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A10V(S)O

Variable Axial Piston pump, swashplate
design Sizes: 18 to 140 ml/r
Flow: 27 to 210 l/min
Nominal Pressure: 280 bar
Maximum Pressure: 350 bar



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Features

- Variable pump with axial piston rotary group in swashplate design for hydraulic open circuit.
- Flow is proportional to drive speed and displacement.
- The flow can be smoothly changed by adjustment.
- 2 drain ports.
- Excellent suction characteristics.
- Low noise level
- Long service life
- Good power to weight ratio
- Versation controller range.
- Short control times.
- The through drive is suitable for adding gear pumps and axial piston pumps up to the same size,i.e.,100% through drive.

Ordering code

A10VS																					
Swashplate design,variable, (ISO Standard) Swashplate design, Variable (SAE Standard) Nominal pressure up to 280 bar Maximum pressure up to 350 bar											= A10VS = A10V										
Pump, Open Circuit											= 0										
Size (mL/r)											= 18, 28, 45, 71, 100, 140										
Control device Pressure controller Pressure control, remote controlled Pressure /flow control Pressure /flow control, without orifice in X-line pressure, flow and power controller											= DR = DRG = DFR = DFR1 = DFLR										
Series											= 31										
Direction of Rotation (View from shaft end) Clockwise Counter-clockwise											= R = L										
Sealing Material NBR nitril~ caoutchouc to DIN ISO 1629 (shaft seal in FKM) FKM fluor~ caoutchouc to DIN ISO 1629											= P = V										
Shaft end See next page (table 1)																					
Mounting Flange ISO 2-hole SAE 2-hole ISO 4-hole SAE 4-hole											= A = C = B = D										
Working Port SAE flange ports according to ISO 6162 working ports, fastening thread metric, lateral top bottom SAE flange ports according to ISO 6162 working ports, fastening thread UNC, lateral top bottom											= 12 = 62										
Through drive See next page (table 2)																					



Ordering Code

Table 1: Shaft end

Size	18	28	45	71	100	140	
Parallel with key DIN6885	✓	✓	✓	✓	✓	✓	P
Parallel with key SAE	✓	✓	✓	✓	✓	✓	K
Splined shaft SAE	3/4"	7/8"	1"	1 1/4"	1 1/2"	1	S
Splined shaft SAE (higher through-shaft drive torque)	/	7/8"	1"	1 1/4"	/	3/4"	R
Splined shaft SAE (limited suitability for through drive)	5/8"	/	7/8"	/	1 1/4"	//	U

Table 2: Through drives

Installation of flange	Hub for shaft diameter	Acceptable	18	28	45	71	100	140	
Without through drive			✓	✓	✓	✓	✓	✓	N00
ISO 80,2-hole	splined shaft 3/4"19-4(SAE A-B)	A10VSO18(shaft S or R)	/	✓	✓	✓	✓	✓	KB2
ISO 80,2-hole	with key shaft Ø18	A10VSO18(shaft P)	/	✓	✓	✓	✓	✓	K51
ISO 100,2-hole	splined shaft 7/8"22-4(SAE B)	A10VSO28(shaft S or R)	/	✓	✓	✓	✓	✓	KB3
ISO 100,2-hole	with key shaft Ø22	A10VSO28(shaft P)	/	✓	✓	✓	✓	✓	K25
ISO 100,2-hole	splined shaft 1"25-4(SAE B-B)	A10VSO45(shaft S or R)	/	/	✓	✓	✓	✓	KB4
ISO 100,2-hole	with key shaft Ø25	A10VSO45(shaft P)	/	/	✓	✓	✓	✓	K26
ISO 125,2-hole	splined shaft 1 1/4"32-4(SAE C)	A10VSO71(shaft S or R)	/	/	/	✓	✓	✓	KB5
ISO 125,2-hole	with key shaft Ø32	A10VSO71(shaft P)	/	/	/	✓	✓	✓	K27
ISO 125,2-hole	splined shaft 1 1/2"38-4(SAE C-C)	A10VSO100(shaft S)	/	/	/	/	✓	✓	KB6
ISO 180,4-hole	splined shaft 1 3/4"44-4(SAE D)	A10VSO140(shaft S)	/	/	/	/	/	✓	KB7
SAE 82,2-hole	splined shaft 5/8"16-4(SAE A)		/	✓	✓	✓	✓	✓	K01
SAE 82,2-hole	splined shaft 3/4"19-4(SAE A-B)	A10VO18(shaft S)	/	✓	✓	✓	✓	✓	K52
SAE 101,2-hole	splined shaft 7/8"22-4(SAE B) radial seal	A10VO28(shaft S)	/	✓	✓	✓	✓	✓	K02
SAE 101,2-hole	splined shaft 7/8"22-4(SAE B) axial seal	A10VO28(shaft S)	/	✓	✓	✓	✓	✓	K68
SAE 101,2-hole	splined shaft 1"25-4(SAE B-B)	A10VO45(shaft S)	/	/	✓	✓	✓	✓	K04
SAE 127,2-hole	splined shaft 1 1/4"32-4(SAE C)	A10VO71(shaft S)	/	/	/	✓	✓	/	K07
SAE 127,2-hole	splined shaft 1 1/2"38-4(SAE C-C)	A10VO100(shaft S)	/	/	/	/	✓	✓	K24
SAE 180,4-hole	splined shaft 1 3/4"44-4(SAE D)	A10VO140(shaft S)	/	/	/	/	/	✓	K17

If a second pump is to be fitted at factory then the two model codes must be linked with

a + sign. Model code 1st pump + Model code 2nd pump.

Ordering example:A10VSO100DR/31R-PPA12KB5 + A10VSO71DFR/31R-PSA12N00

If a gear or radial piston pump is to be fitted at factory please consult us.

Technical data

- **Hydraulic fluid** The A10V(S)O variable displacement pump is suitable for use with mineral oil. we can offer pumps for water based oils, please contact us.

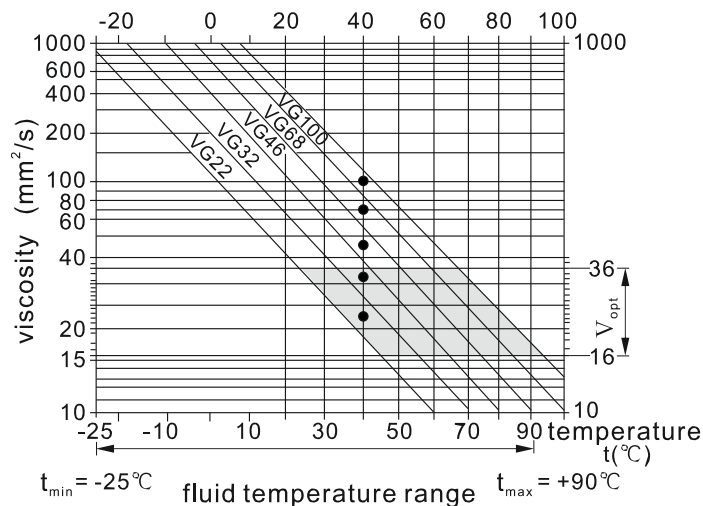
- **Operating viscosity range** In order to obtain optimum efficiency and service life, we recommend that the operating viscosity (at operating temperature) be selected from within the range

Referred to the reservoir temperature (open circuit).

V_{opt} = operating viscosity 16...36 mm²/s

- **Viscosity limits** The limiting values for viscosity are as follows: V_{min} = 10 mm²/s short term at a max. permissible case temp. of 90°C. V_{max} = 1000 mm²/s short term on cold start
Temperature range (see selection diagram) t_{min} = -25°C t_{max} = 90°C

Selection Diagram



- **Notes on the selection of the hydraulic fluid** In order to select the correct fluid, it is necessary to know the operating temperature in the tank (open loop) in relation to the ambient temperature. The hydraulic fluid should be selected so that within the operating temperature range, the operating viscosity lies within the optimum range (V_{opt}) (see shaded section of the selection diagram). We recommend that the higher viscosity range should be chosen in each case. Example: At an ambient temperature of x°C the operating temperature is 60°C. Within the operating viscosity range (opt ; shaded area), this corresponds to viscosity ranges VG46 or VG68; VG68 should be selected.

Important: The leakage oil (case drain oil) temperature is influenced by pressure and pump speed and is always higher than the tank temperature. However, at one point in the circuit the temperature may exceed 90°C. If it is not possible to comply with the above conditions because of extreme operating parameters or high ambient temperatures please consult us.

- **Filtration** The finer the filtration the better the cleanliness 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 cleanliness level of:

9 to NAS 1638 18/15 to ISO/DIS 4406 is necessary

if above mentioned grades cannot be maintained please consult supplier.

High-speed-version The size 140 is available in an optional high speed version. This version allows higher drive speeds at max. displacement (higher output flow) without affecting outside dimensions.

Mechanical displacement limiter Mechanical displacement limiter is possible on the non through-drive model, N00 series but not for the model with through-drive. V_g max : for sizes 28 to 140

V_g min : for sizes 100 and 140 setting range V_g max to 50% V_g max stepless



Technical data

Operating pressure range-inlet Absolute

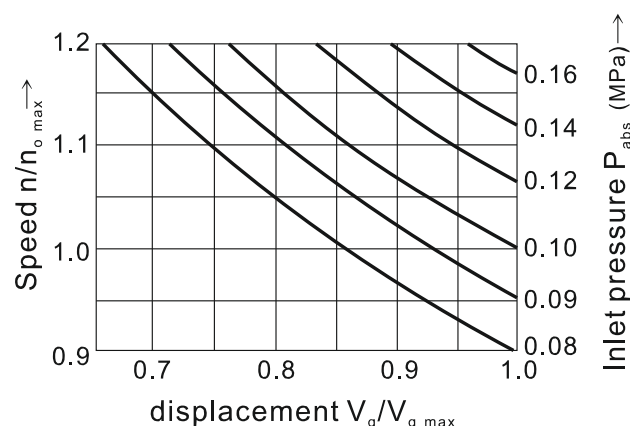
- pressure at port S P_{abs}
min _____ 0.8 bar
 P_{abs} max _____ 30 bar

Operating pressure range-outlet Pressure at port B

- Nominal pressure PN _____ 280 bar
Peak pressure P_{max} _____ 350 bar
(Pressure data to DIN 24312) Applications with intermittent operating pressures up to 315 bar at 10% duty are permissible. Limitation of pump output pressure spikes is possible with relief valve blocks mounted directly on flange connection.

- Case drain pressure** Maximum permissible pressure of leakage fluid (at port L, L1) Maximum 0.5 bar higher than the inlet pressure at port S, but no higher than 2 bar absolute

Determination of inlet pressure P_{abs} at suction port S or reduction of displacement for increasing speed.



Direction of through flow S to B

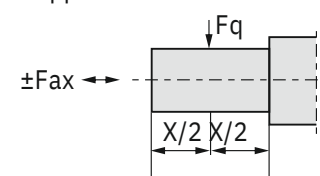
Specifications

Size	18	28	45	71	100	140
Displacement $V_{g \max}$ mL/r	18	28	45	71	100	140
Max. Speed ¹⁾ at $V_{g \max}$ $n_{o \max}$ rpm	3300	3000	2600	2200	2000	1800
Max. permitted speed (limit speed) with increased input pressure P_{abs} bzw. $V_g < V_{g \max}$ $n_{o \max}$ rpm	3900	3600	3100	2600	2400	2100
Max. flow	at $n_{o \max}$ $q_{vo \max}$ L/min	59	84	117	156	200
	at $n_E = 1500 \text{ min}^{-1}$ L/min	27	42	68	107	150
Max. power ($\Delta P = 28 \text{ MPa}$)	at $n_{o \max}$ $P_{vo \max}$ kW	28	39	55	73	93
	at $n_E = 1500 \text{ min}^{-1}$ kW	13	20	32	50	70
Max. torque ($\Delta P = 280 \text{ bar}$) at $V_{g \max}$ T_{\max} Nm	80	125	200	316	445	623
Torque ($\Delta P = 100 \text{ bar}$) at $V_{g \max}$ T Nm	30	45	72	113	159	223
Moment of inertia about drive axis J Kg m^2	0.00093	0.0017	0.0033	0.0083	0.0167	0.0242
Case volume L	0.4	0.7	1.0	1.6	2.2	3.0
Weight (without fluid) m kg	11	15	12	33	45	60
Permissible loading of drive shaft: max. axial force $F_{ax \max}$ N	350	1000	1500	2400	4000	4800
Max. permissible radial force ²⁾ $F_{q \max}$ N	700	1200	1500	1900	2300	2800

1) These values are valid for an absolute pressure of 0.1 MPa at the suction port S. By reducing the displacement or increasing the input pressure the speed can be increased as shown in the diagram.

2) Please consult us for higher radial forces.

application of forces



Determination of displacement

$$\text{Flow } q_v = \frac{V_g \times n \times \eta_v}{1000} \quad (\text{l/min})$$

$$\text{Torque } T = \frac{V_g \times \Delta p}{20 \times \pi \times \eta_{hm}} \quad (\text{Nm})$$

$$\text{Power } P = \frac{2 \pi \times T \times n}{60000} = \frac{q_v \times \Delta p}{600 \times \eta_t} \quad (\text{kW})$$

V_g Displacement per revolution [cm^3]

Δp Differential pressure [bar]

n Rotational speed [rpm]

η_v Volumetric efficiency

η_{hm} Hydraulic-mechanical efficiency

η_t Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)

Installation Notes

Optional installation position. The pump housing must be filled with fluid during commissioning and remain full when operating. In order to attain the lowest noise level, all connections (suction, pressure, case drain ports) must be linked by flexible couplings to tank. Avoid placing a check valve in the case drain line. This may, however, be permissible in individual cases, after consultation with us.

1. Vertical installation (shaft end upwards) The following installation conditions must be taken into account

1.1. Arrangement in the reservoir Before installation all pump housing, keeping it in a horizontal position. a) If the minimum fluid level is equal to or above the pump mounting face close port "L" plugged, leave ports "L" and 1 "S" open; L piped and recommendation S piped (see Fig.1). 1 b) If the minimum fluid level is below the pump mounting face pipe port "L" and "S" according to Fig.2. 1 Close port "L" with respect taking into consideration conditions in 1.2.1.

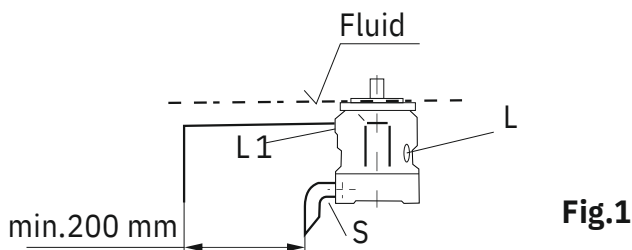


Fig.1

1.2. Arrangement outside the reservoir Before installation all the pump housing, keeping it in a horizontal position. For mounting above reservoir see Fig.2.

Limiting condition: 1.2.1. Minimum pump inlet pressure $P_{abs \min} = 0.8 \text{ bar}$ under both static and dynamic conditions. Note: Avoid mounting above reservoir wherever possible in order to achieve a low noise level. The permissible suction height h comes from the overall pressure loss, but may not be bigger than $h_{\max} = 800 \text{ mm}$ (immersion depth $h_{\min} = 200 \text{ mm}$).

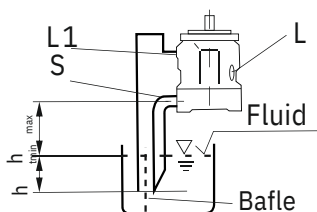


Fig.2

2. Horizontal installation The pump must be installed, so that "L" or "L" is at the top. 1

2.1. Arrangement in the reservoir a) If the minimum fluid level is above the top of the pump, port "L" closed, "L" and "S" should remain open, L piped 1 and recommendation S piped (see Fig.3) b) If the minimum fluid level is equal to or below the top of the pump, pipe ports "L" and possibly "S" as Fig.4.; close port "L". 1 The conditions according to item 1.2.1.

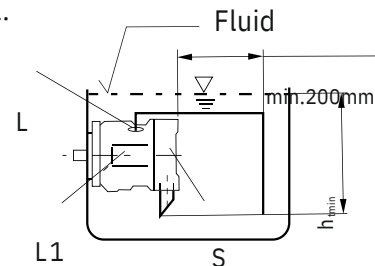


Fig.3

2.2. Installation outside the reservoir

Fill the pump housing before commissioning. Pipe ports "s" and the higher port "L" or "L". 1

a) When mounting above the reservoir, see fig.4. Conditions according to 1.2.1.

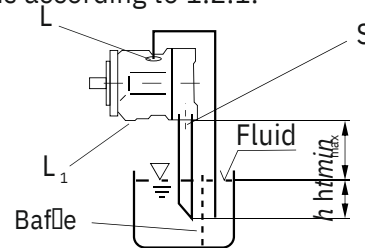


Fig.4

b) Mounting below the reservoir Pipe ports "L" and "S" according to Fig.5, 1 close port "L".

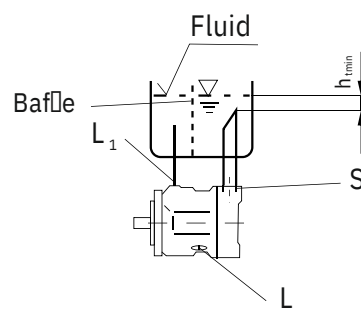


Fig.5

Overall pressure loss $\Delta P_{\text{tot}} = \Delta P_1 + \Delta P_2 + \Delta P_3 \leq (1 - P_{abs \min}) = 0.02 \text{ MPa}$

ΔP_1 : Pressure loss in pipe due 1 to accelerating column of fluid

$$\Delta P = \frac{\rho \times l \times dv}{dt} = 10 (\text{Mpa})$$

ΔP_2 : Pressure loss due to static head

$$\Delta P_2 = h \times \rho \times g \times 10^{-3} (\text{Mpa})$$

ΔP_3 : Line losses (elbows etc.)

ρ = density (kg/m^3)

l = pipe length (m)

dv/dt = rate of change in fluid velocity (m/s^2)

h = height (m)

g = gravity = 9.81 m/s^2

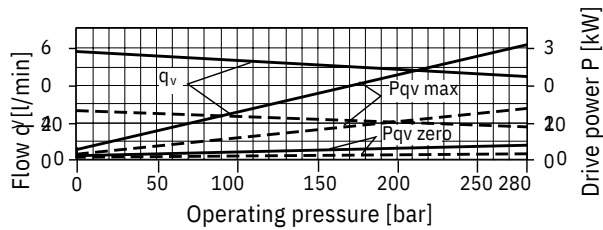
Characteristic curves

Drive Power and flow

Hydraulic fluid ISO VG 46 DIN 51519, $t=50\text{ }^{\circ}\text{C}$

Size 18

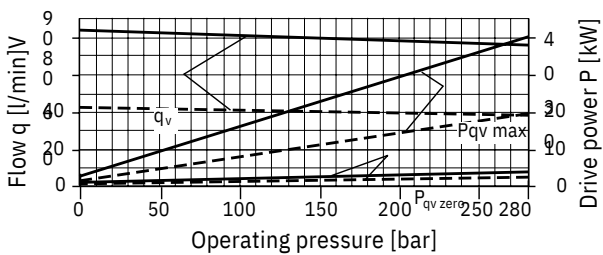
--- $n = 1500\text{ rpm}$ ----- $n = 3300\text{ rpm}$



Size 28

--- $n = 1500\text{ rpm}$

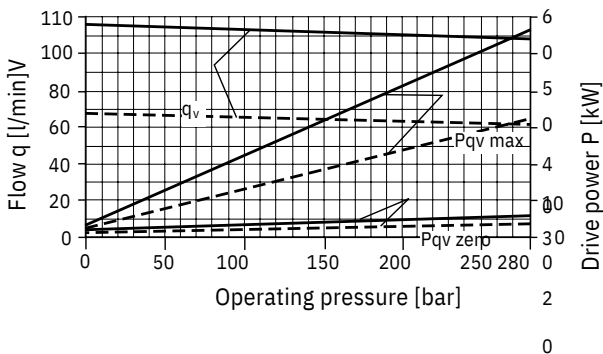
----- $n = 3000\text{ rpm}$



Size 45

--- $n = 1500\text{ rpm}$

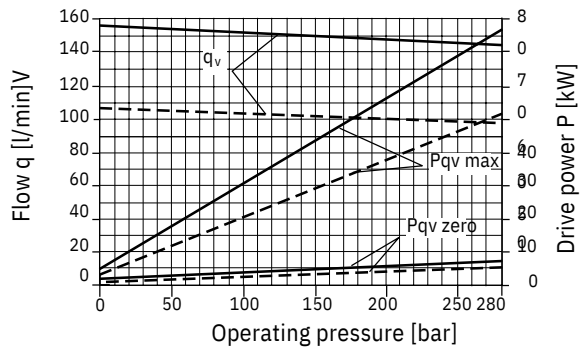
----- $n = 2600\text{ rpm}$



Size 71

--- $n = 1500\text{ rpm}$

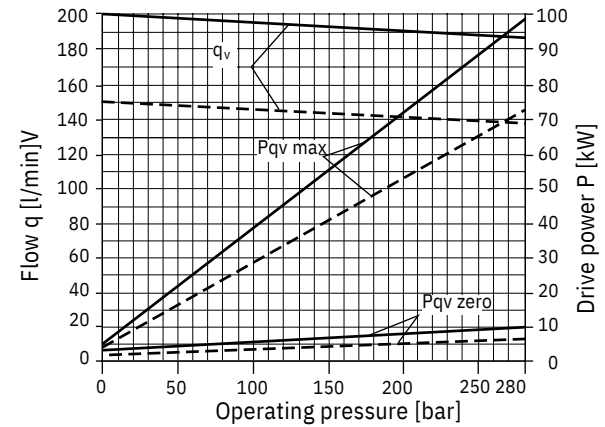
----- $n = 2200\text{ rpm}$



Size 100

--- $n = 1500\text{ rpm}$

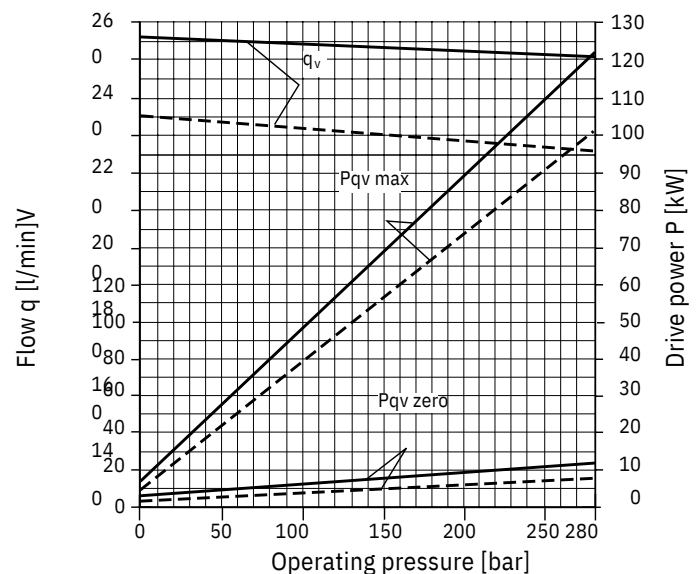
----- $n = 2000\text{ rpm}$



Size 140

--- $n = 1500\text{ rpm}$

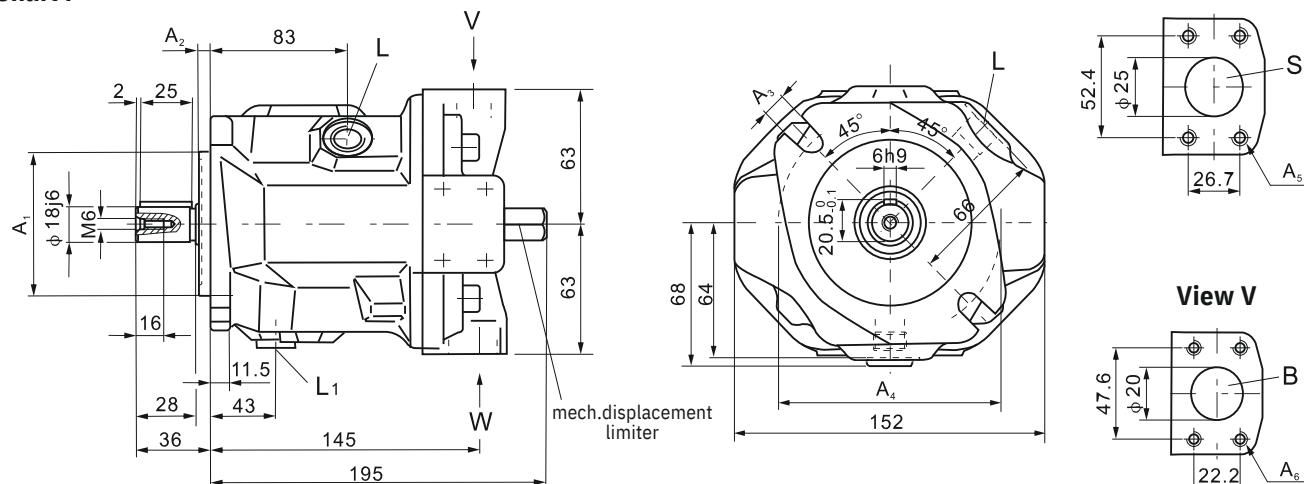
----- $n = 1800\text{ rpm}$



Unit Dimensions A10V(S)018

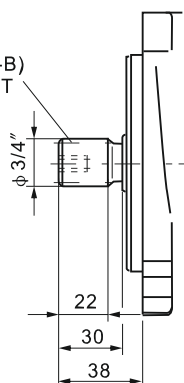
(Dimensions in mm)

A10V(S)018 ※※-※N00(without control valves) Shaft P



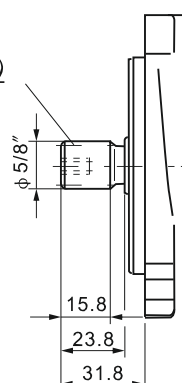
Shaft S

19-4(SAE B-B)
16/32DP; 11T

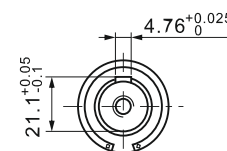
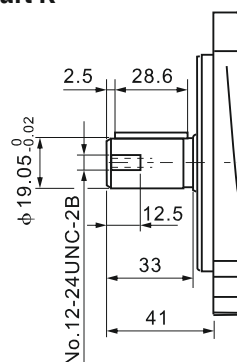


Shaft U

16-4(SAE A)
16/32DP; 9T



Shaft K



B S Pressure port SAE 3/4" (Standard pressure range)
L/L Suction port SAE 1" (Standard pressure range)
1 Case drain ports (L1 plugged at factory)

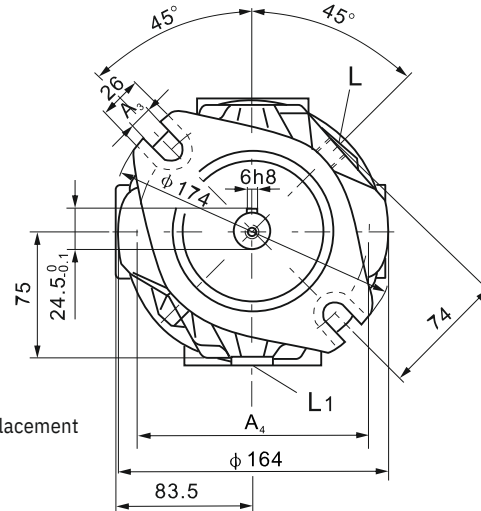
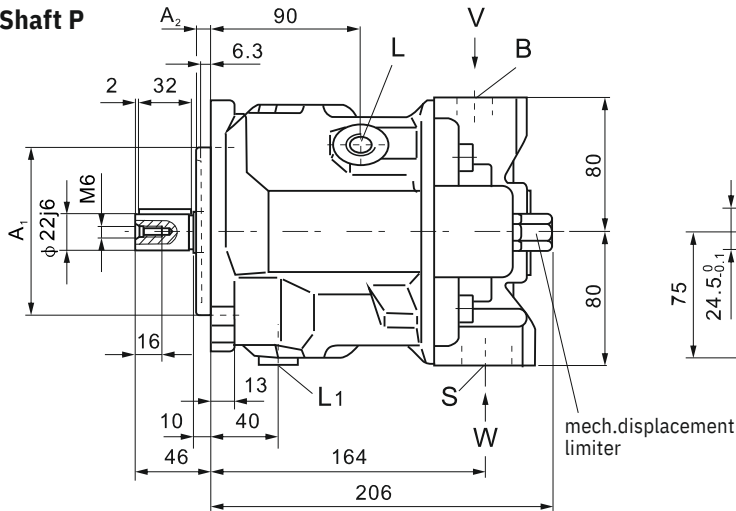
Size	A1	A2	A3	A4	A5	A6	Drain ports L/L1
A10VS018 ISO	Ø80 h8	7	11	Ø109	4-M10,17 deep	4-M10,17 deep	M16x1.5
A10VO18 SAE	Ø82.55 h8	6.3	11	Ø106.4	4-3/8-16UNC-2B,20 deep	4-3/8-16UNC-2B,20 deep	9/16-18UNF-2B

Unit Dimensions A10V(S)028

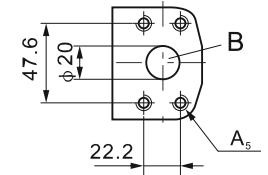
(Dimensions in mm)

A10V(S)028 ※※-※N00(without control valves)

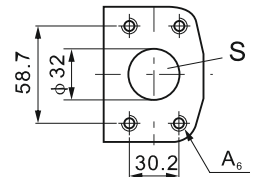
Shaft P



View V

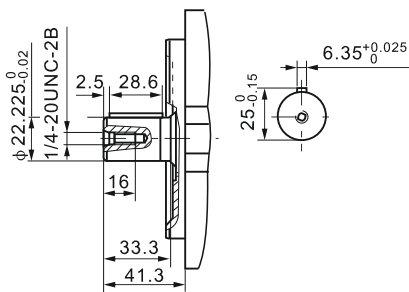


View W



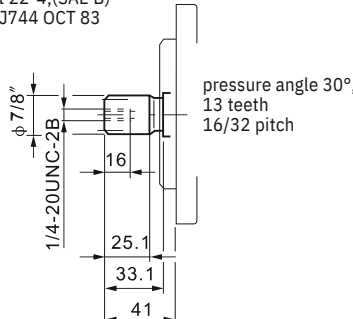
Shaft K

Shaft 22-1;(SAE B)
ISO3019-1



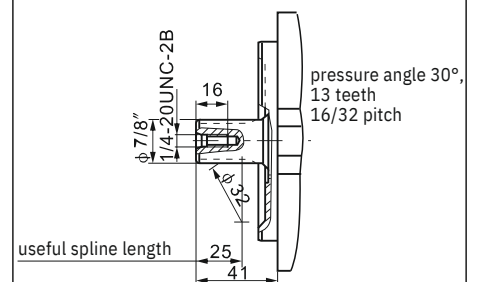
Shaft S

Shaft 22-4;(SAE B)
SAE J744 OCT 83



Shaft R

Shaft 22-4;(SAE B)
SAE J744 OCT 83



B S Pressure
L/L port Suction
1 port
Case drain ports

SAE 3/4"
(Standard pressure range) SAE
11/4" (Standard pressure range)
(L1 plugged at factory)

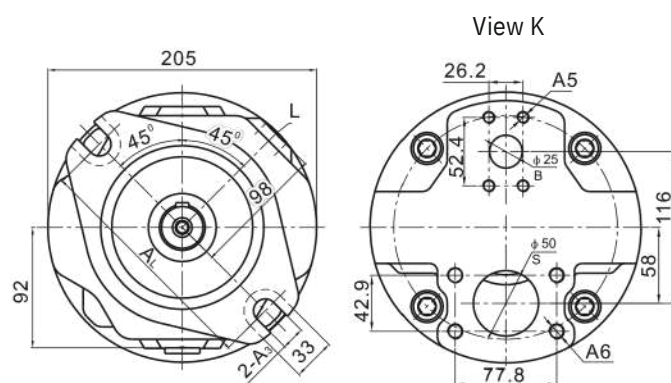
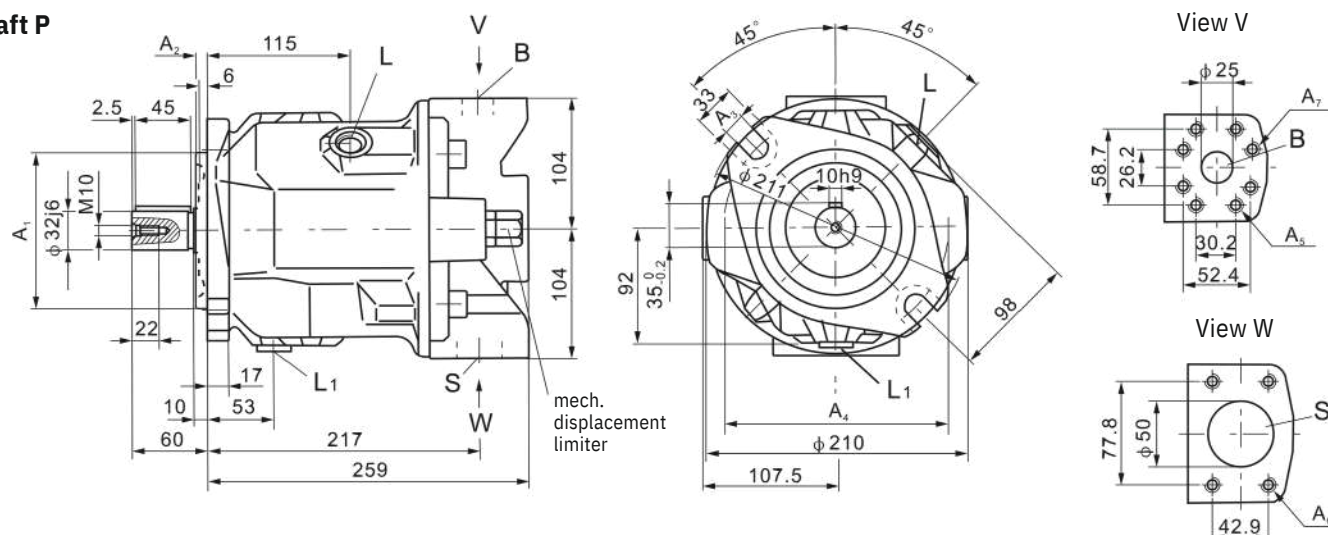
Size	A1	A2	A3	A4	A5	A6	Drain ports L/L1
A10VS028 ISO	Ø100 h8	9	14	Ø140	4-M10,17 deep	4-M10,17 deep	M18x1.5
A10VO28 SAE	Ø101.6 h8	9.5	14	Ø146	4-3/8-16UNC-2B,18 deep	4-7/16-14UNC-2B,24 deep	3/4-16UNF-2B

(Dimensions in mm)

Technical drawing of a circular flange. The overall diameter is 69.9. The central hole has a diameter of $\phi 40$. The flange has four mounting holes, each with a diameter of 35.7. The label 'S' points to the central hole, and 'A₆' points to one of the mounting holes.

(Dimensions in mm)

Shaft P



Technical drawing of a shaft with a keyway. The side view shows a shaft with a keyway of width 3. The shaft has a total length of 55.4. The keyway is located at a distance of 47.5 from the left end. The shaft has a diameter of $\phi 31.75^{+0}_{-0.03}$ and a thread of 5/16-18UNC-2B. The end view shows a circular shaft with a diameter of 35.3 $^{+0}_{-0.2}$ and a keyway of width 7.94 $^{+0.025}_{0}$.

E 3744 OCT 83

pressure angle 30
°, 14 teeth, 12/24
pitch

$\phi 1 \frac{1}{4}"$

5/16-18UNC-2B

19

39.5

47.5

55.4

pressure angle 30
°, 14 teeth, 12/24
pitch

SAE J744 OCT 83

pressure angle 30 °,
14 teeth,
12/24 pitch

useful spline length

5/16-18UNC-2B

19

38

51.6

58.7

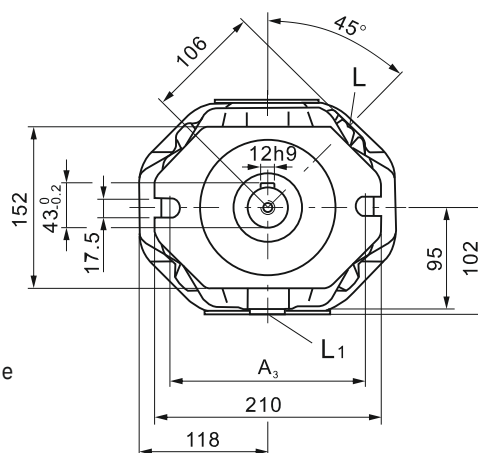
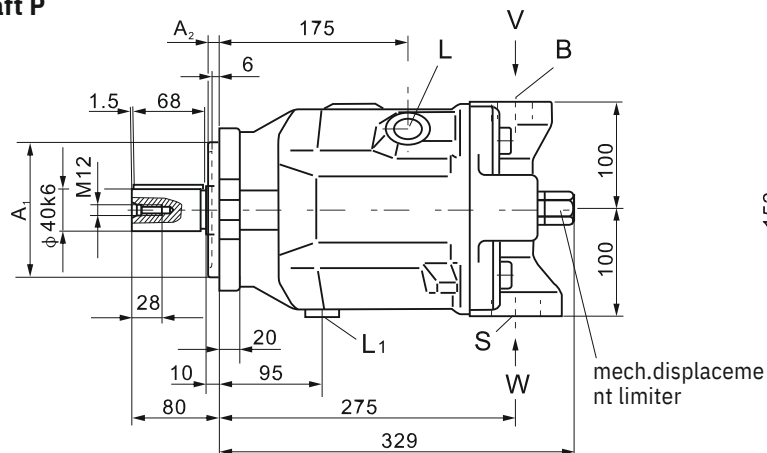
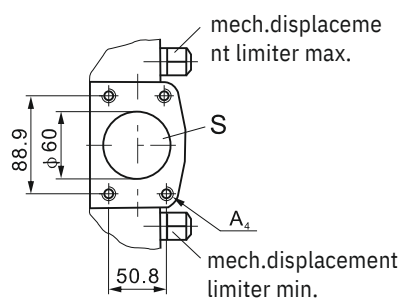
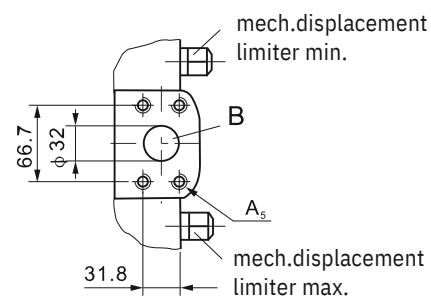
$\phi 1 \frac{1}{4}''$

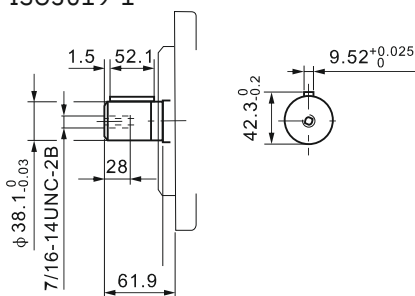
pressure angle 30 °,
14 teeth,
12/24 pitch

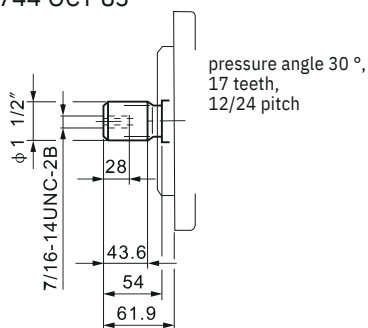
useful spline length

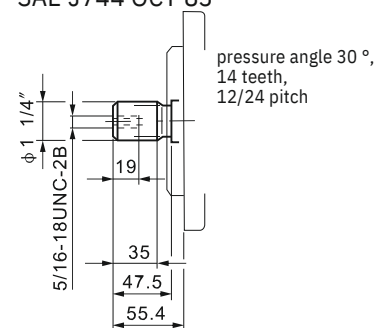
SAE 1" (Standard pressure range)
SAE 1 1/2" (Standard pressure range)
(L plugged factory)

Size	A1	A2	A3	A4	A5	A6	Drain ports L/L1
A10VSO45 ISO	Ø100 h8	9	14	Ø140	4-M10,17 deep	4-M12,20 deep	M22x1.5
A10VO45 SAE	Ø101.6 h8	9.5	14	Ø146	4-3/8-16UNC -2B,18 deep	4-1/2-13UNC -2B,22 deep	7/8-14UNF-2B

Unit Dimensions A10V(S)O100
(Dimensions in mm)
A10V(S)O100 ※※-※N00(without control valves)
Shaft P

View W

View V

Shaft K

 Shaft 38-1;(SAE C-C)
 ISO3019-1

Shaft S

 Shaft 38-4;(SAE C-C)
 SAE J744 OCT 83

Shaft U

 Shaft 32-4;(SAE C)
 SAE J744 OCT 83

 B S Pressure port
 L/L Suction port
 1 Case drain ports

 SAE 1 1/4" (High pressure range)
 SAE 2 1/2" (Standard pressure range)
 (L 1 plugged at factory)

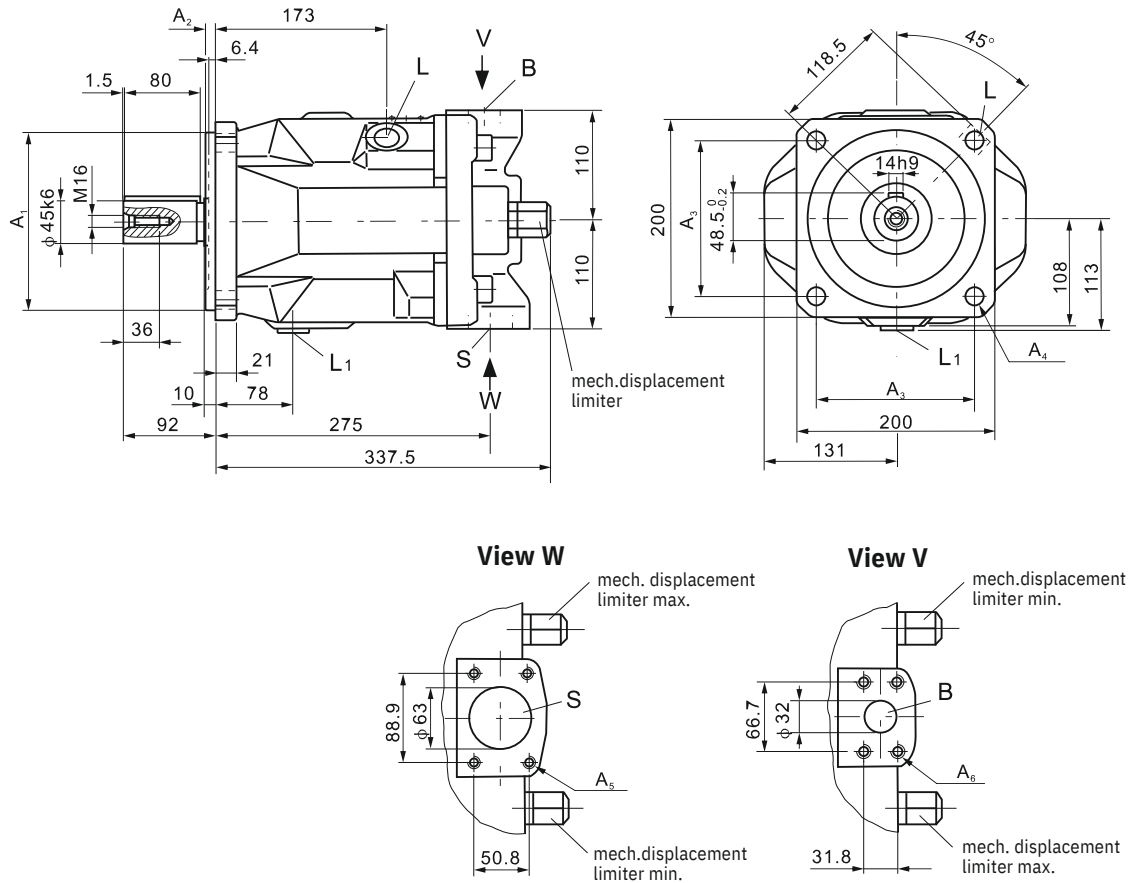
Size	A1	A2	A3	A4	A5	Drain ports L/L1
A10VS0100 ISO	Ø125 h8	9	Ø180	4-M12,17 deep 4-	4-M14,19 deep 4-	M27x2
A10VO100 SAE	Ø127 h8	12.7	Ø181	1/2-13UNC-2B, 27 deep	1/2-13UNC-2B, 29 deep	1 1/16-12UN-2B

Unit Dimensions A10V(S)0140

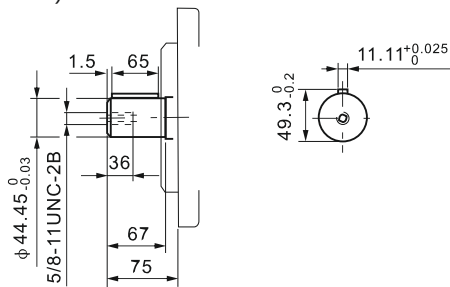
(Dimensions in mm)

A10V(S)0140 ※※-※N00(without control valves)

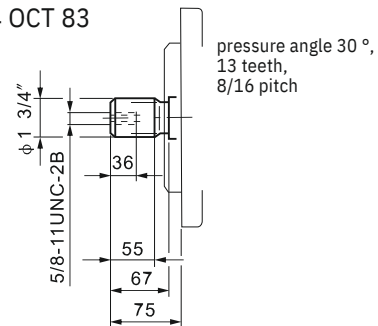
Shaft P



Shaft K

Shaft 44-1;(SAE D)
ISO3019-1


Shaft S

Shaft 44-4;(SAE D)
SAE J744 OCT 83

BS
L/L
1
Pressure port
Suction port
Case drain port

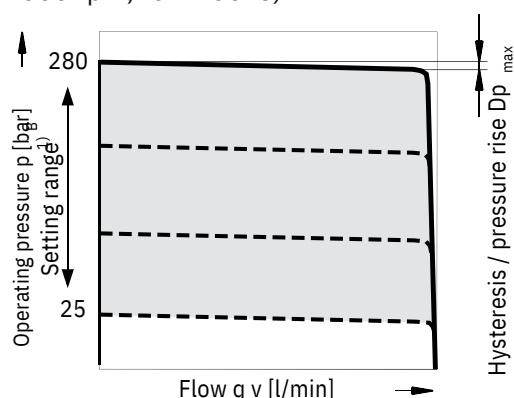
SAE 1 1/4" (High pressure range)
SAE 2 1/2" (Standard pressure range)
(L 1 plugged at factory)

Size	A1	A2	A3	A4	A5	A6	Drain ports L/L1
A10VS0140 ISO	Ø180 h8	9	158.4	4-Ø18	4-M12,17 deep 4-	4-M14,19 deep	M27x2
A10VO140 SAE	Ø152.4 h8	12.7	161.6	4-Ø20	1/2-13UNC-2B, 27 deep	4-1/2-13UNC-2B, 19 deep	1 1/16-12UN-2B

DR Pressure Control

The pressure control limits the maximum pressure at the pump output within the pump control range. The variable pump only supplies as much hydraulic fluid as is required by the consumers. If the operating pressure exceeds the pressure setpoint set at the integrated pressure valve, the pump will adjust towards a smaller displacement and the control deviation will be reduced. The pressure can be set steplessly at the control valve.

Static characteristic curves (at $n=1500$ rpm; $t_{oil} = 50^\circ\text{C}$)



1) In order to prevent damage to the pump and the system, this setting range is the permissible setting range and must not be exceeded. The range of possible settings at the valve are greater.

Dynamic operating curves

The operating curves are mean values measured under test conditions with the unit mounted inside the tank.

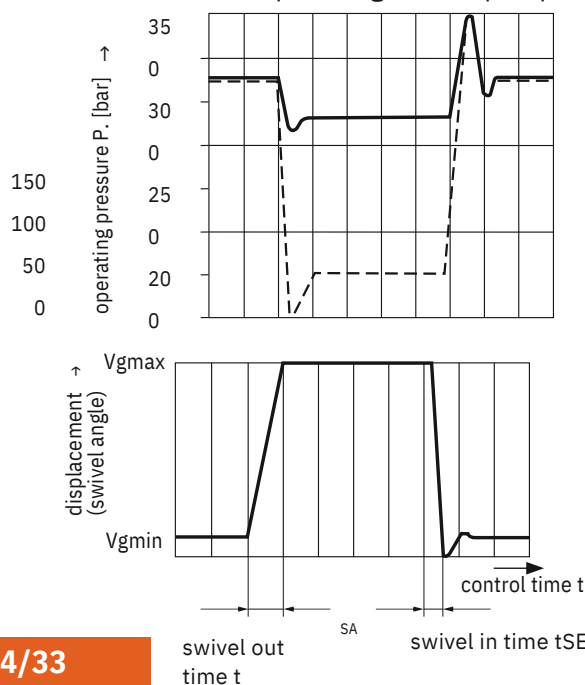
Conditions:

$n = 1500$ rpm

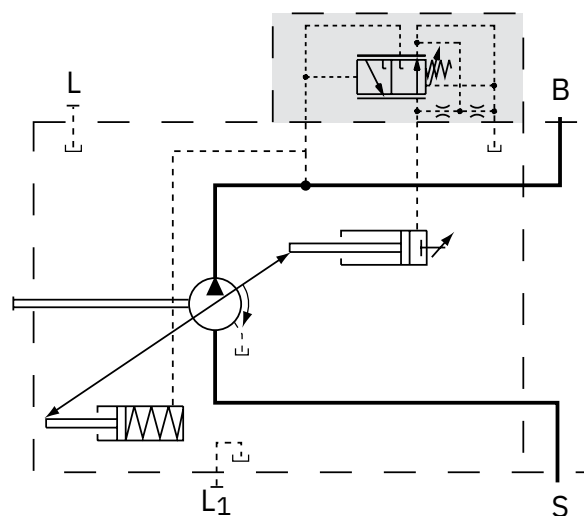
$t_{oil} = 50^\circ\text{C}$

Main relief set at 350 bar

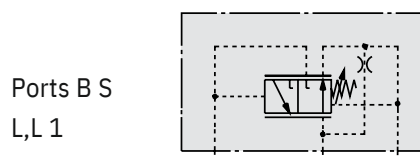
Load steps were obtained by suddenly opening and closing the pressure line with a pressure relief valve as load valve 1 m from the output flange of the pump.



Circuit diagram, sizes 18 to 100



Circuit diagram, size 140



Ports B S
L, L 1

P pressure port Suction port
Case drain ports (L 1 plugged)

Control Data

Hysteresis and repetitive accuracy

Max. pressure rise ΔP max. 3 bar

Size	18	28	45	71	100
ΔP bar	4	4	6	8	10
Pilot oil requirement	140 12 Max.approx 3 L/min				

Control Times

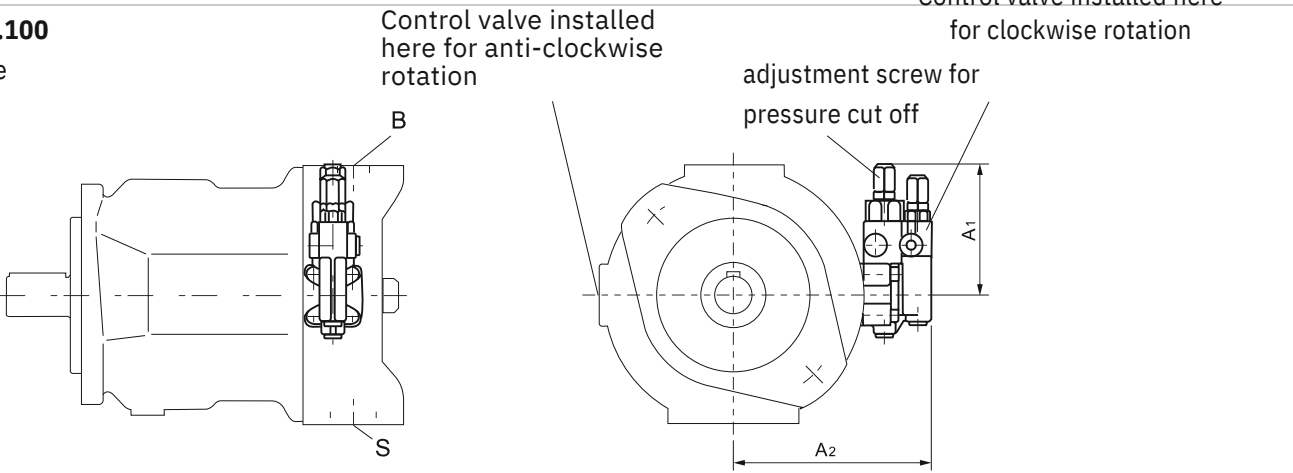
Size	tSA (ms) again 50 bar	tSA (ms) again 220 bar	tSA (ms) again 280 bar
18	50	20	20
28	60	30	20
45	80	40	20
71	100	50	25
100	125	90	30
140	130	110	30



Installation Dimensions

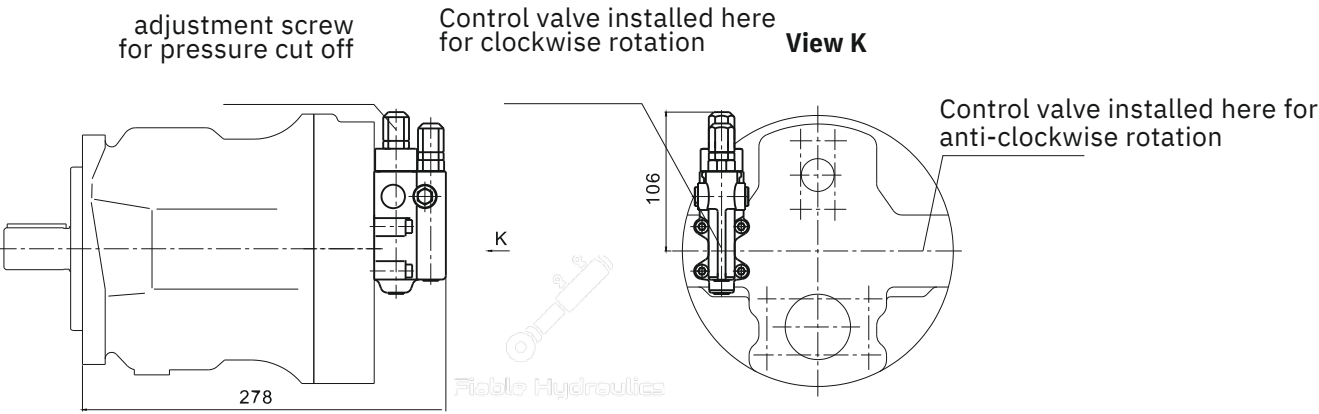
Sizes 18...100

12/62 type

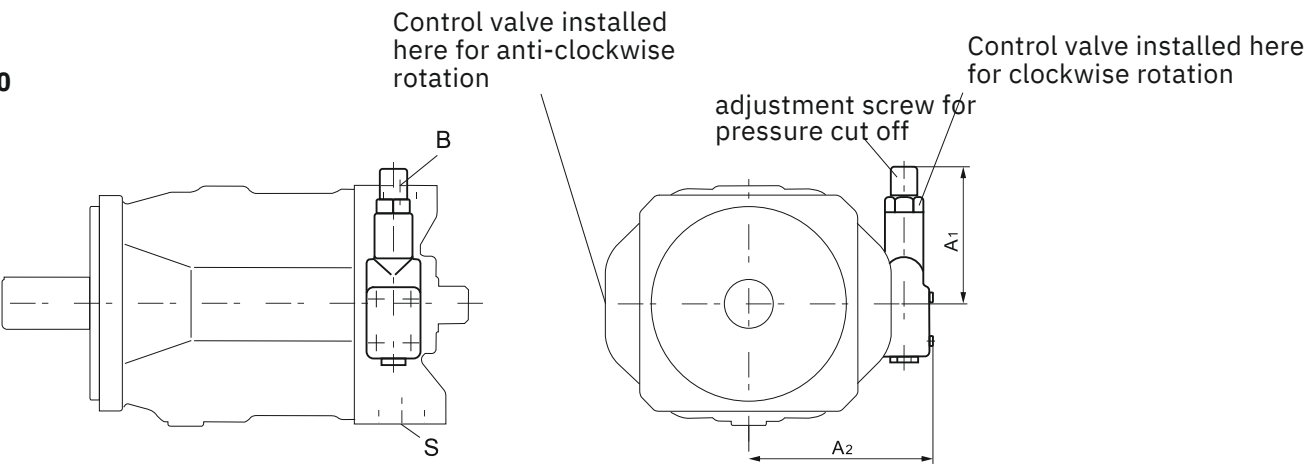


Sizes 71

11/61 type



Sizes 140



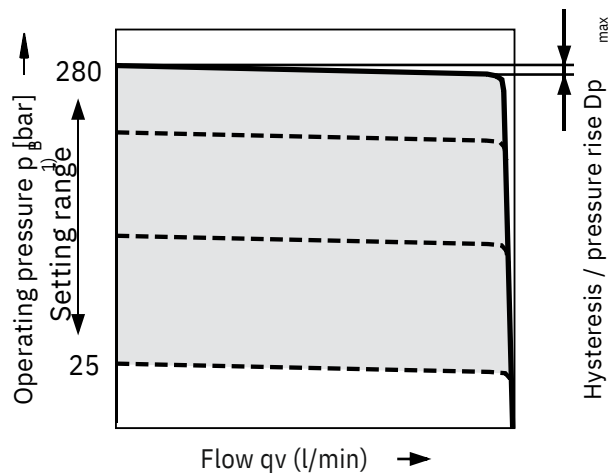
Size	A1	A2
18	104.5	125.5
28	106	136
45	106	146
71	106	160
100	106	165
140	127	169



DRG Pressure Controller, Remote Control

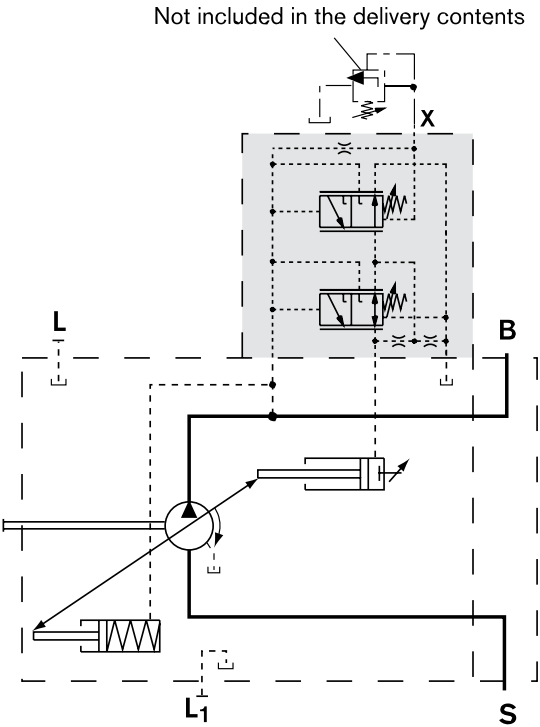
The DR-control valve (see page 14) is overriding this DRG remote setting of max. outlet pressure. A pressure relief valve can be externally piped to port X for remote setting of pressure below the setting of the DR control valve spool. This relief valve is not included in the delivery contents of the DRG control. The differential pressure at the DRG control valve is set as standard to 20 bar. This results in a pilot oil flow to the relief valve of approx. 1.5 l/min at port X. If another setting is required (range from 10-22 bar) please state in clear text. As a separate pressure relief valve we can recommend: DBDH 6 (hydraulic) DBETR-SO 381 with orifice Ø 0.8 mm in P (electric) The max. length of piping should not exceed 2

Static Characteristic Curve
(at n1=1500 rpm; toil=50°C)

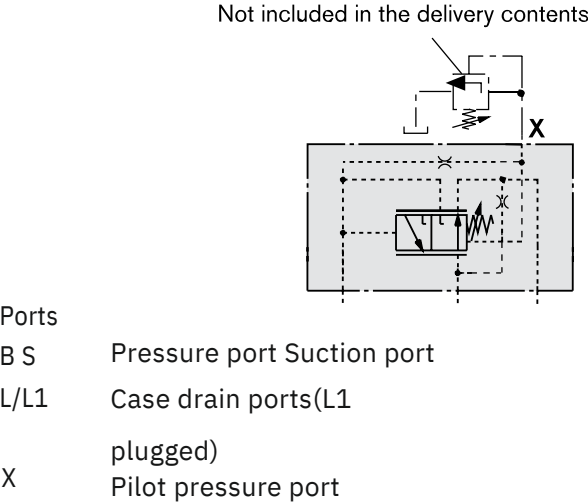


1) In order to prevent damage to the pump and the system, this setting range is the permissible setting range and must not be exceeded. The range of possible settings at the valve are greater.

Circuit diagram, sizes 18 to 100



Circuit diagram, size 140

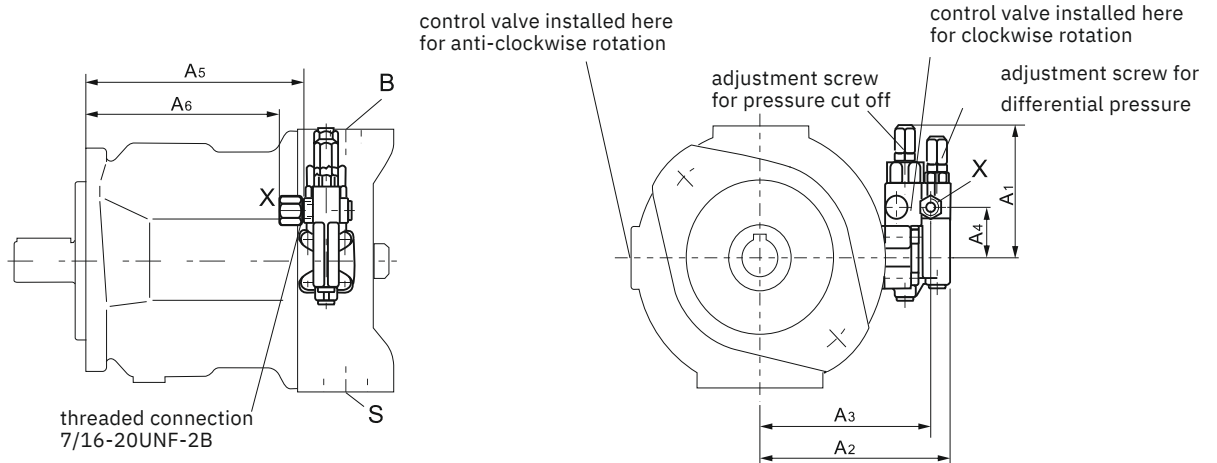


- Ports
- B S Pressure port Suction port
 - L/L1 Case drain ports(L1 plugged)
 - X Pilot pressure port

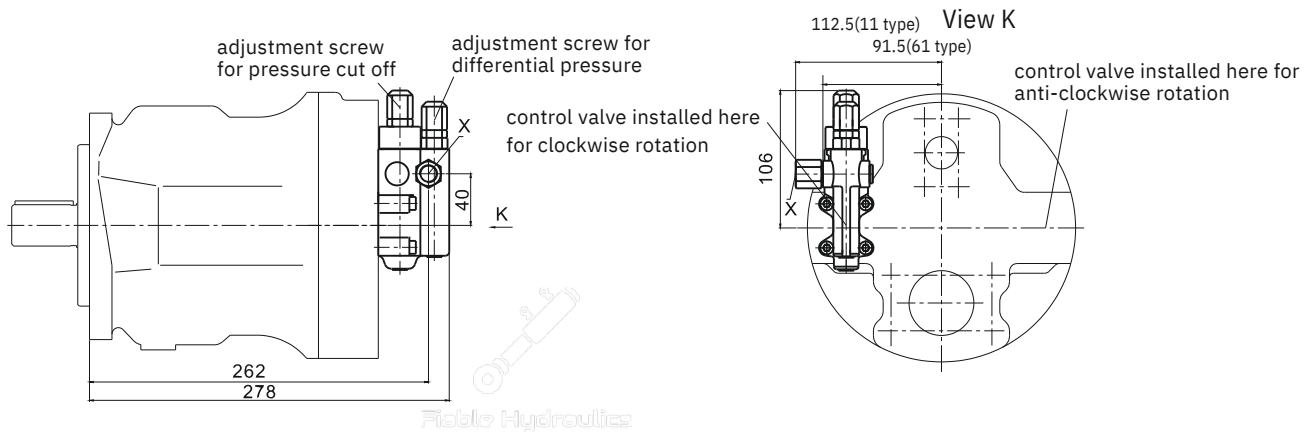
Control Data Hysteresis and repetitive accuracy		ΔP _____ max. 3 bar					
Max. pressure rise							
Size		18	28	45	71	100	140
ΔP	bar	4	4	6	8	10	12
Pilot oil requirement		_____ Max.approx 4.5 L/min					

Installation Dimensions

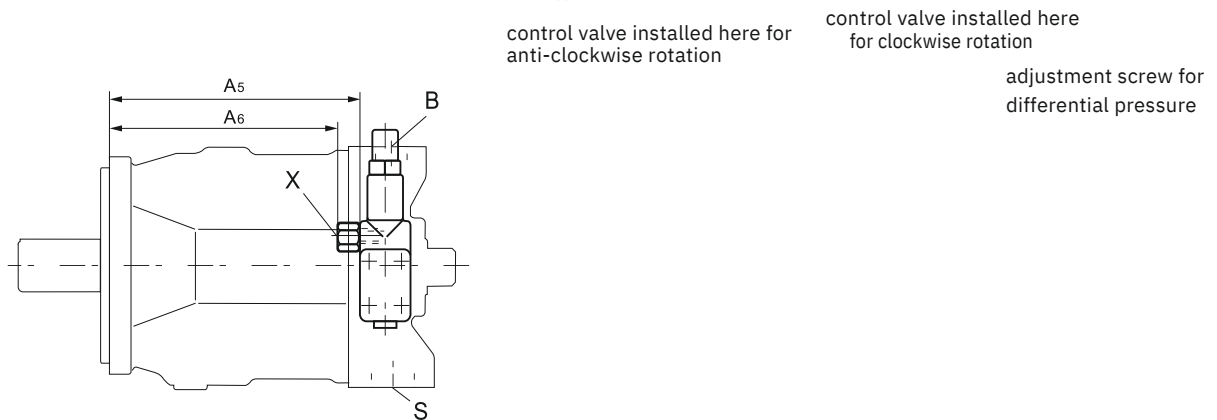
Sizes 18...100 12/62 type



Sizes 71 11/61 type



Sizes 140



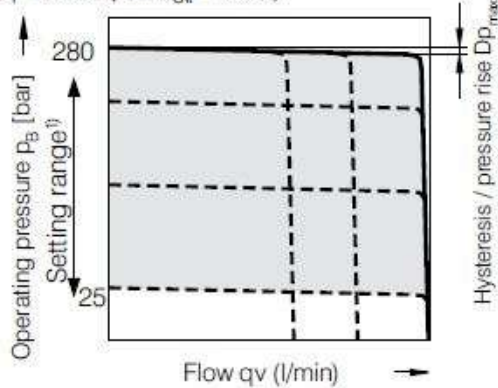
Size	A1	A2	A3	A4	A5	A6	Port X	
18ISO	104.5	125.5	109	40	-	109	M14x1.5; 12 deep	with adaptor
18SAE	104.5	125.5	109	40	130	-	7/16-20UNF-2B; 11.5 deep	without adaptor
28ISO	106	136	119	40	-	119	M14x1.5; 12 deep	with adaptor
28SAE	106	136	119	40	138	-	7/16-20UNF-2B; 11.5 deep	without adaptor
45ISO	106	146	129	40	-	134	M14x1.5; 12 deep	with adaptor
45SAE	106	146	129	40	153	-	7/16-20UNF-2B; 11.5 deep	without adaptor
71ISO	106	160	143	40	-	162	M14x1.5; 12 deep	with adaptor
71SAE	106	160	143	40	181	-	7/16-20UNF-2B; 11.5 deep	without adaptor
100ISO	106	165	148	40	-	229	M14x1.5; 12 deep	with adaptor
100SAE	106	165	148	40	248	-	7/16-20UNF-2B; 11.5 deep	without adaptor
140ISO	127	169	143	27	244	-	M14x1.5; 12 deep	without adaptor
140SAE	127	169	143	27	-	222	9/16-18UNF-2B; 13 deep	with adaptor

DFR/DFR1 Pressure / Flow Control

In addition to the pressure control function the pump flow may be varied by means of a differential pressure over an adjustable orifice (e.g. directional valve) installed in the service line to the actuator. The pump flow is equal to the actual required flow by the actuator, regardless of changing pressure levels. The pressure control overrides the flow control function. **Note** The DFR1 version has no connection between X and the reservoir. Unloading the LS-pilot line must be possible in the valve system. Because of the flushing function sufficient unloading of the X-line must also be provided.

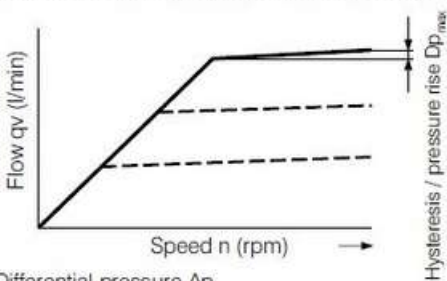
Static operating curve

(at $n_1 = 1500 \text{ rpm}$; $t_{oil} = 50^\circ\text{C}$)



1) In order to prevent damage to the pump and the system, this setting range is the permissible setting range and must not be exceeded. The range of possible settings at the valve are greater.

Static characteristic curve at variable speed



Differential pressure Δp

Standard setting: 14 to 22 bar.

If another setting is required, please state in clear text. Relieving the load on port X to the reservoir results in a zero

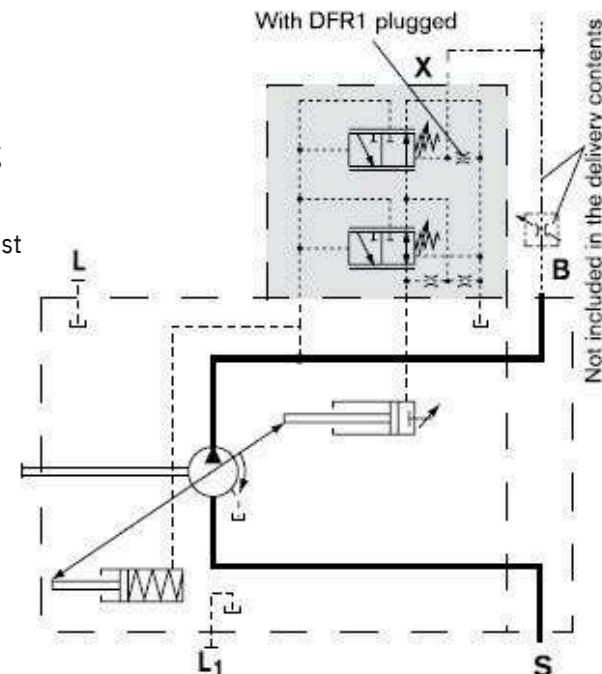
stroke ("standby") pressure which lies about 1 to 2 bar

higher

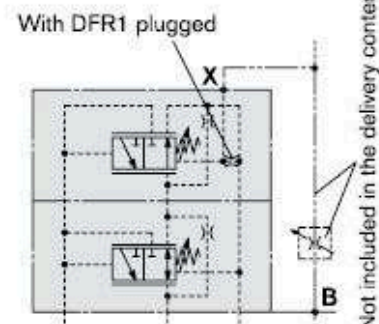
than the differential pressure Δp . System influences are not

taken into account.

Circuit diagram, sizes 18 to 100



Circuit diagram, size 140



Ports

- B Pressure port
- S Suction port
- L/L1 Case drain ports (L1 plugged)
- X Pilot pressure port

Differential Pressure ΔP

Adjustable between 10 and 22 bar (higher valves on request).

Standard setting: 14 bar. If a different setting is required please indicate in clear text.

When port X is unloaded to tank a "zero stroke pressure" of $P = 18 \pm 2 \text{ bar}$ (stand by) results (dependent on ΔP).

Control Data Data pressure controller see page 13. Max. Flow variation (hysteresis and increase) measured at drive speed $n = 1500 \text{ rpm}$

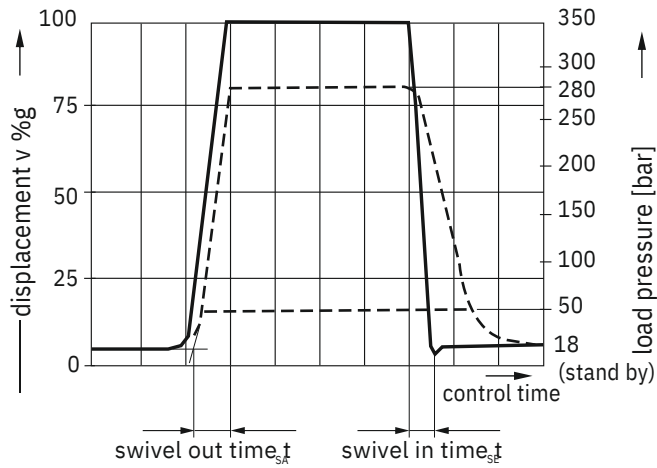
Size	18	28	45	71	100	140
q _{vmax}	0.5	1.0	1.8	2.8	4.0	6.0
L/min						

DFR pilot oil consumption max. approx. 3...4.5 L/min

DFR1 pilot oil consumption max. approx. 3 L/min

DFR/DFR1 Pressure / Flow Control

Dynamic flow control operating curve The operating curves are average values measured under test conditions with the unit mounted inside the tank.



Control Times

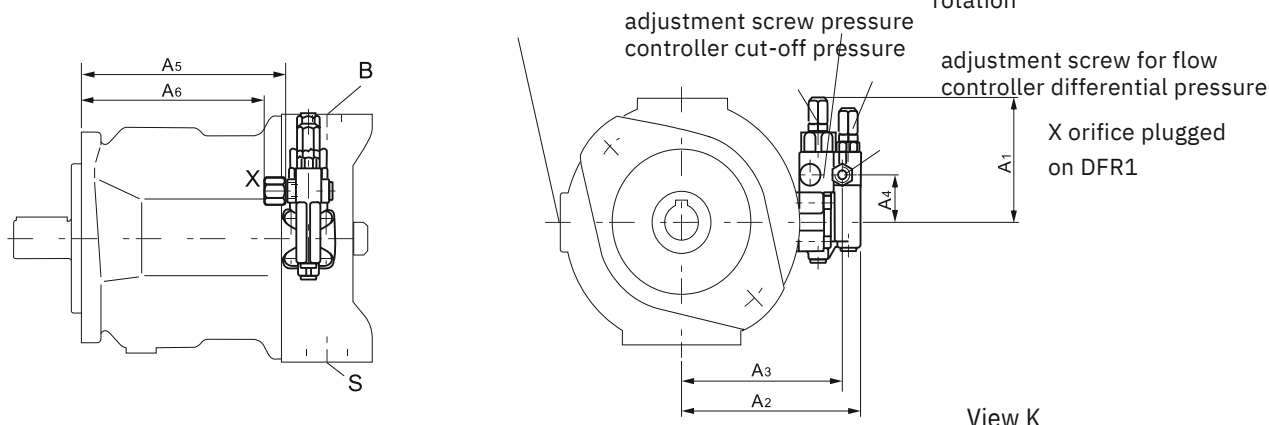
Size	t_{SA} (ms) stand by 280 bar	t_{SE} (ms) 280 bar stand by	t_{SE} (ms) 50 bar stand by
18	40	15	40
28	40	20	40
45	50	25	50
71	60	30	60
100	120	60	120
140	130	60	130

Installation Dimensions

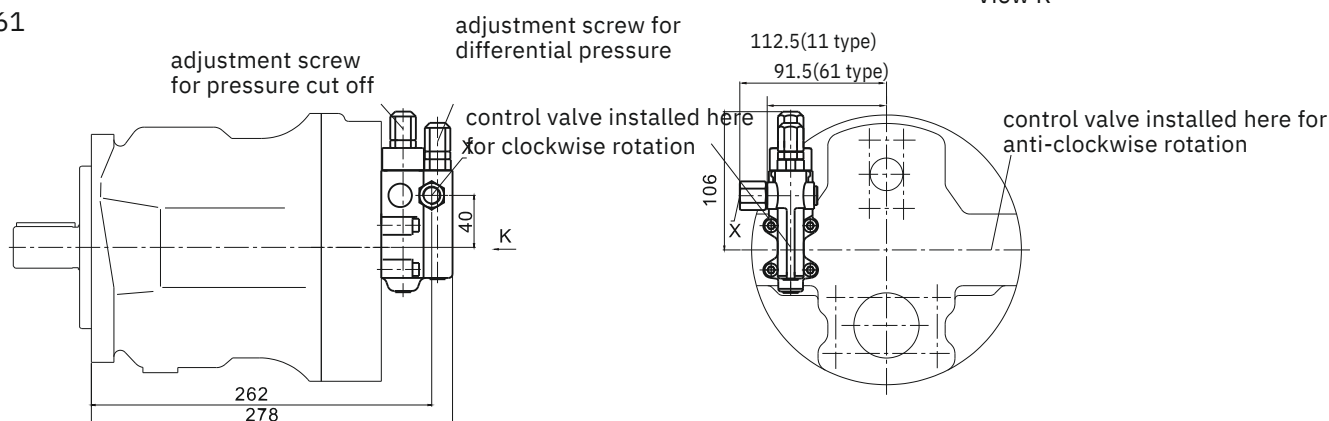
Sizes 18...100 12/62 type

Control valve installed here
for anti-clockwise rotation

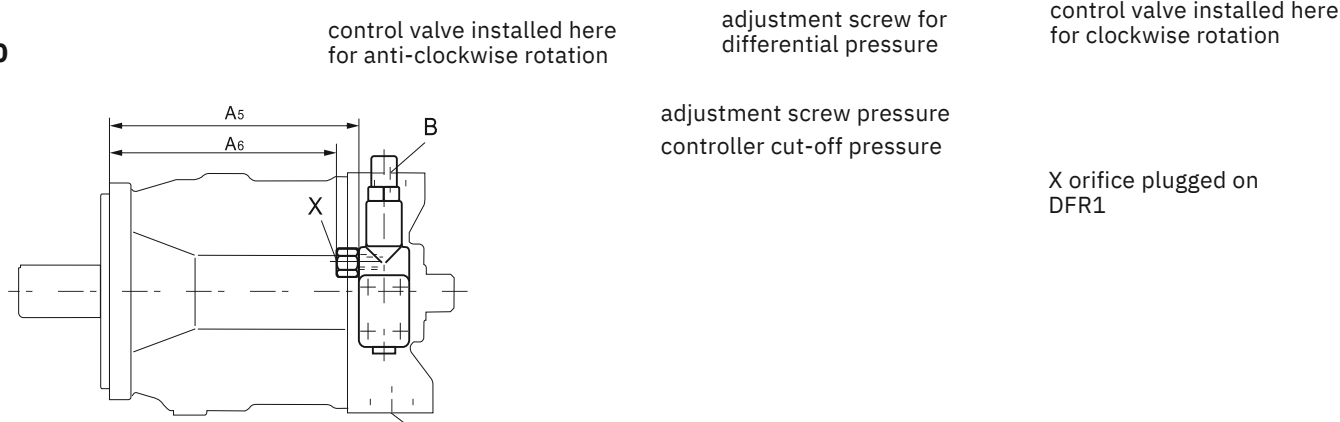
Control valve installed
here for clockwise
rotation



Sizes 71 11/61 type



Sizes 140



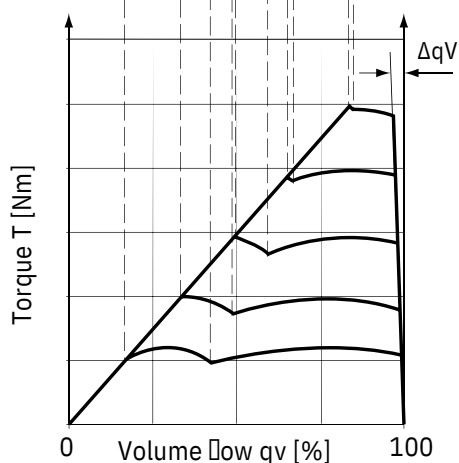
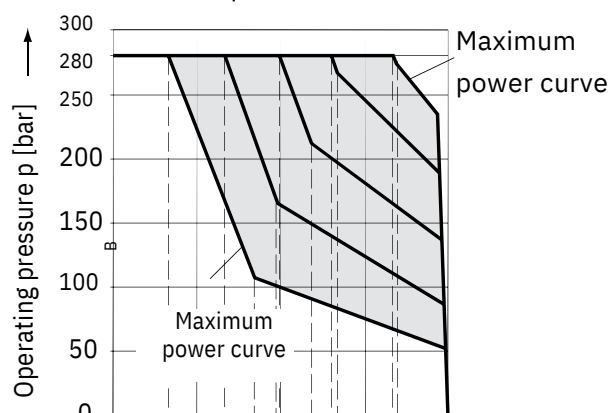
Size	A1	A2	A3	A4	A5	A6	Port X	
18ISO	104.5	125.5	109	40	-	109	M14x1.5;12 deep	with adaptor
18SAE	104.5	125.5	109	40	130	-	7/16-20UNF-2B;11.5 deep	without adaptor
28ISO	106	136	119	40	-	119	M14x1.5;12 deep	with adaptor
28SAE	106	136	119	40	138	-	7/16-20UNF-2B;11.5deep	without adaptor
45ISO	106	146	129	40	-	134	M14x1.5;12 deep	with adaptor
45SAE	106	146	129	40	153	-	7/16-20UNF-2B;11.5 deep	without adaptor
71ISO	106	160	143	40	-	162	M14x1.5;12 deep	with adaptor
71SAE	106	160	143	40	181	-	7/16-20UNF-2B;11.5 deep	without adaptor
100ISO	106	165	148	40	-	229	M14x1.5; 12 deep	with adaptor
100SAE	106	165	148	40	248	-	7/16-20UNF-2B;11.5 deep	without adaptor
140ISO	127	169	143	27	244	-	M14x1.5; 12 deep	without adaptor
140SAE	127	169	143	27	-	222	9/16-18UNF-2B; 13 deep	with adaptor

DFLR Pressure ,Flow and power

Control

Execution of the pressure control like DR(G), Execution of the Flow control like DFR, DFR1, In order to achieve a constant drive torque with varying operating pressures, the swivel angle and with it the output flow from the axial piston pump is varied so that the product of flow and pressure remains constant. Flow control is possible below the power control curve.

Static curves and torque characteristic

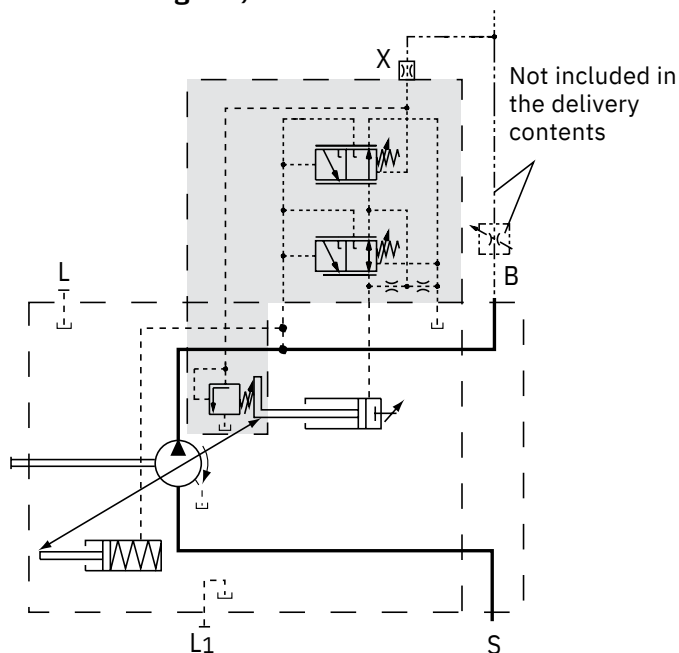


Control data

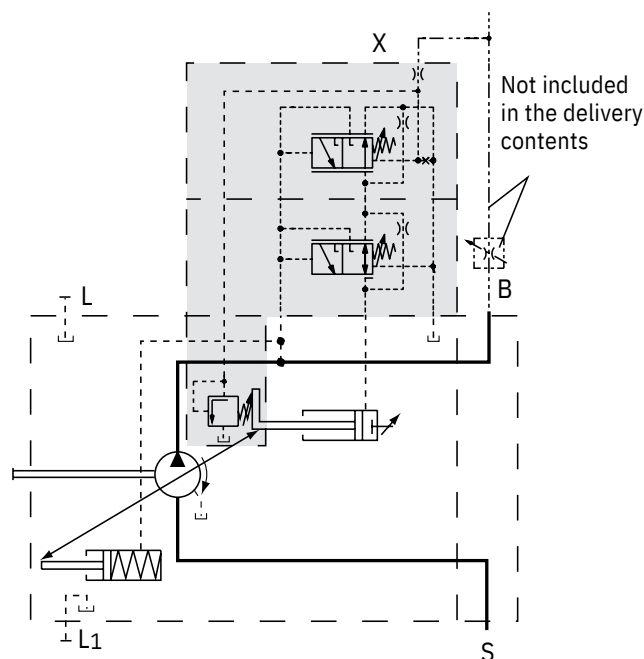
Controls the starting point 80 bar rise
Pilot fluid consumption: maximum approx. 5.5L/min

The power characteristic is set in the factory; when ordering, please state in clear text, e.g. 20 kW at 1500 rpm.

Circuit diagram, sizes 28 to 100



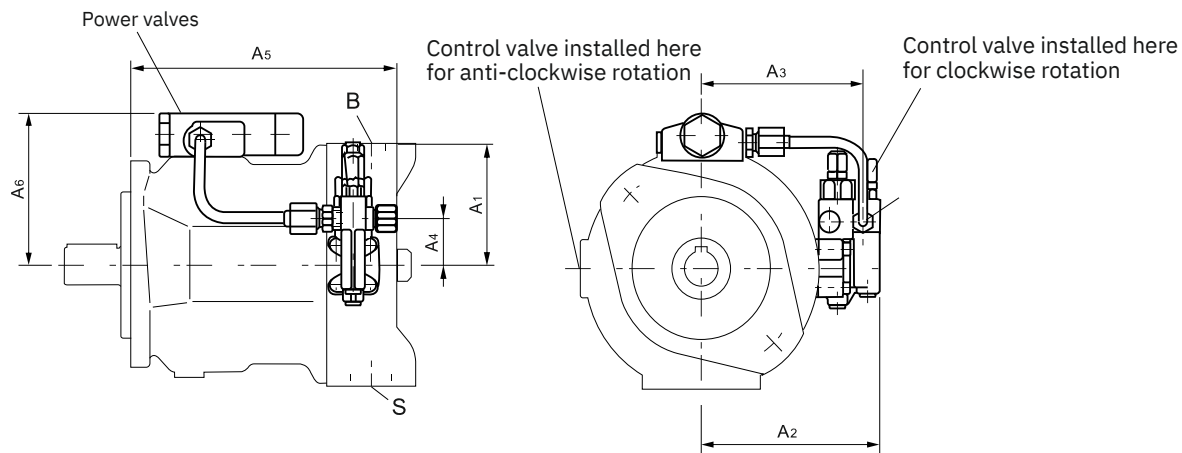
Circuit diagram, size 140



Installation Dimensions

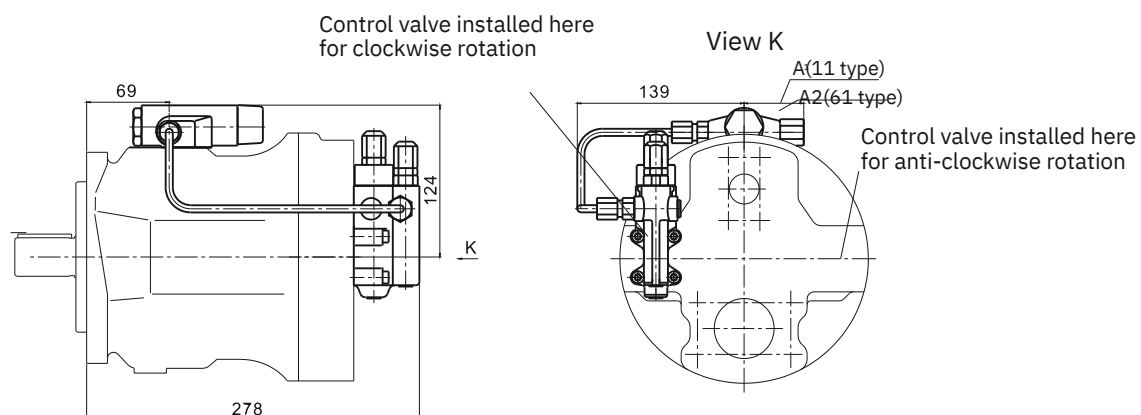
Sizes 18...100

12/62 type

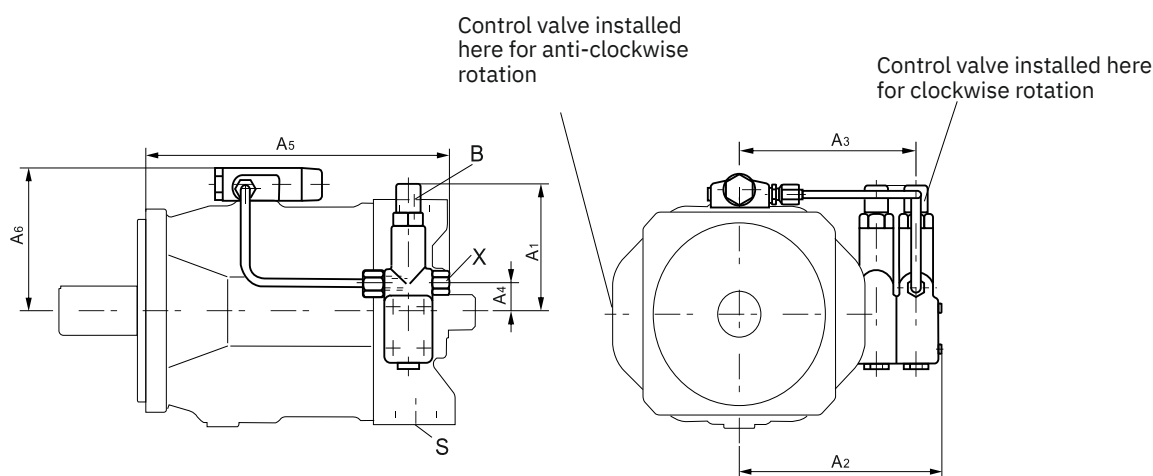


Sizes 71

11/61 type



Sizes 140



Size	A1	A2	A3	A4	A5	A6	Port
28ISO	106	136	119	40	197	107	X M14x1.5;12 deep
28SAE	106	136	119	40	194	107	7/16-20UNF-2B;11.5deep
45ISO	106	146	129	40	212	112	M14x1.5;12 deep
45SAE	106	146	129	40	209	112	7/16-20UNF-2B;11.5 deep
71ISO	106	160	143	40	240	124	M14x1.5;12 deep
71SAE	106	160	143	40	237	124	7/16-20UNF-2B;11.5 deep
100ISO	106	165	148	40	307	129	M14x1.5; 12 deep
100SAE	106	165	148	40	304	129	7/16-20UNF-2B;11.5 deep
140ISO	127	209	183	26	314	140	M14x1.5; 12 deep
140SAE	127	209	183	26	314	140	9/16-18UNF-2B; 13 deep

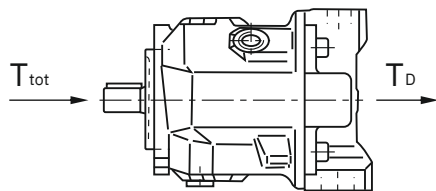
Through Drive

The A10V(S)O pump can be supplied with through drive in accordance with the type code on page 3. The through drive version is designated by the code numbers (KB3-KB6). If on other pumps are fitted by the manufacturer, the simple type designation is sufficient. In this case, the delivery package comprises: Hub fixing screws, seal and, if necessary, an adaptor flange.

Combination Pump By building on further pumps it is possible to obtain independent circuits: If the combination pump consists of 2

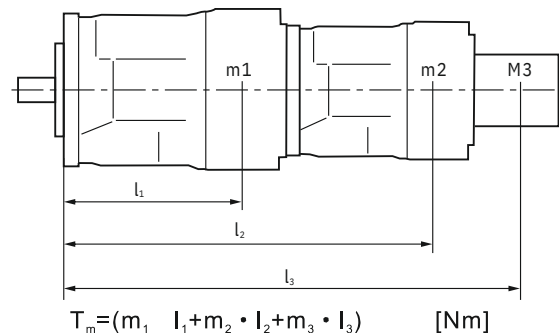
- A10VSO and if these are to be supplied assembled then the two order codes should be linked by means of a "+" sign. Ordering example: A10VSO 71 DR/31 L -PPA12KB3+ A10VSO 28 DR/31 L -PSA12N00 If a gear or radial piston pump is to be built on at the factory, please consult us.

Maximum permissible input and through drive torque



The split in torque between pump 1 and 2 is optional. The max. permissible input torque T_{tot} as well as the max. total permissible through drive torque T_D may not be exceeded.

Permissible moment of inertia



m_1, m_2, m_3 [kg] Pump mass l_1, l_2, l_3 [mm] distance to center of gravity

$$T_m = (m_1 \cdot l_1 + m_2 \cdot l_2 + m_3 \cdot l_3) \cdot \frac{1}{10^2} \text{ Nm}$$

Size Permissible			28	45	71	100	140		
moment of inertia	Tm	Nm	880	1370	2160	3000	4500		
Permissible moment of inertia at dynamic mass acceleration			Tm	Nm	88	137	216	300	450
10g±98.1m /s2			m1	kg	15	21	33	45	60
Mass			l1	mm	110	130	150	160	160
To center of gravity									

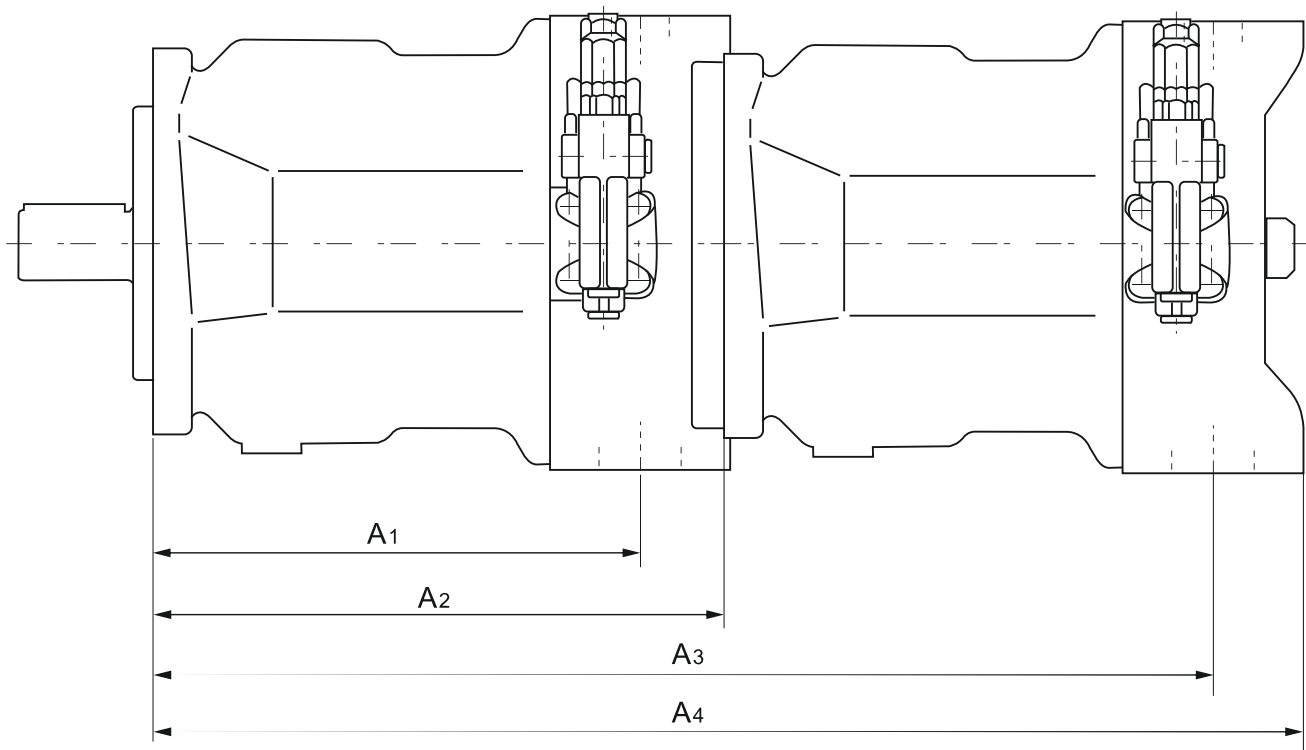
T_{tot} = Max. permissible input torque at pump 1
 T_D = Max. permissible through-drive torque at through-drive to splined shaft
 T_{Dkeyed} = Max. permissible through-drive torque at through-drive to keyed shaft

Size		28	45	71	100	140
Max. permissible input torque at pump 1 with shaft "P"						
	T _{tot}	Nm	137	200	439	857 1206
Max. permissible through-drive torque	T _D	Nm	137	200	439	778 1206
	T _{Dkeyedshaft}	Nm	112	179	283	398 557

Size		28	45	71	100	140
Max. permissible input torque at pump 1 with shaft "S"						
	Ttot	Nm	137	319	626	1104 1620
Max. permissible	TD			319	492	778 1266
through-drive torque		Nm	160			
	T Dkeyedshaft	Nm	112	179	283	398 557

Size		28	45	71	100	140	
Max. Permissible input torque at pump 1 with shaft "R"							
	Ttot	Nm	225	400	644	-	-
Max. permissible through-drive torque	TD	Nm	176	365	548	-	-
	T Dkeyedshaft	Nm	112	179	283	-	-

Installation Dimensions

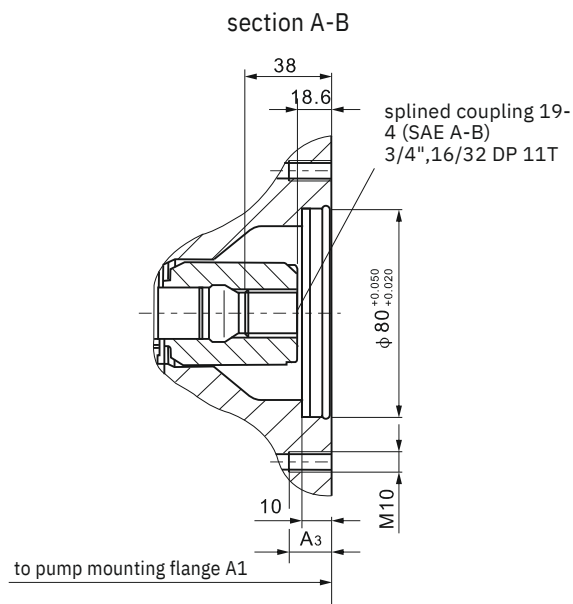
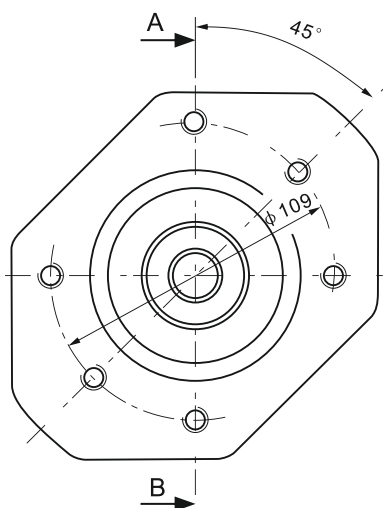


main p. built-on p.	A10V(S)O18				A10V(S)O28				A10V(S)O45			
	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4
A10V(S)O18	164	204	349	399	164	204	349	399	184	229	374	424
A10V(S)O28	-	-	-	-	164	204	368.5	410	184	229	393.5	435
A10V(S)O45	-	-	-	-	-	-	-	-	184	229	413	453
A10V(S)O71	-	-	-	-	-	-	-	-	-	-	-	-
A10V(S)O100	-	-	-	-	-	-	-	-	-	-	-	-
A10V(S)O140	-	-	-	-	-	-	-	-	-	-	-	-

main p. built-on p.	A10V(S)O71				A10V(S)O100				A10V(S)O140			
	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4
A10V(S)O18	217	267	412	462	275	338	483	533	275	350	495	545
A10V(S)O28	217	267	431.5	431.5	275	338	502.5	544	275	350	514	556
A10V(S)O45	217	267	451	491	275	338	522	562	275	350	534	574
A10V(S)O71	217	267	484	524	275	338	555	595	275	350	567	609
A10V(S)O100	-	-	-	-	275	338	613	664	275	350	625	679
A10V(S)O140	-	-	-	-	-	-	-	-	275	350	625	688

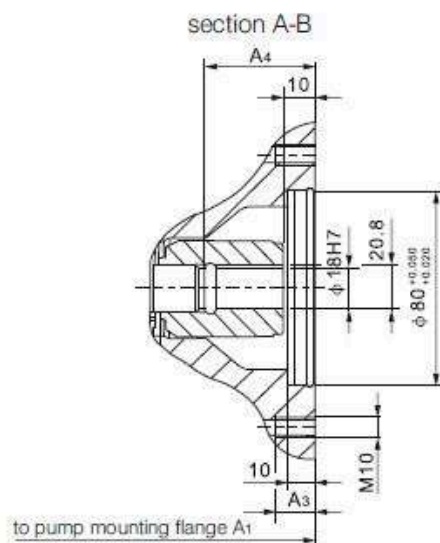
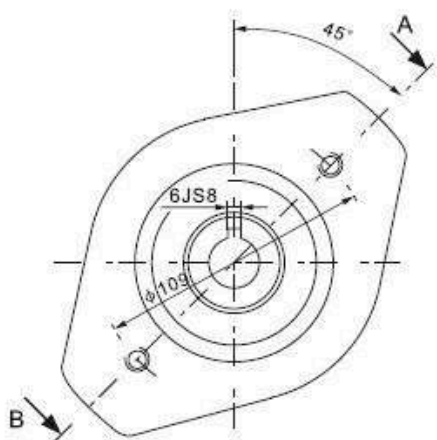
Installation Dimensions, Through drives

Flange ISO 80,2-hole for built-on A10VSO 18 (splined shaft S or R) Order code KB2

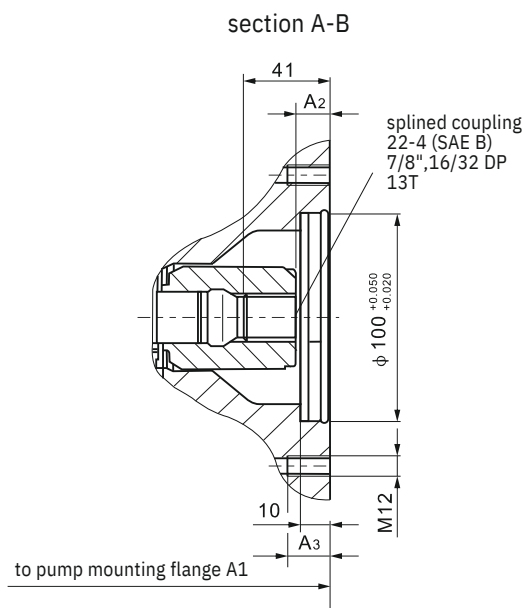


Size main pump	A1	A2
28	204	16
45	229	16
71	267	20

Flange ISO 80,2-hole for built- on A10VSO 18 (splined shaft P.) Order code K51



Size main pump	A1	A3	A4
28	204	16	37
45	229	16	43
71	267	20	51
100	338	20	55
140	350	20	67

Order code KB3

Size main pump	A1	A2	A3
28	20	19.2	14
45	4	16.5	15
71	22	16.5	18
100	9	17.6	18
140	26	18.2	24

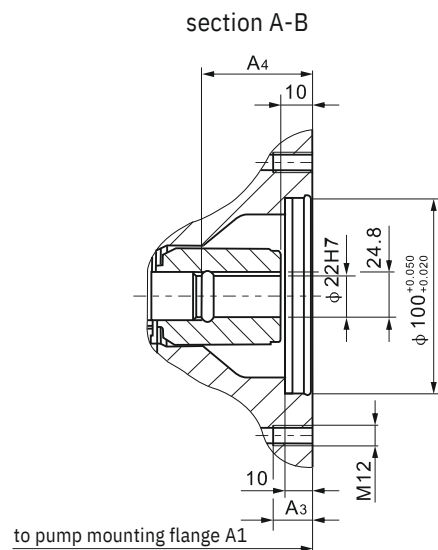
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33

8

35

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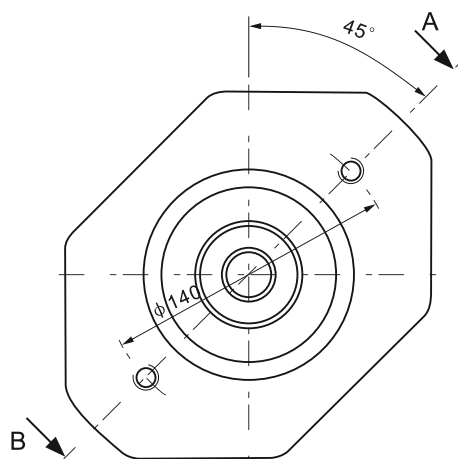
Order code K25

Size main pump	A1	A3	A4
28	204	14	37
45	229	14	43
71	267	23	51
100	338	20	55
140	350	24	62

Installation Dimensions, Through drives

Flange ISO 100,2-hole for built-on A10VSO 45 (splined shaft S or R)

Order code KB4



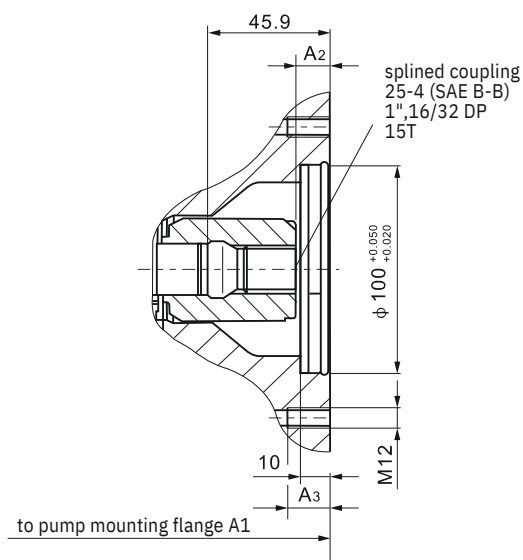
Size main pump	A1	A2	A3
45	22	17.2	14
71	9	17.2	18
100	26	18.2	20
140	7	18.2	24

33

8

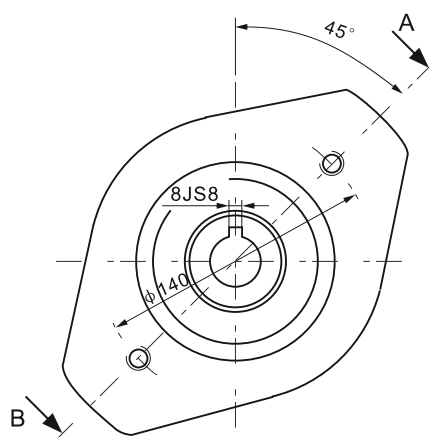
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section A-B



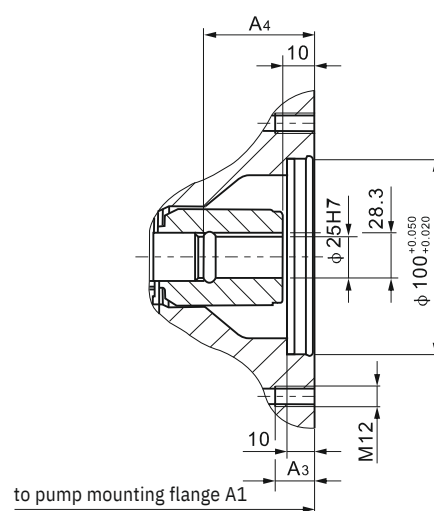
Flange ISO 100,2-hole for built-on A10VSO 45 (splined shaft P.)

Order code K26



Size main pump	A1	A3	A4
45	229	14	43
71	267	23	51
100	338	20	55
140	350	24	67

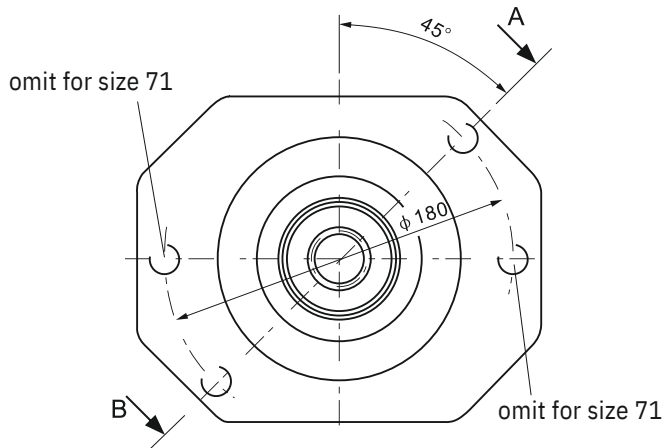
section A-B



Installation Dimensions, Through drives

Flange ISO 125,2-hole for built-on A10VSO 71 (splined shaft S or R)

Order code KB5

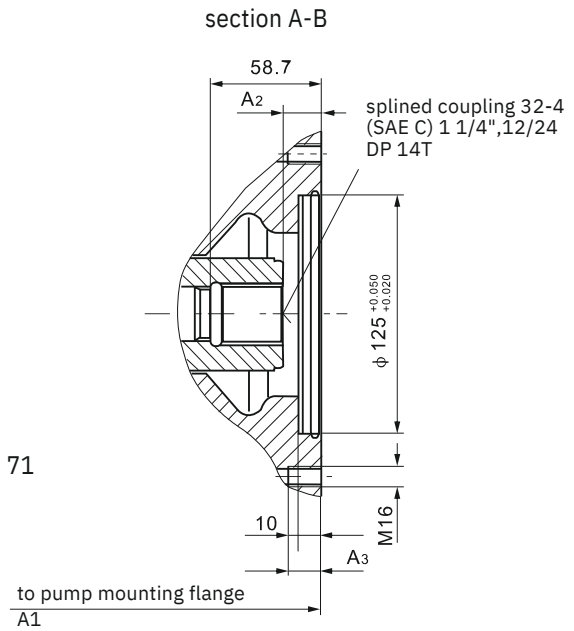


Size main pump	A1	A2	A3
71	26	20	18.5
100	7	20	25
140	33	21	32

8

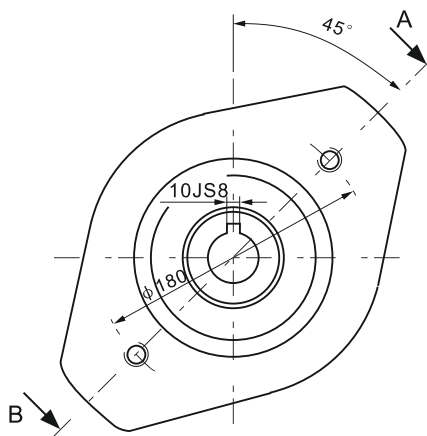
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Flange ISO 125,2-hole for built-on A10VSO 71 (splined shaft P.)

Order code K27

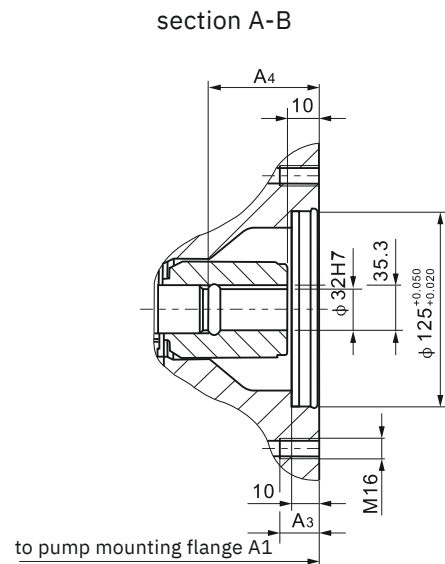


Size main pump	A1	A3	A4
71	26	18	51
100	7	20	54
140	33	24	63

8

35

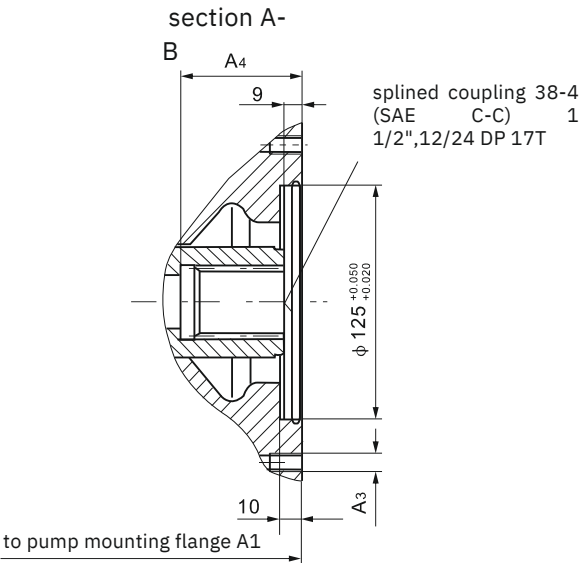
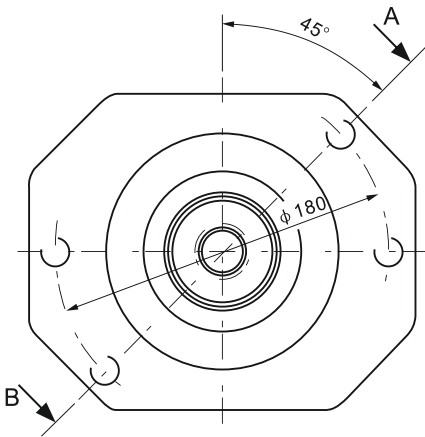
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Installation Dimensions, Through drives

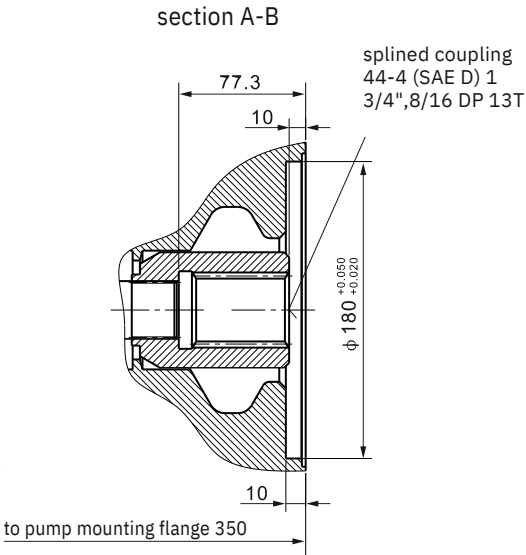
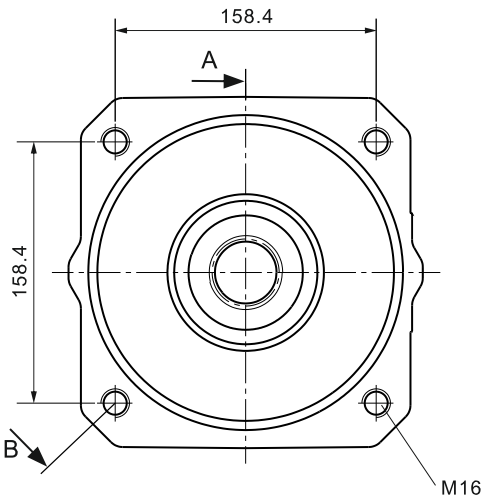
Flange ISO 125,2-hole for built-on A10VSO100 (splined shaft S)

Order code KB6

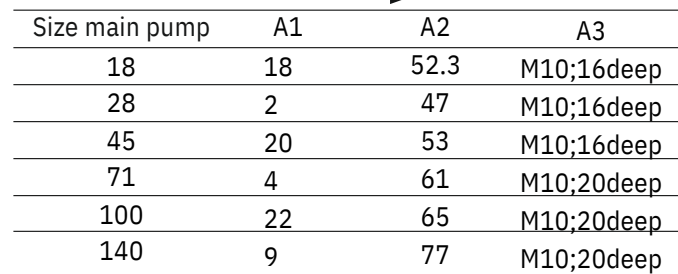


Size main pump	A1	A3	A4
100	33	M16, 25deep	65
140	8	M16, 32deep	77.3
	35		
	0		

Flange ISO 180,4-hole for built-on A10VSO 140 (splined shaft S) Order code KB7

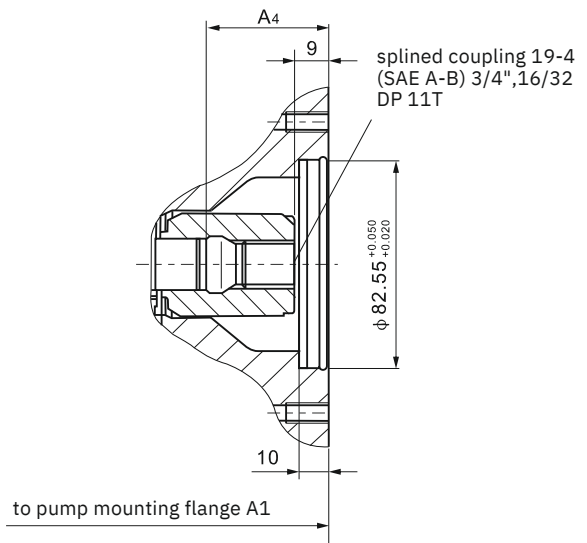


Flange SAE 82,2-hole (SAE A) Order code K01



Size main pump	A1	A2	A3
18	18	52.3	M10;16deep
28	2	47	M10;16deep
45	20	53	M10;16deep
71	4	61	M10;20deep
100	22	65	M10;20deep
140	9	77	M10;20deep

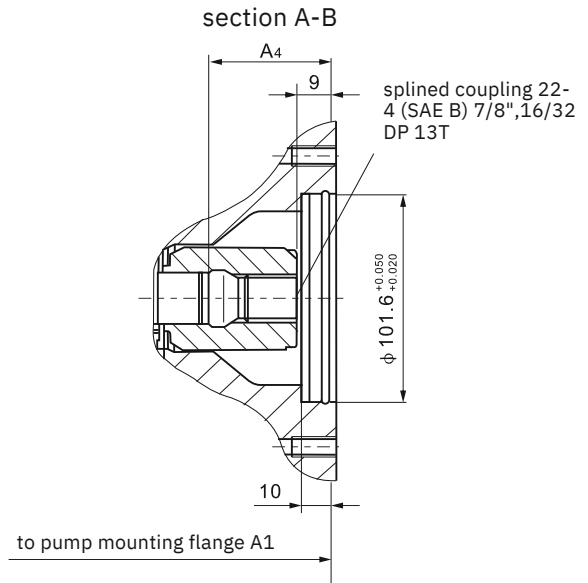
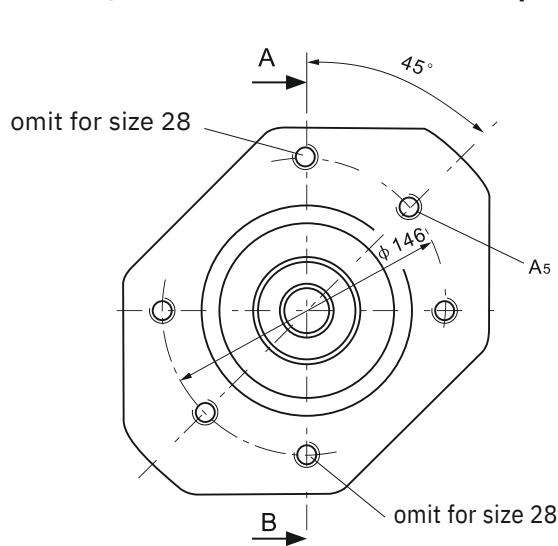
section A-B



Size main pump	A1	A2	A3
18	18	52.3	M10;16deep
28	2	47	M10;16deep
45	20	53	M10;16deep
71	4	61	M10;20deep
100	22	65	M10;20deep
140	9	77	M10;20deep

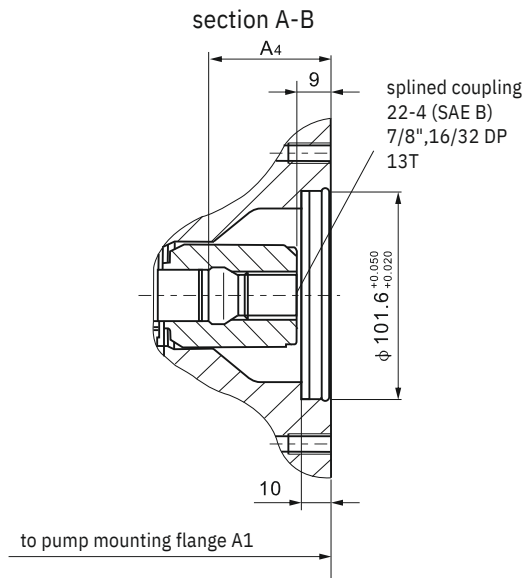
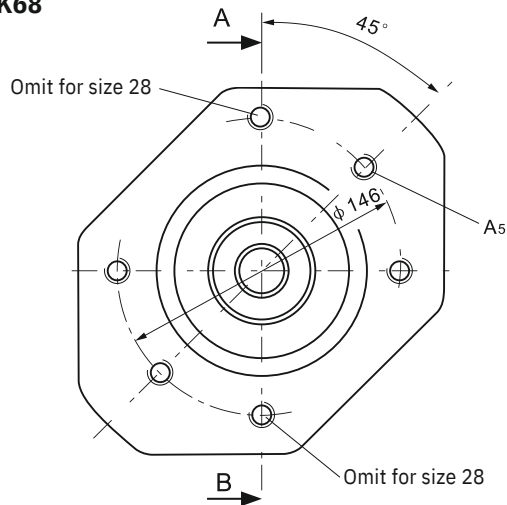
Installation Dimensions, Through drives

Flange SAE 101,2-hole for built-on A10VO 28 (splined shaft S) Order code K02



Size main pump	A1	A4	A5
28	204	47	M12;15deep
45	229	53	M12;18deep
71	267	61	M12;20deep
100	338	65	M12;20deep
140	350	77	M12;20deep

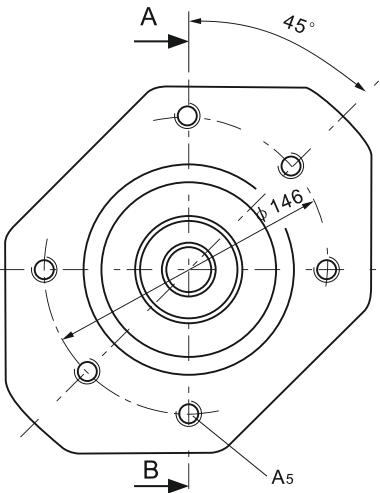
Flange SAE 101,2-hole for built-on A10VO 28 (splined shaft S)
Order code K68



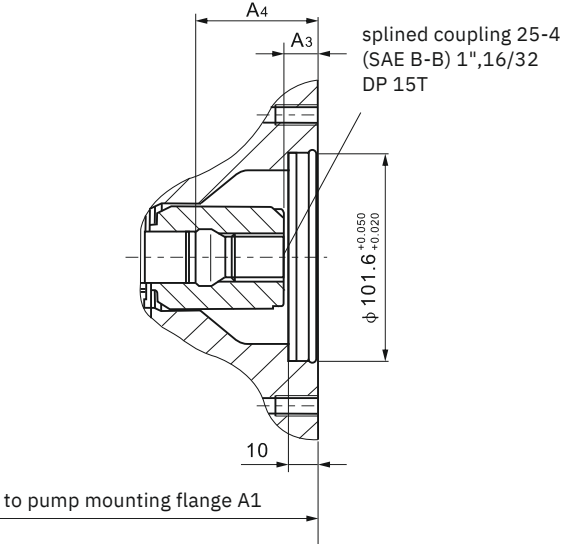
Size main pump	A1	A4	A5
28	20	47	M12;15deep
45	4	53	M12;18deep
71	22	61	M12;20deep
100	9	65	M12;20deep
140	26	77	M12;20deep

Installation Dimensions, Through drives

Flange SAE 101,2-hole for built-on A10VO 45 (splined shaft S) Order code K04

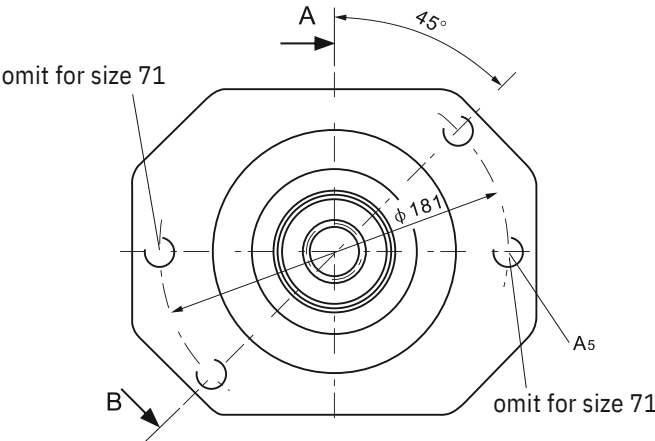


section A-B

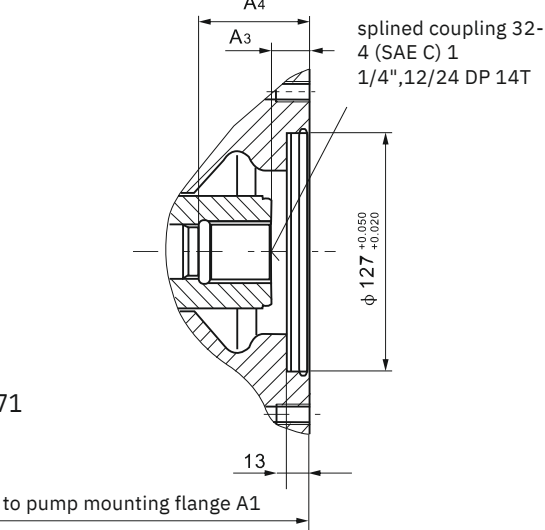


Size main pump	A1	A3	A4	A5
28	204	9	47	M12;15deep
45	229	9	53.4	M12;18deep
71	267	9	61.3	M12;20deep
100	338	10	65	M12;20deep
140	350	8	77.3	M12;20deep

Flange SAE 127,2-hole for built-on A10VO 71 (splined shaft S) Order code K07



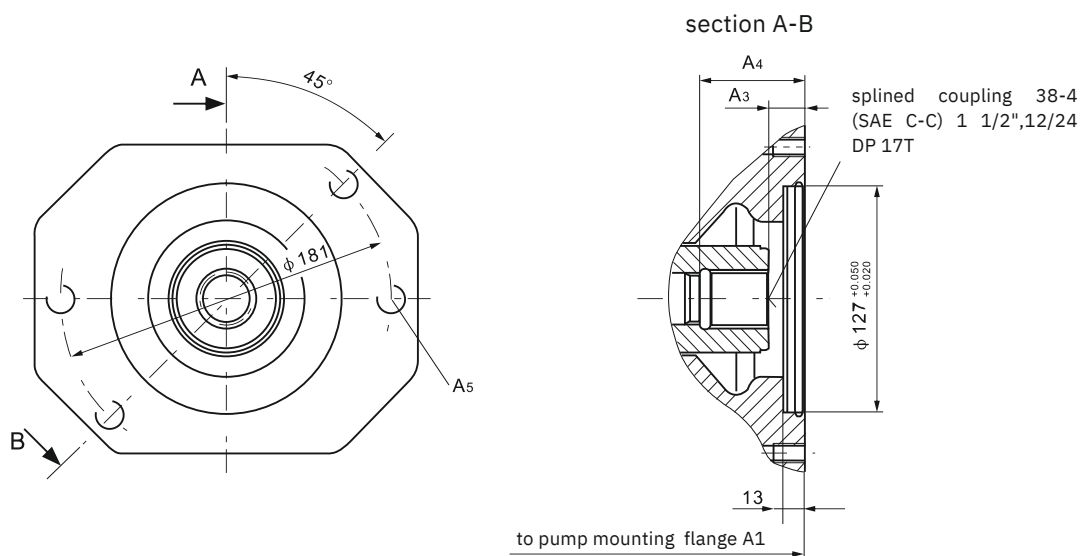
section A-B



Size main pump	A1	A3	A4	A5
71	267	10	61.3	M16;18deep
100	338	9	65	M16;20deep

Installation Dimensions, Through drives

Flange SAE 127,2-hole for built-on A10VO 100(splined shaft S) Order code K24



Size main pump	A1	A3	A4	A5
100	33	8	65	M16;20deep
140	8	9	77.3	M16;32deep
35				
0				

Flange SAE 152,4-hole for built-on A10VO 140 (splined shaft S) Order code K17

