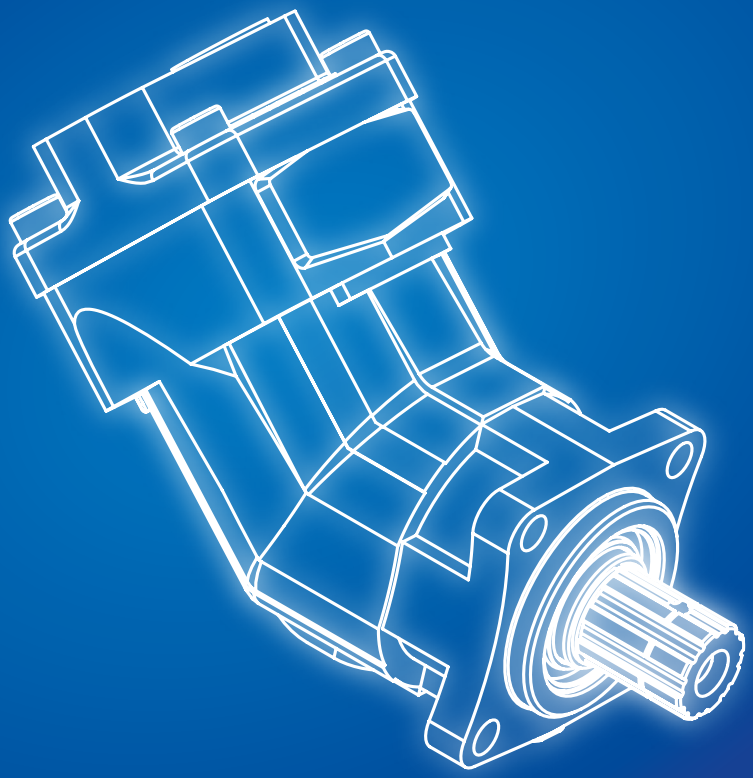
HYDROSILA



Axial piston bent-axis pumps and motors

series PBF20TH

HS-AB-01/012026

PBF20TH-SERIES FIXED DISPLACEMENT AXIAL PISTON PUMPS

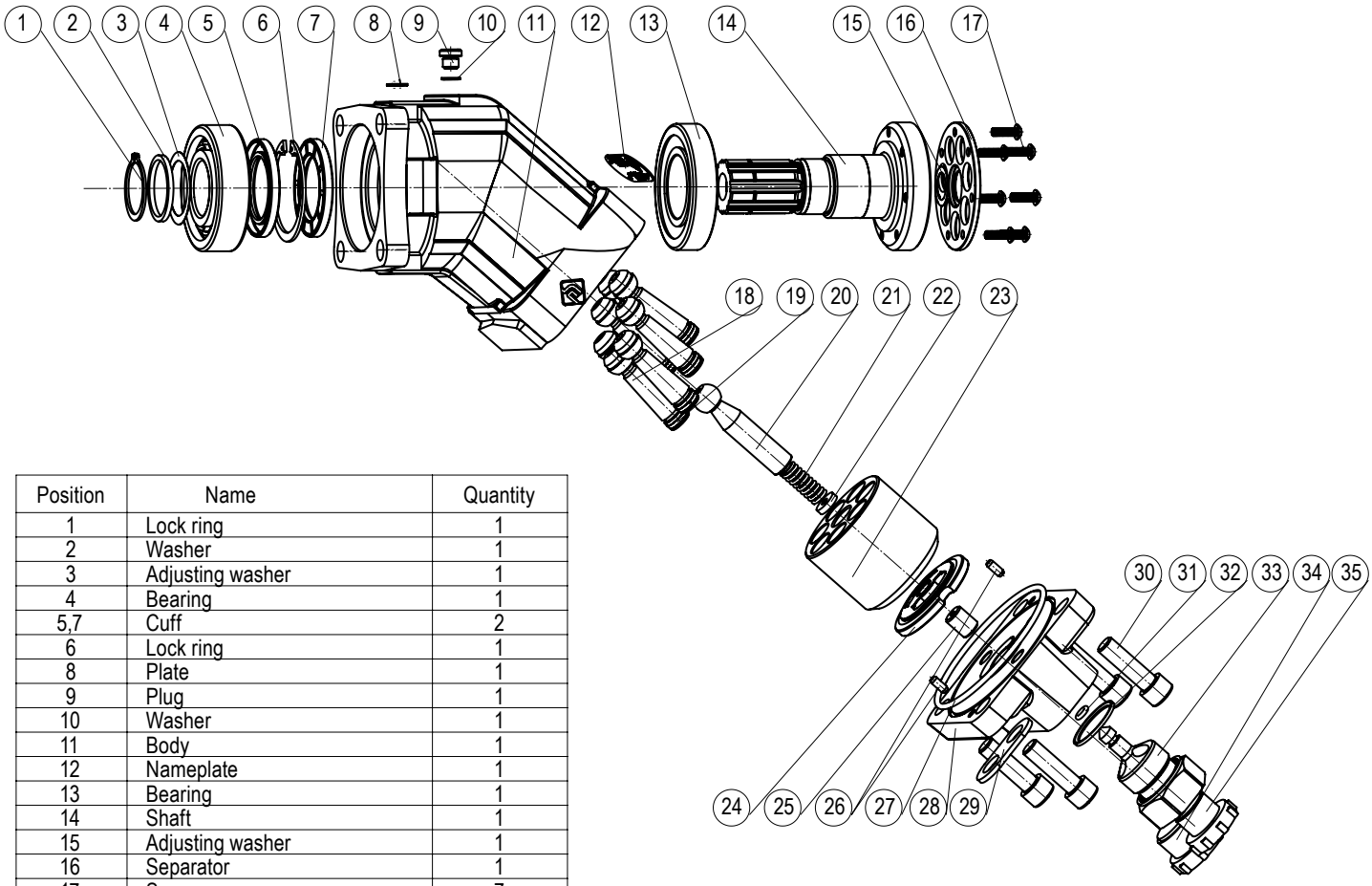
FEATURES

The PBF20TH series is a range of fixed displacement axial piston pumps with displacements from 56 to 107 cm³. They are designed for use in hydraulic systems with a nominal pressure of up to 350 bar. Mounting flanges meet ISO international standards.
Pumps are available with either clockwise or counterclockwise shaft rotation, and the rotation direction can be easily reversed if required. The design allows direct installation on a power take-off (PTO) unit.

These pumps are intended for hydraulic systems of mobile equipment built on truck chassis, including dump trucks, loader and forestry cranes, hook lifts, aerial platforms, plough trucks, and other machinery.

- Bent-axis design, single-flow pump.
- Cast iron body.
- Conical pistons with compressive rings.
- Bimetal cylinder block of the pumping unit has a high wear-resistance.
- No drain line is required.
- Mounting directly on PTO.
- Simple change of rotation.

PBF20TH PUMPS LAYOUT, ALL SIZES



Position	Name	Quantity
1	Lock ring	1
2	Washer	1
3	Adjusting washer	1
4	Bearing	1
5,7	Cuff	2
6	Lock ring	1
8	Plate	1
9	Plug	1
10	Washer	1
11	Body	1
12	Nameplate	1
13	Bearing	1
14	Shaft	1
15	Adjusting washer	1
16	Separator	1
17	Screw	7
18	Piston	7
19	Compression ring	7
20	Pin	1
21	Spring	1
22	Thrust washer	1
23	Cylinder block	1
24	Valve plate	1
25	Pin-orifice	1
26	Pin	2
27	O-ring	1
28	Cover	1
29	Lifting eye	1
30	Screw	4
31	O-ring	1
32	Shaped sealing ring	1
33	Pressure adapter	1
34	Plug	1
35	Transport plug	1

ORDERING INSTRUCTIONS

PBF20	TH	.	63	/	R	E8	1	N			

FIXED DISPLACEMENT AXIAL PISTON PUMP	PBF20TH

SERIES	CODE
Cast iron body	TH

DISPLACEMENT, CM³		CODE
56	●	56
63	●	63
80	●	80
107	●	107

ROTATION	CODE
Clockwise	R
Counterclockwise	L

SHAFT OPTIONS		CODE
Splined shaft to DIN ISO 14	●	E8
Splined shaft to DIN ISO 14 with coupling	○	C8

* SPECIAL FEATURES

CLIMATIC VERSION	CODE
Temperate	N
Tropical	T

WORKING PORTS OPTION		CODE
Two threaded ports on the rear	●	1
Two threaded ports on the rear with suction branch pipe	○	2

SUCTION SLEEVE	CODE
Straight	0
Angle 45°	1
Angle 90°	2

* Special option code - assigned if necessary after agreement of special conditions with the customer

Notes: ● Standart; ○ Optional; **-** Not available

ORDERING EXAMPLE

PBF20TH.63/LE81N

PBF20TH - fixed displacement bent-axis axial piston pump
63 - displacement 63 cm³,
L - counterclockwise rotation,
E8 - drive shaft: splind, acc. to DIN ISO 14,
1 - ports options,
N - climatic version - temperate.

TECHNICAL DATA

SIZE		PBF20TH.56	PBF20TH.63	PBF20TH.80	PBF20TH.107
Displacement, Vg	cm^3	56,1	63	80,4	106,7
Speed					
minimum		500			
rated, at inlet pressure P_{abs}=0,8 bar	min^{-1}	1870		1830	1700
maximum, at inlet pressure P_{abs}=1,0 bar		2200		2150	2000
maximum, at inlet pressure P_{abs}=2,0 bar		3200		3100	2800
Pressure, P					
rated	bar	350			
maximum, t≤6 sec		400			
Inlet pressure, P					
minimum	bar	0,8			
rated		1			
maximum		2			
Flow*, Q					
minimum	l/min	28	32	40	53
rated		105	118	147	181
maximum		123	139	173	213
limit		180	202	249	299
Input power*, N					
rated, at inlet pressure P_{abs}=0,8 bar and pressure drop Δp=350 bar	κW	61	69	86	106
maximum, at inlet pressure P_{abs}=1,0 bar and pressure drop Δp=400 bar		82	92	115	142
Efficiency					
hydromechanical		0,96			
volumetric		0,95			
Weight (without fluid), no more	kg	11		13,9	19,2

* Without efficiency

FORMULAS

Flow $$Q = \frac{V_g \cdot n \cdot \eta_v}{1000} \text{ [l/min]}$$

Input torque $$T = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}} = \frac{1.59 \cdot V_g \cdot \Delta p}{100 \cdot \eta_{mh}} \text{ [N·m]}$$

Input power $$P = \frac{2 \cdot \pi \cdot T \cdot n}{60000} = \frac{Q \cdot \Delta p}{600 \cdot \eta_t} \text{ [kW]}$$

V_g — displacement (cm^3)

Δp — pressure drop (bar)

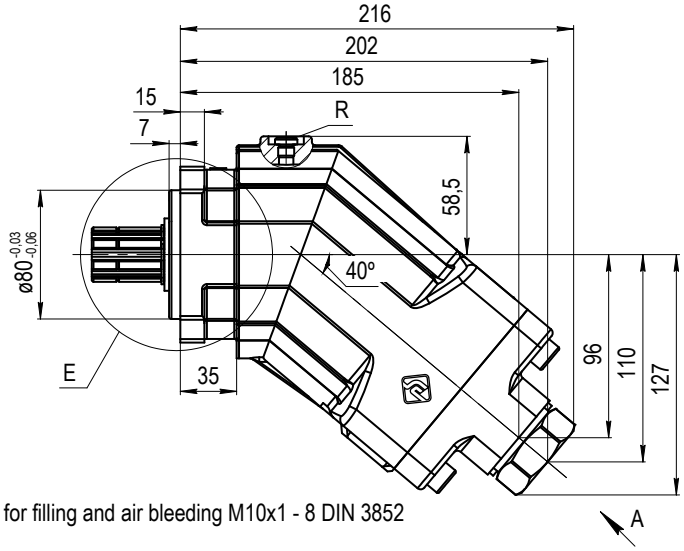
n — speed (min^{-1})

η_v — volumetric efficiency

η_{mh} — hydromechanical efficiency

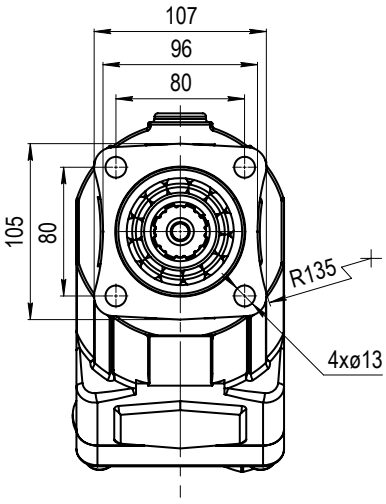
η_t — overall efficiency

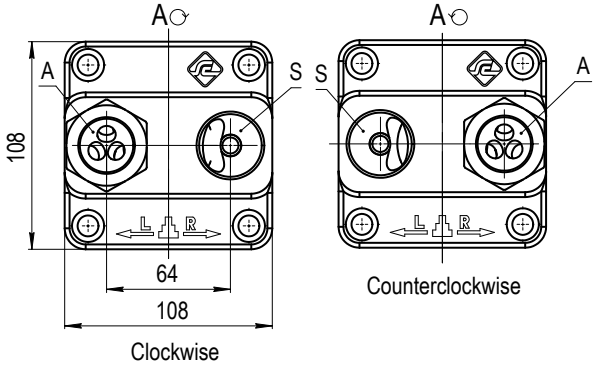
PBF20TH PUMP DIMENSIONS, SIZE 56 AND 63 CM³



R - port for filling and air bleeding M10x1 - 8 DIN 3852

Mounting flange ISO 7653-1985

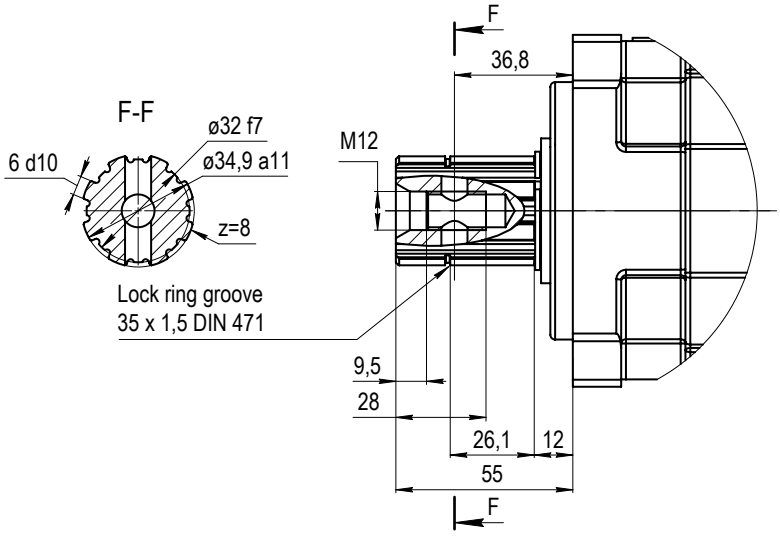




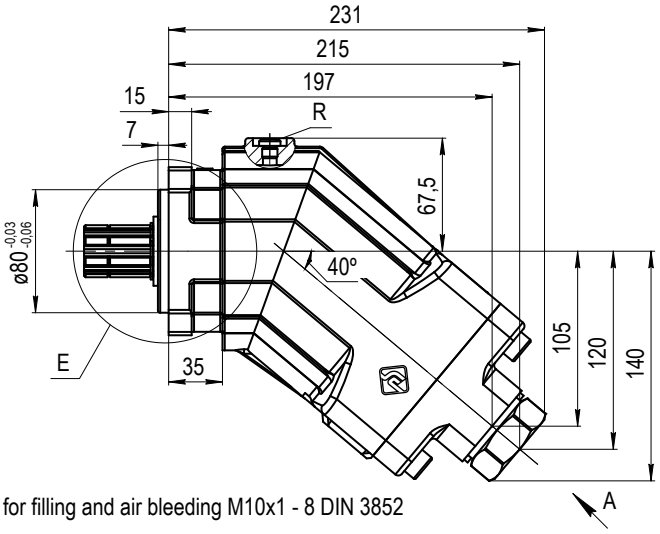
A - pressure line G3/4 - 16 DIN ISO 228
S - suction line G1 - 18 DIN ISO 228

E

Splined shaft E8 - 8x32x35 DIN ISO 14

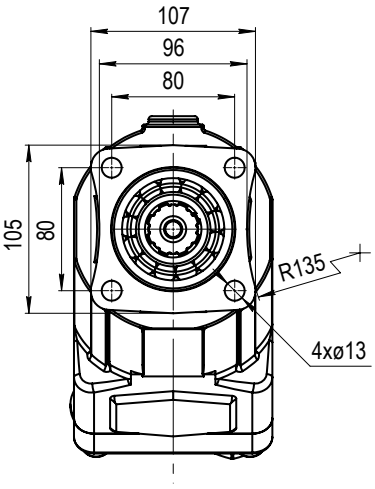


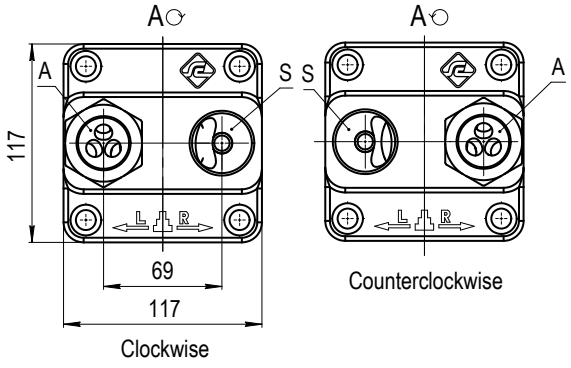
PBF20TH PUMP DIMENSIONS, SIZE 80 CM³



R - port for filling and air bleeding M10x1 - 8 DIN 3852

Mounting flange ISO 7653-1985

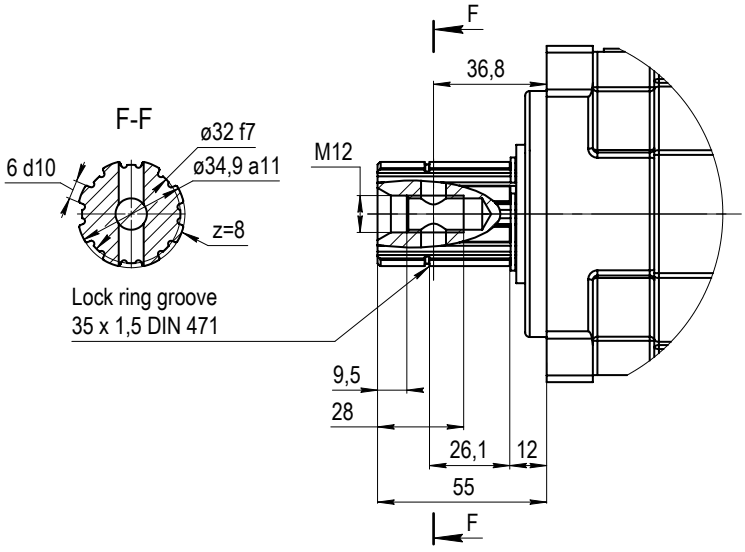




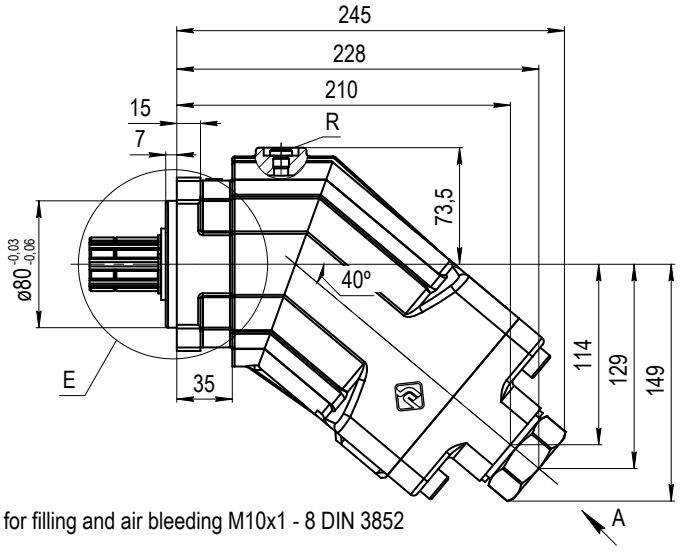
A - pressure line G1 - 18 DIN ISO 228
S - suction line G1 1/4 - 20 DIN ISO 228

E

Splined shaft E8 - 8x32x35 DIN ISO 14

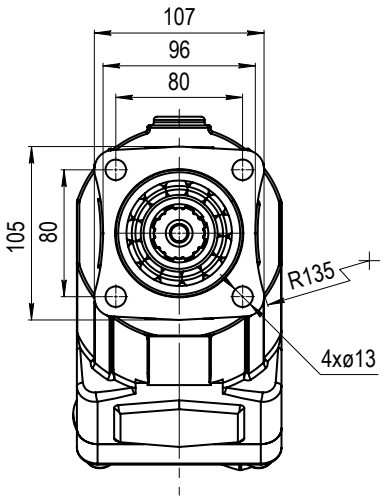


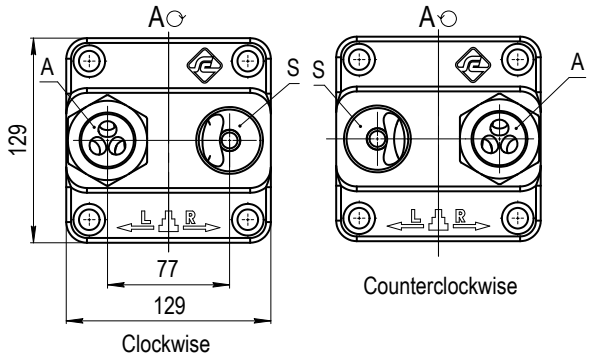
PBF20TH PUMP DIMENSIONS, SIZE 107 CM³



R - port for filling and air bleeding M10x1 - 8 DIN 3852

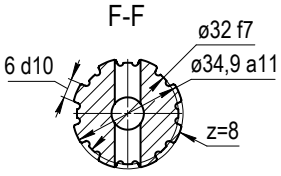
Mounting flange ISO 7653-1985



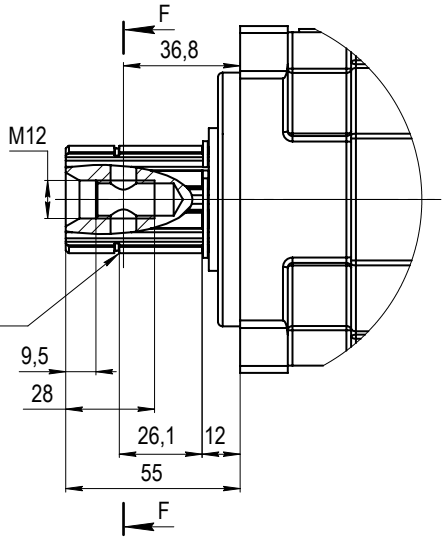


A - pressure line G1 - 18 DIN ISO 228
S - suction line G1 1/4 - 20 DIN ISO 228

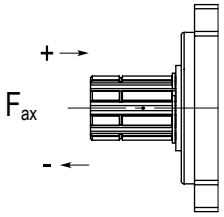
E
Splined shaft E8 - 8x32x35 DIN ISO 14



Lock ring groove
35 x 1,5 DIN 471



LOAD AND DURABILITY



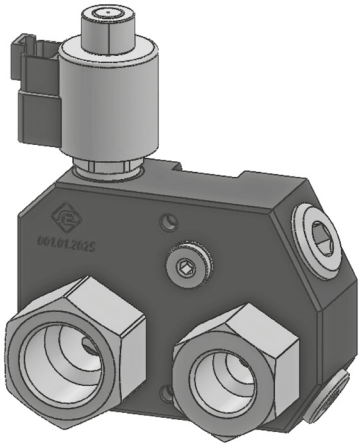
PERMISSIBLE AXIAL AND RADIAL FORCES ON THE DRIVE SHAFT

CHARACTERISTICS		56	63	80	107
A distance to force F from the shaft collar, a, mm		21,5			
Maximum axial force (during standby, no pressure in hydraulic system), F_{ax}	N	0			
Permissible axial force (per bar operating pressure), F_{ax}	$+F_{ax}$, N/bar	50	53	60	71
	$-F_{ax}$, N/bar	0			

NOTE

The direction of the maximum permissible axial force must be consider:
at $-F_{ax}$ - bearing durability is reduced;
at $+F_{ax}$ - bearing durability is increased.

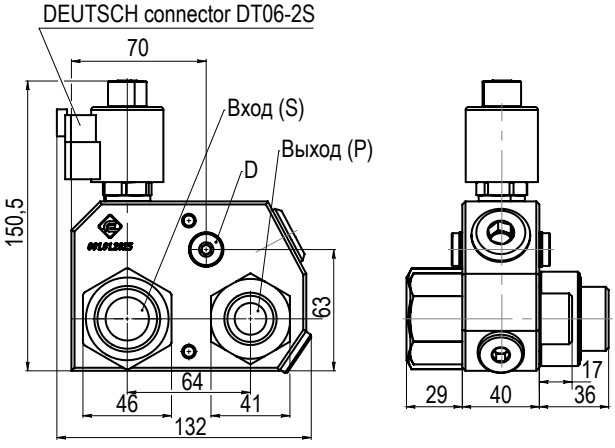
BY-PASS VALVE FOR PBF20TH-SERIES PUMPS



This valve module is designed for hydraulic systems where the pump is driven directly by a power take-off (PTO) that cannot be disengaged. It integrates a poppet-type logic element controlled by a normally open solenoid valve.
Operating Principle.
Solenoid de-energized (default state):
The poppet valve is open, allowing flow from port P to port S (bypass to tank) with minimal pressure drop. This reduces load on the pump during vehicle transit when hydraulics are not in use. Opening the bypass valve during transit prevents energy loss and protects the pump by ensuring it runs unloaded at high speeds.
Solenoid energized:
The poppet is held closed, directing full pump flow from port P to the hydraulic directional control valve. System pressure becomes available for hydraulic actuation.

Port D used optionally to discharge a small volume of oil directly to tank for oil cooling. This valve module can be used in combination with switchable PTOs for additional control. It is mounted directly on the pump using banjo fittings, simplifying installation and reducing space requirements.

DIMENSIONS



TECHNICAL DATA

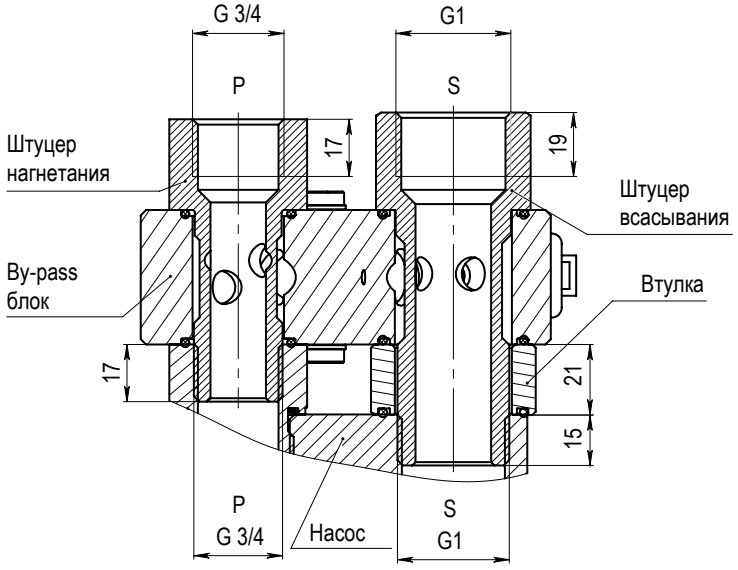
Pump size	PBF20TH.45/56/63
Ordering code, 12V	BP20TH.63-00-00
Ordering code, 24V	BP20TH.63-00-00-01
Max. working pressure	400 bar
Port S	G1
Port P	G 3/4
Port D	G 1/4
Weight	3,4 kg
Ambient temperature range	-40°C to +80°C

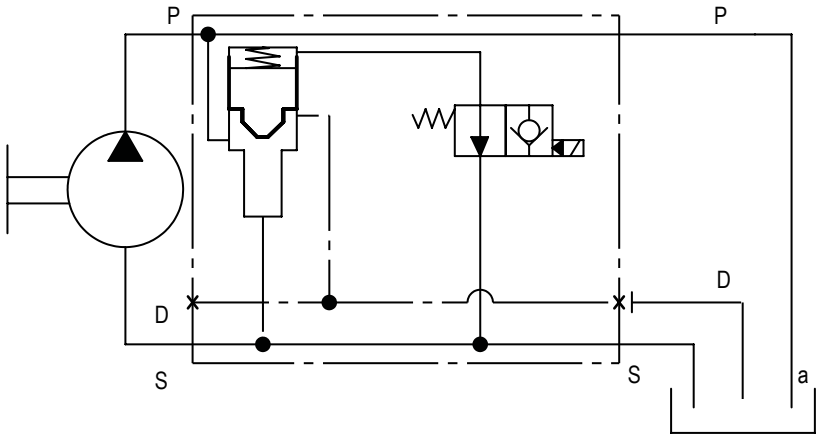
COIL DATA

Power at 20°C	20,5 W
Duty cycle	ED 100%
Protection class	IP67
Coil insulation class	H (180°C)
Wire insulation class	H (185°C)

INSTALLATION INSTRUCTIONS

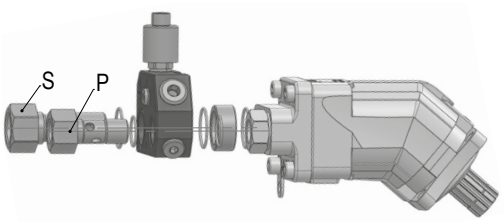
To prevent overheating of the pump during vehicle movement, it is essential to maintain a continuous flow of at least 5 l/min to the tank via port "a" (as shown in the schematic). This requirement applies when the valve is in by-pass mode (i.e., solenoid de-energized) and the system uses an open center main directional valve block.
If the flow to tank through port "a" drops below 5 l/min - which may occur due to a high pressure drop in the main directional control valve - or if the system uses a closed center directional control valve, it is strongly recommended to install an external drain line from port "D" directly to tank to ensure proper cooling and avoid pump overheating.
Refer to the schematic for proper external drain routing.





Hydraulic circuit

MOUNTING INSTRUCTIONS

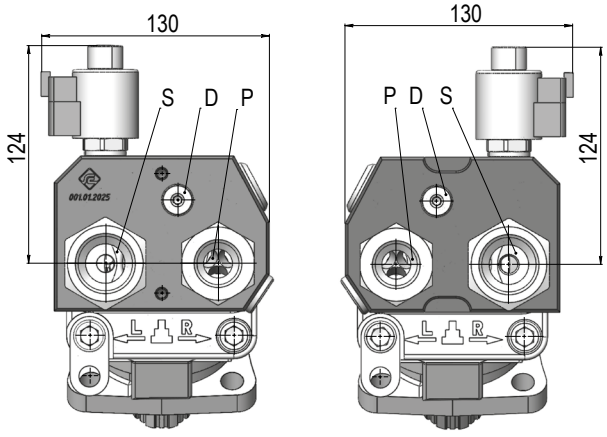


Bypass valve mounting procedure:
1. Clean the surfaces of the pump and the bypass valve from any contaminants.
2. Apply grease to the O-rings.
3. Install and tighten the pressure port fitting, ensuring that the surfaces of the valve and rear cover are in full contact. Tighten according to the torque specified in the table.
4. Install the suction port fitting with the sleeve and fasten it to the cover. Make sure the surfaces of the valve and rear cover are in full contact. Tighten according to the torque specified in the table.
5. Electrical connection: the bypass valve is normally open. To enable oil flow, voltage must be applied to the solenoid valve.

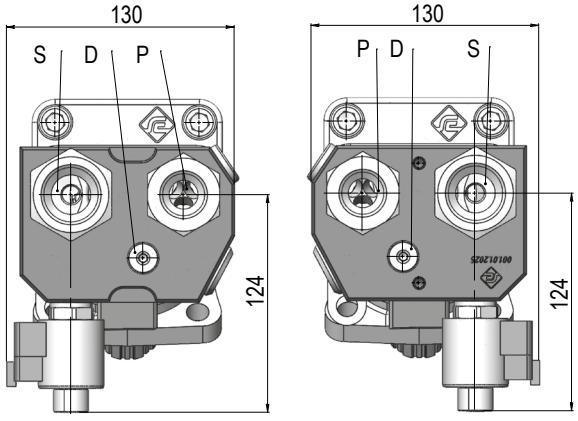
TIGHTENING TORQUE

Pump size	Port P, Nm	Port S, Nm	Port D, Nm
PBF20TH.45/56/63	110	140	40

MOUNTING POSITIONS



Counterclockwise rotation



Clockwise rotation

HYDRAULIC FLUID

Achieving the specified performance and operating parameters of hydraulic units is possible only when using high-quality hydraulic fluids with additives in the hydraulic system. Such fluids must possess a range of properties, including anti-corrosion, anti-oxidation, anti-foaming, and others. These requirements are met by premium turbine oils, machine oil of API CD SAE J183 grade, automatic transmission fluids (ATF), and certain special-purpose fluids.

Never mix different types of fluids.

HYDRAULIC FLUID CHOICE

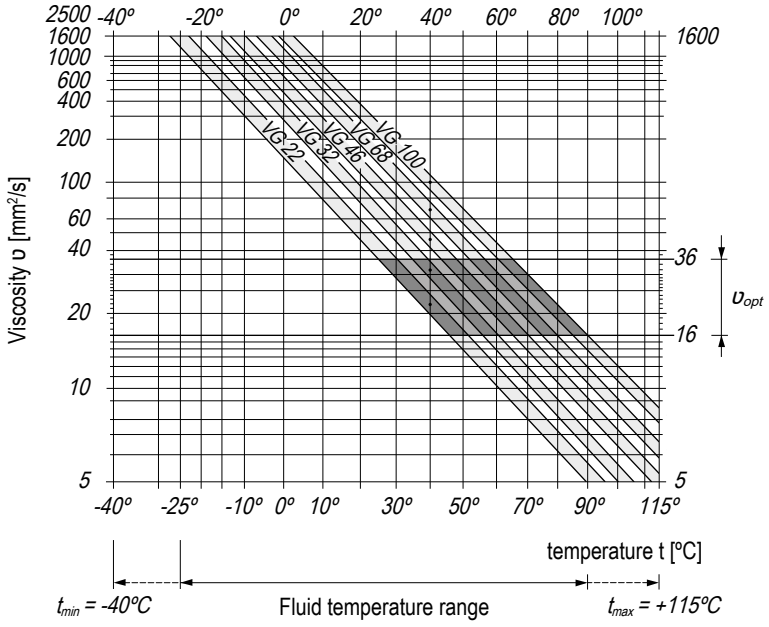
For proper selection, it is necessary to know the operating fluid temperature in the hydraulic tank (depending on ambient temperature) and the fluid viscosity. The fluid should be selected so that its viscosity remains within the permissible range (Vopt) at all temperatures (tmin–tmax) — see diagram. It is recommended to select a working fluid with a higher temperature class accordingly.

Example.

At an ambient temperature of X °C, the operating fluid temperature is determined to be 60 °C. Within the optimal operating viscosity range (Vopt), this corresponds to VG 46 and VG 68 classes. In this case, VG 68 should be selected. The temperature of the fluid in the drain line is always higher than in the tank. At no point in the hydraulic system should the operating fluid temperature exceed 90 °C.

If it is not possible to maintain the required temperature conditions under maximum operating load, please consult for advice.

SELECTION DIAGRAM



HYDRAULIC FLUID FILTRATION

Improved filtration precision results in a higher hydraulic fluid cleanliness class, thereby increasing the service life of the axial piston unit. For reliable operation of the axial piston assembly, the hydraulic fluid cleanliness must comply with ISO 4406. At very high operating fluid temperatures (from 90 °C up to a maximum of 115 °C), a cleanliness class of at least 19/17/14 according to ISO 4406 is required.

If it is not possible to maintain the required cleanliness class, please consult for advice.

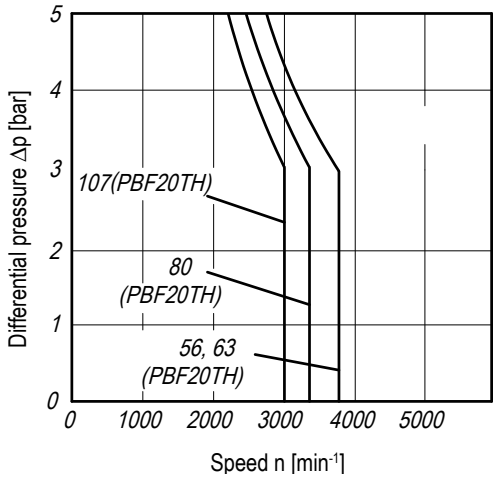
VISCOSITY AND TEMPERATURE OF WORKING FLUID

CONDITIONS	VISCOSITY	TEMPERATURE	NOTES
Storage and transportation		$T_{min} \geq -40°C$ $T_{opt} = +5°C…+20°C$	Storage at the factory: Standard - up to 12 months; Long-term - up to 24 months
Cold start	$\upsilon_{max} \leq 1600$ mm²/s	$T \geq -40°C$	$t \leq 3$ min, $n \leq 1000$ min^{-1}, no load $P \leq 50$ bar
Permissible temperature drop		$T \leq 25°C$	The temperature difference between the axial piston pump and the working fluid in the system
Warm-up period	$\upsilon = 1600...400$ mm²/s	$T = -40°C…-25°C$	at $P \leq 0.7 \cdot P_{nom}$, $n \leq 0.5 \cdot n_{nom}$ $t \leq 15$ min
Continuous operating mode	$\upsilon = 400...10$ mm²/s		In case of VG 46 corresponds to a temperature range of + 5°C to + 85°C
		$\Delta T = 12°C$ $T = -25°C…+103°C$	The temperature difference between the cuff, bearing and drainage Temperature in drain line
	$\upsilon_{opt} = 36...16$ mm²/s		Optimal viscosity range in operating mode
Short-term operating	$\upsilon_{min} \geq 7$ mm²/s	$T = +103°C$	$t < 3$ min, $p < 0.3 \cdot P_{nom}$

SHAFT SEAL

The service life of the shaft seal depends on the shaft rotational speed and the drain pressure. The diagram shows the relationship between the shaft speed and the pressure exerted from the pump housing side onto the seal. When operating the hydraulic unit at the maximum permissible drain pressure, the shaft seal service life is reduced.

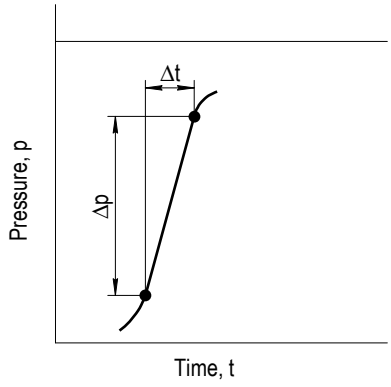
Short-term pressure peaks (t < 0.1 s) up to 10 bar are permissible; however, with an increase in pressure pulsation frequency, the service life of the shaft seal decreases. The case pressure must be equal to or higher than the ambient pressure.



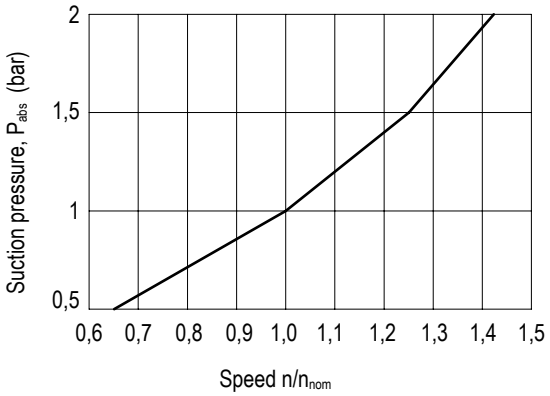
Maximum case pressure - 3 bar.

SUCTION PRESSURE AT INCREASED SPEED

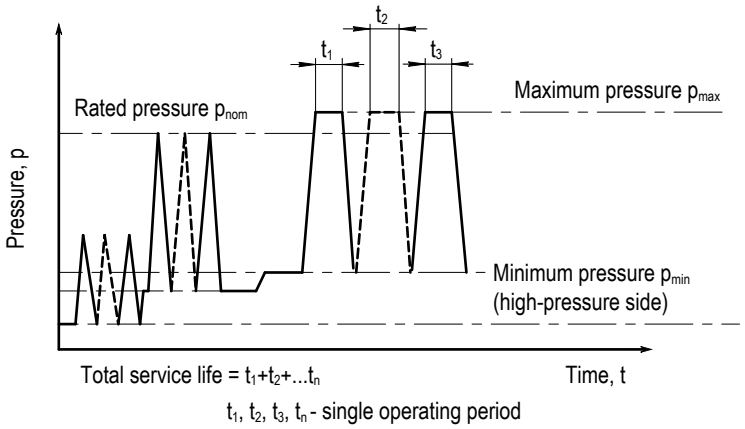
PRESSURE CHANGE RATE



SHAFT ROTATION SPEED TO SUCTION PRESSURE RATE



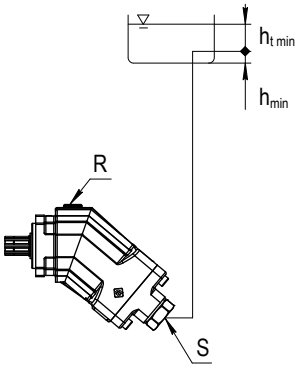
OPERATING PERIODS OF THE PUMP THROUGHOUT THE ENTIRE SERVICE LIFE



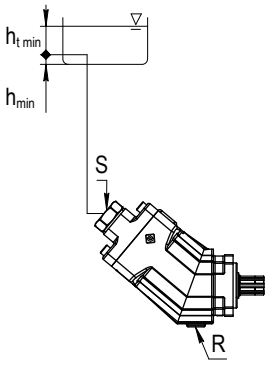
INSTALLATION POSITION FOR PUMPS PBF20TH

Below-reservoir installation (pos. 1 and 2)

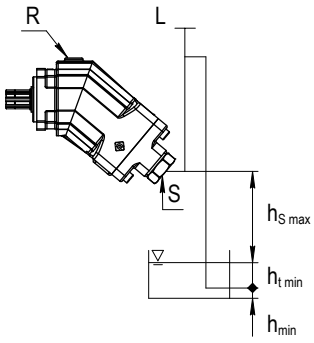
Below-reservoir installation means that the axial piston unit is installed outside of the reservoir below the minimum fluid level. **Installation in positions 1 and 2 is recommended.**



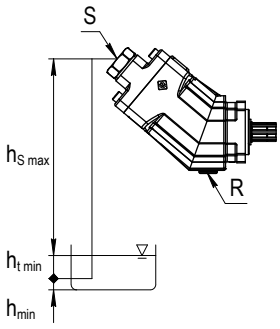
Pos. 1



Pos. 2



Pos. 3



Pos. 4

INSTALLATION POSITIONS	AIR BLEED	FILLING
Pos. 1	R	S
Pos. 2	-	S

Above-reservoir installation (pos. 3 and 4)

Above-reservoir installation means, that the axial piston unit isinstalled above the minimum fluid level.

INSTALLATION POSITIONS	AIR BLEED	FILLING
Pos. 3	R	L
Pos. 4	S	S

S Suction line

R Air bleed

L Filling

$h_{t\,min}$ Minimum required loading depth 200 mm

h_{min} The minimum required distance to the bottom of the tank 100 mm

$h_{S\,max}$ Maximum permissible suction height (800 mm)

MOUNTING INSTRUCTIONS

During commissioning and operation, the axial piston unit must be filled with hydraulic fluid and air bled. This must also be observed following a relatively long standstill as the axial piston unit may drain back to the reservoir via the hydraulic lines.
In case of "above reservoir" installation filling and air bleeding must be carried out completely as there is, for example, a danger of dry running.
To achieve lower noise levels, connect all hydraulic lines using flexible hoses and avoid "above reservoir" installation.
In all operating conditions, the drain line must flow into the reservoir below the minimum fluid level. Maximum permissible suction height is 800 mm.
The minimum pressure in the suction channel S must also not fall below 0.8 bar to absolute pressure (pabs) during the operation and cold start.

ROTATION

The rotation of the shaft is determined by the location of the pressure “A” and suction “S” lines. Adapter is located in the pressure line.

Tightening of threaded connections

	Air bleed R	Pressure line "A"		Suction line "S"
	M10x1	G3/4	G1	G1 ¼
Tightening torque, Nm	5	60	60	60

Counterclockwise rotation (pressure line adapter on the right side)

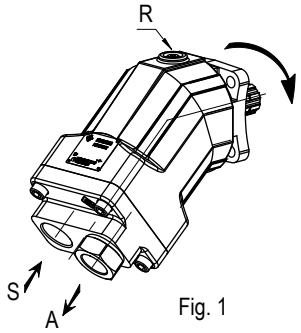


Fig. 1

Clockwise rotation (pressure line adapter on the left side)

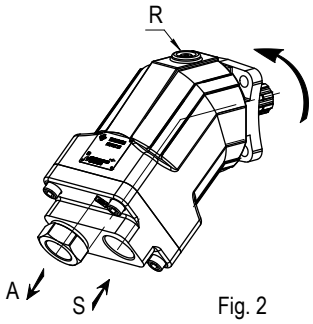
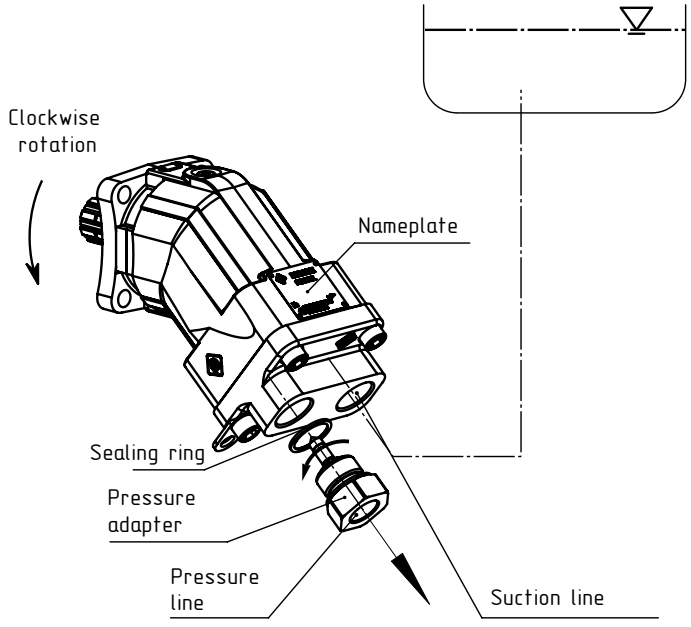
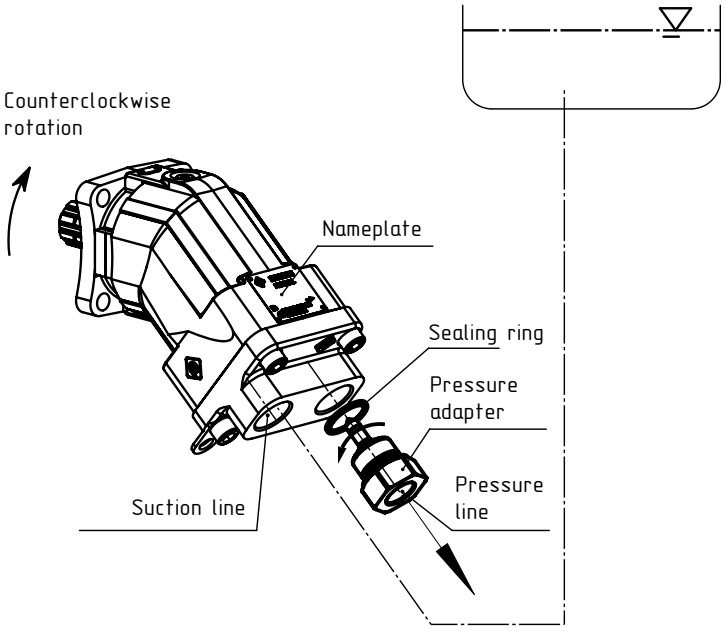


Fig. 2

CHANGING THE DIRECTION OF ROTATION

The direction of rotation of the pump and the PTOs must be the same.
The direction of rotation of the pump indicated on the nameplate.
Also, the direction of rotation of the pump is defined by the position of the pressure adapter, which is screwed into the pump pressure line (see pic. below).





To change the direction of rotation of an axial piston pump, you must perform the following steps:
1. Unscrew the pressure adapter with the sealing ring from the pressure line;
2. Screw the pressure adapter with the sealing ring into the suction line.

The tightening torque for the pressure adapter is 60 Nm.

ATTENTION!
Rotation of the pump shaft while changing the position of the pressure adapter is NOT ALLOWED!
It is prohibited to rotate the pump shaft during and after unscrewing the pressure adapter, as well as while screwing it in. Rotation of the shaft can lead to damage the axial piston pump.

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