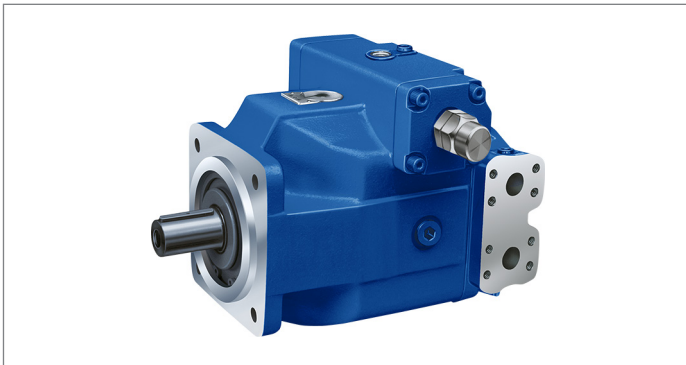


Axial piston variable pump (A)A4VSG series 1x and 3x

Americas



- ▶ Robust high-pressure pump for industrial applications
- ▶ Sizes 40... 1000
- ▶ Nominal pressure 5100 psi (350 bar)
- ▶ Maximum pressure 5800 psi (400 bar)
- ▶ Closed circuit

Features

- ▶ Robust pump with very long service life
- ▶ Low operating noise
- ▶ Through-drive for mounting of further pumps up to same size
- ▶ Flow direction changes when the swashplate is moved through the neutral position
- ▶ Axial and radial load capacity of drive shaft
- ▶ Modular design
- ▶ Optical swivel angle indicator
- ▶ Short control times
- ▶ Operation on HF-fluids under reduced operational data possible
- ▶ Swashplate design

Contents

Type code	2
Hydraulic fluids	5
Working pressure range	7
Technical data	8
Overview of control device	11
Dimensions, size 40 to 1000	15
Dimensions for through drives	33
Overview of mounting options	47
Combination pumps (A)A4VSG + (A)A4VSG	48
Combination pumps (A)A4VSG + (A)A4VSO	48
Attachment of boost and control circuit pumps	
Order code: H02, H04 and H06	50
H024 – A4VSG with an attachment pump for the boost circuit, valve block with filter	51
For example: A4VSG 180....H024N	52
N009N – A4VSG with valve block without filter	53
A4VSG 1000....N009N	53
Installation instructions	54
Project planning notes	57
Safety instructions	58

Type code

01	02	03	04	05	06	07	08	09	10	11	12	13	14
	(A)A4VS	G			/		-						

Hydraulic fluid		40	71	125	180	250	355	500	750	1000	
01	Mineral oil and HFD hydraulic fluids (no code)	●	●	●	●	●	●	●	●	●	
	HFA, HFB, and HFC hydraulic fluids										
	Only with sealing material NBR nitrile rubber and shaft seal PTFE. Please order with code P in position 08.	●	●	●	●	●	●	●	-	-	E

Axial piston unit		40	71	125	180	250	355	500	750	1000		
02	Swashplate design, variable, nominal pressure 5100 psi (350 bar), maximum pressure 5800 psi (400 bar)	SAE	●	●	●	●	●	●	-	-	-	AA4VS
		metric	-	-	-	-	-	-	●	●	●	A4VS

Operating mode		
03	Pump, closed circuit	G

Size (NG)		40	71	125	180	250	355	500	750	1000
04	Geometric displacement, see table of values on page 8	40	71	125	180	250	355	500	750	1000

Control device		Data sheet	40	71	125	180	250	355	500	750	1000	
05	Manual control	92072	●	●	●	●	●	●	●	-	-	MA
	Electric motor control		●	●	●	●	●	●	●	-	-	EM
	Hydraulic control, depending on quantity	92076	●	●	●	●	●	●	●	●	●	HM..
	Digital, electro-hydraulic control, with control valve		●	●	●	●	●	●	●	●	●	HS5.
	Hydraulic control, with proportional valve		●	●	●	●	●	●	●	●	●	EO..
	Hydraulic control, pilot-pressure related	92080	●	●	●	●	●	●	●	●	●	HD..
	Electro-hydraulic control with proportional solenoid	92084	●	●	●	●	●	●	●	●	○	EP..
	Secondary controlled rotational speed control	92058	●	●	●	●	●	●	●	●	●	DS2
	Secondary controlled rotational speed control	92063	●	●	●	●	●	●	●	●	●	DS3

Series		40	71	125	180	250	355	500	750	1000	
06	Series 1, index 0 (index 1)	●	●	-	-	-	-	-	-	-	10(11) ²⁾
	Series 3, index 0	-	-	●	●	▲	●	▲	●	●	30
	Series 3, index 3; efficiency-optimized rotary group	-	-	-	-	●	-	●	-	-	33

Direction of rotation		40	71	125	180	250	355	500	750	1000	
07	Viewed on drive shaft										
	Clockwise	●	●	●	●	●	●	●	●	●	R
	Counter-clockwise	●	●	●	●	●	●	●	●	●	L
	Variable	●	●	●	●	●	●	●	●	●	W ¹⁾

Sealing material		40	71	125	180	250	355	500	750	1000	
08	FKM (fluorocarbon rubber) / HFD operation	●	●	●	●	●	●	●	●	●	V

Drive shaft		40	71	125	180	250	355	500	750	1000	
09	Parallel keyed shaft ISO 3019-1	●	●	●	●	●	●	-	-	-	K
	Splined shaft ISO 3019-1	●	●	●	●	●	-	-	-	-	S
	Splined shaft according to ISO 3019-1	-	-	-	-	-	●	-	-	-	R
	Parallel keyed shaft DIN 6885	-	-	-	-	-	-	●	●	●	P
	Splined shaft DIN 5480	-	-	-	-	-	-	●	●	●	Z

Mounting flange		40	71	125	180	250	355	500	750	1000		
10	In accordance with ISO 3019-1 SAE	4-hole	●	●	●	●	●	●	-	-	-	D
	In accordance with ISO 3019-2 metric	8-hole	-	-	-	-	-	-	●	●	●	H

● = Available ○ = On request - = Not available ▲ = Not for new projects

1) Only in combination with DS2 and DS3

2) Version with HD and EP-controls in series 11

01	02	03	04	05	06	07	08	09	10	11	12	13	14
	(A)A4VS	G			/		-						

Working port			40	71	125	180	250	355	500	750	1000	
11	SAE flange ports A and B , located on same side, metric fastening thread	UNC fastening thread	●	●	●	●	●	●	-	-	-	60
		metric fastening thread	-	-	-	-	-	-	●	●	●	10

Through drives (for mounting options, see page 47)

Through drives (for mounting options, see page 47)			40	71	125	180	250	355	500	750	1000	
12	Flange ISO 3019-2 (metric)	Hub for splined shaft										
	Diameter Mounting ⁵⁾	Diameter										
	Without through drive		●	●	●	●	●	●	●	●	●	N00
	125, 4-hole	32x22x14x9g ³⁾	-	-	-	-	-	-	●	○	○	K31
	140, 4-hole	40x2x18x9g ³⁾	-	-	-	-	-	-	●	○	●	K33
	160, 4-hole	50x2x24x9g ³⁾	-	-	-	-	-	-	●	○	●	K34
	224, 4-hole	60x2x28x9g ³⁾	-	-	-	-	-	-	●	●	●	K35
	224, 4-hole	70x3x22x9g ³⁾	-	-	-	-	-	-	●	○	●	K77
	315, 8-hole	80x3x25x9g ³⁾	-	-	-	-	-	-	●	●	●	K43
	400, 8-hole	90x3x28x9g ³⁾	-	-	-	-	-	-	-	●	●	K76
	400, 8-hole	100x3x32x9g ³⁾	-	-	-	-	-	-	-	-	●	K88
	80, 2-hole	3/4 in 11T 16/32DP ⁴⁾	○	●	●	○	○	○	○	○	○	KB2
	100, 2-hole	7/8 in 13T 16/32DP ⁴⁾	●	●	●	●	●	●	○	○	○	KB3
	100, 2-hole	1 in 15T 16/32DP ⁴⁾	○	●	●	●	●	●	○	○	●	KB4
	125, 2-hole	1 1/4 in 14T 12/24DP ⁴⁾	-	●	●	●	●	●	●	○	○	KB5
	160, 4-hole	1 1/4 in 14T 12/24DP ⁴⁾	○	○	○	○	○	○	○	○	○	KB8
	125, 2-hole	1 1/2 in 17T 12/24DP ⁴⁾	-	-	●	●	●	●	●	●	○	KB6
	180, 4-hole	1 1/2 in 17T 12/24DP ⁴⁾	-	-	○	○	○	○	○	○	○	KB9
	180, 4-hole	1 3/4 in 13T 8/16DP ⁴⁾	-	-	●	●	●	●	●	●	○	KB7
	Flange ISO 3019-1 (SAE)											
	Diameter Mounting ⁵⁾	Hub for splined shaft										
	Through drive	Diameter										
	82-2 (A)	5/8 in 9T 16/32DP ⁴⁾	●	●	●	●	●	●	●	●	○	K01
	82-2 (A)	3/4 in 11T 16/32DP ⁴⁾	○	●	○	●	○	●	○	○	○	K52
	101-2 (B)	7/8 in 13T 16/32DP ⁴⁾	●	●	●	●	●	●	●	●	○	K68
	101-2 (B)	1 in 15T 16/32DP ⁴⁾	●	●	●	●	●	●	●	○	○	K04
	127-2 (C)	1 1/4 in 14T 12/24DP ⁴⁾	-	●	●	●	●	●	●	●	●	K07
	127-2 (C)	1 1/2 in 17T 12/24DP ⁴⁾	-	-	●	●	●	●	●	●	●	K24
	127-4 (C)	1 1/4 in 14T 12/24DP ⁴⁾	●	●	●	○	○	○	-	-	-	K15
		1 1/2 in 17T 12/24DP ⁴⁾		●	●	●	●	●	-	-	-	K16
	152-4 (D)	1 3/4 in 13T 8/16DP ⁴⁾	-	-	●	●	●	●	●	●	○	K17
		2 in 15T 8/16DP ⁴⁾	-	-	-	●	●	●	●	-	-	K78
	165-4 (F)	2 in 15T 8/16DP ⁴⁾	-	-	-	-	●	●	●	-	-	K18
	Prepared for through drive, with pressure-proof plugged cover		●	●	●	●	●	●	●	●	●	K99

● = Available ○ = On request - = Not available ▲ = Not for new projects

3) According to DIN 5480
4) In accordance with ANSI B92.1a
5) Mounting holes pattern viewed on through drive with control at top.

4 (A)A4VSG series 1x and 3x (Americas) | Axial piston variable pump

Type code

01	02	03	04	05	06	07	08	09	10	11	12	13	14
	A4VS	G			/			-					

Boost pump⁶⁾		40	71	125	180	250	355	500	750	1000	
12	A piped up attachment pump for the boost circuit	●	●	●	●	▲	▲	▲	▲	●	H02
	A shared piped up attachment pump for the boost and control circuit (only for EO1 and EO1K)	●	●	●	-	-	-	-	▲	-	H04
	A separate piped up attachment pump for the boost circuit and the control circuit (only for HD1T and HD1U) including pressure relief valve for the control circuit	●	●	●	●	▲	▲	▲	▲	●	H06

Valves		40	71	125	180	250	355	500	750	1000	
13	Without valve block	●	●	●	●	●	●	●	●	●	0
	SDVB valve block mounted Data sheet 95533	▲	▲	▲	▲	▲ ⁹⁾	▲ ⁹⁾	▲ ⁹⁾	▲ ⁹⁾	●	9
	Valve block mounted SDVB 16 (With directly controlled flushing slide and pilot operated high-pressure relief valve) Data sheet 95534	●	●	●	●	-	-	-	-	-	4

Filtration		40	71	125	180	250	355	500	750	1000	
14	Without filter	●	●	●	●	●	●	●	●	●	N
	Filter mounted in boost circuit	●	●	●	●	●	●	●	●	●	F ⁷⁾
	Intermediate plate filter (for DS-control, see data sheet 92058 and 92063)	●	●	●	●	●	●	● ⁸⁾	●	●	Z
	With threaded port for filter in the boost circuit (only for valve block SDVB 16 acc. to data sheet 95534)	●	●	●	●	-	-	-	-	-	D

● = Available ○ = On request - = Not available

▲ = Not for new projects

Notice

- ▶ Note the project planning notes on page 58.
- ▶ In addition to the type code, please specify the relevant technical data when placing your order.
- ▶ For information on the mounting situation of combination pumps, see page 48.

6) For boost pump attachment NG250 to 750, please use A4CSG (see data sheet 92105). An overview of the available boost pumps for the NG40 to 180 and 1000 can be found on page 50.

7) Filter in the boost circuit with visual-electrical contamination indicator in standard version for:
 NG40, 71: LFBN/HC60G20D1.0/V-L24
 NG125, 180: LFBN/HC110G20D1.0/V-L24
 NG250, 355: LFBN/HC240G20D1.0/V-L24
 NG500: LFBN/HC330G20D1.0/V-L24
 NG750, 1000: LFBN/HC660G20D1.0/V-L24
 Please contact us for more information on the filter.

8) For size 500, only available for DS control; see data sheet 92058
 9) For valve block attachment for NG250 to 750, please use A4CSG (see data sheet 92105).

Hydraulic fluids

The A4VSG 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)

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)

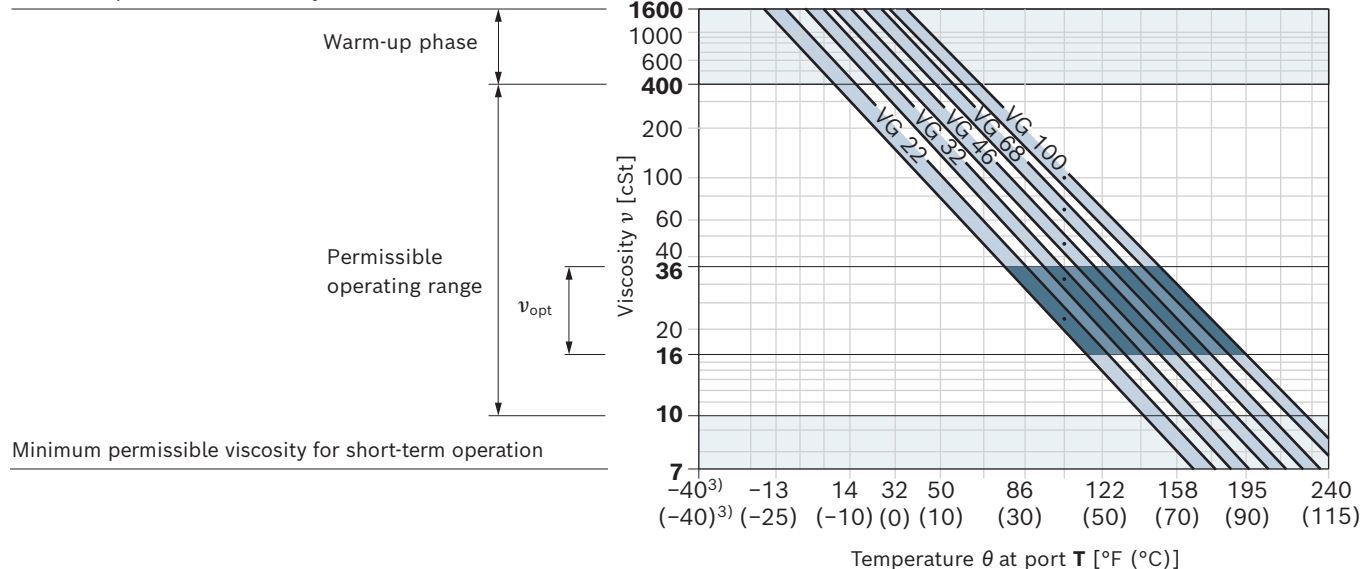
The hydraulic fluid should be selected so that the operating viscosity in the operating temperature range is within the optimum range (v_{opt} ; see selection diagram).

Viscosity and temperature of hydraulic fluids

	Viscosity	Shaft seal	Temperature ²⁾	Comment
Cold start	$v_{max} \leq 1600$ cSt	FKM	$\vartheta_{St} \geq -13^{\circ}\text{F}$ (-25°C)	$t \leq 3$ min, without load ($p \leq 435$ psi (50 bar)), $n \leq 1000$ rpm Permissible temperature difference between axial piston unit and hydraulic fluid in the system maximum 25 K
Warm-up phase	$v = 1600 \dots 400$ cSt			$t \leq 15$ min, $p \leq 0.7 \times p_{nom}$ and $n \leq 0.5 \times n_{nom}$
Permissible operating range	$v = 400 \dots 10$ cSt ¹⁾	FKM	$\vartheta \leq +230^{\circ}\text{F}$ ($+110^{\circ}\text{C}$)	Measured at port T
	$v_{opt} = 36 \dots 16$ cSt			Optimal operating viscosity and efficiency range
Short-term operation	$v_{min} = 10 \dots 7$ cSt	FKM	$\vartheta \leq +230^{\circ}\text{F}$ ($+110^{\circ}\text{C}$)	$t \leq 3$ min, $p \leq 0.3 \times p_{nom}$, measured at port T

▼ Selection diagram

Maximum permissible viscosity on cold start



Notice

The maximum circuit temperature of $+115^{\circ}\text{C}$ must not be exceeded at the working ports **A** and **B** complying with the permissible viscosity.

- 1) This corresponds, for example on the VG 46, to a temperature range of $+39^{\circ}\text{F}$ to $+185^{\circ}\text{F}$ ($+4^{\circ}\text{C}$ to $+85^{\circ}\text{C}$) (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 under ISO 4406 should be maintained.

At a hydraulic fluid viscosity of less than 10 cSt (e.g. due to high temperatures during short-term operation), a cleanliness level of at least 19/17/14 according to ISO 4406 is required.

Examples of temperatures of hydraulic fluids at a viscosity of 10 mm²/s:

- ▶ HLP 32 for 73 °C (163 °F)
- ▶ HLP 46 for 85 °C (185 °F)

Bearing flushing

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

- ▶ Applications with water-containing special fluids due to limited lubricity and narrow operating temperature range
- ▶ Operation with borderline conditions for temperature and viscosity
- ▶ With vertical installation (drive shaft facing upwards) 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.

The following flushing flows are recommended depending on size:

NG		40	71	125	180	250	355	500	750	1000
q_{Sp}	gpm	0.8	1.1	1.3	1.8	2.6	4	5.3	7.9	10.6
	l/min	3	4	5	7	10	15	20	30	40

For the flushing flows stated, there is a pressure differential of about 30 or 45 psi (2 or 3 bar) between port **U** (including fitting) and the housing area (series 1x and series 3x, respectively).

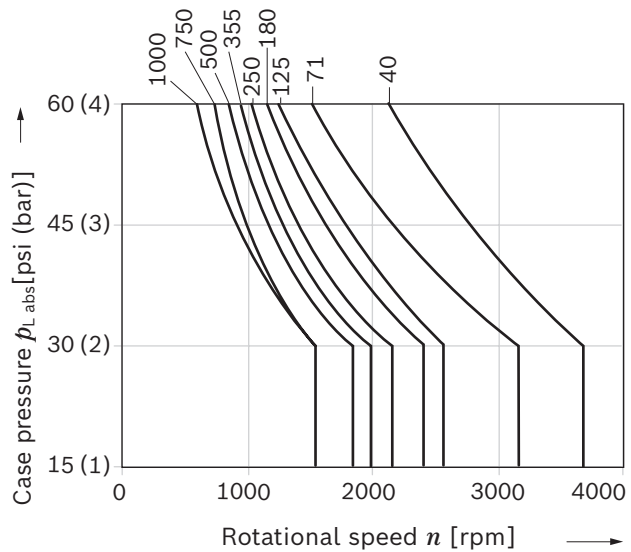
Notice regarding series 3x

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

Shaft seal

Permissible pressure load

The service life of the shaft seal is influenced by the rotational speed of the axial piston unit and the case pressure. Momentary ($t < 0.1$ s) pressure peaks of up to 87 psi (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.

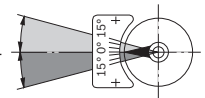


Notice

For details on the viscosity and temperatures of the hydraulic fluids, please see page 5.

Flow direction

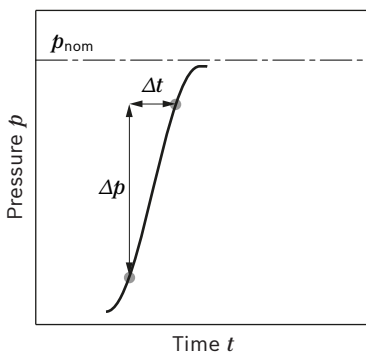
Direction of rotation		Swiveling range
Clockwise	Counter-clockwise	
B to A	A to B	Clockwise
A to B	B to A	Counter-clockwise



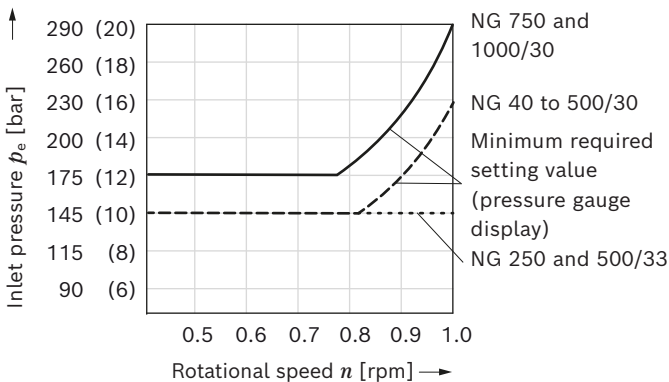
Working pressure range

Pressure at working port A or B		Definition
Nominal pressure p_{nom}	5100 psi (350 bar)	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}	5800 psi (400 bar)	The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of single operating periods must not exceed the total operating period.
Single operating period	1 s	
Total operating period	300 h	
Minimum pressure (high-pressure side)	220 psi (15 bar)	Minimum pressure at the high-pressure side (A or B) which is required to prevent damage to the axial piston unit.
Minimum pressure (low-pressure side)		Minimum pressure on the low-pressure side (A or B) required to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and the boost pressure (see diagram).
Rate of pressure change $R_{A\ max}$	232000 psi/s (16000 bar/s)	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Recommended boost pressure p_{SP} (input) (for boost pumps, see page 50)		
	230 psi (16 bar)	Size 40 to 500 series 1x and 30
	145 psi (10 bar)	Sizes 250 and 500 series 33
	365 psi (25 bar)	Size 750 to 1000 series 30
	365 psi (25 bar)	For a shared attachment pump for boost and control fluid circuit (EO1...H04)
Maximum boost pressure - attachment pump $p_{SP\ max}$ at control ¹⁾ :		
MA, EM, HM, EO, DS	725 psi (50 bar)	For information on the control pressure, see the respective data sheets on page 2
HD, EP, HS5x	not less than 220 psi (15 bar), maximum 365 psi (25 bar)	
Case pressure at connection K₂, K₃, R(L)		
Max. static pressure $p_{L\ max}$	60 psi (4 bar) absolute ²⁾	The permissible case pressure depends on the rotational speed (see diagram shaft seal). A drain line to the reservoir is required.
Pressure peaks $p_{L\ peak}$	87 psi (6 bar) absolute	$t < 0.1$ s

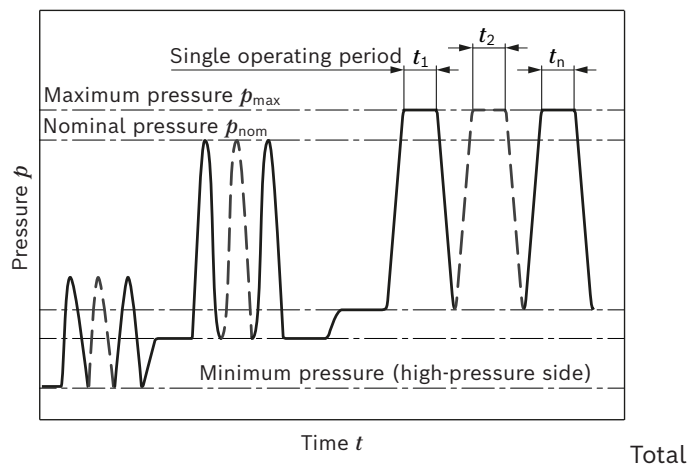
▼ Rate of pressure change $R_{A\ max}$



▼ Minimum pressure, low-pressure side (feed pressure)



▼ Pressure definition



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) For permissible inlet pressure of the respective attachment pump, see the corresponding data sheet
- 2) Slide ring seal for housing pressures up to 8 bar absolute available, please contact us

Technical data

Size	NG		40	71	125	180	250	355	500	750	1000	
Geometric displacement, per revolution	$V_{g \max}$	inch ³	2.44	4.33	7.63	11.0	15.26	21.7	30.51	45.8	61.2	
		cm ³	40	71	125	180	250	355	500	750	1000	
Maximum rotational speed ¹⁾	at $V_{g \max}$	n_{\max}	rpm	3700	3200	2600	2400	2200	2000	1800	1600	1600
Flow	at n_{\max} and $V_{g \max}$	q_v	gpm	39.1	60.0	85.9	114.1	145.3	187.8	237.8	317.0	422.7
			l/min	148	227	325	432	550	710	900	1200	1600
	at 1200 rpm and $V_{g \max}$		gpm	12.7	22.5	39.6	57.0	79.3	112.5	158.5	237.8	317.0
			l/min	48	85	150	216	300	426	600	900	1200
	at 1800 rpm and $V_{g \max}$		gpm	19.0	33.7	59.4	85.6	118.9	168.8	237.7	–	–
			l/min	72	128	225.9	324	450	639	900	–	–
Power	at n_{\max} , $V_{g \max}$ and $\Delta p = 5100$ psi (350 bar)	P	HP	115	177	255	338	431	555	704	939	1251
			kW	86	132	190	252	321	414	525	700	933
	at 1200 rpm, $V_{g \max}$ and $\Delta p = 5100$ psi (350 bar)		HP	37.8	66.9	117.8	169.6	236	334.7	471.6	707.6	943.2
			kW	28	50	88	126	175	248	350	525	700
	at 1800 rpm, $V_{g \max}$ and $\Delta p = 5100$ psi (350 bar)		HP	56.5	100.3	176.7	254.7	353.8	502.3	707	–	–
			kW	42	75	131	189	263	373	525	–	–
Torque	at $V_{g \max}$ and $\Delta p = 5100$ psi (350 bar)	M	lb-ft	165	293	516	743	1032	1465	2064	3096	4127
			Nm	223	395	696	1002	1391	1976	2783	4174	5565
	at $V_{g \max}$ and $\Delta p = 1450$ psi (100 bar)		lb-ft	47	83	147	212	294	417	587	881	1174
			Nm	64	113	199	286	398	564	795	1193	1590
Rotary stiffness of drive shaft	K	c	klb-ft/rad	57	106	175	235	322	592	–	–	–
			kNm/rad	79	146	241	323	443	814	–	–	–
	S	c	klb-ft/rad	49	92	141	202	267	–	–	–	–
			kNm/rad	67	126	194	278	368	–	–	–	–
	R	c	klb-ft/rad	–	–	–	–	–	345	–	–	–
			kNm/rad	–	–	–	–	–	475	–	–	–
	P	c	klb-ft/rad	–	–	–	–	–	–	832	1352	1985
			kNm/rad	–	–	–	–	–	–	1145	1860	2730
Z	c	klb-ft/rad	–	–	–	–	–	–	826	1317	2068	
		kNm/rad	–	–	–	–	–	–	1136	1812	2845	
Moment of inertia of the rotary group	J_{TW}		lb-ft ²	0.116	0.287	0.712	1.305	2.276	4.509	7.809	15.66	28.47
			kgm ²	0.0049	0.0121	0.03	0.055	0.0959	0.19	0.3325	0.66	1.20
Maximum angular acceleration ²⁾	α		rad/s ²	17000	11000	8000	6800	4800	3600	2800	2000	1450
Case volume	V		gal	0.5	0.6	1.3	1.0	2.6	2.1	3.7	5.0	7.13
			l	2	2.5	5	4	10	8	14	19	27
Weight approx.	m		lbs	93	132	236	247	485	518	739	1102	1420
			kg	42	60	107	112	220	235	335	500	644

1) The values are applicable:
 – for the optimum viscosity range from $v_{opt} = 36$ to 16 cST
 – with hydraulic fluid based on mineral oils

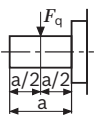
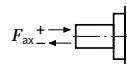
2) The data are valid for values between the minimum required and maximum permissible rotational speed. Valid for external excitation (e.g. diesel engine 2 to 8 times rotary frequency; cardan shaft twice the rotary frequency). The limit value is only valid for a single pump. The load capacity of the connection parts must be considered.

Determination of the characteristics		
Flow	$q_v = \frac{V_g \times n \times \eta_v}{231}$	[gpm]
	$q_v = \frac{V_g \times n \times \eta_v}{1000}$	[l/min]
Torque	$M = \frac{V_g \times \Delta p}{24 \times \pi \times \eta_{hm}}$	[lb-ft]
	$M = \frac{V_g \times \Delta p}{20 \times \pi \times \eta_{hm}}$	[Nm]
Power	$P = \frac{2 \pi \times M \times n}{33000} = \frac{q_v \times \Delta p}{1714 \times \eta_t}$	[HP]
	$P = \frac{2 \pi \times M \times n}{60000} = \frac{q_v \times \Delta p}{600 \times \eta_t}$	[kW]
Key		
V_g	=	Displacement per revolution [inch ³ (cm ³)]
Δp	=	Differential pressure [psi (bar)]
n	=	Rotational speed [rpm]
η_v	=	Volumetric efficiency
η_{hm}	=	Hydraulic-mechanical efficiency
η_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.

Permissible radial and axial loading on the drive shafts

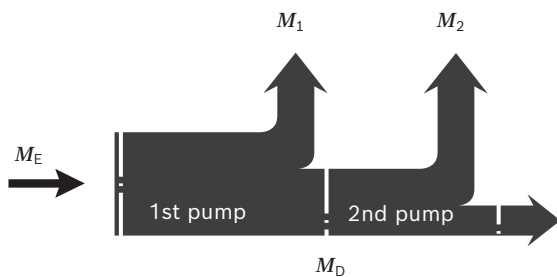
Size	NG	40	71	125	180	250	355	500	750	1000	
Maximum radial force at distance a/2	 $F_{q \max}$	lb	225	270	360	450	450	495	560	675	786
		(N)	(1000)	(1200)	(1600)	(2000)	(2000)	(2200)	(2500)	(3000)	(3500)
Maximum axial force	 $+ F_{ax \max}$ $- F_{ax \max}$	lb	135	180	225	315	405	450	450	495	495
		(N)	(600)	(800)	(1000)	(1400)	(1800)	(2000)	(2000)	(2200)	(2200)

Notice
 ▶ The values given are maximum values and do not apply to continuous operation.
 All loads of the drive shaft reduce the bearing service life!

Permissible input and through-drive torques

Size	NG	40	71	125	180	250	355	500	750	1000		
Torque at $V_{g \max}$ and $\Delta p = 5100 \text{ psi (350 bar)}^1$	M_{\max}	lb-ft	164	291	512	739	1026	1457	2052	3078	4104	
		Nm	223	395	696	1002	1391	1976	2783	4174	5565	
Max. input torque on drive shaft ²⁾	Splined shaft	$M_{E \max}$	lb-ft	329	583	1027	1479	2052	2915	4105	6157	8209
			Nm	446	790	1392	2004	2782	3952	5566	8348	11130
	Shaft key	$M_{E \max}$	lb-ft	243	516	1027	1032	1696	2624	3835	5541	6965
			Nm	380	700	1392	1400	2300	3557	5200	7513	9444
	Maximum through-drive torque	$M_{D \max}$	lb-ft	164	291	512	739	1026	1457	2052	3078	4104
			Nm	223	395	696	1002	1391	1976	2783	4174	5565

▼ 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	$M_D = M_2 + M_3$
	$M_D < M_{D \max}$

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 47

1) Efficiency not considered
 2) For drive shafts free of radial force

Overview of control device

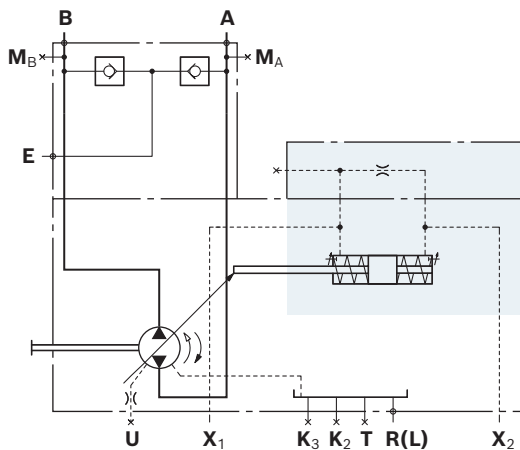
Hydraulic control HM 1/2, volume dependent (see data sheet 92076)

The pump displacement can be steplessly varied in relation to the control oil volume in ports X_1 and X_2 .

Application:

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

▼ Circuit diagram HM1 NG125



Control system HS5., HS5E., with proportional valve (see RE 92076)

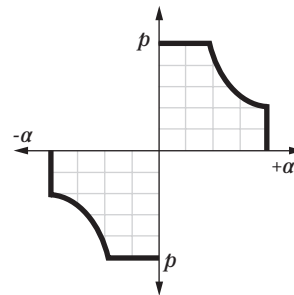
The stepless displacement control is accomplished by means of a proportional valve and electrical feedback of the swivel angle.

The HS5(E)P control system is equipped with a mounted pressure transducer, which means that it can be used for electric pressure and power control.

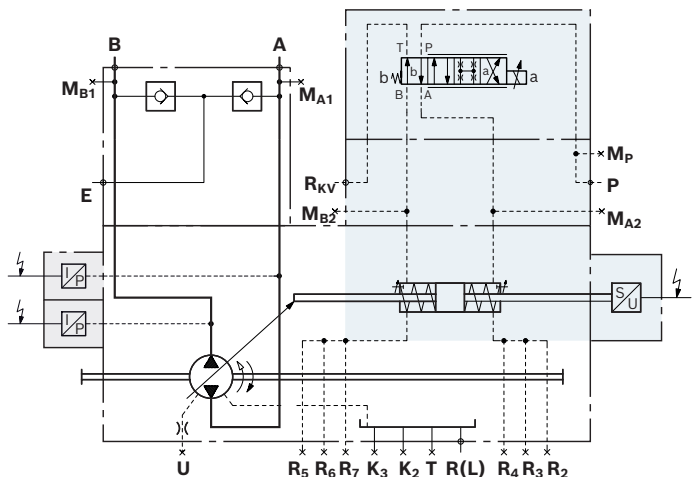
Optional:

- ▶ Proportional valve (HS5)
- ▶ With zero swivel function (HS5Z, HS5EZ)
- ▶ Control system with integrated digital electronics OBE (HS5E)
- ▶ Short circuit valve (HS5(E)K, HS5(E)KP)
- ▶ For oil-immersed use (HS5M)

▼ Characteristic curve HS5



▼ Circuit diagram HS5P NG500



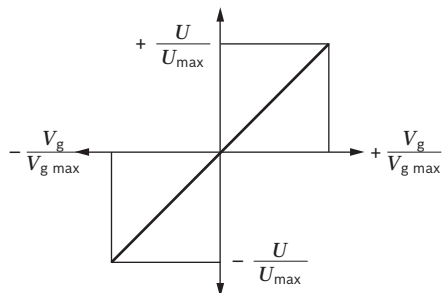
Control system EO1/2
(see RE 92076)

The stepless 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.

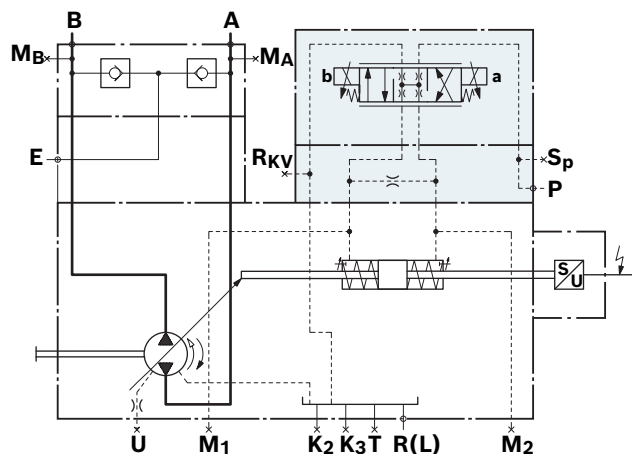
Optional:

- ▶ Control pressure range (EO1, EO2)
- ▶ Short circuit valve (EO1K, EO2K)

▼ **Characteristic curve EO**



▼ **Circuit diagram EO NG125**



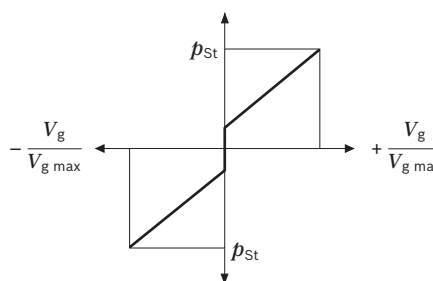
Hydraulic control HD, pilot-pressure related
(see data sheet 92080)

Stepless adjustment 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).

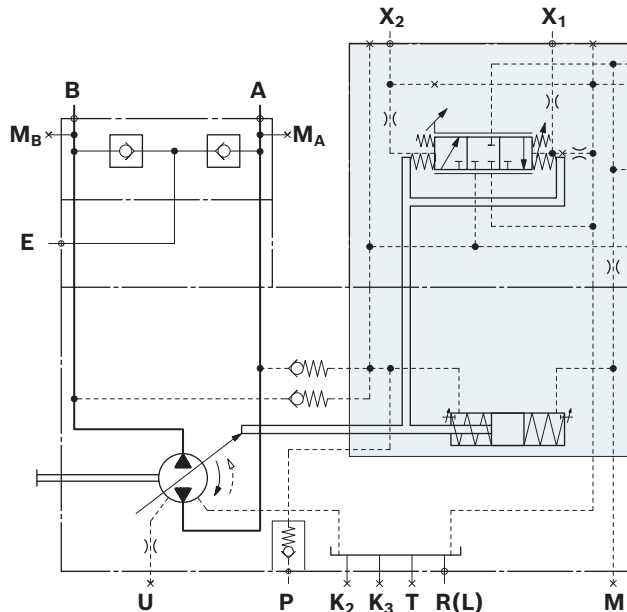
Optional:

- ▶ Control characteristics (HD1, HD2, HD3)
- ▶ Pressure control (HD.B),
- ▶ Remote pressure control (HD.GB)
- ▶ Power control (HD1P)
- ▶ Electrical control of pilot pressure (HD1T)

▼ **Characteristic curve HD**



▼ **Circuit diagram HD**



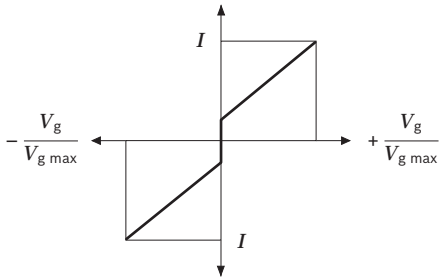
**Electro-hydraulic control EP with proportional solenoid
 (see data sheet 92084)**

The EP control adjusts the pump displacement proportionally to the current at the solenoid. Current-regulated control units with pulse width modulation are recommended for controlling the solenoids.

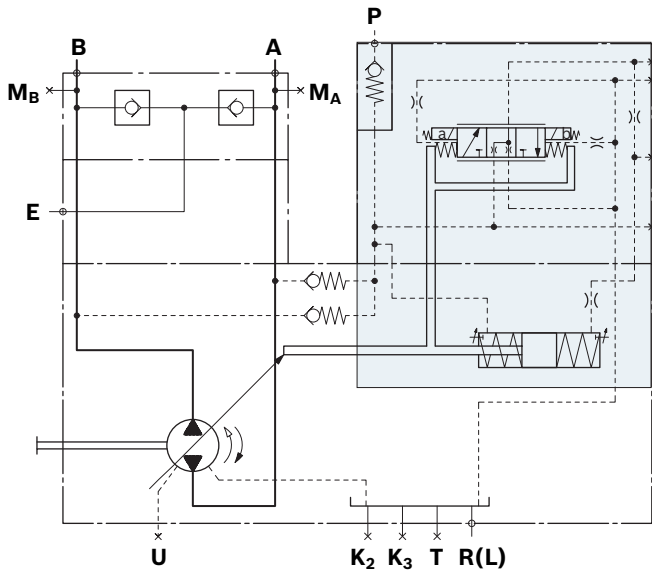
Optional:

- ▶ Pressure control (EPA, EPB, EPD)
- ▶ Remote pressure control (EPGA, EPGB, EPG)

▼ **Characteristic curve EP**



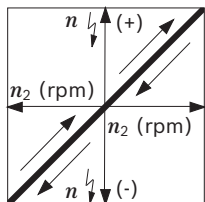
▼ **Circuit diagram EP**



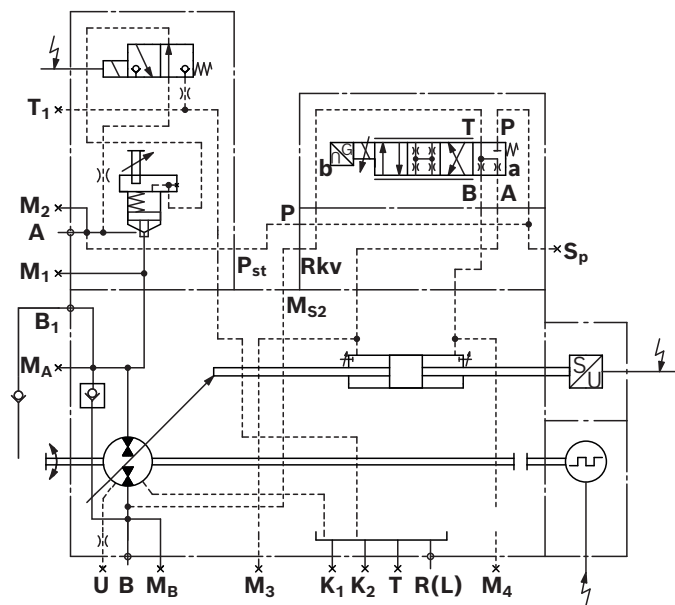
Secondary controlled rotational speed control DS.
(see data sheet 92058 (DS2) data sheet 92059 (DS3))

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. When connected to a constant pressure system, this torque is proportional to motor displacement and thus also proportional to the swivel angle.

▼ **Characteristic curve DS2/DS3**

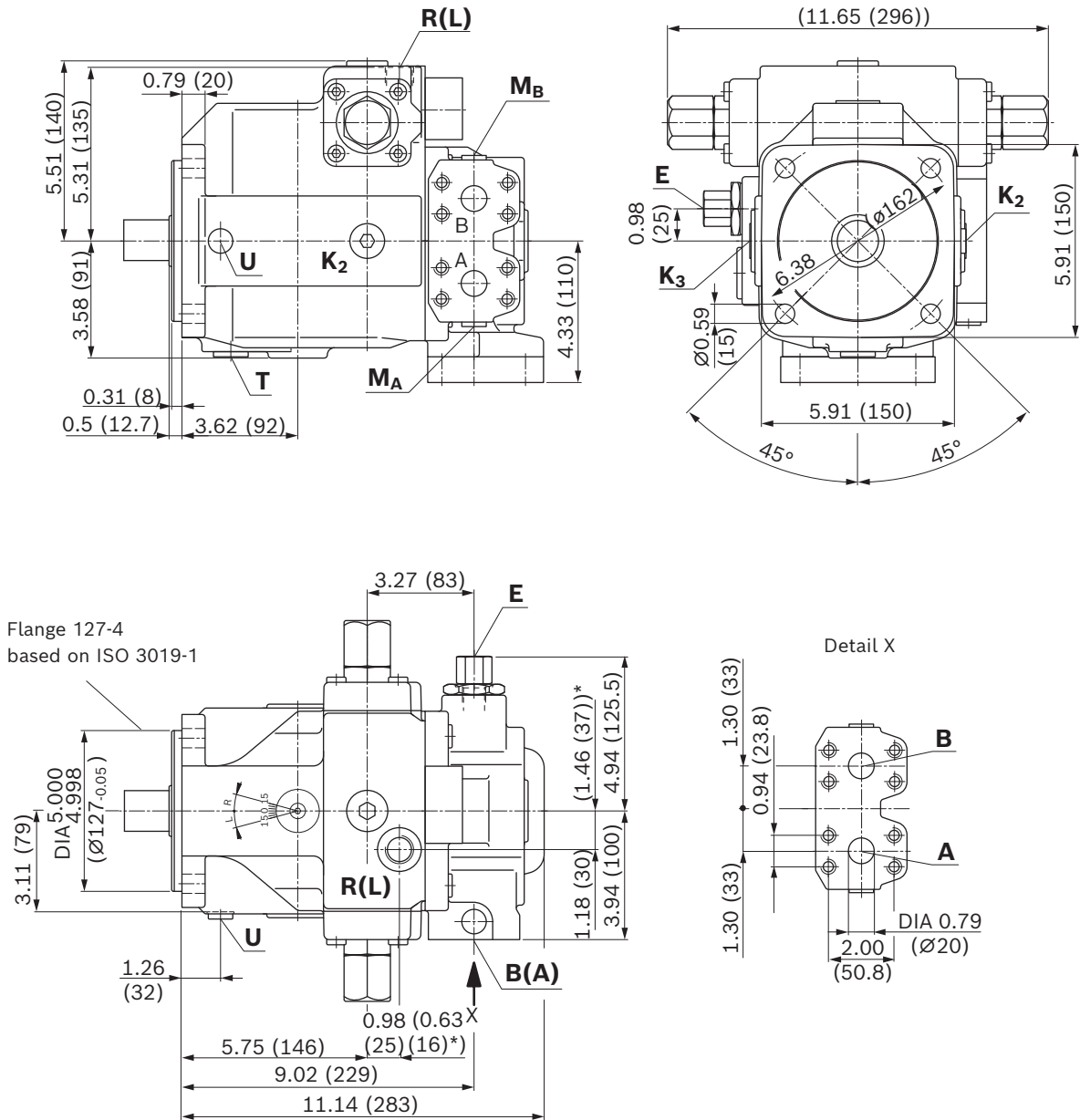


▼ **Example circuit diagram DS2**



Dimensions, size 40

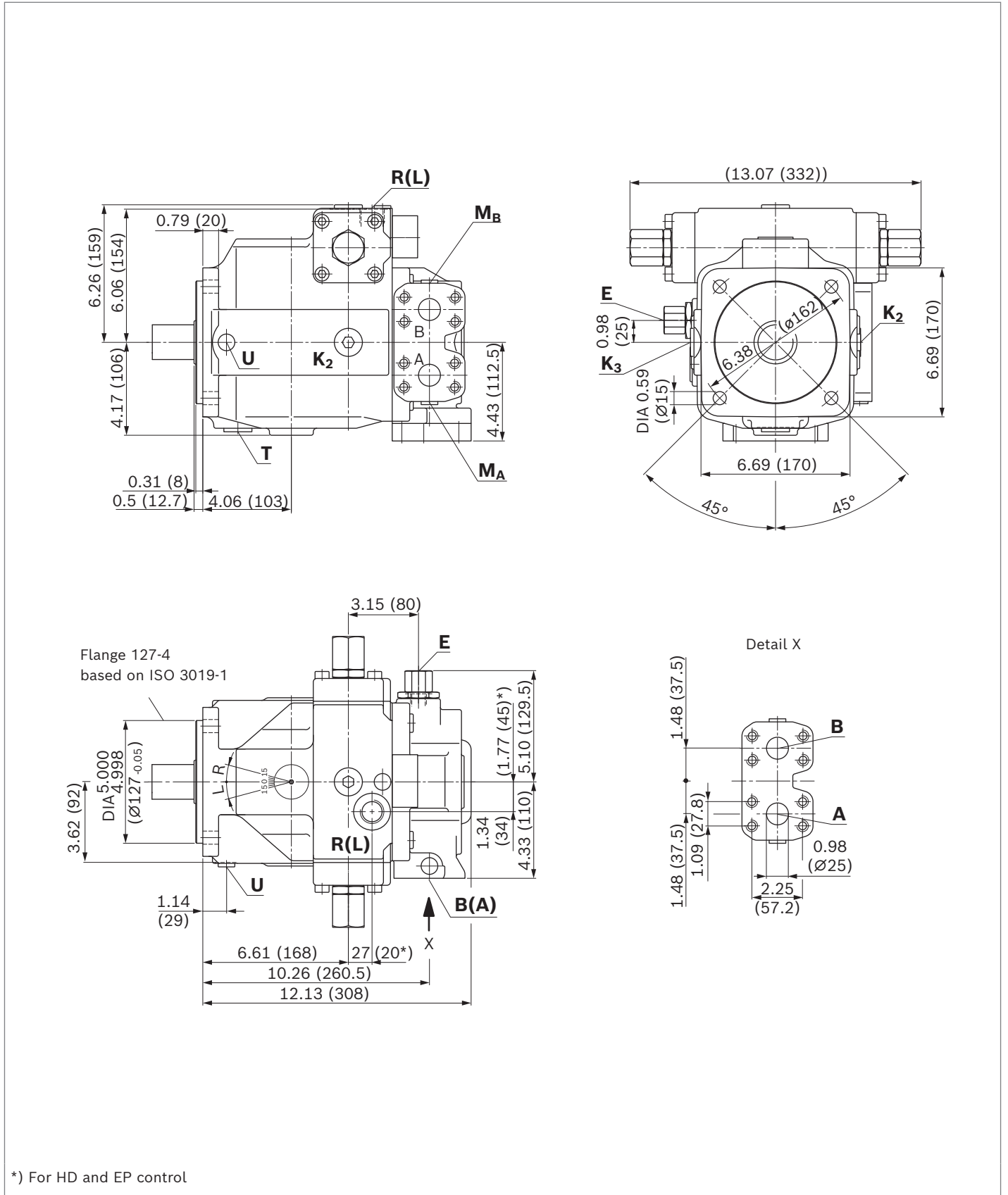
Example: **HM – Hydraulic control, control volume dependent**, for additional dimensions, see data sheets for the controls



*) For HD and EP control

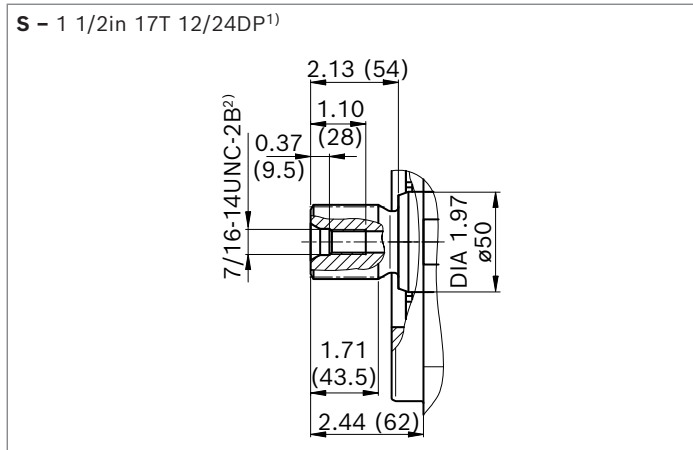
Dimensions, size 71

Example: **HM – Hydraulic control, control volume dependent**, for additional dimensions, see data sheets for the controls

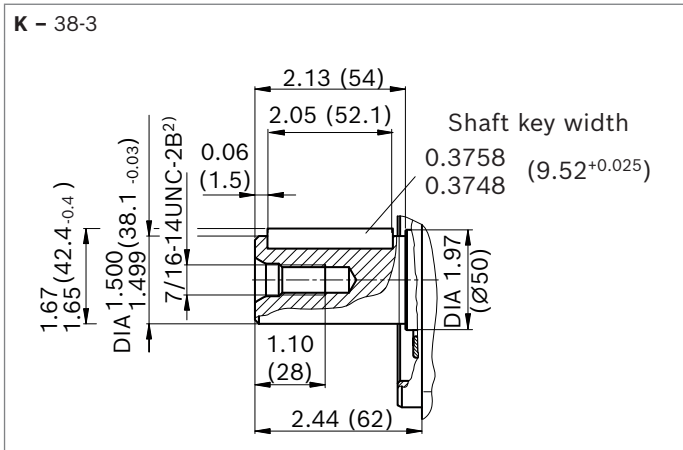


*) For HD and EP control

▼ **Splined shaft SAE J744, SAE C-C**



▼ **Parallel keyed shaft 3019-1, SAE C-C**



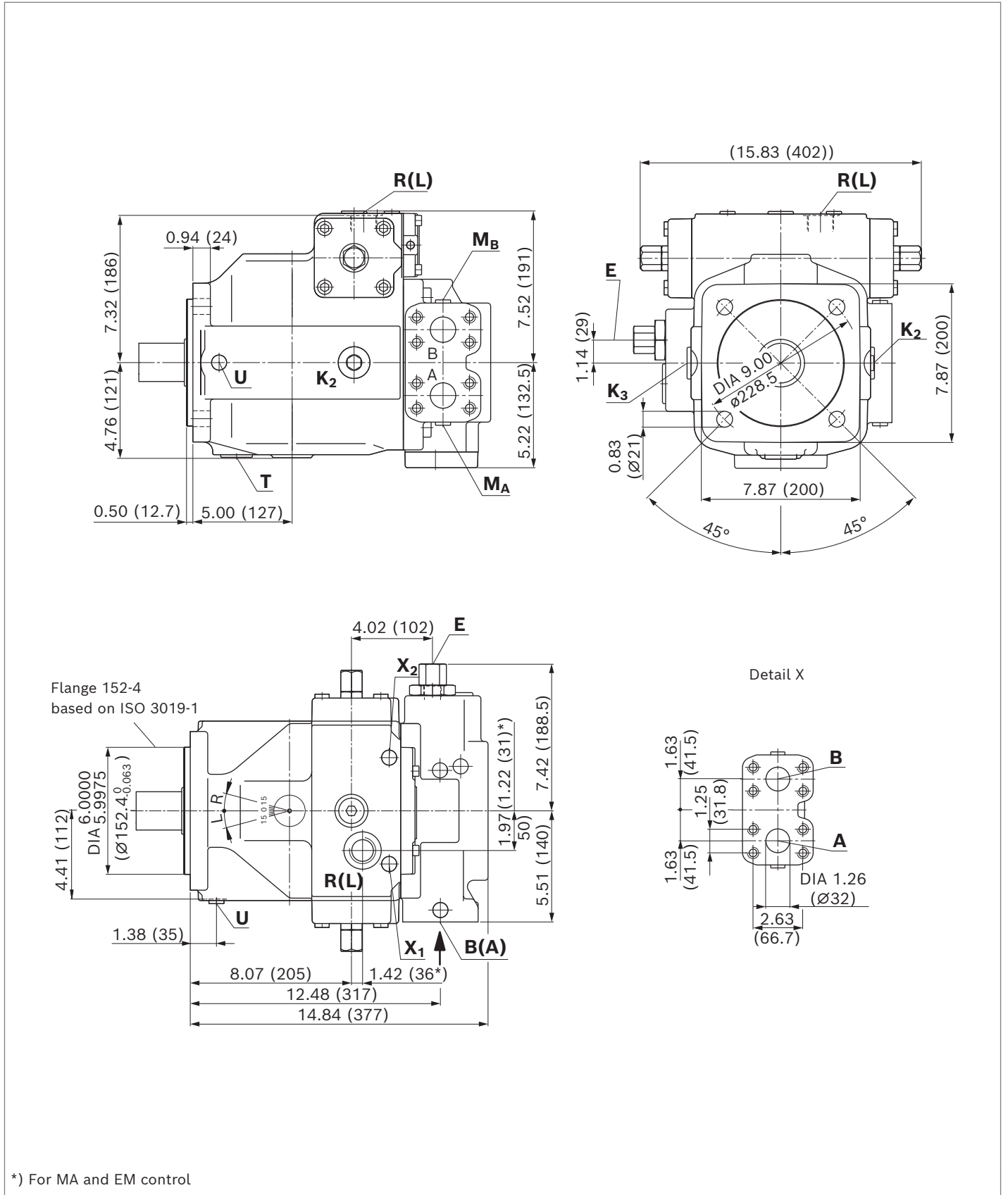
Ports	Standard	Size	p_{max} [psi (bar)] ³⁾	State ⁶⁾	
A, B	Working port (high-pressure series)	SAE J518	1 in	5800 (400)	O
	Fastening thread	ASME B1.1	7/16-14UNC-2B; 0.87 (22) deep		
M_A, M_B	Measuring working pressure A/B	ISO 11926	7/16-20UNF-2B; 0.39 (12) deep	5800 (400)	X
T	Fluid drain	ISO 11926 ⁴⁾	1 1/16-12UN-2B; 0.79 (20) deep	75 (5)	X ⁵⁾
E	Boost pressure supply	ISO 11926	3/4-16UNF-2B; 0.59 (15) deep	725 (50)	O
K₂, K₃	Filling – air bleeding, return flow (drain port)	ISO 11926 ⁴⁾	1 1/16-12UN-2B; 0.79 (20) deep	75 (5)	X ⁵⁾
R(L)	Filling – air bleeding, return flow (drain port)	ISO 11926 ⁴⁾	1 1/16-12UN-2B; 0.79 (20) deep	75 (5)	O ⁵⁾
U	Bearing flushing	ISO 11926 ⁴⁾	7/16-20UNF-2B; 0.39 (12) deep	100 (7)	X

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
 2) Thread according to ASME B1.1
 3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

4) The countersink may be deeper than specified in the standard.
 5) Depending on the installation position **T**, **K₁**, **K₂** or **R(L)** must be connected (see also installation instructions on pages 54 to 56)
 6) O = Must be connected (plugged on delivery)
 X = Plugged (in normal operation)

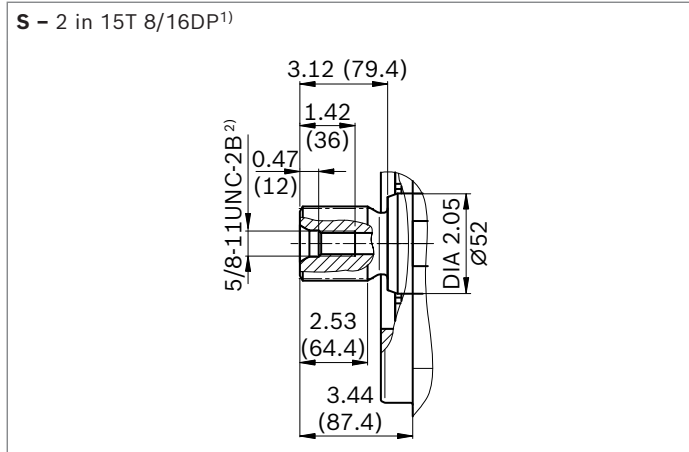
Dimensions, size 180

Example: **HM – Hydraulic control, control volume dependent**, for additional dimensions, see data sheets for the controls

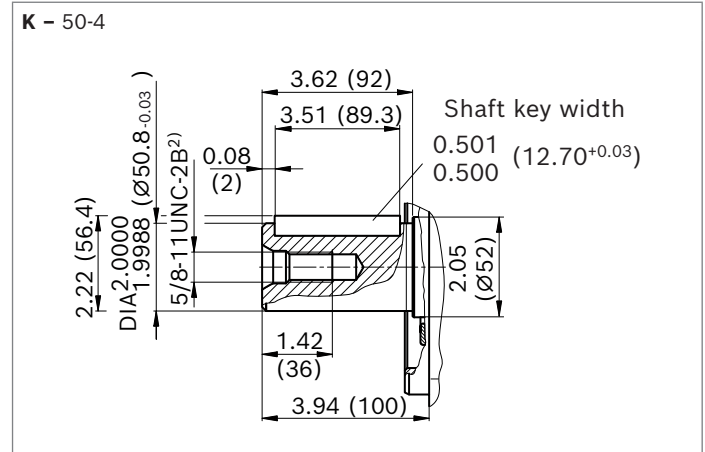


*) For MA and EM control

▼ **Splined shaft SAE J744, SAE F**



▼ **Parallel keyed shaft ISO 3019-1, SAE F**



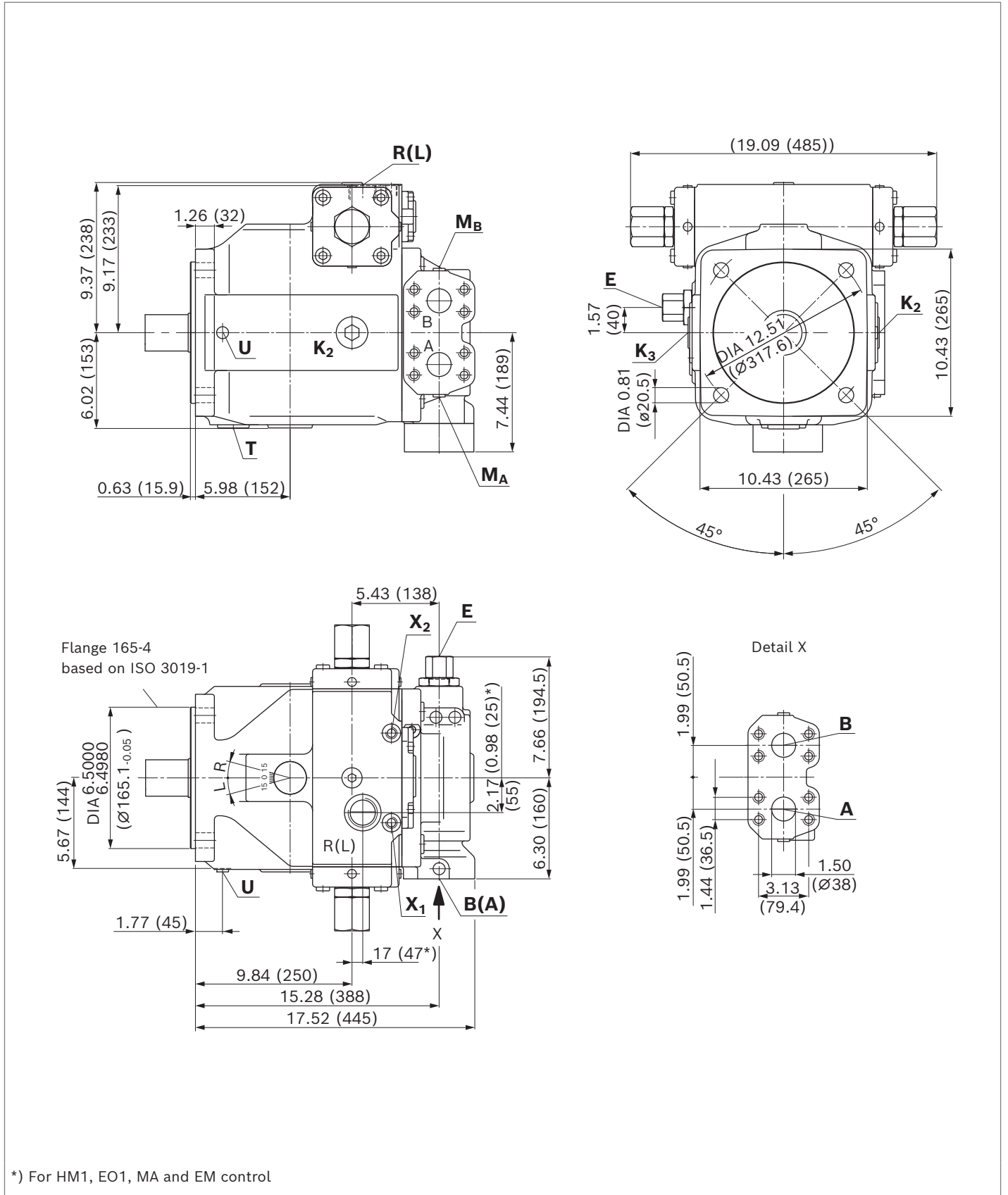
Ports	Standard	Size	p_{max} [psi (bar)] ³⁾	State ⁶⁾	
A, B	Working port (high-pressure series) Fastening thread	SAE J518 ASME B1.1	1 1/4 in 1/2-13UNC-2B; 1.06 (27) deep	5800 (400)	O
M_A, M_B	Measuring working pressure A/B	ISO 11926	7/16-20UNF-2B; 0.39 (12) deep	5800 (400)	X
T	Fluid drain	ISO 11926 ⁴⁾	1 5/16-12UN-2B; 0.79 (20) deep	75 (5)	X ⁵⁾
E	Boost pressure supply	ISO 11926	7/8-14UNF-2B; 0.67 (17) deep	725 (50)	O
X₁, X₂	Control pressure (for HM1)	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	1450 (100)	O
X₁, X₂	Control pressure (for HM2)	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	5100 (350)	O
K₂, K₃	Filling – air bleeding, return flow (drain port)	ISO 11926 ⁴⁾	1 5/16-12UN-2B; 0.79 (20) deep	75 (5)	X ⁵⁾
R(L)	Filling – air bleeding, return flow (drain port)	ISO 11926 ⁴⁾	1 5/16-12UN-2B; 0.79 (20) deep	75 (5)	O ⁵⁾
U	Bearing flushing	ISO 11926 ⁴⁾	7/16-20UNF-2B; 0.39 (12) deep	100 (7)	X

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
 2) Thread according to ASME B1.1
 3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

4) The countersink may be deeper than specified in the standard.
 5) Depending on the installation position **T**, **K₁**, **K₂** or **R(L)** must be connected (see also installation instructions on pages 54 to 56)
 6) O = Must be connected (plugged on delivery)
 X = Plugged (in normal operation)

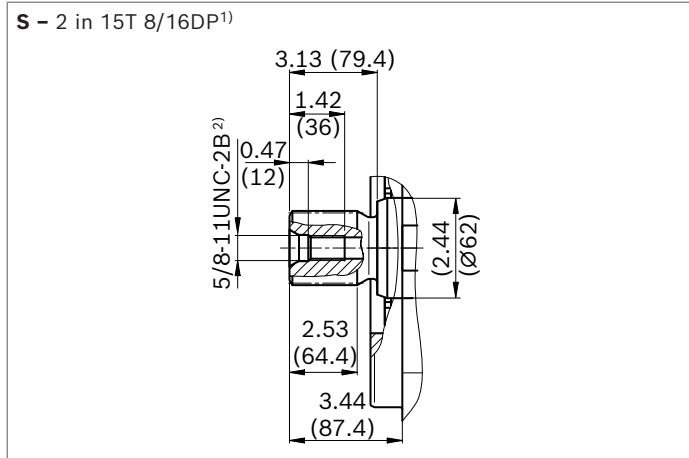
Dimensions, size 250

Example: **HM – Hydraulic control, control volume dependent**, for additional dimensions, see data sheets for the controls

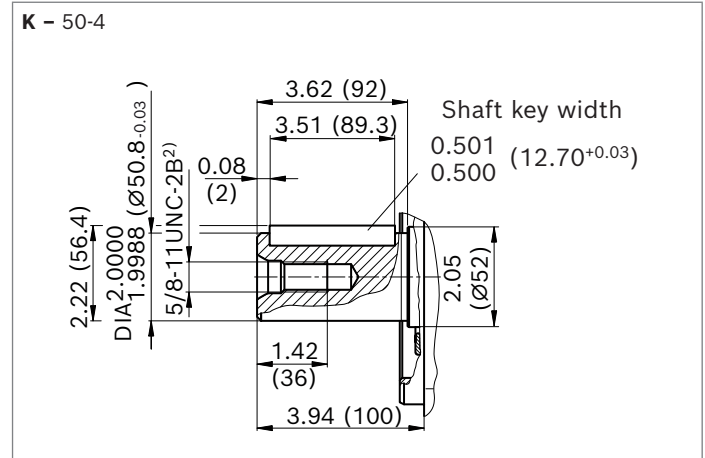


*) For HM1, EO1, MA and EM control

▼ **Splined shaft SAE J744, SAE F**



▼ **Parallel keyed shaft ISO 3019-1, SAE F**



Ports	Standard	Size	p_{max} [psi (bar)] ³⁾	State ⁶⁾
A, B	Working port (high-pressure series) Fastening thread	SAE J518 ASME B1.1	1 1/2 in 5/8-11UNC-2B; 1.14 (29) deep	5800 (400) O
M_A, M_B	Measuring working pressure A/B	ISO 11926	7/16-20UNF-2B; 0.39 (12) deep	5800 (400) X
T	Fluid drain	ISO 11926 ⁴⁾	1 5/8-12UN-2B; 0.79 (20) deep	75 (5) X ⁵⁾
E	Boost pressure supply	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	725 (50) O
X₁, X₂	Control pressure (for HM1)	ISO 11926	3/4-16UNF-2B; 0.59 (15) deep	1450 (100) O
X₁, X₂	Control pressure (for HM2)	ISO 11926	3/4-16UNF-2B; 0.59 (15) deep	5100 (350) O
K₂, K₃	Filling – air bleeding, return flow (drain port)	ISO 11926 ⁴⁾	1 5/8-12UN-2B; 0.79 (20) deep	75 (5) X ⁵⁾
R(L)	Filling – air bleeding, return flow (drain port)	ISO 11926 ⁴⁾	1 5/8-12UN-2B; 0.79 (20) deep	75 (5) O ⁵⁾
U	Bearing flushing	ISO 11926 ⁴⁾	7/16-20UNF-2B; 0.39 (12) deep	100 (7) X

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

2) Thread according to ASME B1.1

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

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

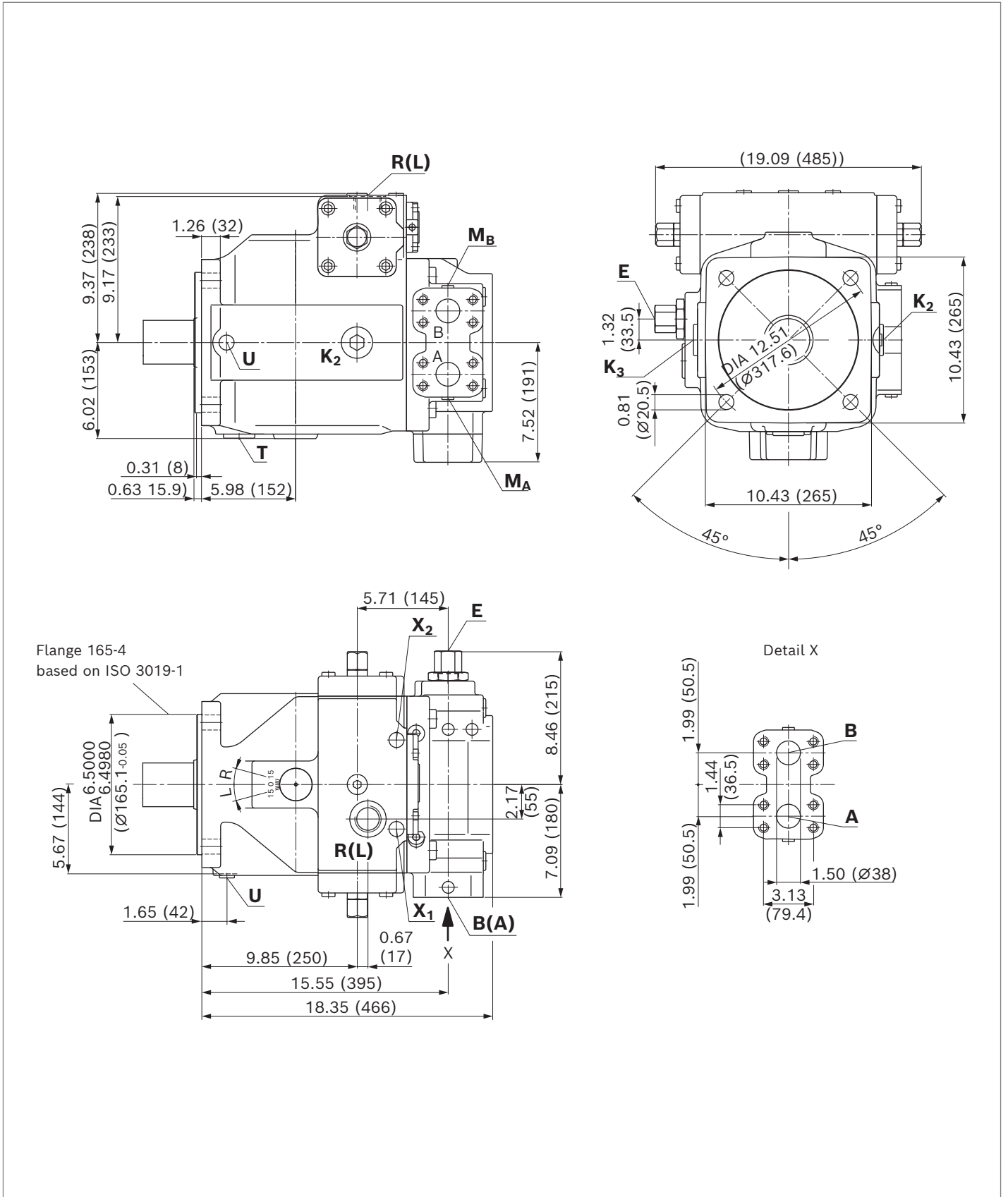
5) Depending on the installation position **T**, **K₁**, **K₂** or **R(L)** must be connected (see also installation instructions on pages 54 to 56)

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

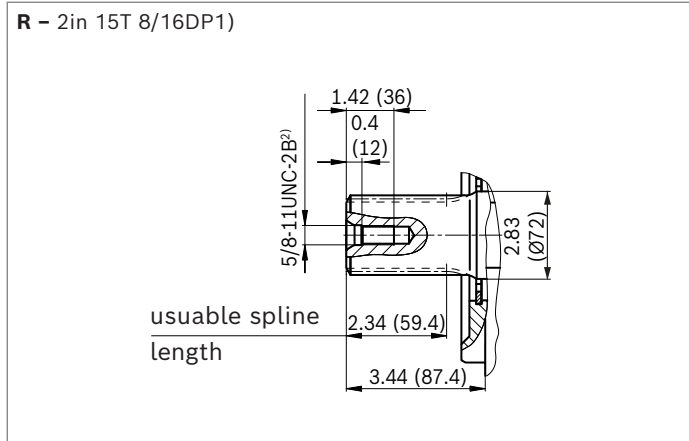
X = Plugged (in normal operation)

Dimensions, size 355

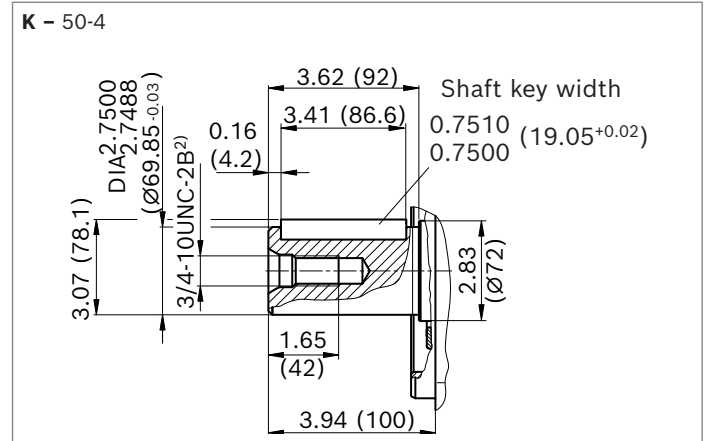
Example: **HM – Hydraulic control, control volume dependent**, for additional dimensions, see data sheets for the controls



▼ **Splined shaft SAE J744, similar to SAE F**



▼ **Parallel keyed shaft ISO 3019-1, SAE F**



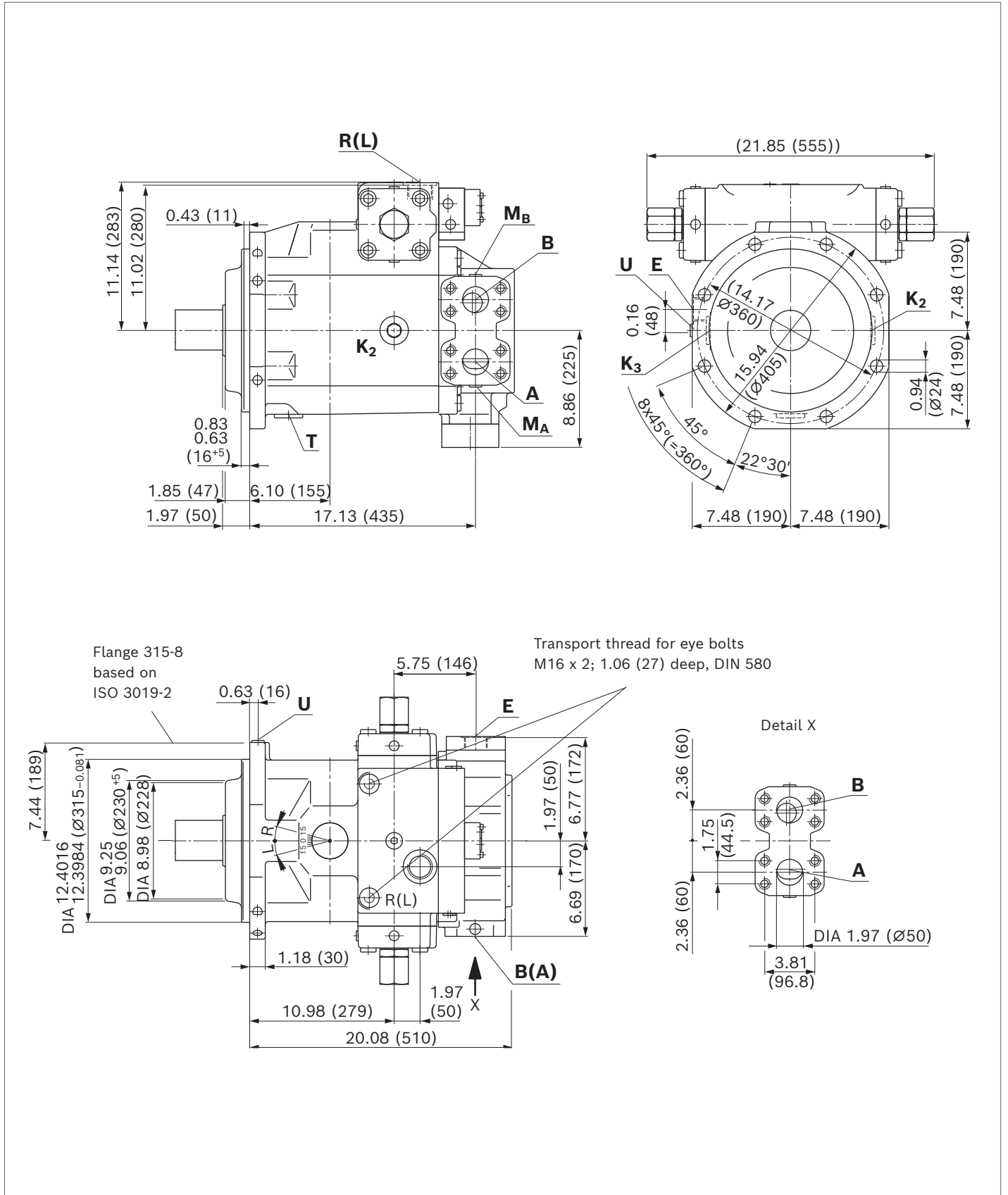
Ports	Standard	Size	p_{max} [psi (bar)] ³⁾	State ⁶⁾	
A, B	Working port (high-pressure series) Fastening thread	SAE J518 ASME B1.1	1 1/2 in 5/8-11UNC-2B; 1.14 (29) deep	5800 (400)	O
M_A, M_B	Measuring working pressure A/B	ISO 11926	7/16-20UNF-2B; 0.39 (10) deep	5800 (400)	X
T	Fluid drain	ISO 11926 ⁴⁾	1 5/8-12UN-2B; 0.79 (20) deep	75 (5)	X ⁵⁾
E	Boost pressure supply	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	725 (50)	O
X₁, X₂	Control pressure (for HM2)	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	5100 (350)	O
K₂, K₃	Filling – air bleeding, return flow (drain port)	ISO 11926 ⁴⁾	1 5/8-12UN-2B; 0.79 (20) deep	75 (5)	X ⁵⁾
R(L)	Filling – air bleeding, return flow (drain port)	ISO 11926 ⁴⁾	1 5/8-12UN-2B; 0.79 (20) deep	75 (5)	O ⁵⁾
U	Bearing flushing	ISO 11926 ⁴⁾	3/4-16UNF-2B; 0.59 (15) deep	100 (7)	X

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
 2) Thread according to ASME B1.1
 3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

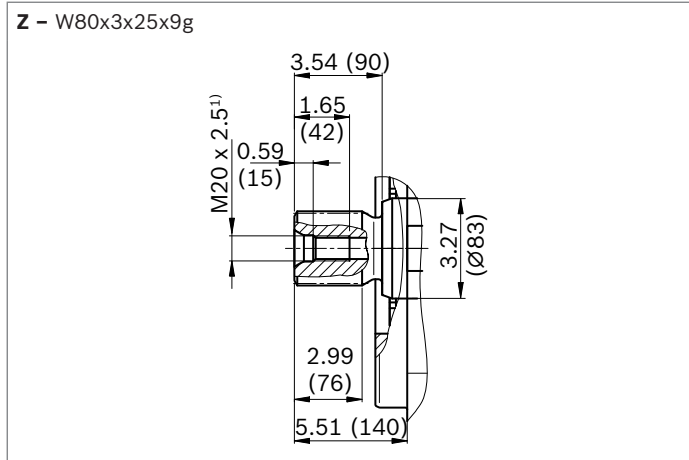
4) The countersink may be deeper than specified in the standard.
 5) Depending on the installation position **T**, **K₁**, **K₂** or **R(L)** must be connected (see also installation instructions on pages 54 to 56)
 6) O = Must be connected (plugged on delivery)
 X = Plugged (in normal operation)

Dimensions, size 500

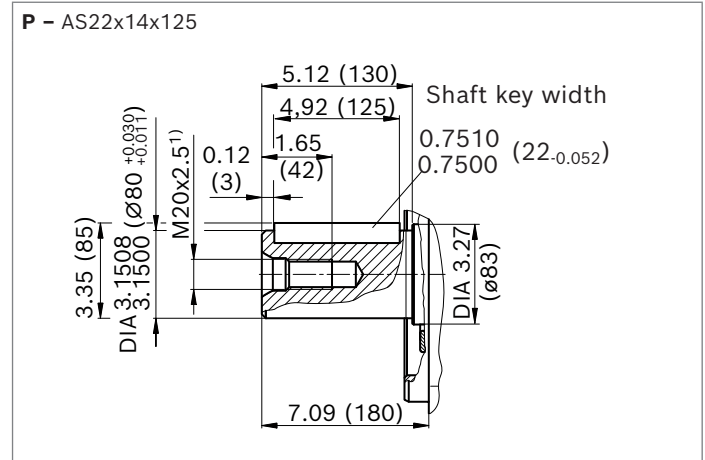
Example: **HM – Hydraulic control, control volume dependent**, for additional dimensions, see data sheets for the controls



▼ **Splined shaft DIN 5480**



▼ **Parallel keyed shaft DIN 6885**



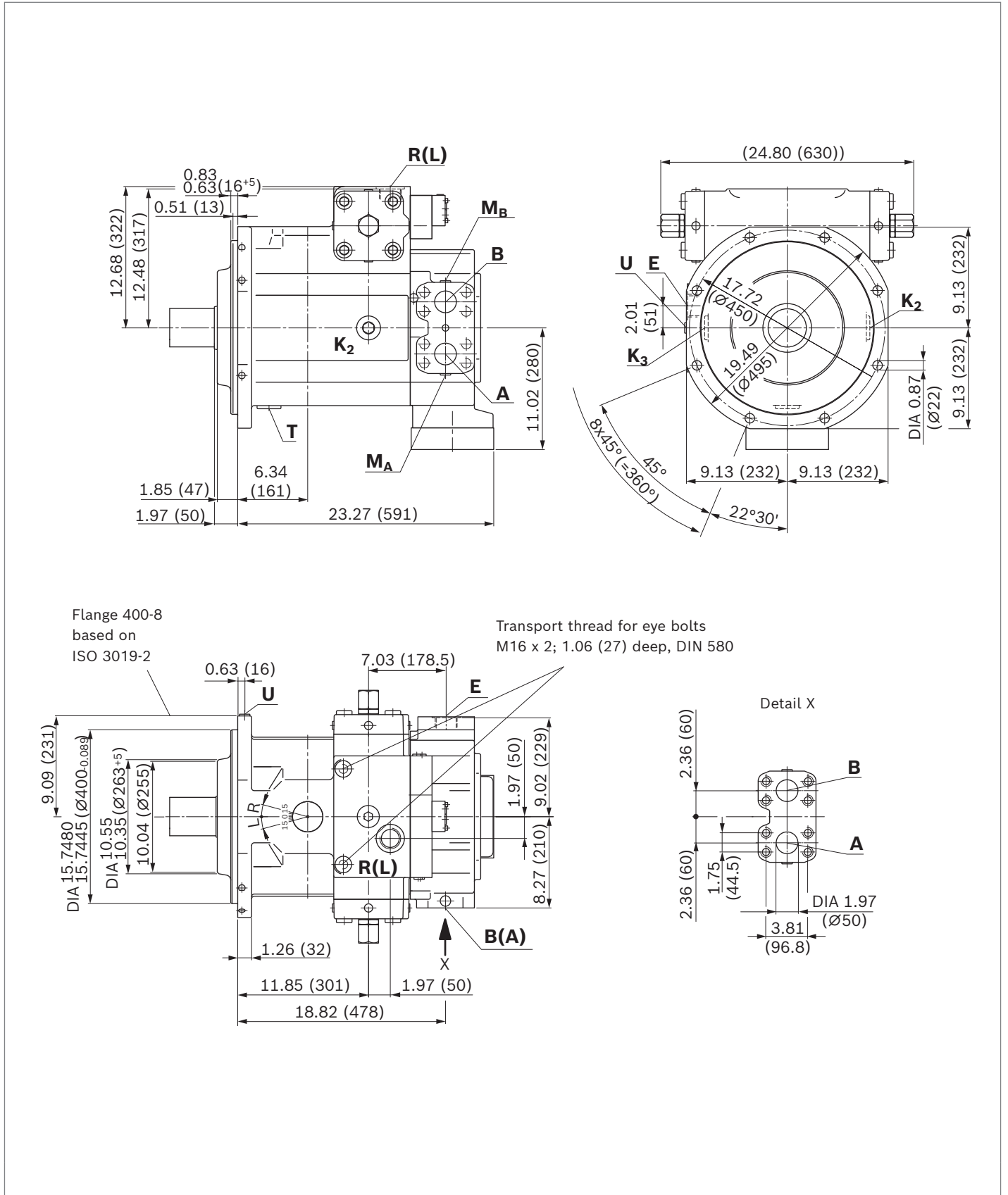
Ports	Standard	Size	p_{max} [psi (bar)] ³⁾	State ⁷⁾
A, B	Working port (high-pressure series) Fastening thread	SAE J518 ⁴⁾ DIN 13	2 in M20 × 2.5; 0.94 (24) deep	5800 (400) O
M_A, M_B	Measuring working pressure A/B	DIN 3852	M18 × 1.5; 0.47 (12) deep	5800 (400) X
T	Fluid drain	DIN 3852 ⁵⁾	M48 × 2; 0.87 (22) deep	75 (5) X ⁶⁾
E	Boost pressure supply	DIN 3852	M33 × 2; 0.71 (18) deep	725 (50) O
X₁, X₂	Control pressure (for HM2)	DIN 3852	M27 × 2; 0.63 (16) deep	5100 (350) O
K₂, K₃	Filling – air bleeding, return flow (drain port)	DIN 3852 ⁵⁾	M48 × 2; 0.87 (22) deep	75 (5) X ⁶⁾
R(L)	Filling – air bleeding, return flow (drain port)	DIN 3852 ⁵⁾	M48 × 2; 0.87 (22) deep	75 (5) O ⁶⁾
U	Bearing flushing	DIN 3852 ⁵⁾	M18 × 1.5; 0.47 (12) deep	100 (7) 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.

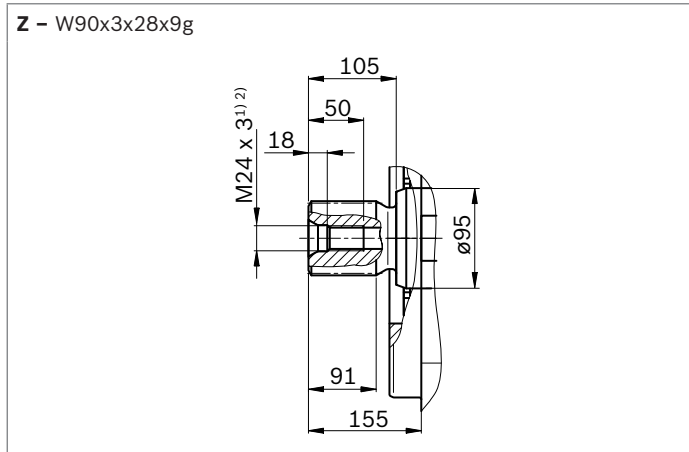
5) The countersink may be deeper than specified in the standard.
 6) Depending on the installation position **T**, **K₁**, **K₂** or **R(L)** must be connected (see also installation instructions on pages 54 to 56).
 7) O = Must be connected (plugged on delivery)
 X = Plugged (in normal operation)

Dimensions, size 750

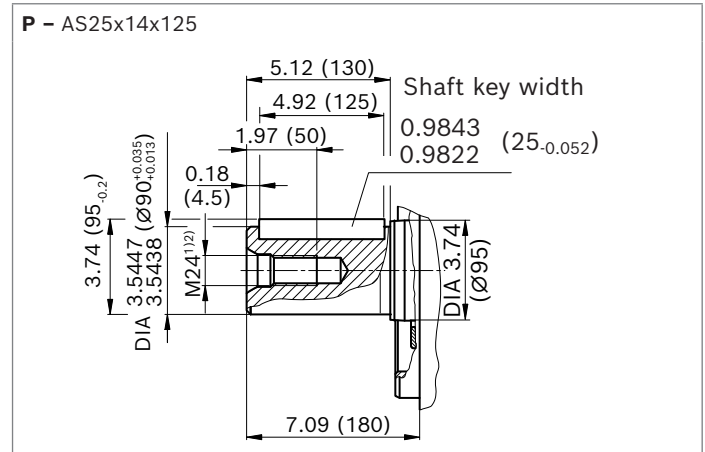
Example: **HM – Hydraulic control, control volume dependent**, for additional dimensions, see data sheets for the controls



▼ **Splined shaft DIN 5480**



▼ **Parallel keyed shaft DIN 6885**



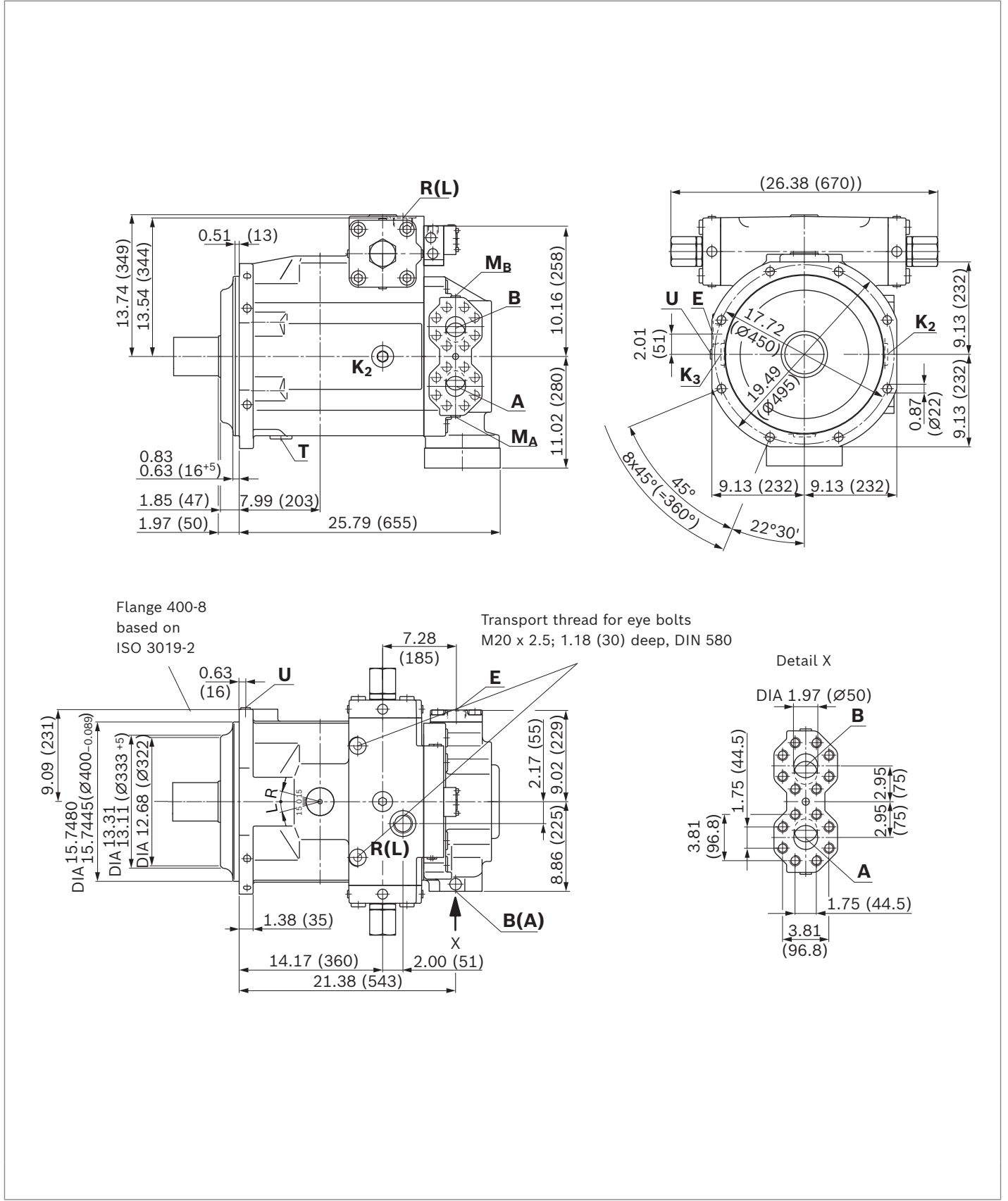
Ports		Standard	Size	p_{max} [psi (bar)] ³⁾	State ⁷⁾
A, B	Working port (high-pressure series)	SAE J518 ⁴⁾	2 in	5800 (400)	O
	Fastening thread	DIN 13	M20 × 2.5; 0.94 (24) deep		
M_A, M_B	Measuring working pressure A/B	DIN 3852	M18 × 1.5; 0.47 (12) deep	5800 (400)	X
T	Fluid drain	DIN 3852 ⁵⁾	M48 × 2; 0.87 (22) deep	75 (5)	X ⁶⁾
E	Boost pressure supply	DIN 3852	M33 × 2; 0.71 (18) deep	725 (50)	O
X₁, X₂	Control pressure (for HM2)	DIN 3852	M27 × 2; 0.63 (16) deep	5100 (350)	O
K₂, K₃	Filling – air bleeding, return flow (drain port)	DIN 3852 ⁵⁾	M48 × 2; 0.87 (22) deep	75 (5)	X ⁶⁾
R(L)	Filling – air bleeding, return flow (drain port)	DIN 3852 ⁵⁾	M48 × 2; 0.87 (22) deep	75 (5)	O ⁶⁾
U	Bearing flushing	DIN 3852 ⁵⁾	M18 × 1.5; 0.47 (12) deep	100 (7)	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.

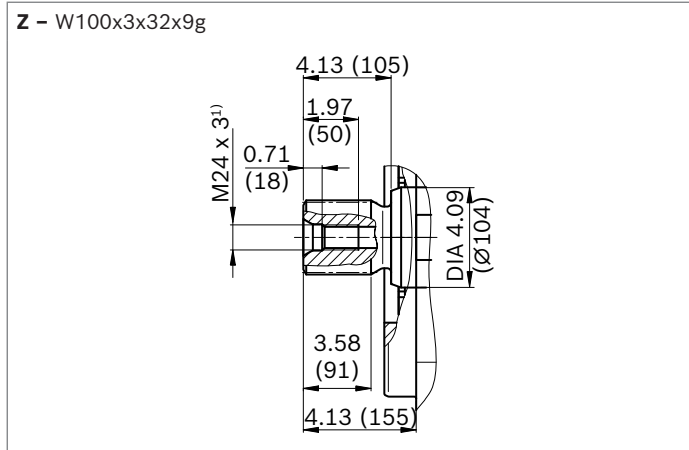
5) The countersink may be deeper than specified in the standard.
 6) Depending on the installation position **T**, **K₁**, **K₂** or **R(L)** must be connected (see also installation instructions on pages 54 to 56).
 7) O = Must be connected (plugged on delivery)
 X = Plugged (in normal operation)

Dimensions size 1000

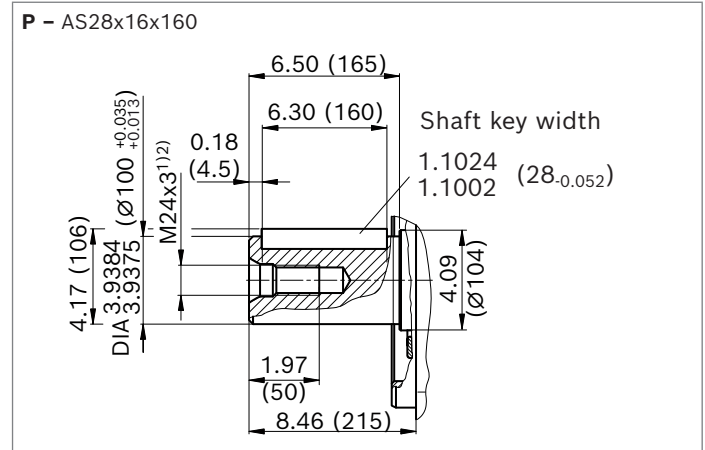
Example: **HM – Hydraulic control, control volume dependent**, for additional dimensions, see data sheets for the controls



▼ **Splined shaft DIN 5480**



▼ **Parallel keyed shaft DIN 6885**



Ports	Standard	Size	p_{max} [psi (bar)] ³⁾	State ⁷⁾
A, B	Working port (high-pressure series) Fastening thread	SAE J518 ⁴⁾ DIN 13	2 in M20 × 2.5; 0.94 (24) deep	5800 (400) O
M_A, M_B	Measuring working pressure A/B	DIN 3852	M18 × 1.5; 0.47 (12) deep	5800 (400) X
T	Fluid drain	DIN 3852 ⁵⁾	M48 × 2; 0.87 (22) deep	75 (5) X ⁶⁾
E	Boost pressure supply	DIN 3852	M48 × 2; 0.87 (22) deep	725 (50) O
K₂, K₃	Filling – air bleeding, return flow (drain port)	DIN 3852 ⁵⁾	M48 × 2; 0.87 (22) deep	75 (5) X ⁶⁾
R(L)	Filling – air bleeding, return flow (drain port)	DIN 3852 ⁵⁾	M48 × 2; 0.87 (22) deep	75 (5) O ⁶⁾
U	Bearing flushing	DIN 3852 ⁵⁾	M18 × 1.5; 0.47 (12) deep	100 (7) 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.

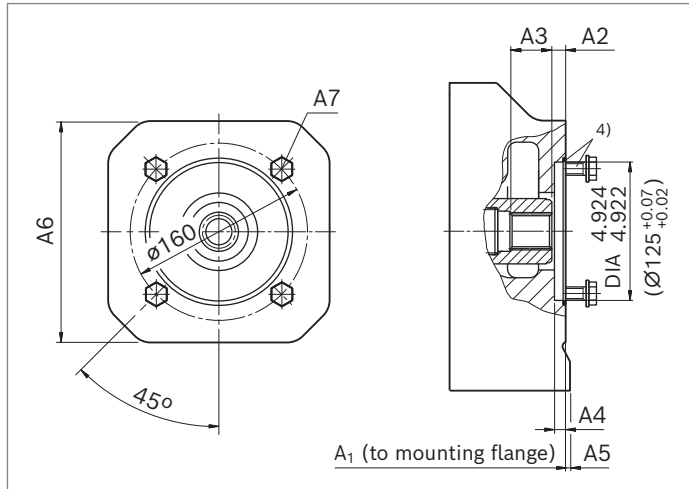
5) The countersink may be deeper than specified in the standard.
 6) Depending on the installation position **T**, **K₁**, **K₂** or **R(L)** must be connected (see also installation instructions on pages 54 to 56).
 7) O = Must be connected (plugged on delivery)
 X = Plugged (in normal operation)

Dimensions for through drives

Flange ISO 3019-2 (metric)		Hub for splined shaft ¹⁾	Availability across sizes									Code
Diameter	Mounting ²⁾	Diameter	40	71	125	180	250	355	500	750	1000	
125-4		N32 × 2 × 14 × 8H	-	-	-	-	-	-	●	○	○	K31
140-4		N40 × 2 × 18 × 8H	-	-	-	-	-	-	●	○	●	K33

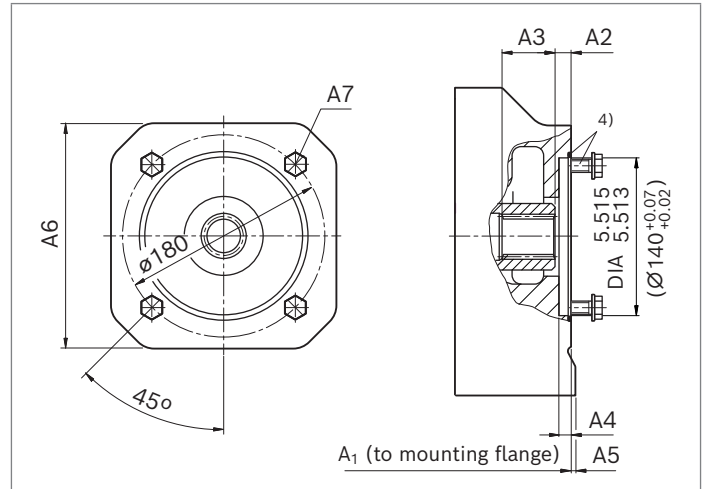
● = Available ○ = On request - = Not available

▼ **125-4**



K31							
NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁵⁾
500	19.88 (505)	0.49 (12.5)	1.51 (38.5)	0.39 (10)	-	-	M12; 0.71 (18) deep

▼ **140-4**



K33							
NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁵⁾
500	19.88 (505)	0.49 (12.5)	1.74 (44)	0.39 (10)	-	-	M12; 0.71 (18) deep
1000	24.72 (628)	0.49 (12.5)	2.54 (64.5)	0.39 (10)	1.06 (27)	11.02 (280)	M12; 0.71 (18) deep

1) According to DIN 5480

2) Mounting holes pattern viewed on through drive with control at top

3) Thread according to DIN 13.

4) O-ring and mounting bolts included in delivery.

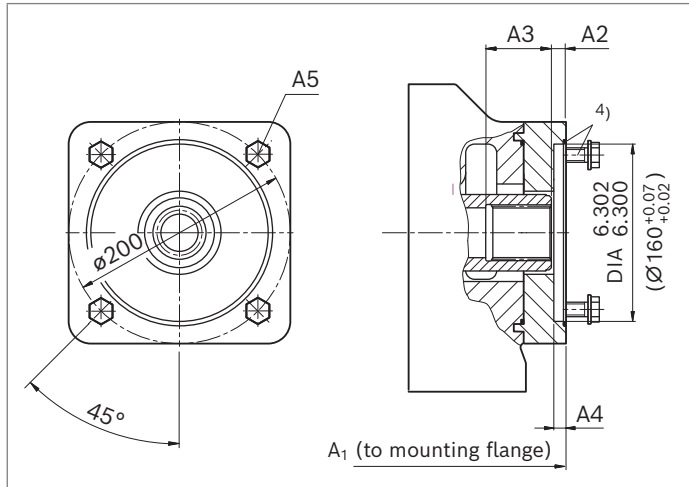
5) Design recommended according to VDI 2230, bolt grade 8.8 according to ISO 898-1

Dimensions for through drives

Flange ISO 3019-2 (metric)		Hub for splined shaft ¹⁾	Availability across sizes									Code
Diameter	Mounting ²⁾		40	71	125	180	250	355	500	750	1000	
160-4		N50 × 2 × 24 × 8H	-	-	-	-	-	-	●	○	●	K34
224-4		N60 × 2 × 28 × 8H	-	-	-	-	-	-	●	●	●	K35

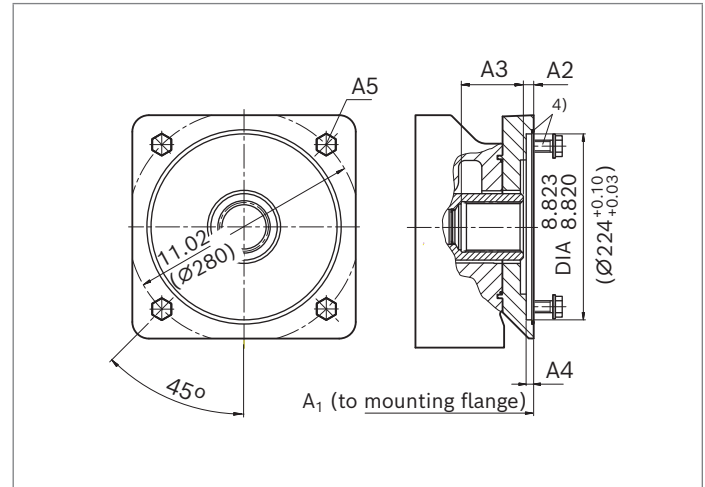
● = Available ○ = On request - = Not available

▼ 160-4



K34					
NG	A1	A2	A3	A4	A5 ³⁾⁵⁾
500	19.88 (505)	0.53 (13.5)	2.16 (55)	0.39 (10)	M16; 0.94 (24) deep
1000	24.72 (628)	0.49 (12.5)	2.16 (55)	0.39 (10)	M16; 0.94 (24) deep

▼ 224-4



K35					
NG	A1	A2	A3	A4	A5 ³⁾⁵⁾
500	21.30 (541)	0.49 (12.5)	2.91 (74)	0.35 (9)	M20; 1.42 (36) deep
750	23.27 (591)	0.49 (12.5)	2.91 (74)	0.35 (9)	M20; 1.42 (36) deep
1000	26.10 (664)	0.49 (12.5)	2.74 (69.5)	0.35 (9)	M20; 1.42 (36) deep

1) According to DIN 5480

2) Mounting holes pattern viewed on through drive with control at top

3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.

4) O-ring and mounting bolts included in delivery.

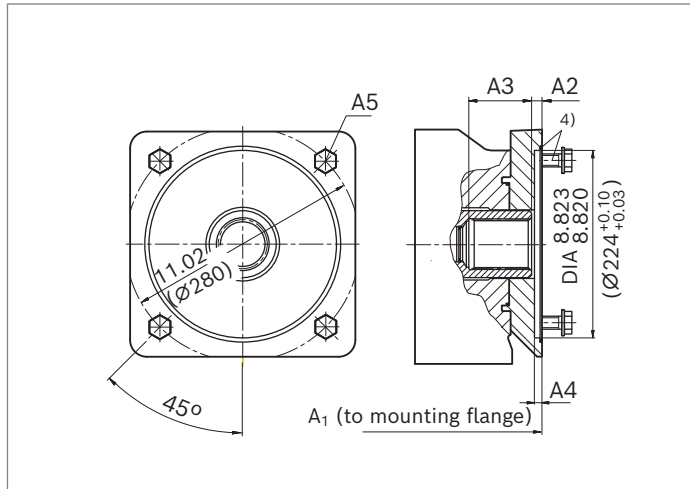
5) Design recommended according to VDI 2230, bolt grade 8.8 according to ISO 898-1

Dimensions for through drives

Flange ISO 3019-2 (metric)		Hub for splined shaft ¹⁾	Availability across sizes									Code	
Diameter	Mounting ²⁾		Diameter	40	71	125	180	250	355	500	750		1000
224-4		N70 × 3 × 22 × 8H	-	-	-	-	-	-	-	●	○	●	K77
315-8		N80 × 3 × 25 × 8H	-	-	-	-	-	-	-	●	●	●	K43

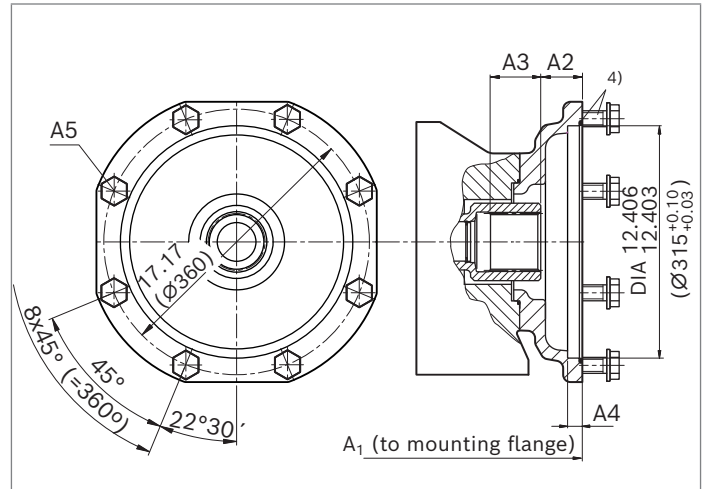
● = Available ○ = On request - = Not available

▼ **224-4**



K77					
NG	A1	A2	A3	A4	A5 ³⁾⁵⁾
500	21.30 (541)	0.49 (12.5)	3.23 (82)	0.35 (9)	M20; 1.42 (36) deep
1000	26.10 (664)	0.49 (12.5)	3.23 (82)	0.35 (9)	M20; 1.42 (36) deep

▼ **315-8**



K43					
NG	A1	A2	A3	A4	A5 ³⁾⁵⁾
500	23.24 (590)	2.11 (53.5)	2.83 (71.9)	0.75 (19)	M20; 1.02 (26) deep
750	25.40 (640)	2.11 (53.5)	2.83 (71.9)	0.75 (19)	M20; 1.02 (26) deep
1000	28.07 (713)	2.11 (53.5)	2.80 (71)	0.75 (19)	M20; 1.02 (26) deep

1) According to DIN 5480

2) Mounting holes pattern viewed on through drive with control at top

3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.

4) O-ring and mounting bolts included in delivery.

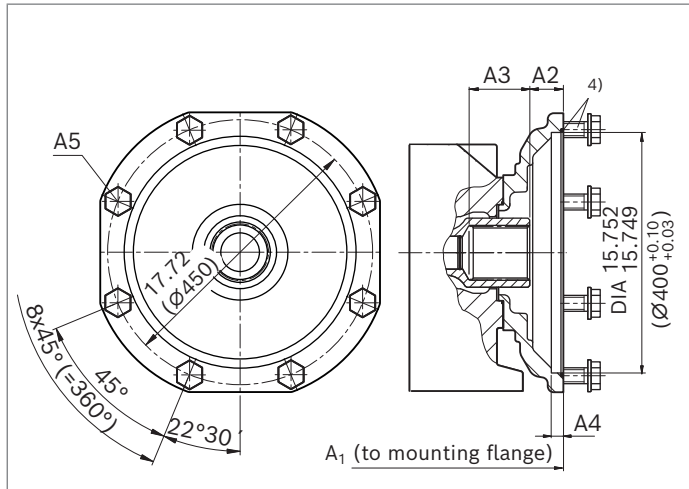
5) Design recommended according to VDI 2230, bolt grade 8.8 according to ISO 898-1

Dimensions for through drives

Flange ISO 3019-2 (metric)		Hub for splined shaft ¹⁾	Availability across sizes									Code
Diameter	Mounting ²⁾	Diameter	40	71	125	180	250	355	500	750	1000	
400-8		N90 × 3 × 28 × 8H	-	-	-	-	-	-	-	•	•	K76
400-8		N100 × 3 × 32 × 8H	-	-	-	-	-	-	-	-	•	K88

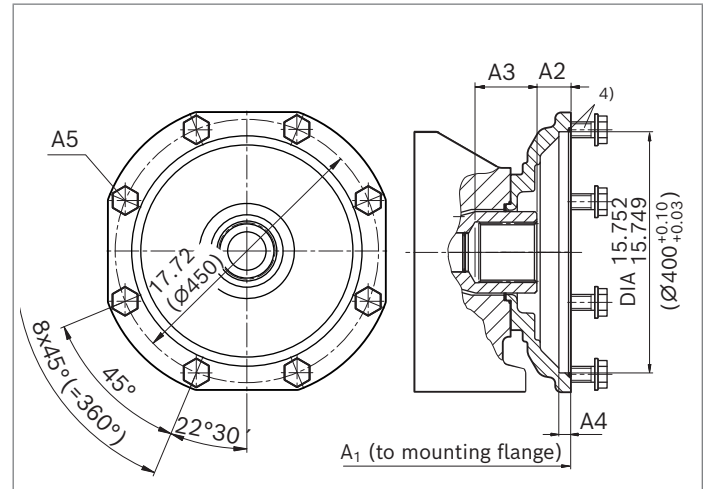
• = Available ◦ = On request - = Not available

▼ 400-8



K76					
NG	A1	A2	A3	A4	A5 ³⁾⁵⁾
750	25.79 (655)	2.09 (53)	4.09 (104)	0.75 (19)	M20; 1.02 (26) deep
1000	28.66 (728)	2.09 (53)	3.82 (97)	0.75 (19)	M20; 1.02 (26) deep

▼ 400-8



K88					
NG	A1	A2	A3	A4	A5 ³⁾⁵⁾
1000	28.66 (728)	2.09 (53)	3.90 (99)	0.75 (19)	M20; 1.02 (26) deep

1) According to DIN 5480

2) Mounting holes pattern viewed on through drive with control at top

3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.

4) O-ring and mounting bolts included in delivery.

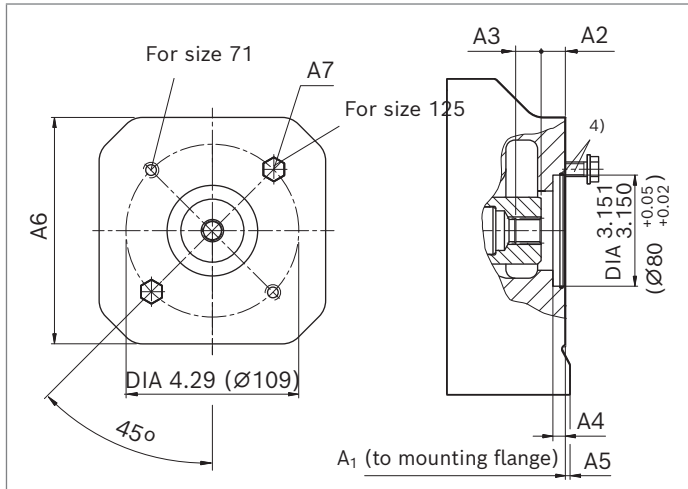
5) Design recommended according to VDI 2230, bolt grade 8.8 according to ISO 898-1

Dimensions for through drives

Flange ISO 3019-2 (metric)		Hub for splined shaft ¹⁾		Availability across sizes								Code	
Diameter	Mounting ²⁾	Diameter		40	71	125	180	250	355	500	750	1000	
80-2		3/4in	11T 16/32DP	○	●	●	○	○	○	○	○	○	KB2

● = Available ○ = On request - = Not available

▼ **80-2**



KB2							
NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁵⁾
71	11.54 (293)	0.85 (21.5)	0.75 (19)	0.39 (10)	0.59 (15)	5.51 (140)	M10; 0.59 (15) deep
125	15.00 (381)	0.95 (24.2)	0.81 (20.5)	0.39 (10)	-	-	M10; 0.47 (12) deep

1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
 2) Mounting holes pattern viewed on through drive with control at top
 3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.

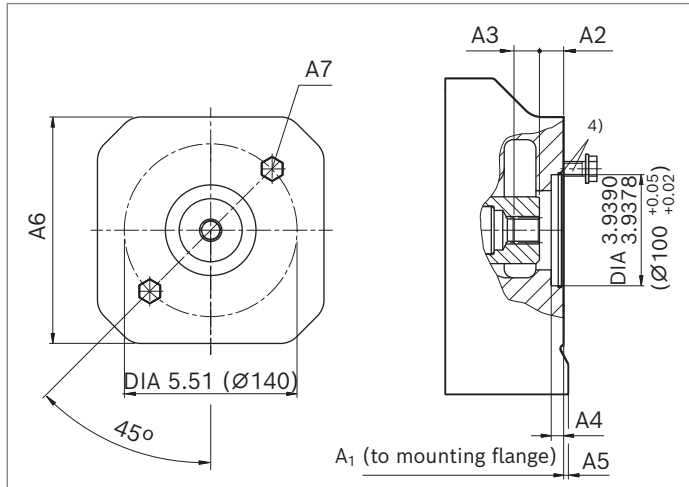
4) O-ring and mounting bolts included in delivery.
 5) Design recommended according to VDI 2230, bolt grade 8.8 according to ISO 898-1

Dimensions for through drives

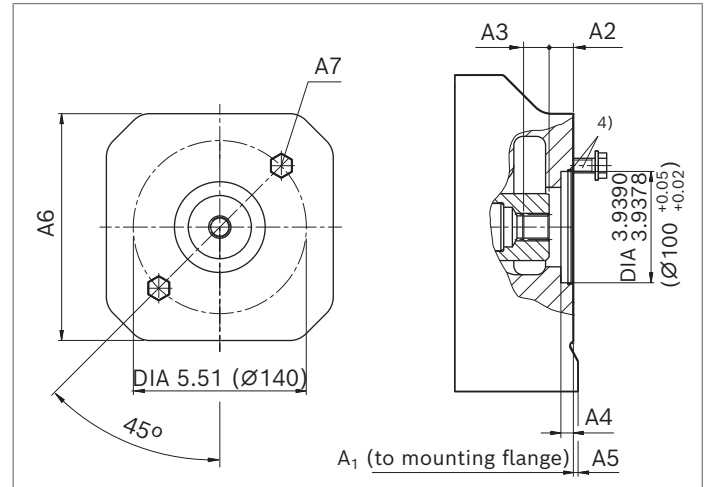
Flange ISO 3019-2 (metric)		Hub for splined shaft ¹⁾		Availability across sizes									Code
Diameter	Mounting ²⁾	Diameter		40	71	125	180	250	355	500	750	1000	
100-2		7/8in	13T 16/32DP	●	●	●	●	●	●	○	○	○	KB3
100-2		1 in	15T 16/32DP	○	●	●	●	●	●	○	○	○	KB4

● = Available ○ = On request - = Not available

▼ 100-2



▼ 100-2



KB3	NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁵⁾
	40	11.50 (292)	0.80 (20.4)	0.90 (23)	0.39 (10)	-	-	M12; 0.71 (18) deep
	71	12.52 (318)	0.80 (20.4)	0.90 (23)	0.35 (9)	-	-	M12; 0.71 (18) deep
	125	14.96 (380)	0.80 (20.3)	0.96 (24.5)	0.39 (10)	-	-	M12; 0.94 (24) deep
	180	14.68 (373)	0.81 (20.5)	0.90 (23)	0.39 (10)	-	-	M12; 0.59 (15) deep
	250	17.05 (433)	0.81 (20.5)	0.90 (23)	0.39 (10)	0.39 (10)	7.87 (200)	M12; 0.71 (18) deep
	355	18.19 (462)	0.81 (20.5)	0.90 (23)	0.39 (10)	-	-	M12; 0.71 (18) deep

KB4	NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁵⁾
	71	12.52 (318)	0.82 (20.8)	1.08 (27.5)	0.31 (8)	-	-	M12; 0.94 (24) deep
	125	14.96 (380)	0.87 (22.2)	1.14 (29)	0.39 (10)	-	-	M12; 0.94 (24) deep
	180	14.68 (373)	0.86 (21.8)	1.10 (27.9)	0.39 (10)	-	-	M12; 0.59 (15) deep
	250	17.05 (433)	0.82 (20.9)	1.08 (27.5)	0.39 (10)	0.39 (10)	7.87 (200)	M12; 0.71 (18) deep
	355	18.19 (462)	0.82 (20.9)	1.08 (27.5)	0.39 (10)	-	-	M12; 0.71 (18) deep

1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

2) Mounting holes pattern viewed on through drive with control at top

3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.

4) O-ring and mounting bolts included in delivery.

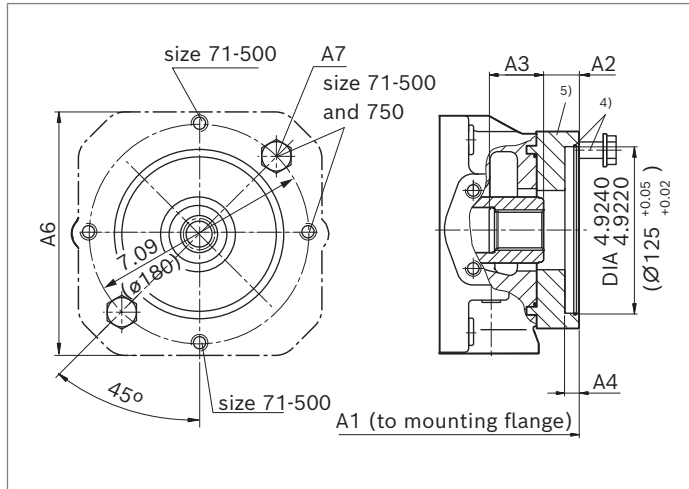
5) Design recommended according to VDI 2230, bolt grade 8.8 according to ISO 898-1

Dimensions for through drives

Flange ISO 3019-2 (metric)		Hub for splined shaft ¹⁾		Availability across sizes								Code	
Diameter	Mounting ²⁾	Diameter		40	71	125	180	250	355	500	750	1000	
125-2		1 1/4in 14T 12/24DP		-	●	●	●	●	●	●	○	○	KB5
125-2		1 1/2in 17T 12/24DP		-	-	●	●	●	●	●	●	○	KB6

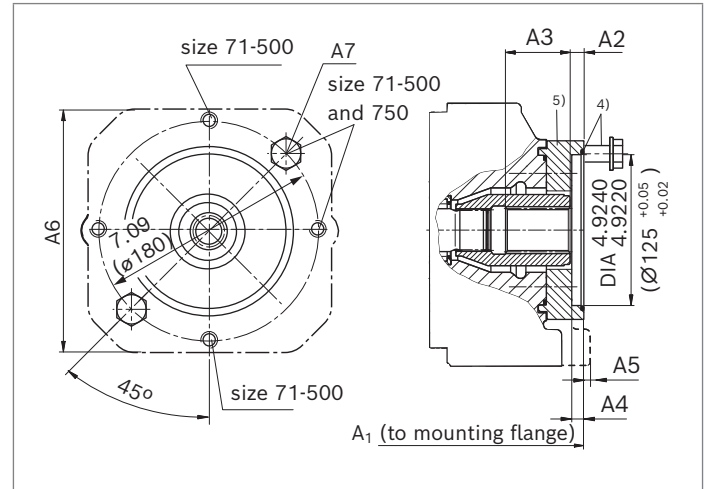
● = Available ○ = On request - = Not available

▼ **125-2**



KB5							
NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁷⁾
71	12.72 (323)	0.91 (23.1)	1.50 (38.1)	0.39 (10)	-	-	M16; 1.14 (29) deep
125	14.96 (380)	0.93 (23.7)	1.50 (38.1)	0.37 (9.5)	-	-	M16; 0.94 (24) deep
180	15.90 (404)	0.93 (23.7)	1.50 (38.1)	0.37 (9.5)	-	-	M16; 0.94 (24) deep
250	17.05 (433)	0.87 (22)	1.42 (36.1)	0.39 (10)	0.39 (10)	7.87 (200)	M16; 0.79 (20) deep
355	18.19 (462)	0.87 (22)	1.42 (36.1)	0.39 (10)	-	-	M16; 0.94 (24) deep
500	19.88 (505)	0.76 (19.3)	1.59 (40.4)	0.39 (10)	-	-	M16; 0.94 (24) deep

▼ **125-2**



KB6							
NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁷⁾
125	14.96 (380)	0.45 (11.4)	2.13 (54)	0.37 (9.5)	-	-	M16; 0.94 (24) deep
180	15.90 (404)	0.45 (11.4)	2.13 (54)	0.37 (9.5)	-	-	M16; 0.94 (24) deep
250	17.83 (453)	0.41 (10.4)	2.16 (55)	0.39 (10)	-	-	M16; 0.79 (20) deep
355	18.98 (482)	0.41 (10.4)	2.16 (55)	0.39 (10)	-	-	M16; 0.79 (20) deep
500	19.88 (505)	0.41 (10.3)	2.20 (56)	0.39 (10)	-	-	M16; 0.94 (24) deep
750	21.85 (555)	0.41 (10.3)	2.20 (56)	0.39 (10)	0.90 (23)	9.84 (250)	M16; 0.94 (24) deep

1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
 2) Mounting holes pattern viewed on through drive with control at top
 3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.

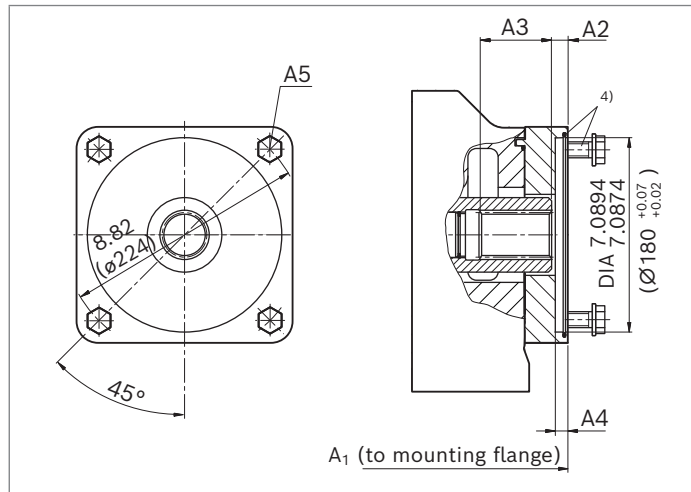
4) O-ring and mounting bolts included in delivery.
 5) For 71 to 180 with intermediate plate
 6) For 125 to 355 with intermediate plate
 7) Design recommended according to VDI 2230, bolt grade 8.8 according to ISO 898-1

Dimensions for through drives

Flange ISO 3019-2 (metric)		Hub for splined shaft ¹⁾		Availability across sizes									Code
Diameter	Mounting ²⁾	Diameter		40	71	125	180	250	355	500	750	1000	
180-4		1 3/4in	13T 8/16DP	-	-	•	•	•	•	•	•	○	KB7

• = Available ○ = On request - = Not available

▼ 180-4



KB7	NG	A1	A2	A3	A4	A5 ³⁾⁵⁾
	125	15.63 (397)	0.41 (10.5)	1.77 (45)	0.39 (10)	M16; 1.18 (30) deep
	180	16.57 (421)	0.41 (10.5)	1.77 (45)	0.39 (10)	M16; 1.18 (30) deep
	250	18.54 (471)	0.43 (10.8)	2.64 (67)	0.39 (10)	M16; 1.26 (32) deep
	355	19.68 (500)	0.43 (10.8)	2.64 (67)	0.39 (10)	M16; 1.26 (32) deep
	500	20.87 (530)	0.41 (10.4)	2.48 (63)	0.39 (10)	M16; 0.98 (25) deep
	750	22.83 (580)	0.41 (10.4)	2.48 (63)	0.39 (10)	M16; 0.98 (25) deep

1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

2) Mounting holes pattern viewed on through drive with control at top

3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.

4) O-ring and mounting bolts included in delivery.

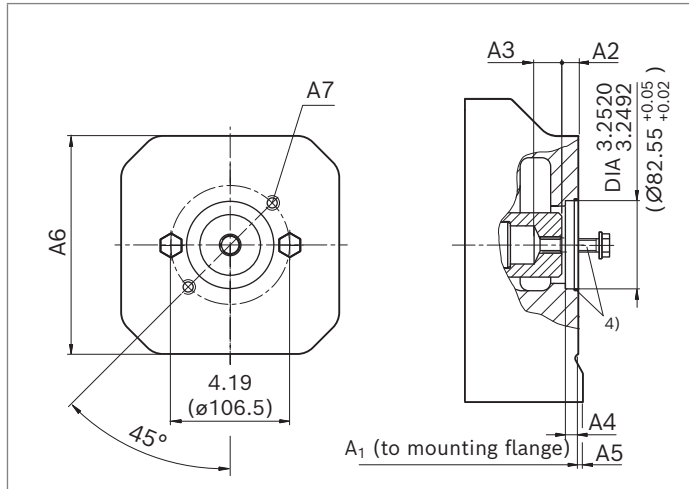
5) Design recommended according to VDI 2230, bolt grade 8.8 according to ISO 898-1

Dimensions for through drives

Flange ISO 3019-1 (SAE J744)		Hub for splined shaft ¹⁾		Availability across sizes								Code	
Diameter	Mounting ²⁾	Diameter		40	71	125	180	250	355	500	750	1000	
82-2 (A)		5/8in	9T 16/32DP	●	●	●	●	●	●	●	●	○	K01
82-2 (A-B)		3/4in	11T 16/32DP	○	●	○	●	○	●	○	○	○	K52

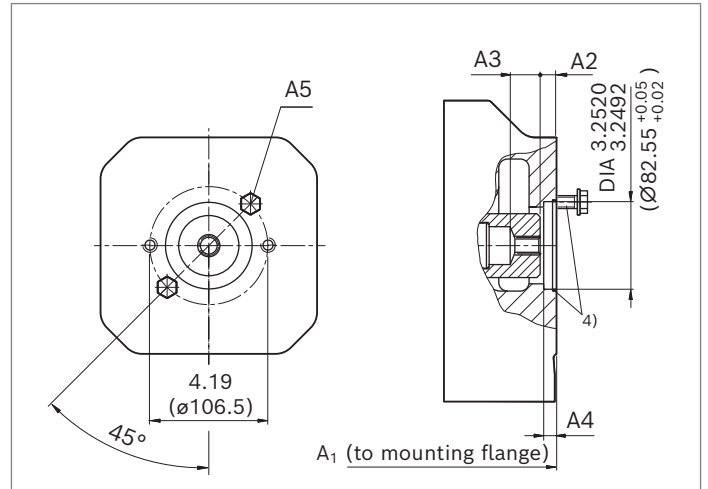
● = Available ○ = On request

▼ **82-2**



K01 (16-4 (A))							
NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁵⁾
40	10.43 (265)	0.41 (10.4)	1.02 (25.8)	0.39 (10)	0.71 (18)	5.12 (130)	M10; 0.59 (15) deep
71	11.54 (293)	0.40 (10.3)	1.00 (25.4)	0.39 (10)	0.59 (15)	5.51 (140)	M10; 0.59 (15) deep
125	13.74 (349)	0.40 (10.3)	1.10 (28)	0.39 (10)	0.51 (13)	5.91 (150)	M10; 0.59 (15) deep
180	14.69 (373)	0.40 (10.3)	1.10 (28)	0.39 (10)	-	-	M10; 0.59 (15) deep
250	17.05 (433)	0.41 (10.5)	1.18 (30)	0.39 (10)	0.39 (10)	7.87 (200)	M10; 0.59 (15) deep
355	18.19 (462)	0.41 (10.5)	1.18 (30)	0.39 (10)	-	-	M10; 0.59 (15) deep
500	19.88 (505)	0.40 (10.3)	1.30 (33)	0.39 (10)	-	-	M10; 0.59 (15) deep
750	21.85 (555)	0.40 (10.3)	1.30 (33)	0.39 (10)	-	-	M10; 0.59 (15) deep

▼ **82-2**



K52 (19-4 (A-B))					
NG	A1	A2	A3	A4	A5 ³⁾⁵⁾
71	12.36 (314)	0.85 (21.5)	0.75 (19)	0.39 (10)	M10; 0.79 (20) deep
180	14.69 (373)	0.84 (21.4)	0.75 (19.1)	0.39 (10)	M10; 0.59 (15) deep
355	18.19 (462)	0.84 (21.4)	0.75 (19.1)	0.39 (10)	M10; 0.59 (15) deep

1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
 2) Mounting holes pattern viewed on through drive with control at top
 3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.

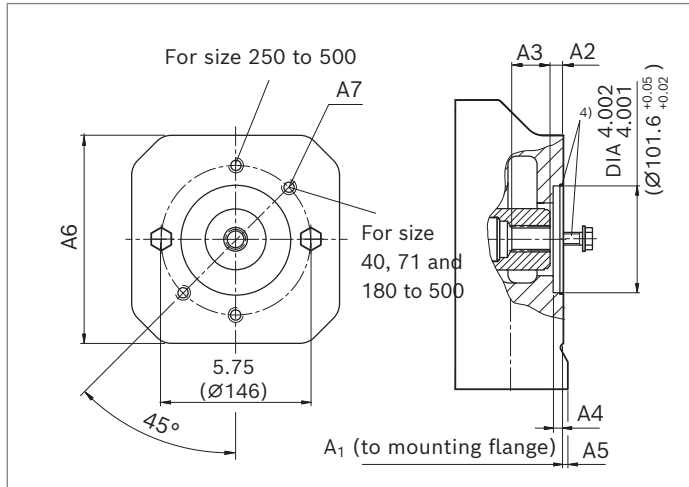
4) O-ring and mounting bolts included in delivery.
 5) Design recommended according to VDI 2230, bolt grade 8.8 according to ISO 898-1

Dimensions for through drives

Flange ISO 3019-1 (SAE J744)		Hub for splined shaft ¹⁾		Availability across sizes									Code
Diameter	Mounting ²⁾	Diameter		40	71	125	180	250	355	500	750	1000	
101-2 (B)		7/8in 13T 16/32DP		●	●	●	●	●	●	●	●	○	K68
101-2 (B-B)		1 in 15T 16/32DP		●	●	●	●	●	●	●	○	○	K04

● = Available ○ = On request

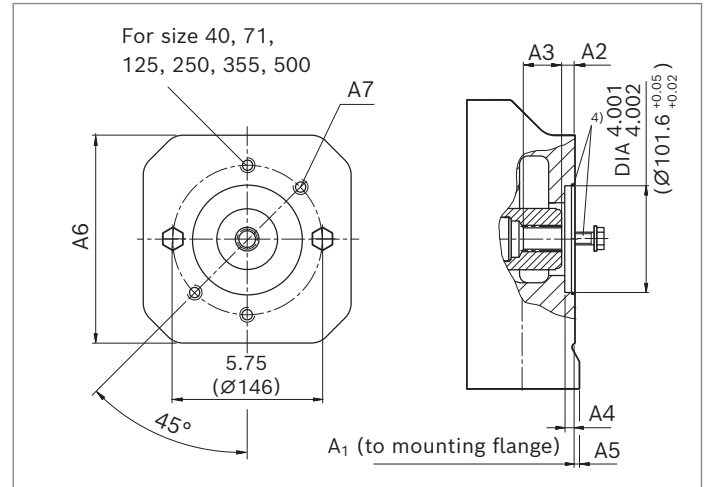
▼ 101-2



K68 (22-4 (B))

NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁵⁾
40	11.50 (292)	0.80 (20.4)	0.91 (23.1)	0.39 (10)	-	-	M12; 0.71 (18) deep
71	12.76 (324)	0.81 (20.5)	0.91 (23.1)	0.39 (10)	-	-	M12; 1.18 (30) deep
125	13.74 (349)	0.81 (20.5)	0.91 (23.1)	0.39 (10)	0.63 (16)	5.91 (150)	M12; 0.59 (15) deep
180	14.68 (373)	0.81 (20.5)	0.91 (23.1)	0.39 (10)	-	-	M12; 0.63 (16) deep
250	17.05 (433)	0.81 (20.5)	0.91 (23.1)	0.39 (10)	0.39 (10)	7.87 (200)	M12; 0.71 (18) deep
355	18.19 (462)	0.81 (20.5)	0.91 (23.1)	0.39 (10)	-	-	M12; 0.71 (18) deep
500	19.88 (505)	0.77 (19.5)	0.98 (25)	0.39 (10)	-	-	M12; 0.71 (18) deep
750	21.85 (555)	0.77 (19.5)	0.98 (25)	0.39 (10)	-	-	M12; 0.71 (18) deep

▼ 101-2



K04 (25-4 (B-B))

NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁵⁾
40	11.50 (292)	0.82 (20.8)	1.08 (27.5)	0.39 (10)	-	-	M12; 0.77 (20) deep
71	12.76 (324)	0.77 (20)	1.16 (29.4)	0.39 (10)	-	-	M12; 1.18 (30) deep
125	15.00 (381)	0.93 (23.7)	1.14 (29)	0.39 (10)	-	-	M12; 1.18 (30) deep
180	14.68 (373)	0.86 (21.8)	1.10 (27.9)	0.39 (10)	-	-	M12; 0.63 (16) deep
250	17.05 (433)	0.82 (20.9)	1.08 (27.5)	0.39 (10)	0.39 (10)	7.87 (200)	M12; 0.71 (18) deep
355	18.19 (462)	0.82 (20.9)	1.08 (27.5)	0.39 (10)	-	-	M12; 0.71 (18) deep
500	19.88 (505)	0.80 (20.4)	1.14 (28.9)	0.39 (10)	-	-	M12; 0.71 (18) deep

1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

2) Mounting holes pattern viewed on through drive with control at top

3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.

4) O-ring and mounting bolts included in delivery.

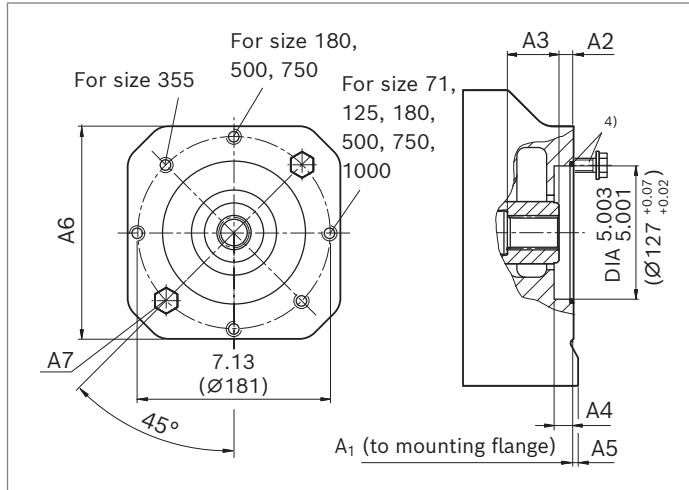
5) Design recommended according to VDI 2230, bolt grade 8.8 according to ISO 898-1

Dimensions for through drives

Flange ISO 3019-1 (SAE J744)	Hub for splined shaft ¹⁾	Availability across sizes										Code	
		Diameter	Mounting ²⁾	Diameter	40	71	125	180	250	355	500		750
127-2 (C)		1 1/4in 14T 12/24DP	-	●	●	●	●	●	●	●	●	●	K07
127-2 (C-C)		1 1/2in 17T 12/24DP	-	-	●	●	●	●	●	●	●	●	K24

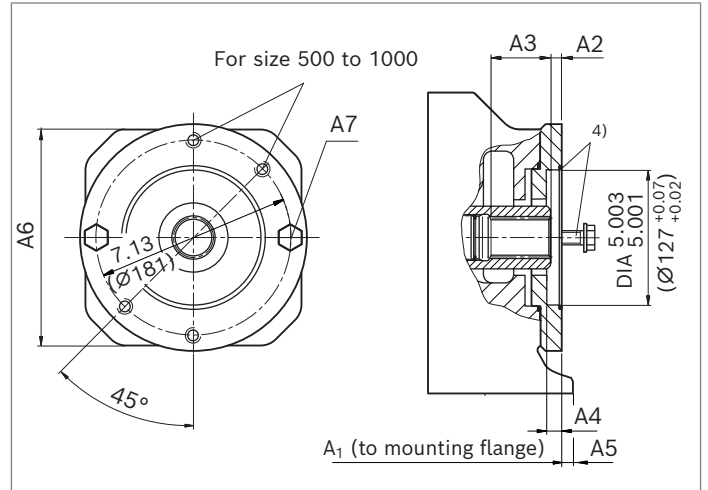
● = Available ○ = On request - = Not available

▼ **127-2**



K07 (32-4 (C))							
NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁵⁾
71	12.72 (323)	0.91 (23)	1.50 (38)	0.51 (13)	-	-	M16; 11.81 (30) deep
125	14.92 (379)	0.89 (22.7)	1.48 (37.5)	0.51 (13)	-	-	M16; 1.10 (28) deep
180	15.87 (403)	0.89 (22.7)	1.48 (37.5)	0.51 (13)	-	-	M16; 1.10 (28) deep
250	17.05 (433)	0.87 (22)	1.42 (36)	0.51 (13)	0.39 (10)	7.87 (200)	M16; 0.78 (20) deep
355	18.19 (462)	0.87 (22)	1.42 (36)	0.51 (13)	-	-	M16; 0.94 (24) deep
500	19.88 (505)	0.76 (19.3)	1.59 (40.4)	0.51 (13)	-	-	M16; 0.94 (24) deep
750	21.85 (555)	0.76 (19.3)	1.59 (40.4)	0.51 (13)	0.91 (23)	9.84 (250)	M16; 0.94 (24) deep
1000	24.72 (628)	0.41 (10.4)	2.15 (54.6)	0.51 (13)	0.98 (25)	11.02 (280)	M16; 1.26 (32) deep

▼ **127-2**



K24 (38-4 (C-C))							
NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁵⁾
125	14.92 (379)	0.41 (10.4)	2.12 (54)	0.51 (13)	-	-	M16; 1.10 (28) deep
180	15.87 (403)	0.41 (10.4)	2.12 (54)	0.51 (13)	-	-	M16; 1.10 (28) deep
250	17.83 (453)	0.41 (10.4)	2.27 (57.6)	0.51 (13)	-	-	M16; 0.78 (20) deep
355	18.98 (482)	0.41 (10.4)	2.27 (57.6)	0.51 (13)	-	-	M16; 0.78 (20) deep
500	19.88 (505)	0.40 (10.3)	2.23 (56.7)	0.51 (13)	-	-	M16; 0.94 (24) deep
750	21.85 (555)	0.40 (10.3)	2.23 (56.7)	0.51 (13)	0.91 (23)	9.84 (250)	M16; 0.94 (24) deep
1000	24.72 (628)	0.41 (10.4)	2.22 (56.6)	0.51 (13)	0.98 (25)	11.02 (280)	M16; 1.26 (32) deep

1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
 2) Mounting holes pattern viewed on through drive with control at top
 3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.

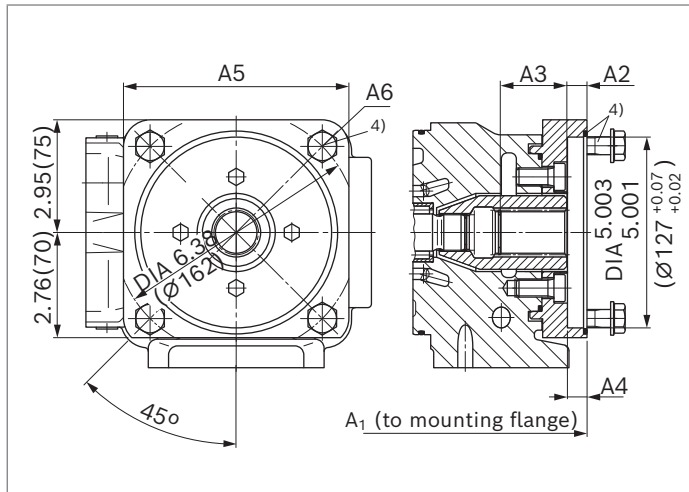
4) O-ring and mounting bolts included in delivery.
 5) Design recommended according to VDI 2230, bolt grade 8.8 according to ISO 898-1

Dimensions for through drives

Flange ISO 3019-1 (SAE J744)		Hub for splined shaft ¹⁾		Availability across sizes								Code	
Diameter	Mounting ²⁾	Diameter		40	71	125	180	250	355	500	750	1000	
127-4 (C)	⊗	1 1/4in	14T 12/24DP	●	●	●	○	○	○	-	-	-	K15
		1 1/2in	17T 12/24DP	-	●	●	●	●	●	-	-	-	K16

● = Available ○ = On request - = Not available

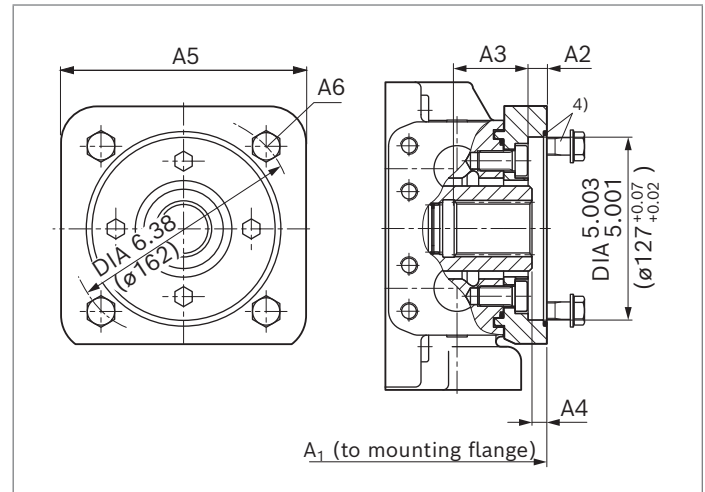
▼ 127-4



K15 (32-4 (C))

NG	A1	A2	A3	A4	A5	A6 ³⁾⁵⁾
40	11.61 (295)	0.53 (13.4)	1.74 (44.3)	0.51 (13)	5.91 (150)	M12; 1.18 (30) deep
71	12.72 (323)	0.90 (23)	1.50 (38)	0.51 (13)	6.69 (170)	M12; 1.18 (30) deep
125	14.92 (379)	0.89 (22.7)	1.48 (37.5)	0.51 (13)	6.69 (170)	M12; 1.18 (30) deep

▼ 127-4




K16 (38-4 (C-C))

NG	A1	A2	A3	A4	A5	A6 ³⁾⁵⁾
71	12.72 (323)	0.41 (10.4)	2.05 (52)	0.51 (13)	6.69 (170)	M12; 1.18 (30) deep
125	14.92 (379)	0.41 (10.4)	2.13 (54)	0.51 (13)	6.69 (170)	M12; 1.18 (30) deep
180	15.87 (403)	0.41 (10.4)	2.13 (54)	0.51 (13)	6.69 (170)	M12; 1.18 (30) deep
250	17.83 (453)	0.41 (10.4)	2.17 (55)	0.51 (13)	6.69 (170)	M12; 1.50 (38) deep
355	18.98 (482)	0.41 (10.4)	2.17 (55)	0.51 (13)	6.69 (170)	M12; 1.50 (38) deep

1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
 2) Mounting holes pattern viewed on through drive with control at top
 3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.

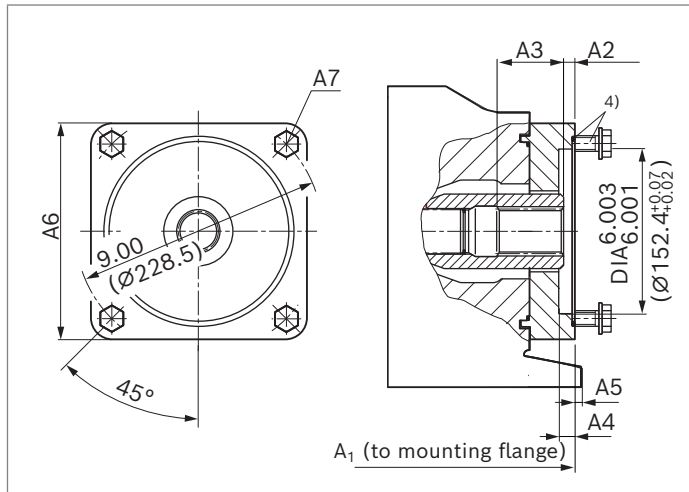
4) O-ring and mounting bolts included in delivery.
 5) Design recommended according to VDI 2230, bolt grade 8.8 according to ISO 898-1

Dimensions for through drives

Flange ISO 3019-1 (SAE J744)		Hub for splined shaft ¹⁾		Availability across sizes								Code	
Diameter	Mounting ²⁾	Diameter		40	71	125	180	250	355	500	750	1000	
152-4 (B)		1 3/4in	13T 8/16DP	-	-	●	●	●	●	●	●	○	K17
		2 in	15T 8/16DP	-	-	-	○	○	○	●	-	-	K78

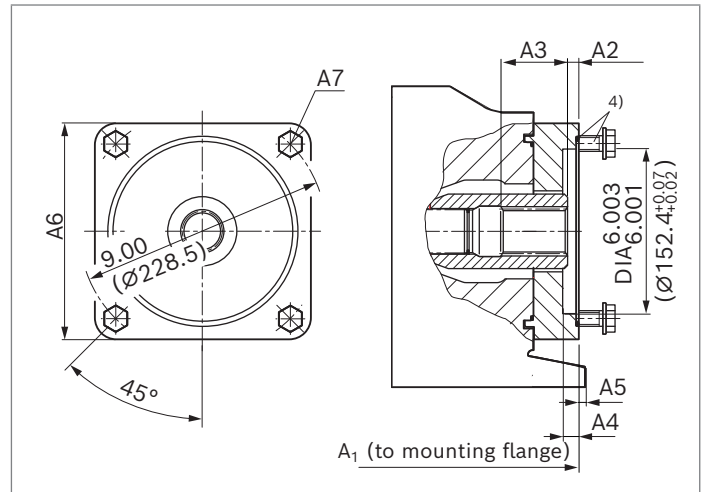
● = Available ○ = On request - = Not available

▼ 152-4



K17 (44-4 (D))							
NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁵⁾
125	15.12 (384)	0.41 (10.4)	2.44 (62)	0.51 (13)	-	-	M16; 1.18 (30) deep
180	16.06 (408)	0.41 (10.4)	2.44 (62)	0.51 (13)	-	-	M16; 1.18 (30) deep
250	18.54 (471)	0.41 (10.4)	2.44 (62)	0.51 (13)	-	-	M16; 1.26 (32) deep
355	19.69 (500)	0.41 (10.4)	2.44 (62)	0.51 (13)	-	-	M16; 1.26 (32) deep
500	20.87 (530)	0.41 (10.4)	2.50 (63.6)	0.51 (13)	-	-	M16; 0.98 (25) deep
750	22.83 (580)	0.41 (10.4)	2.50 (63.6)	0.51 (13)	0.43 (11)	9.84 (250)	M16; 0.98 (25) deep

▼ 152-4




K78 (44-4 (D))							
NG	A1	A2	A3	A4	A5	A6	A5 ³⁾⁵⁾
500	20.87 (530)	0.77 (19.5)	2.52 (64)	0.51 (13)	-	-	M16; 0.98 (25) deep

1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
 2) Mounting holes pattern viewed on through drive with control at top
 3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.

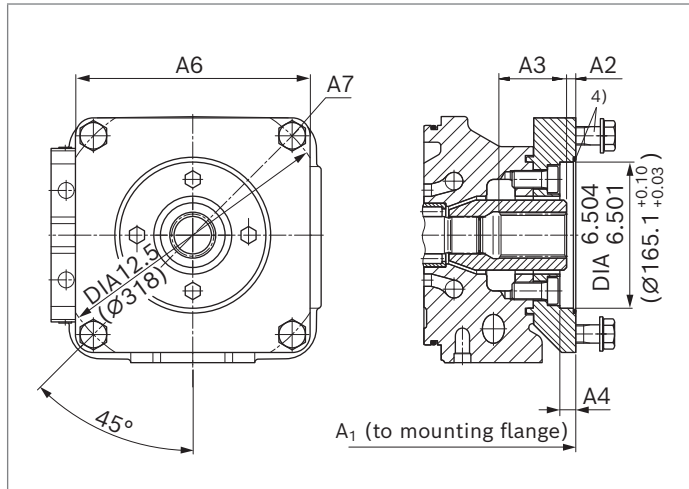
4) O-ring and mounting bolts included in delivery.
 5) Design recommended according to VDI 2230, bolt grade 8.8 according to ISO 898-1

Dimensions for through drives

Flange ISO 3019-1 (SAE J744)	Hub for splined shaft ¹⁾	Availability across sizes											Code
		Diameter	Mounting ²⁾	Diameter	40	71	125	180	250	355	500	750	
165-4 (F)		2 in	15T 8/16DP	-	-	-	-	•	•	•	-	-	K18

• = Available ◦ = On request - = Not available

▼ 165-4



K18 (50-4 (F))							
NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁵⁾
250	18.94 (481)	1.19 (30.4)	2.33 (59.3)	0.71 (18)	-	10.43 (265)	M20; 1.85 (47) deep
355	20.08 (510)	1.19 (30.4)	2.33 (59.3)	0.71 (18)	-	10.43 (265)	M20; 1.85 (47) deep
500	21.30 (541)	1.20 (30.5)	2.33 (59.3)	0.71 (18)	-	10.43 (265)	M20; 1.38 (35) deep

1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
 2) Mounting holes pattern viewed on through drive with control at top
 3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.

4) O-ring and mounting bolts included in delivery.
 5) Design recommended according to VDI 2230, bolt grade 8.8 according to ISO 898-1

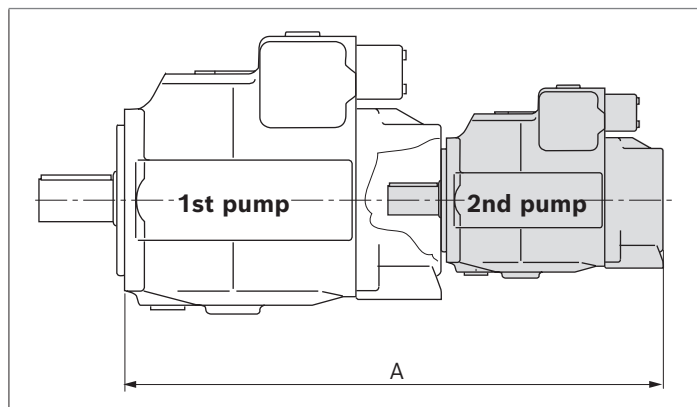
Overview of mounting options

Through drive ¹⁾			Mounting options – 2nd pump				
Flange ISO 3019-2 (metric)	Hub for splined shaft	Code	A4VSO A4VSG NG (shaft)	A4CSG NG (shaft)	A10V(S)O/3x NG (shaft)	A10V(S)O/5x NG (shaft)	External gear pump
80-2	3/4in	KB2	–	–	18 (S, R)/31	10 (S)	–
100-2	7/8in	KB3	–	–	28 (S, R)/31	–	–
	1in	KB4	–	–	45 (S, R)/31	–	–
125-2	1 1/4in	KB5	–	–	71, 88 (S, R)/31	–	–
	1 1/2in	KB6	–	–	100 (S)/31	–	–
125-4	W32x2x14x9g	K31	40 (Z)	–	–	–	–
140-4	W40x2x18x9g	K33	71 (Z)	–	–	–	–
160-4	W50x2x24x9g	K34	125 (Z) 180 (Z)	–	–	–	–
	1 1/4in	KB8	–	–	71, 88 (S, R)/32	–	–
180-4	1 3/4in	KB7	–	–	140, 180 (S)/32	–	–
	1 1/2in	KB9	–	–	100 (S)	–	–
224-4	W60x2x28x9g	K35	250 (Z)	250 (Z)	–	–	–
	W70x3x22x0g	K77	355 (Z)	355 (Z)	–	–	–
315-8	W80x3x25x9g	K43	500 (Z)	500 (Z)	–	–	–
400-8	W90x3x28x9g	K76	750 (Z)	750 (Z)	–	–	–
	W100x3x32x9g	K88	1000 (Z)	–	–	–	–
Flange ISO 3019-1 (SAE J744)	Hub for splined shaft	Code	A4VSO A4VSG NG (shaft)	A4CSG NG (shaft)	A10V(S)O/3x NG (shaft)	A10V(S)O/5x NG (shaft)	External gear pump
82-2 (A)	5/8in	K01	–	–	–	–	Series F ²⁾
	3/4in	K52	–	–	18 (S, R)/31	10, 18 (U)	–
101-2 (B)	7/8in	K68	–	–	28 (S, R)/31	28 (S)	Series N ²⁾
	1in	K04	–	–	45 (S)/31	45 (S)	PGH 4
127-2 (C)	1 1/4in	K07	–	–	71, 88 (S)/31	–	–
	1 1/2in	K24	–	–	100 (S)/31	85 (S)	PGH 5
127-4	1 1/4in	K15	40 (S)	–	71 (S)/32	–	–
	1 1/2in	K16	71 (S)	–	–	–	–
152-4 (D)	1 3/4in	K17	125 (S)	–	140, 180 (S)/32	–	–
	2 in	K78	180 (S)	–	–	–	–
165-4 (E)	2 in	K18	250 (S), 355 (R)	250 (S), 355 (R)	–	–	–

1) Additional through drives are available on request

2) Bosch Rexroth recommends special versions of the external gear pumps. Please contact us.

Combination pumps (A)A4VSG + (A)A4VSG



Total length A

(A)A4VSG (1st pump)	(A)A4VSG (2nd pump)								
	NG40	NG71	NG125	NG180	NG250	NG355	NG500	NG750	NG1000
NG40	22.76 (578)	–	–	–	–	–	–	–	–
NG71	23.86 (606)	24.84 (631)	–	–	–	–	–	–	–
NG125	26.06 (662)	27.05 (687)	29.49 (749)	–	–	–	–	–	–
NG180	27.00 (686)	27.99 (711)	30.43 (773)	30.63 (778)	–	–	–	–	–
NG250	28.19 (716)	29.96 (761)	33.07 (840)	33.78 (858)	36.44 (926)	–	–	–	–
NG355	On request	31.10 (790)	34.21 (869)	34.37 (873)	37.58 (955)	38.43 (976)	–	–	–
NG500	30.98 (787)	31.93 (811)	34.17 (868)	34.65 (880)	38.74 (984)	39.57 (1005)	43.41 (1100)	–	–
NG750	On request	On request	On request	On request	40.71 (1034)	On request	On request	49.06 (1246)	–
NG1000	On request	36.77 (934)	39.02 (991)	39.49 (1003)	43.58 (1107)	On request	48.15 (1223)	51.93 (1319)	54.45 (1383)

Combination pumps (A)A4VSG + (A)A4VSO

Total length A

(A)A4VSG (1st pump)	(A)A4VSO (2nd pump)								
	NG40	NG71	NG125	NG180	NG250	NG355	NG500	NG750	NG1000
NG40	22.17 (563)	–	–	–	–	–	–	–	–
NG71	23.27 (591)	24.41 (620)	–	–	–	–	–	–	–
NG125	25.47 (647)	26.61 (676)	29.17 (741)	–	–	–	–	–	–
NG180	26.42 (671)	27.56 (700)	30.12 (765)	30.63 (778)	–	–	–	–	–
NG250	27.60 (701)	29.53 (750)	32.76 (832)	33.78 (858)	36.14 (918)	–	–	–	–
NG355	On request	30.67 (779)	33.90 (861)	34.37 (873)	37.28 (947)	38.50 (978)	–	–	–
NG500	30.35 (771)	31.50 (800)	33.86 (860)	34.65 (880)	38.43 (976)	39.57 (1005)	43.70 (1110)	–	–
NG750	On request	On request	On request	On request	40.39 (1026)	On request	On request	47.83 (1215)	–
NG1000	On request	36.34 (923)	38.70 (983)	39.49 (1003)	43.27 (1099)	44.41 (1128)	48.54 (1233)	50.71 (1288)	53.58 (1361)

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:

AA4VSG 125 EO1/30R+AA4VSG 71 HM1/10R

- ▶ Each through drive is plugged with a **non-pressure-resistant** cover. This means the units must be sealed with a pressure-resistant cover before commissioning. Through drives can also be ordered with a pressure-resistant cover. Please specify in plain text.

Order example:

AA4VSG 125 EO1/30R-PPB10K339F

AA4VSG 71 HM1/10R-PZB10N00N

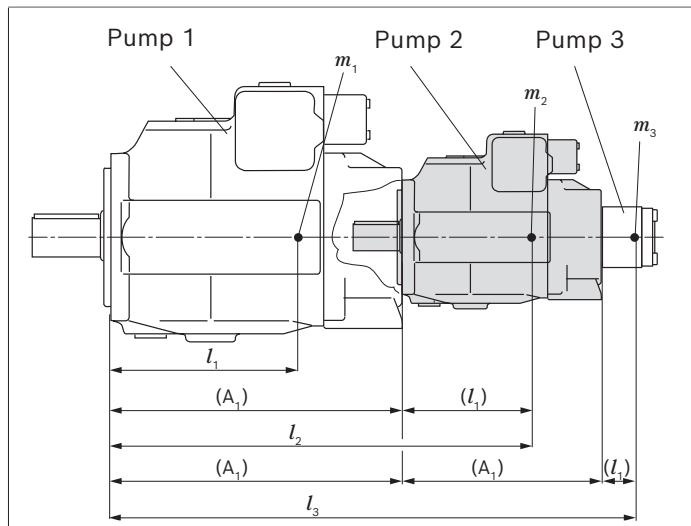
A tandem pump, with two pumps of equal size, is permissible without additional supports, assuming that the dynamic mass acceleration does not exceed maximum 10 g (= 98.1 m/s²).

For combination pumps consisting of more than two pumps, the mounting flange must be calculated for the permissible mass torque.

Notice

- ▶ Collisions with other attachment pumps may occur when controlling the combination pumps. Please check this using the appropriate data sheets for the individual pumps and controls, or contact us.

Details on the piping of the combination pumps can be found on page 49 to 50.



m_1, m_2, m_3	Weight of pump	[lbs (kg)]
l_1, l_2, l_3	Distance from center of gravity	[inch (mm)]
$T_m = (m_1 \cdot l_1 + m_2 \cdot l_2 + m_3 \cdot l_3) \cdot \frac{1}{12}$		[lb-ft]
$T_m = (m_1 \cdot l_1 + m_2 \cdot l_2 + m_3 \cdot l_3) \cdot \frac{1}{102}$		[Nm]

Calculation for multiple pumps	
l_1	Front pump distance from center of gravity (values from "Permissible moments of inertia" table)
l_2	Dimension "A1" from through drive drawings (page 34 to 46) + l_1 of the 2nd pump
l_3	Dimension "A1" from through drive drawings (page 34 to 46) of pump 1 + "A1" of pump 2 + l_1 of pump 3.

Permissible moments of inertia

Size			40	71	125	180	250	355	500	750	1000
Static	T_m	lb-ft	1327	1475	3098	3098	6859	6859	11506	14382	14382
		Nm	1800	2000	4200	4200	9300	9300	15600	19500	19500
Dynamic at 10 g (98.1 m/s ²)	T_m	lb-ft	132	148	310	310	686	686	1151	1438	1438
		Nm	180	200	420	420	930	930	1560	1950	1950
Weight	m	lbs	103	132	220	251	472	523	772	1102	1389
		kg	47	60	100	114	214	237	350	500	630
Distance from center of gravity	l_1	inch	4.72	5.51	6.69	7.09	8.27	8.66	9.06	10.24	11.42
		mm	120	140	170	180	210	220	230	260	290

Attachment of boost and control circuit pumps

Order code: H02, H04 and H06

As standard, we offer the following external gear pumps as boost and control circuit pumps for attachment:

Piped up attachment pump for		NG	40	71	125	180	250	355	500	750	1000
Code	Through drive		K01		K68						K24
H02	The boost circuit										
	Design / type		F		N		-	-	-		PGH5
	Size		11	16	25	32	-	-		-	200
H04	Shared boost and control circuit (only EO1 and EO1K)										
	Design / type		F		N		-	-	-	-	-
	Size		-	16	25	-	-	-	-	-	-
H06	Shared boost and control circuit including pressure relief valve: DB 10 K2-4x/50YV to 50 bar (only HD1T and HD1U)										
	Boost circuit										
	Design / type		F		N		-	-	-	-	PGH5
	Size		11	16	25	32	-	-	-	-	200
	Control circuit										
	Design / type		F								PGF2
	Size		08								11

Notice

- ▶ The shaft and flange of the external gear pumps AZP with the design F, N and G are adjusted for attachment on axial piston units and therefore special versions.

More information on the dimensions and connection options as well as the operating conditions can be found in the data sheets:

AZPF: 10089

AZPN: 10091

AZPG: 10093

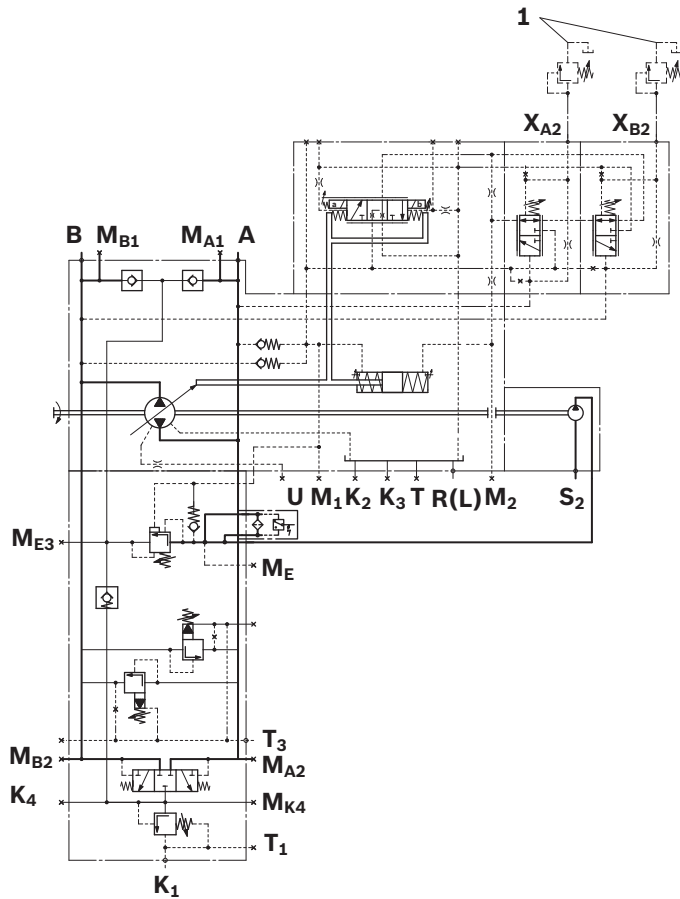
PGF2: 10213

PGH4 and PGH5: 10223

- ▶ The leakage of the external gear pumps at different rotational speeds must be noted.

H024 – A4VSG with an attachment pump for the boost circuit, valve block with filter

- ▶ Circuit diagram H02
- For example: AA4VSG...EPG with H024N
- NG 40 bis 180

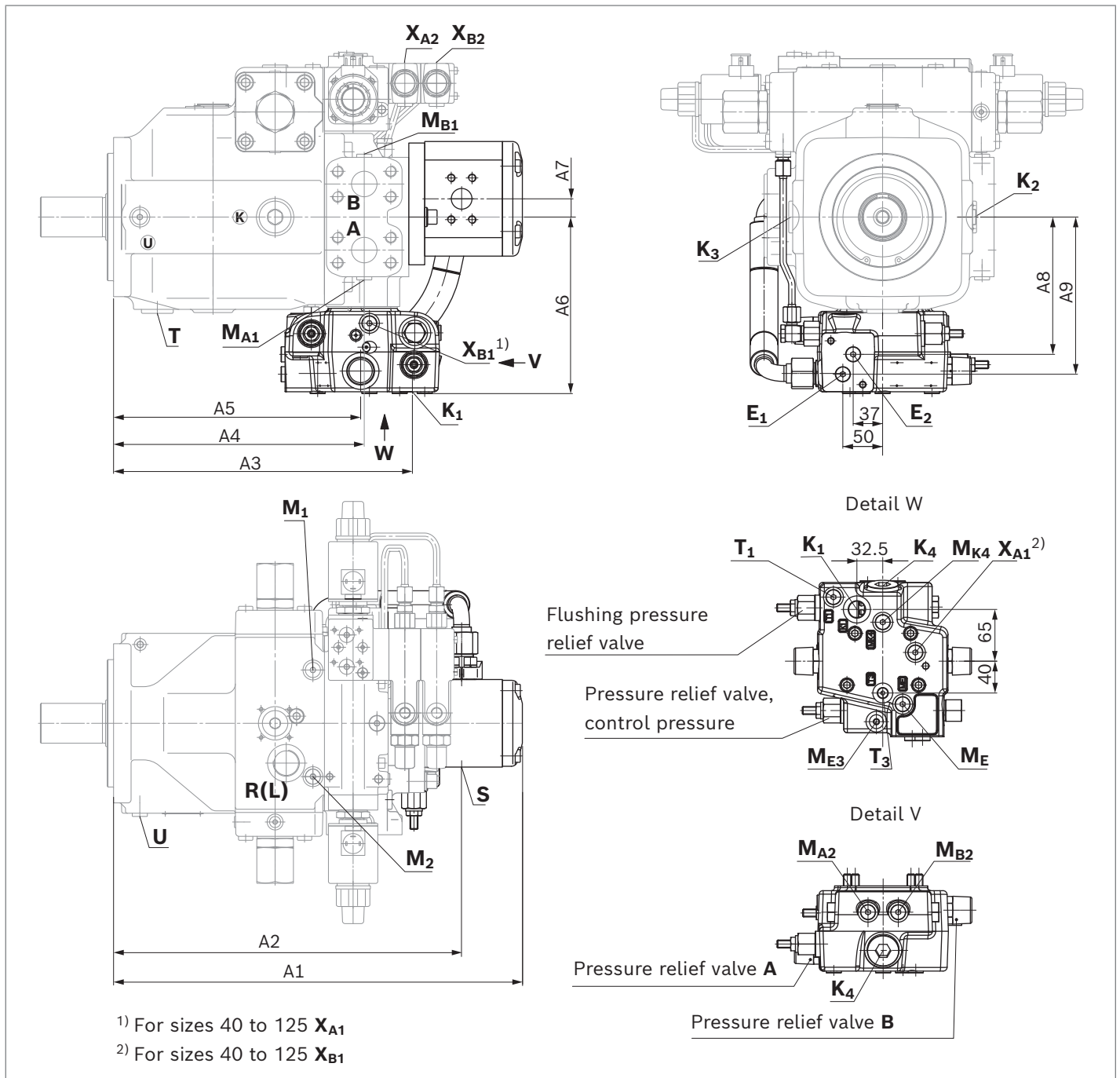


1 Not included in scope of delivery

Ports for		State ¹⁾
A, B	Working line (pressure port)	O
S	Suction line - attachment pump	Piped up
R(L)	Fill and air bleeding (drain port)	O
K ₁	Fill and air bleeding (drain port)	X
K ₂ , K ₃	Fill and air bleeding (drain port)	X
K ₄	Accumulator port	X
T	Fluid drain	X
T ₁	Pressure relief valve unloading port	X
T ₃	Pressure relief valve unloading port	O
E ₁	Filter, supply	X
E ₂	Filter, return	X
X _{A2} , X _{B2}	Pilot pressure port for pressure controller	O
M _{E3}	Measuring boost pressure	X
M _E	Measuring boost pressure supply	X
M _{K4}	Measuring boost pressure	X
M _{A1} , M _{B1}	Measuring working pressure	X
M _{A2} , M _{B2}	Measuring working pressure	X
M ₁ , M ₂	Measuring control pressure	X
U	Bearing flushing	X

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

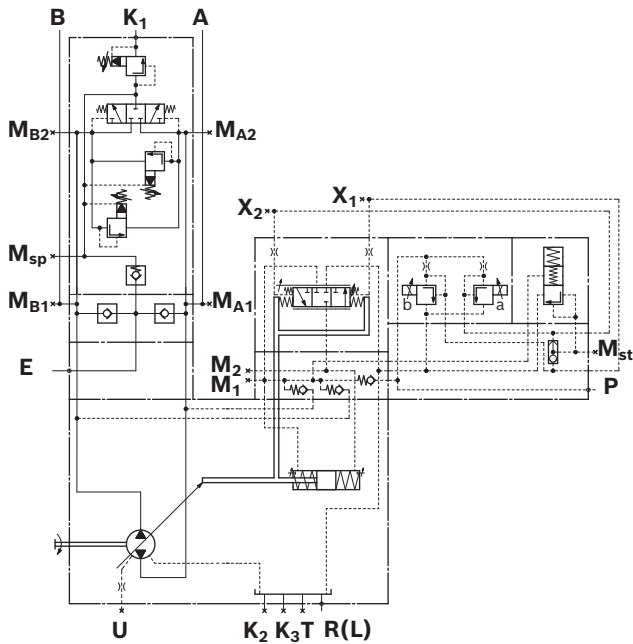
For example: A4VSG 180....H024N



NG	A1	A2	A3	A4	A5	A6	A7	A8	A9
40	14.13 (359)	12.28 (312)	11.77 (299)	9.02 (229)	On request	7.65 (194.3)	0.74 (18.8)	5.91 (150)	6.89 (175)
71	15.63 (397)	13.38 (340)	12.76 (324)	10.26 (260.5)	10.20 (259)	7.75 (196.8)	0.73 (18.7)	On request	On request
125	18.31 (465)	15.90 (404)	14.88 (378)	12.48 (317)	12.32 (313)	8.54 (217)	0.90 (22.9)	6.79 (172.5)	7.78 (197.5)
180	19,57 (497)	17.00 (432)	14.86 (377.5)	12.48 (317)	12.30 (312.5)	8.73 (221.8)	0.90 (22.9)	6.79 (172.5)	7.78 (197.5)

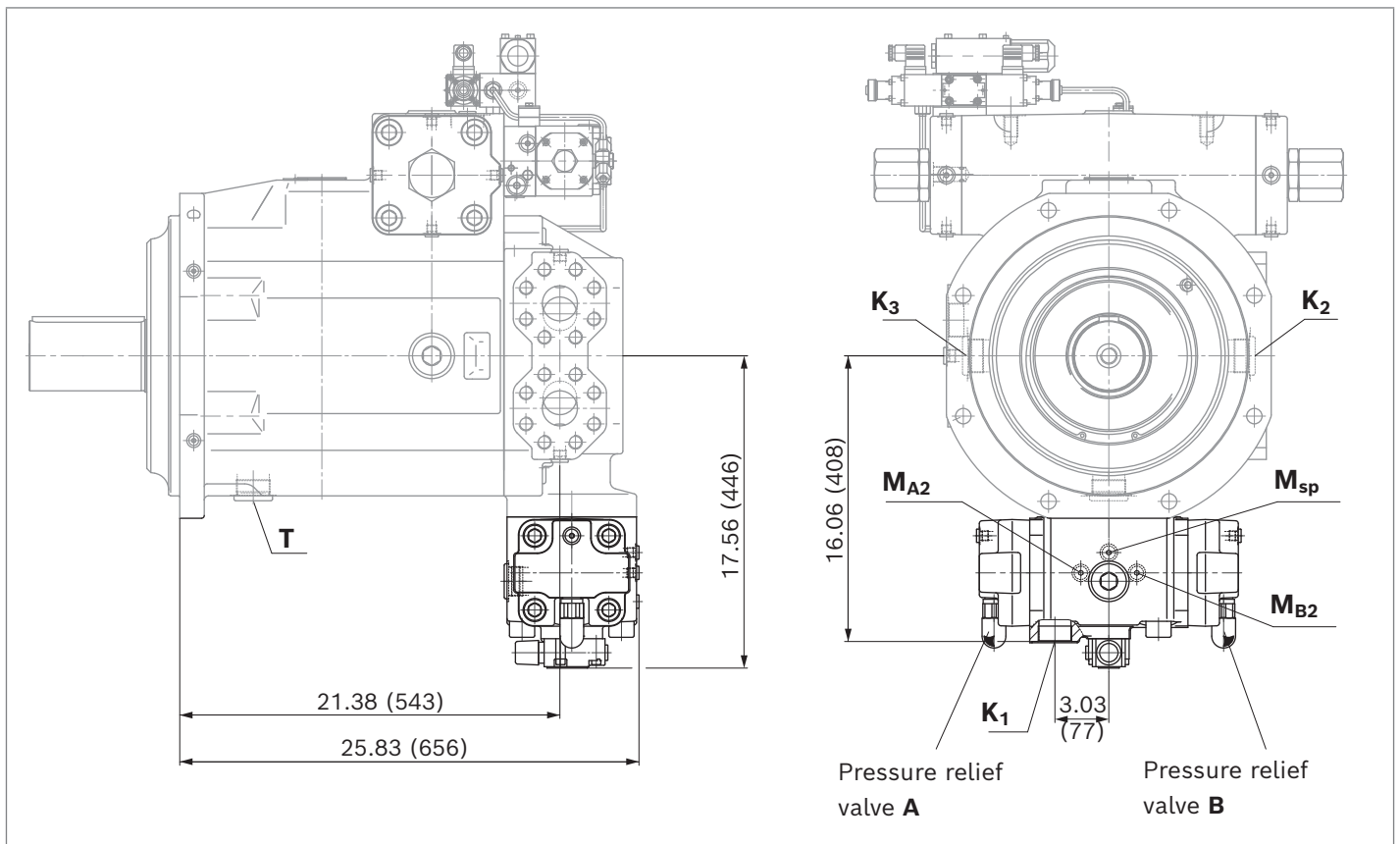
N009N – A4VSG with valve block without filter

► Circuit diagram A4VSG...HDU with N009N, NG1000



Ports for		State ¹⁾
A, B	Working line (pressure port)	O
R(L)	Fill and air bleeding (drain port)	O
K1	Fill and air bleeding (drain port)	O
K2, K3	Fill and air bleeding (drain port)	X
T	Fluid drain	X
P	Control pressure	O
E	Boost pressure supply	O
MA1, MB1	Measuring working pressure	X
MA2, MB2	Measuring working pressure	X
MSP	Measuring flushing pressure	X
M1, M2	Measurement of stroking chamber pressure	X
X1, X2	Pilot pressure measuring	X
Mst	Pilot pressure measuring	X
U	Bearing flushing	X

A4VSG 1000...N009N



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 should be directed to the reservoir via the highest drain port (**T**, **R(L)**, **K₂**, **K₃**). 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.

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 **12** on the following pages. Further installation positions are available upon request. Recommended installation positions: **1** and **2**

Key	
R(L)	Filling / Air bleeding
S	Suction port attachment pump ¹⁾
T, K₂, K₃	Drain port
F	Filling / Air bleeding
SB	Baffle (baffle plate)
$h_{t \min}$	Minimum required immersion depth (200 mm)
h_{\min}	Minimum required distance to reservoir bottom (100 mm)
$h_{ES \min}$	Minimum height required to prevent axial piston unit from draining (25 mm)
$h_{S \max}$	Maximum permissible suction height (800 mm)

Notice

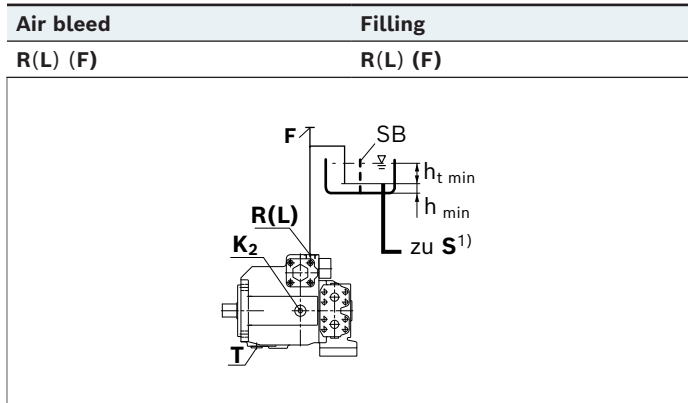
Port **F** is part of the external piping and must be provided on the customer side to make filling and air bleeding easier.

¹⁾ Information on the attachment pump can be found in the respective data sheets (see page 50)

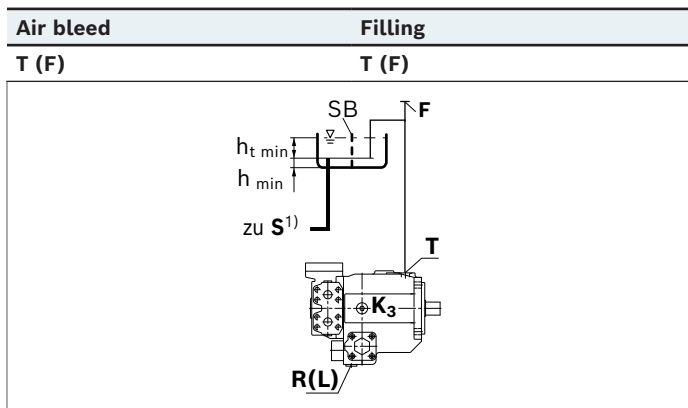
Below-reservoir installation (standard)

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

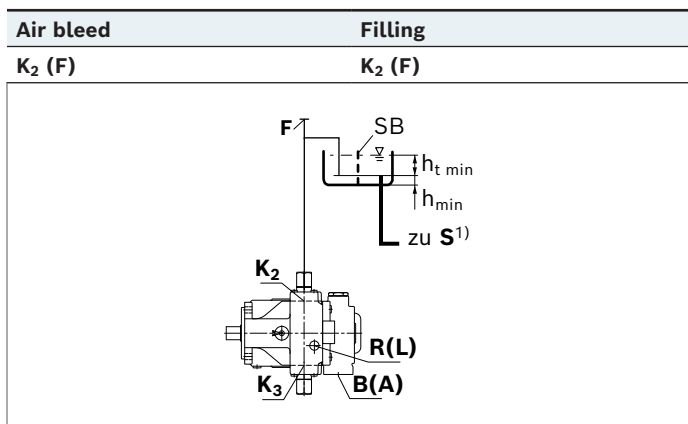
▼ **Installation position 1**



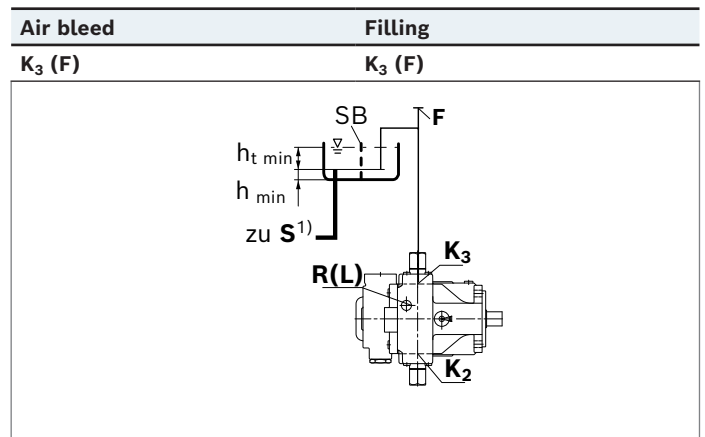
▼ **Installation position 2**



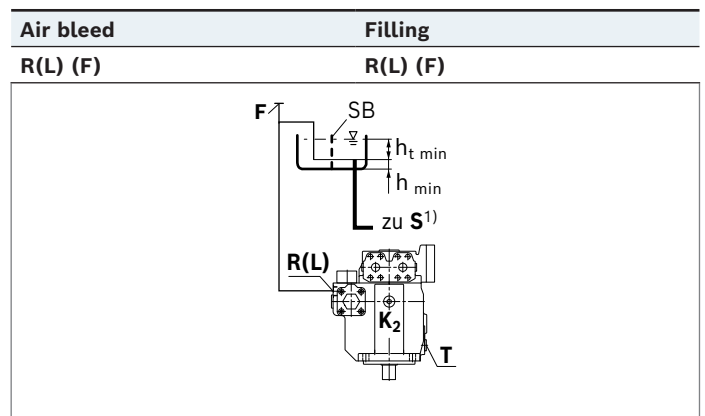
▼ **Installation position 3**



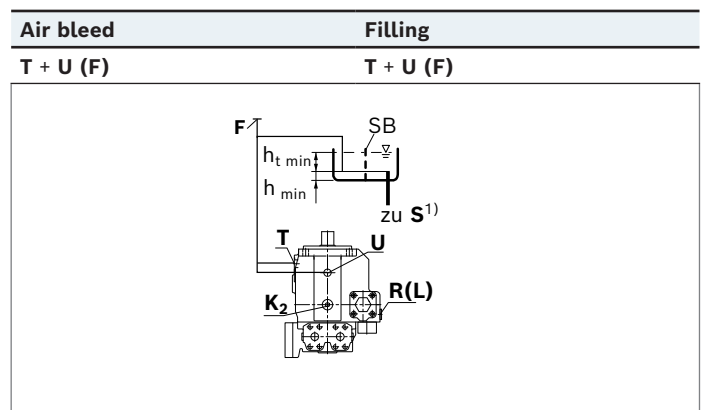
▼ **Installation position 4**



▼ **Installation position 5**



▼ **Installation position 6**



Notice

Bearing flushing at port **U** required.
For information, see page 6

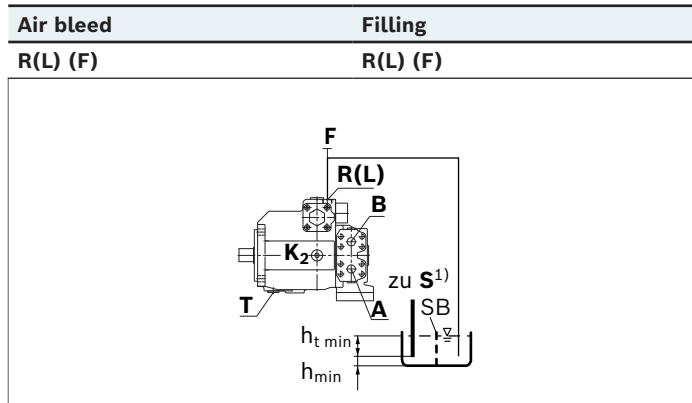
For key, see page 54

1) Information on the attachment pump can be found in the respective data sheets (see page 50)

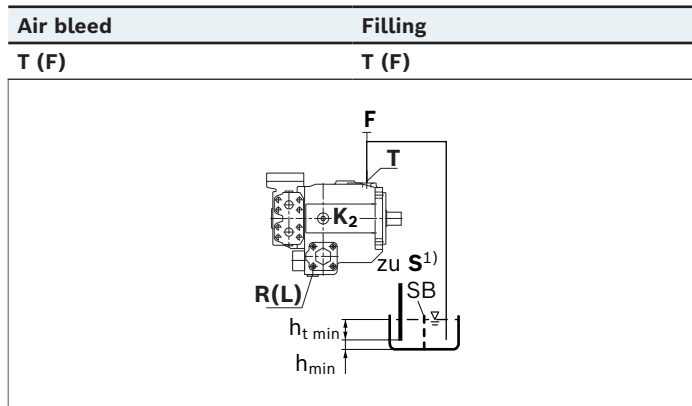
Above-reservoir installation

Above-reservoir installation means that the axial piston unit is installed above the minimum fluid level of the reservoir. To prevent the axial piston unit from draining, a height difference $h_{ES\ min}$ of minimum 25 mm at port **R(L)**, **T** is required in Position 12. Observe the maximum permissible suction height $h_{S\ max} = 800$ mm.

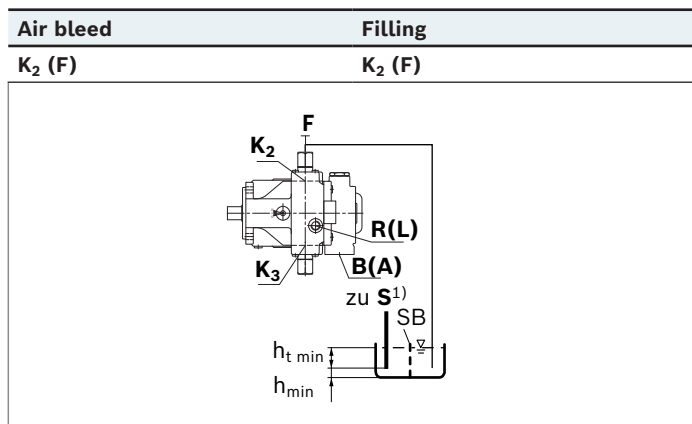
▼ **Installation position 7**



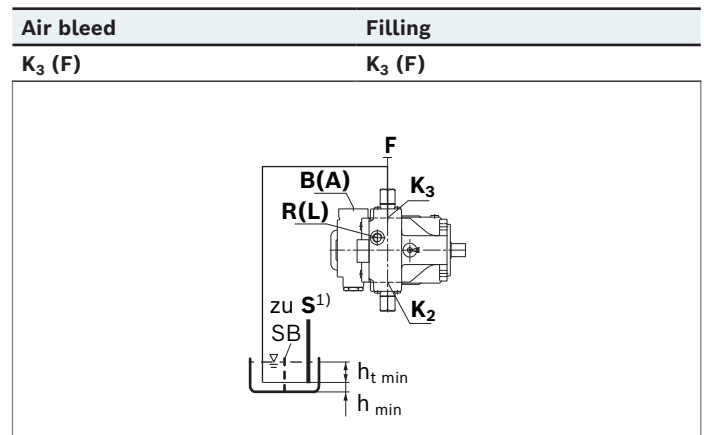
▼ **Installation position 8**



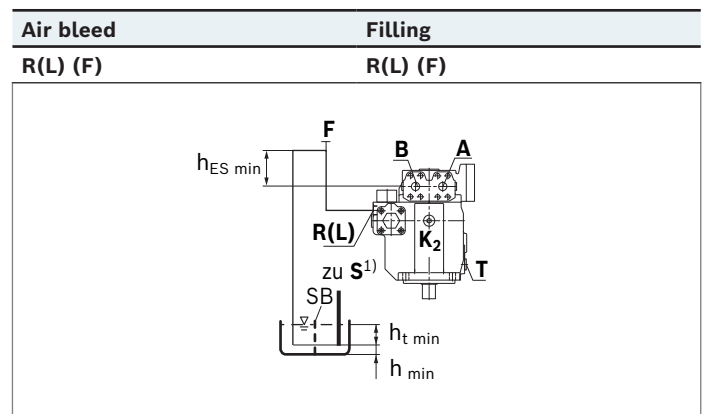
▼ **Installation position 9**



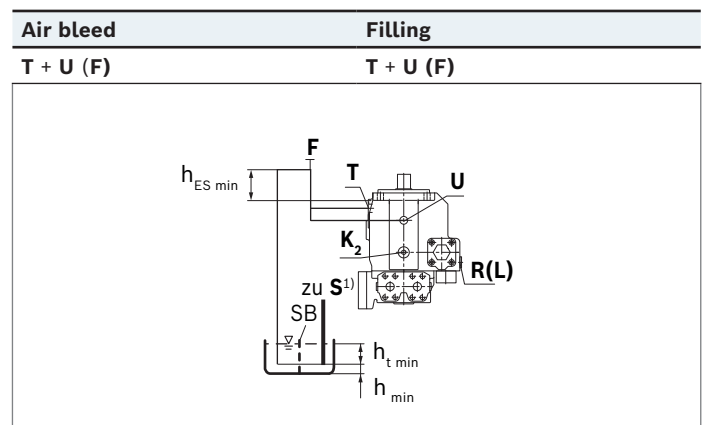
▼ **Installation position 10**



▼ **Installation position 11**



▼ **Installation position 12**



Notice

Bearing flushing at port **U** required.
For information, see page 6

For key, see page 54

1) Information on the attachment pump can be found in the respective data sheets (see page 50)

Project planning notes

- ▶ The axial piston variable pump (A)A4VSG is intended for use in a closed 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 a safety function according to ISO 13849. Please consult the proper contact at Bosch Rexroth if you require reliability parameters (e.g., $MTTF_d$) 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 cut-off (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 application conditions (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.
- ▶ In certain conditions, moving parts in high-pressure relief valves might get stuck in an undefined position due to contamination (e.g. contaminated hydraulic fluid). This can result in restriction or loss of load-holding functions in lifting winches. The machine/system manufacturer must check whether additional measures are required on the machine for the relevant application in order to keep the load in a safe position and ensure they are properly implemented.

Bosch Rexroth Corporation
8 Southchase Court
Fountain Inn, SC 29644-9018
USA
Telephone (864) 967-2777
Facsimile (864) 962-5338
www.boschrexroth-us.com

Bosch Rexroth Corporation
2315 City Line Road
Bethlehem, PA 18017-2131,
USA
Telephone (610) 694-8300
Facsimile (610) 694-8467
www.boschrexroth-us.com

© Bosch Rexroth Corporation 1985. All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights. The data specified within only serves to describe the product. As our products are constantly being further developed, no statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.