

# External gear pump SILENCE PLUS AZPJ

**RE 10094**

Edition: 07.2016

Replaces: 03.2016



- ▶ Platform F
- ▶ Low-noise fixed pump
- ▶ Sizes 12 to 28
- ▶ Continuous pressure up to 250 bar
- ▶ Intermittent pressure up to 280 bar

## Features

- ▶ Very low inherent noise
- ▶ Optimized pressure pulsation reduces noise emissions and oscillations in the system
- ▶ Pleasant tone due to low frequency
- ▶ Consistently high quality due to high-volume series production
- ▶ Long service life
- ▶ Slide bearings for high loads
- ▶ Drive shafts according to ISO or SAE and customer-specific solutions
- ▶ Line connections: Connection flanges
- ▶ Combinations of several pumps possible

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## Functional description

### General

The key task of external gear units is to convert mechanical energy (torque and rotational speed) into hydraulic energy (flow and pressure). To avoid unnecessarily high heat losses, units with high efficiencies are sought after. These are realized by means of pressure-dependent gap sealing and high-precision manufacturing technology.

With extremely low-noise SILENCE PLUS pumps, the intrinsic noise is reduced by 15 dB (A) on average as compared with standard external gear pumps and the flow pulsation is also decreased by 75%.

### Pumping principle

Continuous tooth contact reduces operating noise:

A non-involute rounded tooth profile, combined with helical gearing, forms the heart of the SILENCE PLUS. Thanks to permanent tooth contact, the hydraulic fluid is transported almost continuously and noiselessly. The possibility of noise developing from trapped oil between the tooth flanks is prevented in the first place.

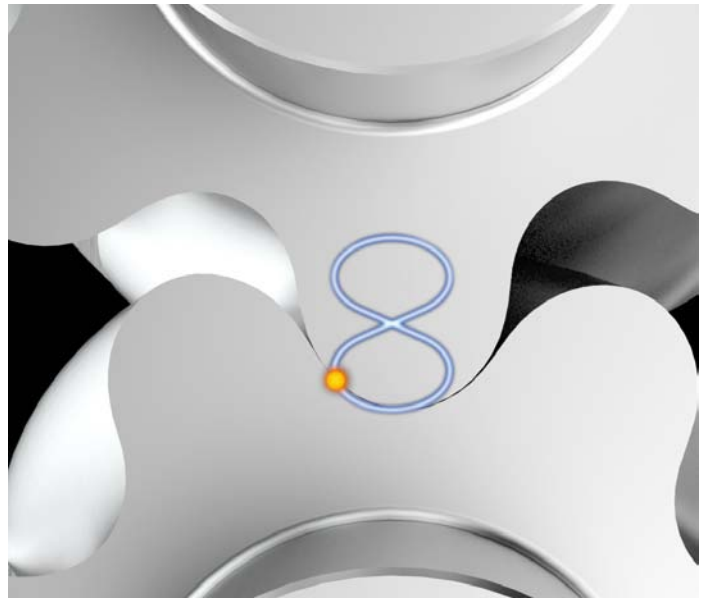
A hydrostatic bearing ensures long service life:

The high performance and long service life of the SILENCE PLUS is due to a Rexroth patented solution: Hydrostatic grooves provide wear-free compensation for the internal axial forces generated in the helical gearing – even at pressures up to 280 bar.

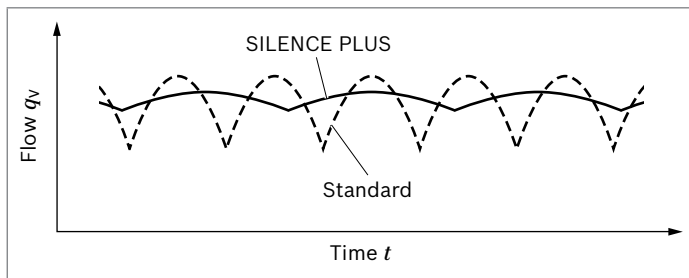
#### ▼ Standard



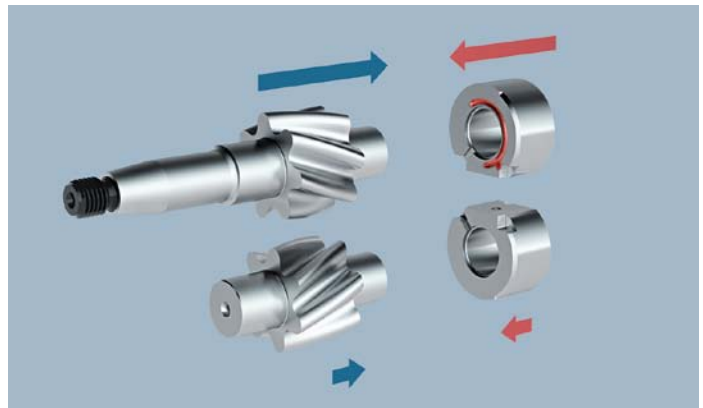
#### ▼ SILENCE PLUS



#### ▼ Flow pulsation



#### ▼ Hydrostatic bearing SILENCE PLUS

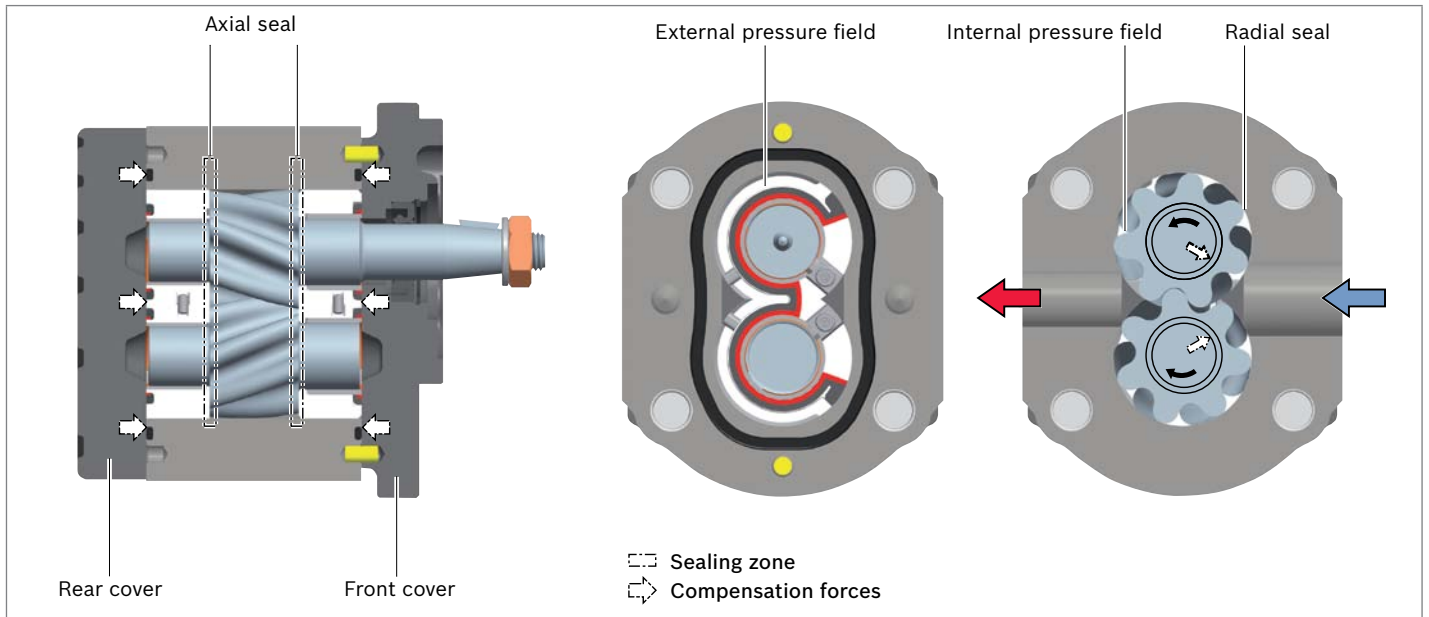


**Construction**

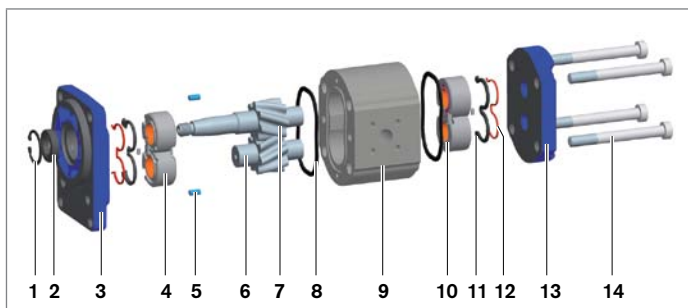
The external gear pump consists essentially of a pair of gear wheels supported in bearing bushes and the housing with a front and a rear cover. The drive shaft protrudes from the front cover where it is sealed by the shaft seal ring. The bearing forces are absorbed by slide bearings. These were designed for high pressures and have excellent emergency running properties, especially at low rotational speeds. The gear wheels have 7 teeth. This keeps both flow pulsation and noise emission to a minimum.

The internal sealing of the pressure chambers is achieved by pressure-dependent forces. This ensures optimum efficiency. On the outside, the movable bearing bushes are pressurized with operating pressure and pressed as seals against the gear wheels. The pressurized compression springs are limited by special seals. The seal on the area between the gear teeth and the housing is ensured by the smallest of gaps that adjust depending on the pressure between the gear teeth and housing.

▼ **Axial compensation SILENCE PLUS**



▼ **Assembly AZPJ**



- 1 Snap ring
- 2 Shaft seal
- 3 Front cover
- 4 Slide bearing
- 5 Centering pin
- 6 Gear wheel
- 7 Drive shaft
- 8 Housing seal ring
- 9 Pump housing
- 10 Bearing bushing
- 11 Axial field seal
- 12 Supporting element
- 13 Rear cover
- 14 Torx screws

▼ **Product overview AZPJ preferred types**

Version				
Page 21	Page 22	Page 23, 24	Page 25	Page 26

4 **AZPJ** | External gear pump  
Type code single pump

## Type code single pump

01	02	03	04	05	06	07	08	09	10	11	12	13	14
<b>AZP</b>	<b>J</b>	-			-								

### External gear unit

01	External gear pump	<b>AZP</b>
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### Series

02	SILENCE PLUS, platform F	<b>J</b>
----	--------------------------	----------

### Series

03	Shaft Ø20	<b>2</b>
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### Version

04	Phosphated, pinned	<b>1</b>
	Chromated, pinned	<b>2</b>

### Size (NG)

05	Geometric displacement $V_g$ [cm <sup>3</sup> ], see "Technical data" on page 9	<b>012</b>	<b>014</b>	<b>016</b>	<b>019</b>	<b>022</b>	<b>025</b>	<b>028</b>
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### Direction of rotation

06	Viewed on drive shaft	clockwise	<b>R</b>
		counter-clockwise	<b>L</b>

### Drive shaft



### Suitable front cover

07	Tapered shaft	1 : 5	<b>B, P</b>	<b>C</b>
		1 : 5	<b>A, G</b>	<b>S</b>
		1 : 8	<b>O</b>	<b>H</b>
	Dihedral, claw		<b>M, T</b>	<b>N</b>
	Splined shaft	SAE J744 16-4 9T	<b>R, C</b>	<b>R</b>
		SAE J744 19-4 11T	<b>R, C</b>	<b>P</b>
		DIN 5482 B17 × 14	<b>B, P</b>	<b>F</b>
	Parallel keyed shaft	SAE J744 16-1 A	<b>R</b>	<b>Q</b>
		ISO Ø18 mm	<b>B</b>	<b>A</b>

### Front cover

08	Rectangular flange	Ø80 mm	<b>B</b>	
		Ø36.47 mm	<b>O</b>	
2-bolt flange		Ø82.55 mm	SAE J744 82-2 A	<b>R</b>
		Ø101.6 mm	SAE J744 101-2 B	<b>C</b>
2-bolt mounting		Ø52 mm	With O-ring	<b>M</b>
		Ø50 mm	Connection variant 1	<b>N</b>
		Ø50 mm	Connection variant 2	<b>P</b>
4-bolt mounting		Ø52 mm	With O-ring	<b>T</b>
Outboard bearing		Ø80 mm	Type 1	<b>A</b>
			Type 2	<b>G</b>

01	02	03	04	05	06	07	08	09	10	11	12	13	14
<b>AZP</b>	<b>J</b>	-			-								

Line connection		012	014	016	019	022	025	028	
09	Square flange 	•	•	•	•	•	•	•	20
	Square flange 	•	•	•	-	-	-	-	30

Sealing material		
10	NBR (nitrile rubber)	M
	FKM (fluoroelastomer)	P
	NBR (nitrile rubber), shaft seal in FKM (fluoroelastomer)	K

Rear cover			
11	Without valve (standard)	B	
	With pressure relief valve	Residual flow internal	D
		Residual flow external	T
	With flow control valve	Residual flow external	E
		Residual flow internal	S
	With pressure relief valve and flow control valve	V	

Valve setting pressure relief valve (parameter only required for rear cover with pressure relief and/or flow control valve)		
12	Without pressure relief valve	XXX
	Cracking pressure in bar, 3-digit, e.g. 180 bar	180

Valve setting flow control valve (parameter only required for rear cover with pressure relief and/or flow control valve)		
13	Without flow control valve	XX
	Flow in l/min, 2-digit, e.g. 9 l/min	09

Special version		
14	Special version	SXXXX

• = Available    - = Not available

**Note**

- ▶ Not all of the variants according to the type code are possible.
- ▶ Please select the desired pump with the help of the selection table (preferred types ) or after consultation with Bosch Rexroth.
- ▶ Special options are available on request.

## Type code multiple pump

01	02	03	04	05	06	07	08	09	10	11	12
<b>AZP</b>		-			-						

### External gear unit

01	External gear pump	<b>AZP</b>
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### Series<sup>1)</sup>

02	High-performance	1.0 to 7.1 cm <sup>3</sup> /rev	Data sheet 10087	<b>B</b>
		4.0 to 28 cm <sup>3</sup> /rev	Data sheet 10089	<b>F</b>
		20.0 to 36 cm <sup>3</sup> /rev	Data sheet 10091	<b>N</b>
		22.5 to 100 cm <sup>3</sup> /rev	Data sheet 10093	<b>G</b>
	SILENCE	4.0 to 28 cm <sup>3</sup> /rev	Data sheet 10095	<b>S</b>
		20.0 to 36 cm <sup>3</sup> /rev	Data sheet 10092	<b>T</b>
		22.5 to 63 cm <sup>3</sup> /rev	Data sheet 10098	<b>U</b>
	SILENCE PLUS	12.0 to 28 cm <sup>3</sup> /rev	Data sheet 10094	<b>J</b>

### Series (relates to pump stage 1)

03	Standard bearing	<b>1</b>
	Reinforced bearing	<b>2</b>

### Version (relates to pump stage 1)

04	Phosphated, pinned	<b>1</b>
	Chromated, pinned	<b>2</b>

### Size (NG)<sup>2)</sup>

05	In accordance with data sheet for the individual series	
----	---	--

### Direction of rotation

06	Viewed on drive shaft	clockwise	<b>R</b>
		counter-clockwise	<b>L</b>

### Drive shaft (relates to pump stage 1)

07	In accordance with data sheet of pump stage 1	
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### Front cover (relates to pump stage 1)

08	In accordance with data sheet of pump stage 1	
----	---	--

### Line connection (per pump stage)<sup>3)</sup>

09	In accordance with data sheet for the individual series	
----	---	--

### Sealing material

10	NBR (nitrile rubber)	<b>M</b>
	FKM (fluoroelastomer)	<b>P</b>
	NBR (nitrile rubber), shaft seal in FKM (fluoroelastomer)	<b>K</b>

### Rear cover (relates to last pump stage)

11	In accordance with data sheet for the last pump stage	
----	---	--

### Special version

12	Special version	<b>SXXXX</b>
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<sup>1)</sup> A letter is to be selected for each pump stage, e.g.

3-way pump AZPJ + AZPJ + AZPB: **JJB**

<sup>2)</sup> A numerical value is to be selected for each pump stage, e.g.

3-way pump **028/016/2.0**

<sup>3)</sup> A numerical value is to be selected for each pump stage, e.g.

3-way pump **202002**

**Note**

- ▶ Not all of the variants according to the type code are possible.
- ▶ Please select the desired pump with the help of the selection table (preferred types ) or after consultation with Bosch Rexroth.
- ▶ Special options are available on request.

**Example 4-way pump:**

AZPG...032... + AZPG...022... + AZPJ...016... + AZPJ...012...

01	02		03	04		05	06	07	08		09	10	11
<b>AZP</b>	<b>GGJJ</b>	-	<b>2</b>	<b>2</b>	-	<b>032/022/016/012</b>	<b>R</b>	<b>C</b>	<b>B</b>		<b>202020</b>	<b>K</b>	<b>B</b>

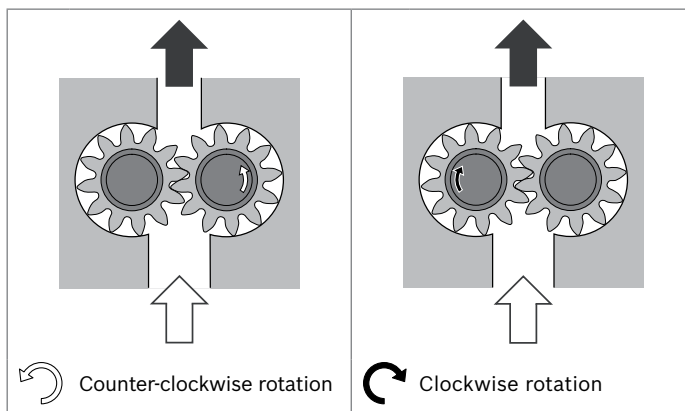
## Technical data

General			
Weight	kg	See dimensions starting on page 21	
Installation position	Any		
Mounting type	Flange or through-bolting with spigot		
Line ports	Flange		
Direction of rotation (viewed on drive shaft)	Clockwise or counter-clockwise, the pump may only be driven in the direction indicated		
Drive shaft bearing	Radial and axial forces only after consultation		
Ambient temperature range $\theta$	°C	-30 to +80 with NBR seals -20 to +110 with FKM seals	
Hydraulic			
Hydraulic fluid	Mineral oil according to DIN 51524, 1-3, however under higher load at least HLP compliant with DIN 51524 Part 2 is recommended. Please observe data sheet 90220. Other hydraulic fluids on request		
Hydraulic fluid temperature range	$\theta$	°C	-30 to +80 with NBR seals (NBR = nitrile rubber) -20 to +110 with NBR seals (FKM = fluoroelastomer)
Viscosity range	permissible in continuous operation	$\nu$	mm <sup>2</sup> /s 12 to 800
	recommended in continuous operation	$\nu_{opt}$	mm <sup>2</sup> /s 20 to 100
	permissible for cold start	$\nu_{max}$	mm <sup>2</sup> /s $\leq 2000$
Maximum admissible degree of contamination of the hydraulic fluid, Cleanliness level according to ISO 4406 (c)			20/18/15 <sup>1)</sup>

### Note

- ▶ Safety requirements pertaining to the whole systems are to be observed.
- ▶ Please contact us for applications with frequent load changes.
- ▶ The dimensions represent pumps for clockwise rotation. The position of the drive shaft or suction and pressure port changes for counter-clockwise rotation.

### ▼ Direction of rotation, viewed on drive shaft

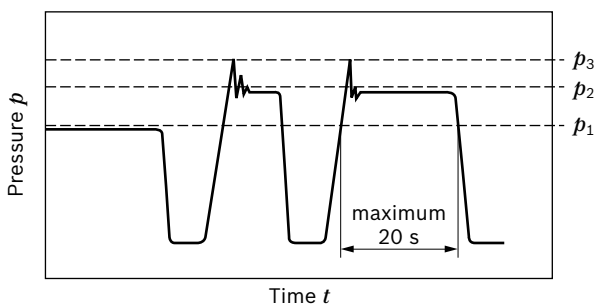


1) For hydraulic systems or devices with function-related, critical failure effects, such as steering and brake valves, the type of filtration selected must be adapted to the sensitivity of these devices.



AZPJ-2x		Size	12	14	16	19	22	25	28
Displacement, geometric, per revolution	$V_g$	cm <sup>3</sup>	12	14	16	19	22.5	25	28
Pressure in suction port <sup>1)</sup>	absolute $p_e$	bar	0.7 to 3						
Maximum continuous pressure	$p_1$	bar	250	250	250	250	210	185	130
Maximum intermittent pressure	$p_2$	bar	280	280	280	280	240	215	160
Maximum pressure peak	$p_3$	bar	300	300	300	300	260	235	180
Minimum rotational speed at bar	12 mm <sup>2</sup> /s	< 100	rpm	500	500	500	500	500	500
		100 to 180	rpm	1000	800	800	800	800	800
		180 to $p_2$	rpm	1200	1000	1000	1000	1000	1000
	25 mm <sup>2</sup> /s	$p_2$	rpm	600	500	500	500	500	500
Maximum rotational speed at	$p_2$	rpm	3500	3000	3000	3000	3000	2800	2600

### ▼ Pressure definition



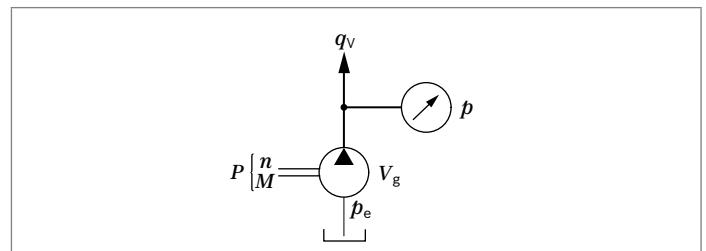
- $p_1$  Maximum continuous pressure  
 $p_2$  Maximum intermittent pressure  
 $p_3$  Maximum pressure peak

### Design calculations for pumps

Flow	$q_v = \frac{V_g \times n \times \eta_v}{1000}$	[l/min]
Torque	$M = \frac{V_g \times \Delta p}{20 \times \pi \times \eta_{hm}}$	[Nm]
Power	$P = \frac{2 \pi \times M \times n}{60000} = \frac{q_v \times \Delta p}{600 \times \eta_t}$	[kW]
Pressure	$\Delta p = \frac{M \times 20 \times \pi \times \eta_{hm}}{V_g}$	[bar]
	$\Delta p = \frac{P \times 600 \times \eta_t}{q_v}$	[bar]
Displacement	$V_g = \frac{q_v \times 1000}{n \times \eta_v}$	[cm <sup>3</sup> ]
	$V_g = \frac{M \times 20 \times \pi \times \eta_{hm}}{\Delta p}$	[cm <sup>3</sup> ]
Rotational speed	$n = \frac{q_v \times 1000}{V_g \times \eta_v}$	[min <sup>-1</sup> ]

### Key

- $V_g$  Displacement per revolution [cm<sup>3</sup>]  
 $\Delta p$  Differential pressure [bar] ( $\Delta p = p - p_e$ )  
 $n$  Rotational speed [rpm]  
 $q_v$  Flow [l/min]  
 $M$  Torque [Nm]  
 $P$  Power [kW]  
 $\eta_v$  Volumetric efficiency<sup>2)</sup>  
 $\eta_{hm}$  Hydraulic mechanical efficiency<sup>2)</sup>  
 $\eta_t$  Total efficiency ( $\eta_t = \eta_v \times \eta_{hm}$ )<sup>2)</sup>



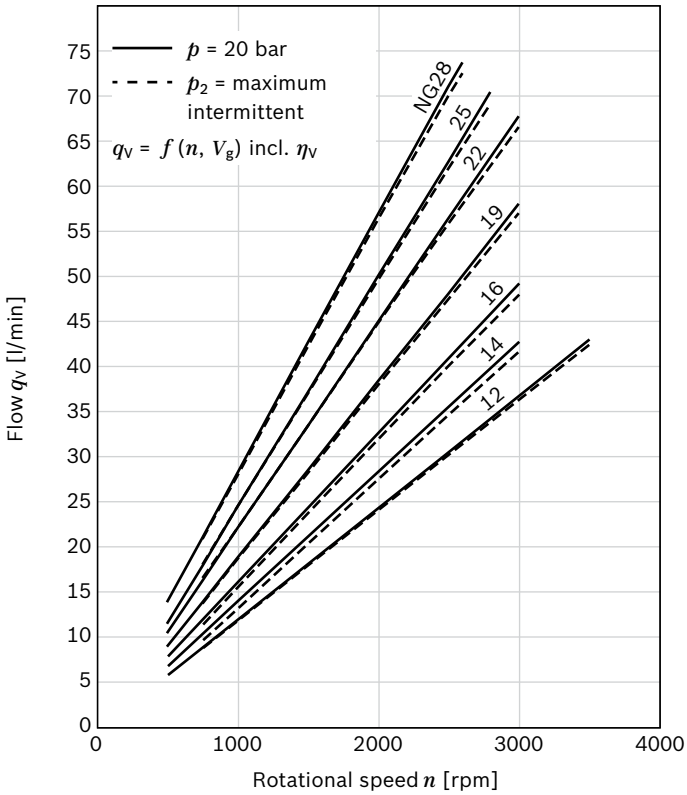
### Note

On the following pages you can find diagrams for a rough calculation.

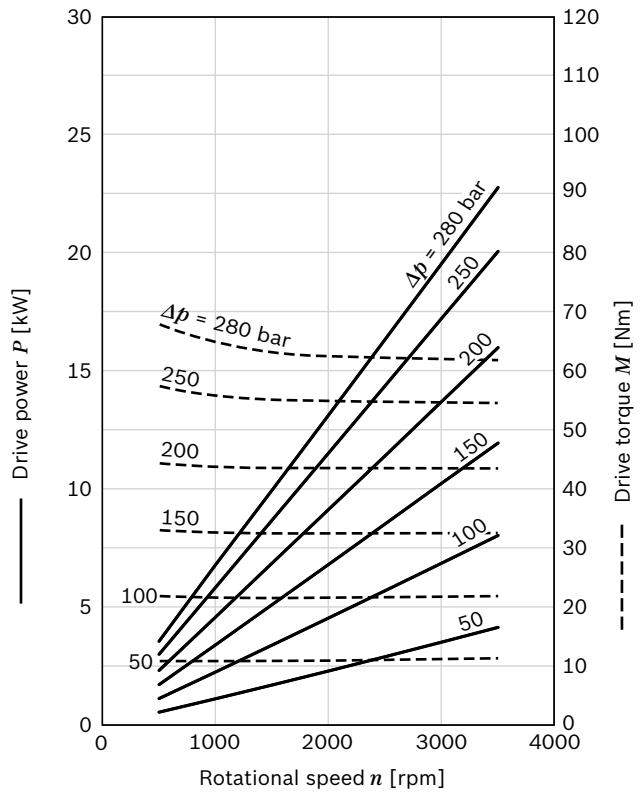
- 1) In the case of tandem pumps, the suction-side pressure difference between the individual pump stages must not exceed 0.5 bar.  
 2) Parameter as a decimal, e.g. 0.9

### Flow and power characteristic curves

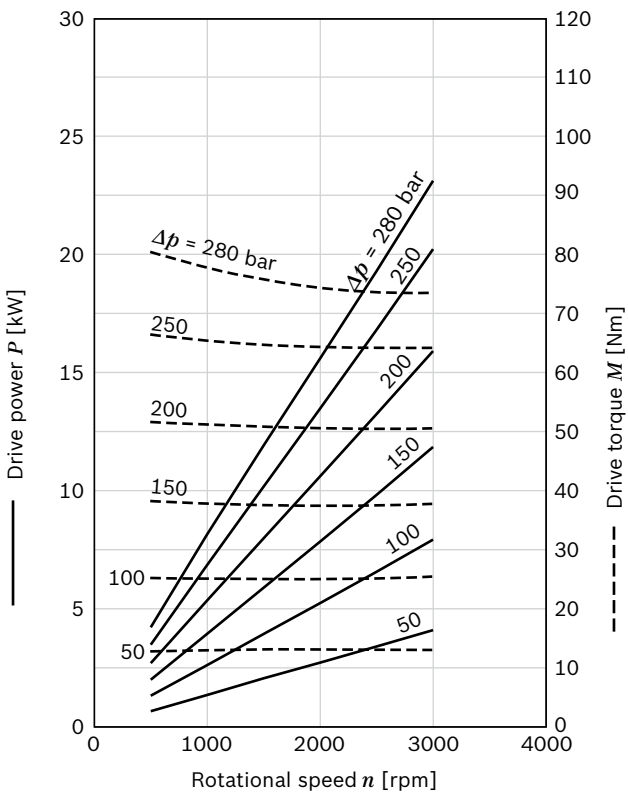
▼ **Flow**



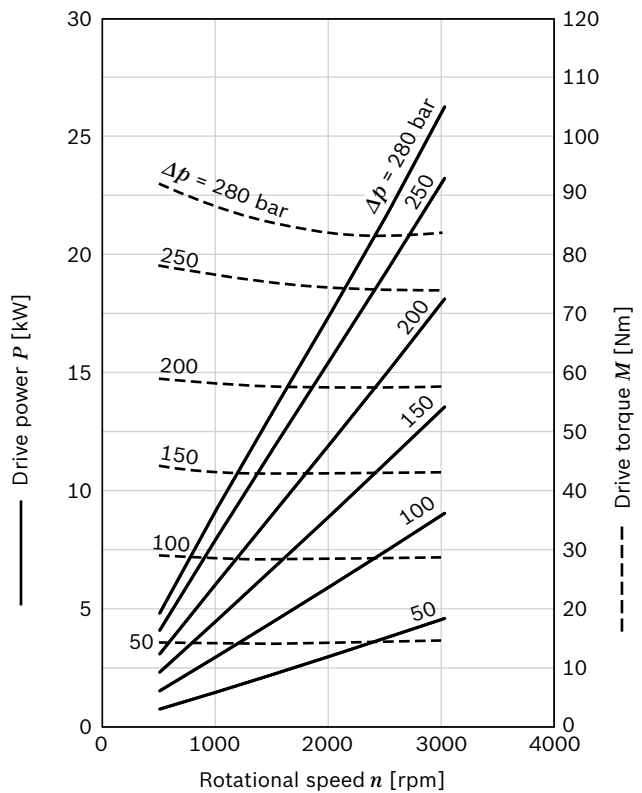
▼ **Size 12**



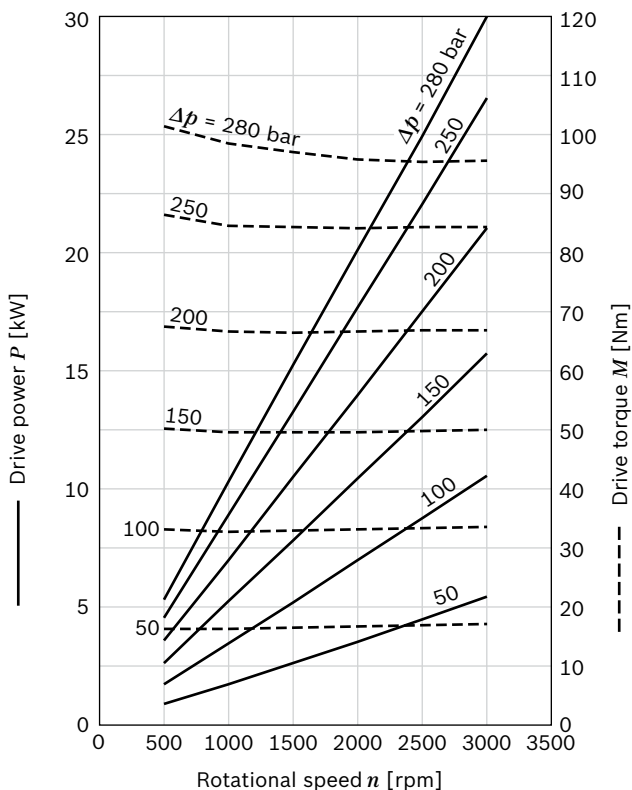
▼ **Size 14**



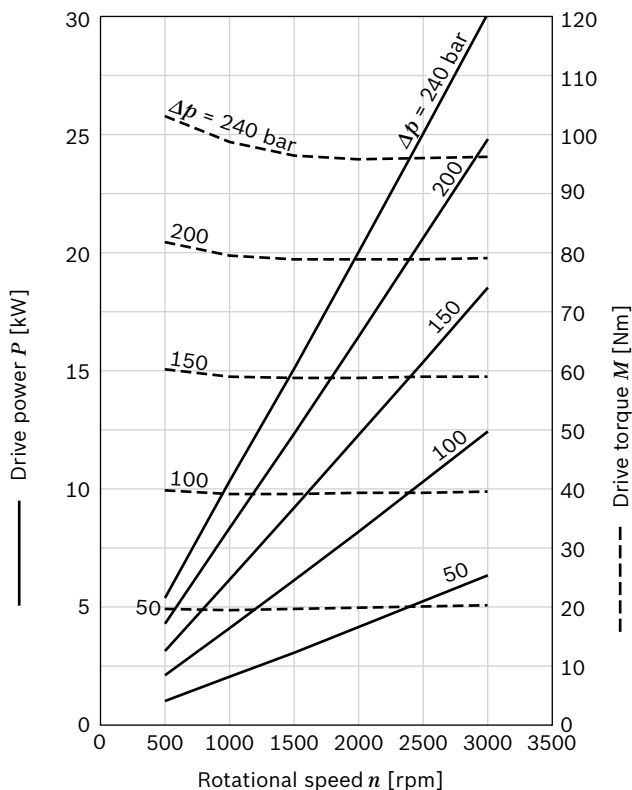
▼ **Size 16**



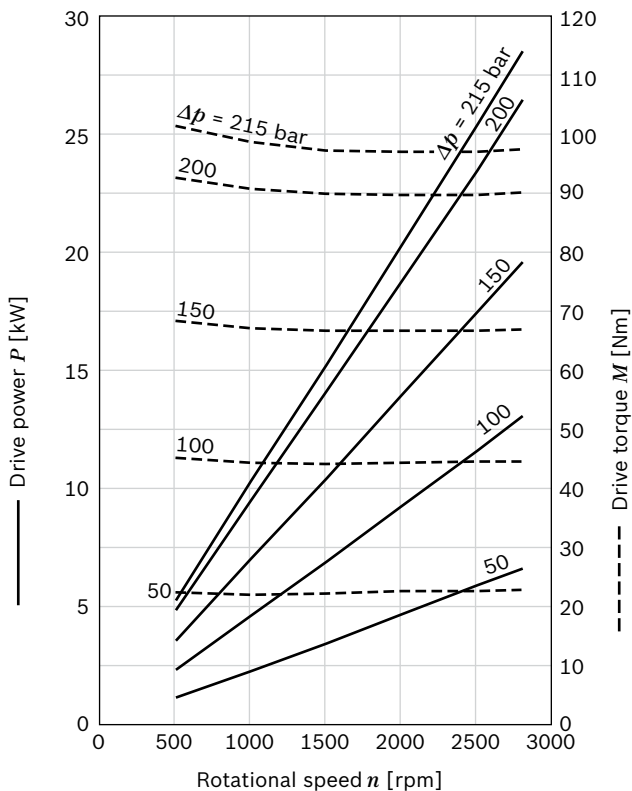
▼ Size 19



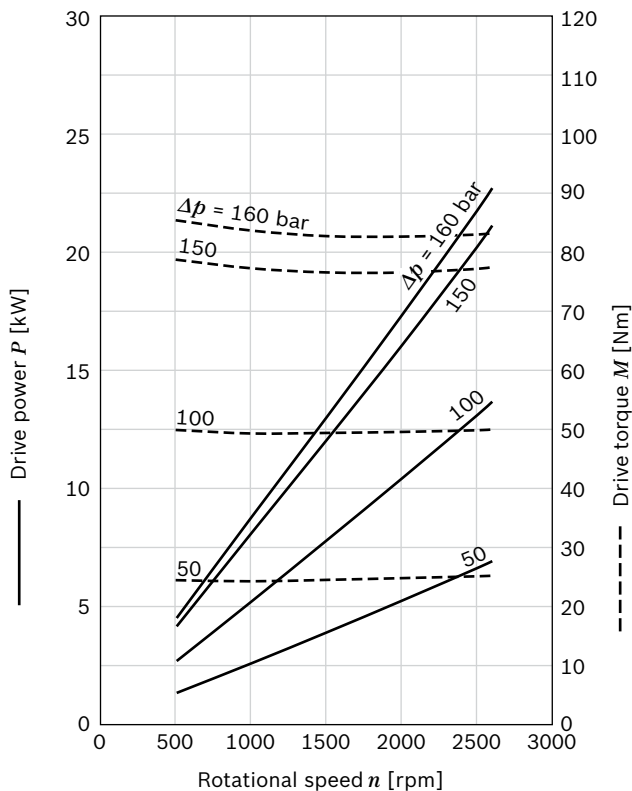
▼ Size 22



▼ Size 25



▼ Size 28



**Note**

Characteristic curves measured at  $v = 32 \text{ mm}^2/\text{s}$  and  $\theta = 50 \text{ }^\circ\text{C}$ .

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

## Noise charts

Apart from the low levels, the much lower frequency also contributes to the substantial noise benefits of the SILENCE PLUS compared with other pump designs.

Noise levels dependent on the rotational speed, pressure range between 10 bar and pressure value  $p_2$  (see technical data on page 9).

These are typical characteristic values for the respective size. They describe the airborne sound emitted solely by the pump.

Ambient influences (installation site, piping, other system components) were not taken into account.

The values refer to one individual pump.

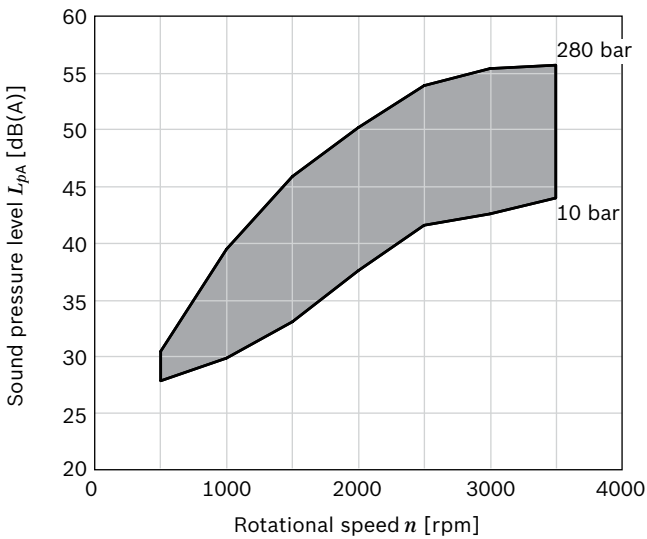
### Note

Characteristic curves measured at  $\nu = 32 \text{ mm}^2/\text{s}$  and  $\theta = 50 \text{ }^\circ\text{C}$ .

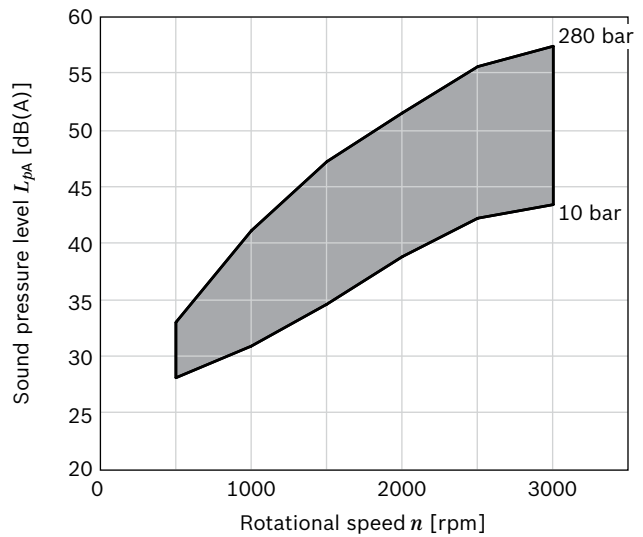
Sound pressure level calculated from noise measurements made in the low reflection measuring room according to DIN 45635, Part 26.

Distance from measuring sensor to pump: 1 m.

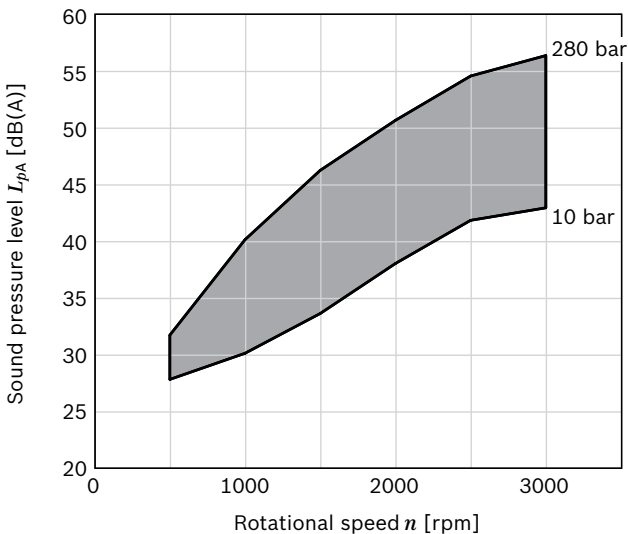
### ▼ Size 12



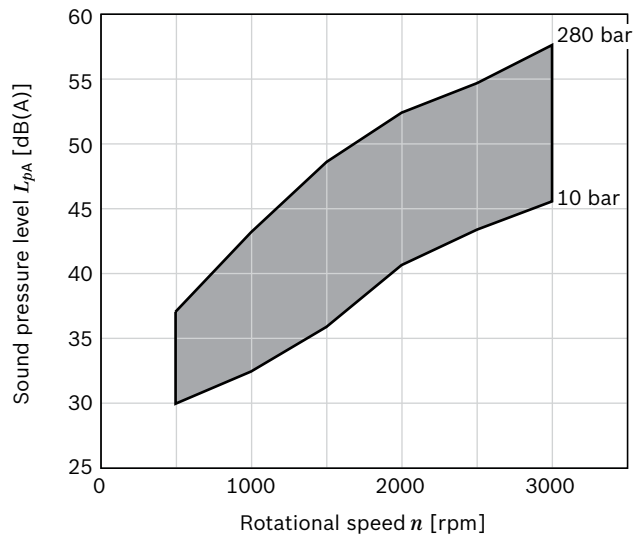
### ▼ Size 16



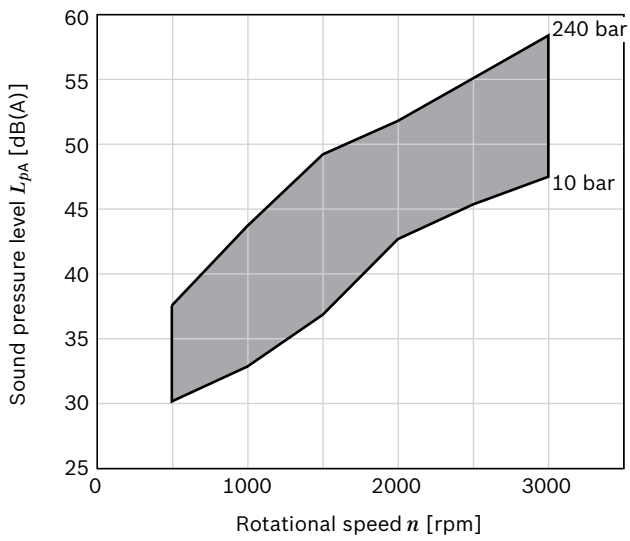
### ▼ Size 14



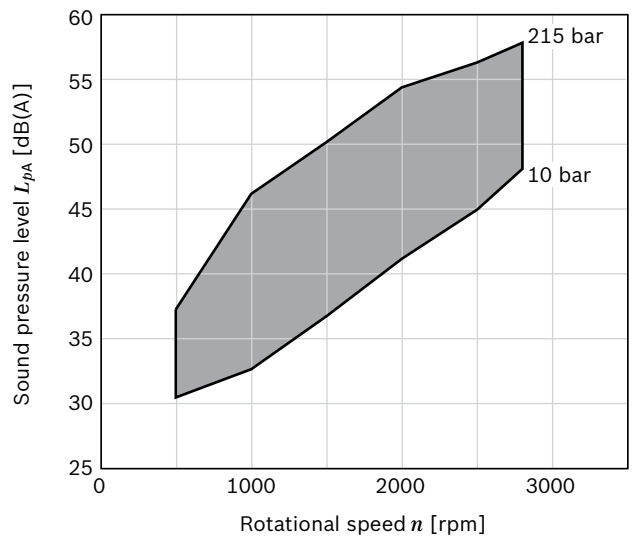
### ▼ Size 19



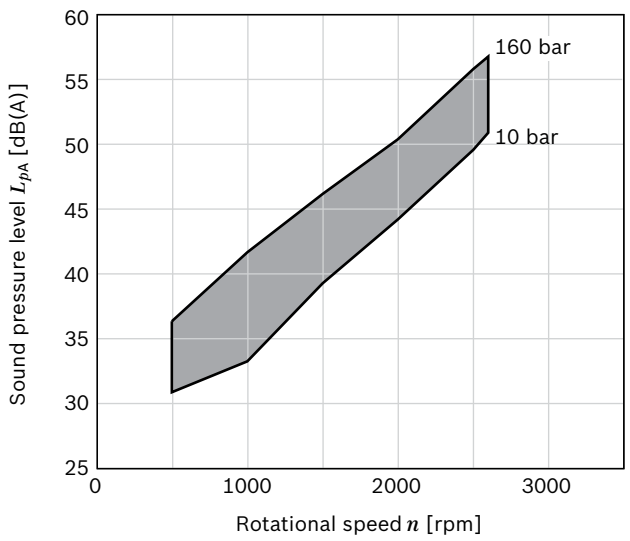
▼ **Size 22**



▼ **Size 25**



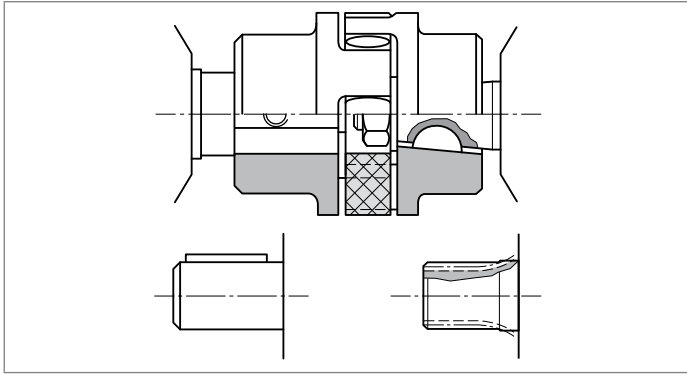
▼ **Size 28**



## Drives

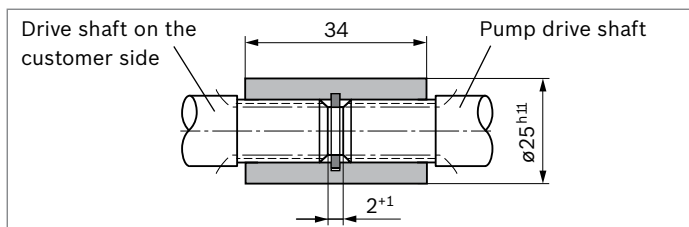
### 1. Elastic coupling

- ▶ The coupling must not transfer any radial or axial forces to the pump.
- ▶ The maximum radial runout from the shaft to the spigot may not exceed 0.2 mm.
- ▶ See the coupling manufacturer's assembly instructions for permissible shaft misalignments.



### 2. Coupling sleeve

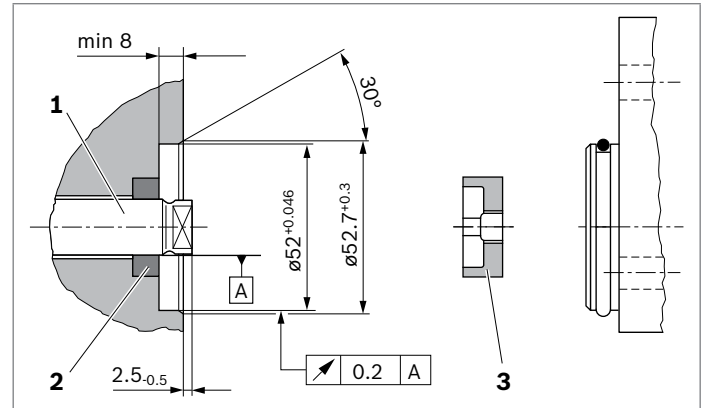
- ▶ To be used on splined shaft profile according to DIN and SAE
- ▶ Attention: No radial or axial forces are permitted on the pump shaft or coupling sleeve. The coupling sleeve must be free to move axially.
- ▶ The distance between the pump drive shaft and drive shaft on the customer side must be  $2^{+1}$  mm
- ▶ Provide installation space for the snap ring.
- ▶ Oil-bath or oil-mist lubrication is required



Drive shaft	$M_{max}$ [Nm]	Size	$p_{max}$ [bar]
<b>F</b>	100	12 to 19	300
		22	250
		25	225
		28	180
		28	180
<b>R</b>	110	12 to 19	300
		22	260
		25	235
		28	180
<b>P</b>	180	12 to 19	300
		22	260
		25	235
		28	180

### 3. Coupling dog

- ▶ For attaching the pump directly to an electric motor or combustion engine, gear, etc.
- ▶ The pump shaft has a special coupling dog and driver (3)
- ▶ There is no shaft sealing
- ▶ Drive-side installation and sealing according to the following recommendations and dimensions



Drive shaft	$M_{max}$ [Nm]	Size	$p_{max}$ [bar]
<b>N</b>	65	12, 14	280
		16	230
		19	250
		22	210
		25	190
		28	170

#### ▶ Drive shaft on the customer side (1)

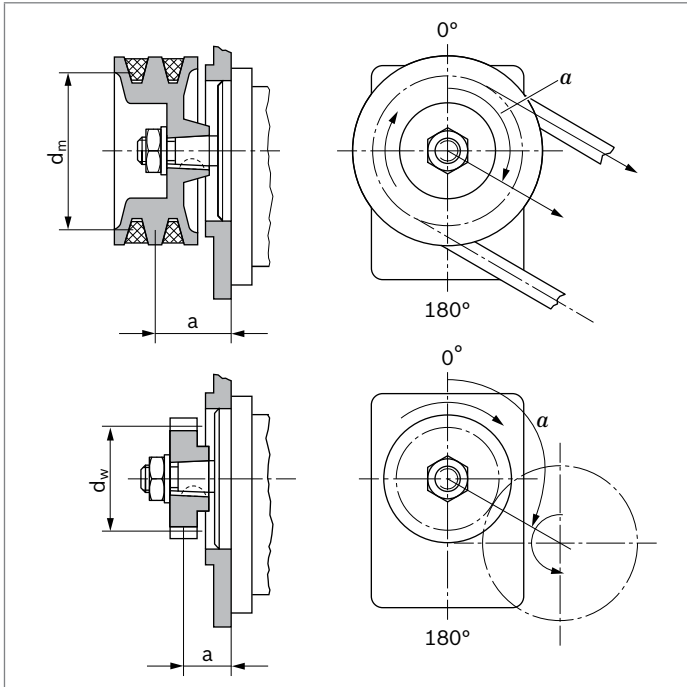
- Case-hardening steel DIN 17210 e.g. 20 MnCrS 5 case-hardened 0.6 deep; HRC 60 $\pm$ 3
- Seal ring running surface ground without rifling  
 $R_{max} \leq 4 \mu m$
- The maximal transmissible torque of 85 Nm applies to a claw height of 19 mm. With lower claw heights, e.g. 17 mm, the transmissible torque decreases to 65 Nm.

#### ▶ Radial shaft seals on the customer side (2)

- Provide with rubber cover (see DIN 3760, type AS, or double-lipped ring)
- Provide installation edge with 15° slant or install shaft seal with protection sleeve

#### 4. V-belts and straight gear wheels or helical toothed gear drives without outboard bearing

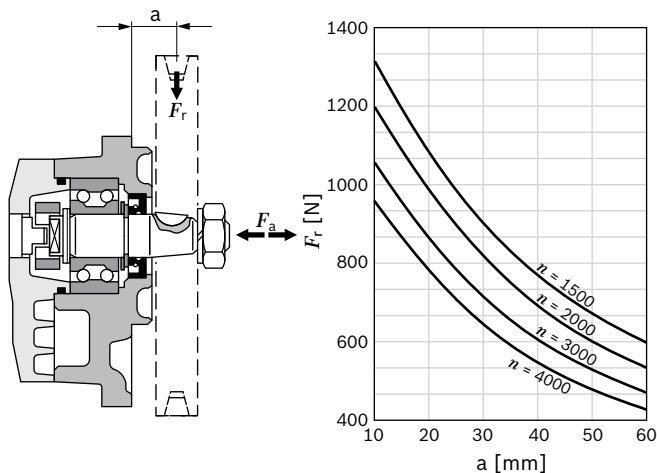
For V-belt or gear wheel drives, please contact us specifying the application and mounting conditions (dimensions  $a$ ,  $d_m$ ,  $d_w$  and angle  $\alpha$ ). For helical toothed gear drives, details of the helix angle  $\beta$  are also required.



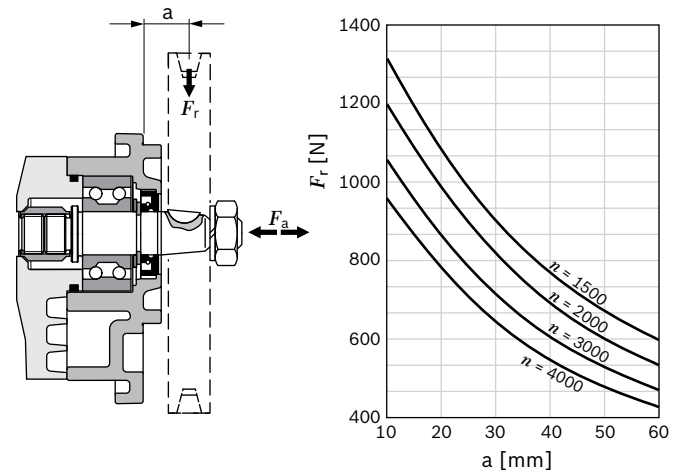
#### 5. Outboard bearing

Outboard bearing are offered to eliminate possible problems when the pumps are driven by V-belts or gear wheels. The diagrams show the radial and axial load capacity in relation to a bearing service life of  $L_H = 1000$  h.

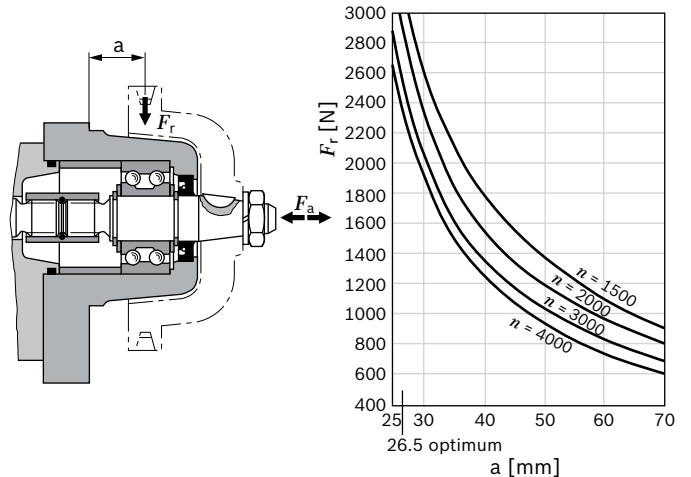
##### ▼ Front cover A, standard (type 1 with claw)



##### ▼ Front cover A, option (type 1 with sleeve)



##### ▼ Front cover G (type 2)



Front cover	$M_{max}$ [Nm]	Size	$p_{max}$ [bar]
A with claw	65	12	300
		14	260
		16	230
		19	190
		22	160
		25	150
		28	130
		A with sleeve	160
22	260		
25	235		
28	180		
G	160	12 to 19	300
		22	260
		25	235
		28	180

## Multiple gear pumps

Gear pumps are well-suited to multiple arrangements, whereby the drive shaft of the first pump stage is extended to a second and possibly third pump stage. The shaft of the individual pump sections are connected via a driver. In most cases, each pump stage is isolated from its neighbor, i.e. the suction ports are separate from one another.

### Note

Basically, the parameters of the single pumps apply, however certain restrictions need to be observed:

#### ► Maximum rotational speed

This is determined by the largest pump stage used.

#### ► Pressures

These are restricted by the load capacity of the drive shaft, the through drive and the driver.

See the dimensional drawings for the parameters.

### Pressure restriction for standard through drive

In the case of series AZPJ, the driver for the second pump 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 potentially additional stages.

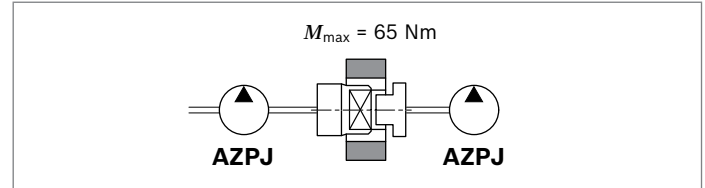
### Maximum transferable drive torque

Drive shaft	Designation	$M_{\max}$ [Nm] <sup>1)</sup>
Splined shafts	<b>R</b> SAE J744 16-4 9T	110
	<b>P</b> SAE J744 19-4 11T	180
	<b>F</b> DIN 5482 B17 × 14	100
Tapered shaft	<b>C</b> 1 : 5	155
	<b>H</b> 1 : 8	160
Parallel keyed shaft	<b>Q</b> SAE J744 16-1 A	55
	<b>A</b> Shaft Ø18	75
Claw	<b>N</b> Dihedral claw	65 for sizes 12 and 14 85 for sizes 16 to 28

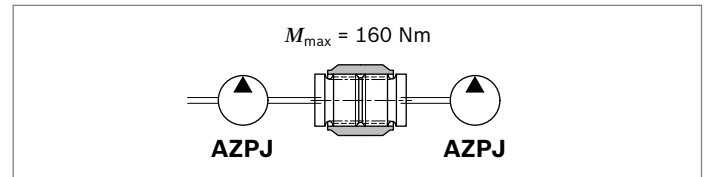
If the first stage is driven by a coupling dog (driver) or outboard bearing type 1, pressure restrictions apply as indicated in the formula.

Reinforced through drives are available for applications with higher transfer torques or torsional vibrations. Design available on request.

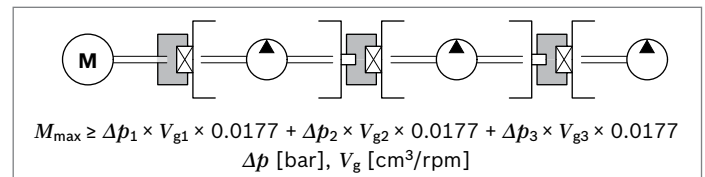
#### ▼ Standard through drive



#### ▼ Reinforced through drive



#### ▼ Formula



### Combinations (coupling dog)

Pump stage 1	$M_{\max}$ [Nm]	Pump stage 2
AZPJ	65	AZPJ
AZPJ	65	AZPF
AZPF	65	AZPJ
AZPJ	25	AZPB-2x

For the configuration of multiple pumps, Bosch Rexroth recommends arranging the pump stage with the largest displacement on the drive side.

1) These values only apply while adhering to the defined conditions on page 8. Please consult Bosch Rexroth if the specified values are to be exceeded.



## Gear pumps with integrated valves

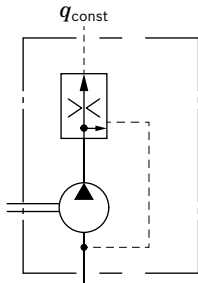
In order to reduce piping complexity, a flow control valve or pressure-relief valve can be integrated in the cover of the gear pump. Such solutions are used, for instance, for the hydraulic oil supply of power steering systems. The pump delivers a constant flow irrespective of the rotational speed. The residual flow is either returned internally to the suction port or distributed externally to other consumers.



### Valves

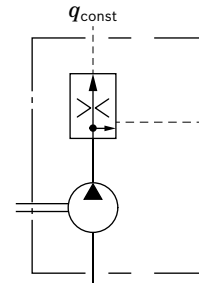
- ▼ **3-way flow control valve, residual flow returned in suction line**  
 $q_{const} = 2 \text{ to } 30 \text{ l/min}$

**SXXX17** (example)



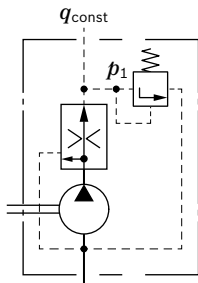
- ▼ **3-way flow control valve, residual flow distributed externally; loadable**  
 $q_{const} = 2 \text{ to } 30 \text{ l/min}$

**EXXX12** (example)



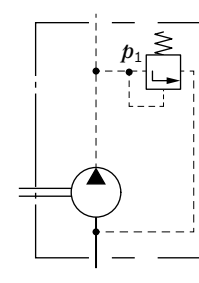
- ▼ **3-way flow control valve with pressure relief valve, residual flow returned in suction line**  
 $q_{const} = 2 \text{ to } 30 \text{ l/min}$   
 $p_1 = 100 \text{ to } 180 \text{ bar}$

**V15011** (example)



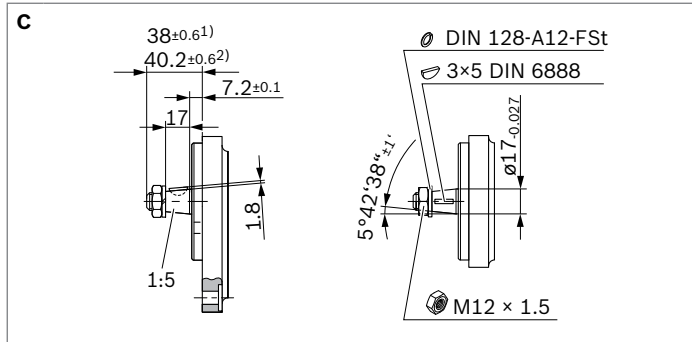
- ▼ **Pressure relief valve, pressure guide in suction line**  
 $p_1 = 5 \text{ to } 250 \text{ bar}$

**D180XX** (example)

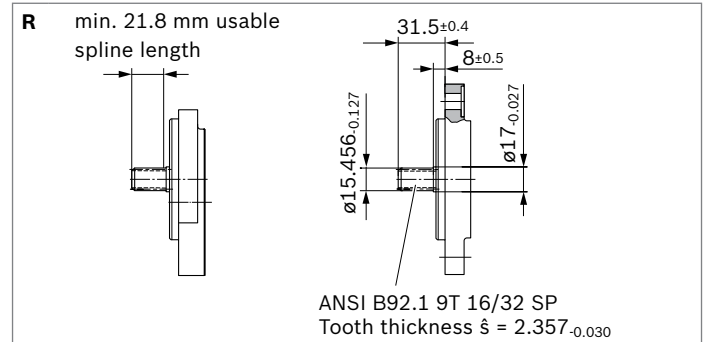


## Dimensions – drive shafts

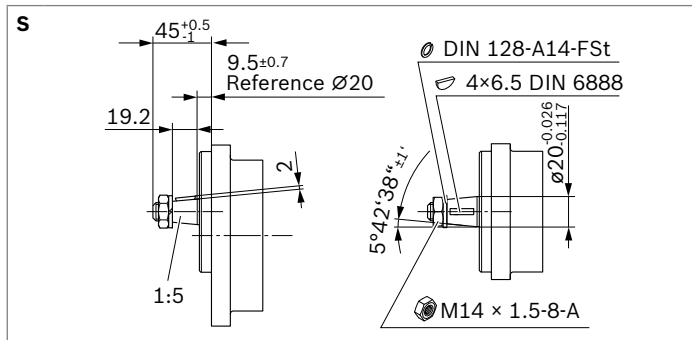
### ▼ Tapered shaft 1 : 5



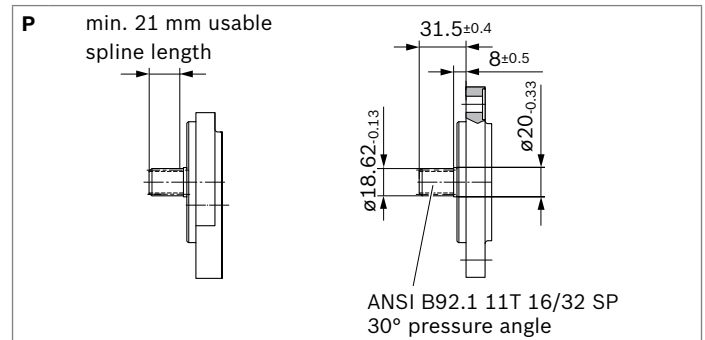
### ▼ Splined shaft (SAE J744 16-4 9T)



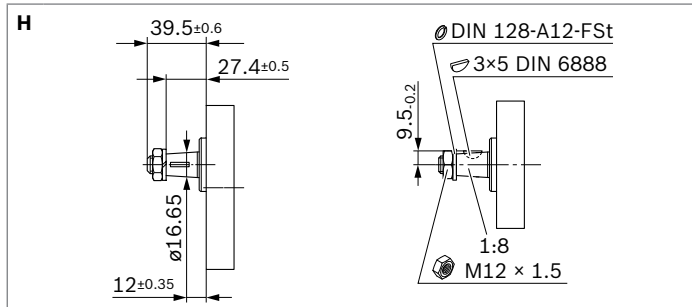
### ▼ Tapered shaft 1 : 5 (for front cover A, G)



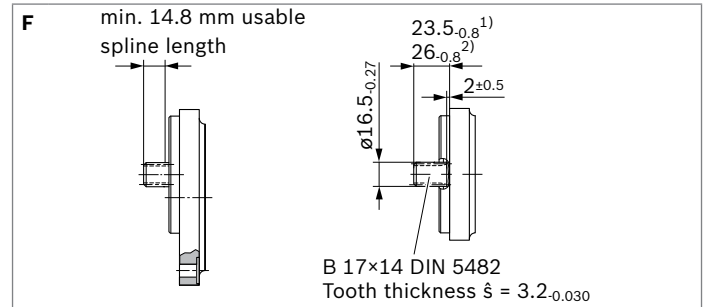
### ▼ Splined shaft (SAE J744 19-4 11T)



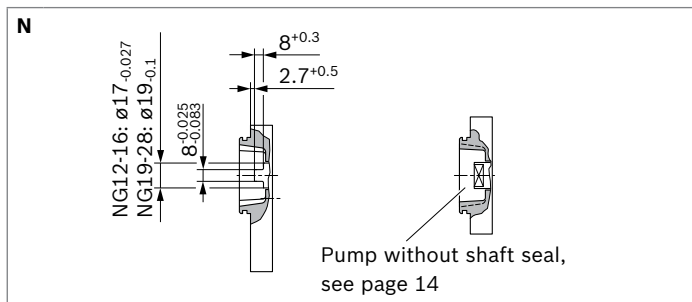
### ▼ Tapered shaft 1 : 8



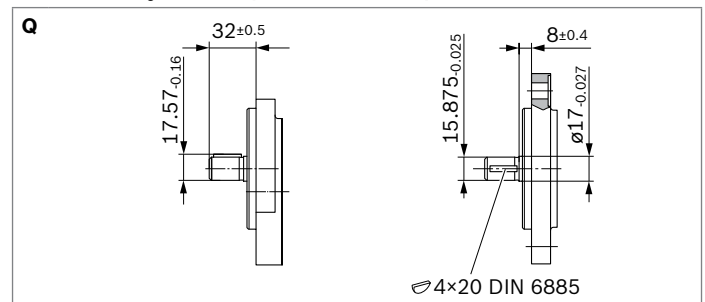
### ▼ Splined shaft / (DIN 5582 B17 x 14)



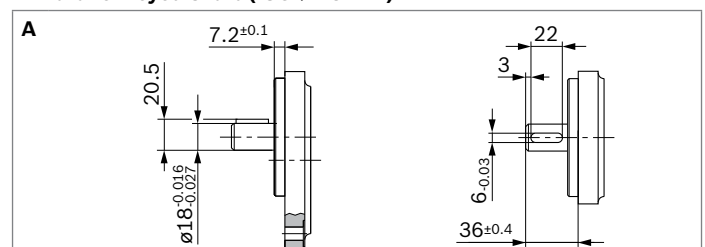
### ▼ Dihedral claw



### ▼ Parallel keyed shaft (SAE J744 16-1 A)



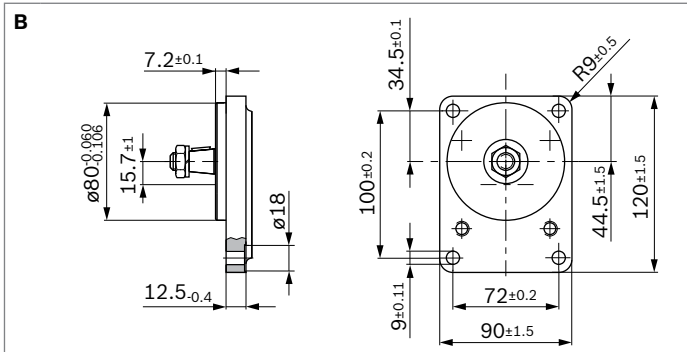
### ▼ Parallel keyed shaft (ISO Ø18 mm)



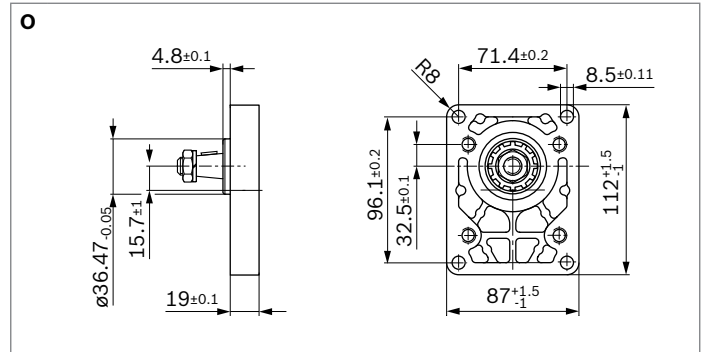
1) In combination with front cover B  
2) In combination with front cover P

### Dimensions – front cover

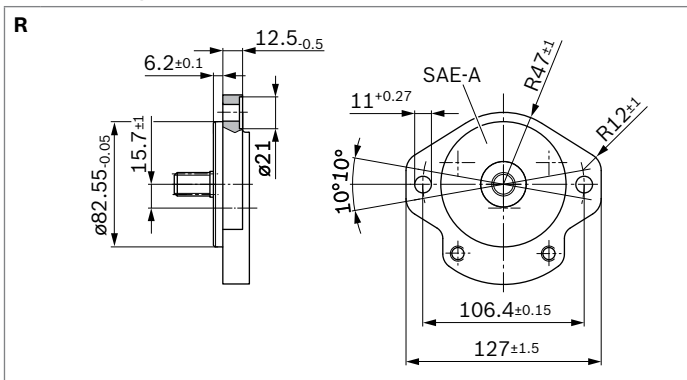
▼ Rectangular flange  $\varnothing 80$  mm



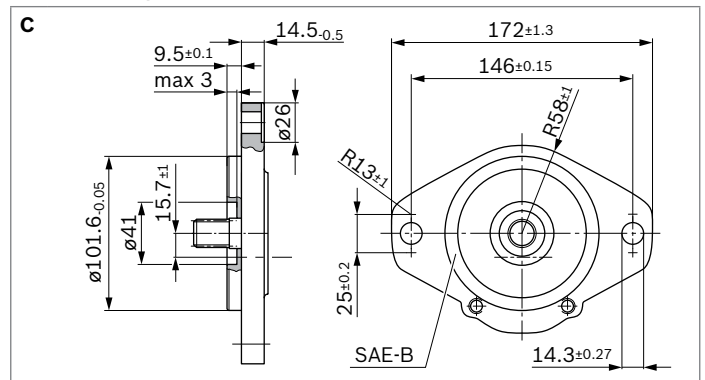
▼ Rectangular flange  $\varnothing 36.47$  mm



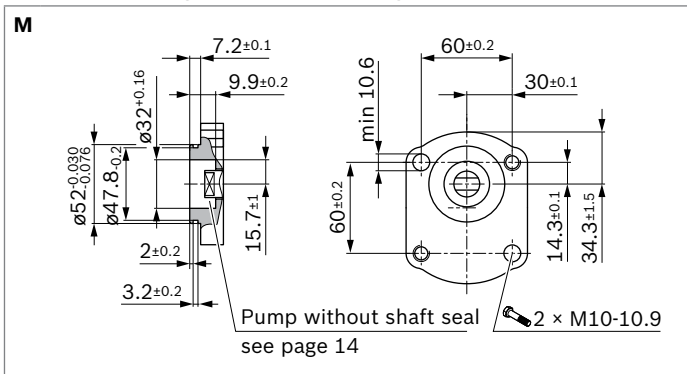
▼ 2-bolt flange  $\varnothing 82.55$  mm, SAE J744 82-2 A



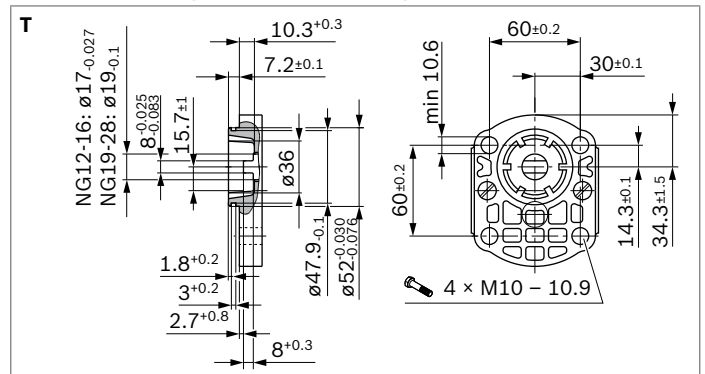
▼ 2-bolt flange  $\varnothing 101.6$  mm, SAE J744 101-2 B



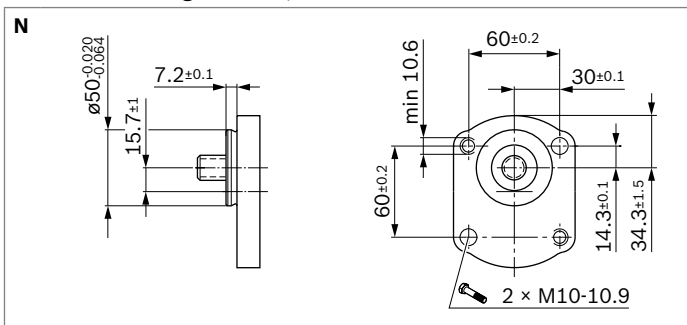
▼ 2-bolt mounting  $\varnothing 52$  mm with O-ring



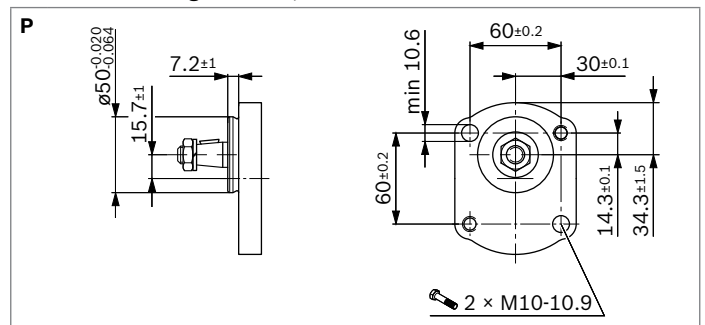
▼ 4-bolt mounting  $\varnothing 52$  mm with O-ring



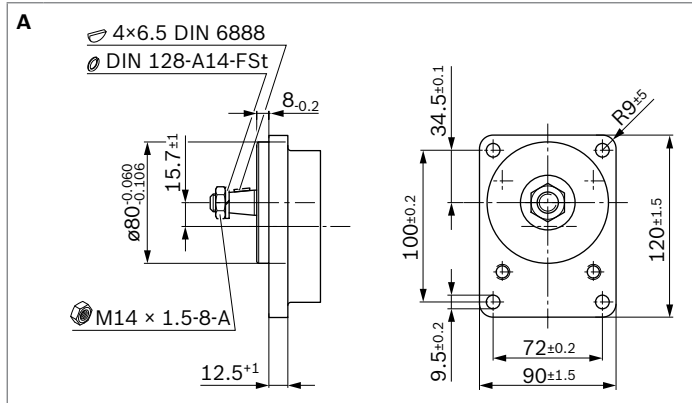
▼ 2-bolt mounting  $\varnothing 50$  mm, connection variant 1



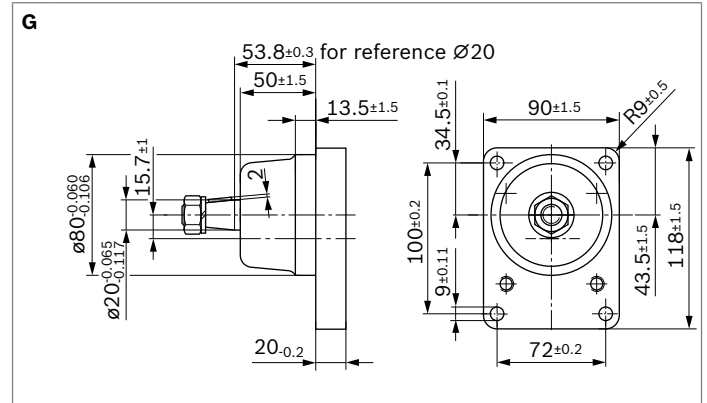
▼ 2-bolt mounting  $\varnothing 50$  mm, connection variant 2



▼ **Outboard bearing Ø80 mm, type 1**

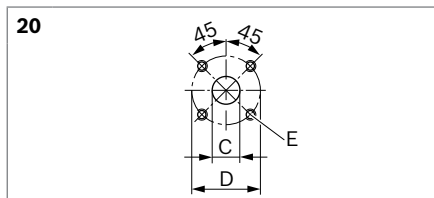


▼ **Outboard bearing Ø80 mm, type 2**

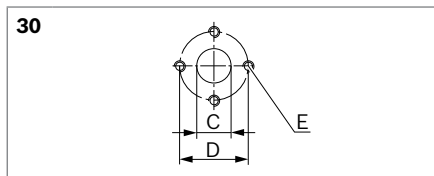


**Dimensions – line ports**

▼ **Square flange**



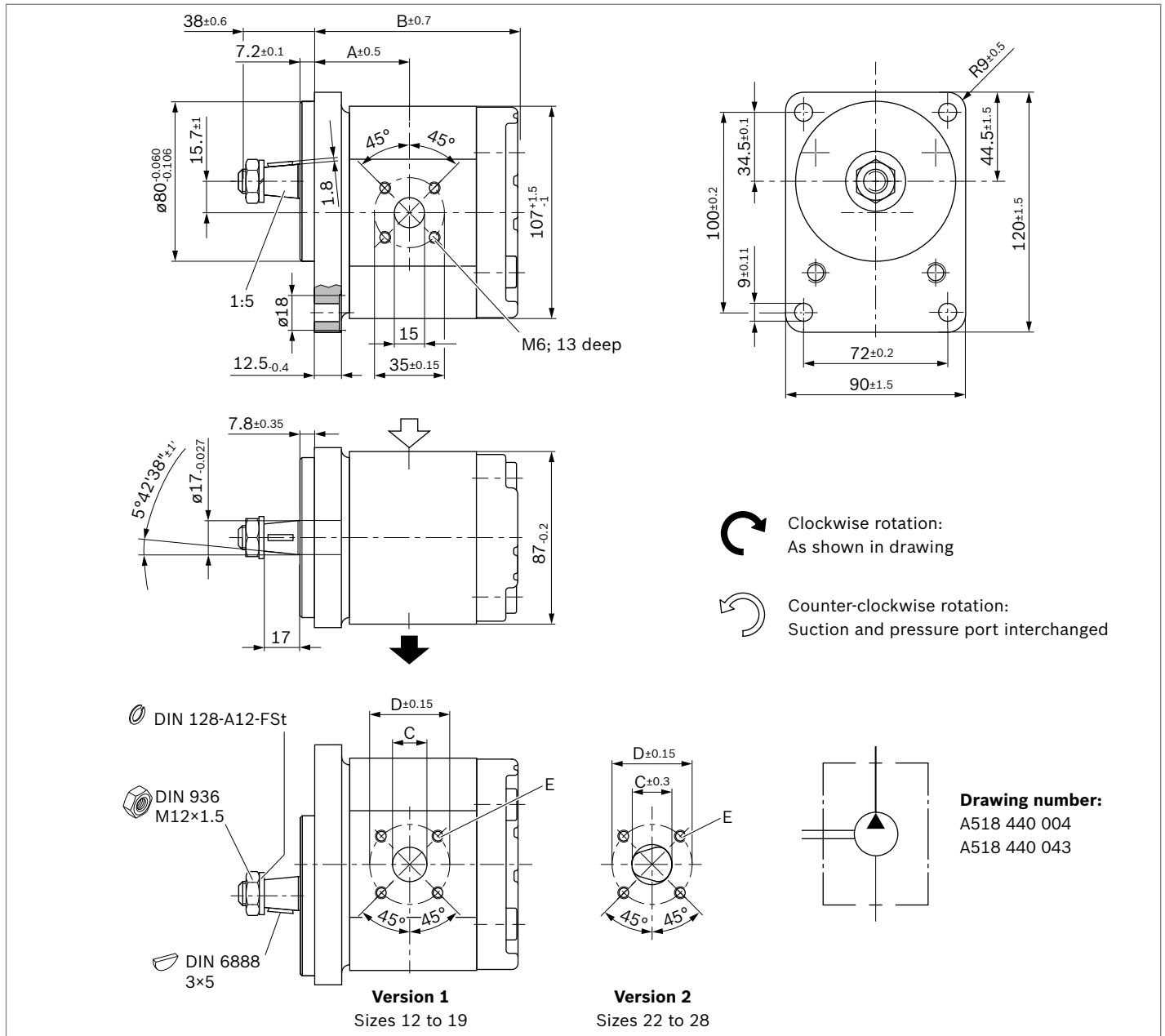
Size	Pressure side			Suction side		
	C	D	E	C	D	E
12 to 16	15	35	M6; 13 deep	20	40	M6; 13 deep
19	15	35	M6; 13 deep	22	55	M8; 13 deep
22 to 28	15	35	M6; 13 deep	26	55	M8; 13 deep



Size	Pressure side			Suction side		
	C	D	E	C	D	E
12 to 16	13.5	30.2	M6; 13 deep	20	39.7	M8; 13 deep

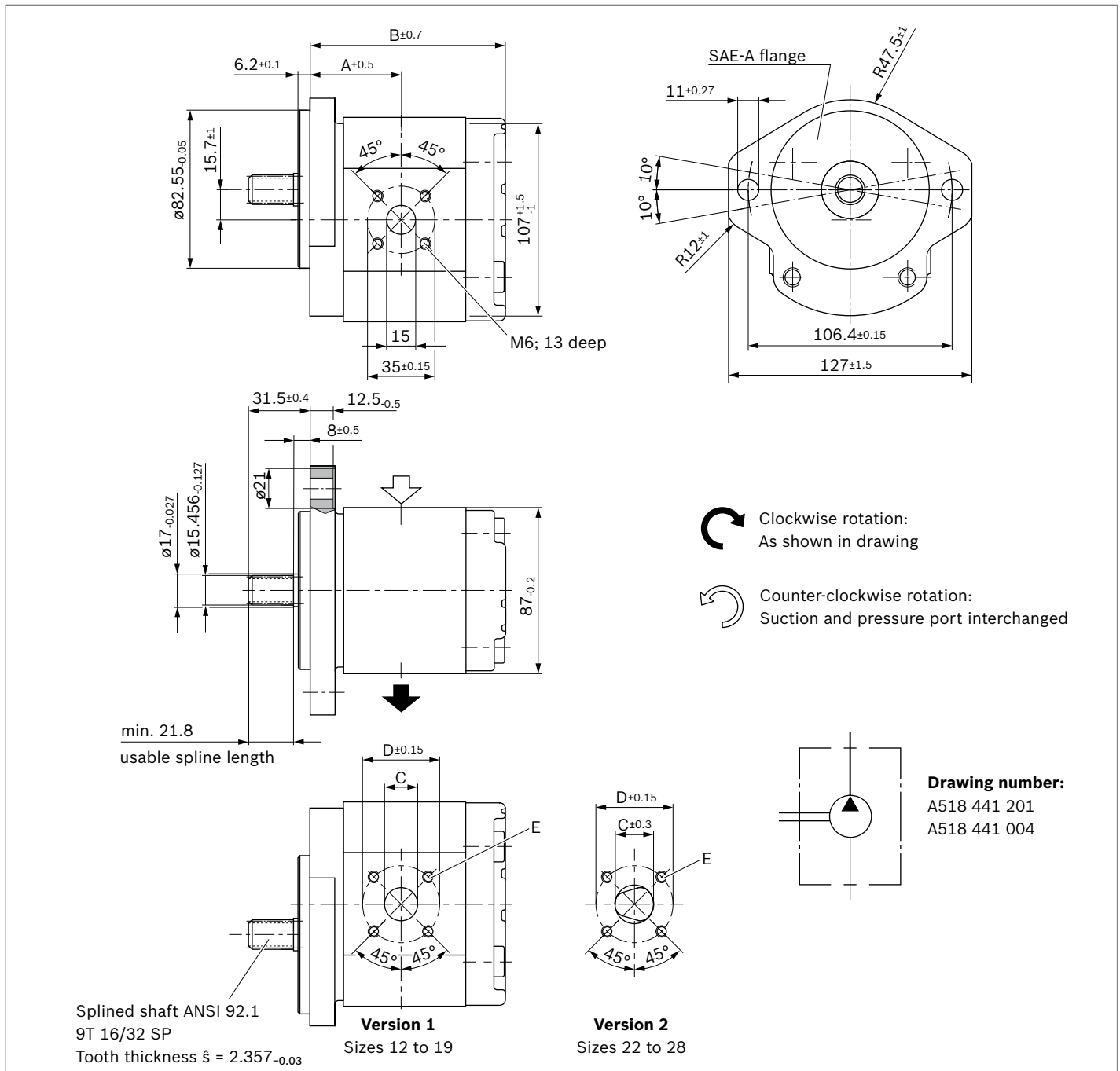
### Dimensions – preferred series

▼ Tapered shaft 1:5 with rectangular flange  $\varnothing 80$  mm  
AZPJ-22- ... **CB20MB**



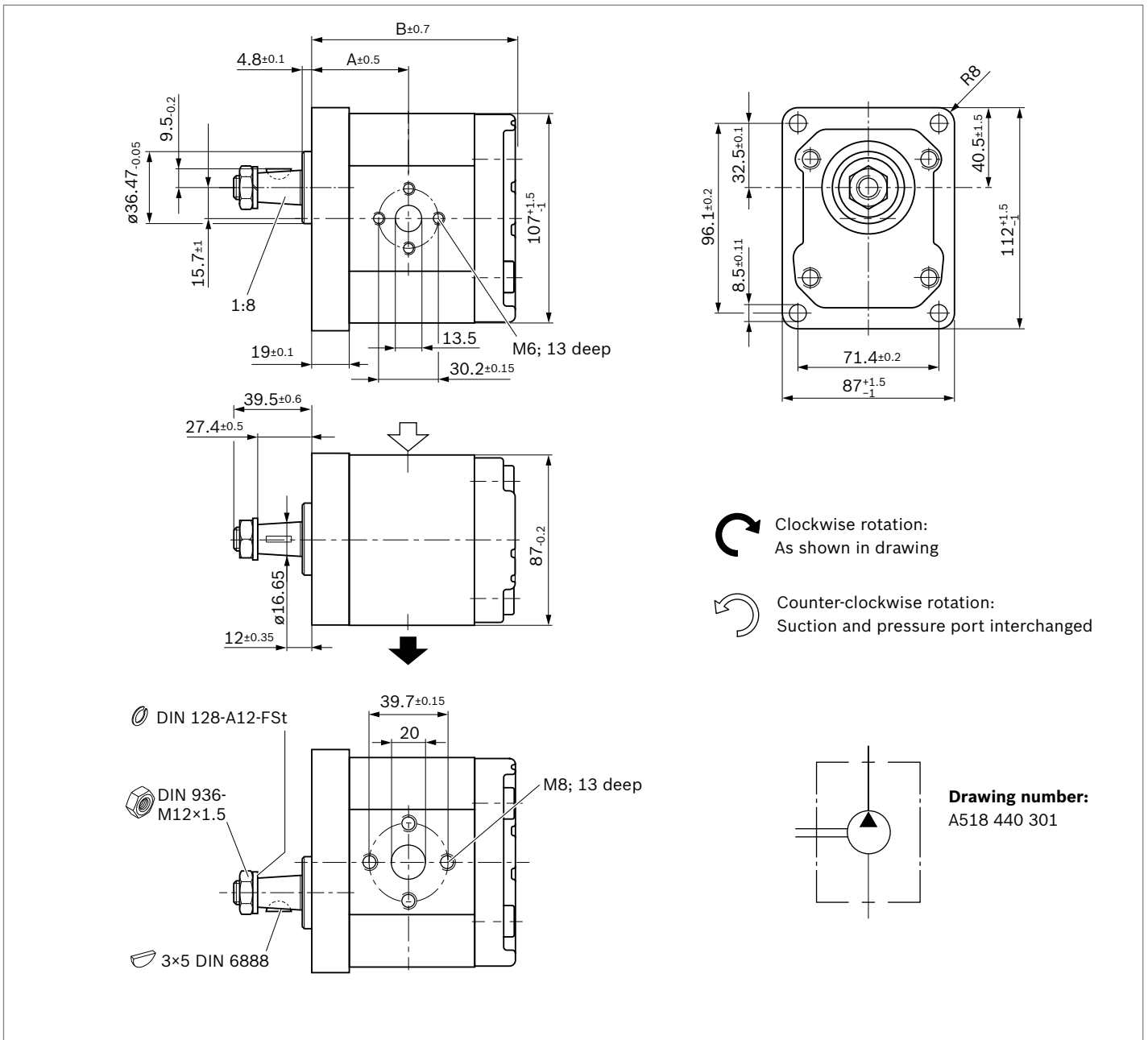
Size	Order number		Maximum intermittent pressure $p_2$ [bar]	Maximum rotational speed [rpm]	Weight [kg]	Dimensions [mm]				
	Direction of rotation Counter-clockwise	Clockwise				A	B	C	D	E
12	0 518 525 302	0 518 525 001	280	3500	3.9	46.5	96.3	20	40	M6;
14	0 518 525 303	0 518 525 002	280	3000	4.0	47.5	99.5	20	40	13 deep
16	0 518 625 301	0 518 625 001	280	3000	4.1	47.5	102.9	20	40	
19	0 518 625 309	0 518 625 010	280	3000	4.5	57.9	107.9	22	55	M8;
22	0 518 725 310	0 518 725 011	240	3000	4.6	60.6	113.3	26	55	13 deep
25	0 518 725 311	0 518 725 012	215	2800	4.8	64.8	117.5	26	55	
28	0 518 725 312	0 518 725 013	160	2600	4.9	69.6	122.3	26	55	

▼ **Splined shaft (SAE J744 16-4 9T) with 2-bolt flange Ø82.55 mm**  
AZPJ – 22 – ... RR20MB



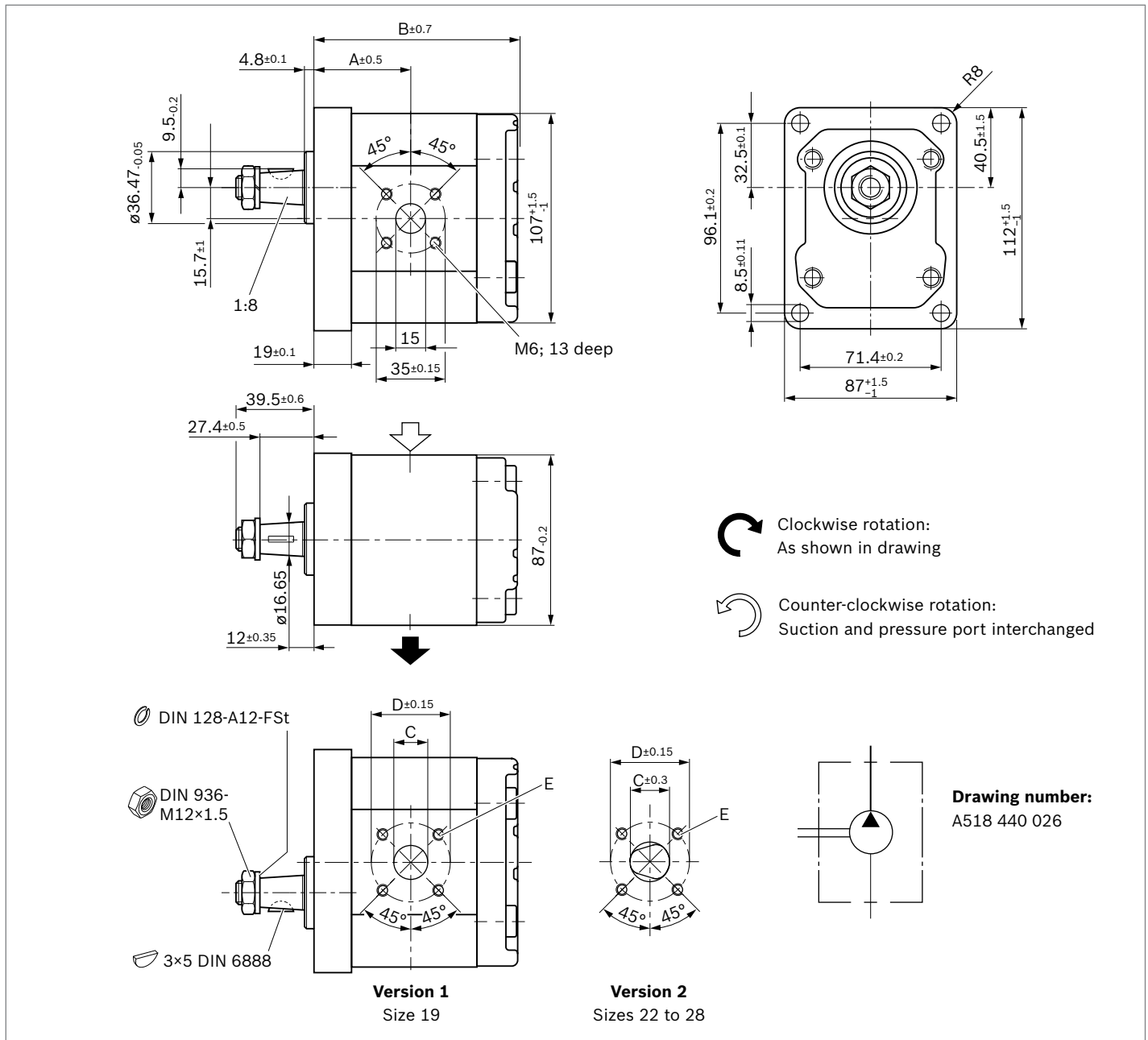
Size	Order number	Direction of rotation		Maximum intermittent pressure $p_2$ [bar]	Maximum rotational speed [rpm]	Weight [kg]	Dimensions [mm]				
		Counter-clockwise	Clockwise				A	B	C	D	E
12	0 518 525 306		0 518 525 005	280	3500	3.8	46.5	96.3	20	40	M6; 13 deep
14	0 518 525 307		0 518 525 006	280	3000	3.9	47.5	99.5	20	40	
16	0 518 625 303		0 518 625 003	280	3000	4.0	47.5	102.9	20	40	
19	0 518 625 306		0 518 625 007	280	3000	4.4	57.9	107.9	22	55	M8; 13 deep
22	0 518 725 301		0 518 725 002	240	3000	4.6	60.6	113.3	26	55	
25	0 518 725 302		0 518 725 003	215	2800	4.7	64.8	117.5	26	55	
28	0 518 725 303		0 518 725 004	160	2600	4.8	69.6	122.3	26	55	

▼ **Tapered shaft 1:8 with rectangular flange  $\varnothing 36.47$  mm**  
AZPJ – 22 – ... HO30MB



Size	Order number	Direction of rotation		Maximum intermittent pressure $p_2$ [bar]	Maximum rotational speed [rpm]	Weight [kg]	Dimensions [mm]	
		Counter-clockwise	Clockwise				A	B
12	0 518 525 308	0 518 525 007	0 518 525 007	280	3500	3.7	48.0	97.8
14	0 518 525 309	0 518 525 008	0 518 525 008	280	3000	2.8	49.0	101.0
16	0 518 625 304	0 518 625 004	0 518 625 004	280	3000	3.9	49.0	104.4

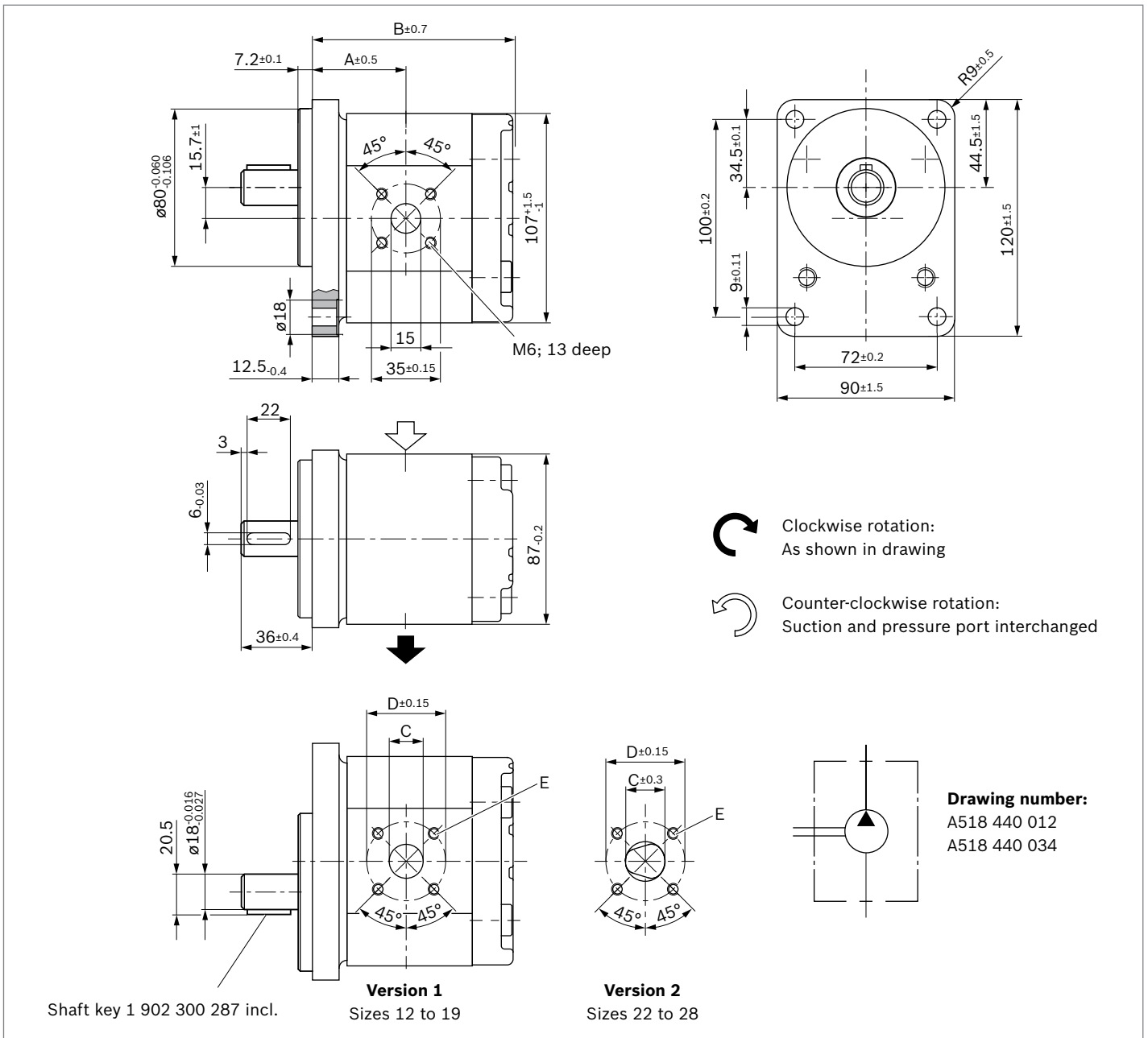
▼ **Tapered shaft 1:8 with rectangular flange  $\varnothing 36.47$  mm**  
AZPJ – 22 – ... HO20MB



Size	Order number	Direction of rotation		Maximum intermittent pressure $p_2$ [bar]	Maximum rotational speed [rpm]	Weight [kg]	Dimensions [mm]				
		Counter-clockwise	Clockwise				A	B	C	D	E
19	0 518 625 307	0 518 625 008	0 518 625 008	280	3000	4.5	59.4	109.4	22	55	M8;
22	0 518 725 304	0 518 725 005	0 518 725 005	240	3000	4.6	62.1	114.8	26	55	13 deep
25	0 518 725 305	0 518 725 006	0 518 725 006	215	2800	4.8	66.3	119.0	26	55	
28	0 518 725 306	0 518 725 007	0 518 725 007	160	2600	4.9	71.1	123.8	26	55	



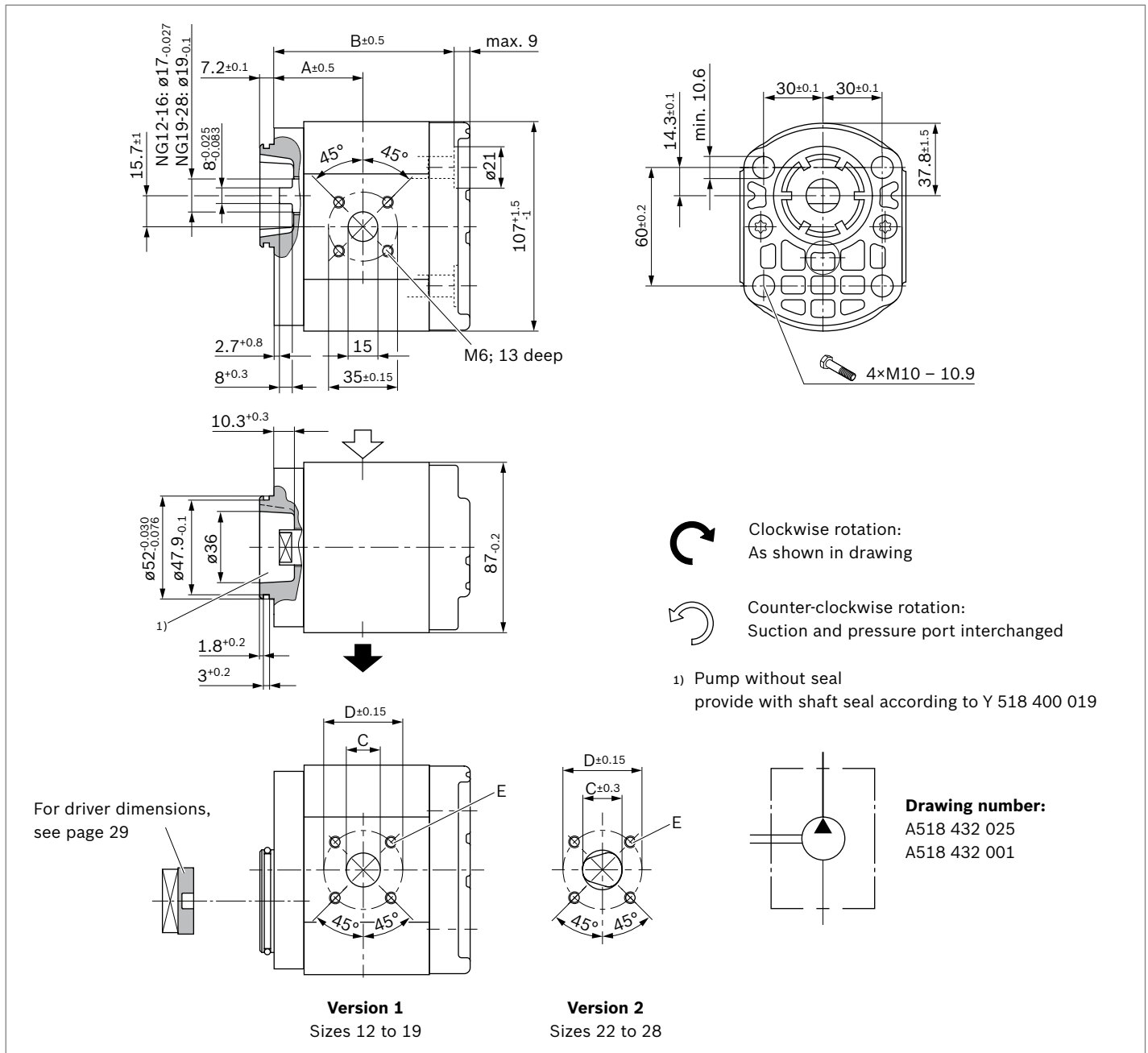
▼ **Cylindrical shaft (ISO Ø18) with rectangular flange Ø80 mm**  
AZPJ – 22 – ... AB20MB



Size	Order number	Direction of rotation		Maximum intermittent pressure $p_2$ [bar]	Maximum rotational speed [rpm]	Weight [kg]	Dimensions [mm]				
		Counter-clockwise	Clockwise				A	B	C	D	E
12	0 518 525 304	0 518 525 003	0 518 525 003	280	3500	3.9	46.5	96.3	20	40	M6;
14	0 518 525 305	0 518 525 004	0 518 525 004	280	3000	4.0	47.5	99.5	20	40	13 deep
16	0 518 625 302	0 518 625 002	0 518 625 002	270	3000	4.1	47.5	102.9	20	40	
19	0 518 625 308	0 518 625 009	0 518 625 009	230	3000	4.5	57.9	107.9	22	55	M8;
22	0 518 725 307	0 518 725 008	0 518 725 008	190	3000	4.6	60.6	113.3	26	55	13 deep
25	0 518 725 308	0 518 725 009	0 518 725 009	170	2800	4.8	64.8	117.5	26	55	
28	0 518 725 309	0 518 725 010	0 518 725 010	150	2600	4.9	69.6	122.3	26	55	

▼ **Dihedral claw with 4-bolt mounting Ø82.55 mm**

AZPJ – 22 – ... NT20MB

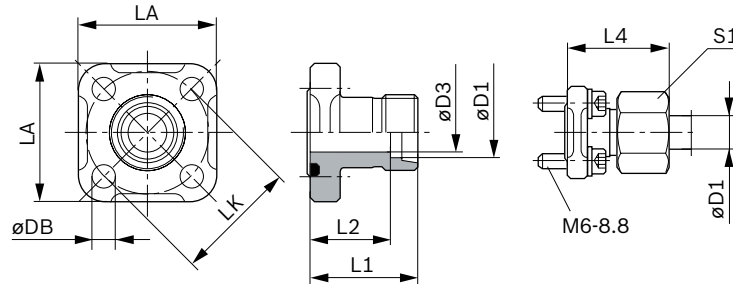


Size	Order number		Maximum intermittent pressure $p_2$ [bar]	Maximum rotational speed [rpm]	Weight [kg]	Dimensions [mm]				
	Direction of rotation Counter-clockwise	Clockwise				A	B	C	D	E
12	0 518 515 301	0 518 515 001	280	3500	2.5	44.0	87.1	20	40	M6; 13 deep
14	0 518 515 302	0 518 515 002	280	3000	2.6	45.0	90.3	20	40	
16	0 518 615 301	0 518 615 001	280	3000	2.7	45.0	93.7	20	40	
19	0 518 615 303	0 518 615 003	250	3000	3.0	55.4	98.7	22	55	M8; 13 deep
22	0 518 715 301	0 518 715 001	215	3000	3.2	58.1	104.1	26	55	
25	0 518 715 302	0 518 715 002	190	2800	3.3	62.3	108.3	26	55	
28	0 518 715 303	0 518 715 003	160	2600	3.4	67.1	113.1	26	55	

## Accessories

### Gear pump flanges, straight, for square flange 20 (see page 20)

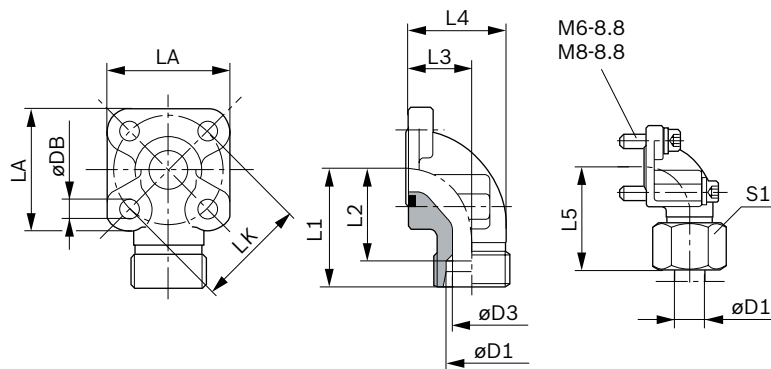
Complete screw connections with O-ring, metric screw set, nuts and olive.



LK	D1	D3	L1	L2	L4	LA	S1	DB	Screws 4x	O-ring NBR	Weight [kg]	Order number	p [bar]
35	10L	8	30	23.0	39.0	40	19	6.4	M6 × 22	20 × 2.5	0.09	1 515 702 064	315
35	12L	10	30	23.0	39.0	40	22	6.4	M6 × 22	20 × 2.5	0.10	1 515 702 065	315
35	15L	12	30	23.0	38.0	40	27	6.4	M6 × 22	20 × 2.5	0.10	1 515 702 066	250
40	15L	12	35	28.0	43.0	42	27	6.4	M6 × 22	24 × 2.5	0.12	1 515 702 067	100
40	18L	15	35	27.5	44.0	42	32	6.4	M6 × 22	24 × 2.5	0.13	1 515 702 068	100
40	22L	19	35	27.5	44.5	42	36	6.4	M6 × 22	24 × 2.5	0.12	1 515 702 069	100
40	28L	24	42	27.5	34.5	42	41	6.4	M6 × 22	24 × 2.5	0.15	1 515 702 008	100

### Gear pump flanges, 90° angle, for square flange 20 (see page 20)

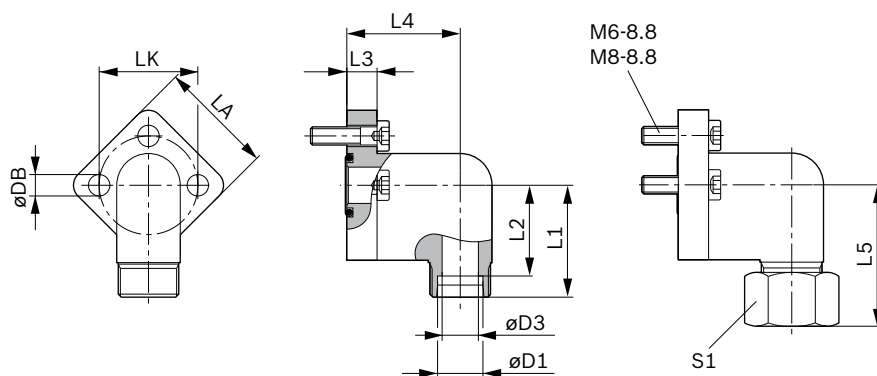
Complete screw connections with O-ring, metric screw set, nuts and olive.



LK	D1	D3	L1	L2	L3	L4	L5	LA	S1	DB	Screws 2x	Screws 2x	O-ring NBR	Weight [kg]	Order number	p [bar]
35	10L	8	38	31.0	16.5	26.5	47.0	40	19	6.4	M6 × 22	M6 × 35	20 × 2.5	0.16	1 515 702 070	315
35	12L	10	38	31.0	16.5	26.5	47.0	40	22	6.4	M6 × 22	M6 × 35	20 × 2.5	0.16	1 515 702 071	315
35	15L	12	38	31.0	16.5	26.5	46.0	40	27	6.4	M6 × 22	M6 × 35	20 × 2.5	0.15	1 515 702 072	250
35	16S	12	38	29.5	20.0	31.0	48.0	40	30	6.4	M6 × 22	M6 × 40	20 × 2.5	0.18	1 515 702 002	315
35	18L	15	38	29.5	20.0	31.0	47.0	40	32	6.4	M6 × 22	M6 × 40	20 × 2.5	0.18	1 545 702 006	250
35	20S	16	45	34.5	25.0	38.0	56.0	40	36	6.4	M6 × 22	M6 × 45	20 × 2.5	0.24	1 515 702 017	315
40	15L	12	38	31.0	22.5	36.5	46.0	42	27	6.4	M6 × 22	M6 × 22	24 × 2.5	0.15	1 515 702 073	100
40	18L	15	38	30.5	22.5	36.5	47.0	42	32	6.4	M6 × 22	M6 × 22	24 × 2.5	0.17	1 515 702 074	100
40	20S	16	40	29.5	22.5	35.5	50.0	42	36	6.4	M6 × 22	M6 × 45	24 × 2.5	0.20	1 515 702 011	250
40	22L	19	38	30.5	22.5	36.5	47.5	42	36	6.4	M6 × 22	M6 × 22	24 × 2.5	0.17	1 515 702 075	100
40	28L	22	40	32.5	28.0	43.0	49.0	42	41	6.4	M6 × 20	M6 × 50	24 × 2.5	0.24	1 515 702 010	100
40	35L	31	41	30.5	34.0	55.0	52.0	42	50	6.4	M6 × 22	M6 × 60	24 × 2.5	0.33	1 515 702 018	100

**Gear pump flange, 3-hole, 90° angle, for square flange 30 (see page 20)**

Complete screw connections with O-ring, metric screw set, nuts and olive.



LK	D1	D3	L1	L2	L3	L4	L5	LA	S1	DB	Screws 3x	O-ring NBR	Weight [kg]	Order number	p [bar]
30	12L	10	37	30.0	10	37.5	46	38	22	6.4	M6 × 22	16 × 2.5	0.13	1 515 702 146	250
30	15L	12	37	30.0	10	37.5	47	38	27	6.4	M6 × 22	16 × 2.5	0.14	1 515 702 147	250
30	18L	15	37	30.0	10	37.5	47	38	32	6.4	M6 × 22	16 × 2.5	0.17	1 515 702 148	160
40	22L	19	43	35.5	14	41.0	53	48	36	8.4	M8 × 30	24 × 2.5	0.29	1 515 702 149	160
40	28L	24	43	35.5	14	41.0	53	48	41	8.4	M8 × 30	24 × 2.5	0.40	1 515 702 150	160

**Note**

You can find the permissible tightening torques in our publication 07012-B1 “General Operating Instructions for External Gear Units”.

### Spare parts

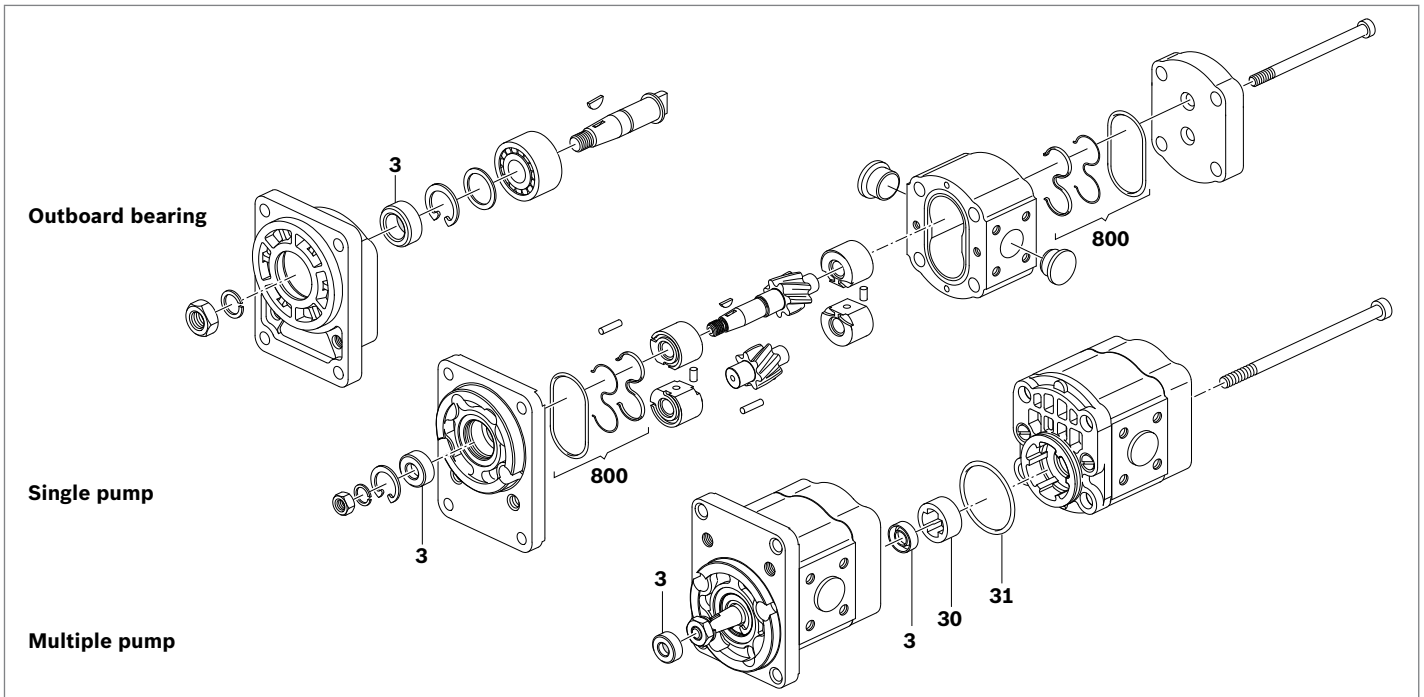
**Note**

Spare parts can be found online at [www.boschrexroth.com/spc](http://www.boschrexroth.com/spc)

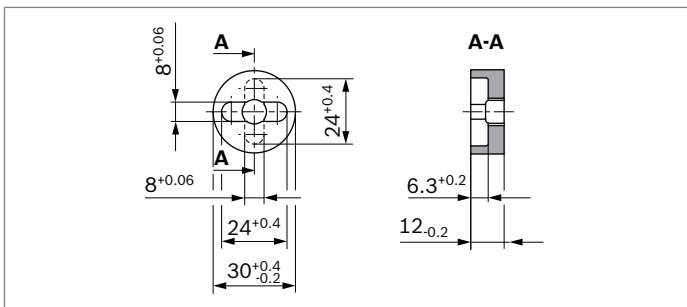
AZPJ-22 - ... CB...	AZPJ-22 - ... RR...	AZPJ-22 - ... HO...	AZPJ-22 - ... AB...	AZPJ-22 - ... NT...
---------------------	---------------------	---------------------	---------------------	---------------------

Pos.	Designation	Order number	Dimensions	Material	AZPJ-22 - ... CB...	AZPJ-22 - ... RR...	AZPJ-22 - ... HO...	AZPJ-22 - ... AB...	AZPJ-22 - ... NT...
3	Shaft seal	1 510 283 008	17 × 30 × 7	NBR	x	x	-	-	-
		1 510 283 027	17 × 30 × 7	FKM	x	x	-	-	-
		1 510 283 037	18 × 30 × 7	NBR	-	-	x	x	-
		1 510 283 077	18 × 30 × 7	FKM	-	-	x	x	-
30	Driver for sizes 12 to 16	1 510 240 011			-	-	-	-	x
	Driver for sizes 19 to 28	1 510 240 013			-	-	-	-	x
31	O-ring	1 900 210 145	45 × 2.5	NBR	-	-	-	-	x
		1 510 210 062	45 × 2.5	FKM	-	-	-	-	x
800	Seal kit	1 517 010 247		NBR	x	x	x	x	x
		1 517 010 269		FKM	x	x	x	x	x

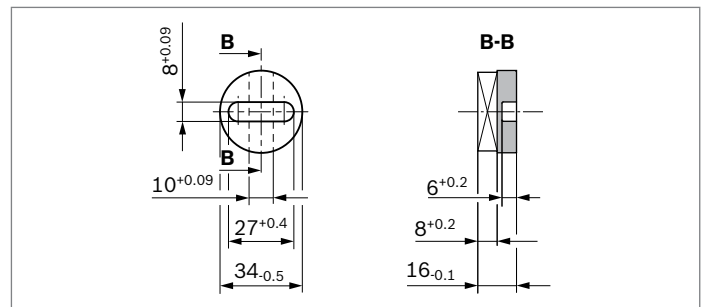
▼ Schematic diagram



▼ Driver (Pos. 30) for sizes 12 to 16



▼ Driver (Pos. 30) for sizes 19 to 28



## Notes for commissioning

### General

Pumps delivered by Bosch Rexroth are tested for function and performance. No changes of any nature may be made, otherwise the warranty is rendered void.

The pump may only be operated with the permissible data (see page 8).

### Technical data

All mentioned technical data are dependent on manufacturing tolerances and are applicable for certain boundary conditions.

Note that certain deviations are therefore possible and that technical data may vary when certain boundary conditions (e.g., viscosity) change.

### Characteristic curves

When dimensioning the gear pump, observe the maximum possible application data on the basis of the characteristic curves shown starting on page 10.

### Scope of delivery

The scope of delivery contains the components with the properties as described under type codes and dimensions starting on page 21.

### Further information

- ▶ Further information on installation, commissioning, and operation can be found in the publication 07012-B1: "General Operating Instructions for External Gear Units".
- ▶ Extensive notes and suggestions can be found in the Hydraulic Trainer, volume 3: "Planning and Design of Hydraulic Power Systems", order number R900018547.

### Filter recommendation

Since the majority of premature failures in gear motors occur due to contaminated hydraulic fluid, filtration should maintain a cleanliness class of 20/18/15 as defined by ISO 4406.

Cleanliness class 20/18/15 can reduce contamination to an acceptable degree in terms of particle size and concentration.

Bosch Rexroth generally recommends full-flow filtration. Basic contamination of the hydraulic fluid should not exceed class 20/18/15 as defined by ISO 4406. New fluids are often above this value. In such instances, a filling device with a special filter should be used.

Bosch Rexroth is not liable for wear due to contamination.

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## AZ configurator

With our practical product selector, it will take you next to no time to find the right solution for your applications, no matter whether it is SILENCE PLUS or another external gear unit.

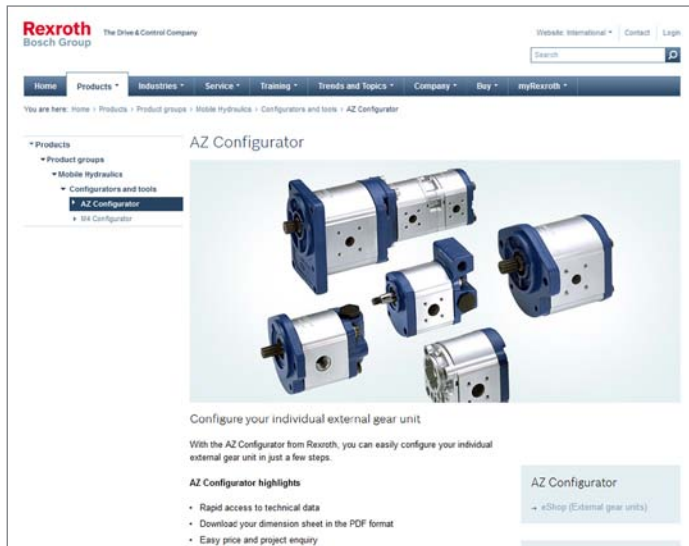
The selector guides you through a selection of features to all of the products available for order. By clicking on the order number, you can view and download the following product information: Data sheet, dimension sheet, operating conditions, and tightening torques.

You can order your selection directly via our online shop and at the same time benefit from an additional discount of 2%. And if you need something really quickly, simply use our fast delivery and preferred programs (GoTo). Then the goods will be sent within 10 working days.

You also have the possibility to easily and conveniently configure your individual external gear unit with our AZ configurator. All the necessary data that you need for the project planning of external gear units is requested by means of the menu navigation.

For an already existing configuration you receive as a result the order number, the type code, as well as further information. If your configuration does not lead to a product that is available for order, our online tools provide you with the possibility of sending a project request directly to Bosch Rexroth. We will then get in contact with you.

Link: [www.boschrexroth.com/az-configurator](http://www.boschrexroth.com/az-configurator)



## Fit4SILENCE app

You want to quickly determine the noise level of an application but don't have a measuring device at hand? No problem with Fit4SILENCE! Our new noise measurement app for all Android devices can be immediately downloaded free of charge. After calibration, you can start using it straight away and conduct fast, accurate noise measurements with different weightings in no time at all. An additional measuring device is no longer necessary, because calibrated smartphones using the app can achieve an accuracy that approximates professional measuring devices.

Last but not least, the app contains interesting information about the SILENCE PLUS technology, including an audio sample.

Link: [www.boschrexroth.com/silence-plus](http://www.boschrexroth.com/silence-plus)

### ▼ Download the Android app:



### Bosch Rexroth AG

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