MANNESMANN REXROTH

Brueninghaus Hydromatik

Variable Displacement Pump AA10VSO

Series 31, Industrial Model, for Open Circuits
Axial piston, swashplate design

Sizes 28...140 | Nominal pressure 4000 psi (280 bar) | Peak pressure 5100 psi (350 bar)

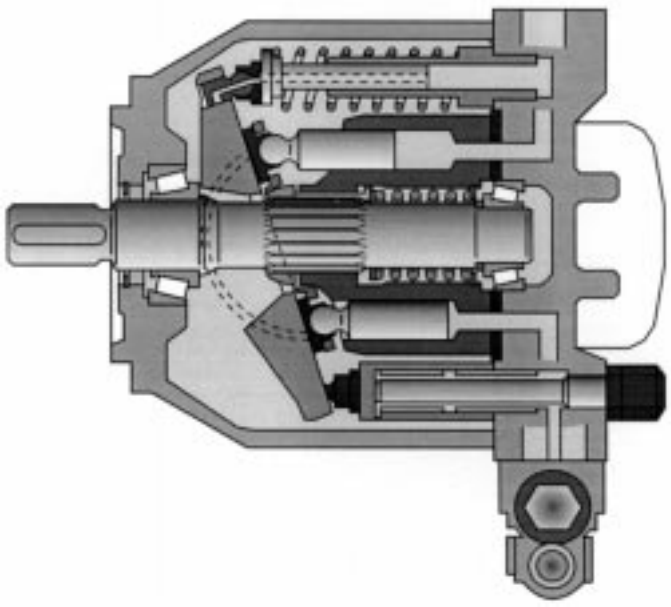
RA 92 711/05.95

replaces 03.93

Variable displacement, axial piston pump AA10VSO of swashplate design is designed for hydrostatic transmissions in open circuits.

Flow is proportional to the drive speed and the displacement. By adjusting the position of the swashplate a stepless variation of the flow is possible.

- SAE mounting flange and shaft
- flange connections SAE
- 2 case drain connections
- good suction characteristics
- permissible continuous operating pressure 4000 psi (280 bar)
- low noise level
- long service life
- axial and radial loading of drive shaft possible
- high power/weight ratio
- wide range of controls available
- short response times
- optional through drive for combination pumps



Ordering code

AA10VSO			/	31	R	–	P	K	C	62	N00

Fluid/Version

Mineral oil (no code)	**omit**
For use with HF fluids	**E-**

Axial piston unit

Swashplate design, variable displacement open circuit, Industrial SAE version	**AA10VSO**

Size

Displacement $V_{g\,max}$		**28**	**45**	**71**	**100**	**140**
	in³/rev.	1.71	2.75	4.33	6.10	8.54
	cm³/rev.	28	45	71	100	140

Control devices

				28	**45**	**71**	**100**	**140**	
Pressure control	DR			●	●	●	●	●	**DR**
	DR	G		●	●	●	●	●	**DRG**
remote pressure control									
Adjustable pressure control for pressure demand control	DFR			●	●	●	●	●	**DFR**
	DFR	1		●	●	●	●	●	**DFR1**
without vent orifice									
Pressure, flow and power control	DFLR			●	●	●	●	●	**DFLR**
Flow control, pilot pressure dependent with pressure control	FHD			●	●	●	●	❍	**FHD**
Electronic flow control	FE1			●	●	●	●	❍	**FE1**
	FE1	D		●	●	●	●	❍	**FE1D**
pressure control									
Electronic pressure / flow control	DFE1			●	●	●	●	●	**DFE1**
Electronic pressure / flow control / integrated electronics	DFEE			●	●	●	●	●	**DFEE** **

Series

	31

Direction of rotation

As viewed from drive shaft	clockwise	**R**
	counter-clockwise	**L**

Seals

Buna-N (NBR per DIN ISO 1629); shaft seal FPM (Fluorocarabon)	**P**
FPM (fluorocarbon)	**V**

Shaft end

	28	**45**	**71**	**100**	**140**	
SAE-keyed shaft	7/8"	1"	1 1/4"	1 1/2"	1 3/4"	**K**
SAE-splined shaft modified, reinforced (higher thru-drive torques)	7/8"	1"	1 1/4"	–	–	**R**

****For complete ordering code information for DFEE, see Page 37.**

– = not available
● = available
❍ = in preparation

Axial piston unit

Size

Control devices

Series

Direction of rotation

Seals

Shaft end

Mounting flange

SAE 2 hole	●	●	●	●	–	**C**
SAE 4 hole	–	–	–	–	●	**D**

Service ports

		28	**45**	**71**	**100***	**140***	
Ports B and S	Opposite side ports, SAE flange, standard series, UNC mounting screws (Code 62)	●	●	–	●	●	**62**
*Note: Size 100 & 14 pressure ports are SAE code 62.	Opposite side ports, SAE flange, standard series, B port size 1", UNC mounting screws (Code 62)	–	–	●	–	–	**92**

Through drives

	28	**45**	**71**	**100**	**140**	
without through drive	●	●	●	●	●	**N00**
with through drives for mounting of axial piston pump, gear pump or radial piston pump						
mounting flange / **shaft/coupling** / **for mounting:**						
SAE A, 2-bolt / keyed SAE A-B / AA10VSO 18	●	●	●	●	●	**K40**
SAE B, 2-bolt / keyed SAE B / AA10VSO 28	●	●	●	●	●	**K03**
SAE B-B, 2-bolt / keyed SAE B-B / AA10VSO 45		●	●	●	●	**K05**
SAE C, 2-bolt / keyed SAE C / AA10VSO 71			●	●	●	**K08**
SAE C, 2-bolt / keyed SAE C-C / AA10VSO 100				●	●	**K38**
SAE D, 4-bolt / keyed SAE D / AA10VSO 140					●	**K21**
ISO 63, 4-bolt metric / keyed ø 25 (mm) / R4	●	●	●	●	●	**K57**
SAE-A, 2-bolt / splined shaft 5/8", SAE A / G2, GC2/3, A10VO 18	●	●	●	●	●	**K01**
SAE-B, 2-bolt / splined shaft 7/8", SAE B / G3, A10VO 28	●	●	●	●	●	**K02**
SAE-A, 2-bolt / splined shaft 3/4" / A10VSO 18	●	●	●	●	●	**K52**
SAE-B, 2-bolt / splined shaft 1", SAE B-B / A10VO 45		●	●	●	●	**K04**
SAE-B, 2-bolt / splined shaft 11/4", SAE C / GC4/5		❍	❍	❍	❍	**K06**
SAE-C, 2-bolt / splined shaft 1 1/4", SAE C / G4, A10VO 71			●	●	●	**K07**
SAE-C, 2-bolt / splined shaft 1 1/2", SAE C-C / A10VO 100,GC6				●	●	**K24**
SAE-D, 4-bolt / splined shaft 1 3/4", SAE D / A10VO 140					●	**K17**
82-2 (SAE A) / 19-4 (SAE A-B mod.) / A10VSO 18 (shaft end R)	●	●	●	●	●	**KA1**
101-2 (SAE B) / 22-4 (SAE B moc.) / A10VO 28 (shaft end R), PVV 1 and 2 (w/J shaft)	●	●	●	●	●	**KA3**
101-2 (SAE B) / 25-4 (SAE B-B mod.) / A10VO 45 (shaft end R)	–	●	●	●	●	**KA4**
127-2 (SAE C) / 3204 (SAE C mod.) / A10VO 71 (shaft end R), PVV 4 and 5 (w/J shaft)	–	–	●	●	●	**KA5**

CAUTION!!
* **Project note for size 71:**
Pressure port B is available in:
SAE 1" standard pressure range, 5000 psi, for **pressures in excess of 3600 psi (250 bar)**
(see page 11)

For new applications high pressure port SAE 1" must be used.

Combination pumps

1. If a second pump is to be mounted at the factory, both ordering codes must be combined with a "+" symbol.
   Ordering code of the 1st pump + Ordering code of 2nd pump.
   Example: AA10VSO 100 DR/31R-PKC62K08 + AA10VSO 71 DFR/31R-PKC62N00
2. If a gear or radial piston pump is to be mounted at the factory, please consult us.

Hydraulic fluid

The AA10VSO pumps in the standard design, should be used with good quality, petroleum oil based, anti-wear hydraulic fluids. More detailed information regarding the selection of hydraulic fluids and their application limits can be found in our Data Sheets RA 90 220 (Petroleum Oil), RA 90 221 (Biodegradable Fluids) and RA 90 223 (Type HF–Fire Resistant/Synthetic Fluids).
When operating with environmentally compatible fluids (Biodegradable) or Fire Resistant (Type HF synthetic fluids) possible reduction of the operating specifications may be required.

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:

Optimum Viscosity (ν_{opt}) 80...170 SUS (16...36 mm²/s)

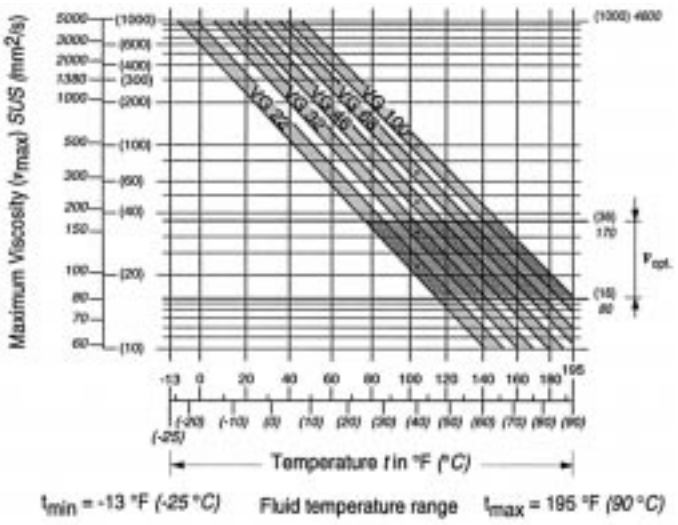
Viscosity limits
The limiting values for viscosity are as follows:

Absolute Minimum Viscosity (ν_{min}) 60 SUS (10 mm²/s)
for short periods at max. permissible leakage oil temperature t_{max} = 195° F (90° C)

Maximum Viscosity (ν_{max}) 4600 SUS (1000 mm²/s)
for short periods during cold start-up

Temperature range (see Selection Diagram)
t_{min} = –13° F (–25° C)
t_{max} = +195° F (+90° C)

Selection diagram



Notes on hydraulic fluid selection
In order to select the correct fluid, it is necessary to know the operating temperature in the tank (open circuit) in relation to the ambient temperature.

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

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

Important: The leakage fluid (case drain fluid) temperature is influenced by pressure and speed and is typically higher than the circuit temperature. However, maximum temperature at any point in the system must be less than 195 °F (90°C).

If it is not possible to comply with the above conditions because of extreme operating parameters or high ambient temperature, please consult us.

Filtration of the hydraulic fluid (axial piston unit)
In order to garantee reliable function, the operating fluid must be maintained to a minimum cleanliness level of

9 to NAS 1638
6 to SAE
18/15 to ISO/DIS 4406

This is achievable, for example, using filter elements type ...D020 (see RA 31278). This gives a filtration quotient of fitted

$\beta_{20} \geq 100$

Mechanical stroke limiter

Mechanical stroke limiter is standard for the non-through drive version (N00). It is not possible in combination with through drive.

Q_{max}: with sizes 28 to 140
adjustment range $V_{g\,max}$ to 50 % $V_{g\,max}$

Q_{min}: with sizes 100 to 140
adjustment range $V_{g\,min}$ to 5 0% $V_{g\,max}$

Technical data

(valid for operation with petroleum oil; for biodegradable fluids, see RA 90 221; for water based and other fire resistant fluids see RA 90 223)

Operating pressure range – Inlet side

Absolute pressure at port S (suction inlet)

$p_{abs\ min}$ ——— 12 psi (0.8 bar)

$p_{abs\ max}$ ——— 435 psi (30 bar)

Operating pressure range – Outlet side

Pressure at port B

Nominal pressure p_N ——— 4000 psi (280 bar)

Intermittent pressure (10% of duty cycle) ——— 4600 psi (315 bar)

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

Applications with intermittend operating pressure up to 4600 psi (315 bar) at ≤ 10 % of duty cycle are possible.

Direction of flow:

S to B.

Case drain pressure

Maximum permissible pressure of leakage fluid (at port L, L_1): Maximum 7 psi (0.5 bar) higher than the inlet pressure at port S, but not higher than 30 psi (2 bar).

Determination of inlet pressure p_{abs} at the suction port S, or the reduction in output flow for increasing speed.

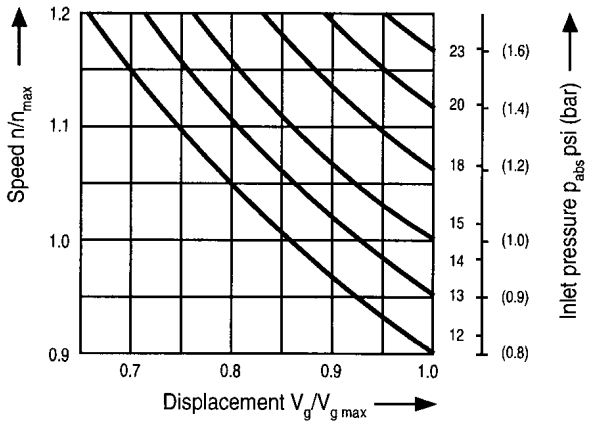
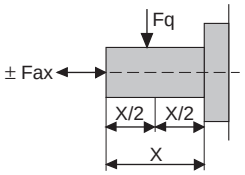


Table of values (theoretical values, without considering η_{mh} and η_v; values rounded)

Size				28	45	71	100	140
Displacement		$V_{g\ max}$	in³ (cm³)	1.71 (28)	2.75 (45)	4.33 (71)	6.10 (100)	8.54 (140)
Max. Speed [1])	at $V_{g\ max}$	$n_{o\ max}$	rpm	3000	2600	2200	2000	1800
Max. permissible speed (speed limit) dependent on inlet pressure p_{abs} or reduced displacement $V_g < V_{g\ max}$		$n_{o\ max\ perm.}$	rpm	3600	3100	2600	2400	2100
Max. Flow	at $n_{o\ max}$	$Q_{o\ max}$	gpm (L/min)	22 (84)	31 (117)	41 (156)	53 (200)	67 (252)
	at n_E = 1800 rpm	Q	gpm (L/min)	13.3 (50)	21.4 (81)	33.8 (128)	47.6 (180)	67 (252)
Max. Power	at $n_{o\ max}$	$P_{o\ max}$	Hp (kW)	51 (39)	72 (55)	96 (73)	124 (93)	156 (118)
Δp = 4000 psi (280 bar)	at n_E = 1800 rpm	P	Hp (kW)	31 (24)	50 (38)	79 (60)	111 (84)	156 (118)
Max. Torque Δp = 4000 psi (280 bar)	at $V_{g\ max}$	T_{max}	lb-ft (Nm)	91 (125)	146 (200)	230 (316)	324 (445)	453 (623)
Torque Δp = 1450 psi (100 bar)	at $V_{g\ max}$	T	lb-ft (Nm)	33 (45)	53 (72)	83 (113)	117 (159)	164 (223)
Moment of inertia about drive axis		J	lb-ft² (kgm²)	0.0403 (0.0017)	0.0783 (0.0033)	0.1970 (0.0083)	0.3963 (0.0167)	0.5743 (0.0242)
Filling volume (case)			gal (L)	0.2 (0.7)	0.26 (1.0)	0.4 (1.6)	0.6 (2.2)	0.8 (3.0)
Approx. weight (without fluid)		m	lbs. (kg)	33 (15)	46 (21)	73 (33)	99 (45)	132 (60)
Max. Force on drive shaft	Max. permissible axial force	$F_{ax\ max}$	lbs.f. (N)	225 (1000)	337 (1500)	540 (2400)	900 (4000)	1080 (4800)
	Max. permissible radial force	$F_{q\ max}$	lbs.f. (N)	270 (1200)	337 (1500)	427 (1900)	517 (2300)	630 (2800)

[1]) These values are valid for an absolute pressure of 14.5 psi (1 bar) at the suction port S. By reducing the output flow or increasing the input pressure, the speed can be increased as shown in the diagram.

Application of forces



Calculation of size

Output Flow: $Q = \frac{V_g \bullet n \bullet \eta_v}{231}$ gpm $\left(Q = \frac{V_g \bullet n \bullet \eta_v}{1000}\right)$ L/min

Output Torque: $T = \frac{V_g \bullet \Delta p}{24 \bullet \pi \bullet \eta_{mh}}$ lb-ft $\left(T = \frac{1.59 \bullet V_g \bullet \Delta p}{100 \bullet \eta_{mh}}\right)$ Nm

Input Power: $P = \frac{T \bullet n}{5252} = \frac{Q \bullet \Delta p}{1714 \bullet \eta_t}$ HP $\left(P = \frac{2\pi \bullet T \bullet n}{60000} = \frac{T \bullet n}{9549} = \frac{Q \bullet \Delta p}{600 \bullet \eta}\right)$ kW

V_g = Geometric displacement - in³ (cm³) per rev.
Δ p = Pressure differential - psi (bar)
n = Speed (rpm)
η_v = Volumetric efficiency
η_{mh} = Mechanical-hydraulic efficiency
η_t = Total efficiency ($\eta_t = \eta_v \bullet \eta_{mh}$)

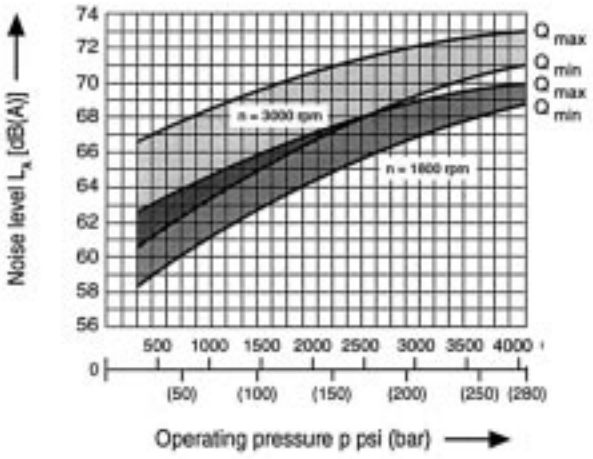
Installation notes

Installation position is optional. The pump housing must be filled with fluid both when commissioning and in operation. In order to achieve low noise level, all connecting lines (suction, pressure, and drain lines) are to be isolated from the tank by flexible members.
A check valve in the drain lines should be avoided. In individual cases, this may be possible, please enquire.

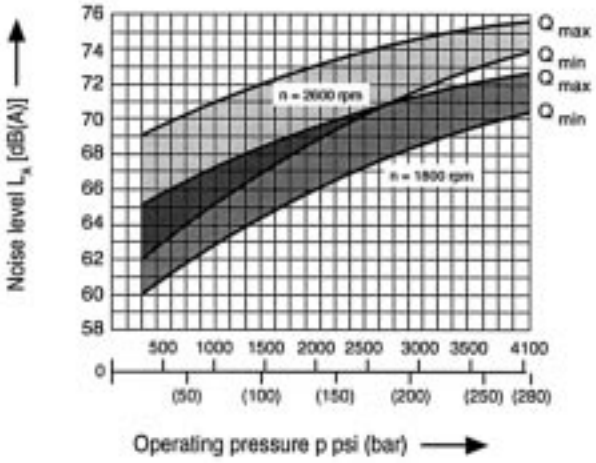
Operating curves for pump with constant pressure control DR

Noise level
Measured in an anechoic chamber to DIN 43635
Distance from microphone to pump = 3.3 ft (1 m)
Measuring error ±2 dB (A)
Fluid used: petroleum oil to ISO VG 46 DIN 51519; temperature = 122°F (50°C)

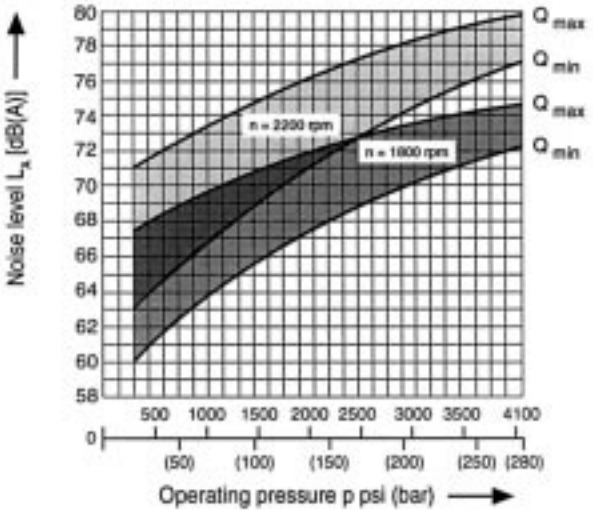
Size 28



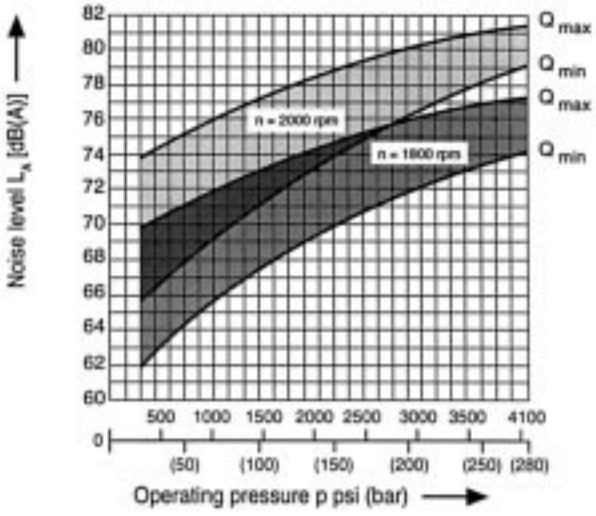
Size 45



Size 71



Size 100

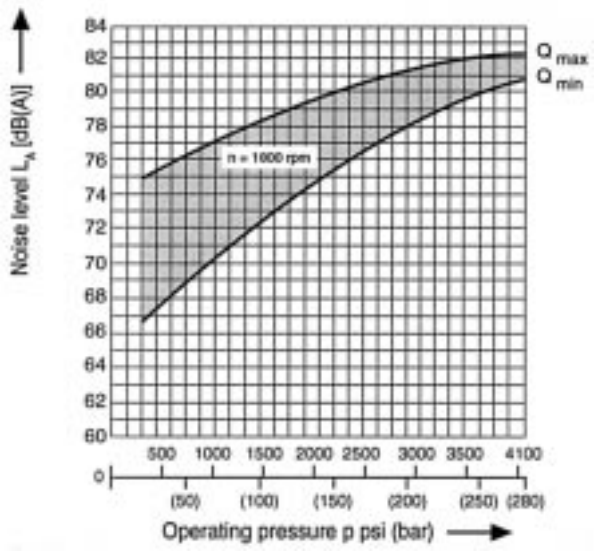


Operating curves for pump with constant pressure control DR

Noise level

Measured in an anechoic chamber to DIN 43635
Distance from microphone to pump = 3.3 ft (1 m)
Measuring error ±2 dB (A)
Fluid used: petroleum oil to ISO VG 46 DIN 51519; temperature = 122°F (50°C)

Size 140

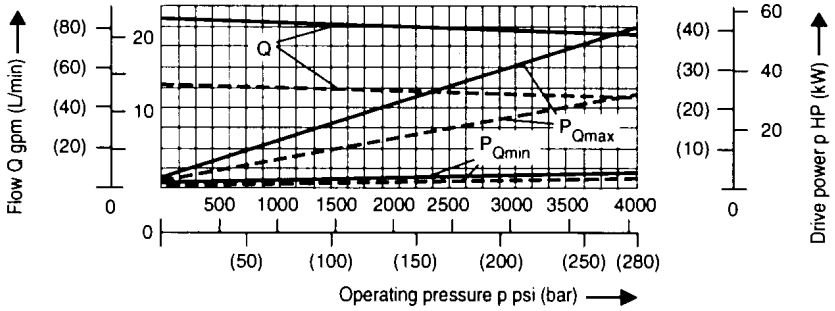


Drive power and output flow

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

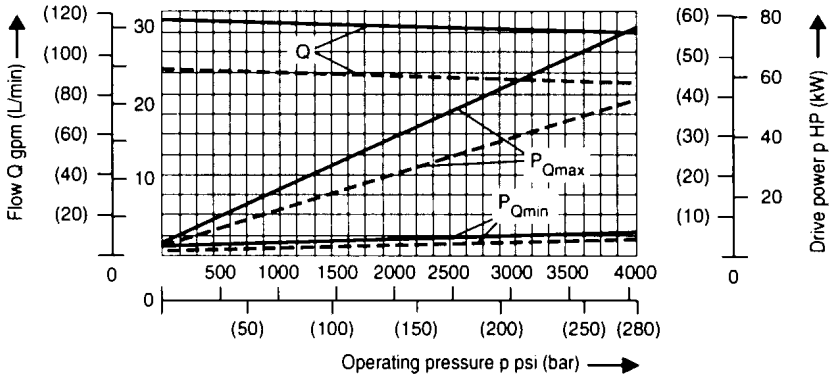
Size 28

– – – – n = 1800 rpm
——— n = 3000 rpm



Size 45

– – – – n = 1800 rpm
——— n = 2600 rpm

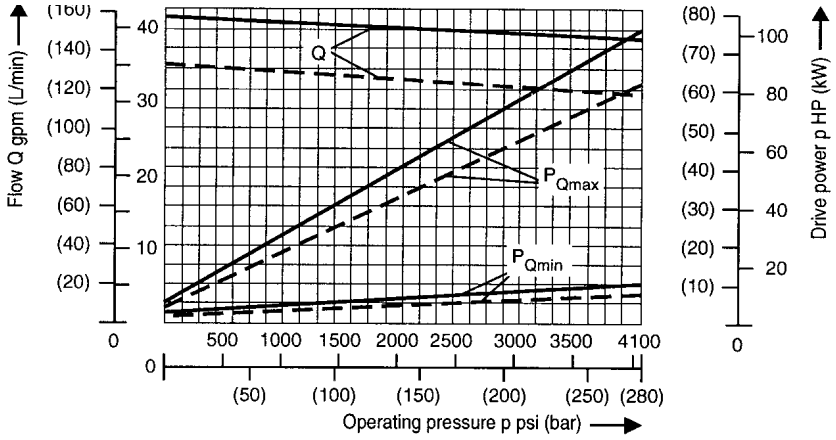


Drive power and output flow

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

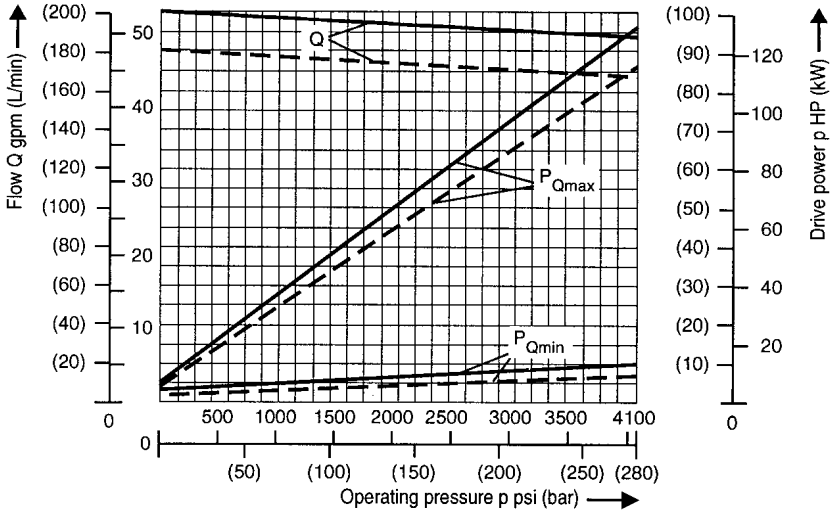
Size 71

– – – – n = 1800 rpm
——— n = 2200 rpm



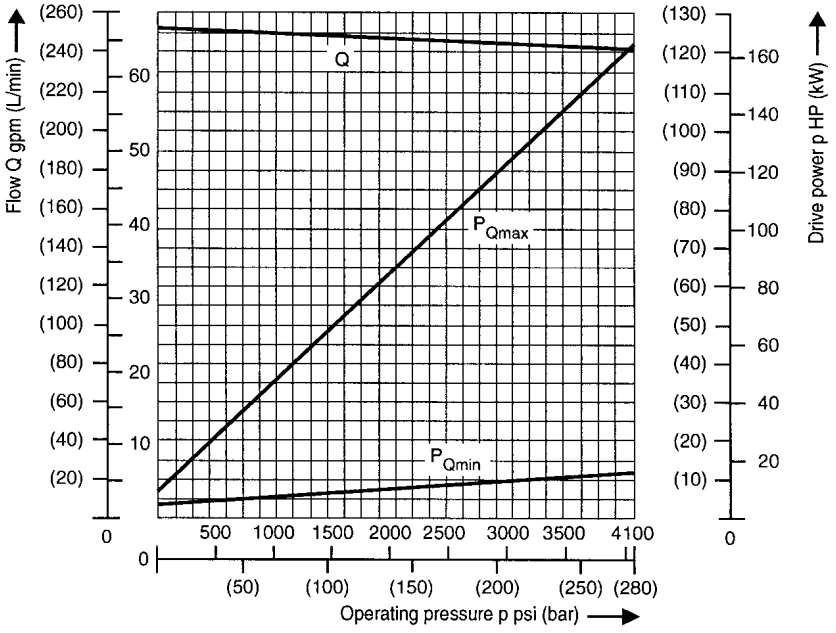
Size 100

– – – – n = 1800 rpm
——— n = 2000 rpm



Size 140

——— n = 1800 rpm



Total efficiency:

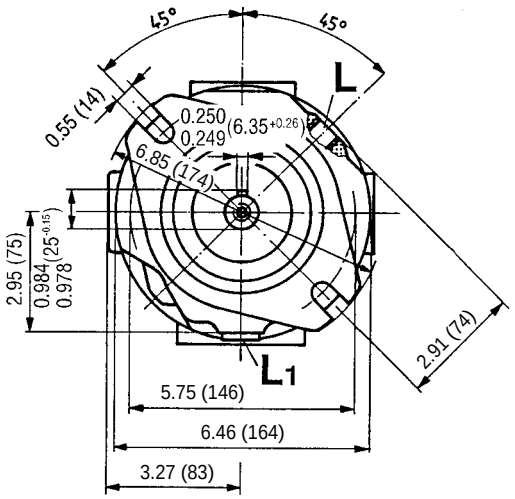
$$\eta_t = \frac{Q \cdot p}{P_{Q\,max} \cdot 1714} \left(\frac{Q \cdot p}{P_{Q\,max} \cdot 600} \right)$$

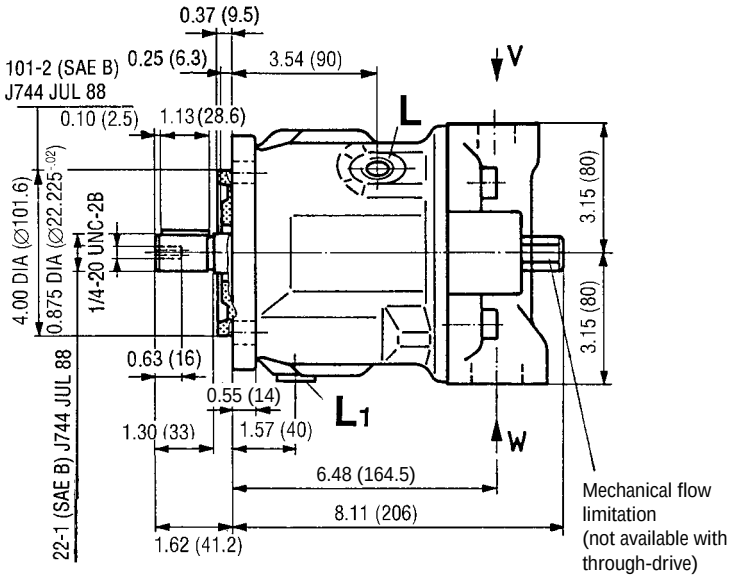
Volumetric efficiency:

$$\eta_v = \frac{Q}{Q_{theor.}}$$

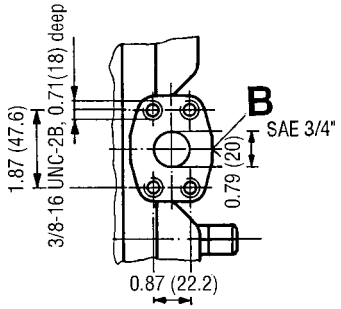
Unit dimensions size 28

Model N**00** (without through drive)
not including control

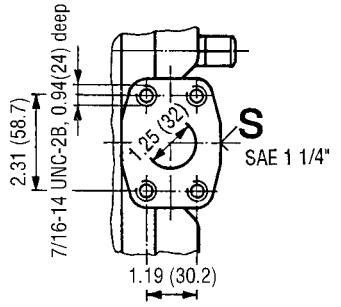




Detail V



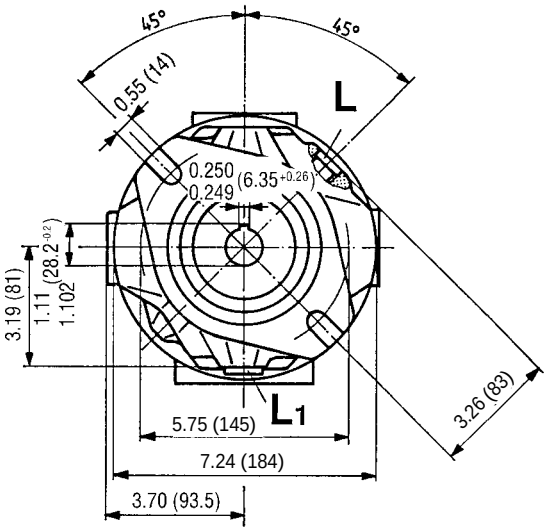
Detail W

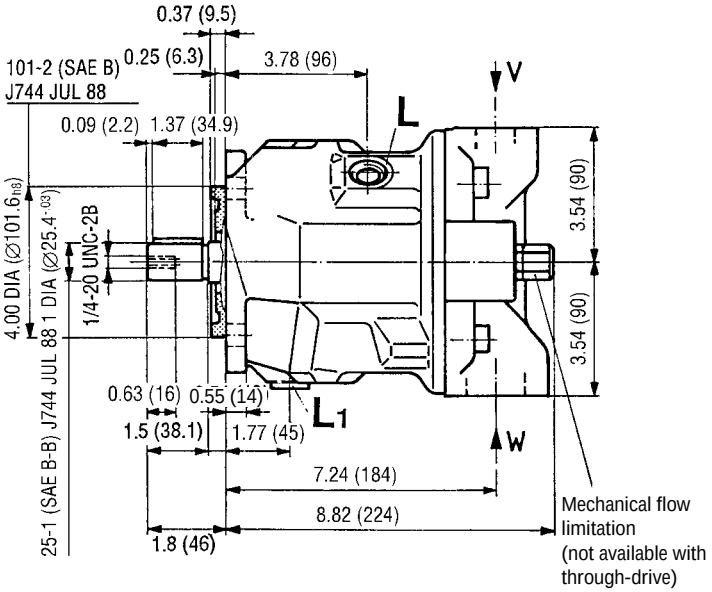


B	Pressure port	3/4" SAE	(standard pressure series, Code 61)
S	Suction port	1 1/4" SAE	(standard pressure series)
L/L_1	Case drain ports	SAE-8; 3/4 - 16 UNF - 2B	(L_1 plugged at factory, Code 61)

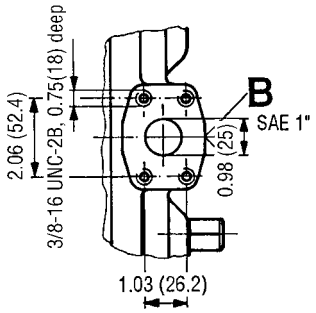
Unit dimensions size 45

Model N**00** (without through drive)
not including control

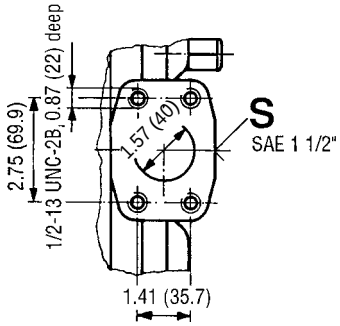




Detail V



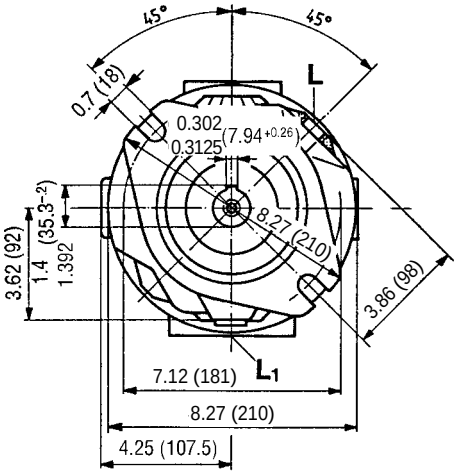
Detail W

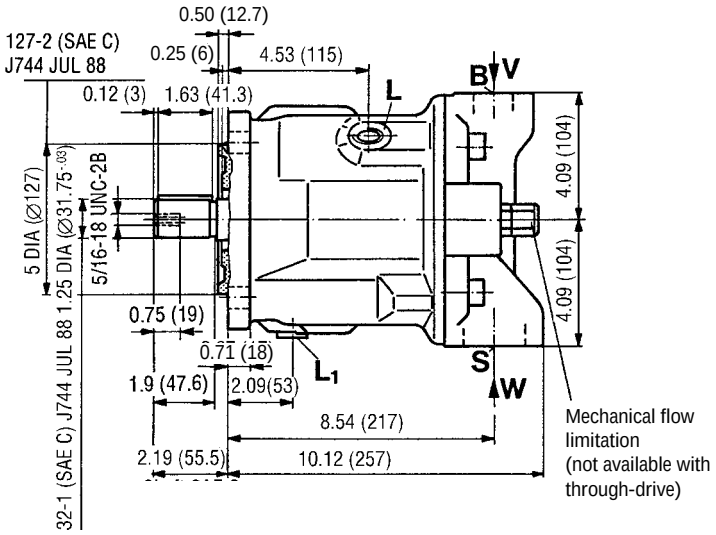


B	Pressure port	1" SAE	(standard pressure series, Code 61 – 5000 psi)
S	Suction port	1 1/2" SAE	(standard pressure series)
L/L_1	Case drain ports	SAE 10; 7/8 - 14 UNF - 2B	(L_1 plugged at factory, Code 61)

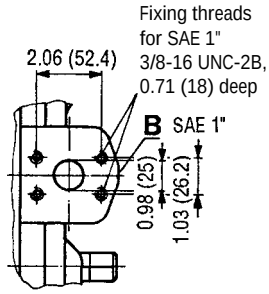
Unit dimensions size 71

Model N**00** (without through drive)
not including control

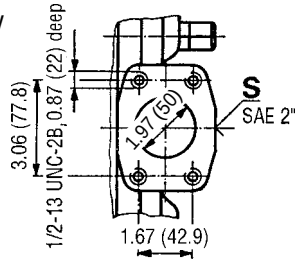




Portplate 92 (1" – 5000 psi)
Detail V



Detail W

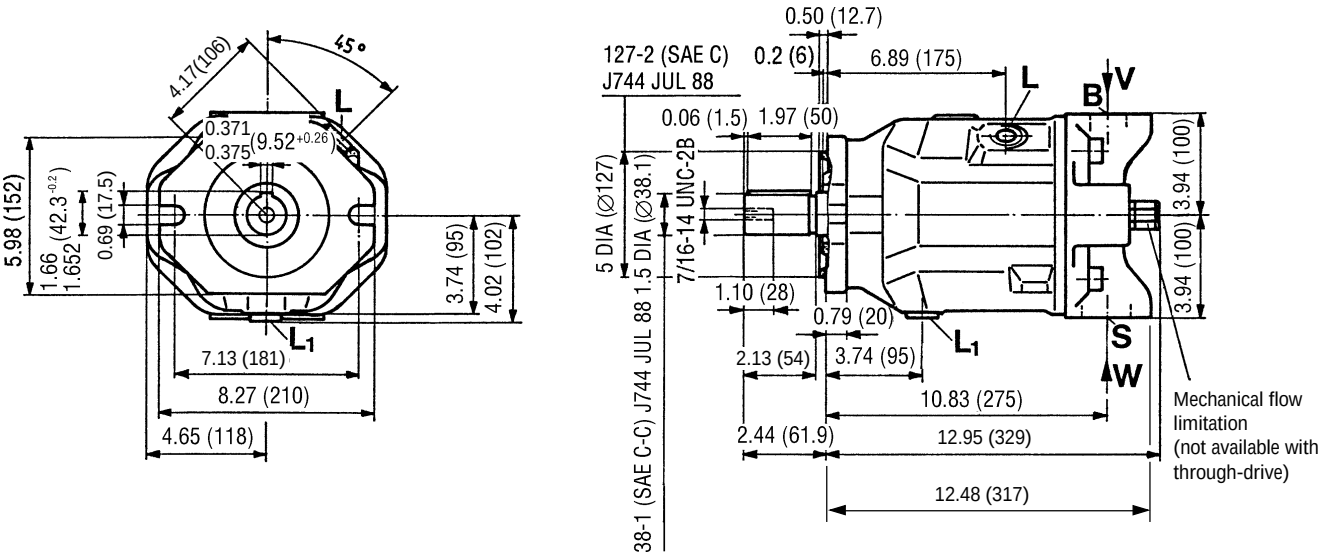


B	Pressure port	1" SAE – 5000 psi	(standard pressure series, Code 61)
S	Suction port	2" SAE	(standard pressure series)
L/L_1	Case drain ports	SAE 10; 7/8 - 14 UNF - 2B	(L_1 plugged at factory)

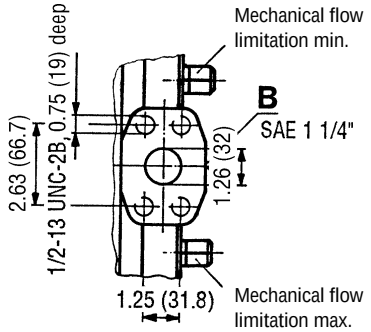
CAUTION!!
At pressure port B there is one optional SAE mounting available,
Portplate code 92 **SAE 1"** standard pressure series, 5000 psi, for pressures **in excess of 3600 psi (250 bar)**. For operating pressures in excess of 3600 psi (250 bar) or for new projects an SAE 1" pressure flange should be used.

Unit dimensions size 100

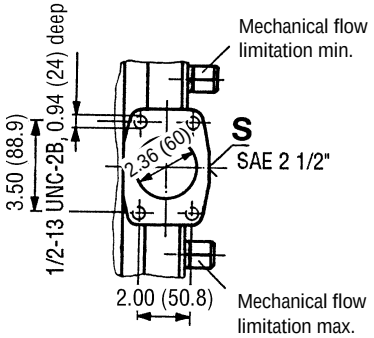
Model N**00** (without through drive)
not including control



Detail V



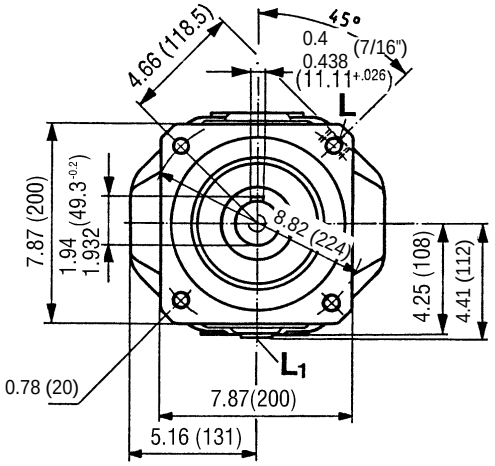
Detail W

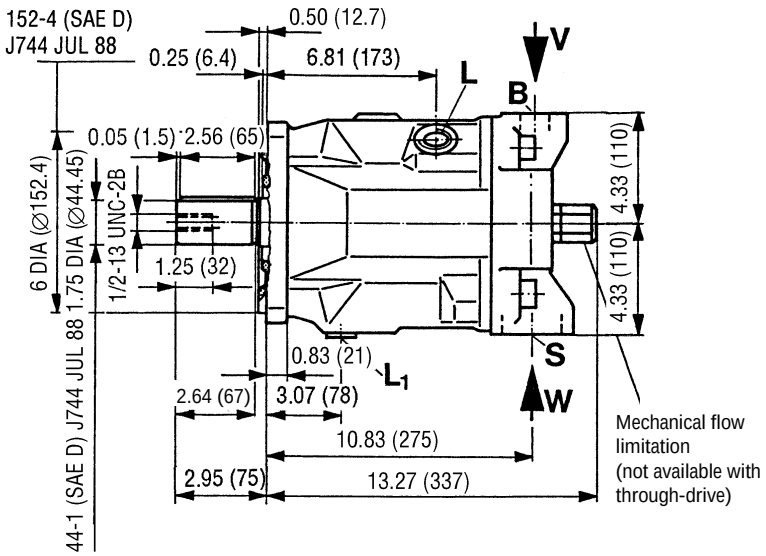


B	Pressure port	1 1/4" SAE – 6000 psi	(high pressure series, Code 62)
S	Suction port	2 1/2" SAE	(standard pressure series, Code 61)
L/L_1	Case drain ports	SAE 12; 1-1/16 - 12UN - 2B	(L_1 plugged at factory)

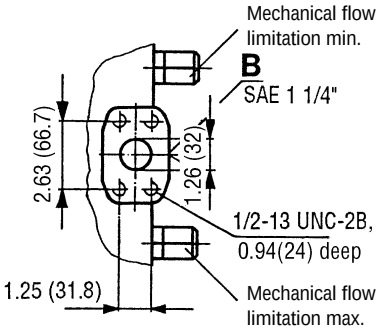
Unit dimensions size 140

Model N**00** (without through drive)
not including control

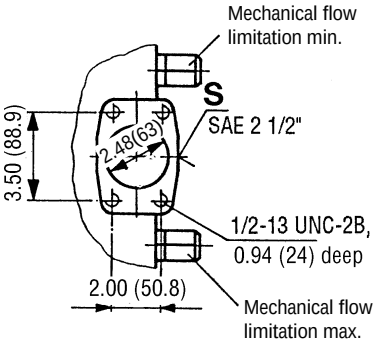




Detail V



Detail W



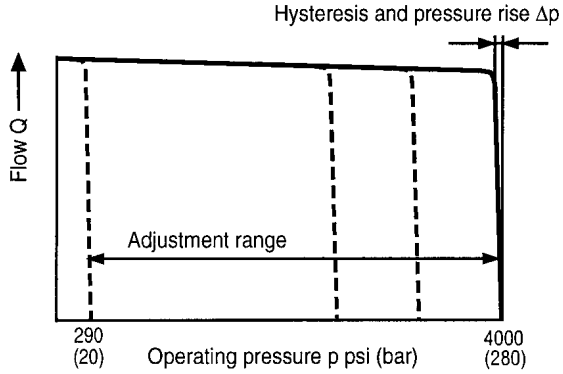
B	Pressure port	1 1/4" SAE – 6000 psi	(high pressure series, Code 62)
S	Suction port	2 1/2" SAE	(standard pressure series, Code 61)
L/L_1	Case drain ports	SAE 12; 1-1/16 - 12UN - 2B	(L_1 plugged at factory)

DR Constant pressure control

The constant pressure control pressure compensation, 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 services. Pressure may be steplessly set at the pilot valve.

Static operating curve

at n_1 = 1500 rpm; t_{oil} = 122°F (50°C)

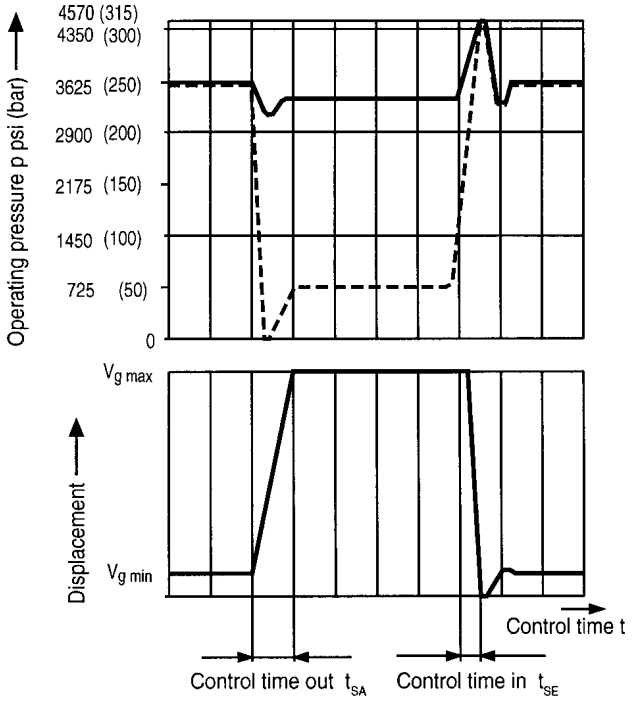


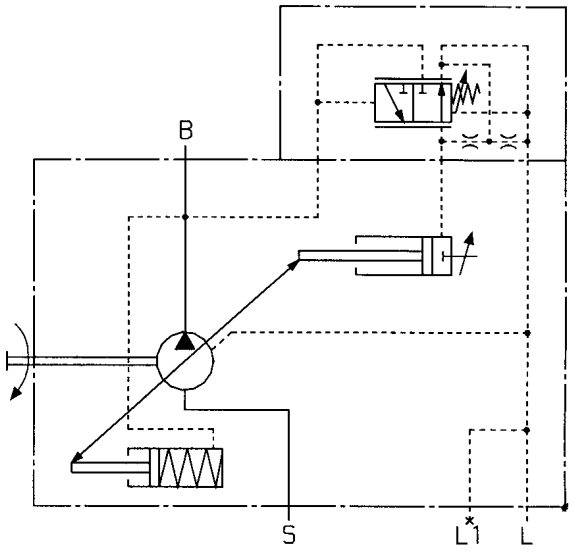
Dynamic response curve

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

Operating conditions: n = 1500 rpm
t_{oil} = 122°F (50°C)
Pressure cut-off at 5100 psi (350 bar)

Load steps were obtained by suddenly opening and closing the pressure line with a pressure relief valve as load valve 3.3 ft (1 m) from the output flange of the pump.





Port connections

B Pressure port
S Suction port
L/L_1 Case drain ports (L_1 plugged at factory)

CAUTION!!

Unloading the compensated pump too fast, e.g. by means of a non-dampened directional valve, too low pressure may lead to cavitation under certain inlet conditions. For sizes 28–100 a damping orifice can be fitted in the control to slow down the on-stroke time of the pump. For the size 140, an adjustable stroke limiter on the compensator spool is available for this purpose. Consult factory for details.

Technical data

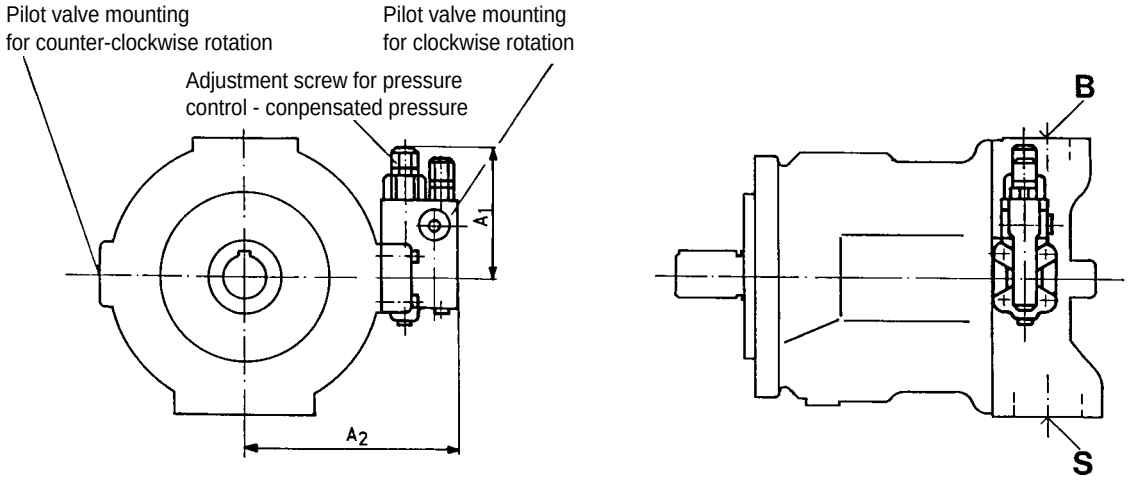
Hysteresis and pressure rise Δp ——— max. 60 psi (4 bar)
External pilot oil usage ——— max. 0.8 gpm (3 L/min)
Loss of flow at Q_{max} see page 7 and 8.

Response 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)
28	60	30	20
45	80	40	20
71	100	50	25
100	125	90	30
140	130	110	30

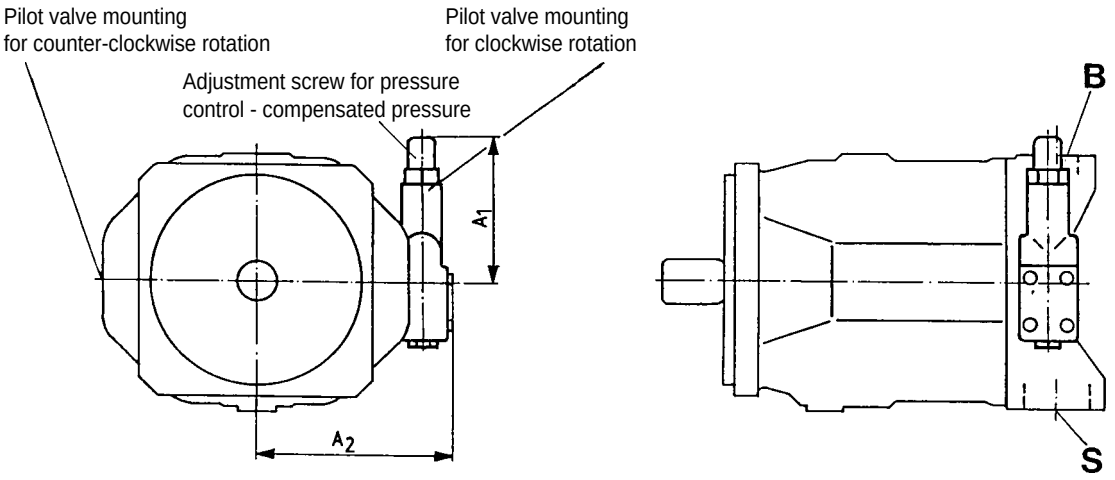
DR Constant pressure control – pressure compensation

Unit dimensions - Sizes 28 to 100



In sizes 28 to 100, the DFR valve is used in which the flow control is blocked at the factory and not tested.

Unit dimensions - Size 140



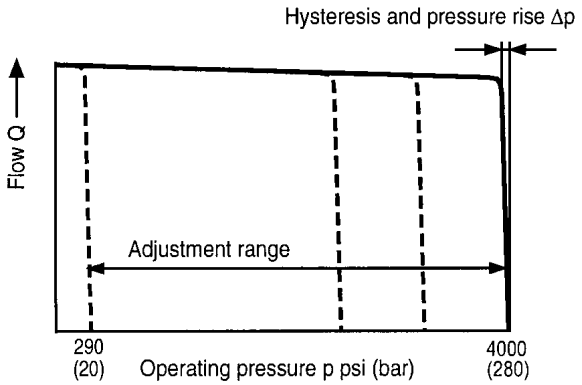
Size	A_1	A_2
28	4.11 (105)	5.35 (135.5)
45	4.11 (105)	5.75 (145.5)
71	4.11 (105)	6.30 (159.5)
100	4.11 (105)	6.50 (164.5)
140	4.92 (125)	6.65 (169)

DRG Remote constant pressure control

Function and equipment is the same as for model DR.

Remote control is possible via a relief valve connected to port X. The relief valve is not included in the supply , and should be ordered separately.
The pressure differential at the pilot valve is set at 290 psi (20 bar) and then requires a pilot flow of 0.40 gpm (1.5 L/min).
If a different pressure differential is required, in the range 145 to 320 psi (10 – 22 bar), please state this in clear text.
As pressure relief valve we recommend:
DBDH-6 hydraulic (RA 25 402);
DBET-5X electrical (RA 29 165) or
DBETR-SO 381 with orifice 0.03 inches dia. (ø 0.8 mm)
electrical (RA 29 166).
The interconnecting line between the reliefvalve and port X should not exceed 6 ft. (2m).

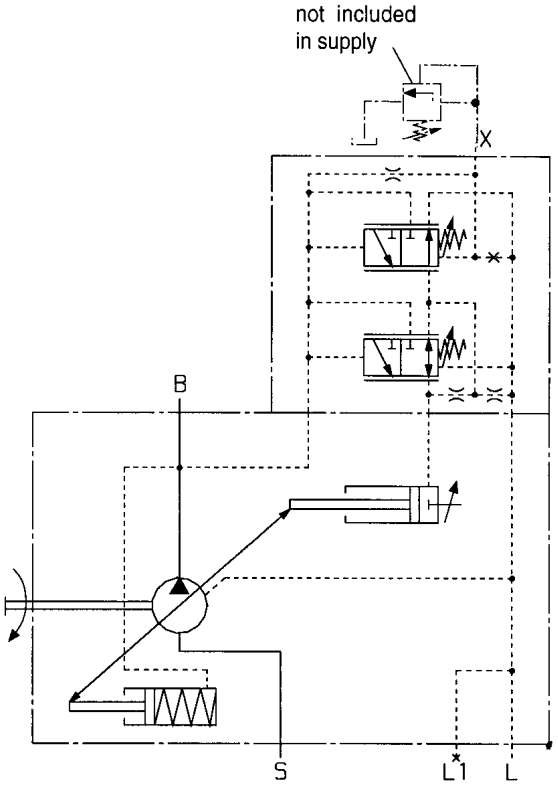
Static operating curve
at n_1 = 1500 rpm; t_{oil} = 122°F (50°C)



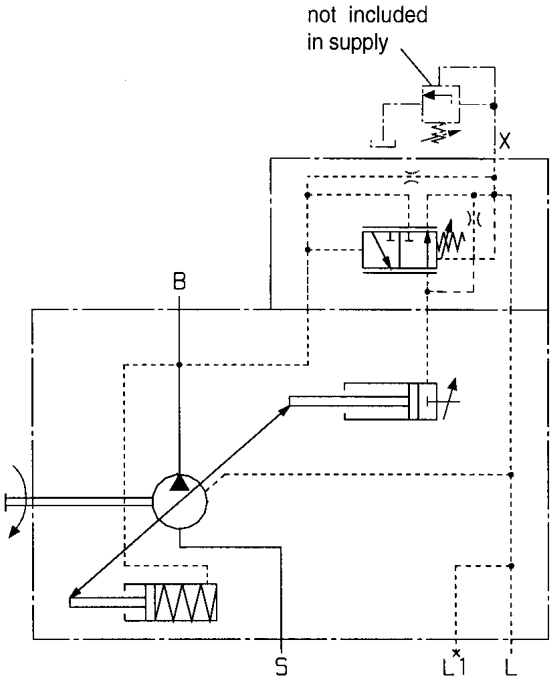
Technical data

Hysteresis and pressure rise Δp ——— max. 60 psi (4 bar)
External pilot oil usage ——— 1.2 gpm (4.5 L/min)
Loss of flow at Q_{max} see page 7 and 8.

Sizes 28…100



Size 140

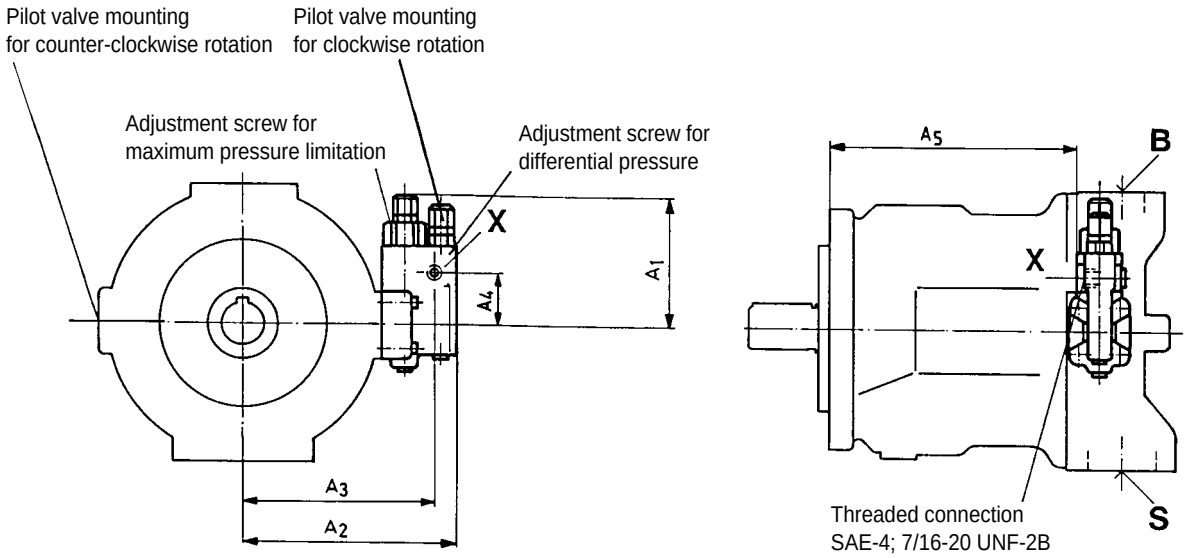


Port connections

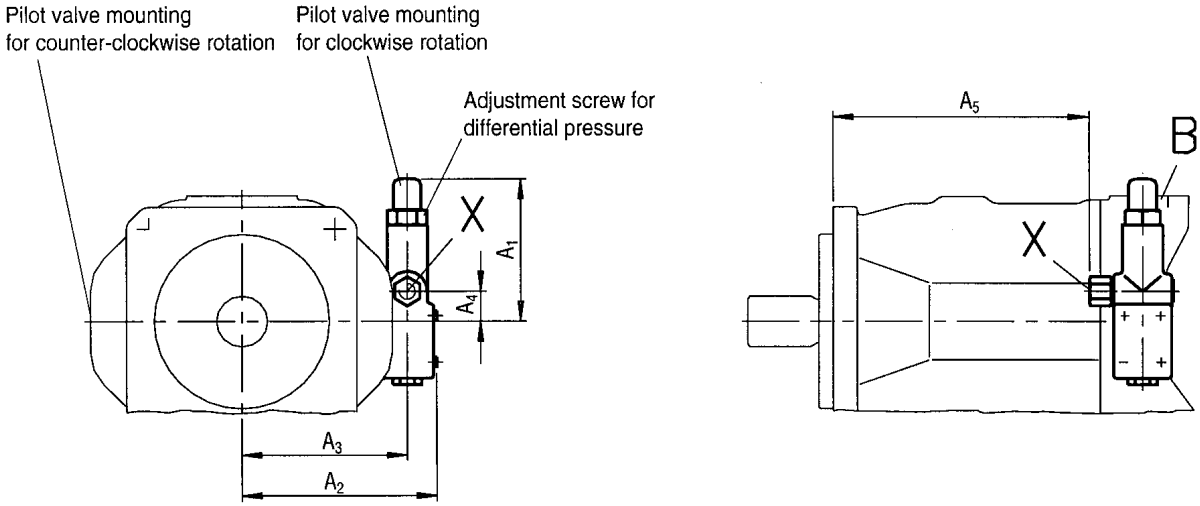
B Pressure port
S Suction port
L/L_1 Case drain ports (L_1 plugged at factory)
X Pilot pressure port

DRG Remote constant pressure control

Unit dimensions - Sizes 28 to 100



Unit dimensions - Size 140

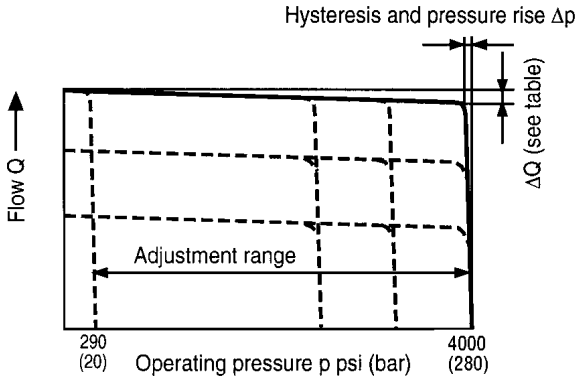


Size	A_1	A_2	A_3	A_4	A_5	Port X
28	4.13 (105)	5.35 (136)	4.69 (119)	1.57 (40)	5.55 (141)	SAE-4; 7/16 - 20 UNF - 2B; deep 0.47 (12)
45	4.13 (105)	5.75 (146)	5.08 (129)	1.57 (40)	6.14 (156)	SAE-4; 7/16 - 20 UNF - 2B; deep 0.47 (12)
71	4.13 (105)	6.30 (160)	5.63 (143)	1.57 (40)	7.24 (184)	SAE-4; 7/16 - 20 UNF - 2B; deep 0.47 (12)
100	4.13 (105)	6.50 (165)	5.83 (148)	1.57 (40)	9.88 (251)	SAE-4; 7/16 - 20 UNF - 2B; deep 0.47 (12)
140	4.92 (125)	8.23 (209)	7.20 (183)	1.02 (26)	8.74 (222)	SAE-6; 9/16 - 18 UNF - 2B; deep 0.51 (13)

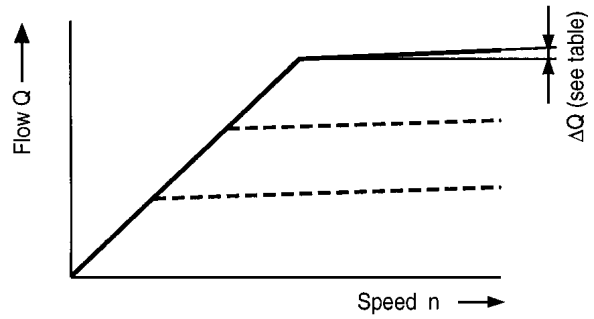
DFR1/DFR Pressure/flow – Load sense control

In addition to the function of the constant pressure control, the pump flow may be regulated by means of a differential pressure (e.g. a throttle) installed in the service line; load sensing.
In model DFR, a bleed down orifice is provided to vent trapped pressure in the load-sense line.

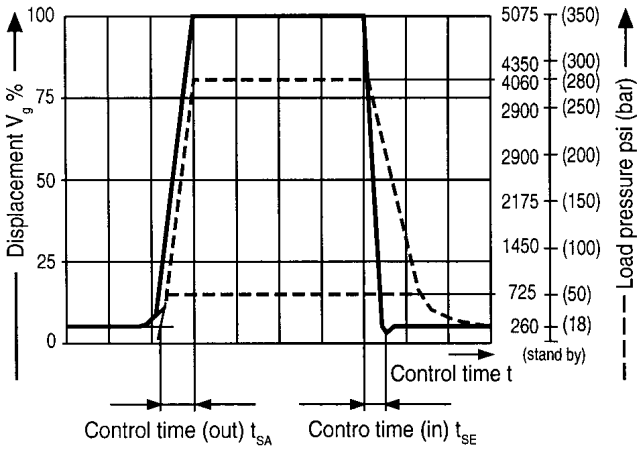
Static operating curve
at n_1 = 1500 rpm; t_{oil} = 122°F (50°C)



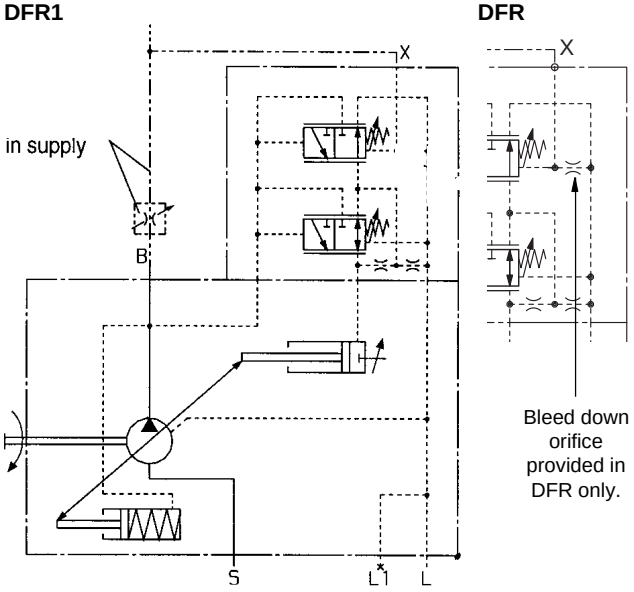
Static operating curve at variable speed



Dynamic operating curves for flow control
These values are average values obtained under test conditions with the unit mounted inside the tank.



DFR1 **DFR**



Port connections

B	Pressure port
S	Suction port
L/L_1	Case drain ports (L_1 plugged at factory)
X	Pilot pressure, load sense, port

Differential pressure Δp
May be set between 145 and 320 psi (10 and 22 bar)
Standard setting: 200 psi (14 bar). If different setting is required, please state in clear text.
When port X is unloaded to tank, a zero stroke pressure of 260 ± 30 psi (18 ± 2 bar) results (stand-by).

Technical data

(Hysteresis and increase)
measured at drive speed n = 1500 rpm

Size	**28**	**45**	**71**	**100**	**140**
ΔQ gpm	0.32	0.58	0.90	1.27	1.90
(L/min)	(1)	(1.8)	(2.8)	(4)	(6.0)

Hysteresis and pressure rise Δp ——— max. 60 psi (4 bar)
External pilot oil usage DFR max. 0.8...1.2 gpm (3...4.5 L/min)
External pilot oil usage DFR 1 ——— max. 0.8 gpm (3 L/min)
Loss of flow at Q_{max} see page 7 and 8.

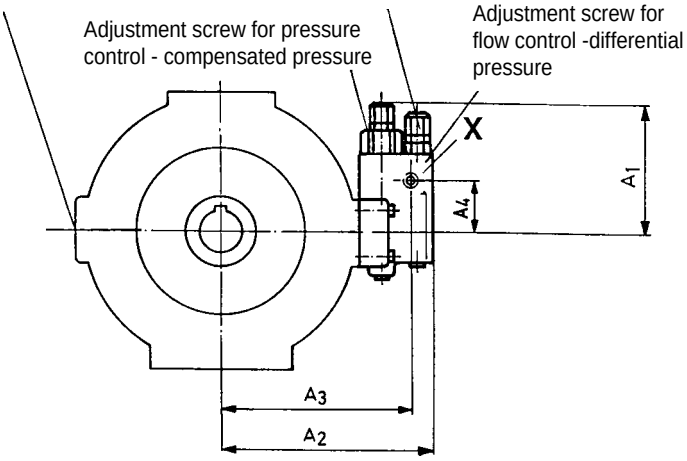
Size	t_{SA} (ms) stand by - 4000 psi (280 bar)	t_{SE} (ms) 4000 psi (280 bar) - stand by	t_{SE} 725 psi (50 bar) - stand by
28	40	20	40
45	50	25	50
71	60	30	60
100	120	60	120
140	130	60	130

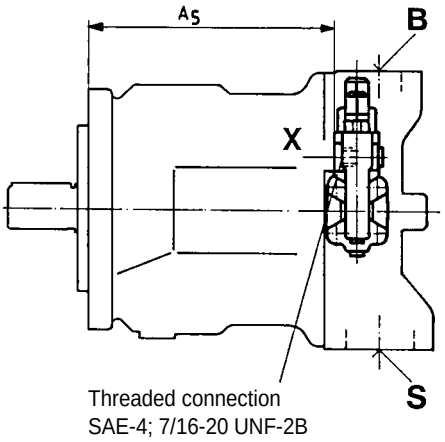
DFR1/DFR Pressure/flow control

Unit dimensions - Sizes 28 to 100

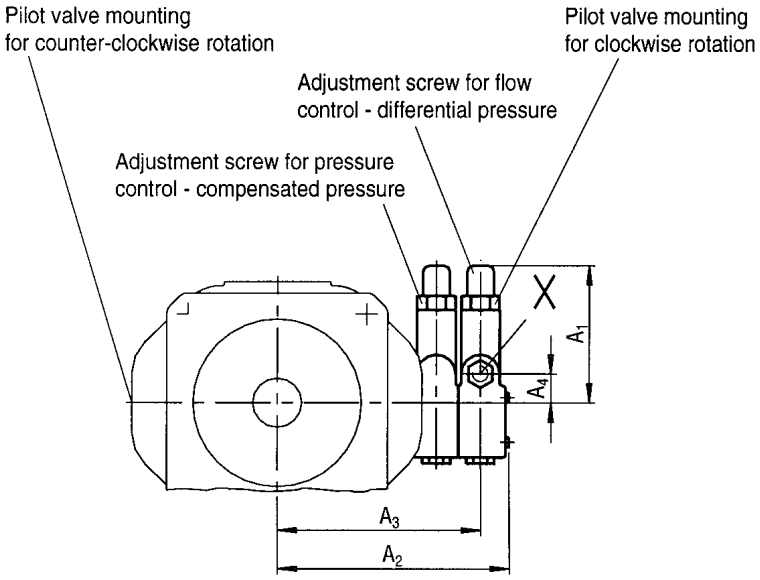
Pilot valve mounting
for counter-clockwise rotation

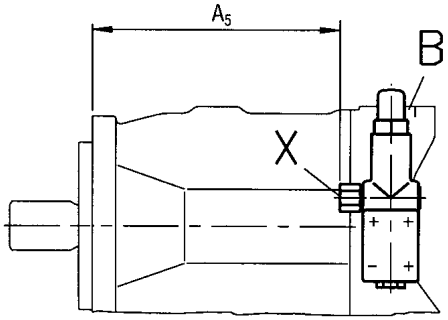
Pilot valve mounting
for clockwise rotation





Unit dimensions - Size 140





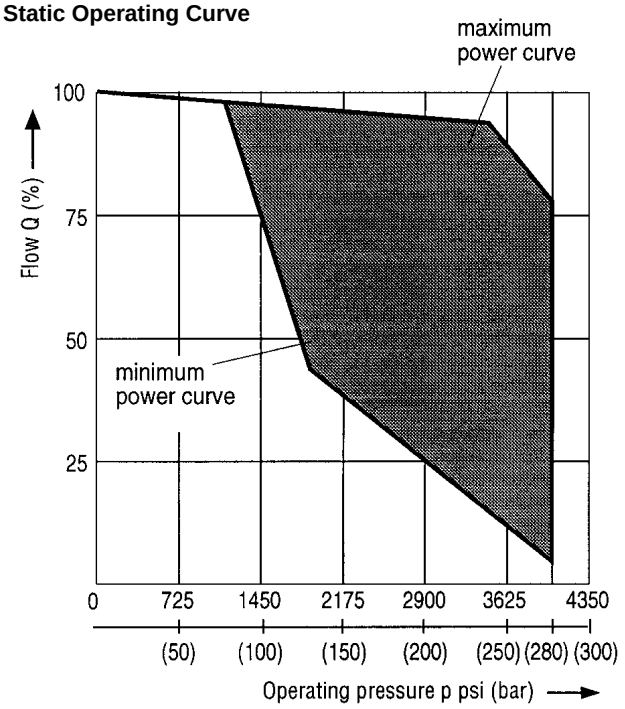
Size	A_1	A_2	A_3	A_4	A_5	Port X
28	4.13 (105)	5.35 (136)	4.69 (119)	1.57 (40)	5.55 (141)	SAE-4, 7/16 - 20 UNF - 2B; deep 0.39 (10)
45	4.13 (105)	5.75 (146)	5.08 (129)	1.57 (40)	6.14 (156)	SAE-4, 7/16 - 20 UNF - 2B; deep 0.39 (10)
71	4.13 (105)	6.30 (160)	5.63 (143)	1.57 (40)	7.24 (184)	SAE-4, 7/16 - 20 UNF - 2B; deep 0.39 (10)
100	4.13 (105)	6.50 (165)	5.83 (148)	1.57 (40)	9.88 (251)	SAE-4, 7/16 - 20 UNF - 2B; deep 0.39 (10)
140	4.92 125	8.23 (209)	7.20 (183)	1.02 (26)	8.74 (222)	SAE-6, 9/16 - 18 UNF - 2B; deep 0.51 (13)

DFLR Constant pressure/flow/power control

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

Constant flow control is possible below the power curve.

Static Operating Curve



Please state required power characteristic in clear text when ordering, e.g. 8 HP at 1800 rpm.
When port X is unloaded to tank, a zero stroke pressure of 260 ± 30 psi (18 ± 2 bar) results (stand-by).
Max. 1.45 gpm (5.5 L/min) pilot oil is required.

Technical data

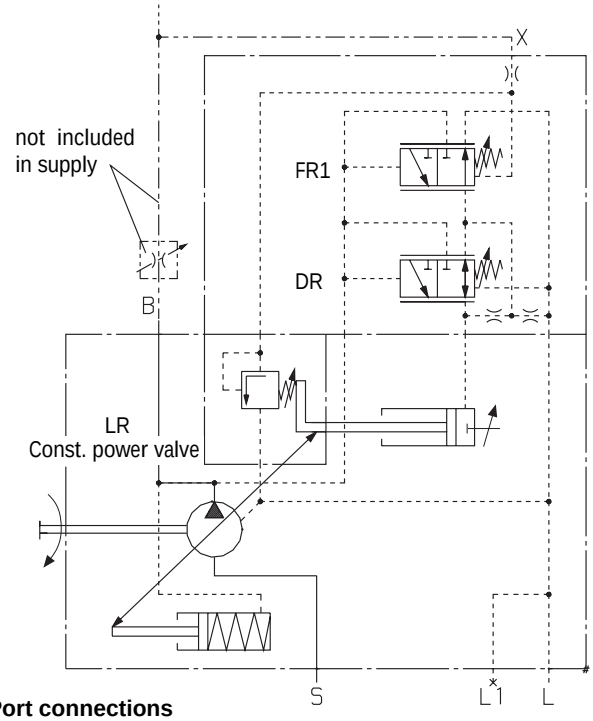
Start of control ——— from 1160 psi (80 bar)
External pilot oil usage ——— max. 1.45 gpm (5.5 L/min)
Loss of flow at Q_{max} see page 7 and 8.

DFLR -- SO160 Constant pressure and power control

With this version of the DFLR control, the flow control function is eliminated. This is used when only pressure and horsepower control is required. It eliminates the need for an external pilot line from the pressure port. In the FR spool an orifice is fitted to feed the LR control valve. The X port is plugged.

The X-port may be used for remote pressure control similar to the DRG control.

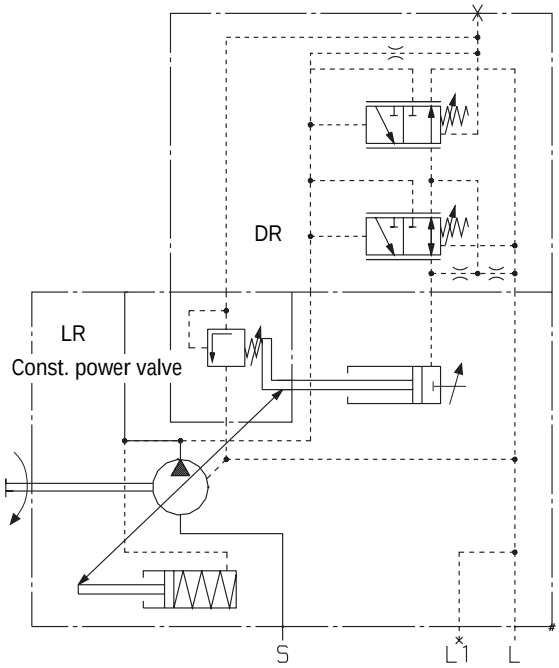
DFLR



Port connections

B Pressure port
S Suction port
L/L_1 Case drain ports (L_1 plugged at factory)
X Pilot pressure port

DFLR -- SO160

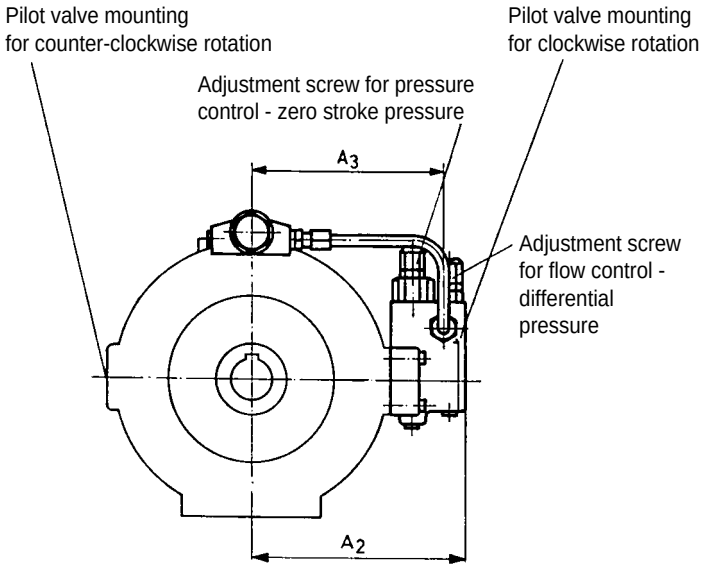


Port connections

B Pressure port
S Suction port
L/L_1 Case drain ports (L_1 plugged at factory)
X Pilot pressure port (plugged)

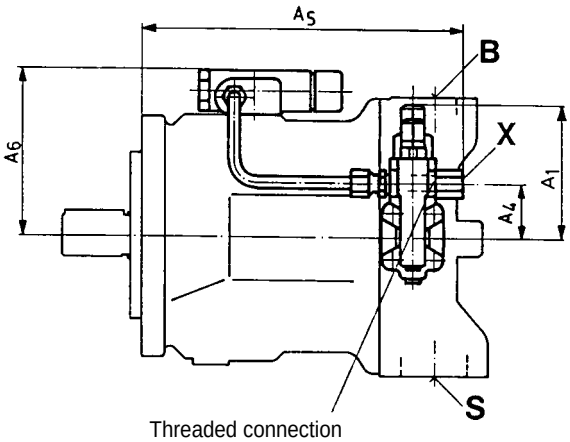
DFLR Constant pressure/flow/power control

Unit dimensions - Sizes 28 to 140



CAUTION!!

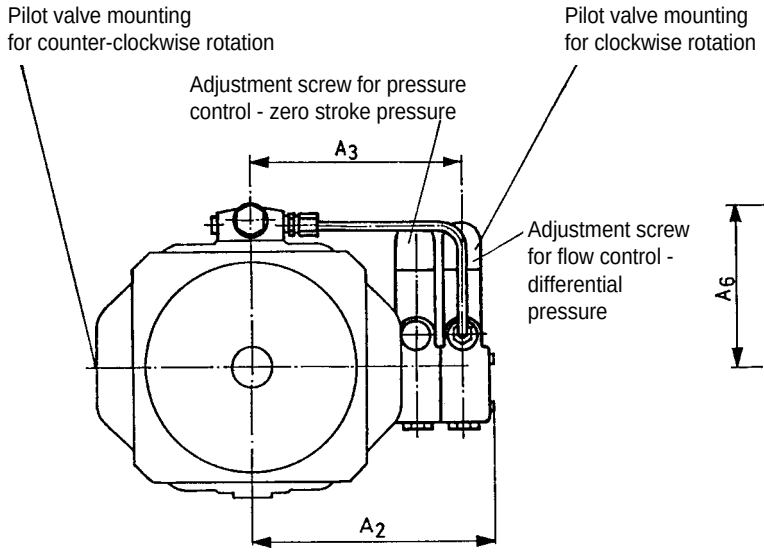
Adapter in X-port contains feed orifice, removal will result in loss of horsepower function.

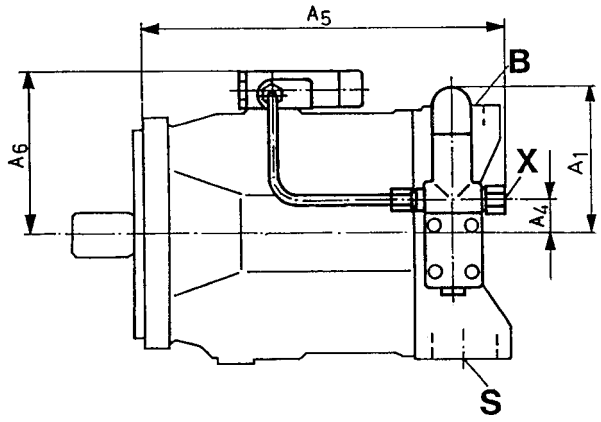


Threaded connection
SAE-4; 7/16-20 UNF-2B

Note: X-port without adapter and plugged with SO160 version.

Unit dimensions - Size 140



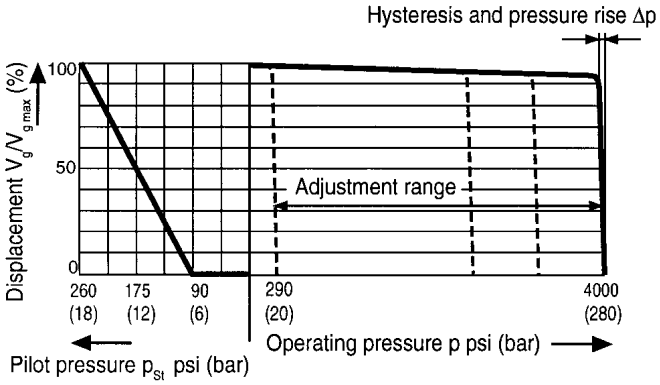


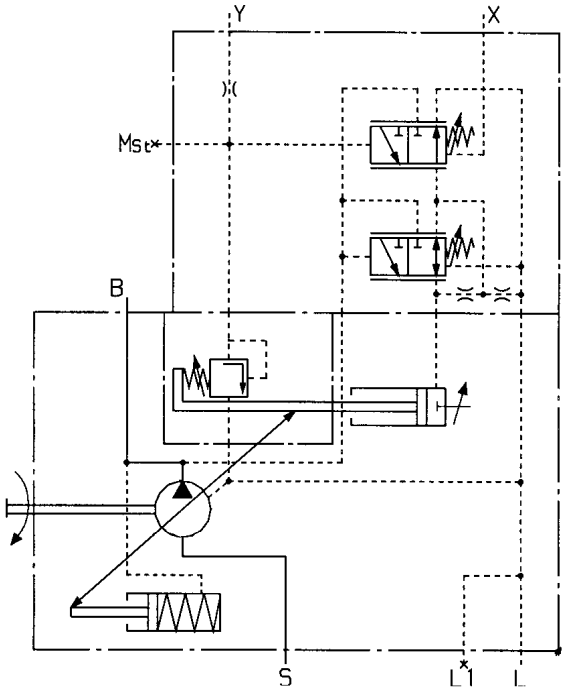
Size	A_1	A_2	A_3	A_4	A_5	A_6	Port X
28	4.13 (105)	5.35 (136)	4.69 (119)	1.57 (40)	6.77 (172)	4.19 (106.5)	SAE-4, 7/16 - 20 UNF - 2B; deep 0.39 (10)
45	4.13 (105)	5.75 (146)	5.08 (129)	1.57 (40)	7.36 (187)	4.41 (112)	SAE-4, 7/16 - 20 UNF - 2B; deep 0.39 (10)
71	4.13 (105)	6.30 (160)	5.63 (143)	1.57 (40)	8.46 (215)	4.96 (126)	SAE-4, 7/16 - 20 UNF - 2B; deep 0.39 (10)
100	4.13 (105)	6.50 (165)	5.83 (148)	1.57 (40)	11.10 (282)	5.08 (129)	SAE-4, 7/16 - 20 UNF - 2B; deep 0.39 (10)
140	4.92 (125)	8.23 (209)	7.20 (183)	1.02 (26)	12.36 (314)	5.49 (139.5)	SAE-6, 9/16 - 18 UNF - 2B; deep 0.51 (13)

FHD flow control, pilot pressure dependent with pressure control

The swivel angle of the pump and therefore its displacement is dependent upon the pilot pressure present in port X.

A constant pressure of 510 psi (35 bar) must be applied to port Y.
The integral pressure control is infinitely adjustable.
(State set value required in clear text).





Technical data

Hysteresis ± 2 % of $V_{g\,max}$

External pilot oil usage at Y max. 0.8...1.2 gpm (3...4.5 L/min)

Pressure rise Δp max. 60 psi (4 bar)

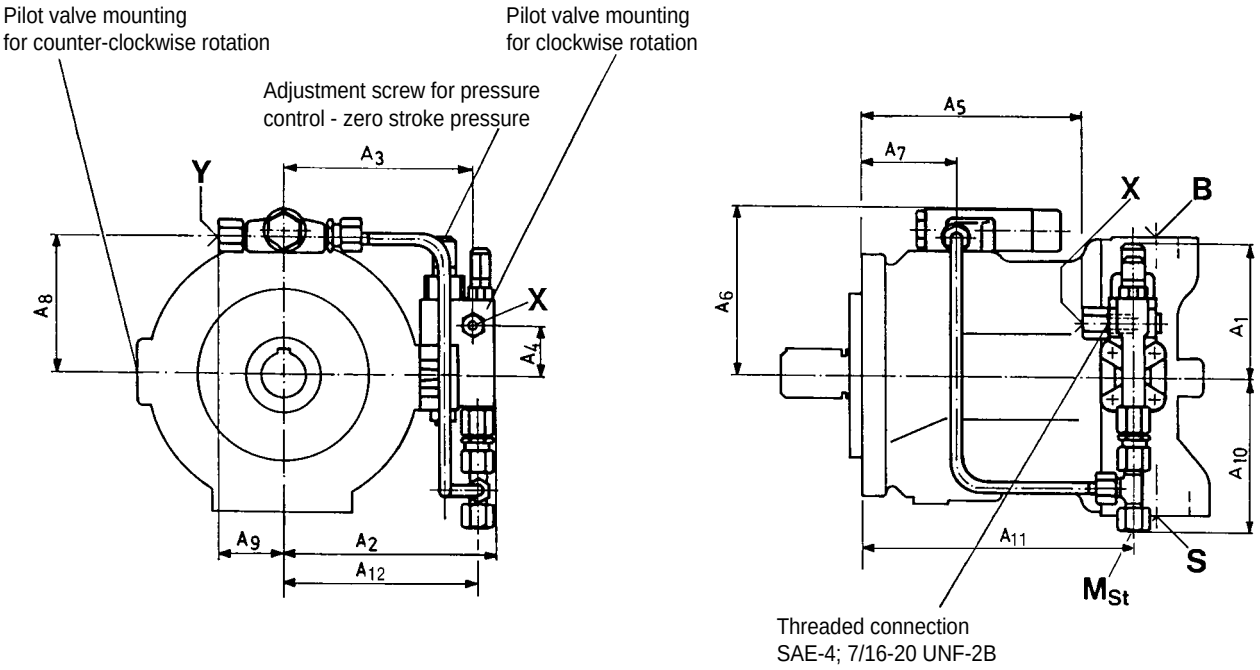
Loss of flow at Q_{max} see page 7 and 8.

Port connections

B	Pressure port
S	Suction port
L/L_1	Case drain ports (L_1 plugged at factory)
X	Pilot pressure port
M_{St}	Measuring port

FHD flow control, pilot pressure dependent with pressure control

Unit dimensions - Sizes 28 to 140



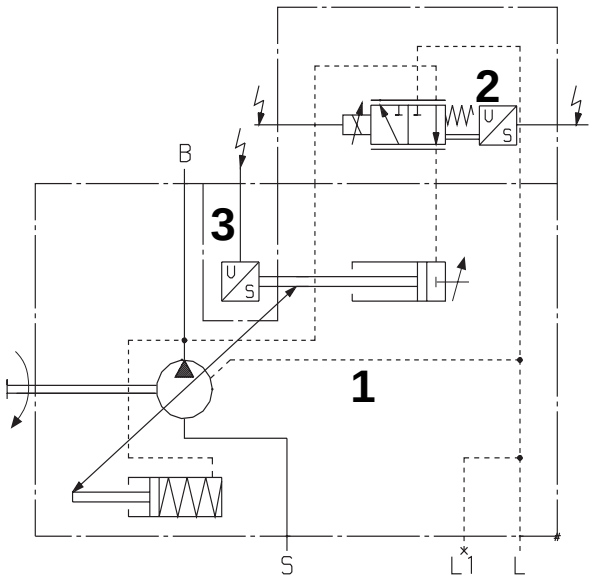
Size	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9
28	4.13 (105)	5.33 (135.5)	4.69 (119)	1.57 (40)	4.69 (119)	4.19 (106.5)	1.89 (48)	3.39 (86)	1.89 (48)
45	4.13 (105)	5.73 (145.5)	5.08 (129)	1.57 (40)	5.28 (134)	4.41 (112)	2.12 (54)	3.60 (91.5)	1.89 (48)
71	4.13 (105)	6.28 (159.5)	5.63 (143)	1.57 (40)	6.38 (162)	4.88 (124)	2.72 (69)	4.07 (103.5)	1.89 (48)
100	4.13 (105)	6.48 (164.5)	5.83 (148)	1.57 (40)	9.02 (229)	5.08 (129)	4.37 (111)	4.27 (108.5)	1.89 (48)
140	4.92 (125)	8.22 (209)	7.20 (183)	1.02 (26)	9.61 (244)	5.49 (139.5)	3.9 (99)	4.69 (119)	1.89 (48)

Size	A_{10}	A_{11}	A_{12}	Port X, Y	M_{St}
28	4.45 (113)	6.22 (158)	4.88 (124)	SAE-4, 7/16 - 20 UNF - 2B; deep 0.39 (10)	Pipe ø8x1.5 mm DIN 2391
45	4.45 (113)	6.81 (173)	5.28 (134)	SAE-4, 7/16 - 20 UNF - 2B; deep 0.39 (10)	Pipe ø8x1.5 mm DIN 2391
71	4.45 (113)	7.91 (201)	5.83 (148)	SAE-4, 7/16 - 20 UNF - 2B; deep 0.39 (10)	Pipe ø8x1.5 mm DIN 2391
100	4.45 (113)	10.55 (268)	6.02 (153)	SAE-4, 7/16 - 20 UNF - 2B; deep 0.39 (10)	Pipe ø8x1.5 mm DIN 2391
140	5.91 (150)	10.55 (268)	7.20 (183)	SAE-6; 9/16 - 18 UNF - 2B; deep 0.51 (13)	Pipe ø8x1.5 mm DIN 2391

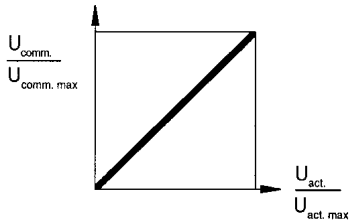
FE1 Electrical flow control

The pump displacement is controlled via an electrically operated proportional valve.
Flow control is achieved by means of the variable swivel angle of the pump, possible variations in drive speed (e. g. diesel engine speeds) are not taken into consideration.
Swivel angle of the pump is fed back via an inductive positional transducer to amplifier card VT 5041-2X / 10V or amplifier VT 13945A (see RA 30 022).

The amplifier card / amplifier modul is used to control pump flow and must be ordered separately.



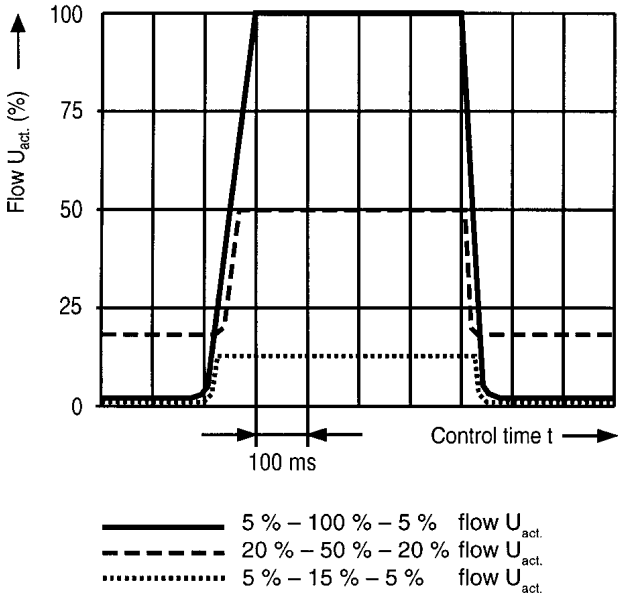
Static operating curve



Dynamic operating curves

Displacement/time characteristics

measured: AA10VSO 45 FE1
stepped pressure signal value against 725 psi (50 bar), pressure relief valve



Port connections

B Pressure port
S Suction port
L/L_1 Case drain ports (L_1 plugged at factory)

Modular elements

1 AA10VSO with hydraulic control device
2 Control valve STW 063-1X
3 Inductive positional transducer IW9-03-01

Technical data

Min. required positioning pressure	290 psi (20 bar)
External pilot oil usage at Y	max. 0.66 gpm (2.5 L/min)
Hysteresis	≤ ± 0.2 % of $V_{g\,max}$
Repeatability	≤ ± 0.2 %
Loss of flow at Q_{max}	see page 7 and 8.

Control valve:

Current type	DC
Nominal voltage	24 V
Coil resistance at 20°C	2 Ω
Duty (operating time)	100 %
Ambient temperature	...122°F (...50°C)
Coil temperature	...300°F (...150°C)
Insulation to DIN 40050	IP 65
Insulation class to VDE 0580	F

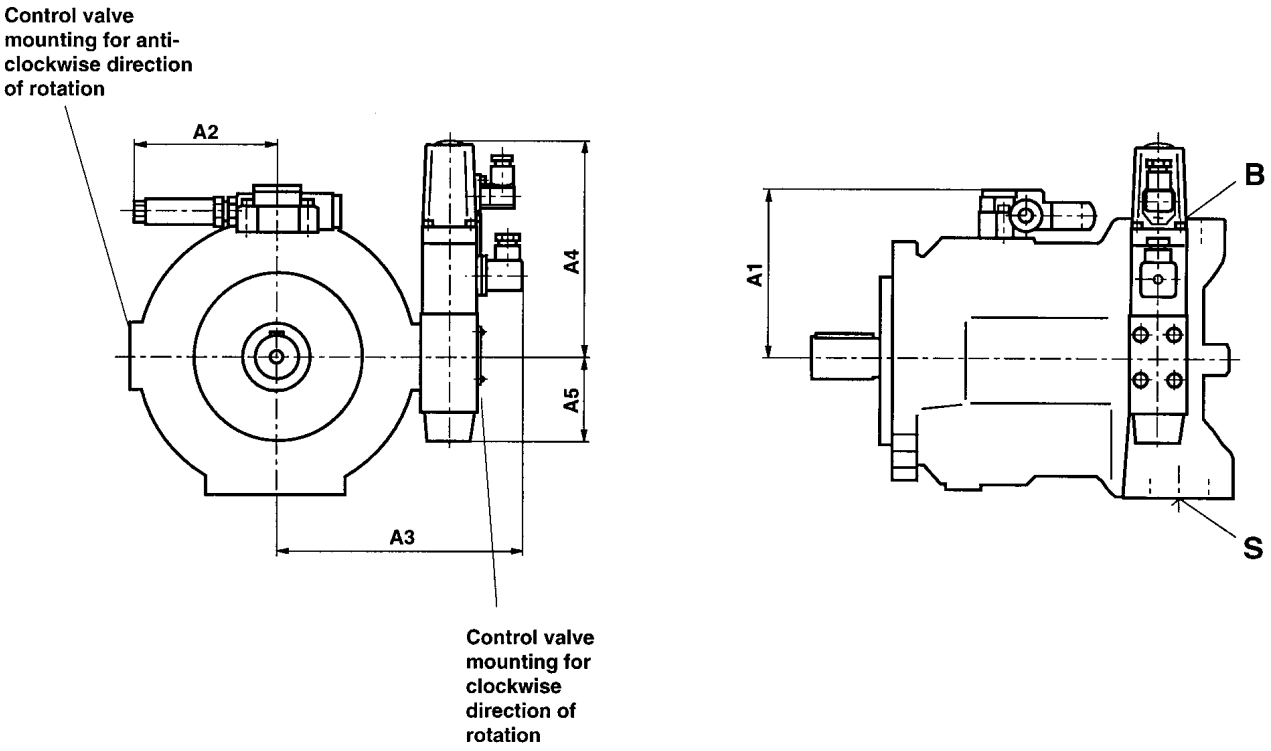
Inductive positional transducer (swivel angle):

Carrier frequency	1000 Hz...5000 Hz
Inductivity	9.5 mH

FE1 Electrical flow control

Unit dimensions - Sizes 28 to 140

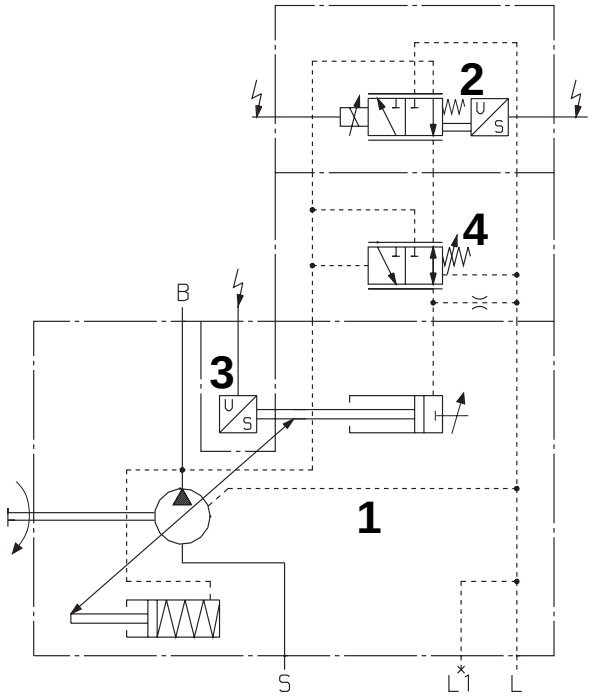
Size 28 to 140



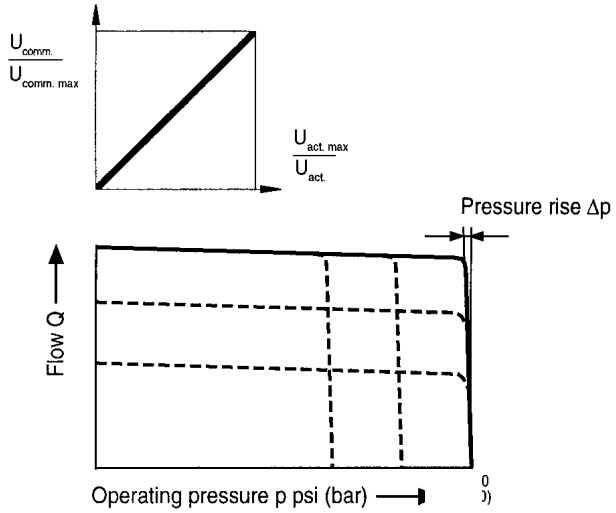
Size	A_1	A_2	A_3	A_4	A_5
28	4.17 (106)	4.20 (107)	6.70 (171)	6.22 (158)	2.48 (63)
45	4.41 (112)	4.20 (101)	7.23 (181)	6.22 (158)	2.48 (63)
71	4.88 (124)	4.20 (107)	7.68 (195)	6.22 (158)	2.48 (63)
100	5.08 (129)	4.20 (107)	7.87 (200)	6.22 (158)	2.48 (63)
140	5.51 (140)	4.20 (1070	9.37 (238)	5.63 (143)	3.07 (78)

FE1D Electrical flow control with pressure control

The output flow of the pump is controlled via an electrically operated proportional valve.
Control of output flow is achieved by means of the variable swivel angle of the pump, possible variations in drive speed (e. g. diesel engine speeds) are not taken into consideration.
Swivel angle of the pump is fed back via an inductive positional transducer to amplifier card VT 13945 (see RA 30 022) or amplifier module VT 5041-2X / 10V.
The amplifier card / amplifier modul is used to control pump flow and must be ordered separately.
As opposed to the FE1, this control is fitted with an additional sandwich valve (item 4) so as to give a supplementary hydraulic pressure control facility.



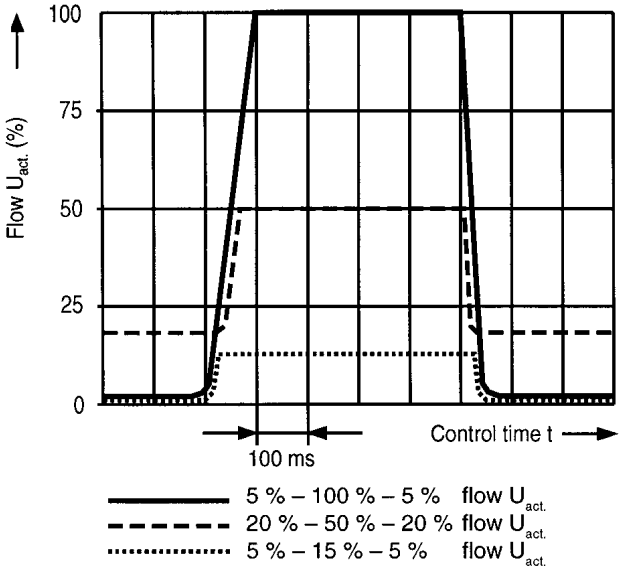
Static operating curve



Dynamic operating curves

Displacement/time characteristics

measured: AA10VSO 45 FE
stepped pressure signal value against 725 psi (50 bar), pressure relief valve



Port connections

B Pressure port
S Suction port
L/L_1 Case drain ports (L_1 plugged at factory)

Modular elements

1 AA10VSO with hydraulic control device
2 Control valve STW 063-1X
3 Inductive positional transducer IW9-03-01
4 Sandwich plate valve

Technical data

Min. required positioning pressure	290 psi (20 bar)
External pilot oil usage at Y	max. 0.8 gpm (3 L/min)
Δp Pressure rise	max. 60 psi (4 bar)
Hysteresis	≤ 0.2 % of $V_{g\,max}$
Repeatability	≤ ± 0.2 %

Loss of flow at Q_{max} see page 7 and 8.

Control valve:

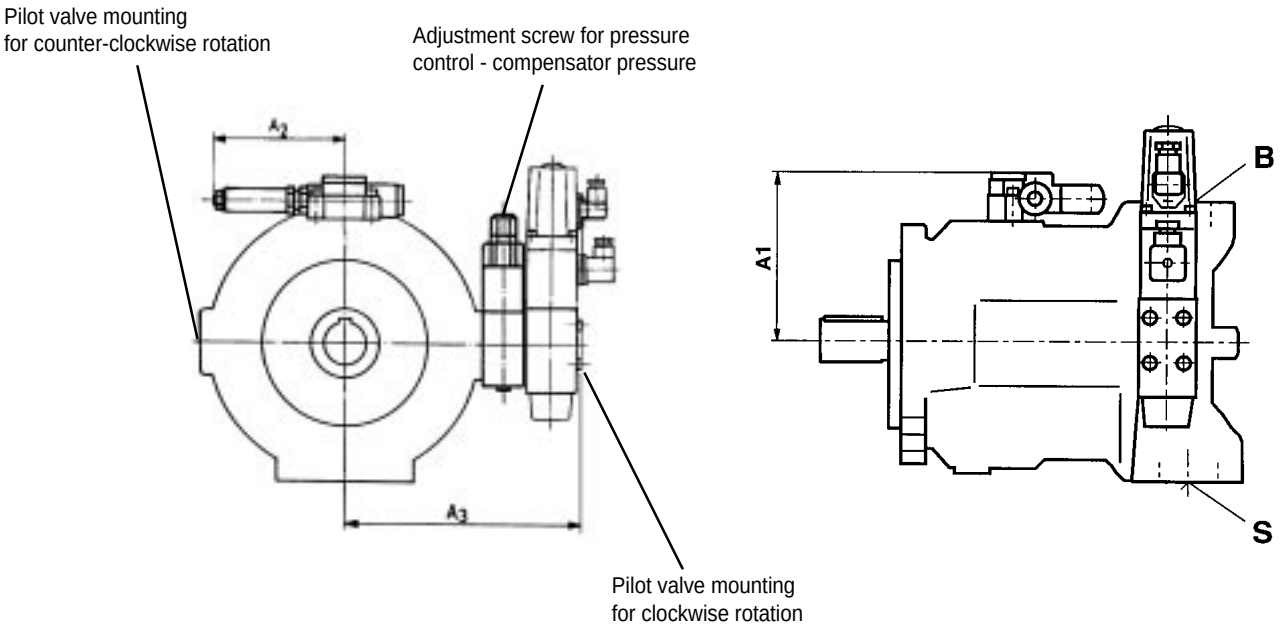
Current type	DC
Nominal voltage	24 V
Coil resistance at 20°C	2 Ω
Duty (operating time)	100 %
Ambient temperature	...122°F (...50°C)
Coil temperature	...300°F (...150°C)
Insulation to DIN 40050	IP 65
Insulation class to VDE 0580	F

Inductive positional transducer:

Carrier frequency	1000 Hz...5000 Hz
Inductivity	9.5 mH

FE1D Electrical flow control with pressure control

Unit dimensions - Sizes 28 to 140



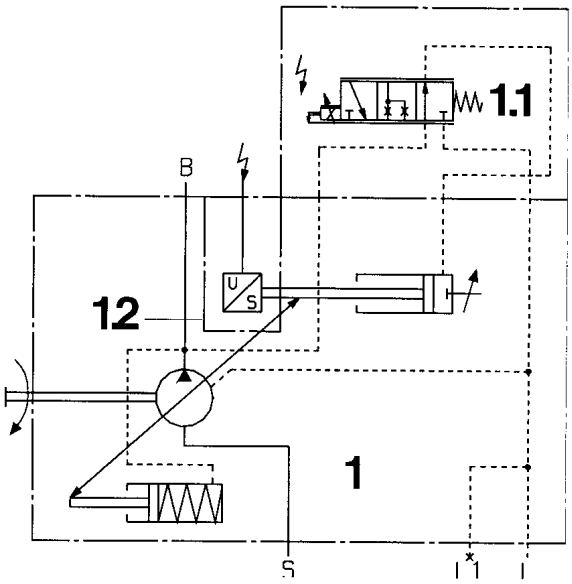
Size	A_1	A_2	A_3	A_4	A_5
28	4.17 (106)	4.20 (107)	8.11 (206)	6.22 (158)	2.48 (63)
45	4.41 (112)	4.20 (101)	8.50 (216)	6.22 (158)	2.48 (63)
71	4.88 (124)	4.20 (107)	9.06 (230)	6.22 (158)	2.48 (63)
100	5.08 (129)	4.20 (107)	9.25 (235)	6.22 (158)	2.48 (63)
140	5.51 (140)	4.20 (1070	10.75 (273)	5.63 (143)	3.07 (78)

DFE1 Electronic pressure and flow control

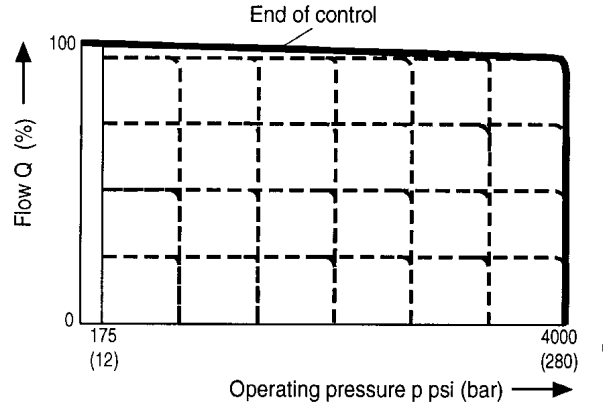
The pressure and output flow of the pump are controlled electronically by means of a proportional valve. The output flow is controlled by changing the swivel angle of the pump. Variations in pump speed – e.g. with a diesel engine drive – are not corrected. The pump pressure and position are fed back via a pressure sensor and inductive positional transducer transducer to the amplifier card which is necessary to the control.

DFE1 pump model is suitable for controlling with the VT 5041 analog amplifier card.
Amplifier card VT 5041 (RA 30 022) and pressure transducer ST (RA 30 022) are to be ordered separately.
On safety grounds, a pressure relief valve must be installed in addition to the pressure control system. It is used to ensure that the maximum pressure is not exceeded.

For additional information and applications, see RA 30 022.



Static operating curves



Port connections

B Pressure port
S Suction port
L/L_1 Case drain ports (L_1 plugged at factory)

Modular elements

1 AA10VSO with hydraulic control device

1.1 Proportional valve

1.2 Inductive positional transducer

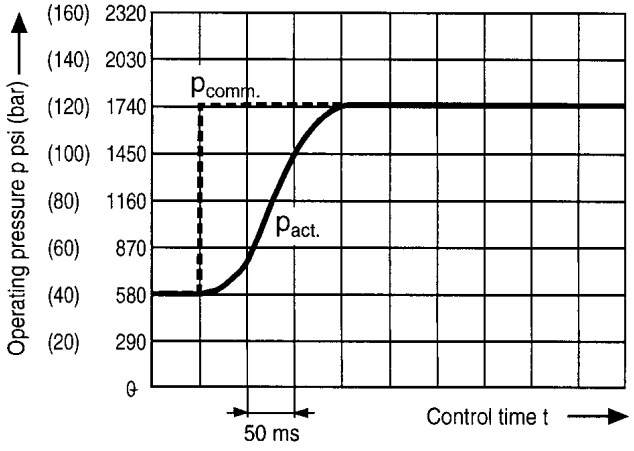
Pressure sensor and control electonics sold separately (please order seperately, according to RA 30 022)

Technical data

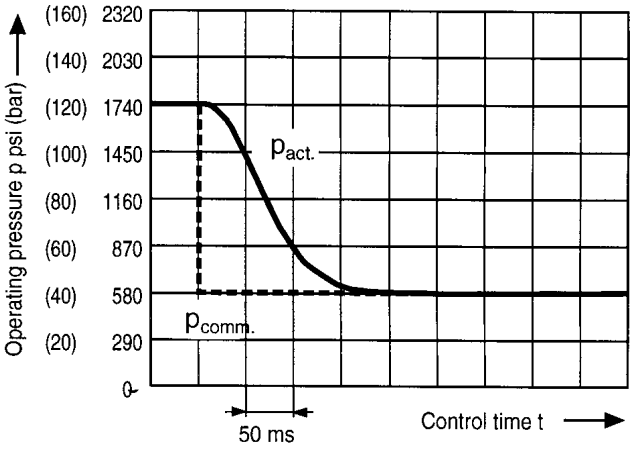
Hysteresis ____ < 0.2 % of $V_{g\,max}$
Repeatability ____ < 0.2 %
External pilot oil usage ____ max. 0.66 gpm (2.5 L/min)
Loss of flow at Q_{max} see page 7 and 8.

Dynamic operating curves

Stepped pressure signal value e.g. 580 to 1740 psi (40 to 120 bar)
DFE1 45 with compressed fluid volumne 1.3 gal (5 L).

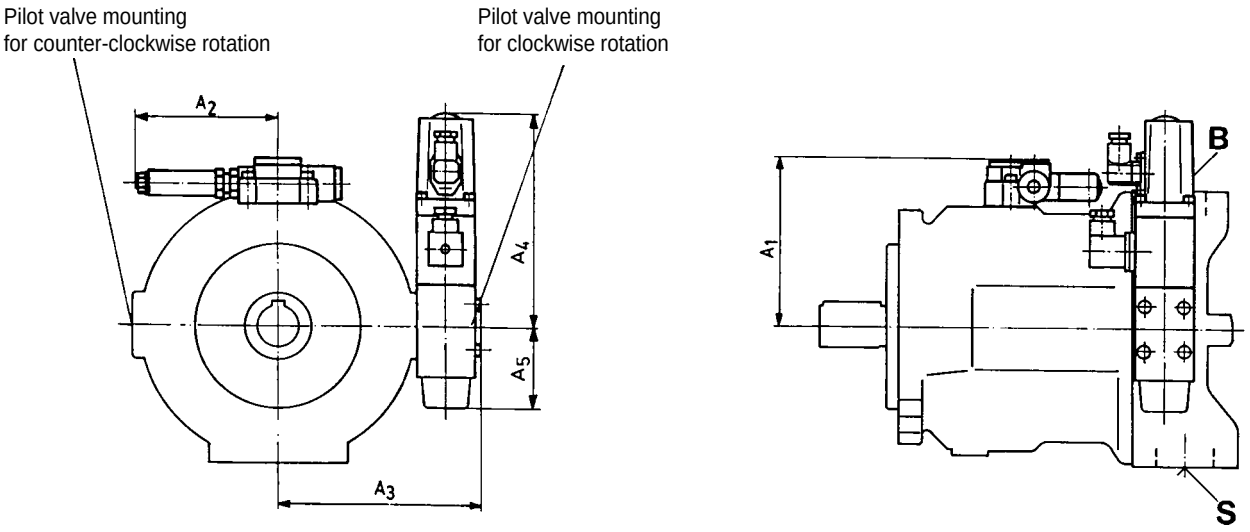


Stepped pressure signal value e.g. 1740 to 580 psi (120 to 40 bar)
DFE1 45 with compressed fluid volumne 1.3 gal (5 L).



DFE1 Electronic pressure and flow control

Unit dimensions - Sizes 28 to 140



Size	A_1	A_2	A_3	A_4	A_5
28	4.09 (106)	4.19 (106.5)	6.71 (170.5)	6.22 (158)	2.48 (63)
45	4.29 (112)	4.19 (106.5)	7.11 (180.5)	6.22 (158)	2.48 (63)
71	4.76 (124)	4.19 (106.5)	7.66 (194.5)	6.22 (158)	2.48 (63)
100	4.96 (129)	4.19 (106.5)	7.85 (199.5)	6.22 (158)	2.48 (63)
140	5.51 (139.5)	4.19 (106.5)	9.35 (237.5)	5.63 (143)	3.07 (78)

Through drive

Axial piston unit AA10VSO is available with a through drive, as shown in the ordering code on page 3. The type of through drive is determined by the codes K....
included in supply are:

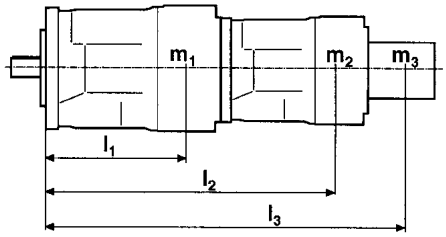
hub, fixing screws, seals and an intermediate flange (if required).

Combination pumps

Two or more independent circuits are available to the user when combination pumps are used.

1. If the combination pump consists of 2 units and if it is supposed to be deliverd as an assembled unit, the two ordering codes have to be combined with the "+" symbol.
   Ordering example:
   AA10VSO 71 DR/31 R-PKC62K03 +
   AA10VSO 28 DR/31 R-PKC62N00
2. If a gear pump or radial piston pump is to be mounted at the factory, RA 90 139 should be consulted. It lists the possible mounted pump combinations with ordering codes of the first pump.

Permissible bending torques



m_1, m_2, m_3 [lbs] Weight of pumps
l_1, l_2, l_3 [in] Center to center distance

$$T_m = (m_1 \bullet l_1 + m_2 \bullet l_2 + m_3 \bullet l_3) \bullet \frac{1}{12} \text{ [Nm]}$$

m_1, m_2, m_3 [kg] Weight of pumps
l_1, l_2, l_3 [mm] Center to center distance

$$T_m = (m_1 \bullet l_1 + m_2 \bullet l_2 + m_3 \bullet l_3) \bullet \frac{1}{102} \text{ [Nm]}$$

Sizes			28	45	71	100	140
Max. bending moment	T_m	lb-ft (Nm)	65 (88)	101 (137)	159 (216)	221 (300)	332 (450)
Weight (Mass)	m	lbs (kg)	33 (15)	46 (21)	73 (33)	99 (45)	132 (60)
Distance to center of gravity	l_1	in (mm)	4.3 (110)	5.11 (130)	6.0 (150)	6.3 (160)	6.3 (160)

Permissible through-drive torque

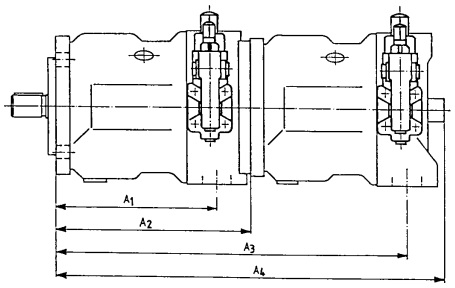
1 $T_{tot.}$ T_{D1} T_{D2}

2 $T_{tot.}$ T_{D1} T_{D2}

Sizes				28	45	71	100	140
Max. permissible through-drive torque at drive shaft "**K**" pump 1 (Pump 1 + pump 2)			lb-ft (Nm)	115 (156)	184 (249)	289 (392)	456 (618)	639 (867)
1	Permissible through-drive torque	T_{D1max}	lb-ft (Nm)	92 (125)	148 (200)	233 (316)	328 (445)	460 (623)
		T_{D2max}	lb-ft (Nm)	23 (31)	36 (49)	56 (76)	128 (173)	180 (244)
2	Permissible through-drive torque	T_{D1max}	lb-ft (Nm)	23 (31)	36 (49)	56 (76)	128 (173)	180 (244)
		T_{D2max}	lb-ft (Nm)	92 (125)	148 (200)	233 (316)	328 (445)	460 (623)
Max. permissible through-drive torque at drive shaft "**R**" pump 1 (Pump 1 + pump 2)			lb-ft (Nm)	164 (223)	184 (400)	466 (632)	—	—
1	Permissible through-drive torque	T_{D1max}	lb-ft (Nm)	92 (125)	147 (200)	233 (316)	—	—
		T_{D2max}	lb-ft (Nm)	72 (98)	147 (200)	233 (316)	—	—
2	Permissible through-drive torque	T_{D1max}	lb-ft (Nm)	72 (98)	147 (200)	233 (316)	—	—
		T_{D2max}	lb-ft (Nm)	92 (125)	147 (200)	233 (316)	—	—

Unit dimensions of combination pumps

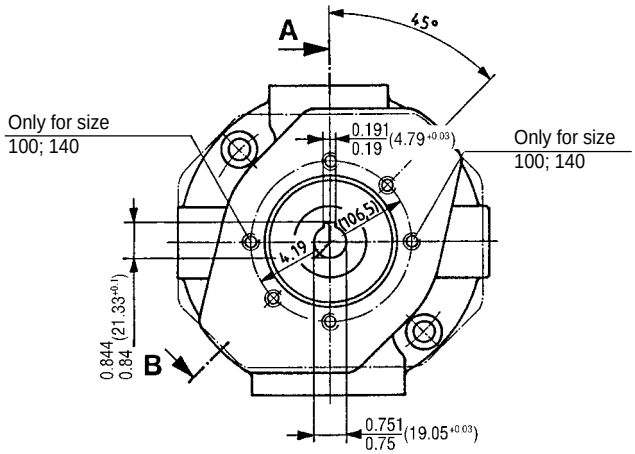
AA10VSO + AA10VSO



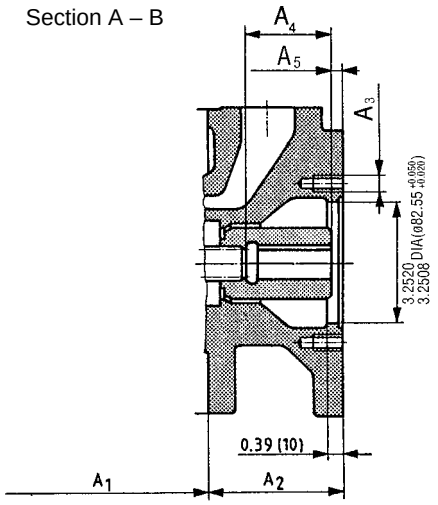
Main pump / 2nd pump	AA10VSO 28			
	A_1	A_2	A_3	A_4
AA10VSO 18	6.46 (164)	8.03 (204)	13.74 (349)	15.71 (399)
AA10VSO 28	6.46 (164)	8.03 (204)	14.49 (368)	16.14 (410)
AA10VSO 45	–	–	–	–
AA10VSO 71	–	–	–	–
AA10VSO 100	–	–	–	–
AA10VSO 140	–	–	–	–

Main pump / 2nd pump	AA10VSO 45				AA10VSO 71				AA10VSO 100				AA4VSO 140			
	A_1	A_2	A_3	A_4	A_1	A_2	A_3	A_4	A_1	A_2	A_3	A_4	A_1	A_2	A_3	A_4
AA10VSO 18	7.24 (184)	9.02 (229)	14.72 (374)	16.69 (424)	8.54 (217)	10.51 (267)	16.22 (412)	18.19 (462)	10.83 (275)	13.31 (338)	19.02 (483)	20.98 (533)	10.83 (275)	13.78 (350)	19.49 (495)	21.46 (545)
AA10VSO 28	7.24 (184)	9.02 (229)	15.47 (393)	17.13 (435)	8.54 (217)	10.51 (267)	16.97 (431)	18.62 (473)	10.83 (275)	13.31 (338)	19.76 (502)	21.42 (544)	10.83 (275)	13.78 (350)	20.24 (514)	21.89 (556)
AA10VSO 45	7.24 (184)	9.02 (229)	16.26 (413)	17.83 (453)	8.54 (217)	10.51 (267)	17.76 (451)	19.33 (491)	10.83 (275)	13.31 (338)	20.55 (522)	22.13 (562)	10.83 (275)	13.78 (350)	21.02 (534)	22.60 (574)
AA10VSO 71	–	–	–	–	8.54 (217)	10.51 (267)	19.06 (484)	20.62 (524)	10.83 (275)	13.31 (338)	21.85 (555)	23.43 (595)	10.83 (275)	13.78 (350)	22.32 (567)	23.90 (607)
AA10VSO 100	–	–	–	–	–	–	–	–	10.83 (275)	14.02 (356)	24.84 (631)	26.85 (682)	10.83 (275)	14.49 (368)	25.31 (643)	27.32 (694)
AA10VSO 140	–	–	–	–	–	–	–	–	–	–	–	–	10.83 (275)	14.49 (368)	25.31 (643)	27.76 (705)

Flange SAE A 2-bolt, for mounting of axial piston pump A10VSO 18 – keyed shaft K
Ordering code **K 40**



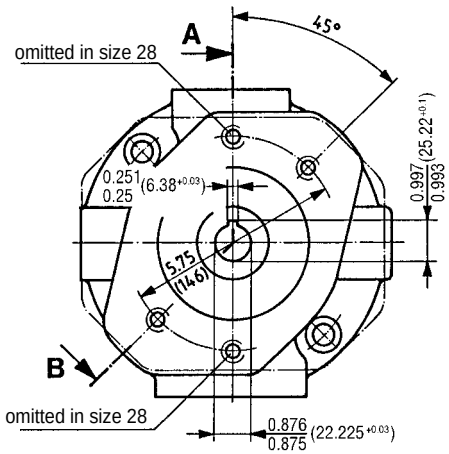
Section A – B



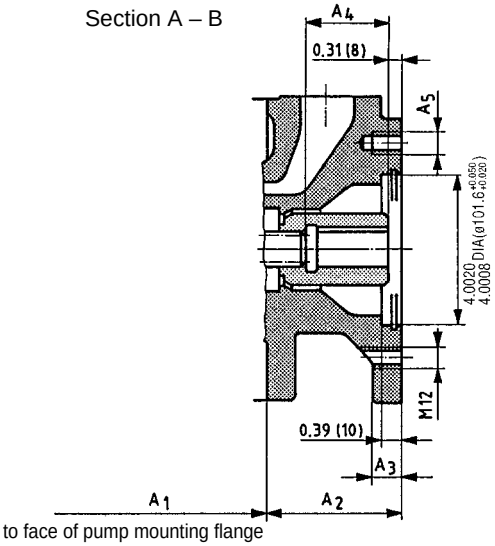
to face of pump mounting flange

Size of main pump	A_1	A_2	A_3	A_4	A_5
28	5.28 (134)	2.76 (70)	M10; deep 0.63 (16)	1.50 (38)	0.35 (9)
45	5.87 (149)	3.15 (80)	M10; deep 0.63 (16)	1.69 (43)	0.39 (10)
71	6.97 (177)	3.54 (90)	M10; deep 0.79 (20)	2.05 (52)	0.35 (9)
100	9.17 (233)	4.13 (105)	M10; deep 0.79 (20)	2.20 (56)	0.35 (9)
140	9.17 (233)	4.61 (117)	M10; deep 0.79 (20)	2.68 (68)	0.35 (9)

Flange SAE B 2-bolt, for mounting of axial piston pump AA10VSO 28 – keyed shaft K
Ordering code **K 03**



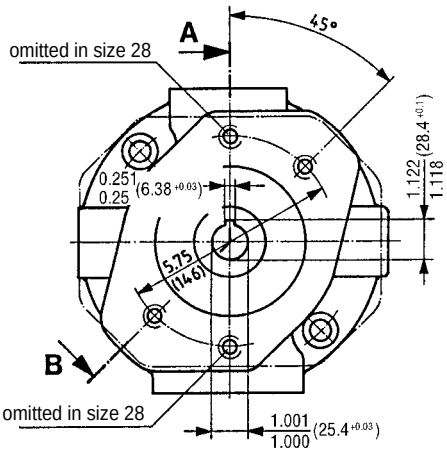
Section A – B



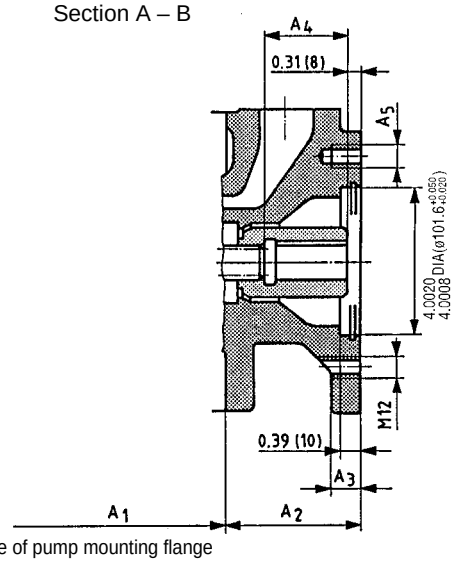
to face of pump mounting flange

Size of main pump	A_1	A_2	A_3	A_4	A_5
28	5.28 (134)	2.76 (70)	0.59 (15)	1.53 (39)	M12;deep 0.59 (15)
45	5.87 (149)	3.15 (80)	0.55 (14)	1.77 (45)	M12;deep 0.71 (18)
71	6.97 (177)	3.54 (90)	0.71 (18)	2.09 (53)	M12;deep 0.79 (20)
100	9.17 (233)	4.13 (105)	–	2.24 (57)	M12;deep 0.79 (20)
140	9.17 (233)	4.61 (117)	–	2.68 (68)	M12;deep 0.79 (20)

Flange SAE B–B 2-bolt, for mounting of axial piston pump AA10VSO 45 – keyed shaft K
Ordering code **K 05**



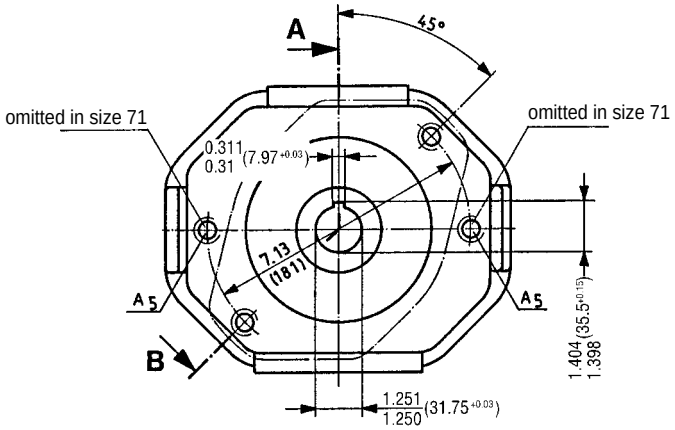
Section A – B



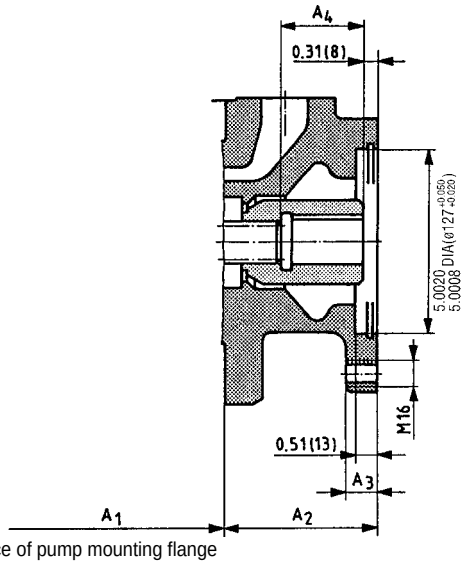
to face of pump mounting flange

Size of main pump	A_1	A_2	A_3	A_4	A_5
45	5.87 (149)	3.15 (80)	0.55 (14)	1.77 (45)	M12;deep 0.71 (18)
71	6.97 (177)	3.54 (90)	0.71 (18)	2.09 (53)	M12;deep 0.79 (20)
100	9.17 (233)	4.13 (105)	–	2.24 (57)	M12;deep 0.79 (20)
140	9.17 (233)	4.61 (117)	–	2.72 (69)	M12;deep 0.79 (20)

Flange SAE C 2-bolt, for mounting of axial piston pump AA10VSO 71 – keyed shaft K
Ordering code **K 08**



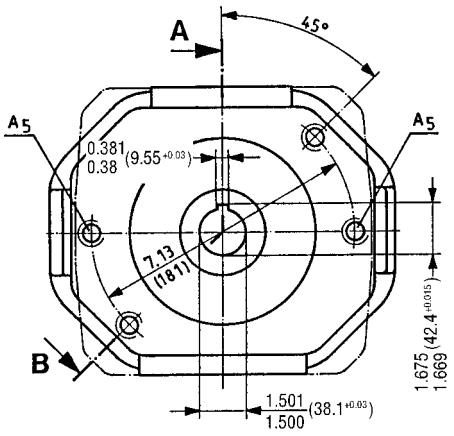
Section A – B



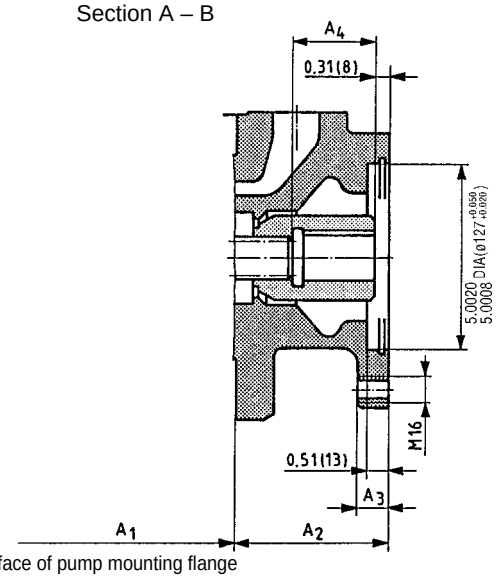
to face of pump mounting flange

Size of main pump	A_1	A_2	A_3	A_4	A_5
71	6.97 (177)	3.54 (90)	0.71 (18)	2.09 (53)	M16;deep 0.71 (18)
100	9.17 (233)	4.13 (105)	0.79 (20)	2.24 (57)	M16;deep 0.98 (25)
140	9.17 (233)	4.61 (117)	0.94 (24)	2.68 (68)	M16;deep 0.98 (25)

Flange SAE C 2-bolt, for mounting of axial piston pump AA10VSO 100 – keyed shaft K
Ordering code **K 38**



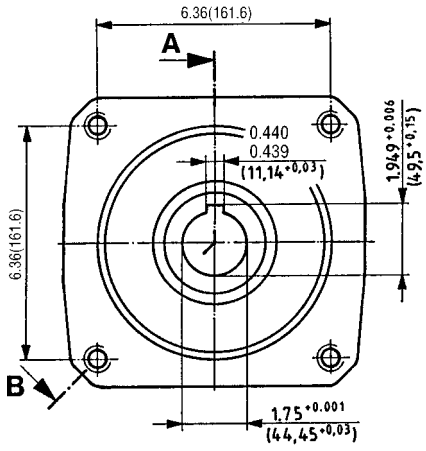
Section A – B



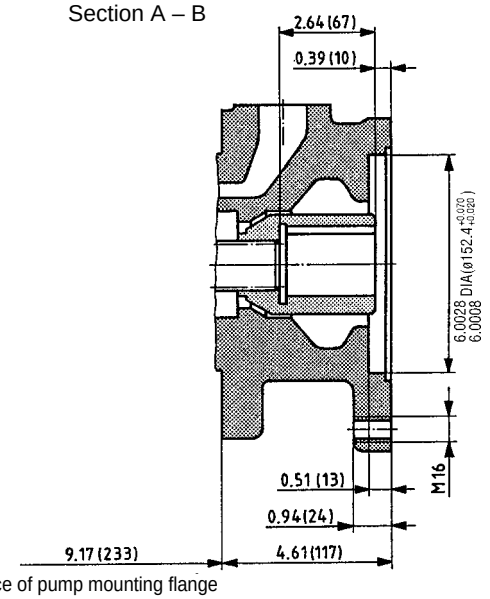
to face of pump mounting flange

Size of main pump	A_1	A_2	A_3	A_4	A_5
100	9.17 (233)	4.13 (105)	0.79 (20)	2.24 (57)	M16; deep 0.98 (25)
140	9.17 (233)	4.61 (117)	0.94 (24)	2.72 (69)	M16; deep 1.26 (32)

Flange SAE D 4-bolt, for mounting of axial piston pump AA10VSO 140 – keyed shaft K
Ordering code **K 21**



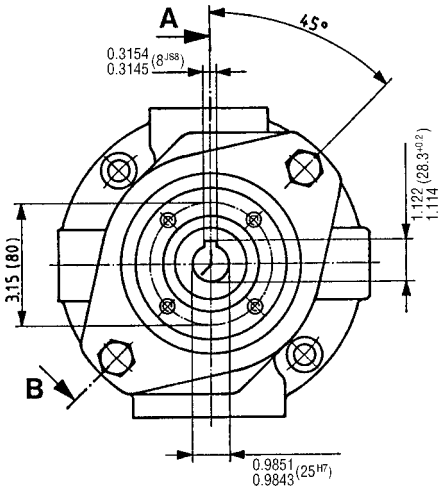
Section A – B



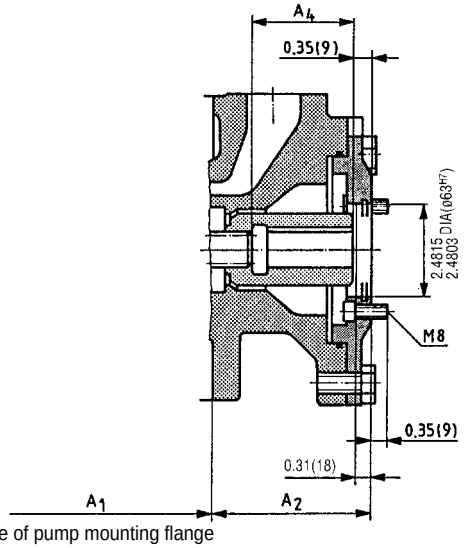
to face of pump mounting flange

Size of main pump 140

Flange ISO 63 4-bolt metric, for mounting of radial piston pump R4 (see RA 11 263)
Ordering code **K 57**



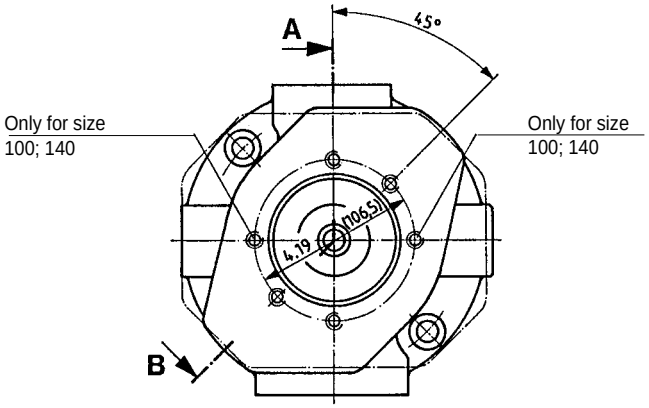
Section A – B



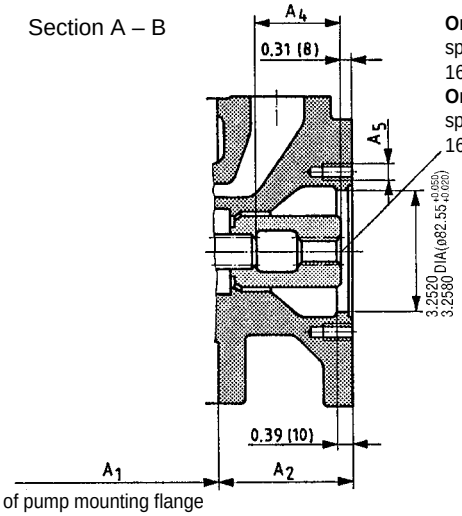
to face of pump mounting flange

Size of main pump	A_1	A_2	A_4
28	5.28 (134)	3.86 (98)	1.85 (47)
45	5.87 (149)	4.75 (108)	2.81 (71.5)
71	6.97 (177)	4.17 (106)	2.68 (68)
100	9.17 (233)	4.76 (121)	2.78 (70.5)
140	9.17 (233)	5.24 (133)	3.31 (84)

Flange 82-4 (SAE A), 2-bolt, for mounting of gear pump G2 – splined shaft (see RA 10 030)
Ordering code **K 01**
Flange 82-4 (SAE A), 2-bolt, for mounting of axial piston pump A10VSO 18 – splined shaft S (see RA 92 712)
Ordering code **K 52**



Section A – B



Ordering code K01:
splined hub 5/8"
16/32 DP, 9 T
Ordering code K52:
splined hub 3/4"
16/32 DP, 11 T

to face of pump mounting flange

Size of main pump	A_1	A_2	A_4	A_5
28	5.28 (134)	2.76 (70)	1.50 (38)	M10;deep 0.63 (16)
45	5.87 (149)	3.15 (80)	1.73 (44)	M10;deep 0.63 (16)
71	6.97 (177)	3.54 (90)	2.05 (52)	M10;deep 0.79 (20)
100	9.17 (233)	4.13 (105)	2.20 (56)	M10;deep 0.79 (20)
140	9.17 (233)	4.61 (117)	2.68 (68)	M10;deep 0.79 (20)

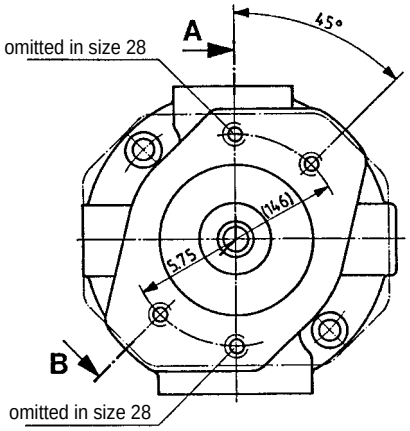
Flange 101-2 (SAE B), 2-bolt, for mounting of gear pump G3 – splined shaft (see RA 10 039) or
for mounting of axial piston pump A10VO 28 (see RA 92 701)

Ordering code **K 02**

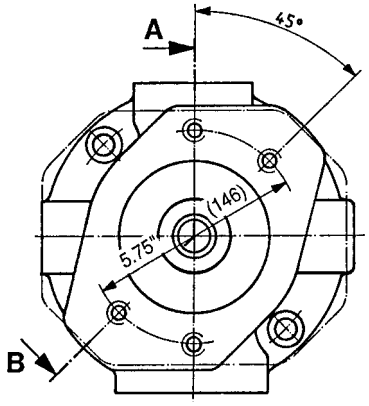
Flange 101-2 (SAE B), 2-bolt, for mounting of axial piston pump A10VO 45 – splined shaft (see RA 92 701)

Ordering code **K 04**

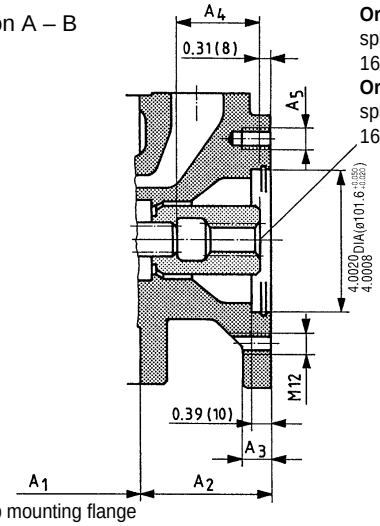
(K02)



(K04)



Section A – B



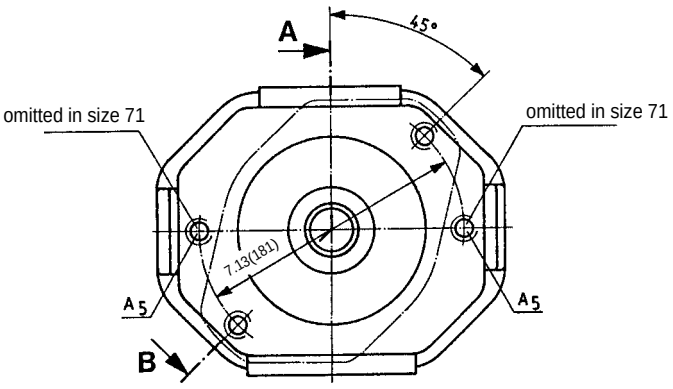
Ordering code K02:
splined hub 7/8"
16/32 DP, 13 T

Ordering code K04:
splined hub 1"
16/32 DP, 15 T

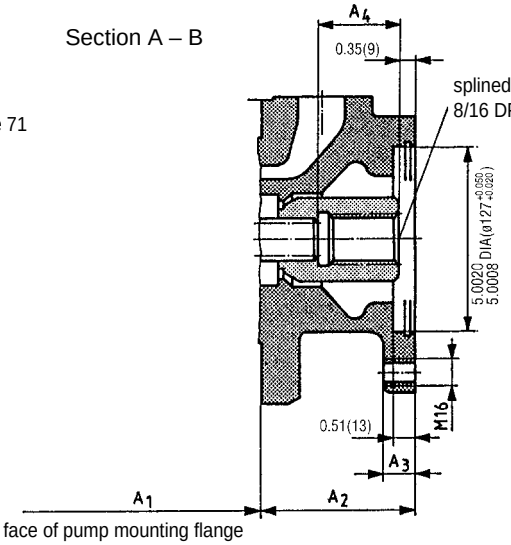
Size of main pump	A_1	A_2	A_3	A_4	A_5
28	5.28 (134)	2.76 (70)	0.59 (15)	1.50 (38)	–
45	5.87 (149)	3.15 (80)	0.55 (14)	1.73 (44)	M12;deep 0.71 (18)
71	6.97 (177)	3.54 (90)	0.71 (18)	2.05 (52)	M12;deep 0.79 (20)
100	9.17 (233)	4.13 (105)	–	2.20 (56)	M12;deep 0.79 (20)
140	9.17 (233)	4.61 (117)	–	2.68 (68)	M12;deep 0.79 (20)

Flange SAE C 2-bolt, for mounting of gear pump G4 – splined shaft (see RA 10 042) or
for mounting of axial piston pump A10VO 71 – splined shaft S (see RA 92 701)

Ordering code **K 07**



Section A – B

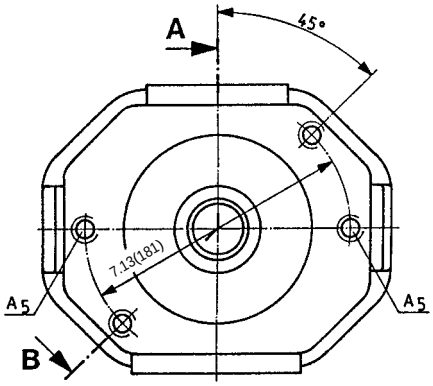


splined hub 1 3/4"
8/16 DP, 13 T

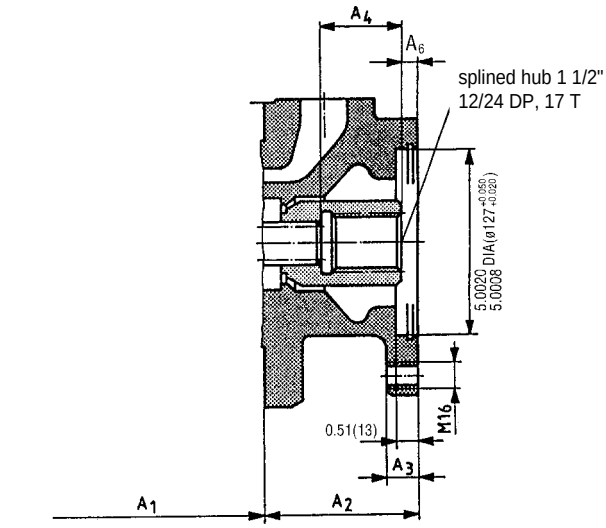
Size of main pump	A_1	A_2	A_3	A_4	A_5
71	6.97 (177)	3.54 (90)	0.71 (18)	2.01 (51)	M16;deep 0.71 (18)
100	9.17 (233)	4.13 (105)	0.79 (20)	2.24 (57)	M16;deep 0.98 (25)
140	9.17 (233)	4.61 (117)	0.94 (24)	2.68 (68)	M16;deep 0.98 (25)

Flange SAE C 2-bolt, for mounting of axial piston pump A10VO 100 – splined shaft S (see RA 92 701) or
for mounting of gear pump GC6 – splined shaft (see RA 10 215)

Ordering code **K 24**



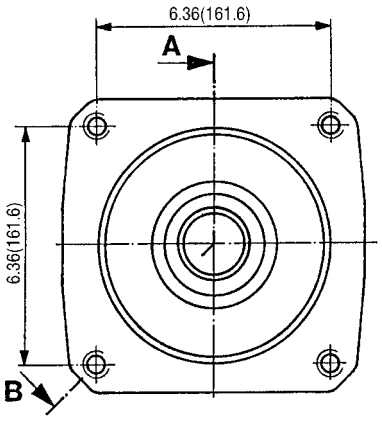
Section A – B



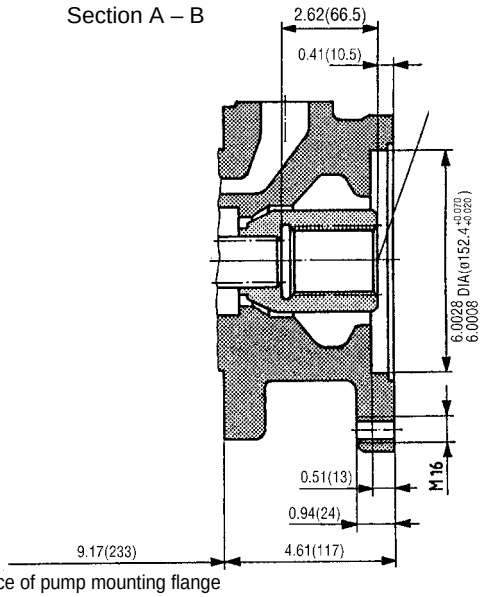
to face of pump mounting flange

Size of main pump	A_1	A_2	A_3	A_4	A_5	A_6
100	9.17 (233)	4.13 (105)	0.79 (20)	2.56 (65)	M16; deep 0.98 (25)	0.31 (8)
140	9.17 (233)	4.61 (117)	0.94 (24)	2.64 (67)	M16; deep 0.98 (25)	0.39 (10)

Flange SAE D 4-bolt, for mounting of axial piston pump A10VO 140 – splined shaft S (see RA 92 701)
Ordering code **K 17**



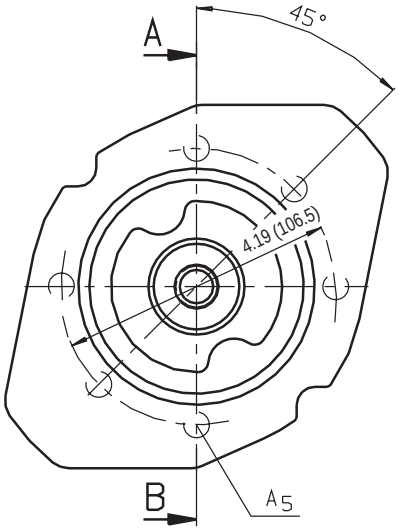
Section A – B



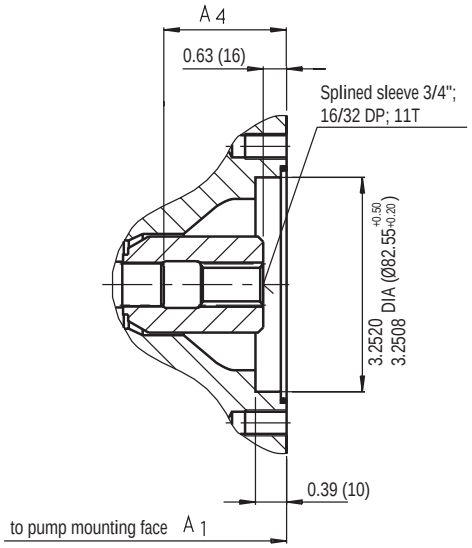
to face of pump mounting flange

Size of main pump 140

Flange SAE 82-2 (SAE A, 2-hole) for mounting of axial piston pump A10VSO 18 - drive shaft "R" (see RA 92 712)
Ordering code: **KA1**

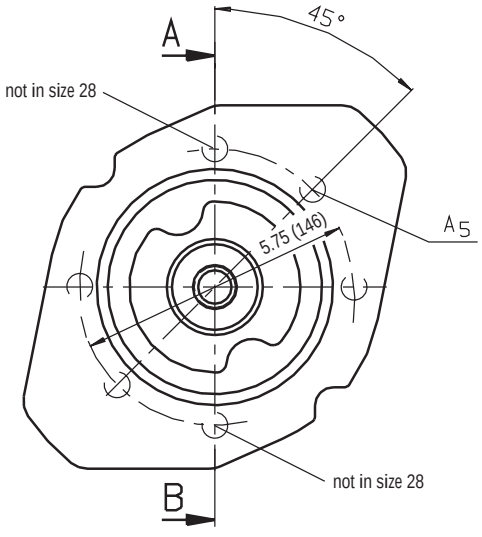


Section A – B

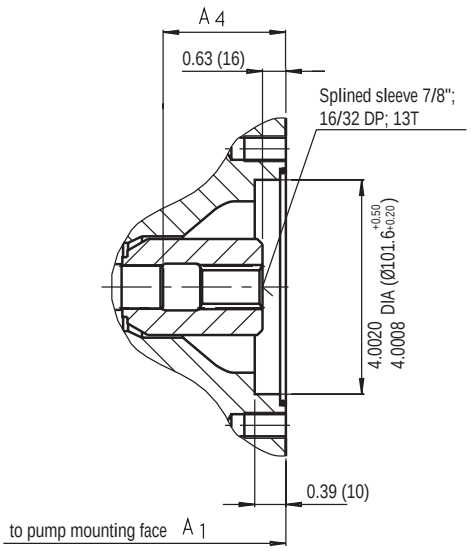


Size	A_1	A_4	A_5 (metric thread)
28	8.03(204)	1.85(47)	M 10; 0.63(16) deep
45	9.02(229)	2.09(53)	M 10; 0.63(16) deep
71	10.51(267)	2.40(61)	M 10; 0.79(20) deep
100	13.31(338)	2.56(65)	M 10; 0.79(20) deep
140	13.78(350)	3.03(77)	M 10; 0.79(20) deep

Flange SAE 101-2 (SAE B, 2-hole) for mounting of fixed vane pump PVV1 or 2 with drive shaft “J” (see RA 10 335) or for mounting of axial piston pump A10VO 28 - drive shaft "R"
Ordering code: **KA3**



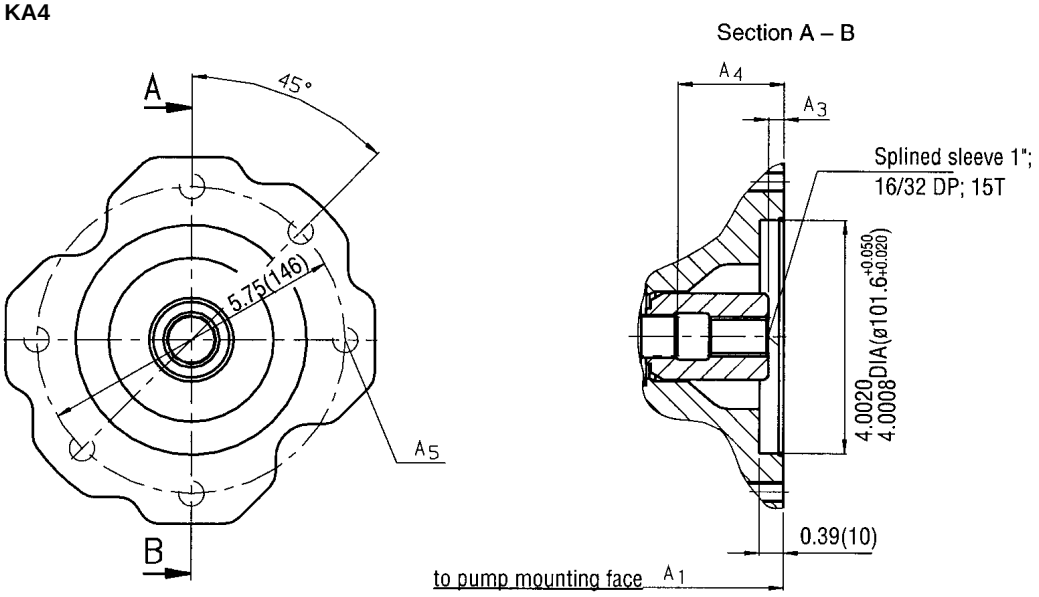
Section A – B



Size	A_1	A_4	A_5 (metric thread)
28	8.03(204)	1.85(47)	M 12; 0.59(15) deep
45	9.02(229)	2.09(53)	M 12; 0.71(18) deep
71	10.51(267)	2.40(61)	M 12; 0.79(20) deep
100	13.31(338)	2.56(65)	M 12; 0.79(20) deep
140	13.78(350)	3.03(77)	M 12; 0.79(20) deep

For size 28, only the fixed vane pump PVV is mounted 45° turned.

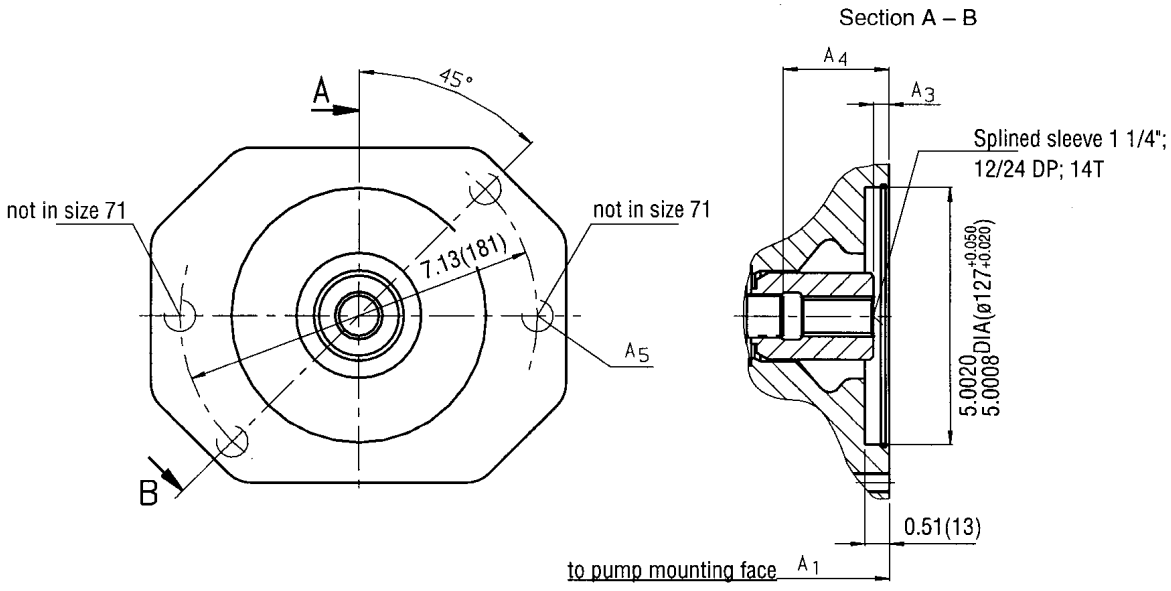
Flange SAE 101-2 (SAE B, 2-hole) for mounting of axial piston pump A10VO 45 - drive shaft "R" or PVV4 or 5 with drive shaft “J” (see RA 10 335) *)
Ordering code: **KA4**



Size	A_1	A_3	A_4	A_5 (metric thread)
45	9.02(229)	0.63(16)	2.09(53)	M 12; 0.71(18) deep
71	10.51(267)	0.59(15)	2.40(61)	M 12; 0.79(20) deep
100	13.31(338)	0.67(17)	2.56(65)	M 12; 0.79(20) deep

*) **CAUTION!**
A 1.5 mm (1/16") spacer plate is required between vane pump mounting face for size A10VO71.

Flange SAE 127-2 (SAE C, 2-hole) for mounting of axial piston pump A10VO 71 - drive shaft "R"
Ordering code: **KA5**



Size	A_1	A_3	A_4	A_5 (metric thread)
71	10.51(267)	0.67(17)	2.40(61)	M 16; 0.71(18) deep
100	13.31(338)	0.59(15)	2.56(65)	M 16; 0.98(25) deep
140	13.78(350)	0.63(16)	3.03(77)	M 16; 1.26(32) deep

Variable Displacement Pump AA10VSO, Series 31

DFEE		/	31	R	-	P	K	C	62	N00	2	C	2

Control type

Proportional pressure and flow control	**DFEE**

Additiona functions

Electronics without additional functions	**omit**
Electronics with power limitation as additional functions	**3**

Series

	31

Direction of rotation

Viewed on shaft end	Right hand, clockwise	**R**
	Left hand, counter-clockwise	**L**

Seals

Buna-N (NBR per DIN ISO 1629); shaft seal FPM (fluorocarbon)	**P**

Shaft end

SAE-keyed shaft	**K**
SAE-splined shaft	**S**

Mounting flange

SAE 2-hole flange mounting flange	**C**
SAE 4-hole flange mounting flange, size 140 only	**D**

Service ports

		28	48	71	100	140	
Ports A/B	Opposite side ports, SAE flange, standard series, UNC mounting screws (Code 61)	●	●	–	●	●	**62**
	Opposite side ports, SAE flange, standard series, B port size 1", UNC mounting screws (Code 61)	–	–	●	–	–	**92**

Thru-drive

No thru-drive	**N00**
With thru-drive; for details see RA 92 711	**KXX**

SYDZ sequence valve option

Without sequence valve	**omit**
With sequence and relief valve, pressure limitation up to 2900 psi (200 bar)*	**1**
With sequence and relief valve, pressure limitation up to 3600 psi (250 bar)*	**2**
With sequence and relief valve, pressure limitation up to 4350 psi (300 bar)*	**3**

Pressure transducer input value (pactual)

Current input 4 to 20 mA	**C**
Voltage input 0–10 Volts	**V**
Voltage input 1–10 Volts	**E**

Special options

Without connecting cable	**1**
Connector with cable 5 meter (15 ft) long	**2**
Connector with cable 10 meter (30 ft.) long	**3**
Connector with cable 20 meter (60 ft) long	**4**

*State settings in clear text when ordering.

Mannesmann Rexroth Corporation
***Rexroth Hydraulics Div., Industrial,* 2315 City Line Road, Bethlehem, PA 18017-2131 Tel. (610) 694-8300 Fax: (610) 694-8467**
***Rexroth Hydraulics Div., Mobile,* 1700 Old Mansfield Road, Wooster, OH 44691-0394 Tel. (330) 263-3400 Fax: (330) 263-3333**