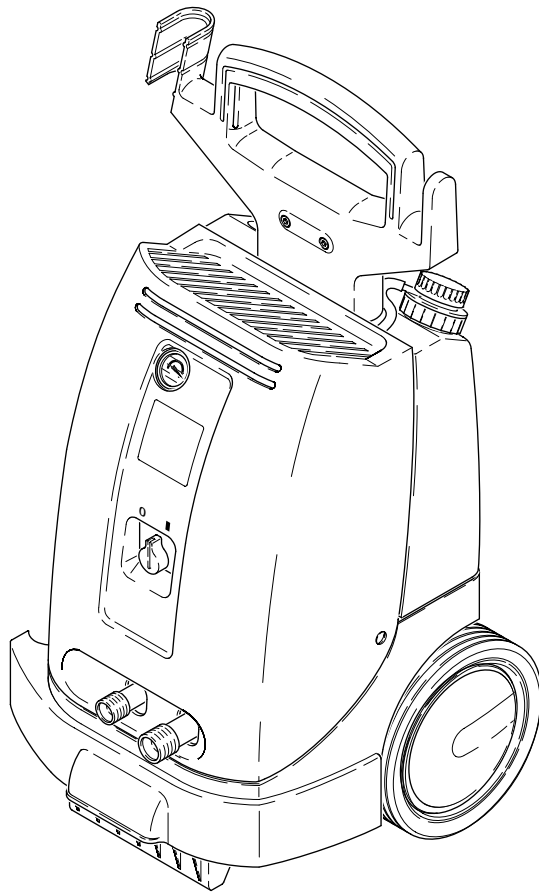


Service Handbook



HD 1090

Foreword

Good servicing requires extensive and relevant training as well as comprehensible reference documents.

We therefore regularly offer all service technicians both basic and ongoing training courses for the full range of our products.

In addition we produce service handbooks for the major equipment which can be used initially as instructional material and subsequently as sources of reference.

Furthermore we regularly distribute service information bulletins that provide details about further developments to the products.

Copying and duplicating texts and illustrations, or passing the contents on to a third party, requires the express permission of:

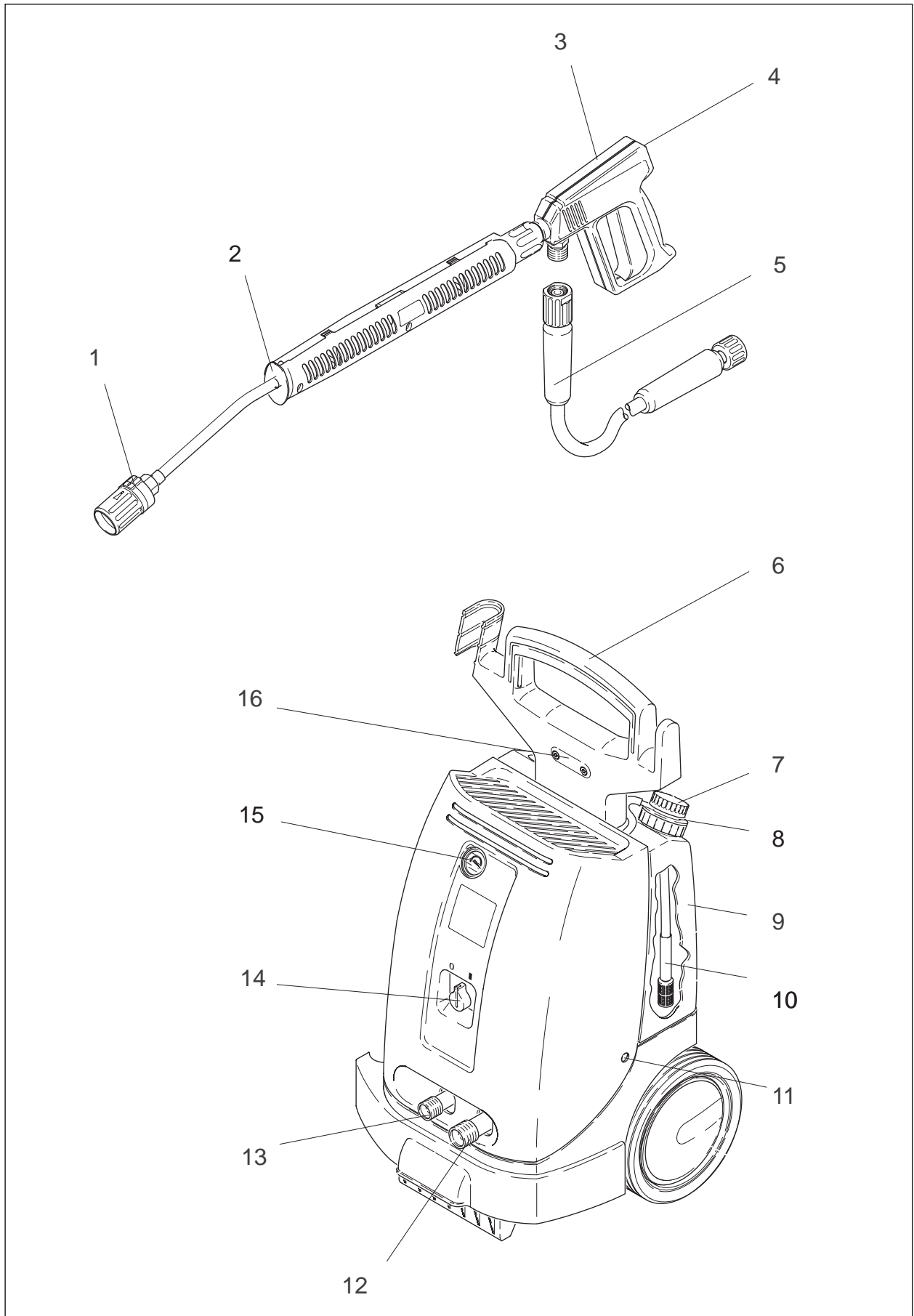
ALFRED KÄRCHER GmbH & Co.
CUSTOMER SERVICE TRAINING
PO Box 160
D-71349 Winnenden

Contents

Unit function	2-15
Equipment	2
Functional diagram	4
Pump	6
Pressure and flow control with the Servopress handgun	8
Detergent injector with non-return valve	10
Detergent metering valve	11
Hand gun with pressure and flow control	
Servopress with low-effort version	12
Changeover nozzle	14
Circuit diagram 0.087-804	15
Troubleshooting and basic settings	16-29
Unit does not run	16
Unit does not reach required pressure	18
Unit switches on and off continuously	23
No detergent function	26
Water escaping between cylinder head and housing	27
Oil escaping between cylinder head and housing	28
Swash plate/shaft sealing ring/motor bearing defective	29
Special tools	30
Technical data	31-32

Unit function

Equipment



Unit function

Equipment

- 1 changeover nozzle
- 2 spray lance
- 3 servopress handgun
- 4 adjusting wheel for pressure and flow control
- 5 high-pressure hose
- 6 handle
- 7 detergent metering valve
- 8 detergent tank cover
- 9 detergent tank
- 10 detergent suction hose with filter
- 11 hood mounting screw
- 12 water inlet with strainer
- 13 high-pressure connection
- 14 unit switch
- 15 pressure gauge
- 16 handle mounting screws

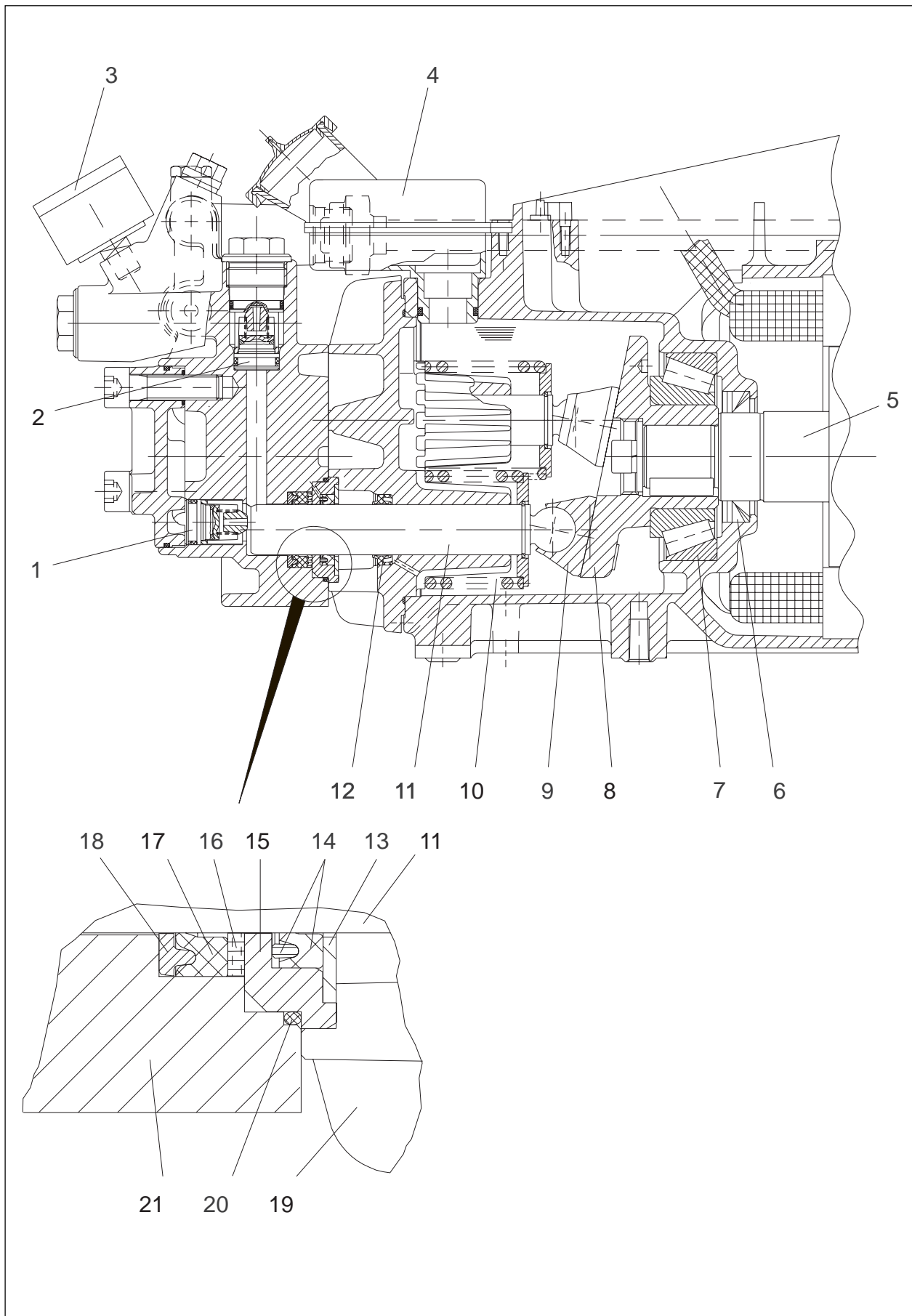
Unit function

Functional diagram

1	high-pressure hose	Any unit without a float tank should not be connected directly to the water inlet. A non-return valve (7) at the water supply is intended to prevent detergent from getting into the supply network.
2	injector	
3	detergent non-return valve	
4	detergent metering valve	
5	detergent suction hose with filter	From the water supply with non-return valve (7), the water flows through the three cooling coils in the motor housing (12) to the pump (13).
6	detergent tank	The pump (13) transports the water through the high-pressure hose (1), the hand gun (15) and the spray lance (16) to the changeover nozzle (17).
7	water inlet with non-return valve	
8	water inlet hose	
9	suction hose with filter and non-return valve	Operating pressure and flow quantity can be set with the hand gun (15).
10	open tank	If the changeover nozzle (17) is set at high-pressure, the non-return valve (3) seals off the detergent suction hose (5) to prevent any water from flowing into the detergent tank (6).
11	fan wheel	
12	motor with cooling coils	
13	pump	As soon as the metering valve (4) is open and the changeover nozzle (17) is set at low-pressure, detergent is taken in from the detergent tank (6) by the injector (2).
14	pressure gauge	
15	hand gun with Servopress	In the event of suction from an open tank (10), the water inlet hose (8) must be replaced by a water suction hose with filter and non-return valve (7).
16	spray lance	
17	changeover nozzle	The motor (12) is cooled via the cooling coils in the motor housing (water cooling) and by the air current of the fan wheel (11) (air-cooling).

Unit function

Pump



Unit function

Pump

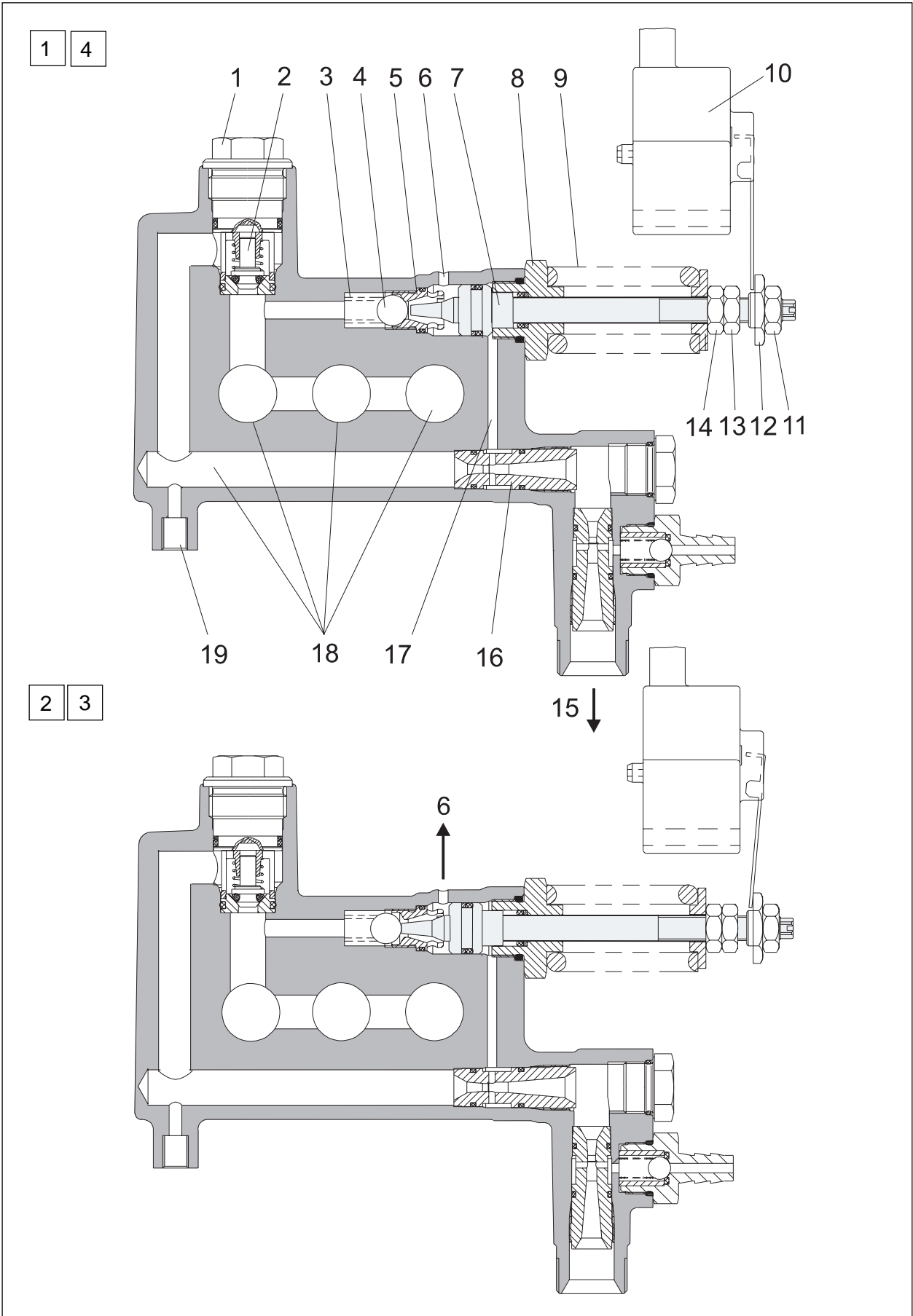
- 1 suction valve
- 2 pressure valve
- 3 pressure gauge
- 4 oil reservoir
- 5 motor shaft
- 6 shaft seal
- 7 motor bearing
- 8 swash plate
- 9 piston glide shoe
- 10 piston spring
- 11 piston
- 12 oil seal
- 13 washer
- 14 low-pressure seal and support ring
- 15 bushing
- 16 washer
- 17 high-pressure seal
- 18 support ring
- 19 piston housing
- 20 O-ring
- 21 cylinder head

Function

The pump is a 3-piston swash plate pump with drive running in an oil bath. It is directly attached to the motor shaft, therewith achieving optimal efficiency. When the piston returns, the water is taken in via the open suction valve. The advancing piston closes the suction valve and the water is transported to the nozzle via the open pressure valve. The operating pressure generated depends on the diameter of the nozzle bore.

Unit function

Pressure and flow control with the Servopress handgun



Unit function

Pressure and flow control with the Servopress handgun

- 1 Threaded plug
- 2 Pressure holding valve
- 3 Spring
- 4 Ball
- 5 Valve seat
- 6 Connecting channel to suction chamber
- 7 Piston Rod
- 8 Threaded fitting
- 9 Spring
- 10 Pressure switch
- 11 Locking nut
- 12 Adjusting nut for pressure switch
- 13 Locking nut
- 14 Adjusting nut for operating pressure
- 15 High-pressure outlet
- 16 Control pressure injector
- 17 Connecting channel between injector and overflow valve
- 18 Pressure chamber
- 19 Pressure gauge connection

1. When the Servopress handgun is opened

When the Servopress handgun is fully opened, water flows out of the pressure chamber (18), through the pressure holding valve (2) and injector (16) then on to the high-pressure outlet (15).

The ball (4) in the overflow valve is pressed against the valve seat (5) by the pump pressure and closes off the connecting channel (6) to the suction chamber. The pressure gauge shows the operating pressure within the pressure chamber (18). The action of the injector (16) results in a pressure level in the connecting channel (17) that is approx. 30 bar lower.

2. The Servopress handgun is partially closed

When the handgun is partially closed, the pressure in the pressure chamber (18) does not increase. Due to the decreased water flow rate, the effect of the injector action (16) is reduced, so that the pressure in the connecting channel (17) rises. The pistonrod (7) is pushed to the left slightly against the spring pressure (9). The tapered tip of the rod pushes the ball (4) away from its seat (5) slightly, so that a part of the pump flow rate flows into the suction chamber (6).

Note:

Opening or closing the Servopress handgun while the cleaner is operating in high-pressure mode does not result in a change to the motor current consumption. The current consumption is only reduced when the cleaner is being operated in cleaning agents mode.

3. The Servopress handgun is completely closed

As the handgun closes, the pressure in the pressure chamber (18) rises abruptly. This peak of pressure acts upon the pistonrod (7) via the connecting channel (17) and forces the pistonrod (7) all the way to the left (approx. 4 mm). The tapered tip of the pistonrod (7) pushes the ball (4) completely off its seat, so that the entire pump flow rate flows through the connecting channel (6) into the suction chamber.

As soon as the handgun is closed, the pressure holding valve (2) closes. This trapped pressure holds the valve in the by-pass mode.

When this position is reached, the pressure switch (10) is actuated, the electrical supply interrupted and the motor switched off.

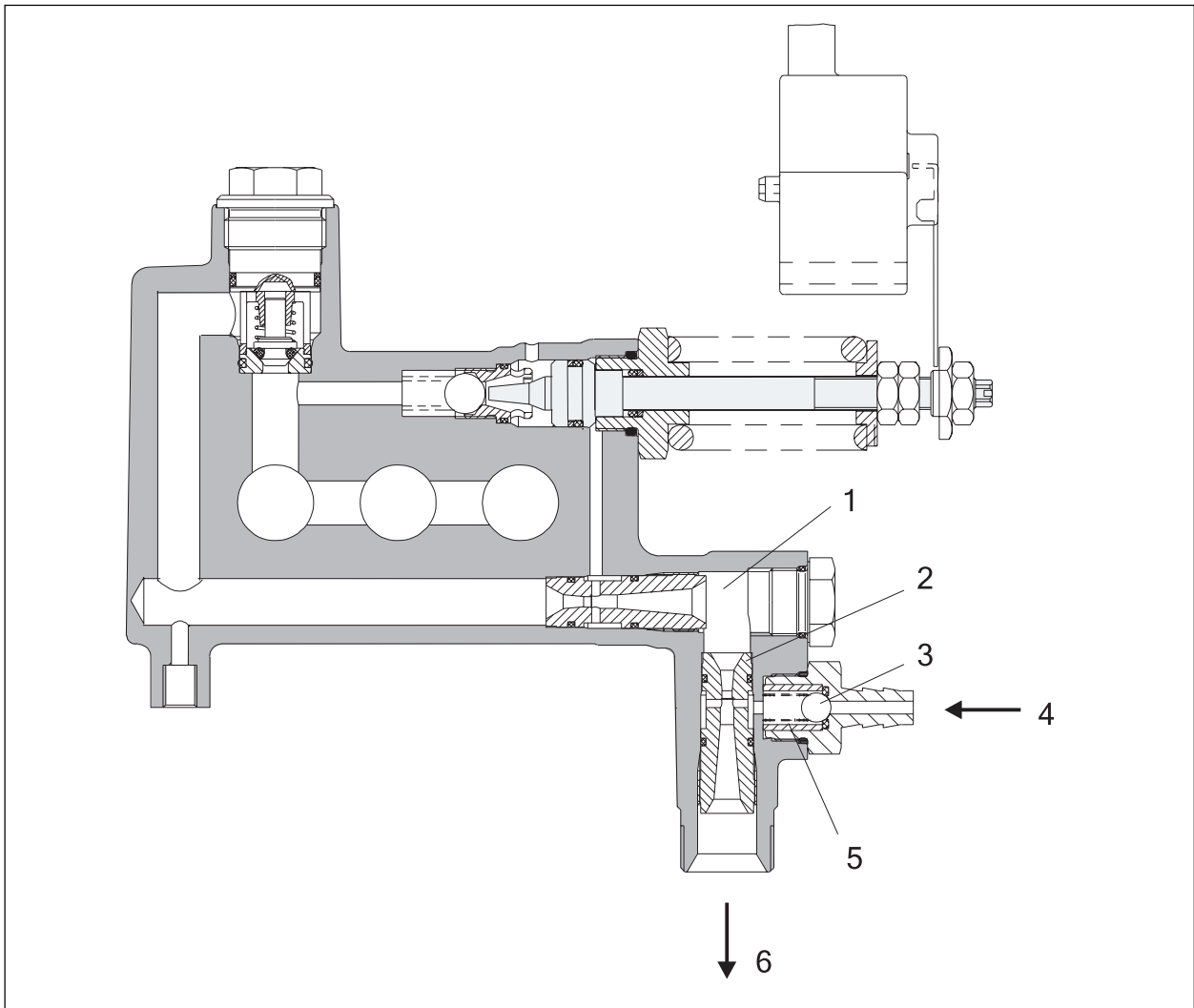
4. The Servopress handgun is opened

If the handgun is opened again, the pressure in the system drops off abruptly.

The overflow valve is pushed back towards the right into its original position by the spring. The pressure switch (10) reconnects the electrical supply and the motor is switched on again.

Unit function

Detergent injector with non-return valve



- 1 pressure chamber in front of injector
- 2 injector
- 3 ball
- 4 detergent connection
- 5 spring
- 6 high-pressure outlet

Detergent can only be taken in if the changeover nozzle on the spray lance is set at "CHEM".

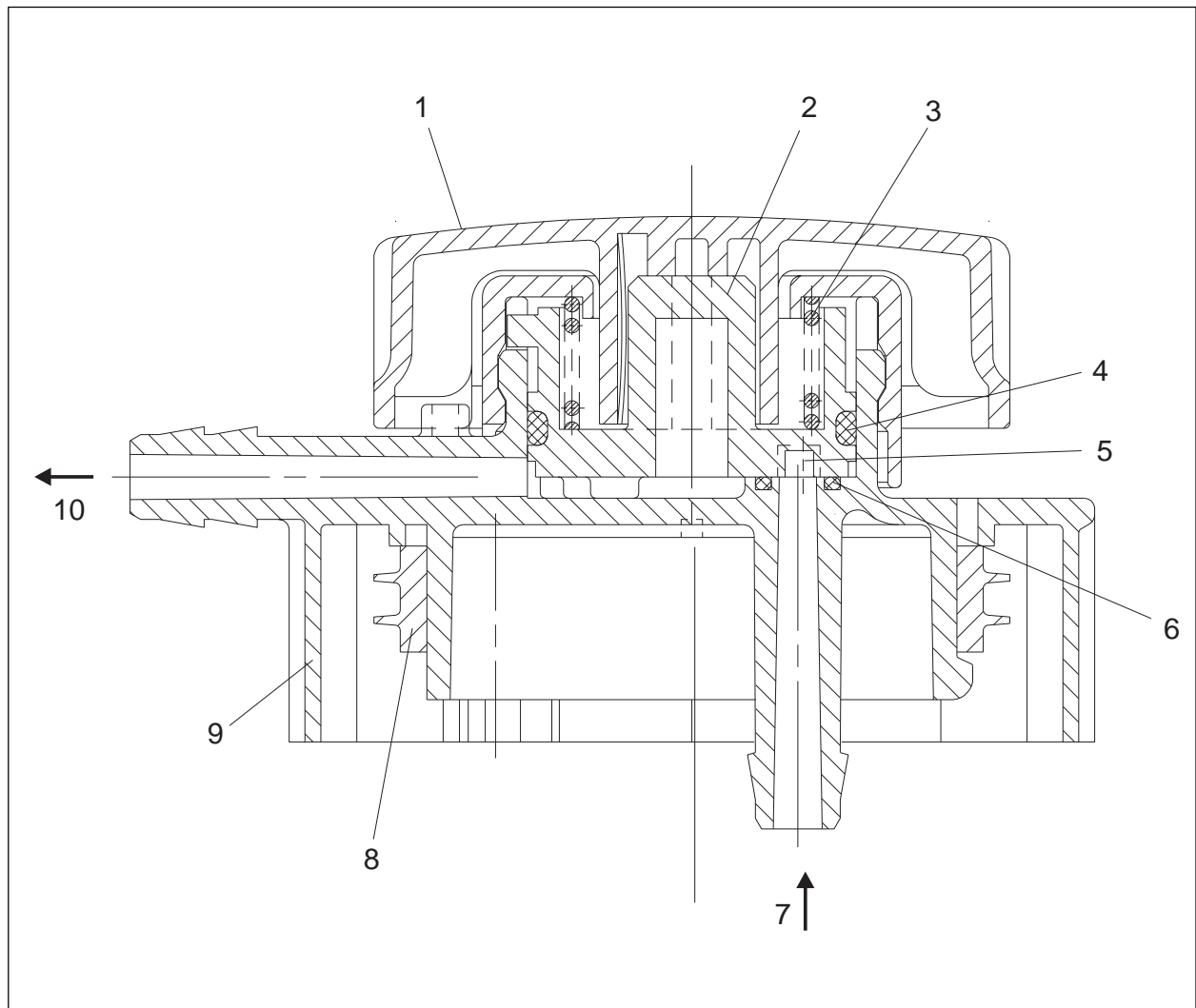
The pressure in the system thereby drops to approx. 50 bar and the injector generates its maximum low pressure (approx. 0.8 bar).

The ball (3) of the detergent non-return valve is lifted out of its seat and detergent is taken in.

With high-pressure operation, the ball of the non-return valve seals off the detergent connection, thus preventing any water from flowing into the detergent tank. With high-pressure operation, no detergent can be taken in.

Unit function

Detergent metering valve



- 1 metering knob
- 2 valve housing
- 3 spring
- 4 O-ring
- 5 metering channel
- 6 O-ring
- 7 inlet
- 8 sealing ring for detergent tank
- 9 tank lid
- 10 outlet

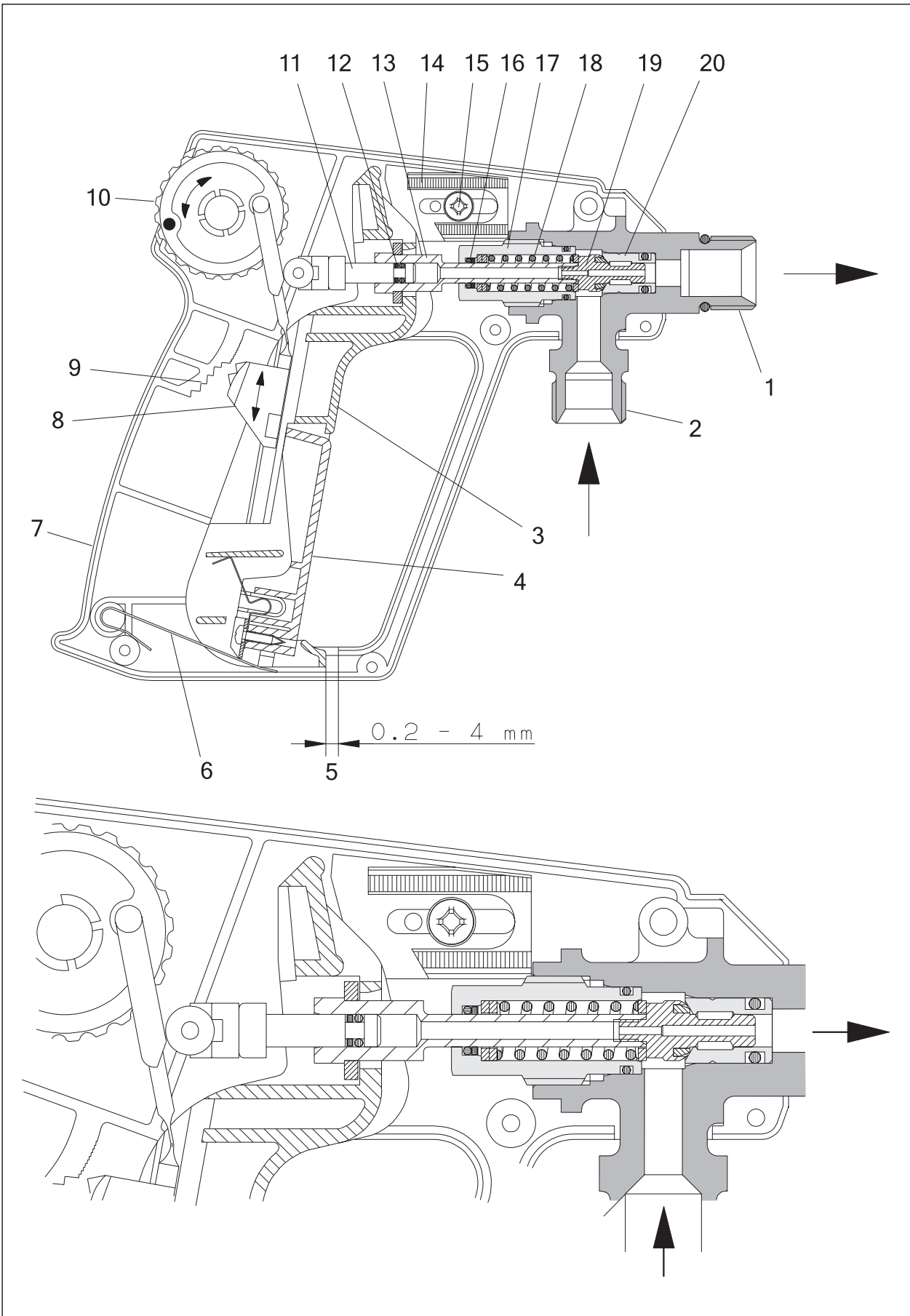
With this system, the tank lid and metering valve are one unit.

In the valve housing, there is a ring-shaped metering channel, the cross-section of which is increasing.

The inlet and outlet are connected with this metering channel. Depending on the position of the valve housing which can be shifted with the metering knob, the open cross-section of the metering channel will change. Thus the amount of detergent taken in can be continuously metered.

Unit function

Handgun with pressure and flow control (Servopress) with low-effort version



Unit function

Handgun with pressure control and flow control (Servopress) with low-effort version

- 1 Spray lance connection
- 2 High-pressure hose connection
- 3 Trigger
- 4 Retention force lever
- 5 Trigger play
- 6 Retention force spring
- 7 Handgun grip covers
- 8 Trigger position stop lever
- 9 Stop position in handgun grip
- 10 Adjusting wheel
- 11 Bolt
- 12 O-ring/support ring
- 13 Spindle
- 14 Trigger adjusting plate
- 15 Retaining screw for adjusting plate
- 16 O-ring/support ring
- 17 Threaded housing
- 18 Spring
- 19 Valve piston
- 20 Valve seat

With this type of handgun it is possible to control the pressure and flow rate continuously, depending on how far the trigger (3) has been depressed.

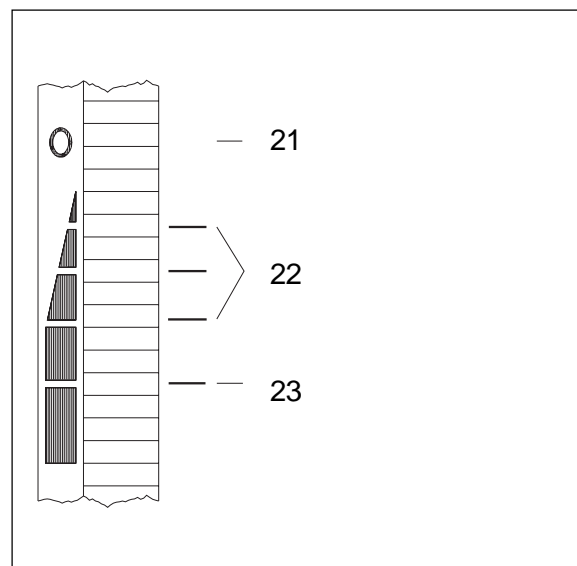
The distance that the trigger (3) can move is limited by an adjustable stop lever (8) which can be moved upwards or downwards by turning the adjusting wheel (10).

The retention force lever (4) and spring (6) reduce the retention force when the handgun is fully opened.

When the trigger (3) is depressed, the valve piston (19) is away from the valve seat (20) and against the pressure of the spring (18) by the spindle (13). This causes a gap to open up between the valve piston (19) and the valve seat (20). The further the valve is opened, the more water can flow through.

The distance (5) by which the trigger (3) can be moved is determined by the position of the trigger adjusting plate (14).

If the adjusting wheel (10) is set to "0", the trigger (3) is locked in the closed position.

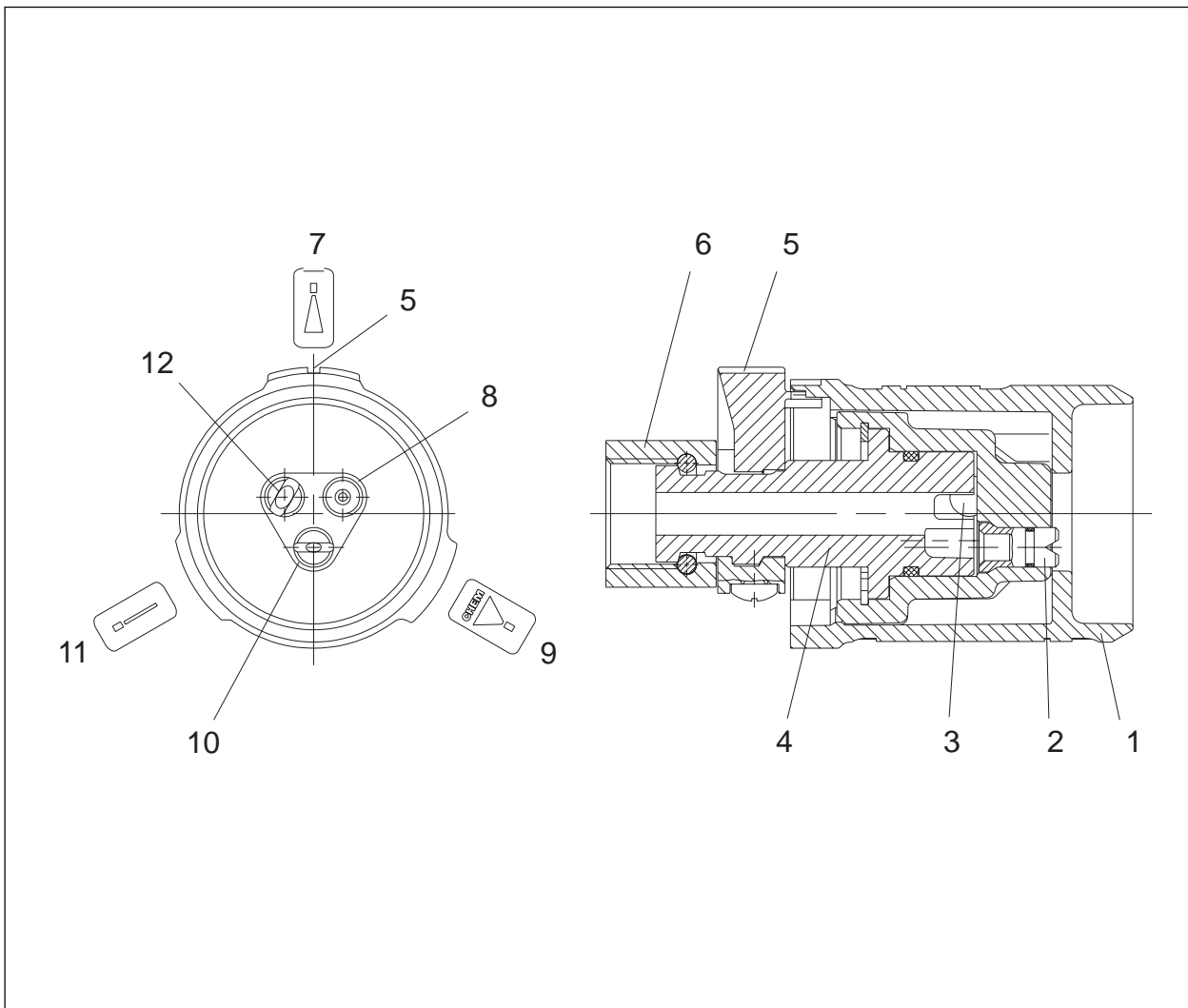


Markings on adjusting wheel

- 21 Handgun closed
- 22 Handgun partially opened
- 23 Handgun fully opened

Unit function

Changeover nozzle



- 1 nozzle guard
- 2 nozzle
- 3 ball (2x)
- 4 screw socket
- 5 marking line
- 6 union nut
- 7 fan jet symbol
- 8 pencil jet nozzle 0°
- 9 fan jet symbol CHEM
- 10 fan jet nozzle 25°
- 11 pencil jet nozzle symbol
- 12 fan jet nozzle CHEM

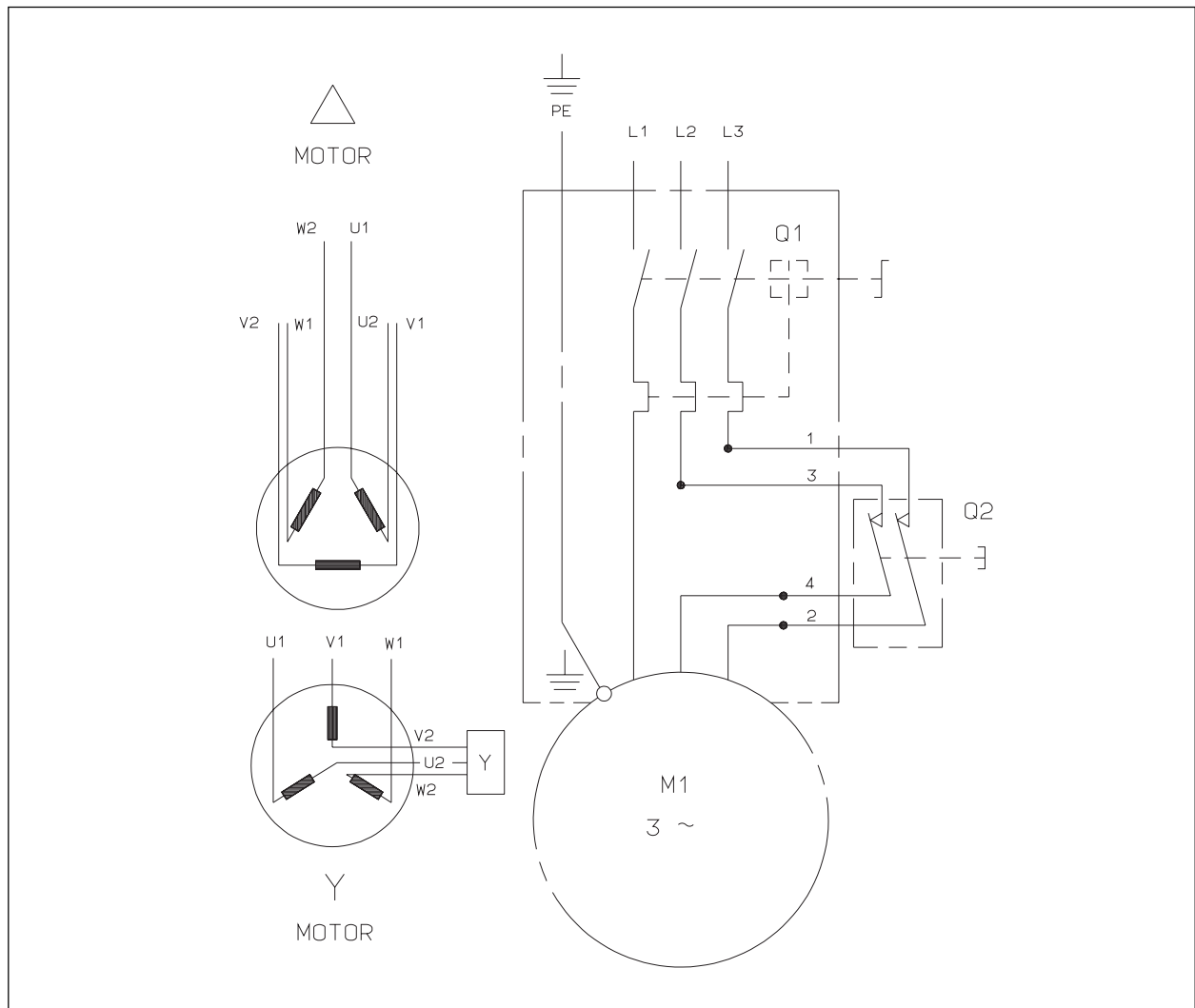
The changeover nozzle should be fitted to the spray lance so that the marking line (5) is at the top.

In this position, the two balls inside the changeover nozzle seal the two upper nozzles so that the water jet always comes out at the lower nozzle.

The marking line always indicates the symbol of the jet concerned. The type of jet is selected by turning the nozzle guard (1) with the three nozzles to the required position, with the hand gun closed.

Unit function

Circuit diagram 0.087-804



Q1 motor circuit-breaker with thermal over-load trip

The model 1.951-261 is reconnectable from 230 V Y (star) to 400 V Δ (delta).

Q2 pressure switch, 2-pole

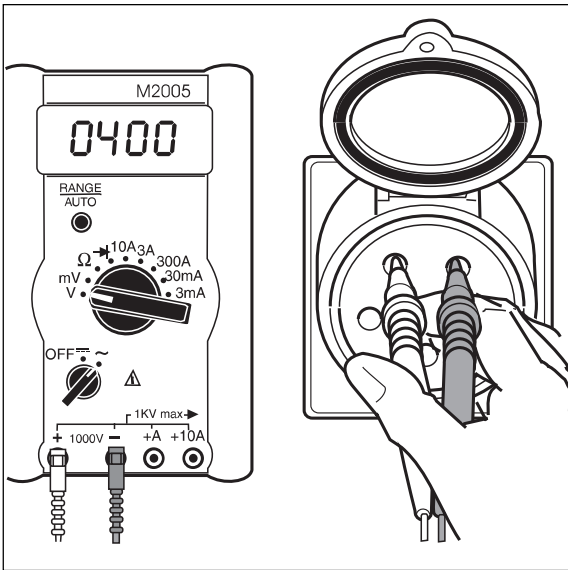
From phases L1, L2 and L3 the voltage reaches the motor via unit switch Q1 and pressure switch Q2.

M1 3-phase a.c. motor

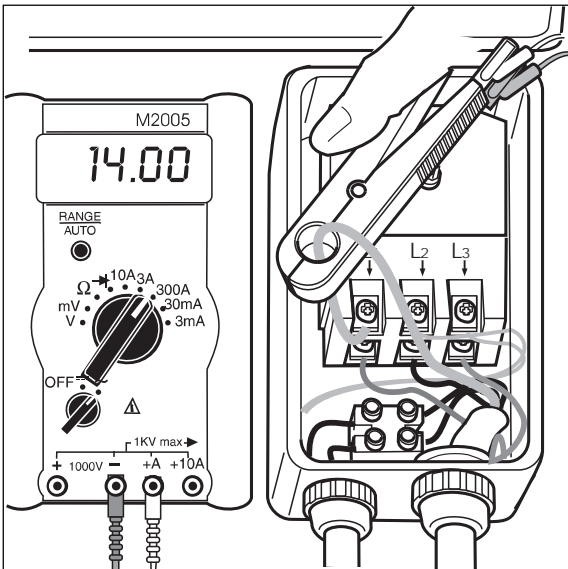
Motor ATB, VEM		Motor LS	
Start of coil winding		Start of coil winding	
U1	red	U1	black
V1	yellow	V1	red
W1	black	W1	white
End of coil winding		End of coil winding	
U2	white	U2	yellow
V2	blue	V2	blue
W2	grey	W2	brown

Troubleshooting and basic settings

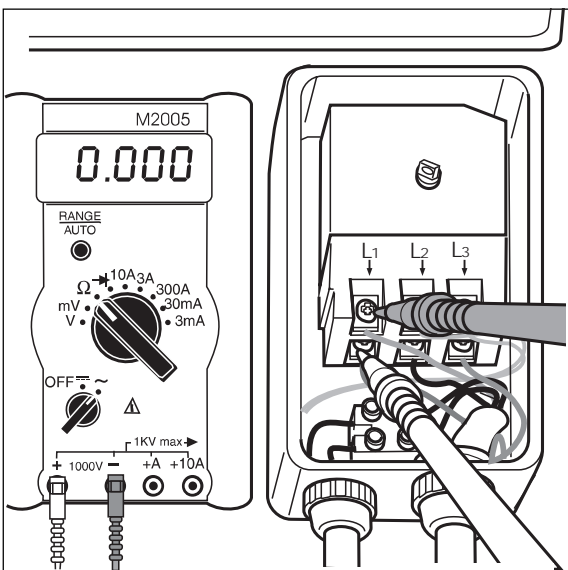
Unit does not run



Check mains voltage



Measure current consumption



Check unit switch

Electrical connection defective

- The voltage indicated on the rating plate must coincide with the mains voltage.
- Check voltage at the socket outlet (all 3 phases).
- Check main fuse.

Note:

Do not repair any domestic installations (sockets, etc.) This should only be done by a qualified electrician.

Extension cable

- The extension cable must always be fully unwound from the cable drum.

Cable cross-section:

min. 1.5 mm² with up to 10 m in length

min. 2.5 mm² from 10 m to 30 m in length

Motor and unit switch defective

- The unit switch has a built-in thermal overload trip. If the overload trip has triggered several times, measure the current consumption under full load at all 3 phases (see technical data). Replace defective parts if necessary.

An excessive power consumption may be caused by the following:

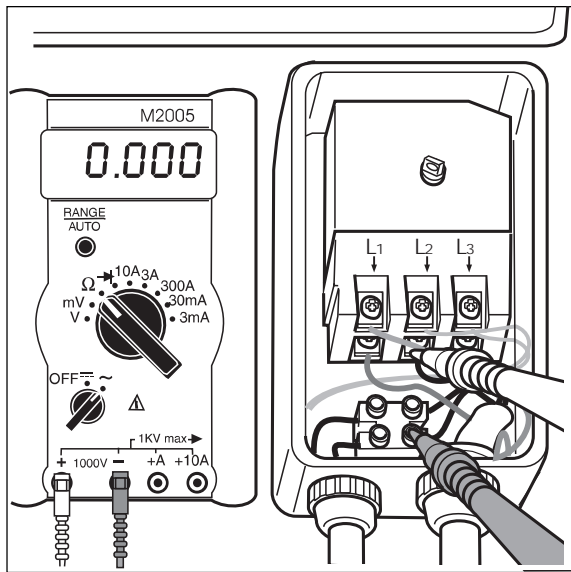
- defective motor winding
- defective connecting cable
- extension cord
- fluctuating supply voltage
- If the electric motor is replaced, the unit switch and pressure switch must also always be renewed.

- Disconnect the unit from the mains and, with the unit switch on, measure the electrical resistance between the connecting terminals (inlet-outlet).

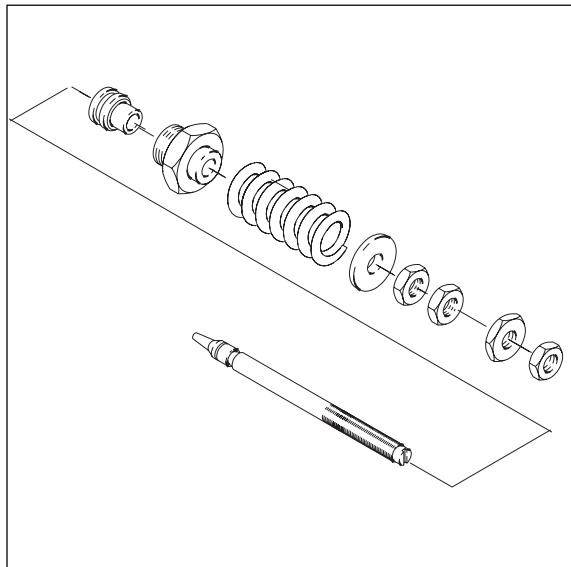
The desired value must be zero Ohms.

Troubleshooting and basic settings

Unit does not run



Check pressure switch



Overflow valve disassembled

Pressure switch defective

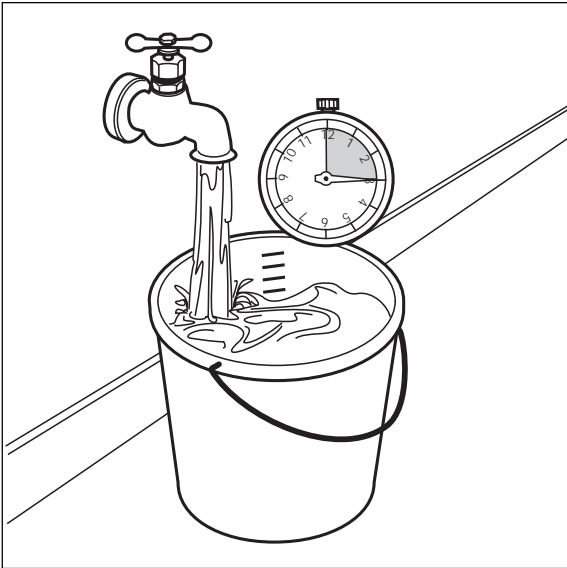
- Disconnect the unit from the mains and, with the unit switch on, measure electrical resistance between the connecting terminals (inlet-outlet). In a pressureless state, there should be zero Ohms (contacts closed).
- If necessary, replace defective parts and reset the pressure switch (see page 22).

Overflow valve stuck

- If the overflow valve has switched off the unit via the pressure switch and is then stuck, the unit will not start.
- Disassemble the overflow valve and check whether it moves easily. If necessary, replace defective parts.
- Lubricate all O-rings with silicone grease 6.288-080.
- Adjustment, see page 22.

Troubleshooting and basic settings

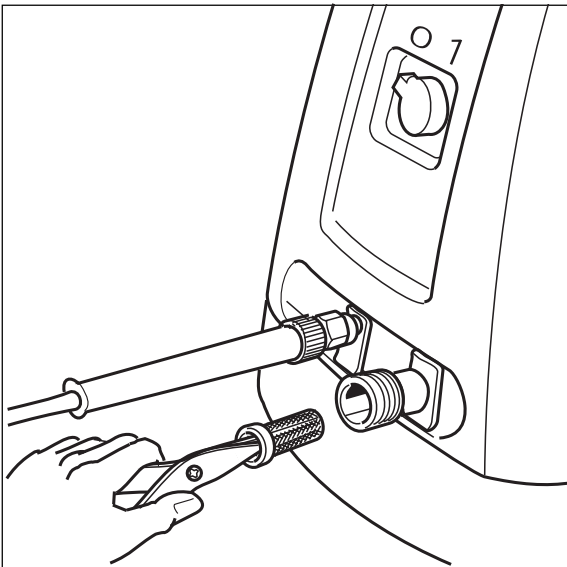
Unit does not reach required pressure



Check water supply quantity

Insufficient water supply

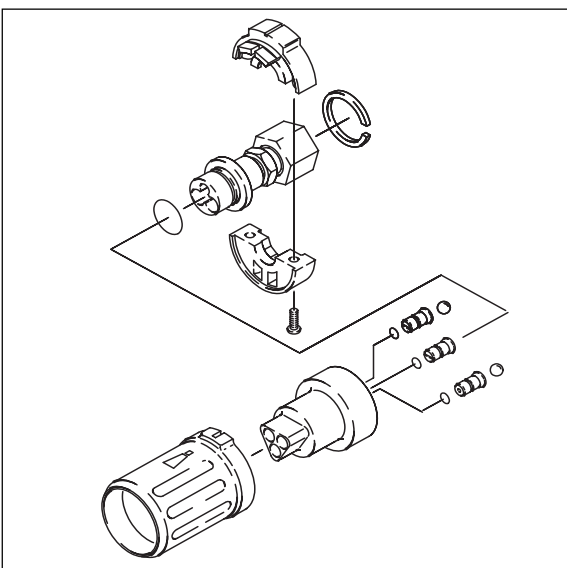
- The water inlet hose must be at least 3/4 inch in diameter.
- Check the water inlet quantity (see technical data).



Pull out water inlet strainer

Water inlet strainer blocked

- Pull out the water inlet strainer with pliers and clean. Replace if necessary.



Disassemble changeover nozzle

High-pressure nozzle insert washed out

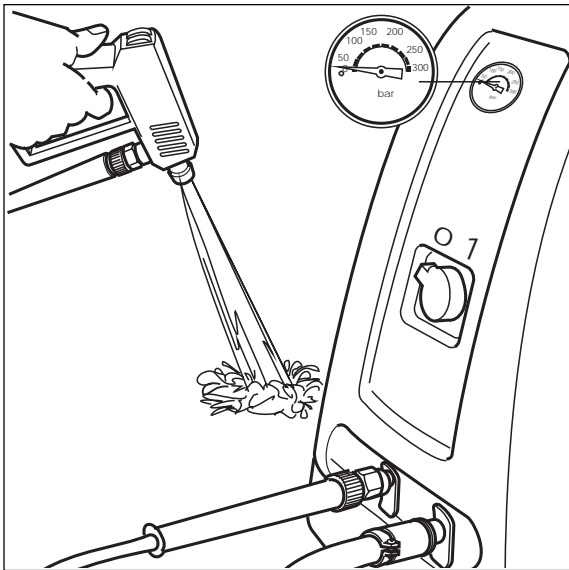
- Disassemble the changeover nozzle. If necessary replace the nozzle inserts.

Note:

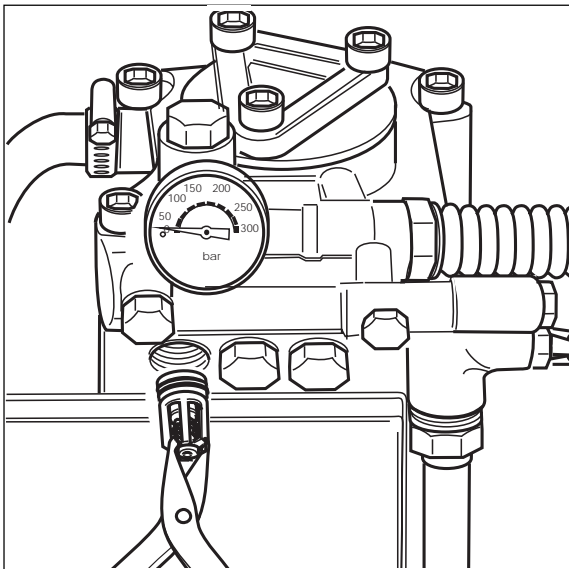
If the nozzle insert is washed out, the unit cannot build up the full operating pressure.

Troubleshooting and basic settings

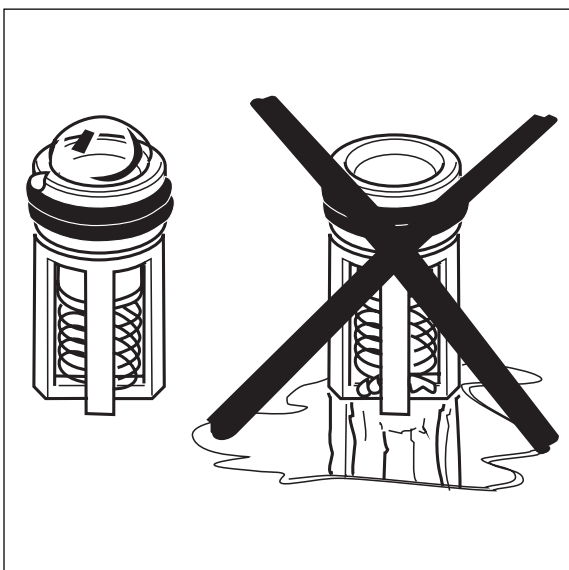
Unit does not reach required pressure



Vent the unit



Disassemble the pressure valves/suction valves



Check seal of valves

Pump not vented

- Switch off the unit. With the gun open, open the water inlet and wait until the water comes out without any bubbles.

Pump takes in air

- Check all the seals of the water inlet hose connection.

Pressure valves leaking

- Unscrew the screw plugs.
- Pull out the valves and check for damage and dirt. Replace if necessary.
- Mount all O-rings using silicone grease.
- Mount all screw plugs, noting the torque (see technical data).

Suction valve leaking

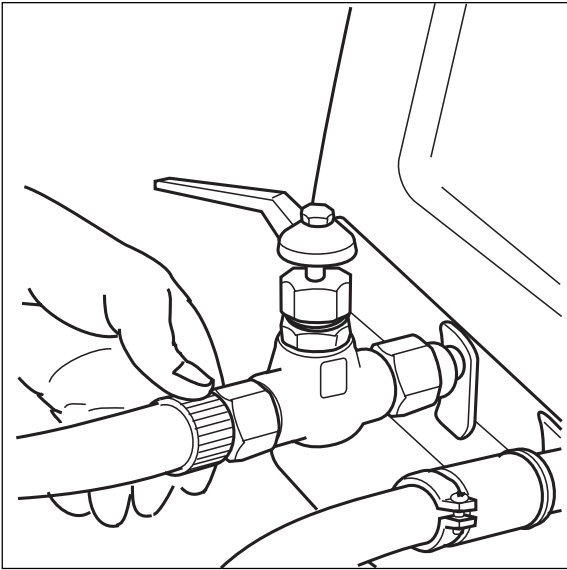
- Remove the suction cover.
- Pull out the valves and check for damage and dirt. Replace if necessary.
- Mount all O-rings using silicone grease.
- Install the suction cover, noting the torque (see technical data).

Check seal of valves

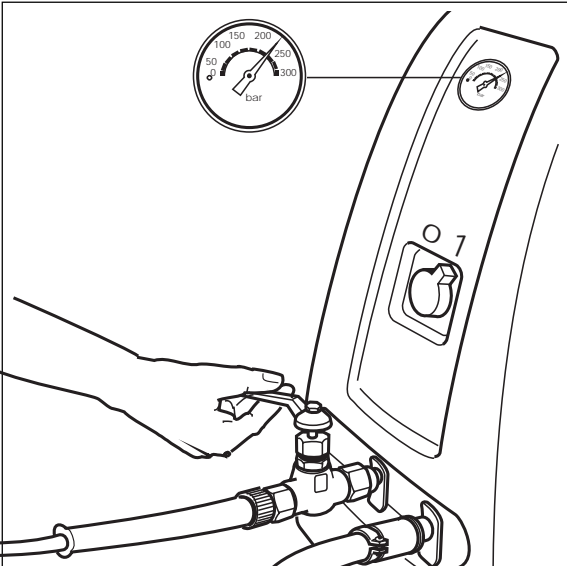
- Position the valves with the valve seat upwards and fill with water. If the valves are defective, the water will leak out underneath. Replace valves if necessary.

Troubleshooting and basic settings

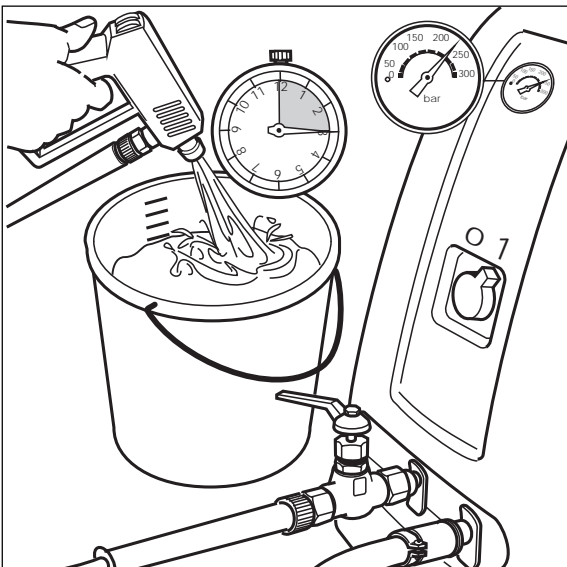
Unit does not reach required pressure



Fitting the shut-off valve



Setting operating pressure



Checking flow rate

Check flow rate

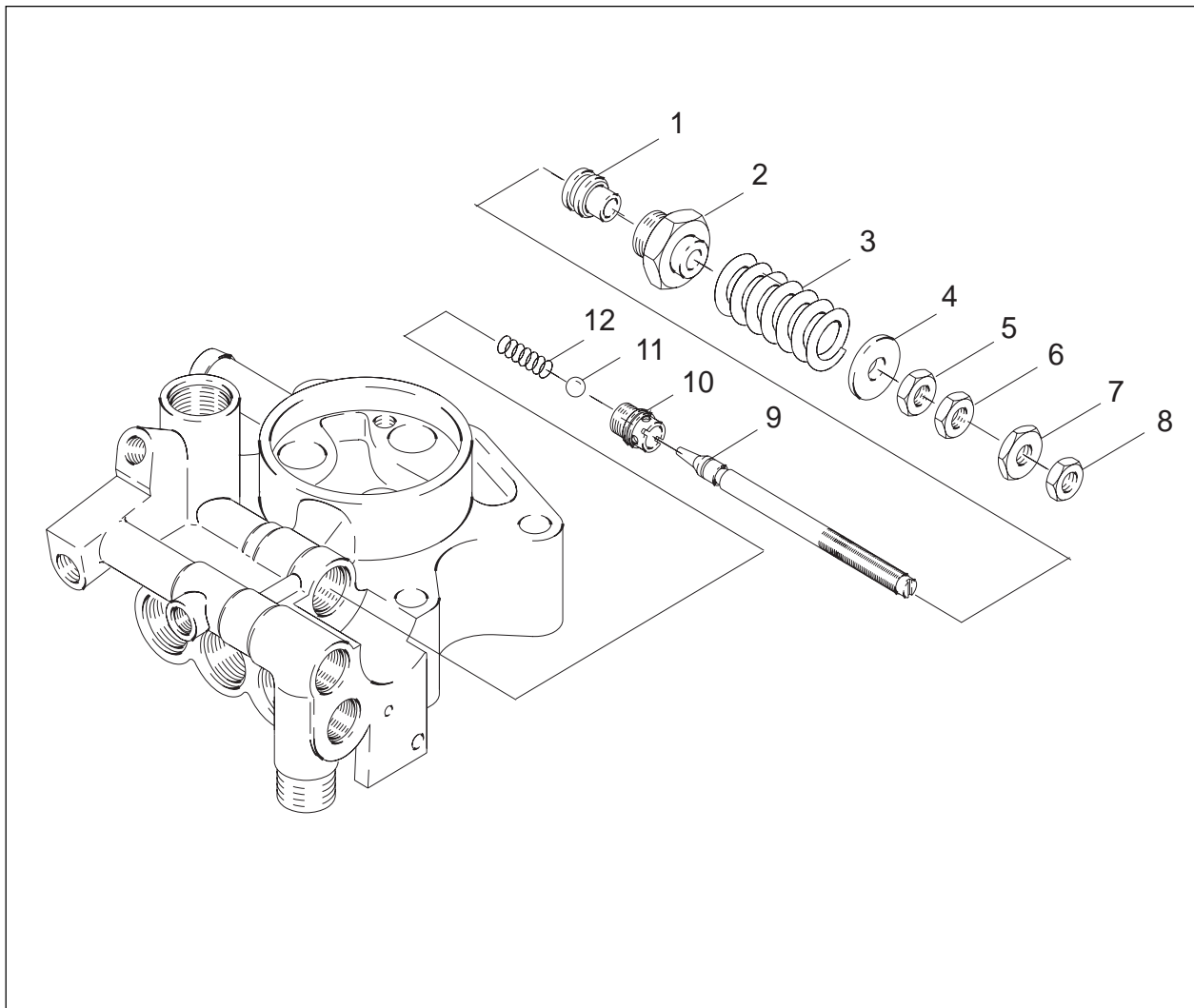
- Mount the water inlet hose.
- Mount the shut-off valve at the high-pressure outlet.
- Connect the high-pressure hose with handgun (no nozzle) to the shut-off valve.
- With the handgun open, start up the unit.

- Use the shut-off valve to set operating pressure (see technical data).

- Using a suitable container, time and measure the water flow volume (e.g., liters per minute). If there is too little water, there may be an external water loss (visible water leakage) or an internal water loss (concealed water leakage), e.g., pressure valves, suction valves, overflow valve leaking.

Troubleshooting and basic settings

Unit does not reach required pressure



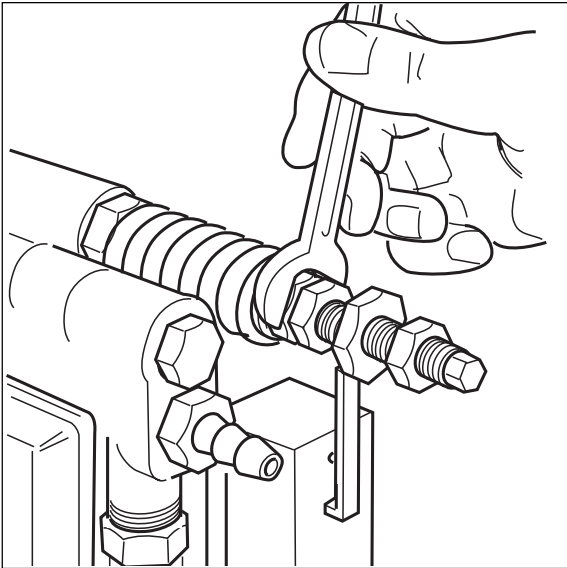
- 1 piston
- 2 mounting nut
- 3 spring
- 4 washer
- 5 adjusting nut, working pressure
- 6 lock nut
- 7 adjusting nut, pressure switch
- 8 lock nut
- 9 rod
- 10 valve seat
- 11 ball
- 12 spring

Overflow valve leaking

- Unscrew lock nut and adjusting nut from the pressure switch.
- Unscrew lock nut and adjusting nut from the overflow valve.
- Remove washer and springs.
- Screw out the mounting nut and pull out the rod.
- Remove the circlip and check all parts. Replace if necessary. Always replace the circlip.
- Unscrew the valve seat and remove ball with spring. Check all parts. Replace if necessary.
- Lubricate all O-rings with silicone grease 6.288-080 and assemble in the reverse order (special tools).
- Adjustment, see page 22.

Troubleshooting and basic settings

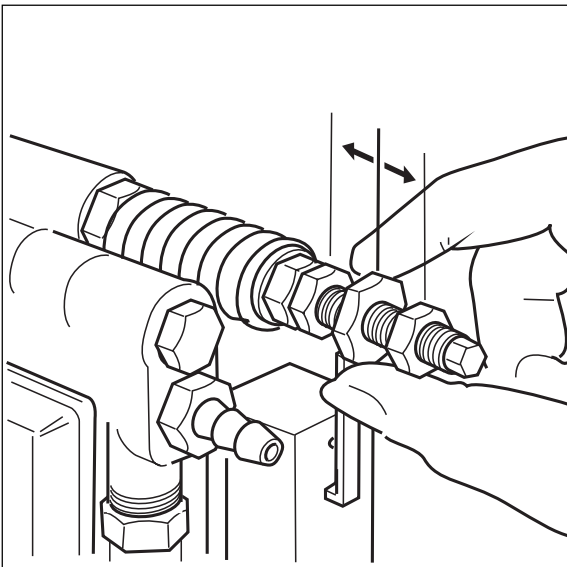
Unit does not reach required pressure



Set overflow valve

Setting overflow valve

- Always use a new high-pressure nozzle for the basic setting.
- Let the unit run with the Servopress handgun fully open.
- With the overflow valve adjusting nut, set the spring tension so that operating pressure is reached (see technical data).
- Secure the adjusting nut with the lock nut.



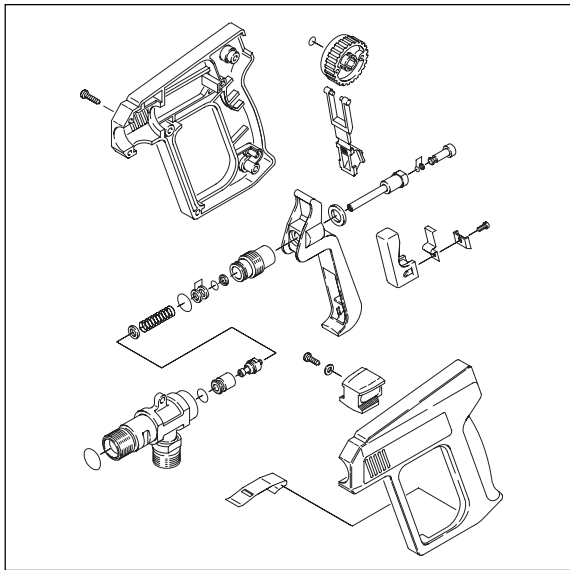
Adjust pressure switch

Setting pressure switch

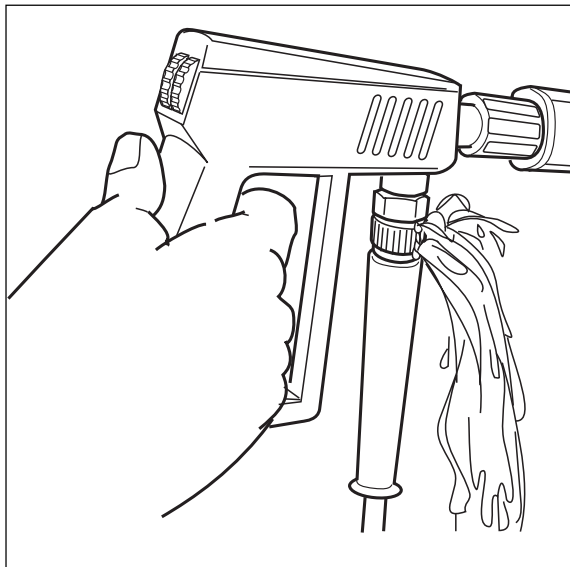
- Turn the unit off and release the pressure by opening the hand gun.
- Rotate the adjusting nut clockwise until it just makes contact with the switch arm.
- Secure the adjusting nut with the lock nut.

Troubleshooting and basic settings

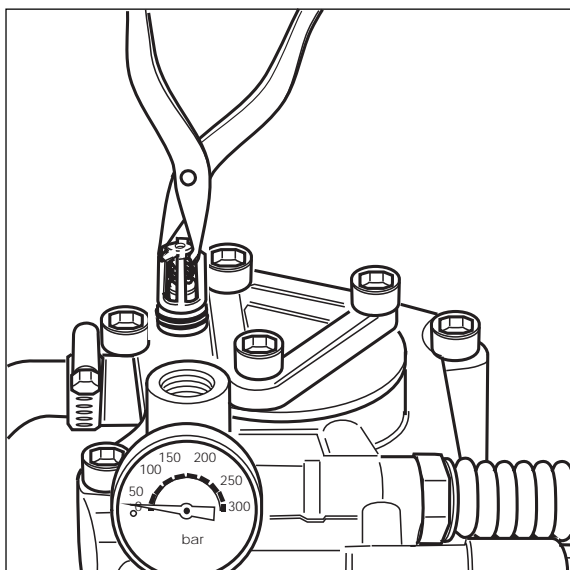
Unit switches on and off continuously



Servopress handgun disassembled



Water leak between high-pressure hose and O-ring



Remove pressure holding valve

Servopress handgun leaking

- Disassemble the handgun and check all components for any malfunction. Replace defective parts if necessary.
- Lubricate all O-rings and empty spaces in the union piece with anti-seize, copper grease compound.

High-pressure screwed connections leaking

- Check all O-rings and seals between the cylinder head connection and the handgun. If necessary replace defective parts.

Water leak at the cylinder head

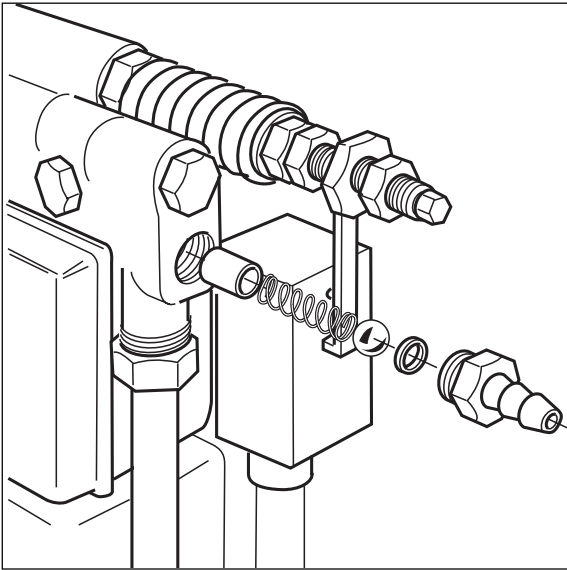
- Check all O-rings, screwed connections and seals at the cylinder head. If necessary replace defective parts.

Pressure holding valve leaking

- Remove threaded plug and pressure holding valve, check for leakage. Replace defective parts if necessary.

Troubleshooting and basic settings

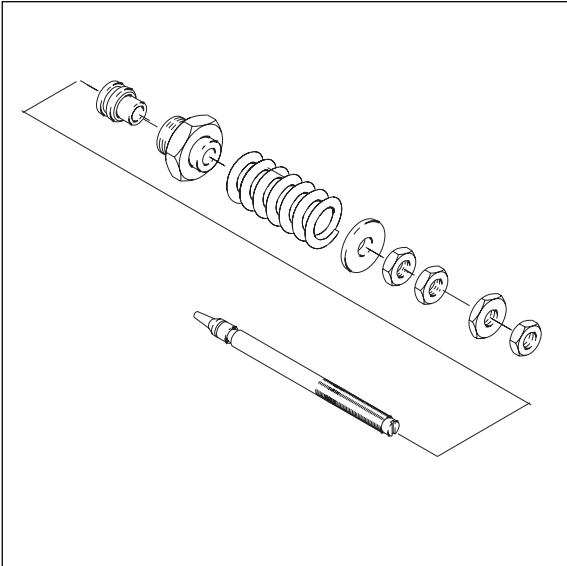
Unit switches on and off continuously



Detergent non-return valve

Detergent non-return valve leaking

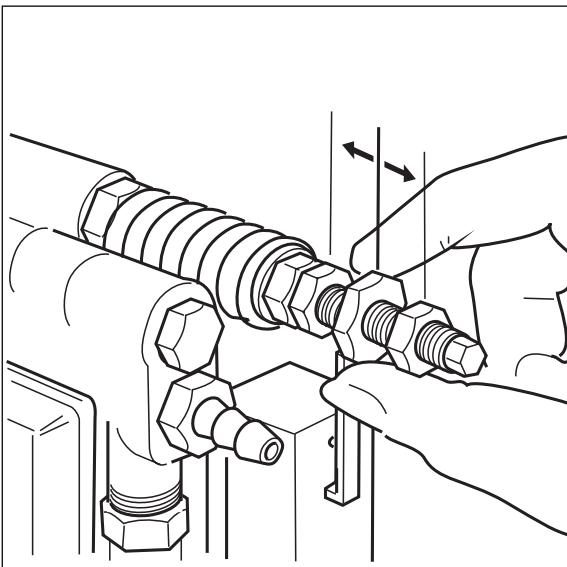
- Remove detergent non-return valve. If necessary replace defective parts. Do not grease steel ball and O-ring before installing.



Overflow valve disassembled

Overflow valve leaking

- Disassemble overflow valve completely and check all O-rings/support rings. Replace defective parts if necessary.
- Lubricate all O-rings with silicone grease 6.288-080.
- Adjustment, see page 22.



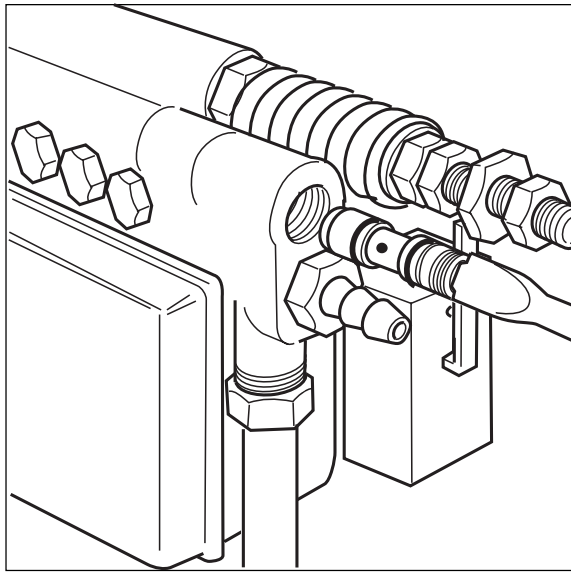
Adjust pressure switch

Setting pressure switch

- Unit switches on and off continuously when operated with the original accessories. Reset (see page 22).

Troubleshooting and basic settings

Unit switches on and off continuously



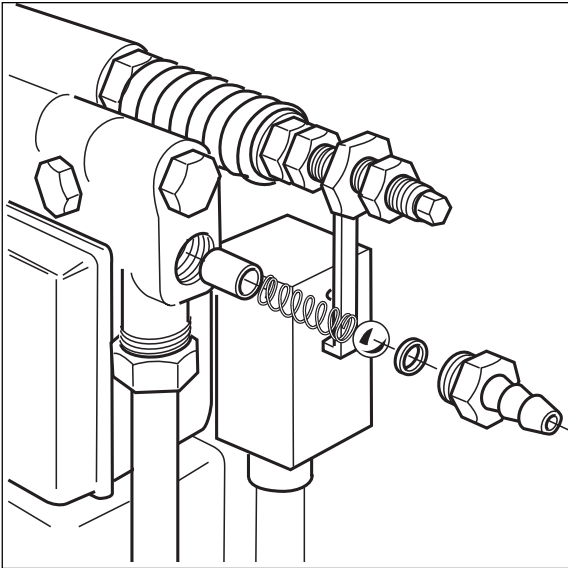
Unscrew control pressure injector

Control pressure injector defective

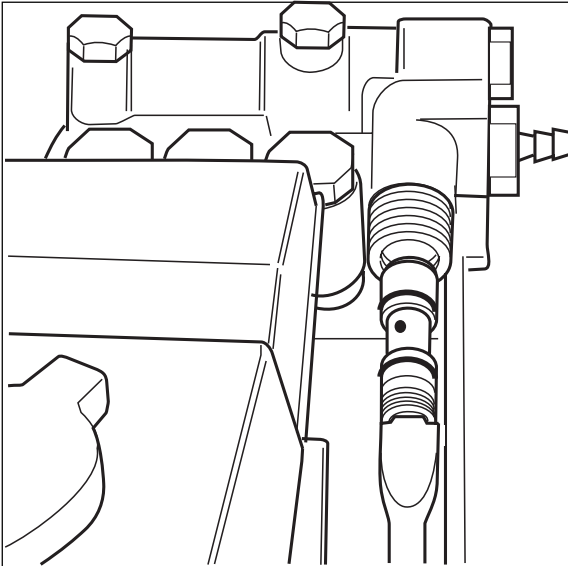
- Control pressure injector of overflow valve is washed out or the O-rings are defective.
- Unscrew the injector; the inside diameter must be $2.4 + 0.05$ mm. Replace if necessary.
- Grease the O-rings with silicone grease and remount.

Troubleshooting and basic settings

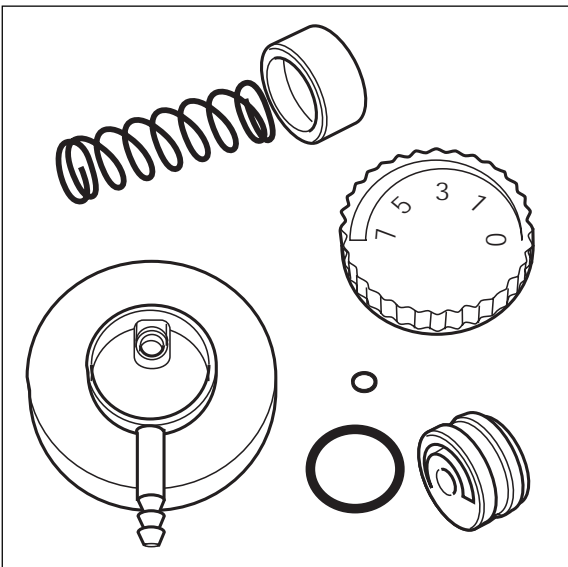
No detergent function



Detergent non-return valve dismantled



Unscrew the injector



Metering valve disassembled

Detergent non-return valve stuck

- Unscrew detergent connection, remove and clean ball, spring, plastic sleeve and O-ring. If necessary replace defective parts.

Washed-out injector

- If the injector is washed out, no detergent can be taken in.
- Unscrew injector, if necessary replace O-rings and injector.

Metering valve defective

- Disassemble and clean metering valve. Replace defective parts if necessary.

High-pressure hose defective/too long

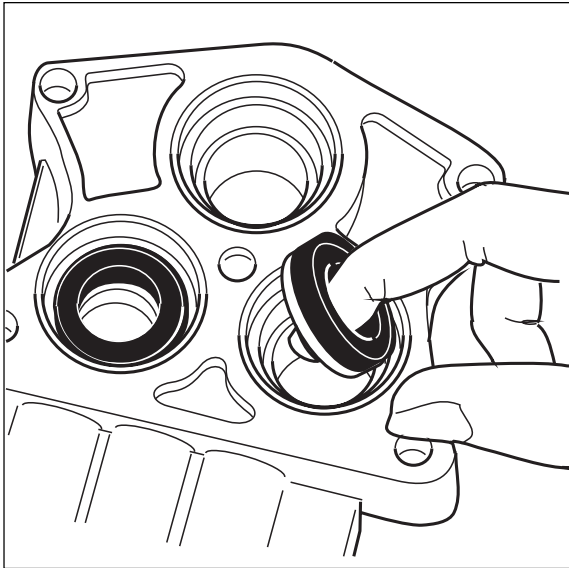
- Check the high-pressure hose for any crushed points. Replace if necessary.

Note:

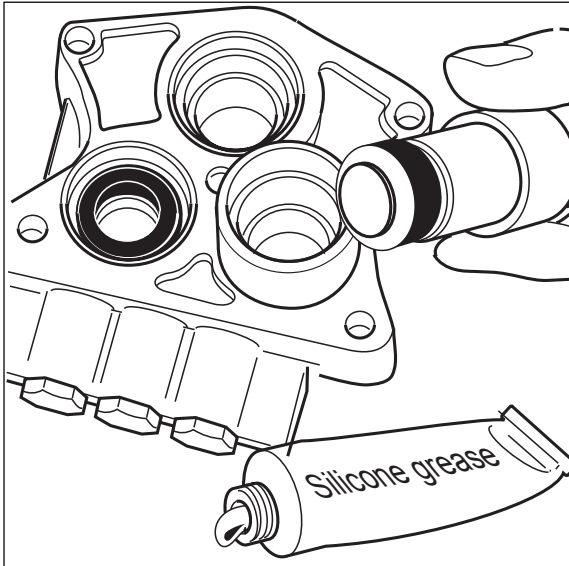
Extended hoses may create a high resistance. Change the nozzle (cross-section) if required.

Troubleshooting and basic settings

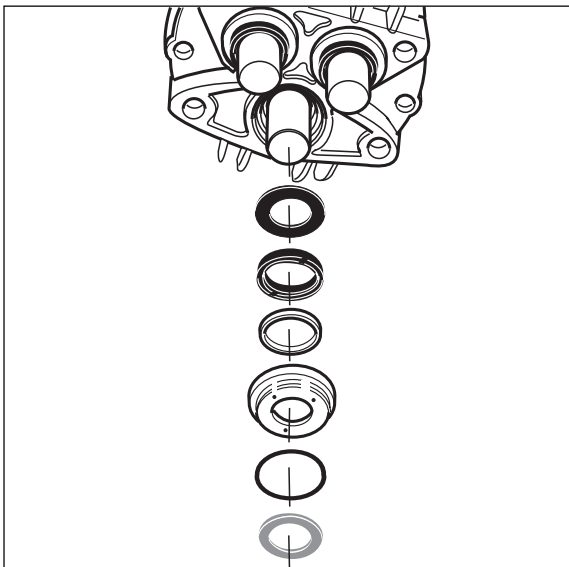
Water escaping between cylinder head and housing



Removing high-pressure seal



Install seal with mounting mandrel



Low-pressure seal disassembled

High-pressure seal defective

- A leak of one drop per minute per piston is permissible.
- Remove cylinder head head bolts and take off cylinder head.
- Carefully dismantle the high-pressure seals. Use an internal extractor if necessary.

Note:

Do not damage the sealing surface in the cylinder head.

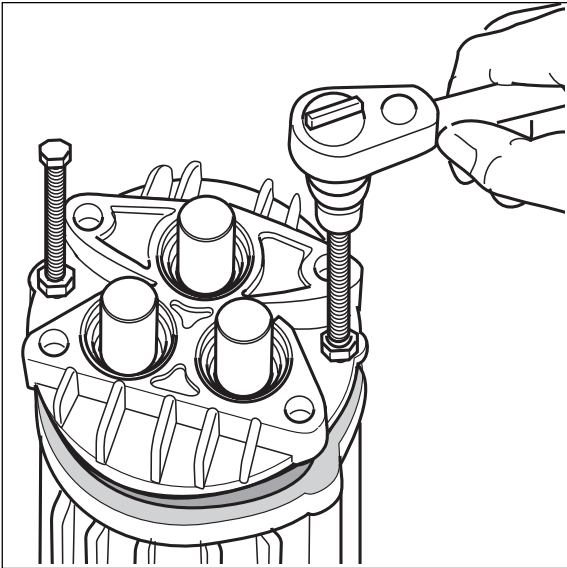
- Check all parts for defects. Replace if necessary.
- Grease any new high-pressure seals generously with silicone grease and install with the mounting mandrel (special tool).
- Pay attention to the mounting position: the sealing lips and support ring must point to the cylinder head.

Low-pressure seal defective

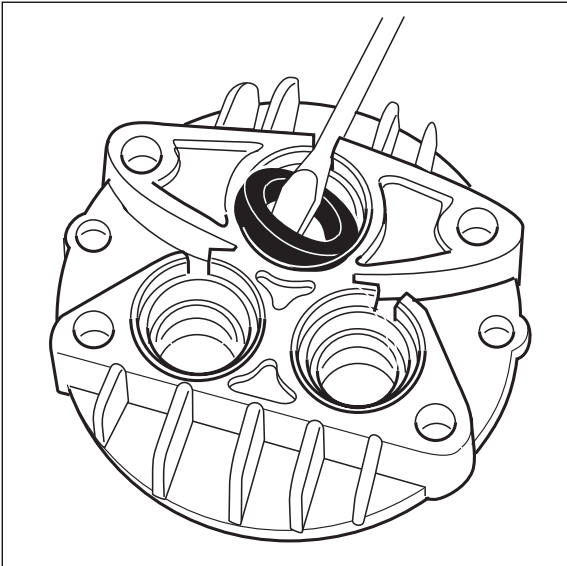
- Remove the low-pressure sealing bushing from the piston.
- Check all parts for defects. Replace parts if necessary.
- Grease all parts lightly with silicone grease and assemble.
- Pay attention to the mounting position of the low-pressure seal. The flat side should point to the brass washer.
- Assemble the cylinder head, observing tightening torque (see technical data).

Troubleshooting and basic settings

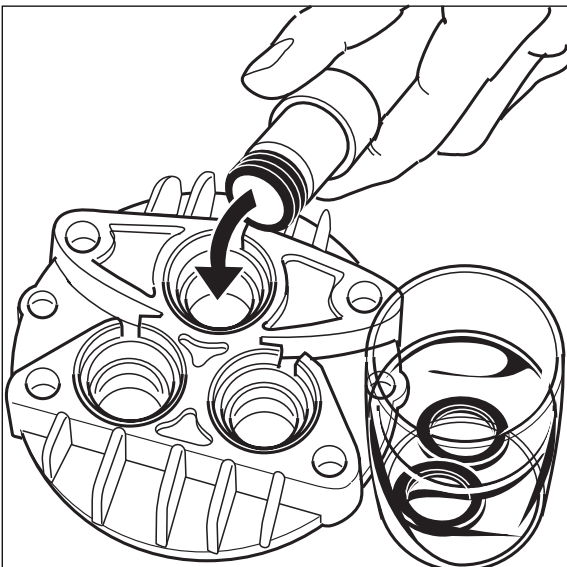
Oil escaping between cylinder head and housing



Dismantling housing



Remove oil seals



Install oil seals

Defective oil seal on piston

- Drain the oil into a suitable container.
- Remove the cylinder head.
- Replace both housing bolts with 2 mounting bolts (special tools).
- Using the mounting bolts, loosen the housing maintaining an even spring pressure against the pistons, making sure that the housing is not canted.

- Remove the housing with pistons and springs.
- Carefully lever out the oil seals from the housing.

Note:

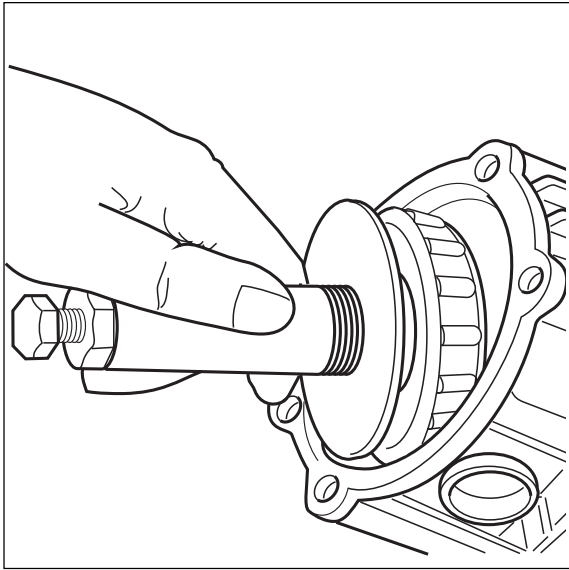
Do not damage the sealing surface. All parts must be checked for damage. Replace if necessary.

- Lay new oil seals in water for some time before mounting.

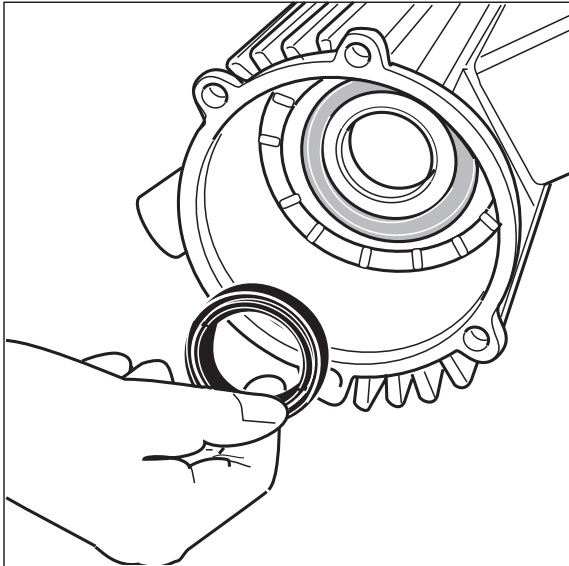
- Using the mounting mandrel (special tool), mount the oil seal in the piston housing without grease or oil.
- Pay attention to the mounting position of the seal: the sealing lip must point to the mounting mandrel.
- Oil the piston and assemble with springs. Grease the O-ring with silicone grease.
- Mount the piston housing with mounting bolts in the reverse order, paying attention to the torque (see technical data).
- Add new oil (see technical data).

Troubleshooting and basic settings

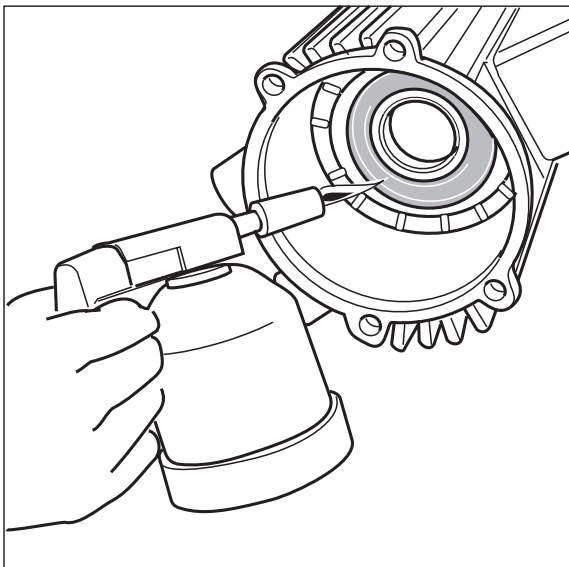
Swash plate/shaft sealing ring/motor bearing defective



Removing swash plate



Shaft sealing ring dismantled



Removing bearing ring (heating)

Swash plate defective

- Unscrew the swash plate retaining screw.
- With an extraction tool (special tool), pull the swash plate off the motor shaft.
- Remove the bearing ring from the swash plate.
- Press a new swash plate onto the bearing ring.
- Assemble all parts in the reverse order of disassembly.

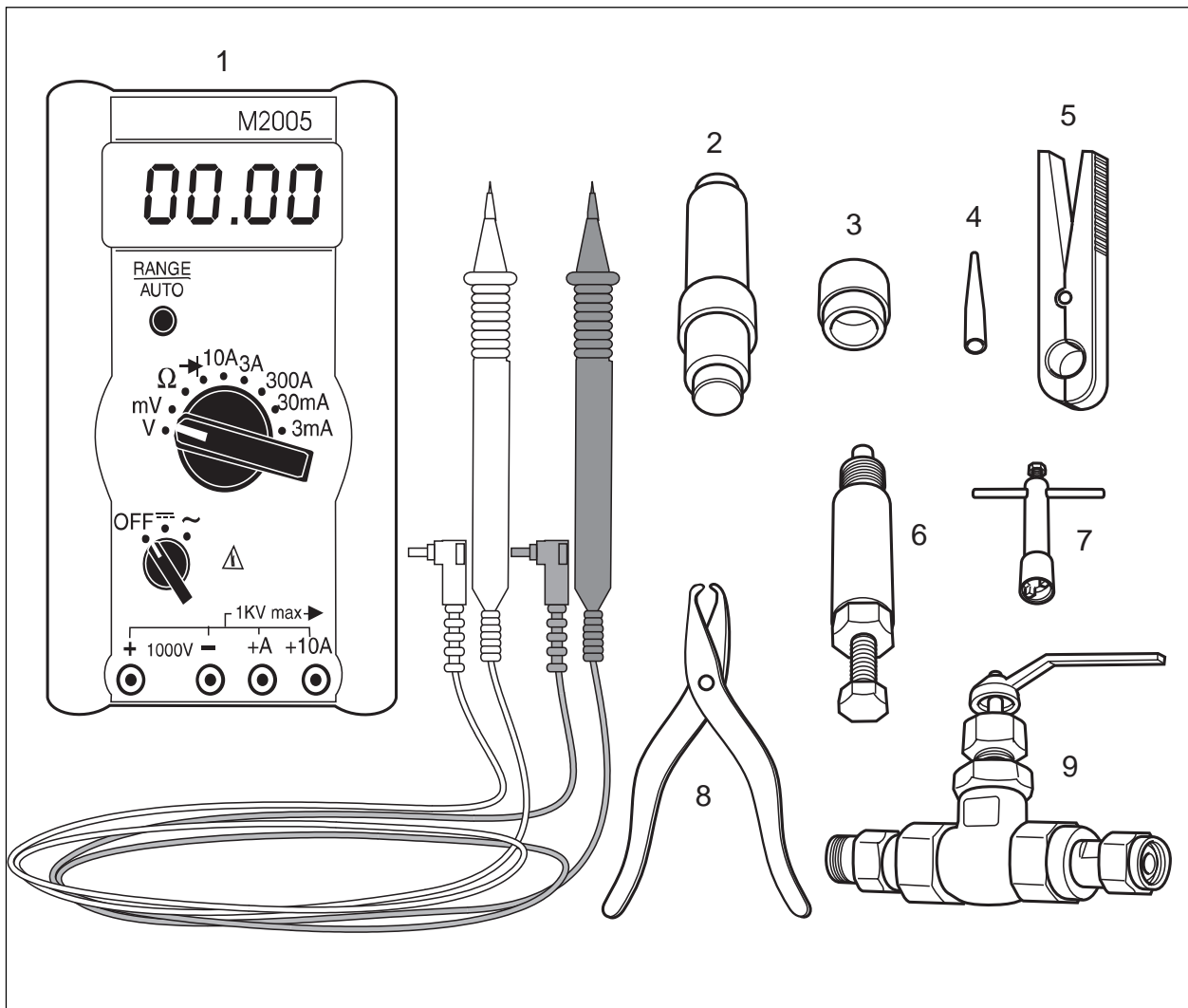
Shaft sealing ring defective

- Remove swash plate as described above.
- Remove motor fan wheel and rear housing cover.
- Pull out the motor rotor from the back.
- Knock out the shaft sealing ring frontwards.
- Install a new shaft sealing ring.
- Assemble all parts in the reverse order.

Motor bearing defective

- Dismantle all parts as described above.
- Remove the unit switch.
- Heat the motor housing evenly in the region of the bearing ring until the bearing ring falls out.
- Insert a new cold bearing ring while the housing is still hot.
- Assemble all parts in the reverse order.
- Pay attention to the torque, oil quantity, type and viscosity (see technical data).

Special tools



1	electric multimeter	6.681-037
2	mounting mandrel – high-pressure seal/oil seal	5.901-055
3	mounting sleeve – high-pressure seal	5.901-136
4	mounting mandrel – overflow valve	5.901-076
5	amperage conduct pliers	6.681-018
6	swash plate extractor	4.901-038
7	assembly/dismantling tool – overflow valve seat	4.901-054
8	valve pliers	4.901-062
9	shut-off valve	4.580-034
	assembly screws M6x80 with long thread (no illustration)	7.304-469 2x

Technical data

Values all versions

Water inlet temperature (max.)	60 °C
Inlet hose length (min.) /diameter (min.)	7.5 m 3/4 inch
Suction height from open tank	1 m
Water inlet volume (min.)	1000 L/h

Tightening torque

Cylinder head screws	50-60 Nm
Swash plate	12-15 Nm
Detergent connection	15 Nm
Blower wheel	12-15 Nm
Pressure holding valve screw plug	50 Nm
Suction valve lid	42-45 Nm
Overflow valve seat	3-5 Nm
Oil outlet screw	20-25 Nm
Pressure valve screw plug	50 Nm

Other

Oil type/viscosity	1-phase motor, SAE 15W 40
Oil type/viscosity	3-phase motor, SAE 90
Oil quantity	750 ml
Weight without accessories	53 kg
Capacity of cleaning agent tank	10 L
Noise level (DIN 45635)	74 dB(A)

Technical data

Cleaner No.	Circuit diagram	Supply voltage/ Type of current	Current consumption	Thermo-contact
	No.	Volt / ph / Hz	Amp.	Amp.
1.951-111	0.087-804	400 / 3 / 50	< 16.0	14.5
1.951-261	0.087-804	230 / 3 / 50	< 25.0	26.0
1.951-281	0.087-804	400 / 3 / 50	< 16.0	14.5
1.951-291	0.087-804	400 / 3 / 50	< 16.0	14.5
1.951-681	0.087-804	440 / 3 / 60	< 13.0	14.0 - 14.5
1.951-761	0.087-804	230 / 3 / 60	< 25.0	26.0
1.951-811	0.087-804	230 / 1 / 60	< 29.0	30.0 - 30.5
1.951-841	0.087-804	240 / 1 / 60	< 29.0	30.0 - 30.5

Cleaner No.	High pressure nozzle	Water volume, full load	Working pressure, full load	Cleaning agent, full load
	Size	l/min	bar	l/min
1.951-111	0.47	> 14.0	230-240	> 0.5
1.951-261	0.47	> 14.0	230-240	> 0.5
1.951-281	0.47	> 14.0	230-240	> 0.5
1.951-291	0.47	> 14.0	230-240	> 0.5
1.951-681	0.47	> 14.0	230-240	> 0.5
1.951-761	0.47	> 14.0	230-240	> 0.5
1.951-811	0.06	> 14.5	160-170	> 0.5
1.951-841	0.06	> 14.5	160-170	> 0.5