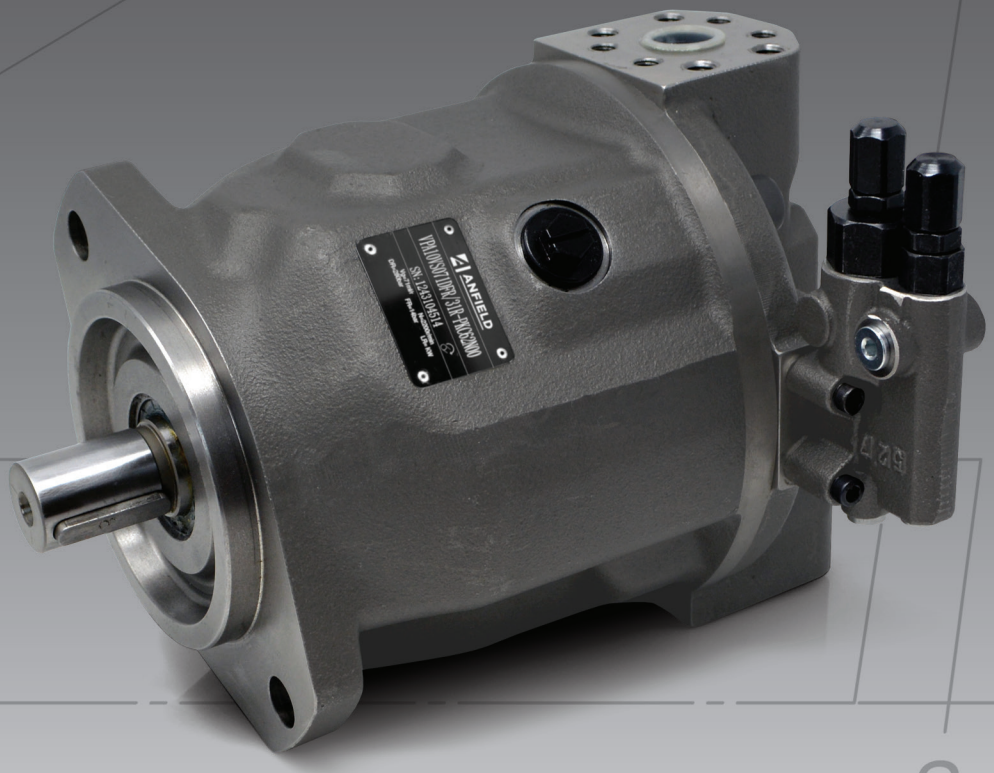
Variable Displacement Axial Piston Pump

VPA10VSO

Series 31



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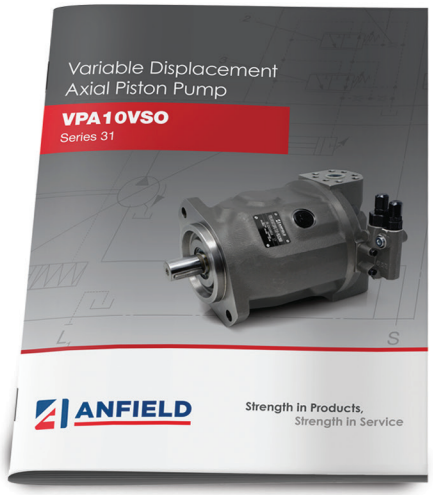
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Axial Piston Pump
VPA10VSO
Series 31
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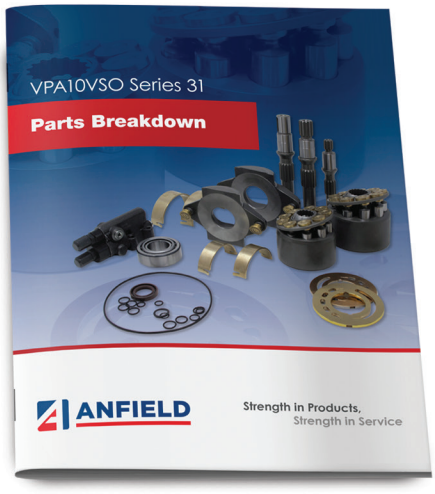
VPA10VSO Series 31
Parts Breakdown
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DESCRIPTION

Anfield VPA10V(S) series variable displacement axial piston pumps are designed for open loop circuits and can be used in both mobile and industrial applications. The output flow is proportional to the drive speed and the displacement.

The VPA10V(S) series pumps are available in six displacements, ranging from 1.10 in³/rev (18 cm³/rev) to 8.54 in³/rev (140 cm³/rev). They offer speeds up to 3,300 rpm, a rated working pressure of 4000 psi (280 bar), single pump or through drive pumps allowing for multi-circuit systems. Offered in SAE or Metric mounting with side or rear porting.

Available in a variety of controls with short control response times. These variable pumps offer the benefit of providing power only when needed.

FEATURES

- Variable pump with axial piston rotary group in swashplate design
- Series 31 in sizes 18, 28, 45, 71, 100, 140
- Designed for open loop circuits
- Output flow is proportional to the drive speed and displacement and can be infinitely varied by adjusting the swashplate angle.
- Versatile controller range
- Short control time
- Excellent suction performance
- Low noise nine-piston design
- Long service life
- Favorable power/weight ratio
- Offered with Buna-N or Viton seal options
- End or side inlet and outlet ports for design flexibility
- Multiple case drain ports for various mounting orientations
- Full power through drive capability

TECHNICAL SPECIFICATIONS

Model	Displacement Vg_{max}		Max. Speed n_{max}	Max. Flow $q_{v\,max}$		Pressure PSI		Max. Power		Suction Port S	Pressure Port B	Drain Port L,L1	Pilot Port X	Weight (approx.)	
	cm³/r	in³/r	rpm	gpm	lpm	Rated	Max	hp	kW					lbs	kg
VPA10V(S)-O-18	18	1.10	3300	15.7	59.4	4000	5000	38	28	1" CD 61 (3/8-16 UNC-2B)	3/4" CD 61 (3/8-16 UNC-2B)	SAE-6	SAE-4	28.7	13
VPA10V(S)-O-28	28	1.71	3000	22.2	84	4000	5000	52	39	1-1/4" CD 61 (7/16-14 UNC-2B)	3/4" CD 61 (3/8-16 UNC-2B)	SAE-8	SAE-4	37.5	17
VPA10V(S)-O-45	45	2.75	2600	30.9	117	4000	5000	74	55	1-1/2" CD 61 (1/2-13 UNC-2B)	1" CD 61 (3/8-16 UNC-2B)	SAE-10	SAE-4	50.7	23
VPA10V(S)-O-71	71	4.33	2200	41.2	156	4000	5000	98	73	2" CD 61 (1/2-13 UNC-2B)	1" CD 61 (3/8-16 UNC-2B)	SAE-10	SAE-4	79.4	36
VPA10V(S)-O-100	100	6.10	2000	52.8	200	4000	5000	125	93	2-1/2" CD 61 (1/2-13 UNC-2B)	1-1/4" CD 62 (1/2-13 UNC-2B)	SAE-12	SAE-4	110.2	50
VPA10V(S)-O-140	140	8.54	1800	66.5	251	4000	5000	158	118	2-1/2" CD 61 (1/2-13 UNC-2B)	1-1/4" CD 62 (1/2-13 UNC-2B)	SAE-12	SAE-6	143.3	65

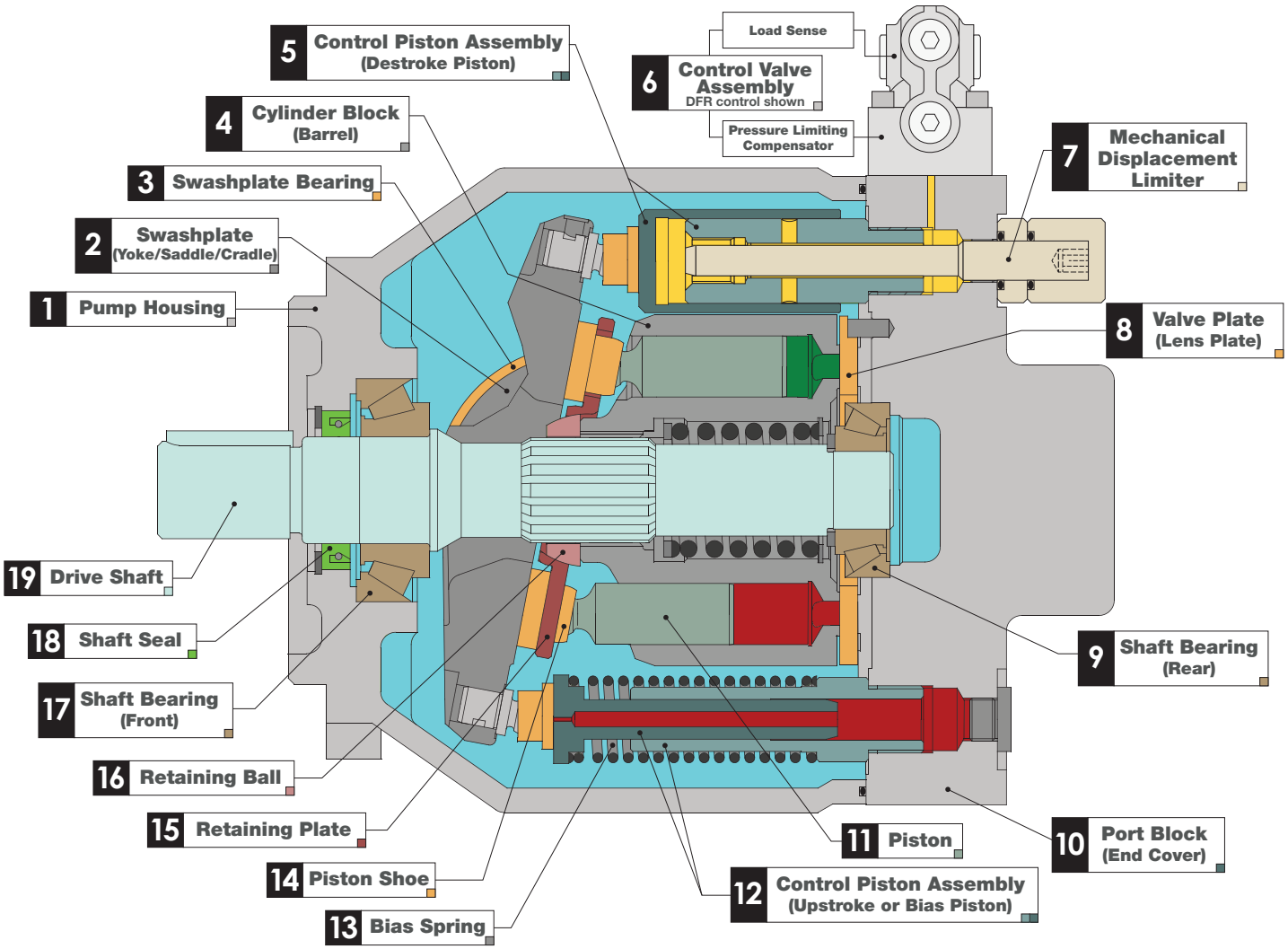
Notes:

1. **Absolute pressure at suction port S (inlet):** Ps min: 11.6 psi (0.8 bar), Ps max: 435 psi (30 bar)
2. **Viscosity:** optimal range 16 to 36 mm2/s (80 to 170 SUS)
3. **Temperature:** T min = -20°C (-4°F), T max = +80°C (+176°F)
4. **Filtration of the hydraulic fluid:** A cleanliness level of at least 20/18/15 is to be maintained according to ISO 4406. At very high hydraulic fluid temperatures (maximum 230 °F (110 °C), measured at Drain port L, L1), at least a cleanliness level of 19/17/14 according to ISO 4406 is necessary.
5. **Cold start:** Allow pump to run ≤ 3 minutes without load (p ≤ 725 psi (50 bar)), Speed ≤ 1000 rev/min. Permissible temperature difference between axial piston unit and hydraulic fluid in the system maximum 45 °F (7.2°C).
6. **Weight:** indicated in the table correspond to units without through drive and are approximate.

FEATURES

Anfield VPA10V series variable piston pump with axial piston rotary group in swashplate design for hydrostatic drives in open circuit. Flow is proportional to drive speed and displacement and by adjusting the position of the swashplate it is possible to smoothly vary the flow.

- Flange connections to SAE (UNC) or ISO (metric)
- Two case drain ports
- Excellent suction characteristics
- High permissible speeds
- Axial and radial loading of drive shaft possible
- Wide range of controllers with short control response time
  DR – Pressure controller
  DRG – Pressure controller, remotely controlled
  DFR/DFR1 – Pressure flow controller
  DFLR – Pressure, flow and power controller
- Low noise nine-piston design
- Long service life
- Good power to weight ratio
- Through drive option for multi-circuit systems, allows adding gear and axial piston pumps up to the same size (100% through drive)
- "Mechanical Displacement Limiter" on all non-through drive models with 12N00 and 62N00 end covers allow for physical limitation of pump's maximum rated displacement ($\mathbf{Vg}_{max}$). (Caution, If the pump flow is reduced more than 30% of max. displacement using this physical limiter, it will negatively affect service life of the pump)



TECHNICAL DATA

Input operating pressure range

Absolute Pressure at inlet Port S	
P_{abs} min	11.6 psi (0.8 bar)
P_{abs} max	435 psi (30 bar)

Output operating pressure range

Pressure at Port B	
Nominal pressure p_N	4000 psi (280 bar)
Peak Pressure p_{max}	5000 psi (350 bar)

Case drain pressure

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

Direction of flow

"S" inlet port to "B" pressure port

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

Size			18	28	45	71	100	140
Displacement	Vg_{max}	in³/rev (cm³/rev)	1.10 (18)	1.71 (28)	2.75 (45)	4.33 (71)	6.10 (100)	8.54 (140)
Max. Speed	n_{max}	rpm	3300	3000	2600	2200	2000	1800
Max. Flow	$q_{v\,max}$	gpm (lpm)	15.7 (59.4)	22.2 (84)	30.9 (117)	41.2 (156)	52.8 (200)	66.5 (251)
Max. Power $\triangle p$ = 4000 psi (280 bar)	P_{omax}	hp (kW)	38 (28)	52 (39)	74 (55)	98 (73)	125 (93)	158 (118)
Max. Torque $\triangle p$ = 4000 psi (280 bar)	T_{omax}	ft-lb (Nm)	59 (80)	92 (125)	148 (200)	233 (316)	328 (445)	460 (623)
Weight w/o through drive (approx.)		lbs (kg)	28.7 (13)	39.7 (18)	52.9 (24)	79.4 (36)	110.2 (50)	144.4 (65.5)
Weight with through drive (approx.)		lbs (kg)	32 (14.5)	44.8 (20.3)	57.3 (26)	85 (38.6)	123.5 (56)	165.3 (75)

Notes:

1. Values shown are valid for an absolute pressure of 1 bar (14.5 psi) at suction port. If the flow is reduced or if the inlet pressure is increased, the speed may be increased.
2. "Mechanical Displacement Limiter" comes standard on all pumps sizes 18/28/45/71/100/140 with the 12N00 and 62N00 end cover.

Determining the operating characteristics		IMPERIAL (U)		METRIC (M)	
Flow	q_v	$q_v = \frac{V_g \cdot n \cdot \eta_v}{231}$	**gpm**	$q_v = \frac{V_g \cdot n \cdot \eta_v}{1000}$	**lpm**
Torque	**T**	$T = \frac{V_g \cdot \triangle p}{24 \cdot \pi \cdot \eta_{hm}}$	**lb-ft**	$T = \frac{V_g \cdot \triangle p}{20 \cdot \pi \cdot \eta_{hm}}$	**Nm**
Power	**P**	$P = \frac{q_v \cdot \triangle p}{1714 \cdot \eta_t}$	**hp**	$P = \frac{q_v \cdot \triangle p}{600 \cdot \eta_t}$	**kW**

Key

V_g	Displacement per revolution in in³ (cm³)
$\triangle p$	Differential pressure in psi (bar)
n	Speed in rpm
η_v	Volumetric efficiency
η_{hm}	Hydraulic-mechanical efficiency
η_t	Total efficiency ($\eta_t = \eta_v \cdot \eta_{hm}$)

Notes:

1. Theoretical values, without efficiency and tolerances; values rounded
2. Operation above the maximum values or below the minimum values may result in a loss of function,a reduced service life or in the destruction of the axial piston unit. Anfield recommends checking the load by means of test or calculation / simulation and comparison with the permissible values.

DESIGNATION & ORDERING CODE

VPA10V(S) - O - 100 - DFR1 - 31 - R - P - K - C - 62 - N00

1	2	3	4	5	6	7	8	9	10	11

1 Axial Piston Unit

VPA10V	Swashplate Design, Variable Pump
VPA10VS	Swashplate Design, Variable Pump (Industrial)

2 Operating Mode

O	Pump, Open Circuit

3 Displacement

	cm³/rev	in³/rev
18	18	1.10
28	28	1.71
45	45	2.75
71	71	4.33
100	100	6.10
140	140	8.54

4 Control Device

		18	28	45	71	100	140
DR **DRG**	Pressure Control Pressure Remote Control	●	●	●	●	●	●
DFR **DFR1**	Pressure & Flow Control (X-T open) Pressure & Flow Control (X-T plugged)	●	●	●	●	●	●
DFLR	Pressure, Flow & Power Control	-	●	●	●	●	●

5 Series

31	Series

6 Direction of Rotation

R	Clockwise	**L**	Counter-clockwise

7 Seal Material

P	Buna-N	**V**	FKM Fluorocarbon Viton®

8 Drive Shaft

			18	28	45	71	100	140
U Imperial	**K**	SAE Parallel Keyed Shaft	3/4"	7/8"	1"	1 1/4"	1 1/2"	1 3/4"
		Key width	3/16"	1/4"	1/4"	5/16"	3/8"	7/16"
U Imperial	**S**	SAE Splined Shaft	3/4"	7/8"	1"	1 1/4"	1 1/2"	1 3/4"
		Number of Teeth	11	13	15	14	17	13
U Imperial	**R**	SAE Splined Shaft, Reinforced (Similar to shaft S however for higher input torque)	-	-	1"	1 1/4"‡	-	-
		Number of Teeth	-	-	15	14	-	-
U Imperial	**U**	SAE Splined Shaft, Smaller size (Reduced diameter, not for through drive)	5/8"	-	7/8"	1"†	1 1/4"	-
		Number of Teeth	9	-	13	15	14	-
M Metric	**P**	Metric Parallel Keyed Shaft DIN 6885 *(mm)*	18	22	25	32	40	45
		Key width (mm)	6	6	8	10	12	14

† Non-Thru Drive Models Only
‡ Thru Drive Models Only

U Imperial M Metric

9 Mounting Flange

			18	28	45	71	100	140
U Imperial	**C**	SAE 2-Bolt	3 1/4" SAE A	4" SAE B	4" SAE B	5" SAE C	5" SAE C	-
M Metric	**A**	ISO 2-Bolt *(mm)*	80	100	100	125	125	-
U Imperial	**D**	SAE 4-Bolt	-	-	-	-	-	6" SAE D
M Metric	**B**	ISO 4-Bolt *(mm)*	-	-	-	-	-	180

10 Service Ports

		Pressure Port B & Suction Port S	18	28	45	71	100	140
U Imperial	**61**	Rear Ports, UNC Mounting Screws [1] [2]	-	●	●	●	●	●
U Imperial	**62**	Opposite Side Ports, UNC Mounting Screws [2]	●	●	●	●	●	●
M Metric	**11**	Rear Ports, Metric Mounting Screws [1]	-	●	●	●	●	●
M Metric	**12**	Opposite Side Ports, Metric Mounting Screws	●	●	●	●	●	●

Port pos. 61, 11 only for version without Through drive
[1] All rear porting, non-Through drive only
[2] VPA10VO71 = 8 threaded holes on pressure port code 11, 61, 12 & 62

11 Through Drive

		18	28	45	71	100	140
N00	Without Through Drive	●	●	●	●	●	●

With through drive to accept axial piston or gear pump

	Mounting Flg.	Coupling for	18	28	45	71	100	140
K01	82-2 (SAE A)	5/8" 9T 16/32DP (SAE A)	●	●	●	●	●	●
K52	82-2 (SAE A)	3/4" 11T 16/32DP (SAE A-B)	●	●	●	●	●	●
K68	101-2 (SAE B)	7/8" 13T 16/32DP (SAE B)	-	●	●	●	●	●
K04	101-2 (SAE B)	1" 15T 16/32DP (SAE B-B)	-	●	●	●	●	●
K07	127-2 (SAE C)	1 1/4" 14T 12/24DP (SAE C)	-	-	-	●	●	●
K24	127-2 (SAE C)	1 1/2" 17T 12/24DP (SAE C-C)	-	-	-	-	●	●
K17	152-4 (SAE D)	1 3/4" 13T 8/16DP (SAE D)	-	-	-	-	-	●

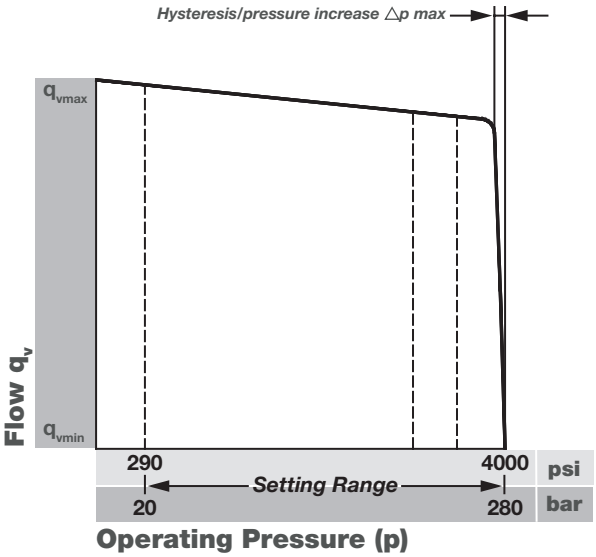
*Contact Anfield if Through Drive option required is not listed.

DR - PRESSURE CONTROLLER

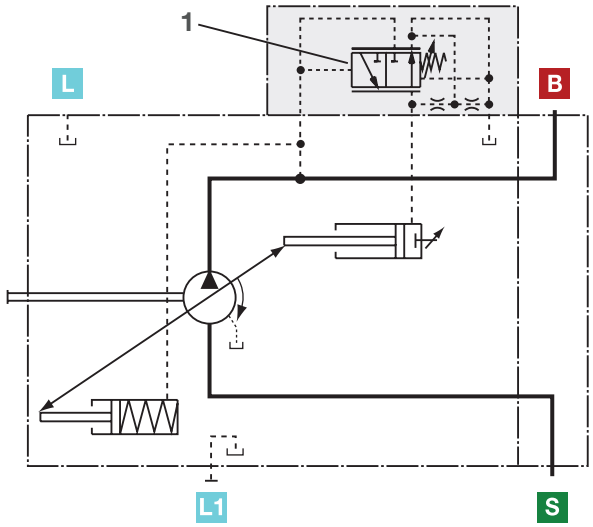
The DR pressure controller maintains the maximum pressure at the pump outlet within the control range of the pump. The pump will therefore only supply as much hydraulic fluid as is required by the actuators. If the working pressure exceeds the pressure setting at the pressure valve, the pump will regulate to a smaller displacement to reduce the control differential.

- **Basic position in depressurized state:**
  Vg max. (Max. displacement)
- **Setting range for pressure control:**
  50 to 280 bar. Standard is 280 bar.

Static characteristic
at n = 1450 rpm ; t_{fluid} = 50°C (122°F)



1. Pressure controller - DR



Ports

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

DR Controller Data

Size	18	28	45	71	100	140
△p psi (bar)	58 (4)	58 (4)	87 (6)	116 (8)	145 (10)	174 (12)
Hysteresis and repeatability accuracy △p	Max. 45 psi (3 bar)					
Pilot oil consumption	0.8 gpm (3 lpm)					

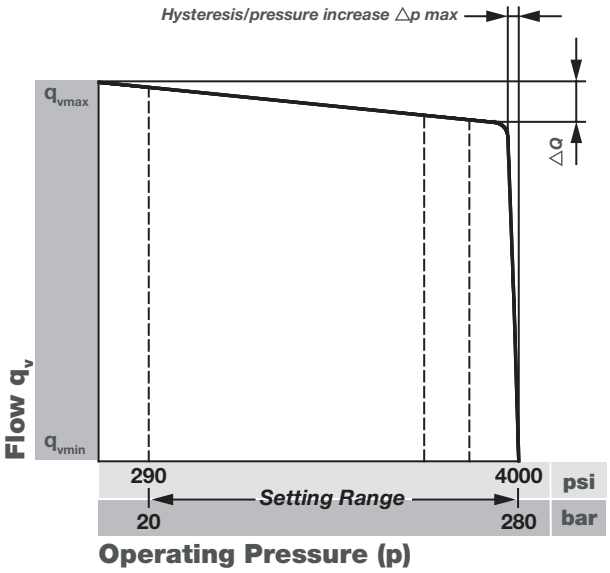
DRG - PRESSURE CONTROLLER, REMOTE CONTROLLED

For the DRG remote controlled pressure controller, the load sense LS pressure limitation is performed using a separately arranged pressure relief valve*. Therefore any pressure control value under the pressure set on the pressure controller can be regulated.

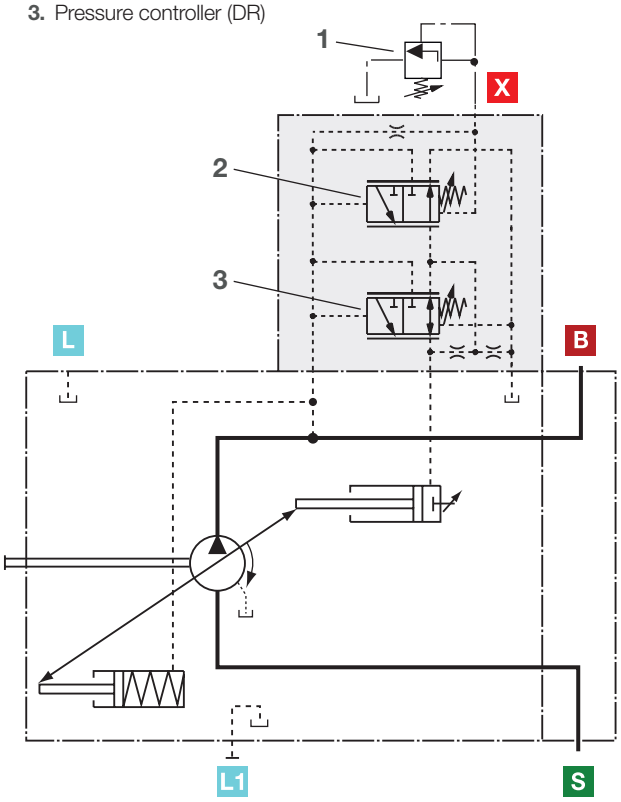
*The separate pressure relief valve and the line are not included in the scope of delivery.

The standard setting on the remote controlled pressure cut-off of LS is 290 psi (20 bar), the amount of control fluid at port is X approx. 0.4 gpm (1.5 l/min). If a different setting (range 145 to 320 psi (10 to 22 bar)) is required, please state in plain text.

Static characteristic
at n = 1450 rpm ; t_{fluid} = 50°C (122°F)



1. The separate pressure relief valve and the line are customer supplied
2. Remote controlled pressure cut-off (G)
3. Pressure controller (DR)



Ports

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

DRG Controller Data

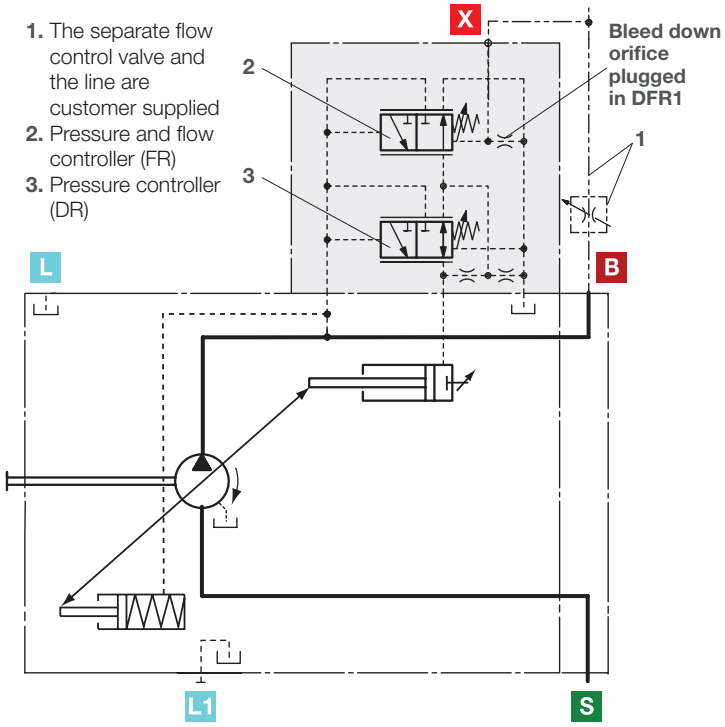
Size	18	28	45	71	100	140
Δp psi (bar)	58 (4)	58 (4)	87 (6)	116 (8)	145 (10)	174 (12)
Hysteresis and repeatability accuracy Δp	Max. 45 psi (3 bar)					
Pilot oil consumption	1.19 gpm (4.5 lpm)					

DFR/DFR1 - PRESSURE AND FLOW CONTROLLER

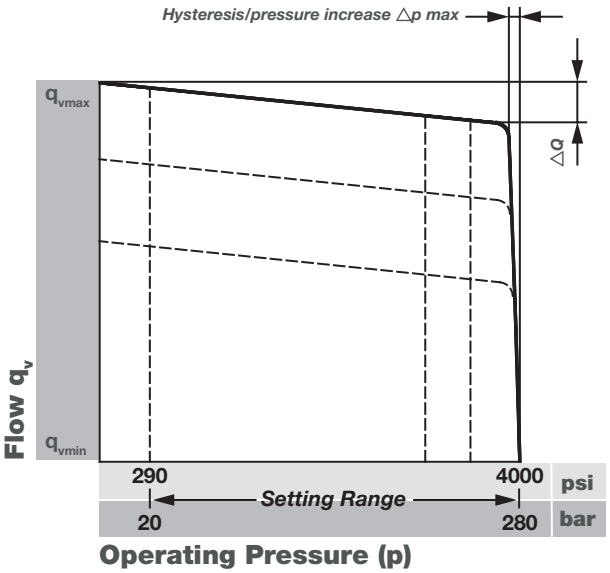
In addition to the pressure control function, the pump flow may be varied by means of a differential pressure at the actuator (e.g. an orifice).

In DFR1 model the bleed down orifice is plugged.

1. The separate flow control valve and the line are customer supplied
2. Pressure and flow controller (FR)
3. Pressure controller (DR)



Static characteristic
at n = 1450 rpm ; t_{fluid} = 50°C (122°F)



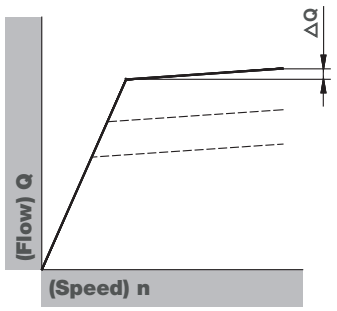
Ports

B	
S	
L, L1	
X	

FLOW CONTROL/DIFFERENTIAL PRESSURE △p

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 = 260 +/- 30 psi (18 +/- 2 bar) results.

Static characteristic at variable speed



DFR/DFR1 Controller Data

■ For pressure control technical data see DR Pressure Control.

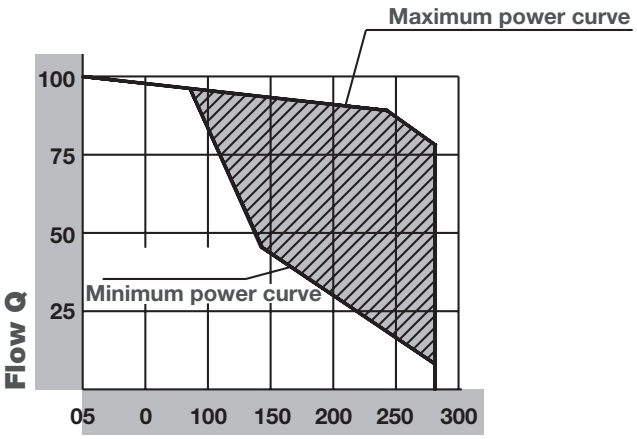
Size	18	28	45	71	100	140
△Qmax lpm (gpm)	0.9 (0.24)	1.0 (0.26)	1.8 (0.48)	2.8 (0.74)	4.0 (1.06)	6.0 (1.6)
Hysteresis & repeatability △p bar (psi)	Max. 60 psi (4 bar)					
Pilot oil consumption	**DFR**: Max. approx. 0.70-1.19 gpm (3-4, 5 lpm) **DFR1**: Max approx. 0.70 gpm (3 lpm)					

DFLR - PRESSURE, FLOW AND POWER CONTROLLER

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.

Execution of the pressure control like DR(G), see page 6.
Execution of the flow control like DFR, DFR1, see page 8.



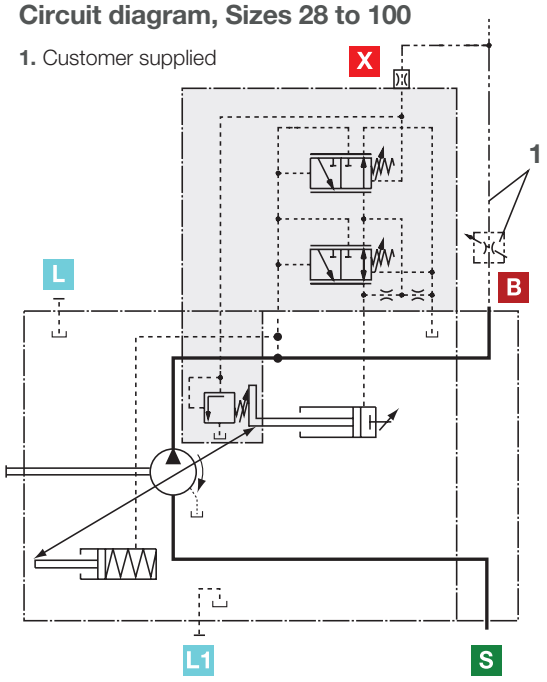
The power characteristic is factory-set, so please enter details in clear text, e.g. 20kW at 1450 rpm (5 hp, 1800 rpm).

Ports

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

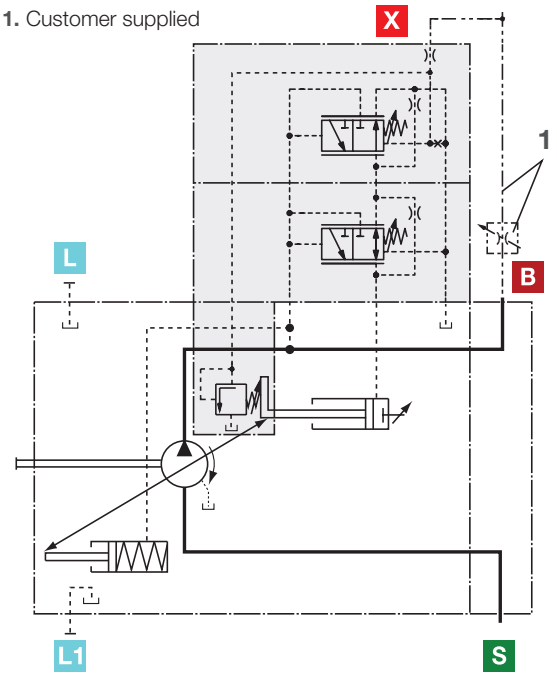
Circuit diagram, Sizes 28 to 100

1. Customer supplied



Circuit diagram, Size 140

1. Customer supplied



DFLR Controller Data

- For pressure control technical data see DR Pressure Control.
- For flow control technical data see DFR Control.

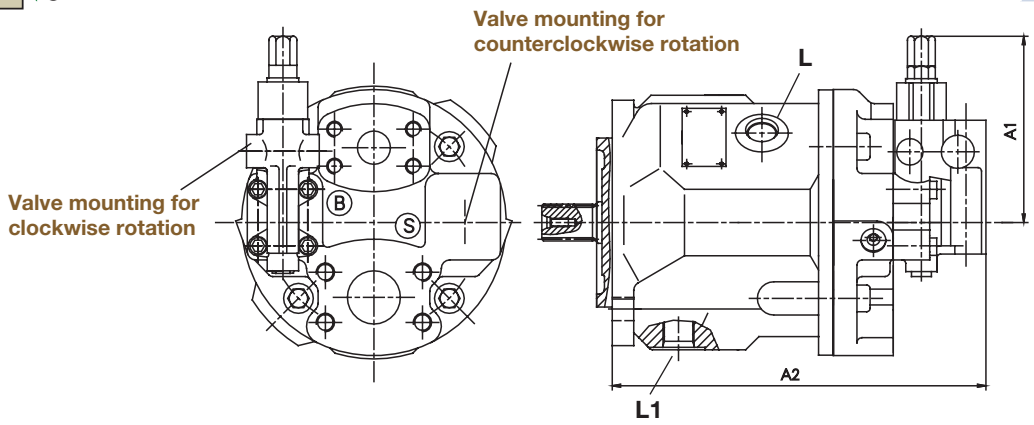
Size	18	28	45	71	100	140
Start of control	From 80 bar (1,160 psi)					
Pilot oil consumption	Max. approx. 5.5 lpm (1.45 gpm)					

DIMENSIONS DR

Service Ports at Rear; Models 61N00 and 11N00

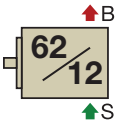
Sizes 18 to 140

U IMPERIAL	61	Rear Ports, UNC Mtg Thread
M METRIC	11	Rear Ports, Metric Mtg Thread
	N00	Without Through Drive

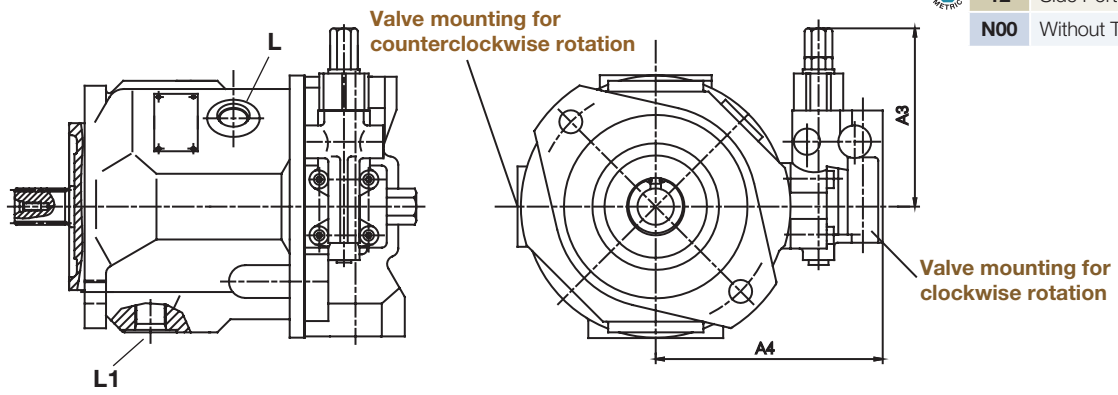


Service Ports at Side; Models 62N00 and 12N00

Sizes 18 to 140



U IMPERIAL	62	Side Ports, UNC Mtg Thread
M METRIC	12	Side Ports, Metric Mtg Thread
	N00	Without Through Drive



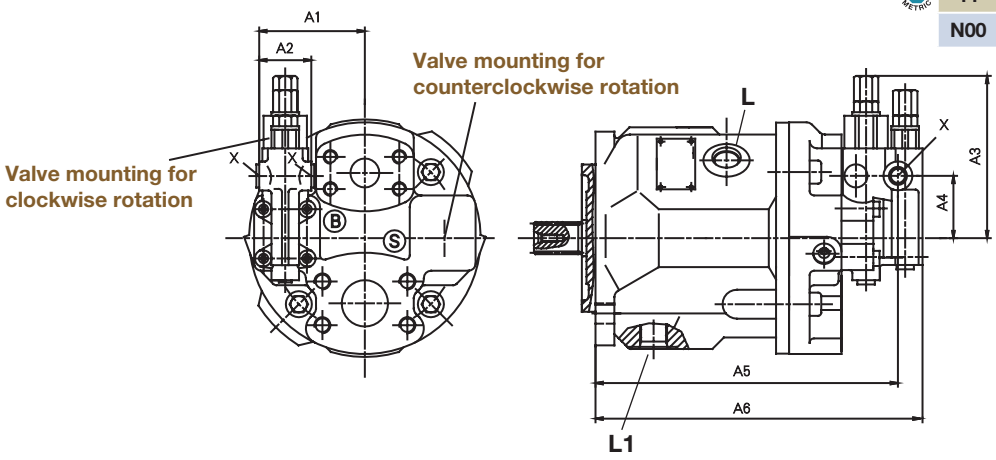
	Rear Port Models 61/11		Side Port Models 62/12	
Sizes	**A1 max. mm (in)**	**A2 mm (in)**	**A3 max. mm (in)**	**A4 mm (in)**
18	-	-	110 (4.33)	126 (4.96)
28	113 (4.45)	226 (8.90)	110 (4.33)	136 (5.35)
45	110 (4.33)	226 (8.90)	110 (4.33)	146 (5.75)
71	110 (4.33)	279 (10.98)	110 (4.33)	160 (6.30)
100	110 (4.33)	344 (13.54)	110 (4.33)	165 (6.50)
140	126 (4.96)	-	126 (4.96)	170 (6.70)

DIMENSIONS DRG / DFR / DFR1

Service Ports at Rear; Models 61N00 and 11N00

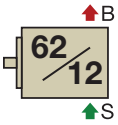
Sizes 18 to 140

U IMPERIAL	61	Rear Ports, UNC Mtg Thread
M METRIC	11	Rear Ports, Metric Mtg Thread
	N00	Without Through Drive

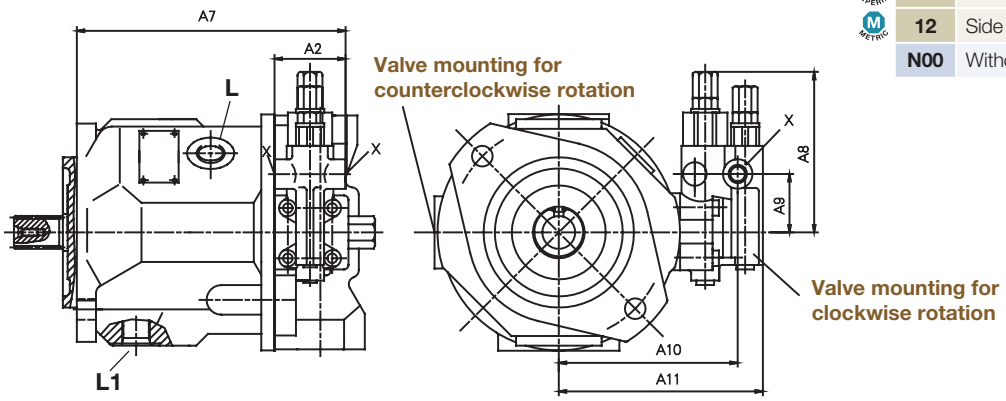


Service Ports at Side; Models 62N00 and 12N00

Sizes 18 to 140



U IMPERIAL	62	Side Ports, UNC Mtg Thread
M METRIC	12	Side Ports, Metric Mtg Thread
	N00	Without Through Drive



Sizes	A1 mm (in)	A2 mm (in)	A3 mm (in)	A4 mm (in)	A5 mm (in)	A6 mm (in)	A7 mm (in)	A8 mm (in)	A9 mm (in)	A10 mm (in)	A11 mm (in)	X mm (in)
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

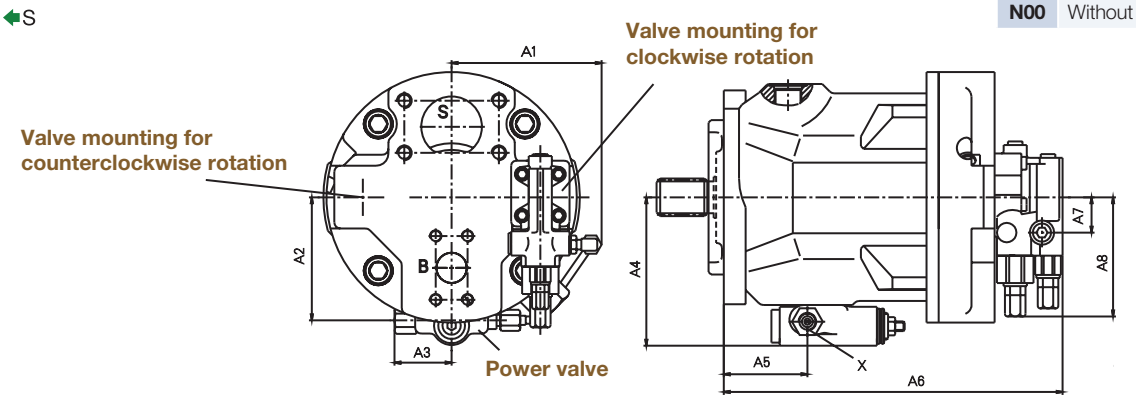
U Imperial M Metric

DIMENSIONS DFLR

Service Ports at Rear; Models 61N00 and 11N00

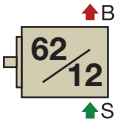
Sizes 18 to 140

U IMPERIAL	**61**	Rear Ports, UNC Mtg Thread
M METRIC	**11**	Rear Ports, Metric Mtg Thread
	N00	Without Through Drive

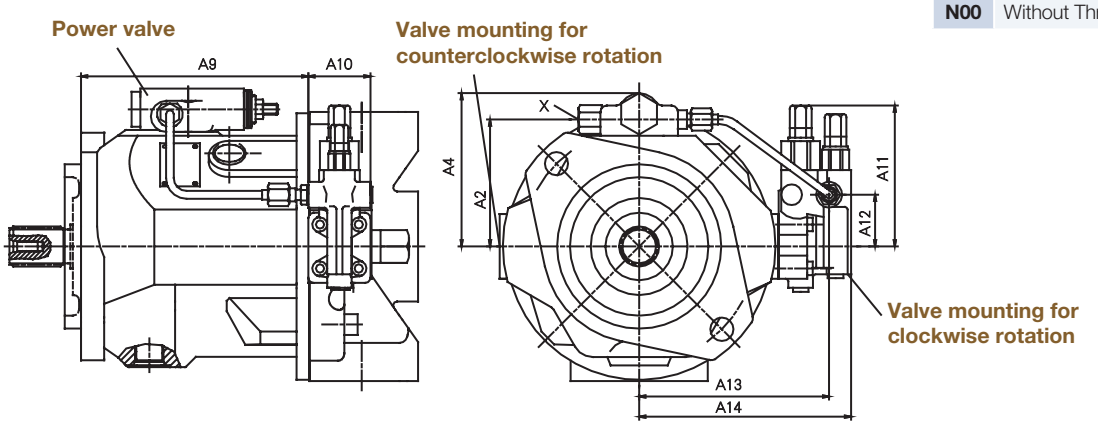


Service Ports at Side; Models 62N00 and 12N00

Sizes 18 to 140



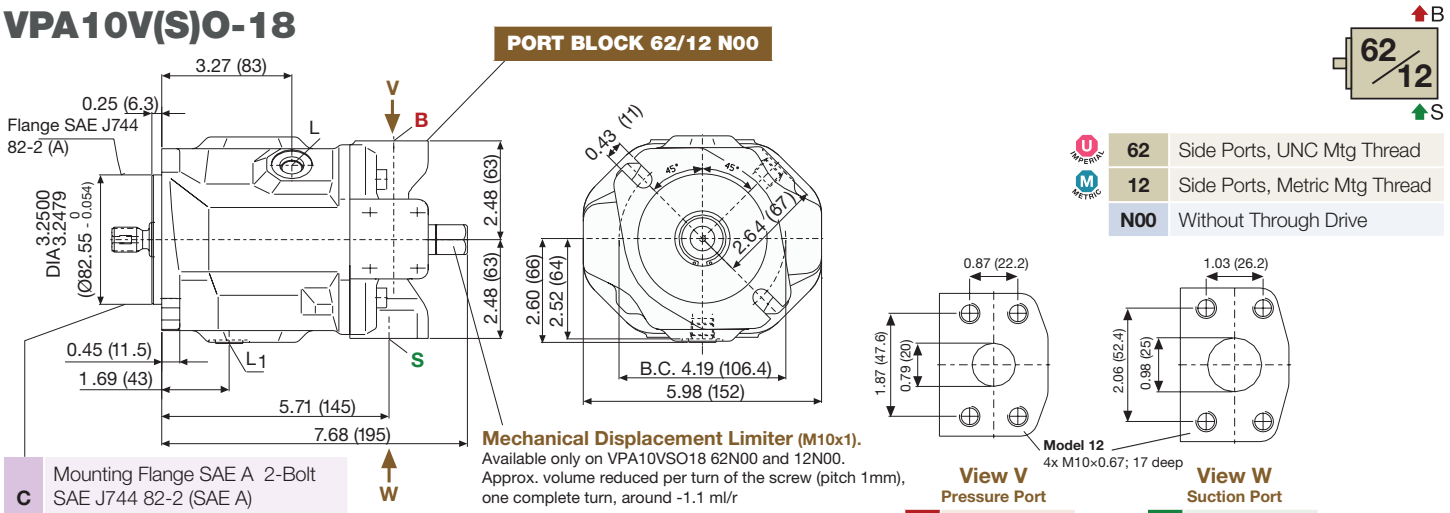
U IMPERIAL	**62**	Side Ports, UNC Mtg Thread
M METRIC	**12**	Side Ports, Metric Mtg Thread
	N00	Without Through Drive



Sizes	A1 mm (in)	A2 mm (in)	A3 mm (in)	A4 mm (in)	A5 mm (in)	A6 mm (in)	A7 mm (in)	A8 mm (in)	A9 mm (in)	A10 mm (in)	A11 mm (in)	A12 mm (in)	A13 mm (in)	A14 mm (in)	X mm (in)
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)	40 (1.57)	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)	40 (1.57)	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)	106.5 (4.17)	40 (1.57)	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)	40 (1.57)	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)	27 (1.06)	-	127 (5.00)	27 (1.06)	183 (7.29)	209 (8.23)	9/16-18UNF-2B x 0.51H

DIMENSIONS, SIZE 18, SERIES 31
Service Ports on Side; Non Through Drive, Models 62N00 and 12N00
Without Considering Adjustment

VPA10V(S)O-18



C	Mounting Flange SAE A 2-Bolt SAE J744 82-2 (SAE A) Ø 82.55 mm (3 1/4")

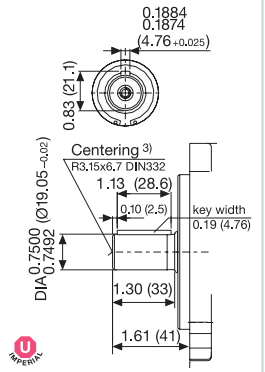
U IMPERIAL	62	Side Ports, UNC Mtg Thread
M METRIC	12	Side Ports, Metric Mtg Thread
	N00	Without Through Drive

B	3/4" Code 61
S	1" Code 61

Drive Shafts VPA10V(S)O-18

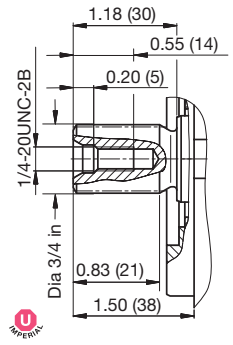
K SAE Parallel Keyed Shaft

3/4 in Parallel shaft with key
ISO 3019-1 19-1



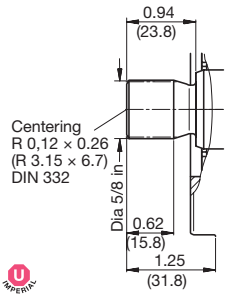
S SAE Splined Shaft

Splined shaft 3/4 in 11T
16/32 DP[1)]
SAE J744-19-4 (A-B)



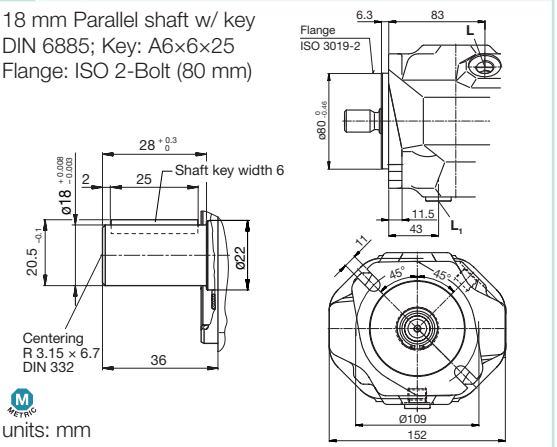
U SAE Splined Shaft, Smaller size
(Reduced diameter, not for through drive)

U Splined shaft 5/8 in in 9T
16/32 DP[1)]
SAE J744-16-4 (A)



P Metric Parallel Keyed Shaft

18 mm Parallel shaft w/ key
DIN 6885; Key: A6×6×25
Flange: ISO 2-Bolt (80 mm)



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

Ports VPA10V(S)O-18

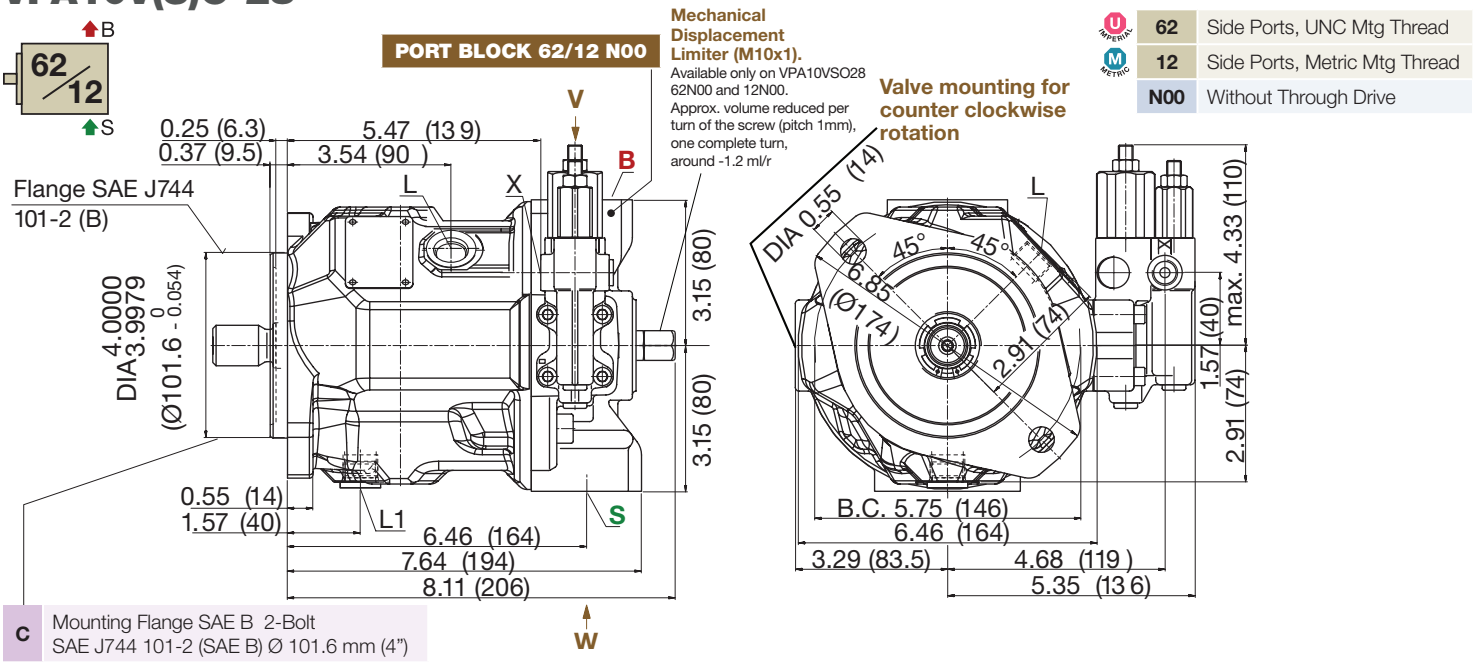
Designation	Port For	Standard	Size	Peak Pressure [psi (bar)]	Tightening Torque Max [lbft (Nm)]	State
B	Pressure port (standard pressure range) Threading in bolt holes	SAE J518 ISO 68	3/4 in (3/4" Code 61) 3/8-16 UNC-2B; 0.79 (20) deep	5100 (350)	29 (40)	O
S	Inlet port (standard pressure range) Threading in bolt holes	SAE J518 ISO 68	1 in (1" Code 61) 3/8-15 UNC-2B; 0.79 (20) deep	75 (5)	29 (40)	O
L, L1	Case drain ports (L1 plugged)	ISO 11926	9/16-18 UNF-2B (SAE-6)	30 (2)	59 (80)	O[1)]
X	Pilot pressure port	ISO 11926	7/16-20 UNF-2B; 0.39 (10) deep (SAE-4)	5100 (350)	29 (40)	O
X	Control pressure for DG control	DIN 3852	R 1/4 in	1740 (120)	48 (70)	O

O = Must be connected (plugged on delivery)
1) Depending on the installation position, L or L1 must be connected (also see installation instructions on page 33).

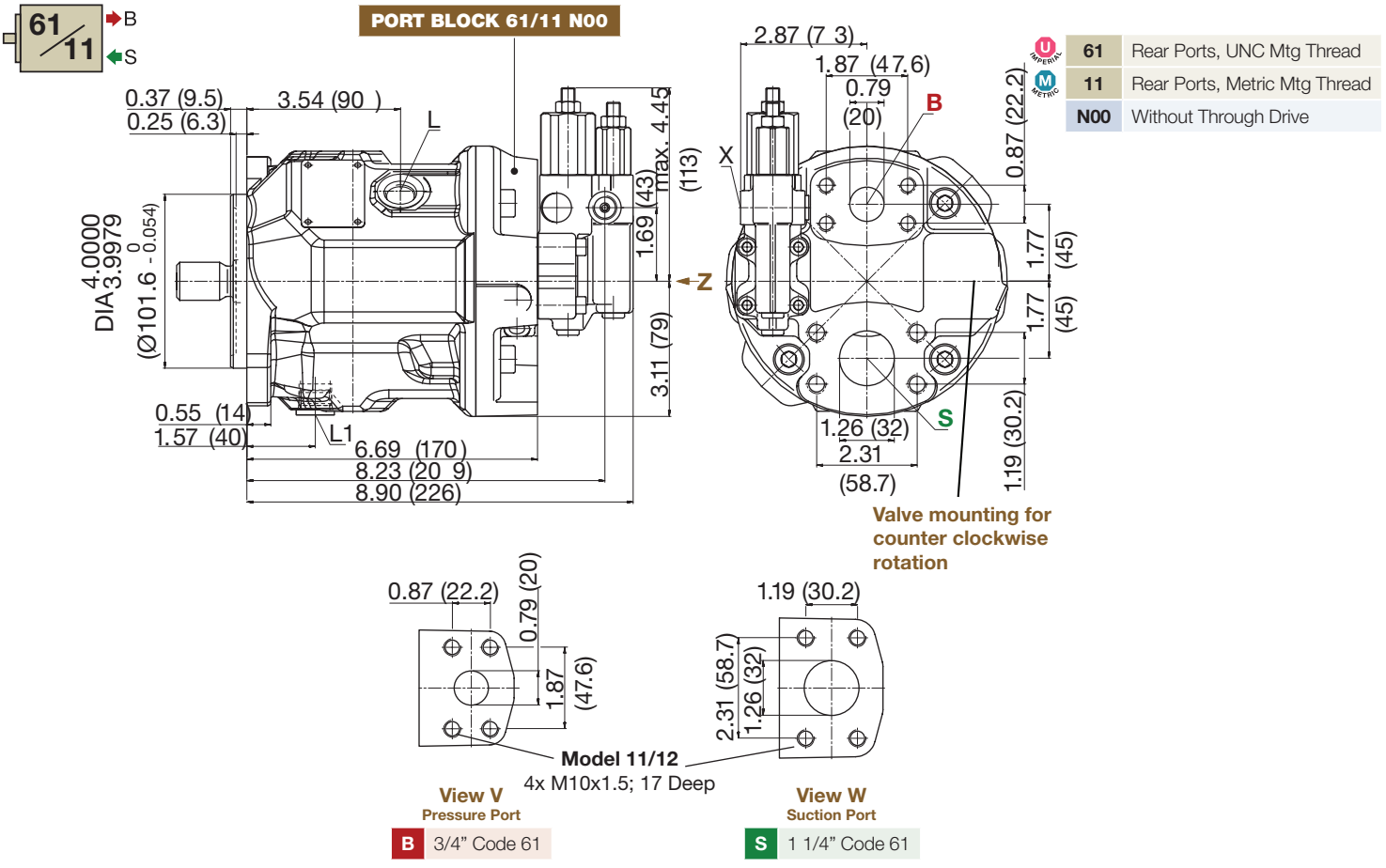
U Imperial M Metric

DIMENSIONS, SIZE 28, SERIES 31
Service Ports on Side and Rear; Non Through Drive
Without Considering Adjustment

VPA10V(S)O-28



C	Mounting Flange SAE B 2-Bolt SAE J744 101-2 (SAE B) Ø 101.6 mm (4")



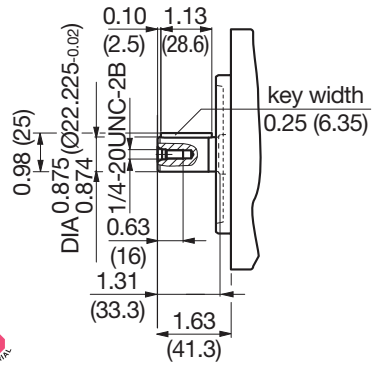
B	3/4" Code 61
S	1 1/4" Code 61

DIMENSIONS, SIZE 28, SERIES 31
Drive Shafts VPA10V(S)O-28, Metric Mount, and Port Dimensions
Without Considering Adjustment

Drive Shafts VPA10V(S)O-28

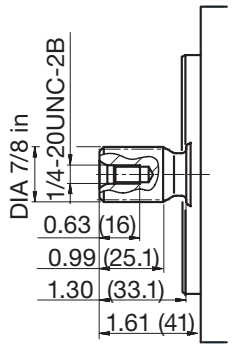
K SAE Parallel Keyed Shaft

7/8 in Parallel shaft with key
ISO 3019-1 22-1



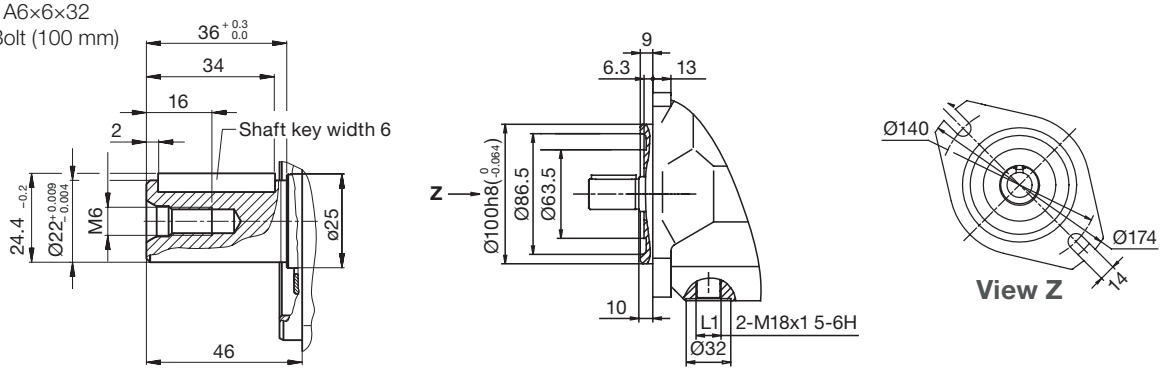
S SAE Splined Shaft

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



P Metric Parallel Keyed Shaft

22 mm Parallel shaft w/ key
DIN 6885; Key: A6×6×32
Flange: ISO 2-Bolt (100 mm)



units: mm

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

Ports VPA10V(S)O-28

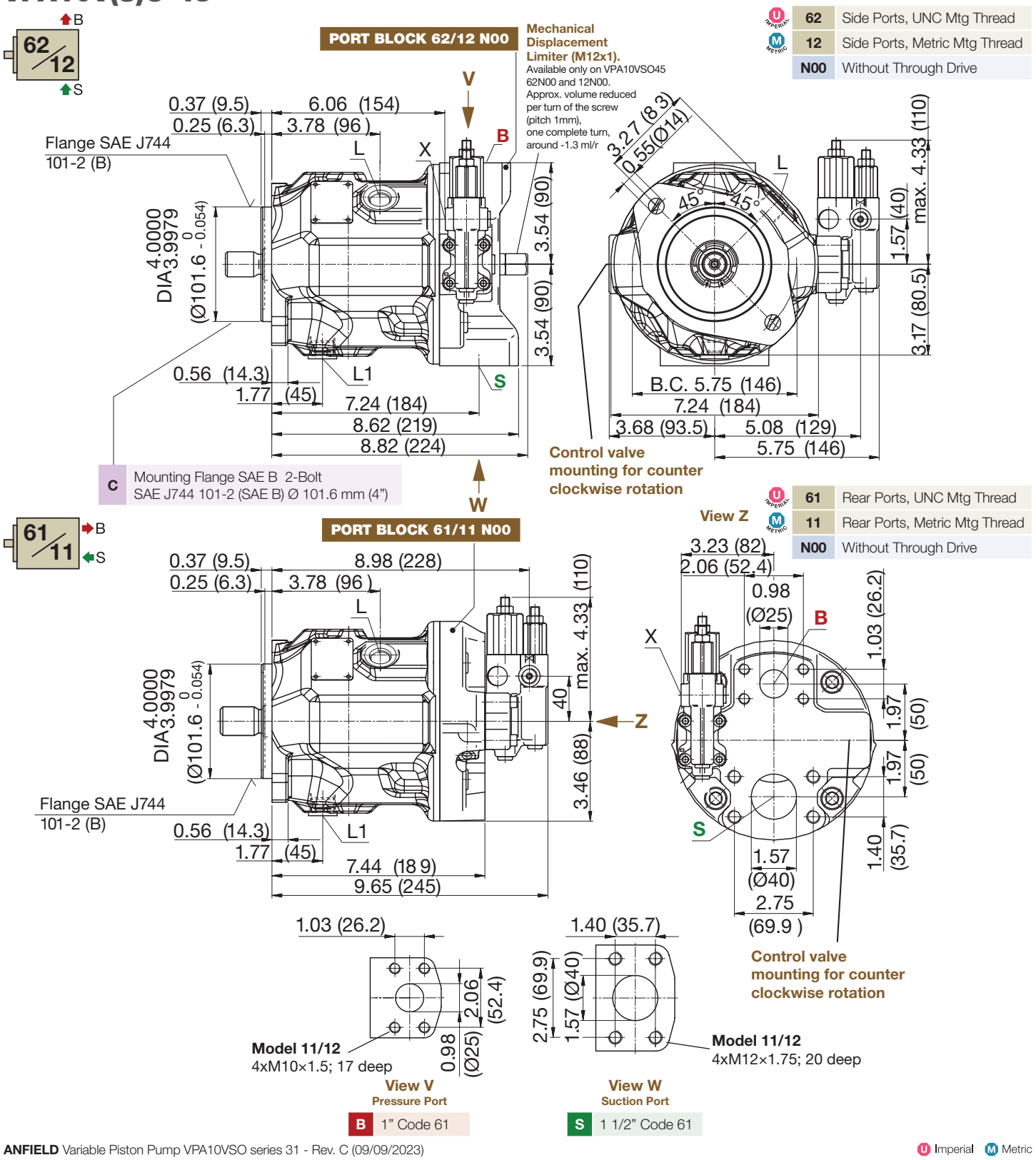
Designation	Port For	Standard	Size	Peak Pressure [psi (bar)]	Tightening Torque Max [lbft (Nm)]	State
B	Pressure port (standard pressure range) Threading in bolt holes	SAE J518 ISO 68	3/4 in (3/4" Code 61) 3/8-16 UNC-2B; 0.79 (20) deep	5100 (350)	29 (40)	O
S	Inlet port (standard pressure range) Threading in bolt holes	SAE J518 ISO 68	1 1/4 in (1 1/4" Code 61) 7/16-14 UNC-2B; 0.94 (24) deep	75 (5)	48 (85)	O
L, L1	Case drain ports (L1 plugged)	ISO 11926	3/4-16 UNF-2B; 0.47 (12) deep (SAE-8)	30 (2)	118 (160)	O[1)]
X	Pilot pressure port	ISO 11926	7/16-20UNC-2B; 0.47 (12) deep (SAE-4)	5100 (350)	29 (40)	O
X	Control pressure for DG control	DIN 3852	R 1/4 in	1740 (120)	48 (70)	O

O = Must be connected (plugged on delivery)
1) Depending on the installation position, L or L1 must be connected (also see installation instructions on page 33).

U Imperial M Metric

DIMENSIONS, SIZE 45, SERIES 31
Service Ports at Side and Rear; Non Through Drive
Without Considering Adjustment

VPA10V(S)O-45

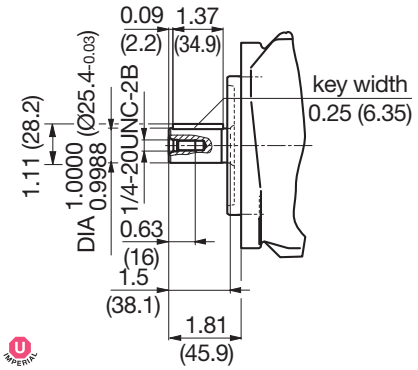


DIMENSIONS, SIZE 45, SERIES 31
Drive Shafts VPA10V(S)O-45, Metric Mount, and Port Dimensions

Drive Shafts VPA10V(S)O-45

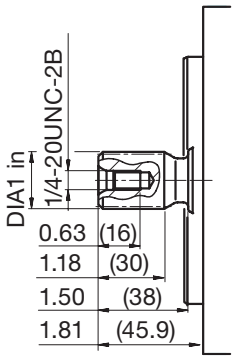
K SAE Parallel Keyed Shaft

1 in Parallel shaft with key
ISO 3019-1 22-1



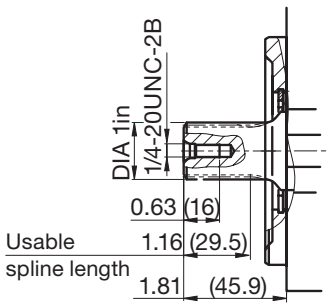
S SAE Splined Shaft

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



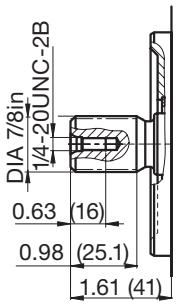
R SAE Splined Shaft, Reinforced
(Similar to shaft S suitable for higher input torque)

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



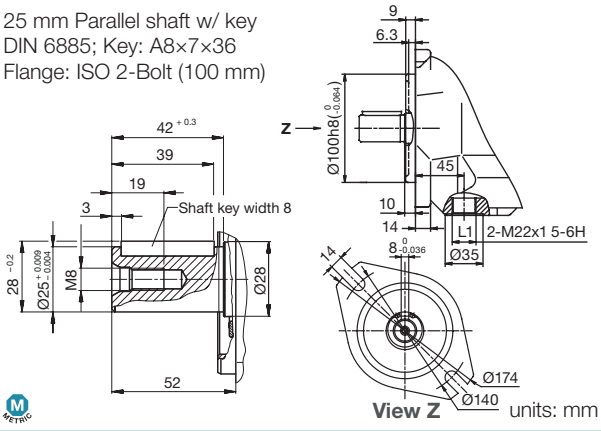
U SAE Splined Shaft, Smaller size
(Reduced diameter, not for through drive)

Splined Shaft 7/8 in 13T 16/32 DP[1)]
SAE J744 - 22-4 (B)



P Metric Parallel Keyed Shaft

25 mm Parallel shaft w/ key
DIN 6885; Key: A8×7×36
Flange: ISO 2-Bolt (100 mm)



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

Ports VPA10V(S)O-45

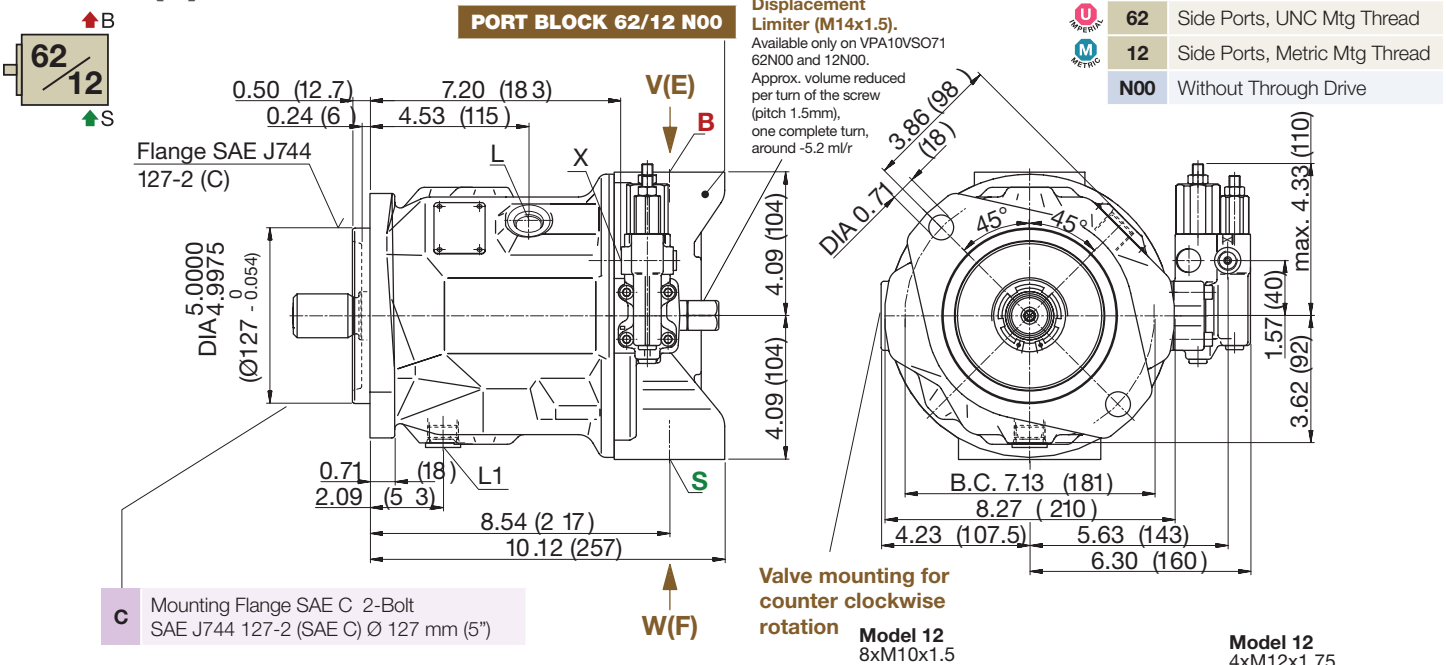
Designation	Port For	Standard	Size	Peak Pressure [psi (bar)]	Tightening Torque Max [lbft (Nm)]	State
B	Pressure port (standard pressure range) Threading in bolt holes	SAE J518 ISO 68	1 in (1" Code 61) 3/8-16 UNC-2B; 0.71 (17) deep	5100 (350)	29 (40)	O
S	Inlet port (standard pressure range) Threading in bolt holes	SAE J518 ISO 68	1 1/2 in (1 1/2" Code 61) 1/2-13 UNC-2N; 0.87 (22) deep	75 (5)	66 (90)	O
L, L1	Case drain ports (L1 plugged)	ISO 11926	7/8-14 UNF-2B (SAE-10)	30 (2)	177 (240)	O[1)]
X	Pilot pressure port	ISO 11926	7/16-20 UNF-2B; 0.39 (10) deep (SAE-4)	5100 (350)	29 (40)	O
X	Control pressure for DG control	DIN 3852	R 1/4 in	1740 (120)	48 (70)	O

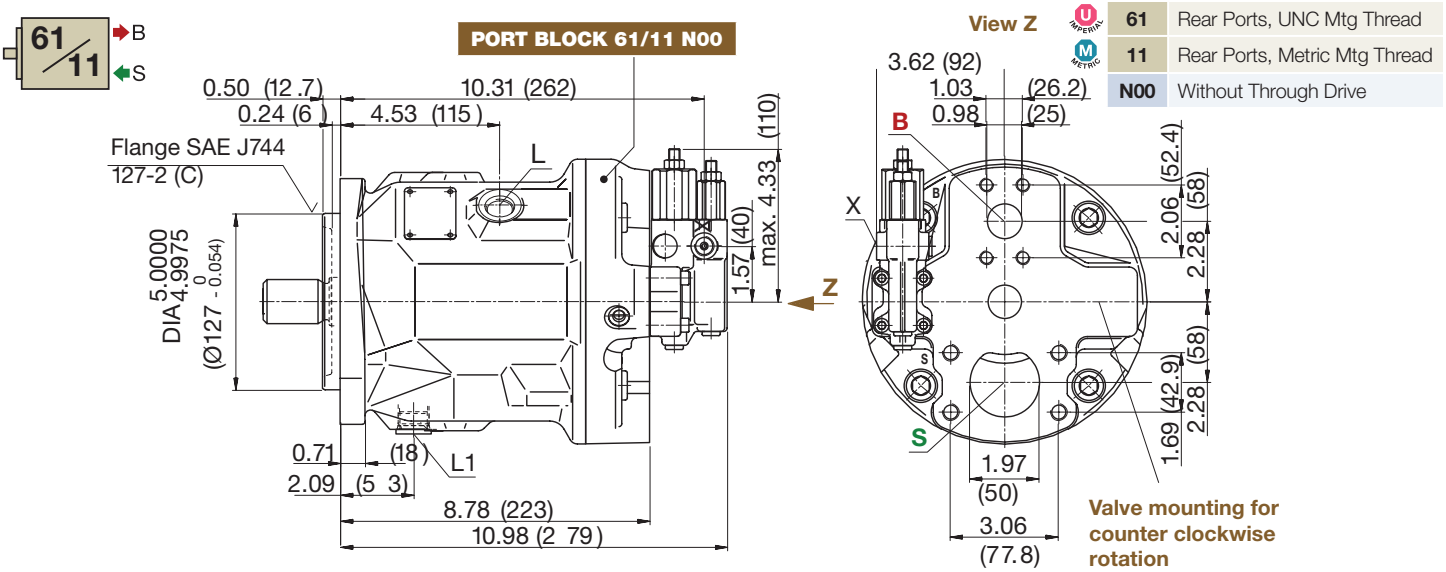
O = Must be connected (plugged on delivery)
1) Depending on the installation position, L or L1 must be connected (also see installation instructions on page 33).

U Imperial M Metric

DIMENSIONS, SIZE 71, SERIES 31
Service Ports on Side and Rear; Non Through Drive
Without Considering Adjustment

VPA10V(S)O-71



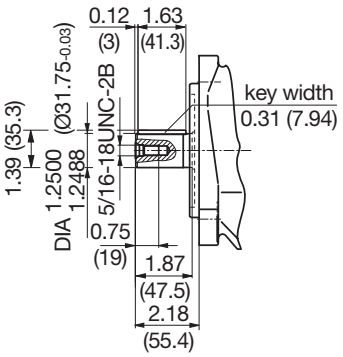


DIMENSIONS, SIZE 71, SERIES 31
Drive Shafts VPA10V(S)O-71, Metric Mount, and Port Dimensions

Drive Shafts VPA10V(S)O-71

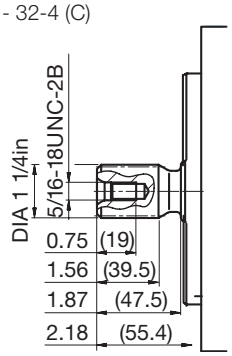
K SAE Parallel Keyed Shaft

1 1/4 in Parallel shaft with key
ISO 3019-1 32-1



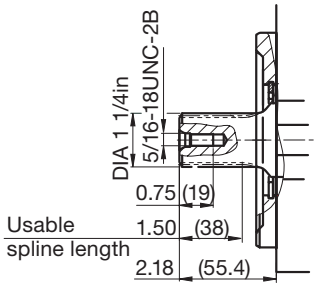
S SAE Splined Shaft

Splined shaft 1 1/4 in 14T 12/24 DP[1)]
SAE J744 - 32-4 (C)



R‡ SAE Splined Shaft, Reinforced
(Similar to shaft S suitable for higher input torque)

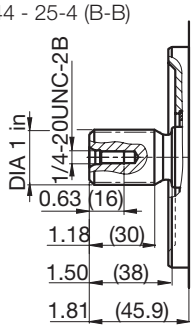
Splined shaft 1 1/4 in 14T 12/24 DP[1)]
SAE J744 - 32-4 (C)



‡ Available on thru drive models only

U† SAE Splined Shaft, Smaller size
(Reduced diameter, not for through drive)

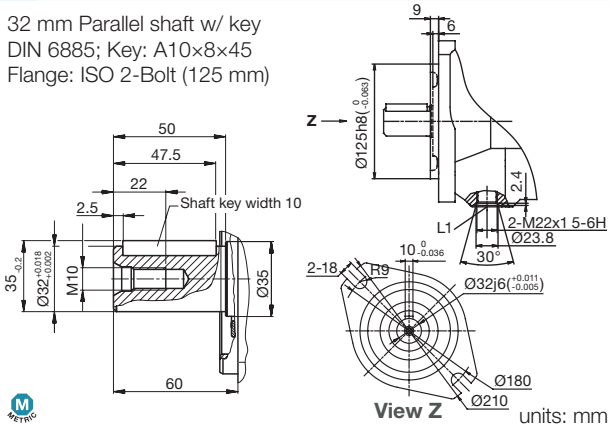
Splined Shaft 1 in 15T 16/32 DP[1)]
SAE J744 - 25-4 (B-B)



† Available on non-thru drive models only

P Metric Parallel Keyed Shaft

32 mm Parallel shaft w/ key
DIN 6885; Key: A10×8×45
Flange: ISO 2-Bolt (125 mm)



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

Ports VPA10V(S)O-71

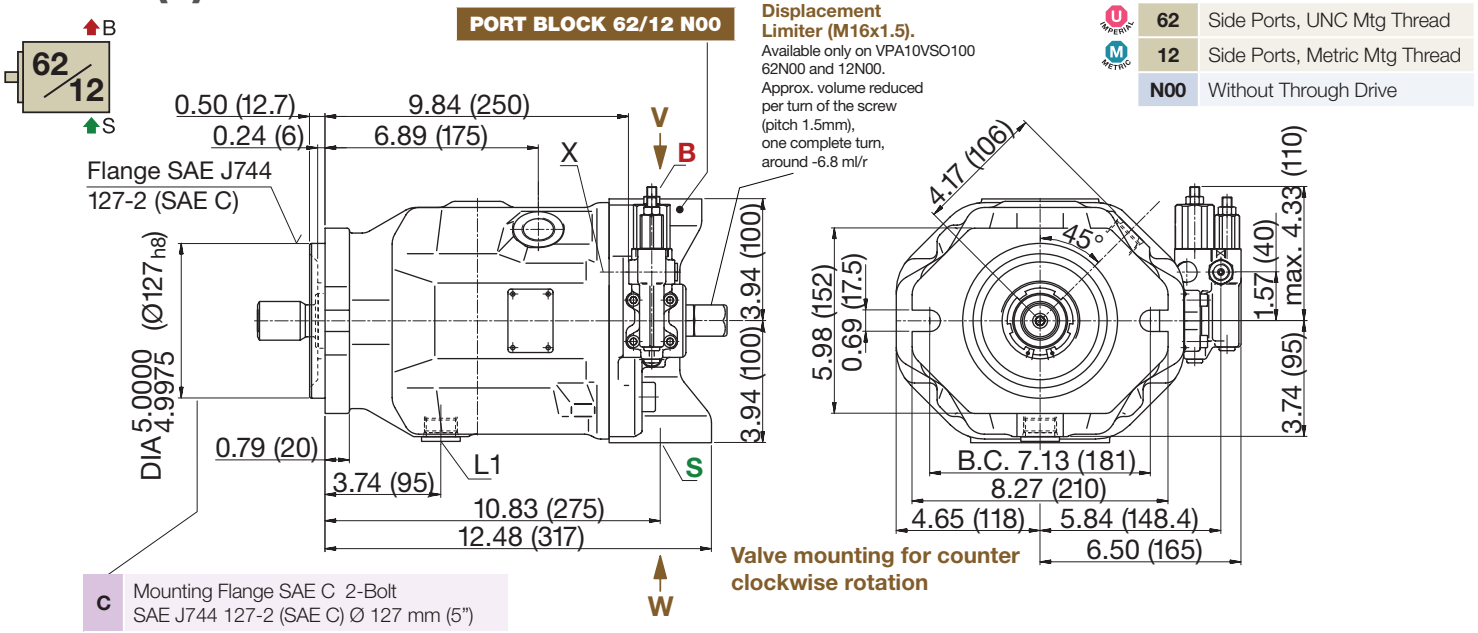
Designation	Port For	Standard	Size	Peak Pressure [psi (bar)]	Tightening Torque Max [lbft (Nm)]	State
B	Pressure port (standard pressure range) Threading in bolt holes	SAE J518 ISO 68	1 in (1" Code 61) ● 3/8-16 UNC-2B; 0.71 (18) deep 1 1/4 (1 1/4" Code 61) ● 7/16-14 UNC-2B; 0.94 (24) deep	5100 (350)	29 (40)	O
S	Inlet port (standard pressure range) Threading in bolt holes	SAE J518 ISO 68	2 in (2" Code 61) 1/2-13 UNC-2B; 0.87 (22) deep	75 (5)	66 (90)	O
L, L1	Case drain ports (L1 plugged)	ISO 11926	7/8-14 UNF-2B (SAE-10)	30 (2)	177 (240)	O[1)]
X	Pilot pressure port	ISO 11926	7/8-14 UNF-2B; 0.39 (10) deep (SAE-4)	5100 (350)	29 (40)	O
X	Control pressure for DG control	DIN 3852	R 1/4 in	1740 (120)	48 (70)	O

O = Must be connected (plugged on delivery)
1) Depending on the installation position, L or L1 must be connected (also see installation instructions on page 33).

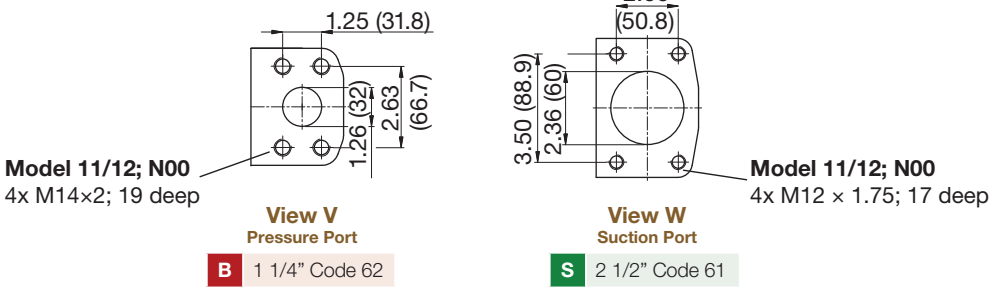
U Imperial M Metric

DIMENSIONS, SIZE 100, SERIES 31
Service Ports on Side and Rear; Non Through Drive
Without Considering Adjustment

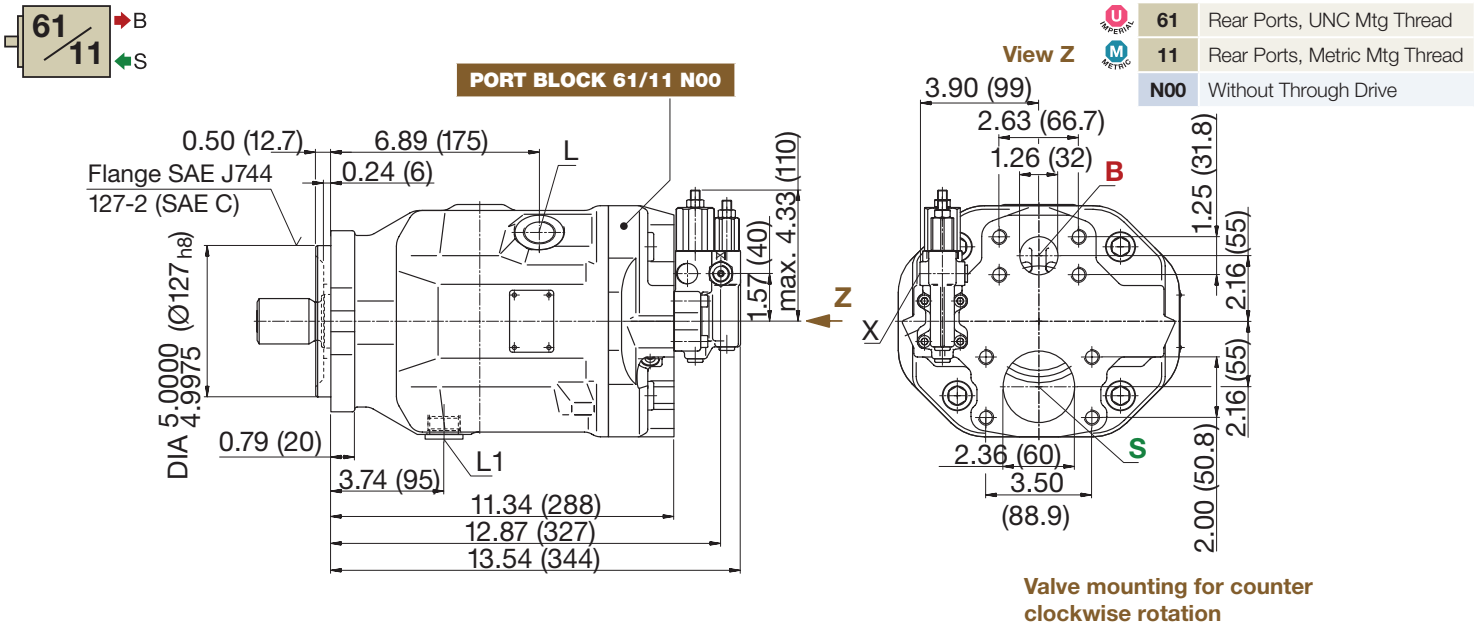
VPA10V(S)O-100



C	Mounting Flange SAE C 2-Bolt SAE J744 127-2 (SAE C) Ø 127 mm (5")	



B	1 1/4" Code 62
S	2 1/2" Code 61



62	Side Ports, UNC Mtg Thread	
12	Side Ports, Metric Mtg Thread	
N00	Without Through Drive	

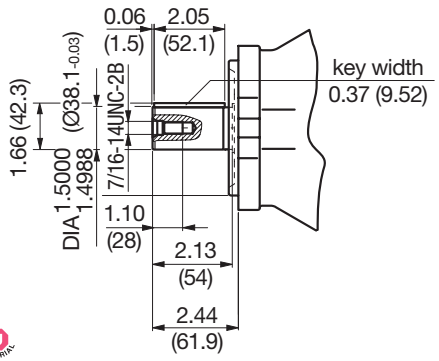
61	Rear Ports, UNC Mtg Thread	
11	Rear Ports, Metric Mtg Thread	
N00	Without Through Drive	

DIMENSIONS, SIZE 100, SERIES 31
Drive Shafts VPA10V(S)O-100, Metric Mount, and Port Dimensions

Drive Shafts VPA10V(S)O-100

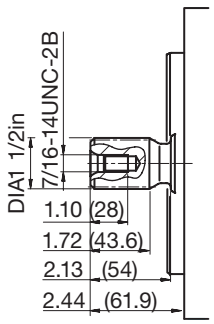
K SAE Parallel Keyed Shaft

1 1/2 in Parallel shaft with key
ISO 3019-1 38-1



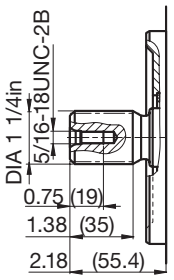
S SAE Splined Shaft

1 1/2 in 17T 12/24 DP1) SAE
J744 - 38-4 (C-C) [1]



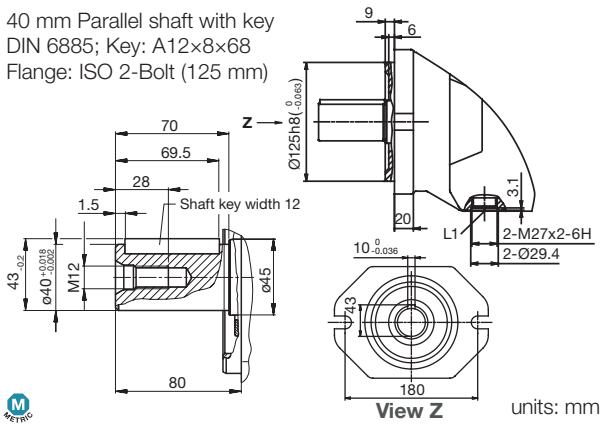
U SAE Splined Shaft, Smaller size
(Reduced diameter, not for through drive)

1 1/4 in 14T 12/24 DP[1]
SAE J744 - 32-4 (C)



P Metric Parallel Keyed Shaft

40 mm Parallel shaft with key
DIN 6885; Key: A12×8×68
Flange: ISO 2-Bolt (125 mm)



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

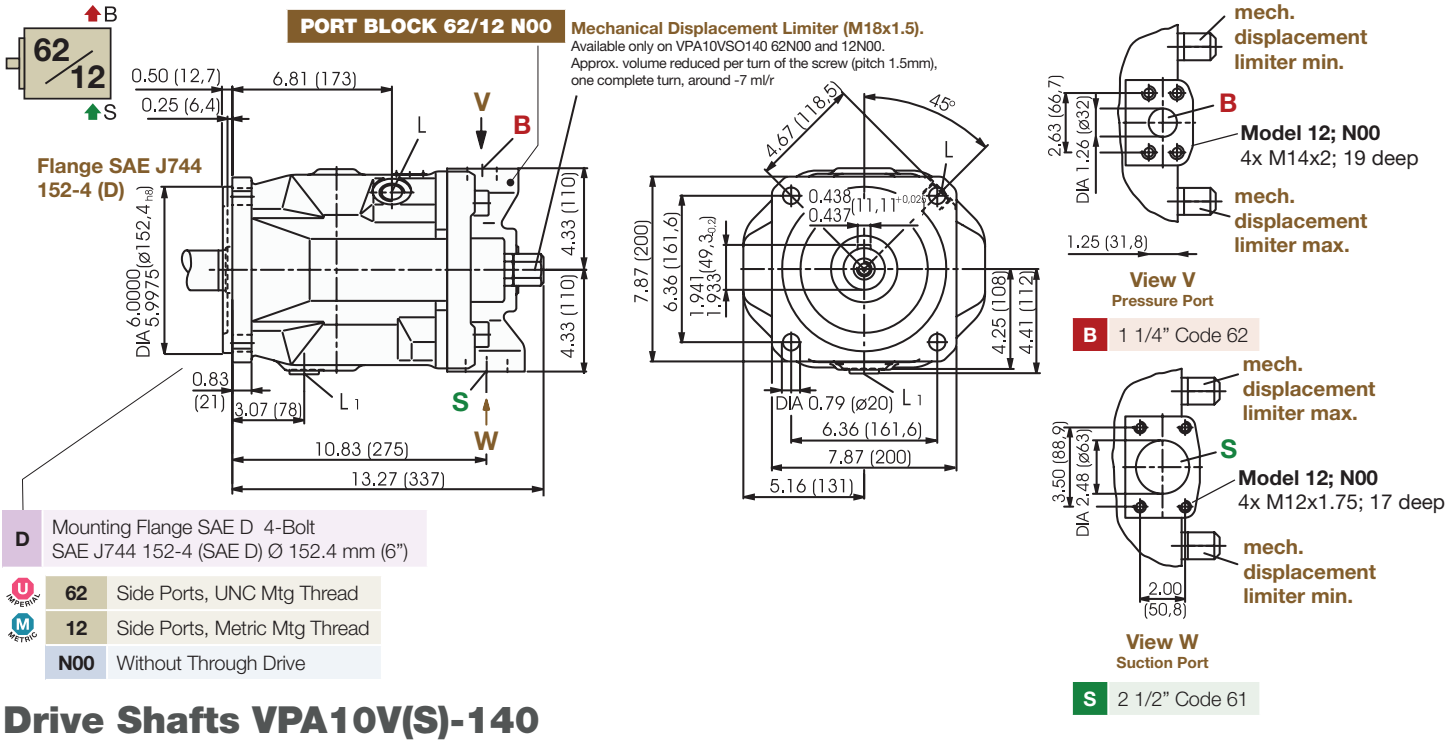
Ports VPA10V(S)O-100

Designation	Port For	Standard	Size	Peak Pressure [psi (bar)]	Tightening Torque Max [lbft (Nm)]	State
B	Pressure port (standard pressure range) Threading in bolt holes	SAE J518 ISO 68	1 1/4 in (1 1/4" Code 62) 1/2-13 UNC-2B; 0.75 (19) deep	5100 (350)	66 (90)	O
S	Inlet port (standard pressure range) Threading in bolt holes	SAE J518 ISO 68	2 1/2 in (2 1/2" Code 61) 1/2-13 UNC-2B; 1.06 (17) deep	75 (5)	66 (90)	O
L, L1	Case drain ports (L1 plugged)	ISO 11926	1 1/16-12 UNF-2B (SAE-12)	30 (2)	265 (360)	O[1]
X	Pilot pressure port	ISO 11926	7/16-20 UNF-2B; 0.39 (10) deep (SAE-4)	5100 (350)	59 (80)	O
X	Control pressure for DG control	DIN 3852	R 1/4 in	1740 (120)	59 (80)	O

O = Must be connected (plugged on delivery)
1) Depending on the installation position, L or L1 must be connected (also see installation instructions on page 33).

U Imperial M Metric

DIMENSIONS, SIZE 140, SERIES 31
Service Ports on Side; Non Through drive, Models 62N00 and 12N00



D	Mounting Flange SAE D 4-Bolt SAE J744 152-4 (SAE D) Ø 152.4 mm (6")

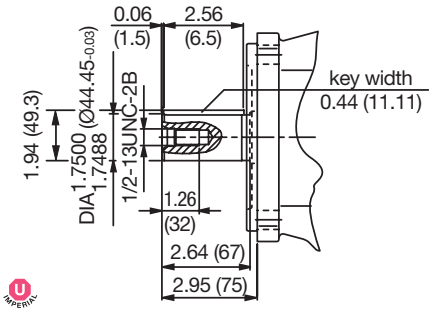
U IMPERIAL	**62**	Side Ports, UNC Mtg Thread
M METRIC	**12**	Side Ports, Metric Mtg Thread
	N00	Without Through Drive

B	1 1/4" Code 62
S	2 1/2" Code 61

Drive Shafts VPA10V(S)-140

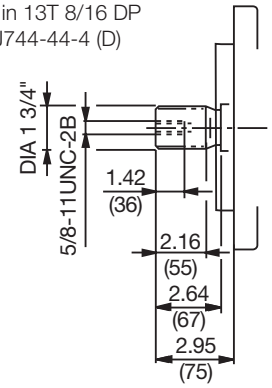
K SAE Parallel Keyed Shaft

1 3/4 in Parallel with key
ISO 3019-1 44-1



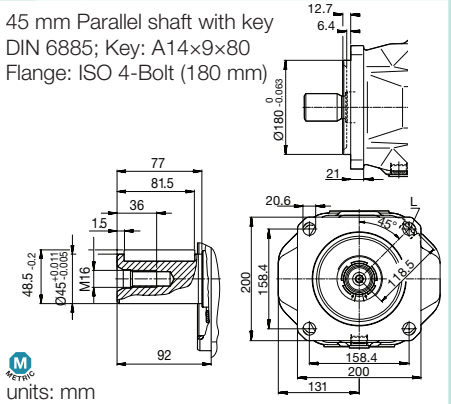
S SAE Splined Shaft

1 3/4 in 13T 8/16 DP
SAE J744-44-4 (D)



P Metric Parallel Keyed Shaft

45 mm Parallel shaft with key
DIN 6885; Key: A14×9×80
Flange: ISO 4-Bolt (180 mm)



Ports VPA10V(S)-140

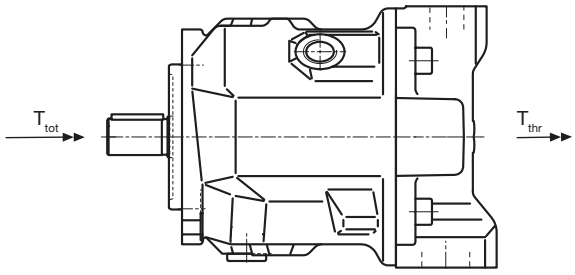
Designation	Port For	Standard	Size	Peak Pressure [psi (bar)]	Tightening Torque Max [lbft (Nm)]	State
B	Pressure port (standard pressure range) Threading in bolt holes	SAE J518 ISO 68	1 1/4 in (1 1/4" Code 62) 1/2-13 UNC-2B; 0.75 (24) deep	5100 (350)	66 (90)	O
S	Inlet port (standard pressure range) Threading in bolt holes	SAE J518 ISO 68	2 1/2 in (2 1/2" Code 61) 1/2-13 UNC-2B; 0.94 (24) deep	75 (5)	66 (90)	O
L, L1	Case drain ports (L1 plugged)	ISO 11926	1 1/16-12 UNF-2B (SAE-12)	30 (2)	265 (360)	O[1)]
X	Pilot pressure port	ISO 11926	9/16-18 UNF-2B; 0.51 (13) deep (SAE-4)	5100 (350)	59 (80)	O
X	Control pressure for DG control	DIN 3852	M14 x 1.5; 0.47 (12) deep	1740 (120)	59 (80)	O

O = Must be connected (plugged on delivery)
1) Depending on the installation position, L or L1 must be connected (also see installation instructions on page 33).

THROUGH DRIVE MOUNTING OPTIONS
Shaft Torque Data

Axial piston units VPA10V can be supplied with a through drive as shown in the ordering code on page 7. 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.

Maximum permissible input and through drive torque

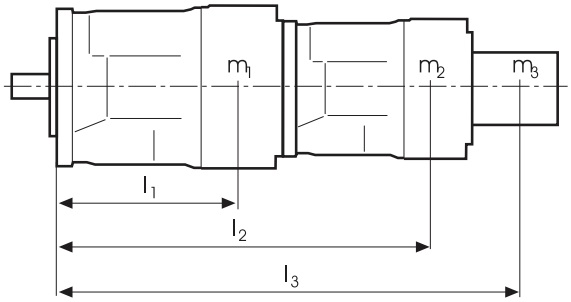


The drive torques for pump 1 and pump 2 can be split up as required. However the max. permissible input torque T_{tot} as well as the max. permissible through drive torque T_{thr} may not be exceeded.

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}	**18**	**28**	**45**	**71**	**100**	**140**
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 $T_{thr\ keyed}$ lb.ft (Nm)	53 (72)	83 (112)	132 (178)	209 (283)	293 (398)	411 (557)

T_{tot} = max. permissible input torque pump 1
T_{thr} = max. permissible through drive torque
$T_{thr\ keyed}$ = 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)]

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

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

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 DRIVE MOUNTING OPTIONS

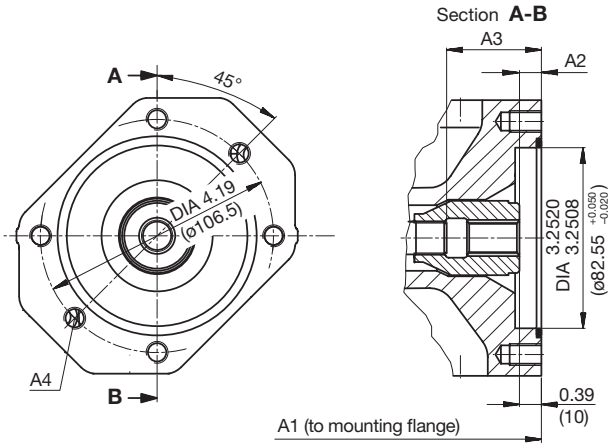
Through Drives - VPA10V		Code	Mounting Options - 2nd Pump			Available on size
Flange SAE J744	Hub Keyed		VPA10V/SO.../31... size shaft	VPA10V/SO.../52... size shaft	Gear Pump	
82-2 (A)	keyed (A-B)	K40	18 (K)	10 (K)	-	18-100
101-2 (B)	keyed (B)	K03	28 (K)	28 (K)	-	28-140
101-2 (B-B)	keyed (B-B)	K05	45 (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) [1]	Size N, G	28-140
101-2 (B)	1 in (B-B)	K04	45 (S, R)	45 (S, R) 60 (U) [2]	-	45-140
127-2 (C)	1 1/4 in (C)	K07	71 (S, R) 100 (U) [3]	85 (U) [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 (SAE A) Ø 82.55 mm

K01	Mounting Flange 82-2 (SAE-A)	Hub for splined shaft[1] 5/8 in 9T 16/32DP (SAE A)	Can use with **VPA10V18(S,R)**



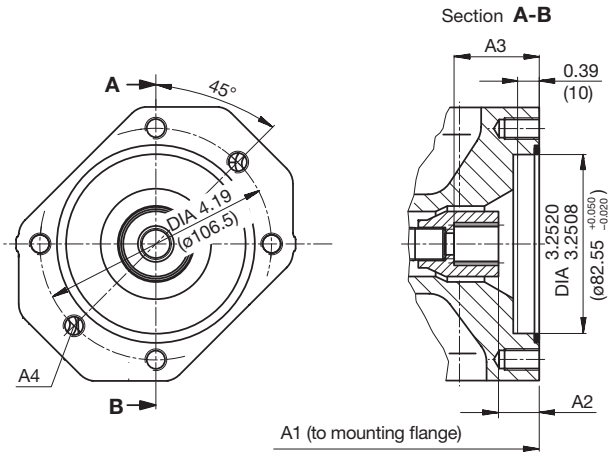
Size	A1	A2	A3	A4[2]
18	7.17 (182)	0.39 (10)	1.70 (43.3)	M10; 0.57 (14.5) deep
28	8.03 (204)	0.39 (10)	1.33 (33.7)	M10; 0.63 (16) deep
45	9.02 (229)	0.42 (10.7)	2.10 (53.4)	M10; 0.63 (16) deep
71	10.50 (267)	0.46 (11.8)	2.41 (61.3)	M10; 0.79 (20) deep
100	13.30 (338)	0.41 (10.5)	2.56 (65)	M10; 0.63 (16) deep
140	13.80 (350)	0.43 (10.8)	3.04 (77.3)	M10; 0.63 (16) deep

1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to DIN 13, see instruction manual for maximum tightening torques.

DIMENSIONS OF THROUGH DRIVES

K52 Flange - SAE J744 82-2 (SAE A) Ø 82.55 mm

K52	Mounting Flange 82-2 (SAE-A)	Hub for splined shaft[1] 3/4 in 11T 16/32DP (SAE A-B)	Can use with **VPA10V18(S,R)**

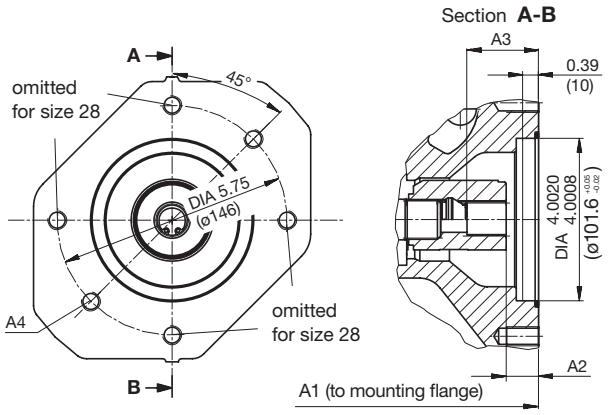


Size	A1	A2	A3	A4[2]
18	7.17 (182)	0.74 (18.8)	1.52 (38.7)	M10; 0.57 (14.5) deep
28	8.03 (204)	0.74 (18.8)	1.52 (38.7)	M10; 0.63 (16) deep
45	9.02 (229)	0.74 (18.9)	1.52 (38.7)	M10; 0.63 (16) deep
71	10.50 (267)	0.84 (21.3)	1.63 (41.4)	M10; 0.79 (20) deep
100	13.30 (338)	0.75 (19)	1.53 (38.9)	M10; 0.63 (16) deep
140	13.80 (350)	0.74 (18.9)	1.52 (38.6)	M10; 0.63 (16) deep

1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to DIN 13, see instruction manual for maximum tightening torques.

K68 Flange - SAE J744 101-2 (SAE B) Ø 101.6 mm

K68	Mounting Flange 101-2 (SAE B)	Hub for splined shaft[1] 7/8 in 13T 16/32DP (SAE B)	Can use with **VPA10V28(S,R), 45(U)**

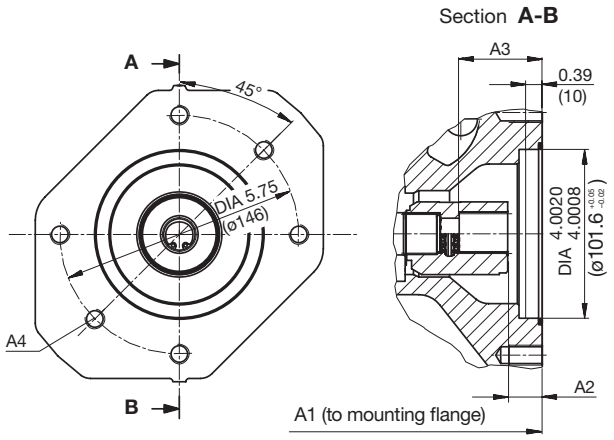


Size	A1	A2	A3	A4[2]
28	8.03 (204)	0.70 (17.8)	1.64 (41.7)	M12;[3]
45	9.02 (229)	0.70 (17.9)	1.64 (41.7)	M12; 0.71 (18) deep
71	10.50 (267)	0.80 (20.3)	1.76 (44.7)	M12; 0.79 (20) deep
100	13.30 (338)	0.71 (18)	1.65 (41.9)	M12; 0.79 (20) deep
140	13.80 (350)	0.70 (17.8)	1.64 (41.6)	M12; 0.79 (20) deep

1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to DIN 13, see instruction manual for maximum tightening torques.
3) Continuous

K04 Flange - SAE J744 101-2 (SAE B) Ø 101.6 mm

K04	Mounting Flange 101-2 (SAE B)	Hub for splined shaft[1] 1 in 15T 16/32DP (SAE B-B)	**VPA10V45(S,R)**



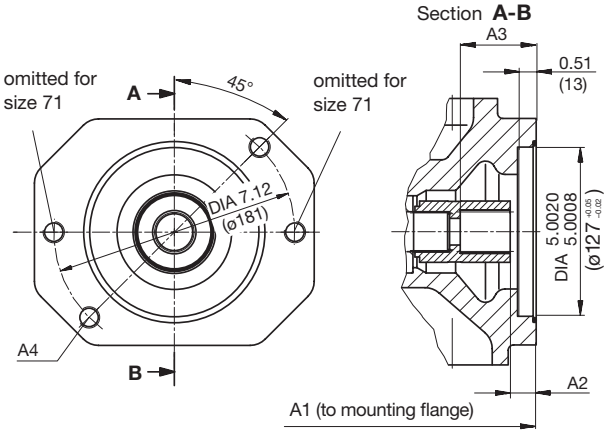
Size	A1	A2	A3	A4[2]
45	9.02 (229)	0.72 (18.4)	1.84 (46.7)	M12; 0.71 (18) deep
71	10.50 (267)	0.82 (20.8)	1.93 (49.1)	M12; 0.79 (20) deep
100	13.30 (338)	0.72 (18.2)	1.83 (46.6)	M12; 0.79 (20) deep
140	13.80 (350)	0.72 (18.3)	1.81 (45.1)	M12; 0.79 (20) deep

1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to DIN 13, see instruction manual for maximum tightening torques.

DIMENSIONS OF THROUGH DRIVES

K07 Flange - SAE J744 127-2 (SAE C) Ø 127 mm

K07 Mounting Flange 127-2 (SAE C) | Hub for splined shaft[1] 1 1/4 in 14T 12/24DP (SAE C) | Can use with **VPA10V71(S,R), 100(U)**

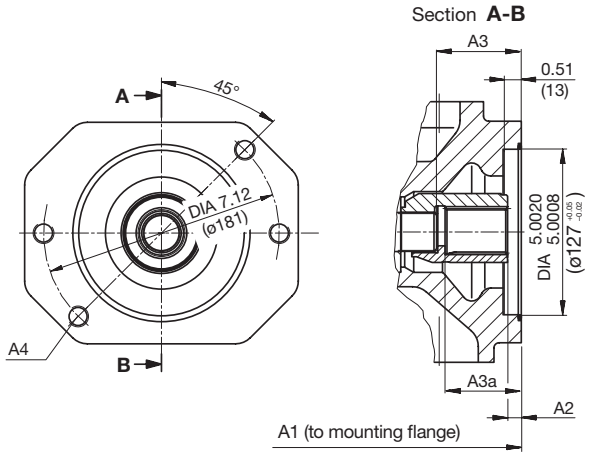


Size	A1	A2	A3	A4[2]
71	10.50 (267)	0.89 (21.8)	2.31 (58.6)	M16;[3]
100	13.30 (338)	0.77 (19.5)	2.22 (56.4)	M16;[3]
140	13.80 (350)	0.76 (19.3)	2.21 (56.1)	M16; 0.94 (24) deep

1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to DIN 13, see instruction manual for maximum tightening torques.
3) Continuous

K24 Flange - SAE J744 127-2 (SAE C) Ø 127 mm

K24 Mounting Flange 127-2 (SAE C) | Hub for splined shaft[1] 1 1/2 in 17T 12/24DP (SAE C-C) | Can use with **VPA10V100(S,R)**

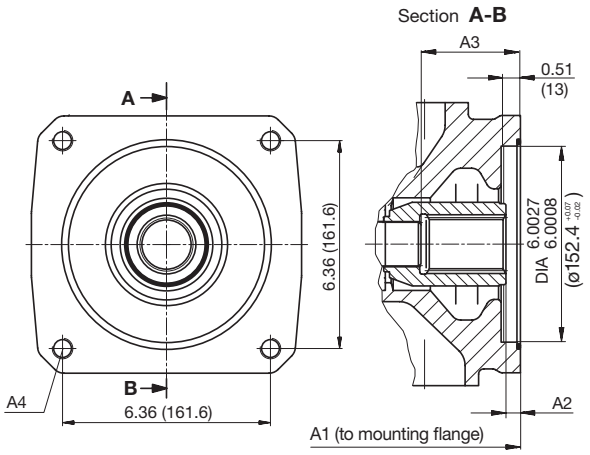


Size	A1	A2	A3	A3a	A4[2]
100	13.30 (338)	0.39 (9.9)	2.56 (65)	-	M16;[3]
140	13.80 (350)	0.38 (9.7)	-	2.72 (69.1)	M16; 0.94 (24) deep

1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to DIN 13, see instruction manual for maximum tightening torques.
3) Continuous

K17 Flange - SAE J744 152-4 (SAE D) Ø 152.4 mm

K17 Mounting Flange 152-4 (SAE D) | Hub for splined shaft[1] 1 3/4 in 13T 8/16DP (SAE D) | Can use with **VPA10V140(S,R)**



Size	A1	A2	A3	A4[2]
140	13.80 (350)[3]	0.53 (11)	3.04 (77.3)	M16;[3]

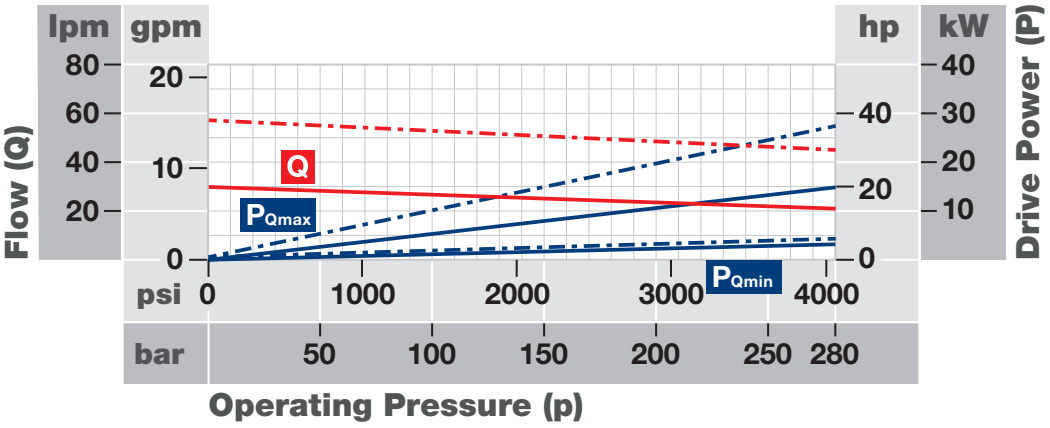
Only available with housing with mounting flange D.
1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to DIN 13, see instruction manual for maximum tightening torques.
3) Continuous

PERFORMANCE DATA - DRIVE POWER AND FLOW

Size 18

Operating at	
n = 1800 rpm	
n_{max} = 3300 rpm	

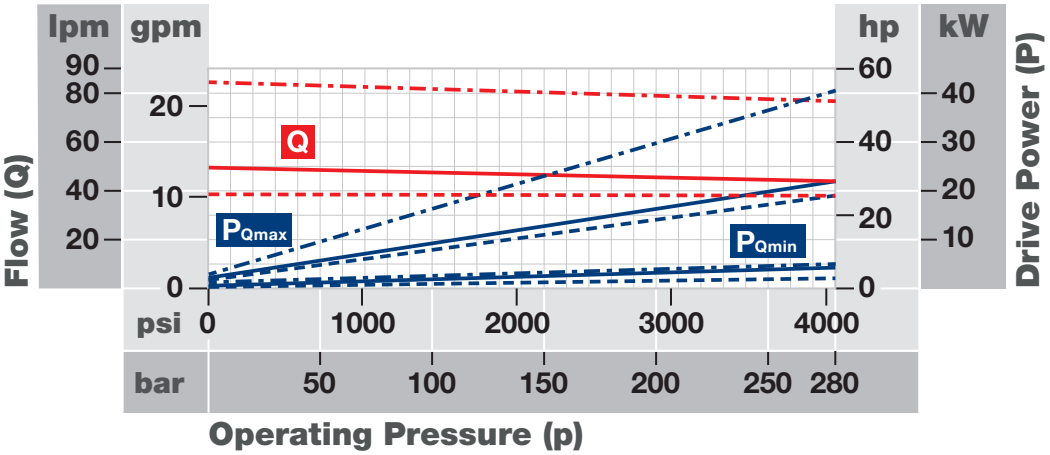
Q Flow
P Power



Size 28

Operating at	
n = 1500 rpm	
n = 1800 rpm	
n_{max} = 3300 rpm	

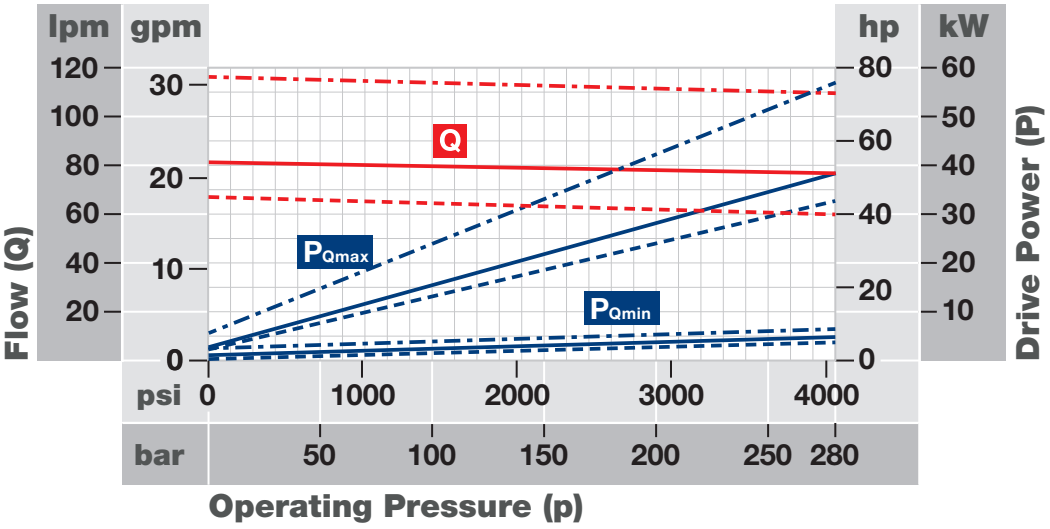
Q Flow
P Power



Size 45

Operating at	
n = 1500 rpm	
n = 1800 rpm	
n_{max} = 2600 rpm	

Q Flow
P Power

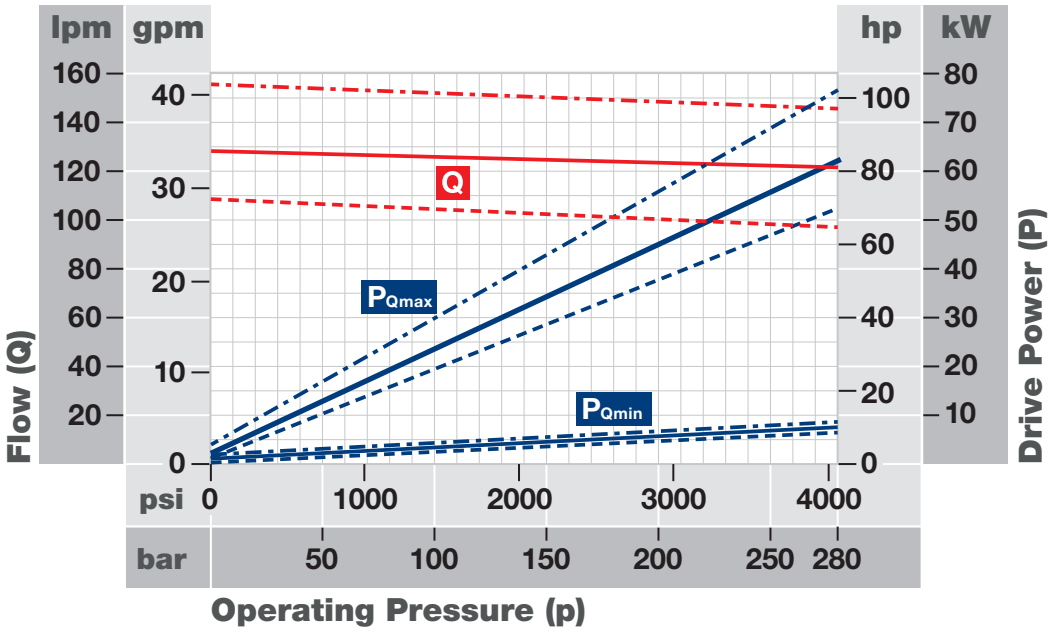


PERFORMANCE DATA - DRIVE POWER AND FLOW

Size 71

Operating at	
n = 1500 rpm	
n = 1800 rpm	
n_{max} = 2200 rpm	

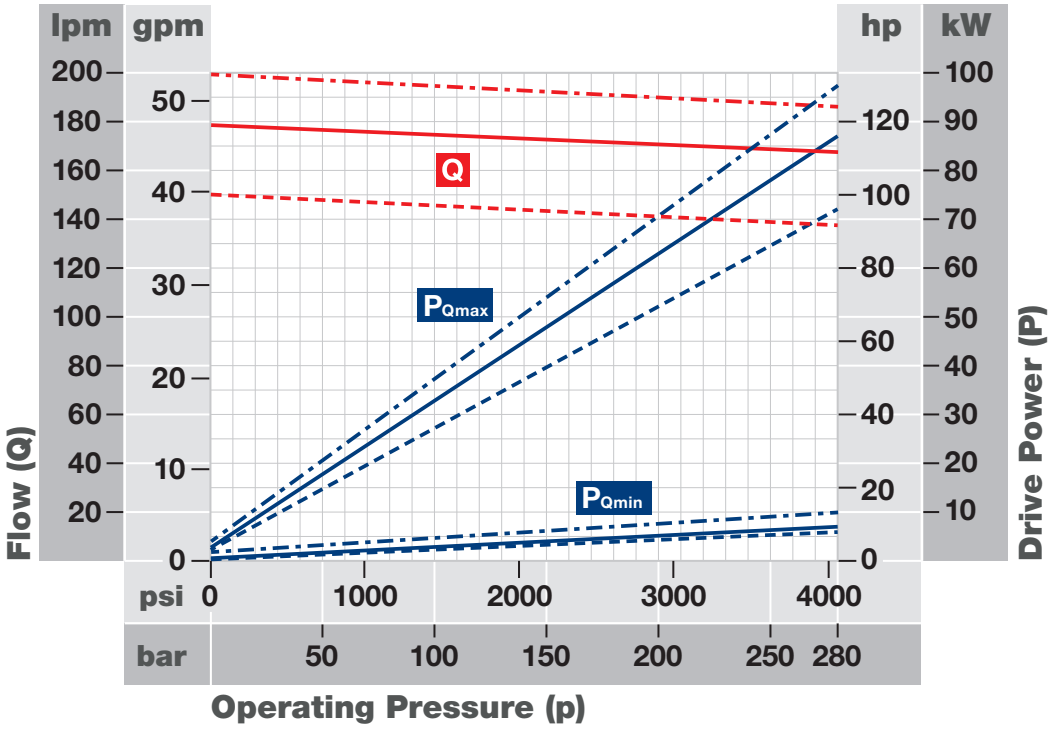
Q	Flow
P	Power



Size 100

Operating at	
n = 1500 rpm	
n = 1800 rpm	
n_{max} = 2200 rpm	

Q	Flow
P	Power

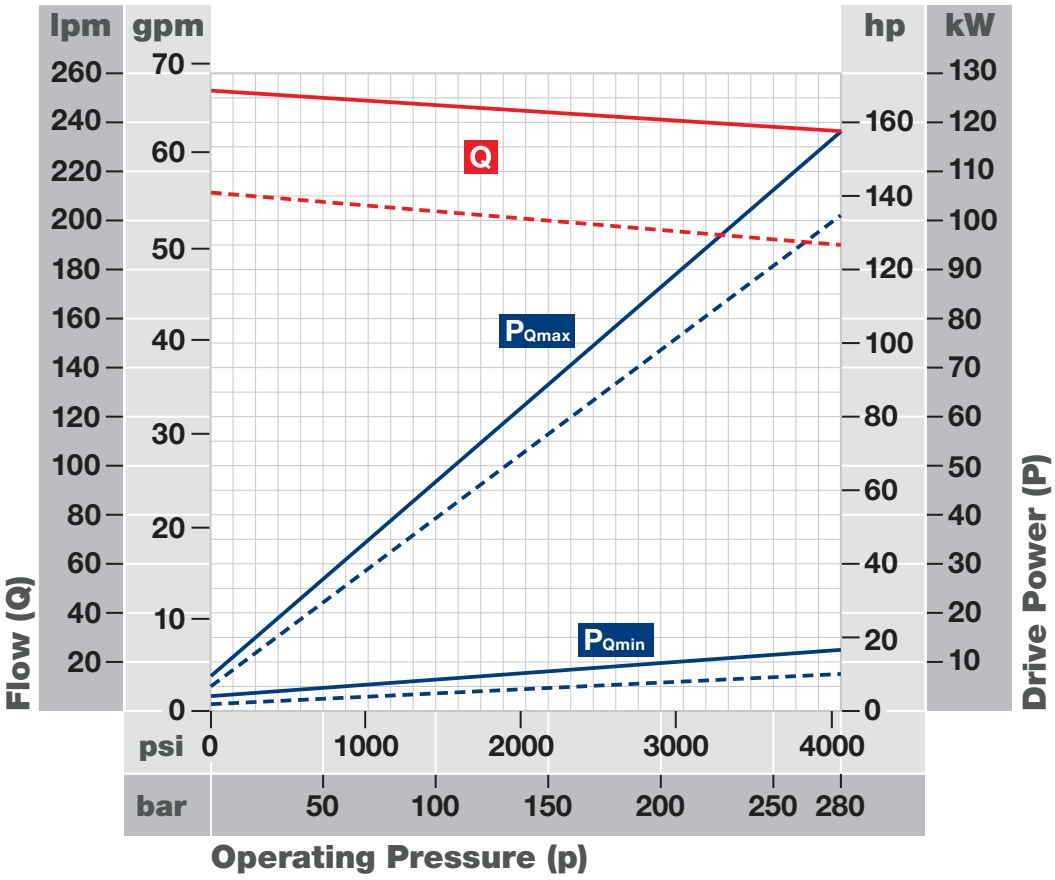


PERFORMANCE DATA - DRIVE POWER AND FLOW

Size 140

Operating at	
n = 1500 rpm	----------
n_{max} = 1800 rpm	————

Q Flow
P Power



FLOW

1 gallon/minute [gpm] = 3.7854 liters/minute [lpm]
1 liters/minute [lpm] = 0.26417 gallon/minute [gpm]

PRESSURE

1 pounds/square inch [psi] = 0.06895 [bar]
1 [bar] = 14.5038 pounds/square inch [psi]

POWER

1 horsepower [HP] = 0.7457 kilowatt [kW]
1 kilowatt [kW] = 1.3410 horsepower [hp]

EFFICIENCY

Total efficiency $\eta_t = \dfrac{Q \times p}{P_{Qmax} \times 1714(600)^*}$

Volumetric efficiency $\eta_v = \dfrac{Q_{act.}}{Q_{theor.}}$

Q (gpm), p (psi), P (hp) Use 1714 (U IMPERIAL)
Q (lpm), p (bar), P (kW) Use 600 (M METRIC)

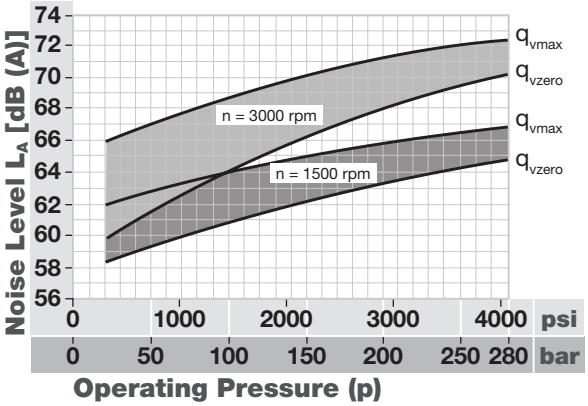
U Imperial M Metric

NOISE LEVEL

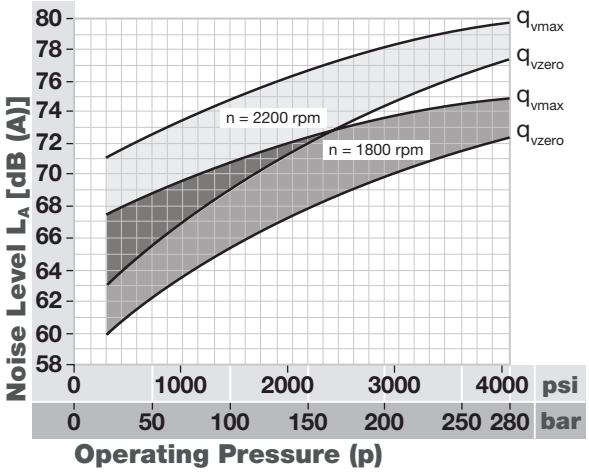
Characteristics for pump

- Measured in an sound chamber
- Distance from microphone to pump = 3.3 ft (1m)
- Measuring error: + 2 dB(A)
- Hydraulic oil to ISO VG 46 DIN 51519, t=122˚ F(50˚C)

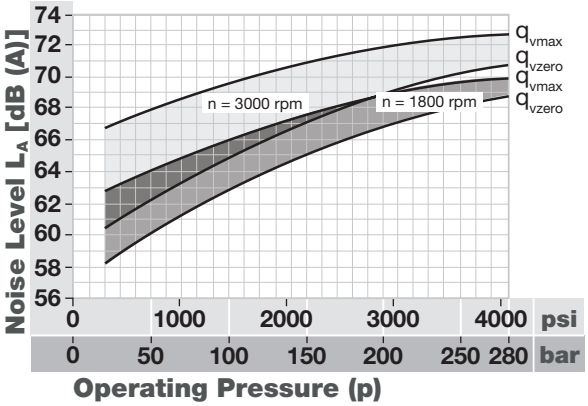
SIZE 18



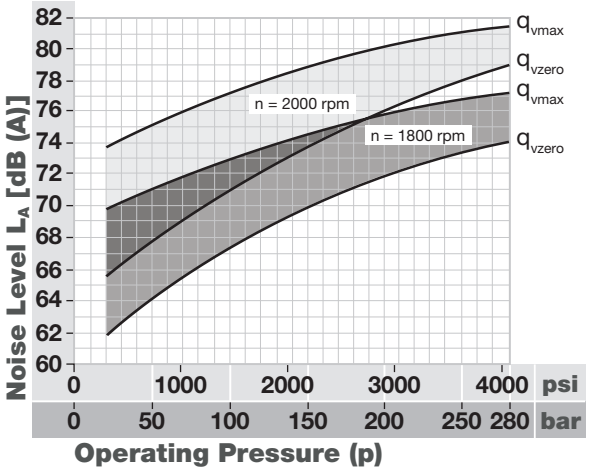
SIZE 71



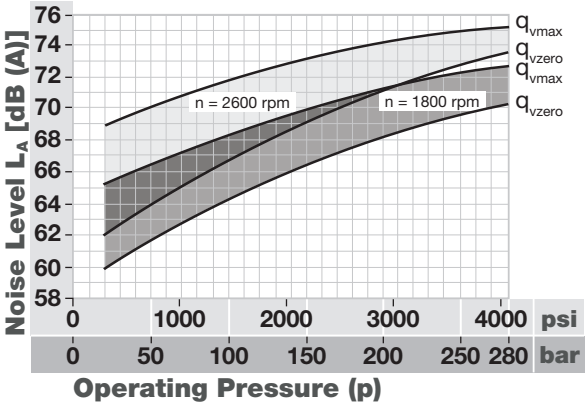
SIZE 28



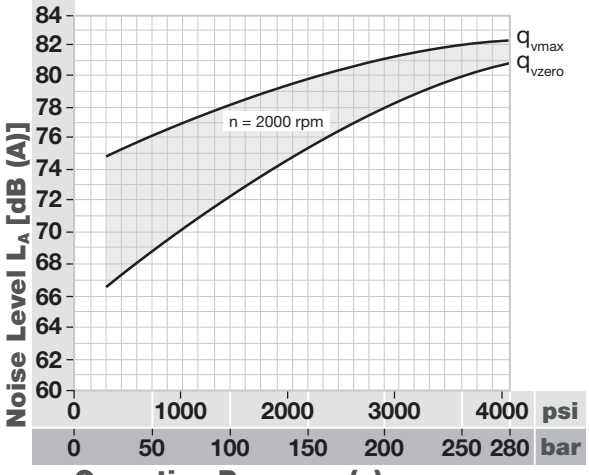
SIZE 100



SIZE 45



SIZE 140



***Sound data representative of piston pumps of this design.**

PUMP INSTALLATION NOTES

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

1. Vertical installation (shaft end upwards)
The following installation conditions must be taken into account:
1.1. Arrangement in tank
Before installation fill pump housing, keeping it in a horizontal position.
a) If the minimum fluid level is equal to or above the pump mounting surface leave ports "L", "L1" and "S" open (see Fig.1).
b) If the minimum fluid level is below the pump mounting surface pipe port "L1", and possibly "S" according to Fig. 2. Close port "L" with respect to conditions in 1.2.1.

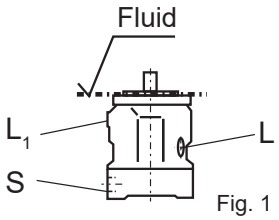


Fig. 1

1.2. Arrangement outside tank
Before installation fill pump housing, keeping it in a horizontal position. For mounting above tank see Fig. 2.
Limiting condition:
1.2.1. Minimum pump inlet pressure $p_{inlet\ min}$ = 0,8 bar under static and dynamic loading.
Note: Avoid mounting above tank wherever possible in order to attain a low noise level.
pressure loss, but may not be greater than h_{max} = 800 mm
(immersion depth $h^{t\ min}$ = 200 mm).

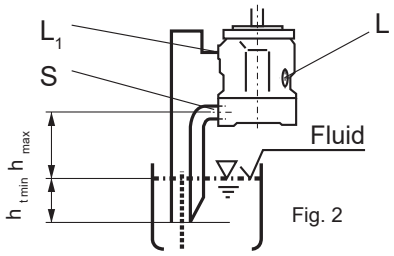


Fig. 2

The permissible suction height h is a result of the overall Total pressure loss $\Delta p_{total} = \Delta p1 + \Delta p2 + \Delta p3 \leq (1 - p_{inlet\ min}) = 0{,}2$ 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/m³)
l = pipe length (m)
dv/dt = change in rate of suction (m/s²)

Δp_2: Pressure loss due to static head

$$\Delta p_2 = h \cdot \rho \cdot g \cdot 10\ (bar)$$

h = height (m)
ρ = density (kg/m³)
g = acc. due to gravity = 9.81 m/s

Δp_3: Line losses (elbows etc.)

Horizontal installation
The pump must be installed so that either "L" or "L1" is at the top.
2.1. Arrangement in tank
a) If the minimum fluid level is above the top of the pump leave ports "L", "L1" and "S" open (see Fig. 3)
b) If the minimum fluid level is equal to or below the top of the pump pipe ports "L", "L1" and possibly "S" according to Fig. 4. Conditions according to 1.2.1.

2.2. Arrangement outside tank

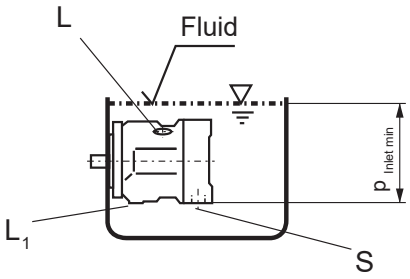


Fig. 3

Fill pump housing before commissioning.
Pipe port "S" and the higher of the two case drain ports "L" and "L_1".
a) For mounting above tank see Fig. 4. Conditions according to 1.2.1.
b) Position below tank

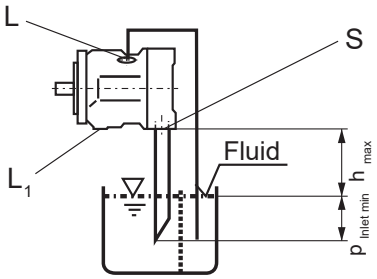


Fig. 4

Pipe ports "L" and "S" according to Fig. 5.

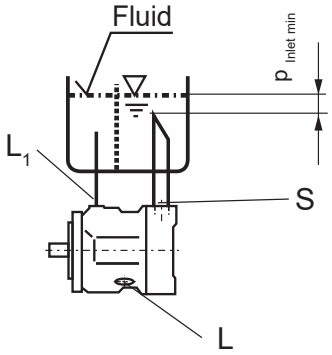


Fig. 5

NOTES

NOTES

Strength in Products, Strength in Service

- Pressure Switches
- Temperature Switches
- Differential Switches
- Level Switches
- Vacuum Switches
- Transducers
- Gear Pumps
- Vane Pumps
- Dump Pumps
- Variable Piston Pumps
- Orbital Motors
- Vane Motors
- Gear Motors
- Monoblock Valves
- High Pressure Ball Valves
- Flow Controls & Needle Valves
- Drive Couplings
- Flanges
- Gauges
- Test Points

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