

#### Features

- Rigid Axial Piston Pump Design
- High Pressure and High Flows achievable.
- For Open Loop Systems
- Large servo piston with strong bias spring achieves fast response.
- Reduced noise due to active decompression of system when destroking and pre-compression technology.
- Thru drive capability.



### Ordering Details

P	Pump
V	Variable
AP	Axial Piston
140-	CC, Centimeters <sup>3</sup> /rev.: 16, 23, 46, 71, 92, 140, 180, 210, 270

PR-	Controller: (ref. 3-5)	Code	Description	Code	Description
		PR	Pressure variable adjustment	HP(X)	Horsepower limiting control, Indicate hp setting "X" in parenthesis
		PRR	Pressure variable adjustment w/remote pressure port	PRP12	Pressure is electro-proportional controlled, 12VDC
		LS	Load Sense, Flow and Pressure	PRP24	Pressure is electro-proportional controlled, 24VDC

K2-	Shaft: (ref. page 6-10)	Keyed			Spline				
		Code	Shaft Dia., in.	Key Width, in.	CC/rev	Code	Shaft Dia.	Details	CC/Rev
		K1	1.00	0.250	16, 23	14T	1.25	14T 12/24 DP	46
		K1.2	1.25	0.312	46	15T	1.00	15T 16/32 DP	16, 23
		K1.75	1.75	0.437	71, 92	13T1.7	1.75	13T 8/16 DP	71, 92
		K2	2.00	0.500	140, 180, 210, 270	15T2	2.00	15T 8/16 DP	140, 180, 210, 270

4D-	Mounting Flange: (ref. page 6-10)	Code	Flange	CC/Rev
		4B	SAE B, 4-bolt	16, 23
		4C	SAE C, 4-bolt	46
		4D	SAE D, 4-bolt	71, 92, 140, 180, 210
		4E	SAE E, 4-bolt	270

HF1.25	Pressure Port: (ref. page 6-10)	4-bolt Flange, Code 62		
		Code	Port Dia., inches	CC/Rev. Pressure
		HF.75	0.75	16, 23
		HF1	1.00	46
		HF1.25	1.25	71, 92, 140, 180, 210
		HF1.5	1.50	270

4-bolt Flange, Code 61		
Code	Port Dia., inches	CC/Rev. Suction
F1.25	1.25	16, 23
F1.5	1.50	46
F2	2.00	71, 92, 140, 180, 210
F3.5	3.50	270

F2	Suction Port:
S-	Port Location: S=Side
R-	Rotation: L=Left Hand (CCW), R= Right Hand (CW)

Through Drive Mounting: Blank = None, T = Prepared for through drive according to the following mounting options:  
(ref. page 10)

Rear pump			Front Pump
Code	Flange	Shaft	CC
T2AA9T.6	SAE AA, 2-bolt	Spline 9T 16/32 DP	16, 23
T2A9T.6	SAE A, 2-bolt	Spline 9T 16/32 DP	16, 23, 46, 71, 92, 140, 180, 210, 270
T4B15T	SAE B, 4-bolt	Spline 15T 16/32 DP	16, 23, 46, 71, 92, 140, 180, 210, 270

Rear pump			FrontPump
Code	Flange	Shaft	CC
T4C14T	SAE C, 4-bolt	Spline, 14T 12/24 DP	46, 71, 92, 140, 180, 210, 270
T4D13T1.7	SAE D, 4-bolt	Spline 13T 8/16 DP	71, 92, 140, 180, 210, 270
T4D15T2	SAE D, 4-bolt	Spline 15T 8/16 DP	140, 180, 210, 270
T4E15T2	SAE E, 4-bolt	Spline 15T 8/16 DP	270

add "+" then rear pump part number for a tandem assembled unit

3	Frame: 3
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Example Part Number: PVAP140-PR-K2-4D-HF1.25F2-S-R-3

## Technical Specifications:

Displacement	cc/rev (in <sup>3</sup> /rev)	16	23	46	71	92	140	180	210	270
Flow at 1800 rpm, 7 bar (100PSI)	lpm (gpm)	28.8 (7.6)	41.4 (10.9)	82.2 (21.9)	128.7 (34)	165.6 (43.8)	252.1 (66.6)	324 (85.6)	378 (99.8)	486 (128.4)
Flow at Max. RPM	lpm (gpm)	44 (11.6)	63.3 (16.6)	110.4 (29.1)	149.1 (39.2)	174.8 (46.0)	308.0 (81.1)	396 (104.2)	441 (116.1)	486 (127.9)

Maximum RPM (continuous)	rpm	2750	2750	2400	2100	1900	2200	2200	2100	1800
Min. Recommended RPM	rpm	300								
Max. Pressure (continuous)	bar (psi)	350 (5075)								
Max. Pressure (intermittent)*	dBA	420 (6090)								
Approximate Noise Level @ 70 bar (1015psi)	dBA	56	56	59	66	66	70	71	73	77
Approximate Noise Level @ 207 bar (3000psi)	dBA	60	60	62	70	70	74	75	77	79
Approximate Noise Level @ 343 bar (4974psi)	dBA	68	68	69	74	74	76	77	79	89
Max. Case Drain Pressure	bar (psi)	1 (14.5)	1 (14.5)	1 (14.5)	1 (14.5)	1 (14.5)	1 (14.5)	1 (14.5)	1 (14.5)	1 (14.5)
Max. Suction Port Pressure	Bar (psi)	2 (29)	2 (29)	2 (29)	2 (29)	2 (29)	2 (29)	2 (29)	2 (29)	2 (29)
Max. Suction Port Vacuum, absolute	bar (psi)	0.8 (11.6)	0.8 (11.6)	0.8 (11.6)	0.8 (11.6)	0.8 (11.6)	0.8 (11.6)	0.8 (11.6)	0.8 (11.6)	0.8 (11.6)
Recommended Oil Viscosity	mm <sup>2</sup> /sec (SUS)	16-36 (80-170) {Cold start ≤ 1600mm <sup>2</sup> /s for ≤ 3min}								
Recommended Fluid		Mineral based oil, VG46 or viscosity range 25-50mm <sup>2</sup> /s (cSt) at 50°C								
Recommended Fluid Filtration level		Class19/15, to ISO 4406 X=25μ (β25≥75) to ISO 4572								
Recommended Temp. Range	°C (°F)	-25 to 82 (-13 to 180)								

\*Single duration <6sec

Note: Fill pump case with oil through case drain port prior to operation.

Weight	Kg (lbs.)	19 (42)	19 (42)	30 (66)	60 (132)	60 (132)	90 (198)	90 (198)	90 (198)	172 (379)
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### Thru Drive Maximum Shaft Power:

The pumps are designed to take the equivalent max flow and pressure (HP) of the lead pump on the trailing pump. Therefore, there is no need to consider the thru drive limitation for 2 tandem mounted pumps. When adding a 3rd pump, care must be taken not to exceed maximum power limit of the lead pump when adding all trailing pumps torque.

$$HP = \frac{\text{flow (gpm)} \times \text{pressure (psi)}}{1714}$$

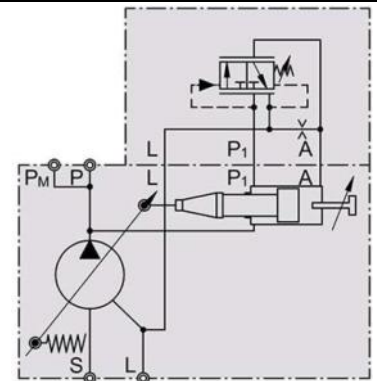
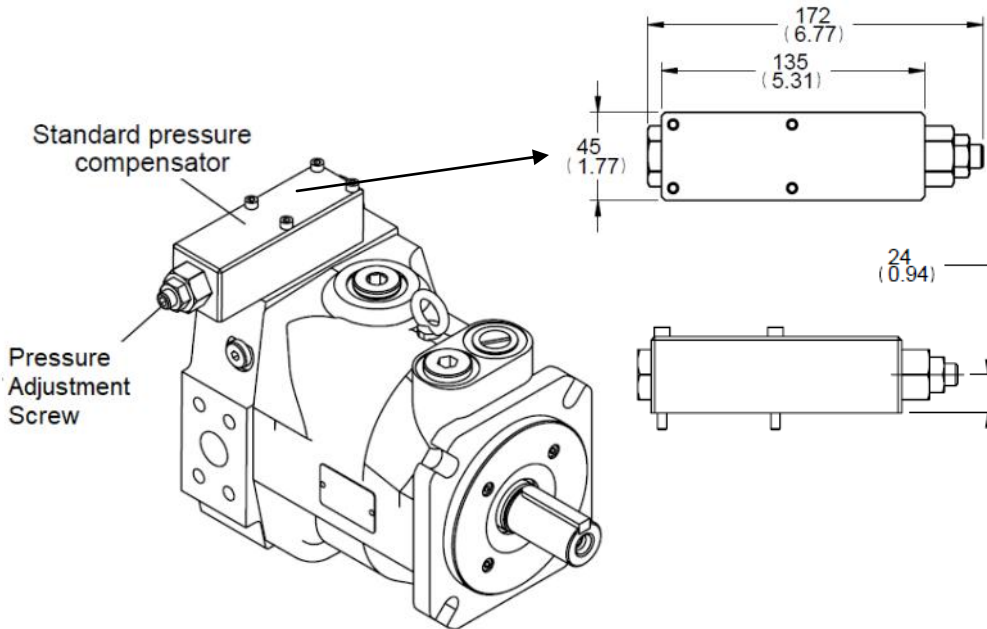
$$HP = \frac{\text{Torque (lb. in)} \times \text{RPM}}{63025}$$

Shaft	Torque Limit, lb-in									
<b>K1</b>	2655	2655								
<b>K1.25</b>			4868							
<b>K1.75</b>				11683	11683					
<b>K2</b>						17701	17701	17701	17701	
<b>14T</b>			5399							
<b>15T</b>	2655	2655								
<b>13T1.7</b>				10780	10780					
<b>15T2</b>						23719	23719	23719	23719	

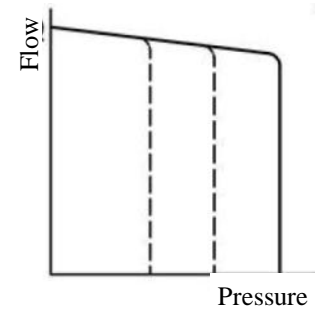
## Controller Options:

### PR-Pressure Compensated

Controls the maximum pressure at port P by varying the pump displacement. The pump will provide the amount of fluid required by the actuators until the pressure limit is met. It will then automatically decrease the flow output to avoid over pressure or pumping flow over a relieve valve. This will reduce the energy loss and heat generation.. The maximum pressure is set manually by an allen wrench adjustment on the compensator.



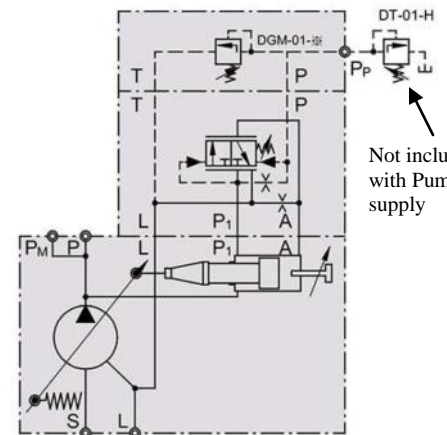
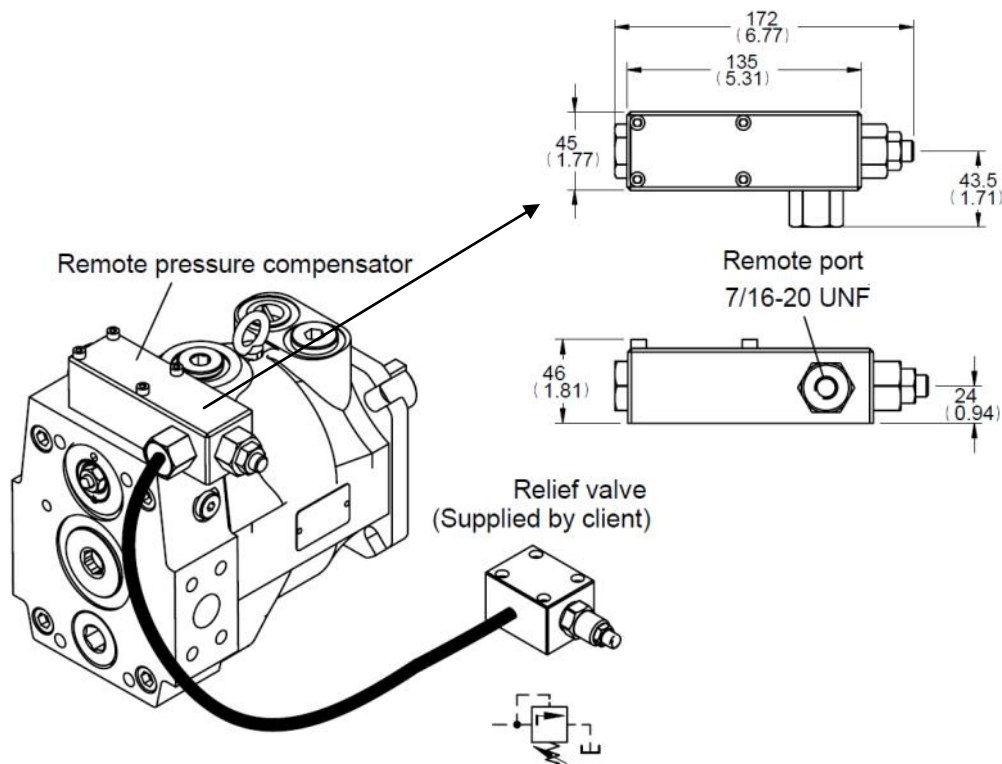
P = Working Pressure Port  
S = Suction Port  
L = Drain Port  
L<sub>1</sub> = Auxiliary Drain Port, plugged



### PRR-Pressure Compensated with Remote Pressure Port

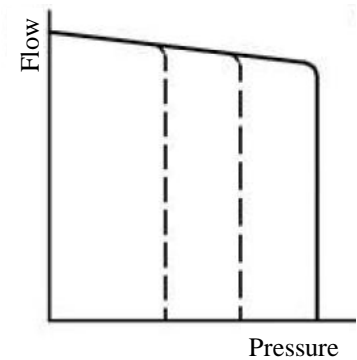
Same as the PR control with a P<sub>p</sub> port to remotely set the pressure. Remote pressure valve not included.

The remote pilot supply flow is internal thru port P<sub>p</sub> at 1-1.5lpm (.26-.39gpm). The maximum recommended line length to the remote pressure control should be ≤ 2m (6.6 ft.)



Not included with Pump supply

P = Working Pressure Port  
S = Suction Port  
L = Drain Port  
P<sub>p</sub> = Remote Pilot Pressure Port



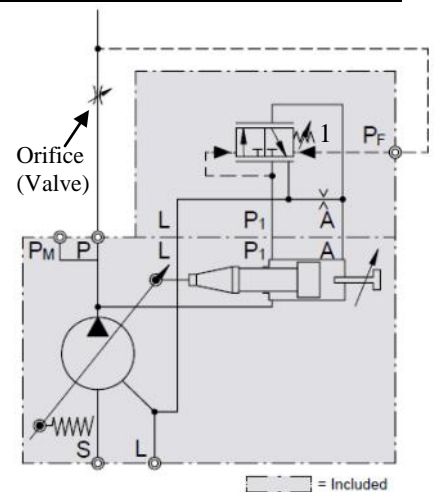
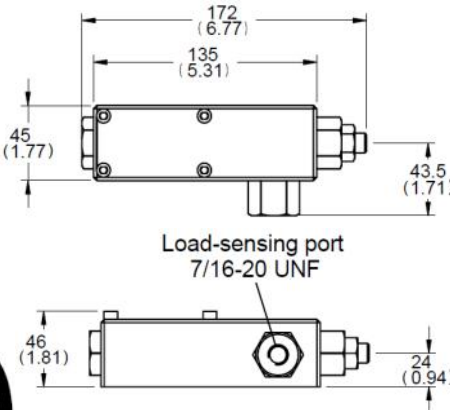
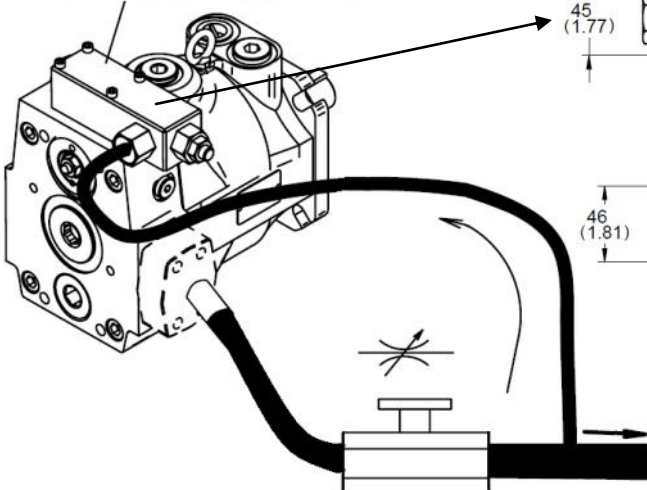
## Controller Options:

### LS—Load Sense Control (Pressure and Flow)

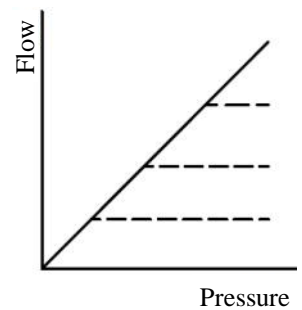
The pump flow will be varied based on the differential pressure across an orifice (valve) in line with each actuator. The pump will limit its flow by means of the spring setting (1) to only what's required for the movement of the actuator based on the orifice (valve) opening. The larger the opening the higher the speed. The pump flow will be consistent regardless of changes in pressure (varying loads on the actuator) or pump rpm. The benefit of a LS controls is energy efficiency, reduced heat generation and consistent speed control.

The load sense flow control spring setting (1) is pre-set to 10 bar (145 psi).

Load-sensing compensator



P = Working Pressure Port  
S = Suction Port  
L = Drain Port  
P<sub>F</sub> = Load Sense Pilot Line

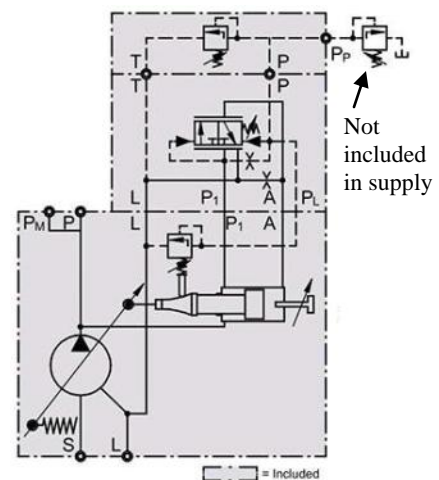
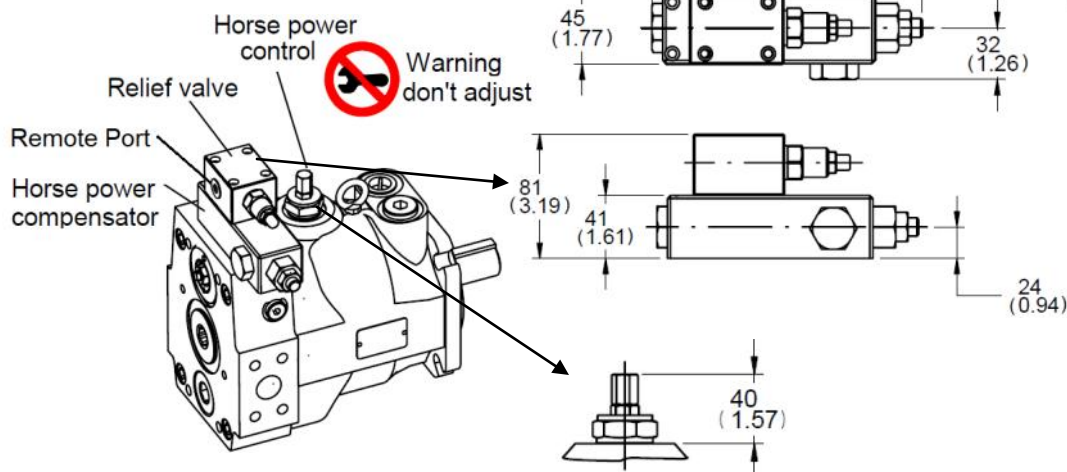


### HP—Horsepower Control (Pressure Flow and Power)

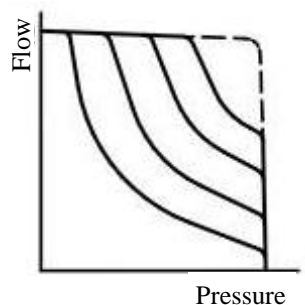
The maximum horsepower required to drive the pumps is limited. The output flow of the pump is varied so the pressure times the flow (HP) is held below the limit setting. A pilot valve is integrated into the pump and adjusted by a cam sleeve. The cam sleeve has a contour that is machined for the selected horsepower range when ordering. This makes the pump compensate along a constant horsepower (torque) curve.

The power setting is set at the factory. Indicate in the part number the hp setting in parenthesis after the HP controller code.

Working pressure can be adjusted remotely by connecting a pressure relief or proportional relief valve to port P<sub>p</sub>. The internal pilot supply flow is 1-1.5lpm (.26-.39gpm),



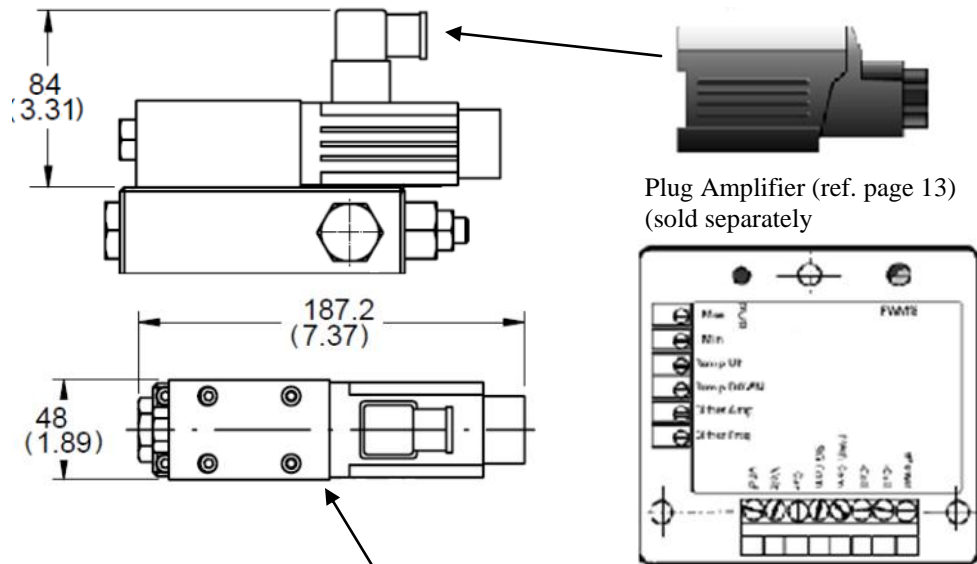
P = Working Pressure Port  
S = Suction Port  
L = Drain Port  
P<sub>p</sub> = Remote Pilot Pressure Port



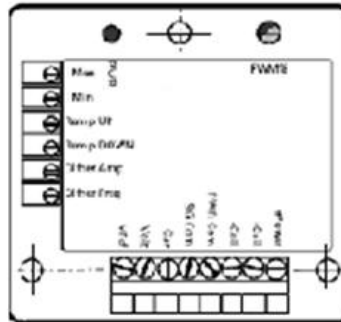
## Controller Options:

### PRP12 and PRP24-Electrical Proportion Pressure Control

The pump pressure is electrically controlled by varying the current to the proportional valve V. The proportional valve V can be powered by 12VDC (PRP12) or 24VDC (PRP24) options. The command voltage to the amplifier can be 4-20mA or 0-10VDC. Reference the table below for the solenoid and amplifier details:

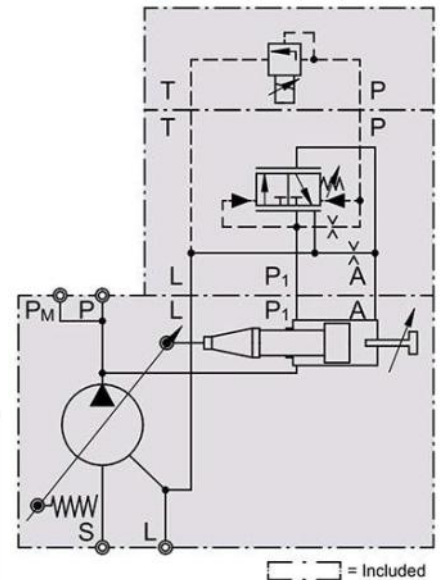
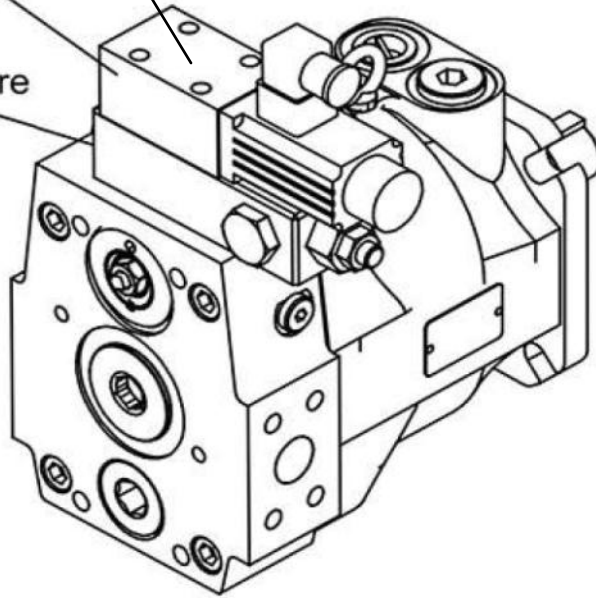


Plug Amplifier (ref. page 13)  
(sold separately)

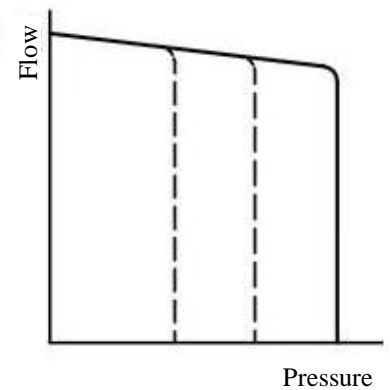


Amplifier Card (ref. page 12)  
(sold separately)

Proportional pressure valve  
Remote pressure compensator



P = Working Pressure Port  
S = Suction Port  
L = Drain Port

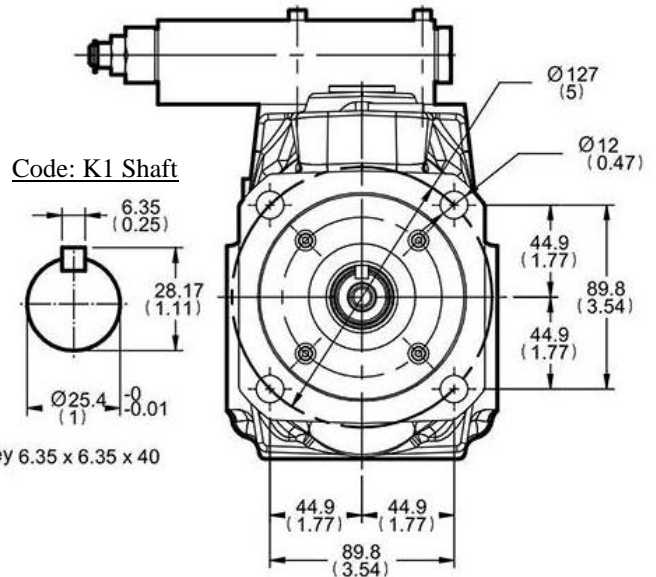
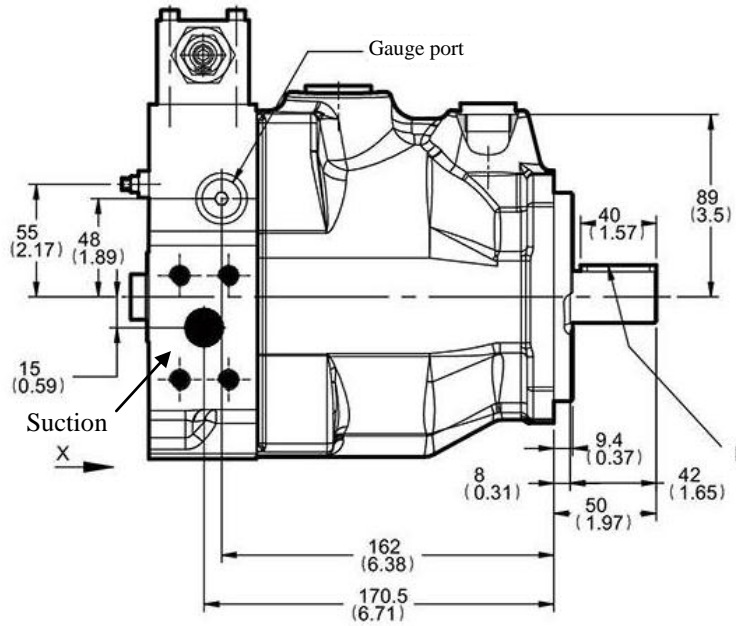
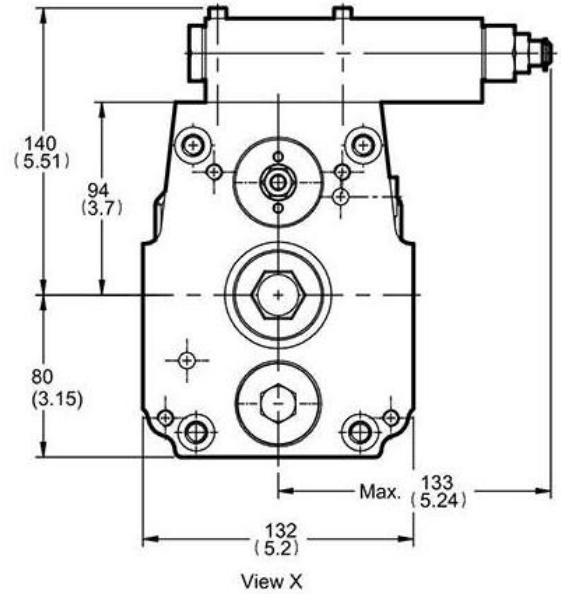
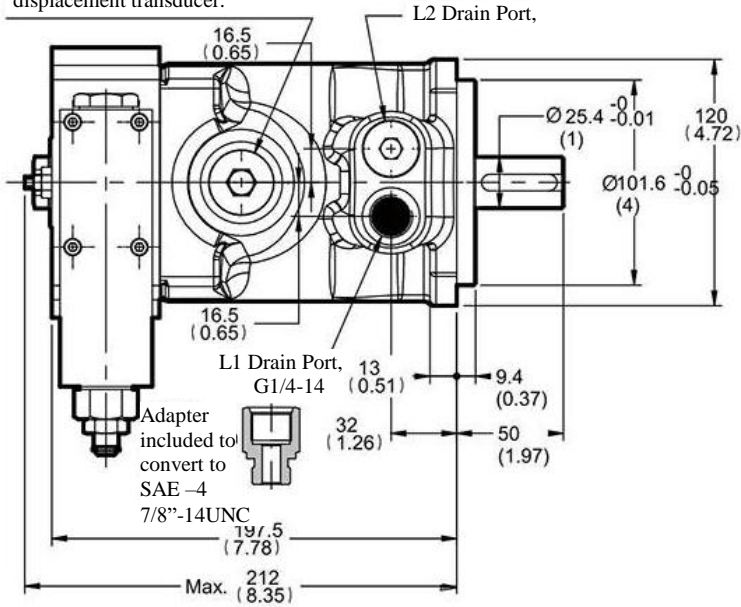


Solenoid Data	PRP12	PRP24
Voltage	12VDC (+/-20%)	24 VDC (+/-20%)
Current at min flow	100 mA	50 mA
Current at max. flow	1200 mA	600mA
Current limit	1.54 A	0.77 A
Nominal Resistance @ 20°C	5.5Ω	22.7Ω
Dither Frequency	100-200 Hz	100-200Hz
Operating Temperature	-20 to 115°C (-4 to 239°F)	
Amplifier Card Part No., Sold Separately (ref. page 11- 12)	AMP PRP12 AMPP PRP12..	AMP PRP24 AMPP PRP24..

**Dimensions, 16 and 23 cc/rev (PR Controller):**

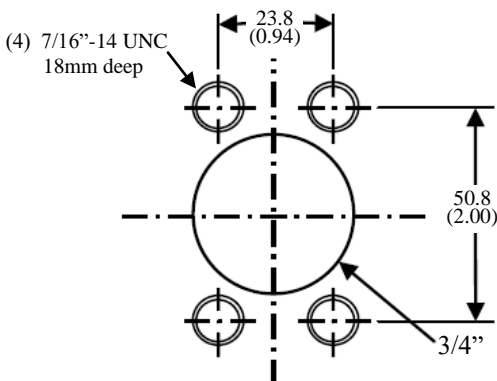
Mounting hole for horsepower compensator pilot or displacement transducer.

Dimensions: mm (inch)

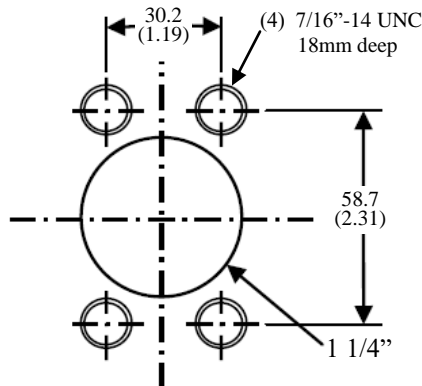


Ports:

Pressure: Code HF.75

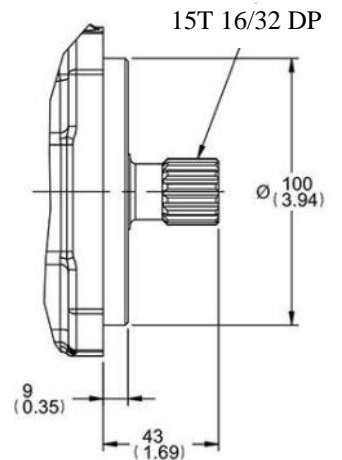


Suction: Code F1.25



Shafts:

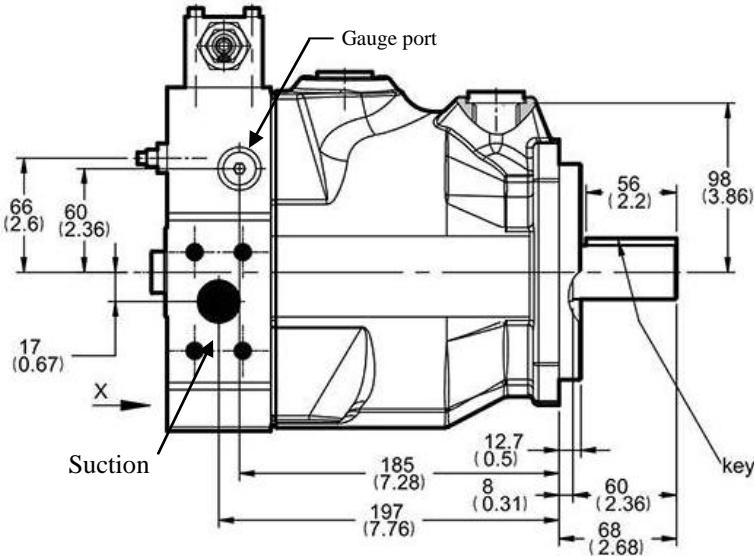
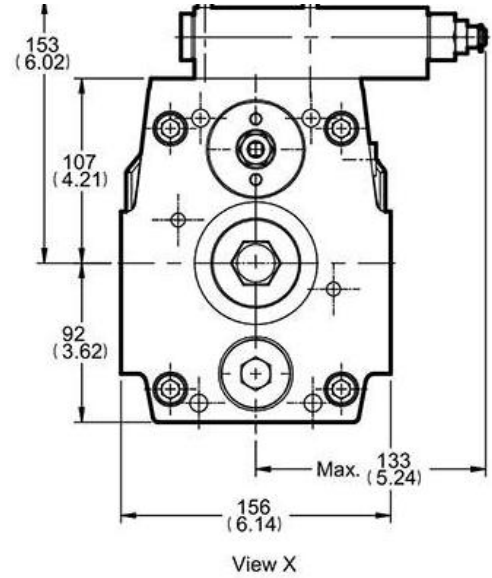
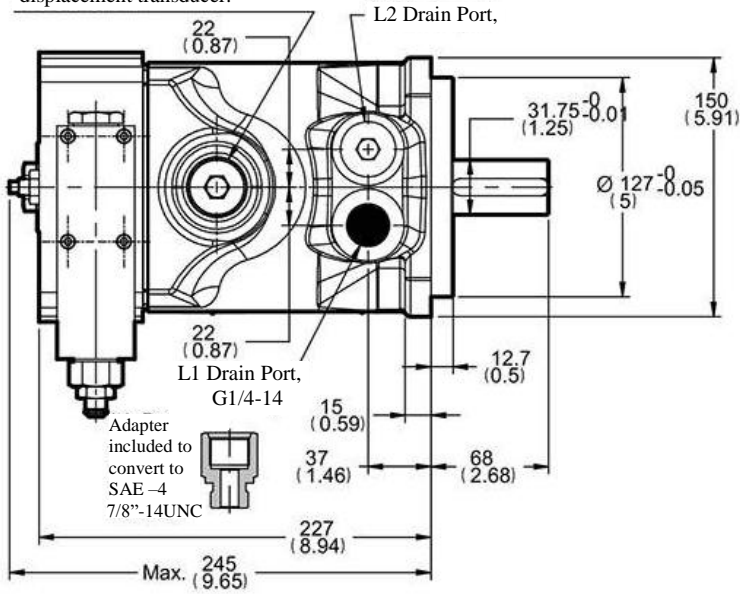
Code: 15T Shaft



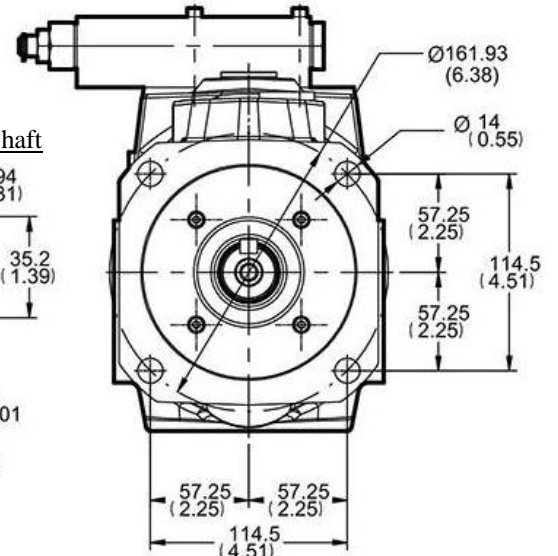
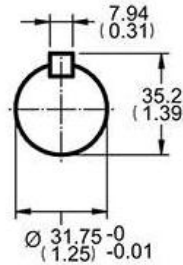
**Dimensions, 46 cc/rev (PR Controller):**

Mounting hole for horsepower compensator pilot or displacement transducer.

Dimensions: mm (inch)



Code: K1.2 Shaft

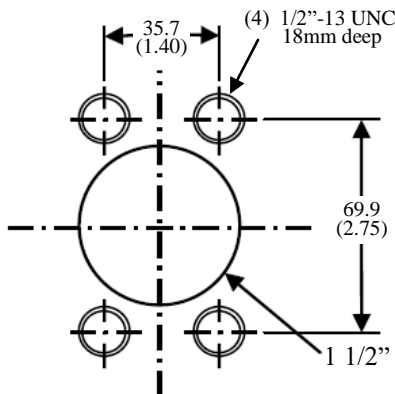
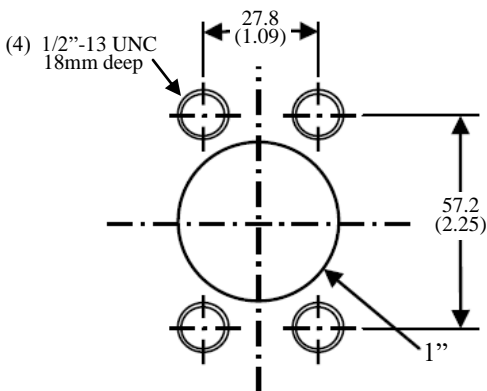


Ports:

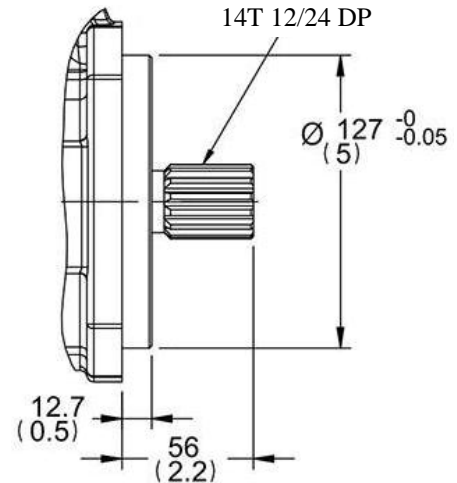
Shafts:

Pressure: Code HF1

Suction: Code F1.5



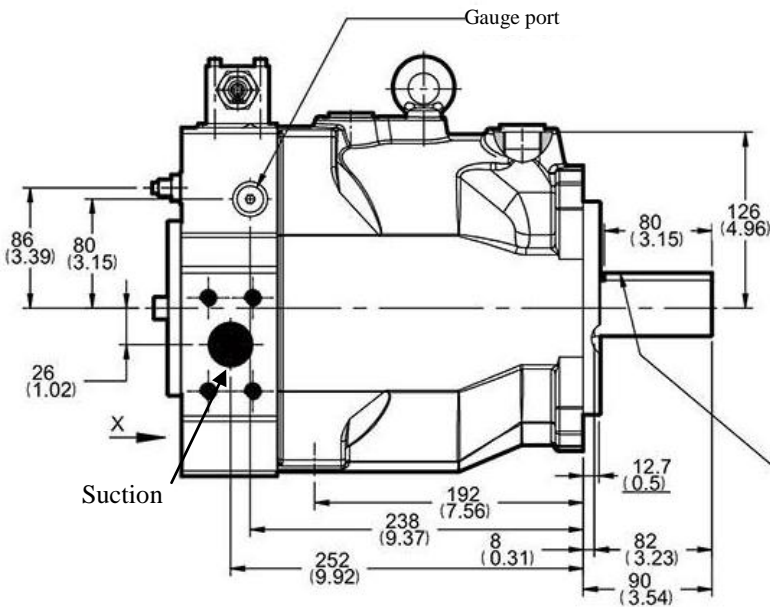
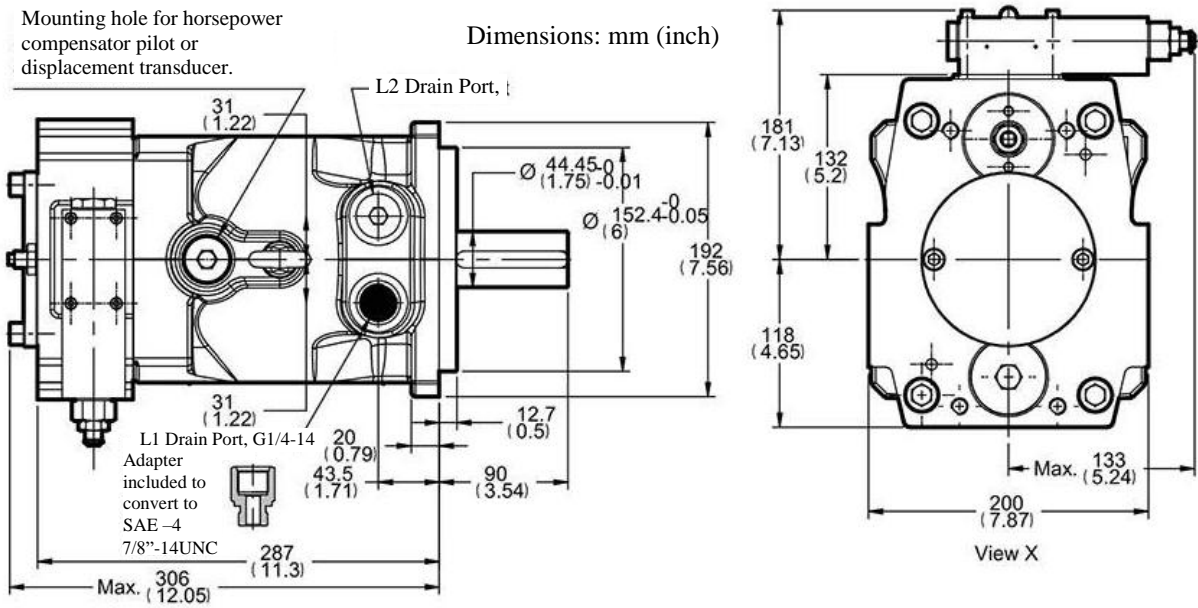
Code: 14T Shaft



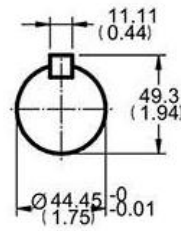
**Dimensions, 71 and 92 cc/rev (PR Controller):**

Mounting hole for horsepower compensator pilot or displacement transducer.

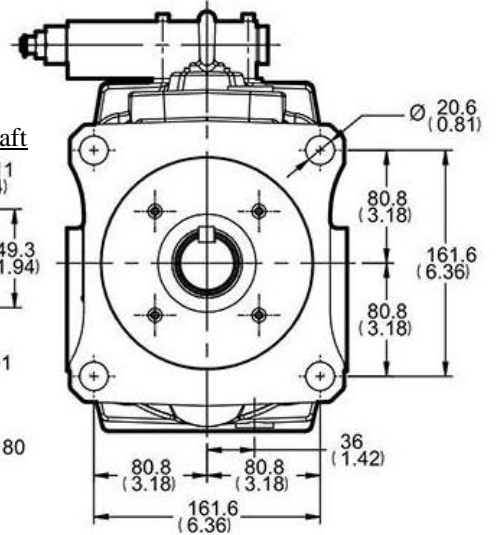
Dimensions: mm (inch)



Code: K1.75 Shaft



key 11.11 x 11.11 x 80



Ports:

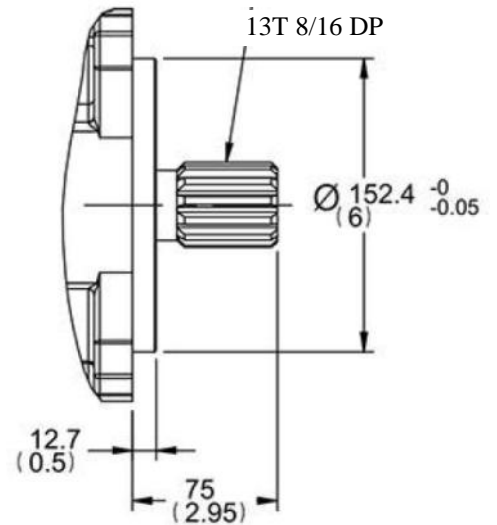
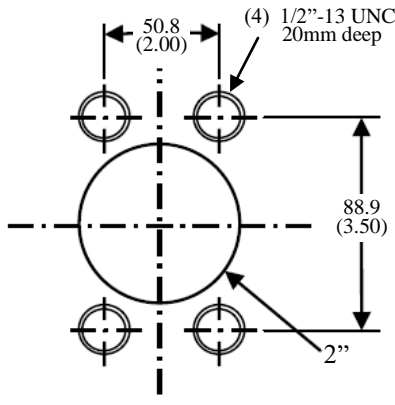
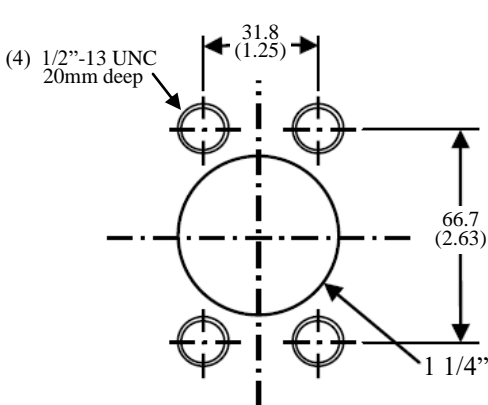
Shafts:

Pressure: Code HF1.25

Suction: Code F2

Code: 13T1.7 Shaft

13T 8/16 DP

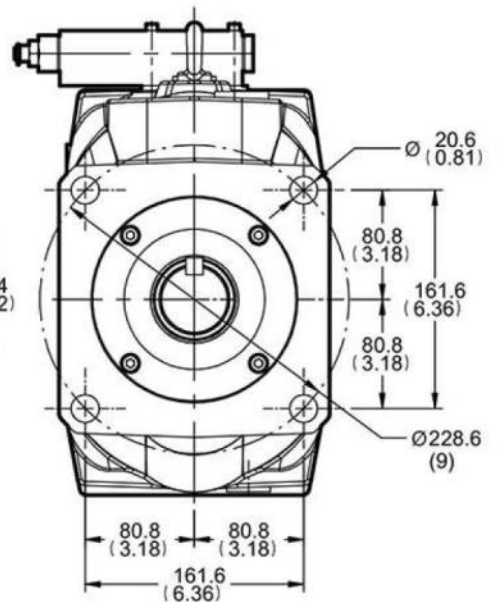
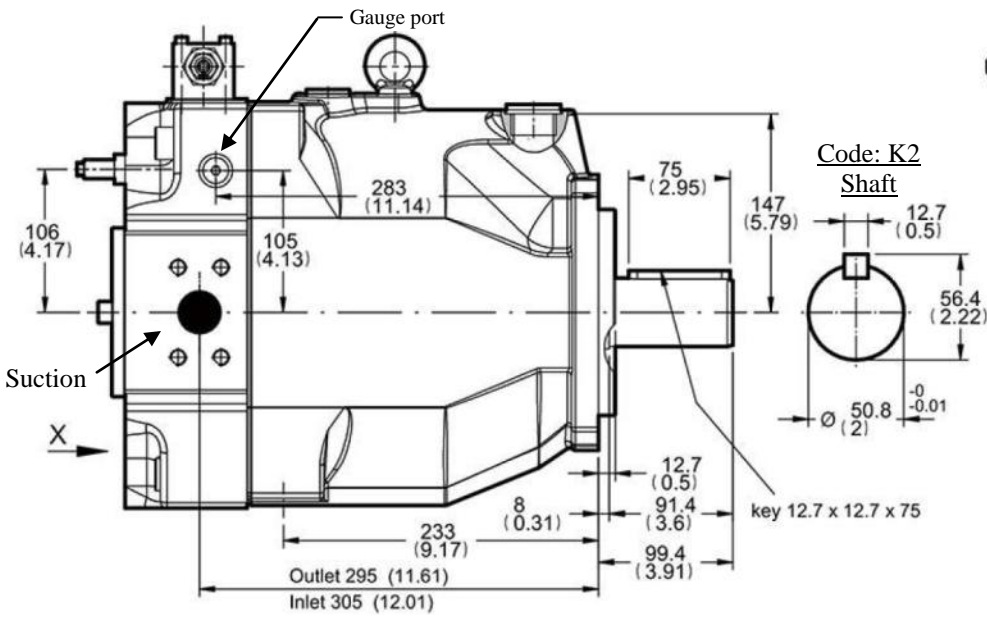
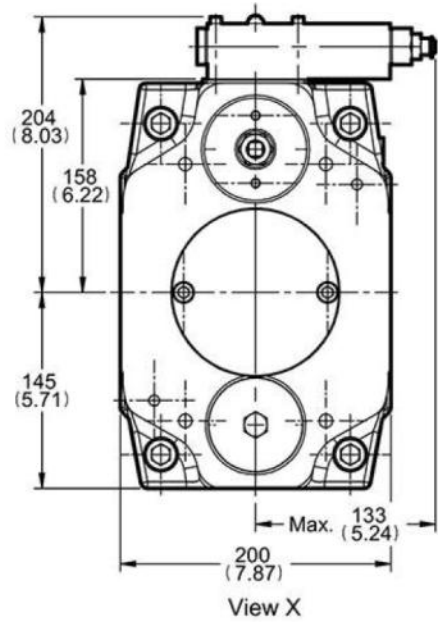
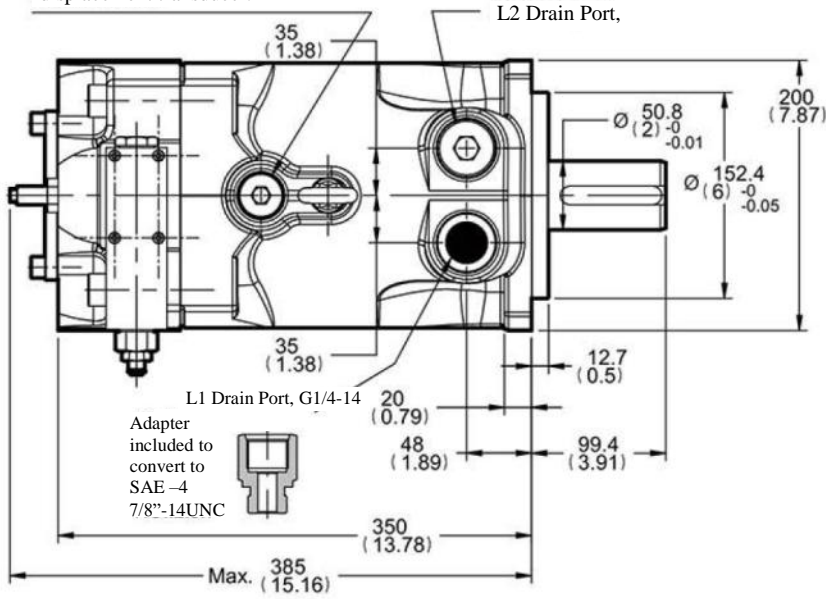




**Dimensions, 140, 180 and 210 cc/rev (PR Controller):**

Mounting hole for horsepower compensator pilot or displacement transducer.

Dimensions: mm (inch)



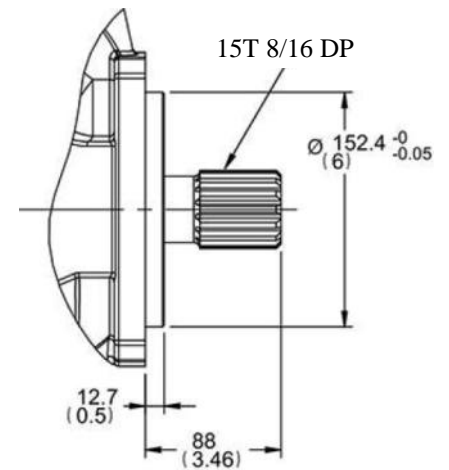
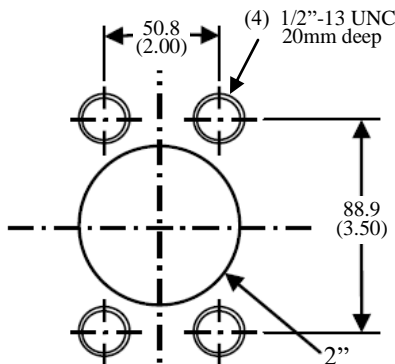
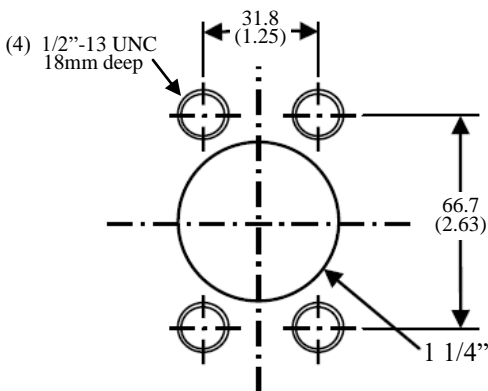
Ports:

Shafts:

Pressure: Code HF1.25

Suction: Code F2

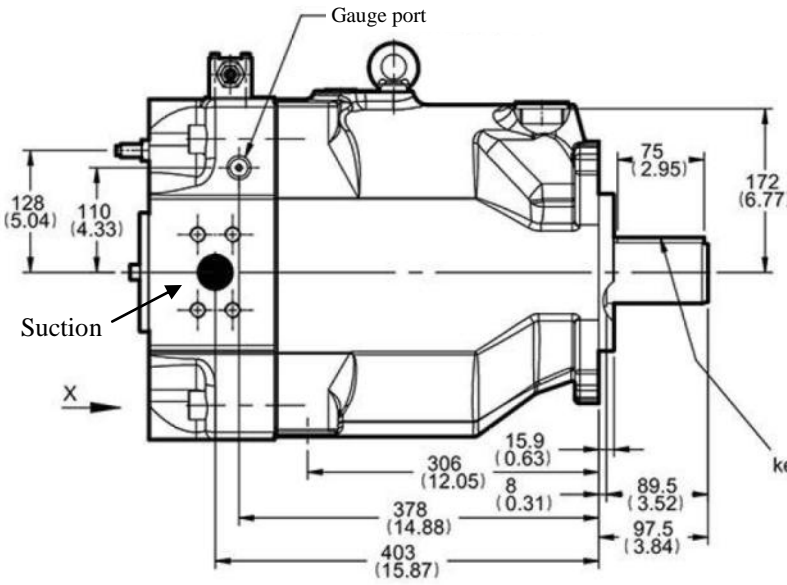
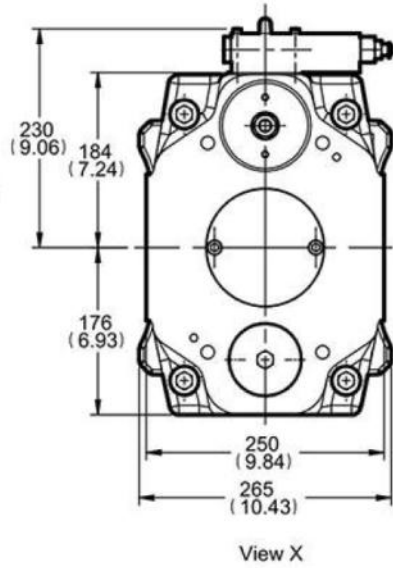
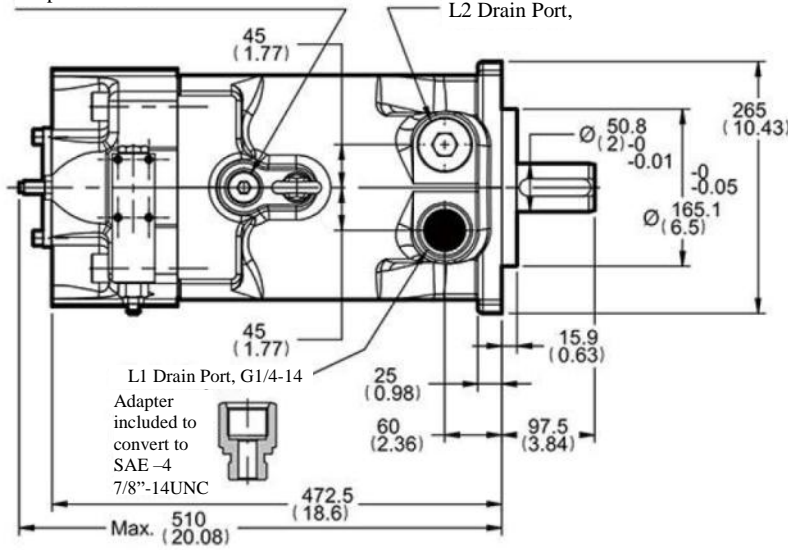
Code:15T2 Shaft



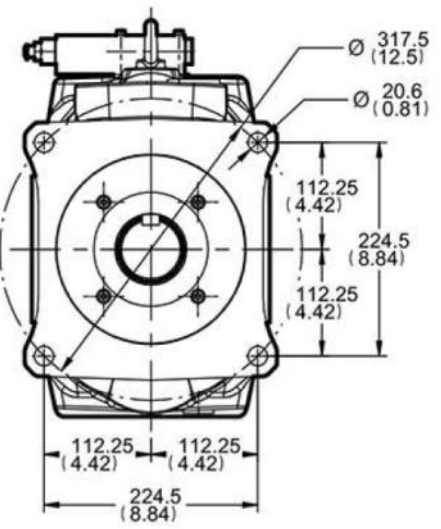
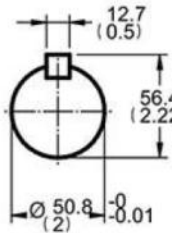
**Dimensions, 270 cc/rev (PR Controller):**

Mounting hole for horsepower compensator pilot or displacement transducer.

Dimensions: mm (inch)



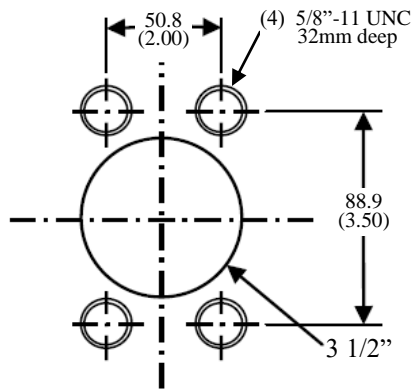
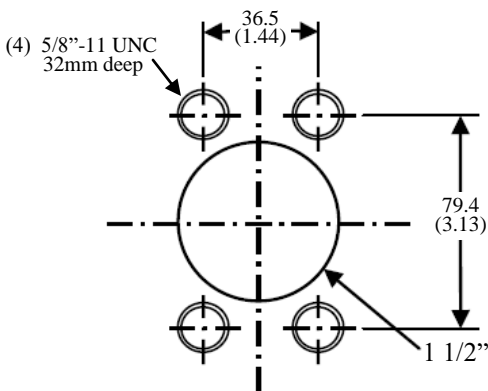
Code: K2 Shaft



Ports:

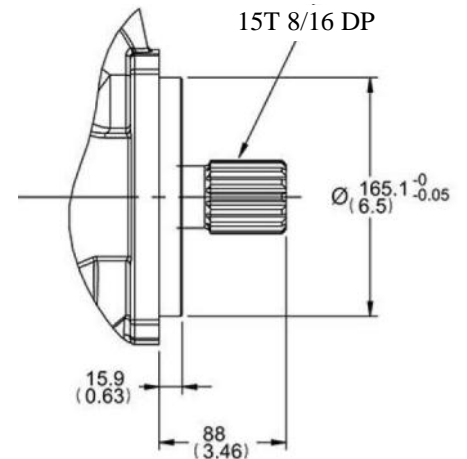
Pressure: Code HF1.5

Suction: Code F3.5



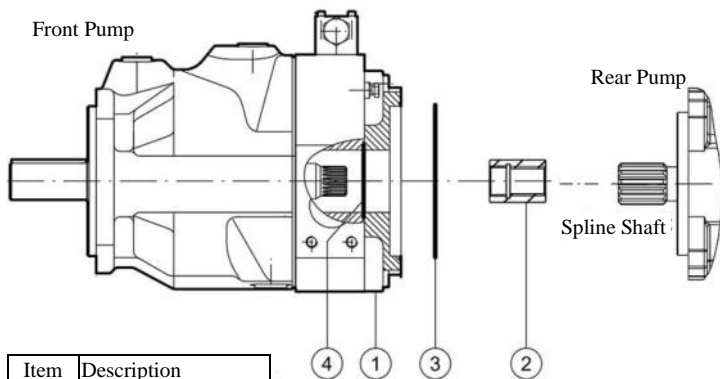
Shafts:

Code: 15T2 Shaft



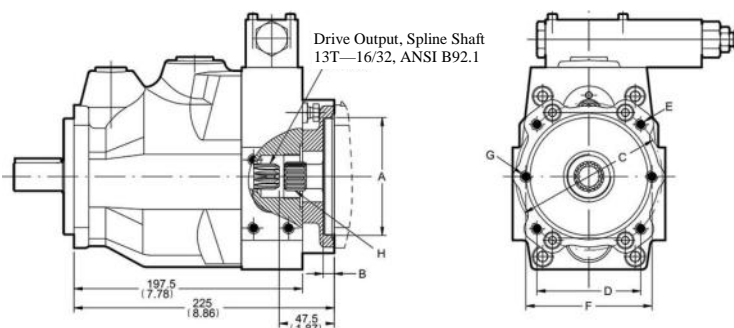
## Through Drive Adapters:

### Adapter Kit Components



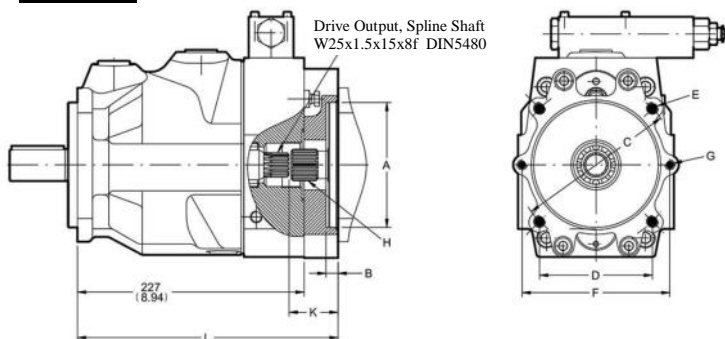
Item	Description
1	Adapter
2	Coupling
3	Front Pump O-ring
4	Rear Pump O-ring

### 16 and 23 cc/rev.:



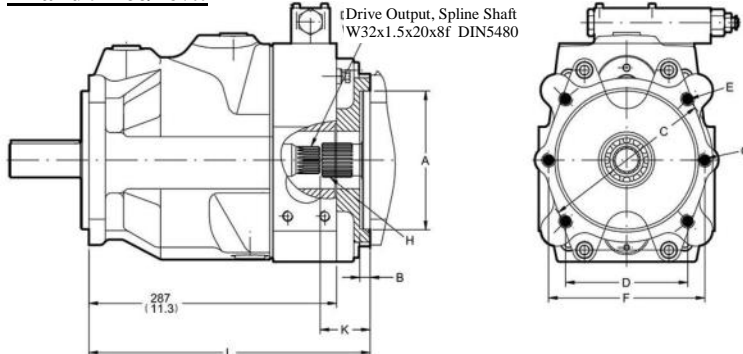
Code	Dimension							Adapter Kit
	A	B	C	D	E	F	G	
T2AA9T.6	50.8	10	-	-	-	82	M8	PVAP16/23-3-T2AA9T.6
T2A9T.6	82.5	10	-	-	-	106	M10	PVAP16/23-3-T2A9T.6
T4B15T	101.6	10.5	-	89.8	M10	omit	omit	PVAP16/23-3-T4B15T

### 46 cc/rev.:



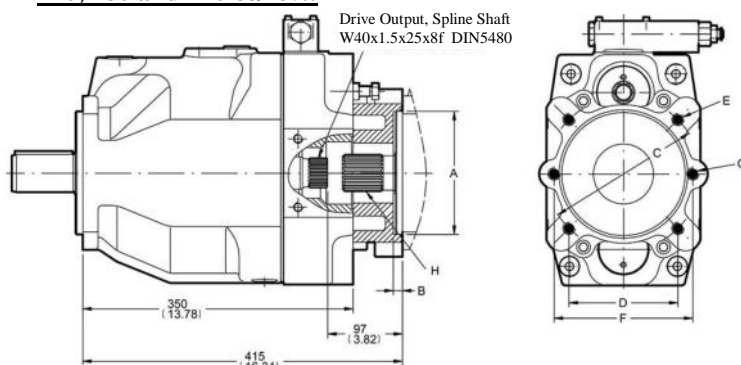
Code	Dimension									Adapter Kit
	A	B	C	D	E	F	G	K	L	
T2A9T.6	82.5	8	-	-	-	106	M10	49	261	PVAP46-3-T2A9T.6
T4B15T	101.6	11	-	89.8	M10	146	M12	49	261	PVAP46-3-T4B15T
T4C14T	127	13.5	-	114.5	M12	omit	omit	64	276	PVAP46-3-T4C14T

### 71 and 92 cc/rev.:



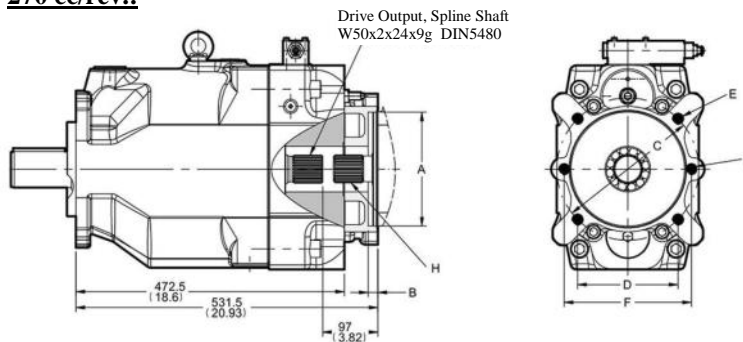
Code	Dimension									Adapter Kit
	A	B	C	D	E	F	G	K	L	
T2A9T.6	82.5	10	-	-	-	106	M10	58	326	PVAP71/92-3-T2A9T.6
T4B15T	101.6	12	-	89.8	M10	146	M12	58	326	PVAP71/92-3-T4B15T
T4C14T	127	14	-	114.5	M12	181	M16	58	326	PVAP71/92-3-T4C14T
T4D13T1.7	152.4	14	-	161.6	M16	omit	omit	78	346	PVAP71/92-3-T4D13T1.7

### 140, 180 and 210 cc/rev.:



Code	Dimension									Adapter Kit
	A	B	C	D	E	F	G	K	L	
T2A9T.6	82.5	10	-	-	-	106	M10	58	326	PVAP140-/210-3-T2A9T.6
T4B15T	101.6	12	-	89.8	M10	146	M12	58	326	PVAP140-210-3-T4B15T
T4C14T	127	14	-	114.5	M12	181	M16	58	326	PVAP140-210-3-T4C14T
T4D13T1.7	152.4	14	-	161.6	M16	181	omit	omit	346	PVAP140-/210-3-T4D13T1.7
T4D15T2	152.4	14	-	161.6	M16	181	omit	omit	346	PVAP140-210-T4D15T2

### 270 cc/rev.:

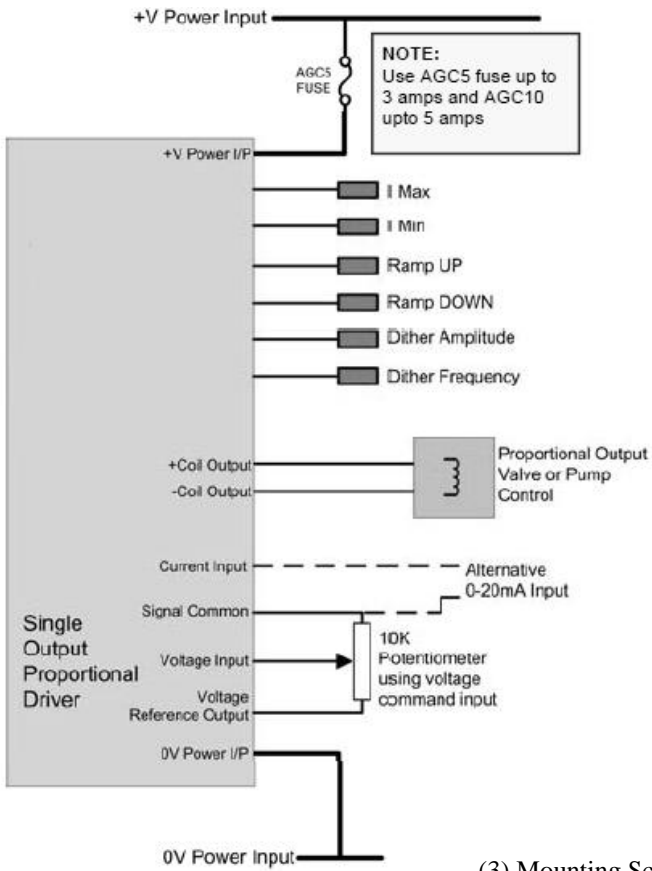


Code	Dimension							Adapter Kit
	A	B	C	D	E	F	G	
T2A9T.6	82.5	8	-	-	-	106	M10	PVAP270-3-T2A9T.6
T4B15T	101.6	11	-	89.8	M10	146	M12	PVAP270-3-T4B15T
T4C14T	127	13.5	-	114.5	M12	181	M16	PVAP270-3-T4C14T
T4D13T1.7	152.4	13.5	-	161.6	M16	229	M20	PVAP270-3-T4D13T1.7
T4D15T2	152.4	13.5	-	161.6	M16	229	M20	PVAP270-T4D15T2
T4E15T2	165.1	17	-	224.5	M20	omit	omit	PVAP270-T4E15T2

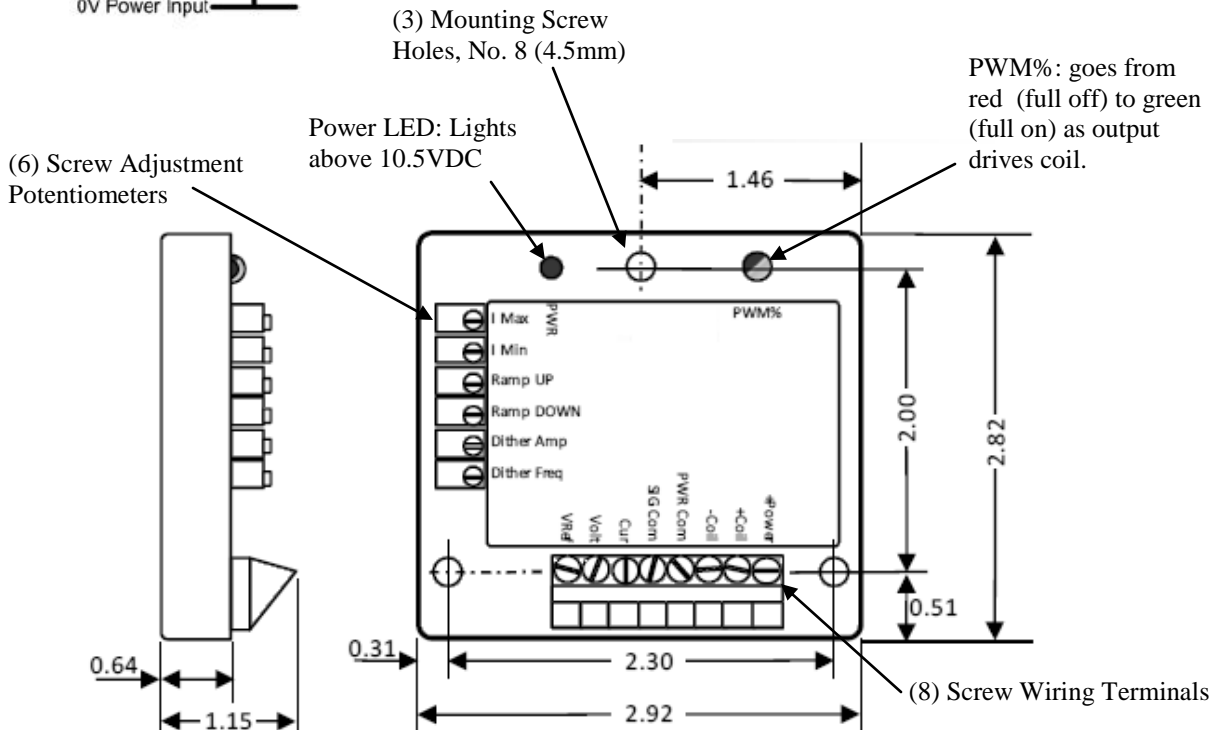
**Accessories:**

**AMP PRP12 and AMP PRP24:**

Amplifier card for use with PRP12 and PRP24 controllers.



Specifications	
Input Supply Voltage	11-30VDC
Input Supply Current	200 mA Quiescent (Max)
Command Input Values	0 to +5VDC, 0 to +10VDC or 0 to 20mA
Proportional Output	1x PWM up to 5A max current
Dither Frequency	~30 to 200Hz (adjustable)
Dither Amplitude	~0 to 100% (adjustable)
Housing Material	Block, Polycarbonate
Mounting Screws	3 x No. 8 (4.5mm) screws
Temperature Range	-20 to +60°C (Operating)
NEMA/IP rating	NEMA 6P/68
Weight	350 grams



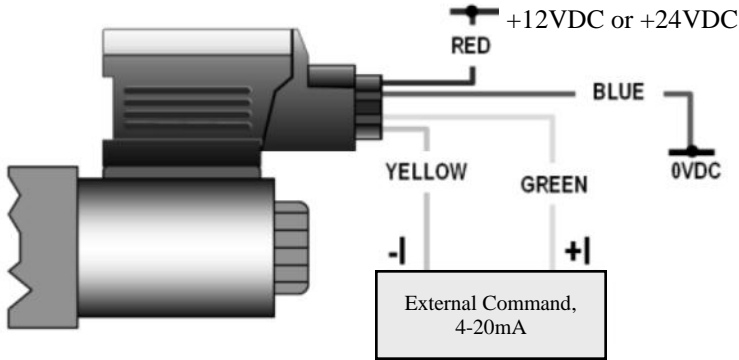
Dimensions in inches

**Accessories:**

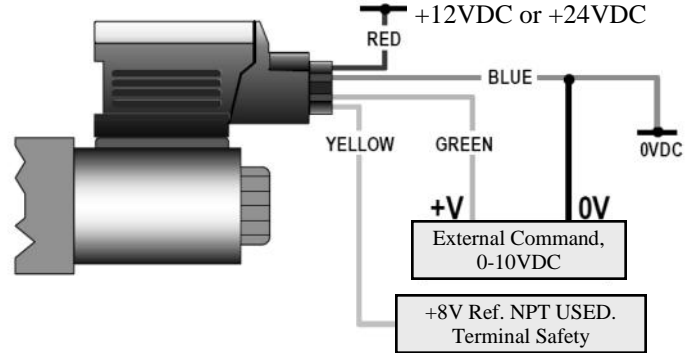
**AMPP PRP12 and AMPP PRP24:**

Plug In Amplifier card for use with PRP12 and PRP24 controllers. Amplifier comes prewired with 10 feet (3meters) of color coded 16 AWG cable that is selected for harsh environments. Separate plugs are required for mA or VDC set point commands.

Wiring Diagram, mA Command

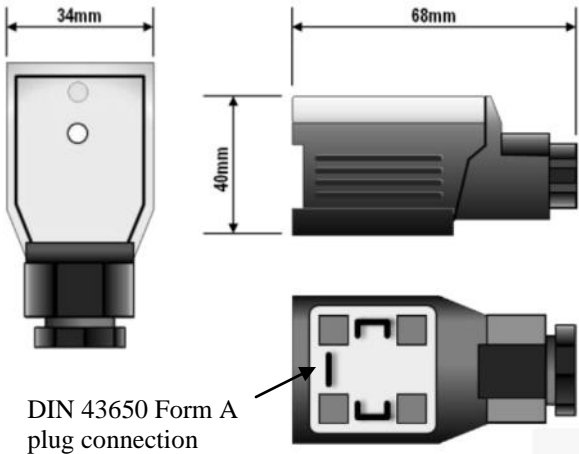


Wiring Diagram, mA Command

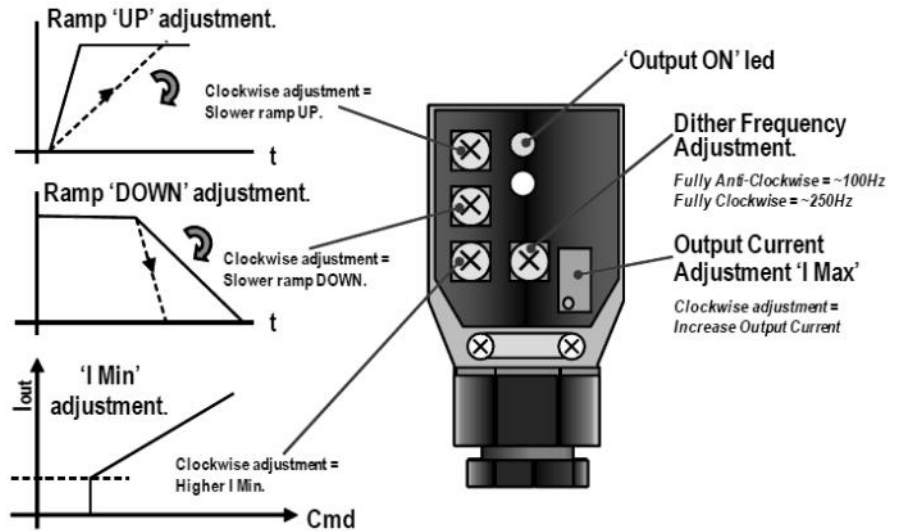


Note: Yellow Wire is internally connected to ground supply.

Dimensions



Adjustments (Cover Off):



Specifications				
Amplifier Part Number	AMPP PRP12 A	AMPP PRP12 V	AMPP PRP24 A	AMPP PRP24 V
Input Supply Voltage	12VDC +/-20%	12VDC +/-20%	24VDC +/-20%	24VDC +/-20%
Command Input Value	4-20mA	0-10VDC	4-20mA	0-10VDC
Input Supply Current	200 mA Quiescent (Max)	200 mA Quiescent (Max)	200 mA Quiescent (Max)	200 mA Quiescent (Max)
Output Current	3 Amps (36W)	3 Amps (36W)	1.5 Amps (36W)	1.5 Amps (36W)
Ramp Times	300mS-8Sec.	300mS-8Sec.	300mS-8Sec.	300mS-8Sec.
Dither Frequency	~100 to 250Hz (adjustable)	~100 to 250Hz (adjustable)	~100 to 250Hz (adjustable)	~100 to 250Hz (adjustable)
Housing Material	High Impact resistant ABS	High Impact resistant ABS	High Impact resistant ABS	High Impact resistant ABS
Mounting Screws	3 x No. 8 (4.5mm) screws	3 x No. 8 (4.5mm) screws	3 x No. 8 (4.5mm) screws	3 x No. 8 (4.5mm) screws
Temperature Range	-20 to +70°C (Operating)	-20 to +70°C (Operating)	-20 to +70°C (Operating)	-20 to +70°C (Operating)
NEMA/IP rating	NEMA 6/IP 65	NEMA 6/IP 65	NEMA 6/IP 65	NEMA 6/IP 65