LE MONARCH HYDRAULICS

Axial piston variable pump
LM-A10VSO series 31

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

Index

Features

- Variable pump witch 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 pistion pumps up to the same size,i.e.,100% through drive.

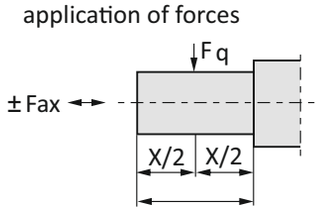
Specifications

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	252
	at n_E=1500 min^{-1}		L/min	27	42	68	107	150	210
Max.power (P.= 28 MPa)	at $n_{o\,max}$	$P_{vo\,max}$	kW	28	39	55	73	93	118
	at n_E=1500 min^{-1}		kW	13	20	32	50	70	98
Max.torque (ΔP.= 280 bar)	at $V_{q\,max}$	T_{max}	Nm	80	125	200	316	445	623
Torque (ΔP.= 100 bar)	at $V_{q\,max}$	T	Nm	30	45	72	113	159	223
Moment of inertia about drive axis		J	Kgm²	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

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

Torque $T = \frac{V_g \times \Delta p}{20 \times \pi \times n_{mh}}$ (Nm)

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

V_g Displacement per revolution [cm³]
Δp Differential pressure [bar]
n Rotational speed [rpm]
n_v Volumetric efficiency
n_{hm} Hydraulic-mechanical efficiency
n_t Total efficiency ($n_t = n_v \times n_{hm}$)

Ordering code

LM	A10VS										

LE MONARCH = LM

Swashplate design,variable, Nominal pressure 28 bar, Maximum pressure 35 bar = A10VS

Pump, Open Circuit = O

Size (mL/r) = 18, 28, 45, 71, 100, 140

Control device

Pressure controller = DR
Pressure control, remote controlled = DRG
Pressure /flow control = DFR
Pressure /flow control, without orifice in X-line = DFR1
pressure, flow and power controller = DFLR

Series = 31

Direction of Rotation
(View from shaft end)
Clockwise = R
Counter-clockwise = L

Sealing Material
NBR nitrl~ caoutchouc to DIN ISO 1629 (shalft seal in FKM) = P
FKM fluor~ caoutchouc to DIN ISO 1629 = V

Shaft end
See next page (table 1)

Mounting Flange
ISO 2-hole = A
SAE 2-hole = C
ISO 4-hole = B
SAE 4-hole = D

Working Port
SAE flange ports according to ISO 6162 working ports, fastening thread metric, lateral top botton = 12
SAE flange ports according to ISO 6162 working ports, fastening thread UNC, lateral top botton = 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 3/4"	S
Splined shaft SAE (higher through-shaft drive torque)	/	7/8"	1"	1 1/4"	/	/	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)	A10VSO18(shaft S)	/	✓	✓	✓	✓	✓	K52
SAE 101,2-hole	splined shaft 7/8"22-4(SAE B) radial seal	A10VSO28(shaft S)	/	✓	✓	✓	✓	✓	K02
SAE 101,2-hole	splined shaft 7/8"22-4(SAE B) axial seal	A10VSO28(shaft S)	/	✓	✓	✓	✓	✓	K68
SAE 101,2-hole	splined shaft 1"25-4(SAE B-B)	A10VSO45(shaft S)	/	/	✓	✓	✓	✓	K04
SAE 127,2-hole	splined shaft 1 1/4"32-4(SAE C)	A10VSO71(shaft S)	/	/	/	✓	✓	/	K07
SAE 127,2-hole	splined shaft 1 1/2"38-4(SAE C-C)	A10VSO100(shaft S)	/	/	/	/	✓	✓	K24
SAE 180,4-hole	splined shaft 1 3/4"44-4(SAE D)	A10VSO140(shaft S)	/	/	/	/	/	✓	K17

✓ = available

/ = not available

- If a second brueninghaus 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.

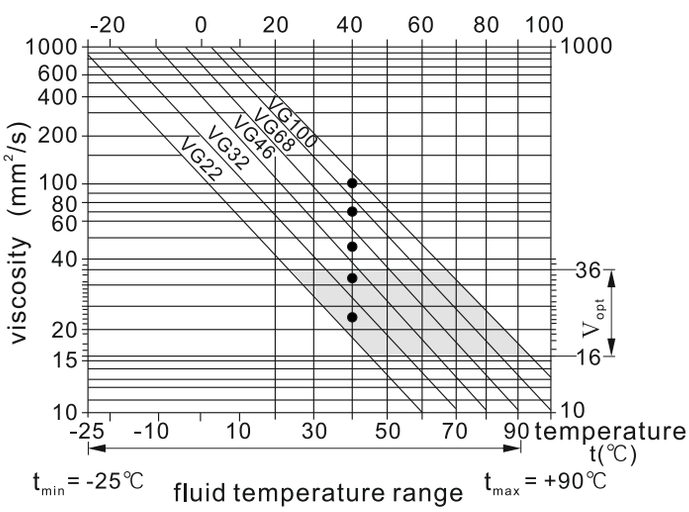
Technical data

- **Hydraulic fluid**
  The A10VSO variable displacement pump is suitable for use with mineral oil.

- **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
  V_{opt} = operating viscosity 16...36 mm²/s
  Referred to the reservoir temperature(open circuit).

- **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 (¦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 xˇ the operating temperature is 60ˇ.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 on point in the circuit may the temperature exceed 90ˇ.
  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 nonthrough-drive model, N00 series but not for the model with through-drive.
$V_{g\,max}$: for sizes 28 to 140
setting range Vg max to 50% Vg max stepless
$V_{g\,min}$: for sizes 100 and 140
setting range Vg min to 50% Vg min stepless

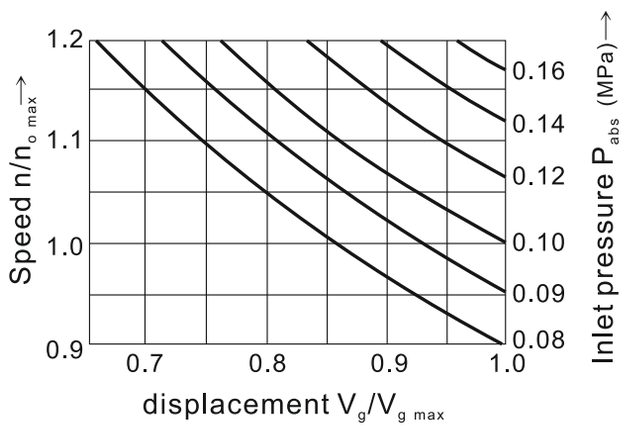
Technical data

- **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 pressurre P_N _____ 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,L_1)
  Maximum 0.5 bar higher than the inlet pressure at port S, but no higher than 2 bar absolute

Determination of inlet pressure Pabs at suction port S or reduction of displacement for increasing speed.



Direction of through flow
S to B

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 flexble 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 fill 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.

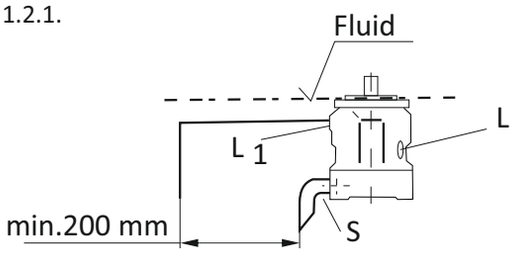


Fig.1

1.2. Arrangement outside the reservoir

Before installation fill 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 Pabs min = 0.08 MPa 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 hmax = 800 mm (immerdion depth ht min = 200mm).

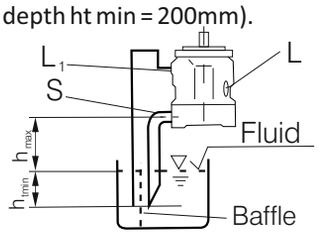


Fig.2

Overall pressure loss $\Delta P_{tot} = \Delta P1+\Delta P2+\Delta P3 \leq (1-P_{abs\ min}) = 0.02MPa$

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

$$\Delta P_1 = \frac{p \times l \times dv}{dt} = 10^{-6}\ (Mpa)$$

p= density(kg/m³)
l = pipe lenght(m)
dv/dt = rate of change in fluid velocity(m/s²)

ΔP_2 : Pressure loss due to static head

$\Delta P2 = h \times p \times g \times 10^{-6}$ (Mpa)

h = height(m)
g = gravity=9.81m/s²

ΔP3:Line losses (elbows etc.)

Bar

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 acconrding to tiem 1.2.1.

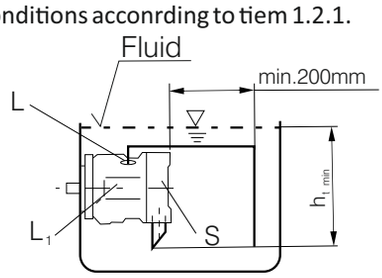


Fig.3

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.

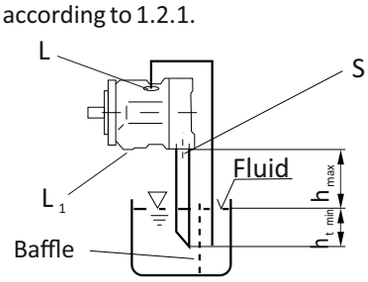


Fig.4

b) Mounting below the reservoir

Pipe ports "L " and "S" according to Fig.5, 1 close port "L".

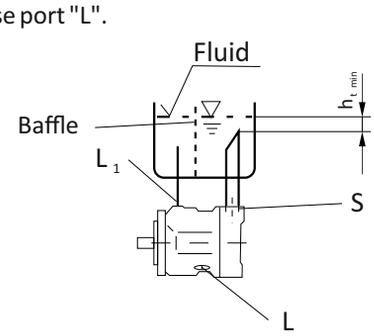
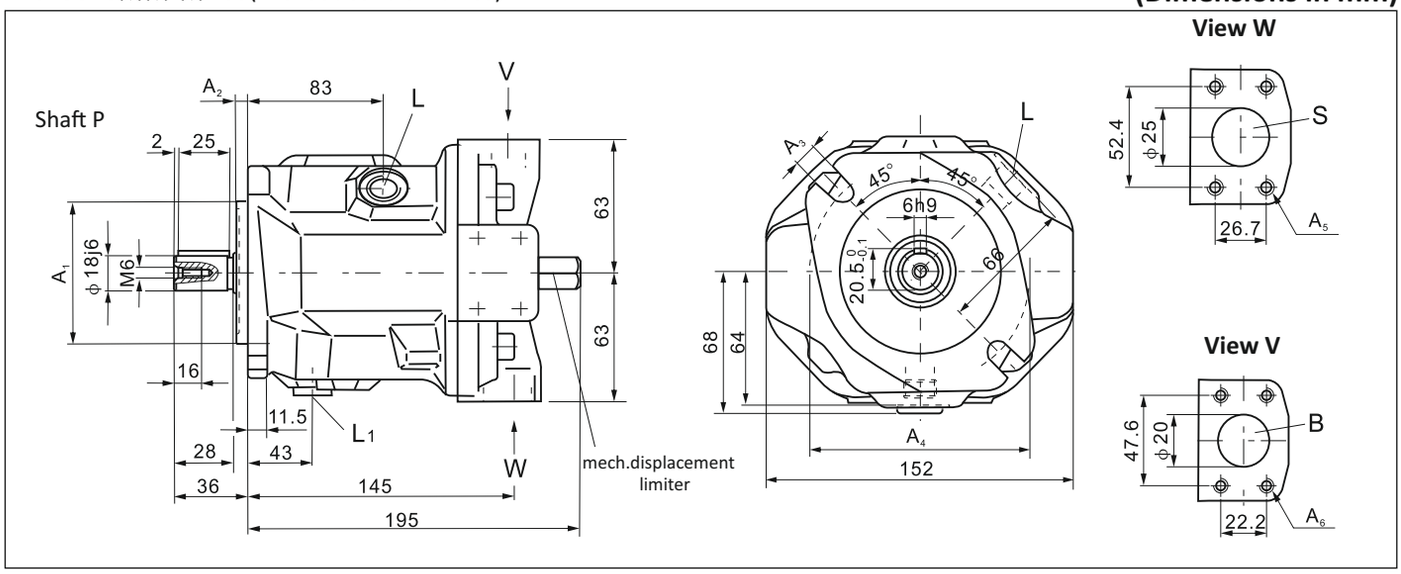


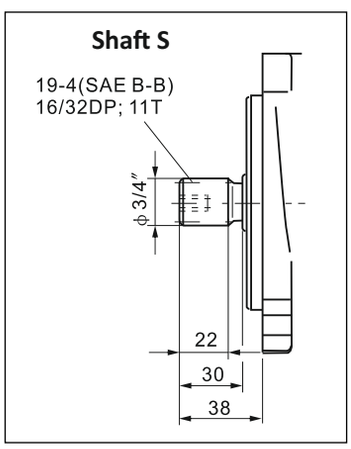
Fig.5

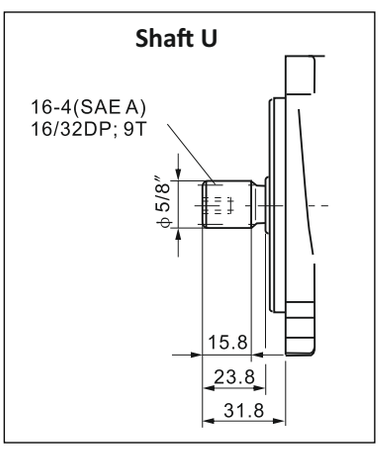
Unit Dimensions Size 18

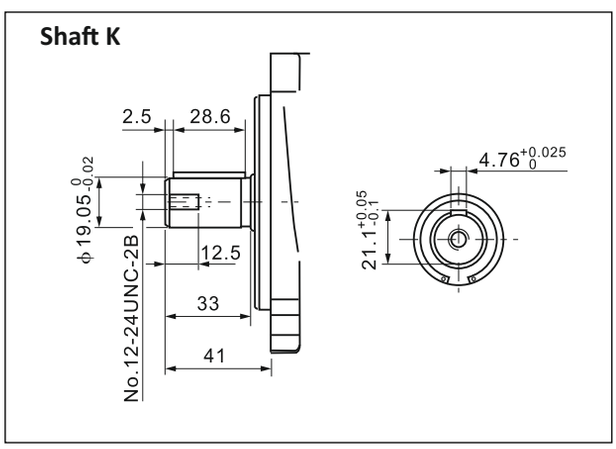
- A10VSO18※※-※N00(without control valves)

(Dimensions in mm)









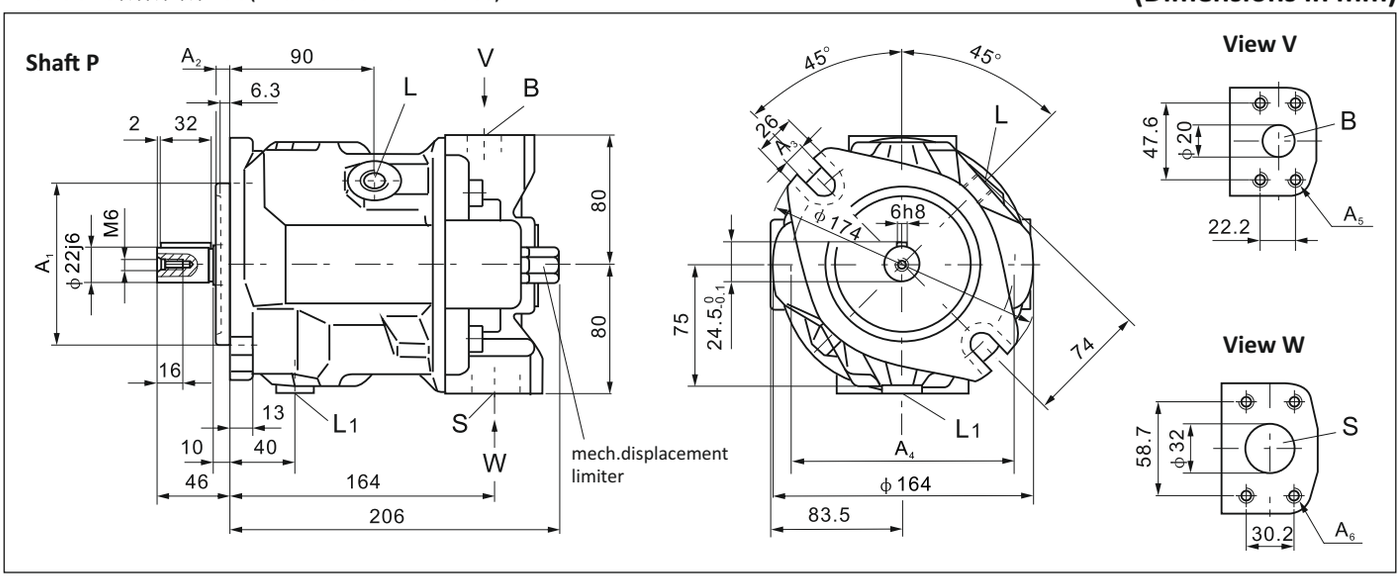
B	Pressure port	SAE 3/4"	(Standard pressure range)
S	Suction port	SAE 1"	(Standard pressure range)
L/L_1	Case drain ports	(L_1 plugged at factory)	

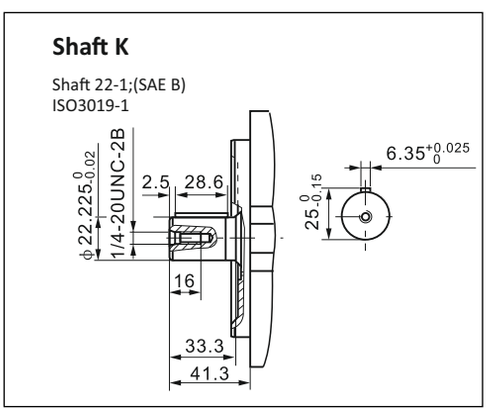
Size	A1	A2	A3	A4	A5	A6	Drain ports L/L1
18 ISO	Ø80 h8	7	11	Ø109	4-M10,17 deep	4-M10,17 deep	M16x1.5
18 SAE	Ø82.55 h8	6.3	11	Ø106.4	4-3/8-16UNC-2B,20 deep	4-3/8-16UNC-2B,20 deep	9/16-18UNF-2B

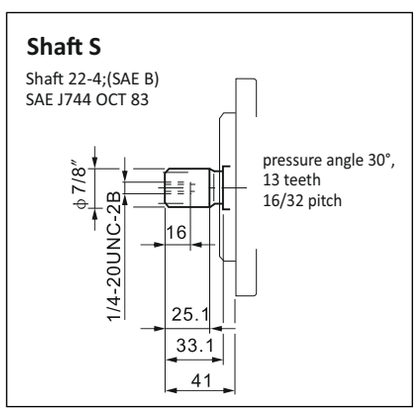
Unit Dimensions Size 28

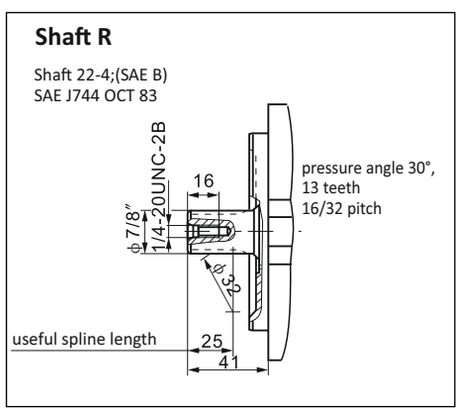
- A10VSO28※※-※N00(without control valves)

(Dimensions in mm)









B	Pressure port	SAE 3/4"	(Standard pressure range)
S	Suction port	SAE 11/4"	(Standard pressure range)
L/L ₁	Case drain ports	(L ₁	plugged at factory)

Size	A1	A2	A3	A4	A5	A6	Drain ports L/L1
28 ISO	Ø100 h8	9	14	Ø140	4-M10,17 deep	4-M10,17 deep	M18x1.5
28 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

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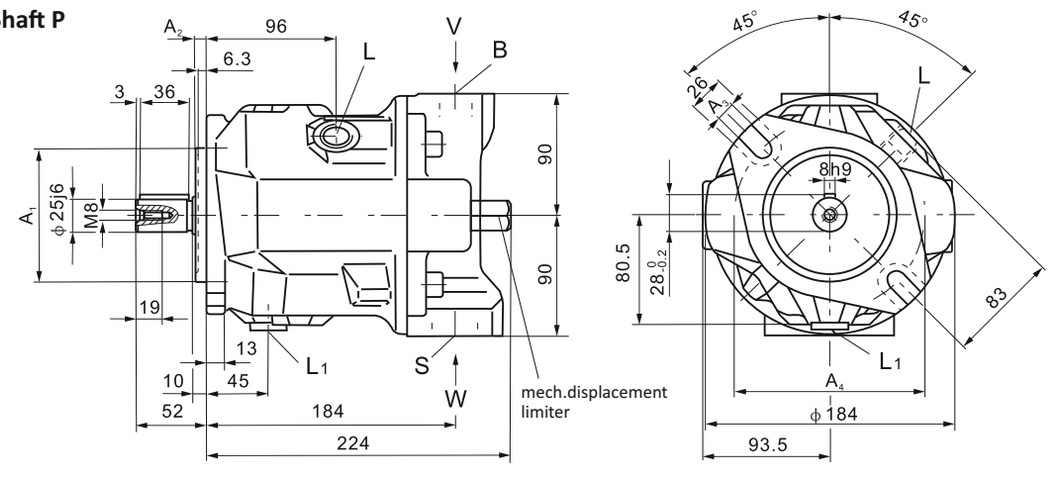
Unit Dimensions Size 45

- A10VSO45※※-※N00(without control valves)

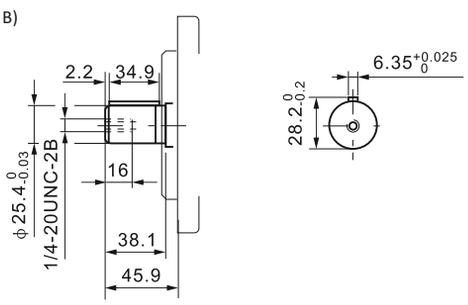
(Dimensions in mm)

Shaft P



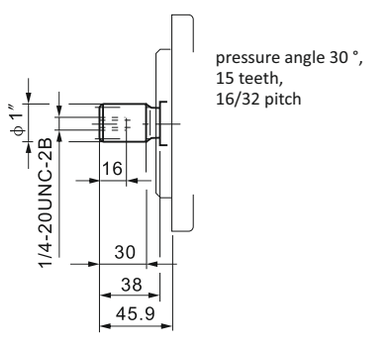
Shaft K

Shaft 25-1;(SAE B)
ISO3019-1



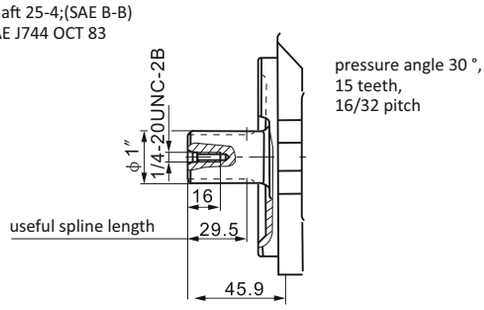
Shaft S

Shaft 25-4;(SAE B-B)
SAE J744 OCT 83



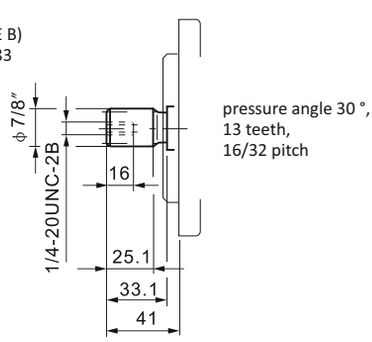
Shaft R

Shaft 25-4;(SAE B-B)
SAE J744 OCT 83



Shaft U

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



B	Pressure port	SAE 1"	(Standard pressure range)
S	Suction port	SAE 11/2"	(Standard pressure range)
L/L1	Case drain ports	(L1 plugged factory)	

Size	A1	A2	A3	A4	A5	A6	Drain ports L/L1
45 ISO	Ø100 h8	9	14	Ø140	4-M10,17 deep	4-M12,20 deep	M22x1.5
45 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

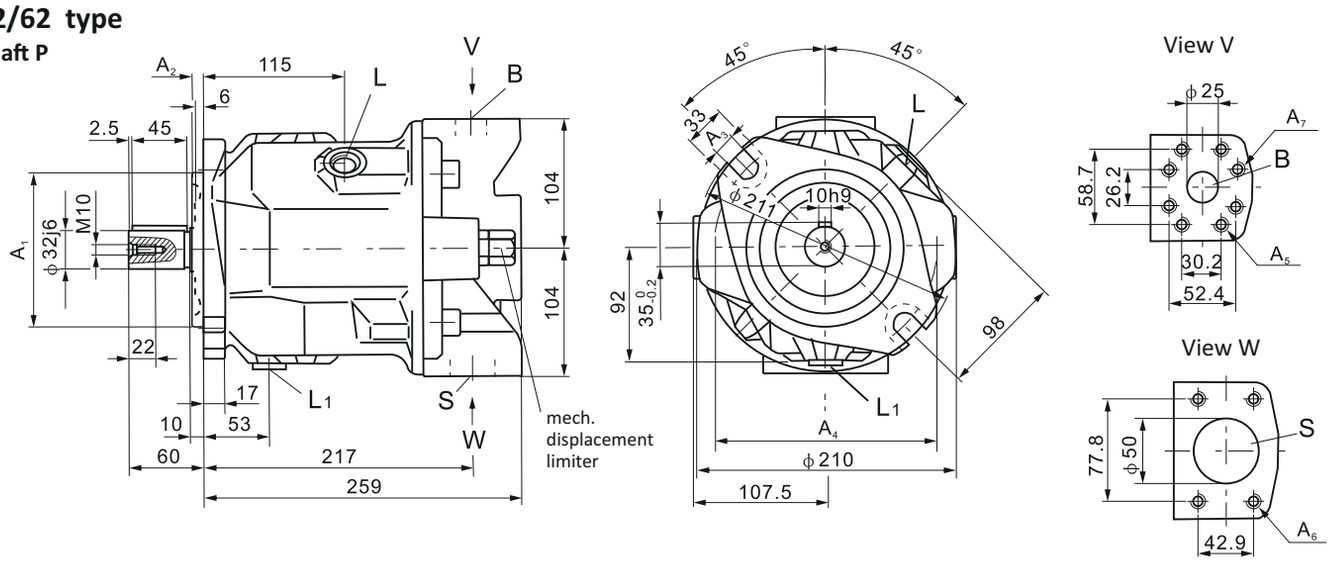
Unit Dimensions Size 71

- A10VSO71※※-※N00(without control valves)

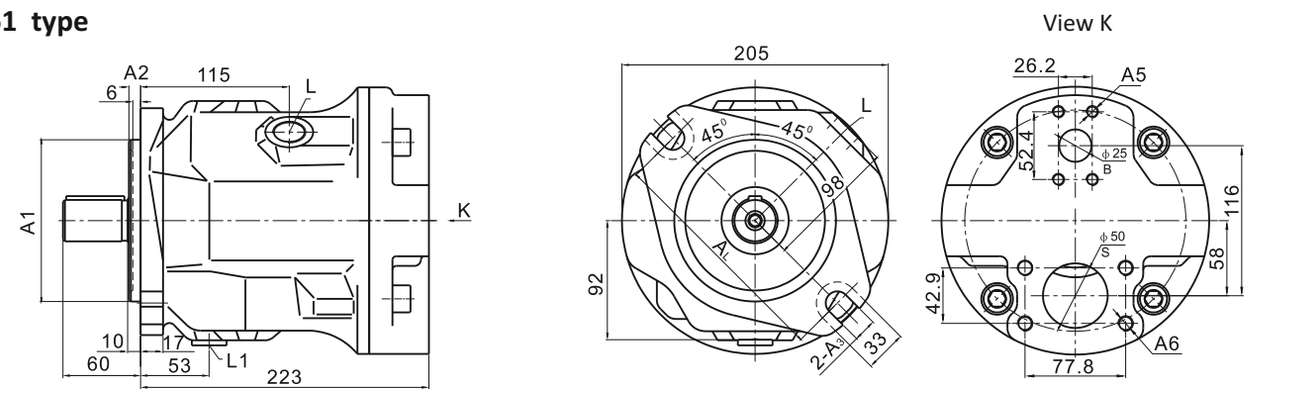
(Dimensions in mm)

12/62 type

Shaft P

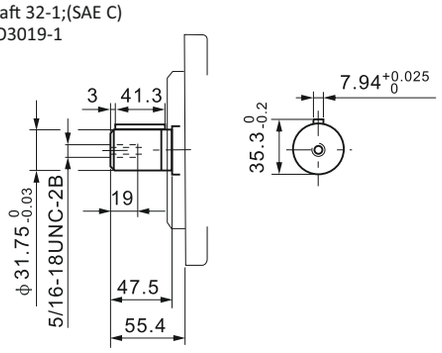


11/61 type



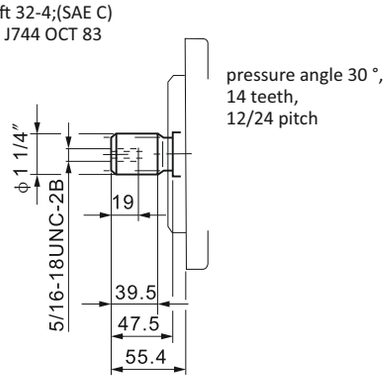
Shaft K

Shaft 32-1;(SAE C)
ISO3019-1



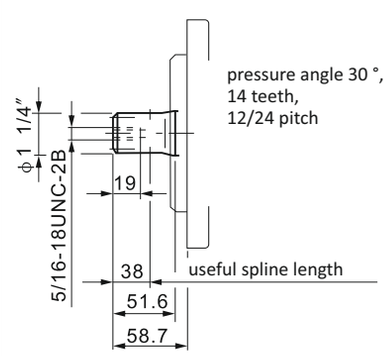
Shaft S

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



Shaft R

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



B	Pressure port	SAE 1˝	(Standard pressure range)
S	Suction port	SAE 2˝	(Standard pressure range)
L/L_1	Case drain ports	(L_1 plugged at factory)	

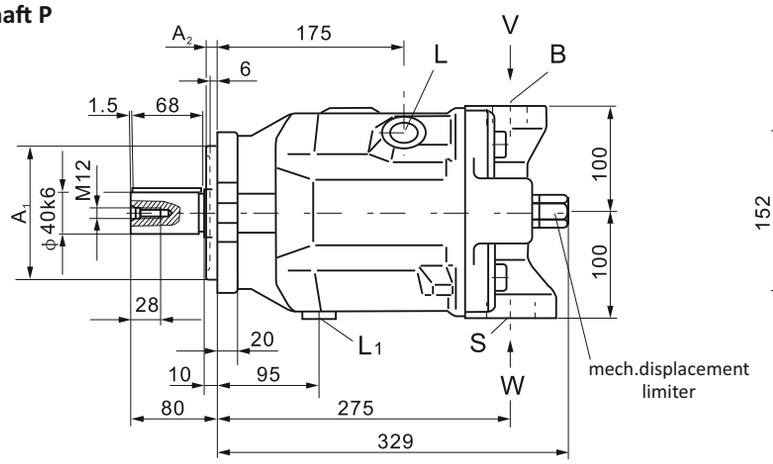
Size	A1	A2	A3	A4	A5	A6	Drain ports L/L1
71 ISO	Ø125 h8	9	18	Ø180	8-M10,17 deep	4-M12,20 deep	M22x1.5
71 SAE	Ø127 h8	12.7	18	Ø181	4-3/8-16UNC,18 deep 4-7/16-14UNC,24 deep	4-1/2-13UNC-2B, 22 deep	7/8-14UNF-2B

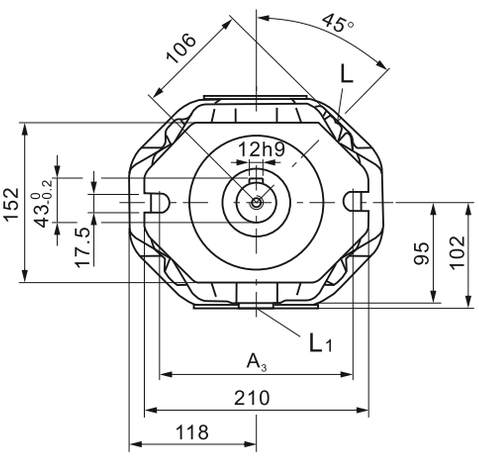
Unit Dimensions Size 100

- A10VSO100※※-※N00(without control valves)

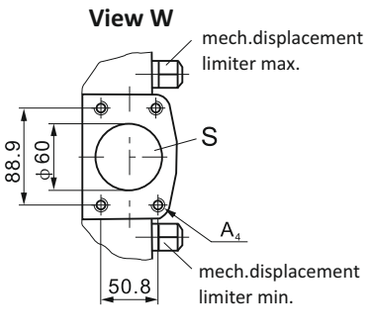
(Dimensions in mm)

Shaft P

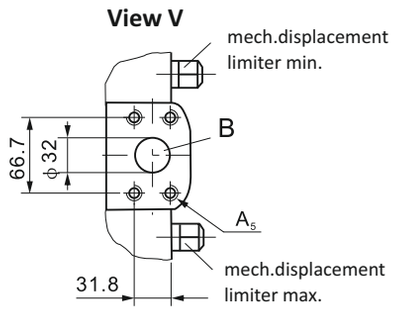




View W

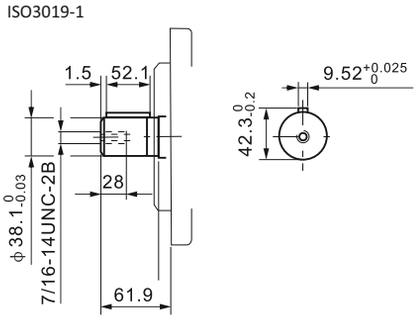


View V



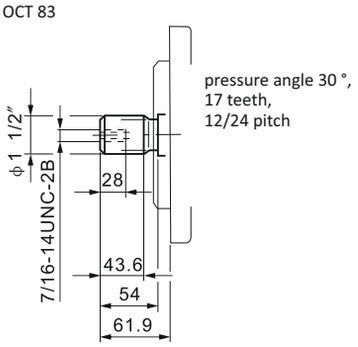
Shaft K

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



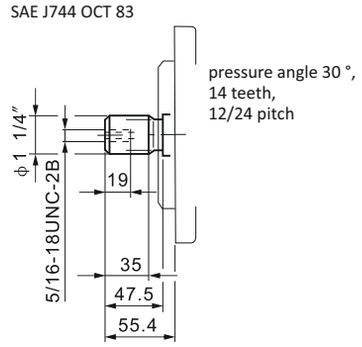
Shaft S

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



Shaft U

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



B	Pressure port	SAE 1 1/4"	(High pressure range)
S	Suction port	SAE 2 1/2"	(Standard pressure range)
L/L_1	Case drain ports	(L_1 plugged at factory)	

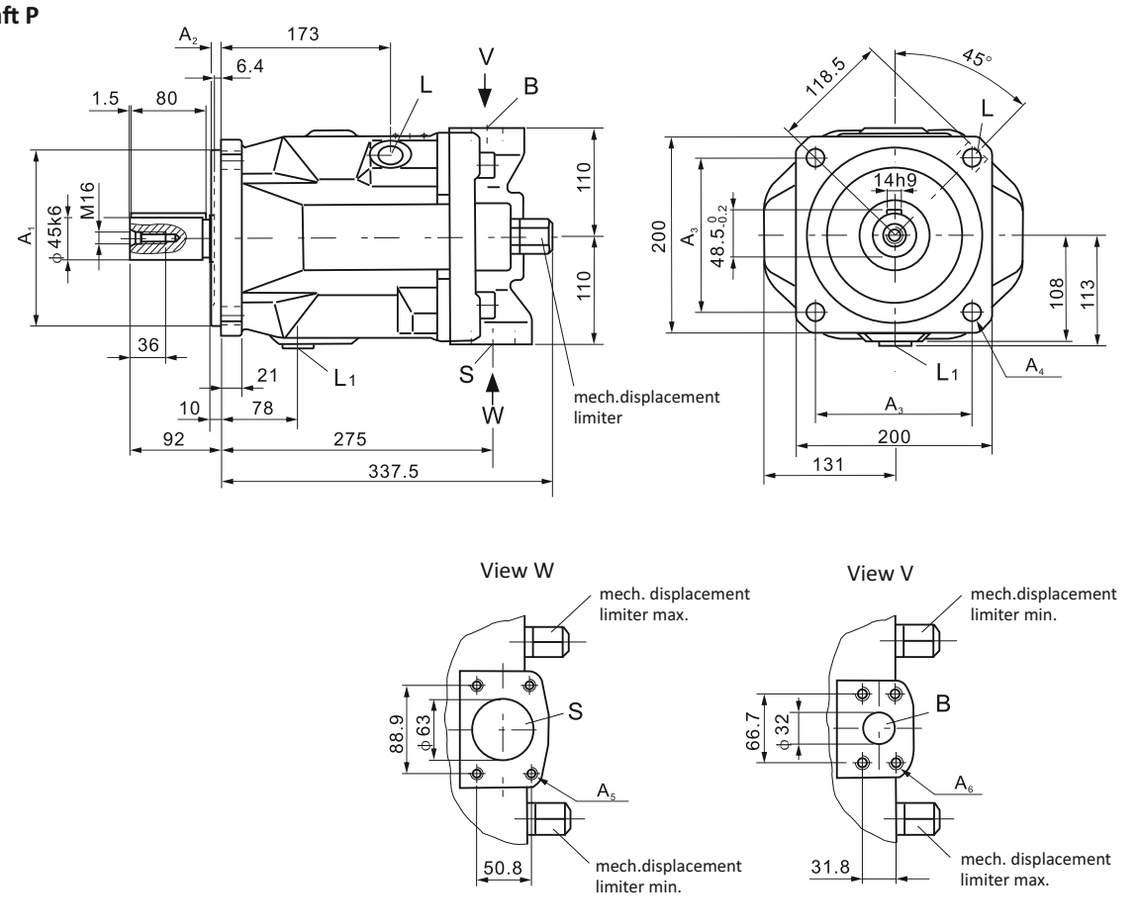
Size	A1	A2	A3	A4	A5	Drain ports L/L1
100 ISO	Ø125 h8	9	Ø180	4-M12,17 deep	4-M14,19 deep	M27x2
100 SAE	Ø127 h8	12.7	Ø181	4-1/2-13UNC-2B, 27 deep	4-1/2-13UNC-2B, 29 deep	1 1/16-12UN-2B

Unit Dimensions Size 140

- A10VSO140※※-※N00(without control valves)

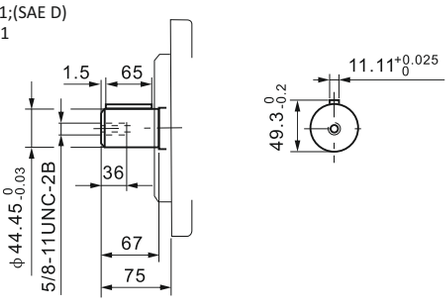
(Dimensions in mm)

Shaft P



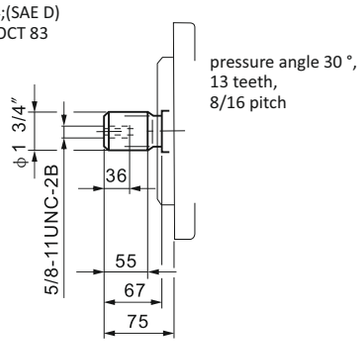
Shaft K

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



Shaft S

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



B	Pressure port	SAE 1 1/4"	(High pressure range)
S	Suction port	SAE 2 1/2"	(Standard pressure range)
L/L_1	Case drain port	(L_1 plugged at factory)	

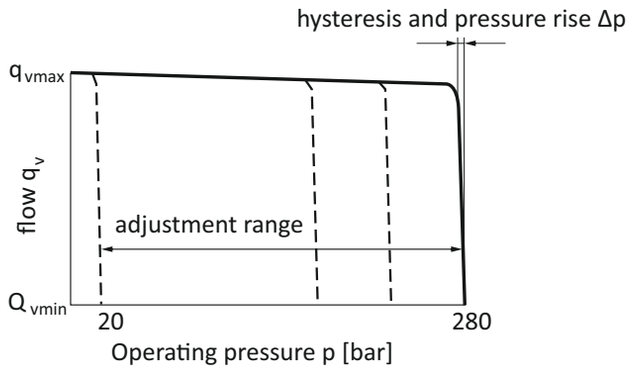
Size	A1	A2	A3	A4	A5	A6	Drain ports L/L1
140 ISO	Ø180 h8	9	158.4	4-Ø18	4-M12,17 deep	4-M14,19 deep	M27x2
140 SAE	Ø152.4 h8	12.7	161.6	4-Ø20	4-1/2-13UNC-2B, 27 deep	4-1/2-13UNC-2B, 19 deep	1 1/16-12UN-2B

DR Pressure Control

- The pressure controller serves to maintain a constant pressure in a hydraulic system within the control range of the pump. The pump therefore supplies only the amount of hydraulic fluid required by the system. Pressure may be step lessly set at the control valves.

Static operating curve

(at n_1=1500 rpm; t_{oil} = 50°C)



Dynanmic operating curves

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

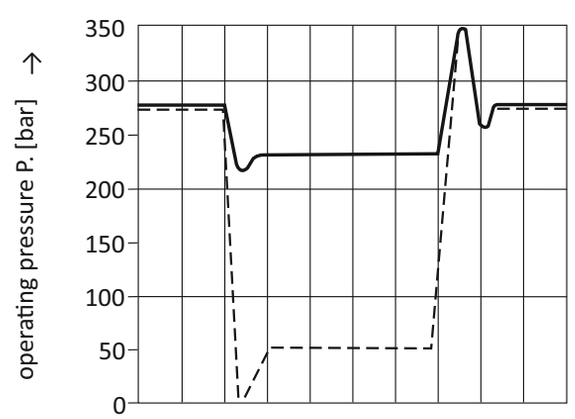
Conditions:

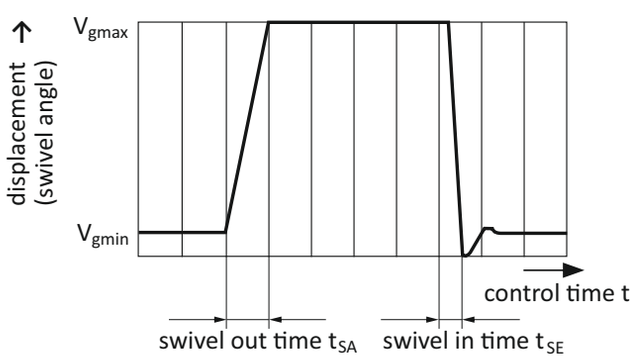
n = 1500 rpm

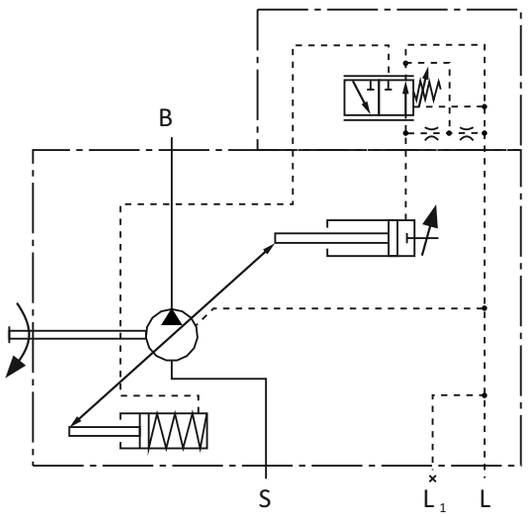
t_{oil}= 50

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.







Ports

B	Pressure port
S	Suction port
LŁL 1	Case drain ports (L pługgedŁ

Contorller 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 3 L/min

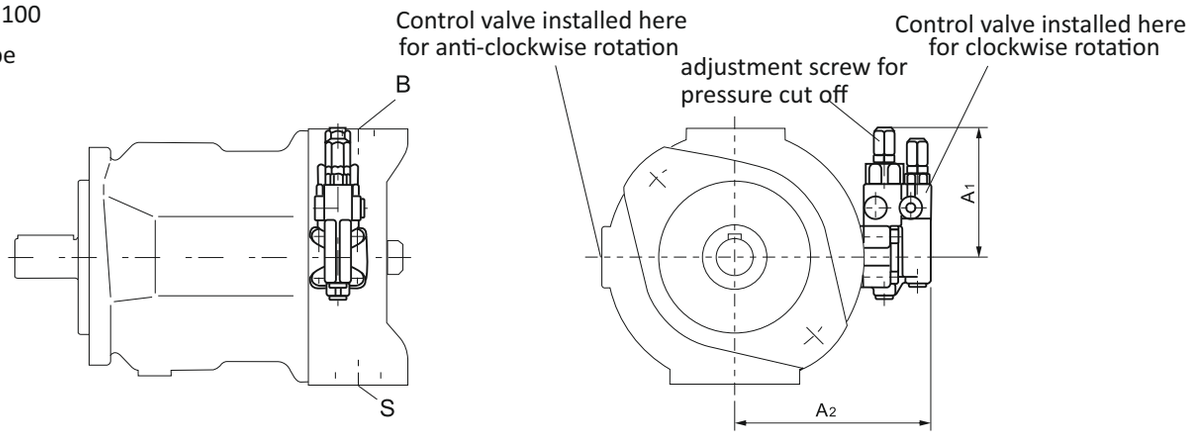
Control Times

Size	t_{SA} (ms) again 50 bar	t_{SA} (ms) again 220 bar	t_{SA} (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

DR Pressure Control - Installation Dimensions

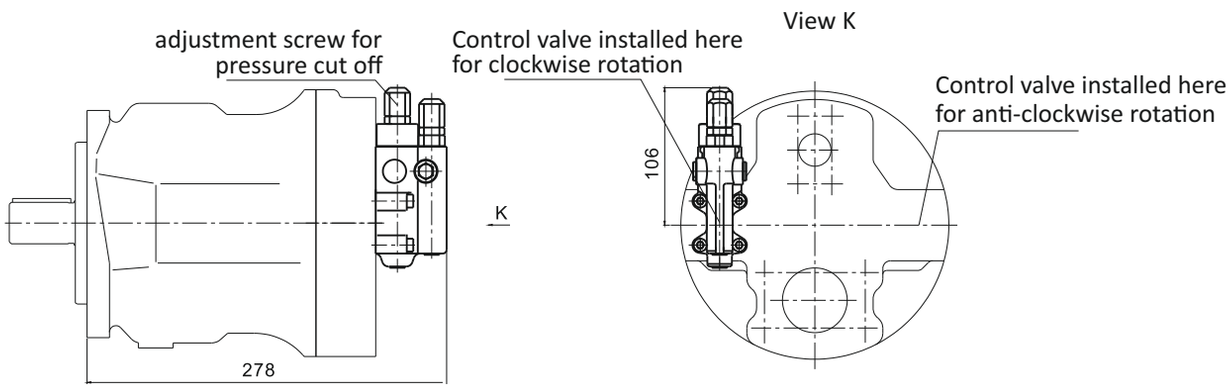
Sizes 18...100

12/62 type

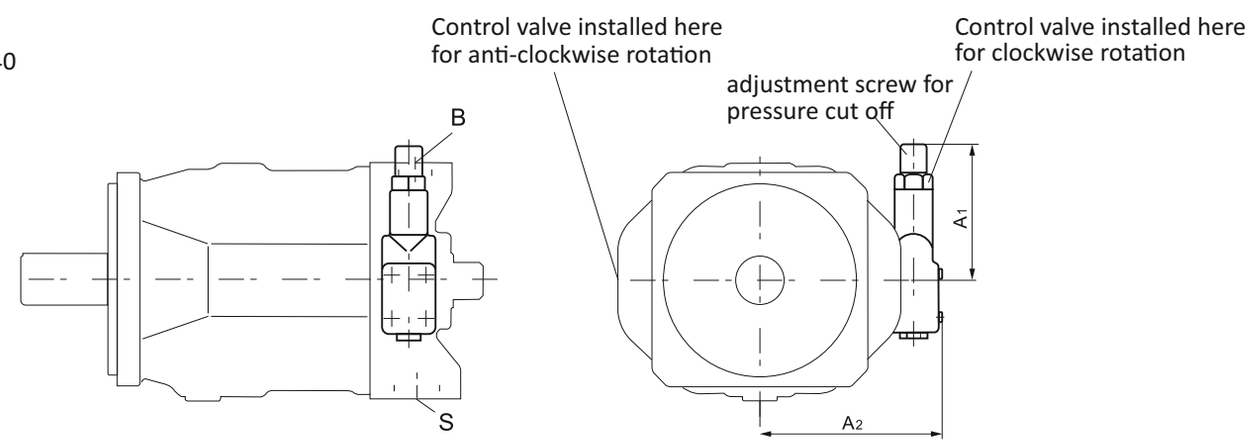


Sizes 71

11/61 type



Sizes 140



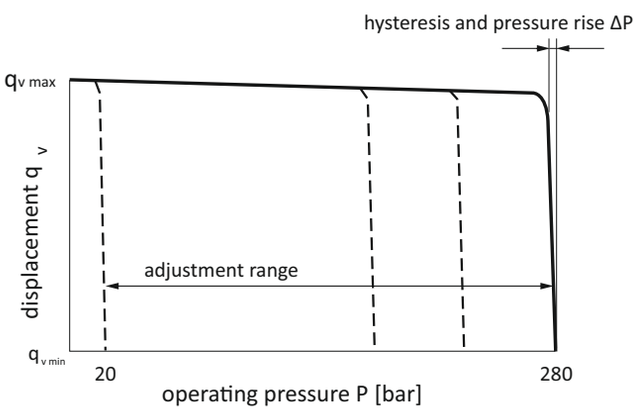
Size	A1	A2
18	104.5	125.5
28	106	136
45	106	146
71	106	160
100	106	165
140	127	169

DRG Pressure Controller, Remote Control

Function and equipment as for DR.
A pressure refief valve can be connected to port X for remote control applications; this is not included in the items supplied with the DRG control.
The standard pressure differential setting at the control valve is 20 bar. A pilot oil flow of approx. 1.5 L/min is then used. If an other setting (range10-22 bar) is required please indicate in clear text.

Static Operating Curve

(at n_1=1500 rpm; t_{oil}=50℃)



Controller data

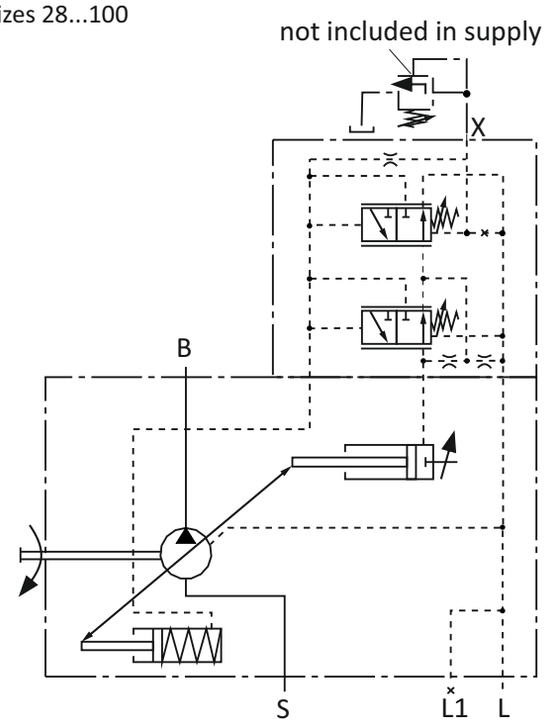
Hysteresis ΔP_____max. 3 bar

Max. pressure rise

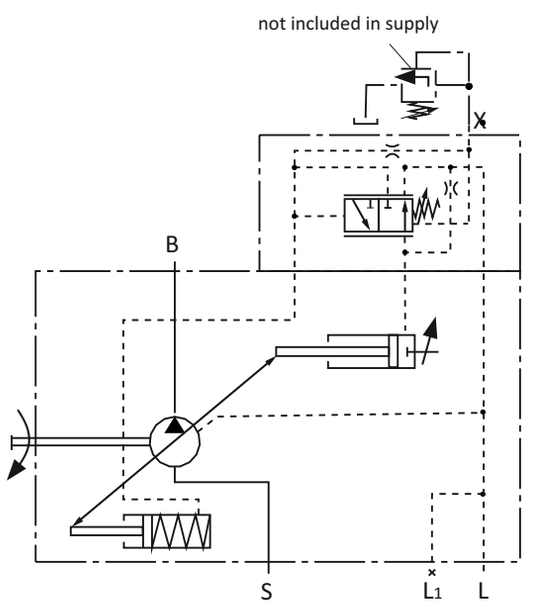
Size		18	28	45	71	100	140
ΔP	bar	4	4	6	8	10	12

Pilot oil requirement _____approx. 4.5 L/min

Sizes 28...100



Size 140

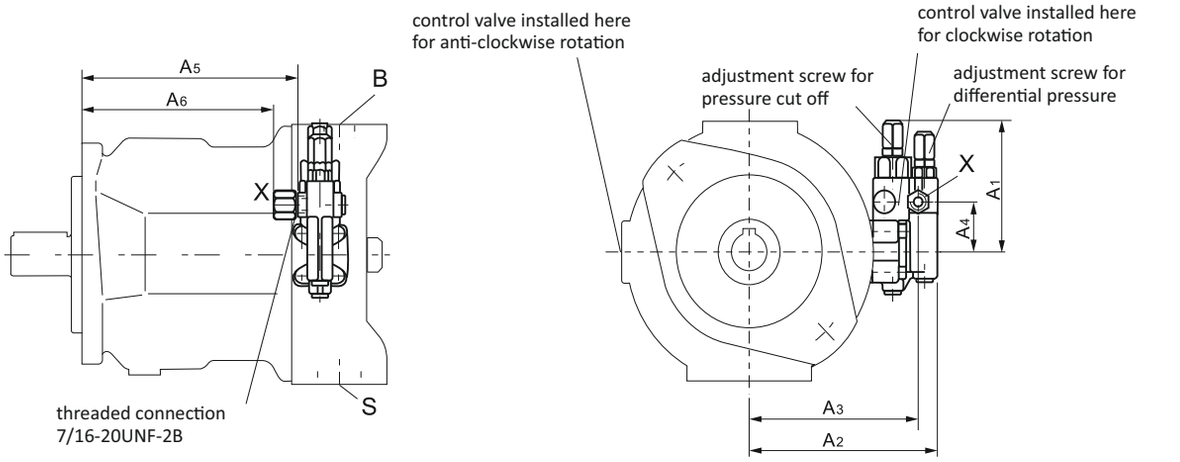


Ports

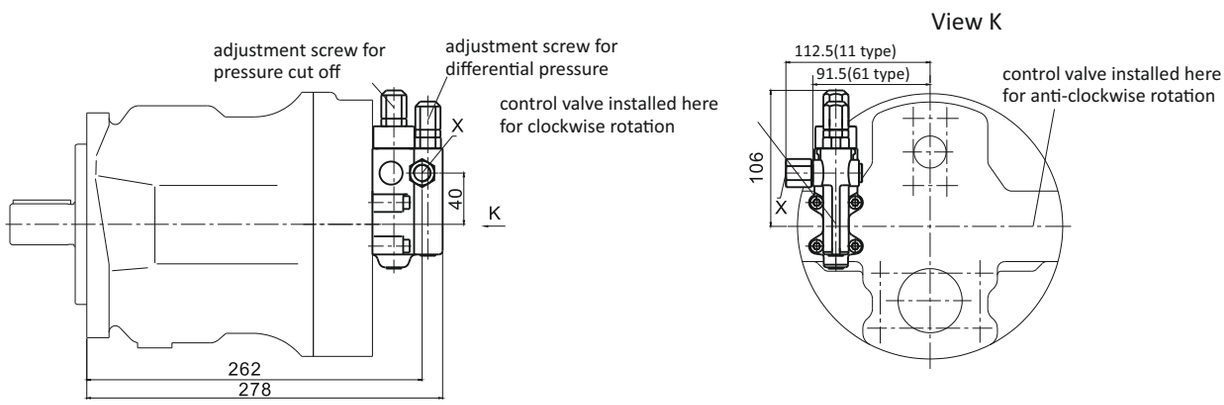
B	Pressure port
S	Suction port
L/L_1	Case drain ports(L_1 pluggedŁ
X	Pilot pressure port

DRG Pressure Controller, Remote Control - Installation Dimensions

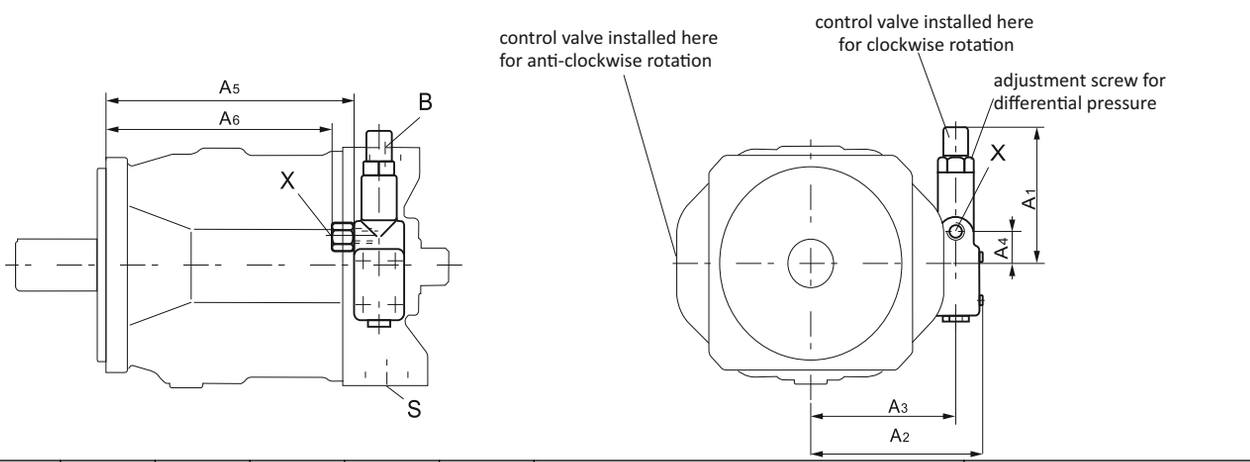
Sizes 18...100
12/62 type



Sizes 71
11/61 type



Sizes 140



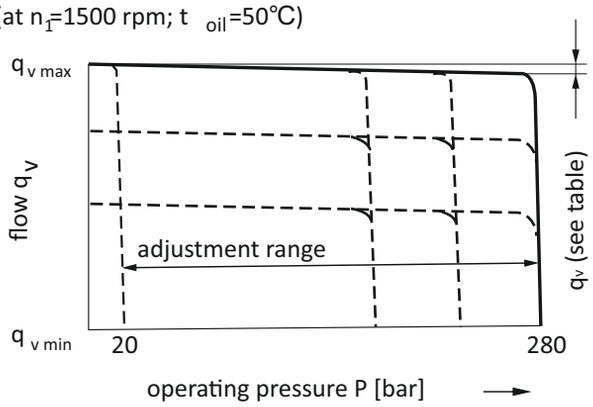
Size	A1	A2	A3	A4	A5	A6	Port X	
18ISO	104.5	125.5	109	40	-	109	M14x1.5;12 deep	with adaptor
18SAE	104.5	125.5	109	40	130	-	7/16-20UNF-2B;11.5 deep	without adaptor
28ISO	106	136	119	40	-	119	M14x1.5;12 deep	with adaptor
28SAE	106	136	119	40	138	-	7/16-20UNF-2B;11.5deep	without adaptor
45ISO	106	146	129	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

DFR/DFR1 Pressure / Flow Control

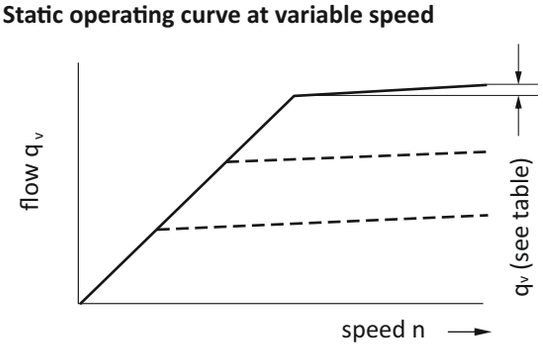
In addition to the pressure control function, the pump flow may be varied by means of a differential pressure over an orifice or valve spool, installed in the service line. The pump flow is equal to the actual required flow by the actuator. The DFR1-valve has no connection between X and the tank.
For function of pressure control see page 13.

Static operating curve

(at n_1=1500 rpm; t_{oil}=50°C)

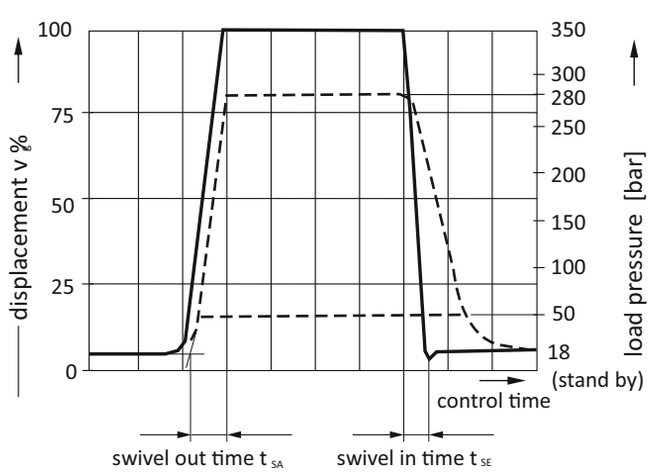


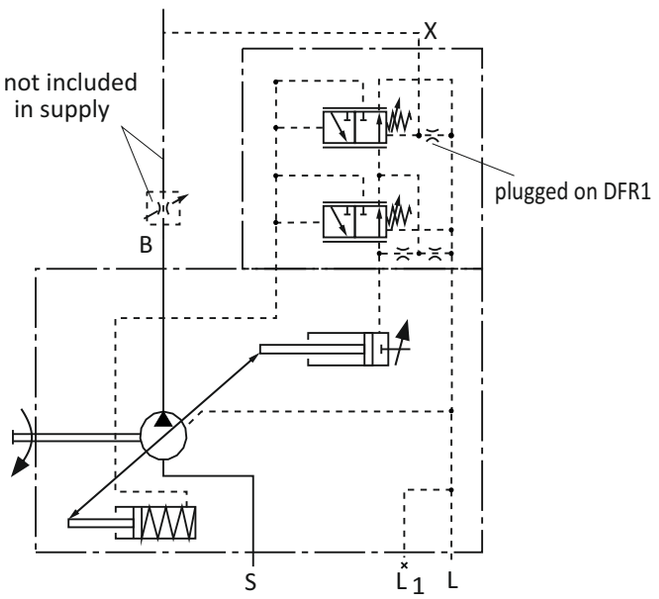
Static operating curve at variable speed



Dynamic flow control operating curve

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





Ports

B	Pressure port
S	Suction port
L/L_1	Case drain ports(L_1 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±2 bar (stand by) results (dependent on ΔP).

Controller Data

Data pressure controller see page 13.
Max. Flow variation (hysteresis and increase) measured at drive speed n=1500 rpm

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

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

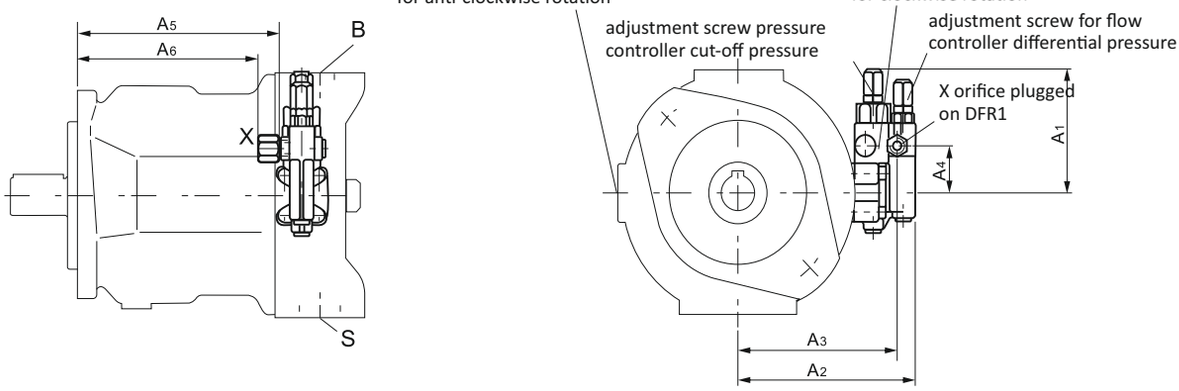
DFR1 pilot oil consumption _____ max.approx. 3 L/min

Control Times

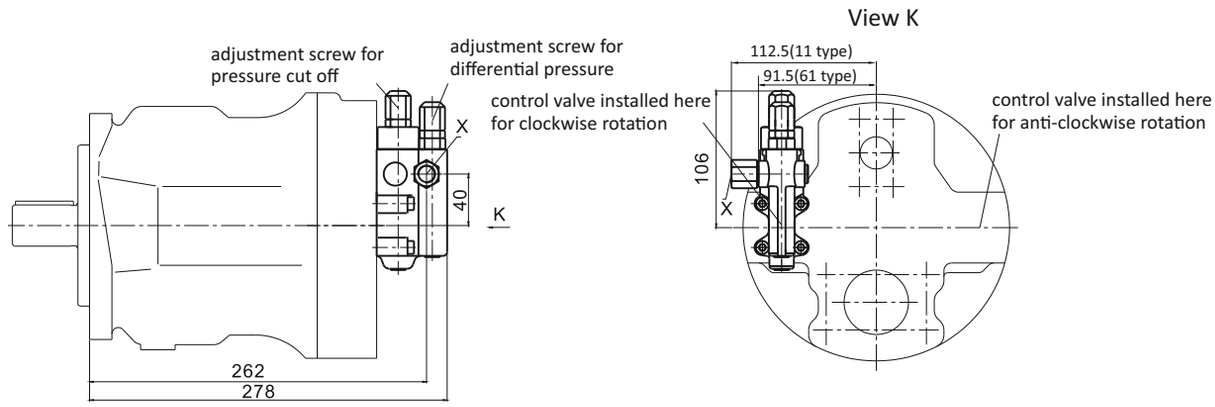
Size	t_{SA} (ms) stand by 280 bar	t_{SE} (ms) 280 bar stand by	t_{SE} (ms) 50 bar stand by
18	40	15	40
28	40	20	40
45	50	25	50
71	60	30	60
100	120	60	120
140	130	60	130

DFR/DFR1 Pressure / Flow Control - Installation Dimensions

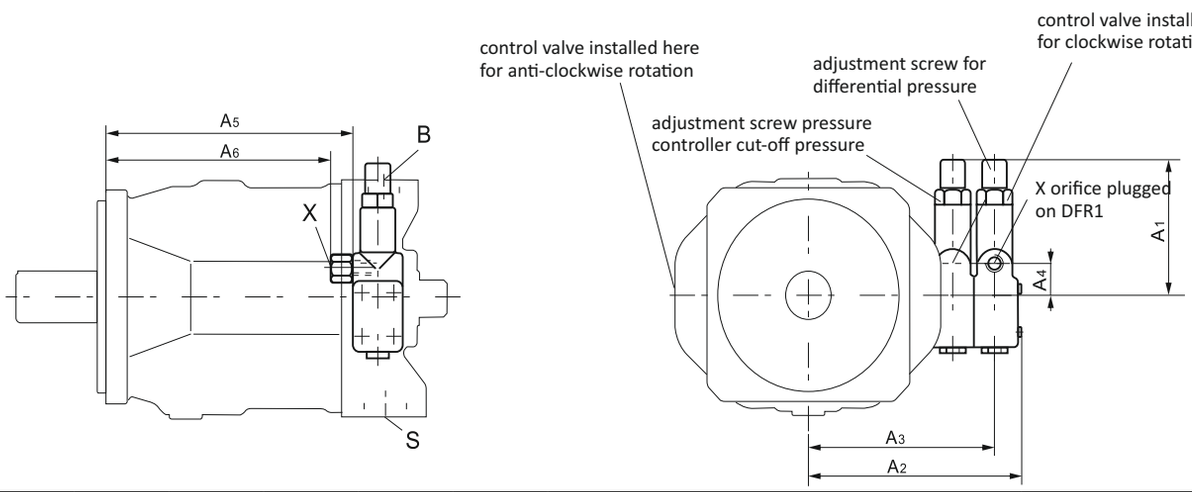
Sizes 18...100
12/62 type



Sizes 71
11/61 type



Sizes 140

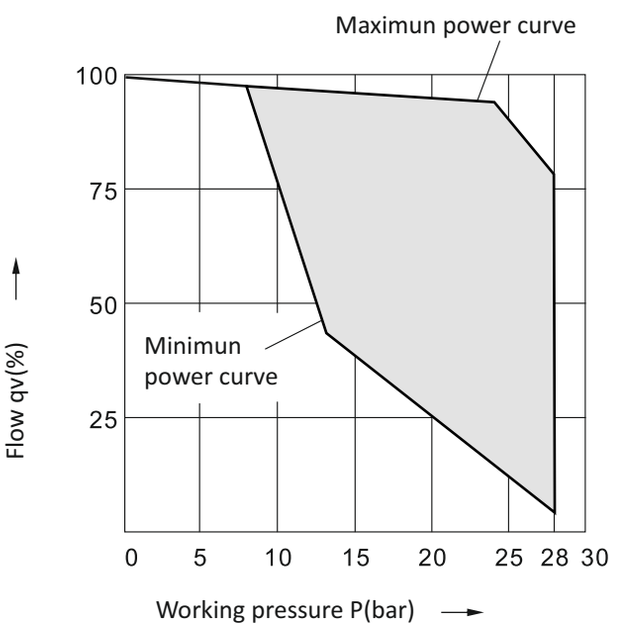


Size	A1	A2	A3	A4	A5	A6	Port X	
18ISO	104.5	125.5	109	40	-	109	M14x1.5;12 deep	with adaptor
18SAE	104.5	125.5	109	40	130	-	7/16-20UNF-2B;11.5 deep	without adaptor
28ISO	106	136	119	40	-	119	M14x1.5;12 deep	with adaptor
28SAE	106	136	119	40	138	-	7/16-20UNF-2B;11.5deep	without adaptor
45ISO	106	146	129	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

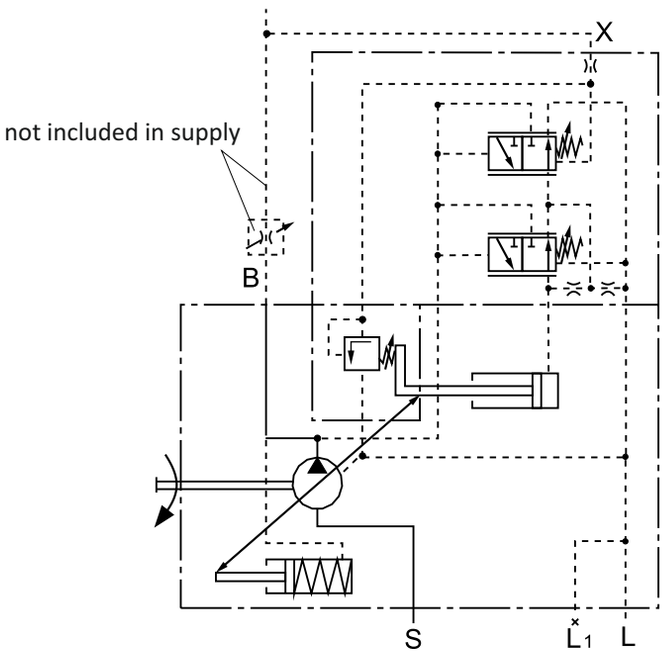
DFLR Pressure ,flow and power Control

Pressure controller equipped as DR(G),see page 14 and 16. Flow controller equipped like DFR,DFR1,see page 18. In order to achieve a constant drive torque with varying working pressure, 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.

Characteristic curve



When ordering please state the power characteristics to be set at the factory in plain text,e.g.20KW at 1500rpm.



Ports

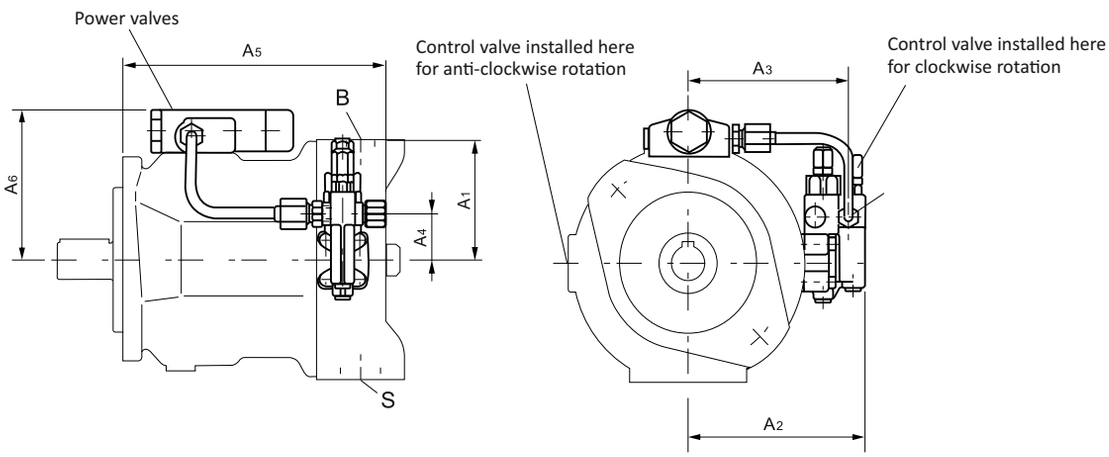
B	Pressure port
S	Suction port
L/L1	Case drain ports(L 1 plugged)
X	Pilot pressure port

Controller data

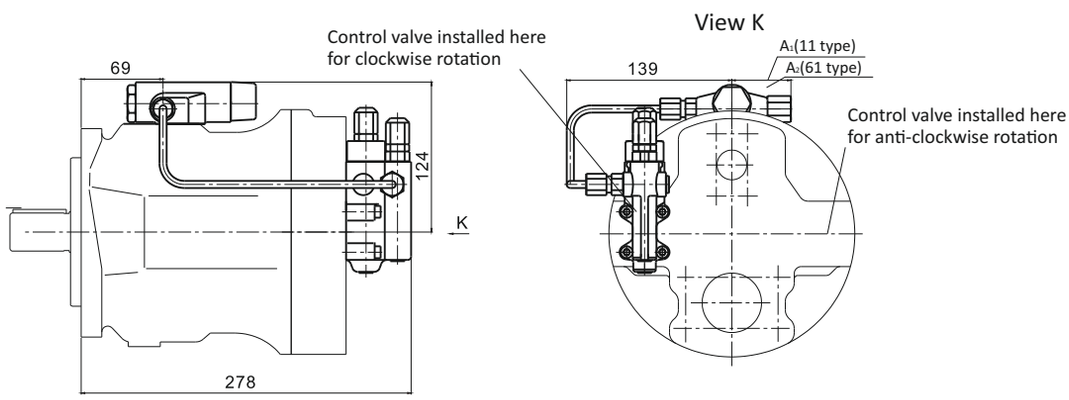
For technical data of pressure controller,see page 13
For technical date of flow controller,see page 15
Controls the starting point 8MPa rise
Pilot fluid consumption:maximum approx.5.5L/min

DFLR Pressure ,flow and power Control - Installation Dimensions

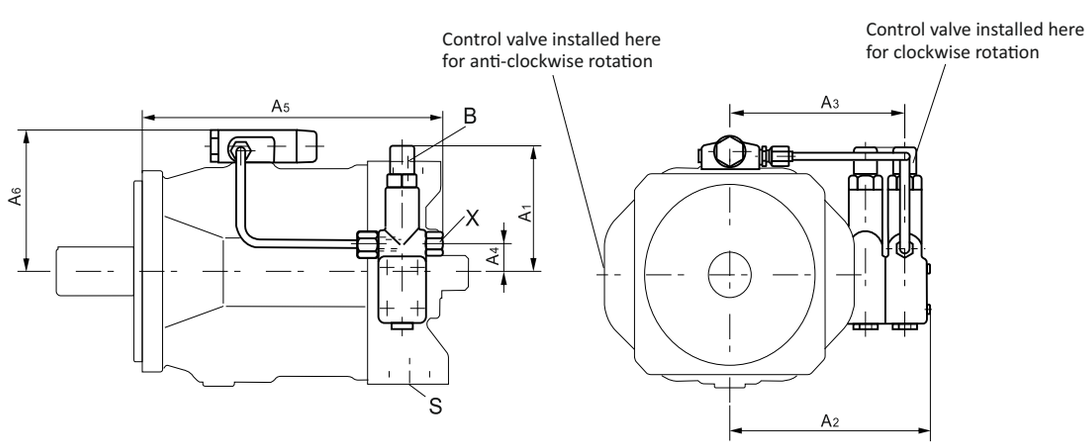
Sizes 18...100
12/62 type



Sizes 71
11/61 type



Sizes 140



Size	A1	A2	A3	A4	A5	A6	Port X
28ISO	106	136	119	40	197	107	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

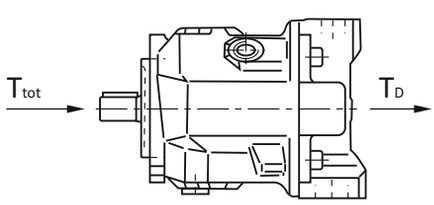
The A10VSO pump can be supplied with through drive in accordance with the type code on page 3.
The through drive version is designated by the code numbers (KB3-KB6).
If on other pumps are fitted by the manufacturer, the simple type designation is sufficient.
in this case, the delivery package comprises:
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



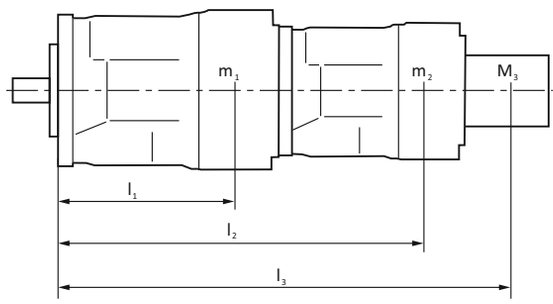
The split in torque between pump 1 and 2 is optional.
The max. permissible input torque T_{tot} as well as the max. tot permissible through drive torque T_D may not be exceeded.

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
	$T_{D\ keyed\ shaft}$	Nm	112	179	283	398	557

Size			28	45	71	100	140
Max. permissible input torque at pump 1 with shaft "S"							
	T_{tot}	Nm	137	319	626	1104	1620
Max. permissible through-drive torque	T_D	Nm	160	319	492	778	1266
	$T_{D\ keyed\ shaft}$	Nm	112	179	283	398	557

Size			28	45	71	100	140
Max. Permissible input torque at pump 1 with shaft "R"							
	T_{tot}	Nm	225	400	644	-	-
Max. permissible through-drive torque	T_D	Nm	176	365	548	-	-
	$T_{D\ keyed\ shaft}$	Nm	112	179	283	-	-

Permissible moment of inertia



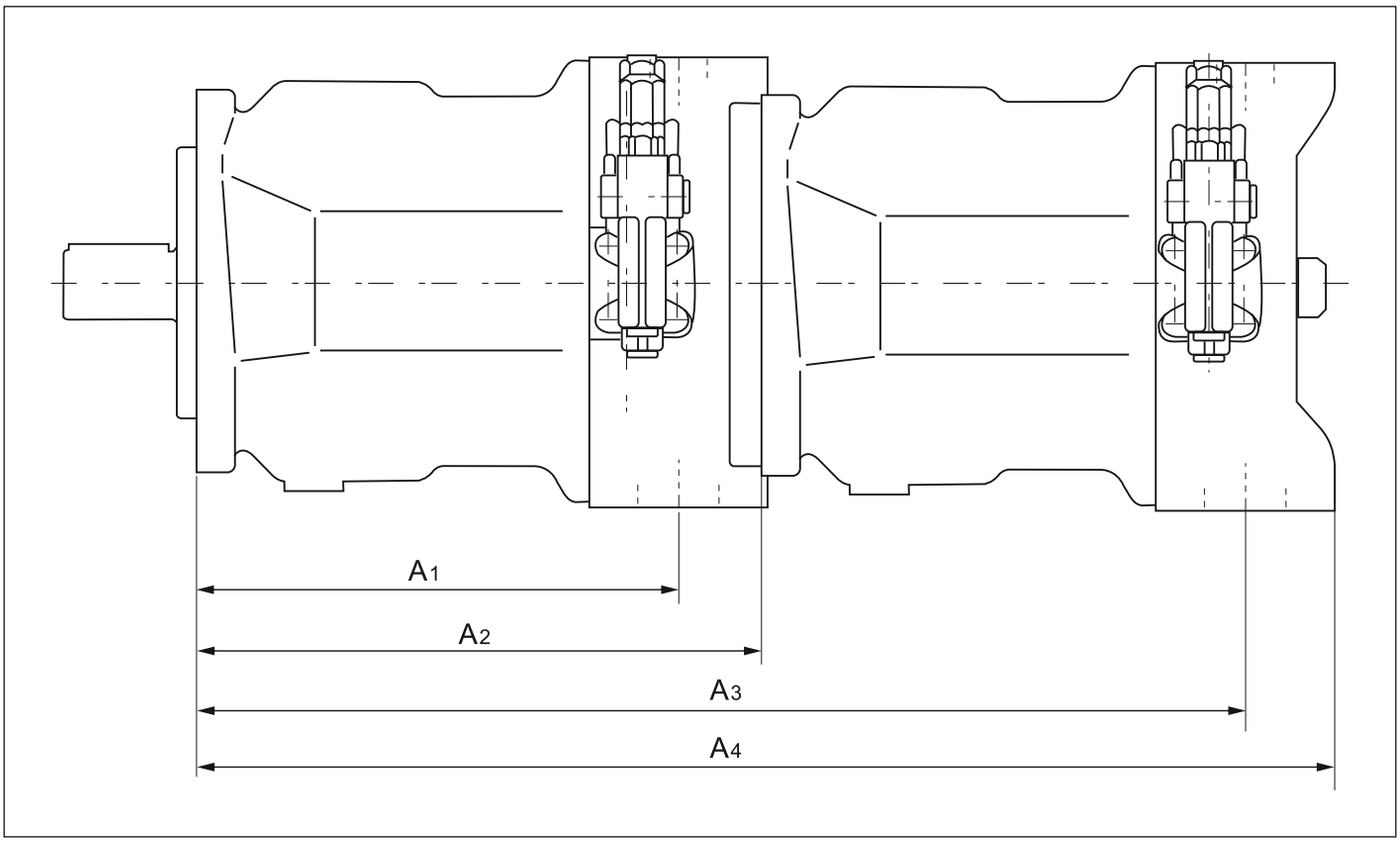
$T_m=(m_1 \ l_1+m_2 \cdot l_2+m_3 \cdot l_3)$ [Nm]

m_1, m_2 ,m_3 [kg] Pump mass
l_1 ,l_2 ,l_3 [mm] distance to center of gravity
$Tm= (m1 \cdot l1+m2 \cdot l2+m3 \cdot l3) \cdot \frac{1}{102}$ Nm

Size			28	45	71	100	140
Permissible moment of inertia	T_m	Nm	880	1370	2160	3000	4500
Permissible moment of inertia at dynamic mass acceleration 10g Ł98.1m/s^2	T_m	Nm	88	137	216	300	450
Mass	m_1	kg	15	21	33	45	60
To center of gravity	l_1	mm	110	130	150	160	160

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

Installation Dimensions

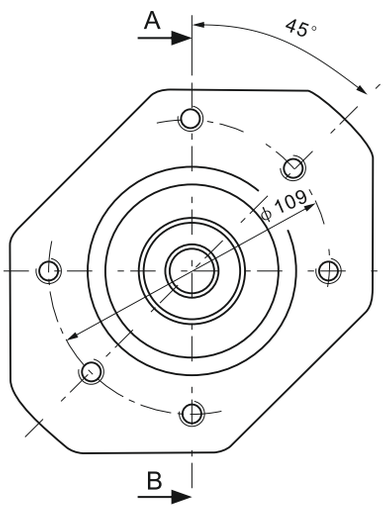


main p. / built-on p.	A10VSO18				A10VSO28				A10VSO45			
	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4
A10VSO18	164	204	349	399	164	204	349	399	184	229	374	424
A10VSO28	-	-	-	-	164	204	368.5	410	184	229	393.5	435
A10VSO45	-	-	-	-	-	-	-	-	184	229	413	453
A10VSO71	-	-	-	-	-	-	-	-	-	-	-	-
A10VSO100	-	-	-	-	-	-	-	-	-	-	-	-
A10VSO140	-	-	-	-	-	-	-	-	-	-	-	-

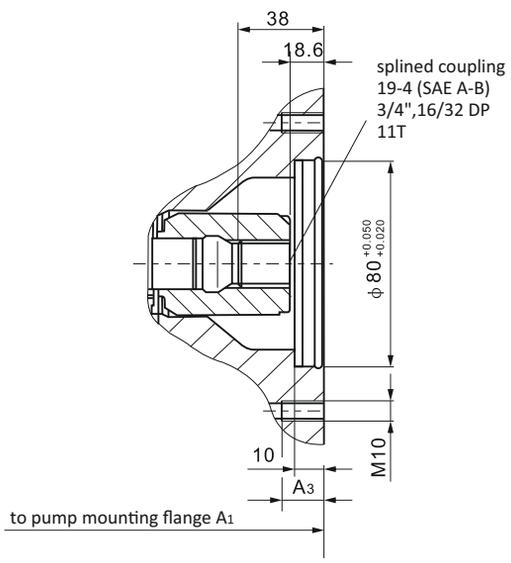
main p. / built-on p.	A10VSO71				A10VSO100				A10VSO140			
	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4
A10VSO18	217	267	412	462	275	338	483	533	275	350	495	545
A10VSO28	217	267	431.5	431.5	275	338	502.5	544	275	350	514	556
A10VSO45	217	267	451	491	275	338	522	562	275	350	534	574
A10VSO71	217	267	484	524	275	338	555	595	275	350	567	609
A10VSO100	-	-	-	-	275	338	613	664	275	350	625	679
A10VSO140	-	-	-	-	-	-	-	-	275	350	625	688

Through drive - Installation Dimensions

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

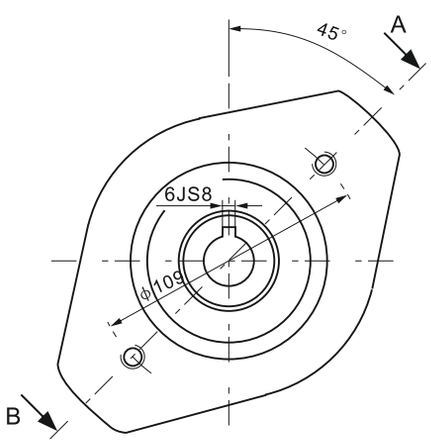


section A-B

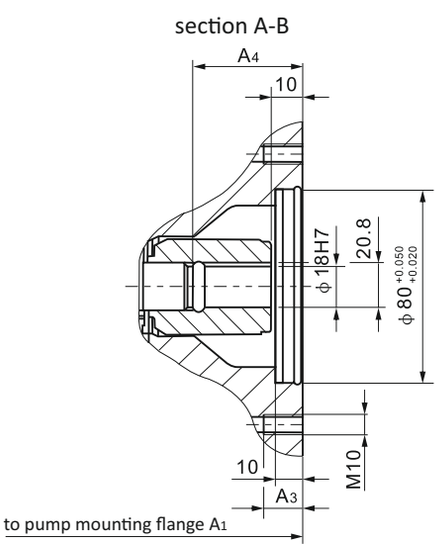


Size main pump	A1	A2
28	204	16
45	229	16
71	267	20

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



section A-B

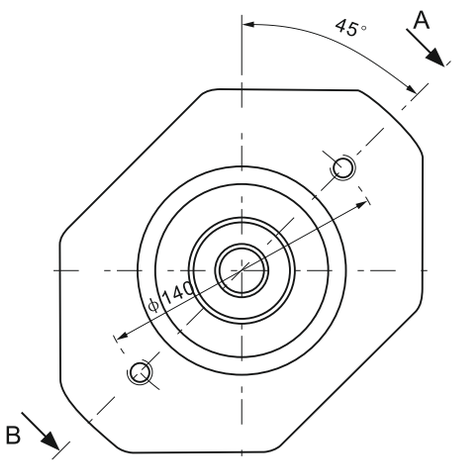


Size main pump	A1	A3	A4
28	204	16	37
45	229	16	43
71	267	20	51
100	338	20	55
140	350	20	67

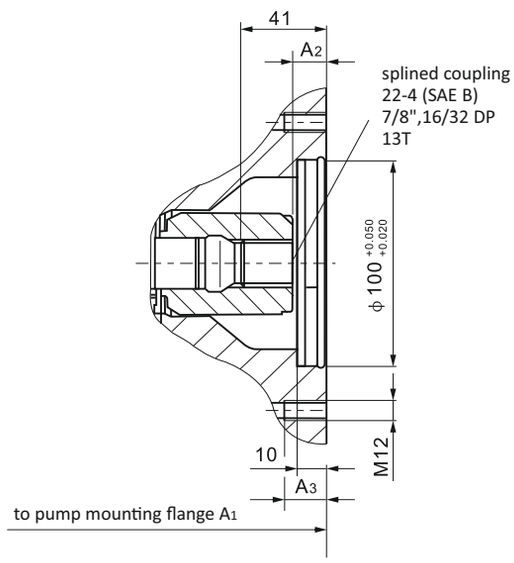
Through drive - Installation Dimensions

Flange ISO 100,2-hole for built-on A10VSO 28 (splined shaft S or R)

Order code KB3



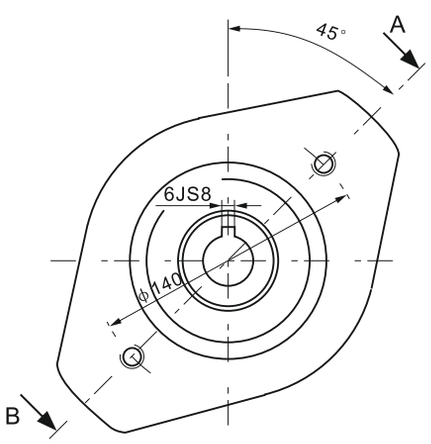
section A-B



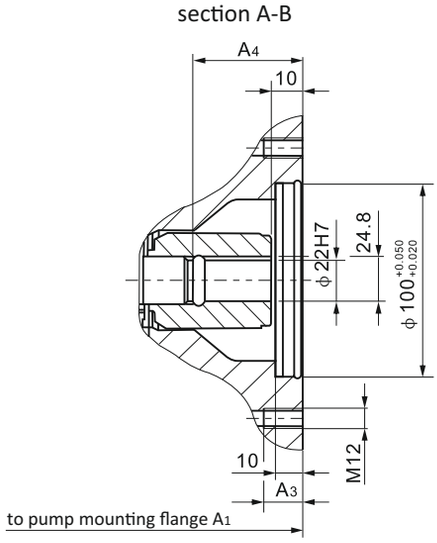
Size main pump	A1	A2	A3
28	204	19.2	14
45	229	16.5	15
71	267	16.5	18
100	338	17.6	18
140	350	18.2	24

Flange ISO 100,2-hole for built-on A10VSO 28 (splined shaft P.)

Order code K25



section A-B

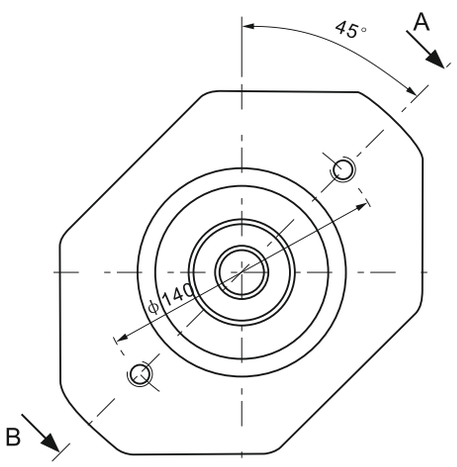


Size main pump	A1	A3	A4
28	204	14	37
45	229	14	43
71	267	23	51
100	338	20	55
140	350	24	62

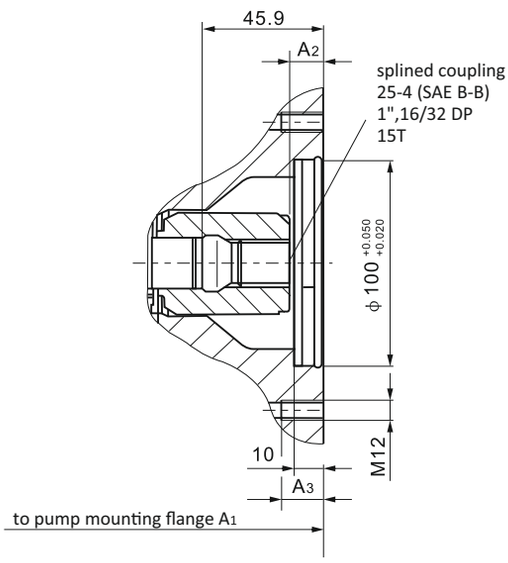
Through drive - Installation Dimensions

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

Order code KB4



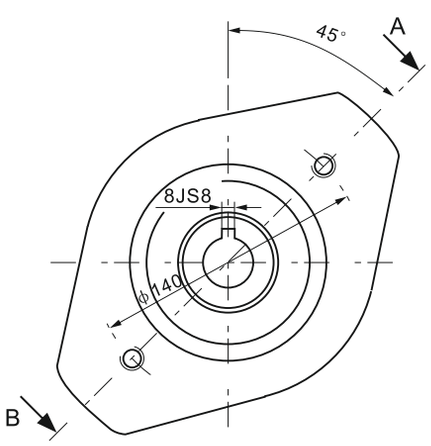
section A-B



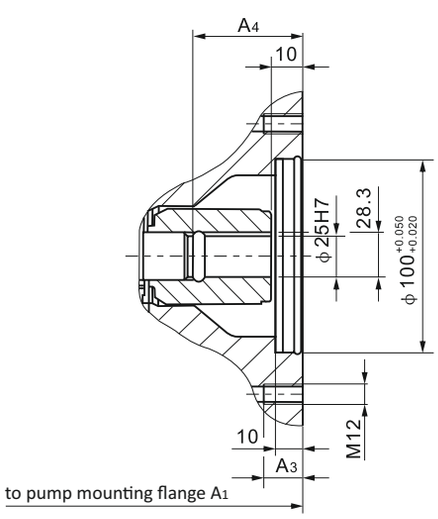
Size main pump	A1	A2	A3
45	229	17.2	14
71	267	17.2	18
100	338	18.2	20
140	350	18.2	24

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

Order code K26



section A-B

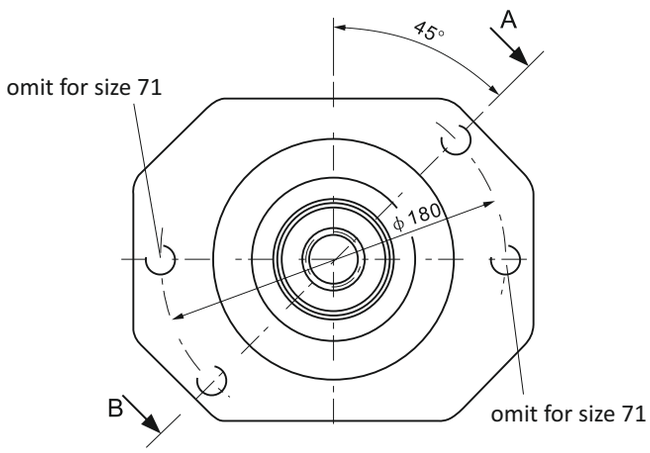


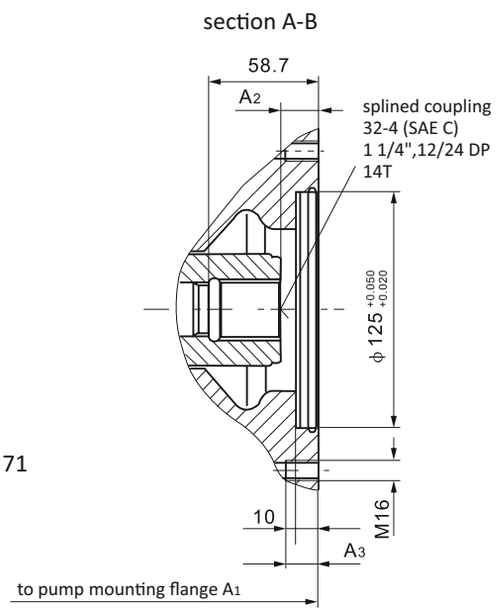
Size main pump	A1	A3	A4
45	229	14	43
71	267	23	51
100	338	20	55
140	350	24	67

Through drive - Installation Dimensions

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

Order code KB5

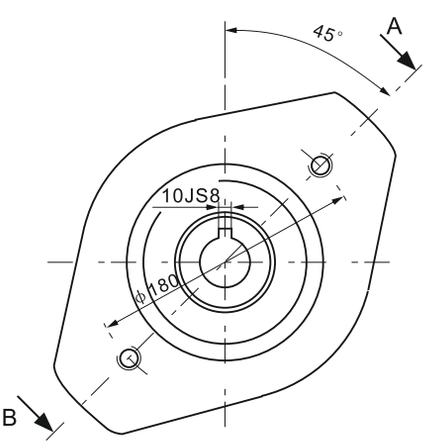


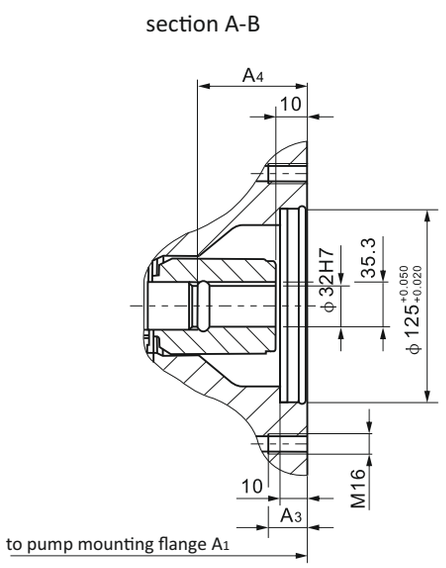


Size main pump	A1	A2	A3
71	267	20	18.5
100	338	20	25
140	350	21	32

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

Order code K27



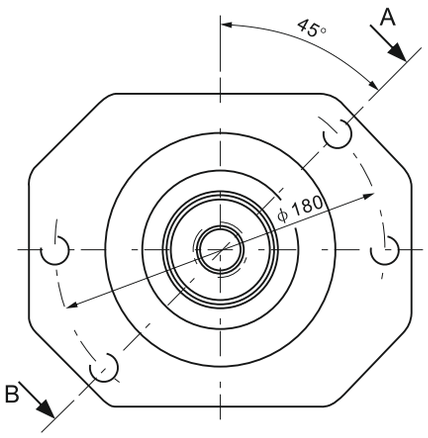


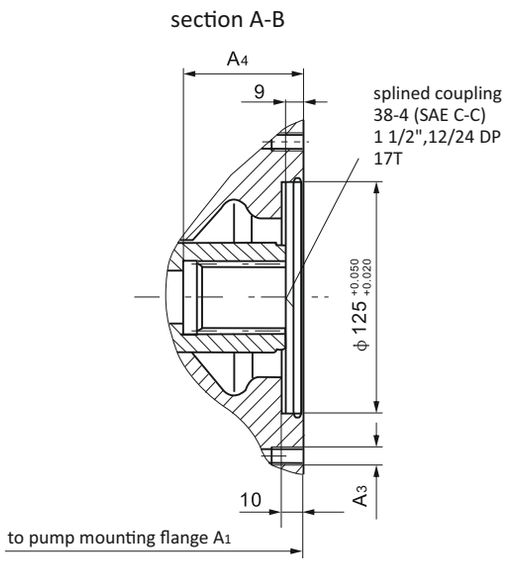
Size main pump	A1	A3	A4
71	267	18	51
100	338	20	54
140	350	24	63

Through drive - Installation Dimensions

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

Order code KB6



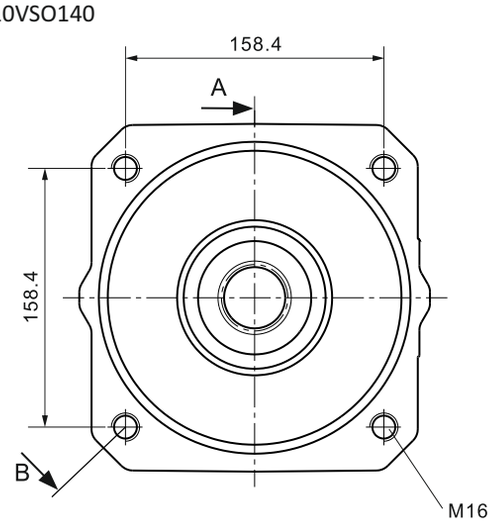


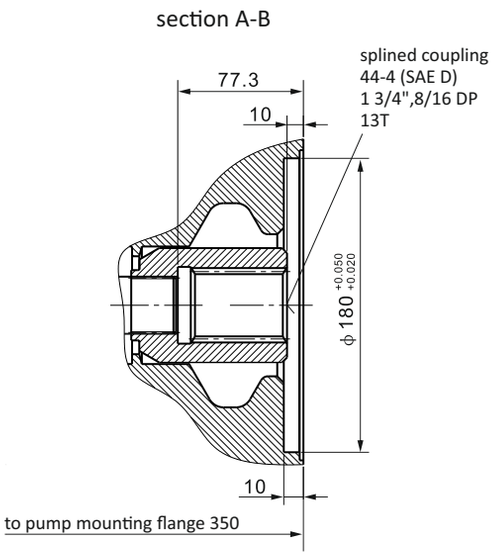
Size main pump	A1	A3	A4
100	338	M16, 25deep	65
140	350	M16,32deep	77.3

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

Order code KB7

Size main pump A10VSO140

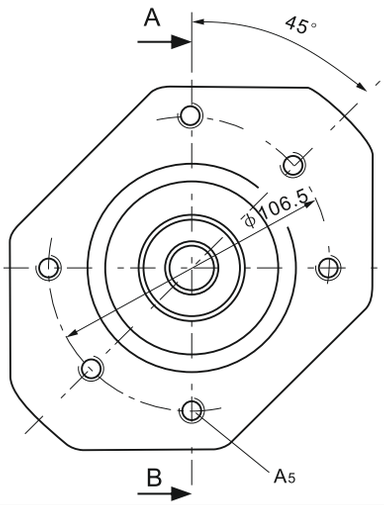




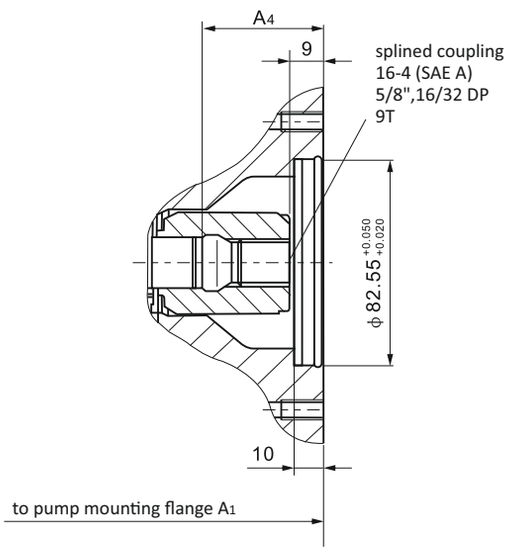
Through drive - Installation Dimensions

Flange SAE 82,2-hole (SAE A)

Order code K01



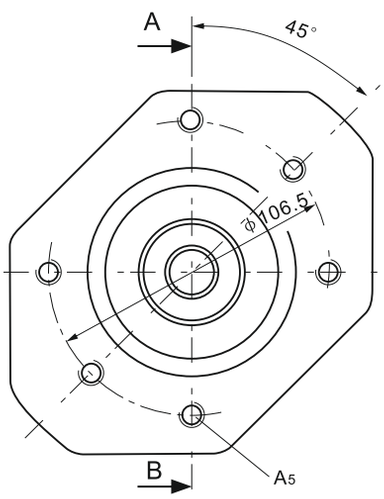
section A-B



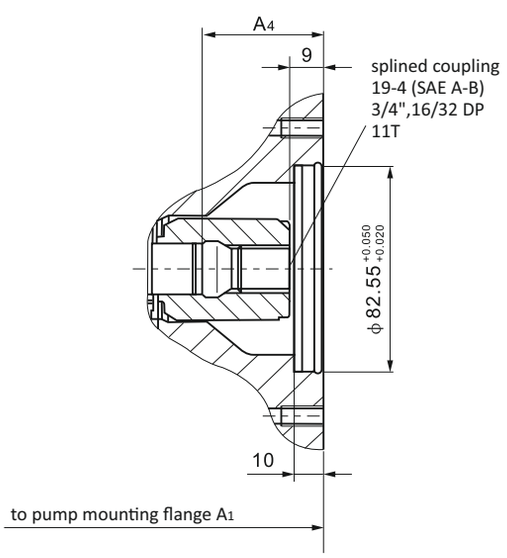
Size main pump	A1	A2	A3
18	182	52.3	M10;16deep
28	204	47	M10;16deep
45	229	53	M10;16deep
71	267	61	M10;20deep
100	338	65	M10;20deep
140	350	77	M10;20deep

Flange SAE 82,2-hole for built-on A10VSO 18 (splined shaft S)

Order code K52



section A-B

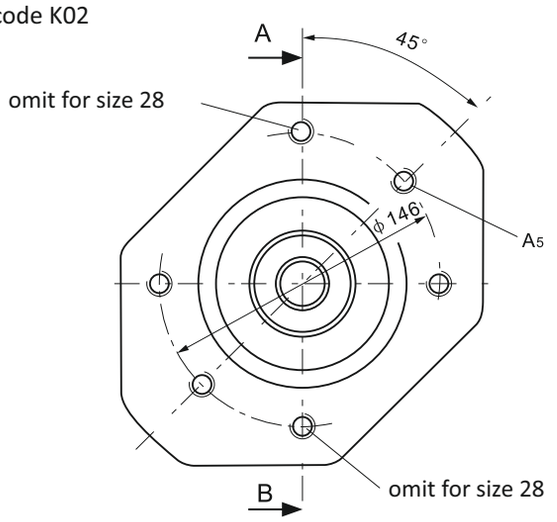


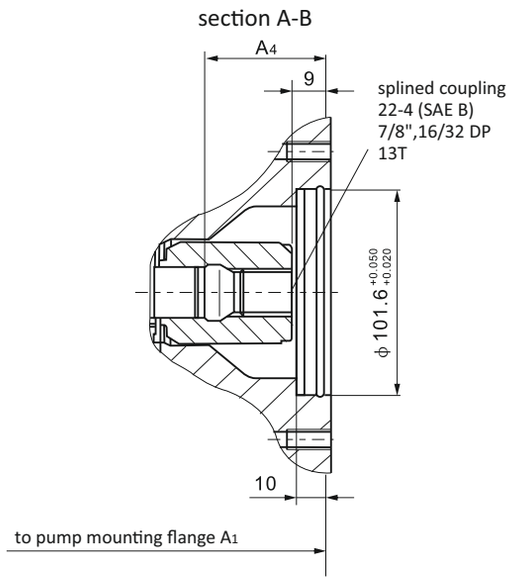
Size main pump	A1	A2	A3
18	182	52.3	M10;16deep
28	204	47	M10;16deep
45	229	53	M10;16deep
71	267	61	M10;20deep
100	338	65	M10;20deep
140	350	77	M10;20deep

Through drive - Installation Dimensions

Flange SAE 101,2-hole for built-on A10VSO 28 (splined shaft S)

Order code K02

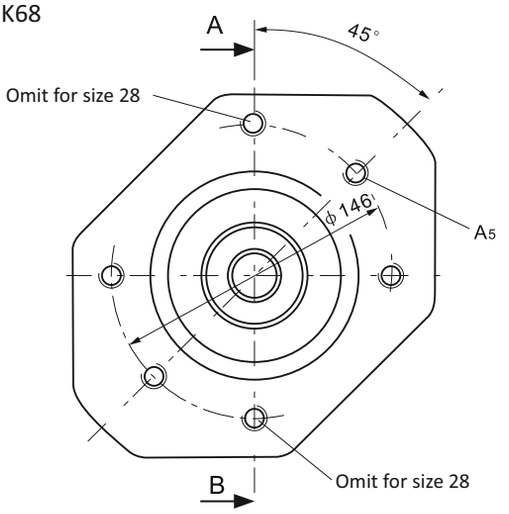


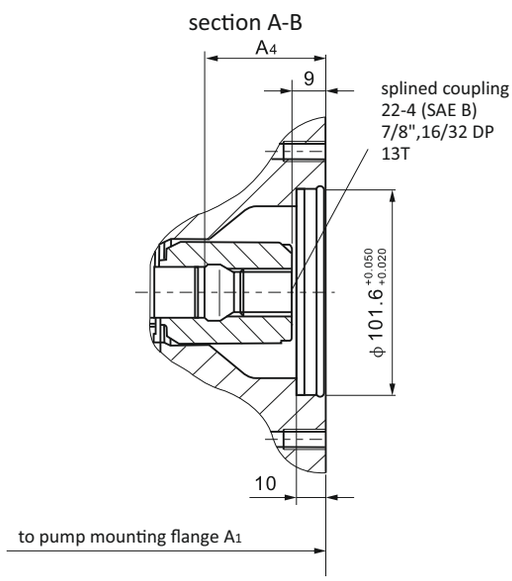


Size main pump	A_1	A_4	A_5
28	204	47	M12;15deep
45	229	53	M12;18deep
71	267	61	M12;20deep
100	338	65	M12;20deep
140	350	77	M12;20deep

Flange SAE 101,2-hole for built-on A10VSO 28 (splined shaft S)

Order code K68



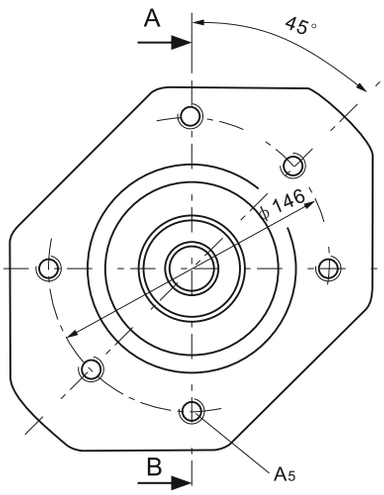


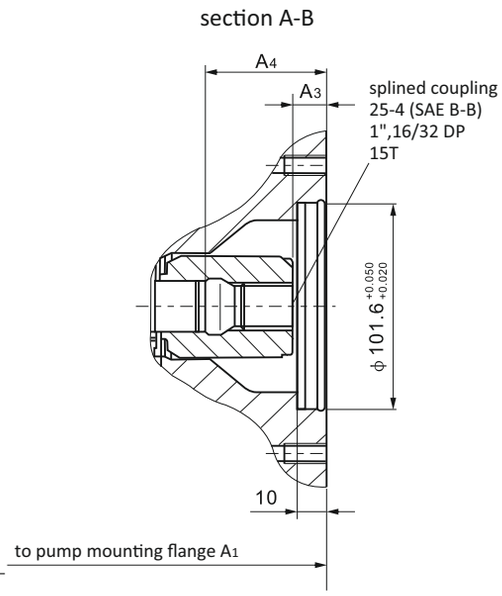
Size main pump	A1	A4	A5
28	204	47	M12;15deep
45	229	53	M12;18deep
71	267	61	M12;20deep
100	338	65	M12;20deep
140	350	77	M12;20deep

Through drive - Installation Dimensions

Flange SAE 101,2-hole for built-on A10VSO 45 (splined shaft S)

Order code K04

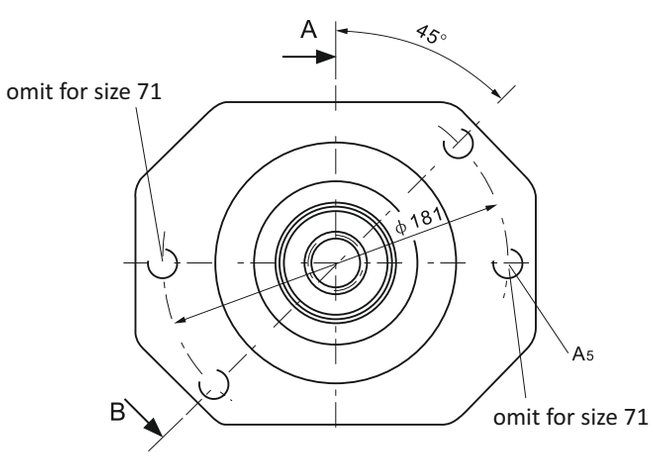


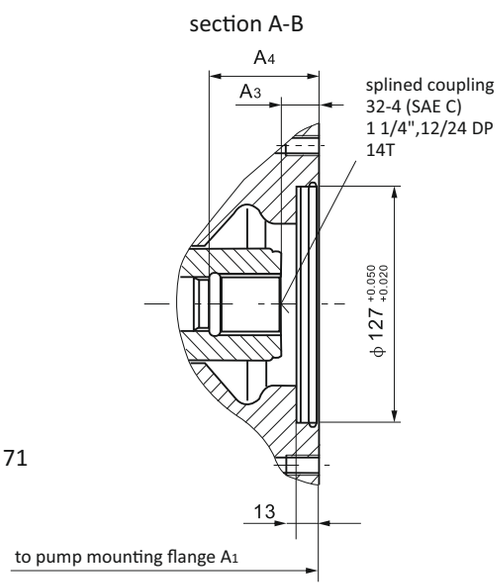


Size main pump	A1	A3	A4	A5
28	204	9	47	M12;15deep
45	229	9	53.4	M12;18deep
71	267	9	61.3	M12;20deep
100	338	10	65	M12;20deep
140	350	8	77.3	M12;20deep

Flange SAE 127,2-hole for built-on A10VSO 71 (splined shaft S)

Order code K07



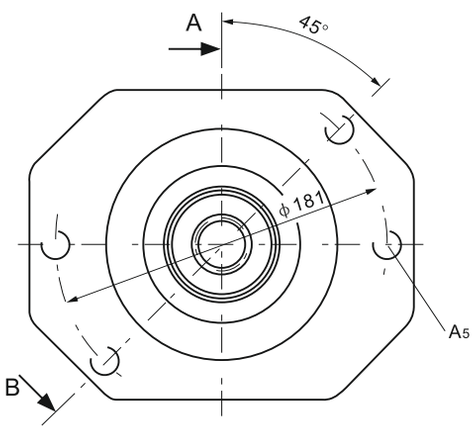


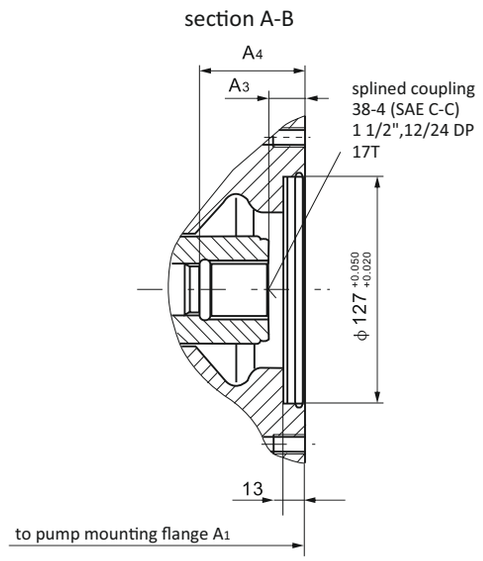
Size main pump	A1	A3	A4	A5
71	267	10	61.3	M16;18deep
100	338	9	65	M16;20deep

Through drive - Installation Dimensions

Flange SAE 127,2-hole for built-on A10VSO 100(splined shaft S)

Order code K24



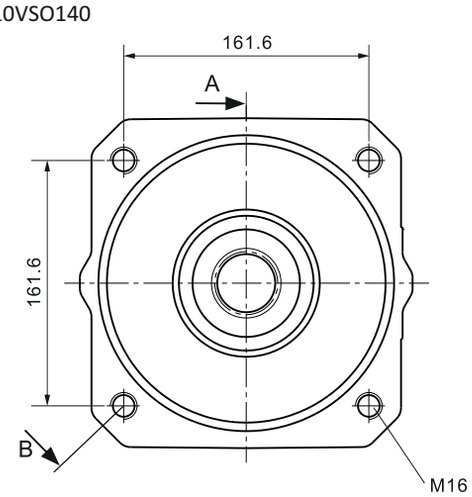


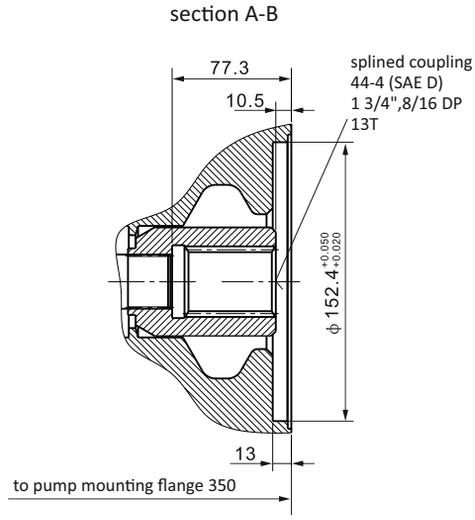
Size main pump	A1	A3	A4	A5
100	338	8	65	M16;20deep
140	350	9	77.3	M16;32deep

Flange SAE 152,4-hole for built-on A10VSO 140 (splined shaft S)

Order code K17

Size main pump A10VSO140





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The specified data is for product description purposes only and may not be deemed to be guaranteed unless expressly confirmed in the contract.