

# Radial piston pumps type R and RG

with several pressure ports

Operating pressure $p_{max}$	= 700 bar	Radial piston pumps type R and RG	D 6010
Delivery flow $Q_{max}$	= 76,0 lpm (at 1450 rpm)	Radial piston pumps type R and RG with one main and one or two auxiliary pressure ports	D 6010 S
Geometric displacement $V_{g max}$	= 53,5 cm <sup>3</sup> /rev.	Hydraulic power packs type R and RG with several pressure ports	D 6010 DB

## 1. General

All pumps presented in D 6010 (with the exception of single-cylinder pumps) are available, depending on the pump design, with two or more individual pressure ports. This allows such pumps to cope with any overlap in consumer movement at various load conditions, as may occur in hydraulic systems due to sequence of functions involved, without requiring any significant design modifications and without such consumers affecting each other. Another application is the stepwise variation of the consumer speed via simple 2/2-way circulation valves by connecting or disconnecting individual pressure circuits to or from the joint pressure line. Additionally they can provide pressure fluid for control circuits with hydraulically controlled directional valves, which usually require a certain minimum pressure. For additional information regarding piloted directional spool valves type HSR, HSL, and HSF see D 7493 and D 7493 E.

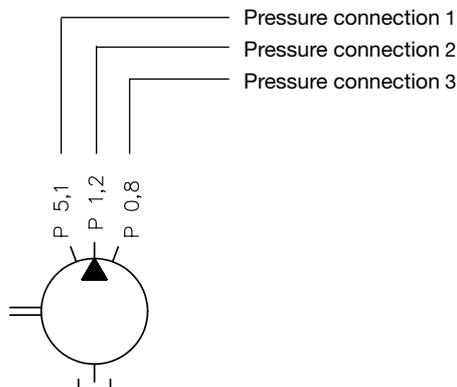
### ● Delivery flow subdivision

The delivery of individual pump cylinders may be either led out separately or joint, depending on the pump design involved (see D 6010). The various versions available are shown in sect. 2 ++, where also the specific type (order) coding is detailed.

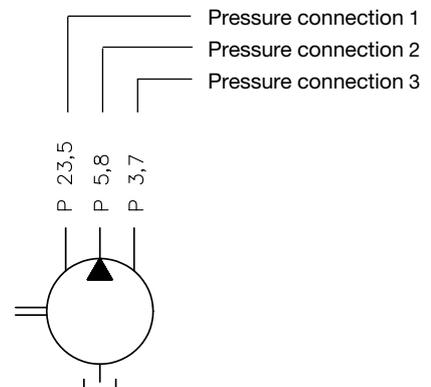
### ● Illustration of symbols

The pump symbols in the following are illustrated basically in two different ways to distinguish whether a port is fed by only one cylinder or by two or more cylinders. The delivery line leaves the pump symbol radially when only one cylinder is led out individually whereas it leaves in parallel whenever several cylinders or even complete radials are grouped. This different style of illustration enables also to judge the flow consistency (smoothness) for the respective pressure port. Complete radials show almost no pulsation, due to the equal distribution of an uneven number of cylinders, while individual or externally grouped cylinders retain their typical delivery characteristic (pulsation) more or less. For more details, see sect. 4.1 "Delivery characteristic". The port index No. count up clockwise in the following.

Typical example of a 1-radial pump with three pressure ports R 5,1 - 1,2 - 0,8. It is mandatory that the order coding specifies the grouped cylinders at port 1 and the individually led out cylinders subsequently i.e. port 2 and 3. For more details, see sect. 2.3.

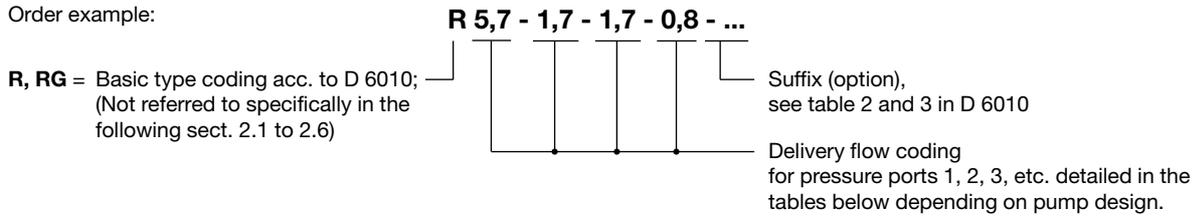


Typical example of a 4-radial pump with three pressure ports (comprising complete cylinder radials) R 23,5 - 5,8 - 3,7. It is mandatory that the order coding specifies the grouped cylinder radials at port 1 and the individually led out cylinder radials subsequently i.e. port 2 and 3. For more details, see sect. 2.5.



## 2. Available versions, main data

Order example:



It is mandatory that the order coding specifies the grouped cylinders (1-radial pumps) or complete radials (more-radial pumps) directly after the R (port 1), whereas the position (port index No.) of the other requested individual flows can be positioned as desired. Attention: 1-radial pumps (design 6011) with 7-cylinders are not available with 6 ports. Also not available are 2-radial pumps (design 6012) where from one of the two radials several individual cylinders should be grouped. Where necessary the cylinders of such a pump with 7 ports had to be grouped externally. See sect. 2.3 ++.

### Delivery flow selection table

Design 7631, for more details see sect. 2.1

Piston-Ø (mm)		4	5	6	7	8	9
Operating pressure $p_{\max}^1$ (bar)		700	550	450	350	300	250
Delivery flow coding	1-cylinder	<b>0,09</b>	<b>0,14</b>	<b>0,22</b>	<b>0,29</b>	<b>0,36</b>	<b>0,45</b>
Delivery flow coding	3-cylinder <sup>2)</sup>	<b>0,27</b>	<b>0,42</b>	<b>0,64</b>	<b>0,81</b>	<b>1,1</b>	<b>1,35</b>

Design 6010, 6011, 6012, 6014, and 6016, for more details see sect. 2.2 to 2.6

Joint pump cylinder per port	Connection index	Delivery flow coding (guideline figure Q in (lpm) at 1450 rpm)								
		Piston-Ø (mm)								
		6	7	8	10	12	13	14	15	16
		Operating pressure $p_{\max}$ (bar) <sup>1)</sup>								
		700	600	550	450	350	300	250	200	160
Indiv. cylinder	a	<b>0,3</b>	<b>0,41</b>	<b>0,5</b>	<b>0,8</b>	<b>1,2</b>	<b>1,45</b>	<b>1,7</b>	<b>1,9</b>	<b>2,2</b>
Cylinder group consisting of	2-cylinder	<b>0,6</b>	<b>0,83</b>	<b>1,0</b>	<b>1,6</b>	<b>2,4</b>	<b>2,8</b>	<b>3,3</b>	<b>3,8</b>	<b>4,4</b>
	3-cylinder	<b>0,9</b>	<b>1,25</b>	<b>1,5</b>	<b>2,5</b>	<b>3,6</b>	<b>4,3</b>	<b>5,1</b>	<b>5,6</b>	<b>6,5</b>
	4-cylinder	<b>1,15</b>	<b>1,65</b>	<b>2,15</b>	<b>3,35</b>	<b>4,8</b>	<b>5,7</b>	<b>6,7</b>	<b>7,7</b>	<b>8,7</b>
	5-cylinder	<b>1,4</b>	<b>2,08</b>	<b>2,6</b>	<b>4,2</b>	<b>6,0</b>	<b>7,0</b>	<b>8,3</b>	<b>9,5</b>	<b>10,9</b>
Complete	6-cylinder	<b>1,8</b>	<b>2,45</b>	<b>3,2</b>	<b>5,0</b>	<b>7,2</b>	<b>8,6</b>	<b>9,9</b>	<b>11,5</b>	<b>13,1</b>
	5-cylinder radial	<b>1,4</b>	<b>2,08</b>	<b>2,6</b>	<b>4,2</b>	<b>6,0</b>	<b>7,0</b>	<b>8,3</b>	<b>9,5</b>	<b>10,9</b>
	7-cylinder radial	<b>2,1</b>	<b>2,9</b>	<b>3,7</b>	<b>5,8</b>	<b>8,4</b>	<b>9,8</b>	<b>11,8</b>	<b>13,3</b>	<b>15,3</b>
Number of joint radials per port (5- or 7-cylinder radials)	2 x 5-cylinder	<b>2,7</b>	<b>4,15</b>	<b>5,3</b>	<b>8,2</b>	<b>12,0</b>	<b>14,2</b>	<b>16,8</b>	<b>19,3</b>	<b>21,7</b>
	2 x 7-cylinder	<b>4,0</b>	<b>5,85</b>	<b>7,4</b>	<b>11,6</b>	<b>17,0</b>	<b>20,0</b>	<b>23,5</b>	<b>26,5</b>	<b>30,4</b>
	3 x 5-cylinder	<b>4,6</b>	<b>6,2</b>	<b>8,25</b>	<b>13,0</b>	<b>18,8</b>	<b>22,5</b>	<b>25,2</b>	<b>28,5</b>	<b>32,6</b>
	3 x 7-cylinder	<b>5,95</b>	<b>8,75</b>	<b>11,2</b>	<b>17,3</b>	<b>25,5</b>	<b>29,9</b>	<b>35,3</b>	<b>39,8</b>	<b>45,6</b>
	4 x 7-cylinder	<b>8,0</b>	<b>11,65</b>	<b>15,0</b>	<b>23,0</b>	<b>34,0</b>	<b>40,0</b>	<b>47,0</b>	<b>53,0</b>	<b>60,8</b>
	5 x 7-cylinder	<b>10,6</b>	<b>14,55</b>	<b>18,3</b>	<b>28,8</b>	<b>42,5</b>	<b>50,0</b>	<b>58,4</b>	<b>66,7</b>	<b>76,0</b>
Geometric displacement of one indiv. cylinder (connection index a)	(cm <sup>3</sup> /rev.)	0,21	0,29	0,38	0,59	0,84	1,0	1,15	1,32	1,53
Nom. delivery flow $Q_N$	(lpm)	The total geom. displacement $V_{g \text{ total}}$ of a cylinder group or radial (connection index b to o) can be calculated by multiplying the indiv. geom. displacement with the respective number of cylinders.								
		The delivery flow coding is a guideline but it can be calculated with the formula below: $Q_N = \frac{V_{g \text{ total}} \cdot n_N}{1000 \cdot \eta_{Vol}}$ Motor speed $n_N$ in rpm Vol. efficiency $\eta_{Vol} \approx 0.98$								

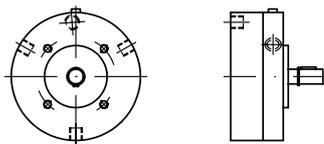
1) The operating pressure should be restricted for applications with continuous operation where the subsequent load cycles are all at the upper end of the pressure range (>75%) e.g. accumulator charging etc.

It is advisable for an economic service life of the bearings to restrict the operating pressure of the respective pump element diameter to about 75% of its original specification. Another pump with smaller but more pump elements should be selected, if this is not possible.

2) Only available as combination with 2 x 3 pump cylinders, e.g. R 0,81 - 0,27

## 2.1 1-radial pump, design 7631

2-, 3-, and 5-cylinder pump

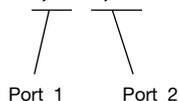


For design reasons each pump cylinder has its own pressure port. These ports must then be externally interconnected via pipes.

The only exception is a combination of 2 x 3 pump cylinders.

2 x 3 pump cylinders

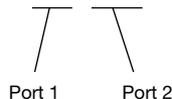
**R 0,27 - 0,64**



### Type coding

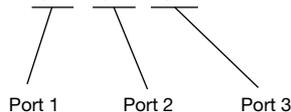
2-cylinder pump

**R 0,14 - 0,36**



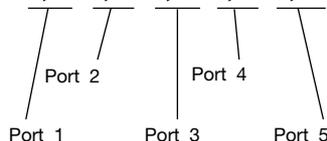
3-cylinder pump

**R 0,09 - 0,29 - 0,29**

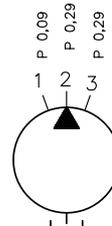
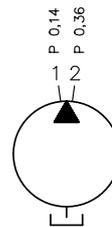


5-cylinder pump

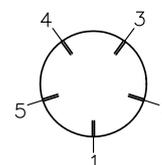
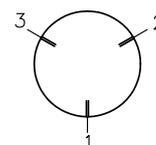
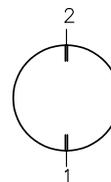
**R 0,09 - 0,36 - 0,09 - 0,36 - 0,36**



### Symbols

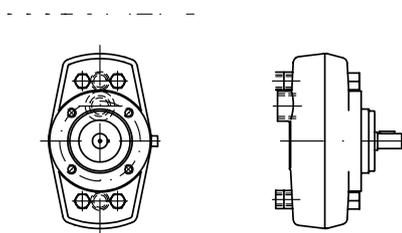


### Cylinder arrangement

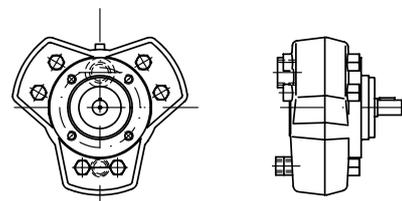


## 2.2 1-radial pump, design 6010

2-cylinder pump



3-cylinder pump



### Option 1:

Delivery flow codings acc. to connection index a in table on page 2. The pump shows as many pressure ports as cylinders.

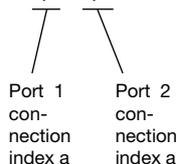
### Option 2:

Two cylinders joint at port 1 (flow coding acc. to connection index b), the remaining cylinders joint at port 2 (flow coding acc. to connection index a).

### Type coding

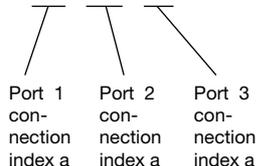
2-cylinder pump

**R 0,8 - 1,7**



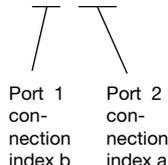
3-cylinder pump (option 1)

**R 1,2 - 1,2 - 1,2**

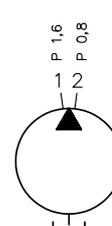
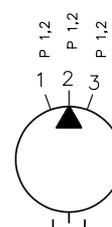
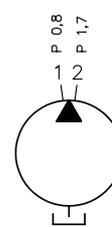


3-cylinder pump (option 2)

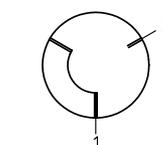
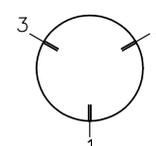
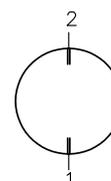
**R 1,6 - 0,8**



### Symbols

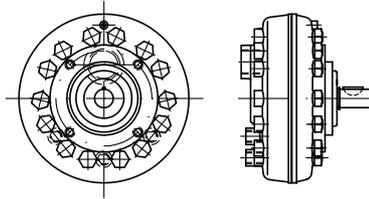


### Cylinder arrangement



### 2.3 1-radial pump, design 6011

5- and 7-cylinder pump



#### Option 1 :

Delivery flow codings acc. to connection index a in table on page 2. The pump shows 5 or 7 pressure ports.

#### Option 2:

5-cylinder pump

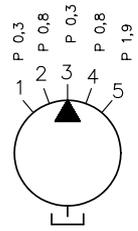
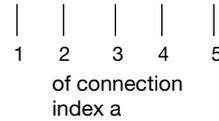
Two, three or four cylinders joint at pressure port 1 (flow coding acc. to connection index b, c or d) ; the remaining cylinders led out individually to pressure ports 2, 3 etc. (delivery flow index as specified in line a).

7-cylinder pump

Three, four, five or six cylinders joint at pressure port 1 (flow coding acc. to connection index c - f), the remaining cylinders led out individually to pressure ports 2, 3 etc. (delivery flow index as specified in line a).

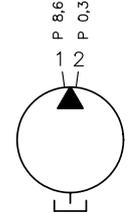
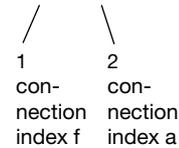
Order example (5-cylinder pump):

**R 0,3 - 0,8 - 0,3 - 0,8 - 1,9**



Order example (7-cylinder pump):

**R 8,6 - 0,3**



Cylinder combinations on versions available and appropriate symbols

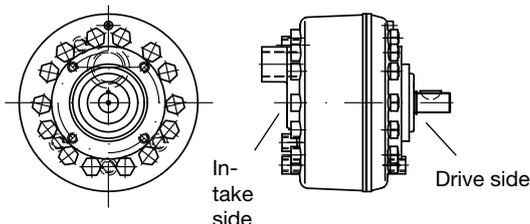
	Option 1	Option 2				
5-cylinder pump						
Order example	R 0,3-0,8-0,3-0,8-1,9	R 3,8-0,8-0,3-0,8	R 4,3-0,5-0,5	R 2,4-1,2-1,2	R 4,8-0,5	
Port 1 acc. to connection index a	a	b	c	b	d	
all other ports acc. to connection index	a	a	a	a	a	
7-cylinder pump						
Order example	R 1,2-1,2-1,2-1,2-1,2-0,5	R 5,1-0,8-0,5-0,8-0,5	R 7,7-1,2-1,2-0,5	R 4,3-1,45-1,45-1,45	R 7,0-0,8-0,8	R 8,6-0,3
Port 1 Connection index a	a	c	d	c	e	f
all other ports acc. to connection index	a	a	a	a	a	a

<sup>1)</sup> e.g. for providing two pressure circuits with equal flow. Dummy cylinders are not indicated in the coding. The respective delivery flow coding for this group represents only the active pump cylinders.

## 2.4 2-radial pump, design 6012

10- and 14-cylinder pump

Each cylinder radial comprises either 5 or 7-cylinders



### Option 1 :

One pressure port per radial = two pressure ports in total. Pressure port 1 on the shaft side, port 2 on the suction side. Flow coding acc. to connection index g (5-cylinder radial) or acc. to line h (7-cylinder radial).

### Option 2:

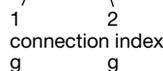
The cylinder radial on the shaft side is joined completely at port 1, the second radial is split up as with design 6011 (1-radial pump) among ports 2, 3... etc.. The flow codings from the two radials are separated by a slash.

### Option 3 :

Both cylinder radials split-up among several pressure ports as with group 6011 (1-radial pumps, flow ratings from each radial separated by a slash). Attention: The usual intermediate flange acc. to D 6010 or D 6010 H or D 6010 Z can not be used. A suitable flange has to be customer furnished, for specifications see SK 6020 155.

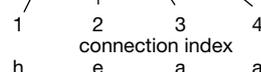
Order example (10-cylinder pump):

**R 7,0 - 2,6**



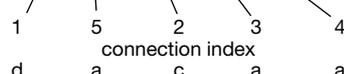
Order example (14-cylinder pump):

**R 13,3 / 4,2 - 0,3 - 0,3**



Order example (10-cylinder pump):

**R 5,7 - 0,5 / 5,1 - 1,2 - 0,8**



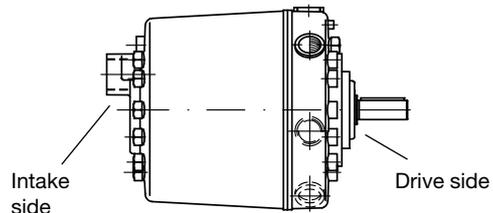
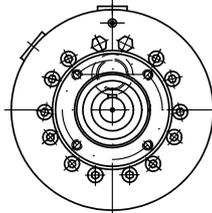
Cylinder combinations and respective symbols (only examples - there are many more versions) available

	Option 1		Option 2		Option 3		
	Drive side	Suction side	Drive side	Suction side	Drive side	Suction side	
10-cylinder pump 2 x 5-cylinder radials							These typical orders are examples of the many variations possible.
Order example	R 7,0-2,6		R 9,5 / 4,8-0,8		R 1,2-1,2-1,2-1,2-1,2 / 1,2-1,2-1,2-1,2-1,2		
Port 1 acc.to conn. index		g		g		a	
Port 2 acc.to conn. index		g		d		a	
all other ports acc. to connection index		--		a		a	
14-cylinder pump 2 x 7-cylinder radials							
Order example	R 8,4-8,4		R 13,3 / 7,7-0,5-0,5-0,5		R 7,7-0,5-0,5-0,5 / 7,7-0,5-0,5-0,5		
Port 1 acc.to conn. index		h		h		d	
Port 2 acc.to conn. index		h		d		d	
all other ports acc. to connection index		--		a		a	

## 2.5 4-radial pump, design 6014

20- and 28-cylinder pump

Each cylinder radial comprises either 5 or 7-cylinders



### Option 1 :

One pressure port per radial = four pressure ports in total. Flow coding acc. to connection index g (5-cylinder radial) or acc. to line h (7-cylinder radial).

Order example (28-cylinder pump):

**R 9,8 - 9,8 - 3,7 - 2,1**

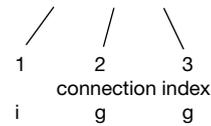


### Option 2:

Two or three cylinder radials joint completely at port 1, the remaining on port 2 (3) acc. to connection index i + g + g, i + i or l + g (5-cylinder radials) or k + h + h, k + k or m + h (7-cylinder radials).

Order example (20-cylinder pump):

**R 19,3 - 2,6 - 1,4**

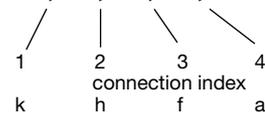


### Option 3 :

One or two cylinders from the lowest radial (suction side) are led out at individual port(s) as supply for a control circuit for piloted valves. For more details, see D 6010S

Order example (28-cylinder pump):

**R 4,0 - 2,1 - 1,8 - 0,3**



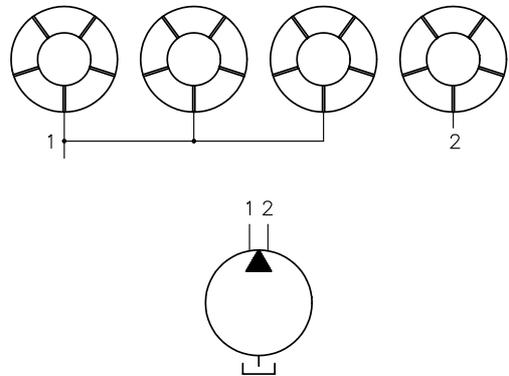
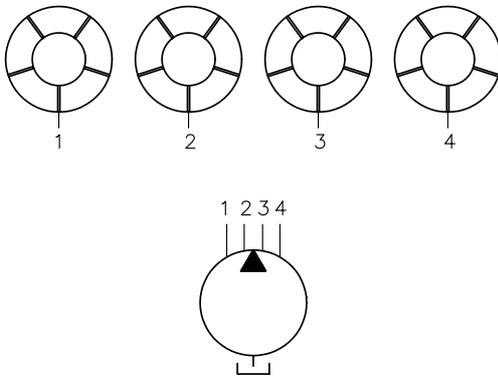
(indiv. cylinder for a control circuit)

Cylinder combinations and respective symbols (only exemplary - there are many more versions)

Option 1

Option 2

20-cylinder pump  
4 x 5-cylinder radials

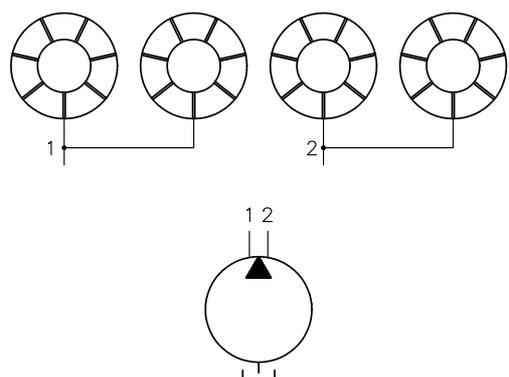
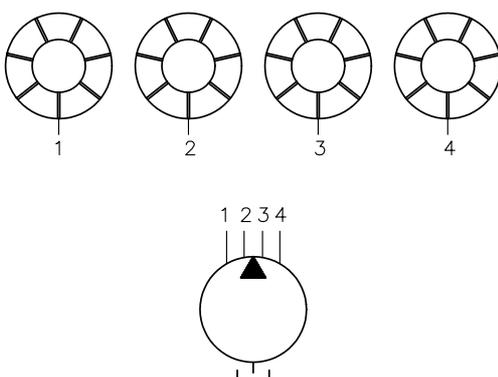


Order example

R 7,0-7,0-2,6-1,4  
Connections 1 - 4 as specified in line g

R 18,8-5,3  
Connection 1 as specif. in line l;  
Connection 2 as specif. in line g

28-cylinder pump  
4 x 7-cylinder radials



Order example

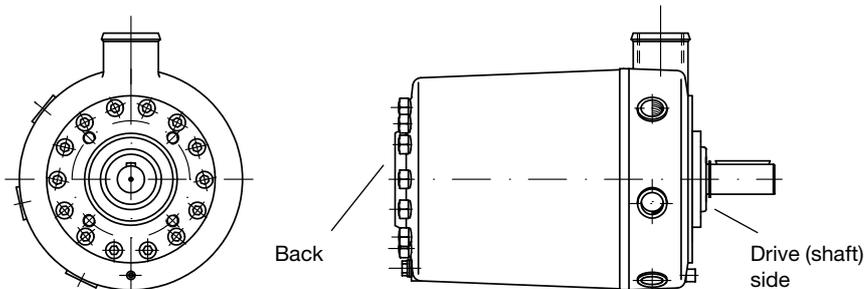
R 8,4-8,4-8,4-8,4  
Connections 1 - 4 as specified in line h

R 17,0-17,0  
Connections 1 - 2 as specified in line k

**2.6 6-radial pump, design 6016**

42-cylinder pump

Each cylinder radial comprises 7 cylinders



**Option 1 :**

One pressure port per radial = six pressure ports in total.  
Flow coding acc. to connection index h (7-cylinder radial).

Order example:

**R 11,8 - 11,8 - 5,8 - 5,8 - 2,1 - 2,1**



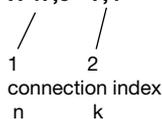
**Option 2 :**

Joint cylinder radials at (highest flow always at port 1):  
Two ports, codings acc. to connection index m + m or n + k or o + h.

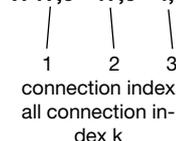
Three or five ports, codings acc. to connection index k + k + k, etc. or m + h + h + h, etc. or k + h + h + h + h

Order example:

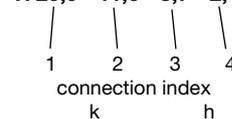
**R 47,0 - 7,4**



**R 17,0 - 17,0 - 4,0**



**R 20,0 - 11,6 - 3,7 - 2,1**



**Option 3 :**

One or two cylinders from the lowest radial (suction side) are led out at individual port(s) as supply for a control circuit for piloted valves. For more details, see D 6010S.

The order coding example is similar to 4-radial pumps (design 6014), see option 3 in sect. 2.5.

	Cylinder combinations and respective symbols (only exemplary - there are many more versions)	
	Option 1	Option 2
42-cylinder pump 6 x 7-cylinder radials		
Order example	R 11,8-11,8-5,3-5,3-2,1-2,1 Connections 1 - 6 as specified in line h	R 25,5-11,6-2,1 Connection 1 as specif. in line m Connection 1 as specif. in line k Connection 1 as specif. in line h

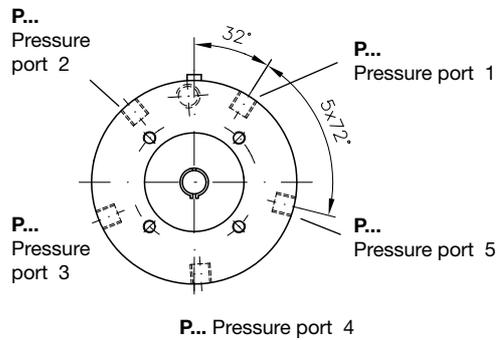
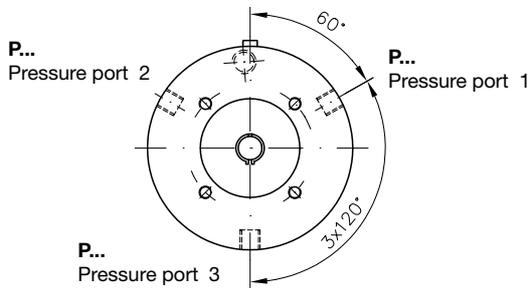
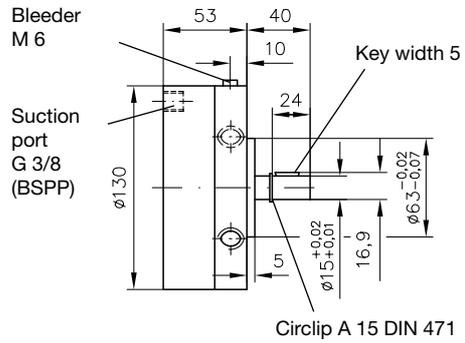
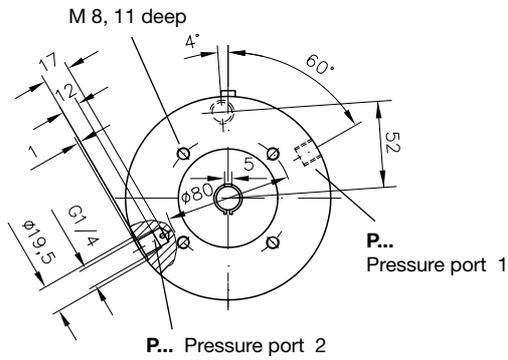
### 3. Dimensions

All dimensions in mm, subject to change without notice!

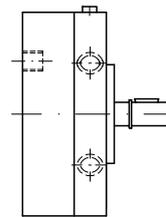
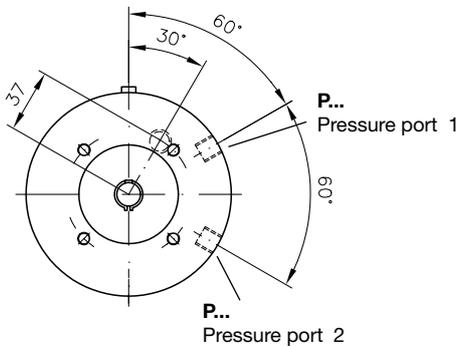
#### 3.1 Design 7631

2-, 3-, and 5-cylinder pumps

Coding 0,09 to 0,45



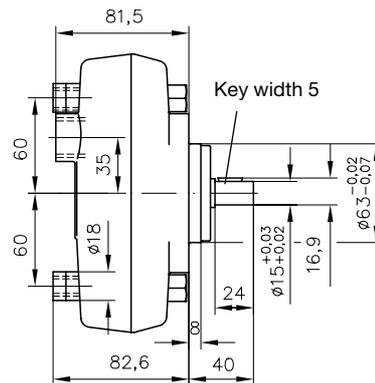
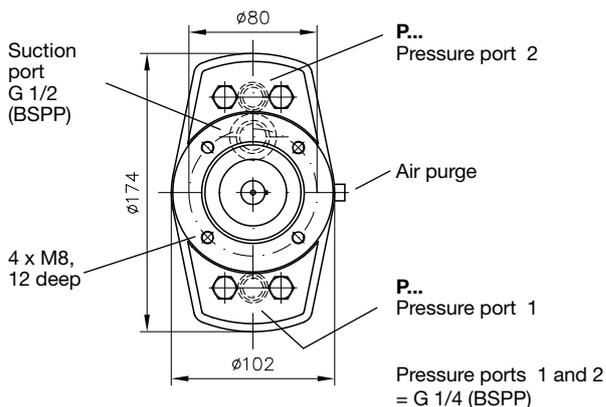
Coding 0,27 to 1,35



For missing dimensions, see coding 0,09 to 0,45

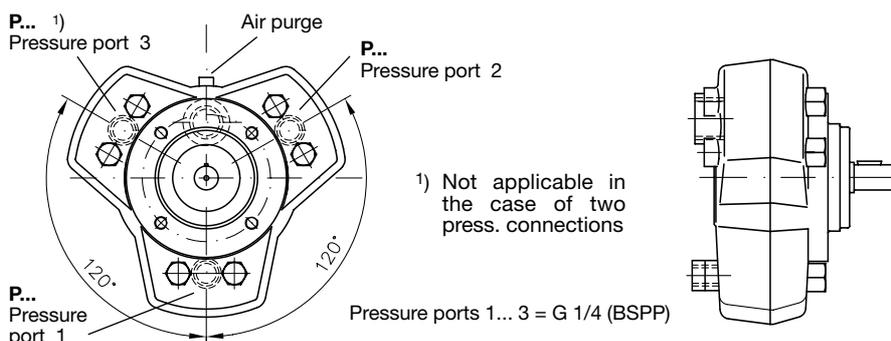
#### 3.2 Design 6010

2-cylinder pumps



### 3.3 Design 6010

3-cylinder pumps

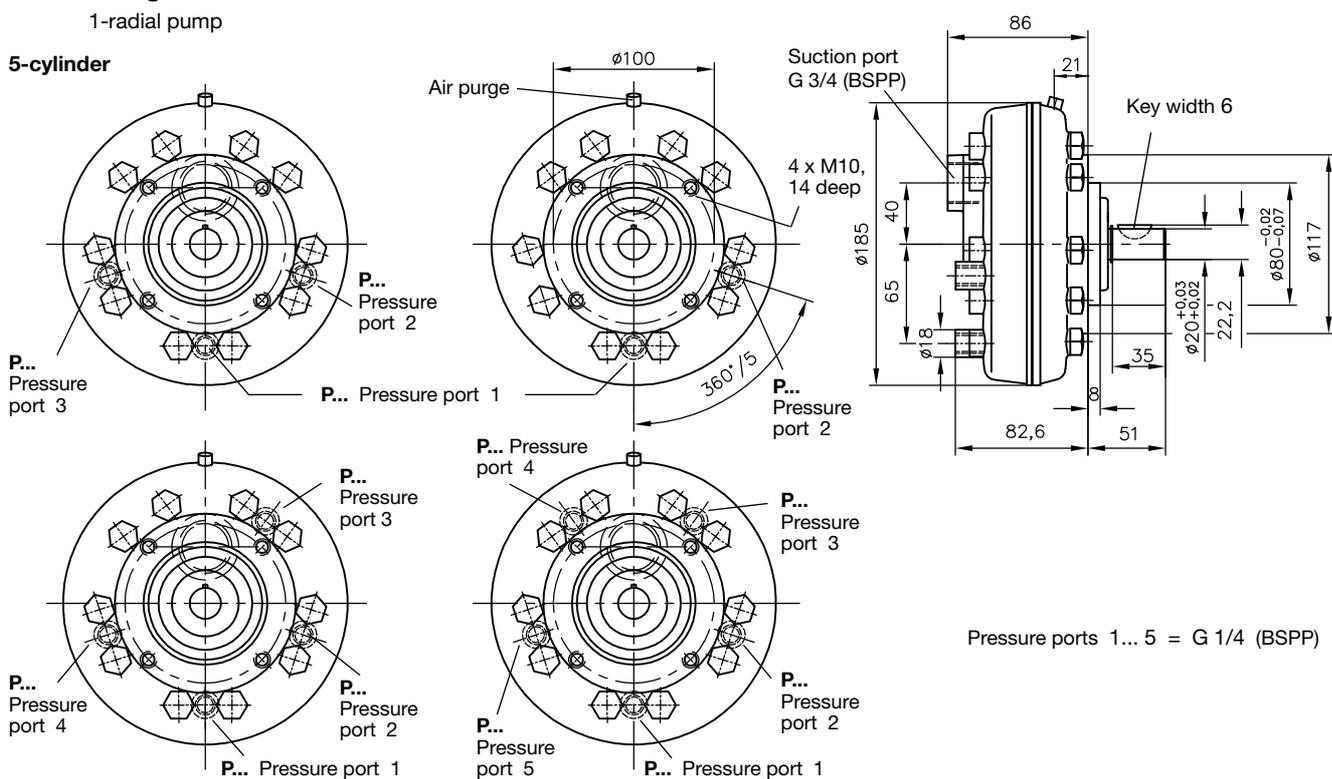


For missing dimensions see pamphlet 3.2

### 3.4 Design 6011

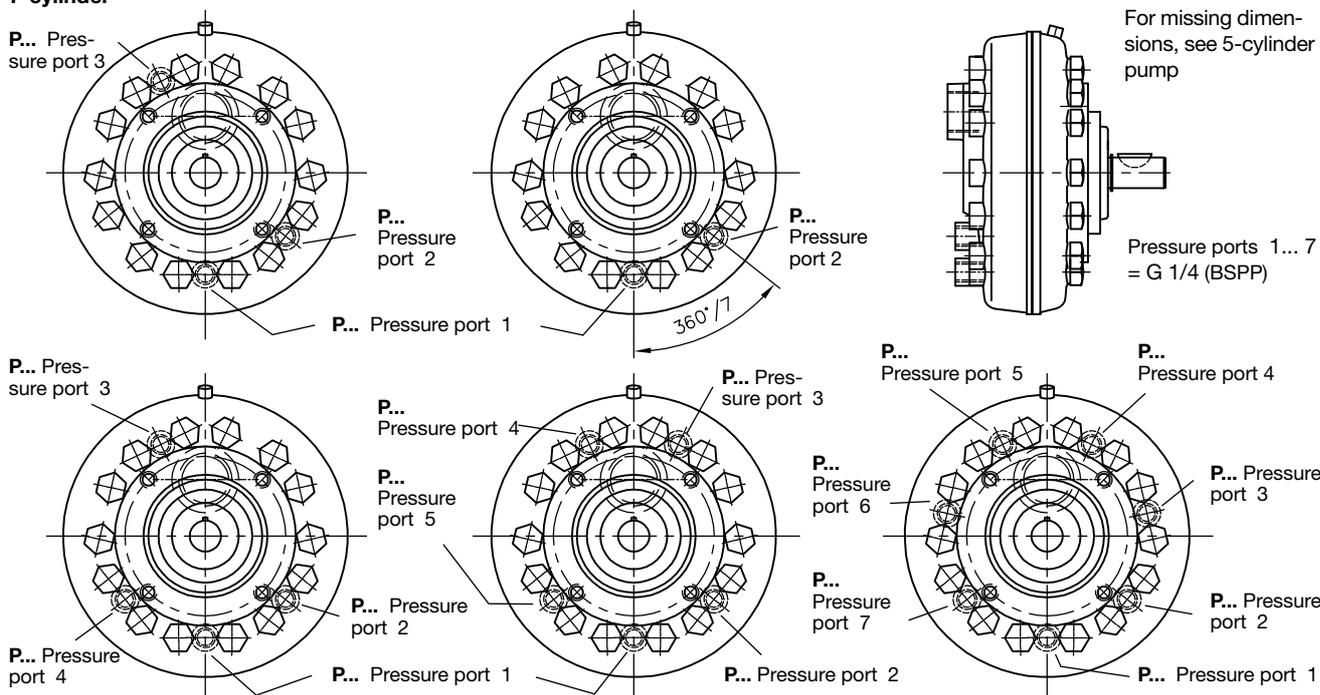
1-radial pump

5-cylinder



Pressure ports 1... 5 = G 1/4 (BSPP)

7-cylinder



For missing dimensions, see 5-cylinder pump

Pressure ports 1... 7 = G 1/4 (BSPP)

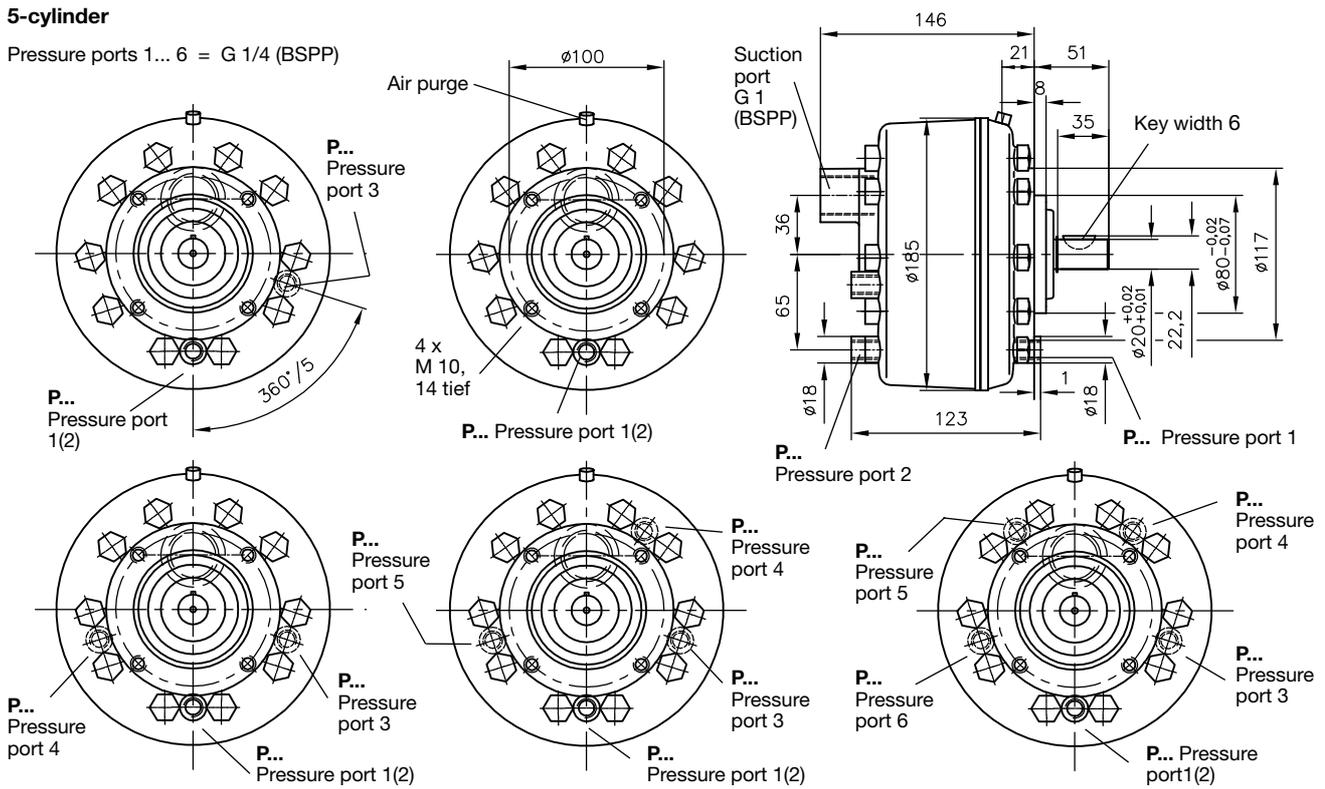
### 3.5 Design 6012

#### 2-radial pump

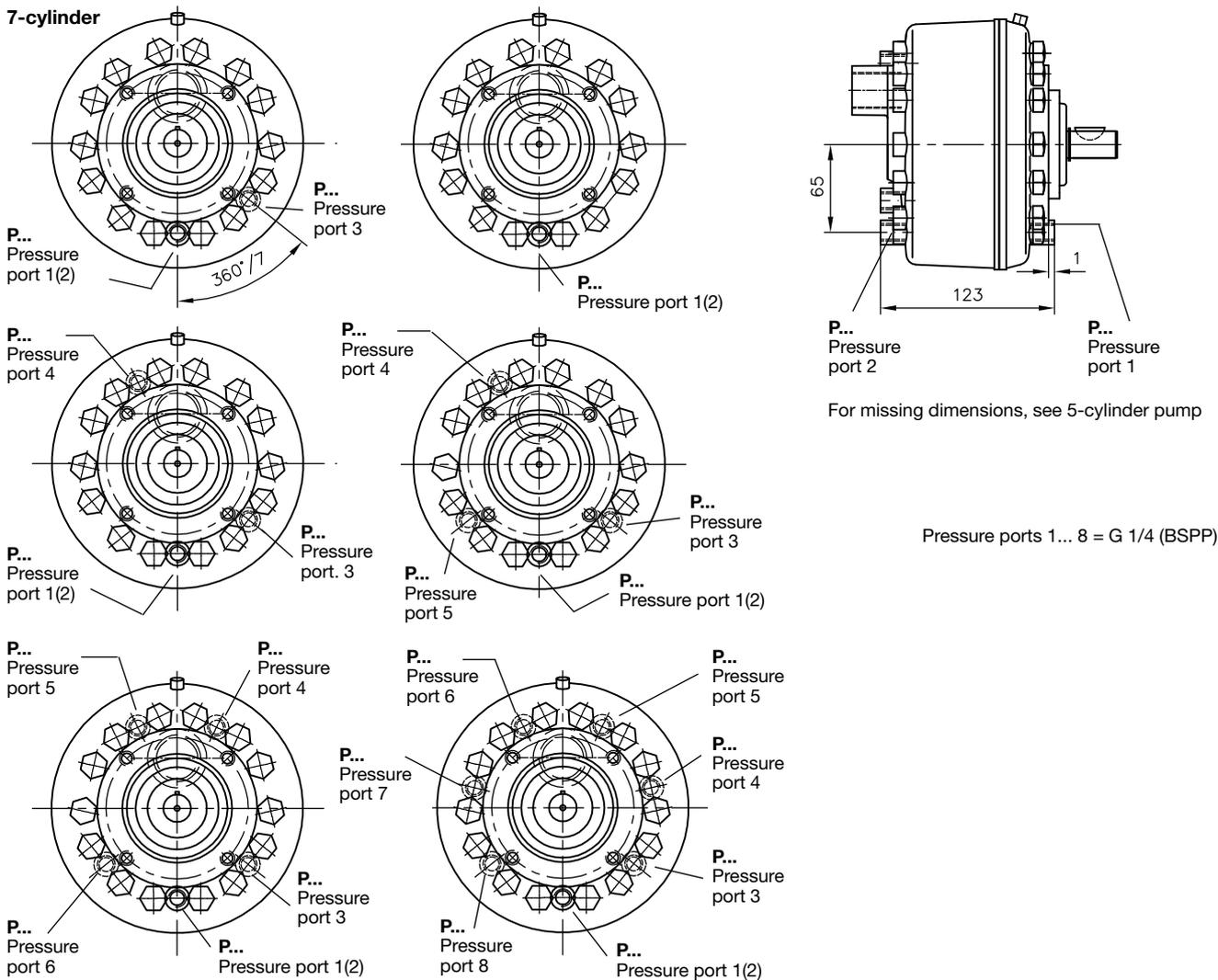
Attention: Not all versions for 2-radial pumps are listed here, due to spatial reasons. The pressure port dimensions are like with the standard version.

#### 5-cylinder

Pressure ports 1... 6 = G 1/4 (BSPP)



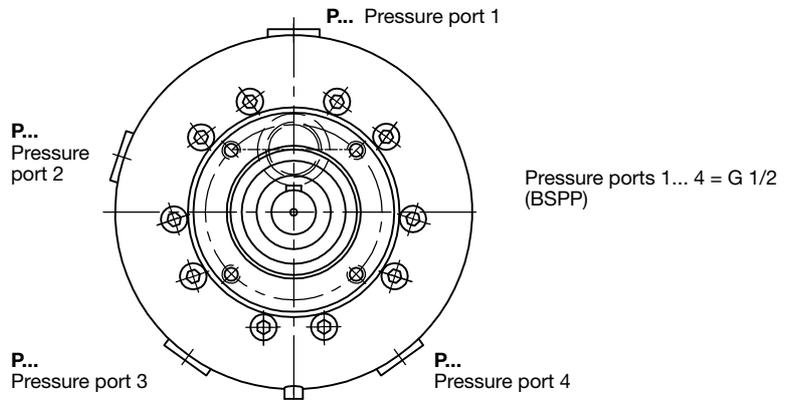
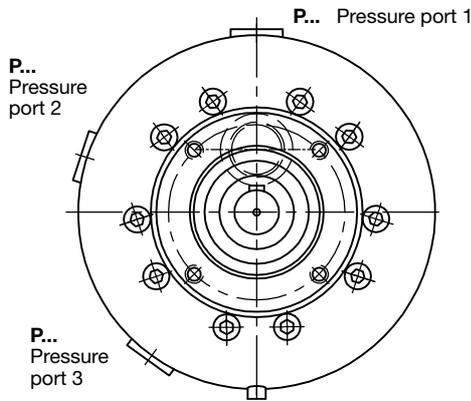
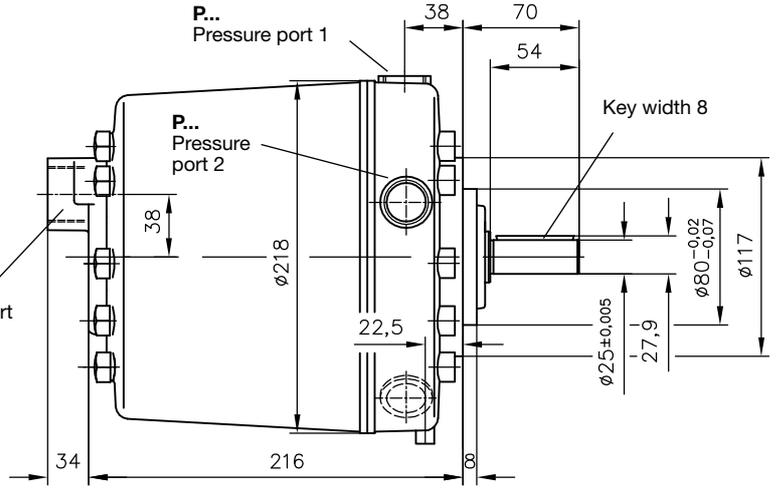
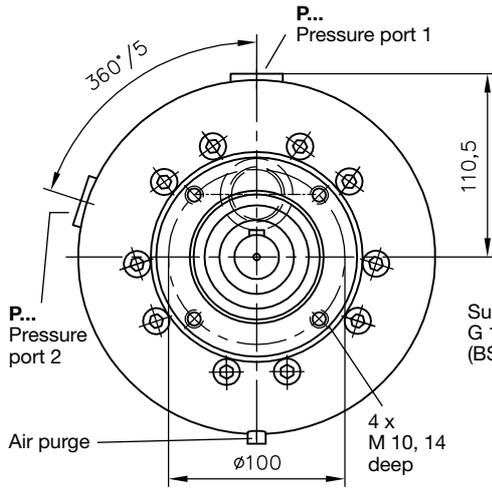
#### 7-cylinder



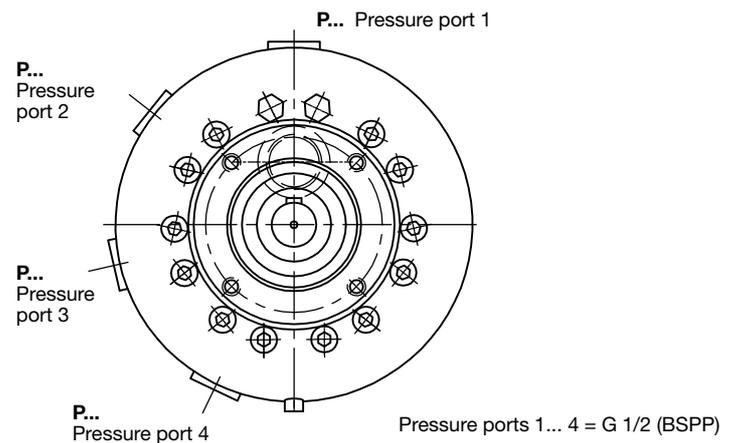
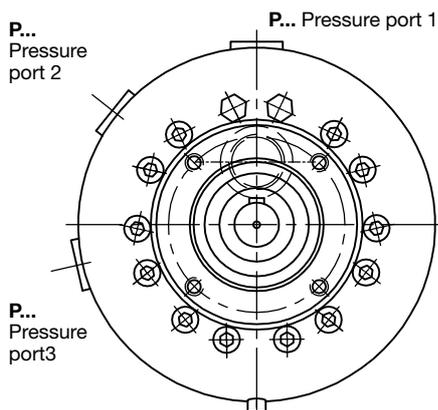
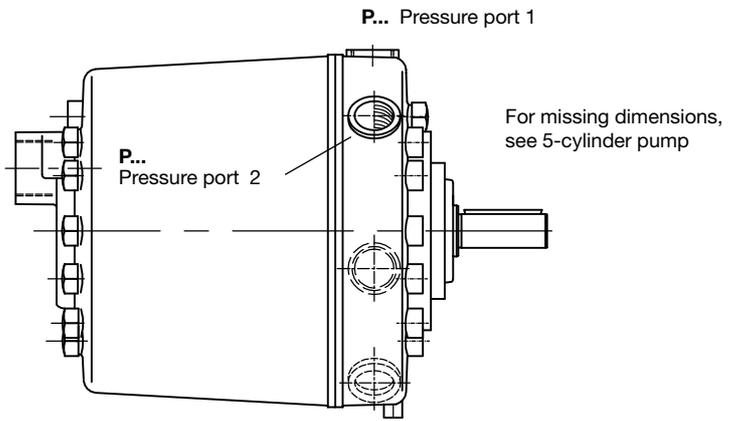
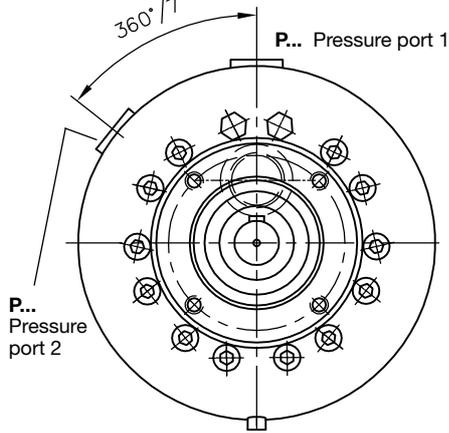
### 3.6 Design 6014

4-radial pump

#### 5-cylinder

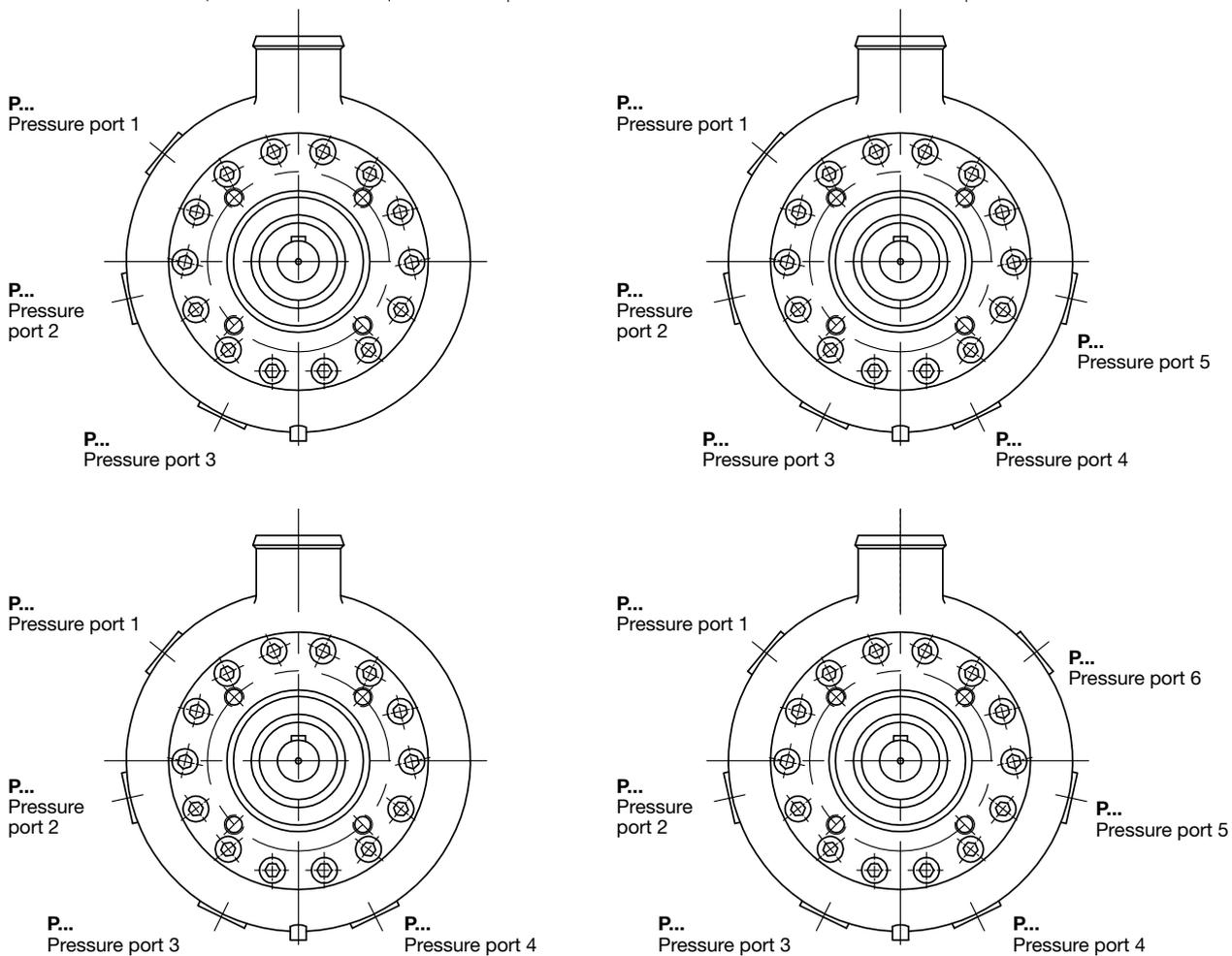
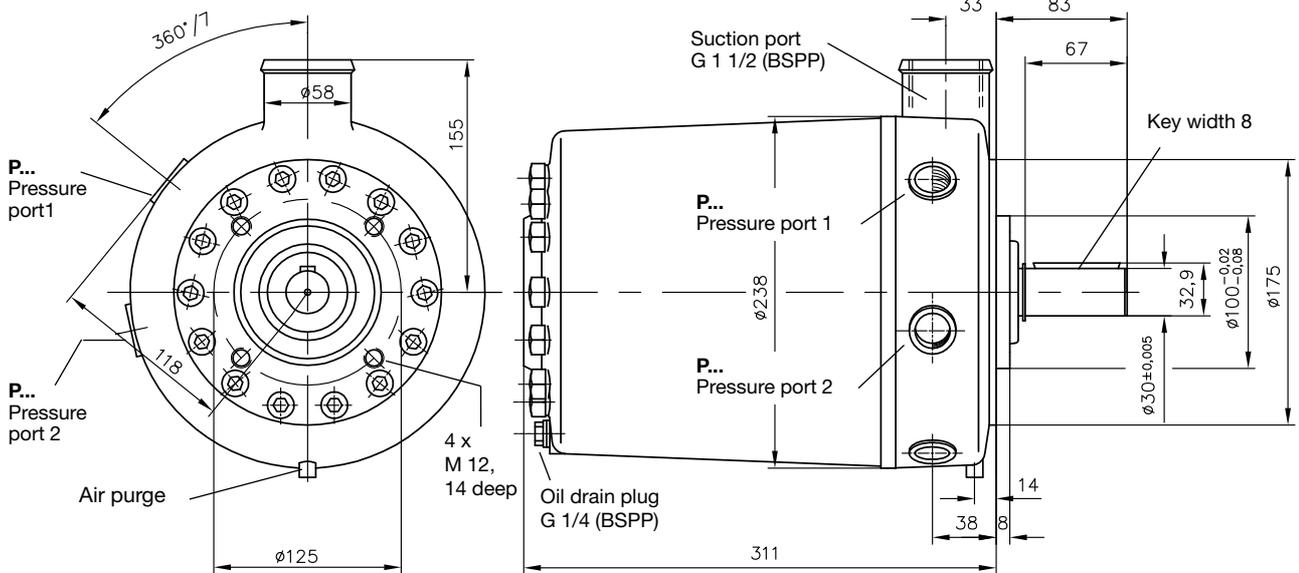


#### 7-cylinder



### 3.7 Design 6016

6-radial pump



#### Size of pressure ports:

The exact size of the pressure ports is determined by the delivery flow coding of each cylinder group (see table opposite)

The position of the pressure ports is determined by the sequence of delivery flow codings within the order coding (see also sect. 2).

Order example:

**R 53,0 - 5,8 - 5,8**

\* (BSPP)

4-radial pump with 4 x 7-cylinders at pressure port 1 = G 1/2\*

Single radial with 7-cylinders at pressure port 2 = G 3/8\*

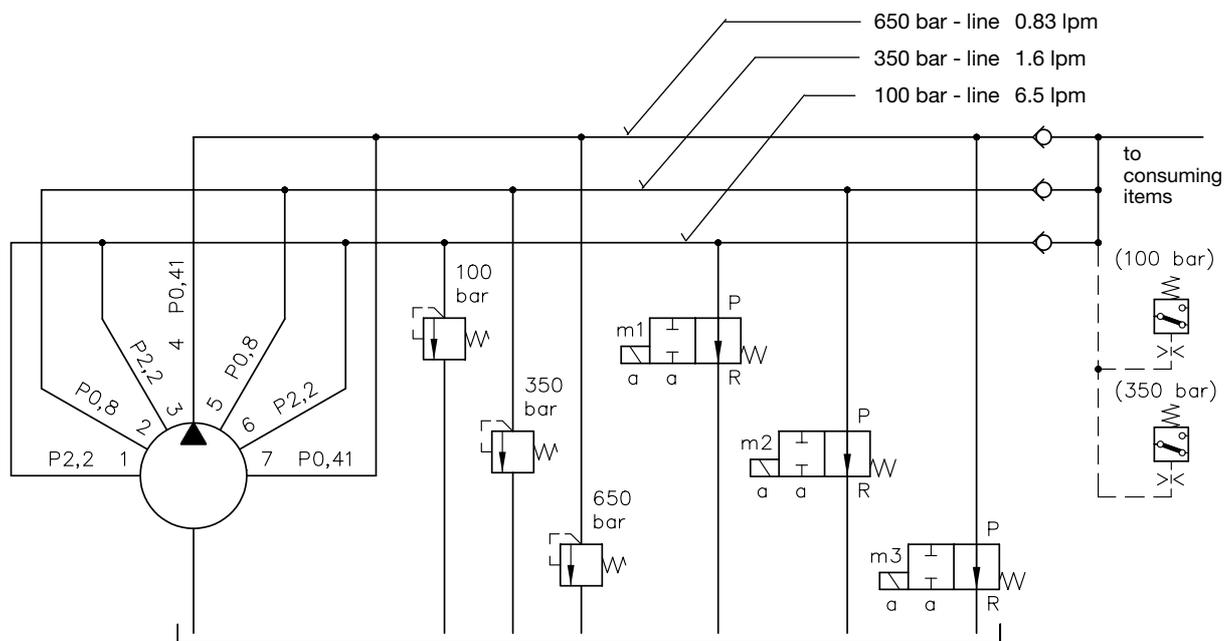
Single radial with 7-cylinders at pressure port 3 = G 3/8\*

Number of grouped cylinder radials x No of cylinders per radial	Delivery flow coding							Ports conf. DIN ISO 228/1 (BSPP)
	2.1	3.7	5.8	8.4	9.8	11.8	13.3	
1 x 7	2.1	3.7	5.8	8.4	9.8	11.8	13.3	G 3/8
2 x 7	4.0	7.4	11.6	17.0	20.0	23.5	26.5	
3 x 7	5.95	11.2	17.3	25.5	29.9	35.3	39.8	G 1/2
4 x 7	8.0	15.0	23.0	34.0	40.0	47.0	53.0	
5 x 7	10.6	18.3	28.8	42.5	50.0	58.4	66.7	G 3/4

## 4. Appendix

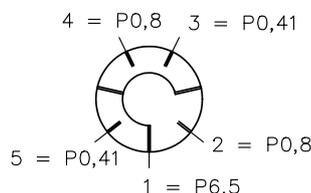
### 4.1 Characteristic features of pressure connections

The pump delivery will show a certain degree of pulsation (usually not pronounced at the usual operating speed of approx. 1450 rpm), whenever cylinder radials are split-up and fed to individual ports (design 7631, 6010, 6011, and 6012) or groups of cylinders (groups 6010, 6011 and 6012). At cylinder groups from 5- or 7-cylinder pumps, the respective pump cylinders are already grouped internally in such a way, that the remaining indiv. cylinders are distributed as far apart as possible (see the combination schemes for groups 6011 or 6012 in sect. 2.2 and 2.3). This ensures a good, superimposed arrangement of cylinders, keeping any pulse effect at a minimum. Whenever pump cylinders, with individual ports, are grouped together outside the pump an appropriate spread of cylinders should be ensured as well by choosing the sequence of delivery flow index ratings accordingly (see the example with five-cylinder pumps design 7631 in sect. 2.1 or design 6011 in sect. 2.3). The example below shows a pump (design 6011) where all 7 ports are joint externally in such a way that three lines with different flow and pressure levels are generated.



**Example:**

R 2,2 - 0,8 - 2, 2 - 0,41 - 0,8 - 2,2 - 0,41  
 In practice a pump R 6,5 - 0,8 - 0,41 - 0,8 - 0,41  
 would be chosen in such a case, the three P 2,2  
 pump cylinders being grouped together internally.



### 4.2 Power consumption

It is usually sufficient to apply approximate figures in the manner shown below, since an exact calculation of the power consumption is rather complicated for such pumps,; The approximate drive power required can be determined by calculating and adding up the power requirements of all deliveries apparent at the same time with their respective maximum pressure rating. Should there still be any inaccuracy in the case of pumps (design 7631, 6010, 6011, and 6012), due to pump cylinders delivering fluid simultaneously but without pressure, multiply the aggregate figure obtained in the above calculation with a correction factor making allowance for any imbalance. If necessary, the calculation may be conducted several times for various load cycles - the highest power demand obtained this way should then be used to sizing the motor.

$R_{req}=(P_{c1}+P_{c2}+...) \cdot c$  Total power requirement in kW

Where :

$P_z = \frac{p_z \cdot Q_z}{600 \cdot \eta_z}$  Power requirement of individual cylinder or group of cylinders in kW

$p_z$  (bar) Max. operating pressure of a group of cylinders

$Q_z$  (lpm) Delivery flow of a group of cylinders = delivery flow index sect. 2.1 or 2.3

$\eta_z$  (-)  $\approx 0.85$  mechanical/hydraulic efficiency of the group of cylinders

$c$  (-) Correction factor, if required



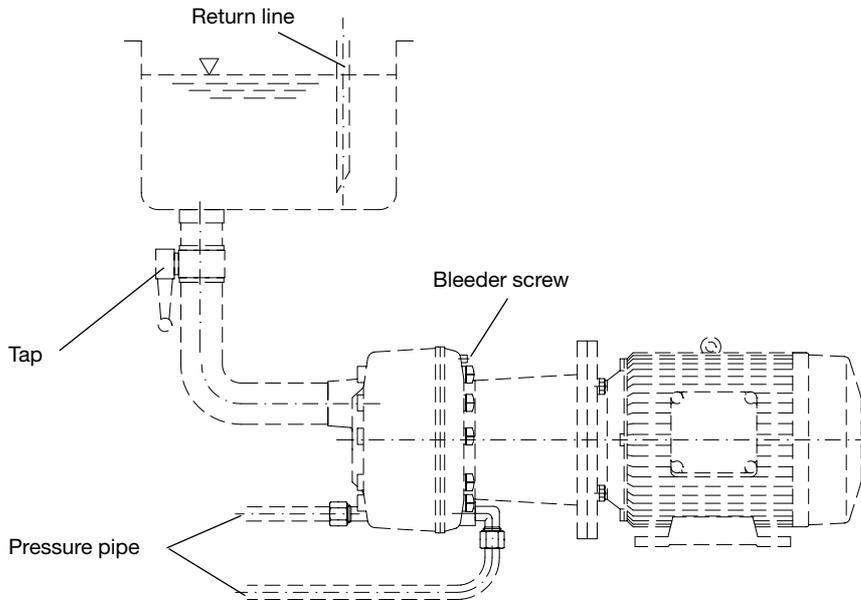
### 4.3 Bleeding and initial operation

The pump has to be bled prior to initial operation and after every fluid service to prevent intake problems and air to be fed into the hydraulic system.

See also notes in pamphlets D 6010, D 6010 H and operation manual B 6010.

#### Pumps installed outside the tank

When installed outside the tank, these pumps should preferably be positioned beneath or below the min. fluid level that a sufficient amount of fluid can flow in automatically via a feed line facing steadily downwards. This makes sure that the pump housing is always filled with fluid and that no air is dragged into the system. The line connecting pump and tank should be equipped with a tap easing removal of the pump for maintenance without the necessity of draining the tank. Slacken, but do not remove the bleeder screw during or after filling the tank and leave it open until fluid without bubbles comes out. Retighten the screw and let the pump run or switch the pump on and off several times in idle circulation mode if possible with your circuitry. Another way is to set the main pressure limiting valve to zero bar, thereby enabling pressure less circulation. Next any air dragged into the system should be removed by operating all functions of the circuitry without load until all cylinders, motors, etc. move steadily and without any hesitation. Next the pressure limiting valve has to be reset to the system requirements (monitored by a pressure gauge).



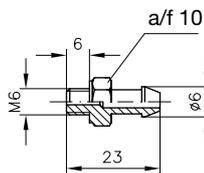
#### Installation inside the tank

For additional information, see also D 6010 DB

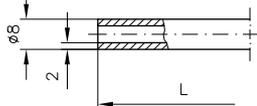
When using your own tank and tank cover plates, replace the bleeder screw at the pump by nipple 6020 070 and install a proper bleeding point at the cover plate, as illustrated below. Both nipples have to be connected via an oil-proof hose (8x2).

#### Available bleeder components:

1. Nipple  
part No. 6020 070



2. Hose (NBR)



Part No.	Length L
6020 077 a	220
6020 077 b	260
6020 077 c	310
6020 077 d	420
6020 077 e	500

