

Axial piston variable pump A4VSO Series 10, 11 and 30

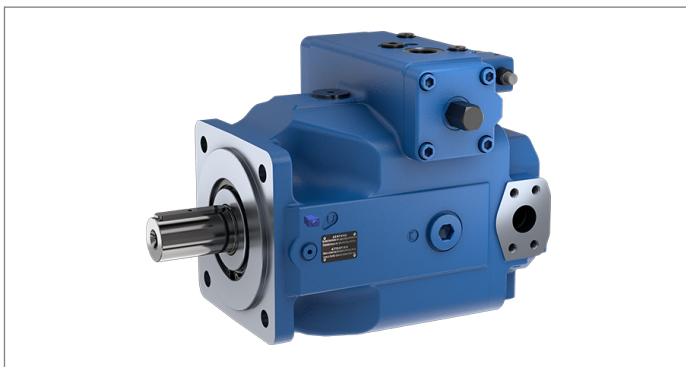
for explosive areas

II 2G Ex h IIC T4-T1 Gb X and

II 3G Ex h IIC T4-T1 Gc X



Part II of the operating
instructions according to
ATEX Directive (2014/34/EU)
data sheet



- ▶ Sizes 40 to 500
- ▶ Nominal pressure 350 bar
- ▶ Maximum pressure 400 bar
- ▶ Open circuit

Information on explosion protection

- ▶ Application according to Directive 2014/34/EU (ATEX)
- ▶ Gas: II 2G Ex h IIC T4-T1 Gb X according to
DIN EN ISO 80079-36:2016,
DIN EN ISO 80079-37:2016
- ▶ Gas: II 3G Ex h IIC T4-T1 Gc X according to
DIN EN ISO 80079-36:2016,
DIN EN ISO 80079-37:2016

Features

Variable displacement pump with axial piston rotary group of swashplate design for hydrostatic drives in open circuit. Flow is proportional to drive speed and displacement.

Flow can be infinitely varied by controlling the swashplate angle.

- ▶ Excellent suction characteristics
- ▶ Low noise level
- ▶ Long service life
- ▶ Modular design
- ▶ Short control response times
- ▶ Variable through drive options
- ▶ Optical swivel angle indicator

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Type code

01	02	03	04	05	06	07	08	09	10	11	12
	A4VS	O			/			-			25

Hydraulic fluid/version								40	71	125	180	250	355	500
01	Mineral oil (without code)							•	•	•	•	•	•	•
	High-speed version							-	-	-	-	•	•	•
														H

Axial piston unit											
02	Swashplate design, variable, nominal pressure 350 bar, maximum pressure 400 bar										A4VS

Operating mode											
03	Pump, open circuit										O

Size (NG)								40	71	125	180	250	355	500
04	Geometric displacement, see table of values on page 6													

Control device			Information on controller selection							
05	Without control		●	●	●	●	●	●	●	OV
	Pressure controller	See page 10 and data sheet 92060	●	●	●	●	●	●	●	DR
	Pressure controller for parallel operation		●	●	●	●	●	●	DP	
	Flow controller		●	●	●	●	●	●	FR..	
	Pressure and flow controller		●	●	●	●	●	●	●	DFR.
	Power controller with hyperbolic characteristic curve	See page 12, 13, and data sheet 92064	●	●	●	●	●	●	●	LR2..
	Power controller with remotely controllable power characteristic		●	●	●	●	●	●	●	LR3..
	Manual control	See page 14	○	○	○	○	○	○	○	MA
	Rod system control (maximum working pressure 150 bar)	Data sheet 92072	–	●	●	●	–	–	–	GE
	Hydraulic control, depending on quantity	Data sheet 92076	●	●	●	●	●	●	●	HM1 HM2
	Hydraulic control, pressure-dependent HD.U and HD.T not available in ATEX	See page 13 and data sheet 92080	●	●	●	●	●	●	●	HD...

Series								40	71	125	180	250	355	500
06	Series 1, index 0							•	•	-	-	-	-	10
	Series 1, index 1 only for HD control							•	•	-	-	-	-	11
	Series 3, index 0							-	-	•	•	•	•	30

Directions of rotation								40	71	125	180	250	355	500
07	Viewed on drive shaft					Clockwise		•	•	•	•	•	•	R
						Counter-clockwise		•	•	•	•	•	•	L

Sealing material and ATEX version								40	71	125	180	250	355	500
08	FKM (fluoroelastomer) and ATEX version II 2G Ex h IIC T4-T1 Gb X							•	•	•	•	•	•	R
	FKM (fluoroelastomer) and ATEX version II 3G Ex h IIC T4-T1 Gc X							•	•	•	•	•	•	A

Drive shafts								40	71	125	180	250	355	500
09	Parallel keyed shaft DIN 6885							•	•	•	•	•	•	P
	Splined shaft DIN 5480							•	•	•	•	•	•	Z

Mounting flange								40	71	125	180	250	355	500
10	Based on ISO 3019-2 (metric)					4-hole		•	•	•	•	•	-	B
						8-hole		-	-	-	-	-	•	H

Working port								40	71	125	180	250	355	500
11	SAE flange ports, metric fastening thread		B and S with 90° lateral offset		2nd pressure port B ₁ , opposite B , plugged with flange plate on delivery			•	•	•	•	•	•	25

• = Available ○ = On request - = Not available

01	02	03	04	05	06	07	08	09	10	11	12
	A4VS	O			/			-			25

Through drive¹⁾ (for mounting options, see page 41)

12	Flange ISO 3019-2 (metric) Diameter	Hub for splined shaft Diameter	For mounting of ATEX axial piston pump	40	71	125	180	250	355	500	
	without through drive and auxiliary pump			●	●	●	●	●	●	●	N00
	with through drive for mounting of an axial piston pump			●	●	-	-	-	-	●	K...
	Universal through drive ²⁾			-	-	●	●	●	●	-	U...
	125-4	32x2x14x9g ³⁾	A4VS NG40	●	●	●	●	●	●	●	31
	140-4	40x2x18x9g ³⁾	A4VS NG71	-	●	●	●	●	●	●	33
	160-4	50x2x24x9g ³⁾	A4VS NG125 and NG180	-	-	●	●	●	●	●	34
	224-4	60x2x28x9g ³⁾	A4VS NG250	-	-	-	-	●	●	●	35
		70x3x22x9g ³⁾	A4VS NG 355 and 500	-	-	-	-	-	●	●	77
	315-8	80x3x25x9g ³⁾	A4VS NG 500	-	-	-	-	-	-	●	43
	80-2	3/4 in 11T 16/32DP ⁴⁾	A10VSO 18/31	○	●	●	●	●	●	○	B2
	100-2	7/8 in 13T 16/32DP ⁴⁾	A10VSO 28/31	●	●	●	●	●	●	○	B3
	100-2	1 in 15T 16/32DP ⁴⁾	A10VSO 45/31	●	●	●	●	●	●	●	B4
	125-2	1 1/4 in 14T 12/24DP ⁴⁾	A10VSO 71/31	-	●	●	●	●	●	●	B5
	125-2	1 1/2 in 17T 12/24DP ⁴⁾	A10VSO 100/31	-	-	●	●	●	●	○	B6
	Prepared for through drive, with pressure-resistant plugged cover			●	●	●	●	●	●	●	99

● = Available ○ = On request - = Not available

Notes

- Note the project planning notes on page 46.
- In addition to the type code, please specify the relevant technical data when placing your order.

Features of the ATEX version

The ATEX version is an advanced development of the A4VSO for compliance with Directive 2014/34/EU (ATEX). External distinguishing features compared to the standard pump:

- The ground terminal.
- The EX mark and the CE mark on the name plate.

Temperature classes according to DIN EN ISO 80079-36

Depending on the two temperature classes, T3 and T4, observe the maximum permissible temperatures (see "Hydraulic fluid" and "Operating data monitoring – X parameters").

Notes

- **ATEX classification:** When ordering, please state which equipment group, category, explosion group, temperature class and ignition protection type are required for your intended ATEX application.
- **Technical data:** Compared to the standard pump, restrictions apply in terms of temperature, case pressure and bearing flushing/installation position.
- **Painting/color selection:** In order to avoid mechanically generated sparks from foreign particles made of aluminum with iron oxide and/or particles of rust on the surface⁵⁾, the pump is painted as standard with corrosion protecting. Please contact your Rexroth partner for available colors.
- **Bearing service life:** The bearing service life must be calculated in any case. The load cycle forms the basis for this. Please contact us.
- **Potential equalization:** The pump must be grounded. For grounding points, please refer to the drawings starting on page 15.

1) All attachment pumps must match the ATEX classification for the application in question.

2) With through-drive shaft, without hub, without intermediate flange, plugged on a functionally reliable basis with cover (see data sheet 95581).

3) Splined hub × 8H according to DIN 5480

4) Hub for splined shaft according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

5) See DIN EN ISO 80079-36, 6.4.2.1

Hydraulic fluids

The A4VSO ATEX 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

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)

Selection of hydraulic fluid shall make sure that the operating viscosity in the operating temperature range is within the optimum range (v_{opt} ; see selection diagram).

Please note

The leakage temperature which is influenced by pressure and rotational speed is always above the reservoir temperature.

Temperature class T4 and T3 according to ATEX:

Safety instructions, see page 5

Ignition temperature of hydraulic fluid

The pump is approved for temperature class T4 to T1 according to DIN EN ISO 80079-36.

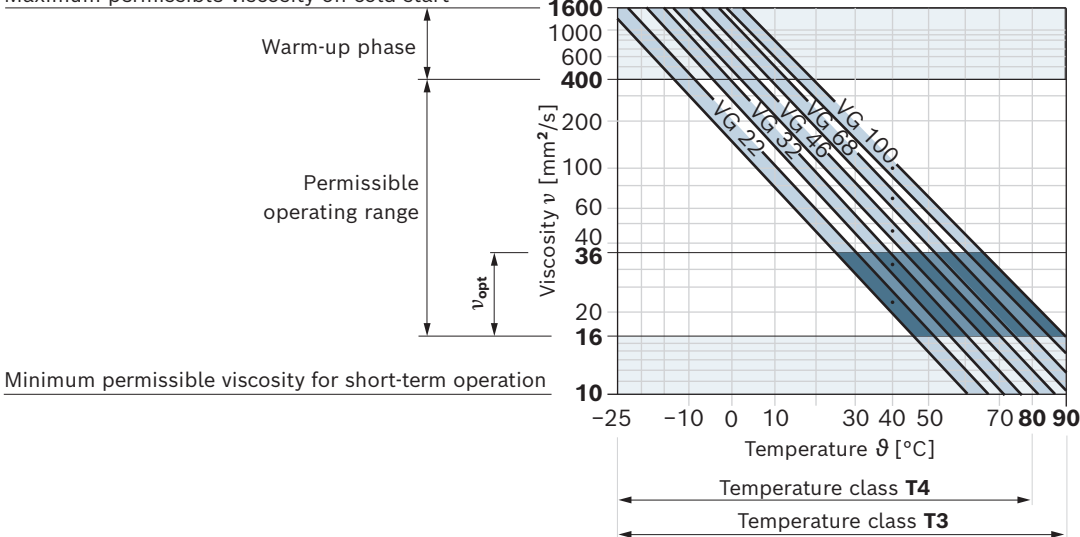
According to DIN EN ISO 80079-37, only hydraulic fluids with an ignition temperature at least 50 K above the maximum surface temperature of the approved temperature class should be used. Example: For the temperature class T4, the ignition temperature of the hydraulic fluid should be $\geq 185\text{ °C}$.

Viscosity and temperature of hydraulic fluids

	Viscosity	Temperature	Remarks
Cold start	$v_{max} \leq 1600\text{ mm}^2/\text{s}$	$\vartheta_{St} \geq -25\text{ °C}$	$t \leq 3\text{ min}$, without load $p \leq 50\text{ bar}$ Permissible temperature difference between axial piston unit and hydraulic fluid in the system maximum 25 K
Warm-up phase	$v = 1600\text{ to }400\text{ mm}^2/\text{s}$		For p_{nom} , $0.5 \times n_{max}$ and $t \leq 15\text{ min}$
Permissible operating range	$v = 400\text{ to }16\text{ mm}^2/\text{s}$	T3 $\vartheta = -25\text{ °C to }+90\text{ °C}$ T4 $\vartheta = -25\text{ °C to }+80\text{ °C}$	Measured at the drain port Observe the permissible temperature range of the shaft seal
	$v_{opt} = 36\text{ to }16\text{ mm}^2/\text{s}$		Optimal operating viscosity and efficiency range
Short-term operation	$v_{min} \leq 16\text{ to }10\text{ mm}^2/\text{s}$	T3 $\vartheta = -25\text{ °C to }+90\text{ °C}$ T4 $\vartheta = -25\text{ °C to }+80\text{ °C}$	$t < 3\text{ min}$, $p < 0.3 \times p_{nom}$

▼ Selection diagram

Maximum permissible viscosity on cold start



Operating data monitoring – X parameters

Ambient temperature Ta (T3-T1): -20 °C to +60 °C; Ta (T4): -20 °C to +40 °C

Safety instructions for temperature class T3-T1

ATEX category II 3G Ex h IIC T3-T1 Gc X

To observe the **maximum leakage temperature of 90 °C**, at least one of the following measures must be taken and checked regularly:

- ▶ Check the leakage temperature at port **T** or **R(L)** (maximum distance 30 cm)
- ▶ Check the maximum inlet temperature of 60 °C at the suction port
- ▶ Check a maximum inlet temperature that must be determined for the following operating points when commissioning:
 - Maximum working pressure and maximum possible flow
 - Maximum working pressure and minimum flow

Also monitor the reservoir level. Take appropriate action if the temperature exceeds limits.

ATEX category II 2G Ex h IIC T3-T1 Gb X

To observe the **maximum leakage temperature of 90 °C**, the following measures must be taken:

- ▶ Continuously monitor the leakage temperature at each pump with a temperature sensor on port **T** or **R(L)** (maximum distance to port 30 cm).
- ▶ Connect the temperature sensor with a switching-off for the system at the limit temperature of 90 °C.
- ▶ This shut-off function should be tested during commissioning; see chapter 8.1.1 of the operating instructions.
- ▶ Reservoir level monitoring is also required.

Safety instructions for temperature class T4

ATEX category II 3G Ex h IIC T4 Gc X

To observe the **maximum leakage temperature of 80 °C**, at least one of the following measures must be taken and checked regularly:

- ▶ Check the leakage temperature at port **T** or **R(L)** (maximum distance 30 cm)
- ▶ Check the maximum inlet temperature of 50 °C at the suction port
- ▶ Check a maximum inlet temperature that must be determined for the following operating points when commissioning:
 - Maximum working pressure and maximum possible flow
 - Maximum working pressure and minimum flow

Also monitor the reservoir level. Take appropriate action if the temperature exceeds limits.

ATEX category II 2G Ex h IIC T4 Gb X

To observe the **maximum leakage temperature of 80 °C**, the following measures must be taken:

- ▶ Continuously monitor the leakage temperature at each pump with a temperature sensor on port **T** or **R(L)** (maximum distance to port 30 cm).
- ▶ Connect the temperature sensor with a switching-off for the system at the limit temperature of 80 °C.
- ▶ This shut-off function should be tested during commissioning; see chapter 8.1.1 of the operating instructions.
- ▶ Reservoir level monitoring is also required.

Filtration of the hydraulic fluid

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

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

At a hydraulic fluid viscosity of less than 10 mm²/s (e.g. due to high temperatures during short-term operation) at the drain port, 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:

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

Bearing flushing

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

- ▶ When installed vertically (drive shaft up) for lubricating the front bearing and shaft seal
- ▶ When operated at temperature and viscosity limits when using mineral oil
- ▶ For above-reservoir installation

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.

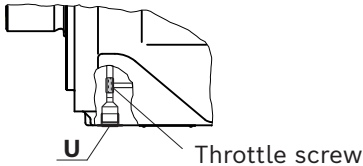
For the individual sizes, the following minimum flushing flows are necessary:

Size			40	71	125	180	250	355	500
Flushing flow	q_{sp}	l/min	3	4	5	7	10	15	20

For the flushing flows indicated, there is a pressure differential of approx. 2 bar (Series 10 and 11) or 3 bar (Series 30) between port **U** (including fitting) and the housing area.

Notice regarding series 3x

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

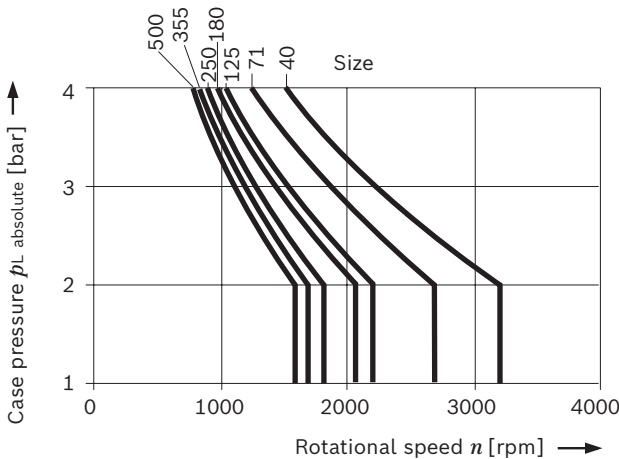


Case pressure

Permissible pressure load

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

The pressure in the housing must be equal to or greater than the ambient pressure.



Maximum case pressure	
p_L absolute max	4 bar absolute

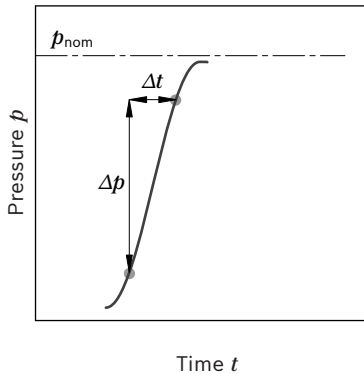
The parameters are reference values; under certain operating conditions, restrictions may be required.

Flow direction
S to B

Working pressure range

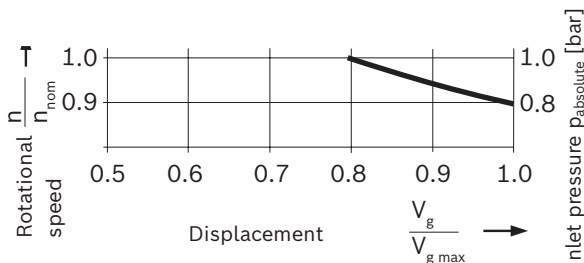
Pressure at working port B		Definition
Nominal pressure p_{nom}	350 bar	The nominal pressure corresponds to the maximum design pressure. The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of the single operating periods must not exceed the total operating period (maximum number of cycles: approx. 1 million).
Maximum pressure p_{max}	400 bar	
Single operating period	1 s	
Total operating period	300 h	
Minimum pressure (high-pressure side)	15 bar	Minimum pressure on the high-pressure side (B) which is required in order to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and the swivel angle.
Rate of pressure change $R_{A \text{ max}}$	16000 bar/s	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Pressure at suction port S (inlet)		
Minimum pressure $p_{S \text{ min}}$	Standard 0.8 bar absolute	Minimum pressure at suction port S (inlet) which is required to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and displacement of the axial piston unit.
Maximum pressure $p_{S \text{ max}}$	30 bar	
Case pressure at port T, K ₁ , K ₂ , R(L)		
Maximum pressure $p_{L \text{ max}}$	4 bar absolute	The permissible case pressure depends on the rotational speed. The parameters are reference values; under certain operating conditions, restrictions may be required.
Pressure peaks $p_{L \text{ peak}}$	6 bar absolute	t<0.1 s

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



▼ Minimum pressure (inlet)

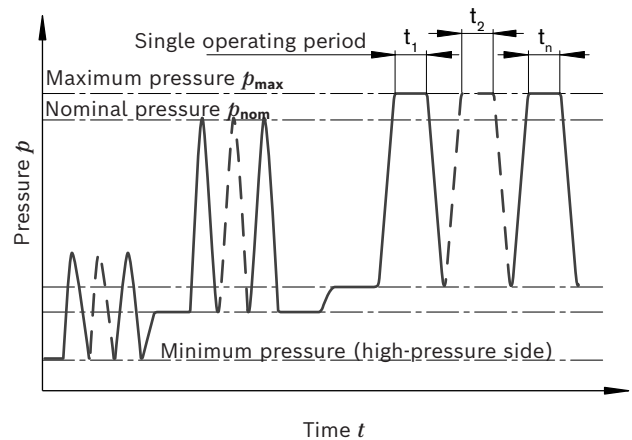
In order to avoid damage to the axial piston unit, a minimum pressure must be guaranteed at the suction port S (inlet).



The inlet pressure is the static supply pressure and the minimum dynamic value, respectively, e.g. in case of pre-charge pressure.

Maximum permissible rotational speed n_{nom} , see page 8.

▼ Pressure definition



Total operating period = $t_1 + t_2 + \dots + t_n$

Notice

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

Technical data

Size		NG		40	71	125	180	250	250 H ¹⁾	355	355 H ¹⁾	500	500 H ¹⁾
Geometric displacement, per revolution		$V_{g \max}$	cm ³	40	71	125	180	250	250	355	355	500	500
Maximum rotational speed ²⁾	at $V_{g \max}$	n_{nom}	rpm	2600	2200	1800	1800	1500	1800	1500	1700	1320	1500
Flow	at n_{nom} and $V_{g \max}$	$q_v \max$	l/min	104	156	225	324	375	450	533	604	660	750
	at $n_E = 1500$ rpm	$q_{vE \max}$	l/min	60	107	186	270	375	375	533	533	–	750
Power	at n_{nom} , $V_{g \max}$ and $\Delta p = 350$ bar	P	kW	61	91	131	189	219	262	311	352	385	437
	at $n_E = 1500$ rpm, $V_{g \max}$ and $\Delta p = 350$ bar	$P_{E \max}$	kW	35	62	109	158	219	219	311	311	–	437
Torque	at $V_{g \max}$ and $\Delta p = 350$ bar	$M_{\max}$	Nm	223	395	696	1002	1391	1391	1976	1976	2783	2783
	at $V_{g \max}$ and $\Delta p = 100$ bar	M	Nm	64	113	199	286	398	398	564	564	795	795
Rotary stiffness	Drive shaft P	c	kNm/rad	80	146	260	328	527	527	800	800	1145	1145
	Drive shaft Z	c	kNm/rad	77	146	263	332	543	543	770	770	1136	1136
Moment of inertia of the rotary group		J_{TW}	kgm ²	0.0049	0.0121	0.03	0.055	0.0959	0.0959	0.19	0.19	0.3325	0.3325
Maximum angular acceleration ³⁾		α	rad/s ²	17000	11000	8000	6800	4800	4800	3600	3600	2800	2800
Case volume		V	L	2	2.5	5	4	10	10	8	8	14	14
Weight without through drive (approx.)		m	kg	39	53	88	102	184	184	207	207	320	320

Determination of the characteristics			
Flow	$q_v = \frac{V_g \cdot n \cdot \eta_v}{1000}$		[l/min]
Torque	$M = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}}$		[Nm]
Power	$P = \frac{2 \pi \cdot M \cdot n}{60000} = \frac{q_v \cdot \Delta p}{600 \cdot \eta_t}$		[kW]
Key			
V_g	=	Displacement per revolution [cm ³]	
Δp	=	Differential pressure [bar]	
n	=	Rotational speed [rpm]	
η_v	=	Volumetric efficiency	
η_{mh}	=	Mechanical-hydraulic efficiency	
η_t	=	Total efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)	

Notice

- Theoretical values, without efficiency and tolerances; values rounded
- Exceeding the maximum or falling below the minimum permissible values can lead to a loss of function, a reduction in operational service life or total destruction of the axial piston unit and loss of explosion protection. We recommend checking the loading by means of experiment or calculation/simulation and comparison with the permissible values.

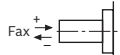
¹⁾ High-speed version

²⁾ The values are applicable:

- at an absolute pressure $p_{\text{absolute}} = 1$ bar at the suction port **S**
- for the optimum viscosity range from $\nu_{\text{opt}} = 36$ to $16 \text{ mm}^2/\text{s}$
- with hydraulic fluid based on mineral oils

³⁾ The data are valid for values between the minimum required and maximum permissible rotational speed. It applies for external stimuli (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.

Permissible radial and axial loading on the drive shafts

Size		NG		40	71	125	180	250	355	500
Radial force, maximum	 at X/2	$F_q \max$	N	1000	1200	1600	2000	2000	2200	2500
Maximum axial force		$\pm F_{ax \max}$	N	600	800	1000	1400	1800	2000	2000

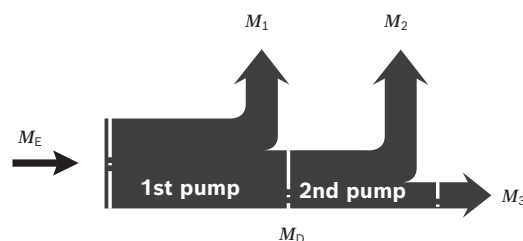
Permissible input and through-drive torques

Size	NG		40	71	125	180	250	355	500
Torque at $V_{g \max}$ and $\Delta p = 350 \text{ bar}^{1)}$	$M_{\max}$	Nm	223	395	696	1002	1391	1976	2783
Max. input torque on drive shaft ²⁾									
Splined shaft Z	$M_{E \max}$	Nm	446	790	1392	2004	2782	3952	5566
Shaft key P	$M_{E \max}$	Nm	380	700	1392	1400	2300	3557	5200
Maximum through-drive torque	$M_{D \max}$	Nm	223	395	696	1002	1391	1976	2783

Notes

- 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 41
- All attachment pumps must match the ATEX classification for the application in question.

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

¹⁾ Efficiency not considered

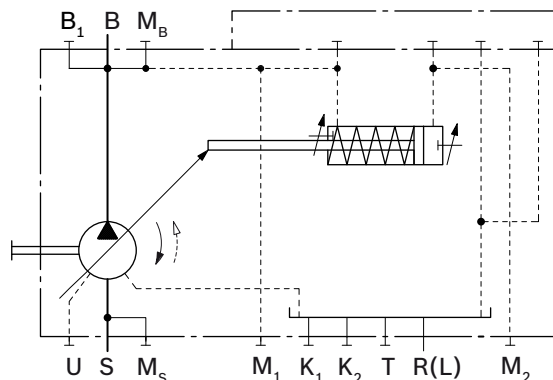
²⁾ For drive shafts with no radial force

Overview of control devices

OV – Without control

At axial piston units without OV control, the stroking piston is based on DR control. The stroking piston is unloaded to the reservoir. The $V_{g\max}$ limitation can be adjusted from 50 to 100%. The axial piston unit without control acts like a fixed pump in operation.

▼ Circuit diagram



DR - Pressure controller

(see 92060)

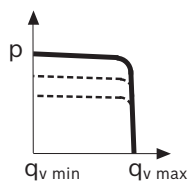
The DR pressure controller limits the maximum pressure at the pump outlet within the control range of the pump. The pressure is continuously adjustable on the control valve.

► Setting range 50...350 bar

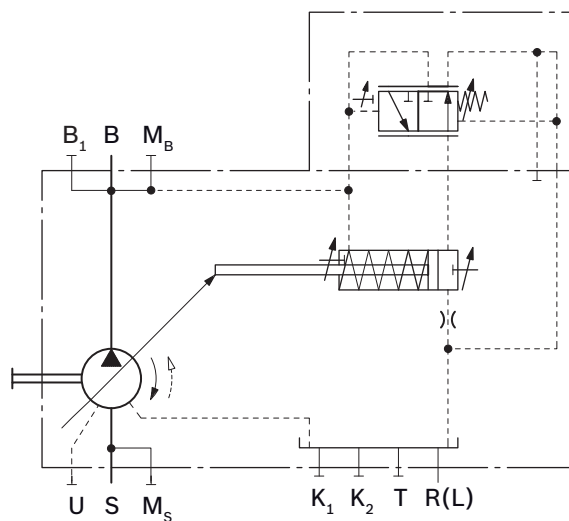
Optional:

Remotely controllable (DRG)

▼ Characteristic curve



▼ Circuit diagram



Notice

- All additional components have to comply with the application-specific ATEX classification.

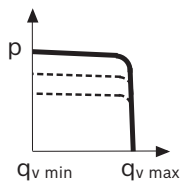
**DP - Pressure controller,
for parallel operation**
(see 92060)

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

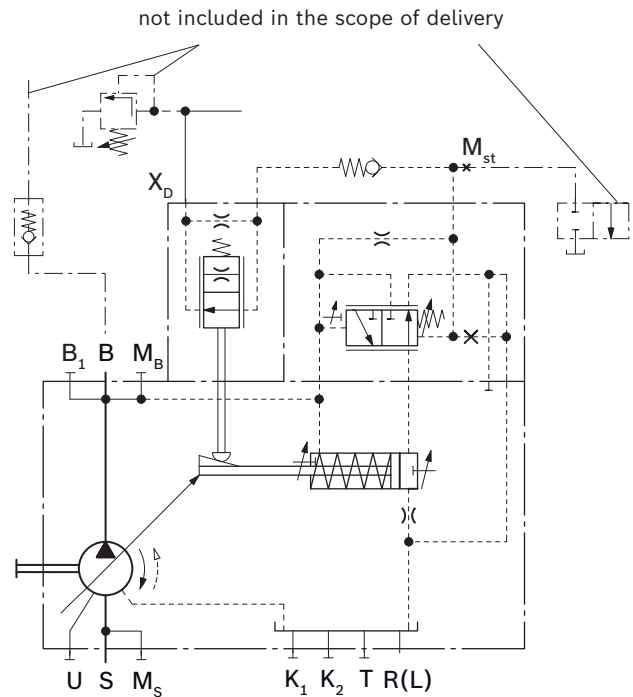
Optional:

Flow control (DPF)

▼ Characteristic curve



▼ **Circuit diagram**



FR – Flow controller
(see 92060)

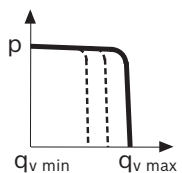
Maintains a constant flow in a hydraulic system.

Optional:

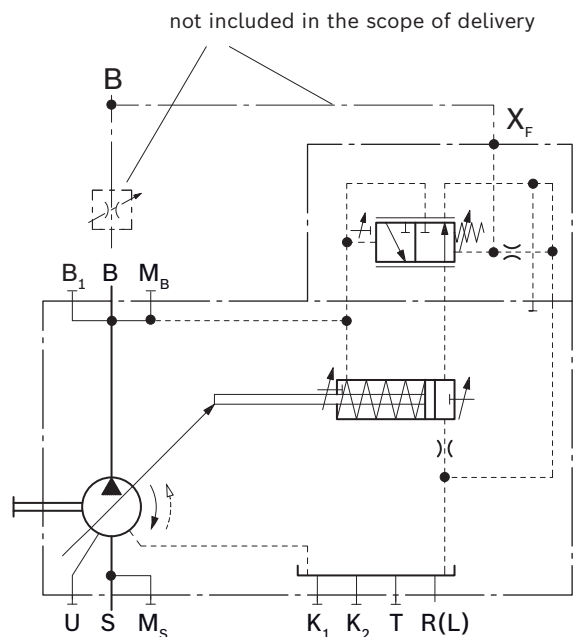
Remotely controllable pressure control (FRG)

Connection from $\mathbf{X}_F$ plugged to the reservoir
(FR1, FRG1)

▼ **Characteristic curve**



▼ Circuit diagram



Notice

- ▶ All additional components have to comply with the application-specific ATEX classification.

DFR – Pressure and flow controller

(see 92060)

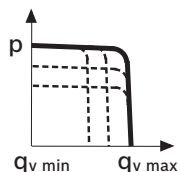
This controller keeps the flow of the pump constant, even under changing operating conditions.

Flow control is overlaid by a mechanically adjustable pressure controller.

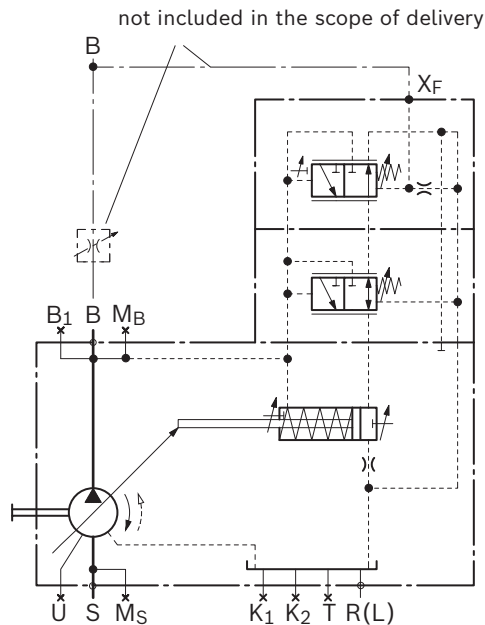
Optional:

Connection from $\mathbf{x}_F$ plugged to the reservoir (DFR1)

▼ Characteristic curve



▼ Circuit diagram



LR2 – Power controller with hyperbolic characteristic curve

(see 92064)

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

Optional:

Pressure control (LR2D), remotely controllable (LR2G);

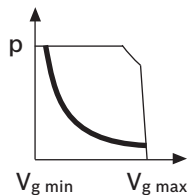
Flow control (LR2F, LR2S);

hydraulic two-point control (LR2Z)

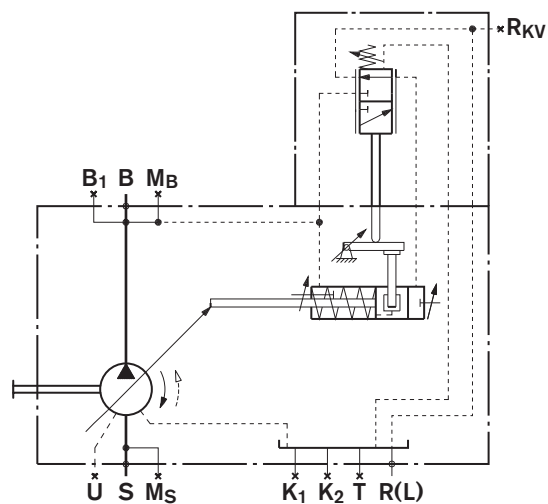
Not available from RE 92064:

LR2.Y (electric unloading valve)

▼ **Characteristic curve**



▼ Circuit diagram



Notice

- ▶ All additional components have to comply with the application-specific ATEX classification.

LR3 – Power controller with remotely adjustable power characteristic (see 92064)

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

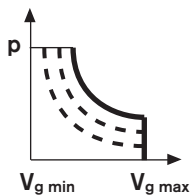
Optional:

Pressure control (LR3D), remotely controllable (LR3G);
Flow control (LR3F, LR3S); hydraulic two-point control (LR3Z)

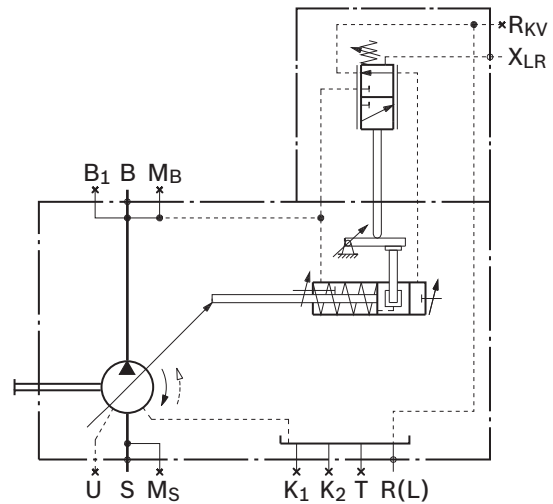
Not available from RE 92064:

LR3.Y (electric unloading valve)

▼ Characteristic curve



▼ Circuit diagram



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

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

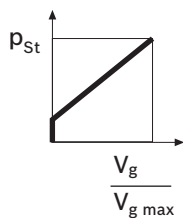
Optional:

Control characteristics (HD1, HD3);
pressure control (HD.B);
Remote pressure control (HD.GB); power control (HD1P)

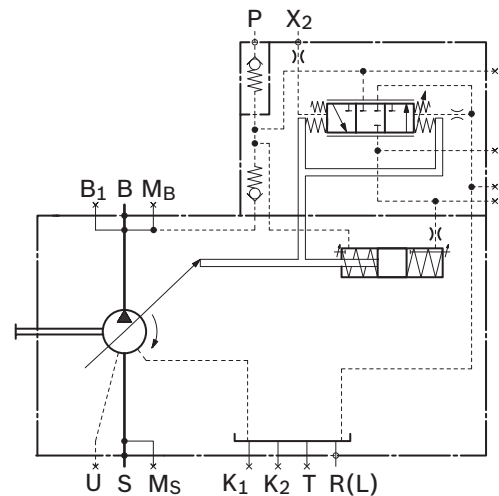
Not available from RE92080:

HD..T and HD..U (DBEP6 mounted)

▼ Characteristic curve



▼ Circuit diagram



Notice

- All additional components have to comply with the application-specific ATEX classification.

MA – Manual control

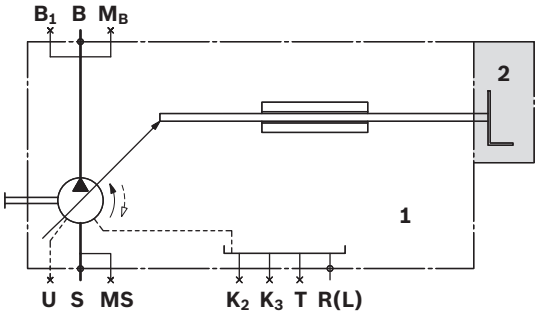
(see 92072)

Manual control enables adjustment of the pump displacement by rotating the handwheel.

The change of displacement can be monitored via the swivel angle indicator.

The MA adjustment has a locking lever for fixing the displacement during operation.

▼ **Circuit diagram** (example using A4VSO)



- Components**
- 1 Axial Piston variable Pump A4VSO
 - 2 Handwheel

GE – Rod system control

A stroke movement of the stroking piston is realized by means of directly connected control on the customer side with a direct connection to the rod system of the stroking piston. This leads to a change in displacement of the pump from $V_{g\ min}$ to $V_{g\ max}$ or vice versa.

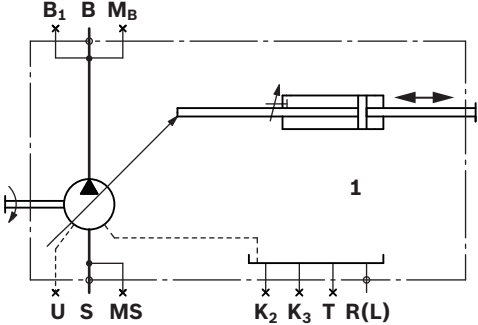
The change of displacement can be monitored via the optical swivel angle indicator.

- Max control force NG 71: 6000 N
- Max control force NG 125, 180: 9000 N
- Maximum permissible working pressure: 150 bar

Flow direction

Drive direction viewed on drive shaft	Swivel direction	Flow
Clockwise	Counter-clockwise	B, B ₁

Circuit diagram (example using A4VSO NG71)



- Components**
- 1 Axial Piston variable Pump A4VSO

Hydraulic control HM 1/2, volume-dependent

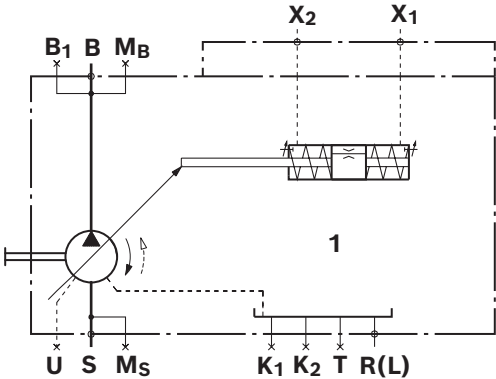
(see 92076)

The pump displacement volume is continuously adjustable in relation to the control fluid quantity in ports X_1 and X_2 .

Application:

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

Circuit diagram (example using A4VSO)

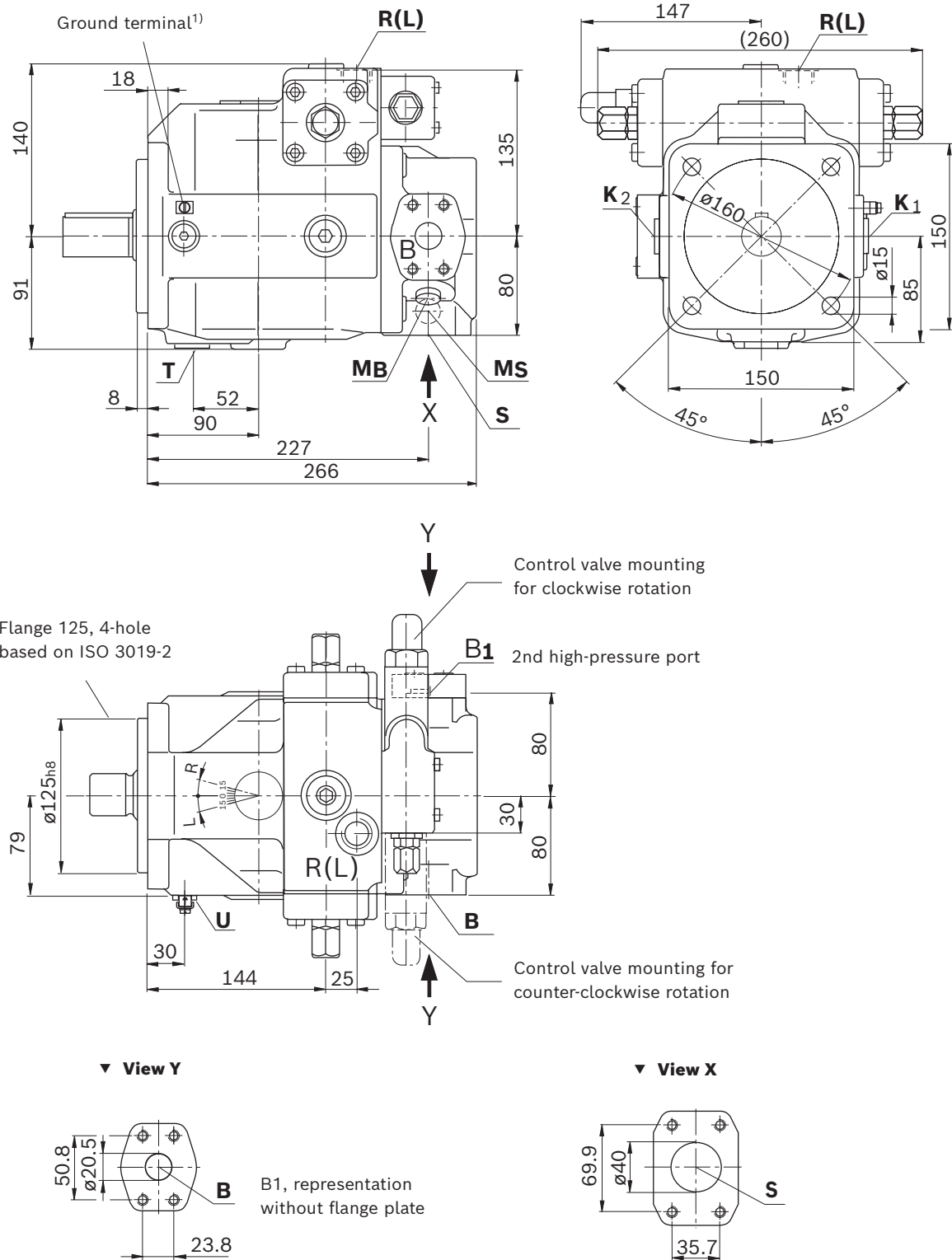


- Components**
- 1 Axial Piston variable Pump A4VSO

Dimensions, size 40

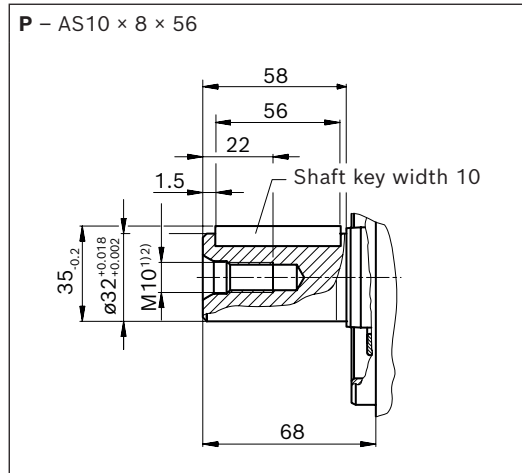
DR – Pressure controller; flange valve version metric

(for further dimensions of control devices, please refer to the respective data sheets)

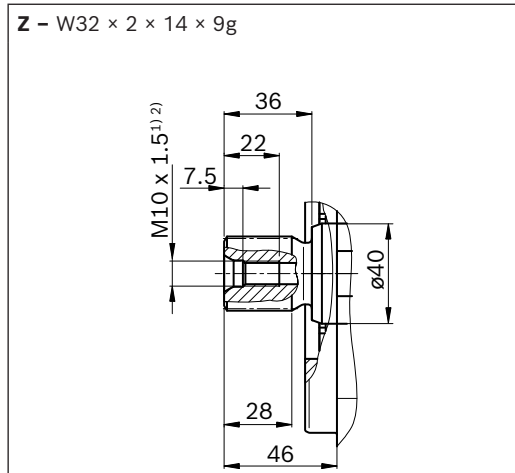


¹⁾ Protective ground terminal configured for up to 2×4 mm². Minimum cross section for ground wire 2.5 mm²

▼ **Parallel keyed shaft (DIN 6885)**



▼ **Splined shaft (DIN 5480)**



Ports		Standard	Size ³⁾	$p_{\max}$ [bar] ⁴⁾	State ⁹⁾
B	Working port (high-pressure series) Fastening thread	SAE J518 ⁶⁾ DIN 13	3/4 in M10 × 1.5; 17 deep	400	O
B1	2nd working port (high-pressure series) Fastening thread	SAE J518 ⁶⁾ DIN 13	3/4 in M10 × 1.5; 17 deep	400	X ⁸⁾
S	Suction port Fastening thread	SAE J518 ⁶⁾ DIN 13	1 1/2 in M12 × 1.75; 20 deep	30	O
K₁, K₂	Flushing port	DIN 3852 ⁵⁾	M22 × 1.5; 14 deep	6 absolute	X
T	Fluid drain	DIN 3852 ⁵⁾	M22 × 1.5; 14 deep	6 absolute	X
M_B	Measuring pressure B	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	400	X
M_S	Measuring pressure S	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleeding (drain port)	DIN 3852 ⁵⁾	M22 × 1.5; 12 deep	6 absolute	O
U	Flushing port	DIN 3852 ⁵⁾	M14 × 1.5; 11.5 deep	6 absolute	X ⁷⁾

1) Center bore according to DIN 332

2) Thread according to DIN 13

3) Observe the instructions in Part I (product-specific and general instructions) concerning the maximum tightening torques.

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

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

6) Metric fastening thread is a deviation from standard.

7) For above-reservoir installation and for all installation positions with "drive shaft up" a bearing flushing must be installed.

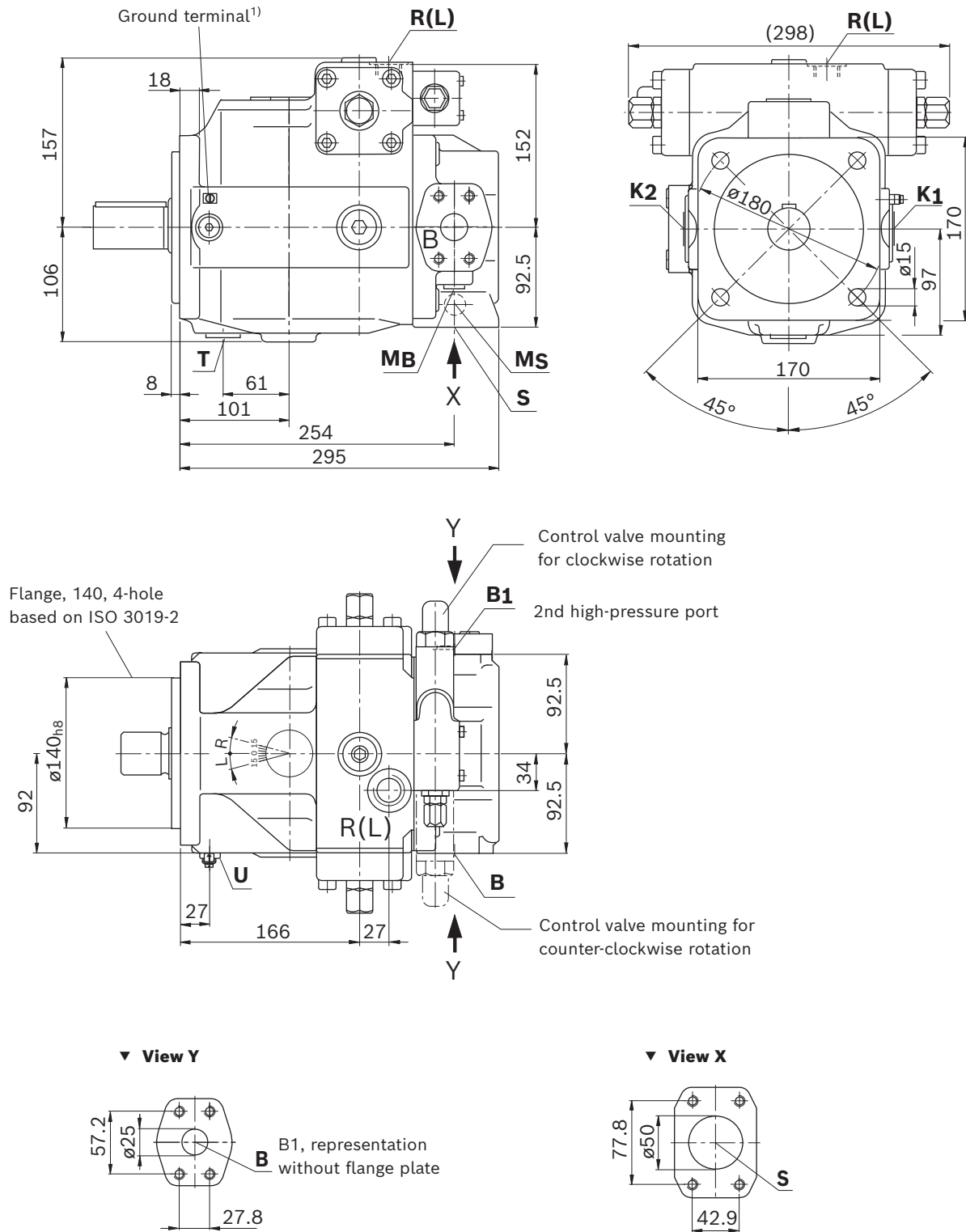
8) Plugged and high-pressure-proof with flange plate. Depending on application, **B** and/or **B₁** must be connected. The unused port must be plugged with a flange plate.

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

X = Plugged (in normal operation)

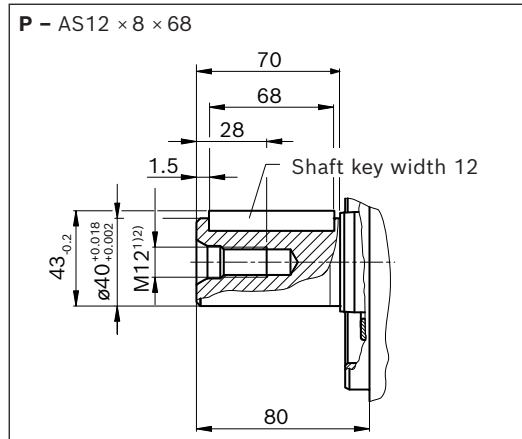
Dimensions, size 71**DR – Pressure controller; flange valve version metric**

(Further dimensions for the controls are provided in the relevant data sheets)

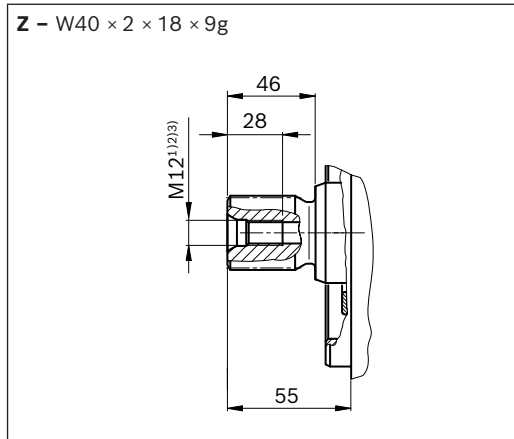


¹⁾ Protective ground terminal configured for up to 2×4 mm². Minimum cross section for ground wire 2.5 mm²

▼ **Parallel keyed shaft (DIN 6885)**



▼ **Splined shaft DIN 5480**



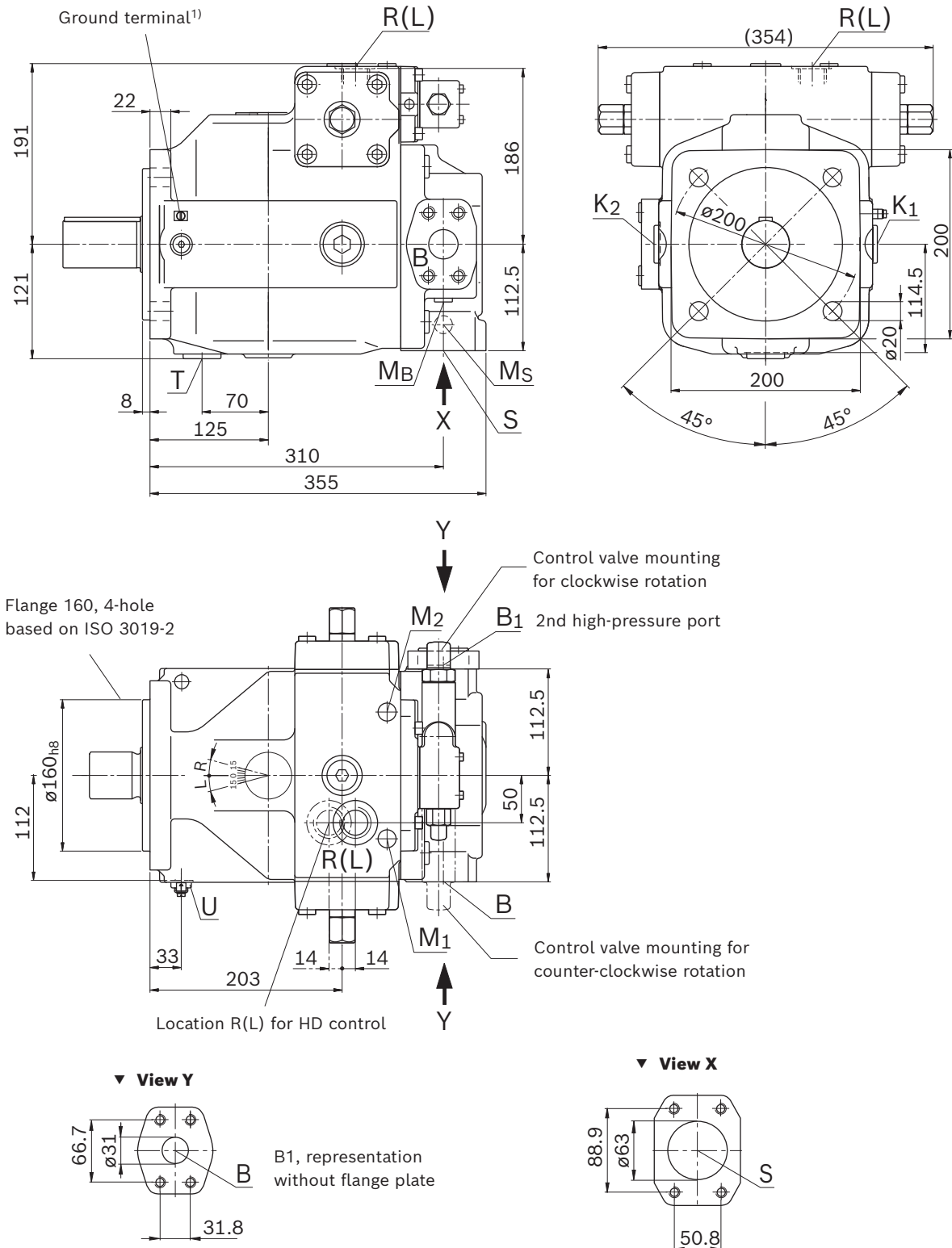
Ports		Standard	Size ³⁾	$p_{\max}$ [bar] ⁴⁾	State ⁹⁾
B	Working port (high-pressure series) Fastening thread	SAE J518 ⁶⁾ DIN 13	1 in M12 × 1.75; 20 deep	400	O
B1	2nd working port (high-pressure series) Fastening thread	SAE J518 ⁶⁾ DIN 13	1 in M12 × 1.75; 20 deep	400	X ⁸⁾
S	Suction port	SAE J518 ⁶⁾ DIN 13	2 in M12 × 1.75; 20 deep	30	O
K₁, K₂	Flushing port	DIN 3852 ⁵⁾	M27 × 2; 16 deep	6 absolute	X
T	Fluid drain	DIN 3852 ⁵⁾	M27 × 2; 16 deep	6 absolute	X
M_B	Measuring pressure B	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	400	X
M_S	Measuring pressure S	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleeding (drain port)	DIN 3852 ⁵⁾	M27 × 2; 16 deep	6 absolute	O
U	Flushing port	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	6 absolute	X ⁷⁾

- 1) Center bore according to DIN 332
- 2) Thread according to DIN 13
- 3) Observe the instructions in Part I (product-specific and general instructions) concerning the maximum tightening torques.
- 4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
- 5) The countersink may be deeper than specified in the standard.
- 6) Metric fastening thread is a deviation from standard.

- 7) For above-reservoir installation and for all installation positions with "drive shaft up" a bearing flushing must be installed.
- 8) Plugged and high-pressure-proof with flange plate. Depending on application, **B** and/or **B₁** must be connected. The unused port must be plugged with a flange plate.
- 9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

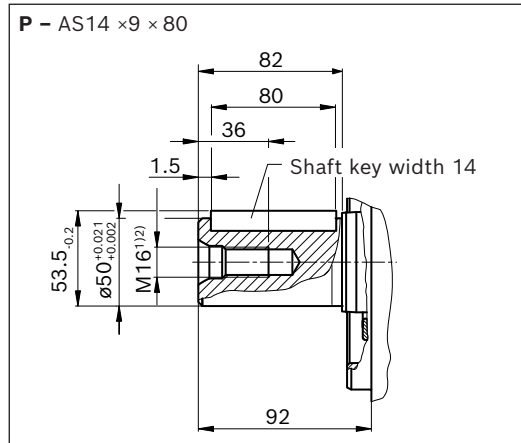
Dimensions, size 125**DR – Pressure controller; flange valve version metric**

(Further dimensions for the controls are provided in the relevant data sheets)

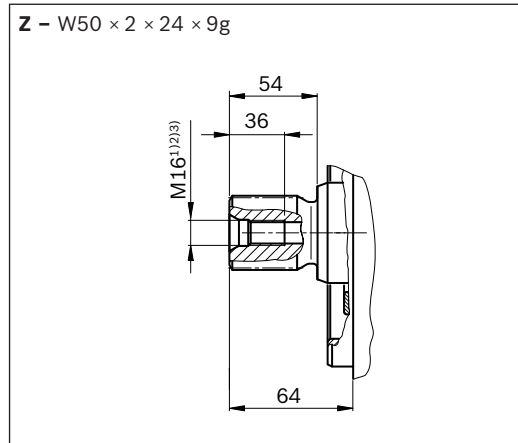


¹⁾ Protective ground terminal configured for up to 2×4 mm². Minimum cross section for ground wire 2.5 mm²

▼ **Parallel keyed shaft (DIN 6885)**



▼ **Splined shaft DIN 5480**



Ports		Standard	Size ³⁾	$p_{\max}$ [bar] ⁴⁾	State ⁹⁾
B	Working port (high-pressure series) Fastening thread	SAE J518 ⁶⁾ DIN 13	1 1/4 in M14 × 2; 19 deep	400	O
B1	2nd working port (high-pressure series) Fastening thread	SAE J518 ⁶⁾ DIN 13	1 1/4 in M14 × 2; 19 deep	400	X ⁸⁾
S	Suction port	SAE J518 ⁶⁾ DIN 13	2 1/2 in M12 × 1.75; 18 deep	30	O
K₁, K₂	Flushing port	DIN 3852 ⁵⁾	M33 × 2; 18 deep	6 absolute	X
T	Fluid drain	DIN 3852 ⁵⁾	M33 × 2; 18 deep	6 absolute	X
M_B	Measuring pressure B	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	400	X
M_S	Measuring pressure S	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleeding (drain port)	DIN 3852 ⁵⁾	M33 × 2; 18 deep	6 absolute	O
U	Flushing port	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	6 absolute	X ⁷⁾
M₁, M₂	Measuring control pressure	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	400	X

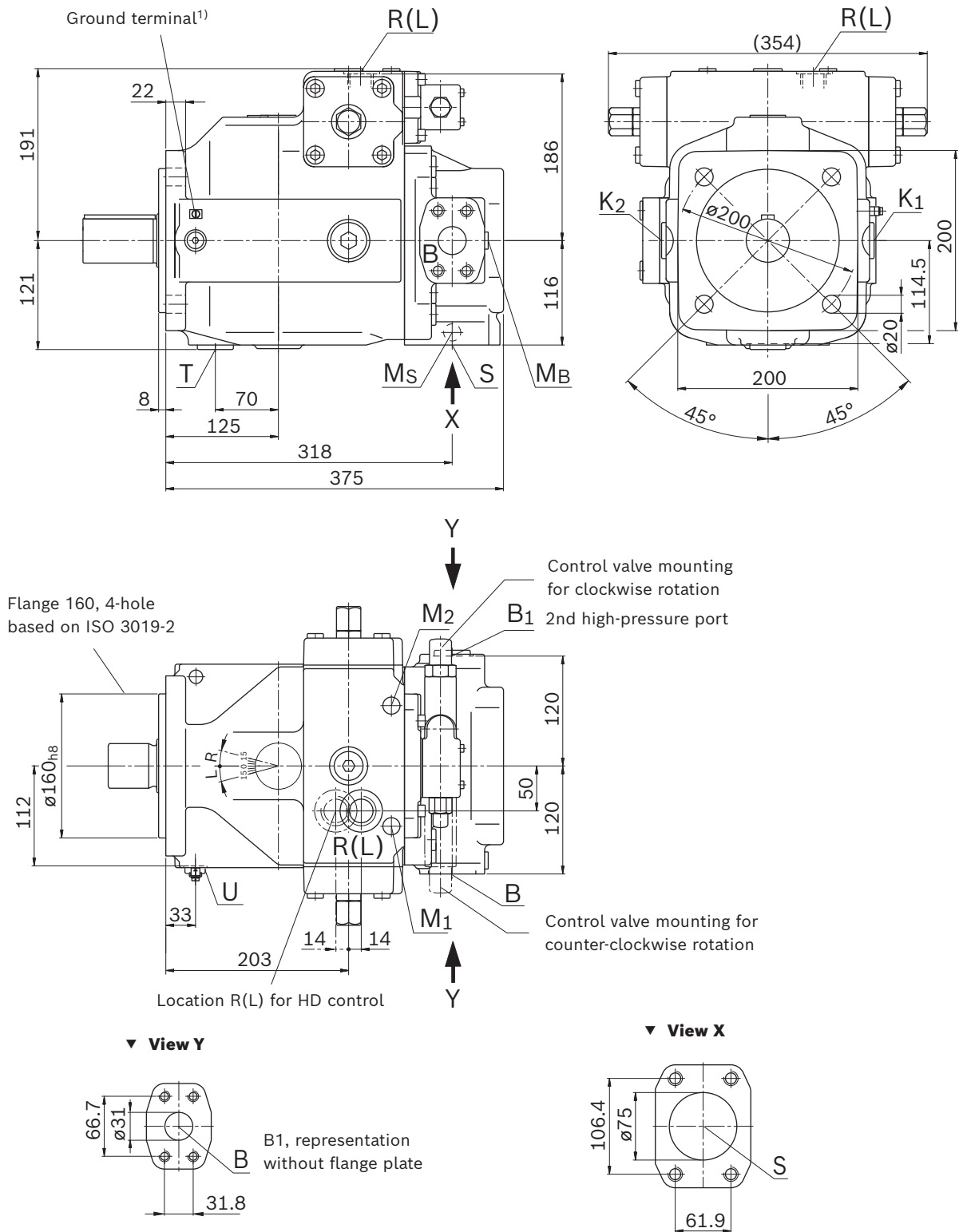
- 1) Center bore according to DIN 332
- 2) Thread according to DIN 13
- 3) Observe the instructions in Part I (product-specific and general instructions) concerning the maximum tightening torques.
- 4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
- 5) The countersink may be deeper than specified in the standard.
- 6) Metric fastening thread is a deviation from standard.

- 7) For above-reservoir installation and for all installation positions with "drive shaft up" a bearing flushing must be installed.
- 8) Plugged and high-pressure-proof with flange plate. Depending on application, **B** and/or **B₁** must be connected. The unused port must be plugged with a flange plate.
- 9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 180

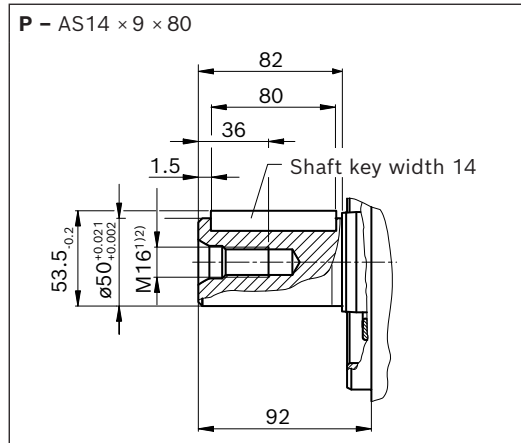
DR – Pressure controller; flange valve version metric

(Further dimensions for the controls are provided in the relevant data sheets)

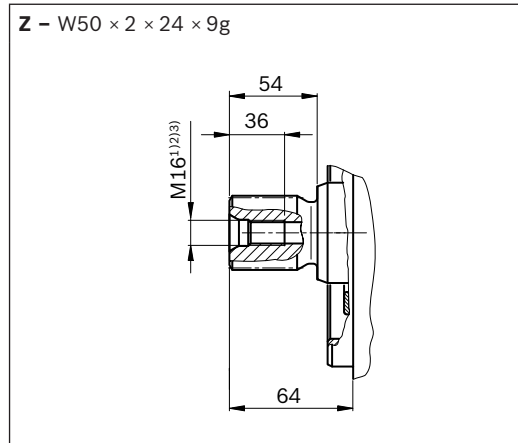


1) Protective ground terminal configured for up to $2 \times 4 \text{ mm}^2$. Minimum cross section for ground wire 2.5 mm^2

▼ **Parallel keyed shaft (DIN 6885)**



▼ **Splined shaft DIN 5480**



Ports		Standard	Size ³⁾	$p_{\max}$ [bar] ⁴⁾	State ⁹⁾
B	Working port (high-pressure series) Fastening thread	SAE J518 ⁶⁾ DIN 13	1 1/4 in M14 × 2; 19 deep	400	O
B1	2nd working port (high-pressure series) Fastening thread	SAE J518 ⁶⁾ DIN 13	1 1/4 in M14 × 2; 19 deep	400	X ⁸⁾
S	Suction port	SAE J518 ⁶⁾ DIN 13	3 in M16 × 2; 24 deep	30	O
K₁, K₂	Flushing port	DIN 3852 ⁵⁾	M33 × 2; 18 deep	6 absolute	X
T	Fluid drain	DIN 3852 ⁵⁾	M33 × 2; 18 deep	6 absolute	X
M_B	Measuring pressure B	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	400	X
M_S	Measuring pressure S	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleeding (drain port)	DIN 3852 ⁵⁾	M33 × 2; 18 deep	6 absolute	O
U	Flushing port	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	6 absolute	X ⁷⁾
M₁, M₂	Measuring control pressure	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	400	X

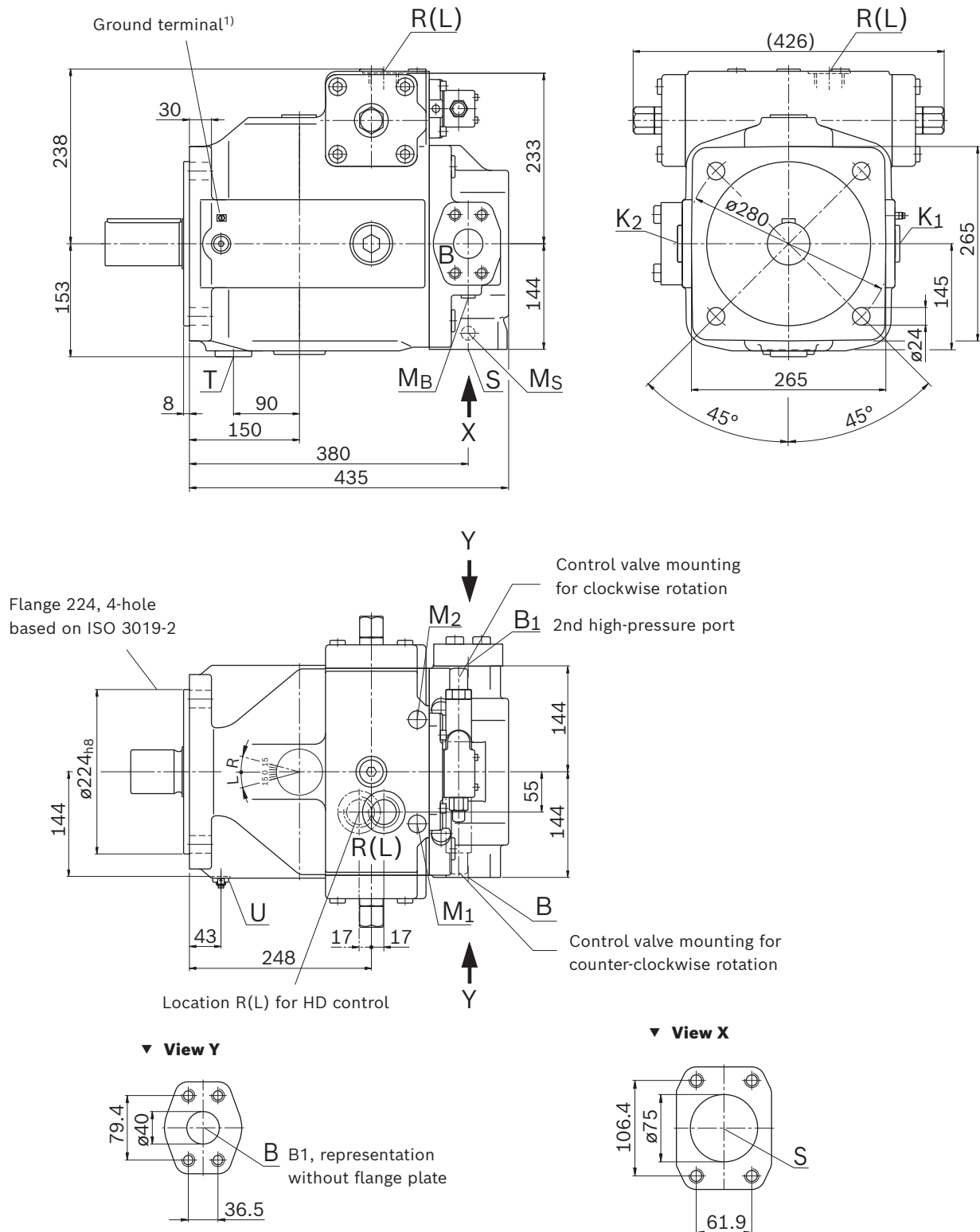
- 1) Center bore according to DIN 332
- 2) Thread according to DIN 13
- 3) Observe the instructions in Part I (product-specific and general instructions) concerning the maximum tightening torques.
- 4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
- 5) The countersink may be deeper than specified in the standard.
- 6) Metric fastening thread is a deviation from standard.

- 7) For above-reservoir installation and for all installation positions with "drive shaft up" a bearing flushing must be installed.
- 8) Plugged and high-pressure-proof with flange plate. Depending on application, **B** and/or **B₁** must be connected. The unused port must be plugged with a flange plate.
- 9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 250

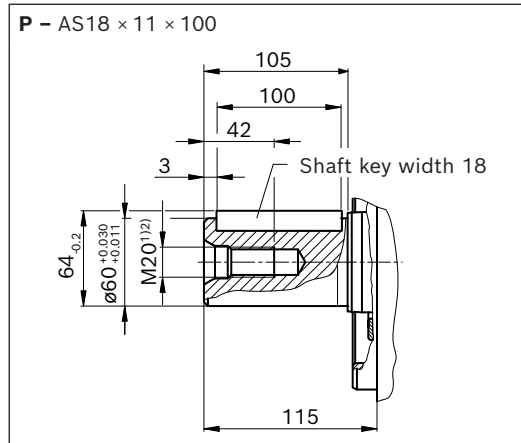
DR – Pressure controller; flange valve version metric

(Further dimensions for the controls are provided in the relevant data sheets)

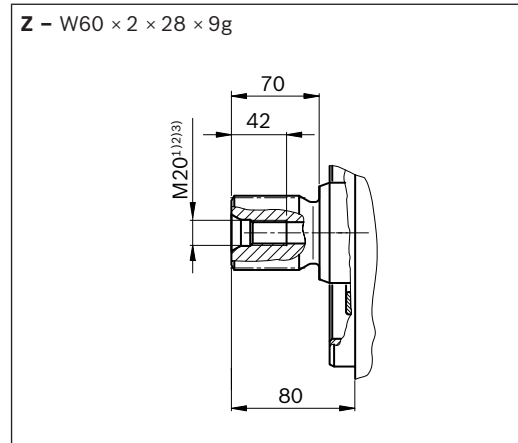


1) Protective ground terminal configured for up to $2 \times 4 \text{ mm}^2$. Minimum cross section for ground wire 2.5 mm^2

▼ **Parallel keyed shaft (DIN 6885)**



▼ **Splined shaft DIN 5480**



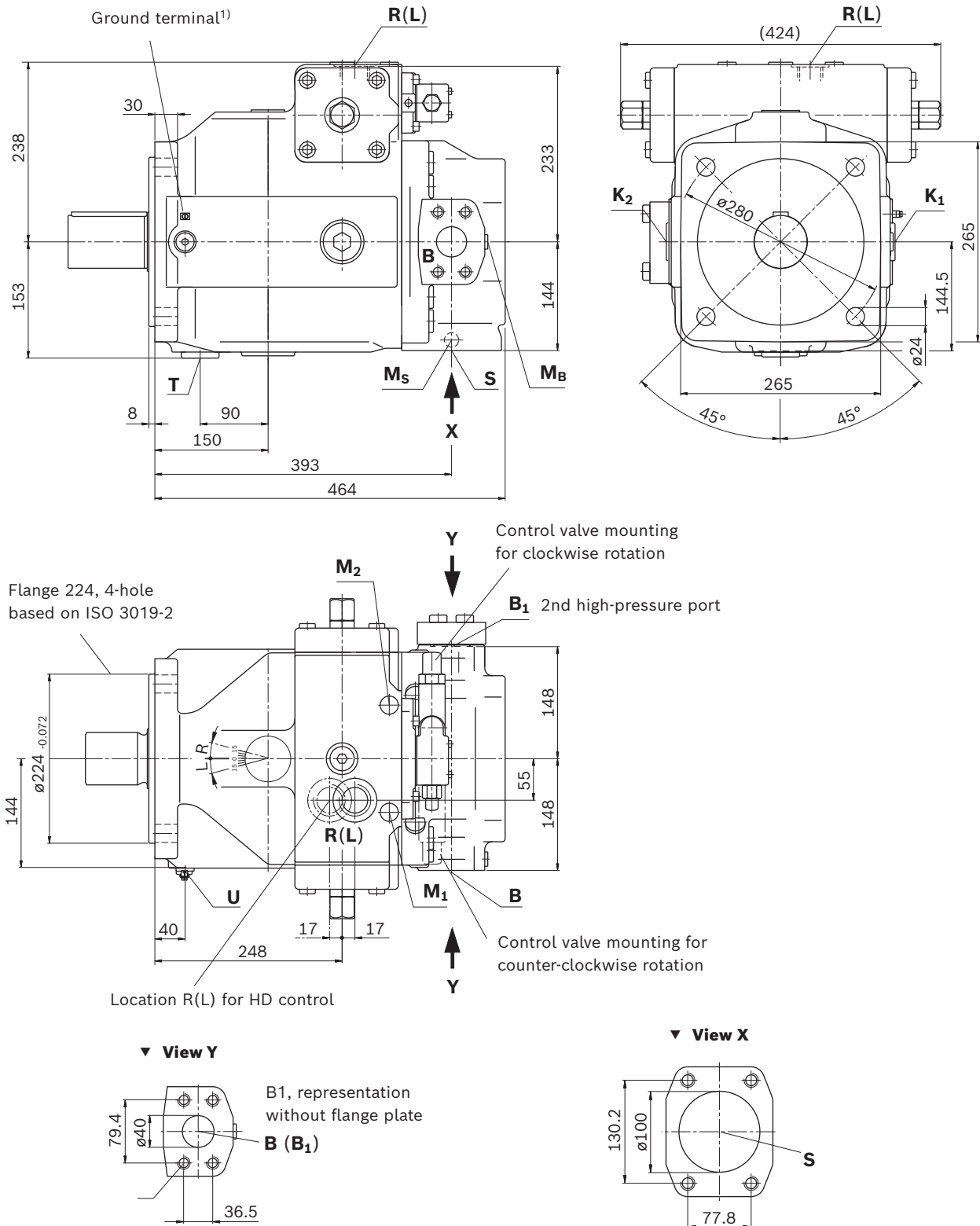
Ports		Standard	Size ³⁾	$p_{\max}$ [bar] ⁴⁾	State ⁹⁾
B	Working port (high-pressure series) Fastening thread	SAE J518 ⁶⁾ DIN 13	1 1/2 in M16 × 2; 25 deep	400	O
B1	2nd working port (high-pressure series) Fastening thread	SAE J518 ⁶⁾ DIN 13	1 1/2 in M16 × 2; 25 deep	400	X ⁸⁾
S	Suction port	SAE J518 ⁶⁾ DIN 13	3 in M16 × 2; 24 deep	30	O
K₁, K₂	Flushing port	DIN 3852 ⁵⁾	M42 × 2; 20 deep	6 absolute	X
T	Fluid drain	DIN 3852 ⁵⁾	M42 × 2; 20 deep	6 absolute	X
M_B	Measuring pressure B	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	400	X
M_S	Measuring pressure S	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleeding (drain port)	DIN 3852 ⁵⁾	M42 × 2; 20 deep	6 absolute	O
U	Flushing port	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	6 absolute	X ⁷⁾
M₁, M₂	Measuring control pressure	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	400	X

- 1) Center bore according to DIN 332
- 2) Thread according to DIN 13
- 3) Observe the instructions in Part I (product-specific and general instructions) concerning the maximum tightening torques.
- 4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
- 5) The countersink may be deeper than specified in the standard.
- 6) Metric fastening thread is a deviation from standard.

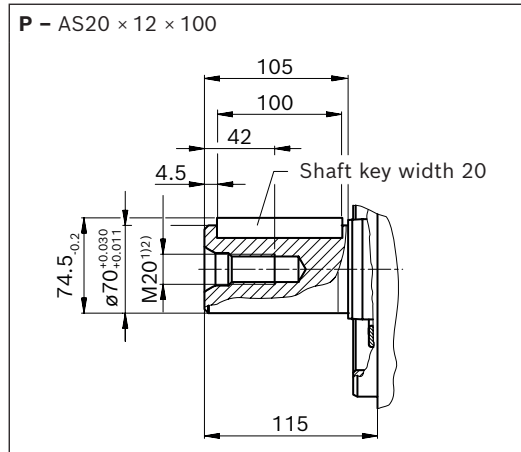
- 7) For above-reservoir installation and for all installation positions with "drive shaft up" a bearing flushing must be installed.
- 8) Plugged and high-pressure-proof with flange plate. Depending on application, **B** and/or **B₁** must be connected. The unused port must be plugged with a flange plate.
- 9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 355**DR – Pressure controller; flange valve version metric**

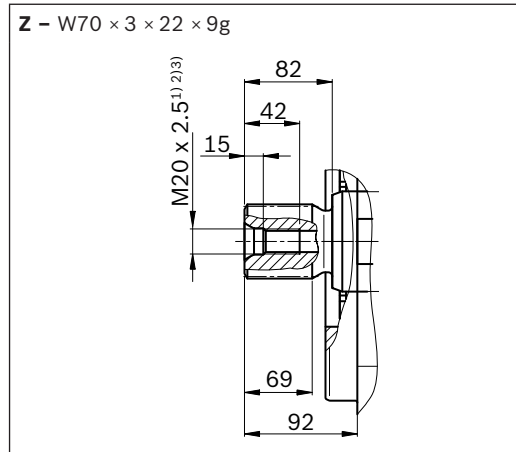
(Further dimensions for the controls are provided in the relevant data sheets)

1) Protective ground terminal configured for up to 2×4 mm². Minimum cross section for ground wire 2.5 mm²

▼ **Parallel keyed shaft (DIN 6885)**



▼ **Splined shaft DIN 5480**



Ports		Standard	Size ³⁾	$p_{\max}$ [bar] ⁴⁾	State ⁹⁾
B	Working port (high-pressure series) Fastening thread	SAE J518 ⁶⁾ DIN 13	1 1/2 in M16 × 2; 25 deep	400	O
B1	2nd working port (high-pressure series) Fastening thread	SAE J518 ⁶⁾ DIN 13	1 1/2 in M16 × 2; 25 deep	400	X ⁸⁾
S	Suction port	SAE J518 ⁶⁾ DIN 13	4 in M16 × 2; 24 deep	30	O
K₁, K₂	Flushing port	DIN 3852 ⁵⁾	M42 × 2; 20 deep	6 absolute	X
T	Fluid drain	DIN 3852 ⁵⁾	M42 × 2; 20 deep	6 absolute	X
M_B	Measuring pressure B	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	400	X
M_S	Measuring pressure S	DIN 3852 ⁵⁾	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleeding (drain port)	DIN 3852 ⁵⁾	M42 × 2; 20 deep	6 absolute	O
U	Flushing port	DIN 3852 ⁵⁾	M18 × 1.5; 12 deep	6 absolute	X ⁷⁾
M₁, M₂	Measuring control pressure	DIN 3852 ⁵⁾	M18 × 1.5; 12 deep	400	X

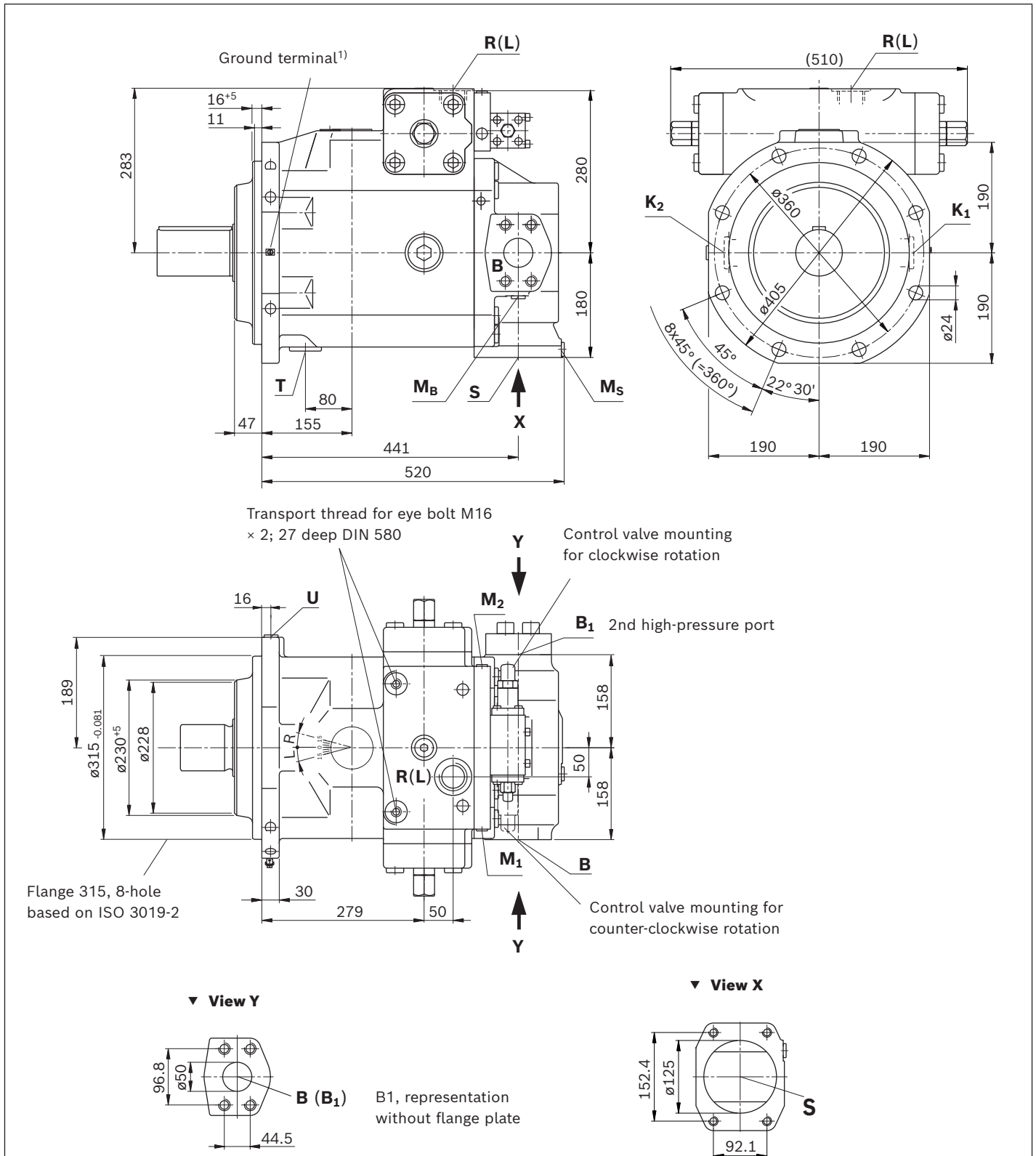
- 1) Center bore according to DIN 332
- 2) Thread according to DIN 13
- 3) Observe the instructions in Part I (product-specific and general instructions) concerning the maximum tightening torques.
- 4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
- 5) The countersink may be deeper than specified in the standard.
- 6) Metric fastening thread is a deviation from standard.

- 7) For above-reservoir installation and for all installation positions with "drive shaft up" a bearing flushing must be installed.
- 8) Plugged and high-pressure-proof with flange plate. Depending on application, **B** and/or **B₁** must be connected. The unused port must be plugged with a flange plate.
- 9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 500

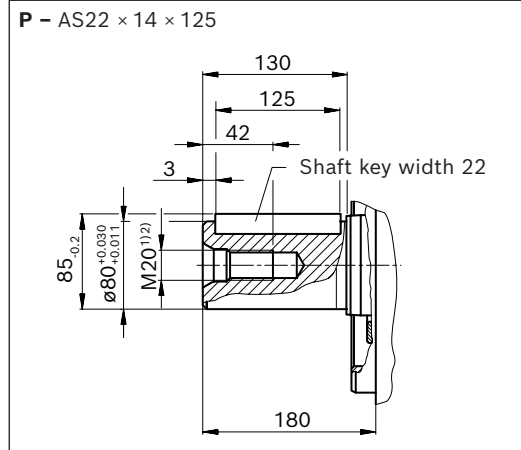
DR – Pressure controller; flange valve version metric

(Further dimensions for the controls are provided in the relevant data sheets)

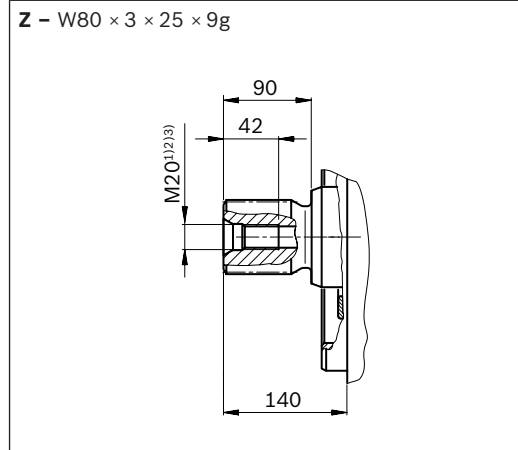


1) Protective ground terminal configured for up to $2 \times 4 \text{ mm}^2$. Minimum cross section for ground wire 2.5 mm^2

▼ **Parallel keyed shaft (DIN 6885)**



▼ **Splined shaft DIN 5480**



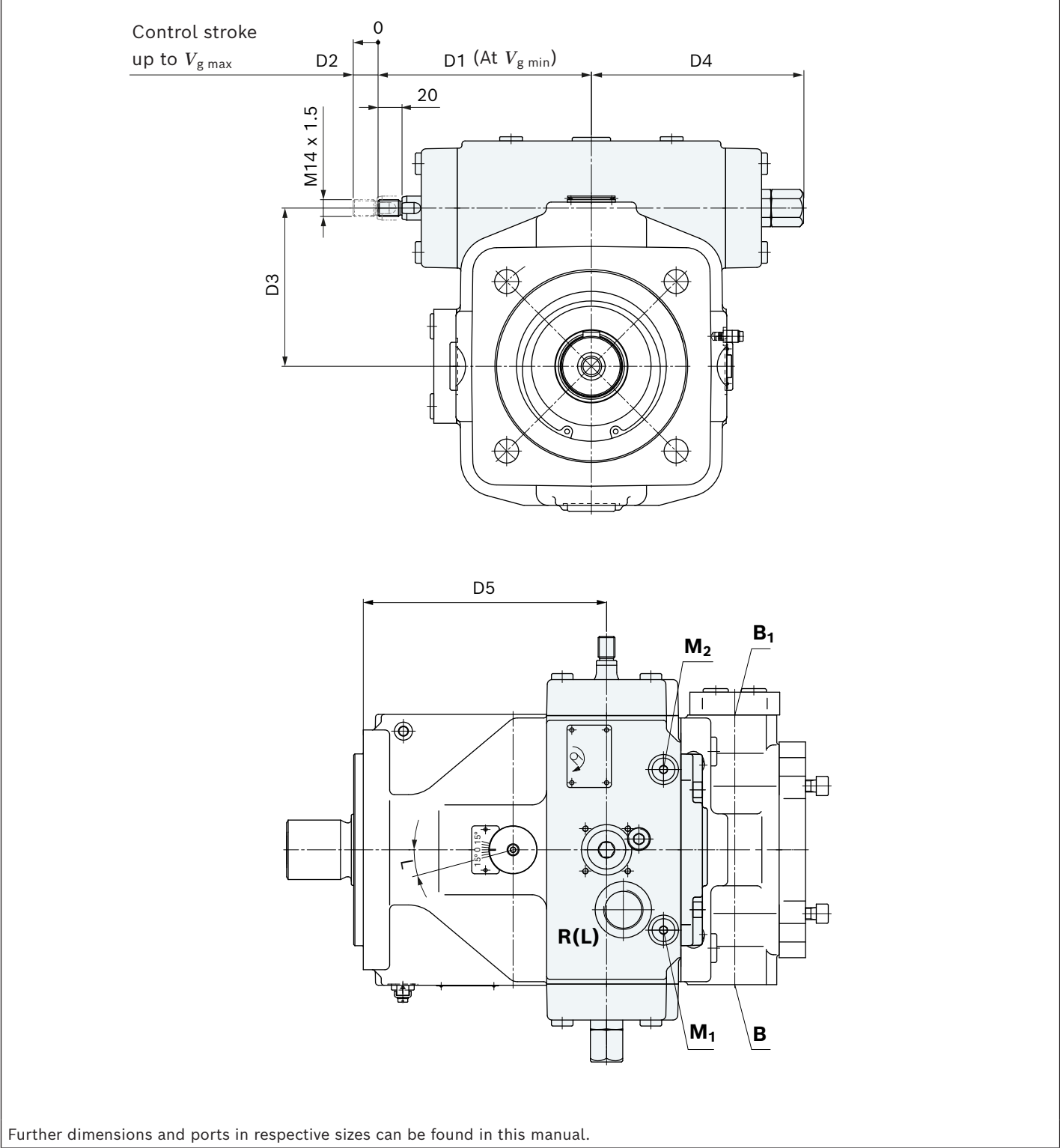
Ports		Standard	Size ³⁾	$p_{\max}$ [bar] ⁴⁾	State ⁹⁾
B	Working port (high-pressure series) Fastening thread	SAE J518 ⁶⁾ DIN 13	2 in M20 × 2.5; 25 deep	400	O
B1	2nd working port (high-pressure series) Fastening thread	SAE J518 ⁶⁾ DIN 13	2 in M20 × 2.5; 24 deep	400	X ⁸⁾
S	Suction port	SAE J518 ⁶⁾ DIN 13	5 in M16 × 2; 24 deep	30	O
K₁, K₂	Flushing port	DIN 3852 ⁵⁾	M48 × 2; 22 deep	6 absolute	X
T	Fluid drain	DIN 3852 ⁵⁾	M48 × 2; 22 deep	6 absolute	X
M_B	Measuring pressure B	DIN 3852 ⁵⁾	M18 × 1.5; 12 deep	400	X
M_S	Measuring pressure S	DIN 3852 ⁵⁾	M18 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleeding (drain port)	DIN 3852 ⁵⁾	M48 × 2; 22 deep	6 absolute	O
U	Flushing port	DIN 3852 ⁵⁾	M18 × 1.5; 12 deep	6 absolute	X ⁷⁾
M₁, M₂	Measuring control pressure	DIN 3852 ⁵⁾	see data sheet of control devices	400	X

- 1) Center bore according to DIN 332
- 2) Thread according to DIN 13
- 3) Observe the instructions in Part I (product-specific and general instructions) concerning the maximum tightening torques.
- 4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
- 5) The countersink may be deeper than specified in the standard.
- 6) Metric fastening thread is a deviation from standard.

- 7) For above-reservoir installation and for all installation positions with "drive shaft up" a bearing flushing must be installed.
- 8) Plugged and high-pressure-proof with flange plate. Depending on application, **B** and/or **B₁** must be connected. The unused port must be plugged with a flange plate.
- 9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, GE control, NG 71, 125 and 180

GE – Rod system control (clockwise rotation, counter-clockwise swivel direction)



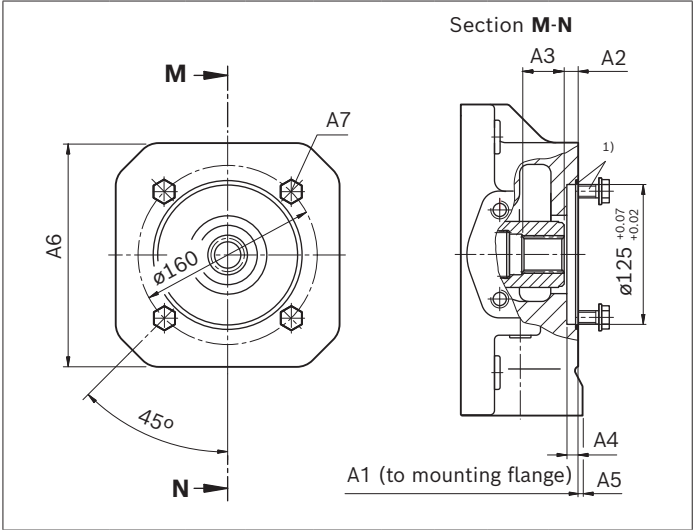
Size	D1	D2	D3	D4	D5	Ports M ₁ and M ₂	State
71	180	17.1	108	149	166	–	–
125	178	20.7	132	177	203	M14 x 1.5	Plugged
180	178	20.7	132	177	203	M14 x 1.5	Plugged

Dimensions, through drive

Flange ISO 3019-2 (metric)		Hub for splined shaft ²⁾	Availability across sizes							Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
125-4		N32×2×14×8H	●	●	–	–	–	–	●	K31
		N32×2×14×8H	–	–	●	●	●	●	–	U31

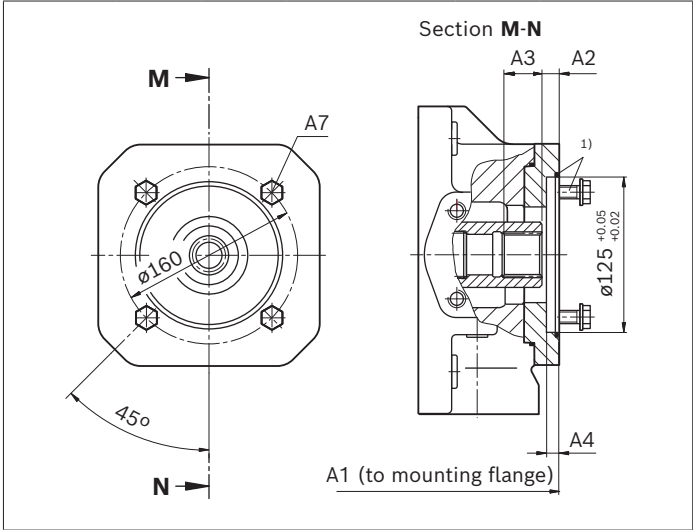
● = Available ○ = On request – = Not available

▼ 125-4



K31	NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁴⁾
	40	288	12.5	40	9	–	–	M12; 24 deep
	71	316	12.5	33.6	9	–	–	M12; 24 deep
	500	505	12.5	38.6	9	15	240	M12; 18 deep

▼ 125-4



U31	NG	A1	A2	A3	A4	A7 ³⁾⁴⁾
	125	369	12.5	35.6	9	M12; 22 deep
	180	393	12.5	35.6	9	M12; 22 deep
	250	453	12.5	38.0	9	M12; 15 deep
	355	482	12.5	38.0	9	M12; 15 deep

Notice

All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery

2) Splined hub according to DIN 5480

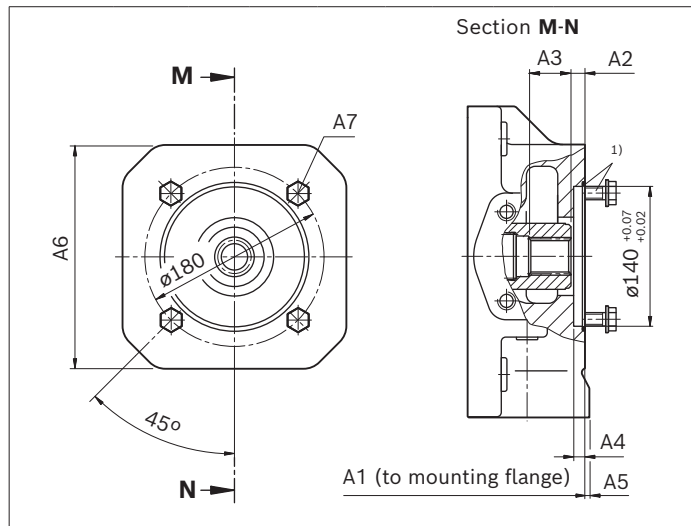
3) Thread according to DIN 13, see Part I for maximum tightening torques

4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Flange ISO 3019-2 (metric)		Hub for splined shaft ²⁾								Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
140-4		N40×2×18×8H	–	●	–	–	–	–	●	K33
		N40×2×18×8H	–	–	●	●	●	●	–	U33

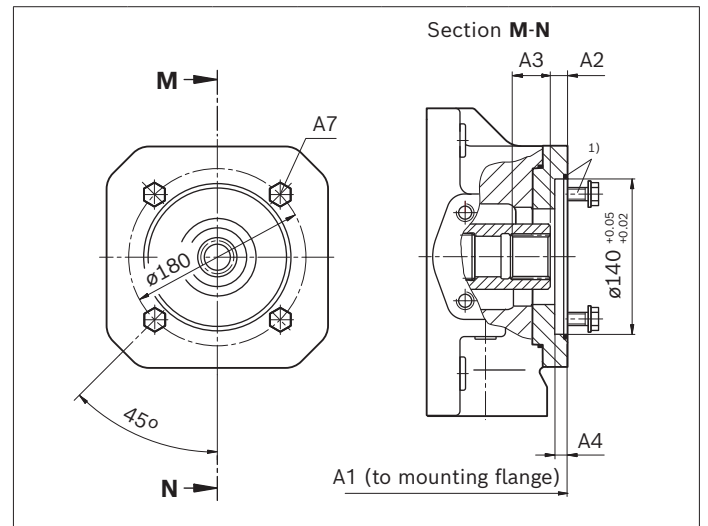
● = Available ○ = On request – = Not available

▼ 140-4



K33	NG	A1	A2	A3	A4	A5	A6	A7 ³⁾⁴⁾
	71	316	11.5	42.8	9	–	–	M12; 24 deep
	500	505	12.5	57	9	–	–	M12; 18 deep

▼ 140-4



U33	NG	A1	A2	A3	A4	A7 ³⁾⁴⁾
	125	369	12.5	43.8	9	M12; 22 deep
	180	393	12.5	43.8	9	M12; 22 deep
	250	453	12.5	48.9	9	M12; 22 deep
	355	482	12.5	48.0	9	M12; 22 deep

Notice

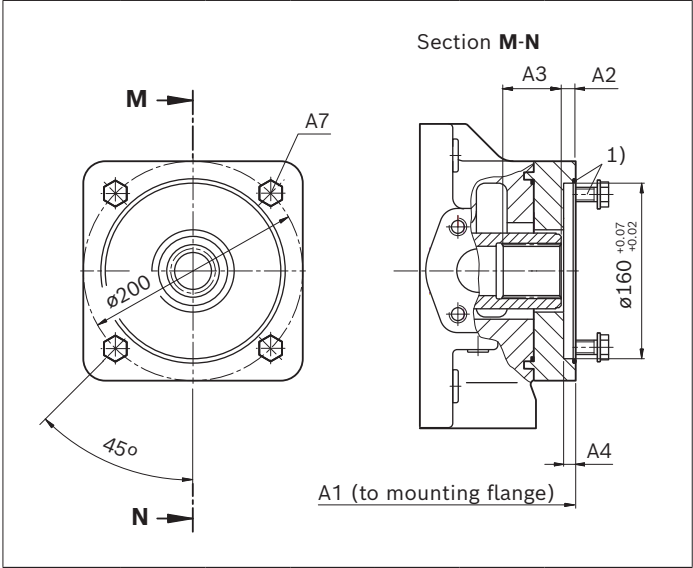
All attachment pumps must match the ATEX classification for the application in question.

- 1) Fixing screws and O-ring seal are included in the scope of delivery
- 2) Splined hub according to DIN 5480
- 3) Thread according to DIN 13, see Part I for maximum tightening torques
- 4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

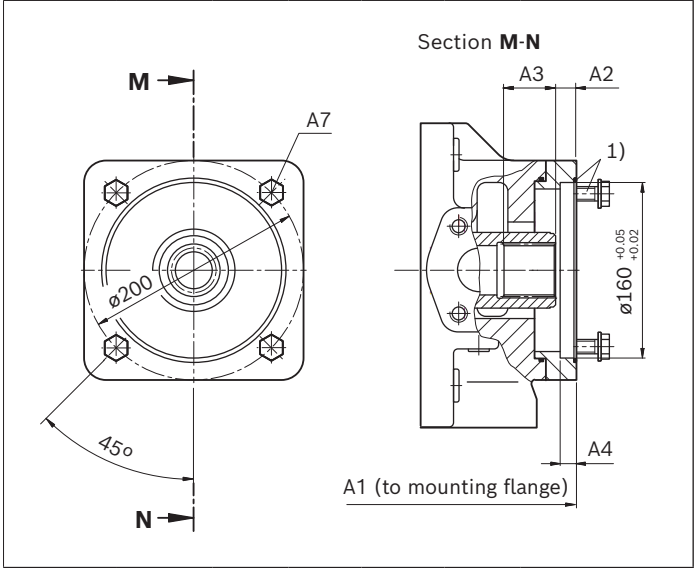
Flange ISO 3019-2 (metric)		Hub for splined shaft ²⁾								Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
160-4		N50×2×24×8H	-	-	-	-	-	-	●	K34
		N50×2×24×8H	-	-	●	●	●	●	-	U34

● = Available ○ = On request - = Not available

▼ 160-4



K34	NG	A1	A2	A3	A4	A7 ³⁾⁴⁾
	500	505	13.5	54.5	10	M16; 24 deep



U34	NG	A1	A2	A3	A4	A7 ³⁾⁴⁾
	125	369	12.5	51.6	9	M16; 22 deep
	180	393	12.5	51.6	9	M16; 22 deep
	250	453	12.5	54.0	9	M16; 22 deep
	355	482	12.5	54.0	9	M15; 22 deep

Notice

All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery

2) Splined hub according to DIN 5480

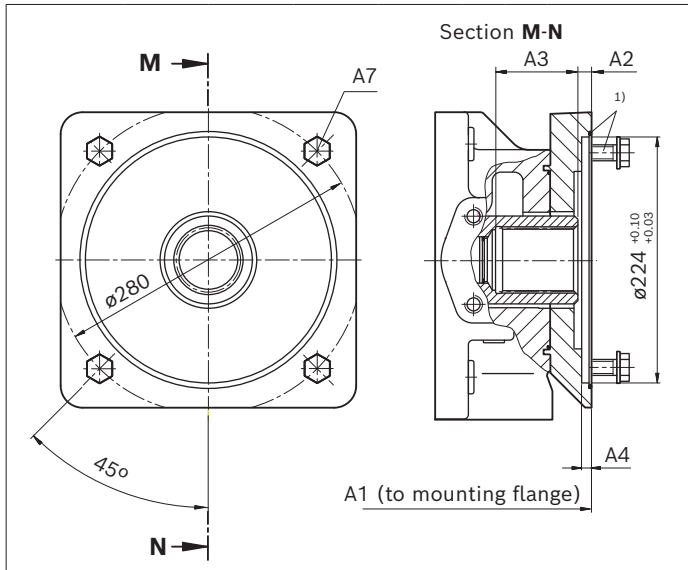
3) Thread according to DIN 13, see Part I for maximum tightening torques

4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Flange ISO 3019-2 (metric)		Hub for splined shaft ²⁾								Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
224-4		N60×2×28×8H	-	-	-	-	-	-	●	K35
		N60×2×28×8H	-	-	-	-	●	●	-	U35

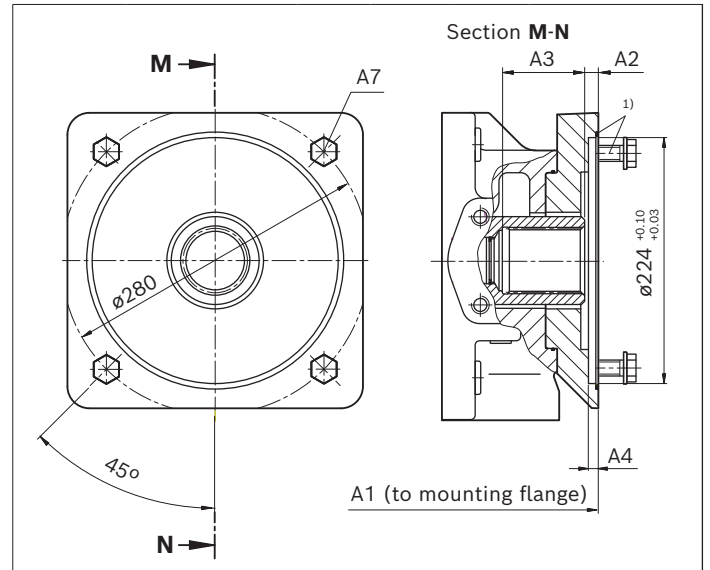
● = Available ○ = On request - = Not available

▼ **224-4**



K35	NG	A1	A2	A3	A4	A7 ³⁾⁴⁾
	500	541	12.5	74	9	M20; 36 deep

▼ **224-4**



U35	NG	A1	A2	A3	A4	A7 ³⁾⁴⁾
	250	469	12.5	75	9	M20; 37 deep
	355	498	12.5	75	9	M20; 37 deep

Notice

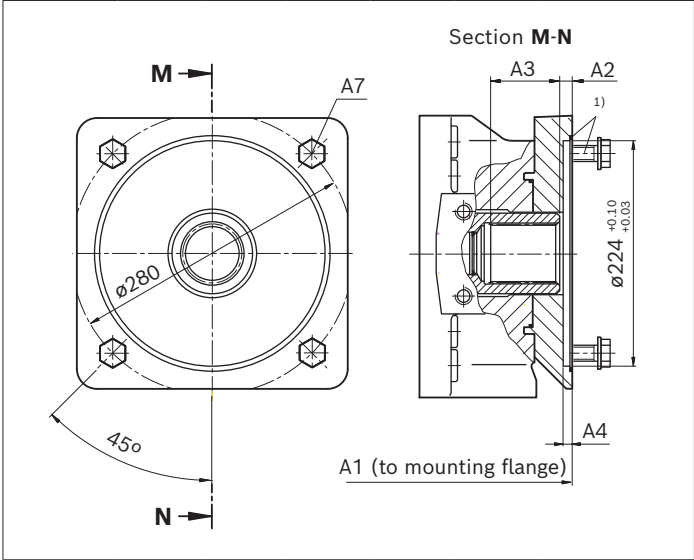
All attachment pumps must match the ATEX classification for the application in question.

- 1) Fixing screws and O-ring seal are included in the scope of delivery
- 2) Splined hub according to DIN 5480
- 3) Thread according to DIN 13, see Part I for maximum tightening torques
- 4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

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

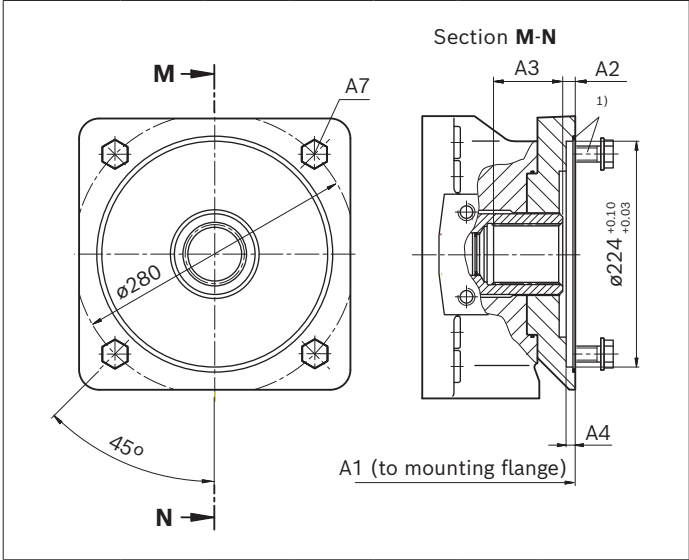
● = Available ○ = On request - = Not available

▼ 224-4



K77	NG	A1	A2	A3	A4	A7 ³⁾⁴⁾
	500	541	12.5	82	9	M20; 36 deep

▼ 224-4



U77	NG	A1	A2	A3	A4	A7 ³⁾⁴⁾
	355	498	12.5	75	9	M20; 37 deep

Notice

All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery

2) Splined hub according to DIN 5480

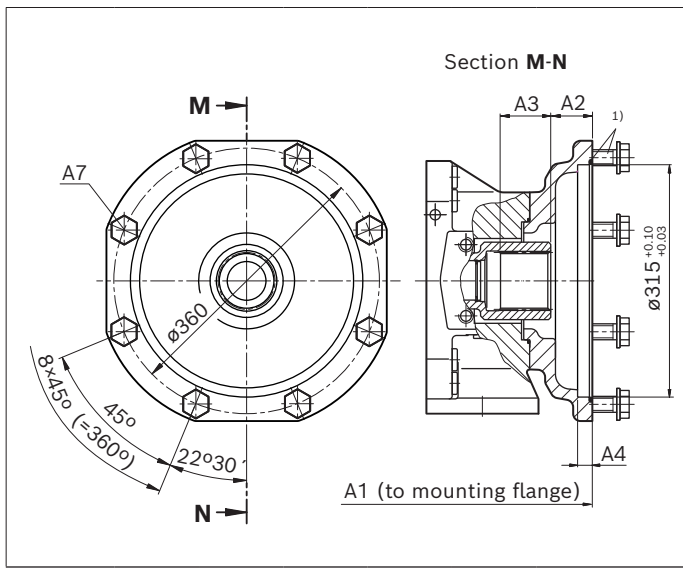
3) Thread according to DIN 13, see Part Ig for maximum tightening torques

4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Flange ISO 3019-2 (metric)		Hub for splined shaft ²⁾								Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	
315-8		N80×3×25×8H	–	–	–	–	–	–	●	K43

● = Available ○ = On request – = Not available

▼ **315-8**



K43	NG	A1	A2	A3	A4	A7 ³⁾⁴⁾
	500	590	53.5	71.9	19	M20; 26 deep

Notice

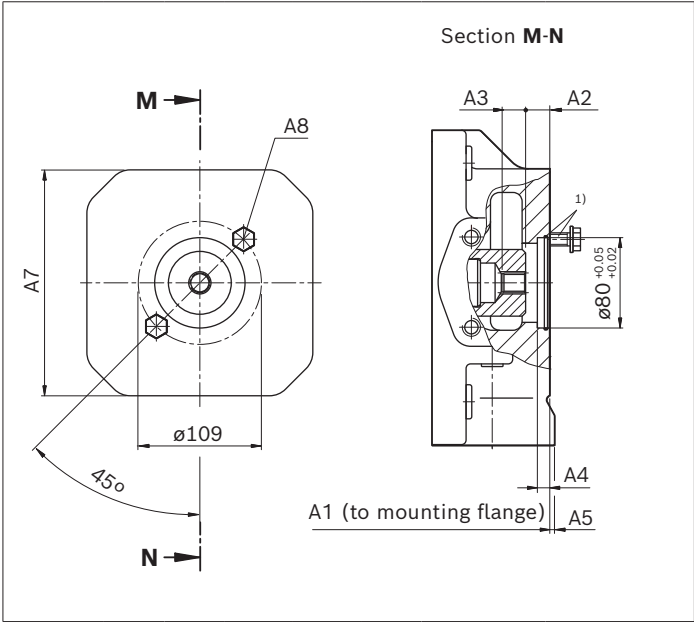
All attachment pumps must match the ATEX classification for the application in question.

- 1) Fixing screws and O-ring seal are included in the scope of delivery
- 2) Splined hub according to DIN 5480
- 3) Thread according to DIN 13, see Part I for maximum tightening torques
- 4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

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

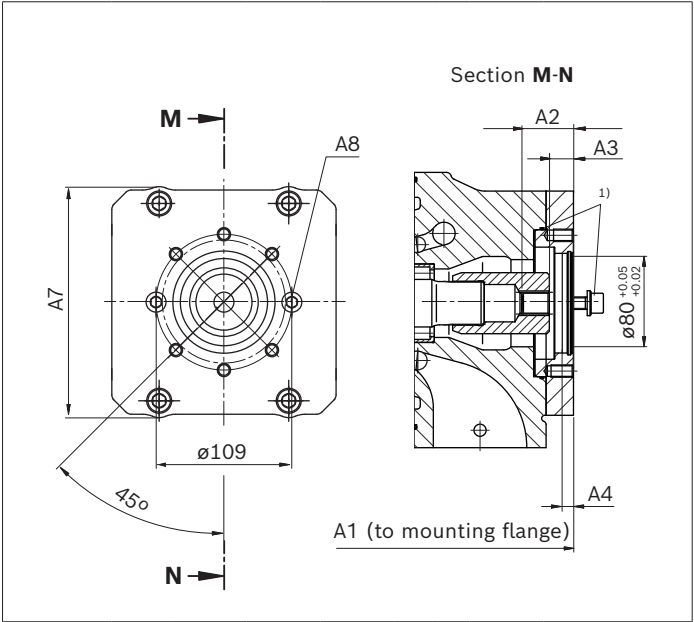
● = Available ○ = On request – = Not available

▼ 80-2



KB2	NG	A1	A2	A3	A4	A5	A7	A8 ³⁾⁴⁾
	71	291	21.5	19	10	2	140	M10; 15 deep

▼ 80-2



UB2	NG	A1	A2	A3	A4	A7 ³⁾	A8 ³⁾⁴⁾
	125	367	40.5	19.4	9	180	M10; 16 deep
	180	393	40.5	19.4	9	180	M10; 16 deep
	250	453	40.5	19	9	200	M10; 16 deep
	355	482	40.4	19	9	200	M10; 16 deep

Notice

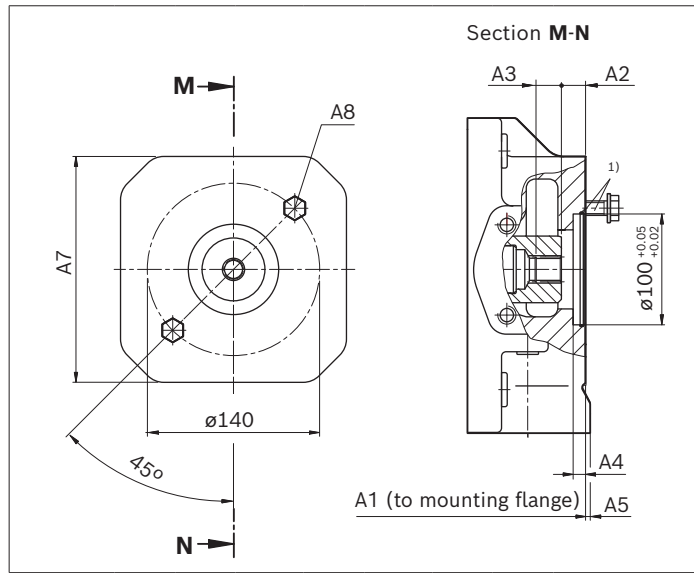
All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery
 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
 3) Thread according to DIN 13, see Part I for maximum tightening torques
 4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

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

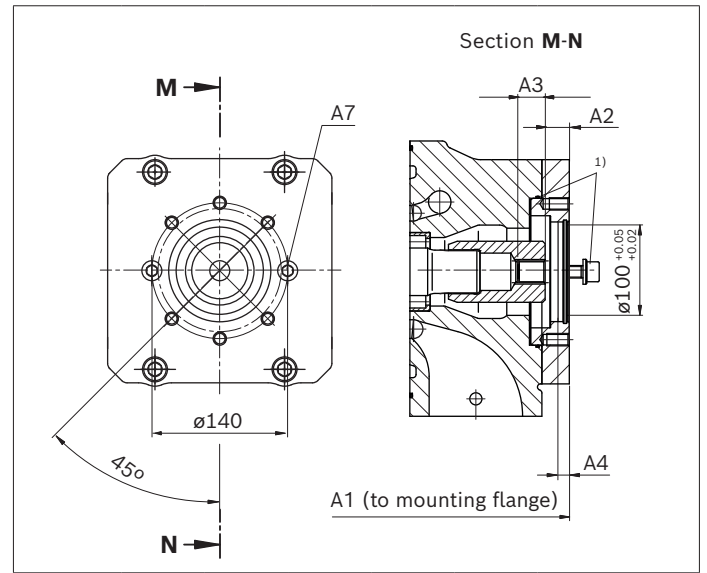
● = Available ○ = On request – = Not available

▼ 100-2



KB3	NG	A1	A2	A3	A4	A5	A7 ³⁾	A8 ³⁾⁴⁾
	40	290	20.3	23	10	–	–	M12; 18 deep
	71	291	20.4	23	10	2	140	M12; 18 deep

▼ 100-2



UB3	NG	A1	A2	A3	A4	A7 ³⁾⁴⁾
	125	369	18.5	24.9	10	M12; 22 deep
	180	393	18.5	24.9	10	M12; 22 deep
	250	453	19.5	23	10	M12; 18 deep
	355	482	19.5	23	10	M12; 18 deep

Notice

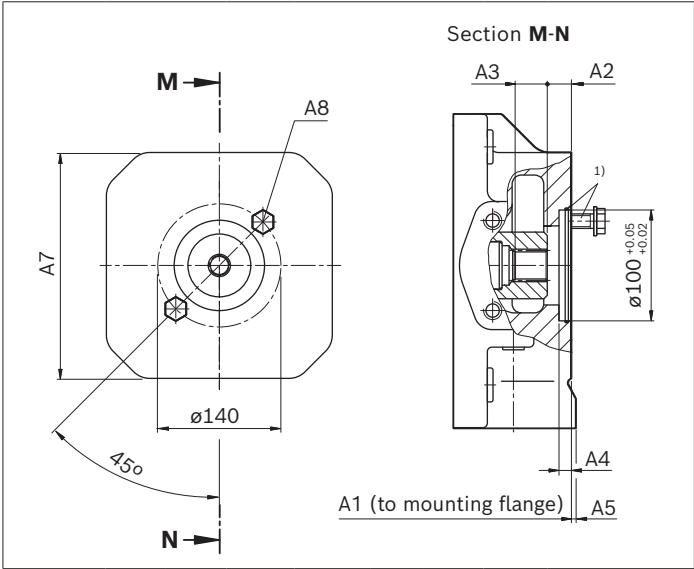
All attachment pumps must match the ATEX classification for the application in question.

- 1) Fixing screws and O-ring seal are included in the scope of delivery
- 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 3) Thread according to DIN 13, see Part I for maximum tightening torques
- 4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

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

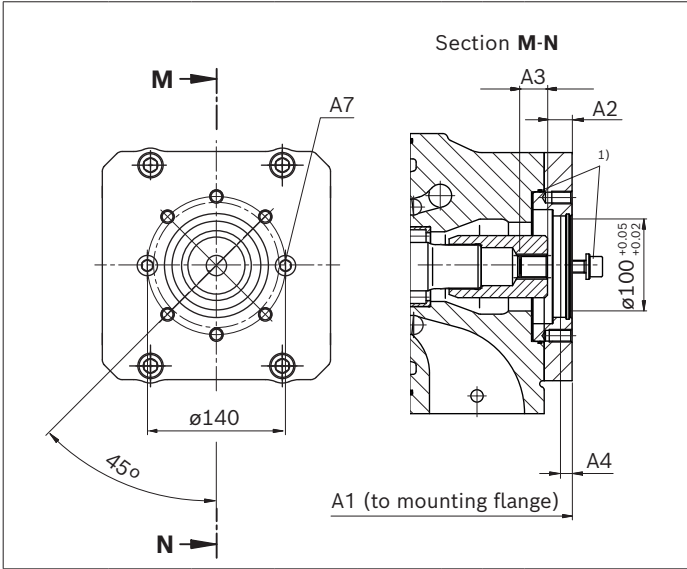
● = Available ○ = On request – = Not available

▼ 100-2



KB4	NG	A1	A2	A3	A4	A5	A7 ³⁾	A8 ³⁾⁴⁾
	40	290	20.8	27.5	10	–	–	M12; 18 deep
	71	316	20.8	27.5	8	–	–	M12; 24 deep
	500	505	20.4	28.9	10	15	240	M12; 18 deep

▼ 100-2



UB4	NG	A1	A2	A3	A4	A7 ³⁾⁴⁾
	125	369	18.9	29.5	10	M12; 22 deep
	180	393	18.9	29.5	10	M12; 22 deep
	250	453	18.9	29.5	10	M12; 18 deep
	355	482	18.9	29.5	10	M12; 18 deep

Notice

All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery

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

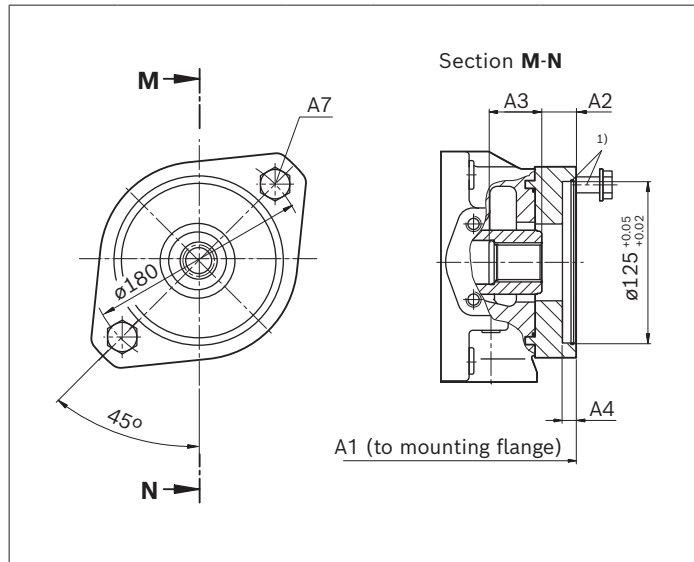
3) Thread according to DIN 13, see Part I for maximum tightening torques

4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

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

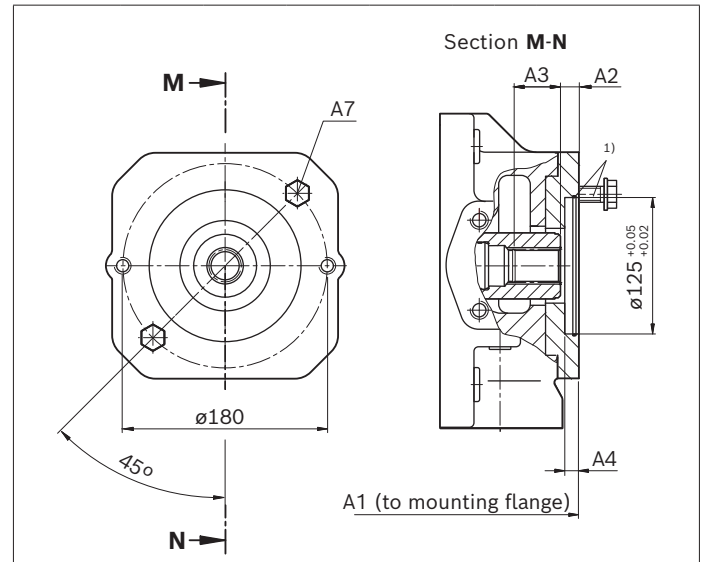
● = Available ○ = On request - = Not available

▼ 125-2



KB5	NG	A1	A2	A3	A4	A7 ³⁾⁴⁾
	71	321	23	38	10	M16; 29 deep
	500	505	19.3	40.4	10	M16; 24 deep

▼ 125-2



UB5	NG	A1	A2	A3	A4	A7 ³⁾⁴⁾
	125	369	20	38	9	M16; 22 deep
	180	393	20	38	9	M16; 22 deep
	250	453	20.9	37.9	9	M16; 22 deep
	355	482	20.9	37.9	9	M16; 22 deep

Notice

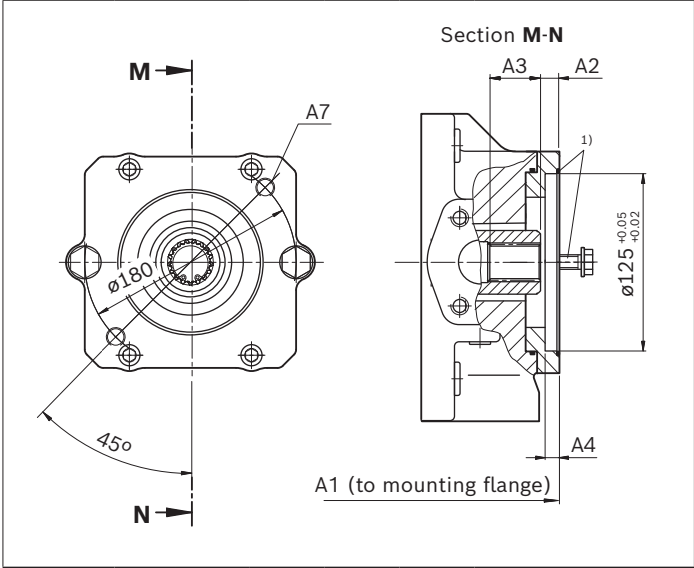
All attachment pumps must match the ATEX classification for the application in question.

- 1) Fixing screws and O-ring seal are included in the scope of delivery
- 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 3) Thread according to DIN 13, see Part I for maximum tightening torques
- 4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

Flange ISO 3019-2 (metric)		Hub for splined shaft ²⁾										Code
Diameter	Symbol	Diameter	40	71	125	180	250	355	500	750	1000	
125-2	⬤, ⬤⬤	1 1/2 in 17T 12/24DP	–	–	●	●	●	●	–	–	–	UB6

● = Available ○ = On request – = Not available

▼ 125-2



UB6	NG	A1	A2	A3	A4	A7 ³⁾⁴⁾
	125	369	10.4	50	9	M16; 22 deep
	180	393	10.4	50	9	M16; 22 deep
	250	453	12.5	55	9	M16; 22 deep
	355	482	12.5	55	9	M16; 22 deep

Notice

All attachment pumps must match the ATEX classification for the application in question.

1) Fixing screws and O-ring seal are included in the scope of delivery
 2) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
 3) Thread according to DIN 13, see Part I for maximum tightening torques
 4) Design recommended according to VDI 2230, screw quality 8.8 according to ISO 898-1

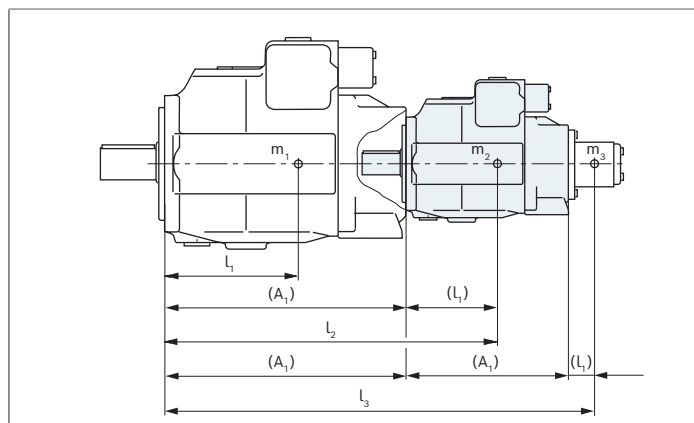
Overview of mounting options

Through drive			Mounting options – 2nd pump
Flange ISO 3019-2	Hub for splined shaft DIN 5480	Short designation	A4VSO ATEX NG (shaft)
125-4	N32×2×14×9g	K31; U31	40 (Z)
140-4	N40×2×18×9g	K33; U33	71 (Z)
160-4	N50×2×24×9g	U34	125, 180 (Z)
224-4	N60×2×28×9g	U35	250 (Z)
	N70×3×22×8H	K77; U77	355 (Z)
315-8	N80×3×25×8H	K43	500 (Z)
Flange ISO 3019-2	Hub for splined shaft SAE J744	Short designation	A10VSO ATEX NG (shaft)
80-2	3/4 in 11T 16/32DP	KB2; UB2	18 (S, R)
100-2	7/8 in 13T 16/32DP	KB3; UB3	28 (S, R)
	1 in 15T 16/32DP	KB4; UB4	45 (S, R)
125-2	1 1/4 in 14T 12/24DP	KB5; UB5	71, 88 (S, R)
	1 1/2 in 17T 12/24DP	KB6; UB6	100 (S)

Combination pumps A4VSO + A4VSO (A4VSO + A10VSO)

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

For combination pumps consisting of more than two pumps, the mounting flange must be rated for the permissible mass torque (please contact us).



Notice

- All attachment pumps must match the ATEX classification for the application in question.

m_1, m_2	Weight of pump	[kg]
l_1, l_2	Distance from center of gravity	[mm]
$T_m = (m_1 \times l_1 + m_2 \times l_2) \times \frac{1}{102} \text{ [Nm]}$		

Permissible mass moment of inertia A4VSO

NG			40	71	125	180	250	355	500
Static	T_m	Nm	1800	2000	4200	4200	9300	9300	15600
Dynamic at 10 g (98.1 m/s ²)	T_m	Nm	180	200	420	420	930	930	1560
Weight	m	kg	39	53	88	102	184	207	320
Distance from center of gravity	l_1	mm	120	140	170	180	210	220	230

Permissible mass moment of inertia A10VSO

NG			18	28	45	71	100
Static	T_m	Nm	500	880	1370	2160	3000
Dynamic at 10 g (98.1 m/s ²)	T_m	Nm	50	88	137	216	300
Weight with through-drive plate	m	kg	14	19	25	39	54
Weight without through-drive plate			12	15	21	33	45
Distance from center of gravity	l_1	mm	90	110	130	150	160

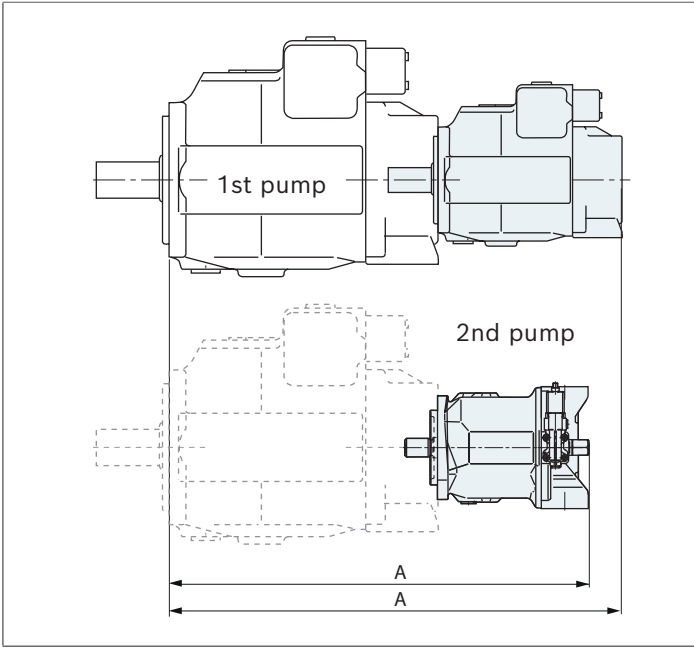
Dimensions of the combination pumps

Total length "A" with attachment pump A4VSO

1st pump A4VSO	2nd pump A4VSO						
Size	40	71	125	180	250	355	500
40	554	-	-	-	-	-	-
71	582	611	-	-	-	-	-
125	635	664	724	-	-	-	-
180	659	688	748	768	-	-	-
250	719	748	808	828	904	-	-
355	748	777	837	857	933	962	-
500	771	800	860	880	976	1005	1110

Total length "A" with attachment pump A10VSO

1st pump A4VSO	2nd pump A10VSO				
Size	18	28	45	71	100
40	458	496	514	-	-
71	486	497	540	548	-
125	564	575	593	626	698
180	588	599	617	650	722
250	648	659	677	710	782
355	677	688	706	741	811
500	700	711	729	764	857



Notice

All attachment pumps must match the ATEX classification for the application in question.

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 during longer standstills, as the axial piston unit can empty itself via the hydraulic lines.

Particularly in the installation position "drive shaft upwards," filling and air bleeding must be carried out completely as there is e.g. a danger of dry running.

The leakage in the housing area must be directed to the reservoir via the highest drain port (**T**, **K₁**, **K₂**, **R(T)**).

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.

To prevent the transmission of structure-borne noise, use elastic elements to decouple all connecting lines from all vibration-capable components (e.g., reservoir, frame parts).

Under all operating conditions, the suction lines and the drain lines must flow into the reservoir below the minimum fluid level. The permissible suction height h_s results from the total pressure loss, but must not be higher than $h_{s \max} = 800 \text{ mm}$. The suction pressure at port **S** must not fall below the minimum of 0.8 bar absolute during operation and cold start.

When designing the reservoir, ensure that there is adequate distance between the suction line and the drain line. We recommend using a baffle (baffle plate) between suction line and drain line.

A baffle improves the air separation ability as it gives the hydraulic fluid more time for desorption. Apart from that, this prevents the heated return flow from being drawn directly back into the suction line. The suction port must be supplied with air-free, calmed and cooled hydraulic fluid.

Notice

In certain installation positions, an influence on the adjustment or control can be expected. Gravity, dead weight and case pressure can cause minor characteristic shifts and changes in actuating time.

Installation position

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

Further installation positions are available upon request.

Recommended installation position: **1** and **2**

Key	
F	Filling / Air bleeding
R(L)	Filling / Air bleeding
S	Suction port
T	Drain port
U	Flushing port
K₁, K₂	Flushing port
SB	Baffle (baffle plate)
$h_{t \min}$	Minimum required immersion depth (200 mm)
$h_{\min}$	Minimum required distance to reservoir bottom (100 mm)
$h_{s \max}$	Maximum permissible suction height (800 mm)

Notice

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

Below-reservoir installation (standard)

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

▼ Installation position 1

Air bleed	Filling
R(L) + F	S + R(L)

▼ Installation position 2

Air bleed	Filling
T + F	S + T

▼ Installation position 3¹⁾

Air bleed	Filling
T + F	S + T + U

For key, see page 43

Above-reservoir installation

Above-reservoir installation means that the axial piston unit is installed above the minimum fluid level of the reservoir. Observe the maximum permissible suction height $h_{s\ max} = 800\text{ mm}$. Above-reservoir installation is not recommended for sizes 180 to 500.

Notice

► To guarantee lubrication of the front bearing and of the shaft seal with above-reservoir installation, Rexroth specifies a working bearing flushing at port "U".

▼ Installation position 4¹⁾

Air bleed	Filling
F + R(L)	R(L) + F

▼ Installation position 5¹⁾

Air bleed	Filling
F + T	T + F + U

¹⁾ Install bearing flushing, minimum flushing volume see page 6

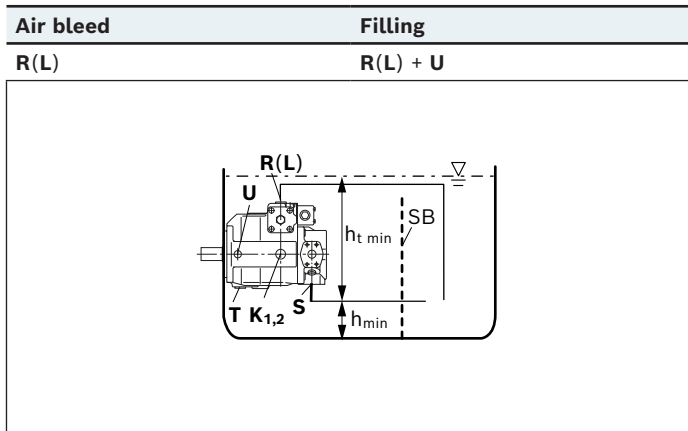
Inside-reservoir installation

Inside-reservoir installation is when the axial piston unit is installed in the reservoir below the minimum fluid level.

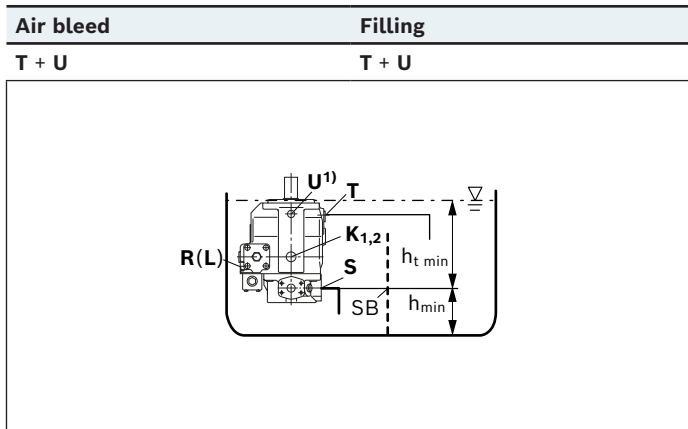
The axial piston unit is completely below the hydraulic fluid if the minimum fluid level is equal to or below the upper edge of the pump, see chapter "**Above-reservoir installation**".

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

▼ Installation position 6



▼ Installation position 7¹⁾



Notice

- We recommend providing the suction port **S** with a suction pipe and piping the drain port **T** or **R(L)**. In this case, the other drain port must be plugged. The housing of the axial piston unit is to be filled via **R(L)** or **T** (see installation position 6 to 7) before the piping is fitted and the reservoir is filled with hydraulic fluid.

¹⁾ Install bearing flushing, minimum flushing volume see page 6

Project planning notes

- ▶ The A4VSO ATEX pump is intended to be used in open circuits.
- ▶ 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 appropriate operating instructions (parts I and II) thoroughly and in full. If necessary, this can be requested from Bosch Rexroth.
- ▶ Before finalizing your design, please request a binding installation drawing.
- ▶ The specified data and information contained herein must be observed.
- ▶ Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- ▶ 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 operating instructions.
- ▶ Not all configuration variants of the product are approved for use in safety functions according to ISO 13849. Please consult the proper contact at Bosch Rexroth if you require reliability parameters (e.g. MTTF_d) for functional safety.
- ▶ 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 ×9). This can be prevented with suitably designed hydraulic lines.
- ▶ Pressure control is not an adequate safeguard against pressure overload. Therefore, a pressure relief valve must be added to 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.
- ▶ Please note the information regarding the tightening torques of connection threads and other screw connections in the operating instructions (part I).
- ▶ 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. Take the appropriate safety measures (e.g. by wearing protective clothing).
- ▶ Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, stick in an undefined 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 make sure any measures are properly implemented.

Related documentation

Product-specific documentation

Document type	Title	Document number
Data sheet	Control systems DR, DP, FR, and DFR for axial piston variable pump A4VSO	92060
	A4VSO, A4VBO power controller LR2, LR3 and LR2N, LR3N	92064
	Control systems MA... for axial piston variable pump A4VSO and A4VSG	92072
	Control devices HM series 1x and 30	92076
	Control devices HD	92080
	Universal through drive for axial piston variable pump A10VSO, A10VO, A10VZO, A4VSO, A4VBO, A15VSO/A15VLO and A15V(L)O	95581
	Storage and preservation of axial piston units	90312
Operating instructions part I	Axial piston variable pump A4VSO Series 1x and 30	92050-01-X-B0

Documentation for hydraulic fluids

Document type	Title	Document number
Data sheet	Hydraulic fluids based on mineral oils and related hydrocarbons	90220
	Rating of hydraulic fluids used in Rexroth hydraulic components (pumps and motors)	90235
	Bosch Rexroth Fluid Rating List for Rexroth hydraulic components (pumps and motors)	90245

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