

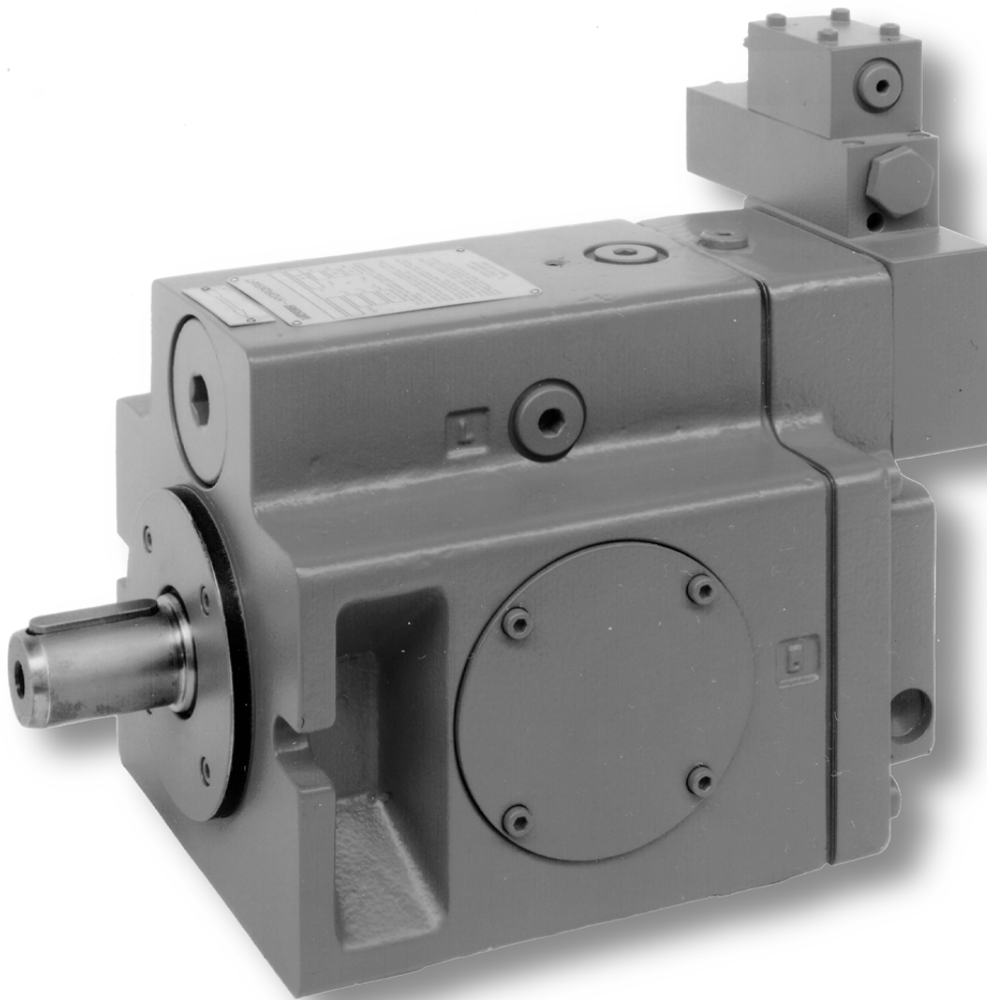
Vickers®

Piston Pumps



Fixed & variable displacement high pressure piston pumps 350 bar (5000 psi)

PF, PV – 20 Design, Open Loop Pumps
066 cm³/r (4.03 in³/r) to 250 cm³/r (15.2 in³/r)



VICKERS

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Introduction

General Description

These pumps are based on low-noise swashplate design, with a maximum yoke angle of 18° and can be applied to hydrostatic drives.

Nine pistons hydrostatically balanced by shoes bearing on the swashplate provide virtually pulsation-free flow.

A wide range of control options is available for variable displacement pumps, including mechanically, hydraulically and electrically controlled arrangements. These provide highly efficient system control.

Thru-drive options facilitate the mounting of controls, boost or other auxiliary pumps. In addition, the thru-drive is of such robust design that a second pump unit of the same size can be mounted, thus providing a genuine tandem pump arrangement.

Features and Benefits

- A range of control options allow matching of pumps to any application.
- High efficiency from automatic pressure-balancing of cylinder block to valve plate.
- Generously sized shaft bearings for long life and thru-drive capability.
- Highly resistant to dirt because of automatic wear compensation.
- Low sound level assured by swashplate design and other proven features.
- Open-loop pumps require no boosting, as they are self-priming.

Performance

Rated pressure
350 bar (5000 psi)

Maximum geometric displacement
66/90/130/180/250 cm³/r
(4.03/5.50/7.93/10.98/15.2 in³/r)

Maximum speed
1800 r/min

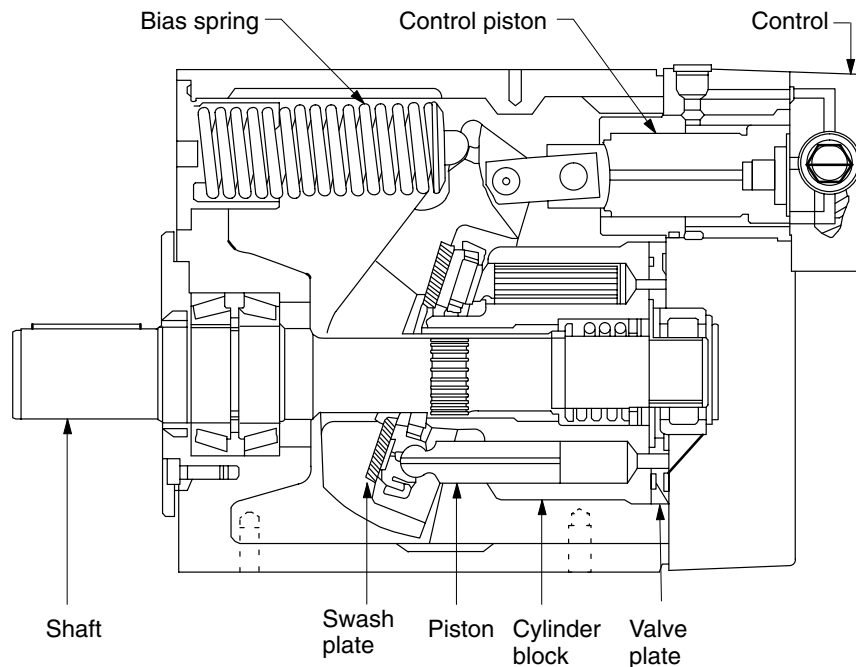
Application

PF Fixed single pump

PV Variable single pump

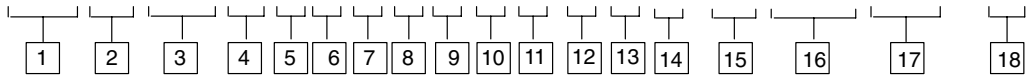
This catalog contains open loop pumps.

Typical section, pressure compensated pump



Model Codes

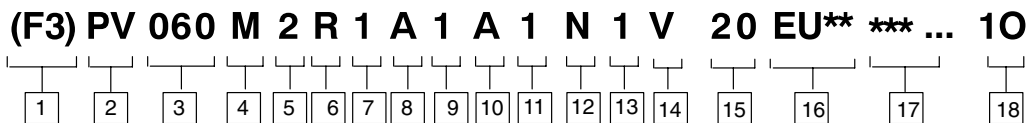
(F3) PV 060 M 2 R 1 A 1 A 1 N 1 V 20 EU *** ... 10**



- | | | |
|---|--|--|
| <p>1 Seals
Blank – Nitrile
F3 – Viton</p> <hr/> <p>2 Type
PF – Fixed displacement
PV – Variable displacement</p> <hr/> <p>3 Displacement
066 – 66,0 cm³/r (4.03 in³/r)
090 – 90,0 cm³/r (5.50 in³/r)
130 – 130,0 cm³/r (7.93 in³/r)
180 – 180,0 cm³/r (11.0 in³/r)
250 – 250,0 cm³/r (15.2 in³/r)</p> <hr/> <p>4 Build
M – ISO Metric</p> <hr/> <p>5 Mounting Flange
2 – ISO3019/2-125A2HW 066,090
3 – ISO3019/2-160A2HW 130,180
4 – ISO3019/2-200A2HW 250</p> <hr/> <p>6 Direction of rotation
R – Clockwise (std)
L – Counterclockwise
(not available on PV250)</p> <hr/> <p>7 Displacement Adjustment Stop
<i>PV models only</i>
1 – Maximum displacement stop
2 – No displacement (std)
3 – Minimum displacement stop
4 – Maximum & minimum displacement stop</p> | <p>8 Thru drive
N – No thru drive (std)
A – SAE A with standard coupling (066,090,130,180,250)
B – SAE B with standard coupling (066,090,130,180,250)
C – SAE C with standard coupling (130,180,250)
D – ISO3019/2-100A2HW with standard coupling (066,090,130,180,250)
E – ISO3019/2-125A2HW with standard coupling (066,090,130,180,250)
P – Pilot pump 8cc/r (066,090,130,180,250)</p> <hr/> <p>9 Main Port Options
1 – SAE ports, Metric bolt holes</p> <hr/> <p>10 Main Port Location
A – Axial – rear port (<i>PV models only</i>)
R – Radial – side port</p> <hr/> <p>11 Drive Shaft End Type
1 – ISO straight key (std)
2 – ISO spline</p> <hr/> <p>12 Drive Shaft Seal
N – No shaft seal
S – Single shaft seal (std)
D – Double shaft seal</p> | <p>13 Yoke Displacement
<i>PV models only</i>
1 – Single side of center “A”
2 – Single side of center “B”
3 – Over center</p> <hr/> <p>14 Yoke Position Indicator
<i>PV models only</i>
N – No position indicator (std)
V – Visual position indicator
P – Position potentiometer
M – Potentiometer with visual indicator</p> <hr/> <p>15 Pump Design
20</p> <hr/> <p>16 Special Suffix
EU11 – Surfaces nickle plated for Skydrol
EU17 – Surfaces unpainted
EU19 – Grey primer finish
EU20 – Paint to customer spec.
EU22 – Assemble to another unit</p> <hr/> <p>17 Controls
<i>PV models only</i>
Refer to pages 5 – 6 for control breakdown.</p> <hr/> <p>18 Control Design
<i>PV models only</i>
10</p> |
|---|--|--|

Control	Description	PV Displacements				
		066	090	130	180	250
DF	Pressure Compensated & Maximum Flow Adjuster	✓	✓	✓	✓	✓
DP	Proportional to Pilot Pressure	✓	✓	✓	✓	✓
DQ	Pressure Compensator – Over center	✓	✓	✓	–	–
ES	Displacement Control by Electric Motor	✓	✓	✓	✓	✓
LR	Constant Power Control	✓	✓	✓	✓	✓
FE	Displacement Control by Adjustment Control	✓	✓	✓	✓	✓
HG	Displacement Control by Handwheel Adjuster	✓	✓	✓	✓	✓
SM	Displacement Control by Servo Valve	✓	✓	✓	✓	✓
SP	Displacement Control by Electro-Hydraulic Proportional Valve	✓	✓	✓	✓	✓

Model Codes



17 DF Control
Pressure Compensator & Maximum Flow Adjuster

- 1 – Direct operated (std)
- 2 – Pilot operated

Maximum Flow Adjustment

- F – Screw adjuster (std)
- H – Handwheel

Compensator Pressure Setting

- 090 – Std setting 90 bar (1300 psi)
- xxx – Customer requested setting

Compensator Control

- R – Remote connection port only (std)
- F – Screw adjuster on compensator (std)
- K – Electro-proportional relief valve

Pressure Limiting Valve Operator

- 1 – No solenoid valve (std)
- 2 – Solenoid unloading valve

Solenoid Control Voltage

- N – No solenoid
- A – 110VAC50Hz
- B – 110VAC50Hz / 120 VAC60 Hz
- C – 220VAC50Hz
- D – 220VAC50Hz / 240VAC60Hz
- G – 12VDC
- H – 24VDC

Load Sensing

- 1 – No load sensing (std)
- 2 – Load sensing

Example of DF model:

DF 1 F 090 R 1 N 1 10

17 DP Control
Displacement Control Proportional to pilot pressure

Power Control

- N – No power control
- 1 – Mounting interface only (std)
- 2 – Pilot relief & remote port
- 3 – Pilot relief, remote port & proportional relief (1-S/S)
- 4 – Pilot relief, remote port & proportional relief (2-S/S)

Power Control

- N – No power control

Pressure Limiter

- 1 – Without pressure limiter (std)
- 2 – With pressure limiter

Pressure Limiting Valve Operation

- A – Single side of center (std)
- B – Over center

Solenoid Control Voltage

- N – No solenoid
- A – 110VAC50Hz
- B – 110VAC50Hz / 120 VAC60 Hz
- C – 220VAC50Hz
- D – 220VAC50Hz / 240VAC60Hz
- G – 12VDC
- H – 24VDC

Example of DP model:

DP 1 N 1 A N 10

17 DQ Control
Pressure Compensator Over Center

- A – Mounted on control
- B – Remote connection only (std)

Method of Operation

- 1 – Direct operated (std)
- 2 – Pilot operated

Solenoid Unloading Valve

- N – No solenoid unloading valve (std)
- V – Solenoid unloading valve

Compensator Pressure Setting

- 090 – Std setting 90 bar (1300 psi)
- xxx – Customer requested setting

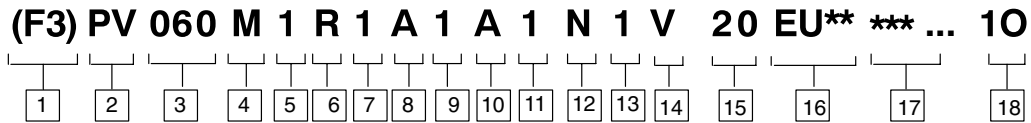
Solenoid Control Voltage

- N – No solenoid
- A – 110VAC50Hz
- B – 110VAC50Hz / 120 VAC60 Hz
- C – 220VAC50Hz
- D – 220VAC50Hz / 240VAC60Hz
- G – 12VDC
- H – 24VDC

Example of DQ model:

DQ B 1 N 090 N 10

Model Codes



17 ES Control

Displacement Control by Electric Motor

Response time

- 8 – Seconds with 50 HZ motor (std)
- 20 – Seconds with 50 HZ motor (std)
- 40 – Seconds with 50 HZ motor

Position Monitoring

- A – 4 limit switches (std)
- B – 8 limit switches
- P – 4 limit switches & Potentiometer
- P – 8 limit switches & Potentiometer

Motor Type

- 1 – Std motor with brake IP44 (std)
- 2 – Std motor with brake IP65
- 3 – Motor without brake – hazardous locations

Electric Motor Voltage

- E – 230 / 400 V, 50 Hz 270 / 460 V – 3 Phase (std)
- U – 220 V, 50 Hz 1 Phase
- V – 220 V, 60 Hz 1 Phase

Example of ES model:

ES 8 A 1 E 10

17 HG Control

Displacement Control by Handwheel Adjuster

Example of HG model:

HG 10

17 LR Control

Constant Power Control

*** – Specify kW @ 1500 rpm (011–350)

Pressure Limiter

- N – No pressure limiter (std)
- F – Pressure limiting, screw adjuster
- K – Pressure limiting, elec. prop. valve

Load Sensing

- 1 – No load sensing (std)
- 2 – Load sensing

Example of LR model:

LR 011 N 1 10

17 SM Control

Displacement Control by Servo Valve

Power control

- N – No power control

Pressure Limiter

- 1 – Without pressure limiter (std)
- 2 – With pressure limiter

Pressure Limiter Valve Operation

- A – Single side of center

Pilot Oil Filter

- V – Filter with visual indicator (std)
- E – Filter with electrical indicator

Example of SM model:

SM N 1 A V 10

17 FE Control

Displacement Control by Adjustment Screw

Example of FE model:

FE 10

17 SP Control

Displacement Control by Electro-hydraulic Proportional Valve

- E – Internal pilot supply

Proportional Valve

- 1 – Mounting interface only (std)
- 2 – With proportional valve

Pilot Oil Filter

- N – Without filter (std)
- V – Filter with visual dirt indicator
- E – Filter with electrical dirt indicator

Fail Safe Solenoid Valve

- 1 – Without fail safe valve (std)
- 2 – With fail safe valve

Constant Power Valve

- N – No power control (std)
- A – With adjustable power control

Pressure Limiter

- 1 – Without pressure limiter (std)
- 2 – With pressure limiter

Solenoid Control Voltage

- N – No solenoid
- A – 110VAC50Hz
- B – 110VAC50Hz / 120 VAC60 Hz
- C – 220VAC50Hz
- D – 220VAC50Hz / 240VAC60Hz
- G – 12VDC
- H – 24VDC

Example of SP model:

SP E 1 N 1 N 1 N 10

Pump Specifications

General

Model			PF/PV 066	PF/PV 090	PF/PV 130	PF/PV 180	PF/PV 250
Design			Swash plate – Axial piston pump				
Type of mounting			Flange or foot-mounted, tandem version foot-mounting only				
Pipe connection SAE flange	B A	psi	1 1/2" - 3000 1" - 6000	2" - 3000 1" - 6000	2 1/2" - 3000 1" - 6000	2 1/2" - 3000 1 1/4" - 6000	3 1/2" - 500 1 1/4" - 6000
Direction of rotation			Clockwise when viewing shaft end of pump. Counterclockwise available on request.				
Speed range	n _{min}	r/min	150				
	n _{max}		1800				
Installation position			Optional, see mounting information				
Ambient temperature range	min max	°C (°F)	-20 (25) +50 (250)				
Weight	m ³)	kg (lbs.)	55 (121)	75 (165)	106 (234)	114 (251)	212 (467)

Hydraulic characteristics

Nominal pressure (100% duty cycle)	p _N	bar (psi)	350 (5000)				
Input pressure	p _{1min} P _{1min}	bar	0.85 abs 50				1 abs 50
Maximum pressure to DIN 24312	p _{2max}	bar (psi)	420 (6090)				
Hydraulic fluid			Hydraulic oil to DIN 51524 part 2, other fluids on request.				
Hydraulic fluid temperature range	min max	°C (°F)	-25 (7) (on startup) + 90 (380)				
Viscosity range for continuous operation	min max	cSt	10 75				
Max permissible start viscosity	v _{max}	cSt	1000				
Filtering			18/15/13				
Max geom. pump capacity n=1500 r/min n=1800 r/min	V _g	cm ³ (in ³)	66 (4.1)	90 (5.5)	130 (7.9)	180 (11.0)	250 (15)
Max geom. pump flow n=1500 r/min n=1800 r/min	Q _g	l/min (USgpm)	99 (26) 118 (32)	135 (36) 162 (43)	195 (52) 234 (62)	270 (71) 324 (86)	375 (99) 450 (119)
Case pressure	p _{v max}	bar	max. 0.5 bar (7.2 psi) over p ₁ , // p _{v max} = 4 bar abs				

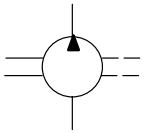
Drive

Maximum driving torque (p ₂ max., η = 100%)	M ₁	Nm(lb.ft)	440 (325)	600 (443)	868 (640)	1202 (887)	1685 (1243)
Maximum power consumption (p ₂ max. n=1500 rpm, η = 100%)	P ₁	kW (hp)	69 (93)	94 (126)	136 (182)	189 (254)	265 (355)

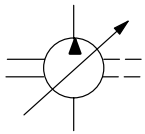
Functional Symbols

Basic Pumps

PF
Fixed displacement
single pump
(shown with
thru-drive option)



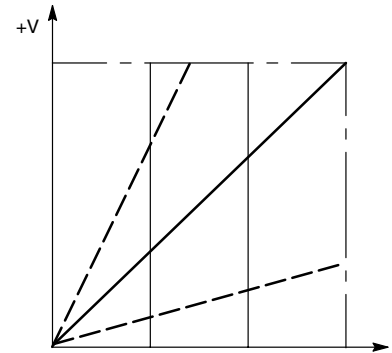
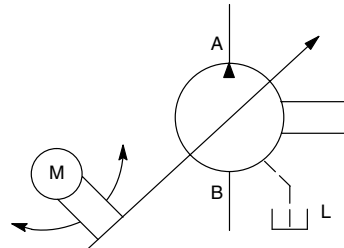
PV
Open-loop variable
displacement single
pump (shown with
thru-drive option)



Control options for variable displacement pumps

Electrical controls

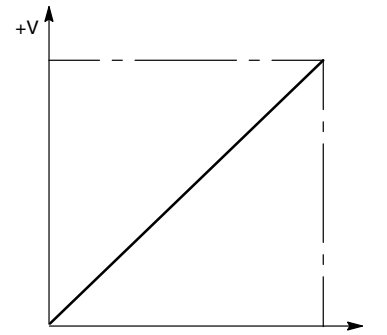
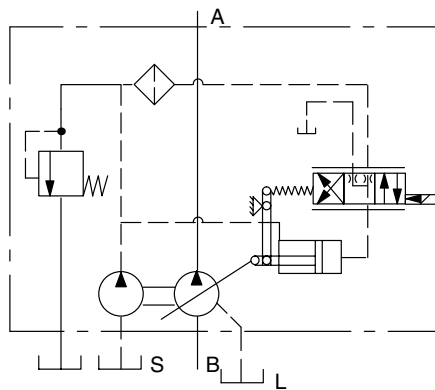
Type ES electric motor displacement control



Response time from 0 to +V
maximum displacement

Type SM servo control with feedback

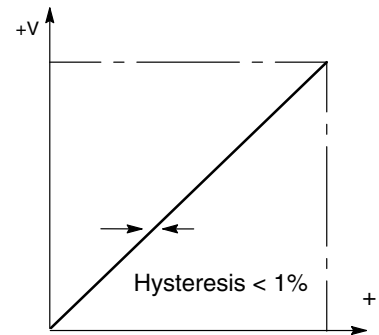
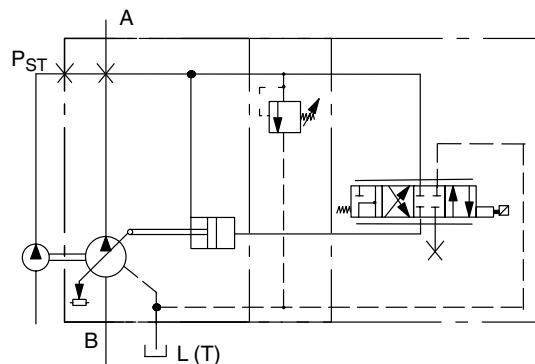
For applications needing moderately fast response.



0 to + U_E (I_E)
electric command signal

Type SP servo control with feedback (piloted by proportional directional valve)

For applications needing very fast response.
Optional extra. Superimposed constant power control.

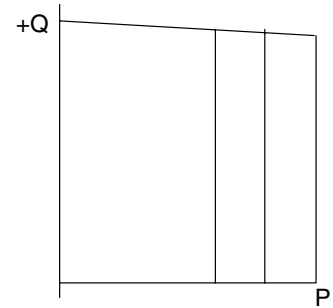
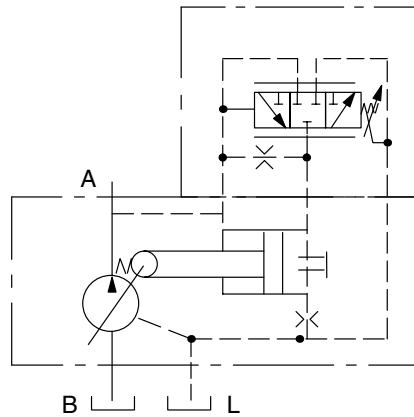


0 to + U_E (I_E)
electric command signal

Hydraulic controls

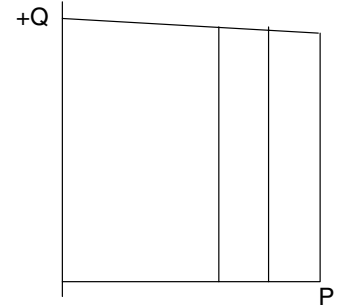
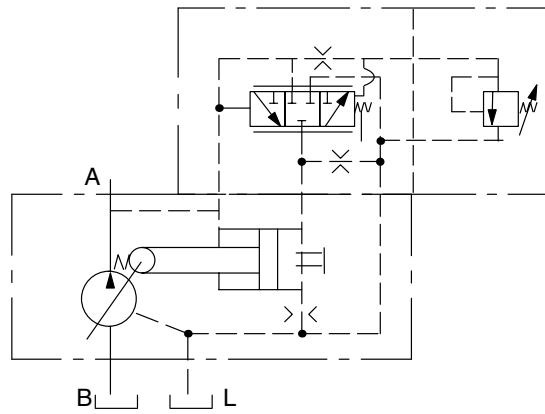
Type DF1:

Single-side-of-center pressure compensators



Type DF2:

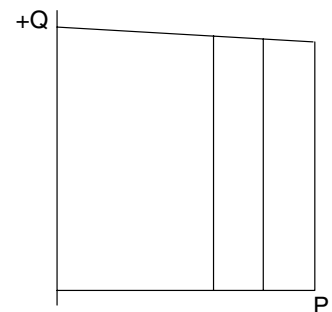
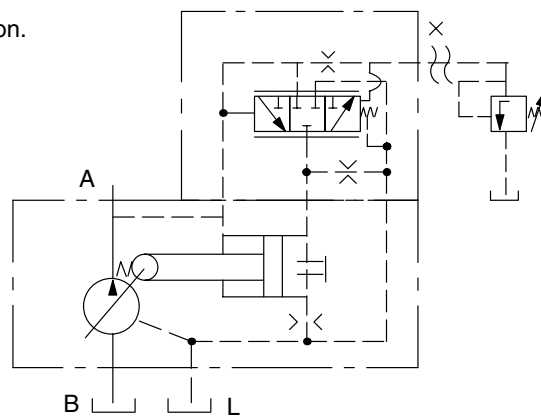
Pilot operated, manually adjustable. Recommended for systems having large pressurized volumes.



Type DF2*K▲** Same as DF2, but piloted by an electro-proportional relief valve instead of a manually adjustable valve

Type DF2*R▲** Same as DF2, but manually adjustable relief valve supplied loose for remote installation.

▲ Pressure compensators with electrically controlled venting option.



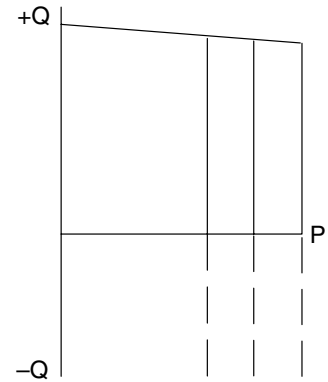
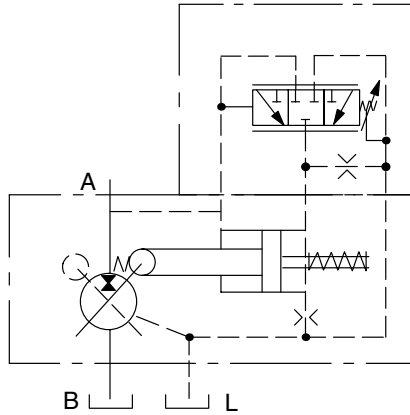
Functional Symbols

Type DQ:

Series overcenter (“mooring” control) pressure compensators, 2 quadrants. For counterbalanced systems or for mooring applications where reverse flow from the system can drive the pump in reverse, (negative pump angle) such as a hydraulic motor.

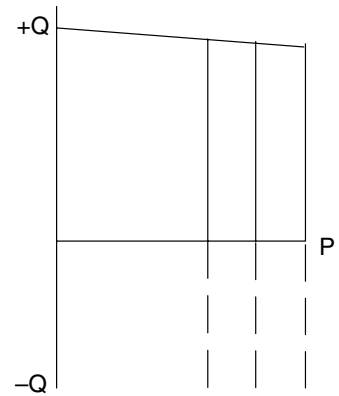
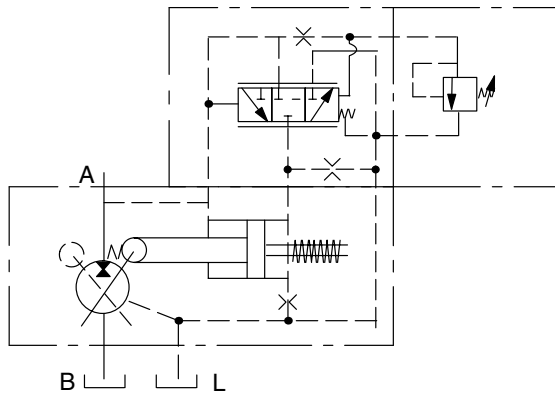
Type DQA-1:

Direct operated, manual pressure adjustment.



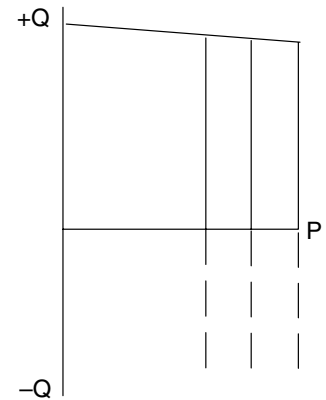
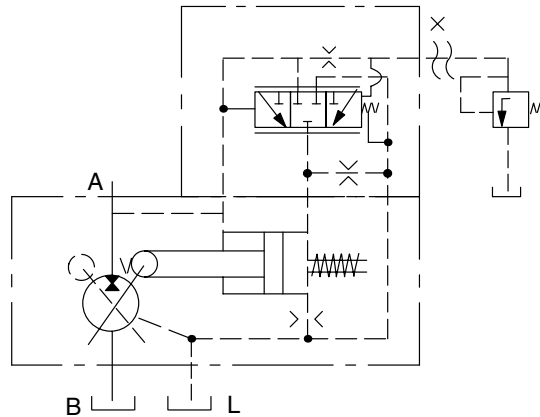
Type DQA2,

Pilot operated, manually adjustable



Type DQB2

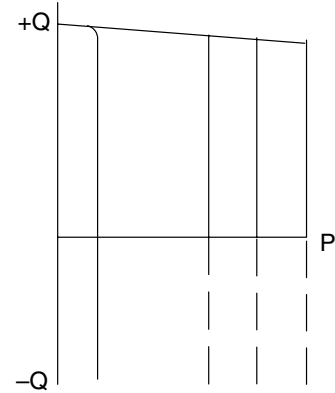
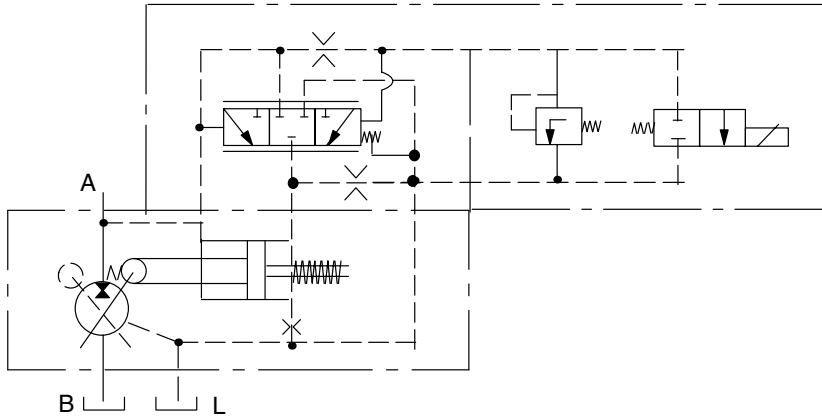
Without pilot valve (user to supply separately).



PV pump example

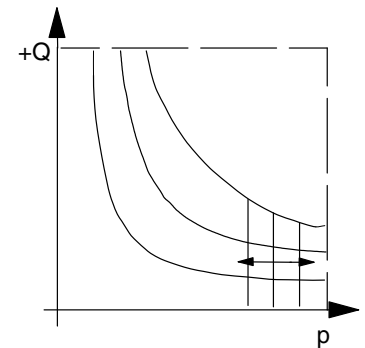
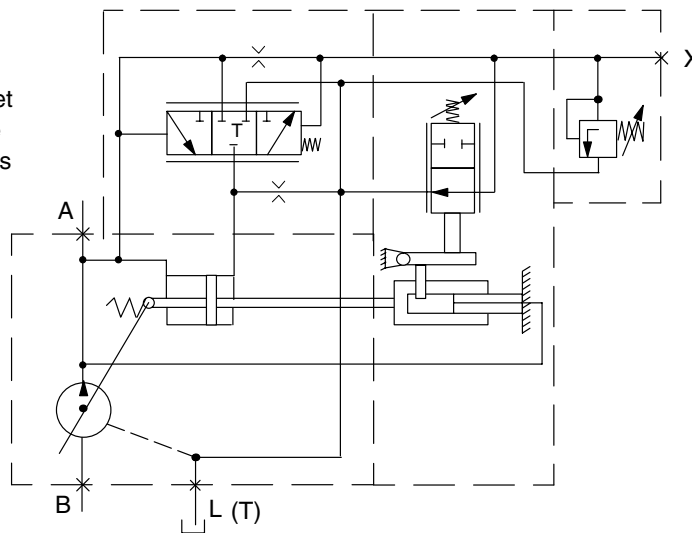
DQ-2-V

Pressure compensator
with venting valve



Type LR:
constant power control

Excellent repeatability of set
power envelopes. Override
pressure limiter available as
an option.

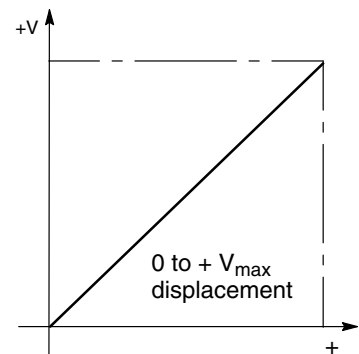
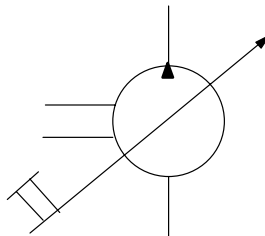


Power setting minimum: size 066/090; 11,0 kW (15 hp)
size 130/180; 18,5 kW (25 hp)
size 250; 30,0 kW (40 hp)

Manual displacement controls

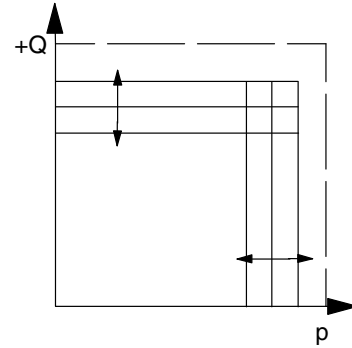
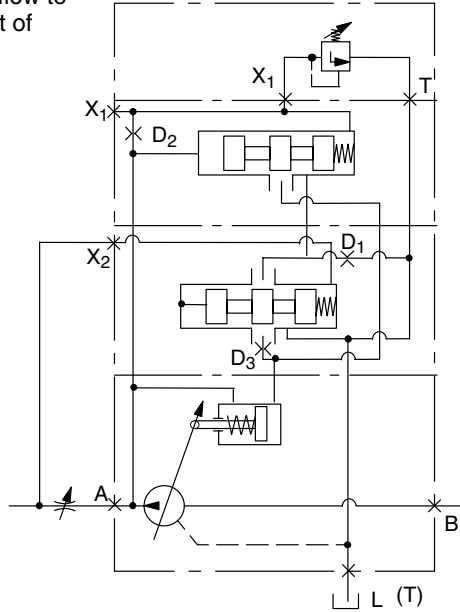
Type FE:
Screw adjustment

Type HG:
Handwheel adjustment



Type DF2-***-F-1-N-2 Compensator

The pressure compensator with flow control maintains a fixed pressure drop (standard 15 bar (218 psi)) over a throttle valve installed in the pump's output line, thereby maintaining a constant flow to the system independent of load changes.

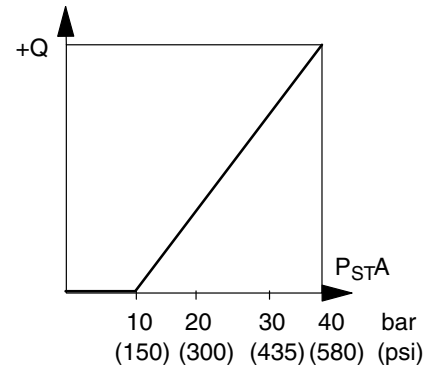
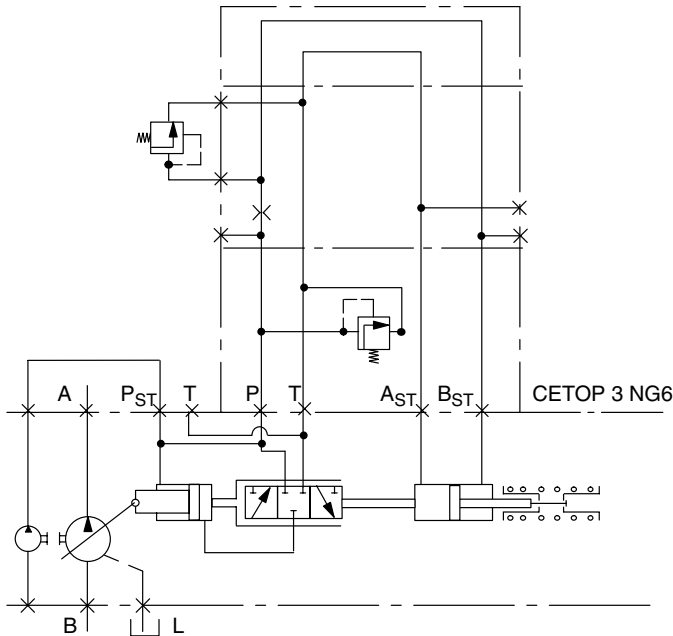


Type DP Pressure Proportional Control

The output flow of the pump is proportional to the pilot oil pressure.

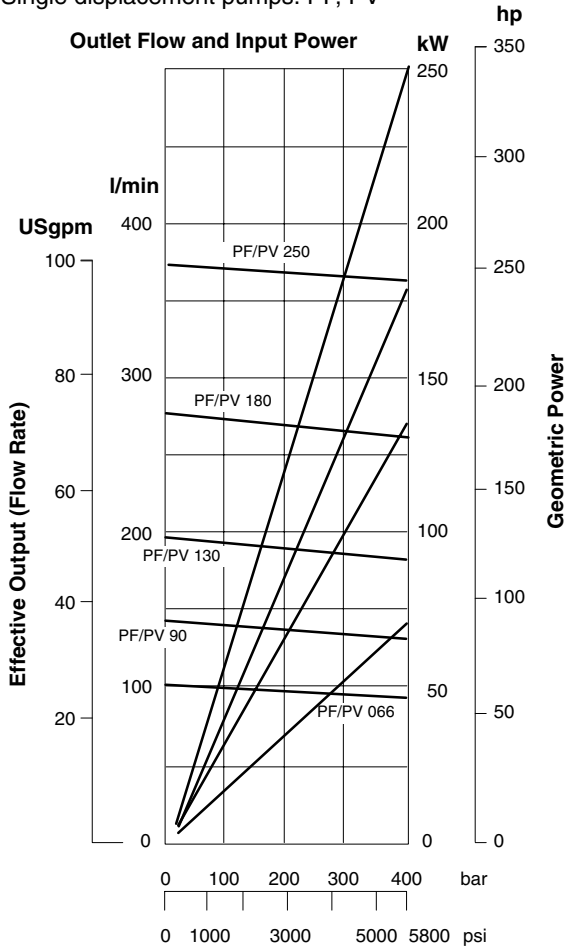
The pilot pressure is controlled by a proportional pressure relief valve.

Pressure override limiter and power valve are available as an option.

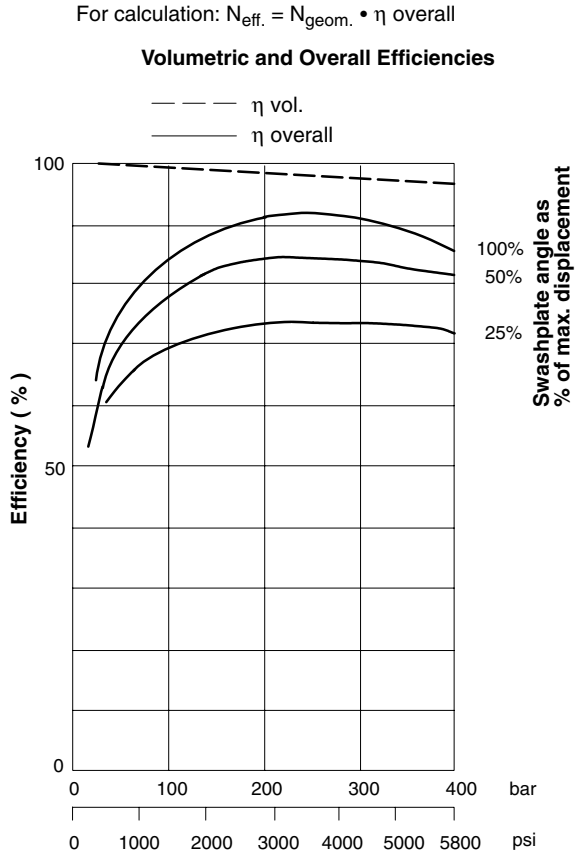


Performance Characteristics

Typical at 1500 r/min with anti-wear oil at 40 cSt (186 SUS)
Single displacement pumps: PF, PV

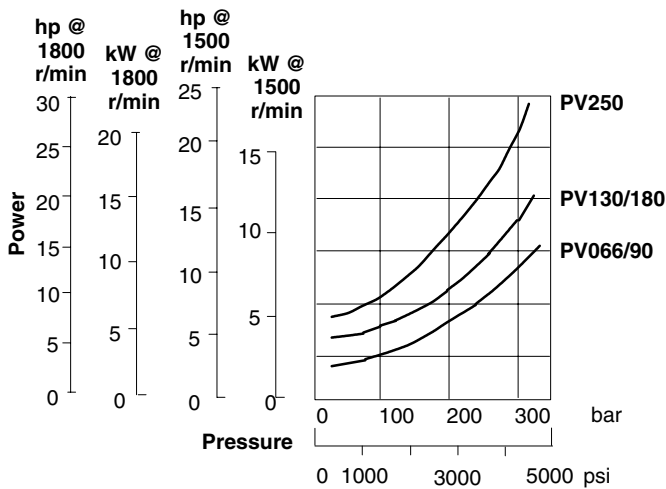


Pressure difference, outlet-inlet. Outlet flow and geometric power vs. pressure difference outlet-inlet.



Pressure difference, outlet-inlet. Volumetric and overall efficiencies vs. pressure difference outlet-inlet.

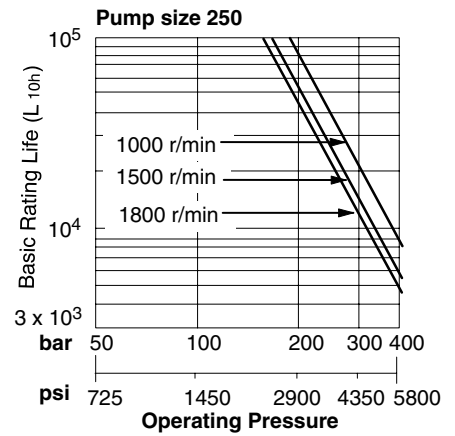
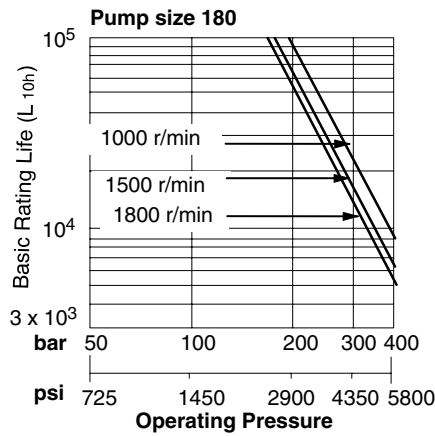
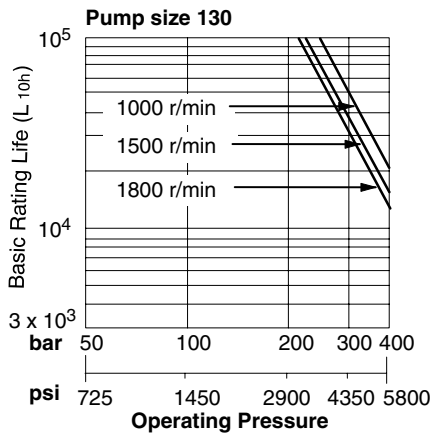
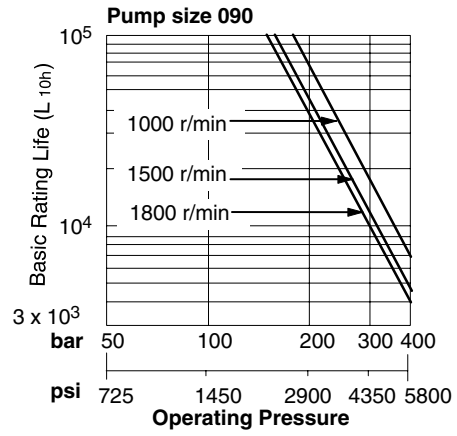
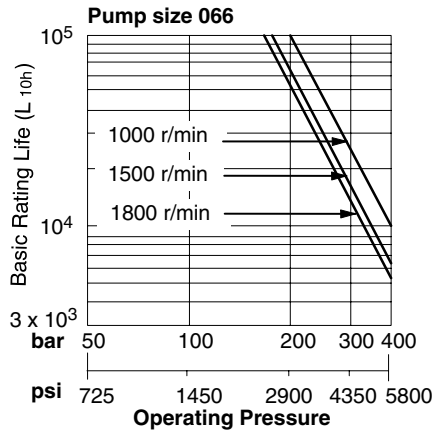
Shaft Input Power



Operating Data

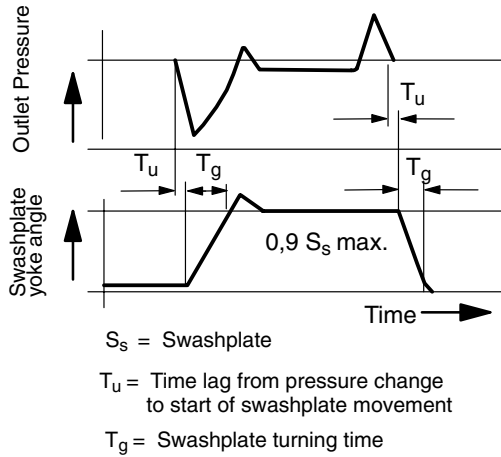
Theoretical Bearing Life

At maximum displacement and various speeds.

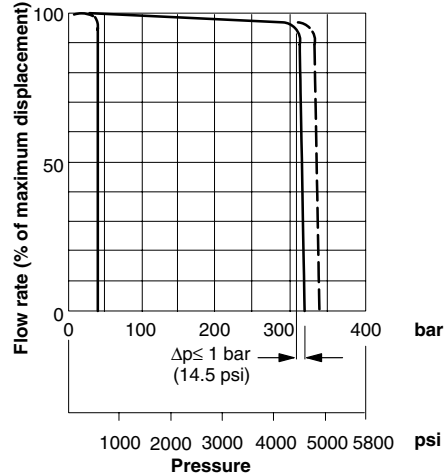


Performance characteristics of variable displacement pumps

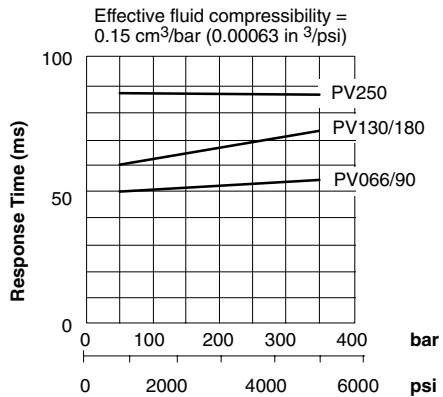
Pressure compensator response times



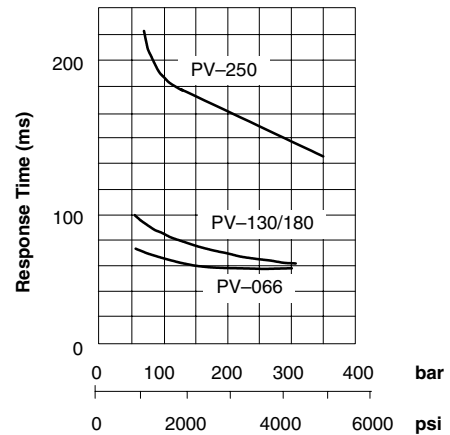
Pressure compensator



Response times from max. to zero displacement (V_{max} to V_0)

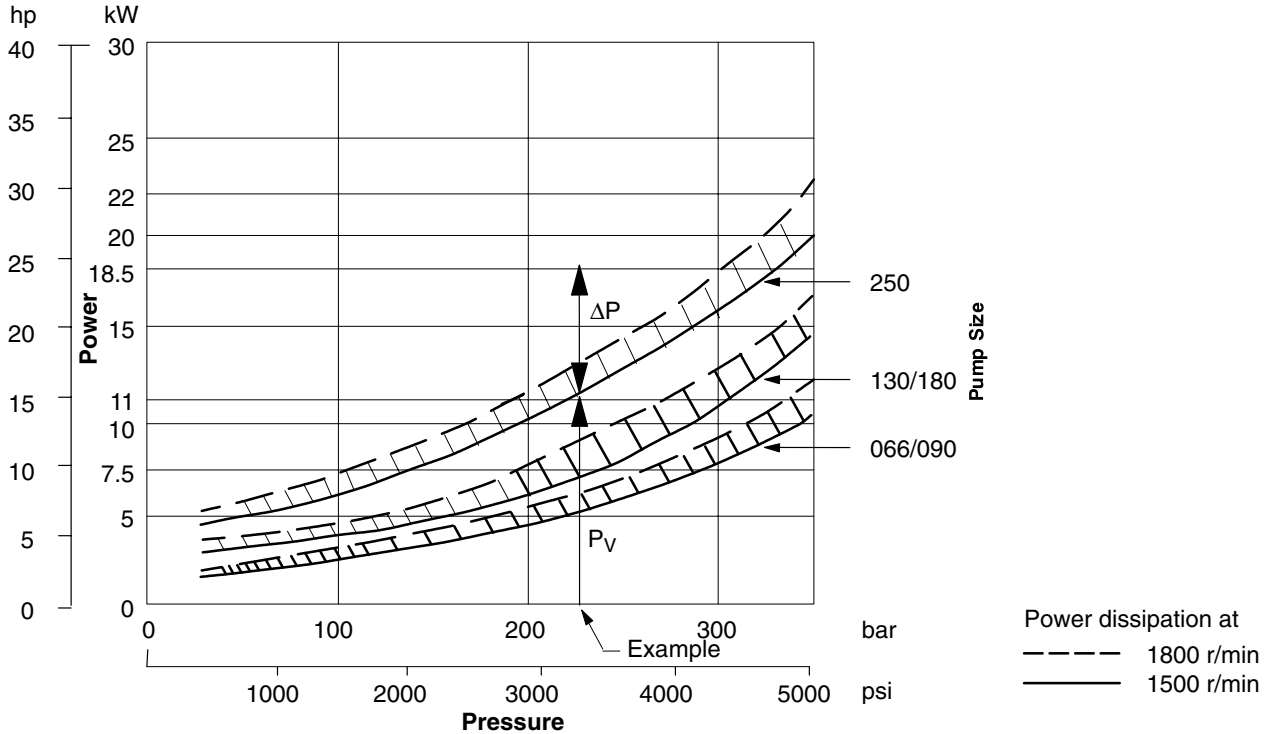


Response times from max. to zero displacement (V_0 to V_{max})



LR controls; characteristics and calculations

Power/pressure characteristics



Power dissipation at
 - - - - - 1800 r/min
 _____ 1500 r/min

Performance Calculations

Where		Metric	Non-metric
P1	= input (shaft) power	kW	hp
Pv	= power loss (see curves above)	kW	hp
ΔP	= input-output power	kW	hp
p2	= output pressure	bar	psi
Q _{eff}	= effective (output) flow	l/min	USgpm
n	= shaft speed	r/min	r/min
_____	1500 r/min		
- - - - -	1800 r/min		

The effective flow rate for a certain operation pressure (p₂) results from the difference between input power and wasted power (Δp):

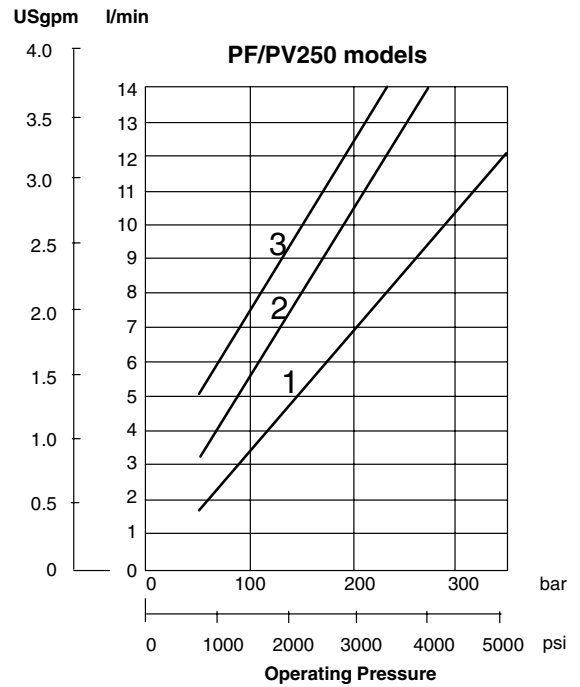
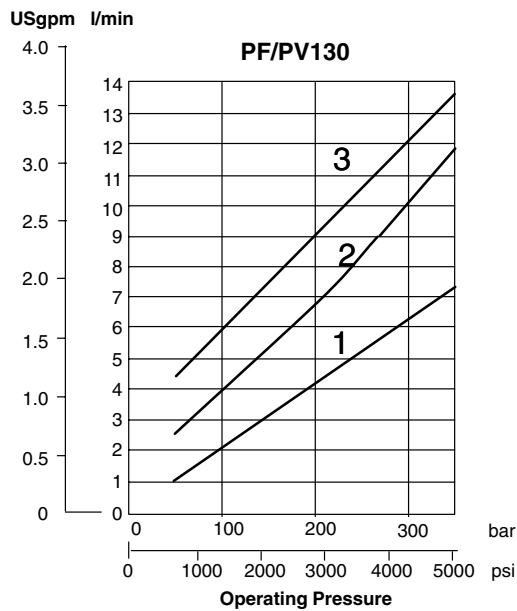
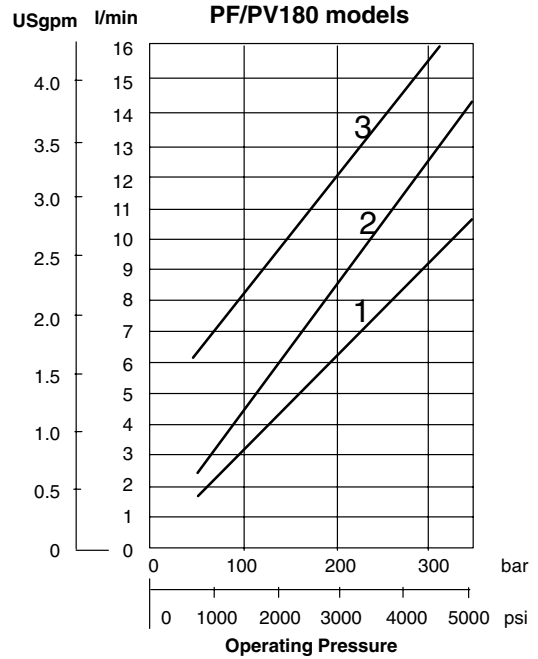
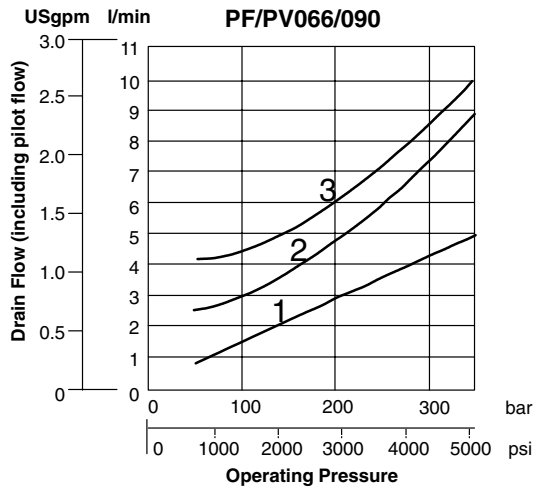
Metric	Non-metric
$Q = \frac{600 (P - \Delta P)}{p_2}$	$Q = \frac{1714 (P - \Delta P)}{p_2}$

Example:

To find Q_{eff} for P₁ = 18,5 kW (24.80 hp) at p₂ = 225 bar (3263 psi); n = 1500 r/min
 Size 250 Pv = 11 kW (14.75 hp) ▲P = 7,5 kW (10.05 hp)

$$Q_{eff} = \frac{600 \times 7,5 \text{ (kW)}}{225 \text{ (bar)}} = 20 \text{ l/min} = \frac{1714 \times 10,05 \text{ (hp)}}{3263 \text{ (psi)}} = 5.28 \text{ USgpm}$$

**Typical drain flow from an open-loop pump
based on 1500 r/min and 35 cSt 175 SUS viscosity**



1 – PF and PV models at maximum displacement (PV models with type FE, HG or ES controls i.e. no control oil flow).

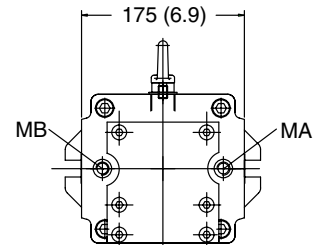
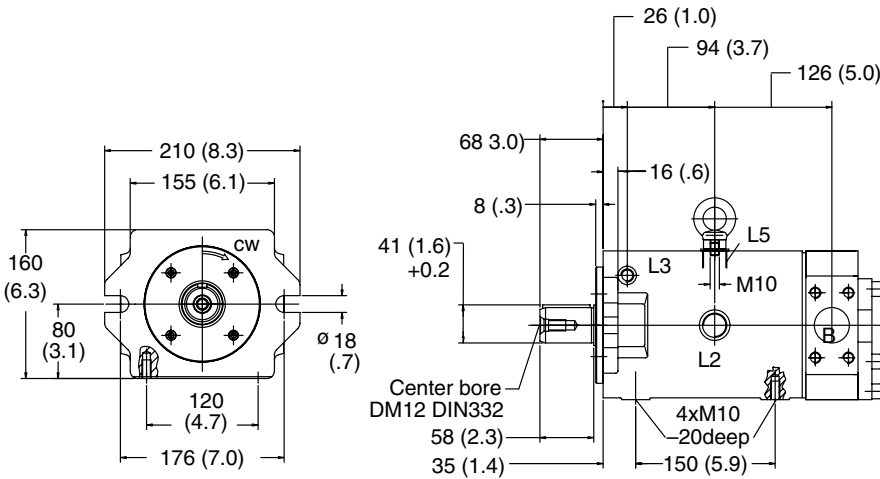
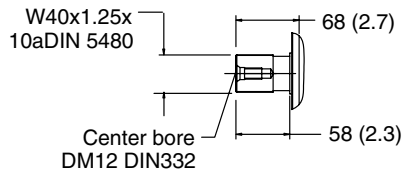
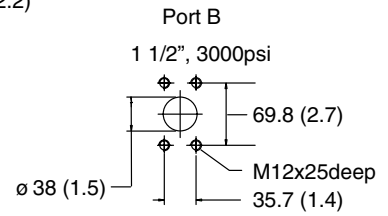
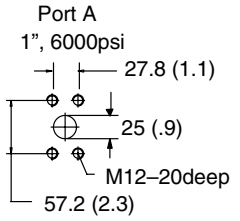
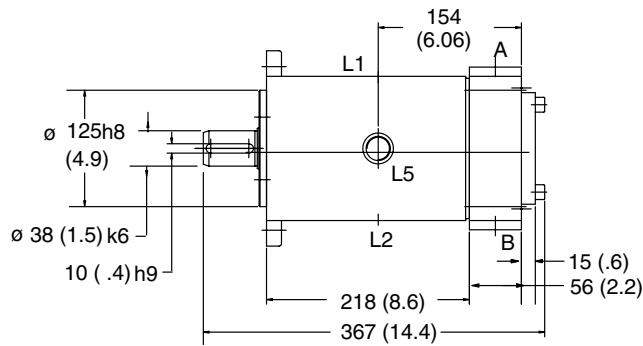
2 – PV models during compensation of pressure compensator displacement

3 – PV models during compensation displacement

Installation Dimensions

PF 066

Dimensions mm (in)

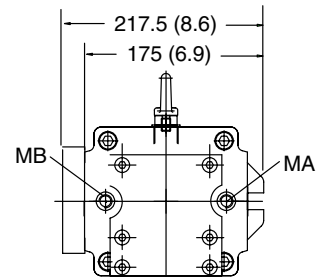
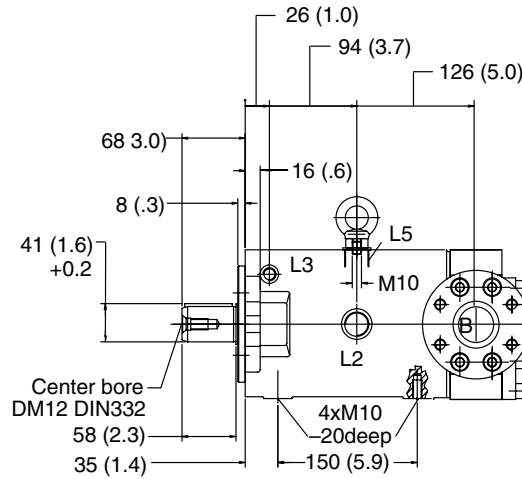
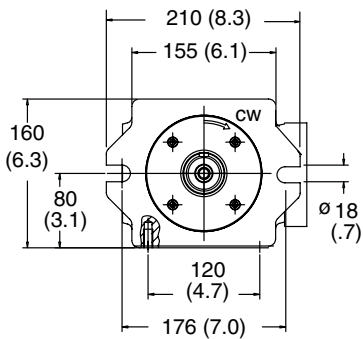
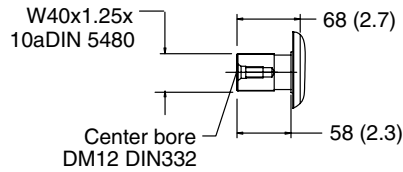
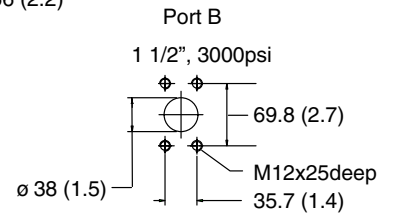
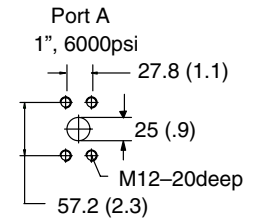
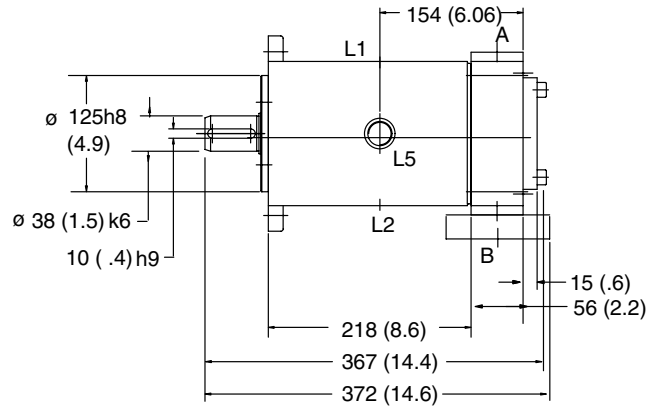


- A System pressure port SAE 1", 6000psi
- B System pressure port SAE 1 1/2", 3000psi
- (L1) Drain port 7/8-14UNF
- (L2) Ventilation port for vertical mounting M26x1.5
- (L3) Ventilation port for vertical mounting G1/4 (shaft upwards)
- (L5) Oil filling plug M26x1.5
- (MA) Gauge port system pressure G1/4
- (MB) Gauge port system pressure G1/4
- (...) normally plugged

Direction of rotation	Inlet	Output
Right hand rotation	B	A
Left hand rotation	A	B

PF 090

Dimensions mm (in)

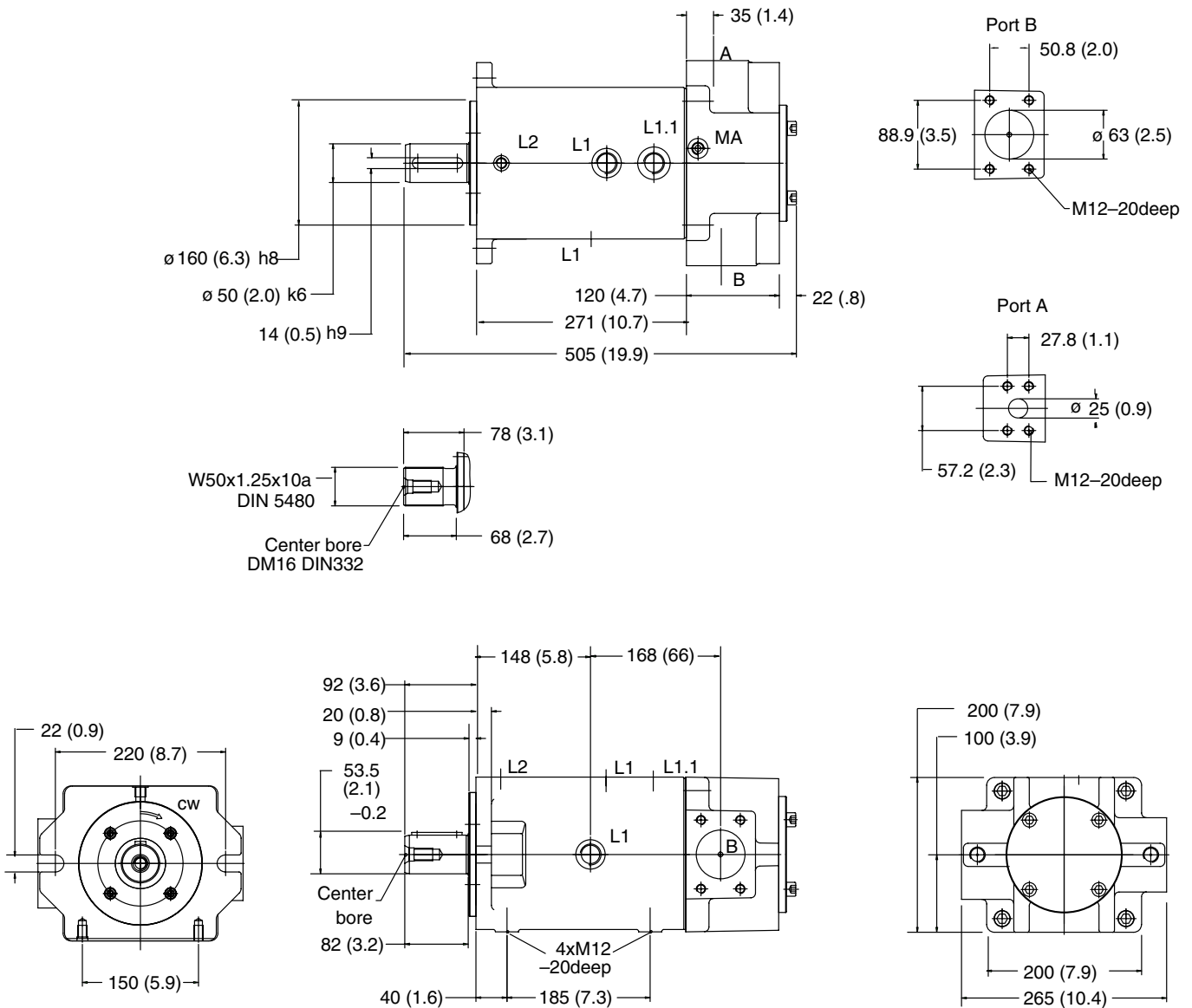


- A System pressure port SAE 1", 6000psi
- B System pressure port SAE 1 1/2", 3000psi
- (L1) Drain port 7/8-14UNF
- (L2) Ventilation port for vertical mounting M26x1.5
- (L3) Ventilation port for vertical mounting G1/4 (shaft upwards)
- (L5) normally plugged
- (MA) Oil filling plug M26x1.5
- (MB) Gauge port system pressure G1/4
- (...) normally plugged

Direction of rotation	Inlet	Outlet
Right hand rotation	B	A
Left hand rotation	A	B

PF 130 / 180

Dimensions mm (in)

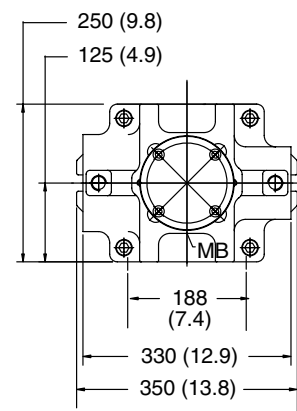
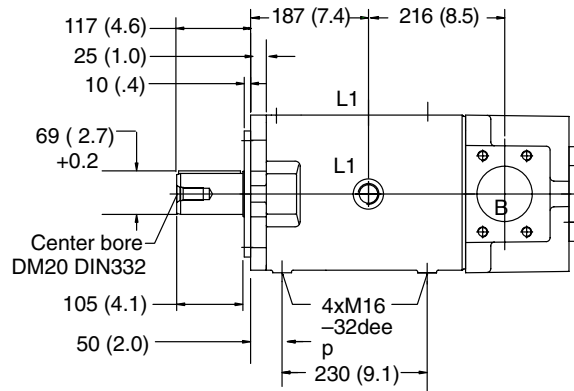
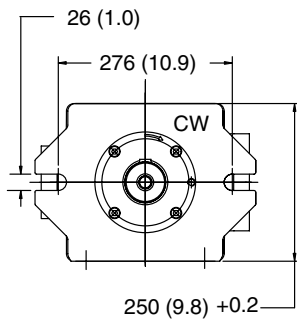
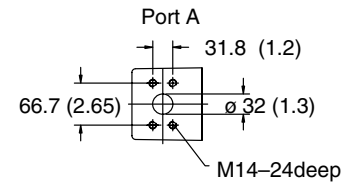
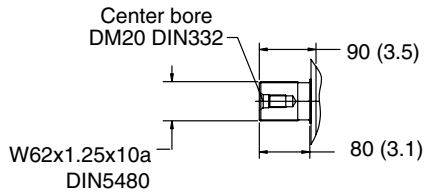
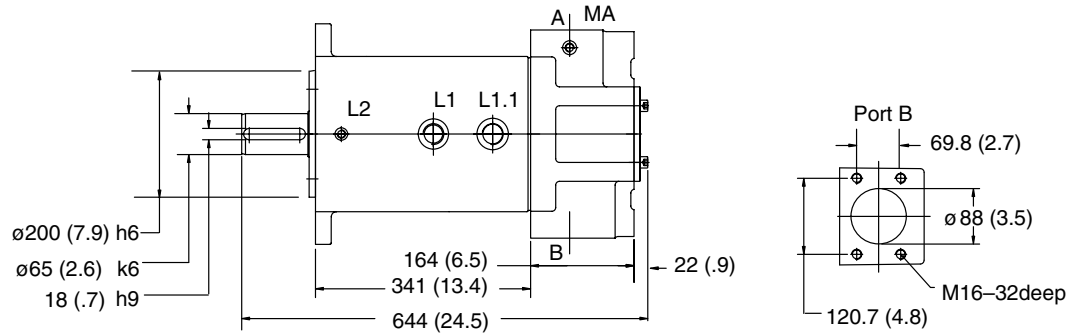


	Direction of rotation	Inlet	Outlet
to + Vmax	Right hand rotation	B	A
	Left hand rotation	A	B

- A System pressure port SAE 1", 6000psi
- B System pressure port SAE 2 1/2", 500psi
- (L1) Drain port M26x1.5
- (L1.1) Oil filling plug 1 1/16-12UN
- (L2) Ventilation port for vertical mounting G1/4
- (MA) Gauge port system pressure G1/4
- (...) normally plugged

PF 250

Dimensions mm (in)

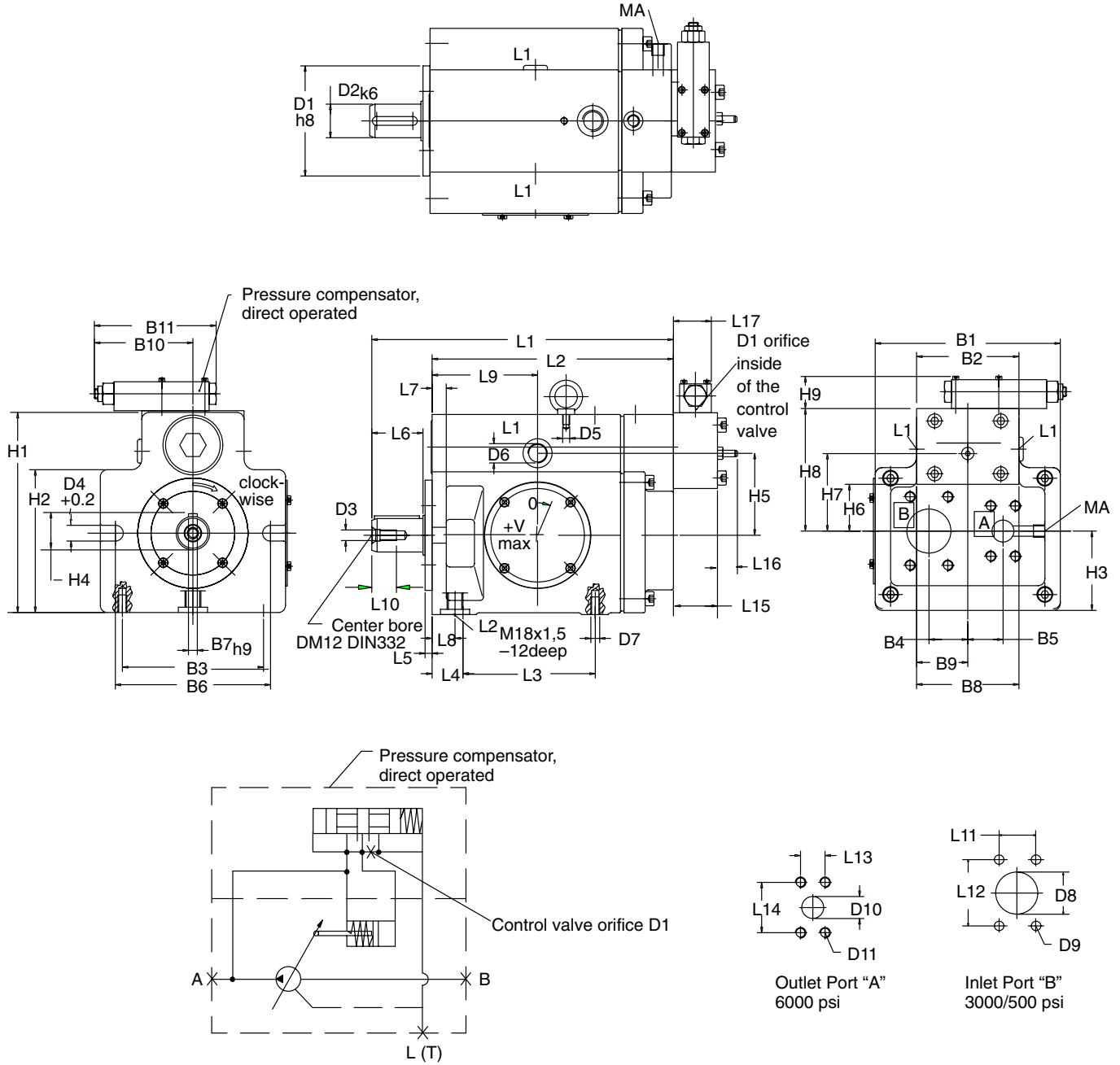


- A System pressure port SAE 1 1/4", 6000psi
- B System pressure port SAE 3 1/2", 500psi
- (L1) Drain port M33x2
- (L2) Ventilation port for vertical mounting G1/4
- (L1.1) Oil filling plug 1 5/16-12UN
- (MA) Gauge port system pressure G1/4
- (MB) Gauge port system pressure G1/4
- (...) normally plugged

	Direction of rotation	Inlet	Outlet
to + Vmax	Right hand rotation	B	A
	Left hand rotation	A	B

Rear Ports – Pressure Compensator, DF1

Dimensions mm (in)



Pump	SAE Inlet Flange "B" 3000/500	SAE Outlet Flange "A" 6000 psi
PV 066	1 1/2"	1"
PV 090	2"	1"
PV 130	2 1/2"	1"
PV 180	2 1/2"	1 1/4"
PV 250	3 1/2"	1 1/4"

Control	Direction of rotation	Inlet	Outlet
to +V _{max}	CW	B	A
	CCW	A	B
to -V _{max}	CW	A	B
	CCW	B	A

- L1** Two drain ports, one supplied plugged.
- L2** M18 x 1,5 x 12 deep; supplementary drain, or bleed plug. Must be drained in addition to L1 if the pump is installed with the shaft input end pointing up.
- MA** G1/4" x 12,5 deep gauge port (supplied plugged).

Model	B1	B2	B3	B4	B5	B6	B7 h9	B8	B9	B10	B11
PV 066	210 (8.27)	116 (4.57)	160 (6.30)	40 (1.57)	40 (1.57)	180 (7.09)	10 (.39)	116 (4.57)	58 (2.28)	147,8 (5.82)	172,8 (6.80)
PV 090	210 (8.27)	116 (4.57)	160 (6.30)	44 (1.73)	40 (1.57)	180 (7.09)	10 (.39)	116 (4.57)	58 (2.28)	147,8 (5.82)	172,8 (6.80)
PV 130	260 (10.2)	140 (5.51)	200 (7.87)	50 (1.97)	65 (2.56)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	147,8 (5.82)	172,8 (6.80)
PV 180	260 (10.2)	140 (5.51)	200 (7.87)	50 (1.97)	65 (2.56)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	147,8 (5.82)	172,8 (6.80)
PV 250	325 (12.8)	175 (6.89)	250 (9.84)	96 (3.78)	70 (2.76)	280 (11.0)	18 (.71)	175 (6.89)	87,5 (3.44)	151,3 (5.96)	172,8 (6.80)

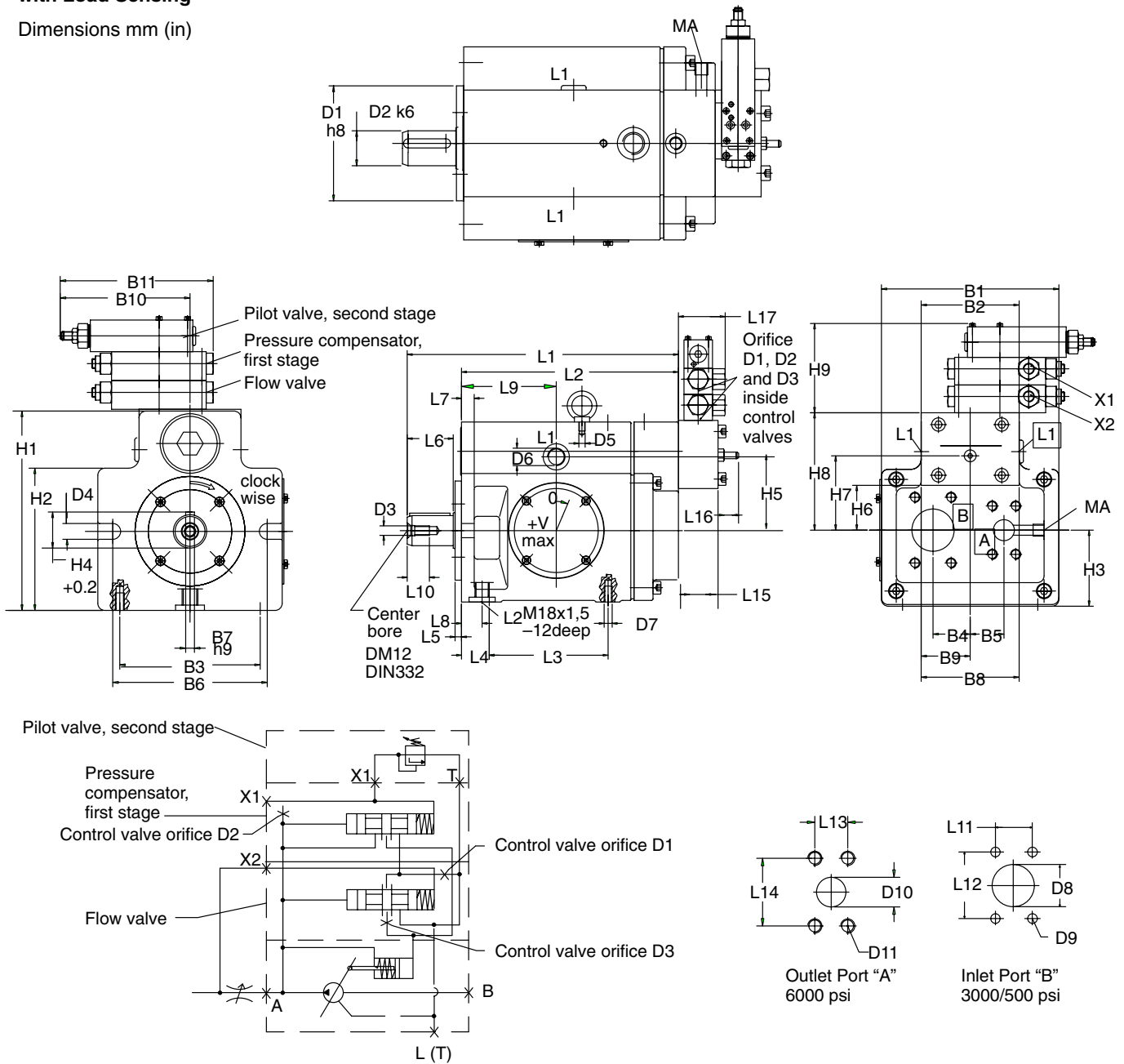
Model	H1	H2	H3	H4 +0.2	H5	H6	H7	H8	H9
PV 066	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	139 (5.47)	47 (1.85)
PV 090	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	139 (5.47)	47 (1.85)
PV 130	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	174 (6.85)	47 (1.85)
PV 180	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	174 (6.85)	47 (1.85)
PV 250	354 (13.9)	260 (10.2)	140 (5.51)	69 (2.72)	146 (5.75)	77 (3.03)	138 (5.43)	217 (8.54)	47 (1.85)

Model	D1 h8	D2 k6	D3	D4	D5	D6	D7	D8	D9	D10	D11
PV 066	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 20 deep	38 (1.50)	M12 x 20 deep	25 (.98)	M12 x 18 deep
PV 090	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 20 deep	50 (1.97)	M12 x 20 deep	25 (.98)	M12 x 18 deep
PV 130	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	25 (.98)	M12 x 18 deep
PV 180	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	32 (1.26)	M14 x 24 deep
PV 250	200 (7.87)	65 (2.56)	M20	26 (1.02)	M12	M33 x 2	M16 x 32 deep	90 (3.54)	M16 x 26 deep	32 (1.26)	M14 x 24 deep

Model	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17
PV 066	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	35,7 (1.41)	69,8 (2.75)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	10 (0.39)	47,5 (1.87)
PV 090	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	42,9 (1.69)	77,8 (3.06)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	10 (0.39)	47,5 (1.87)
PV 130	433 (17.0)	341 (13.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	12 (0.47)	47,5 (1.87)
PV 180	433 (17.0)	341 (13.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	31,8 (1.25)	66,7 (2.63)	50 (1.97)	12 (0.47)	47,5 (1.87)
PV 250	546 (21.5)	429 (16.9)	230 (9.06)	50 (1.97)	10 (.39)	105 (4.13)	25 (.98)	41 (1.61)	187 (7.36)	42 (1.65)	69,8 (2.75)	120,7 (4.75)	31,8 (1.25)	66,7 (2.63)	56 (2.20)	-	50,5 (1.99)

**Rear Ports –
Pressure Compensator
with Load Sensing**

Dimensions mm (in)



Pump	SAE Inlet Flange "B" 3000/500	SAE Outlet Flange "A" 6000 psi
PV 066	1 1/2"	1"
PV 090	2"	1"
PV 130	2 1/2"	1"
PV 180	2 1/2"	1 1/4"
PV 250	3 1/2"	1 1/4"

Control	Direction of rotation	Inlet	Outlet
to +V _{max}	CW	B	A
	CCW	A	B
to -V _{max}	CW	A	B
	CCW	B	A

- X1 G1/4" x 12,5 deep; option for another pilot valve.
- X2 G1/4" x 12,5 deep; load sensing pilot port.
- L1 Two drain ports, one supplied plugged.
- L2 M18 x 1,5 x 12 deep; supplementary drain, or bleed plug. Must be drained in addition to L1 if the pump is installed with the shaft input end pointing up.
- MA G1/4" x 12,5 deep gauge port (supplied plugged).

Model	B1	B2	B3	B4	B5	B6	B7 h9	B8	B9	B10	B11
PV 066	210 (8.27)	116 (4.57)	160 (6.30)	40 (1.57)	40 (1.57)	180 (7.09)	10 (.39)	116 (4.57)	58 (2.28)	185 (7.28)	218 (8.58)
PV 090	210 (8.27)	116 (4.57)	160 (6.30)	44 (1.73)	40 (1.57)	180 (7.09)	10 (.39)	116 (4.57)	58 (2.28)	185 (7.28)	218 (8.58)
PV 130	260 (10.2)	140 (5.51)	200 (7.87)	50 (1.97)	65 (2.56)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	185 (7.28)	218 (8.58)
PV 180	260 (10.2)	140 (5.51)	200 (7.87)	50 (1.97)	65 (2.56)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	185 (7.28)	218 (8.58)
PV 250	325 (12.8)	175 (6.89)	250 (9.84)	96 (3.78)	70 (2.76)	280 (11.0)	18 (.71)	175 (6.89)	87,5 (3.44)	185 (7.28)	218 (8.58)

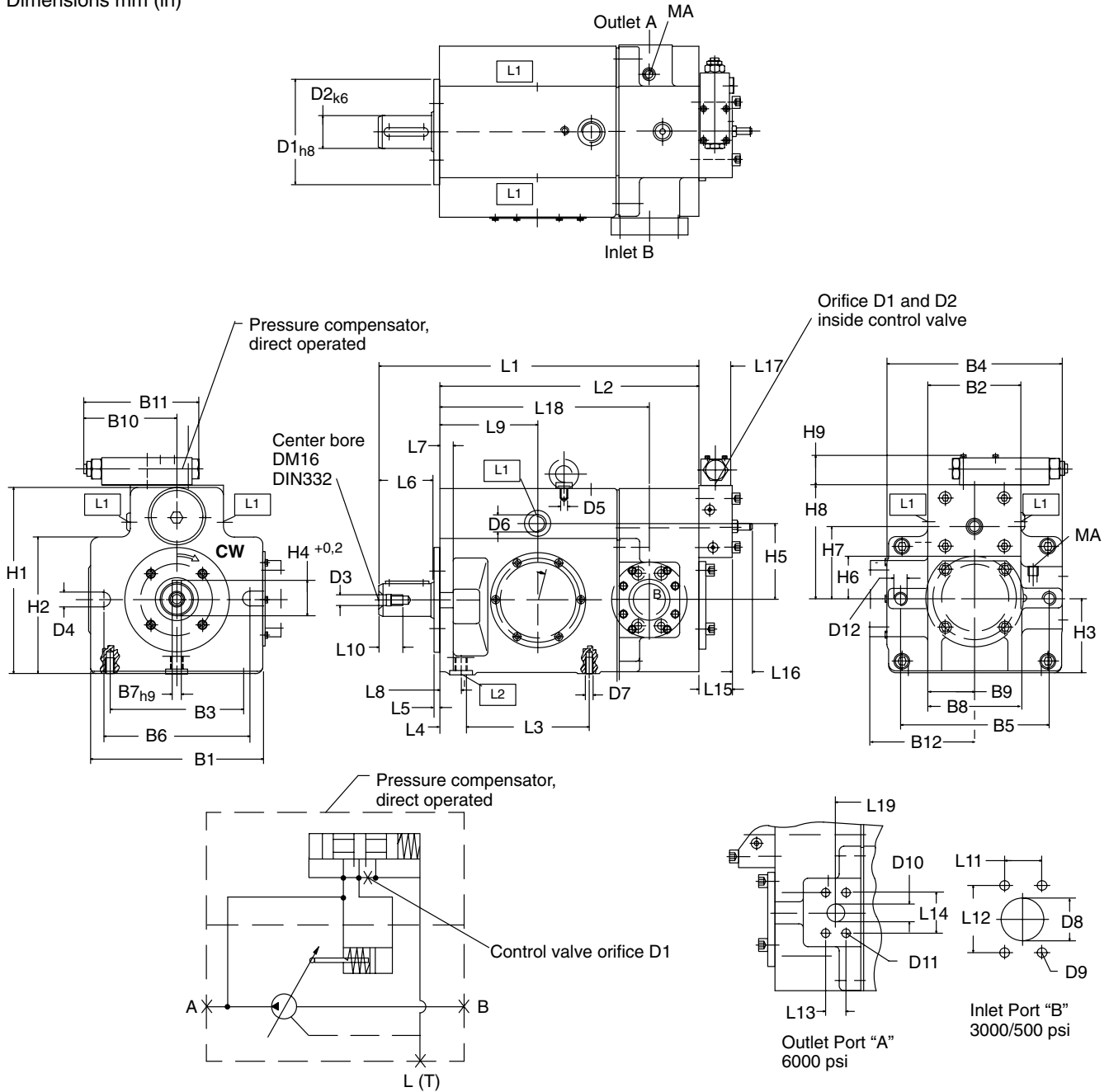
Model	H1	H2	H3	H4 +0.2	H5	H6	H7	H8	H9
PV 066	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	139 (5.47)	132 (5.20)
PV 090	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	139 (5.47)	132 (5.20)
PV 130	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	174 (6.85)	132 (5.20)
PV 180	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	174 (6.85)	132 (5.20)
PV 250	354 (13.9)	260 (10.2)	140 (5.51)	69 (2.72)	146 (5.75)	77 (3.03)	138 (5.43)	217 (8.54)	132 (5.20)

Model	D1 h8	D2 k6	D3	D4	D5	D6	D7	D8	D9	D10	D11
PV 066	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 20 deep	38 (1.50)	M12 x 20 deep	25 (.98)	M12 x 18 deep
PV 090	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 20 deep	50 (1.97)	M12 x 20 deep	25 (.98)	M12 x 18 deep
PV 130	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	25 (.98)	M12 x 18 deep
PV 180	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	32 (1.26)	M14 x 24 deep
PV 250	200 (7.87)	65 (2.56)	M20	26 (1.02)	M12	M33 x 2	M16 x 32 deep	90 (3.54)	M16 x 32 deep	32 (1.26)	M14 x 24 deep

Model	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17
PV 066	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	35,7 (1.41)	69,8 (2.75)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	10 (.39)	67,5 (2.66)
PV 090	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	42,9 (1.69)	77,8 (3.06)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	10 (.39)	67,5 (2.66)
PV 130	433 (17.0)	341 (13.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	12 (.47)	67,5 (2.66)
PV 180	433 (17.0)	341 (13.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	31,8 (1.25)	66,7 (2.63)	50 (1.97)	12 (.47)	67,5 (2.66)
PV 250	546 (21.5)	429 (16.9)	230 (9.06)	50 (1.97)	10 (.39)	105 (4.13)	25 (.98)	41 (1.61)	187 (7.36)	42 (1.65)	69,8 (2.75)	120,7 (4.75)	31,8 (1.25)	66,7 (2.63)	56 (2.20)	-	70,5 (2.78)

Side Ports – Pressure Compensator, DF1

Dimensions mm (in)



Pump	SAE Inlet Flange "B" 3000/500	SAE Outlet Flange "A" 6000 psi
PV 066	1½"	1"
PV 090	2"	1"
PV 130	2½"	1"
PV 180	2½"	1¼"
PV 250	3½"	1¼"

Control	Direction of rotation	Inlet	Outlet
to +V _{max}	CW	B	A
	CCW	A	B
to -V _{max}	CW	A	B
	CCW	B	A

- L1** Two drain ports, one supplied plugged.
- L2** M18 x 1,5 x 12 deep; supplementary drain, or bleed plug. Must be drained in addition to L1 if the pump is installed with the shaft input end pointing up.
- MA** G1/4" x 12,5 deep gauge port (supplied plugged).

Model	B1	B2	B3	B4	B5	B6	B7 h9	B8	B9	B10	B11	B12
PV 066	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	176 (6.93)	10 (.39)	116 (4.57)	58 (2.28)	147,8 (5.82)	172,8 (6.80)	–
PV 090	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	180 (7.09)	10 (.39)	116 (4.57)	58 (2.28)	147,8 (5.82)	172,8 (6.80)	157,5 (6.20)
PV 130	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	147,8 (5.82)	172,8 (6.80)	–
PV 180	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	147,8 (5.82)	172,8 (6.80)	–
PV 250	325 (12.8)	175 (6.89)	250 (9.84)	330 (13.0)	280 (11.0)	280 (11.0)	18 (.71)	175 (6.89)	87,5 (3.44)	151,3 (5.96)	172,8 (6.80)	–

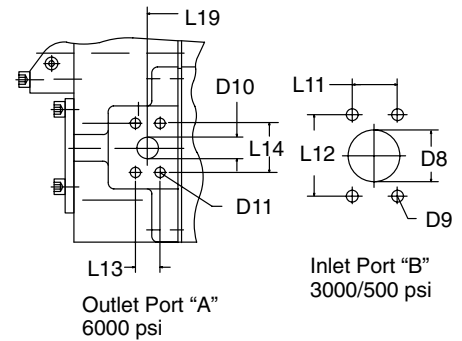
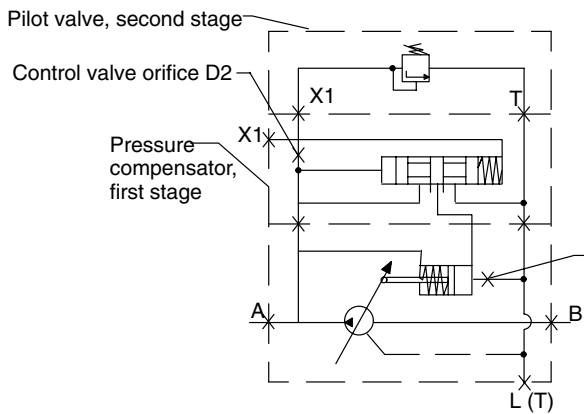
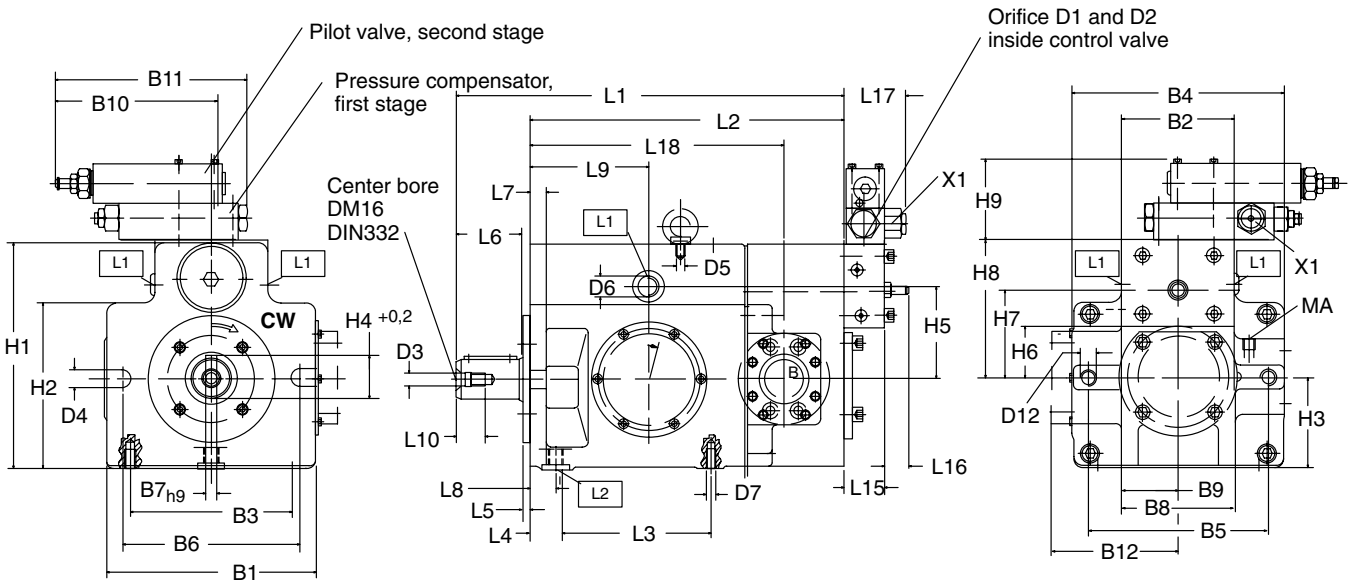
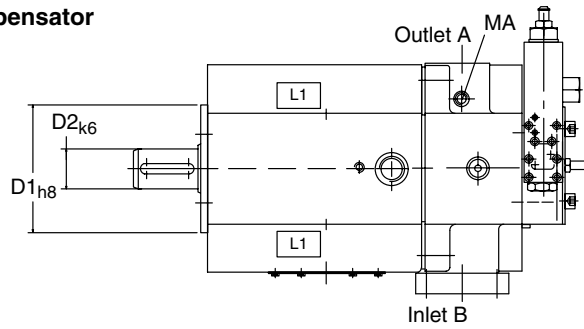
Model	H1	H2	H3	H4 +0.2	H5	H6	H7	H8	H9
PV 066	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	139 (5.47)	47 (1.85)
PV 090	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	139 (5.47)	47 (1.85)
PV 130	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	174 (6.85)	47 (1.85)
PV 180	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	174 (6.85)	47 (1.85)
PV 250	354 (13.9)	260 (10.2)	140 (5.51)	69 (2.72)	146 (5.75)	77 (3.03)	138 (5.43)	217 (8.54)	47 (1.85)

Model	D1 h8	D2 k6	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
PV 066	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 24 deep	38 (1.50)	M12 x 24 deep	25 (.98)	M12 x 21 deep	–
PV 090	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 20 deep	50 (1.97)	M12 x 24 deep	25 (.98)	M12 x 21 deep	–
PV 130	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	25 (.98)	M12 x 20 deep	M20
PV 180	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	32 (1.26)	M14 x 20 deep	M20
PV 250	200 (7.87)	65 (2.56)	M20	26 (1.02)	M12	M33 x 2	M16 x 32 deep	90 (3.54)	M16 x 32 deep	32 (1.26)	M14 x 24 deep	M24

Model	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19
PV 066	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	35,7 (1.41)	69,8 (2.75)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	31 (.22)	47,5 (1.87)	245,6 (9.67)	245,6 (9.67)
PV 090	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	42,9 (1.69)	77,8 (3.06)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	31 (.22)	47,5 (1.87)	245,6 (9.67)	245,6 (9.67)
PV 130	483 (19.0)	391 (15.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	31 (.22)	47,5 (1.87)	316 (12.4)	306 (12.0)
PV 180	483 (19.0)	391 (15.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	31,8 (1.25)	66,7 (2.63)	50 (1.97)	31 (.22)	47,5 (1.87)	316 (12.4)	306 (12.0)
PV 250	622 (24.5)	505 (19.9)	230 (9.06)	50 (1.97)	10 (.39)	105 (4.13)	25 (.98)	41 (1.61)	187 (7.36)	42 (1.65)	69,8 (2.75)	120,7 (4.75)	31,8 (1.25)	66,7 (2.63)	56 (2.20)	35 (.38)	50,5 (1.99)	403 (15.9)	403 (15.9)

Side Ports – Pressure Compensator

Dimensions mm (in)



Pump	SAE Inlet Flange "B" 3000/500	SAE outlet Flange "A" 6000 psi
PV 066	1 1/2"	1"
PV 090	2"	1"
PV 130	2 1/2"	1"
PV 180	2 1/2"	1 1/4"
PV 250	3 1/2"	1 1/4"

Control	Direction of rotation	Inlet	Outlet
to +V _{max}	CW	B	A
	CCW	A	B
to -V _{max}	CW	A	B
	CCW	B	A

- X1 G1/4" x 12,5 deep; option for another pilot valve.
- L1 Two drain ports, one supplied plugged.
- L2 M18 x 1,5 x 12 deep; supplementary drain, or bleed plug. Must be drained in addition to L1 if the pump is installed with the shaft input end pointing up.
- MA G1/4" x 12,5 deep gauge port (supplied plugged).

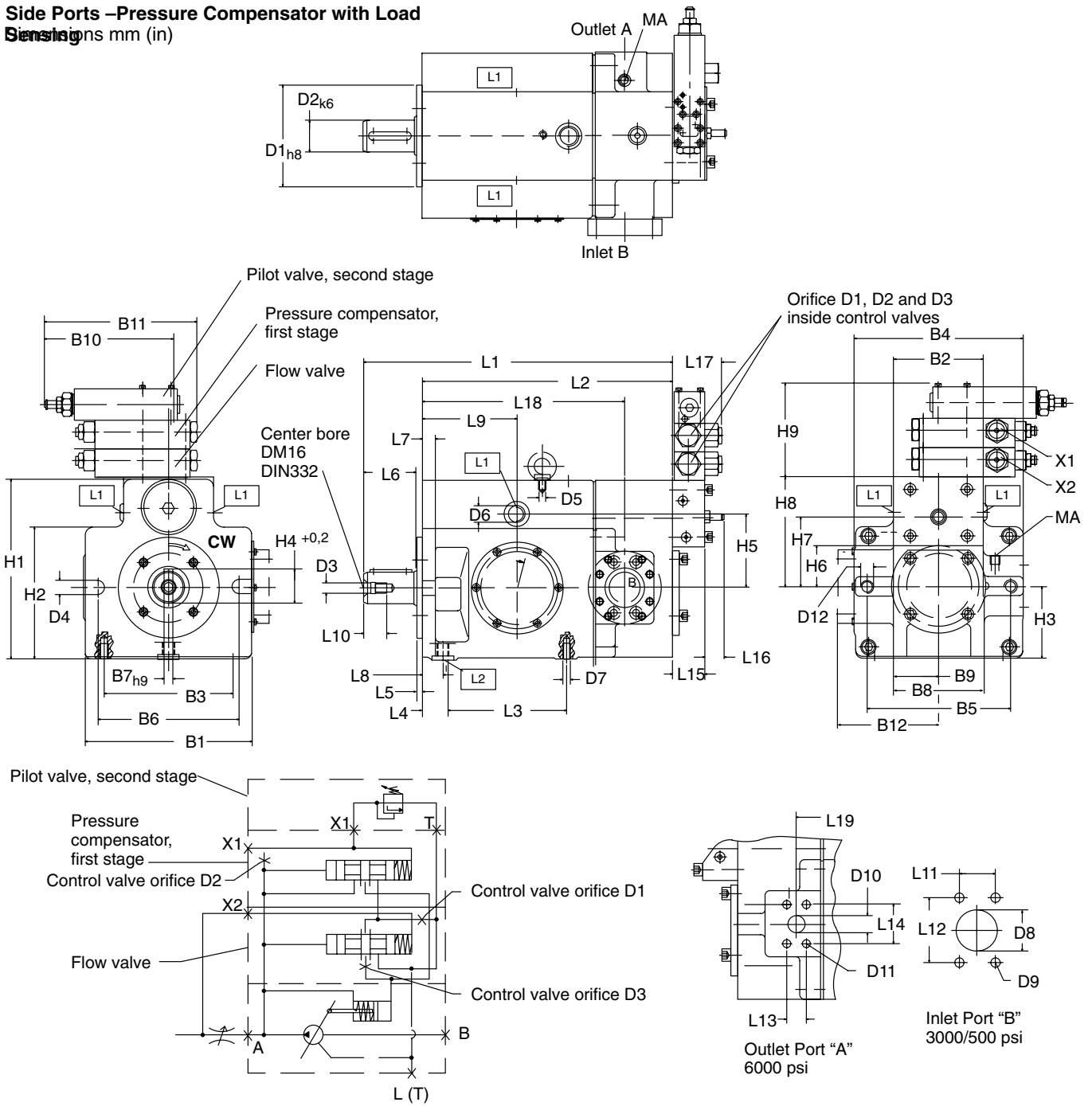
Model	B1	B2	B3	B4	B5	B6	B7 h9	B8	B9	B10	B11	B12
PV 066	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	176 (6.93)	10 (.39)	116 (4.57)	58 (2.28)	185 (7.28)	218 (8.58)	-
PV 090	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	180 (7.09)	10 (.39)	116 (4.57)	58 (2.28)	185 (7.28)	218 (8.58)	157,5 (6.20)
PV 130	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	185 (7.28)	218 (8.58)	-
PV 180	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	185 (7.28)	218 (8.58)	-
PV 250	325 (12.8)	175 (6.89)	250 (9.84)	330 (13.0)	280 (11.0)	280 (11.0)	18 (.71)	175 (6.89)	87,5 (3.44)	185 (7.28)	218 (8.58)	-

Model	H1	H2	H3	H4 +0.2	H5	H6	H7	H8	H9
PV 066	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	139 (5.47)	91 (3.58)
PV 090	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	139 (5.47)	91 (3.58)
PV 130	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	174 (6.85)	91 (3.58)
PV 180	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	174 (6.85)	91 (3.58)
PV 250	354 (13.9)	260 (10.2)	140 (5.51)	69 (2.72)	146 (5.75)	77 (3.03)	138 (5.43)	217 (8.54)	91 (3.58)

Model	D1 h8	D2 k6	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
PV 066	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 24 deep	38 (1.50)	M12 x 24 deep	25 (.98)	M12 x 21 deep	-
PV 090	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 20 deep	50 (1.97)	M12 x 24 deep	25 (.98)	M12 x 21 deep	-
PV 130	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	25 (.98)	M12 x 20 deep	M20
PV 180	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	32 (1.26)	M14 x 20 deep	M20
PV 250	200 (7.87)	65 (2.56)	M20	26 (1.02)	M12	M33 x 2	M16 x 32 deep	90 (3.54)	M16 x 32 deep	32 (1.26)	M14 x 24 deep	M24

Model	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19
PV 066	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	35,7 (1.41)	69,8 (2.75)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	31 (.22)	72,5 (2.85)	245,6 (9.67)	245,6 (9.67)
PV 090	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	42,9 (1.69)	77,8 (3.06)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	31 (.22)	72,5 (2.85)	245,6 (9.67)	245,6 (9.67)
PV 130	483 (19.0)	391 (15.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	31 (.22)	72,5 (2.85)	316 (12.4)	306 (12.0)
PV 180	483 (19.0)	391 (15.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	31,8 (1.25)	66,7 (2.63)	50 (1.97)	31 (.22)	72,5 (2.85)	316 (12.4)	306 (12.0)
PV 250	622 (24.5)	505 (19.9)	230 (9.06)	50 (1.97)	10 (.39)	105 (4.13)	25 (.98)	41 (1.61)	187 (7.36)	42 (1.65)	69,8 (2.75)	120,7 (4.75)	31,8 (1.25)	66,7 (2.63)	56 (2.20)	35 (.38)	75,5 (2.97)	403 (15.9)	403 (15.9)

Side Ports – Pressure Compensator with Load Sensing
 Dimensions mm (in)



Pump	SAE Inlet Flange "B" 3000/500	SAE Outlet Flange "A" 6000 psi
PV 066	1 1/2"	1"
PV 090	2"	1"
PV 130	2 1/2"	1"
PV 180	2 1/2"	1 1/4"
PV 250	3 1/2"	1 1/4"

Control	Direction of rotation	Inlet	Outlet
to +V _{max}	CW	B	A
	CCW	A	B
to -V _{max}	CW	A	B
	CCW	B	A

- X1** G1/4" x 12,5 deep; option for another pilot valve.
- X2** G1/4" x 12,5 deep; load sensing pilot port.
- L1** Two drain ports, one supplied plugged.
- L2** M18 x 1,5 x 12 deep; supplementary drain, or bleed plug. Must be drained in addition to L1 if the pump is installed with the shaft input end pointing up.
- MA** G1/4" x 12,5 deep gauge port (supplied plugged).

Model	B1	B2	B3	B4	B5	B6	B7 h9	B8	B9	B10	B11	B12
PV 066	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	176 (6.93)	10 (.39)	116 (4.57)	58 (2.28)	185 (7.28)	218 (8.58)	–
PV 090	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	180 (7.09)	10 (.39)	116 (4.57)	58 (2.28)	185 (7.28)	218 (8.58)	157,5 (6.20)
PV 130	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	185 (7.28)	218 (8.58)	–
PV 180	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	185 (7.28)	218 (8.58)	–
PV 250	325 (12.8)	175 (6.89)	250 (9.84)	330 (13.0)	280 (11.0)	280 (11.0)	18 (.71)	175 (6.89)	87,5 (3.44)	185 (7.28)	218 (8.58)	–

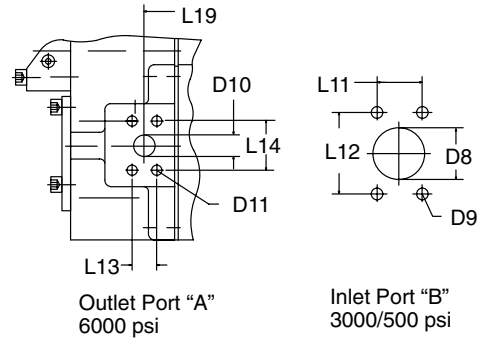
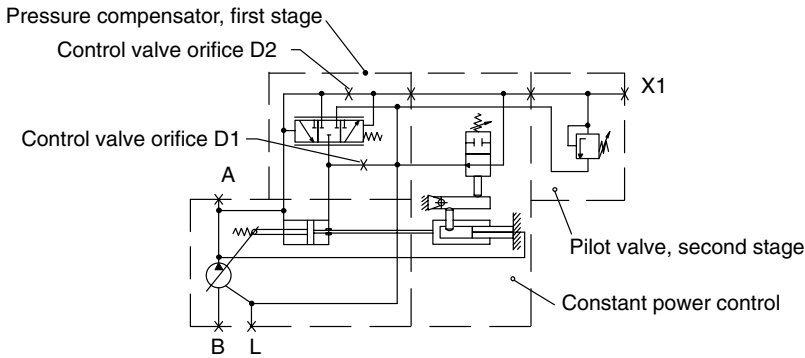
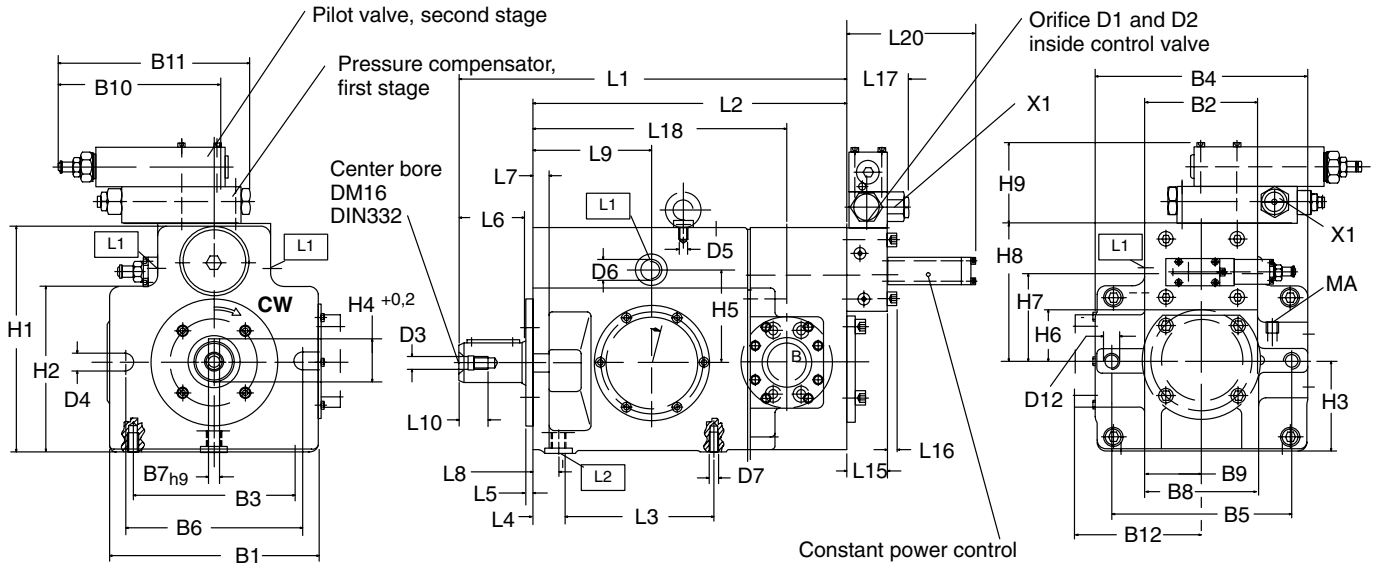
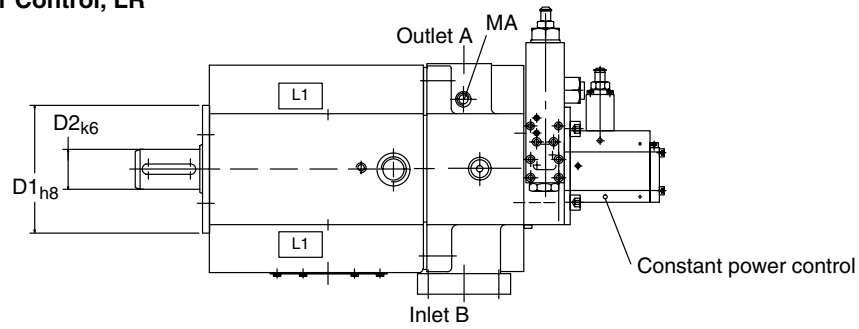
Model	H1	H2	H3	H4 +0.2	H5	H6	H7	H8	H9
PV 066	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	139 (5.47)	132 (5.20)
PV 090	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	139 (5.47)	132 (5.20)
PV 130	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	174 (6.85)	132 (5.20)
PV 180	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	174 (6.85)	132 (5.20)
PV 250	354 (13.9)	260 (10.2)	140 (5.51)	69 (2.72)	146 (5.75)	77 (3.03)	138 (5.43)	217 (8.54)	132 (5.20)

Model	D1 h8	D2 k6	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
PV 066	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 24 deep	38 (1.50)	M12 x 24 deep	25 (.98)	M12 x 21 deep	–
PV 090	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 20 deep	50 (1.97)	M12 x 24 deep	25 (.98)	M12 x 21 deep	–
PV 130	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	25 (.98)	M12 x 20 deep	M20
PV 180	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	32 (1.26)	M14 x 20 deep	M20
PV 250	200 (7.87)	65 (2.56)	M20	26 (1.02)	M12	M33 x 2	M16 x 32 deep	90 (3.54)	M16 x 32 deep	32 (1.26)	M14 x 24 deep	M24

Model	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19
PV 066	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	35,7 (1.41)	69,8 (2.75)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	31 (.22)	67,5 (2.66)	245,6 (9.67)	245,6 (9.67)
PV 090	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	42,9 (1.69)	77,8 (3.06)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	31 (.22)	67,5 (2.66)	245,6 (9.67)	245,6 (9.67)
PV 130	483 (19.0)	391 (15.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	31 (.22)	67,5 (2.66)	316 (12.4)	306 (12.0)
PV 180	483 (19.0)	391 (15.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	31,8 (1.25)	66,7 (2.63)	50 (1.97)	31 (.22)	67,5 (2.66)	316 (12.4)	306 (12.0)
PV 250	622 (24.5)	505 (19.9)	230 (9.06)	50 (1.97)	10 (.39)	105 (4.13)	25 (.98)	41 (1.61)	187 (7.36)	42 (1.65)	69,8 (2.75)	120,7 (4.75)	31,8 (1.25)	66,7 (2.63)	56 (2.20)	35 (.38)	70,5 (2.78)	403 (15.9)	403 (15.9)

**Side Ports – Constant Power Control, LR
(with pressure limiter)**

Dimensions mm (in)



Pump	SAE Inlet Flange "B" 3000/500	SAE Outlet Flange "A" 6000 psi
PV 066	1 1/2"	1"
PV 090	2"	1"
PV 130	2 1/2"	1"
PV 180	2 1/2"	1 1/4"
PV 250	3 1/2"	1 1/4"

Control	Direction of rotation	Inlet	Outlet
to +V _{max}	CW	B	A
	CCW	A	B
to -V _{max}	CW	A	B
	CCW	B	A

- X1** G1/4" x 12,5 deep; option for another pilot valve.
- L1** Two drain ports, one supplied plugged.
- L2** M18 x 1,5 x 12 deep; supplementary drain, or bleed plug. Must be drained in addition to L1 if the pump is installed with the shaft input end pointing up.
- MA** G1/4" x 12,5 deep gauge port (supplied plugged).

Model	B1	B2	B3	B4	B5	B6	B7 h9	B8	B9	B10	B11	B12
PV 066	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	176 (6.93)	10 (.39)	116 (4.57)	58 (2.28)	185 (7.28)	218 (8.58)	-
PV 090	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	180 (7.09)	10 (.39)	116 (4.57)	58 (2.28)	185 (7.28)	218 (8.58)	157,5 (6.20)
PV 130	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	185 (7.28)	218 (8.58)	-
PV 180	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	185 (7.28)	218 (8.58)	-
PV 250	325 (12.8)	175 (6.89)	250 (9.84)	330 (13.0)	280 (11.0)	280 (11.0)	18 (.71)	175 (6.89)	87,5 (3.44)	185 (7.28)	218 (8.58)	-

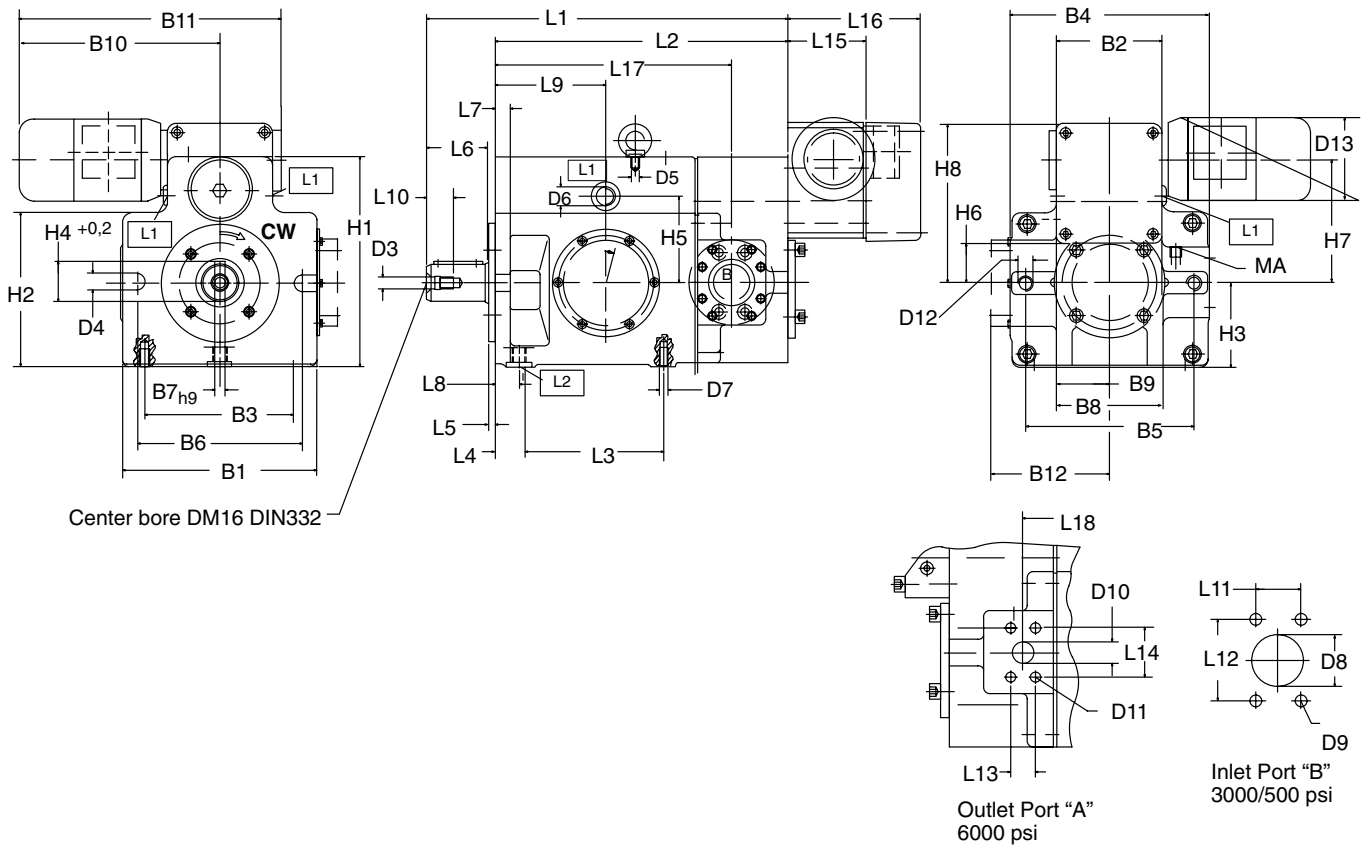
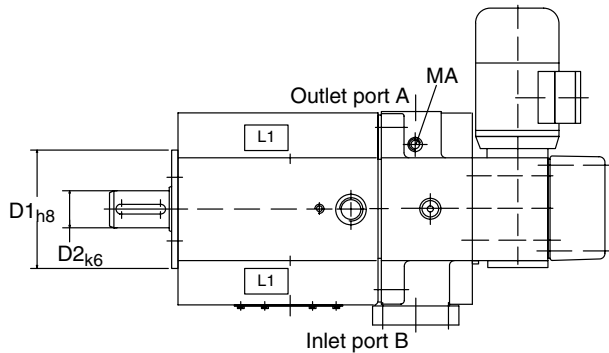
Model	H1	H2	H3	H4 +0.2	H5	H6	H7	H8	H9
PV 066	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	139 (5.47)	91 (3.58)
PV 090	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	139 (5.47)	91 (3.58)
PV 130	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	174 (6.85)	91 (3.58)
PV 180	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	174 (6.85)	91 (3.58)
PV 250	354 (13.9)	260 (10.2)	140 (5.51)	69 (2.72)	146 (5.75)	77 (3.03)	138 (5.43)	217 (8.54)	91 (3.58)

Model	D1 h8	D2 k6	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	L1	L2
PV 066	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 24 deep	38 (1.50)	M12 x 24 deep	25 (.98)	M12 x 21 deep	-	342 (13.5)	274 (10.8)
PV 090	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 20 deep	50 (1.97)	M12 x 24 deep	25 (.98)	M12 x 21 deep	-	342 (13.5)	274 (10.8)
PV 130	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	25 (.98)	M12 x 20 deep	M20	483 (19.0)	391 (15.4)
PV 180	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	32 (1.26)	M14 x 20 deep	M20	483 (19.0)	391 (15.4)
PV 250	200 (7.87)	65 (2.56)	M20	26 (1.02)	M12	M33 x 2	M16 x 32 deep	90 (3.54)	M16 x 32 deep	32 (1.26)	M14 x 24 deep	M24	622 (24.5)	505 (19.9)

Model	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
PV 066	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	35,7 (1.41)	69,8 (2.75)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	10 (.40)	72,5 (2.85)	245,6 (9.67)	245,6 (9.67)	161 (6.34)
PV 090	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	42,9 (1.69)	77,8 (3.06)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	10 (.40)	72,5 (2.85)	245,6 (9.67)	245,6 (9.67)	161 (6.34)
PV 130	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	27,8 (1.09)	57,2 (2.25)	60 (2.36)	12 (.47)	72,5 (2.85)	316 (12.4)	306 (12.0)	171 (6.73)
PV 180	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	31,8 (1.25)	66,7 (2.63)	60 (2.36)	12 (.47)	72,5 (2.85)	316 (12.4)	306 (12.0)	171 (6.73)
PV 250	230 (9.06)	50 (1.97)	10 (.39)	105 (4.13)	25 (.98)	41 (1.61)	187 (7.36)	42 (1.65)	69,8 (2.75)	120,7 (4.75)	31,8 (1.25)	66,7 (2.63)	112 (4.41)	-	75,5 (2.97)	403 (15.9)	403 (15.9)	199,5 (7.85)

Side Ports – ES Control

Dimensions mm (in)



Pump	SAE Inlet Flange "B" 3000/500	SAE Outlet Flange "A" 6000 psi
PV 066	1 1/2"	1"
PV 090	2"	1"
PV 130	2 1/2"	1"
PV 180	2 1/2"	1 1/4"
PV 250	3 1/2"	1 1/4"

Control	Direction of rotation	Inlet	Outlet
to +V _{max}	CW	B	A
	CCW	A	B
to -V _{max}	CW	A	B
	CCW	B	A

- L1** Two drain ports, one supplied plugged.
- L2** M18 x 1,5 x 12 deep; supplementary drain, or bleed plug. Must be drained in addition to L1 if the pump is installed with the shaft input end pointing up.
- MA** G1/4" x 12,5 deep gauge port (supplied plugged).

Model	B1	B2	B3	B4	B5	B6	B7 h9	B8	B9	B10	B11	B12
PV 066	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	176 (6.93)	10 (.39)	116 (4.57)	58 (2.28)	276,5 (10.9)	334,5 (13.2)	–
PV 090	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	180 (7.09)	10 (.39)	116 (4.57)	58 (2.28)	276,5 (10.9)	334,5 (13.2)	157,5 (6.20)
PV 130	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	288,5 (11.4)	368,5 (14.5)	–
PV 180	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	288,5 (11.4)	368,5 (14.5)	–
PV 250	325 (12.8)	180 (7.09)	250 (9.84)	330 (13.0)	280 (11.0)	280 (11.0)	18 (.71)	175 (6.89)	87,5 (3.44)	332,7 (13.1)	434,7 (17.1)	–

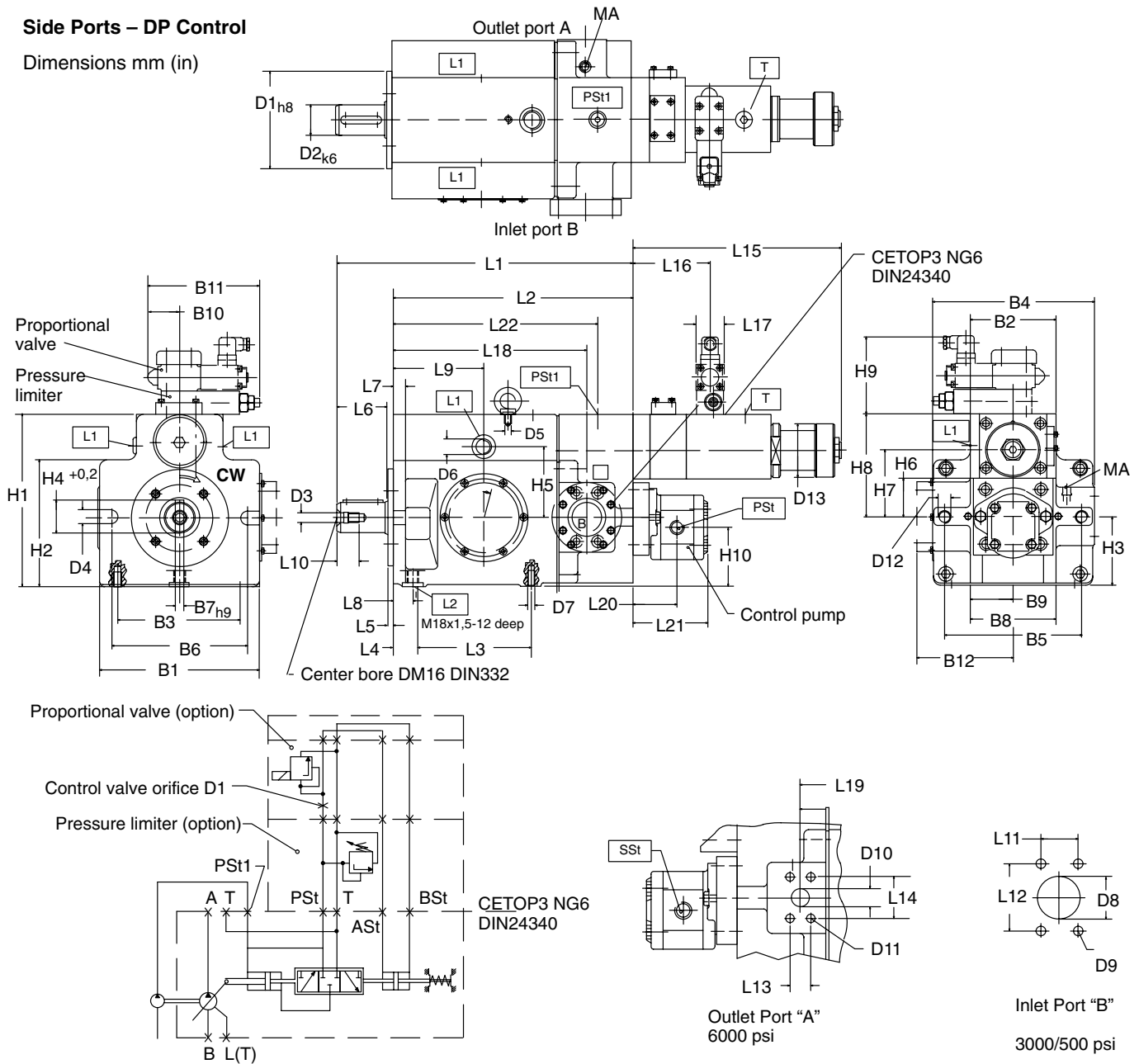
Model	H1	H2	H3	H4 +0.2	H5	H6	H7	H8
PV 066	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	122 (4.80)	168 (6.61)
PV 090	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	122 (4.80)	168 (6.61)
PV 130	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	58.5 (2.30)	165 (6.50)	214 (8.43)
PV 180	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	58.5 (2.30)	165 (6.50)	214 (8.43)
PV 250	354 (13.9)	260 (10.2)	140 (5.51)	69 (2.72)	146 (5.75)	77 (3.03)	198 (7.80)	262 (10.3)

Model	D1 h8	D2 k6	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13
PV 066	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 24 deep	38 (1.50)	M12 x 24 deep	25 (.98)	M12 x 21 deep	–	110,5 (4.35)
PV 090	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 20 deep	50 (1.97)	M12 x 24 deep	25 (.98)	M12 x 21 deep	–	110,5 (4.35)
PV 130	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	25 (.98)	M12 x 20 deep	M20	110,5 (4.35)
PV 180	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	32 (1.26)	M14 x 20 deep	M20	110,5 (4.35)
PV 250	200 (7.87)	65 (2.56)	M20	26 (1.02)	M12	M33 x 2	M16 x 32 deep	90 (3.54)	M16 x 32 deep	32 (1.26)	M14 x 24 deep	M24	123 (4.84)

Model	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18
PV 066	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	35,7 (1.41)	69,8 (2.75)	27,8 (1.09)	57,2 (2.25)	78 (3.07)	153,5 (6.04)	245,6 (9.67)	245,6 (9.67)
PV 090	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	42,9 (1.69)	77,8 (3.06)	27,8 (1.09)	57,2 (2.25)	78 (3.07)	153,5 (6.04)	245,6 (9.67)	245,6 (9.67)
PV 130	483 (19.0)	391 (13.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	27,8 (1.09)	57,2 (2.25)	100 (3.94)	175,5 (6.91)	316 (12.4)	306 (12.0)
PV 180	483 (19.0)	391 (13.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	31,8 (1.25)	66,7 (2.63)	100 (3.94)	175,5 (6.91)	316 (12.4)	306 (12.0)
PV 250	622 (24.5)	505 (19.9)	230 (9.06)	50 (1.97)	10 (.39)	105 (4.13)	25 (.98)	41 (1.61)	187 (7.36)	42 (1.65)	69,8 (2.75)	120,7 (4.75)	31,8 (1.25)	66,7 (2.63)	88 (3.46)	163,5 (6.44)	403 (15.9)	403 (15.9)

Side Ports – DP Control

Dimensions mm (in)



Pump	SAE Inlet Flange "B" 3000/500	SAE Outlet Flange "A" 6000 psi
PV 066	1 1/2"	1"
PV 090	2"	1"
PV 130	2 1/2"	1"
PV 180	2 1/2"	1 1/4"
PV 250	3 1/2"	1 1/4"

Control	Direction of rotation	Inlet	Outlet
to +V _{max}	CW	B	A
	CCW	A	B
to -V _{max}	CW	A	B
	CCW	B	A

T G1/2" Tank port.

SSt G3/4" Inlet port of control pump.

PSt G3/8" Port of control pressure.

PSt1 Port of control pressure:
Size 066/090 = M14x1,5
Size 130/180 = M16x1,5
Size 250 = G1/2" (M22x1,5)

L1 Two drain ports, one supplied plugged.

L2 M18 x 1,5 x 12 deep; supplementary drain, or bleed plug. Must be drained in addition to L1 if the pump is installed with the shaft input end pointing up.

MA G1/4" x 12,5 deep gauge port (supplied plugged).

Model	B1	B2	B3	B4	B5	B6	B7 h9	B8	B9	B10	B11	B12
PV 066	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	176 (6.93)	10 (.39)	116 (4.57)	58 (2.28)	52 (2.05)	182,5 (7.19)	-
PV 090	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	180 (7.09)	10 (.39)	116 (4.57)	58 (2.28)	52 (2.05)	182,5 (7.19)	157,5 (6.20)
PV 130	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	52 (2.05)	182,5 (7.19)	-
PV 180	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	52 (2.05)	182,5 (7.19)	-
PV 250	325 (12.8)	175 (6.89)	250 (9.84)	330 (13.0)	280 (11.0)	280 (11.0)	18 (.71)	175 (6.89)	87,5 (3.44)	52 (2.05)	182,5 (7.19)	-

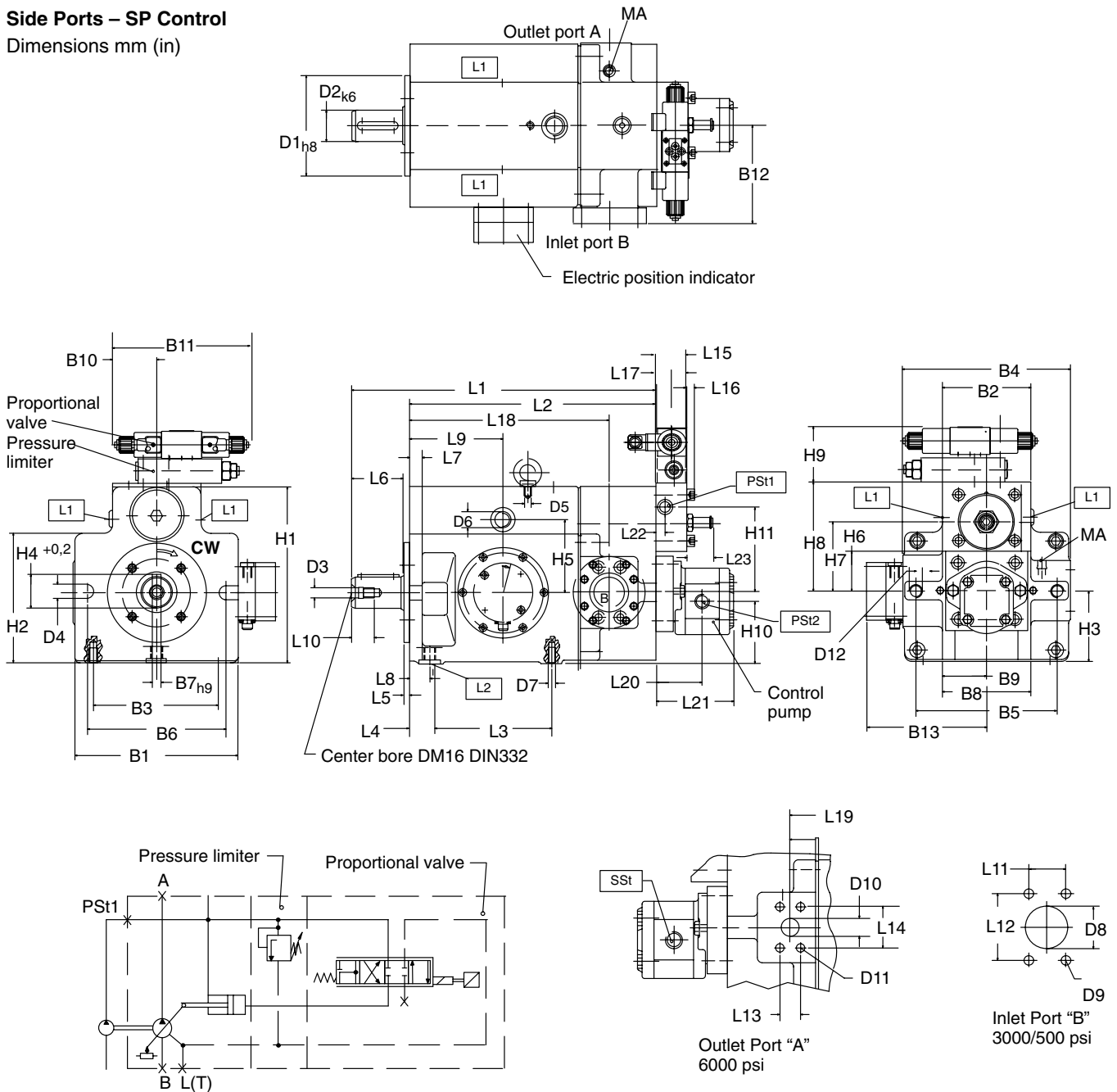
Model	H1	H2	H3	H4 +0.2	H5	H6	H7	H8	H9	H10	H11	D1 h8	D2 k6	D3	D4
PV 066	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	137 (5.39)	127 (5.00)	97 (3.82)	113 (4.45)	125 (4.92)	38 (1.50)	M12	18 (.71)
PV 090	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	137 (5.39)	127 (5.00)	97 (3.82)	113 (4.45)	125 (4.92)	38 (1.50)	M12	18 (.71)
PV 130	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	170 (6.69)	127 (5.00)	97 (3.82)	131 (5.16)	160 (6.30)	50 (1.97)	M16	22 (.87)
PV 180	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	170 (6.69)	127 (5.00)	97 (3.82)	131 (5.16)	160 (6.30)	50 (1.97)	M16	22 (.87)
PV 250	354 (13.9)	260 (10.2)	140 (5.51)	69 (2.72)	146 (5.75)	77 (3.03)	138 (5.43)	214 (8.43)	127 (5.00)	124 (4.88)	167 (6.57)	200 (7.87)	65 (2.56)	M20	26 (1.02)

Model	D5	D6	D7	D8	D9	D10	D11	D12	D13	L1	L2	L3	L4	L5	L6
PV 066	M8	M22 x 1,5	M10 x 24 deep	38 (1.50)	M12 x 24 deep	25 (.98)	M12 x 21 deep	-	64 (2.52)	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)
PV 090	M8	M22 x 1,5	M10 x 20 deep	50 (1.97)	M12 x 24 deep	25 (.98)	M12 x 21 deep	-	64 (2.52)	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)
PV 130	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	25 (.98)	M12 x 20 deep	M20	88 (3.46)	483 (19.0)	391 (13.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)
PV 180	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	32 (1.26)	M14 x 20 deep	M20	88 (3.46)	483 (19.0)	391 (13.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)
PV 250	M12	M33 x 2	M16 x 32 deep	90 (3.54)	M16 x 32 deep	32 (1.26)	M14 x 24 deep	M24	88 (3.46)	622 (24.5)	505 (19.9)	230 (9.06)	50 (1.97)	10 (.39)	105 (4.13)

Model	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22
PV 066	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	35,7 (1.41)	69,8 (2.75)	27,8 (1.09)	57,2 (2.25)	267 (10.5)	104 (4.09)	46 (1.81)	245,6 (9.67)	245,6 (9.67)	73,5 (2.89)	122,6 (4.83)	230,6 (9.08)
PV 090	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	42,9 (1.69)	77,8 (3.06)	27,8 (1.09)	57,2 (2.25)	267 (10.5)	104 (4.09)	46 (1.81)	245,6 (9.67)	245,6 (9.67)	73,5 (2.89)	122,6 (4.83)	230,6 (9.08)
PV 130	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	27,8 (1.09)	57,2 (2.25)	342 (13.5)	128 (5.03)	46 (1.81)	316 (12.4)	306 (12.0)	73,5 (2.89)	122,6 (4.83)	336 (13.2)
PV 180	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	31,8 (1.25)	66,7 (2.63)	342 (13.5)	128 (5.03)	46 (1.81)	316 (12.4)	306 (12.0)	73,5 (2.89)	122,6 (4.83)	336 (13.2)
PV 250	25 (.98)	41 (1.61)	187 (7.36)	42 (1.65)	69,8 (2.75)	120,7 (4.75)	31,8 (1.25)	66,7 (2.63)	387 (15.2)	150 (5.91)	46 (1.81)	403 (15.9)	403 (15.9)	73,5 (2.89)	122,6 (4.83)	437 (17.2)

Side Ports – SP Control

Dimensions mm (in)



Pump	SAE Inlet Flange "B" 3000/500	SAE Outlet Flange "A" 6000
PV 066	1½"	1"
PV 090	2"	1"
PV 130	2½"	1"
PV 180	2½"	1¼"
PV 250	3½"	1¼"

Control	Direction of rotation	Inlet	Outlet
to +V _{max}	CW	B	A
	CCW	A	B
to -V _{max}	CW	A	B
	CCW	B	A

- SSt G3/4" Control pump inlet port.
- PS1 G1/2" Control pressure port.
- PS2 G3/8" Control pressure port.
- L1 Two drain ports, one supplied plugged.
- L2 M18 x 1,5 x 12 deep; supplementary drain, or bleed plug. Must be drained in addition to L1 if the pump is installed with the shaft input end pointing up.
- MA G1/4" x 12,5 deep gauge port (supplied plugged).

Model	B1	B2	B3	B4	B5	B6	B7 h9	B8	B9	B10	B11	B12	B13
PV 066	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	176 (6.93)	10 (.39)	116 (4.57)	58 (2.28)	45 (1.77)	224,4 (8.83)	–	165 (6.50)
PV 090	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	180 (7.09)	10 (.39)	116 (4.57)	58 (2.28)	45 (1.77)	224,4 (8.83)	157,5 (6.20)	165 (6.50)
PV 130	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	45 (1.77)	224,4 (8.83)	–	190 (7.48)
PV 180	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	45 (1.77)	224,4 (8.83)	–	190 (7.48)
PV 250	325 (12.8)	175 (6.89)	250 (9.84)	330 (13.0)	280 (11.0)	280 (11.0)	18 (.71)	175 (6.89)	87,5 (3.44)	67,4 (2.65)	224,4 (8.83)	–	221 (8.70)

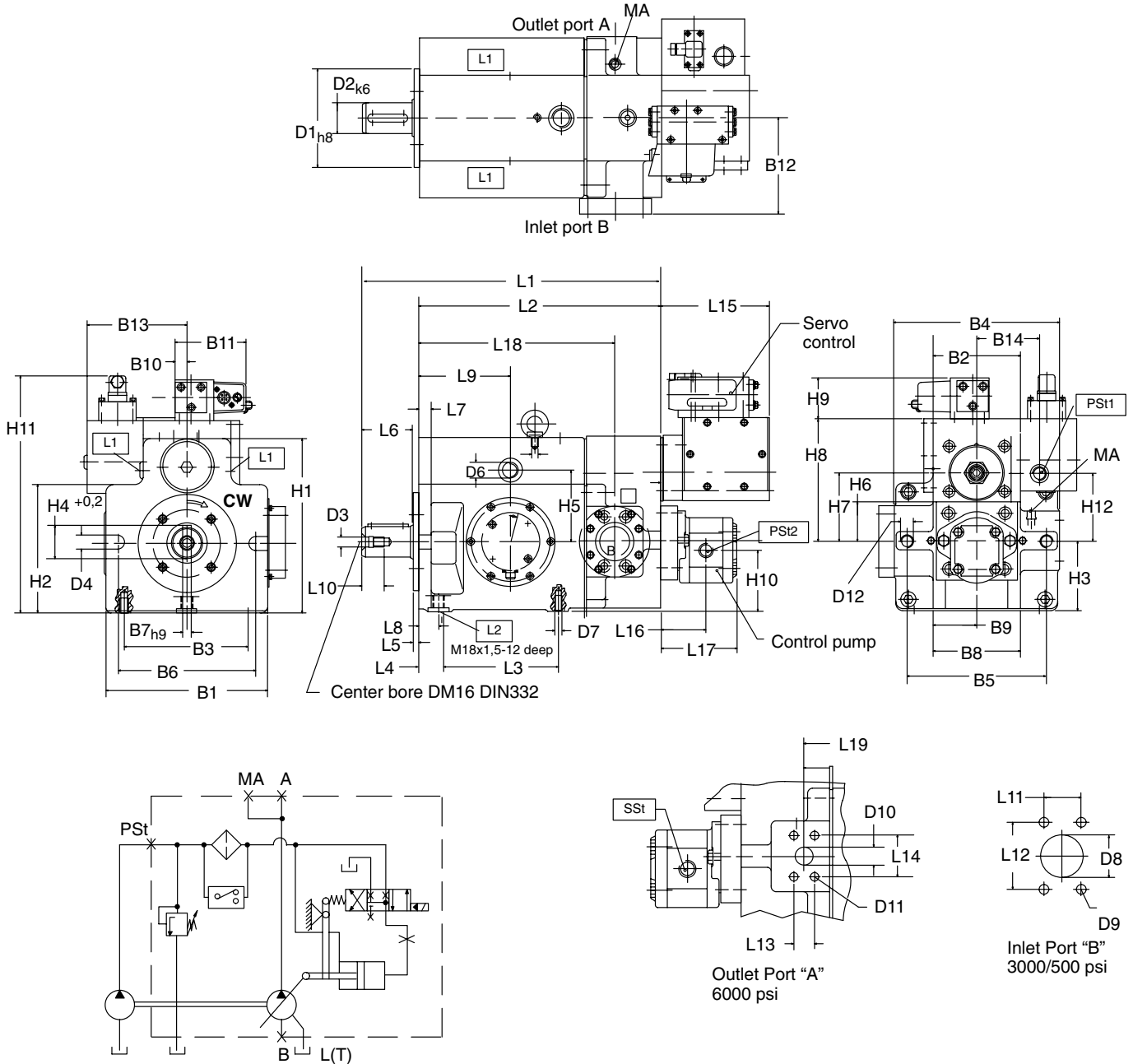
Model	H1	H2	H3	H4 +0.2	H5	H6	H7	H8	H9	H10	H11	D1 h8	D2 k6	D3	D4
PV 066	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	139 (5.47)	125 (4.92)	97 (3.82)	113 (4.45)	125 (4.92)	38 (1.50)	M12	18 (.71)
PV 090	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	139 (5.47)	125 (4.92)	97 (3.82)	113 (4.45)	125 (4.92)	38 (1.50)	M12	18 (.71)
PV 130	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	174 (6.85)	125 (4.92)	97 (3.82)	131 (5.16)	160 (6.30)	50 (1.97)	M16	22 (.87)
PV 180	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	174 (6.85)	125 (4.92)	97 (3.82)	131 (5.16)	160 (6.30)	50 (1.97)	M16	22 (.87)
PV 250	354 (13.9)	260 (10.2)	140 (5.51)	69 (2.72)	146 (5.75)	77 (3.03)	138 (5.43)	217 (8.54)	125 (4.92)	124 (4.88)	167 (6.57)	200 (7.87)	65 (2.56)	M20	26 (1.02)

Model	D5	D6	D7	D8	D9	D10	D11	D12	L1	L2	L3	L4	L5	L6	L7
PV 066	M8	M22 x 1,5	M10 x 24 deep	38 (1.50)	M12 x 24 deep	25 (.98)	M12 x 21 deep	–	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)
PV 090	M8	M22 x 1,5	M10 x 20 deep	50 (1.97)	M12 x 24 deep	25 (.98)	M12 x 21 deep	–	342 (13.5)	274 (10.8)	150 (5.91)	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)
PV 130	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	25 (.98)	M12 x 20 deep	M20	483 (19.0)	391 (13.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)
PV 180	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	32 (1.26)	M14 x 20 deep	M20	483 (19.0)	391 (13.4)	185 (7.28)	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)
PV 250	M12	M33 x 2	M16 x 32 deep	90 (3.54)	M16 x 32 deep	32 (1.26)	M14 x 24 deep	M24	622 (24.5)	505 (19.9)	230 (9.06)	50 (1.97)	10 (.39)	105 (4.13)	25 (.98)

Model	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23
PV 066	26 (1.02)	120 (4.72)	28 (1.10)	35,7 (1.41)	69,8 (2.75)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	10 (.39)	46 (1.81)	245,6 (9.67)	245,6 (9.67)	73,5 (2.89)	122,6 (4.83)	14,5 (.57)	31 (.22)
PV 090	26 (1.02)	120 (4.72)	28 (1.10)	42,9 (1.69)	77,8 (3.06)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	10 (.39)	46 (1.81)	245,6 (9.67)	245,6 (9.67)	73,5 (2.89)	122,6 (4.83)	14,5 (.57)	31 (1.22)
PV 130	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	27,8 (1.09)	57,2 (2.25)	50 (1.97)	10 (.39)	46 (1.81)	316 (12.4)	306 (12.0)	73,5 (2.89)	122,6 (4.83)	14,5 (.57)	31 (1.22)
PV 180	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	31,8 (1.25)	66,7 (2.63)	50 (1.97)	12 (.47)	46 (1.81)	316 (12.4)	306 (12.0)	73,5 (2.89)	122,6 (4.83)	14,5 (.57)	31 (1.22)
PV 250	41 (1.61)	187 (7.36)	42 (1.65)	69,8 (2.75)	120,7 (4.75)	31,8 (1.25)	66,7 (2.63)	56 (2.20)	–	46 (1.81)	403 (15.9)	403 (15.9)	73,5 (2.89)	122,6 (4.83)	14,5 (.57)	35 (1.38)

Side Ports – SM Control

Dimensions mm (in)



Pump	SAE Inlet Flange "B" 3000/500	SAE Outlet Flange "A" 6000
PV 066	1 1/2"	1"
PV 090	2"	1"
PV 130	2 1/2"	1"
PV 180	2 1/2"	1 1/4"
PV 250	3 1/2"	1 1/4"

Control	Direction of rotation	Inlet	Outlet
to +V _{max}	CW	B	A
	CCW	A	B
to -V _{max}	CW	A	B
	CCW	B	A

- SSt** G3/4" Control pump inlet port.
- PS1** G1/2" Control pressure port.
- PS2** G3/8" Control pressure port.
- L1** Two drain ports, one supplied plugged.
- L2** M18 x 1,5 x 12 deep; supplementary drain, or bleed plug. Must be drained in addition to L1 if the pump is installed with the shaft input end pointing up.
- MA** G1/4" x 12,5 deep gauge port (supplied plugged).

Model	B1	B2	B3	B4	B5	B6	B7 h9	B8	B9	B10	B11	B12	B13	B14
PV 066	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	176 (6.93)	10 (.39)	116 (4.57)	58 (2.28)	19 (.75)	113,5 (4.47)	–	158 (6.22)	100 (3.94)
PV 090	210 (8.27)	116 (4.57)	160 (6.30)	235 (9.25)	130 (5.12)	180 (7.09)	10 (.39)	116 (4.57)	58 (2.28)	19 (.75)	113,5 (4.47)	157,5 (6.20)	158 (6.22)	100 (3.94)
PV 130	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	19 (.75)	113,5 (4.47)	–	160 (6.30)	100 (3.94)
PV 180	260 (10.2)	140 (5.51)	200 (7.87)	265 (10.4)	224 (8.82)	224 (8.82)	14 (.55)	140 (5.51)	70 (2.76)	19 (.75)	113,5 (4.47)	–	160 (6.30)	100 (3.94)
PV 250	325 (12.8)	175 (6.89)	250 (9.84)	330 (13.0)	280 (11.0)	280 (11.0)	18 (.71)	175 (6.89)	87,5 (3.44)	19 (.75)	113,5 (4.47)	–	178 (7.00)	100 (3.94)

Model	H1	H2	H3	H4 +0.2	H5	H6	H7	H8	H9	H10	H11	H12
PV 066	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	154,5 (6.08)	65,5 (2.58)	97 (3.82)	315,5 (12.4)	88 (3.46)
PV 090	227 (8.94)	162 (6.38)	90 (3.54)	41 (1.61)	93 (3.66)	53 (2.09)	88 (3.46)	154,5 (6.08)	65,5 (2.58)	97 (3.82)	315,5 (12.4)	88 (3.46)
PV 130	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	199,5 (7.85)	65,5 (2.58)1	97 (3.82)	383,5 (15.1)	110 (4.33)
PV 180	283 (11.1)	207 (8.15)	113 (4.45)	53,5 (2.11)	117 (4.61)	64 (2.52)	110 (4.33)	199,5 (7.85)	65,5 (2.58)	97 (3.82)	383,5 (15.1)	110 (4.33)
PV 250	354 (13.9)	260 (10.2)	140 (5.51)	69 (2.72)	146 (5.75)	77 (3.03)	138 (5.43)	256,5 (10.1)	65,5 (2.58)	124 (4.88)	467 (18.4)	138 (5.43)

Model	D1 h8	D2 k6	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	L1	L2	L3
PV 066	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 24 deep	38 (1.50)	M12 x 24 deep	25 (.98)	M12 x 21 deep	–	342 (13.5)	274 (10.8)	150 (5.91)
PV 090	125 (4.92)	38 (1.50)	M12	18 (.71)	M8	M22 x 1,5	M10 x 20 deep	50 (1.97)	M12 x 24 deep	25 (.98)	M12 x 21 deep	–	342 (13.5)	274 (10.8)	150 (5.91)
PV 130	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	25 (.98)	M12 x 20 deep	M20	483 (19.0)	341 (13.4)	185 (7.28)
PV 180	160 (6.30)	50 (1.97)	M16	22 (.87)	M10	M26 x 1,5	M12 x 20 deep	62 (2.44)	M12 x 20 deep	32 (1.26)	M14 x 20 deep	M20	483 (19.0)	341 (13.4)	185 (7.28)
PV 250	200 (7.87)	65 (2.56)	M20	26 (1.02)	M12	M33 x 2	M16 x 32 deep	90 (3.54)	M16 x 32 deep	32 (1.26)	M14 x 24 deep	M24	622 (24.5)	505 (19.9)	230 (9.06)

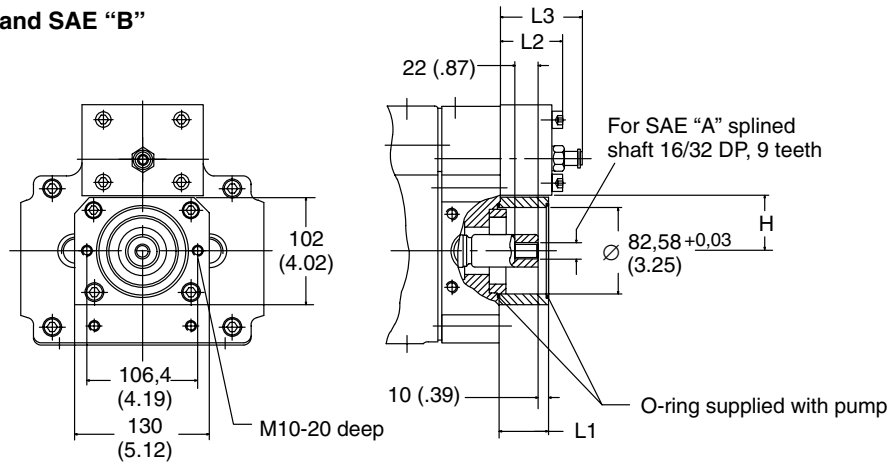
Model	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19
PV 066	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	35,7 (1.41)	69,8 (2.75)	27,8 (1.09)	57,2 (2.25)	163 (6.42)	73,5 (2.89)	122,6 (4.83)	245,6 (9.67)	245,6 (9.67)
PV 090	35 (1.38)	8 (.31)	58 (2.28)	16 (.63)	26 (1.02)	120 (4.72)	28 (1.10)	42,9 (1.69)	77,8 (3.06)	27,8 (1.09)	57,2 (2.25)	163 (6.42)	73,5 (2.89)	122,6 (4.83)	245,6 (9.67)	245,6 (9.67)
PV 130	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	27,8 (1.09)	57,2 (2.25)	175 (6.89)	73,5 (2.89)	122,6 (4.83)	316 (12.4)	306 (12.0)
PV 180	40 (1.57)	9 (.35)	82 (3.23)	20 (.79)	32 (1.26)	148 (5.83)	36 (1.42)	50,8 (2.00)	89 (3.50)	31,8 (1.25)	66,7 (2.63)	175 (6.89)	73,5 (2.89)	122,6 (4.83)	316 (12.4)	306 (12.0)
PV 250	50 (1.97)	10 (.39)	105 (4.13)	25 (.98)	41 (1.61)	187 (7.36)	42 (1.65)	69,8 (2.75)	120,7 (4.75)	31,8 (1.25)	66,7 (2.63)	204 (8.03)	73,5 (2.89)	122,6 (4.83)	403 (15.9)	403 (15.9)

Thru-Drive Mounting Dimensions

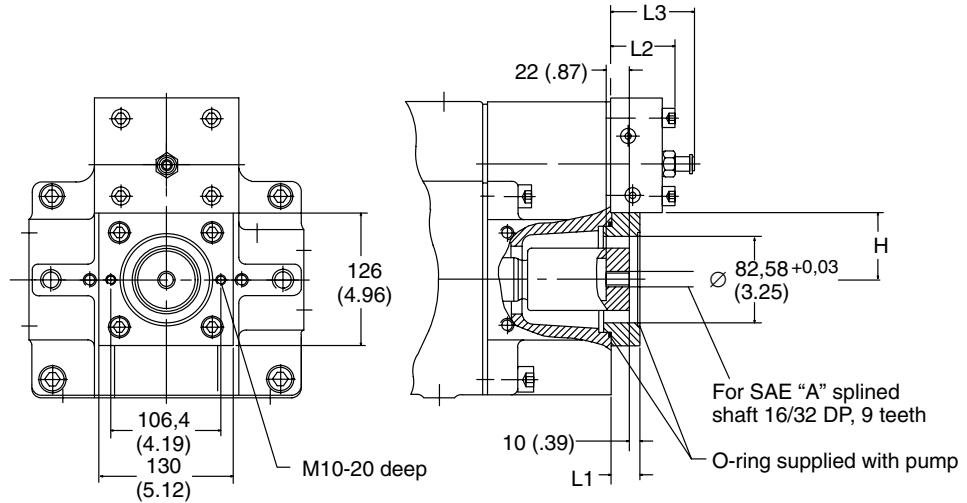
Thru-drive Mounting SAE "A" and SAE "B"

Dimensions mm (in)

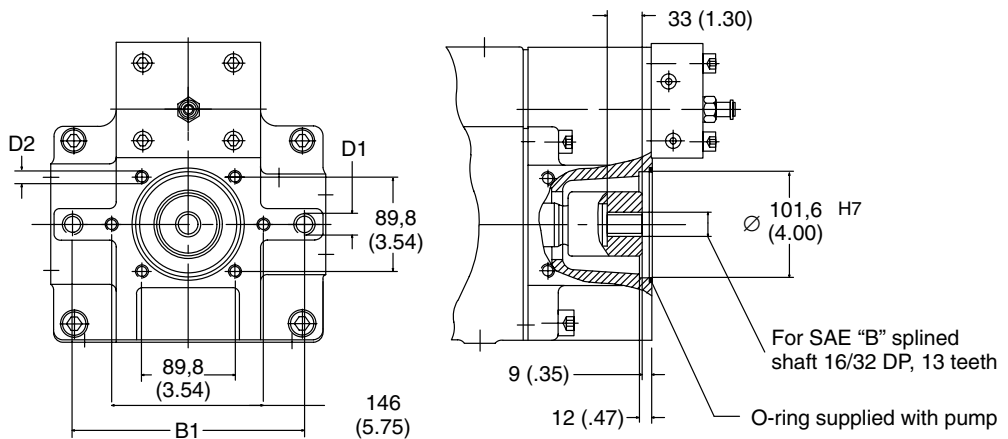
PV 066/090-P-**-5
SAE "A"



PV 130/180/250-P-**-5
SAE "A"

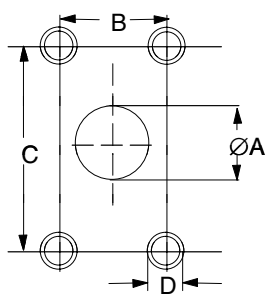


PV 130/180/250-P-**-4
SAE "B"



Pump Size	Thru-drive	B1	D1	D2	L1	L2	L3	H
066/090	SAE "A"	-	-	-	47 (1.85)	60 (2.36)	81 (3.19)	53 (2.09)
130/180	SAE "A"	224 (8.82)	M20-30 deep	M12-20 deep	28 (1.10)	62 (2.44)	81 (3.19)	64 (2.52)
	SAE "B"	-	-	-	-	62 (2.44)	81 (3.19)	64 (2.52)
250	SAE "A"	280 (11.0)	M24-38 deep	M12-24 deep	28 (1.10)	56 (2.20)	91 (3.58)	77 (3.03)
	SAE "B"	-	-	-	-	56 (2.20)	91 (3.58)	77 (3.03)

SAE 4-Bolt Mounting Pads



	Code 61 series				Code 62 series	
	1 1/2	2	2 1/2	3 1/2	1	1 1/4
A	38	50	62	90	25	32 max
B	35,7	42,9	50,8	69,8	27,8	31,8
C	69,8	77,8	89	120,7	57,2	66,7
D	M12 x 20	M12 x 20	M12 x 20	M16 x 26	M12 x 18	M14 x 24
PF/PV 066	Inlet					
	Outlet					
PF/PV 090	Inlet					
	Outlet					
PF/PV 130	Inlet					
	Outlet					
PF/PV 180	Inlet					
	Outlet					
PF/PV 250	Inlet					
	Outlet					

Thru-drive Shaft Output Torque

Pump Size	Max. Output Torque, Nm (lb-ft)		
	Keyed Shaft Increasing Load	Keyed Shaft Reversal Load	Splined Shaft
066	520 (383)	260 (190)	660 (485)
090	520 (383)	260 (190)	660 (485)
130	720 (530)	360 (265)	900 (665)
180	720 (530)	360 (265)	900 (665)
250	1400 (1032)	1400 (1032)	2500 (1843)

Installation data

Installation position is optional, however, note bearing lubrication with respect to mounting position.

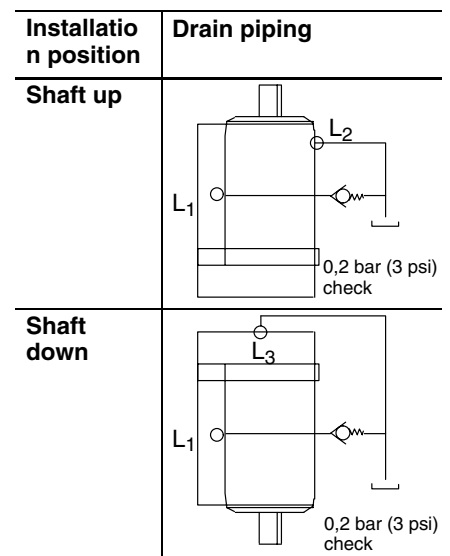
The operation of all sizes of "PV pumps" in an open circuit with the following conditions:

- pump in flow position up to Q_{max} .
- $p_1 < 2$ bar (30 psi) abs.
- $p_2 < 25$ bar (360 psi)

For example: Circulation with no pressure may cause a reverse of the drain flow. Hydraulic fluid will be drawn from the case through the decompression bore of the valve plate into the cylinder. Operating the pumps in this condition will risk dry running the bearings resulting in damage.

Therefore, the drain line has to be installed in such a way as to allow hydraulic fluid to be drawn from the reservoir tank. For this to happen:

- the drain pipe must terminate below the reservoir oil level.
- a check valve in the drain line is not allowed.
- if a check valve is required and cannot be avoided, the case must be flushed by an external flow of 5 to 10 l/min (1.32 to 2.64 USgpm)



Application Data

Case flushing requirements

Case flushing is not necessary for open loop pumps with DR or LR controls.

A check valve must not be used in the drain pipe. The drain pipe must terminate below the oil level in the reservoir.

Case flushing is not necessary for open loop pumps with DF controls if flushing or return oil is drained via the case.

For all other conditions with low pressure <20 bar (<300 psi) and low flow (<10% of Q_{max}) case flushing is required.

For operation with special fluids HFB and HFC, case flushing is required.

Flushing flow

Flushing flow via the pump case should be >1% of maximum pump flow. Maximum flushing flow depends on case pressure.

Fluids

Pumps in this catalog are primarily designed to operate with conventional petroleum based hydraulic oil. Alternative fluids and restrictions:

NOTE:

1. All maximum speed figures are based on atmospheric pressure (1.0 bar absolute) at pump inlet. This requires an overhead reservoir.
2. All listed ratings are based on the use of a good quality fluid.
3. Alternative fluids have a reduced tolerance for contamination over petroleum base fluids. Good filtration is therefore critical.

Pressure and flow ratings of hydraulic components generally have to be reduced when alternative fluids are used.

Because hydraulic pumps depend on the pumping fluid for dynamic lubrication, it is necessary to alter the ratings in order to retain the durability and operating life that is expected in today's hydraulic systems.

These pumps will provide exceptional life when used with a good quality clean fluid at the pump ratings specified for that fluid.

Fluid maintenance is critical to the durability of all hydraulic components, and particularly so with hydraulic pumps. This becomes even more of a factor when alternative fluids are used. All types of alternative fluids require extensive maintenance in order to maintain proper levels of water content, acidity, viscosity and contamination.

Fluid Cleanliness

These pumps are rated for anti-wear petroleum fluids with a contamination level of 18/15/13 (Vickers) or ISO 18/14. 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 Vickers representative for specific duty cycle recommendations.

Vickers 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.

Essential information on the correct methods for treating hydraulic fluid is included in Vickers publication 561 – "Vickers Guide to Systemic Contamination Control" – available from your local Vickers distributor. In this publication, filtration and cleanliness levels for extending the life of axial piston pumps and other system components are listed. Included is an excellent discussion of the selection of products needed to control fluid condition.

Ordering procedure

When ordering please specify full model designations of items required; see "Model codes" section of this catalog.

Note the following:

- Designations of variable displacement pumps must include the supplementary designation of the required control type.

Type	FLUIDS Classification	Max. Pressure bar	Max. Speed rpm	Recommended Seal Material	Max. Operature Temperature °C
Oil-in-Water Emulsion	HFAE	Not Rated			
Water-in-Oil Emulsion	HFB	250	1800	Nitrile	49
Water Glycol	HFC	250	1800	Nitrile	49
Phosphate Ester	HFDR	350 / 420	1800	Fluorocarbon	66
Polyol Ester	HFDU	350 / 420	1800	Fluorocarbon or High ACN Nitrile	66