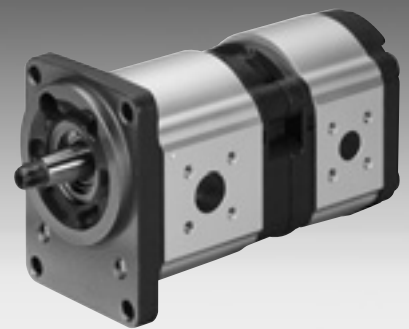


# External Gear Pumps Series S

**RE 10 095/02.12**  
Replaces:  
RE 10 095/09.09

AZPS-...

Fixed pumps  
 $V = 4.0 \dots 28 \text{ cm}^3/\text{rev}$



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## Features

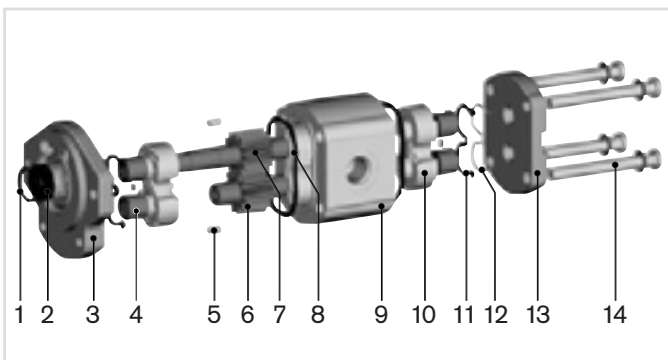
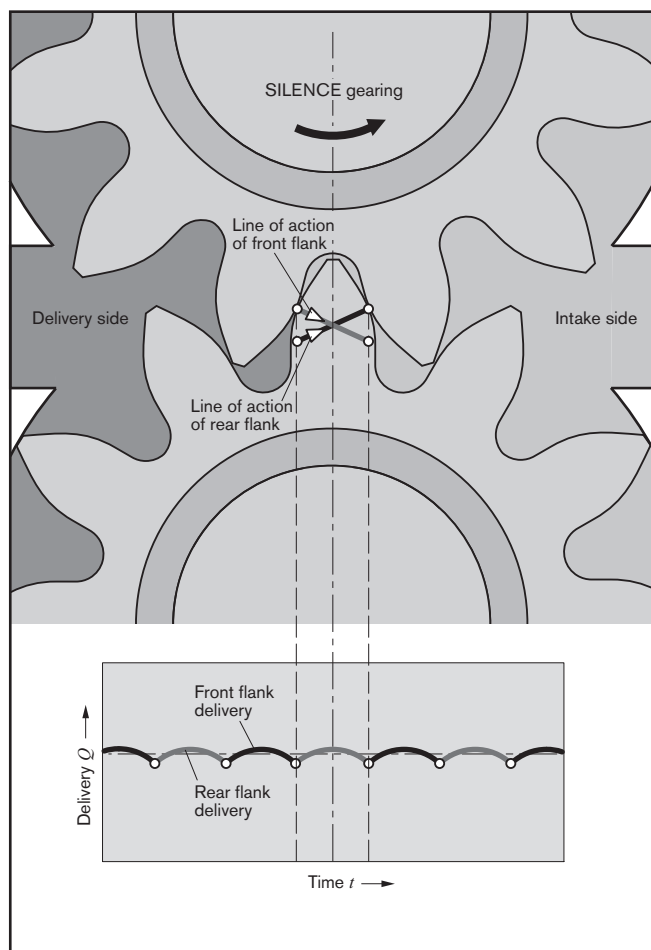
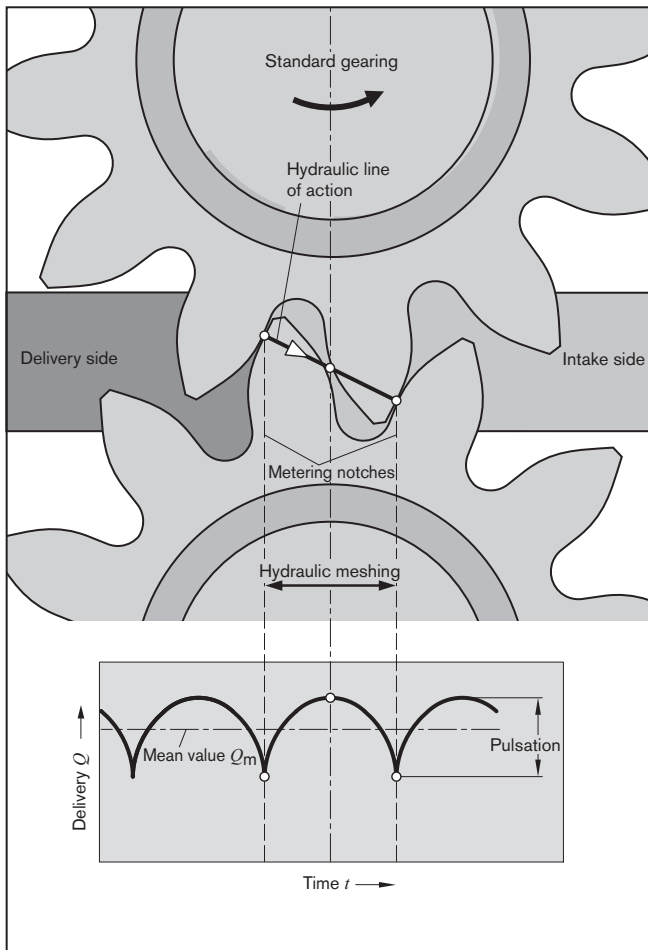
- Nominal pressure 280 bar
- Slide bearings for heavy duty applications
- Drive shafts to ISO or SAE
- Combination of several pumps possible
- Line ports:
  - connection flange or screw thread
- Optimized pressure pulsation with reduced noise emissions and vibration excitation in the system
- Consistent high quality
- Considerably longer service life due to reinforced shaft and case

## General

The key task of external gear units is to convert mechanical energy (torque and rotational speed) into hydraulic energy (flow and pressure). In external gear motors this is the other way round. These machines are required to be highly efficient in order to avoid unnecessary heat. This efficiency is achieved by means of precision production engineering and pressure-sensitive gap sealing.

Moreover, in the low-noise SILENCE pumps, the dual-flank principle helps to reduce flow pulsation by up to 75%.

### The displacement method



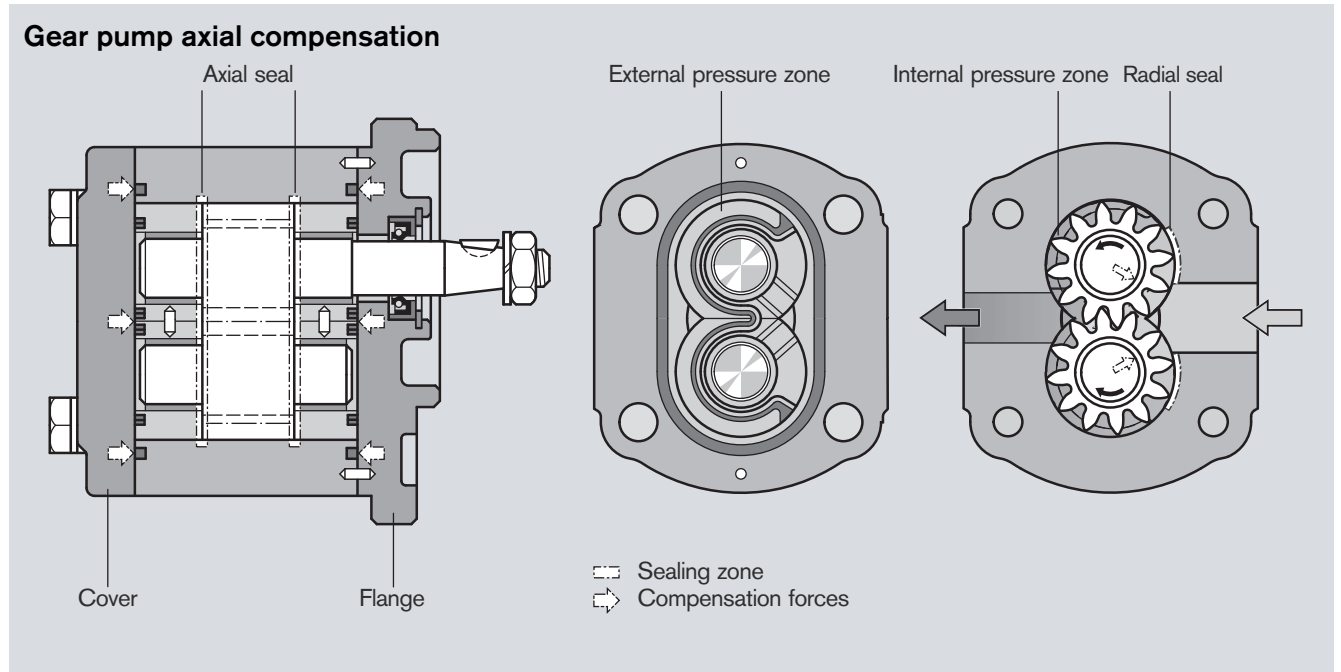
- |                     |                    |
|---------------------|--------------------|
| 1 Retaining ring    | 8 Case seal        |
| 2 Shaft seal ring   | 9 Pump case        |
| 3 Front cover       | 10 Bearing         |
| 4 Slide bearing     | 11 Axial zone seal |
| 5 Centering pin     | 12 Support         |
| 6 Gear              | 13 End cover       |
| 7 Gear (frictional) | 14 Fixing screws   |

The geometry of the displacement gearing, matched in form by the rotation of the drive shaft, results in the parabolic flow characteristic shown here on the left. In a standard pump, this characteristic is repeated each time a gear tooth meshes. With their dual-flank system, the flow pulsation of SILENCE pumps is reduced by 75% – with correspondingly lower excitation of downstream system components – at double the fundamental frequency. During this process, the gear pair exhibits an extremely reduced rear flank backlash, so that hydraulic sealing is provided not just by the front flank of the driven gear, but also by the rear flanks. In this way, the front and rear flanks alternately contribute to flow displacement. And by adapting the shape of the metering notches, the expansion of the hydraulic line of action is half that of the standard pump.

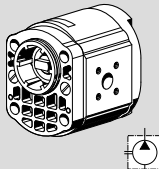
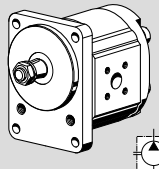
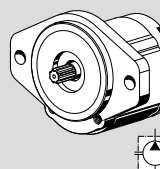
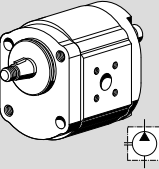
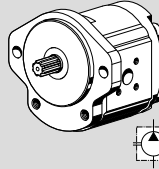
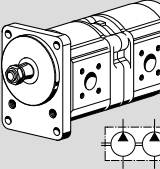
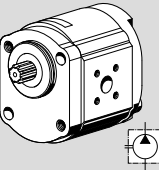
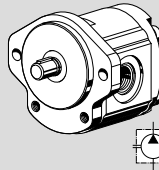
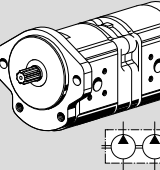
### Construction

The external gear unit consists essentially of a pair of gears supported in bearing bushings and the case with a front and a rear cover. The drive shaft protrudes from the front cover where it is sealed by the shaft seal ring. The bearing forces are absorbed by special bearing bushings with sufficient elasticity to produce surface contact instead of line contact. They also ensure excellent resistance to galling – especially at low speed. The gears have 12 teeth. This keeps both flow pulsation and noise emission to a minimum.

The internal sealing is achieved by forces which are proportional to delivery pressure. This ensures optimum efficiency. The bearings provide the seal at the ends of the gaps between the teeth which carry the pressurized oil. The sealing zone between the gear teeth and the bearings is controlled by the admission of operating pressure to the rear of the bearing bushings. Special seals form the boundary of the zone. The radial clearance at the tips of the gear teeth is sealed by internal forces pushing them against the case.



### Product overview of “SILENCE standard range”

Version	Page	Version	Page	Version	Page
	19		22		25
	20		23		26
	21		24		27

# Ordering code

## External gear units Single pumps "SILENCE"

<b>AZ</b>	<b>P</b>	<b>S</b>	<b>-</b>	<b>x</b>	<b>x</b>	<b>-</b>	<b>016</b>	<b>R</b>	<b>C</b>	<b>B</b>	<b>20</b>	<b>M</b>	<b>B</b>	<b>18009</b>	<b>S xxxx</b>																																																																																																																																																																																																																																																																																																																																																															
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<p>*) Some of the special designs shown on pages 19–27 are not covered in the illustration of the ordering code.</p>																																																																																																																																																																																																																																																																																																																																																																														
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
























Not all variants can be selected by using ordering code!

Please select the required pump by using the selection tables (standard types) or after consultation with Bosch Rexroth!

Special options are possible upon request.

# Ordering code

## External gear units Multiple pumps "SILENCE"

<b>AZ</b>	<b>P</b>	<b>GGSS</b>	<b>-</b>	<b>x</b>	<b>x</b>	<b>-</b>	<b>032/022/016/005</b>	<b>R</b>	<b>C</b>	<b>B</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>K</b>	<b>B</b>
<b>Function</b> P = Pump <b>Series</b> B = 1.0...7.1 cm <sup>3</sup> /rev S = 4.0...28 cm <sup>3</sup> /rev F = 4.0...28 cm <sup>3</sup> /rev N = 20.0...36 cm <sup>3</sup> /rev G = 22.5...63 cm <sup>3</sup> /rev <b>Series</b> , relates to pump section 1 1x = Standard bearing 2x = Reinforced bearing <b>Version</b> , relates to pump section 1 1 = Phosphatized, pinned 2 = Chromatized, pinned <b>Size</b> corresponding to each series <b>Direction of rotation</b> R = Clockwise, L = Counter-clockwise							<b>Rear cover</b> relates to last pump section B = Standard <b>Seals</b> M = NBR P = FKM K = NBR, SSR in FKM Shaft seal relate to pump section 1									
<b>Drive shafts</b> relates to pump part 1							<b>Front cover</b> relates to pump part 1				<b>Line ports</b> every pump parts					
Series B:							Suitable front cover									
<b>H</b>	Tapered key shaft 1 : 8			<b>O</b>	<b>O</b>	Square flange Centering Ø 25.38 mm			<b>02</b>	Thread, metric DIN 3852 T1						
Series F, S:																
<b>C</b>	Tapered key shaft 1 : 5			<b>B</b>	<b>B</b>	Square flange Centering Ø 80 mm			<b>20</b>	Rectangular flange						
<b>H</b>	Tapered key shaft 1 : 8			<b>O</b>	<b>O</b>	Square flange Centering Ø 36.47 mm										
<b>R</b>	Splined shaft SAE J 744 16-4 9T			<b>R</b>	<b>R</b>	SAE J 744 82-2 A Centering Ø 82.55 mm 2-bolt mounting										
Series N, T:																
<b>C</b>	Tapered key shaft 1 : 5			<b>B</b>	<b>B</b>	Square flange Centering Ø 100 mm			<b>07</b>	Square flange SAE Thread, metric						
<b>D</b>	Splined shaft SAE J 744 22-4 13T			<b>C</b>	<b>C</b>	SAE J 744 101-2 B Centering Ø 101.6 mm 2-bolt mounting			<b>20</b>	Rectangular flange						
<b>N</b>	Dihedral claw			<b>M</b>	<b>M</b>	Centering Ø 52 mm with seal ring										
Series G, U:																
<b>C</b>	Tapered key shaft 1 : 5			<b>B</b>	<b>B</b>	Square flange Centering Ø 105 mm			<b>07</b>	Square flange SAE Thread, metric						
<b>D</b>	Splined shaft SAE J 744 22-4 13T			<b>C</b>	<b>C</b>	SAE J 744 101-2 B Centering Ø 101.6 mm 2-bolt mounting			<b>20</b>	Rectangular flange						
<b>H</b>	Tapered key shaft 1 : 8			<b>O</b>	<b>O</b>	Square flange Centering Ø 50.78 mm										

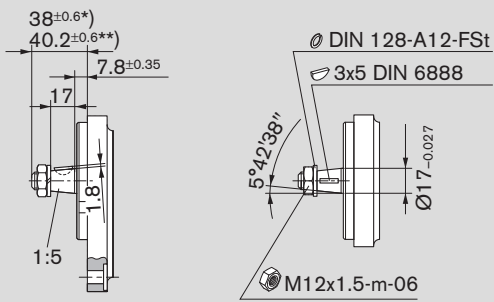
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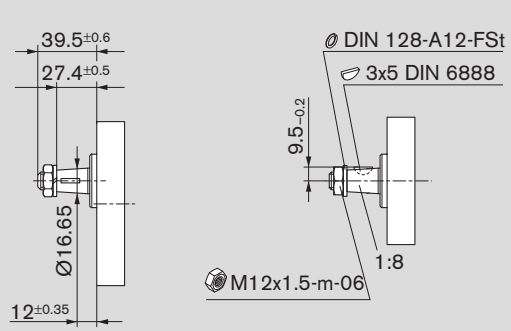
Special options are possible upon request.

Drive shafts

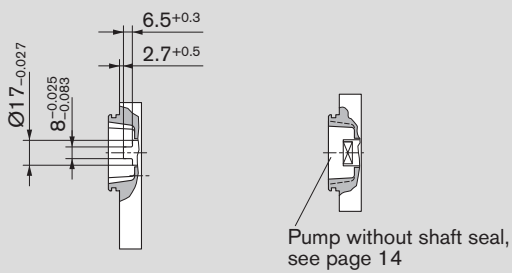
**C**



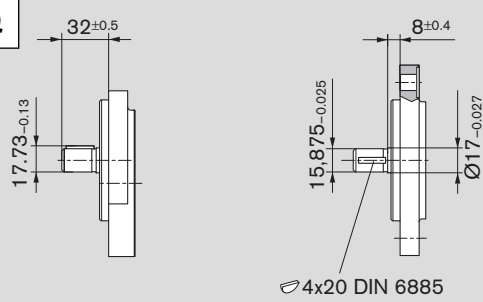
**H**



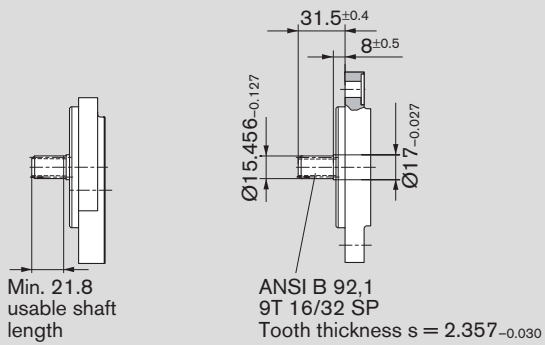
**N**



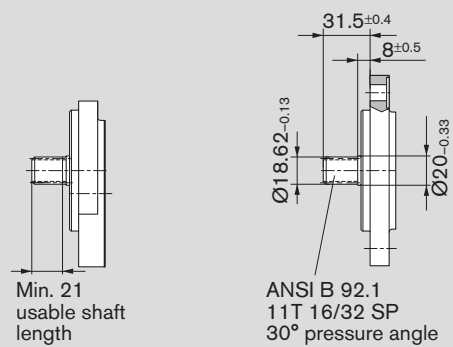
**Q**



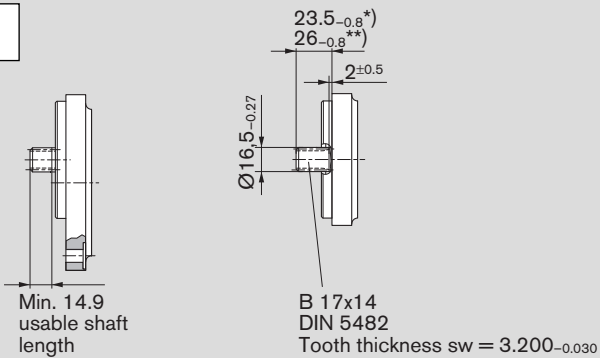
**R**



**P**

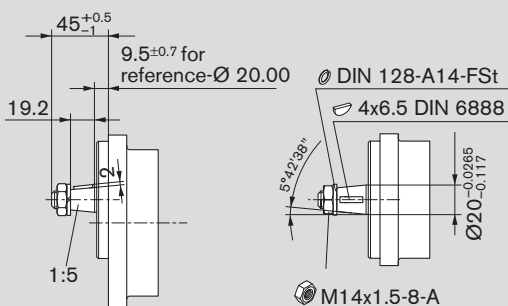


**F**

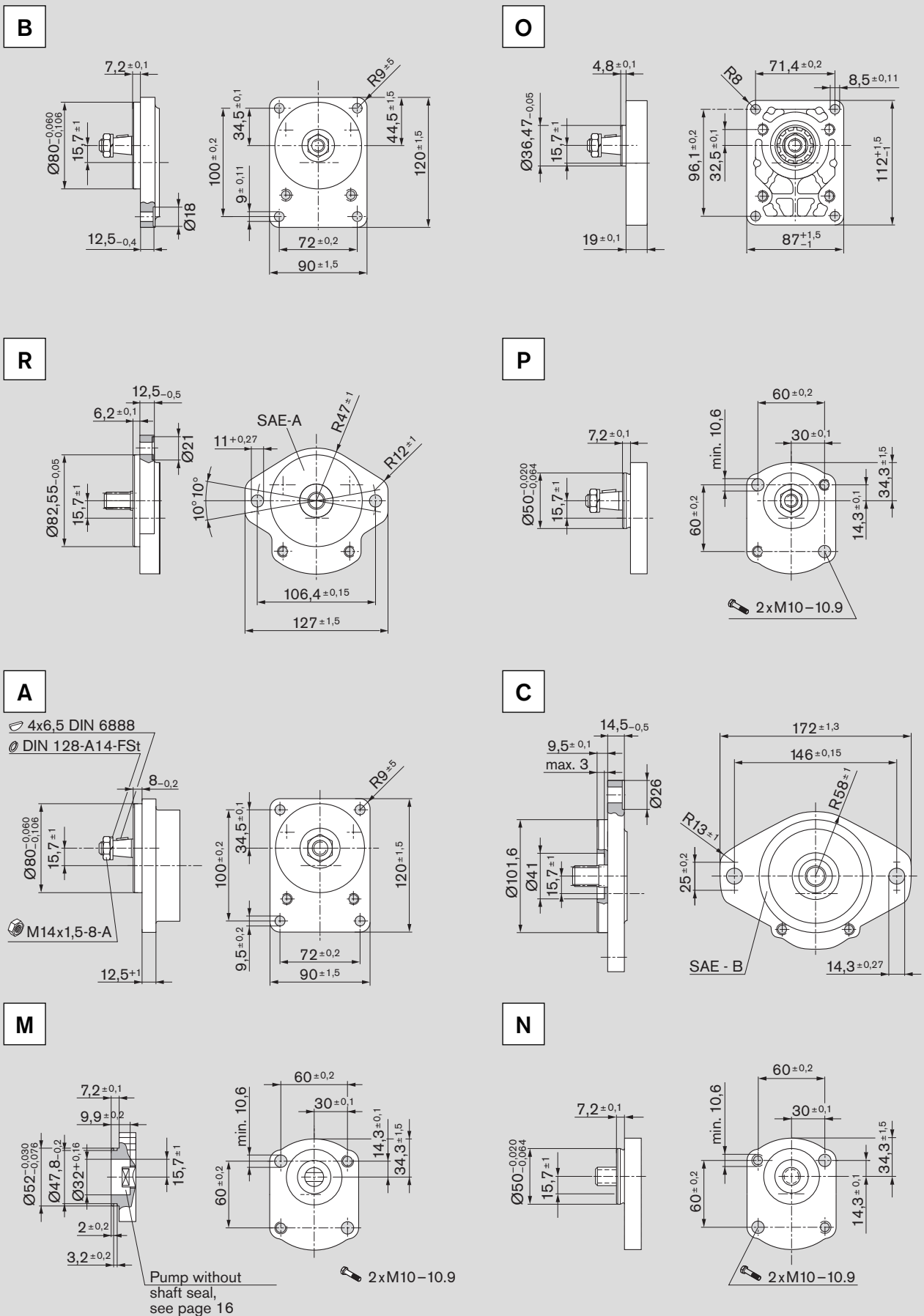


\*) in combination with front cover **B**  
\*\*) in combination with front cover **P**

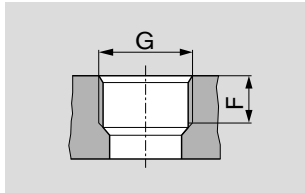
**S**



Front cover



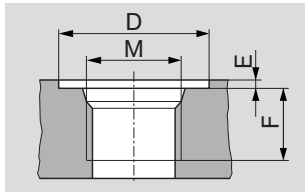
Line ports



**01** Pipe thread  
ISO 228/1

At pressures  $p_2 > 210$  bar  
limited service life

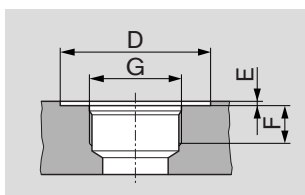
Ordering code	Size	Pressure side		Suction side	
		G	F	G	F
01	4...16 cm <sup>3</sup>	G 1/2	16	G 3/4	16
	19...28 cm <sup>3</sup>	G 3/4		G 1	19



**03** Thread, metric  
ISO 6149 with seal ring

At pressures  $p_2 > 210$  bar  
limited service life

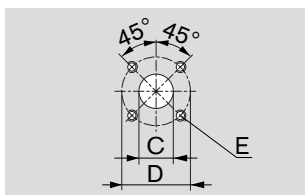
Ordering code	Size	Pressure side				Suction side			
		M	D	E	F	M	D	E	F
03	4...5.5 cm <sup>3</sup>	M 18 x 1.5	29	0.5	16	M 18 x 1.5	29	0.5	16
	8...16 cm <sup>3</sup>	M 22 x 1.5	34		18	M 27 x 1.5	40		19
	19...28 cm <sup>3</sup>					M 33 x 2	46		22



**12** Thread (UN-2B, UNF-2B) SAE  
Seal ring BOSS

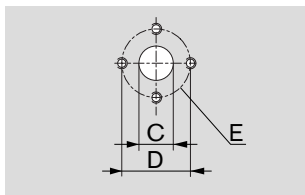
At pressures  $p_2 > 210$  bar  
limited service life

Ordering code	Size	Pressure side				Suction side			
		G	D	E	F	G	D	E	F
12	4...5.5 cm <sup>3</sup>	9/16-18 UNF-2B	25	0.5	13	9/16-18 UNF-2B	25	0.5	13
	8 cm <sup>3</sup>	7/8-14 UNF-2B	35		16	7/8-14 UNF-2B	35		16
	11...28 cm <sup>3</sup>					1 1/16-12 UN-2B	45		19



**20** Rectangular flange

Ordering code	Size	Pressure side			Suction side		
		C	D	E	C	D	E
20	4...5.5 cm <sup>3</sup>	15	35	M6, depth 13	15	40	M6, depth 13
	20						
	19...28 cm <sup>3</sup>	26	55	M8, depth 13			



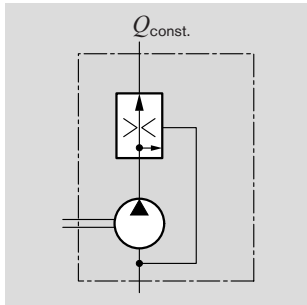
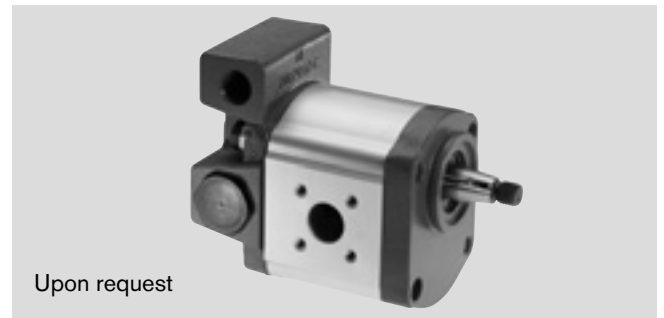
**30** Rectangular flange

Ordering code	Size	Pressure side			Suction side		
		C	D	E	C	D	E
30	4...8 cm <sup>3</sup>	13.5	30.2	M6, depth 13	13.5	30.2	M6, depth 13
	11...28 cm <sup>3</sup>				20.0		

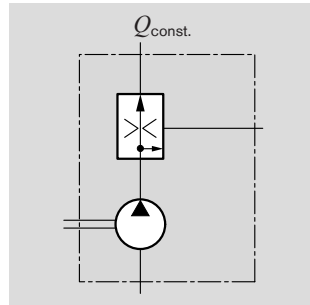


# Gear pumps with integral valves

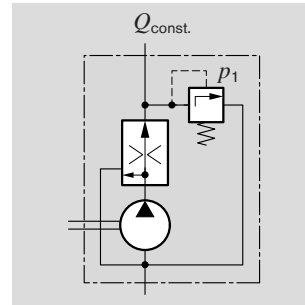
In order to reduce external pipework it is possible to incorporate a flow-control valve or pressure-relief valve in the rear cover of the gear pump. A typical application of this is in the supply of hydraulic oil in power steering systems. The pump delivers a constant flow irrespective of the speed at which it is driven. The excess flow is either returned internally to the suction port or distributed externally to other items of equipment.



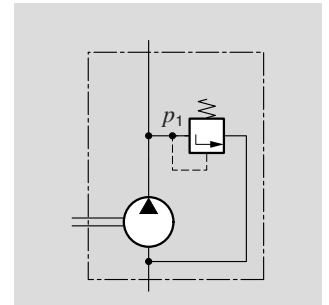
3-way flow-control valve.  
Excess flow returned to suction line  
 $Q_{const.} = 2...30 \text{ l/min}$



3-way flow-control valve.  
Excess flow distributed externally; loadable  
 $Q_{const.} = 2...30 \text{ l/min}$



3-way flow-control valve with pressure-relief valve.  
Excess flow returned to suction line  
 $Q_{const.} = 2...30 \text{ l/min}$   
 $p_1 = 100...180 \text{ bar}$



Pressure-relief valve.  
Discharge returned to suction line  
 $p_1 = 5...250 \text{ bar}$

## Ordering code

S	xxx17
---	-------

E	xxx12
---	-------

V	15011
---	-------

D	180xx
---	-------

# Design calculations for pumps

The design calculations for pumps are based on the following parameters:

$V$ [cm <sup>3</sup> /rev]	Displacement
$Q$ [l/min]	Delivery
$p$ [bar]	Pressure
$M$ [Nm]	Drive torque
$n$ [rev/min]	Drive speed
$P$ [kW]	Drive power

It is also necessary to allow for different efficiencies such as:

$\eta_v$	Volumetric efficiency
$\eta_{hm}$	Hydraulic-mechanical efficiency
$\eta_t$	Overall efficiency

The following formulas describe the various relationships. They include correction factors for adapting the parameters to the usual units encountered in practice.

**Caution:** Diagrams providing approximate selection data will be found on subsequent pages.

$$Q = V \cdot n \cdot \eta_v \cdot 10^{-5}$$

$$p = \frac{M \cdot \eta_{hm}}{1.59 \cdot V}$$

$$P = \frac{p \cdot Q}{6 \cdot \eta_t}$$

$$V = \frac{Q}{n \cdot \eta_v} \cdot 10^5$$

$$M = \frac{1.59 \cdot V \cdot p}{\eta_{hm}}$$

$$Q = \frac{6 \cdot P \cdot \eta_t}{p}$$

$$n = \frac{Q}{V \cdot \eta_v} \cdot 10^5$$

$$M = \frac{1.59 \cdot V \cdot p}{\eta_{hm}}$$

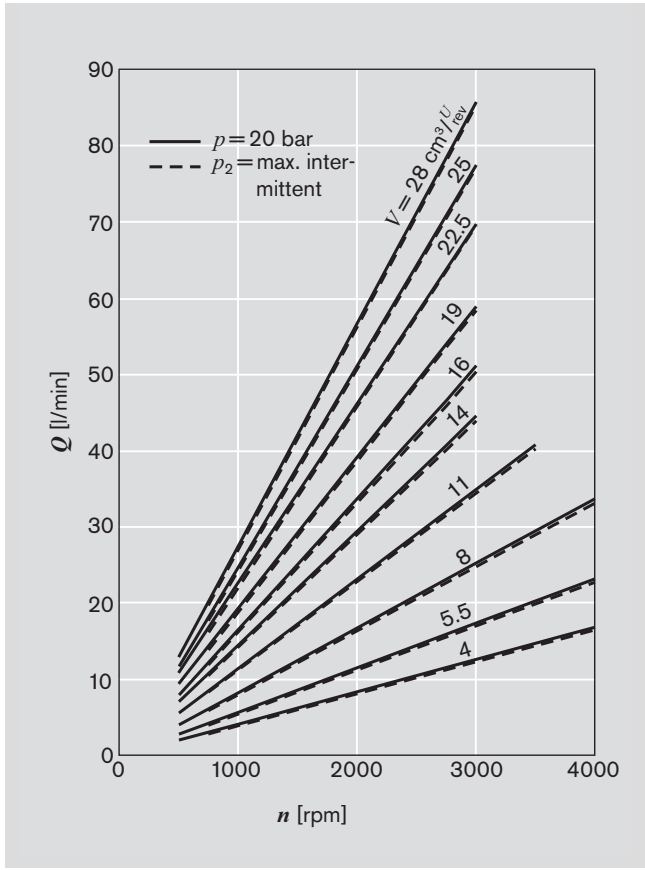
$$p = \frac{6 \cdot P \cdot \eta_t}{Q}$$

	[%]				
$n$	$\eta_v$	$\rightarrow$	$Q$	$V$ [cm <sup>3</sup> /rev]	$Q$ [l/min]
$M$	$\eta_{hm}$	$\rightarrow$	$p$	$p$ [bar]	
$P$	$\eta_t$	$\rightarrow$	$p \cdot Q$	$n$ [rev/min]	$P$ [kW]
				$M$ [Nm]	

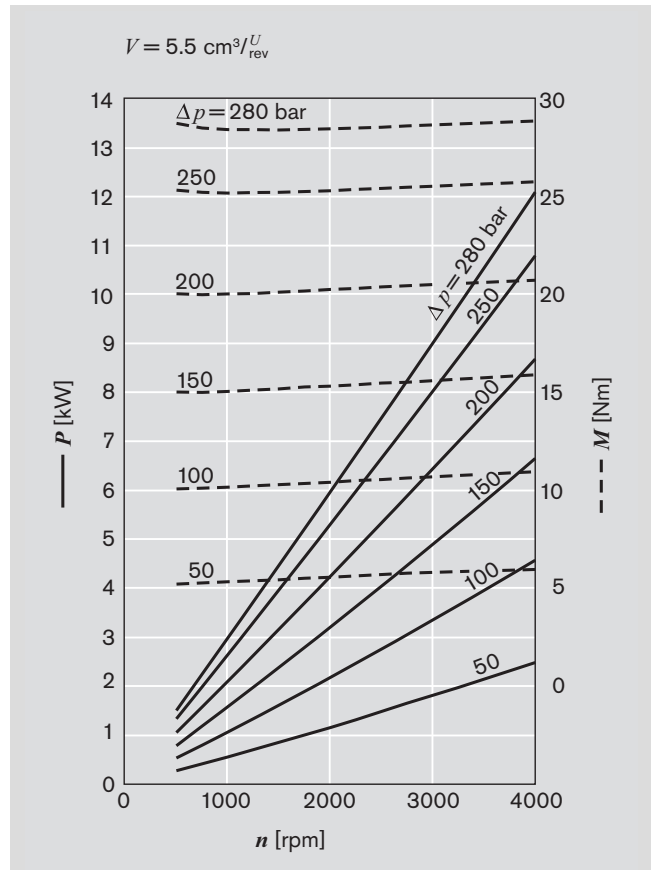
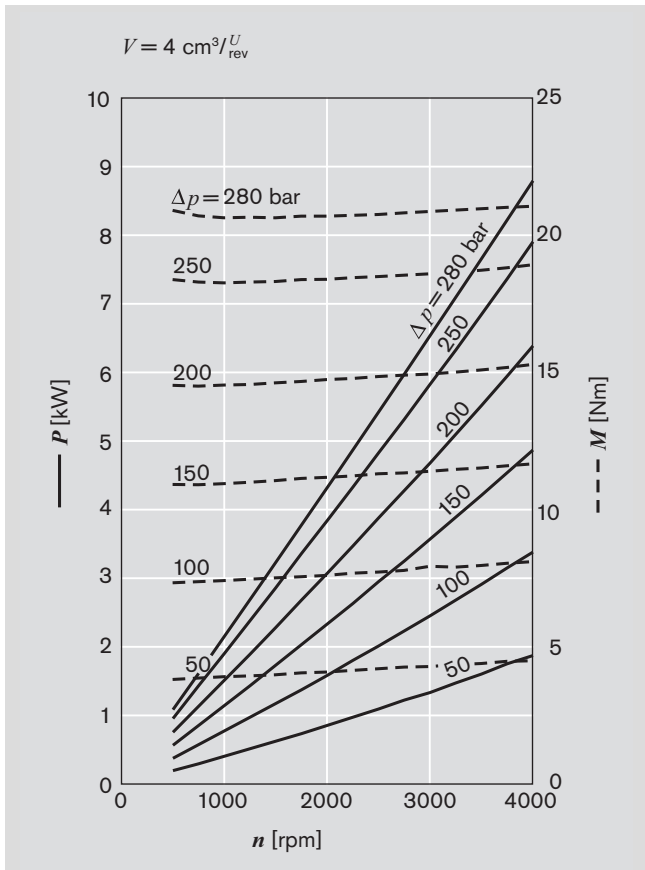
**Caution:**  $\eta$  [%] e.g. 95 [%]

# Performance charts

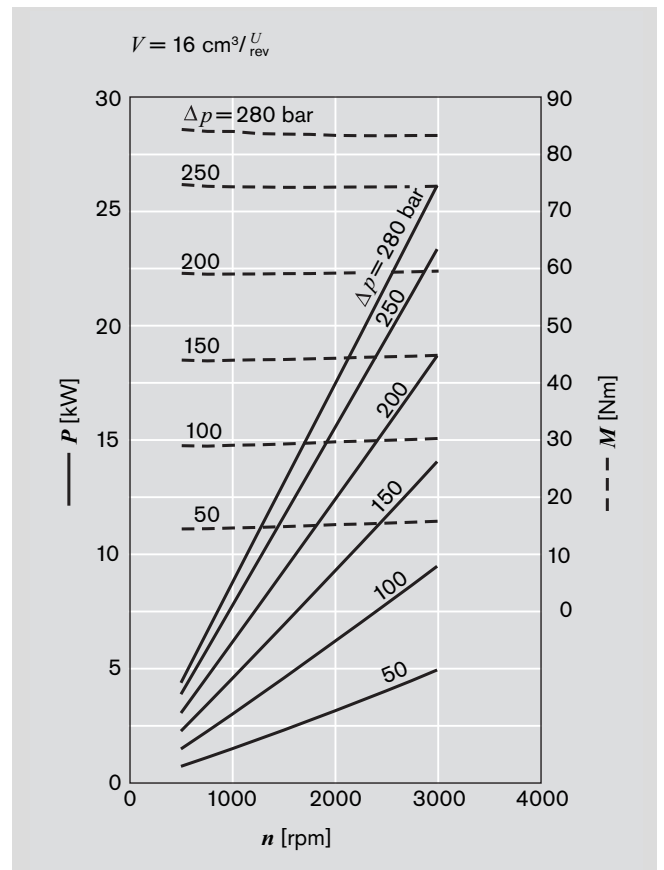
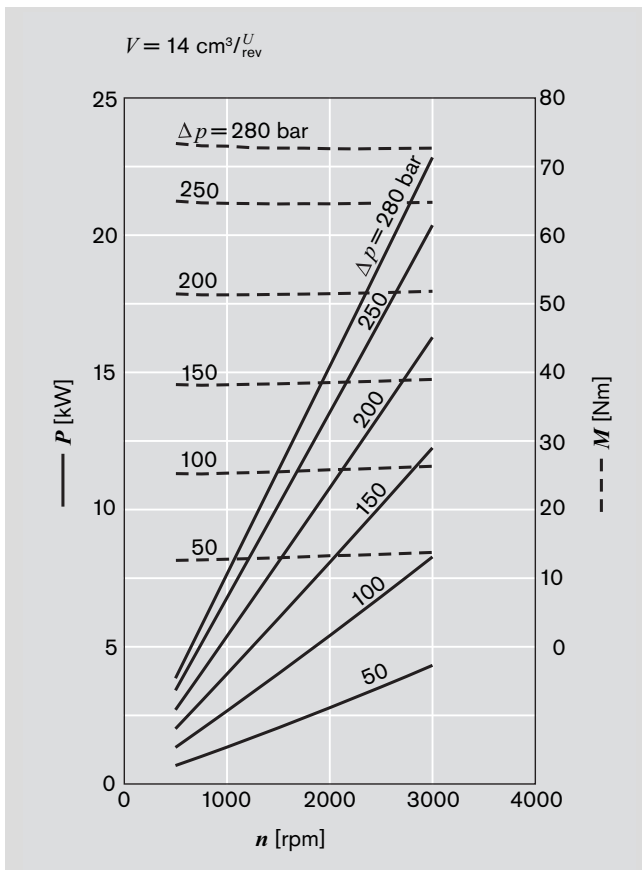
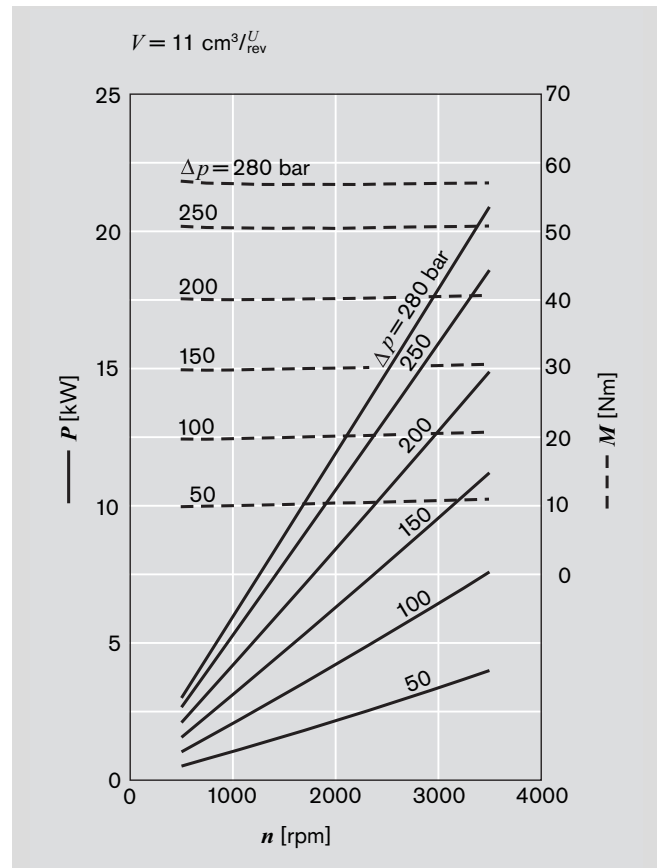
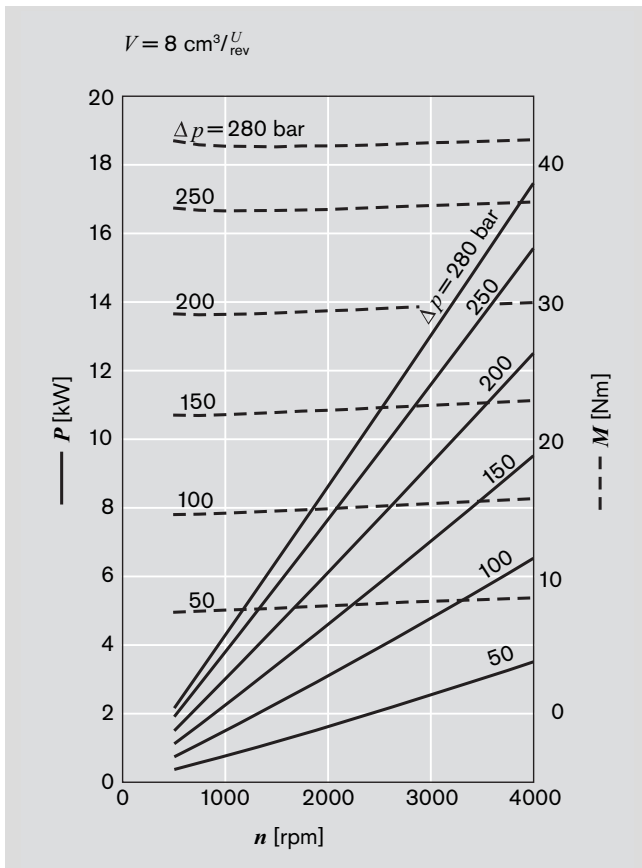
$\nu = 35 \text{ mm}^2/\text{s}, \vartheta = 50^\circ\text{C}$



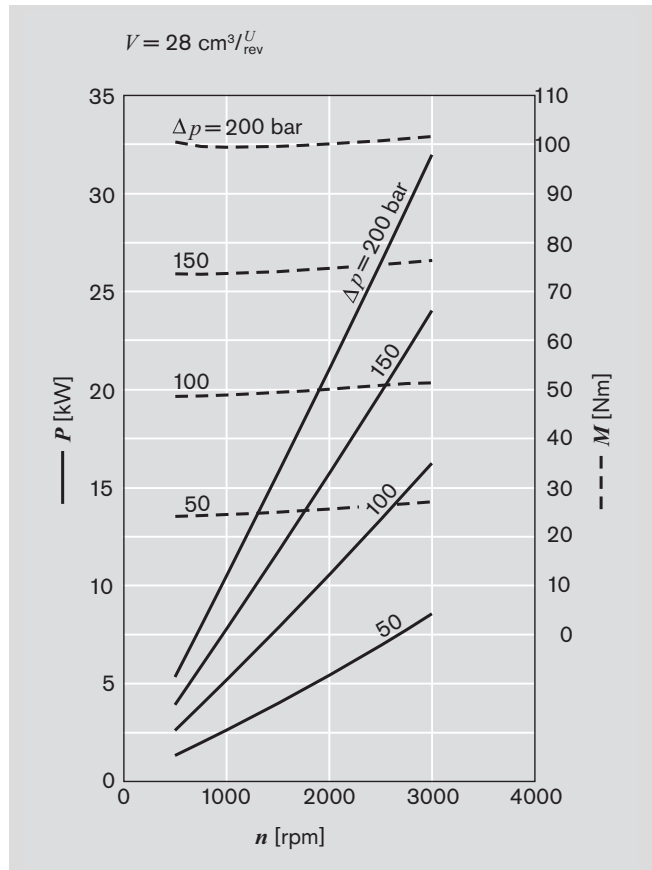
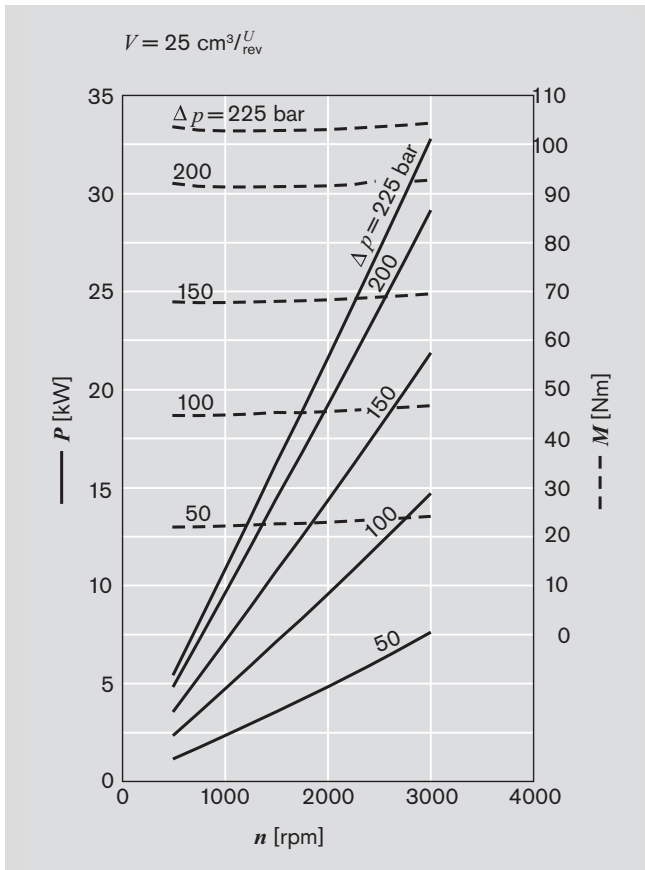
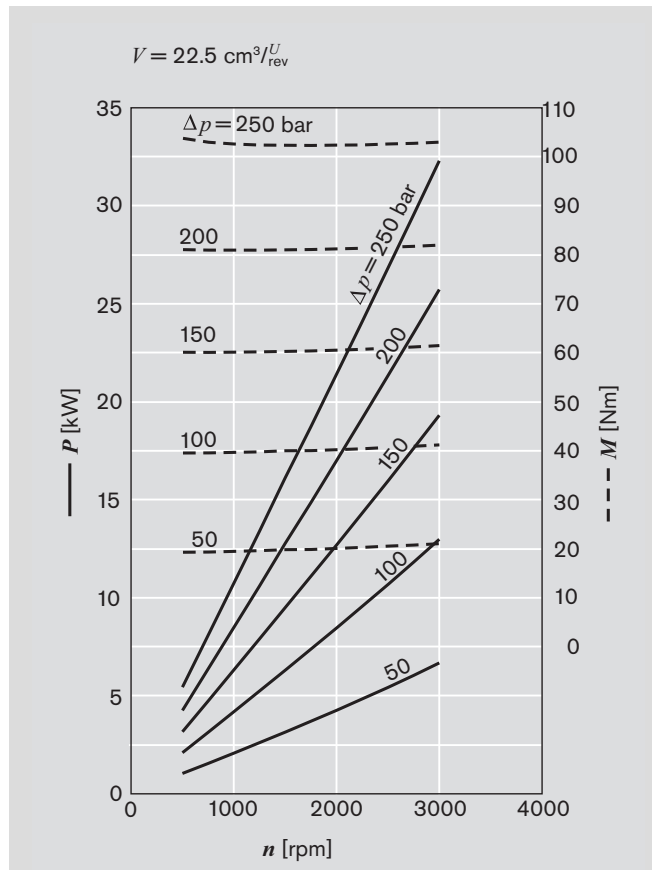
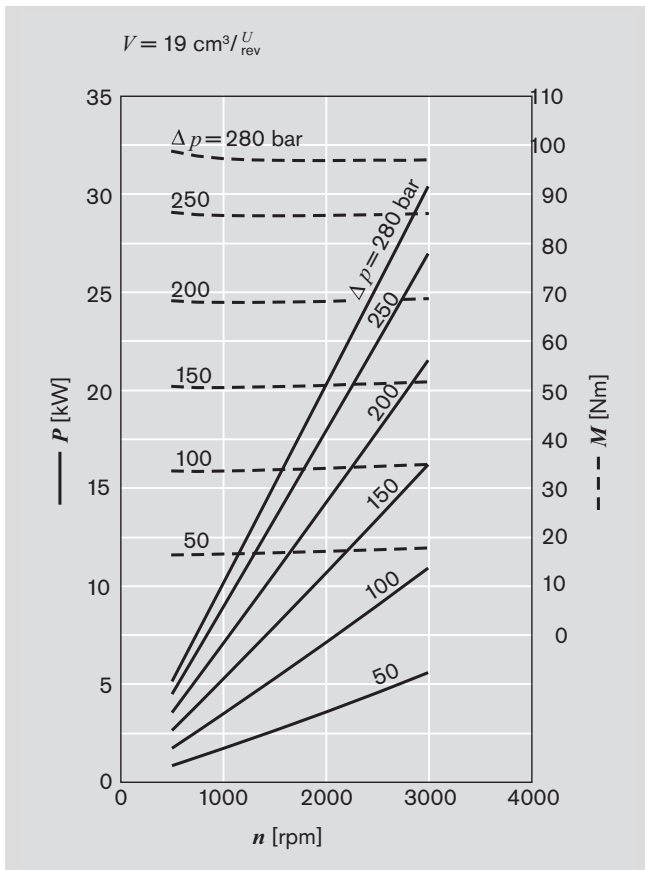
$Q = f(n, V)$  incl.  $\eta_v$   
 $P = f(n, p)$  ——— incl.  $\eta_t$   
 $M = f(n, p)$  - - - incl.  $\eta_{hm}$



Performance charts (continued)



Performance charts (continued)



## Noise charts

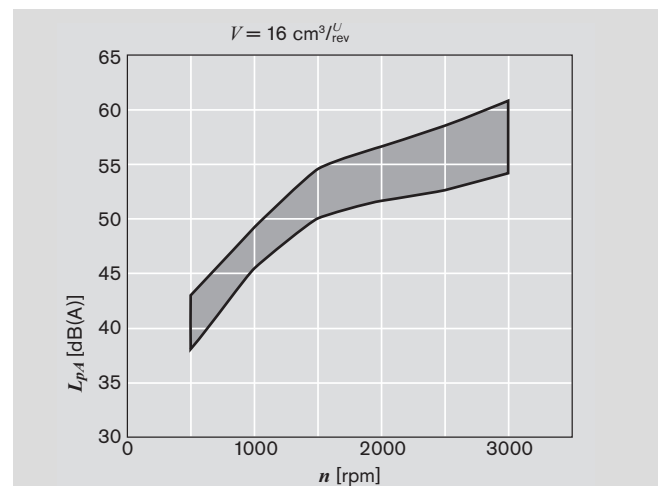
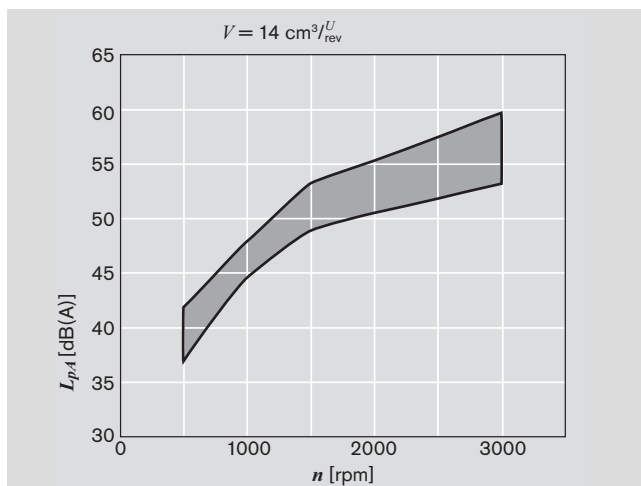
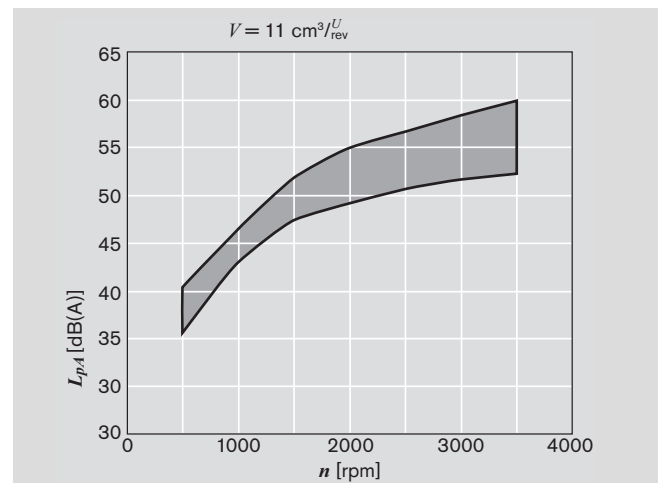
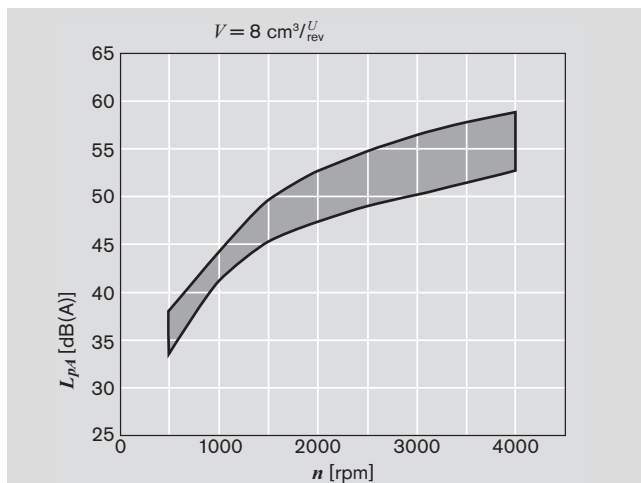
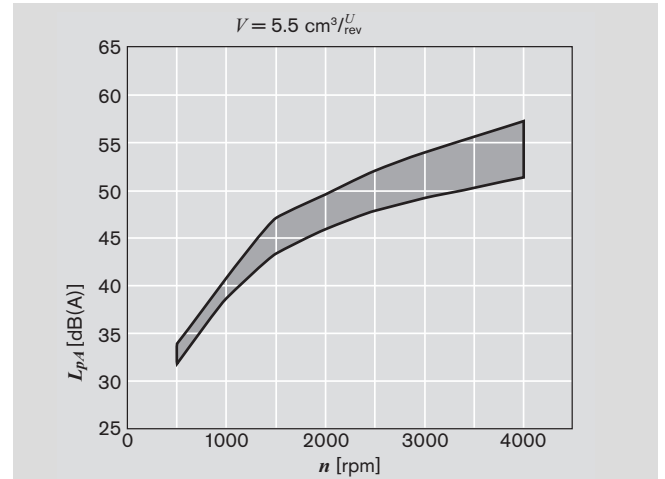
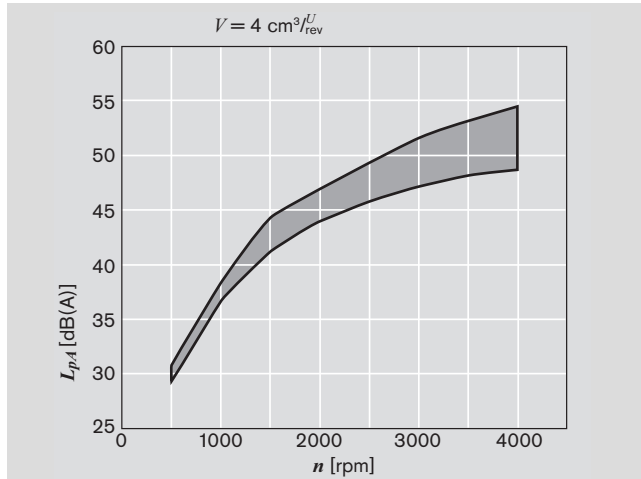
**Noise level** dependent on rotational speed, pressure range between 10 bar and pressure value  $p_2$  (see page 15 Specifications table).

Oil data:  $\nu = 32 \text{ mm}^2/\text{s}$ ,  $\vartheta = 50^\circ\text{C}$ .

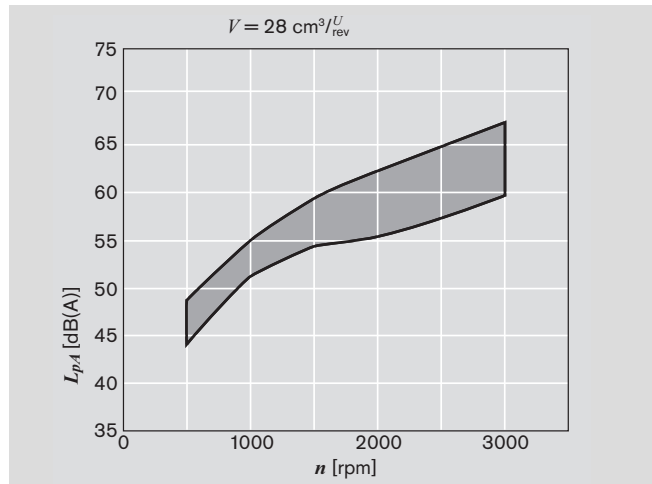
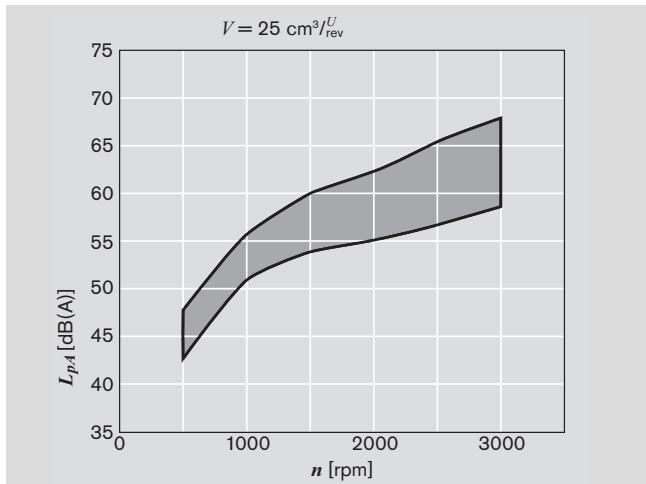
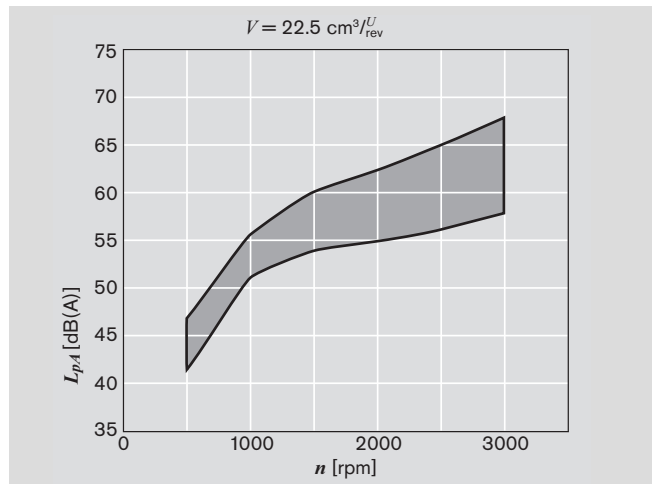
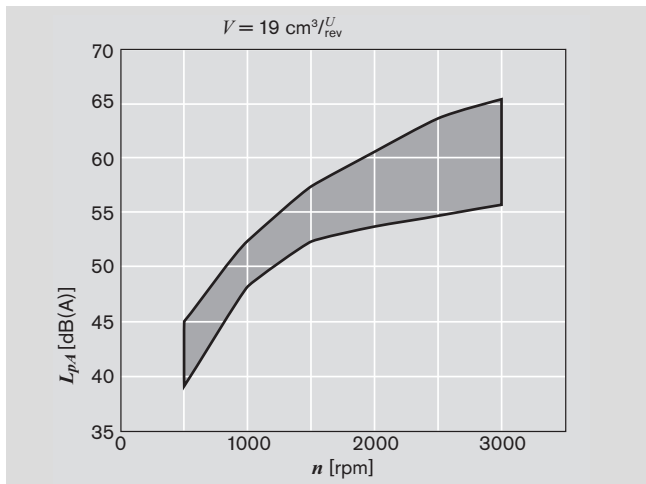
Sound pressure level calculated from noise measurements made in the sound absorbent measuring room compliant with DIN 45635, Part 26.

Spacing between measuring sensor – pump: 1 m.

These are typical characteristic values for the respective model. They describe the airborne sound emitted solely by the pump. Environmental influences (installation site, piping, further system components) are not taken into consideration. Each value applies for a single pump.



Noise charts (continued)



# Specification

General	
Construction	External gear pump
Mounting	Flange or through-bolting with spigot
Line ports	Screw, flange
Direction of rotation (looking on shaft)	Clockwise or counter-clockwise, the pump may only be driven in the direction indicated
Installation position	Any
Load on shaft	Radial and axial forces after consulting
Ambient temperature range	-30°C...+80°C or max. 110°C with FKM seal
Hydraulic fluid	- Mineral oil compliant with DIN 51 524, 1-3, however under higher load at least HLP compliant with DIN 51 524 Part 2 recommended. - Comply with RE 90220 - Further operating fluids possible after consultation
Viscosity	12...800 mm <sup>2</sup> /s permitted range 20...100 mm <sup>2</sup> /s recommended range ...2000 mm <sup>2</sup> /s range permitted for starting
Hydraulic fluid temperature range	max. +80°C with NBR seals*) max. +110°C with FKM seals**)
Filtration ***)	At least cleanliness level 20/18/15 compliant with ISO 4406 (1999)

\*) NBR = Perbunan®  
 \*\*) FKM = Viton®  
 \*\*\*) During the application of control systems or devices with critical counter-reaction, such as steering and brake valves, the type of filtration selected must be adapted to the sensitivity of these devices/systems.

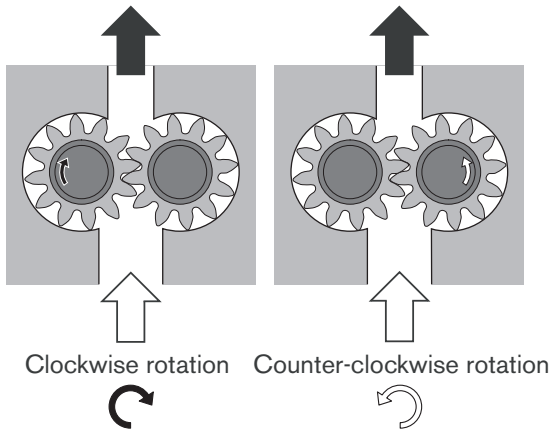
Safety requirements pertaining to the whole systems are to be observed.

In the case of applications with high numbers of load cycles please consulting.

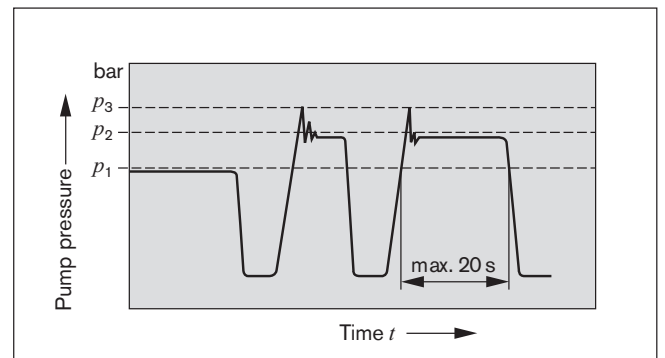
## Definition of direction of rotation

Always look on the drive shaft.

**Caution:** Dimensions drawings always show clockwise-rotation pumps. On counter-clockwise-rotation pumps the positions of the drive shaft and the suction and pressure ports are different.



## Definitions of pressures



$p_1$  max. continuous pressure  
 $p_2$  max. intermittent pressure  
 $p_3$  max. peak pressure

Series			AZPS-1x						AZPS-2x				
Displacement	V	cm <sup>3</sup> /rev	4	5.5	8	11	14	16	19	22.5	25	28	
Suction pressure	$p_e$	bar	0.7...3 (absolute), with tandem pumps: $p_e (p_2) = \max. 0.5 > p_e (p_1)$										
Max. continuous pressure	$p_1$		250						220	195	170		
Max. intermittent pressure	$p_2$		280						250	225	200		
Max. peak pressure	$p_3$		300						290	265	240		
Min. rotational speed	<100	rpm	600	500	500	500	500	500	500	500	500	500	
at bar	12 mm <sup>2</sup> /s		100...180	1200	1200	1000	1000	800	800	800	800	800	800
			180... $p_2$	1400	1400	1400	1200	1000	1000	1000	1000	1000	1000
	25 mm <sup>2</sup> /s		$p_2$	700	700	700	600	500	500	500	500	500	500
Max. rotational speed at	$p_2$			4000			3500	3000	3000	3500	3500	3000	3000

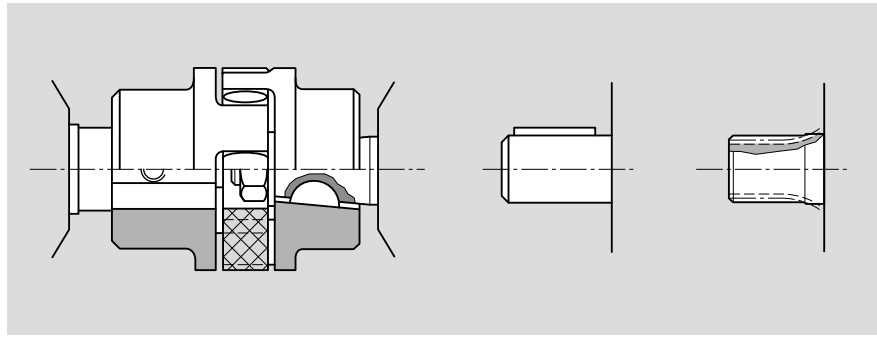
# Drive arrangement

## 1. Flexible couplings

The coupling must not transfer any radial or axial forces to the pump.

The maximum radial runout of shaft pigot is 0.2 mm.

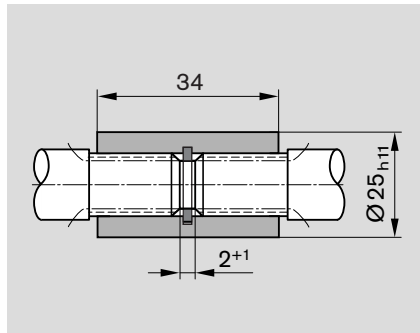
Refer to the fitting instructions provided by the coupling manufacturer for details of the maximum permitted shaft misalignment.



## 2. Coupling sleeve

Used on shafts with DIN or SAE splining.

Caution: There must be no radial or axial forces exerted on the pump shaft or coupling sleeve. The coupling sleeve must be free to move axially. The distance between the pump shaft and drive shaft must be  $2^{+1}$ . Oil-bath or oil-mist lubrications is necessary.



Splined shaft	$M_{max}$ [Nm]	$V$ [cm <sup>3</sup> /rev]	$p_{max}$ [bar]
DIN	100	4...28	$p_{max}$
SAE 9t	110		
SAE 11t	180		

## 3. Drive shaft with tang

For the close-coupling of the pumps to electric motor or internal-combustion engine, gear, etc. The pump shaft has a special tang and driver ③ (not included in supply).

There is no shaft sealing.

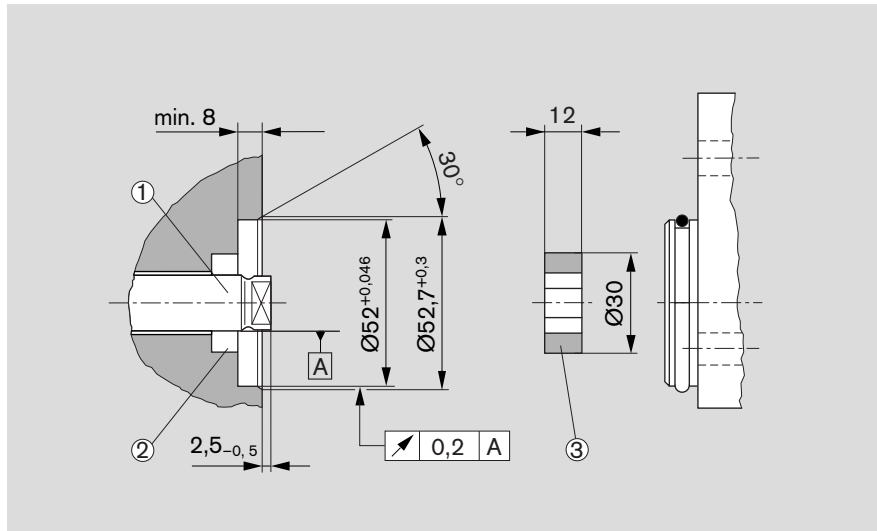
The recommended arrangements and dimensions for the drive end and sealing are as follows.

### ① Drive shaft

Case-hardening steel DIN 17 210  
 e.g. 20 MnCrS 5  
 case-hardened 0.6 deep; HRC 60 $\pm$ 3  
 Surface for sealing ring  
 ground without rifling  $R_{max} \leq 4\mu\text{m}$

### ② Radial shaft seal ring

Rubber-covered seal (see DIN 3760, Type AS, or double-lipped ring).  
 Cut 15° chamfer or fit shaft seal ring with protection sleeve.

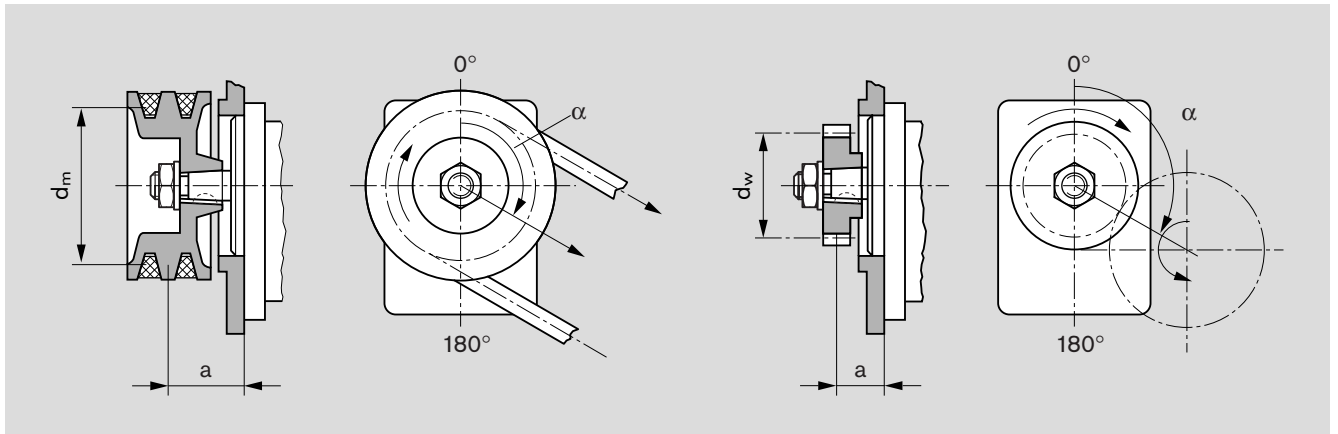


$M_{max}$ [Nm]	$V$ [cm <sup>3</sup> /rev]	$p_{max}$ [bar]
65	4...14	280
	16	230
85	19	250
	22,5	210
	25	190
	28	170



**4. V-belts and straight gearwheels or helical toothed gear drives without outboard bearing**

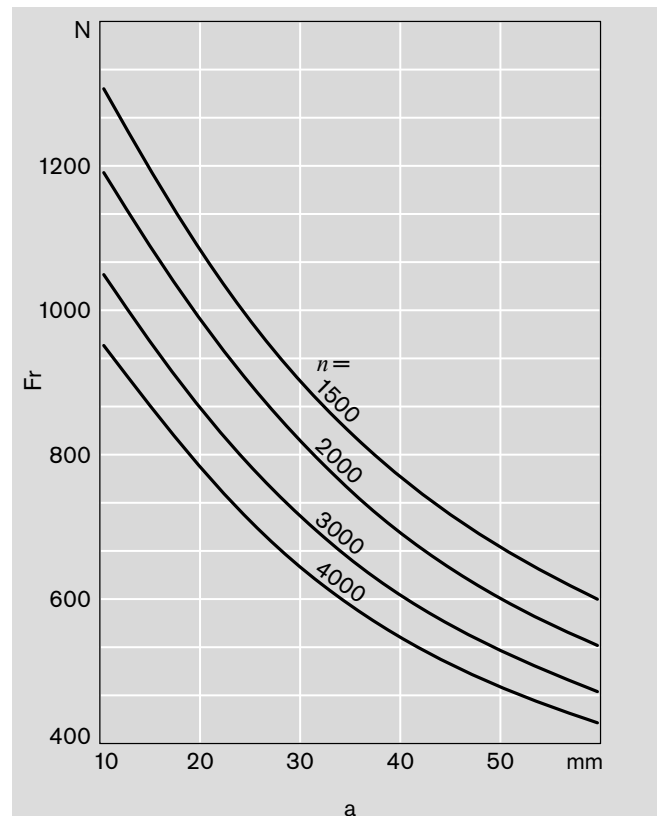
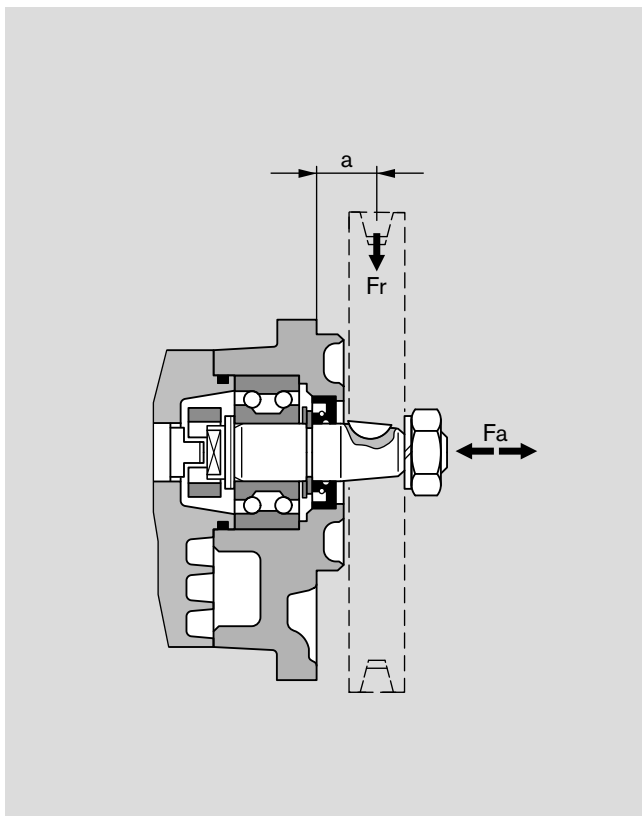
When proposing to use V-belt or gear drive, please submit details of the application for our comments (especially dimensions  $a$ ,  $d_m$ ,  $d_w$  and angle  $\alpha$ ). For helical toothed gear drives, details of the helix angle  $\beta$  are also required.



**5. Outboard bearing**

Outboard bearing eliminate possible problems when the pumps are driven by V-belts or gearwheels. The diagrams below show the maximum radial and axial loads that can be tolerated based on a bearing life of  $L_H = 1,000$  hours.

$M_{max}$ [Nm]	$V$ [cm <sup>3</sup> /rev]	$p_{max}$ [bar]
65	4...14	280
	16	230



# Multiple gear pumps

Gear pumps are well-suited to tandem combinations of pumps in which the drive shaft of the first pump is extended to drive a second pump and sometimes a third pump in the same manner. A coupling is fitted between each pair of pumps. In most cases each pump is isolated from its neighbor, i.e. the suction ports are separate from one another. A common suction port is also possible as an option.

**Caution:** Basically, the specifications for the single pumps apply, but with certain restrictions:

**Max. speed:** This is determined by the highest rated pump speed in use.

**Pressures:** These are restricted by the strength of the drive shaft, the through drives and the drivers. Appropriate data is given in the dimensional drawings.

### Pressure restrictions during standard through drive

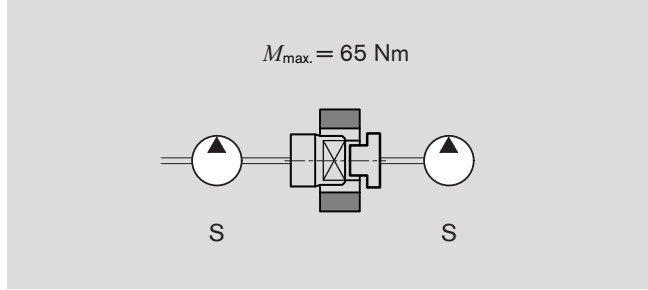
In the case of series N, the driver for the second pumping stage can carry a load of up to  $S_{max.} = 95 \text{ Nm}$ , i.e. there is a pressure restriction for the second stage and any further stages.

Drive shaft		Max. transferrable drive torque * [Nm]
C	1:5	155
N	Claw	65 or 85
D	SAE 13t	320
P	SAE 11t	180

\* These values only apply when the conditions described above are complied with. Bosch Rexroth is to be consulted if the stated values are exceeded.

If the first stage is driven through a tang (driver) or outboard bearing type 1, pressure restrictions apply as indicated in the formula below.

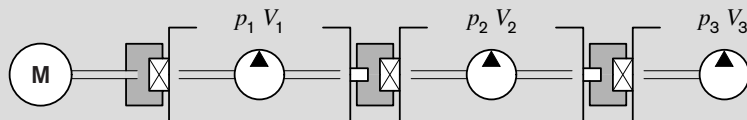
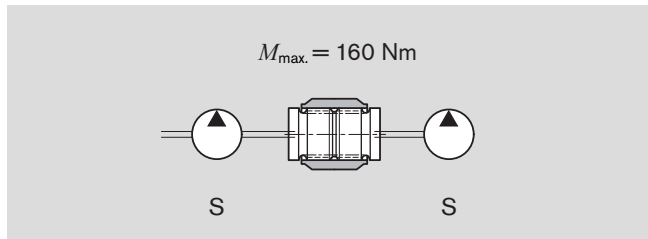
Reinforced through drives are available for applications with higher transfer torques and/or rotational vibrations. Customized designs available on request.



### Combinations

Series pump 1	$M_{max.}$ [Nm]	Series pump 2
S	65	S
S	65	F
S	12	B - 1x
F	65	S
S	25	B - 2x

For configuration of multiple pumps we recommend the pump is positioned with the largest displacement on the drive side.

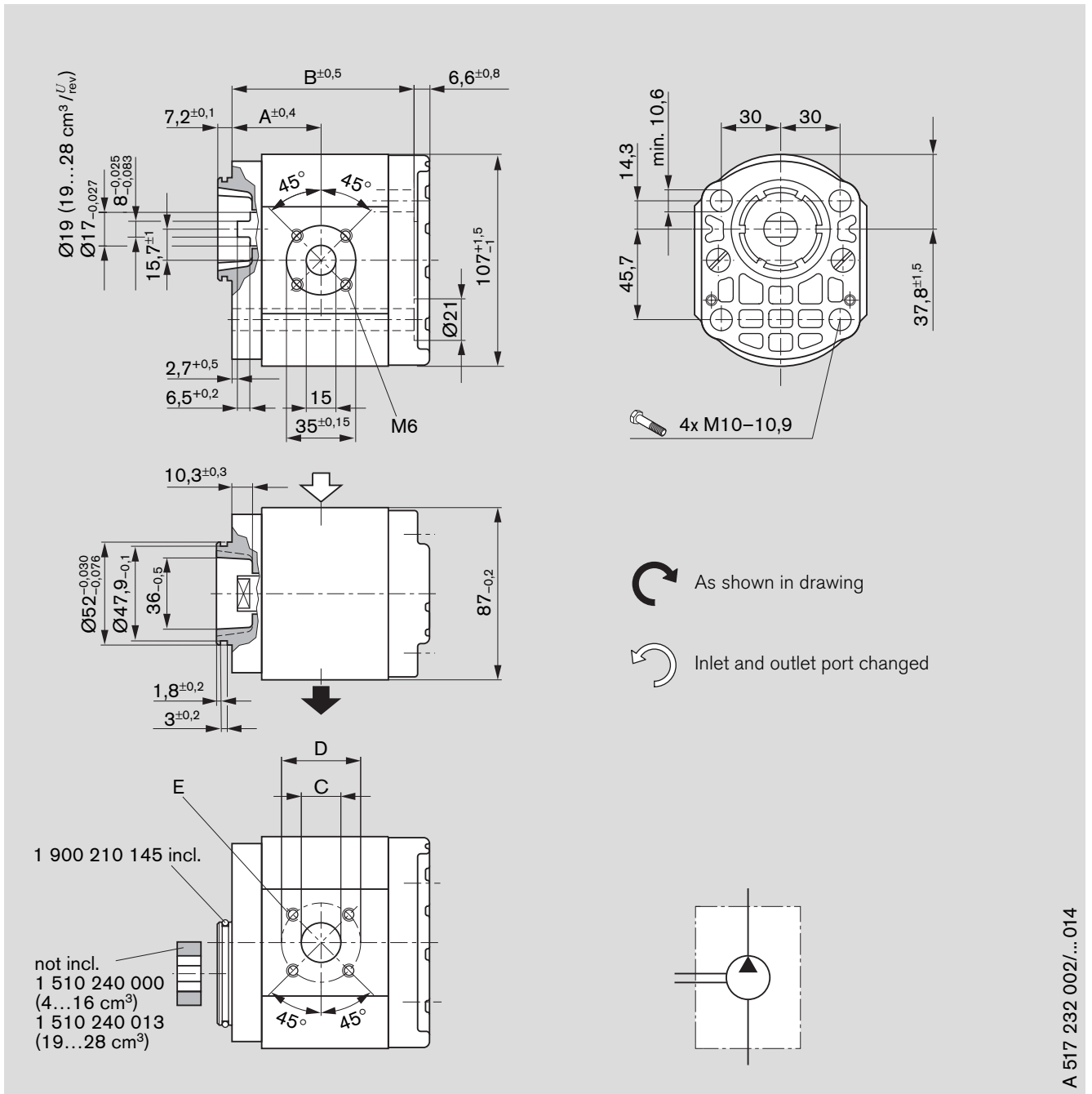


$$M_{max.} \cong \Delta p_1 \cdot V_1 \cdot 0.0177 + \Delta p_2 \cdot V_2 \cdot 0.0177 + \Delta p_3 \cdot V_3 \cdot 0.0177$$

$\Delta p$  [bar]  $V$  [cm<sup>3</sup>/rev]

# Dimensions

## Standard range



A 517 232 002/... 014

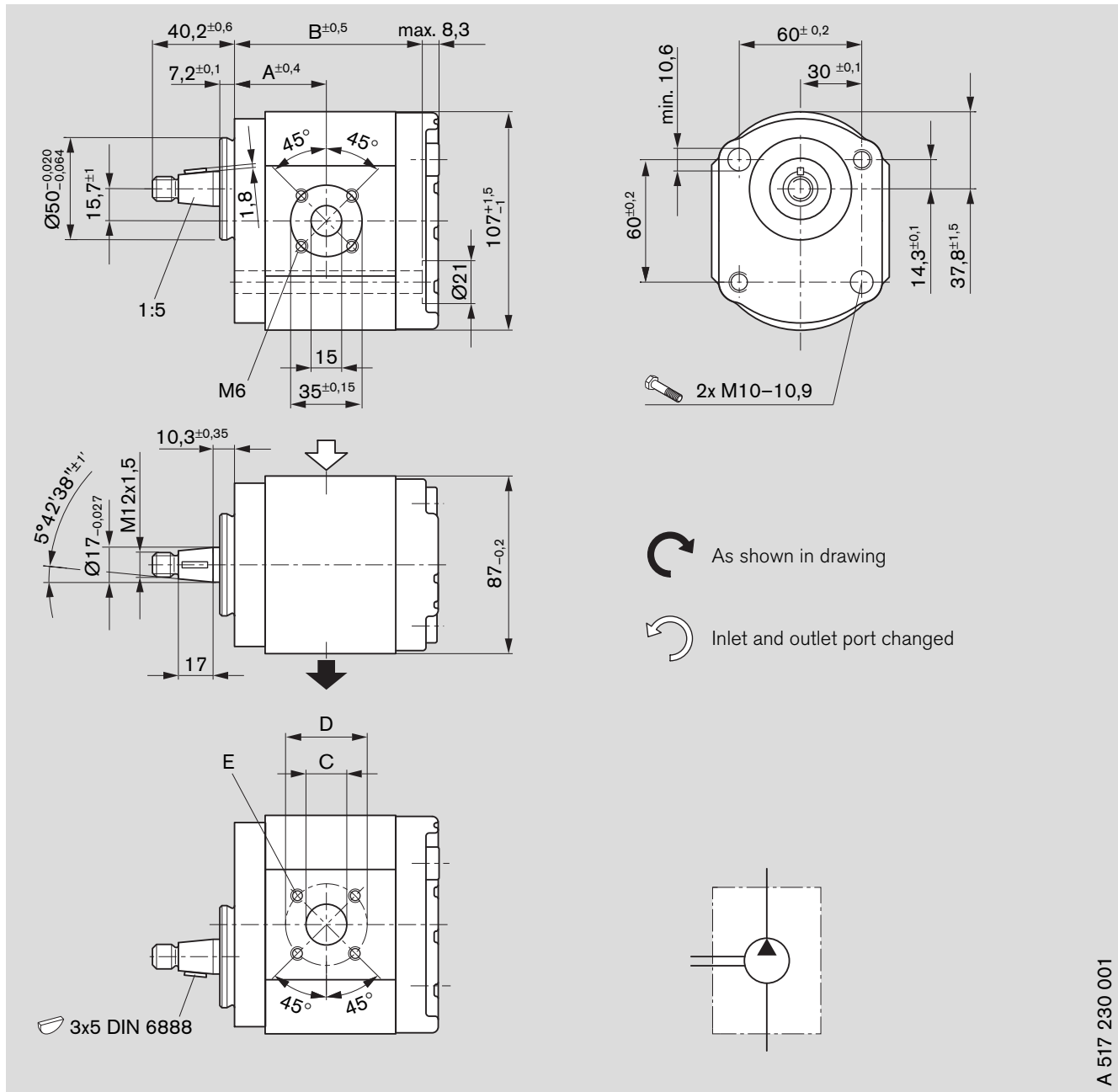
### Ordering code:

AZPS - xx -    N M 20 M B

Displacement [cm <sup>3</sup> /rev]	Ordering-No.		Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]				
	L	R				A	B	C	D	E
4	0 517 215 301	0 517 215 001	280	4000	2.15	37.4	73.7	15	40	M6
5.5	0 517 315 301	0 517 315 001	280	4000	2.2	38.6	76.2	15	40	13 depth
8	0 517 415 301	0 517 415 001	280	4000	2.3	40.7	80.3	20	40	
11	0 517 515 302	0 517 515 001	280	3500	2.4	44.5	85.3	20	40	
14	0 517 515 303	0 517 515 002	280	3000	2.55	45	90.3	20	40	
16	0 517 615 301	0 517 615 001	230	3000	2.6	45	93.7	20	40	M8 13 depth
19	0 517 615 302	0 517 615 002	250	3500	3.0	55.8	110.7	26	55	
22.5	0 517 715 301	0 517 715 001	210	3500	3.2	58.5	116.1	26	55	
25	0 517 715 302	0 517 715 002	190	3000	3.3	60.6	120.3	26	55	
28	0 517 715 303	0 517 715 003	170	3000	3.4	63	125.1	26	55	

# Dimensions

## Standard range



A 517 230 001

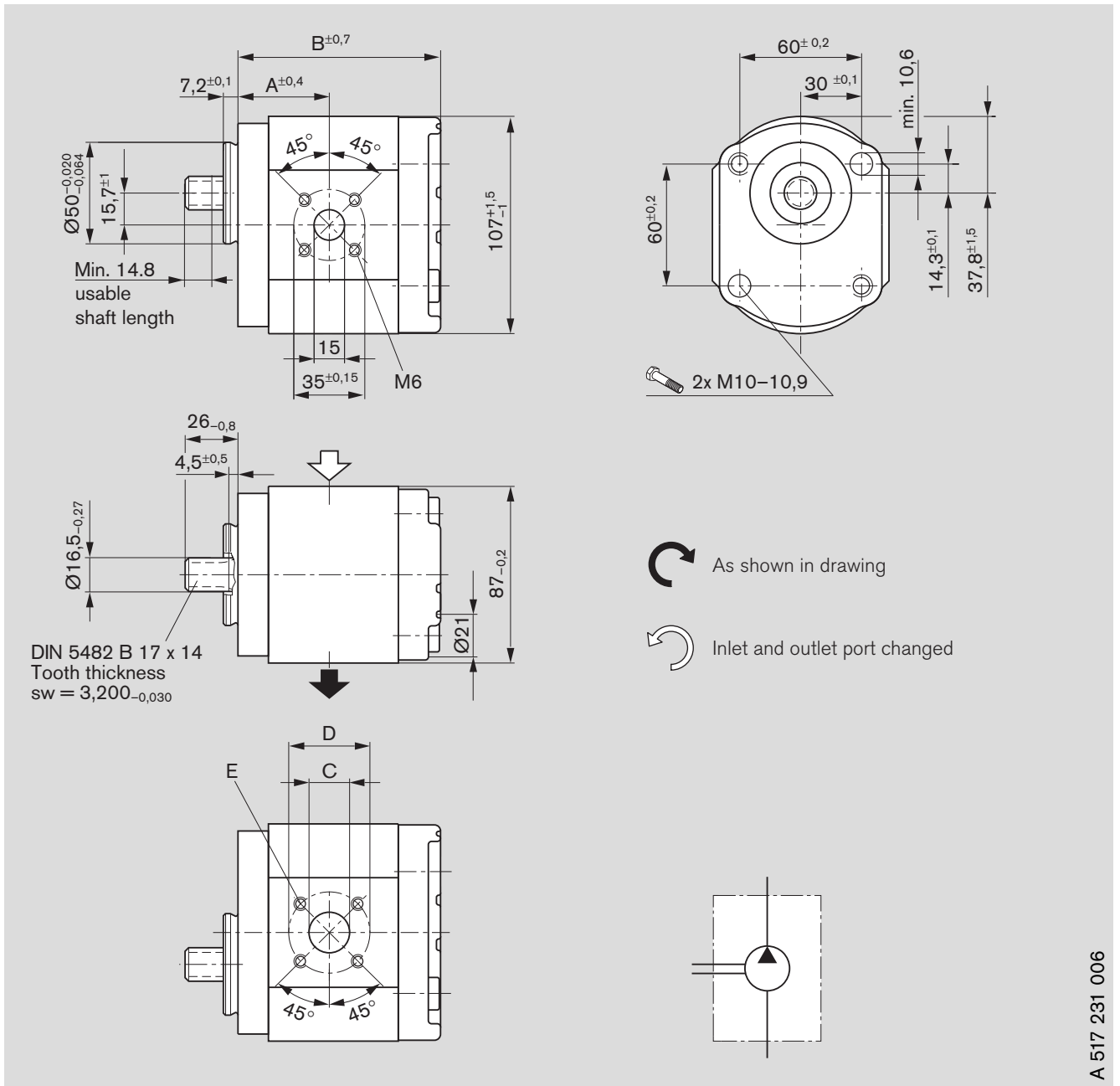
### Ordering code:

AZPS - xx -     C P 20 K B

Displacement [cm <sup>3</sup> /rev]	Ordering-No. L  R	Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]				
					A	B	C	D	E
4		280	4000						M6 13 depth
5.5		280	4000						
8		280	4000						
11	0 517 515 304	280	3500	3.1	44.5	85.3	20	40	
14	0 517 515 306	280	3000	3.3	45	90.3	20	40	
16	0 517 615 303	280	3000	3.4	45	93.7	20	40	
19		280	3500						
22.5		250	3500						
25		225	3000						
28		200	3000						

# Dimensions

## Standard range



A 517 231 006

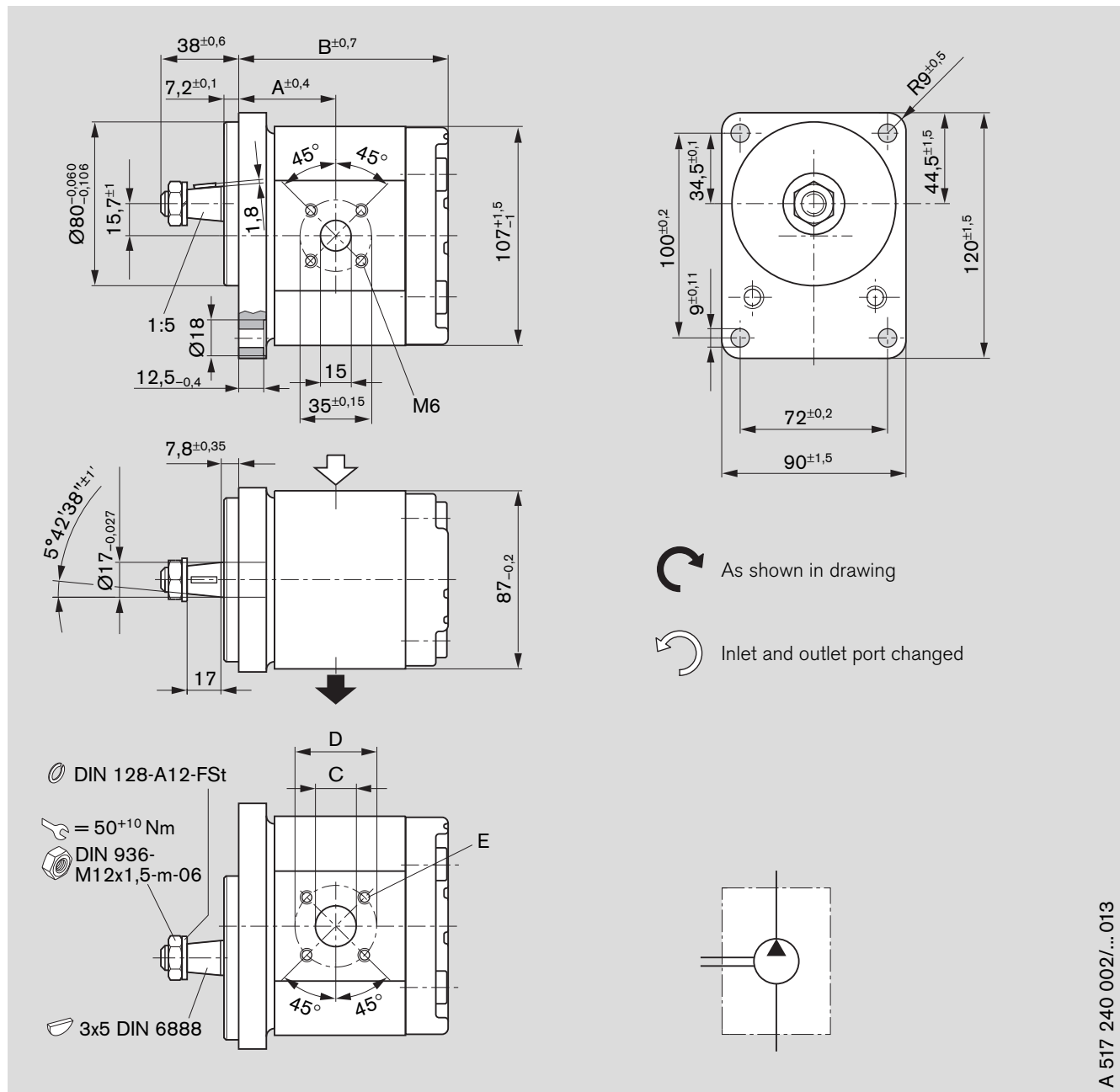
### Ordering code:

AZPS - xx -     FN 20 K B

Displacement [cm <sup>3</sup> /rev]	Ordering-No.		Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]				
						A	B	C	D	E
4			280	4000						M6
5.5			280	4000						13 depth
8			280	4000						
11			280	3500						
14			280	3000						
16		<b>0 517 615 003</b>	280	3000	3.3	45	100.5	20	40	
19			280	3500						
22.5			250	3500						
25			225	3000						
28			200	3000						

# Dimensions

## Standard range



A 517 240 002/... 013

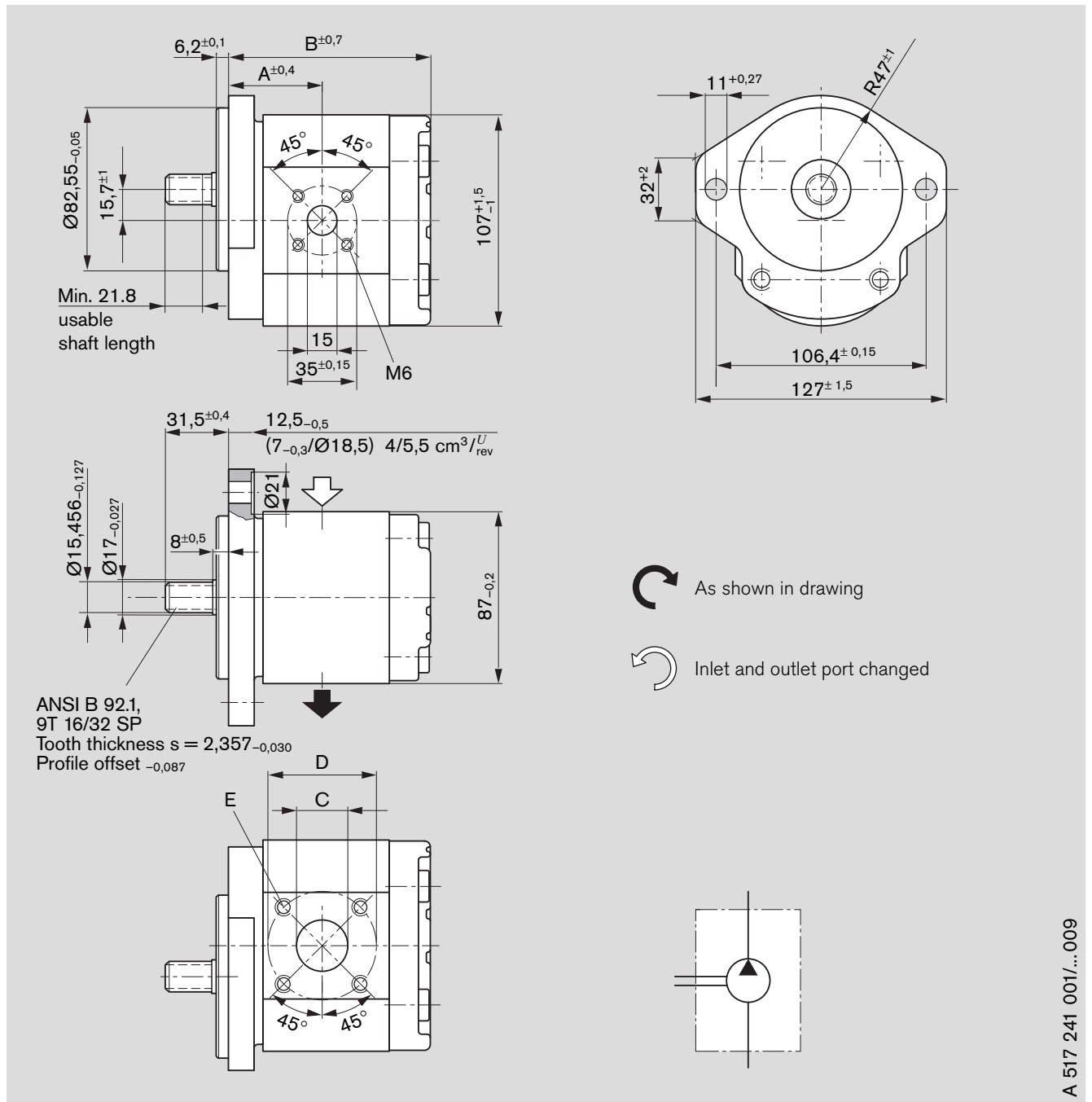
### Ordering code:

AZPS - xx -     C B 20 M B

Displacement [cm <sup>3</sup> /rev]	Ordering-No.		Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]				
						A	B	C	D	E
4	0 517 225 301	0 517 225 001	280	4000	3.4	39.9	83	15	40	M6
5.5	0 517 325 301	0 517 325 001	280	4000	3.5	41.1	85.5	15	40	13 depth
8	0 517 425 301	0 517 425 001	280	4000	3.6	43.2	89.6	20	40	
11	0 517 525 301	0 517 525 001	280	3500	3.8	47	94.6	20	40	
14	0 517 525 302	0 517 525 002	280	3000	3.9	47.5	99.6	20	40	
16	0 517 625 301	0 517 625 001	280	3000	-	47.5	103	20	40	M8 13 depth
19	0 517 625 302	0 517 625 002	280	3500	4.5	58.3	120	26	55	
22.5	0 517 725 301	0 517 725 001	250	3500	4.6	61	125.4	26	55	
25	0 517 725 302	0 517 725 002	225	3000	4.8	63.1	129.6	26	55	
28	0 517 725 303	0 517 725 003	200	3000	4.9	65.5	134.4	26	55	

# Dimensions



## Standard range



A 517 241 001/... 009

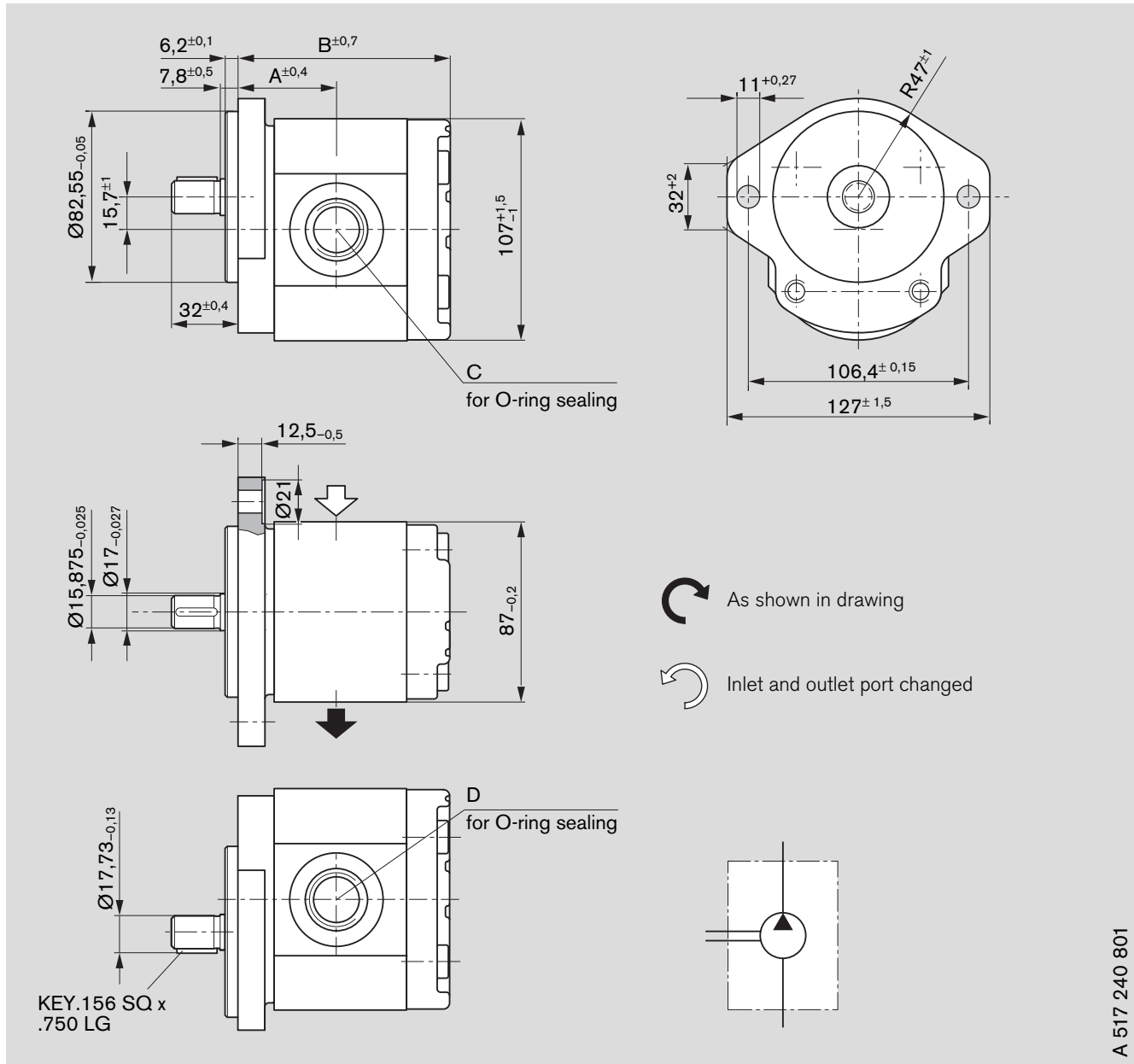
### Ordering code:

AZPS - xx -     R R 20 M B  
 AZPS - 1x - 0 1 6 L R R 20 P B

Displacement [cm <sup>3</sup> /rev]	Ordering-No.		Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]				
	 L	 R				A	B	C	D	E
4	0 517 225 302	0 517 225 002	280	4000	3.4	39.9	83	15	40	M6
5.5	0 517 325 302	0 517 325 002	280	4000	3.5	41.1	85.5	15	40	13 depth
8	0 517 425 302	0 517 425 002	280	4000	3.6	43.2	89.6	20	40	
11	0 517 525 303	0 517 525 003	280	3500	3.7	47	94.6	20	40	
14	0 517 525 304	0 517 525 004	280	3000	3.9	47.5	99.6	20	40	
16	0 517 625 303	0 517 625 003	280	3000	3.9	47.5	103	20	40	M8 13 depth
19	0 517 625 304	0 517 625 004	280	3500	4.4	58.3	120	26	55	
22.5	0 517 725 304	0 517 725 004	250	3500	4.6	61	125.4	26	55	
25	0 517 725 305	0 517 725 005	225	3000	4.7	63.1	129.6	26	55	
28	0 517 725 306	0 517 725 006	200	3000	4.8	65.5	134.4	26	55	

# Dimensions

## Standard range



A 517 240 801

### Ordering code:

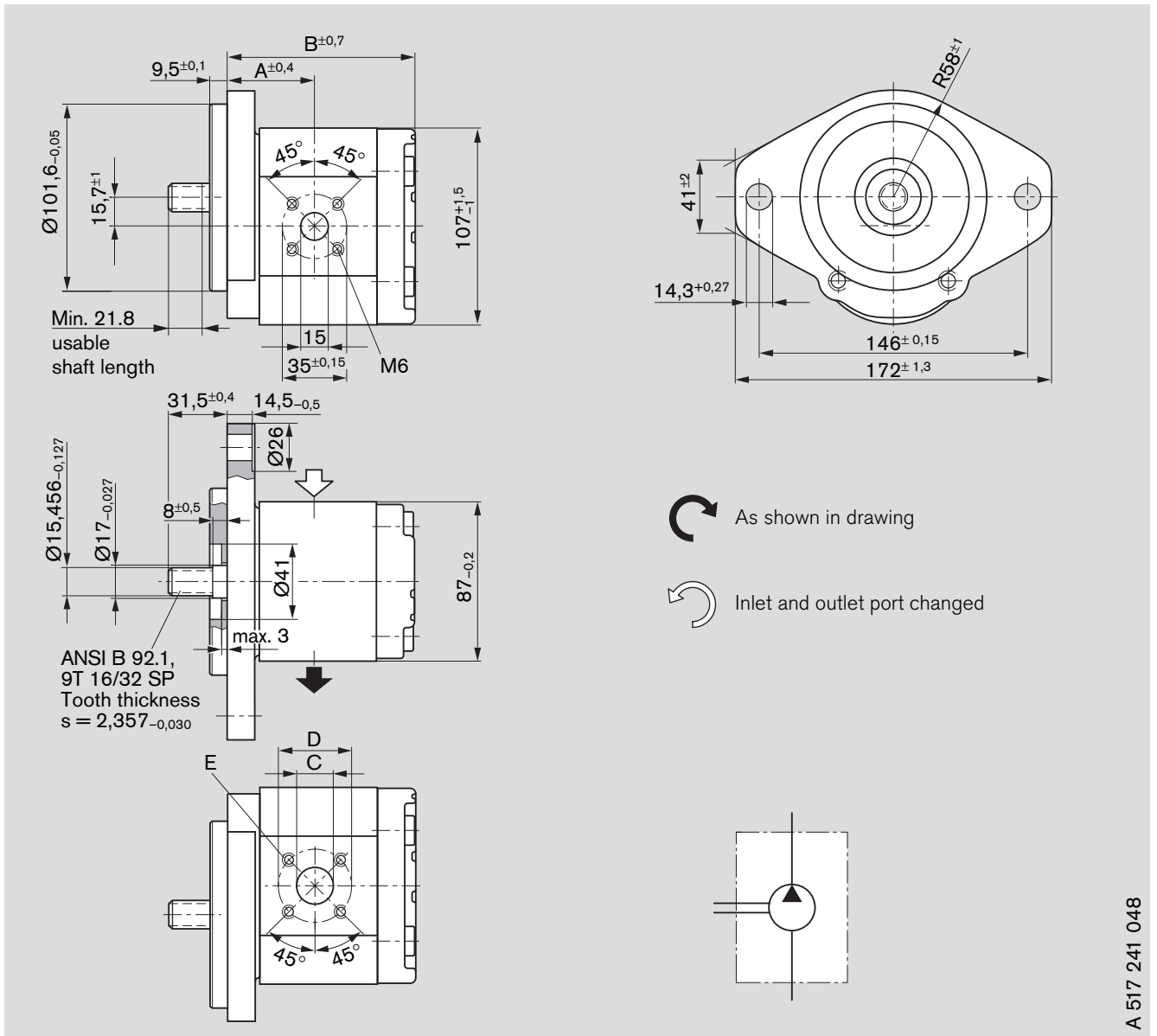
AZPS - xx -     Q R 12 M B

Displacement [cm <sup>3</sup> /rev]	Ordering-No.		Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]			
						A	B	C	D
4			260	4000					
5.5			260	4000					
8		<b>0 517 425 003</b>	260	4000	3.6	43.2	89.6	7/8"-14 UNF-2B 16 depth	
11			260	3500					
14			230	3000					
16			200	3000					
19			210	3500					
22.5			180	3500					
25			160	3000					
28			140	3000					



# Dimensions



## Standard range



A 517 241 048

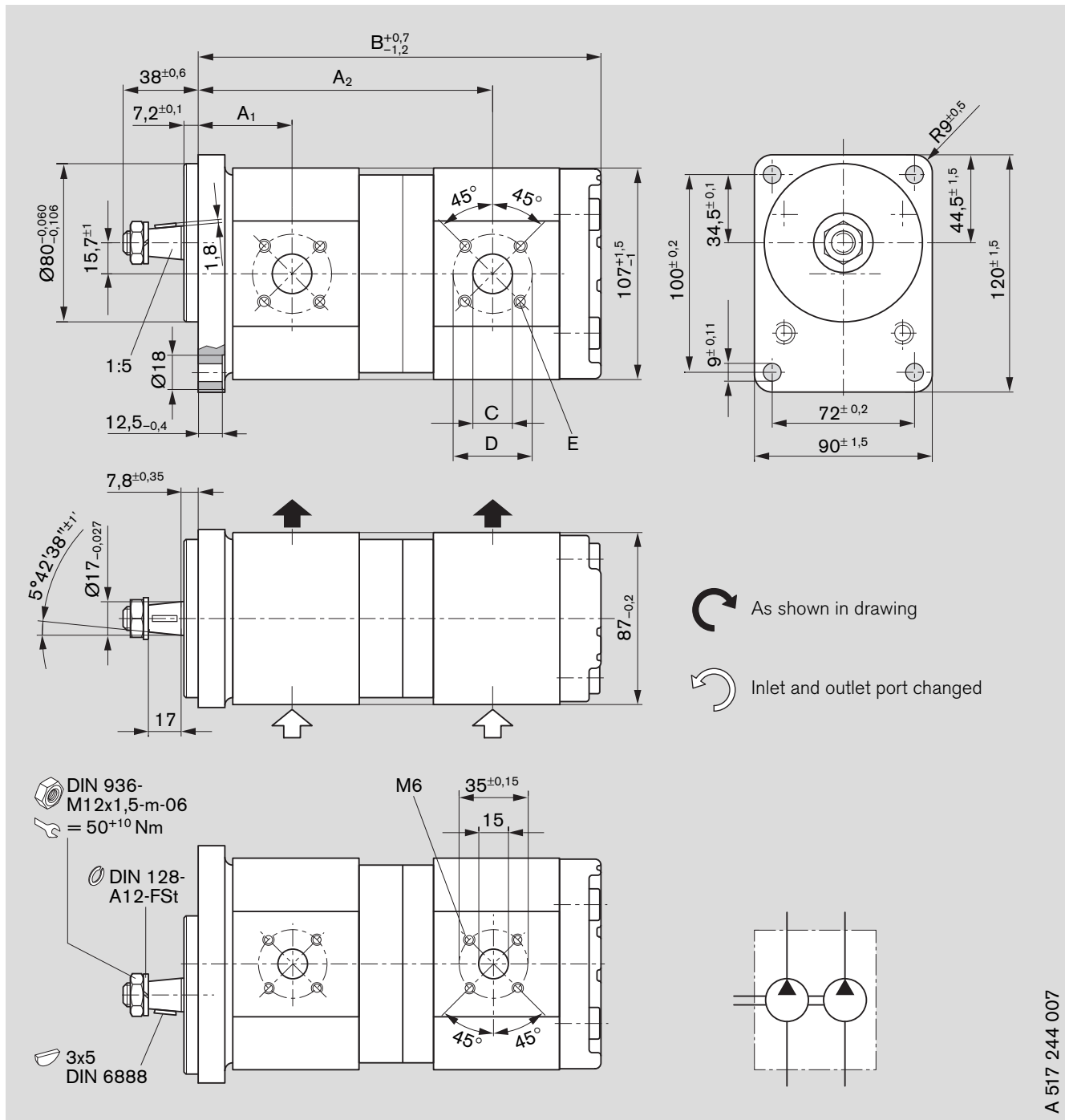
**Ordering code:**

AZPS - xx -     RC 20 KB

Displacement [cm <sup>3</sup> /rev]	Ordering-No.		Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]				
	 L	 R				A	B	C	D	E
4			280	4000						M6
5.5			280	4000						13 depth
8			280	4000						
11		<b>0 517 525 306</b>	280	3500	4.3	47	95.2	20	40	
14			280	3000						
16			280	3000						
19			280	3500						M8
22.5			250	3500						13 depth
25		<b>0 517 725 008</b>	225	3000	5.2	63.1	130.2	26	55	
28			200	3000						

# Dimensions

## Standard range



A 517 244 007

**Ordering code:**

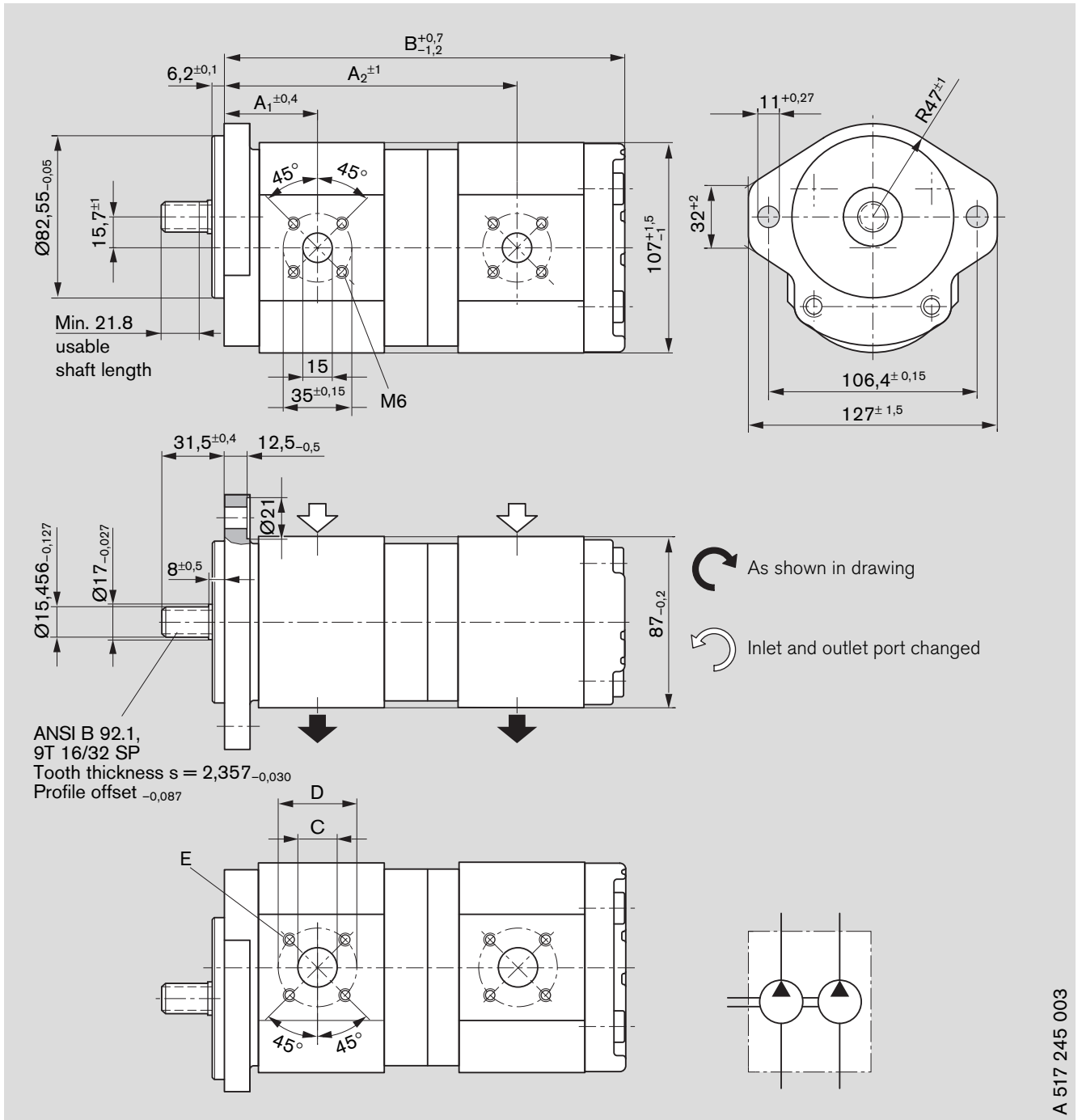
AZPSS - xx -  /   C B 20 20 M B

Displacement [cm <sup>3</sup> /rev]	Ordering-No.		Max. operating pressure [bar]		Max. rotation speed [rpm]	kg	Dimension [mm]					
	P1	P2	P1	P2			A <sub>1</sub>	A <sub>2</sub>	B	C*)	D	E
16	5.5	0 517 665 304	280	280	3000	5.8	47.5	142.8	187.0	20	40	M6
16	8		280	280	3000							13 depth
16	11	0 517 665 305	280	280	3000	6.1	47.5	148.7	196.3	20	40	
14	11	0 517 565 011	280	260	3000	5.9	47.5	145.3	192.5	20	40	

\*) at 4 and 5.5 cm<sup>3</sup> Ø15

# Dimensions

## Standard range



A 517 245 003

**Ordering code:**

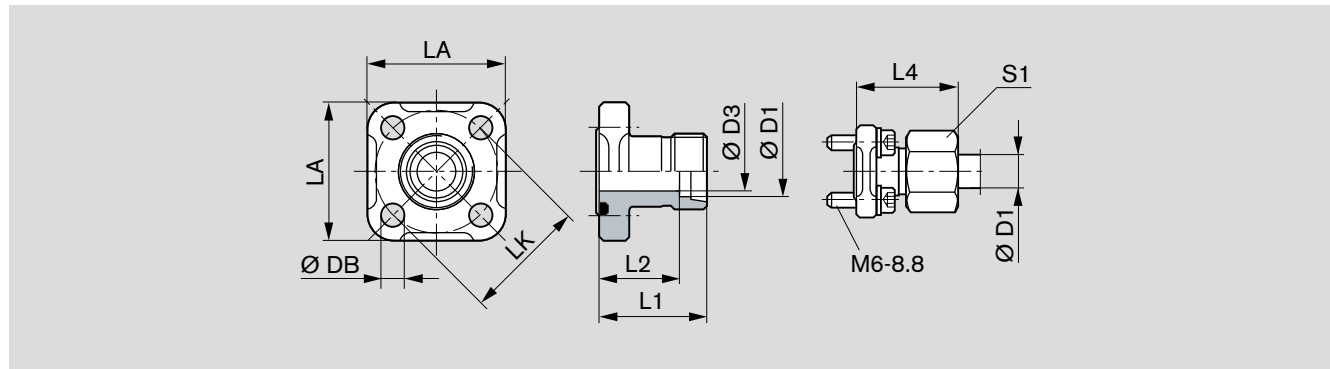
**AZPSS - xx - [ ] [ ] [ ] / [ ] [ ] [ ] [ ] R R 20 20 M B**

Displacement [cm <sup>3</sup> /rev] P1 P2	Ordering-No.		Max. operating pressure [bar]		Max. rotation speed [rpm]	kg	Dimension [mm]					
			P1	P2			A <sub>1</sub>	A <sub>2</sub>	B	C*)	D	E
16 5.5		<b>0 517 665 007</b>	280	280	3000	5.8	47.5	142.8	186.9	20	40	M6
												13 depth

\*) at 4 and 5.5 cm<sup>3</sup> Ø15

# Fittings

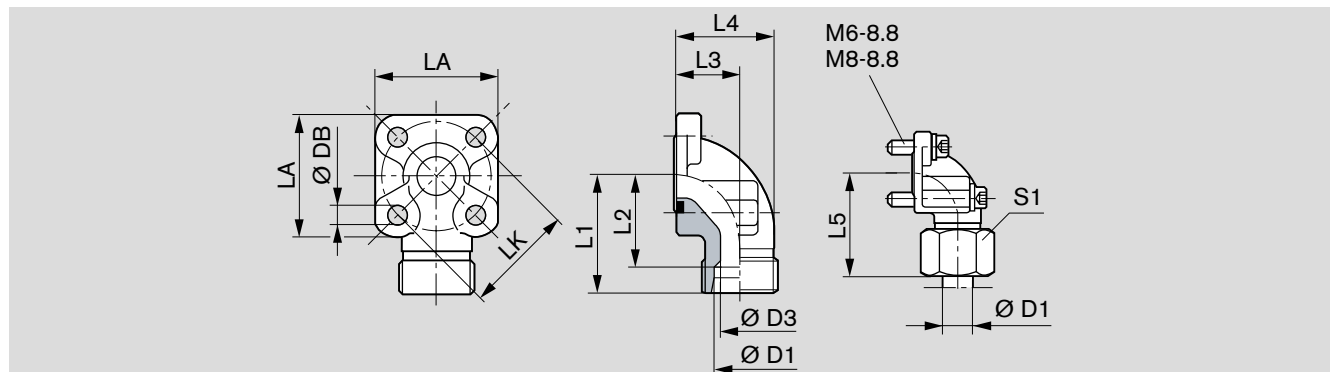
Gear pump flange, straight, for rectangular flange **20** see page 8



LK	D1	D3	L1	L2	L4	LA	S1	DB	Screws 4x	Seal ring NBR *)	Mass [kg]	Part number	p [bar]
35	10L	8	30	23.0	39.0	40	19	6.4	M 6x22	20x2.5	0.09	1 515 702 064	315
35	12L	10	30	23.0	39.0	40	22	6.4	M 6x22	20x2.5	0.10	1 515 702 065	315
35	15L	12	30	23.0	38.0	40	27	6.4	M 6x22	20x2.5	0.10	1 515 702 066	250
40	15L	12	35	28.0	43.0	42	27	6.4	M 6x22	24x2.5	0.12	1 515 702 067	100
40	18L	15	35	27.5	44.0	42	32	6.4	M 6x22	24x2.5	0.13	1 515 702 068	100
40	22L	19	35	27.5	44.5	42	36	6.4	M 6x22	24x2.5	0.12	1 515 702 069	100
40	28L	24	42	27.5	34.5	42	41	6.4	M 6x22	24x2.5	0.15	1 515 702 008	100

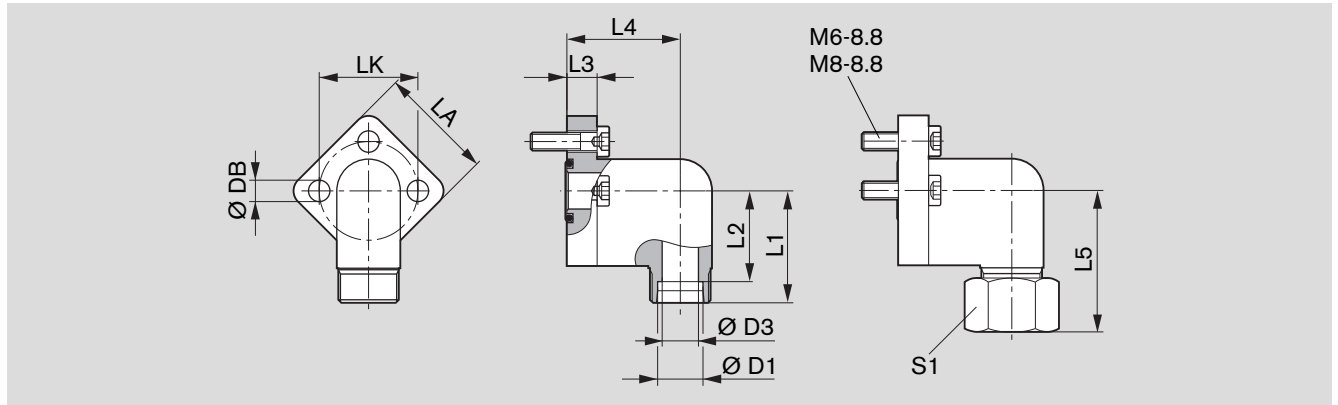
Complete fittings with seal ring, metric screw set, nuts and olive. \*) NBR = Perbunan®

Gear pump flange, 90° angle, for rectangular flange **20** see page 8



LK	D1	D3	L1	L2	L3	L4	L5	LA	S1	DB	Screws		Seal ring NBR *)	Mass [kg]	Part number	p (bar)
											2x	2x				
35	10L	8	38	31.0	16.5	26.5	47.0	40	19	6.4	M 6x22	M 6x35	20x2.5	0.16	1 515 702 070	315
35	12L	10	38	31.0	16.5	26.5	47.0	40	22	6.4	M 6x22	M 6x35	20x2.5	0.16	1 515 702 071	315
35	15L	12	38	31.0	16.5	26.5	46.0	40	27	6.4	M 6x22	M 6x35	20x2.5	0.15	1 515 702 072	250
35	16S	12	38	29.5	20.0	31.0	48.0	40	30	6.4	M 6x22	M 6x40	20x2.5	0.18	1 515 702 002	315
35	18L	15	38	29.5	20.0	31.0	47.0	40	32	6.4	M 6x22	M 6x40	20x2.5	0.18	1 545 702 006	250
35	20S	16	45	34.5	25.0	38.0	56.0	40	36	6.4	M 6x22	M 6x45	20x2.5	0.24	1 515 702 017	315
40	15L	12	38	31.0	22.5	36.5	46.0	42	27	6.4	M 6x22	M 6x22	24x2.5	0.15	1 515 702 073	100
40	18L	15	38	30.5	22.5	36.5	47.0	42	32	6.4	M 6x22	M 6x22	24x2.5	0.17	1 515 702 074	100
40	20S	16	40	29.5	22.5	35.5	50.0	42	36	6.4	M 6x22	M 6x45	24x2.5	0.20	1 515 702 011	250
40	22L	19	38	30.5	22.5	36.5	47.5	42	36	6.4	M 6x22	M 6x22	24x2.5	0.17	1 515 702 075	100
40	28L	22	40	32.5	28.0	43.0	49.0	42	41	6.4	M 6x20	M 6x50	24x2.5	0.24	1 515 702 010	100
40	35L	31	41	30.5	34.0	55.0	52.0	42	50	6.4	M 6x22	M 6x60	24x2.5	0.33	1 515 702 018	100

Complete fittings with seal ring, metric screw set, nuts and olive. \*) NBR = Perbunan®

**Gear pump flange, 3-hole, 90° angle, for rectangular flange 30 see page 8**


LK	D1	D3	L1	L2	L3	L4	L5	LA	S1	DB	Screws 3x	Seal ring NBR *)	Mass [kg]	Part number	p [bar]
30	12L	10	37	30.0	10	37.5	46	38	22	6.4	M6x22	16x2.5	0.13	<b>1 515 702 146</b>	250
30	15L	12	37	30.0	10	37.5	47	38	27	6.4	M6x22	16x2.5	0.14	<b>1 515 702 147</b>	250
30	18L	15	37	30.0	10	37.5	47	38	32	6.4	M6x22	16x2.5	0.17	<b>1 515 702 148</b>	160
40	22L	19	43	35.5	14	41.0	53	48	36	8.4	M8x30	24x2.5	0.29	<b>1 515 702 149</b>	160
40	28L	24	43	35.5	14	41.0	53	48	41	8.4	M8x30	24x2.5	0.40	<b>1 515 702 150</b>	160

Complete fittings with seal ring, metric screw set, nuts and olive. \*) NBR = Perbunan®

**Note**

You can find the permissible tightening torques in our publication:  
 "General Operating Instructions for External Gear Units"  
 RE 07 012-B1.

## Ordering-No.

Ordering-No.	Page	Ordering-No.	Page	Ordering-No.	Page
0 517 215 001	19	0 517 515 306	20	0 517 625 304	23
0 517 215 301	19	0 517 525 001	22	0 517 665 007	27
0 517 225 001	22	0 517 525 002	22	0 517 665 304	26
0 517 225 002	23	0 517 525 003	23	0 517 665 305	26
0 517 225 301	22	0 517 525 004	23	0 517 715 001	19
0 517 225 302	23	0 517 525 301	22	0 517 715 002	19
0 517 315 001	19	0 517 525 302	22	0 517 715 003	19
0 517 315 301	19	0 517 525 303	23	0 517 715 301	19
0 517 325 001	22	0 517 525 304	23	0 517 715 302	19
0 517 325 002	23	0 517 525 306	25	0 517 715 303	19
0 517 325 301	22	0 517 565 011	26	0 517 725 001	22
0 517 325 302	23	0 517 615 001	19	0 517 725 002	22
0 517 415 001	19	0 517 615 002	19	0 517 725 003	22
0 517 415 301	19	0 517 615 003	21	0 517 725 004	23
0 517 425 001	22	0 517 615 301	19	0 517 725 005	23
0 517 425 002	23	0 517 615 303	19	0 517 725 006	23
0 517 425 003	24	0 517 615 303	20	0 517 725 008	25
0 517 425 301	22	0 517 625 001	22	0 517 725 301	22
0 517 425 302	23	0 517 625 002	22	0 517 725 302	22
0 517 515 001	19	0 517 625 003	23	0 517 725 303	22
0 517 515 002	19	0 517 625 004	23	0 517 725 304	23
0 517 515 302	19	0 517 625 301	22	0 517 725 305	23
0 517 515 303	19	0 517 625 302	22	0 517 725 306	23
0 517 515 304	20	0 517 625 303	23		

# Notes for commissioning

## Filter recommendation

The major share of premature failures in external gear pumps is caused by contaminated hydraulic fluid.

As a warranty cannot be issued for dirt-specific wear, we recommend filtration compliant with cleanliness level 20/18/15 ISO 4406, which reduces the degree of contamination to a permissible dimension in terms of the size and concentration of dirt particles:

Operating pressure [bar ]	>160	<160
Contamination class ISO 4406	18/15	19/16
To be reached with $\beta_x = 75$	20	25

We recommend that a full-flow filter always be used. Basic contamination of the hydraulic fluid used may not exceed class 20/18/15 according to ISO 4406. Experience has shown that new fluid quite often lies above this value. In such instances a filling device with special filter should be used.

## General

- The pumps supplied by us have been checked for function and performance. No modifications of any kind may be made to the pumps; any such changes will render the warranty null and void!
- Pump may only be operated in compliance with permitted data (see pages 15 – 18).

## Project planning notes

Comprehensive notes and suggestions are available in Hydraulics Trainer, Volume 3 RE 00 281, "Project planning notes and design of hydraulic systems". Where external gear pumps are used we recommend that the following note be adhered to.

## Technical data

All stated technical data is dependent on production tolerances and is valid for specific marginal conditions.

Note that, as a consequence, scattering is possible, and at certain marginal conditions (e.g. viscosity) **the technical data may change.**

## Characteristics

When designing the external gear pump, note the maximum possible service data based on the characteristics displayed on pages 10 to 12.

Additional information on the proper handling of hydraulic products from Bosch Rexroth is available in our document: "General product information for hydraulic products" RE 07 008.

## Contained in delivery

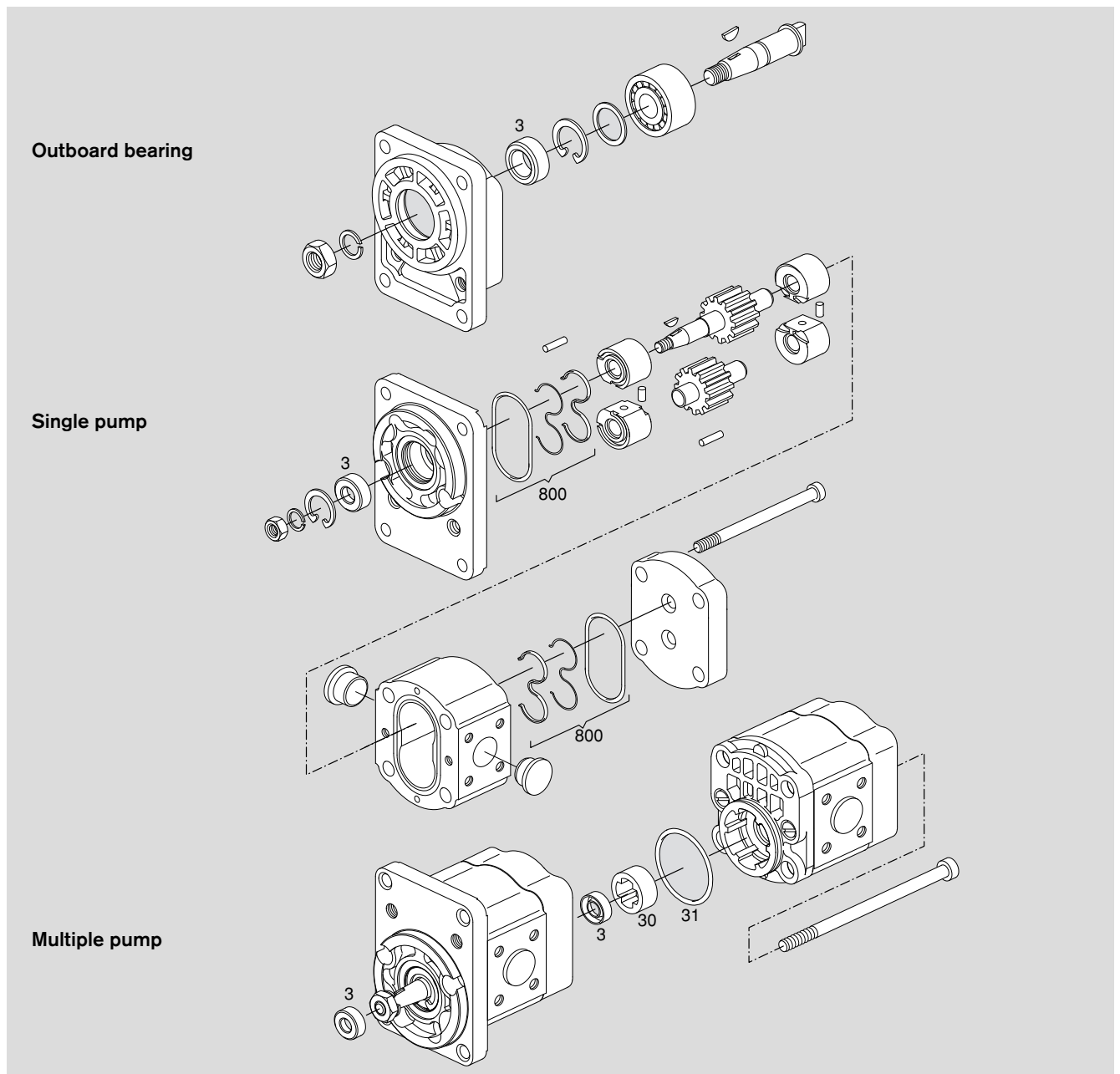
The components with characteristics as described under ordering code and device measurements, pages 19 – 27, are contained in delivery.

**You can find further information in our publication: "General Operating Instructions for External Gear Units" RE 07 012-B1.**

# Service parts

Page	Ordering code	Seal kit Pos. 800 1 517 010...	Shaft seal ring Pos. 3 1 510 283...	Dimension	Seal ring Pos. 31 1 900 210...	Material	Dimen- sion	Driver Pos. 30 1 510 240...
19	AZPS - 1x - □□□ □ N M 20 M B	208	-		145	NBR	45x2.5	000
19	AZPS - 2x - □□□ □ N M 20 K B	212	-		145	NBR	45x2.5	013
20	AZPS - 1x - □□□ □ C P 20 K B	208	027 FKM	17x30x7/8	-	-	-	-
21	AZPS - 1x - □□□ □ F N 20 K B	208	027 FKM	17x30x7/8	-	-	-	-
22	AZPS - 1x - □□□ □ C B 20 M B	208	008 NBR	17x30x7/8	-	-	-	-
22	AZPS - 2x - □□□ □ C B 20 M B	212	008 NBR	17x30x7/8	-	-	-	-
23	AZPS - 1x - □□□ □ R R 20 M B	208	008 NBR	17x30x7/8	-	-	-	-
23	AZPS - 1x - 0 1 6 L R R 20 P B	206	027 FKM	17x30x7/8	-	-	-	-
23	AZPS - 2x - □□□ □ R R 20 M B	212	008 NBR	17x30x7/8	-	-	-	-
24	AZPS - 1x - □□□ □ Q R 12 M B	208	008 NBR	17x30x7/8	-	-	-	-
25	AZPS - 1x - □□□ □ R C 20 K B	208	027 FKM	17x30x7/8	-	-	-	-
25	AZPS - 2x - □□□ □ R C 20 K B	212	027 FKM	17x30x7/8	-	-	-	-
26	AZPSS - 1x - □□□ □□□ □ C B 20 20 M B	208	008 NBR	17x30x7/8	145	NBR	45x2.5	-
27	AZPSS - 1x - □□□ □□□ □ R R 20 20 M B	208	008 NBR	17x30x7/8	145	NBR	45x2.5	-

NBR = Perbunan® FKM = Viton®

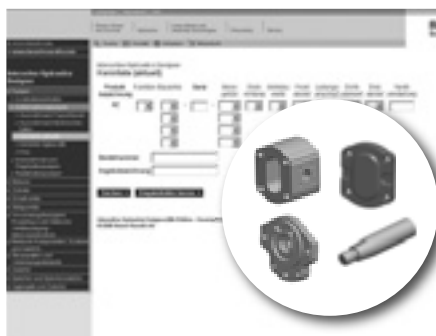


## The AZ configurator at [www.boschrexroth.com/azconfigurator](http://www.boschrexroth.com/azconfigurator)

The AZ configurator assists you to configure your individual external gear unit easily and user-friendly. You only need to specify your requirements: From the displacement, direction of rotation, drive shaft, connection flange right up to the required rear cover. You immediately receive a project drawing (PDF format) if a configuration already exists. You receive the price of the configured external gear unit upon request.



The AZ configurator assists you to configure your individual external gear unit easily and user-friendly – all data needed for project planning are acquired thru menu guidance.



Selection is made either on an ordering code or your technical requirements. This means that you can search for external gear units that have already been configured, or you specify the configuration variant of the external gear unit based upon the operating parameters you require.



If the external gear unit you selected has been released you will receive the part number, ordering code and a detailed installation drawing. If your special configuration is not available please send your specification to Rexroth. One of our employees will then contact you.

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