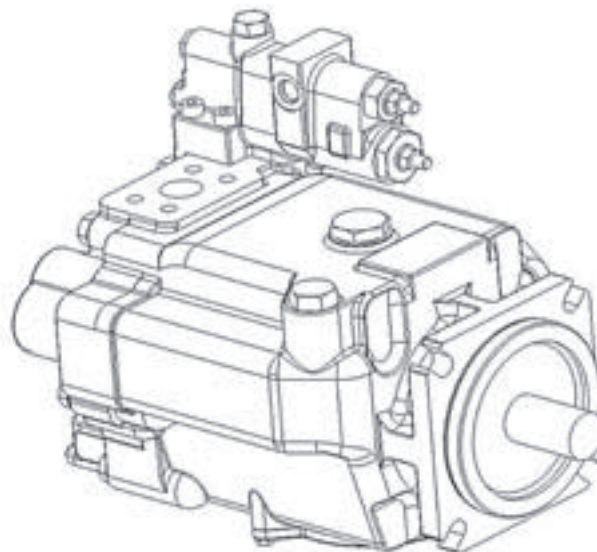
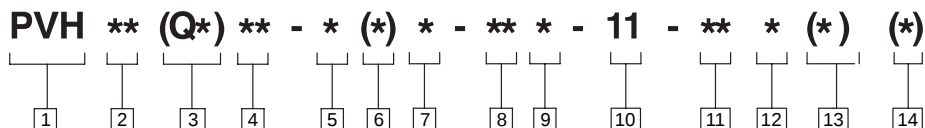


Piston Pumps

PVH Variable Displacement



Model Code



1 Piston pump, variable displacement

2 Maximum geometric displacement

057 – 57.4 cm³/r [3.50 in³/r]
 063 – 63.1 cm³/r [3.85 in³/r]
 074 – 73.7 cm³/r [4.50 in³/r]
 081 – 81.0 cm³/r [4.94 in³/r]
 098 – 98.3 cm³/r [6.00 in³/r]
 106 – 106.5 cm³/r [6.50 in³/r]
 131 – 131.1 cm³/r [8.00 in³/r]
 141 – 141.0 cm³/r [8.60 in³/r]

3 Application style

Blank - Mobile application (rated speed & 250/280 bar (3600-4000 psi) pressures)

QI - Quiet industrial application (1500 - 1800 rpm & 250/280 bar (3600-4000 psi) pressures)

4 Mounting flange, prime mover end

C - SAE "C" 4-bolt type (SAE J744-127-4)

5 Shaft rotation, viewed at prime mover end

R - Right hand, clockwise
L - Left hand, counterclockwise

6 Configuration

Blank - Non-thru-drive (single pump)
A - SAE-A thru-drive pump, standard (SAE J744-82-2)
B - SAE-B thru-drive pump, optional (SAE J744-101-2/4)
C - SAE-C thru-drive pump, optional (SAE J744-127-2/4)
S - Adjustable maximum volume stop ("S" option not available on thru-drive and torque control pump models.)

7 Main ports

F - SAE 4-bolt flange ports (standard)

8 Shaft-end type, at prime mover end

1 - SAE-C straight keyed
2 - SAE-C 14 tooth spline
3 - SAE-CC 17 tooth spline
12 - SAE-D 13 tooth spline
13 - SAE-CC straight keyed
16 - SAE-D straight keyed

9 Shaft seal, prime mover end

S - Single, one-way
D - Double, two-way

10 Pump design number

11 - (Subject to change. Installation dimensions unaltered for design numbers 10 to 19 inclusive.)

11 Pressure control type

C - Compensator, 140-280 bar (2000-4000 psi)
CM - Compensator, 35-140 bar (500-2000 psi)

12 Factory compensator pressure setting

Blank - Leave blank for "IC" controls only
7 - 70 bar (1015 psi) normal "CM7" setting (all pump sizes)
25 - 250 bar (3625 psi) normal "C25" setting (57, 74, 98, 131 models)

13 Optional pressure control functions

Blank - Leave blank for basic compensator controls of IC models.

V - Load sensing, 20 bar (290 psi) factory "differential" pressure setting

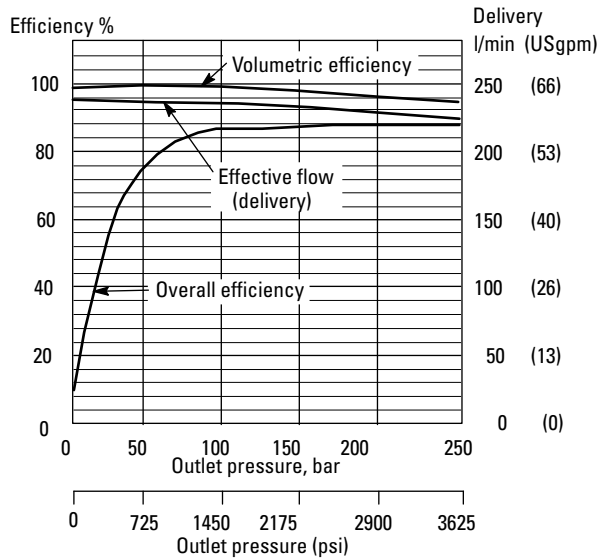
14 Control design number

31 - All control options

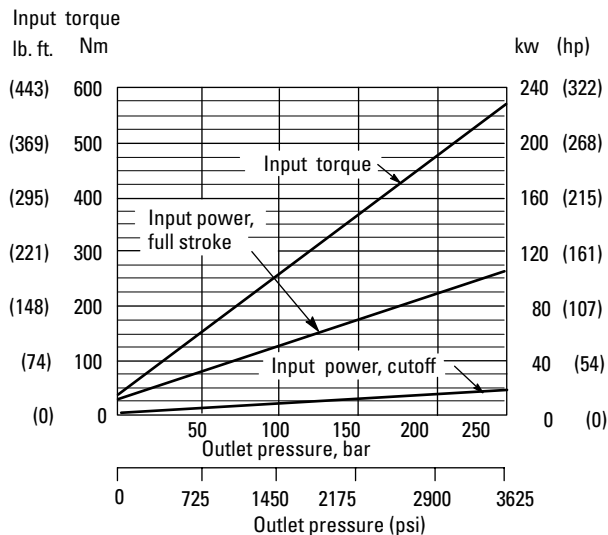
Performance Data

PVH131

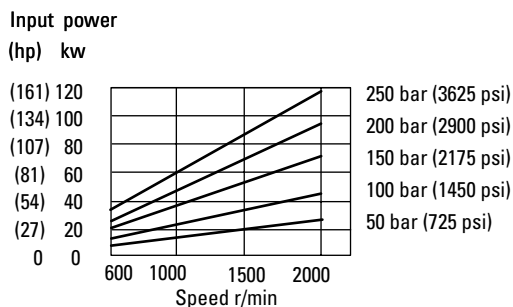
Delivery and efficiency versus outlet pressure at 1800 r/min



Input torque and power versus outlet pressure at 1800 r/min

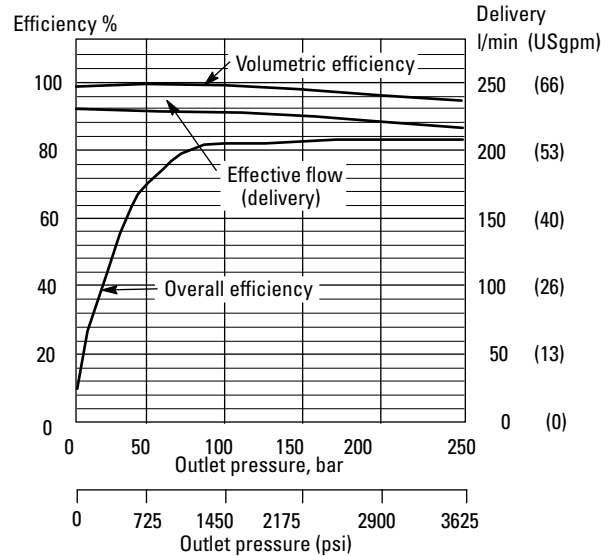


Input power versus speed

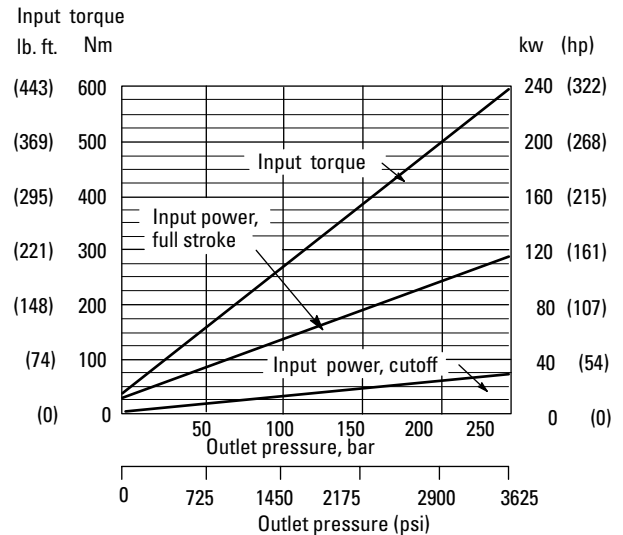


PVH141

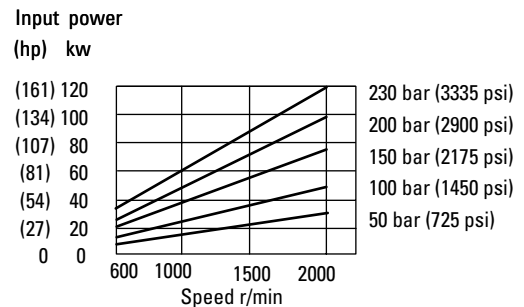
Delivery and efficiency versus outlet pressure at 1800 r/min



Input torque and power versus outlet pressure at 1800 r/min



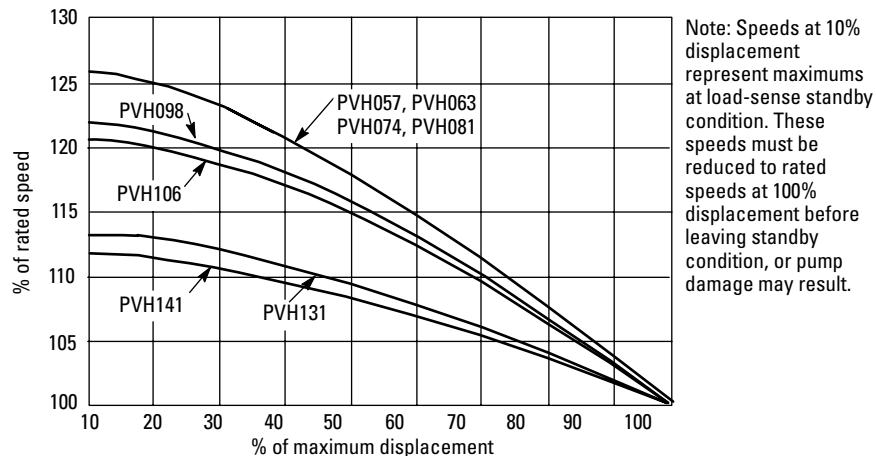
Input power versus speed



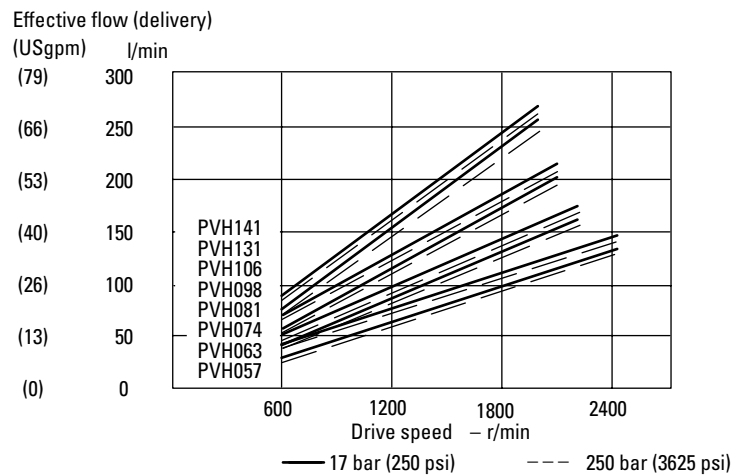
Performance Data

Performance data is typical with SAE 10W anti-wear hydraulic oil at 50°C (120°F) and at zero pump inlet pressure, except where otherwise indicated.

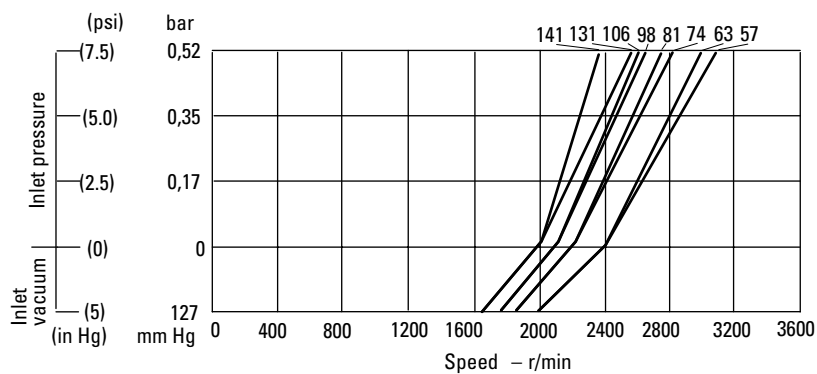
Rated Speed at Reduced Displacement and Zero Inlet Pressure



Effective Flow at Maximum Torque



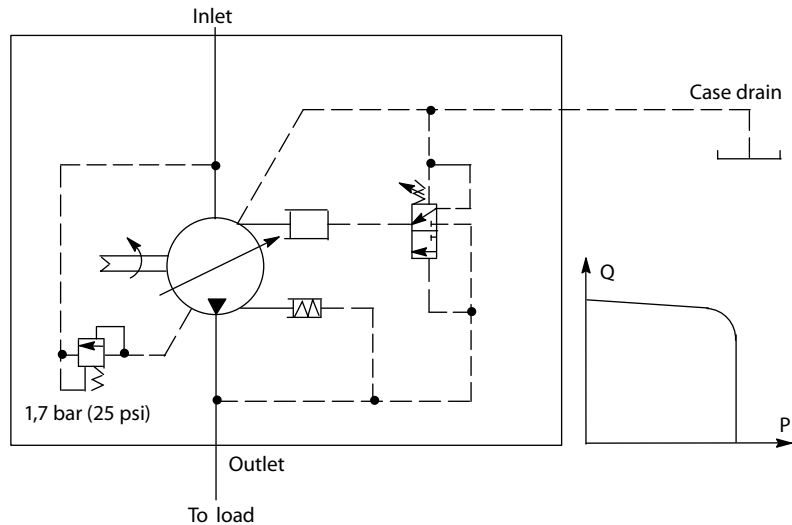
Inlet Pressure/Vacuum versus Speed, Mobile Pumps



Control Options

Pressure Compensator Control (C or CM)

The pump will provide a continuously modulated flow to meet changing load demands at a pre-adjusted compensator pressure. At pressures below the compensator setting, the pump will operate at maximum displacement. The compensator is available in two pressure ranges.



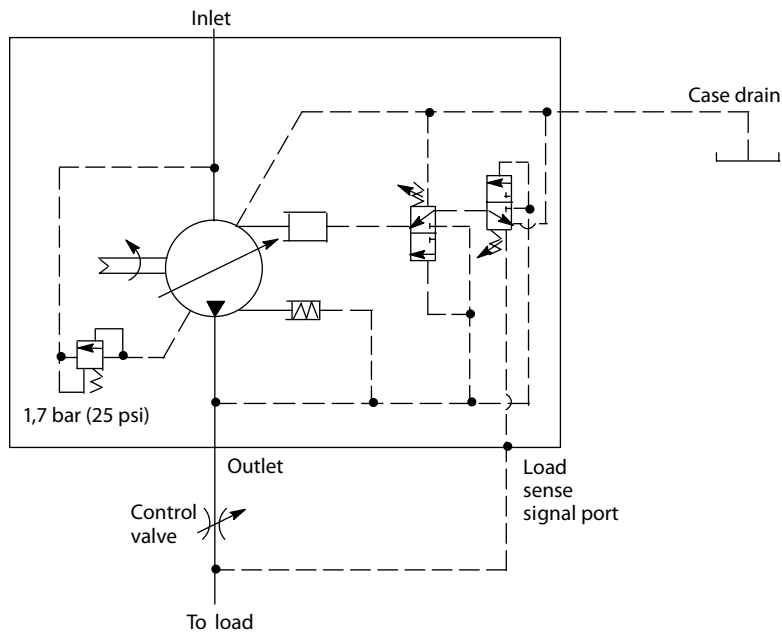
Load Sensing and Pressure Compensator Control (V)

The pump will provide power matching of pump output to system load demand, maximizing efficiency and improving load metering characteristics of any directional control valve installed between the pump and the load.

Load sensing ensures that the pump always provides only the amount of flow needed by the load. At the same time, the pump operating pressure adjusts to the actual load pressure plus a pressure differential required for the control action. When the system is not demanding power, the load sense control will operate in an energy-saving stand-by mode.

Typically, the differential pressure is that between the pressure inlet and service port of a proportionally controlled directional valve, or a load sensing directional control valve. The standard differential pressure setting for load sense is 20 bar (290 psi), but can be adjusted to between 17 and 30 bar (247 and 435 psi) on the pump.

If the load pressure exceeds the system pressure setting, the pressure compensator de-strokes the pump. The load sensing line must be as short as possible and can also be used for remote control or unloading of the pump pressure.



Input Shaft Selection Data

Multiple pump arrangements can be formed by a PVH thru-drive pump and any suitable pump (single or multiple) that can be installed on the SAE "A", "B", or "C" rear-mounting option available for the thru-drive pump.

It is important to check that maximum torque values for individual pump sections, or complete pumps, occurring in a specific application will not exceed the limits tabled below.

Shaft Code	Shaft Designation	Basic Pump Series	Thru-drive Pump Series	Maximum Input Torque Nm (lb. in.)	Maximum Thru-drive Output Torque Nm (lb. in.)
N	ISO 3019/2 – E32N short straight keyed	PVH057/063 PVH074/081	– –	450 (3,980) 450 (3,980)	– –
1	SAE "C" (J744-32-1) straight keyed	PVH057/063 PVH074/081 PVH098/106	PVH057/063 – –	450 (3,980) 450 (3,980) 450 (3,980)	335 (2,965) – –
2	SAE "C" (J744-32-4) 14T 12/24 DP FRSF spline	PVH057/063 PVH074/081 PVH098/106 PVH131/141	PVH057/063 – – –	640 (5,660) 640 (5,660) 640 (5,660) 640 (5,660)	335 (2,965) – – –
3	SAE "CC" (J744-38-4) 17T 12/24 DP FRSF spline	– – PVH131/141	PVH074/081 PVH098/106 PVH131/141	1215 (10,750) 1215 (10,750) 1215 (10,750)	460 (4,070) 640 (5,660) 640 (5,660)
12	SAE "D" (J744-44-4) 13T 8/16 DP FRSF spline	PVH131/141	PVH131/141	1215 (10,750)	640 (5,660)
13	SAE "CC" (J744-38-1) straight keyed	– – PVH131/141	PVH074/081 PVH098/106 –	765 (6,770) 765 (6,770) 765 (6,770)	460 (4,070) 460 (4,070) –
16	SAE "D" (J744-44-1) straight keyed	–	PVH131/141	1200 (10,620)	640 (5,660)

Note: To assure developed thru-drive loads are within PVH pump limitations, actual torque values must not exceed values shown.

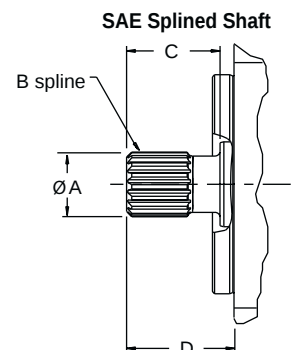
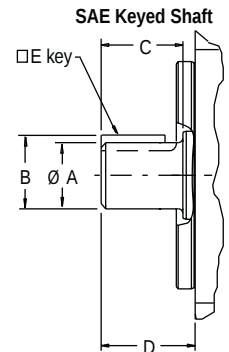
Input Shaft Dimensions

Straight Keyed Shafts*

Shaft Code	Shaft Designation	A	B	C	D	E	Number of teeth
1	SAE "C" (J744-32-1)	31,75 (1.25)	35,32 (1.38)	48,0 (1.89)	56,0 (2.20)	7,93 (.312)	
13	SAE "CC" (J744-38-1)	38,10 (1.50)	42,39 (1.67)	54,0 (2.12)	62,0 (2.44)	9,52 (.375)	
16	SAE "D" (J744-44-1)	44,45 (1.75)	49,46 (1.95)	67,0 (2.64)	75,0 (2.95)	11,11 (.438)	
N	ISO 3019/2–E32N	32,00 (1.26)	35,00 (1.38)	58,0 (2.28)	68,1 (2.68)	10,00 (.393)	

Spline Shafts*

2	SAE "C" (J744-32-4)			48,0 (1.89)	56,0 (2.20)	14
3	SAE "CC" (J744-38-4)			54,0 (2.13)	62,0 (2.44)	17
12	SAE "D" (J744-44-4)			67,0 (2.64)	75,0 (2.95)	13



Performance Data

Performance data is typical with SAE 10W anti-wear hydraulic oil at 50°C (120°F) and at zero pump inlet pressure, except where otherwise indicated.

Rated Characteristics of PVH Industrial Pumps*

Parameters	PVH057	PVH063	PVH074	PVH081	PVH098	PVH106	PVH131	PVH141
Geometric displacement, max. cm ³ /r (in ³ /r)	574 (3.5)	63,1 (3.85)	73,7 (4.5)	81,0 (4.94)	98,3 (6.0)	106,5 (6.50)	131,1 (8.0)	141,1 (8.60)
Rated pressure bar (psi)	250 (3625)†	230 (3300)†	250 (3625)†	230 (3300)†	250 (3625)†	230 (3300)†	250 (3625)†	230 (3300)†
Rated speeds in r/min at various inlet pressures								
127 mm Hg (5" Hg)	1500	1500	1500	1500	1500	1500	1200	1200
Zero inlet pressure	1800	1800	1800	1800	1800	1800	1500	1500
0,48 bar (7 psi)	1800	1800	1800	1800	1800	1800	1800	1800
Typical effective flow in l/min (USgpm) at 1500 r/min	83	102 (22)	140 (27)		186 (37)		(49)	
at 1800 r/min	98 (26)		125 (33)		170 (45)		223 (59)	

† In load sensing systems the compensator can be set at 280 bar (4060 psi).

* Industrial Valve Plates are specified in Pump Special Feature 'Q250' or 'Q140'

Ratings of PVH Industrial Pumps with Alternate Fluids

Parameters	Petroleum based	Polyol ester	Water glycol	HWBF(90-10) thickened
Max. pressure bar (psi)	250 (3625)	230 (3300)	172 (2500)	155 (2250)
Max. speed in r/min at:				
1,0 bar abs. (0 psi)	1800 ‡	1800	1800	1700
0,85 bar abs. (5" Hg)	1500 □	1500	1500	1500
Max. inlet temp. deg. C (deg. F)	93 (200)	65 (150)	50 (120)	50 (120)

‡ 1500 rpm for PVH131/141 only.

□ 1200 rpm for PVH131/141 only.

Rated Characteristics of PVH Mobile Pumps

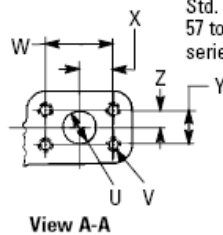
Parameters	PVH057	PVH063	PVH074	PVH081	PVH098	PVH106	PVH131	PVH141
Rated speeds in r/min at various inlet pressures								
127 mm Hg (5" Hg)	2000	2000	1850	1850	1750	1750	1650	1500
Zero inlet pressure	2400	2400	2200	2200	2100	2100	2000	2000
0,48 bar (7 psi)	3000	3000	2750	2750	2600	2600	2500	2500
Typical effective flow in l/min (USgpm) at 250 bar (3625 psi) and rated speed @ zero inlet pressure	134 (35)	146 (38)	156 (41)	172 (45)	202 (53)	216 (57)	249 (66)	272 (72)

◇ Displacements & rated pressure are same as for PVH*** industrial pumps.

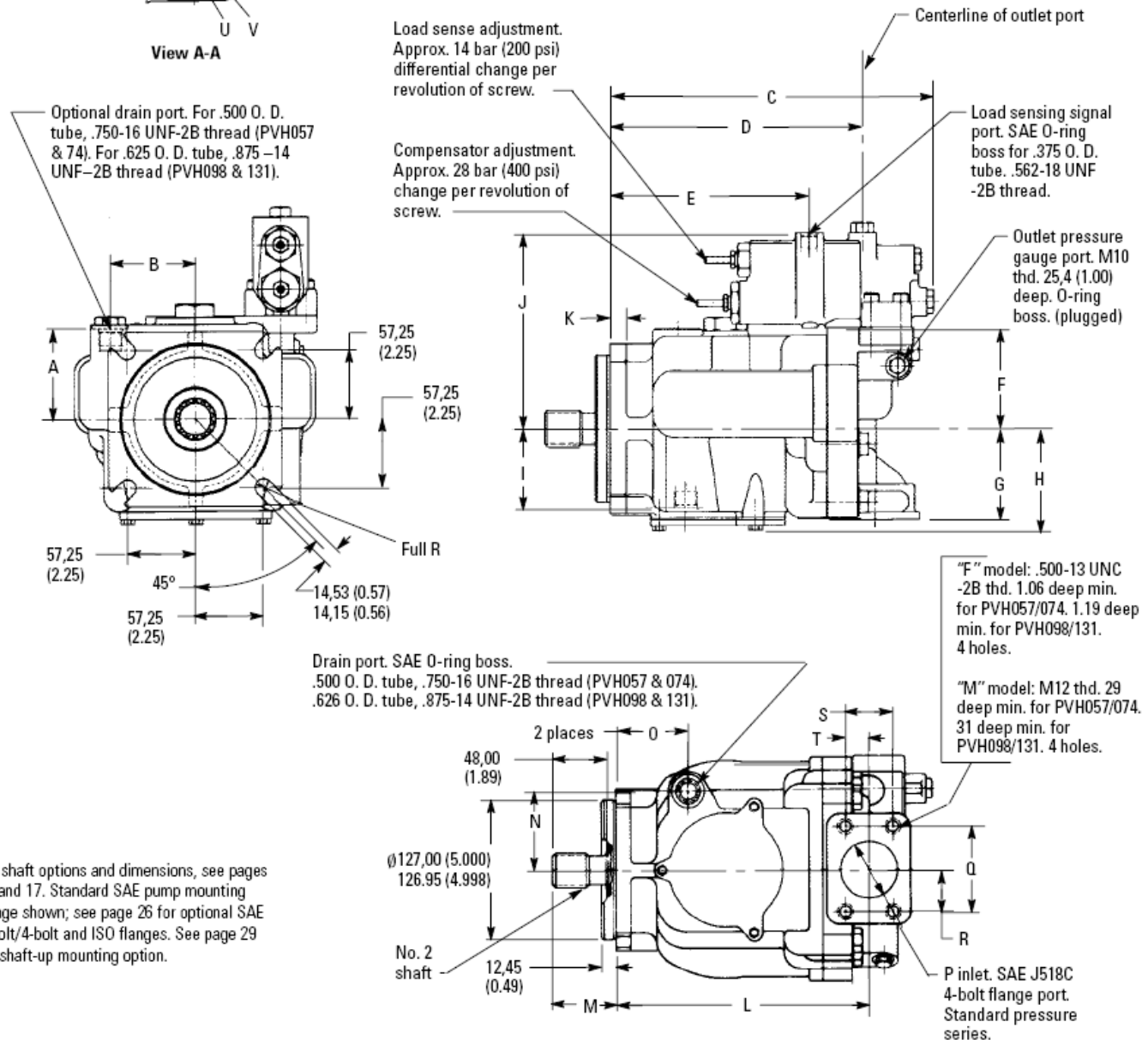
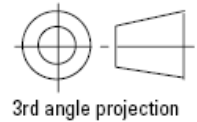
Installation Dimensions

Basic Pump with Pressure Compensator and Load Sense Controls

Dimensions in mm (inches)



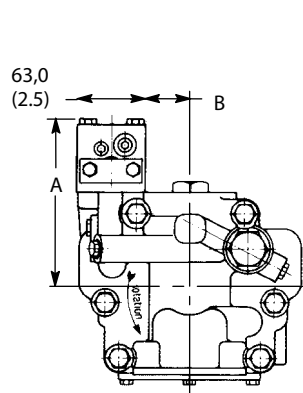
Outlet port. SAE J518C 4-bolt flange.
Std. pressure (code 61) series for
57 to 98 sizes. High pressure (code 62)
series for 131 size.



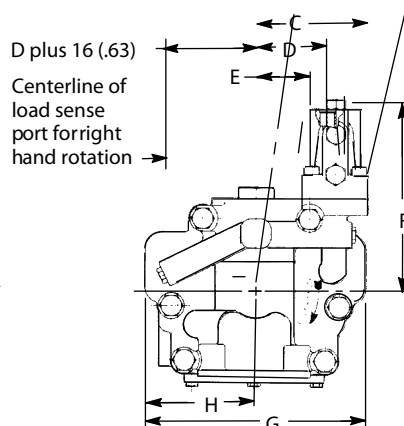
For shaft options and dimensions, see pages 16 and 17. Standard SAE pump mounting flange shown; see page 26 for optional SAE 2-bolt/4-bolt and ISO flanges. See page 29 for shaft-up mounting option.

Installation Dimensions

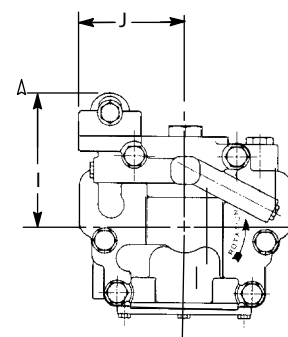
Basic Pump. Rear View
with Various Controls



Right hand rotation,
pressure compensated
and torque limit model



Left hand rotation, pressure
compensated and load
sensing model

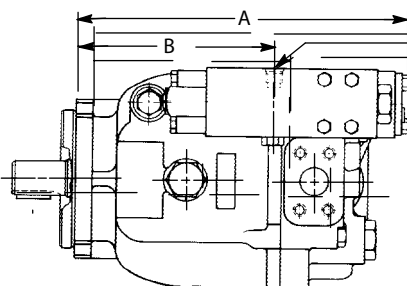


Right hand rotation,
pressure compensated
model

	A	B	C	D	E	F	G	H	I	J
PVH057	176,45 (6.95)	41,0 (1.61)	102,7 (4.04)	64,5 (2.54)	49,0 (1.93)	176,6 (6.95)	203,0 (7.99)	101,5 (4.00)	127,0 (5.00)	102,7 (4.04)
PVH063	182,45 (7.18)	475 (1.87)	109,2 (4.30)	71,0 (2.79)	55,5 (2.19)	182,6 (7.18)	224,0 (8.82)	112,0 (4.41)	133,0 (5.23)	109,2 (4.30)
PVH074	195,45 (7.69)	41,0 (1.61)	102,7 (4.04)	65,5 (2.54)	49,0 (1.93)	185,1 (7.280)	233,0 (9.17)	116,5 (4.59)	135,5 (5.33)	102,7 (4.04)
PVH081	210,50 (8.29)	63,6 (2.50)	125,2 (4.92)	87,0 (3.42)	71,5 (2.81)	210,6 (8.29)	254,2 (10.00)	127,1 (5.00)	161,0 (6.37)	125,2 (4.92)
PVH098										
PVH106										
PVH131										
PVH141										

*Add 16,0 (.63) to dimension D for right hand rotation model.

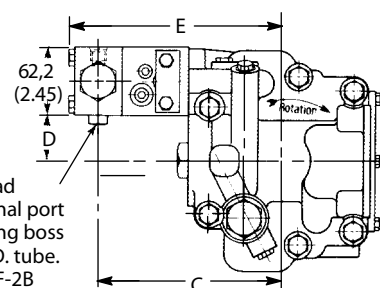
Pump with Pressure
Compensation, Load Sense
and Torque Limit Controls



Left hand rotation, pressure
compensated with load sense
and torque limit model

Optional load
sensing signal port
"J". SAE O-ring boss
for .375 O. D. tube.
.562-18 UNF-2B
thread.

Optional load
sensing signal port
"J". SAE O-ring boss
for .375 O. D. tube.
.562-18 UNF-2B
thread. (plugged)



	A	B	C	D	E
PVH057	316,3 (12.45)	177,4 (6.98)	168,1 (6.62)	41,4 (1.63)	195,4 (7.69)
PVH063	335,5 (13.34)	200,1 (7.88)	174,1 (6.85)	47,9 (1.86)	201,4 (7.93)
PVH074	351,0 (13.82)	212,3 (8.36)	187,1 (7.37)	41,4 (1.63)	214,4 (8.44)
PVH081	375,3 (14.78)	236,6 (9.31)	202,2 (7.96)	63,8 (2.51)	229,5 (9.04)
PVH098					
PVH106					
PVH131					
PVH141					

Installation Dimensions

Basic Pump with Pressure
Compensator and Load
Sense Controls

	A	B	C	D	E	F	G	H	I
PVH057	76,0	71,0	293,0	216,5	171,3	86,0	79,0	88,0	69,0
PVH063	(2.99)	(2.79)	(11.54)	(8.52)	(6.74)	(3.39)	(3.11)	(3.46)	(2.71)
PVH074	88,0	70,0	306,6	241,2	194,3	92,0	94,0	95,0	81,0
PVH081	(3.46)	(2.75)	(12.07)	(9.50)	(7.65)	(3.62)	(3.70)	(3.74)	(3.19)
PVH098	93,1	85,0	323,5	251,3	206,1	94,5	87,5	97,1	80,1
PVH106	(3.67)	(3.35)	(12.74)	(9.89)	(8.11)	(3.72)	(3.44)	(3.82)	(3.15)
PVH131	109,4	88,8	377,0	280,4	230,4	120,0	109,0	107,4	84,8
PVH141	(4.31)	(3.50)	(14.84)	(11.04)	(9.07)	(4.72)	(4.29)	(4.23)	(3.34)

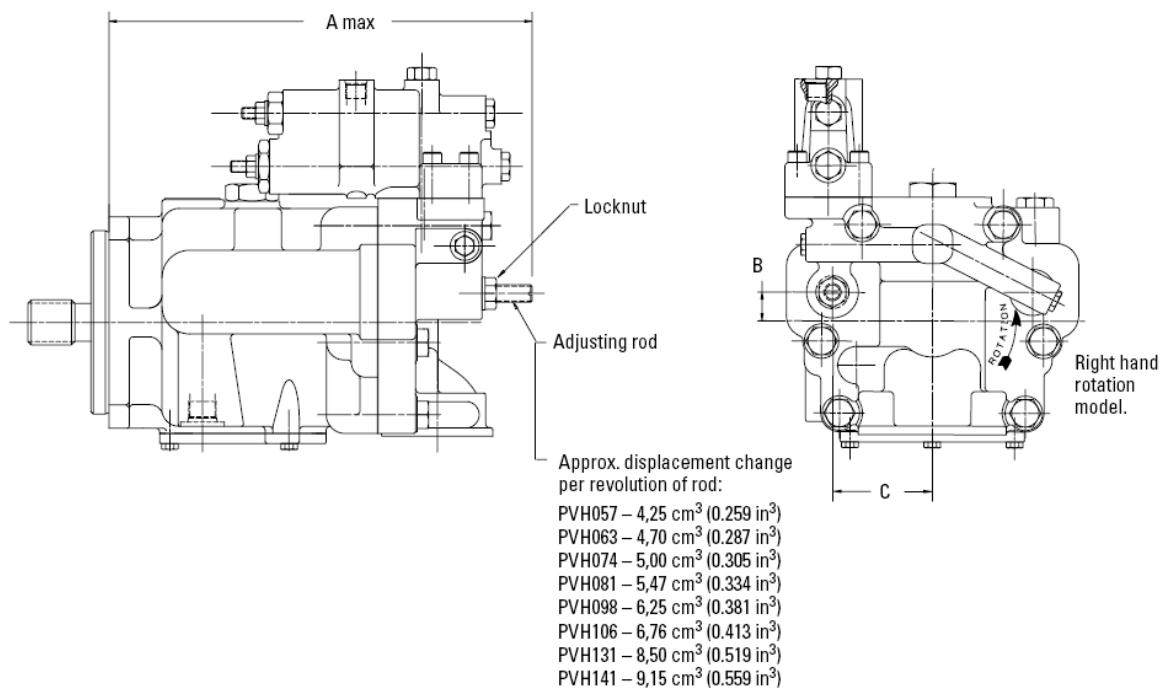
	J	K	L	M	N	O	P	Q	R
PVH057	168,0	14,0	227,4	56,1	71,0	64,8	50,8	77,77	38,88
PVH063	(6.6)	(0.55)	(8.95)	(2.21)	(2.80)	(2.55)	(2.0)	(3.06)	(1.53)
PVH074	174,0	15,0	250,1	56,0	70,0	68,0	50,8	77,77	38,88
PVH081	(6.85)	(0.59)	(9.85)	(2.20)	(2.75)	(2.68)	(2.0)	(3.06)	(1.53)
PVH098	176,5	16,0	269,3	55,5	85,0	74,2	63,5	88,9	44,45
PVH106	(6.95)	(0.63)	(10.60)	(2.18)	(3.35)	(2.92)	(2.5)	(3.50)	(1.75)
PVH131	202,0	15,0	298,6	62,0	88,8	70,6	63,5	88,9	44,45
PVH141	(7.95)	(0.59)	(11.75)	(2.44)	(3.50)	(2.78)	(2.5)	(3.50)	(1.75)

	S	T	U	V	W	X	Y	Z
PVH057	42,88	21,44	25,4	M10x1,5	52,37	26,18	26,19	13,10
PVH063	(1.69)	(0.84)	(1.0)	(.375-16)	(2.06)	(1.03)	(1.03)	(0.52)
PVH074	42,88	21,44	25,4	M10x1,5	52,37	26,18	26,19	13,10
PVH081	(1.69)	(0.84)	(1.0)	(.375-16)	(2.06)	(1.03)	(1.03)	(0.52)
PVH098	50,8	25,4	25,4	M10x15	52,37	26,19	26,19	13,10
PVH106	(2.0)	(1.0)	(1.0)	(.375-16)	(2.06)	(1.03)	(1.03)	(0.52)
PVH131	50,8	25,4	31,75	M14x2,0	66,68	33,34	31,75	15,88
PVH141	(2.0)	(1.0)	(1.25)	(.500-13)	(2.63)	(1.31)	(1.25)	(0.63)

Installation Dimensions

Pump with Adjustable Maximum Volume Stop

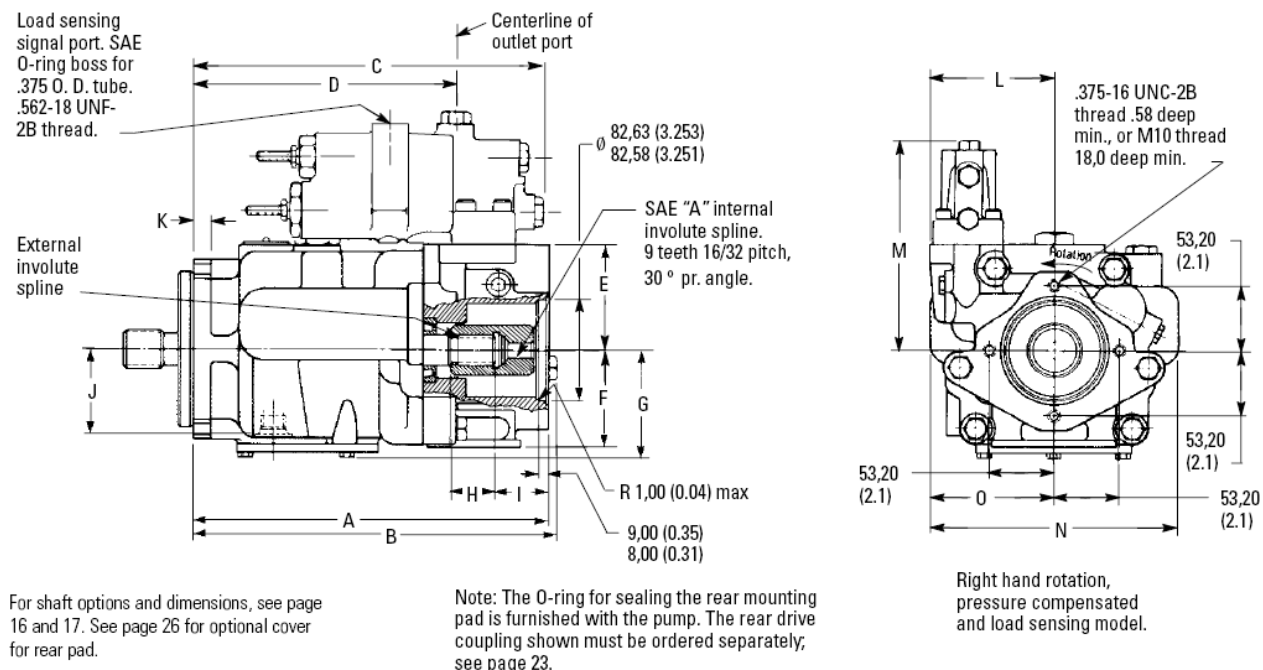
This option allows maximum pump delivery to be externally adjusted from 100 percent down to 25 percent. To assist initial priming, adjust stop to allow at least 40 percent of maximum delivery. Adjust by loosening locknut and turning adjusting rod clockwise to decrease maximum delivery, or counter-clockwise to increase maximum delivery. When desired setting is obtained, torque locknut to 25-50 Nm (18-36 lb. ft.).



	A	B	C
PVH057	293,0	20,0	69,5
PVH063	(11.53)	(.79)	(2.74)
PVH074	306,6	22,0	76,0
PVH081	(12.07)	(.87)	(2.99)
PVH098	323,5	27,5	81,0
PVH106	(12.74)	(1.08)	(3.19)
PVH131	377,0	37,5	88,8
PVH141	(14.84)	(1.48)	(3.50)

Installation Dimensions

Thru-drive Pumps with SAE "A" Rear Pad



For shaft options and dimensions, see page 16 and 17. See page 26 for optional cover for rear pad.

Note: The O-ring for sealing the rear mounting pad is furnished with the pump. The rear drive coupling shown must be ordered separately, see page 23.

	A	B	C	D	E	F	G	H
PVH057	287,9	295,4	275,8	216,4	86,0	79,0	88,0	36,4
PVH063	(11.3)	(11.6)	(10.86)	(8.52)	(3.38)	(3.11)	(3.46)	(1.43)
PVH074	310,6	318,1	300,5	241,2	92,0	94,0	95,0	38,5
PVH081	(12.23)	(12.52)	(11.83)	(9.50)	(3.62)	(3.70)	(3.74)	(1.51)
PVH098	322,8	N/A	312,7	251,3	94,5	87,5	97,1	33,0
PVH106	(12.71)		(12.31)	(9.89)	(3.72)	(3.44)	(3.82)	(1.30)
PVH131	347,1	N/A	337,0	280,4	120,0	109,0	107,4	35,3
PVH141	(13.660)		(13.27)	(11.04)	(4.72)	(4.29)	(4.23)	(1.39)

	I	J	K	L	M	N	O
PVH057	43,6	69,0	14,0	102,7	176,6	203,0	101,5
PVH063	(1.72)	(2.71)	(0.55)	(4.04)	(6.95)	(7.99)	(4.00)
PVH074	43,8	81,0	15,0	109,2	182,6	224,0	112,0
PVH081	(1.72)	(3.19)	(0.59)	(4.30)	(7.18)	(8.82)	(4.41)
PVH098	44,6	80,1	16,0	102,7	185,1	233,0	116,5
PVH106	(1.75)	(3.15)	(6.30)	(4.04)	(7.28)	(9.17)	(4.59)
PVH131	44,7	84,8	15,0	125,2	210,6	254,2	127,1
PVH141	(1.76)	(3.34)	(0.59)	(4.93)	(8.29)	(10.0)	(5.00)

Installation Dimensions

Thru-drive	Flange Kit	and Shaft Coupling			
Front Pump Model Series	SAE (J744) Mounting Flange for Rear Pump	Mounting Flange Adapter Kit Number*	Metric Threads	Inch Threads	Coupling Part Number**
PVH057	A (J744-82-2)	None required	None required	None required	526682
PVH063	B (J744-101-2/4)	876394	876390	876390	526694
	BB (J744-101-2/4)	876394	876390	876390	526695
	C (J744-127-2/4)	876392	876389	876389	526696
PVH074	A (J744-82-2)	None required	None required	None required	864460
PVH081	B (J744-101-2/4)	876394	876390	876390	864457
	BB (J744-101-2/4)	876394	876390	876390	864459
	C (J744-127-2/4)	876392	876389	876389	864458
	CC (J744-127-2/4)	876392	876389	876389	864461
PVH098	A (J744-82-2)	None required	None required	None required	877039
PVH106	B (J744-101-2/4)	876394	876390	876390	877040
PVH131	BB (J744-101-2/4)	876394	876390	876390	877044
PVH141	C (J744-127-2/4)	876392	876389	876389	877045
	CC (J744-127-2/4)	876392	876389	876389	877046

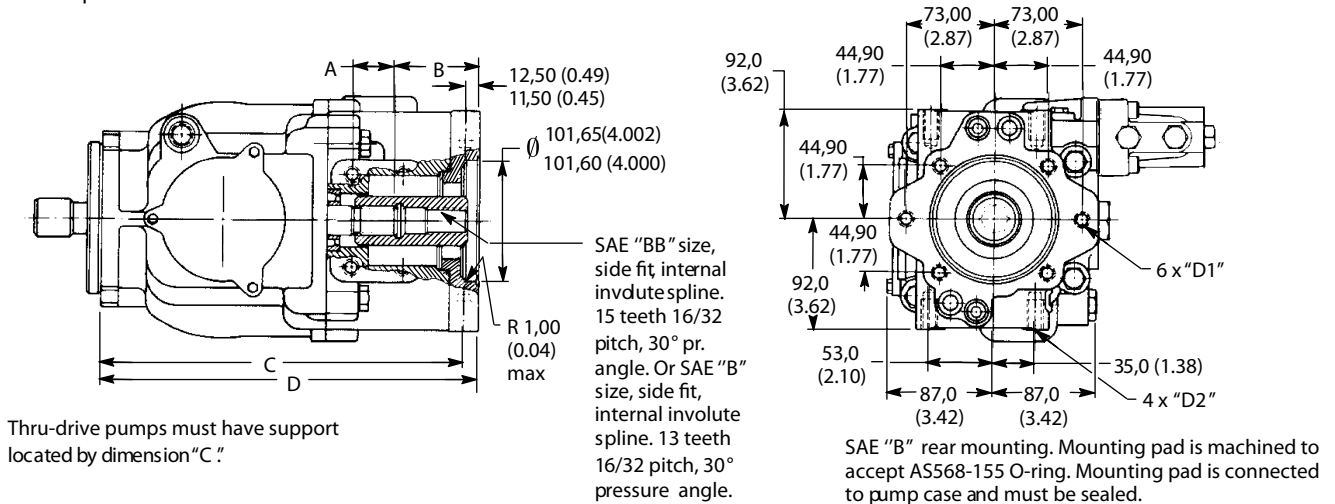
*The basic PVH thru-drive pump has an SAE "A" pad on the rear. An SAE "B" or "C" pad rear mounting requires flange adapters. Required adapters can be provided if specified in the pump model code. The best combination of price, availability and flexibility is achieved by ordering a PVH SAE "A" thru-drive model and the applicable PVH mounting flange adapter separately. For example, a PVH074C-R CF-35-10-C25-31 may also be ordered as a PVH074C-RAF-35-10-C25-31 and a 876389 flange adapter.

** Thru-drive shaft couplings must be ordered separately to drive the second pump.

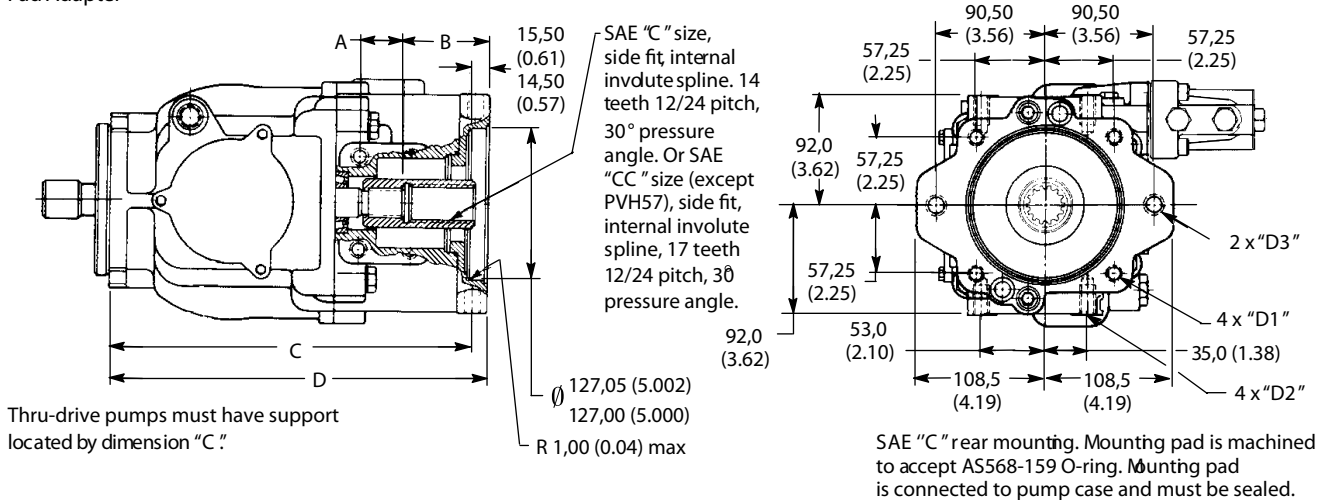
Typical Rear Pumps for Thru-drive Assemblies				
Mounting	Piston pump Series	Shaft Code	Vane pump Series	Shaft Code
SAE A	PVQ10/13	3	V10 V20	11 62
SAE B	PVQ20/32	3	20V	151
	PVQ40/45	3	25V	11
	PVE19/21	9	V2020	11
SAE BB	PVE19/21	2		
	TA19	2		
SAE C	PVH057/063	2	35V	11
	PVH074/081	2	352*V	11
	PVH098/106	2		
SAE CC	PVH131/141	3		

Installation Dimensions

Thru-drive Pumps with SAE "B" Rear Pad Adapter



Thru-drive Pumps with SAE "C" Rear Pad Adapter



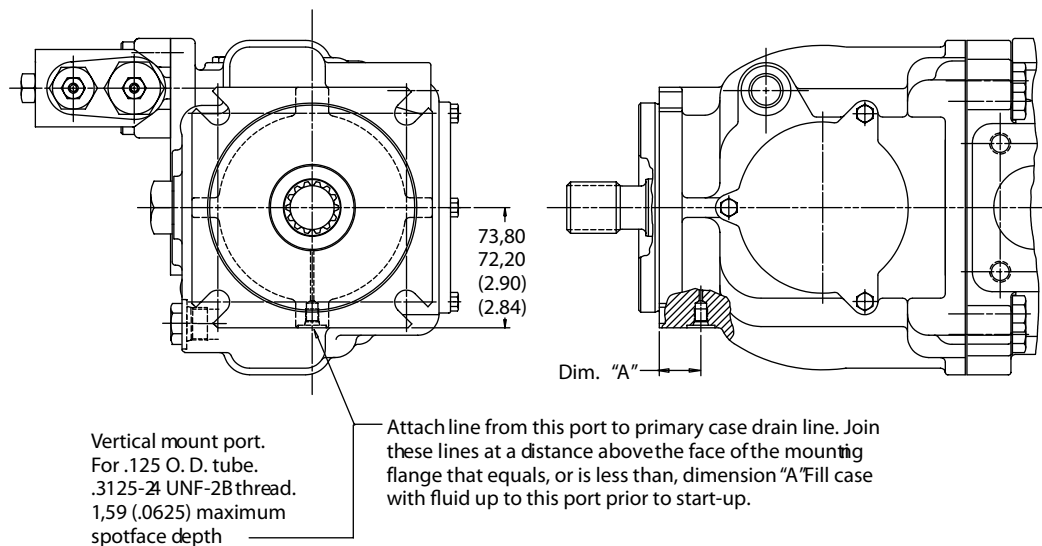
Pump Model	A	B	C	D
PVH057	36,4	68,8	300,4	312,9
PVH063	(1.43)	(2.71)	(11.82)	(12.32)
PVH074	33,5	68,3	323,1	335,6
PVH081	(1.32)	(2.69)	(12.72)	(13.21)
PVH098	33,0	69,8	335,3	347,7
PVH106	(1.30)	(2.75)	(13.20)	(13.69)
PVH131	35,3	69,7	359,6	372,1
PVH141	(1.39)	(2.74)	(14.16)	(14.65)
	D1	D2	D3	
Metric	M14x2,00	M12x1,75	M16x2,00	
	25 deep	25 deep	25 deep	
Inch	0.500-13	0.500-13	0.625-11	
	UNC-2B	UNC-2B	UNC-2B	
	1.0 deep	1.0 deep	1.0 deep	

Note: The O-ring for sealing the rear mounting pad is furnished with the pump. The rear drive couplings shown must be ordered separately.

Installation Dimensions

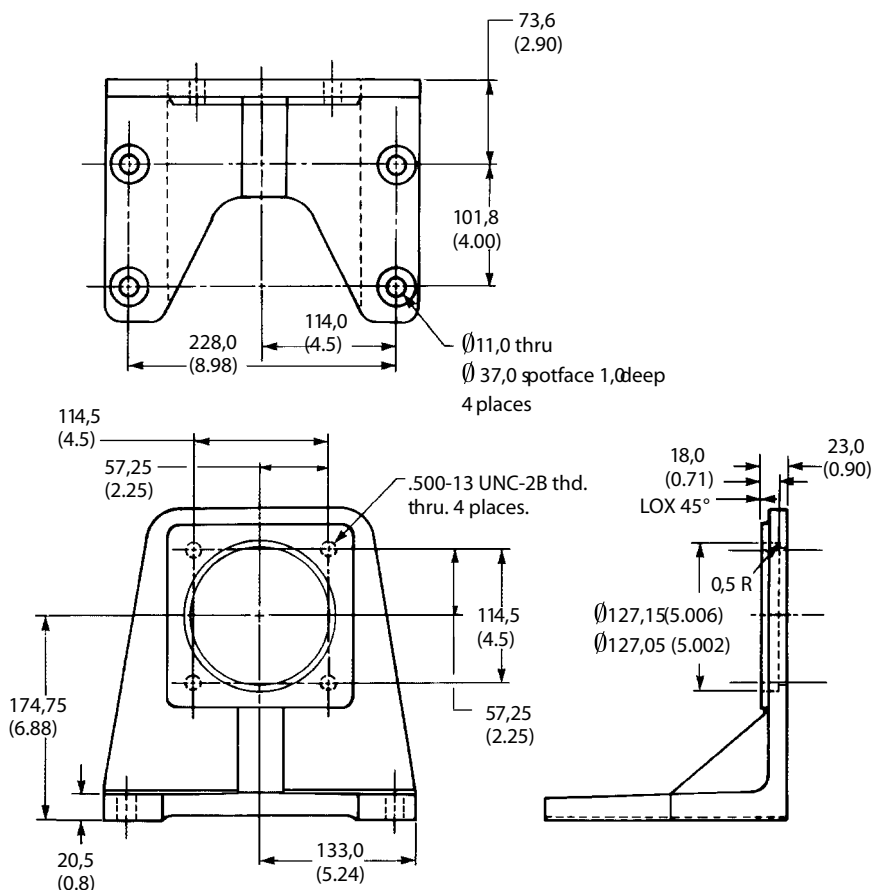
Pumps for Shaft-up Operation
(Vertical Mount, "057" Option)

Model	Dim. "A"
PVH057	25,68/24,94
PVH063	(1.01/0.98)
PVH074	26,64/25,90
PVH081	(1.05/1.02)
PVH098	25,82/25,08
PVH106	(1.02/0.99)
PVH131	25,12/24,38
PVH141	(.99/0.96)

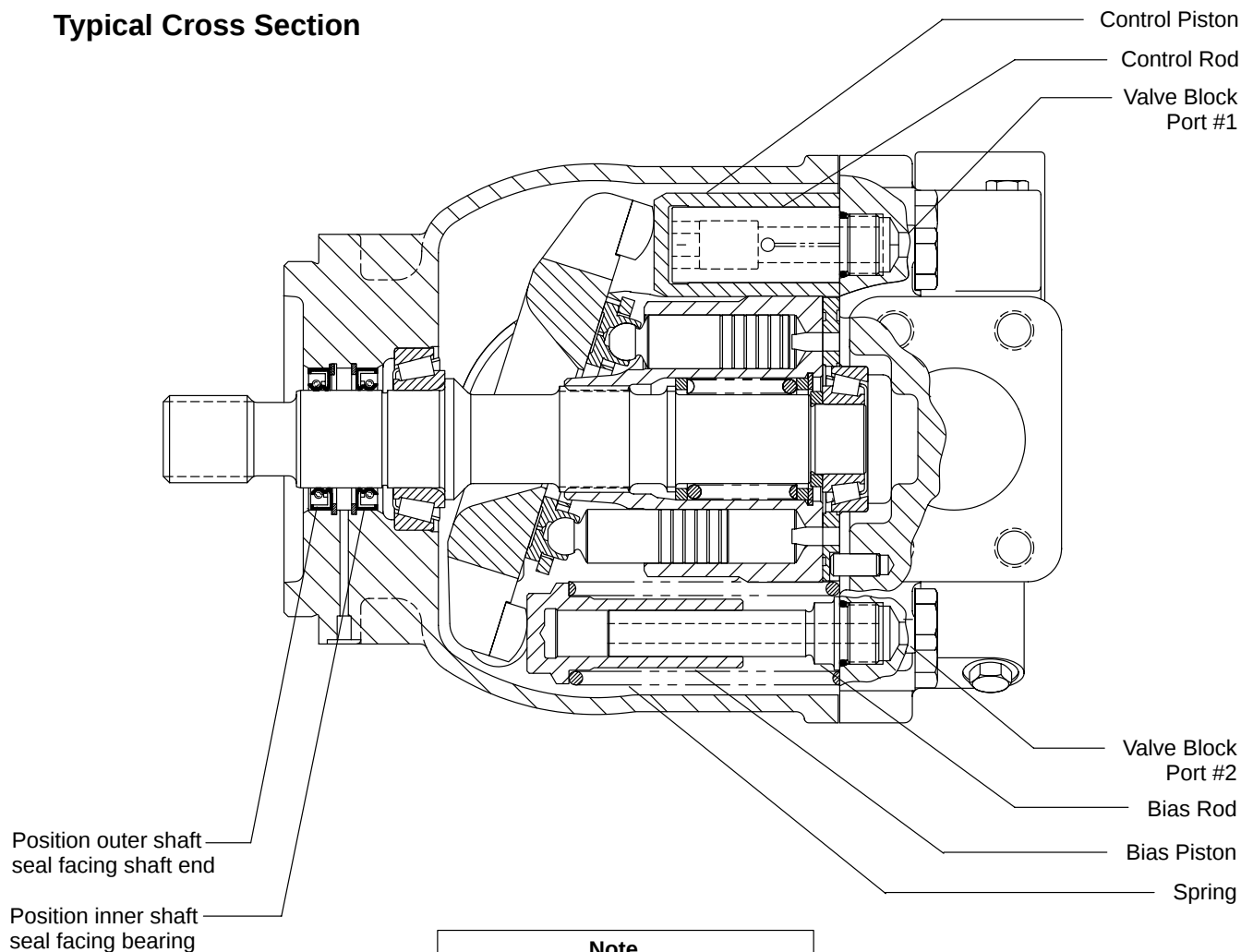


Model FB-C4-10 Foot
Mounting Kit for All
PVH Pumps

Each kit (part no. 02-143419)
includes bracket shown and
four screws for mounting to the
pump. Kits are not included with
pumps and must be ordered
separately by model number.



Typical Cross Section



Note

Parts are shown as installed for right hand rotation. For left hand rotation, install control rod and control piston in valve block port #2. Install bias rod, bias piston and spring in valve block port #2.

Pump Startup

Make sure the reservoir and circuit are clean and free of dirt and debris prior to filling with hydraulic fluid.

Fill the reservoir with filtered oil to a level sufficient to prevent vortexing at suction connection to pump inlet. It is good practice to clean the system by flushing and filtering using an external slave pump.

Before starting the pump, fill with fluid through one of the ports. This is particularly important if the pump is above the fluid level of the reservoir.

When initially starting the pump, remove all trapped air from the system. This can be accomplished by loosening the pump outlet fittings or connections before starting the pump, or by using an air bleed valve. All inlet connections must be tight to prevent air leaks.

Once the pump is started, it should prime within a few seconds. If the pump does not prime, check to make sure that there are no air leaks in the inlet line and connections. Also check to make sure that trapped air can escape at the pump outlet.

After the pump is primed, tighten the loose outlet connections, then operate for five to ten minutes (unloaded) to remove all trapped air from the circuit. If reservoir has a sight gage, make sure the fluid is clear—not milky.

Add fluid to the reservoir up to the proper fill level.