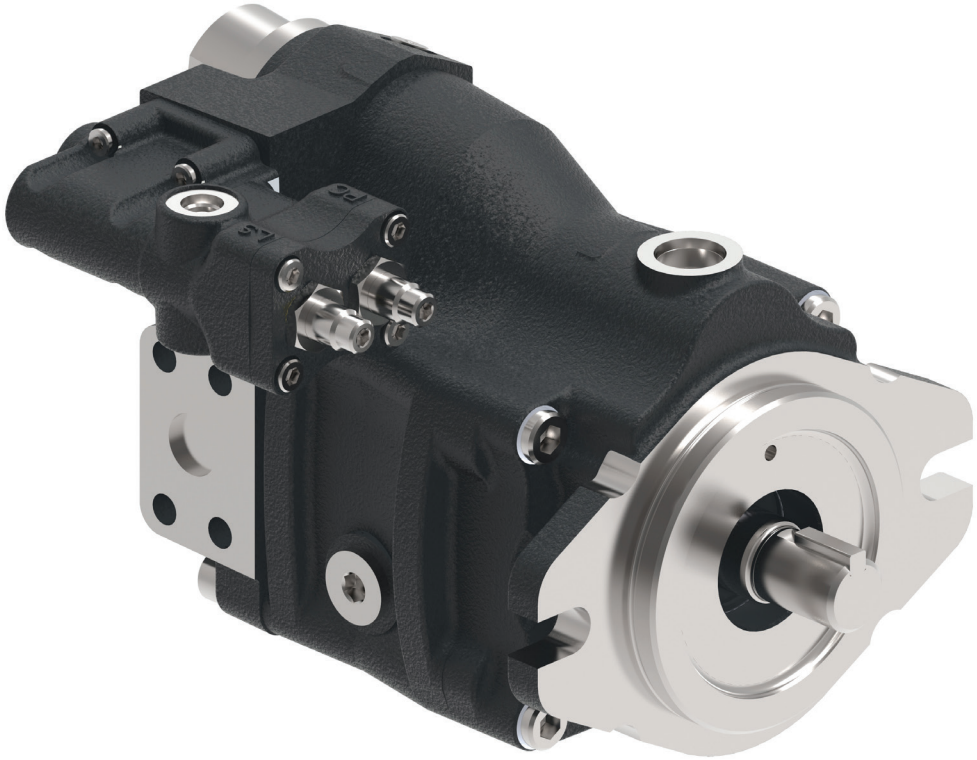
ENGINEERING
TOMORROW

User Guide

Vickers by Danfoss
PVM Variable Displacement Piston Pump
Design Code B - 18/20cc

Up to 315 bar
18/20 cc
(1.1/1.2 in^3)
Variable Speed Drive Ready



VICKERS
by Danfoss

BC474967339987en-000101

Table of Contents

M Series Variable Displacement Piston Pumps

Introduction

Vickers by Danfoss M Series pumps are open circuit, axial piston designs. A variety of control options allows the pumps to perform most efficiently in a specific application. Efficiency of the pump controls allows down-sizing of system cooling needs, saving up front cost in the machine. Alternatively, cooling capacity could be kept the same and the flow capability of the system increased, thus improving performance and customer satisfaction.

The M Series also contains a strong proven rotating group allowing the pumps to handle pressures to 315 bar (4568 psi) continuous with less maintenance cost. High-load bearings and a stiff drive shaft help provide very long life at rated industrial conditions, reducing operating costs and extending operating life.

M Series pumps feature a saddle-type yoke with steel-backed polymer bearings. The stiff yoke reduces deflection and allows even loading of bearings, improving life. A single control piston reduces loading on the yoke, resulting in reduced pump size which allows installation in tighter locations.

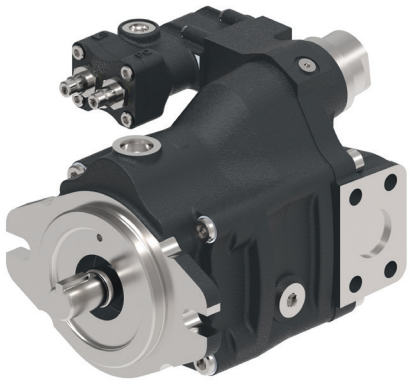
M Series pumps operate at a level of quietness that exceeds the requirements of today's demanding work conditions. The pumps feature a unique three-piece envelope (flange, housing and valve block) specifically created for low fluid-borne and structure-borne noise levels. Another pump feature – a bimetal timing plate – improves pump filling characteristics which, in turn, reduce fluid-borne noise and extend pump life.

M Series pumps reduce, or in some cases remove, the need for damping barriers between the noise source and the operator. This saves money on the installed cost of the system while improving customer comfort.

An adjustable maximum stop provides a means of tuning flow to your system, while gauge ports allow monitoring of inlet and outlet conditions. These standard features reduce system complexity and cost.

Mounting flanges are offered in SAE and ISO configurations, and ports are offered in SAE, ISO, and BSPP in both tube and flange versions. This provides a wide variety of installation opportunities for global machine design.

Side- or end-ported models are available to facilitate plumbing and help fit the pump to your machine space needs. Multiple drain ports allow many mounting orientations, reducing installed costs.



M Series pumps are capable of operating with many types of hydraulic fluids used in industrial systems. High-water-content and phosphate ester fluids can be accommodated, in addition to the typical petroleum based and synthetic fluids.

Typical Applications

- Mining machinery
- Injection molding machines
- Metal forming machines
- Oil and Gas Equipment
- Conveyor lines
- Primary metals
- Metal cutting equipment

Features and Benefits

- Bell shaped housing contains fluid borne sound and reduces operator fatigue
- Standard adjustable maximum volume screw and gage ports give the ultimate in flexibility to the engineer or service technician
- High overall efficiency reduces operating costs
- Robust shaft bearings extends operating life and lowers maintenance costs
- Multiple port type and locations aid in flexibility of machine design
- Very low pressure ripple reduces shock in the system resulting in fewer leaks

Model Code Selection

PVM	018	*	R	**	C	*	*	*	***	**	000	*	*	B	-	**	0	*
1,2,3	4,5,6	7	8	9,10	11	12	13	14	15,16,17	18,19	20,21,22	23	24	25	26	27,28	29	30

1,2,3 **Product Series**

PVM – M Series Variable Piston Pump

4,5,6 **Displacement**

018 18.0 cm3/r [1.1 in3/r] (315 bar MAX)
020 21.1 cm3/r [1.29 in3/r] (230 bar MAX)

7 **Valve Plate**

E - Industrial -1800 rpm max

M - Higher speed version.

8 **Input Rotation**

R – Clockwise (Right hand)

L – Counter-clockwise (Left hand)

9, 10 **Input Shaft**

01 - SAE J744-16-1, SAE A, Straight Keyed
02 - SAE J744-19-1, SAE 19-1, Straight Keyed
04 - SAE J744-19-4, SAE A, 11T Spline
05 - SAE J744-22-1, SAE B, Straight Keyed
06 - SAE J744-25-1, SAE B-B, Straight Keyed
07 - SAE J744-22-4, SAE B, 13T Spline
08 - SAE J744-25-4, SAE B-B, 15T Spline

11 **Mounting Flange**

A - SAE J744-82-2 (A 2-Bolt)
C - SAE J744-101-2 (B 2-Bolt)

12 **Main Port Location**

E – End Ported
S – Side Ported

13 **Main Port Type**

1 - SAE J514 Tube Ports SAE Auxiliary Ports
2 - SAE J518 Flange Ports SAE Auxiliary Ports

14 **Control**

0 - None
A - Pressure Compensator
B - Pressure and Flow Compensator with Bleed Down Orifice
C - Pressure and Flow Compensator with Plugged Orifice

15,16,17 **Pressure Compensator Setting**

000 - None
070 - 070±4 bar [1015±58 lbf/in2] [Default]
230 - 230±4 bar [3335±58 lbf/in2] [Default for 20cc/r]
315 - 315 bar [4567 lbf/in2] [Default for 18cc/r]

18,19 **Flow Compensator Setting**

00 – None
11 – 11 bar setting
20 – 20 bar setting

20,21,22 **Power control Torque Limiter Setting**

000 – None

23 **Auxiliary Mounting Pad**

0 - None (Non-Through Drive)
A - SAE A, 2-BOLT, 9T Spline
B - SAE A, 2-BOLT, 11T Spline
1 - Auxiliary A-Mount With Cover Plate And No Coupler

24 **Paint**

0 – No paint
A – Standard black paint

25 **Design Code**

B – B

26 **Differentiator**

- -

27, 28 **Pump Special Features**

00 – Adjustable Max Displacement Stop
(Contact Danfoss for options)

29 **Compensator Special Features**

0 – None
(Contact Danfoss for options)

30 **Customer Identification**

0 – None
(Contact Danfoss for options)

Specifications and Performance

Quiet version, optimized for 1000-1800 rpm (E)

Displacement, Pressure and Flow Ratings At 50°C (120°F), SAE 10W oil, 1 bar absolute (0 psig) inlet

Model Series	Maximum Geometric Displacement cm^3/r (in^3/r)	Maximum Pressure bar (psi)		Maximum Flow at 280 bar (4000 psi)* l/min (USgpm) – Average measured flow rate			
		Nominal	Peak**	@1800 r/min	@1500 r/min	@1200 r/min	@1000 r/min
PVM018	18 (1.1)	315 (4568)	350 (5000)	31 (8.2)	26 (7)	21 (5.5)	17 (4.5)
PVM020	21,1 (1.29)	230 (3300)	280 (4000)	35 (9)	29 (8)	23 (6)	19 (5)

**Momentary system pressure spikes only.

Speed, Input Power and Torque Ratings At 50°C (120°F), SAE 10W oil, 1 bar absolute (0 psig) inlet

Model Series	Maximum Operating Speed r/min	Maximum Input Power at 280 bar (4000 psi) kw (hp)*@88% M.E.				Maximum Torque at 280 bar (4000 psi)* Nm (lb-ft)	Approximate Weight kg (lb)
		@1800 r/min	@1500 r/min	@1200 r/min	@ 1000 r/min		
PVM018	1800	16 (22)	13 (18)	11 (15)	9 (12)	84 (62)	15 (33)
PVM020	1800	14 (18)	11 (15)	9 (12)	8 (10)	73 (54)	15 (33)

Standard Response Times*

Model Series	On Stroke (msec)	Off Stroke (msec)
PVM018	30	25
PVM020	39	26

* 3300 psi on overbore pumps

Specifications and Performance

Higher speed version (M)

Displacement, Pressure and Flow Ratings At 93°C (200°F), SAE 10W oil, 1 bar absolute (0 psig) inlet

Model Series	Geometric Displacement cm^3/r (in^3/r)	Maximum Pressure bar (psi)		Maximum Flow at 280 bar (4000 psi)	
		Nominal	Peak**	Flange Ports l/min (USgpm) @ 1 bar inlet	Tube Ports l/min (USgpm) @ 1 bar inlet
PVM018	18,0 (1.10)	315 (4568)	350 (5000)	46 (12) @ 2800 r/min	46 (12) @ 2800 r/min
PVM020	20,1 (1.22)	230 (3300)	280 (4000)	53 (14) @ 2800 r/min	53 (14) @ 2800 r/min

**Less than 0.5 second.

Speed, Input Power and Torque Ratings At 93°C (200°F), SAE 10W oil, 1 bar absolute (0 psig) inlet

Approximate Model Series	Operating Speed and Pressure r/min			Max. Input Power at	Max. Torque at	
	1 bar Inlet		0,85 bar Inlet			
	Flange Ports	Tube Ports	Flange Ports	Max. Speed and 280 bar (4000 psi) kW (hp)	280 bar (4000 psi) Nm (lb-ft)	Weight (dry) kg (lbs)
PVM018	2800 r/min			24 (32)	82 (60)	15 (33)
		2800 r/min		24 (32)		
			2600 r/min	22 (30)		
PVM020	2800 r/min			21 (28)	72 (53)	15 (33)
		2800 r/min		21 (28)		
			2600 r/min	20 (27)		

Standard Response Times*

Model Series	On Stroke (msec)	Off Stroke (msec)
PVM018	50	20
PVM020	57	22

*Values with pressure compensator control.

Specifications and Performance

Variable Speed Drive

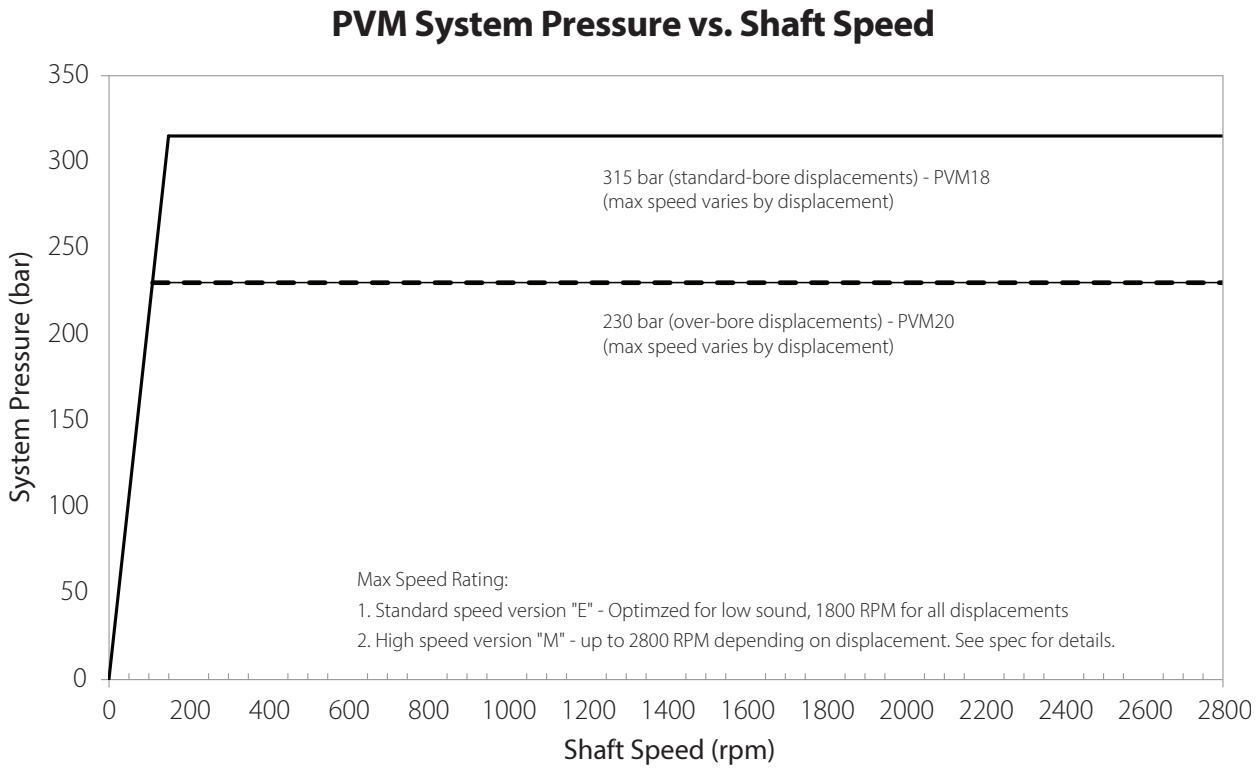
Variable Speed Performance- System Pressure vs Speed

Model Series	Max Speed "E"* (rpm)	Max Speed "M"*(rpm)	Min Speed (rpm)	Nominal Pressure (bar)	Peak Pressure (bar) **	Inertia (kg-cm2)
PVM018	1800	2800	0	315	350	11.8
PVM020	1800	2800	0	230	280	11.8

* Valve plate type
**Less than 0.5 second.

Moment of Inertia (single pump rotating group)

Model	Moment of Inertia	
	N-m (sec²)	lbf-in (sec²)
PVM018	0.0012	0.0104
PVM020	0.0012	0.0104



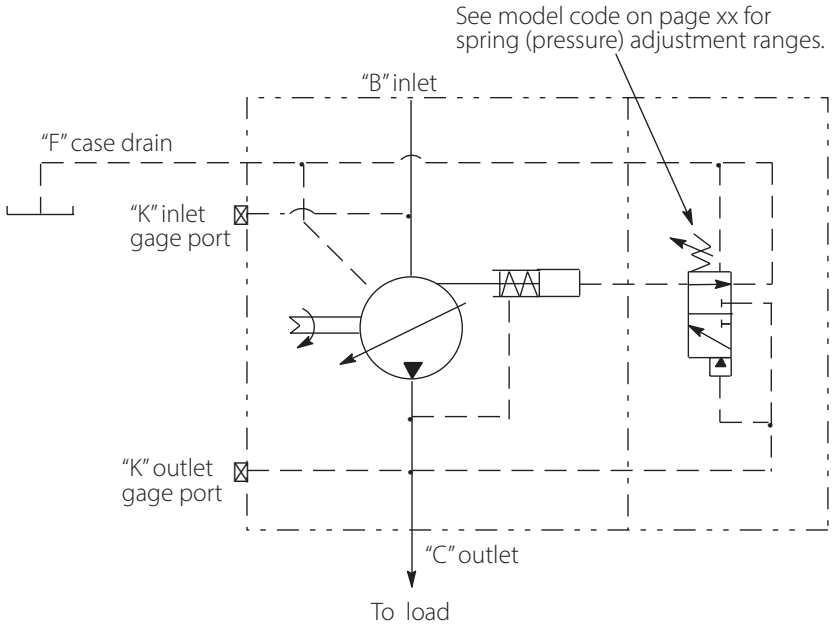
Test condition: Mineral oil SAE 10W, oil temperature 49º C (120º F), 1 bar absolute inlet pressure.

Control Options

Pressure Compensator Control – Code A

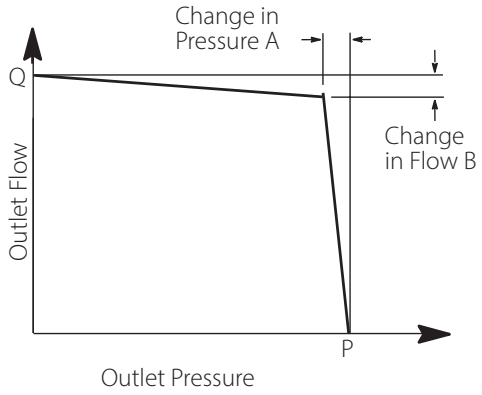
The pump will provide a continuously modulated flow to meet changing load demands at a pre-adjusted compensator pressure. At pressures below the compensator setting, the pump will operate at maximum displacement.

⚠ **Warning:** The pressure compensator may be adjusted beyond the rated pressure of the pump. When adjusting the pressure limiter, install a 0-350 bar (0-5000 psi) gage in the outlet gage port and limit the pressure setting to the continuous rated pressure for the pump displacement.



Pressure Cut-off Characteristics of Code A Pressure Compensator Control

Industrial: at 50°C (120°F), Static conditions
Mobile: 93°C (200 °F), Static conditions



Pressure Cut-off Characteristics of Pressure Compensator Control @ 50°C (120°F), Static Conditions (Industrial version)

Model Series	Max. Speed r/min	"Q" Outlet Flow l/min (USgpm)	"P" Outlet Pressure bar (psi)	A bar (psi)	B L/min (USgpm)
PVM018	1800	32 (8.5)	315 (4568)	2,8 (40)	4,5 (1.2)
PVM020	1800	35 (9.25)	230 (3300)	2,8 (40)	4,5 (1.2)

Pressure Cut-off Characteristics of Pressure Compensator Control @ 93°C (200°F), Static Conditions (Mobile version)

Model Series	Rated Speed r/min	"Q" Outlet Flow l/min (USgpm)	"P" Outlet Pressure bar (psi)	A bar (psi)	B L/min (USgpm)
PVM018	2800	42 (11)	315 (4568)	2,8 (40)	4,5 (1.2)
PVM020	2800	52 (14)	230 (3300)	2,8 (41)	4,5 (1.2)

Control Options

Load Sensing and Pressure Compensator Control – Code B or C

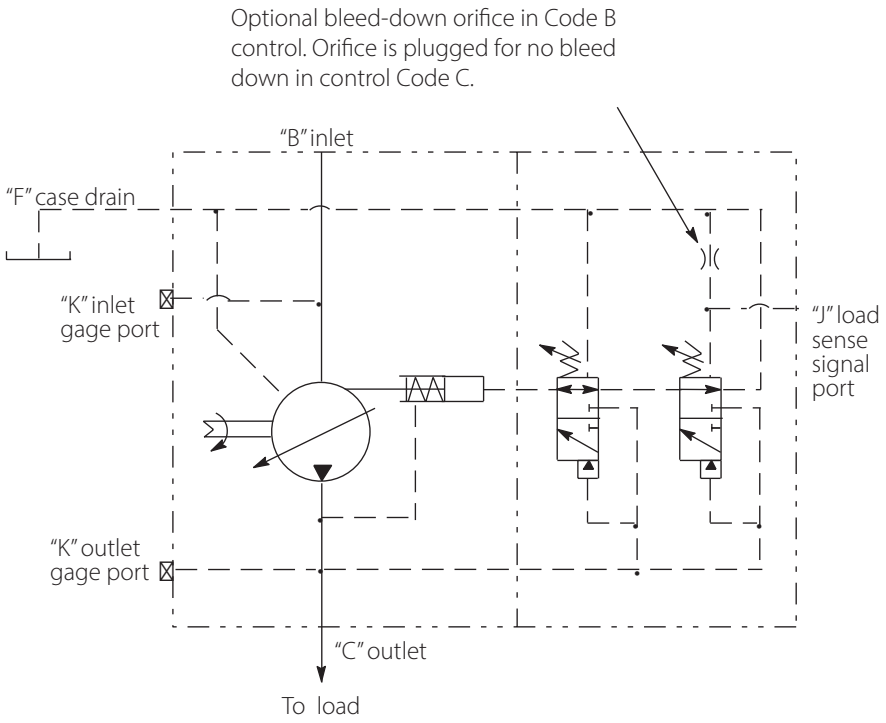
The pump will provide power matching of pump output to system load demand, maximizing efficiency and improving load metering characteristics of any directional control valve installed between the pump and the load.

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.

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. For remote control purposes, it is recommended that you contact your Danfoss representative for the correct configuration of the control.

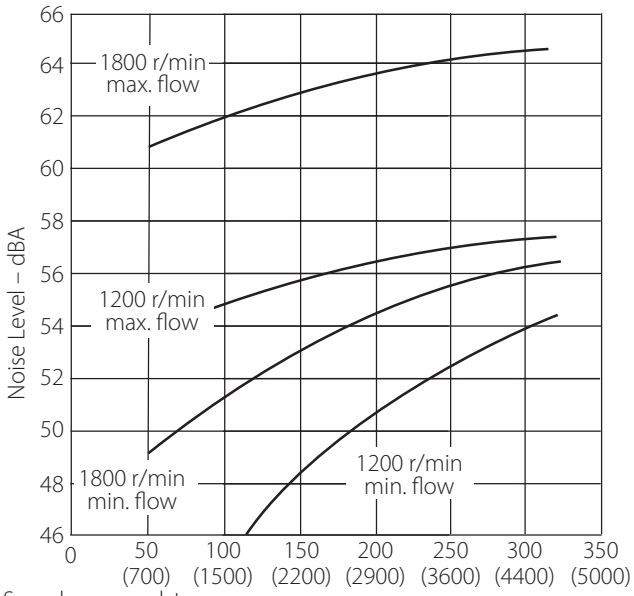
⚠ **Warning:** The pressure compensator may be adjusted beyond the rated pressure of the pump. When adjusting the pressure limiter, install a 0-350 bar (0-5000 psi) gage in the outlet gage port and limit the pressure setting to the continuous rated pressure for the pump displacement.



Performance

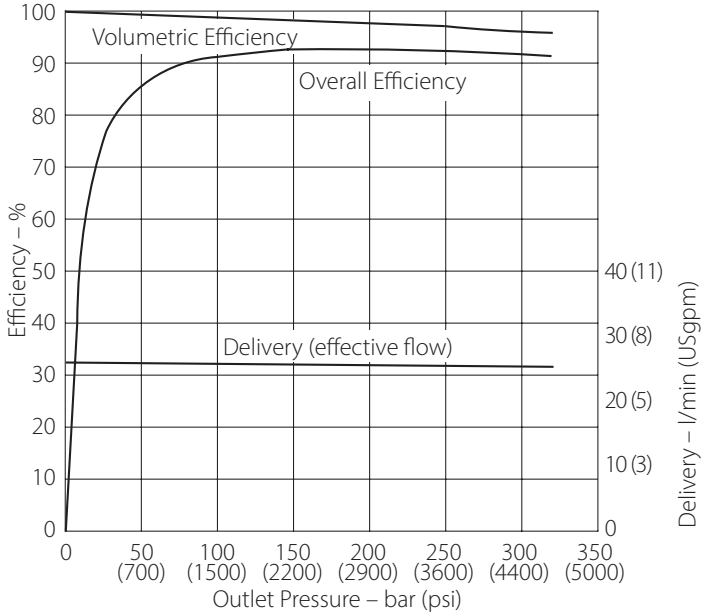
Industrial PVM018

Typical Noise Levels at 1800 and 1200 r/min with
Petroleum Oil (10W) at 50°C (120°F) and 1.0 bar absolute (0 psi gauge) Inlet

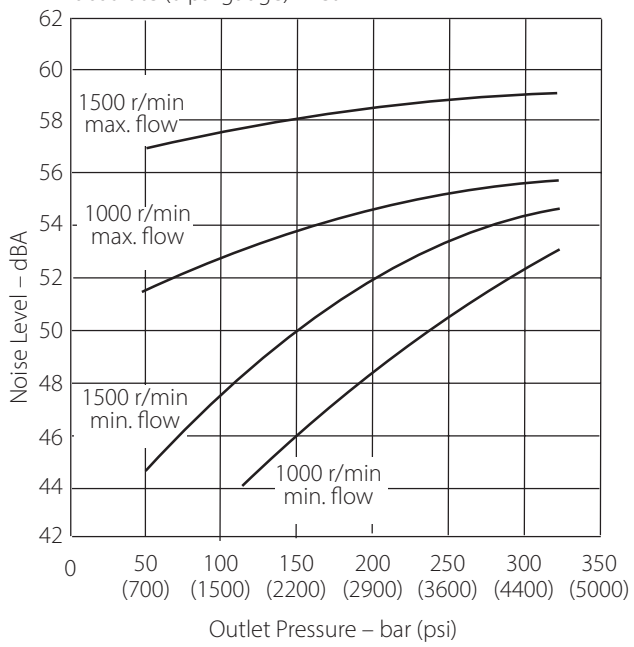


Sound pressure data equivalent to NFPA.

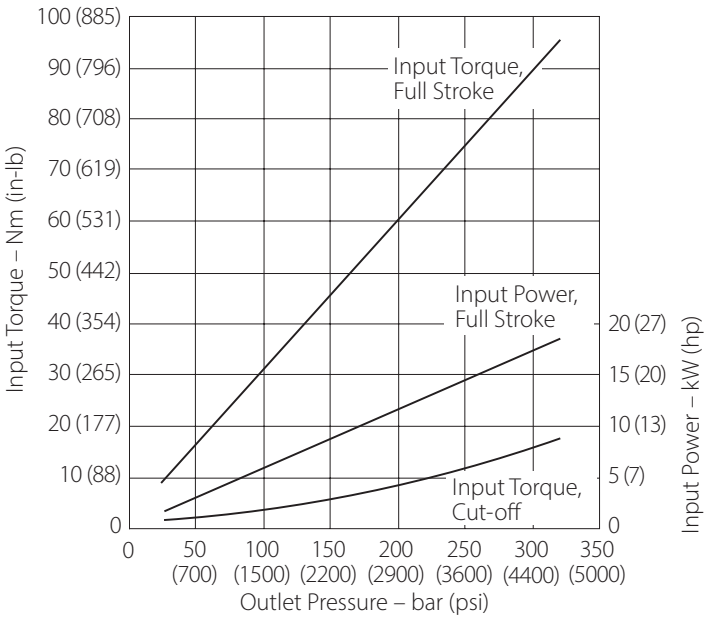
Delivery and E ciency at 1800 r/min
50°C (120°F) and 1.0 bar absolute (0 psi gauge) Inlet



Typical Noise Levels at 1500 and 1000 r/min with
Petroleum Oil (10W) at 50°C (120°F) and 1.0 bar absolute (0 psi gauge) Inlet



Input Torque and Power at 1800 r/min
50°C (120°F) and 1.0 bar absolute (0 psi gauge) Inlet

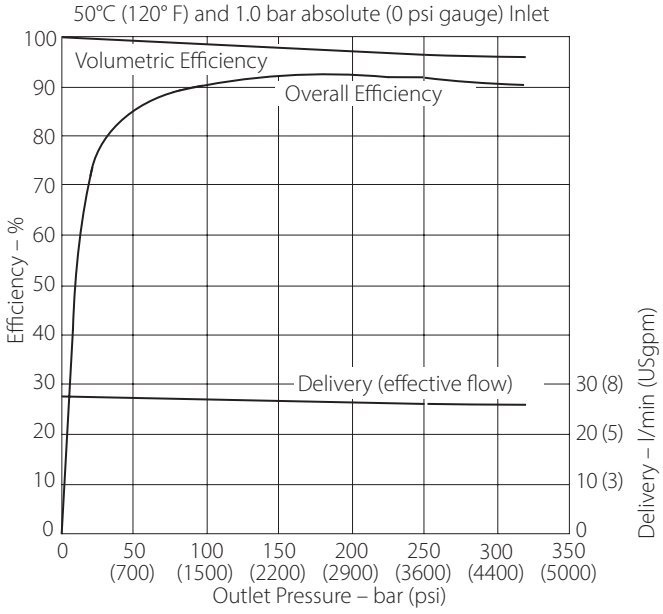


Performance

Quiet version, optimized for 1000-1800 rpm (E) PVM018

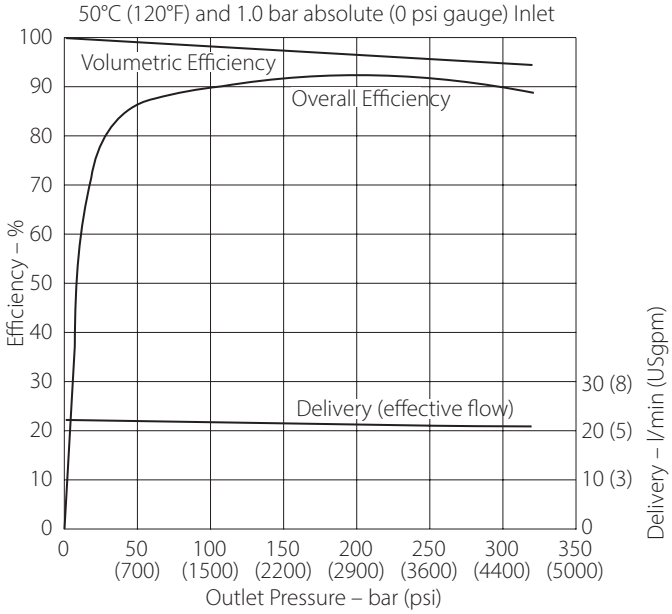
Delivery and E ciency at 1500 r/min

50°C (120° F) and 1.0 bar absolute (0 psi gauge) Inlet



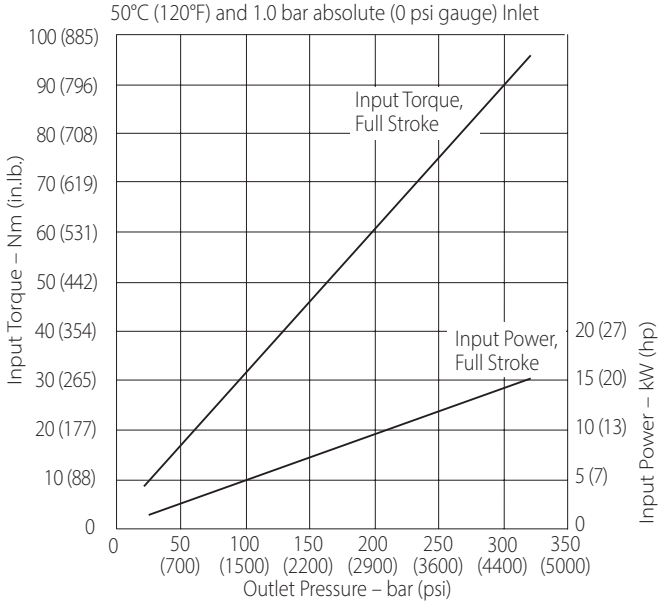
Delivery and E ciency at 1200 r/min

50°C (120°F) and 1.0 bar absolute (0 psi gauge) Inlet



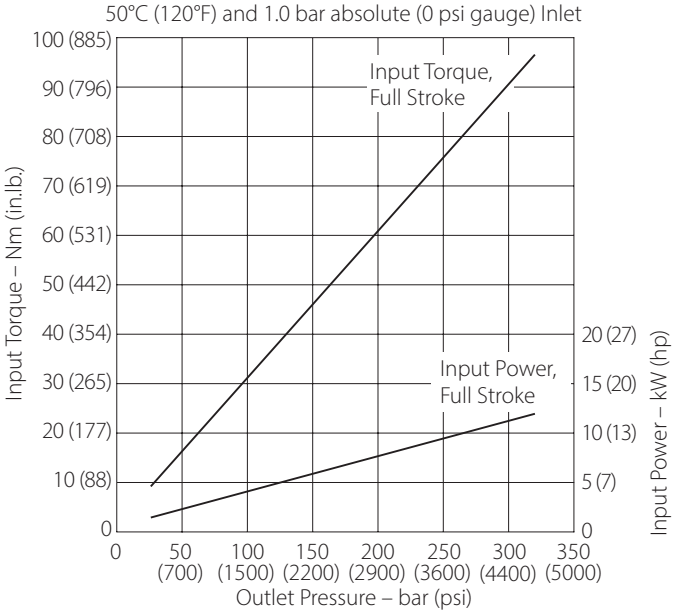
Input Torque and Power at 1500 r/min

50°C (120°F) and 1.0 bar absolute (0 psi gauge) Inlet



Input Torque and Power at 1200 r/min

50°C (120°F) and 1.0 bar absolute (0 psi gauge) Inlet

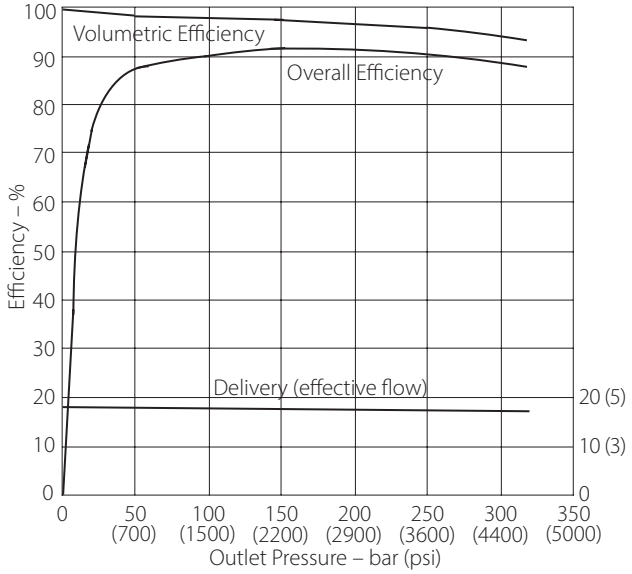


Performance

Quiet version, optimized for 1000-1800 rpm (E) PVM018

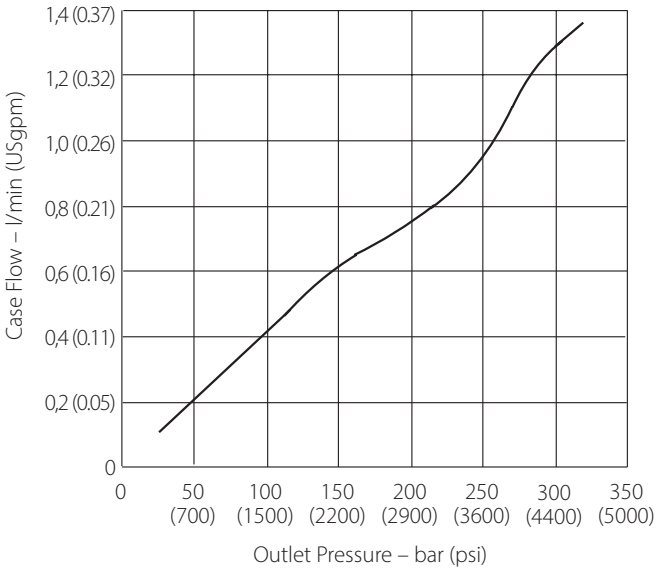
Delivery and E ciency at 1000 r/min

50°C (120°F) and 1.0 bar absolute (0 psi gauge) Inlet



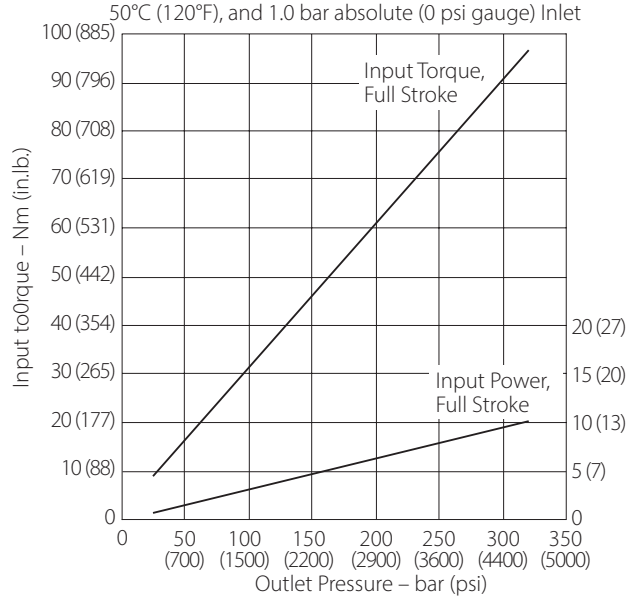
Case Flow Versus Outlet Pressure at 1800 r/min, Full Flow

50°C (120°F) and 1.0 bar absolute (0 psi gauge) Inlet



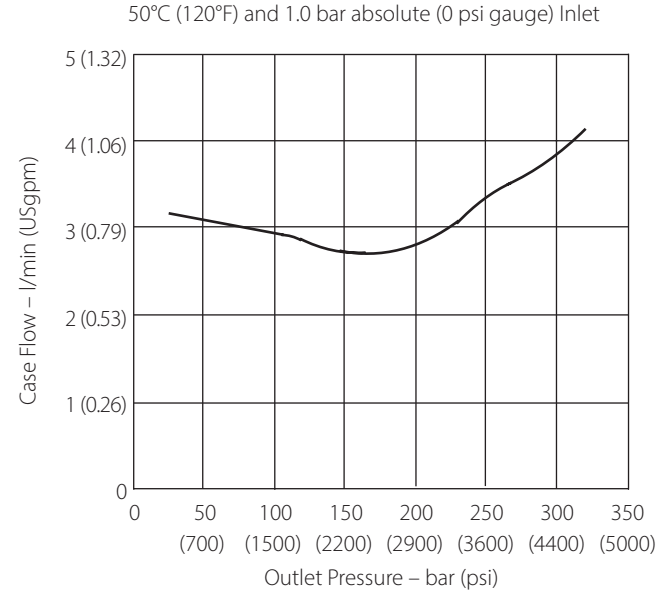
Input Torque and Power at 1000 r/min

50°C (120°F), and 1.0 bar absolute (0 psi gauge) Inlet



Case Flow Versus Outlet Pressure at Cuto , 1800 r/min

50°C (120°F) and 1.0 bar absolute (0 psi gauge) Inlet

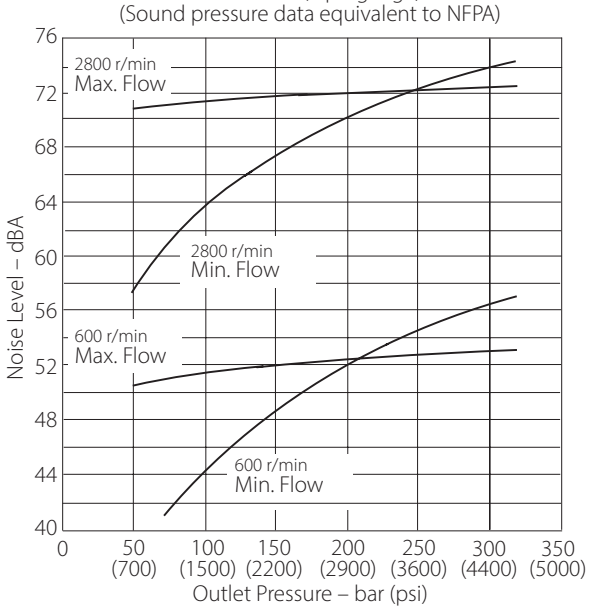


Performance

Higher speed version (M) PVM018

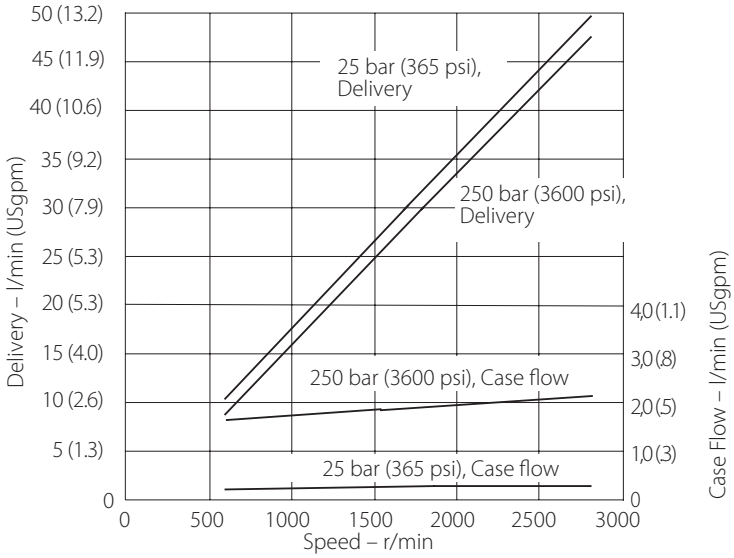
Typical Noise Levels

Petroleum Oil (10W) at 93°C (200°F),
1.0 bar absolute (0 psi gauge) Inlet
(Sound pressure data equivalent to NFPA)



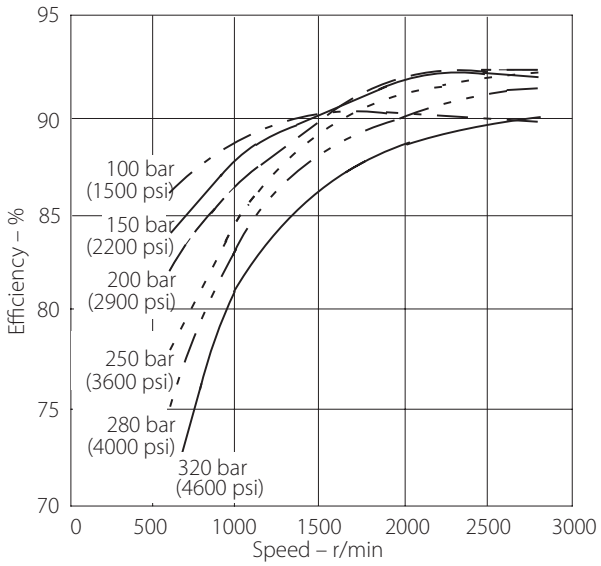
Delivery and Case Flow Versus Speed

@ 93°C (200°F), full flow and 1.0 bar absolute (0 psi) gauge Inlet



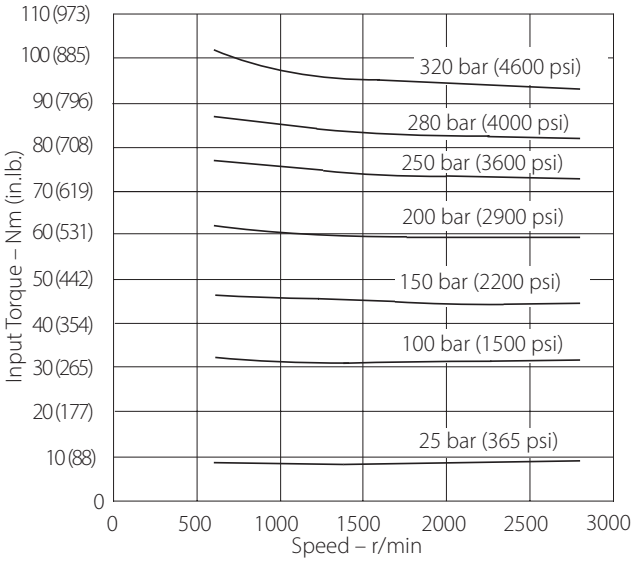
Overall E ciency Versus Speed

at 93°C (200°F) and 1.0 bar absolute (0 psi gauge) Inlet



Input Torque Versus Speed

@ 93°C (200°F), full flow and 1.0 bar absolute (0 psi gauge) inlet

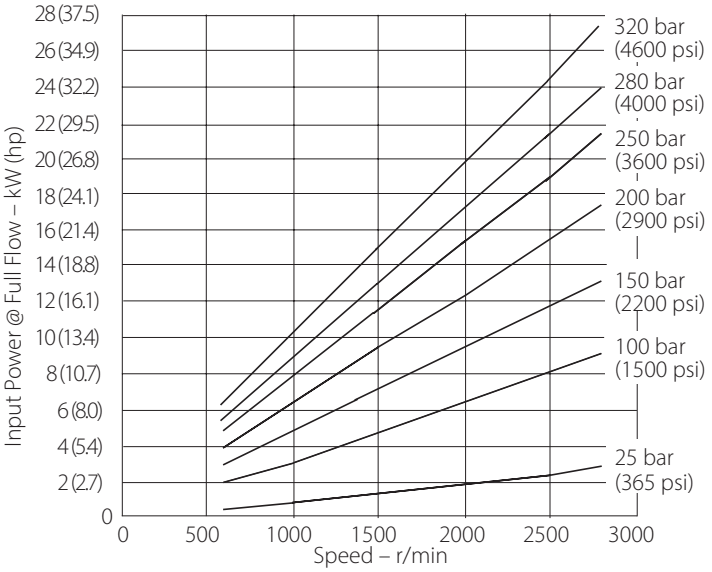


Performance

Higher speed version (M) PVM018

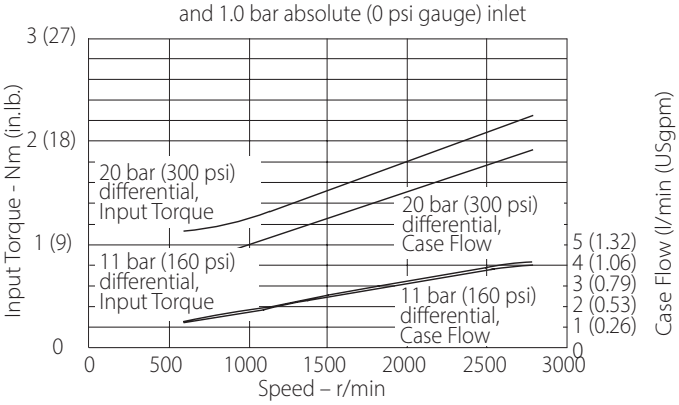
Input Power Versus Speed

@ 93°C (200°F), full flow and 1.0 bar absolute (0 psi gauge) inlet



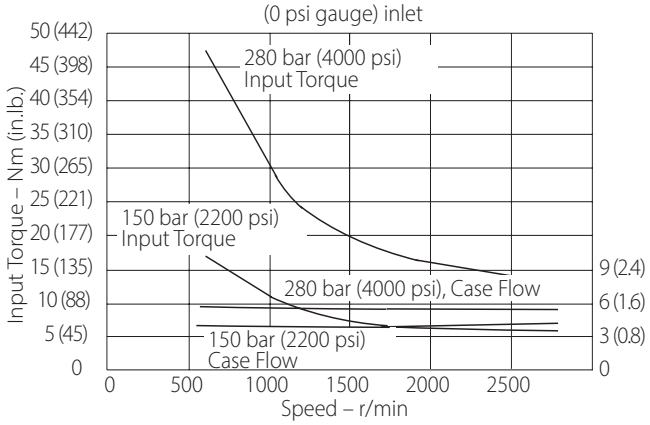
Input Torque and Case Flow Versus Speed

@ 93°C (200°F), load sense standby and 1.0 bar absolute (0 psi gauge) inlet



Input Torque and Case Flow Versus Speed

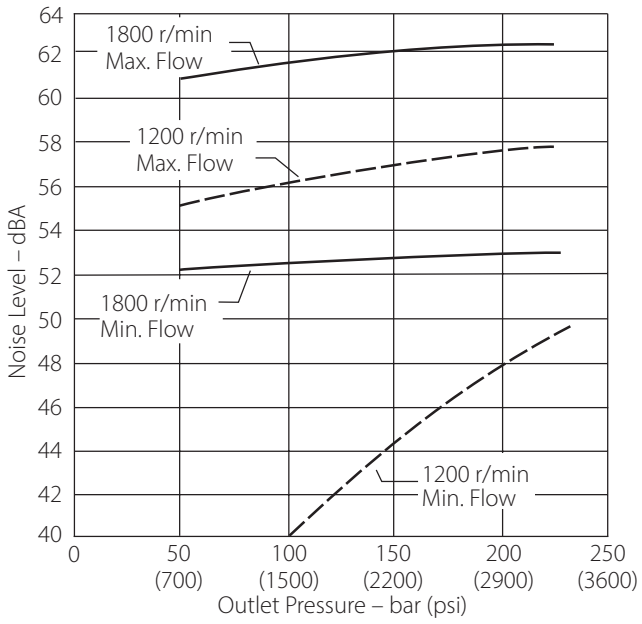
@ 93°C (200°F), cut-off and 1.0 bar absolute (0 psi gauge) inlet



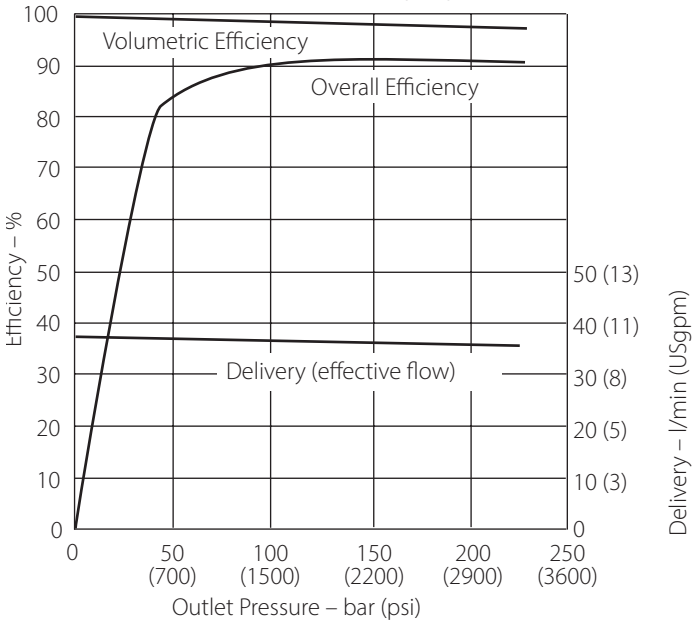
Performance

Quiet version, optimized for 1000-1800 rpm (E) PVM020

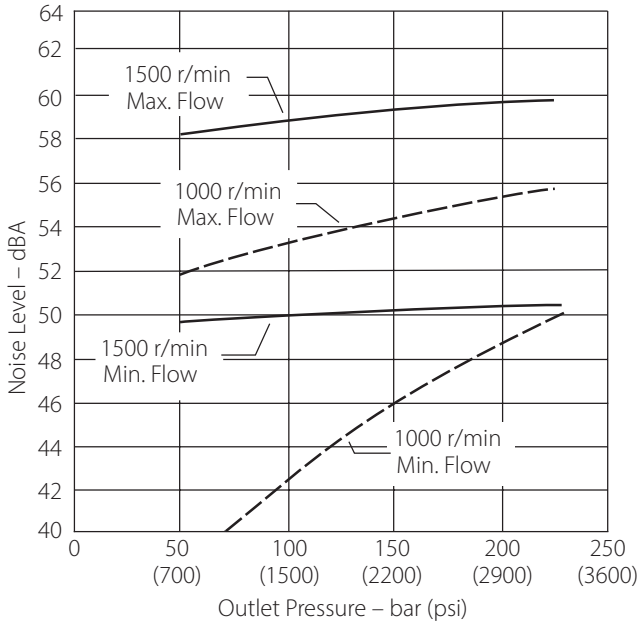
Typical Noise Levels at 1800 and 1200 r/min
with Petroleum Oil (10W) at 50°C (120°F)
and 1.0 bar absolute (0 psi gauge) Inlet



Delivery and E ciency at 1800 r/min, 50°C (120°F), and 1.0 bar absolute (0 psi gauge) Inlet

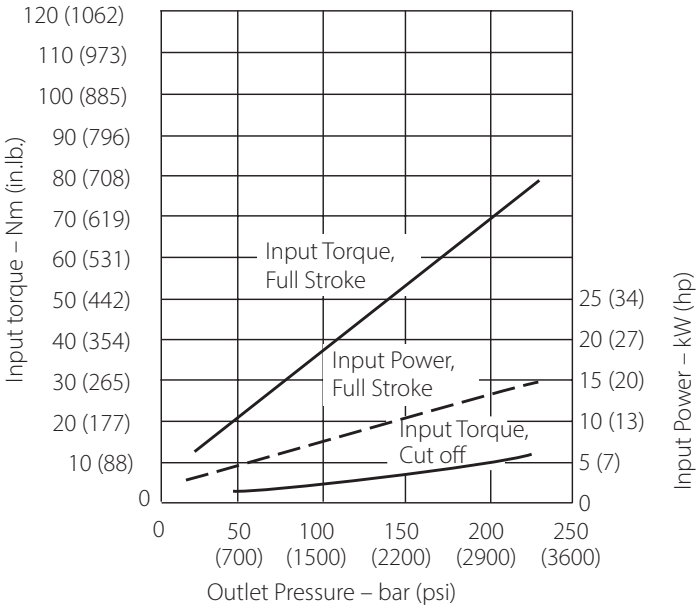


Typical Noise Levels at 1500 and 1000 r/min
with Petroleum Oil (10W) at 50°C (120°F)
and 1.0 bar absolute (0 psi gauge) Inlet



Sound pressure data
equivalent to NFPA

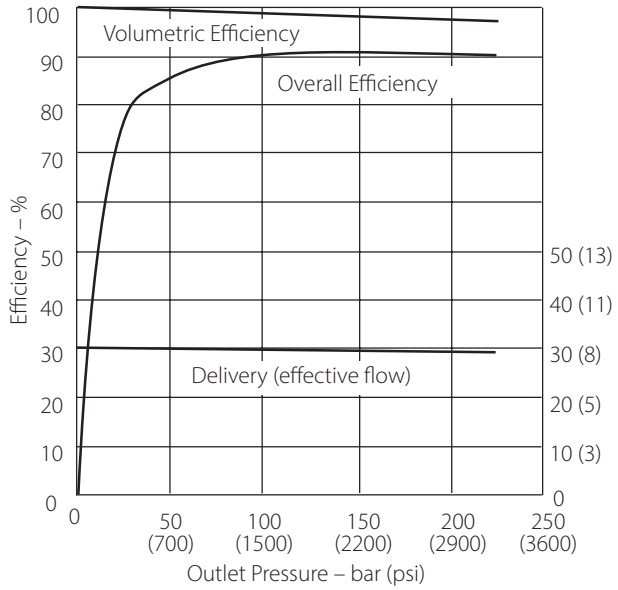
Input Torque and Power at 1800 r/min, 50°C (120°F), and 1.0 bar absolute (0 psi gauge) Inlet



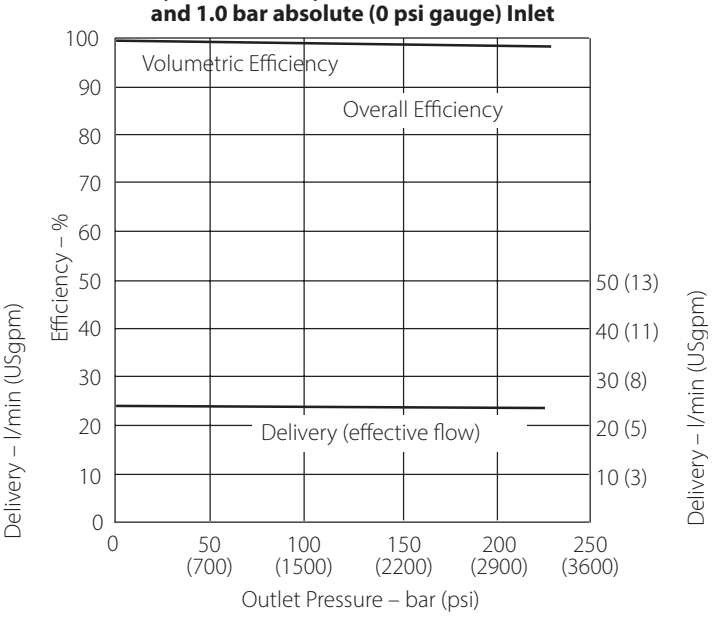
Performance

Quiet version, optimized for 1000-1800 rpm (E) PVM020

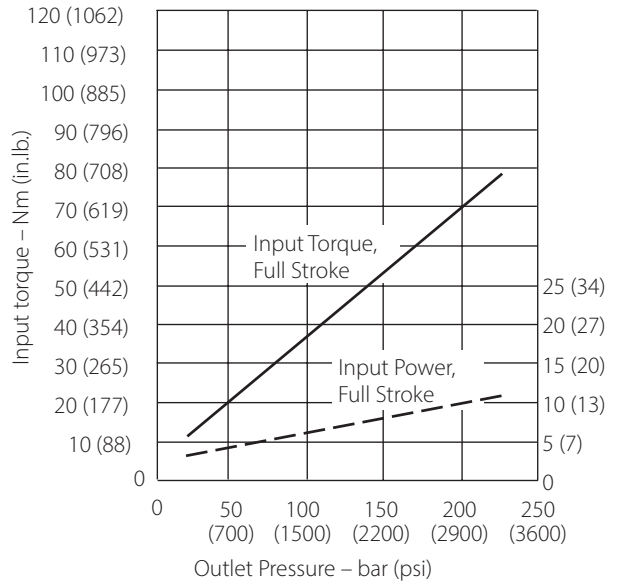
Delivery and E ciency at 1500 r/min, 50°C (120°F), and 1.0 bar absolute (0 psi gauge) Inlet



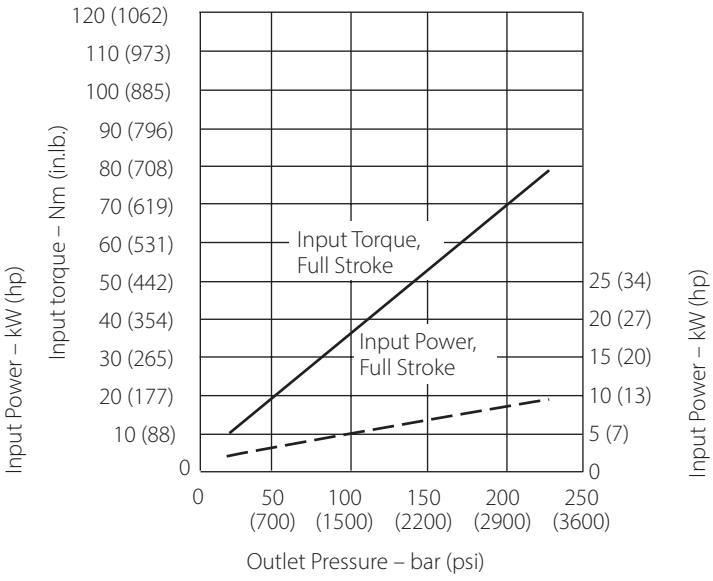
Delivery and E ciency at 1200 r/min, 50°C (120°F), and 1.0 bar absolute (0 psi gauge) Inlet



Input Torque and Power at 1500 r/min, 50°C (120°F), and 1.0 bar absolute (0 psi gauge) Inlet



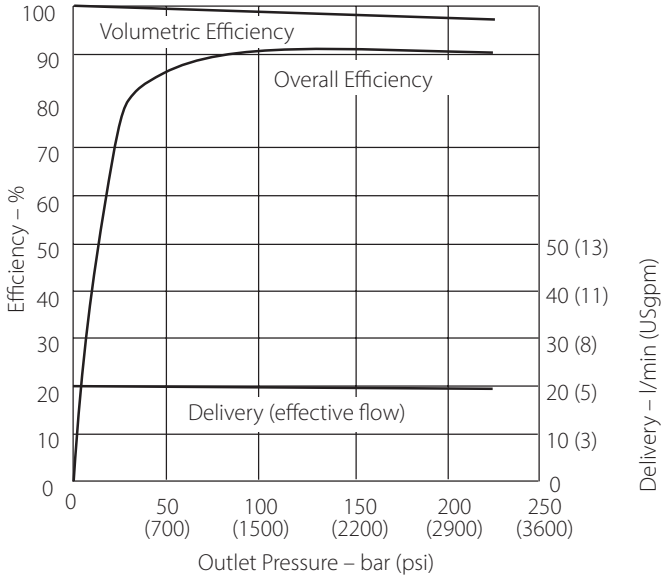
Input Torque and Power at 1200 r/min, 50°C (120°F), and 1.0 bar absolute (0 psi gauge) Inlet



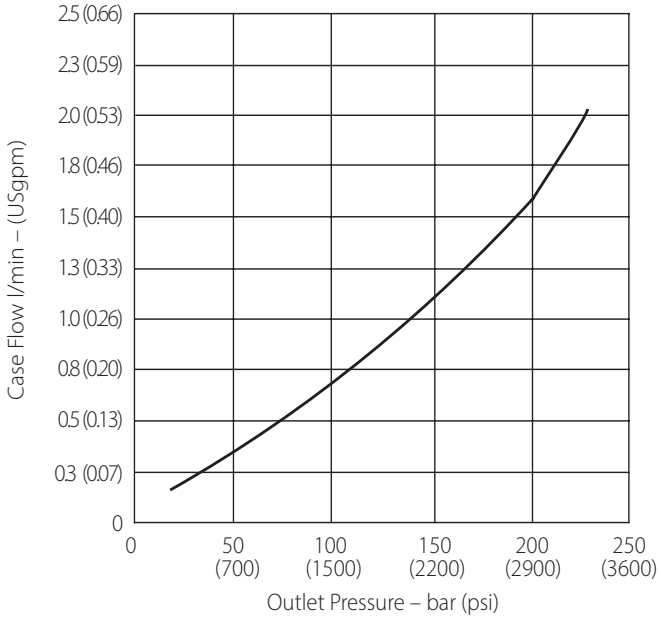
Performance

Quiet version, optimized for 1000-1800 rpm (E) PVM020

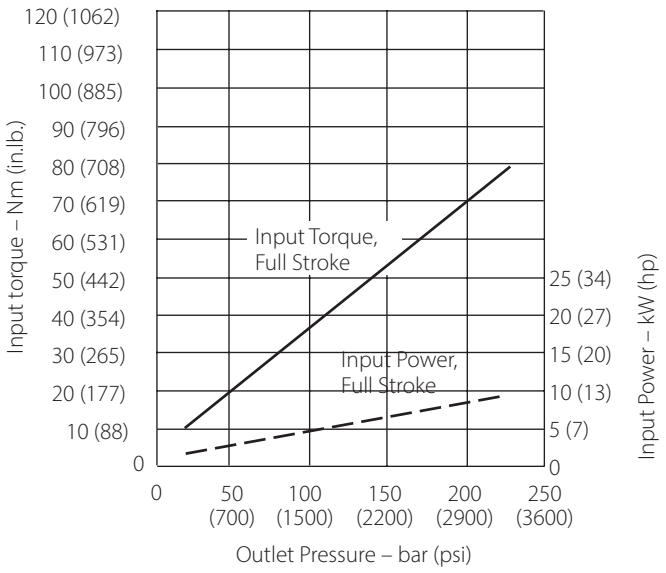
Delivery and E ciency at 1000 r/min, 50°C (120°F), and 1.0 bar absolute (0 psi gauge) Inlet



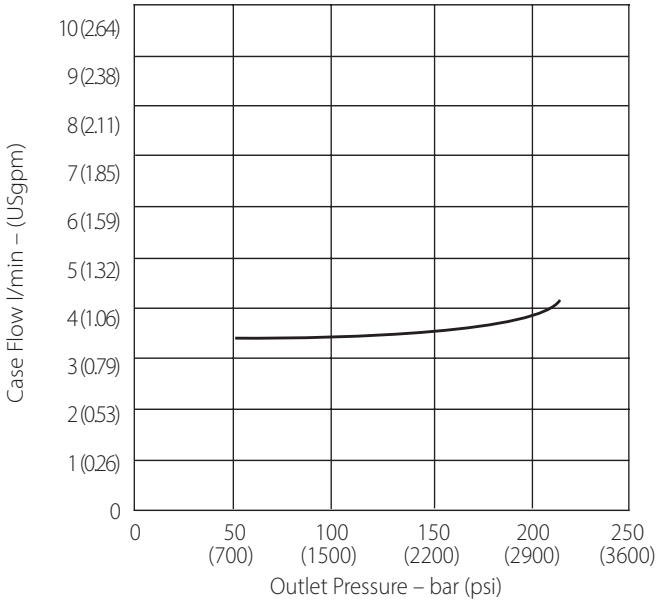
Case Flow versus Outlet Pressure at 1800 r/min, Full Flow, 50°C (120°F), and 1.0 bar absolute (0 psi gauge) Inlet



Input Torque and Power at 1000 r/min, 50°C (120°F), and 1.0 bar absolute (0 psi gauge) Inlet



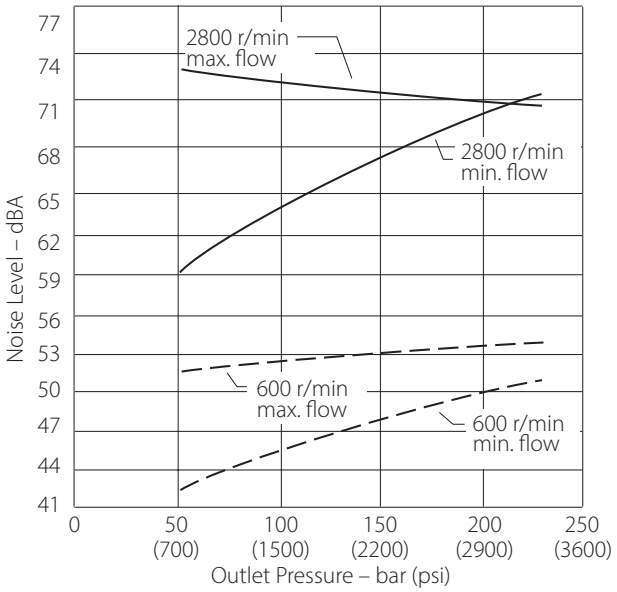
Case Flow versus Outlet Pressure at Cuto , 1800 r/min, 50°C (120°F), and 1.0 bar absolute (0 psi gauge) Inlet



Performance

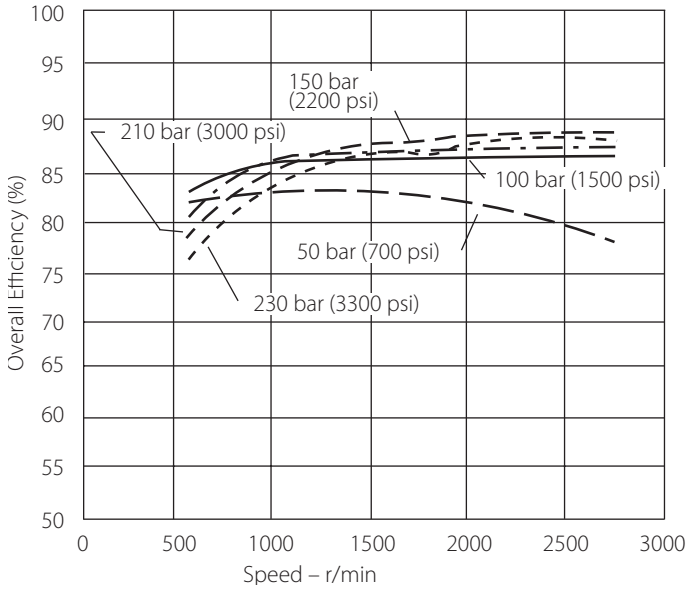
Higher speed version (M) PVM020

Typical Noise Levels at 2800 & 600 r/min with Petroleum Oil (10W) at 93°C (200°F) and 1.0 bar absolute (0 psi gauge) Inlet

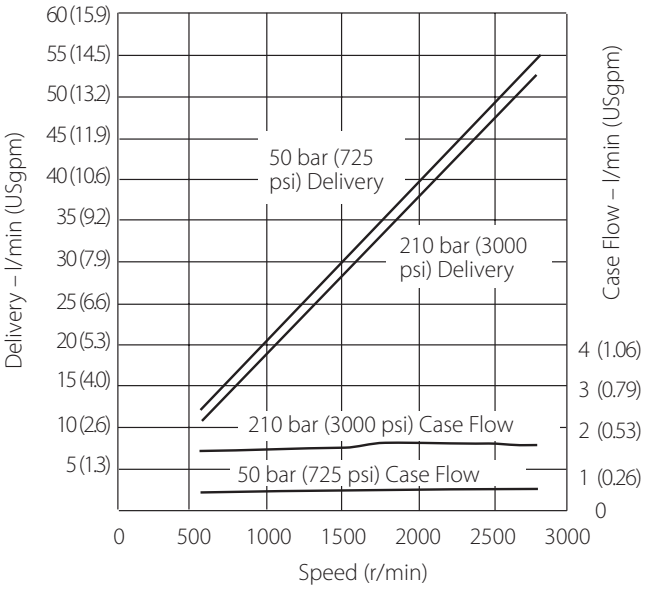


Sound pressure data equivalent to NFPA.

Overall E ciency versus Speed at 93°C (200°F) and 1.0 bar absolute (0 psi gauge) inlet



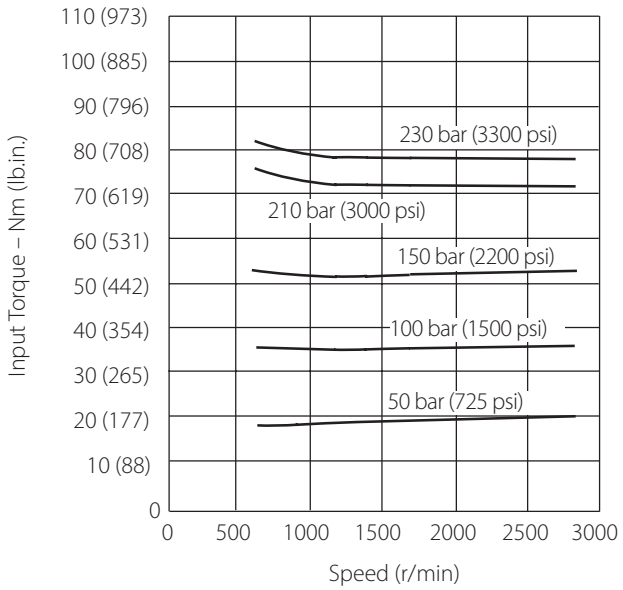
Delivery and Case Flow versus Speed at 93°C (200°F), Full Flow 1.0 bar absolute (0 psi gauge) inlet



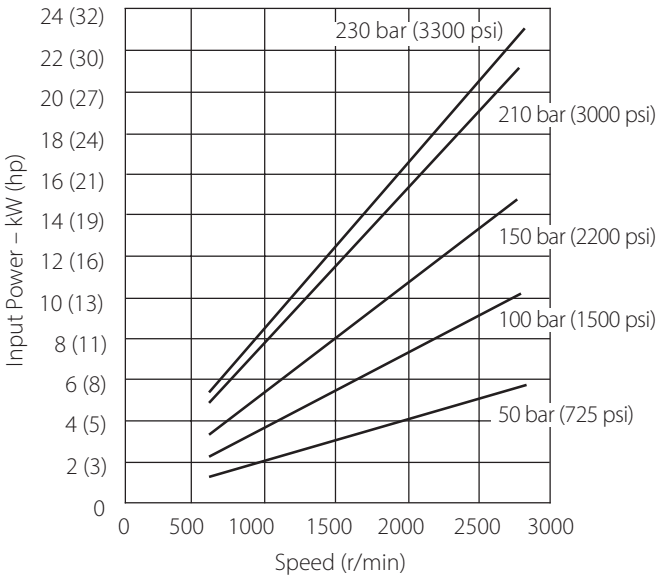
Performance

Higher speed version (M) PVM020

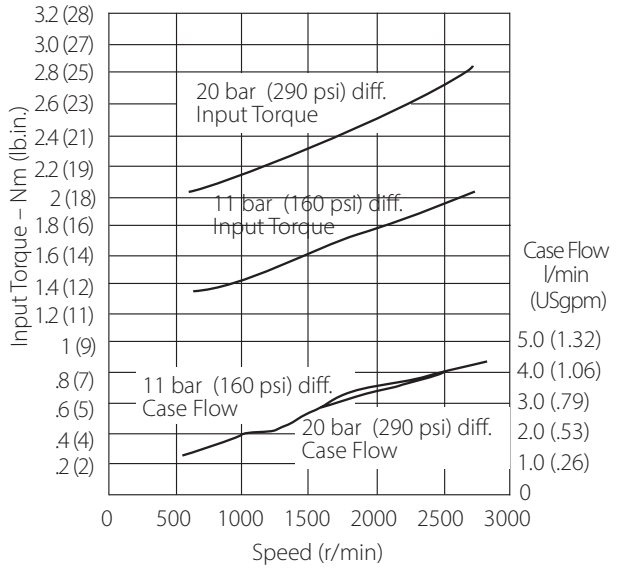
Input Torque versus Speed at 93°C (200°F), Full Flow and 1.0 bar absolute (0 psi gauge) Inlet



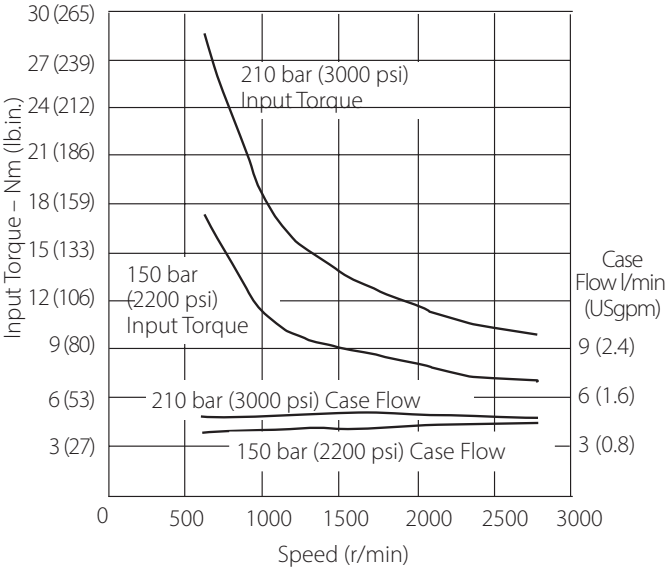
Input Power versus Speed at 93°C (200°F), Full Flow and 1.0 bar absolute (0 psi gauge) Inlet



Input Torque and Case Flow versus Speed at 93°C (200°F), Load Sense Standby and 1.0 bar absolute (0 psi gauge) Inlet

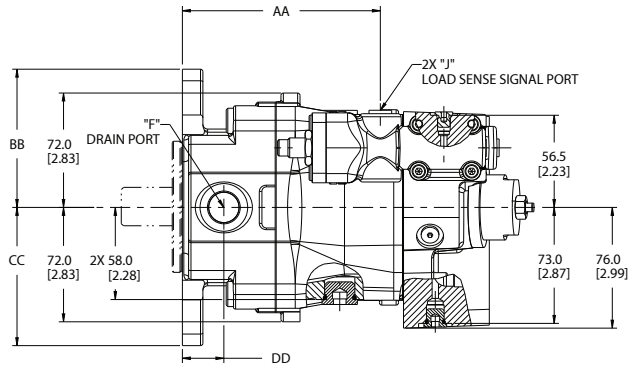


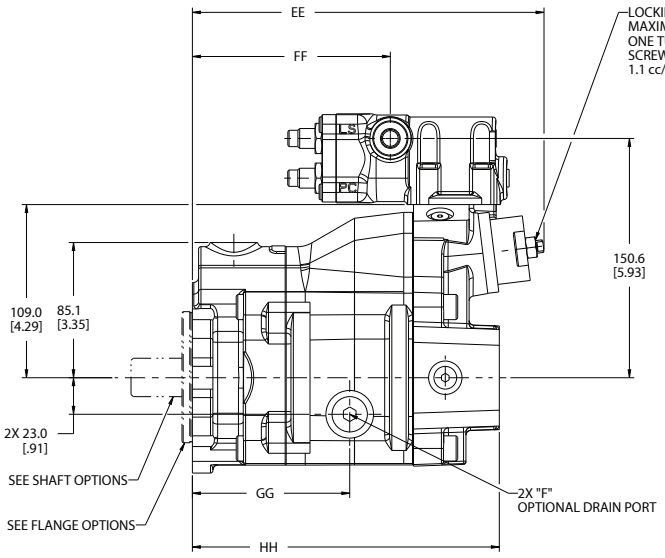
Input Torque and Case Flow versus Speed at 93°C (200°F), Pressure Limit Cut-o and 1.0 bar absolute (0 psi gauge) Inlet

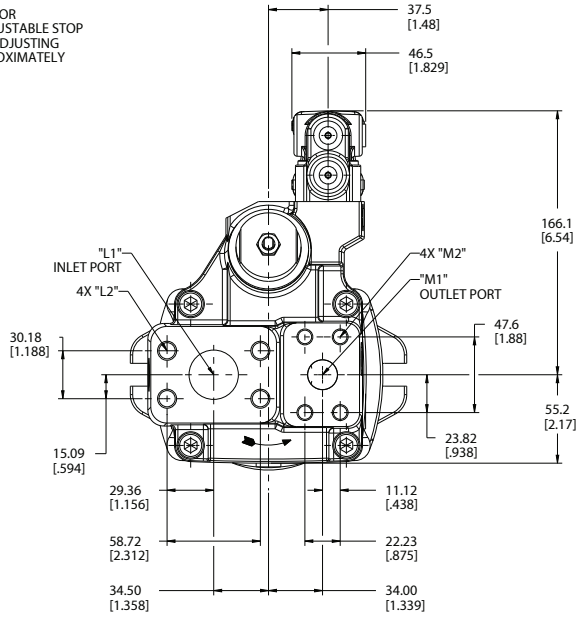


End-ported Models

PVM018





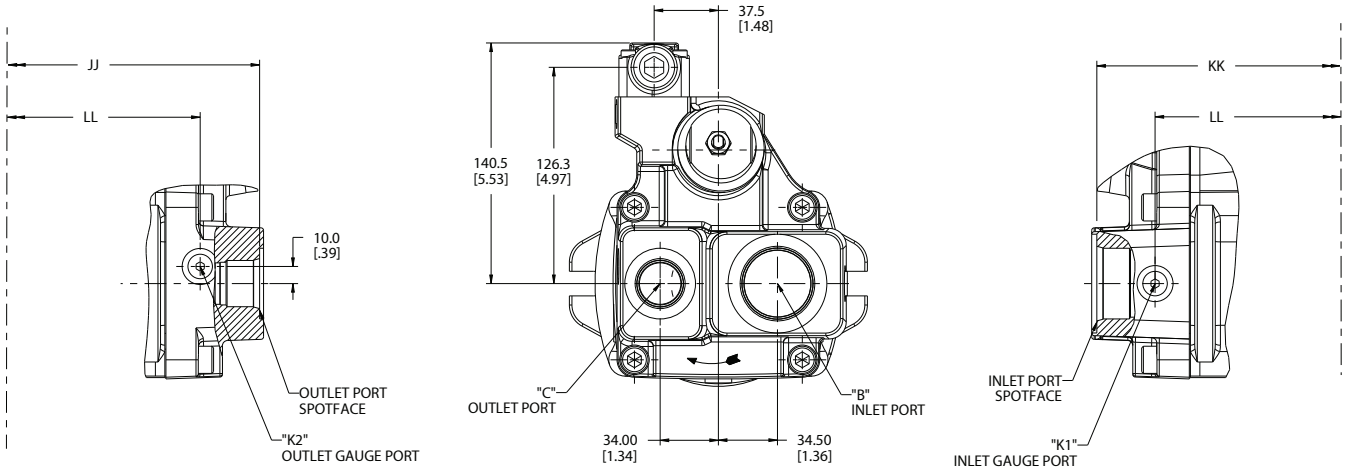


RIGHT HAND ROTATION
SHOWN WITH COMPENSATOR WITH LOAD SENSE

FLANGE PORTS						
PORT	"L1"	"L2"	"M1"	"M2"	"F"	"J"
SAE PORT	Ø 1.25 INLET PORT "L1" SAE J518C 4 BOLT FLANGE PORT STANDARD PRESSURE SERIES	.4375-14 UNC-2B THREAD ↧ 1.12 MINIMUM	Ø .75 OUTLET PORT "M1" SAE J518C 4 BOLT FLANGE PORT STANDARD PRESSURE SERIES	.375-16 UNC-2B THREAD ↧ .88 MINIMUM	SAE J514 O-RING BOSS PORT "F" FOR .50 O.D. TUBE .75-16 UNF-2B THREAD	SAE J1926 O-RING BOSS PORT "J" FOR .250 O.D. TUBE .4375-20UNF-2B THREAD

End-ported Models

PVM018



LEFT HAND ROTATION
SHOWN WITH PRESSURE COMPENSATOR
RIGHT HAND ROTATION SHOWN ON SHEET 2

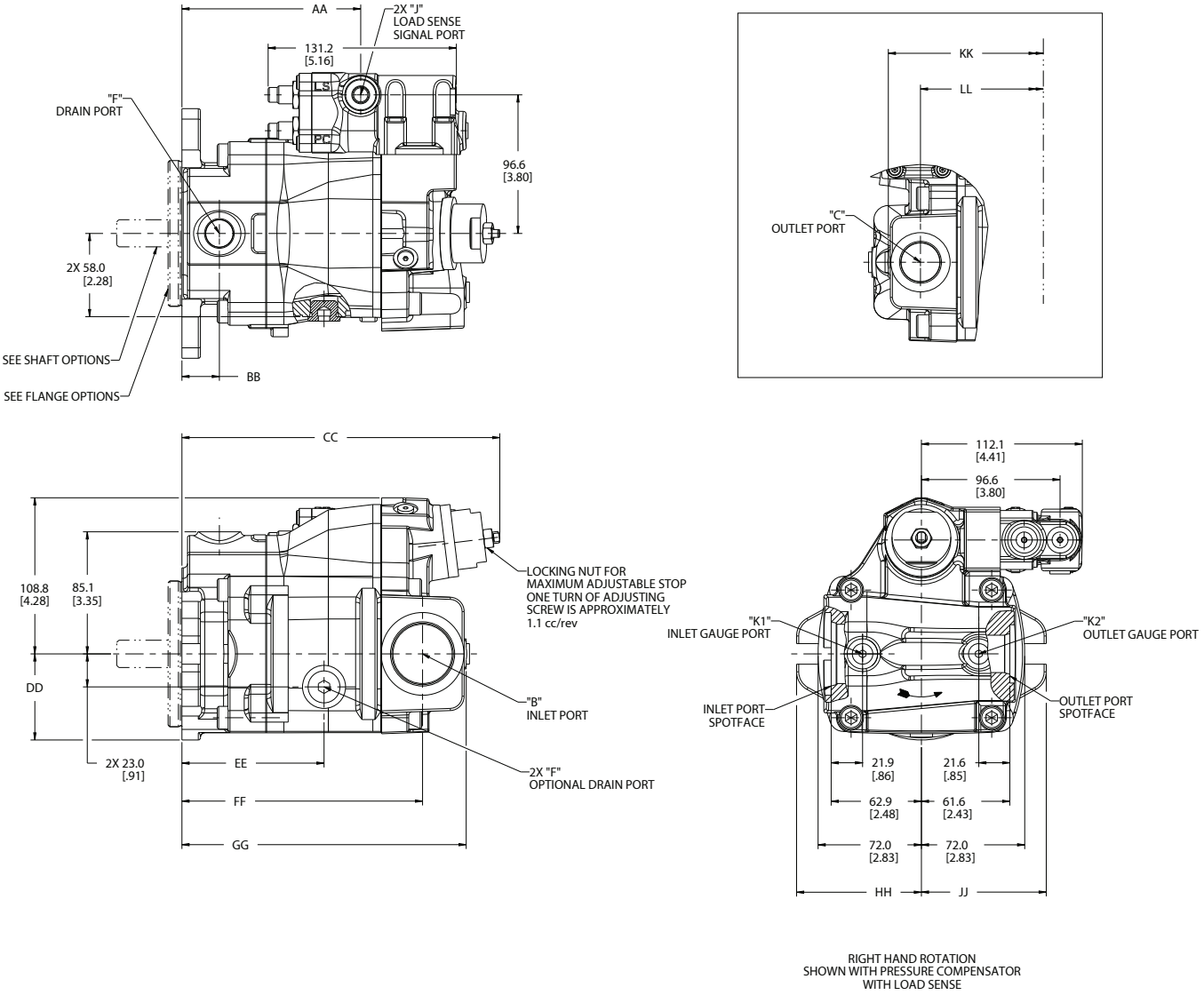
TUBE PORTS				
PORT	"B"	"C"	"K1"	"K2"
SAE PORT	INLET PORT "B" SAE J514 O-RING BOSS TUBE PORT FOR 1.25 O.D. TUBE 1.625-12 UN-2B THREAD	OUTLET PORT "C" SAE J514 O-RING BOSS PORT FOR .75 O.D. TUBE 1.0625-12 UN-2B THREAD	SAE J514 O-RING BOSS PORT "K1" FOR .250 O.D. TUBE .4375-20 UNF-2B THREAD	SAE J514 O-RING BOSS PORT "K2" FOR .250 O.D. TUBE .4375-20 UNF-2B THREAD

MOUNTING FLANGE OPTION	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL
C	124.6 [4.91	87.0 [3.43]	87.0 [3.43]	26.1 [1.03]	221.3 [8.71]	124.6 [4.91]	99.0 [3.90]	193.2 [7.61]	193.9 [7.63]	193.2 [7.61]	159.2 [6.27]
A	132.1 [5.20]	65.2 [2.67]	65.2 [2.67]	33.6 [8.67]	228.8 [9.01]	132.1 [5.20]	106.5 [4.19]	200.7 [7.90]	201.4 [7.93]	200.7 [7.90]	166.7 [6.56]

Side-ported Models

Without through-drive capability

PVM018



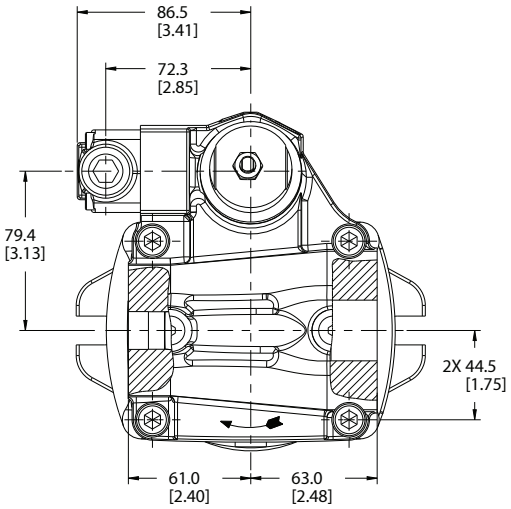
RIGHT HAND ROTATION
SHOWN WITH PRESSURE COMPENSATOR
WITH LOAD SENSE

TUBE PORTS						
PORT	"B"	"C"	"F"	"J"	"K1"	"K2"
SAE PORT	INLET PORT "B" SAE J514 O-RING BOSS TUBE PORT FOR 1.25 O.D. TUBE 1.625-12UN-2B THREAD	OUTLET PORT "C" SAE J514 O-RING BOSS PORT FOR .75 O.D. TUBE 1.0625-12UN-2B THREAD	SAE J514 O-RING BOSS PORT "F" FOR .50 O.D. TUBE .750-16 UNF-20 THREAD	SAE J1926 O-RING BOSS PORT "J" FOR .250 O.D. TUBE .4375-20UNF-2B THREAD	SAE J514 O-RING BOSS PORT "K1" FOR .250 O.D. TUBE .4375-20UNF-2B THREAD	SAE J514 O-RING BOSS PORT "K2" FOR .250 O.D. TUBE .4375-20 UNF-2B THREAD

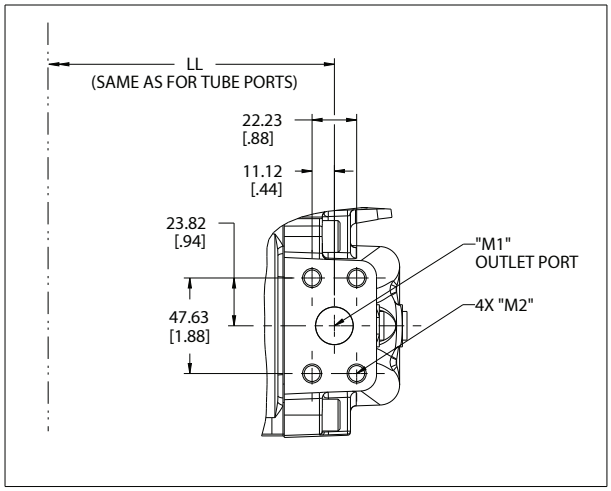
Side-ported Models

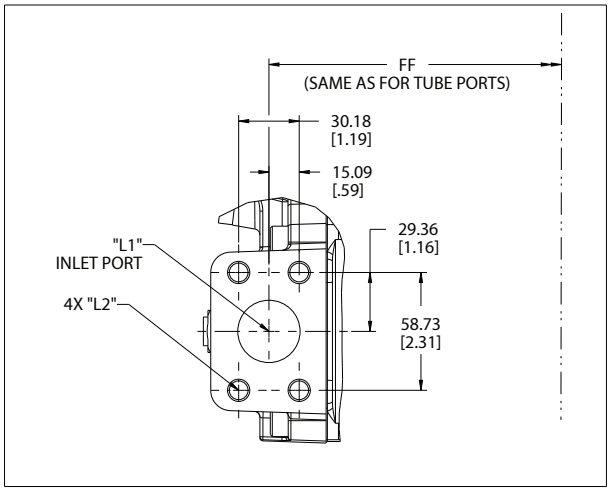
Without through-drive capability

PVM018



LEFT HAND ROTATION
WITH PRESSURE COMPENSATOR





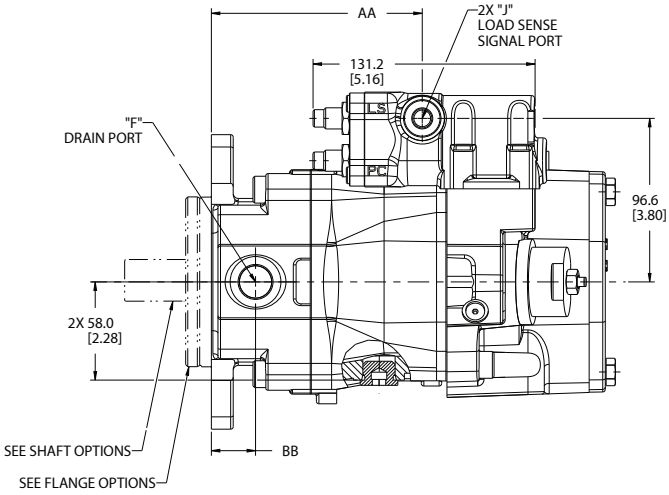
FLANGE PORTS				
PORT	"L1"	"L2"	"M1"	"M2"
SAE PORT	Ø 1.25 INLET PORT "L1" SAE J518C, 4 BOLT FLANGE PORT STANDARD PRESSURE SERIES	.4375-14 UNC - 2B THREAD ↧ 1.12 MINIMUM	Ø .75 OUTLET PORT "M1" SAE J518C, 4 BOLT FLANGE PORT STANDARD PRESSURE SERIES	.375-16 UNC-2B THREAD ↧ .88 MINIMUM

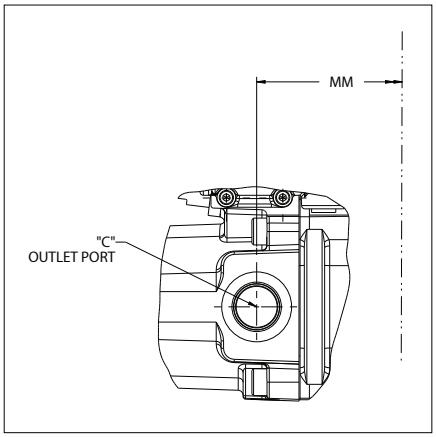
MOUNTING FLANGE OPTION	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL
C	124.6 [4.91]	26.1 [1.03]	221.1 [8.72]	60.0 [2.36]	99.0 [3.90]	167.7 [6.60]	198.1 [7.80]	87.0 [3.43]	87.0 [3.43]	186.6 [7.35]	164.2 [6.46]
A	132.1 [5.20]	33.6 [1.32]	229.0 [9.02]	55.7 [2.19]	106.5 [4.19]	175.2 [6.90]	205.6 [8.09]	65.2 [2.57]	65.2 [2.57]	194.1 [7.64]	171.7 [6.76]

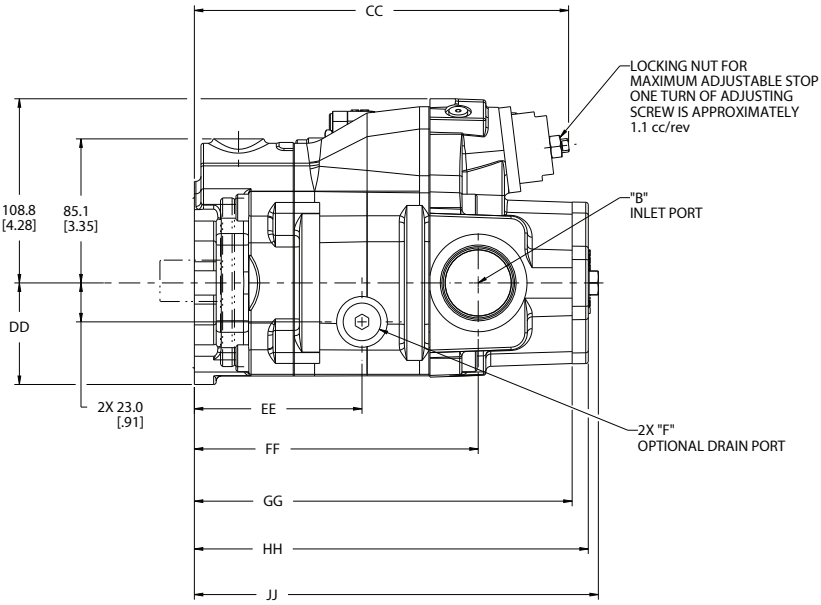
Thru-drive Models

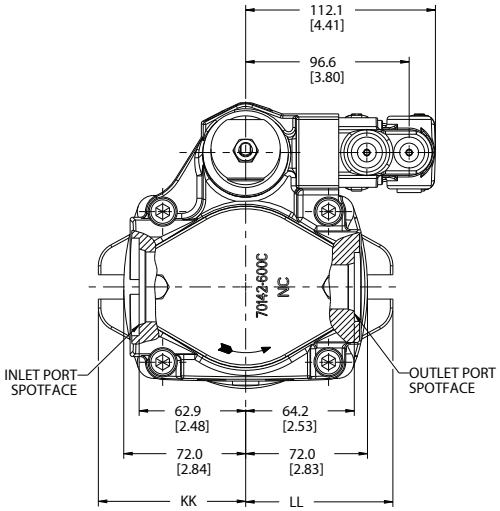
With cover plate

PVM018

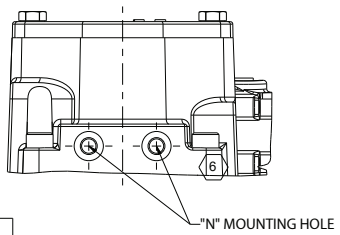








RIGHT HAND ROTATION
SHOWN WITH PRESSURE COMPENSATOR
WITH LOAD SENSE

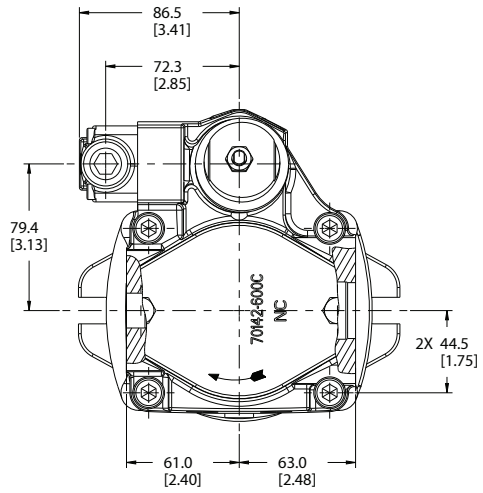


TUBE PORTS					
PORT	"B"	"C"	"F"	"J"	"N"
SAE PORT	INLET PORT "B" SAE J514 O-RING BOSS TUBE PORT FOR 1.25 O.D. TUBE 1.625-12UN-2B THREAD	OUTLET PORT "C" SAE J514 O-RING BOSS PORT FOR .75 O.D. TUBE 1.0625-12UN-2B THREAD	SAE J514 O-RING BOSS PORT "F" FOR .50 O.D. TUBE .750-16 UNF-20 THREAD	SAE J1926 O-RING BOSS PORT "J" FOR .250 O.D. TUBE .4375-20UNF-2B THREAD	.375-16 UNC-2B THD ↧ .62

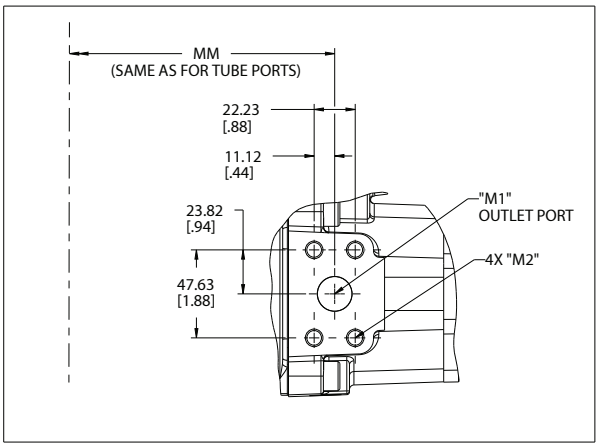
Thru-drive Models

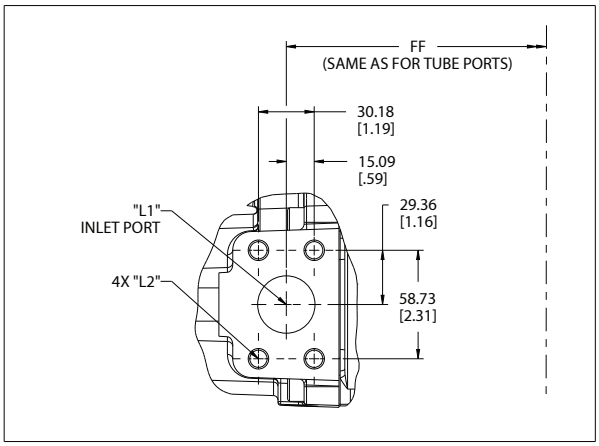
With cover plate

PVM018



LEFT HAND ROTATION
WITH PRESSURE COMPENSATOR





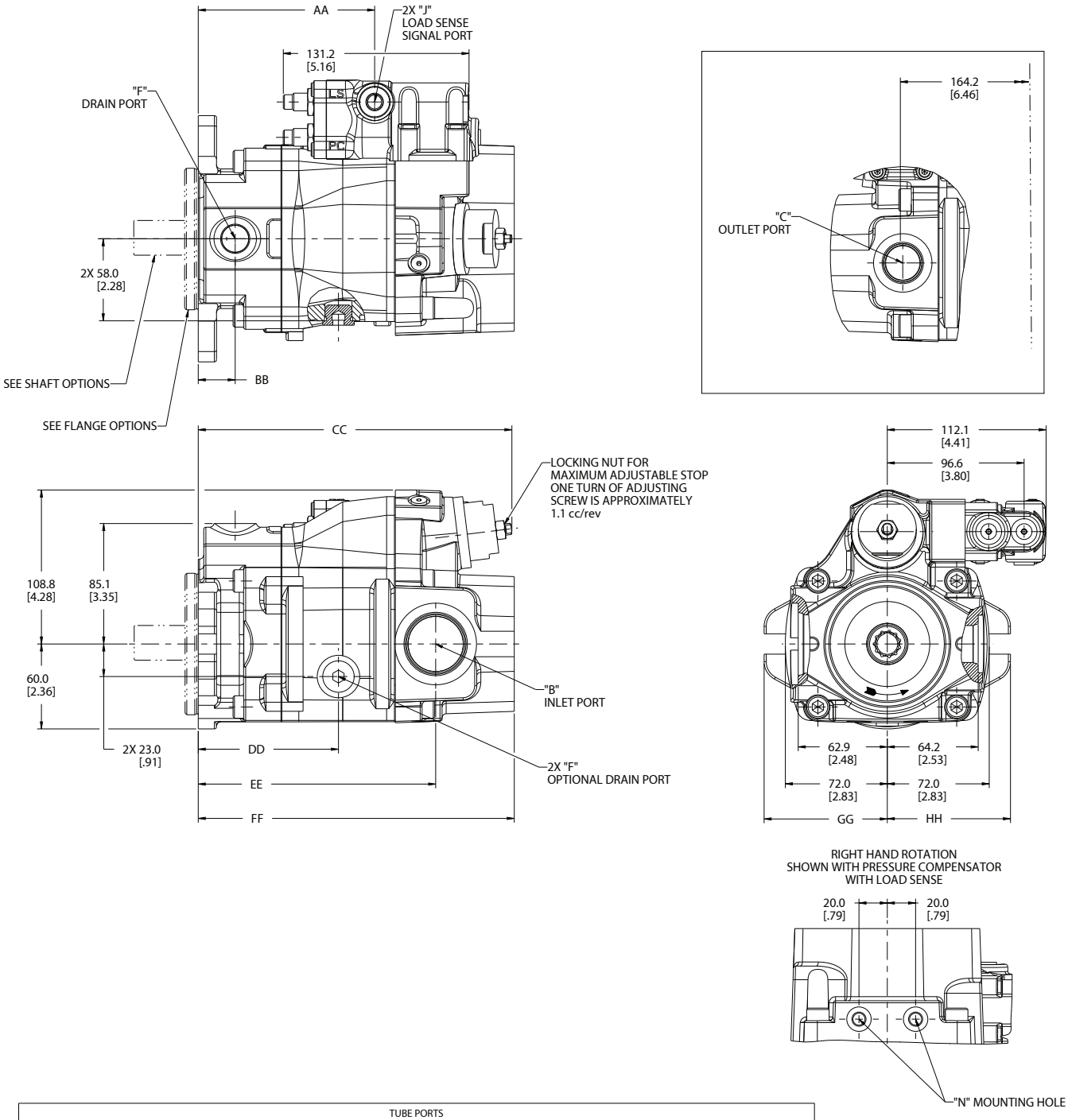
FLANGE PORTS				
PORT	"L1"	"L2"	"M1"	"M2"
SAE PORT	Ø 1.25 INLET PORT "L1" SAE J518C, 4 BOLT FLANGE PORT STANDARD PRESSURE SERIES	.4375-14 UNC-2B THREAD ↧ 1.12 MINIMUM	Ø .75 OUTLET PORT "M1" SAE J518C, 4 BOLT FLANGE PORT STANDARD PRESSURE SERIES	.375-16 UNC-2B THREAD ↧ .88 MINIMUM

MOUNTING FLANGE OPTION	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL	MM
C	124.6 [4.91]	26.1 [1.03]	221.1 [8.70]	60.0 [2.36]	99.0 [3.90]	167.7 [6.60]	223.2 [8.79]	232.7 [9.16]	238.7 [9.40]	87.0 [3.43]	87.0 [3.43]	164.2 [6.46]
A	132.1 [5.20]	33.6 [1.32]	229.0 [9.02]	55.7 [2.19]	106.5 [4.19]	175.2 [6.90]	230.7 [9.08]	240.2 [9.46]	246.2 [9.69]	65.2 [2.57]	65.2 [2.57]	171.7 [6.76]

Thru-drive Models

Without cover plate

PVM018

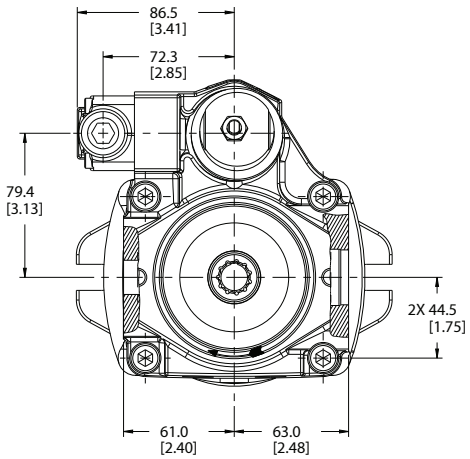


TUBE PORTS					
PORT	"B"	"C"	"F"	"J"	"N"
SAE PORT	INLET PORT "B" SAE J514 O-RING BOSS TUBE PORT FOR 1.25 O.D. TUBE 1.625-12UN-2B THREAD	OUTLET PORT "C" SAE J514 O-RING BOSS PORT FOR .75 O.D. TUBE 1.0625-12UN-2B THREAD	SAE J514 O-RING BOSS PORT "F" FOR .50 O.D. TUBE .750-16 UNF-20 THREAD	SAE J1926 O-RING BOSS PORT "J" FOR .250 O.D. TUBE .4375-20UNF-2B THREAD	.375-16 UNC-2B THD ↧ .62

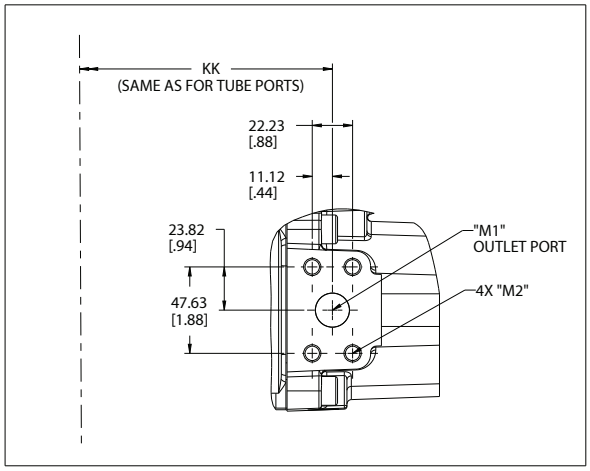
Thru-drive Models

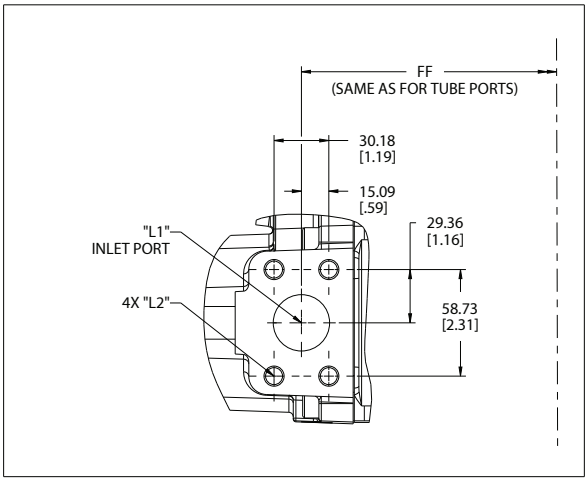
Without cover plate

PVM018



LEFT HAND ROTATION
WITH PRESSURE COMPENSATOR





FLANGE PORTS				
PORT	"L1"	"L2"	"M1"	"M2"
SAE PORT	Ø 1.25 INLET PORT "L1" SAE J518C, 4 BOLT FLANGE PORT STANDARD PRESSURE SERIES	.4375-14 UNC-2B THREAD ↧ 1.12 MINIMUM	Ø .75 OUTLET PORT "M1" SAE J518C, 4 BOLT FLANGE PORT STANDARD PRESSURE SERIES	.375-16 UNC-2B THREAD ↧ .88 MINIMUM

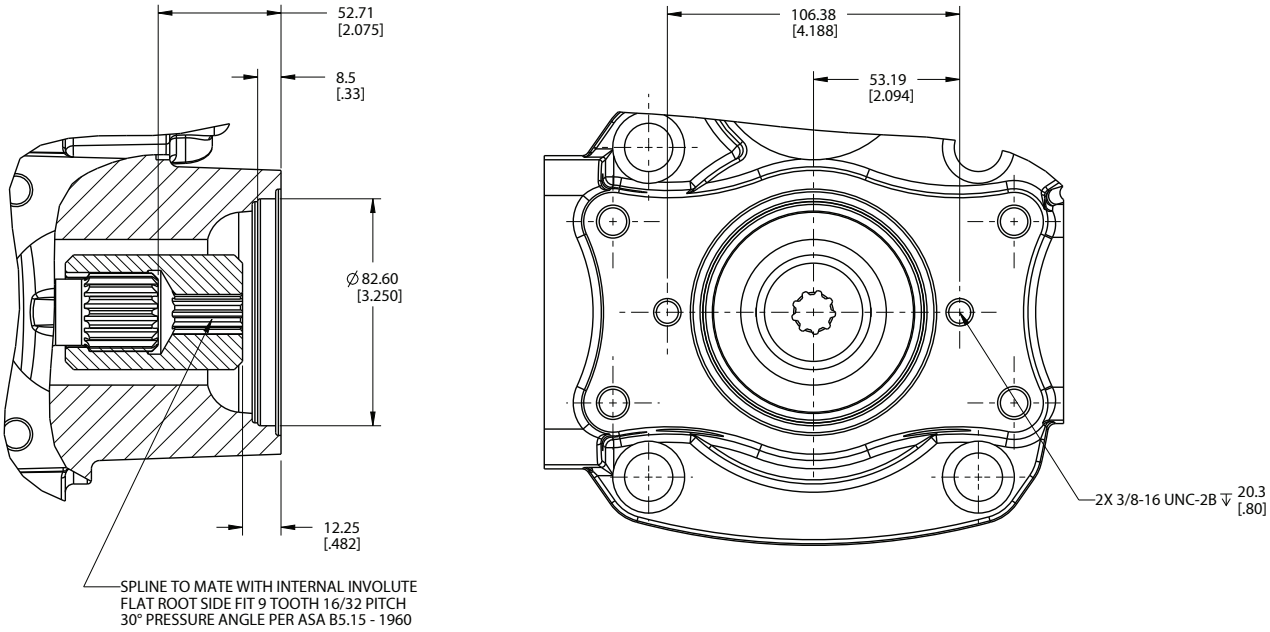
MOUNTING FLANGE OPTION	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK
C	124.6 [4.91]	26.1 [1.03]	221.1 [8.72]	60.0 [2.36]	99.0 [3.90]	167.7 [6.60]	223.2 [8.79]	87.0 [3.43]	87.0 [3.43]	164.2 [6.46]
A	132.1 [5.20]	33.6 [1.32]	229.0 [9.02]	55.7 [2.19]	106.5 [4.19]	175.2 [6.90]	230.7 [9.08]	65.2 [2.57]	65.2 [2.57]	171.7 [6.76]

Thru-drive Models

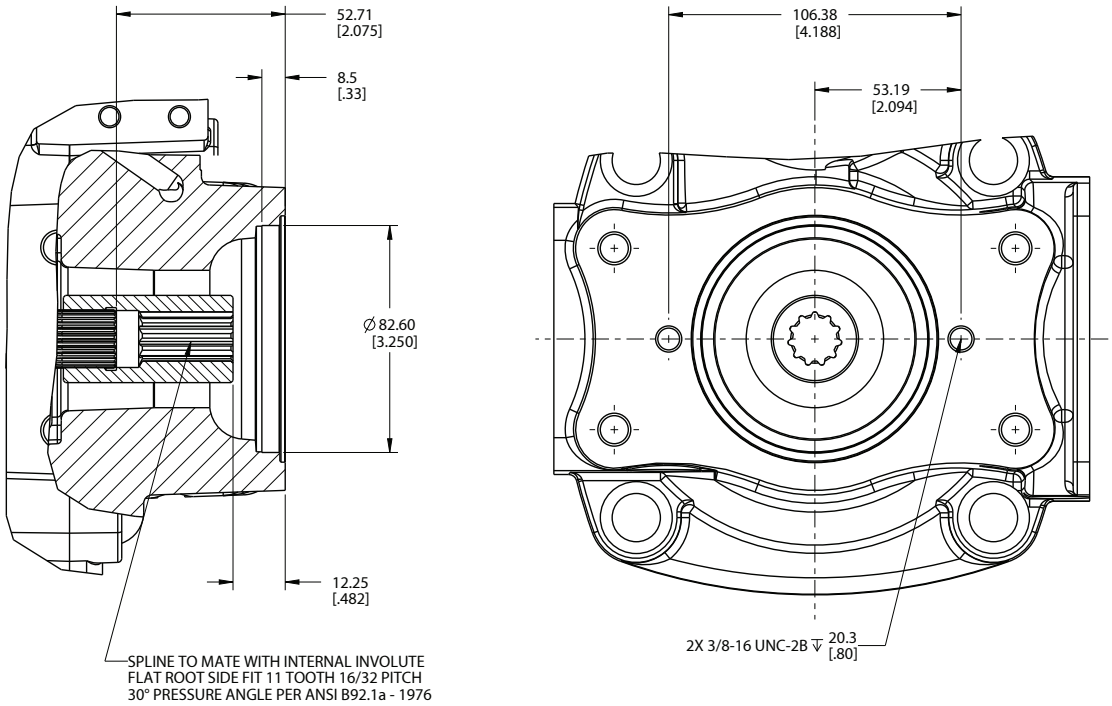
Adapter flanges

PVM018

SAE "A" Adaptor Flange

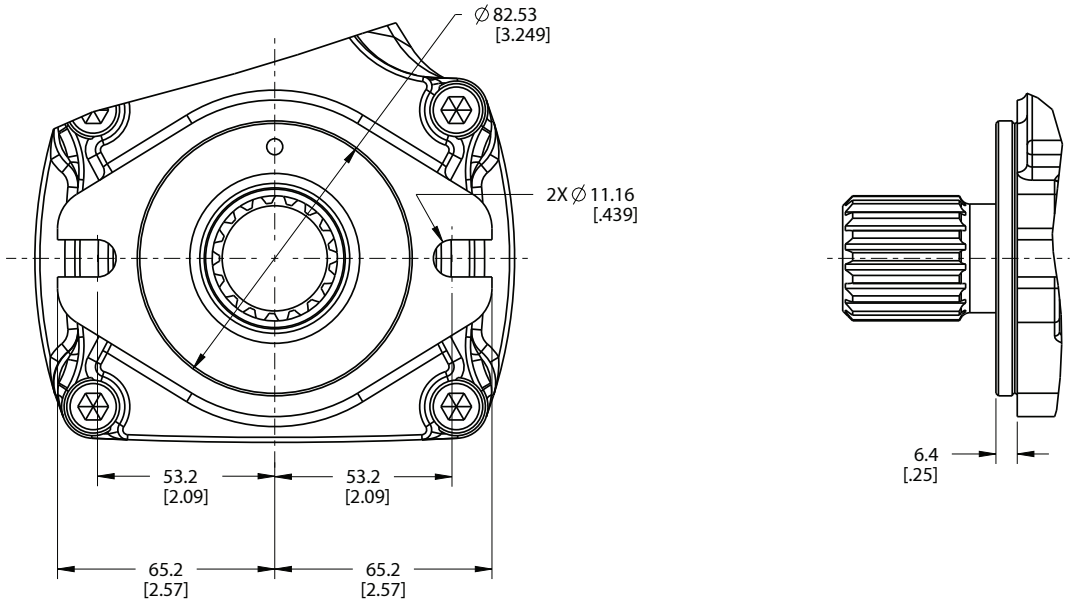


SAE "B" Adaptor Flange

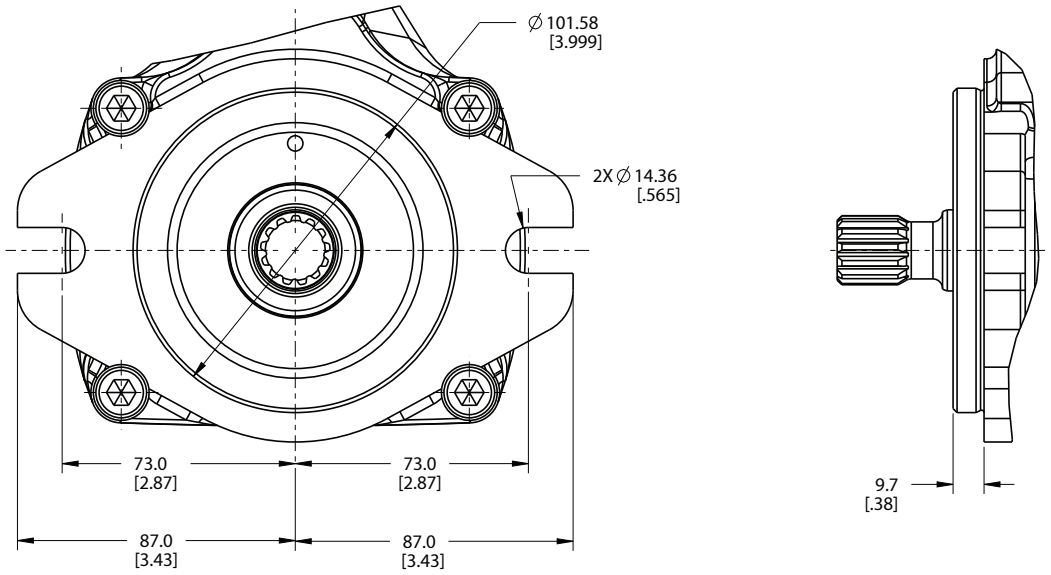


Mounting Flange Options

A - SAE J744-82-2 (A 2-BOLT)

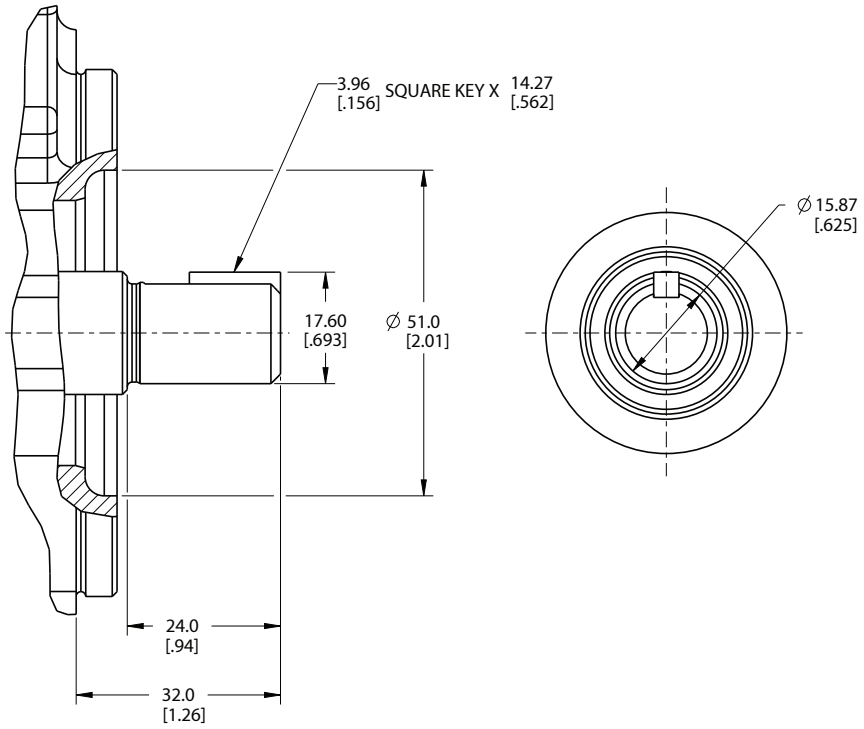


C - SAE J744-101-2 (B 2-BOLT)

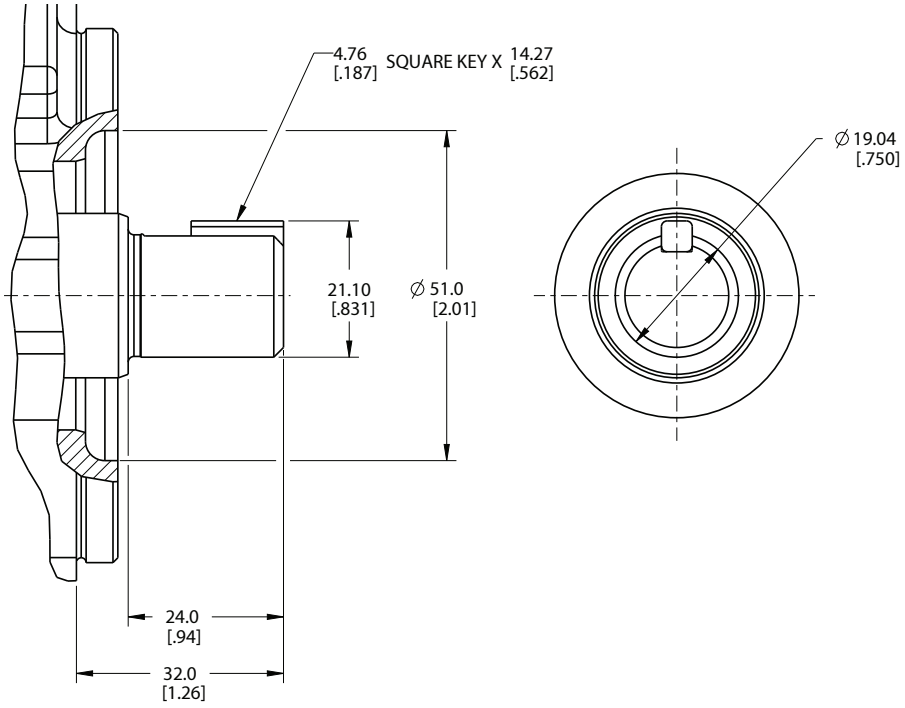


Shaft Options

01 - SAE J744-16-1, SAE A, STRAIGHT KEYED

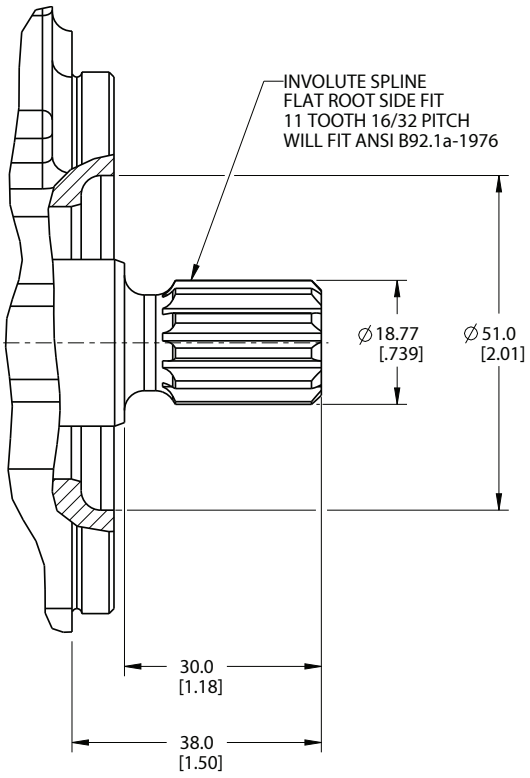


02 - SAE J744-19-1, SAE 19-1, STRAIGHT KEYED

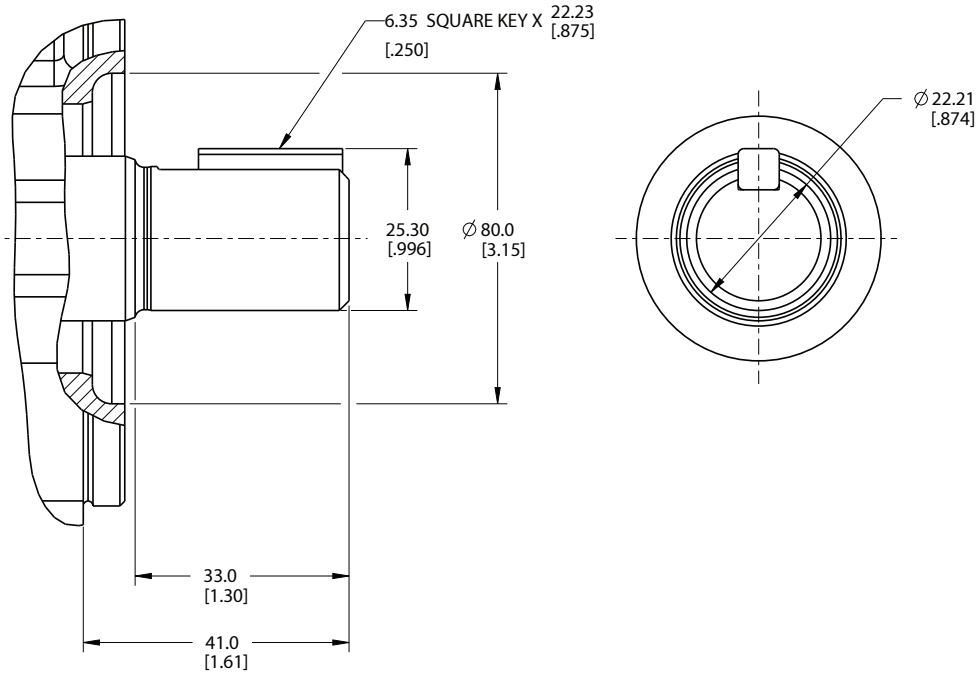


Shaft Options

04 - SAE J744-19-4, SAE A, 11T SPLINE

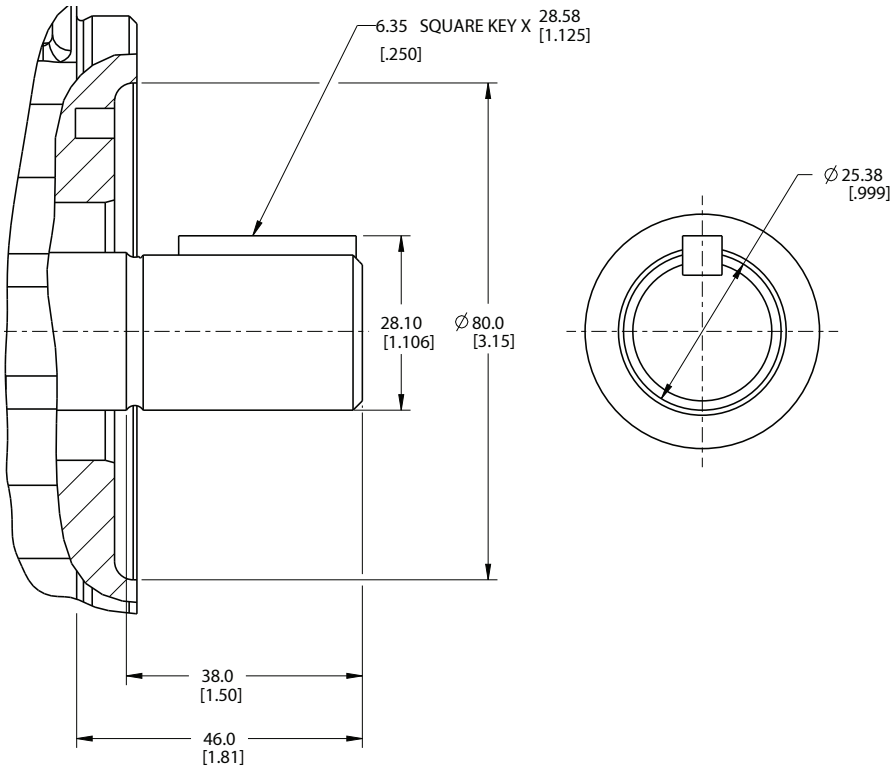


05 - SAE J744-22-1, SAE B, STRAIGHT KEYED

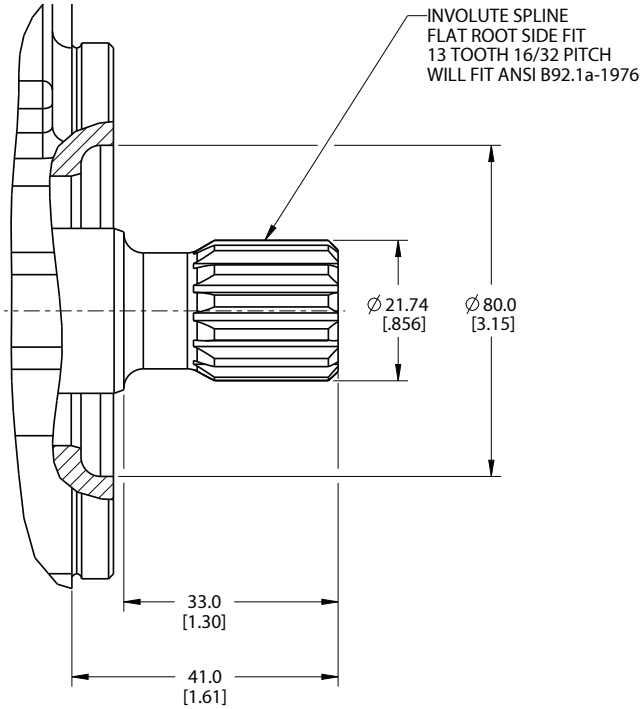


Shaft Options

06 - SAE J744-25-1, SAE B-B, STRAIGHT KEYED

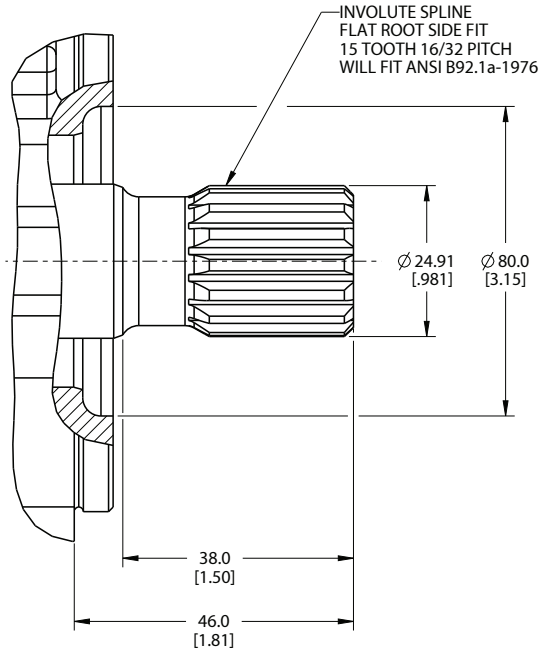


07 - SAE J744-22-4, SAE B, 13T SPLINE



Shaft Options

08 - SAE J744-25-4, SAE B-B, 15T SPLINE



Input Shaft Selection Data

SAE Splined Shafts

Model Series	Shaft Designation	Shaft Code	Max. Input Torque† Nm (lb. in.)	Max. Thru-drive Output Torque‡ Nm (lb. in.)
PVM018/020	SAE J744-16-4 (SAE "A," 9T)	03	58 (513)	Exceeds maximum input torque
	SAE J744-19-4 (SAE "A," 11T)	04	123 (1100)	Exceeds maximum input torque
	SAE J744-22-4 (SAE "B," 13T)	07	208 (1850)	123 (1100)
	SAE J744-25-4 (SAE "B-B," 15T) 0	8	337 (2987)	123 (1100)

SAE Keyed Shafts

Model Series	Shaft Designation	Shaft Code	Max. Input Torque† Nm (lb. in.)	Max. Thru-drive Output Torque‡ Nm (lb. in.)
PVM018/020	SAE J744-16-1 (SAE "A")	01	58 (513)	Exceeds maximum input torque
	SAE J744-19-1 (SAE "19-1")	02	104 (920)	Exceeds maximum input torque
	SAE J744-22-1 (SAE "B")	05	135 (1200)	123 (1100)
	SAE J744-25-1 (SAE "B-B")	06	215 (1900)	123 (1100)

†Maximum total torque of the thru-drive pump and the thru-driven pump(s).

‡Maximum torque that can be applied to the thru-driven pump(s).

*This value is limited by the maximum input torque.

Port Options

Inlet and Outlet Ports

Model Series	Inlet/Outlet Port Option (per model code, page 5)	Port Code	Inlet Port "B"	Outlet Port "C"
PVM018/020	Inch Flange	02	SAE J518 Code 61, standard pressure. 1.25 inch diameter, .4375-14 x 1.12 bolt holes	SAE J518 Code 61, standard pressure. 0.75 inches diameter, .375-16 x .88 bolt holes
	Inch Tube	01	SAE J514 O-ring –20, for 1-1/4 inch O.D. tube	SAE J514 O-ring -12, for 3/4 inch O.D. tube

Drain, Load Sensing, and Gauge Ports

Model Series	Inlet/Outlet Port Option (per model code, page 5)	Port Code	Drain Port "F"	Load Sensing Port "J"	Gauge Port "K"
PVM018/020	Inch Flange or Tube	01, 03	SAE J514 O-ring, .50" O.D. tube. .750-16 UNF 2B thread	SAE J514 O-ring, .25" O.D. tube. .4375-20 UNF 2B thread	SAE J514 O-ring, .25" tube. .4375-20 UNF 2B thread

Operating Requirements

Inlet Pressure, Case Pressure, and Operating Temperature Requirements

Inlet Pressure			Case Pressure			Operating Temperature	
Rated Absolute bar (psi)	Minimum bar, absolute (in. Hg)	Maximum Gauge bar (psi)	Maximum Continuous bar (psi)	Maximum Intermittent bar (psi)	Peak bar (psi)	Rated °C (°F)	Maximum Intermittent °C (°F)
1,0 (14.5)	0,85 (5)	3,5 (50)	0,5 (7)	2 (30)	3,5 (50)	82 (180)	104 (220)

Hydraulic Fluids

Fluid	Recommended Operating Viscosity Range cSt (SUS)	Maximum Viscosity at Startup cSt (SUS)	Minimum Viscosity @ Max. Intermittent Temperature of 104°C (220°F) cSt (SUS)
Use antiwear hydraulic oil, or automotive type crankcase oil (designations SC, SD, SE, or SF) per SAE J183 FEB80	16 to 40 (83 to 187)	1000 (4550)	10 (90)

For more information, see Danfoss publication 579. For operation on other alternative or environmentally friendly fluids, please contact your Danfoss Representative.

Bearing life at 50° C (120° F), SAE 10W oil, 1 bar abs (0 psig) inlet pressure

Model Series	$Pressure_{rated}$ bar (psi)	$Speed_{rated}$ rpm	$Flow_{rated}$ lpm (gpm)	Bearing $life_{rated}$ L10 hours
018	315 (4568)	1800	31 (8.2)	22000
045	315 (4568)	1800	76 (20)	12500
057	315 (4568)	1800	102 (27)	9100
074	315 (4568)	1800	127 (33.5)	9000
098	315 (4568)	1800	170 (45)	11000
131	315 (4568)	1800	215 (57)	14000

Bearing life can be modified for flow, speed and pressure using the formula:

$$L_{adjusted} = life_{rated}\, x \left(\frac{Pressure_{rated}}{Pressure_{adjusted}}\right)^{3.33} \left(\frac{Speed^{rated}}{Speed_{adjusted}}\right) x \left(\frac{Flow_{rated}}{Flow_{adjusted}}\right)^{3.33}$$

Example: PVM131 operating at 1200 rpm, at 230 bar, and 200 lpm

From the chart, find that the rated life is 14000 L10 hours, the rated pressure is 315 bar, the rated flow is 215 lpm and the rated speed is 1800 rpm. Using the formula provided, the new bearing life expectation is calculated as follows:

$$L_{adjusted} = 14000x \quad \left(\frac{315}{230}\right)^{3.33} \quad \left(\frac{1800}{1200}\right) \quad \left(\frac{215}{200}\right)^{3.33}$$

$$L_{adjusted} = 14000x2.85x1.5x1.27$$

$$L_{adjusted} = 76010 \text{ L10 hours}$$

Further modification to bearing life are possible, including de-rating due to special fluids. Generally, standard water-glycol fluids reduce rated bearing life to 20% And case flushing is required. Please contact Danfoss engineering for assistance.

Fluid Cleanliness

The M Series pumps are rated in anti-wear petroleum fluids with a contamination level of 20/18/13 (Danfoss) or ISO 18/13. Operation in fluids with levels more contaminated than this is not recommended. Fluids other than petroleum, severe service cycles, or temperature extremes are cause for adjustment of these codes. Please contact your Danfoss Representative for specific duty cycle recommendation.

Vickers by Danfoss M Series pumps, as with any variable displacement piston pumps, will operate with apparent satisfaction in fluids up to the rating specified here. Experience has shown, however, that pump and hydraulic system life is not optimized with high fluid contamination levels (high ISO cleanliness codes).

Proper fluid condition is essential for long and satisfactory life of hydraulic components and systems. Hydraulic fluid must have the correct balance of cleanliness, materials, and additives for protection against wear of components, elevated viscosity and inclusion of air.

Moment of Inertia (single pump rotating group)

Model	Moment of Inertia	
	N-m (sec^2)	lbf-in (sec^2)
PVM018	0.0012	0.0104
PVM020	0.0012	0.0104

Alternate Fluids Guide

Quiet version, optimized for 1000-1800 rpm (E) and Higher speed version (M)

Specifications and Performance

	Fluid Type / Model Series	Petroleum Base	Petroleum Base	Motor Oil	Universal	Automatic	Mil Spec Fluids	Environmentally Acceptable Fluids		Fire Resistant Fluids					Specialty Fluids	Food Grade Fluid
		ZDDP	Zinc Free		Tractor	Transmission Fluid		Vegetable Base	Synthetic Base	Synthetic Base			Water Containing		Cutting Fluids	H1 - approved
		AW (HM)	AW (HM)		UTTO	ATF		HETG	HEES	Phosphate ester HFDR	Polyester - HFDU	Polyether polyol - HFDU	Water Glycol - HFC	Invert Emulsion - HFB		
1	**Model series Quiet version "E" @ 1800 RPM Unless Noted**															
	PVM 18	4060 PSI	NR	3625 PSI **	3625 PSI **	3625 PSI **	NR	3625 PSI **	3625 PSI 1800 RPM	3300 PSI **	3300 PSI **	NR	2500 PSI **	2250 PSI **	NR	3625 PSI **
	PVM 20	3335 PSI	NR	3250 PSI **	3250 PSI **	3250 PSI **	NR	3250 PSI **	3250 PSI 1800 RPM	3000 PSI **	3000 PSI **	NR	2250 PSI **	2000 PSI **	NR	3250 PSI **
2	**Model Series Higher Speed Version (M)**															
	PVM 18	4060 PSI 2800 RPM	NR	3625 PSI ** 2800 RPM	3625 PSI ** 2800 RPM	3625 PSI ** 2800 RPM	NR	3625 PSI ** 2800 RPM	3625 PSI 1800 RPM	3300 PSI ** 1800 RPM	3300 PSI ** 1800 RPM	NR	2500 PSI ** 1800 RPM	2250 PSI ** 1800 RPM	NR	NR
	PVM 20	3335 PSI 2800 RPM	NR	3250 PSI ** 2800 RPM	3250 PSI ** 2800 RPM	3250 PSI ** 2800 RPM	NR	3250 PSI ** 2800 RPM	3250 PSI 1800 RPM	3000 PSI ** 1800 RPM	3000 PSI ** 1800 RPM	NR	2250 PSI ** 1800 RPM	2000 PSI ** 1800 RPM	NR	NR

Installation and Start-up

⚠ **Warning:** Care should be taken that mechanical and hydraulic resonances are avoided in the application of the pump. Such resonances can seriously compromise the life and/or safe operation of the pump.

Drive Data

Mounting attitude can be either horizontal or vertical, using the appropriate case drain ports to ensure that the case remains full of fluid at all times. Consult your local Danfoss Representative if a different arrangement is required.

In those cases where geometric tolerances of mounting are critical, or where specific tolerance ranges are required and not specified, consult Danfoss Engineering for specific limits.

Direction of shaft rotation, viewed from the prime mover end, must be as indicated in the model designation on the pump – either right hand (clockwise) or left hand (counterclockwise).

Direct coaxial drive through a flexible coupling is recommended. If drives imposing radial shaft loads are considered, please consult your Danfoss Representative.

Start-up Procedure

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

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

Caution: Before the pump is started, fill the case through the uppermost drain port with hydraulic fluid of the type to be used. The case drain line must be connected directly to the reservoir and must terminate below the oil level.

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 restrictions between the reservoir and the inlet to the pump, that the pump is being rotated in the proper direction, and 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 the reservoir has a sight gage, make sure the fluid is clear – not milky.

ENGINEERING
TOMORROW

VICKERS
by Danfoss

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