RE 11 263/08.02

Replaces: 06.98

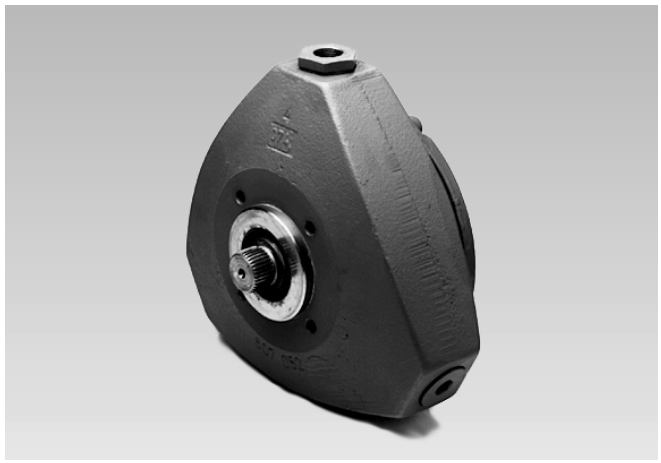
Radial piston pump type R4 Fixed displacement

Nominal sizes (NS) 1.60 to 20.00 cm³

Series 1X

Operating pressure up to 700 bar

-



K 4166/1

Type 1PF1R4-1X/1,60-700RG01M01

K 3156/7

Type 1PF1R4-1X/8,00-700RA01M01

Overview of contents

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Features

- Self-priming, valve controlled
- 14 nominal sizes, with capacities that permit optimum component selection
- Hydro-dynamically lubricated plain bearings for long service life
- Multiple pressure connections with various cylinder combinations

Ordering details

1PF1R4	– 1X /		R		01			*

Further details in clear text

Series

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

Nominal sizes (NS)

V_{geom}		NS–p_{max}
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**
7.14 cm³	(10)	**= 6.30 – 700 [1]**
8.63 cm³	(10)	**= 8.00 – 700 [2]**
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**
16.07 cm³	(10)	**= 16.00 – 500 [1]**
19.43 cm³	(10)	**= 20.00 – 500 [2]**

Code	No. of pressure ports	Cylinder combinations: Radial piston pumps 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

M = NBR seals, suitable for mineral oil HLP to DIN 51 524 part 2

V = FKM seals

Please note the specifications stated within the catalogue sheet RE 07 075

A = Cylinderical shaft end

G = Splined shaft end (rear pump of a combination with V7 and G4)

K = Combination pump for combining with G2 and G3, see RE 11 704 and RE 11 706

(3), (5), (10) ≙ radial piston pumps with 3, 5, 10 pistons

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

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

Function, section, symbol

Hydraulic pumps type R4 are valve controlled, self-priming radial piston pumps with a fixed displacement.

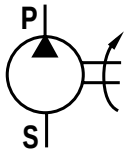
The radial piston pump type R4 basically comprises of the housing (1), eccentric shaft (2) and 3, 5 or 10 pump elements (3) with a suction valve (4), pressure valve (5) and piston (6).

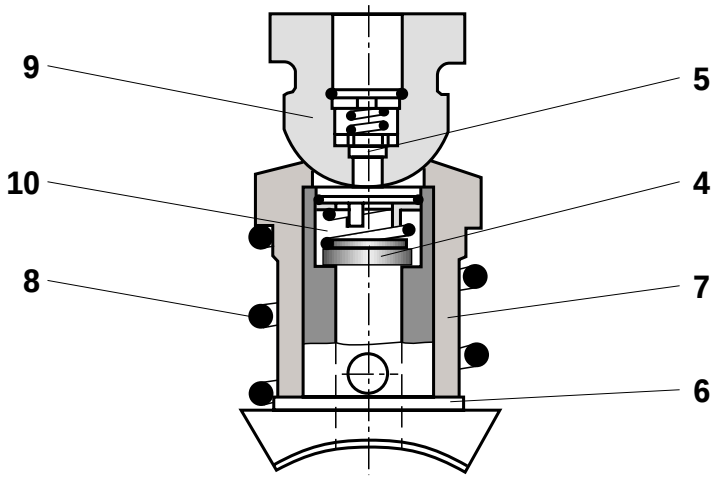
Suction and delivery process

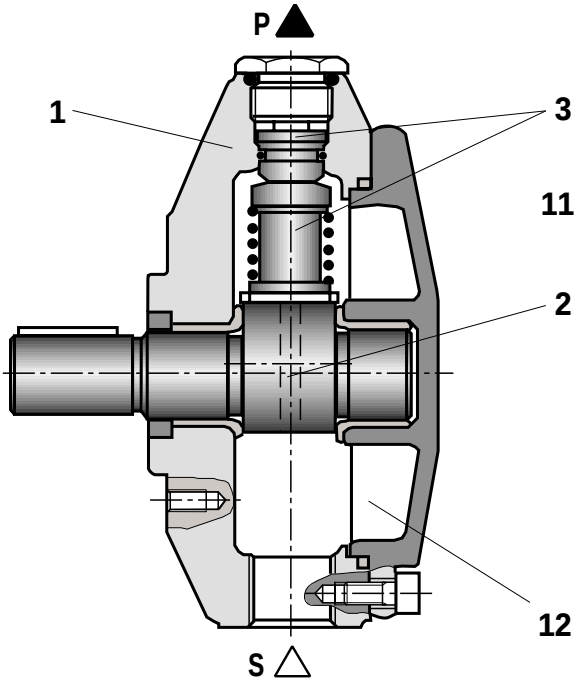
The pistons (6) are arranged radially around the eccentric shaft (2). The hollow piston (6) with suction valve (4) is guided in cylinder (7) and pushed onto the eccentric shaft (s) by the spring (8). The radius of the piston running surface corresponds to the eccentric radius. The cylinder (7) seals against a hemispherical element (9).

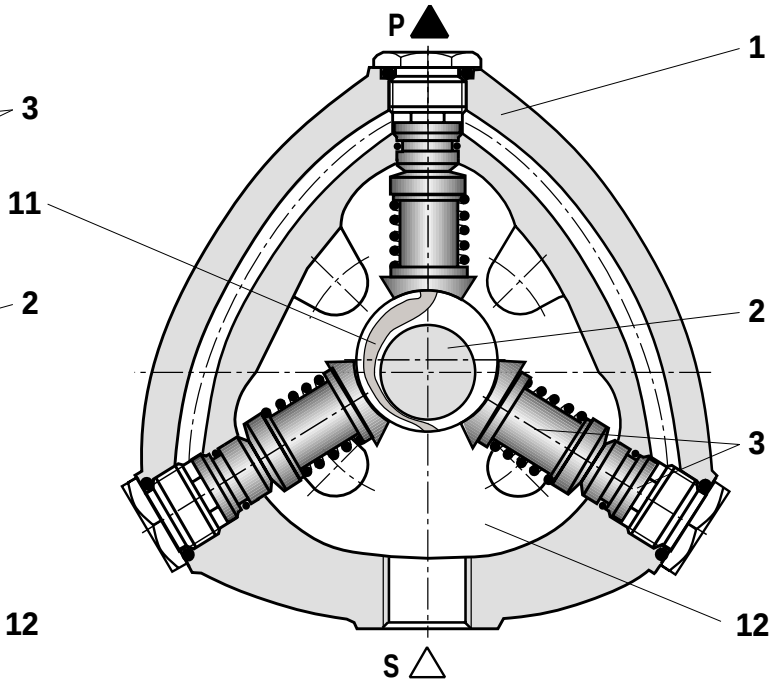
When the piston (6) moves downwards, the working chamber (10) in the cylinder (7) increases in size. The resulting negative pressure lifts the suction valve plate from the sealing edge. At the same time, the suction chamber (12) is connected to the working chamber (10) by means of a radial groove (11) in the eccentric shaft (2).

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









Multi-circuit pump variants

The following may be seen from the diagrams shown below:

– The number and position of the pressure ports,

– Which cylinders are interconnected.

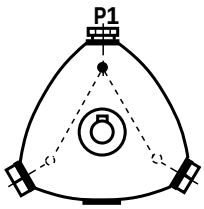
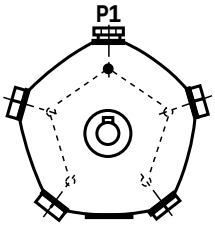
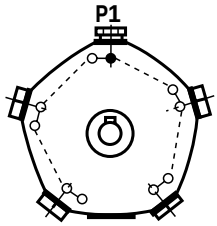
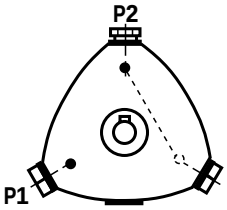
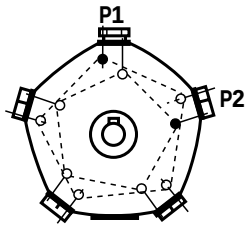
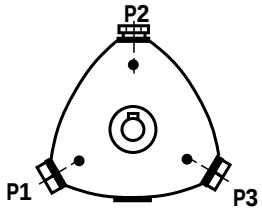
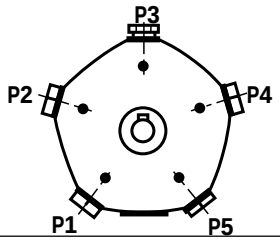
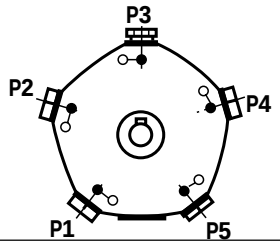
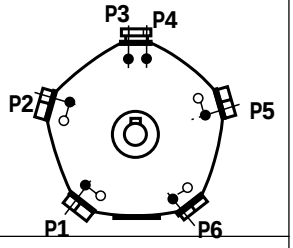
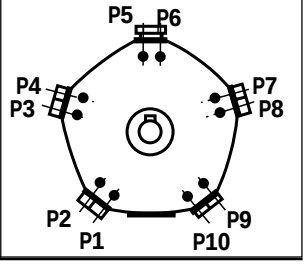
The dots indicate the cylinders which lie directly at a pressure port.

The circles indicate the cylinders which do not lie directly at a pressure port.

The dotted and chain dotted lines indicate which cylinders are interconnected

The sequence of the outlet ports, in the designation of the pressurised ports, is always taken in a clockwise direction.

The pressure port that – in a clockwise direction – lies nearest to the suction port is identified with "P1".

Code	Pressure ports	Cylinder combinations		
		3 pistons	5 pistons	10 pistons
01	1			
02	2			
03	3			
08	5			
11	6			
12	10			

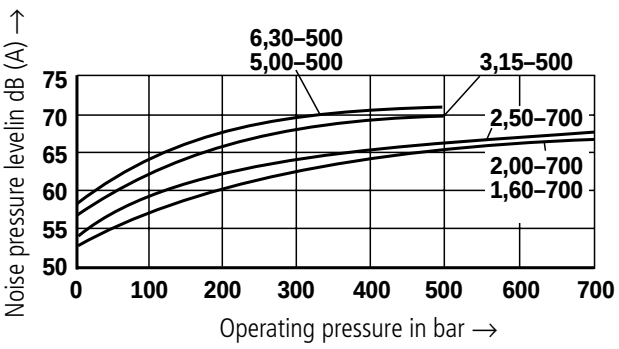
Technical data (for applications outside these parameters, please consult us!)

Speed range		min^{-1}	1000 to 2000	
Operating pressure	Inlet	bar	0.8 to 2.5 absolute	
	Cylinder inside diameter		Ø 10 mm	Ø 15 mm
	Outlet	bar	700	500
Max. permissible torque (drive shaft)		Nm	160	
Installation			Optional	
Shaft loading			Radial and axial forces cannot be absorbed	
Mounting style			Face mounting	
Connection ports			Threaded ports	
Direction of rotation			Clockwise	
Pressure fluid			HLP mineral oil to DIN 51 524 part 2 **Please note the specifications stated within catalogue sheet RE 07 075!**	
Pressure fluid temperature range		°C	– 10 to + 70	
Viscosity range		mm^2/s	10 to 200	
Degree of contamination			Maximum permissible degree of contamination of the pressure fluid is to NAS 1638 class 10. We, therefore recommend a filter with a minimum retention rate of $\beta_{20} \geq 100$. In order to achieve a longer service life, we recommend class 9. This can be achieved by using a filter with a minimum retention rate of $\beta_{10} \geq 100$.	
			3 pistons	5 pistons	10 pistons
Weight		kg	9.2	12.4	16.4

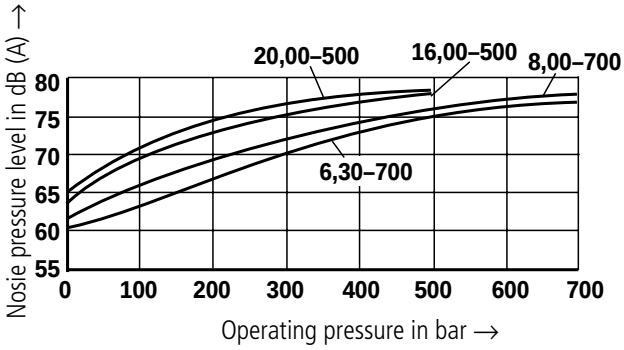
Noise pressure level (average values): (measured at $n = 1450$ min^{-1}, $\nu = 41$ mm^2/s and $\vartheta = 50$ °C)

The characteristic curves do not apply to multi-circuit pumps.

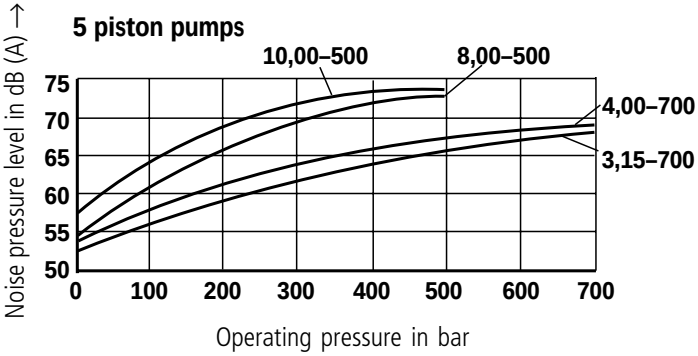
3 piston pumps



10 piston pumps



5 piston pumps



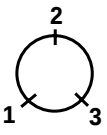
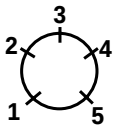
Measured in an anechoic chamber to DIN 45 635, sheet 1,
Distance of microphone – pump = 1m

Flow and performance data (average values): per cylinder (n = 1450 min^{-1})

Cylinder inside Ø in mm	Stroke in mm	V_{geom} in cm³		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 in the table above "flow and performance data" refer to one cylinder. In order to determine the total power required, the values must be multiplied by the number of cylinders in question.
At the same time, an uneven funning factot "*f*" must be introduced.

Radial piston pump			
3 cylinders		5 or 10 cylinders	
Cylinder under load	Factor *f*	Cylinder 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
			

10 cylinder pumps always have 2 cylinders connected to a pressure port.

Example

Pumps 1PF1R4–1X/1,60-700 RA 01M02

Ports 1 and 2 are connected and loaded to 450 bar, port 3 is unloaded.
P_a = 2 x 0.605 kW = 1.21 kW
f = 1.57
P_{erf} = 1.21 kW x 1.57 = 1.90 kW

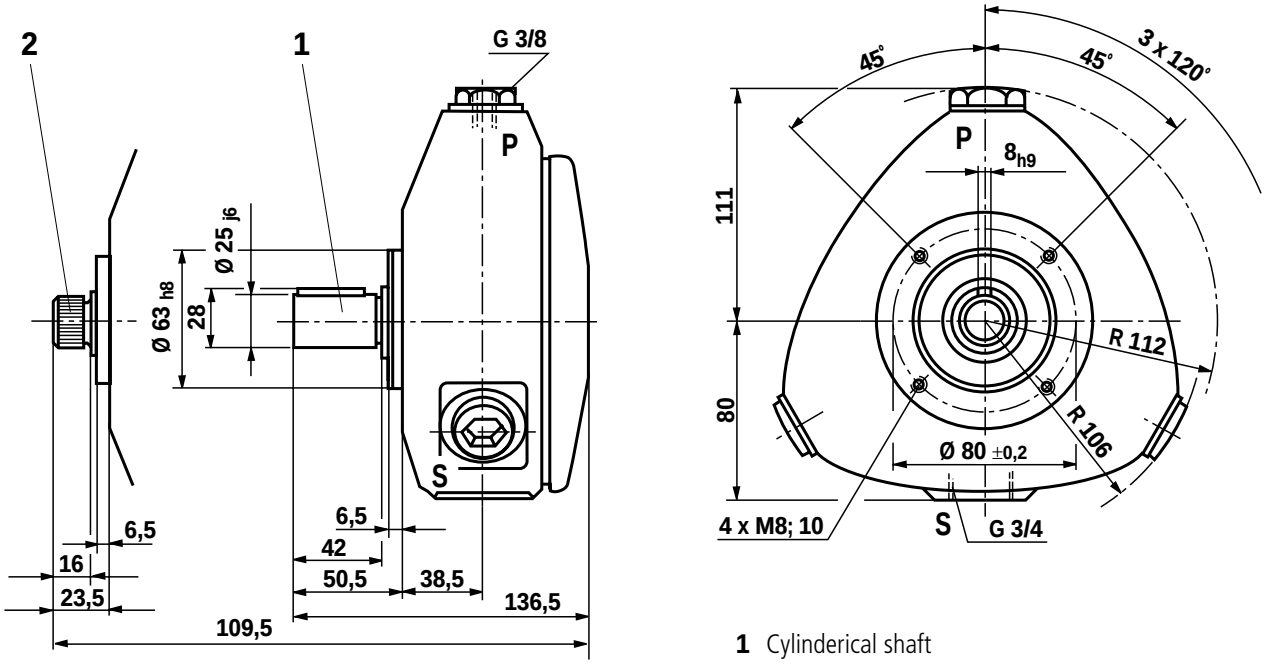
Port 3 is loaded to 300 bar, ports 1 and 2 are unloaded.
P_a = 0.42 kW
f = 3.13
P_{erf} = 0.42 kW x 3.13 = 1.31 kW

Ports 1, 2 and 3 are 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

Flow and performance data (average values): in relationship to the appropriate nominal size
(measured at n = 1450 min^{-1}, ν = 41 mm^2/s and ϑ = 50 °C)

NS–p_{max}	V_{geom} in cm^3	Cylinder inside Ø	Stroke in mm	No. of pistons			Pressure p in bar 50	100	150	200	250	300	350	400	450	500	550	600	650	700
1.60 – 700	1.51	10	6.4	3	$q_{V,eff}$	L/min	2.12	2.1	2.09	2.08	2.07	2.06	2.05	2.04	2.03	2.02	2.01	2.00	1.99	1.98
					P_a	kW	0.29	0.51	0.7	0.89	1.08	1.28	1.46	1.65	1.89	2.1	2.3	2.5	2.7	2.9
2.00 – 700	2.14		9.1		$q_{V,eff}$	L/min	3.02	3.0	2.98	2.97	2.95	2.94	2.92	2.91	2.89	2.88	2.86	2.85	2.83	2.81
					P_a	kW	0.4	0.7	0.97	1.23	1.51	1.8	2.0	2.3	2.6	2.9	3.2	3.5	3.8	4.1
2.50 – 700	2.59		11.0		$q_{V,eff}$	L/min	3.67	3.64	3.62	3.60	3.58	3.56	3.54	3.52	3.50	3.48	3.46	3.44	3.42	3.39
					P_a	kW	0.47	0.84	1.17	1.5	1.78	2.1	2.45	2.8	3.1	3.4	3.8	4.1	4.5	4.9
3.15 – 700	3.57	10	9.1	5	$q_{V,eff}$	L/min	5.07	5.02	5.01	4.97	4.94	4.92	4.89	4.87	4.84	4.82	4.79	4.77	4.74	4.71
					P_a	kW	0.65	1.15	1.64	2.1	2.51	3.0	3.44	3.84	4.28	4.7	5.23	5.8	6.28	6.8
4.00 – 700	4.32		11.0		$q_{V,eff}$	L/min	6.13	6.07	6.03	6.0	5.97	5.95	5.91	5.88	5.85	5.82	5.79	5.76	5.73	5.7
					P_a	kW	0.77	1.4	1.96	2.5	3.01	3.5	4.07	4.6	5.12	5.6	6.26	6.9	7.52	8.1
6.30 – 700	7.14	10	9.1	10	$q_{V,eff}$	L/min	10.15	10.05	10.0	9.95	9.89	9.85	9.8	9.75	9.7	9.65	9.58	9.55	9.47	9.4
					P_a	kW	1.29	2.3	3.28	4.1	5.03	5.8	6.77	7.7	8.56	9.4	10.46	11.6	12.57	13.6
8.00 – 700	8.63		11.0		$q_{V,eff}$	L/min	12.2	12.1	12.05	12.0	11.95	11.9	11.84	11.8	11.74	11.7	11.63	11.57	11.47	11.4
					P_a	kW	1.5	2.75	3.92	4.9	5.94	7.0	8.04	9.1	10.18	11.3	12.44	13.7	14.86	16.1
3.15 – 500	3.39	15	6.4	3	$q_{V,eff}$	L/min	4.8	4.77	4.73	4.7	4.68	4.67	4.64	4.62	4.59	4.57				
					P_a	kW	0.64	1.2	1.64	2.1	2.55	3.0	3.42	3.8	4.3	4.7				
5.00 – 500	4.82		9.1		$q_{V,eff}$	L/min	6.85	6.79	6.75	6.72	6.68	6.65	6.61	6.58	6.53	6.5				
					P_a	kW	0.88	1.6	2.24	2.85	3.49	4.1	4.75	5.4	6.04	6.7				
6.30 – 500	5.83		11.0		$q_{V,eff}$	L/min	8.26	8.18	8.13	8.09	8.04	8.01	7.97	7.93	7.88	7.85				
					P_a	kW	1.03	1.83	2.61	3.3	4.11	4.9	5.62	6.3	7.14	7.9				
8.00 – 500	8.03	15	9.1	5	$q_{V,eff}$	L/min	11.4	11.32	11.25	11.2	11.14	11.08	11.02	10.97	10.9	10.85				
					P_a	kW	1.4	2.5	3.62	4.6	5.69	6.7	7.74	8.8	9.84	10.9				
10.00 – 500	9.71		11.0		$q_{V,eff}$	L/min	13.7	13.63	13.56	13.5	13.42	13.36	13.28	13.2	13.09	13.0				
					P_a	kW	1.7	2.97	4.27	5.5	6.72	7.9	9.15	10.3	11.64	12.9				
16.00 – 500	16.07	15	9.1	10	$q_{V,eff}$	L/min	22.8	22.64	22.5	22.4	22.27	22.16	22.02	21.9	21.78	21.7				
					P_a	kW	2.7	4.9	7.07	9.1	11.12	13.1	15.6	17.0	19.06	21.2				
20.00 – 500	19.43		11.0		$q_{V,eff}$	L/min	27.4	27.3	27.1	27.0	26.84	26.7	26.54	26.4	26.2	26.0				
					P_a	kW	3.2	5.7	8.26	10.6	13.08	15.5	18.02	20.5	22.92	25.3				

Unit dimensions: radial piston pump with 3 pistons (Dimensions in mm)

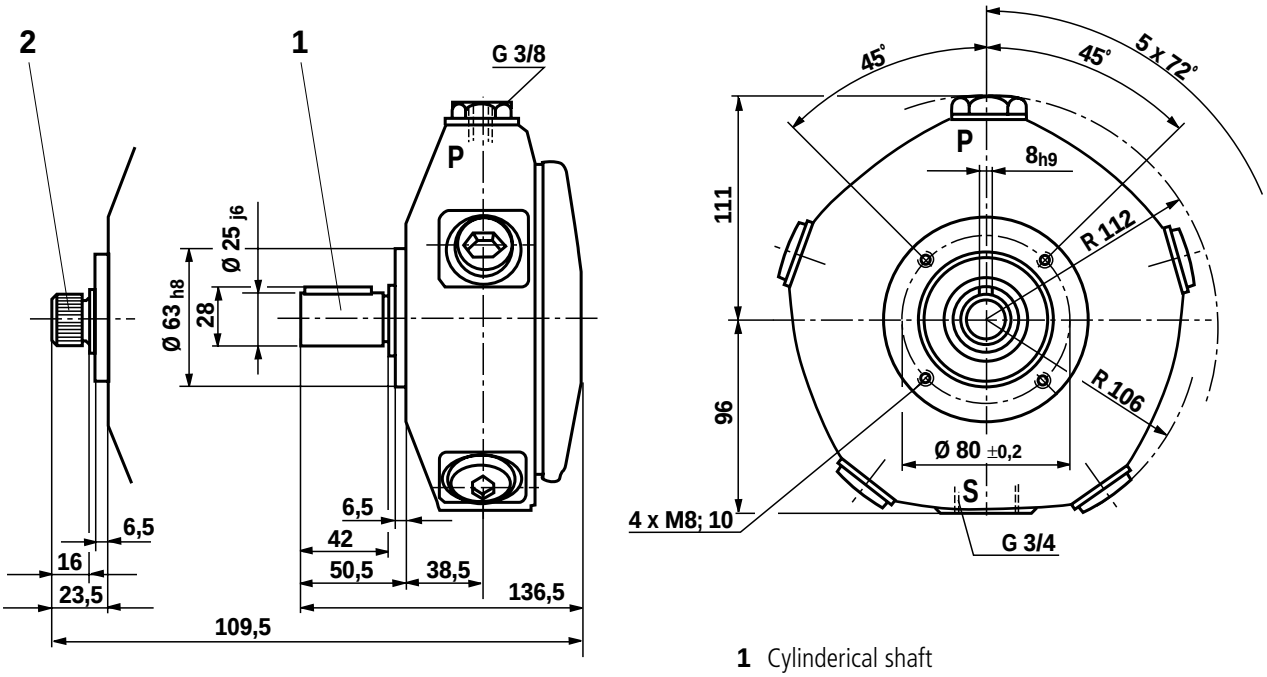


1 Cylinderical shaft

2 Splined shaft,
spline 21 x 24 to DIN 5481

Pipe thread to ISO 228/1

Unit dimensions: radial piston pump with 5 pistons (Dimensions in mm)

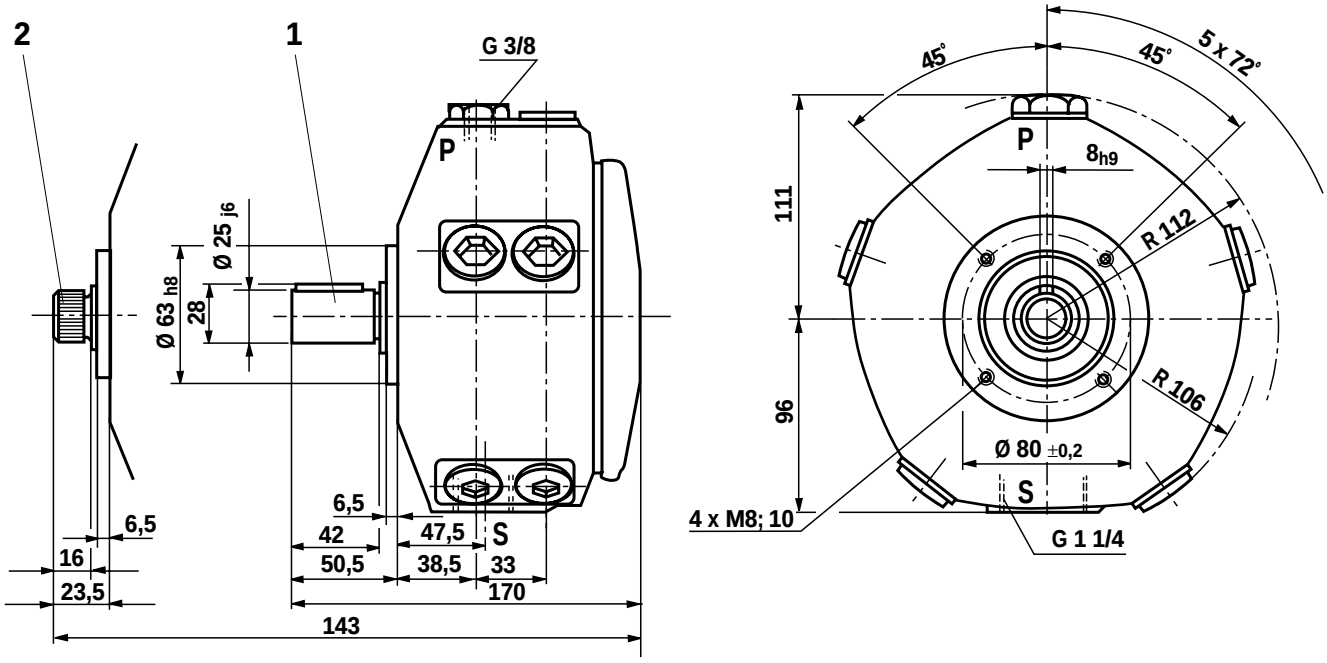


1 Cylinderical shaft

2 Splined shaft,
spline 21 x 24 to DIN 5481

Pipe thread to ISO 228/1

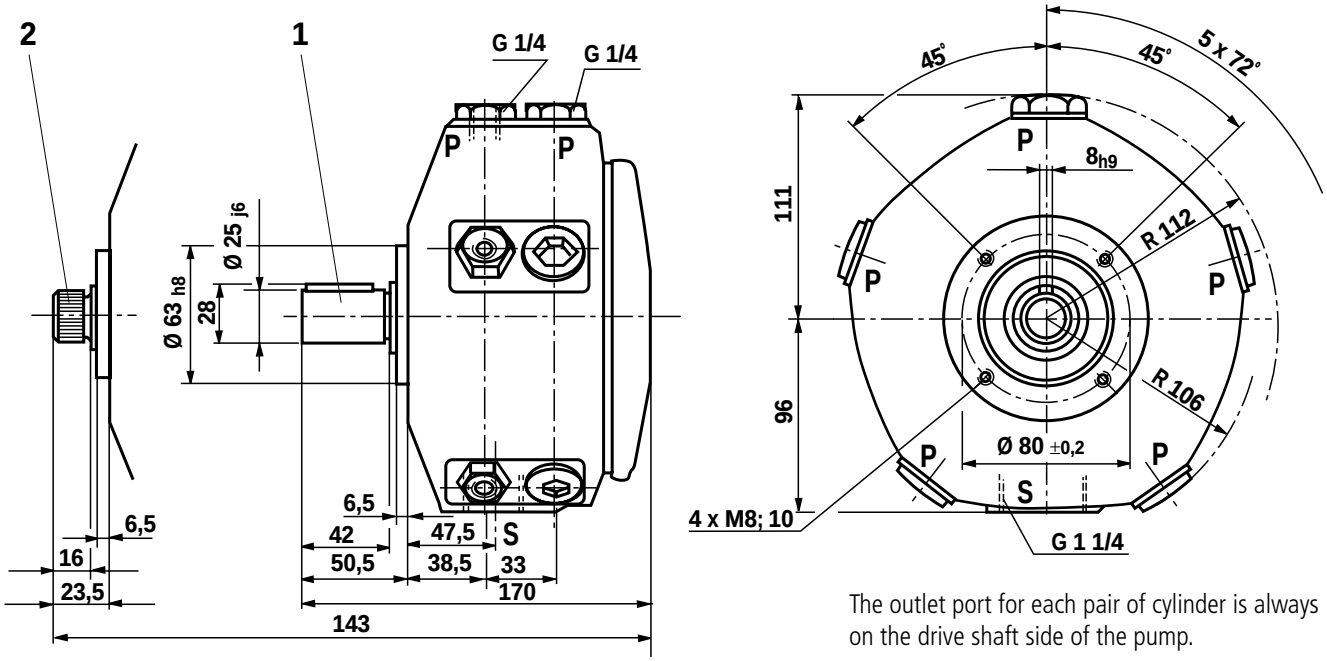
Unit dimensions: radial piston pump with 10 pistons, code 08 (Dimensions in mm)



1 Cylinderical shaft

2 Splined shaft,
spline 21 x 24 to DIN 5481

Unit dimensions: radial piston pump with 10 pistons, codes 11 and 12 (Dimensions in mm)



The outlet port for each pair of cylinder is always on the drive shaft side of the pump.

1 Cylinderical shaft

2 Splined shaft,
spline 21 x 24 to DIN 5481

For pump mounting brackets and double flange feet
see catalogue sheet RE 32 110.

Pipe thread to ISO 228/1

Seal kits

Material No. for NBR seals	Material No. for FKM seals	Valid for
00307726	00307729	3 piston pumps
00307727	00307730	5 piston pumps
00307728	00307594	10 piston pumps

Commissioning guidelines

Bleeding

- All of the type R4 radial piston pumps are self-priming.
- Before commissioning the pump must be bled to protect it from damage.
- Should the pump not deliver without foam after approx. 20 seconds the system must be rechecked. After reaching the operating values, check the pipework for leaks. Check the operating temperatures.

Commissioning

- Check to see whether the system has been correctly and cleanly assembled.
- Take the direction of rotation arrows of the motor and pump into account.
- Run the pump without load and allow it to run for a few seconds without pressure so that sufficient lubrication is provided.
- **Under no circumstances allow the pump to run without pressure fluid!**

⚠ Important notes

- Service and maintenance of the pump may only be carried out by authorised, trained and instructed personnel!
- Only use **original Bosch Rexroth** spare parts!
- The pump may only be used within the permissible data.
- The pump must only be operated when in good condition!
- When work is carried out at the pump (e.g. installation and disassembly) the system must be switched off and depressurised!
- Unauthorised alterations and changes which influence the safety and function are not permitted!
- Fit protective equipment (e.g. coupling guard)!
- Existing protective equipment must not be removed!
- The general valid safety and accident prevention regulations must be observed under all circumstances!