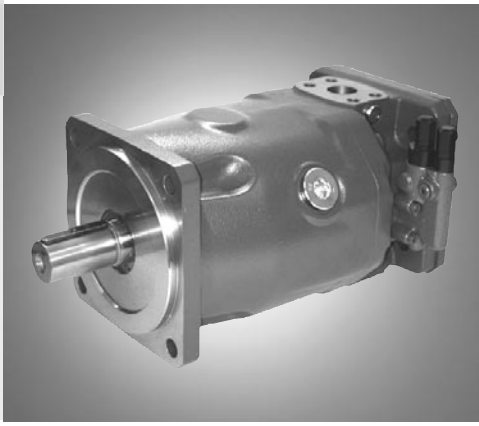
Axial Piston Variable Pump A10VSO

RA 92 714/11.05 1/24

Technical Data Sheet



Size 71 ... 180
Series 32
Nominal pressure 4000 psi (280 bar)
Peak pressure 5100 psi (350 bar)
Open circuit

Contents

Features

- Low noise level
- Variable pump in axial piston-swashplate design
- The flow is proportional to the drive speed and the displacement
- Optimized housing and port plate structure to minimize noise radiation
- Optional with pulsation damping
- High efficiency
- Hydrostatic unloading of cradle bearings
- Double retainer mechanism for high speed version (Size 140 and 180)
- Arrangement to counteract cylinder lift off
- Optimized sealing
- High functional reliability, also with torsional vibrations or under unfavorable operating conditions
- Port for pressure transducer in pump outlet
- Universal through drive
- Excellent power to weight ratio

Ordering code - standard program

A10VS	O			/	32		–	V		D			S
01	02	03	04		05	06		07	08	09	10	11	12

Axial piston unit

01	Swashplate design, variable, industrial applications, nom. pres. 400 psi (280 bar), peak press. 5100 psi (350 bar)	**A10VS**

Type of operation

02	Pump, open circuit	**O**

	Size		**45**	**71**	**100**	**140**	**180**
03	Displacement $V_{g\ max}$	[cm³]	45	71,1	100	140	180
		[in³]	2.75	4.34	6.10	8.54	10.98

Control and adjustment devices

04	Two-point control, directly operated	DG								○	●	●	●	○	**DG**
	Pressure control	DR								○	●	●	●	○	**DR**
	with flow control, hydraulic, X-T open	DR				F				○	●	●	●	○	**DRF**
	X-T closed	DR				S				○	●	●	●	○	**DRS**
	with displacement control, electronic	DF	E1							○	●	●	●	○	**DFE1**[1)]
	(with pressure control), remotely adjustable														
	hydraulic	DR			G					○	●	●	●	○	**DRG**
	electric, inversely prop. characteristic	ED	.							○	●	●	●	○	**ED.**[2)]
	Power control														
	with pressure control														
	Beginning of control below 725 psi (50 bar)	LA	5	D						○	●	●	●	○	**LA5D**
	from 739.5 to 1305 psi (51 to 90 bar)	LA	6	D						○	●	●	●	○	**LA6D**
	1319.5 to 2320 psi (91 to 160 bar)	LA	7	D						○	●	●	●	○	**LA7D**
	2334.5 to 3480 psi (160 to 240 bar)	LA	8	D						○	●	●	●	○	**LA8D**
	over 3480 psi (240 bar)	LA	9	D						○	●	●	●	○	**LA9D**
	with pressure control, remotely adjustable														
	Beginning of control see above	LA	X	D	G					○	●	●	●	○	**LAXDG**
	with pressure and flow control, X-T closed														
	Beginning of control see above	LA	X	D		S				○	●	●	●	○	**LAXDS**
	with separate flow control, X-T closed														
	Beginning of control see above	LA	X			S				○	●	●	●	○	**LAXS**

A10VS	O			/	32		–	V		D			S
01	02	03	04		05	06		07	08	09	10	11	12

Series

05		**32**

Direction of rotation

06	viewing on shaft end	clockwise	**R**
		counter clockwise	**L**

Seals and fluids		**45**	**71**	**100**	**140**	**180**	
07	FKM fluor-rubber	○	●	●	●	○	**V**
	HFA, HFB and HFC-fluids (except Skydrol)	○	●	●	●	–	**C**[3]

Shaft end

08	keyed parallel shaft to SAE	○	●	●	●	○	**K**
	splined to SAE J744	○	●	●	●	○	**S**
	like shaft end S , for higher torque inputs	○	●	–	–	–	**R**

Anbauflansch

09	SAE 4-hole	**D**

Ports for service lines

10	outlet B and inlet S, SAE flange on side, opposite sides metric thread for fixing screws, without through drive	**62N**
	like 62N however with universal through drive	**72U**
	like 62N however with universal through drive and pulsation damping	**82U**

Through drive

11	without through drive (only for port plate 62N)			○	●	●	●	○	**00**
	Flange SAE J744	Hub for splined shaft	Sealing						
	82-2 (A)	5/8 in 9T 16/32DP	axial	○	●	●	●	○	**01**
	82-2 (A)	3/4 in 11T 16/32DP	axial	○	●	●	●	○	**52**
	101-2 (B)	7/8 in 13T 16/32DP	axial	○	●	●	●	○	**68**
	101-2 (B)	1 in 15T 16/32DP	axial	○	●	●	●	○	**04**
	127-4 (C)	1 1/4 in 14T 12/24DP	axial	–	○	○	○	○	**15**
	152-4 (D)	1 1/2 in 17T 12/24DP	axial	–	–	●	●	○	**96**
	152-4 (D)	1 3/4 in 13T 8/16DP	axial	–	–	–	●	○	**17**
	with shaft for through drive, without hub, without adapter flange, closed with cover (not for portplate 62N)								**99**

Type of rotary group

12	High speed (only with port plate 62N and 72U)	–	–	–	●	○	**S**

[1] See RE 30 022, not for HFx-fluids [2] See RE 92 707 [3] See RE 90 223

● available ○ in preparation – not available

Fluids

Prior to project design, please see our technical data sheets RE 90220 (mineral oil), RE 90221 (environmentally acceptable fluis) and RE 90223 (HF- fluids) for detailed information on fluids and operating conditions.

When using HF- or environmentally acceptable fluids attention must be paid to possible limitations of the technical data, if necessary contact us. (when ordering, please state in clear text the fluid to be used). Operation on Skydrol fluid is only possible after consultation with us.

Operating viscosity range

For optimum efficiency and service life we recommend that the operating viscosity (at operating temperature) be selected in the range

ν_{opt} = opt. operating viscosity 80...170 SUS (16...36 mm²/s)

referred to tank temperature (open circuit).

Limit of viscosity range

For critical operating conditions the following values apply:

ν_{min} = 60 SUS (10 mm²/s)
for short periods (t ≤ 1 min)
at max. perm. fluid temperature of 239 °F (115 °C).

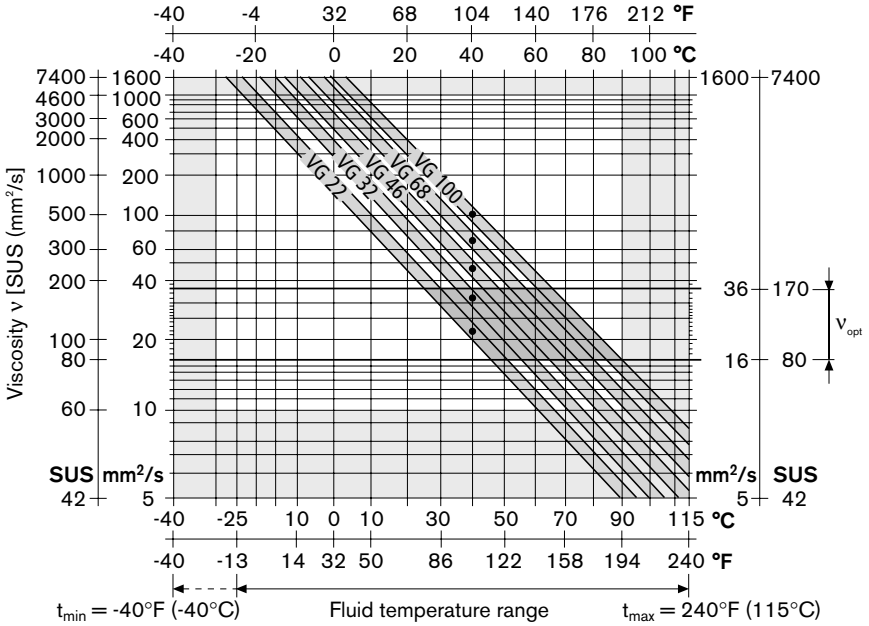
Please note that the max. leakage fluid temperature of 239 °F (115 °C) is also not exceeded in certain areas (for instance bearing area). The fluid temperature in the bearing area is approx. 7 °F (5 K) higher than the average leakage fluid temperature.

ν_{max} = 7500 SUS (1600 mm²/s)
for short periods (t ≤ 1 min)
on cold start
p ≤ 435 psi (30 bar), n ≤ 1800 rpm, t_{min} = -13 °F (-25 °C)

At temperatures between -40 °F (-40 °C) and -13 °F (-25 °C) special measures are required, please consult us for further information.

For detailed information on operation with low temperatures see data sheet RE 90300-03-B.

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 circuit) in relation to the ambient temperature.

The fluid should be selected so that witin the operating temperature range, the viscosity lies within the optimum range (ν_{opt}), see shaded section of the selection diagram. We recommend to select the higher viscosity grade in each case.

Example: at an ambient temperature of X °F (X °C) the operating temperature in the tank is 140 °F (60 °C). In the optimum viscosity range (ν_{opt}; shaded area) this corresponds to viscosity grades VG 46 resp. VG 68; VG 68 should be selected.

Important: The leakage oil (case drain oil) temperature is influenced by pressure and input speed and is always higher than the tank temperature. However, at no point in the circuit may the temperature exceed 239 °F (115 °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 of fluid

The finer the filtration the better the achieved cleanliness of the pressure fluid and the longer the life of the axial piston unit.

To ensure a reliable functioning of the axial piston unit, a minimum cleanliness of

20/18/15 to ISO 4406 is necessary.

At very high temperatures of hydraulic fluid (195 °F (90 °C) up to max. 239 °F (115 °C)) at least cleanliness of

19/17/14 to ISO 4406 is necessary.

If above cleanliness classes cannot be met please consult us.

Technical data

Operating pressure range

Inlet

Absolute pressure at port S

$p_{abs\ min}$ ____ 12 psi (0.8 bar)

$p_{abs\ max}$ ____ 73 psi (5 bar)

To determine the min. required inlet pressure p_{abs} at inlet port S or the reduction of displacement with higher input speeds see the diagram to the right.

Outlet

Pressure at port B

Nominal pressure p_N ____ 4000 psi (280 bar)

Peak pressure p_{max} ____ 5100 psi (350 bar)

(Pressures to DIN 24312)

An intermittent operating pressure of 4600 psi (315) bar with a max. duty cycle of 10 % is permissible.

Direction of flow

S to B.

Case drain pressure

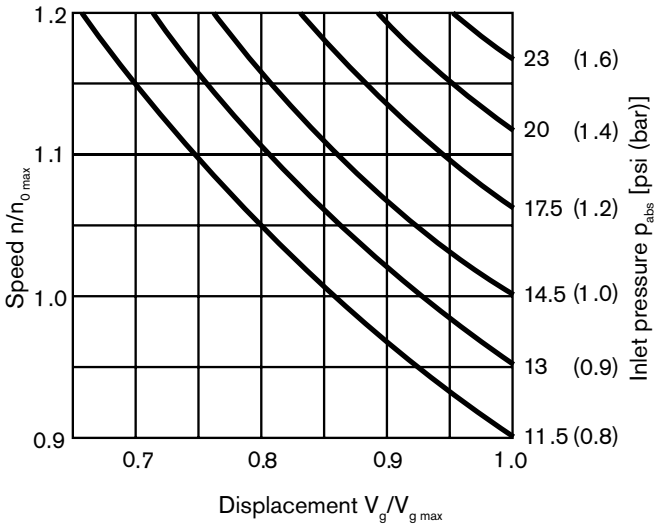
Maximum permissible case drain pressure (port L, L_1):

maximum 7 psi (0.5 bar) higher than the inlet pressure at port S, however not higher than 29 psi (2 bar) absolute

$p_{L\ abs\ max}$ ____ 29 psi (2 bar)

Max. permissible speed (Speed limit)

Permissible speed increase by increase of inlet pressure p_{abs} or reduction of displacement ($V_g \leq V_{g\ max}$).

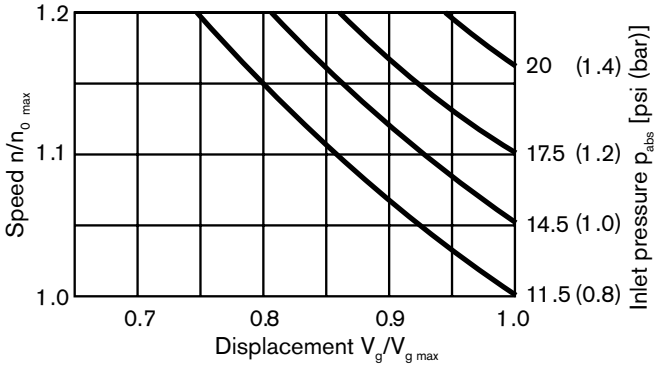


High speed Version

The size 140 without the pulsation damping feature is optionally available as high speed unit.

In comparison with the standard version, this unit can be operated with the same speed as the standard version however with inlet pressure of 12 psi (0.8 bar) abs. at port S.

See table on page 6.



Mechanical flow limitation

Mechanical flow limitation is standard on pumps **without pulsation damping and without through drive (62N00)**. Versions **with through drive or pulsation damping cannot be supplied with flow limitation stop**.

$V_{g\ max}$: Adjustment range $V_{g\ max}$ to 50% $V_{g\ max}$ stepless

$V_{g\ min}$: Adjustment range $V_{g\ min}$ to 50% $V_{g\ max}$ stepless

Technical data

Table of values[1)]

Size		Standard / High-speed		71	100	140	140
Displacement		$V_{g\ max}$	in³	4.34	6.10	8.54	8.54
			(cm³)	(71)	(100)	(140)	(140)
Speed[2)]							
max. at $V_{g\ max}$		$n_{0\ max}$	min⁻¹	2200	2000	1800	1800[3)]
max. at $V_g \leq V_{g\ max}$		$n_{0\ max\ zul}$	min⁻¹	2600	2400	2100	2100
Flow							
at $n_{0\ max}$		$q_{V0\ max}$	gpm	41.1	53	67	67
			(L/min)	(156,4)	(200)	(252)	(252)
at $n_E = 1800$ min⁻¹		$q_{VE\ max}$	gpm	34	47.6	67	67
			(L/min)	(128)	(180)	(252)	(252)
at $n_{0\ max.\ zul}$		$q_{V0\ max\ zul}$	gpm	49	63.8	78.2	78.2
			(L/min)	(184,3)	(240)	(294)	(294)
Power	Δp = 4000 psi (Δp = 280 bar)						
at $n_{0\ max}$		$P_{o\ max}$	HP	96	124	156	156
			(kW)	(73)	(93)	(118)	(118)
at $n_E = 1800$ rpm		$P_{E\ max}$	HP	146	212	156	156
			(kW)	(109)	(158)	(118)	(118)
Torque							
at $V_{g\ max}$	Δp = 4000 psi	T_{max}	lb-ft	231	325	454	454
	(Δp = 280 bar)		(Nm)	(317)	(446)	(624)	(624)
	Δp = 1450 psi	T	lb-ft	83	117	164	164
	(Δp = 100 bar)		(Nm)	(113)	(159)	(223)	(223)
Moment of inertia (about drive axis)		J	lb-ft²	0.2065	0.4390	0.6549	0.6549
			(kgm²)	(0,0087)	(0,0185)	(0,0276)	(0,0276)
Angular acceleration, max.			rad/s²	2900	2400	2000	2000
Torsional stiffness	shaft K		lb-ft/rad	59,466	97,603	138,958	138,958
			(Nm/rad)	(80627)	(132335)	(188406)	(188406)
	shaft S		lb-ft/rad	53,018	89,348	125,042	125,042
			(Nm/rad)	(71884)	(121142)	(169537)	(169537)
	shaft R		lb-ft/rad	56,456	–	–	–
			(Nm/rad)	(76545)	(–)	(–)	(–)
Case volume			gal	0.4	0.6	0.8	0.8
			(L)	(1,6)	(2,2)	(3,0)	(3,0)
Weight (with pressure control)		m	lbs	103	152	161	161
			(kg)	(47)	(69)	(73)	(73)

[1)] theoretical values, without considering η_{mh} and η_v, values rounded
[2)] Values are valid with inlet pressure of 1 bar absolute at port S.
[3)] With inlet pressure of 12 psi (0.8 bar) abs. at port S.

Technical data

Determination of pump size

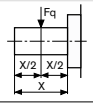
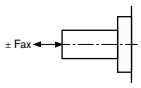
Flow $q_V = \frac{V_g \cdot n \cdot \eta_V}{231\ (1000)}$ [gpm (L/min)]

Torque $T = \frac{V_g \cdot \Delta p}{24\ (20) \cdot \pi \cdot \eta_{mh}}$ [lb-ft (Nm)]

Power $P = \frac{2\pi \cdot T \cdot n}{33{,}000\ (60000)} = \frac{q_V \cdot p}{1{,}714\ (600) \cdot \eta_t}$ [HP (kW)]

V_g = geometr. displacement per revolution in in³ (cm³)
p = pressure differential in psi (bar)
n = drive speed in rpm
η_V = volumetric efficiency
η_{mh} = mechanical-hydraulic efficiency
η_t = overall efficiency ($\eta_t = \eta_V \cdot \eta_{mh}$)

Permissible radial and axial forces on drive speed

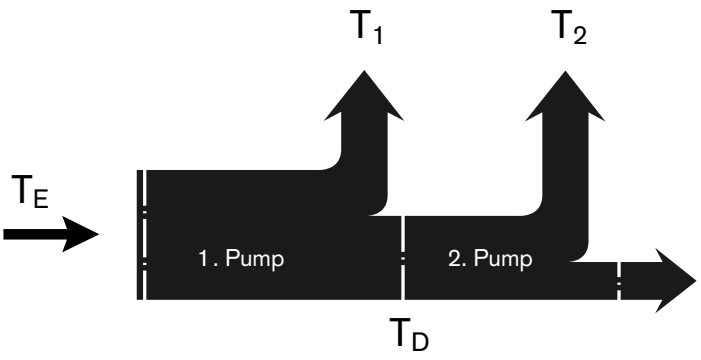
Size				71	100	140
Radial force, max.		at X/2	$F_{q\ max}$ lb-ft (N)	427 (1900)	517 (2300)	630 (2800)
Axial force, max.			F_{ax} lb-ft (N)	540 (2400)	900 (4000)	1080 (4800)

Permissible input and through drive torques

Size			71	100	140
Torque, max. (at $V_{g\ max}$ and Δp = 400 psi (280 bar[1]))	T_{max}	ft-lb (Nm)	231 (317)	325 (446)	454 (624)
Input torque, max. [2]					
for shaft end K	$T_{E\ per}$	ft-lb (Nm)	319 (433)	553 (750)	875 (1186)
SAE		in	1 1/4	1 1/2	1 3/4
for shaft end S	$T_{E\ per}$	ft-lb (Nm)	462 (626)	814 (1104)	1195 (1620)
SAE J744 (ANSI B92.1a-1996)		in	1 1/4	1 1/2	1 3/4
for shaft end R	$T_{E\ per}$	ft-lb (Nm)	475 (644)	—	—
SAE J744 (ANSI B92.1a-1996)		in	1 1/4	—	—
Through drive torque, max.					
for shaft end S	T_{Tper}	ft-lb (Nm)	363 (492)	574 (778)	934 (1266)
for shaft end R	T_{Tper}	ft-lb (Nm)	404 (548)	—	—

[1] Without considering efficiency
[2] for shaft without side load

Distribution of torques



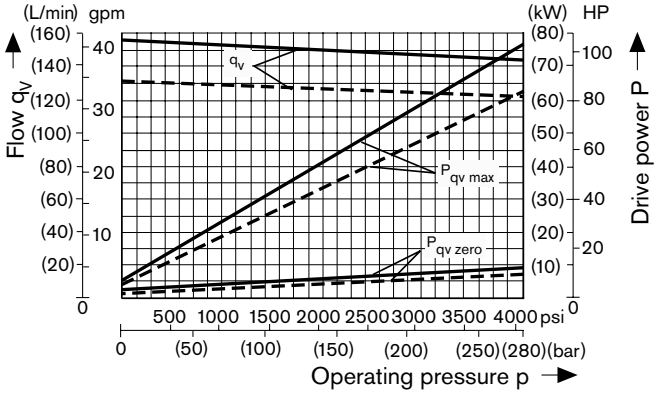
Technical data

Drive power and flow

Fluid: hydraulic oil ISO VG 46 DIN 51519, t = 122 °F (50 °C)

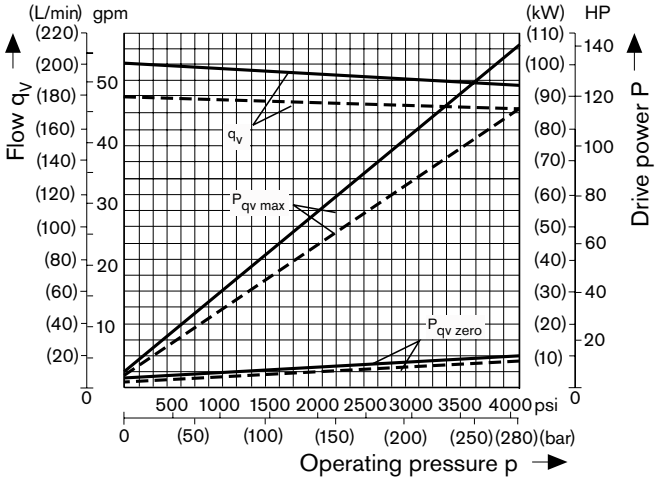
Size 71

— — — n = 1800 rpm
——— n = 2200 rpm



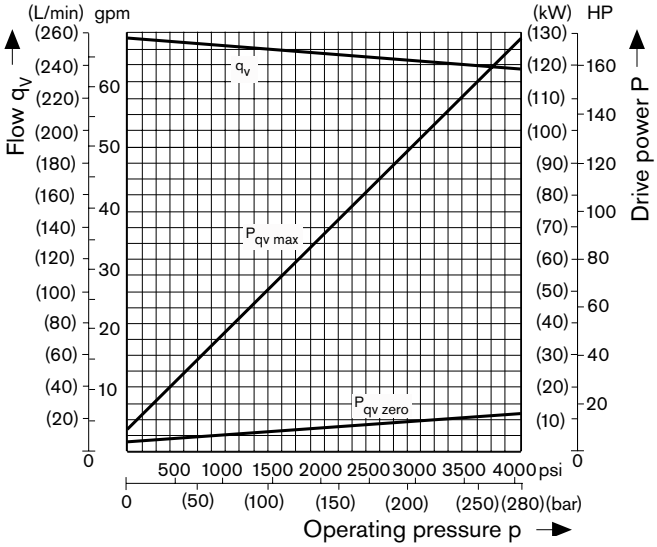
Size 100

— — — n = 1800 rpm
——— n = 2000 rpm



Size 140

——— n = 1800 rpm



Overall efficiency

$$\eta_t = \frac{q_V \bullet p}{P_{pV\ max} \bullet 1714\ (600)}$$

Volumetric efficiency

$$\eta_V = \frac{q_V}{q_{V\ theor}}$$

DG - two point, direct control

The pump can be set to a minimum swivel angle by connecting an external switching pressure to port X.

This will supply the control piston directly with control oil, a minimum pressure of $p_{St} \geq 725$ psi (50 bar) is required.

The pump can only be switched between $V_{g\,max}$ or $V_{g\,min}$.

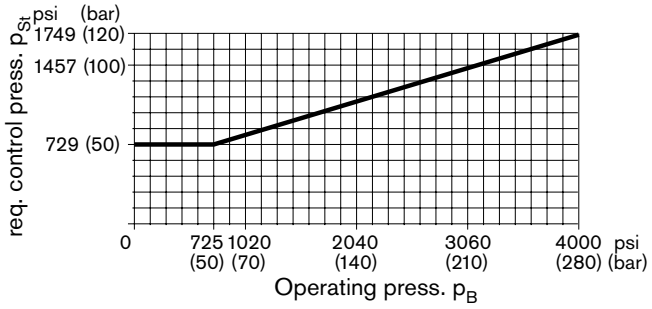
It must be considered, that the required control pressure at port X is directly dependent on the operating pressure p_B (see control pressure diagram below).

Control pressure p_{St} in X = 0 psi (0 bar) ≙ $V_{g\,max}$

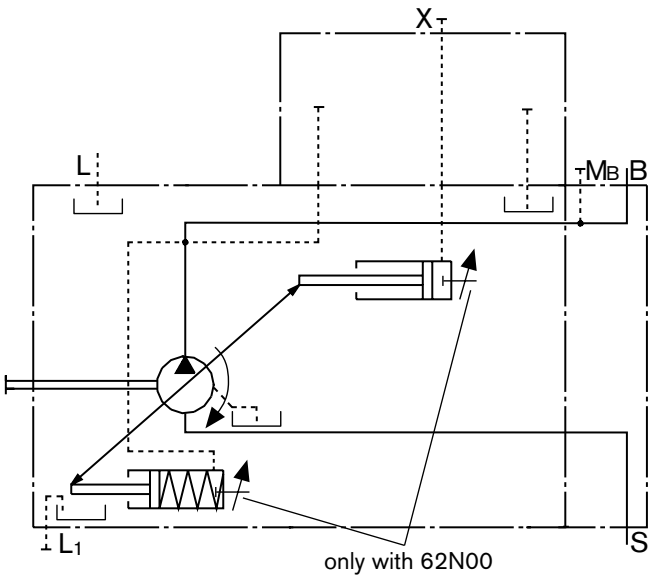
Control pressure p_{St} in X ≥ 725 psi (50 bar) ≙ $V_{g\,min}$

The max. permissible control press. amounts to p_{St} = 4000 psi (280 bar).

Control pressure diagram



Circuit drawing: DG



Ports

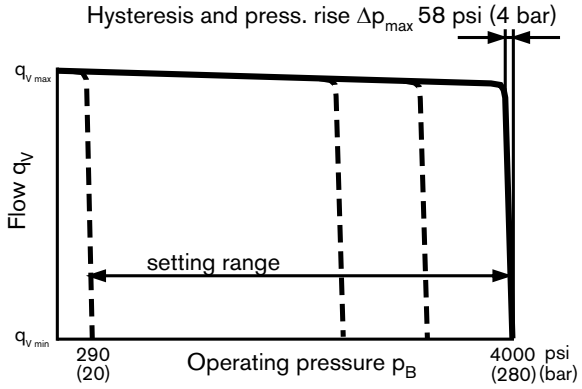
B	Outlet port
S	Inlet port
L, L_1	Case drain port (L_1 plugged)
X	Control pressure port (plugged)
M_B	Measuring port operating press. (plugged)

DR - Pressure control

The pressure control serves to maintain a constant pressure in the hydraulic system, within the control range of the pump. The pump therefore supplies only the amount of hydraulic fluid required by the actuators. The pressure can be steplessly set at the pilot valve.

Static characteristic

at $n_1 = 1500\ min^{-1}$; $t_{fluid} = 122$ °F (50 °C)

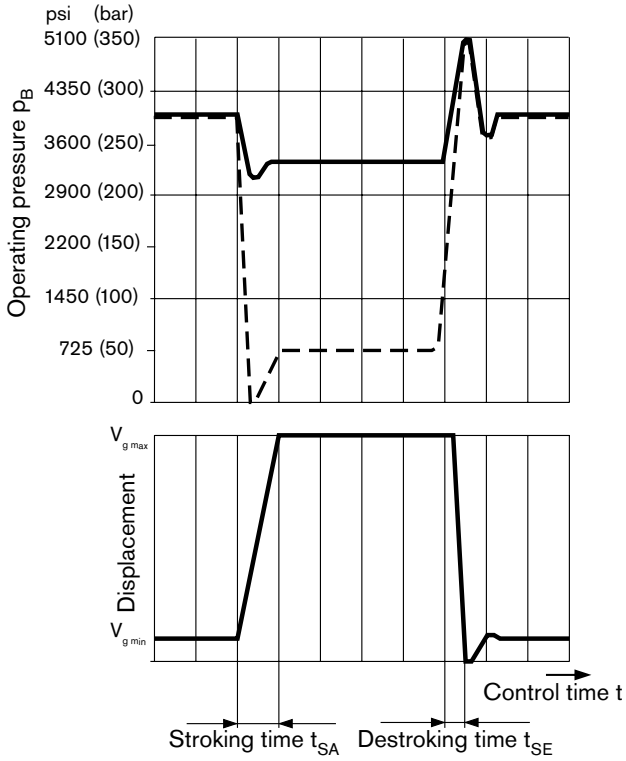


Dynamic characteristics

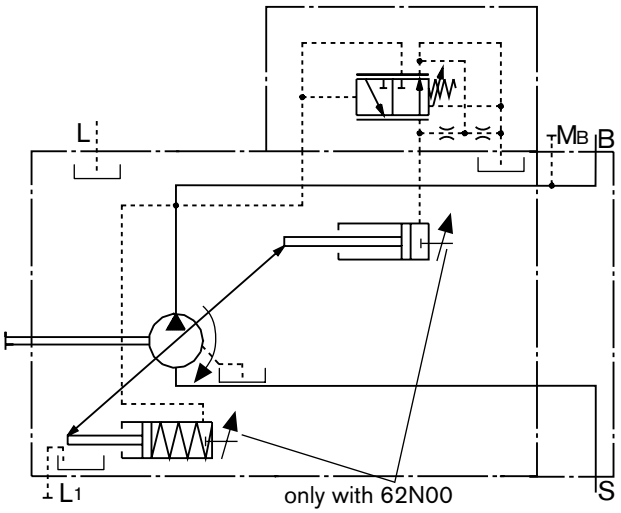
The curves show average measured values under test conditions.

Conditions: $n = 1500\ min^{-1}$
$t_{flid} = 122$ °F (50 °C)
Line main relief set at 5100 psi (350 bar)

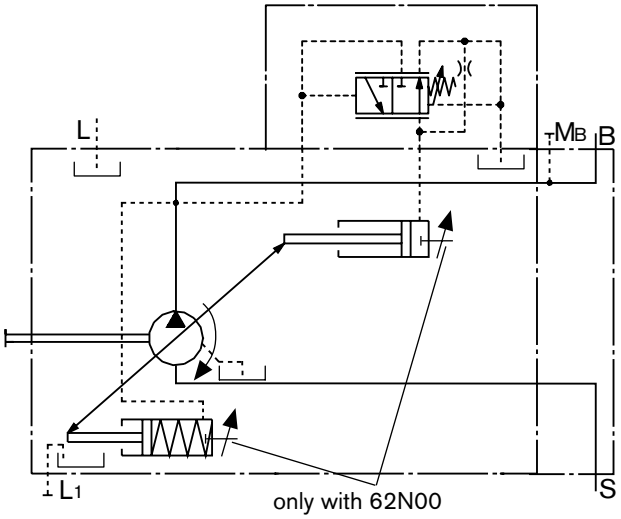
Stepped loading by suddenly opening or closing the pressure line using a pressure relief valve at 3.3 ft (1 m) downstream from the pump pressure outlet.



Circuit drawing: DR size 71...100



Circuit drawing: DR size 140



Ports

B	Outlet port
S	Inlet port
L, L_1	Case drain ports (L_1 plugged)
M_B	Measuring port operating pressure (plugged)

Control data

Hysteresis and repeatability Δp max. 45 psi (3 bar)
Pilot oil consumption max. approx. 0.8 gpm (3 L/min)
Flow loss at $q_{V\ max}$ see page 8

Control time

Size	t_{SA} [ms] against 725 psi (50 bar)	t_{SA} [ms] against 3200 psi (220 bar)	t_{SE} [ms] Zero stroke - 4000 psi (280 bar)
71	100	50	25
100	125	90	30
140	130	110	30

DRG - Pressure control, remote

The DRG-control valve enables a remote setting of max. pump pressure, below the setting of the DR-control spool, see page 10.

For the remote setting of pressure it is necessary to pipe an external relief valve to port X. This valve is not included in the supply of the pump.

The differential pressure at the DRG-control spool is set as standard to 290 psi (20 bar), and this results in a pilot oil flow of approx. 0.4 gpm (1,5 L/min). If another setting is required, please state this in clear text.

We recommend that one of the following is used as the separate relief valve:

– DBDH 6 (hydraulic) to RA 25 402 or

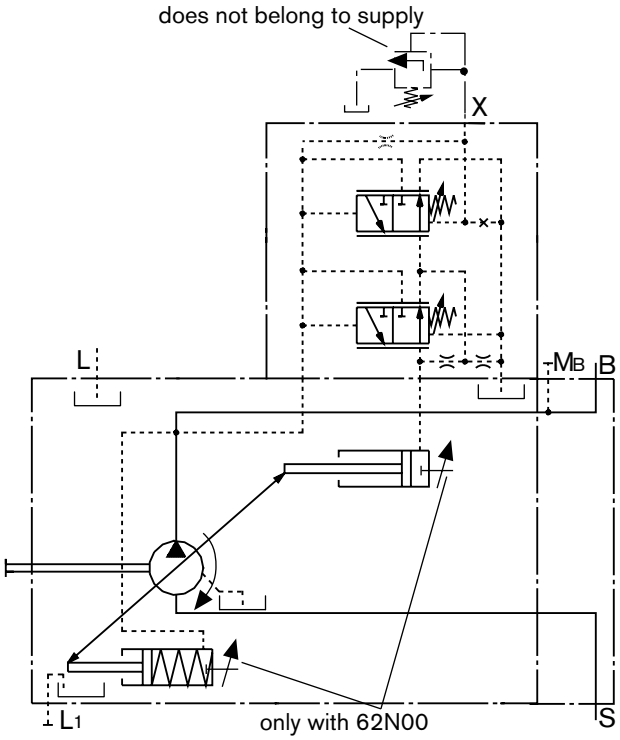
– DBETR -SO381 with orifice DIA 0.03 (Ø 0.8) in P (electric) to RA 29 166.

Max. length of piping should not exceed 6.5 ft (2 m).

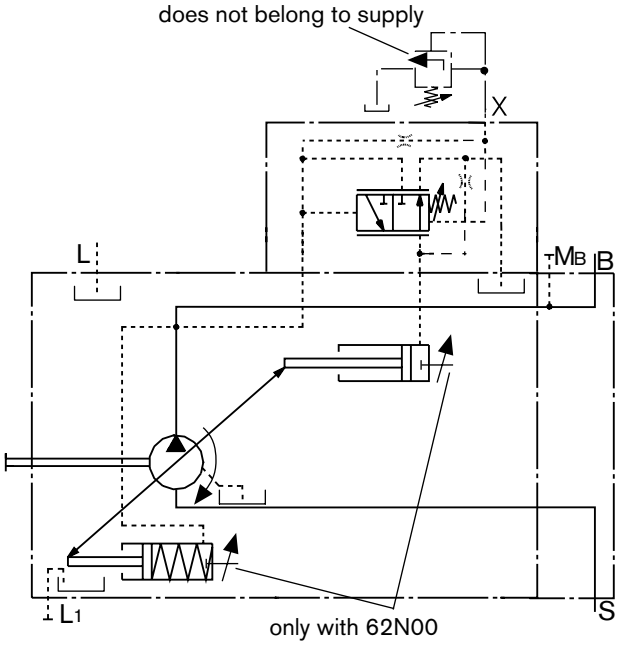
Control data

See page 10.

Circuit drawing: DRG size 71...100



Circuit drawing: DRG size 140



Ports

B	Outlet port
S	Inlet port
L, L_1	Case drain ports (L_1 plugged)
X	Pilot pressure port
M_B	Measuring port operating pressure (plugged)

DRF/DRS - Pressure and flow control

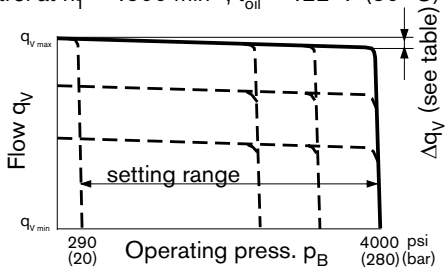
Execution of control valve as described on page 10 and 11.

In addition to the pressure control function, the pump flow to the actuator may be varied by means of a differential pressure (eg. over an orifice or a directional control valve). The pump supplies only the amount of fluid as required by the actuator. The pressure control overrides the flow control function.

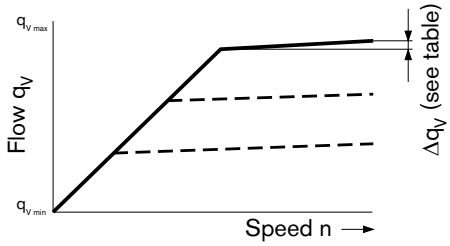
The DRS-valve has no connection between X port and pump housing.

Static characteristic

Flow control at $n_1 = 1500\ min^{-1}$; $t_{oil} = 122$ °F (50 °C)

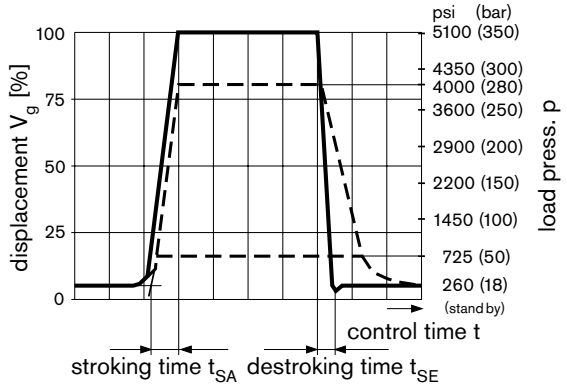


Static characteristic at variable speed



Dynamic characteristic of flow control

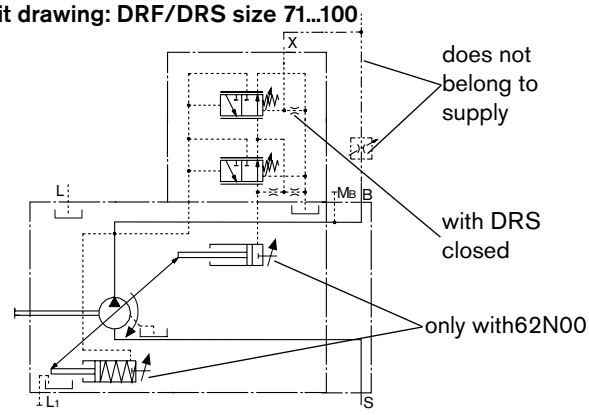
The curves shown are measured average values under test conditions



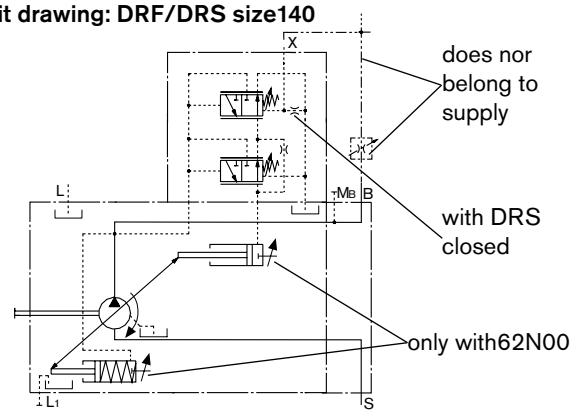
Control time

Size	t_{SA} [ms] stand by - 4000 psi (280 bar)	t_{SE} [ms] 4000 psi (280 bar) - stand by	t_{SE} [ms] 725 psi (50 bar) - stand by
71	60	30	60
100	120	60	120
140	130	60	130

Circuit drawing: DRF/DRS size 71...100



Circuit drawing: DRF/DRS size140



Ports

B	Outlet port
S	Inlet port
L, L_1	Case drain ports (L_1 plugged)
X	Pilot pressure port
M_B	Measuring port operating pressure (plugged)

Differential pressure Δp

Standard setting: 200 psi (14 bar). If a different setting is required, please state in clear text.

When port X is unloaded to tank (and outlet B is closed) a zero stroke pressure ("stand by") of p = 260 ± 30 psi (18 ± 2 bar) results (depends on Δp-setting).

Control data

For pressure control data see page 10.

Max. flow deviation (Hysteresis and rise) measured at drive speed of $n = 1500\ min^{-1}$

Size	71	100	140
Δqv_{max} gpm (L/min)	0.75 (2.8)	1.06 (4.0)	1.6 (6.0)

Pilot oil cons. DRF max. approx. 0.8...122 gpm (3...4,5 L/min)
Pilot oil consumption DRS max. approx. 0.8 gpm (3 L/min)
Flow loss at q_{Vmax} see page 8.

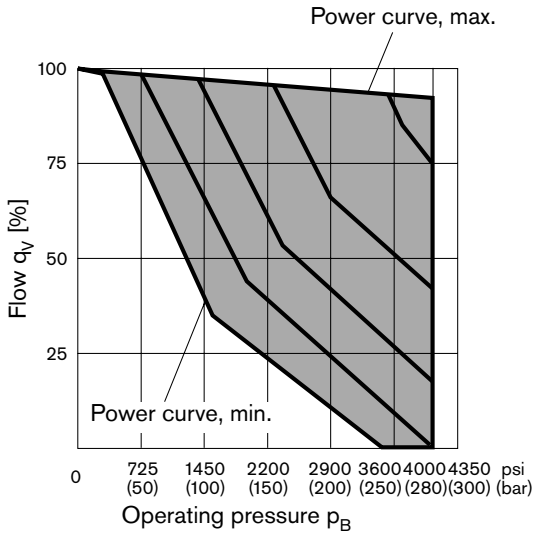
LA... - Pressure, flow, and power control

Set up of pressure control DR, see page 10.
Set up of flow control valve like DRS, see page 12.

In order to achieve a constant drive torque with varying operating pressures, the swivel angle and with it the output flow of the axial piston pump is varied in such a manner, that the product of flow and pressure remains constant.

Flow control is possible below the limit of the power curve.

Static characteristic



The power characteristic is factory set, so enter details in clear text, e.g. 27 HP (20 kW) at 1500 min^{-1}.

Control data

For technical data pressure control see page 10.

For technical data flow control see page 12.

Start of control:

	[psi (bar)]	Ordering-Code
to	725 (50)	5
	7395.5 to 1305 (51 to 90)	6
	1319.5 to 2320 (91 to 160)	7
	2334.5 to 3480 (161 to 240)	8
over	3480 (240)	9

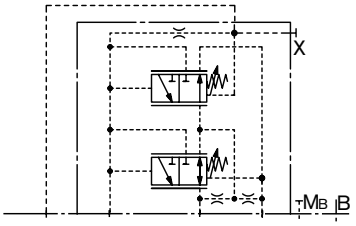
Pilot oil consumption max. approx. 1.45 gpm (5,5 L/min)

Flow loss at $q_{V\,max}$ see page 8.

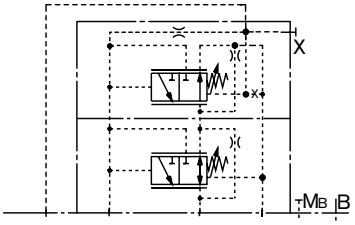
Ports

B	Outlet port
S	Inlet port
L, L_1	Case drain ports (L_1 plugged)
X	Pilot prssure port
M_B	Measuring port operating pressure (plugged)

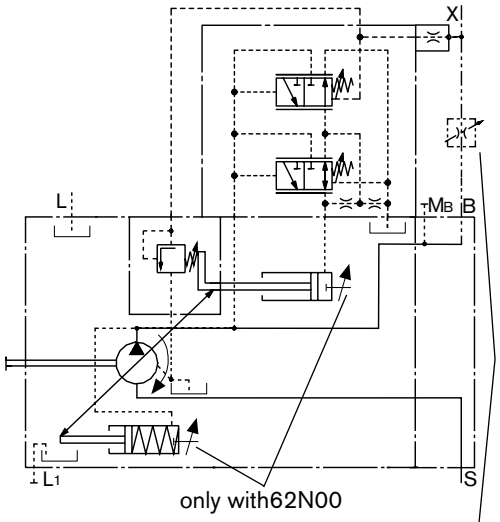
Circuit drawing: LAXD size 71...100



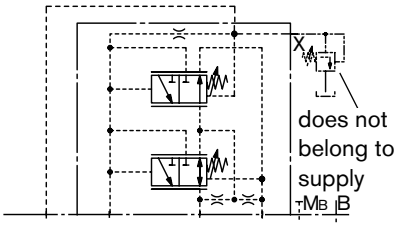
Circuit drawing: LAXD size 140



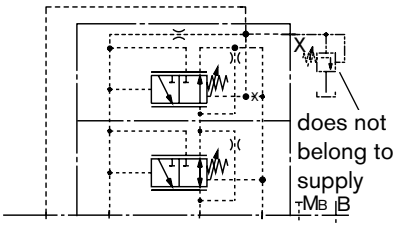
Circuit drawing: LAXDS size 71...100



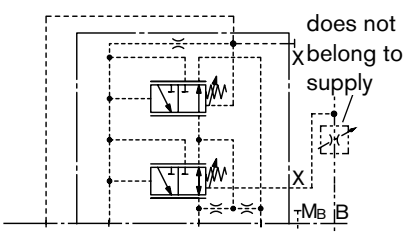
Circuit drawing: LAXDG size 71...100



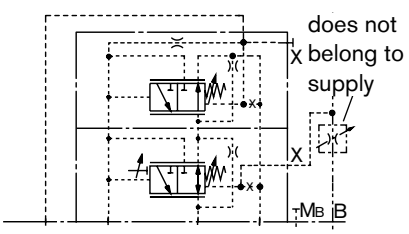
Circuit drawing: LAXDG size 140



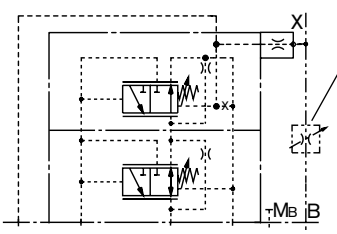
Circuit drawing: LAXS size 71...100



Circuit drawing: LAXS size 140



Circuit drawing: LAXDS size 140

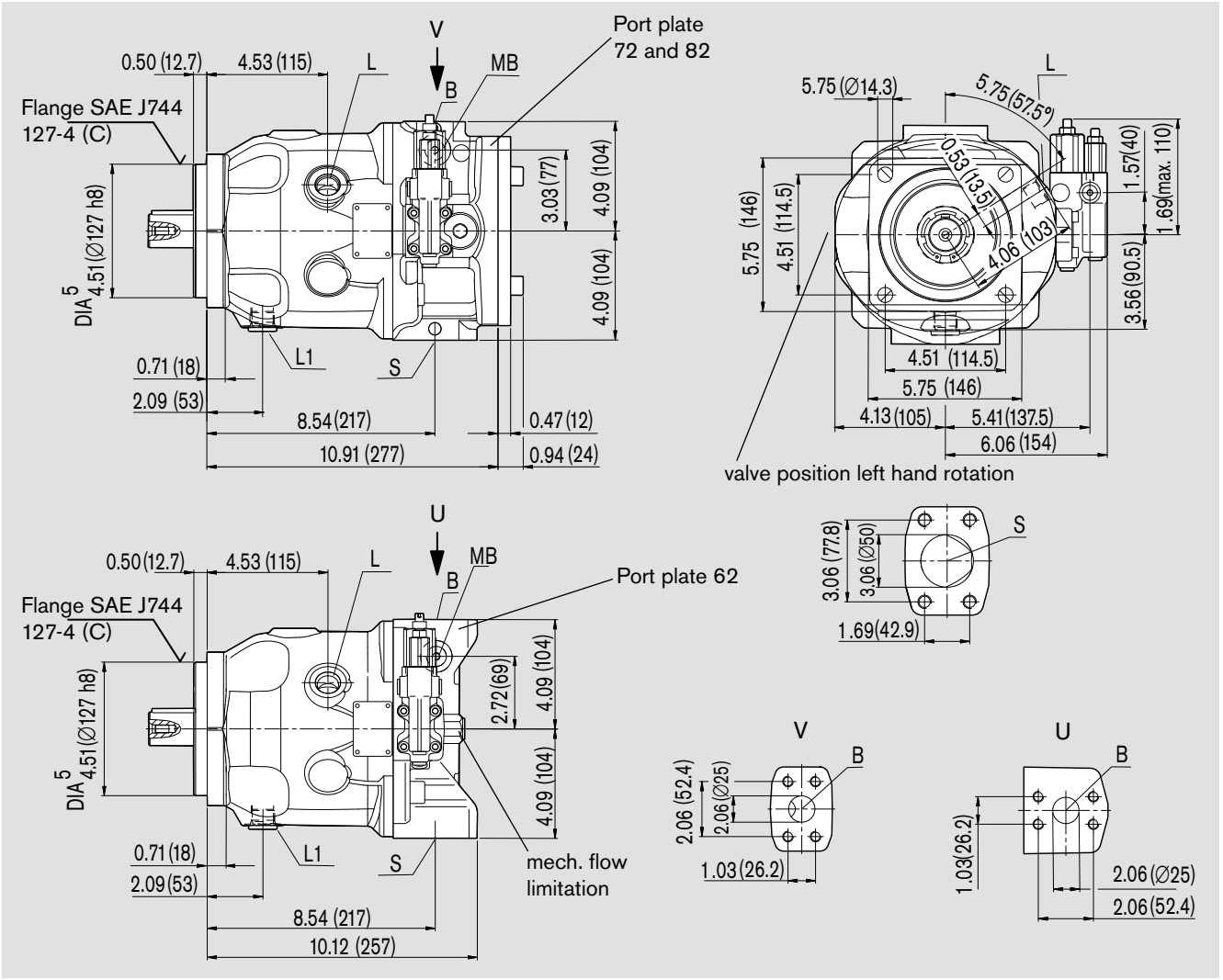


does not belong to supply

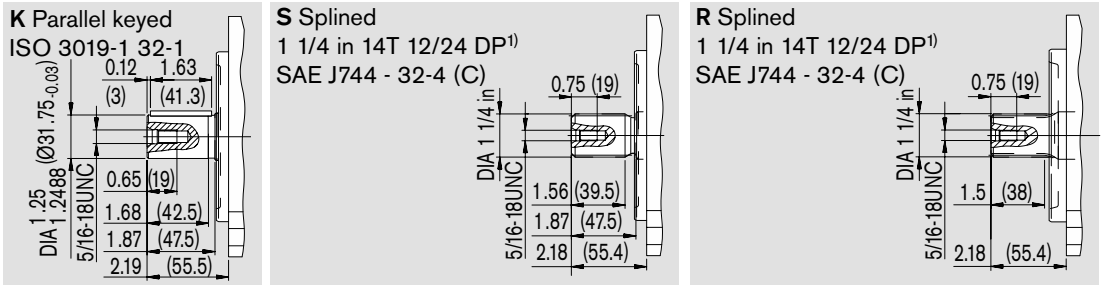
Unit dimensions, size 71

Before finalizing your design please request certified installation drawings. Dimensions in inches (mm).

Example A10VSO71DR/32R-VKD72(62)U99(N00)



Shaft ends



Ports

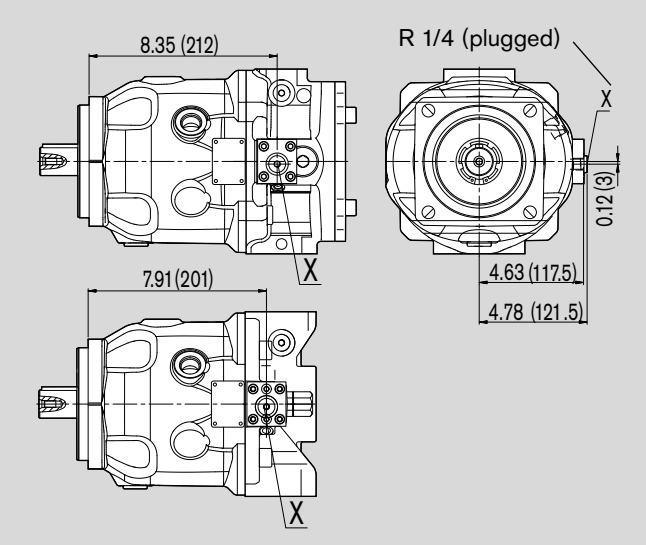
				Tightening torque, max.2)
B	Outlet port, SAE flange (code 61)	SAE J518	1 in	
	Fixing thread	ISO 68	3/8-16 UNC; 0.71 (18) deep	29 lb-ft (40 Nm)
S	Inlet port, SAE flange (code 61)	SAE J518	2 in	
	Fixing thread	ISO 68	1/2-13 UNC; 0.87 (22) deep	66 lb-ft (90 Nm)
L/L_1	Case drain port (L_1 plugged)	ISO 11926	7/8-14 UNF	177 lb-ft (240 Nm)
M_B	Measuring port operating press. (plugged)	DIN 3852	G 1/4	51 lb-ft (70 Nm)

1) ANSI B92.1a-1996, 30° pressure angle, flat base, flank centering, fit class 5
2) see General Notes

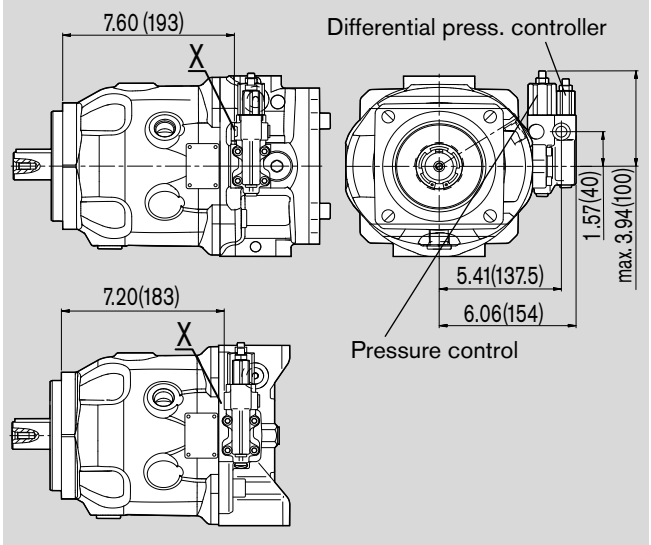
Dimensions with control valves, size 71

Before finalizing your design please request certified installation drawings. Dimensions in inches (mm).

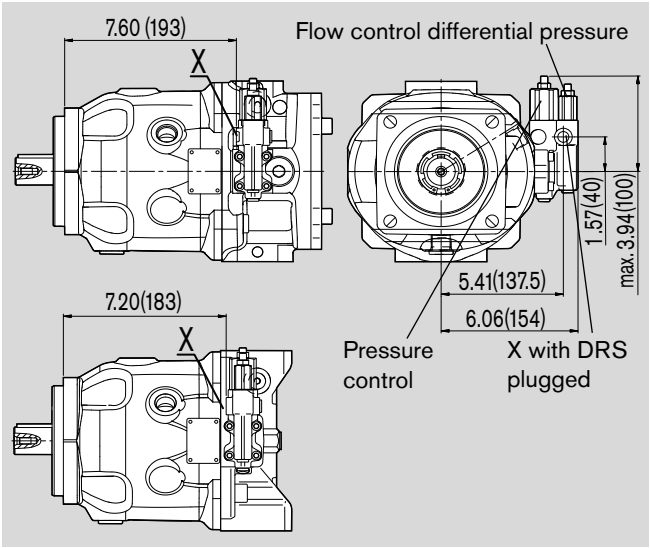
DG - two point, direct control



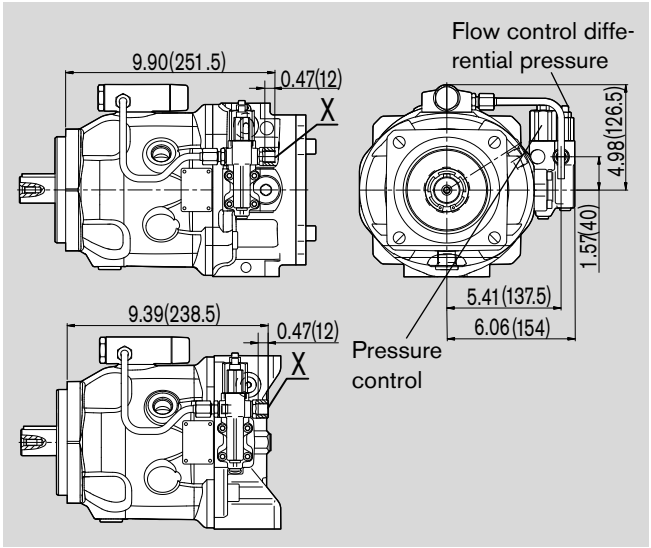
DRG - remote pressure control



DRF/DRS - pressure and flow control



LA... - pressure, flow and power control



Ports

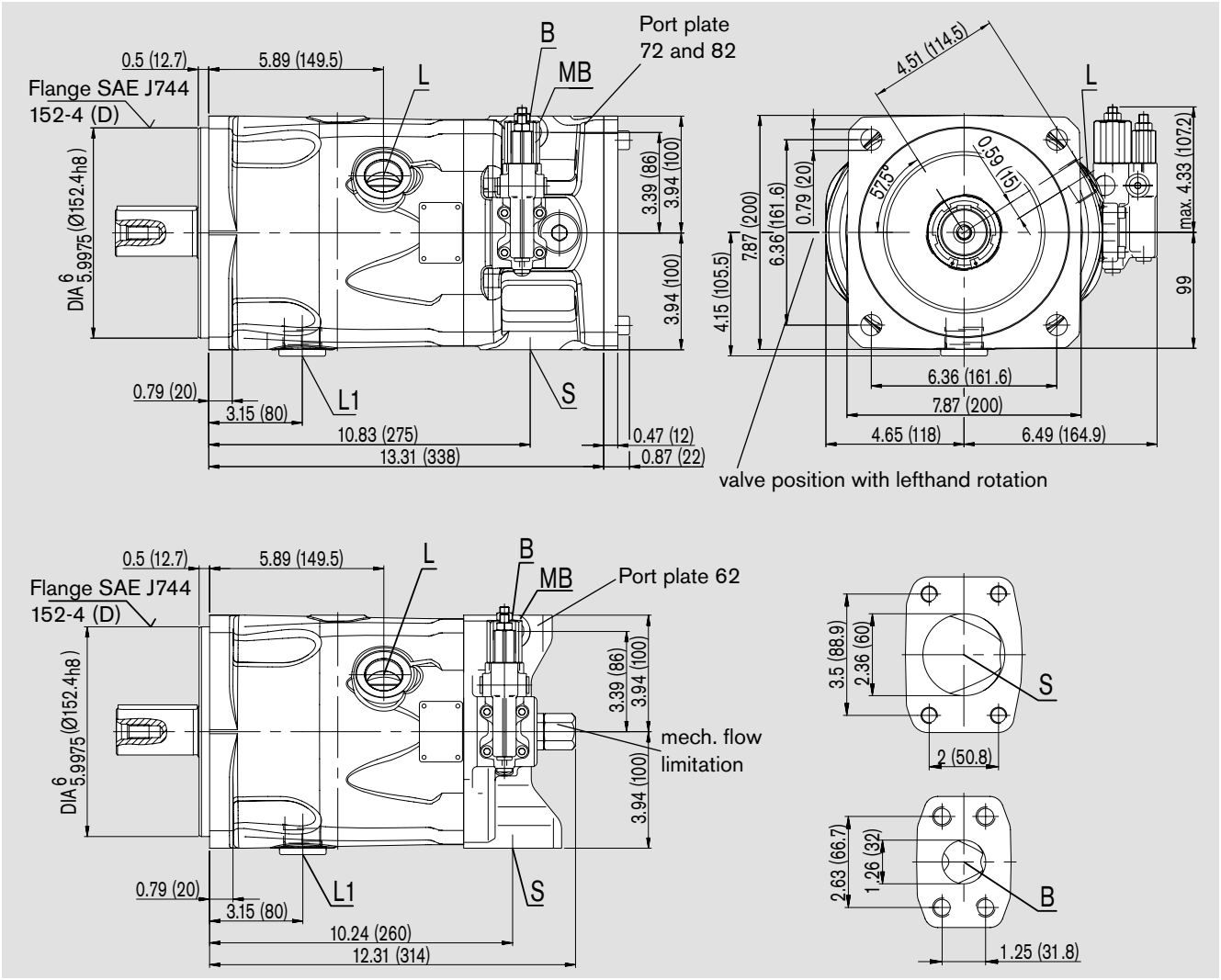
				Tightening torque, max.[1]
X	Pilot pressure port	ISO 11926	7/16-20 UNF; 0.47 (12 deep)	17+1 .8 lb-ft (23+2,5 Nm)

[1] see General Notes

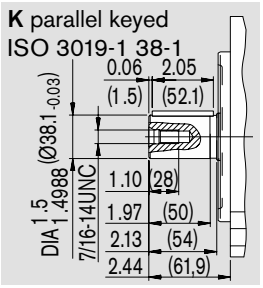
Unit dimensions, size 100

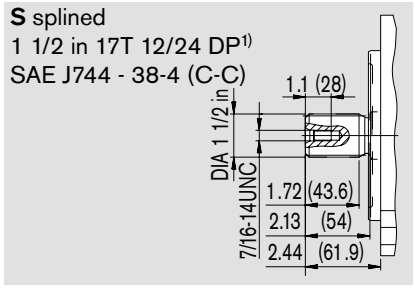
Before finalizing your design please request certified installation drawings. Dimensions in inches (mm).

Example A10VSO100DR/32R-VKD72(62)U99(N00)



Shaft ends





Ports

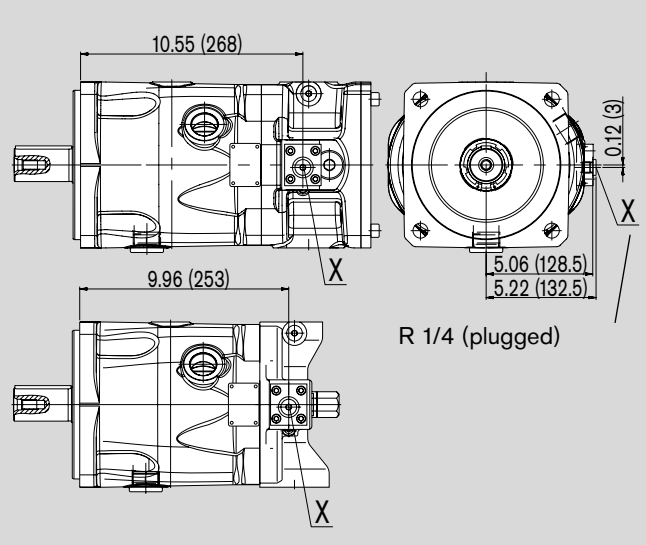
				Tightening torque, max.[2)]
B	Outlet port, SAE flange (code 62)	SAE J518	1 1/4 in	
	Fixing thread	ISO 68	1/2-13 UNC; 0.75 (19) deep	66 lb-ft (90 Nm)
S	Inlet port, SAE flange (code 61)	SAE J518	2 1/2 in	
	Fixing thread	ISO 68	1/2-13 UNC; 0.94 (24) deep	66 lb-ft (90 Nm)
L/L_1	Case drain port (L_1 plugged)	ISO 11926	1 1/16-12 UN	265 lb-ft (360 Nm)
M_B	Measuring port operating press. (plugged)	DIN 3852	G 1/4	51 lb-ft (70 Nm)

[1)] ANSI B92.1a-1996, 30° pressure angle, flat base, flank centering, fit class 5
[2)] see General Notes

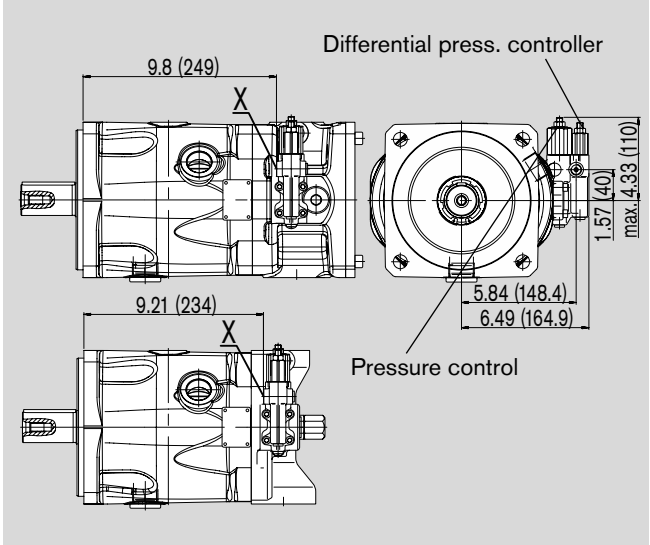
Dimensions with control valves, size 100

Before finalizing your design please request certified installation drawings. Dimensions in inches (mm).

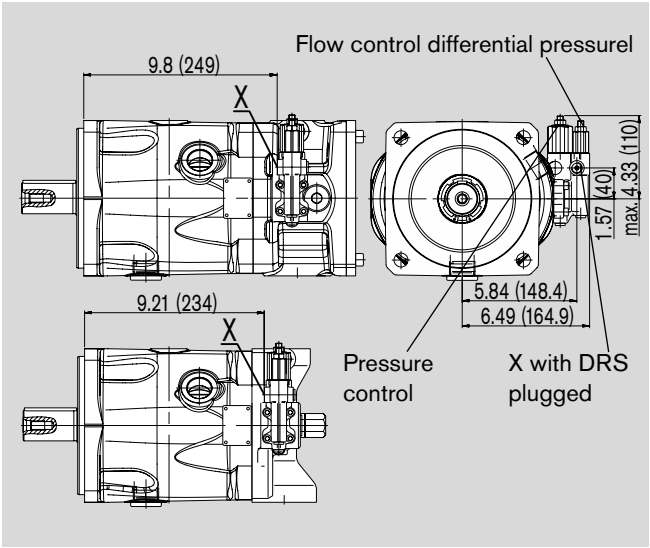
DG - two point, direct control



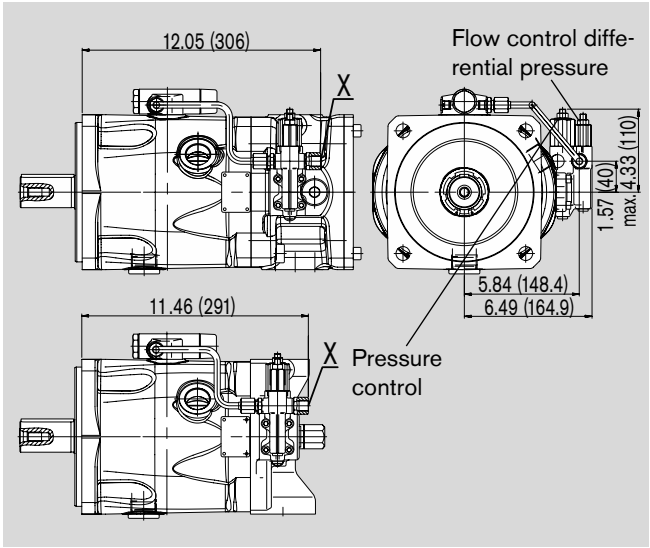
DRG - remote pressure control



DRF/DRS - pressure and flow control



LA... - pressure, flow and power control



Ports

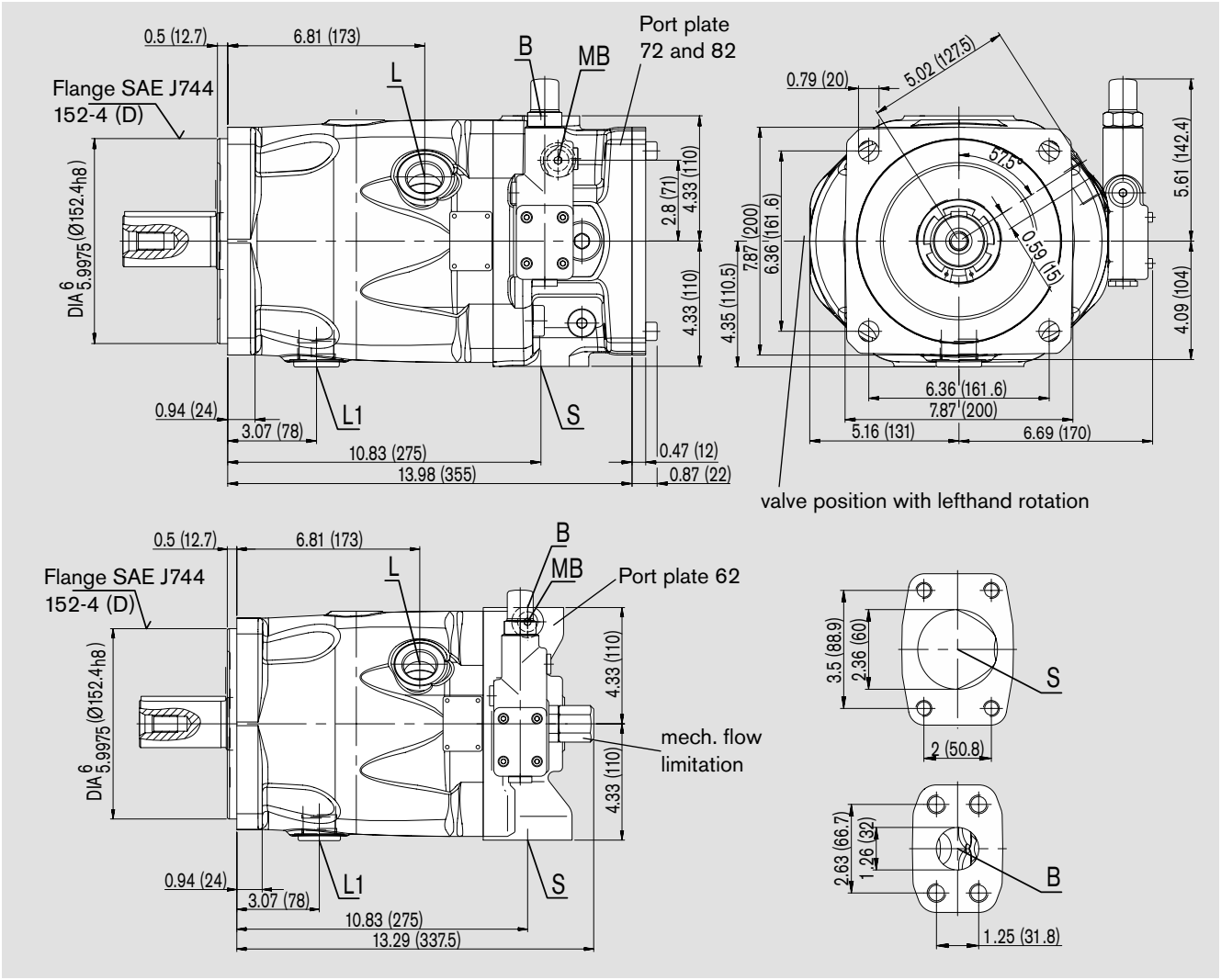
				Tightening torque, max.[1]
X	Pilot pressure port	ISO 11926	7/16-20 UNF; 0.47 (12 deep)	17+1.8 lb-ft (23+2,5 Nm)

[1] see General Notes

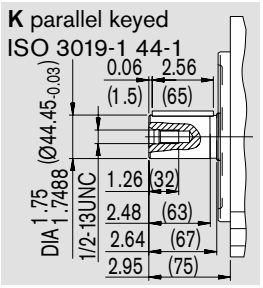
Unit dimensions, size 140

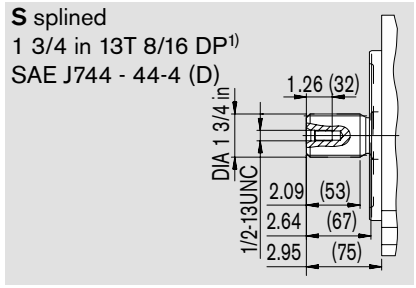
Before finalizing your design please request certified installation drawings. Dimensions in inches (mm).

Example A10VSO140DR/32R-VKD72(62)U99(N00)



Shaft ends





Ports

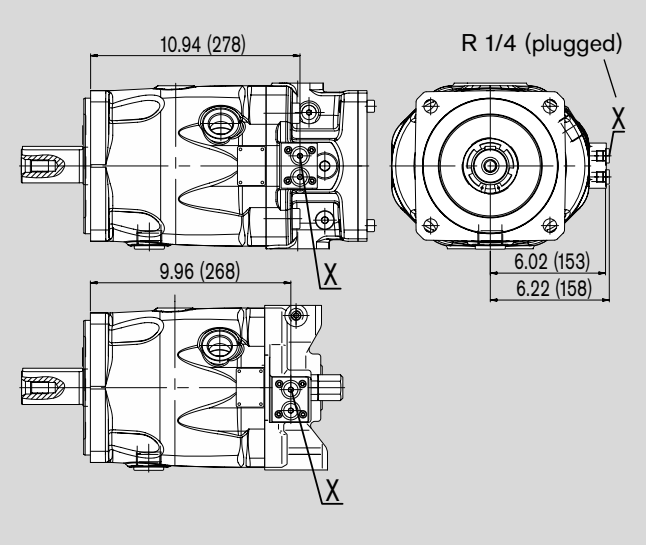
				Tightening torque, max.[2)]
B	Outlet port, SAE flange (code 62)	SAE J518	1 1/4 in	
	Fixing thread	ISO 68	1/2-13 UNC; 0.75 (19) deep	66 lb-ft (90 Nm)
S	Inlet port, SAE flange (code 61)	SAE J518	2 1/2 in	
	Fixing thread	ISO 68	1/2-13 UNC; 0.94 (24) deep	66 lb-ft (90 Nm)
L/L_1	Case drain port (L_1 plugged)	ISO 11926	1 1/16-12 UN	265 lb-ft (360 Nm)
M_B	Measuring port operating press. (plugged)	DIN 3852	G 1/4	51 lb-ft (70 Nm)

[1)] ANSI B92.1a-1996, 30° pressure angle, flat base, flank centering, fit class 5
[2)] see General Notes

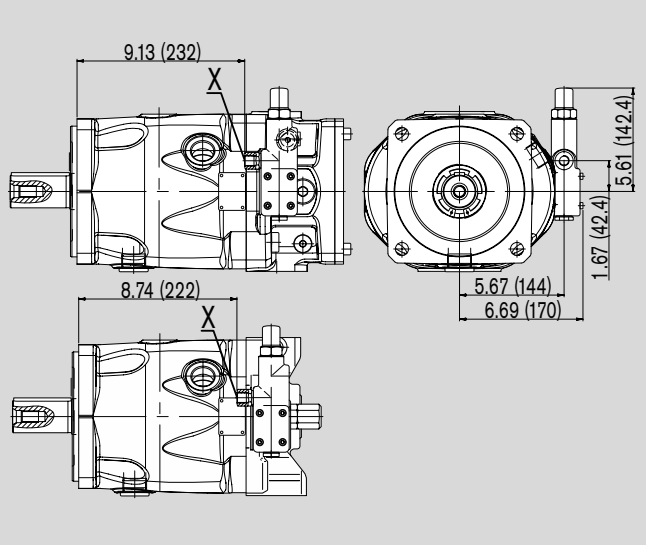
Dimensions with control valves, size 140

Before finalizing your design please request certified installation drawings. Dimensions in inches (mm).

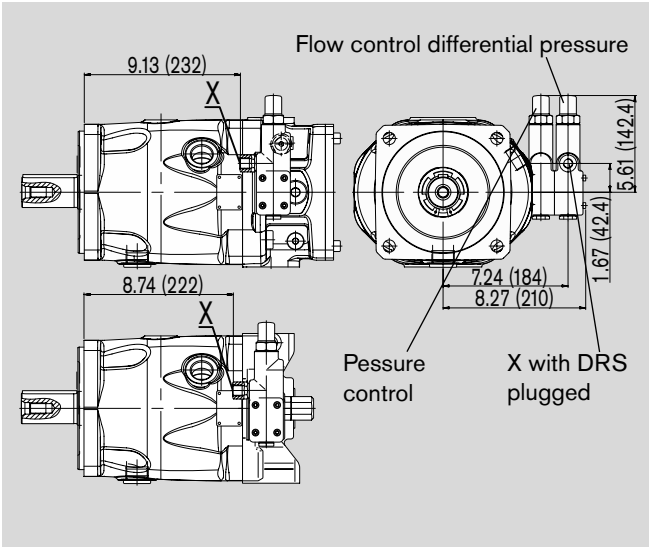
DG - two point, direct control



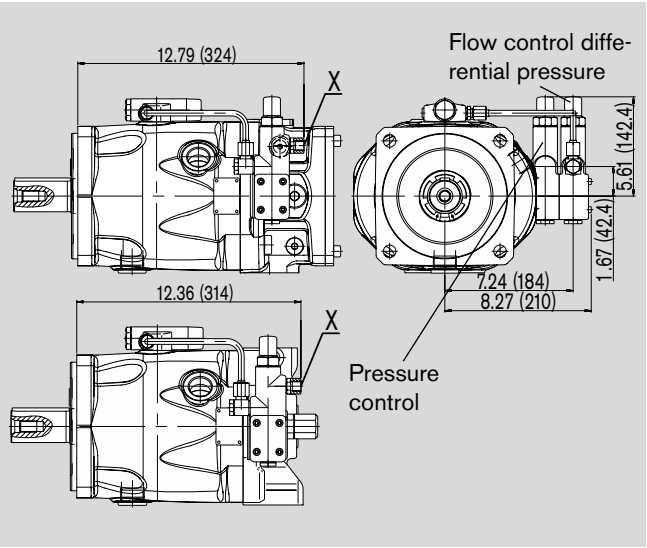
DRG - remote pressure control



DRF/DRS - pressure and flow control



LA... - pressure, flow and power control



Ports

				Tightening torque, max.[1]
X	Pilot pressure port	ISO 11926	9/16-18 UNF; 0.51 (13 deep)	58 lb-ft (80 Nm)

[1] see General Notes

Overview of through drive mounting options

Through drive - A10VSO			mounting option 2. Pumpe			Through drive
Flange	coupler for splined shaft	Code	A10VSO Size (shaft)	A10V(S)O Size (shaft)	Gear pump Series (size)	available on size
SAE J744						
82-2(A)	5/8 in	01			F (5...22)	71...180
	3/4 in	52	10, 18 (S)			71...180
101-2(B)	7/8 in	68		28 (S, R)	N/G (26...49)	71...180
	1 in	04		45 (S, R)		71...180
152-4(D)	1 1/2 in	96		100 (S)		100...180
	1 3/4 in	17		140 (S)		140...180

Combination pumps A10VSO + A10VSO

When using combination pumps it is possible to have multiple, mutually independent hydraulic circuits without the need for a splitter gearbox.

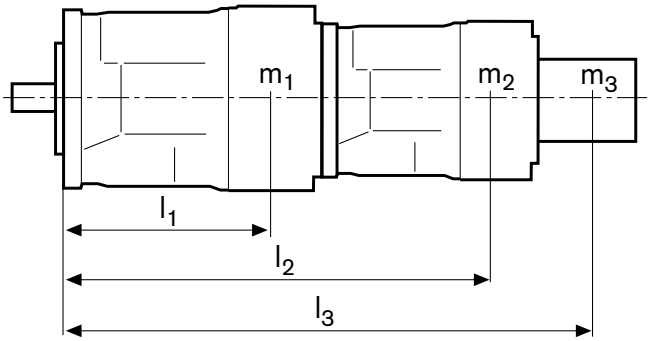
When ordering combination pumps the model codes for the first and the second pump must be joined by a "+".

Ordering example: A10VSO100DR/32R-VSD82**U15** + A10VSO71DRF/32R-VSD62N00

Permissible overhang moment

It is permissible to use a combination of two single pumps of the same size (Tandem pumpp), considering a mass acceleration force of 10 g (10x9,81 m/s^2) without an additional support bracket.

size			71	100	140
Permissible overhang moment					
static	T_m	lb-ft (Nm)	2213 (3000)	3319 (4500)	3319 (4500)
dynamic with 10 g (9,81m/s^2)	T_m	lb-ft (Nm)	221 (300)	332 (450)	332 (450)
Weight	m_1	lbs (kg)	103 (47)	152 (69)	161 (73)
Distance to centre of gravity	l_1	in (mm)	5.59 (142)	6.65 (169)	6.77 (172)



m_1, m_2, m_3 Weight of pumps [lbs (kg)]

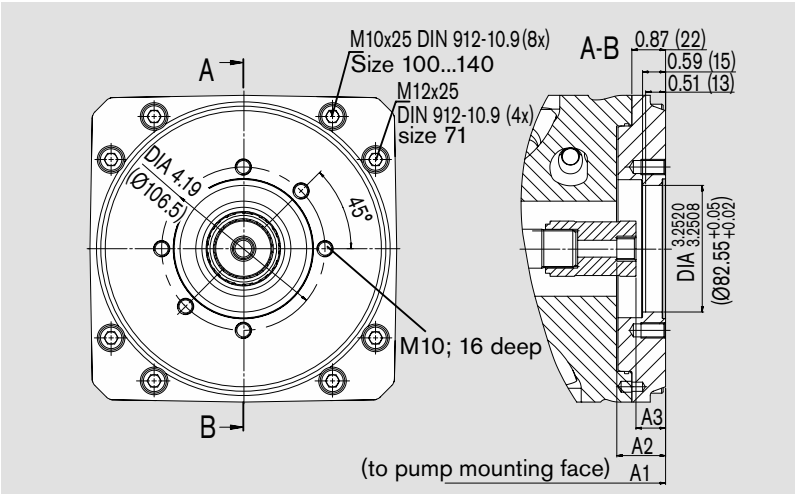
l_1, l_2, l_3 Dist. to centre of gravity [in (mm)]

$$T_m = (m_1 \cdot l_1 + m_2 \cdot l_2 + m_3 \cdot l_3) \cdot \frac{1}{12\ (102)}$$ [lb-ft (Nm)]

Dimensions through drives

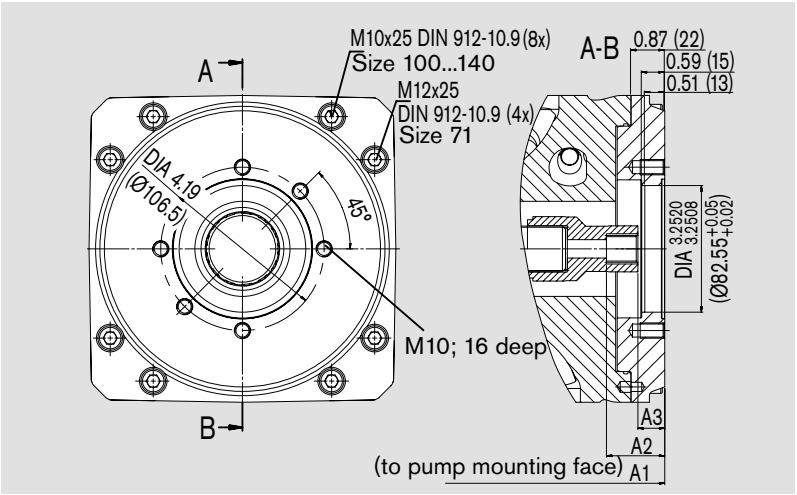
Before finalising your design please request certified installation drawings. Dimensions in inches (mm).

01 **Flange** SAE J744 - 82-2 (A)
Shaft coupler to ANSI B92.1a-1996 5/8 in 9T 16/32DP[1] (SAE J744 - 16-4 (A))



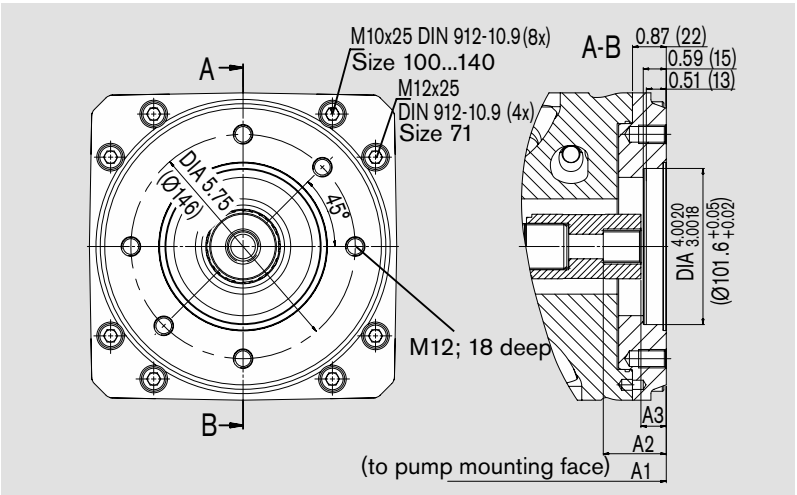
size	A_1	A_2	A_3
71	11.77	1.25	0.76
	(299)	(31,8)	(19,3)
100	14.17	1.25	Request
	(360)	(31,8)	
140	14.84	1.25	Request
	(377)	(31,8)	

52 **Flange** SAE J744 - 82-2 (A)
Shaft coupler to ANSI B92.1a-1996 3/4 in 11T 16/32DP[1] (SAE J744 - 19-4 (A-B))



size	A_1	A_2	A_3
71	11.77	1.5	0.69
	(299)	(38)	(17,5)
100	14.17	1.5	0.69
	(360)	(38)	(17,5)
140	14.84	1.5	0.69
	(377)	(38)	(17,5)

68 **Flange** SAE J744 - 101-2 (B)
Shaft coupler to ANSI B92.1a-1996 7/8 in 13T 16/32DP[1] (SAE J744 - 22-4 (B))



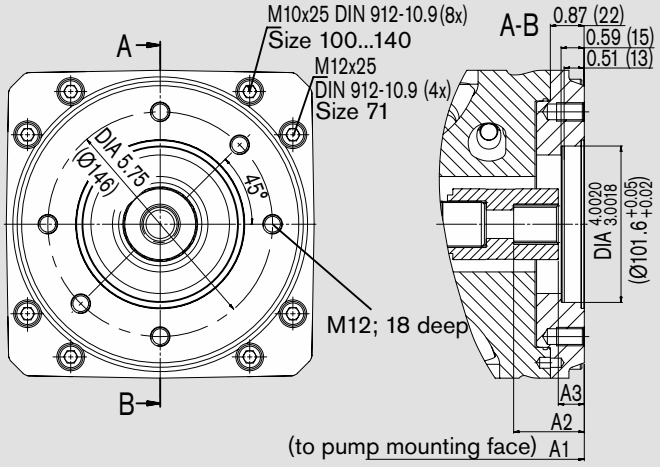
size	A_1	A_2	A_3
71	11.77	1.61	0.65
	(299)	(41)	(16,5)
100	14.17	1.61	0.65
	(360)	(41)	(16,5)
140	14.84	1.61	0.65
	(377)	(41)	(16,5)

[1] 30° pressure angle, flat base, flank centering, fit class 5

Dimensions through drives

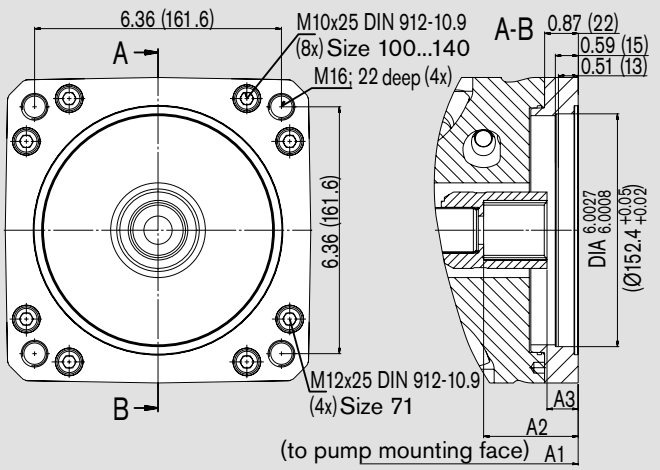
Before finalising your design please request certified installation drawings. Dimensions in inches (mm).

04 **Flange** SAE J744 - 101-2 (B)
Shaft coupler to ANSI B92.1a-1996 1 in 15T 16/32DP[1] (SAE J744 - 25-4 (B-B))



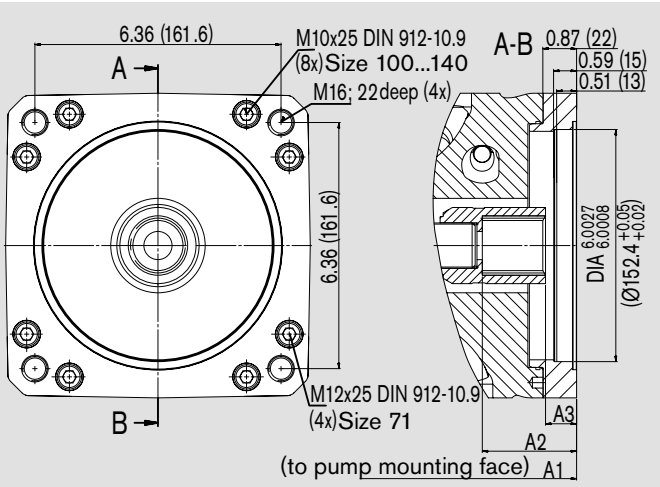
size	A_1	A_2	A_3
71	11.77	1.81	0.67
	(299)	(45,9)	(16,9)
100	14.17	1.81	0.67
	(360)	(45,9)	(16,9)
140	14.84	1.81	0.67
	(377)	(45,9)	(16,9)

96 **Flange** SAE J744 - 152-4 (D)
Shaft coupler to ANSI B92.1a-1996 1 1/2 in 17T 12/24DP[1] (SAE J744 - 38-4 (C-C))



size	A_1	A_2	A_3
100	14.17	2.44	0.8
	(360)	(61,9)	(20,4)
140	14.84	2.44	Request
	(377)	(61,9)	

17 **Flange** SAE J744 - 152-4 (D)
Shaft coupler to ANSI B92.1a-1996 1 3/4 in 13T 8/16DP[1] (SAE J744 - 44-4 (D))



size	A_1	A_2	A_3
140	14.84	3.07	Request
	(377)	(75)	

[1] 30° pressure angle, flat base, flank centering, fit class 5

Installation notes

Optional installation position. The pump housing must be filled with fluid during commissioning and operation

In order to obtain the lowest noise level, all connections (inlet, outlet, pilot pressure and case drain line) must be linked by flexible members to tank.

Avoid placing a check valve in the case drain line. In some case it may be permissible however; please consult us.

The highest of the case drain ports L or L_1 must be connected to tank with piping material for standard pressure rating suitable for the port size.

Vertical installation (Shaft end upwards)

Arrangement inside the reservoir

Before installation fill pump housing, keeping it in a horizontal position.

a) If the min. fluid level is equal to or above the pump mounting face: plug port "L", connect "L_1" and "S" with inlet pipe (recommended); see fig. 1.

b) If the min. fluid level is below the pump mounting face: pipe ports "L_1" and "S" acc. to fig. 2, "L" plugged; see also "Limit of conditions".

Note: to avoid pump damage, remove all protective parts (dust covers, plastic plugs,etc.) before installation.

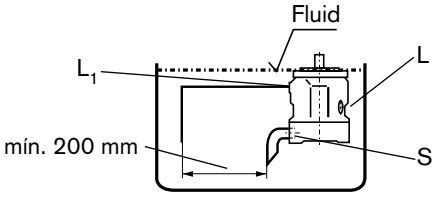


fig. 1

Arrangement outside the reservoir

Before installation fill pump housing, keeping it in a horizontal position. For mounting above the tank see fig. 2.

Limit of conditions

Minimum pump inlet pressure $p_{abs\ min} = 0{,}8$ bar under static and dynamic loading.

Note: try to avoid mounting above tank in order to attain a low noise level.

The permissible suction height h is a result ot the overall pressure loss, but may not be greater than $h_{max} = 800$ mm (immersion depth $h_{t\ min} = 200$ mm).

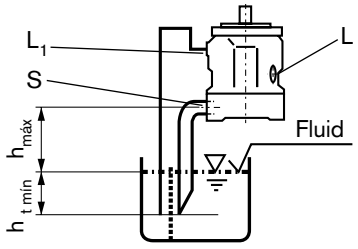


fig 2

Overall pressure loss

$\Delta p = \Delta p_1 + \Delta p_2 + \Delta p_3$ " $(1 - p_{abs\ mín}) = 0{,}2$ bar

Δp_1: Pressure loss in pipe due to acceleration of fluid column

$$\Delta p_1 = \frac{\rho \bullet l \bullet dv}{dt} \bullet 10^{-5}\ [bar]$$

ρ = density [kg/m³]

l = pipe length [m]

dv/dt = change in fluid velocity inlet [m/s²]

Δp_2: Pressure loss due to static head

$$\Delta p_2 = h \bullet \rho \bullet g \bullet 10^{-5}\ [bar]$$

h = height [m]

ρ = density [kg/m³]

g = acc. due to gravity = 9,81 m/s²

Δp_3 = Line losses (Elbows, etc.)

Horizontal installation

The pump must be installed in such a manner, that either "L" or "L_1" is at the top.

Arrangement inside the reservoir

a) If the min. fluid level is above the top of the pump: plug port "L_1", connect "L" and "S" with inlet pipe (recommended); see fig. 3.

b) If the min. fluid level is below the top of the pump: pipe "L" and "S" acc. to fig. 4 , "L_1" plugged; see also "Limit of conditions".

Note: to avoid pump damage, remove all protective parts (dust covers, plastic plugs, etc.) before installation.

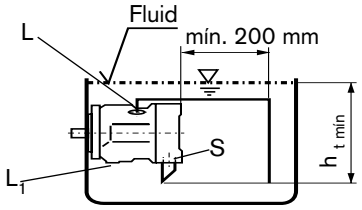


fig. 3

Arrangement outside the reservoir

Fill pump housing before commissioning. Pipe port "S" and the higher of the two case drain ports "L" or "L_1".

a) Mounting above the tank see fig. 4. (see "Limit of conditions")

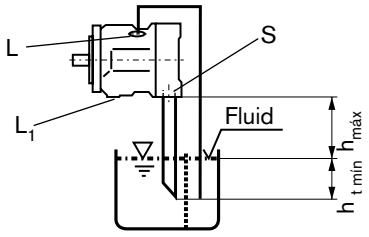


fig. 4

b) Mounting below the tank see fig. 5; pipe port "L_1" and "S" and "L" to be plugged

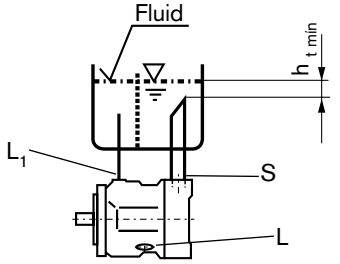


fig. 5

General Notes

– The A10VSO pump is designed to be used in open loop circuits.

– Project planning, assembly, and startup of the motor require the involvement of trained personnel.

– The working and functional ports are only designed to accommodate hydraulic piping.

– Tightening torques: The tightening torques specified in this data sheet are maximum values and may not be exceeded (maximum value for screw thread). Manufacturer specifications for the max. permissible tightening torques of the used fittings must be observed!
For ISO 68/DIN 13 fastening screws we recommend checking the tightening torque individually according to VDI 2230 Edition 2003.

– The housing temperature rises during and shortly after operation. Take suitable safety precautions (e.g. wear protective clothing).

– The data and information contained herein must be adhered to.

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