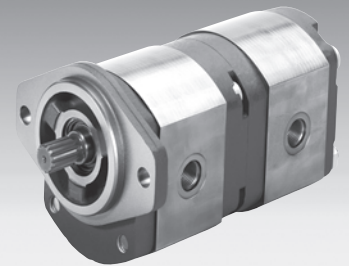
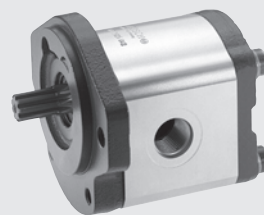


# External Gear Pumps Series F

**RA 10089/08.11**  
Replaces: RA 10097

1/60

AZPF-...



Fixed pumps  
Size 4.0...28 cm<sup>3</sup>/rev (.25 - 1.71 in<sup>3</sup>/rev)

## Overview of contents

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## Features

<b>Page</b>	– Displacements 4 cc - 28 cc
2	– Nominal pressure 280 bar
3	– Slide bearings for heavy duty applications
4	– Drive shafts to SAE or ISO
5	– Ports: threaded or flange
6	– Wide range of configurations
7	– Tandem and multi-pump configurations

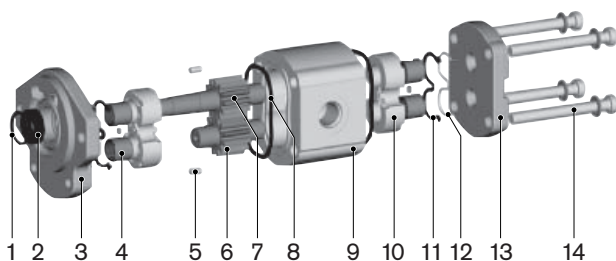
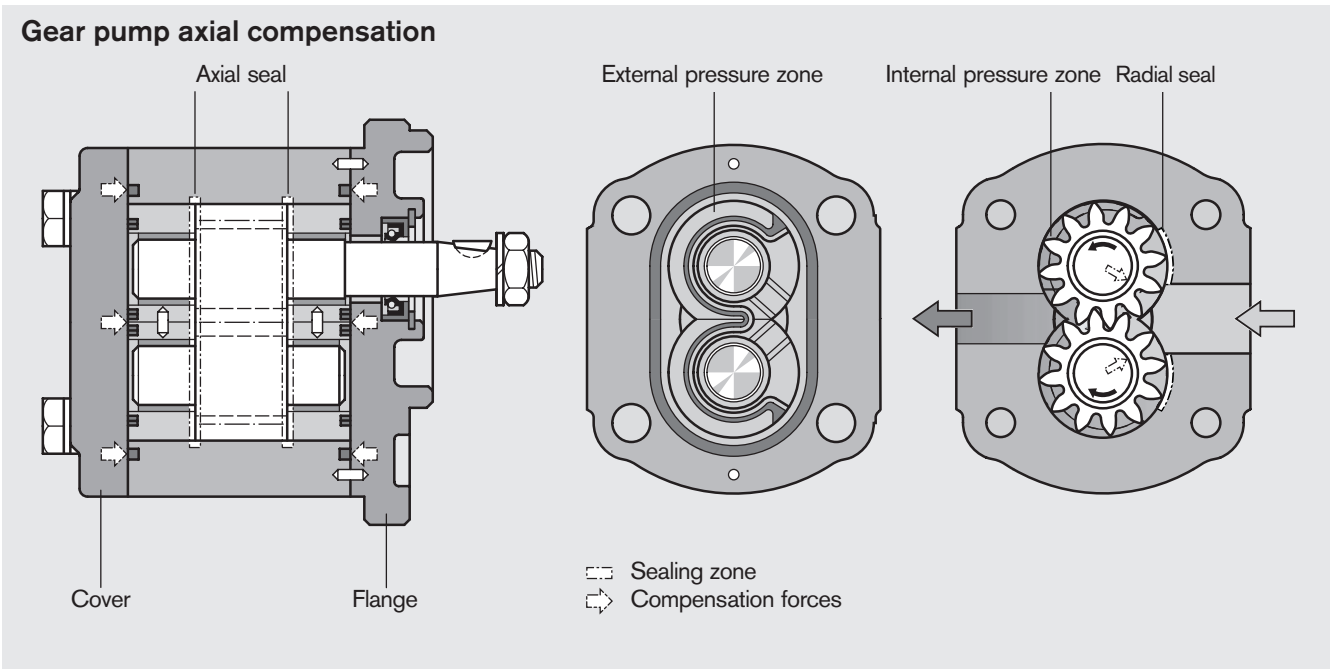
## General

Rexroth external gear pumps are available as standard gear pumps in the B, F, N and G series, and as SILENCE gear pumps in the S, T and U series. 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.

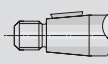


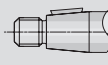








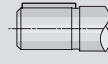


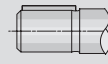





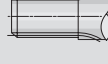

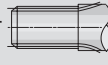

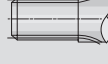



- |                   |                    |
|-------------------|--------------------|
| 1 Retaining ring  | 8 Case seal        |
| 2 Shaft seal ring | 9 Pump case        |
| 3 Front cover     | 10 Bearing         |
| 4 Slide bearing   | 11 Axial zone seal |
| 5 Centering pin   | 12 Support        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

Product overview of "Series F" standard types

Version	Page	Version	Page	Version	Page	Version	Page
	20 24		30		39		50
	21		31		40		51
	22		32		41		52
	23		33		42		
	25		34		43		
	26		35		44		
	27		36		46		
	28		37		48		
	29		38		49		







<b>AZ</b>	<b>P</b>	<b>F</b>	<b>- 1□ or 2□</b>	<b>- 016</b>	<b>R</b>	<b>R</b>	<b>R</b>	<b>12</b>	<b>M</b>	<b>B</b>	<b>-□□□</b>	<b>□□</b>	<b>-S□□□□</b>
											<b>Special Design*</b>		
<b>Function</b>											PRV (bar)		FCV (l/min)
P = Pump											Example:		
<b>Size (F)</b>											180 bar, 9 l/min = 180 09		
.25 in3 ( 4.1 cm3) = 004											Use XXX if valve not applicable		
.34 in3 ( 5.6 cm3) = 005													
.50 in3 ( 8.2 cm3) = 008													
.69 in3 (11.3 cm3) = 011													
.88 in3 (14.4 cm3) = 014													
1.00 in3 (16.5 cm3) = 016													
1.20 in3 (19.6 cm3) = 019													
1.40 in3 (22.9 cm3) = 022													
1.55 in3 (25.5 cm3) = 025													
1.74 in3 (28.5 cm3) = 028													
<b>Direction of rotation</b>													
Right = R													
Left = L													
											<b>End cover</b>		
											Standard = B		
											Rear ports = A		
											FCV, excess flow ext. = E		
											PRV + FCV = V		
											Priority flow control = P		
											Pressure relief valve = D		
											<b>Seals</b>		
											NBR = M		
											FPM = P		
											NBR, shaft seal in FPM = K		

Drive shafts			Front flange			Line connections				
<b>C</b>	Conical 1:5 (Tapered key)		<b>B</b>	<b>P</b>	<b>B</b>	Square flange Pilot Ø 80 mm		<b>20</b>	Rectangular flange	
<b>S</b>	Conical 1:5 for flange A (Tapered key)		<b>A</b>		<b>R</b>	SAE J744 82-2 A 2-bolt flange Ø 82.55 mm		<b>12</b>	Thread (UN-2B) SAE O-ring BOSS	
<b>H</b>	Conical 1:8 (Tapered key)		<b>O</b>		<b>P</b>	Transmission flange Pilot Ø 50 mm		<b>01</b>	BSP pipe thread ISO 228/1	
<b>N</b>	Dihedral claw (Dog tang)		<b>M</b>		<b>O</b>	Square flange Pilo Ø 36.47 mm		<b>30</b>	Rectangular flange	
<b>A</b>	Straight keyed ISO Ø 18 mm		<b>B</b>		<b>C</b>	SAE J744 102-2 B 2-bolt flange Ø 101.6 mm		<b>07</b>	Split flange SAE* ISO 61 62-1 Type 1 Metric threads	
<b>Q</b>	Straight keyed SAE J744 16-1 A		<b>R</b>		<b>M</b>	2-bolt flange Pilot Ø 52 mm with O-ring		<b>40</b>	Split flange SAE* ISO 61 62-1 Type 2 UNC threads	
<b>Q</b>	SAE 5/8" Keyed, long *Use SO022 suffix		<b>R</b>		<b>A</b>	Outboard bearing Pilot Ø 80 mm Type 1		<b>03</b>	Thread, metric ISO 6149 w/seal ring	
<b>R</b>	9T spline SAE J744 16-4 9T		<b>R</b>	<b>C</b>	<b>N</b>	2-bolt mounting Pilot Ø 50 mm				
<b>P</b>	11T spline SAE J744 19-4 11T		<b>R</b>	<b>C</b>	<b>T</b>	4-bolt mounting Ø 52 mm w/O-ring				
<b>F</b>	Spline shaft DIN 5482 B17x14		<b>B</b>	<b>P</b>	<b>G</b>	Outboard bearing Ø 80 mm Type 2				

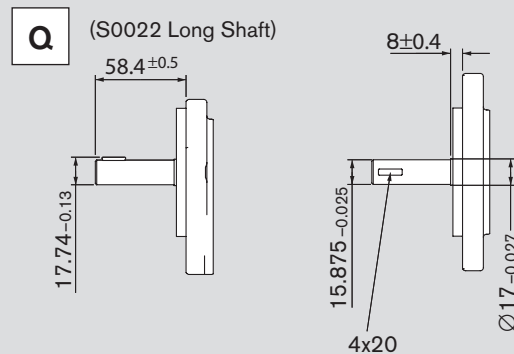
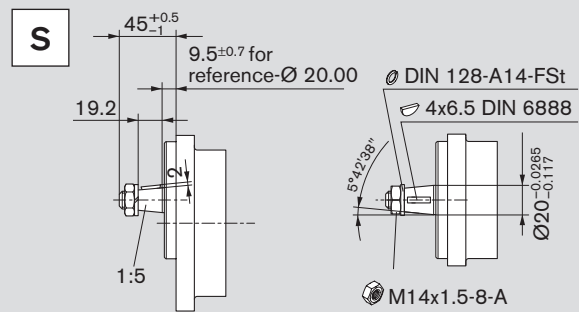
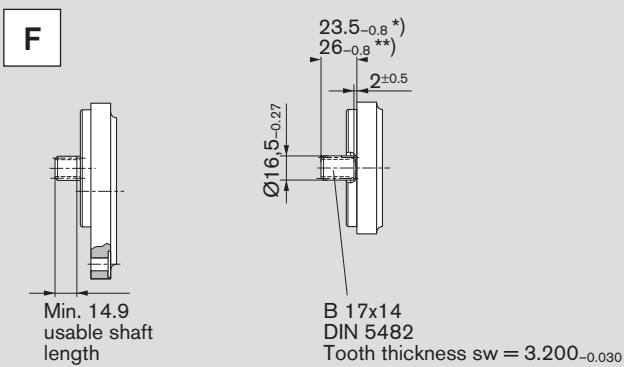
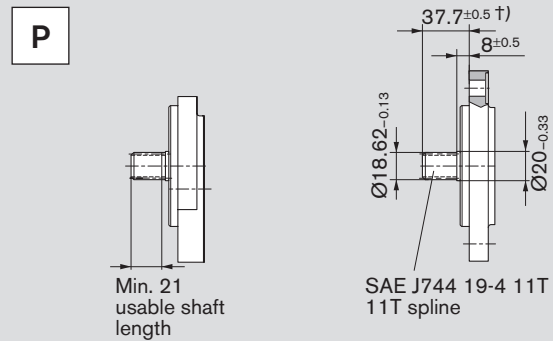
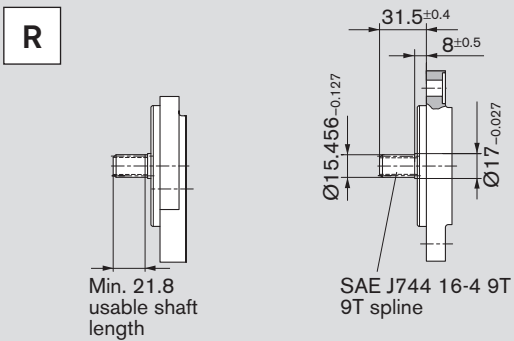
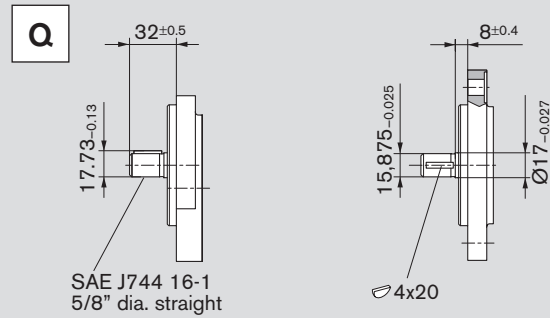
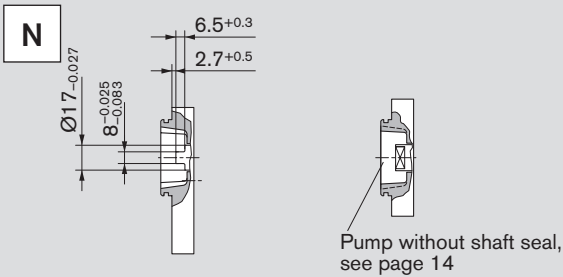
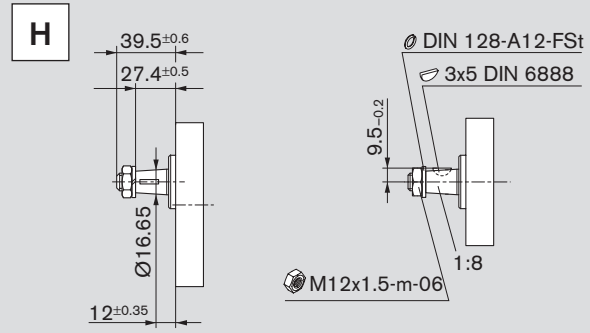
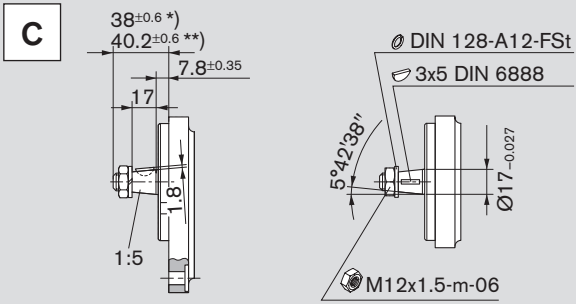
\*07 and 40 line connections limited to 19 cc and larger sizes.

<b>AZ P F F F - □□ - 022 / 016/005 R R R 12 / 12 / 12 M B -S□□□□</b>									
<b>Special Design*</b>									
<b>Function</b> P = Pump									
<b>Model **</b> F = 4.0 ... 28.0 cm <sup>3</sup> /rev									
<b>Series</b> 1x = Standard bearing 2x = Reinforced bearing									
<b>Size</b> Based on available sizes per series									
<b>Direction of rotation</b> Right = R Left = L									
					<b>Rear cover</b> refers on the last pumps part Model F, Standard = B				
					<b>Seals</b> NBR = M FPM = P NBR, shaft seal in FPM = K				

Drive shafts	Front flange	Line connections
--------------	--------------	------------------

<p><b>Q</b> Straight keyed SAE J744 16-1A </p> <p><b>P</b> 11T spline SAE J744 19-4 11T </p> <p><b>R</b> 9T spline SAE J744 16-4 9T </p>	<p style="text-align: center;">Matching front flange</p> <p><b>R</b></p> <p><b>C</b> SAE J744 101-2 B 2-bolt flange Ø 101.6 mm </p> <p><b>R</b> SAE J744 82-2 A 2-bolt flange Ø 82.55 mm </p>	<p><b>12</b> Thread (UN-2B) SAE O-ring BOSS </p>
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Drive shafts

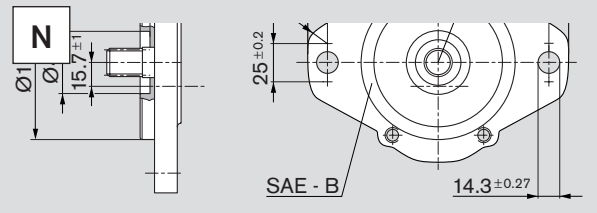
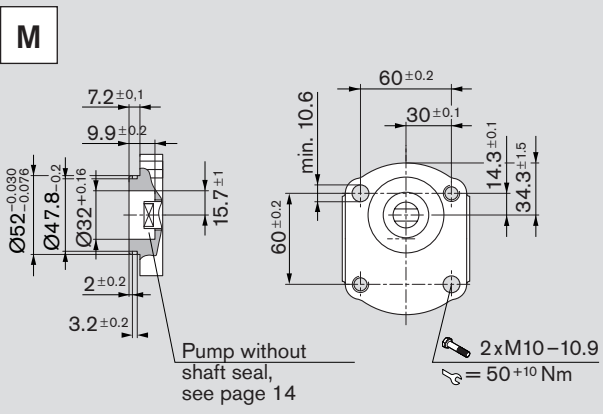
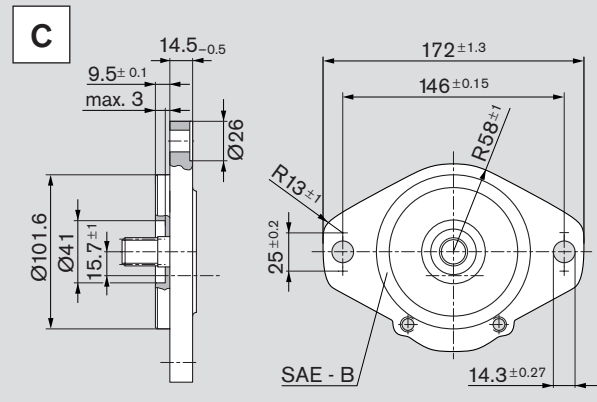
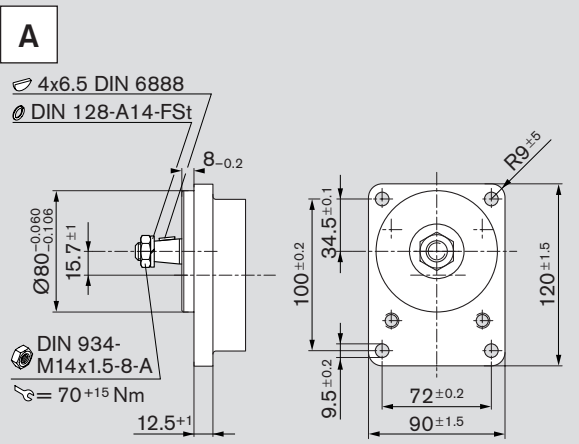
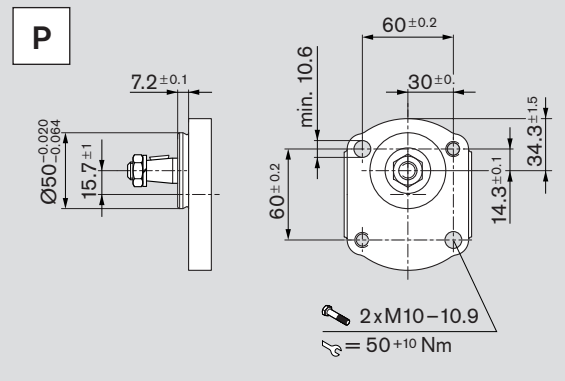
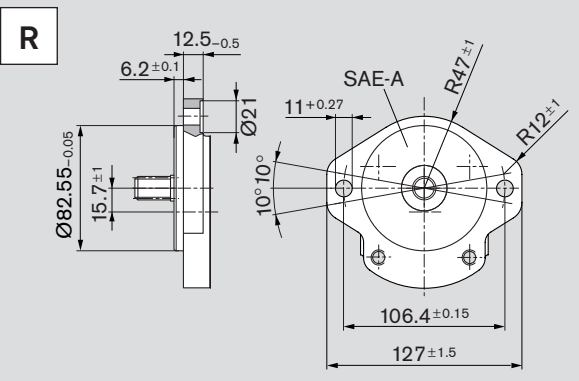
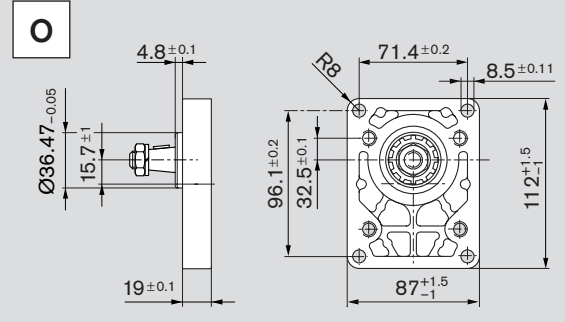
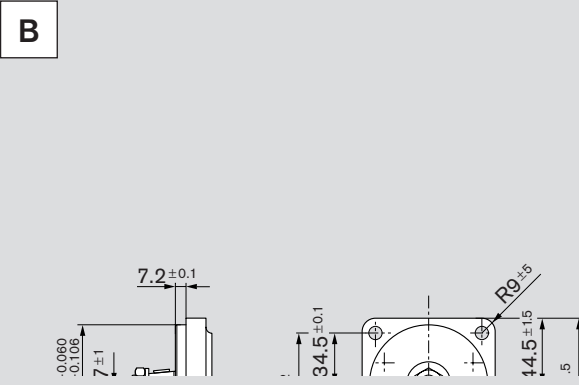


\*) in combination with front cover **B**

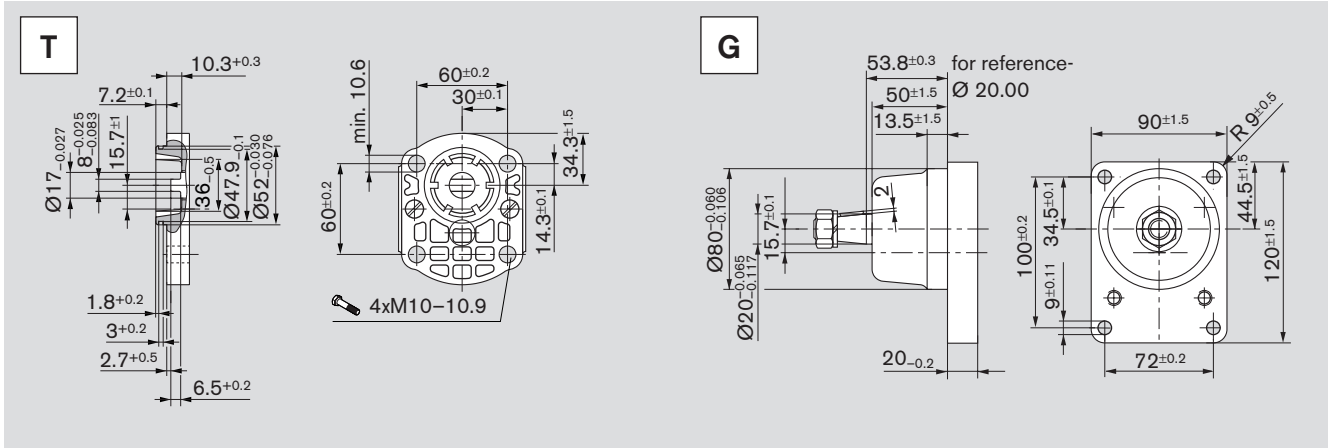
\*\*) in combination with front cover **P**

†) Older version dim. is 31.5±0.4. Some units still use this length. Check specific pump for dimensions.

Front cover

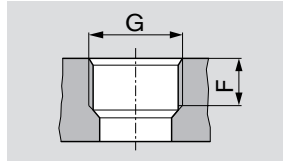


Front cover (continued)





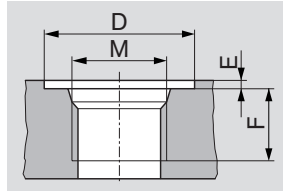
Ports



**01** Pipe thread  
ISO 228/1

At pressures  $p_2 > 210$  bar  
limited fatigue strength

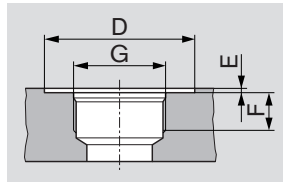
Ordering code	Size	Pressure side		Suction side	
		G	F	G	F
01	4...16 cm <sup>3</sup>	G 1/2	16	G 3/4	16
	19...28 cm <sup>3</sup>	G 3/4		G 1	19



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

At pressures  $p_2 > 210$  bar  
limited service life

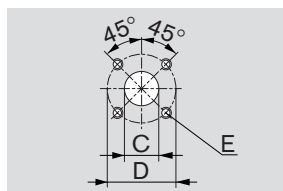
Ordering code	Size	Pressure side				Suction side			
		M	D	E	F	M	D	E	F
03	4...5.5 cm <sup>3</sup>	M 18 x 1.5	29	0.5	16	M 18 x 1.5	29	0.5	16
	8...16 cm <sup>3</sup>	M 22 x 1.5	34		18	M 27 x 2	40		19
	19...28 cm <sup>3</sup>					M 33 x 2	46		22



**12** Thread  
(UN-2B, UNF-2B)  
SAE J1926-1  
seal ring BOSS

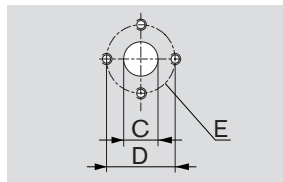
At pressures  $p_2 > 210$  bar  
limited service life

Ordering code	Size	Pressure side				Suction side			
		G	D	E <sub>max</sub>	F	G	D	E <sub>max</sub>	F
12	4...5.5 cm <sup>3</sup>	3/4-16 UNF-2B	30	2.4	14.3	7/8-14 UNF-2B	34	2.4	16.7
	8 cm <sup>3</sup> - 14 cm <sup>3</sup>	7/8-14 UNF-2B	34		16.7	1-1/16-12 UN-2B	41		19
	16...28 cm <sup>3</sup>					1 5/16-12 UN-2B	49	3.2	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...22.5 cm <sup>3</sup>				20		
	19...28 cm <sup>3</sup> *)				26	55	



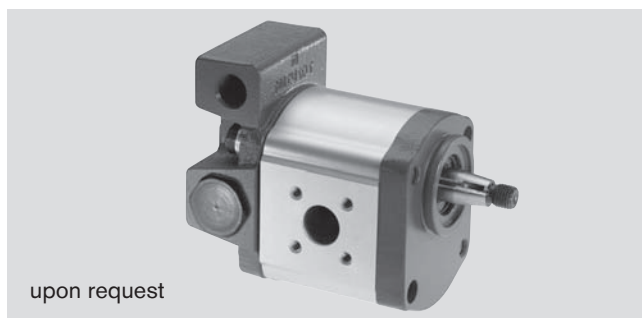
**30** Rectangular flange

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	39.7	M8, depth 13

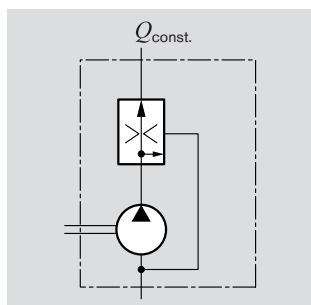
\*) Dimension of Series 2

## Gear pumps with integral valves

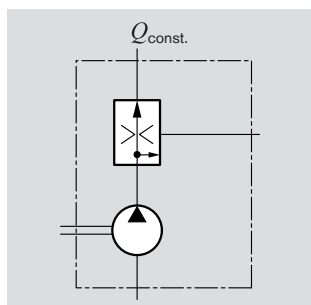
In order to reduce external pipework it is possible to incorporate a flow-control valve or pressure-relief valve in the rear cover of the gear pump. A typical application of this is in the supply of hydraulic oil in power steering systems. The pump delivers a constant flow irrespective of the speed at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



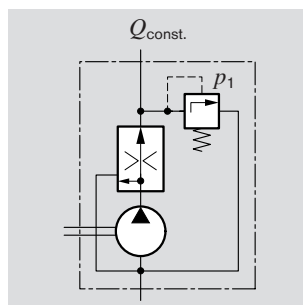
upon request



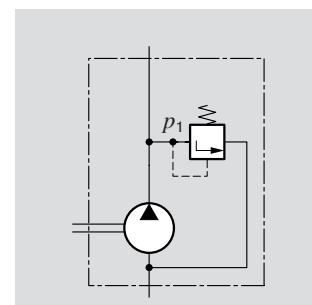
3-way flow-control valve.  
Excess flow returned to suction line  
 $Q_{const.} = 2...30 \text{ l/min}$



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



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



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

### Ordering code

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

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

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

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

## Design calculations for pumps

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

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

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

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

The following formulas describe the various relationships.

They include correction factors for adapting the parameters to the usual units encountered in practice.

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

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

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

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

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

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

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

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

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

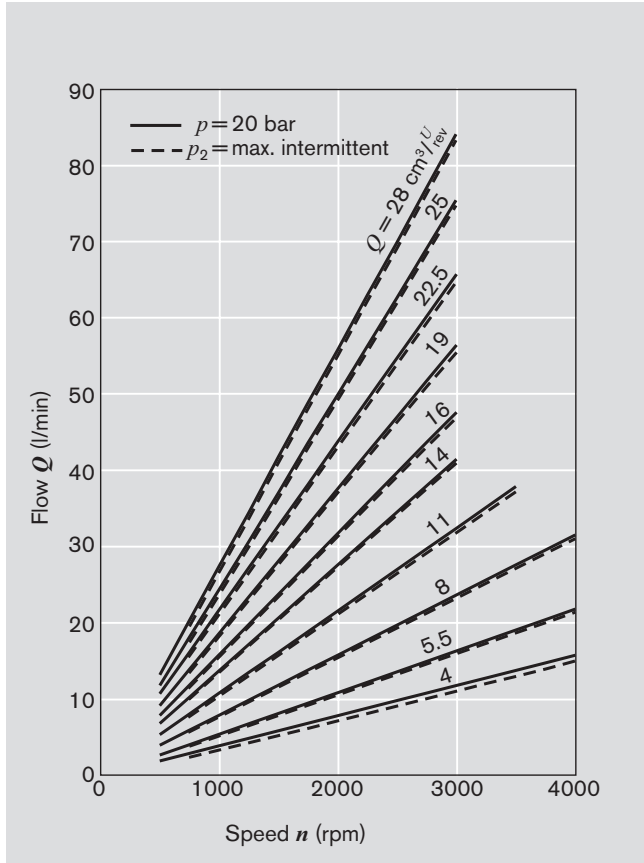
$$p = \frac{6 \cdot P \cdot \eta_t}{Q}$$

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

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

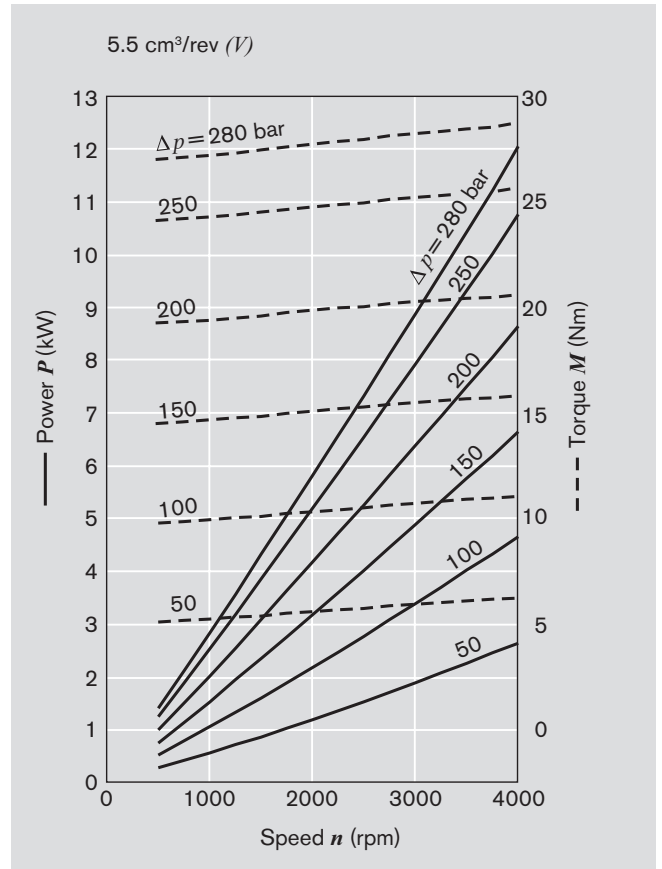
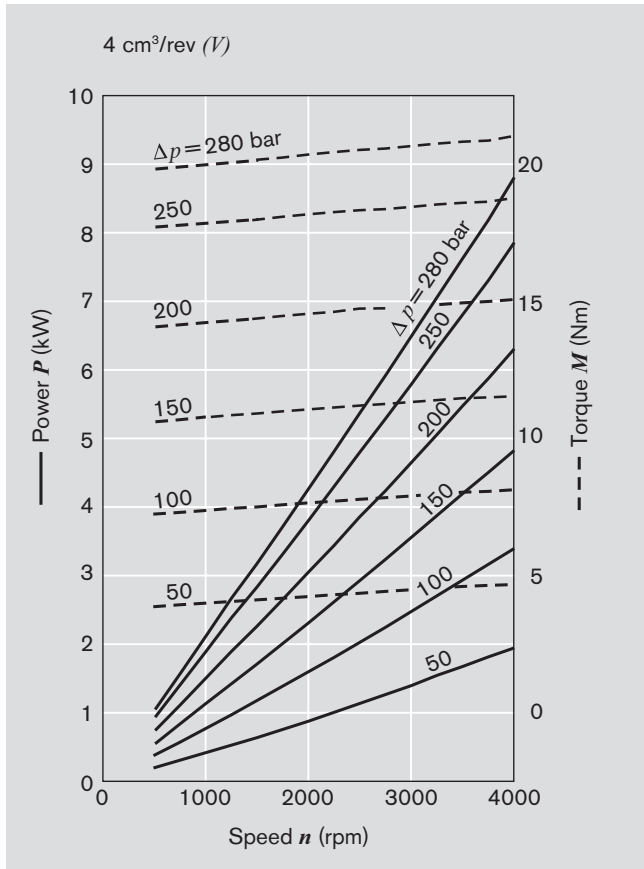
\* Some versions have relief line returning to reservoir. Contact factory for additional information.

### Performance charts

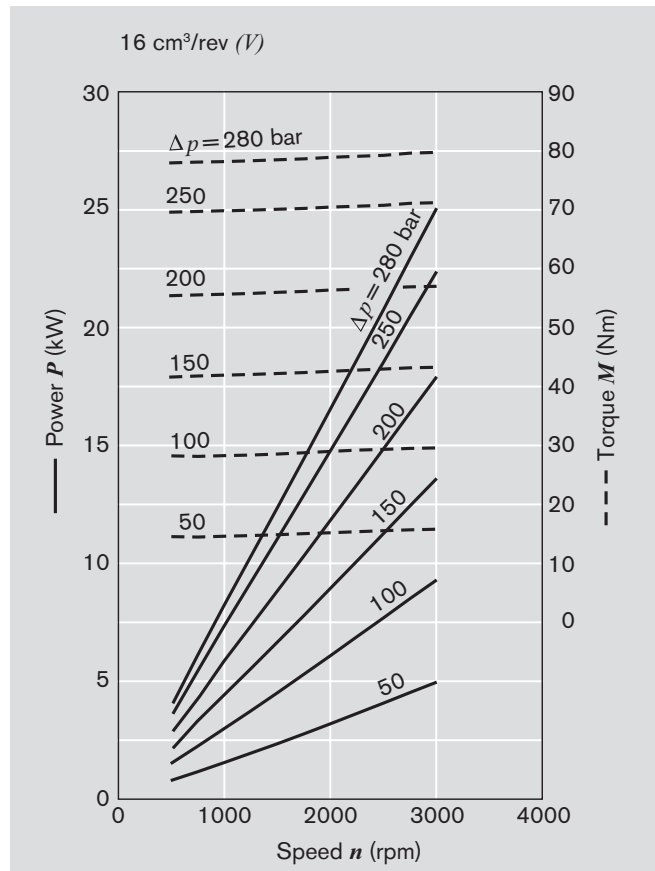
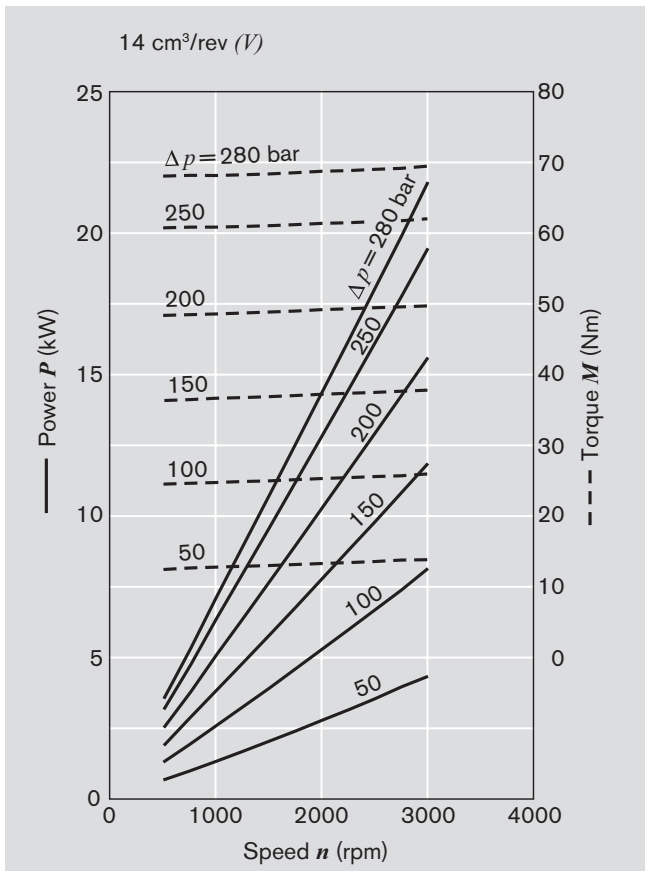
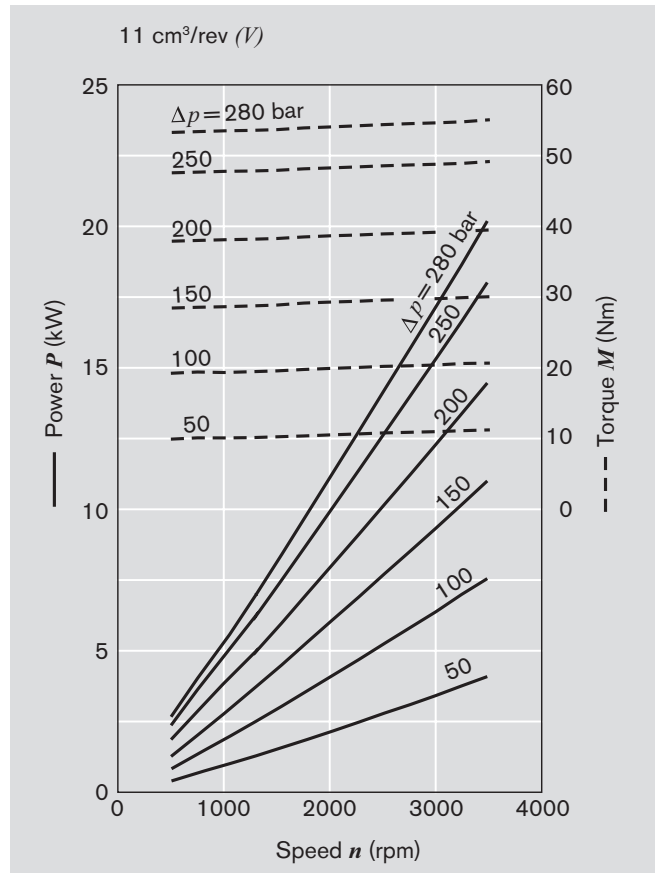
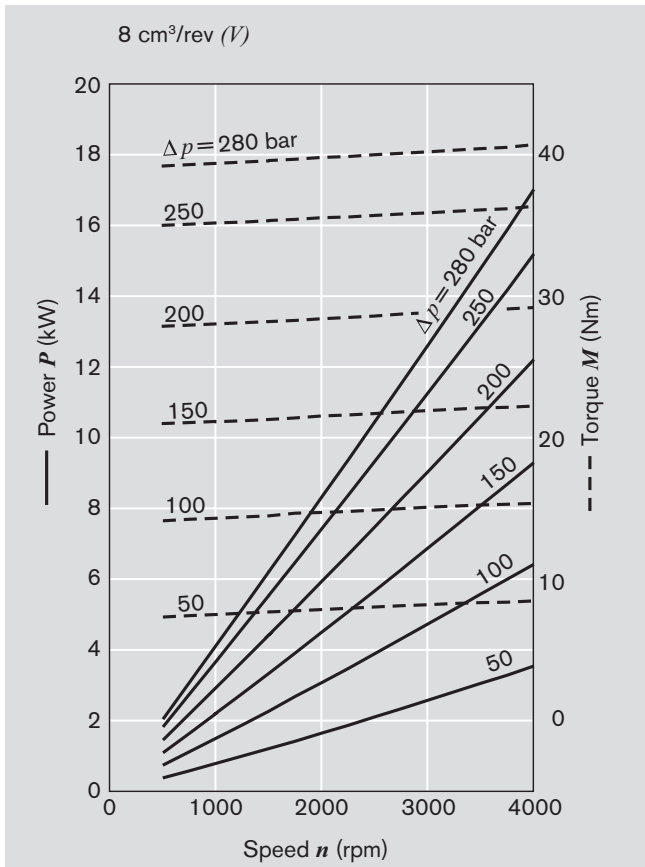


$\nu = 32$  mm<sup>2</sup>/s,  $\vartheta = 50^\circ\text{C}$

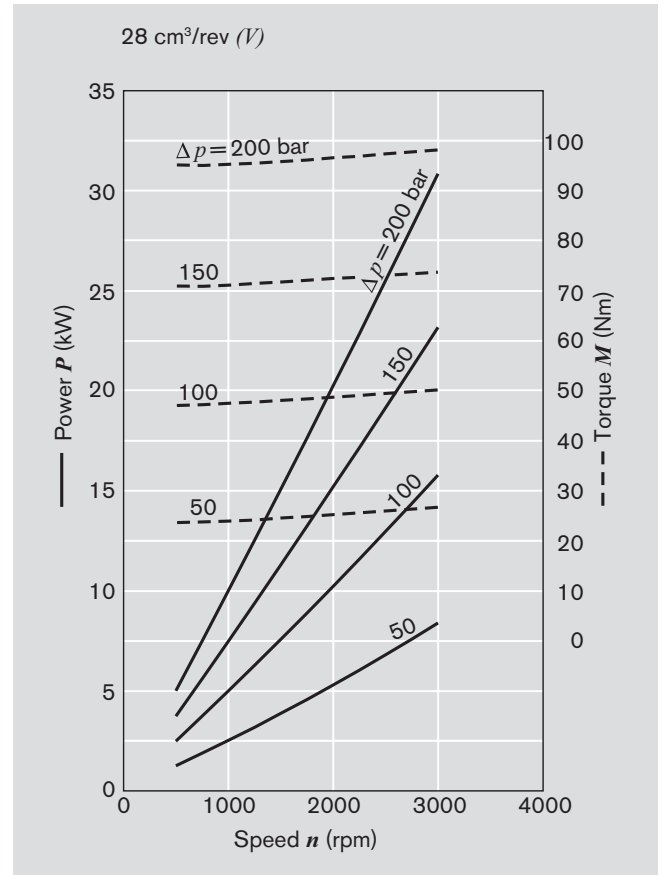
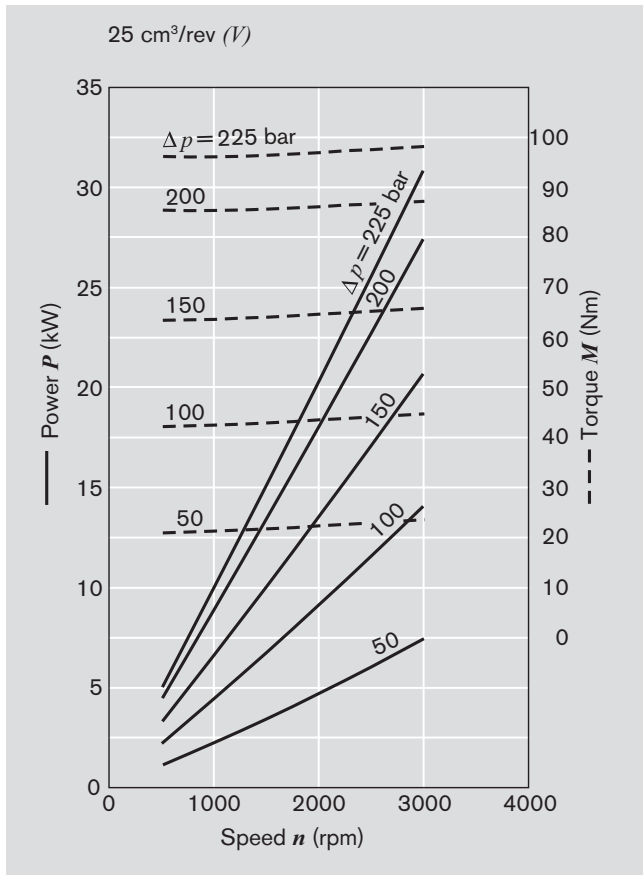
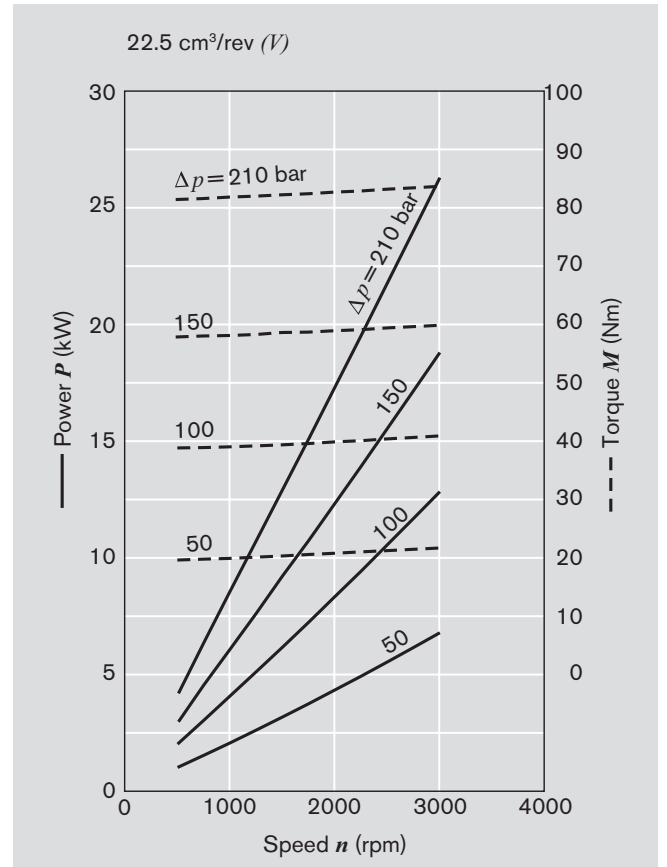
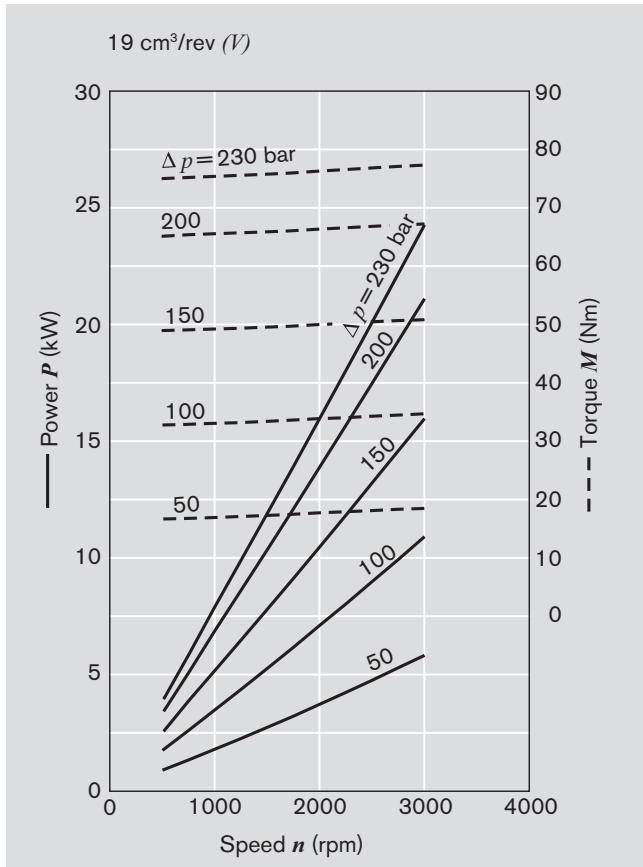
$Q = f(n, V)$  incl.  $\eta_v$   
 $P = f(n, p)$  — incl.  $\eta_t$   
 $M = f(n, p)$  - - - incl.  $\eta_{hm}$



Performance charts (continued)



Performance charts (continued)



## Noise charts

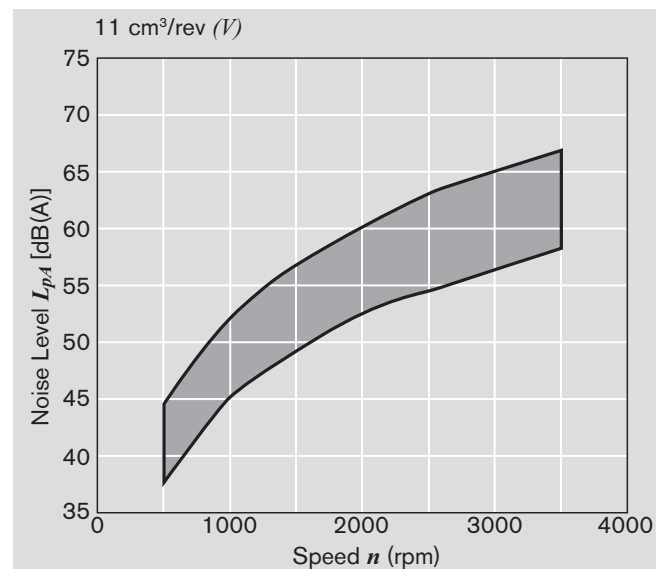
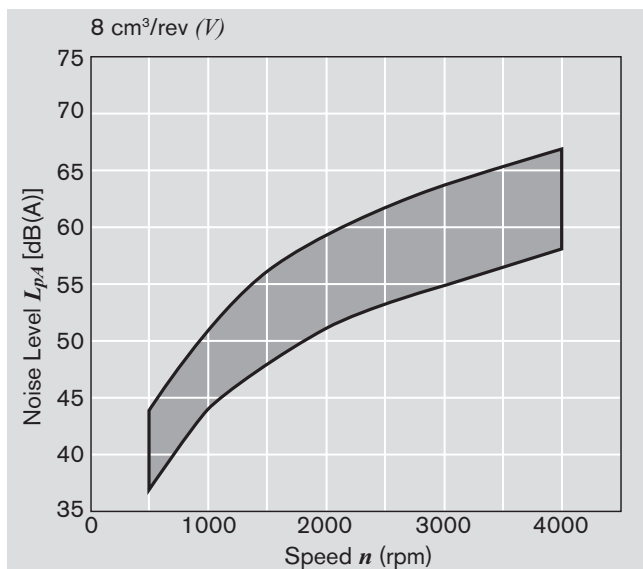
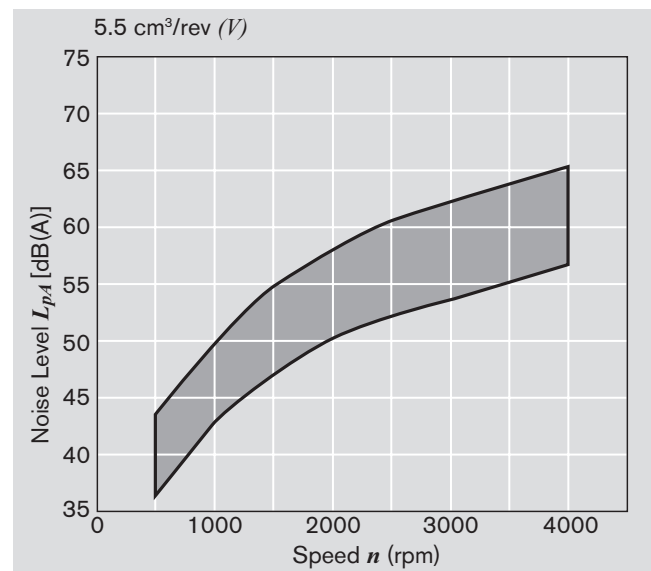
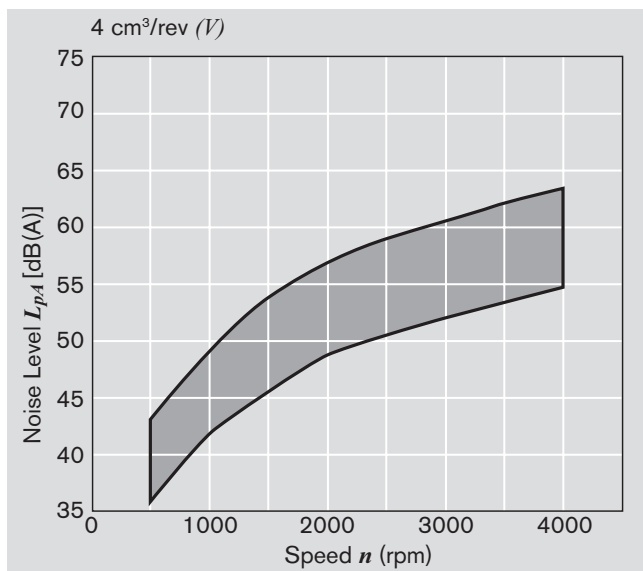
**Noise level** dependent on rotational speed, pressure range between 10 bar and pressure value  $p_2$  (see page 16 Specifications table).

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

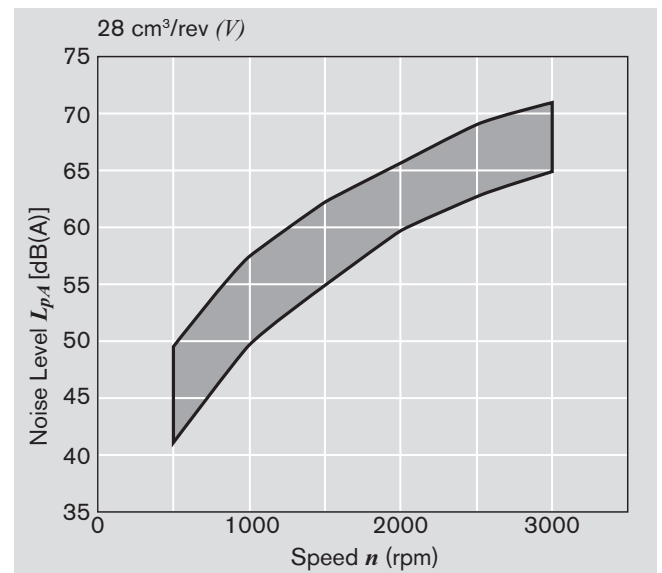
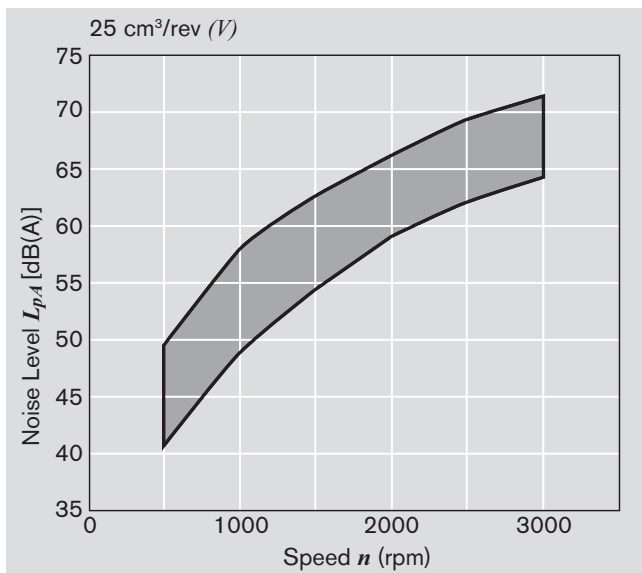
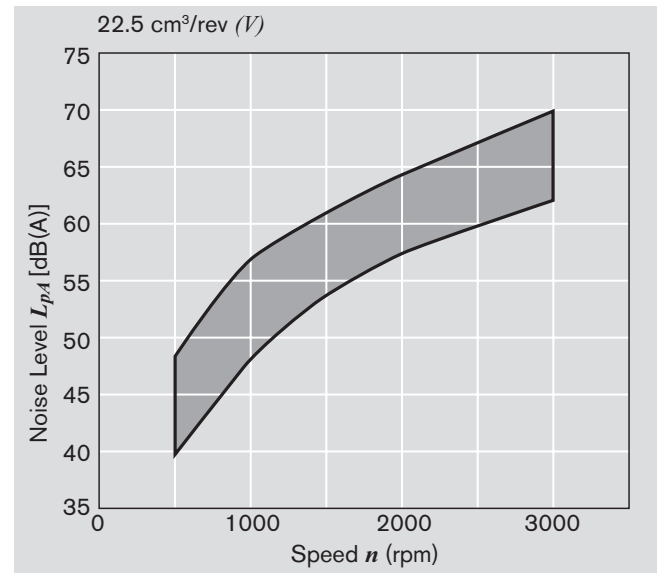
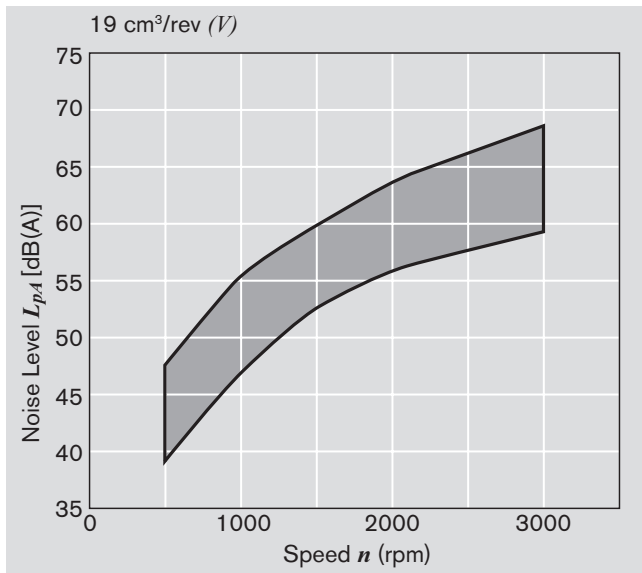
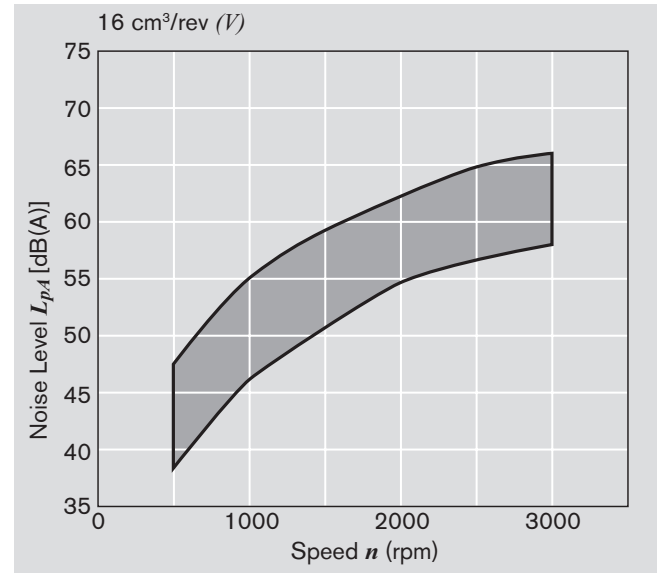
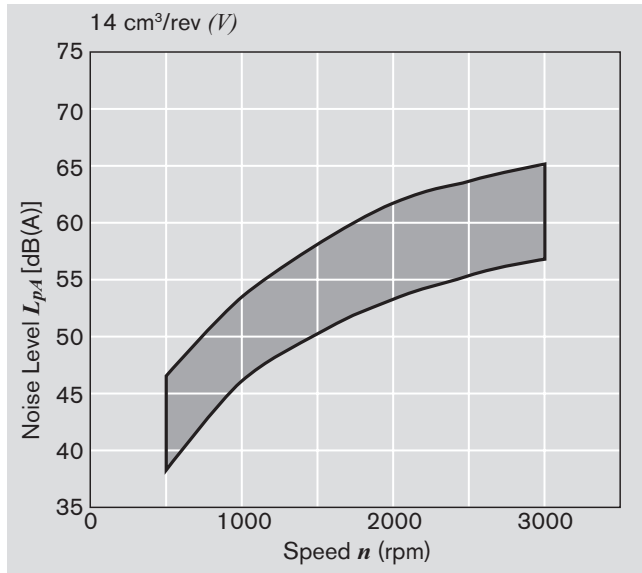
Sound pressure level calculated from noise measurements made in the sound absorbent measuring room compliant with DIN 45 635, Part 26.

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
Ports	Threaded, flange
Direction of rotation (looking on shaft)	Clockwise or counter-clockwise, the pump may only be driven in the direction indicated
Installation position	Any
Load on shaft	Radial and axial forces after consulting
Ambient temperature range	-30 °C...+80 °C (-22 °F... +176 °F) or max. 110 °C (230 °F) with FPM seal
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 90220 - Further operating fluids possible after consultation
Viscosity	12...800 mm <sup>2</sup> /s permitted range 20...100 mm <sup>2</sup> /s recommended range ...2000 mm <sup>2</sup> /s range permitted for starting
Fluid temperature range	max. +80 °C (176 °F) with NBR seals*) max. +110 °C (230 °F) with FPM seals**)
Filtration ***)	At least cleanliness level 20/18/15 compliant with ISO 4406 (1999)

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

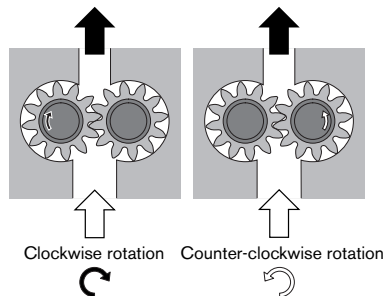
Safety requirements pertaining to the whole systems are to be observed.

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

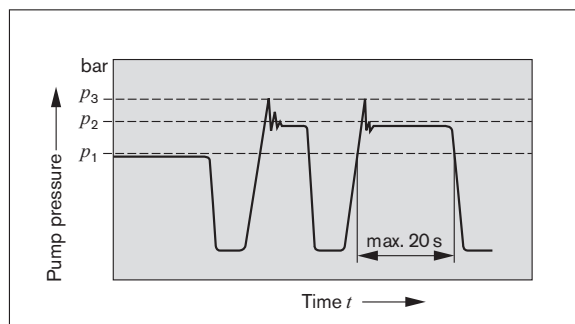
## Definition of direction of rotation

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	800
			180... $p_2$	1400	1400	1400	1200	1000	1000	1000	1000	1000
	25 mm <sup>2</sup> /s		$p_2$	700	700	700	600	500	500	500	500	500
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	500
at bar	12 mm <sup>2</sup> /s		100...180	1200	1200	1000	1000	800	800	800	800	800
			180... $p_2$	1400	1400	1400	1200	1000	1000	1000	1000	1000
	25 mm <sup>2</sup> /s		$p_2$	700	700	700	600	500	500	500	500	500
Max. rotational speed at	$p_2$		4000			3500	3000	3000	3500	3500	3000	3000

\* Pumps with threaded ports may experience reduced life if used continuously above 210 bar.



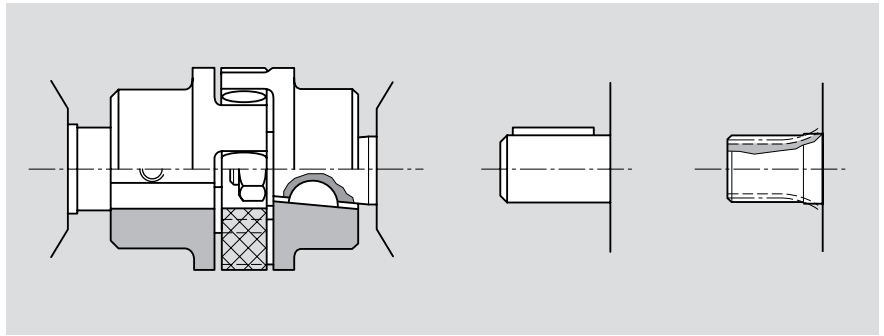
## Drive arrangements

### 1. Flexible couplings

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

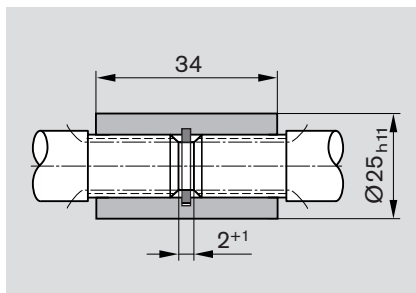
The maximum radial runout of shaft spigot is 0.2 mm.

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.

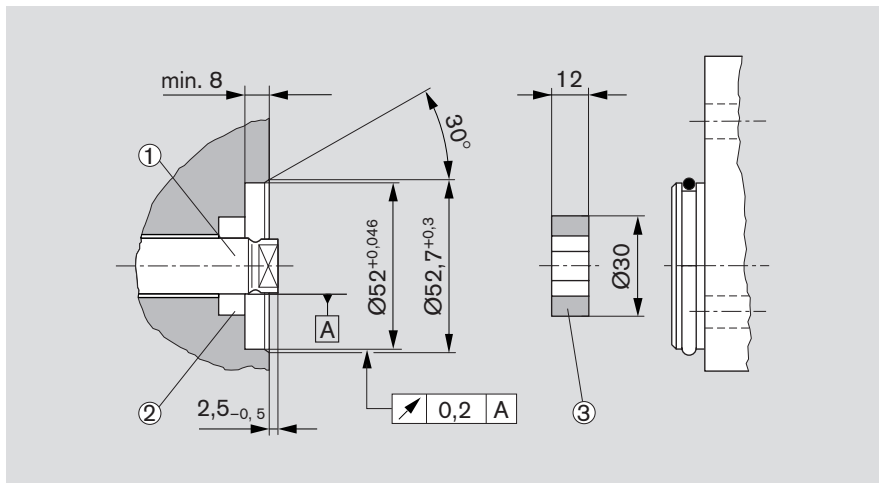


Splined shaft	Torque $M_{max}$ [Nm]	Displacement $V$ [cm <sup>3</sup> /rev]	Pressure $p_{max}$ [bar]
DIN	100	4...28	$p_{max}$
SAE 9t	110		
SAE 11t	180		

### 3. Drive shaft with tang

For the close-coupling of 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 seal.

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  $R_{max.} \leq 4\mu\text{m}$

#### ② Radial shaft seal ring

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

### Drive with tang

#### AZPF-1x

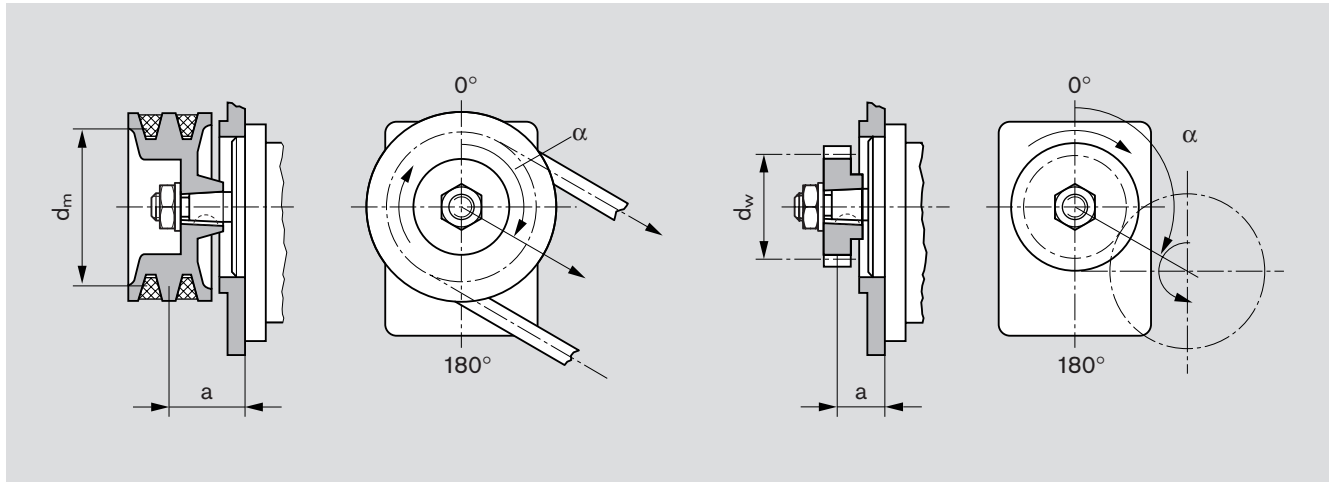
Torque $M_{max}$ [Nm]	Displacement $V$ [cm <sup>3</sup> /rev]	Pressure $p_{max}$ [bar]
65	4...14	280
	16	230
65	19	190
	22.5	160

#### AZPF-2x

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

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

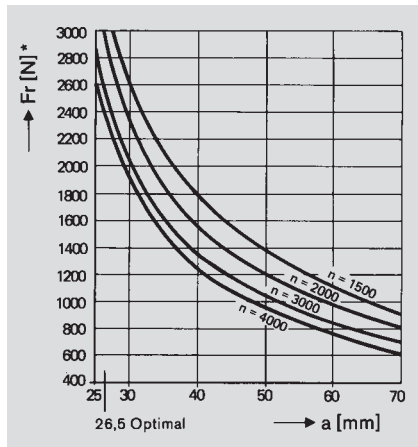
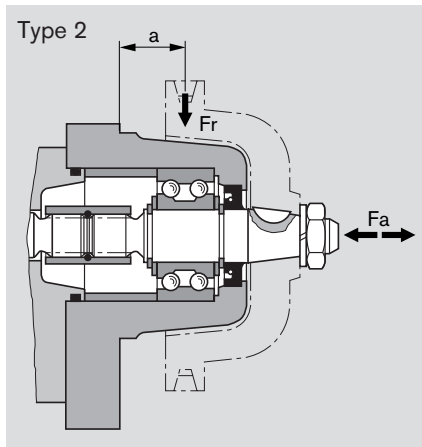
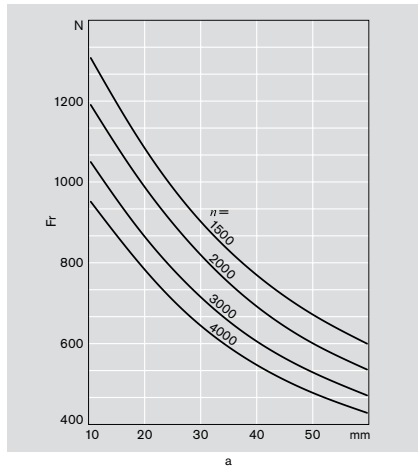
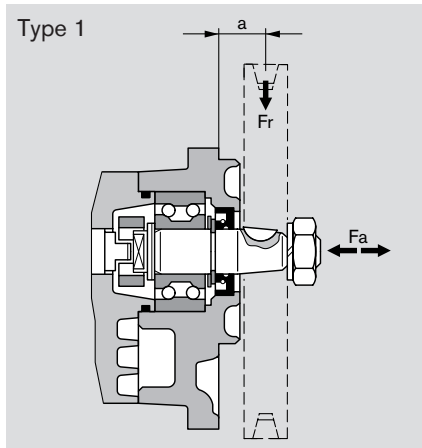
When proposing to use V-belt or gear drive, please submit details of the application for our evaluation (especially dimensions  $a$ ,  $d_m$ ,  $d_w$  and angle  $\alpha$ ).



**5. Outboard bearing**

Outboard bearings eliminate possible problems when 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.

Torque $M_{max}$ [Nm]	Displacement $V$ [cm <sup>3</sup> /rev]	Pressure $p_{max}$ [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.

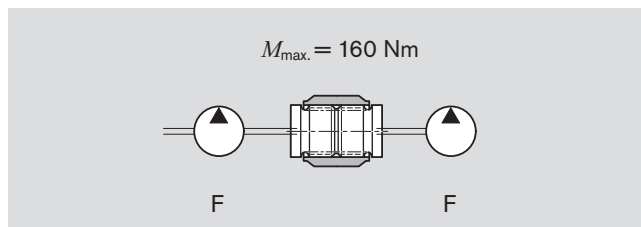
$M_{max.}$ [Nm]	$V$ [cm <sup>3</sup> /rev]	$p_{max.}$ [bar]
65	16	230
	19	190
	22.5	160
	25	140
	28	130

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.

In instances where common inlet is required, contact factory to determine flow capability.

### Reinforced through drive



### Torque $M_{max}$ calculation

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

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

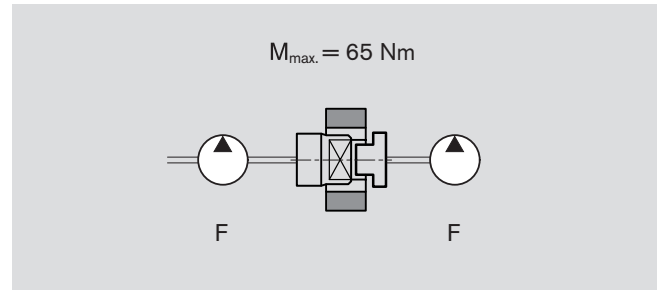
Example: 19 cc + 16 cc tandem (F+F) with R splined shaft

Pressure  $P_1 = 200 / P_2 = 150$

$M_{max.} = (200 \times 16 \times 0.0177) + (150 \times 19 \times 0.0177) = 56.64 + 50.45 = 107.08$

R shaft acceptable because  $M_{max.}$  is < 110 [Nm]

### Standard through drive



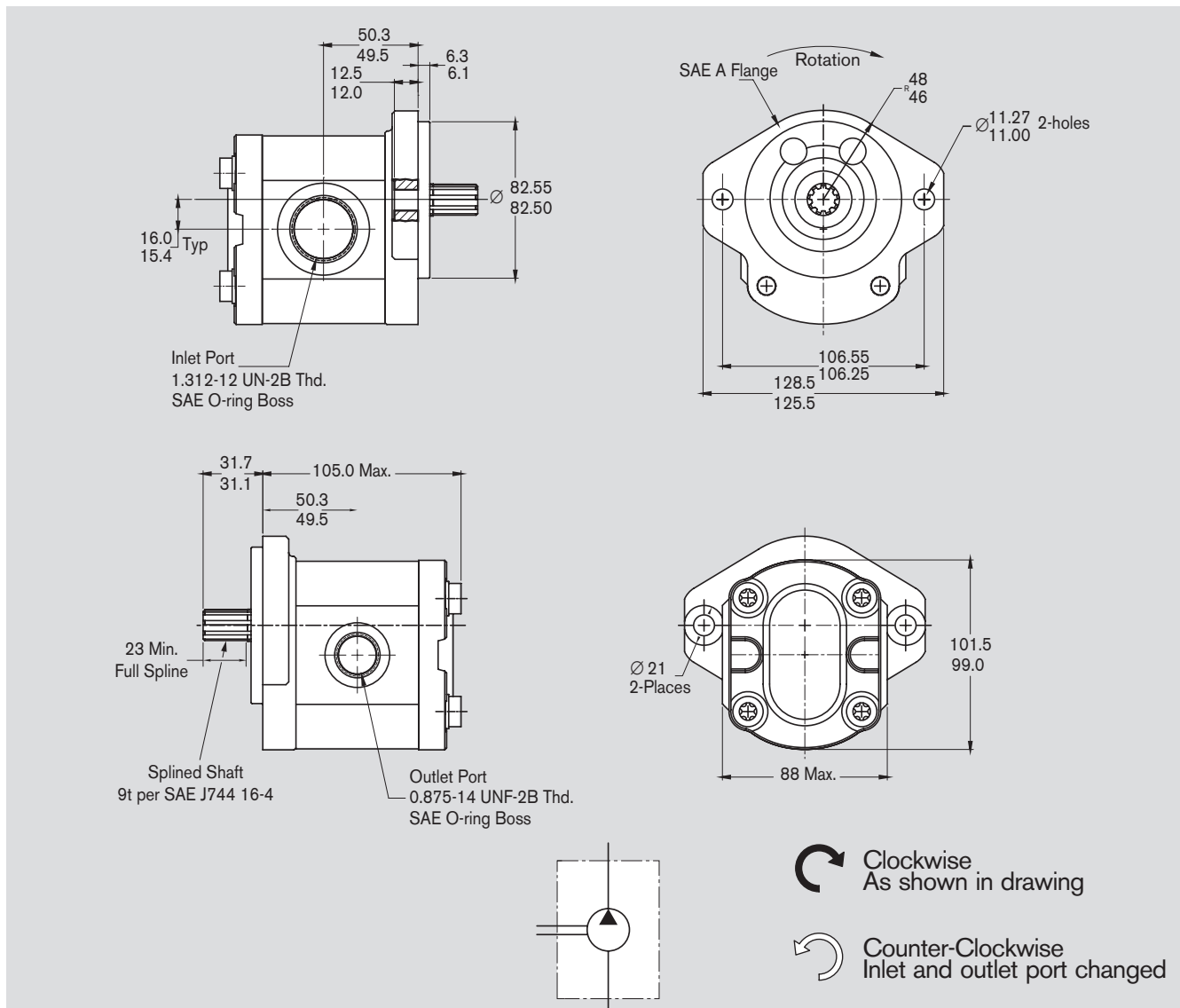
### Combinations

Series pump 1	Torque $M_{max.}$ [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]
Splined 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 $\varnothing$ 15.875	55
	A	Shafts $\varnothing$ 18	75
	Q	5/8" keyed SAE J744 16-1A	55
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.



**Ordering code**

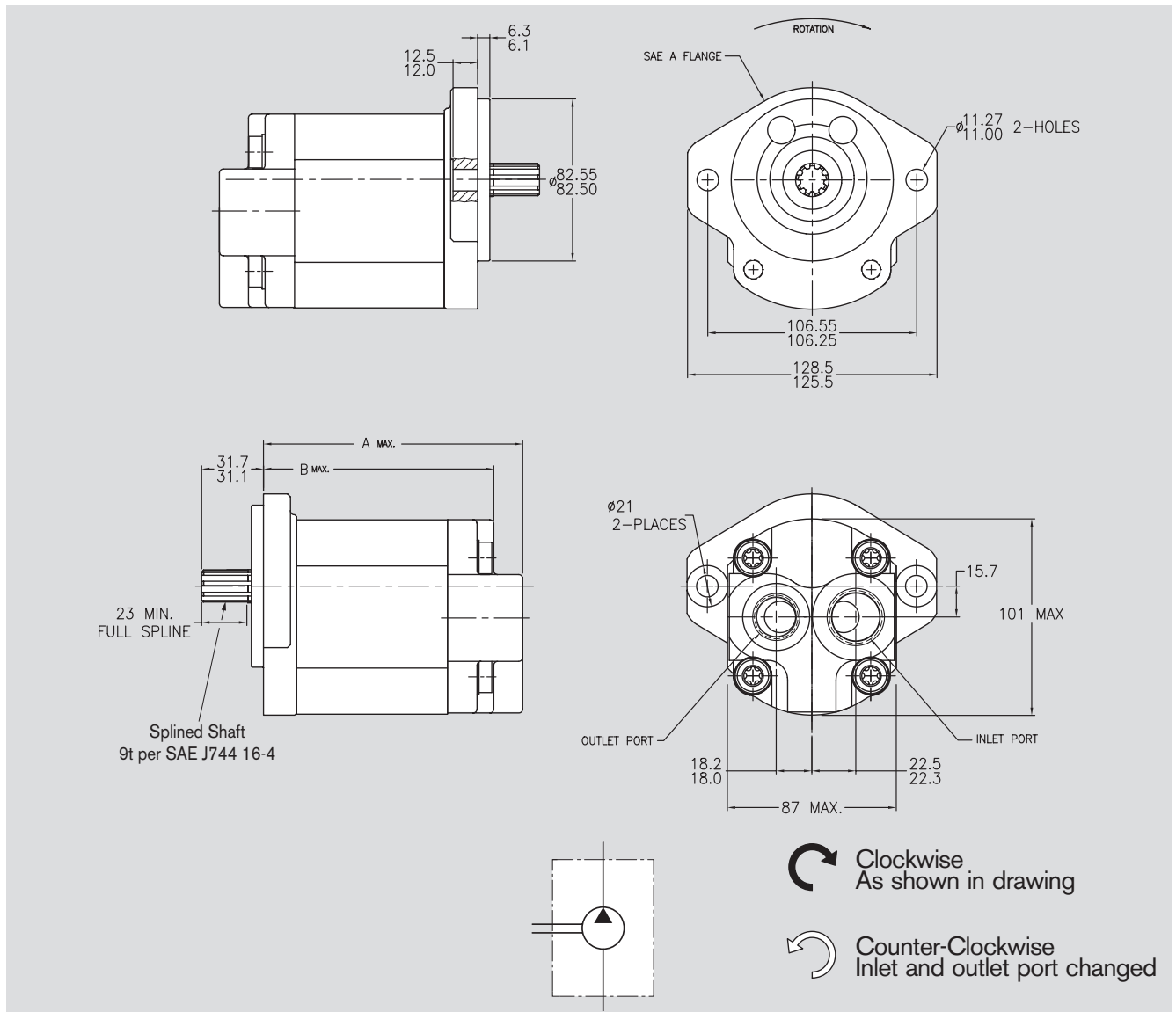
AZPF - 12 -     R R 12 MB

AZPF - 22 -     R R 12 MB\*

Displacement (cm <sup>3</sup> /rev)	Ordering Number		Dimension (mm)				
	 L	 R	A	B	C	Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
4.0	9 510 290 036	9 510 290 015	85.0	39.9	39.9	-10	-8
5.5	9 510 290 037	9 510 290 005	85.6	41.1	41.1	-10	-8
8.0	9 510 290 038	9 510 290 017	91.6	43.2	43.2	-12	-10
11.0	9 510 290 039	9 510 290 414	96.6	47.0	47.0	-12	-10
14.0	9 510 290 040	9 510 290 004	101.8	47.5	47.5	-12	-10
16.0	9 510 290 127	9 510 290 056	105.0	47.5	47.5	-16	-10
19.0	9 510 290 128	9 510 290 125	110.0	47.5	47.5	-16	-10
22.5	9 510 290 129	9 510 290 126	115.4	55.1	55.1	-16	-10
25.0	9 510 290 117*	9 510 290 111*	131.6	63.2	63.2	-16	-10
28.0	9 510 290 120*	9 510 290 114*	136.5	65.6	65.6	-16	-10

**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for product weight.



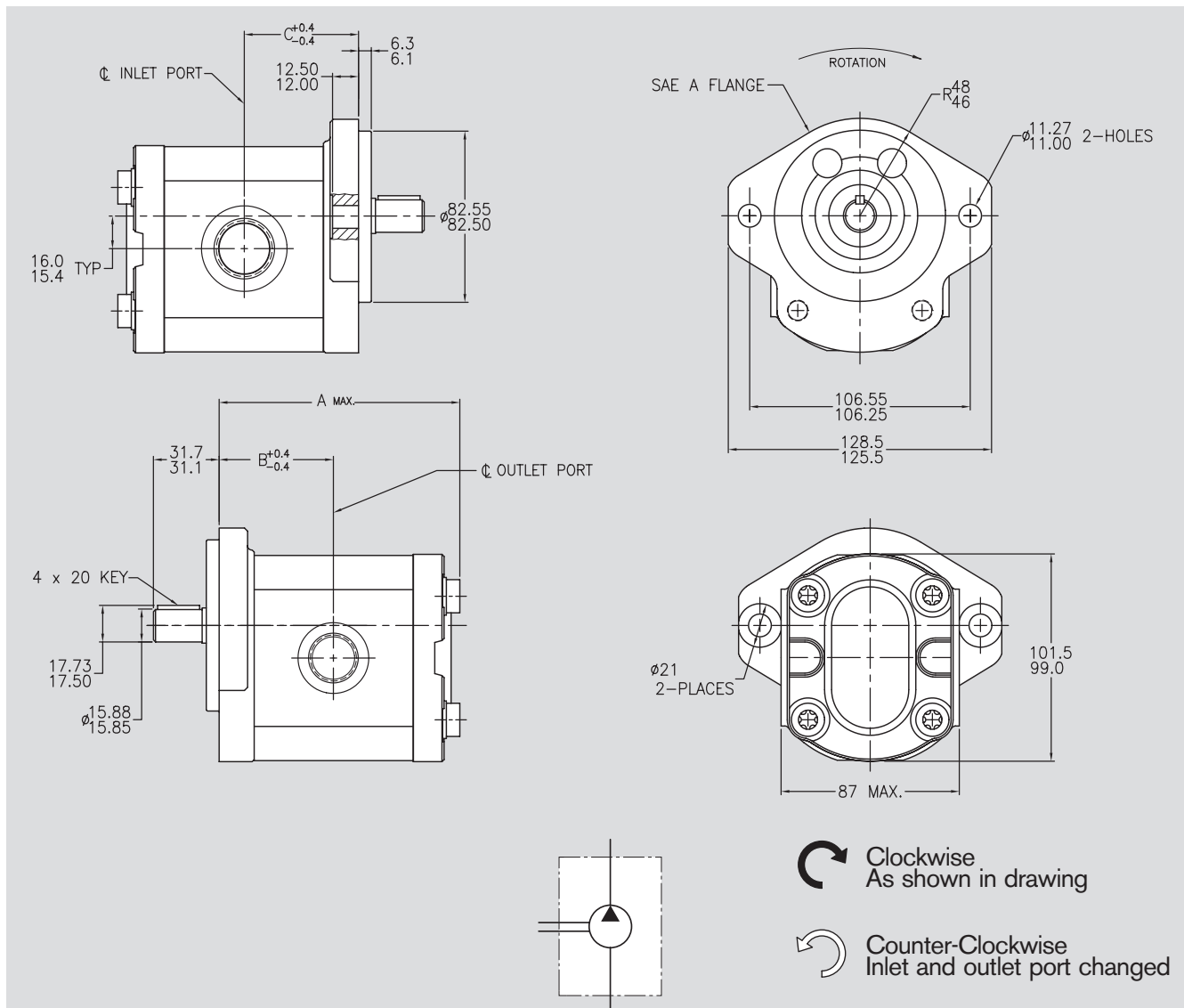
**Ordering code**

AZPF - 12 - [ ] [ ] [ ] R R 12 MA

Displacement (cm <sup>3</sup> /rev)	Ordering Number		Dimension (mm)				
	L	R	A	B	C	Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
4.0	9 510 290 083	9 510 290 075	100.3	85.0		-12	-10
5.5	9 510 290 084	9 510 290 076	103.3	88.4		-12	-10
8.0	9 510 290 085	9 510 290 077	107.4	92.5		-12	-10
11.0	9 510 290 086	9 510 290 078	112.4	97.5		-12	-10
14.0	9 510 290 087	9 510 290 079	117.4	102.5		-12	-10
16.0	9 510 290 088	9 510 290 080	120.8	105.5		-12	-10
19.0	9 510 290 089	9 510 290 081	126.8	110.9		-12	-10
22.5	9 510 290 090	9 510 290 082	131.2	116.3		-12	-10
25.0							
28.0							

**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.
3. Contact factory for product weight.



**Ordering code**

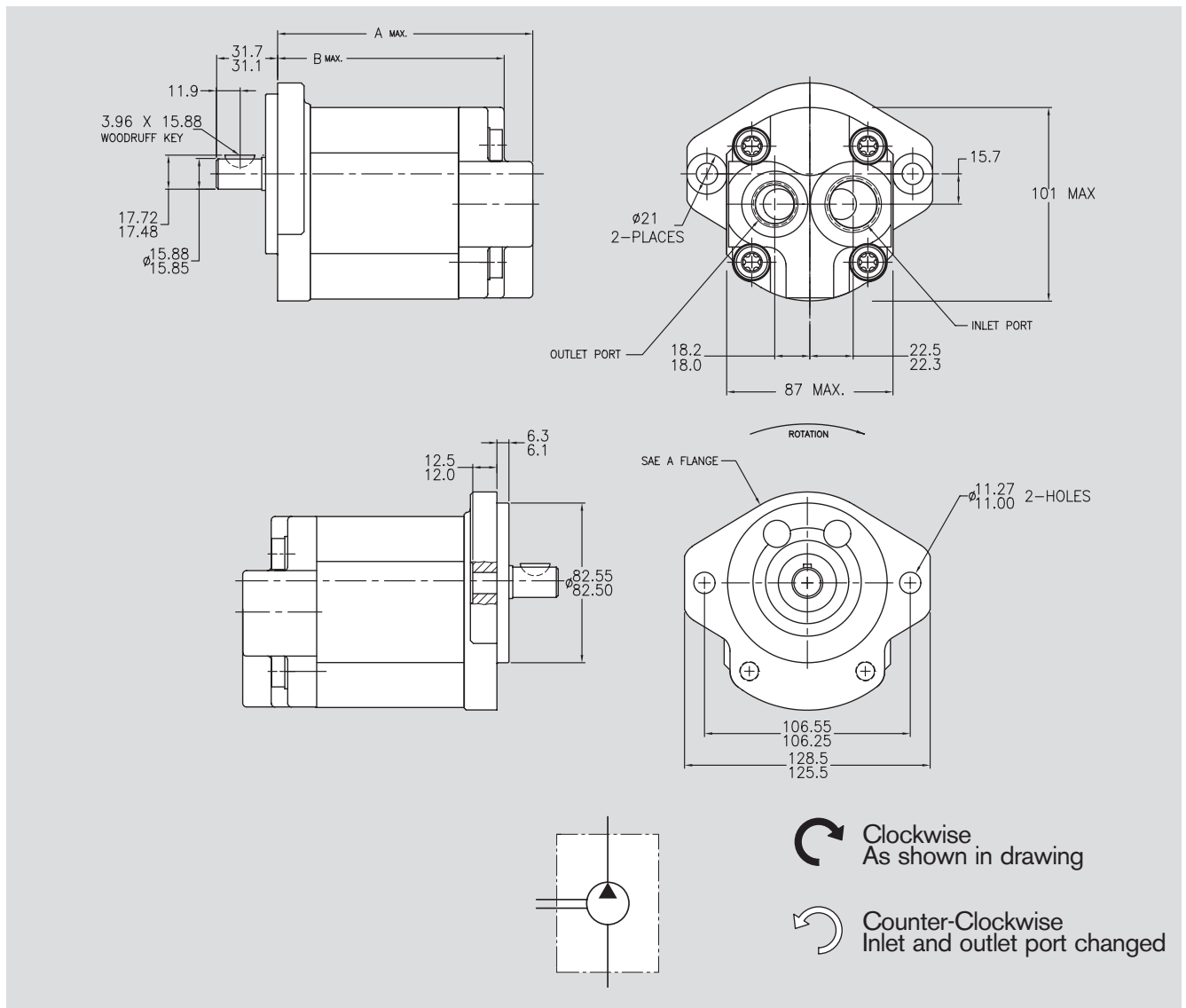
AZPF - 12 -     Q R 12 MB

AZPF - 22 -     Q R 12 MB\*

Displacement (cm <sup>3</sup> /rev)	Ordering Number		Dimension (mm)				
	L	R	A	B	C	Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
4.0	9 510 290 044	9 510 290 021	85.0	39.9	39.9	-10	-8
5.5	9 510 290 045	9 510 290 022	85.6	41.1	41.1	-10	-8
8.0	9 510 290 046	9 510 290 023	91.6	43.2	43.2	-12	-10
11.0	9 510 290 047	9 510 290 024	96.6	47.0	47.0	-12	-10
14.0	9 510 290 048	9 510 290 025	101.6	47.5	47.5	-12	-10
16.0	9 510 290 130	9 510 290 122	105.0	47.5	47.5	-16	-10
19.0	9 510 290 131	9 510 290 123	110.0	47.5	47.5	-16	-10
22.5	9 510 290 132	9 510 290 124	115.4	55.1	55.1	-16	-10
25.0	9 510 290 118*	9 510 290 112*	131.6	63.2	63.2	-16	-10
28.0	9 510 290 121*	9 510 290 115*	136.4	65.6	65.6	-16	-10



**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for product weight.



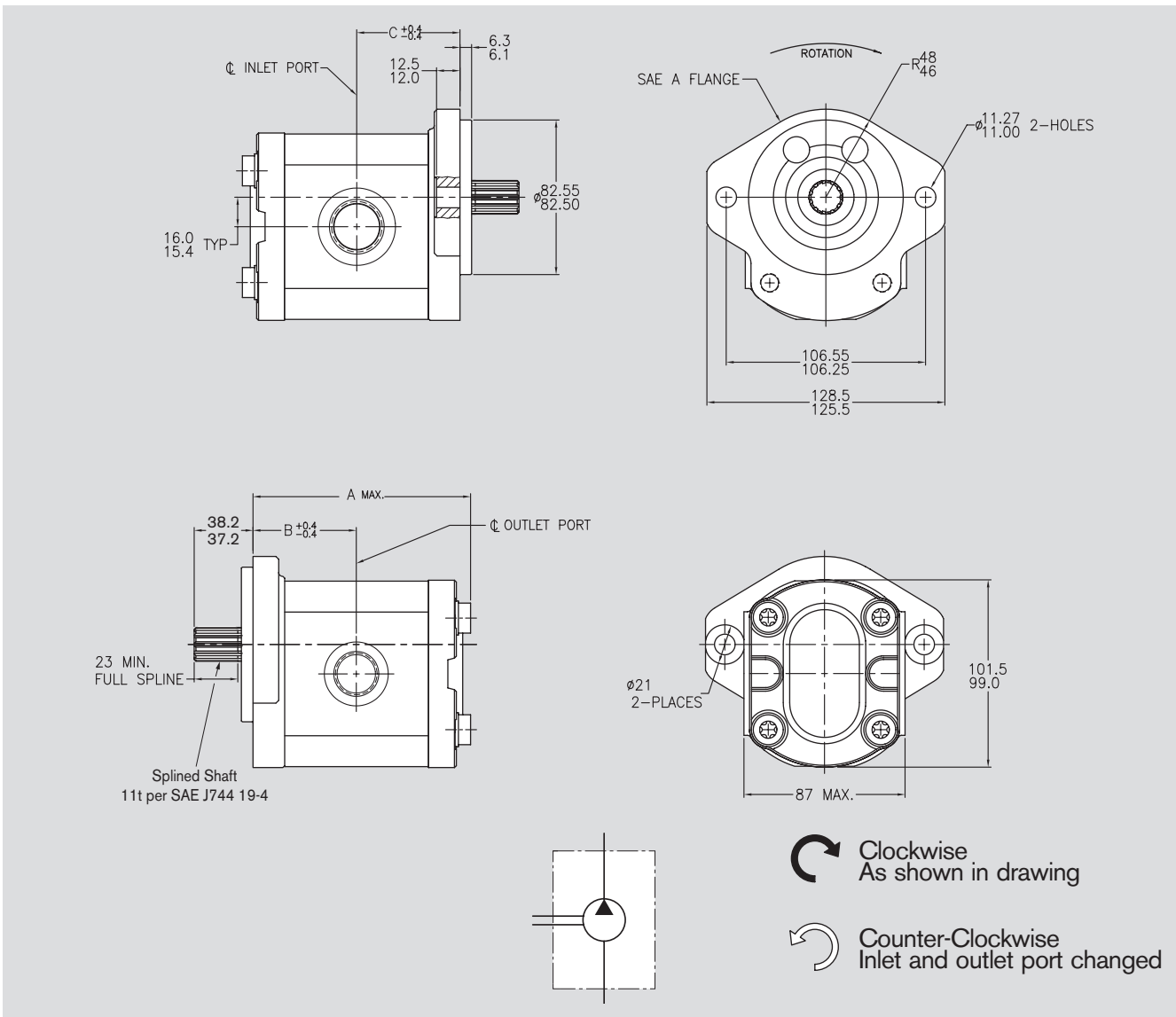
**Ordering code**

AZPF - 12 -     Q R 12 MA

Displacement (cm <sup>3</sup> /rev)	Ordering Number		Dimension (mm)				
	 L	 R	A	B	C	Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
4.0	9 510 290 099	9 510 290 091	100.8	85.9		-12	-10
5.5	9 510 290 100	9 510 290 092	103.3	88.4		-12	-10
8.0	9 510 290 101	9 510 290 093	107.4	92.5		-12	-10
11.0	9 510 290 102	9 510 290 094	112.4	97.5		-12	-10
14.0	9 510 290 103	9 510 290 095	117.4	102.5		-12	-10
16.0	9 510 290 104	9 510 290 096	120.8	105.9		-12	-10
19.0	9 510 290 105	9 510 290 097	126.8	110.9		-12	-10
22.5	9 510 290 106	9 510 290 098	131.2	116.3		-12	-10
25.0							
28.0							



**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.
3. Contact factory for product weight.



**Ordering code**

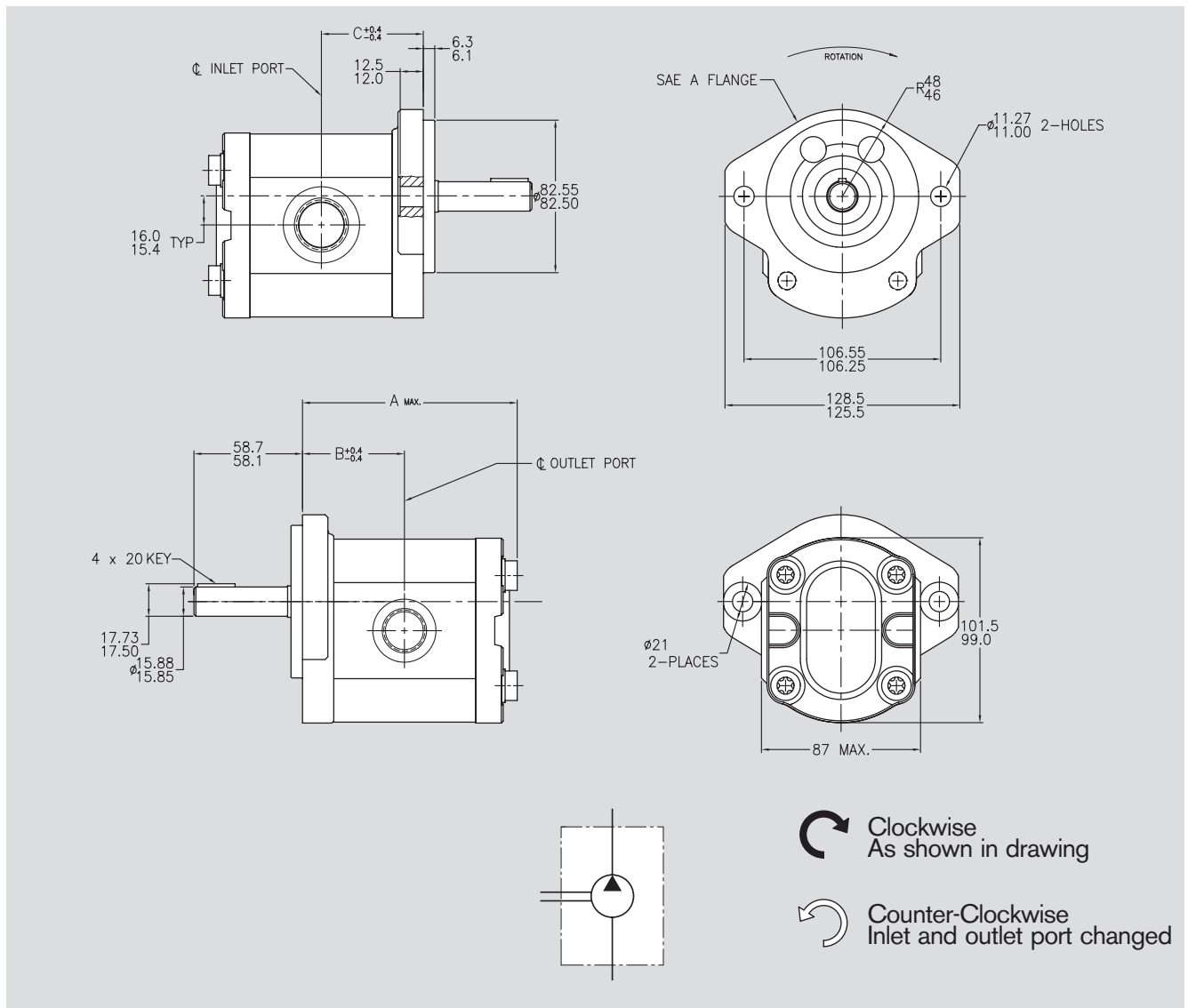
AZPF - 22 -     P R 12 MB

Displacement (cm <sup>3</sup> /rev)	Ordering Number		Dimension (mm)				
	 L	 R	A	B	C	Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
4.0	9 510 290 444	9 510 290 453	85.0	40.5	40.5	-10	-8
5.5	9 510 290 445	9 510 290 454	85.6	41.1	41.1	-10	-8
8.0	9 510 290 446	9 510 290 455	91.6	43.2	43.2	-12	-10
11.0	9 510 290 447	9 510 290 456	96.6	47.0	47.0	-12	-10
14.0	9 510 290 448	9 510 290 457	101.6	47.5	47.5	-12	-10
16.0	9 510 290 449	9 510 290 458	105.0	49.9	49.9	-16	-10
19.0	9 510 290 450	9 510 290 459	110.0	52.4	52.4	-16	-10
22.5	9 510 290 439	R918 000 008	115.4	55.1	55.1	-16	-10
25.0	9 510 290 451	9 510 290 460	131.6	63.2	63.2	-16	-10
28.0	9 510 290 452	9 510 290 461	136.4	65.6	65.6	-16	-10

**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for product weight.





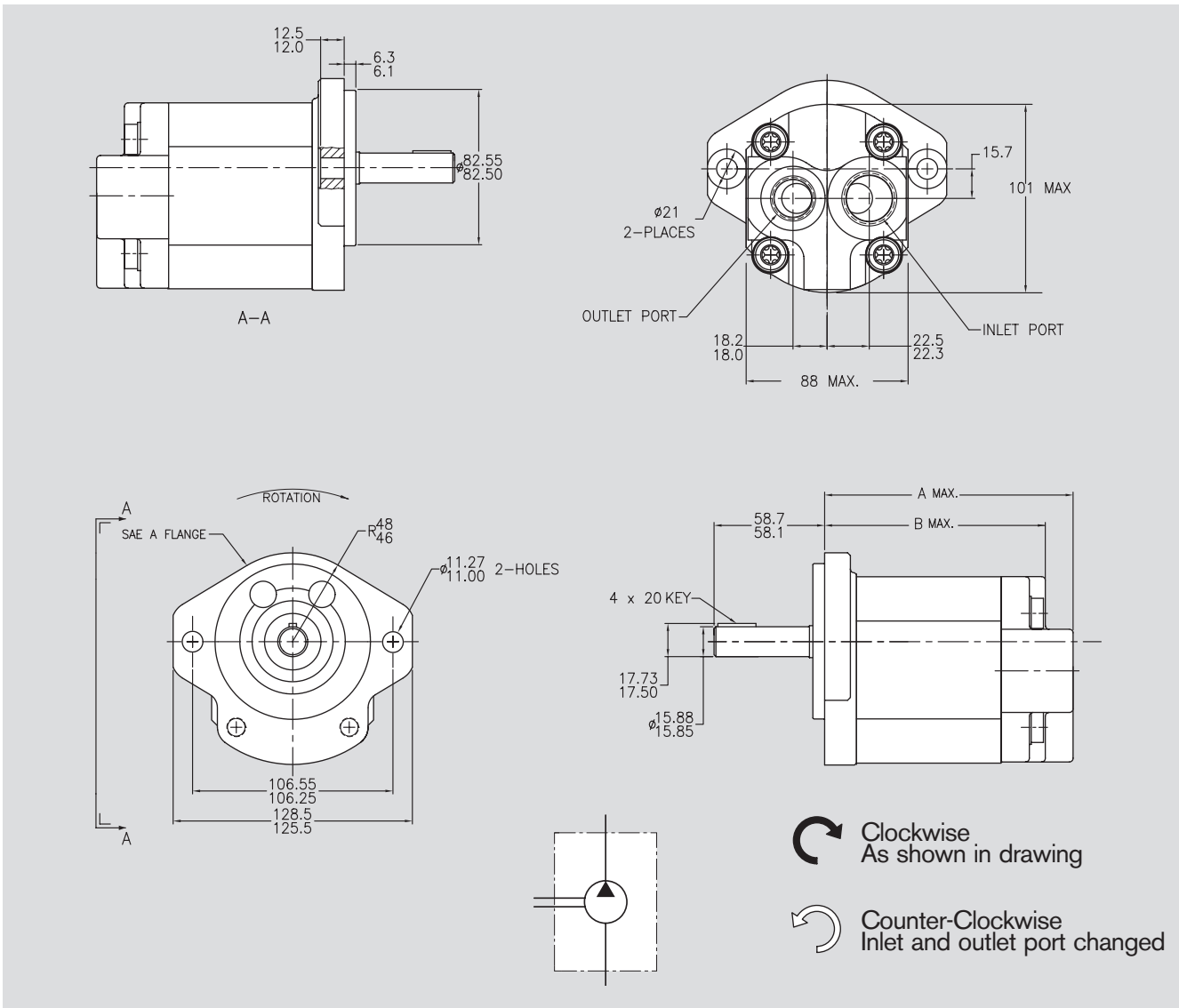
**Ordering code**

AZPF - 12 -     Q R 12 MB - S0022

Displacement (cm <sup>3</sup> /rev)	Ordering Number		Dimension (mm)				
	L	R	A	B	C	Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
4.0		9 510 290 417	85.0	39.9	39.9	-10	-8
5.5		9 510 290 259	85.6	41.1	41.1	-10	-8
8.0	9 510 290 214	9 510 290 191	91.6	43.2	43.2	-12	-10
11.0	9 510 290 254	9 510 290 209	96.6	47.0	47.0	-12	-10
14.0	9 510 290 215	9 510 290 133	101.6	47.5	47.5	-12	-10
16.0	9 510 290 255	9 510 290 210	105.0	49.9	49.9	-16	-10
19.0	9 510 290 256	9 510 290 211	110.0	52.4	52.4	-16	-10
22.5	9 510 290 257	9 510 290 212	115.4	55.1	55.1	-16	-10
25.0							
28.0							

**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.
3. Contact factory for product weight.



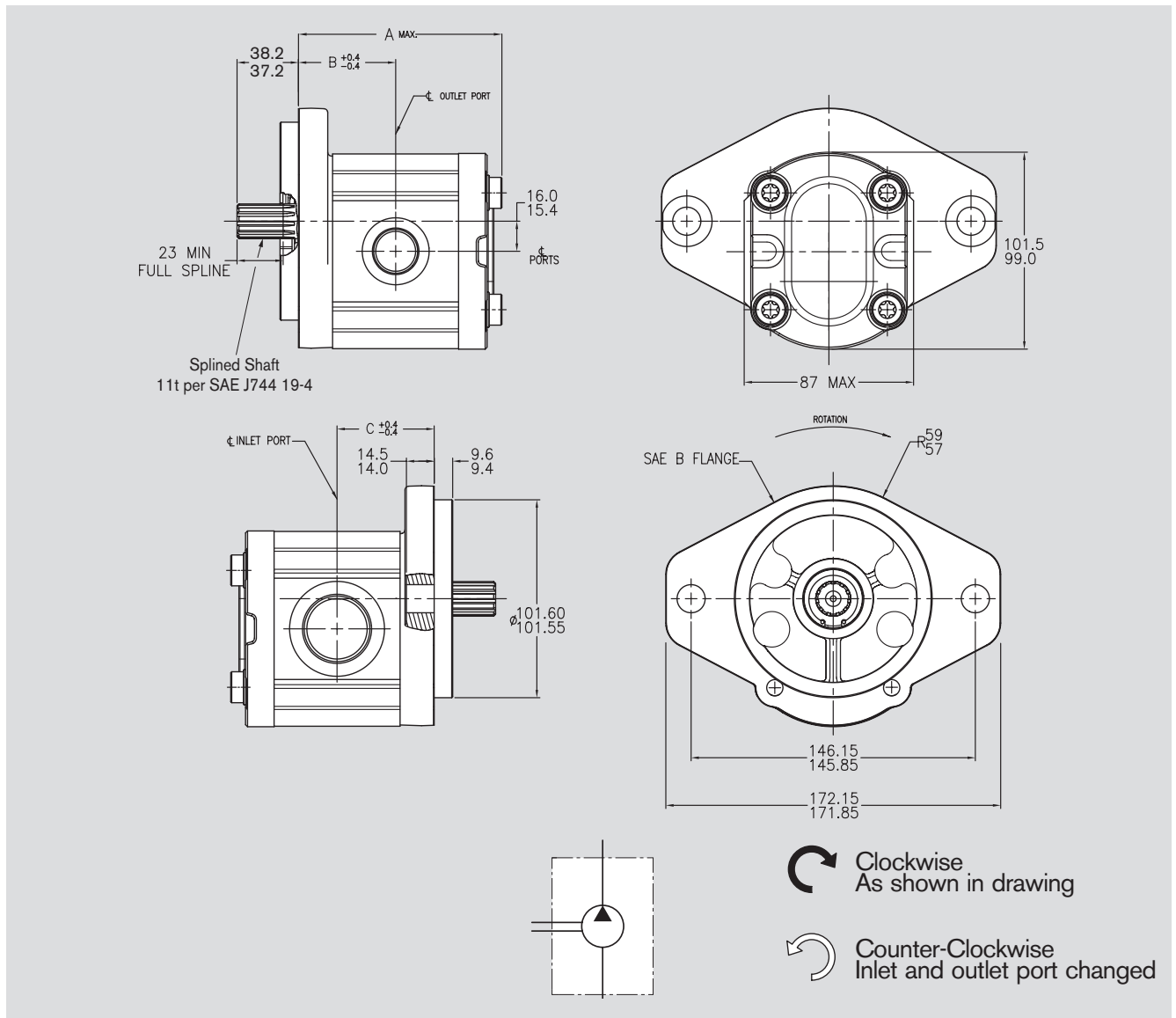
**Ordering code**

**AZPF - 12 - □ □ □ □ Q R 12 MA - S0022**

Displacement (cm <sup>3</sup> /rev)	Ordering Number		Dimension (mm)			Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
	L	R	A	B	C		
4.0							
5.5							
8.0		9 510 290 317	107.4	92.5		-12	-10
11.0		9 510 290 134	112.4	97.5		-12	-10
14.0							
16.0							
19.0	9 510 290 135	9 510 290 213	125.8	110.9		-12	-10
22.5							
25.0							
28.0							

**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.
3. Contact factory for product weight.



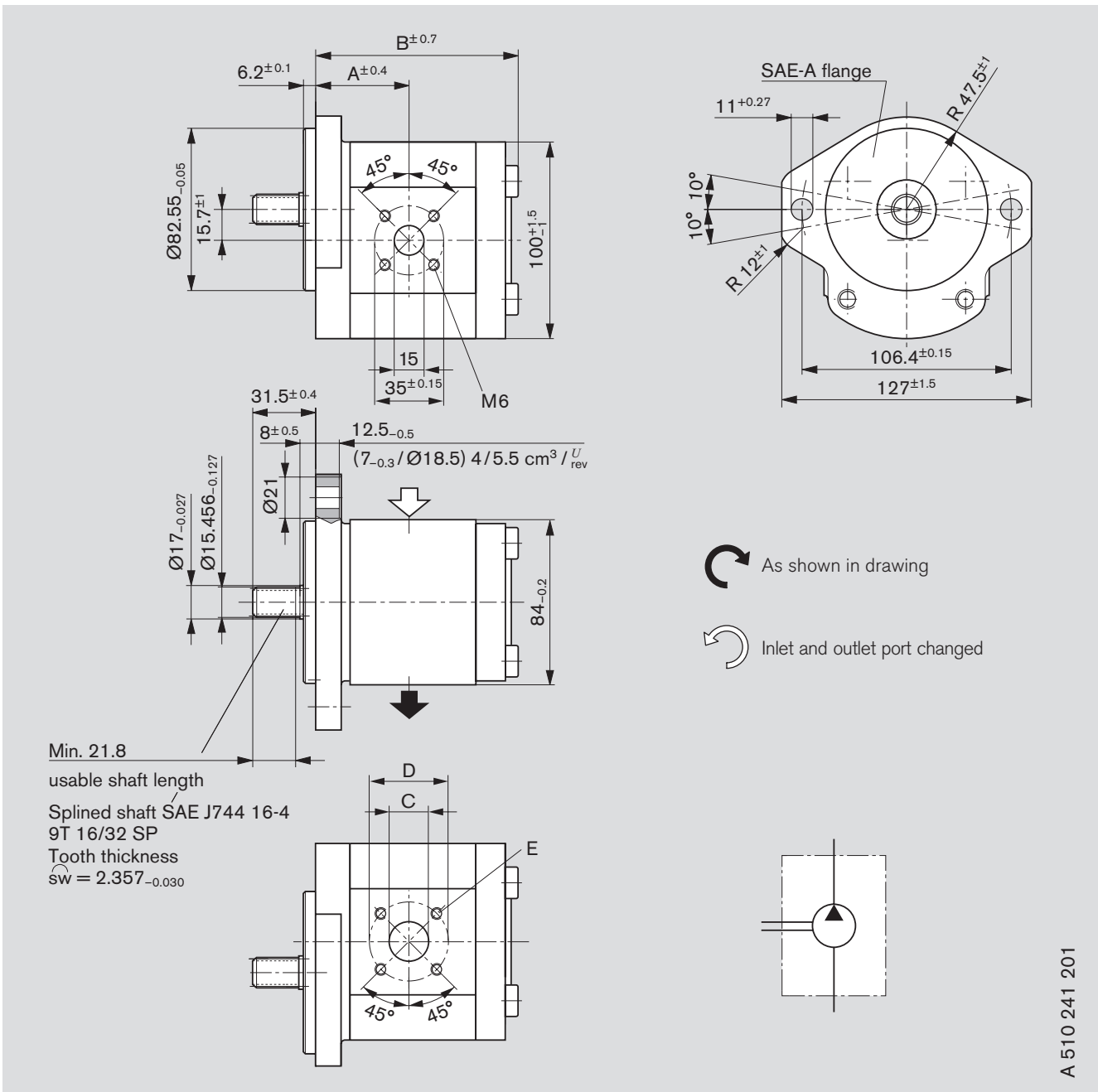
**Ordering code**

**AZPF - 22 -     P C 12 MB**

Displacement (cm <sup>3</sup> /rev)	Ordering Number		Dimension (mm)					Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
	L	R	A	B	C				
4.0		9 510 290 462	85.0	40.5	40.5		-10	-8	
5.5		9 510 290 463	85.0	41.1	41.1		-10	-10	
8.0		9 510 290 464	91.6	43.2	43.2		-12	-10	
11.0		9 510 290 465	96.6	47.0	47.0		-12	-10	
14.0		9 510 290 466	101.6	47.5	47.5		-12	-10	
16.0		9 510 290 467	105.0	49.9	49.9		-16	-10	
19.0		9 510 290 468	110.0	52.4	52.4		-16	-10	
22.5		9 510 290 469	115.4	55.1	55.1		-16	-10	
25.0		9 510 290 470	131.6	63.2	63.2		-16	-10	
28.0		9 510 290 471	136.4	65.6	65.6		-16	-10	

**Notes:**



1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.
3. Contact factory for product weight.



A 510 241 201

**Ordering code**

AZPF - 10 -     R R 20 M B  
 AZPF - 11 -     R R 20 K B\*

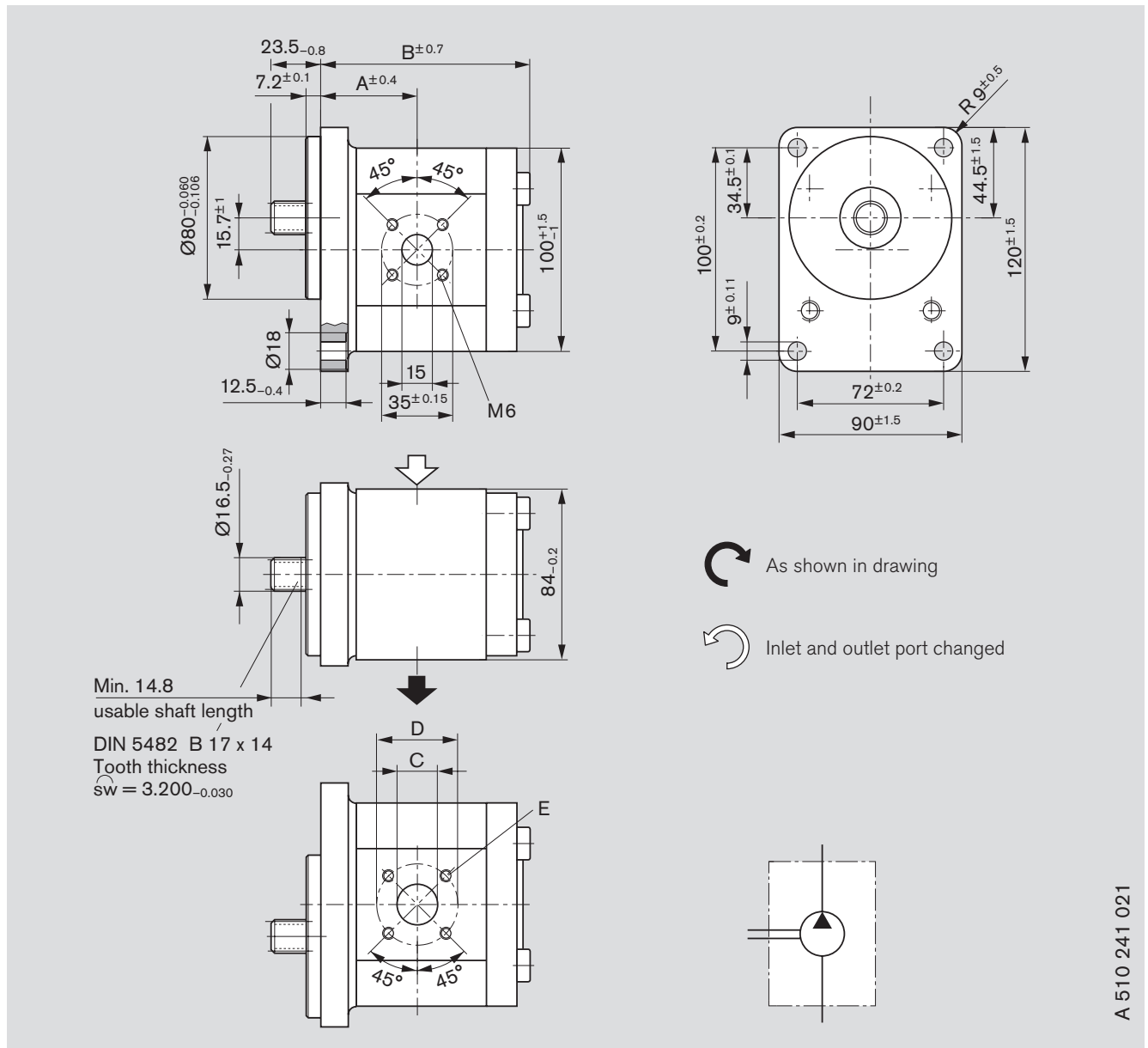
Displacement [cm <sup>3</sup> /rev]	Ordering No.		kg	Dimension [mm]				
	 L	 R		A	B	C	D	E
4	0 510 225 314	0 510 225 013	3.15	39.9	85.0	15	40	M6 depth 13
5.5	0 510 325 313	0 510 325 013	3.2	41.1	87.5	15	40	
8	0 510 425 314	0 510 425 020	3.3	43.2	91.6	20	40	
11	0 510 525 324*	0 510 525 019	3.5	47.0	96.6	20	40	
14	0 510 525 325	0 510 525 020	3.6	47.5	101.6	20	40	
16	0 510 625 329	0 510 625 028	3.8	47.5	105.0	20	40	
19	0 510 625 330*	0 510 625 029*	3.9	47.5	110.0	20	40	
22.5	0 510 725 361	0 510 725 077*	4.1	55.1	115.4	20	40	

**Note:**

1. Refer to page 16 for performance specifications by displacement size.







A 510 241 021

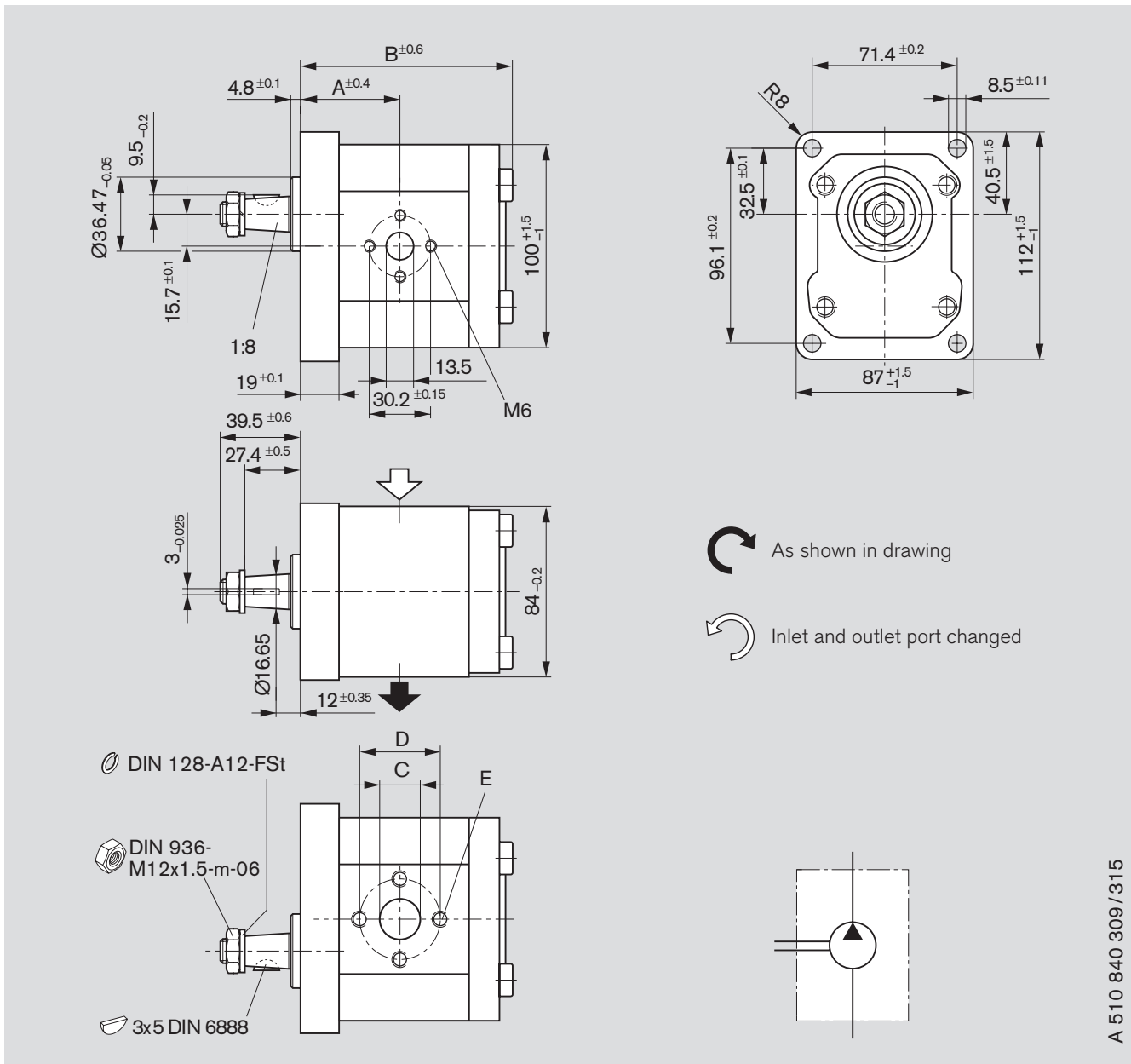
**Ordering code**

AZPF - 10 -     F B 20 M B  
 AZPF - 11 -     F B 20 M B\*

Displacement [cm <sup>3</sup> /rev]	Ordering No.		kg	Dimension [mm]				
	L	R		A	B	C	D	E
4	0 510 225 307	0 510 225 007	3.1	39.9	85.0	15	40	M6 depth 13
5.5	0 510 325 307	0 510 325 007	3.2	41.1	87.5	15	40	
8	0 510 425 308	0 510 425 010	3.3	43.2	91.6	20	40	
9	0 510 425 336*		3.4	43.7	92.4	20	40	
11	0 510 525 312	0 510 525 010	3.5	47.0	96.6	20	40	
14	0 510 525 328	0 510 525 030	3.6	47.5	101.6	20	40	
16	0 510 625 317	0 510 625 015	3.65	47.5	105.0	20	40	
19	0 510 625 316	0 510 625 014	3.8	47.5	110.0	20	40	
22.5	0 510 725 349		4.4	61.1	127.4	20	40	
22.5		0 510 725 062	4.0	55.1	115.4	20	40	

**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.





A 510 840 309/315

**Ordering code**

AZPF - 12 -     H O 30 K B

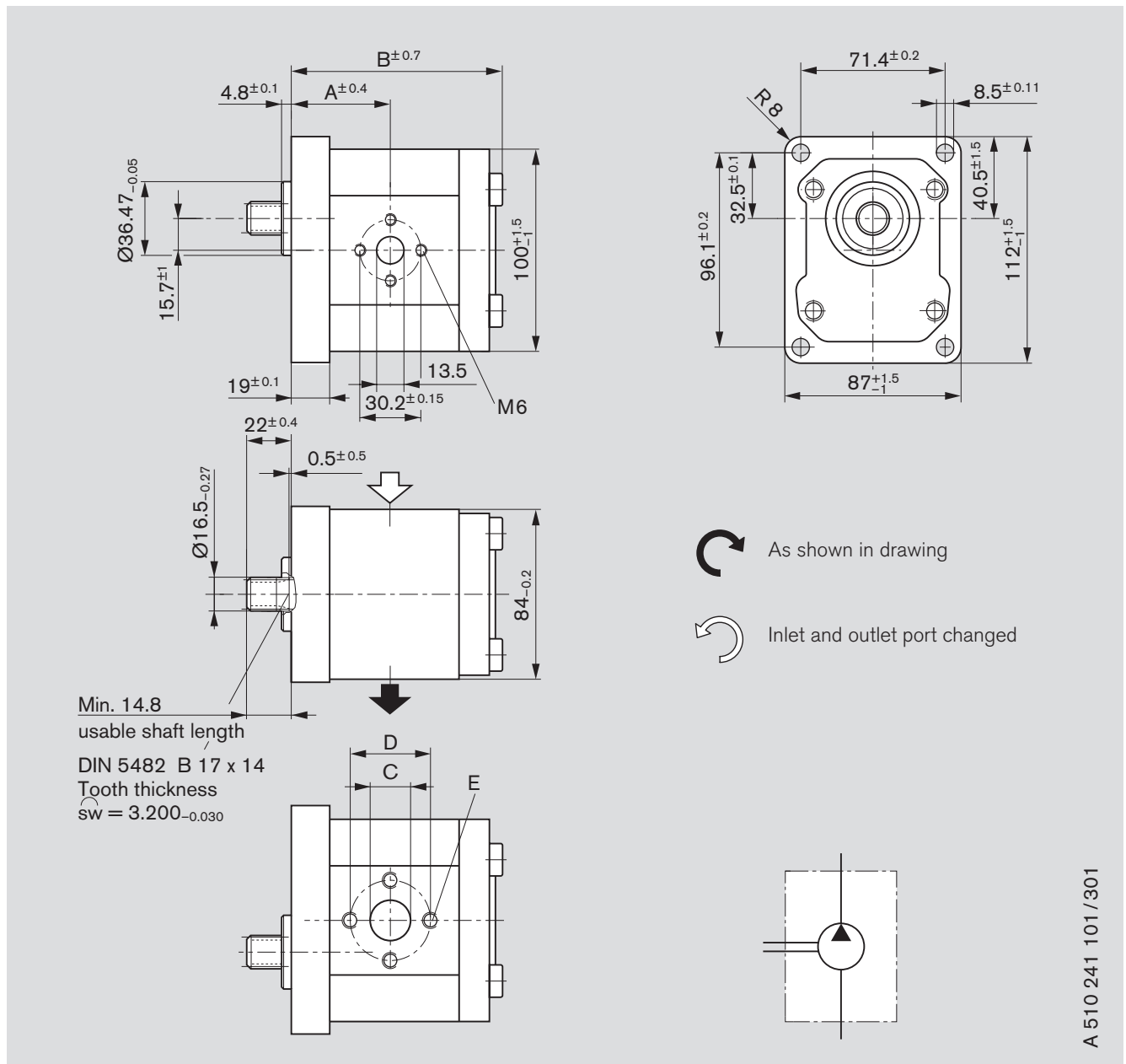
AZPF - 22 -     H O 30 K B\*

Displacement [cm <sup>3</sup> /rev]	Ordering No.		kg	Dimension [mm]				
	 L	 R		A	B	C	D	E
4	0 510 225 317	0 510 225 022	3.1	41.4	84.1	13.5	30.2	M6
5.5	0 510 325 320	0 510 325 025	3.2	42.6	86.6	13.5	30.2	depth 13
8	0 510 425 334	0 510 425 043	3.3	44.7	92.5	13.5	30.2	
11	0 510 525 374	0 510 525 074	3.4	48.5	97.5	13.5	30.2	M8 depth 13
14	0 510 525 375	0 510 525 075	3.6	49.0	102.5	13.5	30.2	
16	0 510 625 381	0 510 625 075	3.6	49.0	105.9	13.5	30.2	
19	0 510 625 386*	0 510 625 076*	4.1	59.9	121.1	20.0	39.7	
22.5	0 510 725 410*	0 510 725 112*	4.2	62.6	126.5	20.0	39.7	
25	0 510 725 411*	0 510 725 113*	4.4	64.7	132.5	20.0	39.7	
28	0 510 725 412*	0 510 725 114*	4.5	67.1	137.3	20.0	39.7	

**Note:**

1. Refer to page 16 for performance specifications by displacement size.







A 510 241 101 / 301

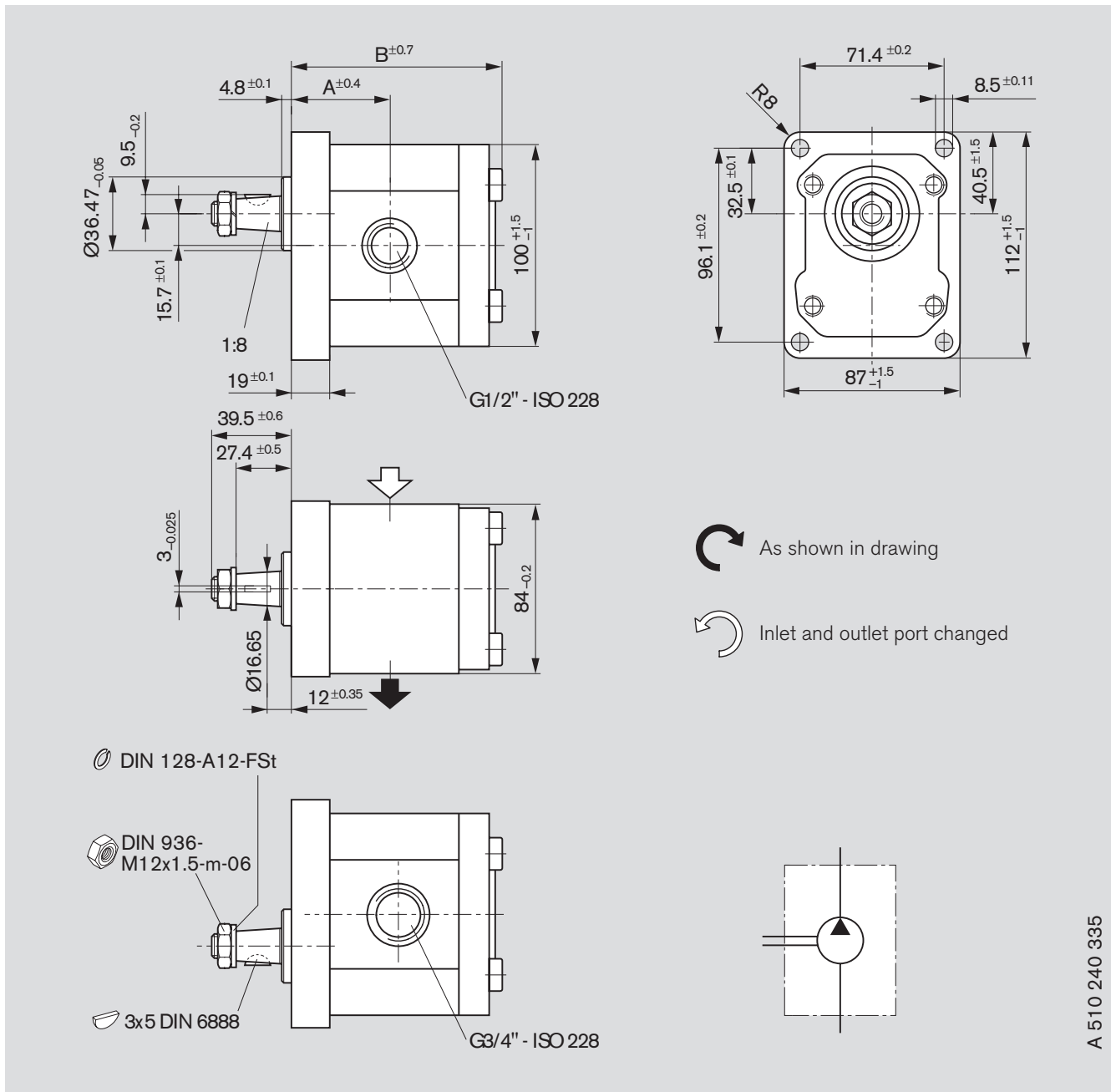
**Ordering code**

AZPF - 10 -     FO 30 M B  
 AZPF - 10 -     FO 30 P B\*  
 AZPF - 21 -     FO 30 P B\*\*

Displacement [cm <sup>3</sup> /rev]	Ordering No.		kg	Dimension [mm]				
	 L	 R		A	B	C	D	E
8	0 510 425 315	0 510 425 021	3.3	44.7	93.1	13.5	30.2	M6, depth 13
11	0 510 525 323	0 510 525 024	3.4	48.5	98.1	20.0	39.7	M8, depth 13
11	0 510 525 331*		3.3	48.5	98.1	20.0	39.7	
14		0 510 525 034*	3.4	49.0	103.1	20.0	39.7	
16	0 510 625 327*	0 510 625 039*	3.5	49.0	106.5	20.0	39.7	
19		0 510 625 049*	3.7	49.0	111.5	20.0	39.7	
19	0 510 625 332**		4.0	59.9	123.5	20.0	39.7	
22.5	0 510 725 348**	0 510 725 076**	4.2	62.6	127.8	20.0	39.7	

**Notes:**



1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.



A 510 240 335

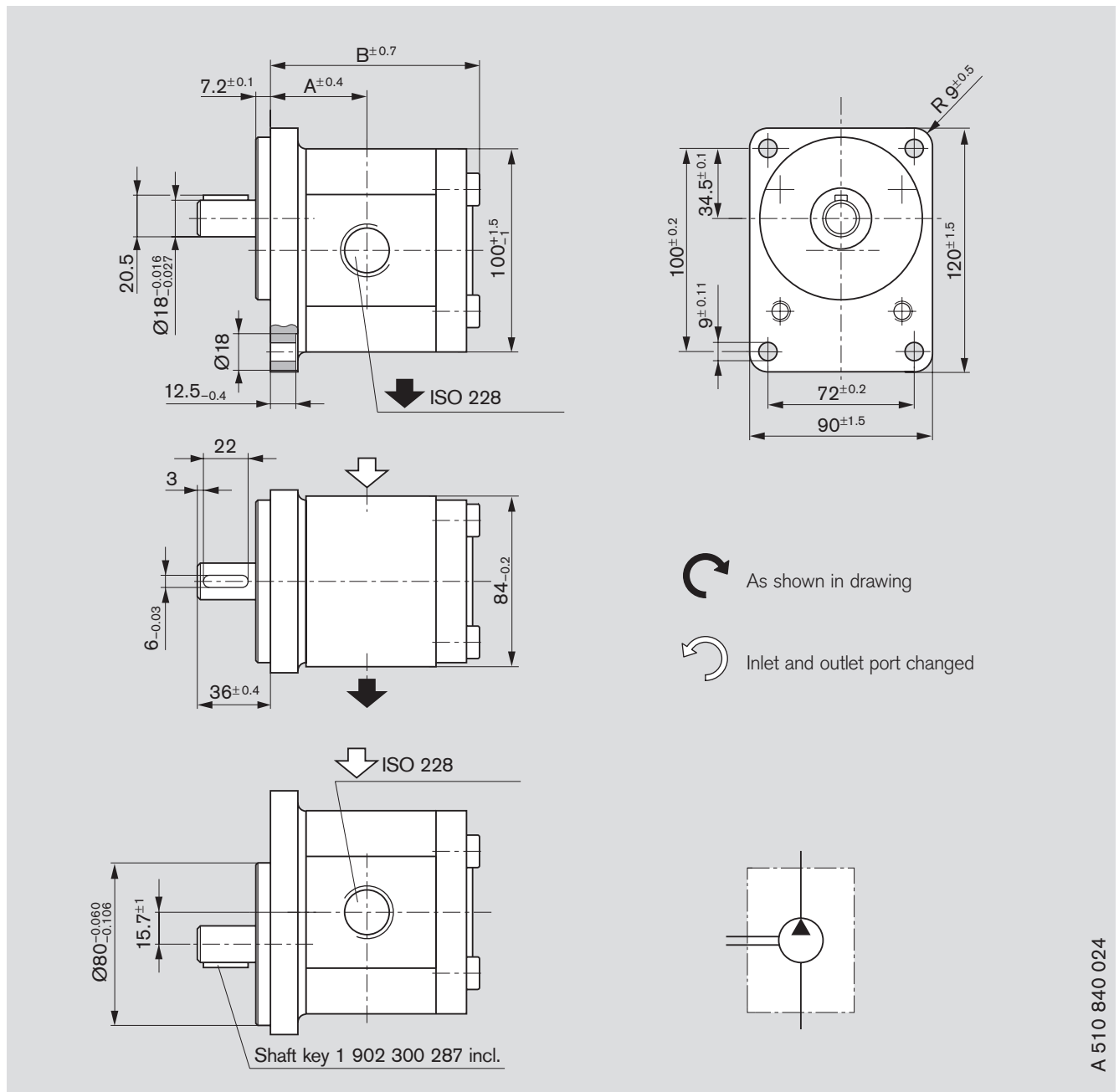
**Ordering code**

AZPF - 10 -     H O 01 M B

Displacement [cm <sup>3</sup> /rev]	Ordering No.		kg	Dimension [mm]		
	 L	 R		A	B	G
4						ISO 228 depth 16
5.5		<b>0 510 325 018</b>	3.1	42.6	89.0	
8		<b>0 510 425 027</b>	3.15	44.7	93.1	
11		<b>0 510 525 039</b>	3.3	48.5	98.1	
14		<b>0 510 525 040</b>	3.4	49.0	103.1	
16		<b>0 510 625 047</b>	3.58	49.0	106.5	
19		<b>0 510 625 052</b>	3.6	49.0	111.5	
22.5		<b>0 510 725 084</b>	3.8	56.6	116.4	

**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.



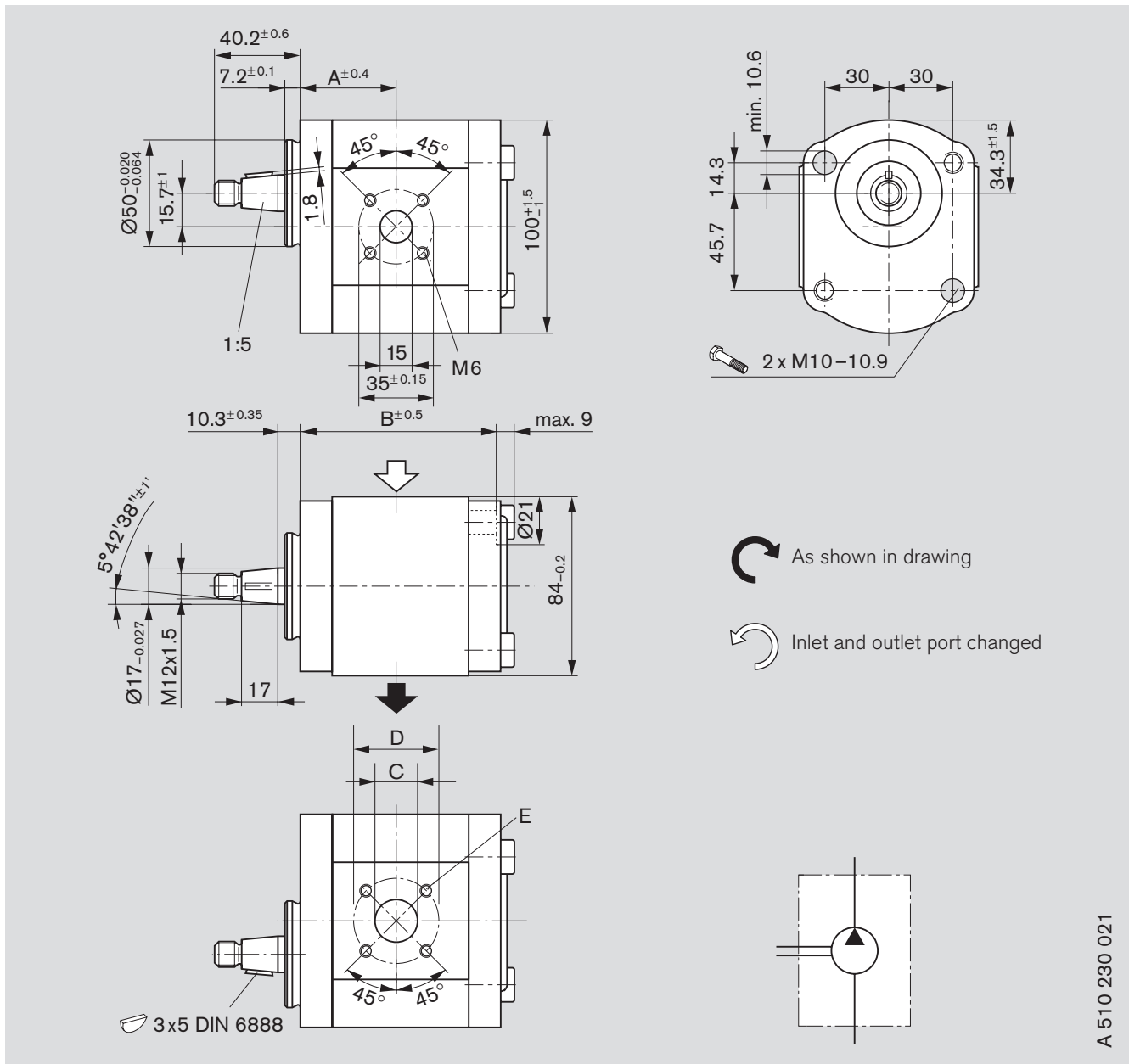
**Ordering code**

AZPF - 11 -     A B 01 M B

Displacement [cm³/rev]	Ordering No.		kg	Dimension [mm]		
	L	R		A	B	G
4	0 510 225 318	0 510 225 023	3.3	39.9	84.3	G 1/2 - ISO 228
5.5	0 510 325 321	0 510 325 026	3.3	41.1	85.2	depth 16
8	0 510 425 335	0 510 425 044	3.4	43.2	89.3	
11	0 510 525 376	0 510 525 076	3.6	45.6	94.3	G 3/4 - ISO 228
14						depth 16
16	0 510 625 382	0 510 625 077	3.8	49.9	102.7	
19						
22.5	0 510 725 418	0 510 725 120	4.1	55.1	114.7	

**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.



A 510 230 021

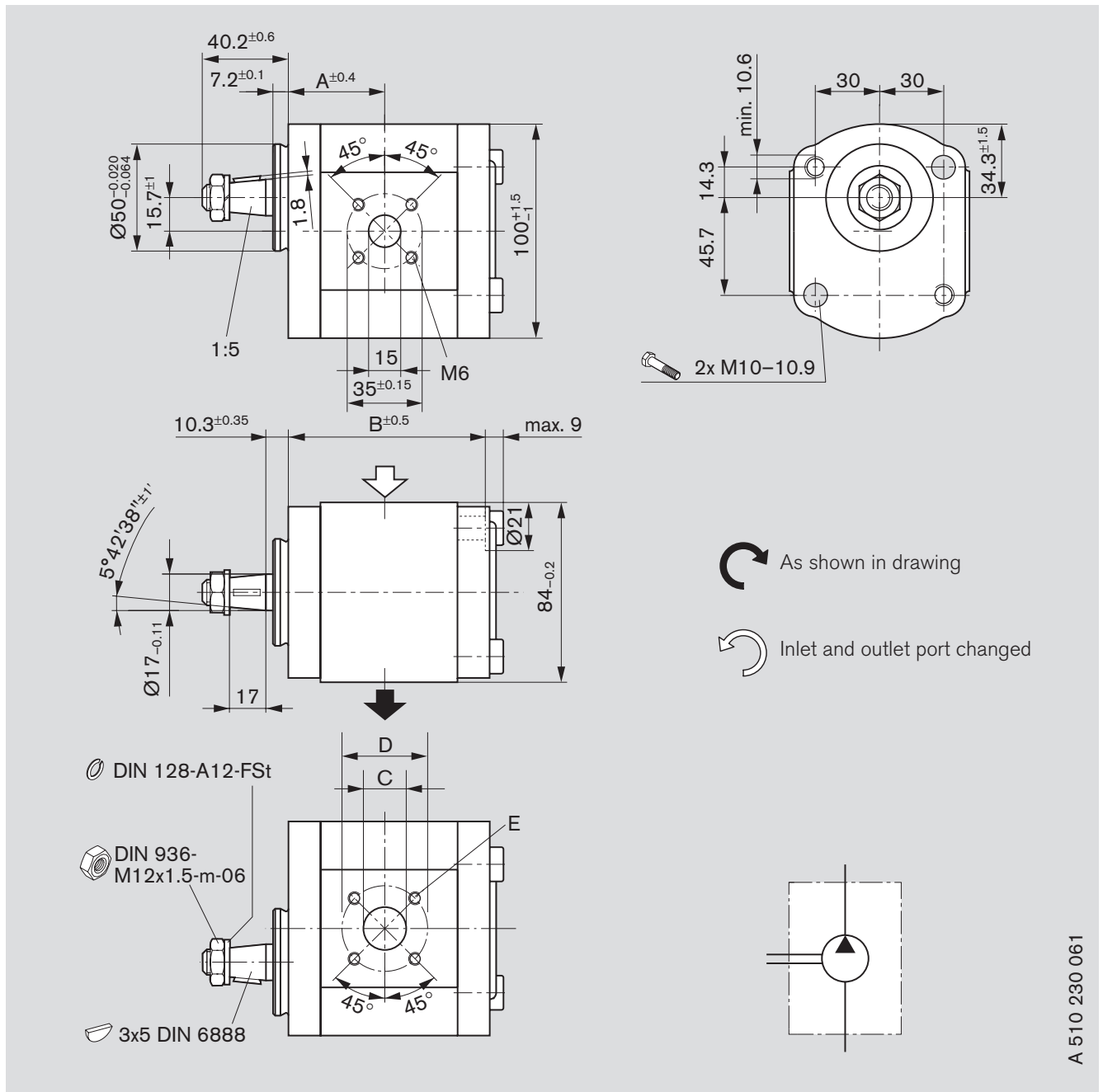
**Ordering code**

- AZPF - 1X -     C P 20 M B
- AZPF - 1X -     C P 20 K B\*
- AZPF - 1X -     C P 20 P B\*\*

Displacement [cm³/rev]	Ordering No.		kg	Dimension [mm]				
	L	R		A	B	C	D	E
4	0 510 215 009*	0 510 215 309*	2.5	37.7	73.7	15	40	M6 depth 13
5.5	0 510 315 307	0 510 315 006*	2.65	38.6	76.2	15	40	
8	0 510 415 316*		2.7	40.6	80.3	20	40	
11	0 510 515 309*	0 510 515 007*	2.75	44.5	85.5	20	40	
14	0 510 515 316*	0 510 515 018*	3.1	45.0	90.3	20	40	
16	0 510 515 317**	0 510 615 010*	2.9	45.0	93.7	20	40	
19	0 510 615 318*	0 510 615 005*	3.2	45.0	98.7	20	40	
22.5	0 510 715 306*		3.3	52.5	104.1	20	40	

**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.



A 510 230 061

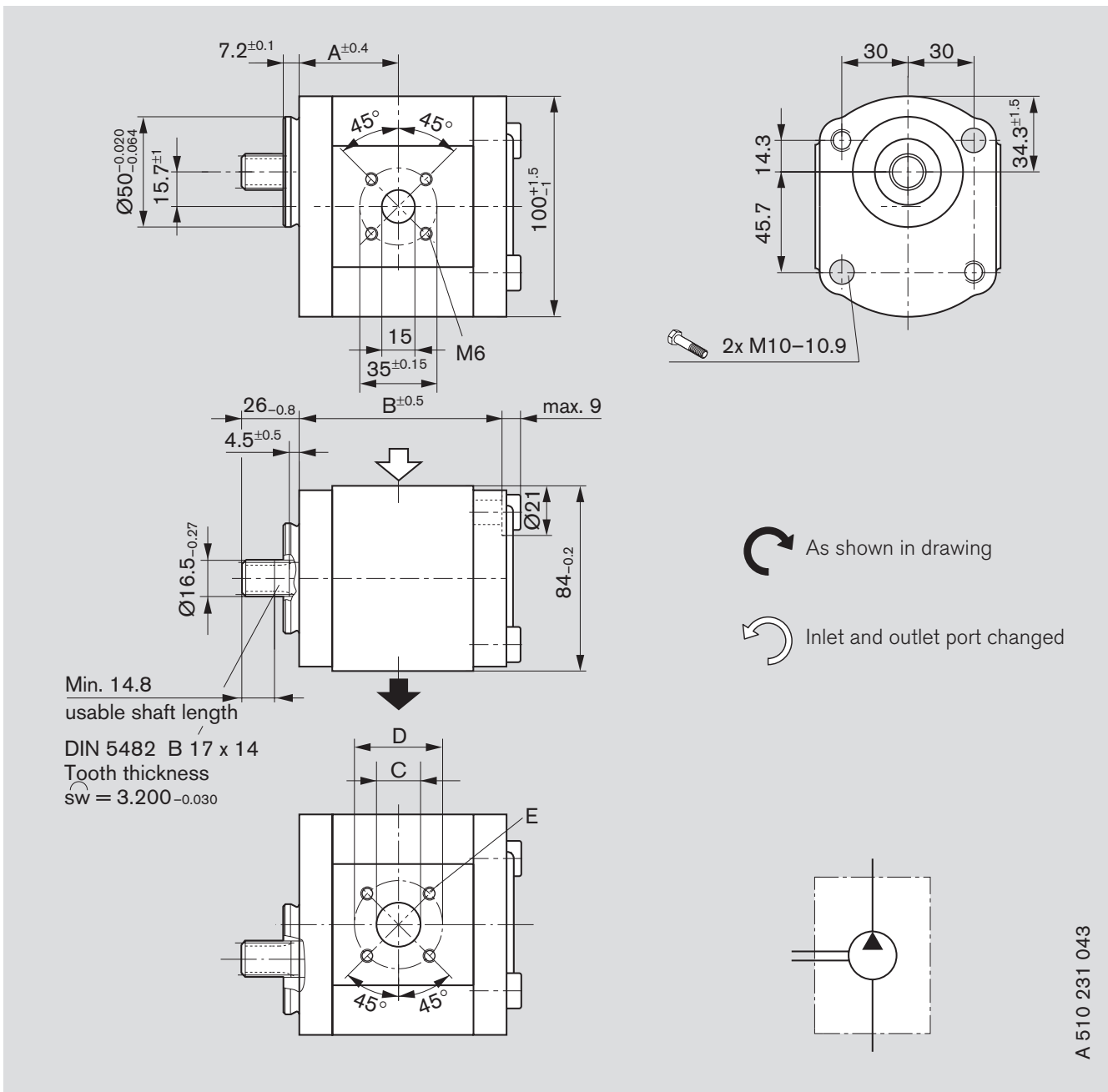
**Ordering code**

**AZPF - 1X -**    **C N 20 M B**

Displacement [cm <sup>3</sup> /rev]	Ordering No.		kg	Dimension [mm]				
	L	R		A	B	C	D	E
4	<b>0 510 215 306</b>	<b>0 510 215 006</b>	2.6	37.4	73.7	15	40	M6 depth 13
5.5	<b>0 510 315 304</b>	<b>0 510 315 004</b>	2.6	38.6	76.2	15	40	
8	<b>0 510 415 313</b>	<b>0 510 415 005</b>	2.8	40.7	80.3	20	40	
11	<b>0 510 515 310</b>	<b>0 510 515 004</b>	2.9	44.5	85.3	20	40	
14		<b>0 510 515 015</b>	3.0	45.0	90.3	20	40	
16	<b>0 510 615 314</b>	<b>0 510 615 006</b>	3.1	45.0	93.7	20	40	
19	<b>0 510 615 341</b>		3.2	45.0	98.7	20	40	



**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.



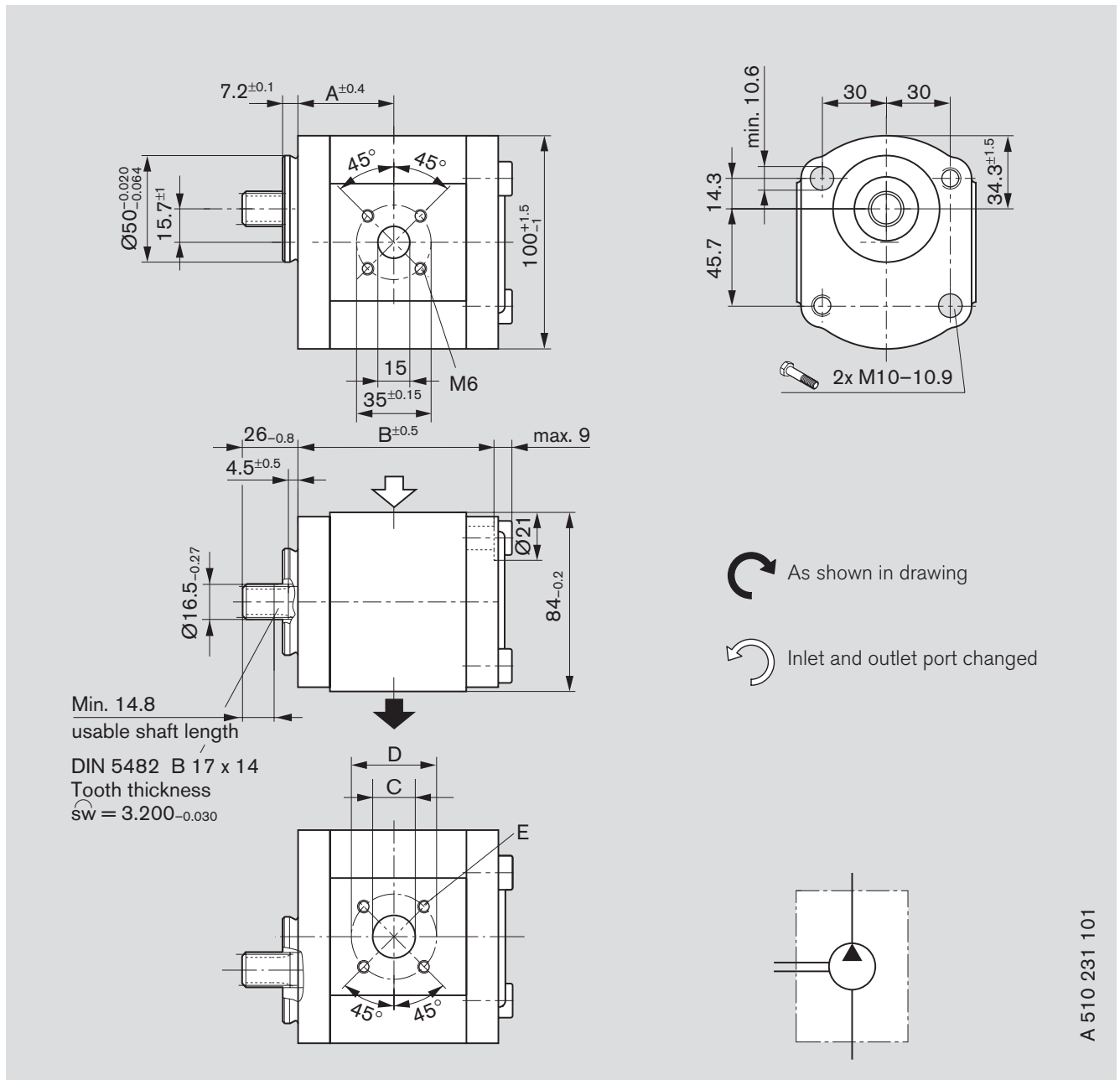
**Ordering code**

AZPF - 1X -     F N 20 M B

Displacement [cm <sup>3</sup> /rev]	Ordering No.		kg	Dimension [mm]					E
	 L	 R		A	B	C	D		
5.5		<b>0 510 315 007</b>	2.55	38.6	76.2	15	40	M6 depth 13	
8									
11		<b>0 510 515 011</b>	2.85	44.5	85.3	20	40		
14									
16									
19		<b>0 510 615 009</b>	3.2	45.0	98.7	20	40		
19									
22.5									



**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.



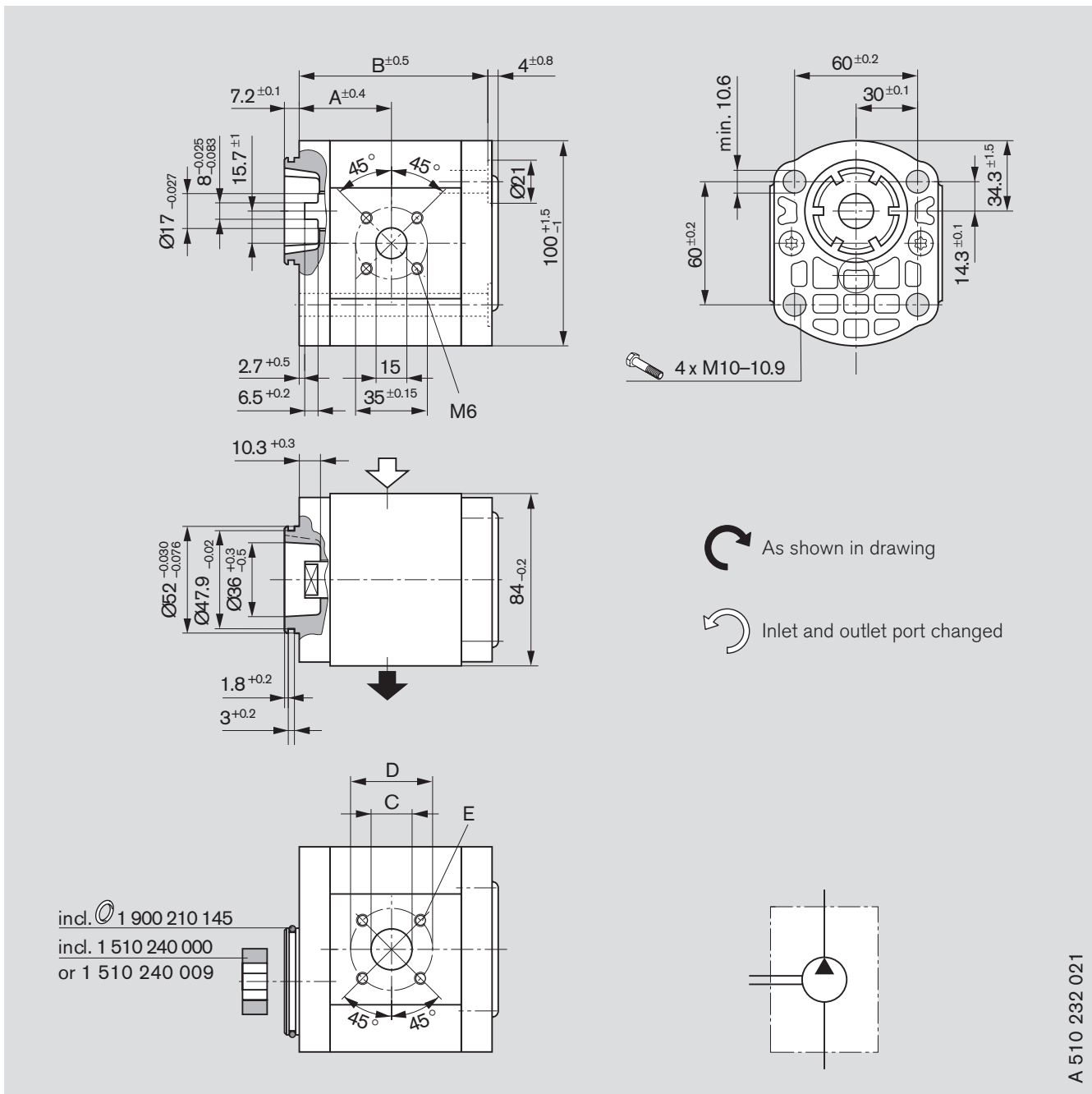
Ordering code

AZPF - 1X -     FP 20 P B  
 AZPF - 22 -     FP 20 P B\*  
 AZPF - 1X -     FP 20 P B S xxxx\*\*

Displacement [cm <sup>3</sup> /rev]	Ordering No.		kg	Dimension [mm]				
	 L	 R		A	B	C	D	E
5.5								M6
8	<b>0 510 415 328</b>		2.7	40.7	80.3	20	15	depth 13
11	<b>0 510 515 337</b>	<b>0 510 515 012</b>	2.8	44.5	85.3	20	15	
14	<b>0 510 515 338</b>	<b>0 510 515 013</b>	3.0	45.0	90.3	20	15	
16								
19								
22.5	<b>0 510 715 320**</b>	<b>0 510 715 008*</b>	3.6	58.6	116.1	20	15	

Notes:



1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.



A 510 232 021

**Ordering code**

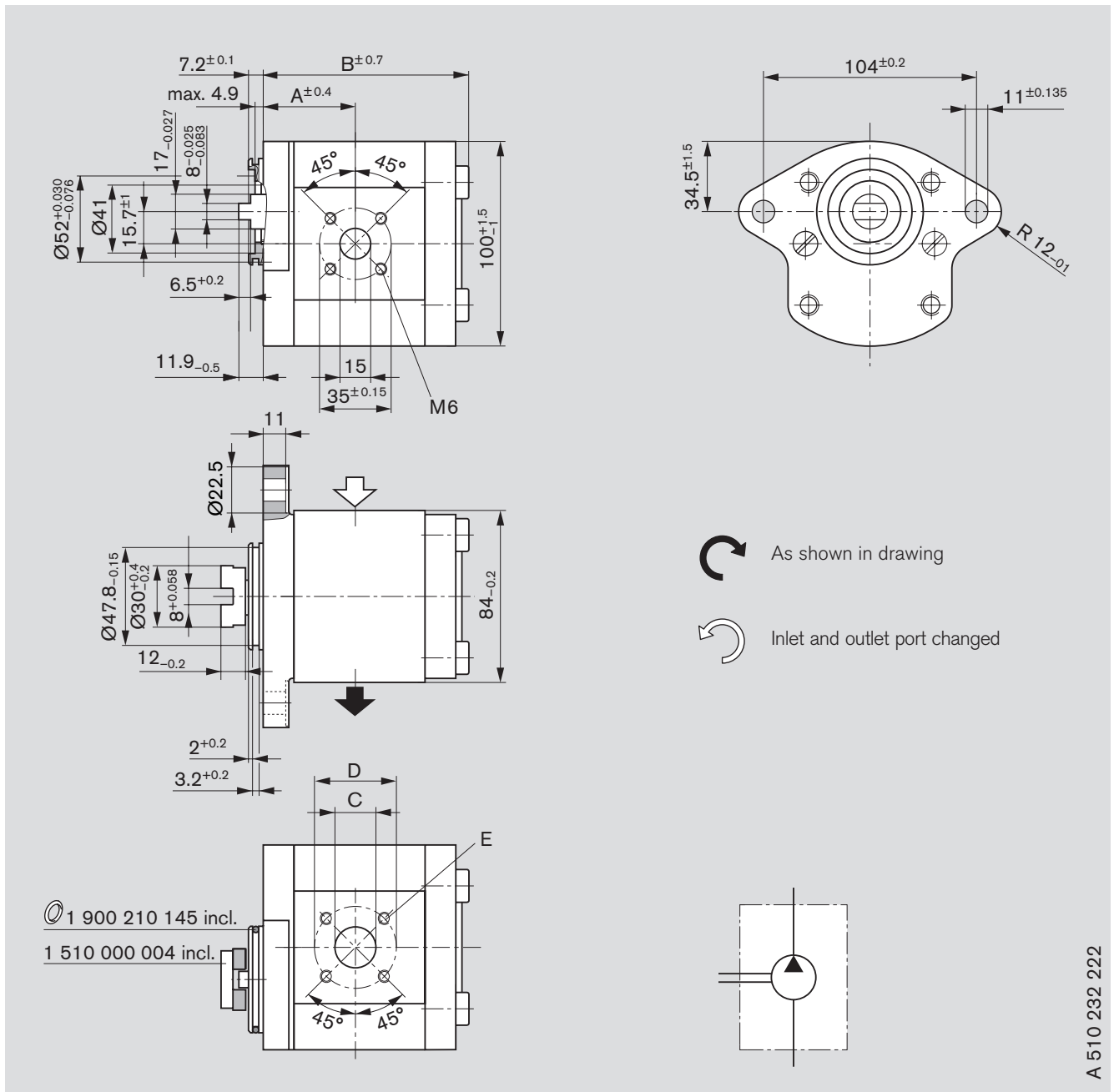
AZPF - 1X -     NT 20 M B

Displacement [cm <sup>3</sup> /rev]	Ordering No.		kg	Dimension [mm]				
	 L	 R		A	B	C	D	E
4	0 510 215 307	0 510 215 007	2.5	37.4	73.7	15	40	M6 depth 13
5.5	0 510 315 305	0 510 315 005	2.5	38.6	76.2	15	40	
8	0 510 415 314	0 510 415 006	2.5	40.7	80.3	20	40	
11	0 510 515 311	0 510 515 005	2.6	44.5	85.3	20	40	
14	0 510 515 340	0 510 515 019	2.38	45.0	90.3	20	40	
16	0 510 615 315	0 510 615 007	3.0	45.0	93.7	20	40	
19	0 510 615 321	0 510 615 008	3.0	45.0	98.7	20	40	
22.5	0 510 715 307	0 510 715 004	3.2	52.6	104.1	20	40	

**Note:**

1. Refer to page 16 for performance specifications by displacement size.





A 510 232 222

**Ordering code**

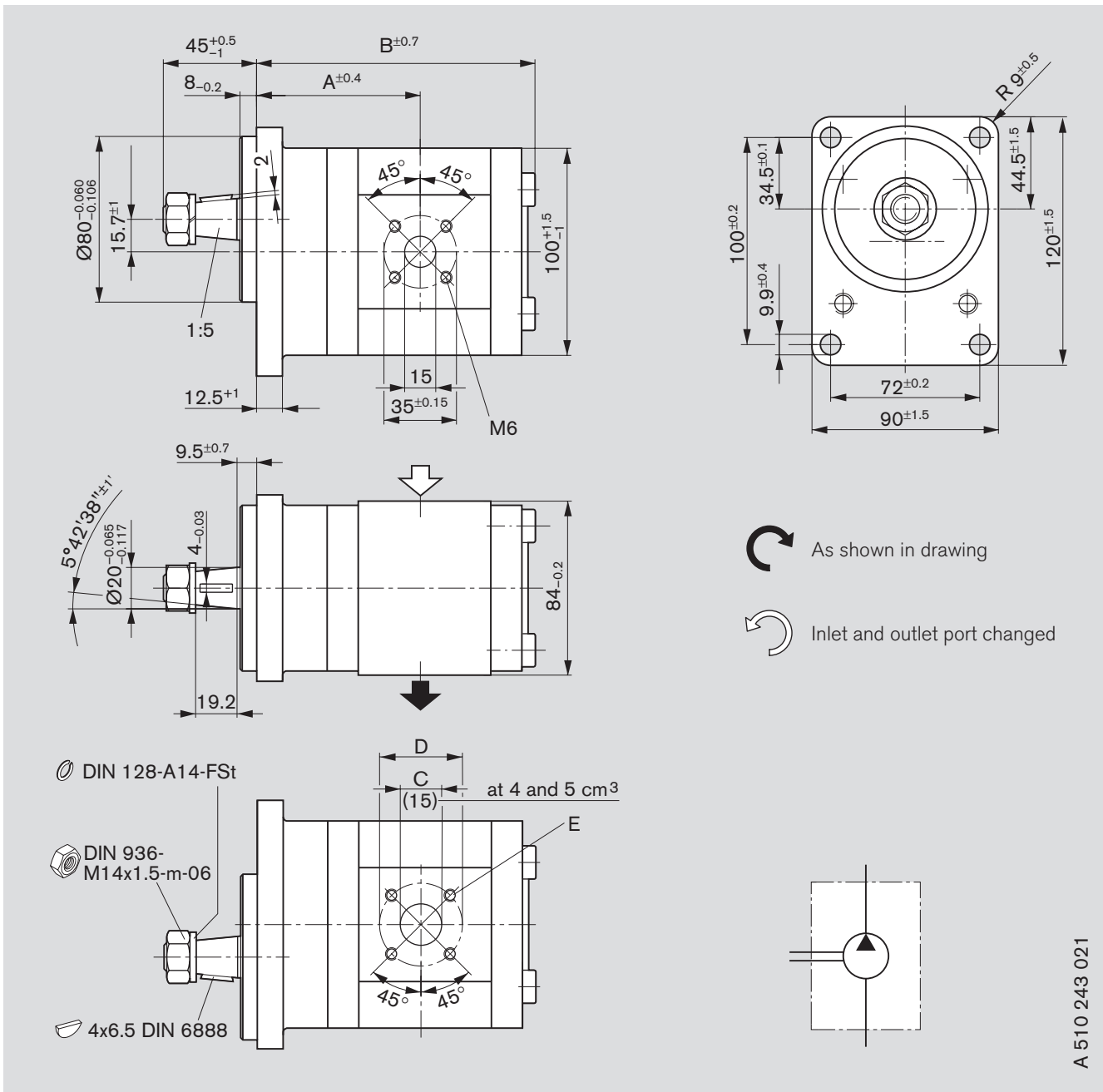
AZPF - 1X -     N L 20 K B

AZPF - 21 -     N L 20 K B\*

Displacement [cm <sup>3</sup> /rev]	Ordering No.		kg	Dimension [mm]				
	L	R		A	B	C	D	E
4		<b>0 510 225 012</b>	2.8	37.4	81.7	15	40	M6 depth 13
5.5	<b>0 510 325 312</b>	<b>0 510 325 012</b>	2.82	38.6	84.4	15	40	
8	<b>0 510 425 331</b>	<b>0 510 425 019</b>	3.0	40.7	88.5	20	40	
11		<b>0 510 525 025</b>	3.1	44.5	93.3	20	40	
16	<b>0 510 625 358</b>	<b>0 510 625 027</b>	3.3	45.0	101.9	20	40	
19	<b>0 510 625 368</b>	<b>0 510 625 032</b>	3.5	45.0	106.9	20	40	
22.5		<b>0 510 725 044*</b>	4.0	58.6	122.5	20	40	

**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.



A 510 243 021

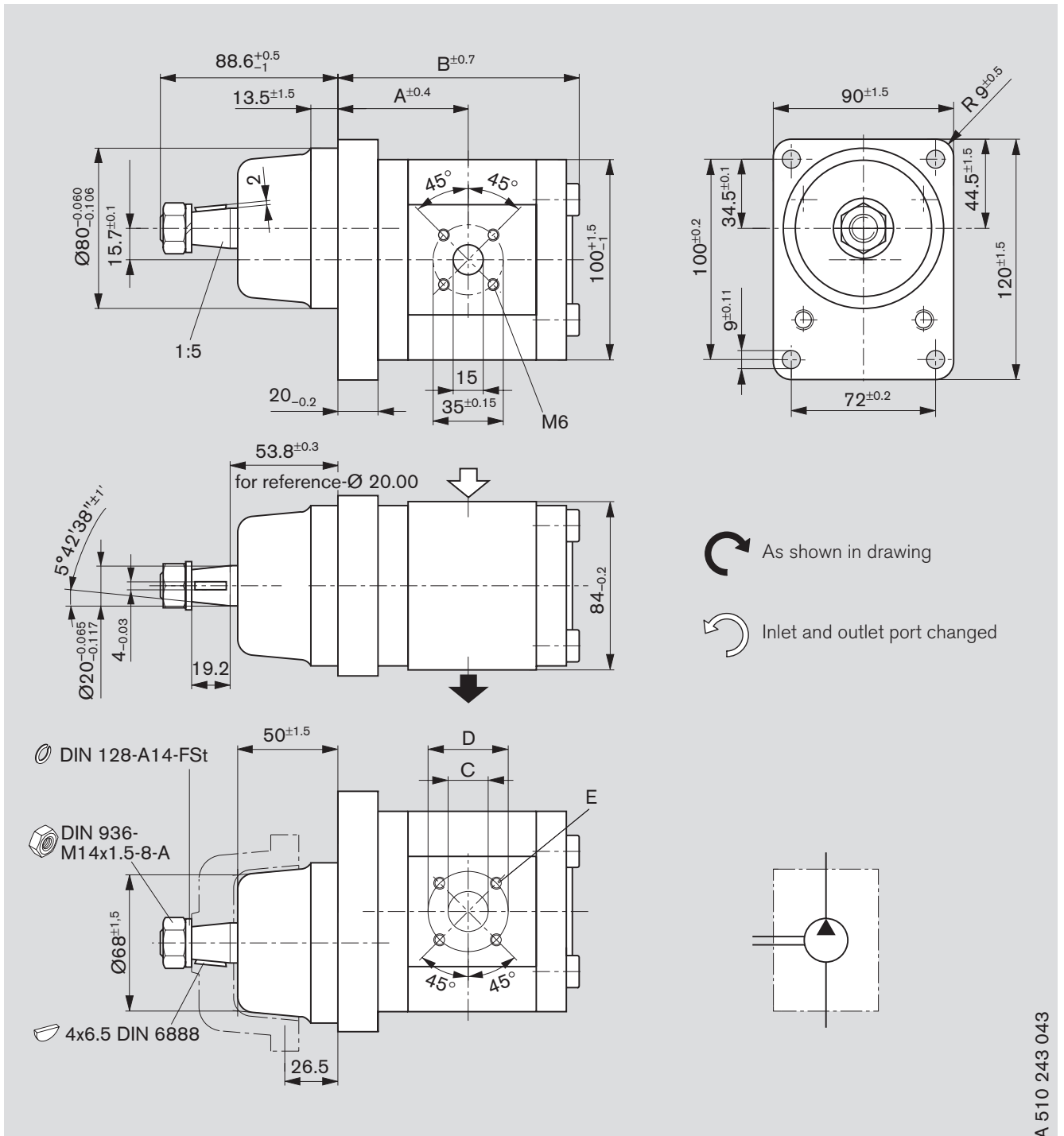
**Ordering code**

AZPF - 1X -     S A 20 M B

Displacement [cm <sup>3</sup> /rev]	Ordering No.		kg	Dimension [mm]				
	L	R		A	B	C	D	E
4	0 510 245 300	0 510 245 001	3.1	71.1	114.2	15	40	M6 depth 13
5.5	0 510 345 300	0 510 345 001	3.1	72.3	116.7	15	40	
8	0 510 445 300	0 510 445 001	3.3	74.4	120.8	20	40	
11	0 510 545 300	0 510 545 001	3.5	78.2	125.8	20	40	
14				78.7	130.8	20	40	
16	0 510 645 300	0 510 645 004	3.6	78.7	134.2	20	40	
19		0 510 645 002	3.9	78.7	139.2	20	40	
22.5				92.3	156.6	20	40	

**Notes:**

1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.



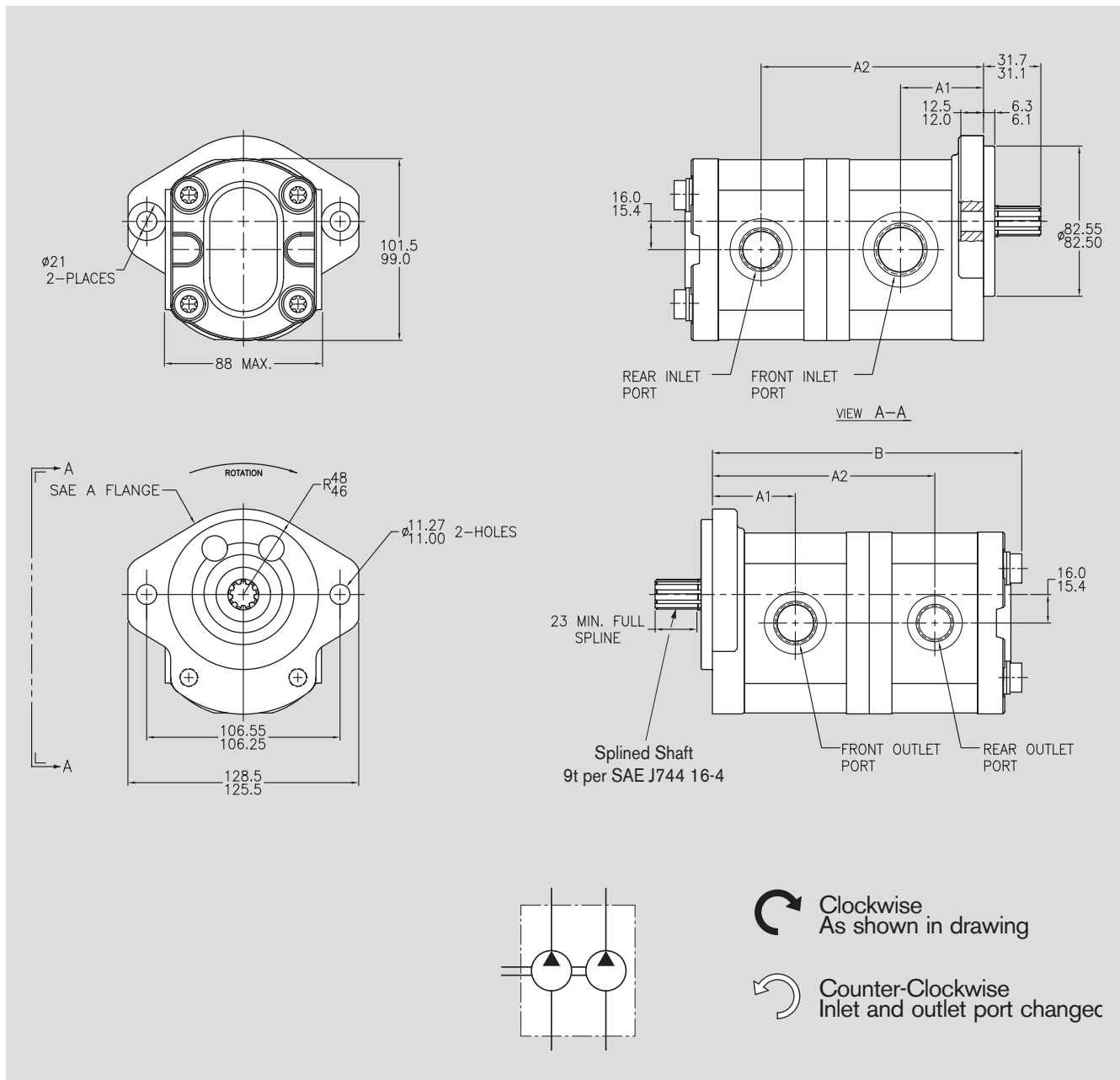
**Ordering code**

AZPF - 1X -     S G 20 M B

Displacement [cm <sup>3</sup> /rev]	Ordering No.		kg	Dimension [mm]				
	L	R		A	B	C	D	E
11		0 510 545 003	3.8	64.5	113.8	20	40	M6 depth 13
14	0 510 545 302	0 510 545 002	4.0	65.0	118.8	20	40	
16		0 510 645 005	4.1	65.0	122.0	20	40	
19		0 510 645 003	4.3	65.0	127.0	20	40	

**Notes:**



1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for availability of units with no ordering number listed.



**Ordering code**

- AZPFF - 12 -  -   RR1212MB
- AZPFF - 12 -  -   RR1212MB-S0040\*
- AZPFF - 12 -  -   RR1212KB\*\*

**Ordering code**AZPFF - 12 -  -   RR1212MBAZPFF - 12 -  -   RR1212MB-S0040\*AZPFF - 12 -  -   RR1212KB\*\*

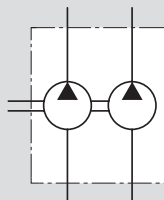
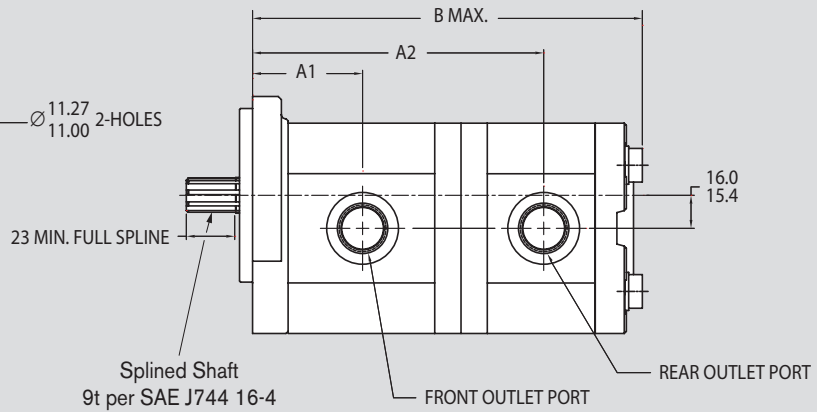
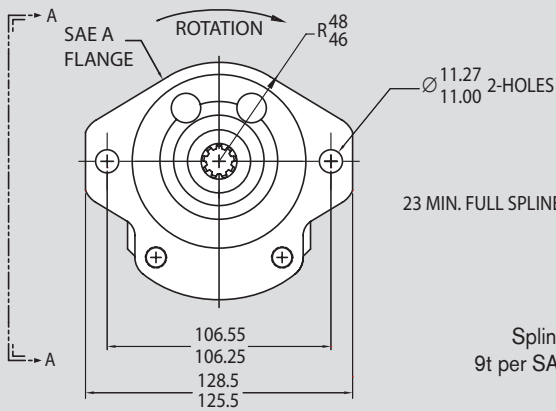
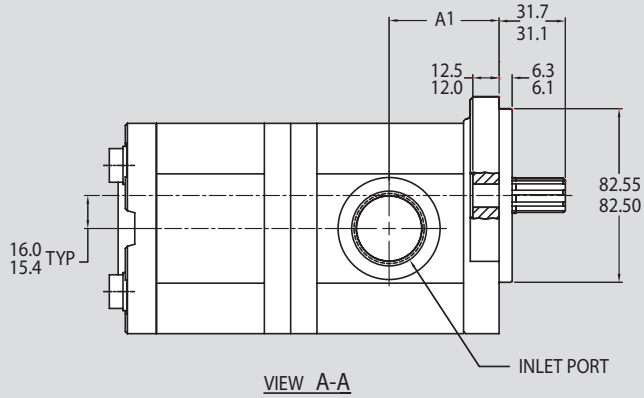
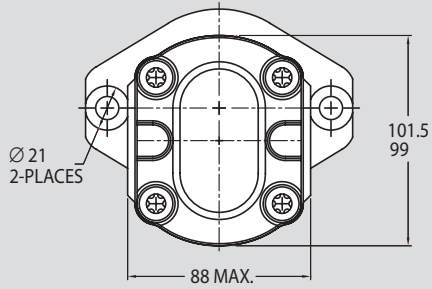
Displacement (cm <sup>3</sup> /rev)	Ordering Number		Dimension (mm)				
	 L	 R	A1	A2	B	Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
008 / 008		9 510 290 034	43.2	119.5	166.2	-12 / -12	-8 / -8
008 / 008		9 510 290 373**	43.2	119.6	166.2	-12 / -12	-8 / -8
011 / 005		9 510 290 142	45.7	122.4	170.9	-12 / -10	-10 / -8
011 / 005		9 510 290 374**	45.7	122.5	170.9	-12 / -10	-10 / -8
011 / 011	9 510 290 234		45.7	127.1	176.2	-12 / -12	-10 / -10
011 / 011	9 510 290 375**		45.7	127.1	176.2	-12 / -12	-10 / -10
014 / 005		9 510 290 143	48.2	127.4	175.9	-12 / -10	-10 / -8
014 / 005		9 510 290 376**	48.2	127.5	175.9	-12 / -10	-10 / -8
014 / 008		9 510 290 144	48.2	129.0	176.2	-12 / -12	-10 / -10
014 / 008		9 510 290 377**	48.2	129.6	176.2	-12 / -12	-10 / -10
014 / 014		9 510 290 402	48.2	134.5	186.2	-12 / -12	-10 / -10
016 / 014		9 510 290 203	49.9	137.6	191.5	-16 / -12	-10 / -10
016 / 014		9 510 290 378**	49.9	137.9	191.5	-16 / -12	-10 / -10
016 / 016		9 510 290 405*	49.9	138.6	193.0	-12 / -12	-10 / -10
019 / 014		9 510 290 333*	52.4	142.9	196.5	-16 / -16	-12 / -12
022 / 008		9 510 290 425	55.1	143.3	191.9	-12 / -12	-10 / -10
022 / 011		9 510 290 195	55.1	197.3	196.9	-12 / -12	-10 / -10
022 / 011		9 510 290 379**	55.1	147.3	196.9	-12 / -12	-10 / -10
022 / 016		9 510 290 406*	55.1	150.0	203.4	-12 / -12	-10 / -10
025 / 014		9 510 290 403*	63.2	164.5	216.2	-12 / -12	-10 / -10

**Notes:**

- Refer to page 19 - "Multiple Gear Pumps" for max operating pressures and torque.  
Maximum pressure for each pump module is limited to displacement ratings as stated on page 16.
- Contact factory for availability of units with no ordering number listed.

\* Non-standard size inlet port.

\*\* Viton shaft seal.





Clockwise  
As shown in drawing

Counter-Clockwise  
Inlet and outlet port changed

**Ordering code**

- AZPFF - 12 -  -   RR1212MB-S0014
- AZPFF - 12 -  -   RR1212MB-S0529\*
- AZPFF - 12 -  -   RR1212MB-S0516\*\*

**Ordering code**AZPFF - 12 -  -   RR1212MB-S0014AZPFF - 12 -  -   RR1212MB-S0529\*AZPFF - 12 -  -   RR1212MB-S0516\*\*

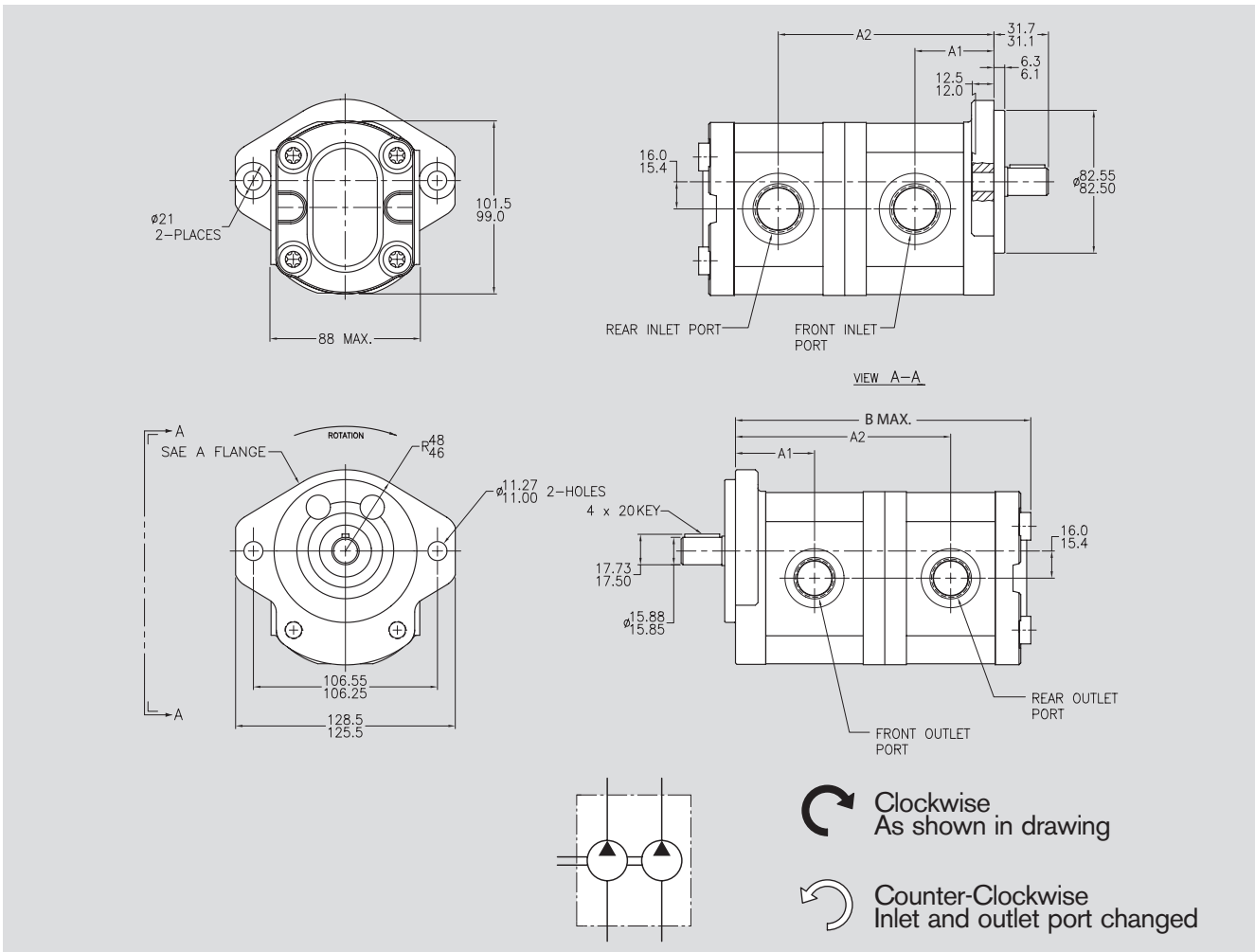
Displacement (cm <sup>3</sup> /rev)	Ordering Number		Dimension (mm)				
	 L	 R	A1	A2	B	Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
004 / 004		9 510 290 032**	39.3	109.6	156.8	-12	-8 / -8
004 / 004	9 510 290 415**		39.9	109.7	156.8	-12	-8 / -8
008 / 004		9 510 290 012	43.2	116.2	161.5	-12	-10 / -8
008 / 004		9 510 290 031*	43.3	116.3	161.5	-12	-8 / -8
008 / 008		9 510 290 440*	43.2	119.6	166.2	-12	-8 / -8
011 / 004		9 510 290 013	45.7	121.2	166.5	-12	-10 / -8
011 / 008		9 510 290 054	45.7	124.6	171.2	-12	-10 / -10
011 / 008	9 510 290 073**		45.7	124.6	171.2	-16	-10 / -10
011 / 011		9 510 290 145**	45.7	127.1	176.3	-16	-10 / -10
014 / 004		9 510 290 109	48.2	126.2	171.5	-12	-10 / -8
014 / 005		9 510 290 407	48.2	127.5	175.9	-12	-10 / -8
014 / 008		9 510 290 147**	48.2	129.6	176.2	-16	-10 / -10
014 / 014		9 510 290 146**	48.2	133.6	186.2	-16	-10 / -10
016 / 004		9 510 290 014	49.9	129.6	173.0	-16	-10 / -8
016 / 008		9 510 290 055	49.9	133.0	181.5	-16	-10 / -10
016 / 014		9 510 290 202	49.9	137.9	191.5	-16	-10 / -10
019 / 008	9 510 290 008		52.4	137.9	186.5	-16	-10 / -10
019 / 008		9 510 290 201	52.4	137.9	186.5	-16	-10 / -10
019 / 014		9 510 290 074	52.4	143.0	196.5	-16	-10 / -10
022 / 004		9 510 290 002	55.1	140.1	183.4	-16	-10 / -8
022 / 011		9 510 290 473	55.1	145.9	196.9	-16	-10 / -10

**Notes:**

- Refer to page 19 - "Multiple Gear Pumps" for max operating pressures and torque.  
Maximum pressure for each pump module is limited to displacement ratings as stated on page 16.
- Contact factory for availability of units with no ordering number listed.
- Contact factory to confirm sufficient flow through inlet port. Provide working pressure for both pump modules and speed.

\* Non-standard size outlet port.

\*\* Common inlet port, size is non-standard.



**Ordering code**

AZPFF - 12 -  -  **QR1212MB**

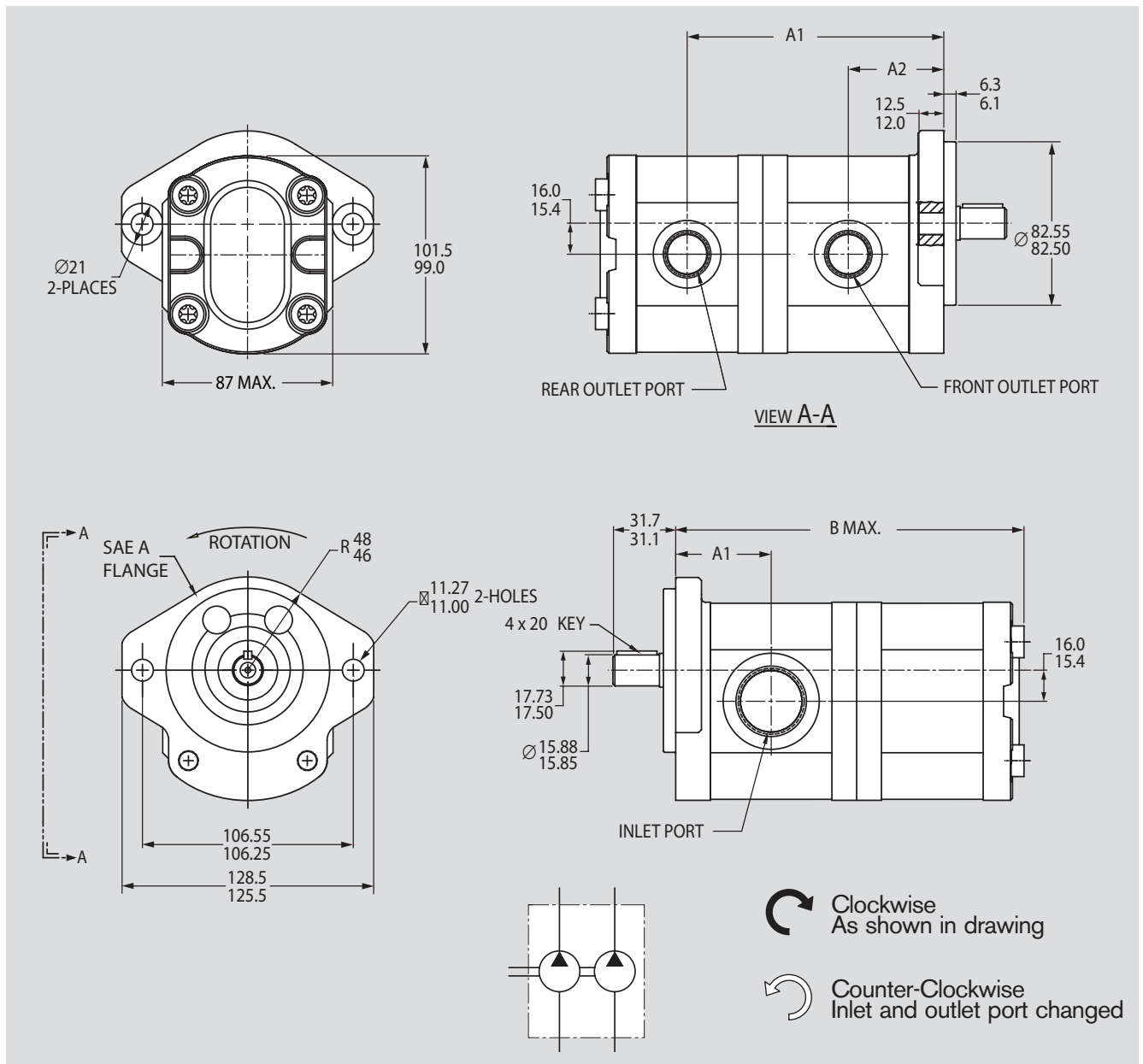
AZPFF - 12 -  -  **QR1212PB\***

Displacement (cm <sup>3</sup> /rev)	Ordering Number		Dimension (mm)					Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
	L	R	A1	A2	B				
005 / 005		9 510 290 232	41.1	113.3	161.8			-10 / -10	-8 / -8
005 / 005	9 510 290 412		41.1	113.4	161.8			-10 / -10	-8 / -8
008 / 004		9 510 290 138	43.2	155.0	161.5			-12 / -10	-10 / -8
008 / 008		9 510 290 137	45.7	155.0	166.2			-12 / -12	-10 / -10
011 / 004		9 510 290 139	45.7	121.3	164.6			-12 / -10	-10 / -8
011 / 005		9 510 290 140	45.7	122.5	170.9			-12 / -10	-10 / -8
011 / 008		9 510 290 141	45.7	124.6	171.2			-12 / -12	-10 / -10
014 / 004		9 510 290 411*	48.2	126.2	171.5			-12 / -10	-10 / -8
014 / 005		9 510 290 052	48.2	127.4	175.9			-12 / -10	-10 / -8
014 / 011		9 510 290 229	48.2	124.6	183.1			-12 / -12	-10 / -10
016 / 004		9 510 290 206	49.9	129.6	173.0			-16 / -10	-10 / -8
025 / 005		9 510 290 216	63.2	157.4	204.0			-16 / -10	-10 / -8

**Notes:**

- Refer to page 19 - "Multiple Gear Pumps" for max operating pressures and torque.  
Maximum pressure for each pump module is limited to displacement ratings as stated on page 16.
  - Contact factory for availability of units with no ordering number listed.
- \* All seals are Viton.





**Ordering code**

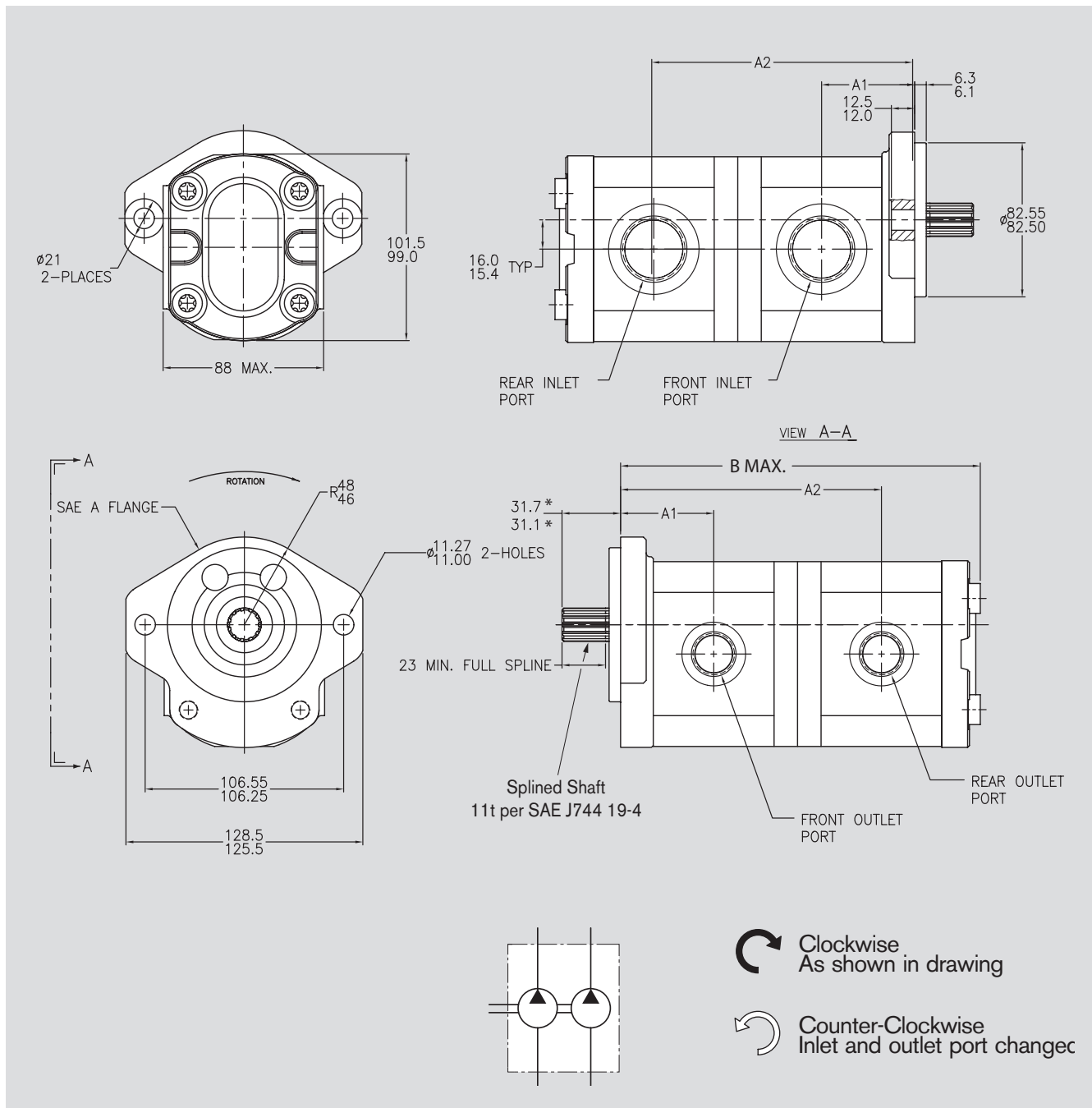
AZPFF - 12 -  -  **QR1212MB-S0014**

AZPFF - 12 -  -  **QR1212MB-S0516\***

Displacement (cm <sup>3</sup> /rev)	Ordering Number*		Dimension (mm)				Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
	L	R	A1	A2	B			
005 / 005		9 510 290 219	41.1	113.4	161.8	-10	-8 / -8	
008 / 008		9 510 290 192	43.2	119.5	166.2	-12	-10 / -10	
011 / 011		9 510 290 053*	45.6	127.0	175.3	-16	-10 / -10	
014 / 008	9 510 290 217*		48.2	129.5	176.2	-16	-10 / -10	
016 / 008		9 510 290 395	49.9	133.0	181.5	-16	-10 / -10	

**Notes:**

1. Refer to page 19 - "Multiple Gear Pumps" for max operating pressures and torque.  
Maximum pressure for each pump module is limited to displacement ratings as stated on page 16.
  2. Contact factory for availability of units with no ordering number listed.
  3. Contact factory to confirm sufficient flow through inlet port. Provide working pressure for both pump modules and speed.
- \* Common inlet port, size is non-standard.



**Ordering code**

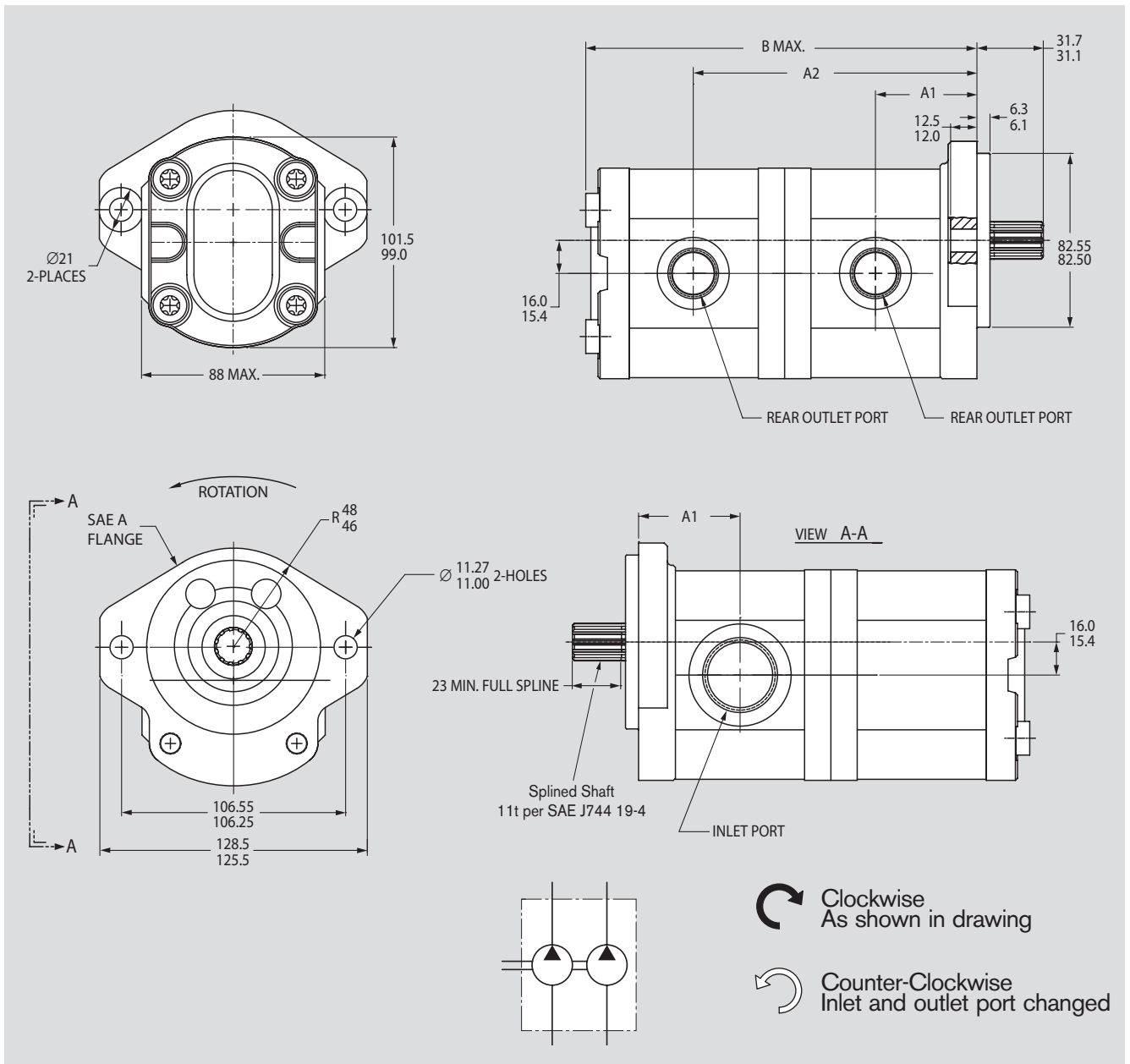
AZPFF - 12 -  -  PR1212MB

AZPFF - 22 -  -  PR1212MB\*

Displacement (cm <sup>3</sup> /rev)	Ordering Number		Dimension (mm)				
	L	R	A1	A2	B	Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
016 / 016		9 510 290 108	49.9	139.6	193.0	-16 / -16	-10 / -10
022 / 016		9 510 290 408	55.1	150.0	203.4	-16 / -16	-10 / -10
028 / 016		9 510 290 409*	65.6	171.0	226.3	-16 / -16	-10 / -10

**Notes:**

1. Refer to page 19 - "Multiple Gear Pumps" for max operating pressures and torque.  
Maximum pressure for each pump module is limited to displacement ratings as stated on page 16.
  2. Contact factory for availability of units with no ordering number listed.
- \* Shaft dimension for 9510290409 is 37.2 – 38.2 mm.



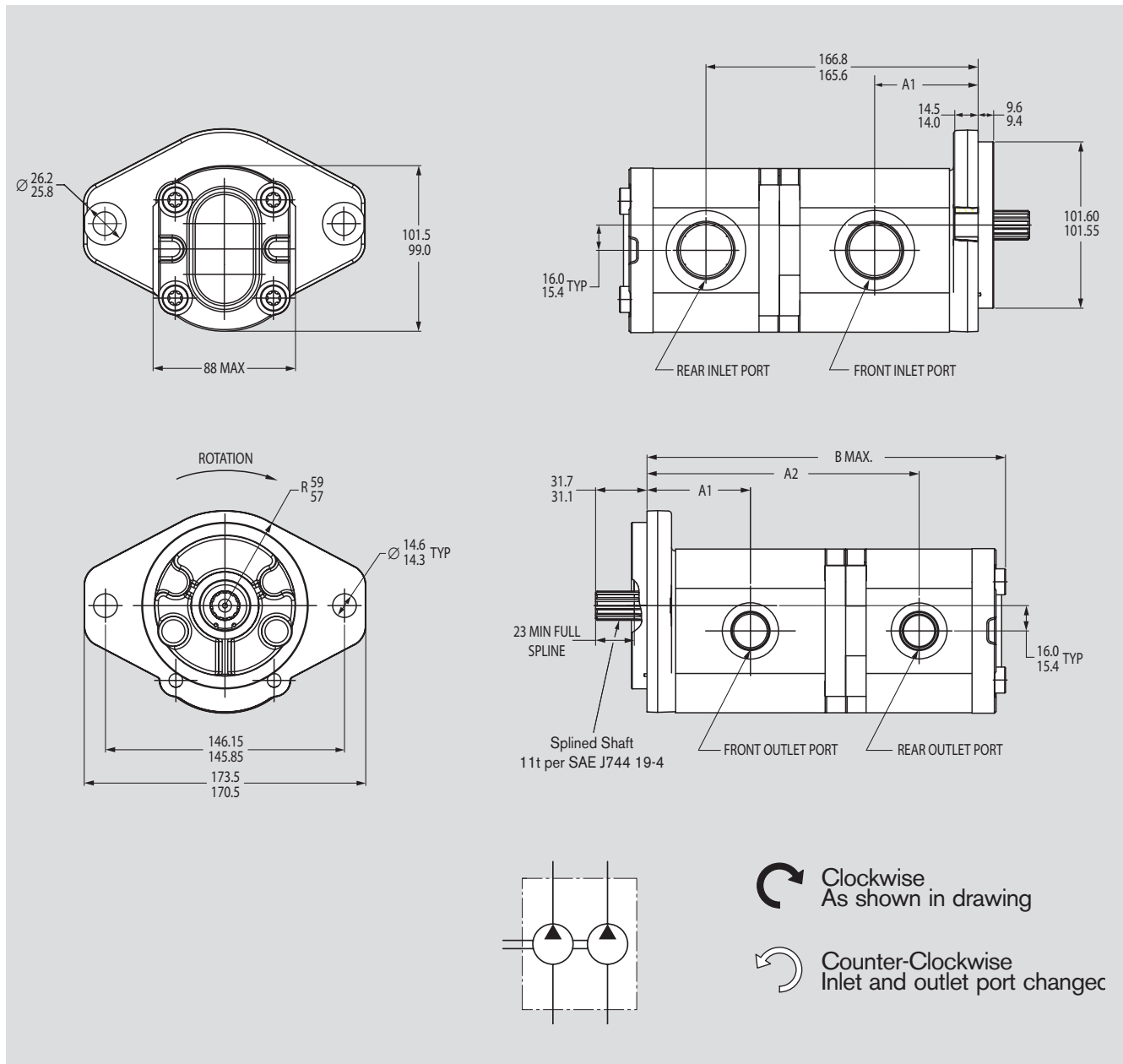
**Ordering code**

- AZPFF - 22 -  -   PR1212MB-S0014
- AZPFF - 22 -  -   PR1212MB-S0516\*
- AZPFF - 12 -  -   PR1212MB-S0516\*\*

Displacement (cm <sup>3</sup> /rev)	Ordering Number		Dimension (mm)			Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
	L	R	A1	A2	B		
014 / 005	9 510 290 434*		48.2	126.4	172.1	-16	-10 / -8
014 / 014	9 510 290 258		48.2	133.6	186.2	-16	-10 / -10
022 / 004		9 510 290 430	61.1	152.1	197.3	-16	-10 / -8

**Notes:**



1. Refer to page 19 - "Multiple Gear Pumps" for max operating pressures and torque.  
Maximum pressure for each pump module is limited to displacement ratings as stated on page 16.
  2. Contact factory for availability of units with no ordering number listed.
  3. Contact factory to confirm sufficient flow through inlet port. Provide working pressure for both pump modules and speed.
- \* Common inlet port, size is non-standard -22 design.  
\*\* Common inlet port, size is non-standard -12 design.



**Ordering code**

AZPFF - 12 -  -   PC1212MB

AZPFF - 22 -  -   PC1212MB\*

Displacement (cm <sup>3</sup> /rev)	Ordering Number		Dimension (mm)				
	 L	 R	A1	A2	B	Inlet Port (SAE O-Ring Boss)	Outlet Port (SAE O-Ring Bpss)
016 / 016		9 510 290 398	50.0	140.0	193.0	-16 / -16	-10 / -10
025 / 016		9 510 290 399*	63.0	166.0	219.6	-16 / -16	-10 / -10

**Notes:**

1. Refer to page 19 - "Multiple Gear Pumps" for max operating pressures and torque.  
Maximum pressure for each pump module is limited to displacement ratings as stated on page 16.
2. Contact factory for availability of units with no ordering number listed.

## Notes for commissioning

### Filter recommendation

The majority of premature failures in external gear pumps are caused by contaminated pressure fluid.

As a warranty cannot be issued for dirt-specific wear, we recommend filtration compliant with cleanliness level 20/18/15 ISO 4406 (1999), 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 pressure fluid used may not exceed class 20/18/15 according to ISO 4406 (1999). Experience has shown that new fluid quite often lies above this value. In such instances a filling device with special filter should be used.

### General

- The pumps supplied by us have been checked for function and performance. No modifications of any kind may be made to the pumps; any such changes will render the warranty null and void.
- Pump may only be operated in compliance with permitted data (see pages 16 – 19).

### 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".

### Technical data

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

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

### Characteristics

When designing the external gear pump, note the maximum possible service data based on the characteristics displayed on pages 11 to 15.

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

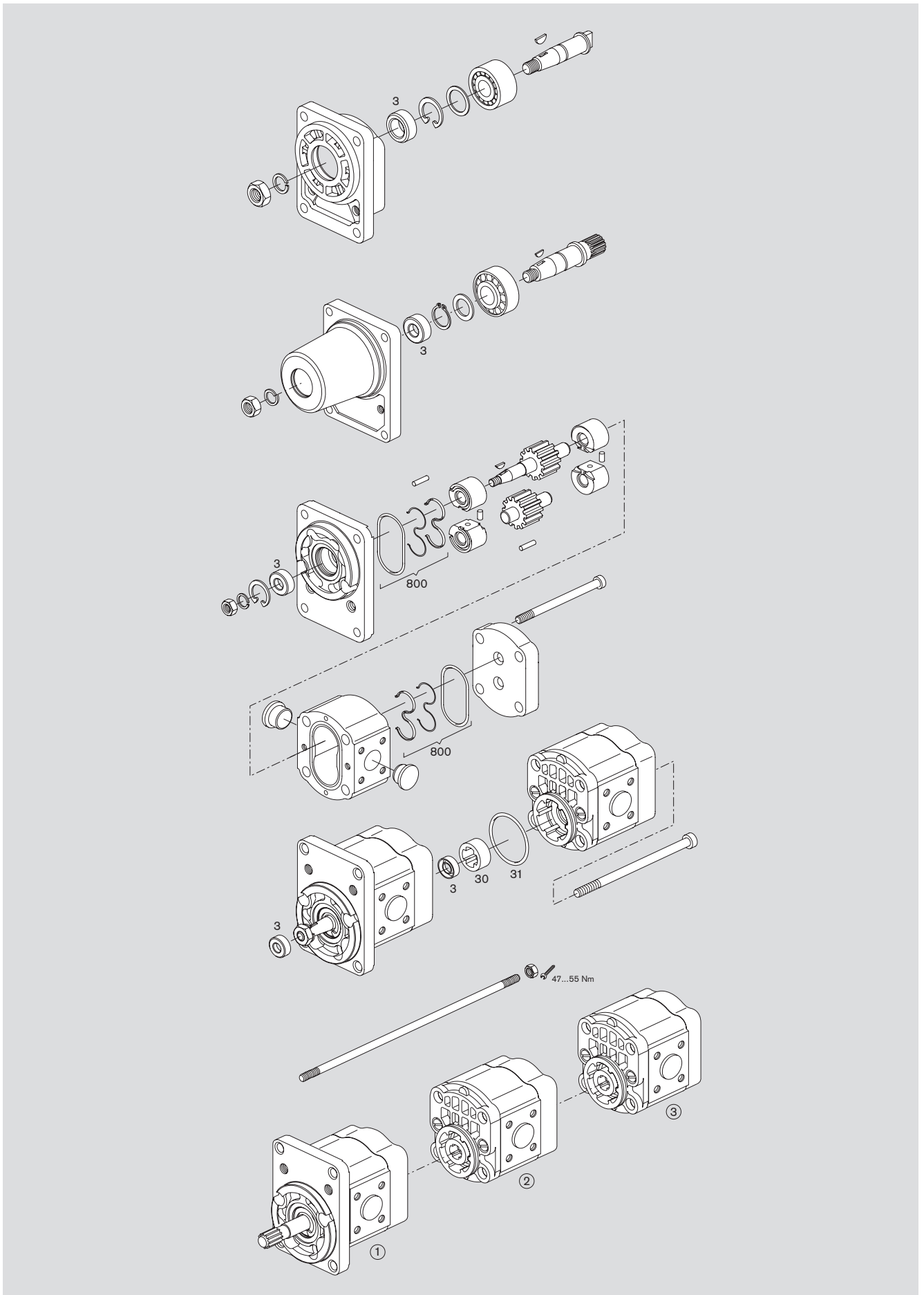
**You can find further information in our publication: "General Operating Instructions for External Gear Units" RE 07 012-B1.**

## Service parts

Pg.	Ordering code	Seal Pos. 800 and Pos. 3	Seal kit Pos. 800 1 517 010 ...	Shaft seal ring Pos. 3 1 510 283 ...	Shaft Seal Mate- rial	Shaft Seal Dimen- sion	Seal ring Pos. 31 1 900 210 ...	Mate- rial	Dimen- sion
20	AZPF - 12 - □□□□ RR12MB	R98640006P	152 NBR	035	NBR	17x30x7			
	AZPF - 22 - □□□□ RR12MB	R98640006P	152 NBR	035	FPM	17x30x7			
21	AZPF - 12 - □□□□ RR12MA	R98640006P	152 NBR	035	NBR	17x30x7			
22	AZPF - 12 - □□□□ QR12MB	R98640006P	152 NBR	035	NBR	17x30x7			
	AZPF - 22 - □□□□ QR12MB	n/a	152 NBR	035	NBR	17x30x7			
23	AZPF - 12 - □□□□ QR12MA	R98640006P	152 NBR	035	NBR	17x30x7			
24	AZPF - 22 - □□□□ PR12MB	n/a	152 NBR	009	NBR	17x30x7			
25	AZPF - 12 - □□□□ QR12MB - S0022	R98640006P	152 NBR	035	NBR	17x30x7			
26	AZPF - 12 - □□□□ QR12MA - S0022	R98640006P	152 NBR	035	NBR	17x30x7			
27	AZPF - 22 - □□□□ PC12CB	n/a	152 NBR	009	NBR	20x40x7			
28	AZPF - 12 - □□□□ RR20MB	R98640006P	152 NBR	035	NBR	17x30x7			
	AZPF - 12 - □□□□ RR20KB	n/a	152 NBR	065	FPM	17x30x7			
29	AZPF - 1X - □□□□ QR20MB	R98640006P	152 NBR	035	NBR	17x30x7			
30	AZPF - 1X - □□□□ CB20MB	R98640006P	152 NBR	035	NBR	17x30x7			
31	AZPF - 1X - □□□□ FB20MB	R98640006P	152 NBR	035	NBR	17x30x7			
32	AZPF - 1X - □□□□ HO30KB	--	152 NBR	044	FPM	18x30x7			
	AZPF - 2X - □□□□ HO30KB	--	152 NBR	044	FPM	18x30x7			
33	AZPF - 1X - □□□□ FO30MB	R98640006P	152 NBR	035	NBR	17x30x7			
	AZPF - 1X - □□□□ FO30PB	n/a	193 FPM	065	FPM	17x30x7			
	AZPF - 2X - □□□□ FO30PB	n/a	193 FPM	065	FPM	17x30x7			
34	AZPF - 1X - □□□□ HO01MB	R98640006P	152 NBR	035	NBR	17x30x7			
35	AZPF - 1X - □□□□ AB01MB	--	208 FPM	037	NBR	18x30x7			
36	AZPF - 1X - □□□□ CP20MB	R98640006P	152 NBR	035	NBR	17x30x7			
	AZPF - 1X - □□□□ CP20KB	n/a	152 NBR	065	FPM	17x30x7			
	AZPF - 1X - □□□□ CP20PB	n/a	193 FPM	065	FPM	17x30x7			
37	AZPF - 1X - □□□□ CN20MB	R98640006P	152 NBR	035	NBR	17x30x7			
38	AZPF - 1X - □□□□ FN20MB	R98640006P	152 NBR	035	NBR	17x30x7			
39	AZPF - 1X - □□□□ FP20PB	n/a	193 FPM	065	FPM	17x30x7			
	AZPF - 2X - □□□□ FP20PB	n/a	193 FPM	065	FPM	17x30x7			
40	AZPF - 1X - □□□□ NT20MB	R98640006P	152 NBR	035	NBR	17x30x7			
41	AZPF - 1X - □□□□ NL20KB	n/a	152 NBR	065	FPM	17x30x7			
	AZPF - 2X - □□□□ NL20KB	n/a	152 NBR	065	FPM	17x30x7			
42	AZPF - 1X - □□□□ SA20MB	R98640006P	152 NBR	035	NBR	17x30x7			
	AZPF - 1X - □□□□ SA20KB	n/a	152 NBR	065	FPM	17x30x7			
43	AZPF - 1X - □□□□ SG20MB	n/a	152 NBR	009	NBR	20x40x7			
44	AZPFF - 1X - □□□ - □□□□ RR1212MB	R98640006P (2x)	152 (2x) NBR	035	NBR	17x30x7	145	NBR	45x2.5
	AZPFF - 1X - □□□ - □□□□ RR1212KB	n/a	152 (2x) NBR	065	FPM	17x30x7	145	NBR	45x2.5
46	AZPFF - 1X - □□□ - □□□□ RR1212MB - S0XXX	R98640006P (2x)	152 (2x) NBR	035	NBR	17x30x7	145	NBR	45x2.5
48	AZPFF - 1X - □□□ - □□□□ QR1212MB	R98640006P (2x)	152 (2x) NBR	035	NBR	17x30x7	145	NBR	45x2.5
	AZPFF - 1X - □□□ - □□□□ QR1212PB	n/a	152 (2x) NBR	065	FPM	17x30x7	1 520 210 101	FPM	45x2.5
49	AZPFF - 1X - □□□ - □□□□ QR1212MB - S0XXX	R98640006P (2x)	152 (2x) NBR	035	NBR	17x30x7	145	NBR	45x2.5
50	AZPFF - 1X - □□□ - □□□□ PR1212MB	R98640006P (2x)	152 (2x) NBR	009	NBR	20x40x7	145	NBR	45x2.5
	AZPFF - 2X - □□□ - □□□□ PR1212MB	R98640006P (2x)	152 (2x) NBR	009	NBR	20x40x7	145	NBR	45x2.5
51	AZPFF - 1X - □□□ - □□□□ PR1212MB - S0XXX	R98640006P (2x)	152 (2x) NBR	009	NBR	20x40x7	145	NBR	45x2.5
	AZPFF - 2X - □□□ - □□□□ PR1212MB - S0XXX	R98640006P (2x)	152 (2x) NBR	009	NBR	20x40x7	145	NBR	45x2.5
52	AZPFF - 1X - □□□ - □□□□ PC1212MB	R98640006P (2x)	152 (2x) NBR	009	NBR	20x40x7	145	NBR	45x2.5
	AZPFF - 2X - □□□ - □□□□ PC1212MB	R98640006P (2x)	152 (2x) NBR	009	NBR	20x40x7	145	NBR	45x2.5

NBR = Perbunan® FPM = Viton®

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



## Ordering No.

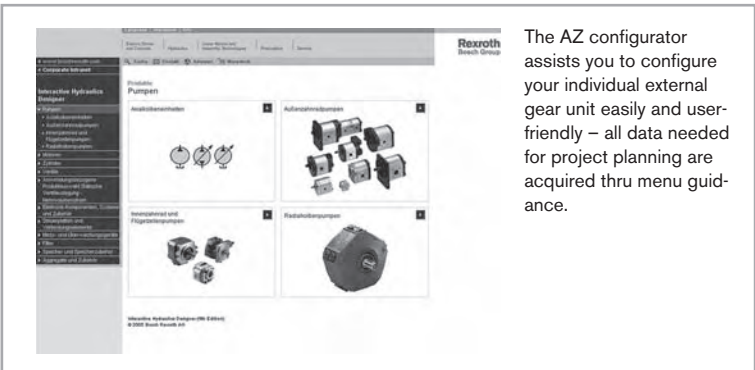
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0 510 215 007	40	0 510 425 020	28	0 510 525 323	33	0 510 625 368	41
0 510 215 009	36	0 510 425 021	33	0 510 525 324	28	0 510 625 381	32
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0 510 215 309	36	0 510 425 043	32	0 510 525 331	33	0 510 645 002	42
0 510 225 006	30	0 510 425 044	35	0 510 525 374	32	0 510 645 003	43
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0 510 225 013	28	0 510 425 314	28	0 510 545 001	42	0 510 645 300	42
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0 510 225 023	35	0 510 425 334	32	0 510 545 300	42	0 510 715 306	36
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0 510 225 307	31	0 510 425 336	31	0 510 615 005	36	0 510 715 320	39
0 510 225 314	28	0 510 445 001	42	0 510 615 006	37	0 510 725 030	30
0 510 225 317	32	0 510 445 300	42	0 510 615 007	40	0 510 725 044	41
0 510 225 318	35	0 510 515 004	37	0 510 615 008	40	0 510 725 060	29
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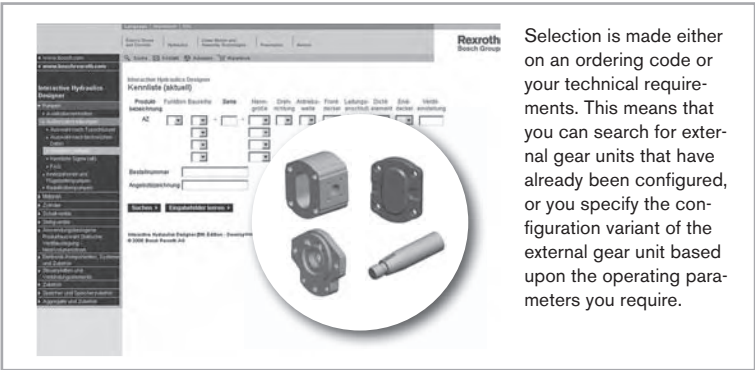
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# The AZ configurator at [www.boschrexroth-us.com/azconfigurator](http://www.boschrexroth-us.com/azconfigurator)

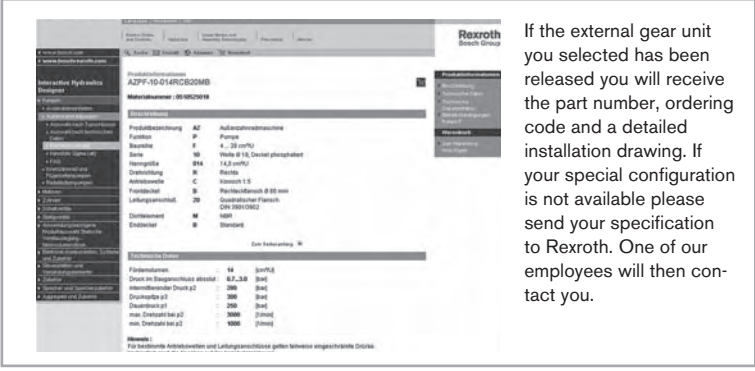
The AZ configurator assists you to configure your individual external gear unit easily and user-friendly. You only need to specify your requirements: From the displacement, direction of rotation, drive shaft, connection flange right up to the required rear cover. You immediately receive a project drawing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

**Notes:**

## Notes:

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