

# External Gear Pumps Series F

**RE 10 089/02.07**  
Replaces: Series F  
Issue 04.04

AZPF-...

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
- Consistent high quality thru mass production
- Numerous configuration variants available

# General

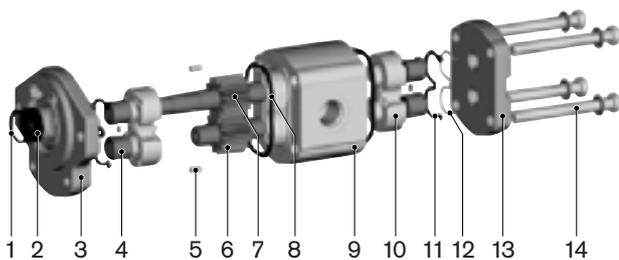
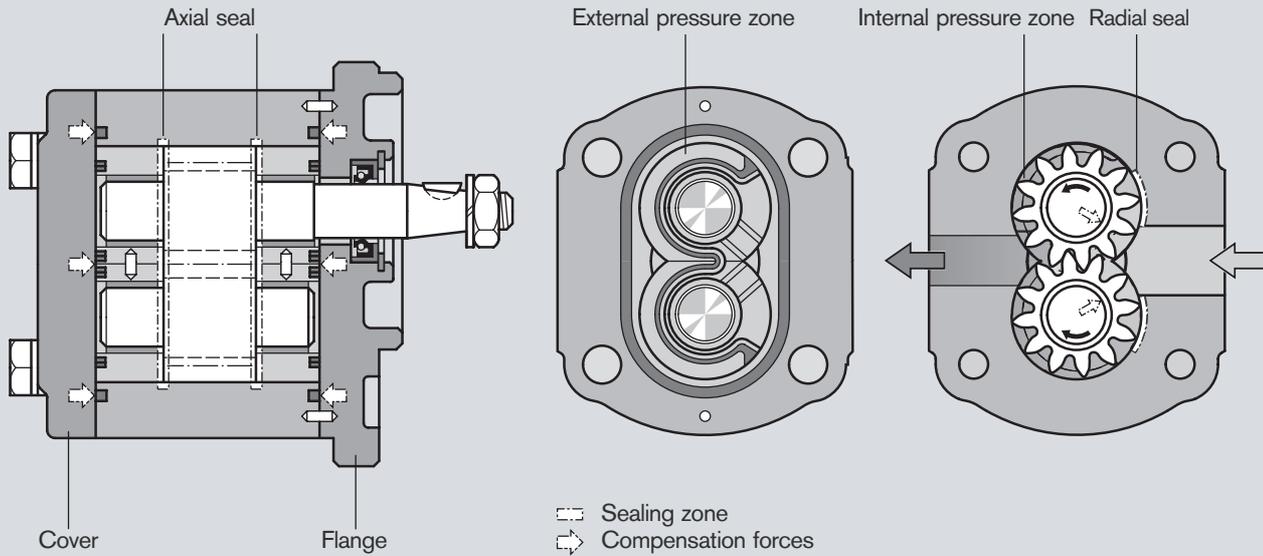
Rexroth external gear pumps are available as standard gear pumps in the 4 series of B, F, N and G and as SILENCE gear pumps in the series of S, T and U, in which the displacements are graded by different gear widths. Further configuration variants are given by different flanges, shafts, valve arrangements and multiple pump combinations.

## Construction

The external gear pump 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.

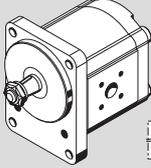
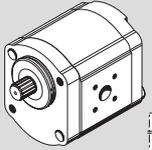
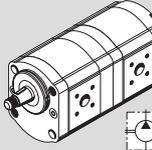
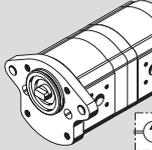
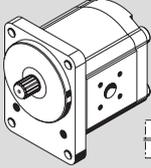
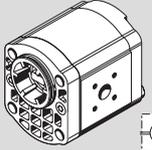
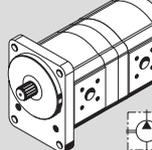
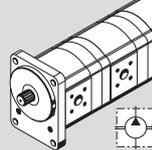
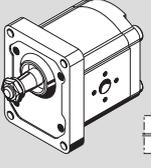
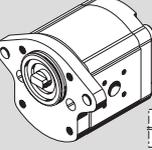
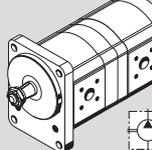
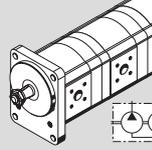
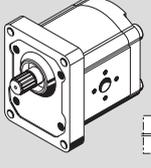
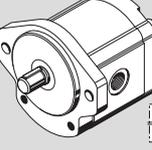
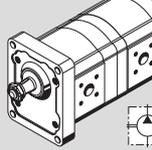
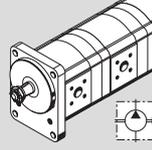
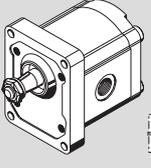
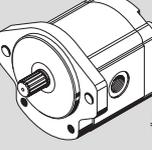
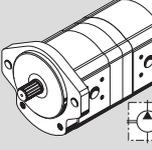
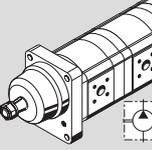
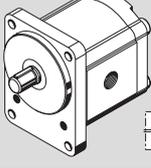
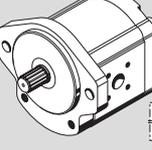
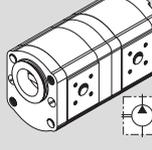
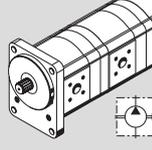
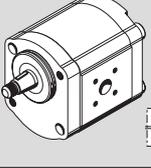
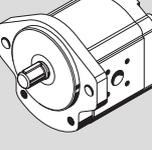
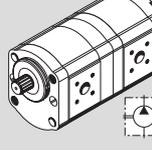
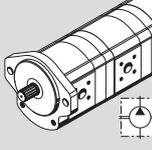
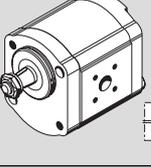
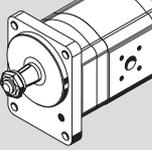
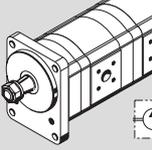
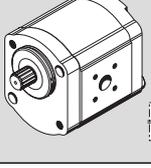
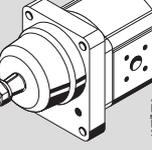
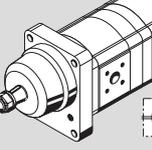
The internal sealing is achieved by forces which are proportional to delivery pressure. This ensures optimum efficiency. The bearings provide the seal at the ends of the gaps between the teeth which carry the pressurized oil. The sealing zone between the gear teeth and the bearing is controlled by the 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.

### Gear pump axial compensation



- |                     |                    |
|---------------------|--------------------|
| 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   |

Product overview of "Series F" standard types

Version	Page	Version	Page	Version	Page	Version	Page
	20		29		38		52
	21		30		40		53
	22		31		42		54
	23		32		44		55
	24		33		46		56
	25		34		48		57
	26		35		49		58
	27		36		50		
	28		37		51		

# Ordering code

## External gear units, single pumps, standard

<b>AZ</b>	<b>P</b>	<b>F</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 xxx</b>																										
<table border="1"> <tr> <td><b>Function</b></td> <td rowspan="2">Special design *)</td> </tr> <tr> <td><b>P = Pump</b></td> </tr> <tr> <td><b>Series</b></td> <td rowspan="5">Valve adjustment</td> </tr> <tr> <td><b>1 = Standard bearing</b></td> </tr> <tr> <td><b>2 = Reinforced bearing</b></td> </tr> <tr> <td><b>Version</b></td> </tr> <tr> <td><b>0 = Phosphatized</b></td> </tr> <tr> <td><b>1 = Phosphatized, pinned</b></td> </tr> <tr> <td><b>2 = Chromatized, pinned</b></td> </tr> <tr> <td><b>Size (F)</b></td> <td rowspan="10">Rear cover</td> </tr> <tr> <td><b>004 = 4.0 cm<sup>3</sup>/rev</b></td> </tr> <tr> <td><b>005 = 5.5 cm<sup>3</sup>/rev</b></td> </tr> <tr> <td><b>008 = 8.0 cm<sup>3</sup>/rev</b></td> </tr> <tr> <td><b>011 = 11.0 cm<sup>3</sup>/rev</b></td> </tr> <tr> <td><b>014 = 14.0 cm<sup>3</sup>/rev</b></td> </tr> <tr> <td><b>016 = 16.0 cm<sup>3</sup>/rev</b></td> </tr> <tr> <td><b>019 = 19.0 cm<sup>3</sup>/rev</b></td> </tr> <tr> <td><b>022 = 22.5 cm<sup>3</sup>/rev</b></td> </tr> <tr> <td><b>025 = 25.0 cm<sup>3</sup>/rev</b></td> </tr> <tr> <td><b>028 = 28.0 cm<sup>3</sup>/rev</b></td> </tr> <tr> <td><b>Direction of rotation</b></td> <td rowspan="3">Seals</td> </tr> <tr> <td><b>R = Clockwise</b></td> </tr> <tr> <td><b>L = Counterclockwise</b></td> </tr> </table>															<b>Function</b>	Special design *)	<b>P = Pump</b>	<b>Series</b>	Valve adjustment	<b>1 = Standard bearing</b>	<b>2 = Reinforced bearing</b>	<b>Version</b>	<b>0 = Phosphatized</b>	<b>1 = Phosphatized, pinned</b>	<b>2 = Chromatized, pinned</b>	<b>Size (F)</b>	Rear cover	<b>004 = 4.0 cm<sup>3</sup>/rev</b>	<b>005 = 5.5 cm<sup>3</sup>/rev</b>	<b>008 = 8.0 cm<sup>3</sup>/rev</b>	<b>011 = 11.0 cm<sup>3</sup>/rev</b>	<b>014 = 14.0 cm<sup>3</sup>/rev</b>	<b>016 = 16.0 cm<sup>3</sup>/rev</b>	<b>019 = 19.0 cm<sup>3</sup>/rev</b>	<b>022 = 22.5 cm<sup>3</sup>/rev</b>	<b>025 = 25.0 cm<sup>3</sup>/rev</b>	<b>028 = 28.0 cm<sup>3</sup>/rev</b>	<b>Direction of rotation</b>	Seals	<b>R = Clockwise</b>	<b>L = Counterclockwise</b>
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<p>*) Some of the special designs shown on pages 18–55 are not covered in the illustration of the ordering code.</p>																																									

Drive shafts			Front cover			Line ports				
<b>C</b>	Tapered key shaft 1:5		<b>B</b>	<b>P</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>R</b>	SAE J 744 82-2 A 2-bolt flange Ø 82.55 mm		<b>12</b>	Thread (UNF-2B) SAE Seal ring BOSS	
<b>N</b>	Dihedral claw		<b>M</b>		<b>P</b>	2-bolt mounting Centering Ø 50 mm		<b>30</b>	Rectangular flange	
<b>Q</b>	Straight keyed shaft SAE J 744 16-1 A		<b>R</b>		<b>O</b>	Square flange Centering Ø 36.47 mm		<b>01</b>	Pipe thread ISO 228/1	
<b>R</b>	Splined shaft SAE J 744 16-4 9T		<b>R</b>	<b>C</b>	<b>C</b>	SAE J 744 101-2 B 2-bolt flange Ø 101.6 mm		<b>03</b>	Thread, metric ISO 6149 with seal ring	
<b>P</b>	Splined shaft SAE J 744 19-4 11T		<b>R</b>	<b>C</b>	<b>M</b>	2-bolt mounting Centering Ø 52 mm with seal ring				
<b>F</b>	Splined shaft DIN 5482 B 17 x 14		<b>B</b>	<b>P</b>	<b>A</b>	Outboard bearing Ø 80 mm, Type 1				
<b>S</b>	Tapered key shaft 1:5 for flange A		<b>A</b>		<b>N</b>	2-bolt mounting Centering Ø 50 mm				
<b>A</b>	Straight keyed shaft ISO Ø 18 mm		<b>B</b>		<b>T</b>	4-bolt mounting Ø 52 mm with seal ring				
					<b>G</b>	Outboard bearing Ø 80 mm, Type 2				

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, standard

<b>AZ</b>	<b>P</b>	<b>GGFF</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>Rear cover</b> relates to last pump section					
<b>Series</b> B = 1.0... 7.1 cm <sup>3</sup> /rev S = 4.0...28.0 cm <sup>3</sup> /rev F = 4.0...28.0 cm <sup>3</sup> /rev N = 20.0...36.0 cm <sup>3</sup> /rev G = 22.5...56.0 cm <sup>3</sup> /rev											<b>B = Standard</b>					
<b>Series,</b> relates to pump section 1 1 = Standard bearing 2 = Reinforced bearing											<b>Seals</b> M = NBR P = FPM K = NBR, SSR in FPM Shaft seal relate to pump section 1					
<b>Version,</b> relates to pump section 1 0 = Phosphatized 1 = Phosphatized, pinned 2 = Chromatized, pinned																
<b>Size</b> corresponding to each series																
<b>Direction of rotation</b> R = Clockwise L = Counterclockwise																

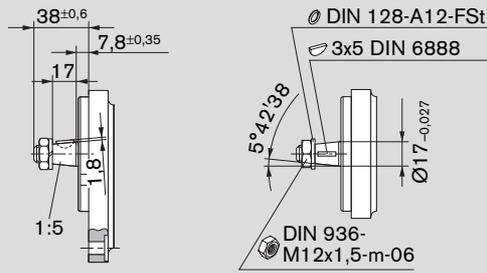
Drive shafts relates to pump part 1				Front cover relates to pump part 1				Line ports every pump parts			
Series B: <b>H</b> Tapered key shaft 1 : 8  <b>O</b> Suitable front cover <b>O</b>				<b>O</b> Square flange Centering Ø 25.38 mm 				<b>02</b> Thread, metric DIN 3852 T1 			
Series F, S: <b>C</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 							

Not all variants can be selected by using ordering code!

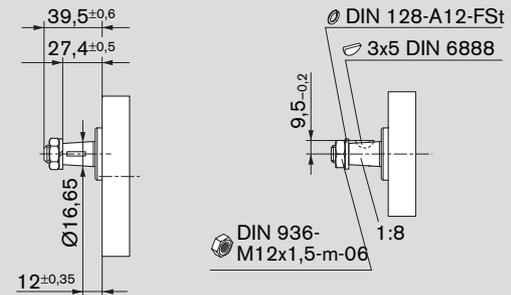
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Drive shafts

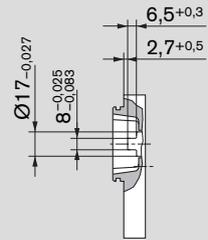
C



H

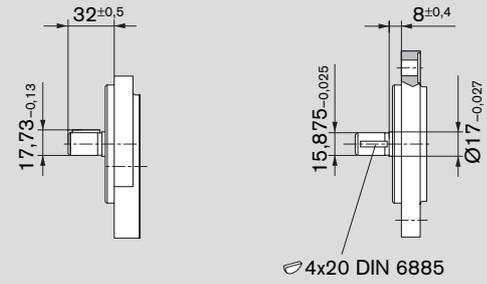


N

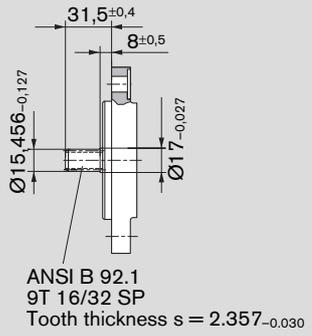
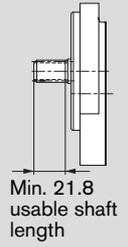


Pump without shaft seal, see page 17

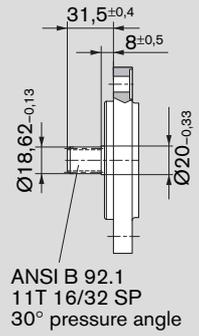
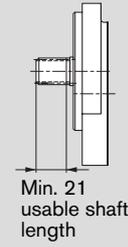
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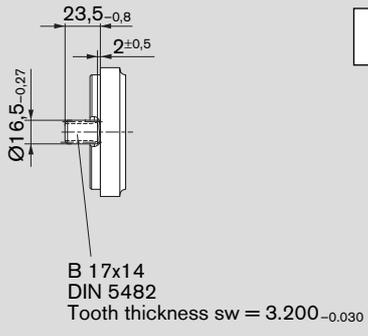
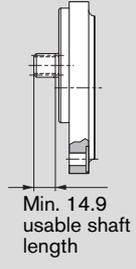
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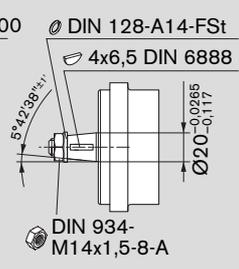
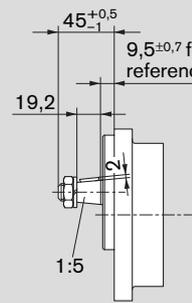
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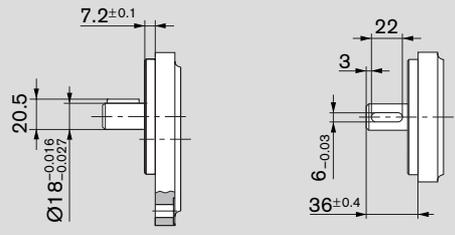
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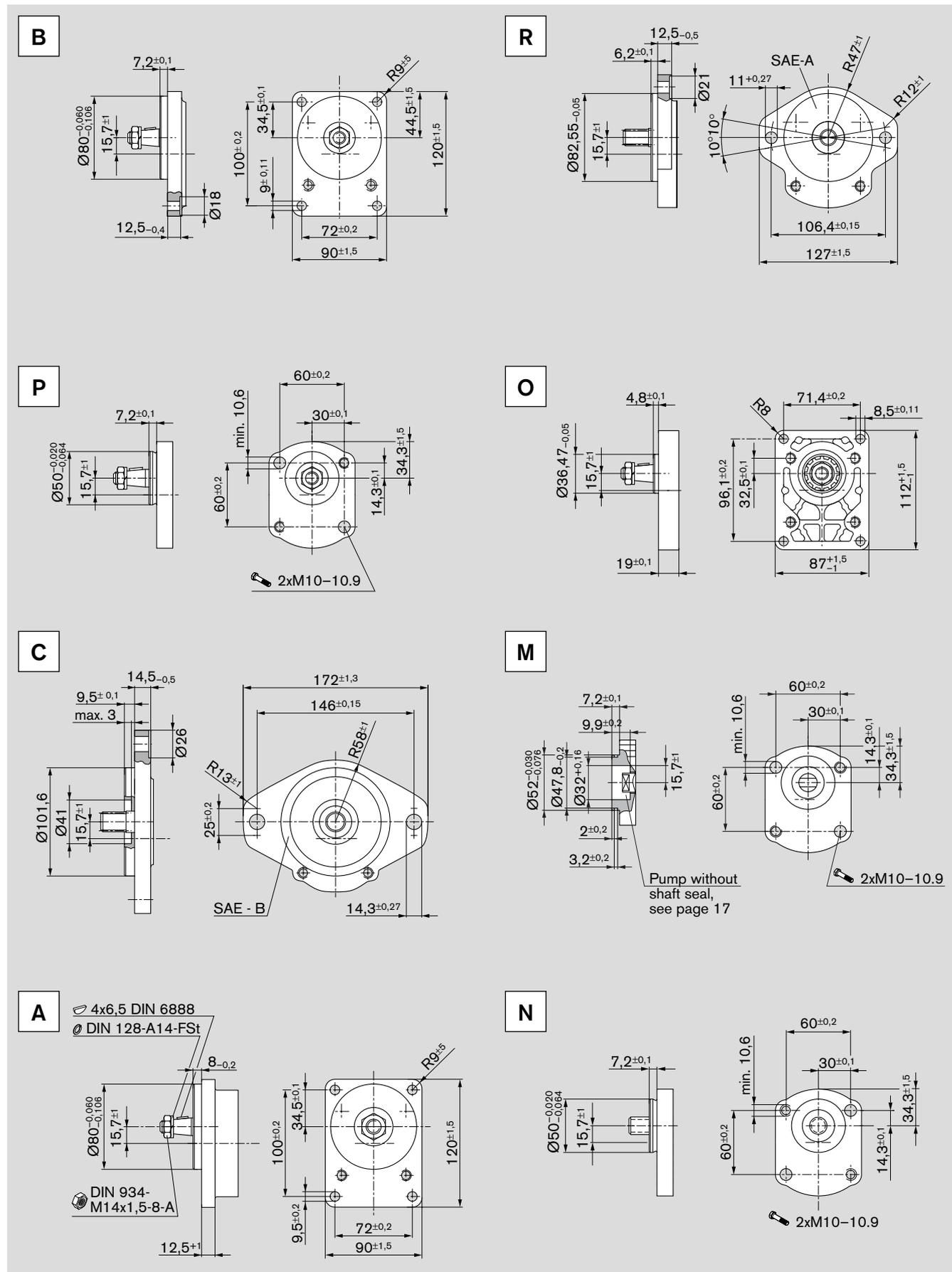
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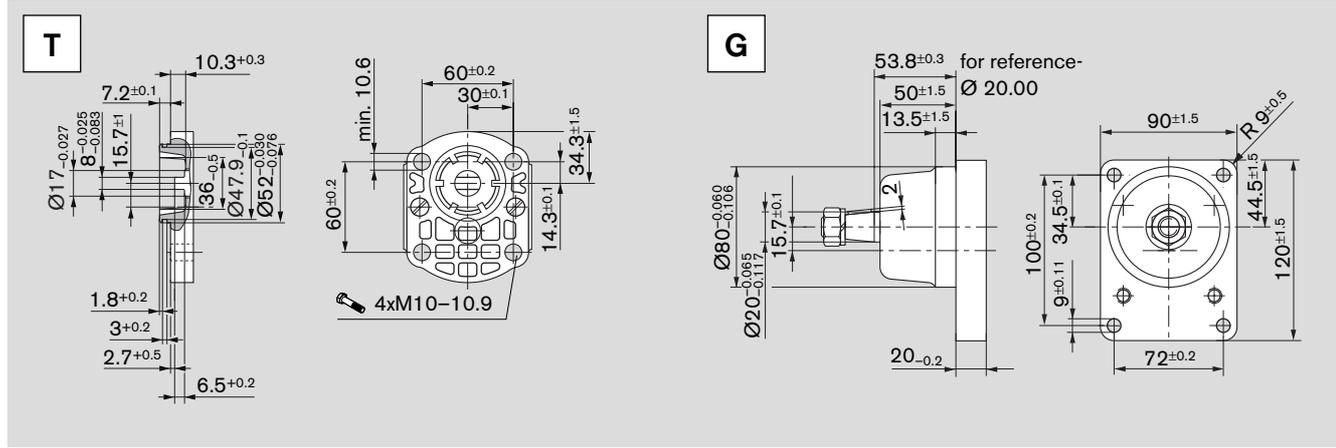
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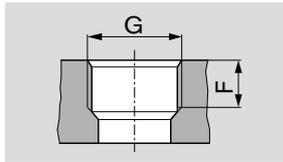
Front cover



Front cover (continued)



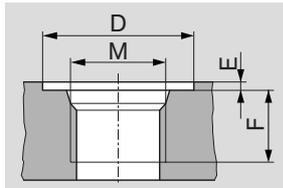
Line ports



**01** Pipe thread  
ISO 228/1

At pressures  $p_2 > 210$  bar  
limited fatigue strength

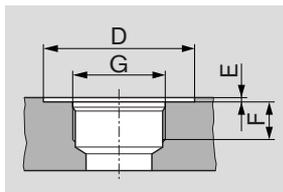
Ordering code	Size	Pressure side		Suction side	
		G	F	G	F
01	4...16 cm <sup>3</sup>	G 1/2	16	G 3/4	16
	19...28 cm <sup>3</sup>	G 3/4		G 1	19



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

At pressures  $p_2 > 210$  bar  
limited service life

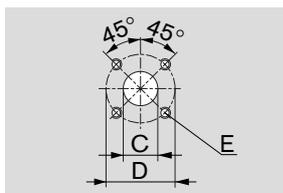
Ordering code	Size	Pressure side				Suction side			
		M	D	E	F	M	D	E	F
03	4...5.5 cm <sup>3</sup>	M 18 x 1.5	29	0.5	16	M 18 x 1.5	29	0.5	16
	8...16 cm <sup>3</sup>	M 22 x 1.5	34		18	M 27 x 2	40		19
	19...28 cm <sup>3</sup>			M 33 x 2	46	22			



**12** Thread  
(UNF-2B) SAE  
seal ring BOSS

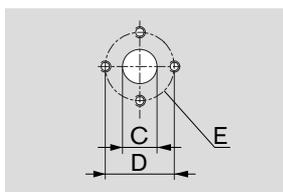
At pressures  $p_2 > 210$  bar  
limited service life

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
	11...28 cm <sup>3</sup>	1 1/16-12 UNF-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
	8...16 cm <sup>3</sup>				20		
	19...28 cm <sup>3</sup>	20	40		M8, depth 13		

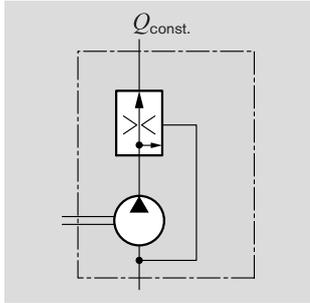


**30** Rectangular flange

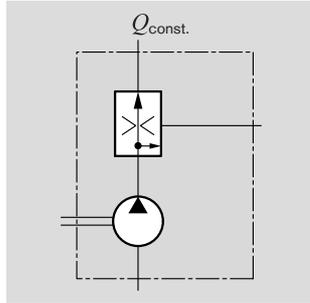
Ordering code	Size	Pressure side			Suction side		
		C	D	E	C	D	E
30	4...8 cm <sup>3</sup>	13.5	30.2	M6, depth 13	13.5	30.2	M6, depth 13
	11...28 cm <sup>3</sup>				20.0		

# Gear pumps with integral valves

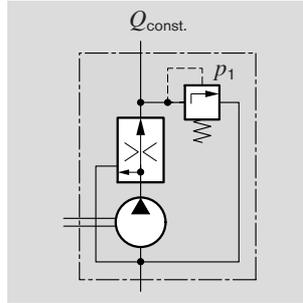
In order to reduce external pipework it is possible to incorporate a flow-control valve or pressure-relief valve in the rear cover of the gear pump. A typical application of this is in the supply of hydraulic oil in power steering systems. The pump delivers a constant flow irrespective of the speed at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



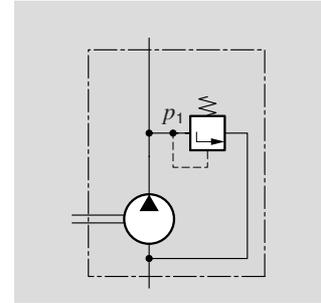
3-way flow-control valve.  
Excess flow returned to suction line  
 $Q_{const.} = 2...30 \text{ l/min}$



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

<b>S</b>	<b>xxx17</b>
----------	--------------

<b>E</b>	<b>xxx12</b>
----------	--------------

<b>V</b>	<b>15011</b>
----------	--------------

<b>D</b>	<b>180xx</b>
----------	--------------

# Design calculations for pumps

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

- $V$  [ $\text{cm}^3/\text{rev}$ ] Displacement
- $Q$  [ $\text{l}/\text{min}$ ] Delivery
- $p$  [ $\text{bar}$ ] Pressure
- $M$  [ $\text{Nm}$ ] Drive torque
- $n$  [ $\text{rev}/\text{min}$ ] Drive speed
- $P$  [ $\text{kW}$ ] 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.

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

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

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

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

$$V = \frac{M \cdot \eta_{hm}}{159 \cdot p}$$

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

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

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

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

[%]

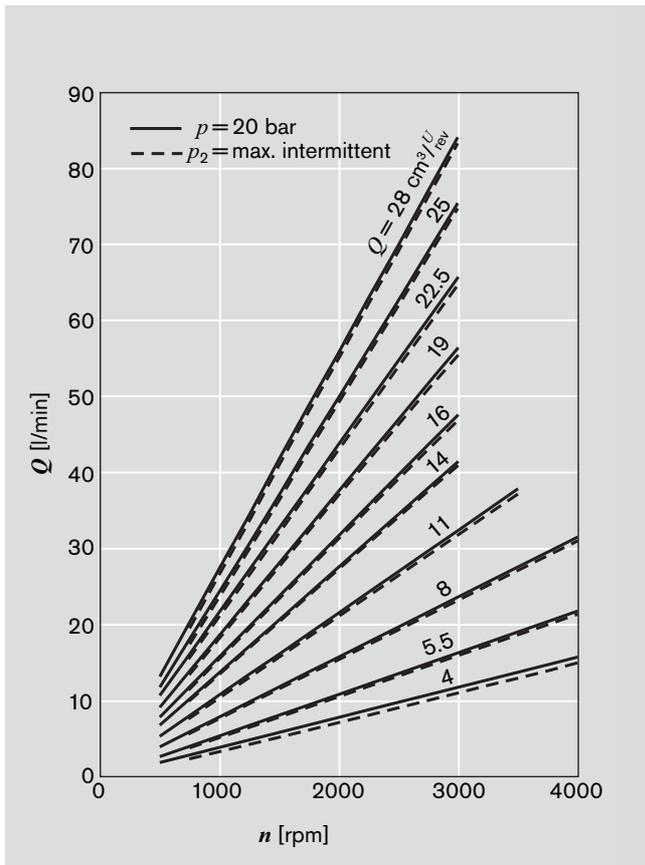
$n$  —  $\eta_v$  —  $Q$       $V$  [ $\text{cm}^3/\text{rev}$ ]    $Q$  [ $\text{l}/\text{min}$ ]    $p$  [ $\text{bar}$ ]

$M$  —  $\eta_{hm}$  —  $p$

$P$  —  $\eta_t$  —  $P \cdot Q$       $n$  [ $\text{rev}/\text{min}$ ]    $P$  [ $\text{kW}$ ]    $M$  [ $\text{Nm}$ ]

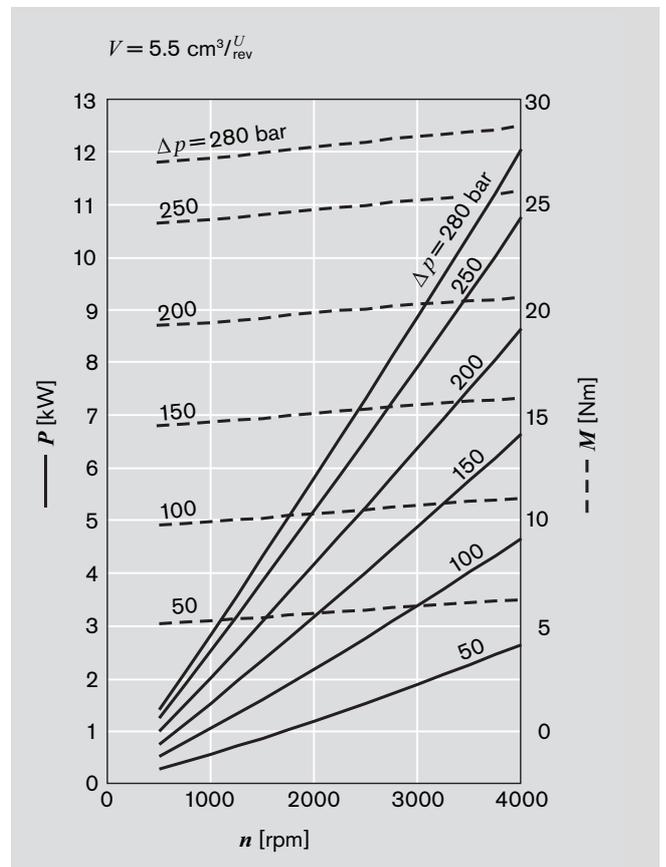
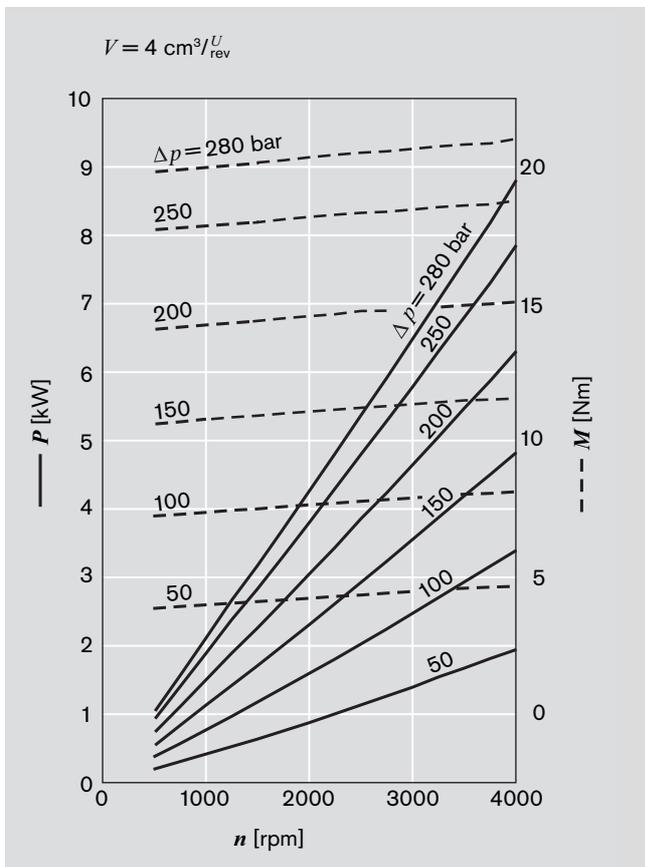
**Caution:**  $\eta$  [%] e.g. 95 [%]

# Performance charts

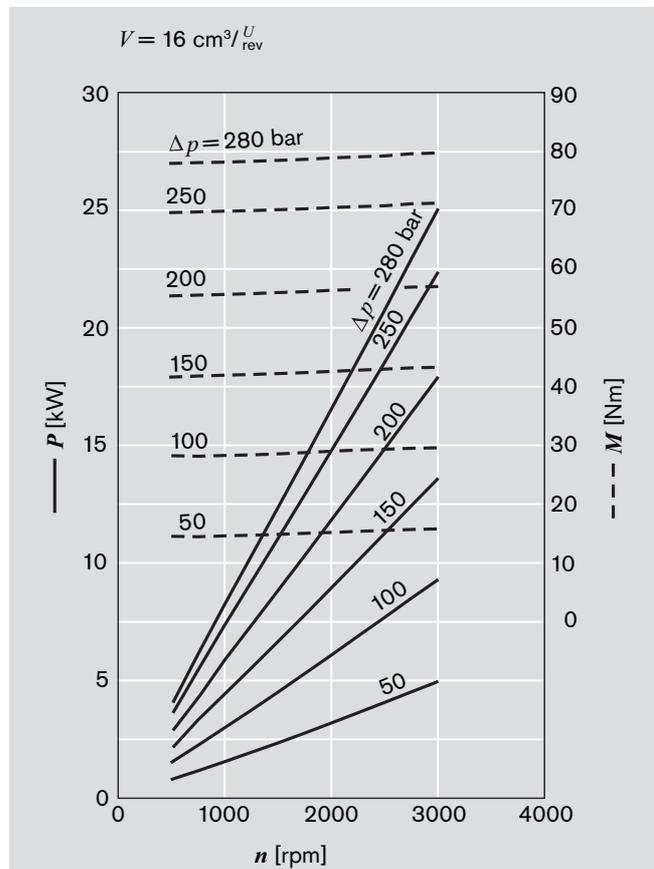
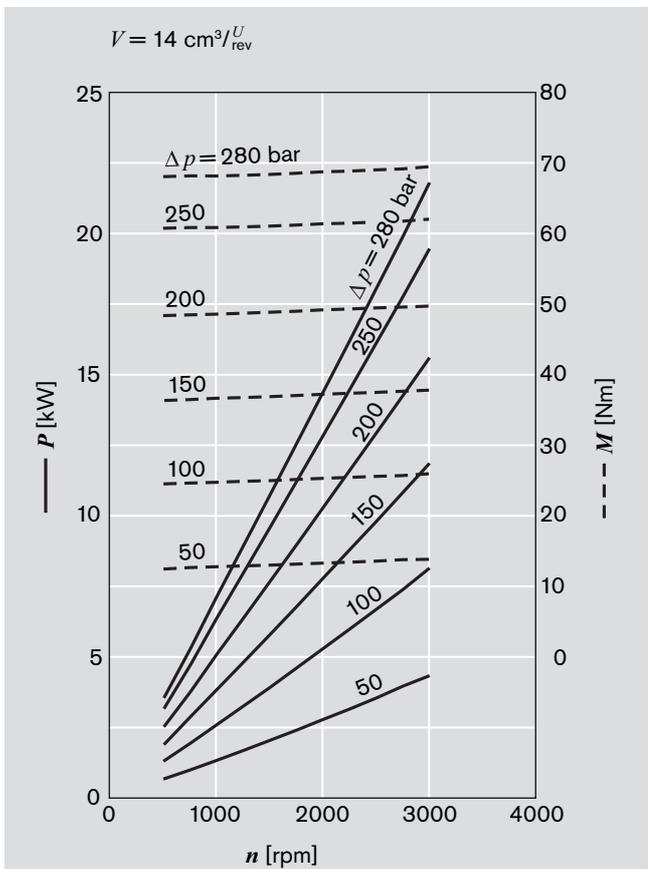
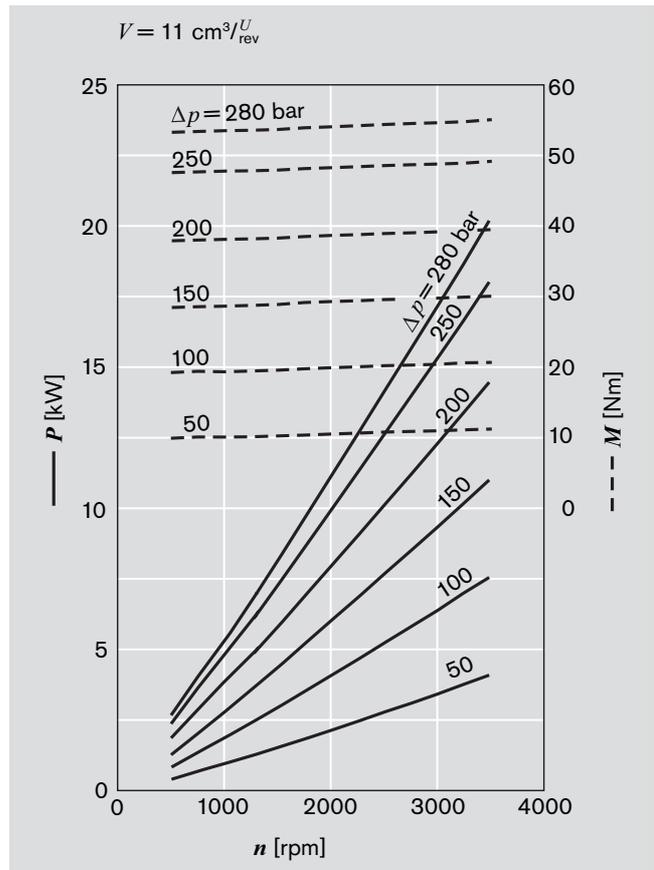
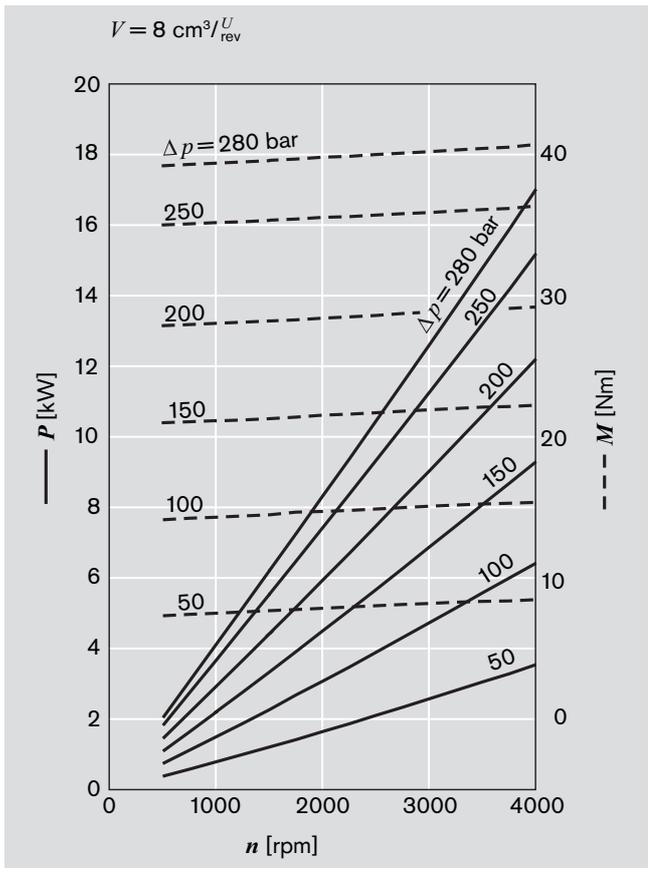


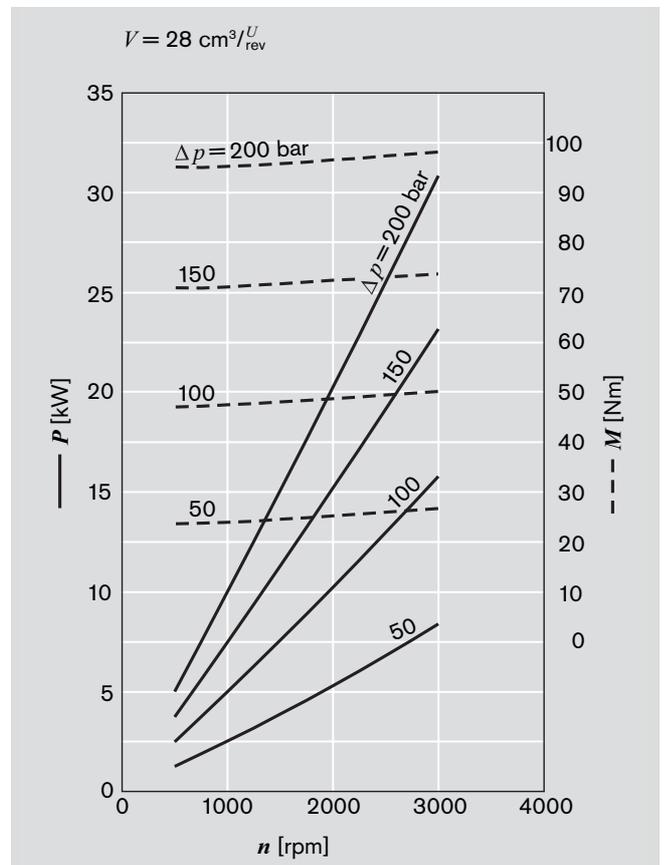
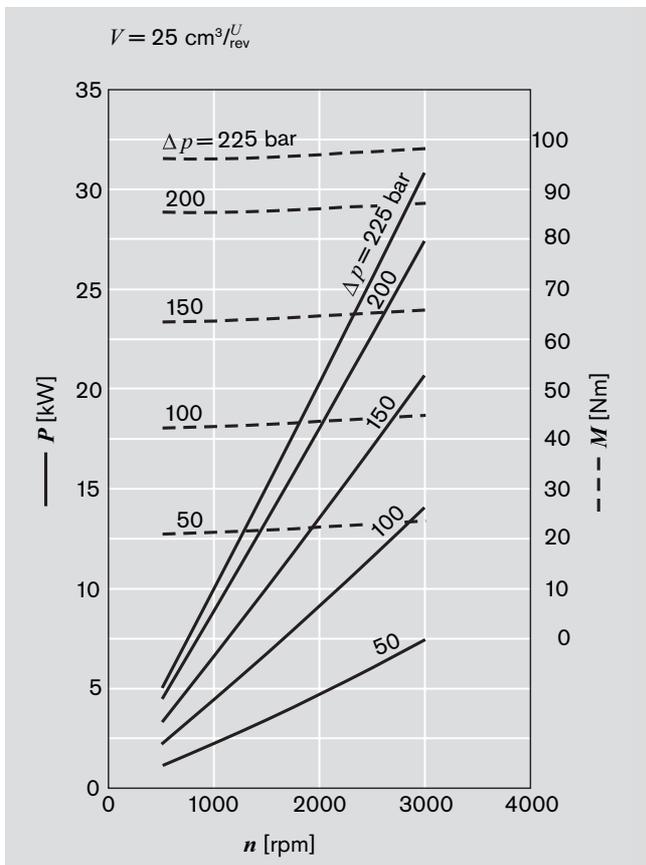
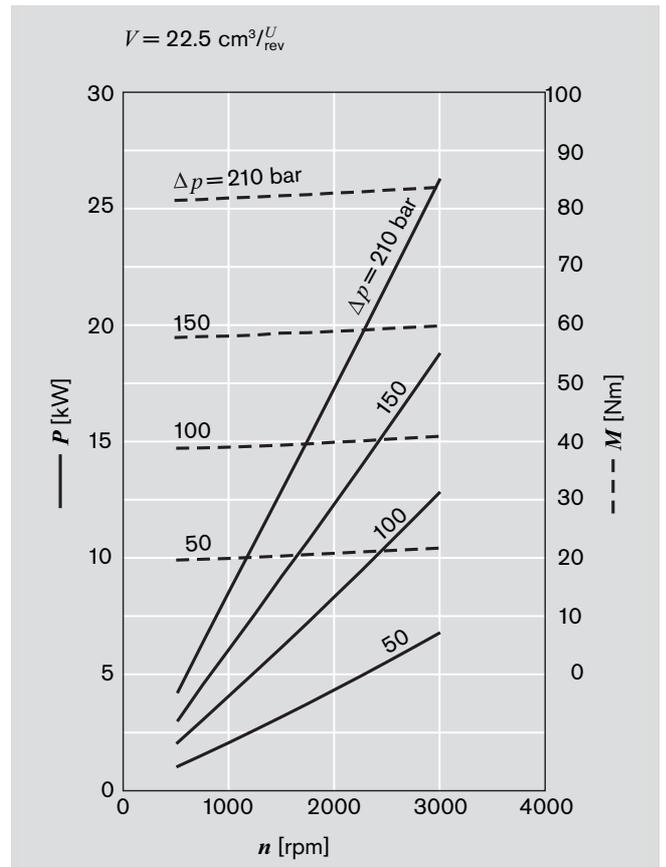
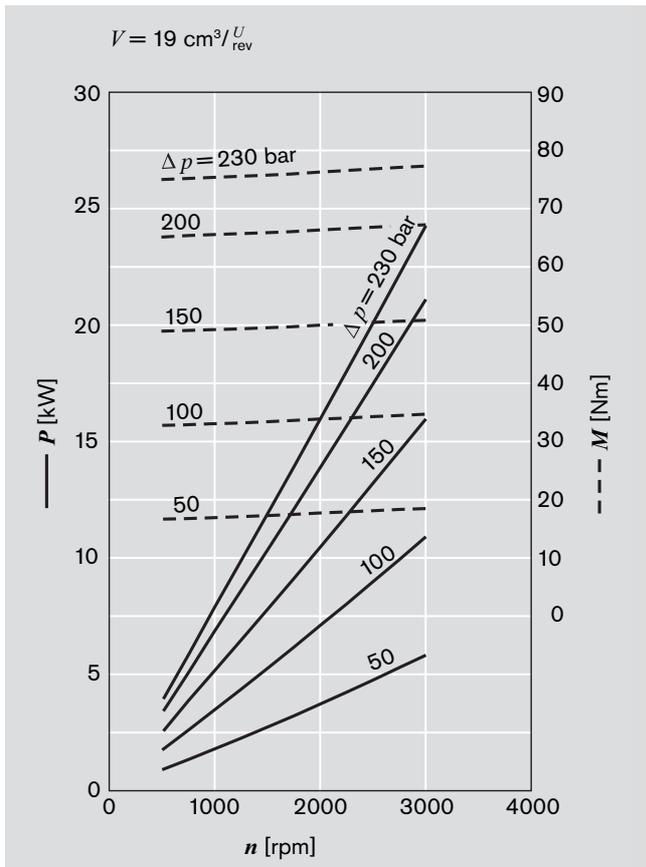
$\nu = 32 \text{ mm}^2/\text{s}, \vartheta = 50^\circ\text{C}$

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



Performance charts (continued)





# Noise charts

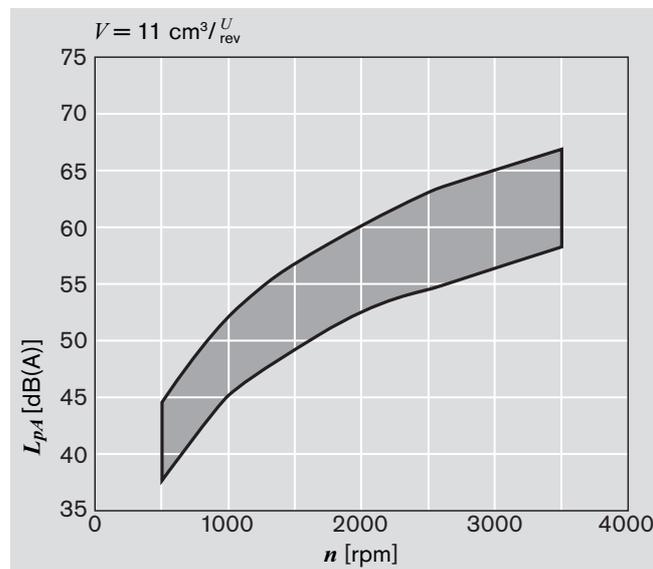
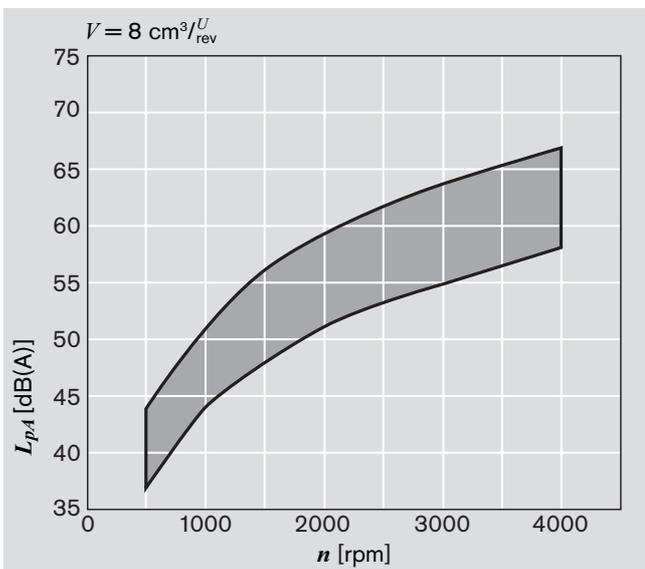
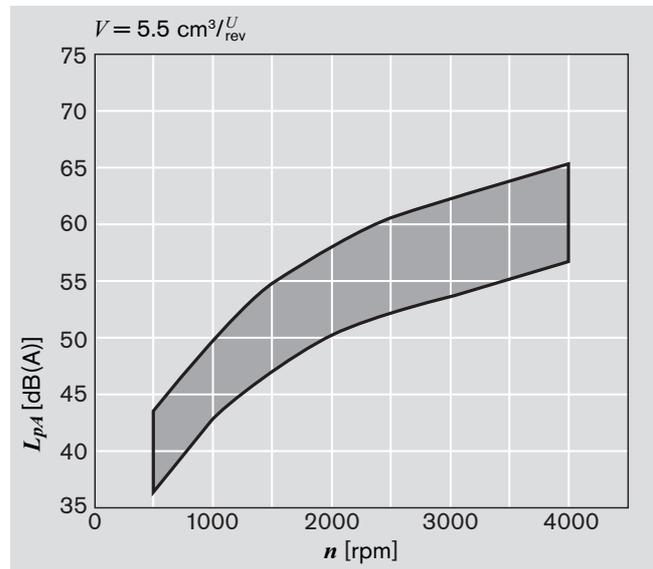
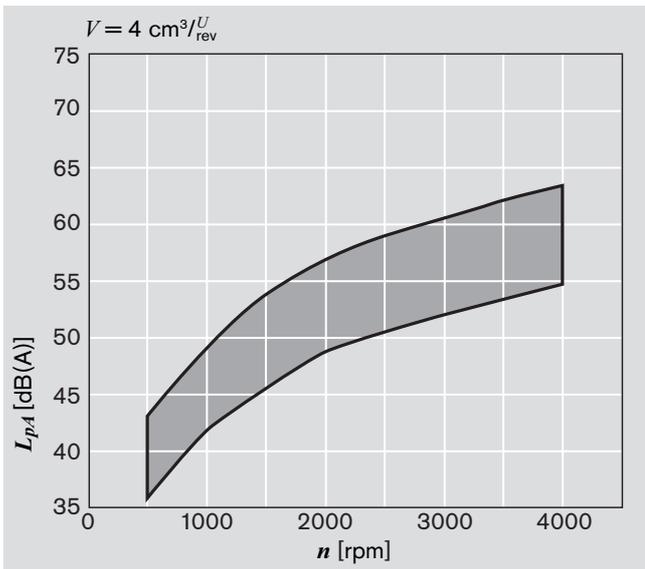
**Noise level** dependent on rotational speed, pressure range between 10 bar and pressure value  $p_2$  (see page 16 Specifications table).

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

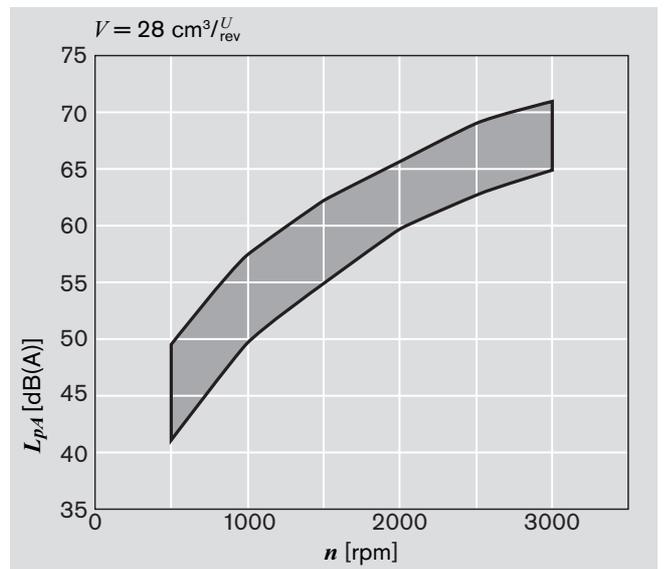
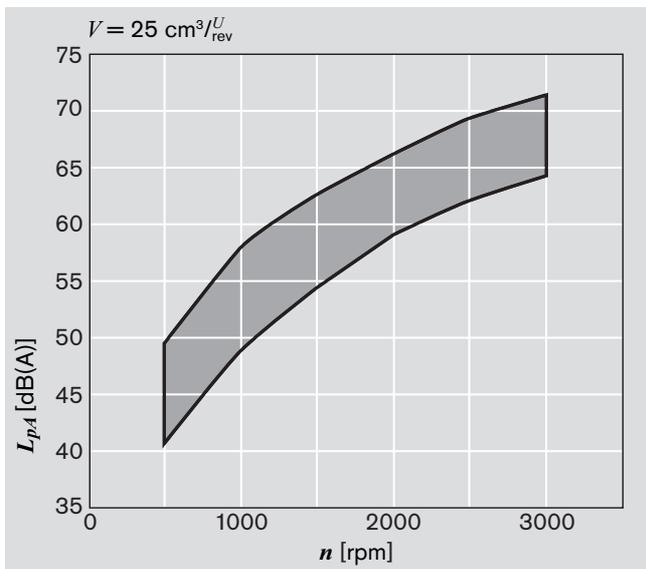
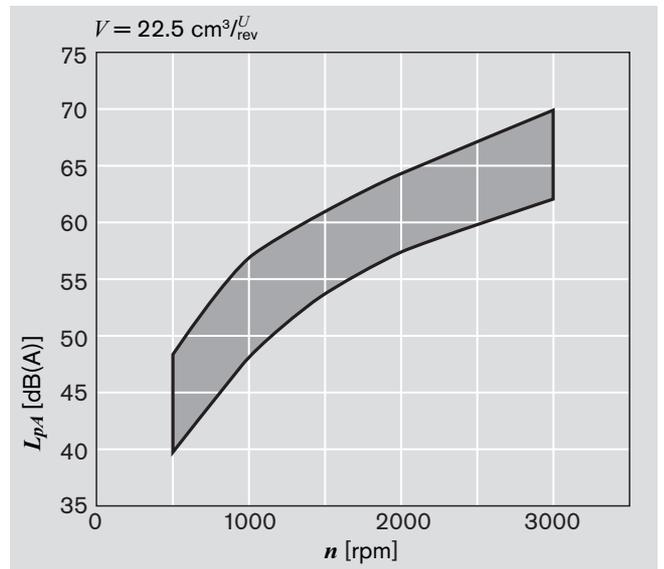
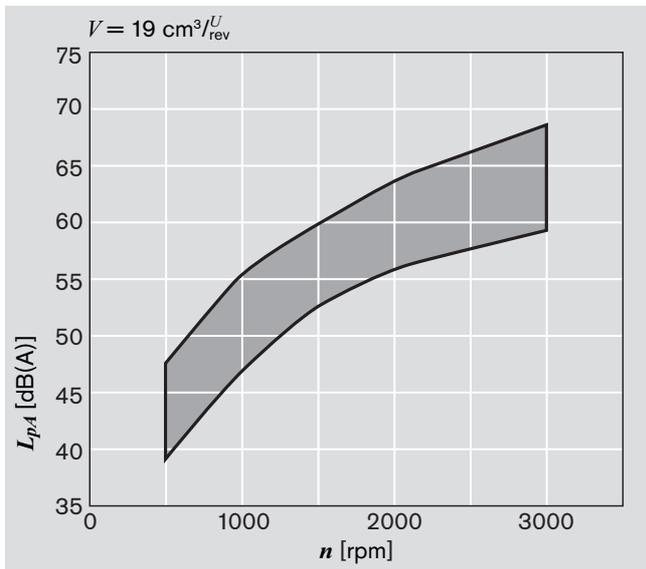
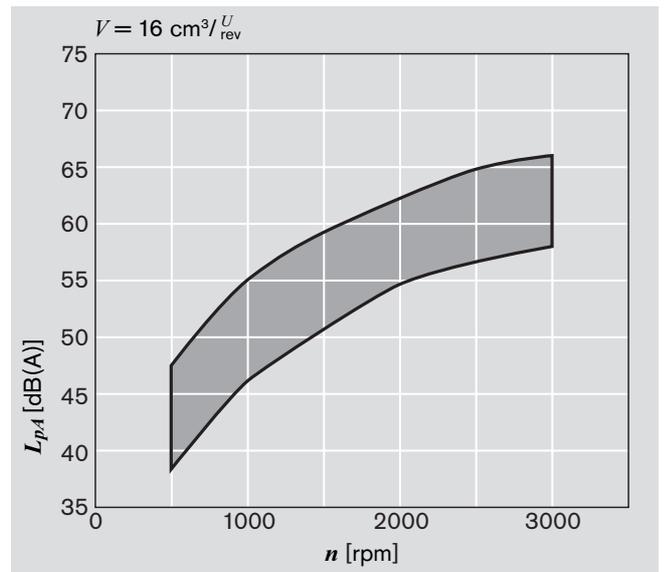
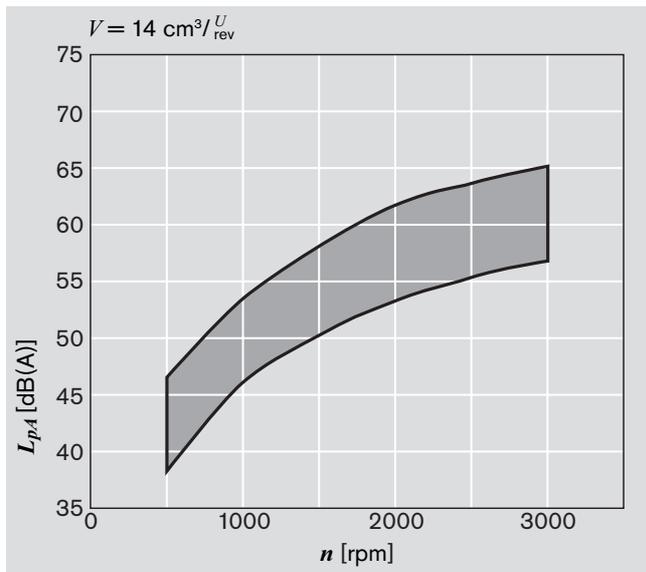
Sound pressure level calculated from noise measurements made in the sound absorbent measuring room compliant with DIN 45 635, Part 26.

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)



# Specifications

General	
Construction	External gear pump
Mounting	Flange or through-bolting with spigot
Line ports	Screw, flange
Direction of rotation (looking on shaft)	Clockwise or counterclockwise, 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 Viton seals
Fluids	- 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 07075 - 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
Fluid temperature range	-30°C...+80°C -20°C...+110°C with FPM seals
Filtration *)	At least cleanliness level 21/18/15 compliant with ISO 4406 (1999)

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

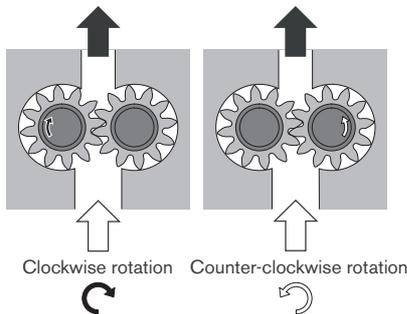
Safety requirements pertaining to the whole systems are to be observed.

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

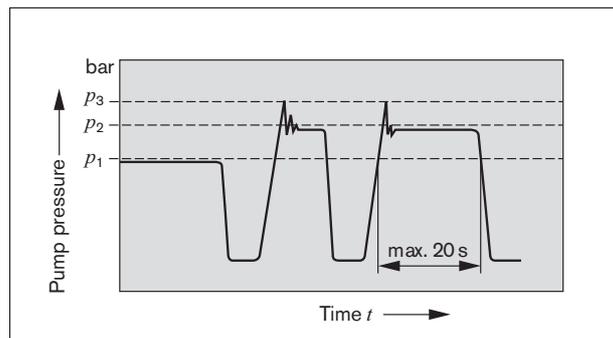
## Definition of direction of rotation

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

### AZPF-1x

Displacement	V	cm <sup>3</sup> /rev	4	5.5	8	11	14	16	19	22.5	22.5
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						210	180	210
Max. intermittent pressure $p_2$			280						230	210	230
Max. peak pressure $p_3$			300						250	230	250
Min. rotational speed	< 100	rpm	600	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
			180... $p_2$	1400	1400	1400	1200	1000	1000	1000	1000
	25 mm <sup>2</sup> /s		$p_2$	700	600	500	450	400	400	400	400
Max. rotational speed at	$p_2$		4000			3500	3000	3000	3000	2500	3000

\*) Version with extended bearings

### AZPF-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	
at bar	12 mm <sup>2</sup> /s		100...180	1200	1200	1000	1000	800	800	800	800	
			180... $p_2$	1400	1400	1400	1200	1000	1000	1000	1000	
	25 mm <sup>2</sup> /s		$p_2$	600	500	400	350	300	300	300	300	
Max. rotational speed at	$p_2$		4000			3500	3000	3000	3500	3500	3000	3000

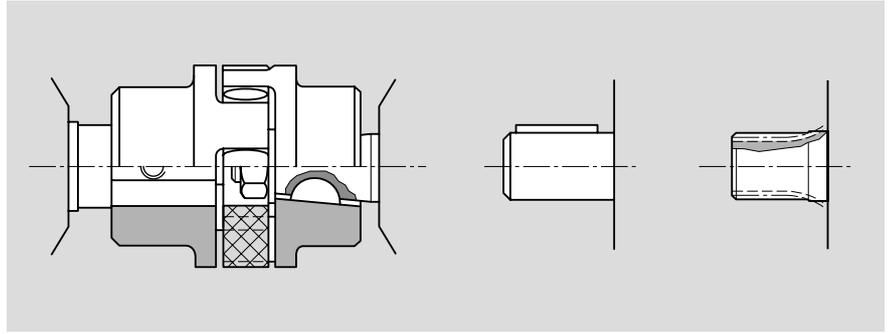
# Drive arrangements

## 1. Flexible couplings

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

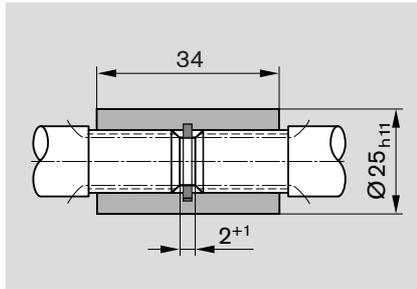
The maximum radial runout of shaft spigot is 0.2 mm.

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]
DIN	100	4...28
SAE	110	

## 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.

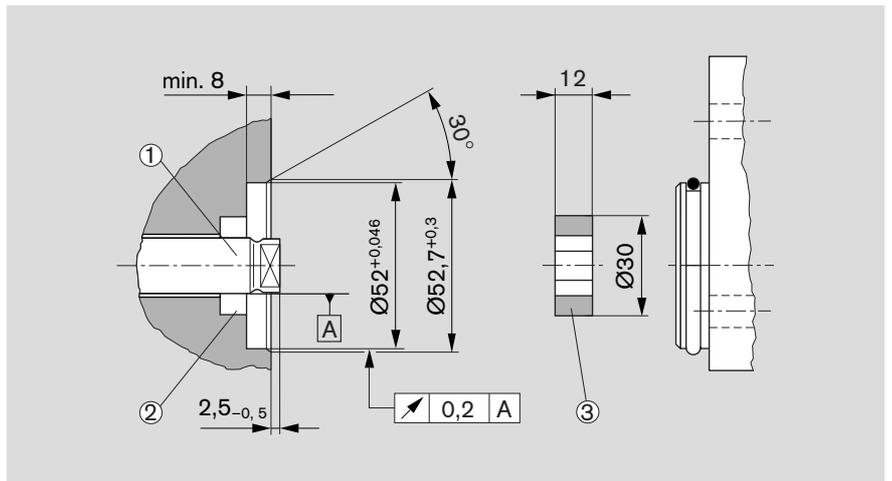
The recommended arrangements and dimensions for the drive end and sealing are as follows.

### ① Drive shaft

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

### 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.



## Drive with tang

### AZPF-1x

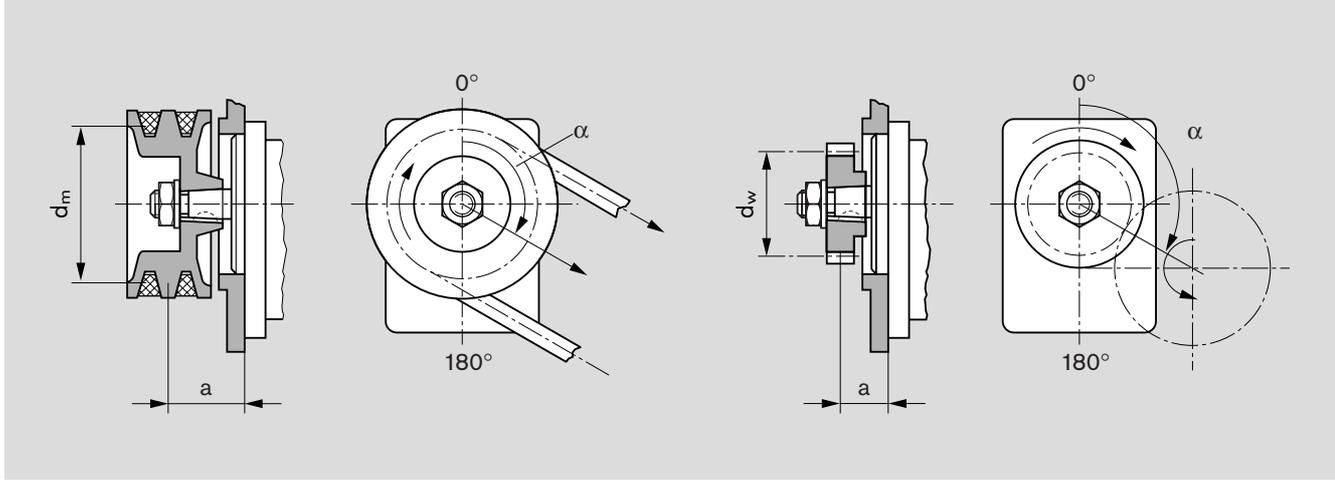
$M_{max.}$ [Nm]	$V$ [cm <sup>3</sup> /rev]	$p_{max.}$ [bar]
65	4...14	280
	16	230
65	19	190
	22.5	160

### AZPF-2x

$M_{max.}$ [Nm]	$V$ [cm <sup>3</sup> /rev]	$p_{max.}$ [bar]
85	4...14	280
	16	280
85	19	250
	22.5	210
85	25	190
	28	170

**4. V-belts and gearwheels without outboard bearing**

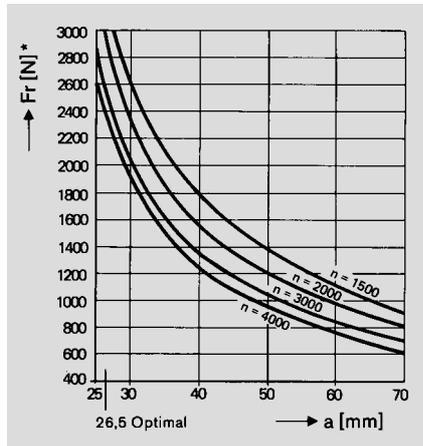
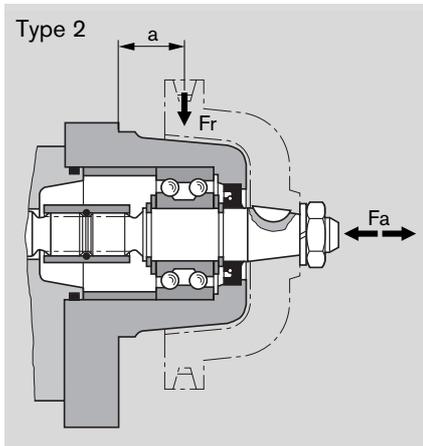
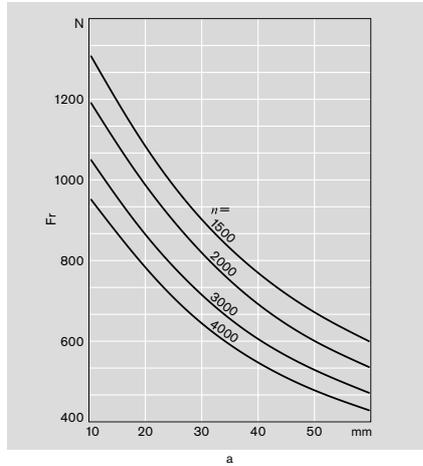
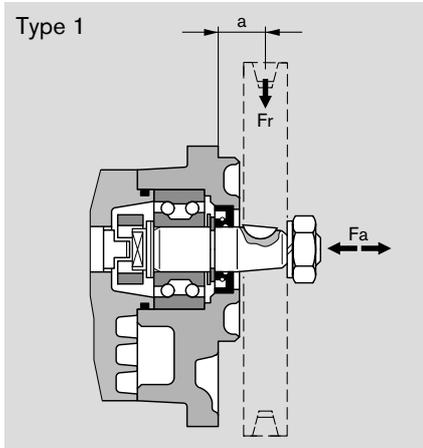
When proposing to use V-belt or gear drive, please submit details of the application for our comments (especially dimensions  $a$ ,  $d_m$ ,  $d_w$  and angle  $\alpha$ ).



**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  $L_H = 1000$  hours.

$M_{max.}$ [Nm]	$V$ [cm <sup>3</sup> /rev]	$p_{max.}$ [bar]
65	16	230
	19	190
	22.5	160



# 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

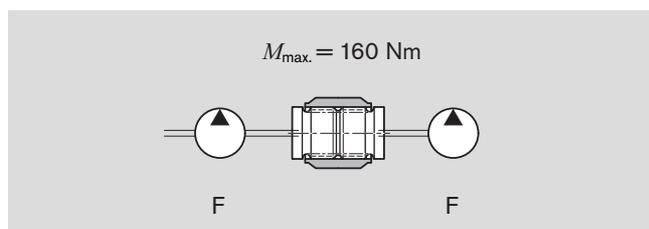
In the case of series S, the driver for the second pumping stage can carry a load of up to  $M_{max.} = 65 \text{ Nm}$ , i.e. there is a pressure restriction for the second stage and any further stages.

$M_{max.}$ [Nm]	$V$ [cm <sup>3</sup> /rev]	$p_{max.}$ [bar]
65	16	230
	19	190
	22.5	160
	25	140
	28	130

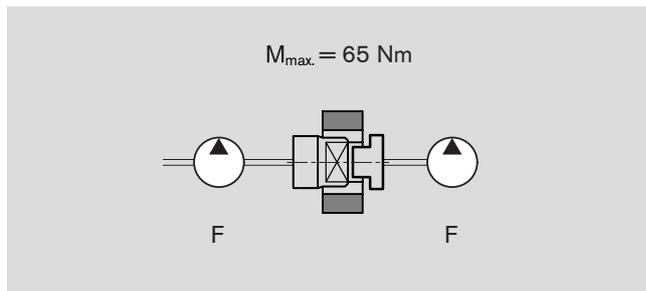
If the first stage is driven through a tang (driver) or outboard bearing type 1, pressure restrictions apply as indicated in the formula below.

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

### Reinforced through drive



### Standard through drive



### Combinations

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

### Max. transferrable drive torque \*

Function	Code letter	Designation	Max. transferrable drive torque * [Nm]
Spined shafts	R	SAE J744 16-4 9T	110
	P	SAE J744 19-4-11T	180
Tapered key shaft	C	1:5	155
	H	1:8	160
Cylinder shafts	G	Shafts Ø 15.875	55
	A	Shafts Ø 18	75
Claw	N	Dihedral claw	65

\* These values only apply when the conditions described on page 16 are complied with. Bosch Rexroth is to be consulted if the stated values are exceeded.

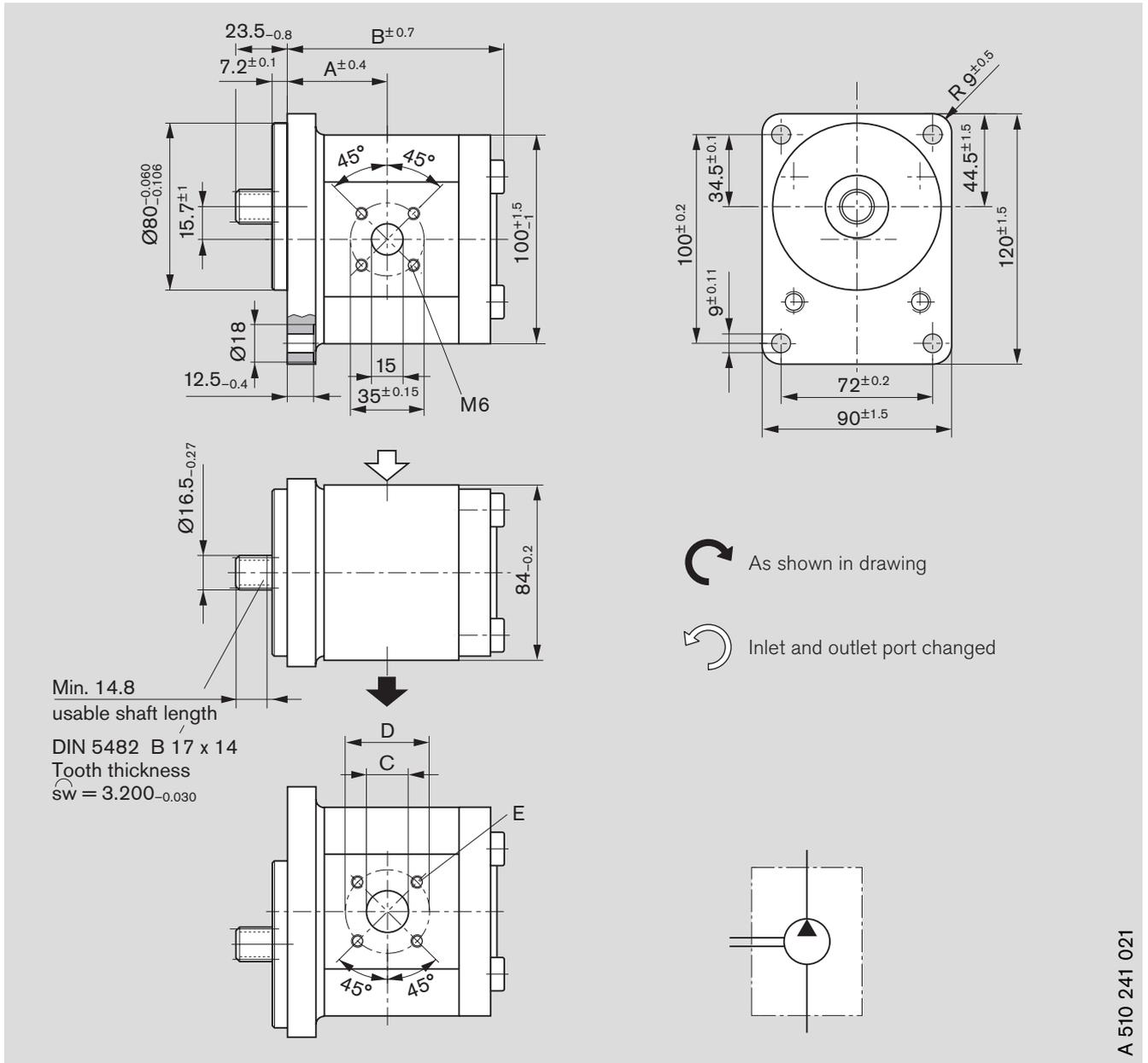
$$M_{max.} \cong \Delta p_1 \cdot V_1 \cdot 0.0177 + \Delta p_2 \cdot V_2 \cdot 0.0177 + \Delta p_3 \cdot V_3 \cdot 0.0177$$

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



# Unit dimensions

## Standard range



A 510 241 021

### Ordering code

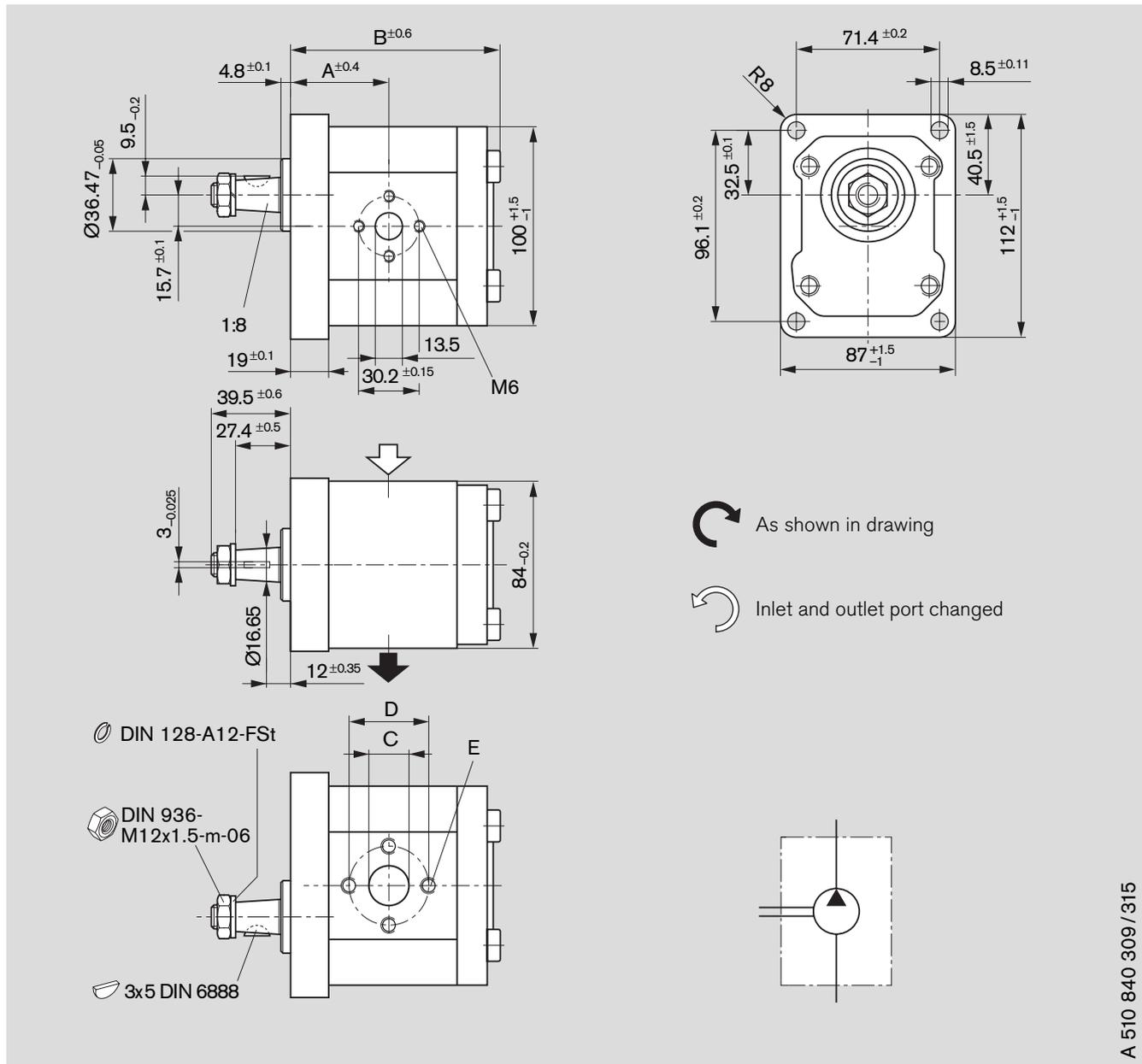
AZPF - 10 -     F B 20 M B

AZPF - 11 -     F B 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	0 510 225 307	0 510 225 007	280	4000	3.1	39.9	85.0	15	40	M6 depth 13
5.5	0 510 325 307	0 510 325 007	280	4000	3.2	41.1	87.5	15	40	
8	0 510 425 308	0 510 425 010	280	4000	3.3	43.2	91.6	20	40	
9	0 510 425 336*	-	280	4000	3.4	43.7	92.4	20	40	
11	0 510 525 312	0 510 525 010	280	3500	3.5	47.0	96.6	20	40	
14	0 510 525 328	0 510 525 030	280	3000	3.6	47.5	101.6	20	40	
16	0 510 625 317	0 510 625 015	280	3000	3.65	47.5	105.0	20	40	
19	0 510 625 316	0 510 625 014	230	3000	3.8	47.5	110.0	20	40	
22.5	0 510 725 349	-	230	3000	4.4	61.1	127.4	20	40	
22.5	-	0 510 725 062	210	2500	4.0	55.1	115.4	20	40	

# Unit dimensions

## Standard range



### Ordering code

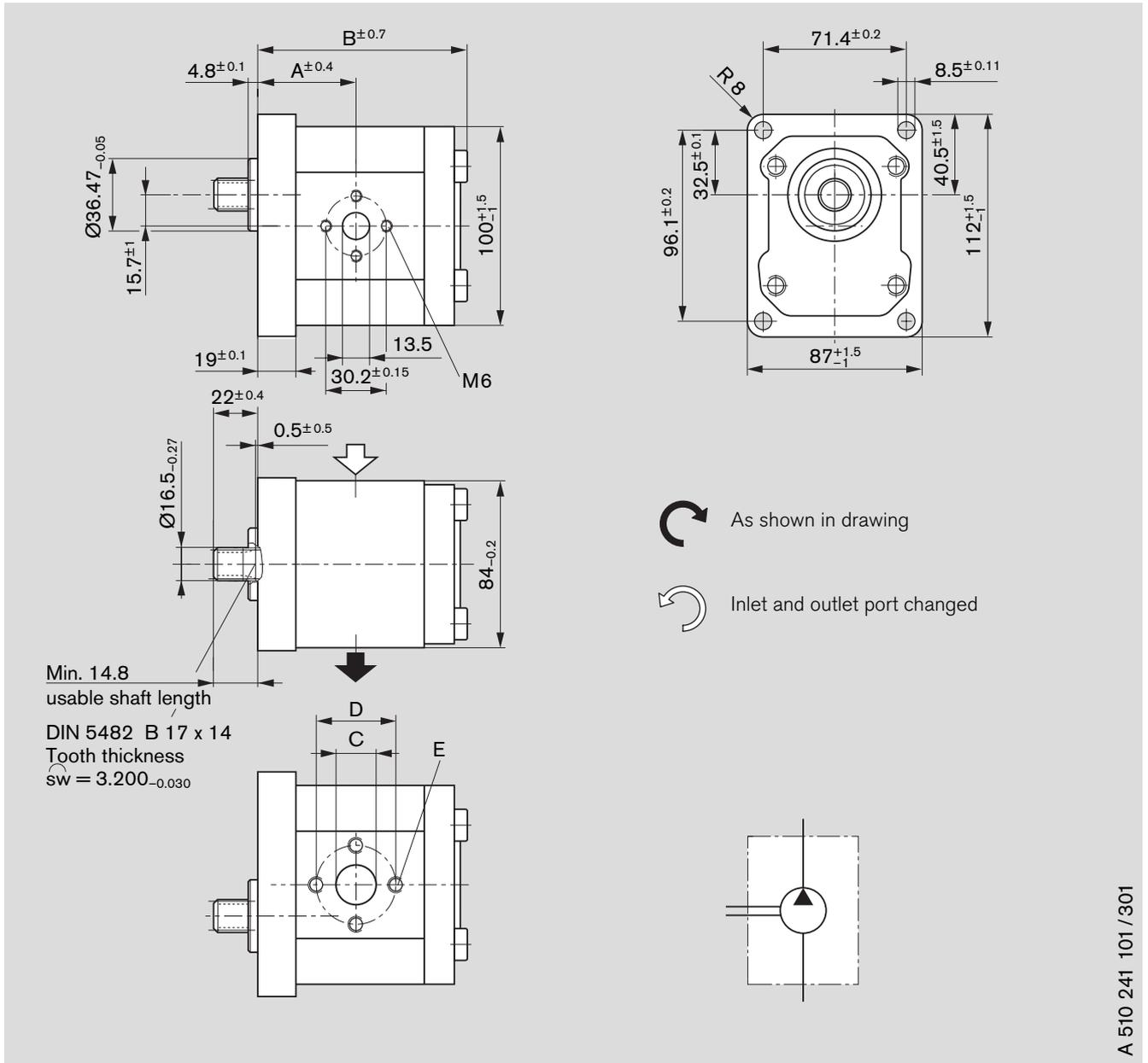
AZPF - 12 -     H O 30 K B

AZPF - 22 -     H O 30 K 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	0 510 225 317	0 510 225 022	280	4000	3.1	41.4	84.1	13.5	30.2	M6
5.5	0 510 325 320	0 510 325 025	280	4000	3.2	42.6	86.6	13.5	30.2	depth 13
8	0 510 425 334	0 510 425 043	280	4000	3.3	44.7	92.5	13.5	30.2	
11	0 510 525 374	0 510 525 074	280	3500	3.4	48.5	97.5	13.5	30.2	M8
14	0 510 525 375	0 510 525 075	280	3000	3.6	49.0	102.5	13.5	30.2	depth 13
16	0 510 625 381	0 510 625 075	280	3000	3.6	49.0	105.9	13.5	30.2	
19	0 510 625 386*	0 510 625 076*	280	3500	4.1	59.9	121.1	20.0	39.7	
22.5	0 510 725 410*	0 510 725 112*	250	3500	4.2	62.6	126.5	20.0	39.7	
25	0 510 725 411*	0 510 725 113*	225	3000	4.4	64.7	132.5	20.0	39.7	
28	0 510 725 412*	0 510 725 114*	200	3000	4.5	67.1	137.3	20.0	39.7	

# Unit dimensions

## Standard range



A 510 241 101 / 301

### Ordering code

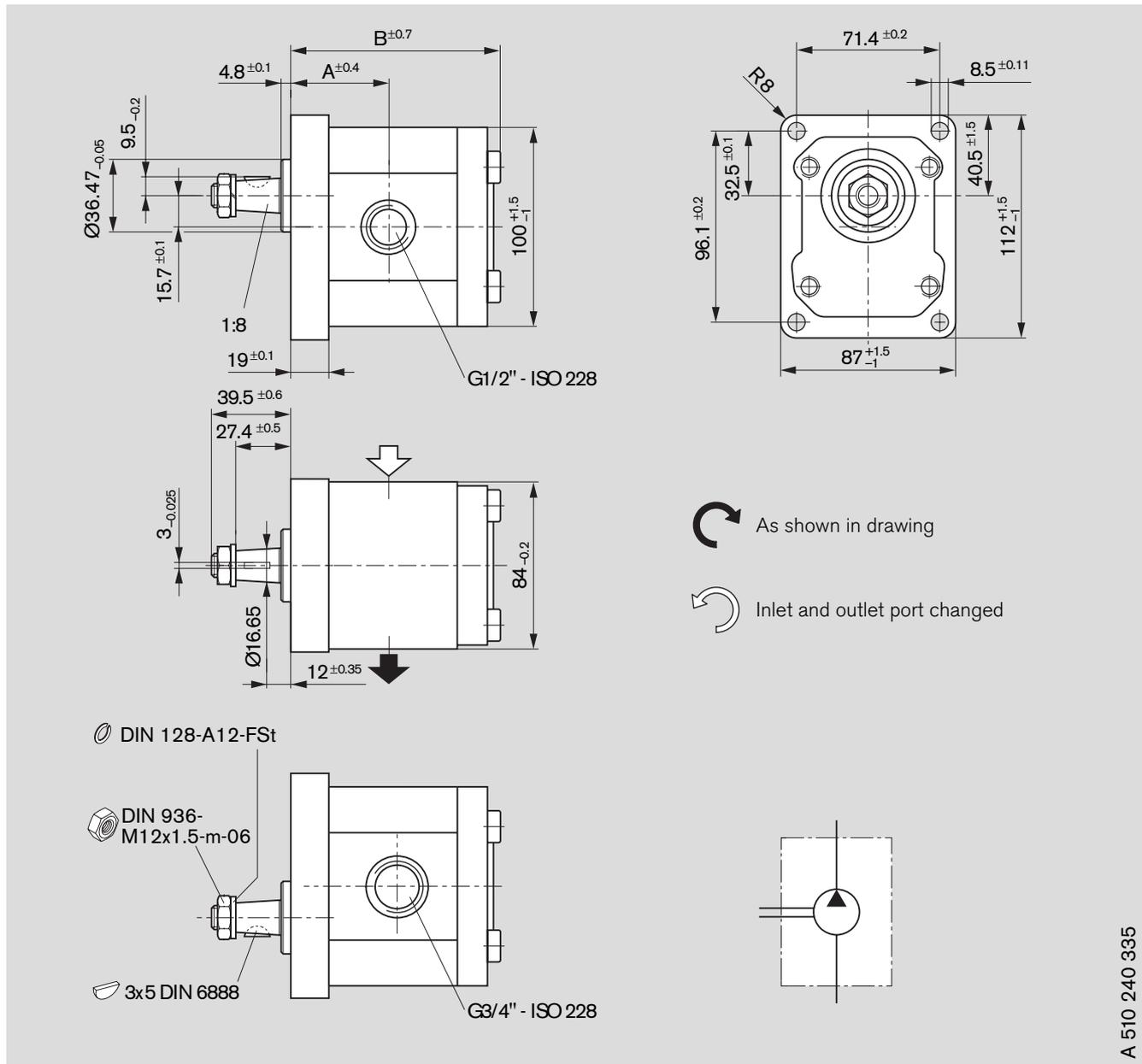
AZPF - 10 -     F O 30 M B

AZPF - 10 -     F O 30 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
8	0 510 425 315	0 510 425 021	280	4000	3.3	44.7	93.1	13.5	30.2	M6, depth 13
11	0 510 525 323	0 510 525 024	280	3500	3.4	48.5	98.1	20.0	39.7	M8, depth 13
11	0 510 525 331*	-	210	3500	3.3	48.5	98.1	20.0	39.7	
14	-	0 510 525 034*	210	3000	3.4	49.0	103.1	20.0	39.7	
16	0 510 625 327*	0 510 625 039*	210	3000	3.5	49.0	106.5	20.0	39.7	
19	-	0 510 625 049*	210	3000	3.7	49.0	111.5	20.0	39.7	
19	0 510 625 332*	-	210	3000	4.0	59.9	123.5	20.0	39.7	
22.5	0 510 725 348*	0 510 725 076*	210	3000	4.2	62.6	127.8	20.0	39.7	

# Unit dimensions

## Standard range



A 510 240 335

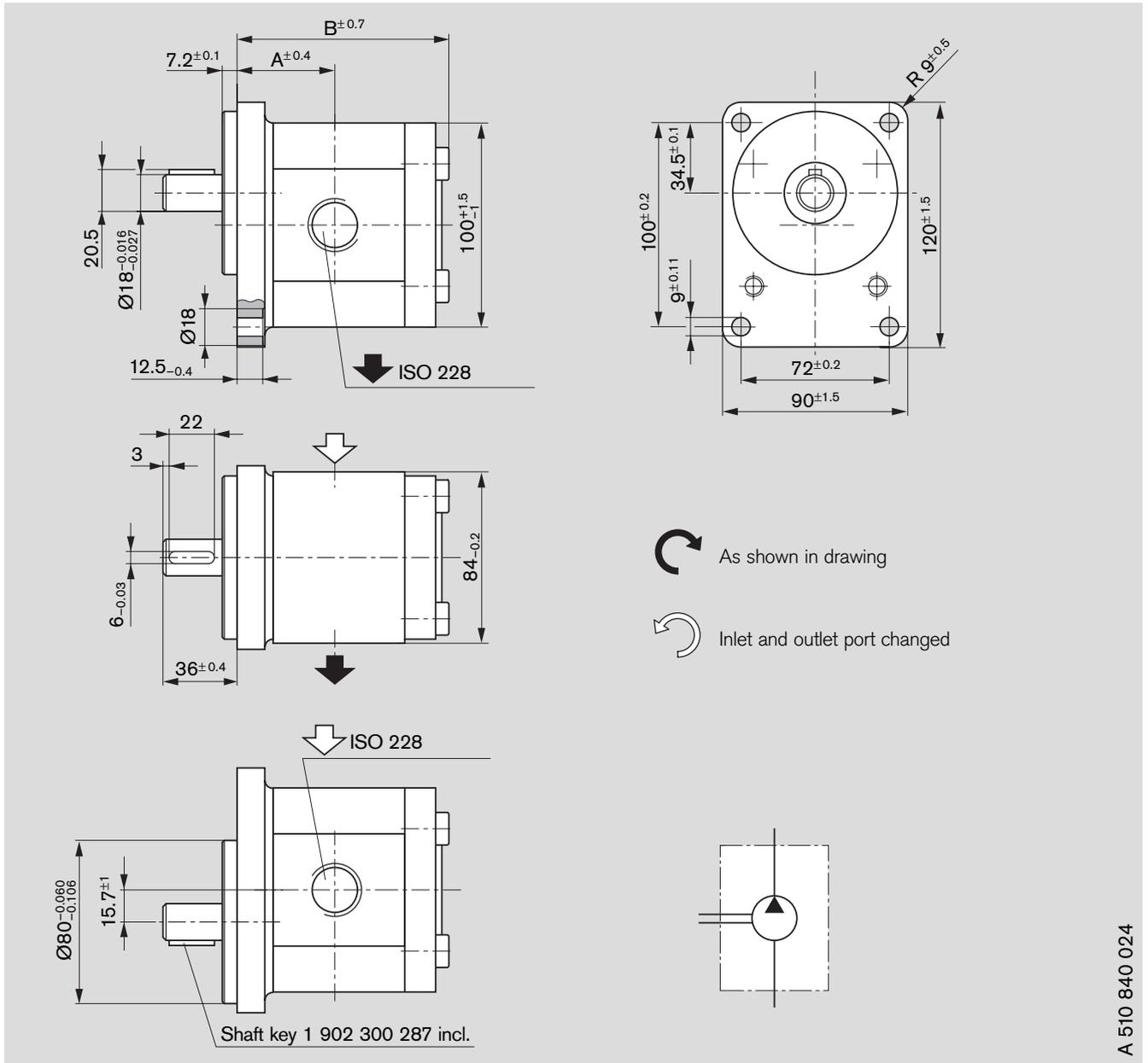
### Ordering code

AZPF - 10 -     H O 01 M B

Displacement [cm³/rev]	Ordering-No.		Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]		
	L	R				A	B	G
4	-	-	-	-	-	-	-	ISO 228
5.5	-	<b>0 510 325 018</b>	280	4000	3.1	42.6	89.0	depth 16
8	-	<b>0 510 425 027</b>	280	4000	3.15	44.7	93.1	
11	-	<b>0 510 525 039</b>	280	3500	3.3	48.5	98.1	
14	-	<b>0 510 525 040</b>	280	3000	3.4	49.0	103.1	
16	-	<b>0 510 625 047</b>	280	3000	3.58	49.0	106.5	
19	-	<b>0 510 625 052</b>	230	3000	3.6	49.0	111.5	
22.5	-	<b>0 510 725 084</b>	210	2500	3.8	56.6	116.4	

# Unit dimensions

## Standard range



A 510 840 024

### Ordering code

AZPF - 11 -    A B 01 M B

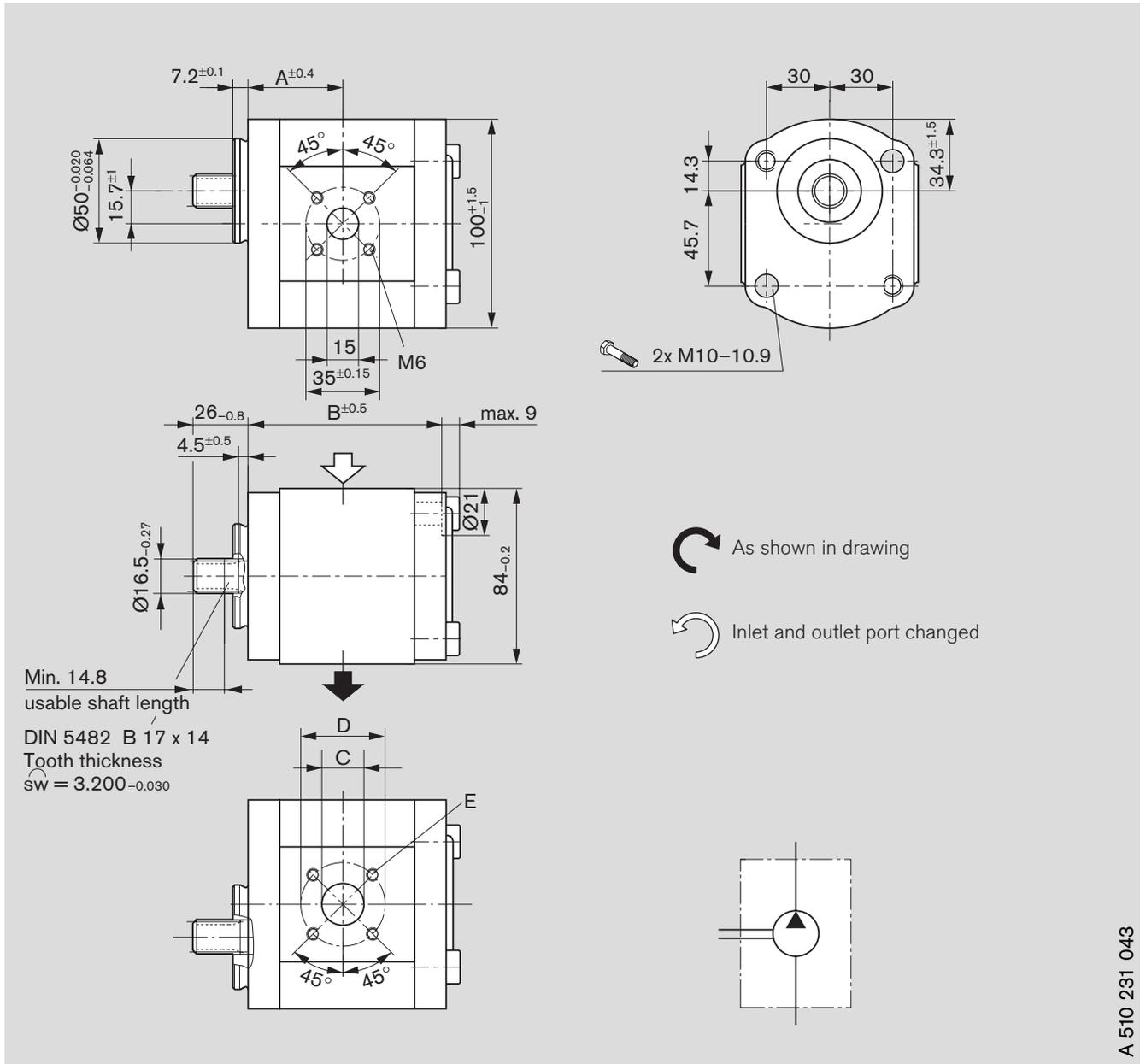
Displacement [cm <sup>3</sup> /rev]	Ordering-No.		Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]		
						A	B	G
4	0 510 225 318	0 510 225 023	280	4000	3.3	39.9	84.3	G 1/2 - ISO 228
5.5	0 510 325 321	0 510 325 026	280	4000	3.3	41.1	85.2	depth 16
8	0 510 425 335	0 510 425 044	280	4000	3.4	43.2	89.3	G 3/4 - ISO 228 depth 16
11	0 510 525 376	0 510 525 076	280	3500	3.6	45.6	94.3	
14	-	-	-	-	-	-	-	
16	0 510 625 382	0 510 625 077	250	3000	3.8	49.9	102.7	
19	-	-	-	-	-	-	-	
22.5	0 510 725 418	0 510 725 120	180	2500	4.1	55.1	114.7	





# Unit dimensions

## Standard range



A 510 231 043

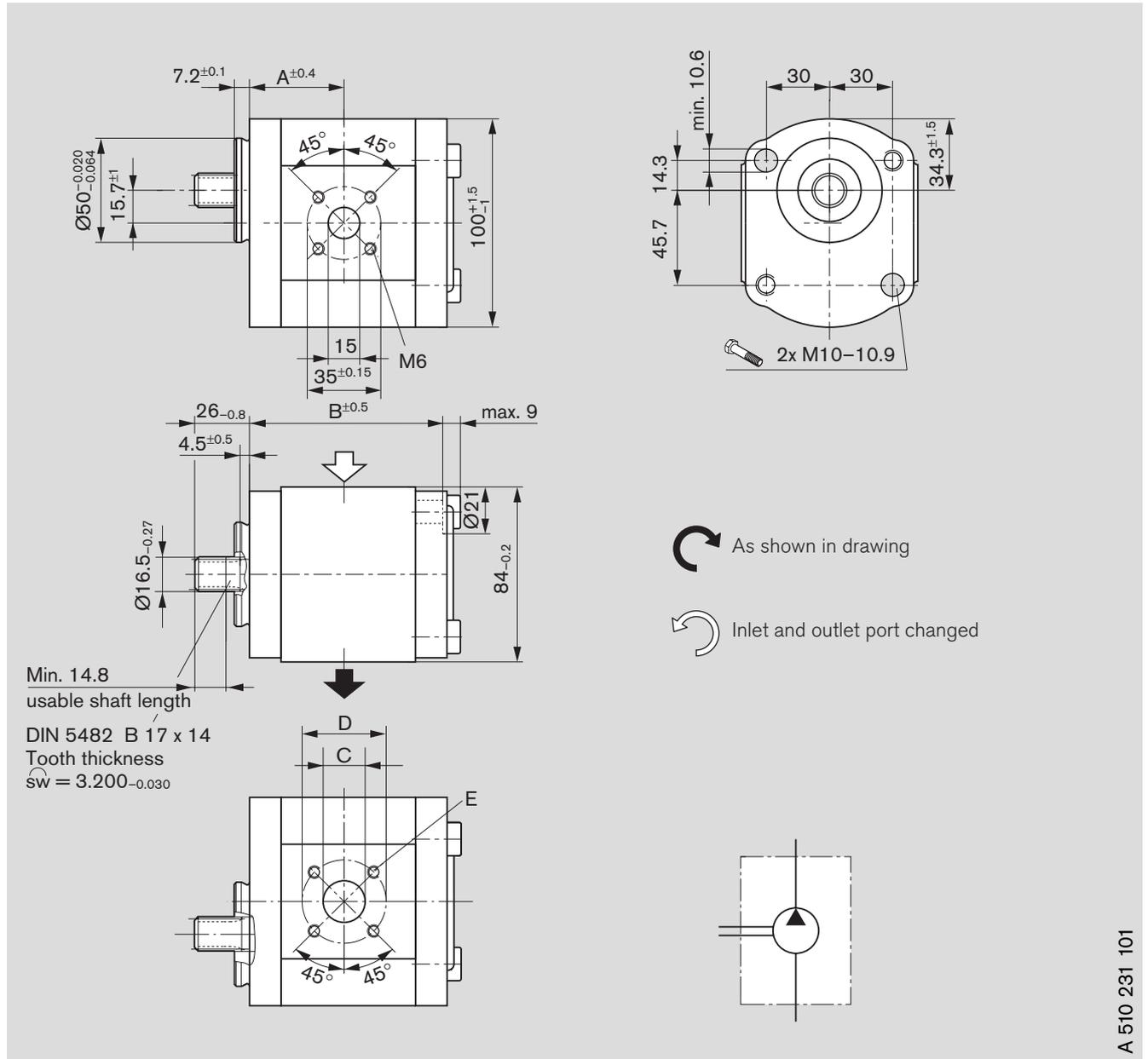
### Ordering code

AZPF - 10 -    FN 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
5.5	-	0 510 315 007	280	4000	2.55	38.6	76.2	15	40	M 6 depth 13
8	-	-	-	-	-	-	-	-	-	
11	-	0 510 515 011	280	3500	2.85	44.5	85.3	20	40	
14	-	-	-	-	-	-	-	-	-	
16	-	-	-	-	-	-	-	-	-	
19	-	0 510 615 009	230	3000	3.2	45.0	98.7	20	40	
19	-	-	-	-	-	-	-	-	-	
22.5	-	-	-	-	-	-	-	-	-	

# Unit dimensions

## Standard range



A 510 231 101

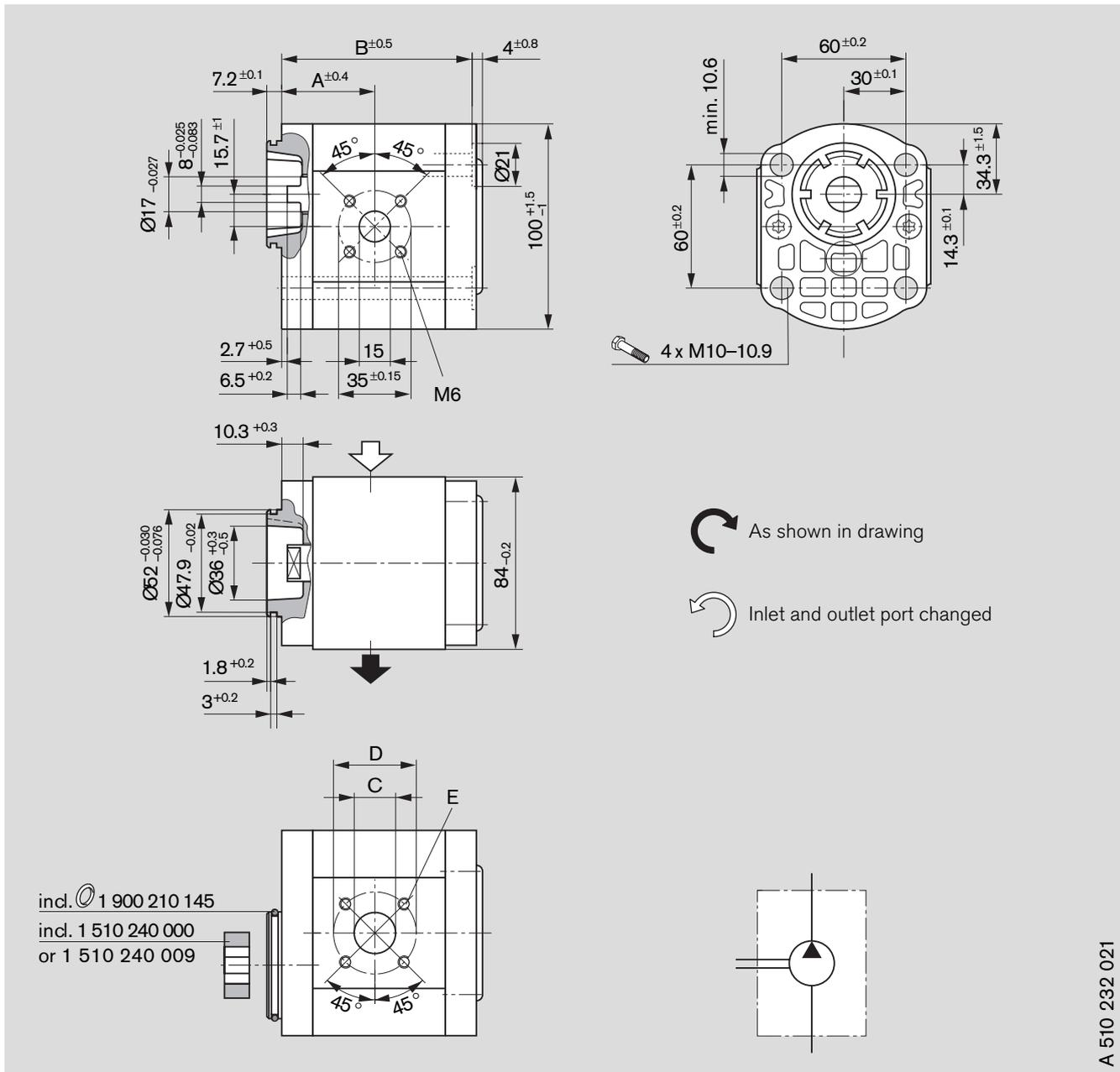
### Ordering code

AZPF - 10 -     F P 20 P B  
 AZPF - 12 -     F P 20 P B\*  
 AZPF - 12 -     F P 20 P B S xxxx\*\*

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
5.5	-	-	-	-	-	-	-	-	-	M6
8	0 510 415 328	-	210	4000	2.7	40.7	80.3	20	15	depth 13
11	0 510 515 337*	0 510 515 012	280	3500	2.8	44.5	85.3	20	15	
14	0 510 515 338	0 510 515 013	210	3000	3.0	45.0	90.3	20	15	
16	-	-	-	-	-	-	-	-	-	
19	-	-	-	-	-	-	-	-	-	
22.5	0 510 715 320**	0 510 715 008**	210	3000	3.6	58.6	116.1	20	15	

# Unit dimensions

## Standard range



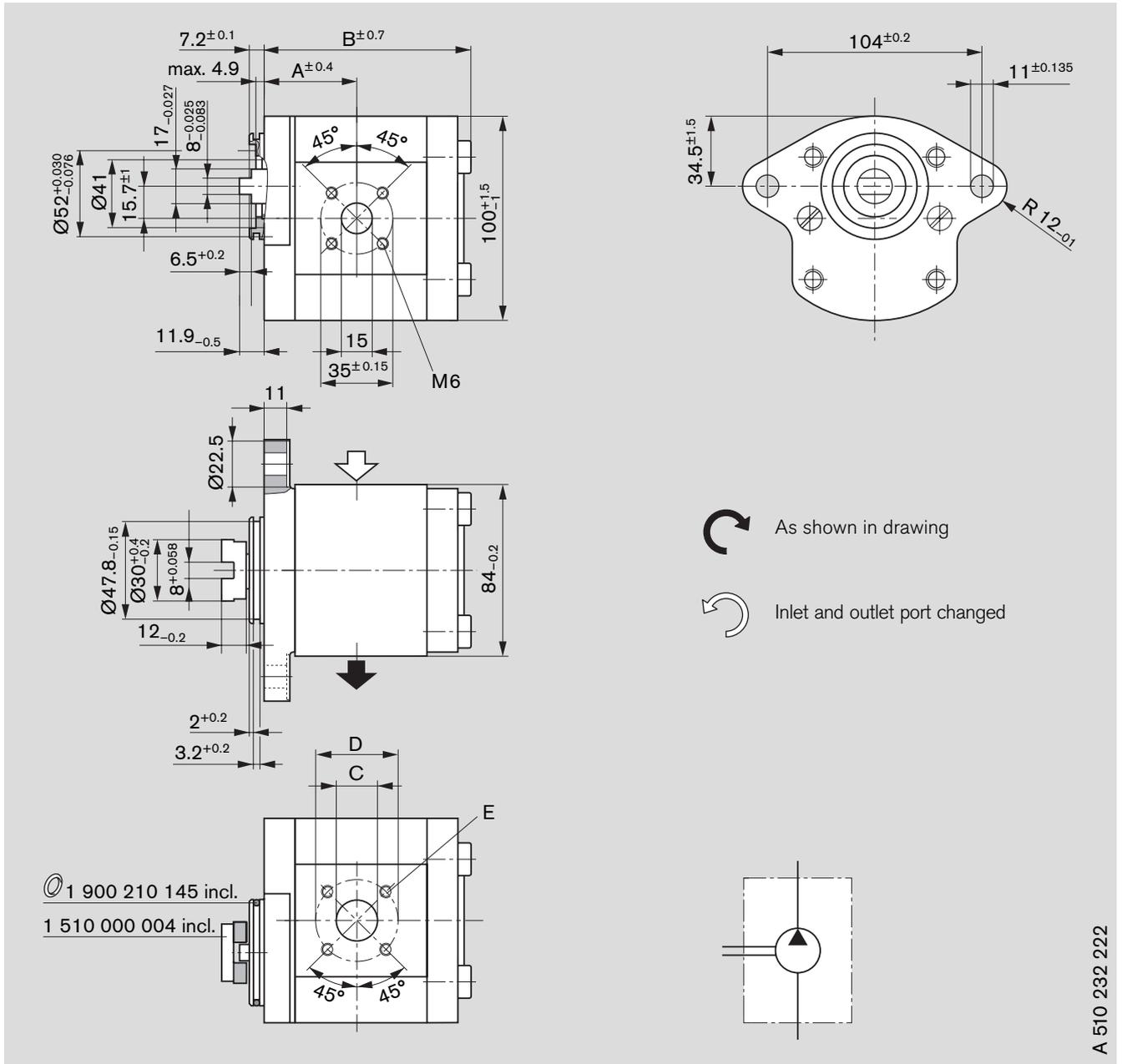
### Ordering code

AZPF - XX -     NT 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	0 510 215 307	0 510 215 007	280	4000	2.5	37.4	73.7	15	40	M 6 depth 13
5.5	0 510 315 305	0 510 315 005	280	4000	2.5	38.6	76.2	15	40	
8	0 510 415 314	0 510 415 006	280	4000	2.5	40.7	80.3	20	40	
11	0 510 515 311	0 510 515 005	280	3500	2.6	44.5	85.3	20	40	
14	0 510 515 340	0 510 515 019	280	3000	2.38	45.0	90.3	20	40	
16	0 510 615 315	0 510 615 007	230	3000	3.0	45.0	93.7	20	40	
19	0 510 615 321	0 510 615 008	190	3000	3.0	45.0	98.7	20	40	
22.5	0 510 715 307	0 510 715 004	160	2500	3.2	52.6	104.1	20	40	

# Unit dimensions

## Standard range



A 510 232 222

### Ordering code

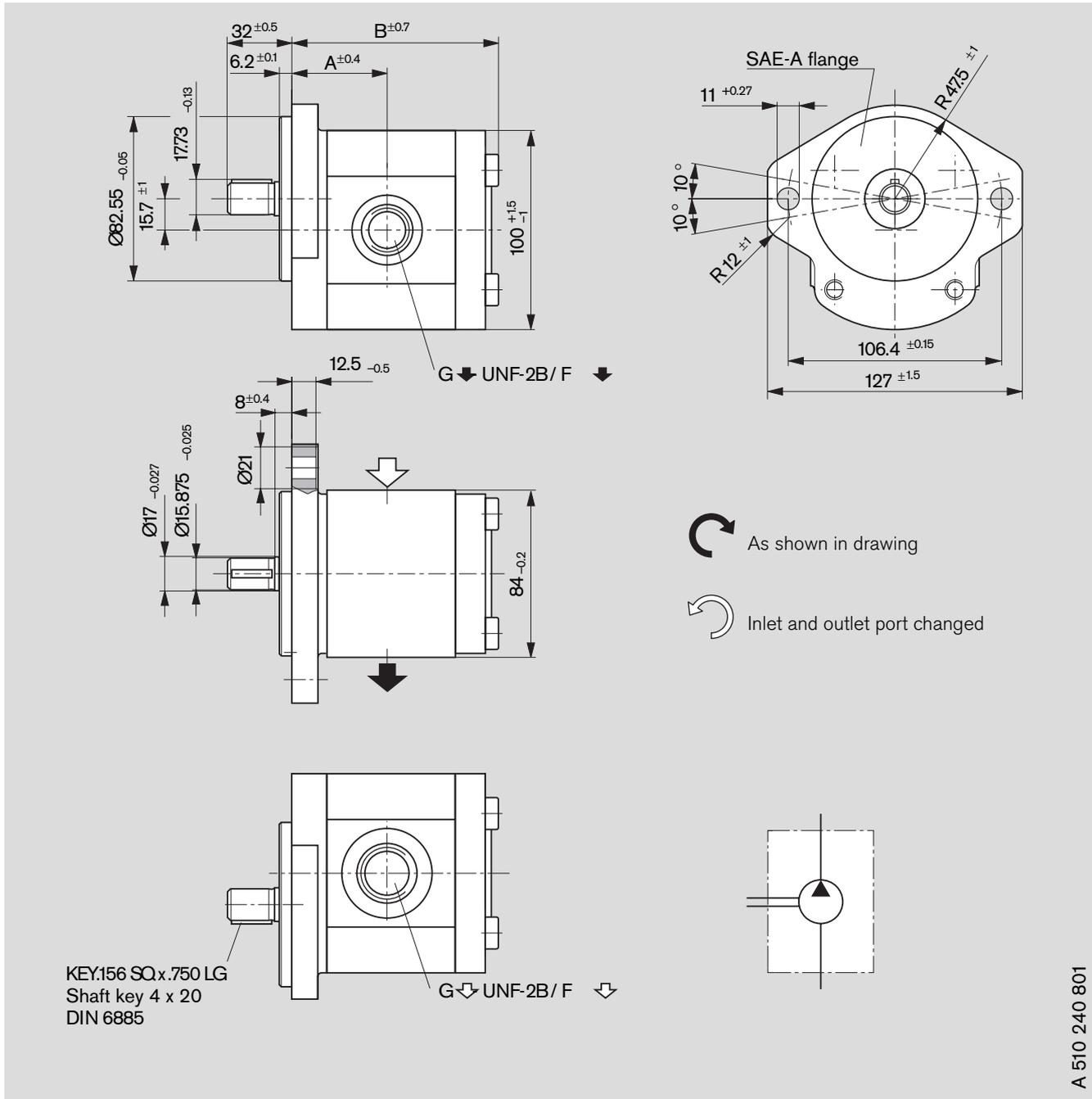
AZPF - 10 -     N L 20 K B

AZPF - 11 -     N L 20 K 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	-	0 510 225 012	280	4000	2.8	37.4	81.7	15	40	M6
5.5	0 510 325 312	0 510 325 012	280	4000	2.82	38.6	84.4	15	40	depth 13
8	0 510 425 331*	0 510 425 019	280	4000	3.0	40.7	88.5	20	40	
11	-	0 510 525 025	280	3500	3.1	44.5	93.3	20	40	
16	0 510 625 358*	0 510 625 027*	230	3000	3.3	45.0	101.9	20	40	
19	0 510 625 368	0 510 625 032	190	3000	3.5	45.0	106.9	20	40	
22.5	-	0 510 725 044*	160	3000	4.0	58.6	122.5	20	40	

# Unit dimensions

## Standard range



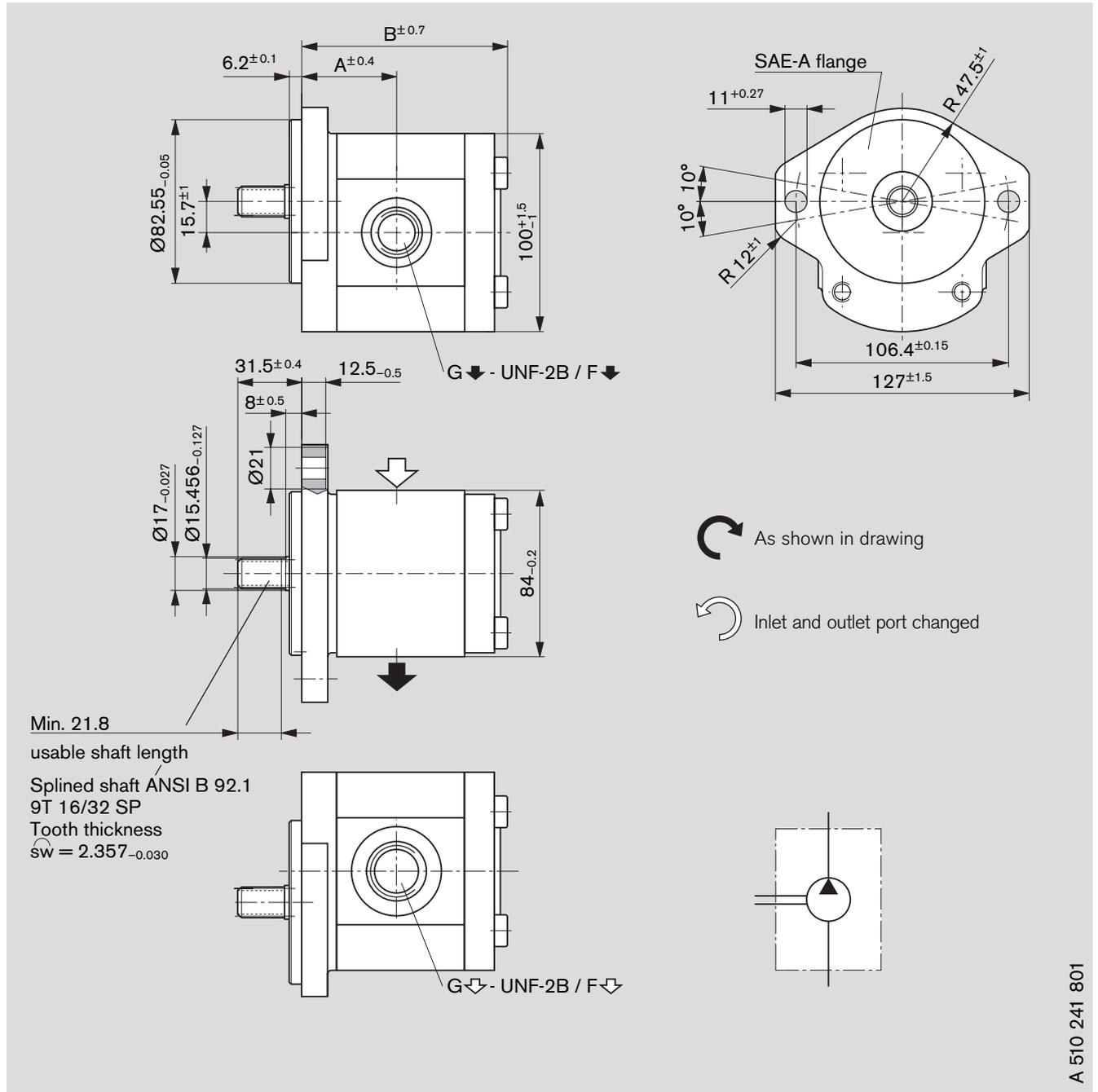
### Ordering code

AZPF - 10 -     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	$G \downarrow$	$G \uparrow$	$F \downarrow$	$F \uparrow$
4	-	0 510 225 011	260	4000	3.3	39.9	85.0	9/16-18	9/16-18	13	13
5.5	-	0 510 325 011	260	4000	3.3	41.1	87.5	9/16-18	9/16-18	13	13
8	-	0 510 425 016	260	4000	3.4	43.2	91.6	7/8-14	7/8-14	16	16
11	-	0 510 525 015	260	3500	3.6	47.0	96.6	7/8-14	7/8-14	16	16
14	-	0 510 525 031	230	3000	3.65	47.5	101.6	11/16-12	7/8-14	19	16
16	-	0 510 625 021	200	3000	3.7	47.5	105.0	11/16-12	7/8-14	19	16
19	-	0 510 625 041	170	3500	3.9	47.5	110.0	11/16-12	7/8-14	19	16
22.5	-	0 510 725 059	140	2500	4.0	55.1	115.4	11/16-12	7/8-14	19	16

# Unit dimensions

## Standard range



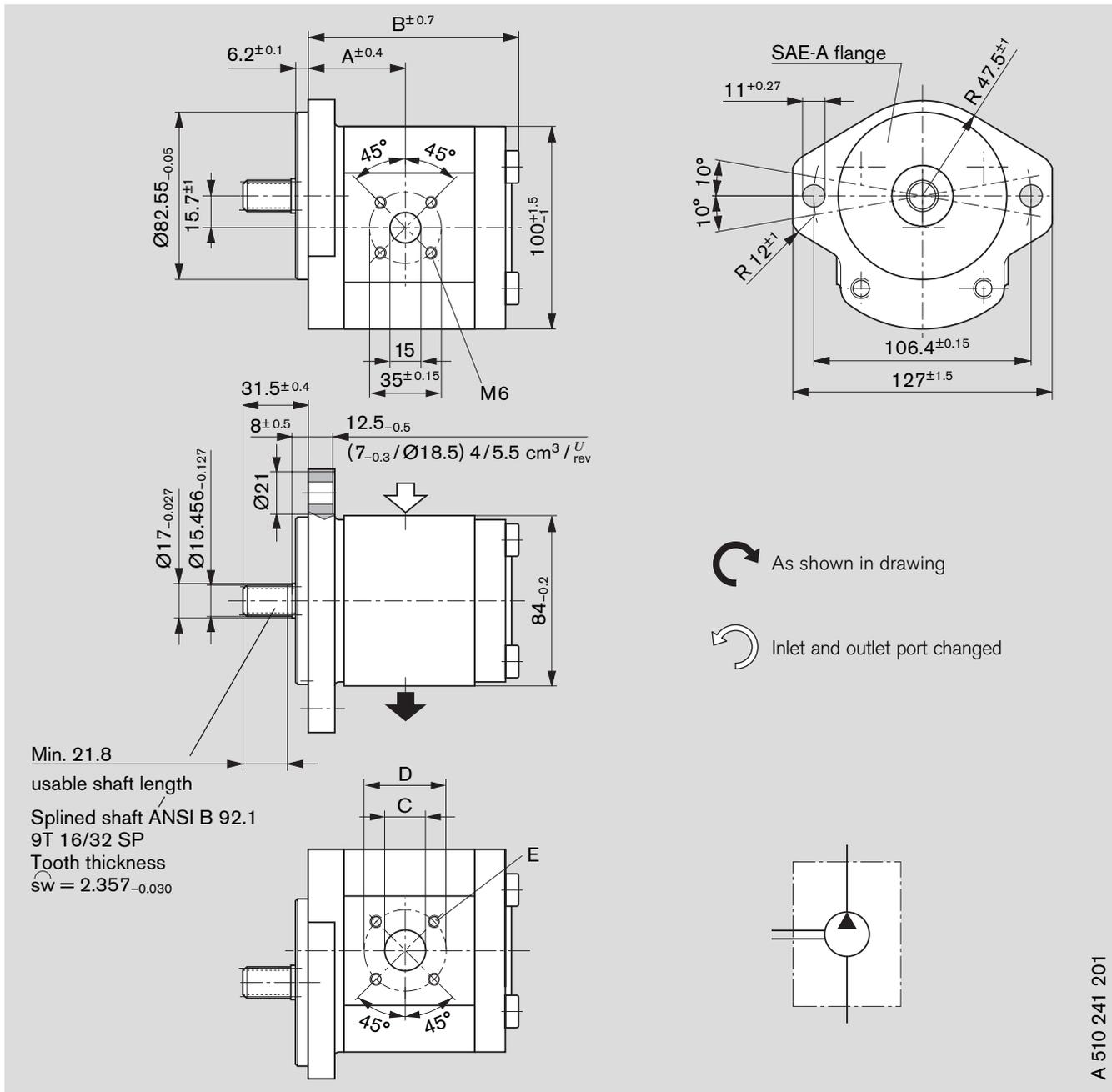
### Ordering code

AZPF - 10 -    R R 12 M B

Dis- place- ment [cm <sup>3</sup> /rev]	Ordering-No.		Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]					
						A	B	$G \downarrow$	$G \leftarrow$	$F \downarrow$	$F \leftarrow$
4	-	<b>0 510 225 010</b>	280	4000	3.15	39.9	82.7	9/16-18	9/16-18	13	13
5.5	-	<b>0 510 325 010</b>	280	4000	3.2	41.4	85.2	9/16-18	9/16-18	13	13
8	-	<b>0 510 425 015</b>	280	4000	3.3	43.2	91.1	7/8-14	7/8-14	16	16
11	<b>0 510 525 315</b>	<b>0 510 525 014</b>	280	3500	3.4	47.0	96.1	11/16-12	7/8-14	19	16
14	-	<b>0 510 525 041</b>	280	3000	3.5	47.5	101.1	11/16-12	7/8-14	19	16
16	-	<b>0 510 625 020</b>	280	3000	3.75	47.5	104.5	11/16-12	7/8-14	19	16
19	<b>0 510 625 346</b>	<b>0 510 625 048</b>	230	3000	3.9	47.5	109.5	11/16-12	7/8-14	19	16
22.5	-	<b>0 510 725 063</b>	210	2500	4.0	55.1	114.9	11/16-12	7/8-14	19	16

# Unit dimensions

## Standard range



### Ordering code

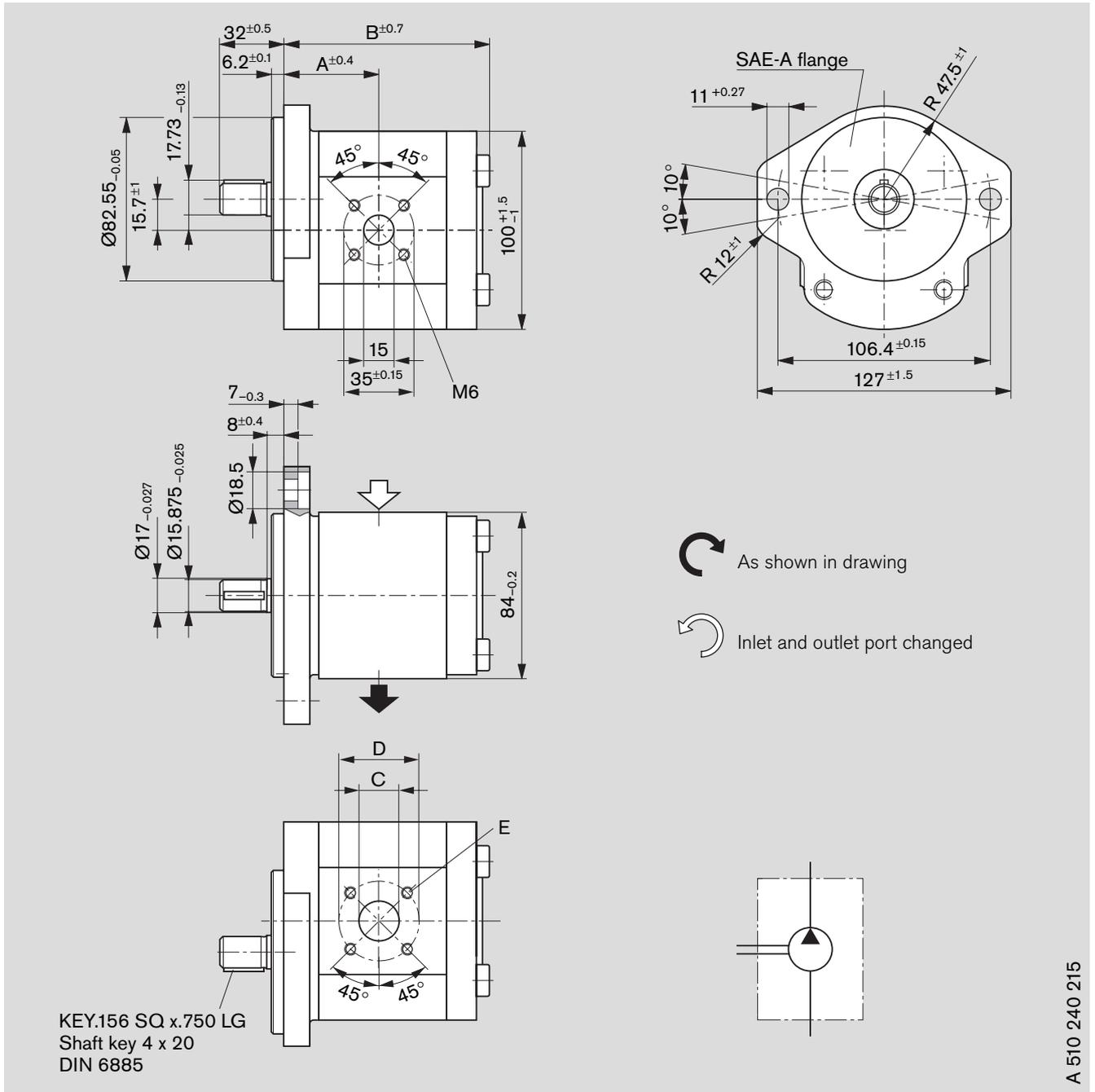
AZPF - 10 -     R R 20 M B

AZPF - 11 -     R R 20 K 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	0 510 225 314	0 510 225 013	280	4000	3.15	39.9	85.0	15	40	M6
5.5	0 510 325 313	0 510 325 013	280	4000	3.2	41.1	87.5	15	40	depth 13
8	0 510 425 314	0 510 425 020	280	4000	3.3	43.2	91.6	20	40	
11	0 510 525 324*	0 510 525 019	280	3500	3.5	47.0	96.6	20	40	
14	0 510 525 325	0 510 525 020	280	3000	3.6	47.5	101.6	20	40	
16	0 510 625 329	0 510 625 028	280	3000	3.8	47.5	105.0	20	40	
19	0 510 625 330*	0 510 625 029*	230	3000	3.9	47.5	110.0	20	40	
22.5	0 510 725 361	0 510 725 077*	210	2500	4.1	55.1	115.4	20	40	

# Unit dimensions

## Standard range



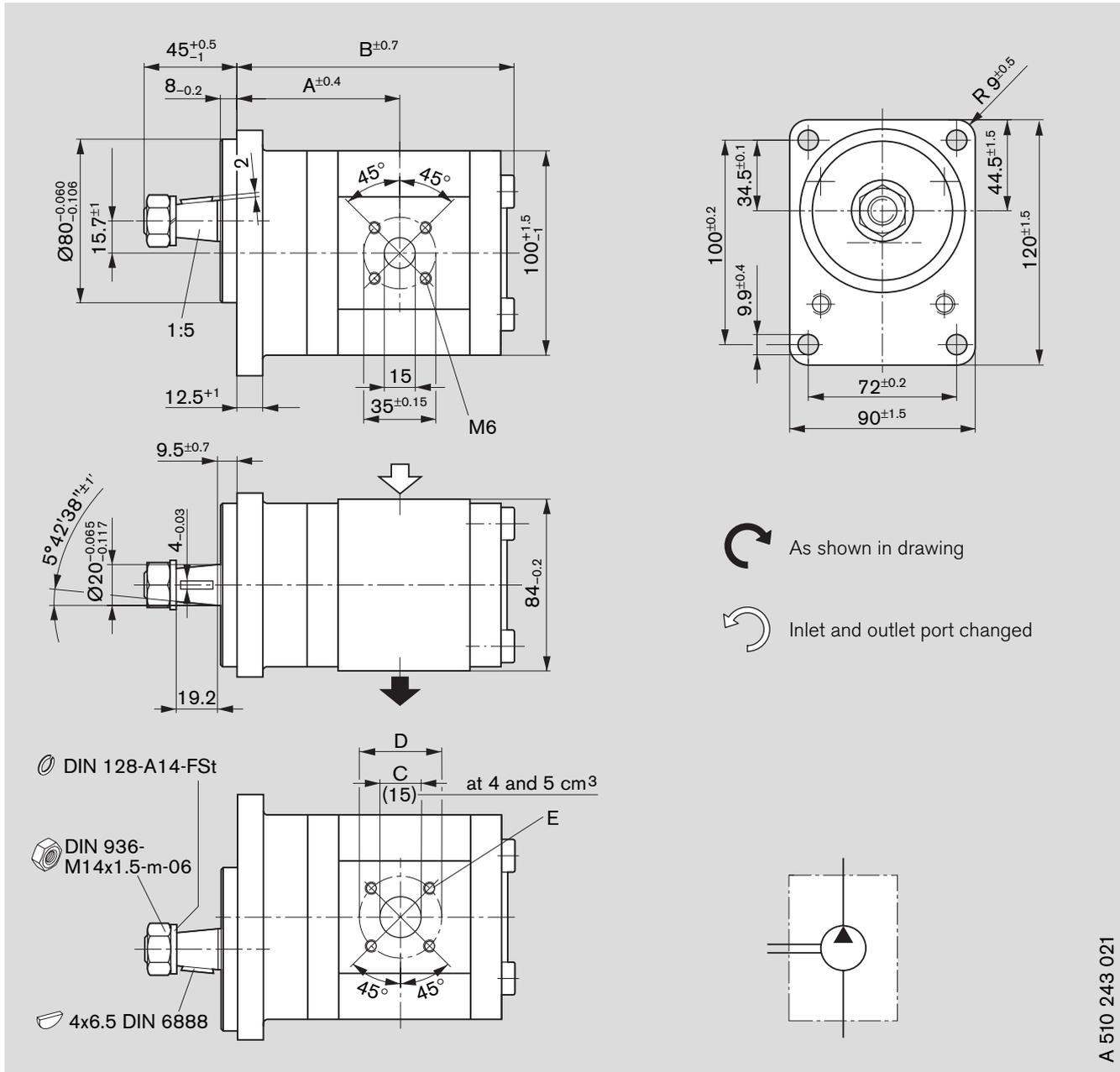
### Ordering code

AZPF - 10 -    Q R 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	-	0 510 225 014	280	4000	3.2	39.9	84.5	15	40	M6 depth 13
5.5	-	0 510 325 016	280	4000	3.3	41.1	87.0	15	40	
8	-	0 510 425 025	280	4000	3.3	43.2	91.1	20	40	
11	-	0 510 525 033	280	3500	3.5	47.0	96.1	20	40	
16	-	0 510 625 042	200	3000	3.8	47.5	104.5	20	40	
19	-	0 510 625 043	170	3000	3.9	47.5	109.5	20	40	
22.5	0 510 725 396	0 510 725 060	140	2500	3.9	55.1	114.9	20	40	

# Unit dimensions

## Standard range



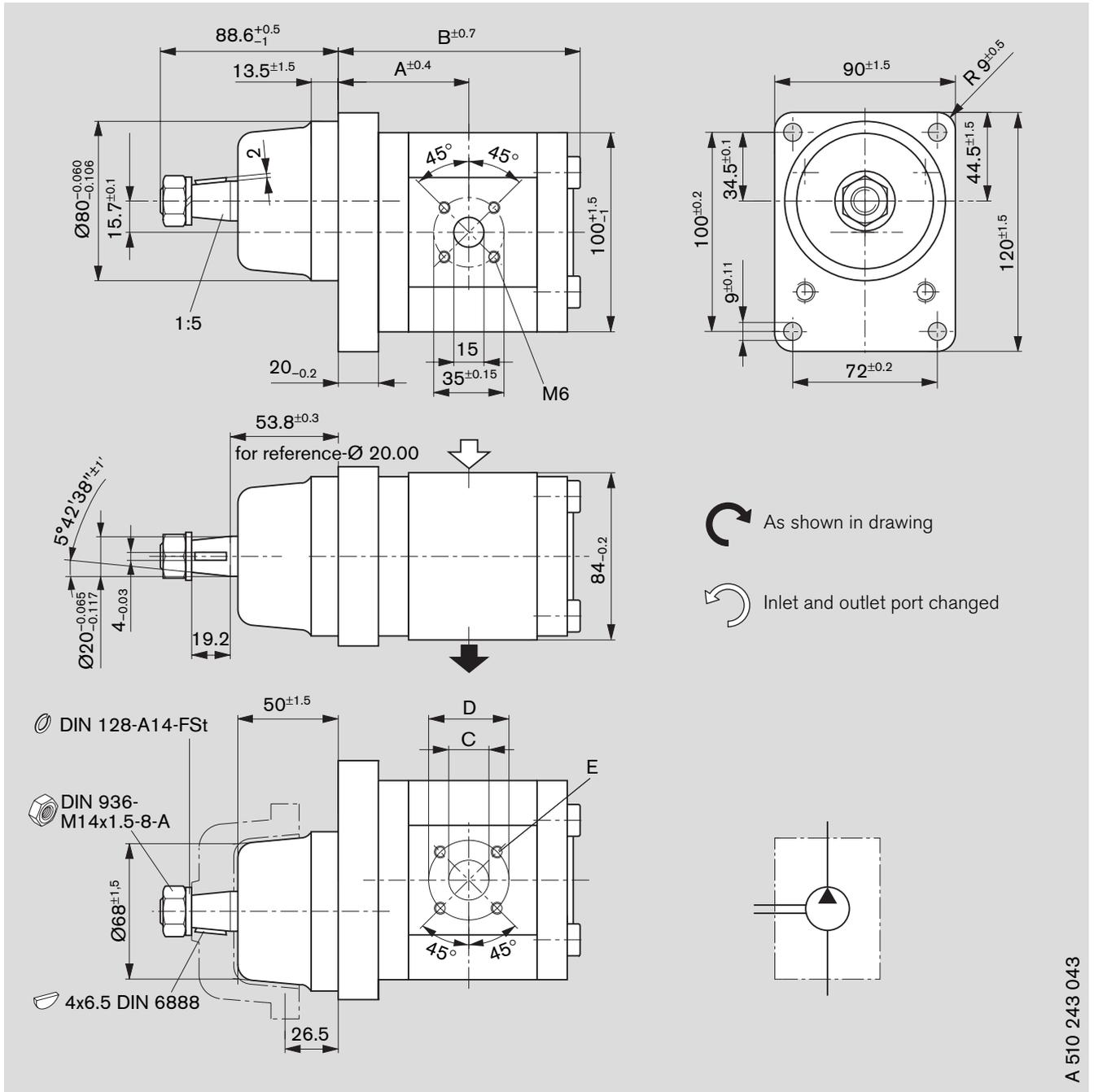
### Ordering code

AZPF - 11 -     S A 20 M B  
 AZPF - 11 -     S A 20 K 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	0 510 245 300	0 510 245 001	280	4000	3.1	71.1	114.2	15	40	M6 depth 13
5.5	0 510 345 300	0 510 345 001	280	4000	3.1	72.3	116.7	15	40	
8	0 510 445 300	0 510 445 001*	280	4000	3.3	74.4	120.8	20	40	
11	0 510 545 300	0 510 545 001	280	3500	3.5	78.2	125.8	20	40	
14			280	3000		78.7	130.8	20	40	
16	0 510 645 300	0 510 645 004	230	3000	3.6	78.7	134.2	20	40	
19		0 510 645 002	190	3000	3.9	78.7	139.2	20	40	
22.5			160	2500		92.3	156.6	20	40	

# Unit dimensions

## Standard range



A 510 243 043

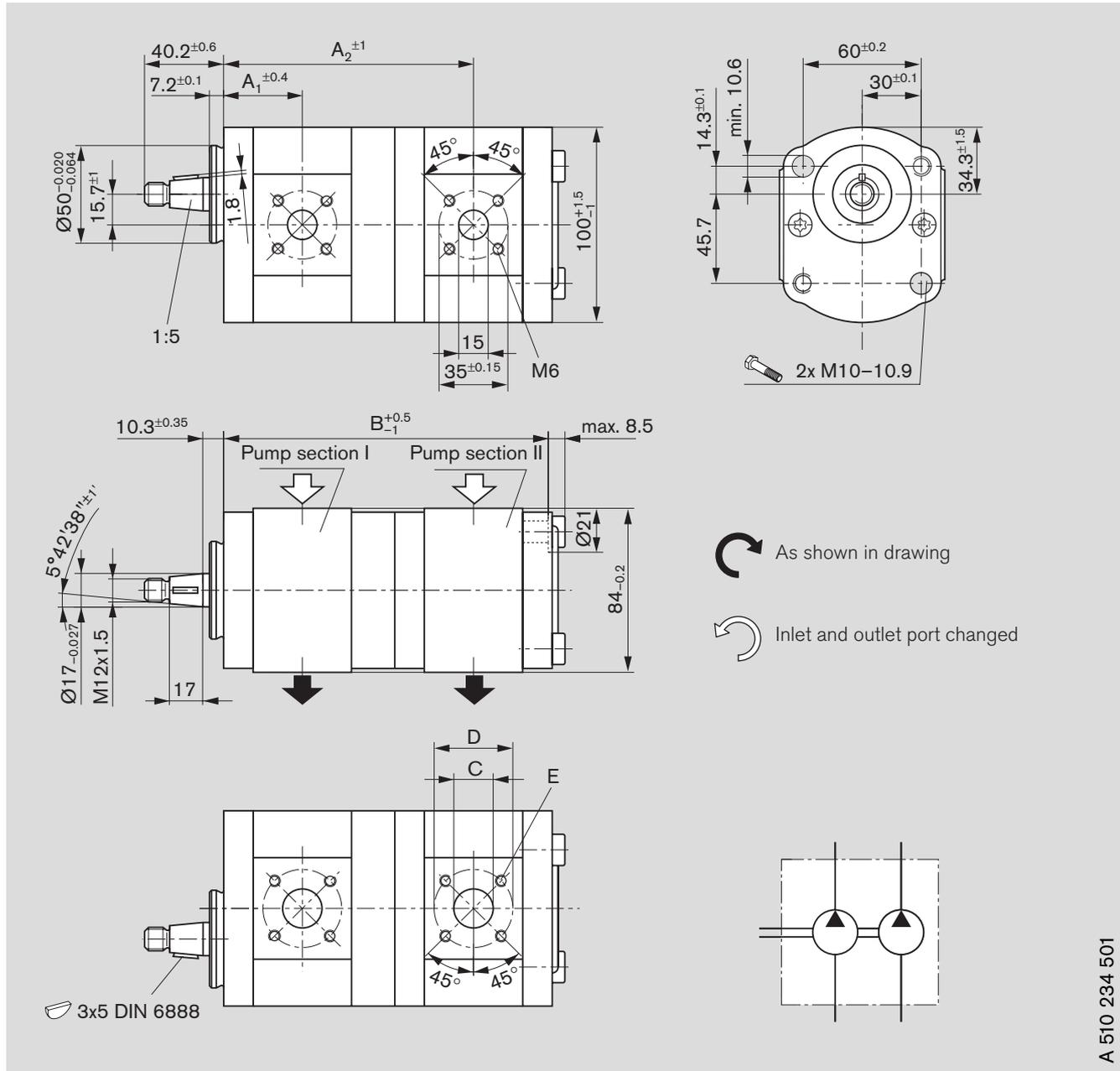
### Ordering code

AZPF - 10 -    S G 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
11	-	0 510 545 003	280	3500	3.8	64.5	113.8	20	40	M6 depth 13
14		0 510 545 302	280	3000	4.0	65.0	118.8	20	40	
16	-	0 510 645 005	230	3000	4.1	65.0	122.0	20	40	
19	-	0 510 645 003	230	3000	4.3	65.0	127.0	20	40	

# Unit dimensions

## Standard range



A 510 234 501

## Ordering code

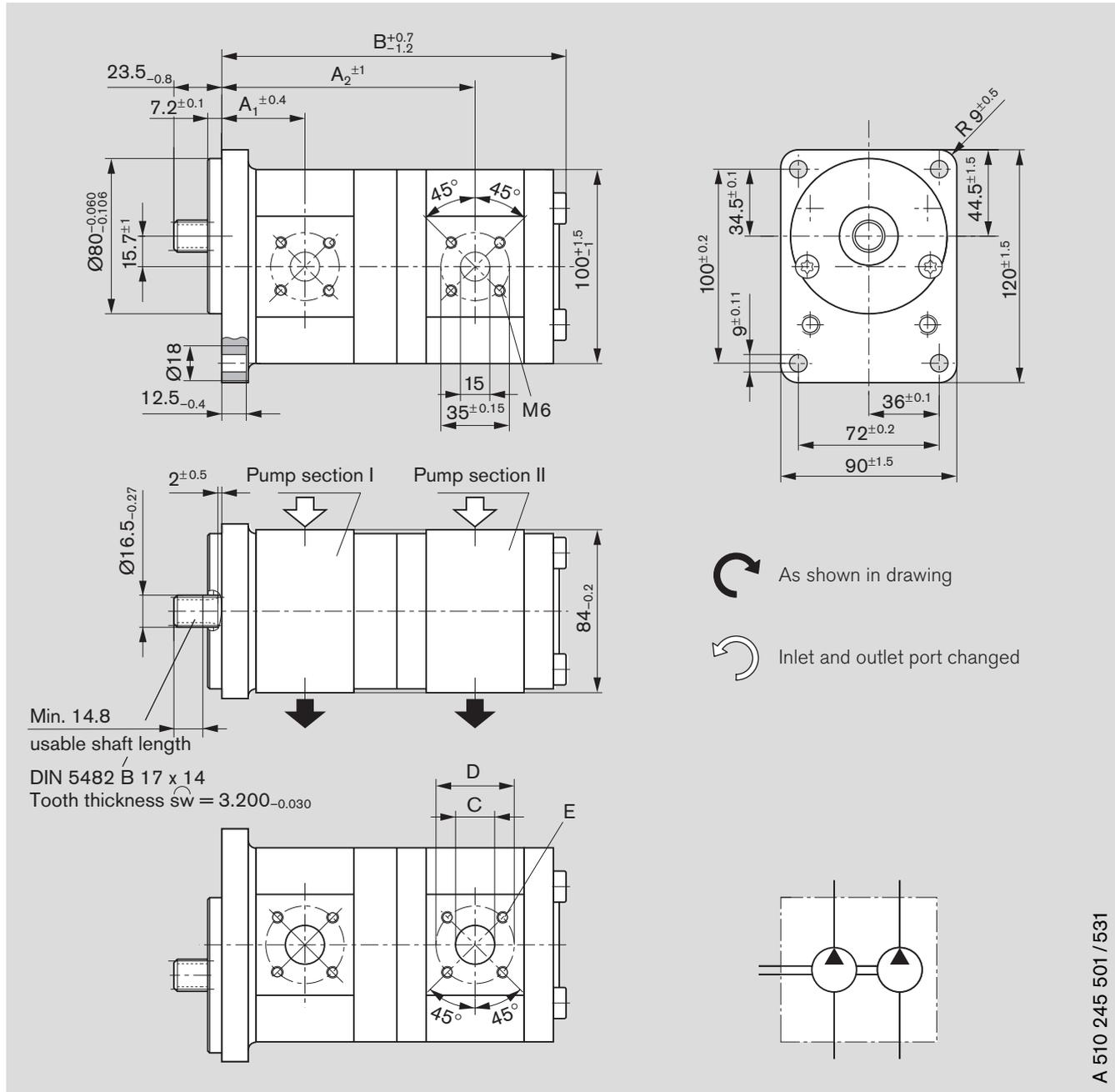
AZPFF - 12 -    /     C P 20 20 K B

Displacement [cm <sup>3</sup> /rev] P <sub>I</sub>   P <sub>II</sub>	Ordering-No.		Max. operating pressure [bar]		Max. rotation speed [rpm]	kg	Dimension [mm]					
	 L	 R	P <sub>I</sub>	P <sub>II</sub>			A <sub>1</sub>	A <sub>2</sub>	B	C <sup>1)</sup>	D	E
5.5   4	0 510 365 305	-	280	280	4000	4.8	38.6	121.6	157.9	15	40	M6 depth 13
8   4	0 510 465 324	0 510 465 011	280	280	4000	4.4	40.7	125.7	162.0	20	40	
8   5.5	0 510 465 344	0 510 465 032	280	280	4000	4.4	40.7	126.9	164.5	20	40	
8   8	0 510 465 320	0 510 465 023	280	280	4000	5.4	40.7	129.0	168.6	20	40	
11   4	0 510 565 387	-	280	280	3500	4.5	44.5	130.7	167.0	20	40	
11   5.5	0 510 565 319	0 510 565 095	280	280	3500	4.5	44.5	131.9	169.5	20	40	
11   8	0 510 565 389	0 510 565 014	280	280	3500	4.6	44.5	134.0	173.6	20	40	
11   11	0 510 565 376	0 510 565 061	280	280	3500	4.8	44.5	137.8	178.6	20	40	
14   4	0 510 565 406	-	280	280	3000	4.6	45.0	135.7	172.0	20	40	
14   8	0 510 565 335	0 510 565 072	280	280	3000	4.8	45.0	139.0	178.6	20	40	
14   11	0 510 565 393	-	280	280	3000	5.0	45.0	142.8	183.6	20	40	
14   14	-	0 510 565 417	280	280	3000	5.0	45.0	143.3	188.6	20	40	
16   4	0 510 665 348	-	280	280	3000	4.75	45.0	139.1	175.4	20	40	
16   5.5	0 510 665 337	-	280	280	3000	4.8	45.0	140.3	177.9	20	40	
16   8	0 510 665 328	0 510 665 135	280	280	3000	6.0	45.0	142.4	182.0	20	40	
16   11	0 510 665 382	0 510 665 152	280	280	3000	5.0	45.0	146.2	187.0	20	40	
16   14	0 510 665 381	0 510 665 144	280	280	3000	5.1	45.0	146.7	192.0	20	40	
16   16	0 510 665 330	0 510 665 052	280	230	3000	6.4	45.0	146.7	195.4	20	40	
19   4	0 510 665 369	-	230	280	3000	4.9	45.0	144.1	180.4	20	40	
19   5	0 510 665 442	-	230	280	3000	4.8	45.0	145.3	183.2	20	40	
19   11	0 510 665 368	-	230	280	3000	5.2	45.0	146.2	192.0	20	40	
19   14	0 510 665 418	-	230	280	3000	5.0	45.0	151.7	197.0	20	40	
19   19	0 510 665 336	-	230	190	3000	6.6	45.0	151.7	205.4	20	40	
22   8	0 510 765 345	0 510 765 045	210	280	2500	5.1	52.6	152.8	192.4	20	40	
22   11	0 510 765 309	0 510 765 049	210	280	2500	5.2	52.6	156.7	197.7	20	40	
22   16	0 510 765 343	0 510 765 028	210	230	2500	5.5	52.6	157.1	205.8	20	40	

1) 4 and 5.5 cm<sup>3</sup> Ø 15

# Unit dimensions

## Standard range



A 510 245 501 / 531

## Ordering code

AZPFF - 10 -    /     F B 20 20 M BAZPFF - 11 -    /     F B 20 20 M B\*

Displacement		Ordering-No.		Max. operating pressure		Max. rotation speed [rpm]	kg	Dimension					
[cm <sup>3</sup> /rev]				[bar]				[mm]					
P <sub>I</sub>	P <sub>II</sub>	L	R	P <sub>I</sub>	P <sub>II</sub>		A <sub>1</sub>	A <sub>2</sub>	B	C <sup>1)</sup>	D	E	
8	5.5	0 510 465 345	-	280	280	4000	5.1	43.2	129.4	174.0	20	40	M6 depth 13
8	8	0 510 465 326*	-	280	280	4000	5.1	43.2	131.5	178.1	20	40	
11	4	-	0 510 565 032	280	280	3500	6.3	47.0	133.2	176.5	20	40	
11	5.5	0 510 565 332	0 510 565 034	280	280	3500	6.35	47.0	134.4	179.0	20	40	
11	8	0 510 565 334*	0 510 565 018	280	280	3500	6.4	47.0	136.5	183.1	20	40	
11	11	0 510 565 328	0 510 565 035	280	280	3500	6.5	47.0	140.3	188.1	20	40	
14	4	0 510 565 367	-	280	280	3000	6.4	47.5	138.2	181.5	20	40	
14	5.5	0 510 565 069	-	280	280	3500	6.5	47.5	139.4	183.7	20	40	
14	8	0 510 565 356	0 510 565 019	280	280	3000	6.5	47.5	141.5	188.1	20	40	
16	4	-	0 510 665 058	280	280	3000	6.7	47.5	141.6	184.9	20	40	
16	8	0 510 665 333	0 510 665 064	280	280	3000	6.8	47.5	144.9	191.5	20	40	
16	11	0 510 665 347	0 510 665 036	280	280	3000	6.9	47.5	148.7	196.5	20	40	
16	16	0 510 665 334	0 510 665 029	280	230	3000	7.3	47.5	149.2	204.9	20	40	
19	4	-	0 510 665 115	230	280	3000	5.5	47.5	146.6	189.0	20	40	
19	11	0 510 665 375*	-	230	280	3000	5.9	47.5	153.7	201.5	20	40	
19	19	0 510 665 420	0 510 665 097	230	190	3000	6.3	47.5	154.2	214.9	20	40	
22.5	5.5	0 510 765 317	0 510 765 022	210	280	2500	5.8	61.1	165.2	209.8	20	40	
22.5	8	0 510 765 331	-	210	280	2500	6.18	61.1	167.3	213.9	20	40	
22.5	16	0 510 765 341	-	210	230	2500	6.4	61.1	171.6	227.3	20	40	
22.5	22.5	0 510 765 338	-	210	160	2500	7.05	61.1	185.2	249.7	20	40	

1) 4 and 5.5 cm<sup>3</sup> Ø 15



## Ordering code

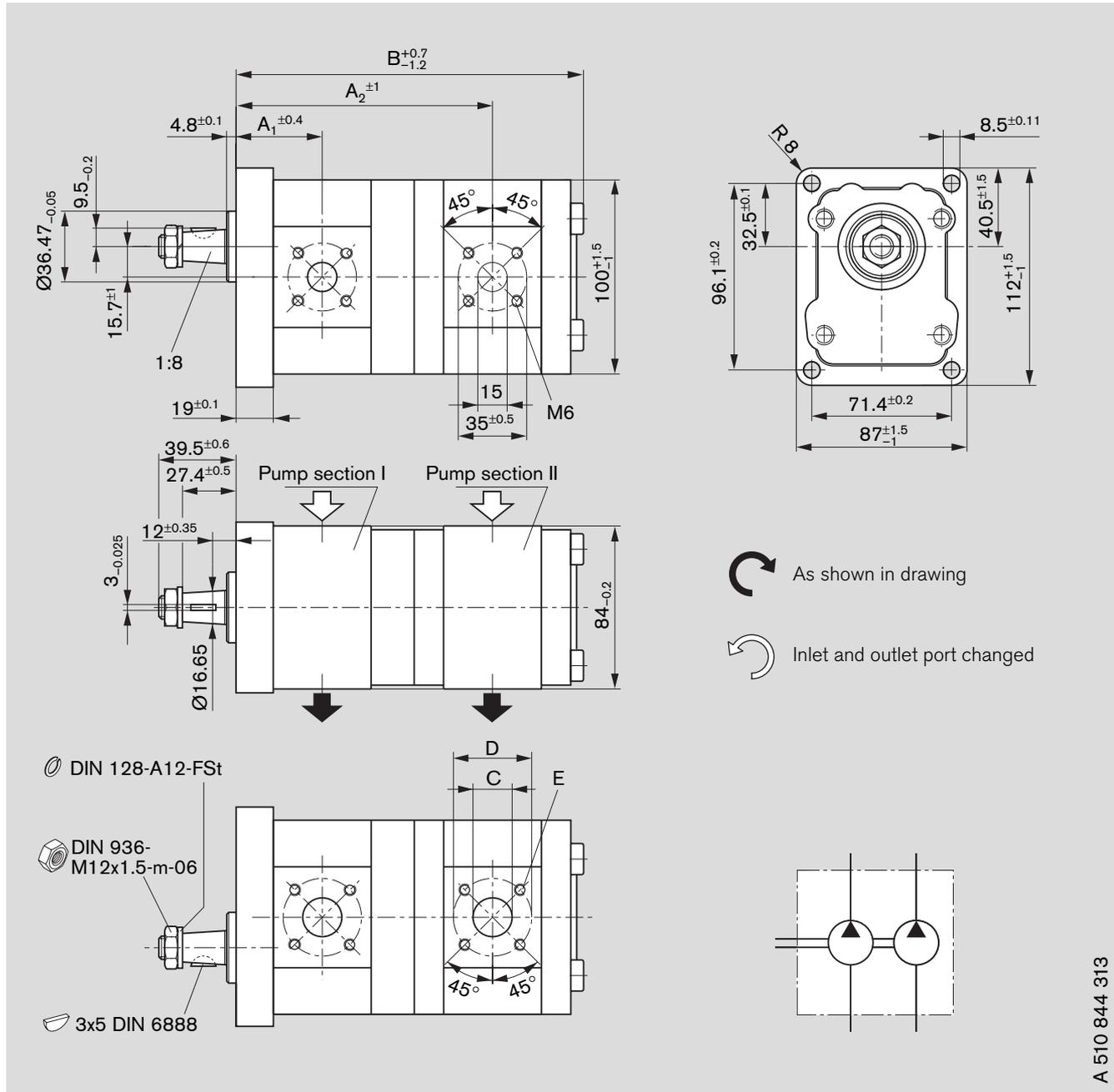
AZPFF - 10 -    /     C B 20 20 M BAZPFF - 11 -    /     C B 20 20 M B\*

Displacement [cm <sup>3</sup> /rev]	Ordering-No.		Max. operating pressure [bar]		Max. rotation speed [rpm]	kg	Dimension [mm]						
	P <sub>I</sub>	P <sub>II</sub>	L	R			P <sub>I</sub>	P <sub>II</sub>	A <sub>1</sub>	A <sub>2</sub>	B	C <sup>1)</sup>	D
4	4	0 510 900 002*	0 510 900 001*	280	280	4000	4.5	39.9	121.6	164.4	15	40	M6 depth 13
5.5	4	0 510 900 005*	-	280	280	4000	4.9	41.1	124.1	166.9	15	40	
5.5	5.5	0 510 900 004*	0 510 900 003*	280	280	4000	5.0	41.1	125.3	169.4	15	40	
8	16	-	0 510 900 042*	280	230	3000	5.6	43.2	135.8	191.0	20	40	
8	4	0 510 900 008*	0 510 900 051*	280	280	4000	5.1	43.2	128.2	171.0	20	40	
8	5.5	0 510 900 009*	0 510 900 007*	280	280	4000	5.1	43.2	129.4	173.5	20	40	
8	8	0 510 900 010*	0 510 900 006*	280	280	4000	5.2	43.2	131.5	177.6	20	40	
11	4	0 510 900 015*	0 510 900 012*	280	280	3500	5.2	47.0	133.2	176.0	20	40	
11	5.5	0 510 900 017*	0 510 900 046*	280	280	3500	5.2	47.0	134.4	178.5	20	40	
11	8	0 510 900 016*	0 510 900 044*	280	280	3500	5.4	47.0	136.5	182.6	20	40	
11	11	0 510 900 018*	0 510 900 039*	280	280	3500	5.5	47.0	140.3	187.6	20	40	
14	4	0 510 900 036*	-	280	280	3000	5.3	47.5	138.2	181	20	40	
14	5.5	-	0 510 900 060*	280	280	3000	5.4	47.5	139.4	183.5	20	40	
14	8	0 510 900 020*	0 510 900 011*	280	280	3000	5.5	47.5	141.5	187.6	20	40	
14	8	0 510 565 364	0 510 565 012	280	280	3000	5.6	47.5	141.5	188.1	20	40	
14	11	0 510 900 019*	0 510 900 013*	280	280	3000	5.6	47.5	145.3	192.6	20	40	
14	11	0 510 565 353	0 510 565 033	280	280	3000	5.7	47.5	145.3	193.1	20	40	
14	14	-	0 510 900 014*	280	280	3000	5.8	47.5	145.8	197.6	20	40	
14	14	-	0 510 565 037	280	280	3000	5.9	47.5	145.8	198.1	20	40	
16	4	0 510 900 059*	0 510 900 021*	280	280	3000	5.5	47.5	141.6	184.4	20	40	
16	5.5	0 510 900 028*	-	280	280	3000	5.5	47.5	142.8	186.9	20	40	
16	8	0 510 900 035*	0 510 900 022*	280	280	3000	5.6	47.5	144.9	191.0	20	40	
16	11	0 510 900 029*	0 510 900 023*	280	280	3000	5.7	47.5	148.7	196.0	20	40	
16	14	-	0 510 900 061*	280	280	3000	5.9	47.5	149.2	201.0	20	40	
16	16	0 510 900 030*	0 510 900 024*	280	230	3000	6.0	47.5	149.2	204.4	20	40	
19	4	0 510 900 043*	0 510 900 049*	230	280	3000	5.6	47.5	146.6	189.4	20	40	
19	5.5	-	0 510 665 067	230	280	3000	5.6	47.5	147.8	192.4	20	40	
19	5.5	-	0 510 900 027*	230	280	3000	5.6	47.5	147.8	191.9	20	40	
19	8	0 510 900 031*	0 510 900 047*	230	280	3000	5.8	47.5	149.9	196.0	20	40	
19	8	0 510 665 325*	0 510 665 024	230	280	3000	6.7	47.5	149.9	196.5	20	40	
19	11	0 510 900 032*	0 510 900 052*	230	280	3000	5.9	47.5	153.7	201.0	20	40	
19	11	0 510 665 326	-	230	280	3000	6.9	47.5	153.9	201.5	20	40	
19	14	0 510 900 053*	-	230	280	3000	6.0	47.5	154.2	206.0	20	40	
19	16	0 510 665 327	0 510 665 053	230	230	3000	7.1	47.5	154.2	209.9	20	40	
19	16	0 510 900 033*	0 510 900 026*	230	230	3000	6.1	47.5	154.2	209.4	20	40	
19	19	0 510 900 034*	0 510 900 025*	230	210	3000	6.2	47.5	154.2	214.4	20	40	
19	19	0 510 665 400	0 510 665 025	230	190	3000	6.2	47.5	154.2	214.9	20	40	
22.5	4	-	0 510 900 050*	210	280	2500	5.8	55.1	152.0	194.8	20	40	
22.5	5.5	0 510 900 055*	0 510 900 045*	210	280	2500	5.8	55.1	153.2	197.3	20	40	
22.5	8	0 510 900 057*	0 510 900 040*	210	280	2500	5.9	55.1	155.3	201.4	20	40	
22.5	8	-	0 510 765 023	230	280	3000	5.9	61.0	167.3	213.9	20	40	
22.5	11	-	0 510 900 054*	210	280	2500	6.0	55.1	159.1	206.4	20	40	
22.5	11	0 510 765 320	-	210	250	3000	6.3	61.0	171.1	218.9	20	40	
22.5	14	0 510 900 048*	0 510 900 058*	210	280	2500	6.2	55.1	159.6	211.4	20	40	
22.5	16	0 510 900 041*	0 510 900 037*	210	230	2500	6.2	55.1	159.6	214.8	20	40	
22.5	16	0 510 765 340	-	210	230	3000	6.55	61.0	171.6	227.3	20	40	
22.5	22.5	0 510 900 056*	0 510 900 038*	210	180	2500	6.5	55.1	167.2	225.2	20	40	
22.5	22.5	-	0 510 765 012	210	160	3000	6.5	61.0	185.2	249.7	20	40	

1) 4 and 5.5 cm<sup>3</sup> Ø 15

# Unit dimensions

## Standard range



A 510 844 313

## Ordering code

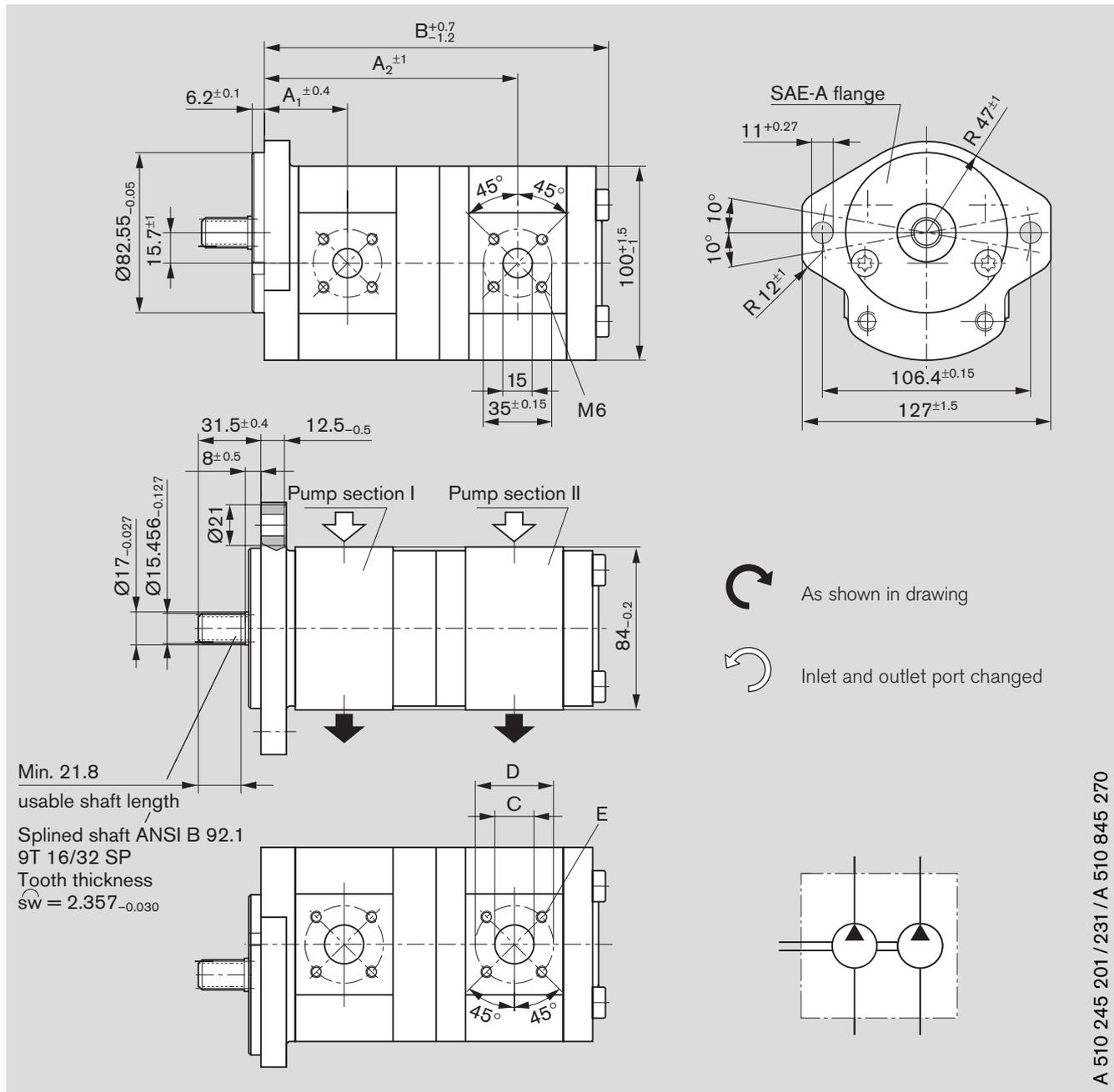
AZPFF - 10 -    /     H O 20 20 M BAZPFF - 10 -    /     H O 20 20 K B\*

Displacement [cm <sup>3</sup> /rev] P <sub>I</sub>   P <sub>II</sub>	Ordering-No.		Max. operating pressure [bar]		Max. rotation speed [rpm]	kg	Dimension [mm]					
	 L	 R	P <sub>I</sub>	P <sub>II</sub>			A <sub>1</sub>	A <sub>2</sub>	B	C <sup>1)</sup>	D	E
4   4	-	<b>0 510 901 500</b>	280	280	4000	4.7	41.4	123.1	165.9	15	40	M6 depth 13
8   5.5	<b>0 510 901 512</b>		280	280	4000	4.9	44.7	130.9	175.0	20	40	
8   8	-	<b>0 510 901 504</b>	280	280	4000	5.0	44.7	133.0	179.1	20	40	
11   4	-	<b>0 510 901 509</b>	280	280	3500	5.0	48.5	134.7	177.5	20	40	
11   5.5	<b>0 510 565 436*</b>	<b>0 510 901 503</b>	280	280	3500	5.1	48.5	135.9	180.0	20	40	
14   5.5	<b>0 510 565 435*</b>	-	280	280	3000	5.2	49.0	140.9	185.0	20	40	
14   11	-	<b>0 510 901 513</b>	280	280	3000	5.5	49.0	146.8	194.1	20	40	
16   5.5	-	<b>0 510 901 510</b>	280	280	3000	5.3	49.0	144.3	188.4	20	40	
16   8	<b>0 510 901 514</b>	-	280	280	3000	5.4	49.0	146.4	192.5	20	40	
16   14	-	<b>0 510 901 515</b>	280	280	3000	5.7	49.0	150.7	202.5	20	40	
16   16	-	<b>0 510 901 501</b>	280	230	3000	5.8	49.0	150.7	205.9	20	40	
19   8	-	<b>0 510 901 507</b>	230	280	3000	5.5	49.0	151.4	197.5	20	40	
19   11	-	<b>0 510 901 508</b>	230	280	3000	5.6	49.0	155.2	202.5	20	40	
19   16	-	<b>0 510 901 502</b>	230	230	3000	5.9	49.0	155.7	210.9	20	40	
19   19	<b>0 510 901 506</b>	-	230	190	3000	6.0	49.0	155.7	215.9	20	40	
22.5   16	<b>0 510 901 511</b>	-	210	230	2500	6.1	56.6	161.1	216.3	20	40	
22.5   19	-	<b>0 510 901 505</b>	210	190	2500	6.2	56.6	161.7	220.3	20	40	

1) 4 and 5.5 cm<sup>3</sup> Ø 15

# Unit dimensions

## Standard range



A 510 245 201 / 231 / A 510 845 270

## Ordering code

AZPFF - 10 -    /     R R 20 20 M BAZPFF - 11 -    /     R R 20 20 M B\*AZPFF - 11 -    /     R R 20 20 K B\*\*

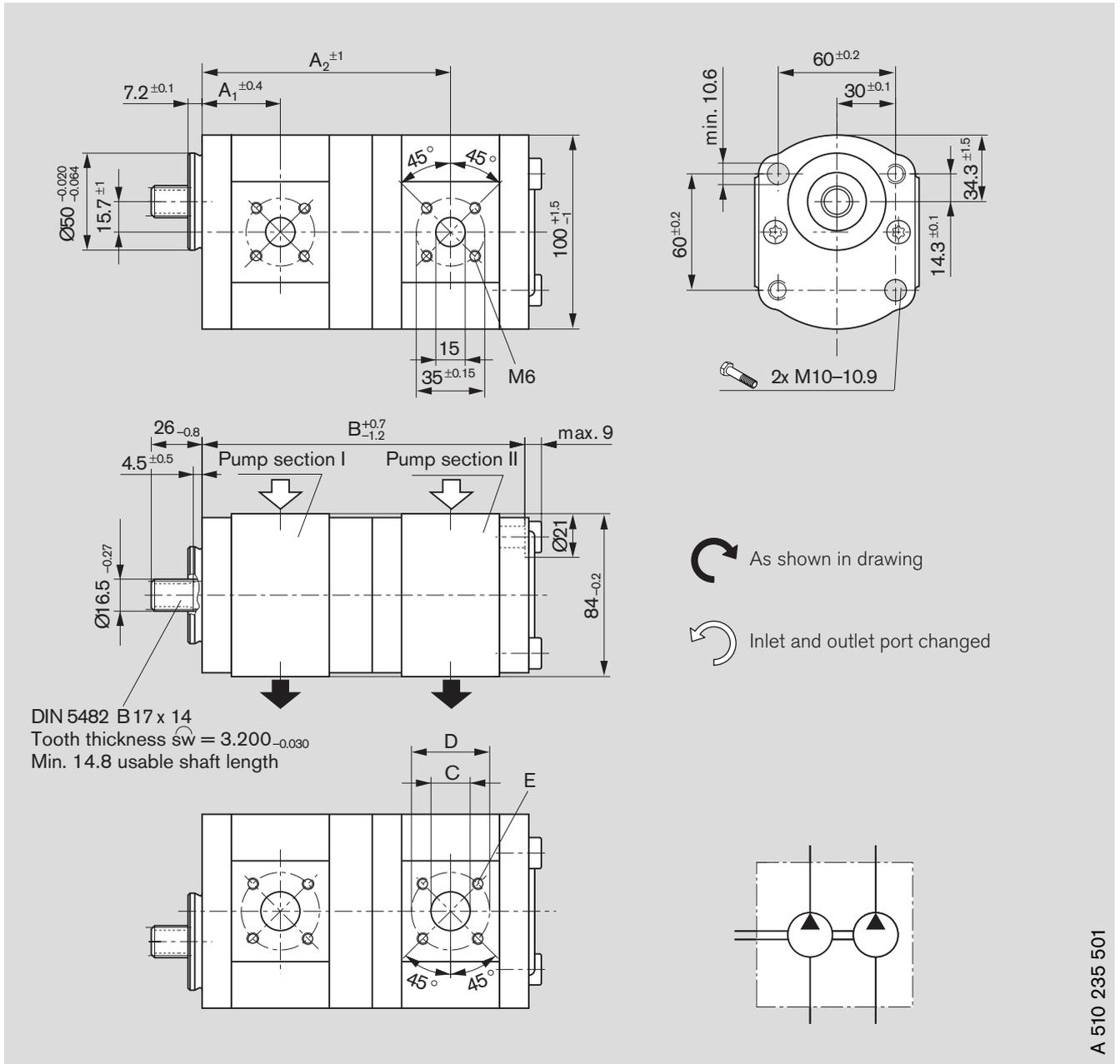
Displacement		Ordering-No.		Max. operating pressure		Max. rotation speed	kg	Dimension					
$P_I$	$P_{II}$	 L	 R	[bar]	[bar]			[rpm]	[mm]				
$P_I$	$P_{II}$			$P_I$	$P_{II}$			$A_1$	$A_2$	B	C <sup>1)</sup>	D	E
5.5	4	0 510 901 029*	-	280	280	4000	4.9	41.1	124.1	166.9	15	40	M6 depth 13
5.5	5.5	-	0 510 901 042*	280	280	4000	5.0	41.1	125.3	169.4	15	40	
8	4	0 510 901 032*	0 510 901 034*	280	280	4000	5.0	43.2	128.2	171.0	20	40	
8	5.5	0 510 901 018*	0 510 901 030*	280	280	4000	5.1	43.2	129.4	173.5	20	40	
8	8	-	0 510 901 021*	280	280	4000	5.1	43.2	131.5	177.6	20	40	
11	4	-	0 510 901 024*	280	280	3500	5.1	47.0	133.2	176.0	20	40	
11	4	-	0 510 565 022	280	280	3500	5.2	47.0	133.2	176.5	20	40	
11	5.5	0 510 901 015*	0 510 901 000*	280	280	3500	5.2	47.0	134.4	178.5	20	40	
11	5.5	-	0 510 565 023	280	280	3500	5.2	47.0	134.4	179.0	20	40	
11	8	0 510 901 031*	0 510 901 037*	280	280	3500	5.3	47.0	136.5	182.6	20	40	
11	11	0 510 901 009*	0 510 901 035**	280	280	3500	5.5	47.0	140.3	187.6	20	40	
14	5.5	0 510 901 033*	-	280	280	3000	5.4	47.5	139.4	183.5	20	40	
14	8	-	0 510 901 016*	280	280	3000	5.5	47.5	141.5	187.6	20	40	
14	11	0 510 565 346	-	280	280	3000	5.7	47.5	145.3	193.1	20	40	
14	11	0 510 901 001*	0 510 901 011*	280	280	3000	5.6	47.5	145.3	192.6	20	40	
14	14	-	0 510 901 036*	280	280	3000	5.7	47.5	145.8	197.6	20	40	
16	4	-	0 510 901 028*	280	280	3000	5.4	47.5	141.6	184.4	20	40	
16	5.5	0 510 901 014*	0 510 901 008*	280	280	3000	5.4	47.5	142.8	186.9	20	40	
16	8	0 510 901 006*	0 510 901 005*	280	280	3000	5.5	47.5	144.9	191.0	20	40	
16	11	0 510 901 012*	0 510 901 002*	280	280	3000	5.7	47.5	148.7	196.0	20	40	
16	11	0 510 665 354	0 510 665 042	280	280	3000	5.8	47.5	148.7	196.0	20	40	
16	16	0 510 901 027*	0 510 901 022*	280	280	3000	5.9	47.5	149.2	204.4	20	40	
19	4	-	0 510 901 044*	230	280	3000	5.5	47.5	146.6	189.4	20	40	
19	5.5	0 510 901 041*	0 510 901 043*	230	280	3000	5.6	47.5	147.8	191.9	20	40	
19	8	0 510 901 017*	0 510 901 003*	230	280	3000	5.7	47.5	149.9	196.0	20	40	
19	8	-	0 510 665 126**	230	280	3000	5.6	47.5	149.9	196.0	20	40	
19	8	-	0 510 665 047	230	280	3000	5.8	47.5	149.9	196.0	20	40	
19	11	0 510 665 435	0 510 901 004*	230	280	3000	5.8	47.5	153.7	201.0	20	40	
19	14	0 510 901 040*	0 510 901 025*	230	280	3000	5.9	47.5	154.2	206.0	20	40	
19	16	0 510 901 039*	0 510 901 045*	230	230	3000	6.0	47.5	154.2	209.4	20	40	
19	19	0 510 901 010*	-	230	190	3000	6.2	47.5	154.2	214.4	20	40	
19	19	-	0 510 665 132	230	190	3000	6.1	47.5	154.2	214.4	20	40	
22.5	4	-	0 510 901 023*	210	280	2500	5.7	55.1	152.0	194.8	20	40	
22.5	5.5	-	0 510 901 020*	210	280	2500	5.7	55.1	153.2	197.3	20	40	
22.5	8	-	0 510 765 016	180	280	2500	7.6	55.1	155.3	201.4	20	40	
22.5	11	0 510 901 019*	0 510 901 026*	210	280	2500	5.9	55.1	159.1	206.4	20	40	
22.5	14	0 510 901 013*	0 510 901 007*	210	280	2500	6.1	55.1	159.6	211.4	20	40	
22.5	22.5	0 510 901 038*	-	210	180	2500	6.4	55.1	167.2	225.2	20	40	

1) 4 and 5.5 cm<sup>3</sup> Ø 15



# Unit dimensions

## Standard range



A 510 235 501

### Ordering code

AZPFF - 10 -    /     F P 20 20 M B

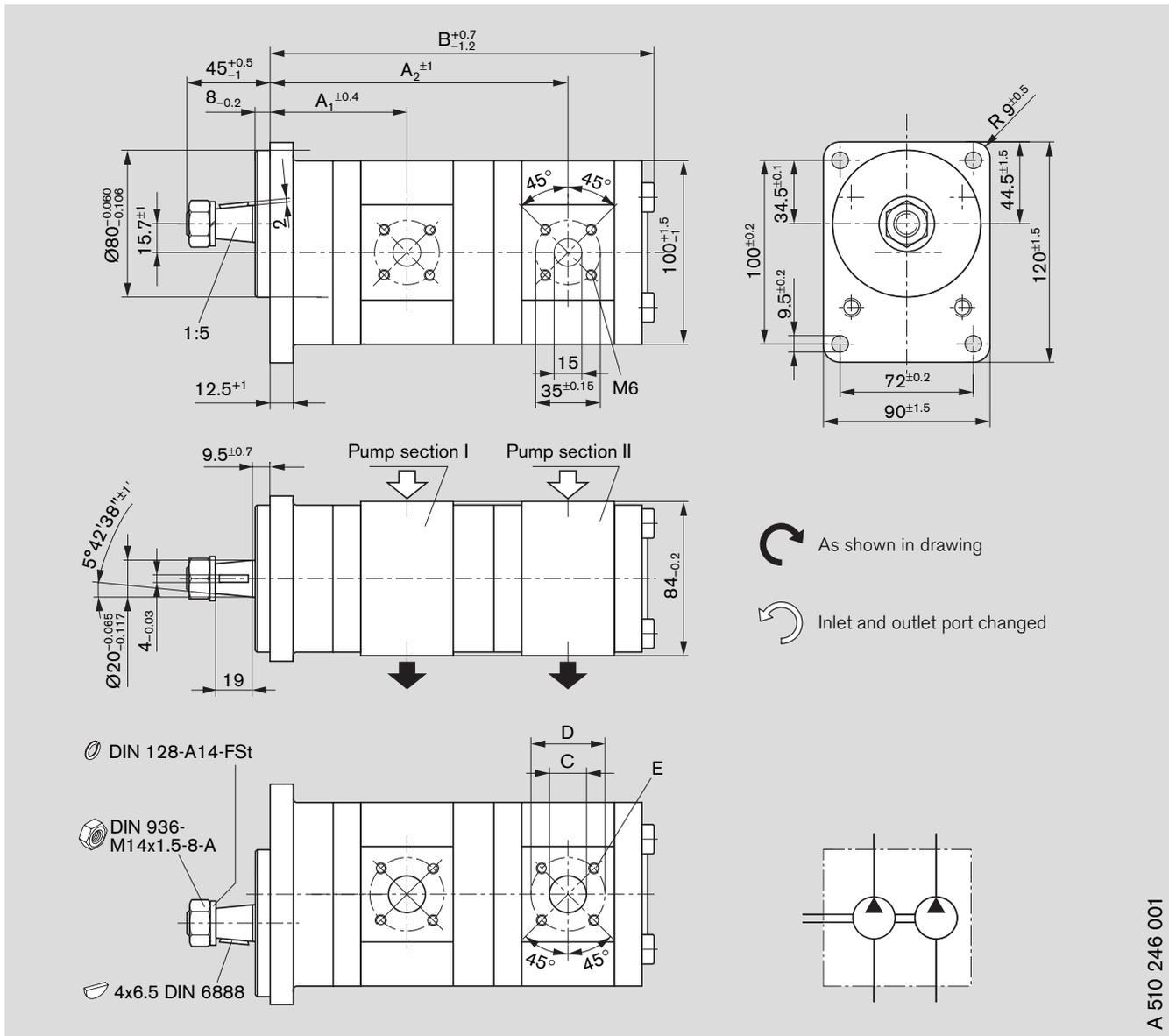
AZPFF - 10 -    /     F P 20 20 K B\*

Displacement [cm <sup>3</sup> /rev]	Ordering-No.		Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]							
	L	R				A <sub>1</sub>	A <sub>2</sub>	B	C <sup>1)</sup>	D	E		
8	4	0 510 465 355	280	280	4.4	40.7	125.7	162.0	20	40	M6 depth 13		
11	8	0 510 565 385	280	280	4.6	44.5	134.0	173.6	20	40			
16	8	-	0 510 665 071	280	280	3000	4.85	45.0	142.4	182.0		20	40
16	11	-	0 510 665 076	280	280	3000	4.98	45.0	146.2	187.0		20	40
16	14	0 510 665 404*	-	280	280	3000	5.12	45.0	146.7	192.0		20	40
16	16	0 510 665 376	0 510 665 062	280	230	3000	5.2	45.0	146.7	195.4		20	40

<sup>1)</sup> 4 and 5.5 cm<sup>3</sup> Ø 15

# Unit dimensions

## Standard range



A 510 246 001

### Ordering code

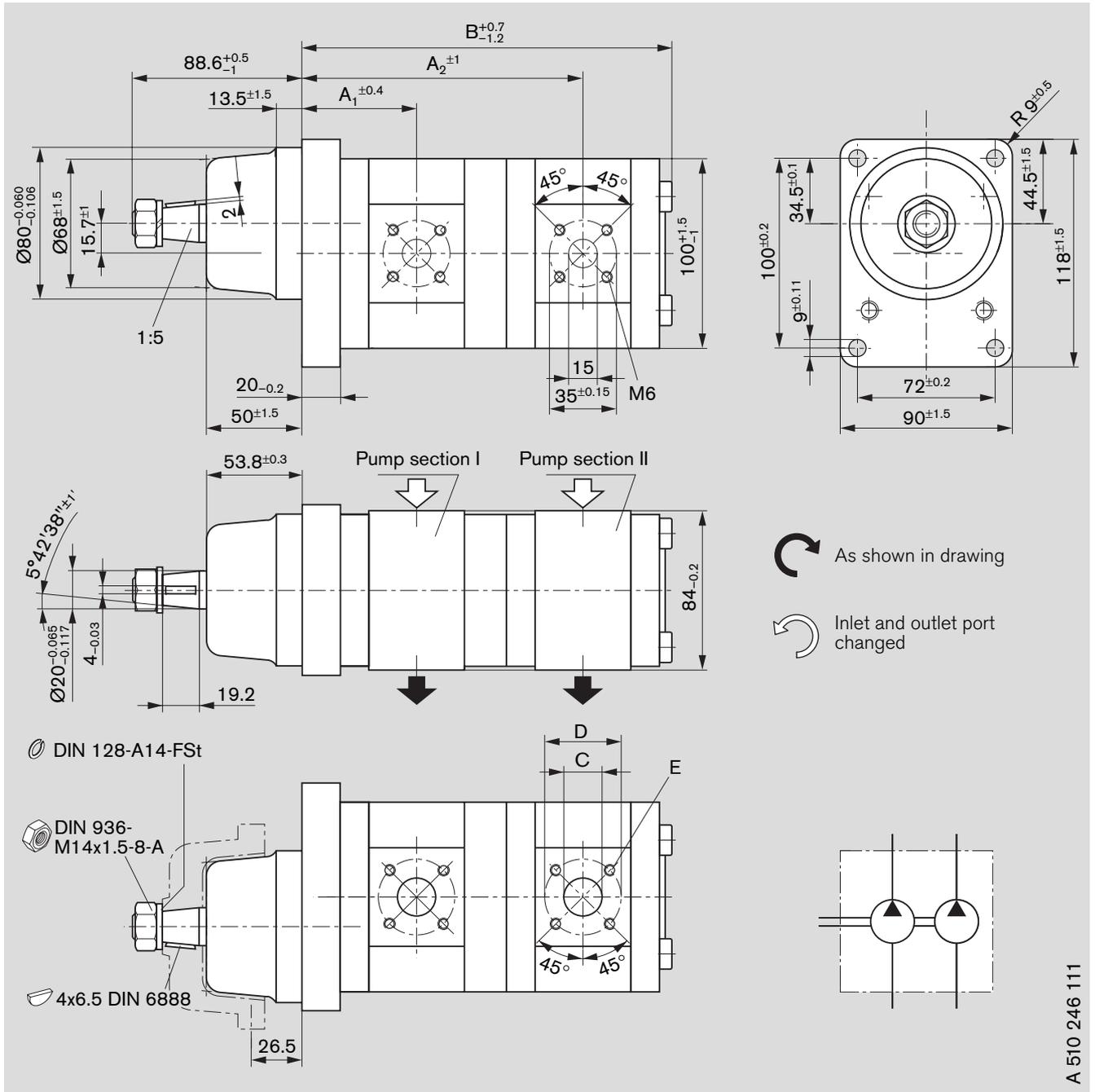
AZPFF - 10 -    /     S A 20 20 M B

Displacement [cm <sup>3</sup> /rev]	Ordering-No.		Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]							
	L	R				A <sub>1</sub>	A <sub>2</sub>	B	C <sup>1)</sup>	D	E		
P <sub>I</sub> P <sub>II</sub>			P <sub>I</sub> P <sub>II</sub>										
4	4	0 510 255 300	-	280	280	4000	4.8	71.3	153.0	197.0	15	40	M6 depth 13
5.5	4	0 510 355 301	-	280	280	4000	5.0	72.6	155.5	199.5	15	40	
8	5.5	0 510 455 300	0 510 455 001	280	280	4000	5.2	74.6	160.8	206.1	20	40	
8	8	0 510 455 301	0 510 455 002	280	280	4000	5.3	74.6	163.0	210.2	20	40	
11	5.5	0 510 555 300	0 510 555 001	280	280	3500	5.3	79.0	165.8	211.1	20	40	
11	8	0 510 555 301	0 510 555 002	280	280	3500	5.4	79.0	168.0	215.2	20	40	
11	11	0 510 555 302	0 510 555 003	280	280	3500	5.5	79.0	172.3	220.2	20	40	
16	4	0 510 655 300	0 510 655 001	280	280	3000	6.4	79.0	173.0	217.0	20	40	
16	5.5	0 510 655 301	0 510 655 002	280	280	3000	5.5	79.0	174.2	219.5	20	40	
16	8	0 510 655 302	0 510 655 003	280	280	3000	5.6	79.0	176.3	223.6	20	40	
16	11	0 510 655 303	0 510 655 004	280	280	3000	5.7	79.0	180.7	228.6	20	40	
16	16	0 510 655 304	0 510 655 005	280	230	3000	6.0	79.0	180.7	237.0	20	40	

<sup>1)</sup> 4 and 5.5 cm<sup>3</sup> Ø 15

# Unit dimensions

## Standard range



**Ordering code:**

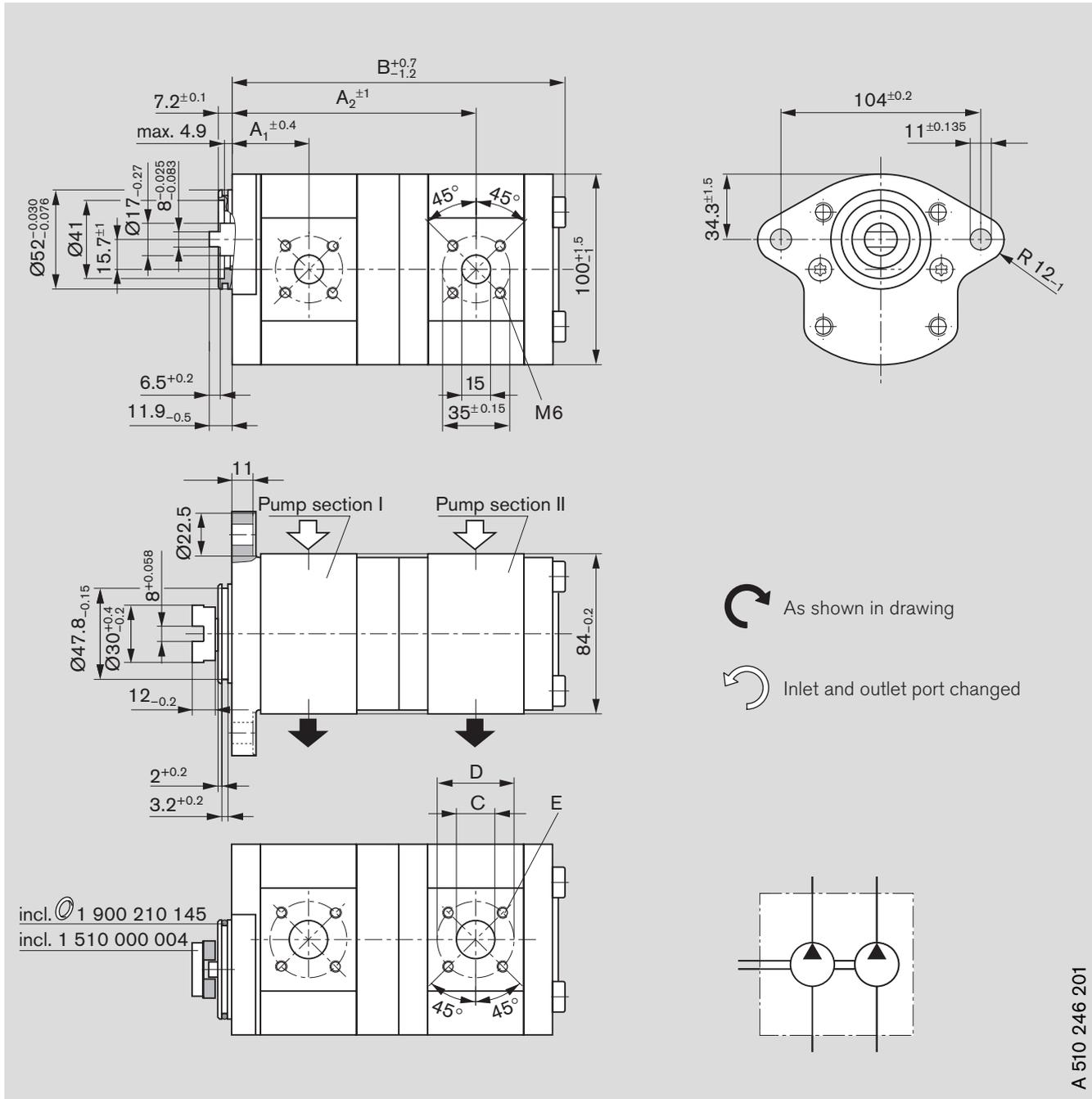
**AZPFF - 10 -**    /     **S G 20 20 P B**

Displacement [cm <sup>3</sup> /rev]	Ordering-No.		Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension						
						A <sub>1</sub>	A <sub>2</sub>	B	C <sup>1)</sup>	D	E	
P <sub>I</sub>   P <sub>II</sub>	L	R	P <sub>I</sub>   P <sub>II</sub>									
16   16	-	<b>0 510 655 007</b>	280   280	3000	6.2	65.0	166.7	221.9	20	40	M6	
19   19	-	<b>0 510 655 011</b>	230   190	3000	6.6	65.0	171.7	231.9	20	40	depth 13	

<sup>1)</sup> 4 and 5.5 cm<sup>3</sup> Ø 15

# Unit dimensions

## Standard range



### Ordering code

AZPFF - 10 -    /     N L 20 20 K B

Displacement [cm <sup>3</sup> /rev]	Ordering-No.		Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]							
	 L	 R				P <sub>I</sub>	P <sub>II</sub>	A <sub>1</sub>	A <sub>2</sub>	B	C <sup>1)</sup>	D	E
5.5	5.5	-	<b>0 510 365 009</b>	280	280	4000	4.65	38.6	122.8	169.2	15	40	M6 depth 13
11	11	-	<b>0 510 565 043</b>	280	280	3500	5.2	44.5	137.5	187.4	20	40	
16	8	<b>0 510 665 449</b>	-	280	280	3000	5.2	45.0	142.4	188.4	20	40	
16	22.5	<b>0 510 665 068</b>	-	280	160	2500	6.17	45.0	160.3	226.6	20	40	

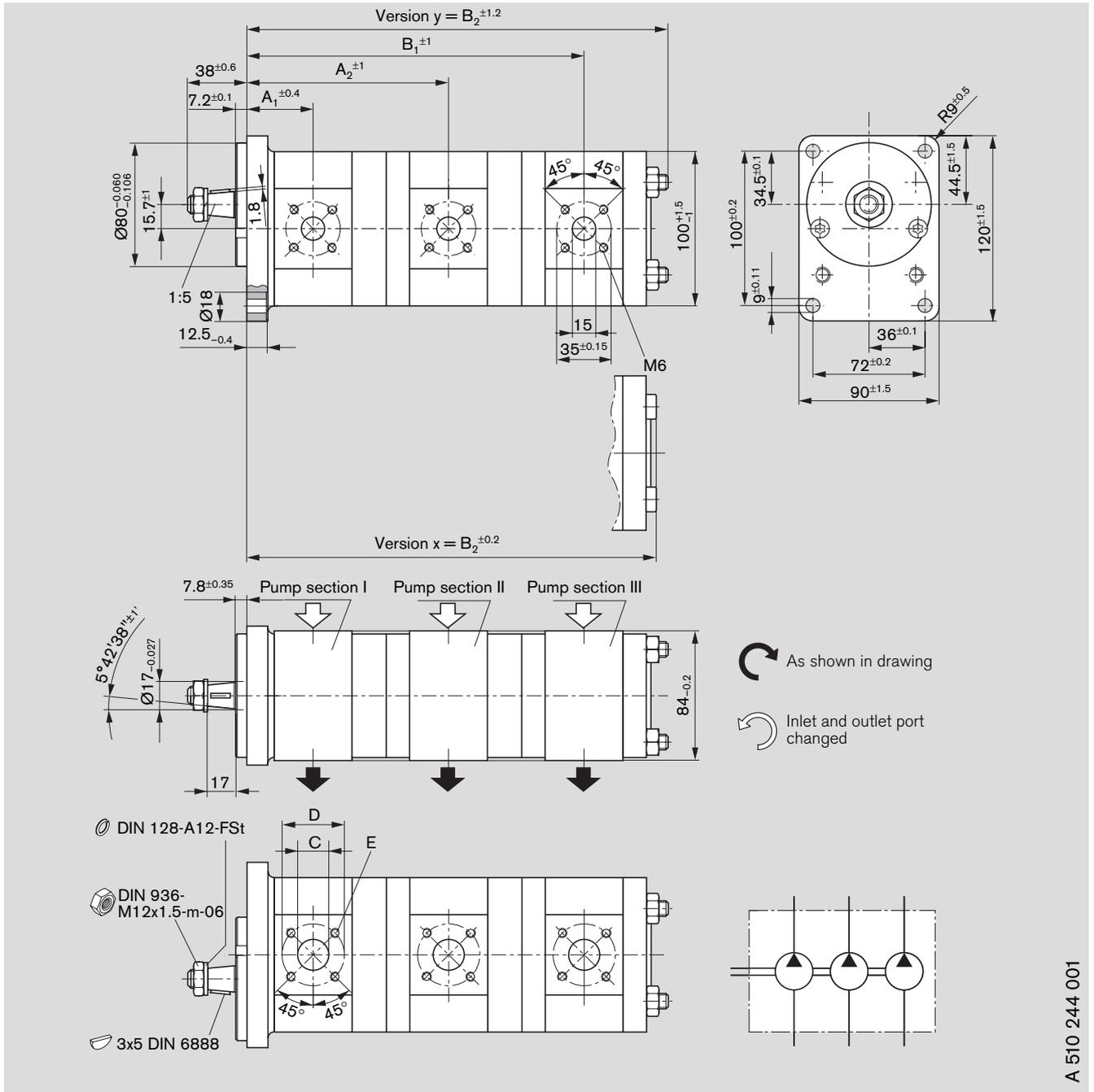
<sup>1)</sup> 4 and 5.5 cm<sup>3</sup>  $\varnothing$  15





# Unit dimensions

## Standard range



A 510 244 001

### Ordering code

AZPFFF - 10 -    /    /     C B 20 20 20 M B

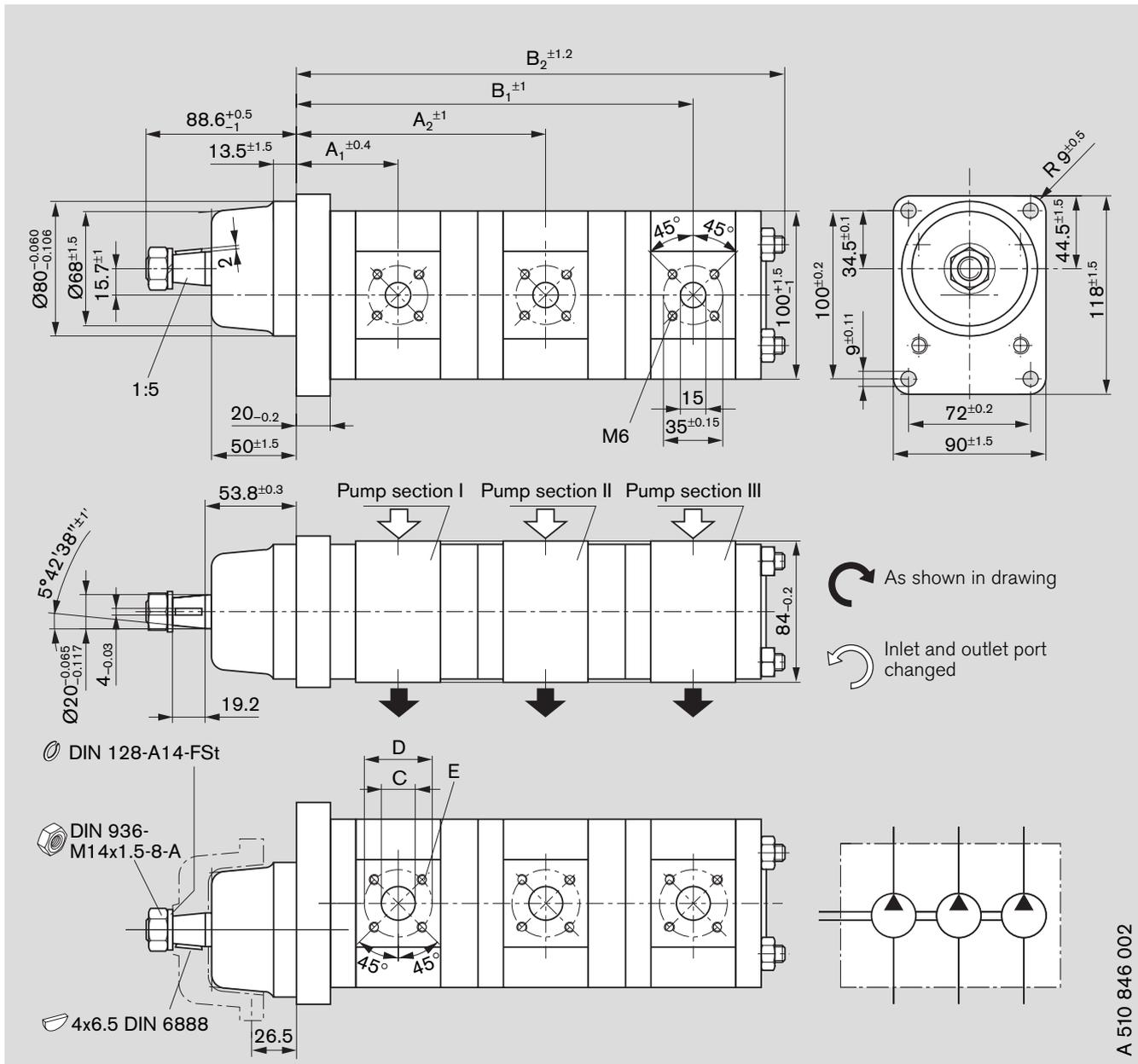
AZPFFF - 11 -    /    /     C B 20 20 20 K B\*

Displacement [cm <sup>3</sup> /rev]	Ordering-No.			Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]						Version				
	P <sub>I</sub>	P <sub>II</sub>	P <sub>III</sub>				A <sub>1</sub>	A <sub>2</sub>	B <sub>1</sub>	B <sub>2</sub>	C <sup>1)</sup>	D		E			
8	8	4	-	0 510 465 027	280	280	280	4000	7.0	43.2	131.5	216.5	260.6	20	40	M6	x
11	8	8	-	0 510 565 081	280	230	230	3500	7.2	47.0	136.5	224.8	272.2	20	40	depth 13	x
16	4	4	0 510 665 419*	-	280	280	280	3000	7.1	47.5	141.6	223.3	267.4	20	40		x
16	8	4	-	0 510 665 134	280	280	280	3000	7.3	47.5	144.9	229.9	272.7	20	40	x	
22.5	8	9	0 510 765 334*	-	230	210	210	3000	8.15	61.6	167.3	255.6	307.5	20	40	y	

1) 4 and 5.5 cm<sup>3</sup> Ø 15

# Unit dimensions

## Standard range



A 510 846 002

### Ordering code

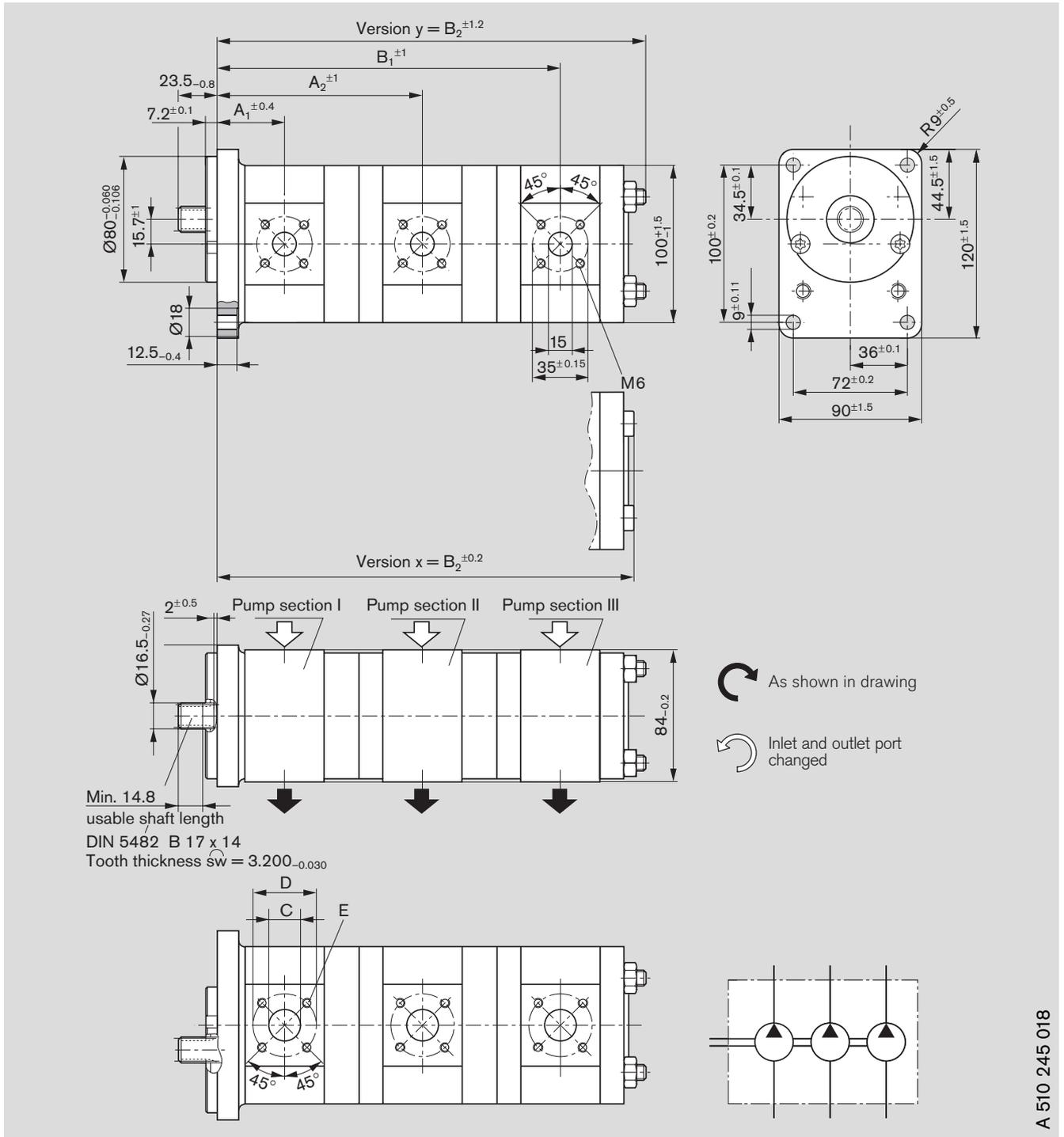
AZPFFF - 10 -    /    /     S G 20 20 20 M B

Displacement [cm <sup>3</sup> /rev]	Ordering-No.			Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]						
	$P_I$	$P_{II}$	$P_{III}$				$A_1$	$A_2$	$B_1$	$B_2$	$C^1)$	$D$	$E$
8	8	5.5	-	280	4000	7.4	60.7	149.0	235.2	284.0	20	40	M6
14	14	5.5	-	280	3000	7.9	65.0	163.3	255.3	304.0	20	40	depth 13

<sup>1)</sup> 4 and 5.5 cm<sup>3</sup> Ø 15

# Unit dimensions

## Standard range



### Ordering code

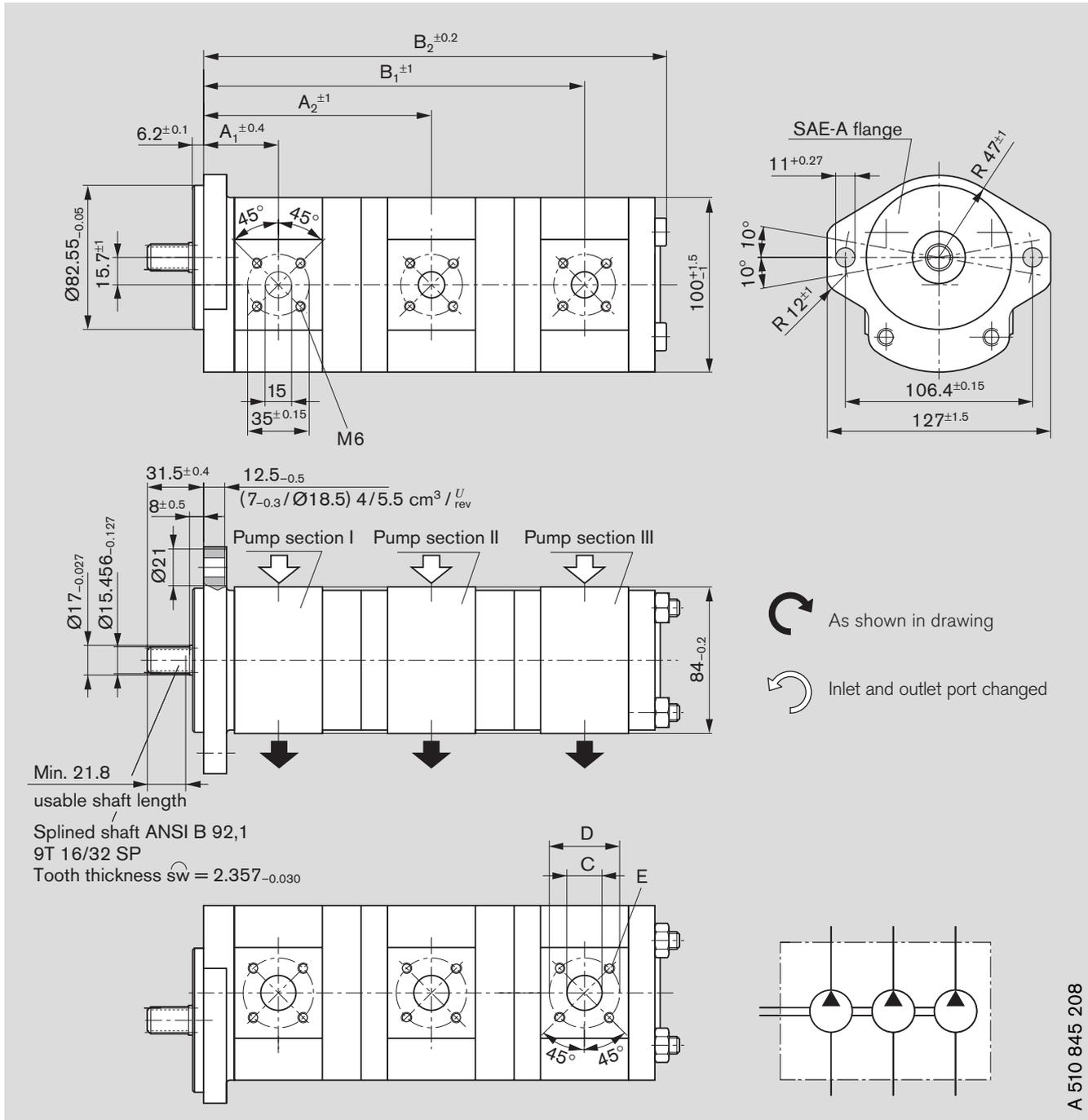
AZPFFF - 10 -  /  /  F B 20 20 20 M B

Displacement [cm <sup>3</sup> /rev]	Ordering-No.			Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]						Version				
	P <sub>I</sub>	P <sub>II</sub>	P <sub>III</sub>				L	R	P <sub>I</sub>	P <sub>II</sub>	P <sub>III</sub>	A <sub>1</sub>		A <sub>2</sub>	B <sub>1</sub>	B <sub>2</sub>	C <sup>1)</sup>
8	8	4	-	0 510 465 019	280	280	280	4000	7.0	43.2	131.5	216.5	260.8	20	40	M6	x
19	16	4	0 510 665 380	-	230	190	190	3000	7.8	47.5	154.2	248.3	297.5	20	40	depth 13	y

<sup>1)</sup> 4 and 5.5 cm<sup>3</sup> Ø 15

# Unit dimensions

## Standard range



**Ordering code:**

**AZPFFF - 10 -**    /    /       **R R 20 20 20 M B**

Displacement			Ordering-No.	Max. operating pressure [bar]	Max. rotation speed [rpm]	kg	Dimension [mm]						
$P_I$	$P_{II}$	$P_{III}$					$P_I$	$P_{II}$	$P_{III}$	$A_1$	$A_2$	$B_1$	$B_2$
8	5.5	5.5	<b>0 510 465 025</b>	280	280	280	43.2	129.4	213.6	257.7	20	40	M6 depth 13

<sup>1)</sup> 4 and 5.5 cm<sup>3</sup> Ø 15

## Notes for commissioning

- Fill pump with hydraulic fluid before installation.
- Check direction of rotation.
- Avoid axial and radial forces when mounting the couplings.
- Pipelines to be cleaned of dirt, cinders, sand, chips etc. Pipes, in particular must be pickled or rinsed.
- The introduction of external forces through pipe or hose lines is to be avoided.
- During the initial startup the overall hydraulics system is to be carefully vented. Vertical installations, in particular, with a drive shaft pointing upwards may result in air inclusions near the shaft seal ring.
- Cover up radial lip-type shaft seal ring when spraying and painting.
- Observe parameters, in particular, speeds and pressures as well as negative pressure in the suction line.
- Allow pump to run without load and have it deliver in depressurized state for several seconds to ensure it is sufficiently lubricated.
- Do not allow pump to run without any oil.
- If, after approx. 20 seconds, the pump is still operating without bubbles then the system should be checked again. Once the operating values have been reached, check pipe connections for signs of leaks. Check operating temperature.

### Filter recommendation

The major share of premature failures in gear pumps is due to contaminated hydraulic fluid.

As a warranty cannot be issued for dirt-specific wear, we recommend filtration compliant with cleanliness level 21/18/15 ISO 4406, which reduces the degree of contamination to a permissible dimension in terms of the size and concentration of dirt particles:

We recommend that a full-flow filter always be used.

Basic contamination of the hydraulic fluid used may not exceed class 19/16 as under 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!
- Repairs may only be made by the manufacturer or its authorized dealers and subsidiaries. Repairs conducted on their own will render the warranty null and void.

### Important notes

- Assembly, maintenance and repair of the pumps to be performed by authorized, skilled and instructed personnel only.
- Pump to be operated at specified data only (see page 16).
- Pump to be operated in proper working condition only.
- System to be depressurized when work conducted on pump.
- Arbitrary conversions and modifications, which affect safety and function are not allowed.
- Mount safety devices (e.g. coupling protection) or do not remove existing ones.
- Make sure that all fixing screws are tight (observe specified tightening torque values).
- General safety and accident prevention regulations must be adhered to.

### 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 scattering is therefore possible, and at certain marginal conditions (e.g. viscosity) the technical data may change.

### Characteristics

When configuring the engine note the maximum possible application data based on the characteristics shown on pages 11 to 13.

**You can find further information in our publication:**

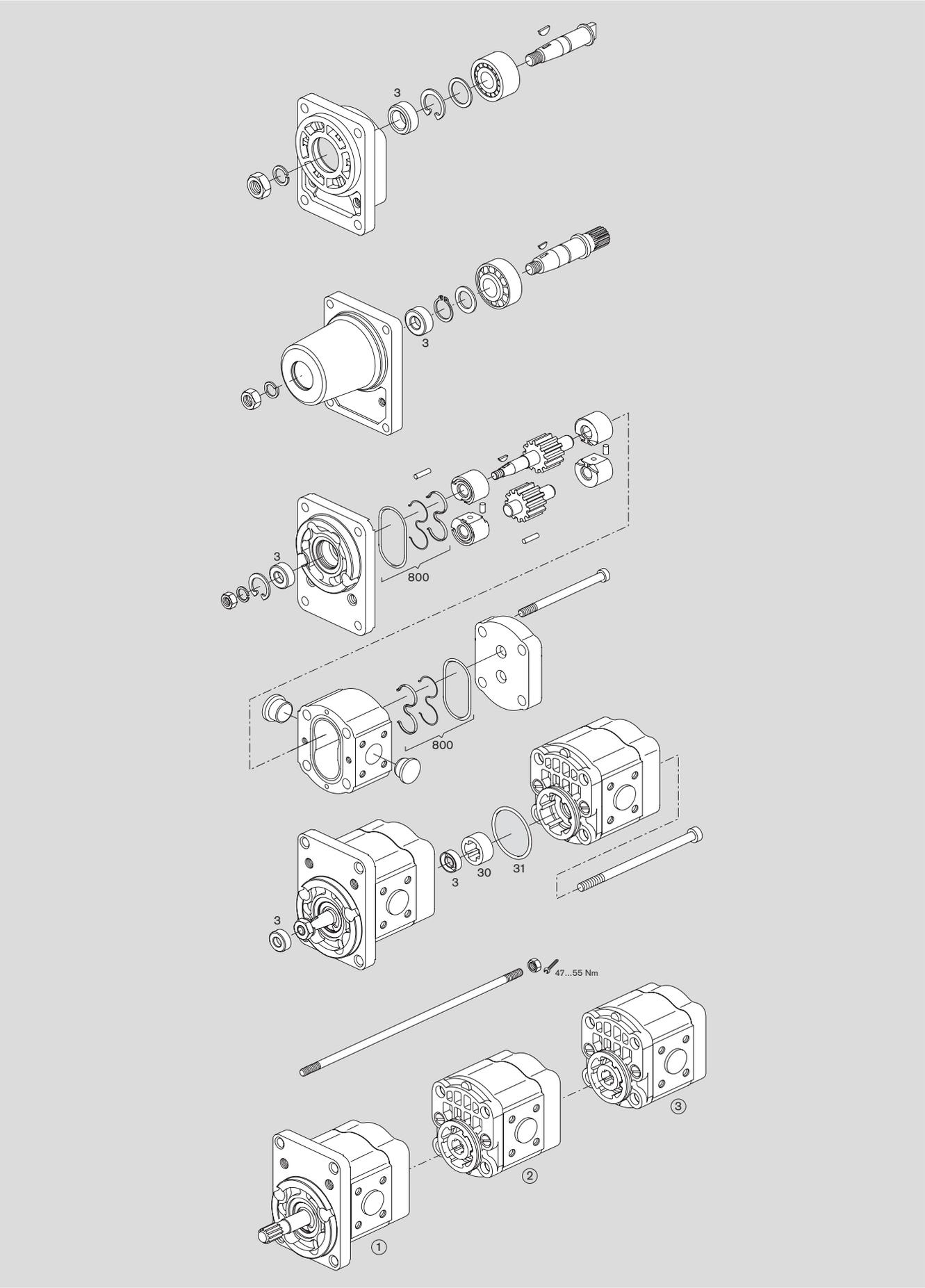
**"General Operating Instructions for External Gear Units"  
RE 07 012-B1.**

# Service parts

Page	Ordering code	Seal kit Pos. 800 1 517 010 ...	Shaft seal ring Pos. 3 1 510 283 ...	Material	Dimension	Seal ring Pos. 31 1 900 210 ...	Material	Dimension
20	AZPF - 1x - □□□□ CB 20 MB	152 NBR	008	NBR	17 x 30 x 7			
21	AZPF - 1x - □□□□ FB 20 MB	152 NBR	008	NBR	17 x 30 x 7			
22	AZPF - 1x - □□□□ HO 30 KB	152 NBR	044	FPM	18 x 30 x 7			
23	AZPF - 1x - □□□□ FO 30 MB	152 NBR	008	NBR	17 x 30 x 7			
23	AZPF - 1x - □□□□ FO 30 PB	193 FPM	027	FPM	17 x 30 x 7			
24	AZPF - 1x - □□□□ HO 01 MB	152 NBR	008	NBR	17 x 30 x 7			
25	AZPF - 1x - □□□□ AB 01 MB	206 FPM	037	NBR	18 x 30 x 6			
26	AZPF - 1x - □□□□ CP 20 MB	152 NBR	008	NBR	17 x 30 x 7			
26	AZPF - 1x - □□□□ CP 20 KB	152 NBR	027	FPM	17 x 30 x 7			
27	AZPF - 1x - □□□□ CN 20 MB	152 NBR	008	NBR	17 x 30 x 7	145	NBR	45 x 2.5
28	AZPF - 1x - □□□□ FN 20 MB	152 NBR	008	NBR	17 x 30 x 7			
29	AZPF - 1x - □□□□ FP 20 PB	193 FPM	027	FPM	17 x 30 x 7			
30	AZPF - 1x - □□□□ NT 20 MB	152 NBR	008	NBR	17 x 30 x 7	145	NBR	45 x 2.5
31	AZPF - 1x - □□□□ NL 20 KB	152 NBR	027	FPM	17 x 30 x 7	145	NBR	45 x 2.5
32	AZPF - 1x - □□□□ QR 12 MB	152 NBR	008	NBR	17 x 30 x 7			
33	AZPF - 1x - □□□□ RR 12 MB	152 NBR	008	NBR	17 x 30 x 7			
34	AZPF - 1x - □□□□ RR 20 MB	152 NBR	008	NBR	17 x 30 x 7			
34	AZPF - 1x - □□□□ RR 20 KB	152 NBR	027	FPM	17 x 30 x 7			
35	AZPF - 1x - □□□□ QR 20 MB	152 NBR	008	NBR	17 x 30 x 7			
36	AZPF - 1x - □□□□ SA 20 MB	152 NBR	008	NBR	17 x 30 x 7	145	NBR	45 x 2.5
36	AZPF - 1x - □□□□ SA 20 KB	152 NBR	015	FPM	17 x 30 x 7	145	NBR	45 x 2.5
37	AZPF - 1x - □□□□ SG 20 MB	152 NBR	009	NBR	20 x 40 x 7	145	NBR	45 x 2.5
39	AZPF - 1x - □□□□ CP 20 20 KB	152 NBR	027/008	NBR	17 x 30 x 7	145	NBR	45 x 2.5
41	AZPFF - 1x - □□□□ / □□□□ FB 20 20 MB	152 (2x) NBR	008 (2x)	NBR	17 x 30 x 7	145	NBR	45 x 2.5
43	AZPFF - 1x - □□□□ / □□□□ CB 20 20 MB	152 (2x) NBR	008 (2x)	NBR	17 x 30 x 7	145	NBR	45 x 2.5
45	AZPFF - 1x - □□□□ / □□□□ HO 20 20 MB	152 (2x) NBR	008 (2x)	NBR	17 x 30 x 7	145	NBR	45 x 2.5
45	AZPFF - 1x - □□□□ / □□□□ HO 20 20 KB	152 (2x) NBR	027/008	FPM/ NBR	17 x 30 x 7	145	NBR	45 x 2.5
47	AZPFF - 1x - □□□□ / □□□□ RR 20 20 MB	152 (2x) NBR	008 (2x)	NBR	17 x 30 x 7	145	NBR	45 x 2.5
47	AZPFF - 1x - □□□□ / □□□□ RR 20 20 KB	152 (2x) NBR	027 (2x)	FPM	17 x 30 x 7	145	NBR	45 x 2.5
48	AZPFF - 1x - □□□□ / □□□□ NM 20 20 MB	152 (2x) NBR	008	NBR	17 x 30 x 7	145	NBR	45 x 2.5
49	AZPFF - 1x - □□□□ / □□□□ FP 20 20 MB	152 NBR	008 (2x)	NBR	17 x 30 x 7	145	NBR	45 x 2.5
49	AZPFF - 1x - □□□□ / □□□□ FP 20 20 KB	152 (2x) NBR	027	FPM	17 x 30 x 7	145	NBR	45 x 2.5
50	AZPFF - 1x - □□□□ / □□□□ SA 20 20 MB	152 (2x) NBR	008/009	NBR	17 x 30 x 7	145	NBR	45 x 2.5
51	AZPFF - 1x - □□□□ / □□□□ SG 20 20 PB	193 (2x) FPM	015/027	FPM	17 x 30 x 7	1 520 210 101	FPM	45 x 2.5
52	AZPFF - 1x - □□□□ / □□□□ NL 20 20 KB	152 (2x) NBR	027 (2x)	FPM	17 x 30 x 7	145	NBR	45 x 2.5
53	AZPFFF - 1x - □□□□ / □□□□ / □□□□ FB 20 20 20 MB	152 (3x) NBR	008 (3x)	NBR	17 x 30 x 7	145 (2x)	NBR	45 x 2.5
54	AZPFFF - 1x - □□□□ / □□□□ / □□□□ CB 20 20 20 MB	152 (3x) NBR	008 (3x)	NBR	17 x 30 x 7	145 (2x)	NBR	45 x 2.5
55	AZPFFF - 1x - □□□□ / □□□□ / □□□□ CB 20 20 20 MB	152 (3x) NBR	008 (3x)	NBR	17 x 30 x 7	145 (2x)	NBR	45 x 2.5
55	AZPFFF - 1x - □□□□ / □□□□ / □□□□ CB 20 20 20 KB	152 (3x) NBR	027/008 (2x)	FPM/ NBR	17 x 30 x 7	145	NBR	45 x 2.5
56	AZPFFF - 1x - □□□□ / □□□□ / □□□□ SG 20 20 20 MB	152 (3x) NBR	008 (3x)	NBR	17 x 30 x 7	145 (2x)	NBR	45 x 2.5
57	AZPFFF - 1x - □□□□ / □□□□ / □□□□ FB 20 20 20 MB	152 (3x) NBR	008 (3x)	NBR	17 x 30 x 7	145 (2x)	NBR	45 x 2.5
58	AZPFFF - 1x - □□□□ / □□□□ / □□□□ RR 20 20 20 MB	152 (3x) NBR	008 (3x)	NBR	17 x 30 x 7	145 (2x)	NBR	45 x 2.5

NBR = Perbunan® FPM = Viton®

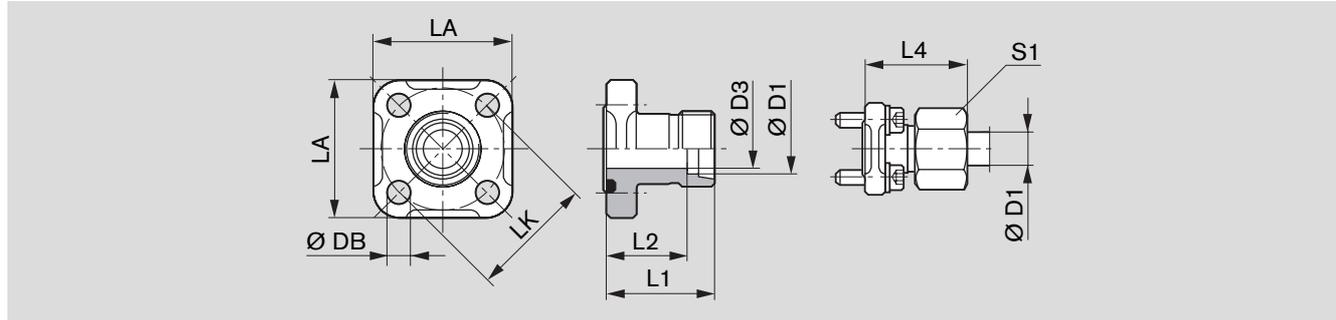
For further service parts refer to CD-ROM HYparts 1 987 760 010



# Fittings

Fittings can be used for rectangular flange **20** see page 9

## Gear pump flange, straight

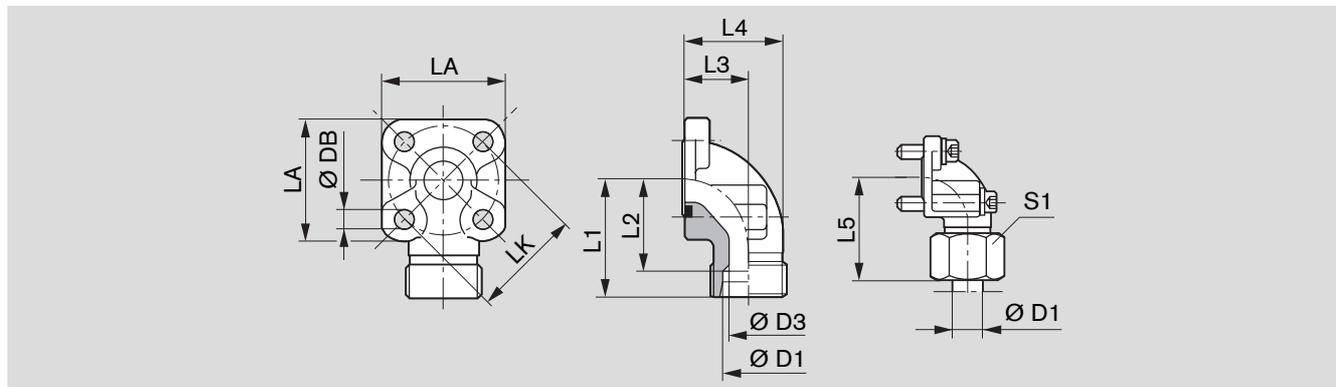


LK	D1	D3	L1	L2	L4	LA	S1	DB	Screws (metr.) 4x	Seal ring	Part number	p [bar]
35	10L	8	30	23.0	39.0	40	19	6.4	M 6 x 22	20 x 2.5	<b>1 515 702 064</b>	315
35	12L	10	30	23.0	39.0	40	22	6.4	M 6 x 22	20 x 2.5	<b>1 515 702 065</b>	315
35	15L	12	30	23.0	38.0	40	27	6.4	M 6 x 22	20 x 2.5	<b>1 515 702 066</b>	250
40	15L	12	35	28.0	43.0	42	27	6.4	M 6 x 22	24 x 2.5	<b>1 515 702 067</b>	100
40	18L	15	35	27.5	44.0	42	32	6.4	M 6 x 22	24 x 2.5	<b>1 515 702 068</b>	100
40	22L	19	35	27.5	44.5	42	36	6.4	M 6 x 22	24 x 2.5	<b>1 515 702 069</b>	100
40	28L	24	42	27.5	44.5	42	41	6.4	M 6 x 22	24 x 2.5	<b>1 515 702 008</b>	100

Complete fittings with seal ring, metric screw set, nuts and olive.

Fittings can be used for rectangular flange **20** see page 9

## Gear pump flange, 90° angle

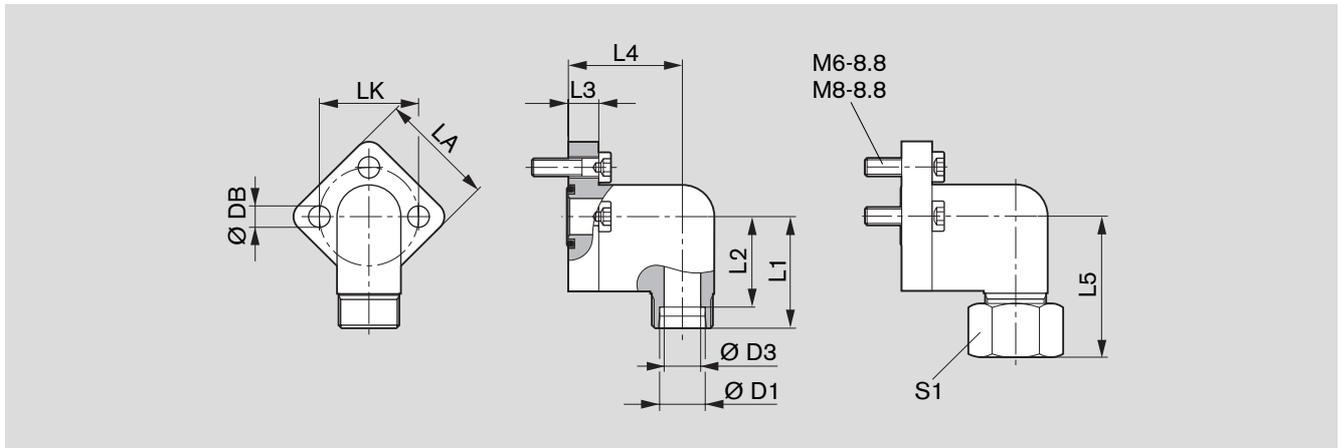


LK	D1	D3	L1	L2	L3	L4	L5	LA	S1	DB	Screws 2x	2x	Seal ring	Part number	p [bar]
35	10L	8	38	31.0	16.5	26.5	47.0	40	19	6.4	M 6 x 22	M 6 x 35	20 x 2.5	<b>1 515 702 070</b>	315
35	12L	10	38	31.0	16.5	26.5	47.0	40	22	6.4	M 6 x 22	M 6 x 35	20 x 2.5	<b>1 515 702 071</b>	315
35	15L	12	38	31.0	16.5	26.5	46.0	40	27	6.4	M 6 x 22	M 6 x 35	20 x 2.5	<b>1 515 702 072</b>	250
35	16S	12	38	29.5	20.0	31.0	48.0	40	30	6.4	M 6 x 22	M 6 x 40	20 x 2.5	<b>1 515 702 002</b>	315
35	18L	15	38	29.5	20.0	31.0	47.0	40	32	6.4	M 6 x 22	M 6 x 40	20 x 2.5	<b>1 545 702 006</b>	250
35	20S	16	45	34.5	25.0	38.0	56.0	40	36	6.4	M 6 x 22	M 6 x 45	20 x 2.5	<b>1 515 702 017</b>	315
40	15L	12	38	31.0	22.5	36.5	46.0	42	27	6.4	M 6 x 22	M 6 x 22	24 x 2.5	<b>1 515 702 076</b>	100
40	18L	15	38	30.5	22.5	36.5	47.0	42	32	6.4	M 6 x 22	M 6 x 22	24 x 2.5	<b>1 515 702 074</b>	100
40	20S	16	40	29.5	22.5	35.5	50.0	42	36	6.4	M 6 x 22	M 6 x 45	24 x 2.5	<b>1 515 702 011</b>	250
40	22L	19	38	30.5	22.5	36.5	47.5	42	36	6.4	M 6 x 22	M 6 x 22	24 x 2.5	<b>1 515 702 075</b>	100
40	28L	22	40	32.5	28.0	43.0	49.0	42	41	6.4	M 6 x 20	M 6 x 50	24 x 2.5	<b>1 515 702 010</b>	100
40	35L	31	41	30.5	32.0	55.0	52.0	42	50	6.4	M 6 x 22	M 6 x 60	24 x 2.5	<b>1 515 702 018</b>	100

Complete fittings with seal ring, metric screw set, nuts and olive.

Fittings can be used for rectangular flange **30** see page 9

Gear pump flange, 3-hole, 90° angle



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.

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0 510 215 009	26	0 510 415 006	30	0 510 515 019	30	0 510 565 014	39
0 510 215 306	27	0 510 415 313	27	0 510 515 309	26	0 510 565 015	48
0 510 215 307	30	0 510 415 314	30	0 510 515 310	27	0 510 565 016	48
0 510 215 309	26	0 510 415 316	26	0 510 515 311	30	0 510 565 018	41
0 510 225 006	20	0 510 425 009	20	0 510 515 316	26	0 510 565 019	41
0 510 225 007	21	0 510 425 010	21	0 510 515 317	26	0 510 565 022	47
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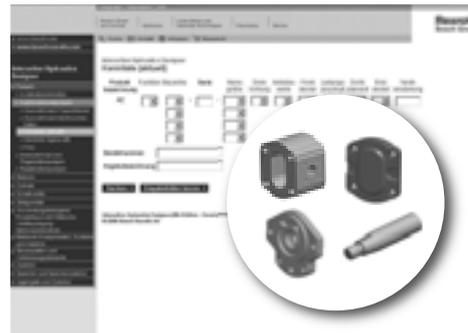
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## The AZ configurator at [www.boschrexroth.com/azconfigurator](http://www.boschrexroth.com/azconfigurator)

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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