Radial piston pump
PR4 series 1X

RA 11260
Edition: 08.2017
Replaces: 07.2015

PR4-1X/1,00-450WA01M01

- Fixed displacement
- Sizes 0,40 to 2,00
- Maximum working pressure 700 bar (10150 psi)
- Maximum displacement 2 cm^3 (0.122 in^3)

Features

- Self-priming, valve-controlled
- Very low noise
- Long service life due to hydrodynamically lubricated slide bearings
- Very compact design, therefore installation-friendly dimensions
- Combination options with fixed and variable vane pumps
- Five sizes

Contents

Type code

01		02		03	04	05	06	07	08	09
PR4	–	**1X**	**/**		**W**		**01**			*

Type

01	Radial piston pump, fixed displacement, maximum pressure 700 bar (10150 psi)	**PR4**

Series

02	10 to 19 (10 to 19: unchanged installation and connection dimensions)	**1X**

Size (NG)		**NG**	**Pressure stage**	
03	Size – pressure stage (maximum)	0,40	700 bar (10150 psi)	**0,40-700**
	(all sizes have three pistons)	0,63	700 bar (10150 psi)	**0,63-700**
		1,00	450 bar (6500 psi)	**1,00-450**
		1,60	250 bar (3600 psi)	**1,60-250**
		2,00	175 bar (2550 psi)	**2,00-175**

Direction of rotation

04	Viewed on drive shaft	clockwise and counter-clockwise	**W**

Drive shaft

05	Parallel keyed shaft	**A**
	Splined shaft 10 × 12, DIN 5481 (for combination with vane pumps)	**G**

Line connection

06	Pipe thread, ISO 228/1	**01**

Sealing material

07	NBR seals (nitrile rubber)	**M**
	FKM seals (fluoroelastomer)	**V**

Pressure ports

08	1 pressure port	**01**
	3 pressure ports	**03**

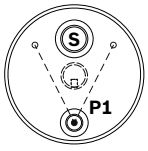
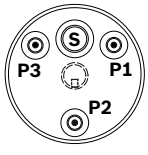
09	Further specifications in plain text	*

Design versions for multi circuit pumps

The following schematic diagrams show:

- the number and position of the pressure ports
- which cylinders are interconnected.

The dots indicate the cylinders that are connected directly to the pressurized pressure port.
The circles indicate the cylinders that are not connected directly to the pressurized pressure port.
The dotted and chain-dotted lines show, which cylinders are interconnected.
The designation sequence of the pressurized pressure ports is in clockwise direction.
The pressure port which is closest to the suction port on clockwise direction is labeled with **P1**.

Code (Pos. 08)	Number of pressure ports	3 pistons
01	1	
03	3	

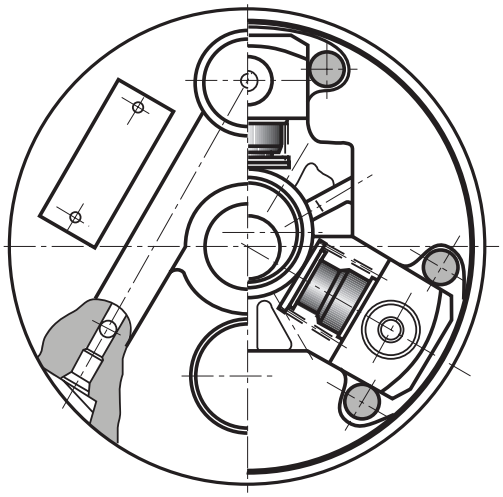
Functional description

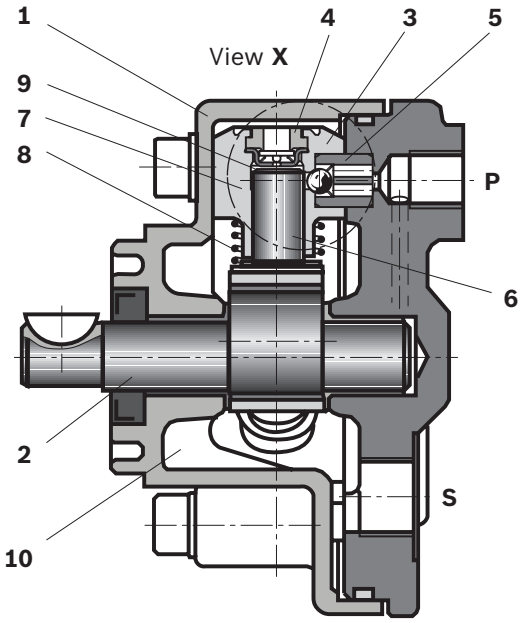
Assembly

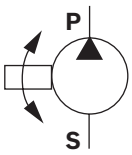
The pumps are valve-controlled, self-priming radial piston pumps with fixed displacement.
They consist essentially of the housing (**1**), eccentric shaft (**2**) and pump elements (**3**), with suction valve (**4**), pressure valve (**5**) and piston (**6**).

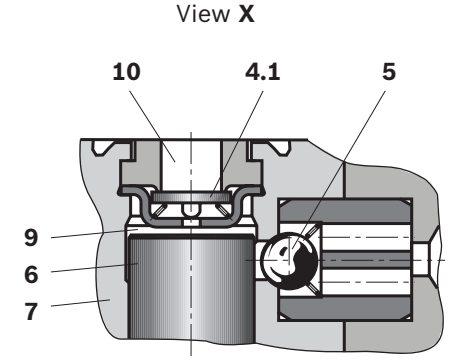
Suction and displacement process

Pistons (**6**) are arranged radially to the eccentric shaft (**2**). The piston (**6**) is guided in cylinder (**7**) and pressed against the eccentric (**2**) by the spring (**8**). During the downward movement of piston (**6**), the working chamber (**9**) in the cylinder (**7**) increases in size. The resulting negative pressure lifts the suction valve plate (**4.1**) from the sealing edge. This opens the connection from the suction chamber (**10**) to the working chamber (**9**). The working chamber fills with fluid. During the upward movement of piston (**6**), the suction valve closes and the pressure valve (**5**) opens. Fluid can now flow to the system via pressure port (**P**).









Technical data

Size		NG	0,40	0,63	1,00	1,60	2,00
Displacement, geometric	V_g	cm^3 (in^3)	0.4 (0.024)	0.63 (0.038)	1 (0.061)	1.6 (0.098)	2 (0.122)
Drive speed	n_{min}	rpm	1000	1000	1000	1000	1000
	n_{max}	rpm	3400	3000	2000	2000	2000
Working pressure (absolute)							
Inlet	p	bar (psia)	0.8 to 1.5 (12 to 22)				
Outlet continuous	p_N	bar (psi)	700 (10150)	700 (10150)	450 (6500)	250 (3600)	175 (2550)
Torque, maximum (drive shaft)		Nm (lb-ft)	10 (7.38)	10 (7.38)	10 (7.38)	10 (7.38)	10 (7.38)
Weight	m	kg (lbs)	2.6 (5.7)	2.6 (5.7)	2.6 (5.7)	2.6 (5.7)	2.6 (5.7)
Shaft load			Radial and axial forces **cannot** be absorbed!				
Mounting type			Front face mounting				
Line connections			Screw-in fittings				
Direction of rotation (viewed to drive shaft)			Counter-clockwise or clockwise, has no influence on the flow direction				

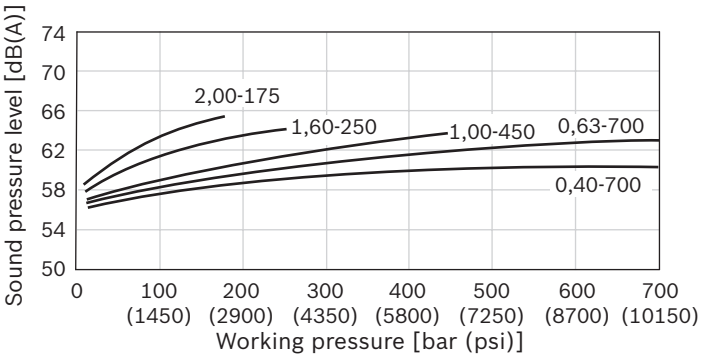
Hydraulic fluid	
Permissible hydraulic fluid[1)]	HLP mineral oil according to DIN 51524 part 2
Operating temperature range	–10 to +70 °C (14 to 158 °F)
Viscosity range	10 to 200 mm^2/s (60 to 925 SUS)
Maximum admissible degree of contamination of the hydraulic fluid Cleanliness level according to ISO 4406 (c)	Class 20/18/15[1)]

Note

- Please contact us if the unit is to be used outside the specified values.
- Observe our specifications according to data sheet 90220.
- Information on the installation position, see page 8

1) Cleanliness levels specified for the components must be maintained in the hydraulic systems. Effective filtration prevents malfunctions and simultaneously extends the service life of the components. When selecting filters, see data sheet RE 51144.

Sound pressure level



Note

- Characteristic curves are mean values, measured at n = 1450 min^{-1}; v = 41 mm^2/s (190 SUS), θ =50 °C (122 °F)
- Sound pressure level measured in acoustic room according to DIN 45635, part 26
- Distance: Microphone – pump = 1 m (39.4 in)
- At a system pressure below 4 bar (60 psi) and a viscosity > 150 mm^2/s (700 SUS) audible valve noise may occur.
- Sound pressure level at system pressure < 4 bar (60 psi): ≤ 58 dB(A).

Flow/drive power[1)]

NG - p_{max}	V_g [cm^3 (in^3)]	Pressure [bar]		50	100	150	200	250	300	350	400	450	500	550	600	650	700
			[psi]	725	1450	2200	2900	3600	4350	5100	5800	6500	7250	7950	8700	9450	10150
0,40-700	0.40 (0.024)	$q_{V, eff}$	[l/min]	0.55	0.54	0.54	0.53	0.53	0.52	0.51	0.50	0.50	0.49	0.49	0.48	0.48	0.47
			[gpm]	0.15	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.12
		P_A	[kW]	0.07	0.12	0.16	0.20	0.25	0.30	0.34	0.39	0.43	0.48	0.52	0.57	0.61	0.66
			[hp]	0.09	0.16	0.21	0.27	0.34	0.40	0.46	0.52	0.58	0.64	0.70	0.76	0.82	0.89
0,63-700	0.63 (0.038)	$q_{V, eff}$	[l/min]	0.95	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.88	0.87	0.86	0.85	0.84	0.83
			[gpm]	0.25	0.25	0.25	0.24	0.24	0.24	0.24	0.23	0.23	0.23	0.23	0.22	0.22	0.22
		P_A	[kW]	0.10	0.18	0.26	0.34	0.42	0.51	0.58	0.67	0.74	0.82	0.90	0.98	1.07	1.15
			[hp]	0.13	0.24	0.35	0.46	0.56	0.68	0.78	0.90	0.99	1.10	1.21	1.31	1.44	1.54
1,00-450	1.00 (0.061)	$q_{V, eff}$	[l/min]	1.47	1.45	1.43	1.41	1.40	1.39	1.38	1.37	1.36	–	–	–	–	–
			[gpm]	0.39	0.38	0.38	0.37	0.37	0.37	0.36	0.36	0.36	–	–	–	–	–
		P_A	[kW]	0.16	0.28	0.41	0.53	0.66	0.77	0.89	1.02	1.14	–	–	–	–	–
			[hp]	0.21	0.38	0.55	0.71	0.89	1.03	1.19	1.37	1.53	–	–	–	–	–
1,60-250	1.60 (0.098)	$q_{V, eff}$	[l/min]	2.35	2.35	2.34	2.33	2.33	–	–	–	–	–	–	–	–	–
			[gpm]	0.62	0.62	0.62	0.62	0.62	–	–	–	–	–	–	–	–	–
		P_A	[kW]	0.22	0.43	0.64	0.85	1.06	–	–	–	–	–	–	–	–	–
			[hp]	0.30	0.58	0.86	1.14	1.42	–	–	–	–	–	–	–	–	–
2,00-175	2.00 (0.122)	$q_{V, eff}$	[l/min]	2.98	2.97	2.96	–	–	–	–	–	–	–	–	–	–	–
			[gpm]	0.79	0.78	0.78	–	–	–	–	–	–	–	–	–	–	–
		P_A	[kW]	0.31	0.58	0.86	–	–	–	–	–	–	–	–	–	–	–
			[hp]	0.42	0.78	1.15	–	–	–	–	–	–	–	–	–	–	–

For pumps with 3 pressure ports, type “03“ applies the following:
Using various operating pressures for each cylinder the drive power of the highest cylinder pressure is to be selected.

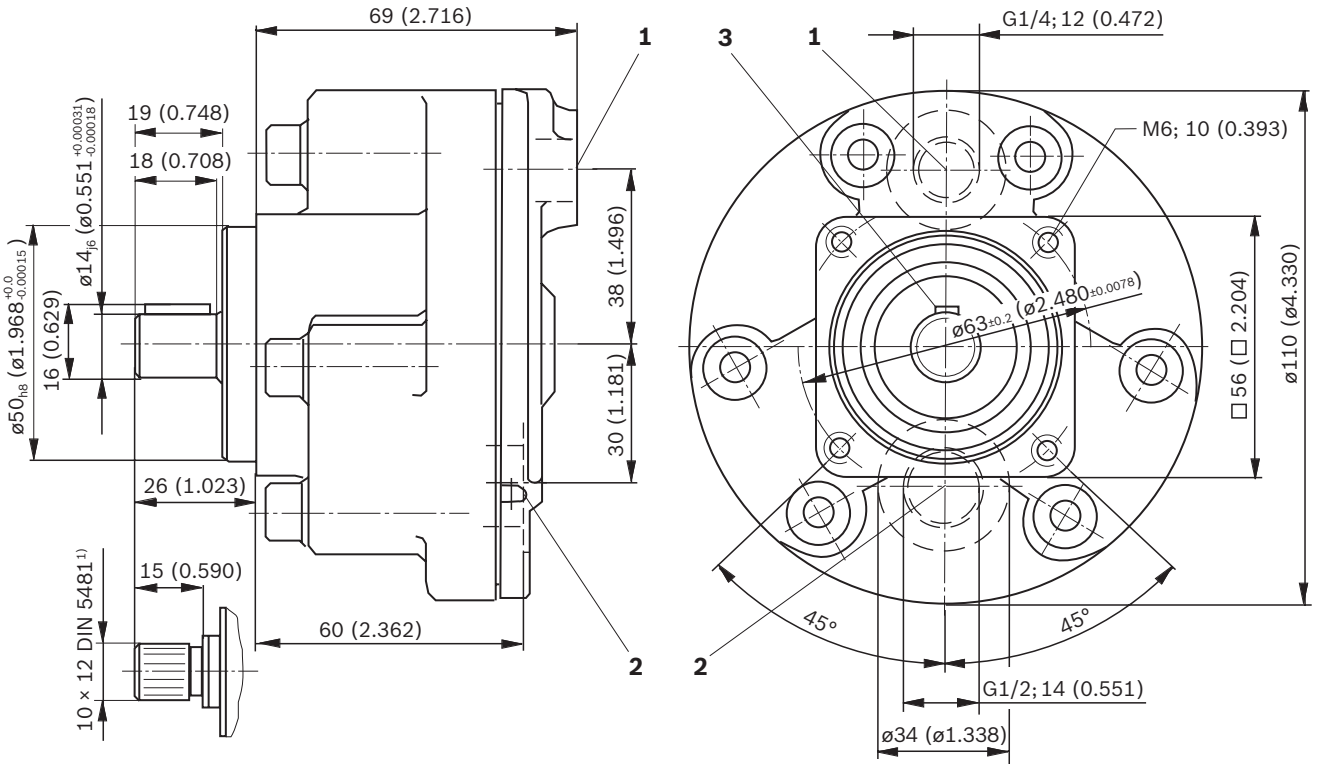
▼ **Example: Pump PR4–1X/0.63–700...03**

Port 1 and 2, each loaded with 450 bar (6500 psi), 3 is circulating at zero pressure.
P_A = 0.74 kW (0.99 hp)

1) Mean values measured at n = 1450 rpm, θ = 50 °C (122 °F)

Dimensions

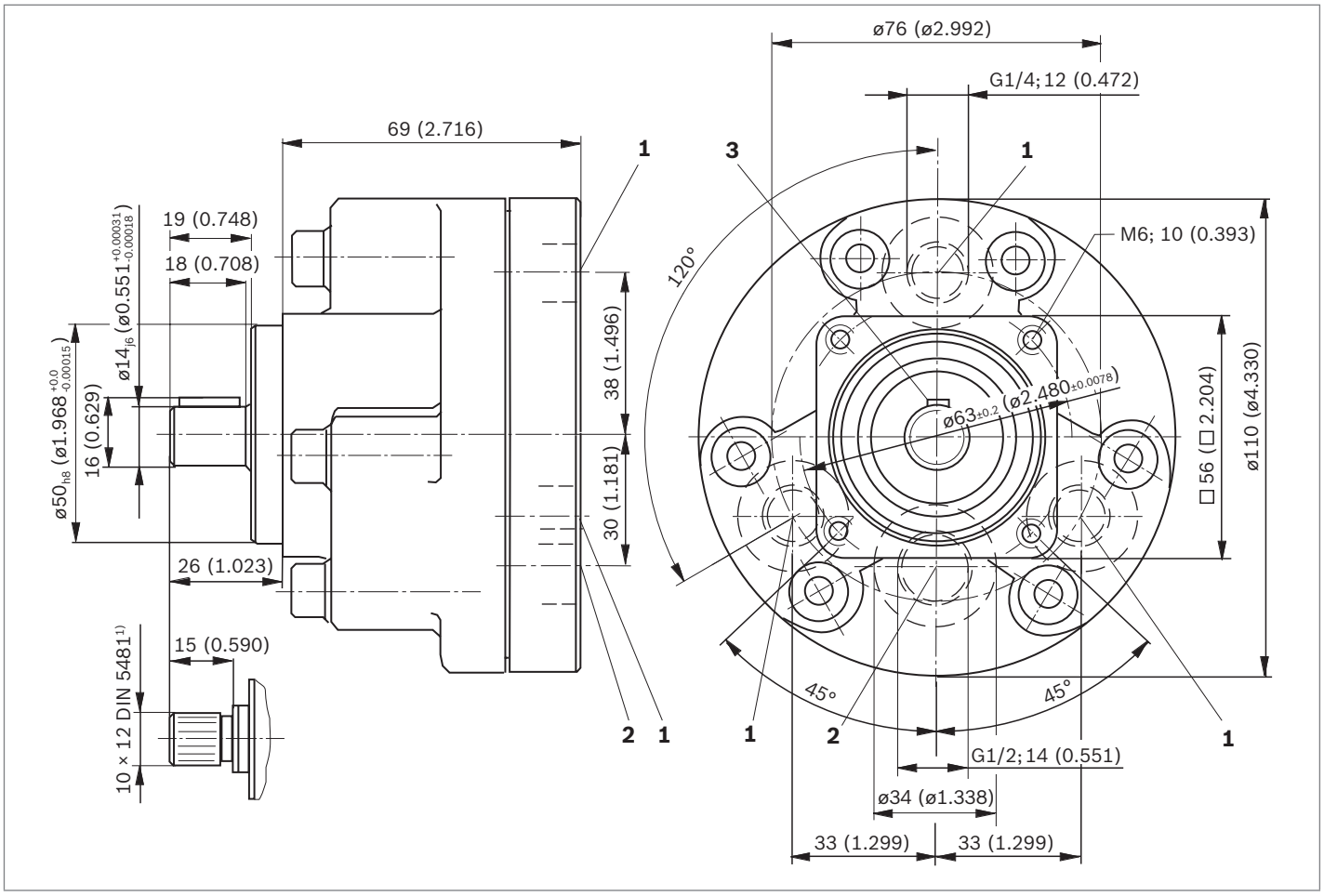
Design with one pressure port



1 Pressure port **P**
2 Suction port **S**
3 Woodruff key 5 × 6.5 DIN 6888

1) Splined shaft

Design with three pressure ports



1 Pressure port **P**
2 Suction port **S**
3 Woodruff key 5 × 6.5 DIN 6888

1) Splined shaft

Installation instructions

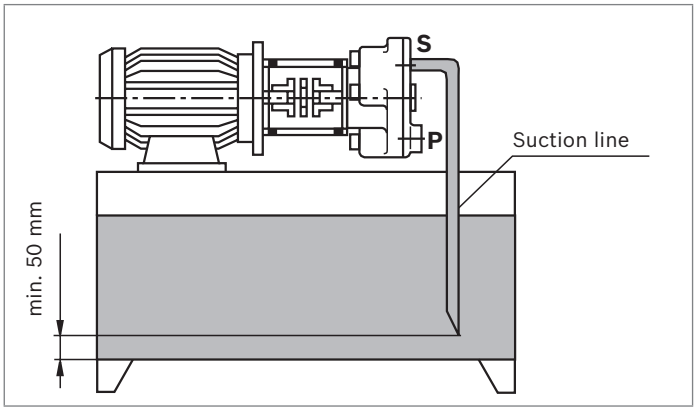
Fluid reservoir

- Match the usable reservoir volume to the operating conditions.
- The permissible fluid temperature may not be exceeded, if required, provide a cooler!

Lines and ports

- Remove protection plugs from the pump.
- We recommend the use of seamless precision steel pipes according to DIN EN 10305-1 and removable pipe connections.
- Select the clear width of pipes according to the ports (suction speed 1 to 1.5 m/s / 3.28 to 4.92 ft/s).
- Inlet pressure, see page 4
- Thoroughly clean pipelines and fittings prior to installing.

Proposal for piping layout



- Under no circumstances may drain and returning fluid be drawn directly into the suction port again, i.e., select the largest possible distance between suction line and return line.
- The return drain must always be below the oil level.
- Ensure suction-tight installation of the pipes.

Filters

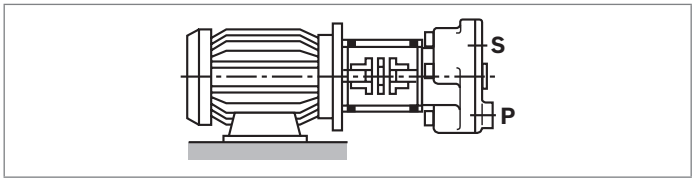
If possible, use return line filters or pressure filters.
(use suction filters only in combination with underpressure switch/contamination indicator).

Hydraulic fluid

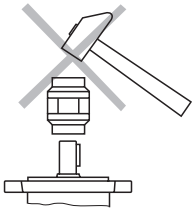
- Please observe our specifications according to data sheet 90220.
- We recommend brand name hydraulic fluids.
- Do not mix hydraulic fluids of different types since this can result in decomposition and deterioration of the lubricity.
- The hydraulic fluid must be replaced at regular intervals according to the operating conditions. When doing this, the hydraulic fluid reservoir must also be cleaned of residues.

Drive

Electric motor + pump mounting bracket + coupling + pump

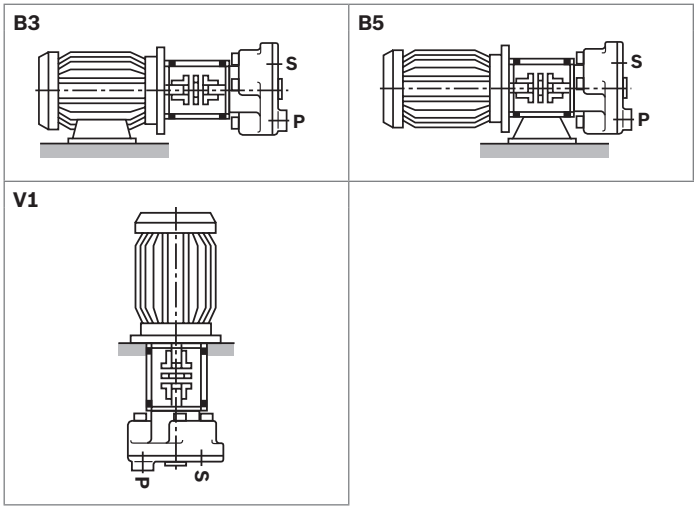


- No radial or axial forces permissible on the pump drive shaft!
- Motor and pump must be exactly aligned!
- Always use a coupling that is suitable for compensating for shaft offsets!
- When installing the coupling, avoid axial forces, i.e., when installing, do not hammer or press the coupling onto the shaft. Use the female thread on the drive shaft.



Installation positions

- Horizontal installation (**B3, B5**): always position the suction port above the pressure port. This arrangement ensures improved pump air bleeding.
- Vertical installation (**V1**): no limitations



Project planning notes

When using radial piston pumps, the following notes should be observed in particular.
The project planning, installation and commissioning of the radial piston pump require the involvement of qualified skilled personnel.

Technical data
All the technical data are dependent on manufacturing tolerances and are valid with certain operating conditions. Please note that certain deviations are therefore possible, and that technical data may vary when boundary conditions (e.g. viscosity) change.

Characteristic curves for flow and absorbed power
When designing the drive motor, observe the maximum possible application data.

Noise
The sound pressure level values shown on page 5 were measured according to DIN 45635 part 26. This means that only the noise emitted by the pump is depicted. Ambient influences (such as place of installation, piping, etc.) are not taken into consideration. The values only refer to one pump. During pressure-free operation, the pressure line must be pre-charged with a check valve (cracking pressure p = 5 bar / 75 psi) due to noise development.

Note
Due to the power unit design and influences at the final place of installation of the pump, the noise pressure level is usually 5 to 10 dB(A) higher than the value of the pump itself.

Commissioning instructions

Air bleeding
- All PR4 radial piston pumps are self-priming.
- Fill the housing with filtered oil via port S.
- During initial commissioning, set the pump to pressureless circulation. To do so, release the pressure hose and direct it into the reservoir.
- Before initial commissioning, the pump must be air-bled to protect it against damage.
- Switch to pressureless circulation, or direct the pressure line or pressure hose back into the reservoir.
- Briefly switch the pump on (inching mode).
- Should the pump not displace bubble-free oil after approx. 20 seconds, re-check the system. After the operating values have been reached, check the pipe connections for leakage. Check the operating temperature.
- Be aware of noise generation.

Commissioning
- Check whether the system is thoroughly and properly installed.
- Start the pump without load and let it displace fluid without pressure for a few seconds in order to ensure sufficient lubrication.
- **In no case may the pump be operated without hydraulic fluid!**

Note
- Adjustment, maintenance and repair of the pump may only be carried out by authorized, trained and instructed personnel!
- Use only original Rexroth spare parts!
- The pump may only be operated within the permissible data.
- The pump may only be operated when in perfect condition!
- When carrying out any work on the pump (e.g. installation and removal) the system must be switched off and depressurized!
- Unauthorized conversions and changes, affecting the safety and function are not permissible!
- Mount protective devices (e.g., coupling protection)!
- Do not remove any existing protective devices!
- The generally valid safety and accident prevention regulations must be strictly observed!

Spare parts

Designation	Material number
NBR seal kit	R900312138
FKM seal kit	R900313049

(valid for all sizes)

Information on available spare parts:
www.boschrexroth.com/spc

Bosch Rexroth Corporation
Industrial Applications
2315 City Line Road
Bethlehem, PA 18017-2131, USA
Telephone (610) 694-8300
Facsimile (610) 694-8467
www.boschrexroth-us.com

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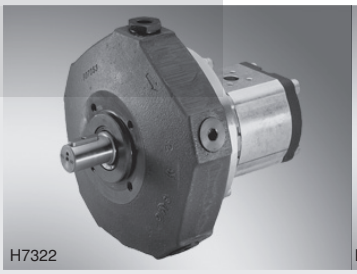
Rexroth
Bosch Group

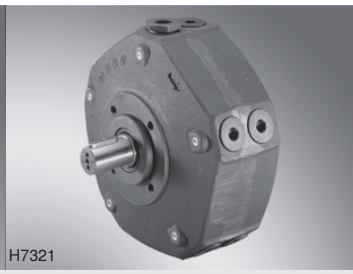
Fixed displacement radial piston pump

RE 11263/05.13 1/16
Replaces: 10.05

Type PR4



P2R4-3X/4,00-700RK01M01+AZPF8



PR4-3X/16,00-500RA01M01

Sizes 1.60 to 20.00 cm^3
Component series 3X
Maximum operating pressure 700 bar

Table of contents

Features

- Self-priming, valve-controlled
- 14 sizes, favourable gradations for optimum pump selection
- Long service life due to hydrodynamically lubricated sliding bearings
- Several pressure ports with various cylinder combinations

Ordering code

PR	4 – 3X/	R						*

Type of device = PR

Series **= 4**

Component series

Component series 30 to 39 **= 3X**
(30 to 39: Unchanged installation and connection dimensions)

Component size

Component size - pressure stage (maximum)

1.51 cm^3	(3)	**= 1.60-700**
2.14 cm^3	(3)	**= 2.00-700**
2.59 cm^3	(3)	**= 2.50-700**
3.57 cm^3	(5)	**= 3.15-700**
4.32 cm^3	(5)	**= 4.00-700**
7.14 cm^3	(10)	**= 6.30-700** [1]
8.63 cm^3	(10)	**= 8.00-700** [2]
3.39 cm^3	(3)	**= 3.15-500**
4.82 cm^3	(3)	**= 5.00-500**
5.83 cm^3	(3)	**= 6.30-500**
8.03 cm^3	(5)	**= 8.00-500**
9.71 cm^3	(5)	**= 10.00-500**
16.07 cm^3	(10)	**= 16.00-500** [1]
19.43 cm^3	(10)	**= 20.00-500** [2]

Direction of rotation

Clockwise rotation **= R**

A = Cylindrical shaft end
G = Serrated shaft 21x24 to DIN 5481
K = Cylindriical shaft with output for mounting an AZPF or AZPFF

Shaft version

01 = BSP thread to ISO 228/1
12 = SAE thread to ANSI B1.1

Line connection

M = NBR seals
V = FKM seals

Seal material

Code	Number of pressure ports	Combination of cylinders		
		Radial piston pump with		
		3 pistons	5 pistons	10 pistons
01 =	1	3	5	10
02 =	2	1+2		5+5
03 =	3	1+1+1		
08 =	5		1+1+1+1+1	2+2+2+2+2
11 =	6			2+2+2+2+1+1
12 =	10			10x1

Number of pressure ports

Further details in clear text

[1] Not available with shaft end (versions "G" and "K")

[2] Not available with shaft end (version "K")

Function, section, symbol

Hydraulic pumps of type PR4 are valve-controlled, self-priming radial piston pumps with fixed displacement.

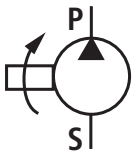
Radial piston pump type PR4 mainly consists of the housing (1), eccentric shaft (2) and 3, 5 or 10 pumping elements (3) with suction valve (4), pressure valve (5) and piston (6).

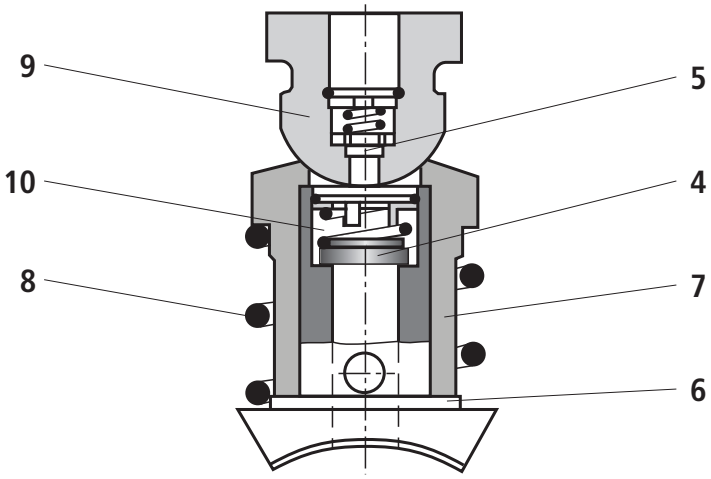
Suction and displacement process

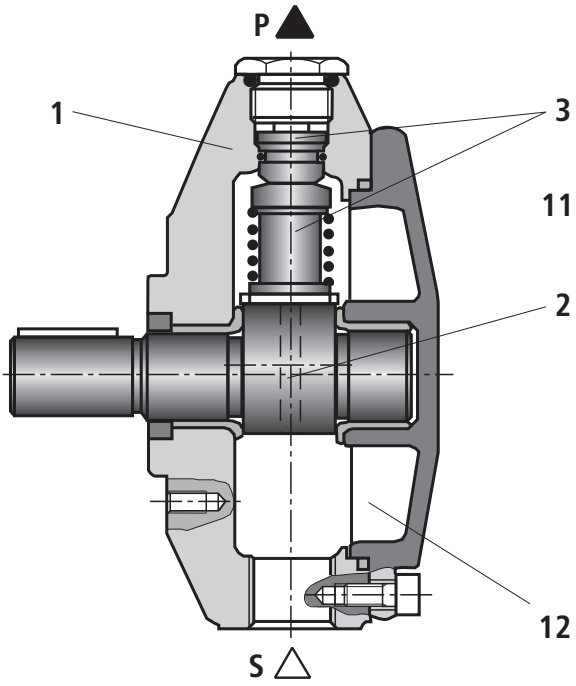
The pistons (6) are arranged radially to the eccentric shaft (2). The hollow piston (6) with suction valve (4) is guided in a cylinder (7) and pressed by a spring (8) onto the eccentric shaft (2). The radius of the piston running face corresponds to the radius of the eccentric shaft. The cylinder (7) seals against a semi-spherical element (9).

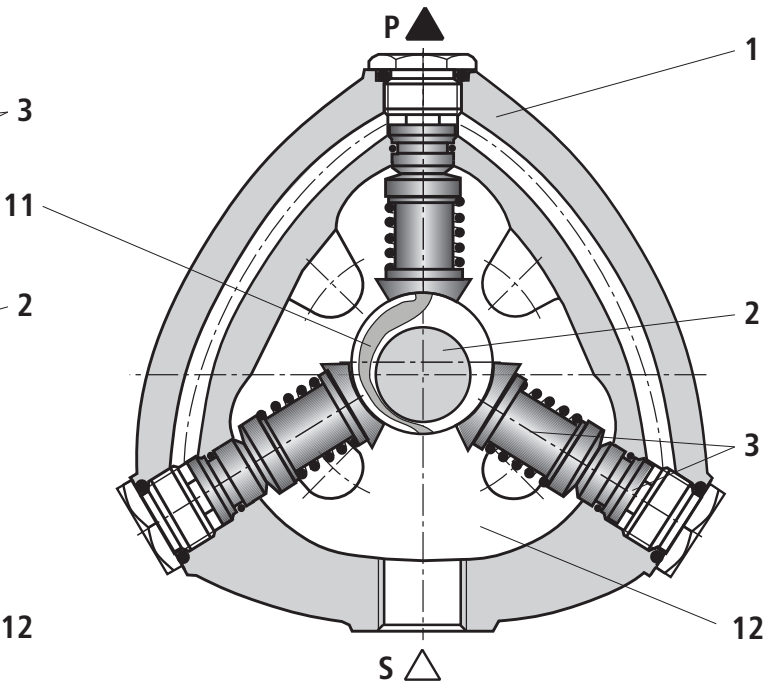
As the piston (6) moves downwards, the working chamber (10) enlarges in cylinder (7). The ensuing negative pressure causes the suction valve plate to lift off the sealing edge. At the same time, the connection from suction chamber (12) to working chamber (10) is opened via a radial groove (11) in the eccentric shaft (2).

The working chamber fills with fluid. As the piston (6) moves upwards, suction valve (4) closes and pressure valve (5) opens. The fluid now flows via pressure port (P) into the system.









Design options for multi-circuit pumps

The following can be seen from the schematic diagrams below:
– the number and position of pressure ports,
– which cylinders are interconnected.

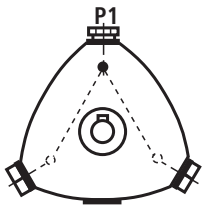
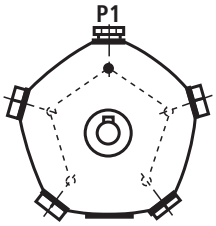
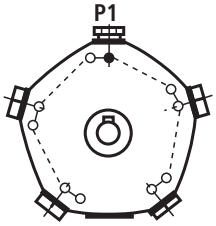
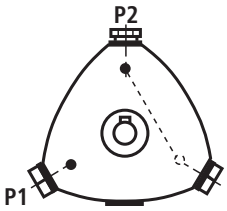
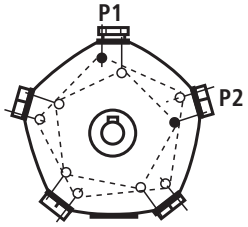
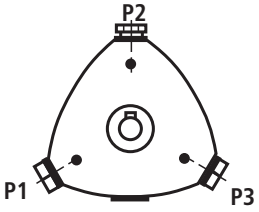
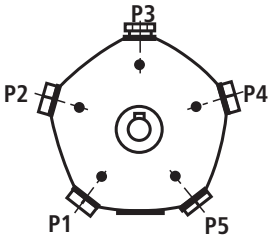
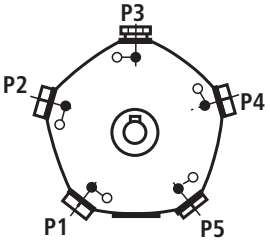
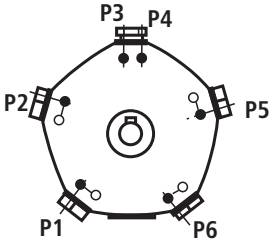
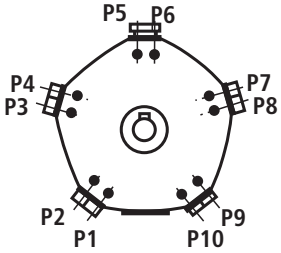
The dots indicate the cylinders that are connected directly to the pressurised pressure port.

The circles indicate the cylinders that are not connected directly to the pressurised pressure port.

The dotted and chain-dotted lines show, which cylinders are interconnected.

The pressurised pressure ports are numbered clockwise.

The pressure port, which - in the clockwise direction - is closest to the suction port, is identified with "P1".

Code	Number of pressure ports	Combination of cylinders		
		3 pistons	5 pistons	10 pistons
01	1			
02	2			
03	3			
08	5			
11	6			
12	10			

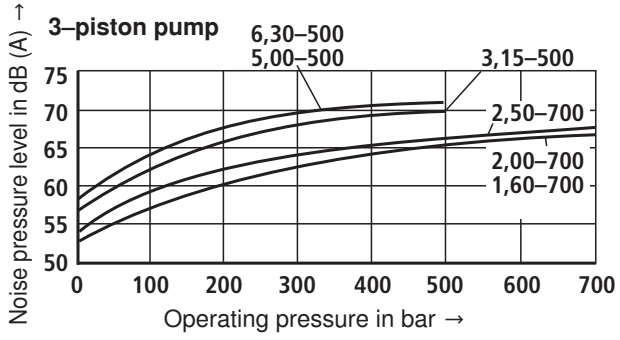
Technical data (for applications outside these parameters, please consult us!)

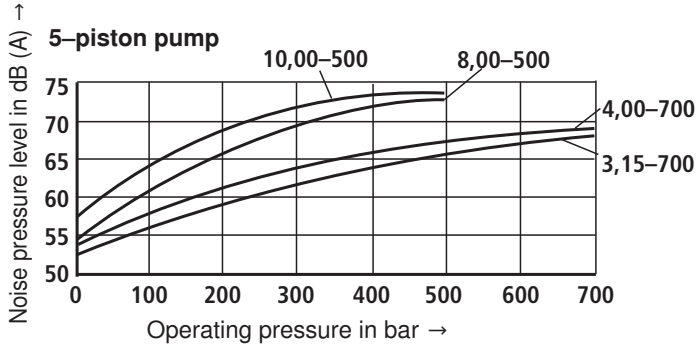
Speed range			min $^{-1}$	1000 to 2000	
Operating pressure	Inlet		bar	0.8 to 2.5 absolute	
		Cylinder ID	mm	Ø 10	Ø 15
	Outlet		bar	700	500
For circulation at zero pressure, the pressure line must be preloaded by means of a check valve			bar	5	
Max. permissible torque (drive shaft)			Nm	160	
Installation position				Optional	
Shaft loading				Radial and axial forces **cannot** be absorbed	
Type of mounting				Face mounting	
Line connections				Screw-in fittings	
Direction of rotation (viewed to shaft end)				Clockwise	
Hydraulic fluid				HLP mineral oil to DIN 51524 part 2 **Please observe the specifications according to data sheet 90220!**	
Hydraulic fluid temperature range			°C	–10 to +70	
Viscosity range			mm^2/s	10 to 200	
Max. permissible degree of contamination of the hydraulic fluid - cleanliness classes to ISO 4406 (c)				Class 20/18/15 [1]	
				3 pistons	5 pistons	10 pistons
Weight			kg	9.2	12.4	16.4

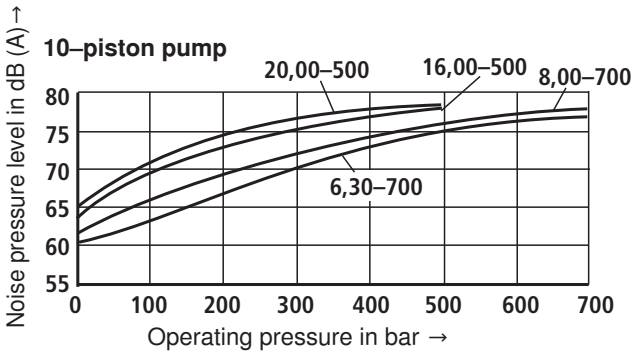
[1] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of the components. For selecting the filters, see data sheet 51144.

Noise pressure level (average value): (measured at n = 1450 min^{-1}, v = 41 mm^2/s and ϑ = 50 °C)

The characteristic curves are not valid for multi-circuit variants.







Measured in the anechoic chamber according to DIN 45635, part 26,

distance from pump to microphone = 1 m

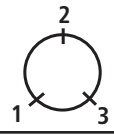
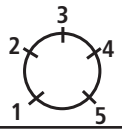
Flow and drive power (average value): Referred to 1 cylinder (n = 1450 min$^{-1)}$)

Cylinder ID in mm	Stroke in mm	V_{geom} in cm^3		Operating pressure p in bar 50	100	150	200	250	300	350	400	450	500	550	600	650	700
10	6.4	0.509	$q_{V.eff}$ L/min	0.71	0.7	0.69	0.69	0.69	0.685	0.68	0.68	0.675	0.67	0.67	0.665	0.66	0.66
			P_a kW	0.093	0.164	0.231	0.29	0.358	0.42	0.481	0.54	0.605	0.67	0.739	0.81	0.888	0.97
10	9.1	0.714	$q_{V.eff}$ L/min	1.02	1.01	1.0	0.995	0.99	0.985	0.98	0.975	0.97	0.965	0.96	0.955	0.95	0.94
			P_a kW	0.129	0.23	0.328	0.41	0.503	0.58	0.677	0.77	0.856	0.94	1.046	1.16	1.257	1.36
10	11.0	0.864	$q_{V.eff}$ L/min	1.22	1.21	1.205	1.2	1.195	1.19	1.184	1.18	1.174	1.17	1.163	1.157	1.147	1.14
			P_a kW	0.15	0.275	0.392	0.49	0.594	0.7	0.804	0.91	1.018	1.13	1.244	1.37	1.486	1.61
15	6.4	1.13	$q_{V.eff}$ L/min	1.6	1.59	1.58	1.567	1.56	1.556	1.546	1.54	1.53	1.523				
			P_a kW	0.213	0.4	0.547	0.7	0.85	1.0	1.14	1.27	1.433	1.566				
15	9.1	1.61	$q_{V.eff}$ L/min	2.28	2.26	2.25	2.24	2.23	2.22	2.20	2.19	2.18	2.17				
			P_a kW	0.27	0.49	0.71	0.91	1.11	1.31	1.51	1.7	1.91	2.12				
15	11.0	1.94	$q_{V.eff}$ L/min	2.74	2.73	2.71	2.7	2.68	2.67	2.65	2.64	2.62	2.6				
			P_a kW	0.32	0.57	0.826	1.06	1.31	1.55	1.8	2.05	2.29	2.53				

Factor "*f*" for uneven running at n = 1450 min^{-1}

The values given in the table "flow and drive power" refer to only 1 cylinder. In order to determine the required drive power, the value must be multiplied by the number of cylinders.

At the same time, the uneven running factor "*f*" must be applied.

Radial piston pump			
3 cylinders		5 or 10 cylinders	
Cylinders under load	Factor *f*	Cylinders under load	Factor *f*
1	3.13	1	3.13
		1+2	1.89
1+2	1.57	1+3	1.57
		1+2+3	1.60
		1+3+4	1.35
		1+2+3+4	1.30
1+2+3	1.00	1+2+3+4+5	1.00
			

For pumps with 10 cylinders, 2 cylinders each are connected to a pressure port.

Example

Pump PR4–3X/1,60-700/RA01M02

Ports 1 and 2 are connected together and loaded to 450 bar, 3 is circulating at zero pressure.

P_a = 2 x 0.605 kW = 1.21 kW

f = 1.57

P_{erf} = 1.21 kW x 1.57 = 1.90 kW

Port 3 loaded to 300 bar, 1 and 2 circulating at zero pressure.

P_a = 0.42 kW

f = 3.13

P_{erf} = 0.42 kW x 3.13 = 1.31 kW

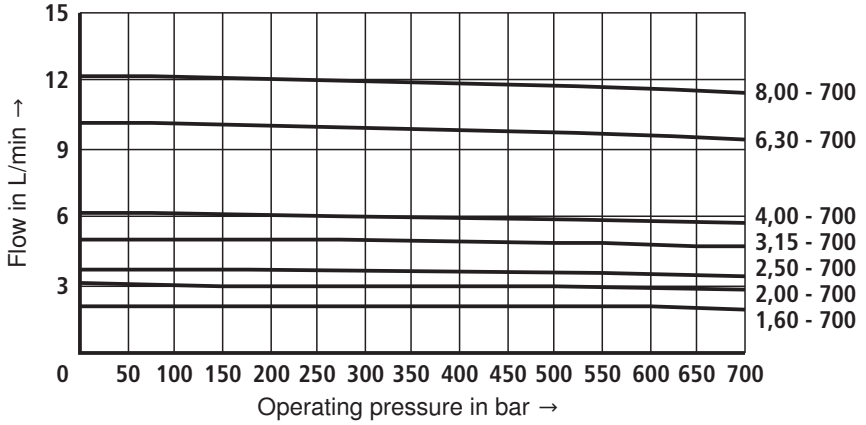
Ports 1, 2 and 3 loaded to 200 bar.

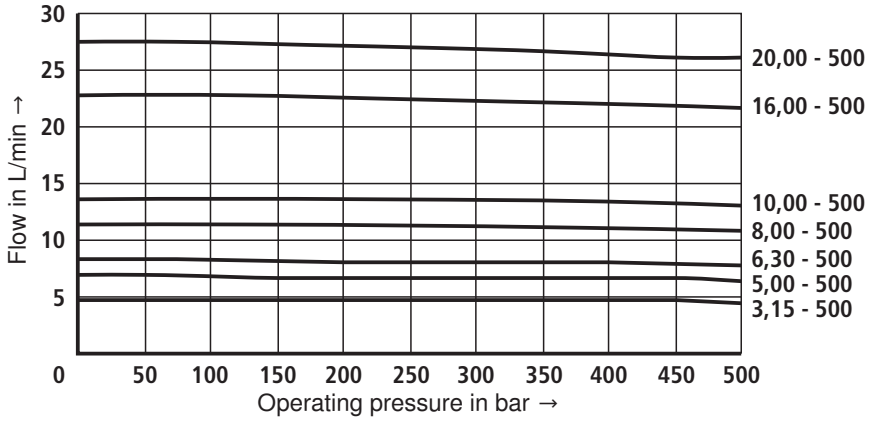
P_a = 3 x 0.29 kW = 0.87 kW

P_{erf} = 0.87 kW x 1.0 = 0.87 kW

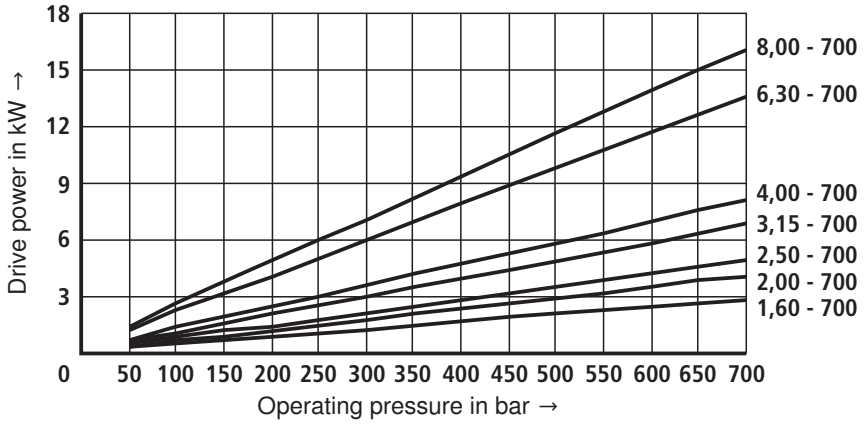
Characteristic curves (measured at n = 1450 min^{-1}, v = 41 mm^2/s and ϑ = 50 °C)

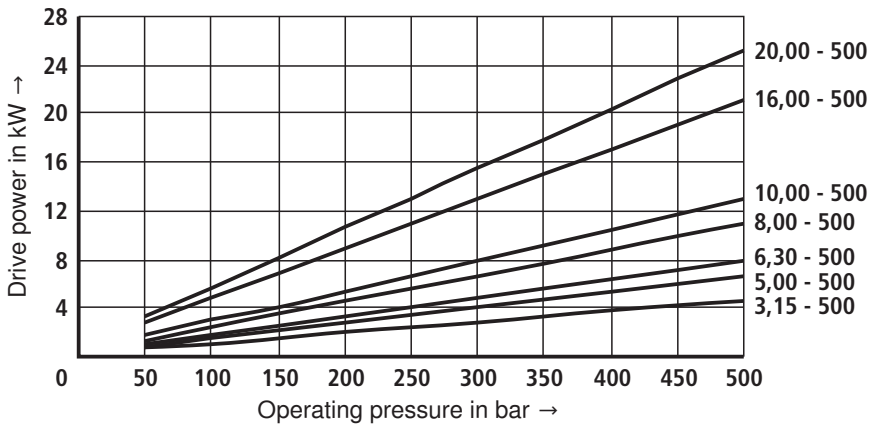
Flow



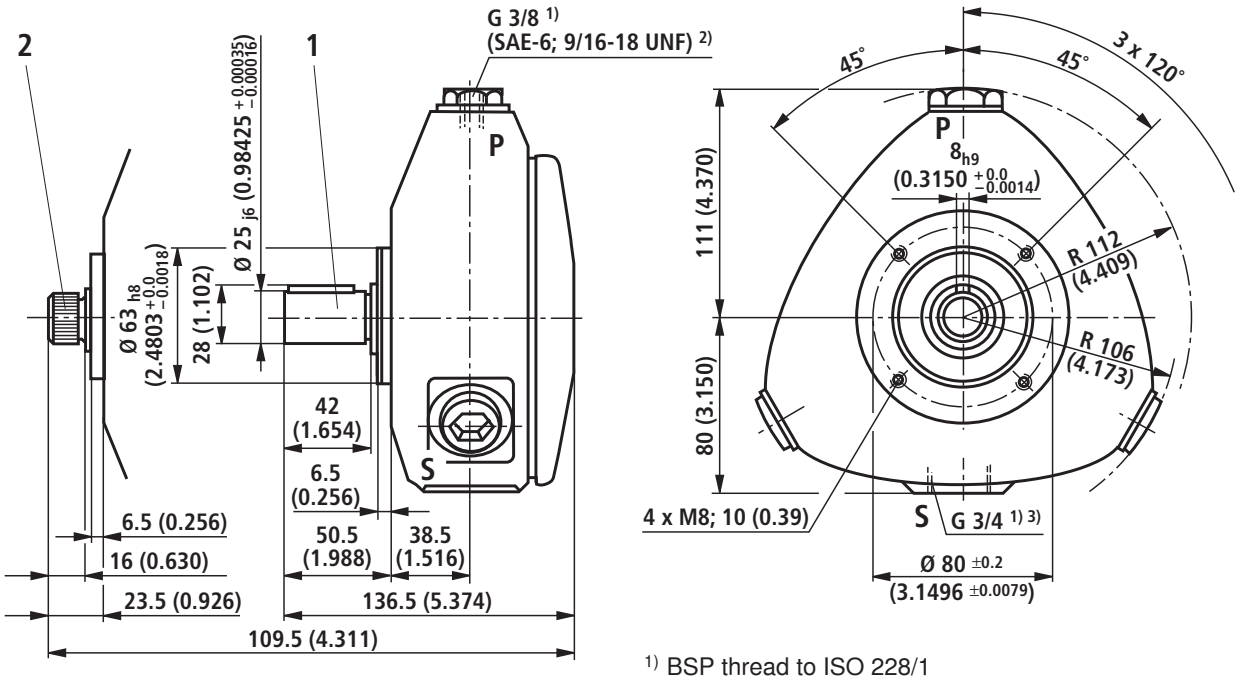


Drive power





Unit dimensions: Radial piston pump with 3 pistons, nominal dimensions in mm (inch)



1 Cylindrical shaft end

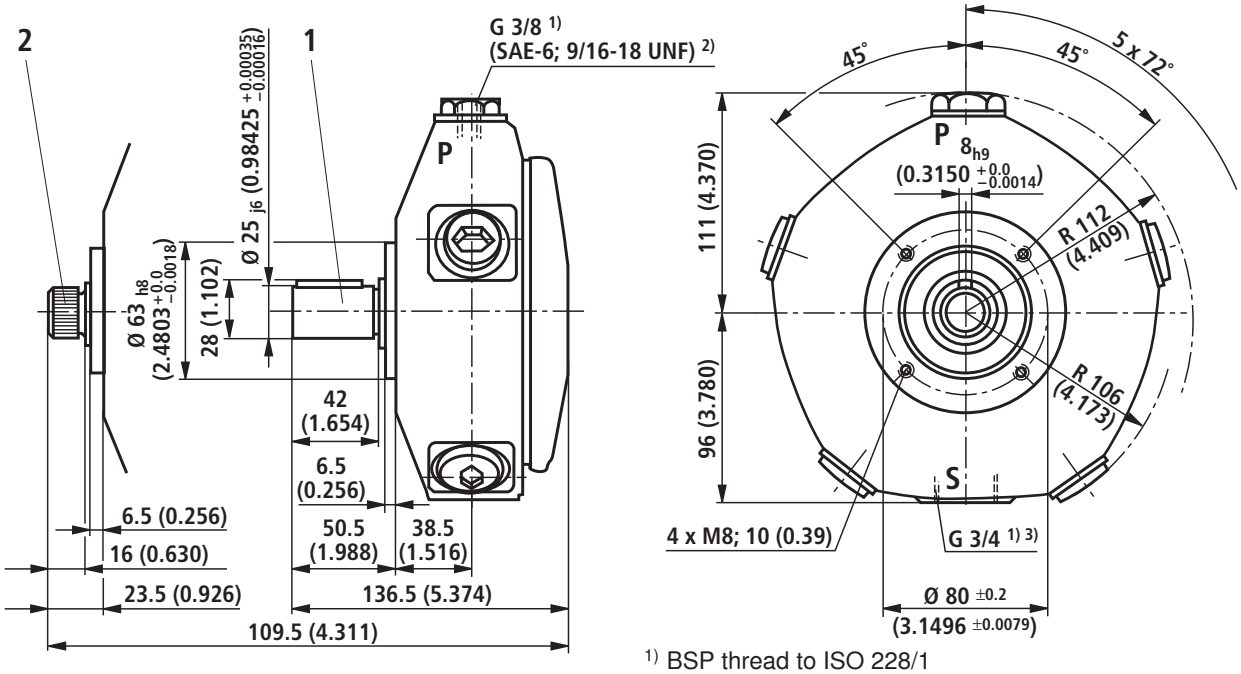
2 Splined shaft to DIN 5481

1) BSP thread to ISO 228/1

2) For line connection with code 12 to ANSI B 1.1

3) For line connection with code 12, connection adapter (SAE-12; 1 1/16-12 UN) to ANSI B 1.1 not included in the scope of supply

Unit dimensions: Radial piston pump with 5 pistons, nominal dimensions in mm (inch)



1 Cylindrical shaft end

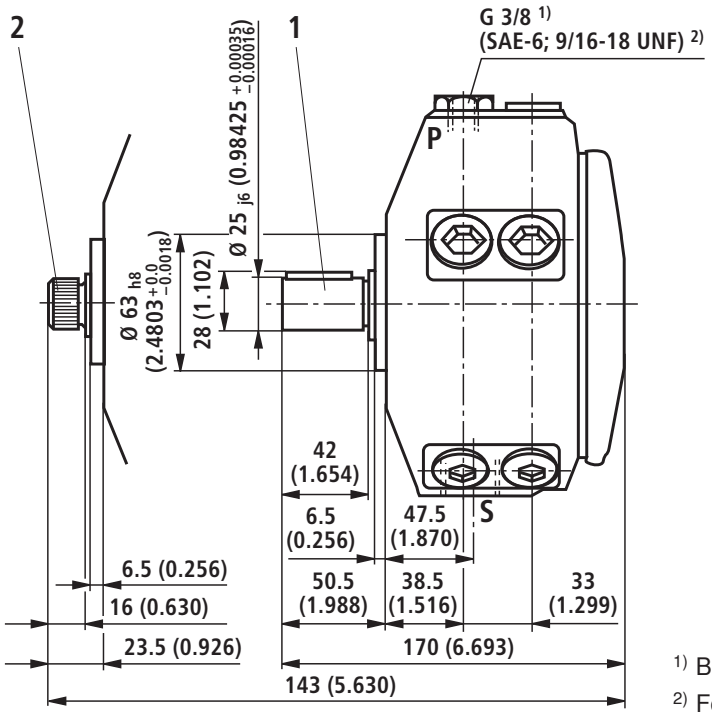
2 Splined shaft to DIN 5481

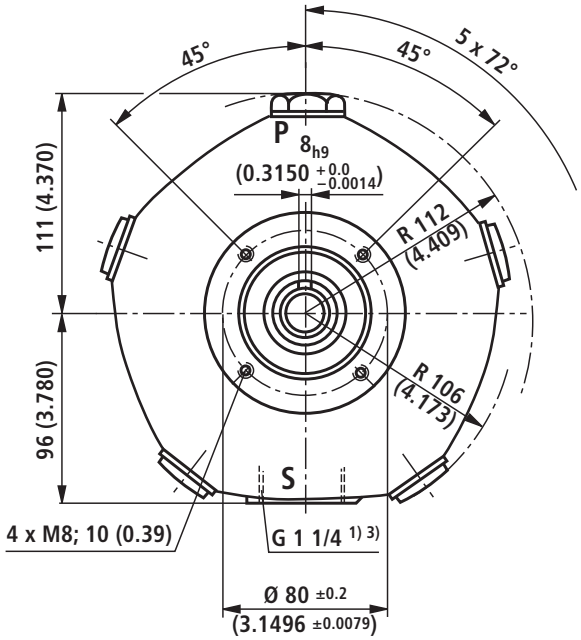
1) BSP thread to ISO 228/1

2) For line connection with code 12 to ANSI B 1.1

3) For line connection with code 12, connection adapter (SAE-12; 1 1/16-12 UN) to ANSI B 1.1 not included in the scope of supply

Unit dimensions: Radial piston pump with 10 pistons, code 01, 02 and 08, nominal dimensions in mm (inch)





1 Cylindrical shaft end

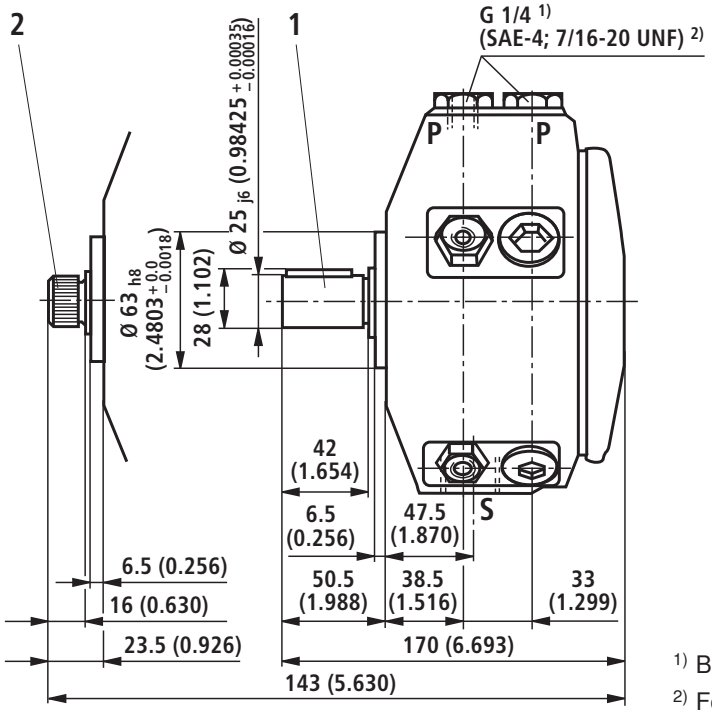
2 Splined shaft end to DIN 5481

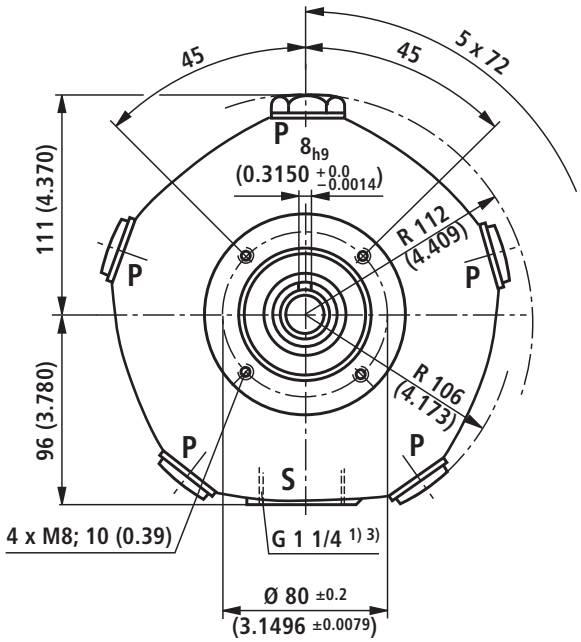
1) BSP thread to ISO 228/1

2) For line connection with code 12

3) For line connection with code 12, connection adapter (SAE-20; 1 5/8-20 UN) to ANSI B 1.1 not included in the scope of supply

Unit dimensions: Radial piston pump with 10 pistons, codes 11 and 12, nominal dimensions in mm (inch)





1 Cylindrical shaft end

2 Splined shaft end to DIN 5481

1) BSP thread to ISO 228/1

2) For line connection with code 12

3) For line connection with code 12, connection adapter (SAE-20; 1 5/8-20 UN) to ANSI B 1.1 not included in the scope of supply

Seal kits

Material number for NBR seals	Material number for FKM seals	Valid for
R900307726	R900307729	3-piston pumps
R900307727	R900307730	5-piston pumps
R900307728	R900307594	10-piston pumps

Ordering code for P2R4 and P3R4 pump combinations

	R4–3X/	R	K		M	+	*

Type of device
Double **= P2**
Triple **= P3**

Series **= 4**

Component series
Component series 30 to 39 **= 3X**
(30 to 39: Unchanged installation and connection dimensions)

Component size
Component size - pressure stage (maximum)

1.51 cm³	(3)	**= 1.60-700**
2.14 cm³	(3)	**= 2.00-700**
2.59 cm³	(3)	**= 2.50-700**
3.57 cm³	(5)	**= 3.15-700**
4.32 cm³	(5)	**= 4.00-700**
3.39 cm³	(3)	**= 3.15-500**
4.82 cm³	(3)	**= 5.00-500**
5.83 cm³	(3)	**= 6.30-500**
8.03 cm³	(5)	**= 8.00-500**
9.71 cm³	(5)	**= 10.00-500**

Direction of rotation
Clockwise rotation **= R**

Shaft version
Cylindrical shaft end with output for mounting an AZPF or AZPFF **= K**

Line connection
BSP thread to ISO 228/1 **= 01**
SAE thread to ANSI B1.1 **= 12**

Seal material
NBR seals **= M**

Further details in clear text

Component sizes for double pump

AZPF4 =	4 cm³	(p_{max} = 280 bar) [1]
AZPF5 =	5 cm³	(p_{max} = 280 bar) [1]
AZPF8 =	8 cm³	(p_{max} = 280 bar) [1]
AZPF11 =	11 cm³	(p_{max} = 230 bar) [1]
AZPF14 =	14 cm³	(p_{max} = 180 bar) [1]
AZPF16 =	16 cm³	(p_{max} = 160 bar) [1]
AZPF19 =	19 cm³	(p_{max} = 135 bar) [1]
AZPF22 =	22 cm³	(p_{max} = 110 bar) [1]
AZPF25 =	25 cm³	(p_{max} = 100 bar) [1]
AZPF28 =	28 cm³	(p_{max} = 90 bar) [1]

Component sizes for triple pump

AZPFF5-4 =	5 cm³ - 4 cm³
AZPFF8-4 =	8 cm³ - 4 cm³
AZPFF8-8 =	8 cm³ - 8 cm³
AZPFF11-4 =	11 cm³ - 4 cm³
AZPFF11-5 =	11 cm³ - 5 cm³
AZPFF11-8 =	11 cm³ - 8 cm³
AZPFF16-8 =	16 cm³ - 8 cm³
AZPFF16-16 =	16 cm³ - 16 cm³

Number of pressure ports

Code	Number of pressure ports	Combination of cylinders	
		Radial piston pump with	
		3 pistons	5 pistons
01 =	1	3	5
02 =	2	1+2	
03 =	3	1+1+1	
08 =	5		1+1+1+1+1

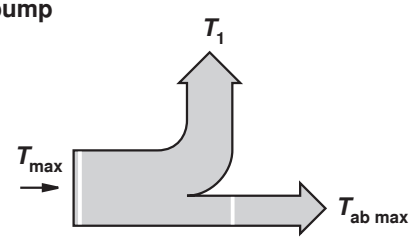
[1] Observe the note on the engineering of multiple pumps (page 12)

Notes on the engineering of multiple pumps

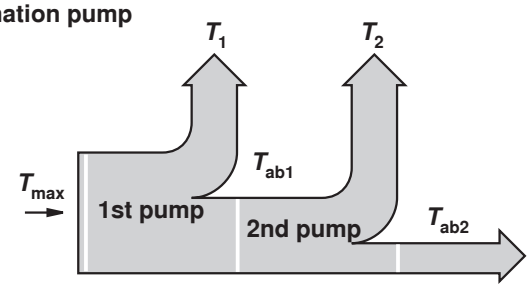
- The general technical data of the single pumps are also valid for multiple pumps (see below and page 5).
- The pump that is subjected to greater loads (pressure x flow) should be the first pump stage.
- When several pumps are combined, the occurring torque can reach impermissibly high values.
- The sum of torques must not exceed the permissible values (see table below)

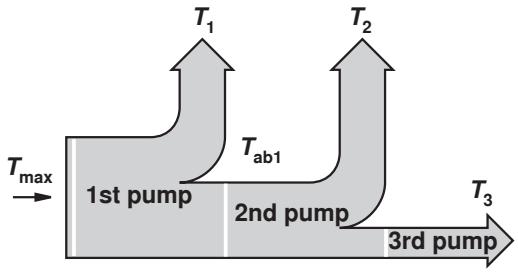
Pump type	Max. permissible input torque T_{max}	Max. permissible output torque T_{max}
PR4…	160 Nm	45 Nm
AZPF…	45 Nm	45 Nm
AZPFF…	45 Nm	45 Nm

Single pump



Combination pump





Calculation example:

V	=	displacement in cm^3
$\eta_{hydr.-mech.}$	=	hydraulic-mechanical efficiency
T	=	torque in Nm
Δp	=	pressue in bar

$$T = \frac{\Delta p \bullet V \bullet 0.0159}{\eta_{hydr.-mech.}} \text{ (Nm)}$$

Example: Pump combination
P3R4-3X/3,15-700… + AZPFF8-4

$$T_1 = \frac{700 \text{ bar} \bullet 3.57 \text{ cm}^3 \bullet 0.0159}{0.9} = 44.2 \text{ Nm}$$

$$T_2 = \frac{100 \text{ bar} \bullet 8 \text{ cm}^3 \bullet 0.0159}{0.85} = 15.0 \text{ Nm}$$

$$T_3 = \frac{50 \text{ bar} \bullet 4 \text{ cm}^3 \bullet 0.0159}{0.85} = 3.8 \text{ Nm}$$

$T_{ab2} = 45$ Nm

$T_3 = 3.8 \text{ Nm} \leq T_{ab2\,max}$

$T_{ab1} = 45$ Nm

$T_{1,2} = T_2 + T_3$

$T_{1,2} = 18.8 \text{ Nm} \leq T_{ab1\,max}$

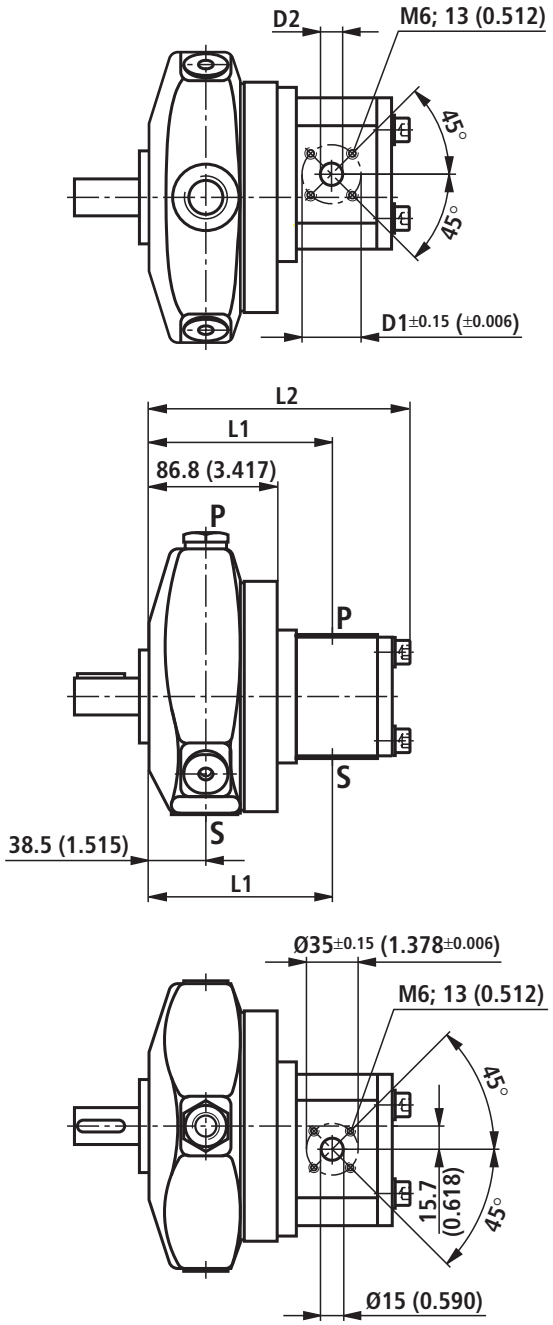
$T_{max} = 160$ Nm

$T = T_1 + T_2 + T_3$

$T = 63 \text{ Nm} \leq T_{max}$

The pump combination can be operated at the calculated technical data.

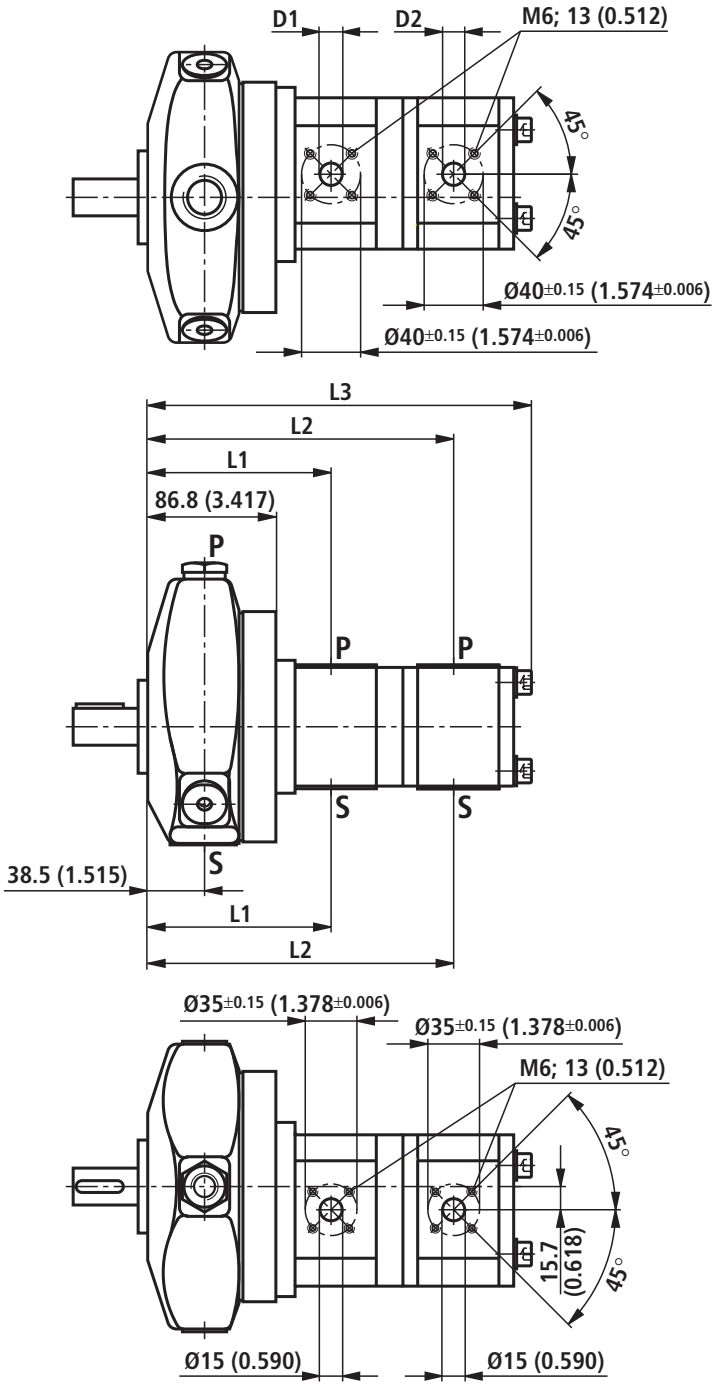
Unit dimensions: P2R4…, nominal dimensions in mm (inch)



Type P2R4- ...+	D1 ±0.15 (±0.006)		D2		L1		L2	
	mm	(inch)	mm	(inch)	mm	(inch)	mm	(inch)
AZPF4	40.00	(1.575)	15.00	(0.591)	124.2	(4.890)	170.5	(6.713)
AZPF5	40.00	(1.575)	15.00	(0.591)	125.4	(4.937)	173.0	(6.811)
AZPF8	40.00	(1.575)	20.00	(0.787)	127.5	(5.020)	177.1	(6.972)
AZPF11	40.00	(1.575)	20.00	(0.787)	131.3	(5.169)	182.1	(7.169)
AZPF14	40.00	(1.575)	20.00	(0.787)	131.8	(5.189)	187.1	(7.366)
AZPF16	40.00	(1.575)	20.00	(0.787)	131.8	(5.189)	190.5	(7.500)
AZPF19	40.00	(1.575)	20.00	(0.787)	131.8	(5.189)	195.5	(7.697)
AZPF22	40.00	(1.575)	20.00	(0.787)	139.4	(5.488)	200.9	(7.909)
AZPF25	55.00	(2.165)	26.00	(1.024)	147.5	(5.807)	217.3	(8.555)
AZPF28	55.00	(2.165)	26.00	(1.024)	148.1	(5.831)	222.1	(8.744)

For dimensions missing for R4, see pages 8 and 9.

Unit dimensions: P3R4…, nominal dimensions in mm (inch)



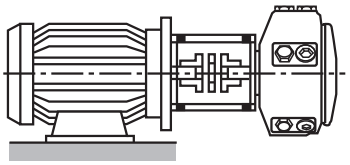
Type P3R4- ...+	D1		D2		L1		L2		L3	
	mm	(inch)	mm	(inch)	mm	(inch)	mm	(inch)	mm	(inch)
AZPFF5-4	15.00	(0.591)	15.00	(0.591)	125.4	(4.937)	208.4	(8.205)	254.7	(10.028)
AZPFF8-4	20.00	(0.787)	15.00	(0.591)	127.5	(5.020)	212.5	(8.366)	258.8	(10.189)
AZPFF8-8	20.00	(0.787)	20.00	(0.787)	127.5	(5.020)	215.8	(8.496)	265.4	(10.449)
AZPFF11-4	20.00	(0.787)	15.00	(0.591)	131.3	(5.169)	217.5	(8.563)	263.8	(10.386)
AZPFF11-5	20.00	(0.787)	15.00	(0.591)	131.3	(5.169)	218.7	(8.610)	266.3	(10.484)
AZPFF11-8	20.00	(0.787)	20.00	(0.787)	131.3	(5.169)	220.8	(8.693)	270.4	(10.646)
AZPFF16-16	20.00	(0.787)	20.00	(0.787)	131.8	(5.189)	233.5	(9.193)	292.2	(11.504)

For dimensions missing for R4, see pages 8 and 9.

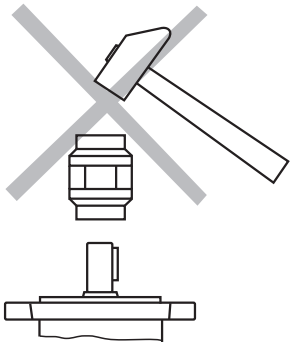
Installation notes

Drive

El. motor + pump mounting bracket + coupling + pump

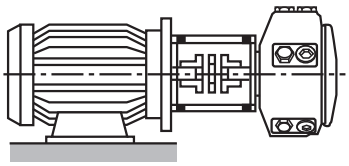


- No radial and axial forces permitted on the pump drive shaft!
- Motor and pump must be exactly aligned!
- Always use a coupling that is suitable for compensating for shaft offsets!
- When installing the coupling, avoid axial forces, that is, **do not hammer or press the coupling onto the shaft!** Use the female thread of the drive shaft!

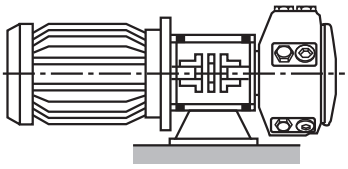


Installation positions

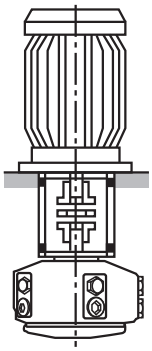
B3



B5



V1



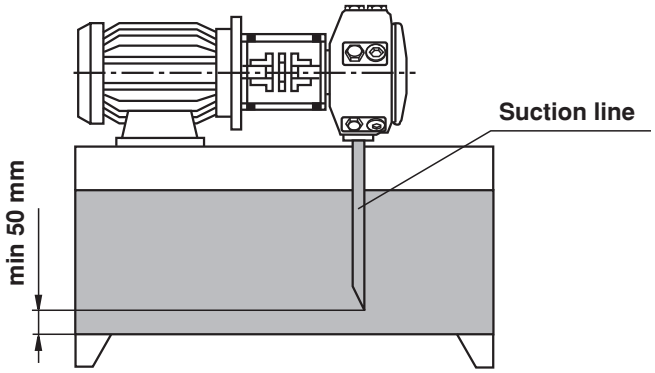
Fluid tank

- Adjust the useful capacity of the tank to the operating conditions
- The permissible fluid temperature must not be exceeded; if required, provide cooler

Lines and connections

- Remove protective plug from pump
- We recommend the use of seamless precision steel pipes according to DIN 2391 and pipe connections that can be loosened
- Select the clear width of pipes according to the connections (suction velocity 1 to 1.5 m/s)
- For inlet pressure, see page 5
- Thoroughly clean pipes and fittings before their installation

Recommendation for piping



- The returning oil must **under no circumstances** be reaspired directly, i.e. select the largest possible distance between suction and return line
- The return oil outlet must always be immersed in the oil
- Ensure suction-tight installation of the pipes

Filters

- If possible, use return line or pressure filters. (Use suction filter only in conjunction with an underpressure switch/clogging indicator)

Hydraulic fluid

- Please observe the specifications according to data sheet 90220!
- We recommend the use of branded hydraulic oils
- Different oil grades must not be mixed, since this can result in decomposition and deterioration of the lubricating properties
- The fluid must be changed at certain intervals depending on the operating conditions. This involves cleaning of the fluid tank from residues.

Engineering notes

Comprehensive notes and suggestions can be found in The Hydraulic Trainer, edition 3, RE 00281, "notes on the planning and design of hydraulic systems".

For the use of radial piston pumps, we recommend that the notes given in the following be strictly observed.

Technical data

All technical data given depend on manufacturing tolerances and are valid in conjunction with certain boundary conditions.

Please note that certain tolerances are therefore possible, and that technical data may vary when boundary conditions (e.g. viscosity) are changed.

Characteristic curves

Characteristic curves for flow and required power.
When selecting the drive motor, take the max. possible operating data into account.

Noise

The noise pressure level values given on page 5 are measured in accordance with DIN 45635 part 26. This means that only the noise emitted by the pump is shown. Influences by the surroundings (such as place of installation, piping, etc.) were eliminated. The values always refer to only one pump.

For circulation at zero pressure, the pressure line must be preloaded by means of a check valve (opening pressure p = 5 bar) due to noise emissions.

Caution!

The power unit design and influences at the place of final installation of the pump result in the fact that the noise pressure level is usually 5 to 10 10 dB(A) higher than the value of the pump alone.

Commissioning notes

Bleeding

- All radial piston pumps of type PR4 are self-priming.
- Before initial commissioning, the pump must be bled in order to protect it from damage.
- **During initial commissioning, foaming oil must be drained by opening the pressure flange or the pressure line (if required, provide splash guard) while the pump is running in absolutely pressureless circulation. Only when bubble-free oil starts to flow out can the flange be re-tightened to the specified torque.**
- Should the pump not displace bubble-free oil after approx. 20 seconds, check the system again. When the operating values are reached, check the pipe connections for leakage. Check the operating temperature.

Commissioning

- Check that the system is thoroughly and properly installed.
- Observe the arrows for the direction of rotation of the motor and the pump.
- Start the pump up under no load and let it displace at zero pressure for some seconds in order to ensure sufficient lubrication.
- **The pump may in no case be operated without fluid!**

⚠ Important notes

- Adjustments, maintenance and repair of the pump may only be carried out by authorised, trained and instructed personnel!
- Use only genuine Rexroth spare parts!
- The pump may only be operated at the permissible data.
- The pump may only be operated when in perfect condition!
- When carrying out any work on the pump (e.g. installation or removal), the system must be switched off and depressurised!
- Unauthorised conversions or changes that affect safety and function are not permitted!
- Attach protective guards (e.g. coupling protection)!
- Any existing protective guards must not be removed!
- The generally valid safety regulations and regulations for the prevention of accidents must be strictly observed!

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