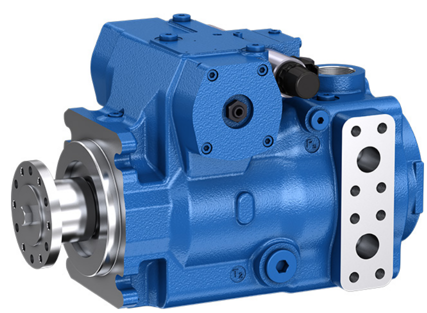
RE 92770/2022-11-21
Replaces: 11.2016

Axial piston variable pump A10VGT Series 11



- High pressure pump for the drum drive in concrete mixer trucks
- Sizes 71, 90 and 115
- Maximum pressure 420 bar
- Closed circuit

Features
- Optional with coupling flange for direct cardan shaft drive
- Integrated boost pump for boost and pilot oil supply
- Flow direction changes smoothly when the swashplate is moved through the neutral position
- High-pressure relief valves with integrated boost function
- Boost-pressure relief valve
- Swashplate design

Contents

Type code

01	02	03	04	05	06	07		08	09	10	11	12	13		14	15	16	17	18	19		20
A10V	**G**	**T**					**/**	**11**	**N**		**N**			**–**		**G**		**A**	**S**	**0**	**–**	

Axial piston unit

01	Swashplate design, variable	**A10V**

Operating mode

02	Pump, closed circuit	**G**

Application

03	Concrete mixer truck	**T**

Size (NG)

		071	090	115
04	Geometric displacement, see “Technical data” on page 7	●	●	○

Control device

				071	090	115	
05	Proportional control, hydraulic	Mechanical servo, hexagon shaft with lever to rear		●	●	●	**HW2**
		Mechanical servo, hexagon shaft with lever to rear and neutral position switch		●	●	●	**HW8**
	Proportional control, electric	with manual override and spring return	U = 12 V	●	●	●	**EP3**
			U = 24 V	●	●	●	**EP4**

Connectors for solenoids[1)]

		071	090	115	
06	Without connectors (only for purely hydraulic control)	●	●	●	**0**
	DEUTSCH molded connector, 2-pin – without suppressor diode	●	●	●	**P**

Additional function

		071	090	115	
07	Without additional function	●	●	●	**0**
	Stroking chamber bypass (sequence valve)	○	○	○	**K**
	Stroking chamber pressure port $\mathbf{X}_3$, $\mathbf{X}_4$	○	○	○	**T**

Series

08	Series 1, index 1	**11**

Configuration of port and fastening threads

		071	090	115	
09	Metric ports with profile sealing ring based on DIN 3852, metric fastening thread according to DIN 13	●	●	●	**N**
	Metric ports with O-ring seal based on ISO 6149, metric fastening thread according to DIN 13	○	○	○	**M**
	Ports with O-ring seal (ANSI) based on ISO 11926, metric fastening thread according to DIN 13 on the working port and on the through drive[2)]	○	○	○	**D**

Direction of rotation

			071	090	115	
10	Viewed on drive shaft	rechts	●	●	●	**R**
		links	●	●	●	**L**

Sealing material

		071	090	115	
11	NBR (nitrile rubber), shaft seal made of FKM (fluorocarbon rubber)	●	●	●	**N**

Mounting flange

			071	090	115	
12	SAE J744	127-4	●	●	●	**C4**

● = Available ○ = On request **–** = Not available

1) Connectors for other electric components may deviate
2) Also valid for version without through drive

01	02	03	04	05	06	07		08	09	10	11	12	13		14	15	16	17	18	19		20
A10V	**G**	**T**					**/**	**11**	**N**		**N**			**–**		**G**		**A**	**S**	**0**	**–**	

Drive shaft

					071	090	115	
13	Splined shaft ANSI B92.1a	1 3/8 in	21T 16/32DP	without coupling flange	●	–	–	**V8**
				with coupling flange	●	–	–	**C8**
		1 1/2 in	23T 16/32DP	without coupling flange	○	●	●	**V9**
				with coupling flange	○	●	●	**C9**
	Tapered shaft SAE J501	Ø38 (1 1/2 in)			○	○	○	**M9**

Working port

			071	090	115	
14	SAE working port **A** and **B**, same side left	Suction port **S** bottom	○	○	○	**1**
	SAE working port **A** and **B**, same side right	Suction port **S** top	●	●	●	**2**

Boost pump

		071	090	115	
15	Integrated boost pump	●	●	●	**G**

Through drive[3]

							071	090	115	
16	Without through drive						●	●	●	**0000**
	Flange SAE J744			Hub for splined shaft[5]						
	Diameter	Mounting[4]	Code	Diameter		Code				
	82-2 (A)	⚯	A2	5/8 in	9T 16/32DP	S2	○	○	○	**A2S2**
	101-2 (B)	⚯	B2	7/8 in	13T 16/32DP	S4	○	○	○	**B2S4**

High-prressure relief valve

		071	090	115	
17	High-pressure relief valve, direct operated	●	●	●	**A**

Filtration boost circuit

		071	090	115	
18	Filtration in the boost pump suction line	●	●	●	**S**
	Filtration in the boost pump pressure line, ports for external boost circuit filtration $\mathbf{F}_e$ and $\mathbf{F}_a$	○	○	–	**D**

Other sensors

		071	090	115	
19	Without sensor	●	●	●	**0**

Standard / special version

20	Standard version	**0**
	Standard version with installation variants, e.g. **T** ports against standard open or closed	**Y**
	Special version	**S**

● = Available ○ = On request – = Not available

Notice
- Note the project planning notes on page 23!
- In addition to the type code, please specify the relevant technical data when placing your order.
- Please note that not all type code combinations are available although the individual functions are marked as being available.

3) Specifications for version with integrated boost pump, please contact us for version without boost pump
4) Mounting hole pattern viewed on through drive
5) Hub for splined shaft according to ANSI B92.1a-1976 (drive shaft allocation according to SAE J744)

Hydraulic fluid

The axial piston unit is designed for operation with HLP mineral oil according to DIN 51524.
Application instructions and requirements for hydraulic fluid selection, behavior during operation as well as disposal and environmental protection should be taken from the following data sheets before the start of project planning:
- 90220: Hydraulic fluids based on mineral oils and related hydrocarbons
- 90221: Environmentally acceptable hydraulic fluids
- 90222: Fire-resistant, water-free hydraulic fluids (HFDR/HFDU)

Selection of hydraulic fluid
Bosch Rexroth evaluates hydraulic fluids on the basis of the Fluid Rating according to the technical data sheet 90235.
Hydraulic fluids with positive evaluation in the Fluid Rating are provided in the following technical data sheet:
- 90245: Bosch Rexroth Fluid Rating List for Rexroth hydraulic components (pumps and motors)

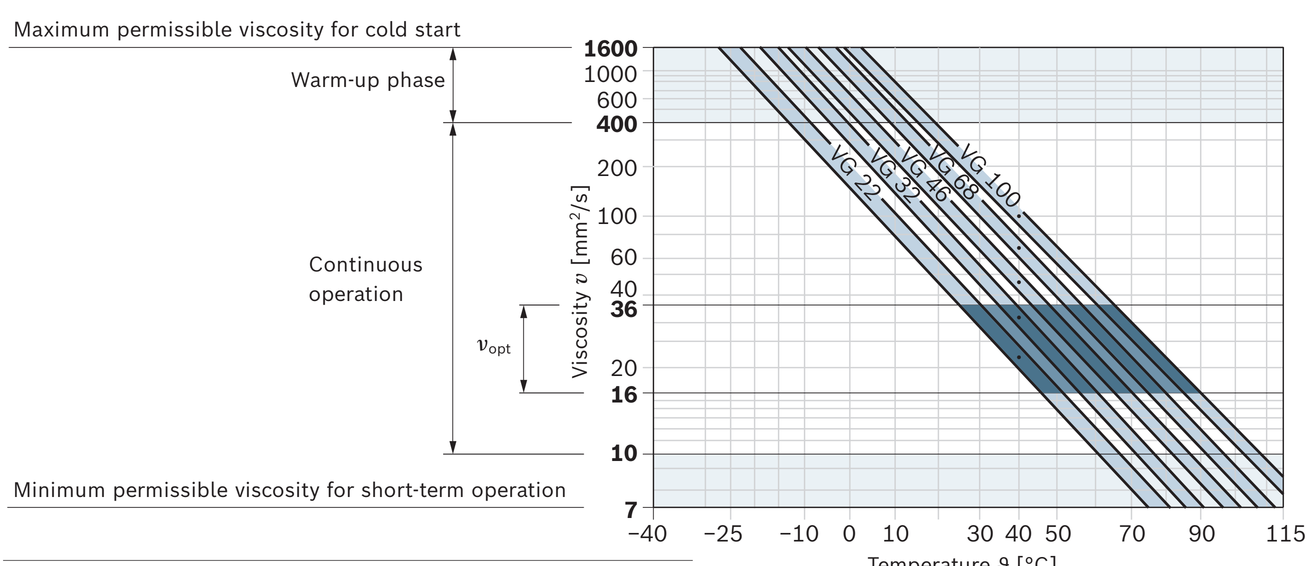
Selection of hydraulic fluid shall make sure that the operating viscosity in the operating temperature range is within the optimum range (ν_{opt}; see selection diagram).

Viscosity and temperature of hydraulic fluids

	Viscosity	Shaft seal	Temperature[2)]	Comment
Cold start	$\nu_{max} \leq 1600$ mm²/s	FKM	$\vartheta_{St} \geq -25$ °C	$t \leq 3$ min, without load ($p \leq 50$ bar), $n \leq 1000$ rpm Permissible temperature difference between axial piston unit and hydraulic fluid in the system maximum 25 K
Warm-up phase	$\nu = 1600 \ldots 400$ mm²/s			$t \leq 15$ min, $p \leq 0.7 \times p_{nom}$ and $n \leq 0.5 \times n_{nom}$
Continuous operation	$\nu = 400 \ldots 10$ mm²/s[1)]	FKM	$\vartheta \leq +110$ °C	Measured at port **T**
	$\nu_{opt} = 36 \ldots 16$ mm²/s			Optimal operating viscosity and efficiency range
Short-term operation	$\nu_{min} = 10 \ldots 7$ mm²/s	FKM	$\vartheta \leq +110$ °C	$t \leq 3$ min, $p \leq 0.3 \times p_{nom}$, measured at port **T**

Notice
The maximum circuit temperature of +115 °C must not be exceeded at the working ports A and B complying with the permissible viscosity.

▼ Selection diagram



1) This corresponds, for example on the VG 46, to a temperature range of +4 C to +85 °C (see selection diagram)
2) If the temperature at extreme operating parameters cannot be adhered to, please contact us.

Filtration of the hydraulic fluid

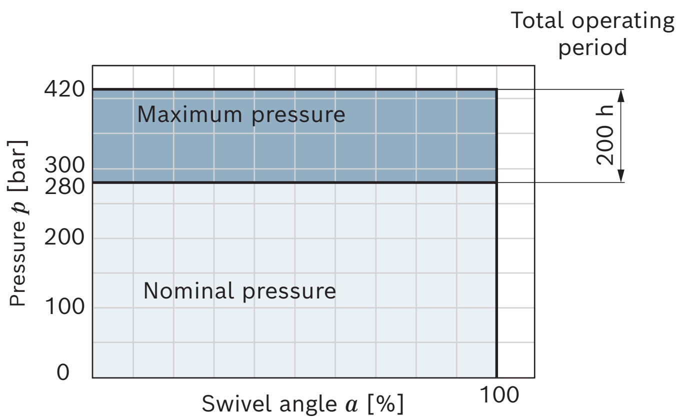
Finer filtration improves the cleanliness level of the hydraulic fluid, which increases the service life of the axial piston unit.
A cleanliness level of at least 20/18/15 is to be maintained according to ISO 4406.
At a hydraulic fluid viscosity of less than 10 mm²/s (e.g. due to high temperatures during short-term operation), a cleanliness level of at least 19/17/14 according to ISO 4406 is required.
For example, the viscosity is 10 mm²/s at:

- HLP 32 a temperature of 73°C
- HLP 46 a temperature of 85°C

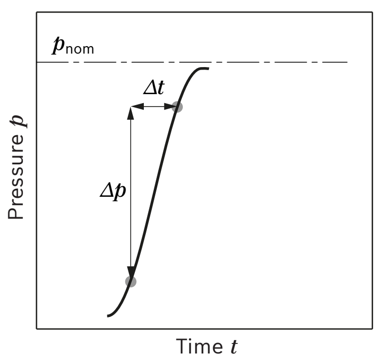
Working pressure range

Pressure at working port A or B		**Definition**
Nominal pressure	280 bar	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}	420 bar	The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of single operating periods must not exceed the total operating period.
Maximum single operating period	10 s	
Total operating period	200 h	
Minimum pressure (low-pressure side)	10 bar above case pressure	Minimum pressure at the low-pressure side (**A** or **B**) which is required to prevent damage to the axial piston unit.
Rate of pressure change $R_{A\ max}$	9000 bar/s	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Boost pump		
Maximum pressure $p_{Sp\ max}$	30 bar	
Standard setting p_{Sp}	22 bar	at n = 1500 rpm
Pressure at suction port **S** (inlet)		
Continuous $p_{S\ min}$	≥ 0.8 bar absolute	at ν ≤ 30 mm²/s
Short-term, at a cold start	≥ 0.5 bar absolute	t < 3 min
Maximum pressure $p_{S\ max}$	≤ 5 bar absolute	
Control pressure		
Minimum control pressure $p_{St\ min}$ at n = 1500 rpm Controls EP, HW	22 bar above case pressure	Required control pressure p_{St}, to ensure the function of the control. The required control pressure is dependent on rotational speed, working pressure and the spring assembly of the stroking piston.
Case pressure at port T		
Continuous differential pressure $\Delta p_{T\ cont}$	2 bar	Maximum, averaged differential pressure at the shaft seal (case to ambient pressure)
Maximum differential pressure $\Delta p_{T\ max}$	See the diagram	Permissible differential pressure at the shaft seal (case to ambient pressure)
Pressure peak $p_{T\ peak}$	10 bar	t < 0.1 s, maximum 1000 pressure peaks permissible

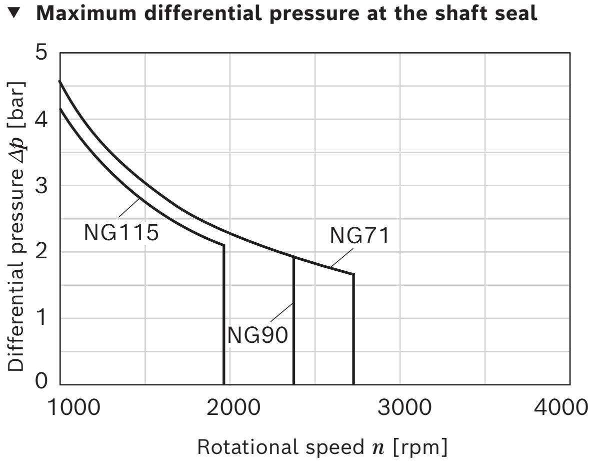
▼ **Maximum pressure p_{max} up to 420 bar and total operating period**



▼ **Rate of pressure change $R_{A\ max}$**



▼ **Maximum differential pressure at the shaft seal**



Notice

- Working pressure range applies when using hydraulic fluids based on mineral oils. Please contact us for values for other hydraulic fluids.
- In addition to the hydraulic fluid and the temperature, the service life of the shaft seal is influenced by the rotational speed of the axial piston unit and the case pressure.
- The service life of the shaft seal decreases with increasing frequency of pressure peaks and increasing mean differential pressure.
- The case pressure must be higher than the external pressure (ambient pressure) at the shaft seal.

Technical data

Size			NG		71	90	115
Displacement, geometric, per revolution							
	variable pump		$V_{g\ max}$	cm³	71	90	115
	boost pump at p = 22 bar		$V_{g\ Sp}$	cm³	27	27	32
Rotational speed[1]	0.6 × $V_{g\ max}$		n	rpm	On request	3000	On request
	maximum at $V_{g\ max}$		n_{nom}	rpm	2700	2350	1950
	at $\Delta p \geq$ 40 bar (t < 15 s)		$n_{max\ 40}$	rpm	2950	2600	On request
	minimum[2]		n_{min}	rpm	500	500	500
Flow	at n_{nom} and $V_{g\ max}$		q_v	l/min	192	212	224
Power[3]	at n_{nom}, $V_{g\ max}$ and Δp = 280 bar		P	kW	89	99	105
Torque[3]	at $V_{g\ max}$ and	Δp = 280 bar	M	Nm	317	401	513
		Δp = 100 bar	M	Nm	113	143	183
Rotary stiffness of drive shaft		V8, C8	c	kNm/rad	122	–	–
		V9, C9	c	kNm/rad	–	140	164
Moment of inertia for rotary group			J_{TW}	kgm²	0.01159	0.01159	0.01909
Case volume			V	l	1.5	1.5	1.5
Weight approx.[4]			m	kg	51	51	59

Notice

- ▶ Theoretical values, without efficiency and tolerances; values rounded
- ▶ Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. Bosch Rexroth recommend testing the loads by means of experiment or calculation / simulation and comparison with the permissible values.

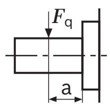
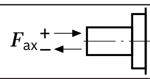
Determining the operating characteristics		
Flow	$q_v = \dfrac{V_g \times n \times \eta_v}{1000}$	[l/min]
Torque	$M = \dfrac{V_g \times \Delta p}{20 \times \pi \times \eta_{hm}}$	[Nm]
Power	$P = \dfrac{2\ \pi \times M \times n}{60000} = \dfrac{q_v \times \Delta p}{600 \times \eta_t}$	[kW]

Key

- V_g Displacement per revolution [cm³]
- Δp Differential pressure [bar]
- n Rotational speed [rpm]
- η_v Volumetric efficiency
- η_{hm} Hydraulic-mechanical efficiency
- η_t Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)

1) The values are applicable:
   - – for the optimum viscosity range from n_{opt} = 36 to 16 mm²/s
   - – for hydraulic fluid based on mineral oils
2) The full function of the control is available from 800 rpm
3) Without boost pump
4) Weight may vary by equipment.

Permissible radial and axial forces of the drive shafts

Size		NG		71	90	115
Drive shaft			in	1 3/8	1 1/2	1 1/2
Maximum radial force at distance a (from shaft collar)		$F_{q\ max}$	N	On request	On request	On request
		a	mm	24	24	24
Maximum axial force		$+ F_{ax\ max}$	N	3500	3500	4800
		$- F_{ax\ max}$	N	3500	3500	4800

Notice

- The axial and radial forces generally influence the service life of the bearings.
- Special requirements apply in the case of belt drive and cardan shaft. Please contact us.

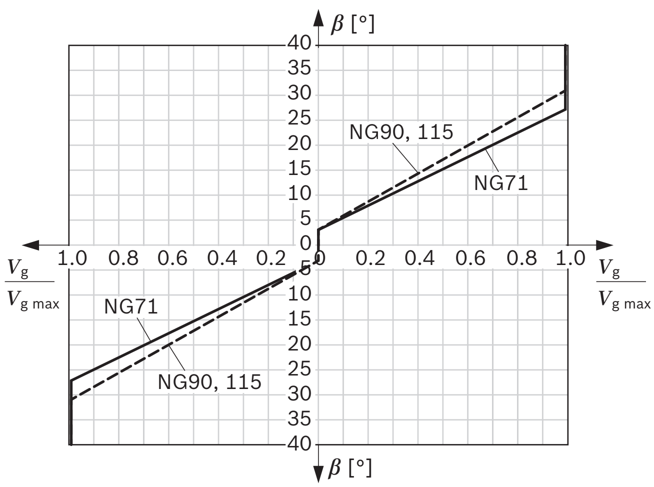
Permissible input torque

Size			NG		71	90	115
Torque at $V_{g\ max}$ and Δp = 280 bar[1]			M	Nm	317	401	513
Maximum input torque at drive shaft, maximum							
ANSI B92.1a (SAE J744)[2]	V8, C8	1 3/8 in	$M_{E\ max}$	Nm	970	–	–
	V9, C9	1 1/2 in	$M_{E\ max}$	Nm	–	1305	1305

1) Efficiency not considered
2) For drive shafts free of radial force

HW – Proportional control, hydraulic, mechanical servo

The output flow of the pump is infinitely variable between 0 and 100%, proportional to the swivel angle of the control lever.
A feedback lever connected to the stroking piston maintains the pump flow for any given position of the control lever.



Nenngröße		71	90, 115
Beginning of control ($V_{g\,0}$)	β	±3°	±3°
End of control ($V_{g\,max}$)	β	±27°	±31°
Rotational limiter control lever (internal)	β	±38°	±38°

The maximum required torque at the control lever is 170 Ncm. To prevent damage to the HW control module, a positive mechanical stop of 36.5°±1 must be provided for the HW control lever on the customer side.

Key

V_g	Displacement
$V_{g\,0}$	Displacement in neutral position
$V_{g\,max}$	Maximum displacement
β	Swivel angle at the control lever

Notice

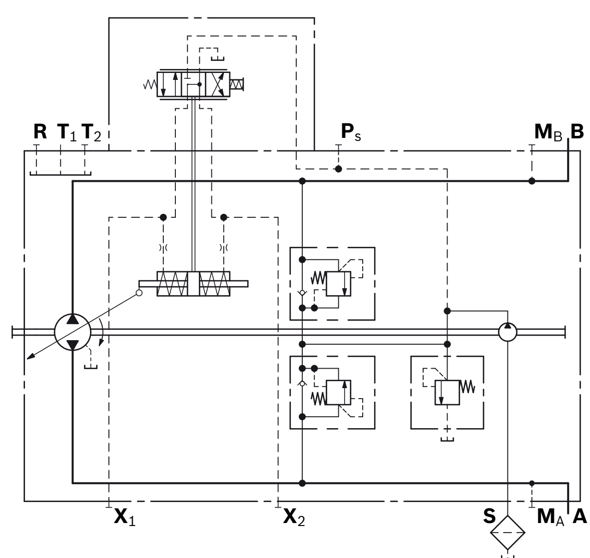
- Spring-centering enables the pump, depending on pressure and rotational speed, to move automatically to the neutral position (V_g = 0) as soon as there is no longer any torque on the control lever of the HW control module.
- As standard delivery, the control lever is oriented toward the through drive (see dimensions).
- If necessary, the position of the control lever can be changed. The procedure is defined in the instruction manual.
- On delivery, the position of the control lever can deviate from the installation drawing.

Option: Sequence valve
Actuation of the sequence valve establishes pressure equilibrium in the stroking chambers. The spring in the stroking chamber moves the stroking piston towards the central position (neutral position). The reset function is influenced by the current working pressure and the rotational speed.

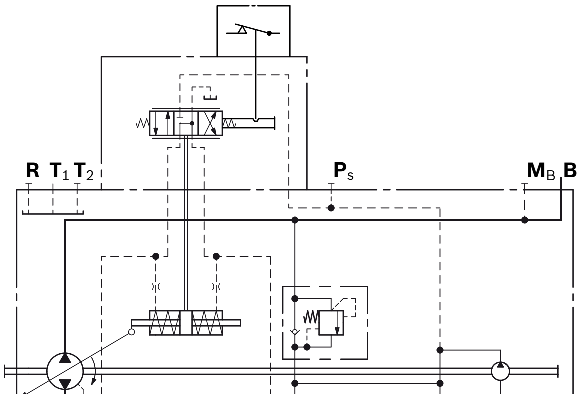
Option: Neutral position switch
The switch contact in the neutral position switch is closed when the control lever on the HW control module is in its neutral position. The switch opens when the control lever is moved out of the central position in either direction. Thus, the neutral position switch provides a monitoring function for drive units that require the control lever at the HW control module to be in the neutral position during certain operating conditions (e.g. starting diesel engines).

Technical data	
Current load capacity	5 mA ... 2A
Max. operating voltage	24 VDC
Connector version	DEUTSCH DT04-2P-EP04 (mating connector, see page 19)

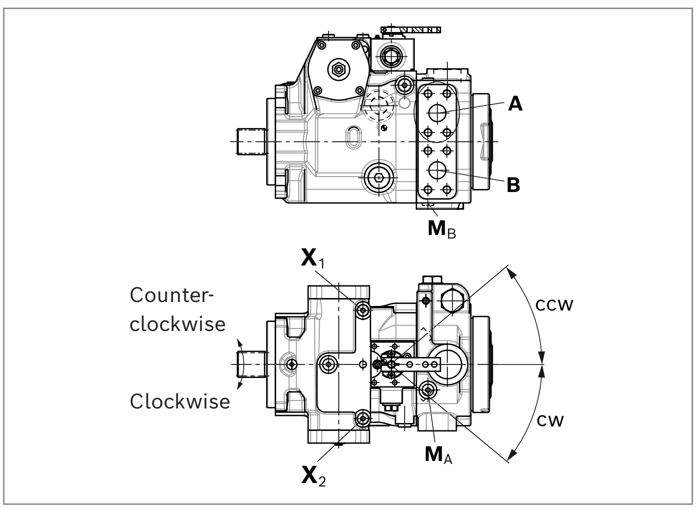
▼ **Circuit diagram, standard version**



▼ **Circuit diagram, version with neutral position switch**



▼ **Position of ports (expample)**

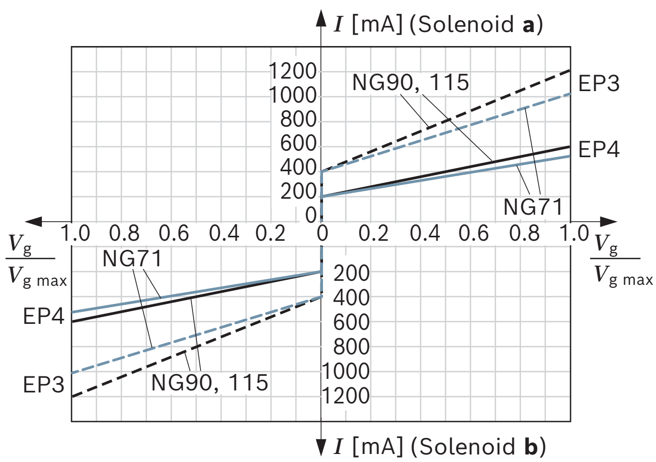


Correlation of direction of rotation, control and flow direction				
Direction of rotation	Clockwise		Counter-clockwise	
Lever direction[1)]	**ccw**	**cw**	**ccw**	**cw**
Control pressure	$\mathbf{X}_2$	$\mathbf{X}_1$	$\mathbf{X}_2$	$\mathbf{X}_1$
Flow direction	**B** to **A**	**A** to **B**	**A** to **B**	**B** to **A**
Working pressure	$\mathbf{M}_A$	$\mathbf{M}_B$	$\mathbf{M}_B$	$\mathbf{M}_A$

1) ccw = counter-clockwise
cw = clockwise

EP – Proportional control, electric

The output flow of the pump is infinitely variable in the range between 0 to 100%, proportional to the electrical current supplied to the solenoid. The flow is reversible, depending on solenoid side **a** or **b** and the direction of rotation of the pump. The magnetic force acts as a setpoint value on the control spool. It then directs control oil into and out of the stroking cylinder to adjust pump displacement according to the setpoint value. The mechanical feedback lever connected to the stroking piston closes the control circuit via a force comparison with the magnetic force. In this case, the pump swivel angle is adjusted proportionally to the control current.



Control current EP3	NG	71	90	115
Start of control	mA	400	400	400
End of control	mA	1070	1200	1200
Control current EP4	**NG**	**71**	**90**	**115**
Start of control	mA	200	200	200
End of control	mA	535	600	600

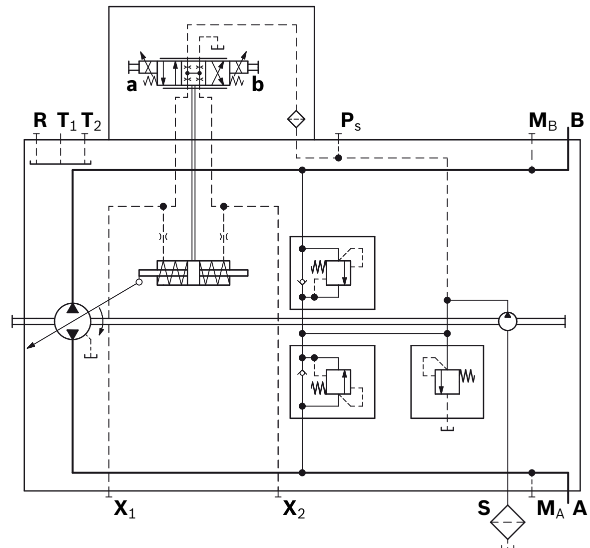
Technical data, proportional solenoid	EP3	EP4
Voltage	12 V (±20%)	24 V (±20%)
Current limit	1.54 A	0.77 A
Nominal resistance (at 20 °C)	5.5 Ω	22.7 Ω
Dither		
Frequency	100 Hz	100 Hz
minimum oscillation range[1)]	240 mA	120 mA
Duty cycle	100%	100%
Type of protection: see connector version page 19		

Notice

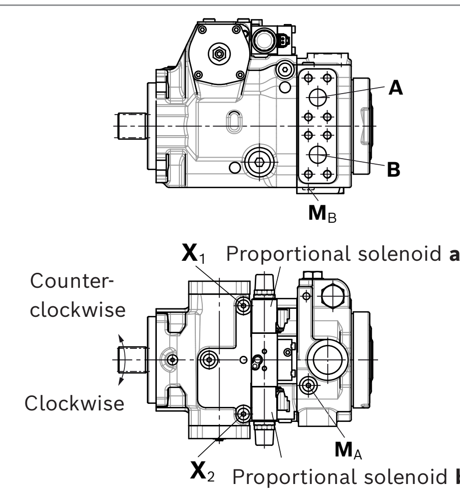
The proportional solenoids in the EP3/EP4 version have manual override and spring return.

Various BODAS controllers with application software and amplifiers are available for controlling the proportional solenoids.
Further information can also be found on the internet at www.boschrexroth.com/mobile-electronics

▼ **Circuit diagram**



▼ **Position of ports (expample)**



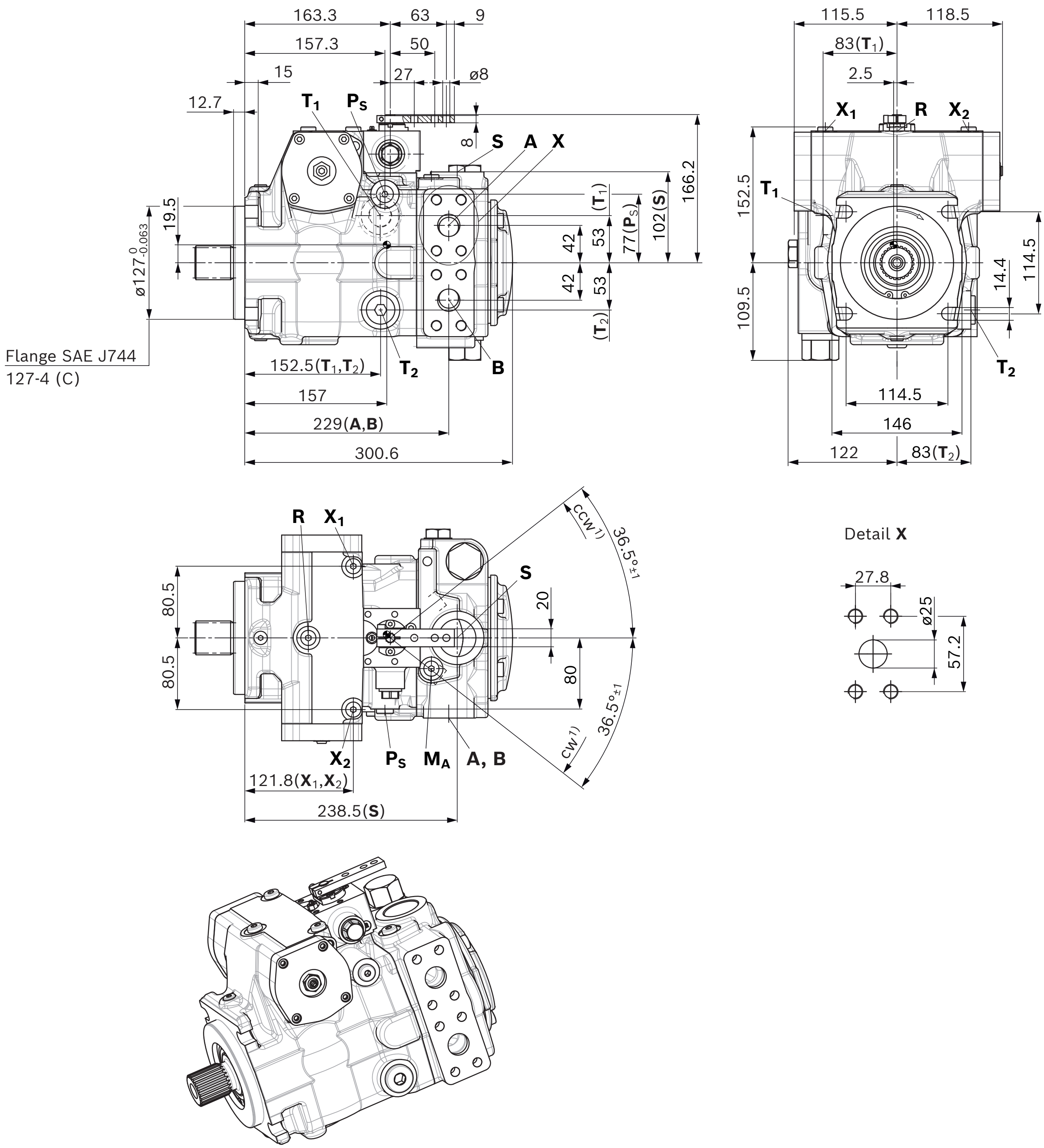
Correlation of direction of rotation, control and flow direction				
Direction of rotation	clockwise		counter-clockwise	
Actuation of proportional solenoid	**b**	**a**	**b**	**a**
Control pressure	X_2	X_1	X_2	X_1
Flow direction	**B to A**	**A to B**	**A to B**	**B to A**
Working pressure	M_A	M_B	M_B	M_A

1) Minimum required oscillation range of the control current $\Delta I_{p\text{-}p}$ (peak to peak) within the respective control range (start of control to end of control)

Dimensions sizes 71, 90

HW – Proportional control, hydraulic, mechanical servo

Standard: SAE working port **A** and **B** same side right, suction port **S** top (2)



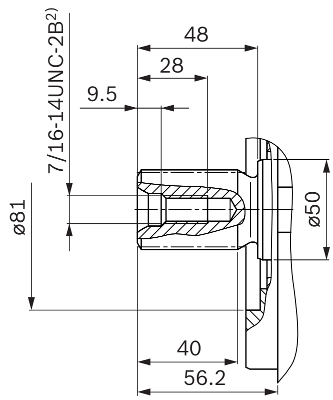
1) ccw = counter-clockwise
cw = clockwise

Center of gravity

Drive shaft size 71

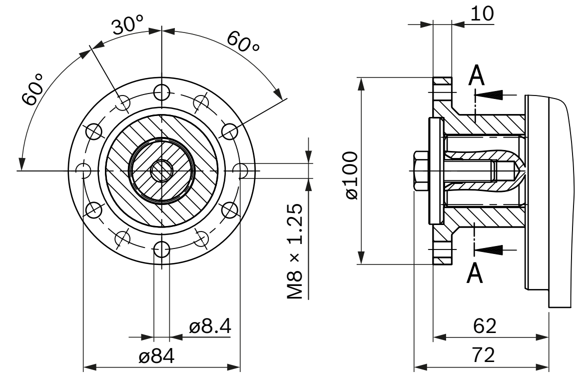
▼ **Splined shaft ANSI B92.1a**

V8 – 1 3/8 in 21T 16/32DP[1)]



▼ **Splined shaft ANSI B92.1a with coupling flange**

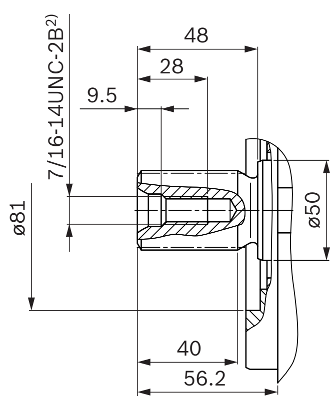
C8 – 1 3/8 in 21T 16/32DP[1)]



Drive shaft size 90

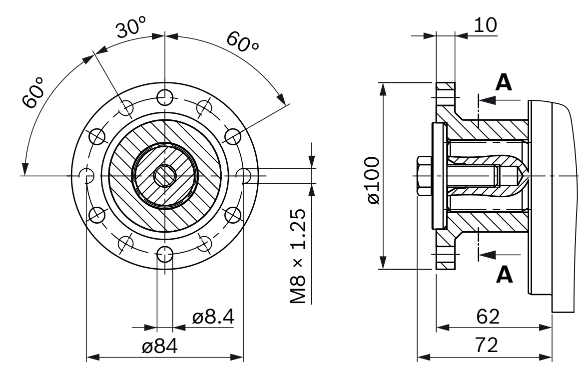
▼ **Splined shaft ANSI B92.1a**

V9 – 1 1/2 in 23T 16/32DP[1)]



▼ **Splined shaft ANSI B92.1a with coupling flange**

C9 – 1 1/2 in 23T 16/32DP[1)]

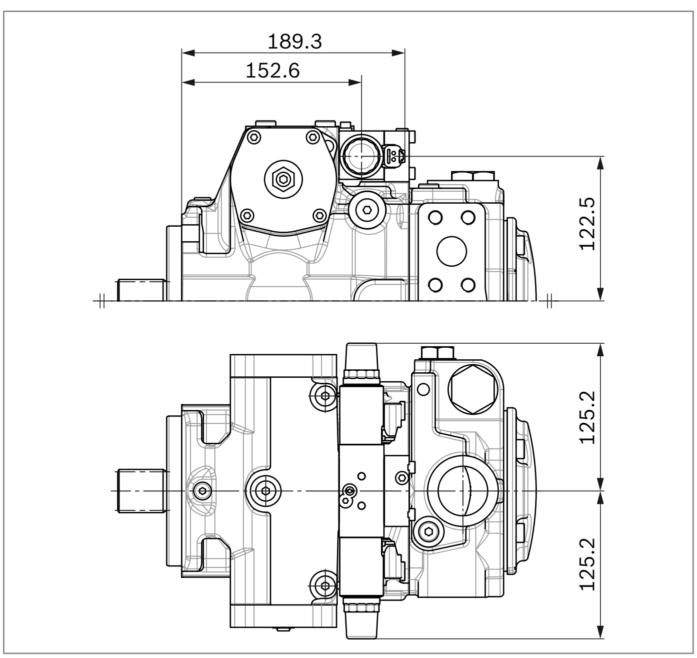


1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1

Ports version "N", metric		**Standard**	**Size**	p_{max} **[bar]**[3)]	**State**[8)]
A, B	Working port Fastening thread	SAEJ518[4)] DIN 13	1 in M12 × 1.75; 17 deep	420	O
S	Suction port	DIN 3852[5)]	M42 × 2; 20 deep	5	O
T_1	Drain port	DIN 3852[5)]	M26 × 1.5; 16 deep	3	O[7)]
T_2	Drain port	DIN 3852[5)]	M26 × 1.5; 16 deep	3	X[7)]
R	Air bleed port	DIN 3852[5)]	M12 × 1.5; 12 deep	3	X
X_1, X_2	Control pressure port (upstream of orifice)	DIN 3852[5)]	M12 × 1.5; 12 deep	30	X
P_S	Pilot pressure port	DIN 3852[5)]	M14 × 1.5; 12 deep	30	X
M_A, M_B	Measuring port pressure A, B	DIN 3852[5)]	M12 × 1.5; 12 deep	420	X

Ports version "D", ANSI, metric fastening thread		**Standard**	**Size**	p_{max} **[bar]**[3)]	**State**[8)]
A, B	Working port Fastening thread	SAEJ518[4)] DIN 13	1 in M12 × 1.75; 17 deep	420	O
S	Suction port	ISO 11926[6)]	1 5/8-12 UN-2B; 20 deep	5	O
T_1	Drain port	ISO 11926[6)]	1 1/16-12 UN-2B; 20 deep	3	O[7)]
T_2	Drain port	ISO 11926[6)]	1 1/16-12 UN-2B; 20 deep	3	X[7)]
R	Air bleed port	ISO 11926[6)]	7/16-20 UNF-2B; 12 deep	3	X
X_1, X_2	Control pressure port (upstream of orifice)	ISO 11926[6)]	7/16-20 UNF-2B; 12 deep	30	X
P_S	Pilot pressure port	ISO 11926[6)]	9/16-18 UNF-2B; 13 deep	30	X
M_A, M_B	Measuring port pressure A, B	ISO 11926[6)]	9/16-18 UNF-2B; 13 deep	420	X

▼ **EP – Proportional control, electric**

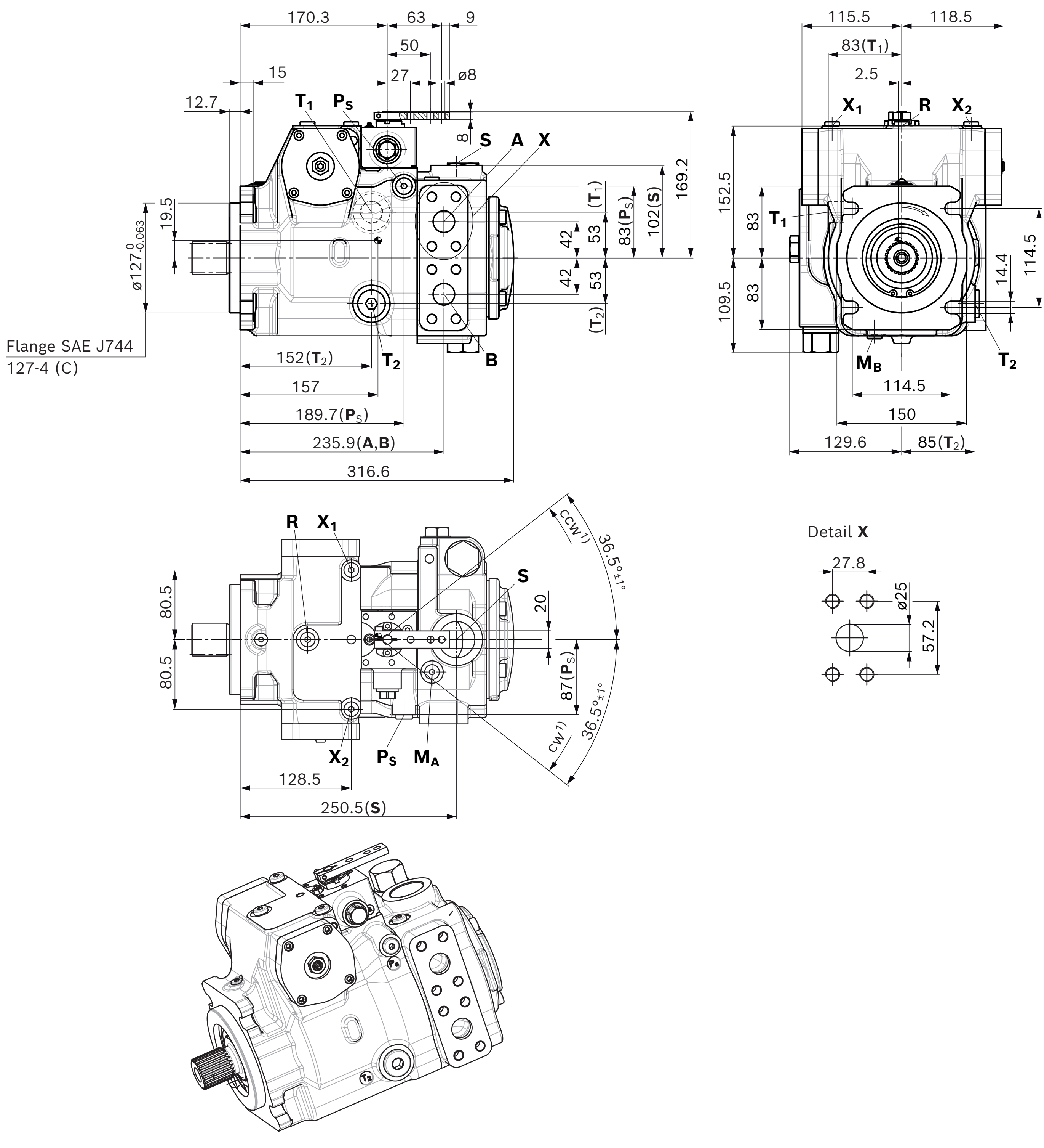


3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
4) Only dimensions according to SAE J518, metric fastening thread is a deviation from the standard.
5) The countersink can be deeper than specified in the standard. Ports designed for straight stud ends according to EN ISO 9974-2 type E.
6) The countersink can be deeper than specified in the standard. Ports designed for straight stud ends according to ISO 11926-2.
7) Depending on installation position, T_1 or T_2 must be connected (see also installation instructions on page 21).
8) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

Dimensions, size 115

HW – Proportional control, hydraulic, mechanical servo

Standard: SAE working port **A** and **B** same side right, suction port **S** top (2)

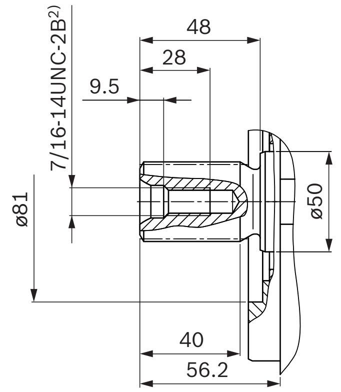


1) ccw = counter-clockwise
cw = clockwise

Center of gravity

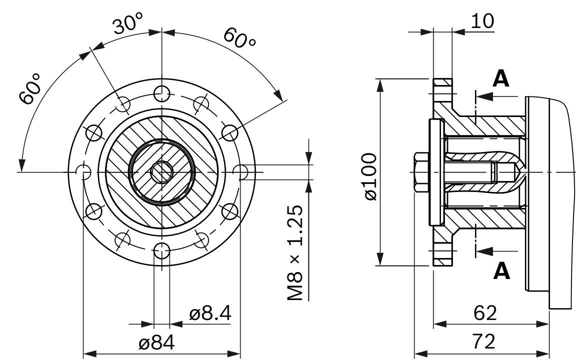
▼ **Splined shaft ANSI B92.1a**

V9 – 1 1/2 in 23T 16/32DP[1)]



▼ **Splined shaft ANSI B92.1a with coupling flange**

C9 – 1 1/2 in 23T 16/32DP[1)]

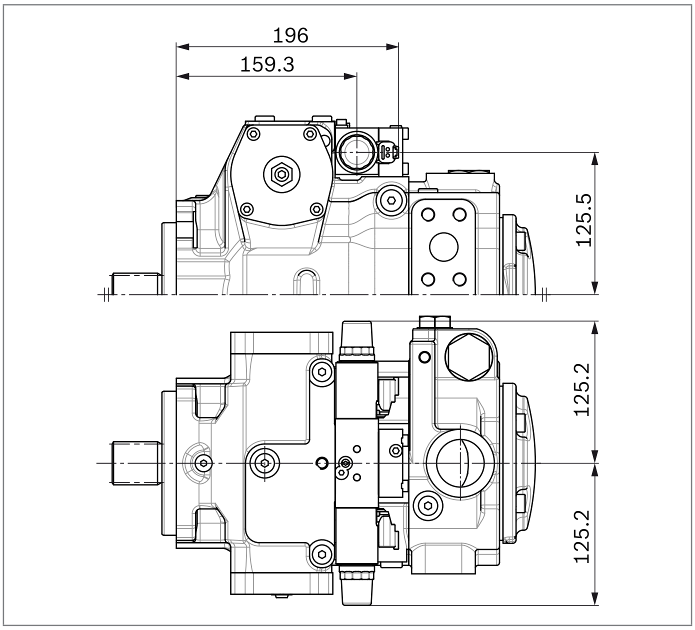


Ports		**Standard**	**Size**	p_{max} **[bar]**[3)]	**State**[8)]
A, B	Working port Fastening thread	SAEJ518[4)] DIN 13	1 in M12 × 1.75; 17 deep	420	O
S	Suction port	DIN 3852[5)]	M42 × 2; 20 deep	5	O
$\mathbf{T}_1$	Drain port	DIN 3852[5)]	M26 × 1.5; 16 deep	3	O[7)]
$\mathbf{T}_2$	Drain port	DIN 3852[5)]	M26 × 1.5; 16 deep	3	X[7)]
R	Air bleed port	DIN 3852[5)]	M12 × 1.5; 12 deep	3	X
$\mathbf{X}_1$, $\mathbf{X}_2$	Control pressure port (upstream of orifice)	DIN 3852[5)]	M12 × 1.5; 12 deep	30	X
$\mathbf{P}_S$	Pilot pressure port	DIN 3852[5)]	M14 × 1.5; 12 deep	30	X
$\mathbf{M}_A$, $\mathbf{M}_B$	Measuring port pressure A, B	DIN 3852[5)]	M12 × 1.5; 12 deep	420	X

Ports version “D”, ANSI, metric fastening thread		**Standard**	**Size**	p_{max} **[bar]**[3)]	**State**[8)]
A, B	Working port Fastening thread	SAEJ518[4)] DIN 13	1 in M12 × 1.75; 17 deep	420	O
S	Suction port	ISO 11926[6)]	1 5/8-12 UN-2B; 20 deep	5	O
$\mathbf{T}_1$	Drain port	ISO 11926[6)]	1 1/16-12 UN-2B; 20 deep	3	O[7)]
$\mathbf{T}_2$	Drain port	ISO 11926[6)]	1 1/16-12 UN-2B; 20 deep	3	X[7)]
R	Air bleed port	ISO 11926[6)]	7/16-20 UNF-2B; 12 deep	3	X
$\mathbf{X}_1$, $\mathbf{X}_2$	Control pressure port (upstream of orifice)	ISO 11926[6)]	7/16-20 UNF-2B; 12 deep	30	X
$\mathbf{P}_S$	Pilot pressure port	ISO 11926[6)]	9/16-18 UNF-2B; 13 deep	30	X
$\mathbf{M}_A$, $\mathbf{M}_B$	Measuring port pressure A, B	ISO 11926[6)]	9/16-18 UNF-2B; 13 deep	420	X

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
4) Only dimensions according to SAE J518, metric fastening thread is a deviation from the standard.
5) The countersink can be deeper than specified in the standard. Ports designed for straight stud ends according to EN ISO 9974-2 type E.
6) The countersink can be deeper than specified in the standard. Ports designed for straight stud ends according to ISO 11926-2.
7) Depending on installation position, $\mathbf{T}_1$ or $\mathbf{T}_2$ must be connected (see also installation instructions on page 21).
8) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

▼ EP – Proportional control, electric



High-pressure relief valves

The two high-pressure relief valves protect the hydrostatic gear (pump and motor) from overloading. They limit the maximum pressure in the respective high-pressure line and serve simultaneously as boost valves.

High-pressure relief valves are not working valves and are only designed for limitation of pressure peaks. Pressure peaks are generated by sudden load cycles and generate high rates of pressure change. Information on the permissible rates of pressure change can be found in section "Working pressure range" (see page 5).

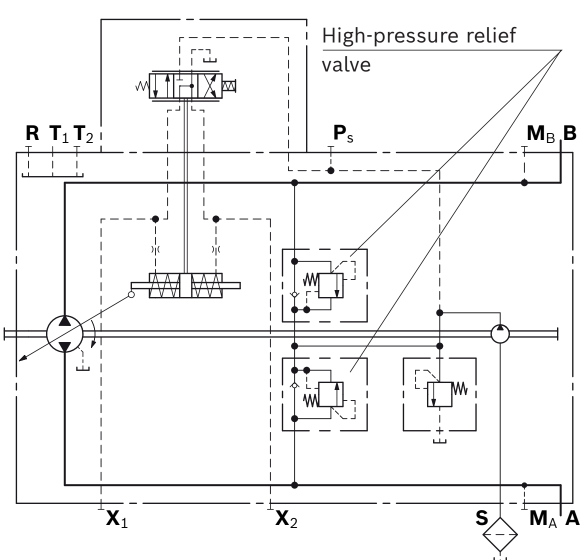
Setting range

High-pressure relief valve, A and B	Differential pressure setting Δp_{HD}
Standard value	398 bar
Optional value	370 bar

Settings on high-pressure relief valve A and B	
Differential pressure setting	Δp_{HD} = ... bar
Set pressure of the HD valve (at $q_{V\,1}$) ($p_{max} = \Delta p_{HD} + p_{Sp}$)	p_{max} = ... bar

- The valve settings are made at n = 1000 rpm and at $V_{g\,max}$ ($q_{v\,1}$). There may be deviations with other operating parameters.
- When ordering, state differential pressure setting in plain text.

▼ **Circuit diagram**

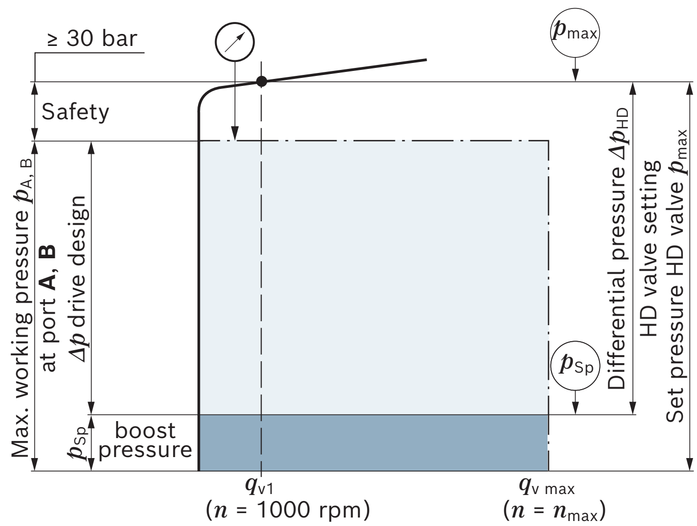


Example: Δp drive design = 368 bar ($p_{A,\,B} - p_{Sp}$)

Max. working pressure $p_{A,B}$	–	Boost pressure p_{Sp}	+	Safety	=	Differential pressure Δp_{HD}
390 bar	–	22 bar	+	30 bar	=	**398 bar**

- Set pressure of the HD valve (at q_{V1}): p_{max} = 420 bar ($p_{max} = \Delta p_{HD} + p_{Sp}$)

▼ **Setting diagram**



Key	
HD valve	High-pressure relief valve
Set pressure HD valve p_{max}	The factory-set pressure value set at q_{V1}
Differential pressure HD valve Δp_{HD}	Set pressure HD valve (abs.) minus the boost pressure setting
Maximum working pressure $p_{A,\,B}$	The total design of the hydrostatic drive is based on the maximum working pressure $p_{A,\,B}$. It is composed of the feed pressure setting and the Δp drive design.
Δp Drive design	Differential pressure value determining the available torque at the hydraulic motor ($p_{A,\,B} - p_{Sp}$).
Boost pressure p_{Sp}	Boost pressure setting of the low-pressure valve
Safety	Required distance between maximum working pressure and set pressure of the high-pressure relief valve to prevent constant response of the high-pressure relief valves at maximum working pressure.

Notice
Upon response of the high-pressure relief valve, the permissible temperature and viscosity must be complied with.

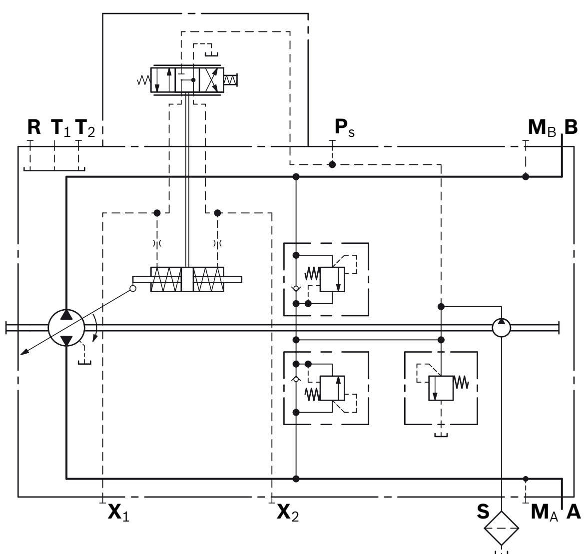
Filtration in the boost pump suction line

Version S

Filter version	Suction filter
Recommendation	With contamination indicator, with bypass
Recommended flow resistance at filter element	
At ν = 30 mm^2/s, n = n_{max}	Δp ≤ 0.1 bar
At ν = 1000 mm^2/s, n = n_{max}	Δp ≤ 0.3 bar
Pressure at suction port S	
Continuous $p_{S\ min}$ (ν ≤ 30 mm^2/s)	≥ 0.8 bar absolute
Short-term, at a cold start (t < 3 min)	≥ 0.5 bar absolute
Maximum $p_{S\ max}$	≤ 5 bar absolute

The suction filter is not included in the scope of delivery.

▼ **Circuit diagram**



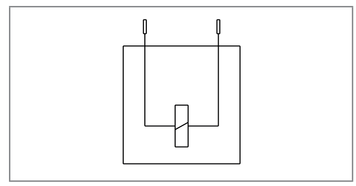
Connector for solenoids

DEUTSCH DT04-2P-EP04

Molded, 2-pin, without bidirectional suppressor diode
The following type of protection ensues with an installed mating connector:

- ▶ IP67 (DIN/EN 60529) and
- ▶ IP69K (DIN 40050-9)

▼ **Switching symbol**



▼ **Mating connector DEUTSCH DT06-2S-EP04**

Consisting of	DT designation
1 housing	DT06-2S-EP04
1 wedge	W2S
2 sockets	0462-201-16141

The mating connector is not included in the scope of delivery. This can be supplied by Bosch Rexroth on request (material number R902601804).

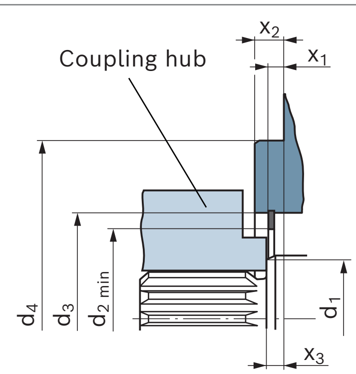
Notice

- ▶ If necessary, you can change the position of the connector by turning the solenoid.
- ▶ The procedure is defined in the instruction manual.
- ▶ Manual override can be used on the electric system in case of malfunction. Not permissible for continuous operation!

Installation dimensions for coupling assembly

To ensure that rotating components (coupling hub) and fixed components (housing, snap ring) do not come into contact with each other, the installation conditions described here must be observed. This depends on the pump size and the splined shaft.

SAE splined shaft (spline according to ANSI B92.1a)
Splined shaft **V8** and **V9**
The outer diameter of the coupling hub must be smaller than the inner diameter of the snap ring (dimension d_2) in the area near the drive shaft collar (dimension $x_2 - x_3$).



NG	Ød1	Ød2 min	Ød3	Ød4	x1	x2	x3
71	48.5	66.5	81±0.1	$127^{\ 0}_{-0.063}$	$7.0^{+0.2}$	$12.7_{-0.5}$	$8^{+0.9}_{-0.6}$
90	48.5	66.5	81±0.1	$127^{\ 0}_{-0.063}$	$7.0^{+0.2}$	$12.7_{-0.5}$	$8^{+0.9}_{-0.6}$
115	53.5	76.3	91±0.1	$127^{\ 0}_{-0.063}$	$8^{+0.2}$	$12.7_{-0.5}$	$8^{+0.9}_{-0.6}$

Installation instructions

General

The axial piston unit must be filled with hydraulic fluid and air bled during commissioning and operation. This must also be observed following a longer standstill as the axial piston unit may empty via the hydraulic lines.
The leakage in the housing area must be directed to the reservoir via the highest drain port (**T**$_1$, **T**$_2$).
If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. The shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operating conditions, particularly at cold start. If this is not possible, separate drain line must be laid, if necessary.
To prevent the transmission of structure-borne noise, use elastic elements to decouple all connecting lines from all vibration-capable components (e.g. reservoir, frame parts).
Under all operating conditions, the suction line and drain line must flow into the reservoir below the minimum fluid level. The permissible suction height h_S results from the total pressure loss, it must not, however, be higher than $h_{S\ max}$ = 800 mm.
The suction pressure at port **S** must also not fall below the minimum value of 0.8 bar absolute during operation (cold start 0.5 bar absolute).
When designing the reservoir, ensure that there is adequate distance between the suction line and the drain line. We recommend using a baffle (baffle plate) between suction line and drain line. A baffle improves the air separation ability as it gives the hydraulic fluid more time for desorption. Apart from that, this prevents the heated return flow from being drawn directly back into the suction line. The suction port must be supplied with air-free, „calmed“ and cooled hydraulic fluid.

Installation position

See the following examples 1 to 4.
Further installation positions are available upon request.
Recommended installation position: 1 and 2.

Notice

- For optimum function and dynamics of the axial piston unit, a complete filling of the two stroking chambers **X**$_1$ and **X**$_2$ with hydraulic fluid is required. By swiveling the swashplate several times during commissioning, this can usually be be ensured. In case of unfavorable installation positions, air bleeding of the stroking chambers may take some time, so we recommend filling the stroking chambers via ports **X**$_1$ and **X**$_2$ before installation.
- In certain installation positions, an influence on the adjustment or control can be expected. Gravity, dead weight and case pressure can cause minor characteristic shifts and changes in response time.

Key	
F$_1$, **F**$_2$	Filling / air bleeding
R	Air bleed port
S	Suction port
T$_1$, **T**$_2$	Drain port
X$_1$, **X**$_2$	Control pressure port
SB	Baffle (baffle plate)
$h_{t\ min}$	Minimum required immersion depth (200 mm)
h_{min}	Minimum required distance to the reservoir bottom (100 mm)
$h_{S\ max}$	Maximum permissible suction height (800 mm)

Notice

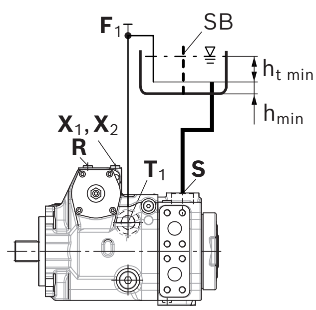
Ports **F**$_1$ and **F**$_2$ are part of the external piping and must be provided on the customer side to make filling and air bleeding easier.

Below-reservoir installation (standard)

Below-reservoir installation means that the axial piston unit is installed outside of the reservoir below the minimum fluid level.

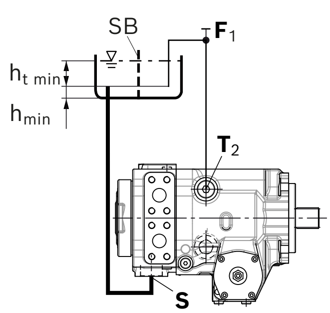
▼ Installation position 1

Air bleed the housing	Air bleed the stroking chamber	Filling
R	X_1, X_2	$S + T_1 (F_1) + X_1 + X_2$



▼ Installation position 2

Air bleed the housing	Air bleed the stroking chamber	Filling
–	–	$S + T_2 (F_1)$



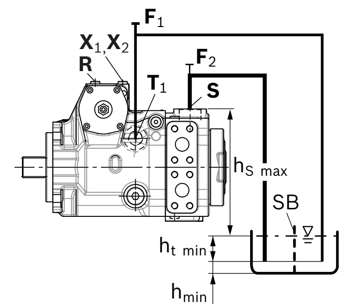
Above-reservoir installation

Above-reservoir installation means that the axial piston unit is installed above the minimum fluid level of the reservoir.

Observe the maximum permissible suction height $h_{S\ max}$ = 800 mm.

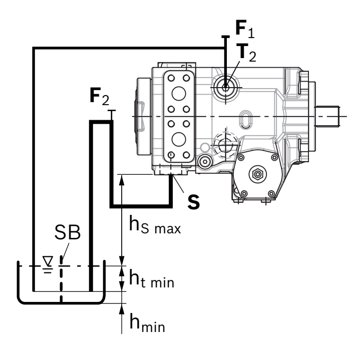
▼ Installation position 3

Air bleed the housing	Air bleed the stroking chamber	Filling
$S (F_2) + R$	X_1, X_2	$S (F_2) + T_2 (F_1)$



▼ Installation position 4

Air bleed the housing	Air bleed the stroking chamber	Filling
$S (F_2) + T_2 (F_1)$	–	$S (F_2) + T_2 (F_1)$



Project planning notes

- The pump is designed to be used as a drum drive in concrete mixer trucks in closed circuits.
- The pump has been specifically designed and constructed for the load spectra in this particular application. The performance data given is based on this load spectrum.
- The project planning, installation and commissioning of the axial piston unit requires the involvement of qualified skilled personnel.
- Before using the axial piston unit, please read the corresponding instruction manual completely and thoroughly. If necessary, this can be requested from Bosch Rexroth.
- Before finalizing your design, please request a binding installation drawing.
- The specified data and notes contained herein must be observed.
- Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- Preservation: Our axial piston units are supplied as standard with preservative protection for a maximum of 12 months. If longer preservative protection is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, details of which can be found in the data sheet 90312 or in the instruction manual.
- Not all versions of the product are approved for use in a safety function according to ISO 13849. Please consult the responsible contact person at Bosch Rexroth if you require reliability parameters (e.g. $MTTF_D$) for functional safety.
- Depending on the type of control used, electromagnetic effects can be produced when using solenoids.
  Applying a direct voltage signal (DC) to solenoids does not create electromagnetic interference (EMI) nor is the solenoid affected by EMI. Electromagnetic interference (EMI) potential exists when operating and controlling a solenoid with a modulated direct voltage signal (e.g. PWM signal). Appropriate testing and measures should be taken by the machine manufacturer to ensure other components or operators (e.g. with pacemaker) are not affected by this potential.
- With dynamic power flow (switch of pumps to operation as a motor) a maximum of 95% $V_{g\ max}$ is permissible. We recommend configuring the software accordingly.
- Please note that a hydraulic system is an oscillating system. This can lead, for example, to the stimulation the natural frequency within the hydraulic system during operation at constant rotational speed over a long period of time. The stimulation frequency of the pump is 9 times the rotational speed frequency. This can be prevented, for example, with suitably designed hydraulic lines.
- Please note the details regarding the tightening torques of port threads and other threaded joints in the instruction manual.
- The ports and fastening threads are designed for the permissible pressures p_{max} of the respective ports, see the port tabeles. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified operating conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
- The working ports and function ports are only intended to accommodate hydraulic lines.

Safety instructions

- During and shortly after operation, there is a risk of getting burnt on the axial piston unit and especially on the solenoids. Take appropriate safety measures (e.g. by wearing protective clothing).
- Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, get stuck in position as a result of contamination (e.g. impure hydraulic fluid, abrasion, or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer respond correctly to the operator's specifications. Even the use of various filter elements (external or internal flow filtration) will not rule out a fault but merely reduce the risk. The machine/system manufacturer must test whether remedial measures are needed on the machine for the application concerned in order to bring the driven consumer into a safe position (e.g. safe stop) and ensure any measures are properly implemented.
- Moving parts in high-pressure relief valves may in certain circumstances become stuck in an undefined position due to contamination (e.g. impure hydraulic fluid). This can result in restriction or loss of the load holding function in lifting winches.
  The machine/system manufacturer must check whether additional measures are required on the machine for the relevant application in order to keep the load in a safe position and ensure they are properly implemented.
- If the sequence valve option is used in a different application than a drum drive in concrete mixer trucks, then the machine manufacturer has to verify that the pump will always go into the central position (neutral position) when the sequence valve is actuated (e.g. travel drive downhill-slope).

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