

VARIABLE DISPLACEMENT PUMP H(S)P-10V

SERIES 31



- Industrial & Mobile, Single & Thru Shaft Models, H(S)P-10V
- 18, 28, 45, 71, 100 & 140 Frame Sizes Available
- Same Day Shipment of Units or Parts Orders
- DR, DRG, DFR, DFRI, DFLR Controls
- SAE & Metric Units
- Available series 31 and 52

VARIABLE DISPLACEMENT PUMP H(S)P-10V

SERIES 31

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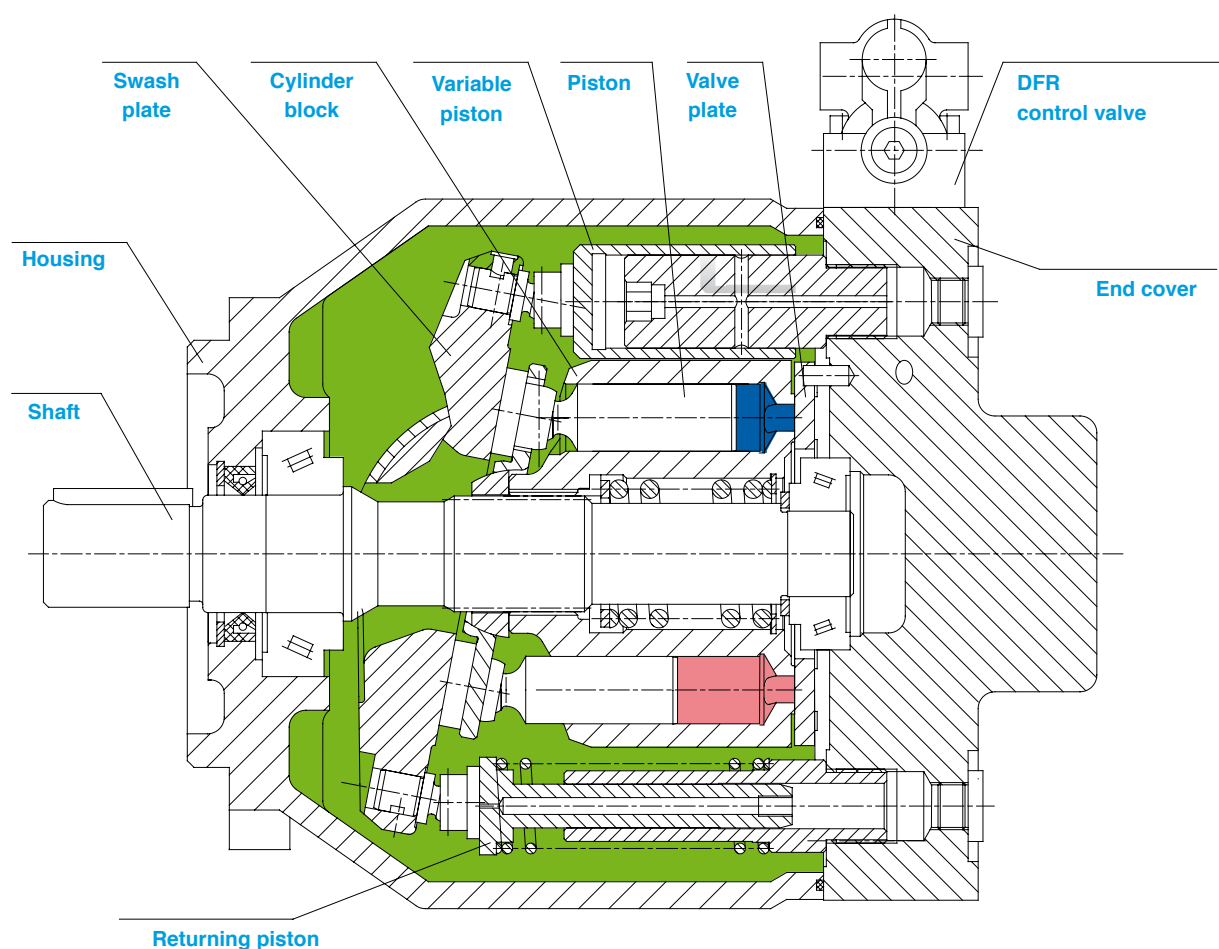
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VARIABLE DISPLACEMENT PUMP H(S)P-10V

SERIES 31

FEATURES

Axial piston pump H(S)P-10V in swashplate design is used for hydrostatic transmissions in open loop circuits. Flow is proportional to drive speed and displacement. By adjusting the position of the swashplate it is possible to smoothly vary the flow.



- Flange connections to SAE-UNC or Isometric
- 2 case drain ports
- High permissible speeds
- Good suction characteristics
- Low noise level
- High power/weight ratio
- Long service life
- Quick response time
- Axial and radial loading of drive shaft possible
- Wide range of controls
- Through drive option for multi-circuit system

VARIABLE DISPLACEMENT PUMP H(S)P-10V

SERIES 31

TECHNICAL DATA

1. Input operating pressure range

Absolute pressure at port S (A)

$P_{\text{abs min}}$ 0.8bar (12 psi)

$P_{\text{abs max}}$ 30bar (435 psi)

2. Output operating pressure range

Pressure at port B

Nominal pressure P_N 280bar (4000 psi)

Peak pressure P_{max} 350bar (5100 psi)

Pressure data to DIN24312

3. Case drain pressure

Maximum pressure of leakage fluid (at ports L, L1). Maximum 7 psi (0.5 bar) higher than input pressure at port S, but not higher than 30 psi (2 bar) absolute.

4. Direction of flow : (S to B)

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

Size cm ³ /rev			18	28	45	71	100	140
Displacement	$V_g \text{ max}$	cm ³ /rev (in ³ /rev)	18 (1.10)	28 (1.71)	45 (2.75)	71 (4.33)	100 (6.1)	140 (8.54)
Max. Speed	$N_o \text{ max}$	rpm	3300	3000	2600	2200	2000	1800
Max. Flow	$O_o \text{ max}$	L / min (gpm)	59.4 (15.7)	84 (22)	117 (31)	156 (41)	200 (53)	252 (67)
Max. Power	$P_o \text{ max}$	kW (HP)	28 (36.6)	39 (51)	55 (72)	73 (96)	93 (124)	118 (156)
Max. Torque @ $V_g \text{ max}$, $N_o \text{ max}$	T_{max}	Nm (ft - lb)	80 (58)	125 (91)	200 (146)	316 (230)w	445 (324)	623 (453)
Weight (without fluid)		Kg (lbs)	12 (27)	15 (33)	21 (46)	33 (73)	45 (99)	60 (132)

Notes: Values shown are valid for an absolute pressure of 1 bar at suction port. If the flow is reduced or if the inlet pressure is increased the speed may be increased.

6. Determination of size

$$\text{Flow } q_v = \frac{V_g \cdot n \cdot \eta_v}{231} \quad [\text{gpm}] \quad \left(q_v = \frac{V_g \cdot n \cdot \eta_v}{1000} \quad [\text{L/min}] \right)$$

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

$$\text{Power } P = \frac{q_v \cdot \Delta p}{1714 \cdot \eta_t} \quad [\text{HP}] \quad \left(P = \frac{q_v \cdot \Delta p}{600 \cdot \eta_t} \quad [\text{kW}] \right)$$

V_g = Displacement per revolution in in³ (cm³)
 Δp = Differential pressure in psi (bar)
 n = Speed in rpm (min⁻¹)
 η_v = Volumetric efficiency
 η_{mh} = Mechanical-hydraulic efficiency
 η_t = Total efficiency

VARIABLE DISPLACEMENT PUMP H(S)P-10V

SERIES 31

ORDERING CODE

H(S)P-10V		O	71	DR	/	31	R	-	P	S
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Axial Piston Unit

Swash plate variable pump	HP-10V
Swash plate variable pump for industrial	HSP-10V

Mode of Operation

Pump, open circuit	O
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Size

Displacement V_{gmax}	cm ³ /rev (in ³ /rev)	18 (1.10)	28 (1.71)	45 (2.75)	71 (4.33)	100 (6.10)	140 (8.54)
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Control Devices

Pressure control	●	●	●	●	●	●	DR
Pressure remote control							DRG
Pressure and flow control	●	●	●	●	●	●	DFR
Pressure & flow (w/ X port blocked)							DFR1
Pressure, Flow & Power control	●	●	●	●	●	●	DFLR

Series

Series	31
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Direction of Rotation

Viewed from shaft end	clockwise	R
	counter-clockwise	L

Seals

Buna-N (NBR per DIN ISO 1629) ;	P
FPM (fluorocarbon)	V

Shaft End

	18	28	45	71	100	140	
SAE-splined shaft	●	●	●	●	●	●	S
SAE-splined shaft, reinforced (higher thru drive torque)	●	●	●	●	-	-	R
SAE splined shaft, smaller size (not for pumps with thru drive)	●	-	●	●	●	-	U
SAE- splined shaft, reinforced (U-type shaft)	●	●	●	●	●	-	W
SAE- keyed shaft	●	●	●	●	●	●	K
Parallel with key DIN 6885	●	●	●	●	●	●	P

VARIABLE DISPLACEMENT PUMP H(S)P-10V

SERIES 31

ORDERING CODE

C	62	N00
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Through drives

18 28 45 71 100 140

Without through drive (Non-Thru Drive)	●	●	●	●	●	●	N00
With through drive to accept an axial piston pump or a gear pump							
Mounting flange SAEJ744 hub sealing to mount							
82-2 (A) 3/4" keyed (A-B) axial H(S)P-10V18 (K)	○	●	●	●	●	●	K40 ¹⁾
101-2 (B) 7/8" keyed (B) axial H(S)P-10V28 (K)	-	●	●	●	●	●	K03 ¹⁾
101-2 (B-B) 1" keyed (B-B) axial H(S)P-10V45 (K)	-	-	●	●	●	●	K05 ¹⁾
127-2 (C) 1-1/4" keyed (C) axial H(S)P-10V71 (K)	-	-	-	●	●	●	K08 ¹⁾
127-2 (C) 1-1/2" keyed (C) radial H(S)P-10V100 (K)	-	-	-	-	●	●	K38 ¹⁾
152-4 (D) 1-3/4" keyed (D) axial H(S)P-10V140 (K)	-	-	-	-	-	●	K21 ¹⁾
82-2 (A) 5/8" 9T (A) axial H(S)P-10V18(U)	●	●	●	●	●	●	K01
82-2 (A) 3/4" 11T (A-B) axial H(S)P-10V18(S,R), 10(S)	●	●	●	●	●	●	K52
101-2 (B) 7/8" 13T (B) axial H(S)P-10V28(S,R), 45(U,W)	-	●	●	●	●	●	K68/K02
101-2 (B) 1" 15T (B-B) axial H(S)P-10V45(S,R), 60(U,W)	-	-	●	●	●	●	K04
127-2 (C) 1-1/4" 14T (C) axial H(S)P-10V71(S,R), 100 (U,W)	-	-	-	●	●	●	K07/K15
127-2 (C) 1-1/2" 17T (C-C) axial H(S)P-10V100(S,R), 85(S)	-	-	-	-	●	●	K24
152-4 (D) 1-3/4" 13T (D) axial H(S)P-10V140(S,R)	-	-	-	-	-	●	K17

¹⁾ Permitted with reduced thru drive torque

See Thru Drives section for other options

Service Ports

(Pressure port B and Suction port S)

18 28 45 71 100 140

Rear ports, UNC mounting screws		●	●	●	●	-	61	Ports 61, 11, 91 & 41 non-through drive only
Opposite side ports, UNC mounting screws	●	●	●	●	●	●	62	
Rear ports, metric mounting screws		●	●	●	-	-	11	
Opposite side ports, metric mounting screws		●	●	●	●	●	12	
Rear ports, UNC mounting screws		-	-	●	-	-	91	
Opposite side ports, UNC mounting screws		-	-	●	-	-	92	
Rear ports, metric mounting screws				●		-	41	
Opposite side ports, metric mounting screws		-	-	●	-	-	42	

Mounting Flange

18 28 45 71 100 140

SAE 2 hole	●	●	●	●	●	-	C
ISO 2 hole	-	●	●	●	●	-	A
SAE 4 hole	-	-	-	-	-	●	D

● = available
○ = in preparation
- = not available

VARIABLE DISPLACEMENT PUMP H(S)P-10V

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FLUID

1. Fluid: AW68 (Q / TCNK 12-2001)

2. Operating viscosity range

$$V_{opt} = 16 \text{ mm}^2 / \text{s} \sim 36 \text{ mm}^2 / \text{s} \text{ (80-170 sus)}$$

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

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

Referred to tank temperature (open loop circuit).

Limits of viscosity range

(The following values are valid for extreme operating conditions):

$$V_{min} = 10 \text{ mm}^2 / \text{s} \text{ (60 sus)}$$

For short periods ($t \leq 1$ minute) at max. leakage oil temperature of 80°C (176 °F)

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

For short periods upon cold start

3. Temperature range

$$T_{min} = -20^\circ\text{C} \text{ (-13}^\circ\text{F)} : T_{max} = +80^\circ\text{C} \text{ (+176}^\circ\text{F)}$$

4. Filtration

In order to ensure reliable operation of the axial piston unit the operating fluid must be maintained to a cleanliness class of at least 16 / 19 to ISO4406. This may be achieved with filter elements with a cleanliness code of 10 μ m.

Installation Notes

The pump housing must be filled with fluid during commissioning and remain full when operating. The concentricity between engine transmission shaft and pump shaft must be less than $\Phi 0.05\text{mm}$ (0.002 in).

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NOISE LEVEL

Characteristics for pump

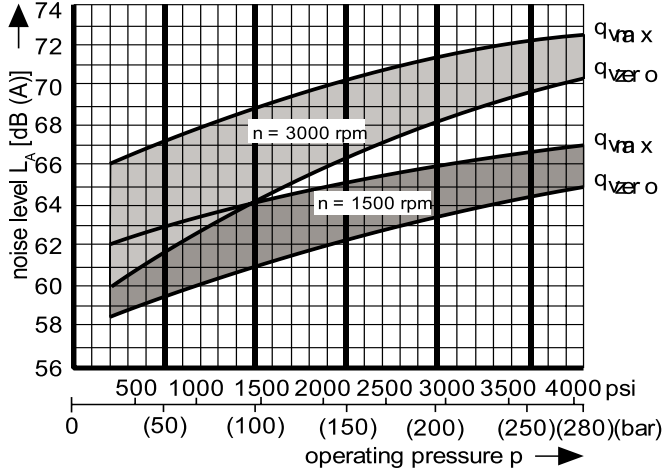
Measured in a sound chamber

Distance from microphone to pump = 3.3 ft (1m)

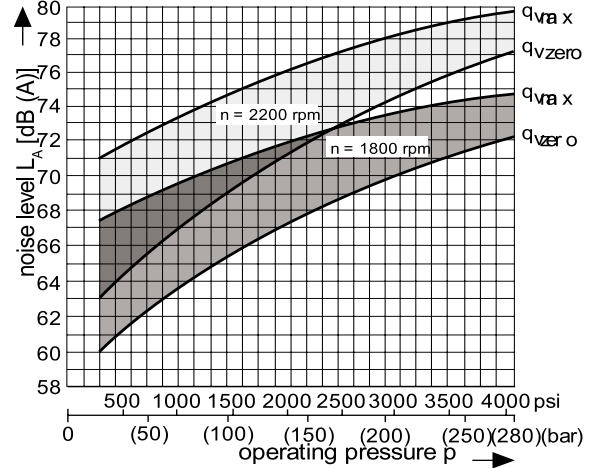
Measuring error: + 2 dB(A)

Fluid: Hydraulic oil to ISO VG 46 DIN 51519, $t=122^{\circ}\text{F}(50^{\circ}\text{C})$

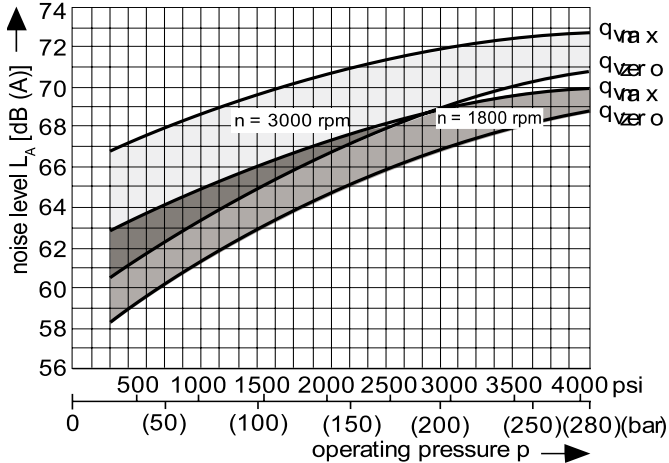
Size 18



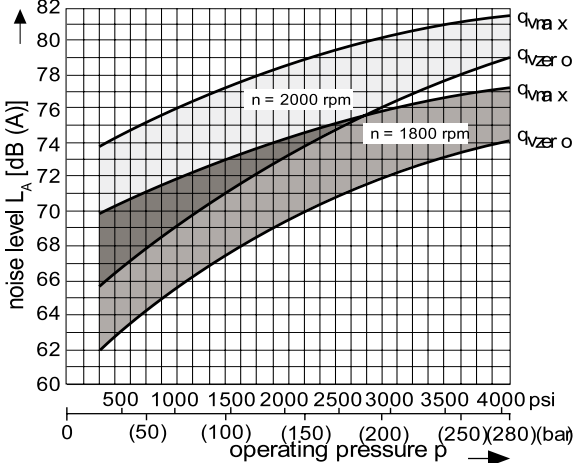
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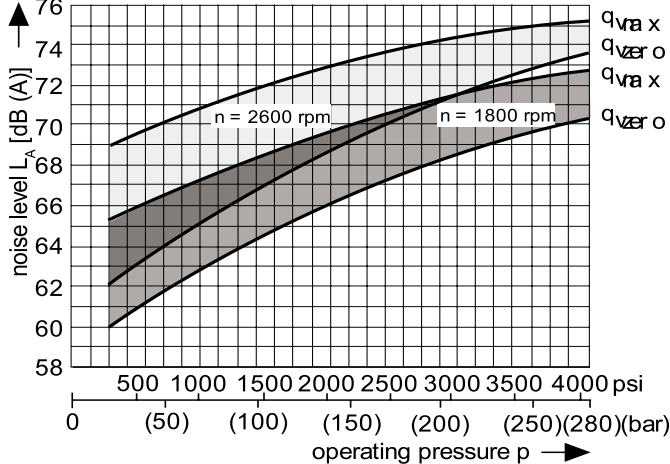
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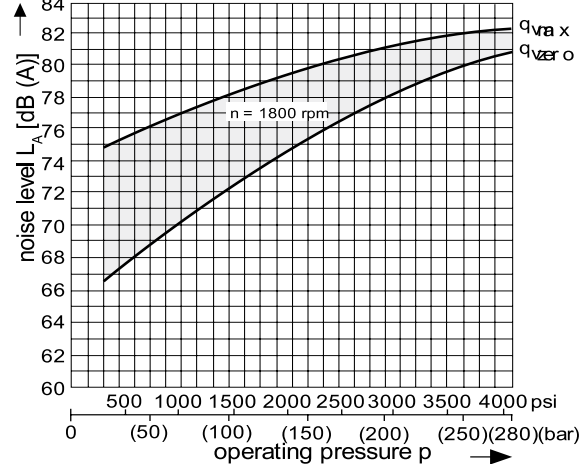
Size 100



Size 45



Size 140



*Sound data representative of piston pumps of this design.

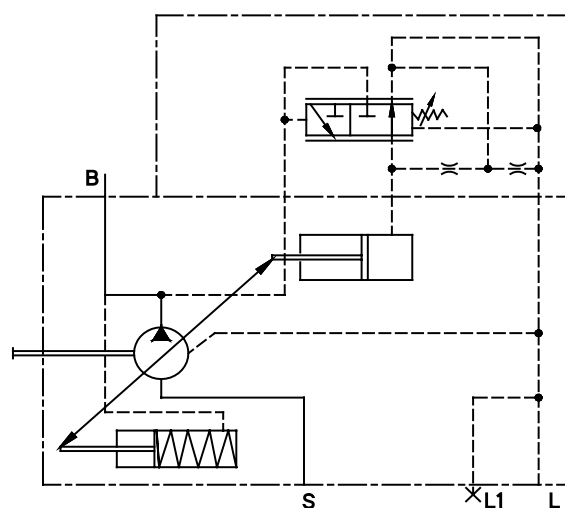
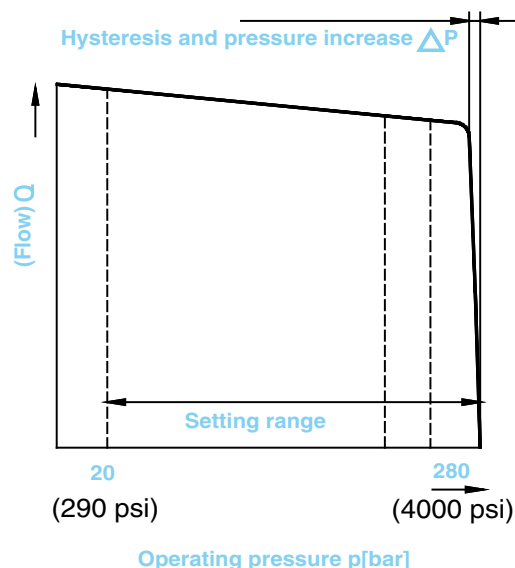
VARIABLE DISPLACEMENT PUMP H(S)P-10V

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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. Pressure may be smoothly set at the pilot valve.

Static characteristic
(at $n_1 = 1450\text{rpm}$; $t_{oil} = 50^\circ\text{C}$) 122°F



Ports

B	Pressure port
S	Suction port
L, L1	Case drain ports (L1 sealed)

CONTROL DATA

Hysteresis and repetitive accuracy Δp max. 3 bar (45 psi)

Size		18	28	45	71	100	140
Δp	Bar (psi)	4 (58)	4 (58)	6 (87)	8 (116)	10 (145)	12 (174)

Pilot oil consumption.....max. approx. 3 L/min (0.8 gpm)

VARIABLE DISPLACEMENT PUMP H(S)P-10V

SERIES 31

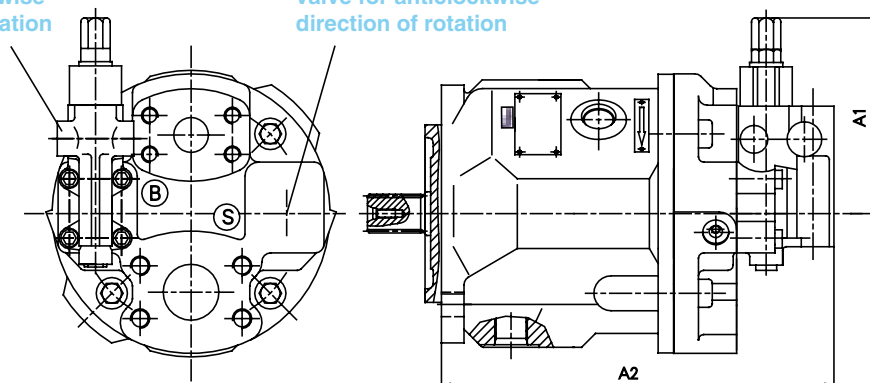
UNIT DIMENSIONS DR

SERVICE PORTS AT REAR; MODELS 61N00 AND 11N00

Sizes 18 to 140

Mounting of pilot
valve for clockwise
direction of rotation

Mounting of pilot
valve for anticlockwise
direction of rotation

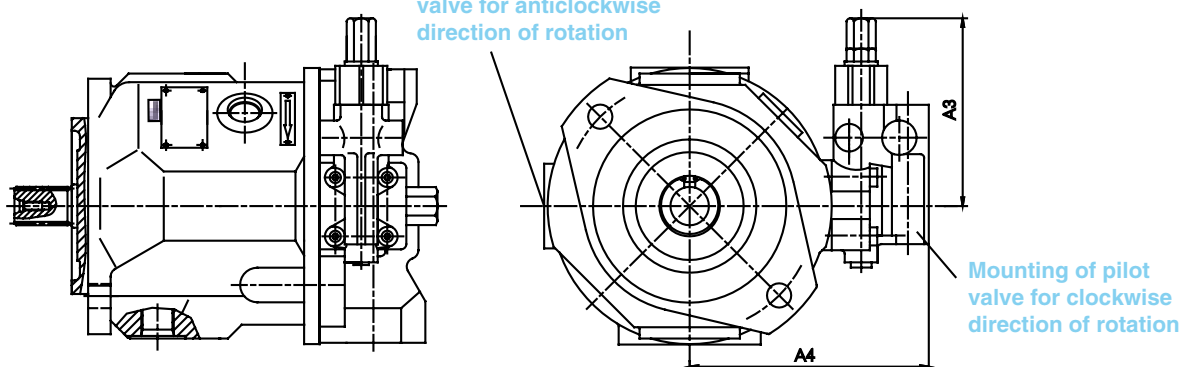


UNIT DIMENSIONS DR

SERVICE PORTS ON SIDE; MODELS 62N00 AND 12N00

Sizes 18 to 140

Mounting of pilot
valve for anticlockwise
direction of rotation



Sizes	A1 mm (in)	A2 mm (in)	A3 mm (in)	A4 mm (in)
18	110 (4.33")	-	105 (4.13")	126 (4.96")
28	108.5 (4.27")	226.2 (8.91")	108.5 (4.27")	136 (5.35")
45	108.5 (4.27")	245 (9.65")	108.5 (4.27")	146 (5.75")
71	106 (4.17")	279 (10.98")	108.5 (4.27")	160 (6.3")
100	108.5 (4.27")	344 (13.54")	108.5 (4.27")	158 (6.22")
140	126 (4.964")	-	127 (5.0")	169 (6.65")

VARIABLE DISPLACEMENT PUMP H(S)P-10V

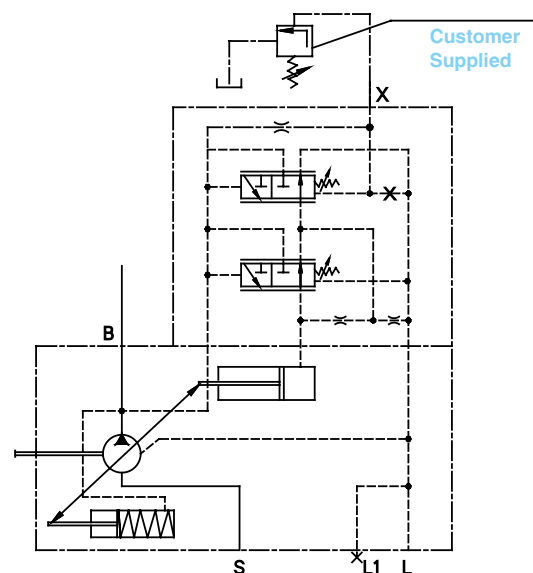
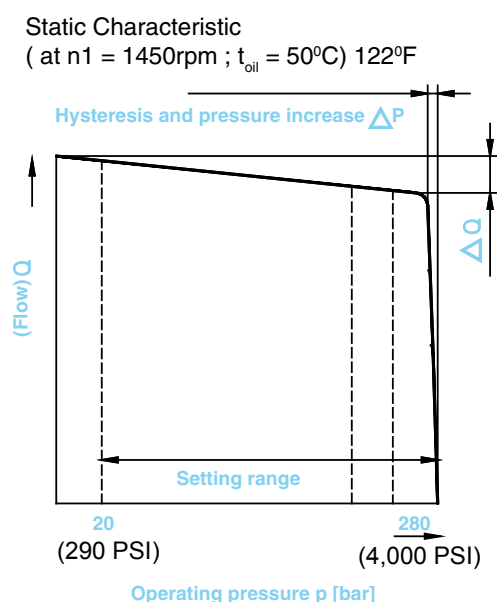
SERIES 31

DRG PRESSURE CONTROL, REMOTE CONTROL

Function and design for DRG.

A pressure relief valve may be externally piped to port X for remote control purposes. It is not, however, included with DRG control.

The differential pressure at the pilot valve is set as standard to 20 bar (290 psi) and this results in a pilot flow of (0.4gpm) 1.5 L/min. If another setting is required (in the range 10-22 bar), please state this in clear text.



Ports

B	Pressure port
S	Suction port
L, L1	Case drain ports (L1 sealed)
X	Pilot pressure port

CONTROL DATA

Hysteresis and repetitive accuracy p.....max 3 bar (45 psi)

Max. pressure increases

Size		18	28	45	71	100	140
Δp	Bar (psi)	4 (58)	4 (58)	6 (87)	8 (116)	10 (145)	12 (174)

Pilot oil consumption.....max. approx. 4.5 L/min(1.19gpm)

VARIABLE DISPLACEMENT PUMP H(S)P-10V

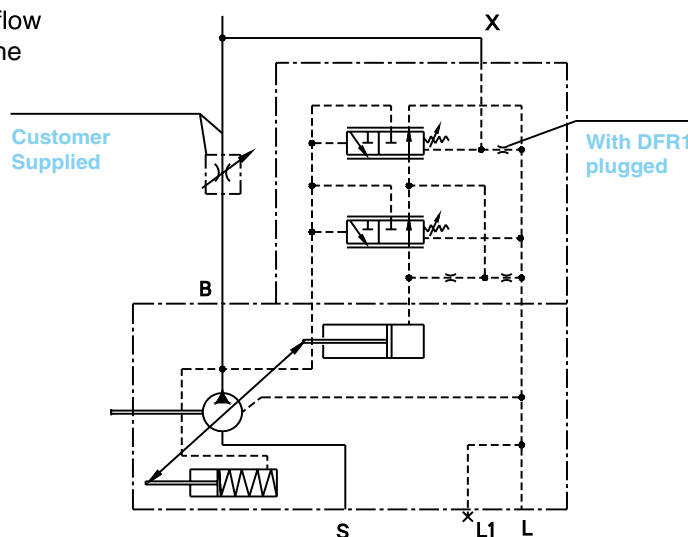
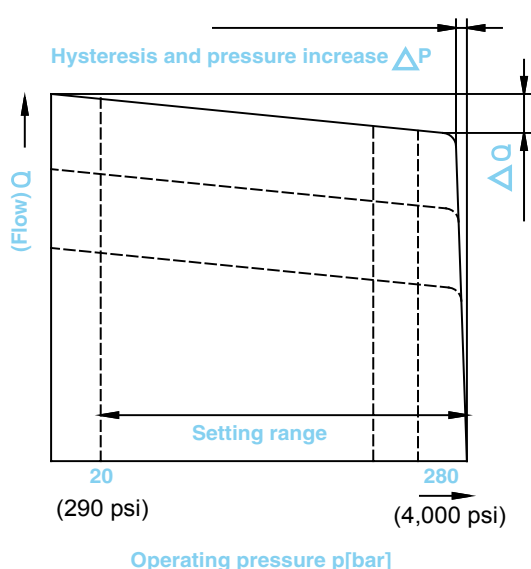
SERIES 31

DFR/DFR1 PRESSURE/FLOW CONTROL

In addition to the pressure control function, the pump flow may be varied by means of a differential pressure at the actuator (e.g. an orifice).

In model DFR1 the X orifice is plugged.

Static Characteristic
(at $n_1 = 1450 \text{ rpm}$; $t_{oil} = 50^\circ\text{C}$) 122°F



Ports

B	Pressure port
S	Suction port
L, L1	Case drain ports (L1 sealed)
X	Pilot pressure port

FLOW CONTROL/DIFFERENTIAL PRESSURE

Standard setting: 14 bar (203psi). If a different setting is required, please state in clear text.

When port X is unloaded to tank, a zero stroke pressure ("stand by") of $p = 18 \pm 2 \text{ bar}$ ($260 \pm 30 \text{ psi}$) results.

CONTROL DATA

For pressure control technical data see DR Pressure control

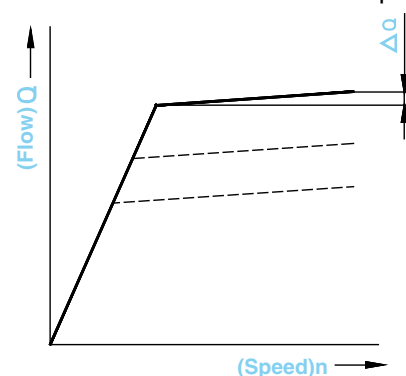
Max. flow deviation (hysteresis and increase) measured at drive speed $n = 1450 \text{ rpm}$

Size	18	28	45	71	100	140
▲ Qmax (gpm) L/min	0.9 (0.24)	1.0 (0.26)	1.8 (0.48)	2.8 (0.74)	4.0 (1.06)	6.0 (1.6)

Pilot oil consumption DFR.....max. approx. 3-4, 5 L/min (0.70-1.19 gpm)

Pilot oil consumption DFR1.....max. approx. 3 L/min (0.70 gpm)

Static characteristic at variable speed



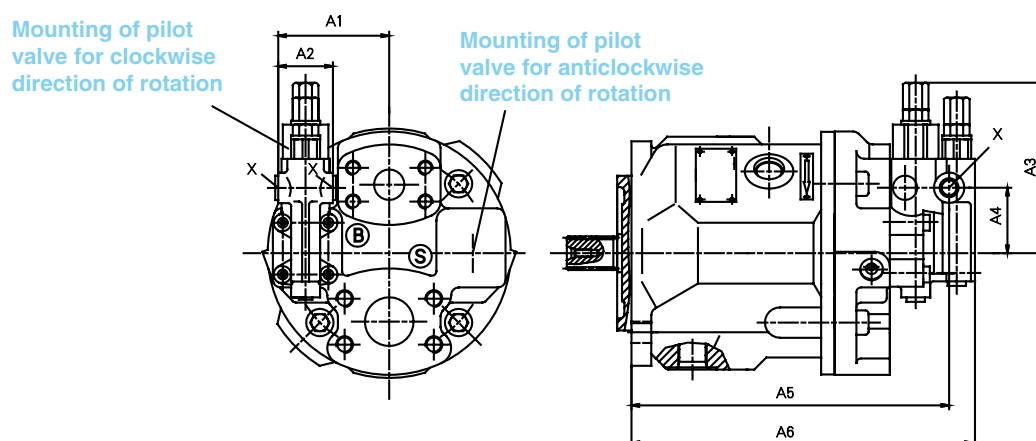
VARIABLE DISPLACEMENT PUMP H(S)P-10V

SERIES 31

UNIT DIMENSIONS DFR / DFR1 / DRG

SERVICE PORTS AT REAR; MODELS 61N00 AND 11N00

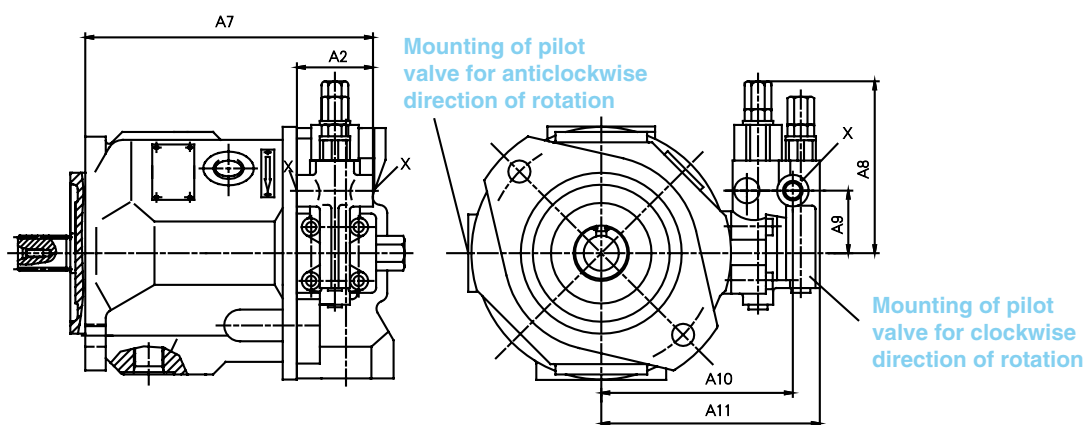
Sizes 18 to 140



UNIT DIMENSIONS DFR / DFR1 / DRG

SERVICE PORTS ON SIDE; MODELS 62N00 AND 12N00

Sizes 18 to 140



Sizes mm (in)	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	X
18	-	36(1.42)	-	-	-	-	166(6.54)	105(4.13)	40(1.57)	109(4.29)	126(4.96)	7/16-20UNF-2B
28	73(2.87)	36(1.42)	108.5(4.27)	43(1.69)	209.2(8.23)	226.2(8.9)	176(6.9)	108.5(4.27)	40(1.57)	119(4.69)	136(5.35)	7/16-20UNF-2B
45	82(3.21)	36(1.42)	108.5(4.27)	40(1.57)	229(8.98)	245(9.65)	191(7.5)	108.5(4.27)	40(1.57)	129(5.08)	146(5.75)	7/16-20UNF-2B
71	91(3.60)	36(1.42)	106(4.17)	42(1.65)	262(10.31)	279(10.98)	219(8.6)	108.5(4.27)	40(1.57)	143(5.63)	160(6.30)	7/16-20UNF-2B
100	96.3(3.79)	36(1.42)	108.5(4.27)	40(1.57)	327(12.87)	344(13.54)	287(11.3)	108.5(4.27)	40(1.57)	141(5.55)	158(6.22)	7/16-20UNF-2B
140	140(5.51)	36(1.42)	-	27(1.06)	353(13.9)	379(14.92)	258(10.16)	127(5.0)	27(1.06)	183(7.2)	209(8.23)	9/16-18UNF-2B

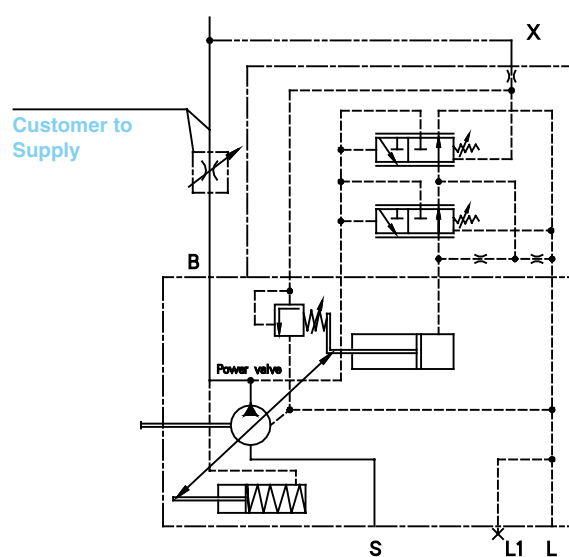
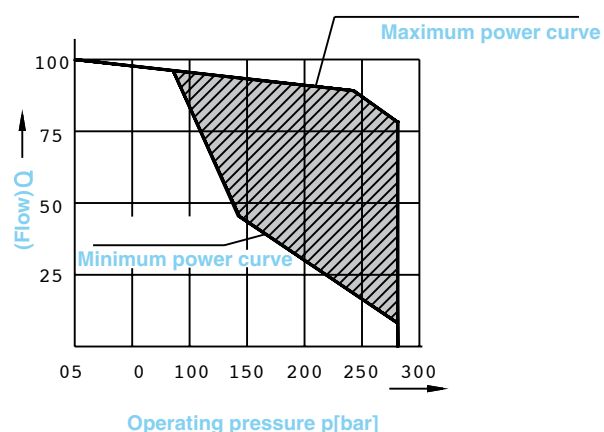
VARIABLE DISPLACEMENT PUMP H(S)P-10V

SERIES 31

DFLR 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 from the axial piston unit is varied so that the product of flow and pressure remain constant.

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



Ports

B	Pressure port
S	Suction port
L, L1	Case drain ports (L1 sealed)
X	Pilot pressure port

The power characteristic is factory - set, so please enter details in clear text, e.g. 20kW at 1450 rpm (5HP, 1800RPM).

CONTROL DATA

For pressure control technical data see DR Pressure control.

For flow control technical data see DFR control.

Start of control.....from 80 bar (1,160 psi)

Pilot oil consumption.....max. approx. 5.5 L/min (1.45 gpm)

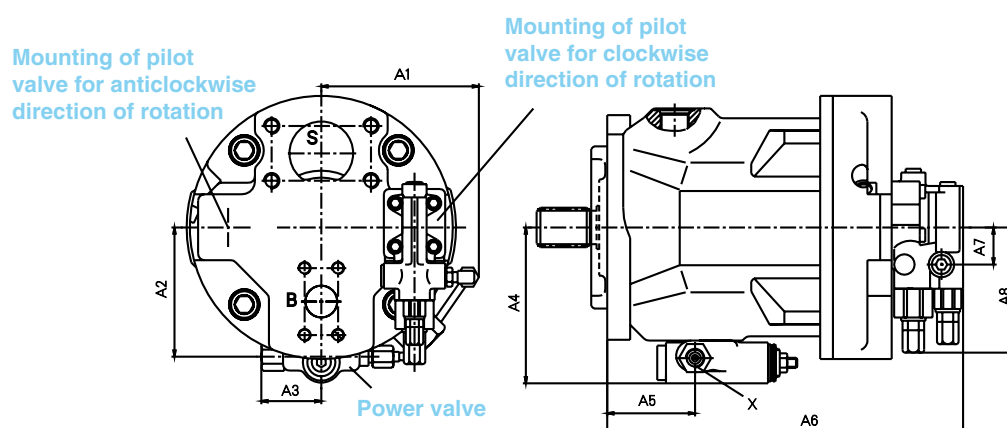
VARIABLE DISPLACEMENT PUMP H(S)P-10V

SERIES 31

UNIT DIMENSIONS DFLR

SERVICE PORTS AT REAR; MODELS 61N00 AND 11N00

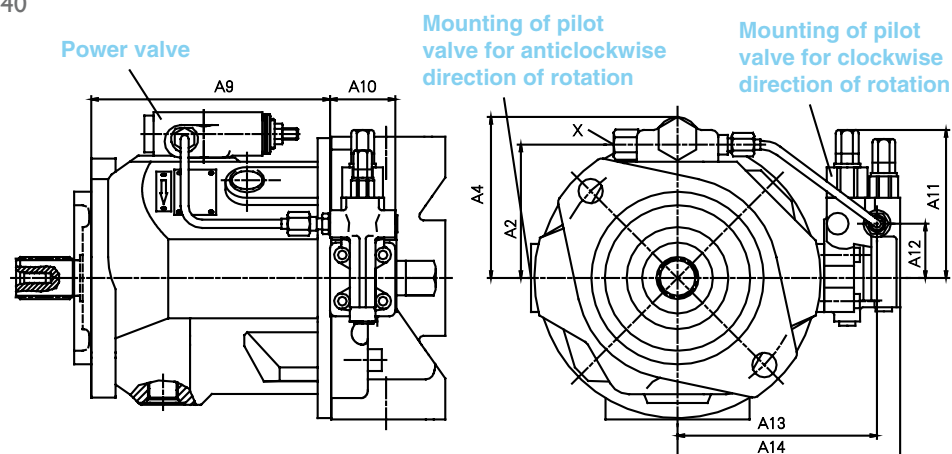
Sizes 18 to 140



UNIT DIMENSIONS DFLR

SERVICE PORTS ON SIDE; MODELS 62N00 AND 12N00

Sizes 18 to 140



Sizes mm(in)	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	X
28	120(4.72)	87.5(3.44)	47(1.9)	108.5(4.27)	48(1.89)	226.2(8.9)	43(1.69)	108.5(4.27)	140(5.51)	36(1.42)	108.5(4.27)	40(1.57)	119(4.69)	136(5.35)	7/16-20UNF-2B x 0.39H
45	129(5.08)	92.8(3.65)	47(1.9)	112.5(4.43)	55(2.17)	245(9.65)	40(1.57)	108.5(4.27)	155(6.10)	36(1.42)	108.5(4.27)	40(1.57)	129(5.08)	146(5.75)	7/16-20UNF-2B x 0.39H
71	139(5.47)	103.5(4.07)	47(1.9)	124(4.88)	69(2.72)	279(10.98)	42(1.65)	106(4.17)	218.8(8.61)	36(1.42)	108.5(4.27)	40(1.57)	143(5.63)	160(6.30)	7/16-20UNF-2B x 0.39H
100	145(5.71)	112.6(4.43)	47(1.9)	132.5(5.22)	110.8(4.36)	344(13.54)	40(1.57)	108.5(4.27)	250(9.84)	36(1.42)	108.5(4.27)	40(1.57)	148(5.83)	165(6.50)	M14 x 1.5-6H
140	148(5.83)	140(5.51)	-	140(5.51)	99(3.90)	379(14.92)	209(8.23)	183(7.2)	-	-	127(5.00)	27(1.06)	183(7.29)	209(8.23)	9/16-18UNF-2B x 0.51H

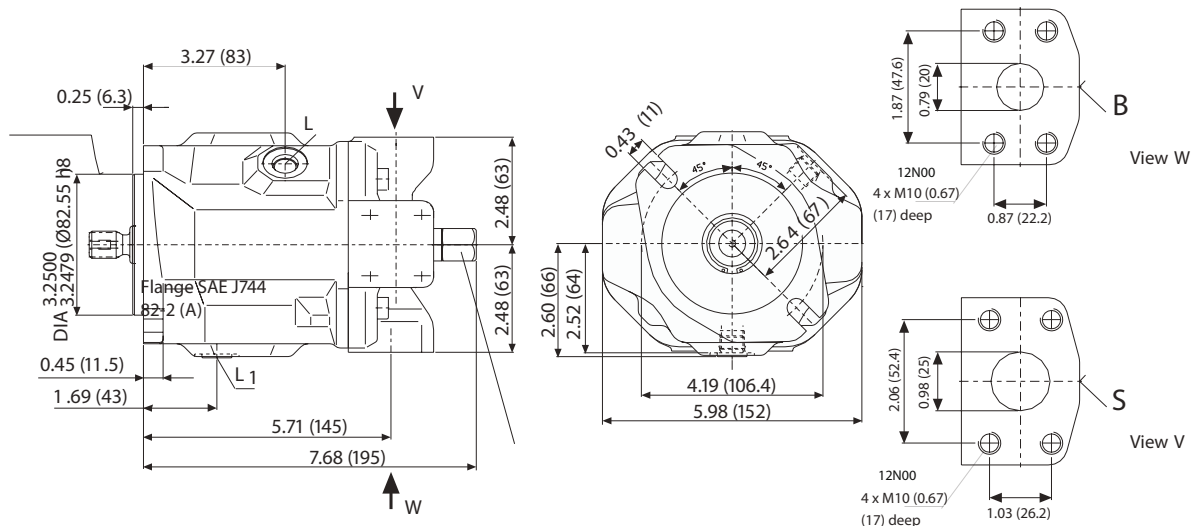
MOUNTING DIMENSIONS, SIZE 18

SERIES 31

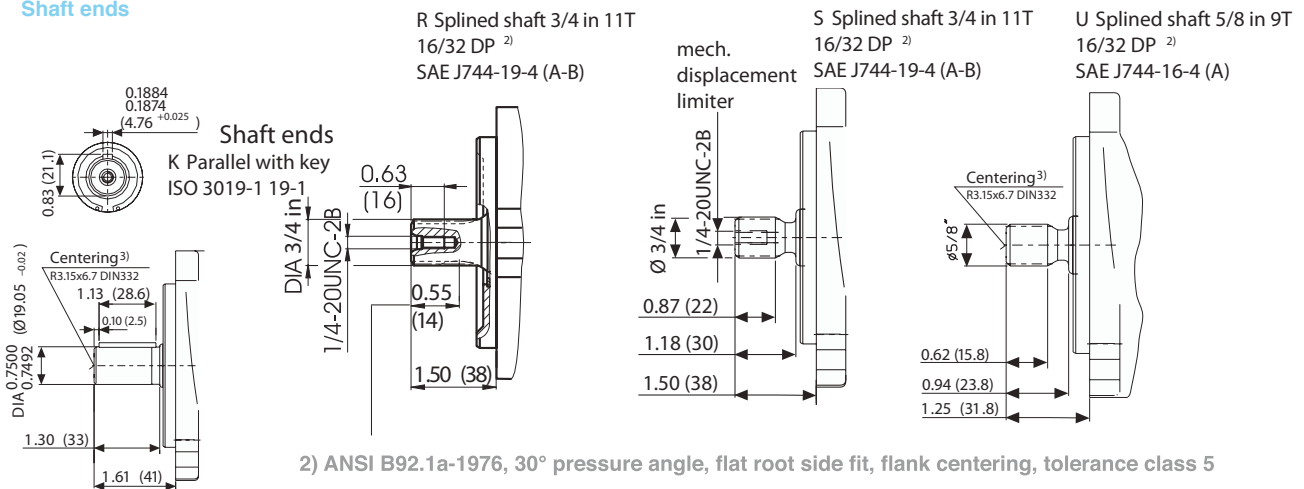
H(S)P-10V18

SERVICE PORTS ON SIDE; NON THROUGH DRIVE, MODELS 62N00 AND 12N00

Without Considering Adjustment



Shaft ends



Ports

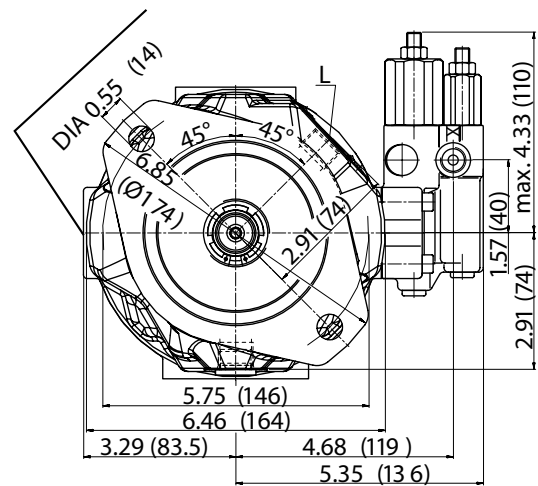
Designation	Port for	Standard	Size	Peak Pressure [psi (bar)]	Tightening Torque Max [lb-ft (Nm)]
B	Pressure port (standard pressure range) Threading in bolt holes	SAE J518 ISO 68	3/4 in 3/8-16 UNC-2B; 0.79 (20) deep	5100 (350)	29 (40)
S	Inlet (standard pressure range) Threading in bolt holes	SAE J518 ISO 68	1 in 3/8-15 UNC-2B; 0.79 (20) deep	75 (5)	29 (40)
L, L ₁	Case drain (L ₁ plugged)	ISO 11926	9/16-18 UNF-2B	30 (2)	59 (80)
X	Pilot Pressure	ISO 11926	7/16-20 UNF-2B; 0.39 (10) deep	5100 (350)	29 (40)
X	Control pressure for DG control	DIN 3852	R 1/4 in	1740 (120)	48 (70)

1) Dependent on the installation position, port L or L₁ must be connected

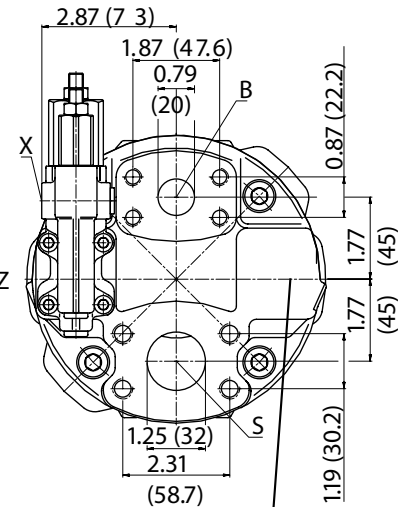
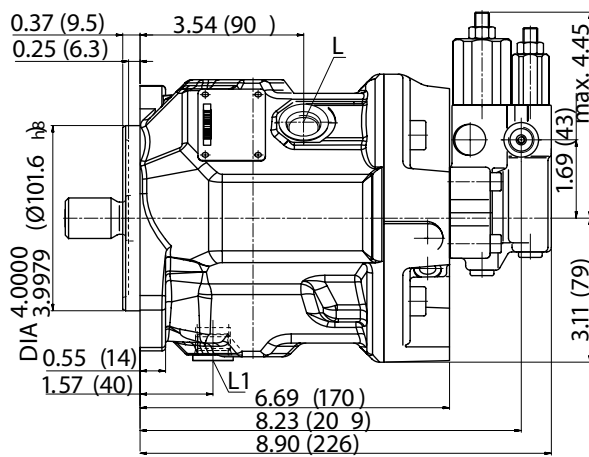
SERIES 31

SERVICE PORTS AT SIDE AND REAR; NON THROUGH DRIVE

Port plate 62/12

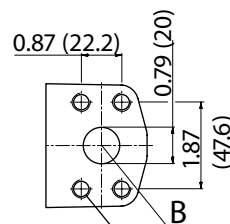


Port plate 61/11

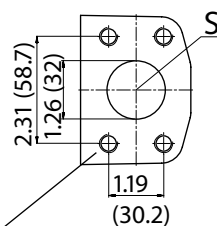


Valve mounting for counter clockwise rotation

View V



View W



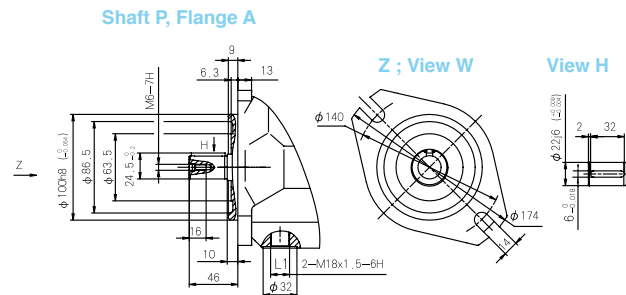
11/12N00 threads,
M10; 17 deep

MOUNTING DIMENSIONS, SIZE 28

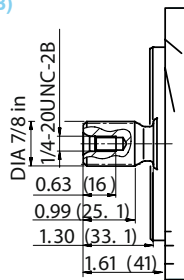
SERIES 31

H(S)P-10V28 SHAFT, METRIC MOUNT, AND PORT DIMENSIONS

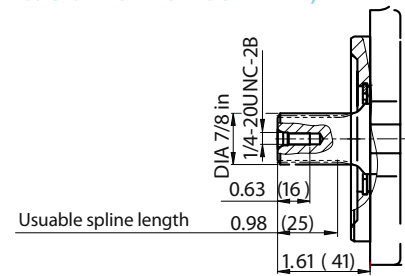
Without Considering Adjustment



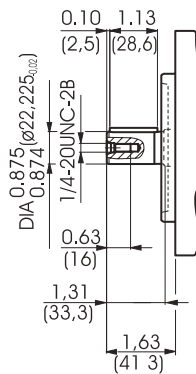
S Splined shaft 7/8 in 13T 16/32 DP 1)
SAE J744- 22-4 (B)



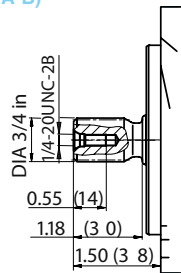
R Splined shaft 7/8 in 13T 16/32 DP 1)



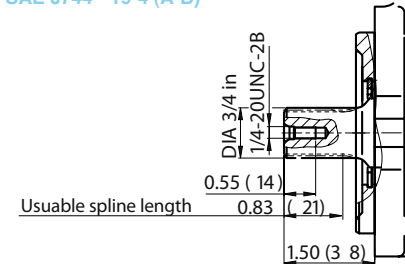
K Parallel with key
ISO 3019-1 22-1



U Splined Shaft 3/4 in 11T 16/32 DP 1)
SAE J744- 19-4 (A-B)



W Splined Shaft 3/4 in 11T 16/32 DP 1)
SAE J744 - 19-4 (A-B)



1) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, flank centering, tolerance class 5

Ports H(S)P-10V 28

Designation	Port for	Standard	Size	Peak press. [psi (bar)]	Tightening Torque, Max [lb-ft (Nm)]	State
B	Service line (standard pressure range) Fixing thread	SAE J518 ISO 68	3/4 in 3/8-16 UNC-2B; 0.79 (20) deep	5100 (350)	29 (40)	O
S	Inlet (standard pressure range) Fixing thread	SAE J518 ISO 68	1 1/4 in 7/16-14 UNC-2B; 0.94 (24) deep	75 (5)	48 (85)	O
L, L ₁	Case drain (L ₁ plugged)	ISO 11926	3/4-16 UNF-2B; 0.47 (12) deep	30 (2)	118 (160)	O ¹⁾
X	Pilot pressure	ISO 11926	7/16-20UNC-2B; 0.47 (12) deep	5100 (350)	29 (40)	O
X	Control pressure for DG control	DIN 3852	R 1/4 in	1740 (120)	48 (70)	O

1) Dependent on the installation position, port L or L₁ must be connected

O = Must be connected

MOUNTING DIMENSIONS, SIZE 45

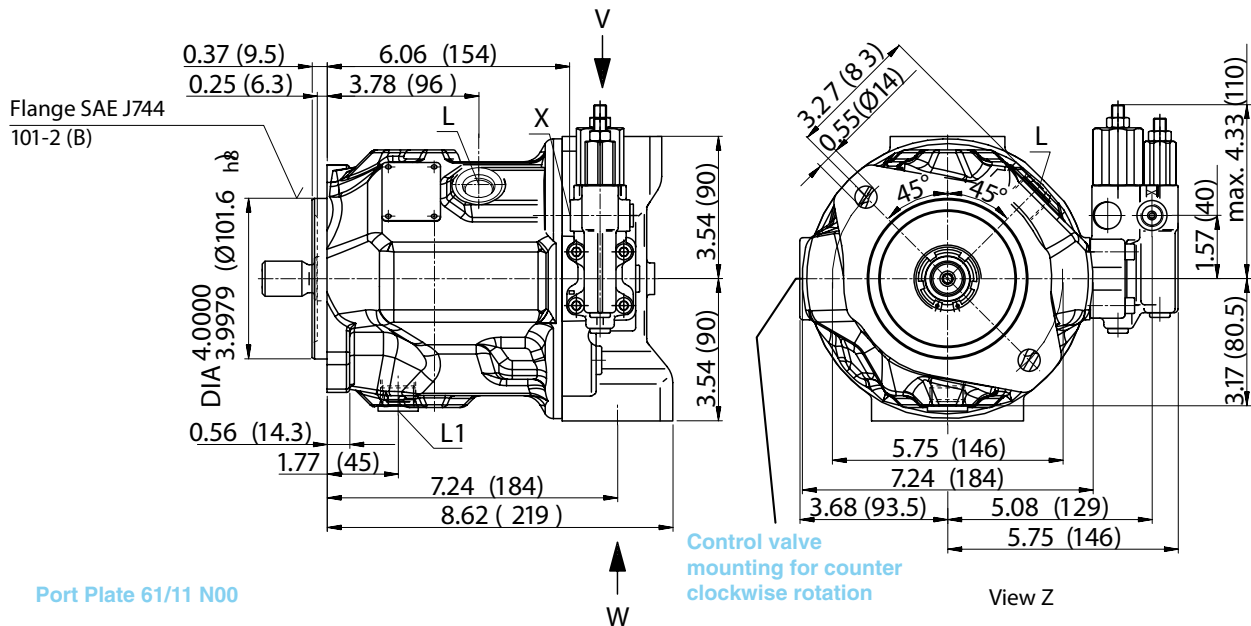
SERIES 31

H(S)P-10V45 SHAFT,

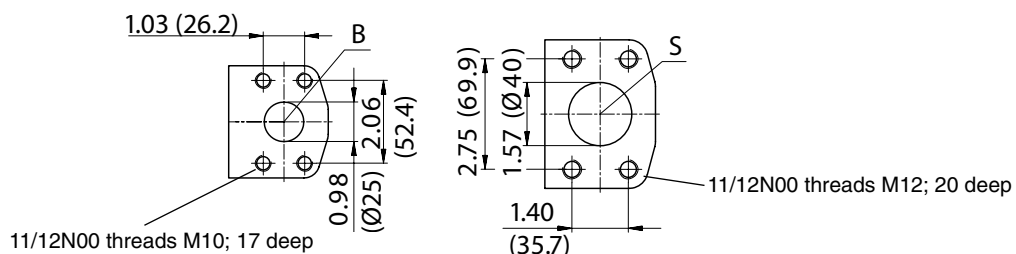
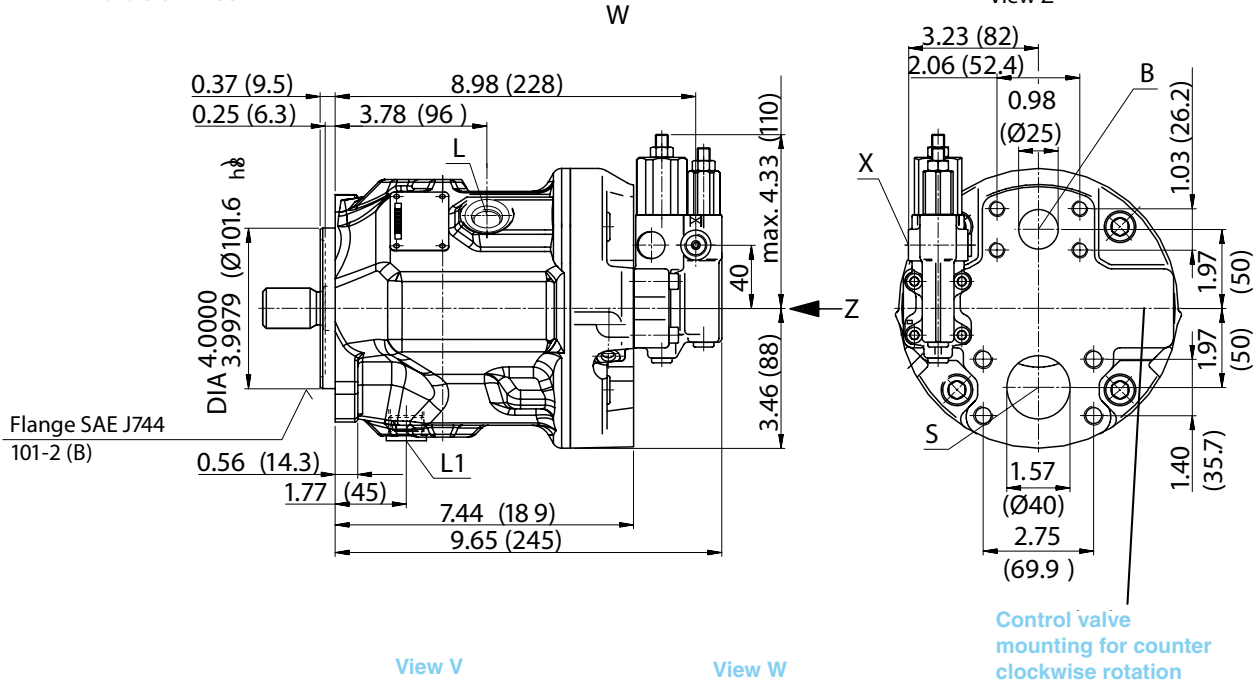
SERVICE PORTS AT SIDE AND REAR; NON THROUGH DRIVE

Without Considering Adjustment

Port Plate 62/12 N00



Port Plate 61/11 N00

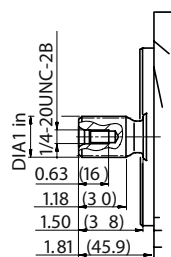


MOUNTING DIMENSIONS, SIZE 45

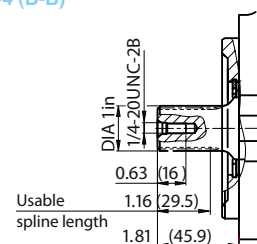
SERIES 31

H(S)P-10V45 SHAFT, METRIC MOUNT, AND PORT DIMENSIONS

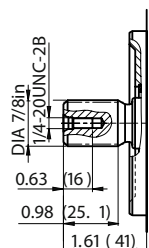
S Splined shaft 1 in 15T 16/32 DP
SAE J744 - 25-4 (B-B)



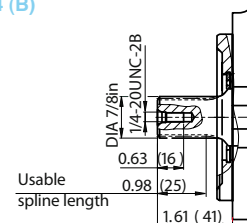
R Splined shaft 1 in 15T 16/32 DP
SAE J744 - 25-4 (B-B)



U Splined shaft 7/8 in 13T 16/32 DP
SAE J744 - 22-4 (B)

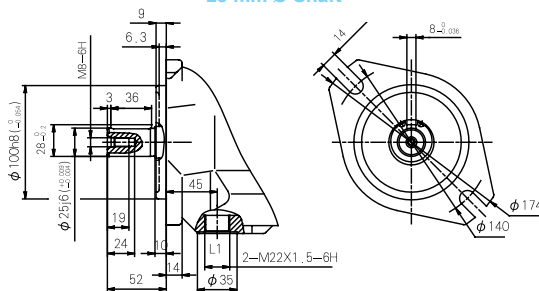


W Splined shaft 7/8 in 13T 16/32 DP
SAE J744 - 22-4 (B)

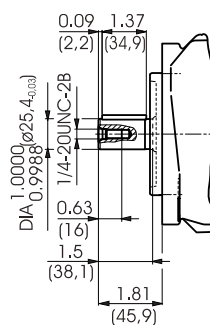


1) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, flank centering, tolerance class 5

Shaft P, ISO Flange A
25 mm Ø Shaft



K Parallel with key
ISO 3019-1 25-1



Ports H(S)P-10V45

Designation	Port for	Standard	Size	Peak press. [psi (bar)]	Tightening Torque, Max [lb-ft (Nm)]	State
B	Service line (standard pressure range) Fixing thread	SAE J518 ISO 68	1 in 3/8-16 UNC-2B; 0.71 (17) deep	5100 (350)	29 (40)	O
S	Inlet (standard pressure range) Fixing thread	SAE J518 ISO 68	1 1/2 in 1/2-13 UNC-2N; 0.87 (22) deep	75 (5)	66 (90)	O
L, L ₁	Case drain	ISO 11926	7/8-14 UNF-2B	30 (2)	177 (240)	O ¹⁾
X	Pilot pressure	ISO 11926	7/16-20 UNF-2B; 0.39 (10) deep	5100 (350)	29 (40)	O
X	Control pressure for DG control	DIN 3852	R 1/4 in	1740 (120)	48 (70)	O

1) Dependent on the installation position, port L or L₁ must be connected

O = Must be connected

SERIES 31

SERVICE PORTS ON SIDE AND REAR; NON THROUGH DRIVE

DFR/DFR1 Pressure and flow control; clockwise rotation

With port plate 92 (others available)

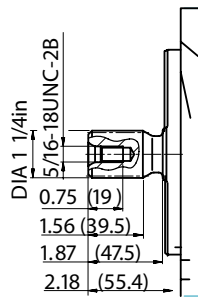


MOUNTING DIMENSIONS, SIZE 71

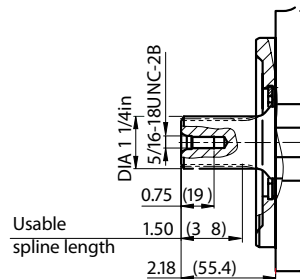
SERIES 31

H(S)P-10V71 SHAFT, METRIC MOUNT, AND PORT DIMENSIONS

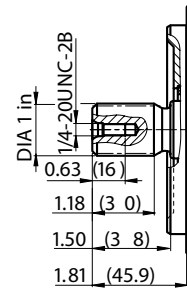
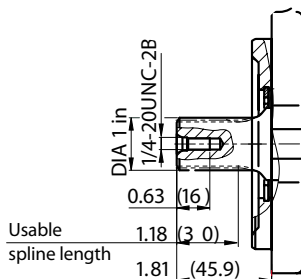
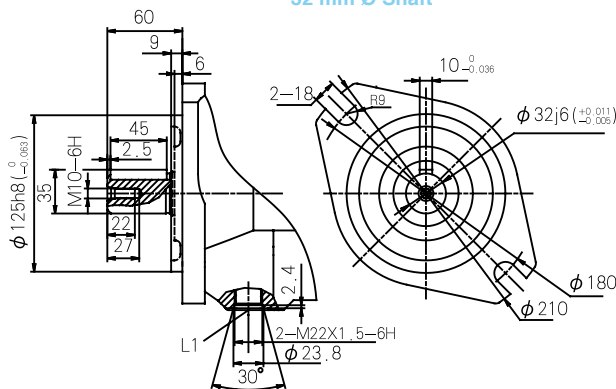
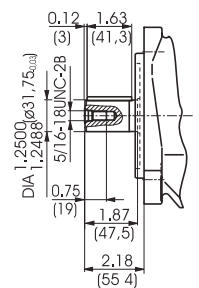
SAE J744- 32-4 (C) 2)



SAE J744- 32-4 (C) 2)



SAE J744- 25-4 (B-B) 2)

W Splined shaft 1 in 15T 16/32 DP
SAE J744- 25-4 (B-B) 2)Shaft P, ISO Flange A
32 mm Ø ShaftK Parallel with key
ISO 3019-1 32-1

2) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, flank centering, tolerance class 5

Ports H(S)P-10V71

Designation	Port for	Standard	Size	Peak press. [psi (bar)]	Max Tightening Torque [lb-ft (Nm)]	State
B	Service line (standard pressure range) Fixing thread	SAE J518 ISO 68	1 in 3/8-16 UNC-2B; 0.71 (18) deep	5100 (350)	29 (40)	O
S	Intlet (standard pressure range) Fixing thread	SAE J518 ISO 68	2 in 1/2-13 UNC-2B; 0.87 (22) deep	75 (5)	66 (90)	O
L, L ₁	Case drain	ISO 11926	7/8-14 UNF-2B	30 (2)	177 (240)	O ¹⁾
X	Pilot pressure	ISO 11926	7/8-14 UNF-2B; 0.39 (10) deep	5100 (350)	29 (40)	O
X	Control pressure for DG control	DIN 3852	R 1/4 in	1740 (120)	48 (70)	O

1) Dependent on the installation position, port L or L₁ must be connected

O = Must be connected

MOUNTING DIMENSIONS, SIZE 100

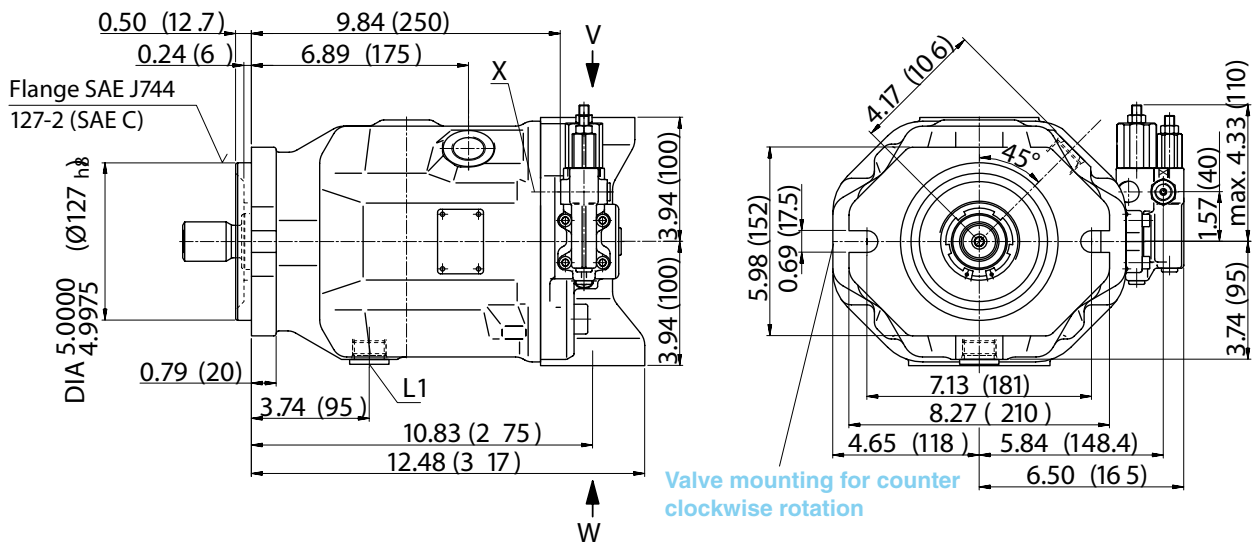
SERIES 31

H(S)P-10VI100 SHAFT,

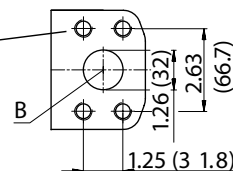
SERVICE PORTS ON SIDE & REAR; NON THROUGH DRIVE

Without Considering Adjustment

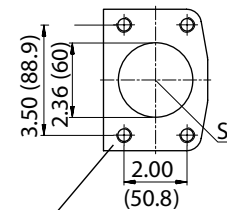
Port Plate 62/12 NOO



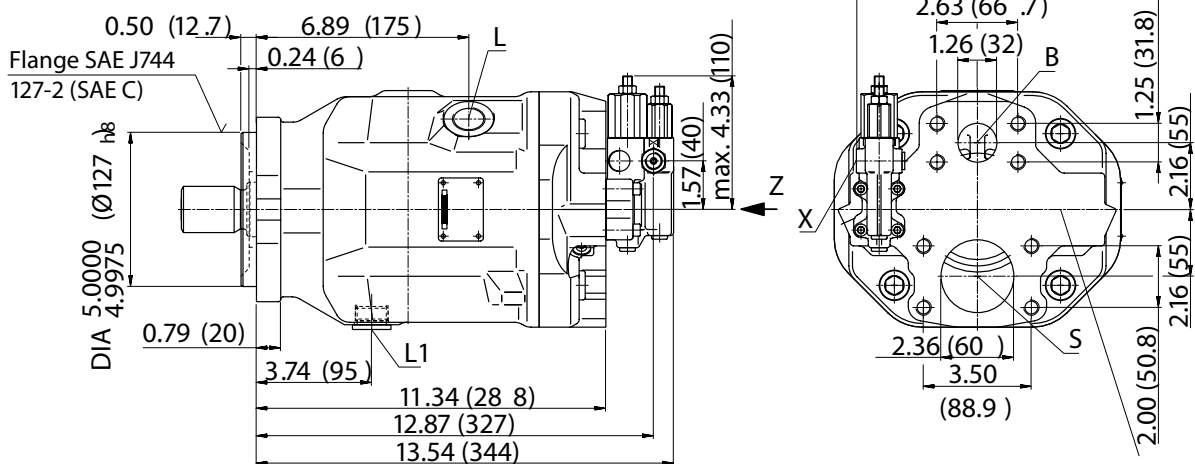
View V



View W



Port Plate 61/11 NOO



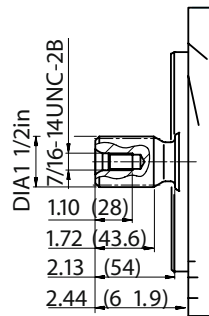
Valve mounting for counter clockwise rotation

MOUNTING DIMENSIONS, SIZE 100

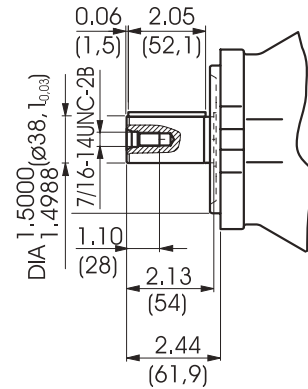
SERIES 31

DRIVE SHAFTS

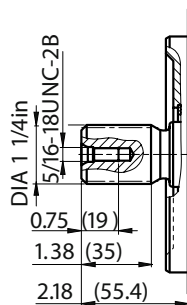
S Splined shaft 1 1/2 in 17T 12/24 DP1)
SAE J744 - 38-4 (C-C) ¹⁾



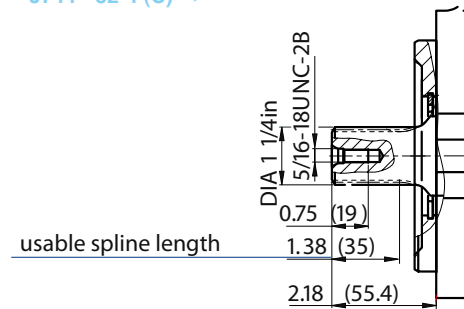
K Parallel with key
ISO 3019-1 38-1



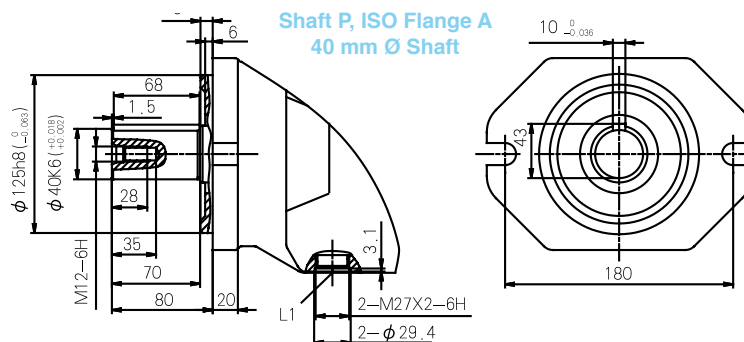
U Splined shaft 1 1/4 in 14T 12/24 DP1) SAE
J744 - 32-4 (C) ¹⁾



W Splined shaft 1 1/4 in 14T 12/24 DP1) SAE
J744 - 32-4 (C) ¹⁾



¹⁾ ANSI B92.1a-1976, 30° pressure angle, flat root side fit, flank centering, tolerance class 5



Ports H(S)P-10V 100

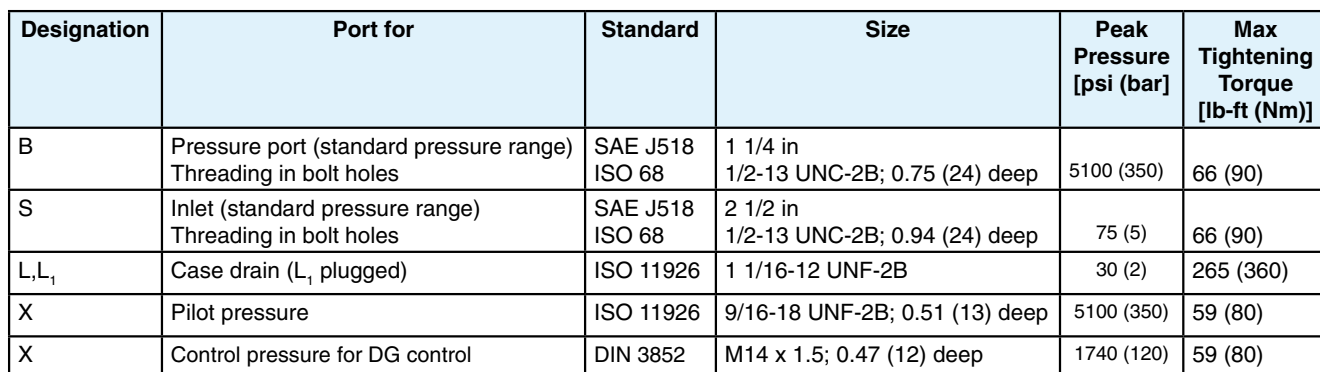
Designation	Port for	Standard	Size	Peak press. [psi (bar)]	Max Tightening Torque [lb-ft (Nm)]	State
B	Service line (high pressure range) Fixing thread	SAE J518 ISO 68	1 1/4 in 1/2-13 UNC-2B; 0.75 (19) deep	5100 (350)	66 (90)	O
S	Intlet (standard pressure range) Fixing thread	SAE J518 ISO 68	2 1/2 in 1/2-13 UNC-2B; 1.06 (17) deep	75 (5)	66 (90)	O
L, L ₁	Case drain	ISO 11926	1 1/16-12 UNF-2B	30 (2)	265 (360)	O ¹⁾
X	Pilot pressure	ISO 11926	7/16-20 UNF-2B; 0.39 (10) deep	5100 (350)	59 (80)	O
X	Control pressure for DG control	DIN 3852	R 1/4 in	1740 (120)	59 (80)	O

¹⁾ Dependent on the installation position, port L or L₁ must be connected

O = Must be connected

SERIES 31

SERVICE PORTS ON SIDE; NON THROUGH DRIVE, MODELS 62N00 AND 12N00



O = Must be connected

THROUGH DRIVES

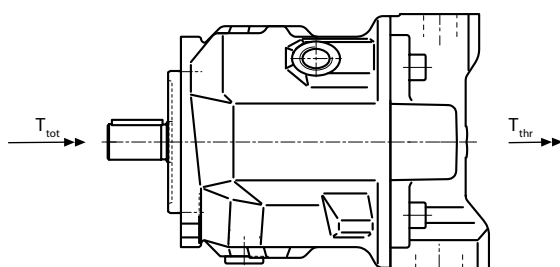
THROUGH DRIVE MOUNTING OPTIONS

Shaft Torque Data

Axial piston units H(S)P-10V can be supplied with a through drive as shown in the ordering code on page 3. The type of through drive is determined by codes (K40-K...). If the combination pump is not mounted in the factory, the simple type code is sufficient.

Included in this case are: shaft coupler, seals, and if necessary an adapter flange.

Maximum permissible input and through drive torque.



The drive torques for pump 1 and pump 2 can be split up as required. However the max. permissible input torque T_{tot} as well as the max. permissible through drive torque T_{thr} may not be exceeded.

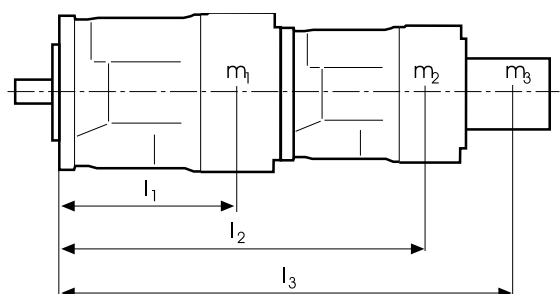
Max. perm. input torque T_{tot}	18	28	45	71	100	140
With shaft U T_{tot} lb.ft (Nm)	43 (59)	- (-)	139 (188)	- (-)	439 (595)	- (-)
With shaft K T_{tot} lb.ft (Nm)	77 (104)	107 (145)	156 (212)	319 (433)	553 (750)	875 (1186)
With shaft S T_{tot} lb.ft (Nm)	92 (124)	146 (198)	235 (319)	462 (626)	814 (1104)	1195 (1620)
With shaft R T_{tot} lb.ft (Nm)	111 (150)	166 (225)	295 (400)	475 (644)	- (-)	- (-)
Max. perm. through drive torque T_{thr}						
With shaft K T_{thr} lb.ft (Nm)	77 (104)	107 (145)	156 (212)	319 (433)	553 (750)	875 (1186)
With shaft S T_{thr} lb.ft (Nm)	80 (108)	118 (160)	235 (319)	363 (492)	574 (778)	934 (1266)
With shaft R T_{thr} lb.ft (Nm)	88 (120)	130 (176)	269 (365)	404 (548)	- (-)	- (-)
Keyed shaft $T_{thr\text{ keyed}}$ lb.ft (Nm)	53 (72)	83 (112)	132 (179)	209 (283)	293 (398)	411 (557)

T_{tot} = max. permissible input torque pump 1

T_{thr} = max. permissible through drive torque

$T_{thr\text{ keyed}}$ = max. permissible through drive torque at through drive to keyed shaft

Permissible overhang moment



m_1, m_2, m_3 weight of pump [lbs (kg)]

l_1, l_2, l_3 distance to center of gravity [in (mm)]

$$T_m = (m_1 \cdot l_1 + m_2 \cdot l_2 + m_3 \cdot l_3) \cdot \frac{1}{12} \quad [\text{lb.ft}]$$

$$\dots \cdot \frac{1}{102} \quad [\text{Nm}]$$

Size		18	28	45	71	100	140
Permissible overhang moment T_m	lb.ft (Nm)	369 (500)	649 (880)	1010 (1370)	1593 (2160)	2213 (3000)	3319 (4500)
at dyn. acceleration 10g = 98.1 m/s ²	T_m lb.ft (Nm)	37 (50)	65 (88)	101 (137)	159 (216)	221 (300)	332 (450)
Weight	m lbs (kg)	26,5 (12)	33 (15)	46 (21)	73 (33)	99 (45)	132 (60)
Distance to center of gravity	l_1 in (mm)	3.54 (90)	4.33 (110)	5.12 (130)	5.91 (150)	6.30 (160)	6.30 (160)

THROUGH DRIVES

THROUGH DRIVE MOUNTING OPTIONS

Through drives - H(S)P-10V		Code	Mounting option - 2 nd pump			available on size
Flange SAE J744	Hub Keyed		H(S)P-10VSO.../31... size (shaft)	H(S)P-10V(S)O.../52 size (shaft)	gear pump	
82-2(A)	keyed (A-B)	K40	18 (K)	10 (K)	-	18-100
101-2 (B)	keyed (B)	K03	28 (K)	28 (K)	-	28-140
101-2 (B-B)	keyed (B-B)	K05	45 (K)	60, 45 (K)	-	45-140
127-2 (C)	keyed (C)	K08	71 (K)	-	-	71-140
127-2 (C)	keyed (C)	K38	100 (K)	85 (K)	-	100-140
152-4 (D)	keyed (D)	K21	140 (K)	-	-	140
SAE J744	splined					
82-2 (A)	5/8 in (A)	K01	18 (U)	-	size F	18-140
82-2 (A)	3/4 in (A-B)	K52	18 (S, R)	10 (S)	-	18-140
101-2 (B)	7/8 in (B)	K68 K02	28 (S, R) 45 (U) ¹⁾	28 (S, R) 45 (U, W) ¹⁾	size N, G	28-140
101-2 (B)	1 in (B-B)	K04	45 (S, R)	45 (S, R) 60 (U, W) ²⁾	-	45-140
127-2 (C)	1 1/4 in (C)	K07	71 (S, R) 100 (U) ³⁾	85 (U, W) ³⁾	-	71-140
127-2 (C)	1 1/2 in (C-C)	K24	100 (S)	85 (S)	-	100-140
152-4 (D)	1 3/4 in (D)	K17	140 (S)	-	-	140

¹⁾ Not with K68 through drive on main pump size 28

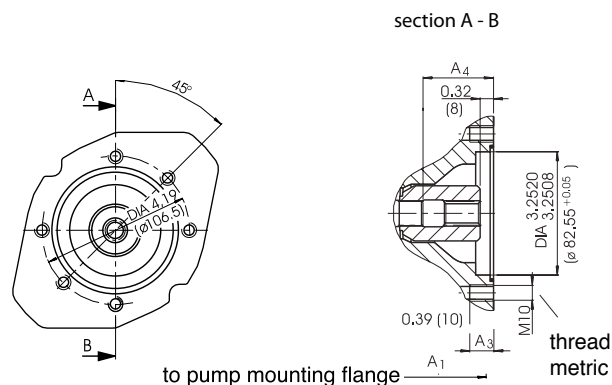
²⁾ Not with K04 through drive on main pump size 45

³⁾ Not with K07 through drive on main pump size 71

DIMENSIONS OF THROUGH DRIVES

K01 FLANGE SAE J744 - 82-2 (A)

Hub for splined shaft to ANSI B.92.1a-1976 5/8 in 9T 16/32 DP



¹⁾ (SAE J744 - 16-4 (A))

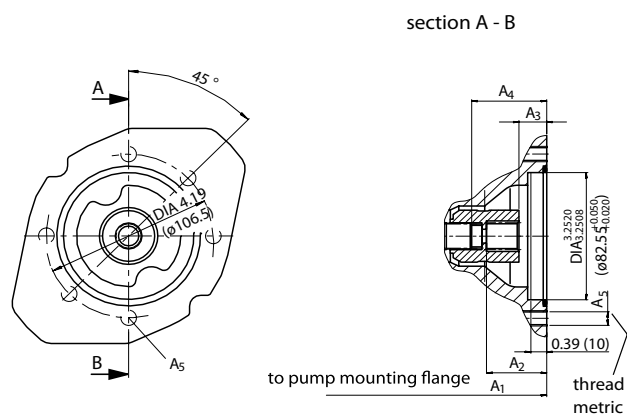
Size	A ₁	A ₃	A ₄
18	7.16 (182)	0.57 (14,5)	1.65 (42)
28	8.03 (204)	0.63 (16)	1.85 (47)
45	9.02 (229)	0.63 (16)	2.09 (53)
71	10.51 (267)	0.79 (20)	2.40 (61)
100	13.31 (338)	0.79 (20)	2.56 (65)
140	13.78 (350)	0.63 (17)	3.03 (77)

THROUGH DRIVES

DIMENSIONS OF THROUGH DRIVES

K52 FLANGE SAE J744 - 82-2 (A)

Hub for splined shaft to ANSI B.92.1a-1976 3/4 in 11T 16/32 DP

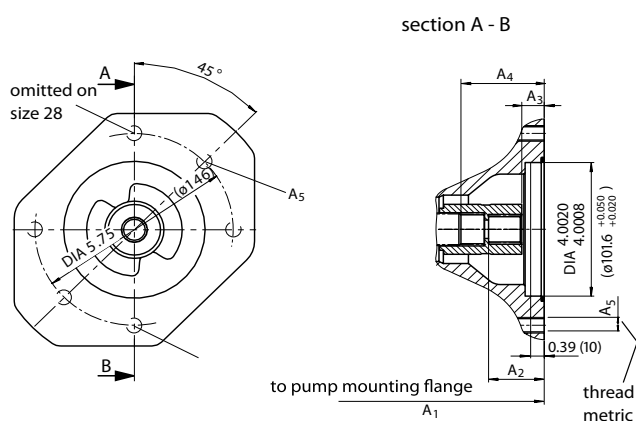


¹⁾ (SAE J744 - 19-4 (A-B))

Size	A ₁	A ₂	A ₃	A ₄	A ₅
18	7.16 (182)	1.57 (40)	0.74 (18,8)	1.69 (43)	M10; 0.57 (14,5) deep
28	8.03 (204)	1.53 (39)	0.74 (18,8)	1.85 (47)	M10; 0.63 (16) deep
45	9.02 (229)	1.59 (40,5)	0.75 (18,9)	2.09 (53)	M10; 0.63 (16) deep
71	10.51 (267)	1.57 (40)	0.84 (21,3)	2.40 (61)	M10; 0.79 (20) deep
100	13.31 (338)	1.57 (40)	0.75 (19)	2.56 (65)	M10; 0.79 (20) deep
140	13.78 (350)	1.61 (41)	0.75 (18,9)	3.03 (77)	M10; 0.67 (17) deep

K02/K68 FLANGE SAE J744 - 101-2 (B)

Hub for splined shaft to ANSI B.92.1a-1976 7/8 in 13T 16/32 DP

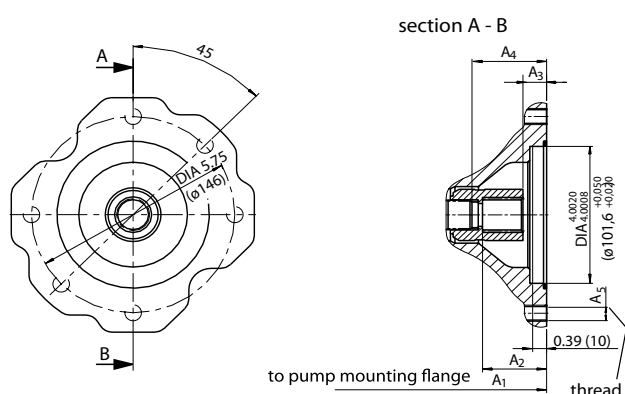


¹⁾ (SAE J744 - 22-4 (B))

Size	A ₁	A ₂	A ₃	A ₄	A ₅
28	8.03 (204)	1.69 (43)	0.70 (17,8)	1.85 (47)	M12; 0.71 (18) deep
45	9.02 (229)	1.65 (42)	0.70 (17,9)	2.09 (53)	M12; 0.71 (18) deep
71	10.51 (267)	1.69 (43)	0.80 (20,3)	2.40 (61)	M12; 0.79 (20) deep
100	13.31 (338)	1.61 (41)	0.71 (18)	2.56 (65)	M12; 0.79 (20) deep
140	13.78 (350)	1.73 (44)	0.70 (17,9)	3.03 (77)	M12; 0.79 (20) deep

¹⁾ pressure angle 30 °, flat root side fit, tolerance class 5

¹⁾ (SAE J744 - 25-4 (B-B))



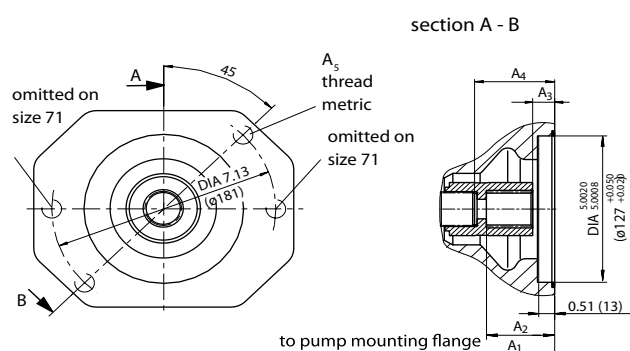
Size	A ₁	A ₂	A ₃	A ₄	A ₅
45	9.02 (229)	1.87 (47,5)	0.73 (18,4)	2.09 (53)	M12; 0.71 (18) deep
71	10.51 (267)	1.87 (47,5)	0.82 (20,8)	2.40 (61)	M12; 0.79 (20) deep
100	13.31 (338)	1.87 (47,5)	0.72 (18,2)	2.56 (65)	M12; 0.79 (20) deep
140	13.78 (350)	1.87 (47,5)	0.73 (18,4)	3.03 (77)	M12; 0.79 (20) deep

THROUGH DRIVES

DIMENSIONS OF THROUGH DRIVES

K07 FLANGE SAE J744 - 127-2 (C)

Hub for splined shaft to ANSI B.92.1a-1976 1 1/4 in 14T 12/24 DP

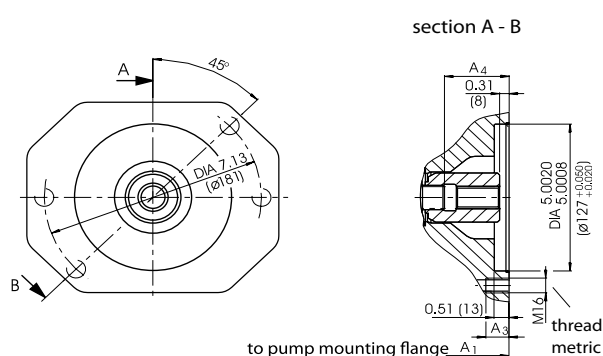


¹⁾ (SAE J744 - 32-4 (C))

Size	A ₁	A ₂	A ₃	A ₄	A ₅
71	10.51 (267)	2.18 (55,5)	0.87 (22)	2.40 (61)	M16; 0.70 (18) deep
100	13.31 (338)	2.24 (57)	0.77 (19,5)	2.56 (65)	M16; 0.95 (24) deep
140	13.78 (350)	2.36 (60)	0.77 (19,4)	3.03 (77)	M16; 0.95 (24) deep

K24 FLANGE SAE J744 - 127-2 (C)

Hub for splined shaft to ANSI B.92.1a-1976 1 1/2 in 17T 12/24 DP



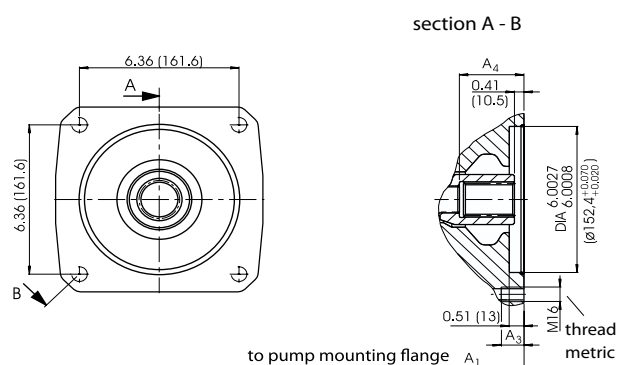
¹⁾ (SAE J744 - 38-4 (C-C))

Size	A ₁	A ₃	A ₄
100	13.31 (338)	0.95 (24)	2.56 (65)
140	13.78 (350)	0.95 (34)	3.03 (77)

¹⁾ pressure angle 30 °, flat root side fit, tolerance class 5

K17 FLANGE SAE J744 - 152-4 (D)

Hub for splined shaft to ANSI B.92.1a-1976 1 3/4 in 13T 8/16 DP



¹⁾ (SAE J744 - 44-4 (D))

Size	A ₁	A ₃	A ₄
140	13.78 (350)	approx. 0.83 (ca. 21)	3.03 (77)

PUMP INSTALLATION NOTES

INSTALLATION NOTES

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

In order to attain the lowest noise level, all connections (suction, pressure, pilot, case drain) must be linked by flexible members to tank.

Avoid placing a check valve in the case drain line.

The case drain hose corresponding to the size of the case drain port should be installed at the highest case drain port location.

Vertical installation (shaft end upwards)

Following installation conditions must be taken into account:

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 surface:

Close port "L", "L₁" and "S" open; L₁ piped and also S with suction pipe (see fig. 1).

b) If the min. fluid level is below the pump mounting surface: pipe port "L" and "S" acc. to fig. 2, close port "L" (compare item limiting conditions)

Note: In order to avoid damages to the pump, all attached parts (e.g. protective caps, covers, etc.) must be removed before installation.

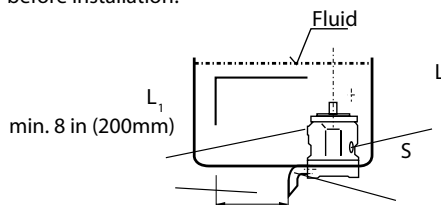


fig. 1

Arrangement outside the reservoir

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

Limiting condition:

Min. pump inlet pressure $p_{abs\ min} = 12\ psi\ (0,8\ bar)$ under static and dynamic loading.

Note: Avoid mounting above tank wherever possible in order to attain a low noise level.

The permissible suction height h is a result of the overall pressure loss, but may not be greater than $h_{max} = 31.5\ in\ (800\ mm)$ (Immersion depth $h_{t\ min} = 8\ in/200\ mm$).

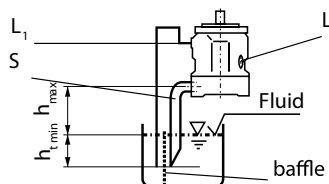


fig. 2

Overall pressure loss

$$\Delta p_{ges} = \Delta p_1 + \Delta p_2 + \Delta p_3 \leq (1 - p_{abs\ min}) = 0,2\ bar$$

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

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

ρ = density $[kg/m^3]$

l = pipe length $[m]$

dv/dt = rate of change in fluid velocity $[m/s^2]$

Δp_2 : Pressure loss due to static head

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

h = head $[m]$

ρ = density $[kg/m^3]$

g = gravity. = $9,81\ m/s^2$

Δp_3 : line losses (elbows etc.)

Horizontal installation

The pump must be installed in such a manner, that either "L" or "L₁" is at the top.

Arrangement inside the reservoir

a) If the min. fluid level is above the top of the pump:

Close "L", "L₁" and "S" open, mount suction pipe to port S, and pipe "L" at least 200 mm away from suction pipe.

(see fig. 3)

b) If the min. fluid level is equal to or below the top of the pump:

Pipe port "L" and "S" acc. to fig. 4, port "L₁" closed.

(compare limiting conditions)

Note: In order to avoid damages to the pump, all attached parts (e.g. protective caps, covers, etc.) must be removed before installation.

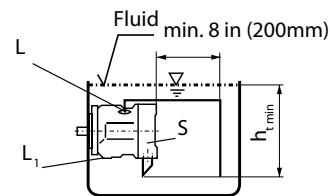


fig. 3

Arrangement outside the reservoir

Fill pump housing before commissioning.

Pipe port "S" and the higher port "L" or "L₁"

a) When mounting above the reservoir: see fig. 4 (compare item limiting conditions)

b) Mounting below the reservoir: pipe ports "L" and "S" according to fig. 5, "L" closed.

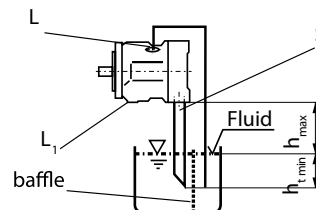


fig. 4

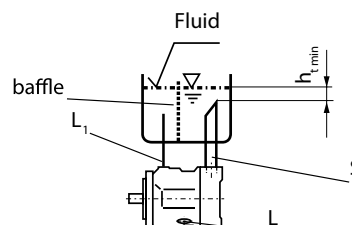


fig. 5

RANGE OF PRODUCTS



SINGLE • DOUBLE • THRU-DRIVE VANE PUMPS



VARIABLE DISPLACEMENT PUMP H(S)P-10V



DIRECTIONAL CONTROL VALVE



HYDRAULIC CYLINDERS

hydraut