

# Axial piston variable pump A4VSO series 1x and 30



- ▶ Robust high-pressure pump for industrial applications
- ▶ Size 40 ... 1000
- ▶ Nominal pressure 350 / 380 bar
- ▶ Maximum pressure 400 / 420 bar
- ▶ Open circuit

## Features

- ▶ Variable displacement pump with axial piston rotary group of swashplate design for hydrostatic drives in open circuit
- ▶ Flow is proportional to the drive speed and displacement.
- ▶ The flow can be continuously changed by adjusting the swashplate.
- ▶ Excellent suction characteristics
- ▶ Low noise level
- ▶ With pre-compression volume for pressure pulsation reduction
- ▶ Nominal pressure 380 bar / maximum pressure 420 bar for selected control devices with port plate 36.
- ▶ Long service life
- ▶ Modular design
- ▶ Variable through drive options
- ▶ Optical swivel angle indicator
- ▶ Any installation position possible
- ▶ Suitable for variable-speed drives
- ▶ HF operation with reduced data possible for HFC operation, special version available

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## Type code

01	02	03	04	05	06	07	08	09	10	11	12	13	14
	<b>A4VS</b>		<b>O</b>			/		-					

Hydraulic fluid		40	71	125	180	250	355	370	500	750	1000	
01	Mineral oil and HFD hydraulic fluids (no code)	●	●	●	●	●	●	●	●	●	●	
	HFA, HFB and HFC hydraulic fluids <sup>1)</sup> Only with sealing material NBR nitrile rubber and shaft seal PTFE. Please order with code P in position 09.	●	-	-	-	-	-	-	●	-	-	E
	High-speed version	-	●	-	○	●	●	●	●	-	-	H

Axial piston unit		
02	Swashplate design, variable, nominal pressure 350 bar, maximum pressure 400 bar	<b>A4VS</b>

Charge pump		40	71	125	180	250	355	370	500	750	1000	
03	Without charge pump (without code)	●	●	●	●	●	●	●	●	●	●	
	With charge pump, can only be ordered with port plate 25 (see item 12) and only in counter-clockwise rotation (see item 08).	-	-	-	-	-	-	-	-	●	-	L

Operating mode		
04	Pump, open circuit	<b>O</b>

Size (NG)		40	71	125	180	250	355	370	500	750	1000
05	Geometric displacement, see "Technical data" on page 9										

Control device		Data sheet	40	71	125	180	250	355	370	500	750	1000	
06	Pressure controller, one-sided swiveling	92060	●	●	●	●	●	▲	●	●	●	●	DR.. <sup>2)</sup>
	Pressure controller for parallel operation		●	●	●	●	●	▲	●	●	●	●	DP.. <sup>2)</sup>
	Flow controller		●	●	●	●	●	▲	●	-	-	-	FR..
	Pressure and flow controller		●	●	●	●	●	▲	●	-	-	-	DFR
	Power controller with hyperbolic characteristic curve	92064	●	●	●	●	●	▲	●	●	●	●	LR.. <sup>2)</sup>
	Manual control	92072	●	●	●	●	●	●	-	●	-	-	MA
	Electric motor control		●	●	●	●	●	●	-	●	-	-	EM
	Hydraulic control, depending on quantity	92076	●	●	●	●	●	▲	● <sup>3)</sup>	●	●	●	HM..
	Digital electro-hydraulic pump control system		●	●	●	●	●	▲	● <sup>3)</sup>	●	●	●	HS5.. <sup>2)</sup>
	Analog electro-hydraulic pump control system		●	●	●	●	●	▲	● <sup>3)</sup>	●	●	●	EO.. <sup>2)</sup>
	Hydraulic control, pressure-dependent	92080	●	●	●	●	●	●	○	●	●	●	HD.. <sup>2)</sup>
	Pressure control, secondary controlled	92057	●	●	●	●	●	●	-	●	●	●	DS2 <sup>2)</sup>
	Pressure control, secondary controlled	92059	●	●	●	●	●	●	-	●	●	●	DS3 <sup>2)</sup>
	Electro-hydraulic control system DFE1	92088	●	●	●	●	●	●	○	-	-	-	DFE1.. <sup>2)</sup>
	System solution SYHDFEE	30035	●	●	●	●	●	●	-	-	-	-	SYDFE

Series		40	71	125	180	250	355	370	500	750	1000	
07	Series 1, index 0 (series 1, index 1, only for control HD and EP)	●	●	-	-	-	-	-	-	-	-	<b>10 (11)</b>
	Series 3, index 0	-	-	●	●	●	●	●	●	●	●	<b>30</b>

● = Available    ○ = On request    - = Not available

▲ = Not for new projects

1) For the enhanced-power special version in HFC mode, see data sheet 92053 and/or order position 09 For versions with HFA and HFB pressure media, see data sheet 90223

2) Observe the restrictions for operation with HF hydraulic fluids in the relevant data sheets for the controls and/or mounted valves.

3) Nominal pressure 380 bar / maximum pressure 420 bar possible when using port plate 36.

01	02	03	04	05	06	07	08	09	10	11	12	13	14
	<b>A4VS</b>		<b>O</b>			/		-					

**Directions of rotation** 40 71 125 180 250 355 370 500 750 1000

08	Viewed on drive shaft	Clockwise	●	●	●	●	●	●	●	●	●	●	●	●	●	R
		Counter-clockwise	●	●	●	●	●	●	○	●	●	●	●	●	●	L

**Sealing material** 40 71 125 180 250 355 370 500 750 1000

09	FKM (fluorocarbon rubber) / HFD operation	●	●	●	●	●	●	●	●	●	●	●	●	●	●	V
	Special version for HFC mode, see data sheet 92053	-	●	●	●	●	●	-	-	-	-	-	-	-	-	F.

**Drive shaft** 40 71 125 180 250 355 370 500 750 1000

10	Parallel keyed shaft DIN 6885	●	●	●	●	●	●	●	●	●	●	●	●	●	●	P
	Splined shaft DIN 5480	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Z

**Mounting flange** 40 71 125 180 250 355 370 500 750 1000

11	Based on ISO 3019-2 metric	4-hole	●	●	●	●	●	●	●	●	-	-	-	-	-	B
		8-hole	-	-	-	-	-	-	-	-	●	●	●	●	●	H

**Working port**

12	<b>Standard version</b>	40	71	125	180	250	355	370	500	750	1000					
	Ports <b>B</b> and <b>S</b> : Lateral SAE flange, offset 90°, metric fastening thread (can only be ordered without through drive (N00) or with K.. through drives)	●	●	●	●	●	●	●	-	-	-	-	-	-	-	13
	Ports <b>B</b> and <b>S</b> : Lateral SAE flange, offset 90°, metric fastening thread <b>2nd pressure port B<sub>1</sub></b> , opposite <b>B</b> plugged with flange plate upon delivery	●	●	●	●	●	●	●	●	●	●	●	●	●	●	25
	<b>High-speed version</b>	40	71	125	180	250	355	370	500	750	1000					
	Ports <b>B</b> and <b>S</b> : Lateral SAE flange, offset 90°, metric fastening thread (can only be ordered without through drive (N00) or with K.. through drives)	-	●	-	-	●	●	-	-	-	-	-	-	-	-	13
	Ports <b>B</b> and <b>S</b> : Lateral SAE flange, offset 90°, metric fastening thread <b>2nd pressure port B<sub>1</sub></b> , opposite <b>B</b> plugged with flange plate upon delivery	-	●	-	-	●	●	●	●	-	-	-	-	-	-	25
	Ports <b>B</b> and <b>S</b> : Lateral SAE flange, offset 90°, metric fastening thread. <b>2nd pressure port B<sub>1</sub></b> , opposite <b>B</b> plugged with flange plate upon delivery; <b>with pulsation damping</b>	-	-	-	-	-	-	●	-	-	-	-	-	-	-	36 <sup>1)2)</sup>








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1) Nominal pressure 380 bar / maximum pressure 420 bar for selected control devices  
2) In combination with the controllers:  
- that comprise a flow or a remote controllable pressure control (RE92060, 92064), a minimum working pressure of 30 bar is required.  
- DFE1 (92088) and HS5(E)V. (RE92076), a minimum working pressure of 40 bar is required.

4 **A4VSO series 1x and 30** | Axial piston variable pump  
Type code

01	02	03	04	05	06	07	08	09	10	11	12	13	14
	<b>A4VS</b>	<b>O</b>			/			-					

**Through drive** (for mounting options, see page 74)

13			<b>40</b>	<b>71</b>	<b>125</b>	<b>180</b>	<b>250</b>	<b>355</b>	<b>370</b>	<b>500</b>	<b>750</b>	<b>1000</b>		
	Without through drive		●	●	●	●	●	●	●	●	●	●	<b>N00</b>	
	With through drive	Without conversion option	●	●	-	-	-	-	-	●	●	●	<b>K...</b>	
		For universal through drive, see data sheet 95581	-	-	●	●	●	●	●	-	-	-	<b>U...</b>	
	Prepared for through drive, with pressure-resistant plugged cover		●	●	●	●	●	●	●	●	●	●	<b>99</b>	
	Flange <b>ISO 3019-2</b> (metric)													
	Hub for splined shaft													
	Diameter	Attachment	Diameter	<b>40</b>	<b>71</b>	<b>125</b>	<b>180</b>	<b>250</b>	<b>355</b>	<b>370</b>	<b>500</b>	<b>750</b>	<b>1000</b>	
	125, 4-hole		32x2x14x9g <sup>1)</sup>	●	●	●	●	●	●	●	●	●	○	<b>31</b>
	140, 4-hole		40x2x18x9g <sup>1)</sup>	-	●	●	●	●	●	●	●	●	○	<b>33</b>
	160, 4-hole		50x2x24x9g <sup>1)</sup>	-	-	●	●	●	●	●	●	●	○	<b>34</b>
	224, 4-hole		60x2x28x9g <sup>1)</sup>	-	-	-	-	●	●	●	●	●	○	<b>35</b>
				70x3x22x9g <sup>1)</sup>	-	-	-	-	-	●	●	●	○	●
	315, 8-hole		80x3x25x9g <sup>1)</sup>	-	-	-	-	-	-	-	●	●	●	<b>43</b>
	400, 8-hole		90x3x28x9g <sup>1)</sup>	-	-	-	-	-	-	-	-	●	●	<b>76</b>
				100x3x32x9g <sup>1)</sup>	-	-	-	-	-	-	-	-	-	●
	80, 2-hole		3/4 in 11T 16/32DP <sup>2)</sup>	○	●	●	●	●	●	●	○	○	○	<b>B2</b>
	100, 2-hole		7/8 in 13T 16/32DP <sup>2)</sup>	●	●	●	●	●	●	●	○	○	○	<b>B3</b>
				1 in 15T 16/32DP <sup>2)</sup>	●	●	●	●	●	●	●	○	○	○
	125, 4-hole		1 in 15T 16/3 2DP <sup>2)</sup>	-	●	○	○	○	○	○	○	○	○	<b>E1</b>
	125, 2-hole		1 1/4 in 14T 12/24DP <sup>2)</sup>	-	●	●	●	●	●	●	●	○	○	<b>B5</b>
				1 1/2 in 17T 12/24DP <sup>2)</sup>	-	-	●	●	●	●	●	○	○	○
	160, 4-hole		1 1/4 in 14T 12/24DP <sup>2)</sup>	-	○	●	●	●	●	●	○	○	○	<b>B8</b>
	180, 4-hole		1 1/2 in 17T 12/24DP <sup>2)</sup>	-	-	○	○	○	○	○	○	○	○	<b>B9</b>
				1 3/4 in 13T 8/16DP <sup>2)</sup>	-	-	-	●	●	●	●	○	○	○

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1) Splined hub ..... × 8H according to DIN 5480  
2) Hub for splined shaft according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

01	02	03	04	05	06	07	08	09	10	11	12	13	14
	<b>A4VS</b>	<b>O</b>			/			-					

13	Flange ISO <b>3019-1</b> (SAE) Hub for splined shaft													
	Diameter	Attachment	Diameter	<b>40</b>	<b>71</b>	<b>125</b>	<b>180</b>	<b>250</b>	<b>355</b>	<b>370</b>	<b>500</b>	<b>750</b>	<b>1000</b>	
	82-2 (A)		5/8 in 9T 16/32DP <sup>1)</sup>	●	●	●	●	●	●	●	●	●	○	<b>01</b>
			3/4 in 11T 16/32DP <sup>1)</sup>	●	●	●	●	●	●	●	○	○	○	<b>52</b>
	101-2 (B)		7/8 in 13T 16/32DP <sup>1)</sup>	●	●	●	●	●	●	●	●	●	○	<b>68</b>
			1 in 15T 16/32DP <sup>1)</sup>	●	●	●	●	●	●	●	●	○	○	<b>04</b>
			1 1/4 in 14T 12/24DP <sup>1)</sup>	-	●	○	○	○	○	○	○	○	○	<b>06</b>
	127-4 (C)		1 in 15T 16/32DP <sup>1)</sup>	○	●	●	●	○	○	○	○	○	○	<b>E2</b>
			1 1/4 in 14T 12/24DP <sup>1)</sup>	-	●	●	●	●	●	●	●	○	○	<b>15</b>
	127-2 (C)		1 1/4 in 14T 12/24DP <sup>1)</sup>	-	●	●	●	●	●	●	●	●	○	<b>07</b>
			1 1/2 in 17T 12/24DP <sup>1)</sup>	-	-	●	●	●	●	●	●	●	●	<b>24</b>
	152-4 (D)		1 1/2 in 17T 12/24DP <sup>1)</sup>	-	-	●	●	●	●	●	○	○	○	<b>96</b>
			1 3/4 in 13T 8/16DP <sup>1)</sup>	-	-	●	●	●	●	●	●	●	○	<b>17</b>
165-4 (D)		N50x2x24x9g <sup>2)</sup>	-	-	-	-	○	●	●	●	○	○	<b>84</b>	
Ø 63, metr.4-hole		for keyed shaft Ø 25	●	●	●	●	●	●	●	○	○	○	<b>57</b>	
<b>Filtration</b> (specification only with DS.. control)			<b>40</b>	<b>71</b>	<b>125</b>	<b>180</b>	<b>250</b>	<b>355</b>	<b>370</b>	<b>500</b>	<b>750</b>	<b>1000</b>		
14	Without filter		●	●	●	●	●	●	●	●	●	●	<b>N</b>	
	Intermediate plate filter (for DS.. control, see data sheet 92057)		●	●	●	●	●	●	-	●	-	-	<b>Z</b>	

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**Notice**

- ▶ Note the project planning notes on page 78.
- ▶ In addition to the type code, please specify the relevant technical data when placing your order.
- ▶ For information on combination pumps, see page 74

1) Hub for splined shaft according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5  
2) Splined hub ..... × 8H according to DIN 5480

## Hydraulic fluids

The A4VSO, A4VSLO variable pump is designed for operation with HLP mineral oil according to DIN 51524. Application instructions and requirements for hydraulic fluid selection, behavior during operation as well as disposal and environmental protection should be taken from the following data sheets before the start of project planning:

- ▶ 90220: Hydraulic fluids based on mineral oils and related hydrocarbons
- ▶ 90221: Environmentally acceptable hydraulic fluids
- ▶ 90222: Fire-resistant, water-free hydraulic fluids (HFDR/HFDU)
- ▶ 90223: Fire-resistant, water-containing hydraulic fluids (HFAx, HFB, HFC)

### Selection of hydraulic fluid

Bosch Rexroth evaluates hydraulic fluids on the basis of the Fluid Rating according to the technical data sheet 90235.

Hydraulic fluids with positive evaluation in the Fluid Rating are listed in the following data sheet:

- ▶ 90245 Bosch Rexroth fluid rating list for Rexroth hydraulic components (pumps and motors)

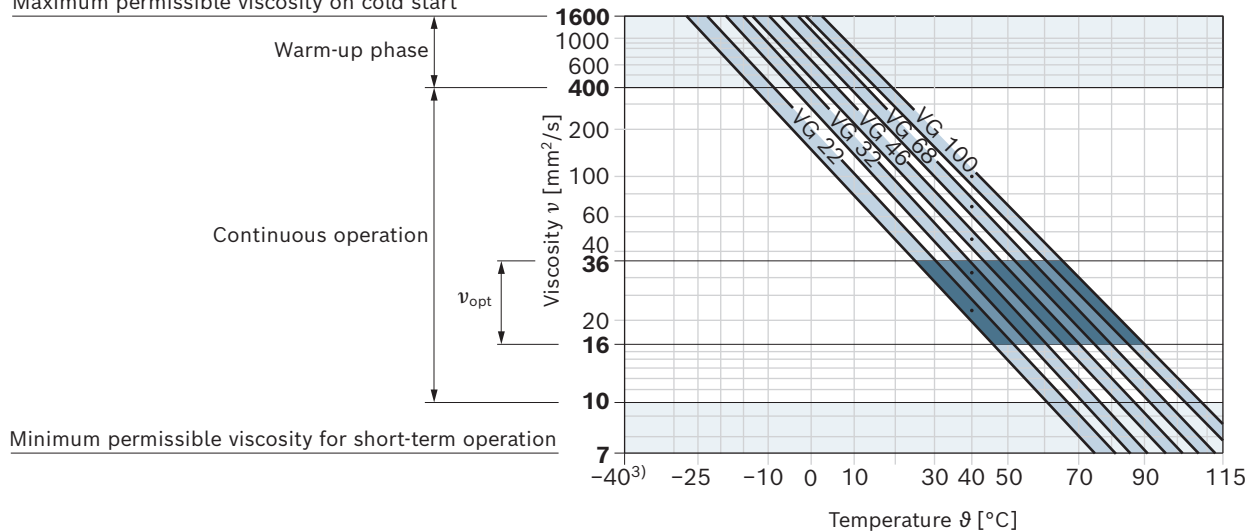
The hydraulic fluid should be selected so that the operating viscosity in the operating temperature range is within the optimum range ( $v_{opt}$ ; see selection diagram).

### Viscosity and temperature of hydraulic fluids

	Viscosity	Shaft seal	Temperature <sup>2)</sup>	Comment
Cold start	$v_{max} \leq 1600 \text{ mm}^2/\text{s}$	FKM	$\vartheta_{St} \geq -25^\circ\text{C}$	$t \leq 3 \text{ min}$ , without load ( $p \leq 50 \text{ bar}$ ) Permissible temperature difference between axial piston unit and hydraulic fluid in the system maximum 25 K
Warm-up phase	$v = 1600 \dots 400 \text{ mm}^2/\text{s}$			$t \leq 15 \text{ min}$ , $p \leq 0.7 \times p_{nom}$ und $n \leq 0.5 \times n_{nom}$
Continuous operation	$v = 400 \dots 10 \text{ mm}^2/\text{s}^1)$	FKM	$\vartheta_{St} \leq +110^\circ\text{C}$	Measured at port <b>T</b>
	$v_{opt} = 36 \dots 16 \text{ mm}^2/\text{s}$			Optimal operating viscosity and efficiency range
Short-term operation	$v_{min} = 10 \text{ mm}^2/\text{s}$	FKM	$\vartheta_{St} \leq +110^\circ\text{C}$	$t \leq 3 \text{ min}$ , $p \leq 0.3 \times p_{nom}$ , measured at port <b>T</b>

#### ▼ Selection diagram

Maximum permissible viscosity on cold start



Minimum permissible viscosity for short-term operation

1) This corresponds, for example on the VG 46, to a temperature range of +4 °C to +85 °C (see selection diagram)

2) If the temperature at extreme operating parameters cannot be adhered to, please contact us.

3) For applications in the low-temperature range, please contact us.

**Filtration of the hydraulic fluid**

Finer filtration improves the cleanliness level of the hydraulic fluid, which increases the service life of the axial piston unit.

A cleanliness level of at least 20/18/15 is to be maintained according to ISO 4406

At a hydraulic fluid viscosity of less than 10 mm<sup>2</sup>/s (e.g. due to high temperatures during short-term operation) at the drain port, a cleanliness level of at least 19/17/14 under ISO 4406 is required.

Examples of temperatures of hydraulic fluids at a viscosity of 10 mm<sup>2</sup>/s:

- ▶ 73 °C at HLP 32
- ▶ 85 °C at HLP 46

**Bearing flushing**

Bearing flushing is required for a safe, continuous operation under the following operating conditions:

- Applications with special fluids (not mineral fluids) due to limited lubricity and narrow operating temperature range
- When operated at temperature and viscosity limits when using mineral oil

With vertical installation (drive shaft facing upwards) bearing flushing is recommended for lubricating the front bearing and the shaft seal.

Bearing flushing is realized at port **U** in the area of the front flange of the variable pump. The flushing fluid flows through the front bearing and discharges with the pump drain at the drain port.

Depending on the individual sizes, the following flushing flows are recommended:

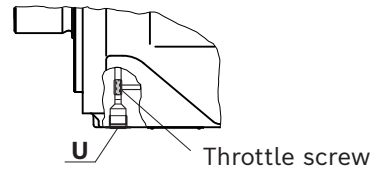
NG	40	71	125	180	250	355 370	500	750	1000
<i>q<sub>SP</sub></i> l/min	3	4	5	7	10	15	20	30	40

For the flushing flows stated, there is a pressure differential of about 2 or 3 bar between port **U** (including fitting) and the housing area (series 1x and series 3x, respectively).

For version F (order position 09), the corresponding flushing flows in accordance with data sheet 92053 must be observed.

**Notice regarding series 3x**

When using external bearing flushing, the throttle screw in port **U** must be turned in to the end stop.

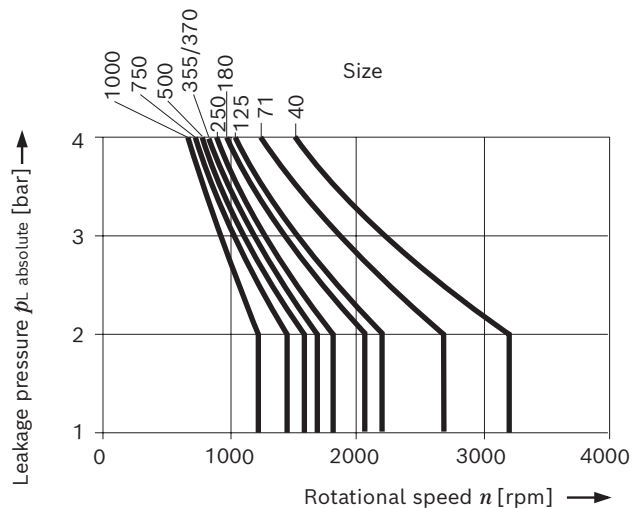


**Case pressure**

Permissible pressure load

The service life of the shaft seal is affected by the rotational speed of the axial piston unit and the case pressure. Momentary ( $t < 0.1$  s) pressure peaks of up to 6 bar absolute are acceptable. The service life of the shaft seal decreases with increasing frequency of pressure peaks and increasing mean differential pressure.

A slide ring seal is available for higher housing pressures. The pressure in the housing must be equal to or greater than the ambient pressure.



<b>Maximum case pressure</b>	
<i>p<sub>L absolute max</sub></i>	4 bar absolute

The parameters are reference values; under certain operating conditions, restrictions may be required.

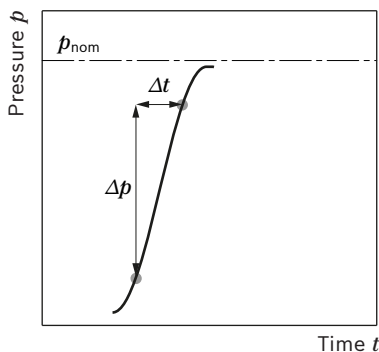
**Flow direction**

**S to B**

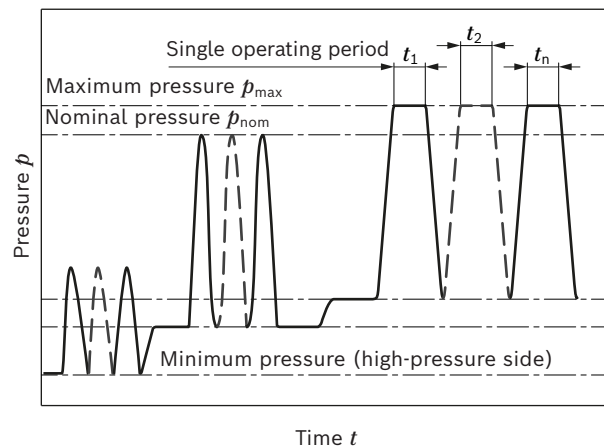
## Working pressure range

Pressure at working port B			Definition
Nominal pressure $p_{nom}$	with port plate 13 and 25	350 bar	The nominal pressure corresponds to the maximum design pressure.
	with port plate 36	380 bar	The nominal pressure corresponds to the maximum design pressure for certain control devices (see type code on page 2).
Maximum pressure $p_{max}$	with port plate 13 and 25	400 bar	The maximum pressure corresponds to the maximum working pressure within a single operating period.
	with port plate 36	420 bar	
Single operating period		1 s	The sum of the single operating periods must not exceed the total operating period (maximum number of cycles: approx. 1 million).
Total operating period		300 h	
Minimum pressure $p_{B absolute}$ (high-pressure side)		15 bar <sup>1)</sup>	Minimum pressure on the high-pressure side ( <b>B</b> ) which is required in order to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and the swivel angle.
Rate of pressure change $R_{A max}$		16000 bar/s	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Pressure at suction port S (inlet)			
Version without charge pump			Minimum pressure at suction port <b>S</b> (inlet) which is required to prevent damage to the axial piston unit. The minimum pressure is dependent on the rotational speed and displacement of the axial piston unit (see diagram "Maximum permissible rotational speed" on page 9).
Minimum pressure $p_{S min}$		$\geq 0.8$ bar absolute	
Maximum pressure $p_{S max}$		$\leq 30$ bar	
Case pressure at port T, K <sub>1</sub> , K <sub>2</sub> , R(L)			
Max. static pressure $p_{L max}$		4 bar absolute <sup>2)</sup>	Maximum 1.2 bar higher than inlet pressure at port <b>S</b> , but not higher than $p_{L max}$ . See also diagram "Case pressure" on page 7 A drain line to the reservoir is required.
Pressure peaks $p_{L peak}$		6 bar absolute	$t < 0.1$ s

### ▼ Rate of pressure change $R_{A max}$



### ▼ Pressure definition



$$\text{Total operating period} = t_1 + t_2 + \dots + t_n$$

#### Notice

- ▶ Working pressure range applies when using hydraulic fluids based on mineral oils. Please contact us for values for other hydraulic fluids.

1) Lower values on request

2) For higher housing pressures up to 8 bar a slide ring seal is available, please contact us



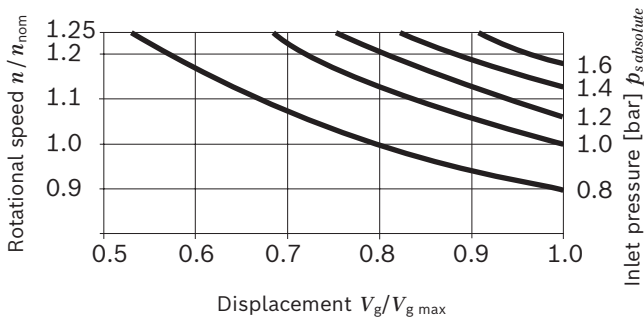
## Technical data for sizes 40 to 1000

### Standard rotary group version

Size	NG		40	71	125	180	250	355	370	500	750	750 <sup>5)</sup>	1000	
Geometric displacement, per revolution	$V_{g \max}$	cm <sup>3</sup>	40	71	125	180	250	355	370	500	750	750	1000	
Maximum rotational speed <sup>1)</sup>	at $V_{g \max}$ <sup>2)</sup>	$n_{\text{nom}}$	rpm	2600	2200	1800	1800	1500	1500	1320	1200	1500	1000	
	at $V_g \leq V_{g \max}$ <sup>3)</sup>	$n_{\text{max}}$	rpm	3200	2700	2200	2100	1800	1700	1700	1600	1500	1500	1200
Flow	at $n_{\text{nom}}$ and $V_{g \max}$	$q_v$	l/min	104	156	225	324	375	532	555	660	900	1125	1000
Power	at $n_{\text{nom}}$ , $V_{g \max}$ and $\Delta p = 350$ bar	$P$	kW	61	91	131	189	219	311	323	385	525	656	583
	at 1500 rpm	$P$	kW	35	62	109	158	219	311	323	339 <sup>6)</sup>	449 <sup>6)</sup>	656	-
	at 1800 rpm	$P$	kW	42	74	131	189	262	-	-	-	-	-	-
Torque	at $V_{g \max}$ and $\Delta p = 350$ bar <sup>2)</sup>	$M_{\text{max}}$	Nm	223	395	696	1002	1391	1976	2061	2783	4174	4174	5565
	and $\Delta p = 100$ bar <sup>2)</sup>	$M$	Nm	64	113	199	286	398	564	589	795	1193	1193	1590
Rotary stiffness of drive shaft	Shaft end P	$c$	kNm/rad	80	146	260	328	527	800	800	1145	1860	1860	2730
	Shaft end Z	$c$	kNm/rad	77	146	263	332	543	770	770	1136	1812	1812	2845
Moment of inertia	$J_{\text{TW}}$	kgm <sup>2</sup>	0.0049	0.0121	0.03	0.055	0.0959	0.19	0.19	0.3325	0.66	0.66	1.20	
Maximum angular acceleration <sup>4)</sup>	$\alpha$	rad/s <sup>2</sup>	17000	11000	8000	6800	4800	3600	3600	2800	2000	2000	1450	
Case volume	$V$	l	2	2.5	5	4	10	8	8	14	19	22	27	
Weight (without through drive) approx.	$m$	kg	39	53	88	102	184	207	207	320	460	490	605	

Observe the notice and "Determination of characteristics" on page 11.

### Maximum permissible rotational speed (speed limit) NG40 to 1000 standard



- 1) The values are applicable:
  - for the optimum viscosity range from  $v_{\text{opt}} = 36$  to  $16 \text{ mm}^2/\text{s}$
  - with hydraulic fluid based on mineral oils
- 2) The values apply at absolute pressure  $p_{\text{abs}} = 1 \text{ bar}$  at suction port **S**.
- 3) Maximum rotational speed (speed limit) for increased inlet pressure  $p_{\text{absolute}}$  at suction port **S** and  $V_g < V_{g \max}$ , see diagram on page 9.
- 4) The data are valid for values between the minimum required and maximum permissible rotational speed. Valid for external excitation (e.g. diesel engine 2 to 8 times rotary frequency; cardan shaft twice the rotary frequency). The limit value is only valid for a single pump. The load capacity of the connection parts must be considered.
- 5) With charge pump (A4VSLO)
- 6) At  $V_g < V_{g \max}$

## Technical data for sizes 71, 250, 355, 370 and 500

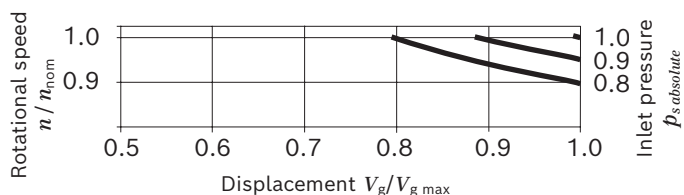
### High-speed rotary group version

Size	NG		71	250	355	370	500
Geometric displacement, per revolution	$V_{g \max}$	cm <sup>3</sup>	71	250	355	370	500
Maximum rotational speed <sup>1)</sup>	at $V_{g \max}$	$n_{\text{nom}}$	3000 <sup>2)5)6)</sup>	1900 <sup>2)</sup>	1700 <sup>2)</sup>	1630 <sup>2)</sup>	1500 <sup>2)</sup>
	at $V_g \leq V_{g \max}$ and $\Delta p = 350$ bar	$n_{\text{max}}$	–	2100 <sup>3)</sup>	1900 <sup>3)</sup>	1900 <sup>3)7)</sup>	1800 <sup>3)</sup>
Flow	at $n_{\text{nom}}$ and $V_{g \max}$	$q_v$	213 <sup>5)</sup>	475	603	603	750
Power	at $n_{\text{nom}}$ , $V_{g \max}$ and $\Delta p = 350$ bar	$P$	124	277	352	352	437
	at $n_{\text{nom}}$ , $V_{g \max}$ and $\Delta p = 380$ bar	$P$	–	–	–	382	–
Torque	at $V_{g \max}$ and $\Delta p = 350$ bar	$M_{\text{max}}$	395	1391 <sup>2)</sup>	1976 <sup>2)</sup>	2061 <sup>2)</sup>	2783 <sup>2)</sup>
	at $V_{g \max}$ and $\Delta p = 380$ bar	$M_{\text{max}}$	–	–	–	2238	–
Rotary stiffness drive shaft	Shaft end P	$c$	146	527	800	800	1145
	Shaft end Z	$c$	146	543	770	770	1136
Moment of inertia		$J_{\text{TW}}$	0.0121	0.0959	0.19	0.19	0.3325
Maximum angular acceleration <sup>4)</sup>		$\alpha$	11000	4800	3600	3600	2800
Case volume		$V$	2.5	10	8	8	14
Weight (without through-drive) approx.		$m$	53	184	207	207	320

### Maximum permissible rotational speed (speed limit)

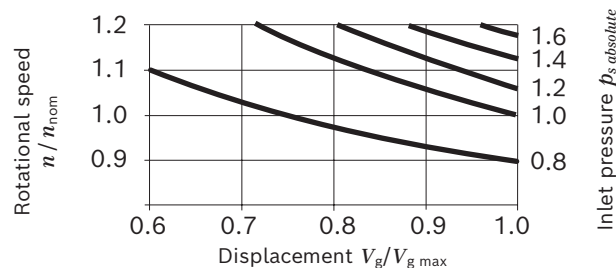
#### Size 71

( $p_{\text{S absolute}}$  = Inlet pressure [bar])



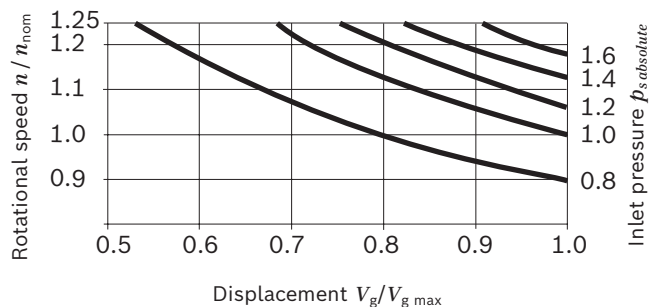
#### Size 370

( $p_{\text{S absolute}}$  = Inlet pressure [bar])



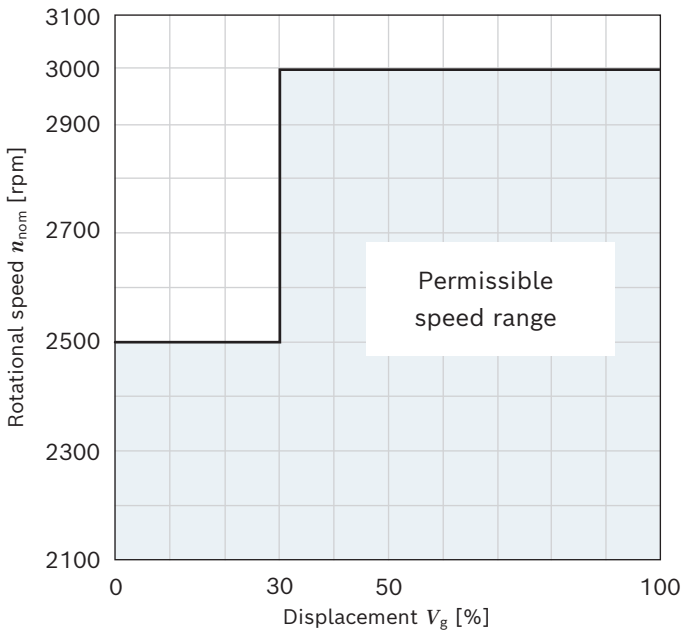
#### Sizes 250, 355, 500

( $p_{\text{S absolute}}$  = Inlet pressure [bar])



- The values are applicable:
  - for the optimum viscosity range from  $\nu_{\text{opt}} = 36$  to  $16 \text{ mm}^2/\text{s}$
  - with hydraulic fluid based on mineral oils
- The values apply at absolute pressure  $p_{\text{abs}} = 1$  bar at suction port **S**.
- Maximum rotational speed (speed limit) for increased inlet pressure  $p_{\text{absolute}}$  at suction port **S** and  $V_g < V_{g \max}$ , see diagrams for sizes 250, 355, 370 and 500.
- The data are valid for values between the minimum required and maximum permissible rotational speed. Valid for external excitation (e.g. diesel engine 2 to 8 times rotary frequency; cardan shaft twice the rotary frequency). The limit value is only valid for a single pump. The load capacity of the connection parts must be considered.
- If  $V_g > 30\%$  (depending on the rotational speed see diagram "Maximum permissible rotational speed High Speed NG71" on page 11)
- At suction pressure  $< 1$  bar see diagram Maximum rotational speed (speed limit) size 71, no speed increase possible with increase in the inlet pressure.
- When using port plate 36, a maximum rotational speed of 1800 rpm is permissible.

**Maximum permissible rotational speed for high-speed NG 71**



**Determination of the characteristics**

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]


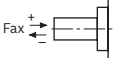
**Key**

- $V_g$  = Displacement per revolution [cm<sup>3</sup>]
- $\Delta p$  = Differential pressure [bar]
- $n$  = Rotational speed [rpm]
- $\eta_v$  = Volumetric efficiency
- $\eta_{hm}$  = Hydraulic-mechanical efficiency
- $\eta_t$  = Total efficiency ( $\eta_t = \eta_v \times \eta_{hm}$ )

**Notice**

- ▶ Theoretical values, without efficiency and tolerances; values rounded
- ▶ Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. We recommend checking loads through tests or calculation/simulation and comparing them with the permissible values.
- ▶ Special requirements apply in the case of belt drives. Please contact us.

### Permissible radial and axial loading on the drive shafts

Size	NG	40	71	125	180	250	355	370	500	750 <sup>1)</sup>	1000		
Radial force, maximum	 at X/2	$F_{q \max}$	N	1000	1200	1600	2000	2000	2200	2200	2500	3000	3500
Maximum axial force		$\pm F_{ax \max}$	N	600	800	1000	1400	1800	2000	2000	2000	2200	2200

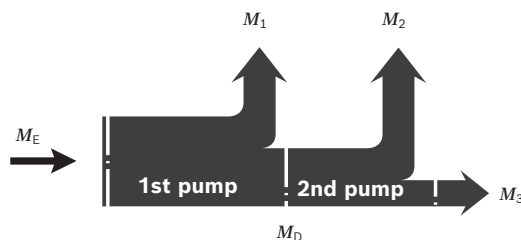
### Permissible inlet and through-drive torques

Size	NG	40	71	125	180	250	355	370	500	750	1000	
Torque at $V_{g \max}$ and $\Delta p = 350 \text{ bar}^2)$	$M_{\max}$	Nm	223	395	696	1002	1391	1976	2061	2783	4174	5565
Torque at $V_{g \max}$ and $\Delta p = 380 \text{ bar}^2)$	$M_{\max}$	Nm	–	–	–	–	–	2238	–	–	–	–
Max. input torque on drive shaft <sup>3)</sup>												
Splined shaft Z	$M_{E \max}$	Nm	446	790	1392	2004	2782	3952	4214	5566	8348	11130
Shaft key P	$M_{E \max}$	Nm	380	700	1392	1400	2300	3557	3557	5200	7513	9444
Maximum through-drive torque	$M_{D \max}$	Nm	223	395	696	1002	1391	1976	1976	2783	4174	5565

#### Notice

- ▶ In case of through drive pumps as well as in case of bi-directional torque loads, the use of a splined shaft is recommended.
- ▶ The through-drive torques apply to the through-drive shaft without hub:  
Prepared for through drive, with pressure-resistant plugged cover – order code K/U99.
- ▶ The permissible output torques of the supplied hub depend on the drive torques of the attachment pumps from the table:  
Overview of mounting options on page 72

#### ▼ Distribution of torques



Torque at 1st pump	$M_1$
Torque at 2nd pump	$M_2$
Torque at 3rd pump	$M_3$
Input torque	$M_E = M_1 + M_2 + M_3$
	$M_E < M_{E \max}$
Through-drive torque	$M_D = M_2 + M_3$
	$M_D < M_{D \max}$

<sup>1)</sup> Values also apply for the version with charge pump (A4VSLO)

<sup>2)</sup> Efficiency not considered

<sup>3)</sup> For drive shafts with no radial force

## Characteristic curves

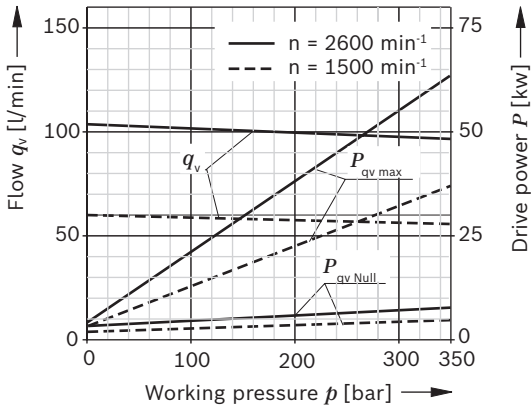
### Drive power and flow

(Operating fluid: hydraulic fluid ISO VG 46 DIN 51519,  
 $t = 50\text{ }^{\circ}\text{C}$ )

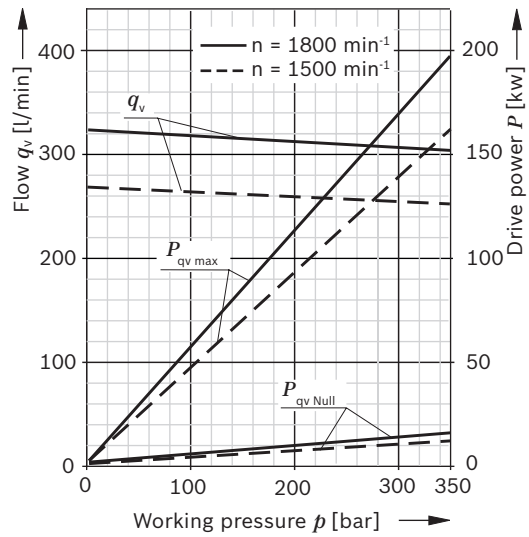
Total efficiency  $n_t = \frac{q_v \times p}{P_{qv \max} \times 600}$

Volumetric efficiency  $n_v = \frac{q_v}{q_{v \text{ theor}}}$

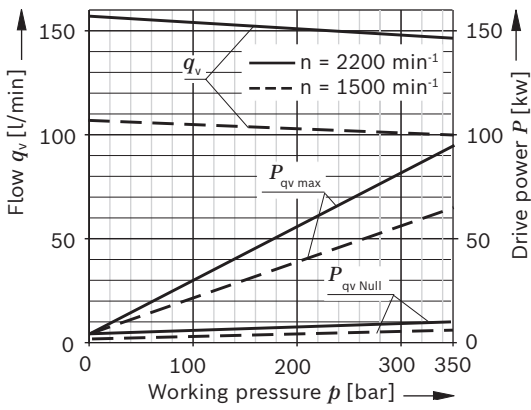
#### ▼ Size 40



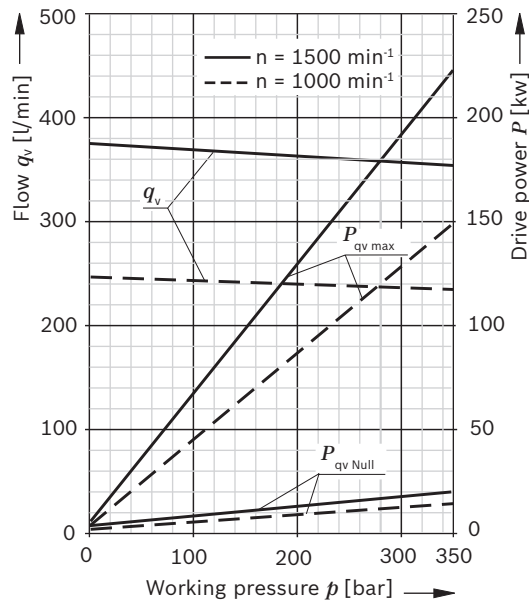
#### ▼ Size 180



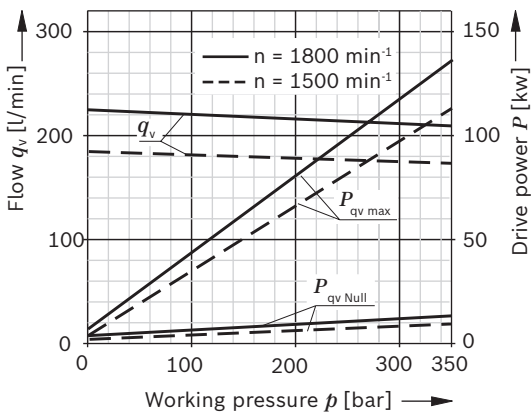
#### ▼ Size 71



#### ▼ Size 250



#### ▼ Size 125



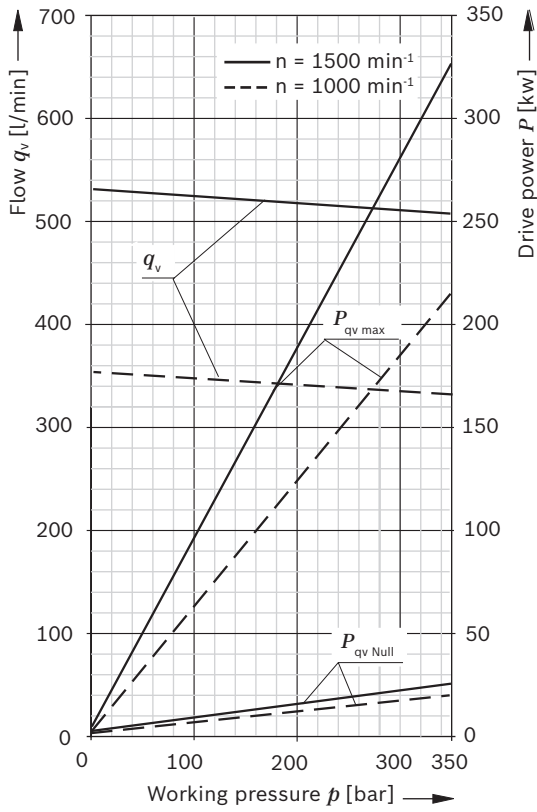
**Drive power and flow**

(Operating fluid: hydraulic fluid ISO VG 46 DIN 51519,  
 $t = 50\text{ }^{\circ}\text{C}$ )

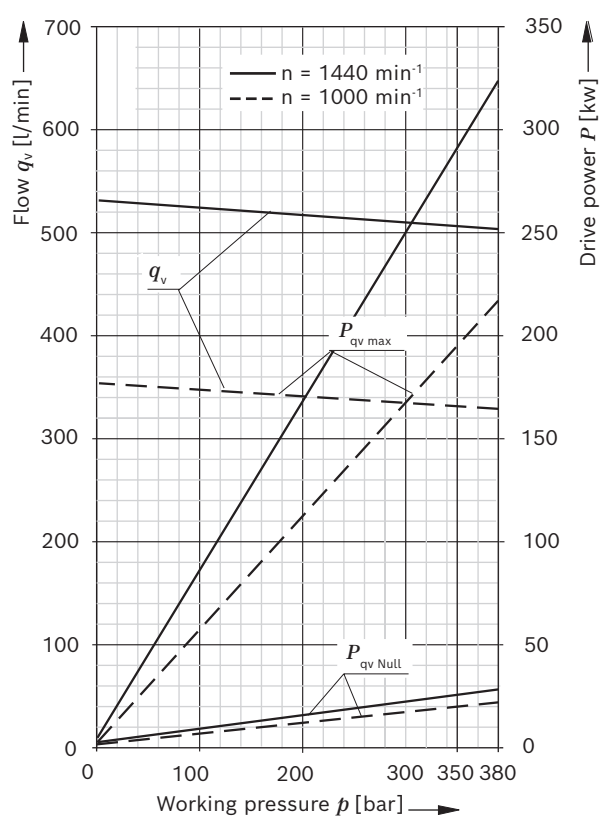
Total efficiency  $n_t = \frac{q_v \times p}{P_{qv\ max} \times 600}$

Volumetric efficiency  $n_v = \frac{q_v}{q_{v\ theor}}$

▼ **Size 355**



▼ **Size 370**



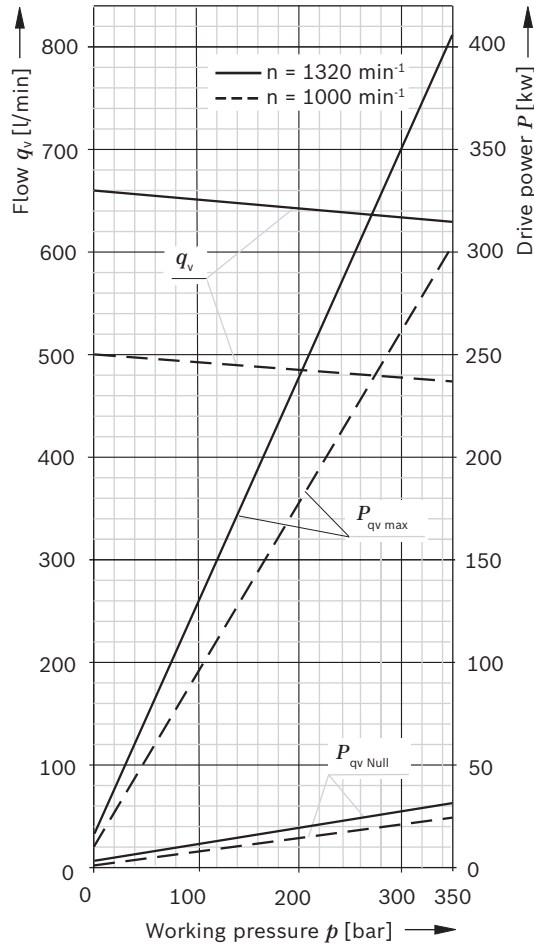
**Drive power and flow**

(Operating fluid: hydraulic fluid ISO VG 46 DIN 51519,  
 t = 50 °C)

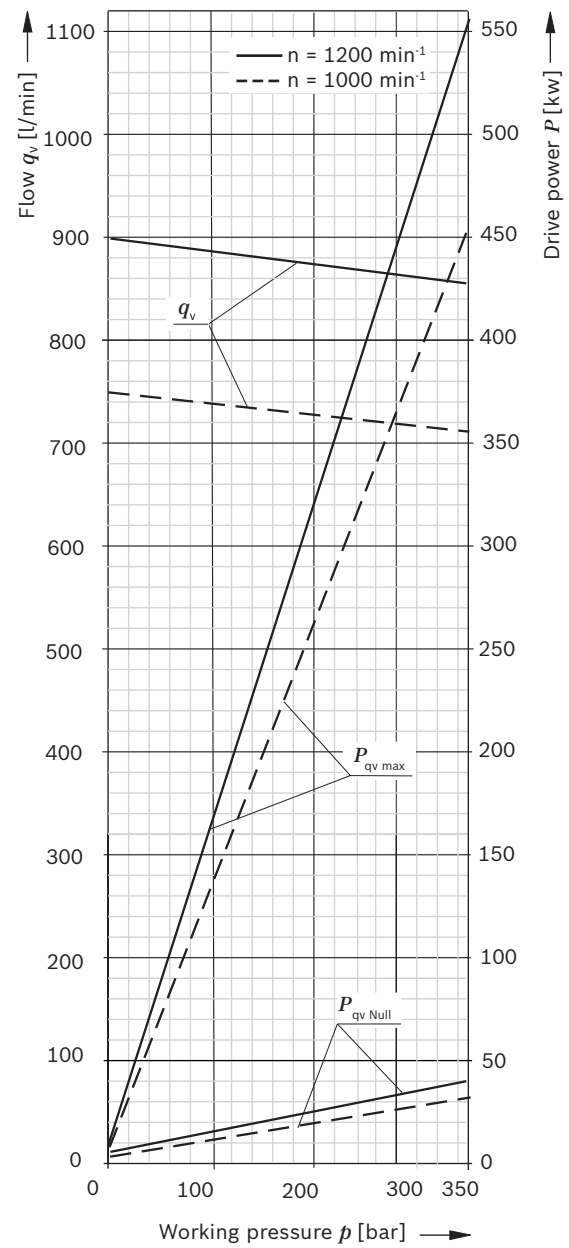
Total efficiency  $n_t = \frac{q_v \times p}{P_{qv \max} \times 600}$

Volumetric efficiency  $n_v = \frac{q_v}{q_v \text{ theor}}$

▼ **Size 500**



▼ **Size 750**



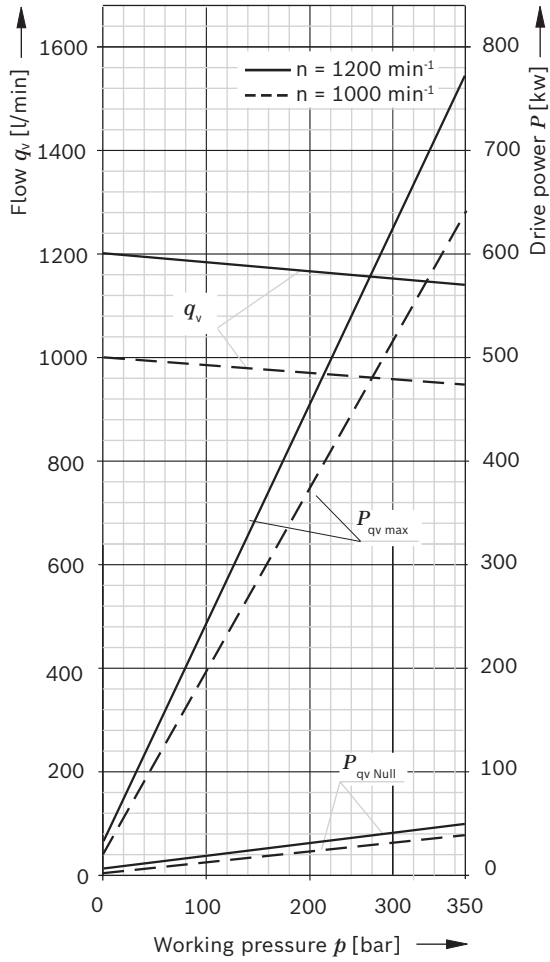
**Drive power and flow**

(Operating fluid: hydraulic fluid ISO VG 46 DIN 51519,  
 $t = 50\text{ }^{\circ}\text{C}$ )

Total efficiency  $n_t = \frac{q_v \times p}{P_{qv\ max} \times 600}$

Volumetric efficiency  $n_v = \frac{q_v}{q_{v\ theor}}$

▼ **Size 1000**





## Overview of control devices

### Pressure controller DR

(for further information, see data sheet 92060)

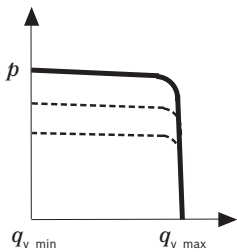
The pressure controller limits the maximum pressure at the pump outlet within the control range of the variable pump. The variable pump only supplies as much hydraulic fluid as is required by the consumers. If the working pressure exceeds the pressure command value at the pressure valve, the pump will regulate to a smaller displacement to reduce the control differential.

- ▶ Basic position in depressurized state:  $V_{g \max}$ .
- ▶ Setting range for pressure control: 50 to 350 bar. Standard is 350 bar.

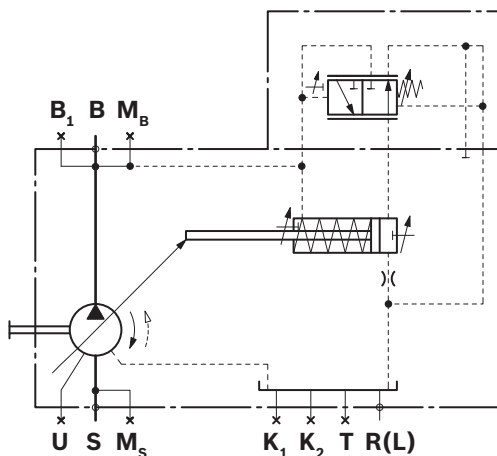
#### Optional:

- ▶ Pressure controller, remotely operated (DRG)<sup>1)</sup>

#### ▼ Characteristic curve



#### ▼ Circuit diagram



### Pressure controller for parallel operation DP<sup>1)</sup>

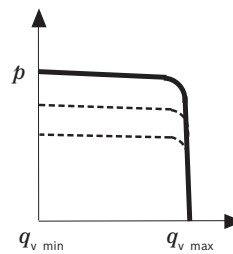
(for further information, see data sheet 92060)

Suitable for pressure control of multiple axial piston units A4VSO in parallel operation.

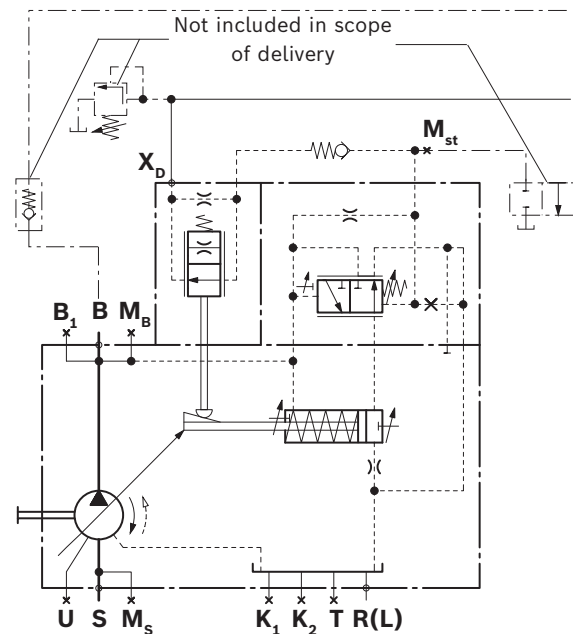
#### Optional:

- ▶ with flow control (DPF)<sup>1)</sup>

#### ▼ Characteristic curve



#### ▼ Circuit diagram



<sup>1)</sup> In combination with port plate 36, a minimum working pressure of 30 bar is required.

### Flow controller FR<sup>1)</sup>

(for further information, see data sheet 92060)

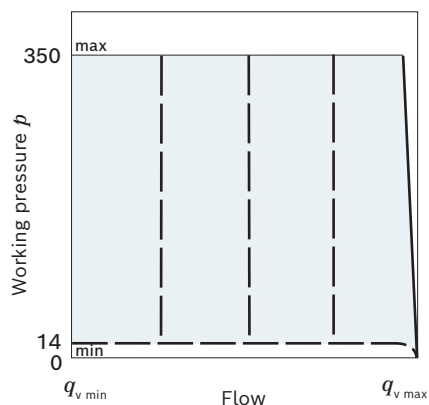
The flow controller adjusts the displacement of the pump to the volume required by the consumer. The flow of the pump is then dependent on the cross section of the external metering orifice (item **4**), which is located between the pump and the consumer. The flow is nearly independent of the load pressure within the control range of the pump.

Initial position in depressurized state:  $V_{g \max}$

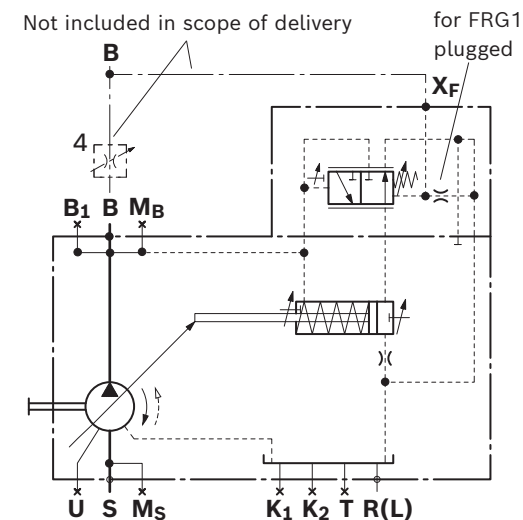
Mechanical minimum and maximum swivel angle limitation

- ▶ The  $V_{g \min}$  stop is set so that a pressure of 15 to 20 bar is set when port **B** is plugged.
- ▶ The  $V_{g \max}$  stop is set to nominal  $V_{g \max}$ . When ordering, please state other setting values in plain text (possible setting ranges  $V_{g \max}$  to 50%  $V_{g \max}$ ).

#### ▼ Characteristic curve



#### ▼ Circuit diagram, sample sizes 40 and 71

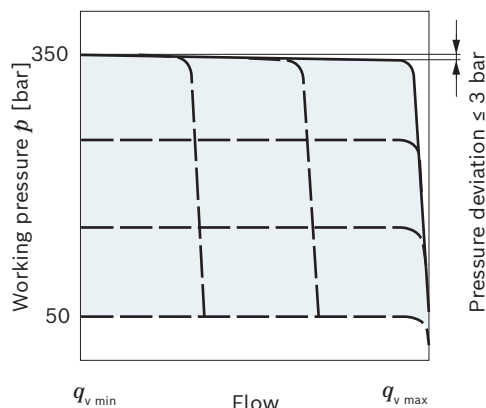


### Pressure and flow controller DFR<sup>1)</sup>

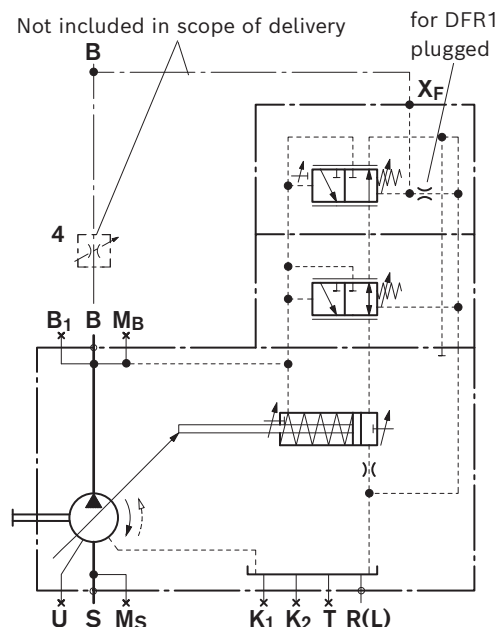
(for further information, see data sheet 92060)

The pressure and flow controller is a combination of the DR pressure controller and FR flow controller.

#### ▼ Characteristic curve



#### Circuit diagram, sample sizes 40 and 71



<sup>1)</sup> In combination with port plate 36, a minimum working pressure of 30 bar is required.

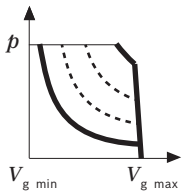
**Power controller LR2 with hyperbolic characteristic curve**  
 (for further information, see data sheet 92064)

The hyperbolic power controller keeps the specified drive power constant at the same drive speed.

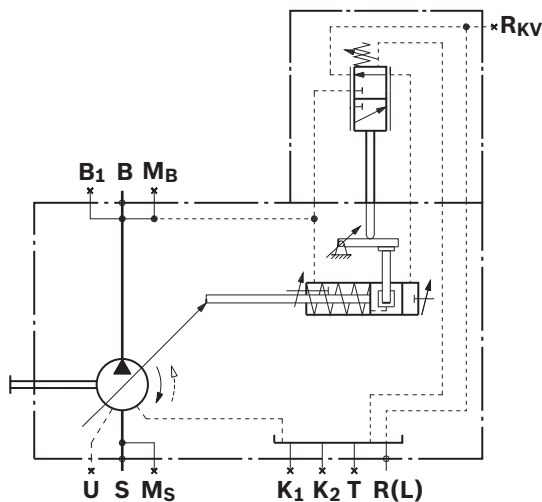
**Optional:**

- ▶ Pressure control (LR2D), remotely controllable (LR2G<sup>1)</sup>);
- ▶ Flow control (LR2F<sup>1)</sup>, LR2S<sup>1)</sup>)
- ▶ Hydraulic stroke limiter (LR2H);
- ▶ Mechanical stroke limiter (LR2Z);
- ▶ Hydraulic two-point control (LR2Z);
- ▶ With electric unloading valve as starting aid (LR2Y).

▼ **Characteristic curve**



▼ **Circuit diagram**



**Power controller LR3 with remotely controllable power characteristic**

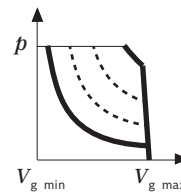
(for further information, see data sheet 92064)

This hyperbolic power controller keeps the specified drive power constant, whereby the power characteristic is adjustable remotely.

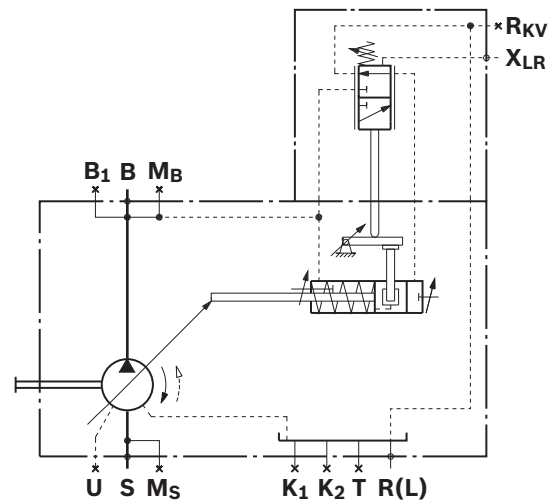
**Optional:**

- ▶ Pressure control (LR3D), remotely controllable (LR3G<sup>1)</sup>);
- ▶ Flow control (LR3F<sup>1)</sup>, LR3S<sup>1)</sup>)
- ▶ Hydraulic stroke limiter (LR3H);
- ▶ Mechanical stroke limiter (LR3Z);
- ▶ Hydraulic two-point control (LR3Z);
- ▶ With electric unloading valve as starting aid (LR3Y).

▼ **Characteristic curve**



▼ **Circuit diagram**



1) In combination with port plate 36, a minimum working pressure of 30 bar is required.

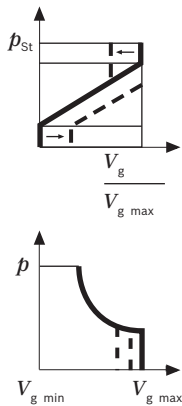
**Hydraulic control LR2N and LR3N pilot-pressure related, basic setting  $V_{g \min}$**   
(for further information, see data sheet 92064)

The displacement is adjusted proportionally to the pilot pressure in  $P_{St}$ .  
The additional hyperbola power controller is superimposed on the pilot pressure signal and keeps the specified drive power constant.

**Optional:**

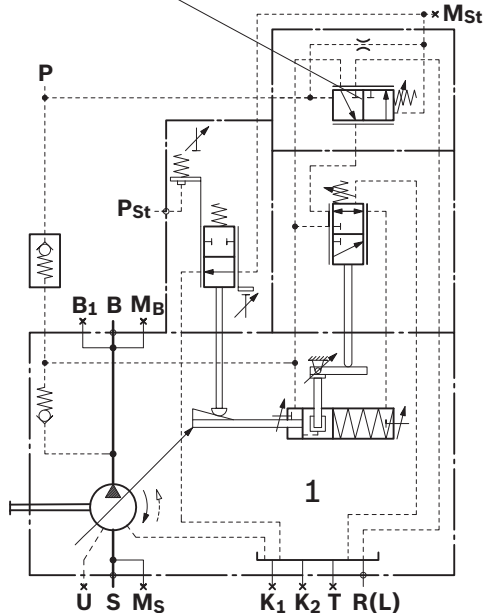
- ▶ Power characteristics, remotely controllable (LR3N)
- ▶ Pressure control (LR.DN),
- ▶ Remote pressure control (LR.GN<sup>1)</sup>)
- ▶ Electrical control of pilot pressure (LR, NT)

▼ **Characteristic curve**



▼ **Circuit diagram**

Shown in switched position, i.e. P pressurized



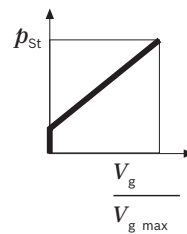
**Hydraulic control HD, pilot-pressure related**  
(for further information, see data sheet 92080)

Stepless setting of the pump displacement according to the pilot pressure. The control is proportional to the specified pilot pressure (difference between pilot pressure and case pressure).

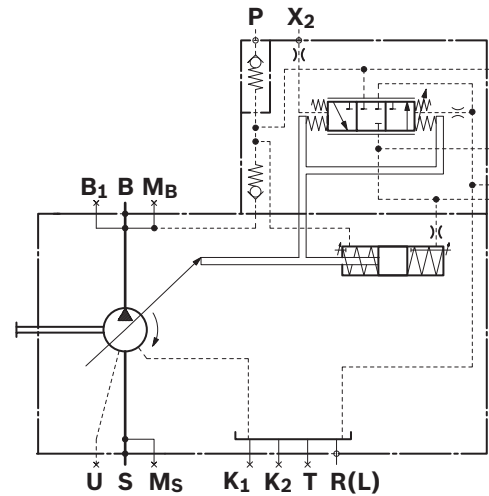
**Optional:**

- ▶ Control characteristics (HD1, HD3)
- ▶ Pressure control (HD.B),
- ▶ Remote pressure control (HD.GB)
- ▶ Power control (HD1P)
- ▶ Electrical control of pilot pressure (HD1T)

▼ **Characteristic curve**



▼ **Circuit diagram**



1) In combination with port plate 36, a minimum working pressure of 30 bar is required.

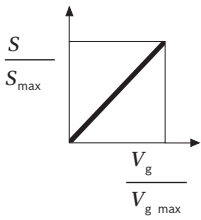
**Electric motor control EM**

(for further information, see data sheet 92072)

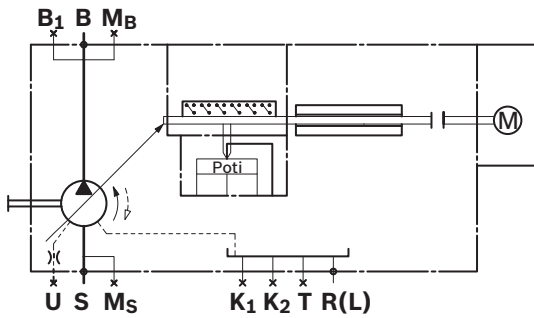
Stepless adjustment of displacement volume by means of the electric motor control EM.

Various intermediate displacement values can be selected with a programmed sequence control by means of built on limit switches and an optional potentiometer for feedback of the swivel angle.

▼ **Characteristic curve**



▼ **Circuit diagram**

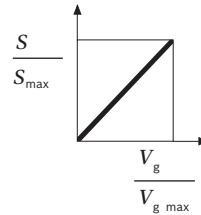


**Manual control MA**

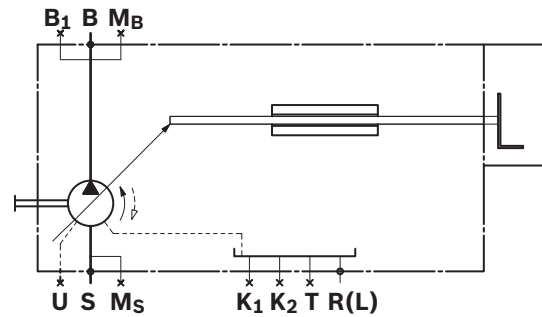
(for further information, see data sheet 92072)

Continuous control of displacement volume by means of a handwheel.

▼ **Characteristic curve**



▼ **Circuit diagram**



### Hydraulic control HM 1/2, volume-dependent

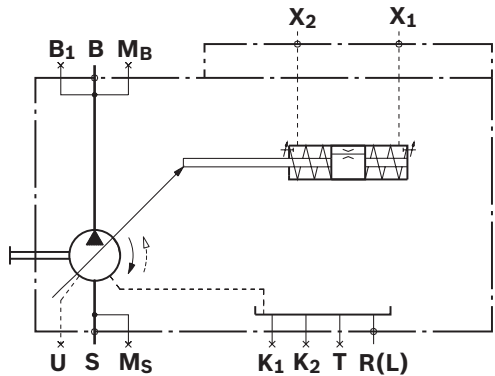
(for further information, see data sheet 92076)

The pump displacement is continuously adjustable depending on the control fluid amount in ports **X<sub>1</sub>** and **X<sub>2</sub>**.

Application:

- 2-point circuit
- Base device for servo or proportional controls

#### ▼ Circuit diagram



### Digital electro-hydraulic pump control system HS5.

(for detailed information see data sheet 92076)

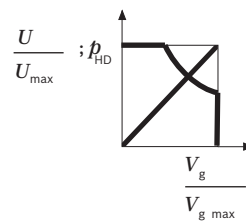
The continuous displacement control is accomplished by means of a proportional valve and electrical feedback of the swivel angle.

The HS5PP control system is equipped with a mounted pressure transducer, which means that it can be used for electric pressure and power control.

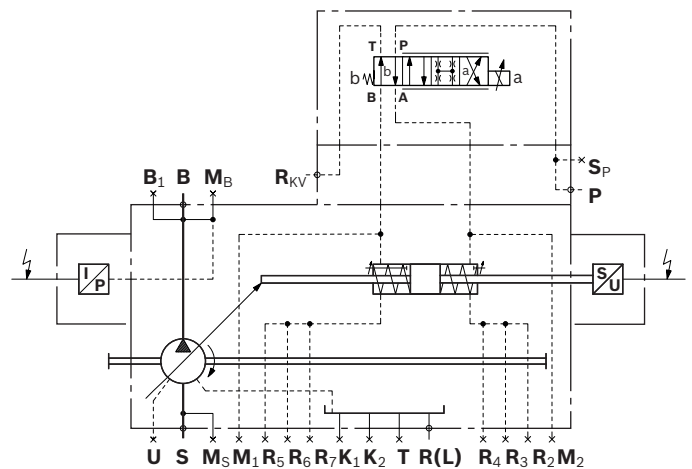
#### Optional:

- ▶ Proportional valve (HS5);
- ▶ Short circuit valve (HSK, HS5K, HS5KP);
- ▶ For the den submerged oil insert (HS5M);
- ▶ With internal control pressure supply (HS5(E)V<sup>1)</sup>);
- ▶ Control system with integrated digital **O**n **B**oard **E**lectronics **O**BE (HS5E).

#### ▼ Characteristic curve



#### ▼ Circuit diagram NG 125 and 180 HS5P

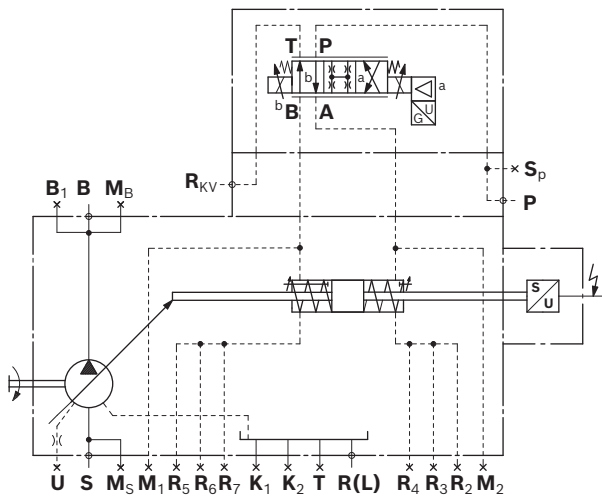


1) In combination with port plate 36, a minimum working pressure of 40 bar is required.

**Customer solution with proportional valve, position transducer HM2C**  
 (for further information, see data sheet 92076)

The HM2C customer solution provides the base unit, sensors and actuators required for a control system. This means that a pump control system can be built up by the end users themselves for electronic volume, pressure and power control. The HM2C can be integrated freely in the control architecture of the plant operator machine with defined standard interfaces.

▼ **Circuit diagram**



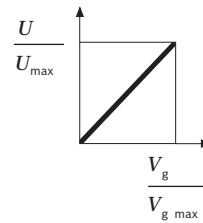
**Analog electro-hydraulic pump control system EO.**  
 (for further information, see data sheet 92076)

The continuous control of the displacement flow is accomplished by means of a proportional valve and electrical feedback of the swivel angle. Thus, the control can be used as an electric displacement control.

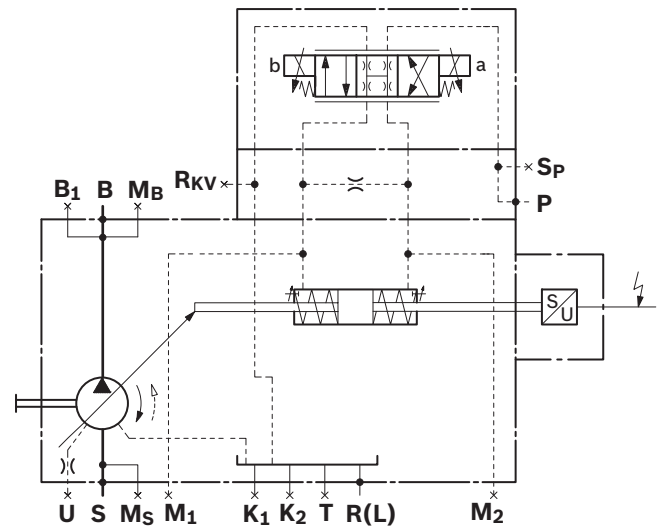
**Optional:**

- ▶ Control pressure range (EO1, EO2)
- ▶ Short circuit valve (EO1K, EO2K)
- ▶ Without valves (EO1E, EO2E)

▼ **Characteristic curve**



▼ **Circuit diagram**



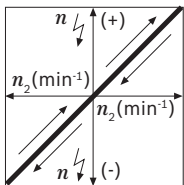
### Secondary controlled rotational speed control DS..

(for further information, see data sheet 92057, 92059)

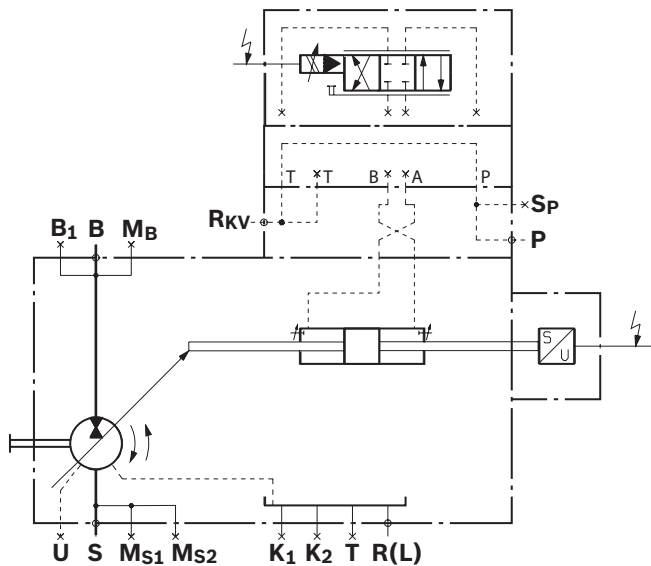
The rotational speed control DS2 and DS3 controls the secondary unit in such a manner, that this motor delivers sufficient torque to maintain the required rotational speed.

- ▶ This torque is
  - in the network with constant pressure
  - proportional to the displacement volume and therefore proportional to the swivel angle.

#### ▼ Characteristic curve



#### ▼ Circuit diagram



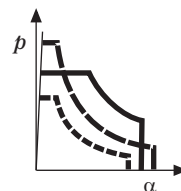
### Electrohydraulic control system DFE1<sup>1)</sup>

(for further information, see data sheet 92088)

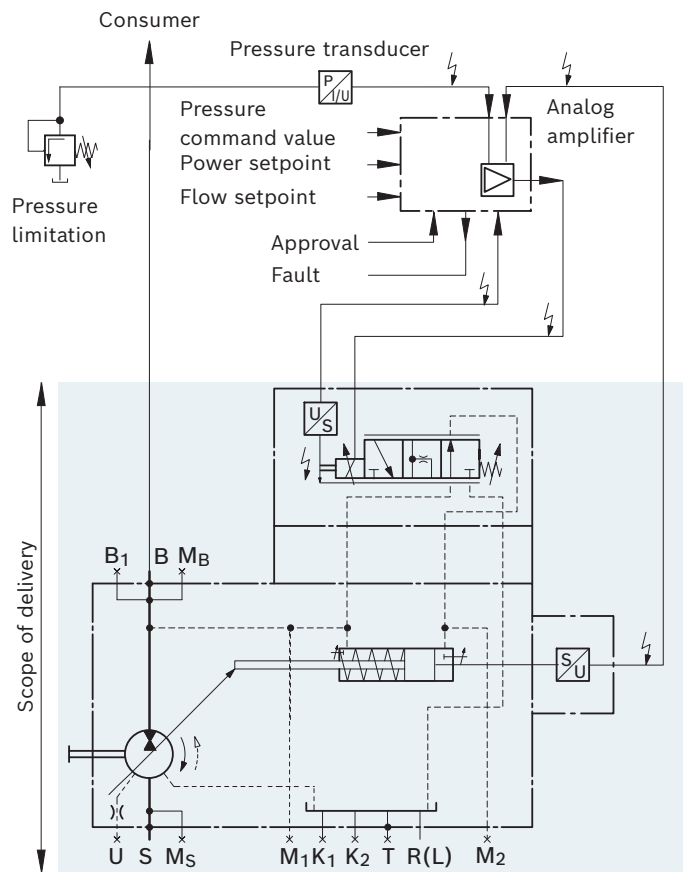
An electrically actuated proportional valve controls the power, pressure and swivel angle of the A4VSO...DFE1 variable pump. The current at the proportional valve determines the position of the swashplate angle and thus the flow of the pump via the stroking piston and the position transducer.

With the electric motor switched off and actuator system depressurized, the pump swivels to maximum displacement ( $V_{g \max}$ ) through spring force.

#### ▼ Characteristic curve



#### ▼ Circuit diagram

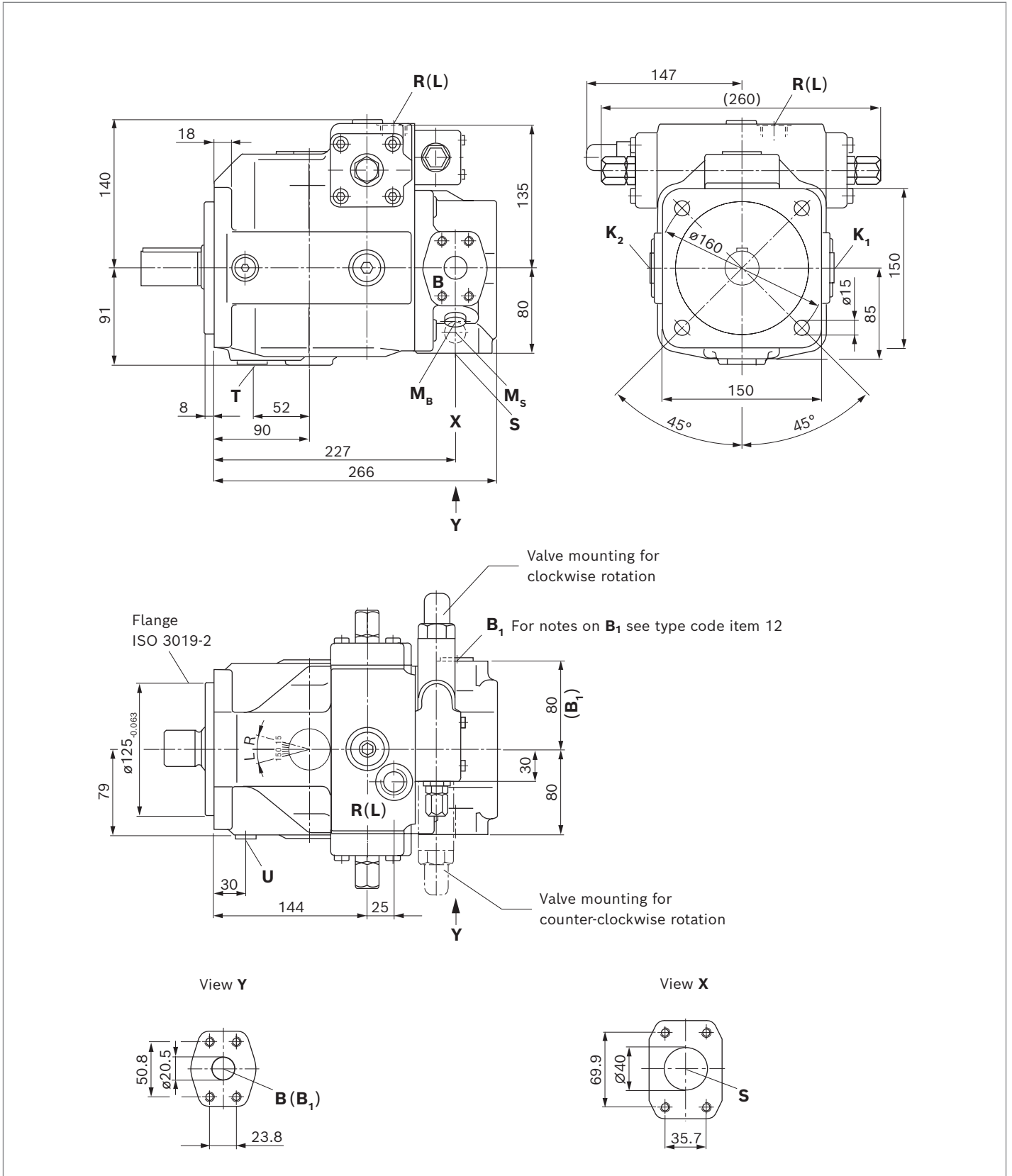


1) In combination with port plate 36, a minimum working pressure of 40 bar is required.

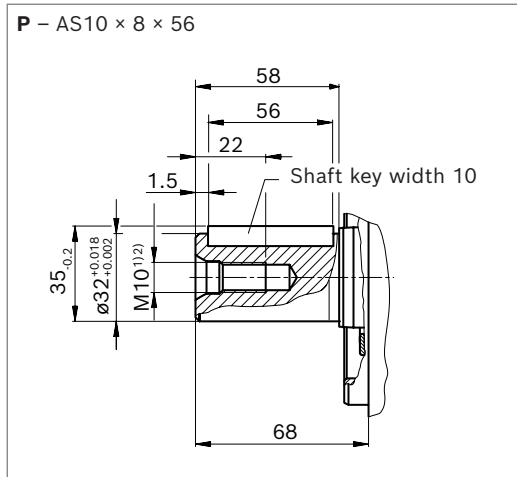


## Dimensions, size 40

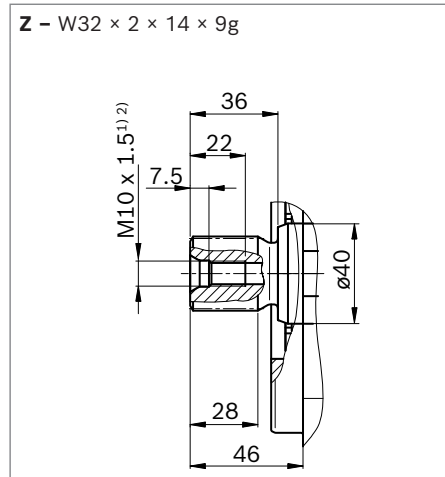
Main dimensions only for the basic unit, further dimensions for the controls are given in the relevant data sheets.



▼ **Parallel keyed shaft DIN 6885**



▼ **Splined shaft DIN 5480**



Ports		Standard	Size	$p_{\max}$ [bar] <sup>(3)</sup>	State <sup>(7)</sup>
<b>S</b>	Suction port (standard pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	1 1/2 in M12 × 1.75; 20 deep	30	O
For port plate version 13					
<b>B</b>	Pressure port (high-pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	3/4 in M10 × 1.5; 17 deep	400	O
<b>B<sub>1</sub></b>	Additional port	DIN 3852	M22 × 1.5; 14 deep	400	X
For port plate version 25					
<b>B</b>	Pressure port (high-pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	3/4 in M10 × 1.5; 17 deep	400	O
<b>B<sub>1</sub></b>	2nd working port (high-pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	3/4 in M10 × 1.5; 17 deep	400	X <sup>(8)</sup>
<b>K<sub>1</sub>, K<sub>2</sub></b>	Flushing port	DIN 3852	M22 × 1.5; 14 deep	6 absolute	X <sup>(6)</sup>
<b>T</b>	Drain port	DIN 3852 <sup>(5)</sup>	M22 × 1.5; 14 deep	6 absolute	X <sup>(6)</sup>
<b>M<sub>B</sub></b>	Measuring port working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
<b>M<sub>S</sub></b>	Measuring port suction pressure	DIN 3852	M14 × 1.5; 12 deep	30	X
<b>R(L)</b>	Drain port	DIN 3852 <sup>(5)</sup>	M22 × 1.5; 14 deep	6 absolute	O <sup>(6)</sup>
<b>U</b>	Flushing port	DIN 3852	M14 × 1.5; 12 deep	6 absolute	X

1) Center bore according to DIN 332

2) Thread according to DIN 13

3) Depending on the application, momentary pressure peaks can occur.  
Keep this in mind when selecting measuring devices and fittings.

4) Metric fastening thread is a deviation from standard.

5) The countersink may be deeper than specified in the standard.

6) Depending on the installation position **T**, **K<sub>1</sub>**, **K<sub>2</sub>** or **R(L)** must be connected (see also installation instructions on pages 75 and 77)

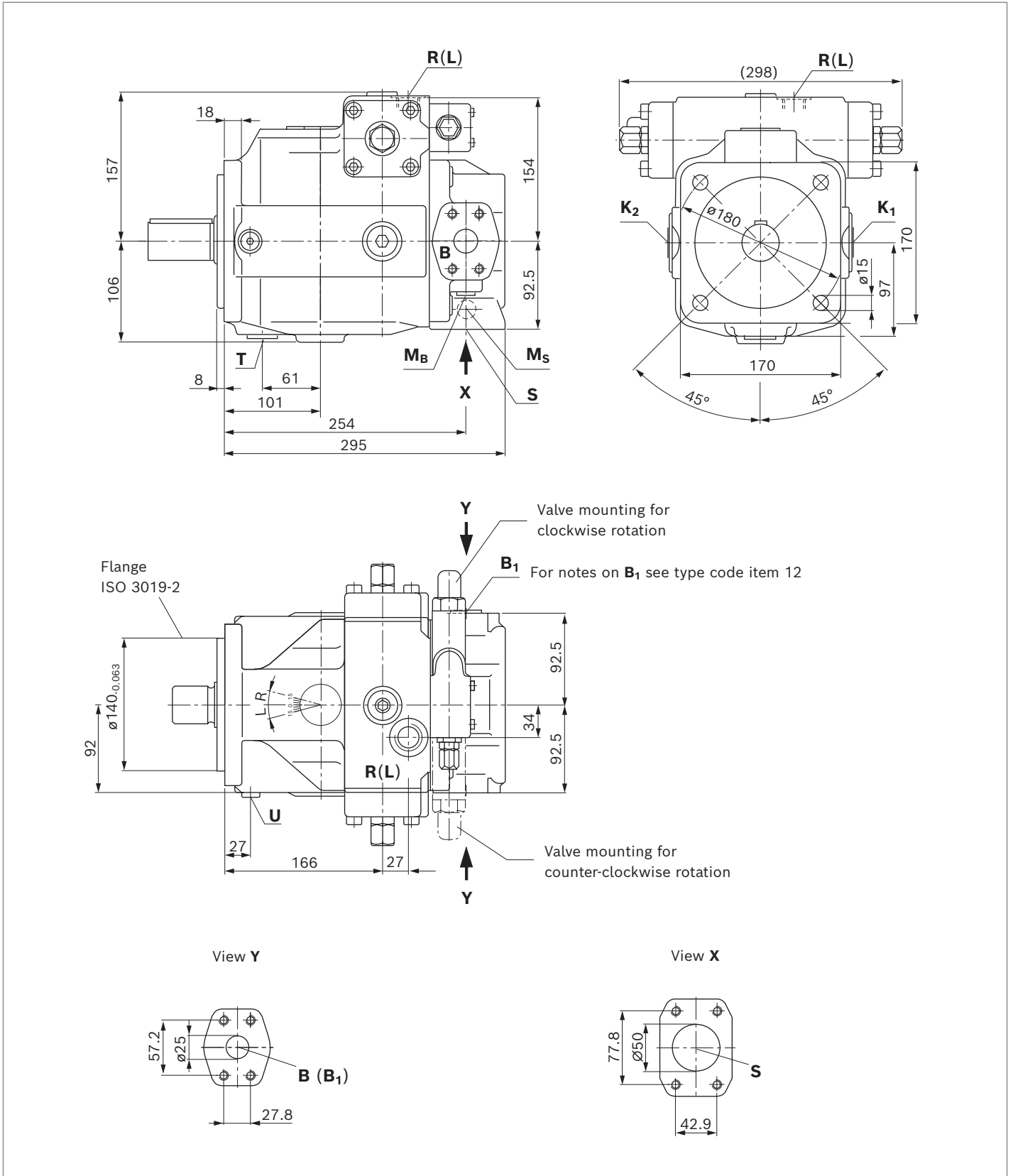
7) O = Must be connected (plugged on delivery)

X = Plugged (in normal operation)

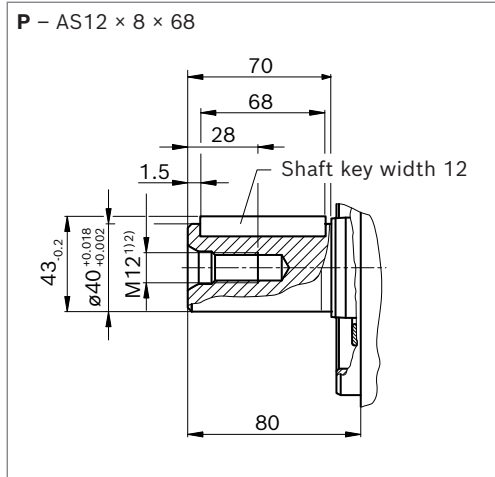
8) Plugged with flange plate

## Dimensions, size 71

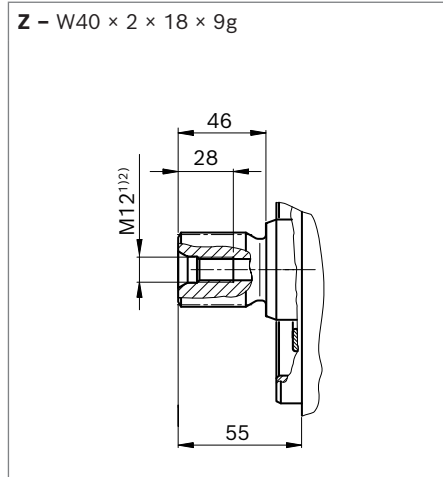
Main dimensions only for the basic unit, further dimensions for the controls are given in the relevant data sheets.



▼ **Parallel keyed shaft DIN 6885**



▼ **Splined shaft DIN 5480**



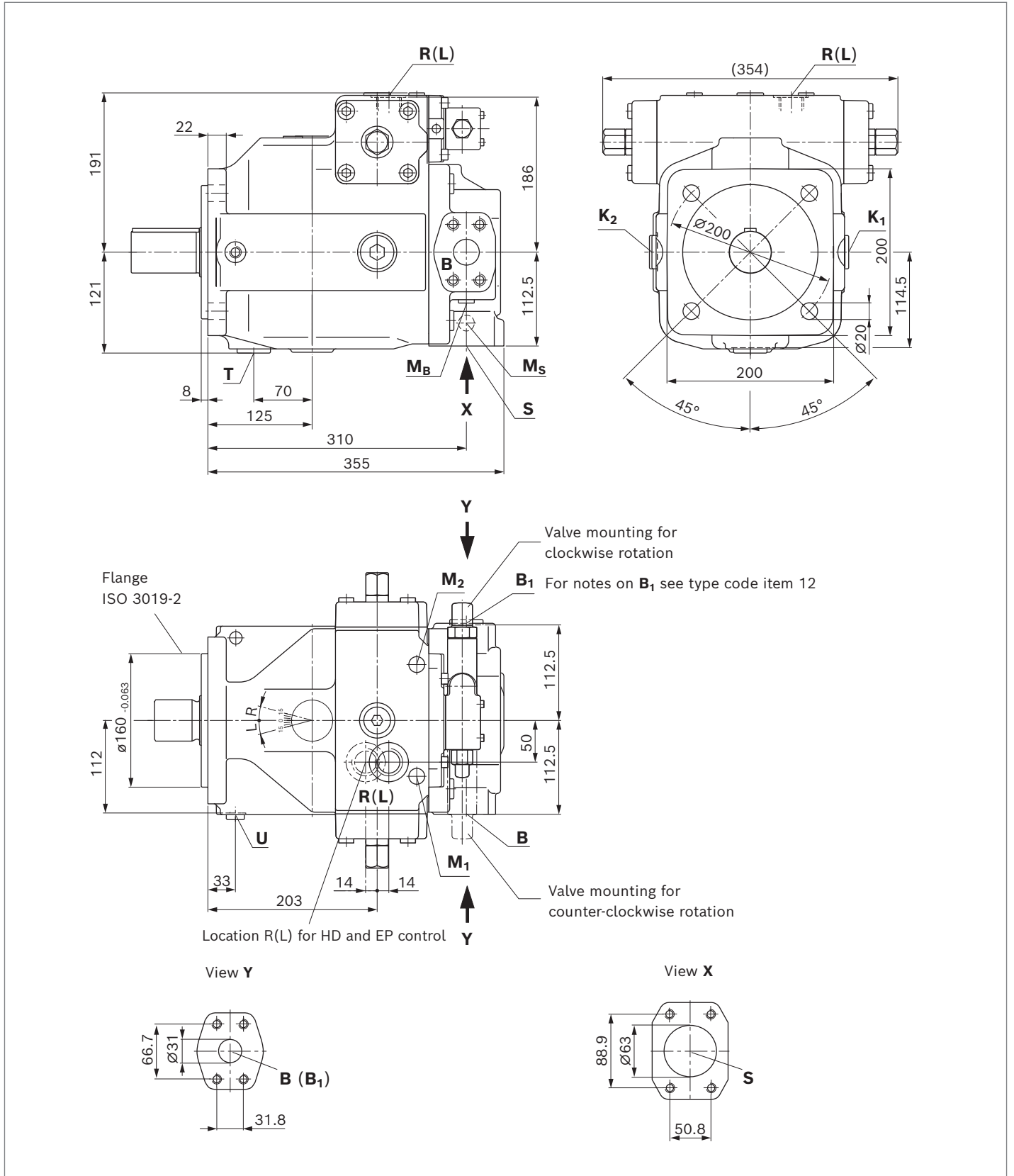
Ports	Standard	Size	$p_{\max}$ [bar] <sup>(3)</sup>	State <sup>(7)</sup>
<b>S</b>	Suction port (standard pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	2 in M12 × 1.75; 20 deep	30 O
For port plate version 13				
<b>B</b>	Pressure port (high-pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	1 in M12 × 1.75; 20 deep	400 O
<b>B<sub>1</sub></b>	Additional port	DIN 3852	M27 × 2; 16 deep	400 X
For port plate version 25				
<b>B</b>	Pressure port (high-pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	1 in M12 × 1.75; 20 deep	400 O
<b>B<sub>1</sub></b>	2nd working port (high-pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	1 in M12 × 1.75; 20 deep	400 X <sup>(8)</sup>
<b>K<sub>1</sub>, K<sub>2</sub></b>	Flushing port	DIN 3852 <sup>(5)</sup>	M27 × 2; 16 deep	6 absolute X <sup>(6)</sup>
<b>T</b>	Drain port	DIN 3852 <sup>(5)</sup>	M27 × 2; 16 deep	6 absolute X <sup>(6)</sup>
<b>M<sub>B</sub></b>	Measuring port working pressure	DIN 3852 <sup>(5)</sup>	M14 × 1.5; 12 deep	400 X
<b>M<sub>S</sub></b>	Measuring port suction pressure	DIN 3852 <sup>(5)</sup>	M14 × 1.5; 12 deep	30 X
<b>R(L)</b>	Drain port	DIN 3852 <sup>(5)</sup>	M27 × 2; 16 deep	6 absolute O <sup>(6)</sup>
<b>U</b>	Flushing port	DIN 3852 <sup>(5)</sup>	M14 × 1.5; 12 deep	6 absolute X

1) Center bore according to DIN 332  
 2) Thread according to DIN 13  
 3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.  
 4) Metric fastening thread is a deviation from standard.  
 5) The countersink may be deeper than specified in the standard.

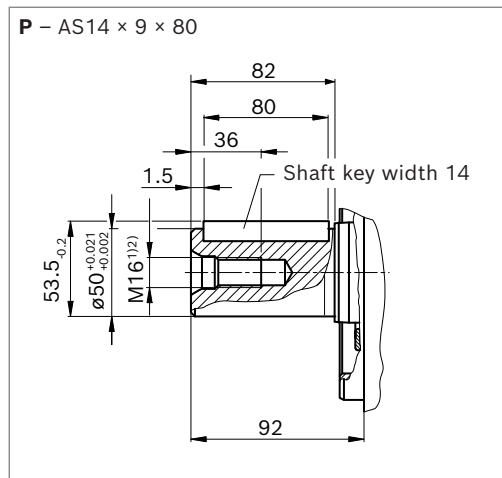
6) Depending on the installation position **T**, **K<sub>1</sub>**, **K<sub>2</sub>** or **R(L)** must be connected (see also installation instructions on pages 75 and 77)  
 7) O = Must be connected (plugged on delivery)  
 X = Plugged (in normal operation)  
 8) Plugged with flange plate

## Dimensions, size 125

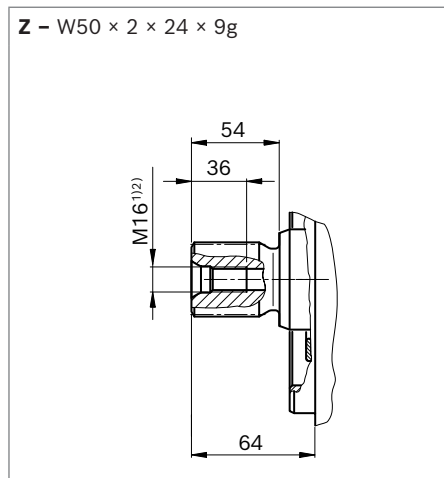
Main dimensions only for the basic unit, further dimensions for the controls are given in the relevant data sheets.



▼ **Parallel keyed shaft DIN 6885**



▼ **Splined shaft DIN 5480**



Ports	Standard	Size	$p_{\max}$ [bar] <sup>(3)</sup>	State <sup>(7)</sup>
<b>S</b>	Suction port (standard pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	2 1/2 in M12 × 1.75; 18 deep	30 O
For port plate version 13				
<b>B</b>	Pressure port (high-pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	1 1/4 in M14 × 2; 19 deep	400 O
<b>B<sub>1</sub></b>	Additional port	DIN 3852	M33 × 2; 18 deep	400 X
For port plate version 25				
<b>B</b>	Pressure port (high-pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	1 1/4 in M14 × 2; 19 deep	400 O
<b>B<sub>1</sub></b>	2nd working port (high-pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	1 1/4 in M14 × 2; 19 deep	400 X <sup>(8)</sup>
<b>K<sub>1</sub>, K<sub>2</sub></b>	Flushing port	DIN 3852 <sup>(5)</sup>	M33 × 2; 18 deep	6 absolute X <sup>(6)</sup>
<b>T</b>	Drain port	DIN 3852 <sup>(5)</sup>	M33 × 2; 18 deep	6 absolute X <sup>(6)</sup>
<b>M<sub>B</sub></b>	Measuring port working pressure	DIN 3852 <sup>(5)</sup>	M14 × 1.5; 12 deep	400 X
<b>M<sub>S</sub></b>	Measuring port suction pressure	DIN 3852 <sup>(5)</sup>	M14 × 1.5; 12 deep	30 X
<b>R(L)</b>	Drain port	DIN 3852 <sup>(5)</sup>	M33 × 2; 18 deep	6 absolute O <sup>(6)</sup>
<b>U</b>	Flushing port	DIN 3852 <sup>(5)</sup>	M14 × 1.5; 12 deep	6 absolute X

1) Center bore according to DIN 332

2) Thread according to DIN 13

3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

4) Metric fastening thread is a deviation from standard.

5) The countersink may be deeper than specified in the standard.

6) Depending on the installation position **T**, **K<sub>1</sub>**, **K<sub>2</sub>** or **R(L)** must be connected (see also installation instructions on pages 75 and 77)

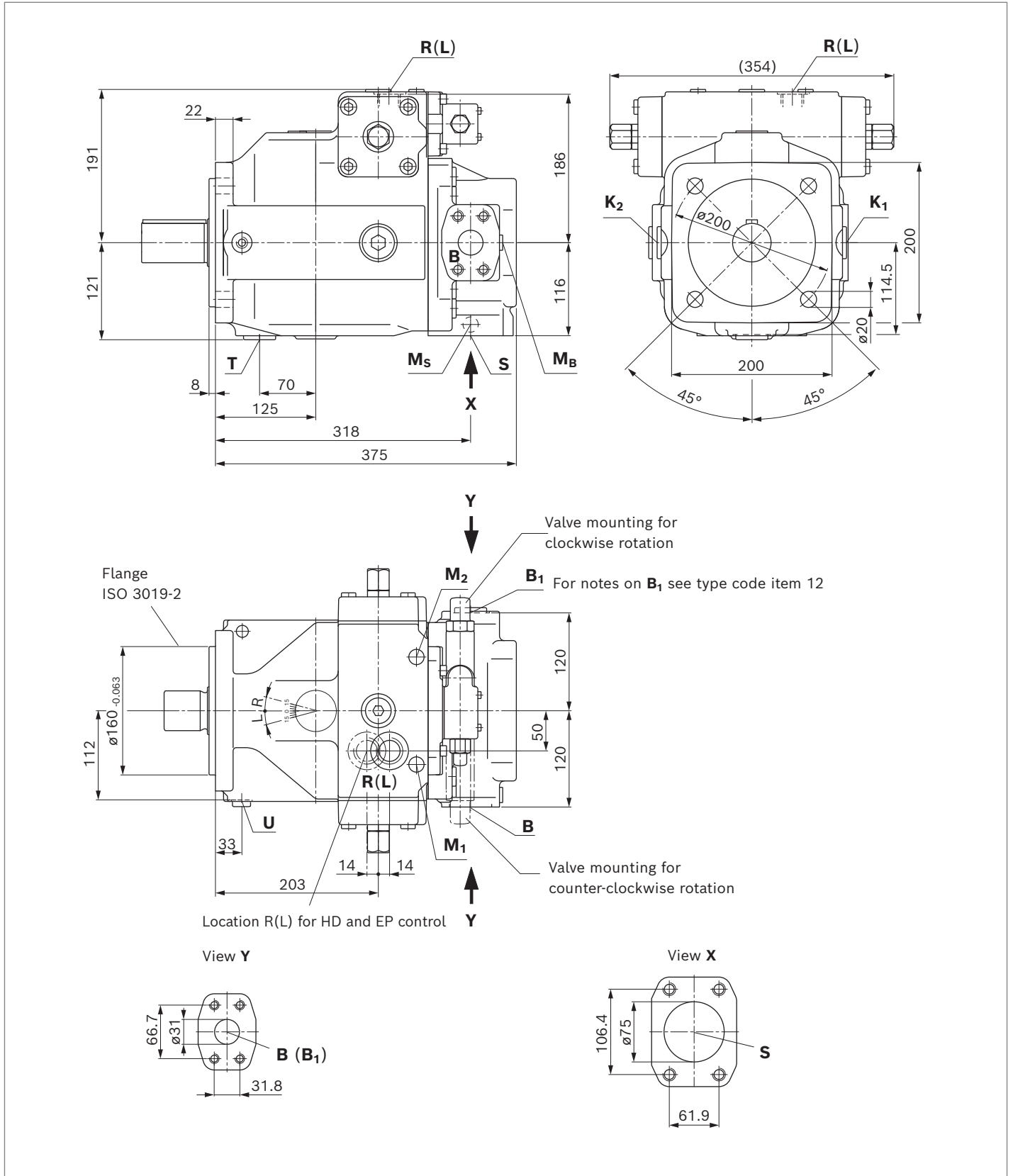
7) O = Must be connected (plugged on delivery)

X = Plugged (in normal operation)

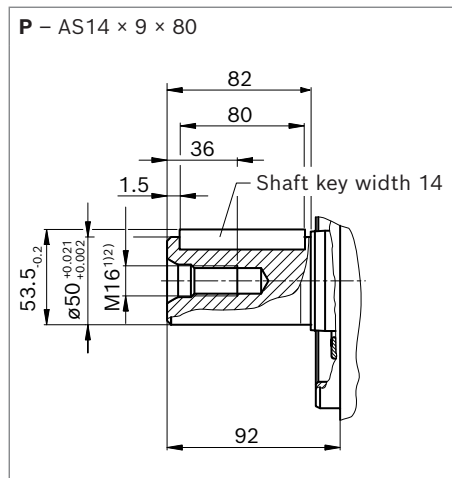
8) Plugged with flange plate

## Dimensions, size 180

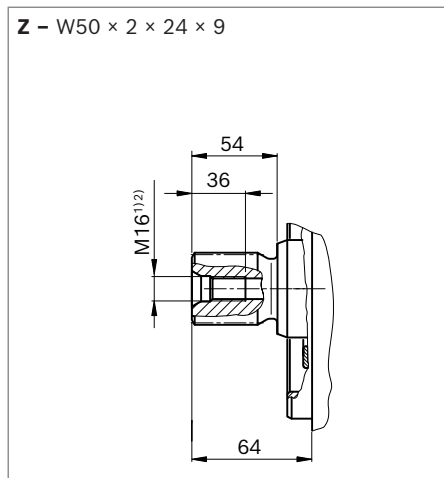
Main dimensions only for the basic unit, further dimensions for the controls are given in the relevant data sheets.



▼ **Parallel keyed shaft, DIN 6885**



▼ **Splined shaft DIN 5480**



Ports		Standard	Size	$p_{\max}$ [bar] <sup>(3)</sup>	State <sup>(7)</sup>
<b>S</b>	Suction port (standard pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	3 in M16 × 2; 24 deep	30	O
For port plate version 13					
<b>B</b>	Pressure port (high-pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	1 1/4 in M14 × 2; 19 deep	400	O
<b>B<sub>1</sub></b>	Additional port	DIN 3852	M33 × 2; 18 deep	400	X
For port plate version 25					
<b>B</b>	Pressure port (high-pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	1 1/4 in M14 × 2; 19 deep	400	O
<b>B<sub>1</sub></b>	2nd working port (high-pressure series) Fastening thread	SAE J518 <sup>(4)</sup> DIN 13	1 1/4 in M14 × 2; 19 deep	400	X <sup>(8)</sup>
<b>K<sub>1</sub>, K<sub>2</sub></b>	Flushing port	DIN 3852 <sup>(5)</sup>	M33 × 2; 18 deep	6 absolute	X <sup>(6)</sup>
<b>T</b>	Drain port	DIN 3852 <sup>(5)</sup>	M33 × 2; 18 deep	6 absolute	X <sup>(6)</sup>
<b>M<sub>B</sub></b>	Measuring port working pressure	DIN 3852 <sup>(5)</sup>	M14 × 1.5; 12 deep	400	X
<b>M<sub>S</sub></b>	Measuring port suction pressure	DIN 3852 <sup>(5)</sup>	M14 × 1.5; 12 deep	30	X
<b>R(L)</b>	Drain port	DIN 3852 <sup>(5)</sup>	M33 × 2; 18 deep	6 absolute	O <sup>(6)</sup>
<b>U</b>	Flushing port	DIN 3852 <sup>(5)</sup>	M14 × 1.5; 12 deep	6 absolute	X
<b>M<sub>1</sub>, M<sub>2</sub></b>	Measuring port (stroking chamber pressure)	DIN 3852 <sup>(5)</sup>	M14 × 1.5; 12 deep	400	X

1) Center bore according to DIN 332

2) Thread according to DIN 13

3) Depending on the application, momentary pressure peaks can occur.  
Keep this in mind when selecting measuring devices and fittings.

4) Metric fastening thread is a deviation from standard.

5) The countersink may be deeper than specified in the standard.

6) Depending on the installation position **T**, **K<sub>1</sub>**, **K<sub>2</sub>** or **R(L)** must be connected (see also installation instructions on pages 75 and 77)

7) O = Must be connected (plugged on delivery)

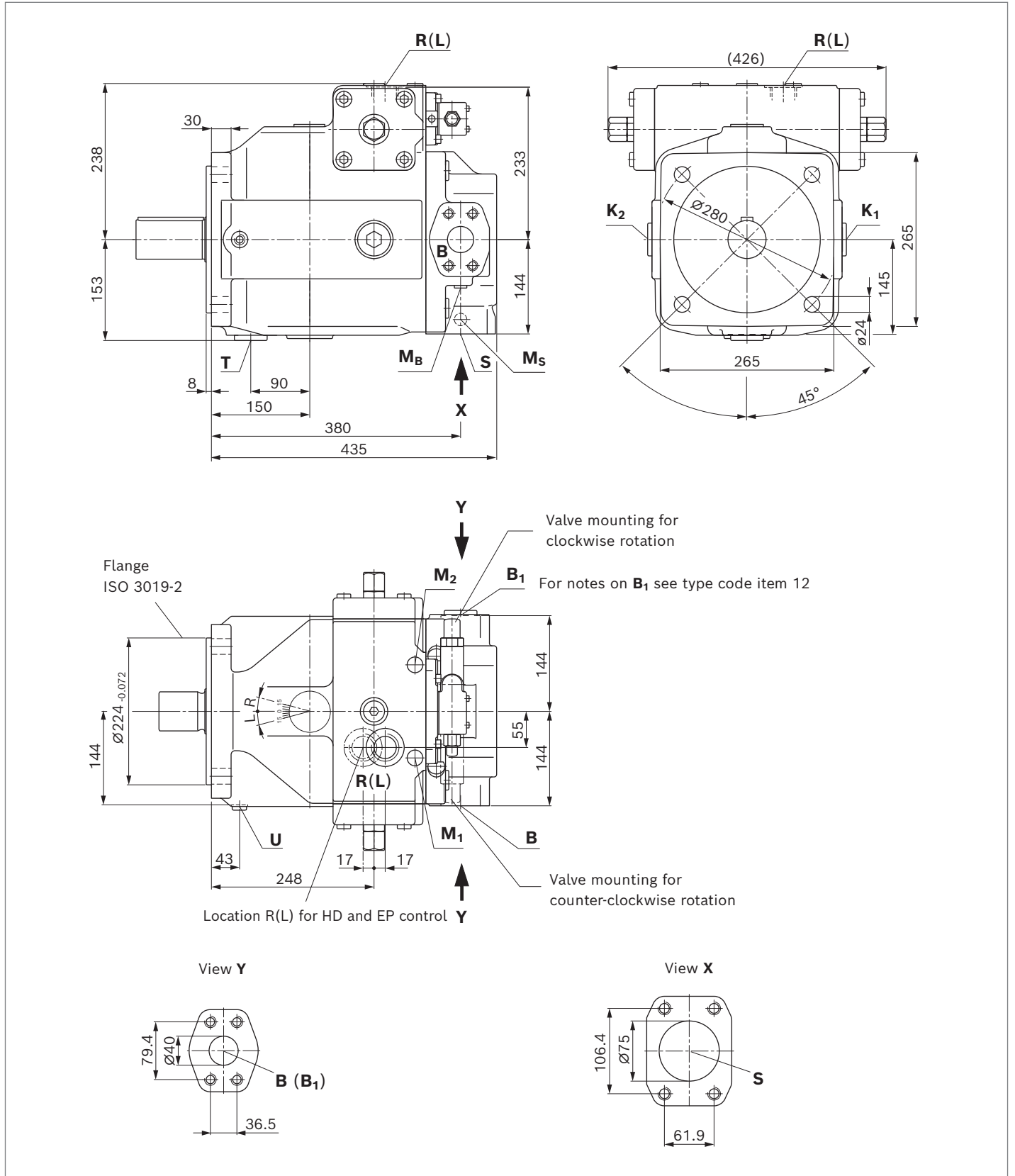
X = Plugged (in normal operation)

8) Plugged with flange plate

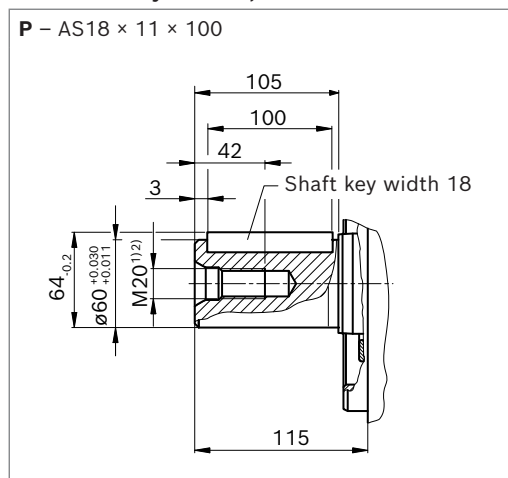


### Dimensions, size 250

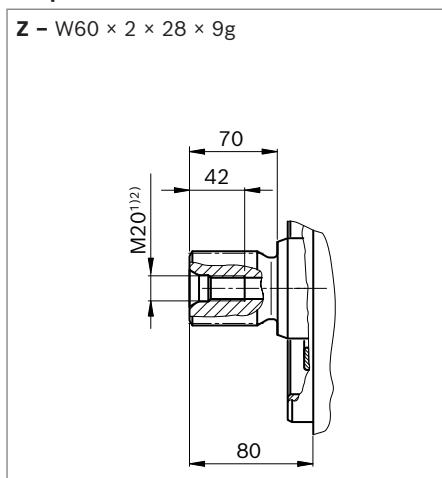
Main dimensions only for the basic unit, further dimensions for the controls are given in the relevant data sheets.



▼ **Parallel keyed shaft, DIN 6885**



▼ **Splined shaft DIN 5480**



Ports		Standard	Size	$p_{\max}$ [bar] <sup>3)</sup>	State <sup>7)</sup>
<b>S</b>	Suction port (standard pressure series) Fastening thread	SAE J518 <sup>4)</sup> DIN 13	3 in M16 × 2; 24 deep	30	O
For port plate version 13					
<b>B</b>	Pressure port (high-pressure series) Fastening thread	SAE J518 <sup>4)</sup> DIN 13	1 1/2 in M16 × 2; 25 deep	400	O
<b>B<sub>1</sub></b>	Additional port	DIN 3852	M42 × 2; 20 deep	400	X
For port plate version 25					
<b>B</b>	Pressure port (high-pressure series) Fastening thread	SAE J518 <sup>4)</sup> DIN 13	1 1/2 in M16 × 2; 25 deep	400	O
<b>B<sub>1</sub></b>	2nd working port (high-pressure series) Fastening thread	SAE J518 <sup>4)</sup> DIN 13	1 1/2 in M16 × 2; 25 deep	400	X <sup>8)</sup>
<b>K<sub>1</sub>, K<sub>2</sub></b>	Flushing port	DIN 3852 <sup>5)</sup>	M42 × 2; 20 deep	6 absolute	X <sup>6)</sup>
<b>T</b>	Drain port	DIN 3852 <sup>5)</sup>	M42 × 2; 20 deep	6 absolute	X <sup>6)</sup>
<b>M<sub>B</sub></b>	Measuring port working pressure	DIN 3852 <sup>5)</sup>	M14 × 1.5; 12 deep	400	X
<b>M<sub>S</sub></b>	Measuring port suction pressure	DIN 3852 <sup>5)</sup>	M14 × 1.5; 12 deep	30	X
<b>R(L)</b>	Drain port	DIN 3852 <sup>5)</sup>	M42 × 2; 20 deep	6 absolute	O <sup>6)</sup>
<b>U</b>	Flushing port	DIN 3852 <sup>5)</sup>	M14 × 1.5; 12 deep	6 absolute	X
<b>M<sub>1</sub>, M<sub>2</sub></b>	Measuring port (stroking chamber pressure)	DIN 3852 <sup>5)</sup>	M18 × 1.5; 12 deep	400	X

1) Center bore according to DIN 332

2) Thread according to DIN 13

3) Depending on the application, momentary pressure peaks can occur.  
Keep this in mind when selecting measuring devices and fittings.

4) Metric fastening thread is a deviation from standard.

5) The countersink may be deeper than specified in the standard.

6) Depending on the installation position **T**, **K<sub>1</sub>**, **K<sub>2</sub>** or **R(L)** must be connected (see also installation instructions on pages 75 and 77)

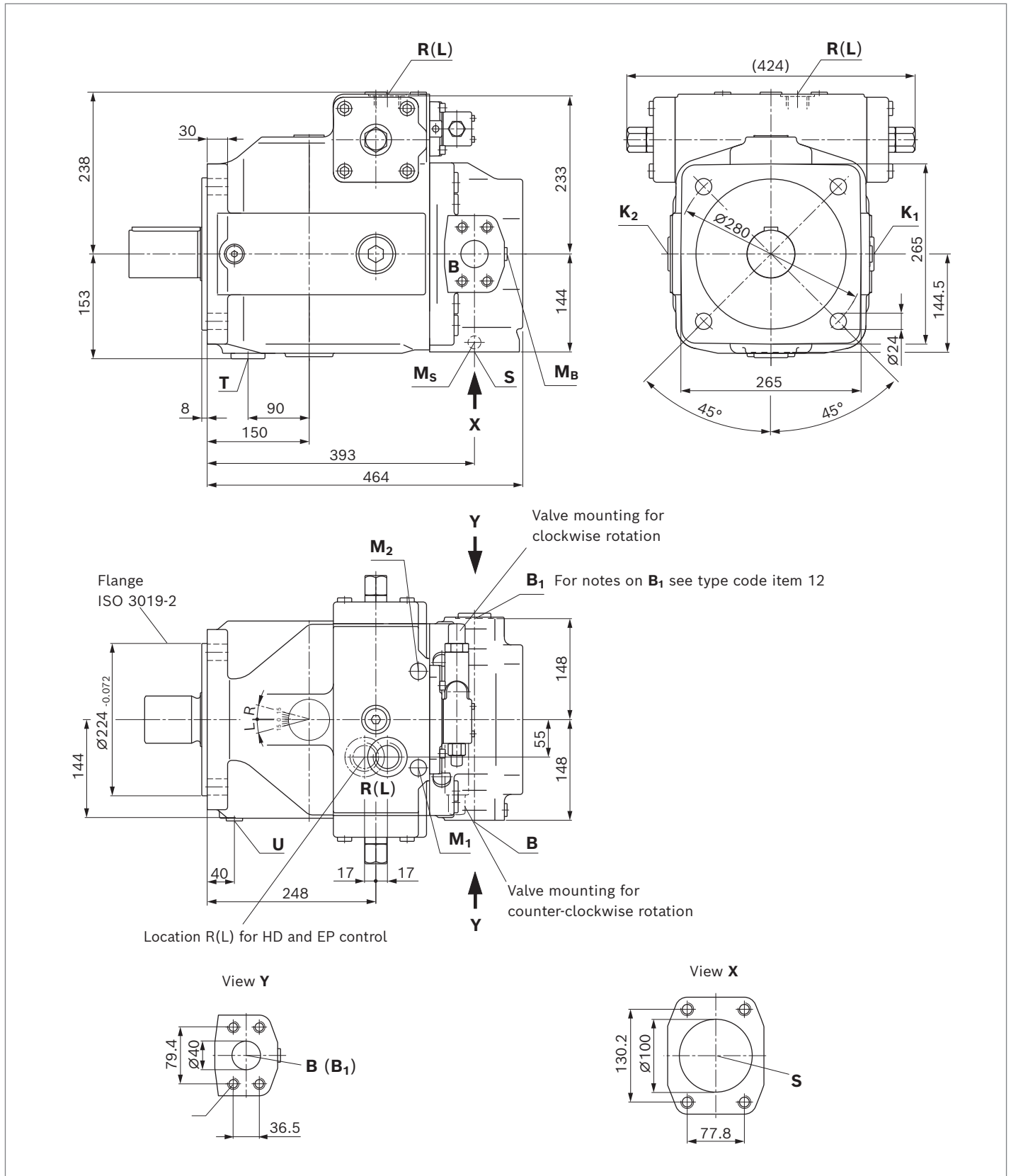
7) O = Must be connected (plugged on delivery)

X = Plugged (in normal operation)

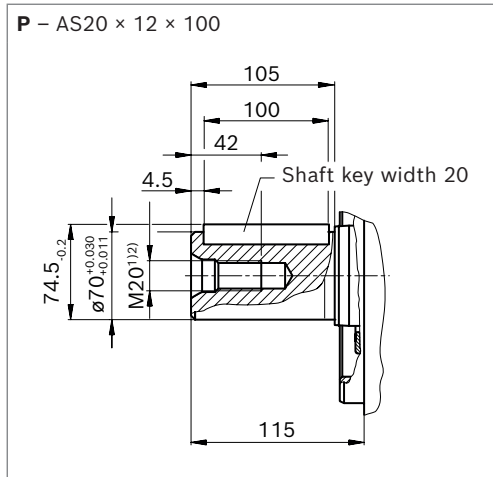
8) Plugged with flange plate

**Dimensions size 355 and size 370**

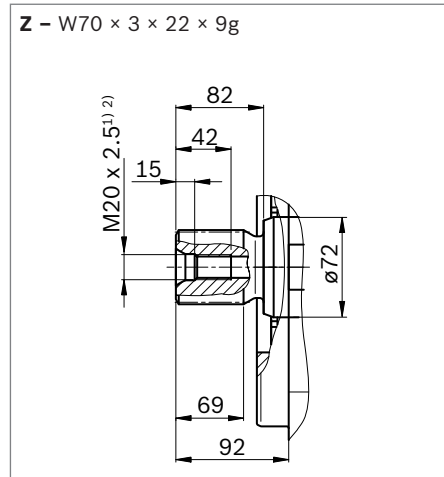
**Main dimensions only for the basic unit, further dimensions for the controls are given in the relevant data sheets.**



▼ **Parallel keyed shaft DIN 6885**



▼ **Splined shaft DIN 5480**



Ports		Standard	Size	$p_{\max}$ [bar] <sup>3)</sup>	State <sup>7)</sup>
<b>S</b>	Suction port (standard pressure series) Fastening thread	SAE J518 <sup>4)</sup> DIN 13	4 in M16 × 2; 24 deep	30	O
For port plate version 13					
<b>B</b>	Pressure port (high-pressure series) Fastening thread	SAE J518 <sup>4)</sup> DIN 13	1 1/2 in M16 × 2; 25 deep	400	O
<b>B<sub>1</sub></b>	Additional port	DIN 3852	M42 × 2; 20 deep	400	X
For port plate version 25					
<b>B</b>	Pressure port (high-pressure series) Fastening thread	SAE J518 <sup>4)</sup> DIN 13	1 1/2 in M16 × 2; 25 deep	400	O
<b>B<sub>1</sub></b>	2nd working port (high-pressure series) Fastening thread	SAE J518 <sup>4)</sup> DIN 13	1 1/2 in M16 × 2; 25 deep	400	X <sup>8)</sup>
For port plate version 36					
<b>B</b>	Pressure port (high-pressure series) Fastening thread	SAE J518 <sup>4)</sup> DIN 13	1 1/2 in M16 × 2; 25 deep	420	O
<b>B<sub>1</sub></b>	2nd working port (high-pressure series) Fastening thread	SAE J518 <sup>4)</sup> DIN 13	1 1/2 in M16 × 2; 25 deep	420	X <sup>8)</sup>
<b>K<sub>1</sub>, K<sub>2</sub></b>	Flushing port	DIN 3852 <sup>5)</sup>	M42 × 2; 20 deep	6 absolute	X <sup>6)</sup>
<b>T</b>	Drain port	DIN 3852 <sup>5)</sup>	M42 × 2; 20 deep	6 absolute	X <sup>6)</sup>
<b>M<sub>B</sub></b>	Measuring port working pressure	DIN 3852 <sup>5)</sup>	M14 × 1.5; 12 deep	400	X
<b>M<sub>S</sub></b>	Measuring port suction pressure	DIN 3852 <sup>5)</sup>	M14 × 1.5; 12 deep	30	X
<b>R(L)</b>	Drain port	DIN 3852 <sup>5)</sup>	M42 × 2; 20 deep	6 absolute	O <sup>6)</sup>
<b>U</b>	Flushing port	DIN 3852 <sup>5)</sup>	M18 × 1.5; 12 deep	6 absolute	X
<b>M<sub>1</sub>, M<sub>2</sub></b>	Measuring port (stroking chamber pressure)	DIN 3852	M18 × 1.5; 12 deep	400	X

1) Center bore according to DIN 332

2) Thread according to DIN 13

3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

4) Metric fastening thread is a deviation from standard.

5) The countersink may be deeper than specified in the standard.

6) Depending on the installation position **T**, **K<sub>1</sub>**, **K<sub>2</sub>** or **R(L)** must be connected (see also installation instructions on pages 75 and 77)

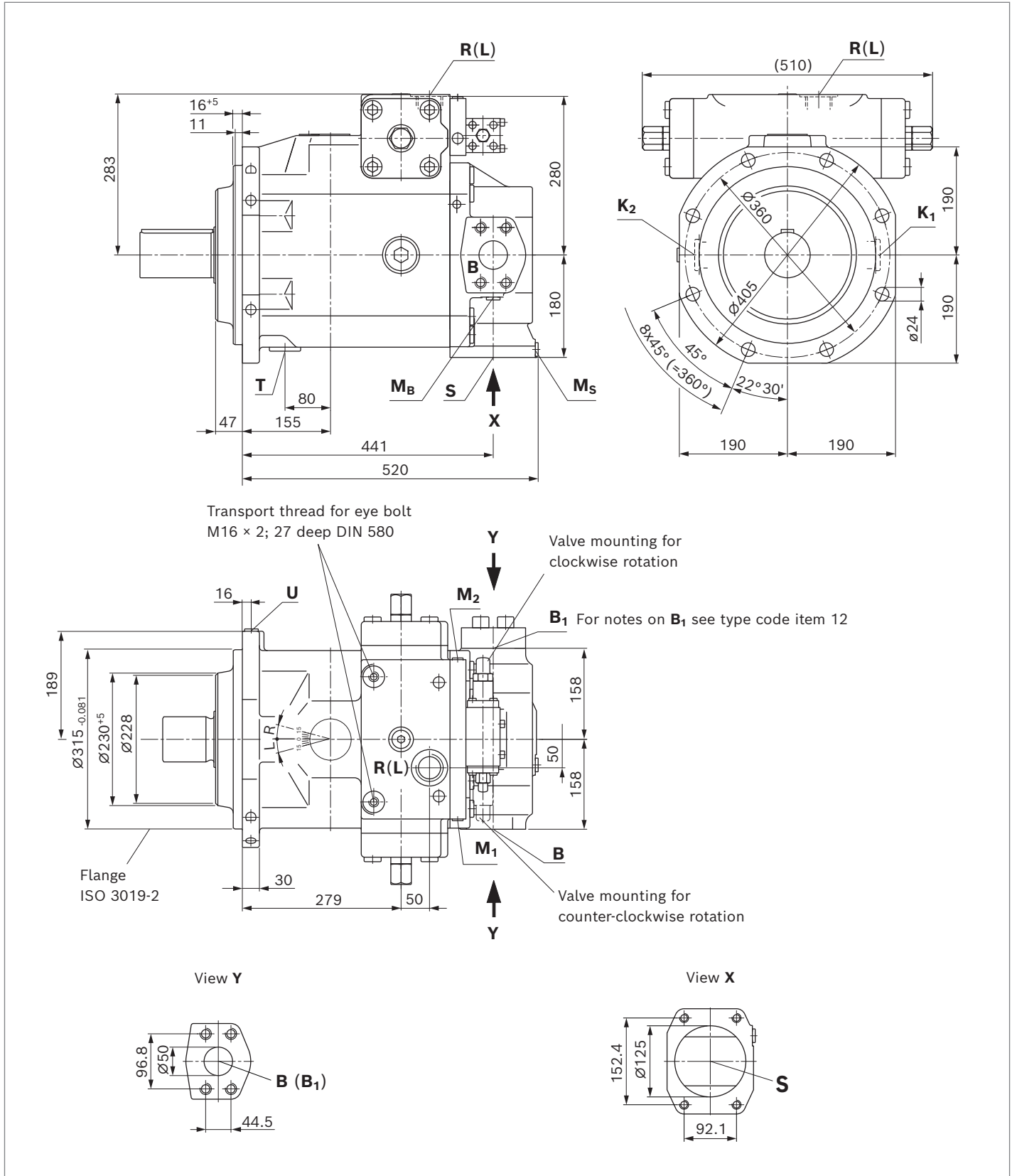
7) O = Must be connected (plugged on delivery)

X = Plugged (in normal operation)

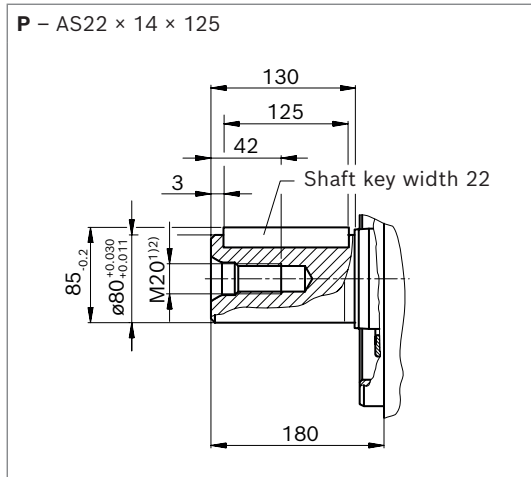
8) Plugged with flange plate

**Dimensions, size 500**

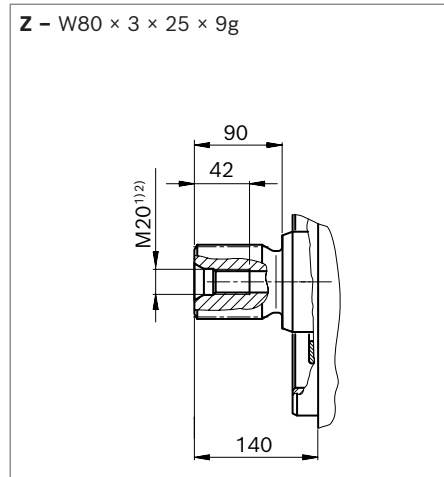
Main dimensions only for the basic unit, further dimensions for the controls are given in the relevant data sheets.



▼ **Parallel keyed shaft DIN 6885**



▼ **Splined shaft DIN 5480**



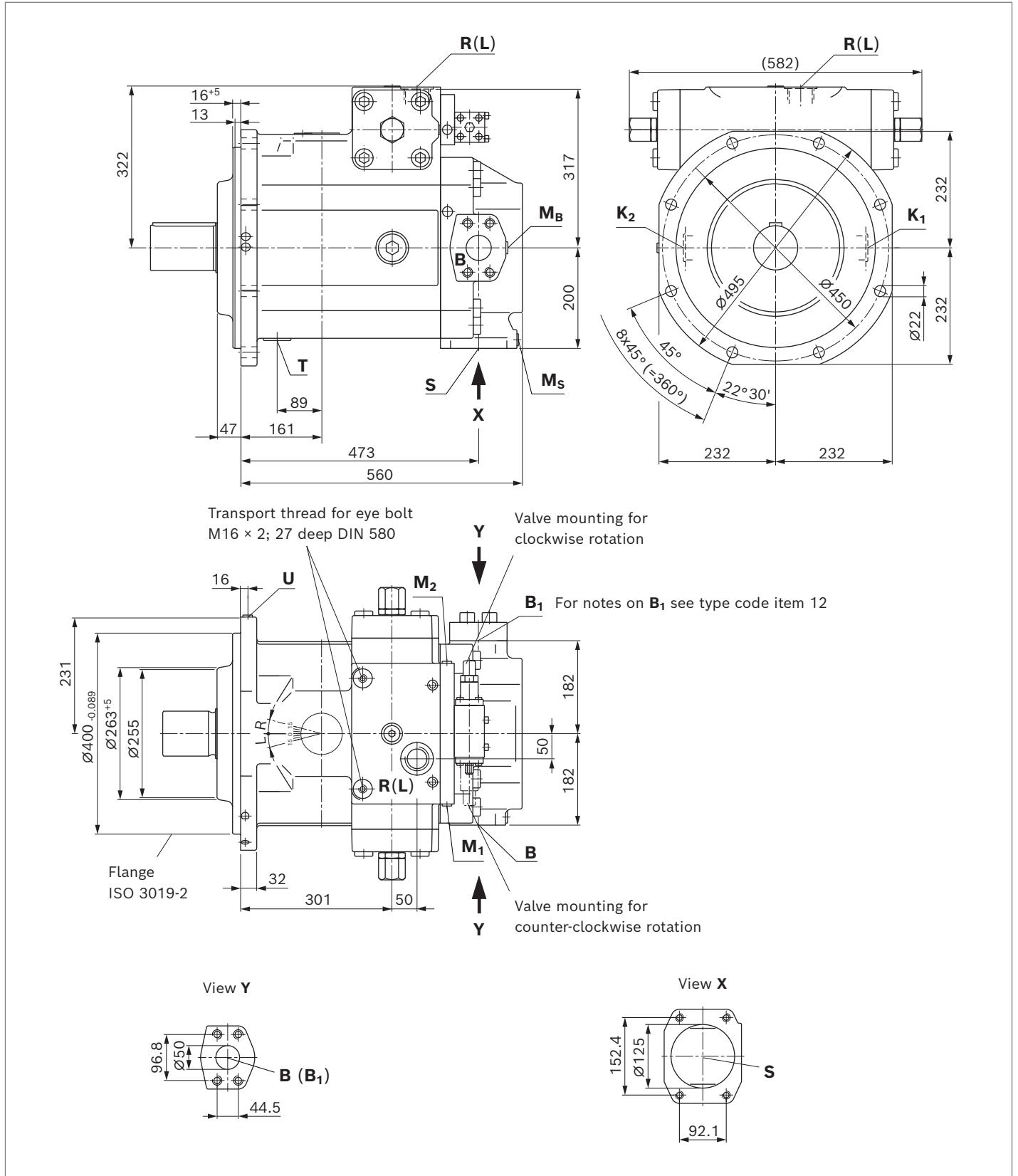
Ports		Standard	Size	$p_{\max}$ [bar] <sup>3)</sup>	State <sup>7)</sup>
<b>S</b>	Suction port (standard pressure series) Fastening thread	SAE J518 <sup>4)</sup> DIN 13	5 in M16 × 2; 24 deep	30	O
For port plate version 25					
<b>B</b>	Pressure port (high-pressure series) Fastening thread	SAE J518 <sup>4)</sup> DIN 13	2 in M20 × 2.5; 25 deep	400	O
<b>B<sub>1</sub></b>	2nd working port (high-pressure series) Fastening thread	SAE J518 <sup>4)</sup> DIN 13	2 in M20 × 2.5; 24 deep	400	X <sup>8)</sup>
<b>K<sub>1</sub>, K<sub>2</sub></b>	Flushing port	DIN 3852	M48 × 2; 22 deep	6 absolute	X <sup>6)</sup>
<b>T</b>	Drain port	DIN 3852 <sup>5)</sup>	M48 × 2; 22 deep	6 absolute	X <sup>6)</sup>
<b>M<sub>B</sub></b>	Measuring port working pressure	DIN 3852	M18 × 1.5; 12 deep	400	X
<b>M<sub>S</sub></b>	Measuring port suction pressure	DIN 3852	M18 × 1.5; 12 deep	30	X
<b>R(L)</b>	Drain port	DIN 3852 <sup>5)</sup>	M48 × 2; 22 deep	6 absolute	O <sup>6)</sup>
<b>U</b>	Flushing port	DIN 3852	M18 × 1.5; 12 deep	6 absolute	X
<b>M<sub>1</sub>, M<sub>2</sub></b>	Measuring port (stroking chamber pressure)	DIN 3852	See data sheet of the respective control devices	400	X

1) Center bore according to DIN 332  
 2) Thread according to DIN 13  
 3) Depending on the application, momentary pressure peaks can occur.  
 Keep this in mind when selecting measuring devices and fittings.  
 4) Metric fastening thread is a deviation from standard.  
 5) The countersink may be deeper than specified in the standard.

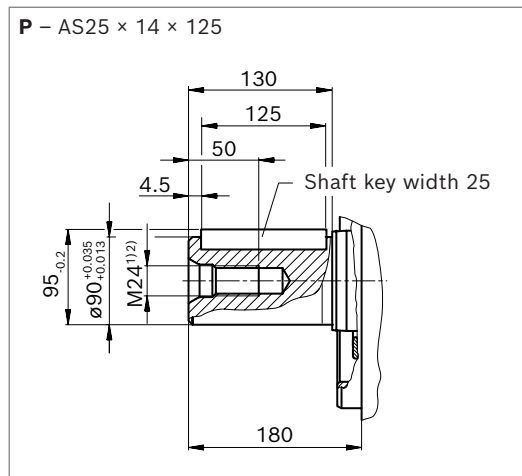
6) Depending on the installation position **T**, **K<sub>1</sub>**, **K<sub>2</sub>** or **R(L)** must be connected (see also installation instructions on pages 75 and 77)  
 7) O = Must be connected (plugged on delivery)  
 X = Plugged (in normal operation)  
 8) Plugged with flange plate

**Dimensions, size 750**

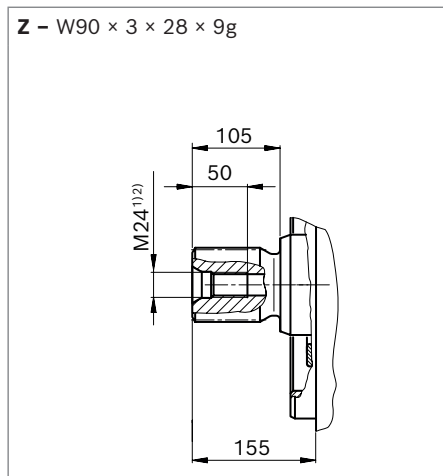
Main dimensions only for the basic unit, further dimensions for the controls are given in the relevant data sheets.



▼ **Parallel keyed shaft DIN 6885**



▼ **Splined shaft DIN 5480**



Ports		Standard	Size	$p_{\max}$ [bar] <sup>3)</sup>	State <sup>7)</sup>
<b>S</b>	Suction port (standard pressure series)	SAE J518 <sup>4)</sup>	5 in	30	O
	Fastening thread	DIN 13	M16 × 2; 24 deep		
For port plate version 25					
<b>B</b>	Pressure port (high-pressure series)	SAE J518 <sup>4)</sup>	2 in	400	O
	Fastening thread	DIN 13	M20 × 2.5; 25 deep		
<b>B<sub>1</sub></b>	2nd working port (high-pressure series)	SAE J518 <sup>4)</sup>	2 in	400	X <sup>8)</sup>
	Fastening thread	DIN 13	M20 × 2.5; 24 deep		
<b>K<sub>1</sub>, K<sub>2</sub></b>	Flushing port	DIN 3852 <sup>5)</sup>	M48 × 2; 22 deep	6 absolute	X <sup>6)</sup>
<b>T</b>	Drain port	DIN 3852 <sup>5)</sup>	M48 × 2; 22 deep	6 absolute	X <sup>6)</sup>
<b>M<sub>B</sub></b>	Measuring port working pressure	DIN 3852 <sup>5)</sup>	M18 × 1.5; 12 deep	400	X
<b>M<sub>S</sub></b>	Measuring port suction pressure	DIN 3852 <sup>5)</sup>	M18 × 1.5; 12 deep	30	X
<b>R(L)</b>	Drain port	DIN 3852 <sup>5)</sup>	M48 × 2; 22 deep	6 absolute	O <sup>6)</sup>
<b>U</b>	Flushing port	DIN 3852 <sup>5)</sup>	M18 × 1.5; 12 deep	6 absolute	X
<b>M<sub>1</sub>, M<sub>2</sub></b>	Measuring port (stroking chamber pressure)	DIN 3852 <sup>5)</sup>	See data sheet of the respective control devices	400	X

1) Center bore according to DIN 332

2) Thread according to DIN 13

3) Depending on the application, momentary pressure peaks can occur.  
Keep this in mind when selecting measuring devices and fittings.

4) Metric fastening thread is a deviation from standard.

5) The countersink may be deeper than specified in the standard.

6) Depending on the installation position **T**, **K<sub>1</sub>**, **K<sub>2</sub>** or **R(L)** must be connected (see also installation instructions on pages 75 and 77)

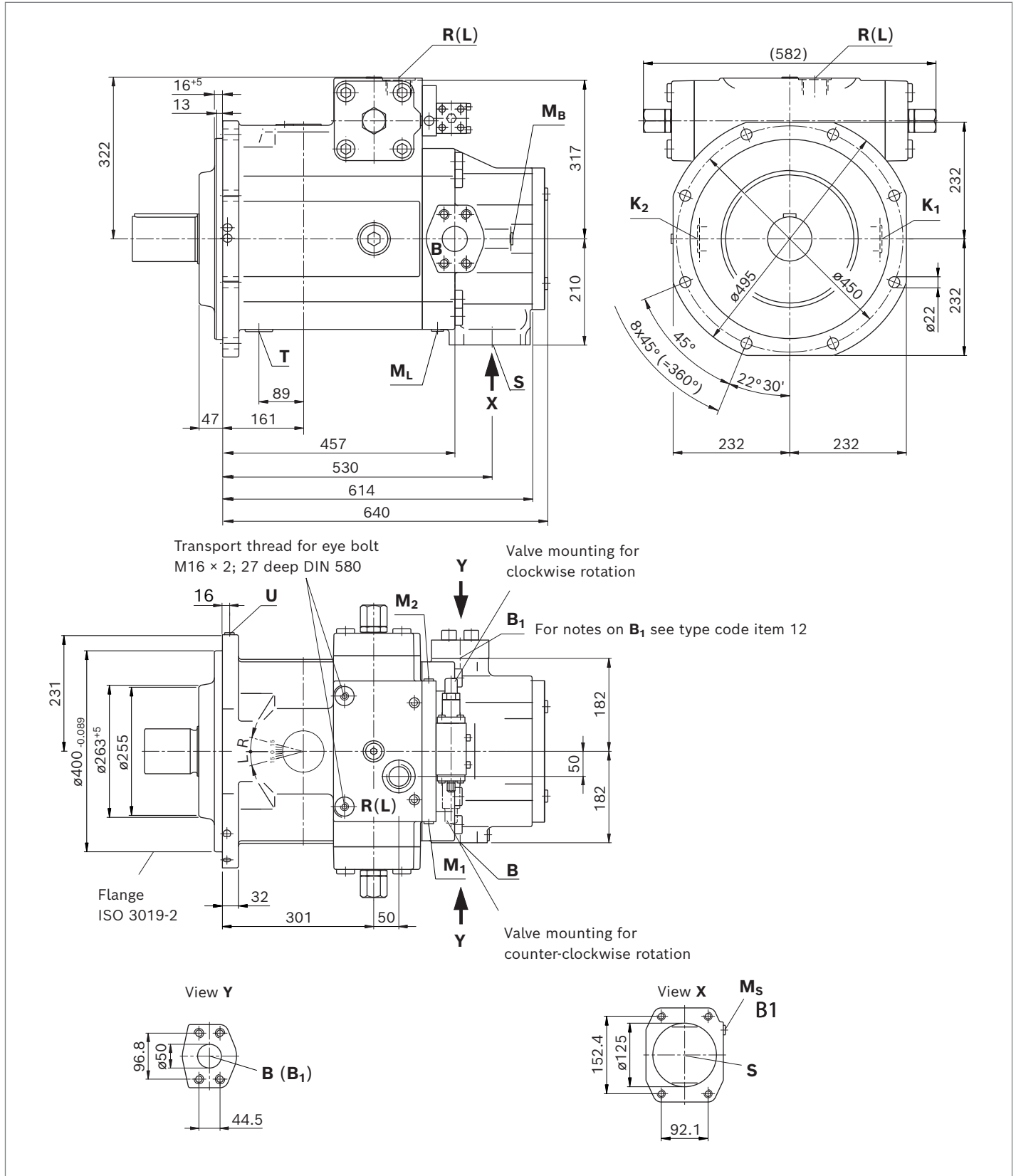
7) O = Must be connected (plugged on delivery)  
X = Plugged (in normal operation)

8) Plugged with flange plate

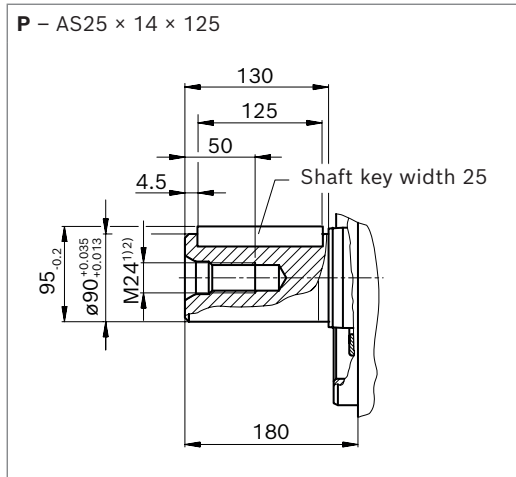


### Dimensions of size 750 with charge pump (impeller)

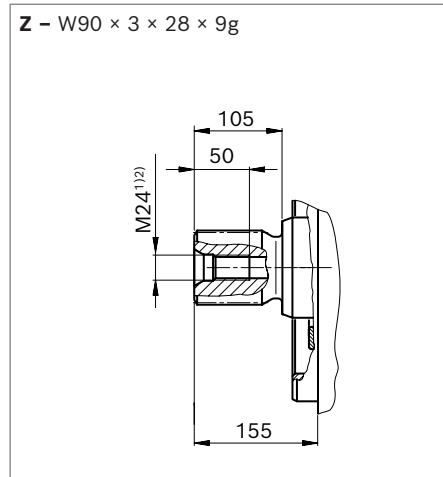
Main dimensions only for the basic unit, further dimensions for the controls are given in the relevant data sheets.



▼ **Parallel keyed shaft DIN 6885**



▼ **Splined shaft DIN 5480**



Ports		Standard	Size	$p_{\max}$ [bar] <sup>3)</sup>	State <sup>7)</sup>
<b>S</b>	Suction port (standard pressure series)	SAE J518 <sup>4)</sup>	5 in	30	O
	Fastening thread	DIN 13	M16 × 2; 24 deep		
For port plate version 25					
<b>B</b>	Pressure port (high-pressure series)	SAE J518 <sup>4)</sup>	2 in	400	O
	Fastening thread	DIN 13	M20 × 2.5; 25 deep		
<b>B<sub>1</sub></b>	2nd working port (high-pressure series)	SAE J518 <sup>4)</sup>	2 in	400	X <sup>8)</sup>
	Fastening thread	DIN 13	M20 × 2.5; 24 deep		
<b>K<sub>1</sub>, K<sub>2</sub></b>	Flushing port	DIN 3852	M48 × 2; 22 deep	6 absolute	X <sup>6)</sup>
<b>T</b>	Drain port	DIN 3852 <sup>5)</sup>	M48 × 2; 22 deep	6 absolute	X <sup>6)</sup>
<b>M<sub>B</sub></b>	Measuring port working pressure	DIN 3852	M18 × 1.5; 12 deep	400	X
<b>M<sub>S</sub></b>	Measuring port suction pressure	DIN 3852	M18 × 1.5; 12 deep	30	X
<b>M<sub>L</sub></b>	Measuring port charging pressure	DIN 3852	M18 × 1.5; 12 deep	30	X
<b>R(L)</b>	Drain port	DIN 3852 <sup>5)</sup>	M48 × 2; 22 deep	6 absolute	O <sup>6)</sup>
<b>U</b>	Flushing port	DIN 3852	M18 × 1.5; 12 deep	6 absolute	X
<b>M<sub>1</sub>, M<sub>2</sub></b>	Measuring port (stroking chamber pressure)	DIN 3852	See data sheet of the respective control devices	400	X

1) Center bore according to DIN 332

2) Thread according to DIN 13

3) Depending on the application, momentary pressure peaks can occur.  
Keep this in mind when selecting measuring devices and fittings.

4) Metric fastening thread is a deviation from standard.

5) The countersink may be deeper than specified in the standard.

6) Depending on the installation position **T**, **K<sub>1</sub>**, **K<sub>2</sub>** or **R(L)** must be connected (see also installation instructions on pages 75 and 77)

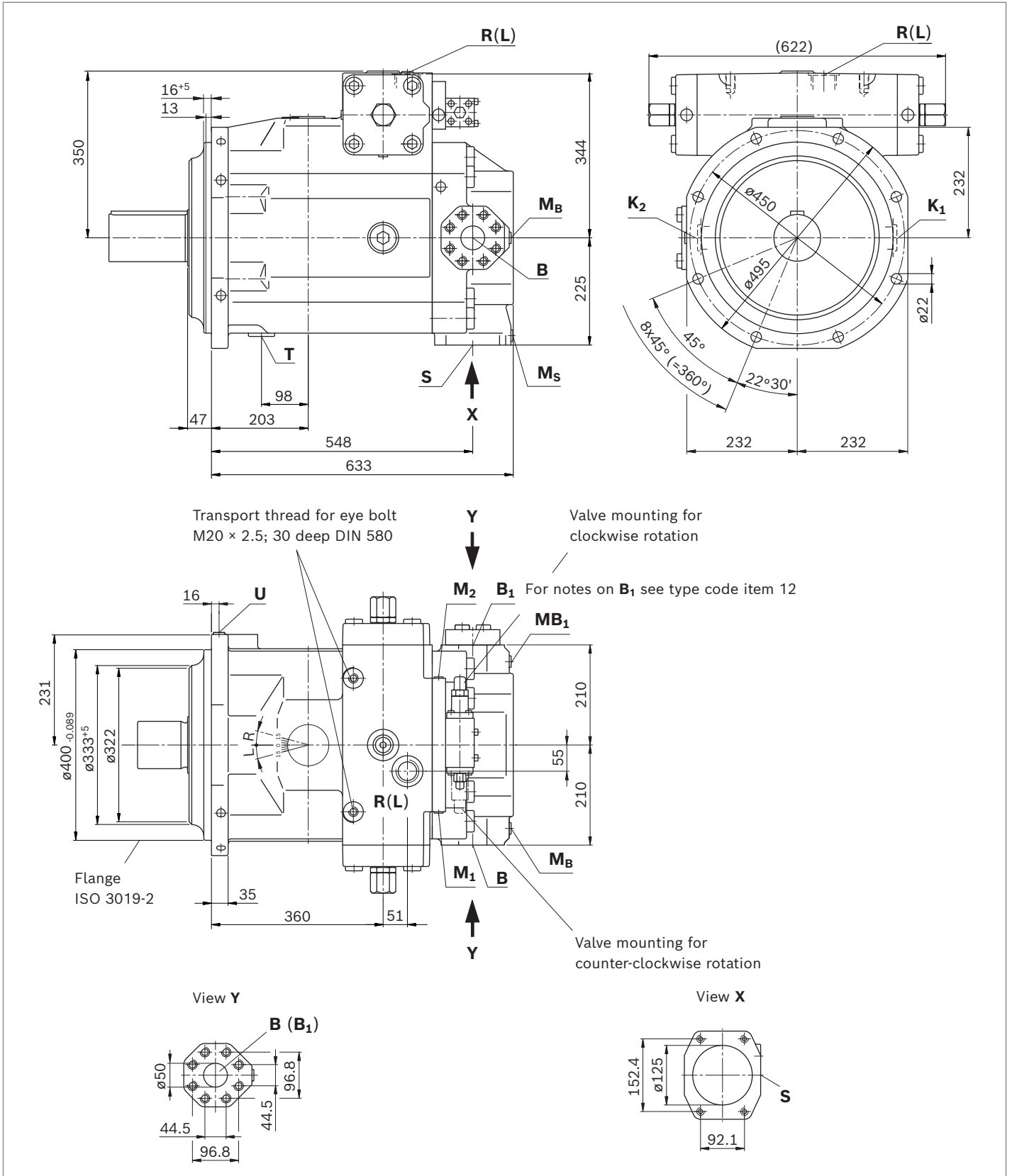
7) O = Must be connected (plugged on delivery)

X = Plugged (in normal operation)

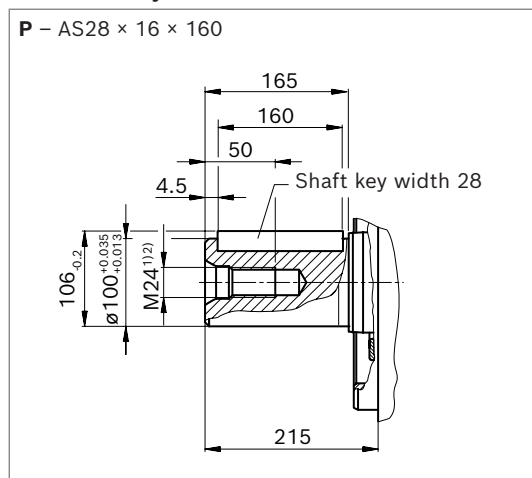
8) Plugged with flange plate

**Dimensions, size 1000**

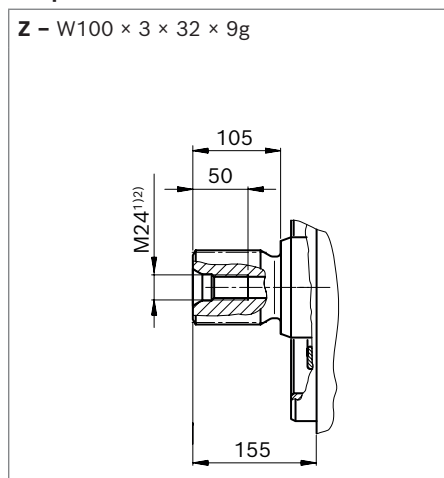
Main dimensions only for the basic unit, further dimensions for the controls are given in the relevant data sheets.



▼ **Parallel keyed shaft DIN 6885**



▼ **Splined shaft DIN 5480**



Ports		Standard	Size	$p_{\max}$ [bar] <sup>3)</sup>	State <sup>7)</sup>
<b>S</b>	Suction port (standard pressure series)	SAE J518 <sup>4)</sup>	5 in	30	O
	Fastening thread	DIN 13	M16 × 2; 24 deep		
For port plate version 25					
<b>B</b>	Pressure port (high-pressure series)	SAE J518 <sup>4)</sup>	2 in	400	O
	Fastening thread	DIN 13	M20 × 2.5; 30 deep		
<b>B<sub>1</sub></b>	2nd working port (high-pressure series)	SAE J518 <sup>4)</sup>	2 in	400	X <sup>8)</sup>
	Fastening thread	DIN 13	M20 × 2.5; 30 deep		
<b>K<sub>1</sub>, K<sub>2</sub></b>	Flushing port	DIN 3852 <sup>5)</sup>	M48 × 2; 22 deep	6 absolute	X <sup>6)</sup>
<b>T</b>	Drain port	DIN 3852 <sup>5)</sup>	M48 × 2; 22 deep	6 absolute	X <sup>6)</sup>
<b>M<sub>B</sub>, M<sub>B1</sub></b>	Measuring port working pressure	DIN 3852 <sup>5)</sup>	M18 × 1.5; 12 deep	400	X
<b>M<sub>S</sub></b>	Measuring port suction pressure	DIN 3852 <sup>5)</sup>	M18 × 1.5; 12 deep	30	X
<b>R(L)</b>	Drain port	DIN 3852 <sup>5)</sup>	M48 × 2; 22 deep	6 absolute	O <sup>6)</sup>
<b>U</b>	Flushing port	DIN 3852 <sup>5)</sup>	M18 × 1.5; 12 deep	6 absolute	X
<b>M<sub>1</sub>, M<sub>2</sub></b>	Measuring port (stroking chamber pressure)	DIN 3852 <sup>5)</sup>	See data sheet of the respective control devices	400	X

1) Center bore according to DIN 332  
 2) Thread according to DIN 13  
 3) Depending on the application, momentary pressure peaks can occur.  
 Keep this in mind when selecting measuring devices and fittings.  
 4) Metric fastening thread is a deviation from standard.  
 5) The countersink may be deeper than specified in the standard.

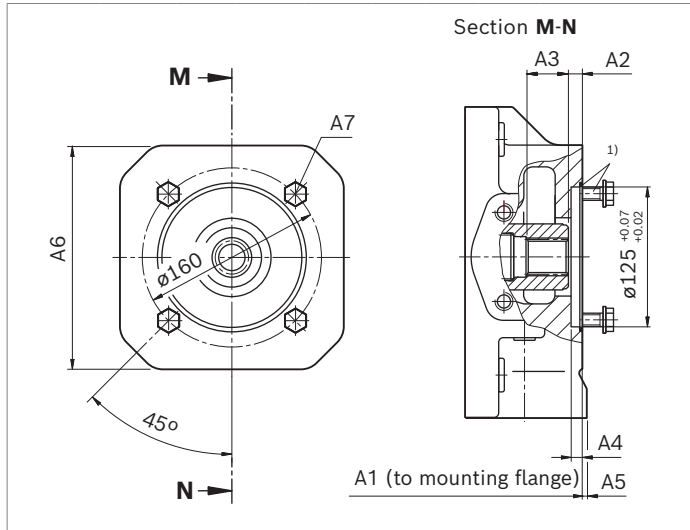
6) Depending on the installation position **T**, **K<sub>1</sub>**, **K<sub>2</sub>** or **R(L)** must be connected (see also installation instructions on pages 75 and 77)  
 7) O = Must be connected (plugged on delivery)  
 X = Plugged (in normal operation)  
 8) Plugged with flange plate

### Dimensions, through drive

Flange ISO 3019-2 (metric)		Hub for splined shaft <sup>2)</sup>	Availability across sizes								Code	
Diameter	Symbol	Diameter	40	71	125	180	250	355 370	500	750	1000	
125-4		N32×2×14×8H	●	●	-	-	-	-	●	●	○	K31
		N32×2×14×8H	-	-	●	●	●	●	-	-	-	U31

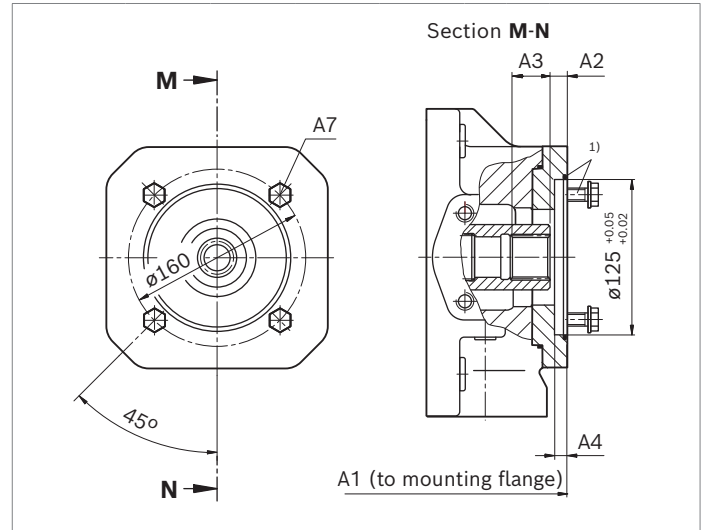
● = Available    ○ = On request    - = Not available

▼ 125-4



K31	NG	A1	A2	A3	A4	A5	A6	A7 <sup>3)</sup>
	40	288	12.5	40	9	-	-	M12; 24 deep
	71	316	12.5	33.6	9	-	-	M12; 24 deep
	500	505	12.5	38.6	9	15	240	M12; 18 deep
	750	555	12.5	44.5	9	15	240	M12; 18 deep

▼ 125-4




U31	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	12.5	35.6	9	M12; 22 deep
	180	393	12.5	35.6	9	M12; 22 deep
	250	453	12.5	38.0	9	M12; 15 deep
	355 370	482	12.5	38.0	9	M12; 15 deep

1) Mounting bolts and O-ring seal are included in the scope of delivery

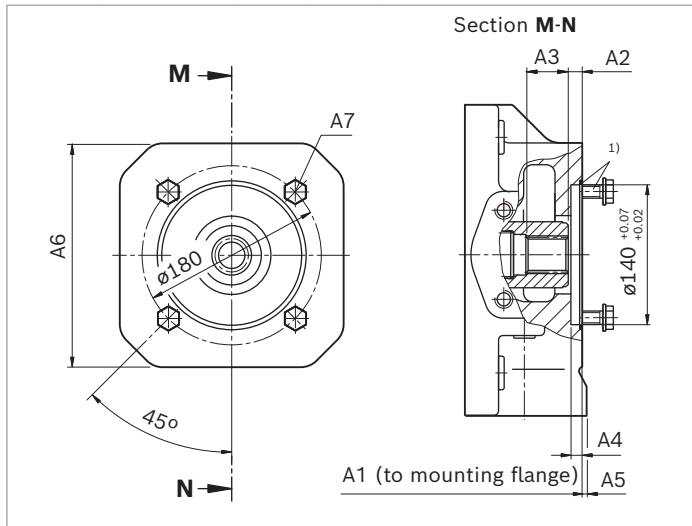
2) Splined hub according to DIN 5480

3) Thread according to DIN 13

Flange ISO 3019-2 (metric)		Hub for splined shaft <sup>2)</sup>											Code
Diameter	Symbol	Diameter	40	71	125	180	250	355 370	500	750	750 <sup>4)</sup>	1000	
140-4		N40×2×18×8H	-	●	-	-	-	-	●	●	○	●	K33
		N40×2×18×8H	-	-	●	●	●	●	-	-	-	-	U33

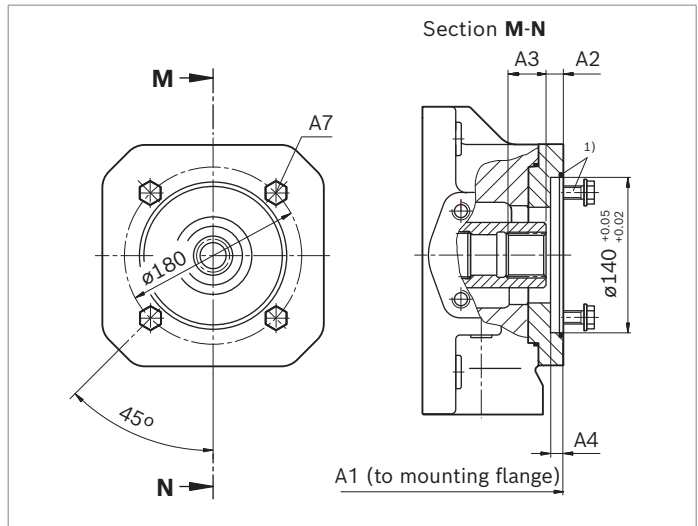
● = Available    ○ = On request    - = Not available

▼ 140-4



K33	NG	A1	A2	A3	A4	A5	A6	A7 <sup>3)</sup>
	71	316	11.5	42.8	9	-	-	M12; 24 deep
	500	505	12.5	57	9	-	-	M12; 18 deep
	750	555	12.5	44.5	9	15	240	M12; 18 deep
	1000	628	12.5	60	10	-	280	M12; 18 deep

▼ 140-4



U33	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	12.5	43.8	9	M12; 22 deep
	180	393	12.5	43.8	9	M12; 22 deep
	250	453	12.5	48.9	9	M12; 22 deep
	355 370	482	12.5	48.0	9	M12; 22 deep

1) Mounting bolts and O-ring seal are included in the scope of delivery

2) Splined hub according to DIN 5480

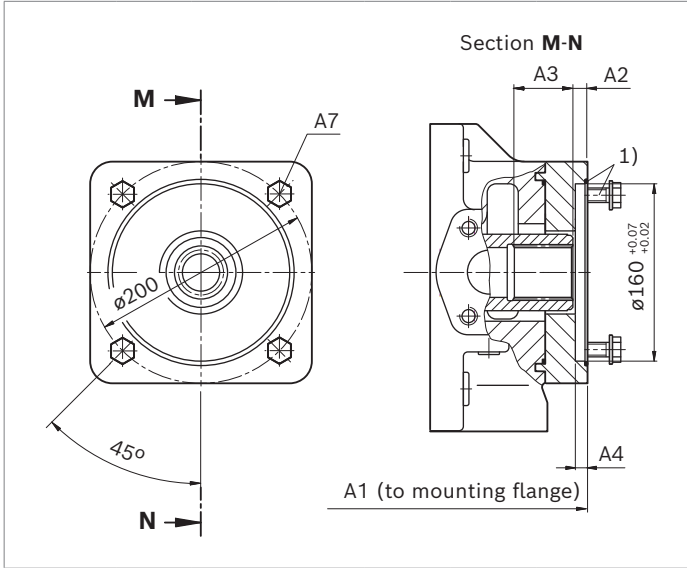
3) Thread according to DIN 13

4) With charge pump

Flange ISO 3019-2 (metric)		Hub for splined shaft <sup>2)</sup>										Code	
Diameter	Symbol	Diameter	40	71	125	180	250	355		500	750		750 <sup>4)</sup>
160-4		N50×2×24×8H	-	-	-	-	-	-	•	•	○	○	K34
		N50×2×24×8H	-	-	•	•	•	•	-	-	-	-	U34

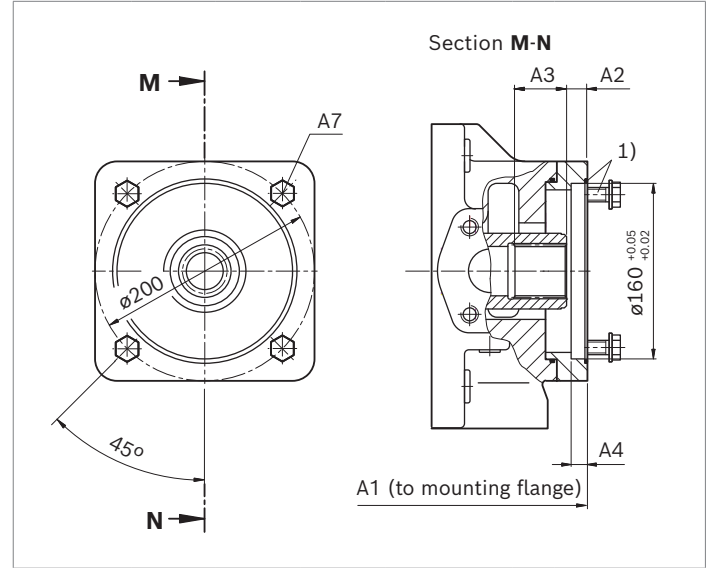
• = Available    ○ = On request    - = Not available

▼ 160-4



K34	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
500	505	13.5	54.5	10	M16; 24 deep	
750	555	13.5	55.5	10	M16; 24 deep	
1000	628	12.5	54.5	10	M16; 24 deep	

▼ 160-4



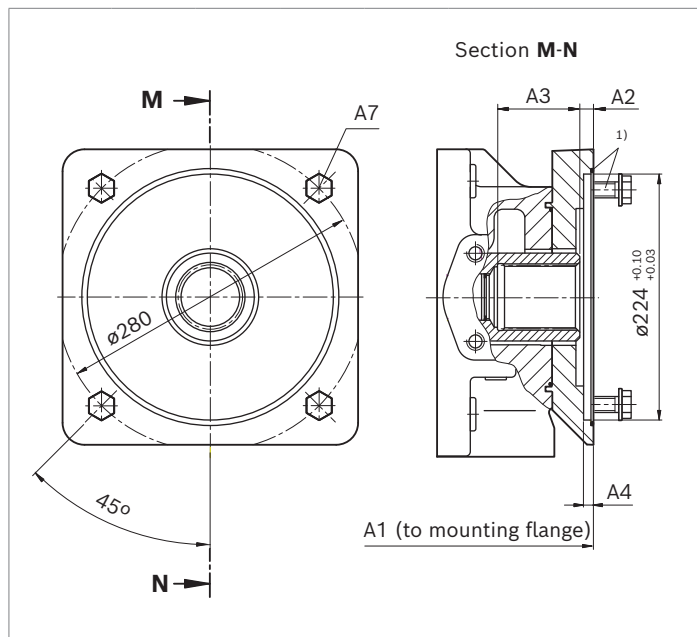
U34	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
125	369	12.5	51.6	9	M16; 22 deep	
180	393	12.5	51.6	9	M16; 22 deep	
250	453	12.5	54.0	9	M16; 22 deep	
355	482	12.5	54.0	9	M16; 22 deep	
370						

1) Mounting bolts and O-ring seal are included in the scope of delivery  
 2) Splined hub according to DIN 5480  
 3) Thread according to DIN 13  
 4) With charge pump

Flange ISO 3019-2 (metric)		Hub for splined shaft <sup>2)</sup>											Code	
Diameter	Symbol	Diameter	40	71	125	180	250	355	370	500	750	750 <sup>4)</sup>		1000
224-4	☼	N60×2×28×8H	-	-	-	-	-	-	●	●	○	●		K35
		N60×2×28×8H	-	-	-	-	●	●	-	-	-	-	-	U35

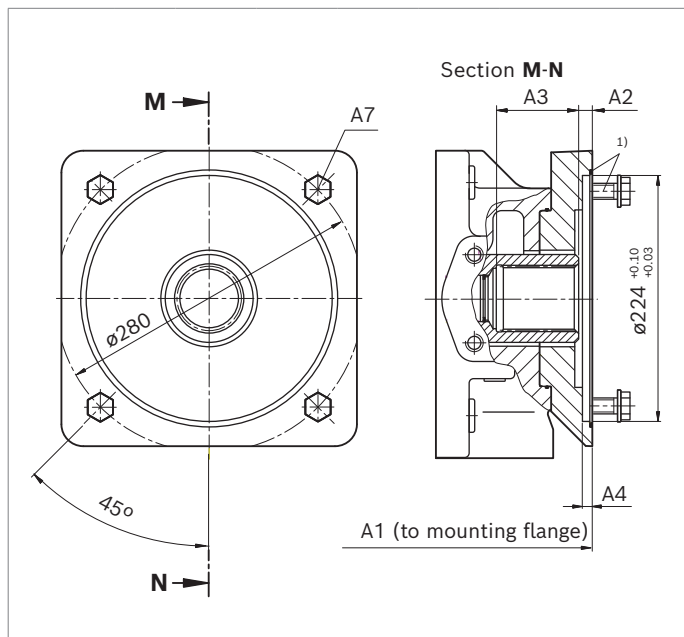
● = Available    ○ = On request    - = Not available

▼ 224-4



K35	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	500	541	12.5	74	9	M20; 36 deep
	750	591	12.5	74	9	M20; 36 deep
	1000	664	12.5	70	9	M20; 36 deep

▼ 224-4



U35	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	250	469	12.5	75	9	M20; 37 deep
	355	498	12.5	75	9	M20; 37 deep
	370					

1) Mounting bolts and O-ring seal are included in the scope of delivery

2) Splined hub according to DIN 5480

3) Thread according to DIN 13

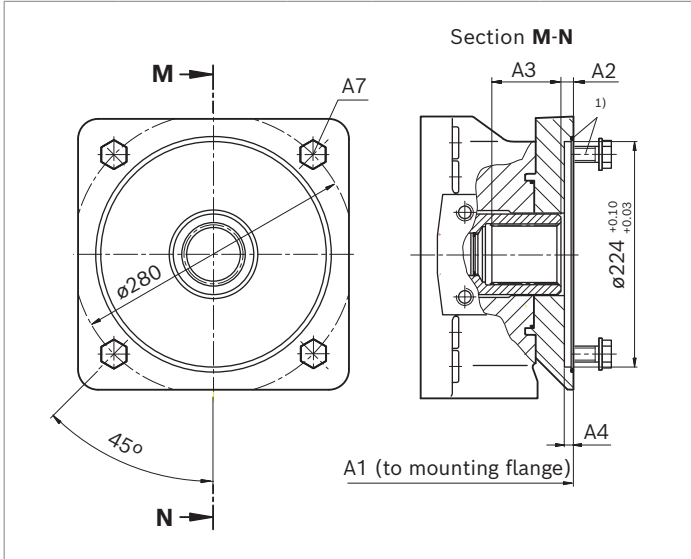
4) With charge pump



Flange ISO 3019-2 (metric)		Hub for splined shaft <sup>2)</sup>	355										Code
Diameter	Symbol	Diameter	40	71	125	180	250	370	500	750	1000		
224-4		N70×3×22×8H	-	-	-	-	-	-	●	○	●	K77	
		N70×3×22×8H	-	-	-	-	-	●	-	-	-	U77	

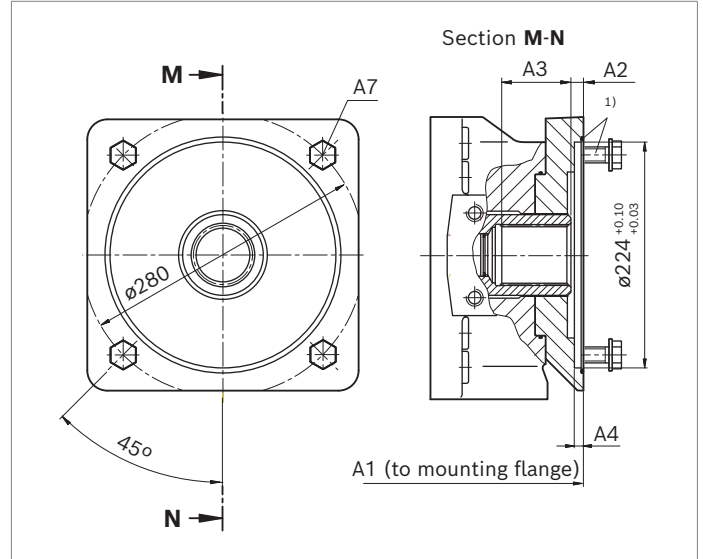
● = Available    ○ = On request    - = Not available

▼ 224-4



K77	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	500	541	12.5	82	9	M20; 36 deep
	1000	664	12.5	82	9	M20; 36 deep

▼ 224-4




U77	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	355	498	12.5	75	9	M20; 37 deep
						370

1) Mounting bolts and O-ring seal are included in the scope of delivery

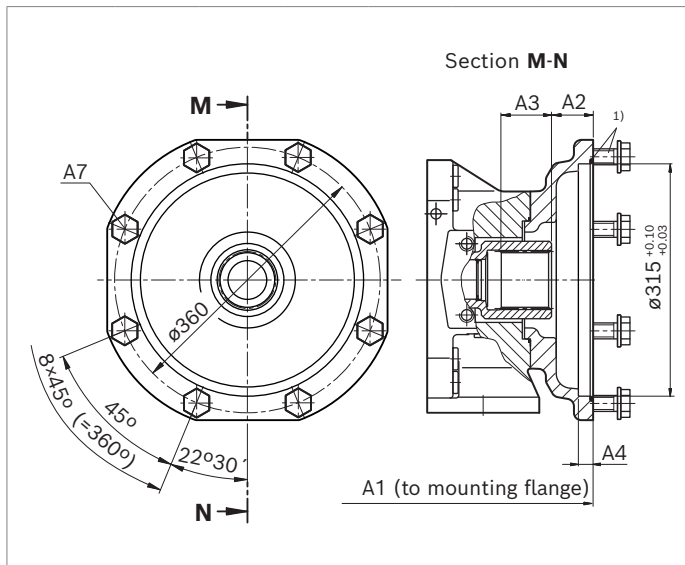
2) Splined hub according to DIN 5480

3) Thread according to DIN 13

Flange ISO 3019-2 (metric)		Hub for splined shaft <sup>2)</sup>	355										Code
Diameter	Symbol	Diameter	40	71	125	180	250	370	500	750	750 <sup>4)</sup>	1000	
315-8		N80×3×25×8H	-	-	-	-	-	-	●	●	○	●	K43
		N90×3×28×8H	-	-	-	-	-	-	-	●	●	●	K76

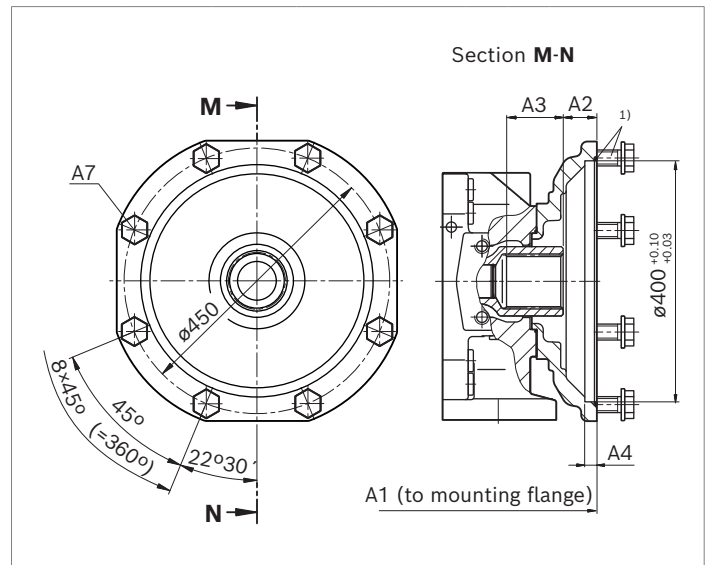
● = Available    ○ = On request    - = Not available

▼ 315-8



K43	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	500	590	53.5	71.9	19	M20; 26 deep
	750	640	53.5	71.9	19	M20; 26 deep
	1000	713	53.5	71	19	M20; 26 deep

▼ 315-8



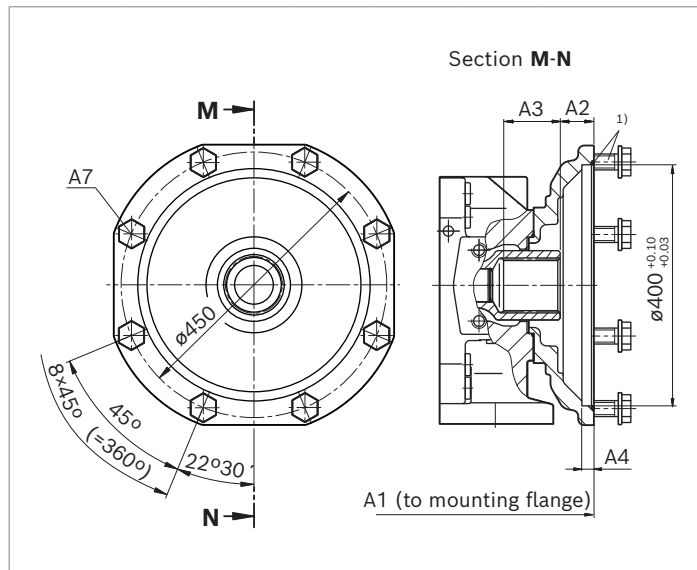
K76	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	750	655	53	104	19	M20; 26 deep
	750 <sup>4)</sup>	749	53	97	19	M20; 26 deep
	1000	728	53	97	19	M20; 26 deep

1) Mounting bolts and O-ring seal are included in the scope of delivery  
 2) Splined hub according to DIN 5480  
 3) Thread according to DIN 13  
 4) With charge pump

Flange ISO 3019-2 (metric)		Hub for splined shaft <sup>2)</sup>	355								Code	
Diameter	Symbol	Diameter	40	71	125	180	250	370	500	750	1000	
400-8		N100×3×32×8H	-	-	-	-	-	-	-	-	●	K88

● = Available    ○ = On request    - = Not available

▼ 400-8



K88	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	1000	728	53	99	19	M20; 26 deep

1) Mounting bolts and O-ring seal are included in the scope of delivery

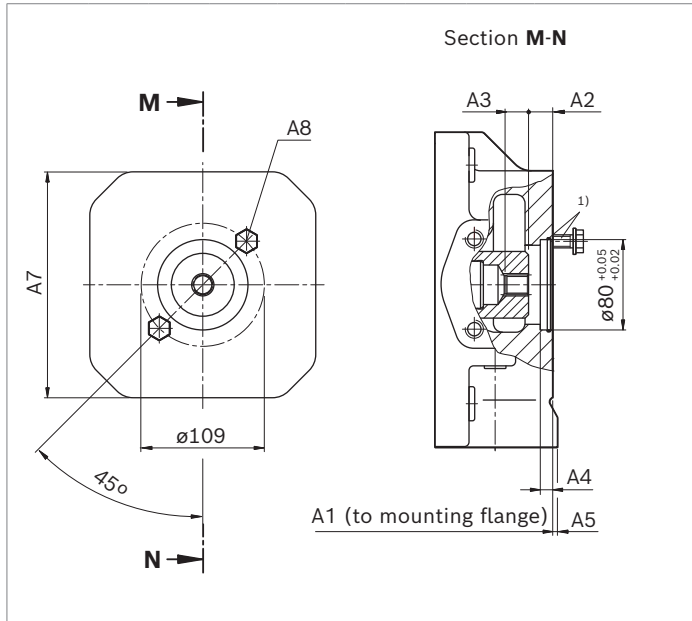
2) Splined hub according to DIN 5480

3) Thread according to DIN 13

Flange ISO 3019-2 (metric)		Hub for splined shaft <sup>(2)</sup>										Code	
Diameter	Symbol	Diameter	40	71	125	180	250	355	370	500	750		1000
80-2		3/4 in 11T 16/32DP	○	●	-	-	-	-	-	○	○	○	KB2
		3/4 in 11T 16/32DP	-	-	●	●	●	●	●	-	-	-	UB2

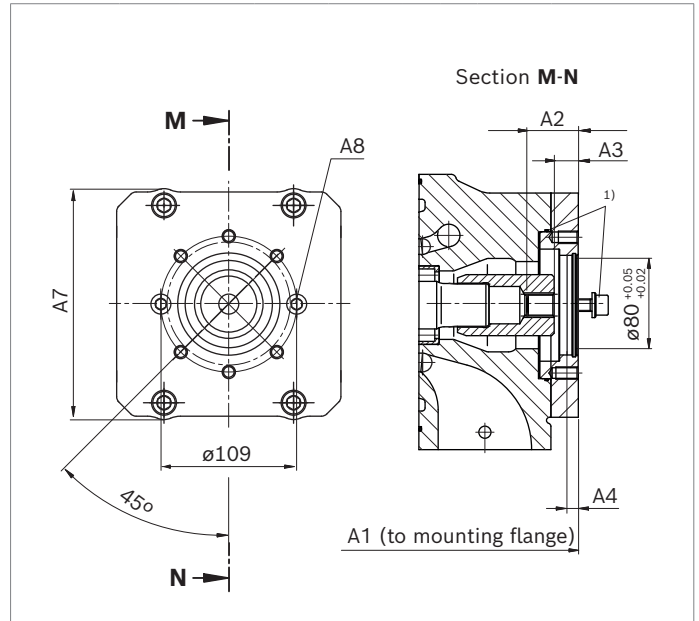
● = Available    ○ = On request    - = Not available

▼ 80-2



KB2	NG	A1	A2	A3	A4	A5	A7	A8 <sup>(3)</sup>
	71	291	21.5	19	10	2	140	M10; 15 deep

▼ 80-2



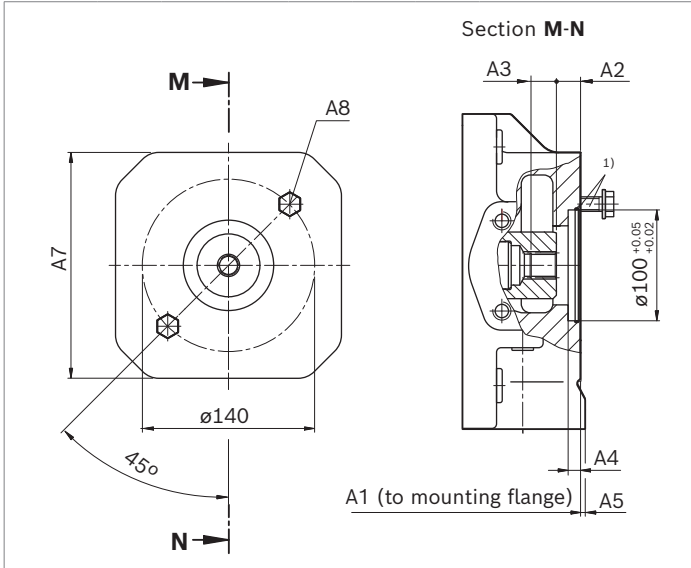
UB2	NG	A1	A2	A3	A4	A7	A8 <sup>(3)</sup>
	125	367	40.5	19.4	9	180	M10; 16 deep
	180	393	40.5	19.4	9	180	M10; 16 deep
	250	453	40.5	19	9	200	M10; 16 deep
	355	482	40.4	19	9	200	M10; 16 deep
	370						

1) Mounting bolts and O-ring seal are included in the scope of delivery  
 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5  
 3) Thread according to DIN 13

Flange ISO 3019-2 (metric)		Hub for splined shaft <sup>2)</sup>										Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	370	500	750	
100-2		7/8 in 13T 16/32DP	●	●	-	-	-	-	○	○	○	KB3
		7/8 in 13T 16/32DP	-	-	●	●	●	●	-	-	-	UB3

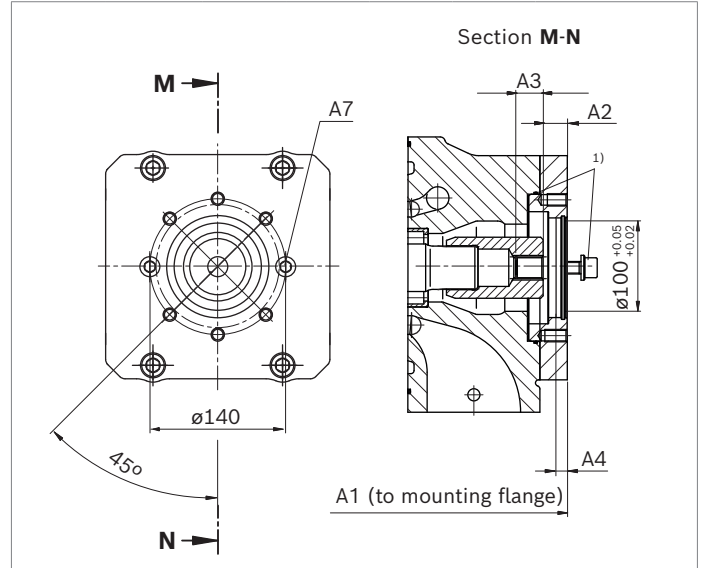
● = Available    ○ = On request    - = Not available

▼ 100-2



KB3	NG	A1	A2	A3	A4	A5	A7	A8 <sup>3)</sup>
	40	290	20.3	23	10	-	-	M12; 18 deep
	71	291	20.4	23	10	2	140	M12; 18 deep

▼ 100-2



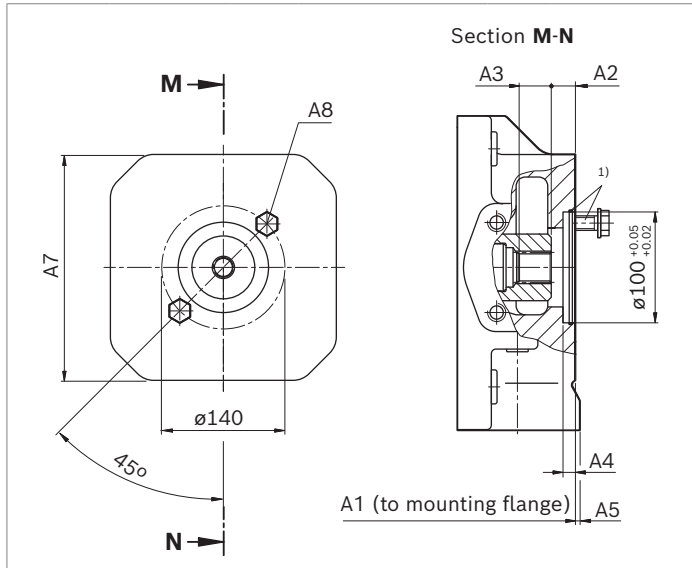
UB3	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	18.5	24.9	10	M12; 22 deep
	180	393	18.5	24.9	10	M12; 22 deep
	250	453	19.5	23	10	M12; 18 deep
	355	482	19.5	23	10	M12; 18 deep
	370					

1) Mounting bolts and O-ring seal are included in the scope of delivery  
 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5  
 3) Thread according to DIN 13

Flange ISO 3019-2 (metric)		Hub for splined shaft <sup>2)</sup>										Code
Diameter	Symbol	Diameter	40	71	125	180	250	355		500	750	
100-2		1 in 15T 16/32DP	●	●	-	-	-	-	●	○	○	KB4
		1 in 15T 16/32DP	-	-	●	●	●	●	-	-	-	UB4

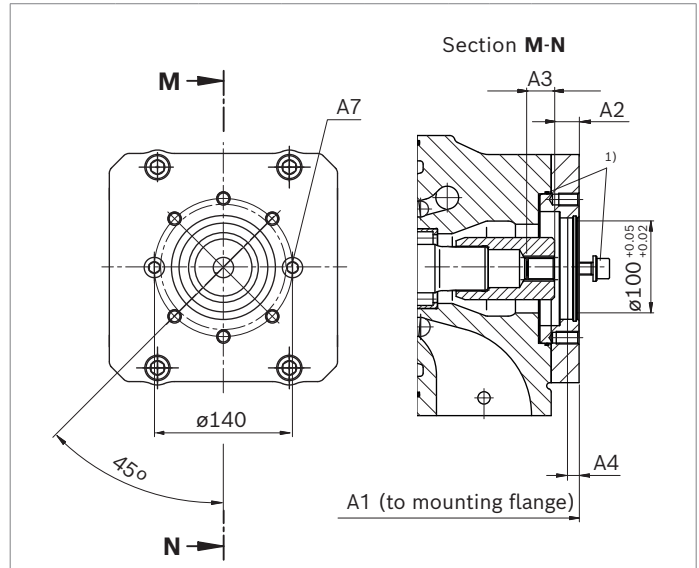
● = Available    ○ = On request    - = Not available

▼ 100-2



KB4	NG	A1	A2	A3	A4	A5	A7	A8 <sup>3)</sup>
	40	290	20.8	27.5	10	-	-	M12; 18 deep
	71	316	20.8	27.5	8	-	-	M12; 24 deep
	500	505	20.4	28.9	10	15	240	M12; 18 deep

▼ 100-2



UB4	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	18.9	29.5	10	M12; 22 deep
	180	393	18.9	29.5	10	M12; 22 deep
	250	453	18.9	29.5	10	M12; 18 deep
	355	482	18.9	29.5	10	M12; 18 deep
	370					

1) Mounting bolts and O-ring seal are included in the scope of delivery

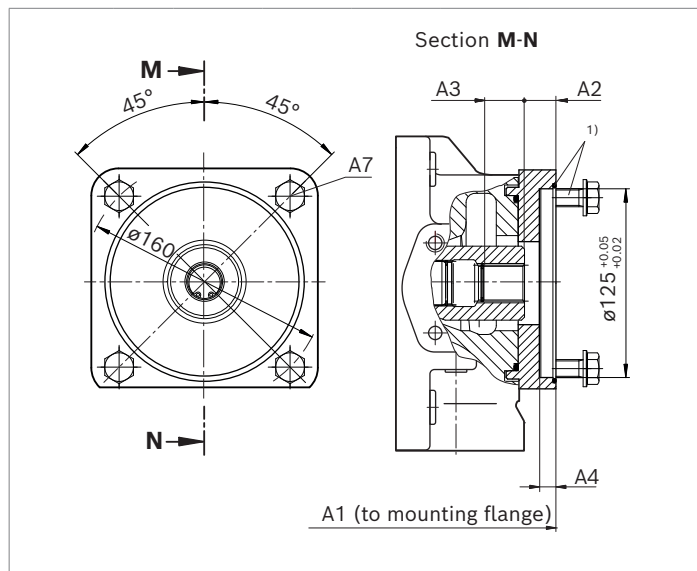
2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

3) Thread according to DIN 13

Flange ISO 3019-2 (metric)		Hub for splined shaft <sup>2)</sup>										Code	
Diameter	Symbol	Diameter	40	71	125	180	250	355		500	750	1000	
125-4	☒	1 in 15T 16/32DP	-	●	-	-	-	-	-	○	○	○	KE1
		1 in 15T 16/32DP	-	-	○	○	○	○	-	-	-	UE1	

● = Available    ○ = On request    - = Not available

▼ 125-4



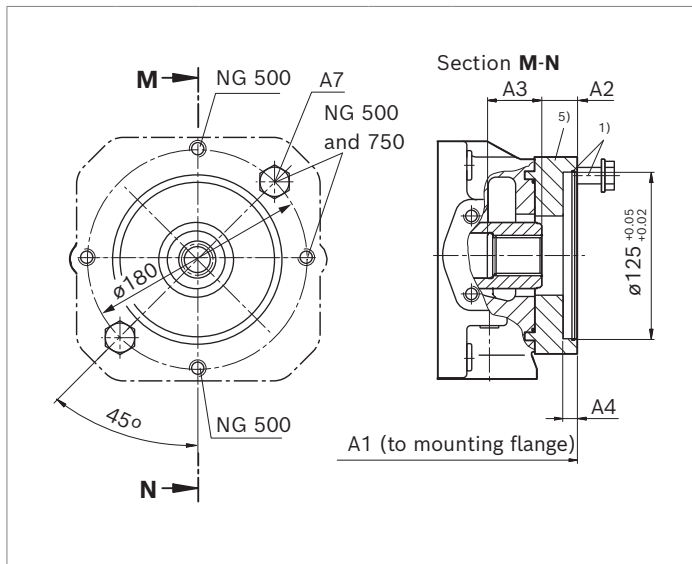
KE1	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	71	316	20.8	27.5	10	M12; 24 deep

1) Mounting bolts and O-ring seal are included in the scope of delivery  
 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5  
 3) Thread according to DIN 13

Flange ISO 3019-2 (metric)		Hub for splined shaft <sup>2)</sup>											Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	750	750 <sup>4)</sup>	1000	
125-2		1 1/4 in 14T 12/24DP	-	●	-	-	-	-	●	○	●	○	KB5
		1 1/4 in 14T 12/24DP	-	-	●	●	●	●	-	-	-	-	UB5

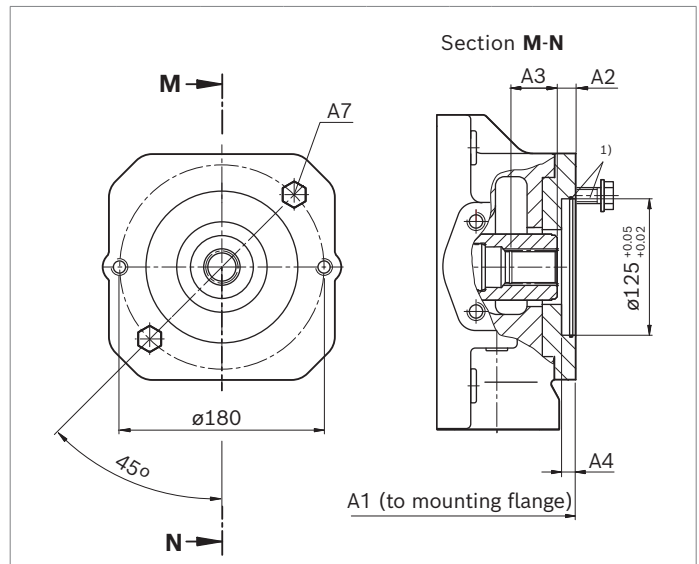
● = Available    ○ = On request    - = Not available

▼ 125-2



KB5	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	71	321	23	38	10	M16; 29 deep
	500	505	19.3	40.4	10	M16; 24 deep
	750 <sup>4)</sup>	649	19.3	40.4	10	M16; 20 deep

▼ 125-2



UB5	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	20	38	9	M16; 22 deep
	180	393	20	38	9	M16; 22 deep
	250	453	20.9	37.9	9	M16; 22 deep
	355	482	20.9	37.9	9	M16; 22 deep
	370					

1) Mounting bolts and O-ring seal are included in the scope of delivery

2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

3) Thread according to DIN 13

4) With charge pump

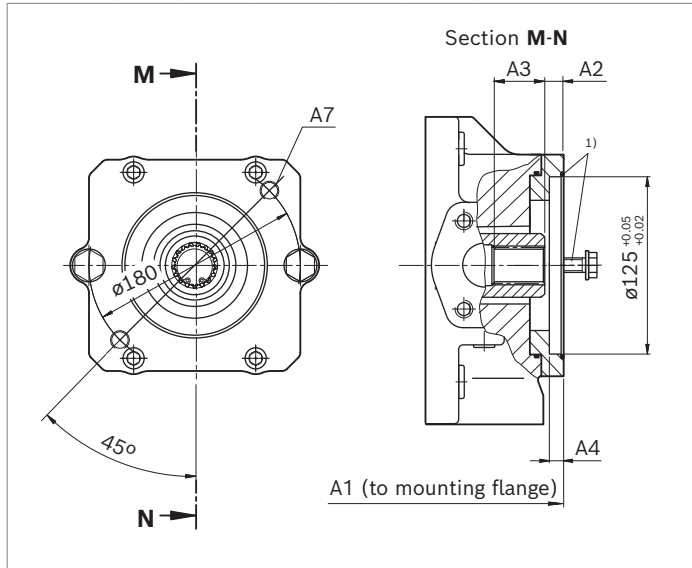
5) For NG71 with intermediate plate



Flange ISO 3019-2 (metric)		Hub for splined shaft <sup>2)</sup>										Code
Diameter	Symbol	Diameter	40	71	125	180	250	355				
								370	500	750	1000	
125-2		1 1/2 in 17T 12/24DP	-	-	-	-	-	-	o	o	o	KB6
		1 1/2 in 17T 12/24DP	-	-	•	•	•	•	-	-	-	UB6
160-4		1 1/4 in 14T 12/24DP	-	o	-	-	-	-	o	o	o	KB8
		1 1/4 in 14T 12/24DP	-	-	•	•	•	•	-	-	-	UB8

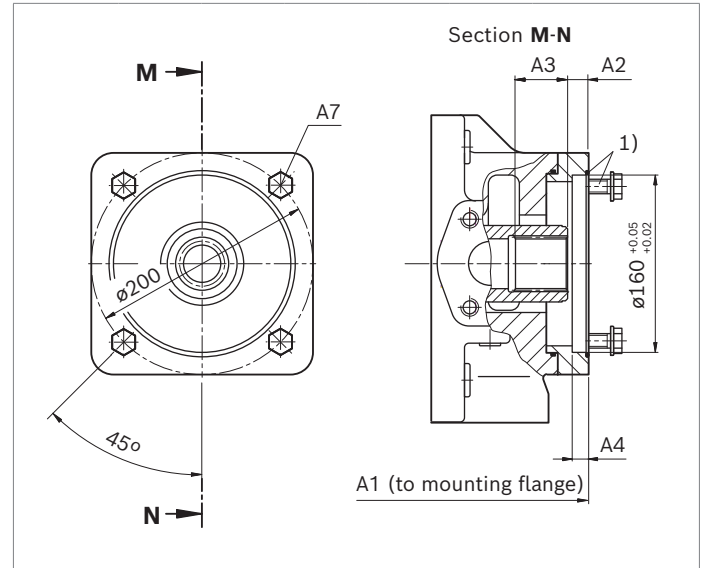
• = Available    o = On request    - = Not available

▼ 125-2




UB6	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	10.4	50	9	M16; 22 deep
	180	393	10.4	50	9	M16; 22 deep
	250	453	12.5	55	9	M16; 22 deep
	355	482	12.5	55	9	M16; 22 deep
	370					

▼ 160-4



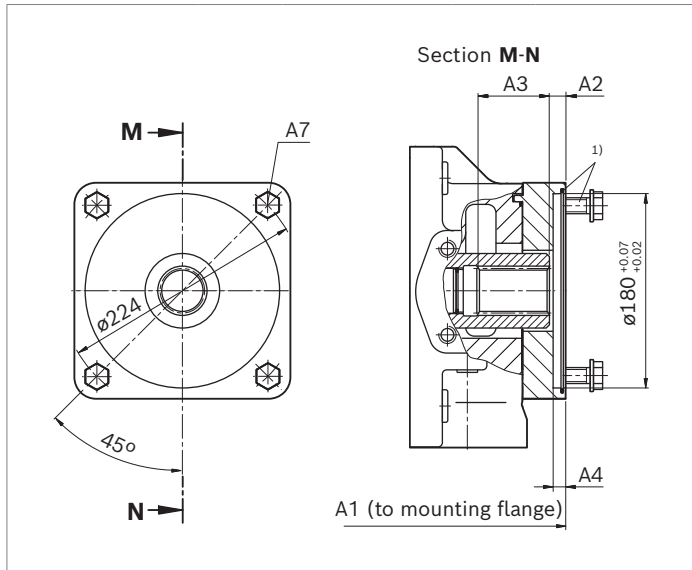
UB8	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	20	38	9	M16; 22 deep
	180	393	20	38	9	M16; 22 deep
	250	453	20.9	38	9	M16; 22 deep
	355	482	20.9	38	9	M16; 22 deep
	370					

1) Mounting bolts and O-ring seal are included in the scope of delivery  
 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5  
 3) Thread according to DIN 13

Flange ISO 3019-2 (metric)		Hub for splined shaft <sup>2)</sup>										Code	
Diameter	Symbol	Diameter	40	71	125	180	250	355			500		750
180-4		1 3/4 in 13T 8/16DP	-	-	-	-	-	-	-	o	o	o	KB7
		1 3/4 in 13T 8/16DP	-	-	-	•	•	•	-	-	-	-	UB7

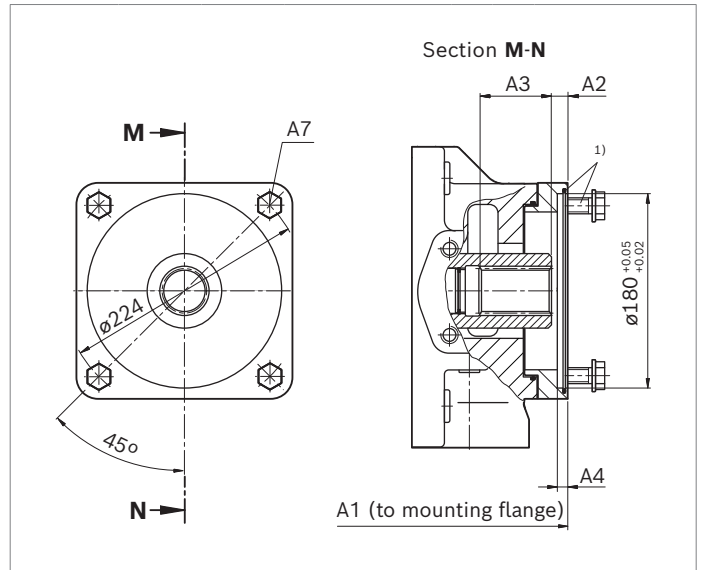
• = Available    o = On request    - = Not available

▼ 180-4



KB7	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	500	530	10.4	63.6	10	M16; 25 deep
	750	580	10.4	63.6	10	M16; 25 deep

▼ 180-4



UB7	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	180	406	10.6	62	9	M16; 34 deep
	250	453	10.6	64	9	M16; 22 deep
	355	482	10.6	64	9	M16; 22 deep
	370					

1) Mounting bolts and O-ring seal are included in the scope of delivery

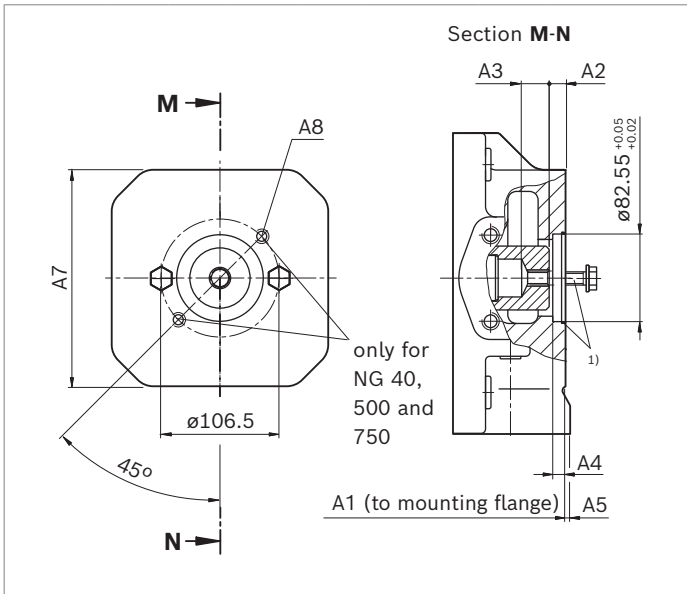
2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

3) Thread according to DIN 13

Flange ISO 3019-1 (SAE)		Hub for splined shaft <sup>2)</sup>	Availability across sizes											Code
Diameter	Symbol		Diameter	40	71	125	180	250	355	370	500	750	750 <sup>4)</sup>	
82-2 (A)		5/8 in 9T 16/32DP	●	●	-	-	-	-	-	●	●	○	○	K01
		5/8 in 9T 16/32DP	-	-	●	●	●	●	-	-	-	-	-	U01

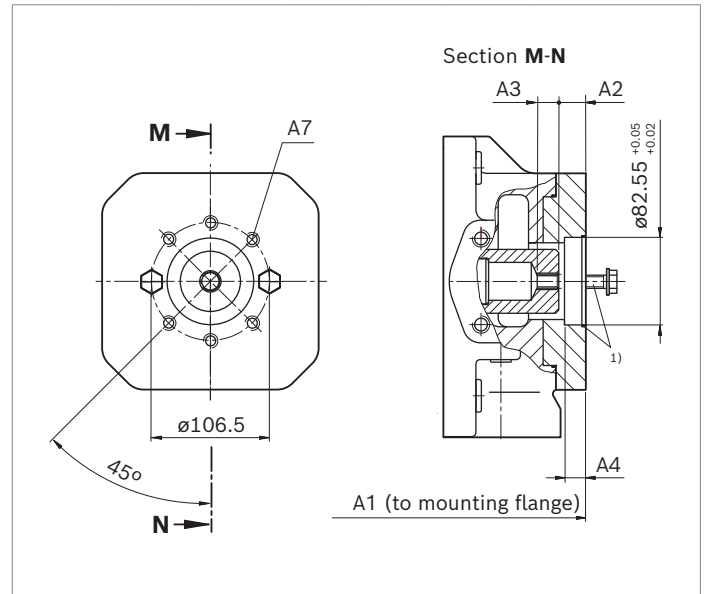
● = Available    ○ = On request    - = Not available

▼ 82-2



K01	NG	A1	A2	A3	A4	A5	A7	A8 <sup>3)</sup>
	40	263	10.4	25.9	10	-	-	M10; 15 deep
	71	291	10.3	24.6	10	2	140	M10; 15 deep
	500	505	10.3	32.7	10	15	240	M10; 15 deep
	750	555	10.3	32.7	10	-	-	M10; 15 deep

▼ 82-2



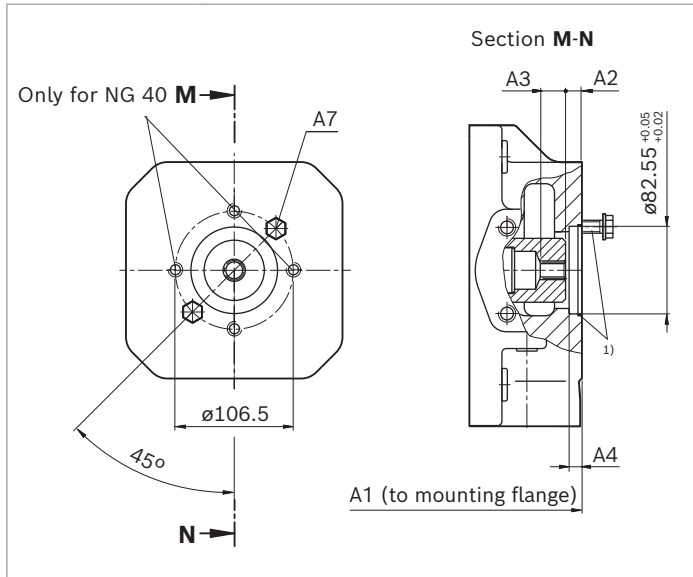
U01	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	10.3	19.4	13	M10; 16 deep
	180	393	10.3	19.4	13	M10; 16 deep
	250	453	16	19.4	13	M10; 16 deep
	355	482	16	19.4	13	M10; 16 deep
	370					

1) Mounting bolts and O-ring seal are included in the scope of delivery  
 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5  
 3) Thread according to DIN 13  
 4) With charge pump

Flange ISO 3019-1 (SAE)		Hub for splined shaft <sup>2)</sup>	Availability across sizes										Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	750	1000		
82-2 (A)		3/4 in 11T 16/32DP <sup>4)</sup>	●	●	-	-	-	-	○	○	○	K52	
		3/4 in 11T 16/32DP	-	-	●	●	●	●	-	-	-	U52	

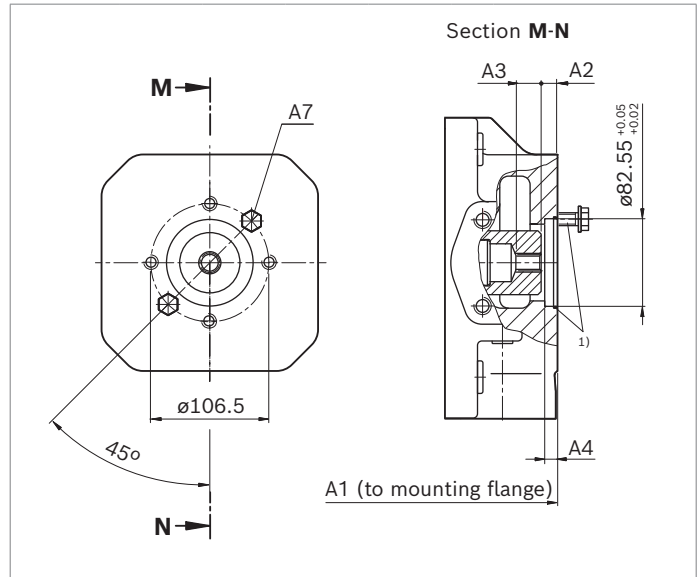
● = Available    ○ = On request    - = Not available

▼ **82-2**



K52	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	40	263	19.5	21	10	M10; 15 deep
	71	312.5	21.5	19	10	M10; 20 deep

▼ **82-2**



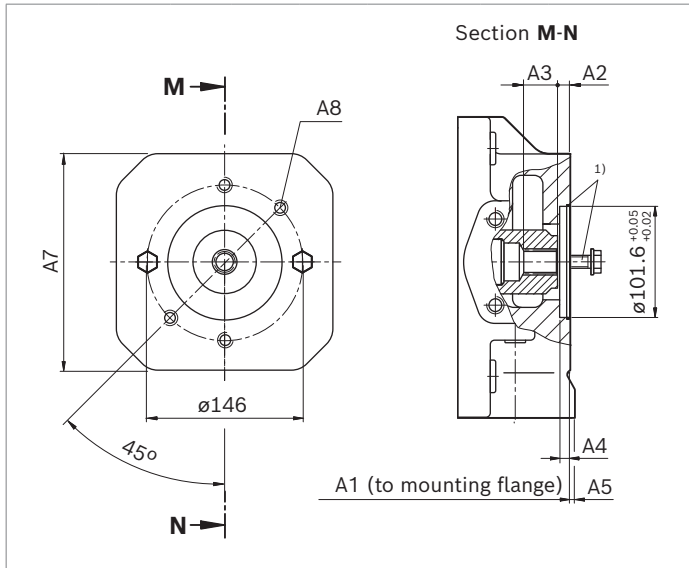
U52	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	19.4	21.1	10	M10; 16 deep
	180	393	19.4	21.1	10	M10; 16 deep
	250	453	19.5	23.9	10	M10; 16 deep
	355	482	19.4	23.9	10	M10; 16 deep
	370					

- 1) Mounting bolts and O-ring seal are included in the scope of delivery
- 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 3) Thread according to DIN 13
- 4) If an attachment pump with "R" shaft is to be mounted, please contact us.

Flange ISO 3019-1 (SAE)		Hub for splined shaft <sup>2)</sup>	Availability across sizes											Code
Diameter	Symbol	Diameter	355											
			40	71	125	180	250	370	500	750	750 <sup>4)</sup>	1000		
101-2 (B)		7/8 in 13T 16/32DP	●	●	-	-	-	-	●	●	●	○		K68
		7/8 in 13T 16/32DP	-	-	●	●	●	●	-	-	-	-		U68

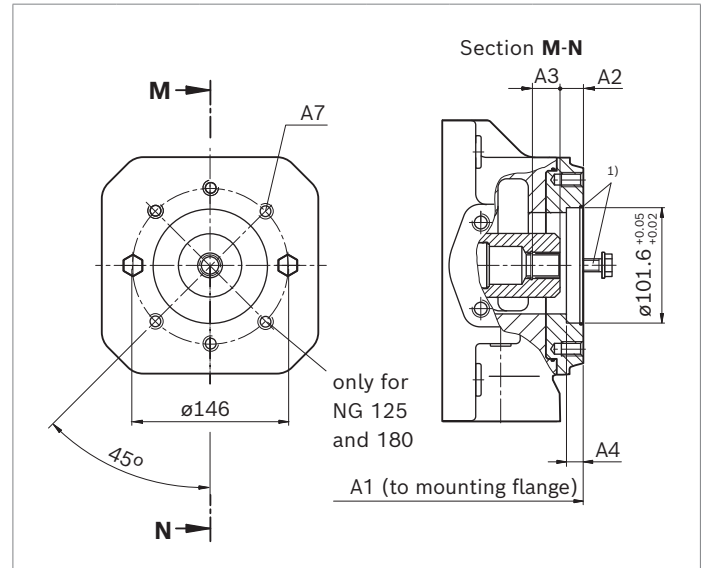
● = Available    ○ = On request    - = Not available

▼ 101-2



K68	NG	A1	A2	A3	A4	A5	A7	A8 <sup>3)</sup>
	40	290	20.4	23.1	10	-	-	M12; 18 deep
	71	322	20.5	23.1	10	-	-	M12; 30 deep
	500	505	19.5	25	10	15	240	M12; 18 deep
	750	555	19.5	25	10	-	-	M12; 18 deep
	750 <sup>4)</sup>	649	19.5	25	10	-	-	M12; 18 deep

▼ 101-2



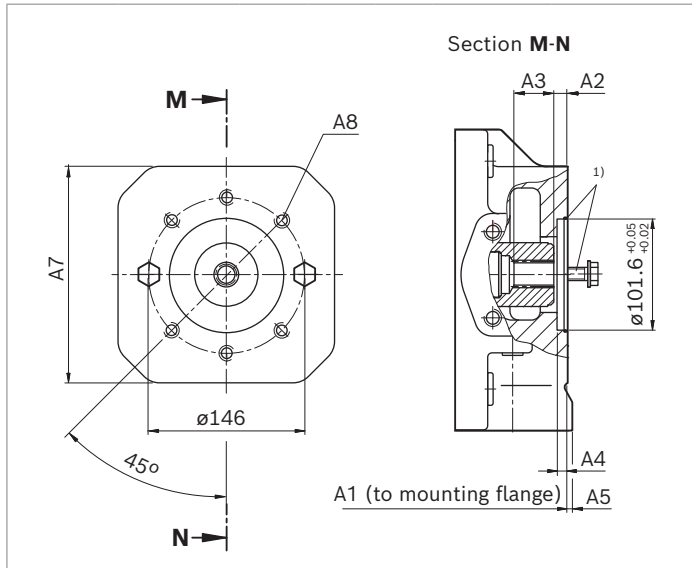
U68	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	18.5	25	13	M12; 22 deep
	180	393	18.5	25	13	M12; 22 deep
	250	453	19.5	23.1	13	M12; 18 deep
	355	482	19.5	23.1	13	M12; 18 deep
	370					

- 1) Mounting bolts and O-ring seal are included in the scope of delivery
- 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 3) Thread according to DIN 13
- 4) With charge pump

Flange ISO 3019-1 (SAE)		Hub for splined shaft <sup>2)</sup>	Availability across sizes										Code
Diameter	Symbol		Diameter	40	71	125	180	250	355		500	750	
101-2 (B)		1 in 15T 16/32DP	●	●	-	-	-	-	-	●	○	○	K04
		1 in 15T 16/32DP	-	-	●	●	●	●	-	-	-	-	U04

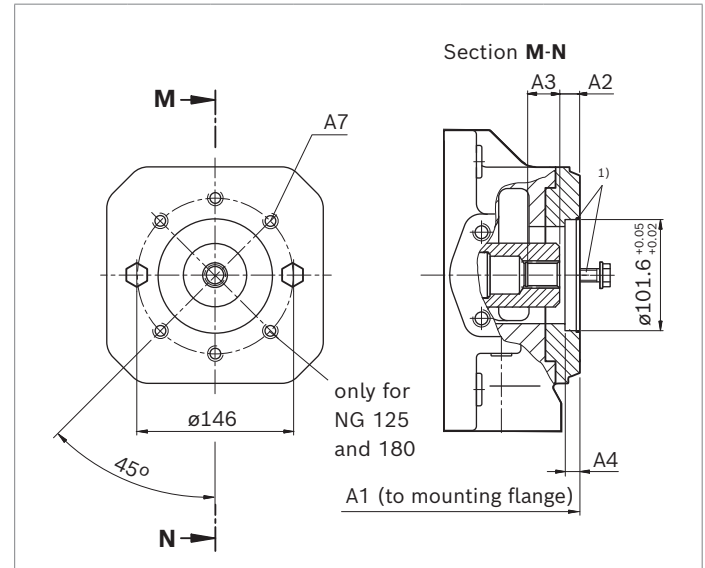
● = Available    ○ = On request    - = Not available

▼ 101-2



K04	NG	A1	A2	A3	A4	A5	A7	A8 <sup>3)</sup>
	40	290	20.8	27.5	10	-	-	M12; 20 deep
	71	322	20	29.4	10	-	-	M12; 30 deep
	500	505	20.4	28.9	10	15	240	M12; 18 deep

▼ 101-2



U04	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	18.9	29.4	13	M12; 22 deep
	180	393	18.9	29.4	13	M12; 22 deep
	250	453	18.9	29.4	13	M12; 18 deep
	355	482	18.9	29.4	13	M12; 18 deep
	370					

1) Mounting bolts and O-ring seal are included in the scope of delivery

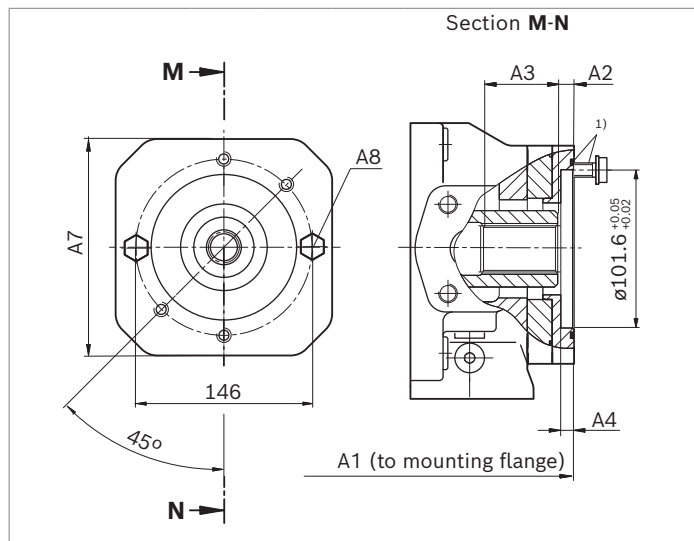
2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

3) Thread according to DIN 13

Flange ISO 3019-1 (SAE)		Hub for splined shaft <sup>2)</sup>										Code	
Diameter	Symbol	Diameter	40	71	125	180	250	355		500	750		1000
101-2 (B)	⚙, ⚙, ⚙	1 1/4 in 14T 12/24 DP	-	●	-	-	-	-	-	○	○	○	K06
		1 1/4 in 14T 12/24 DP	-	-	○	○	○	○	○	-	-	-	U06


● = Available    ○ = On request    - = Not available

▼ 101-2<sup>4)</sup>



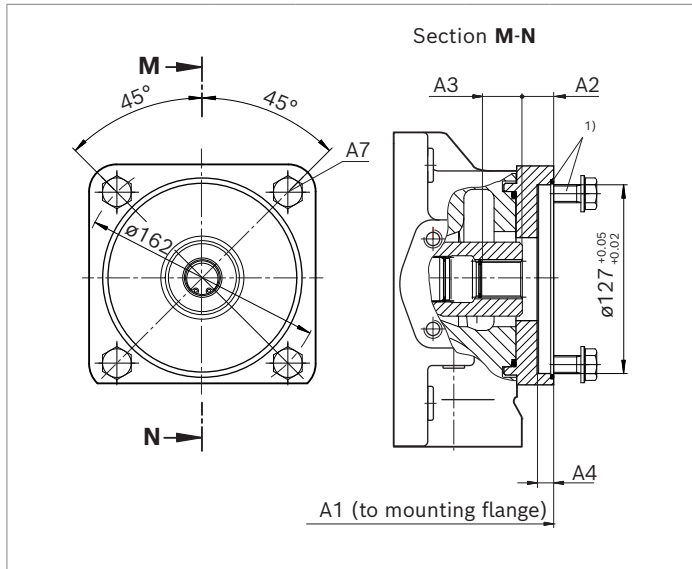
K06	NG	A1	A2	A3	A4	A7	A8 <sup>3)</sup>
	71	322	20.8	38	10	140	M12; 30 deep

1) Mounting bolts and O-ring seal are included in the scope of delivery  
 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5  
 3) Thread according to DIN 13  
 4) For attaching A10FZO/G63

Flange ISO 3019-1 (SAE)		Hub for splined shaft <sup>2)</sup>	Availability across sizes									Code	
Diameter	Symbol		Diameter	40	71	125	180	250	355		500		750
127-4 (C)		1 in 15T 16/32 DP	○	●	-	-	-	-	-	○	○	○	KE2
		1 in 15T 16/32 DP	-	-	●	●	○	○	-	-	-	-	UE2

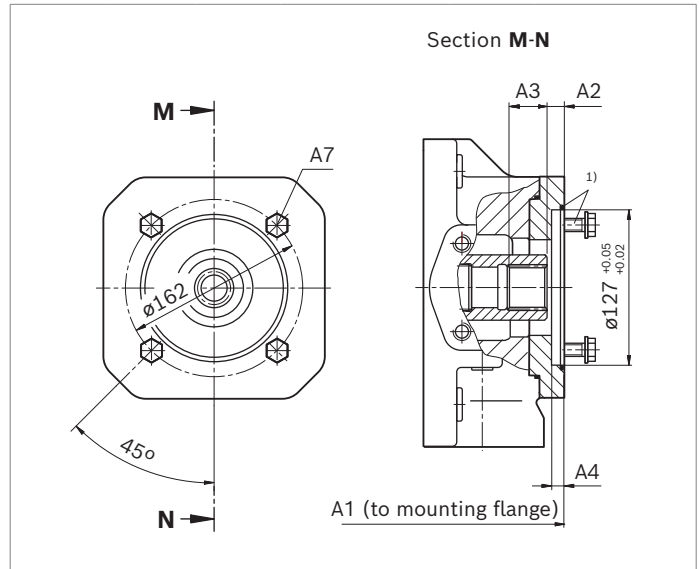
● = Available    ○ = On request    - = Not available

▼ 127-4<sup>4)</sup>



KE2	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	71	321	19	29.4	13	M12; 30 deep

▼ 127-4



UE2	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	19.9	29.5	13	M12; 22 deep
	180	393	19.9	29.5	13	M12; 22 deep


1) Mounting bolts and O-ring seal are included in the scope of delivery

2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

3) Thread according to DIN 13

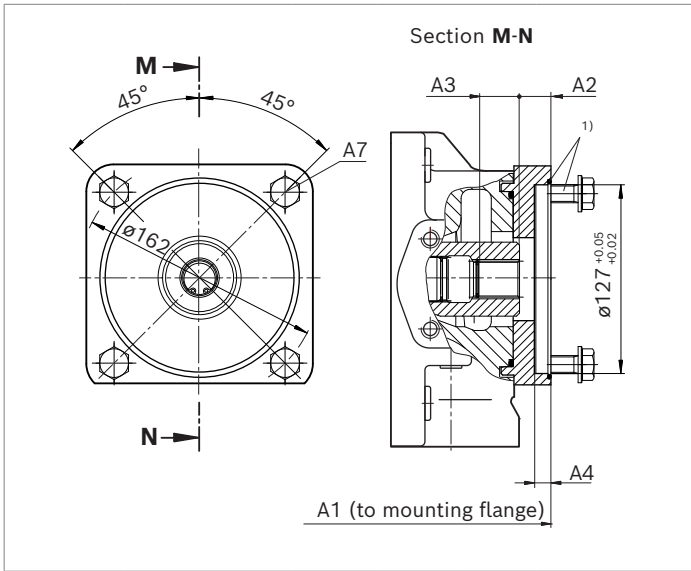
4) For fitting an A10VZO45



Flange ISO 3019-1 (SAE)		Hub for splined shaft <sup>2)</sup>	Availability across sizes										Code
Diameter	Symbol		Diameter	40	71	125	180	250	355	370	500	750	
127-4 (C)		1 1/4 in 14T 12/24 DP	-	●	-	-	-	-	-	●	○	○	K15
		1 1/4 in 14T 12/24 DP	-	-	●	●	●	●	-	-	-	-	U15

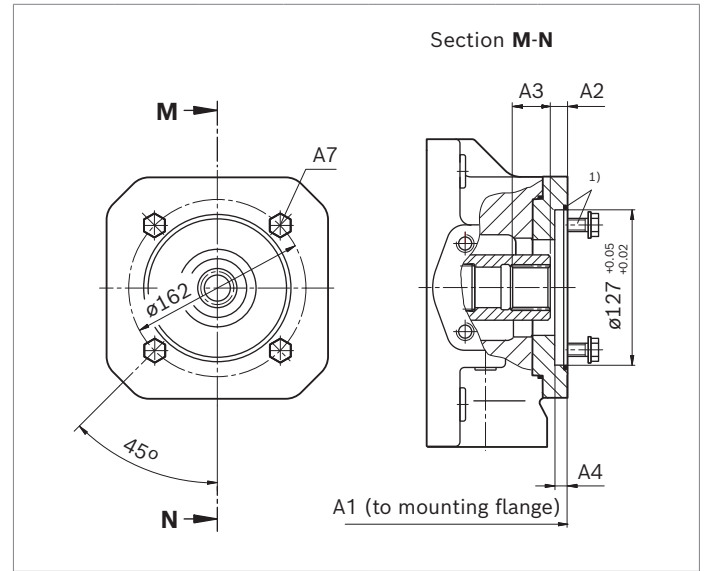
● = Available    ○ = On request    - = Not available

▼ 127-4<sup>4)</sup>



K15	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	71	321	23	38	13	M12; 30 deep
	500	505	19.3	40	13	M12; 18 deep

▼ 127-4



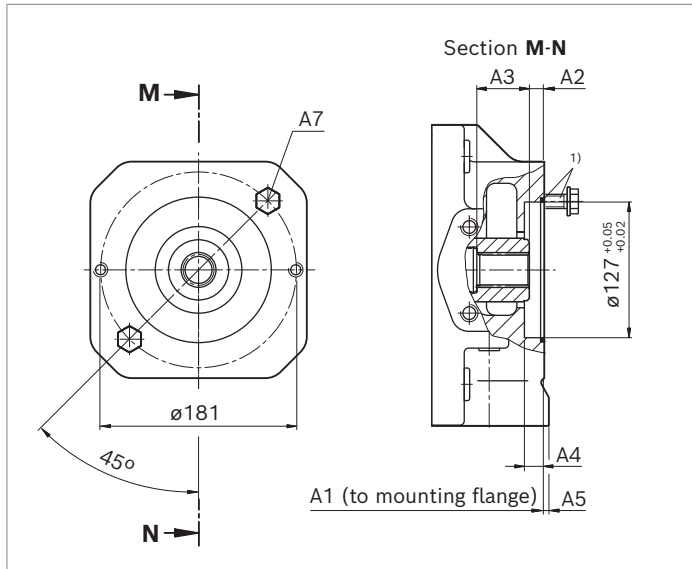
U15	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	20	38	13	M12; 22 deep
	180	393	20	38	13	M12; 22 deep
	250	453	20.9	38	13	M12; 22 deep
	355	482	20.9	38	13	M12; 22 deep
	370					

1) Mounting bolts and O-ring seal are included in the scope of delivery  
 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5  
 3) Thread according to DIN 13  
 4) For fitting an A10VZO71

Flange ISO 3019-1 (SAE)		Hub for splined shaft <sup>2)</sup>											Code	
Diameter	Symbol	Diameter	40	71	125	180	250	355	370	500	750	750 <sup>4)</sup>		1000
127-2 (C)	☛, ☛☛	1 1/4 in 14T 12/24 DP	-	●	-	-	-	-	-	●	●	●	○	K07
		1 1/4 in 14T 12/24 DP	-	-	●	●	●	●	-	-	-	-	-	U07

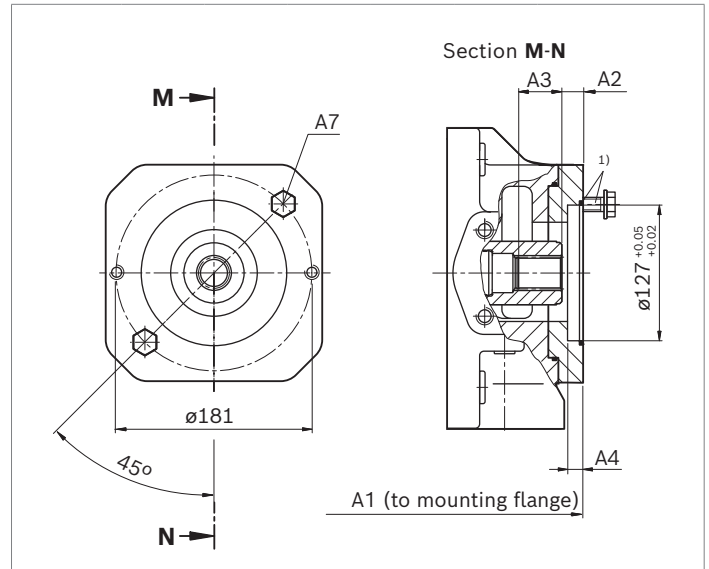
● = Available    ○ = On request    - = Not available

▼ 127-2



K07	NG	A1	A2	A3	A4	A5	A7	A8 <sup>3)</sup>
	71	321	23	38	13	-	-	M16; 30 deep
	500	505	19.3	40.4	13	15	240	M16; 24 deep
	750	555	19.3	40.4	13	-	260	M16; 24 deep
	750 <sup>4)</sup>	649	19.3	40.4	13	-	-	M16; 24 deep

▼ 127-2



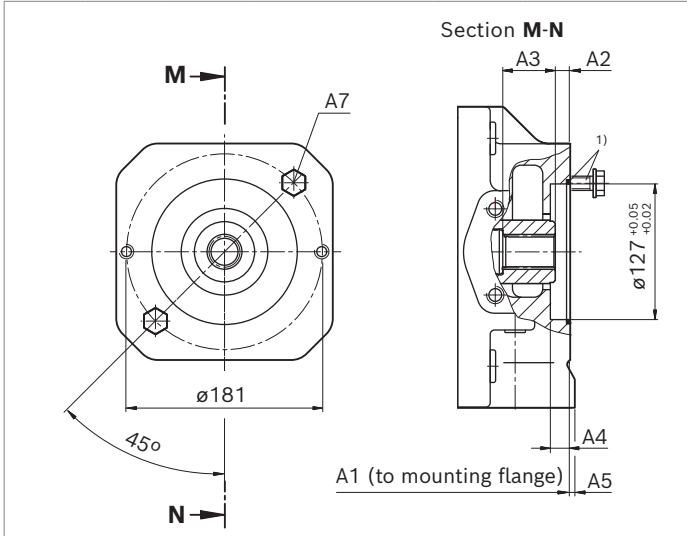
U07	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	20.9	37.9	13	M16; 22 deep
	180	393	20.9	37.9	13	M16; 22 deep
	250	453	20.9	37.9	13	M16; 22 deep
	355	482	20.9	37.9	13	M16; 22 deep
	370					

- 1) Mounting bolts and O-ring seal are included in the scope of delivery
- 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 3) Thread according to DIN 13
- 4) With charge pump

Flange ISO 3019-1 (SAE)		Hub for splined shaft <sup>2)</sup>										Code	
Diameter	Symbol	Diameter	40	71	125	180	250	355		500	750		1000
127-2 (C)		1 1/2 in 17T 12/24 DP	-	-	-	-	-	-	-	•	•	•	K24
		1 1/2 in 17T 12/24 DP	-	-	•	•	•	•	-	-	-	-	U24

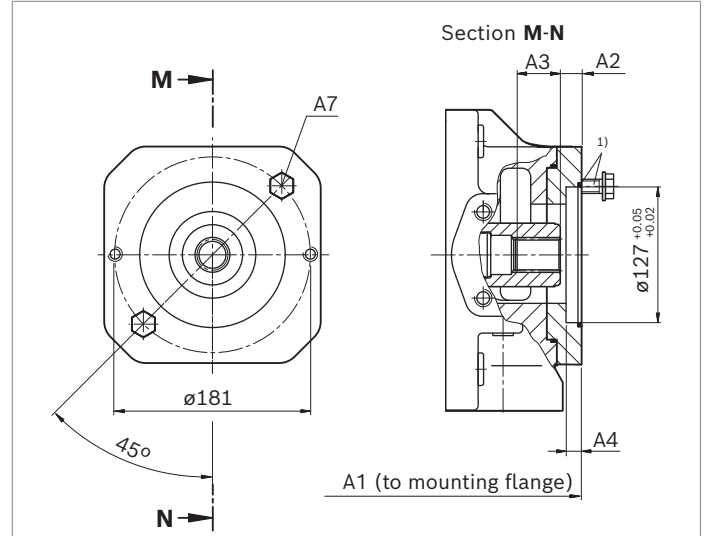
• = Available    ◦ = On request    - = Not available

▼ 127-2




K24	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	500	505	10.3	56.7	13	M16; 24 deep
	750	555	10.3	56.7	13	M16; 24 deep
	1000	628	10.4	56.6	13	M16; 32 deep

▼ 127-2



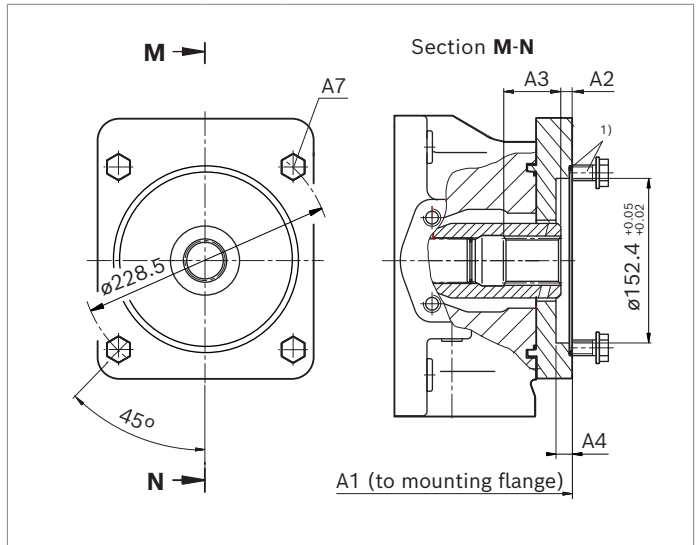
U24	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	10.4	50	13	M16; 22 deep
	180	393	10.4	50	13	M16; 22 deep
	250	453	12.4	55	13	M16; 22 deep
	355	482	12.4	55	13	M16; 22 deep
	370					

1) Mounting bolts and O-ring seal are included in the scope of delivery  
 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5  
 3) Thread according to DIN 13

Flange ISO 3019-1 (SAE)		Hub for splined shaft <sup>2)</sup>										Code	
Diameter	Symbol	Diameter	40	71	125	180	250	355	370	500	750	1000	
152-4 (D)		1 1/2 in 17T 12/24DP	-	-	-	-	-	-	-	o	o	o	K96
		1 1/2 in 17T 12/24DP	-	-	•	•	•	•	-	-	-	-	U96

• = Available    o = On request    - = Not available

▼ 152-4



U96	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	369	10.4	52	13	M16; 22 deep
	180	393	10.4	52	13	M16; 22 deep
	250	453	12.4	55	13	M16; 22 deep
	355	482	12.4	55	13	M16; 22 deep
	370					

1) Mounting bolts and O-ring seal are included in the scope of delivery

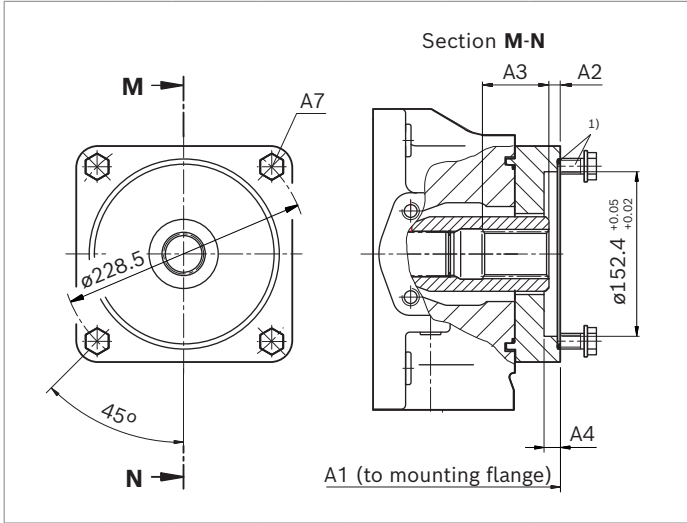
2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

3) Thread according to DIN 13

Flange ISO 3019-1 (SAE)		Hub for splined shaft <sup>2)</sup>	Availability across sizes										Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	750	1000		
152-4		1 3/4 in 13T 8/16DP	-	-	-	-	-	-	•	•	○	K17	
		1 3/4 in 13T 8/16DP	-	-	•	•	•	•	-	-	-	U17	

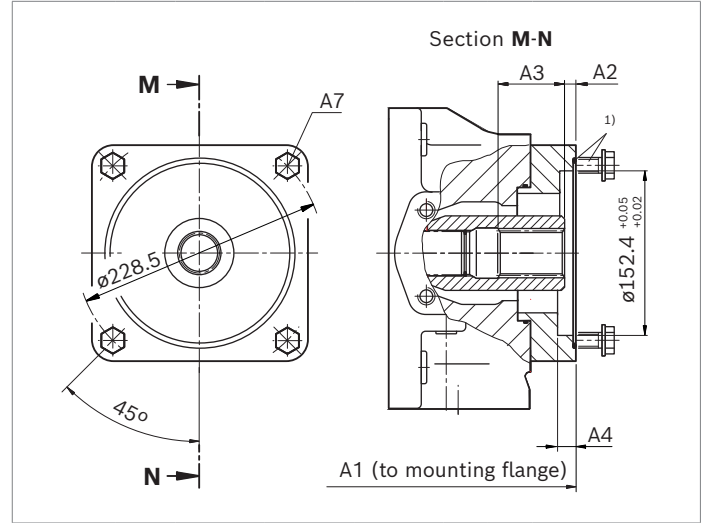
• = Available    ○ = On request    - = Not available

▼ 152-4



K17	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	500	530	10.4	59.6	13	M16; 25 deep
	750	580	10.4	59.6	13	M16; 25 deep

▼ 152-4



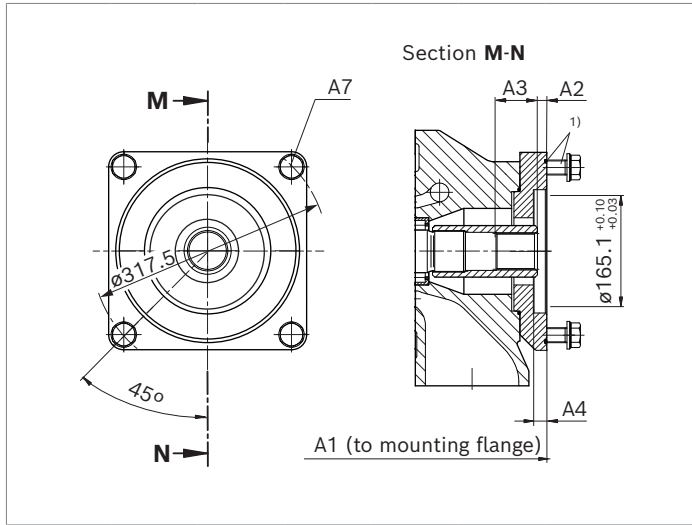
U17	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	125	382	10.4	62	13	M16; 35 deep
	180	406	10.4	62	13	M16; 35 deep
	250	453	10.6	62	13	M16; 22 deep
	355	482	10.6	62	13	M16; 22 deep
	370					

1) Mounting bolts and O-ring seal are included in the scope of delivery  
 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5  
 3) Thread according to DIN 13

Flange ISO 3019-1 (SAE)		Hub for splined shaft <sup>2)</sup>	Availability across sizes								Code	
Diameter	Symbol		Diameter	40	71	125	180	250	355	500		750
165-4 (D)		N50×2×24×8H	-	-	-	-	-	-	●	○	○	K84
		N50×2×24×8H	-	-	-	-	●	●	-	-	-	U84

● = Available    ○ = On request    - = Not available

▼ 165-4



K84	NG	A1	A2	A3	A4	A7 <sup>3)</sup>
	355	508	24.2	44.9	17	M20; 47 deep
	370	508	24.4	44.9	17	M20; 47 deep
	500	541	12.5	55.5	18	M20; 36 deep

1) Mounting bolts and O-ring seal are included in the scope of delivery

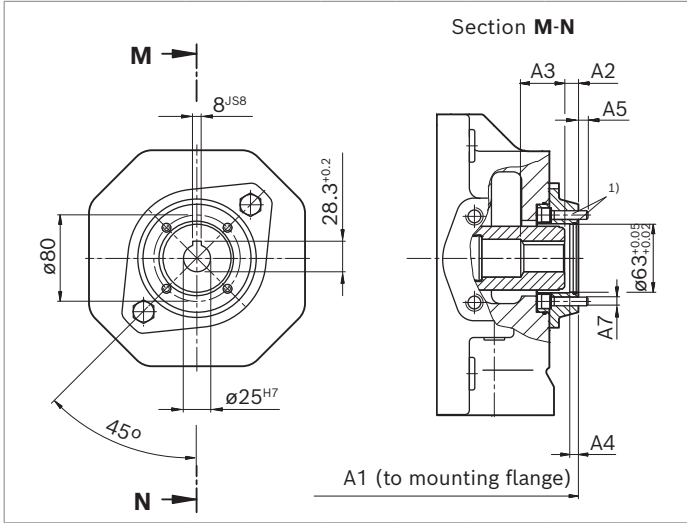
2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

3) Thread according to DIN 13

Flange ISO 3019-1 (SAE)		Hub for splined shaft <sup>2)</sup>	Availability across sizes										Code
Diameter	Symbol		Diameter	40	71	125	180	250	355	370	500	750	
ø63		shaft key ø25	•	•	-	-	-	-	○	○	○	○	K57
		shaft key ø25	-	-	•	•	•	•	-	-	-	-	U57

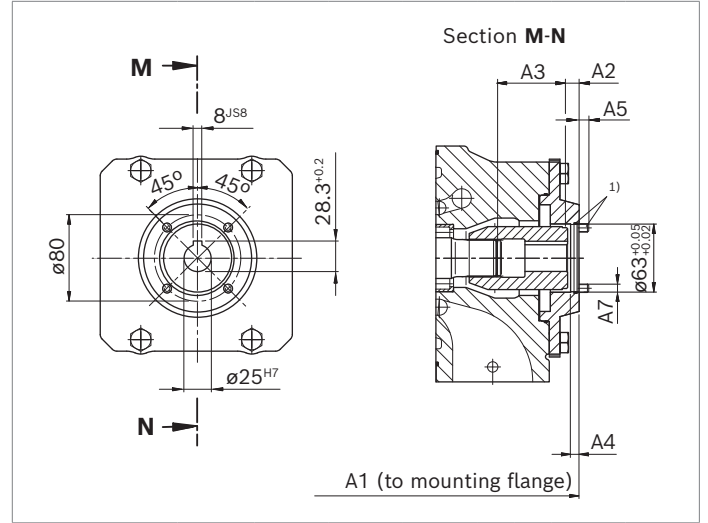
• = Available    ○ = On request    - = Not available

▼ ø63



K57	NG	A1	A2	A3	A4	A5	A7 <sup>2)</sup>
	40	288	11	56	9	9	M8
	71	319	10.9	42	8	9	M8

▼ ø63



U57	NG	A1	A2	A3	A4	A5	A7 <sup>2)</sup>
	125	375	10.8	40	8	9	M8
	180	399	10.8	40	8	9	M8
	250	459	10.8	42.6	8	9	M8
	355/ 370	488	10.8	42.6	8	9	M8

1) Mounting bolts and O-ring seal are included in the scope of delivery

2) Thread according to DIN 13

## Overview of mounting options

Through drive <sup>1)</sup>			Mounting options – 2nd pump						
Flange	Hub for splined shaft	Code	A4VSO/G NG (shaft)	A4CSG NG (shaft)	A10V(S)O/3x NG (shaft)	A10V(S)O/5x NG (shaft)	A10FZO/G NG (shaft)	A10VZO/G NG (shaft)	External/ internal gear pump
<b>Flange ISO 3019-2 (metric)</b>									
80-2	3/4 in <sup>3</sup>	K/U B2	–	–	18 (S, R)/31	10 (S)/52	–	–	–
100-2	7/8 in <sup>3</sup>	K/U B3	–	–	28 (S, R)/31	–	–	–	–
	1 in <sup>3</sup>	K/U B4	–	–	45 (S, R)/31	–	–	–	–
125-2	1 1/4 in <sup>3</sup>	K/U B5	–	–	71/88 (S, R)/31	–	–	–	–
	1 1/2 in <sup>3</sup>	K/U B6	–	–	100 (S)/31	–	–	–	–
125-4	1 in <sup>3</sup>	K/U E1	–	–	45 (S, R)/32	–	–	–	–
	W32 <sup>2)</sup>	K/U 31	40 (Z)	–	–	–	–	–	–
140-4	W40 <sup>2)</sup>	K/U 33	71 (Z)	–	–	–	–	–	–
160-4	W50 <sup>2)</sup>	K/U 34	125 (Z)	–	–	–	–	–	–
	W50 <sup>2)</sup>	K/U 34	180 (Z)	–	–	–	–	–	–
	1 1/4 in <sup>3</sup>	K/U B8	–	–	71 (S, R)/32	–	–	–	–
180-4	1 3/4 in <sup>3</sup>	K/U B7	–	–	140 (S)/ 32 180 (S)/ 32	–	–	–	–
	1 1/2 in <sup>3</sup>	K/U B9	–	–	100 (S)/32	–	–	–	–
224-4	W60 <sup>2)</sup>	K/U 35	250 (Z)	250 (Z)	–	–	–	–	–
	W70 <sup>2)</sup>	K/U 77	355 (Z) 370 (Z)	355 (Z) 370 (Z)	–	–	–	–	–
315-8	W80 <sup>2)</sup>	K43	500 (Z)	500 (Z)	–	–	–	–	–
400-8	W90 <sup>2)</sup>	K76	750 (Z)	750 (Z)	–	–	–	–	–
	W100 <sup>2)</sup>	K88	1000 (Z)	–	–	–	–	–	–
<b>Flange SAE J 744 (ISO 3019-1)</b>									
82-2 (A) <sup>1)</sup>	5/8 in <sup>3</sup>	K/U 01	–	–	–	–	–	–	F NG 004 to 022 <sup>4)</sup>
	3/4 in <sup>3</sup>	K/U 52	–	–	18 (S, R)/31	10/18 (S, R)	3...10 (S) 11...18 (R)	3...10 (S) 18 (R)	–
101-2 (B) <sup>1)</sup>	7/8 in <sup>3</sup>	K/U 68	–	–	28 (S, R)/31	28 (S, R)	21...28 (R)	28 (R)	N NG 020 to 032 <sup>4)</sup>
	1 in <sup>3</sup>	K/U 04	–	–	45 (S)/31	45 (S, R)	37...45 (R)	45 (R)	PGH4
	1 1/4 in <sup>3</sup>	K/U 06	–	–	–	–	63 (R)/10	–	–
127-2 (C) <sup>1)</sup>	1 1/4 in <sup>3</sup>	K/U 07	–	–	71/88 (S)/31	–	–	–	–
	1 1/2 in <sup>3</sup>	K/U 24	–	–	100 (S)/31	85/100 (S)	–	–	PGH5
127-4 (C) <sup>1)</sup>	1 in <sup>3</sup>	K/U E2	–	–	–	–	–	45 (R)/10	–
	1 1/4 in <sup>3</sup>	K/U 15	–	–	–	60/63/72 (S)	–	71 (R)/10	–
152-4 (D) <sup>1)</sup>	1 3/4 in <sup>3</sup>	K/U 17	–	–	140 (S)/ 32 180 (S)/ 32	–	–	140/180 (S)	–
	1 1/2 in <sup>3</sup>	K/U 96	–	–	100 (S)/32	–	–	100 (S)	–
ø63-4, metr.	shaft key ø25	K/U 57	–	–	–	–	–	–	R4

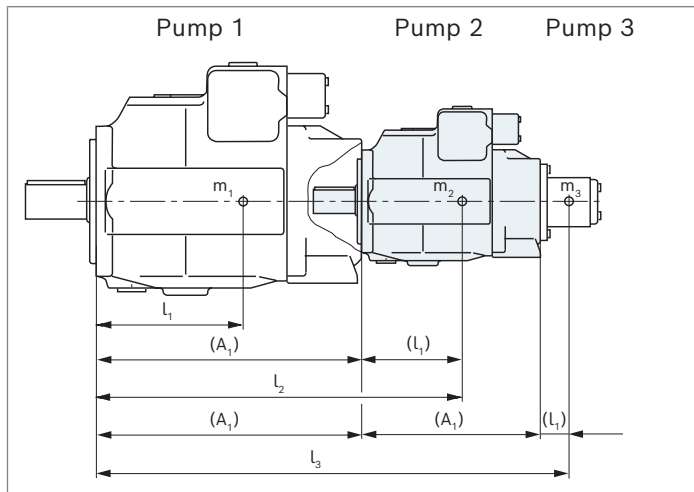
- 1) Additional through drives are available on request
- 2) According to DIN 5480
- 3) Splined shaft in accordance with SAE J744
- 4) Bosch Rexroth recommends special versions of the external gear pumps. Please contact us.



### Permissible mass moment of inertia

Based on mounting flange on primary pump

Size			40	71	125	180	250	355	370	500	750	1000
Permissible moment of inertia	$M_{m \text{ perm.}}$	Nm	1800	2000	4200	4200	9300	9300	9300	15600	19500	19500
Permissible moment of inertia for dynamic mass acceleration 10 g (= 98.1 m/s <sup>2</sup> )	$M_{m \text{ perm.}}$	Nm	180	200	420	420	930	930	930	1560	1950	1950
Weight (A4VSO...DR)	$m$	kg	39	53	88	102	184	207	207	320	460	605
Distance from center of gravity	$l_1$	mm	120	140	170	180	210	220	220	230	260	290



$m_1, m_2, m_3$	Weight of pump	[kg]
$l_1, l_2, l_3$	Distance from center of gravity	[mm]

$$M_m = (m_1 \times l_1 + m_2 \times l_2 + m_3 \times l_3) \times \frac{1}{102} \text{ [Nm]}$$

Calculation for multiple pumps	
$l_1$	= front pump distance from center of gravity (value from "Permissible moment of inertia" table)
$l_2$	= dimension "A <sub>1</sub> " from through drive drawings (from page 45) + $l_1$ of the 2nd pump
$l_3$	= dimension "A <sub>1</sub> " from through drive drawings (from page 45) of the 1st pump + "A <sub>1</sub> " of the 2nd pump + $l_1$ of the 3rd pump

## Combination pumps A4VSO + A4VSO

### Total length A

A4VSO (1st pump)	A4VSO...DR...N00 (2nd pump)									
	NG 40	NG 71	NG 125	NG 180	NG 250	NG 355	NG 370	NG 500	NG 750	NG 1000
NG 40	554	-	-	-	-	-	-	-	-	-
NG 71	582	611	-	-	-	-	-	-	-	-
NG 125	635	664	724	-	-	-	-	-	-	-
NG 180	659	688	748	768	-	-	-	-	-	-
NG 250	719	748	808	828	904	-	-	-	-	-
NG 355	748	777	837	857	933	962	-	-	-	-
NG 370	748	777	837	857	933	962	-	-	-	-
NG 500	771	800	860	880	976	1005	1005	1110	-	-
NG 750	821	850	910	930	1026	1055	1055	1160	1214	-
NG 1000	o	923	983	1003	1099	1128	1128	1233	1288	1368

o = On request

By using combination pumps, it is possible to have independent circuits without the need for splitter gearboxes.

When ordering combination pumps the type designations for the first and the second pump must be joined by a "+" and are combined into one part number. Each single pump should be ordered according to type code.

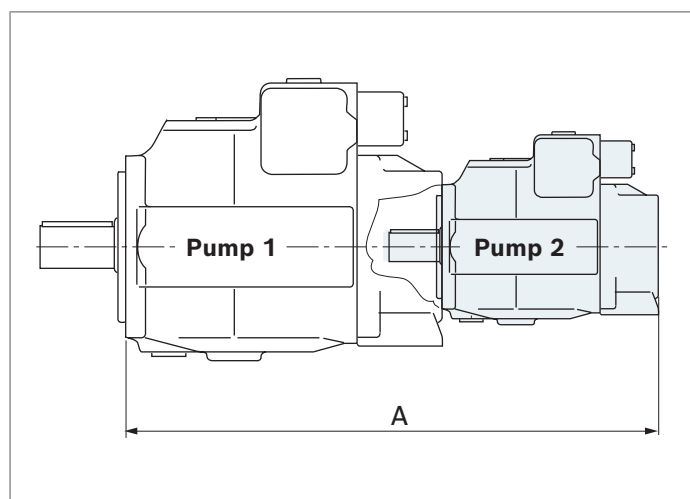
#### Notice

- ▶ The combination pump type code is shown in shortened form in the order confirmation.

#### Example:

**A4VSO 250LR2D/30R+A4VSO 250LR2D/30R**

- ▶ Each through drive is plugged with a **non-pressure-resistant** cover. Therefore, the units must be fitted with a pressure-resistant cover or a specified attachment pump before commissioning.



## Installation instructions

### General

The axial piston unit must be filled with hydraulic fluid and air bled during commissioning and operation. This must also be observed following a longer standstill as the axial piston unit may empty via the hydraulic lines. Particularly in the installation position "drive shaft upwards," filling and air bleeding must be carried out completely as there is, for example, a danger of dry running.

The leakage in the housing area must be directed to the reservoir via the highest drain port (**T**, **K<sub>1</sub>**, **K<sub>2</sub>**, **R(L)**).

For combination pumps, the leakage must be drained off at each single pump.

If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. The shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operating condition, particularly at cold start. If this is not possible, separate drain line must be laid, if necessary.

To prevent the transmission of structure-borne noise, use elastic elements to decouple all connecting lines from all vibration-capable components (e.g. reservoir, frame parts). Under all operating conditions, the suction lines and the drain lines must flow into the reservoir below the minimum fluid level. The permissible suction height  $h_s$  results from the total pressure loss. However, it must not be higher than  $h_{s\ max} = 800\ \text{mm}$ . The minimum suction pressure at port **S** must also not fall below 0.8 bar absolute (without charge pump) or 0.7 bar absolute (with charge pump) during operation and during a cold start.

When designing the reservoir, ensure that there is adequate distance between the suction line and the drain line. We recommend using a baffle (baffle plate) between suction line and drain line. A baffle improves the air separation ability as it gives the hydraulic fluid more time for desorption. Apart from that, this prevents the heated return flow from being drawn directly back into the suction line. The suction port must be supplied with air-free, calmed and cooled hydraulic fluid.

### Notice

In certain installation positions, an influence on the adjustment or control can be expected.

Gravity, dead weight and case pressure can cause minor characteristic shifts and changes in actuating time.

### Installation position

See the following examples **1** to **7**.

Further installation positions are available upon request.

Recommended installation positions: **1** and **2**

Key	
<b>R(L)</b> <b>(F)</b>	Filling / Air bleeding
<b>S</b>	Suction port
<b>T</b>	Drain port
<b>U</b>	Flushing port
<b>K<sub>1</sub>, K<sub>2</sub></b>	Flushing port
<b>SB</b>	Baffle (baffle plate)
$h_{t\ min}$	Minimum required immersion depth (200 mm)
$h_{min}$	Minimum required distance to reservoir bottom (100 mm)
$h_{s\ max}$	Maximum permissible suction height (800 mm)

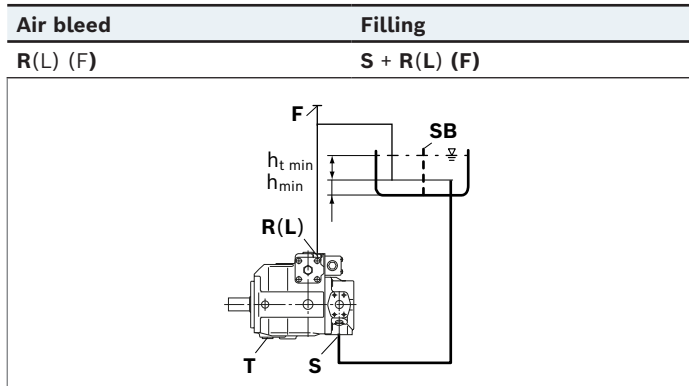
### Notice

Port **F** is part of the external piping and must be provided on the customer side to make filling and air bleeding easier.

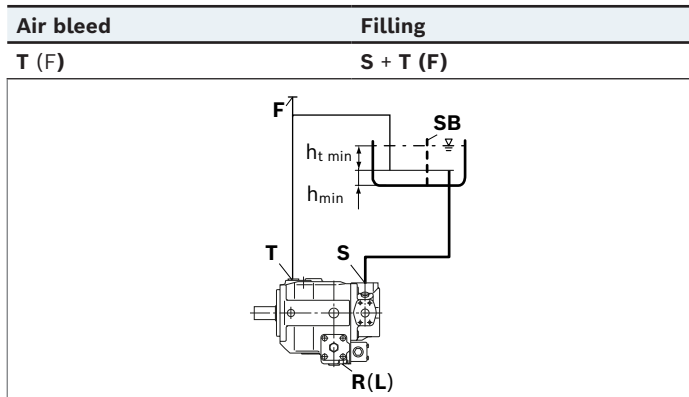
**Below-reservoir installation (standard)**

Below-reservoir installation means that the axial piston unit is installed outside of the reservoir below the minimum fluid level.

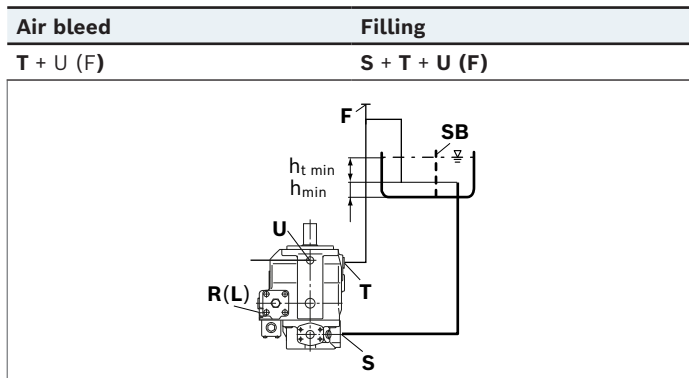
▼ **Installation position 1**



▼ **Installation position 2**



▼ **Installation position 3**



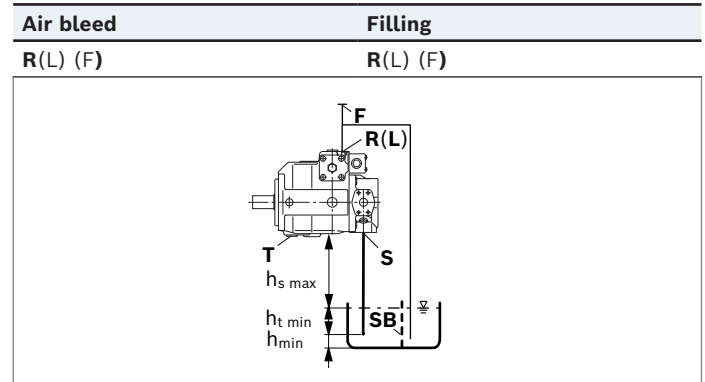
For key, see page 75

**Above-reservoir installation**

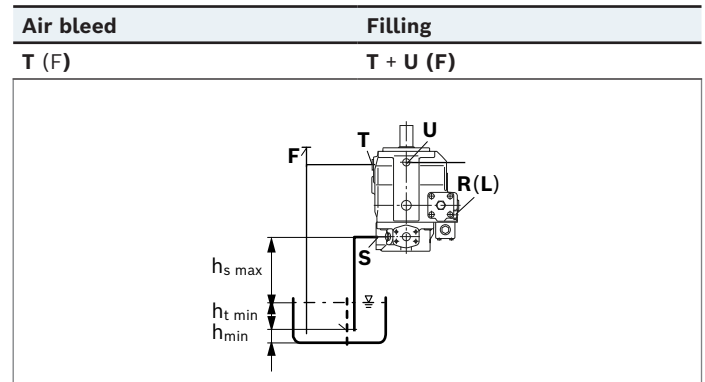
Above-reservoir installation means that the axial piston unit is installed above the minimum fluid level of the reservoir. Observe the maximum permissible suction height  $h_{s \max} = 800 \text{ mm}$ .

The above-reservoir installation is not recommended for sizes 180 to 1000 and is not permissible for units with charge pump (A4VSLO).

▼ **Installation position 4**



▼ **Installation position 5**



### Inside-reservoir installation

Inside-reservoir installation is when the axial piston unit is installed in the reservoir below the minimum fluid level. The axial piston unit is completely below the hydraulic fluid if the minimum fluid level is equal to or below the upper edge of the pump, see chapter "Above-reservoir installation".

Axial piston units with electric components (e.g., electric controls, sensors) must not be installed in a reservoir below the fluid level.

#### The exception is control HS5M

The proportional valve which is not included in scope of delivery can be positioned outside the reservoir in the system and piped up via the provided ports **X<sub>1</sub>** and **X<sub>2</sub>** of the pump.

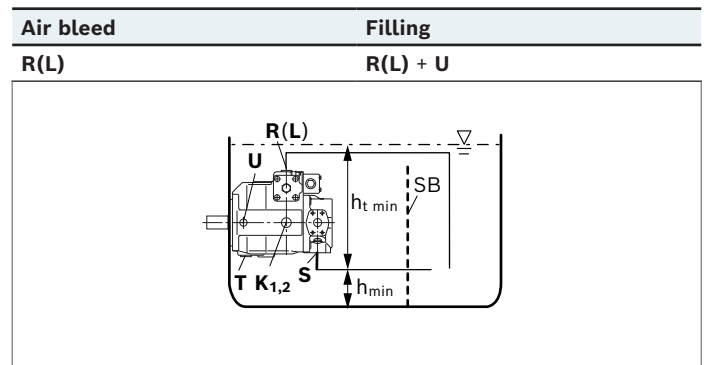
The unit can be installed in the reservoir together with the directly mounted position transducer.

Approved for HLP fluids DIN 51524.

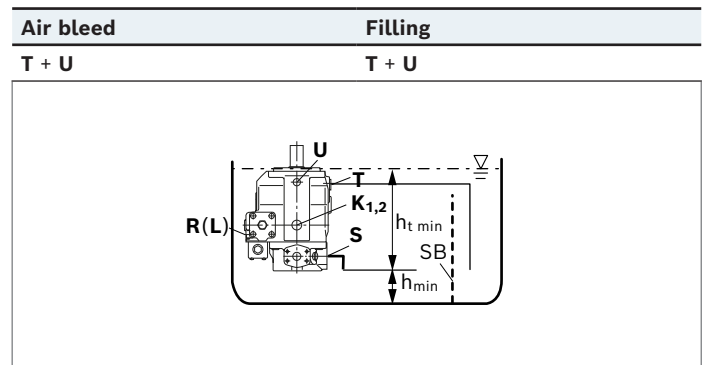
#### Notice

- We recommend to provide the suction port **S** with a suction pipe and for the drain port **T** or **R(L)** to be piped. In this case, the other drain port must be plugged. The housing of the axial piston unit is to be filled via **R(L)** or **T** (see installation position 7 to 9) before the pipework is fitted and the reservoir is filled with hydraulic fluid.

#### ▼ Installation position 6



#### ▼ Installation position 7



For key, see page 75

1) For the high-speed version, **P<sub>HD</sub>** must be filled.

## Project planning notes

- ▶ The axial piston variable pump A4VSO is intended to be used in an open circuit.
- ▶ The project planning, installation and commissioning of the axial piston unit requires the involvement of skilled personnel.
- ▶ Before using the axial piston unit, please read the corresponding instruction manual completely and thoroughly. If necessary, this can be requested from Bosch Rexroth.
- ▶ Before finalizing your design, please request a binding installation drawing.
- ▶ The specified data and notes contained herein must be observed.
- ▶ Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- ▶ The characteristic curve may also shift due to the dither frequency or control electronics.
- ▶ Preservation: Our axial piston units are supplied as standard with preservation protection for a maximum of 12 months. If longer preservation protection is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, details of which can be found in the data sheet 90312 or the instruction manual.
- ▶ Not all versions of the product are approved for use in safety functions according to ISO 13849. Please consult the proper contact at Bosch Rexroth if you require reliability parameters (e.g., MTTF<sub>d</sub>) for functional safety.
- ▶ Depending on the type of control used, electromagnetic effects can be produced when using solenoids. Applying a direct voltage signal (DC) to solenoids does not create electromagnetic interference (EMI) nor is the solenoid affected by EMI. Electromagnetic interference (EMI) potential exists when operating and controlling a solenoid with a modulated direct voltage signal (e.g. PWM signal) Appropriate testing and measures should be taken by the machine manufacturer to ensure other components or operators (e.g. with pacemaker) are not affected by this potential.
- ▶ The pressure control (hydraulic or electronic) is not an adequate safeguard against pressure overload. Therefore, a pressure relief valve must be provided in the hydraulic system (integrated into the pump or externally in the system). In this connection, observe the technical limits of the pressure relief valve.
- ▶ For controllers requiring external pilot pressure, sufficient control fluid must be provided to the associated ports to ensure the required pilot pressures for the respective controller function. These controllers are subject to leakage due to their design. An increase in control fluid demand has to be anticipated over the total operating time. The design of the control fluid supply must thus be sufficiently large. If the control fluid is too low, the respective controller function may be impaired and undesired system behavior may result.
- ▶ For drives that are operated for a long period of time with constant rotational speed, the natural frequency of the hydraulic system can be stimulated by the excitation frequency of the pump (rotational speed frequency x 9). This can be prevented with suitably designed hydraulic lines.
- ▶ Please note the details regarding the tightening torques of port threads and other threaded joints in the instruction manual.
- ▶ The ports and fastening threads are designed for the  $p_{\max}$  permissible pressures of the respective ports, see the connection tables. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified conditions of use (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
- ▶ The service ports and function ports are only intended to accommodate hydraulic lines.

## Safety instructions

- ▶ During and shortly after operation, there is a risk of getting burnt on the axial piston unit and especially on the solenoids. Take the appropriate safety measures (e.g. by wearing protective clothing).
- ▶ Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, get stuck in position as a result of contamination (e.g. contaminated hydraulic fluid, abrasion, or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer respond correctly to the operator's specifications. Even the use of various filter elements (external or internal flow filtration) will not rule out a fault but merely reduce the risk. The machine/system manufacturer must test whether remedial measures are needed on the machine for the application concerned in order to bring the driven consumer into a safe position (e.g. safe stop) and ensure any measures are properly implemented.

## Related documentation

### Product-specific documentation

Document type	Title	Document number
Data sheet	Axial piston variable pump A4VSO series 1X and 30 for HFC hydraulic fluids	92053
	Axial piston units with DS2 secondary control A4VSO series 10 and 30	92057
	Axial piston units with DS3 secondary control A4VSO series 10 and 30	92059
	Control systems DR, DP, FR and DFR for axial piston variable pump A4VSO	92060
	A4VSO, A4VBO power controller LR2, LR3 and LR2N, LR3N	92064
	Control systems MA and EMA... for axial piston variable pump A4VSO and A4VSG	92072
	Control systems HM, HS, HS5 and EO series 1x and 30	92076
	Control devices HD	92080
	Electrohydraulic control system DFE1x for axial piston variable pumps A4VSO and A4VBO series 1x and 3x	92088
	Pressure and flow control system type SYHDFEE, SYHDFED, SYHDFEF	30035
	Universal through drive for axial piston variable pumps A10VSO, A10VO, A10VZO, A4VSO, A4VBO, A15VSO/A15VLO and A15V(L)O	95581
	Storage and preservation of axial piston units	90312
Instruction manuals	Axial piston variable pump A4VSO series 1, 2 and 3	92050-01-B

### Documentation for hydraulic fluids

Document type	Title	Document number
Data sheet	Hydraulic fluids based on mineral oils and related hydrocarbons	90220
	Environmentally acceptable hydraulic fluids	90221
	Fire-resistant, water-free hydraulic fluids (HFDR/HFDU)	90222
	Fire-resistant, water-containing hydraulic fluids (HFAX, HFB, HFC)	90223
	Rating of hydraulic fluids used in Rexroth hydraulic components (pumps and motors)	90235
	Bosch Rexroth Fluid Rating List for Rexroth hydraulic components (pumps and motors)	90245

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