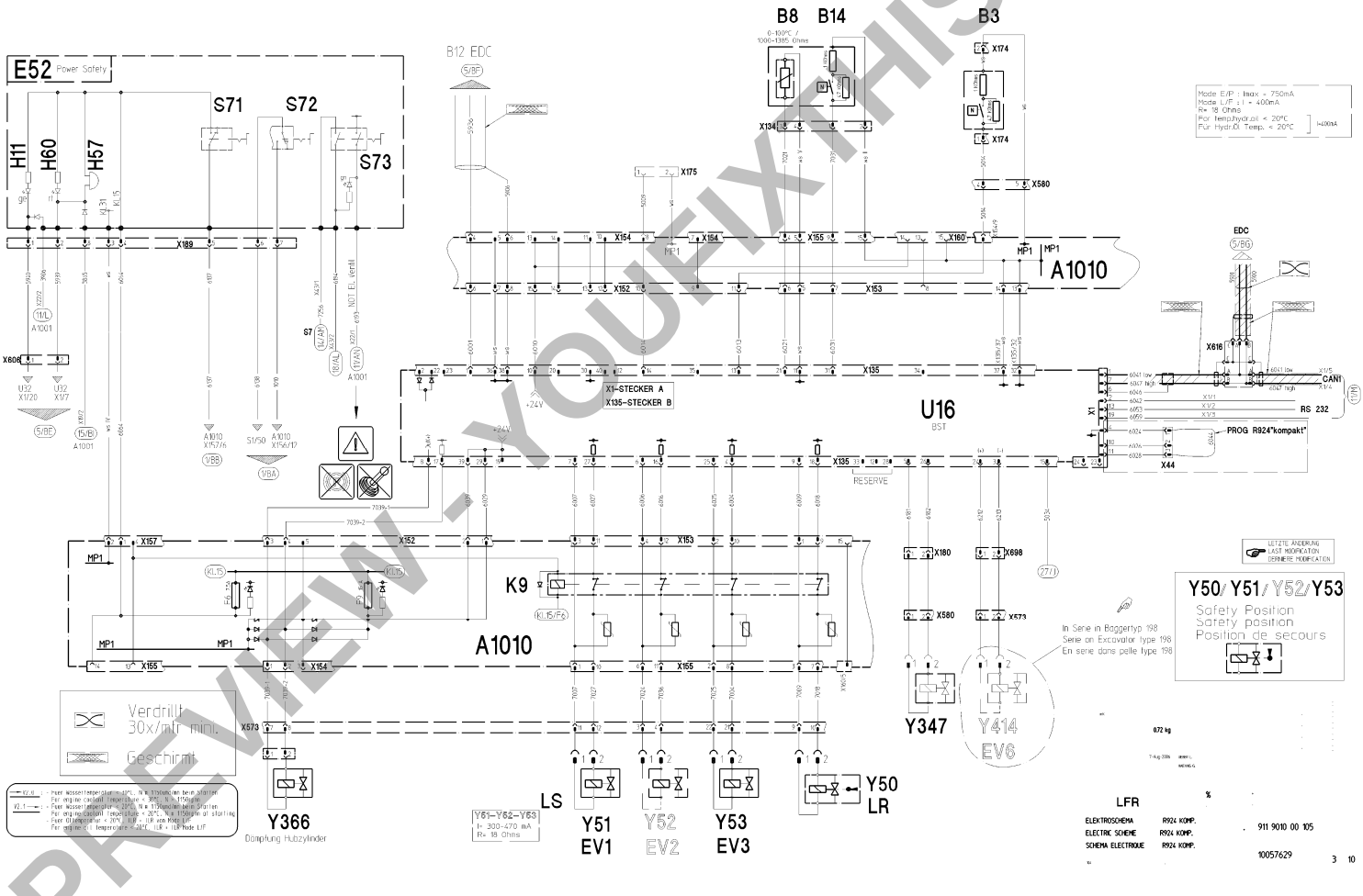
1 To remove gear

- ▶ Close shut off valve on hydraulic tank.
- ▶ Disconnect suction, pressure, control and leak oil lines from hydraulic pumps.
- ▶ Attach the splitterbox and the pumps with a sling
- ▶ Remove cooler fan pump (see sub-group 7.19).
- ▶ Drain the gear oil with drain valve **82**.
- ▶ Remove mounting screws on flywheel housing to remove splitterbox with working pumps.
- ▶ Remove screws **41**/**42**.
- ▶ Remove splitterbox **6** from pumps housing **7**.
- ▶ Remove the three o-rings **16** from pumps housing **7**.
- ▶ Remove seal **45** from splitterbox **6**.



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6	7	8	9	10
Not Schaltung, Mengenregelung Pumpe 1 und Pumpe 2, A1010.	Leistungsregelung Pumpe 1 und Pumpe 2, U16-A1010	A1010-U16	Hydrauliköltemperatur, Hydraulikölstand, Wasserniveau, Drehzahlverstellung , A1010-U16	A1010-U16, Kodierung Bagger Typ
Power safety, Flow regulation pump 1 and 2, A1010.	regulating pump 1 and 2, U16-A1010	A1010-U16	Hydraulic oil temperature, Hydraulic oil level, Water level, RPM adjustement, A1010-U16	A1010-U16, Code Excav.Type
Commutation de secours, régulation de débit pompe 1 et 2, A1010.	régulation pompe 1 et 2, U16-A1010	huile moteur, A1010-U16	Température huile hydraulique, Niveau huile hydraulique, Niveau d'eau, Réglage de regime, A1010-U16	A1010-U16, codage type de pelle



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Introduction

This manual contains technical data, design and functional descriptions, as well as service and set up instructions. The documents include numbers of drawings, functional diagrams, as well as detailed views of units and assemblies of LIEBHERR hydraulic excavators.

This manual has been created in order to assist the customer support services, but does of course replace neither proper technical training and qualification of the user nor participation in LIEBHERR operator training courses.

General basic technical information is not included in this manual. For operating instructions and information on spare parts, please refer to the separate documentation.

For maintenance and reparation of the machine, follow conscientiously the safety instructions and warnings.

Symbols used in this manual

In this manual the description of tasks and procedures that are associated with specific dangers are accompanied by safety instructions mentioning the danger related to described work. The safety instructions are graded according to the severity of the risk, and are identified with the symbols «**Danger»** and «**Caution»**, which have the following significances:

These terms are identified by symbols in the operating instructions and :



Danger!
Warning referring to a danger where there is a high probability of death or serious injury to operators, unless the prescribed safety measures are taken.



Caution!
Warning relating to dangers that might lead to injury or machine damages, unless the prescribed safety measures are taken.

The symbol «**Note»** is destined to attract the attention of the persons having to intervene on the machine upon observations and comments concerning the procedure to be followed for operating as well for maintenance or repair works.



Note!
Comments and advices which will, if adhered to, help you to keep your excavator operating, to insure longlife to your machine and to facilitate certain procedures.

Signification of specific punctuation marks in descriptions

– This mark introduces «an entry in a list».

  • This mark introduces «an entry in a sublist».

❑ This mark indicates «a requirement that must be fulfilled», before going on with the procedure below.

▶ This mark identifies «an injunction to perform the mentioned action».

  ↳ This mark indicates «the normally expected result of a carried out action».

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2.1.2 Test point 57

The control pressure generated from solenoid valve **Y51** for the △**p**-lowering is measured here, see also flow rate reduction in **Group 16**.

2.1.3 Test point 59

The control pressure generated from solenoid valve **Y50** for the load control is measured here, see **sub-group 6.68.**

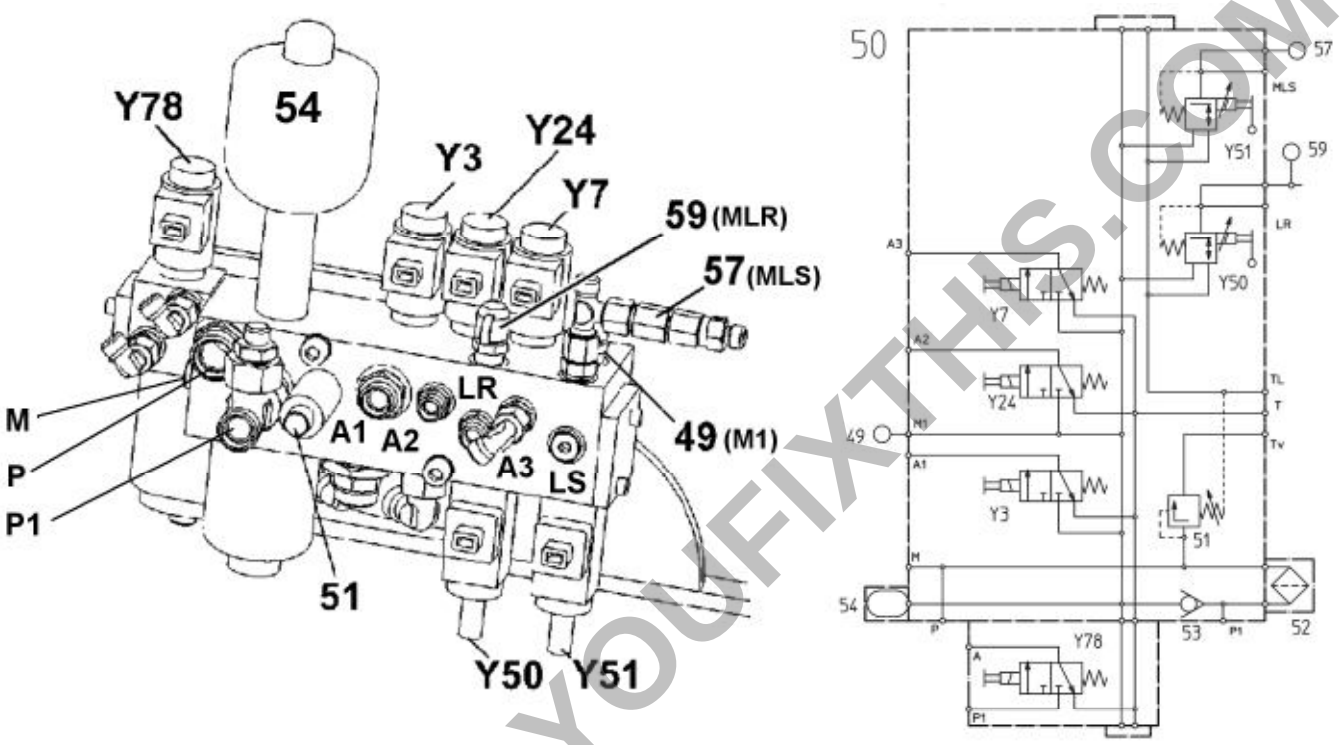


Fig. 2 *Control oil and control unit **50***

49 Test point control pressure
50 *Control oil and control unit*
51 Pressure relief valve
52 Pressure filter
53 Check valve
54 Accumulator

Y3 **Solenoid valve servo enabling**
Y7 Solenoid valve / swing gear brake
Y24 Solenoid valve / travel regulation motors
Y50 Proportional solenoid valve / load control
Y51 Proportional solenoid valve / LS-control
Y78 Solenoid valve / grapple operation

3 Functional description

(see Fig. 2 on page2)

3.1 Generating the servo pressure

The gear pump **30** feeds the servo oil unit **50** via the connection **P**. The pressure relief valve **51** mounted on the servo oil unit limits the servo pressure to a preadjusted value (see «adjustment check list» in group 6).

The oil goes through the filtre **52** and the check valve **53** to the accumulator **54**. This accumulator maintains the servo pressure and enables the performance of a limited number of controls (for instance necessary controls to lower the attachment or to depressurize the high pressure circuit) after the engine has been turned off or if the gear pump for servo oil is defective.

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3.2 Scavenging oil device

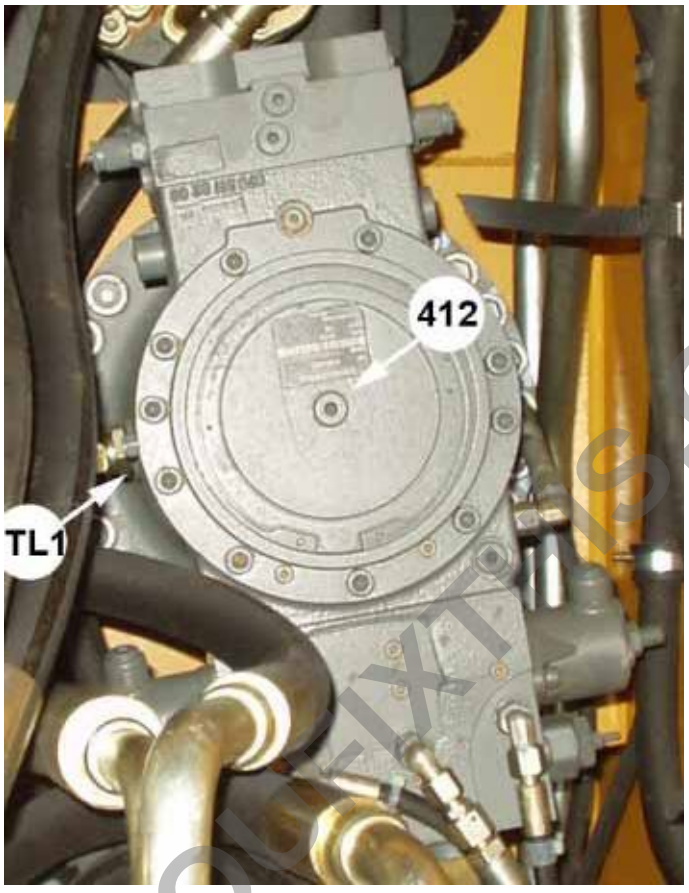


Fig. 3 *Scavenging oil device on the swing gear*

TL1 Scavenging oil - leak oil connection **412** Screw plug

The leak oil from the hydraulic motor is used primarily for lubrication of the hydraulic motor and the scavenging oil from the brake aeration piston is used for the brake discs. This oil flows through connection TL1 (scavenging oil and leak oil connection) back to the tank.

↳ An oil change is therefore not necessary

Note!
For initial filling, open the screw plug 412. Fill the drive via connection TL1 until oil is exuded at connection 412, then tighten the screw plug with the prescribed tightening torque.

4 Maintenance

4.1 Maintenance of the gear

The gear must undergo regular inspections for leaks and for secure fastening of the gear and oil motor at the intervals specified, see maintenance guidelines **Group 3**.

4.2 Maintenance of the lubrication device

Optimum replenishment or supplementation of the grease packing in the grease cap is resulted automatically via the central lubrication system in accordance with the intervals determined, see maintenance guidelines in **Group 3**.

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Fault code	Error description	Remedial measures
032	Combustion air blower motor: Short circuit. Carry out a check with approx. 15 volt + 0.2 volts. Ensure correct connection of lines! Brown = + Black = - (ensure short-circuit protection of mains power supply)!	Blower wheel or combustion air blower motor blocked (contaminated, stiff, drive train scraping against the end of the shaft...): ▶ Remedy the blockage. ▶ Measure the resistance. Resistance < 2 kΩ = earth fault: ▶ Replace the combustion air blower. Resistance > 2 kΩ = no earth fault: ▶ Measure the speed of the combustion air blower motor. Measure the speed of the combustion air blower motor: ▶ Unplug the 14-pin plug pin 14 (0.75^2 brown) and pin 13 (0.75^2 black). ▶ Mount the reflective strips on the shaft. ▶ Charge the combustion air blower motor with 15 volts. ▶ Measure the speed with non-contact speedometer. Speed < 1000 rpm: ▶ Replace the combustion air blower. Speed > 1000 rpm: ▶ Replace the control unit.
038	Relay control of vehicle blower: Interruption	▶ Check the electrical line to the relay. ▶ Remedy the interruption. ▶ Replace the relay.
039	Relay control of vehicle blower: Short circuit, overload of earth fault	▶ Remove the relay. ↳ Fault code 038 appears in the display. ▶ Remedy the interruption. ▶ Replace the relay.
041	Water pump: Interruption	Inspect the supply line to the water pump for clear passage: ▶ Unplug the 14-pin plug pin 10 (0.5^2 brown) and pin 11 (0.5^2 purple). ▶ Remedy the interruption. ▶ If necessary, replace the water pump.
042	Water pump: Short circuit, overload, earth fault	▶ Disconnect the plug connection in the cable harness „water pump“: If fault code 041 is displayed: ↳ Water pump faulty. ▶ Replace the water pump.
047	Batching pump: Short circuit, overload, earth fault	▶ Disconnect plug connection in the cable harness „batching pump“: If fault code 048 is displayed: ▶ Replace the batching pump.

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