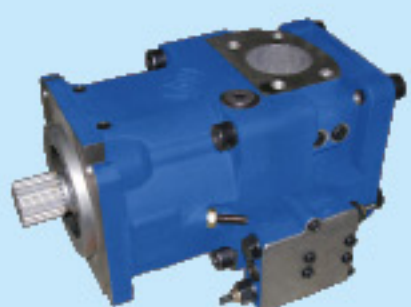




HD-A4VSO

**Open Circuit Axial
Piston Variable Pump**



BEIJING HUADE HYDRAULIC INDUSTRIAL GROUP CO.,LTD.

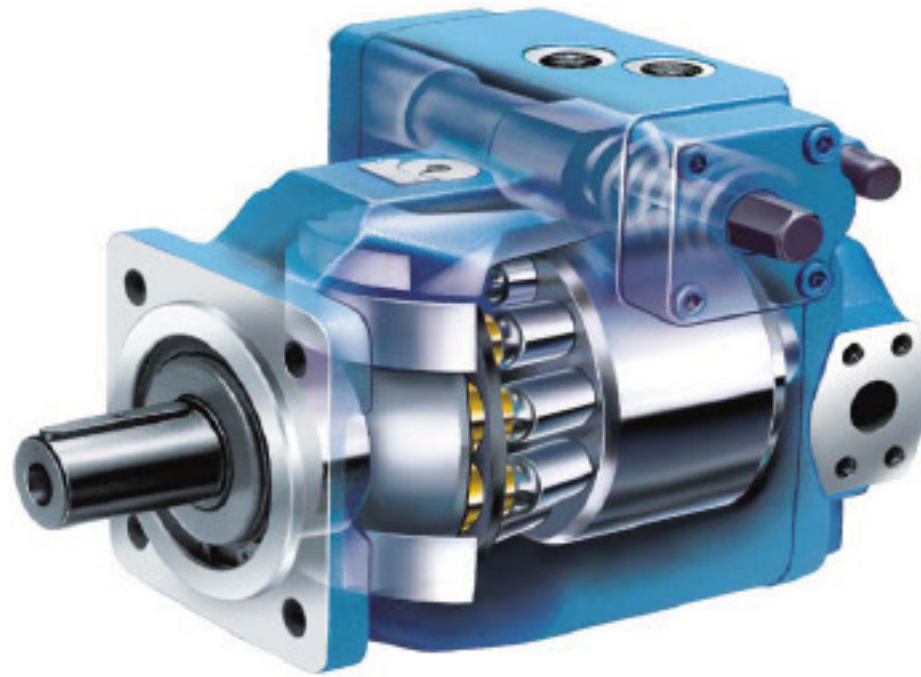
Beijing Huade
Hydraulic Industrial
Group Co., Ltd

HD-A4VSO Open Circuit Axial Piston Variable Pump

HDBT2012WB

Data Sheet 40...500

Peak Pressure 45 MPa



■ Product description:

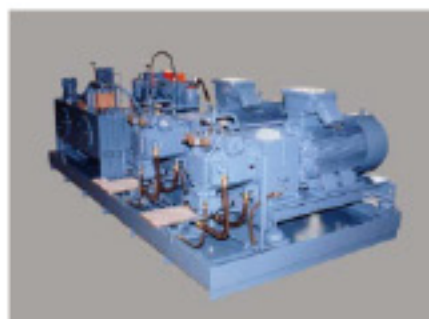
- HD-A4VSO Axial piston pump in swash plate design for hydrostatic drives in open circuit operation.
- The flow is proportional to the input drive speed and displacement. By adjusting the swash plate angle it is possible to infinitely vary the output flow.

■ Features:

- Excellent Suction Characteristics
- Low Noise Level
- Long Service Life
- Modular Design
- Short Response Times
- Variable Through Drive Options
- Visual Swivel Angle Indicator
- Optional Mounting Position
- Operation On HF-fluids Under Reduced Operational Data Possible

■ Applications:

- High-Voltage, Overload, Variable, Large Displacement, Long Life And High Reliability of Hydraulic Transmission Areas.
- The Steel Metallurgy and Forging Machine
- The Ceramics and Refractories Hydraulic Machine
- The Ships and Water Resources and Hydropower Hoist
- The Rubber Vulcanizing Machine and Paper Equipment
- The Oil and Petrochemical Machinery
- The Building and Operating Machinery
- The Railway and Shield Mechanical



■ Contents :

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■ Type Code For Standard Program:

HD	-		A4VS		O	250	DR	/	30	R	-	P	P	B	13	N00
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0	1	2	3	4	5	6	7	8	9	10	11	12	13
---	---	---	---	---	---	---	---	---	---	----	----	----	----

0. Manufacturer:

华德液压 HUADE HYDRAULIC

1. Hydraulic fluid / Version:

Hydraulic fluid / Version:	40	71	125	180	250	300	355	370	500	Code
Mineral oil and HFD-fluids.....no code	■	■	■	■	■	■	■	■	■	-
HFA-, HFB- and HFC-fluids	■	■	■	■	■	■	■	■	□	E
High-Speed-Version	-	-	-	-	■	■	■	■	□	H

2. Axial piston unit:

Axial piston unit / Version:	40	71	125	180	250	300	355	370	500	Code
Swash plate design, variable	■	■	■	■	■	■	■	■	■	A4VS

3. Boost pump (Impeller):

Boost pump / Version:	40	71	125	180	250	300	355	370	500	Code
Without boost pump.....No code	■	■	■	■	■	■	■	■	■	-
With boost pump	-	-	-	-	■	■	■	-	-	L

4. Type of operation:

Type of operation / Version:	40	71	125	180	250	300	355	370	500	Code
Pump, open circuit	■	■	■	■	■	■	■	■	■	O

5. Size:

Size / Version:	40	71	125	180	250	300	355	370	500	Code
Size $\leq v_{gmax}$ (cm ³ /r)	40	71	125	180	250	300	355	370	500	-

6. Control devices:

Control devices / Version:	40	71	125	180	250	300	355	370	500	Code
Pressure control	■	■	■	■	■	■	■	■	■	DR
Pressure control for parallel operation	■	■	■	■	■	■	■	■	■	DP
Flow control	■	■	■	■	■	■	■	■	□	FR
Pressure and flow control	■	■	■	■	■	■	■	■	□	DFR
Power control with hyperbolic curve	■	■	■	■	■	■	■	■	■	LR
Manual control	■	■	■	■	■	■	■	■	□	MA
Electric motor control	□	□	□	□	□	□	□	□	□	EM
Hydraulic control, control volume dependent	■	■	■	■	■	■	■	■	□	HM
Hydr. control, with servo/proportional valve	■	■	■	■	■	■	■	■	□	HS
Electronic control	■	■	■	■	■	■	■	■	■	EO
Hydraulic control, pilot pressure dependent	■	■	■	■	■	□	■	■	■	HD
Secondary speed control	□	□	□	□	□	□	□	□	□	DS1
Electro-hydraulic control system	□	□	□	□	□	□	□	□	□	DFE1

* See to summary of controls

■ Type Code For Standard Program:

7. Series:

Series / Version:	40	71	125	180	250	300	355	370	500	Code
10 Series	■	■	□	□	□	-	□	-	-	10
22 Series	-	-	■	■	■	□	■	□	-	22
30 Series	-	-	■	■	■	■	■	■	■	30

8. Direction of rotation:

Direction of rotation:	Direction of rotation	Code
With view on shaft end	Clockwise (forward dextral)	R
	Counter-clockwise (reverse left-handed)	L

9. Seals:

Seals / Version:	40	71	125	180	250	300	355	370	500	Code
NBR (Nitrile-rubber DIN ISO 1629)	■	■	■	■	■	■	■	■	■	P
Shaft seal FKM (Fluoro-rubber)										
FKM (Fluoro-rubber DIN ISO 1629) for operation on HFD	■	■	■	■	■	■	■	■	■	V

10. Shaft end:

Shaft end / Version:	40	71	125	180	250	300	355	370	500	Code
Keyed parallel shaft to DIN 6885	■	■	■	■	■	■	■	■	■	P
Splined shaft to DIN 5480	■	■	■	■	■	■	■	■	■	Z

11. Mounting flange:

Mounting flange / Version:	40	71	125	180	250	300	355	370	500	Code	
Similar to ISO 3019-2 metric	4-hole	■	■	■	■	■	■	■	■	-	B
	8-hole	-	-	-	-	-	-	-	■	■	H

12. Service line connections:

Service line connections / Version:	40	71	125	180	250	300	355	370	500	Code
Port B and S: SAE flange on side, 90° offset, metric fixing screws	■	■	■	■	■	■	■	■	■	13
Port B and S: SAE flange on side, 90° offset, metric fixing screws, pressure port B ₁ , opposite B-closed with blanking plate on delivery	■	■	■	■	■	■	■	■	□	25

- = Preferred Program
- = Available
- = In Preparation
- = Not Available

■ Type Code For Standard Program :

13. Through drive :

Through drive / Version :			40	71	125	180	250	300	355	370	500	Code
without auxiliary pump, without through drive			■	■	■	■	■	■	■	■	■	N00
with through drive for mounting an axial piston unit, gear or radial piston pump			■	■	-	-	-	-	-	■	■	K
Universal through drive, can be adapted			-	-	■	■	■	■	■	-	-	U
Flange	splined shaft coupler ¹⁾	to mount	40	71	125	180	250	300	355	370	500	Code
ISO 125 4 hole	32X2X14X9g	A4VSO 40	■	■	■	■	■	■	■	■	■	31
ISO 140 4 hole	40X2X18X9g	A4VSO 71	-	■	■	■	■	■	■	■	■	33
ISO 160 4 hole	50X2X24X9g	A4VSO 125	-	-	■	■	■	■	■	■	■	34
ISO 160 4 hole	50X2X24X9g	A4VSO 180	-	-	-	■	■	■	■	■	■	34
ISO 224 4 hole	60X2X28X9g	A4VSO 250	-	-	-	-	■	■	■	■	■	35
ISO 224 4 hole	70X3X22X9g	A4VSO 355	-	-	-	-	-	-	■	■	■	77
ISO 315 8 hole	80X3X25X9g	A4VSO 500	-	-	-	-	-	-	-	-	■	43
ISO 80 2 hole	3/4" 19-4 (SAE A-B)	A10VSO 10, 18	□	■	□	□	□	□	□	□	□	B2
ISO 100 2 hole	7/8" 22-4 (SAE B)	A10VSO 28	■	■	■	■	□	□	□	□	□	B3
	1" 25-4 (SAE B-B)	A10VSO 45	■	■	■	■	■	■	■	■	■	B4
ISO 125 2 hole	1-1/4" 32-4 (SAE C)	A10VSO 71	-	■	■	■	■	■	■	■	□	B5
	1-1/2" 38-4 (SAE C-C)	A10VSO 100	-	-	□	□	□	□	□	□	□	B6
ISO 180 4 hole	1-3/4" 44-4 (SAE D)	A10VSO 140	-	-	-	■	■	■	■	■	■	B7
82-2 (SAE A 2 hole)	5/8" 16-4 (SAE A,)	G2/GC2/GC3	■	■	■	■	■	■	■	■	■	01
	3/4" 19-4 (SAE A-B)	A10VO 10, 18	■	■	□	□	□	□	□	□	□	52
101-2 (SAE B)	7/8" 22-4 (SAE B)	A10VO 28, G3/G4	■	■	■	■	■	■	■	■	■	68
	1" 25-4 (SAE B-B)	A10VO 45, GC4/5	■	■	■	■	■	■	■	■	■	04
127-2 (SAE C)	1-1/4" 32-4 (SAE C)	A10VO 71	-	■	■	■	■	■	■	■	■	07
	1-1/2" 38-4 (SAE C-C)	A10VO 100, GC6	-	-	■	■	■	■	■	■	■	24
152-4 (SAE D)	1-3/4" 44-4 (SAE D)	A10VO 140	-	-	-	■	■	■	■	■	■	17
Φ63, metr.4-hole	for keyed shaft Ø 25	R4	■	■	□	□	□	□	□	□	□	57
with through drive shaft, without coupler, without adapter fl ange,			■	■	■	■	■	■	■	■	■	99
closed with cover plate												

■ Combination pumps :

1. Combination pumps consisting of axial piston units – ordering example Subsequent detailed instructions; overview mounting options see Subsequent detailed instructions
2. If delivery with mounted gear or radial piston pump is desired, please consult us.

- = Preferred Program
- = Available
- = In Preparation
- = Not Available

- Hydraulic Fluid
- The variable pump A4VSO is suitable for operation on fluids:

- Hydraulic fluids based on mineral;
- Environmentally acceptable hydraulic fluids:
 - ✚ Synthetic hydraulic fluids based on esters, HEES.
 - ✚ Synthetic hydraulic fluids based on Polyglycol, HEPG.
 - ✚ Synthetic hydraulic fluids based on Vegetable, HETG
- Fire-resistant, water-containing hydraulic fluids:

Code	Type of Fluid	Water content (wt%)
HFA	oil-in-water emulsion	95...98
HFB	water-in-oil emulsion	>40
HFC	water-based solutions	35...55
HFD	water-free fluids	≤0.1

■ Selection of Fluids:

- All mineral oil based fluids are suitable to a greater or lesser degree for applications with axial piston units. Their basic classification of application results from what has already been said due to the water, viscosity and temperature relationships, with consideration of oxidisation and corrosion protection, material compatibility, air and water separation characteristics.
- Axial piston pump on operation with oil-in-water emulsion (HFA), water-in-oil emulsion (HFB), water-based solution (HFC) or environmentally acceptable hydraulic fluids, to consider the axial piston pump technology data restriction or reduced. HUADE hydraulic technology necessary contact consulting.

■ Operating viscosity range:

- Within the operating viscosity range between 6...100 mm²/s, the units can be operated without limitations of the technical data.
- In order to obtain optimum efficiency and service life, we recommend that the operating viscosity (at operating temperature) be selected in the range.

$$V_{opt} = \text{opt. viscosity range } 16...36 \text{ mm}^2/\text{s}$$

referred to tank temperature (open circuit).

- Limit of viscosity range

- For critical operating conditions the following values apply:

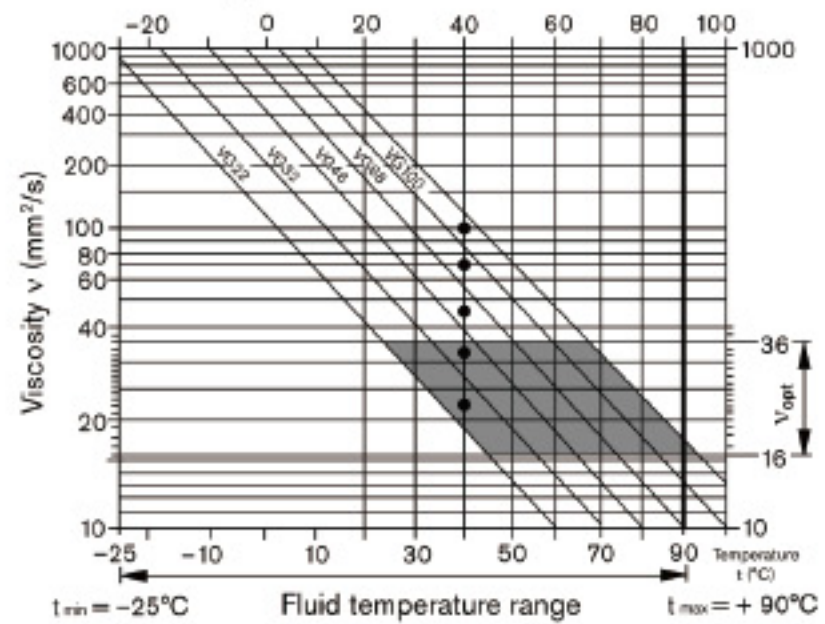
$$V_{min} = 10 \text{ mm}^2/\text{s}$$

for short periods (t < 3 min)
at max. permissible case drain temperature
t_{max} = +90°C.

$$V_{max} = 1000 \text{ mm}^2/\text{s}$$

for short periods (on cold start, operating viscosity should be below 100 mm²/sec within 15 minutes)
t_{min} = -25°C

■ Selection diagram:



- Selection of hydraulic fluid:

- ✚ Example: at an ambient temperature of X°C the operating temperature in the tank is 60°C. In the optimum viscosity range (V_{opt}; shaded area), this corresponds to grades VG 46 or VG 68; select: VG 68.
- ✚ Important: The case drain temperature is influenced by pressure and speed and is always higher than the tank temperature. However the max. temperature at any point in the system may not exceed 90°C.

- Notes on the selection of hydraulic fluid:

- ✚ In order to select the correct fluid, it is necessary to know the operating temperature in the tank (open circuit) in relation to the ambient temperature.
- ✚ The hydraulic fluid should be selected so that within the operating temperature range, the viscosity lies within the optimum range (V_{opt}); see shaded section in the selection diagram. We recommend, that the higher viscosity grade is selected in each case.

■ Filtration:

- The finer the filtration the better the achieved purity grade of the pressure fluid and the longer the life of the axial piston unit. To ensure the functioning of the axial piston unit a minimum purity grade of:
 - ✚ 9 to NAS 1638
 - ✚ 6 to SAE
 - ✚ 18/15 to ISO/DIS 4406 is necessary.
- In this case we recommend, depending on system and application filter element β₂₀ ≥ 100.
- With the rising differential pressure at the filter element the β-value must not decrease.
- At very high temperatures of the hydraulic fluid (90°C to max. 115°C) at least cleanless class.
 - ✚ 8 to NAS 1638
 - ✚ 5 to SAE
 - ✚ 17/14 to ISO/DIS 4406 is necessary.

■ Bearing flushing:

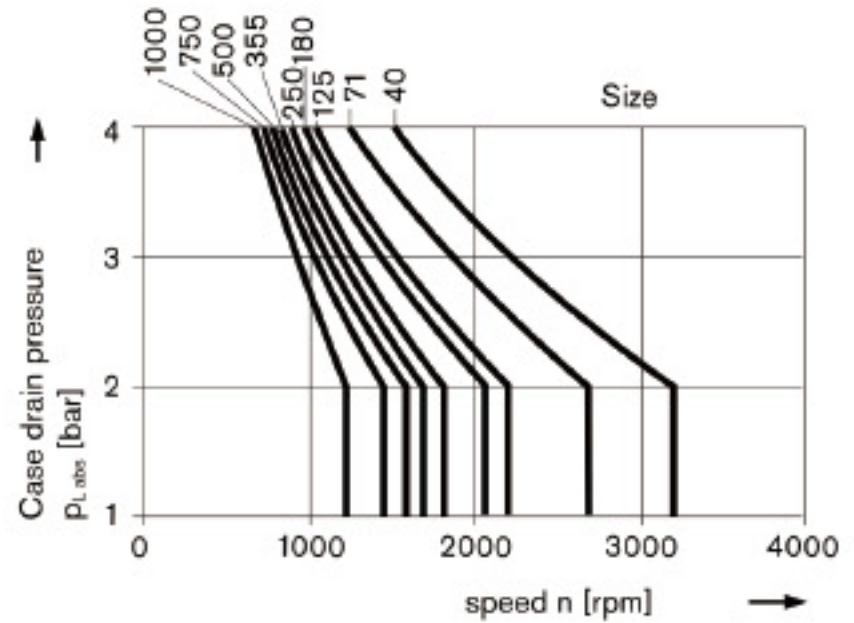
- For the following operating conditions bearing flushing is required for a safe, continuous operation:
 - Applications with special fluids (non mineral oils) due to limited lubricity and narrow operating temperature range
 - Operation at critical conditions of temperature and viscosity with mineral oil
- Flushing is recommended with vertical mounting (drive shaft facing upwards) in order to ensure lubrication of the front bearing and shaft seal.
- Flushing is carried out via port „U“, located in the front flange area of the pump. The flushing fluid flows through the front bearing and leaves the pump together with the case drain flow.
- Depending on pump size, the following flushing flows are recommended:

Size	40	71	125	180	250	355	500
q _{sp} (L/min)	3	4	5	7	10	15	20

- These recommended flushing flows will cause a pressure drop of approx. 2 bar (series 1) and 3 bar (series 3) between the entrance to port „U“ and the pump case (including the pipe fittings).
- Notes regarding series 30
- When using external bearing flushing the throttle screw at port U must be turned in to the end stop.

■ Case drain pressure:

- The permissible case drain pressure (housing pressure) is dependent on the drive speed (see diagram).



- Max. case drain pressure (housing pressure)
PL abs max ----- 4 bar absolute
- These are approximate values; under certain operating conditions a reduction in these values may be necessary.

■ Direction of flow:

- S to B

■ Determination of pump size:

Flow $q_v = \frac{V_g \cdot n \cdot \eta_v}{1000}$ [L/min]

Drive torque $T = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}}$ [Nm]

Power $P = \frac{2\pi \cdot T \cdot n}{60000} = \frac{q_v \cdot \Delta p}{600 \cdot \eta_t}$ [kW]

- V_g = geometr. displacement per rev. in cm³
- Δp = pressure difference in bar
- n = speed in rpm
- η_v = volumetric efficiency
- η_{mh} = mechanical-hydraulic efficiency
- η_t = overall efficiency (η_t = η_v · η_{mh})

■ Technical data:

□ Applies to mineral oil medium run;

■ Operating pressure range:

□ Pressure at service line port (pressure port) B:

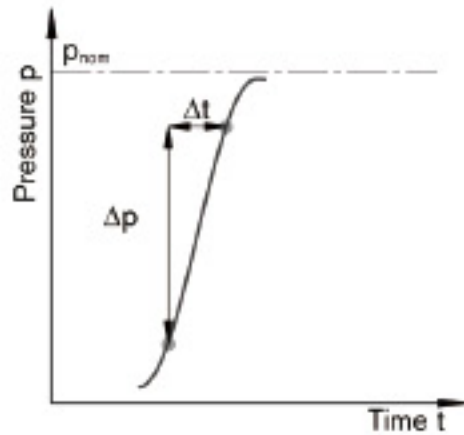
Nominal pressure P_{nom} ----- 350 bar absolute

Peak pressure P_{max} ----- 400 bar absolute

□ Single operating period 1 s, Total operating period 300 h

□ Minimum pressure (high-pressure side): 15 bar absolute

□ Rate of pressure change R_{Amax} : 16000 bar/s



□ Pressure at suction port S (inlet):

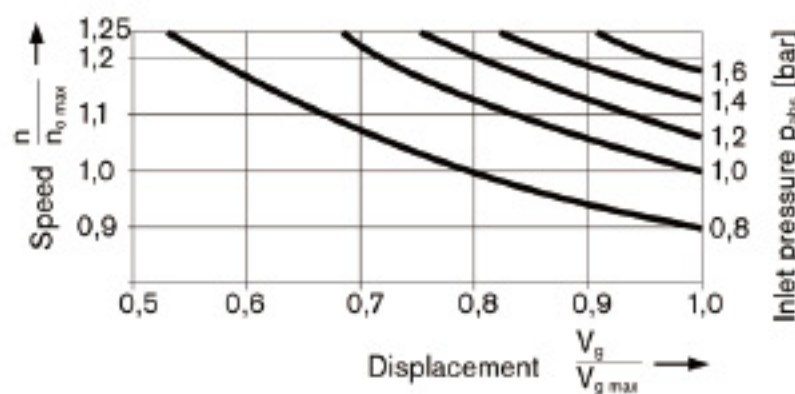
Minimum suction pressure P_{Smin} ----- 0.8 bar absolute

Maximum suction pressure P_{Smax} ----- 30 bar absolute

■ Minimum pressure (inlet):

□ In order to avoid damage to the axial piston unit, a minimum pressure must be ensured at the suction port S (inlet). The minimum pressure is dependent on the speed and displacement of the axial piston unit.

□ The inlet pressure is the static feed pressure or the minimum dynamic value of the boost pressure.



■ Definition:

□ Nominal pressure P_{nom}

The nominal pressure corresponds to the maximum design pressure.

□ Peak pressure P_{max}

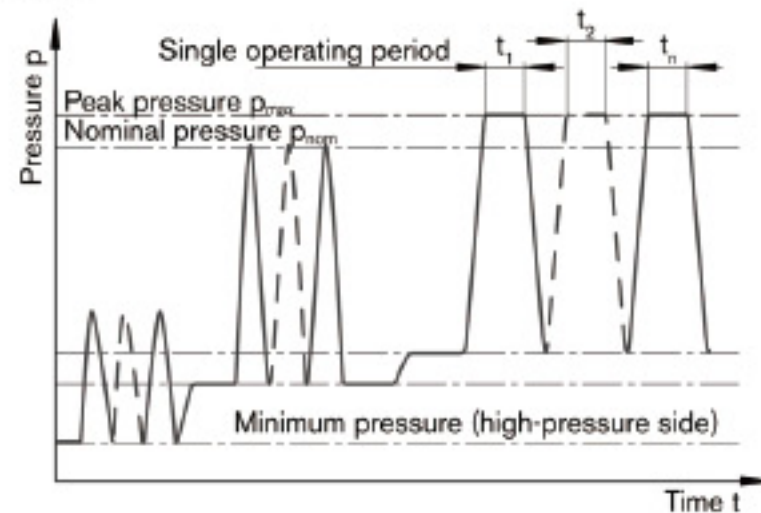
The peak pressure corresponds the maximum operating pressure within the single operating period. The sum of the single operating periods must not exceed the total operating period.

□ Minimum pressure (high-pressure side):

Minimum pressure on the high-pressure side (B) that is required in order to prevent damage to the axial piston unit.

□ Rate of pressure change R_A

Maximum permissible rate of pressure build-up and pressure reduction during a pressure change over the entire pressure range.



□ Total operating period = $t_1 + t_2 + t_3 + \dots + t_n$

■ Technical data:

□ Applies to mineral oil medium run;

□ Table of values (theoretical values, without considering efficiencies and tolerances; values rounded off)

Size		40	71	125	180	250/ H ¹⁾	355/ H ¹⁾	500/ H ¹⁾
Displacement	$V_{g\ max}$ cm ³	40	71	125	180	250/ 250	355/ 355	500/ 500
Speed ²⁾								
max. at $V_{g\ max}$	$n_{o\ max}$ rpm	2600	2200	1800	1800	1500/ 1900	1500/ 1700	1320/ 1500
max. at $V_g \leq V_{g\ max}$ (speed limit)	$n_{o\ max\ zul}$ rpm	3200	2700	2200	2100	1800/ 2100	1700/ 1900	1600/ 1800
Flow								
at $n_{o\ max}$	$q_{vo\ max}$ L/min	104	156	225	324	375/ 475	533/ 604	660/ 750
at $n_E = 1500$ rpm	$q_{vE\ max}$ L/min	60	107	186	270	375	533	581 ³⁾
Power $\Delta p = 350$ bar								
at $n_{o\ max}$	$P_{o\ max}$ kW	61	91	131	189	219/ 277	311/ 352	385/ 437
at $n_E = 1500$ rpm	$P_{E\ max}$ kW	35	62	109	158	219	311	339 ³⁾
Torque								
at $V_{g\ max}$ $\Delta p = 350$ bar	T_{max} Nm	223	395	696	1002	1391	1976	2783
$\Delta p = 100$ bar	T Nm	64	113	199	286	398	564	795
Rotary stiffness								
Shaft end P	c kNm/rad	80	146	260	328	527	800	1145
Shaft end Z	c kNm/rad	77	146	263	332	543	770	1136
Moment of inertia rotary group	J_{TW} kgm ²	0,0049	0,0121	0,03	0,055	0,0959	0,19	0,3325
Angular acceleration max. ⁴⁾	α rad/s ²	17000	11000	8000	6800	4800	3600	2800
Case volume	V L	2	2,5	5	4	10	8	14
Weight (with press. contr.) approx.	m kg	39	53	88	102	184	207	320

1) High-Speed-Version

2) Values are valid with inlet pressure pabs 1 bar at inlet port S, with increased speed up to speed limit please observe diagram.

3) $V_g < V_{g\ max}$

4) The range of validity lies between zero and the maximum permissible drive speeds; Valid for external excitation;

The limiting value is only valid for a single pump;

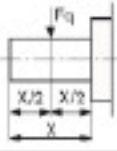
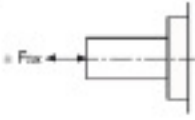
The loading capacity of the connecting parts must be considered.

□ Notes:

⚠ 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.

⚠ The permissible values can be determined through calculation.

□ Permissible radial and axial forces on the drive shaft:

Size		40	71	125	180	250	355	500
Radial force, max.	 at X/2 $F_{q\ max}$ N	1000	1200	1600	2000	2000	2200	2500
Axial force, max.	 $\pm F_{xa\ max}$ N	600	800	1000	1400	1800	2000	2000

■ Characteristics

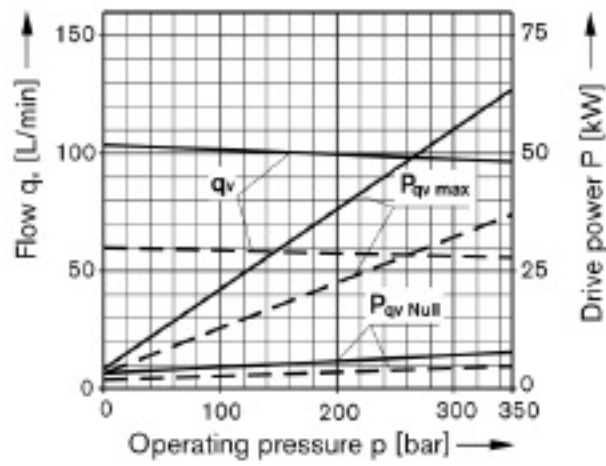
□ Drive power and flow:

□ (Fluid: Hydraulic oil ISO VG 46 DIN 51519, t = 50°C)

Overall efficiency: $\eta_t = \frac{q_v \cdot P}{P_{qv, max} \cdot 600}$

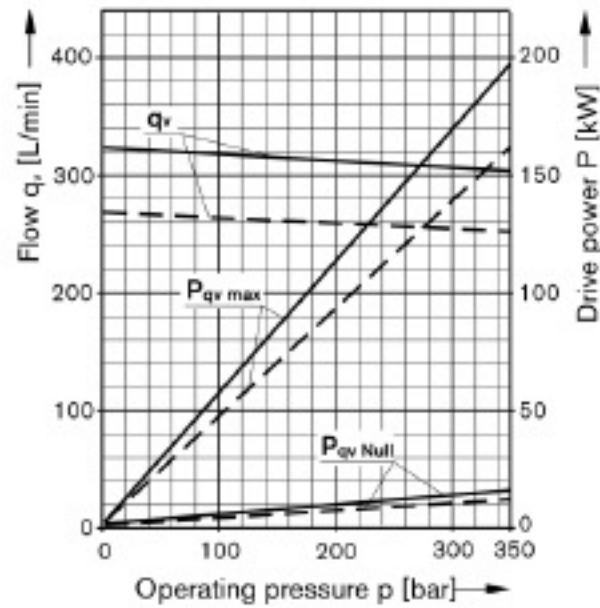
Volumetric efficiency: $\eta_v = \frac{q_v}{q_{v, theor}}$

Size 40



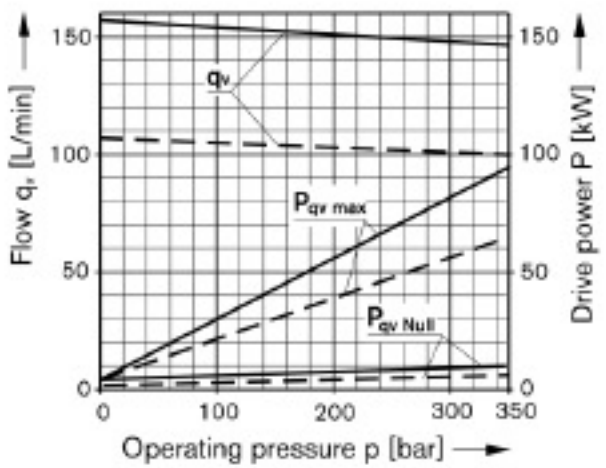
— n = 2600 rpm
- - - n = 1500 rpm

Size 180



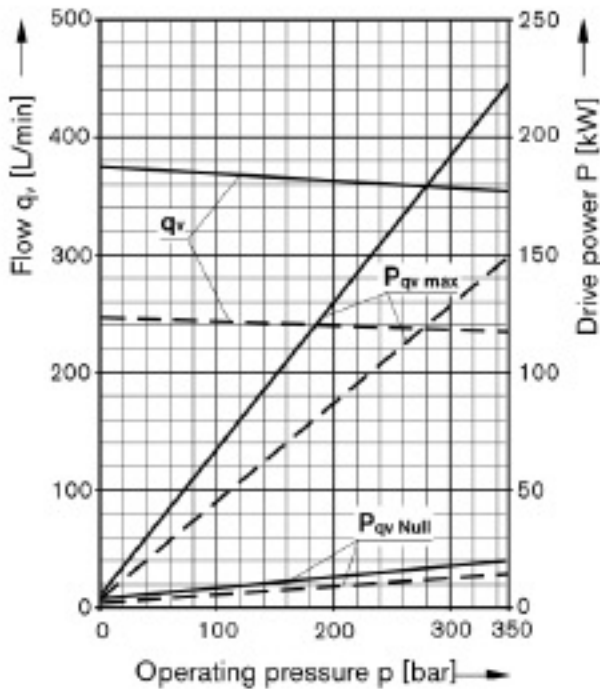
— n = 1800 rpm
- - - n = 1500 rpm

Size 71



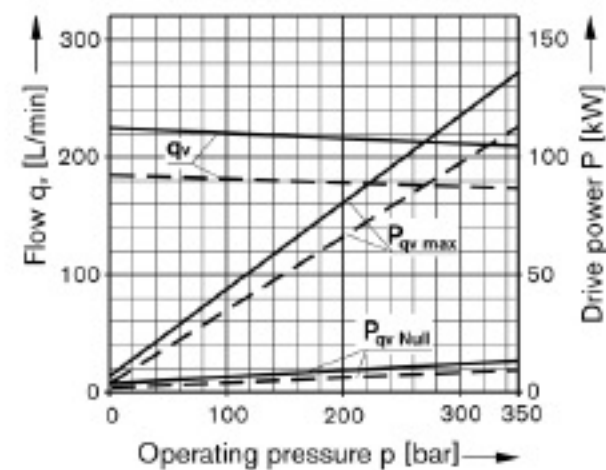
— n = 2200 rpm
- - - n = 1500 rpm

Size 250



— n = 1500 rpm
- - - n = 1000 rpm

Size 125



— n = 1800 rpm
- - - n = 1500 rpm

■ Characteristics

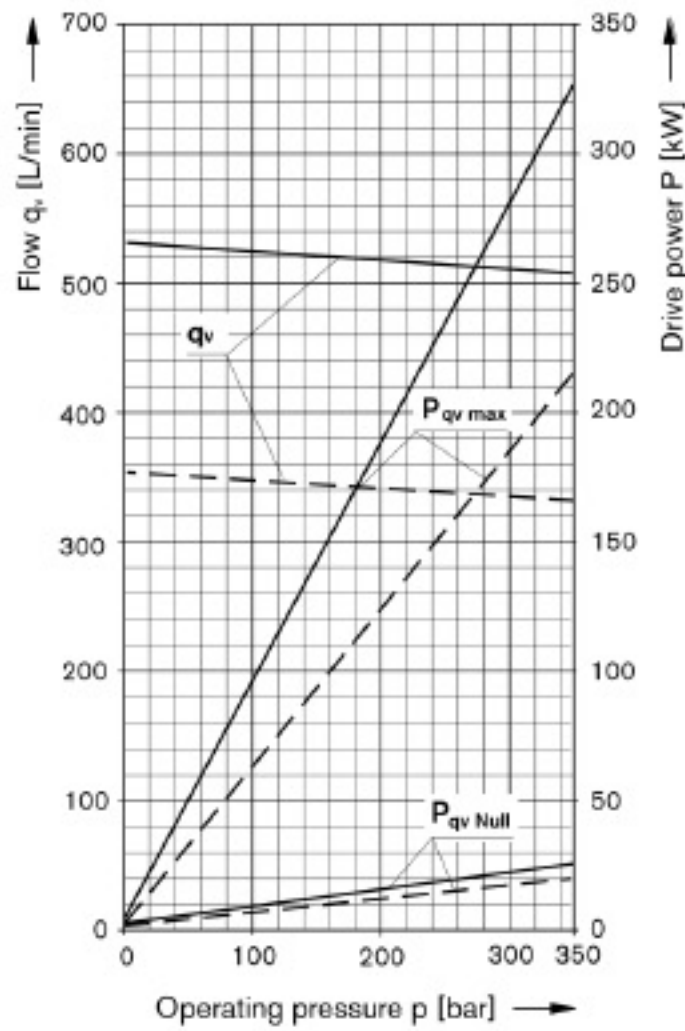
□ Drive power and flow:

□ (Fluid: Hydraulic oil ISO VG 46 DIN 51519, t = 50°C)

Overall efficiency: $\eta_t = \frac{q_v \cdot p}{P_{q_v \max} \cdot 600}$

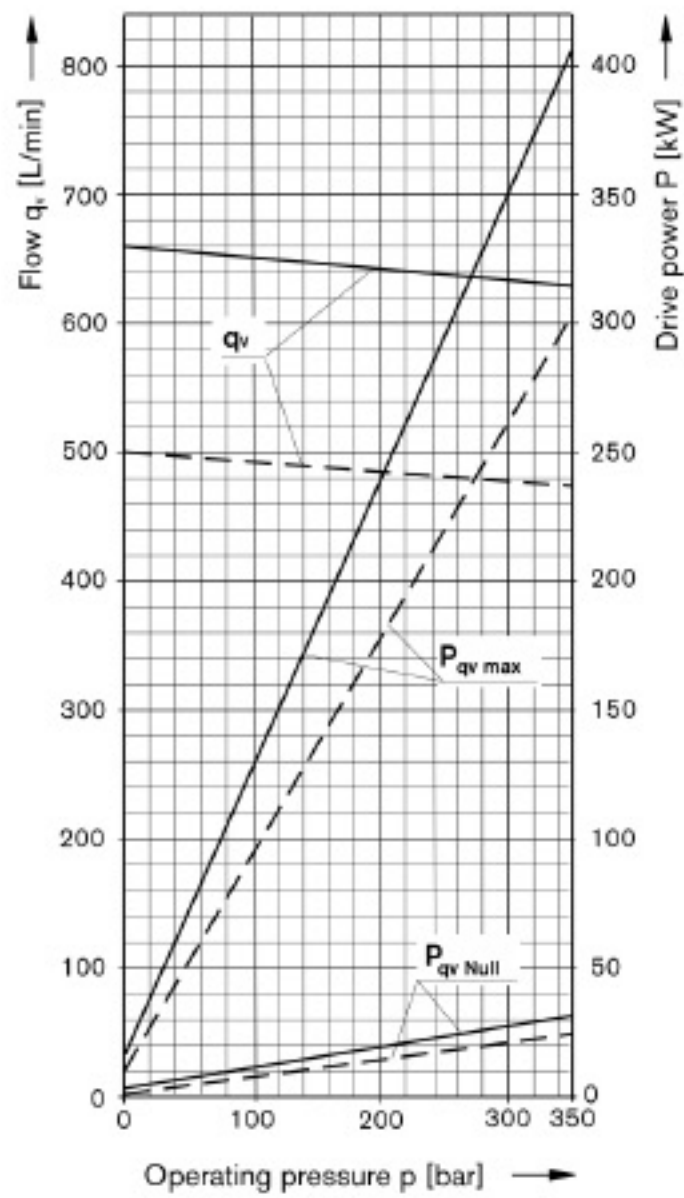
Volumetric efficiency: $\eta_v = \frac{q_v}{q_{v \text{ theor}}}$

Size 355



— $n = 1500$ rpm
 - - - $n = 1000$ rpm

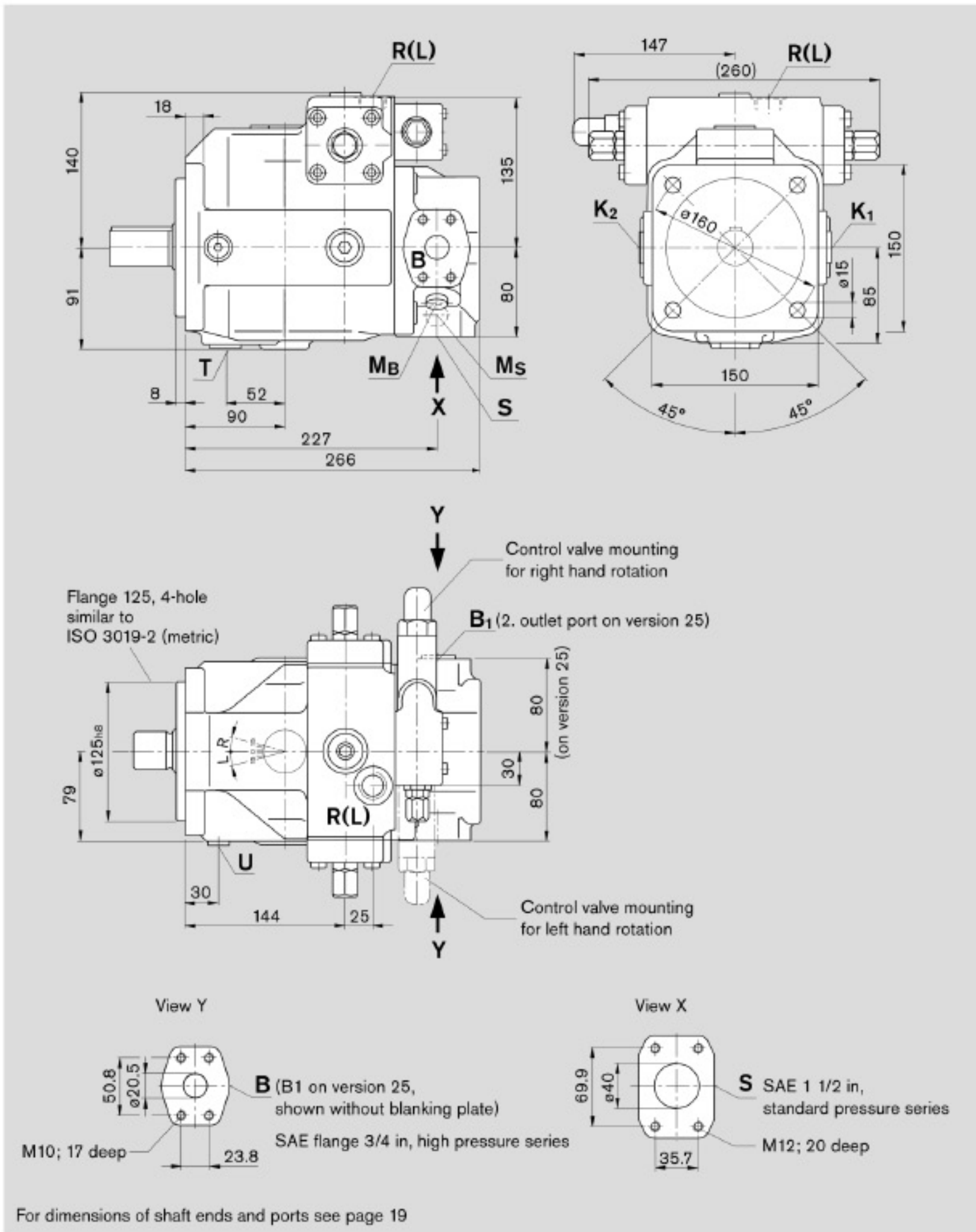
Size 500



— $n = 1320$ rpm
 - - - $n = 1000$ rpm

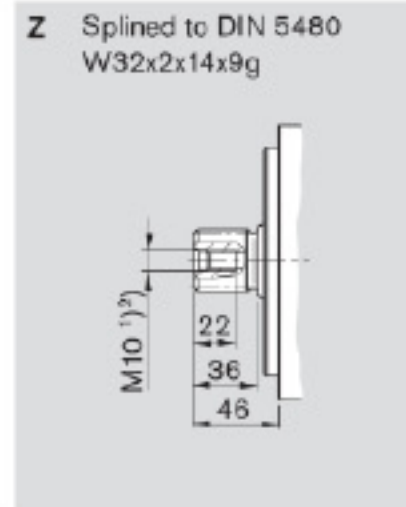
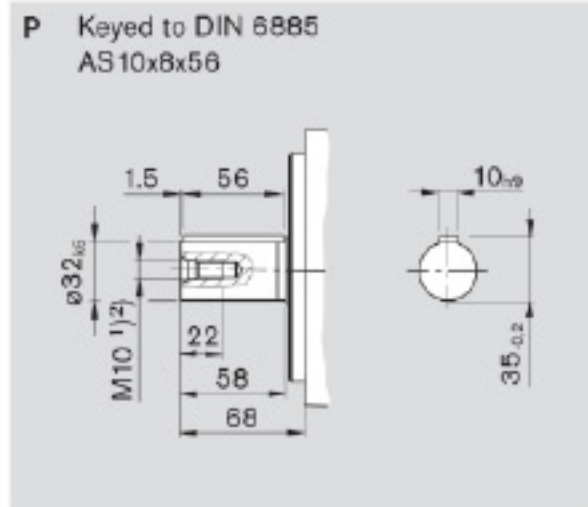
■ Dimensions, Size 40 Series 10:

□ (Example: pressure control; for exact dimensions of the control devices see separate data sheets):



■ Dimensions, Size 40 Series 10:

Shaft ends



Ports

max. tightening torque ²⁾

S	Suction port (standard pressure series) Fixing thread	SAE J518 ³⁾ 1 1/2 in DIN 13 M12x1,75; 20 deep ²⁾	
K ₁ , K ₂	Flushing port	DIN 3852 M22x1,5; 14 deep (plugged)	210 Nm
T	Drain	DIN 3852 M22x1,5; 14 deep (plugged)	210 Nm
M _a	Measuring port outlet pressure	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm
M _s	Measuring port suction pressure	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm
R(L)	Fill and bleed (case drain port)	DIN 3852 M22x1,5; 14 deep	210 Nm
U	Flushing port	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm
on version 13			
B	Pressure port (high pressure series) Fixing thread	SAE J518 ³⁾ 3/4 in DIN 13 M10x1,5; 17 deep ²⁾	
B ₁	Additional port	DIN 3852 M22x1,5; 14 deep (plugged)	210 Nm
on version 25			
B	Pressure port (high pressure series) Fixing thread	SAE J518 ³⁾ 3/4 in DIN 13 M10x1,5; 17 deep ²⁾	
B ₁	2. press. port (high pressure series) Fixing thread	SAE J518 ³⁾ 3/4 in (closed with blanking plate) DIN 13 M10x1,5; 17 deep ²⁾	

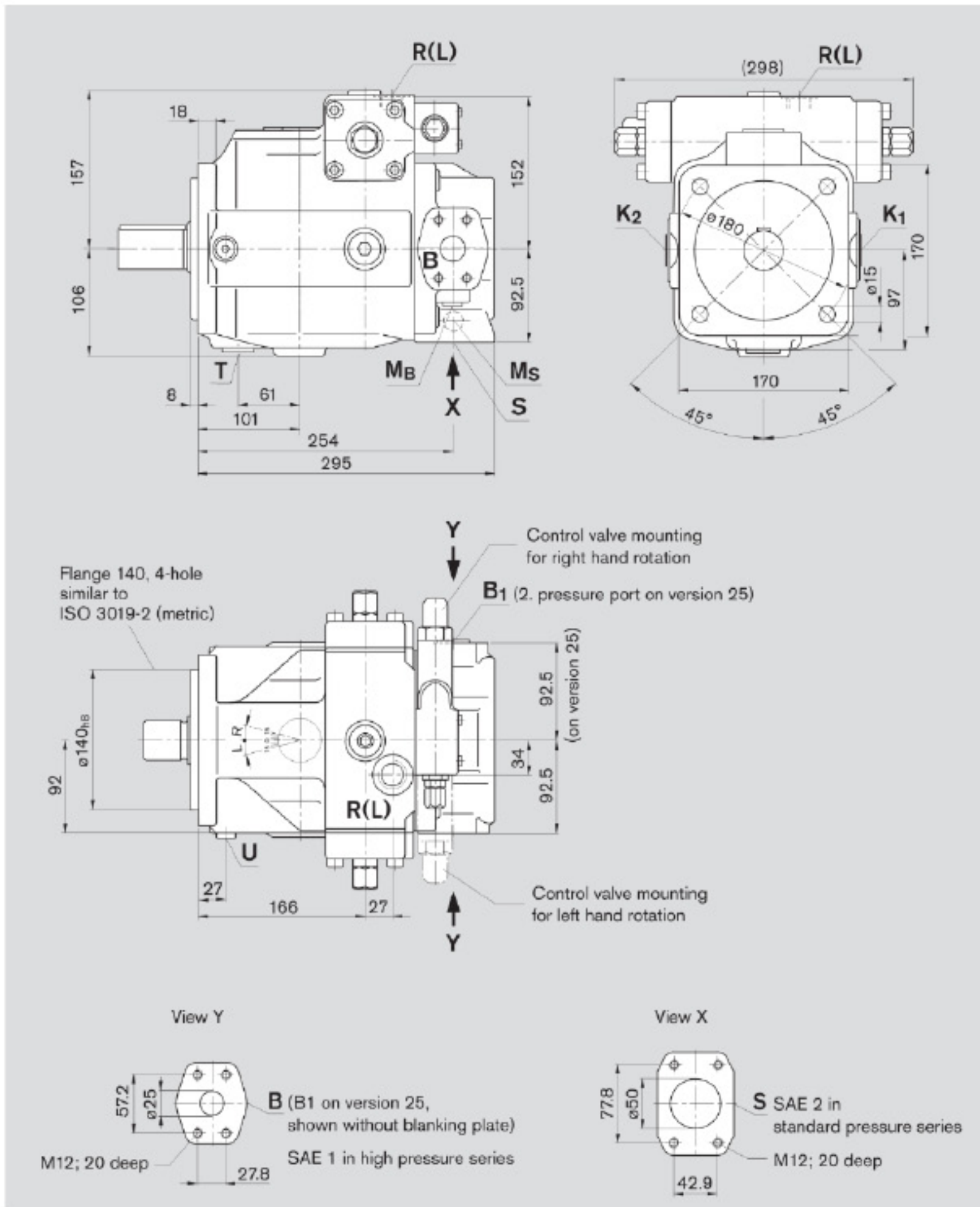
¹⁾ Center bore to DIN 332 (threaded to DIN 13)

²⁾ for the max. tightening torques please observe the manufacturer's information on the used fittings and the general information on page 68

³⁾ Caution: metric thread deviates from standard

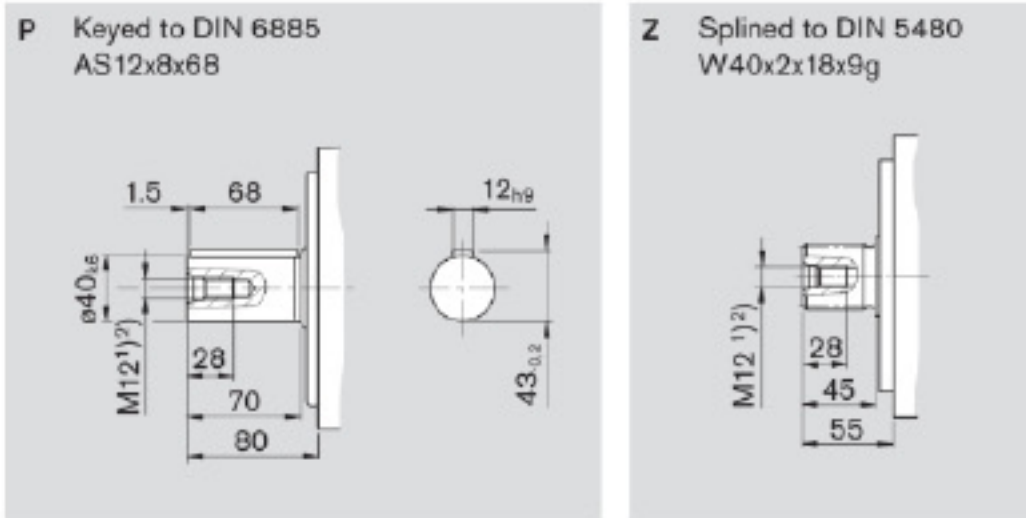
■ Dimensions, Size 71 Series 10:

□ (Example: pressure control; for exact dimensions of the control devices see separate data sheets):



■ Dimensions, Size 71 Series 10:

Shaft ends



Ports

max. tightening torque ²⁾

S	Suction port (standard pressure series)	SAE J518 ³⁾	2 in	
	Fixing thread	DIN 13	M12x1,75; 20 deep ²⁾	
K _s K ₂	Flushing port	DIN 3852	M27x2; 16 deep (plugged)	330 Nm
T	Drain	DIN 3852	M27x2; 16 deep (plugged)	330 Nm
M ₀	Measuring port outlet pressure	DIN 3852	M14x1,5; 12 deep (plugged)	80 Nm
M ₃	Measuring port suction pressure	DIN 3852	M14x1,5; 12 deep (plugged)	80 Nm
R(L)	Fill + air bleed (case drain port)	DIN 3852	M27x2; 16 deep	330 Nm
U	Flushing port	DIN 3852	M14x1,5; 12 deep (plugged)	80 Nm
on version 13				
B	Pressure port (high pressure series)	SAE J518 ³⁾	1 in	
	Fixing thread	DIN 13	M12x1,75; 20 deep ²⁾	
B ₁	Additional port	DIN 3852	M27x2; 16 deep (plugged)	330 Nm
on version 25				
B	Pressure port (high pressure series)	SAE J518 ³⁾	1 in	
	Fixing thread	DIN 13	M12x1,75; 20 deep ²⁾	
B ₁	2. pressure port (high pressure series)	SAE J518 ³⁾	1 in (closed with blanking plate)	
	Fixing thread	DIN 13	M12x1,75; 20 deep ²⁾	

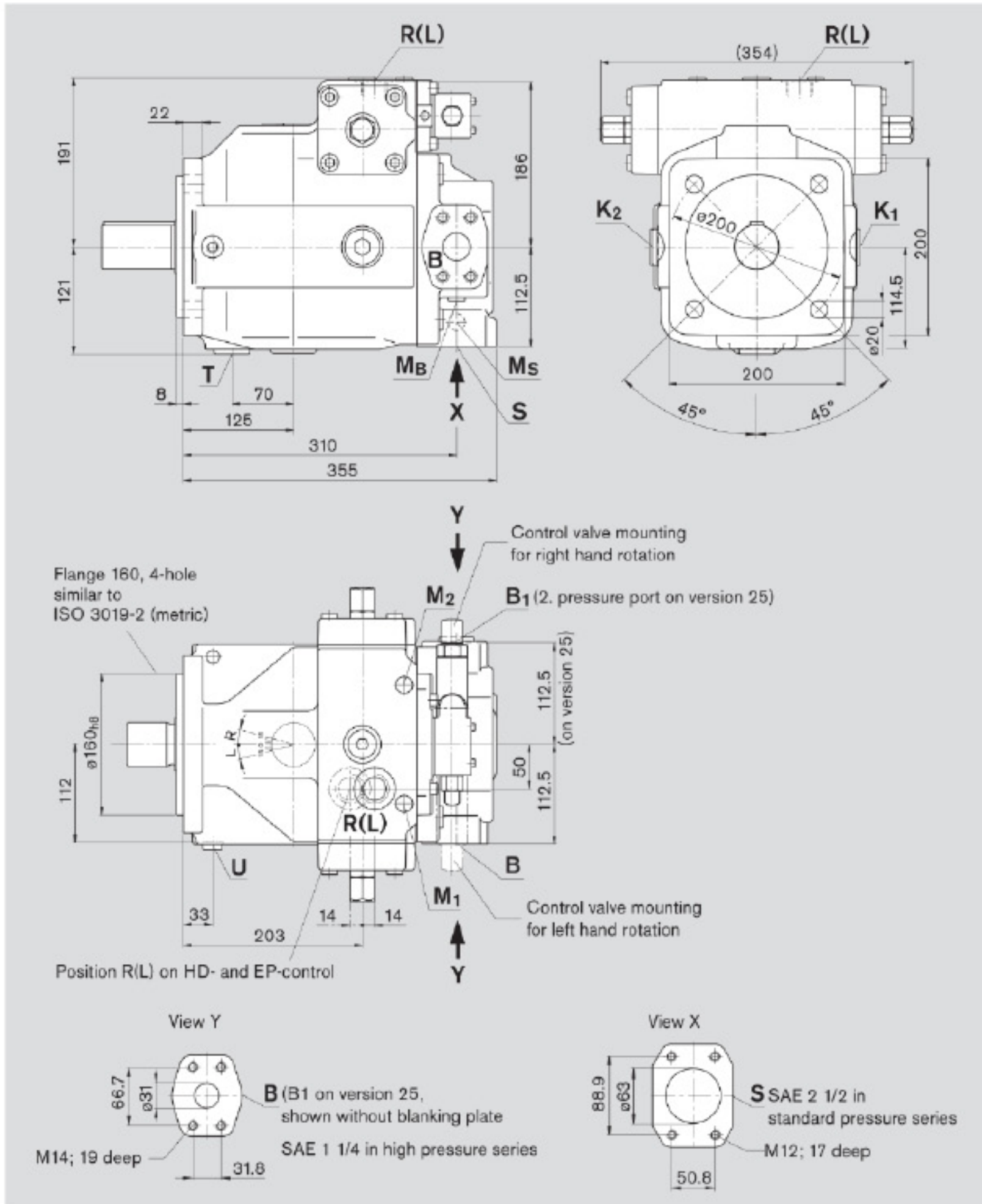
¹⁾ Center bore to DIN 332 (thread to DIN 13)

²⁾ for the max. tightening torques please observe the manufacturer's information on the used fittings and the general information on page 68

³⁾ Caution: metric thread deviates from standard

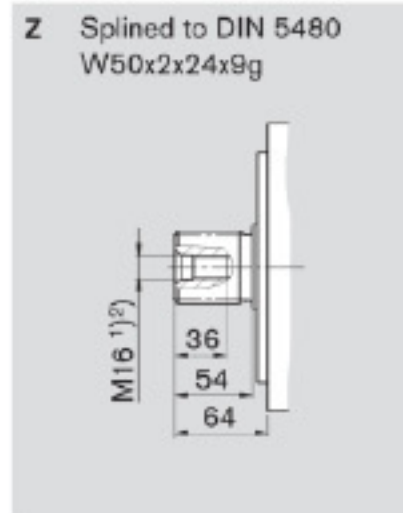
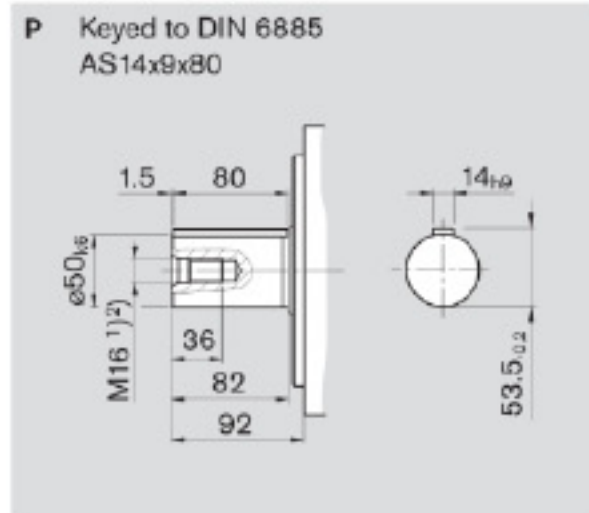
■ Dimensions, Size 125 Series 20, 30:

□ (Example: pressure control; for exact dimensions of the control devices see separate data sheets):



■ Dimensions, Size 125 Series 20, 30:

Shaft ends



Ports

			max. tightening torque ²⁾
S	Suction port (standard pressure series) Fixing thread	SAE J518 ³⁾ 2 1/2 in DIN 13 M12x1,75; 17 deep ²⁾	
K ₁ , K ₂	Flushing port	DIN 3852 M33x2; 18 deep (plugged)	540 Nm
T	Drain	DIN 3852 M33x2; 18 deep (plugged)	540 Nm
M _D	Measuring port outlet pressure	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm
M _S	Measuring port suction pressure	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm
R(L)	Fill + air bleed (case drain port)	DIN 3852 M33x2; 18 deep	540 Nm
U	Flushing port	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm
M ₁ , M ₂	Measuring port control chamber press.	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm

on version 13

B	Pressure port (high pressure series) Fixing thread	SAE J518 ³⁾ 1 1/4 in DIN 13 M14x2; 19 deep ²⁾	
B ₁	Additional port	DIN 3852 M33x2; 18 deep (plugged)	540 Nm

on version 25

B	Pressure port (high pressure series) Fixing thread	SAE J518 ³⁾ 1 1/4 in DIN 13 M14x2; 19 deep ²⁾	
B ₁	2. pressure port (high pressure series) Fixing thread	SAE J518 ³⁾ 1 1/4 in (closed with blanking plate) DIN 13 M14x2; 19 deep ²⁾	

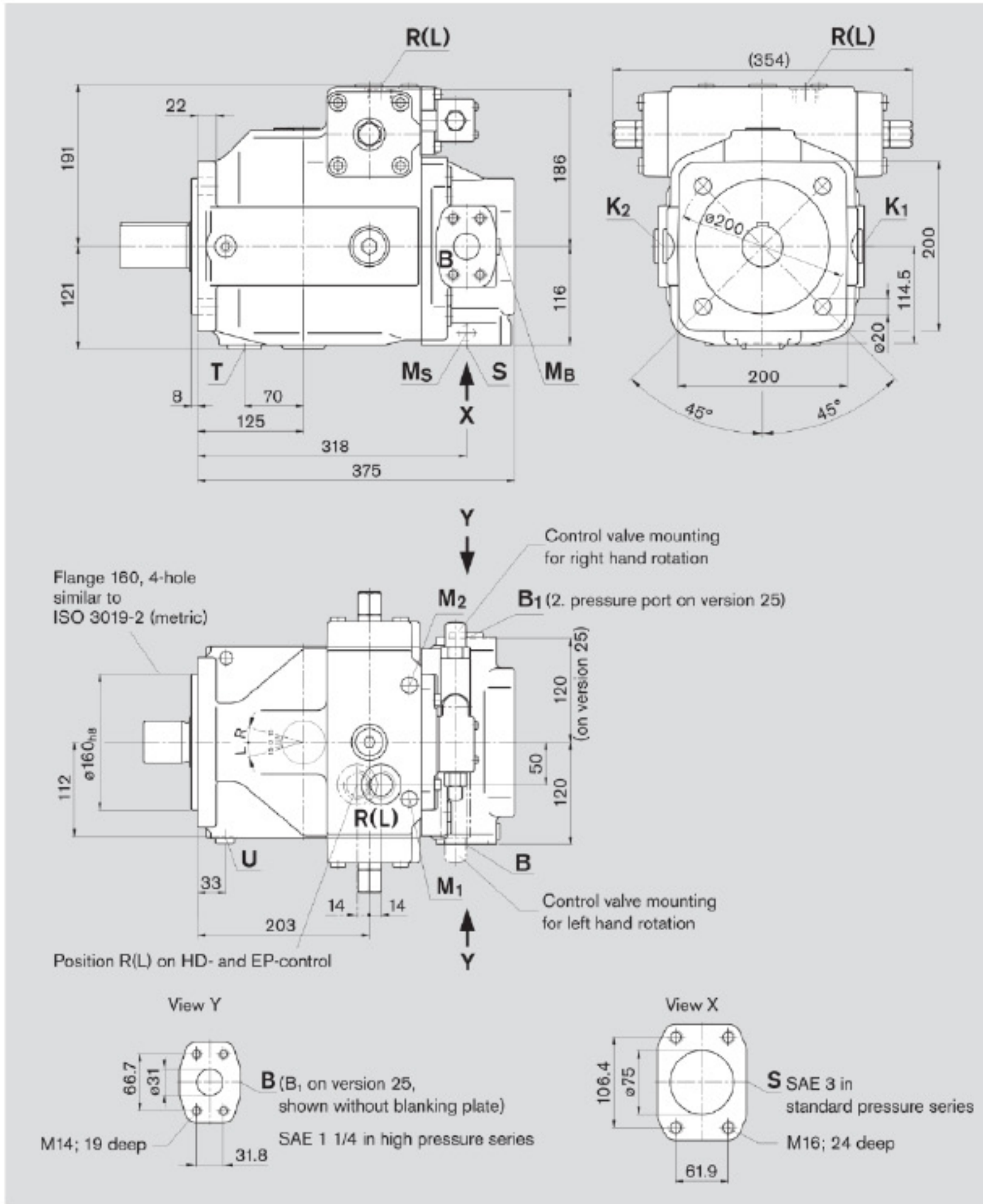
¹⁾ Center bore to DIN 332 (thread to DIN 13)

²⁾ for the max. tightening torques please observe the manufacturer's information on the used fittings and the general information on page 68

³⁾ Caution: metric thread deviates from standard

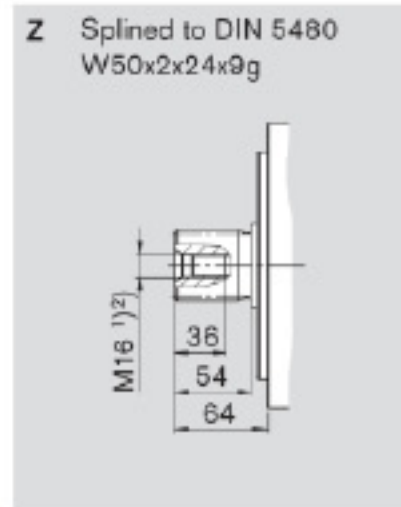
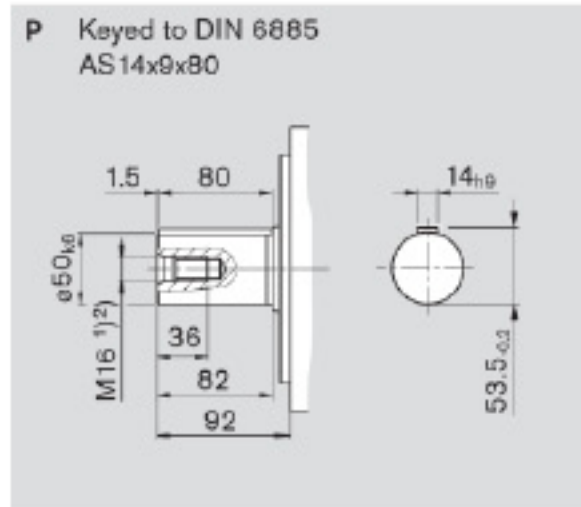
■ Dimensions, Size 180 Series 20, 30:

□ (Example: pressure control; for exact dimensions of the control devices see separate data sheets):



■ Dimensions, Size 180 Series 20、30:

Shaft ends



Ports

max. tightening torque ²⁾

S	Suction port (standard pressure series) Fixing thread	SAE J518 ³⁾ 3 in DIN 13 M16x2; 24 deep ²⁾	
K ₁ , K ₂	Flushing port	DIN 3852 M33x2; 18 deep (plugged)	540 Nm
T	Drain	DIN 3852 M33x2; 18 deep (plugged)	540 Nm
M _B	Measuring port outlet pressure	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm
M _S	Measuring port suction pressure	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm
R(L)	Fill + air bleed (case drain port)	DIN 3852 M33x2; 18 deep	540 Nm
U	Flushing port	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm
M ₁ , M ₂	Measuring port control chamber pressure	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm

on version 13

B	Pressure port (high pressure series) Fixing thread	SAE J518 ³⁾ 1 1/4 in deep ²⁾ DIN 13 M14x2; 19 deep ²⁾	
B ₁	Additional port	DIN 3852 M33x2; 18 deep (plugged)	540 Nm

on version 25

B	Pressure port (high pressure series) Fixing thread	SAE J518 ³⁾ 1 1/4 in DIN 13 M14x2; 19 deep ²⁾	
B ₁	2. pressure port (high pressure series) Fixing thread	SAE J518 ³⁾ 1 1/4 in (closed with blanking plate) DIN 13 M14x2; 19 deep ²⁾	

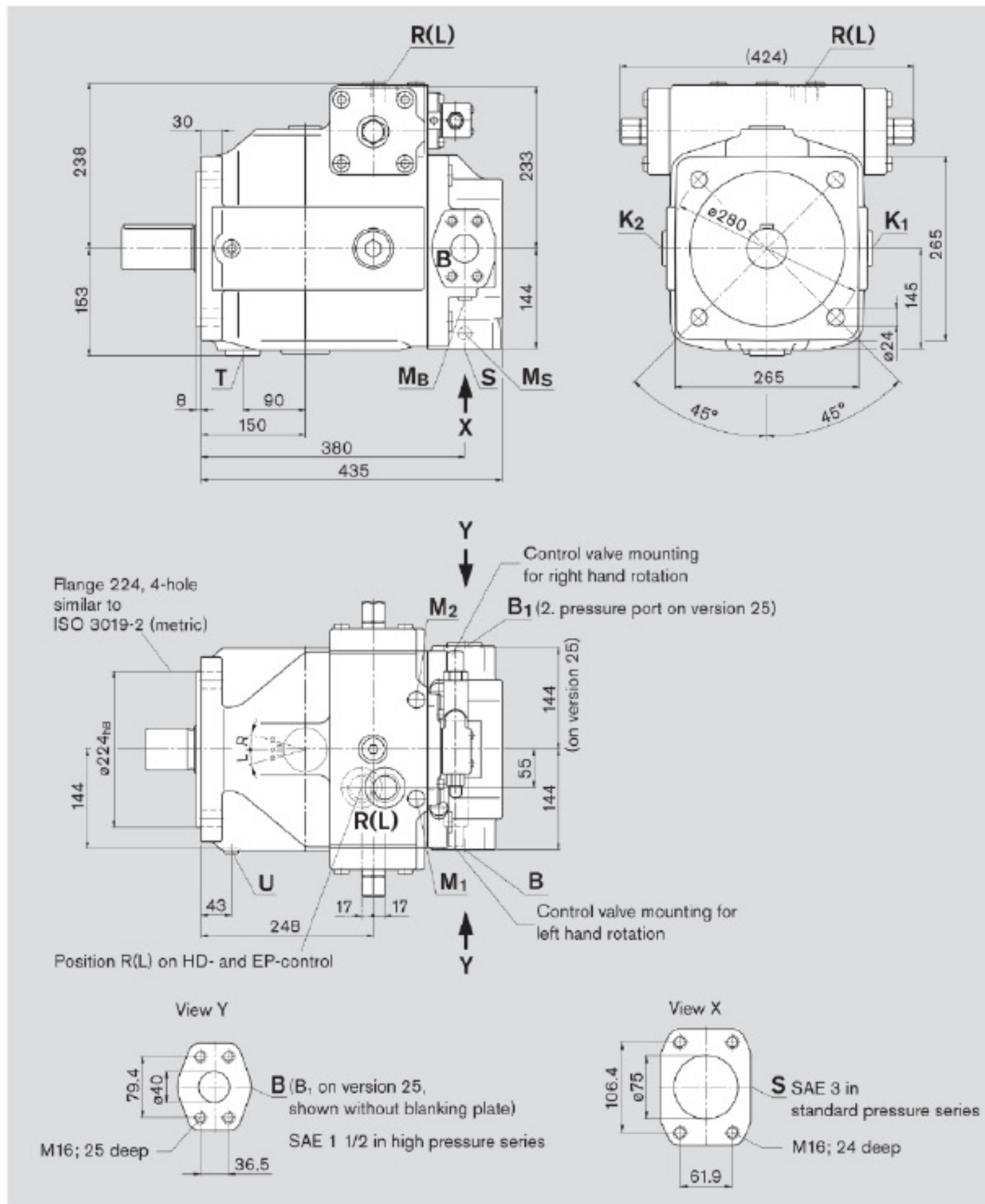
¹⁾ Center bore to DIN 332 (thread to DIN 13)

²⁾ for the max. tightening torques please observe the manufacturer's information on the used fittings and the general information on page 68

³⁾ Caution: metric thread deviates from standard

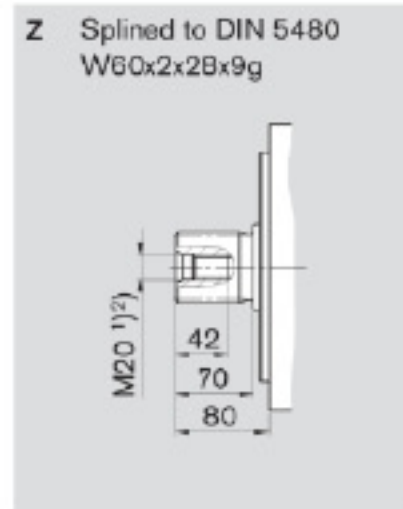
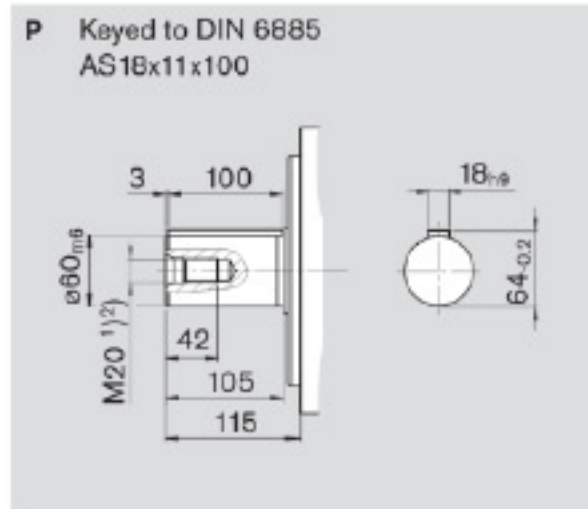
■ Dimensions, Size 250 Series 30:

□ (Example: pressure control; for exact dimensions of the control devices see separate data sheets):



■ Dimensions, Size 250 Series 30:

Shaft ends



Ports

max. tightening torque ²⁾

S	Suction port (standard pressure series) Fixing thread	SAE J518 ³⁾ 3 in DIN 13 M16x2; 24 deep ²⁾	
K ₁ , K ₂	Flushing port	DIN 3852 M42x2; 20 deep (plugged)	720 Nm
T	Drain	DIN 3852 M42x2; 20 deep (plugged)	720 Nm
M _B	Measuring port outlet pressure	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm
M _S	Measuring port suction pressure	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm
R(L)	Fill + air bleed (case drain port)	DIN 3852 M42x2; 20 deep	720 Nm
U	Flushing port	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm
M ₁ , M ₂	Measuring port control chamber pressure	DIN 3852 M18x1,5; 12 deep (plugged)	140 Nm

on version 13

B	Pressure port (high pressure series) Fixing thread	SAE J518 ³⁾ 1 1/2 in DIN 13 M16x2; 25 deep ²⁾	
B ₁	Additional port	DIN 3852 M42x2; 20 deep (plugged)	720 Nm

on version 25

B	Pressure port (high pressure series) Fixing thread	SAE J518 ³⁾ 1 1/2 in DIN 13 M16x2; 25 deep ²⁾	
B ₁	2. pressure port (high pressure series) Fixing thread	SAE J518 ³⁾ 1 1/2 in (closed with blanking plate) DIN 13 M16x2; 25 deep ²⁾	

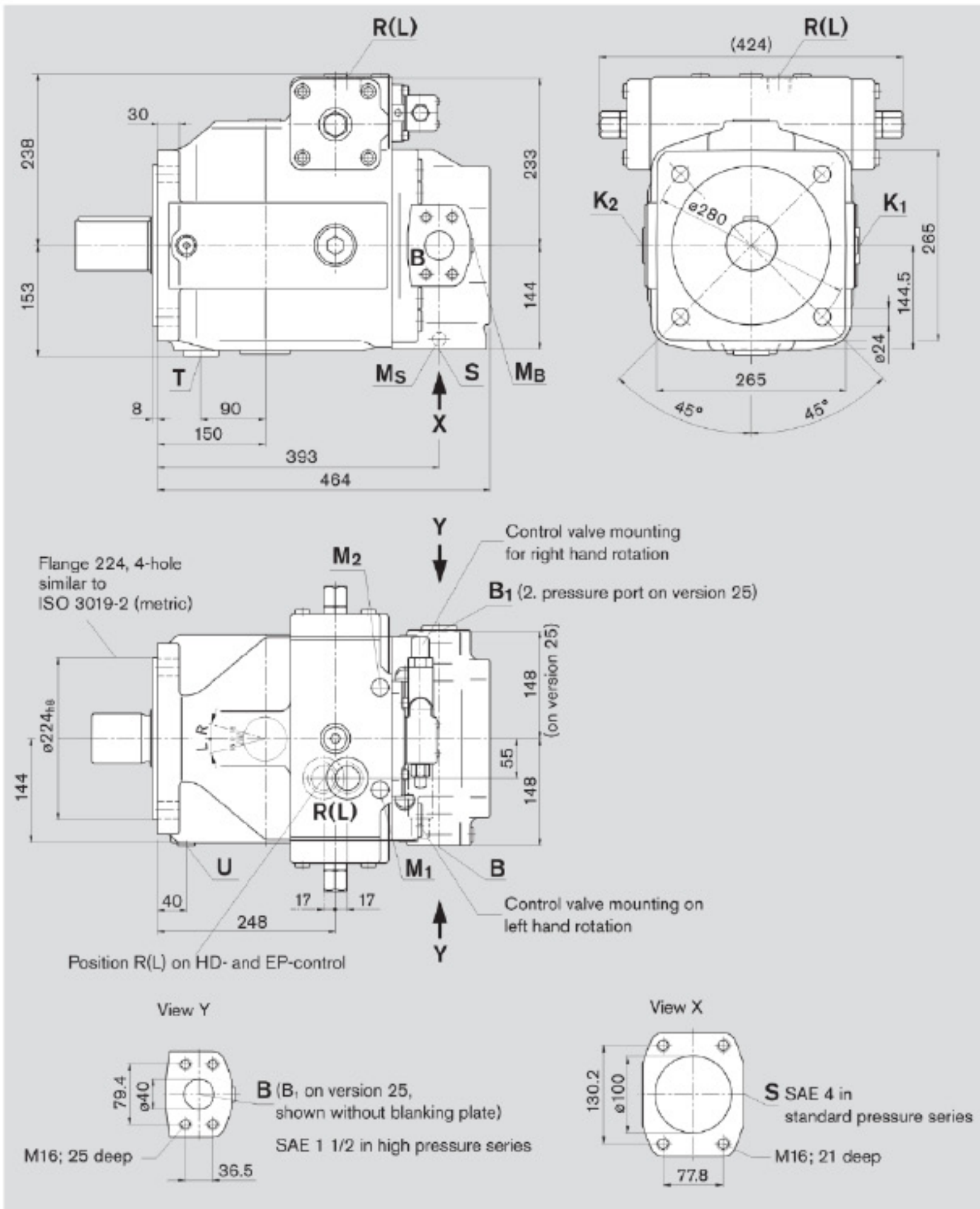
¹⁾ Center bore to DIN 332 (thread to DIN 13)

²⁾ for the max. tightening torques please observe the manufacturer's information on the used fittings and the general information on page 68

³⁾ Caution: thread deviates from standard

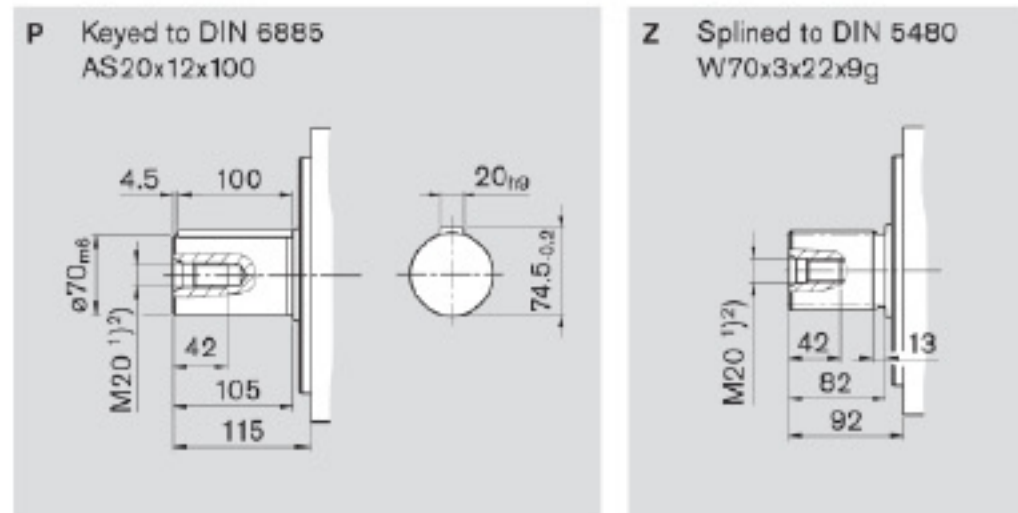
■ Dimensions, Size 300/355/370 Series 20, 30:

□ (Example: pressure control; for exact dimensions of the control devices see separate data sheets):



■ Dimensions, Size 300/355/370 Series 20, 30:

Shaft ends



Ports

max. tightening torque ²⁾

S	Suction port (standard pressure series)	SAE J518 ³⁾ 4 in	
	Fixing thread	DIN 13 M16x2; 21 deep ²⁾	
K ₁ , K ₂	Flushing port	DIN 3852 M42x2; 20 deep (plugged)	720 Nm
T	Drain	DIN 3852 M42x2; 20 deep (plugged)	720 Nm
M _B	Measuring port outlet pressure	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm
M _S	Measuring port suction pressure	DIN 3852 M14x1,5; 12 deep (plugged)	80 Nm
R(L)	Fill + air bleed (case drain port)	DIN 3852 M42x2; 20 deep	720 Nm
U	Flushing port	DIN 3852 M18x1,5; 12 deep (plugged)	140 Nm
M ₁ , M ₂	Measuring port control chamber pressure	DIN 3852 M18x1,5; 12 deep (plugged)	140 Nm

on version 13

B	Pressure port (high pressure series)	SAE J518 ³⁾ 1 1/2 in	
	Fixing thread	DIN 13 M16x2; 25 deep ²⁾	
B _i	Additional port	DIN 3852 M42x2; 20 deep (plugged)	720 Nm

on version 25

B	Pressure port (high pressure series)	SAE J518 ³⁾ 1 1/2 in	
	Fixing thread	DIN 13 M16x2; 25 deep ²⁾	
B _i	2. pressure port (high pressure series)	SAE J518 ³⁾ 1 1/2 in (closed with blanking plate)	
	Fixing thread	DIN 13 M16x2; 25 deep ²⁾	

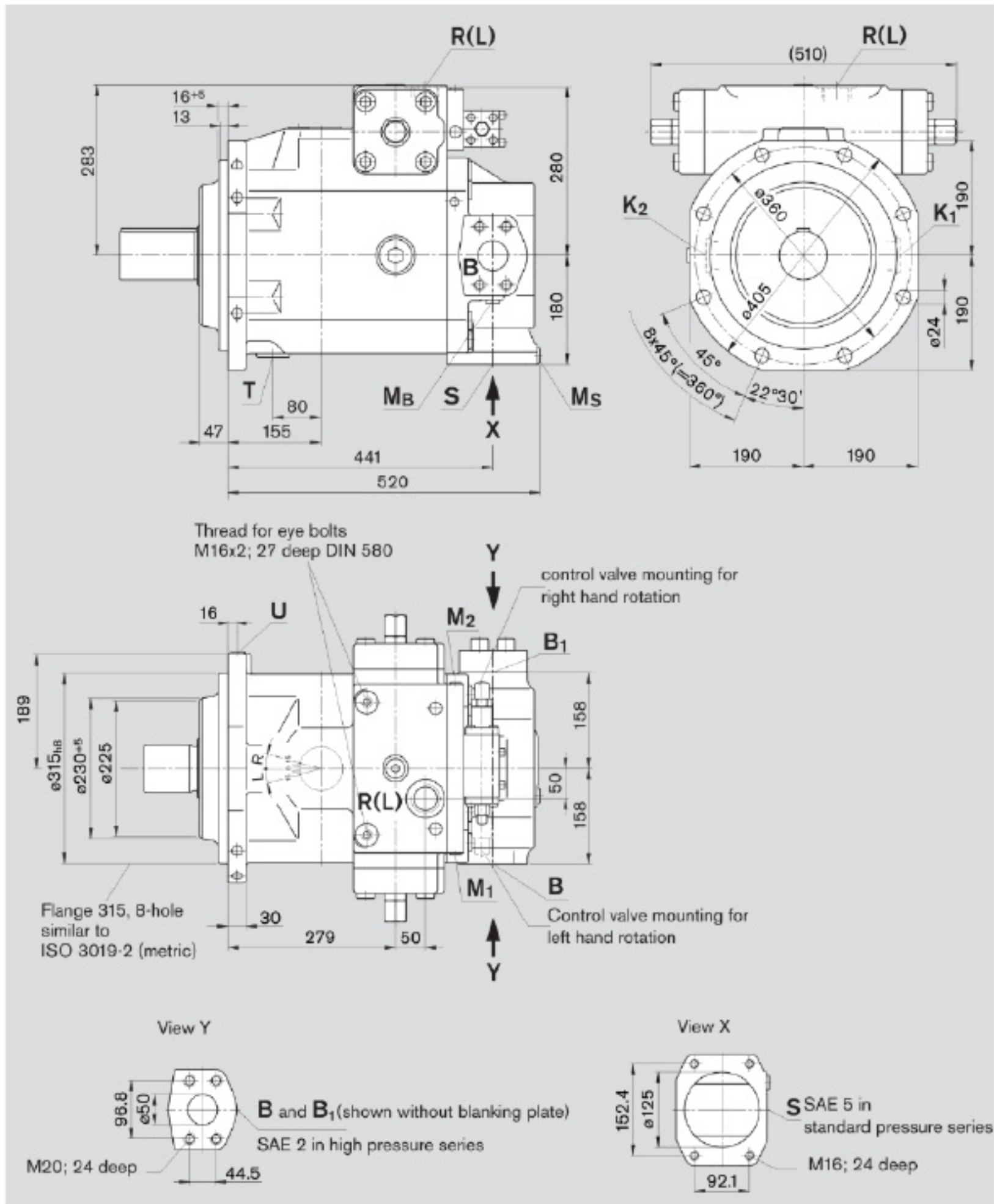
¹⁾ Center bore to DIN 332 (thread to DIN 13)

²⁾ for the max. tightening torques please observe the manufacturer's information on the used fittings and the general information on page 68

³⁾ Caution: metric thread deviates from standard

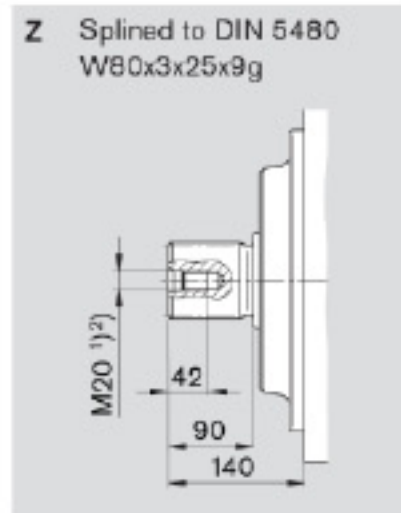
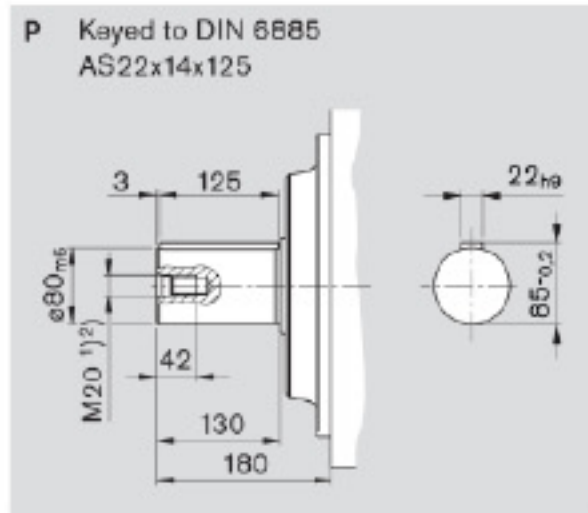
■ Dimensions, Size 500 Series 30:

□ (Example: pressure control; for exact dimensions of the control devices see separate data sheets):



■ Dimensions, Size 500 Series 30:

Shaft ends



Ports

max. tightening torque ²⁾

S	Suction port (standard pressure series) Fixing thread	SAE J518 ³⁾ 5 in DIN 13 M16x2; 24 deep ²⁾	
K ₁ , K ₂	Flushing port	DIN 3852 M48x2; 22 deep (plugged)	960 Nm
T	Drain	DIN 3852 M48x2; 22 deep (plugged)	960 Nm
M _B	Measuring port outlet pressure	DIN 3852 M18x1,5; 12 deep (plugged)	140 Nm
M _S	Measuring port suction pressure	DIN 3852 M18x1,5; 12 deep (plugged)	140 Nm
R(L)	Fill + air bleed (case drain port)	DIN 3852 M48x2; 22 deep	960 Nm
U	Flushing port	DIN 3852 M18x1,5; 12 deep (plugged)	140 Nm
M ₁ , M ₃	Measuring port control chamber pressure or dependent on control device	DIN 3852 M18x1,5; 12 deep (plugged) DIN 3852 M14x1,5; 12 deep (plugged)	140 Nm 80 Nm
B	Pressure port (high pressure series) Fixing thread	SAE J518 ³⁾ 2 in DIN 13 M20x2,5; 24 deep ²⁾	
B ₁	2. pressure port (high pressure series) Fixing thread	SAE J518 ³⁾ 2 in (closed with blanking plate) DIN 13 M20x2,5; 24 deep ²⁾	

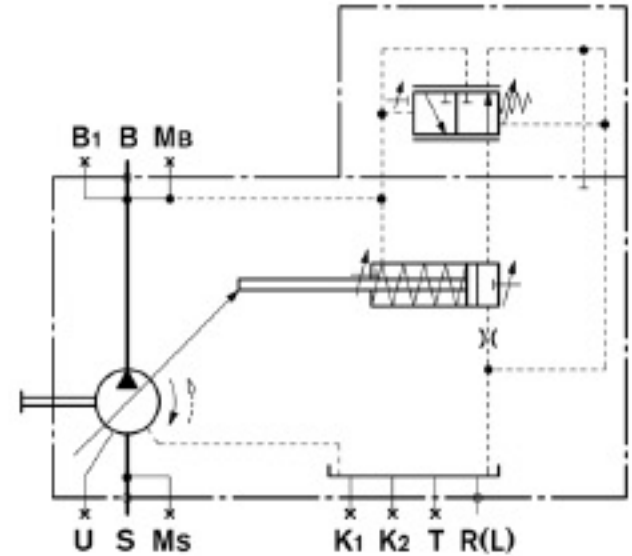
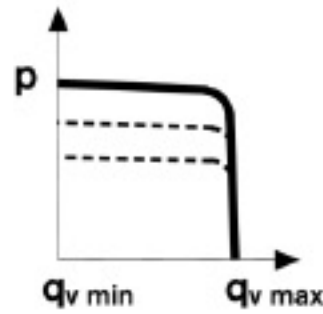
¹⁾ Center bore to DIN 332 (thread to DIN 13)

²⁾ for the max. tightening torques please observe the manufacturer's information on the used fittings and the general information on page 68

³⁾ Caution: metric thread deviates from standard

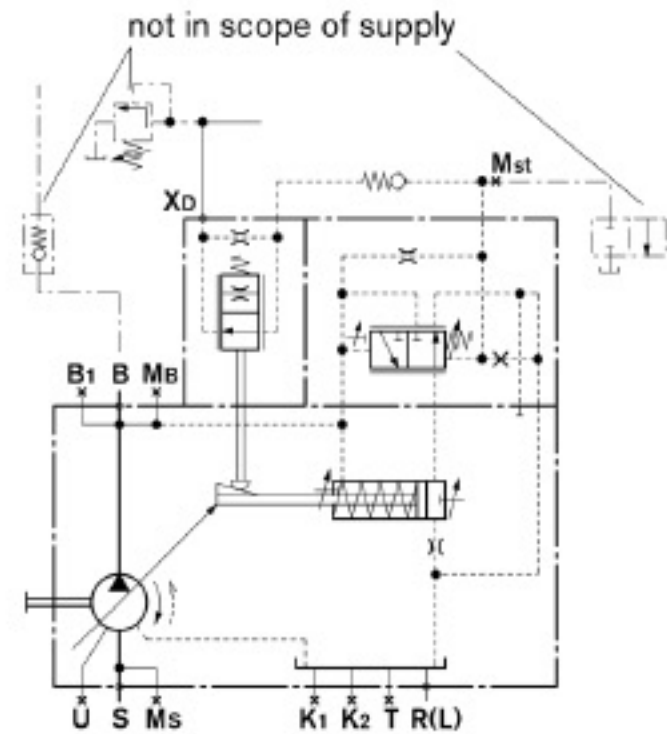
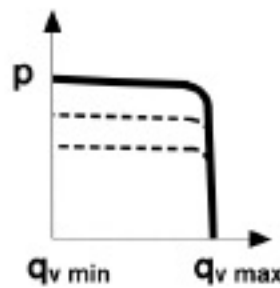
■ Pressure control DR:

- The DR-pressure control limits the maximum pressure at the pump outlet within the pump's control range. This max. pressure level can be steplessly set at the control valve.
- Setting range 20...350 bar
- Optional:
Remote control (DRG)



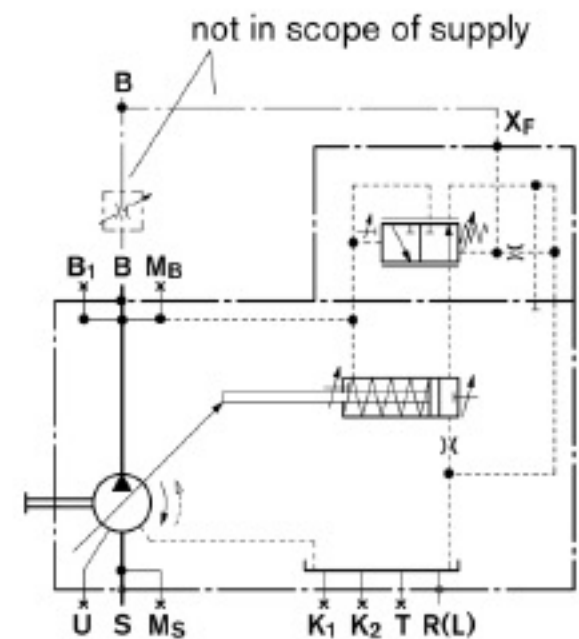
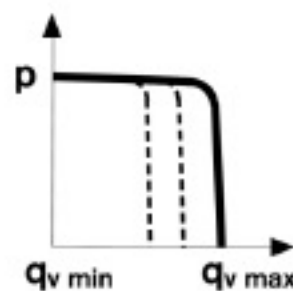
■ Pressure control for parallel operation DP:

- Suitable for pressure control with multiple A4VSO axial piston pumps in parallel operation.
- Optional:
Flow control (DPF)



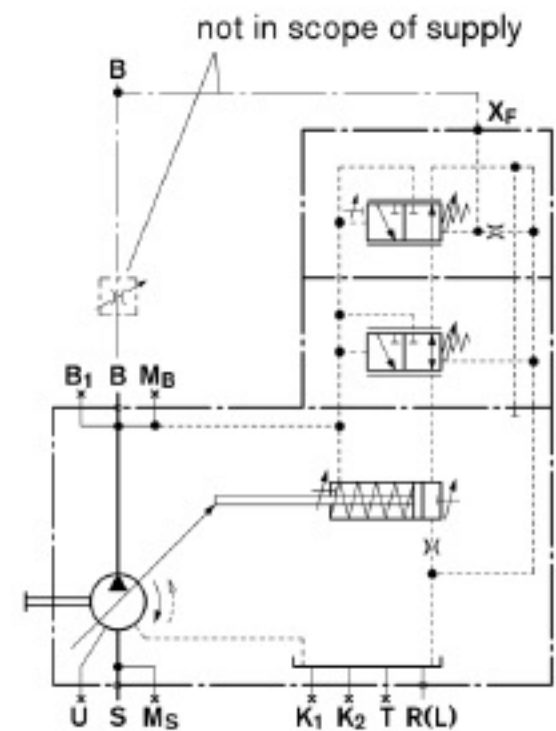
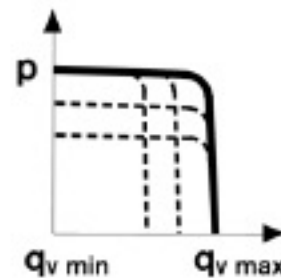
■ Flow control FR:

- Maintains a constant flow in a hydraulic system.
- Optional:
Remote pressure control (FRG)
connection between X_F and tank closed (FR1, FRG1)



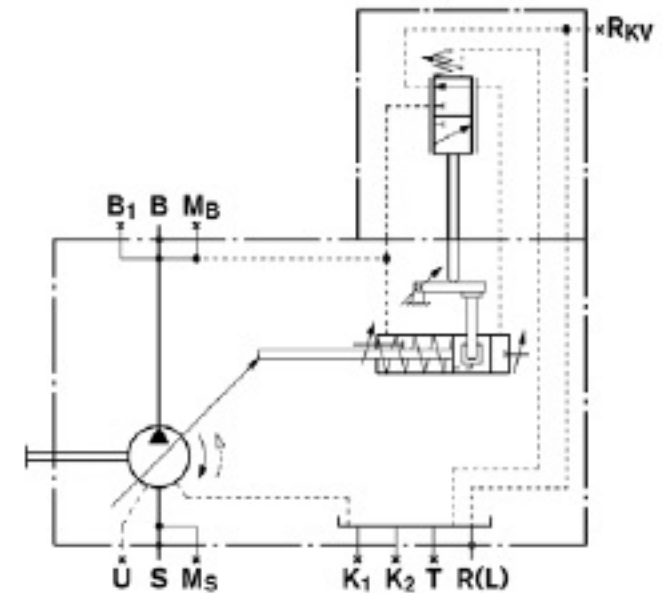
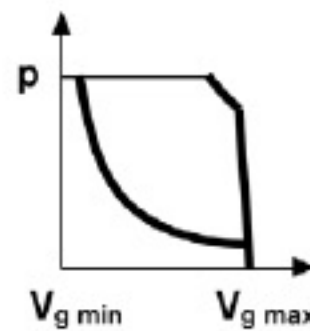
■ Pressure and flow control DFR:

- This control maintains a constant flow from the pump even under varying operating conditions.
- Overriding this control is a mechanically adjustable pressure control.
- Optional: connection between X_F and tank closed (DFR1)



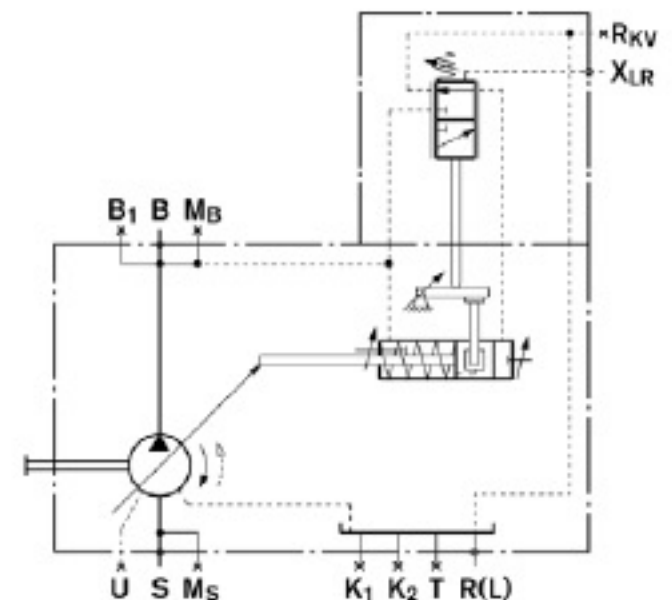
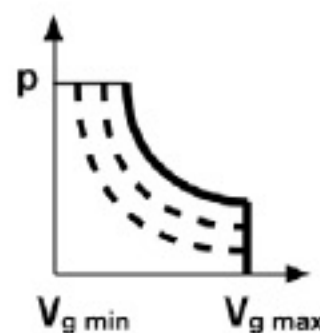
■ Power control LR2 with hyperbolic characteristic:

- The hyperbolic power control maintains a constant preset drive power at the same input speed.
- Optional:
 - Pressure control (LR2D), remotely controlled (LR2G);
 - Flow control (LR2F, LR2S);
 - Hydraulic stroke limiter (LR2H);
 - Mechanical stroke limiter (LR2M);
 - Hydraulic two-point control (LR2Z);
 - with electric unloading valve for easy start (LR2Y).

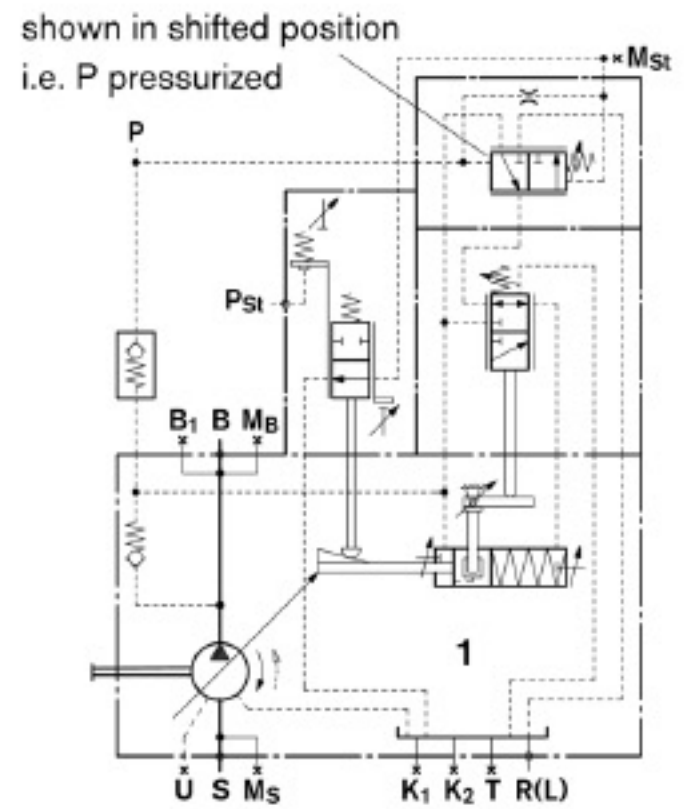
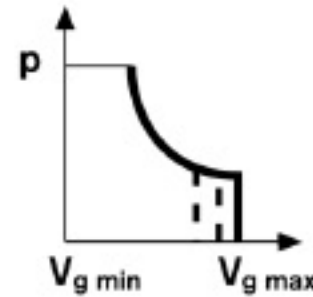
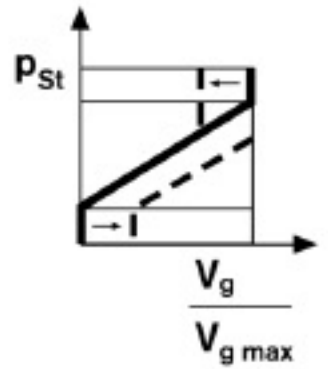


■ Power control LR3 with remote control of power characteristics:

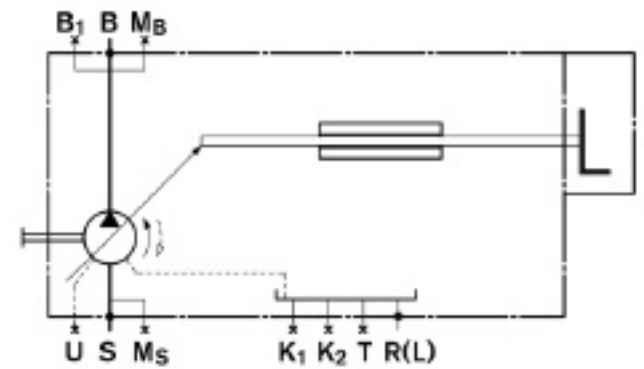
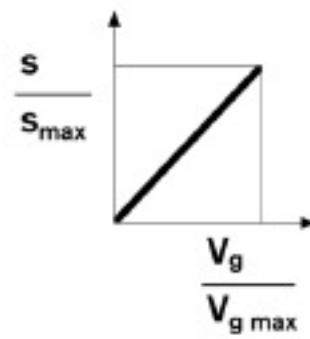
- This power control maintains a constant preset drive power, with remote control of the power characteristics.
- Optional:
 - Pressure control (LR3D), remotely controlled (LR3G);
 - Flow control (LR3F, LR3S);
 - Hydraulic stroke control (LR3H);
 - Mechanical stroke control (LR3M);
 - Hydraulic two-point control (LR3Z);
 - with electric unloading valve for easy start (LR3Y)



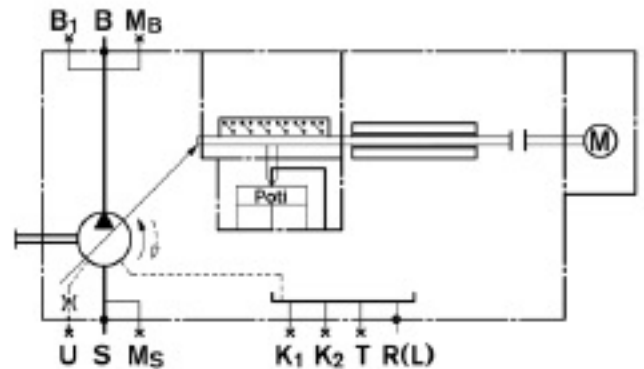
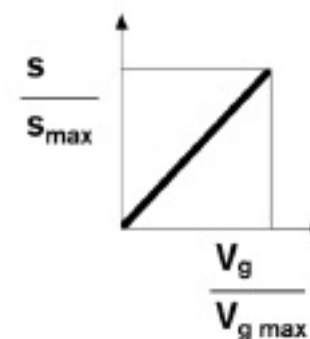
- Hydraulic control LR2N and LR3N pilot pressure dependent, initial position $V_{g \min}$:
 - With overriding power control.
 - The pump displacement is proportional to a pilot pressure signal in P_{St} .
 - The additional hyperbolic power control overrides the pilot pressure signal and holds the preset drive power constant.
 - Optional:
 - Remote control of power characteristics (LR3N)
 - Pressure control (LR.DN),
 - Remote pressure control (LR.GN)
 - Electric control of pilot pressure signal (LR.NT)



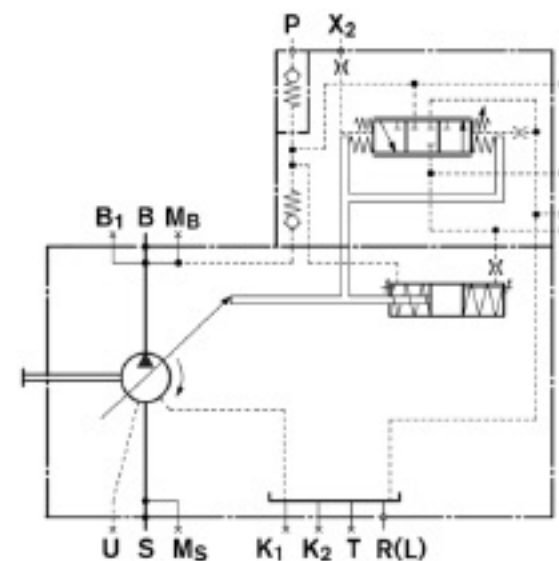
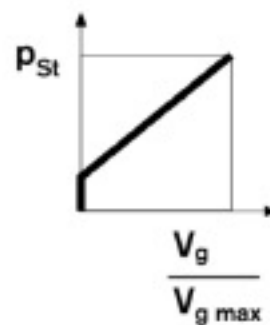
- Manual control MA:
- Stepless adjustment of displacement by means of a handwheel.



- Electric motor control EM:
- Stepless adjustment of displacement via an electric motor.
- Various intermediate displacement values can be selected with a programmed sequence control, by means of built on limit switches and an optional potentiometer for feedback signal.

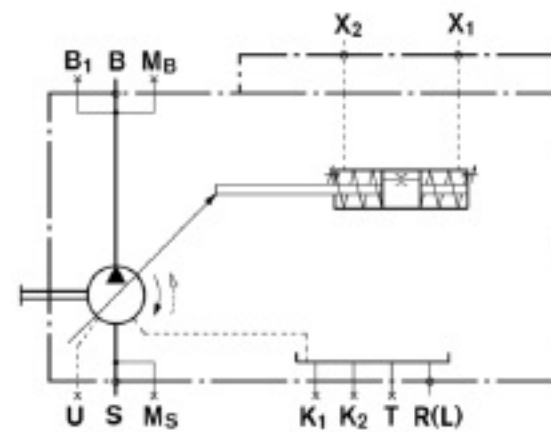


- Hydraulic control HD pilot pressure dependent:
- Stepless adjustment of displacement proportional to a pilot pressure signal. The displacement is proportional to the applied pilot pressure (Difference between pilot pressure level and pump case pressure).
- Optional:
 - Pilot pressure curves (HD1, HD2, HD3)
 - Pressure control (HD.B),
 - Remote pressure control (HD.GB)
 - Power control (HD1P)
 - with electric control of pilot pressure (HD1T)



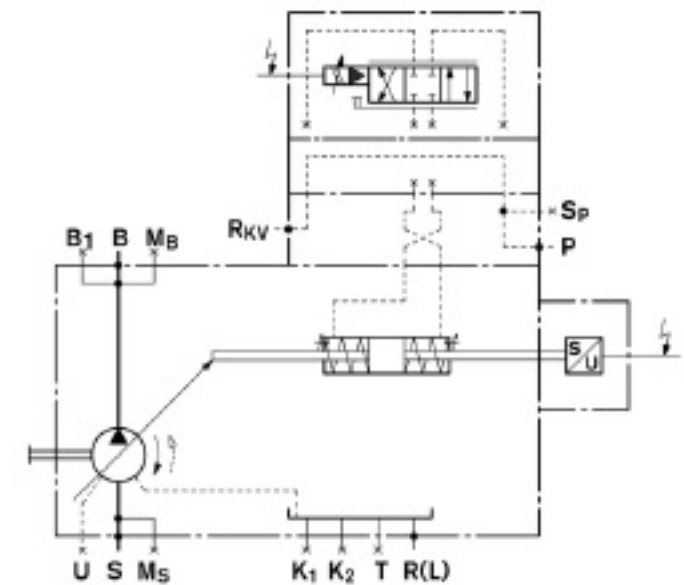
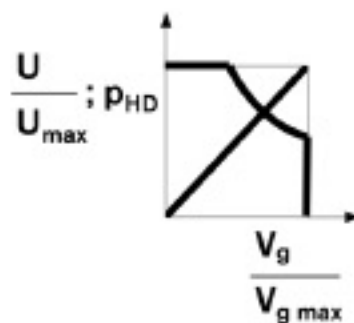
■ Hydraulic control HM 1/2, control volume dependent:

- The pump displacement is infinitely variable in relation to the control oil volume in ports X₁ and X₂.
- Application:
2-point control
basic control device for servo or proportional valve control



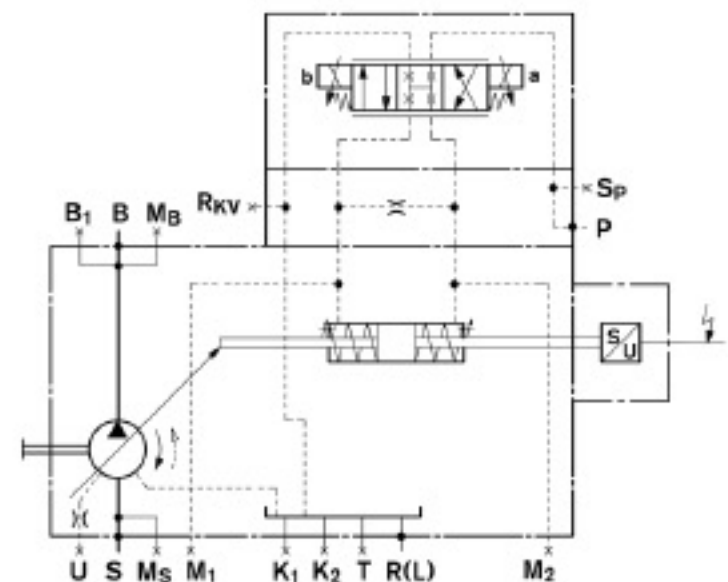
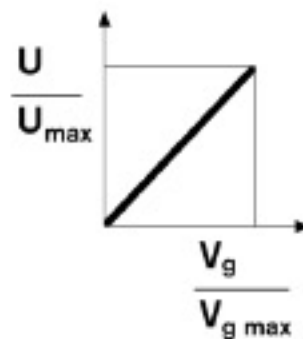
■ Control system HS, HS4, with servo or proportional valve:

- The stepless displacement control is accomplished by means of servo or proportional valve with electrical feedback of the swivel angle.
- The HS4P-control system is fitted with a built on pressure transducer so that it can be utilized for electrical pressure and power control.
- Optional:
Servo valve (HS);
Proportional valve (HS4);
Short circuit valve (HSK, HS4K, HS4K P);
Without valves (HSE, HS4E).
For oil-immersed use (HS4M)



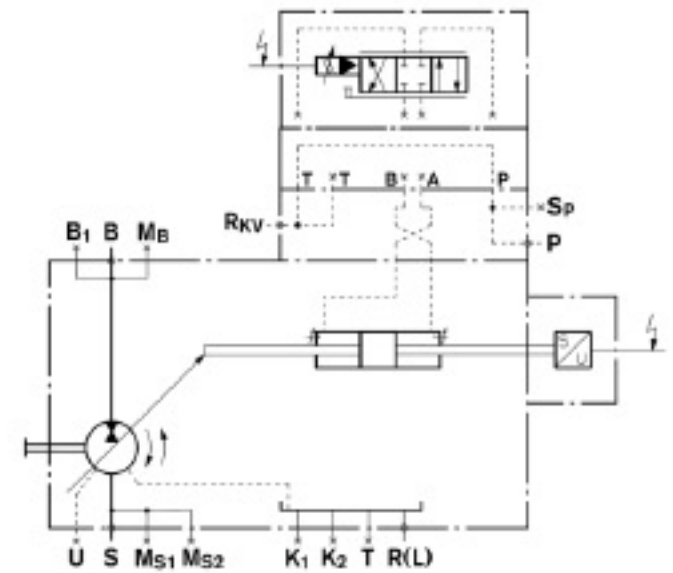
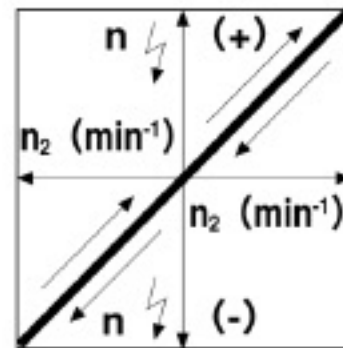
■ Control system EO1/2:

- The stepless adjustment of the displacement is accomplished by means of a proportional valve with electrical feedback of the swivel angle.
- This control can be utilized as an electric control of displacement.
- Optional:
Control pressure range (EO1, EO2)
Short circuit valve (EO1K, EO2K)
Without valves (EO1E, EO2E)



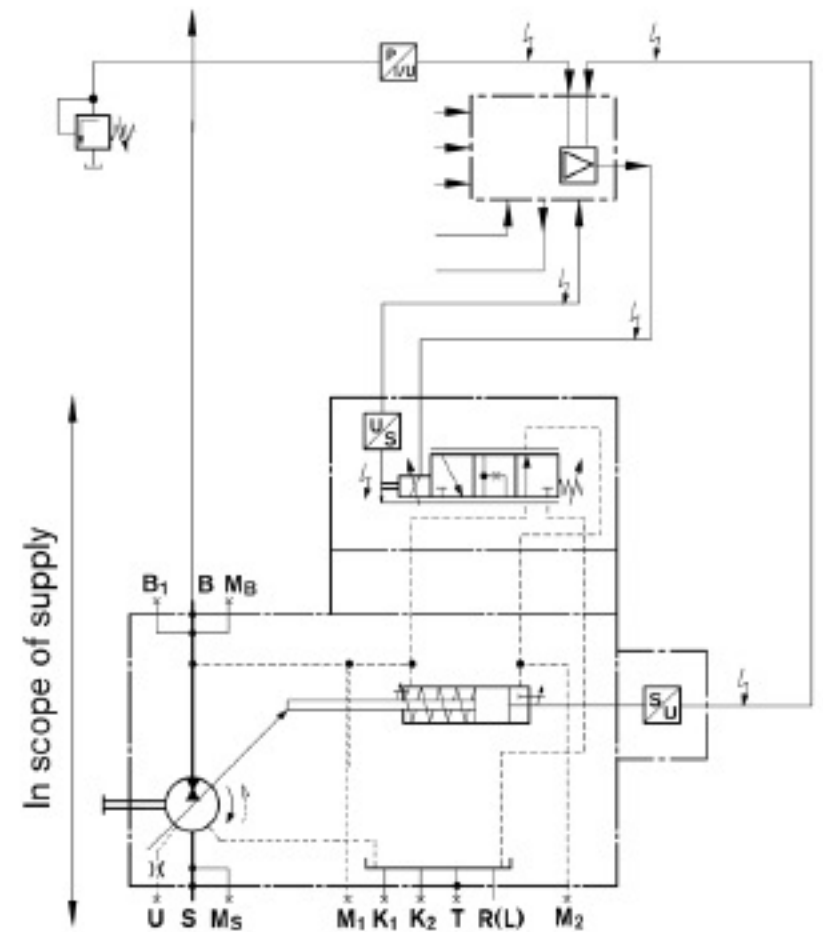
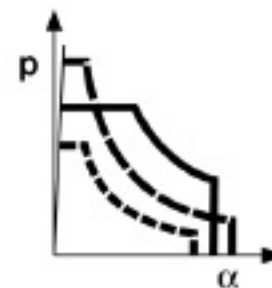
■ Speed control DS1, secondary controlled:

- The speed control DS1 controls the secondary unit (motor) in such a manner, that this motor delivers sufficient torque to maintain the required output speed. When connected to a constant pressure system, this torque is proportional to motor displacement and thus also proportional to the swivel angle.



■ Electro hydraulic control system DFE1:

- The power, pressure and swivel angle control of the variable pump A4VSO...DFE1 is accomplished by means of an electrically controlled proportional valve. A current signal to the proportional valve moves the control piston and determines via an integrated positional transducer the cradle's swivel angle and thus the pump flow. When the electric drive motor is switched off and the system is pressureless, the bias spring in the control chamber will swivel the pump to max. displacement ($V_{g\max}$).



- **Through drive:**
 - The axial piston unit A4VSO can be equipped with a through drive, as shown in the type code "K/U31...99";
 - The through drive execution is designated by the code K/U 31...99.
 - We recommend, that no more than three pumps be coupled together.
- **Single pump with through drive:**

If no further pumps are factory-mounted the simple type code is sufficient.

 - included in this case are:
 - on all through drives except K/U 99
 - shaft coupler, mounting screws, seal and if required an adapter flange on K/U 99
 - with through drive shaft, without shaft coupler, without adapter flange; unit is closed with pressure tight cover.
 - Universal through drive

On pump sizes 125...355 all through drives are supplied as universal through drives „U“ .

These have the advantage, that they can be adapted later on.

Simply by exchanging the adapter flange and the shaft coupler it is possible to convert the through drive option.

The conversion sets must be ordered separately.

- **Combination pumps:**
 - Independent circuits are available for the user when further pumps are built on.
 - 1. If the combination consists of 2 axial piston pumps, and if this must be factory mounted , the two individual type codes must be joined by a "+" .
 - Ordering example:
 - A4VSO125DR/30R-PPB13K33 + A4VSO71DR/10R-PZB13N00
 - 2. If a gear or a radial piston pump must be factory mounted as the second pump please consult us.

■ **Permissible input and through drive torques:**

Size		40	71	125	180	250	355	500		
Splined shaft										
Max. perm. total input torque at shaft of pump 1 (Pump 1 + pump 2)		$T_{tot\ max}$	Nm	446	790	1392	2004	2782	3952	5566
A Perm. through drive torque		$T_{D1\ max}$	Nm	223	395	696	1002	1391	1976	2783
		$T_{D2\ max}$	Nm	223	395	696	1002	1391	1976	2783
B Perm. through drive torque		$T_{D1\ max}$	Nm	223	395	696	1002	1391	1976	2783
		$T_{D2\ max}$	Nm	223	395	696	1002	1391	1976	2783
Keyed shaft										
Max. perm. total input torque at shaft of pump 1 (Pump 1 + pump 2)		$T_{tot\ max}$	Nm	380	700	1392	1400	2300	3557	5200
A Perm. through drive torque		$T_{D1\ max}$	Nm	223	395	696	1002	1391	1976	2783
		$T_{D2\ max}$	Nm	157	305	696	398	909	1581	2417
B Perm. through drive torque		$T_{D1\ max}$	Nm	157	305	696	398	909	1581	2417
		$T_{D2\ max}$	Nm	223	395	696	1002	1391	1976	2783

■ **Distribution of torques:**



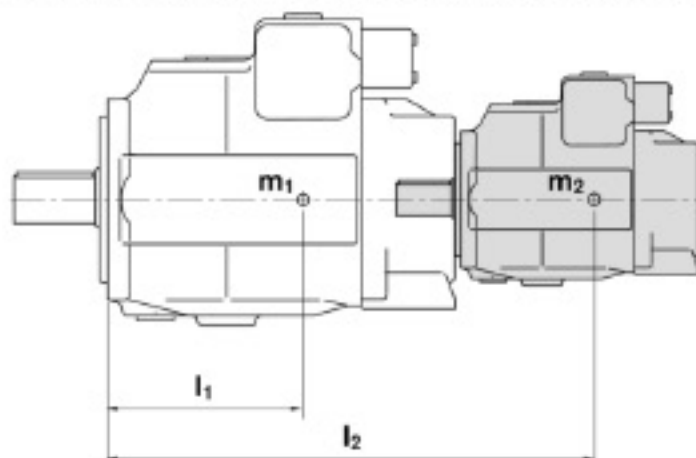
■ Overview of A4VSO through drive options:

Through drive - A4VSO			Mounting option 2. pump					Through drive
Flange	Coupler for splined shaft ⁵⁾	Code	A4VSO/G size (shaft)	A4CSG size (shaft)	A10V(S)O/31(2) ³⁾ size (shaft)	A10V(S)O/52(3) size (shaft)	External/internal gear pump	available for size
Flange ISO 3019-2 (metric)								
80, 2-hole	19-4 (3/4in, 11T) ³⁾	K/UB2	-	-	18 (S)/31	10 (S)	-	71
100, 2-hole	22-4 (7/8in, 13T) ³⁾	K/UB3	-	-	28 (S)/31	-	-	40...180
	25-4 (1in, 15T) ³⁾	K/UB4	-	-	45 (S)/31	-	-	40...500
125, 2-hole	32-4 (1 1/4in, 14T) ³⁾	K/UB5	-	-	71 (S)/31	-	-	71...355
	38-4 (1 1/2in, 17T) ³⁾	UB6	-	-	100 (S)/31	-	-	in preparation
125, 4-hole	W 32x2x14x9g ²⁾	K/U31	40 (Z)	-	-	-	-	40...500
140, 4-hole	W 40x2x18x9g ²⁾	K/U33	71 (Z)	-	-	-	-	71...750
160, 4-hole	W 50x2x24x9g ²⁾	K/U34	125 (Z)	-	-	-	-	125...750
			180 (Z)	-	-	-	-	180...750
	32-4 (1 1/4in, 14T) ³⁾	UB8	-	-	71 (S)/32	-	-	250
180, 4-hole	44-4 (1 3/4in, 13T) ³⁾	K/UB7	-	-	140 (S)/31/32	-	-	180... 500
	38-4 (1 1/2in, 17T) ³⁾	UB9	-	-	100 (S)/32	-	-	in preparation
224, 4-hole	W 60x2x28x9g ²⁾	K/U35	250 (Z)	250 (Z)	-	-	-	250...750
	W 70x3x22x9g ²⁾	K/U77	355 (Z)	355 (Z)	-	-	-	355, 500
315, 8-hole	W 80x3x25x9g ²⁾	K43	500 (Z)	500 (Z)	-	-	-	500, 750
Flange SAE J 744 (ISO 3019-1)								
82-2 (A) ¹⁾	16-4 (5/8in, 9T) ³⁾	K/U01	-	-	-	-	AZ-PF-1X-004...022 ⁴⁾	40...750
	19-4 (3/4in, 11T) ³⁾	K/U52	-	-	18 (S)/31	10, 18 (S)	-	40 u. 71
101-2 (B) ¹⁾	22-4 (7/8in, 13T) ³⁾	K/U68	-	-	28 (S)/31	28 (S)	AZ-PN-1X-020...032 ⁴⁾	40...500
	25-4 (1in, 15T) ³⁾	K/U04	-	-	45 (S)/31	45 (S)	PGH4	40...500
127-2 (C) ¹⁾	32-4 (1 1/4in, 14T) ³⁾	K/U07	-	-	71 (S)/31	-	-	71...500
	38-4 (1 1/2in, 17T) ³⁾	K/U24	-	-	100 (S)/31	85 (S)	PGH5	125...500
152-4 (D) ¹⁾	44-4 (1 3/4in, 13T) ³⁾	K/U17	-	-	140 (S)/31	-	-	180...500
Dia 63-4, metr. Keyed dia 25		K/U57	-	-	-	-	R4	40 u. 71

- 1) 2 = 2-hole, 4 = 4-hole
 2) to DIN 5480
 3) Splined shafts acc. to SAEJ744 OCT83
 4) Huade recommends special executions of the gear pumps.
 5) If a through drive for an A10V(S)O with R-shaft is desired, please consult us.
 6) Keyed shaft on through drive code K/U57.

■ Permissible mass moment of inertia:

□ referred to the mounting flange of the main pump:



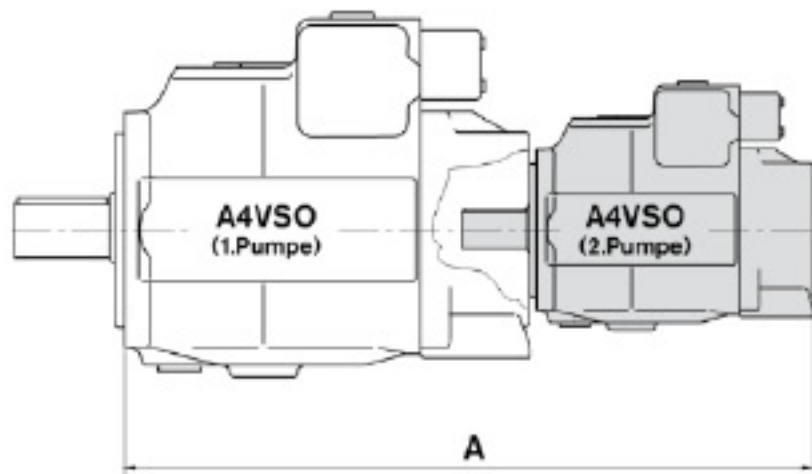
m_1, m_2 [kg] Weight of pump

l_1, l_2 [mm] Distance center of gravity

$$T_{in} = m_1 \cdot l_1 \cdot \frac{1}{102} + m_2 \cdot l_2 \cdot \frac{1}{102} \text{ [Nm]}$$

Size		40	71	125	180	250	355	500
Perm. mass moment of inertia	$T_{in, perm.}$ Nm	1800	2000	4200	4200	9300	9300	15600
Perm. mass moment at dynam. acceleration of 10 g $\hat{=}$ 98,1 m/sec ²	$T_{in, perm.}$ Nm	180	200	420	420	930	930	1560
Weight (A4VSO...DR)	m kg	39	53	88	102	184	207	320
Distance center of gravity	l_f mm	120	140	170	180	210	220	230

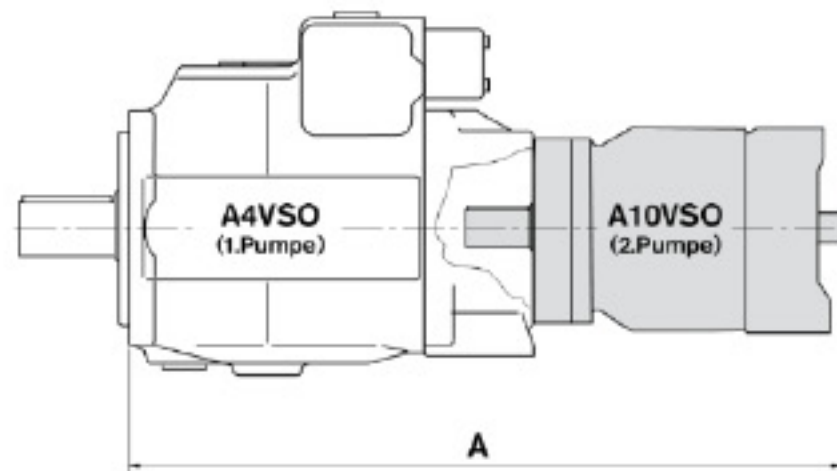
- Dimensions combination pumps:
- A4VSO + A4VSO



- Overall length A:

A4VSO (1. pump)	A4VSO..DR..N00 (2. pump)						
	Size 40	Size 71	Size 125	Size 180	Size 250	Size 355	Size 500
Size 40	554	-	-	-	-	-	-
Size 71	582	611	-	-	-	-	-
Size 125	635	664	724	-	-	-	-
Size 180	659	688	748	768	-	-	-
Size 250	719	748	808	828	904	-	-
Size 355	748	777	837	857	933	962	-
Size 500	771	800	860	880	976	1005	1110

- A4VSO + A10VSO



- Overall length A:

A4VSO (1. pump)	A10VSO.../31 (2. pump)					
	Size 18	Size 28	Size 45	Size 71	Size 100	Size 140
Size 40	458	496	514	-	-	-
Size 71	486	497	540	580	-	-
Size 125	564	575	593	628	698	-
Size 180	588	599	617	652	722	744
Size 250	648	659	677	712	782	791
Size 355	*	*	706	741	*	820
Size 500	700	711	729	764	857	868

- Dimensions through drives...K31:
- Flange ISO 3019-2 125, 4-hole; Shaft coupler to DIN 5480 N32x2x14x8H
- for mounting an A4VSO/G 40 splined shaft:

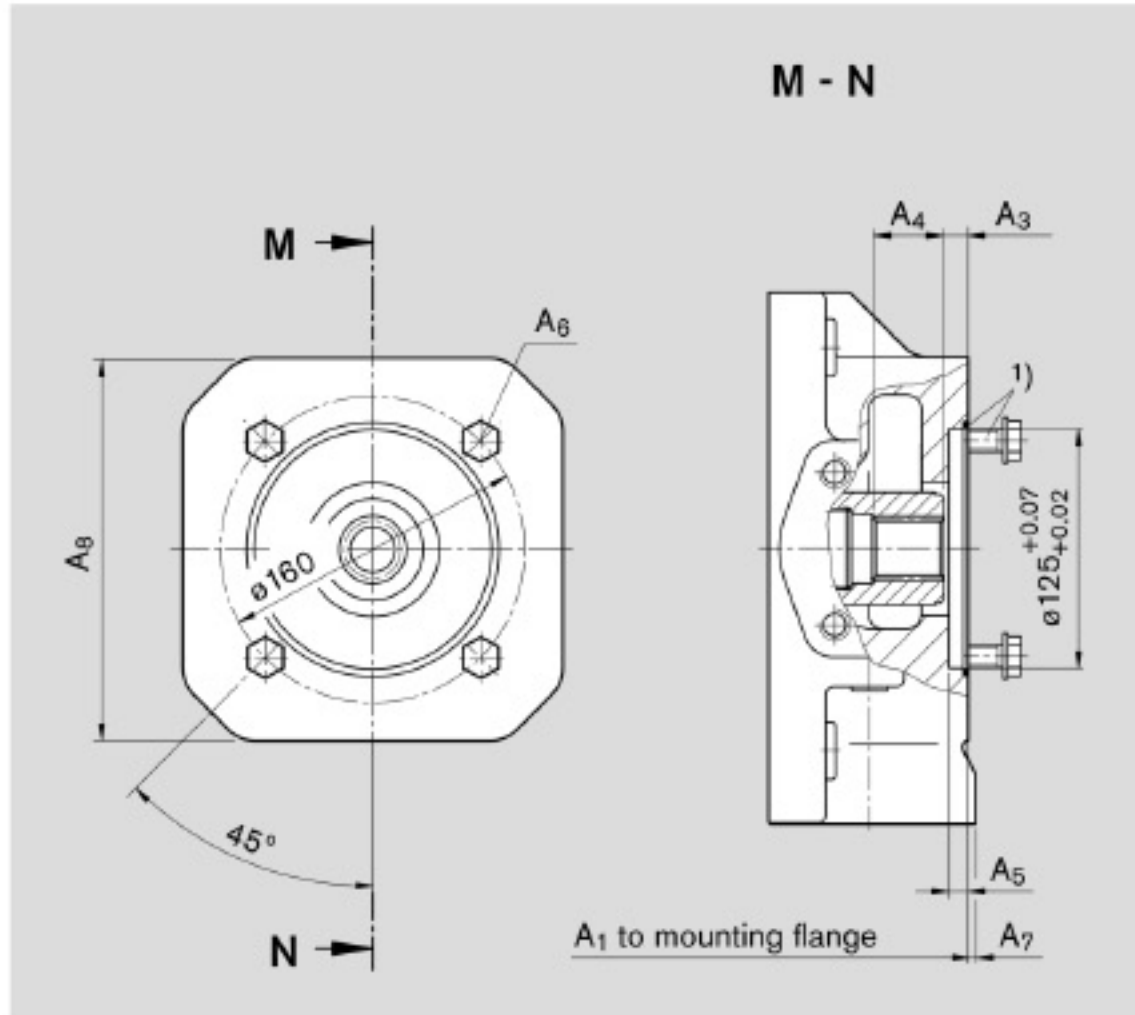
□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
40	288	12,5	40	9	M12
71	316	12,5	33,6	9	M12
500	505	12,5	38,5	9	M12

Size	A ₇	A ₈
40	-	-
71	-	-
500	15	240

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.



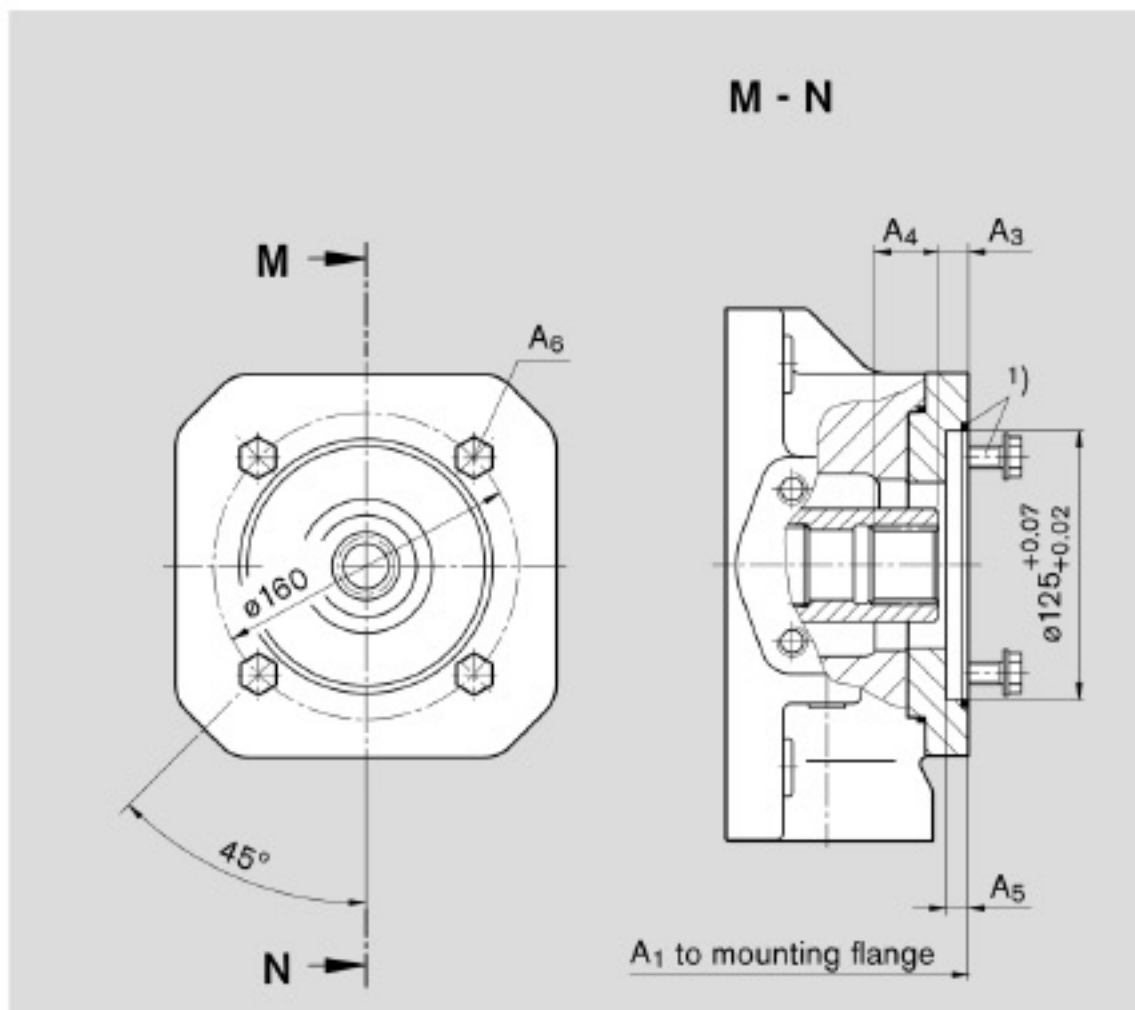
- Dimensions through drives...U31:
- Flange ISO 3019-2 125, 4-hole Shaft coupler to DIN 5480 N32x2x14x8H
- for mounting an A4VSO/G 40 splined shaft:

□ Dimensions:

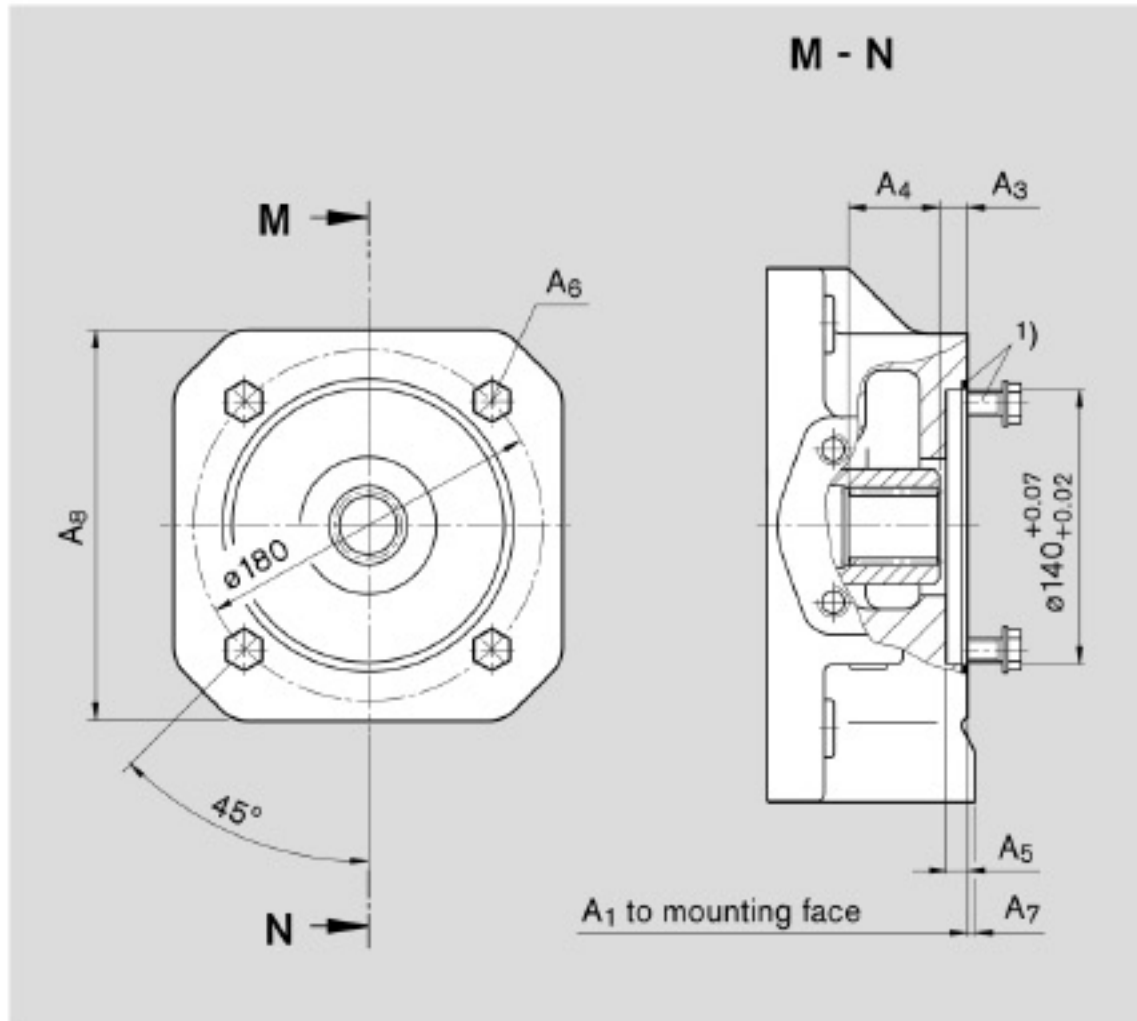
Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
125	369	12,5	35,6	9	M12
180	393	12,5	35,6	9	M12
250	453	12,5	38	9	M12
355	482	12,5	38	9	M12

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.



- Dimensions through drives...K33:
- Flange ISO 3019-2 140, 4-hole; Shaft coupler to DIN 5480 N40x2x18x8H
- for mounting an A4VSO/G 71 splined shaft:



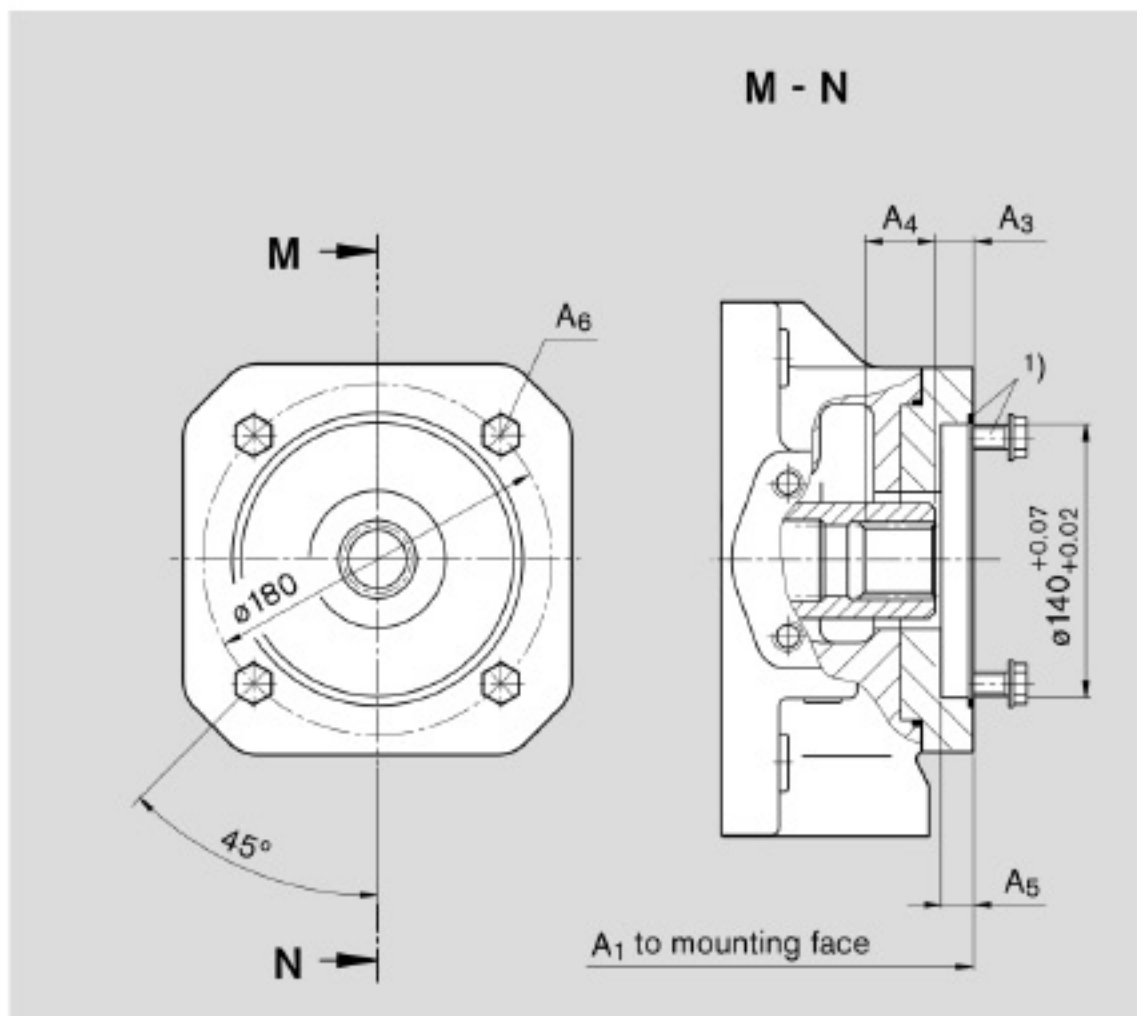
□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
71	316	11,5	42,8	9	M12
500	505	12,5	57	9	M12

Size	A ₇	A ₈
71	-	-
500	15	240

- 1) Mounting screws and O-ring seal are included with supply.
- 2) Thread to DIN 13, for the max. tightening torques observe the general information.

- Dimensions through drives...U33:
- Flange ISO 3019-2 140, 4-hole; Shaft coupler to DIN 5480 N40x2x18x8H
- for mounting an A4VSO/G 71 splined shaft:



□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
125	369	12,5	43,8	9	M12
180	393	12,5	43,8	9	M12
250	453	12,5	48,9	9	M12
355	482	12,5	48	9	M12

- 1) Mounting screws and O-ring seal are included with supply.
- 2) Thread to DIN 13, for the max. tightening torques observe the general information.

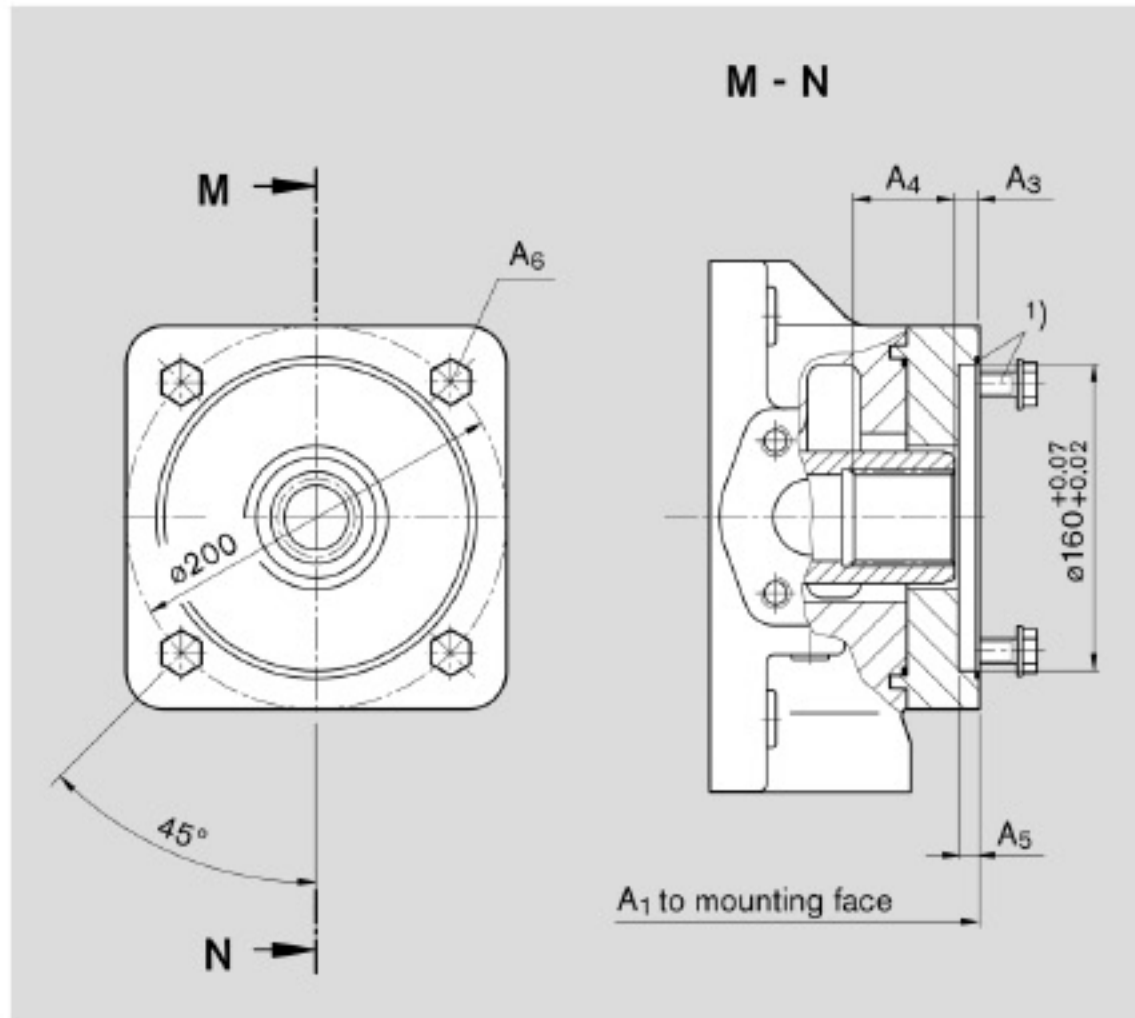
- Dimensions through drives...K34:
- Flange ISO 3019-2 160, 4-hole; Shaft coupler to DIN 5480 N50x2x24x8H
- for mounting an A4VSO/G 125 or 180 splined shaft:

□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
500	505	13,5	54,5	9	M16

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.



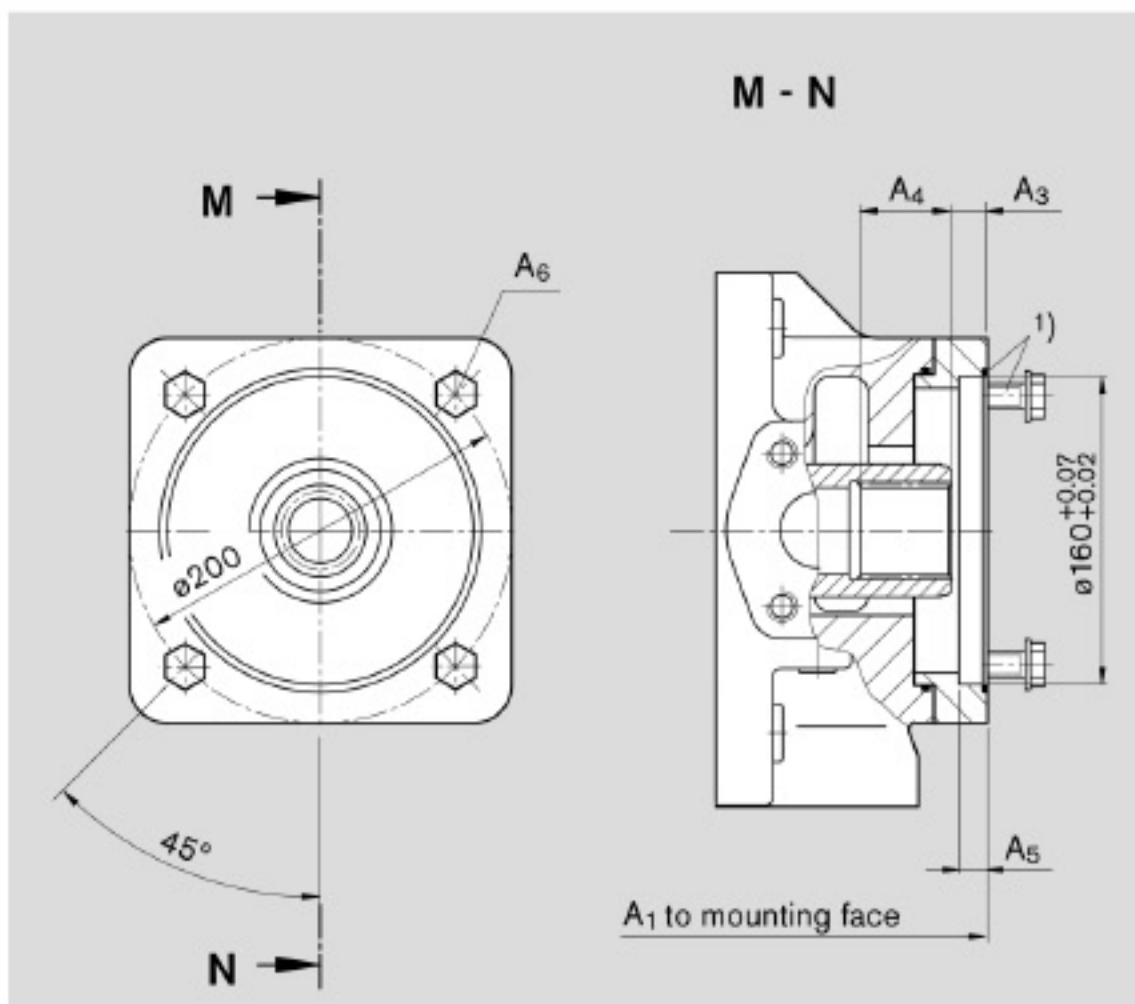
- Dimensions through drives...U34:
- Flange ISO 3019-2 160, 4-hole; Shaft coupler to DIN 5480 N50x2x24x8H
- for mounting an A4VSO/G 125 or 180 splined shaft:

□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
125	369	12,5	51,6	9	M16
180	393	12,5	51,6	9	M16
250	453	12,5	54	9	M16
355	482	12,5	54	9	M16

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.



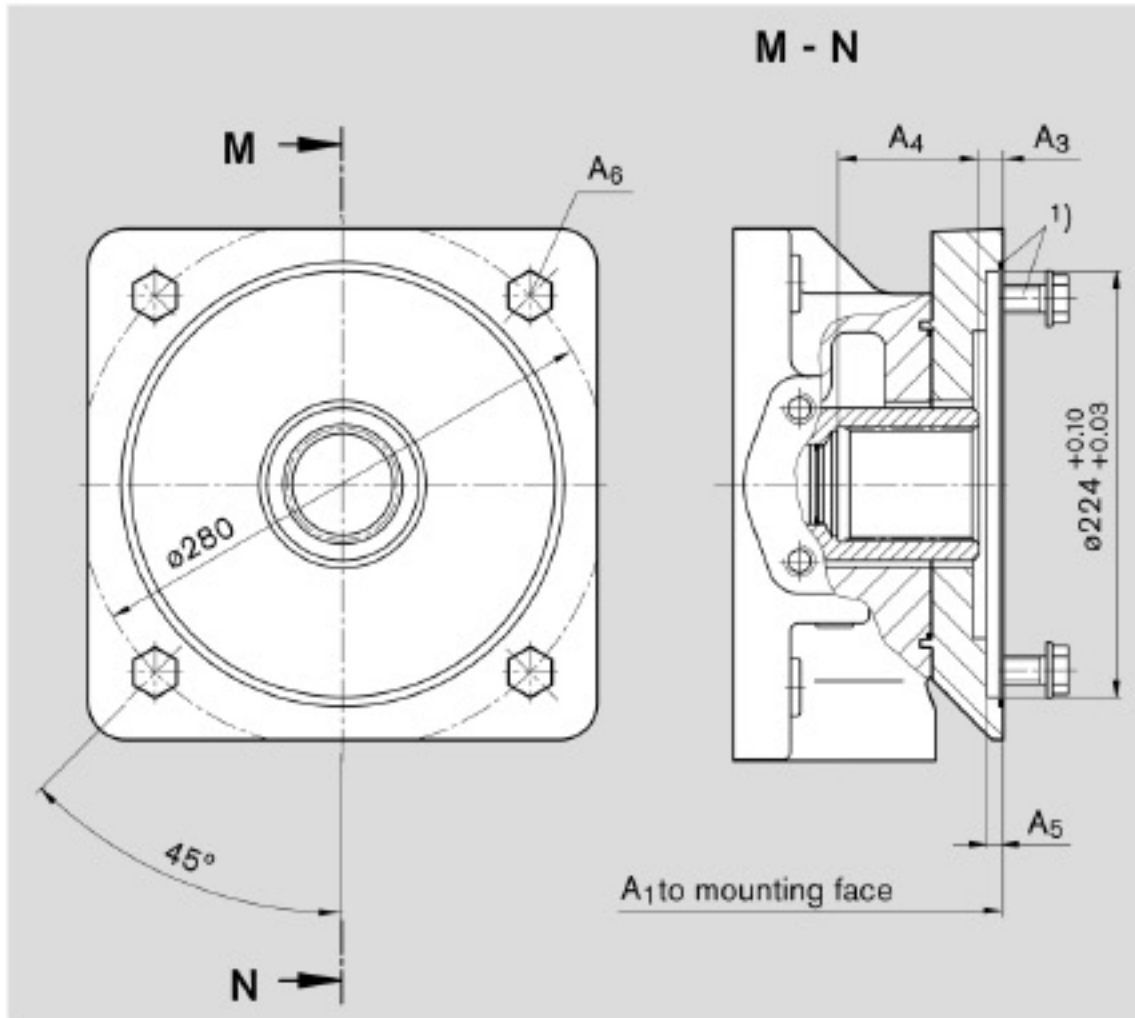
- Dimensions through drives...K35:
- Flange ISO 3019-2 224, 4-hole; Shaft coupler to DIN 5480 N60x2x28x8H
- for mounting an A4VSO/G 250 splined shaft:

□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
500	541	12,5	74	9	M20

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.



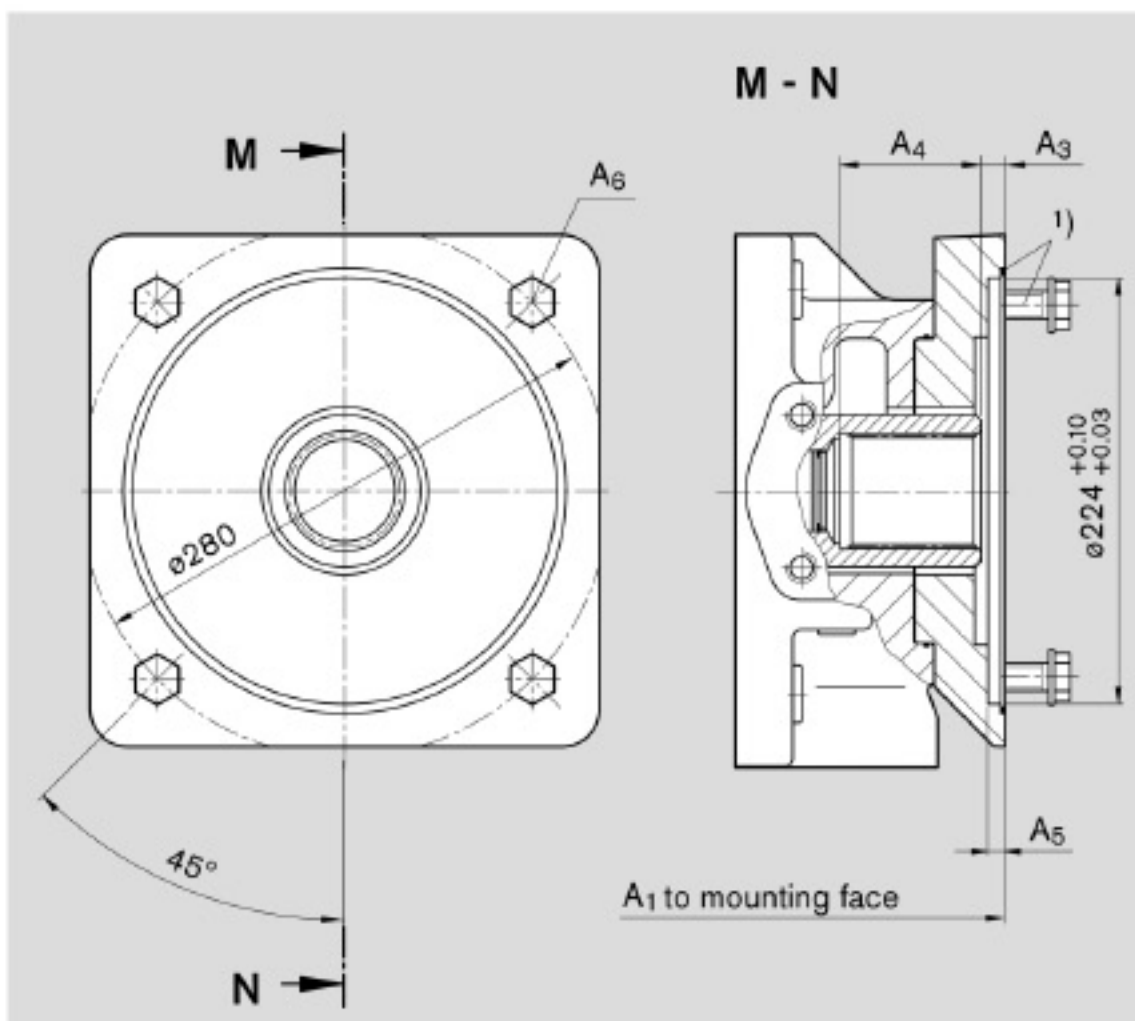
- Dimensions through drives...U35:
- Flange ISO 3019-2 224, 4-hole; Shaft coupler to DIN 5480 N60x2x28x8H
- for mounting an A4VSO/G 250 splined shaft:

□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
250	469	12,5	75	9	M20
355	498	12,5	75	9	M20

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.

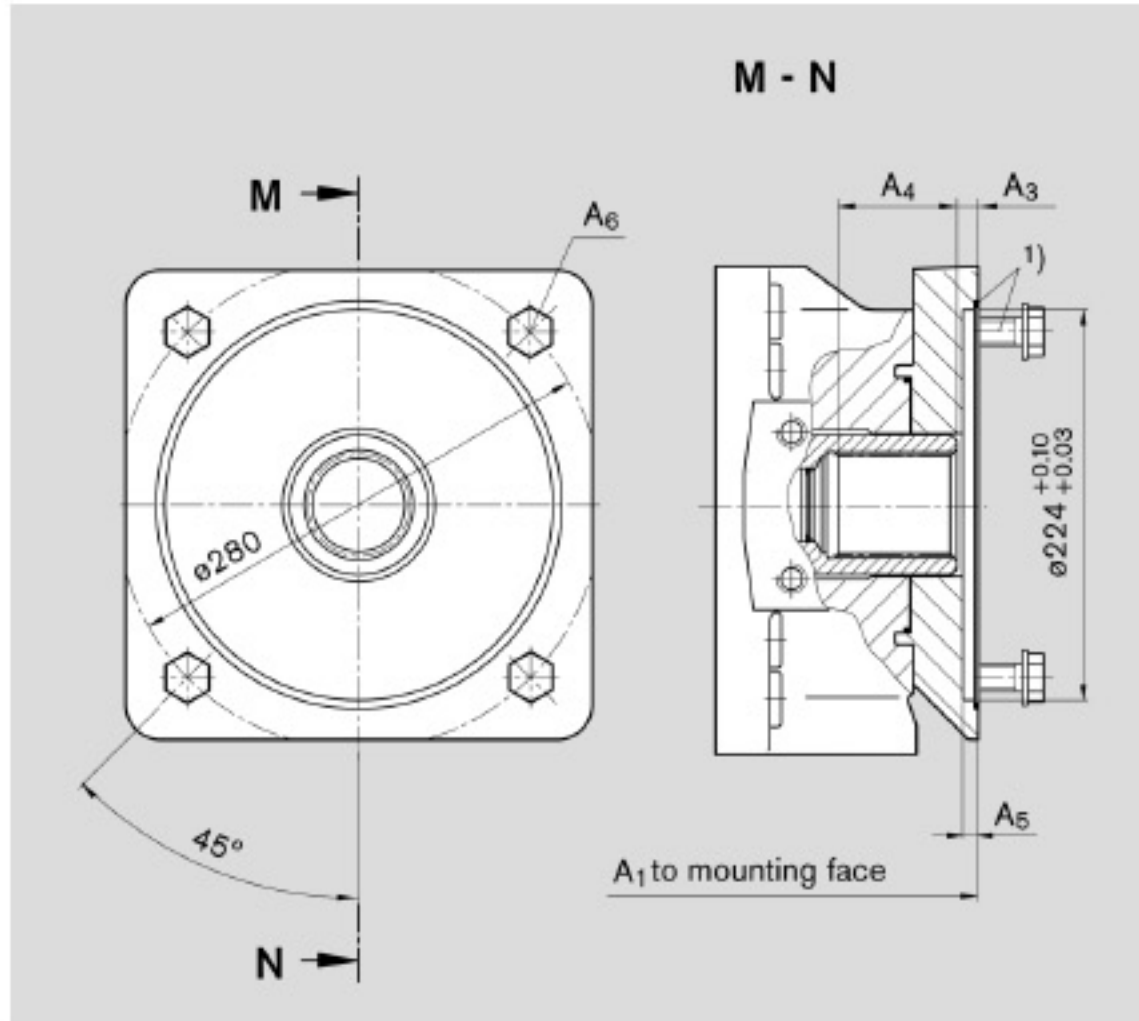


- Dimensions through drives...K77:
- Flange ISO 3019-2 224, 4-hole; Shaft coupler to DIN 5480 N70x3x22x8H
- for mounting an A4V SO/G 355 splined shaft:

□ Dimensions:

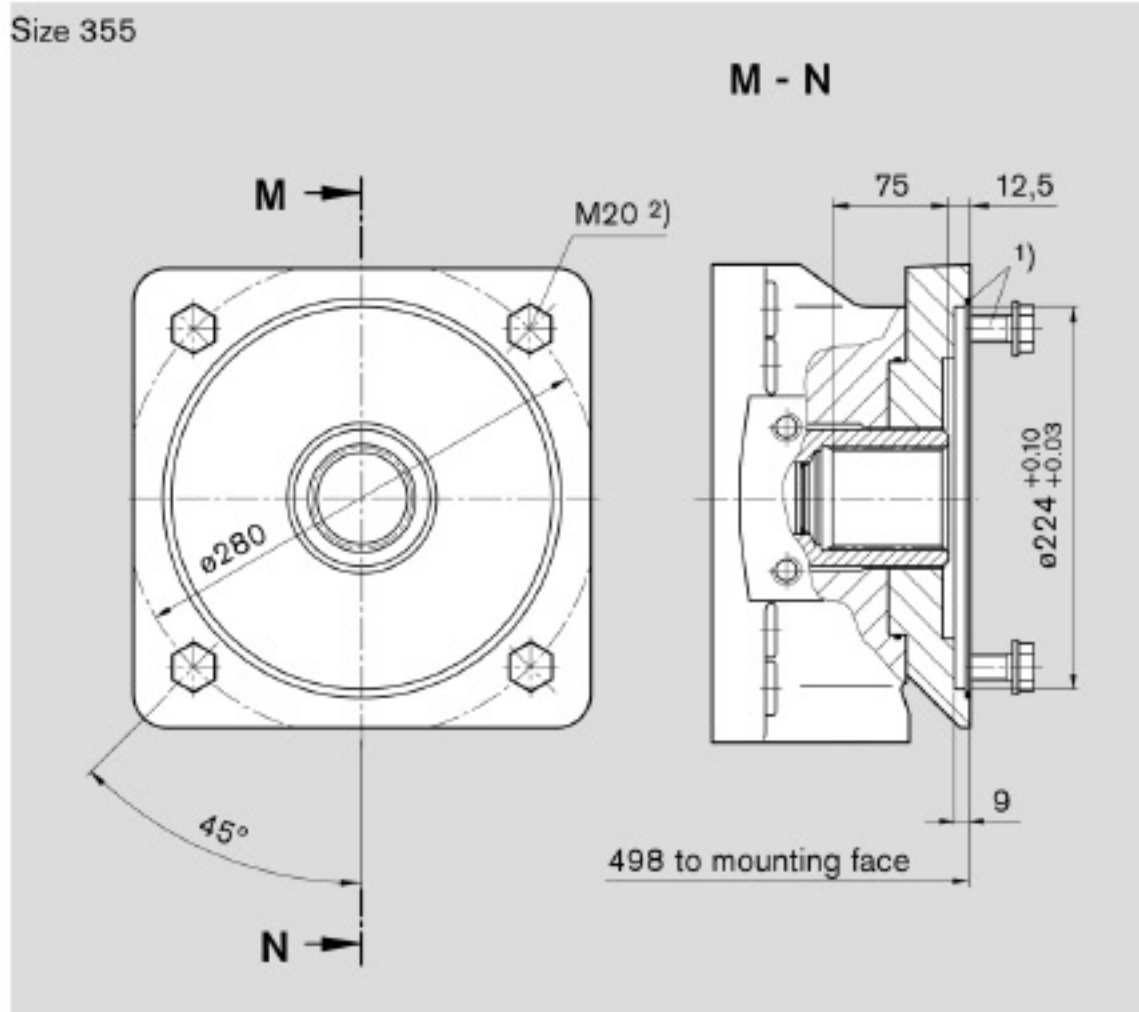
Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
500	541	12,5	76	9	M20

- 1) Mounting screws and O-ring seal are included with supply.
- 2) Thread to DIN 13, for the max. tightening torques observe the general information.



- Dimensions through drives...U77:
- Flange ISO 3019-2 224, 4-hole; Shaft coupler to DIN 5480 N70x3x22x8H
- for mounting an A4V SO/G 355 splined shaft:

- 1) Mounting screws and O-ring seal are included with supply.
- 2) Thread to DIN 13, for the max. tightening torques observe the general information.



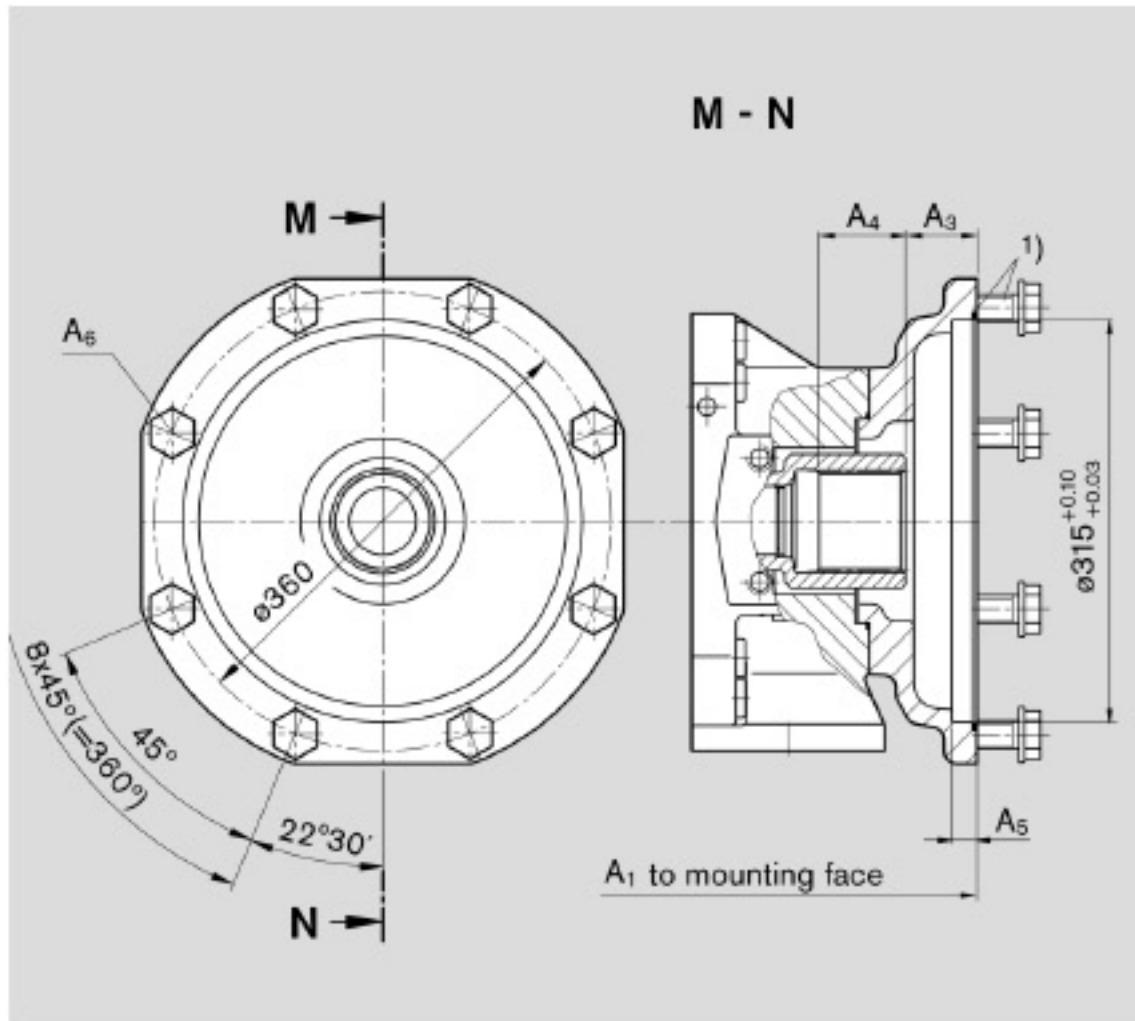
- Dimensions through drives...K43:
- Flange ISO 3019-2 315, 8-hole;
- Shaft coupler to DIN 5480 N80x3x25x8H
- for mounting an A4V SO/G 500 splined shaft:

□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₅ ²⁾
500	590	53,5	71,9	19	M20

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.



- Dimensions through drives...KB2:
- Flange ISO 3019-2 80, 2-hole,
- Shaft coupler for splined shaft, 19-4 SAE A-B, 3/4 in, 16/32 DP; 11T³⁾
- for mounting an A10VSO 18/31 shaft S or A10VSO 10/52 shaft S

□ Dimensions:

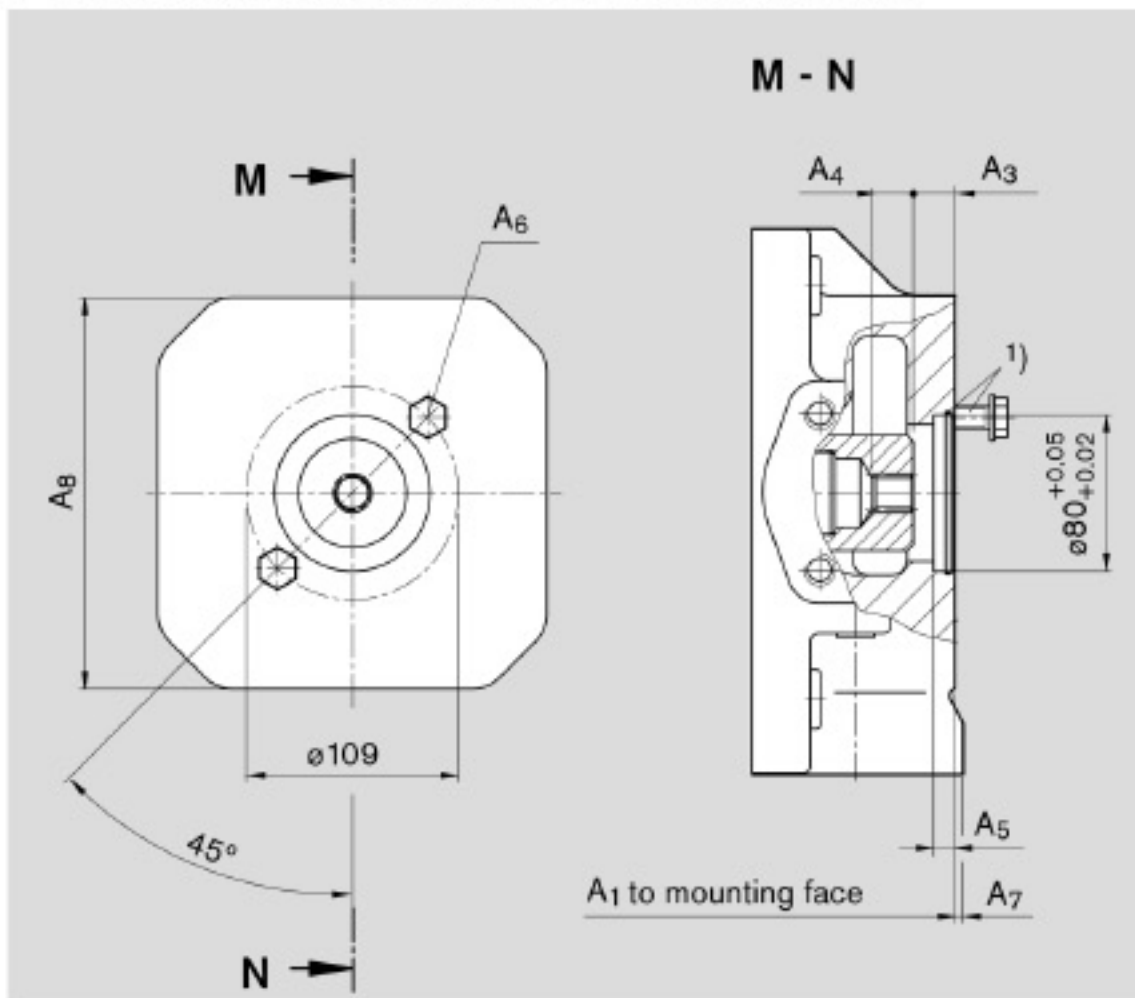
Size	A ₁	A ₃	A ₄	A ₅	A ₅ ²⁾
40	in preparation				
71	291	21,5	19	10	M10
500	in preparation				

Size	A ₇	A ₈
40	in preparation	
71	2	140
500	in preparation	

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.

3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



■ Dimensions through drives...KB3:

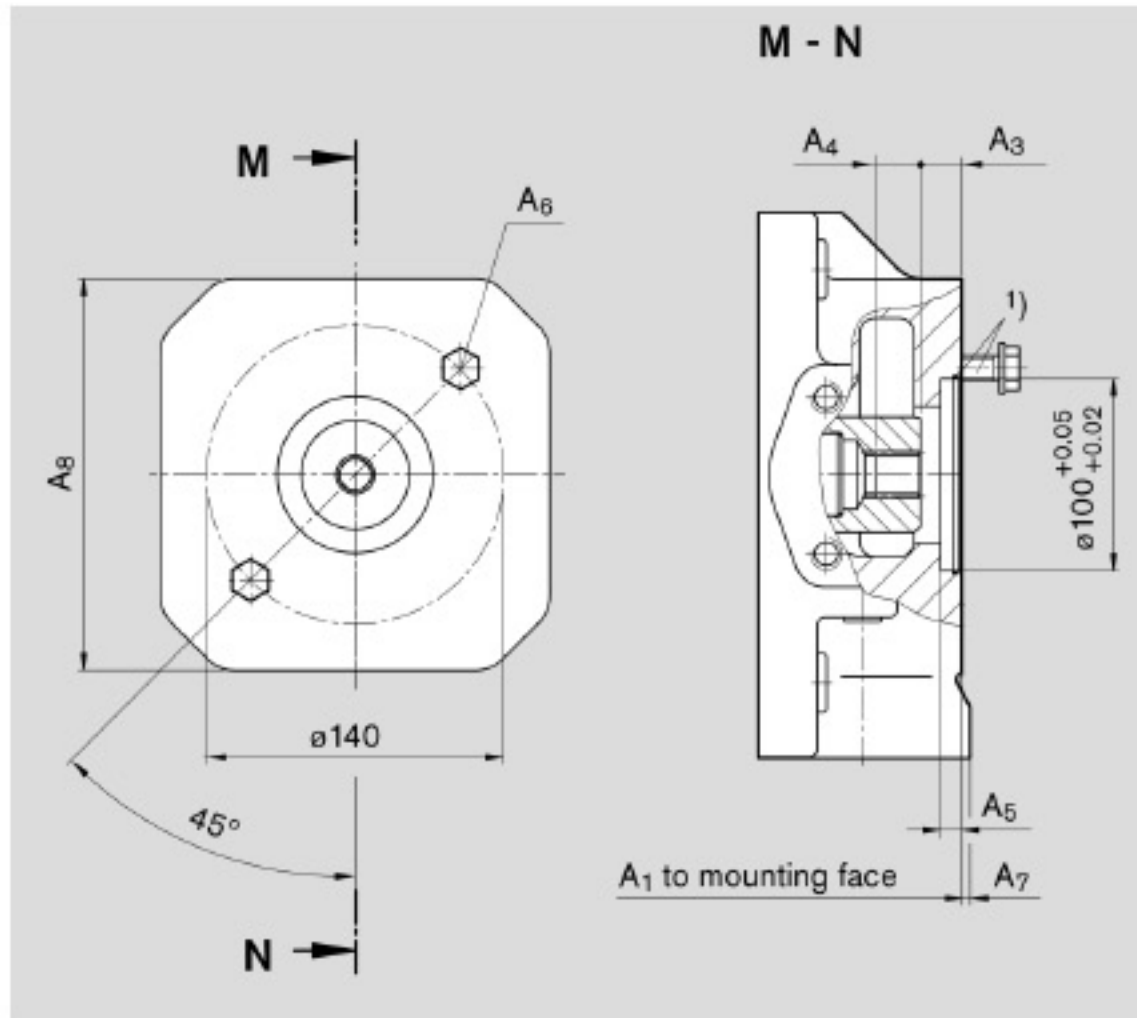
- Flange ISO 3019-2 100, 2-hole;
- Shaft coupler for splined shaft, 22-4 SAE B, 7/8 in, 16/32 DP; 13T³⁾
- for mounting an A10VSO 28/31 splined shaft S;

□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
40	290	20,3	23	10	M12
71	291	20,4	23	10	M12
500	in preparation				

Size	A ₇	A ₈
40	-	-
71	2	140
500	in preparation	

- 1) Mounting screws and O-ring seal are included with supply.
- 2) Thread to DIN 13, for the max. tightening torques observe the general information.
- 3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



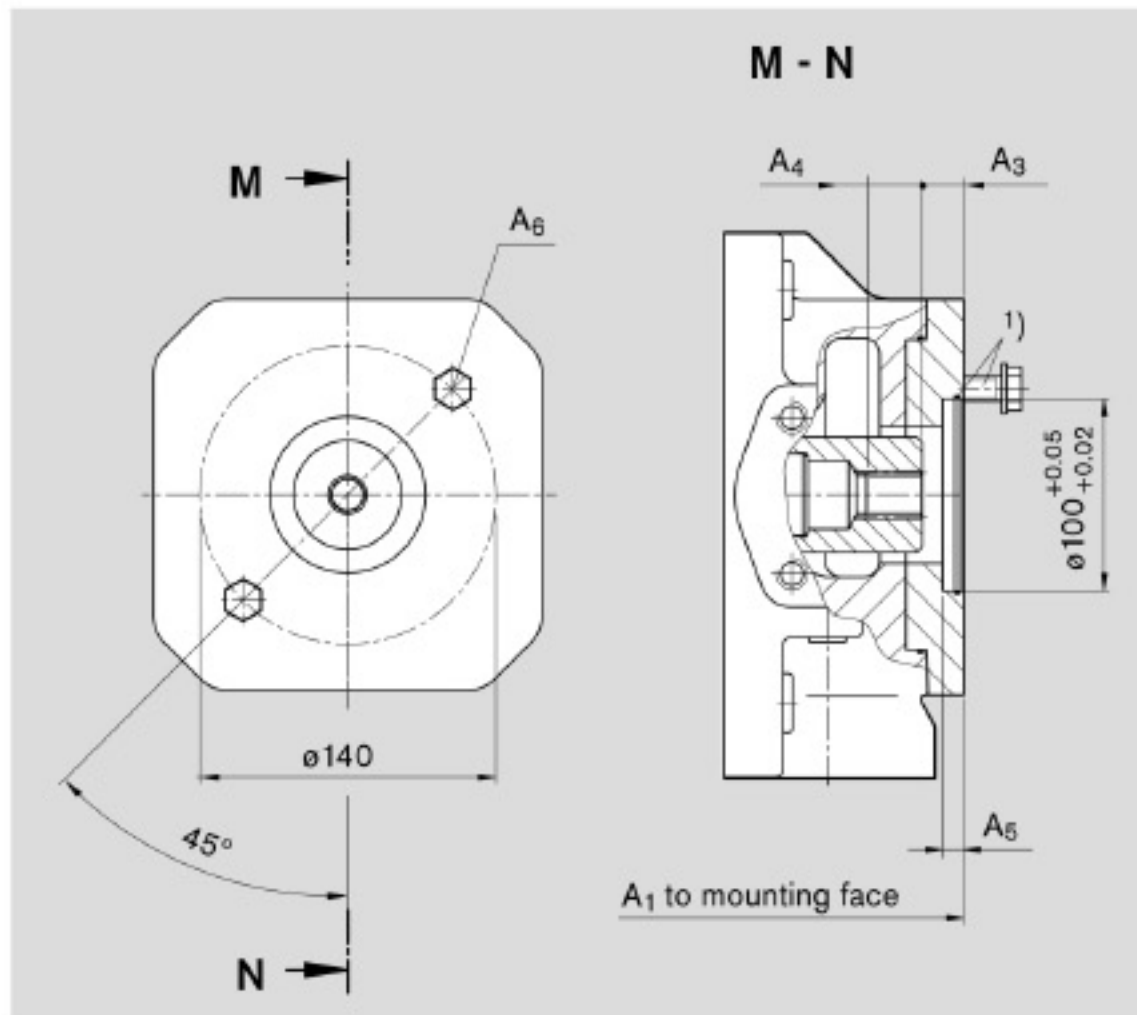
■ Dimensions through drives...UB3:

- Flange ISO 3019-2 100, 2-hole;
- Shaft coupler for splined shaft, 22-4 SAE B, 7/8 in, 16/32 DP; 13T³⁾
- for mounting an A10VSO 28/31 splined shaft S;

□ Dimensions:

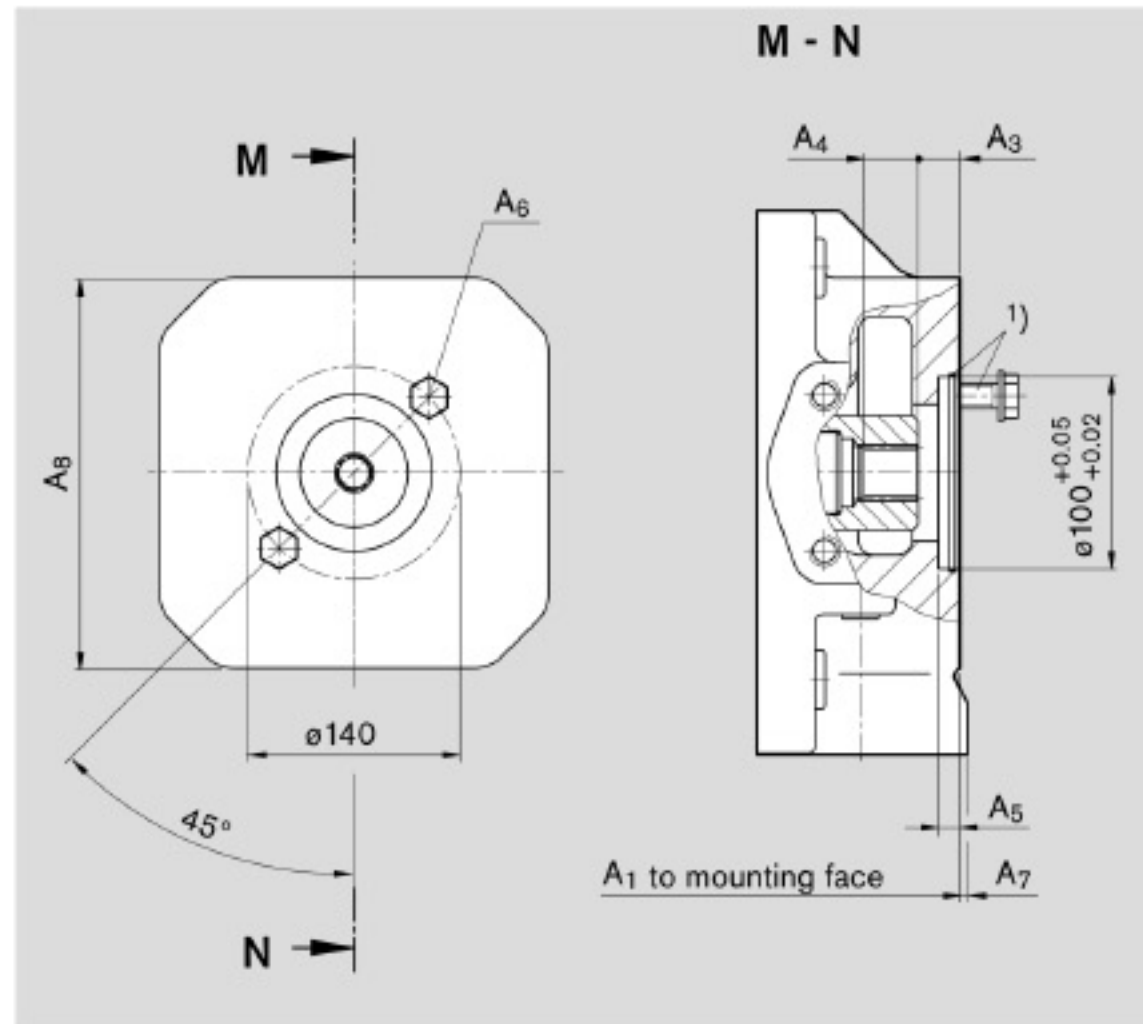
Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
125	369	20,5	24,9	10	M12
180	393	20,5	24,9	10	M12
250	in preparation				
355	in preparation				

- 1) Mounting screws and O-ring seal are included with supply.
- 2) Thread to DIN 13, for the max. tightening torques observe the general information.
- 3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



■ Dimensions through drives...KB4:

- Flange ISO 3019-2 100, 2-hole;
- Shaft coupler for splined shaft, 25-4 SAE B-B, 1 in, 16/32 DP; 15T³⁾
- for mounting an A10VSO 45/31 splined shaft S;



□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
40	290	20,8	27,5	10	M12
71	316	20,8	27,5	8	M12
500	505	20,4	28,9	10	M12

Size	A ₇	A ₈
40	-	-
71	-	-
500	15	240

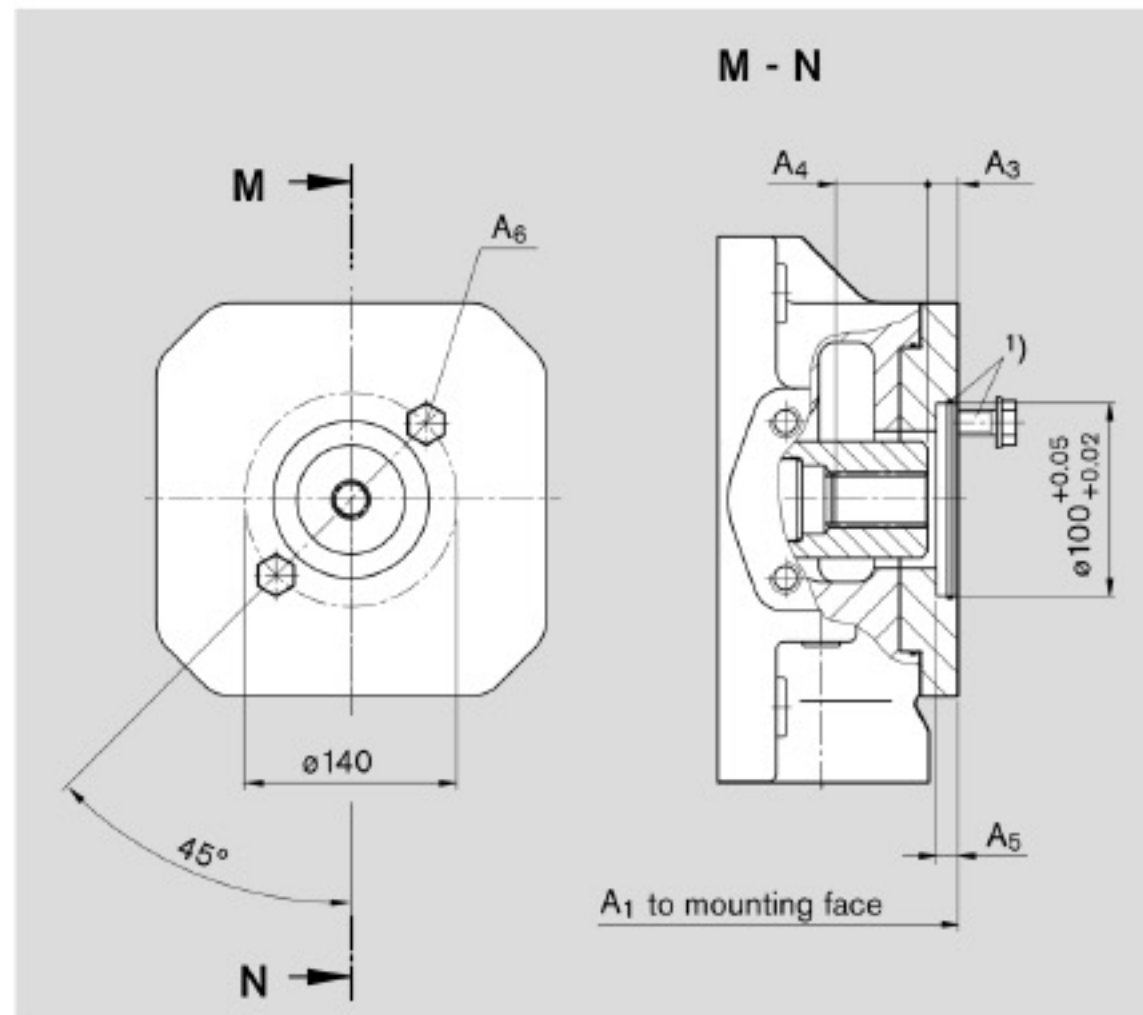
1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.

3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.

■ Dimensions through drives...UB4:

- Flange ISO 3019-2 100, 2-hole;
- Shaft coupler for splined shaft, 25-4 SAE B-B, 1 in, 16/32 DP; 15T³⁾
- for mounting an A10VSO 45/31 splined shaft S;



□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
125	369	18,9	29,5	10	M12
180	393	18,9	29,5	10	M12
250	453	20,9	29,5	10	M12
355	482	20,9	29,5	10	M12

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.

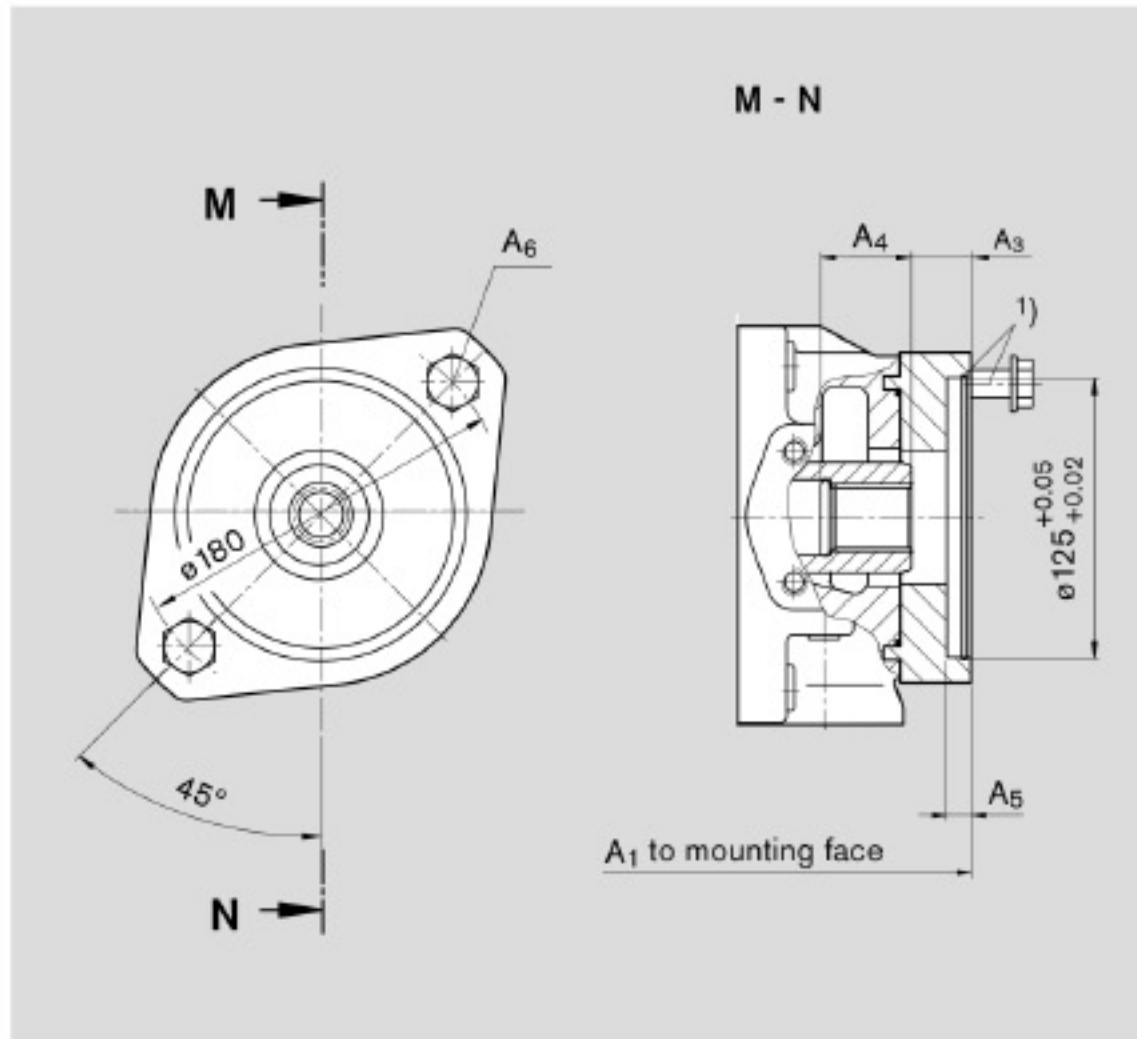
3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.

- Dimensions through drives...KB5:
- Flange ISO 3019-2 125, 2-hole;
- Shaft coupler for splined shaft, 32-4 SAE C, 1 1/4 in, 12/24 DP; 14T³⁾
- for mounting an A10VSO 71/31 splined shaft S;

□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
71	321	23	38	10	M20
500	in preparation				

- 1) Mounting screws and O-ring seal are included with supply.
- 2) Thread to DIN 13, for the max. tightening torques observe the general information.
- 3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.

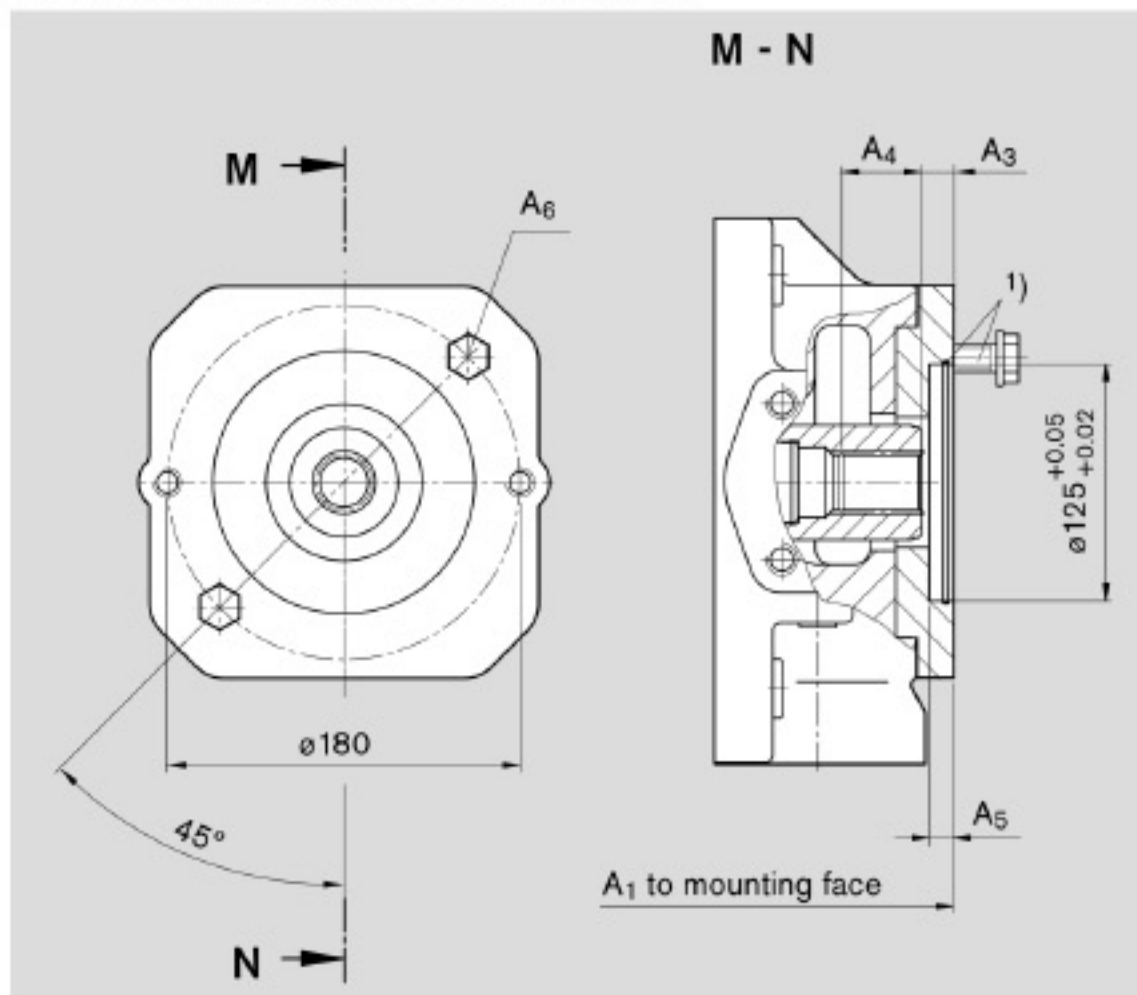


- Dimensions through drives...UB5:
- Flange ISO 3019-2 125, 2-hole;
- Shaft coupler for splined shaft, 32-4 SAE C, 1 1/4 in, 12/24 DP; 14T³⁾
- for mounting an A10VSO 71/31 splined shaft S;

□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
125	369	20	38	9	M16
180	393	20	38	9	M16
250	453	20,9	37,9	9	M16
355	482	20,9	37,9	9	M16

- 1) Mounting screws and O-ring seal are included with supply.
- 2) Thread to DIN 13, for the max. tightening torques observe the general information.
- 3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



■ Dimensions through drives...KB7:

- Flange ISO 3019-2 180, 4-hole;
- Shaft coupler for splined shaft, 44-4 SAE D, 1 3/4 in, 8/16 DP; 13T³⁾
- for mounting an A10VSO 140/31(32) splined shaft S;

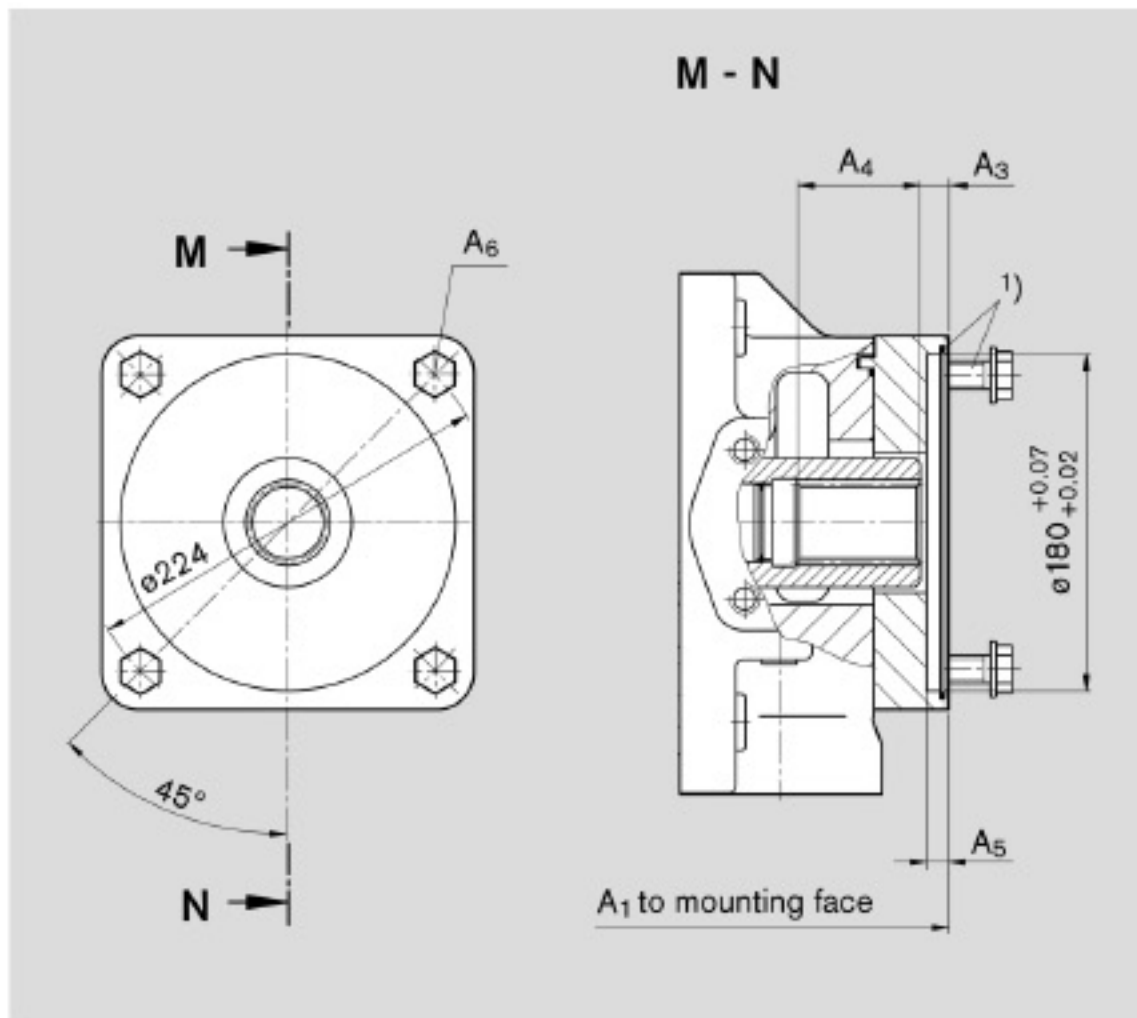
□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
500	530	10,4	63,6	10	M16

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.

3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



■ Dimensions through drives...UB7:

- Flange ISO 3019-2 180, 4-hole;
- Shaft coupler for splined shaft, 44-4 SAE D, 1 3/4 in, 8/16 DP; 13T³⁾
- for mounting an A10VSO 140/31(32) splined shaft S;

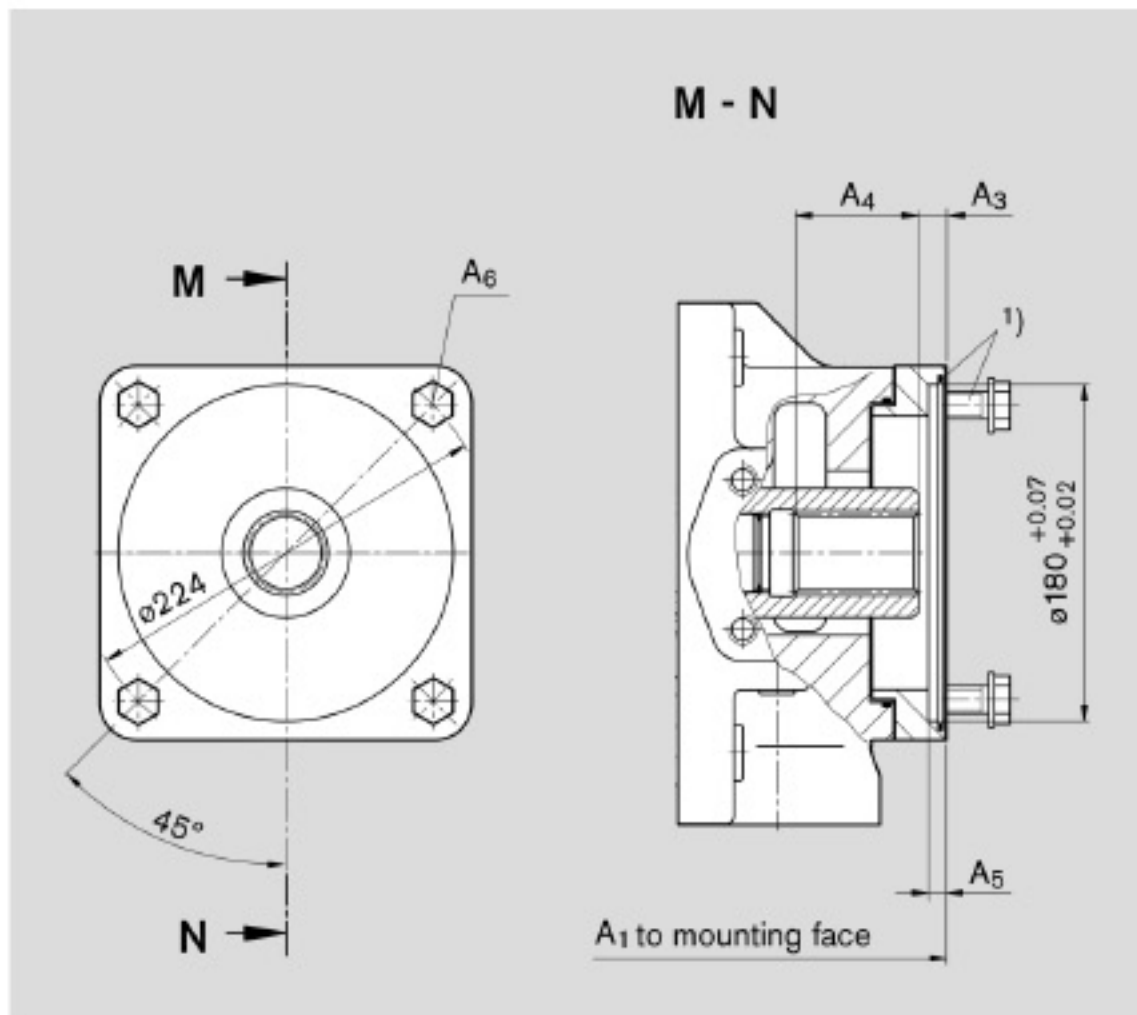
□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
180	406	10,6	62	9	M16
250	453	10,6	64	9	M16
355	482	10,6	64	9	M16

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.

3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



■ Dimensions through drives...K01:

- Flange ISO 3019-1 82-2 (SAE A);
- Shaft coupler for splined shaft, 16-4 SAE A, 5/8 in, 16/32 DP; 9T³⁾
- for mounting an external gear pump G3;

□ Dimensions:

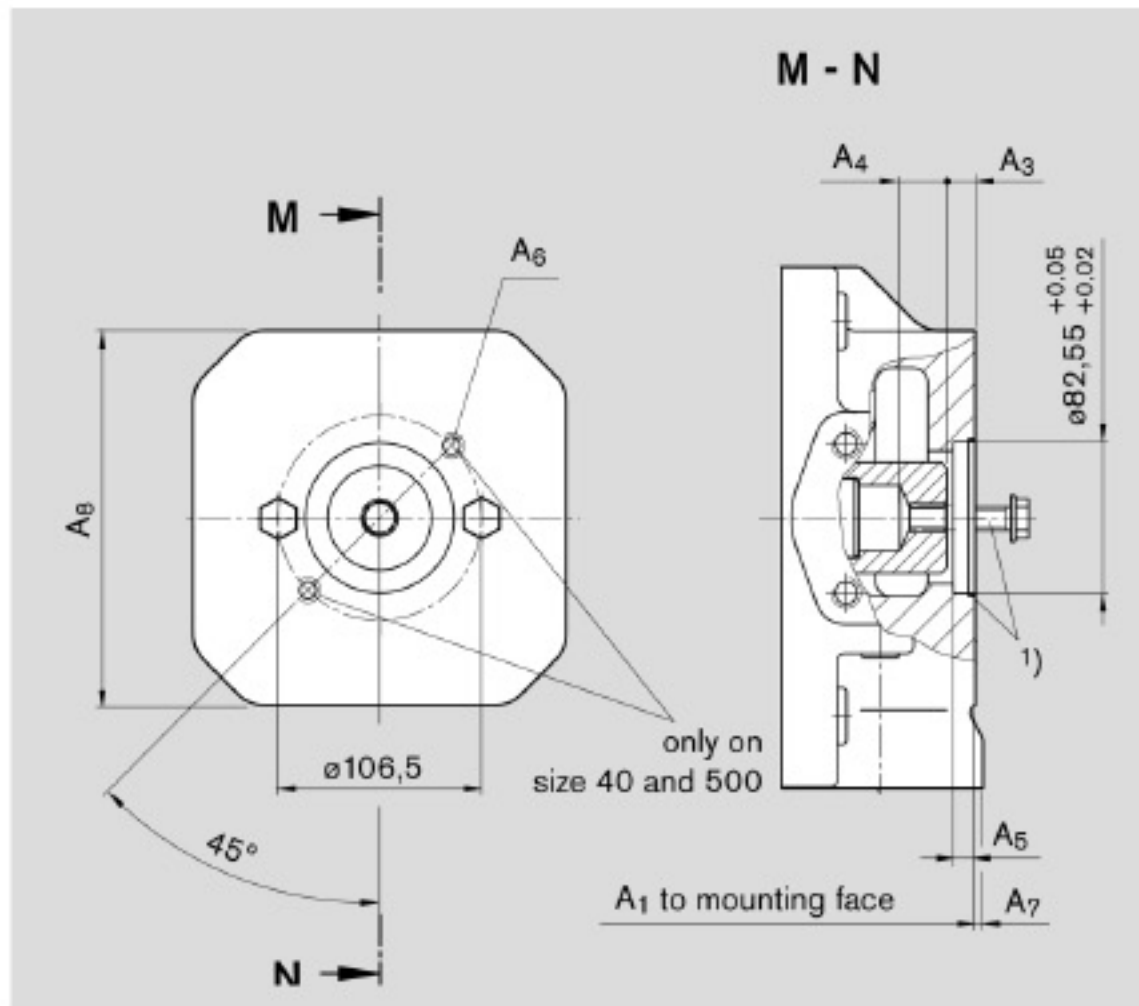
Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
40	263	10,3	25,9	10	M10
71	291	10,3	24,6	10	M10
500	505	10,3	32,7	10	M10

NG	A ₇	A ₈
40	-	-
71	2	140
500	15	240

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.

3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



■ Dimensions through drives...U01:

- Flange ISO 3019-1 82-2 (SAE A);
- Shaft coupler for splined shaft, 16-4 SAE A, 5/8 in, 16/32 DP; 9T³⁾
- for mounting an external gear pump G3;

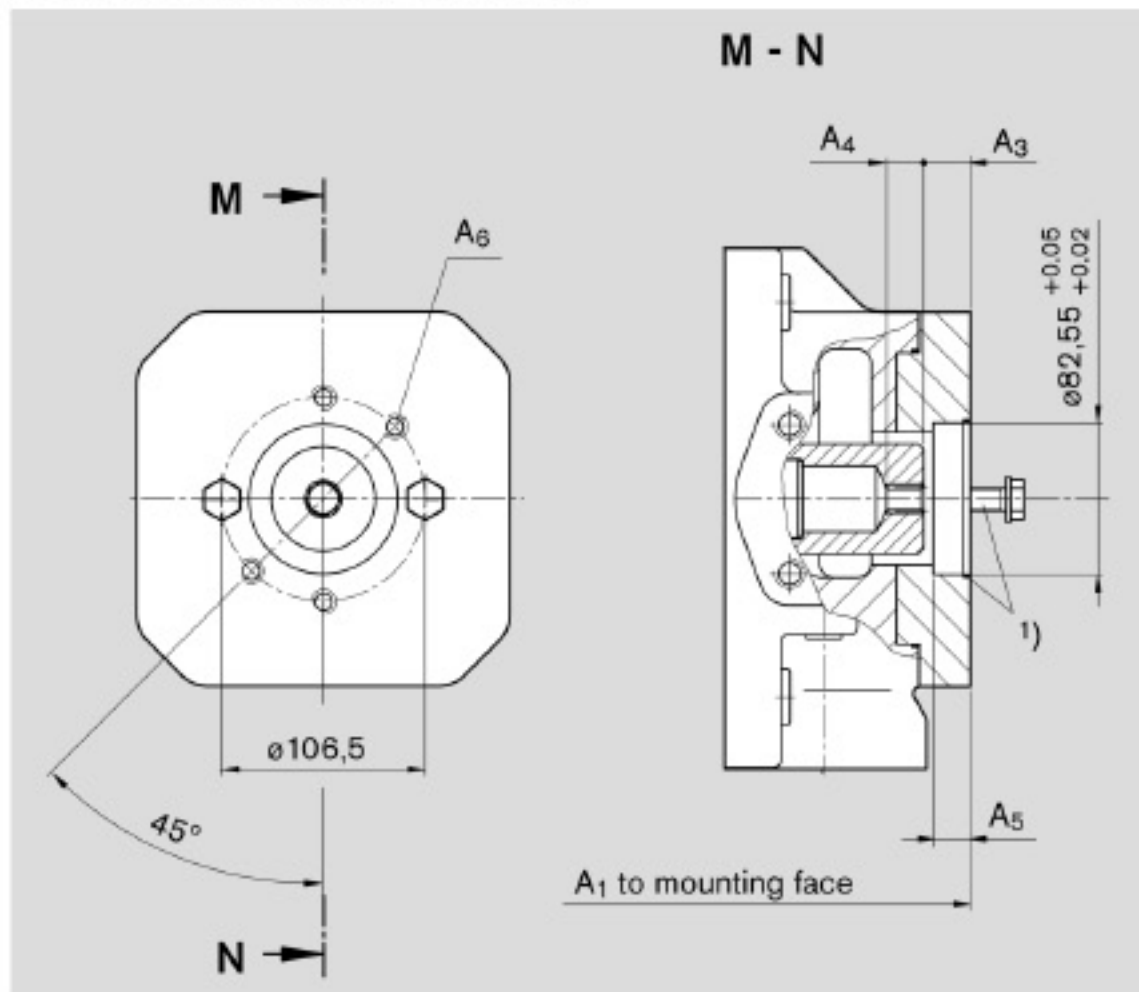
□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
125	369	16	19,4	13	M10
180	393	16	19,4	13	M10
250	453	16	19,4	13	M10
355	482	16	19,4	13	M10

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.

3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



■ Dimensions through drives...K52:

- Flange ISO 3019-1 82-2 (SAE A);
- Shaft coupler for splined shaft, 19-4 SAE A-B, 3/4 in, 16/32 DP; 11T³⁾
- for mounting an A10VSO 18/31 splined shaft S or A10VSO10 or 18/52 splined shaft S;

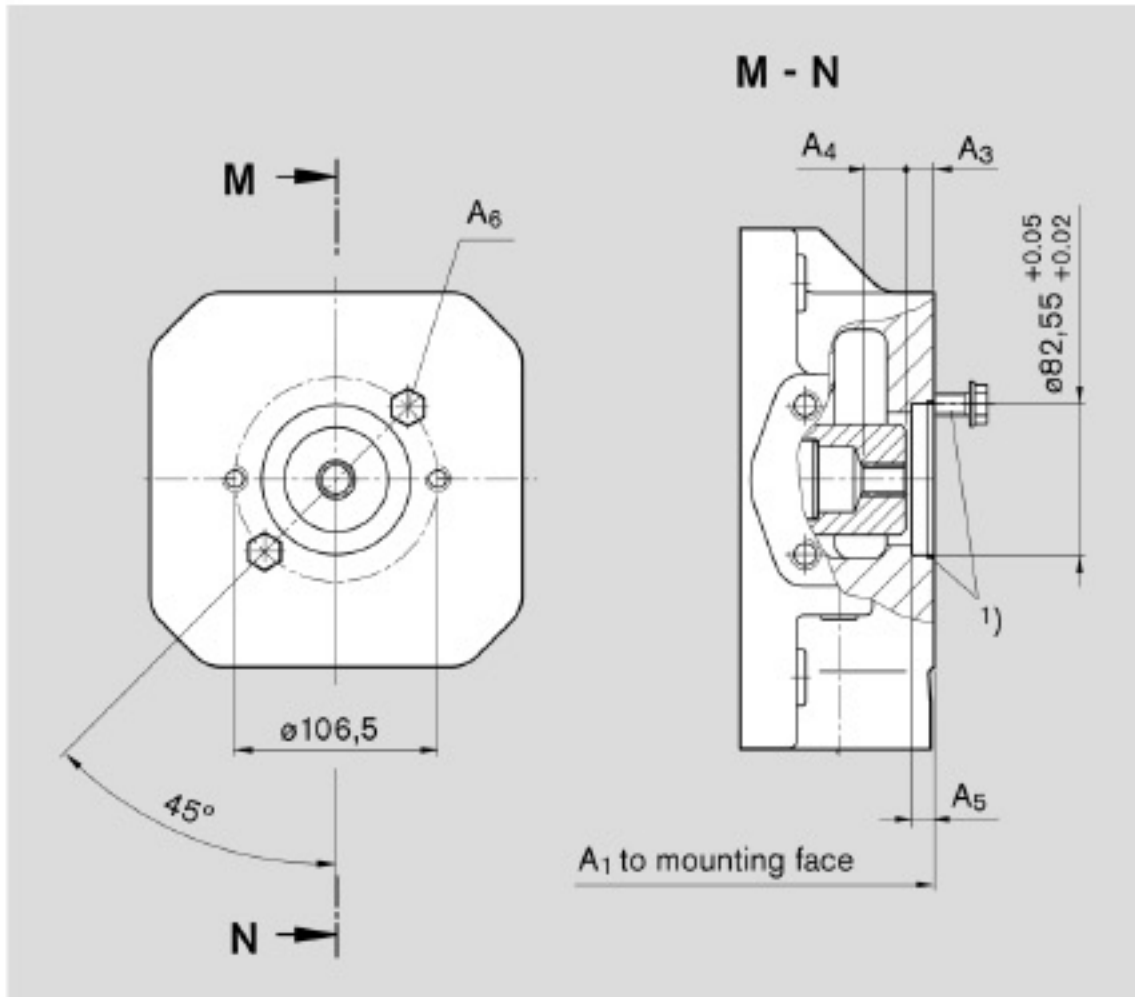
□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ¹⁾
40	263	10,5	33,8	10	M10
71	315	10,5	30	10	M10
500	in preparation				

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.

3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



■ Dimensions through drives...K68:

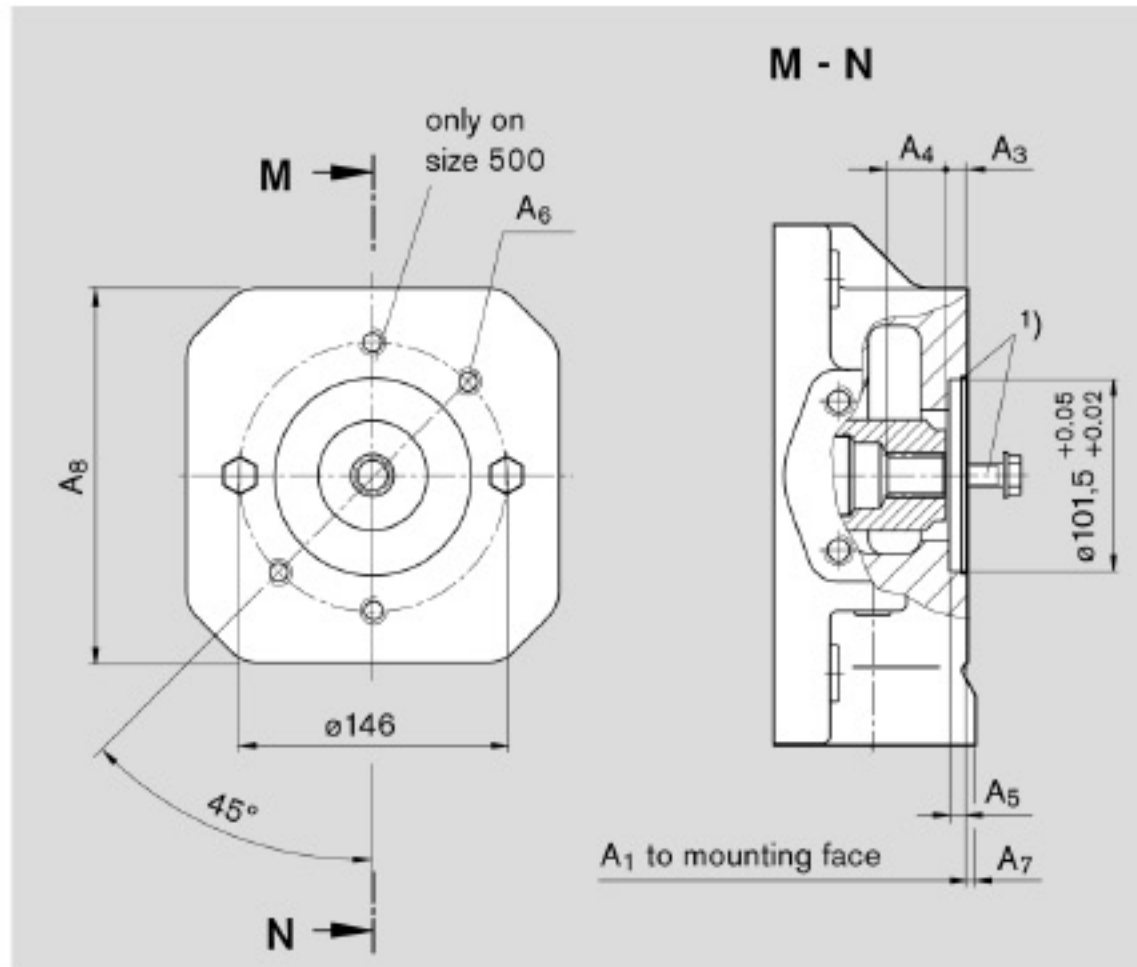
- Flange ISO 3019-1 101-2 (SAE B);
- Shaft coupler for splined shaft 22-4 SAE B, 7/8 in, 16/32 DP; 13T³⁾
- for A10VO 28/31 and 52(53) splined shaft S or mounting an external gear pump G4

□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
40	290	20,4	23,1	10	M12
71	322	10,4	35,1	10	M12
500	505	19,5	25	10	M12

Size	A ₇	A ₈
40	-	-
71	-	-
500	15	240

- 1) Mounting screws and O-ring seal are included with supply.
- 2) Thread to DIN 13, for the max. tightening torques observe the general information.
- 3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



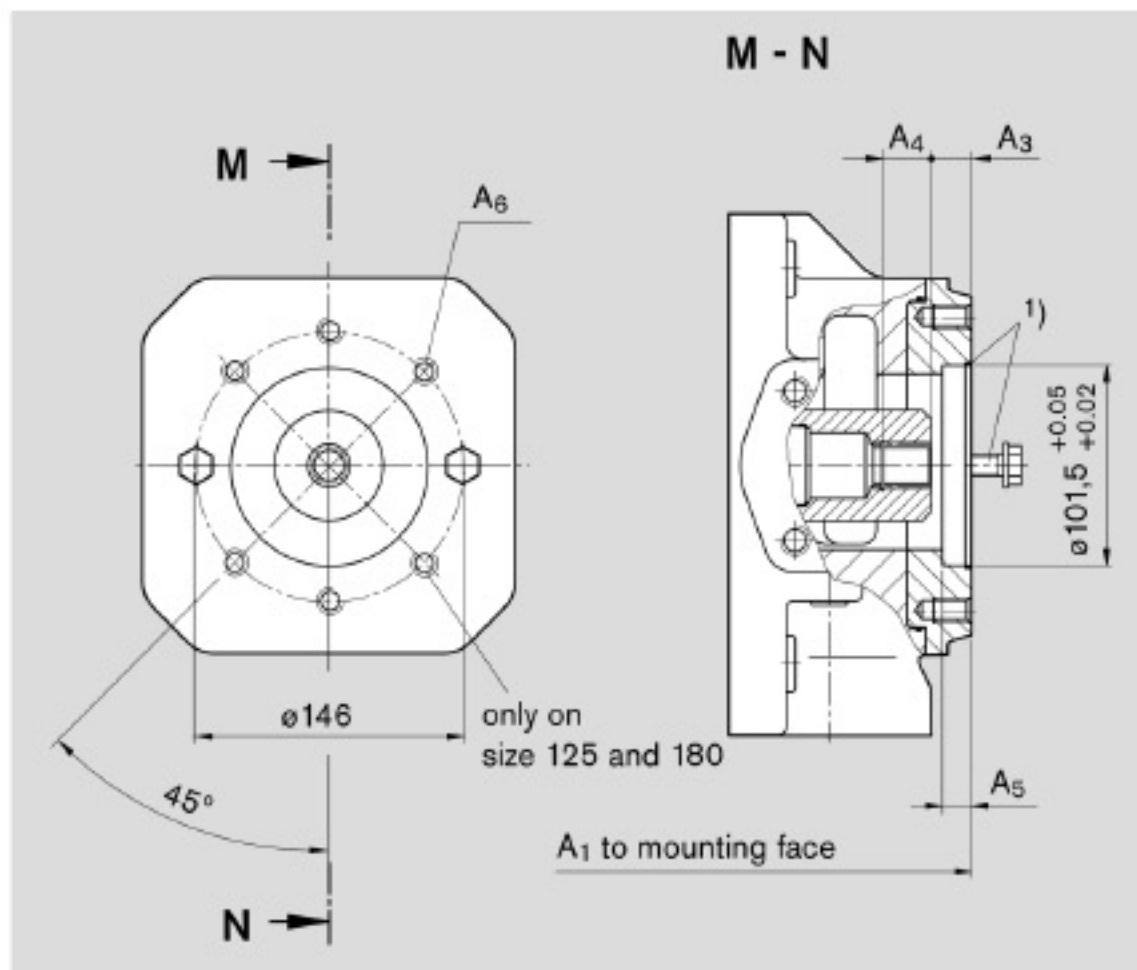
■ Dimensions through drives...U68:

- Flange ISO 3019-1 101-2 (SAE B);
- Shaft coupler for splined shaft 22-4 SAE B, 7/8 in, 16/32 DP; 13T³⁾
- for A10VO 28/31 and 52(53) splined shaft S or mounting an external gear pump G4

□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
125	369	28	25	13	M12
180	393	28	25	13	M12
250	453	19,5	23,1	13	M12
355	482	19,5	23,1	13	M12

- 1) Mounting screws and O-ring seal are included with supply.
- 2) Thread to DIN 13, for the max. tightening torques observe the general information.
- 3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



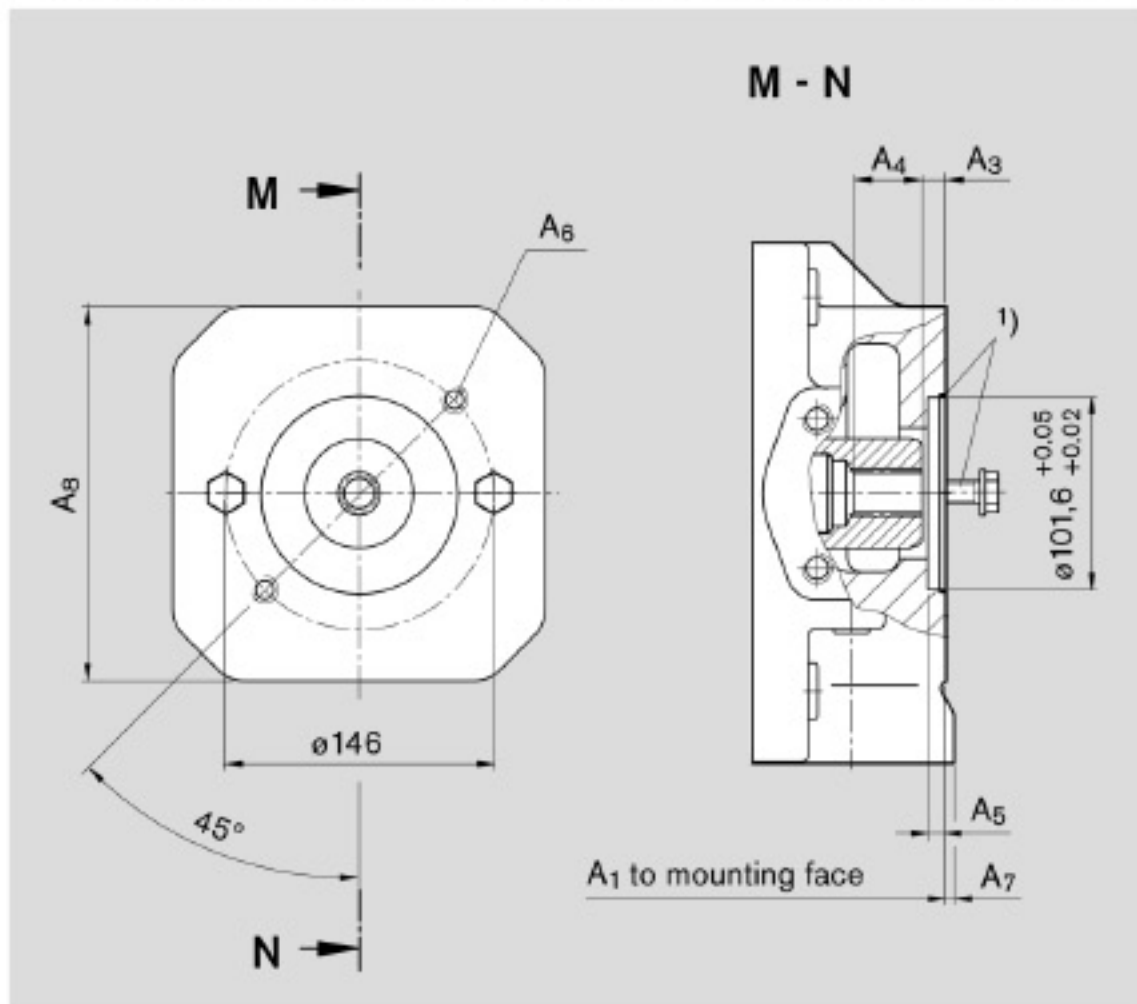
- Dimensions through drives...K04:
- Flange ISO 3019-1 101-2 (SAE B);
- Shaft coupler for splined shaft 25-4 SAE B-B, 1 in, 16/32 DP; 15T³⁾
- for mounting an A10VO 45/31 and 52 (53) splined shaft S or internal gear pump

□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
40	290	10,4	37,9	10	M12
71	322	10,3	35,7	10	M12
500	505	10,3	28,9	10	M12

Size	A ₇	A ₈
40	-	-
71	-	-
500	15	240

- 1) Mounting screws and O-ring seal are included with supply.
- 2) Thread to DIN 13, for the max. tightening torques observe the general information.
- 3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.

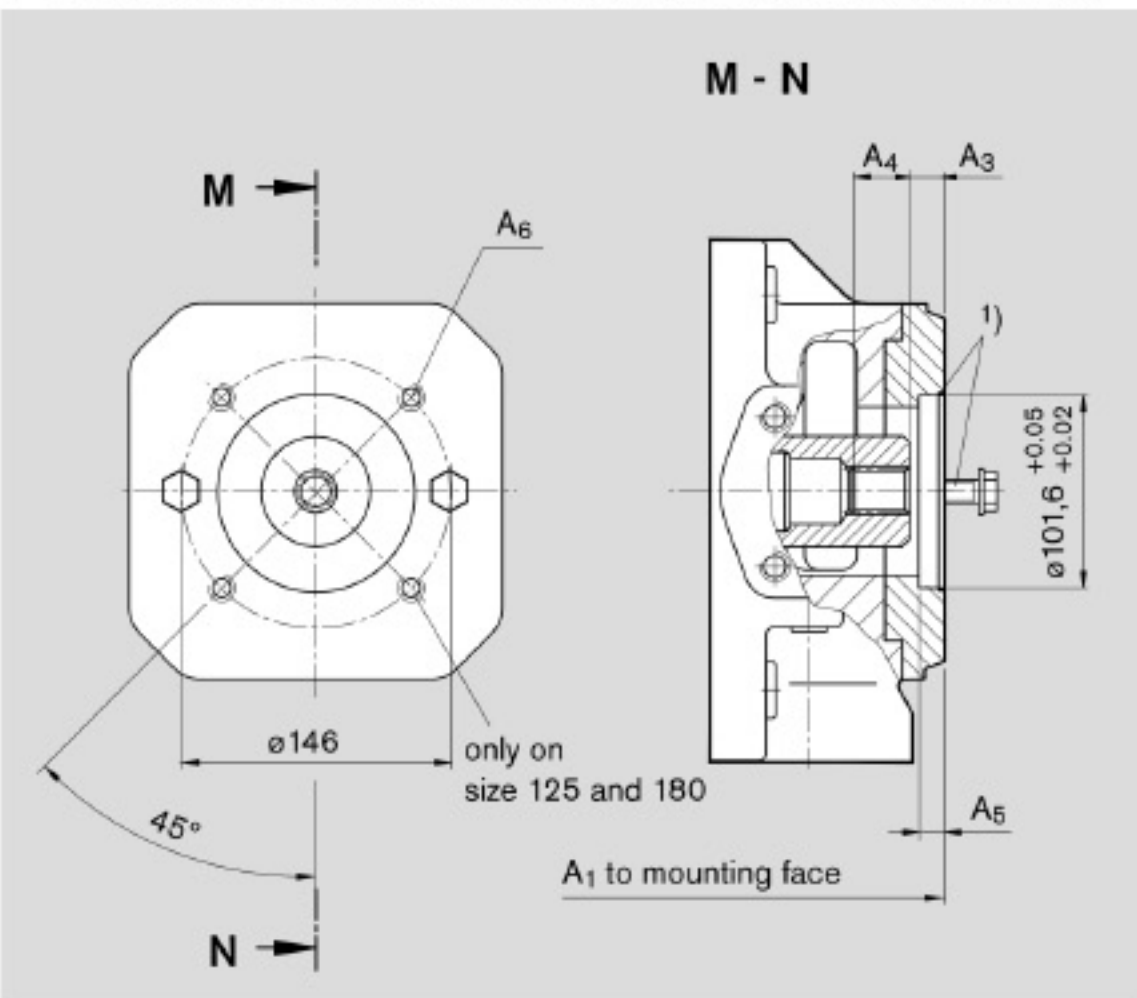


- Dimensions through drives...U04:
- Flange ISO 3019-1 101-2 (SAE B);
- Shaft coupler for splined shaft 25-4 SAE B-B, 1 in, 16/32 DP; 15T³⁾
- for mounting an A10VO 45/31 and 52 (53) splined shaft S or internal gear pump

□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
125	369	18,9	29,4	13	M12
180	393	18,9	29,4	13	M12
250	453	18,9	29,4	13	M12
355	482	18,9	29,4	13	M12

- 1) Mounting screws and O-ring seal are included with supply.
- 2) Thread to DIN 13, for the max. tightening torques observe the general information.
- 3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



■ Dimensions through drives...K07:

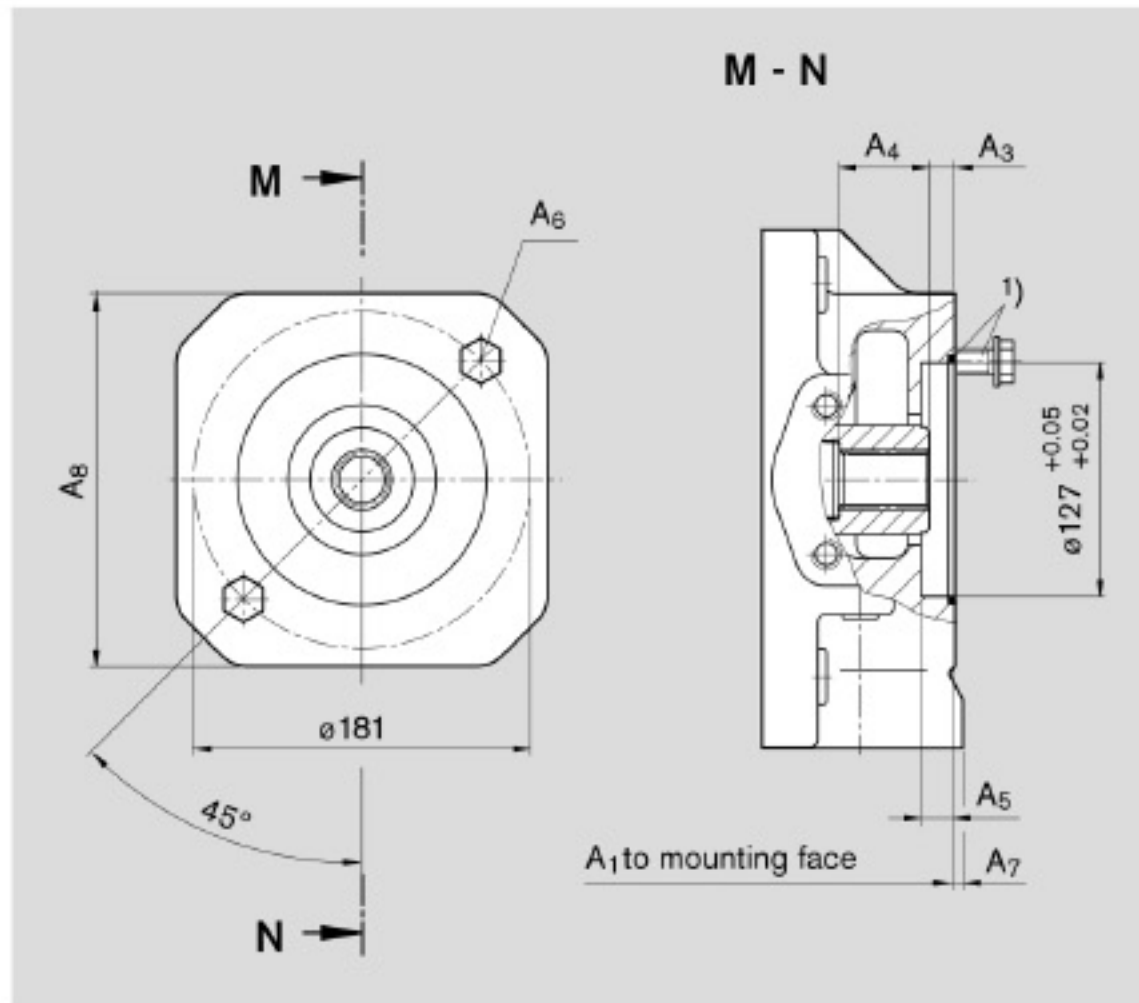
- Flange ISO 3019-1 127-2 (SAE C);
- Shaft coupler for splined shaft 32-4 SAE C, 1 1/4 in, 12/24 DP; 14T³⁾
- for mounting an A10VO 71/31 splined shaft S

□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
71	321	10,4	47,6	13	M16
500	505	11,3	40,2	13	M16

Size	A ₇	A ₈
71	-	-
500	15	240

- 1) Mounting screws and O-ring seal are included with supply.
- 2) Thread to DIN 13, for the max. tightening torques observe the general information.
- 3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



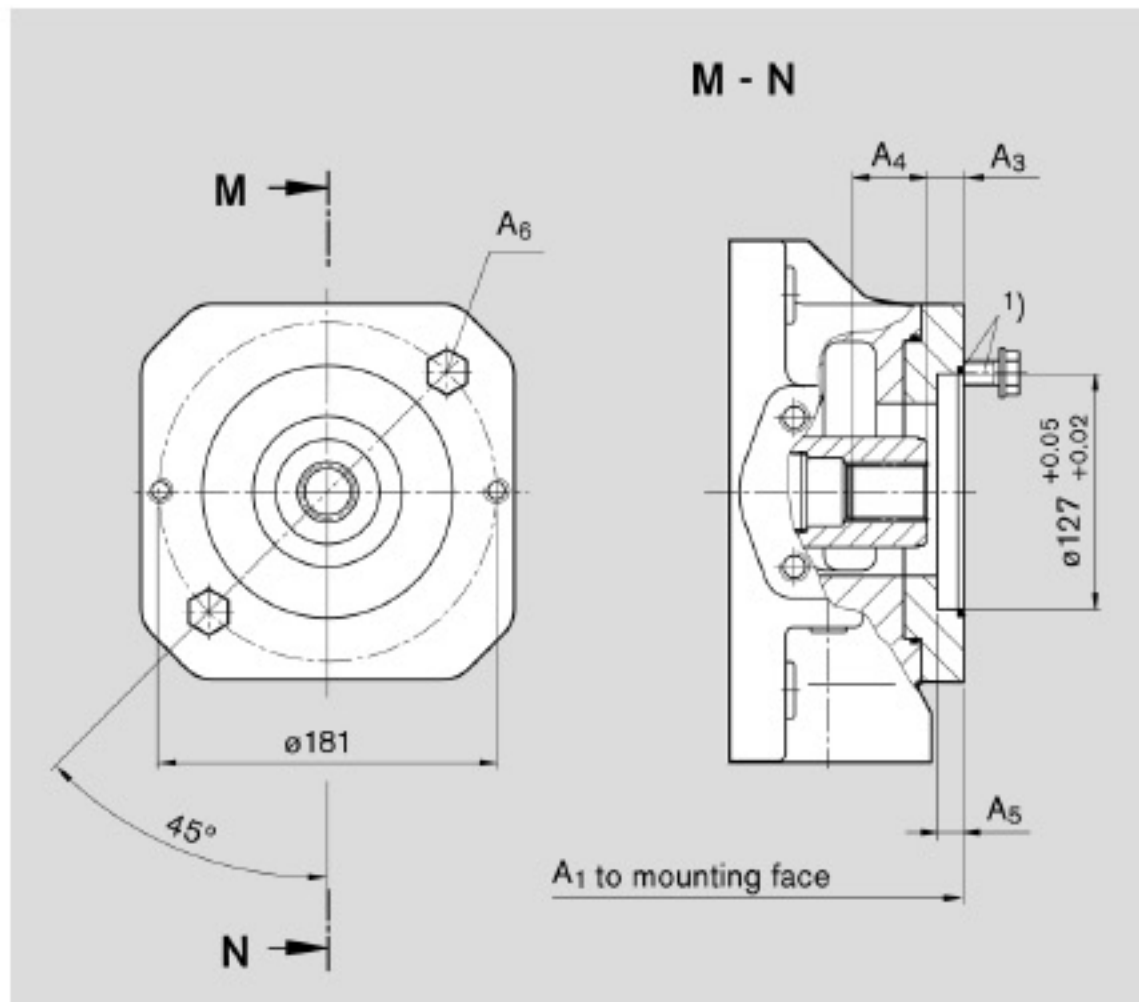
■ Dimensions through drives...U07:

- Flange ISO 3019-1 127-2 (SAE C);
- Shaft coupler for splined shaft 32-4 SAE C, 1 1/4 in, 12/24 DP; 14T³⁾
- for mounting an A10VO 71/31 splined shaft S

□ Dimensions:

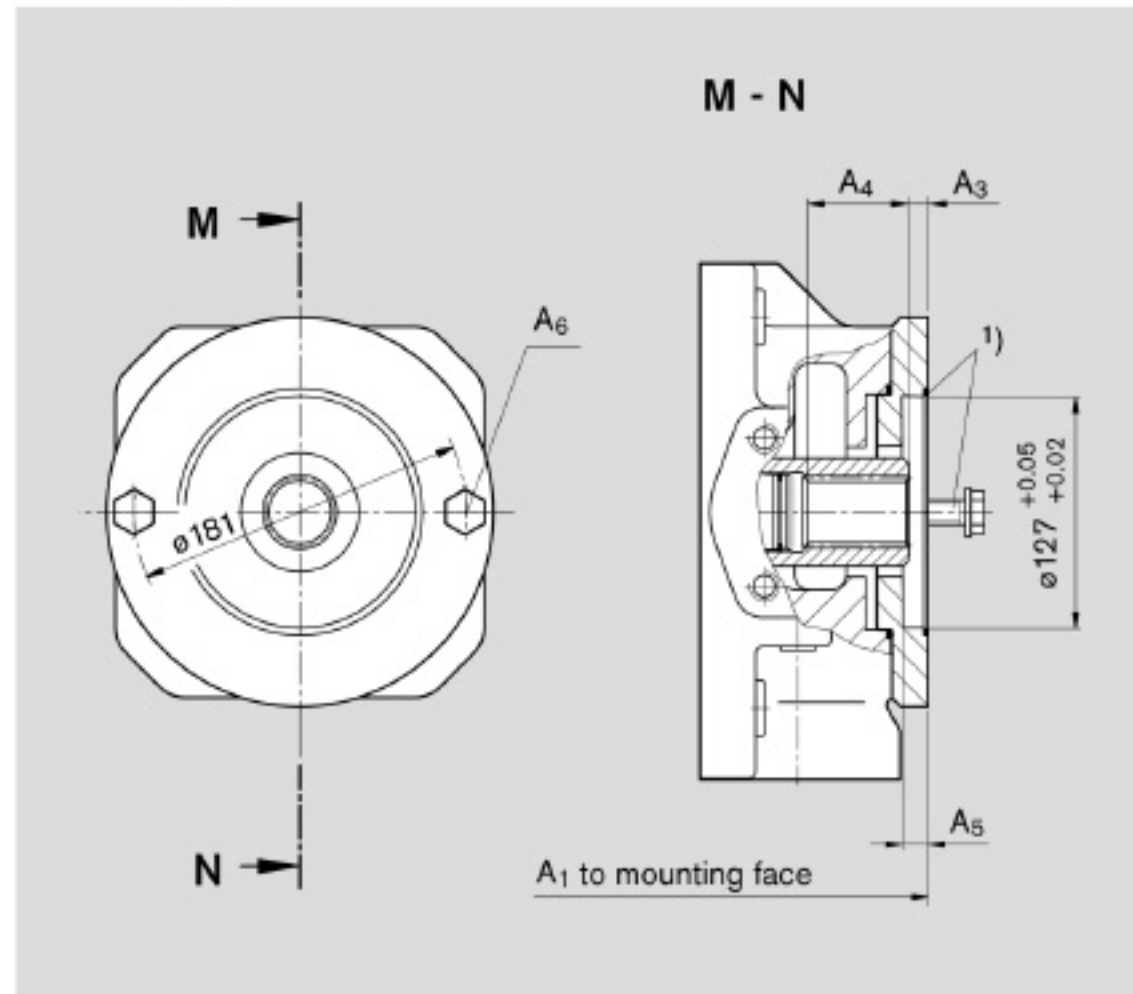
Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
125	369	20,9	37,9	13	M16
180	393	20,9	37,9	13	M16
250	453	20,9	37,9	13	M16
355	482	20,9	37,9	13	M16

- 1) Mounting screws and O-ring seal are included with supply.
- 2) Thread to DIN 13, for the max. tightening torques observe the general information.
- 3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



■ Dimensions through drives...K24:

- Flange ISO 3019-1 127-2 (SAE C),
- Shaft coupler for splined shaft 38-4 SAE C-C, 1 1/2 in, 12/24 DP; 17T³⁾
- for mounting an A10VO 100/31 splined shaft S or A10VO 85/52(53) splined shaft S or internal gear pump PGH5



□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
500	505	10,3	56,7	13	M16

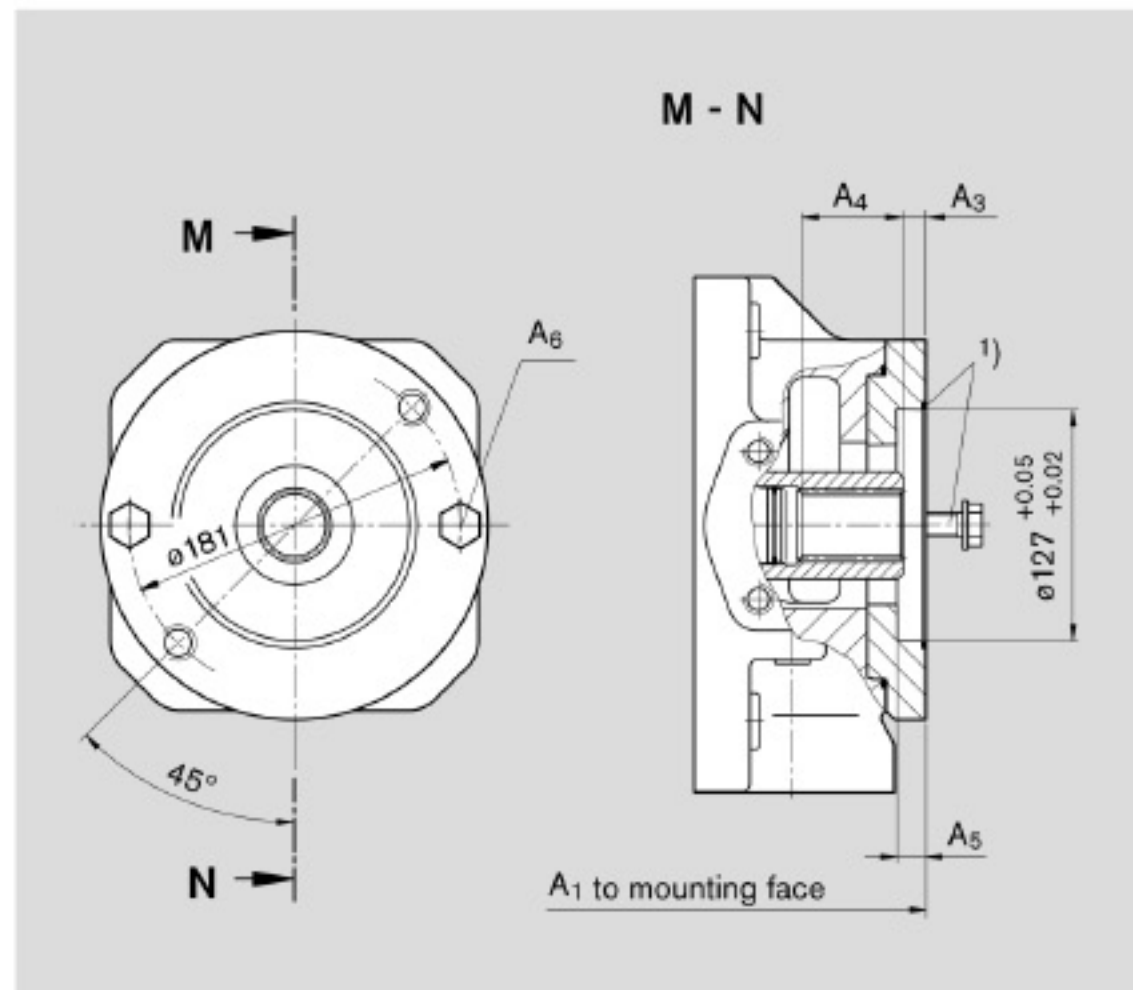
1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.

3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.

■ Dimensions through drives...U24:

- Flange ISO 3019-1 127-2 (SAE C),
- Shaft coupler for splined shaft 38-4 SAE C-C, 1 1/2 in, 12/24 DP; 17T³⁾
- for mounting an A10VO 100/31 splined shaft S or A10VO 85/52(53) splined shaft S or internal gear pump PGH5



□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
125	369	10,4	50	13	M16
180	393	10,4	50	13	M16
250	453	12,4	55	13	M16
355	482	12,4	55	13	M16

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.

3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.

■ Dimensions through drives...K17:

- Flange ISO 3019-1 152-4 (SAE D),
- Shaft coupler for splined shaft 44-4 SAE D, 1 3/4 in, 8/16 DP; 13T³⁾
- for mounting an A10VO 140/31 splined shaft S

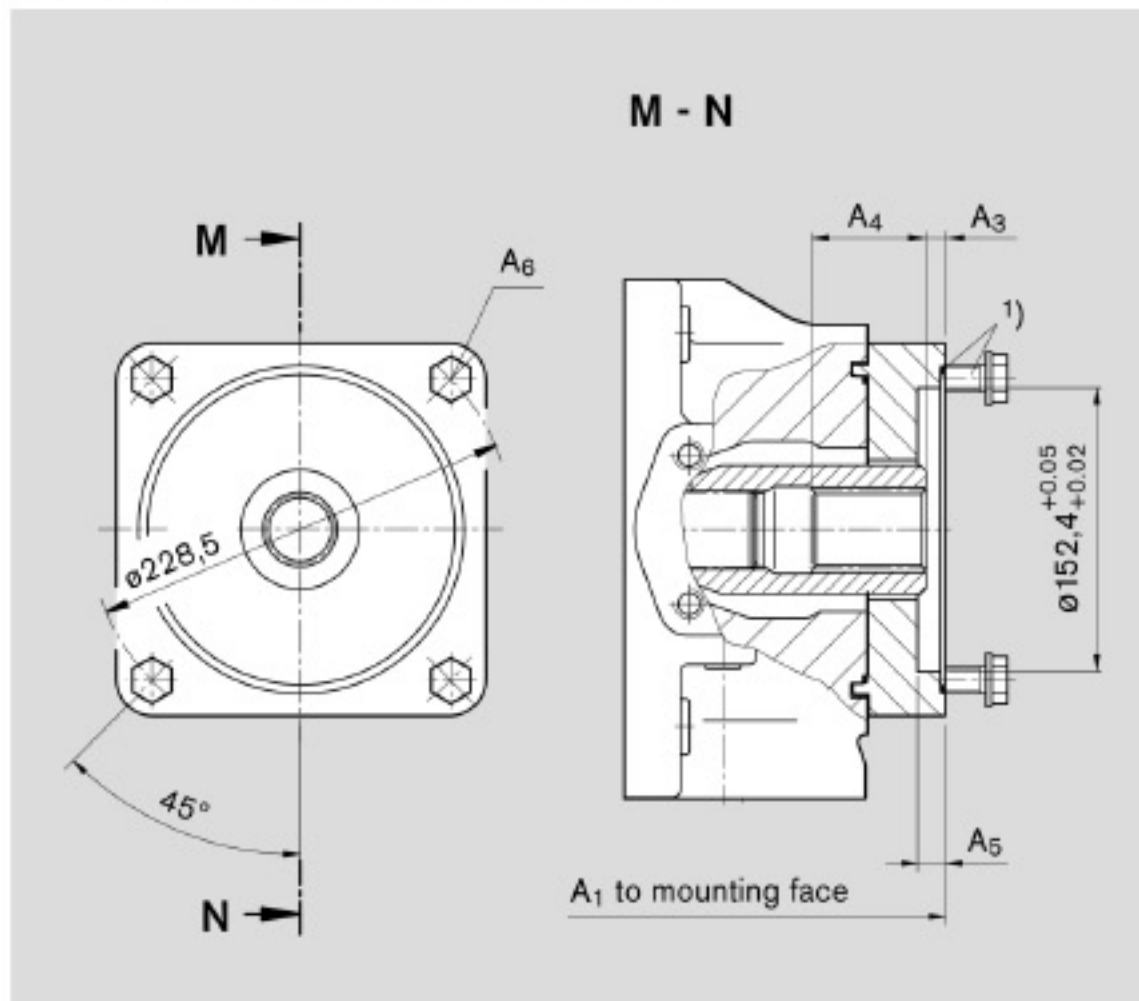
□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
500	505	10,4	59,6	13	M16

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.

3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



■ Dimensions through drives...U17:

- Flange ISO 3019-1 152-4 (SAE D),
- Shaft coupler for splined shaft 44-4 SAE D, 1 3/4 in, 8/16 DP; 13T³⁾
- for mounting an A10VO 140/31 splined shaft S

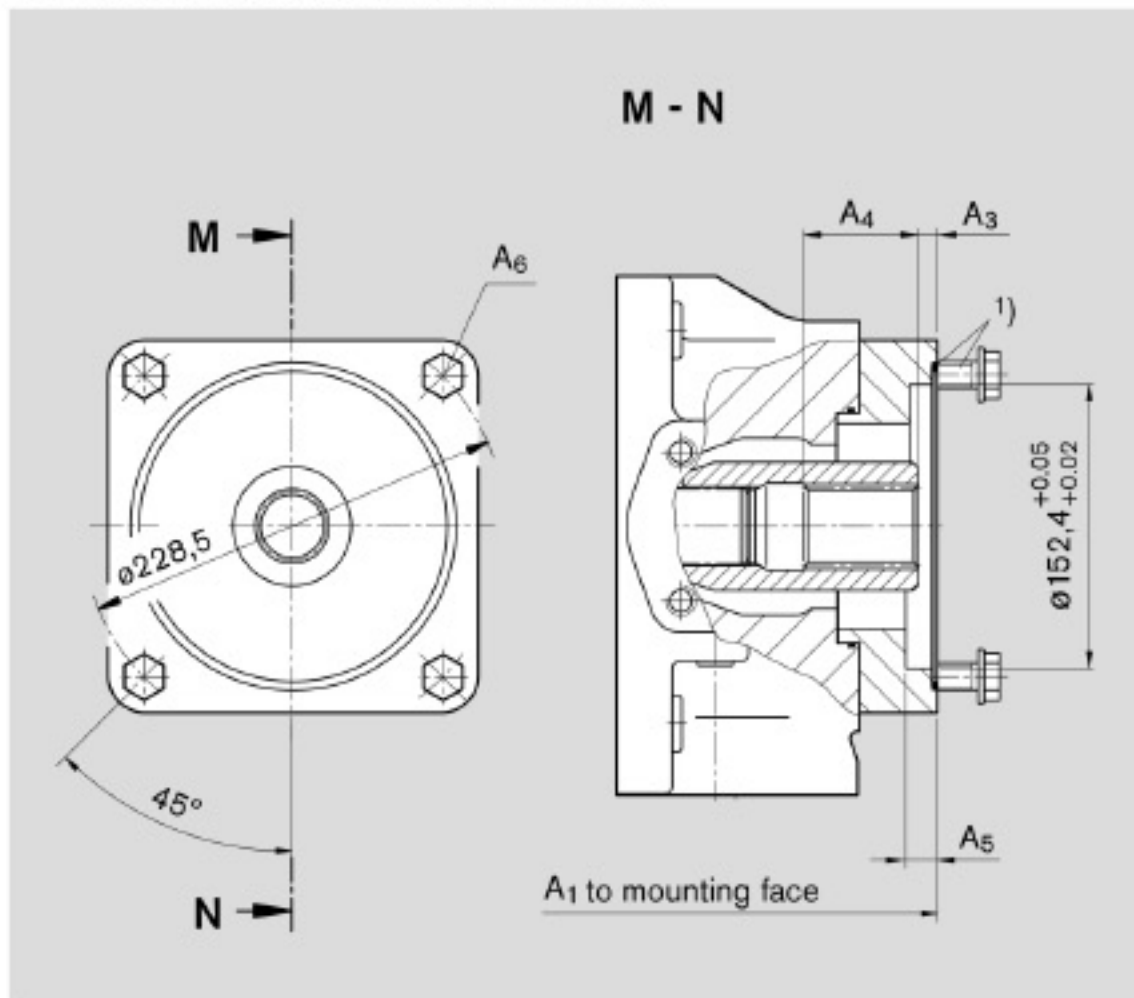
□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾
180	406	10,4	62	13	M16
250	453	10,6	62	13	M16
355	482	10,6	62	13	M16

1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.

3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



■ Dimensions through drives...K57:

- dia. 63 metric, 4-hole; Shaft coupler for keyed shaft dia. 25
- for mounting a radial piston pump R4

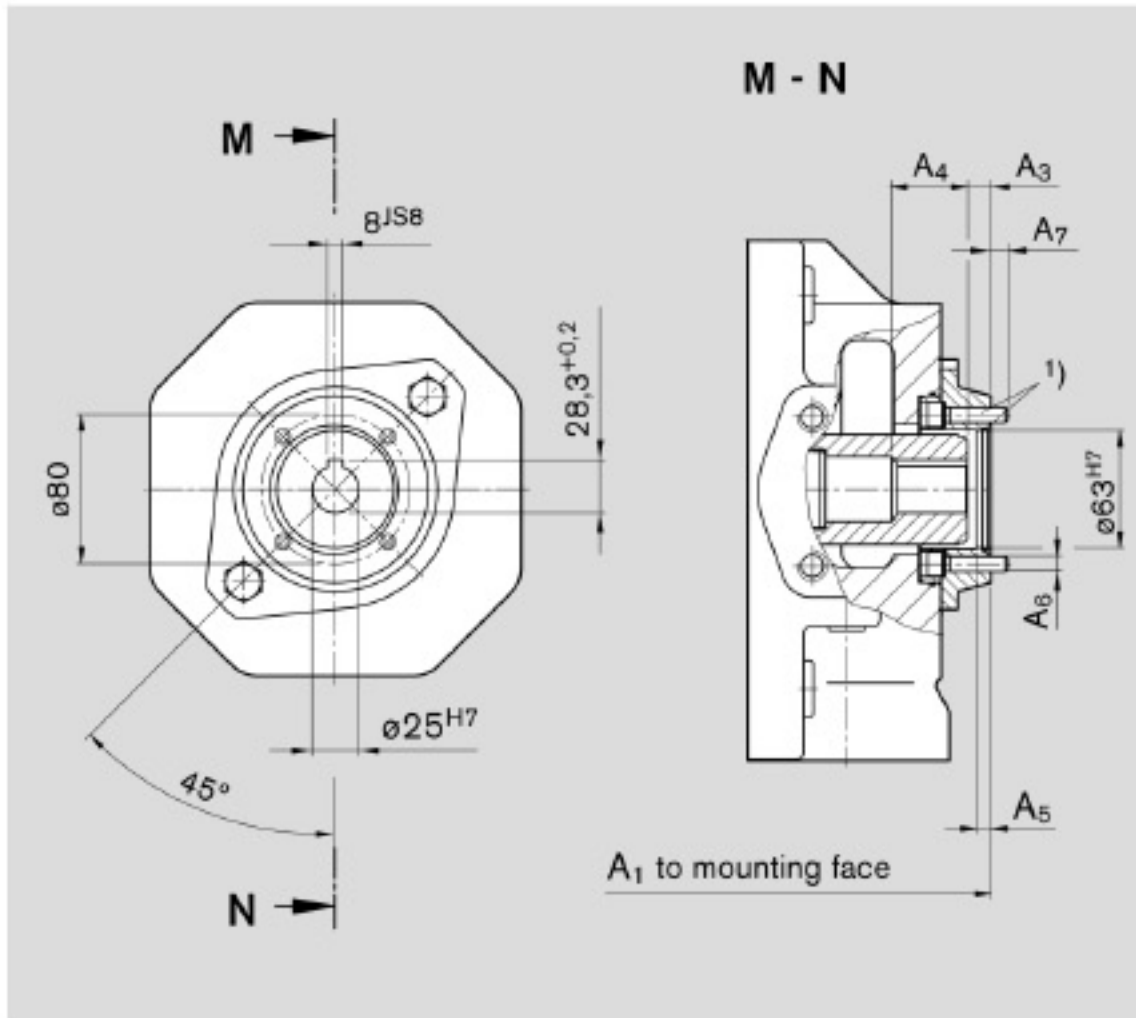
□ Dimensions:

Size	A ₁	A ₃	A ₄	A ₅	A ₆ ²⁾	A ₇
40	288	11	56	8	M8	9
71	319	10,9	42	8	M8	9
500	in preparation					

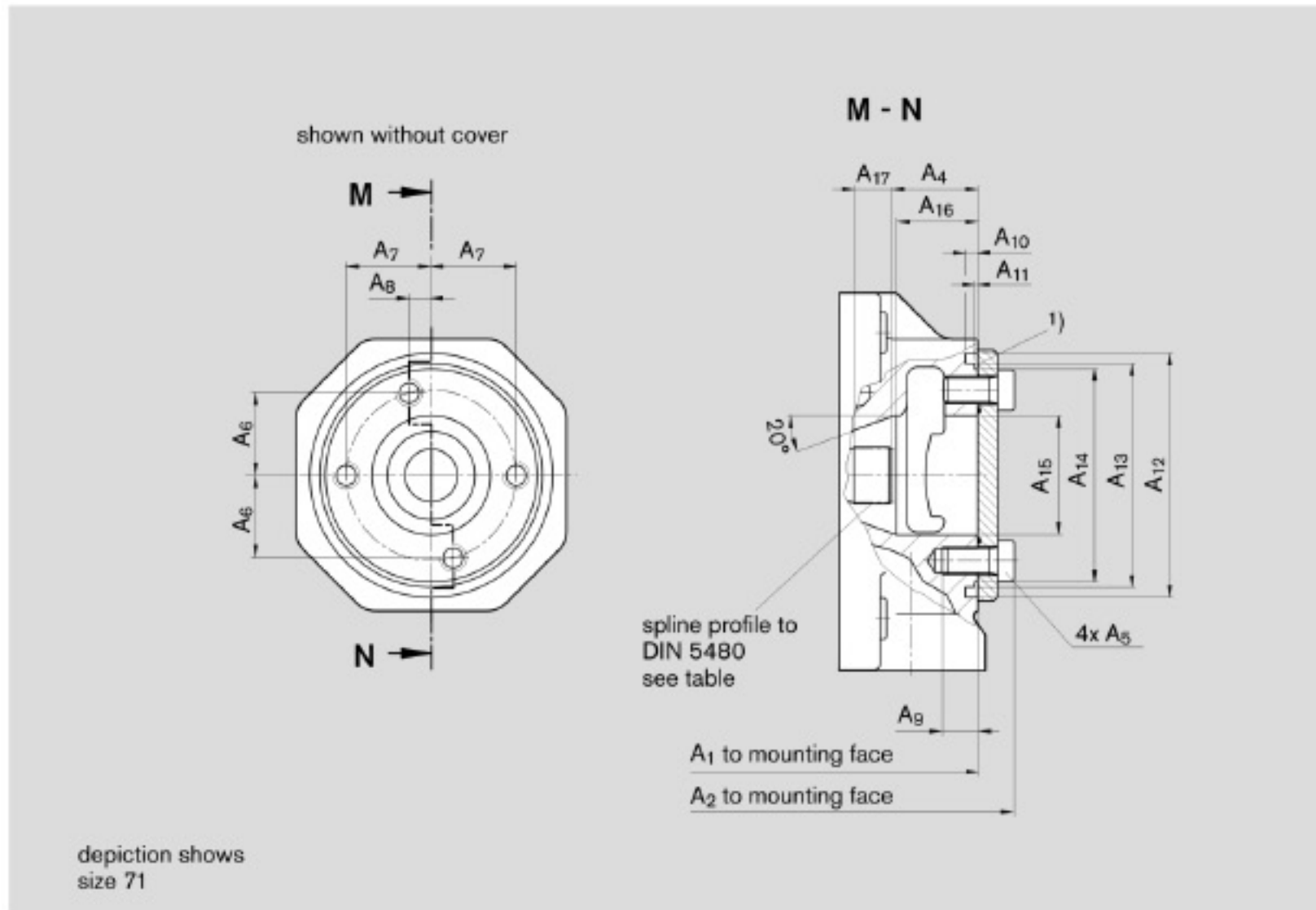
1) Mounting screws and O-ring seal are included with supply.

2) Thread to DIN 13, for the max. tightening torques observe the general information.

3) To ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5.



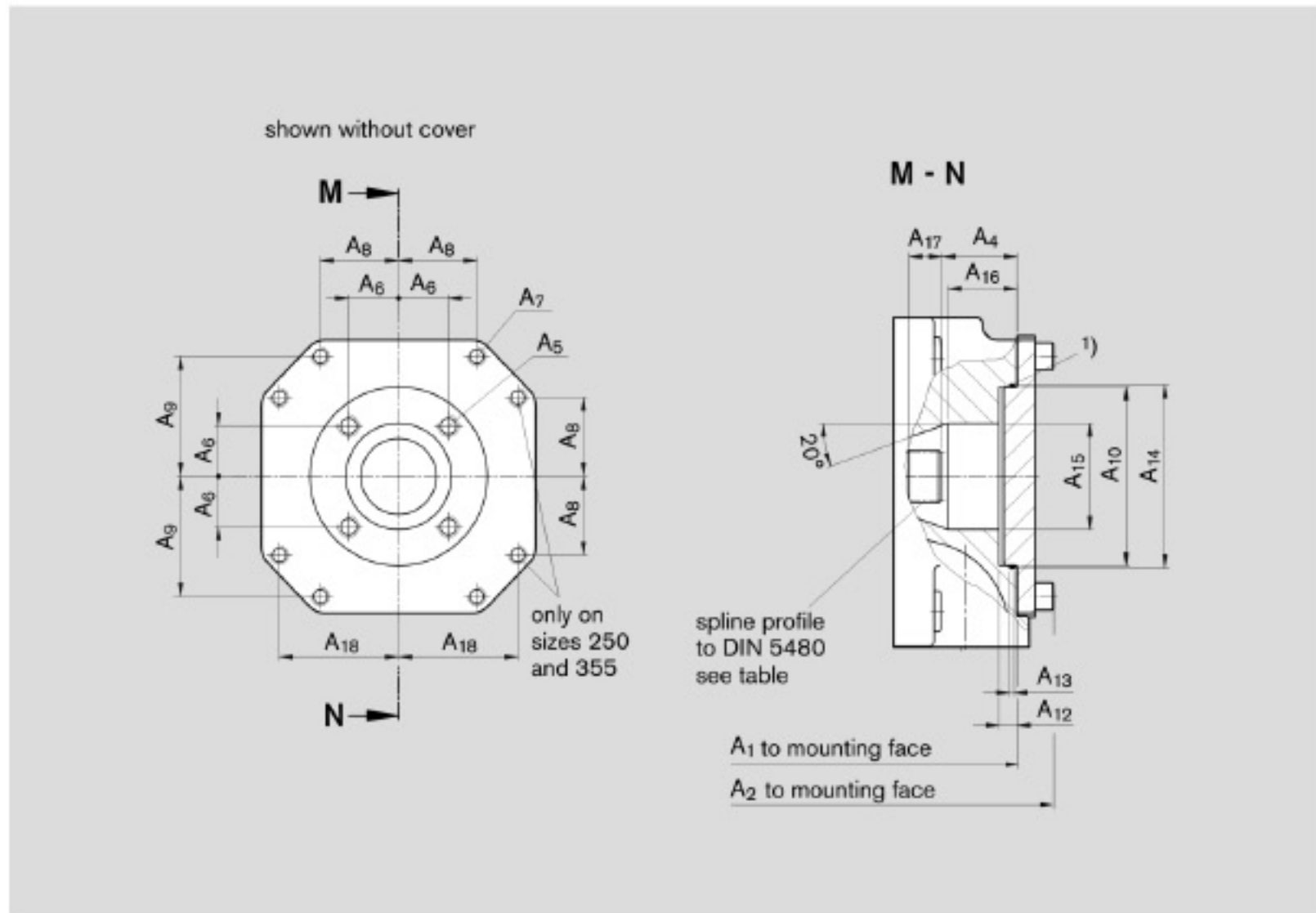
- Dimensions through drives...K99:
- Sizes 40 and 71,
- with through drive shaft,
- without shaft coupler, without adapter flange, closed with pressure tight cover



Size Main pump	A ₁	A ₂	A ₄	A ₅	A ₆	A ₇	A ₈	A ₉	A ₁₀	A ₁₁	A ₁₂	A ₁₃
40	263	280	51.3±1	M12x25	37±0.2	37±0.2	0	18	9	2.3 ^{+0.1}	∅118	∅105 _{g6}
71	291	310	48±1	M12x25	42,3 ±0,5	45 ±0,15	15,4±0,5	18	9	2.7 ^{+0.1}	∅130	∅116 _{g6}

Size Main pump	A ₁₄	A ₁₅	A ₁₆	A ₁₇	Spline profile to DIN 5480	¹⁾ O-Ring for retrofitting (not in supply)
40	∅97.6 _{-0.4}	∅52	44	14	W25x1,25x18x9g	99 x 3
71	∅106.4 _{-0.4}	∅63	38	16	W30x1,25x22x9g	110,72 x 3,53

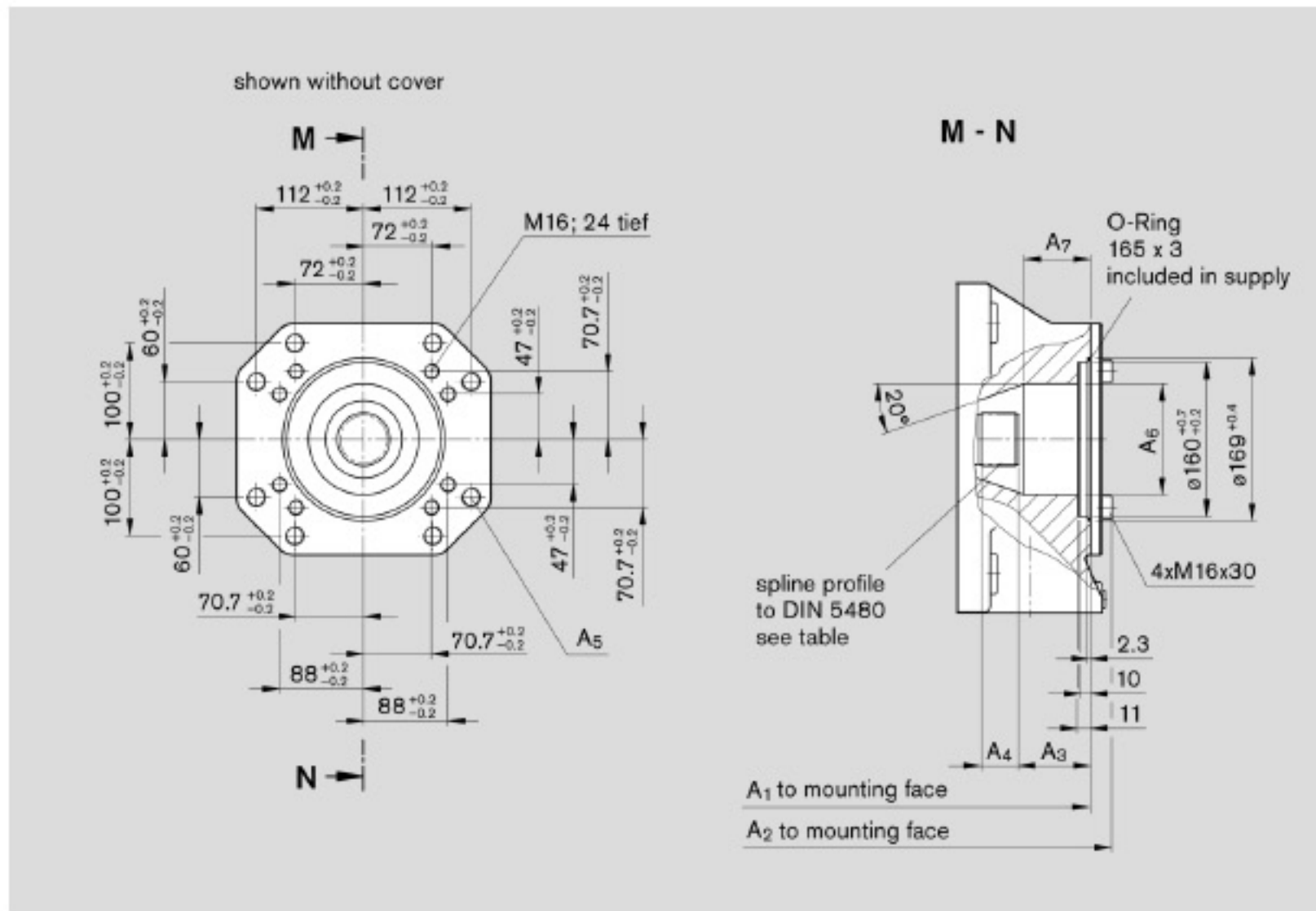
- Dimensions through drives...K99:
- Sizes 125...355,
- with through drive shaft, without shaft coupler,
- without adapter flange, closed with pressure tight cover;



Size Main pump	A ₁	A ₂	A ₄	A ₅	A ₆	A ₇	A ₈	A ₉	A ₁₀	A ₁₂	A ₁₃
125	347	368	49.7±1	M14; 15 deep	33,2 ^{+0.15}	M12; 18 deep	-	79,2 ^{+0.15}	ø118 ^{H7}	9	2,8 ^{+0.2}
180	371	392	49.7±1	M14; 15 deep	33,2 ^{+0.15}	M12; 18 deep	-	79,2 ^{+0.15}	ø118 ^{H7}	9	2,8 ^{+0.2}
250	431	455	61.4±1	M20; 22 deep	44,5 ^{+0.15}	M10; 15 deep	58,15 ^{+0.15}	86,2 ^{+0.15}	ø160 ^{H7}	9	2,8 ^{+0.2}
355	460	487	61.4±1	M20; 22 deep	44,5 ^{+0.15}	M10; 15 deep	58,15 ^{+0.15}	86,2 ^{+0.15}	ø160 ^{H7}	9	2,8 ^{+0.2}

Size Main pump	A ₁₄	A ₁₅	A ₁₆	A ₁₇	A ₁₈	Spline profile to DIN 5480	1) O-Ring for retrofitting (included in supply)
125	ø121 ^{+0.1}	ø70	46	22	-	W35x1,25x26x9g	118 x 2
180	ø121 ^{+0.1}	ø70	46	25	-	W35x1,25x26x9g	118 x 2
250	ø163 ^{+0.1}	ø87	64	30,5	86,2 ^{+0.15}	W42x1,25x32x9g	160 x 2
355	ø163 ^{+0.1}	ø87	64	34	86,2 ^{+0.15}	W42x1,25x32x9g	160 x 2

- Dimensions through drives...K99:
- Sizes 500,
- with through drive shaft, without shaft coupler,
- without adapter flange, closed with pressure tight cover;



Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	Spline profile to DIN 5480
Main pump								
500	505	527	73	41	M20; 24 deep	ø115	75	W55x1,25x42x9g

■ General safety instructions

- ❑ The axial piston unit has been manufactured according to the generally accepted rules of current technology. There is, however, still a danger of personal injury or damage to equipment if the following general safety instructions and the warnings before the steps contained in these instructions are not complied with.
- 📖 Read these instructions completely and thoroughly before working with the axial piston unit.
- 📖 Keep these instructions in a location where they are accessible to all users at all times.
- 📖 Always include the operating instructions when you pass the axial piston unit on to third parties.

■ Intended use

- ❑ Axial piston units is exclusively intended for being integrated in a machine or system or for being assembled with other components to form a machine or system. The product may only be commissioned after it has been installed in the machine/system for which it is intended.
- ❑ The axial piston variable pump generates, controls and regulates a hydraulic-fluid flow. It is approved for use as a hydraulic pump in hydrostatic drives in open circuits.
- 📖 Observe the technical data, operating conditions and performance limits as specified in the data sheet and order confirmation.
- ❑ The axial piston unit is not designed for private use.
- ❑ Intended use includes having read and understood these instructions, especially chapter "General safety instructions".

■ Improper use

- ❑ The axial piston unit may not be used in explosive environments.
- ❑ In addition, any use of the axial piston unit other than described in chapter "ntended use" is considered to be improper.

■ Personnel qualifications

- ❑ Assembly, commissioning and operation, disassembly, maintenance and repair require basic mechanical, hydraulic and electrical knowledge, as well as knowledge of the appropriate technical terms. For transporting and handling the product, additional knowledge is necessary with regard to working with a crane and the corresponding attachment equipment. In order to ensure operating safety, these activities may therefore only be carried out by qualified personnel or an instructed person under the direction and supervision of qualified personnel.
- ❑ Qualified personnel are those who can recognize possible hazards and institute the appropriate safety measures due to their professional training, knowledge, and experience, as well as their understanding of the relevant conditions pertaining to the work to be done. Qualified personnel must observe the rules relevant to the subject area.

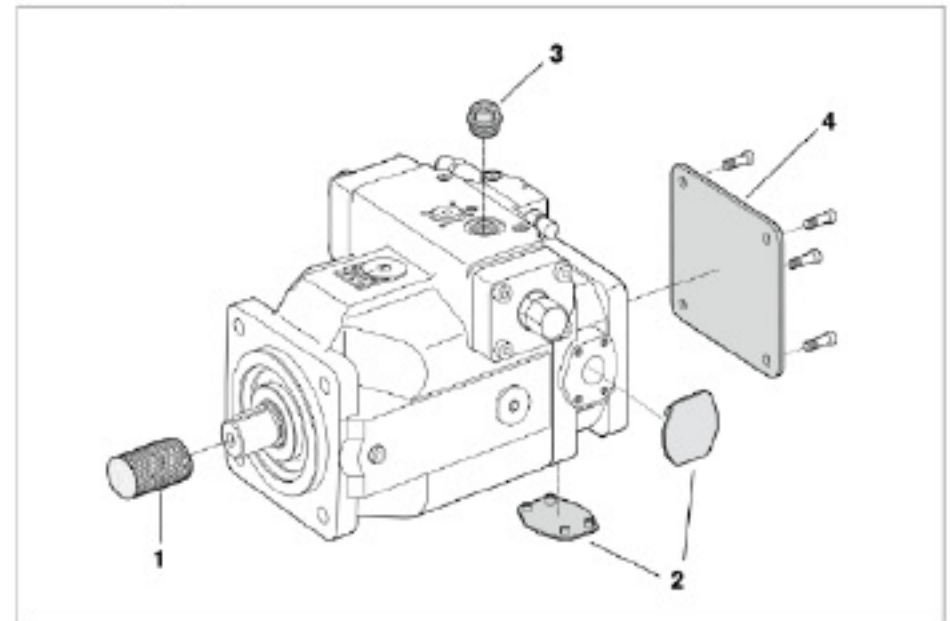
■ Adhere to the following instructions

■ General instructions

- ❑ Observe the regulations for accident prevention and environmental protection for the country where the product is used and at the workplace.
- ❑ Only use Rexroth axial piston units in good technical order and condition. Inspect the product for obvious defects.
- ❑ Do not modify or retrofit the axial piston unit.
- ❑ Only use the product within the performance range provided in the technical data.
- ❑ Persons who assemble, commission, operate, disassemble or maintain Rexrot products must not consume any alcohol, drugs or pharmaceuticals that may affect their ability to respond.
- ❑ The warranty only applies to the delivered configuration.
- ❑ The warranty is rendered void if the product is incorrectly assembled, commissioned or operated, as well as if not used as intended and/or handled improperly.
- ❑ Do not expose the product to any mechanical loads under any circumstances.
- ❑ Never use the product as a handle or step. Do not place/lay any objects on it.
- ❑ The noise emission of axial piston units depends on speed, operating pressure and installation conditions. The sound pressure level may rise above 70 dBA during normal operating conditions. This can cause hearing damage.
- ❑ Always wear hearing protection while working in the vicinity of the operating axial piston unit.
- ❑ The axial piston unit heats up considerably during operation. The solenoids of he axial piston unit get so hot during operation that you may burn yourself.
- ❑ Allow the axial piston unit to cool down sufficiently before touching it.
- ❑ Wear heat-resistant protective clothing, e.g. gloves.

- **During transport**
 - Make certain that the lifting gear has adequate lifting capacity. The weight can be found in chapter "Transport and storage".
- **During assembly**
 - Before assembling, make sure that all fluids have been completely removed from the axial piston unit to prevent mixing with the hydraulic fluid used in the system.
 - Make sure the relevant system component is not under pressure or voltage before assembling the product or when connecting and disconnecting plugs.
 - Protect the system against being switched on.
 - Lay cables and lines so that they cannot be damaged and no one can trip over them.
 - Before commissioning, make sure that all hydraulic connections are tight and that all the connection seals and plugs are installed correctly to ensure that they are leakproof and fluids and contaminants are prevented from penetrating the product.
 - When assembling, provide for absolute cleanliness in order to prevent
 - contaminants such as welding beads or metal cuttings from getting into the hydraulic lines and causing product wear or malfunctions.
- **During commissioning**
 - Ensure that all electrical and hydraulic connections and ports are occupied or plugged. Only commission a completely installed product.
- **During cleaning**
 - Plug all openings with the appropriate protective equipment in order to prevent detergents from penetrating the system.
 - Never use solvents or aggressive detergents. Use only water and, if necessary, a mild detergent to clean the axial piston unit.
 - Do not point the high-pressure cleaner at sensitive components such as, e.g. shaft seal ring, electrical connections and electrical components.
- **During maintenance and repair**
 - Perform the prescribed maintenance work at the intervals specified in the operating instructions (see chapter "Maintenance").
 - Make sure that no lines, connections or components are disconnected as long as the system is under pressure. Protect the system against being switched on.

- **Disposal**
 - Dispose of the product and the hydraulic fluid in accordance with the currently applicable national regulations in your country.
- **Operator's obligations**
 - The operator of the axial piston unit from Rexroth must provide personnel training on a regular basis regarding the following subjects:
 - Observation and use of the operating instructions and the legal regulations Intended use and operation of the axial piston unit .
 - Observation of the instructions from the factory security offices and of the work instructions from the operator.
- **Delivery contents**



- Included in the delivery contents are:
 - 📦 1 Axial piston unit
- The following parts are also assembled on delivery:
 - 📦 Transport protection for drive shaft end (1).
 - 📦 Protective covers (2).
 - 📦 Plastic plugs / locking screws (3).
 - 📦 Flange cover and fixing screws (4) (optional for versions with through drive).

■ Product description

■ Performance description

- The axial piston unit is designed and built for the generation, the control and the regulation of a hydraulic fluid flow. It is designed for stationary or mobile applications.
- Please refer to the data sheet and order confirmation for the technical data, operating conditions and operating limits of the axial piston unit.

■ Device description

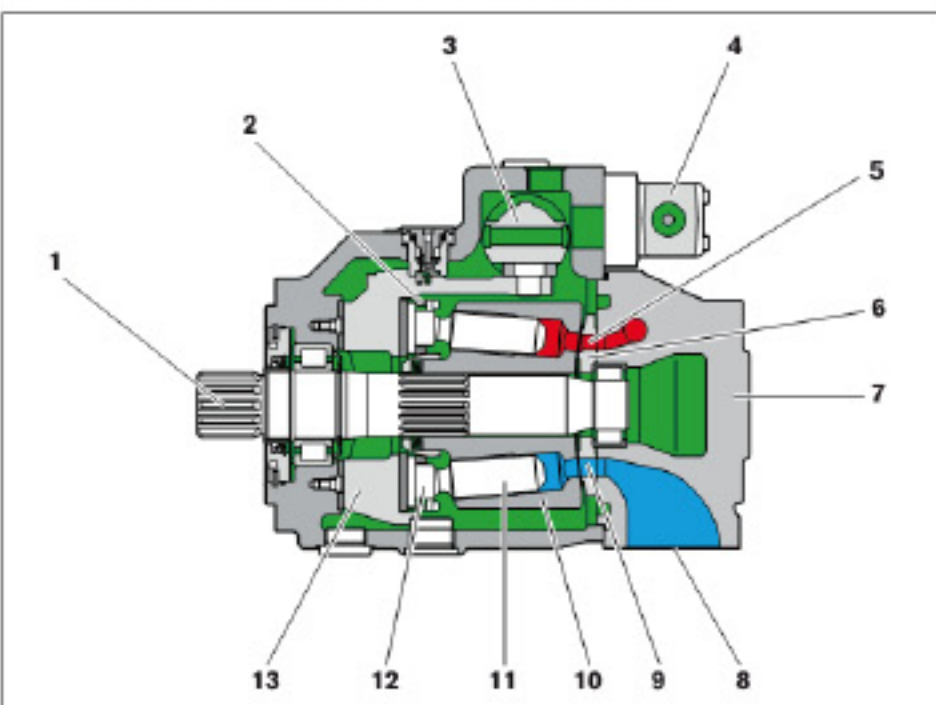
- The HD-A4VSO is an axial piston variable pump with swashplate design for hydrostatic drives in open circuits.
- Flow is proportional to drive speed and displacement. The flow can be steplessly changed by controlling the swashplate.

■ Open circuit

- With an open circuit, the hydraulic fluid flows from the tank to the variable pump and is transported from there to the consumer via a directional valve.
- From the consumer, the hydraulic fluid flows back to the tank via the directional valve.

■ Assembly of the axial piston unit

- Assembly of the A4VSO series 10, 22 and 30



- | | |
|---|----------------------|
| 1. Drive shaft | 7. Port plate |
| 2. Retaining plate | 8. Suction port |
| 3. Stroke piston | 9. Low-pressure side |
| 4. Control unit (here using the DR as an example) | 10. Cylinder |
| 5. High-pressure side | 11. Piston |
| 6. Control plate | 12. Slipper pad |
| | 13. Swashplate |

■ Product description

- For axial piston units with swashplate design, the pistons (11) are arranged axially with respect to the drive shaft (1). They are guided in the rotating cylinder (10) and support themselves with the slipper pads (12) on the non-rotating swashplate (13). The drive shaft (1) and cylinder (10) are connected to one another by means of gearing.

■ Functional description

■ Pump

- Torque is applied to the drive shaft (1) by an engine. The cylinder (10) turns with the drive shaft (1), turning with it the pistons (11). On each rotation, the pistons (11) perform a stroke movement which is defined by the pitch of the swashplate (13). The slipper pads (12) are held on and guided along the glide surface of the swashplate (13) by the retaining plate (2). During a rotation, each piston (11) moves over the bottom and top dead centers back to its initial position.
- During this action, the fluid volume defined by the piston surface and the stroke is fed in or removed through the two control slits in the control plate (6). On the low-pressure side (9), fluid flows into the enlarging piston chamber via the suction port (8). At the same time, on the high-pressure side (5) the fluid is pushed out of the cylinder chamber into the hydraulic system by the pistons.

■ Control

- The swivel angle of the swashplate (13) is infinitely variable. By changing the swivel angle, the piston stroke and, therefore, the displacement change. The swivel angle is controlled hydraulically via the stroke piston (3). The swashplate (13) is mounted for easy motion in swivel bearings. Increasing the swivel angle increases the displacement; reducing the angle results in a corresponding reduction in displacement.
- The swivel angle can never be swiveled completely to zero because a minimum amount of hydraulic fluid is necessary for
 - ⚡ cooling the pistons.
 - ⚡ supplying the control.
 - ⚡ compensating for case drain fluid and.
 - ⚡ lubricating all moving parts.

■ **Transporting the axial piston unit:**

- ❑ Axial piston units can be transported with a fork lift truck or with a lifting device.
- ❑ Make certain that the fork lift truck or lifting device has adequate lifting capacity.
- ❑ Dimensions and weights

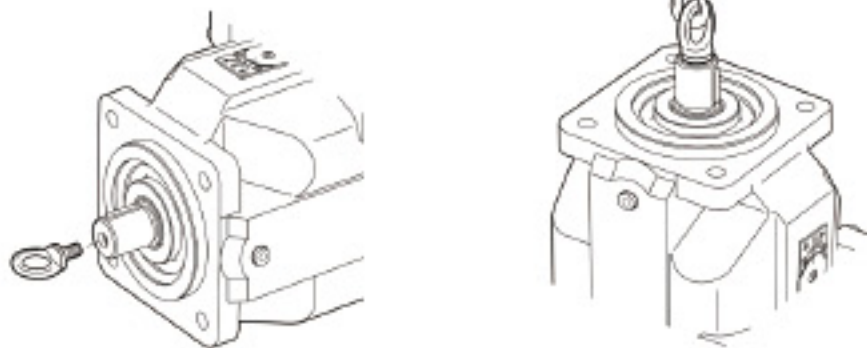
Size		40	71	125	180	250	355	500
Weight	Kg	39	53	88	102	184	207	320
Width	mm	The dimensions vary with the unit type. The values applicable to your axial piston unit can be found in the installation drawing.						
Height	mm							
Depth	mm							

■ **Transporting with lifting device**

- ❑ For transporting, the axial piston unit can be connected to a lifting device via a ring screw or a lifting strap.

■ **Transport with ring screw**

- ❑ The drive shaft can be used to transport the axial piston unit as long as only outward axial forces occur. Thus, you can suspend the axial piston unit from the drive shaft.
- ✚ To do this, screw a ring screw completely into the thread on the drive shaft. The size of the thread is stated in the installation drawing.
- ✚ Make sure that each ring screw can bear the total weight of the axial piston unit plus approx. 20%.
- ❑ You can hoist the axial piston unit as shown in Fig using the ring screw screwed into the drive shaft without any risk of damage.



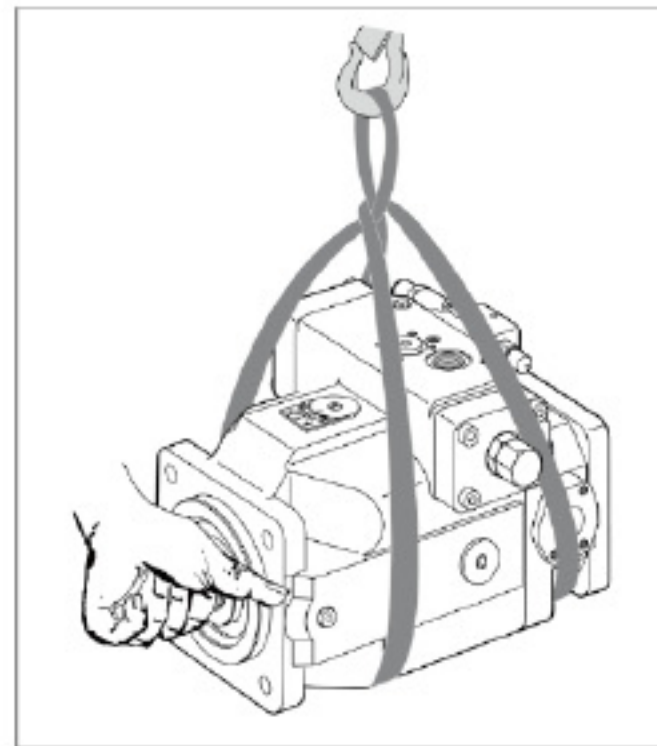
- ❑ Fixing the ring screw

■ **WARNING ! Risk of injury!**

- ❑ Hitting or impulsive forces on the drive shaft can damage the axial piston unit.
- ❑ Do not hit the coupling or drive shaft of the axial piston unit.
- ❑ Do not set/place the axial piston unit on the drive shaft.
- ❑ Details on the permissible axial and radial forces can be found in the data sheet.

■ **Transport with lifting strap:**

- ❑ Place the lifting strap around the axial piston unit in such a way that it passes over neither the attachment parts (e.g. valves) nor such that the axial piston unit is hung from attachment parts.



- ❑ Transport with lifting strap

■ **WARNING ! Risk of injury!**

- ❑ During transport with a lifting device, the axial piston unit can fall out of the lifting strap and cause injuries.
- ❑ Hold the axial piston unit with your hands to prevent it from falling out of the lifting strap.
- ❑ Use the widest possible lifting strap.

■ Storing the axial piston unit

■ Requirement:

- ❑ The storage areas must be free from corrosive materials and gasses.
- ❑ The storage areas must be dry.
- ❑ The ideal temperature for storage lies between +5 °C and +20 °C.
- ❑ Avoid intense lights.
- ❑ Do not stack axial piston units and store them shock-proof.
- ❑ For other storage conditions, see Table.
- ❑ Check the axial piston unit monthly to ensure proper storage.

■ After delivery

- ❑ The axial piston unit is provided ex-works with a corrosion protection packaging (corrosion protection film).
- ❑ Listed in the following table are the maximum permissible storage times for an originally packed axial piston unit.

❑ Storage time with factory corrosion protection

Storage conditions	Standard corrosion protection	long-term corrosion protection
Closed, dry room, uniform temperature between +5 °C and +20 °C. Undamaged and closed corrosion protection film.	Maximum 12 months	Maximum 24 months

❑ Procedure after expiration of the maximum storage time:

1. Check the entire axial piston unit for damage and corrosion prior to installation.
2. Check the axial piston unit for proper function and leaks during a test run.
3. Replace the shaft seal ring if the storage time of 24 months is exceeded.

- ❑ In the event of questions regarding spare parts, contact your responsible huade Service partner or the service department of the manufacture's plant for the axial piston unit, see chapter "Spare parts" for further information.

■ After disassembly

- ❑ If a dismantled axial piston unit is to be stored, it must be conserved against corrosion for the duration of the storage.
- ❑ Recommends the following procedure:
 1. Clean the axial piston unit, see chapter "Cleaning and care" for further information.
 2. Completely empty the axial piston unit.
 3. For storage time up to 12 months: Moisten the inside of the axial piston unit with mineral oil and fill with approx. 100 ml mineral oil. For storage time up to 24 months: Fill the axial piston unit with corrosion protection VCI 329 (20 ml). Fill via case drain port K₁ or K₂, see chapter "Assembling the axial piston unit".
 4. Seal all ports airproof.
 5. Moisten the unpainted surfaces of the axial piston unit with mineral oil.
 6. Package the axial piston unit airproof together with desiccant in corrosion protection film.
 7. Store the axial piston unit so that it is protected against jolts. See "Requirement" in this chapter for further conditions.

■ Assembly

- ❑ Prior to assembly, the following documents must be available:
 - 📄 Installation drawing for the axial piston unit (available from huade)
 - 📄 Hydraulic circuit diagram for the axial piston unit (in the installation drawing) .
 - 📄 Hydraulic circuit diagram for the system (available from the system manufacturer).
 - 📄 Order confirmation (contains the preset data of the axial piston unit)
 - 📄 Data sheet for the axial piston unit (contains the technical data)

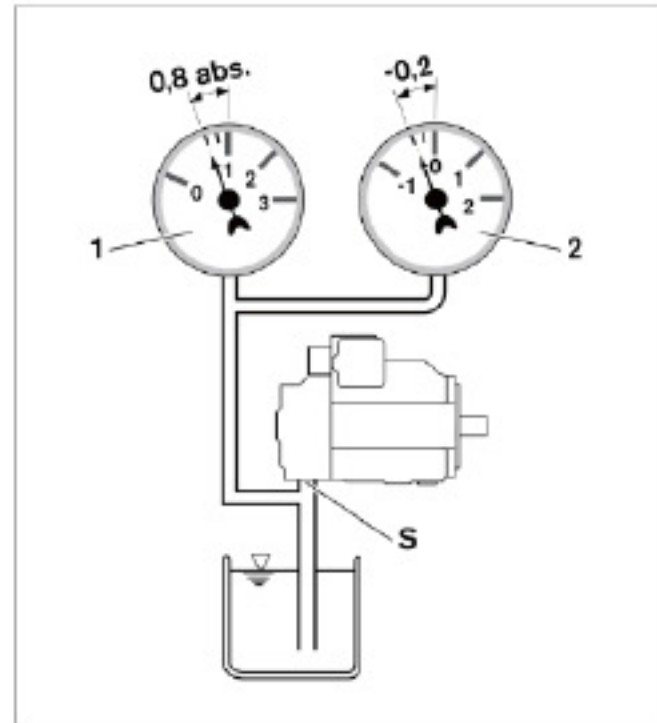
■ Unpacking

- ❑ The axial piston unit is delivered in a corrosion protection film made of polyethylene material.
- ❑ Dispose of the packaging according to the national regulations of your country.

■ Installation conditions

- ❑ The installation location and position of the axial piston unit essentially determine the procedures during installation and commissioning (such as when filling the axial piston unit).
- ❑ Note that you can expect certain installation positions to affect the control device. Because of gravity, dead weight and case pressure, minor characteristic displacements and actuating time changes may occur.
- ❑ Adhere to all limits specified in the data sheet regarding temperature, viscosity, cleanliness of the hydraulic fluid.
- ❑ Make certain that the case of the axial piston unit is filled with hydraulic fluid during commissioning and operation. This is also to be observed following relatively long standstill periods as the axial piston unit may empty via the hydraulic lines.
- ❑ The case drain fluid in the case interior must be directed to the tank via the highest case drain port. Use the line size which is appropriate for the port.
- ❑ A check valve in the case drain line is only permissible on a case-by-case basis upon request.
- ❑ To achieve favorable noise values, decouple all connecting lines from all vibration-capable components (e.g. tank) using elastic elements.
- ❑ Make certain that the suction line, case drain line, and return line flow into the tank below the minimum fluid level in all operational states.

❑ Suction pressure Fig:



- 1 Absolute pressure gauge
- 2 Standard pressure gauge

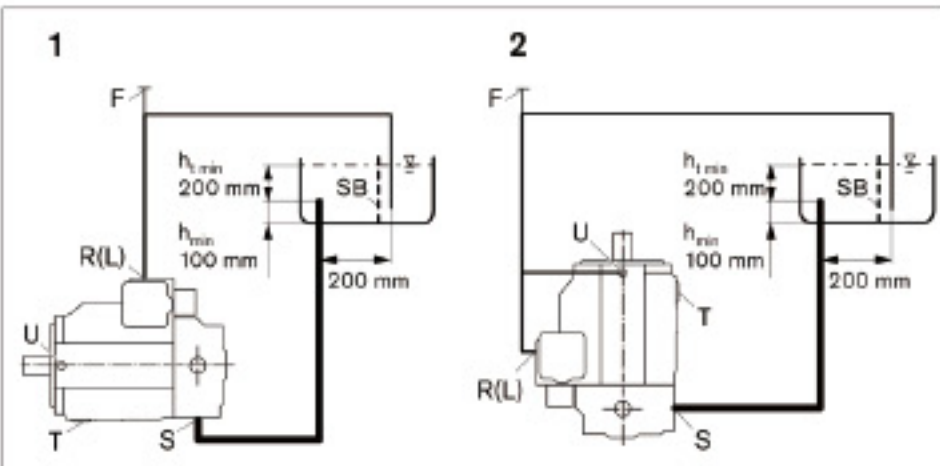
- ❑ Make certain that a minimum suction pressure of 0.8 bar absolute is present at port "S" during operation and on cold starts in all installation positions and installation locations for the axial piston pump, see Fig. See data sheet for additional values.
- ❑ Absolute cleanliness is required. The axial piston unit must be installed in a clean condition. Contamination of the hydraulic fluid can have a considerable impact on the service life of the axial piston unit.
- ❑ Do not use any cotton waste or lint cloths for cleaning.
- ❑ Use suitable liquid detergents to remove lubricants and other difficult-to-remove contamination. Detergents must not penetrate the hydraulic system.

■ Installation position

□ The following installation positions are permissible. The shown piping layout illustrates the basic layout.

■ Below-tank installation

- Below-tank installation is when the axial piston unit is installed outside of the tank below the minimum hydraulic fluid level.
- Fig. 22: Below-tank installation with horizontal installation position 1 and vertical installation position 2



- F** Filling / air bleeding
- R(L)** Fluid filling
- T** Fluid drain
- S** Suction port
- U** Flow port
- SB** Baffle (baffle plate)
- h_{t min}** Min. permissible immersion depth
- h_{min}** Min. permissible distance from suction port to tank base

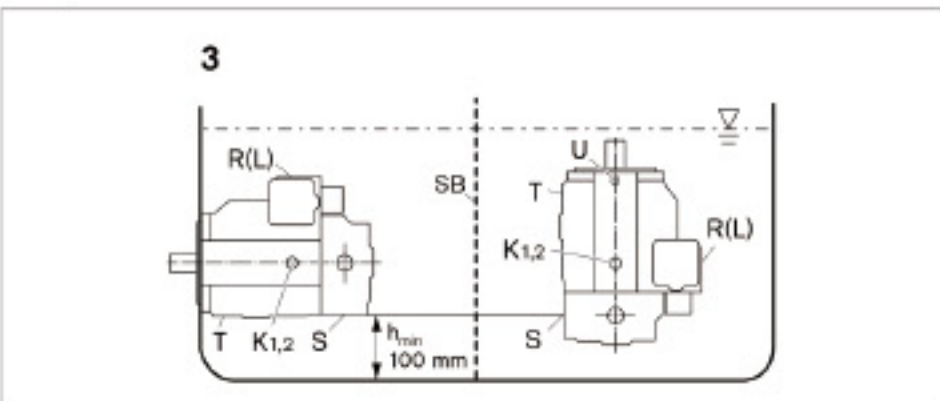
Table 5: Below-tank installation

Installation position	Air bleeding	Filling
1 (drive shaft, horizontal)	R(L) (F)	S + R(L) (F)
2 (drive shaft, vertical)	R(L) (F)	S + T

■ Tank installation

□ Tank installation is when the axial piston unit is installed in the tank below the minimum hydraulic fluid level. The axial piston unit is completely below the hydraulic fluid.

- Fig. 23: Tank installation with horizontal and vertical installation position 3



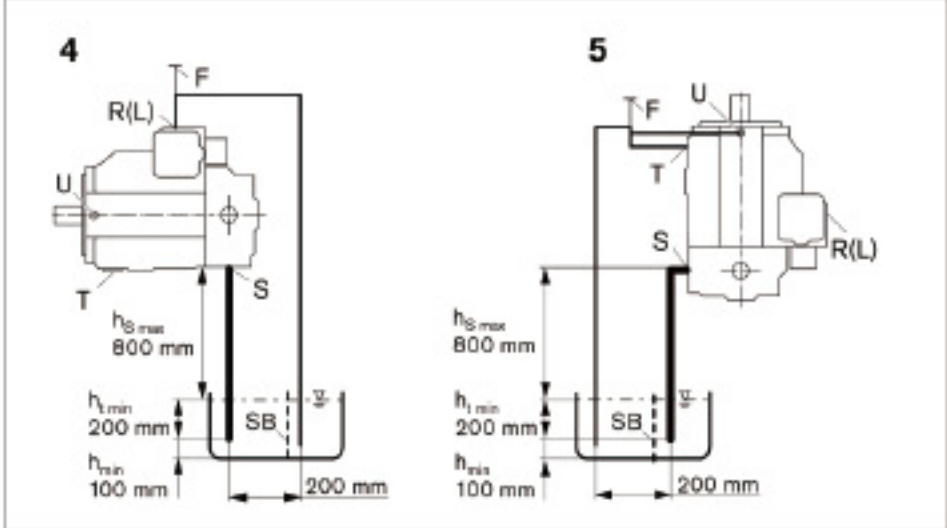
- R(L)** Air bleed port
- T** Fluid port
- S** Suction port
- K₁, K₂, U** Flow port
- SB** Baffle (baffle plate)
- h_{min}** Min. permissible distance from lower edge of suction port to tank base

Table 6: Tank installation

Installation position	Air bleeding	Filling
3	via the highest opened port T, K ₁ , K ₂ , R(L), U	via all opened ports T, K ₁ , K ₂ , R(L), U and S automatic, due to position below hydraulic fluid level

■ Above-tank installation

- Above-tank installation is when the axial piston unit is installed above the minimum fluid level of the tank.
- For vertical installation (shaft end upward), HUADE recommends the use of a bearing flushing at port "U" in order to ensure lubrication of the front bearing and of the shaft seal ring.
- Fig. 24: Above-tank installation with horizontal installation position 4 and vertical installation position 5



- F** Filling / air bleeding
- R(L)** Fluid filling
- T** Fluid drain
- S** Suction port
- U** Flow port
- SB** Baffle (baffle plate)
- h_{s max}** Max. permissible suction height
- h_{t min}** Min. permissible immersion depth
- h_{min}** Min. permissible distance from suction port to tank base

Table 7: Above-tank installation

Installation position	Air bleeding	Filling
4 (drive shaft, horizontal)	R(L) (F)	R(L) (F)
5 (drive shaft, vertical)	U (F)	T (F)

■ **Assembling the axial piston unit**

■ **Preparation**

- 1 Check the delivery contents for completeness and transport damages.
- 2 Compare the material number and designation (ordering code) with the details in the order confirmation.
- 3 Before assembling, completely empty the axial piston unit to prevent mixing with the hydraulic fluid used in the system.
- 4 Check the direction of rotation of the axial piston unit (on the name plate) and make sure that this corresponds to the direction of rotation of the engine.

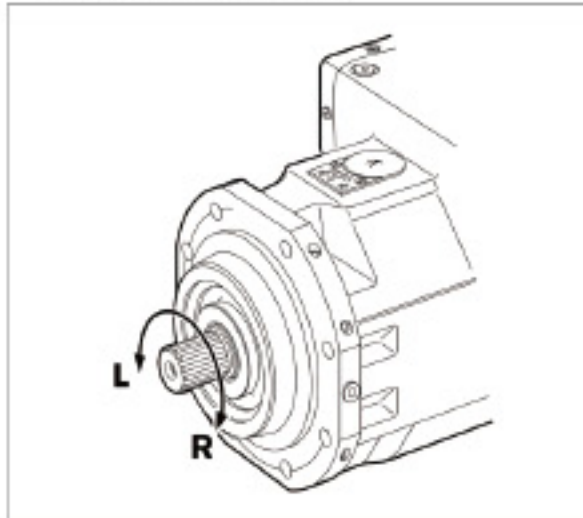


Fig. 25: Direction of rotation

L: Counter-clockwise R: Clockwise

- 5 Check the swivel angle indicator on the axial piston unit. 5.

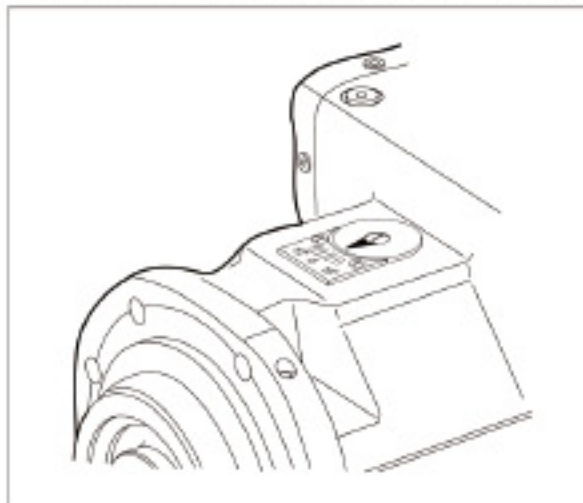


Fig. 26: Swivel angle indicator

■ **Dimensions**

- The installation drawing contains the dimensions for all ports on the axial piston unit. Also observe the instructions provided by the manufacturers of the other components when selecting the required tools.

■ **General instructions**

- During assembly (and disassembly) of the axial piston unit, observe the following general instructions and handling instructions:
 - ✚ After a short operating time, toothed belts lose a major portion of their pre-tension and thus cause speed variations and torsional vibrations.
 - ✚ Torsional vibrations may cause leakages on the shaft seal ring or increased rotary angle accelerations of the rotary group of the driven axial piston unit.
 - ✚ Particularly at risk are diesel drives with a small number of cylinders and low flywheel mass.

- V-belt drives without automatic tensioning device are also critical with regard to speed variations and torsional vibrations. These can also lead to leakages on the shaft seal ring.
- ✚ An automatic tensioning device can lessen the speed variations and vibrations and thus avoid consequential damage.
- When driving an axial piston unit with the aid of a cardan shaft, vibrations may occur which may result in leakages on the shaft seal ring of the axial piston unit depending on the temperature and frequency.
- When driving with toothed belts or v-belts, always use an automatic tensioning device.
- Fix the axial piston unit so that the expected forces and torques can be transferred without any danger.
- The permissible axial and radial loading of the drive shaft, the permissible torsional vibration, the optimum direction of load force, as well as the limit speeds can be found in the data sheet.
- Observe the permissible radial forces on the drive shaft when driving with radial loading (belt drives). If necessary, the belt pulley must be separately mounted.

■ **Installation with coupling**

- How to assemble the axial piston unit with a coupling is described in detail in the following:
 1. Assemble the specified coupling half onto the drive shaft of the axial piston unit according to the instructions of the coupling manufacturer.
 2. Make sure that the installation location is clean and free from dirt and contaminants.
 3. Clamp the coupling hub onto the drive shaft or ensure permanent lubrication of the drive shaft. This prevents the formation of frictional corrosion and the associated wear.
 4. Transport the axial piston unit to the installation location.
 5. Assemble the coupling onto the drive according to the instructions of the coupling manufacturer.
 6. Fix the axial piston unit at the installation location.
 7. If necessary, details on the required tools and tightening torques for the fixing screws are available from the machine or system manufacturer.
 8. When using flexible couplings, check that the drive is free of resonance after completing the installation.

■ **Installation on a gearbox**

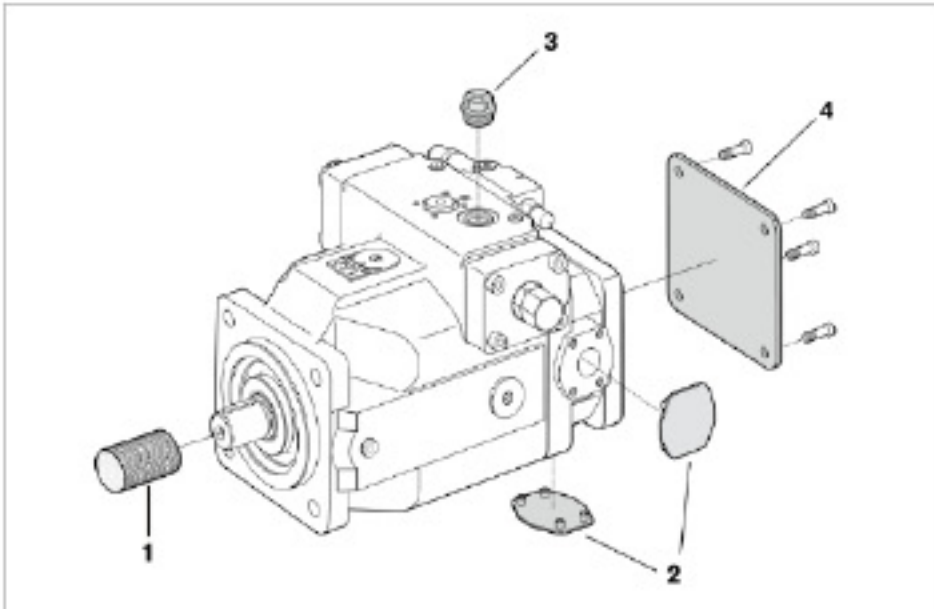
- How to assemble the axial piston unit on a gearbox is described in detail in the following:
 - After installing on a gearbox, the axial piston unit is covered and is difficult to access:

■ **Installation with cardan shaft**

- To connect the axial piston unit to the engine via a cardan shaft:
 1. Position the axial piston unit close to the specified installation point. It should
 2. Allow enough space for the cardan shaft to fit through on both sides. Position the cardan shaft on the output shaft of the engine.
 3. Push the axial piston unit to the cardan shaft and position the cardan shaft on the drive shaft of the axial piston unit.
 4. Bring the axial piston unit to the installation position and secure. If necessary, details on the required tools and tightening torques for the fixing screws can be obtained from the system manufacturer.

■ **Completing assembly:**

1. Remove any mounted transport screws.
2. Remove the transport protection.
The axial piston unit was delivered with protective covers and plastic plugs or locking screws. These must be removed before connecting. Use appropriate tools.
3. Make certain that the sealing and functional surfaces are not damaged.
4. For versions with through drive, assemble the auxiliary pump according to the pump manufacturer's instructions.



□ **Removing transport protection:**

1. Transport protection for shaft end
2. Protective covers
3. Plastic plugs / locking screws
4. Flange cover and fixing screws (optional for versions with through drive)

■ **Hydraulically connecting the axial piston unit**

- The machine or system manufacturer is responsible for dimensioning the lines.
- The axial piston unit must be connected to the rest of the hydraulic system in accordance with the hydraulic circuit diagram of the machine or system manufacturer.
- The ports and fixing threads are designed for the maximum pressure specified in the data sheet. The machine/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.

■ **Notes on routing the lines**

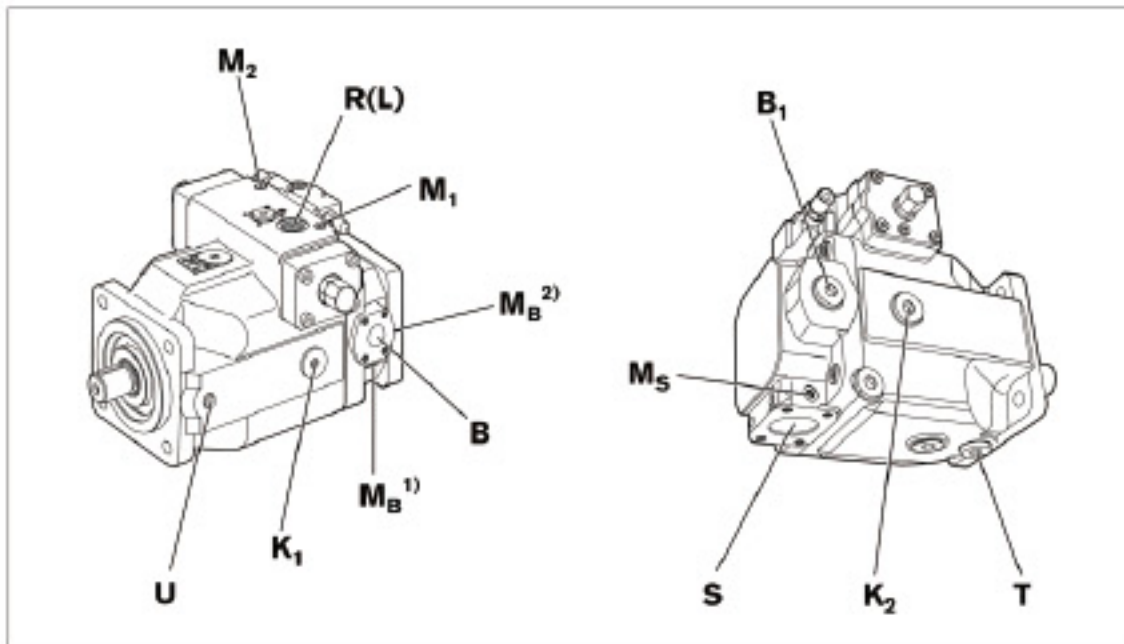
- Lines and hoses must be installed without pre-charge pressure, so that no further mechanical forces are applied during operation that will reduce the service life of the axial piston unit and, if applicable, the entire machine / system.
- ✚ Use suitable seals as sealing material.
- Suction line (pipe or hose):
- ✚ The suction line should be as short and straight as possible.
- ✚ Measure the line cross section of the suction line so that the pressure at the suction port does not drop below the minimum permissible pressure. Make sure that the maximum suction pressure is not exceeded (e.g. when pre-filling).
- ✚ Make sure the connections and connecting elements are air-tight.
- ✚ The hose must be pressure-resistant, also for external air pressure.
- Pressure line:
- ✚ For the pressure lines, use only pipes, hoses and connecting elements rated for the operating pressure range specified in data sheet.
- Drain line:
- ✚ Always route the reservoir lines so that the case is constantly filled with hydraulic fluid and to ensure that no air gets through the shaft seal eye during extended standstill periods.
- ✚ The case internal pressure must not exceed the limit values listed for the axial piston unit in the data sheet under any operating conditions.
- ✚ The reservoir line joint in the reservoir must always be below the minimum fluid level under all conditions (see chapter "Installation position").

■ **Procedure**

- To connect the axial piston unit to the hydraulic system:
 1. Remove the locking screws at the ports at which the connections are to be made according to the hydraulic circuit diagram.
 2. Use only clean hydraulic lines.
 3. Connect the lines according to the hydraulic circuit diagram. Either pipes or hoses must be connected to all ports according to the installation drawing and machine or system circuit diagram or the ports plugged using suitable locking screws.
 4. Make sure
 - ✚ that the cap nuts are correctly tightened on the fittings and flanges (observe tightening torques!). Mark all checked fittings using e.g. a permanent marker
 - ✚ that the pipes and hose lines and every combination of connecting piece, coupling or connecting point with hoses or pipes have been inspected by a technically qualified person for safe working condition.

■ Port overview

□ Port overview of A4VSO series 10, 22 and 30 (standard ports):



- 1) Version MB below: valid for sizes 40, 71, 125, 250 and 500
- 2) Version MB rear: valid for sizes 180, 355

■ Ports of A4VSO series 10, 22 and 30 Table 8:

Designation	Function	Control device (optional)	Standard	Peak pressure (bar) ¹⁾	State
B	Pressure port (high pressure series) Fixing thread		SAE J518 ²⁾ DIN 13	400	O
B ₁ ³⁾	Additional port		DIN 3852	400	X
B ₁ ⁴⁾	2. Pressure port (high pressure series) fixing thread		SAE J518 ²⁾ DIN 13	400	X ⁵⁾
S	Suction port Fixing thread		SAE J518 ²⁾ DIN 13	30	O
K ₁	Flow port		DIN 3852	4	X
K ₂	Flow port		DIN 3852	4	X
U	Flow port		DIN 3852	4	O ⁶⁾
T	Fluid drain		DIN 3852	4	X
R(L)	Fluid filling and air bleeding		DIN 3852	4	O
M _B	Gauge port		DIN 3852	400	X
M _S	Gauge port		DIN 3852	30	X
M ₁ , M ₂ ⁷⁾	Gauge port for control pressure		DIN 3852	400	X
M _{St}	Gauge port for pilot pressure	DP	DIN 3853	400	X
M _{St}	Gauge port for pilot pressure	LR.H., LR.N.	DIN 3853	100	X
X _D	Pilot pressure port for pressure control	DP, DRG, FRG(1)	DIN 3852	400	O
X _F	Pilot pressure port for flow control	DPF, FR.(1), DFR(1)	DIN 3852	400	O
R _{KV}	External control fluid return (sizes 40–355)	LR..	DIN 3852	400	X
R _{KV}	Control fluid return	HS.	DIN 3852	5	O
R _{KV}	Control fluid return	EO1 (sizes 125, 250), EO2	DIN 3852	5	X
R _{KV}	Pilot oil return (pipes)	DS1	DIN 3852	30	X
X _{LR}	Pilot pressure port Remote adjustment for power control	LR3	DIN 3852	100	O
P _{St}	Pilot pressure port	LR.H., LR.N.	DIN 3852	100	X
P _{St}	Gauge port for pilot pressure	LR.NT	DIN 3853	100	X

■ Port overview

Designation	Function	Control device (optional)	Standard	Peak pressure (bar) ¹⁾	State
X ₁ , X ₂	Pilot pressure port	HD.P/T/U (sizes 40–71, sizes 500–1000)	DIN 3853	100	O ⁸⁾
X ₁ , X ₂	Pilot pressure port	HD.P/T/U (sizes 125–355)	DIN 3852	100	O ⁸⁾
X ₁ , X ₂	Pilot pressure port	HD	DIN 3852	100	O ⁸⁾
X ₁ , X ₂	Pilot pressure port	HM1	DIN 3852	100	O
X ₁ , X ₂	Pilot pressure port	HM2, HS4M	DIN 3852	350	O
S _p	Control pressure port, accumulator port	EO1 (size 125, 250)	DIN 3852	100	X
S _p	Control pressure port, accumulator port	EO2	DIN 3852	315	X
S _p	Control pressure port, accumulator port	HS., DS1	DIN 3852	350	X
P	Control pressure port	EO1	DIN 3852	100	O
P	Control pressure port	EO2	DIN 3852	315	O
P	Control pressure port	HS.	DIN 3852	350	O
P	Control pressure port	HD (sizes 40-355)	DIN 3853	400	O
P	Control pressure port	HD (sizes 500-1000), HD.P/T/U (sizes 125–355)	DIN 3852	400	O
P	Pilot pressure port (pipes)	DS1	DIN 3852	350	X
R ₂ – R ₇	Air bleeding of positioning chamber	EO2	DIN 3852	315	X
R ₂ – R ₇	Air bleeding of positioning chamber	HM. (sizes 125–1000), HS. (sizes 125–1000)	DIN 3852	350	X

- 1) Brief pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and armatures.
- 2) Only dimensions according to SAE J518
- 3) Version 13: available for sizes 40 to 355
- 4) Version 25: available for sizes 40 to 500
- 5) Sealed with flange plate
- 6) Must be connected for version for HFC hydraulic fluids
- 7) Only present for series 3
- 8) Condition and availability dependent on version and size

O = Must be connected (plugged with plastic plugs on delivery)

X = Plugged (in normal operation)

- **Tightening torques**
- **The following tightening torques apply:**
 - Threaded hole in the axial piston unit:
 - ⚠ The maximum permissible tightening torques M_{Gmax} are the maximum values of the threaded holes and must not be exceeded. For values, refer to the following table.
 - Armatures:
 - ⚠ Observe the manufacturer's instruction regarding tightening torques for the used armatures.
 - Fixing screws:
 - ⚠ For fixing screws according to DIN 13/ISO 68, we recommend checking the tightening torque in individual cases as per VDI 2230.
 - Locking screws:
 - ⚠ For the metal locking screws supplied with the axial piston unit, the required tightening torques of locking screws M_V apply. For values, refer to the following table.
- **Risk of mix-ups with threaded connections**
 - The axial piston units are used in application areas with metric as well as with Imperial systems of units.
 - Both the system of units as well as the size of threaded hole and threaded plug (e.g. locking screw) must match.
 - Due to the lack of options for visually detecting differences, there is a risk of mix-ups.
- **Electrical connection of axial piston unit**
 - The machine or system manufacturer is responsible for the layout of the electric control.
 - Electrically controlled axial piston units must be connected in accordance with the electrical circuit diagram for the machine or system.
 - For axial piston units with electrical control and/or mounted sensors, please comply with the details given in data sheets.
 - ⚠ the permissible voltage range
 - ⚠ the permissible current
 - ⚠ correct connection
 - ⚠ the recommended electrical control units
 - Exact details on the connector, type of protection and matching mating connector can also be found in data sheets RE 92701 and RE 92711. The mating connector is not included in the delivery contents.
 1. Switch off power supply to the relevant system component.
 2. Electrically connect the axial piston unit (12 or 24V). Before connection, check that the connector including all seals are intact.

■ **Table 9: Tightening torques of the threaded holes and locking screws**

Threaded size of the ports		Max. permissible tightening torque of the threaded holes M_{Gmax}	Required tightening torque of the locking screws M_V	WAF hexagon socket
M10x1	DIN 3852	30 Nm	12 Nm	5 mm
M12x1.5	DIN 3852	50 Nm	25 Nm	6 mm
M14x1.5	DIN 3852	80 Nm	35 Nm	6 mm
M16x1.5	DIN 3852	100 Nm	50 Nm	8 mm
M18x1.5	DIN 3852	140 Nm	60 Nm	8 mm
M22x1.5	DIN 3852	210 Nm	80 Nm	10 mm
M26x1.5	DIN 3852	230 Nm	120 Nm	12 mm
M27x2	DIN 3852	330 Nm	135 Nm	12 mm
M33x2	DIN 3852	540 Nm	225 Nm	17 mm
M42x2	DIN 3852	720 Nm	360 Nm	22 mm
M48x2	DIN 3852	900 Nm	400 Nm	24 mm
5/16-24 UNF-2B	ISO 11926	10 Nm	7 Nm	1/8 in
3/8-24 UNF-2B	ISO 11926	20 Nm	7 Nm	5/32 in
7/16-20 UNF-2B	ISO 11926	40 Nm	15 Nm	3/16 in
9/16-18 UNF-2B	ISO 11926	80 Nm	25 Nm	1/4 in
3/4-16 UNF-2B	ISO 11926	160 Nm	62 Nm	5/16 in
7/8-14 UNF-2B	ISO 11926	240 Nm	127 Nm	3/8 in
1 1/16-12 UN-2B	ISO 11926	360 Nm	147 Nm	9/16 in
1 5/16-12 UN-2B	ISO 11926	540 Nm	198 Nm	5/8 in
1 5/8-12 UN-2B	ISO 11926	960 Nm	320 Nm	3/4 in
1 7/8-12 UN-2B	ISO 11926	1200 Nm	390 Nm	3/4 in

- **First commissioning**
- **Filling the axial piston unit**
 - You will require an approved hydraulic fluid.
 - The machine or system manufacturer can provide you with precise details on the hydraulic fluid. Details on minimum requirements for mineral-oil based hydraulic fluids, environmentally acceptable hydraulic fluids or HF hydraulic fluids for the axial piston unit are available.
 - To ensure the functional reliability of the axial piston unit, cleanliness level 20/18/15 according to at least ISO 4406 is necessary for the hydraulic fluid. For permissible temperatures, see the data sheet.
- 1. Fill and air bleed the axial piston unit via the appropriate ports, see chapter "Installation position". The hydraulic lines of the system must also be filled.
- 2. Test the direction of rotation of the engine. To do this, rotate the engine briefly at the lowest rotational speed (inching). Make sure that direction of rotation of the axial piston unit matches the details on the name plate, see also chapter "Product identification".
- 3. Operate the axial piston pump at a lower speed (starter speed for internal combustion engines or inching operation for electric engines) until the pump system is completely filled and bled. To inspect, drain the hydraulic fluid at the case drain port and wait until it drains without bubbles.
- 4. Make certain that all ports are either connected to pipes or plugged according to the general circuit diagram.
- **Testing the hydraulic fluid supply**
 - The axial piston unit must always have a sufficient supply of hydraulic fluid.
 - For this reason, the supply of hydraulic fluid must be ensured at the start of the commissioning process.
 - When you test the hydraulic fluid supply, constantly monitor the noise development and check the hydraulic fluid level in the tank. If the axial piston unit becomes louder (cavitation) or the case drain fluid is discharged with bubbles, this is an indication that the axial piston unit is not being sufficiently supplied with hydraulic fluid.
 - Notes on troubleshooting can be found in chapter "Troubleshooting".
 - To test the hydraulic fluid supply:
 1. Allow the engine to run at the slowest speed. The axial piston unit must be operated without load. Pay attention to leakage and noise.
 2. Check the axial piston unit's case drain line during the test. The case drain fluid should not contain any bubbles.
 3. Check the suction pressure at port "S" of the axial piston pump. Refer to data sheet RE 92050 for the permissible value.
 4. Check the case drain pressure at connected port "K₁" or "K₂". Refer to data sheet for the permissible value.
- **Performing functional test**
 - Once you have tested the hydraulic fluid supply, you must perform a functional test on the machine or system. The functional test should be performed according to the instructions of the machine or system manufacturer.
 - The axial piston unit is checked for functional capability before delivery according to the technical data. During commissioning, it must be ensured that the axial piston unit was installed in accordance with the design of the machine or system.
 - Use the swivel angle indicator to check whether the axial piston unit swivels in and out correctly during operation.
 - The position of the swivel angle indicator and the assignment of the swivel direction to the direction of rotation and control can be found in the corresponding technical data sheets.
- **Performing flushing cycle**
 - In order to remove foreign bodies from the system, HUADE recommends a flushing cycle for the entire system.
- **Recommissioning after downtime**
 - Depending on the installation conditions and ambient conditions, changes may occur in the system which make recommissioning necessary.
 - Among others, the following criteria may make recommissioning necessary:
 - ✚ Air in the hydraulic system
 - ✚ Water in the hydraulic system
 - ✚ Old hydraulic fluid
 - ✚ Other contamination
 - Before recommissioning, proceed as described in chapter "First commissioning".
- **Running-in phase**
 - The bearings and sliding surfaces are subject to a running-in phase.
 - The increased friction at the start of the running-in phase results in increased heat development which decreases with increasing operating hours. The volumetric and mechanical-hydraulic efficiency increases as well through the conclusion of the running-in phase of approx. 10 operating hours.
- **Operation**
 - The product is a component which requires no settings or changes during operation. For this reason, this chapter of the manual does not contain any information on adjustment options. Only use the product within the performance range provided in the technical data.
 - The machine or system manufacturer is responsible for the proper project planning of the hydraulic system and its control.

■ Cleaning and care

- ❑ For cleaning and care of the axial piston unit, observe the following:
- ❑ Plug all openings with suitable protective caps/devices.
- ❑ Check whether all seals and plugs of the plug connections are securely seated to ensure that no moisture can penetrate into the axial piston unit during cleaning.
- ❑ Use only water and, if necessary, a mild detergent to clean the axial piston unit.
- ❑ Remove coarse dirt from the outside of the machine and keep sensitive and important components, such as solenoids, valves and displays, clean.

■ Inspection

- ❑ In order to enable long and reliable operation of the axial piston unit, huade recommends testing the hydraulic system and axial piston unit on a regular basis and to document the following operating conditions:
- ❑ Inspection schedule

Task to be carried out		Interval
Hydraulic system	Check level of hydraulic fluid in the tank.	daily
	Check operating temperature (comparable load state).	weekly
	Check quality of the hydraulic fluid.	yearly or every 2000 h (which ever occurs first)
Axial piston unit	Check axial piston unit for leakage. Check axial piston unit for leakage. Early detection of hydraulic fluid loss can help identify and rectify faults on the machine or system. For this reason, HUADE recommends that the axial piston unit and system always be kept in a clean condition.	daily
	Check axial piston unit for noise development.	daily
	Check fixing elements for tight seating. All fixing elements have to be checked when the system is switched off, depressurized and cooled down.	monthly

■ Maintenance

- ❑ The axial piston unit is low maintenance when used as intended.
- ❑ The service life of the axial piston unit is heavily dependent on the quality of the hydraulic fluid. For this reason, we recommend changing the hydraulic fluid at least once per year or every 2000 operating hours (which ever occurs first) or having it analyzed by the hydraulic fluid manufacturer or a laboratory to determine its suitability for further use.
- ❑ The service life of the axial piston unit is limited by the service life of the built-in bearings. The service life can be requested on the basis of the load cycle from the responsible HUADE Service partner, see "Spare parts" for address.
- ❑ Based on these details, a maintenance period is to be determined by the system manufacturer for the replacement of the bearings and included in the maintenance schedule of the hydraulic system.

■ Repair

- ❑ HUADE offers a comprehensive range of services for the repair of HUADE axial piston units.
- ❑ Repairs of the axial piston unit may only be performed by authorized, skilled and instructed staff.
- ❑ Only use genuine spare parts from HUADE for repairing the HUADE axial piston units.
- ❑ Tested and pre-assembled original HUADE assembly groups allow for successful repair requiring only little time.

■ Spare parts

- ❑ The list of spare parts for axial piston units are order specific. When ordering spare parts, please quote the material and serial number of the axial piston unit as well as the material numbers of the spare parts.
- ❑ Please address all questions regarding spare parts to your responsible huade Service partner or the service department of the manufacture's plant for the axial piston unit.

■ Troubleshooting

- ❑ The following table may assist you in troubleshooting. The table makes no claim for completeness.
- ❑ In practical use, problems which are not listed here may also occur.

■ How to proceed for troubleshooting


- ❑ Always act systematically and targeted, even under pressure of time. Random and imprudent disassembly and readjustment of settings might result in the inability to ascertain the original error cause.
- ❑ First obtain a general overview of how your product works in conjunction with the entire system.
- ❑ Try to determine whether the product worked properly in conjunction with the entire system before the troubles occurred.
- ❑ Try to determine any changes of the entire system in which the product is integrated.
- 🔧 Were there any changes to the product's operating conditions or operating range?
- 🔧 Were there any changes or repairs on the complete system (machine / system, electrics, control) or on the product? If yes, which?
- 🔧 Was the product or machine used as intended?
- 🔧 How did the malfunction appear?
- ❑ Try to get a clear idea of the error cause. Directly ask the (machine) operator.
- ❑ If you cannot rectify the error, contact HUADE.

■ Malfunction table for variable pumps:

Fault	Possible cause	Remedy	
Unusual noises	Drive speed too high.	Machine or system manufacturer.	
	Wrong direction of rotation.	Ensure correct direction of rotation.	
	Insufficient suction conditions, e.g. air in the suction line, insufficient diameter of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, contaminants in the suction line.		Machine or system manufacturer (e.g. optimize inlet conditions, use suitable hydraulic fluid).
			Completely air bleed axial piston unit, fill suction line with hydraulic fluid.
			Remove contaminants from the suction line.
	Improper fixing of the axial piston unit.	Check fixing of the axial piston unit according to the specifications of the machine or system manufacturer. Observe tightening torques.	
	Improper fixing of the attachment parts, e.g. coupling and hydraulic lines.	Fix attachment parts according to the information provided by the coupling or armature manufacturer.	
	Pressure-relief valves of the axial piston unit.	Air bleed axial piston unit Check viscosity of the hydraulic fluid Contact HUADE Service.	
Mechanical damage to the axial piston unit.	Exchange axial piston unit, contact HUADE Service.		
No or insufficient flow	Faulty mechanical drive (e.g. defective coupling).	Machine or system manufacturer.	
	Drive speed too low.	Machine or system manufacturer.	
	Insufficient suction conditions, e.g. air in the suction line, insufficient diameter of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, contaminants in the suction line.		Machine or system manufacturer (e.g. optimize inlet conditions, use suitable hydraulic fluid).
			Completely air bleed axial piston unit, fill suction line with hydraulic fluid.
			Remove contaminants from the suction line.
	Hydraulic fluid not in optimum viscosity range.	Use suitable hydraulic fluid (machine or system manufacturer).	
	External control of the control device defective.	Check external control (machine or system manufacturer).	
	Insufficient pilot pressure.	Check pilot pressure, contact HUADE Service.	
	Malfunction of the control device or controller of the axial piston unit.	Contact HUADE Service.	
	Wear of axial piston unit.	Exchange axial piston unit, contact HUADE Service.	
Mechanical damage to the axial piston unit.	Exchange axial piston unit, contact HUADE Service.		
No or insufficient pressure	Faulty mechanical drive (e.g. defective coupling).	Machine or system manufacturer.	
	Drive power too low.	Machine or system manufacturer.	
	Insufficient suction conditions, e.g. air in the suction line, insufficient diameter of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, contaminants in the suction line.		Machine or system manufacturer (e.g. optimize inlet conditions, use suitable hydraulic fluid).
			Completely air bleed axial piston unit, fill suction line with hydraulic fluid.
			Remove contaminants from the suction line.
	Hydraulic fluid not in optimum viscosity range.	Use suitable hydraulic fluid (machine or system manufacturer).	
	External control of the control device defective.	Check external control (machine or system manufacturer).	
	Insufficient pilot pressure.	Check pilot pressure, contact HUADE Service.	
	Malfunction of the control device or controller of the axial piston unit.	Contact HUADE Service.	
	Wear of axial piston unit.	Exchange axial piston unit, contact HUADE Service.	
	Mechanical damage to the axial piston unit.	Exchange axial piston unit, contact HUADE Service.	
Output unit defective (e.g. hydraulic motor or cylinder).	Machine or system manufacturer.		
Pressure/flow fluctuations	Axial piston unit not or insufficiently air bled.	Completely air bleed axial piston unit.	
	Insufficient suction conditions, e.g. air in the suction line, insufficient diameter of the suction line, viscosity of the hydraulic fluid too high, suction height too high, suction pressure too low, contaminants in the suction line.		Machine or system manufacturer (e.g. optimize inlet conditions, use suitable hydraulic fluid).
			Completely air bleed axial piston unit, fill suction line with hydraulic fluid.
	Remove contaminants from the suction line.		
Hydraulic fluid temperature too high	Excessive inlet temperature at the axial piston unit.	Machine or system manufacturer: inspect system, e.g. malfunction of the cooler, insufficient hydraulic fluid in the tank.	
	Malfunction of the pressure control valves (e.g. high-pressure relief valve, pressure cut-off, pressure control).	Contact HUADE Service.	
	Wear of axial piston unit.	Exchange axial piston unit, contact HUADE Service.	



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Our company has passed:

- ISO9001 Quality Managing System Certificate
- ISO14001 Environment Managing System Certificate
- OH SAS18001 Occupational Health Safety Managing System Certificate
- CE Certificate

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