

# Whisper™ Pumps VPV Vane Pumps





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## Introduction

This catalog provides details on the Rexroth VPV series variable vane pump, including performance, dimensional, and technical specifications. Please consult the factory if further details are required.

The pumps are designed to meet the requirements of the machine tool, general machinery, and other markets where low noise, high performance and competitive pricing are needed.

The design of the VPV series of vane pumps utilizes 30 years of field and manufacturing experience from the current Rexroth vane pump line. State-of-the-art technologies and materials were utilized while retaining the superior features of the existing designs. Additional goals were to create a pump with the international market in mind and to incorporate the extremely high quality standards the Rexroth name has come to exemplify.

Keeping in mind market expectations, Bosch Rexroth Corporation developed a pump with the following improvements and features:

- ▶ High reliability with fewer parts.
- ▶ Significant advances in noise reduction.
- ▶ High volumetric and overall efficiency.
- ▶ Excellent durability.
- ▶ Modern appearance.
- ▶ Improved ring and vane wear technology.
- ▶ Very good response and recovery times.
- ▶ Generally reduced envelope size.
- ▶ Redesigned controls with shock clipper.
- ▶ Conforms to the latest SAE, ISO, NFPA, and ANSI standards.
- ▶ Combination capability - full horsepower may be transferred to pump 2. Combinations of construction of multiple pumps may be required to be de-rated.

## Benefits

- ▶ **LOW COST** - Competitively priced with other manufacturers of vane pumps and economy axial piston pumps.
- ▶ **EXCEPTIONALLY QUIET** - Helps machinery builders meet government and purchased sound level requirements.
- ▶ **CONTINUOUS DUTY RATING - @ 3,000 PSI** - High performance and long life design for 10,000 plus hours.
- ▶ **HIGHLY EFFICIENT FAST RESPONSE & RECOVERY** - Exceptional reaction time for critical system demands.
- ▶ **PRESSURE COMPENSATED** - Controls pump delivery to circuit demand thereby conserving energy.
- ▶ **HIGH STRENGTH** - Computer optimized casting design.
- ▶ **HYDRODYNAMIC JOURNAL BEARINGS** - Provides long life and quiet operation.
- ▶ **NO PREFILL REQUIREMENTS** - Pump case prefill not required for initial start-ups.
- ▶ **REPAIRABLE** - Repair kits and parts available from local distribution centers or the factory.
- ▶ **CONTROL OPTIONS** - Single stage; two-stage, remote control; solenoid multi-pressure, and load sensing.
- ▶ **SHOCK CLIPPER** - Reduces shock pressure by up to 50% increasing system component life and system stability. Must be plumbed on VPV 16, 25, & 32. The shock clipper is integrated into VPV 45, 63, 80, 100, 130, & 164 and drains to the case drain. See page 86.

## Specifications

General		VPV 16	VPV 25	VPV 32
Displacement (Nominal)		1 in <sup>3</sup> /rev (16 cm <sup>3</sup> /rev)	1.5 in <sup>3</sup> /rev (25 cm <sup>3</sup> /rev)	2 in <sup>3</sup> /rev (32 cm <sup>3</sup> /rev)
Displacement (Actual)		1.06 in <sup>3</sup> /rev (17.37 cm <sup>3</sup> /rev)	1.66 in <sup>3</sup> /rev (27.20 cm <sup>3</sup> /rev)	2.05 in <sup>3</sup> /rev (33.59 cm <sup>3</sup> /rev)
Flow at 1750 RPM <sup>1</sup>		7.57 GPM (28.6 L/min)	11.36 GPM (43.0 L/min)	15.15 GPM (57.3 L/min)
Maximum continuous pressure <sup>2</sup>		3000 psi (210 bar)		
Pressure compensating range	Single stage	200-3000 psi (14-210 bar) Minimum pressure of 190 PSI		
	Two stage	300-3000 psi (20-210 bar) Minimum pressure of 290 PSI		
Max. transient spike pressure		3800 psi (260 bar)	4000 psi (280 bar)	
Maximum case pressure		10 psi (0.7 bar)		
Speed range		900-1800 RPM		
Direction of rotation (viewed from shaft end)		Right hand (clockwise)		
Case drain flow while compensating @ 1800 RPM	1000 psi (70 bar)	0.6 GPM (2.3 L/min)	0.6 GPM (2.3 L/min)	
	2000 psi (140 bar)	0.9 GPM (3.4 L/min)	1.1 GPM (4.2 L/min)	
	3000 psi (210 bar)	1.26 GPM (4.8 L/min)	1.4 GPM (5.3 L/min)	
Maximum inlet vacuum at sea level		6 in. HG (152 mm HG)		
Mounting <sup>3</sup> – SAE 2-bolt flange (ISO 3019/1)		S.A.E. 'A' 2-bolt flange	S.A.E. 'B' 2-bolt flange	
Mounting Position		Unrestricted		
Port sizes	Inlet	#16 S.A.E.	#24 S.A.E.	
	Outlet	#12 S.A.E.	#16 S.A.E.	
	Case drain	#8 S.A.E.		
	Clipper control drain (opt.)	#6 S.A.E.		
	Remote control (opt.)	#4 S.A.E.		
Drive		Pump to be connected to prime mover by means of a flexible coupling that is aligned to a maximum of 0.006" (.152mm) total indicator reading. No overhung or side loads permitted. Alignments greater than 0.006" indicator reading could cause increased noise and vibration as well as premature shaft seal wear resulting in leakage.		
Fluid recommendations		A premium quality hydraulic oil with anti-wear additives is recommended, but not required. Refer to publication 9 535 233 456 "Petroleum Hydraulic Fluids" for a list of fluids which meet or exceed the necessary lubrication requirements. Consult factory for use with water base fire resistant fluids.		
Fluid viscosity at operating temperature	Minimum	100 SUS (21 cSt)		
	Maximum	1000 SUS (216 cSt)		
	Optimum	150-250 SUS (32-54 cSt)		
	Max. start-up	4000 SUS (864 cSt)		
Fluid temperature		Normal inlet fluid temperature should not exceed 140°F (60° C). Always select a fluid for optimum viscosity at operating temperature. Consult factory for applications assistance when inlet fluid temperatures over 140° F (60° C) are expected.		
Seals		Fluorocarbon Standard		
Filtration		Fluid cleanliness per ISO 4406 Std. For pressures up to 2000 psi, 18/16/13 ISO code is required. For 2000 to 3000 psi operation, 17/15/12 ISO is required.		
Response time (circuit dependent)	Full flow to min. flow	20-35 ms	20-35 ms	
Recovery time (circuit dependent)	Min. flow to full flow	50-135 ms – single stage compensator	70-185 ms – single stage compensator	
Weight	Single stage	34 lbs. (16.5 kg)	61 lbs. (28 kg)	
	Two stage	38 lbs. (17.3 kg)	65 lbs. (28.5 kg)	

- 1) Flows are actual. Volumetric efficiencies shown in technical data taken into account.
- 2) For new applications exceeding 2500 psi (172 bar) system pressure, please consult factory.
- 3) Metric 4-bolt flange available (ISO 3019/2) available. Please consult factory.

**Specifications**

General		VPV 45	VPV 63	VPV 80
Displacement (Nominal)		2.75 in <sup>3</sup> /rev (45 cm <sup>3</sup> /rev)	3.84 in <sup>3</sup> /rev (63 cm <sup>3</sup> /rev)	4.88 in <sup>3</sup> /rev (80 cm <sup>3</sup> /rev)
Displacement (Actual)		2.98 in <sup>3</sup> /rev (48.83 cm <sup>3</sup> /rev)	4.03 in <sup>3</sup> /rev (66.04 cm <sup>3</sup> /rev)	5.06 in <sup>3</sup> /rev (82.92 cm <sup>3</sup> /rev)
Flow at 1750 RPM <sup>1</sup>		20.83 GPM (72.84 L/min)	29.10 GPM (110.1 L/min)	36.97 GPM (139.9 L/min)
Maximum continuous pressure <sup>2</sup>		3000 psi (210 bar)		
Pressure compensating range	Two stage	350-3000 psi (24-210 bar) Minimum pressure of 300 PSI		
Max. transient spike pressure		4000 psi (280 bar)		
Maximum case pressure		10 psi (0.7 bar)		
Speed range		900-1800 RPM		
Direction of rotation (viewed from shaft end)		Right hand (clockwise)		
Case drain flow while compensating @ 1800 RPM	1000 psi (70 bar)	1.5 GPM (5.7 L/min)	1.4 GPM (5.3 L/min)	1.4 GPM (5.3 L/min)
	2000 psi (140 bar)	1.9 GPM (7.2 L/min)	1.8 GPM (6.8 L/min)	1.8 GPM (6.8 L/min)
	3000 psi (210 bar)	2.5 GPM (9.5 L/min)	2.4 GPM (9.1 L/min)	2.3 GPM (8.7 L/min)
Maximum inlet vacuum at sea level		6 in. HG (152 mm HG)		
Mounting <sup>3</sup> – SAE 2-bolt flange (ISO 3019/1)		S.A.E. 'C' 2-bolt flange		
Mounting Position		Unrestricted		
Port sizes	Inlet	2" S.A.E.		
	Outlet	1 1/4" S.A.E.		
	Case drain	#8 S.A.E.		
	Remote control (opt.)	#4 S.A.E.		
Drive		Pump to be connected to prime mover by means of a flexible coupling that is aligned to a maximum of 0.006" (.152mm) total indicator reading. No overhung or side loads permitted. Alignments greater than 0.006" indicator reading could cause increased noise and vibration as well as premature shaft seal wear resulting in leakage.		
Fluid recommendations		A premium quality hydraulic oil with anti-wear additives is recommended, but not required. Refer to publication 9 535 233 456 "Petroleum Hydraulic Fluids" for a list of fluids which meet or exceed the necessary lubrication requirements. Consult factory for use with water base fire resistant fluids.		
Fluid viscosity at operating temperature	Minimum	150 SUS (32 cSt)		
	Maximum	1000 SUS (216 cSt)		
	Optimum	200-300 SUS (42-65 cSt)		
	Max. start-up	4000 SUS (864 cSt)		
Fluid temperature		Normal inlet fluid temperature should not exceed 140°F (60° C). Always select a fluid for optimum viscosity at operating temperature. Consult factory for applications assistance when inlet fluid temperatures over 140° F (60° C) are expected.		
Seals		Fluorocarbon Standard		
Filtration		Fluid cleanliness per ISO 4406 Std. For pressures up to 2000 psi, 18/16/13 ISO code is required. For 2000 to 3000 psi operation, 17/15/12 ISO is required.		
Response time (circuit dependent)	Full flow to min. flow	20-40 ms		
Recovery time (circuit dependent)	Min. flow to full flow	100-200 ms – two stage compensator		
Weight	Single stage	120 lbs. (55 kg)		
	Two stage	128 lbs. (58 kg)		

- 1) Flows are actual. Volumetric efficiencies shown in technical data taken into account.
- 2) For new applications exceeding 2500 psi (172 bar) system pressure, please consult factory.
- 3) Metric 4-bolt flange available (ISO 3019/2) available. Please consult factory.

## Specifications

General		VPV 100	VPV 130	VPV 164
Displacement (Nominal)		6.1 in <sup>3</sup> /rev (100 cm <sup>3</sup> /rev)	7.9 in <sup>3</sup> /rev (130 cm <sup>3</sup> /rev)	10.0 in <sup>3</sup> /rev (164 cm <sup>3</sup> /rev)
Displacement (Actual)		6.49 in <sup>3</sup> /rev (106.35 cm <sup>3</sup> /rev)	8.25 in <sup>3</sup> /rev (135.19 cm <sup>3</sup> /rev)	10.33 in <sup>3</sup> /rev (169.28 cm <sup>3</sup> /rev)
Flow at 1750 RPM <sup>1</sup>		45.4 GPM (171.8 L/min)	59.85 GPM (226.5 L/min)	75.76 GPM (286.7 L/min)
Maximum continuous pressure <sup>2</sup>		3000 psi (210 bar)		
Pressure compensating range	Two stage	350-3000 psi (24-210 bar)		
Max. transient spike pressure		4000 psi (280 bar)		
Maximum case pressure		10 psi (0.7 bar)		
Speed range		900-1800 RPM		
Direction of rotation (viewed from shaft end)		Right hand (clockwise)		
Case drain flow while compensating @ 1800 RPM	1000 psi (70 bar)	1.5 GPM (5.7 L/min)	1.6 GPM (6.0 L/min)	1.7 GPM (6.4 L/min)
	2000 psi (140 bar)	2.0 GPM (7.6 L/min)	2.2 GPM (8.3 L/min)	2.3 GPM (8.7 L/min)
	3000 psi (210 bar)	2.5 GPM (9.5 L/min)	3.0 GPM (11.3 L/min)	3.1 GPM (11.7 L/min)
Maximum inlet vacuum at sea level		6 in. HG (152 mm HG)		
Mounting <sup>3</sup> – SAE 2-bolt flange (ISO 3019/1)		S.A.E. 'D' 2-bolt flange		
Mounting Position		Unrestricted		
Port sizes	Inlet	2 1/2" S.A.E.		
	Outlet	1 1/2" S.A.E.		
	Case drain	#8 S.A.E.		
	Remote control (opt.)	#4 S.A.E.		
Drive		Pump to be connected to prime mover by means of a flexible coupling that is aligned to a maximum of 0.006" (.152mm) total indicator reading. No overhung or side loads permitted. Alignments greater than 0.006" indicator reading could cause increased noise and vibration as well as premature shaft seal wear resulting in leakage.		
Fluid recommendations		A premium quality hydraulic oil with anti-wear additives is recommended, but not required. Refer to publication 9 535 233 456 "Petroleum Hydraulic Fluids" for a list of fluids which meet or exceed the necessary lubrication requirements. Consult factory for use with water base fire resistant fluids.		
Fluid viscosity at operating temperature	Minimum	150 SUS (32 cSt)		
	Maximum	1000 SUS (216 cSt)		
	Optimum	200-300 SUS (42-65 cSt)		
	Max. start-up	4000 SUS (864 cSt)		
Fluid temperature		Normal inlet fluid temperature should not exceed 140°F (60° C). Always select a fluid for optimum viscosity at operating temperature. Consult factory for applications assistance when inlet fluid temperatures over 140° F (60° C) are expected.		
Seals		Fluorocarbon Standard		
Filtration		Fluid cleanliness per ISO 4406 Std. For pressures up to 2000 psi, 18/16/13 ISO code is required. For 2000 to 3000 psi operation, 17/15/12 ISO is required.		
Response time (circuit dependent)	Full flow to min. flow	20-50 ms		
Recovery time (circuit dependent)	Min. flow to full flow	180-280 ms		
Weight	Single stage	240 lbs. (109 kg)		
	Two stage	248 lbs. (112.7 kg)		

- 1) Flows are actual. Volumetric efficiencies shown in technical data taken into account.
- 2) For new applications exceeding 2500 psi (172 bar) system pressure, please consult factory.
- 3) Metric 4-bolt flange available (ISO 3019/2) available. Please consult factory.

## Ordering details

The alpha-numeric ordering code system enables any particular type of pump to be specified. Preferred type are also identified by a 10-digit part number for computerized ordering.

Item No.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Pump 1	<b>0513</b>	<b>R</b>				<b>V</b>	<b>P</b>	<b>V</b>		<b>S</b>					
Pump 2 <sup>1</sup>						<b>V</b>	<b>P</b>	<b>V</b>		<b>S</b>					
Pump 3 (Gear Pump)						<b>AZ</b>	<b>P</b>	<b>F</b>		<b>R</b>		<b>R</b>	<b>12</b>		

01	Vane Pump, stand alone version single pump or combination	<b>0513</b>
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02	Direction of rotation, clockwise, viewed from shaft end	<b>R</b>
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### Speed

03	Calibrated speed, 1200 rpm	<b>12</b>
	Calibrated speed, 1500 rpm	<b>15</b>
	Calibrated speed, 1800 rpm	<b>18</b>
	<i>VPV pumps can be operated over the entire speed range as defined in the specifications pages, independent of the calibrated speed.</i>	

### Drive Shaft

04	Key to DIN 6885	<b>A</b>
	Key to SAE Standard	<b>C</b>
	Spline to ANSI B92.1	<b>D</b>

### Bearing Arrangement / Mounting Flange

05	Standard bearing arrangement, mounting flange to SAE standards	
	Standard bearing arrangement, mounting flange to DIN ISO 3019/2	

06	Operation, Vane type	<b>V</b>
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07	Pump	<b>P</b>
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08	Variable displacement pump (open circuit)	<b>V</b>
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### Displacement

09	16 cc/rev = 1.00 cu in/rev	<b>16</b>
	25 cc/rev = 1.50 cu in/rev	<b>25</b>
	32 cc/rev = 2.00 cu in/rev	<b>32</b>
	45 cc/rev = 2.75 cu in/rev	<b>45</b>
	63 cc/rev = 3.84 cu in/rev	<b>63</b>
	80 cc/rev = 4.88 cu in/rev	<b>80</b>
	100 cc/rev = 6.10 cu in/rev	<b>100</b>
	130 cc/rev = 7.90 cu in/rev	<b>130</b>
	164 cc/rev = 10.00 cu in/rev	<b>164</b>

10	Housing 210 bar = 3000 PSI	<b>S</b>
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<sup>1</sup>When trailing pump is another VPV pump, it can be coded by selecting items 6 through 15 for the alpha-numeric description. Consult factory for other models and descriptions of trailing pumps.

### Price and Part Numbers

See VPV Pump Identification Guide, Publication #9 535 233 782 for

SAE, and 9 535 233 785 for metric pumps.

### Product Literature Disclaimer

Specifications and/or dimensions are subject to change without prior notice. Please consult factory.



**Ordering details (continued)**

Item No.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Pump 1	<b>0513</b>	<b>R</b>				<b>V</b>	<b>P</b>	<b>V</b>		<b>S</b>					
Pump 2 <sup>1</sup>						<b>V</b>	<b>P</b>	<b>V</b>		<b>S</b>					
Pump 3 (Gear Pump)						<b>AZ</b>	<b>P</b>	<b>F</b>		<b>R</b>		<b>R</b>	<b>12</b>		

11	Water glycol ( <i>this option is PHASED OUT</i> )	<b>C</b>
	Mineral oil and ester ( <i>provides viton/FKM elastomer material</i> )	<b>M</b>

**Operating Pressure**

12	Maximum operating pressure; e.g. 14 = 140 bar = 2000 psi	<b>14</b>
	21 = 210 bar = 3000 psi	<b>21</b>

**Control / Regulator**

13	Pressure regulator - single stage	<b>F</b>	
	Pressure regulator - single stage - lockable 16/25/32cc only	<b>G</b>	
	Pressure regulator - two stage - with remote option	<b>H</b>	
	Combined pressure/flow compensator (load sense)	<b>J</b>	
	Torque limiter	<b>S</b>	
	Proportional P/Q ( <i>PHASED OUT 2002</i> )	<b>T</b>	
	<i>Solenoid Operated Two Press. Norm. (Normally open)/Normally Low Pressure/Energize to High</i>		
	115V N.O. w/DIN 43650 & quick connect (compression fitting) w/sentinel light	<b>XA</b>	
	220V N.O. w/DIN 43650 & quick connect (compression fitting) w/sentinel light	<b>XB</b>	
	12V N.O. w/DIN 43650 & quick connect (compression fitting) w/sentinel light	<b>XC</b>	
	24V N.O. w/DIN 43650 & quick connect (compression fitting) w/sentinel light	<b>XD</b>	
	115V N.O. w/flying leads	<b>XE</b>	
	220V N.O. w/flying leads	<b>XF</b>	
	12V N.O. w/flying leads	<b>XG</b>	
	24V N.O. w/flying leads	<b>XH</b>	
	<i>Solenoid Operated Two Press. Normally Closed (Normally High Pressure/Energize to Low)</i>		
	115V N.C. w/DIN 43650 & quick connect (compression fitting) w/sentinel light	<b>YA</b>	
	220V N.C. w/DIN 43650 & quick connect (compression fitting) w/sentinel light	<b>YB</b>	
	12V N.C. w/DIN 43650 & quick connect (compression fitting) w/sentinel light	<b>YC</b>	
	24V N.C. w/DIN 43650 & quick connect (compression fitting) w/sentinel light	<b>YD</b>	
	115V N.C. w/flying leads	<b>YE</b>	
	220V N.C. w/flying leads	<b>YF</b>	
	12V N.C. w/flying leads	<b>YG</b>	
	24V N.C. w/flying leads	<b>YH</b>	
	<i>Solenoid Operated Vent Two Press. Normally Open (Normally Vented/Energize to Pressure)</i>		
	115V N.O. w/DIN 43650 & quick connect (compression fitting) w/sentinel light	<b>ZA</b>	
	220V N.O. w/DIN 43650 & quick connect (compression fitting) w/sentinel light	<b>ZB</b>	
	12V N.O. w/DIN 43650 & quick connect (compression fitting) w/sentinel light	<b>ZC</b>	
	24V N.O. w/DIN 43650 & quick connect (compression fitting) w/sentinel light	<b>ZD</b>	
	115V N.O. w/flying leads	<b>ZE</b>	
	220V N.O. w/flying leads	<b>ZF</b>	
	12V N.O. w/flying leads	<b>ZG</b>	
	24V N.O. w/flying leads	<b>ZH</b>	

**Ordering details (continued)**

Item No.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Pump 1	<b>0513</b>	<b>R</b>				<b>V</b>	<b>P</b>	<b>V</b>		<b>S</b>					
Pump 2 <sup>1</sup>						<b>V</b>	<b>P</b>	<b>V</b>		<b>S</b>					
Pump 3 (Gear Pump)						<b>AZ</b>	<b>P</b>	<b>F</b>		<b>R</b>		<b>R</b>	<b>12</b>		

**Control / Regulator (continued)**

13	<i>Solenoid Operated Vented Norm. High Normally closed (Normally at Pressure/Energize to Vent)</i>		
	115V N.C. w/DIN 43650 & quick connect (compression fitting) w/sentinel light		<b>WA</b>
	220V N.C. w/DIN 43650 & quick connect (compression fitting) w/sentinel light		<b>WB</b>
	12V N.C. w/DIN 43650 & quick connect (compression fitting) w/sentinel light		<b>WC</b>
	24V N.C. w/DIN 43650 & quick connect (compression fitting) w/sentinel light		<b>WD</b>
	115V N.C. w/flying leads		<b>WE</b>
	220V N.C. w/flying leads		<b>WF</b>
	12V N.C. w/flying leads		<b>WG</b>
	24V N.C. w/flying leads		<b>WH</b>

**Accessories**

14	Special (Consult Factory)	<b>S</b>
	Maximum delivery limiter	<b>Y</b>
	No other accessories	<b>Z</b>

**Design Series**

15	Pump 1 of a quick combination unit (adapter kit & coupling required to create a combination, see page 81)	<b>B01</b> <b>P1</b>
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## Ordering details (continued)

### Gear Pump Guide

Item No.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Pump 1	<b>0513</b>	<b>R</b>				<b>V</b>	<b>P</b>	<b>V</b>		<b>S</b>					
Pump 2 <sup>1</sup>						<b>V</b>	<b>P</b>	<b>V</b>		<b>S</b>					
Pump 3 (Gear Pump)						<b>AZ</b>	<b>P</b>	<b>F</b>		<b>R</b>		<b>R</b>	<b>12</b>		

06	Principle of operation, Hydraulic gear	<b>AZ</b>
07	Function, Pump	<b>P</b>

#### Size range

08	F Series	4 cc to 28 cc	<b>F</b>
	G Series	22 cc to 56 cc	<b>G</b>

#### Displacement

09	4 cc/rev = .24 cu in/rev	25 cc/rev = 1.53 cu in/rev	<b>4</b>
	5.5 cc/rev = .34 cu in/rev	28 cc/rev = 1.71 cu in/rev	<b>5.5</b>
	8 cc/rev = .49 cu in/rev	32 cc/rev = 1.95 cu in/rev	<b>8</b>
	11 cc/rev = .67 cu in/rev	38 cc/rev = 2.32 cu in/rev	<b>11</b>
	14 cc/rev = .85 cu in/rev	45 cc/rev = 2.75 cu in/rev	<b>14</b>
	16 cc/rev = .98 cu in/rev	56 cc/rev = 3.42 cu in/rev	<b>16</b>
	19 cc/rev = 1.16 cu in/rev		<b>19</b>
	22.5 cc/rev = 1.37 cu in/rev		<b>22.5</b>

10	Direction of rotation, right hand (clockwise)	<b>R</b>
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#### Shaft type

11	9T Spline shaft	<b>R</b>
	5/8" diameter keyed shaft	<b>Q</b>

12	Mounting shaft, SAE A pilot (3.25")	<b>R</b>
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13	Port type, SAE thread (O-ring boss)	<b>12</b>
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#### Seals

14	Buna	<b>M</b>
	Viton	<b>P</b>

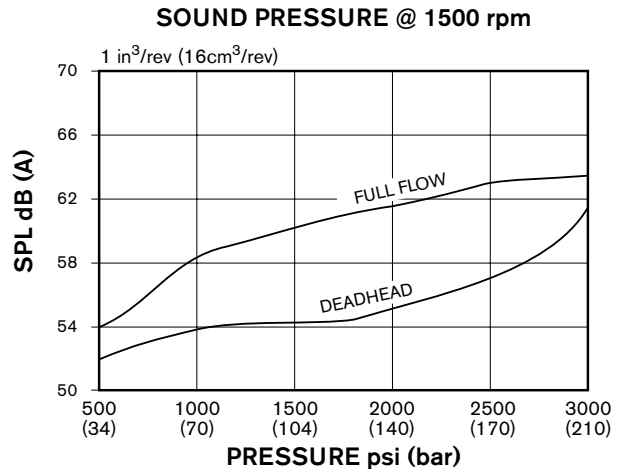
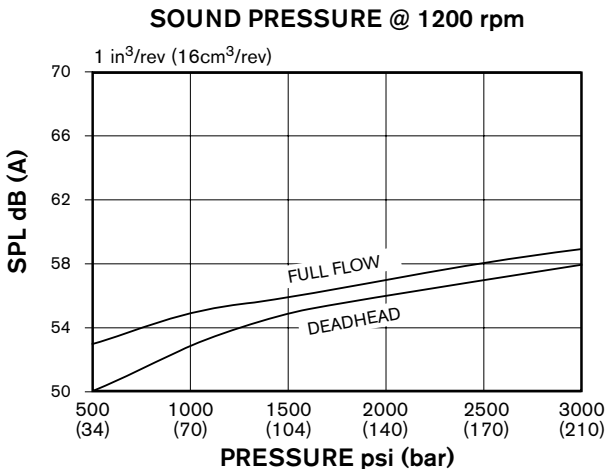
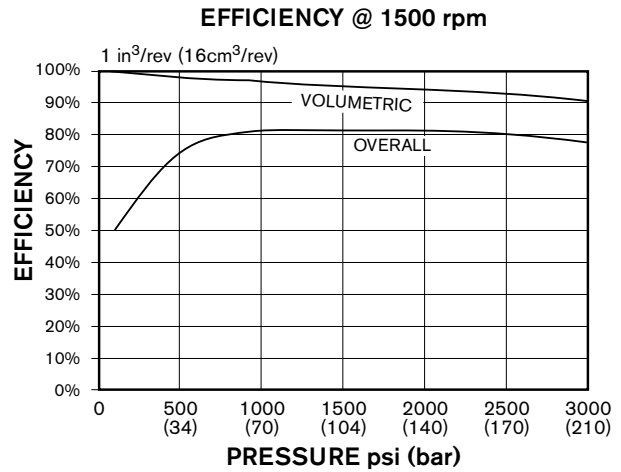
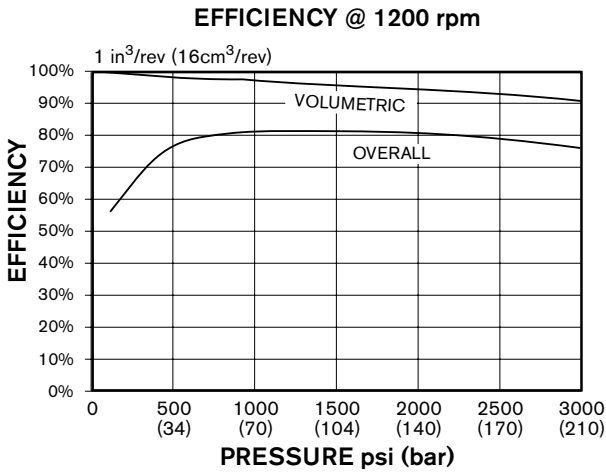
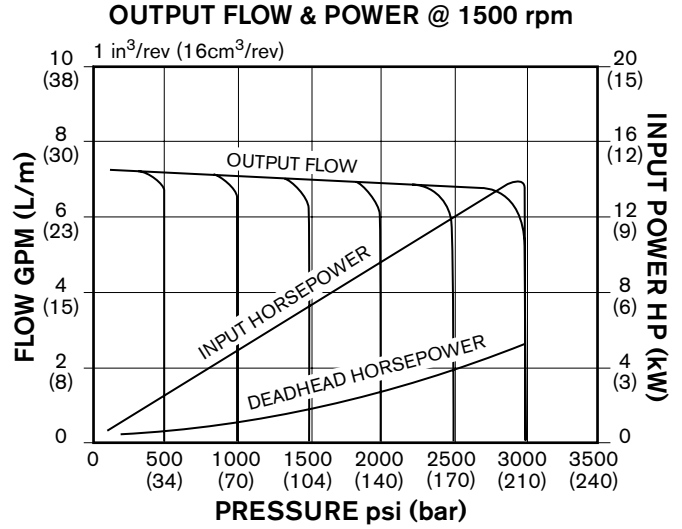
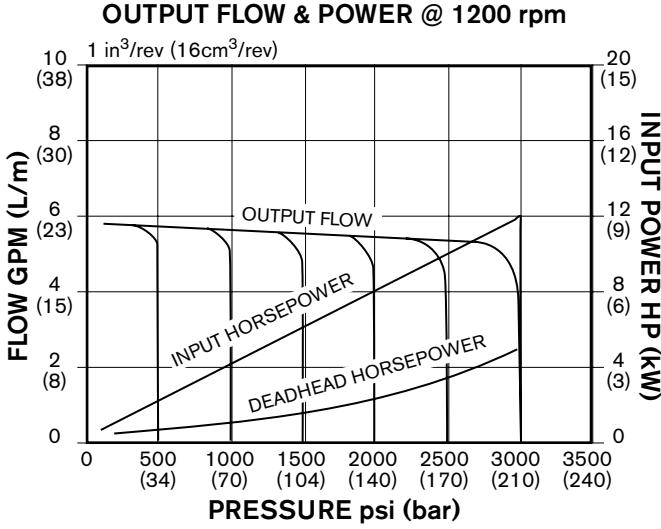
#### End cover

15	Standard, side ports	<b>B</b>
	Optional rear ports	<b>A</b>

On the following pages are line graphs of the Performance Characteristics for each of the pumps in our series. Characteristics are shown at 1200 rpm, 1500 rpm and 1800 rpm. Since different geographical areas can utilize different drive frequencies, please refer to the appropriate graph.

**Performance characteristics – VPV 16 to 3000 PSI (210 Bar)**

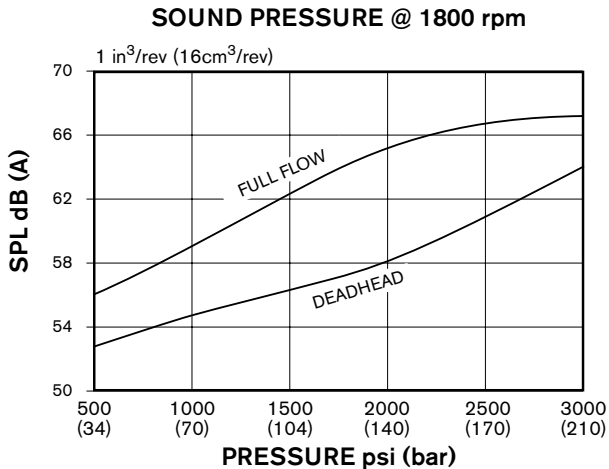
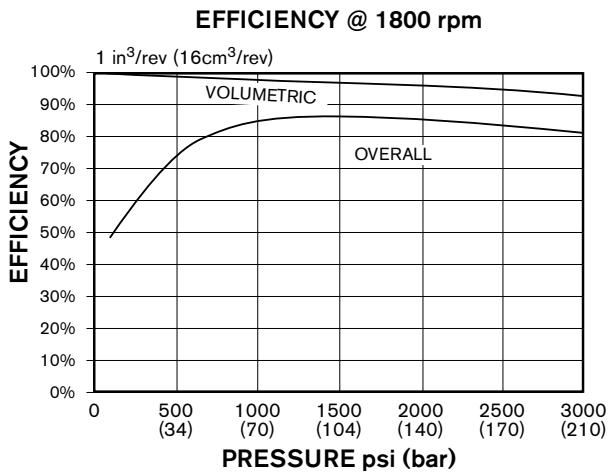
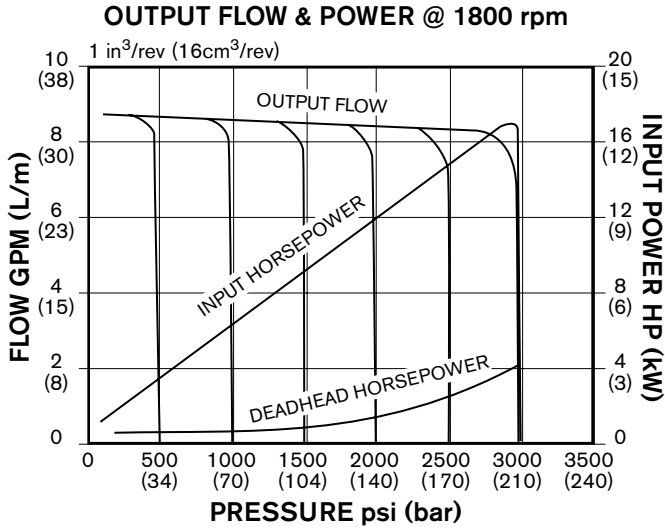
Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)



Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spacially and time-weighted averaged.

**Performance characteristics – VPV 16 to 3000 PSI (210 Bar) (continued)**

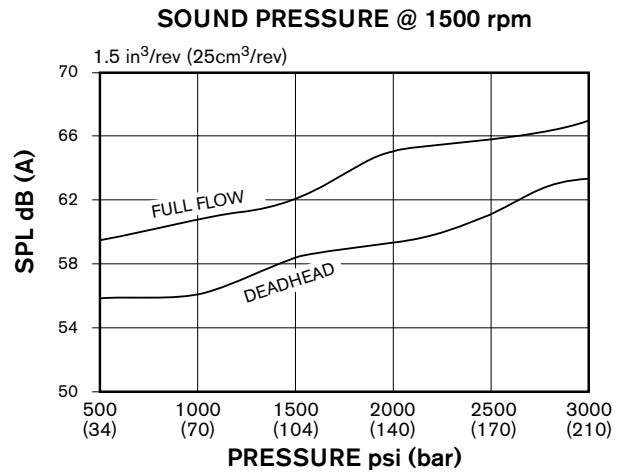
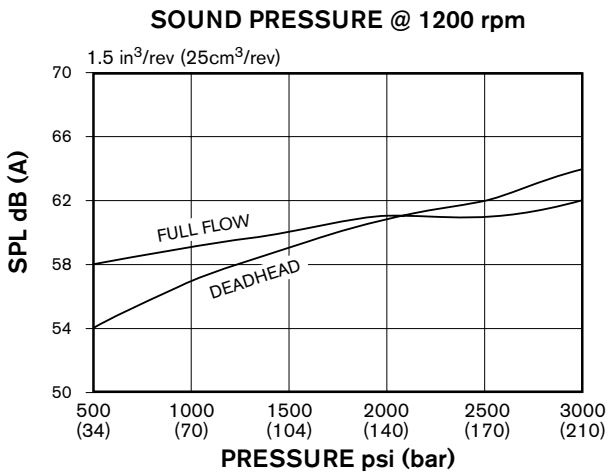
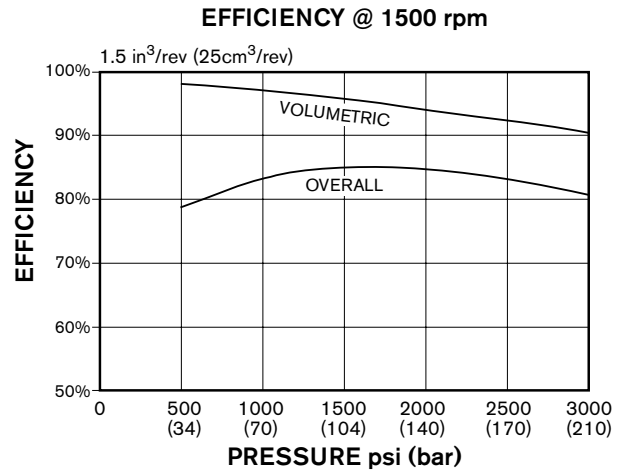
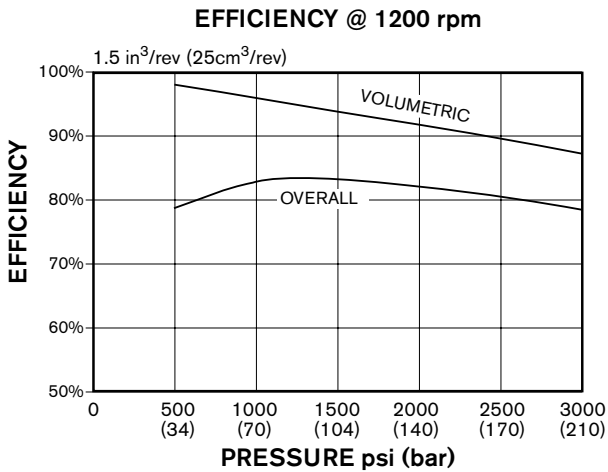
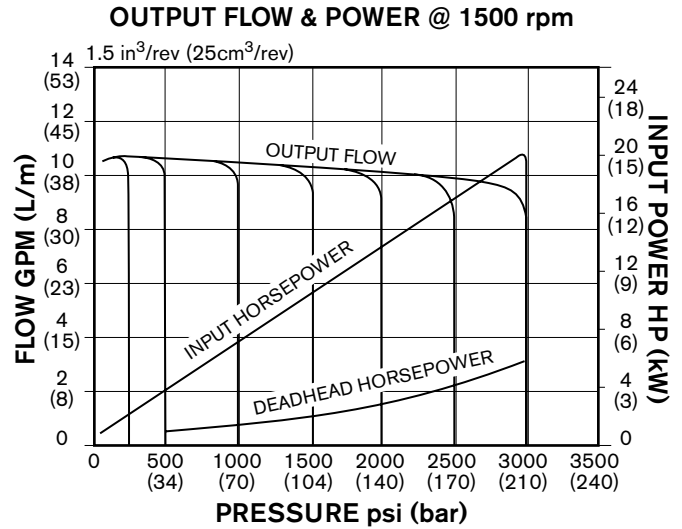
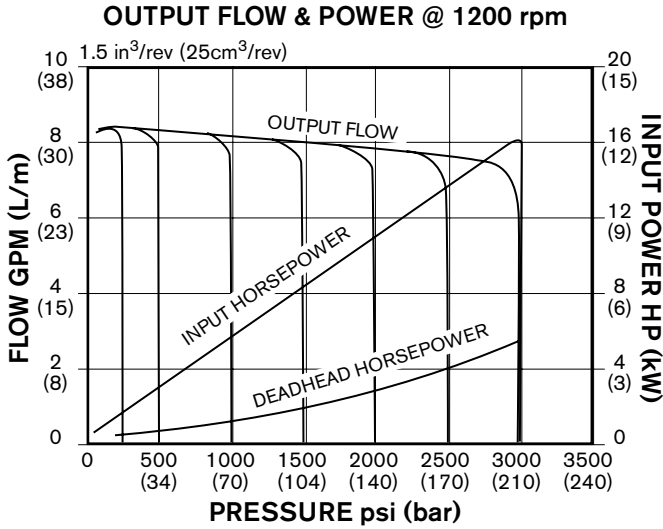
Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)



Sound pressure levels measured in a hemi-anoich chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spacially and time-weighted averaged.

**Performance characteristics – VPV 25 to 3000 PSI (210 Bar)**

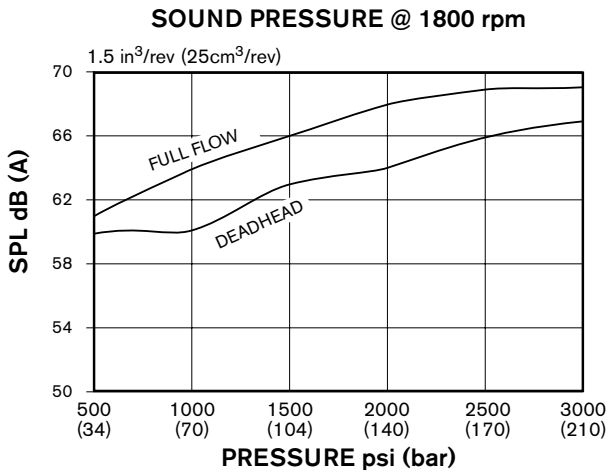
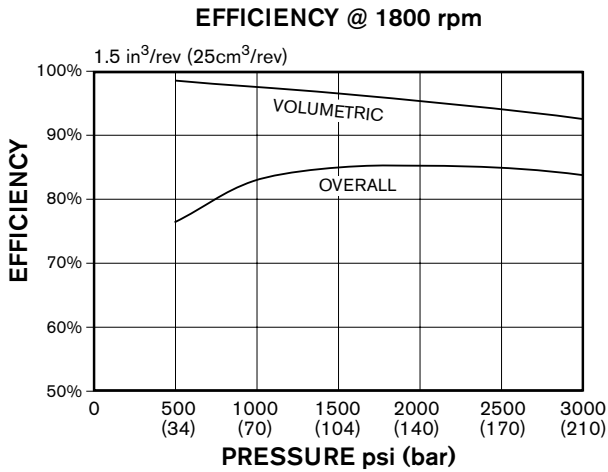
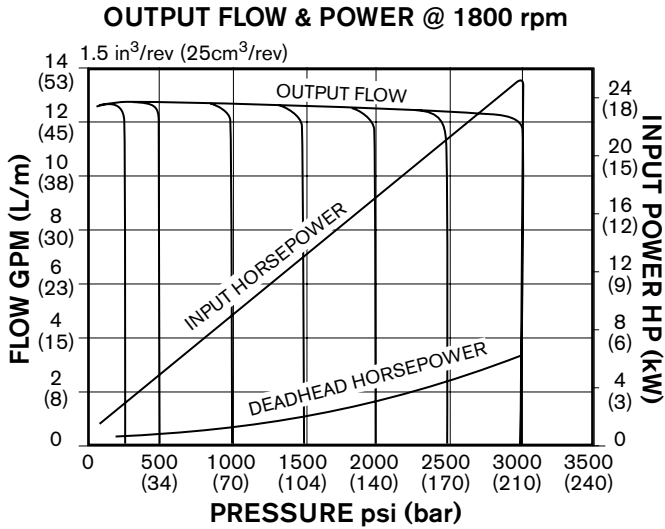
Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)



Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spatially and time-weighted averaged.

**Performance characteristics – VPV 25 to 3000 PSI (210 Bar) (continued)**

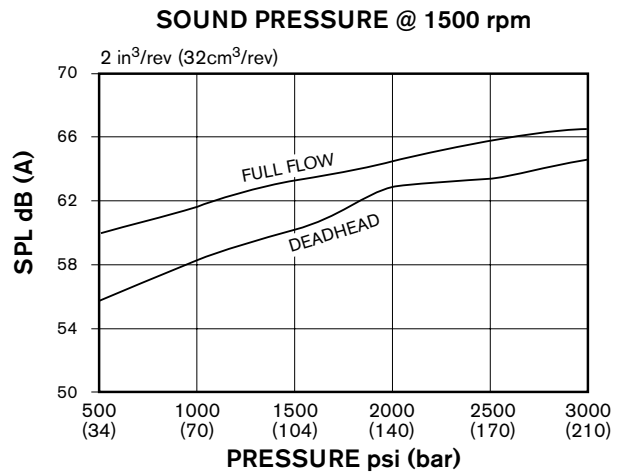
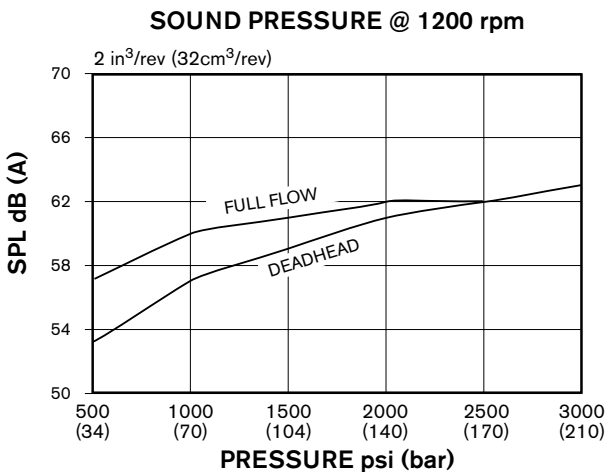
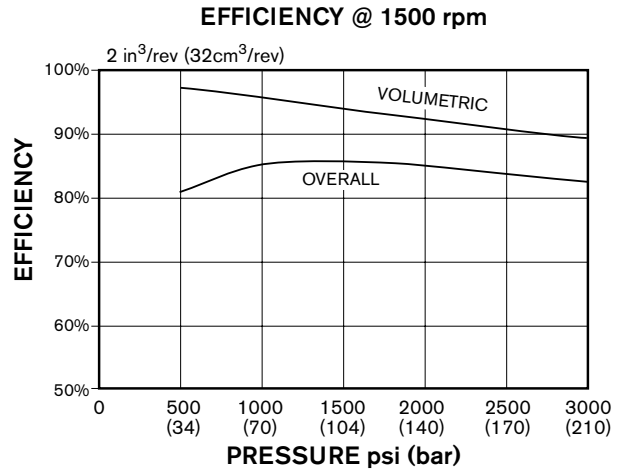
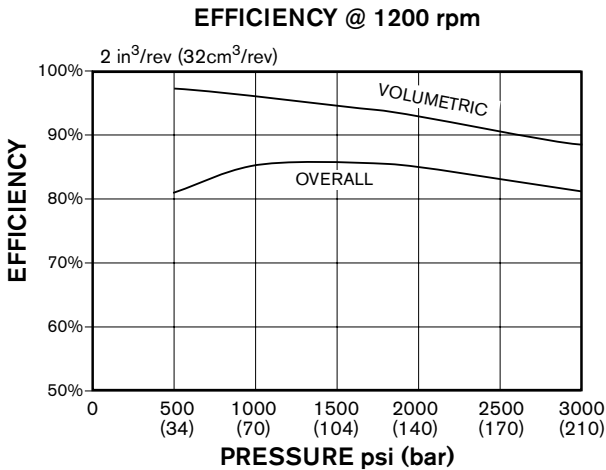
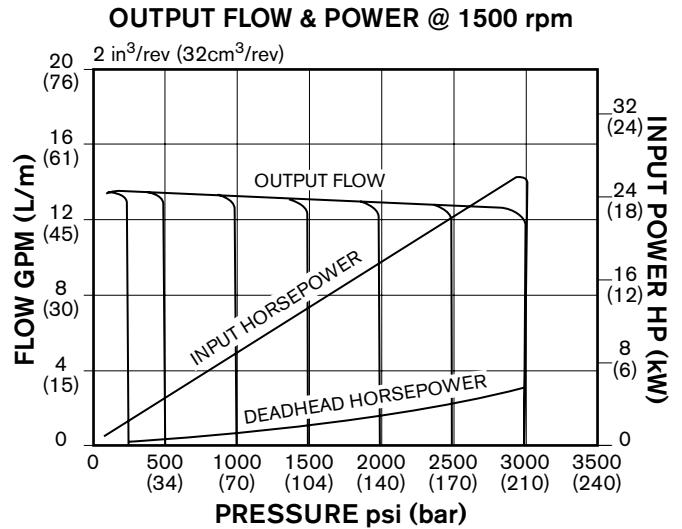
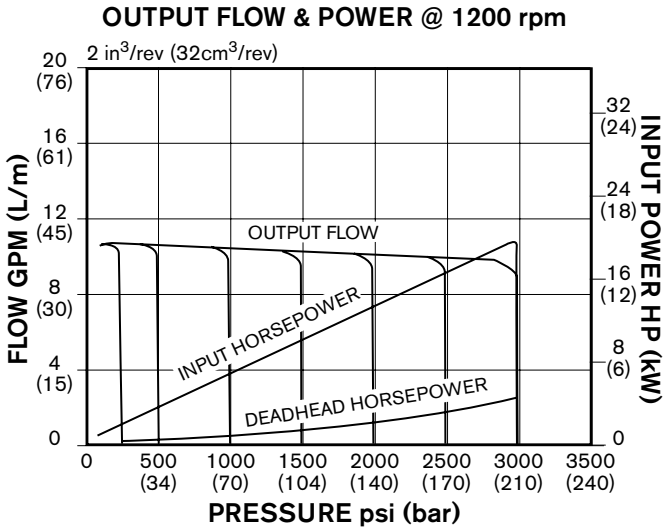
Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)



Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spatially and time-weighted averaged.

**Performance characteristics – VPV 32 to 3000 PSI (210 Bar)**

Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)

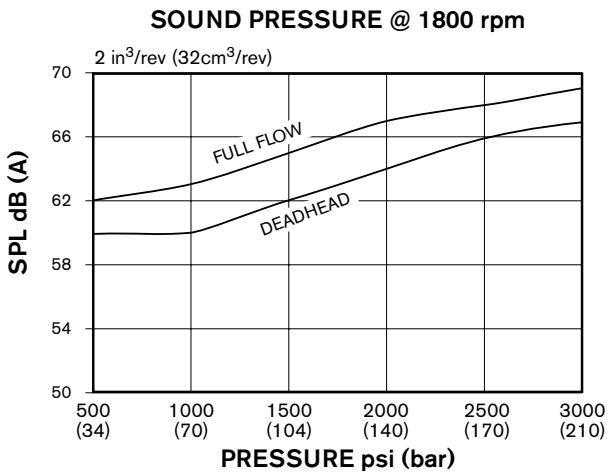
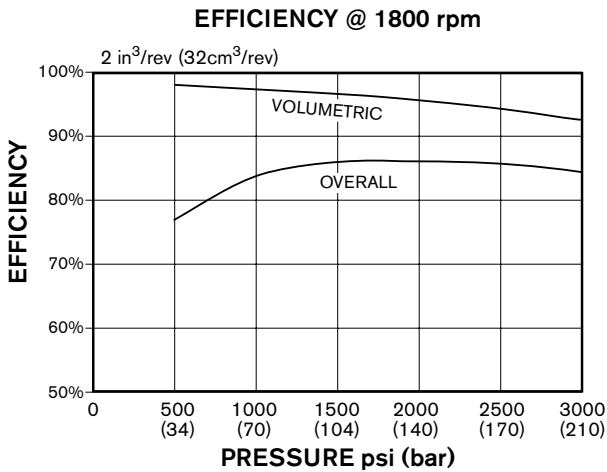
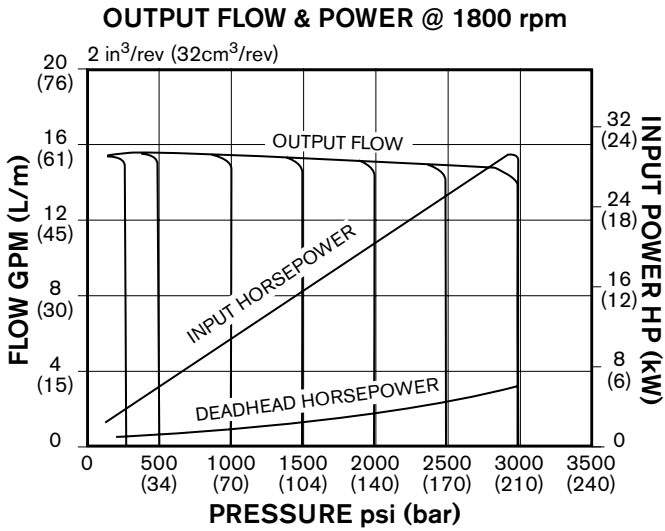


Sound pressure levels measured in a hemi-anoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spacially and time-weighted averaged.



**Performance characteristics – VPV 32 to 3000 PSI (210 Bar) (continued)**

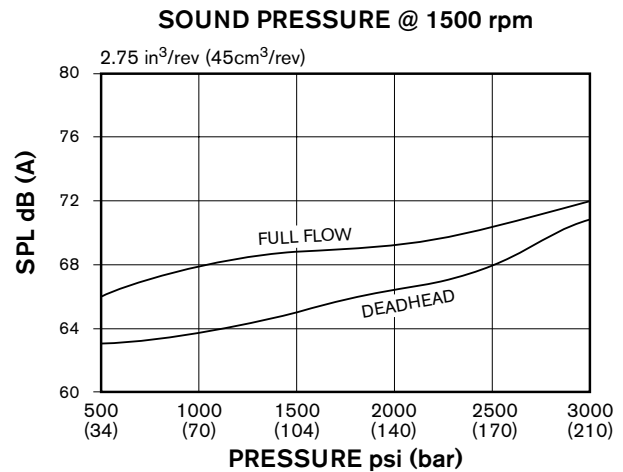
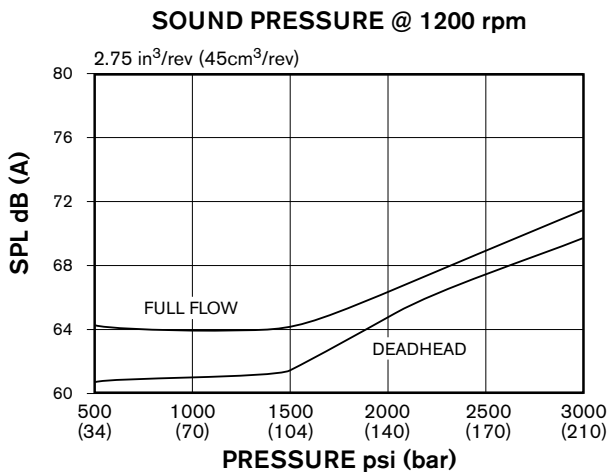
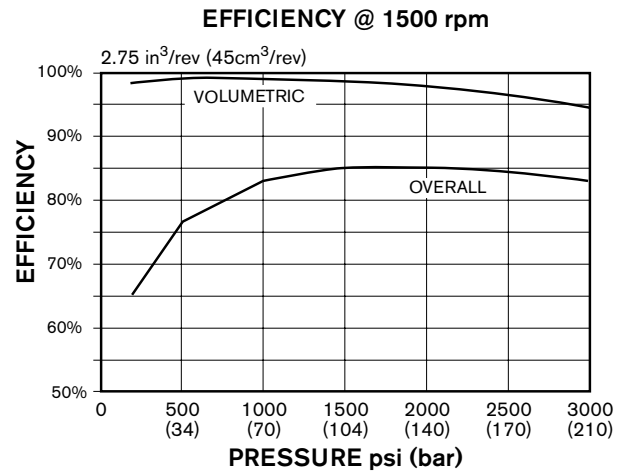
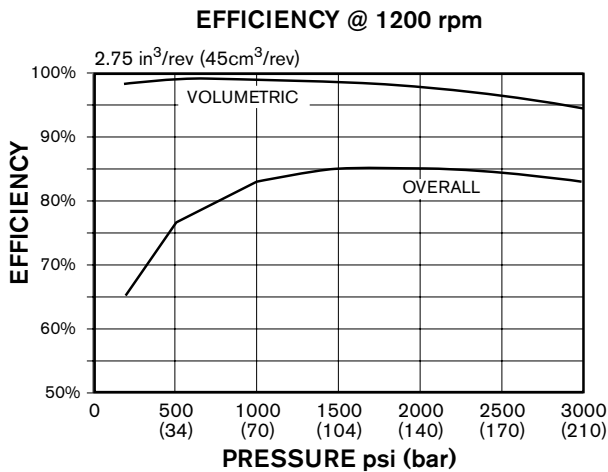
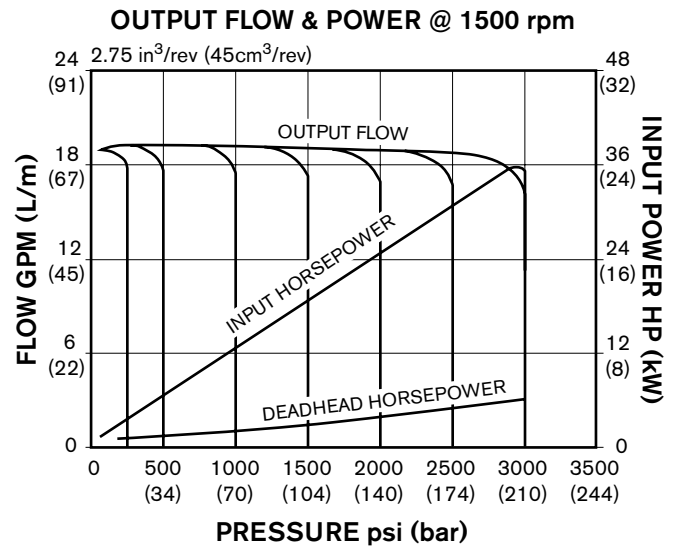
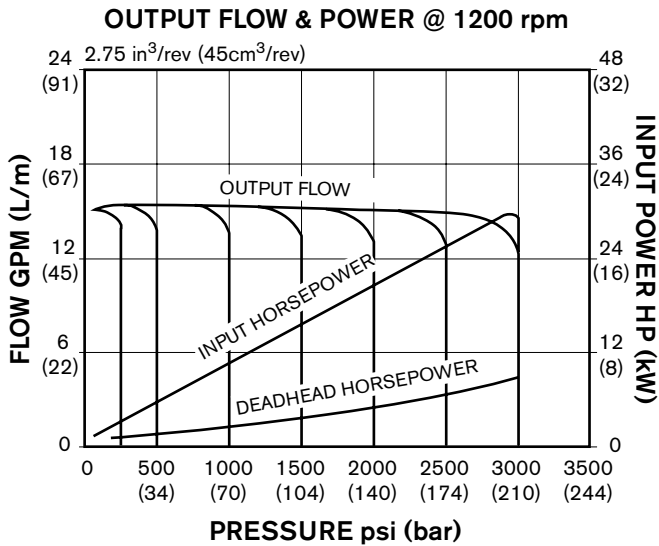
Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)



Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spatially and time-weighted averaged.

**Performance characteristics – VPV 45 to 3000 PSI (210 Bar)**

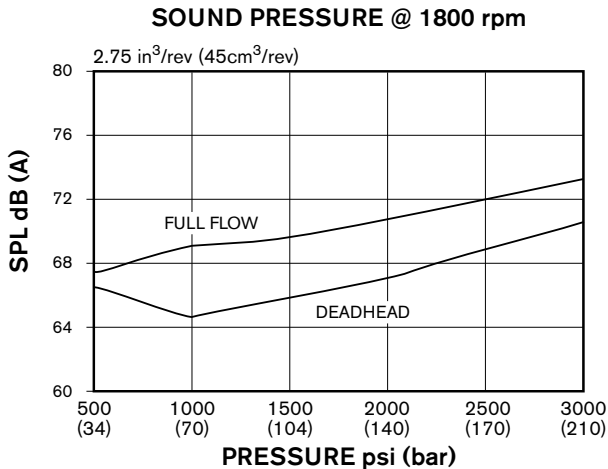
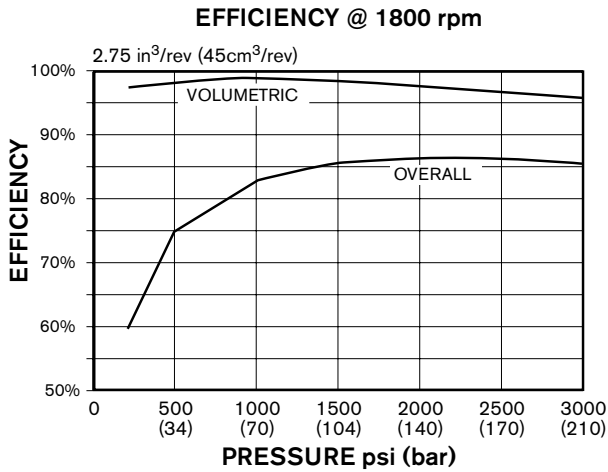
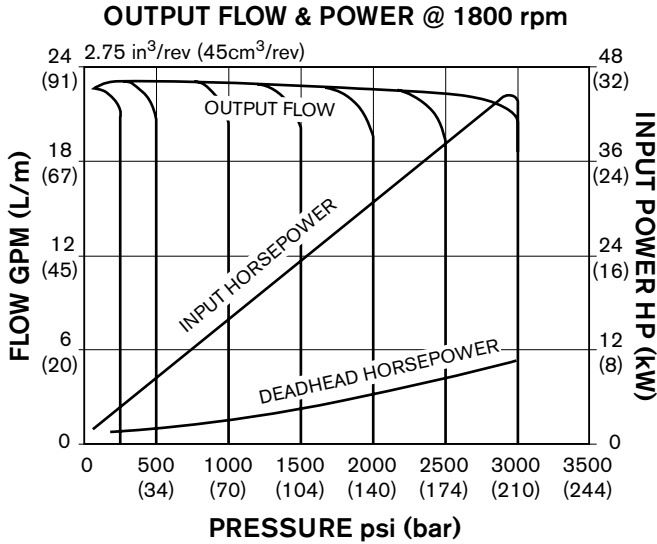
Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)



Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spacially and time-weighted averaged.

**Performance characteristics – VPV 45 to 3000 PSI (210 Bar) (continued)**

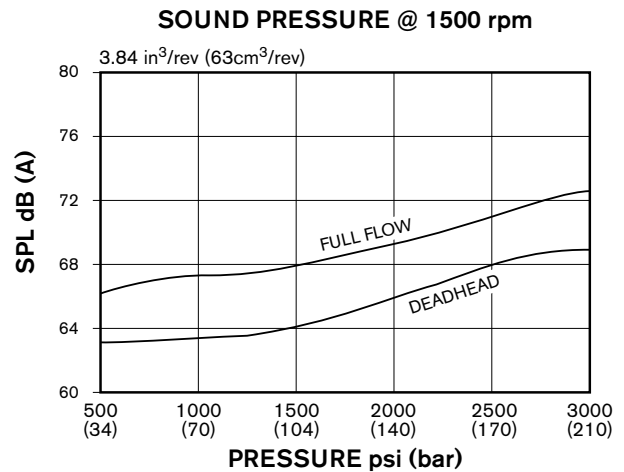
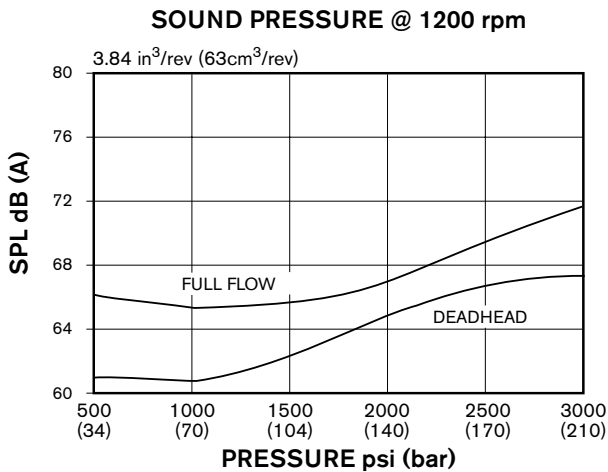
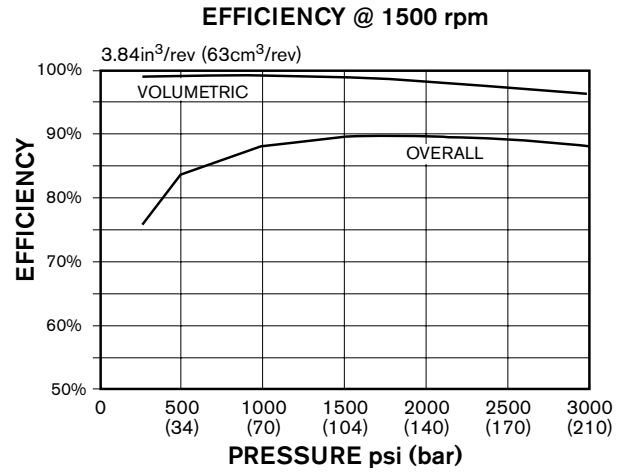
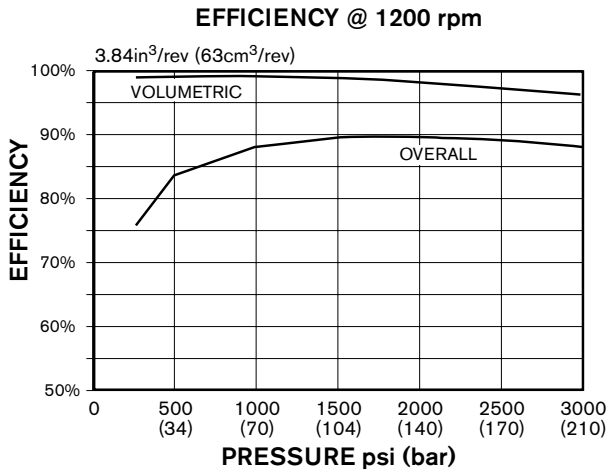
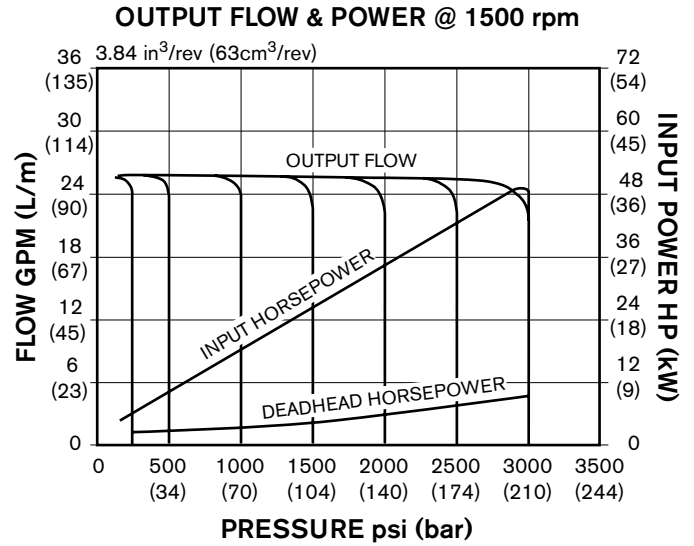
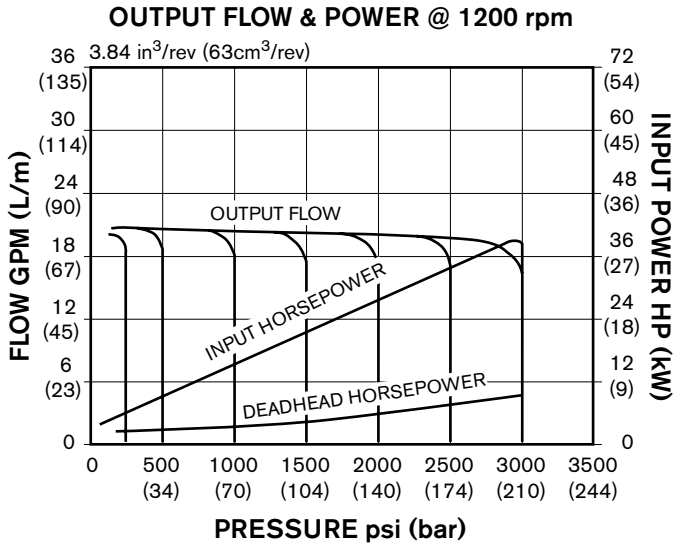
Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)



Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spatially and time-weighted averaged.

**Performance characteristics – VPV 63 to 3000 PSI (210 Bar)**

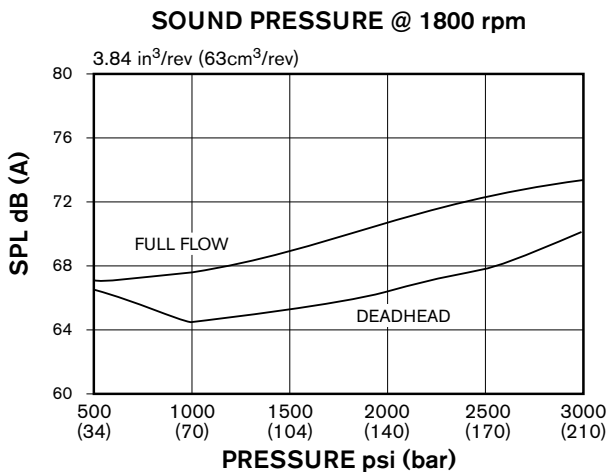
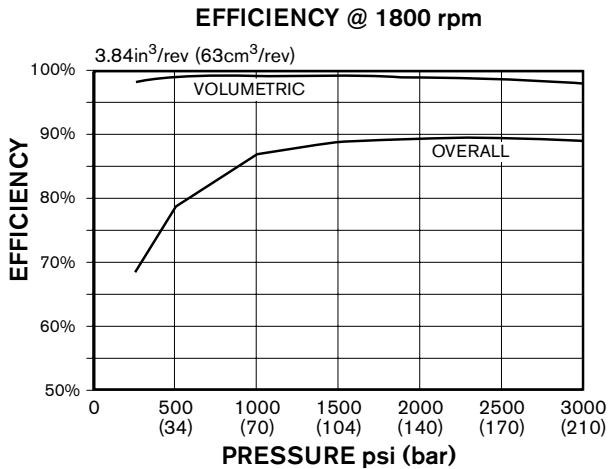
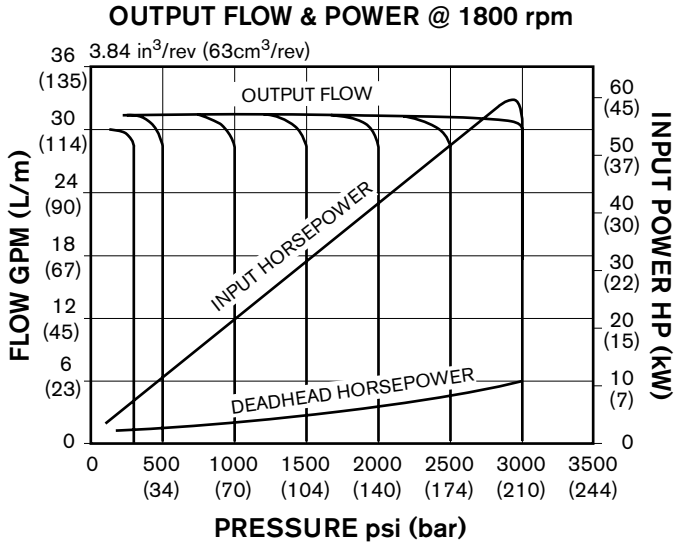
Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)



Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spacially and time-weighted averaged.

**Performance characteristics – VPV 63 to 3000 PSI (210 Bar) (continued)**

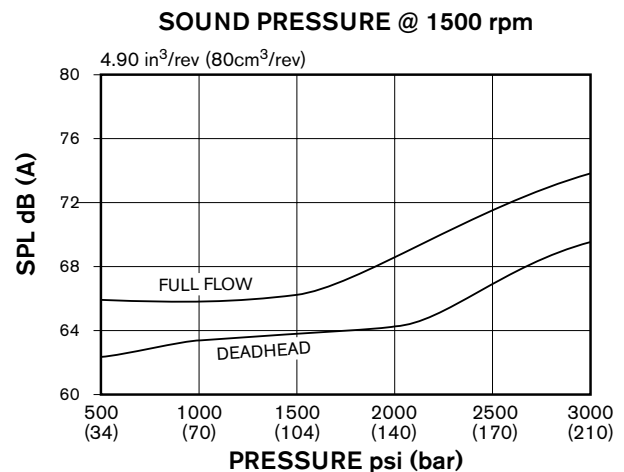
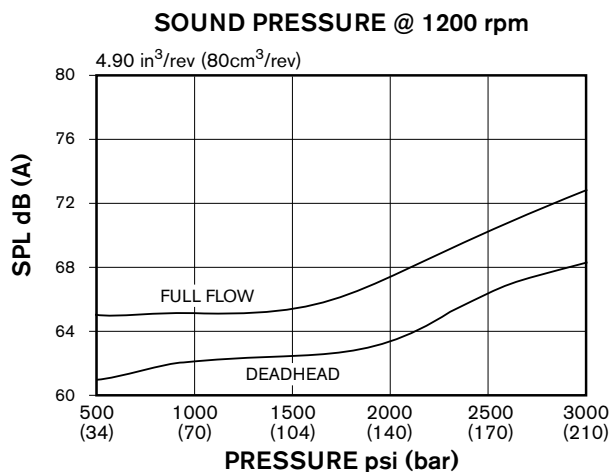
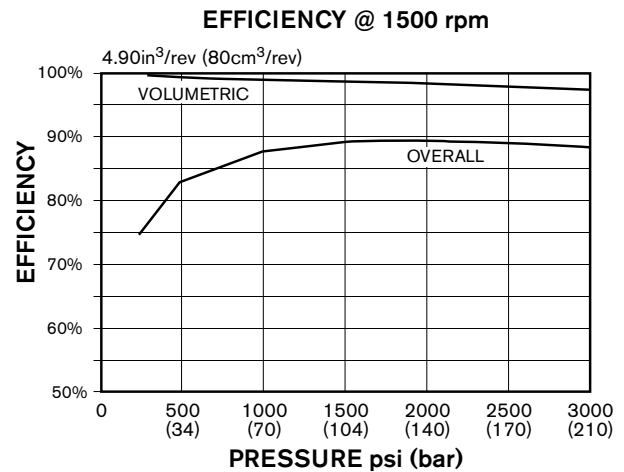
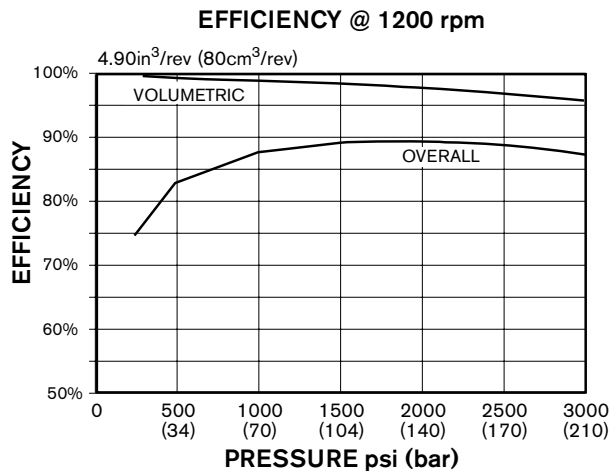
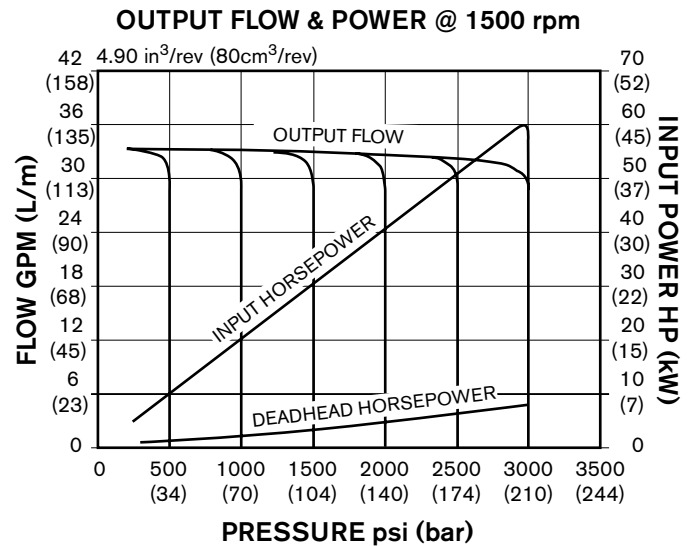
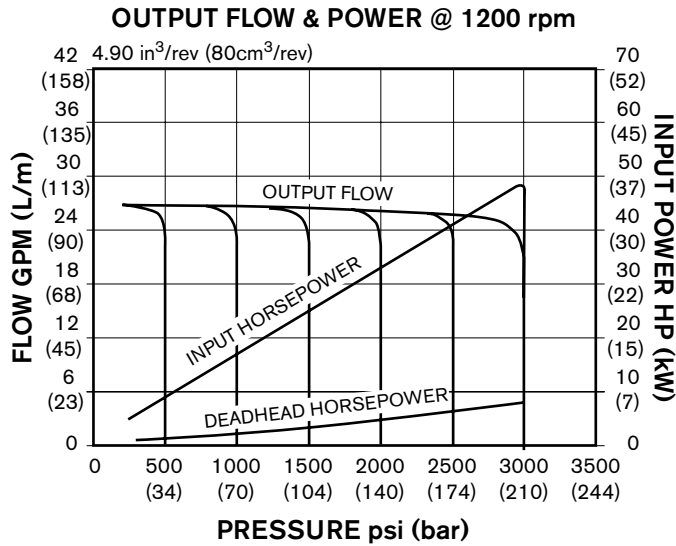
Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)



Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spatially and time-weighted averaged.

**Performance characteristics – VPV 80 to 3000 PSI (210 Bar)**

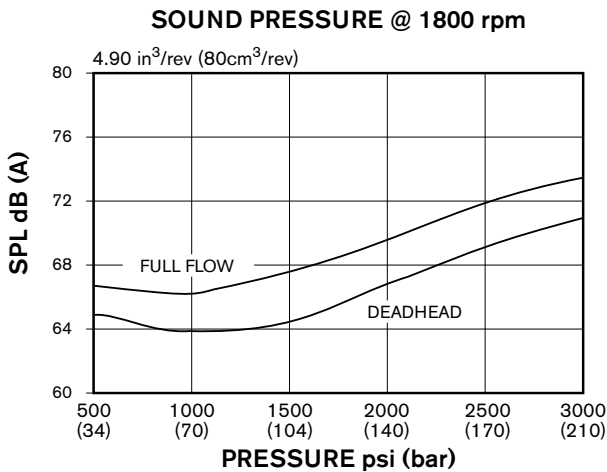
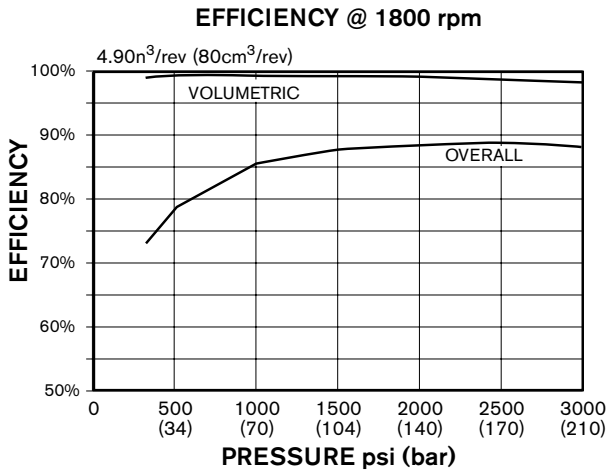
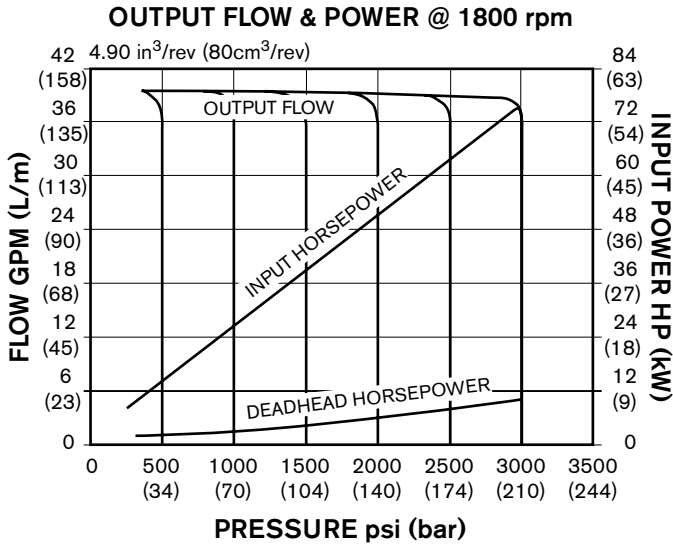
Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)



Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spacially and time-weighted averaged.

**Performance characteristics – VPV 80 to 3000 PSI (210 Bar) (continued)**

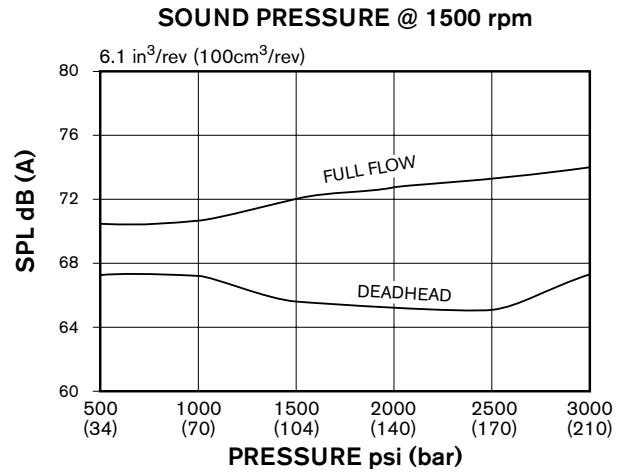
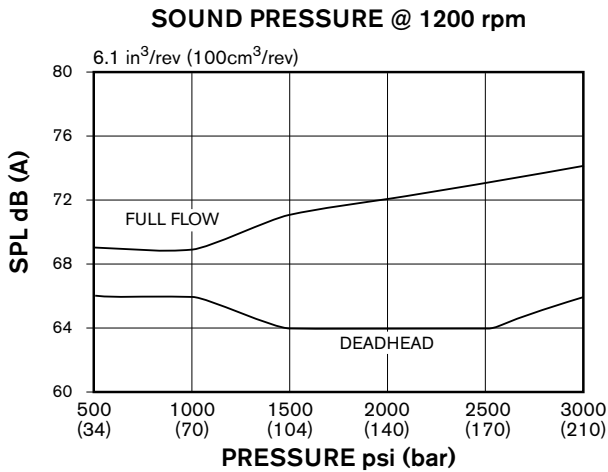
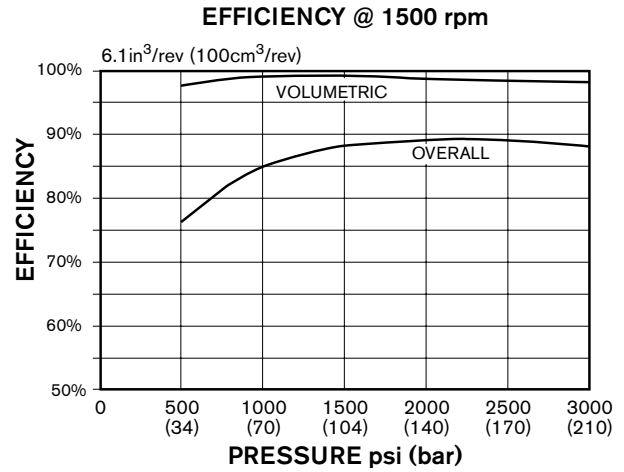
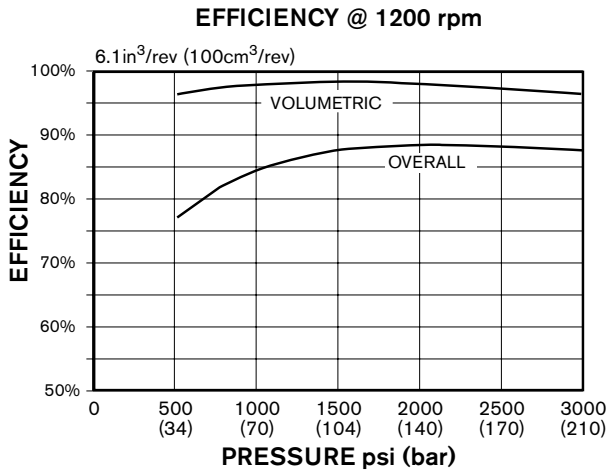
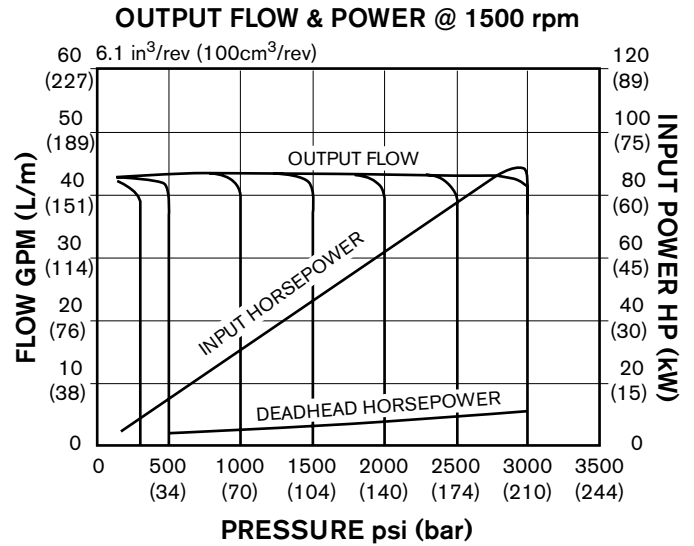
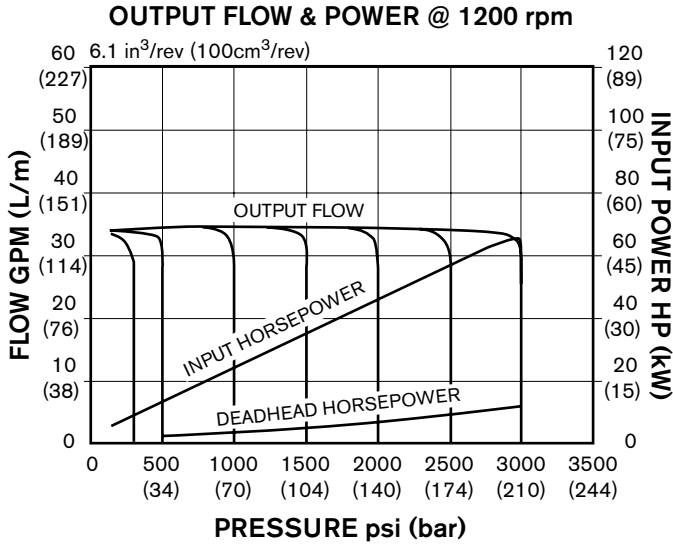
Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)



Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spatially and time-weighted averaged.

**Performance characteristics – VPV 100 to 3000 PSI (210 Bar)**

Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)

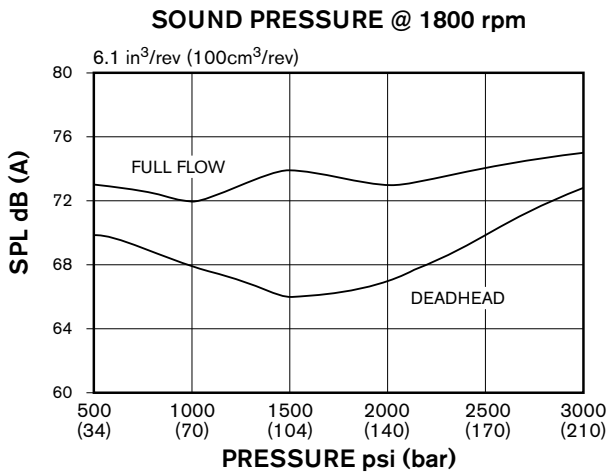
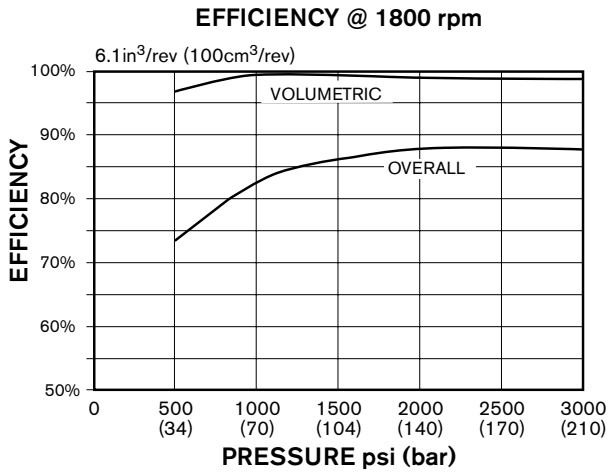
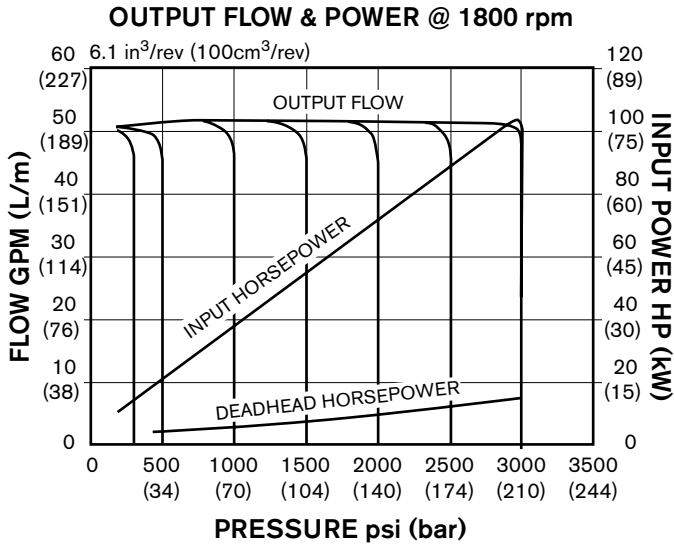


Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spacially and time-weighted averaged.



**Performance characteristics – VPV 100 to 3000 PSI (210 Bar) (continued)**

Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)

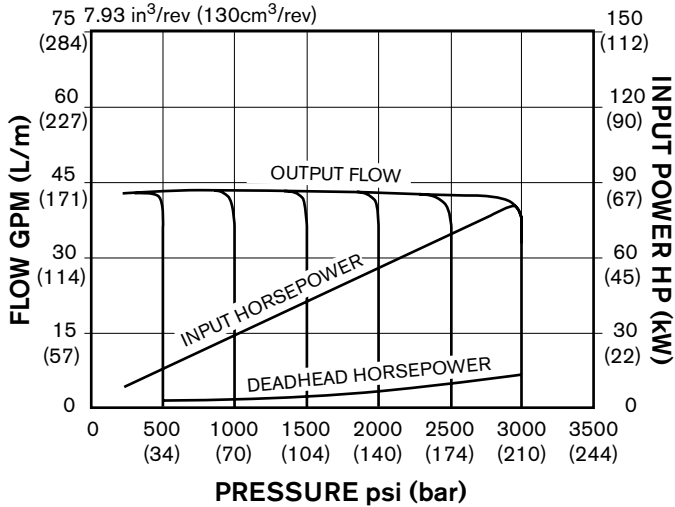


Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spatially and time-weighted averaged.

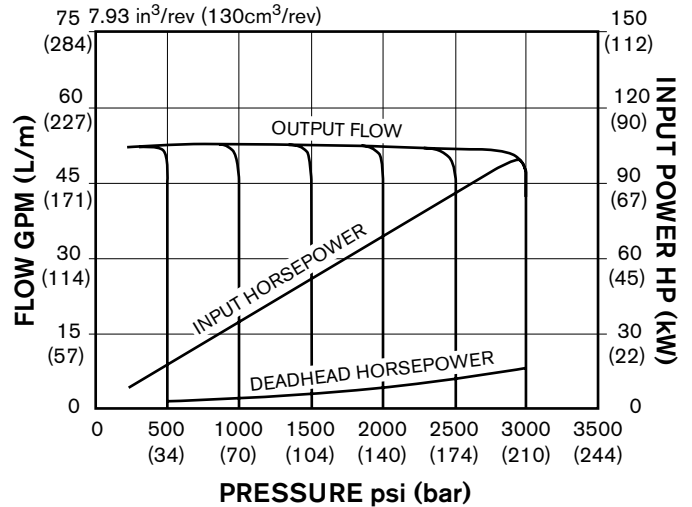
**Performance characteristics – VPV 130 to 3000 PSI (210 Bar)**

Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)

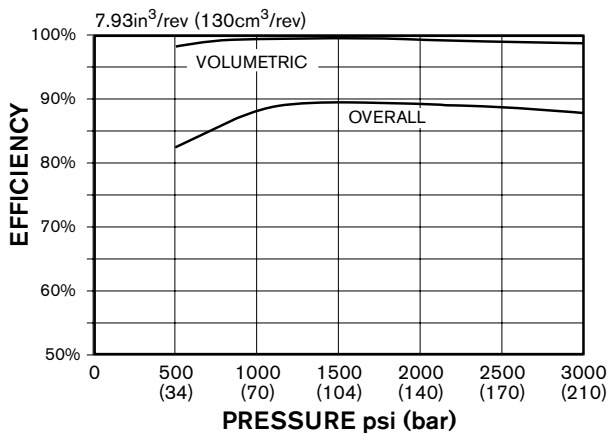
**OUTPUT FLOW & POWER @ 1200 rpm**



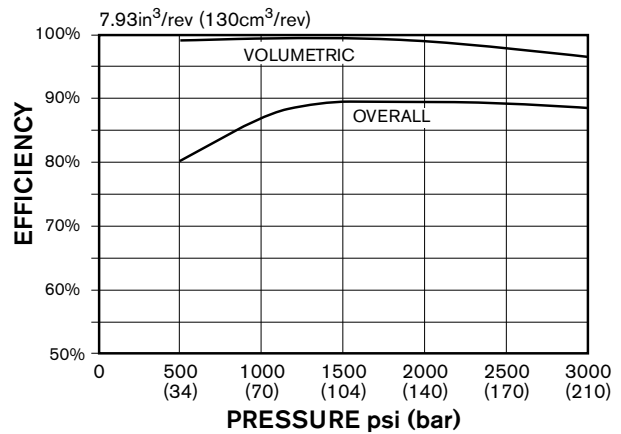
**OUTPUT FLOW & POWER @ 1500 rpm**



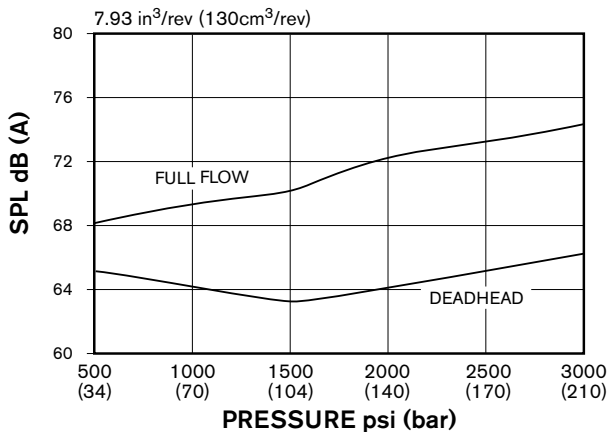
**EFFICIENCY @ 1200 rpm**



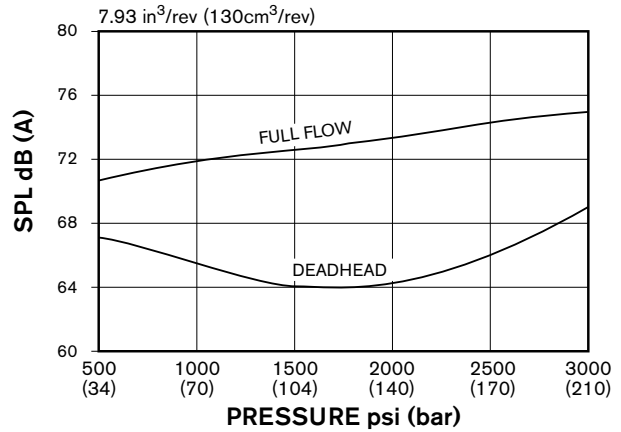
**EFFICIENCY @ 1500 rpm**



**SOUND PRESSURE @ 1200 rpm**



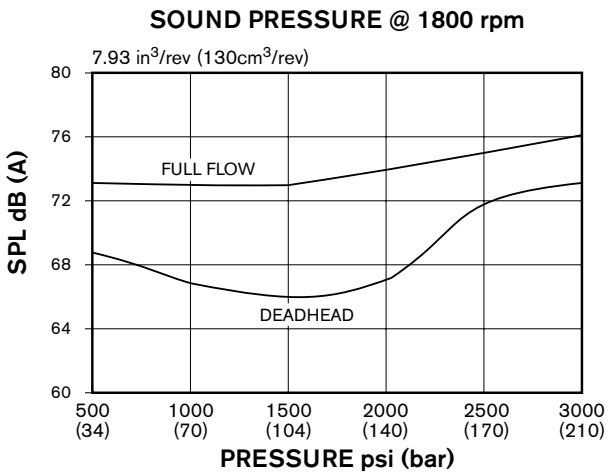
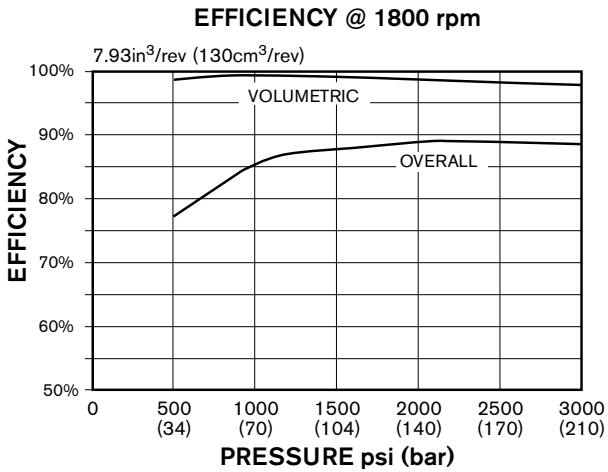
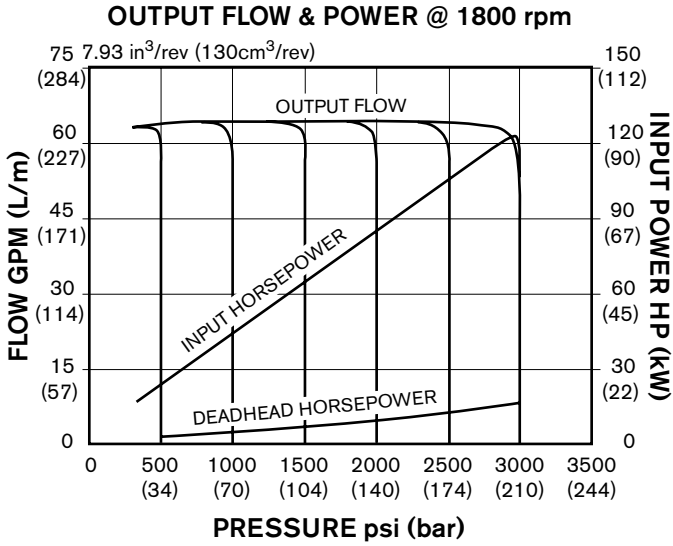
**SOUND PRESSURE @ 1500 rpm**



Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spatially and time-weighted averaged.

**Performance characteristics – VPV 130 to 3000 PSI (210 Bar) (continued)**

Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)

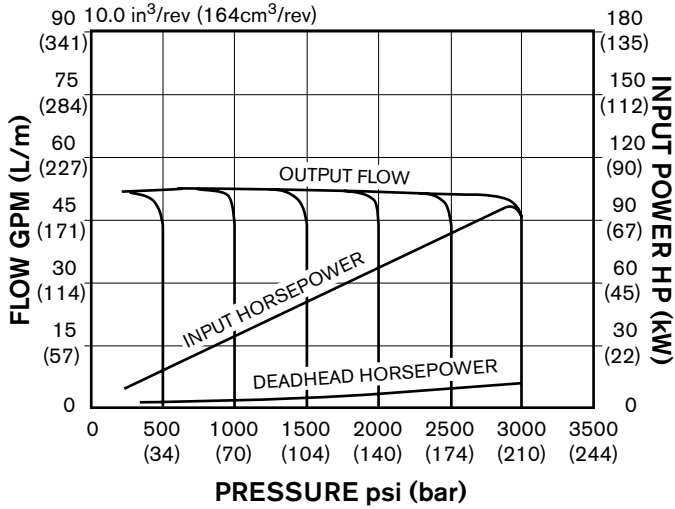


Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spatially and time-weighted averaged.

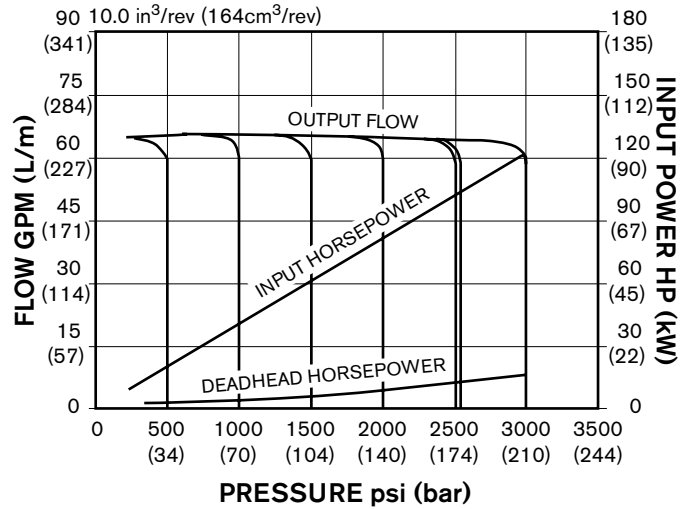
**Performance characteristics – VPV 164 to 3000 PSI (210 Bar)**

Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)

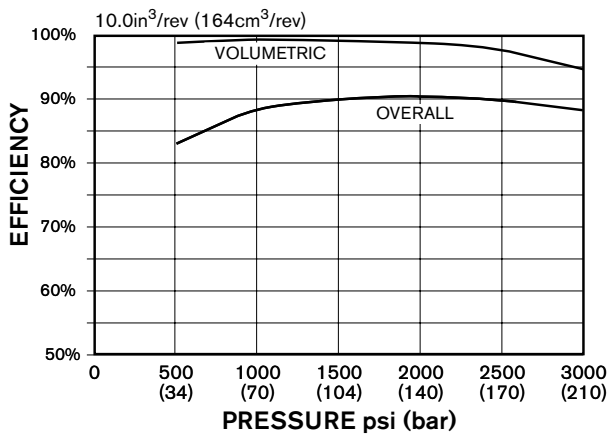
**OUTPUT FLOW & POWER @ 1200 rpm**



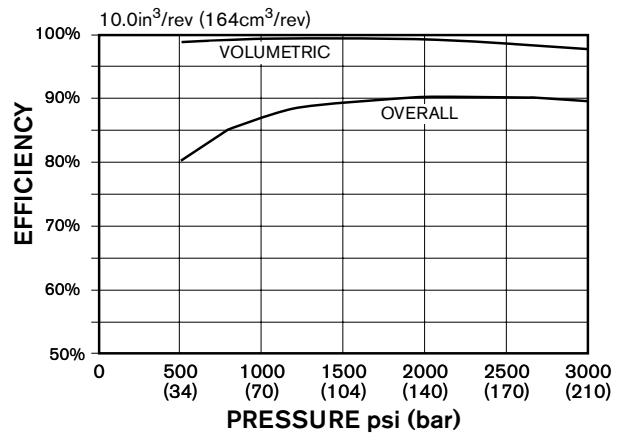
**OUTPUT FLOW & POWER @ 1500 rpm**



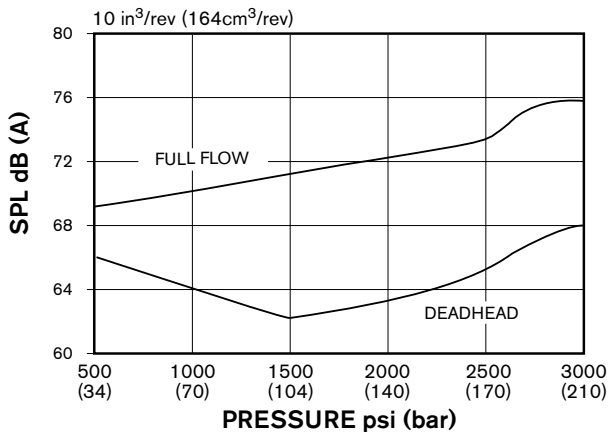
**EFFICIENCY @ 1200 rpm**



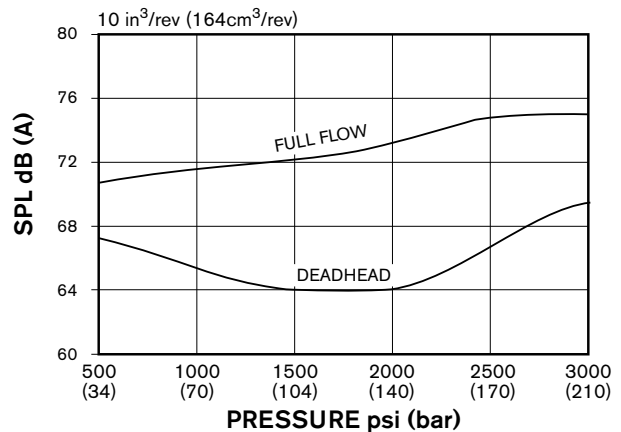
**EFFICIENCY @ 1500 rpm**



**SOUND PRESSURE @ 1200 rpm**



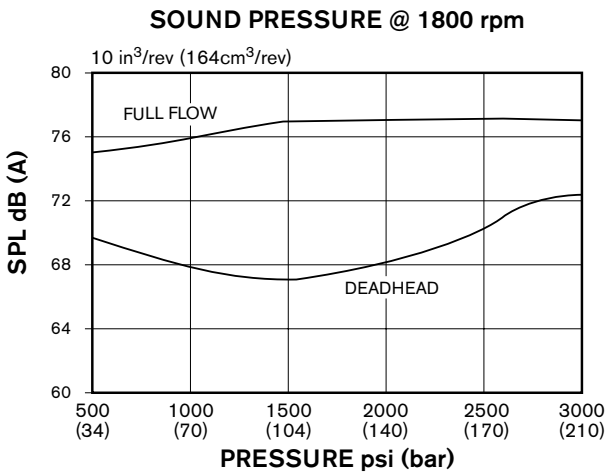
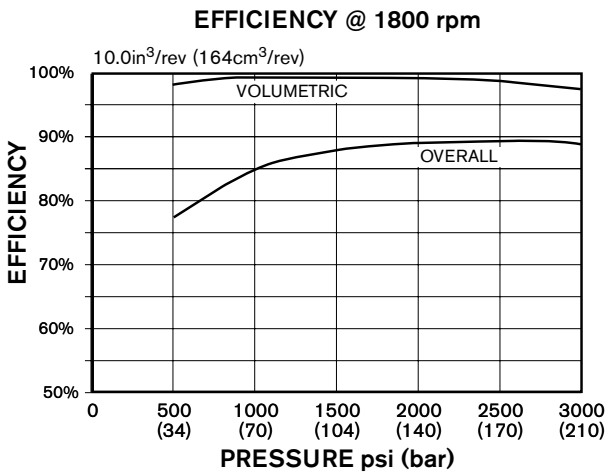
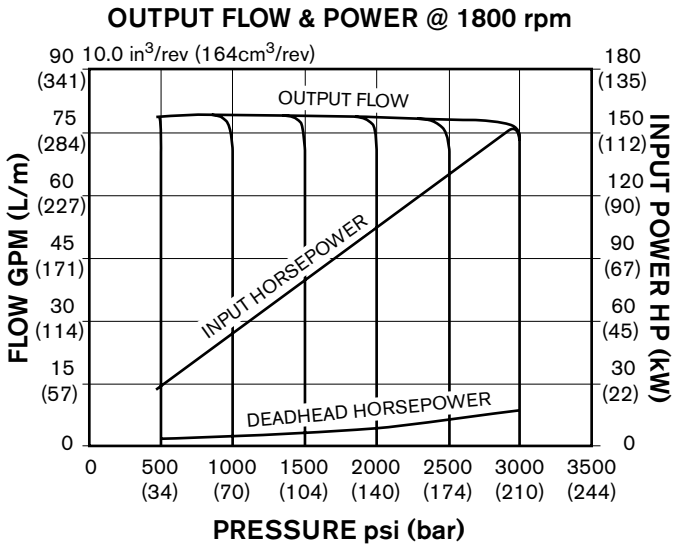
**SOUND PRESSURE @ 1500 rpm**



Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spatially and time-weighted averaged.

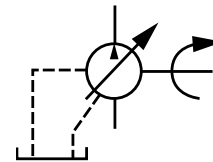
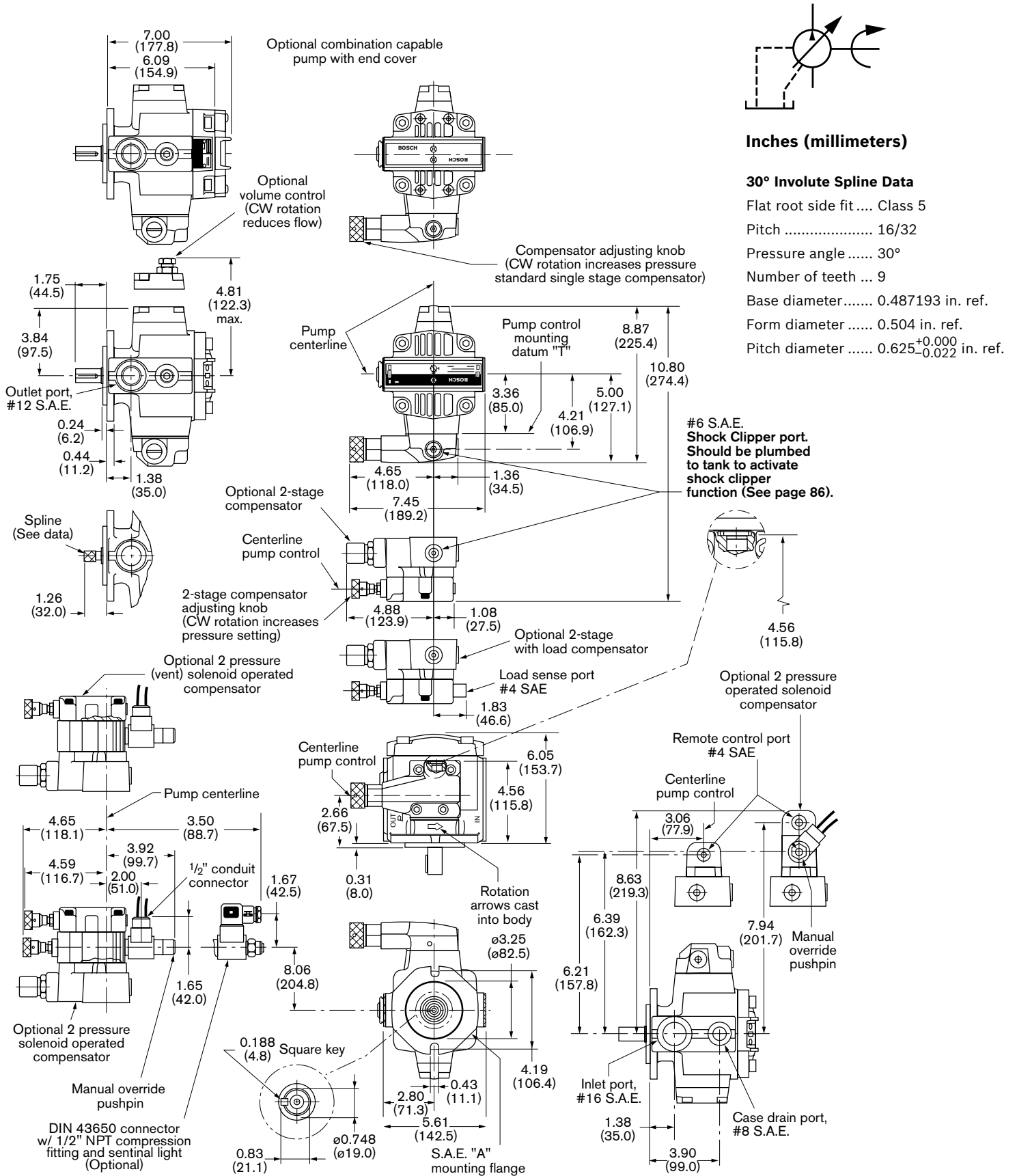
**Performance characteristics – VPV 164 to 3000 PSI (210 Bar) (continued)**

Data plotted: with oil at 120°F (49°C) Viscosity at 120° = 140 SUS (29.6 cSt)



Sound pressure levels measured in a hemi-anechoic chamber w/microphone placed 1 meter away at discrete locations. Sound pressure levels are spatially and time-weighted averaged.

**VPV 16, Single pump, S.A.E. 'A' flange, RH rotation**

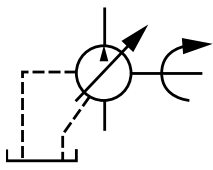
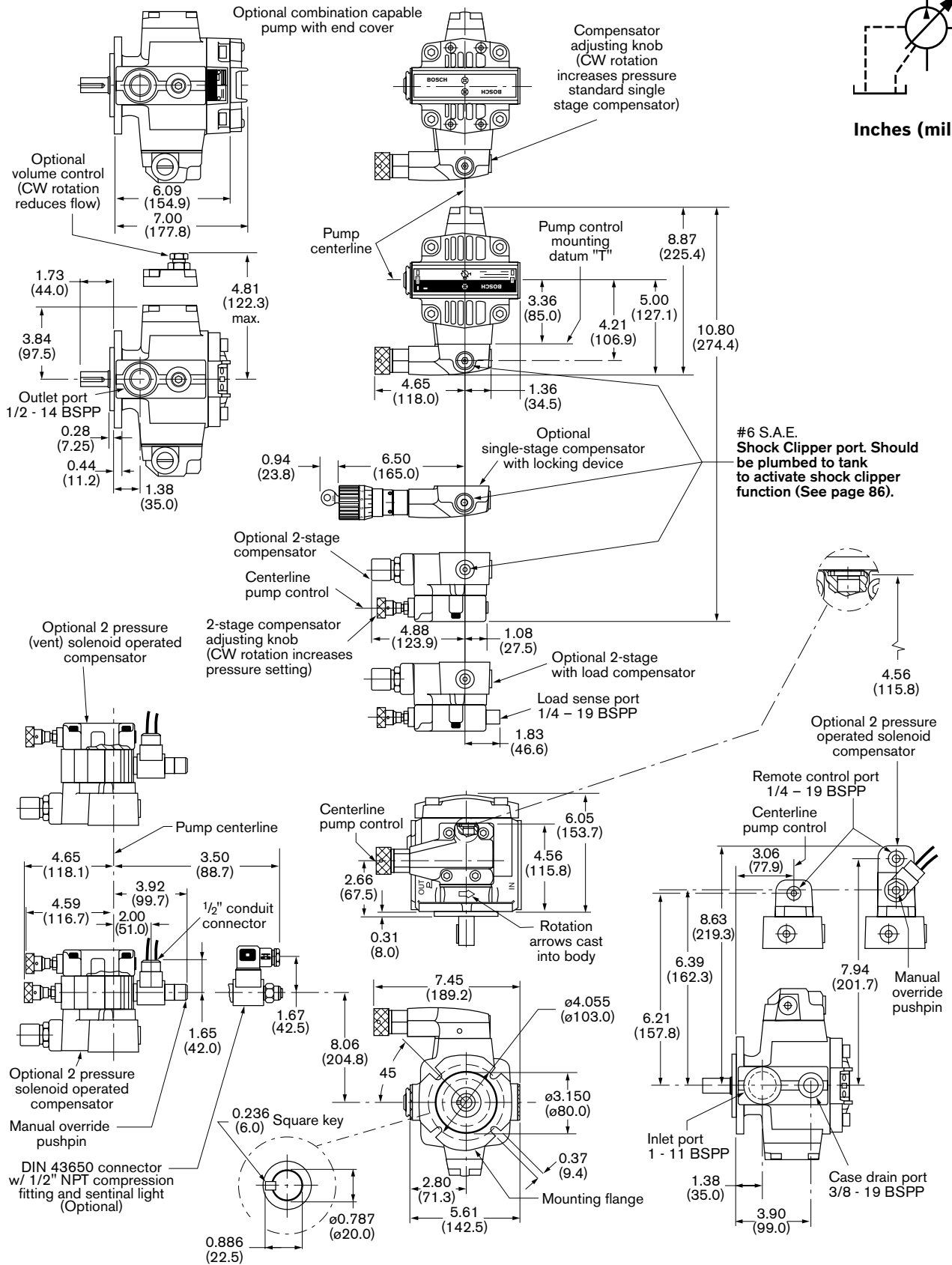


**Inches (millimeters)**

**30° Involute Spline Data**

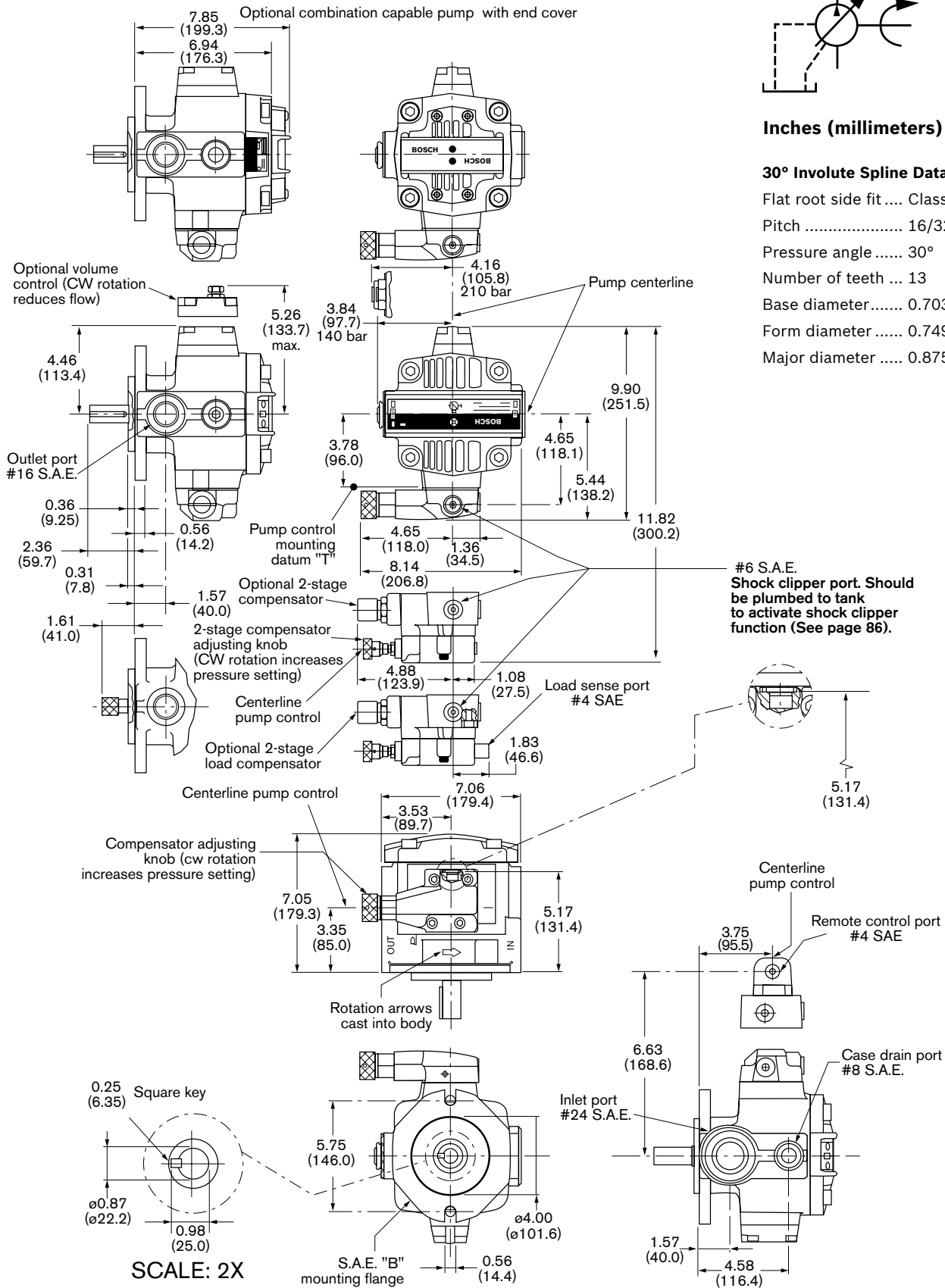
Flat root side fit .... Class 5  
 Pitch ..... 16/32  
 Pressure angle ..... 30°  
 Number of teeth ... 9  
 Base diameter ..... 0.487193 in. ref.  
 Form diameter ..... 0.504 in. ref.  
 Pitch diameter ..... 0.625<sup>+0.000</sup><sub>-0.022</sub> in. ref.

### VPV 16, Single pump, metric flange, RH rotation



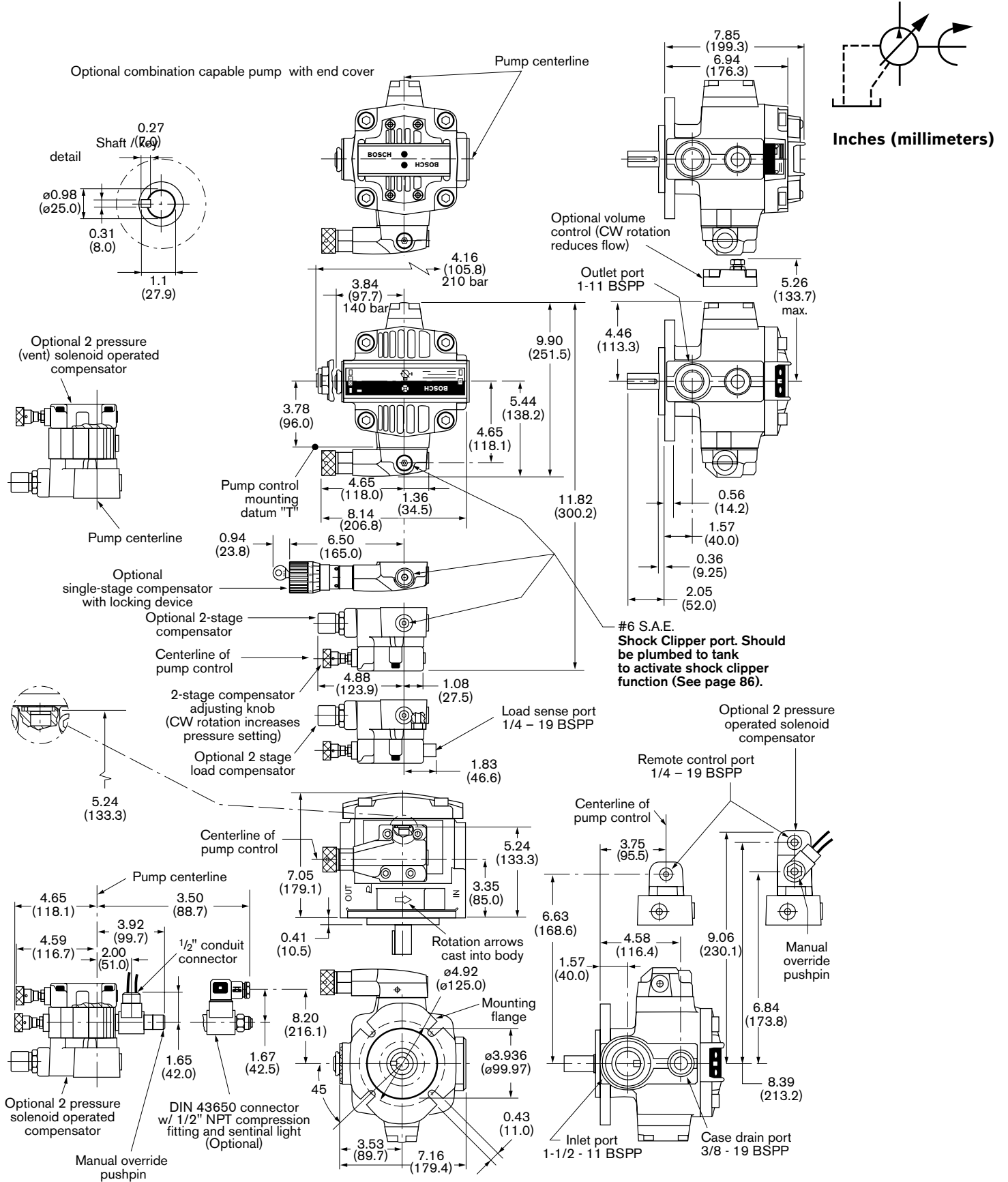
**Inches (millimeters)**

**VPV 25/32, Single pump, S.A.E. 'B' flange, RH rotation**

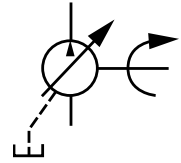




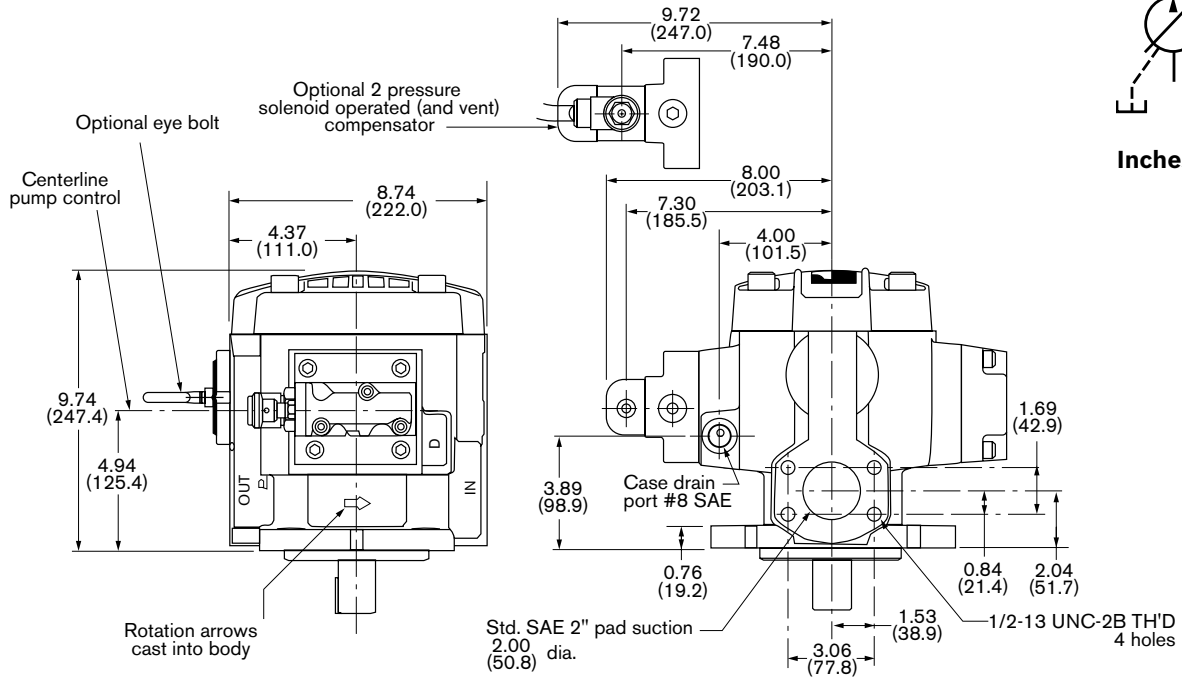
**VPV 25/32, Single pump, metric flange, RH rotation**



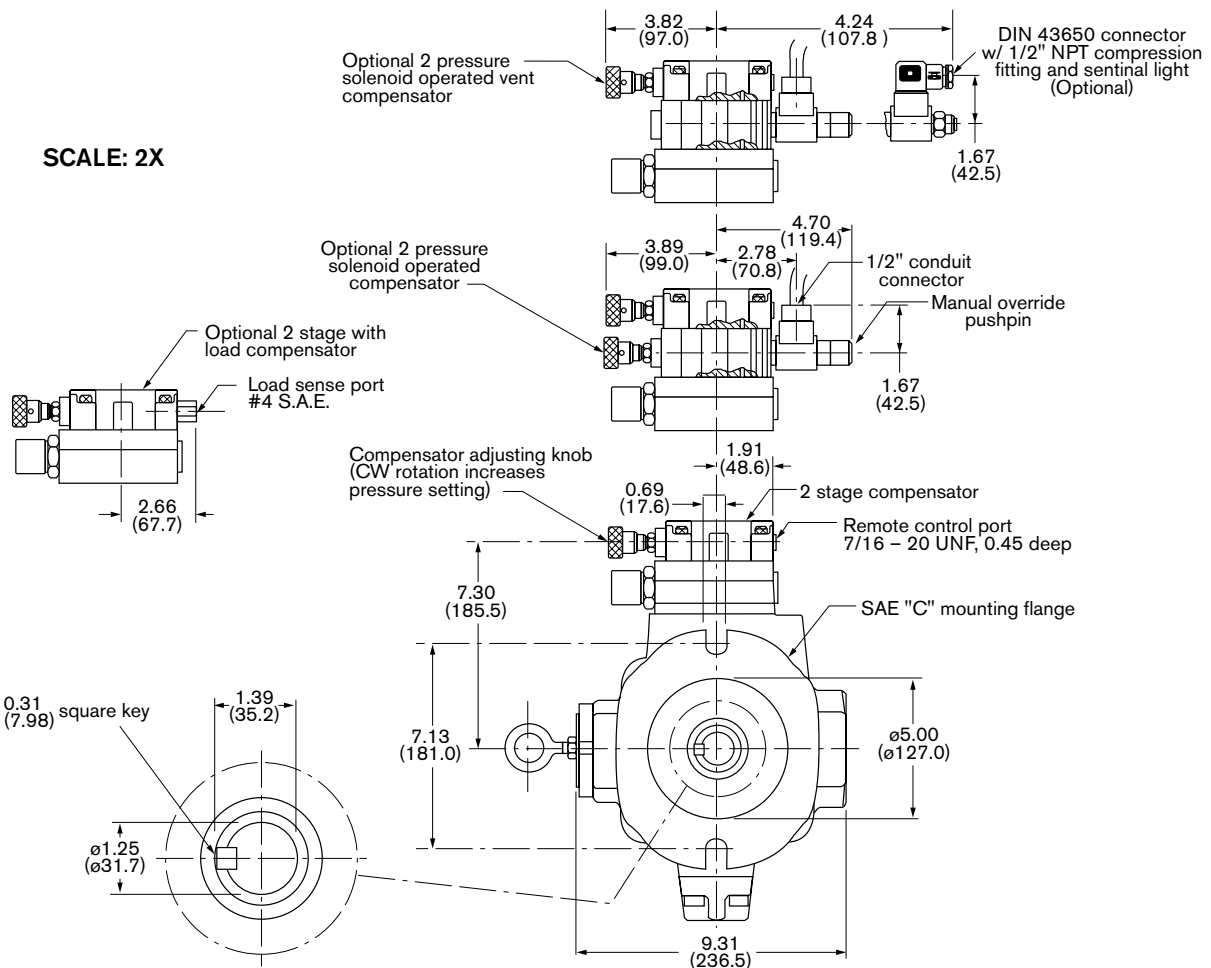
**VPV 45/63/80, Single pump, S.A.E. 'C' flange, RH rotation**



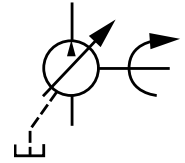
**Inches (millimeters)**



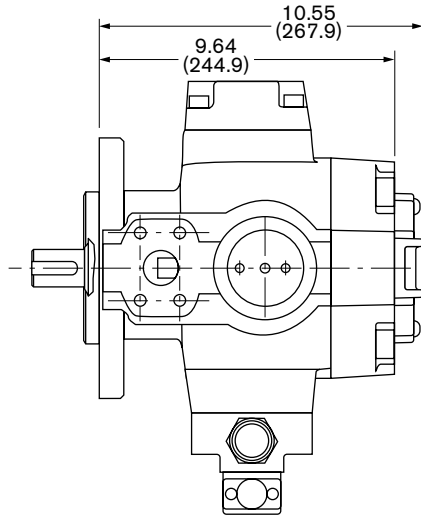
**SCALE: 2X**



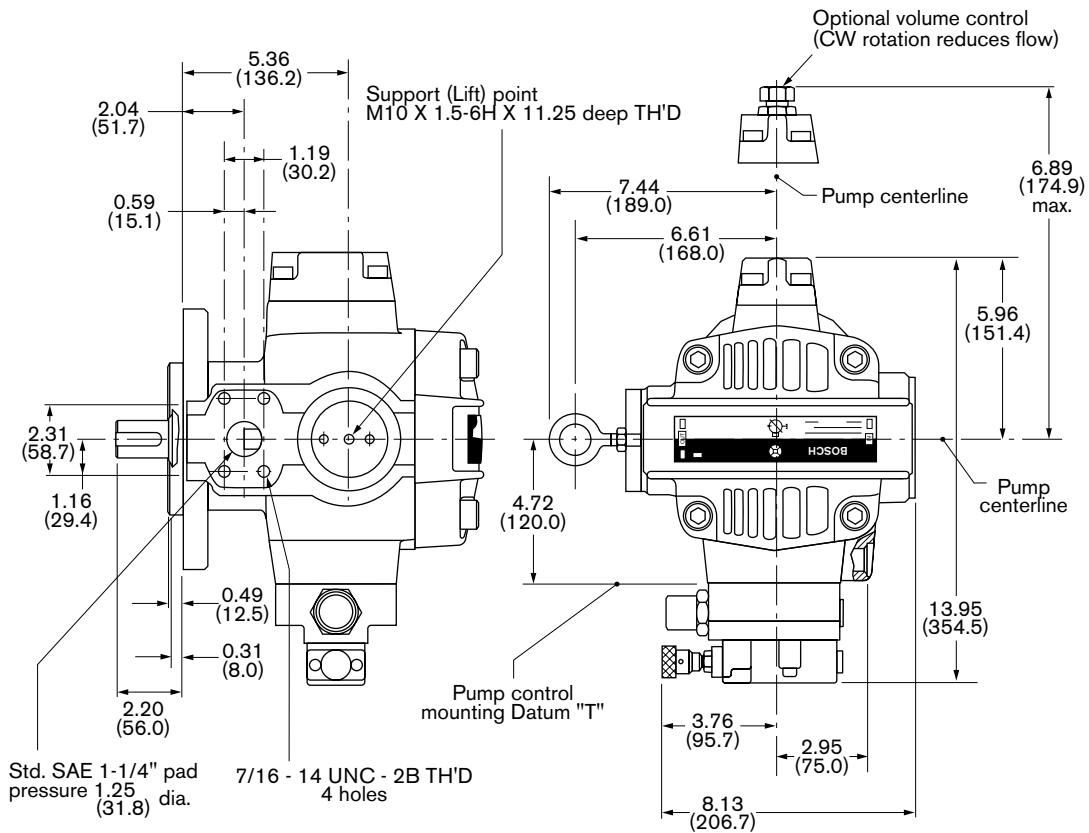
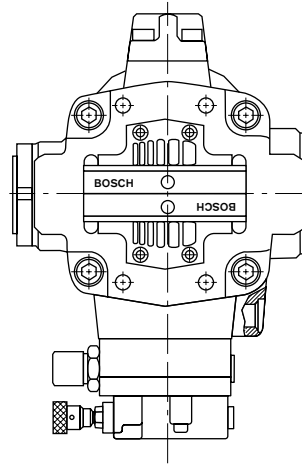
**VPV 45/63/80, Single pump, S.A.E. 'C' flange, RH rotation (continued)**



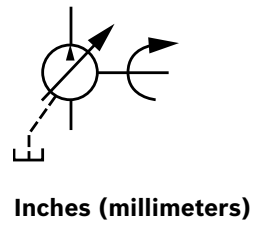
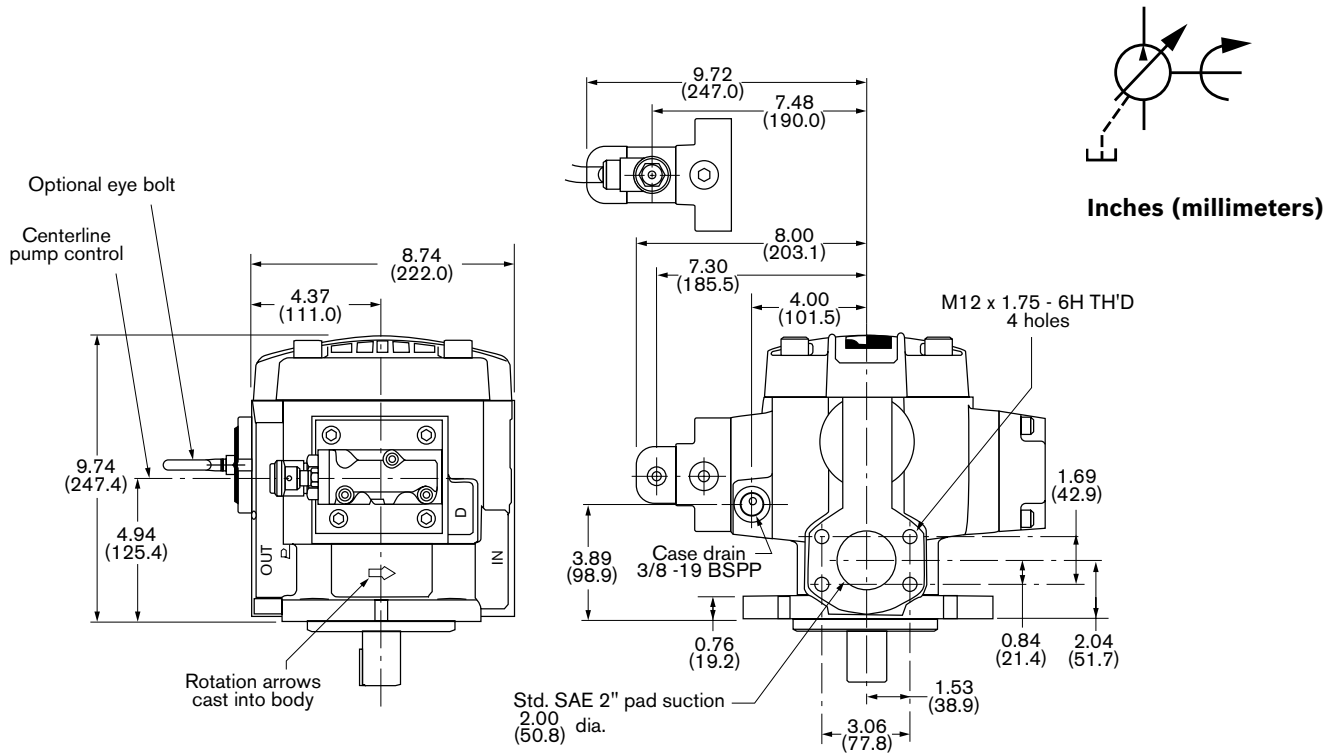
**Inches (millimeters)**



Optional combination capable pump with end cover (P1 Version)

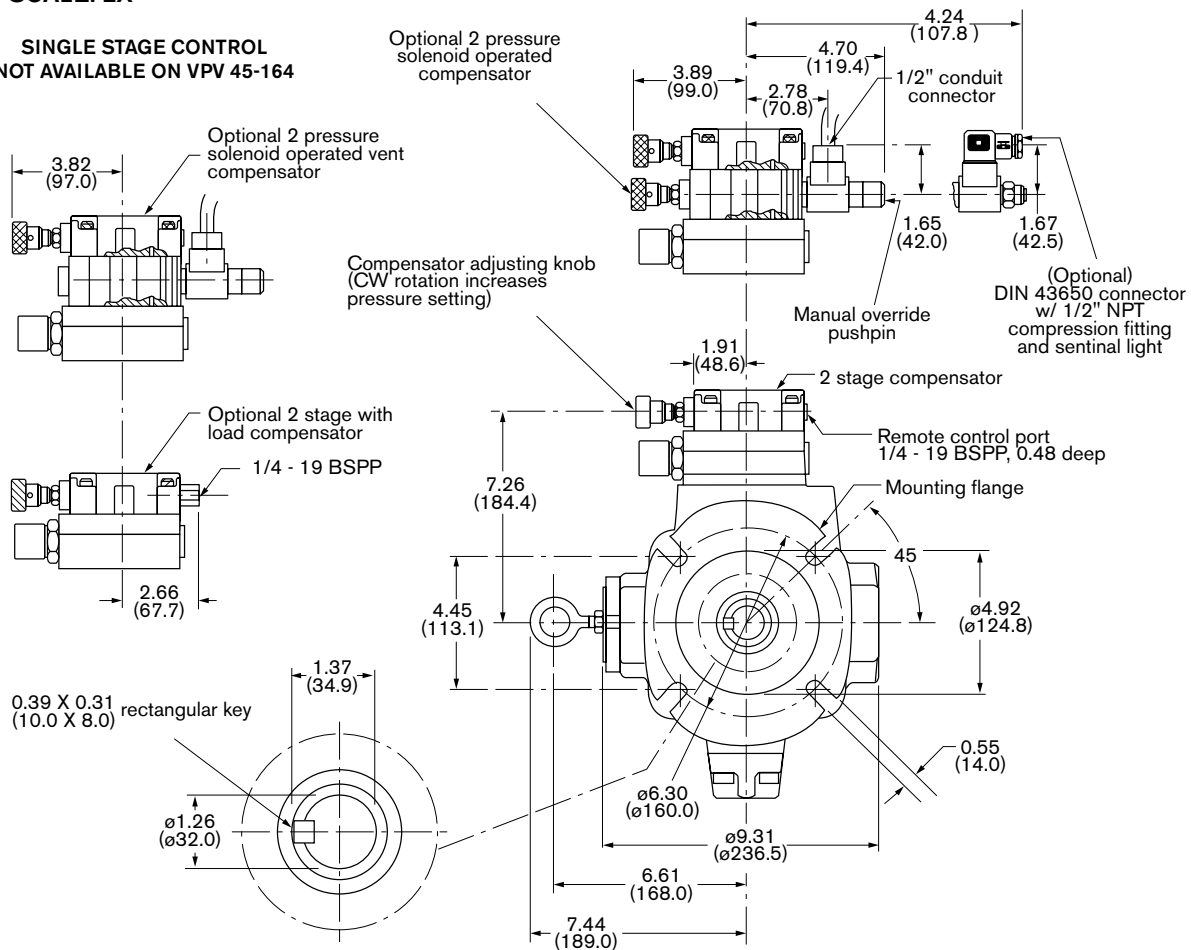


**VPV 45/63/80, Single pump, metric flange, RH rotation**

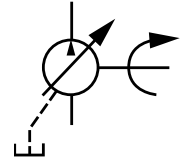


**SCALE: 2X**

**SINGLE STAGE CONTROL**  
**NOT AVAILABLE ON VPV 45-164**

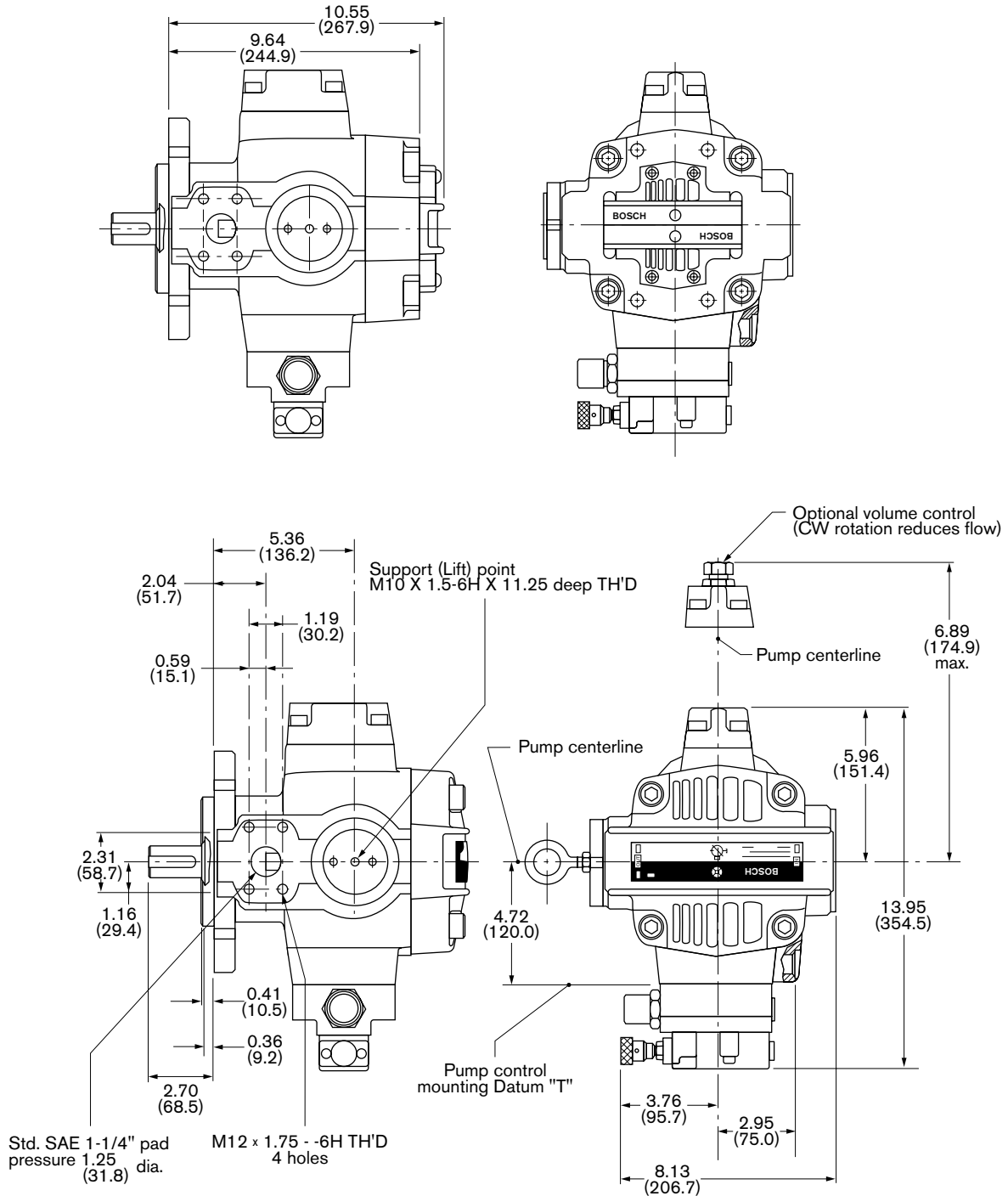


**VPV 45/63/80, Single pump, metric flange, RH rotation (continued)**

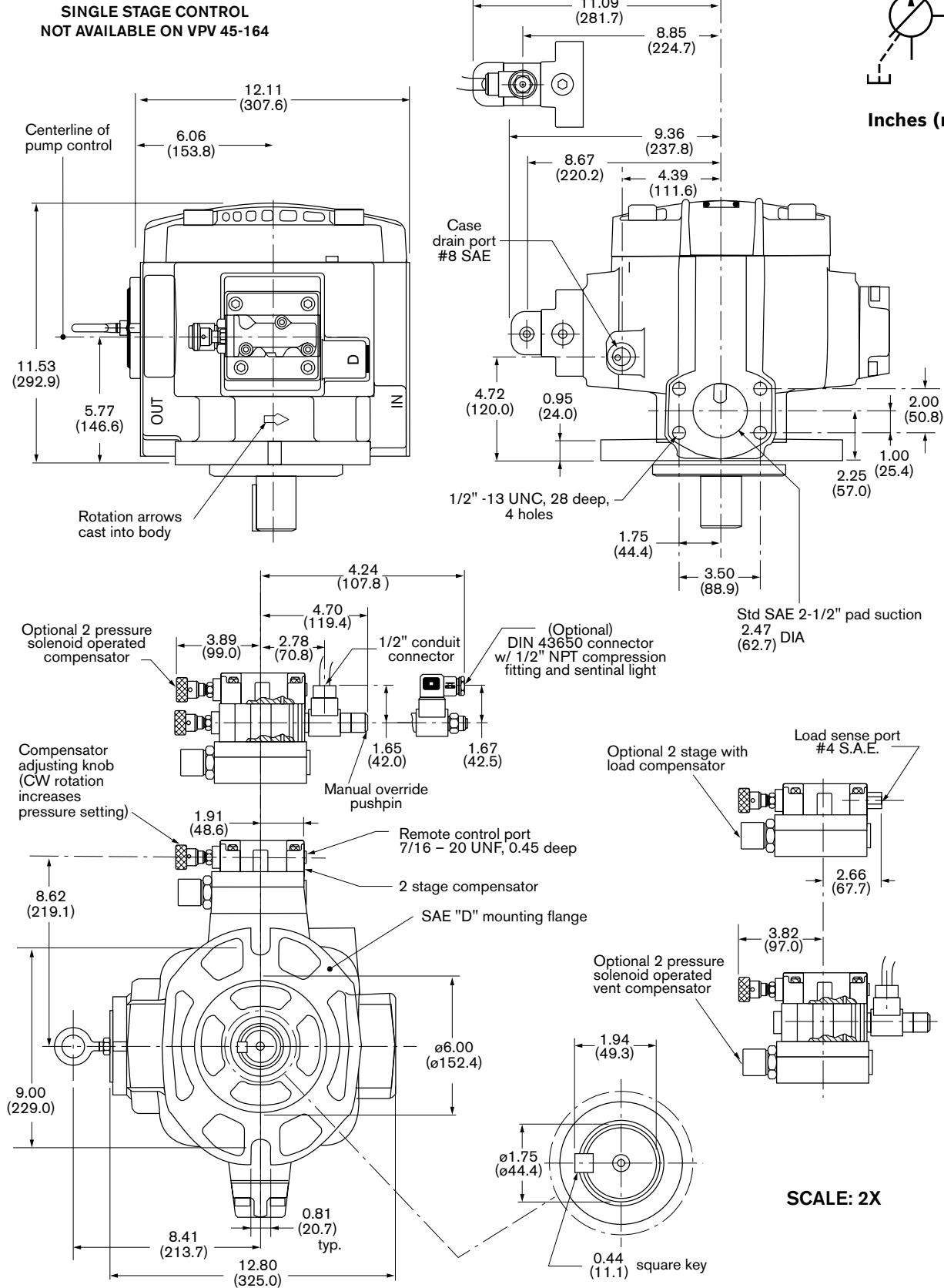


**Inches (millimeters)**

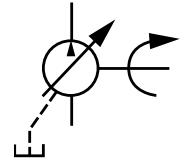
Optional combination capable pump  
with end cover (P1 Version)



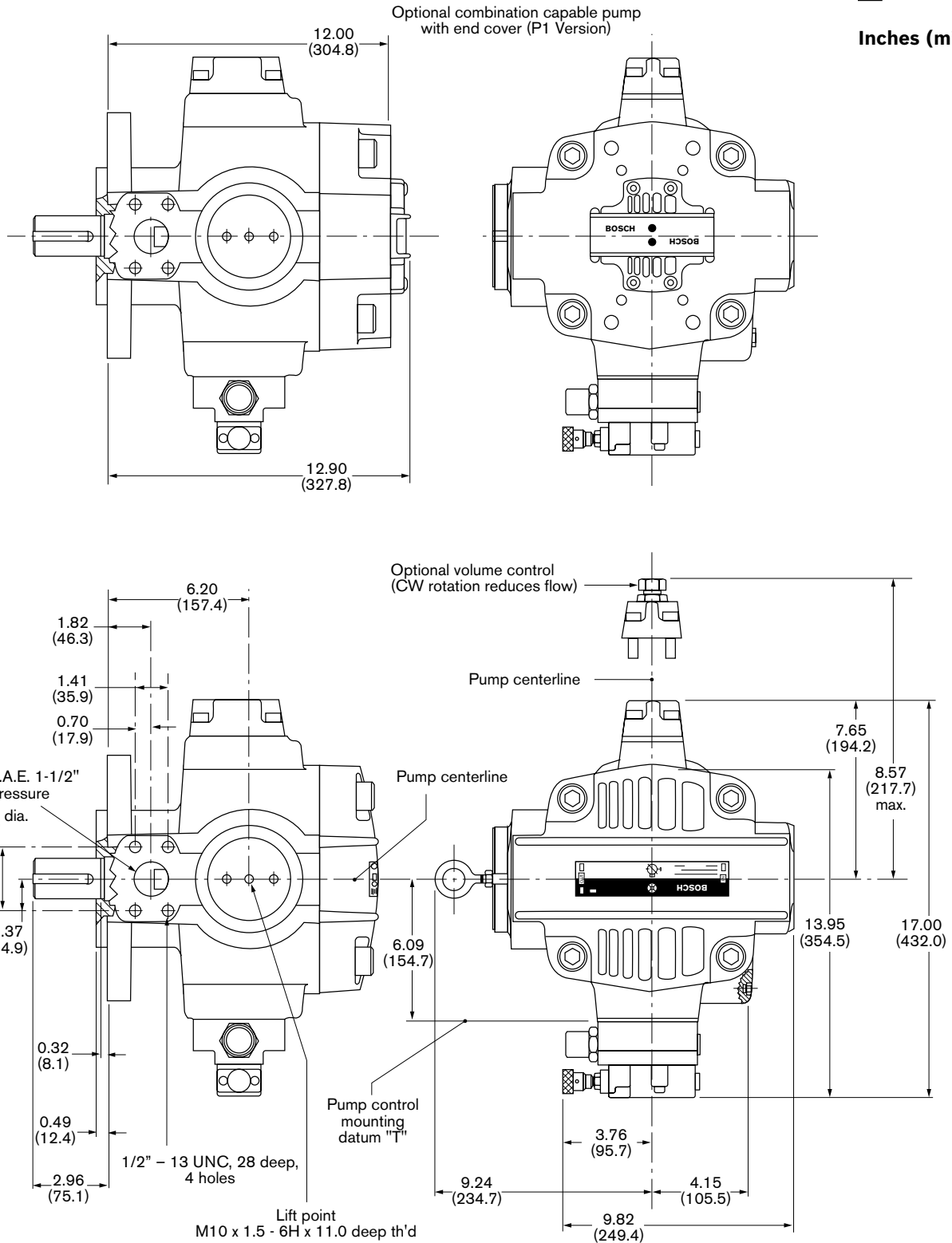
**VPV 100/130/164, Single pump, S.A.E. 'D' flange, RH rotation**



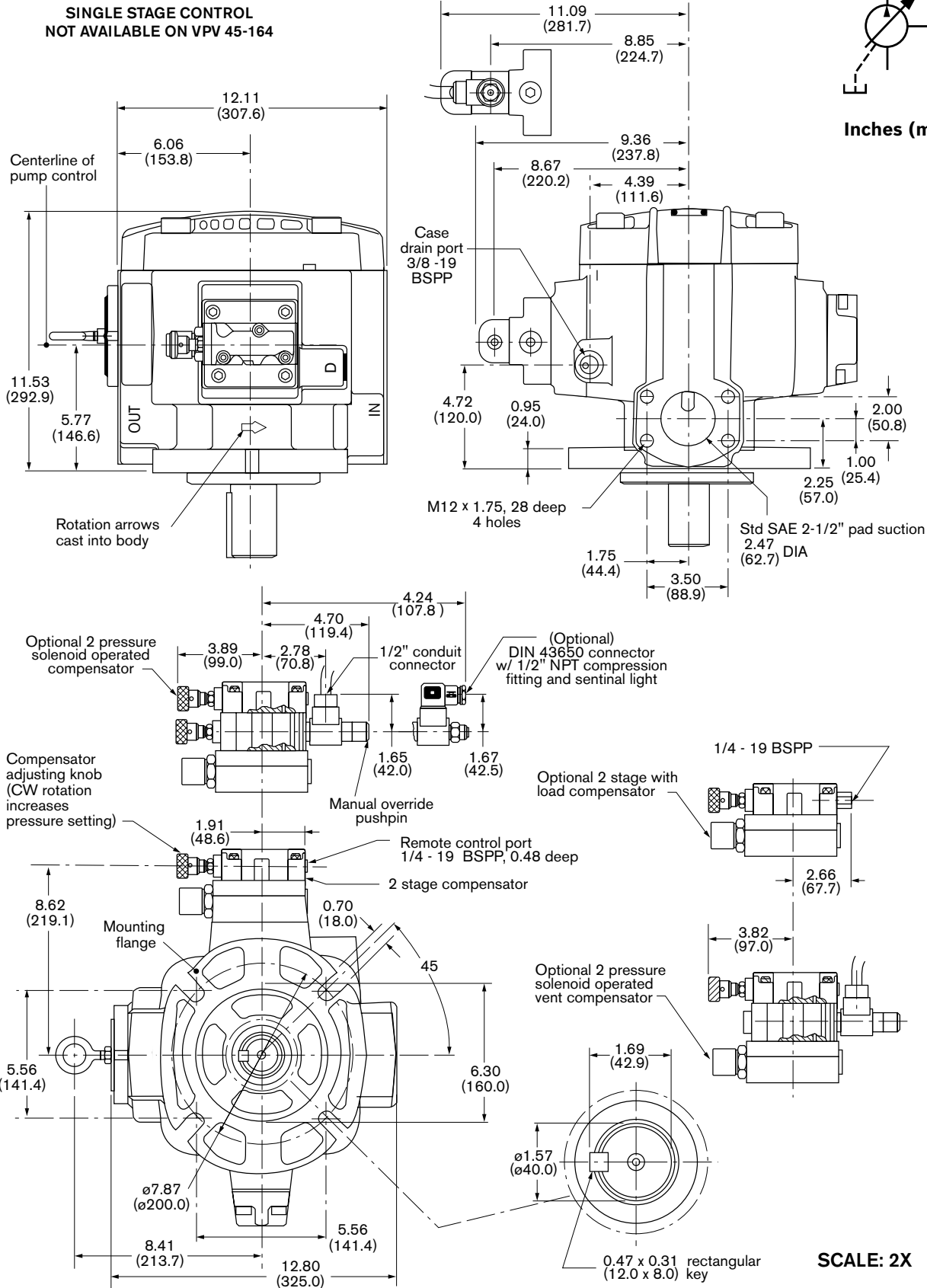
**VPV 100/130/164, Single pump, S.A.E. 'D' flange, RH rotation (continued)**



**Inches (millimeters)**

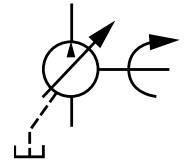


**VPV 100/130/164, Single pump, metric flange, RH rotation**

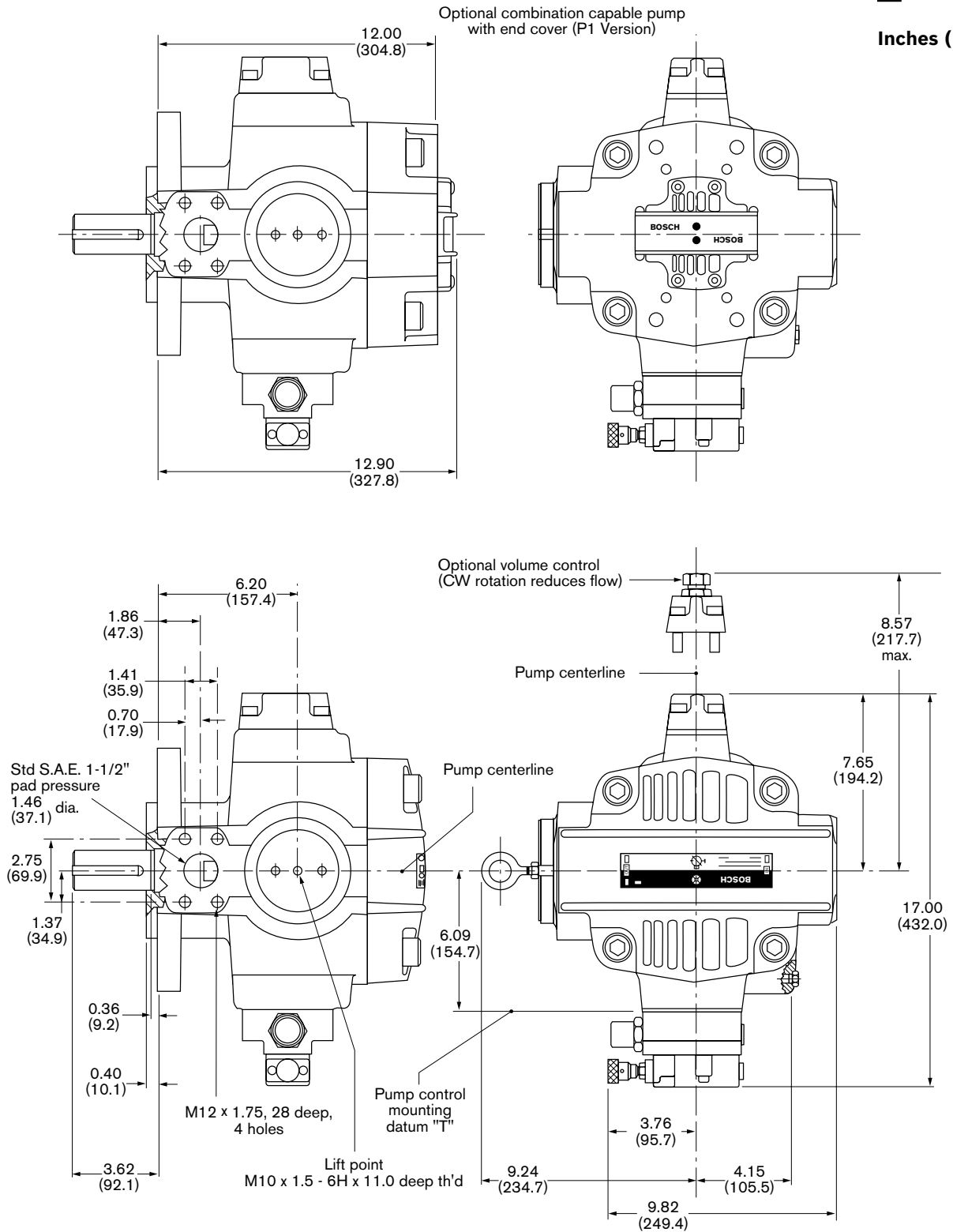




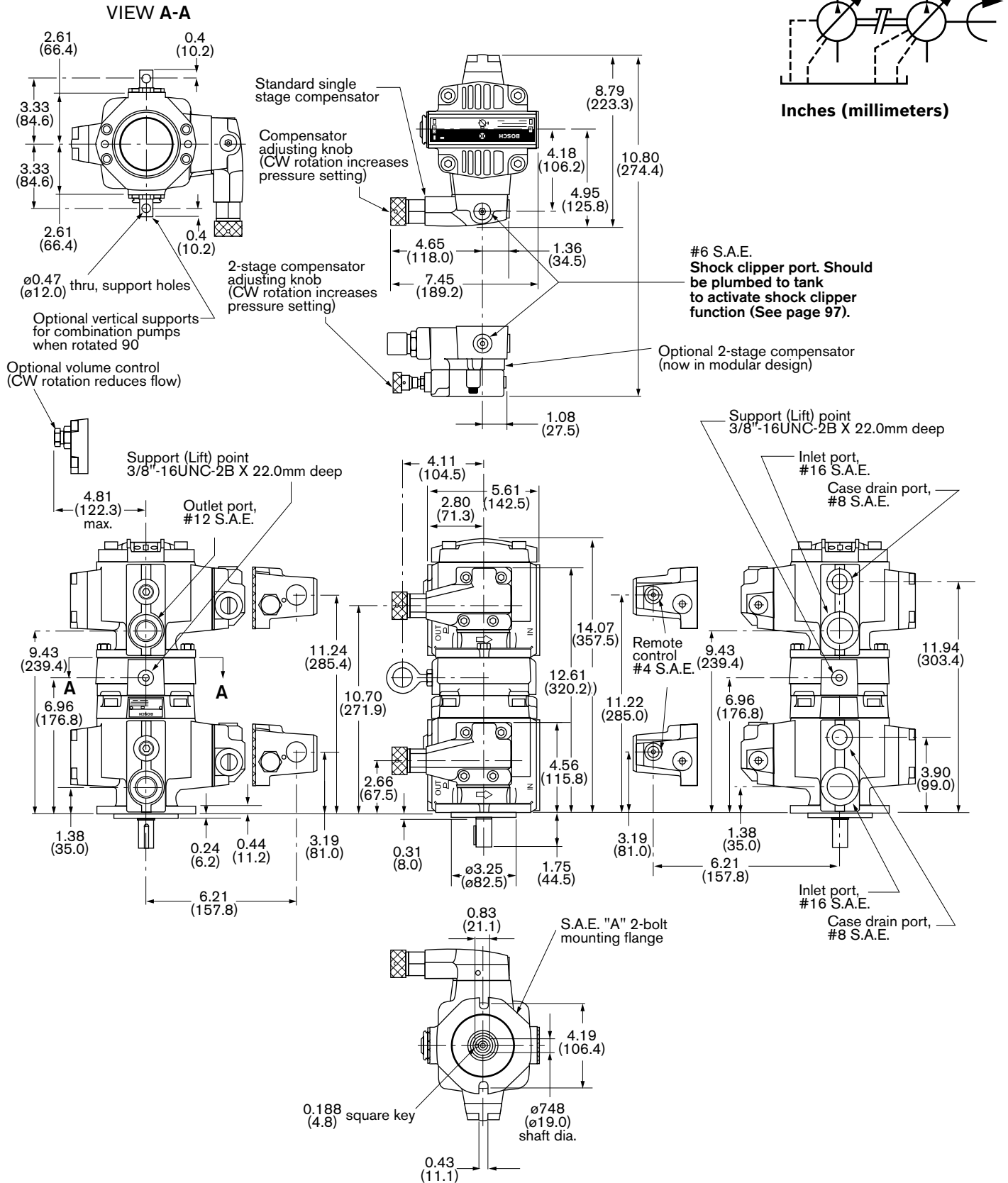
**VPV 100/130/164, Single pump, metric flange, RH rotation (continued)**



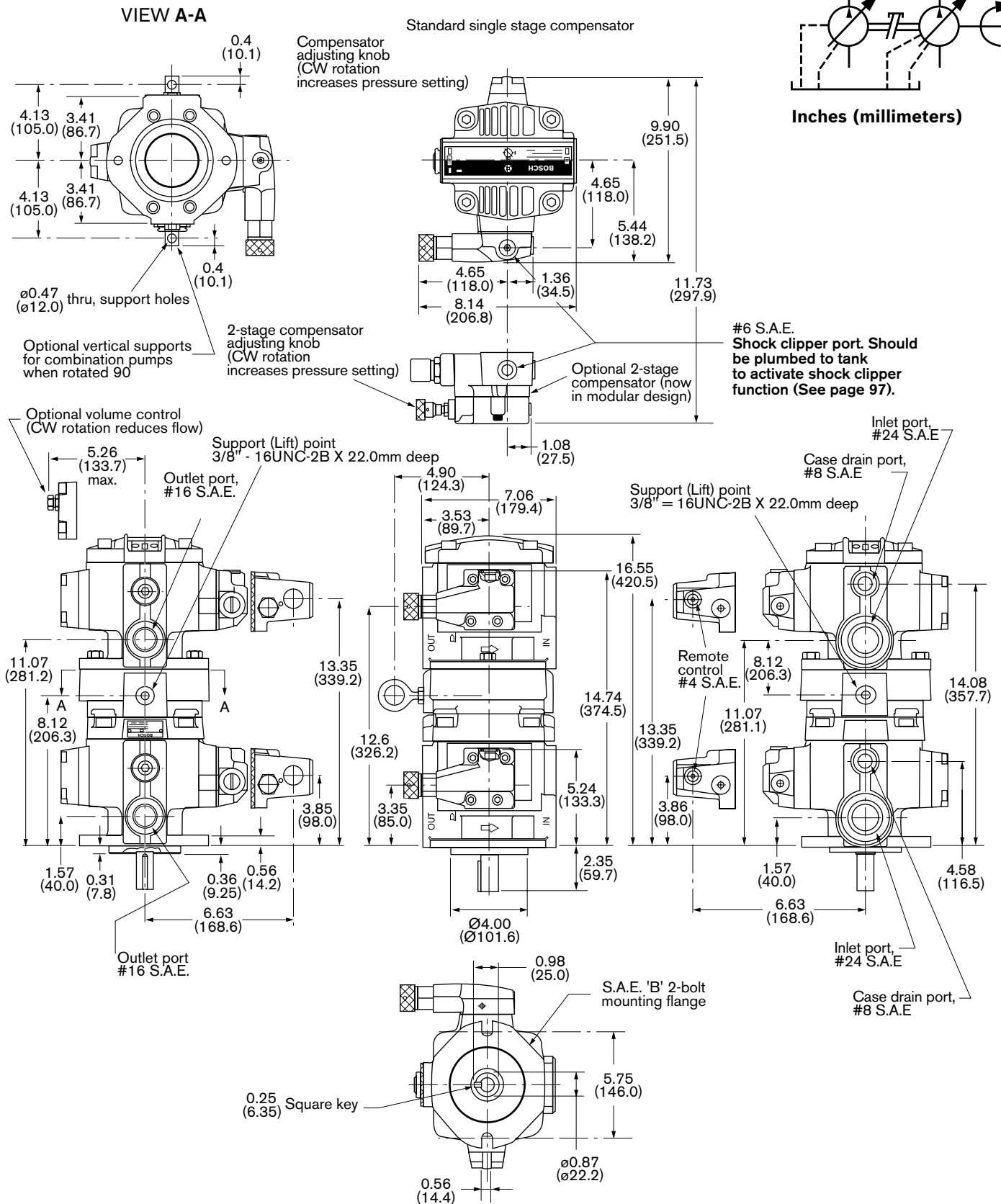
**Inches (millimeters)**



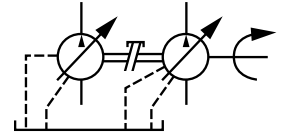
**VPV 16, Combination pump, S.A.E. 'A' flange, RH rotation**



**VPV 25/32, Combination pump, S.A.E. 'B' flange, RH rotation**



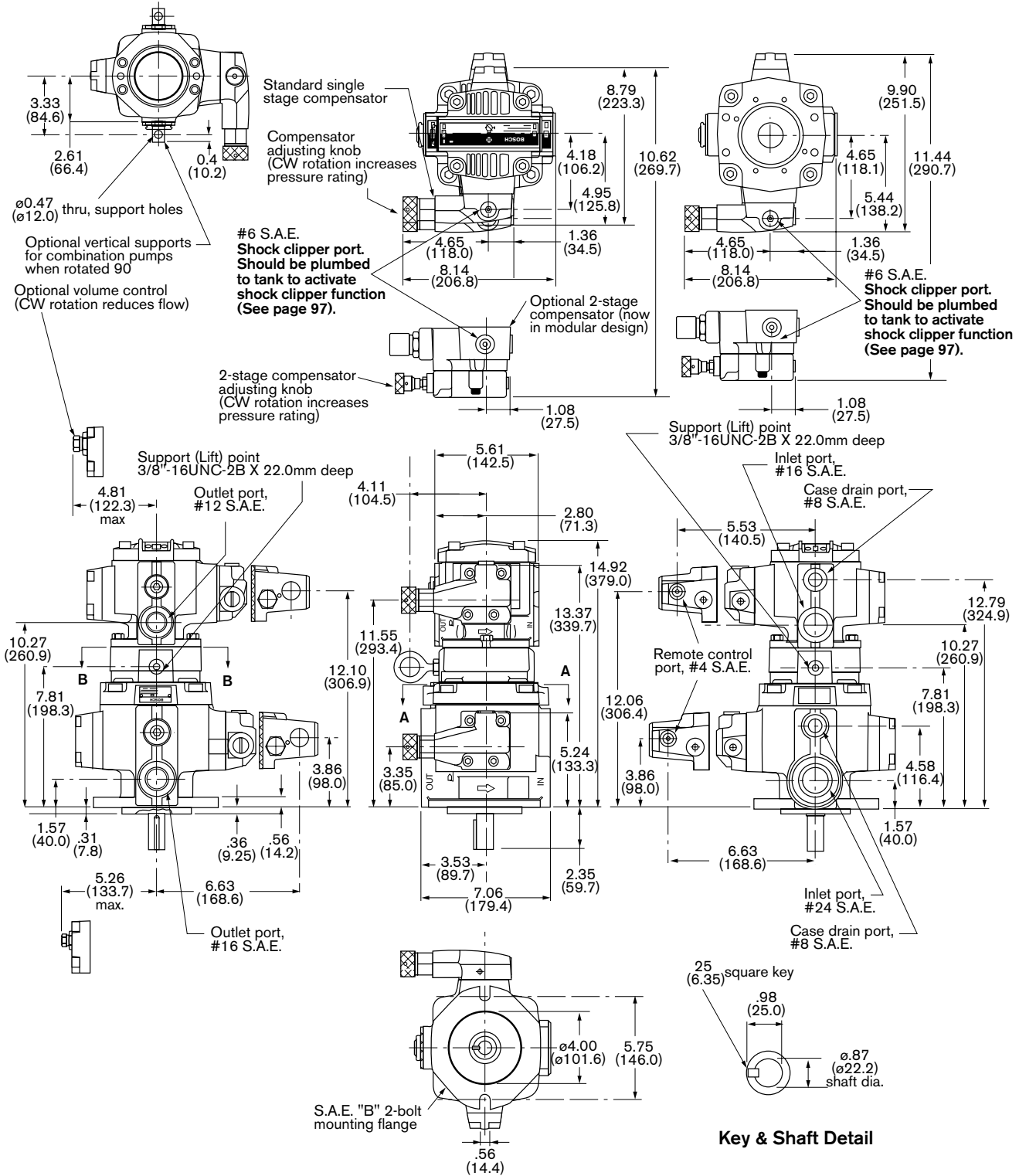
**VPV 32/16, Combination pump, S.A.E. 'B' flange, RH rotation**



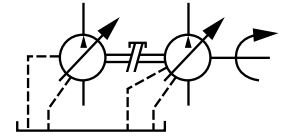
**VIEW A-A**

**Inches (millimeters)**

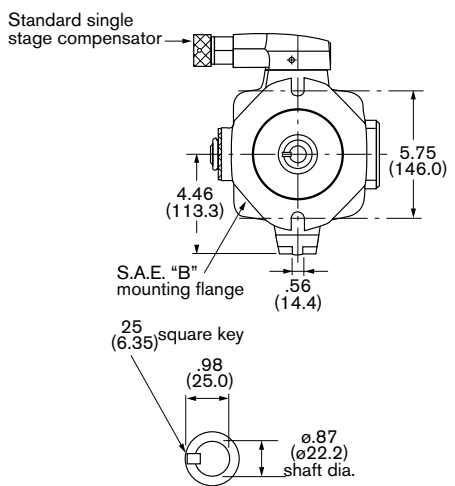
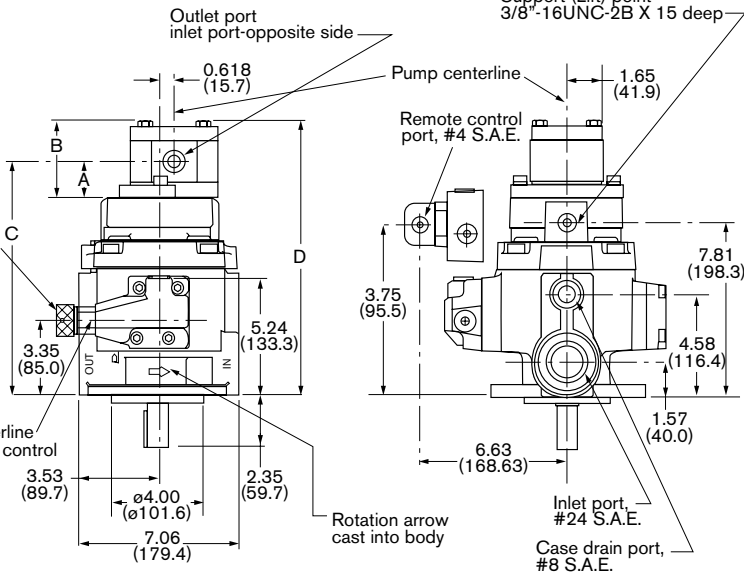
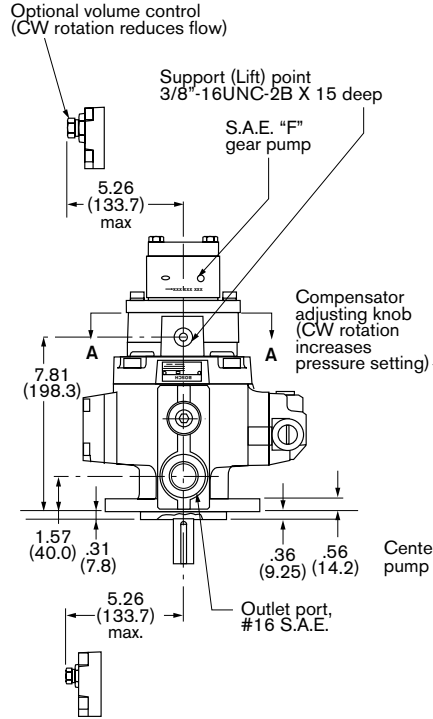
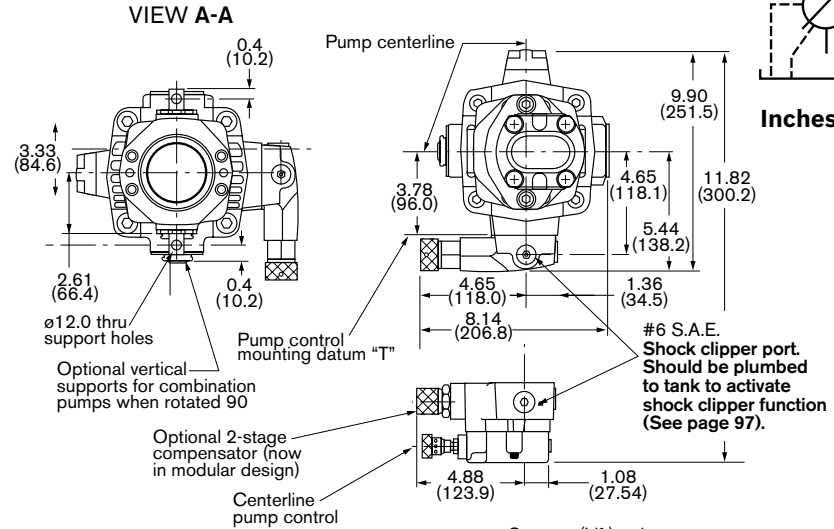
**VIEW B-B**



**VPV 32/25, Combination pump, S.A.E. to 'F' gear, RH rotation**



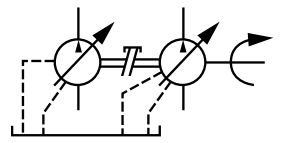
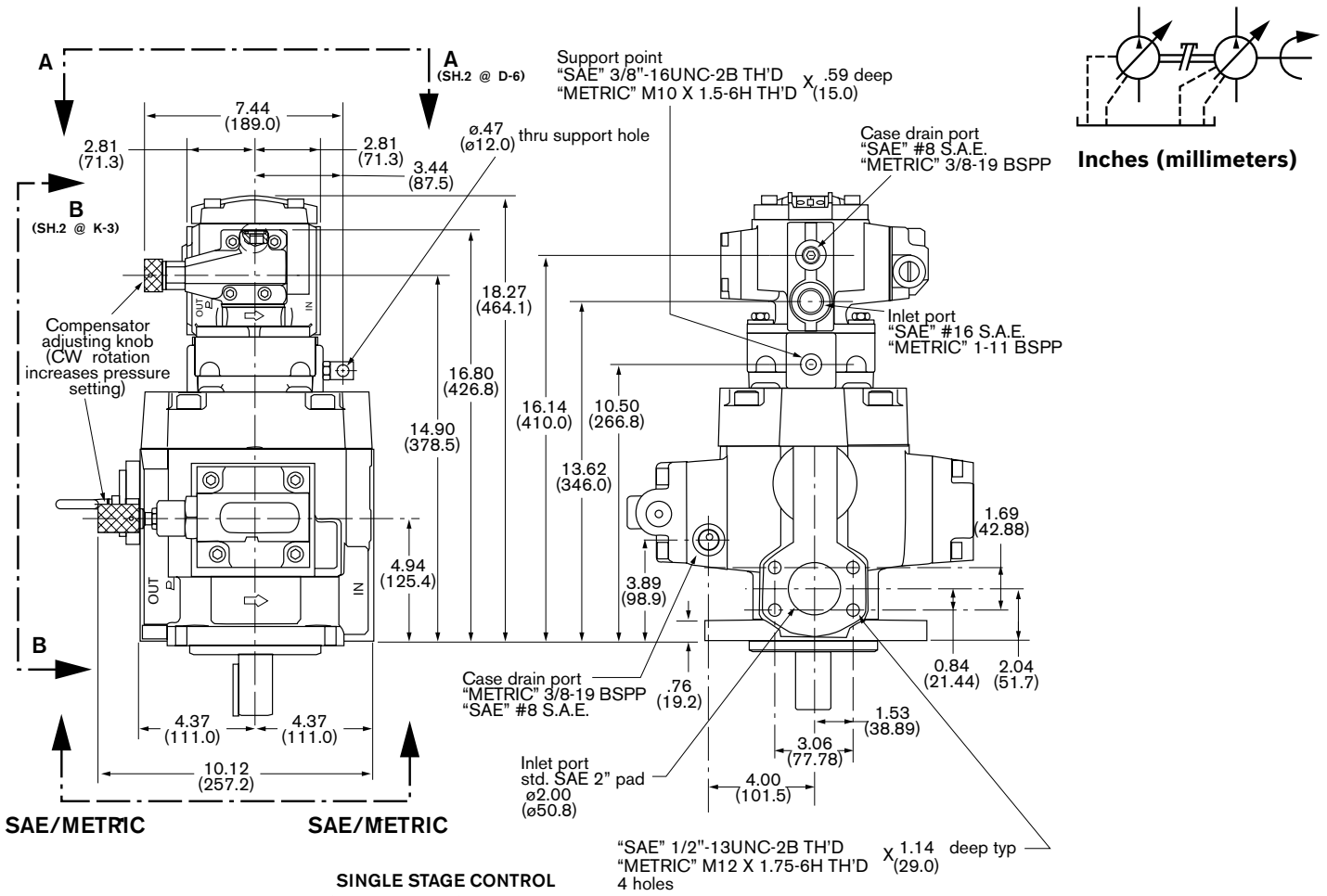
**Inches (millimeters)**



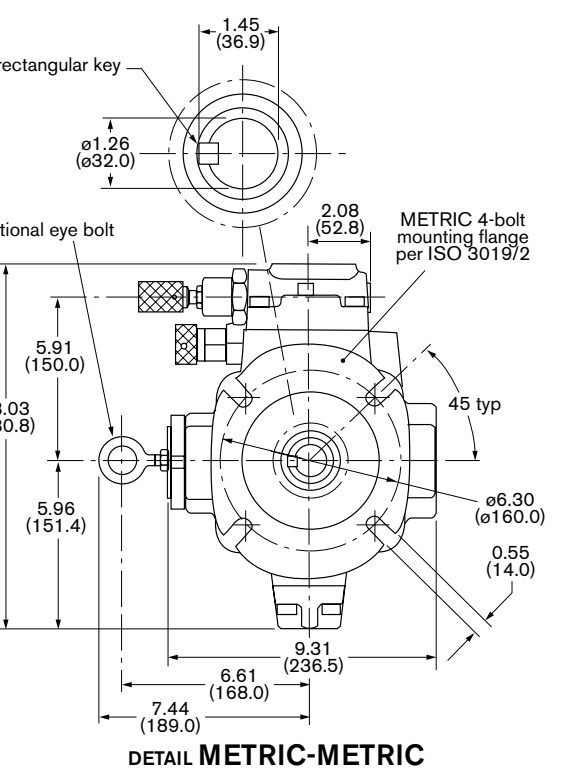
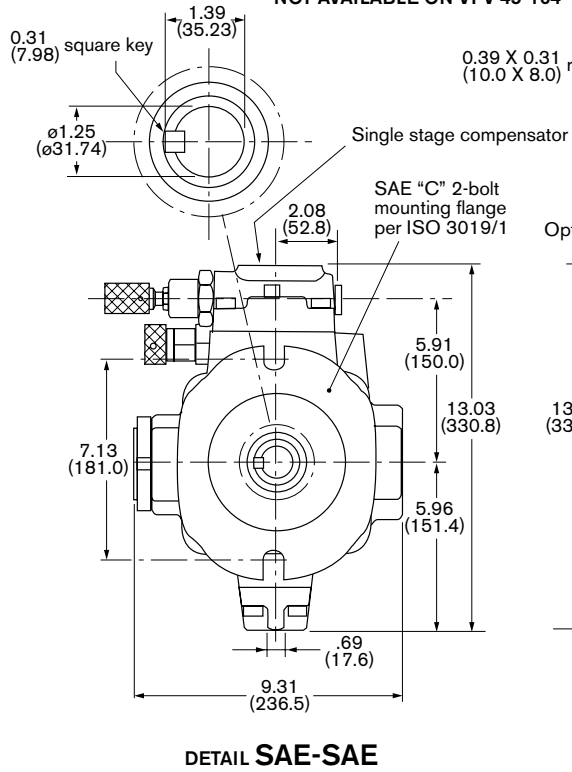
**Key & Shaft Detail**

Gear Pump Theoretical Displacement	Dimension				Total Weight (Vane Pump + Gear Pump)
	A	B	C	D	
in <sup>3</sup> /rev (cc/rev)	in (mm)	in (mm)	in (mm)	in (mm)	lbs. (Kg)
0.2 (4)	1.571 (39.9)	3.346 (85.0)	10.46 (265.7)	12.24 (311.0)	70.0 (31.7)
0.3 (5.5)	1.618 (41.1)	3.445 (87.5)	10.51 (267.0)	12.34 (313.5)	70.2 (31.8)
0.49 (8)	1.697 (43.2)	3.606 (91.6)	10.59 (269.0)	12.50 (317.5)	70.4 (31.9)
0.67 (11)	1.850 (47.0)	3.803 (96.6)	10.74 (272.8)	12.70 (322.5)	70.6 (32.0)
0.85 (14)	1.870 (47.5)	4.0 (101.6)	10.76 (273.3)	12.90 (327.7)	70.8 (32.1)
0.98 (16)	1.870 (47.5)	4.134 (105.0)	10.76 (273.3)	13.03 (331.0)	70.9 (32.2)
1.16 (19)	1.870 (47.5)	4.330 (110.0)	10.76 (273.3)	13.23 (336.0)	71.1 (32.3)
1.37 (22.5)	2.169 (55.1)	4.543 (115.4)	11.06 (281.0)	13.44 (341.4)	71.4 (32.4)

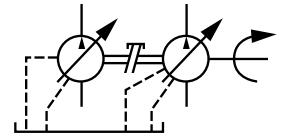
**VPV 45/63/80 to VPV 16, S.A.E. & metric combination**



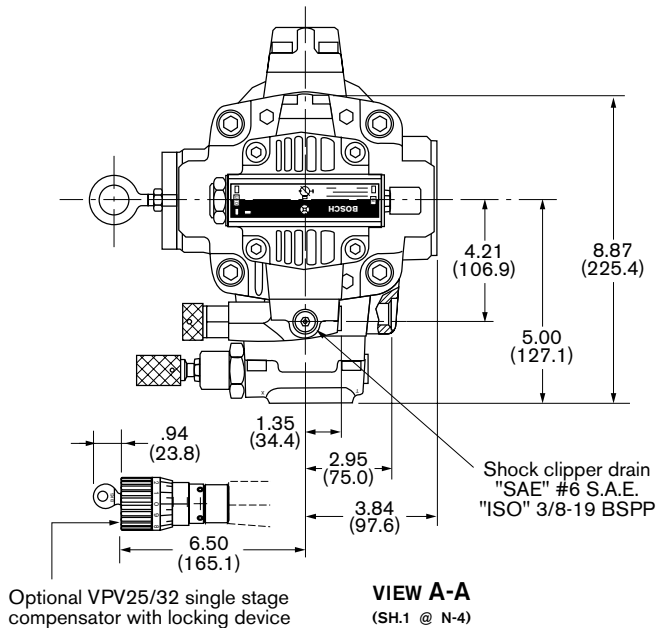
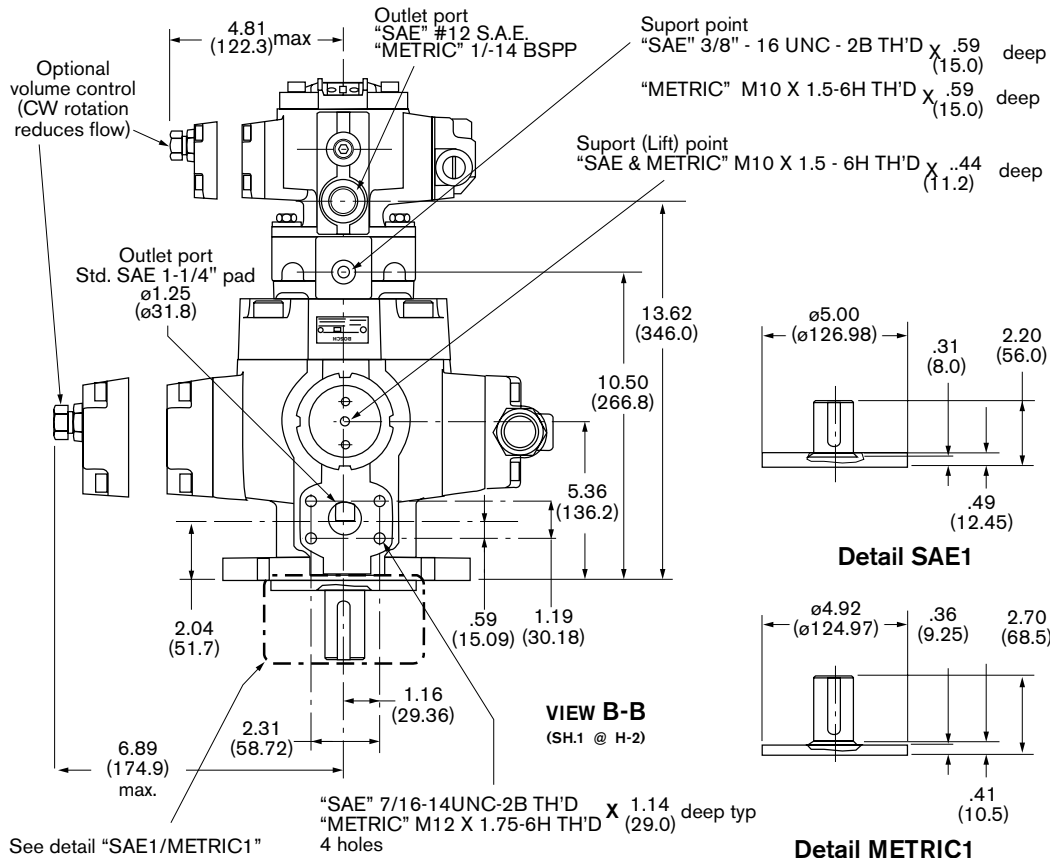
**Inches (millimeters)**



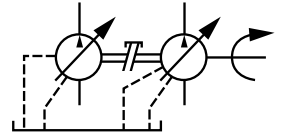
**VPV 45/63/80 to VPV 16, S.A.E. & metric combination (continued)**



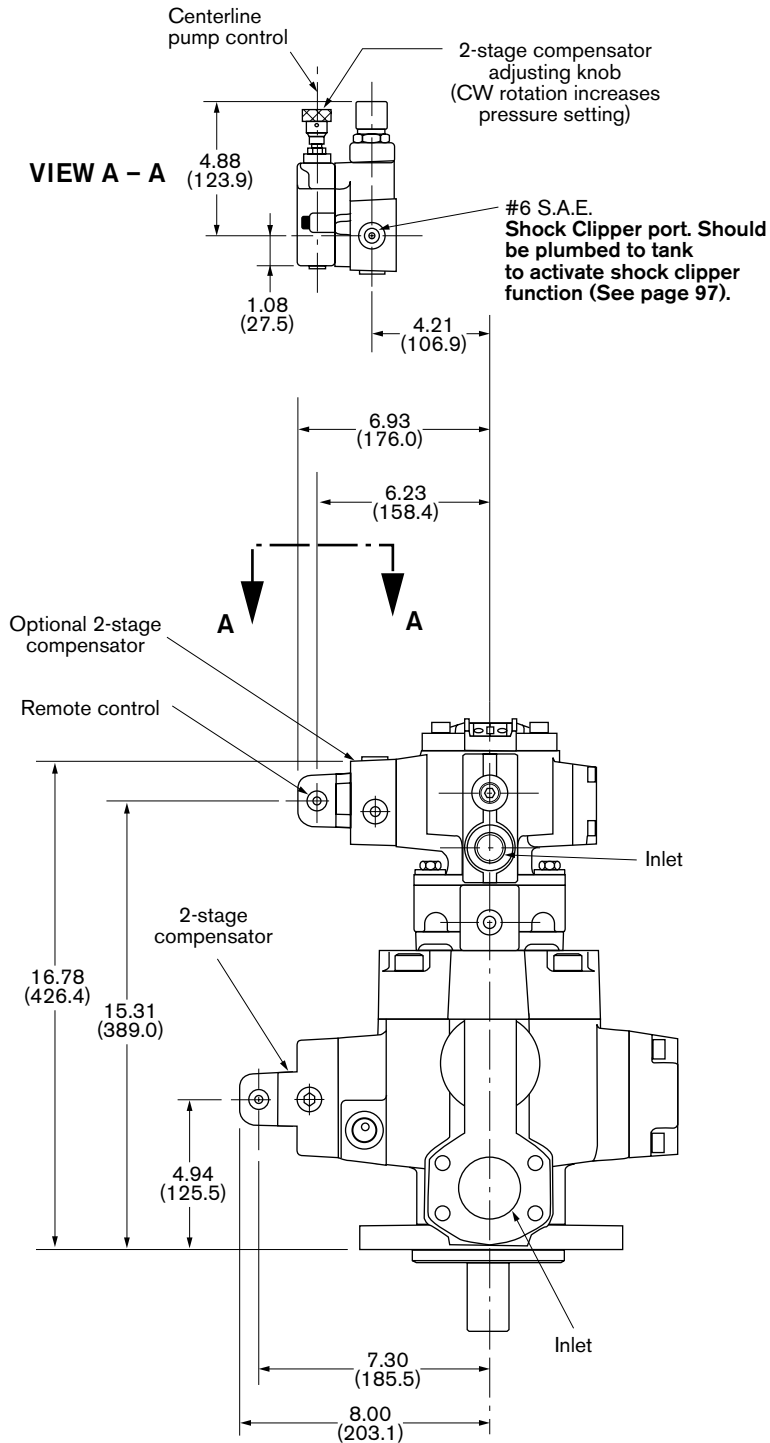
**Inches (millimeters)**



**VPV 45/63/80 to VPV 16, S.A.E. & metric combination (continued)**

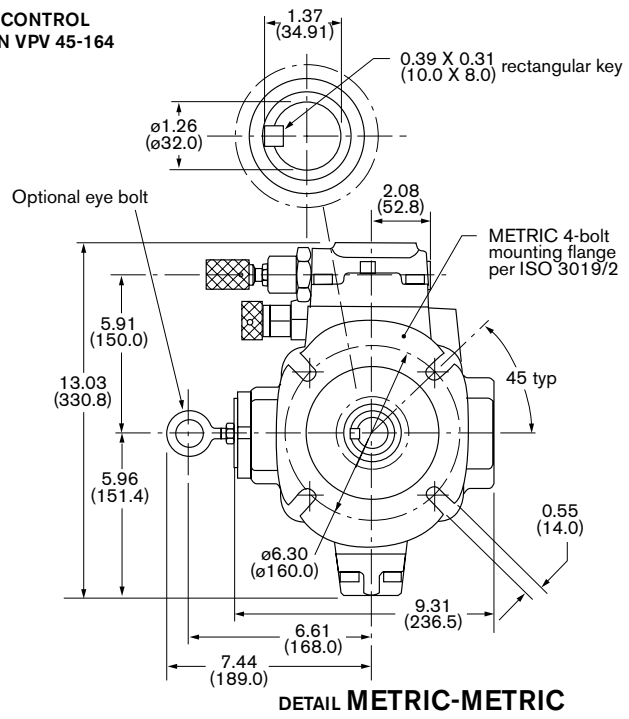
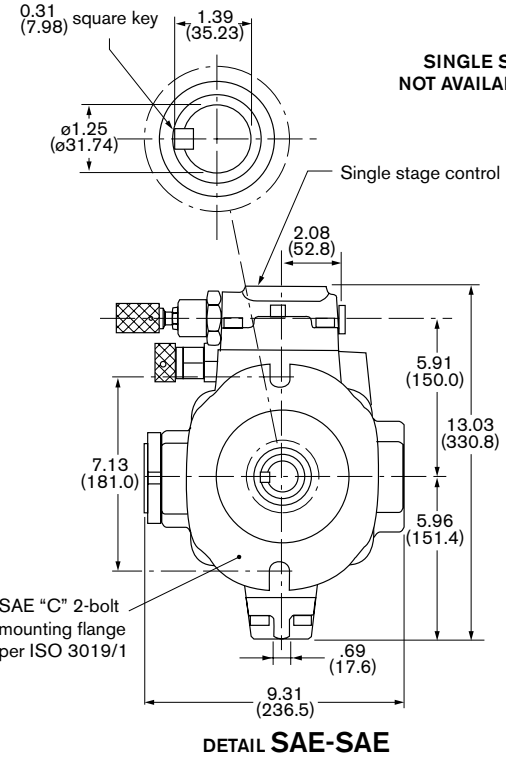
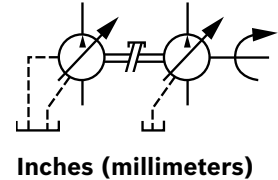
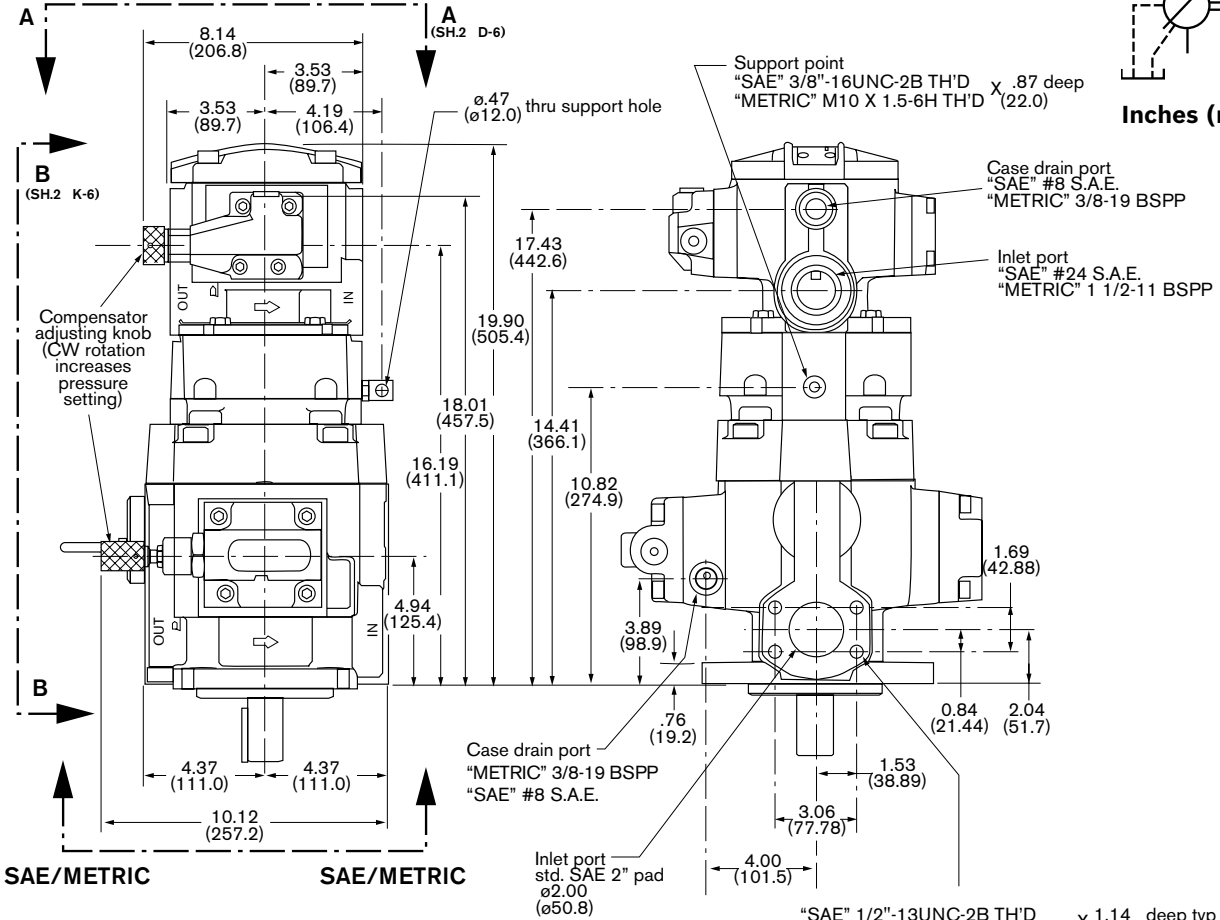


**Inches (millimeters)**

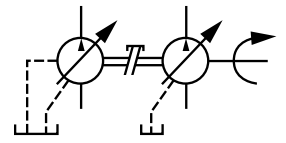
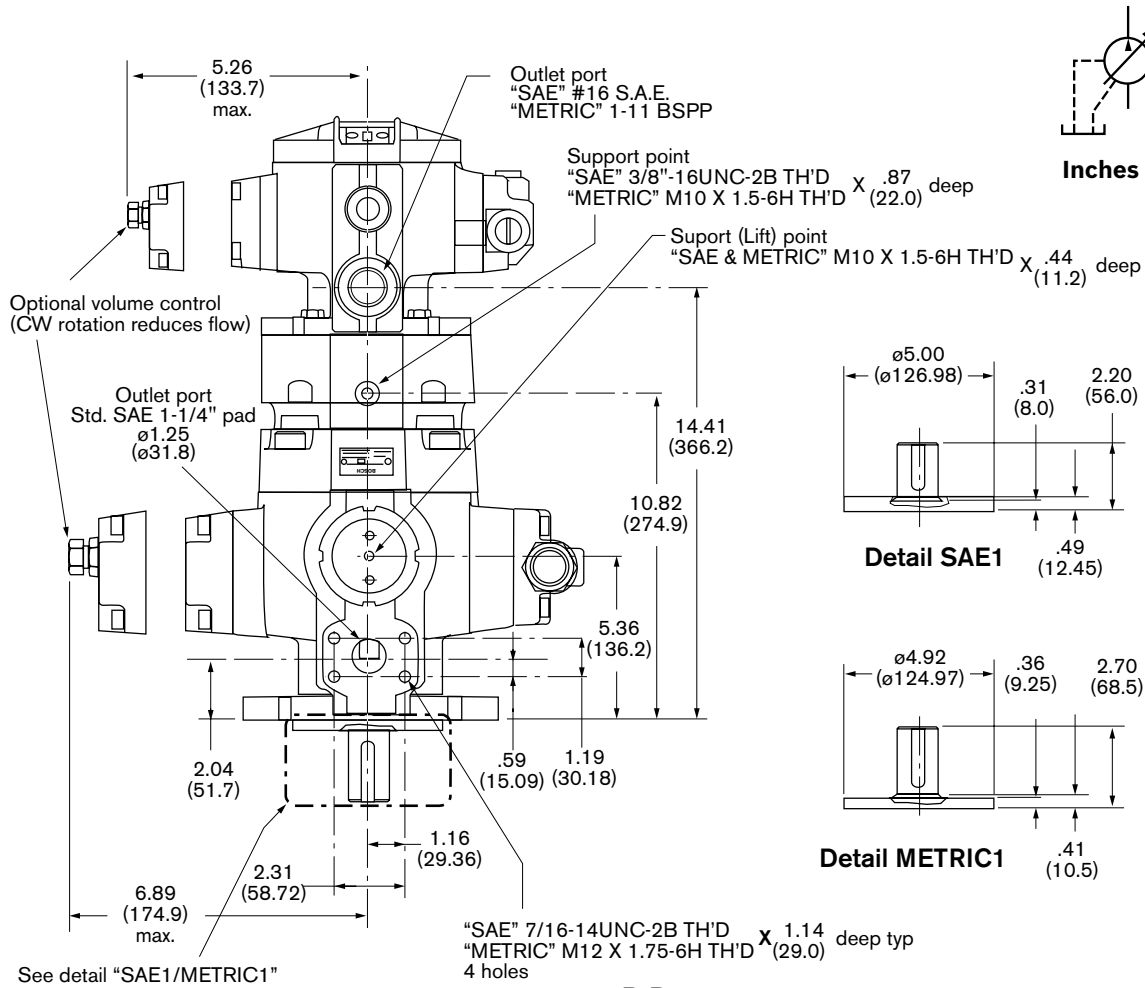




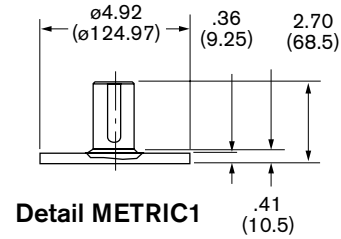
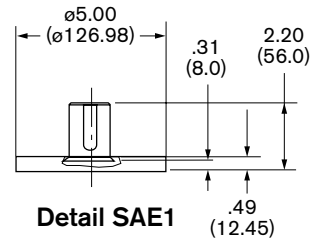
**VPV 45/63/80 to VPV 25/32, S.A.E. & metric combination**



**VPV 45/63/80 to VPV 25/32, S.A.E. & metric combination (continued)**

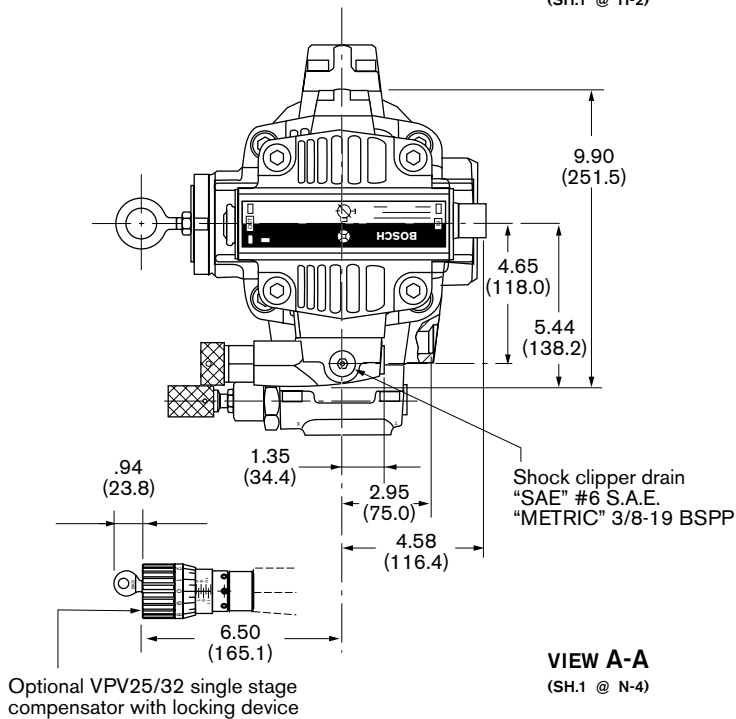


**Inches (millimeters)**



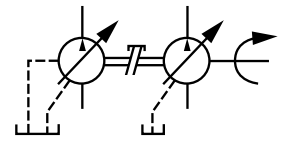
See detail "SAE1/METRIC1"

**VIEW B-B**  
(SH.1 @ H-2)

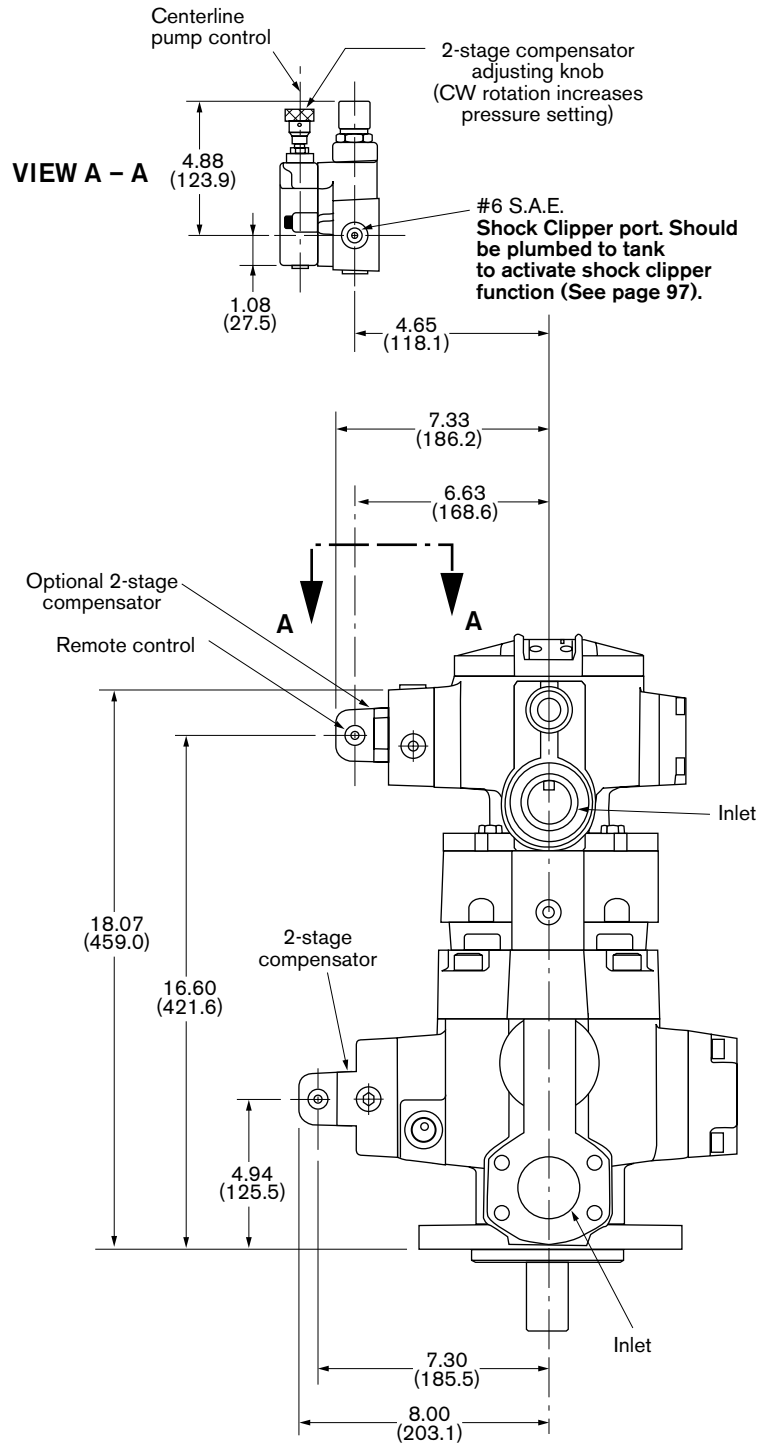


**VIEW A-A**  
(SH.1 @ N-4)

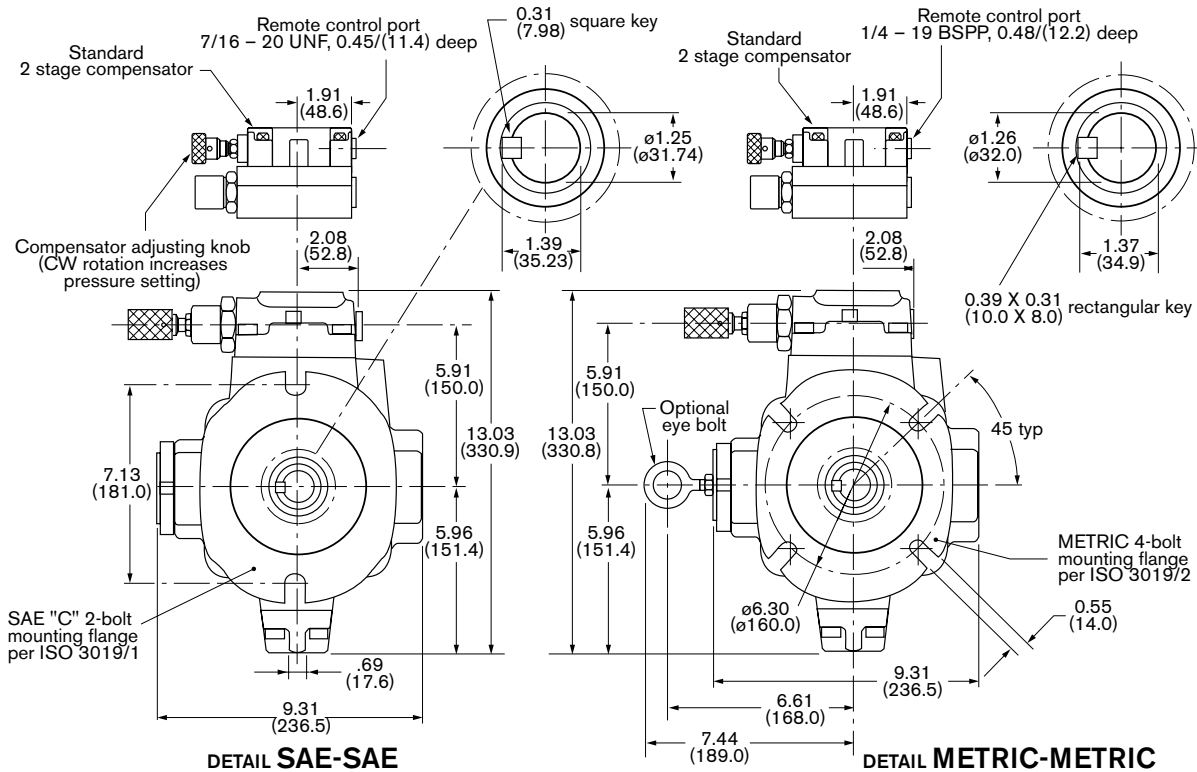
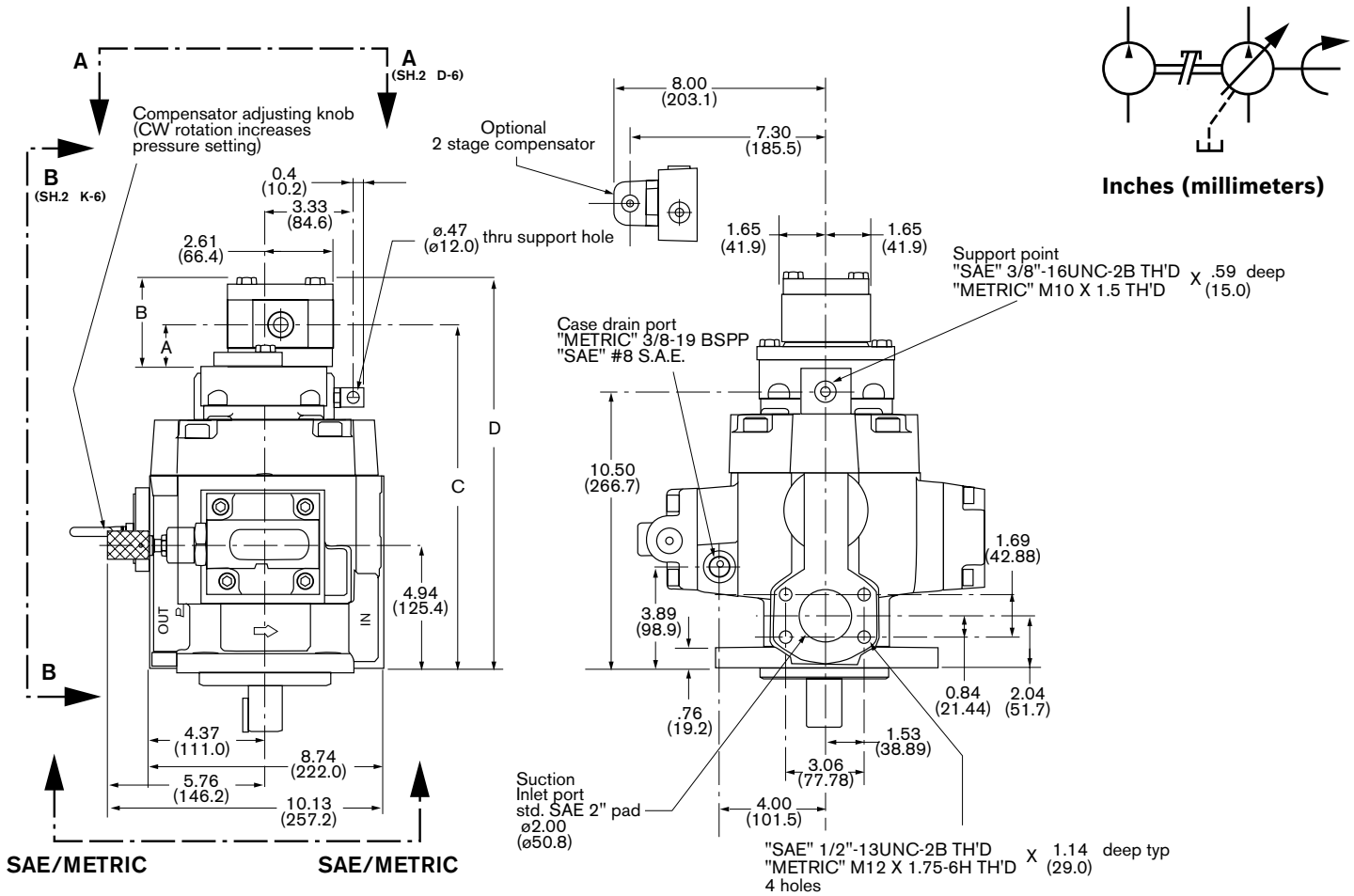
**VPV 45/63/80 to VPV 25/32, S.A.E. & metric combination (continued)**



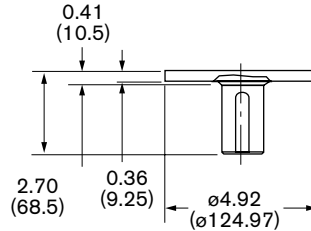
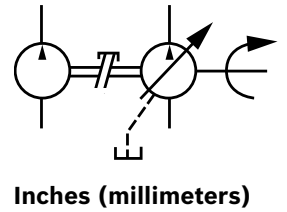
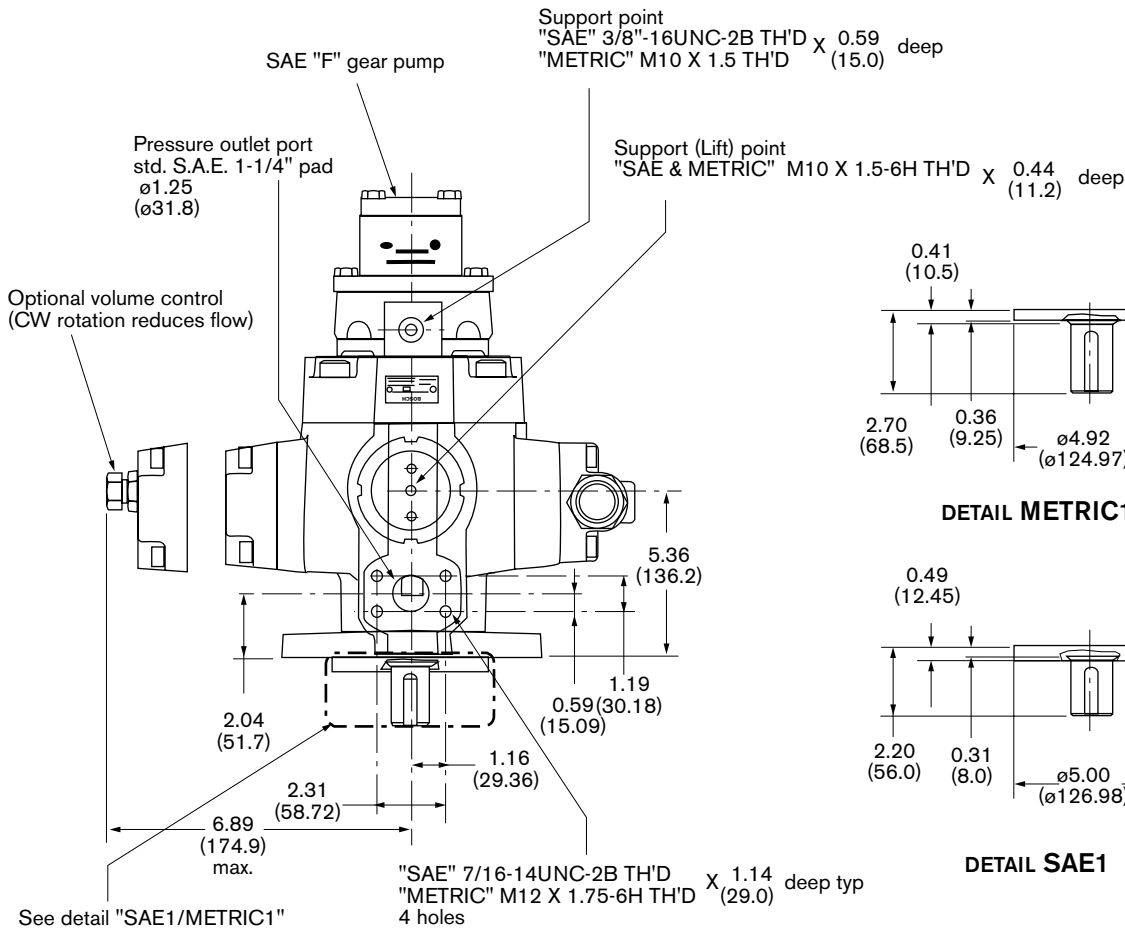
**Inches (millimeters)**



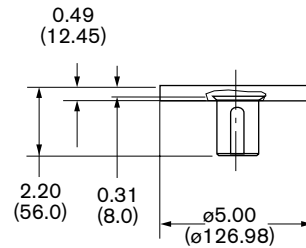
**VPV 45/63/80 to an 'F' gear pump, S.A.E. & metric combination**



**VPV 45/63/80 to an 'F' gear pump, S.A.E. & metric combination (continued)**

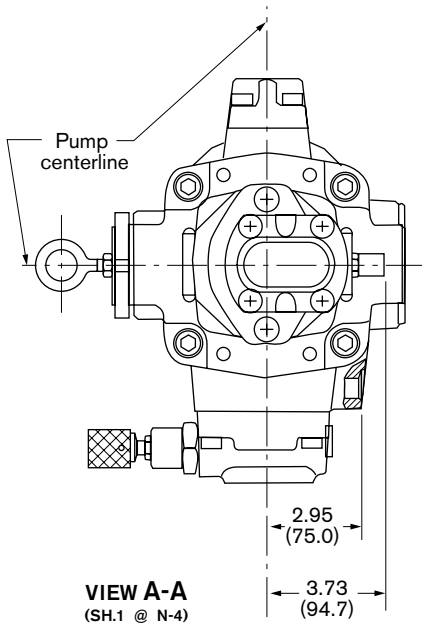


**DETAIL METRIC1**



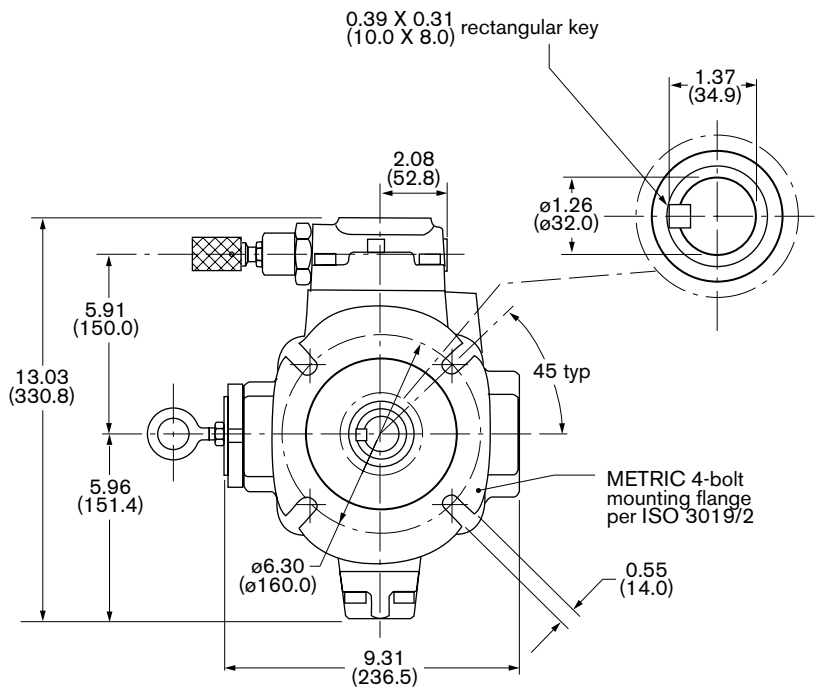
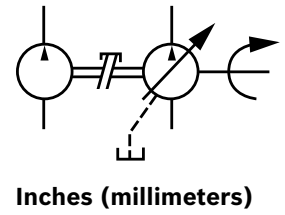
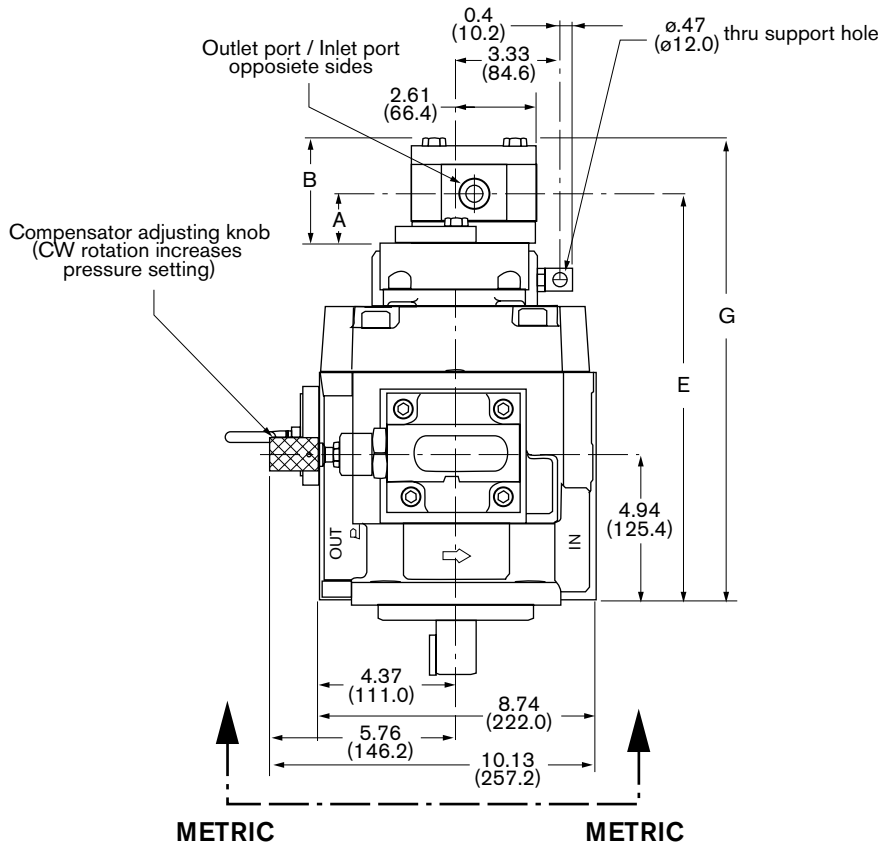
**DETAIL SAE1**

**VIEW B-B**  
(SH.1 @ H-2)

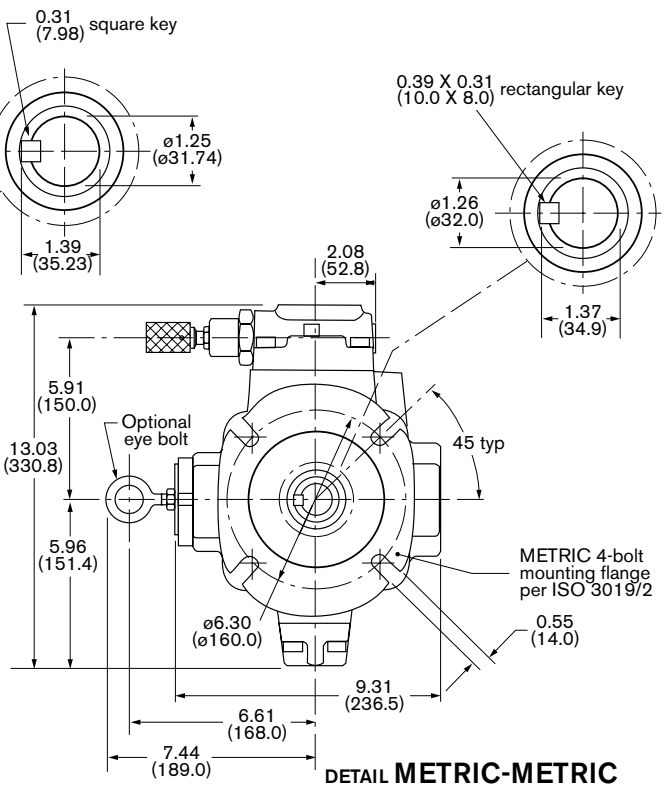
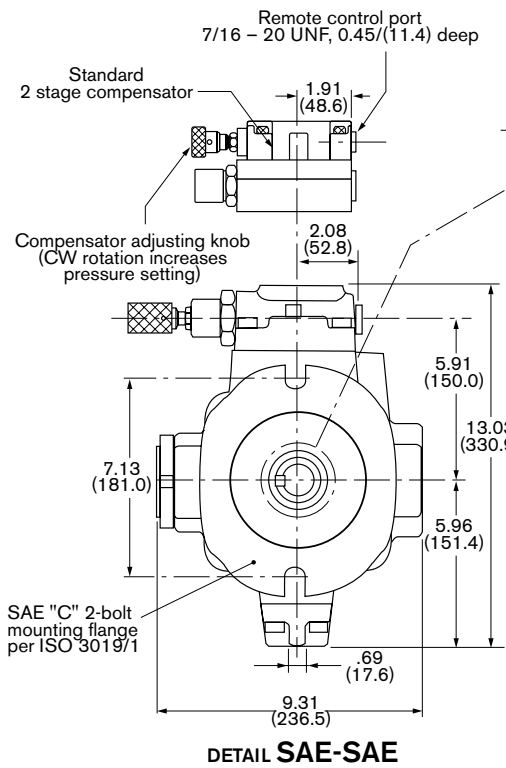
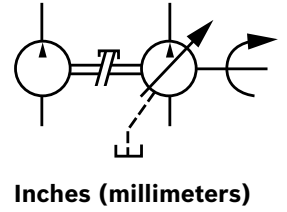
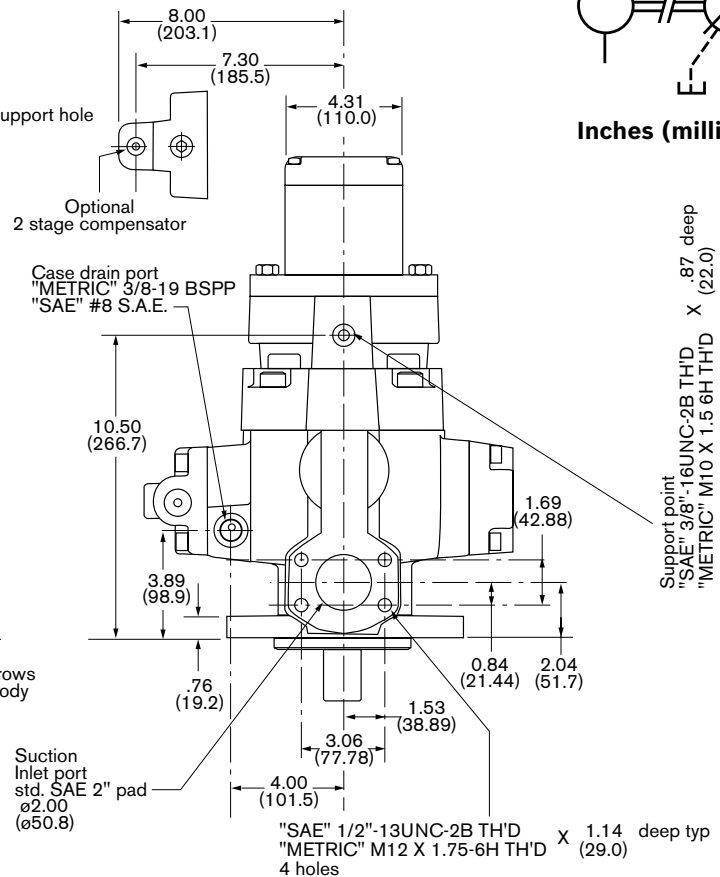
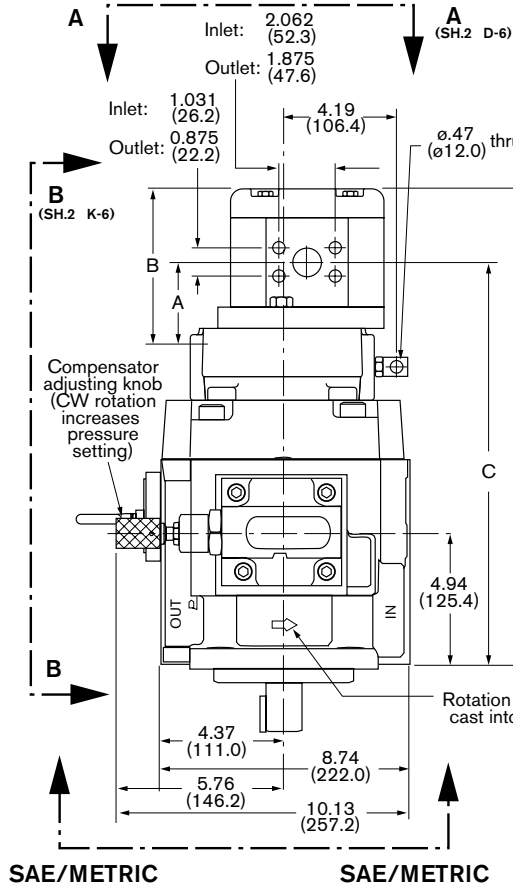


Gear Pump Theoretical Displacement	Dimension						Total Weight (Vane Pump + Gear Pump)
	A	B	C	D	E	F	
in <sup>3</sup> /rev (cc/rev)	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	lbs. (Kg)
0.24 (4)	1.571 (39.9)	3.346 (85.0)	13.30 (337.8)	15.08 (383.2)	13.56 (344.6)	15.35 (390.0)	135 (61.2)
0.34 (5.5)	1.618 (41.1)	3.445 (87.5)	13.35 (339.1)	15.19 (385.7)	13.62 (345.9)	15.45 (392.5)	135.2 (61.3)
0.49 (8)	1.697 (43.2)	3.606 (91.6)	13.43 (341.1)	15.34 (389.7)	13.70 (347.9)	15.61 (396.5)	135.4 (61.4)
0.67 (11)	1.850 (47.0)	3.803 (96.6)	13.58 (344.9)	15.49 (393.4)	13.85 (351.7)	15.76 (400.2)	135.6 (61.5)
0.85 (14)	1.870 (47.5)	4.0 (101.6)	13.60 (345.4)	15.69 (398.5)	13.87 (352.2)	15.96 (405.3)	135.8 (61.6)
0.98 (16)	1.870 (47.5)	4.134 (105.0)	13.6 (345.6)	15.86 (403.0)	13.87 (352.4)	16.13 (409.8)	135.9 (61.6)
1.16 (19)	1.870 (47.5)	4.330 (110.0)	13.6 (345.5)	16.06 (408.0)	13.86 (352.3)	16.33 (414.8)	136.1 (61.7)
1.37 (22.5)	2.169 (55.1)	4.543 (115.4)	13.90 (353.12)	16.27 (413.4)	14.17 (359.9)	16.54 (420.2)	136.4 (61.9)

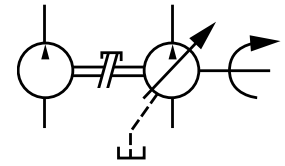
**VPV 45/63/80 to an 'F' gear pump, S.A.E. & metric combination (continued)**



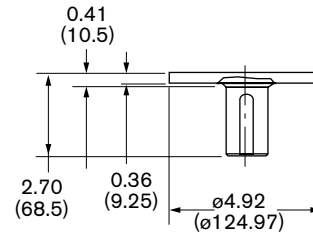
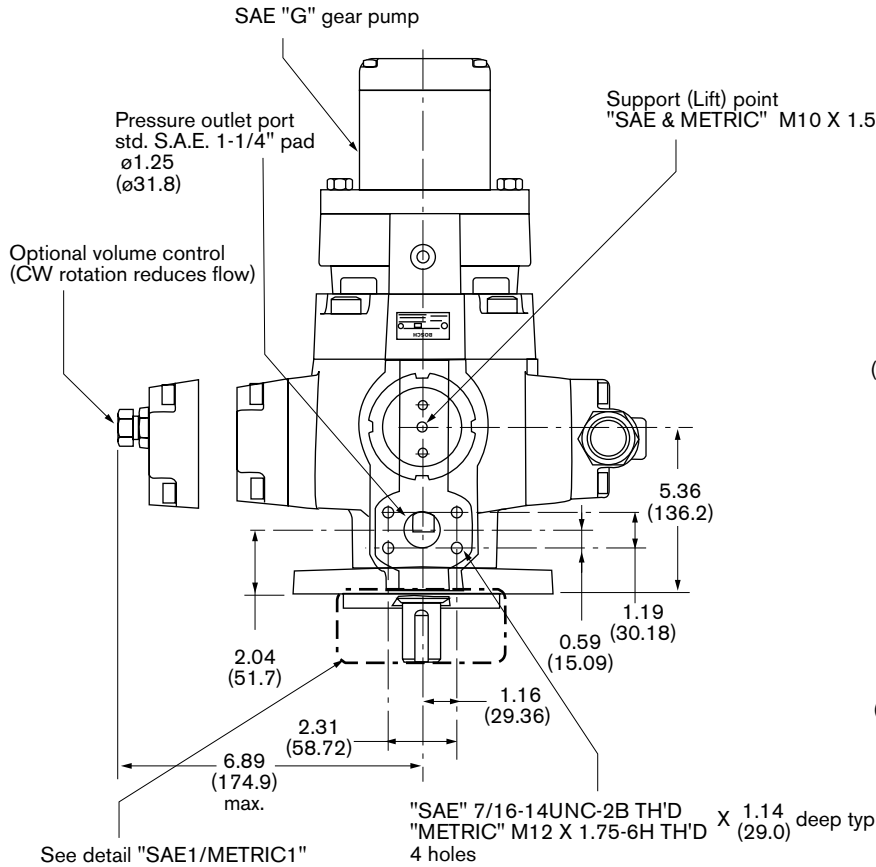
**VPV 45/63/80 to a 'G' gear pump, S.A.E. & metric combination**



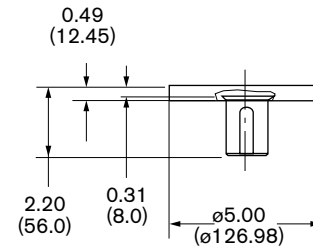
**VPV 45/63/80 to a 'G' gear pump, S.A.E. & metric combination (continued)**



**Inches (millimeters)**



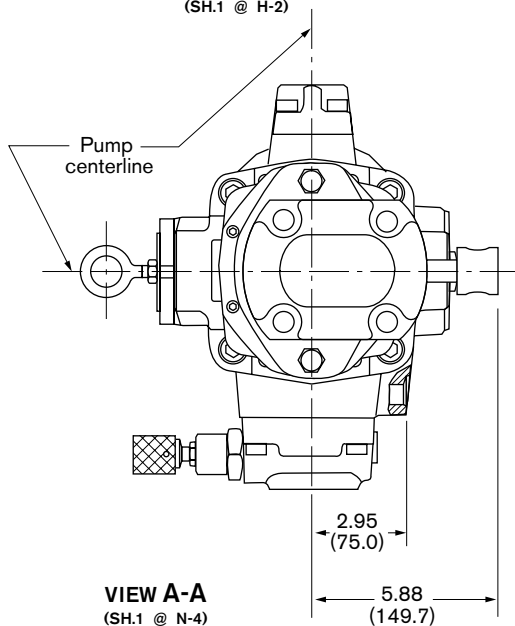
**DETAIL METRIC1**



**DETAIL SAE1**

See detail "SAE1/METRIC1"

**VIEW B-B**  
(SH.1 @ H-2)

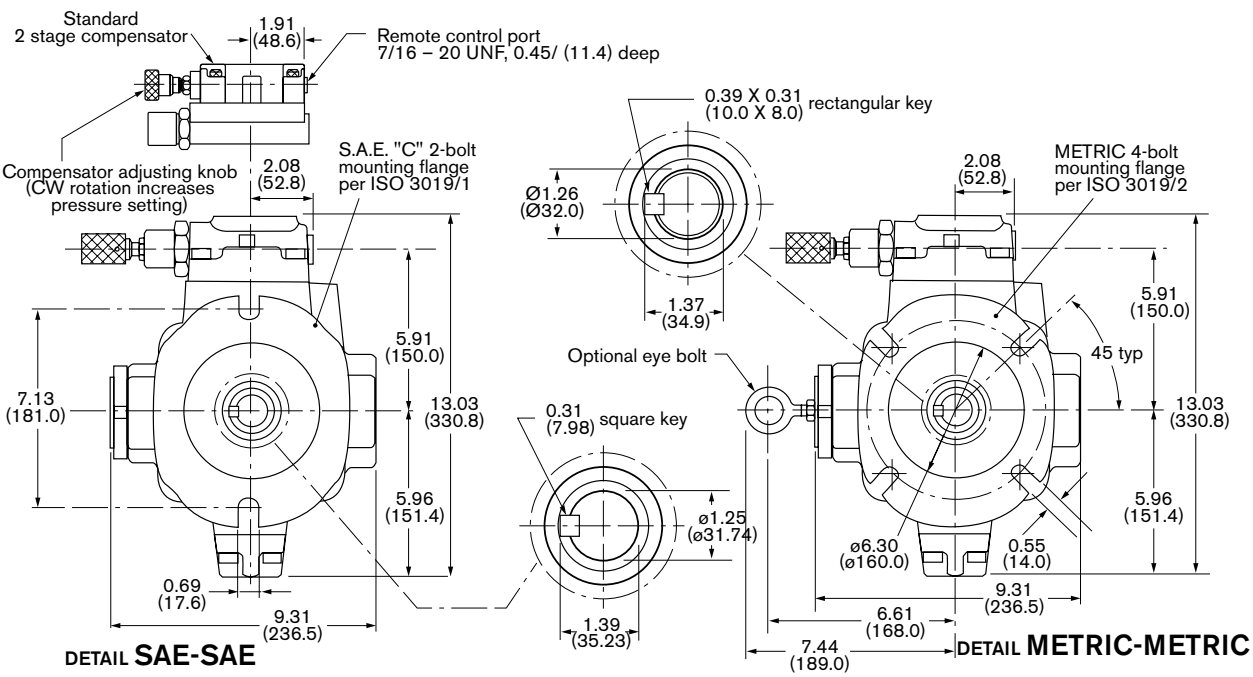
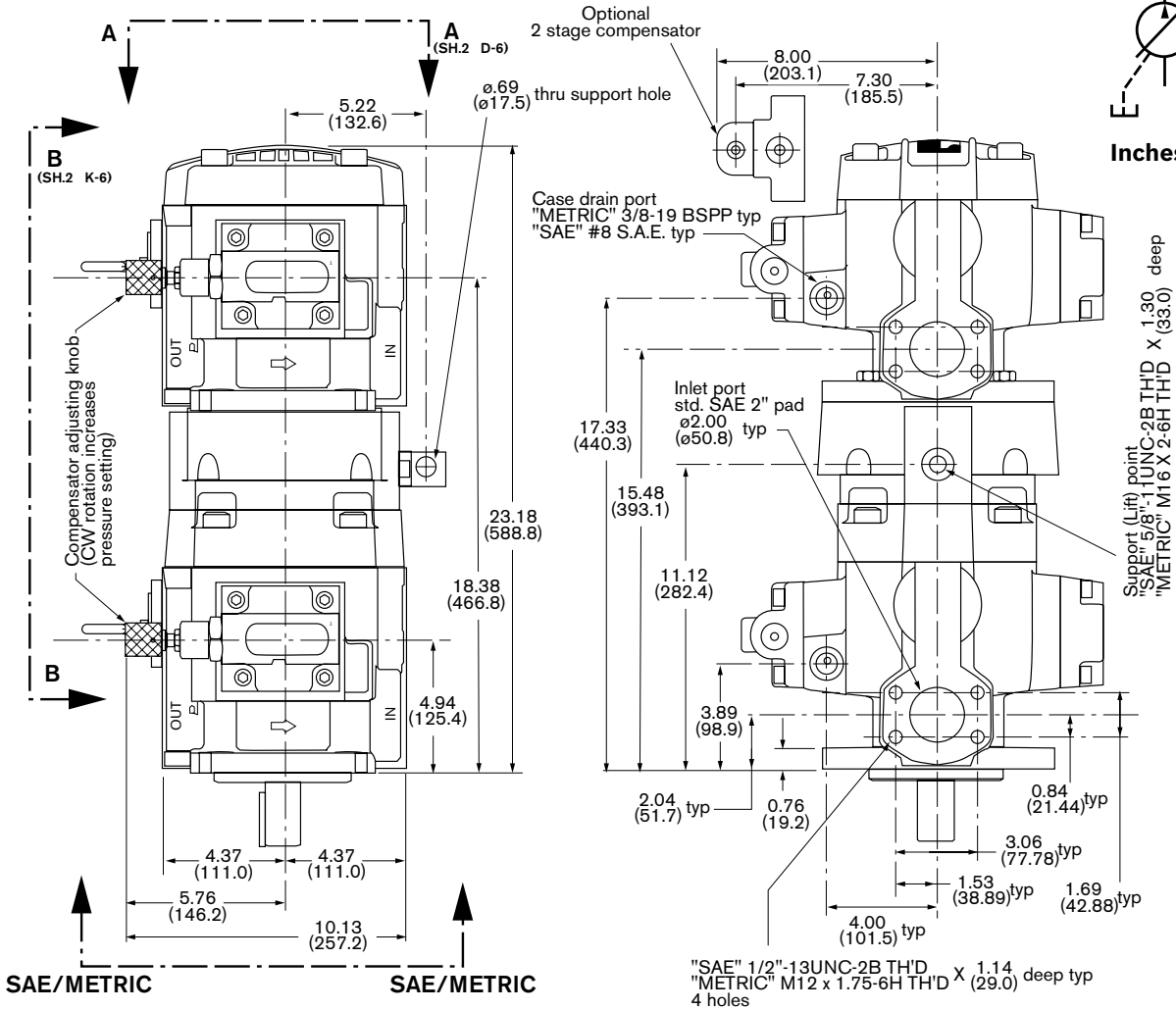
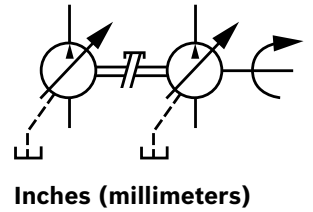


**VIEW A-A**  
(SH.1 @ N-4)

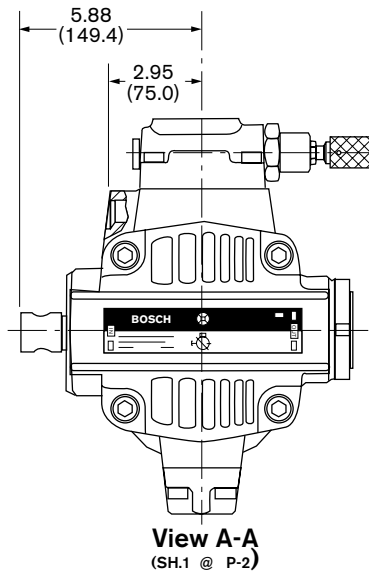
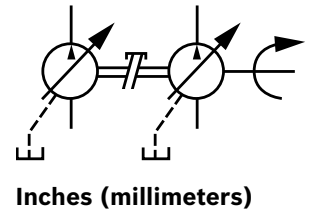
Gear Pump Theoretical Displacement	Dimension				Total Weight (Vane Pump + Gear Pump)
	A	B	C	D	
1.37 (22.5)	2.40 (61.0)	5.07 (128.5)	14.6 (370.8)	17.26 (438.6)	271.4 (123.1)
1.71 (28)	2.48 (63.0)	5.26 (133.7)	14.68 (372.8)	17.45 (443.2)	271.8 (123.3)
1.95 (32)	2.54 (64.5)	5.40 (137.2)	14.74 (374.4)	17.59 (446.8)	272.3 (123.5)
2.32 (38)	2.62 (66.5)	5.62 (142.6)	14.82 (376.4)	17.81 (452.3)	272.6 (123.6)
2.75 (45)	2.74 (69.5)	5.87 (149.2)	14.94 (379.4)	18.06 (458.7)	273.1 (123.9)
3.42 (56)	2.95 (75.2)	6.31 (160.2)	15.15 (384.8)	18.5 (469.9)	274.1 (124.3)



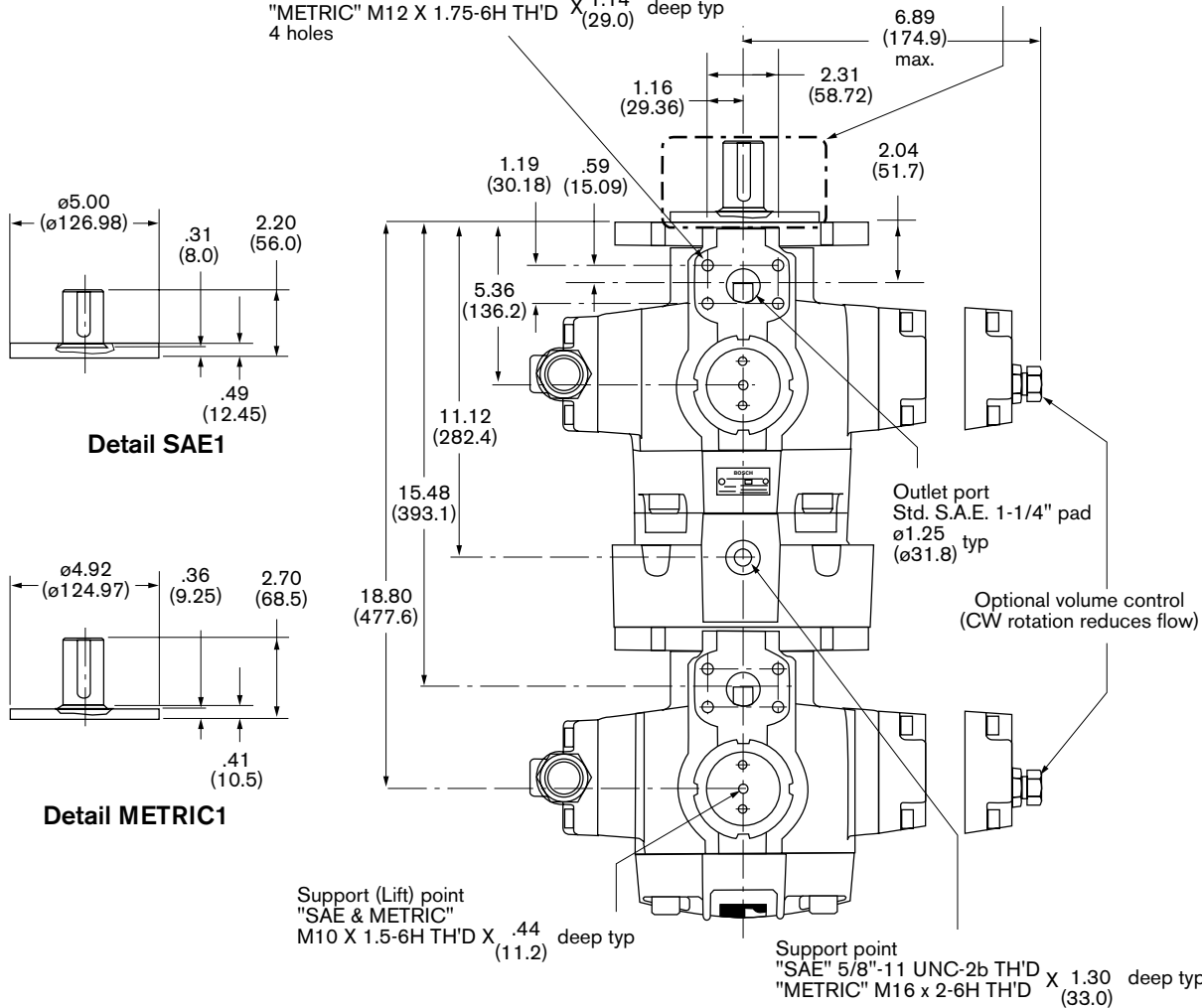
**VPV 45/63/80 to VPV 45/63/80, S.A.E. & metric combination**



**VPV 45/63/80 to VPV 45/63/80, S.A.E. & metric combination (continued)**

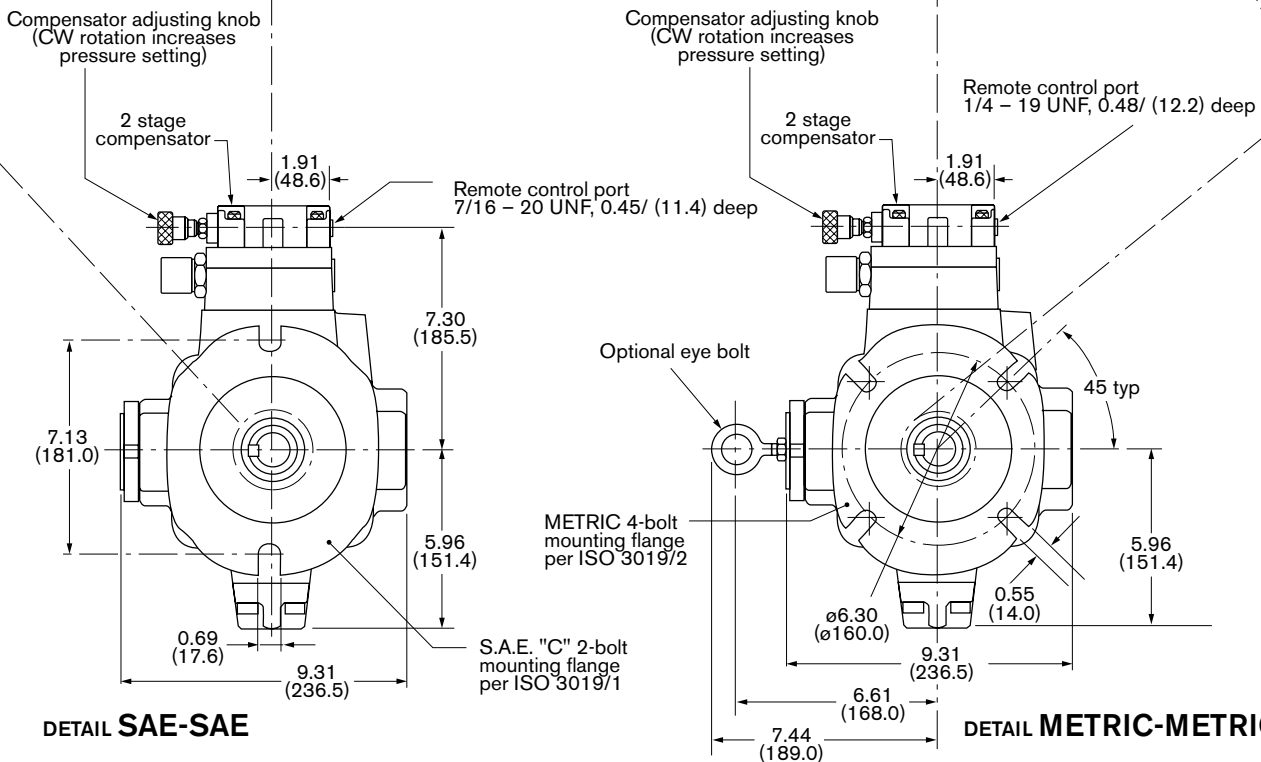
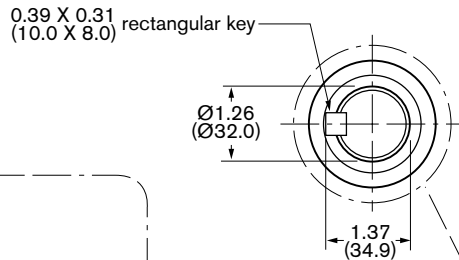
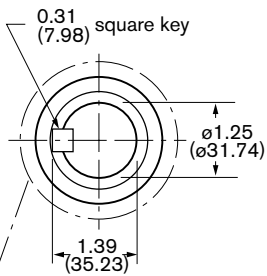
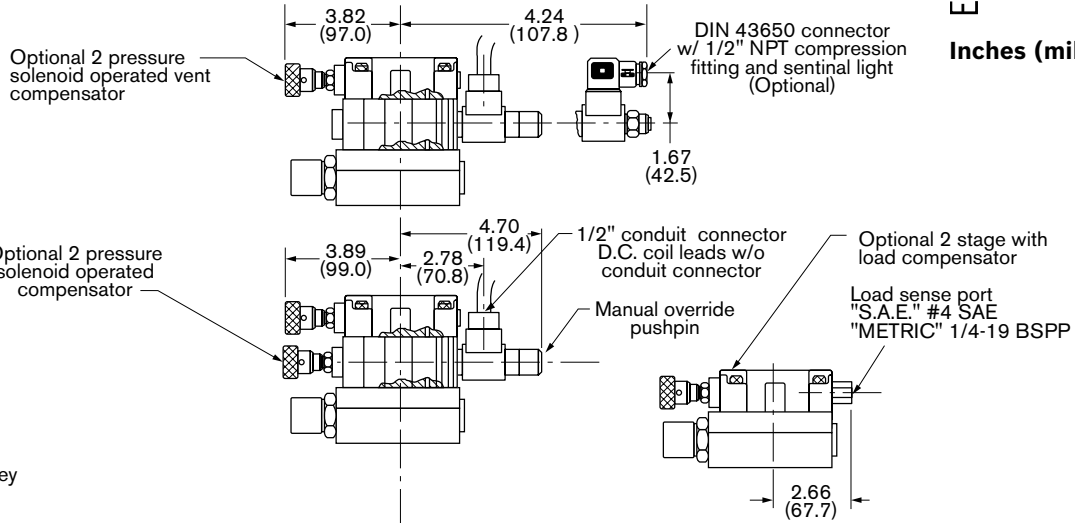
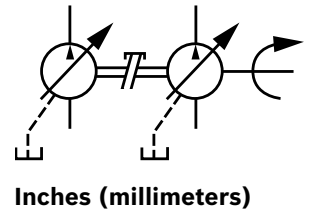


"SAE" 7/16"-14UNC-2B TH'D X 1.14 deep typ  
 "METRIC" M12 X 1.75-6H TH'D X (29.0) deep typ  
 4 holes  
 See detail "SAE1/METRIC1"

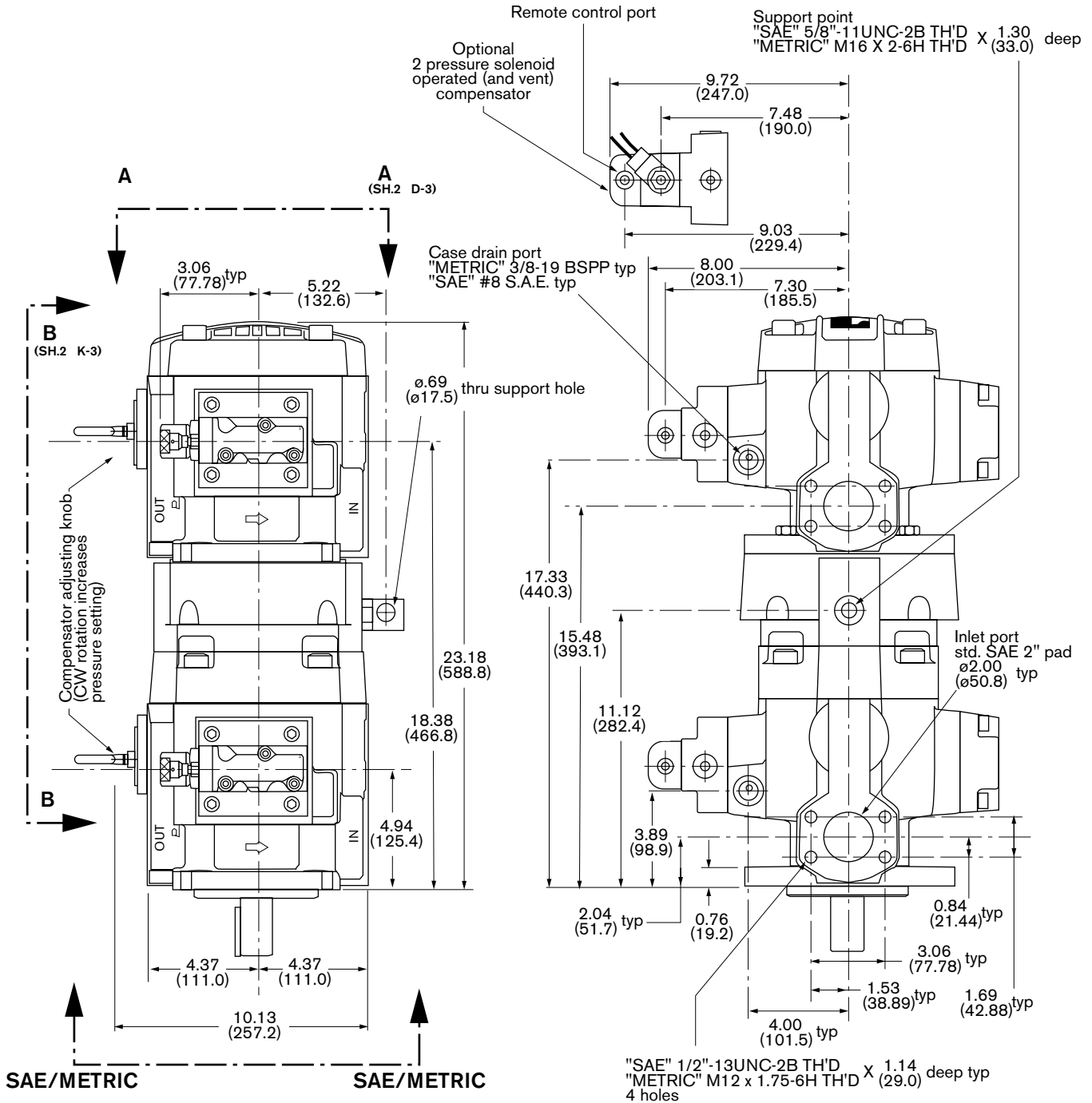
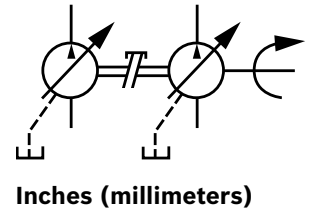


**View B-B**  
(SH.1 @ H-2)

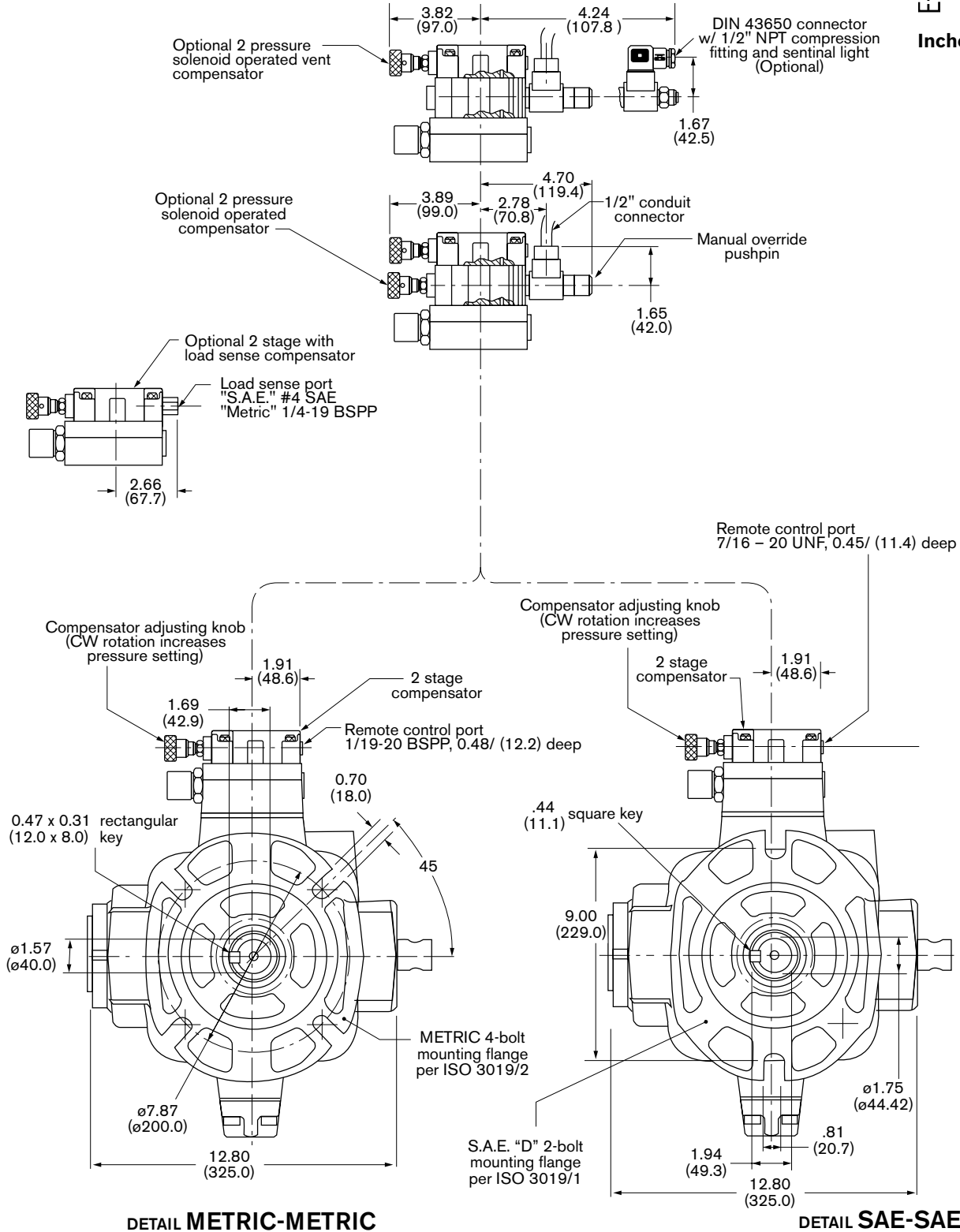
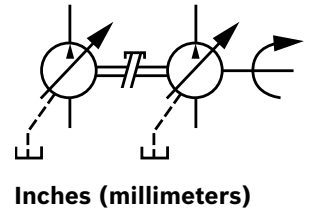
**VPV 45/63/80 to VPV 45/63/80, S.A.E. & metric combination (continued)**



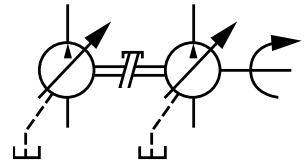
**VPV 45/63/80 to VPV 45/63/80, S.A.E. & metric combination (continued)**



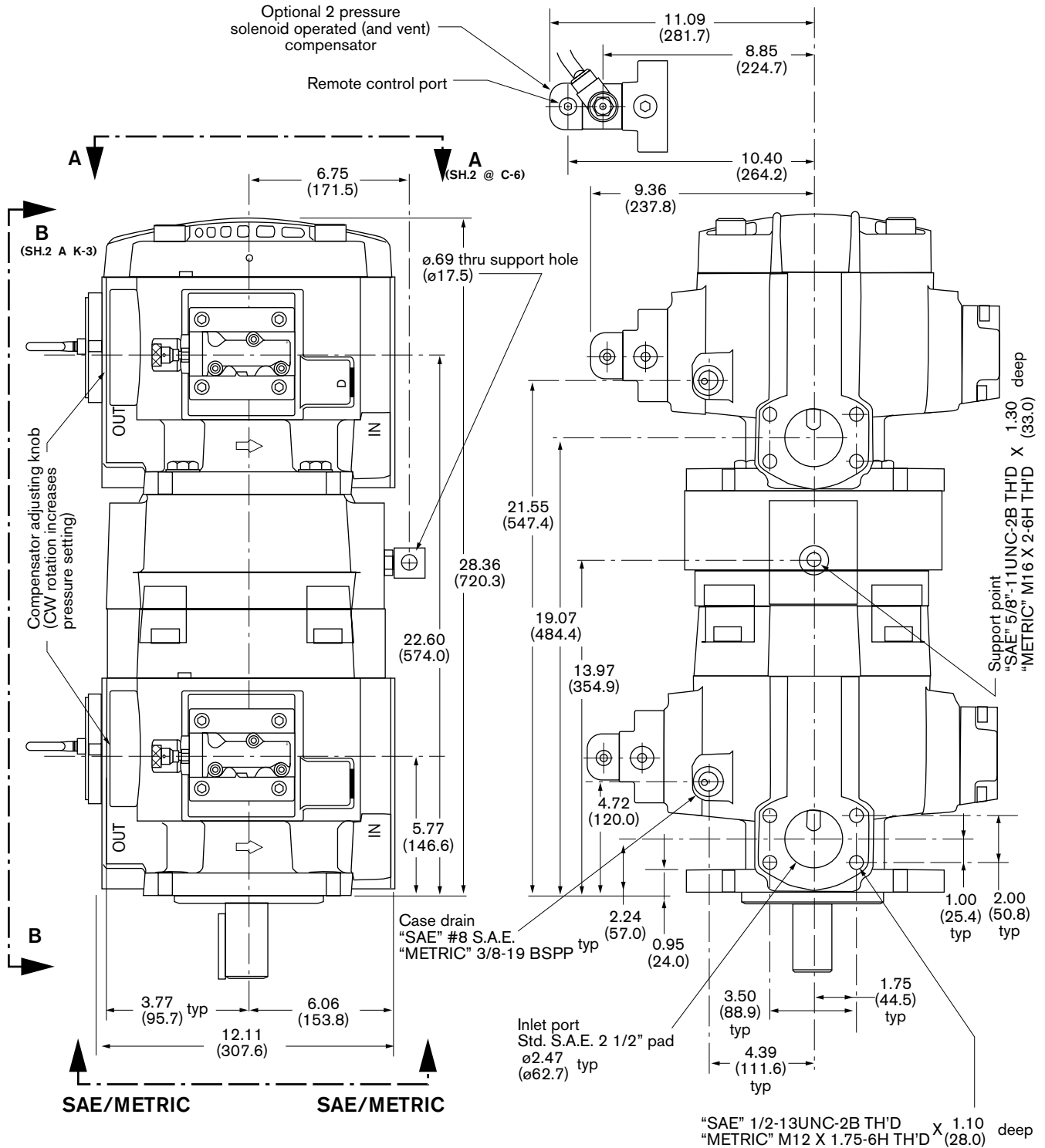
**VPV 100/130/164 to VPV 100/130/164, S.A.E. & metric combination**



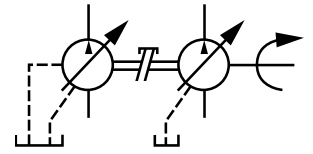
**VPV 100/130/164 to VPV 100/130/164, S.A.E. & metric combination (continued)**



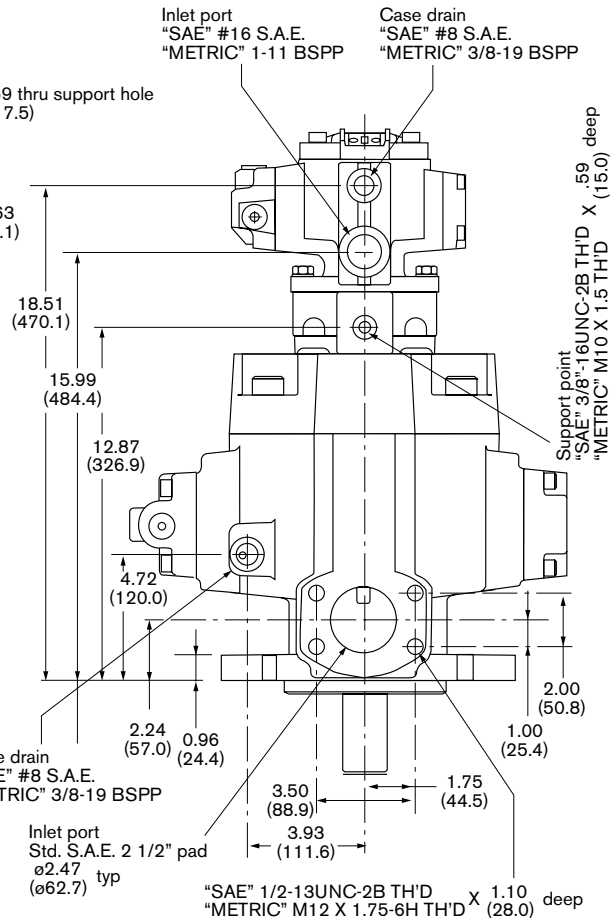
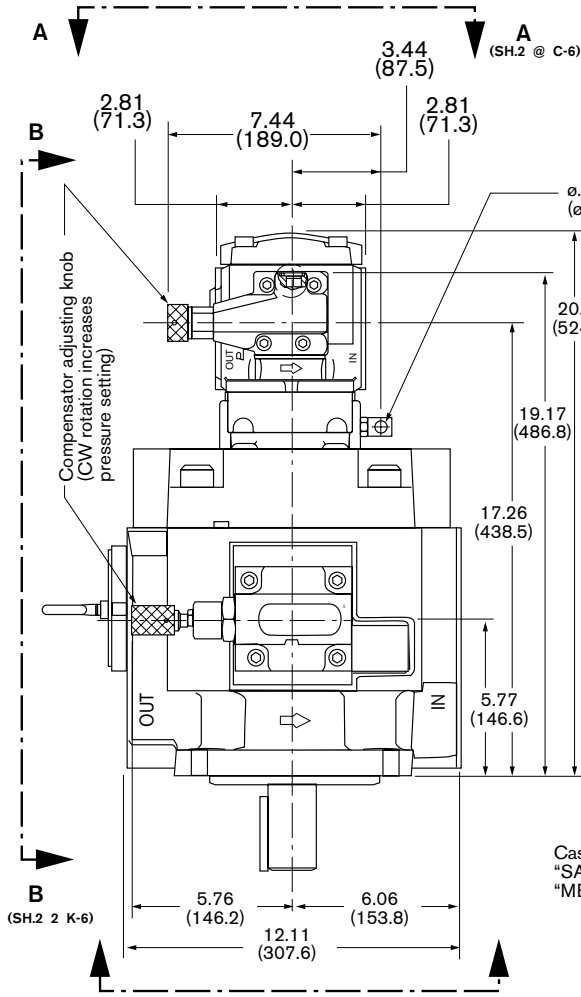
**Inches (millimeters)**



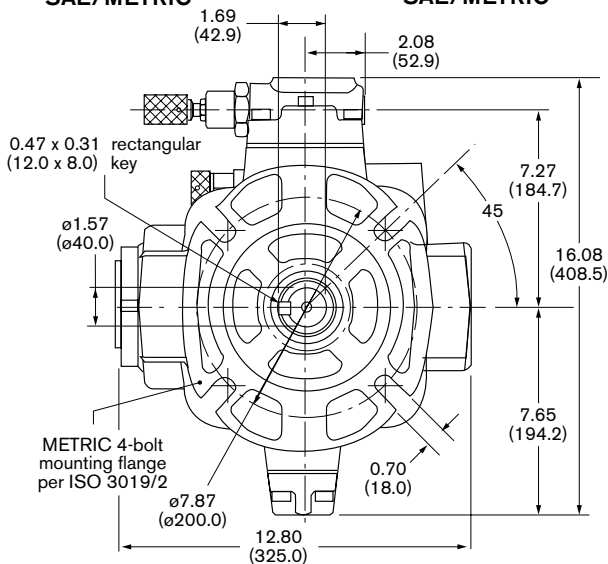
**VPV 100/130/164 to VPV 16, S.A.E. & metric combination**



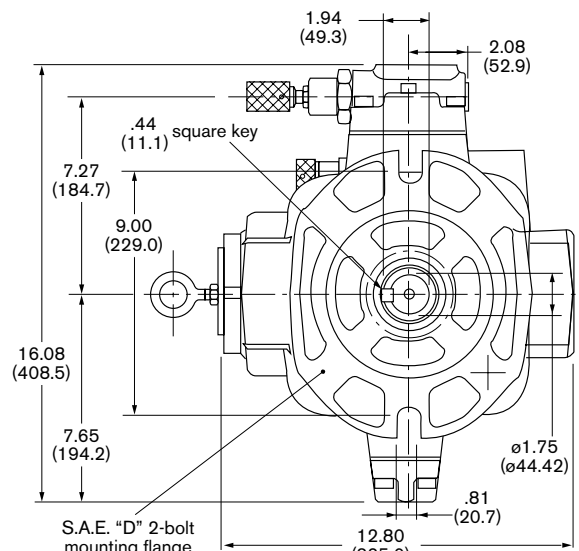
**Inches (millimeters)**



**SAE/METRIC SAE/METRIC**

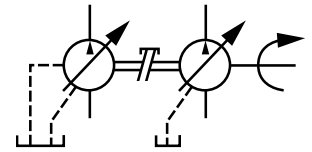


**DETAIL METRIC-METRIC**

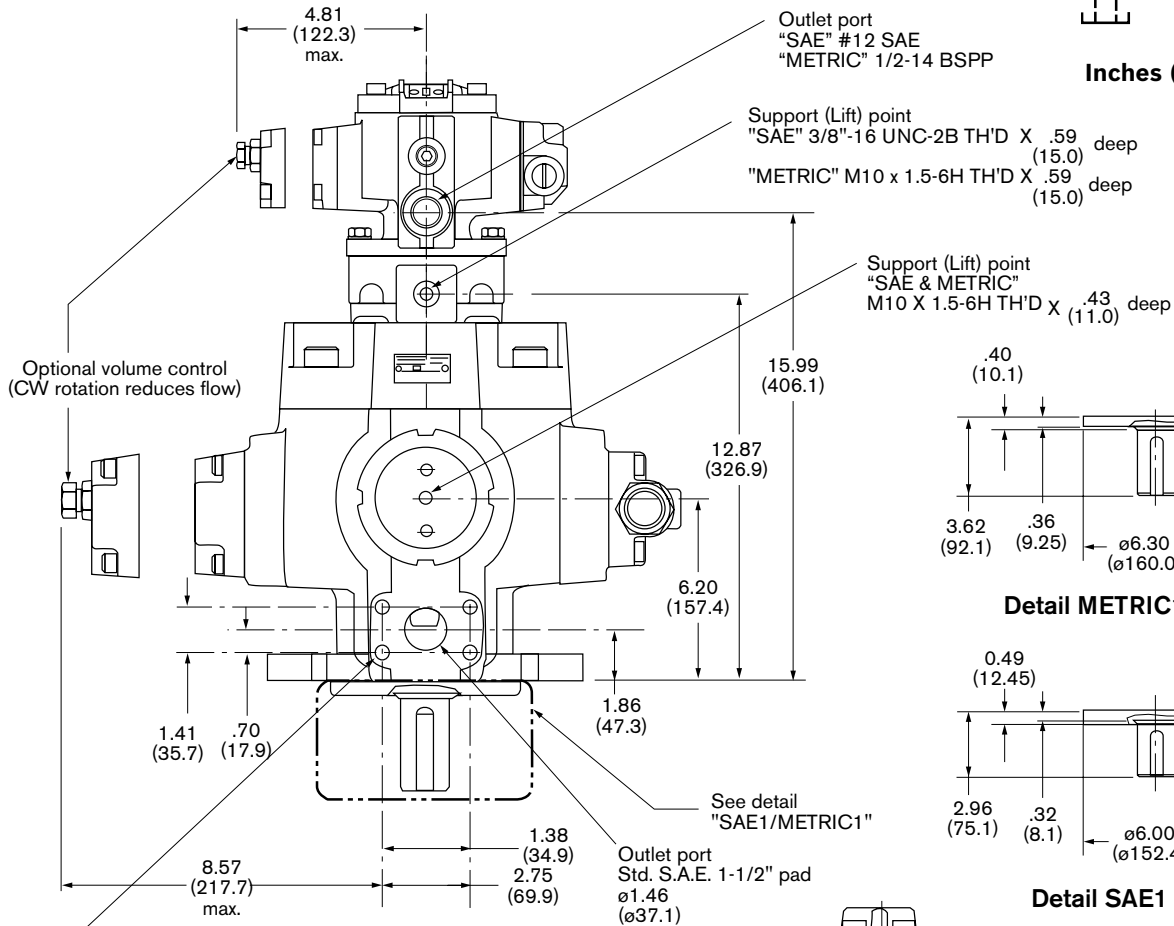


**DETAIL SAE-SAE**

**VPV 100/130/164 to VPV 16, S.A.E. & metric combination (continued)**



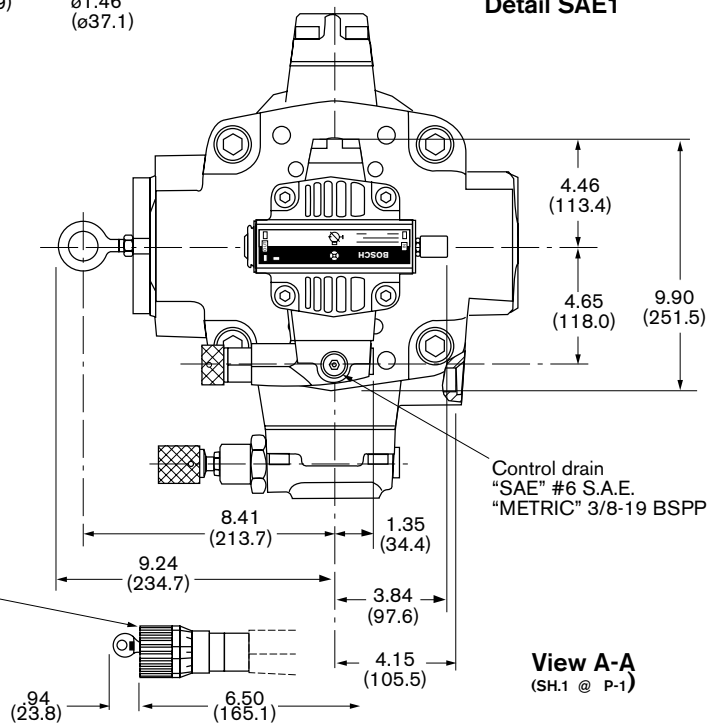
**Inches (millimeters)**



"SAE" 1/2"-13UNC-2B TH'D X 1.10 (28.0) deep  
"METRIC" M12 X 1.75-6H TH'D (28.0) deep

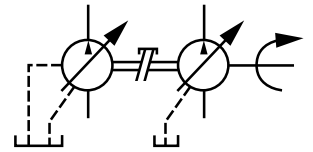
**View B-B**  
(SH.1 @ G-1)

Optional VPV25/32  
single stage  
compensator with  
locking device

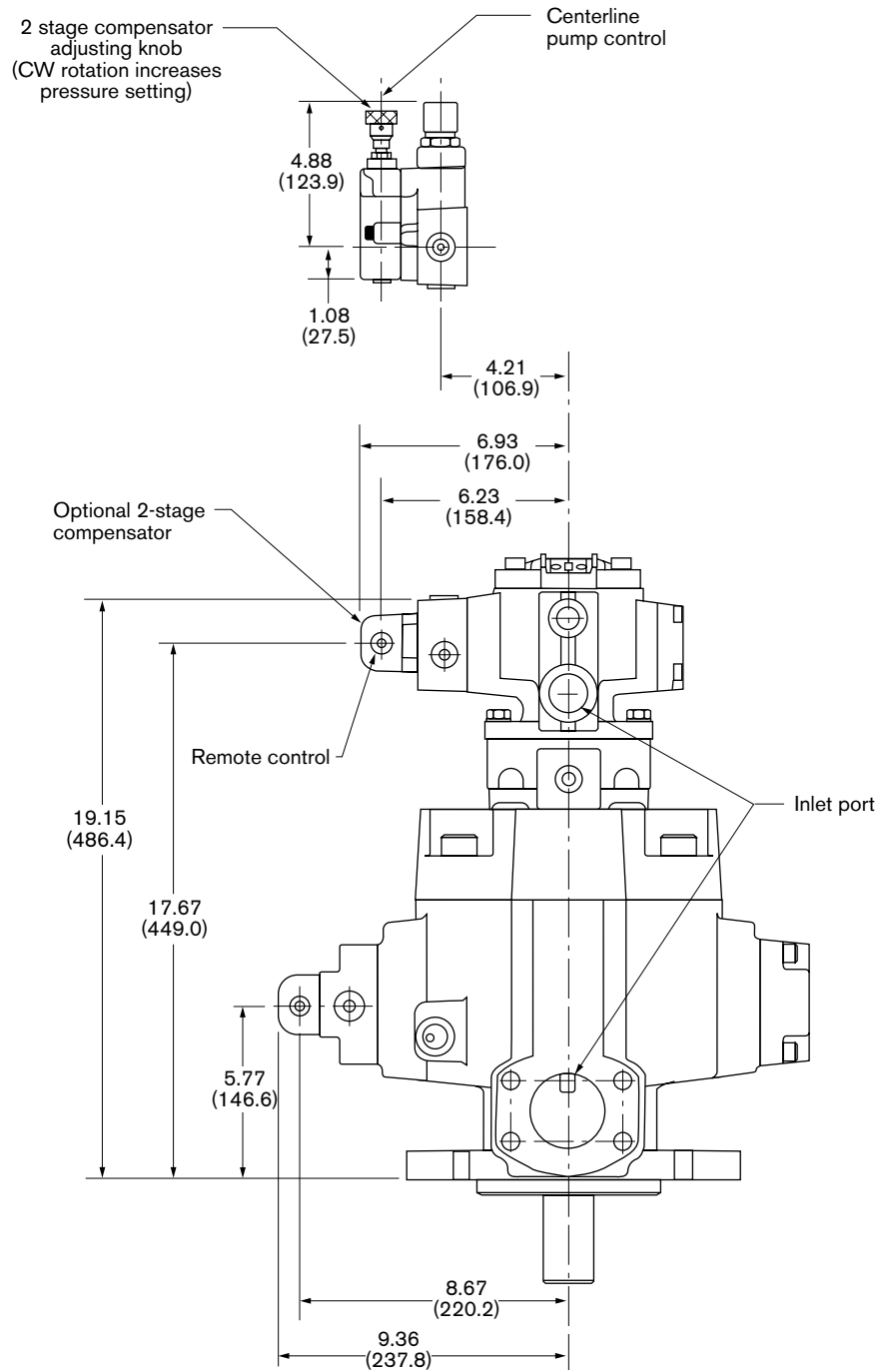




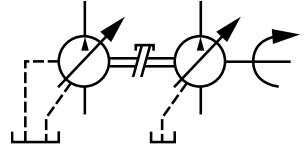
**VPV 100/130/164 to VPV 16, S.A.E. & metric combination (continued)**



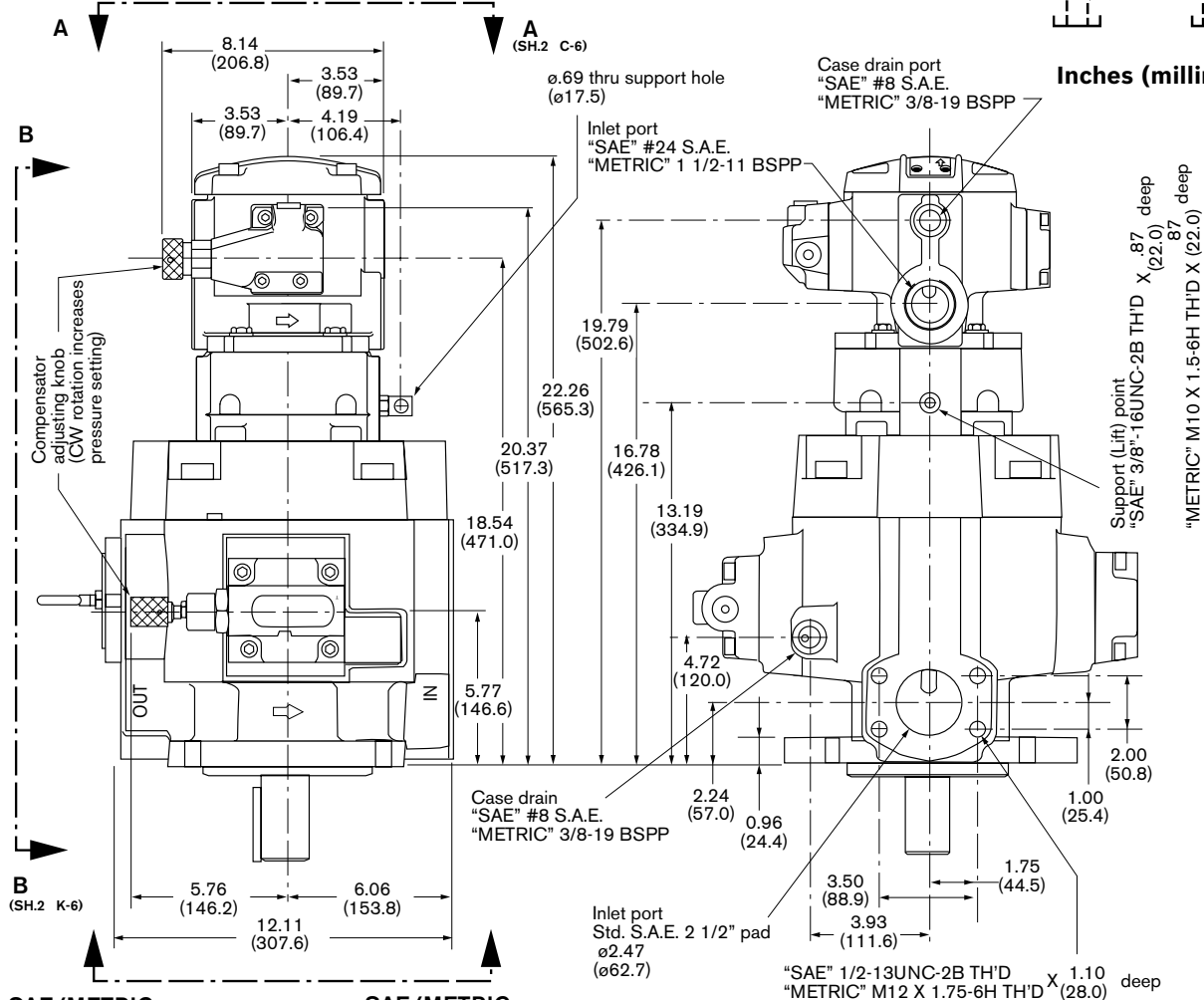
**Inches (millimeters)**



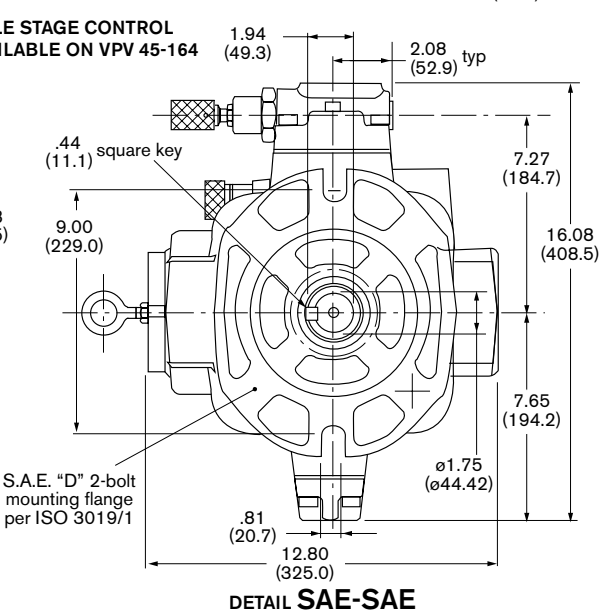
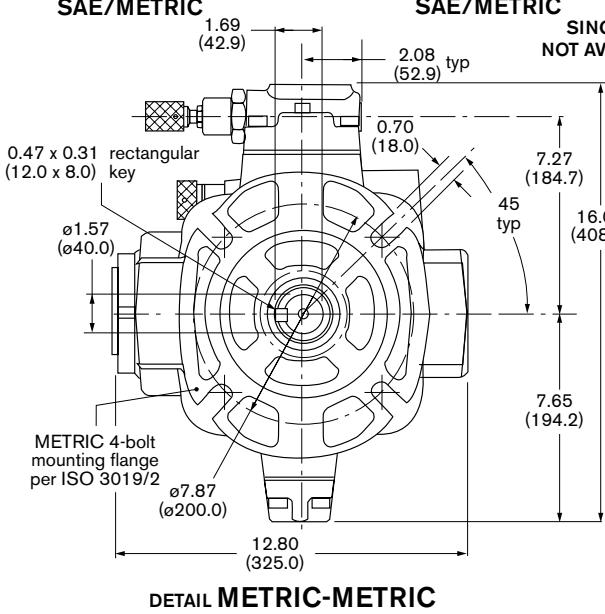
**VPV 100/130/164 to VPV 25/32, S.A.E. & metric combination**



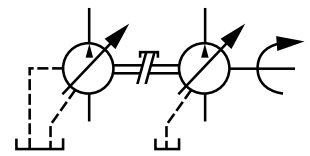
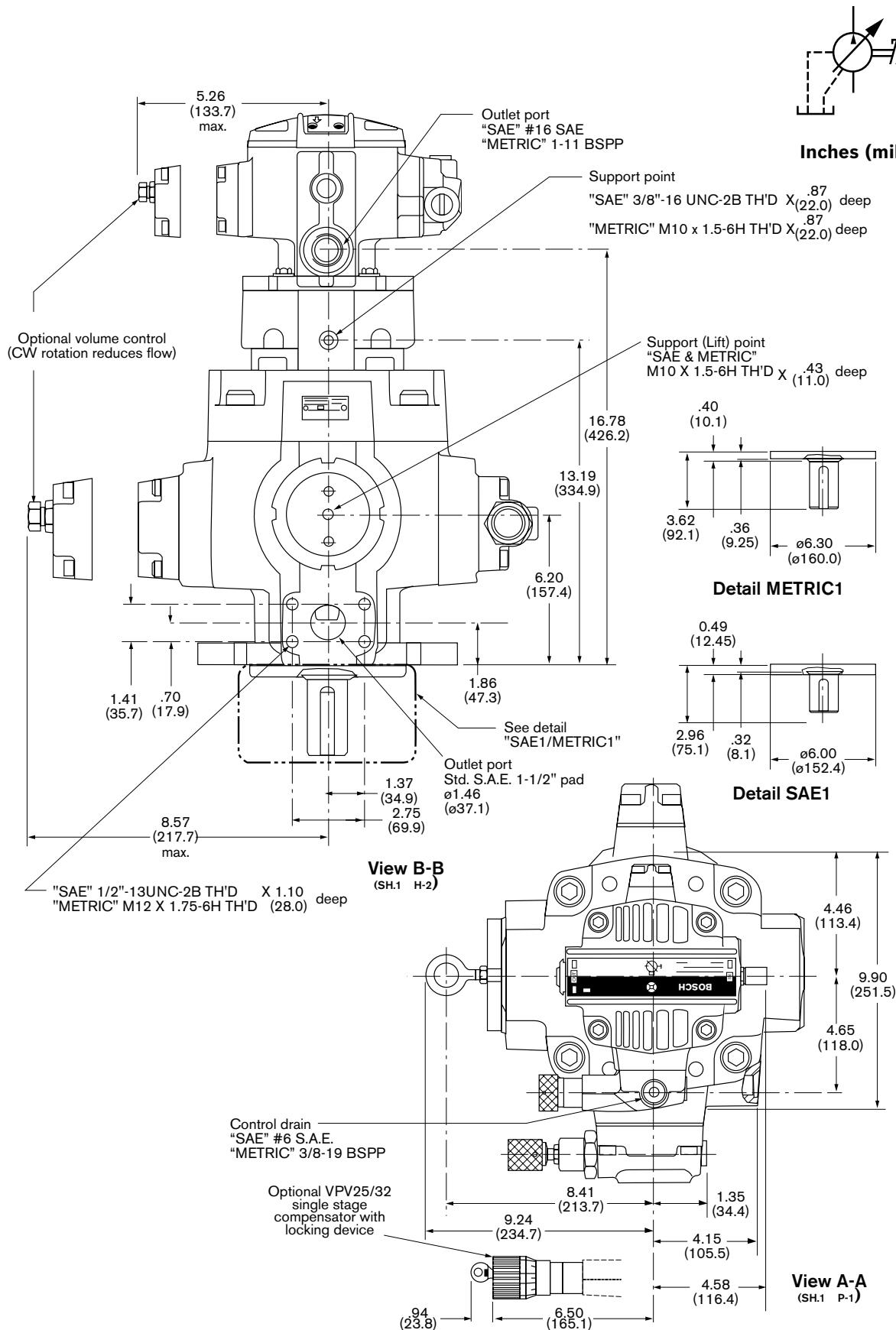
**Inches (millimeters)**



**SINGLE STAGE CONTROL NOT AVAILABLE ON VPV 45-164**

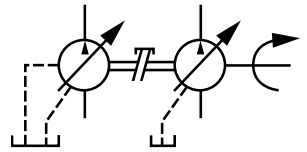


**VPV 100/130/164 to VPV 25/32, S.A.E. & metric combination (continued)**

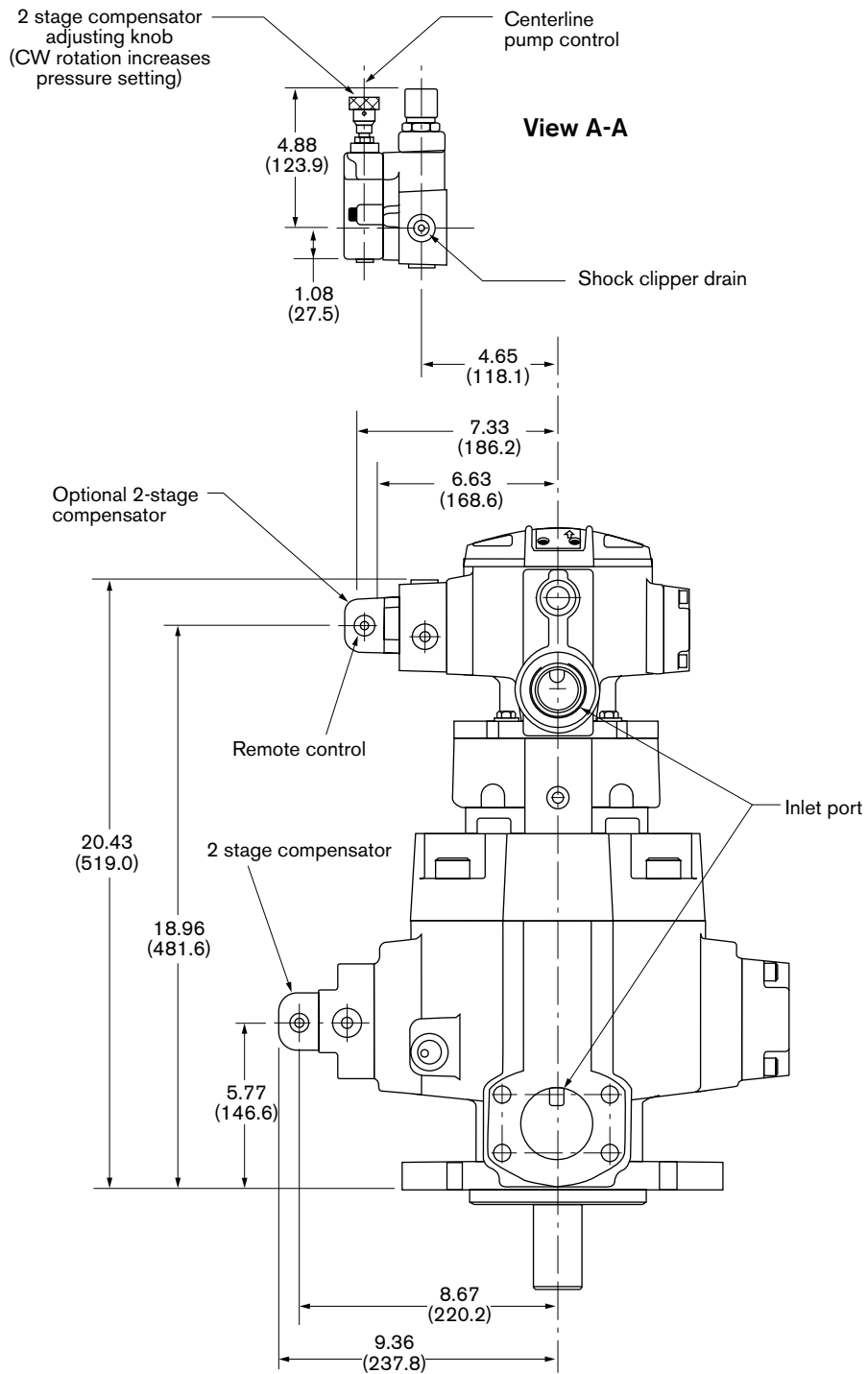


**Inches (millimeters)**

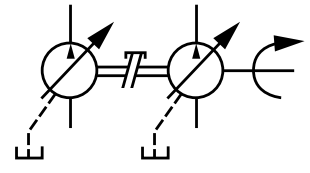
**VPV 100/130/164 to VPV 25/32, S.A.E. & metric combination (continued)**



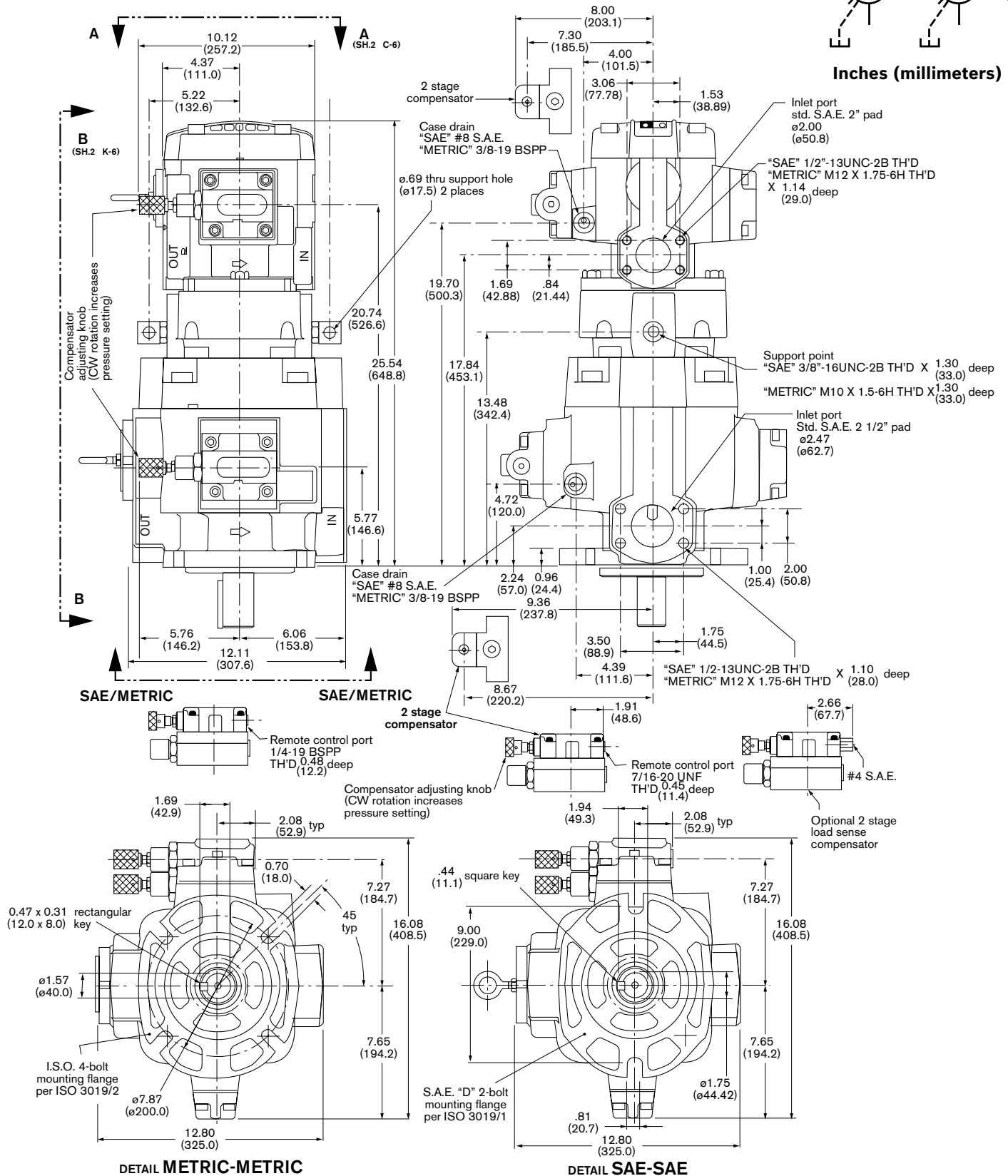
**Inches (millimeters)**



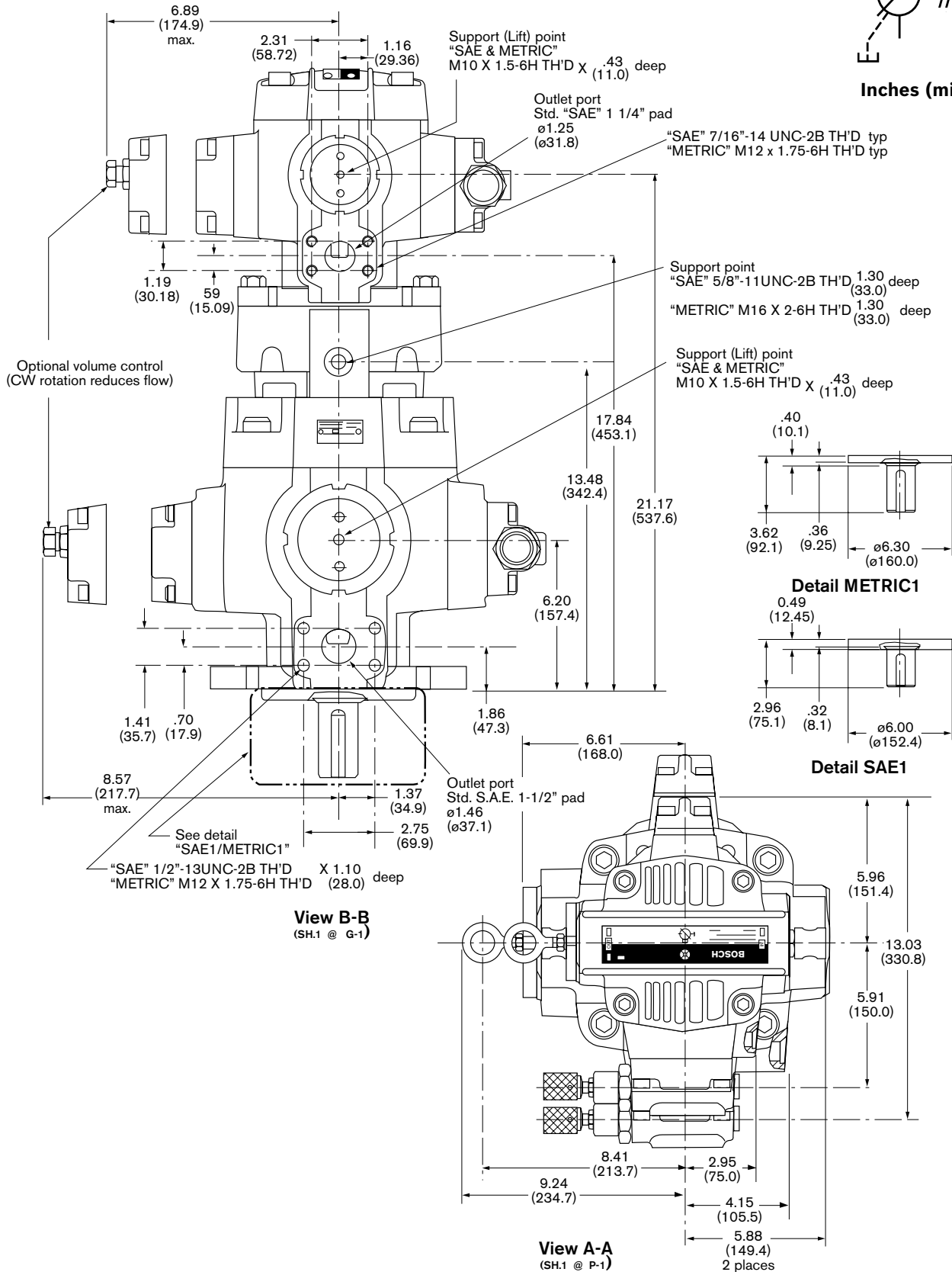
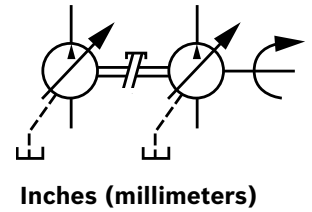
**VPV 100/130/164 to VPV 45/63/80, S.A.E. & metric combination**



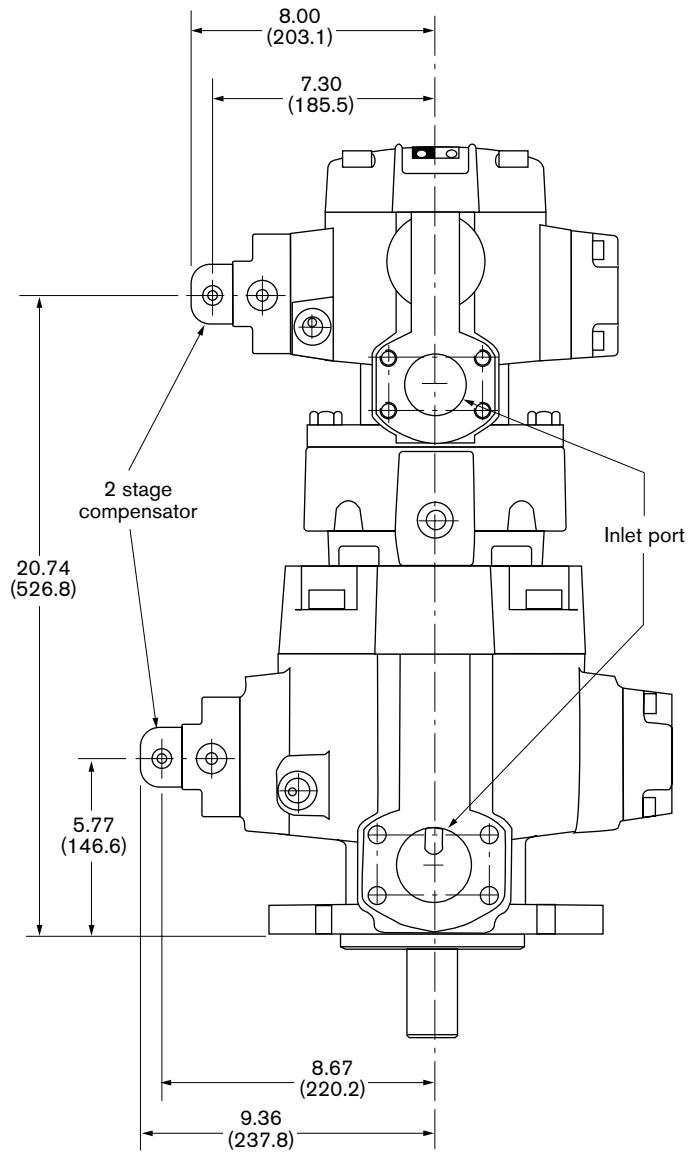
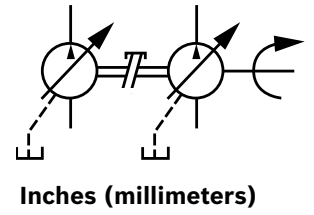
**Inches (millimeters)**



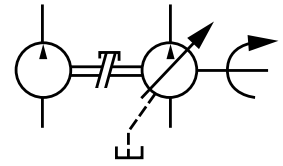
**VPV 100/130/164 to VPV 45/63/80, S.A.E. & metric combination (continued)**



**VPV 100/130/164 to VPV 45/63/80, S.A.E. & metric combination (continued)**

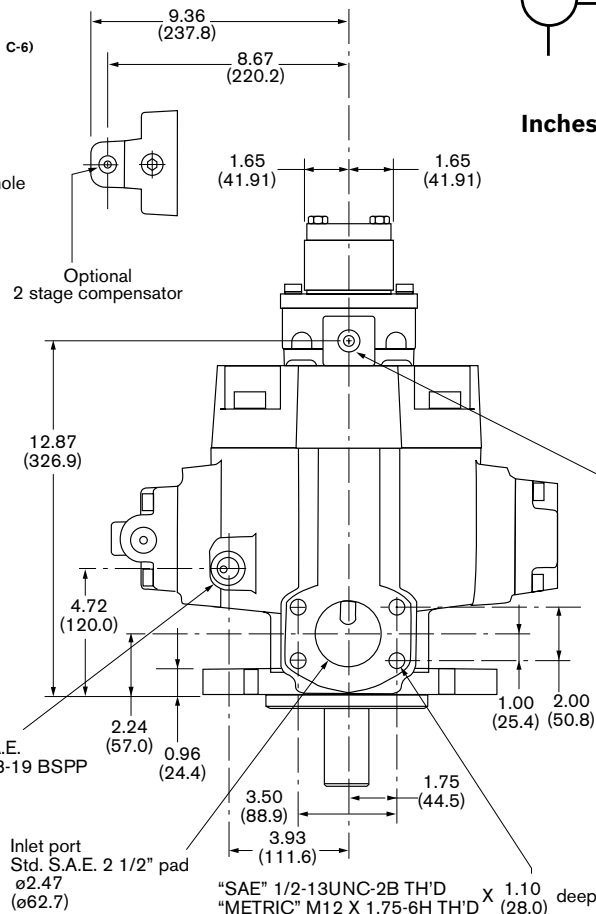
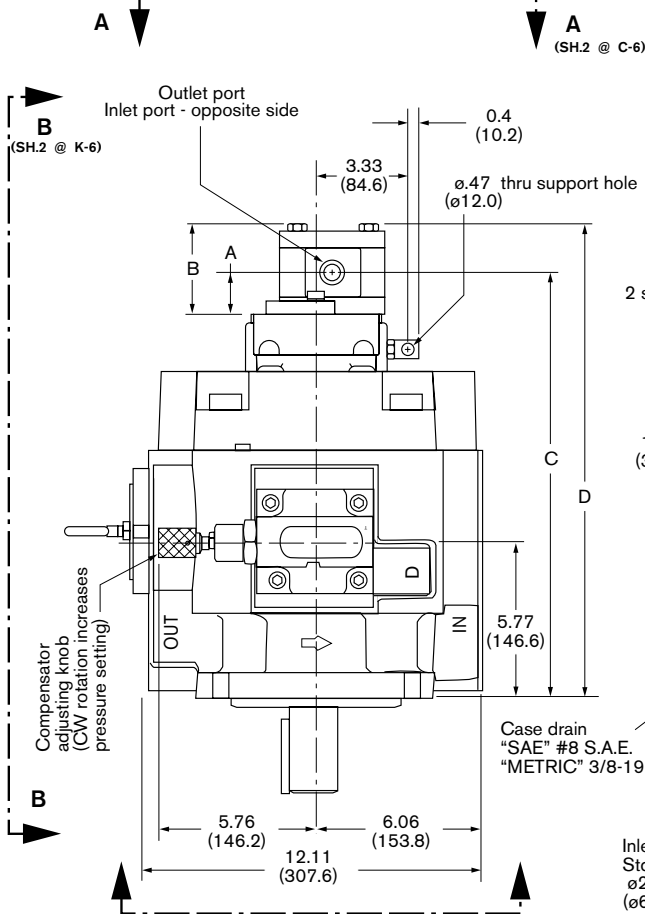


**VPV 100/130/164 to an 'F' gear pump, S.A.E. & metric combination**

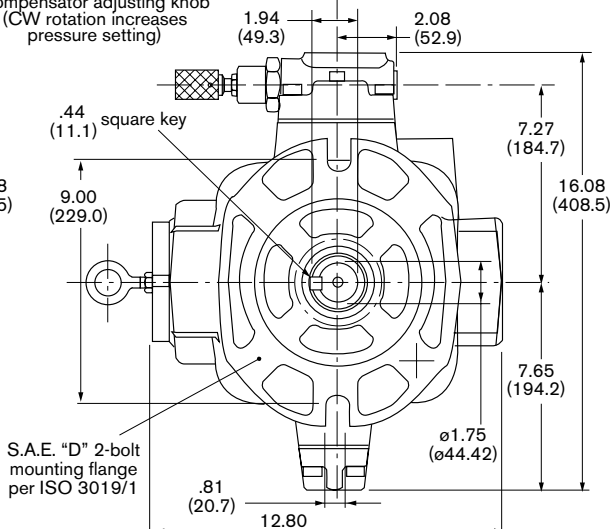
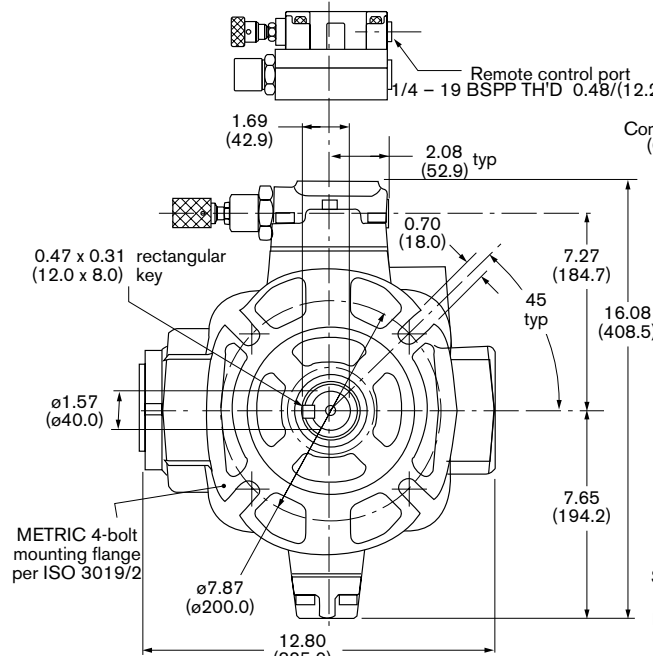
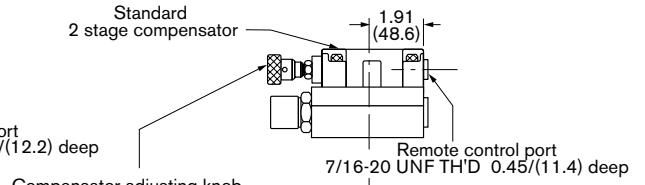


**Inches (millimeters)**

Support point  
 "SAE" 3/8"-16UNC-2B TH'D X 0.59 deep  
 "METRIC" M10 X 1.5-6H TH'D X 0.59 deep



**SAE/METRIC SAE/METRIC**

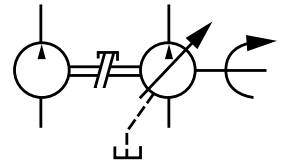
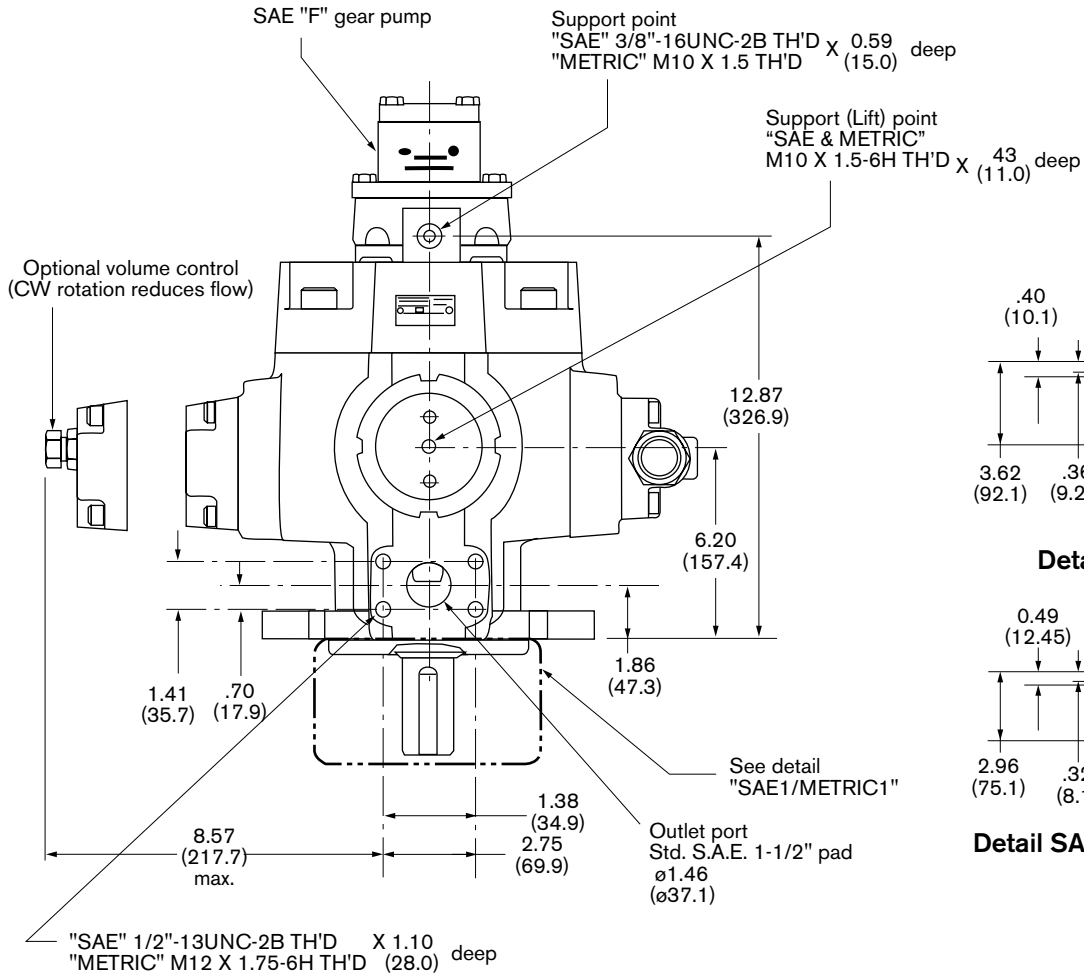


**DETAIL METRIC-METRIC**

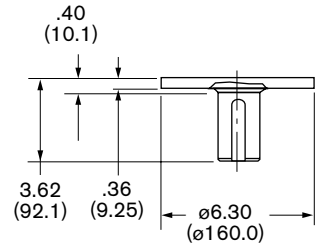
**DETAIL SAE-SAE**



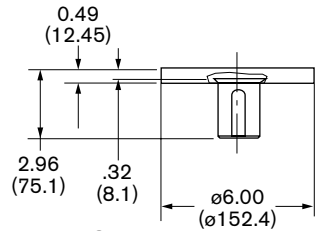
**VPV 100/130/164 to an 'F' gear pump, S.A.E. & metric combination (continued)**



**Inches (millimeters)**



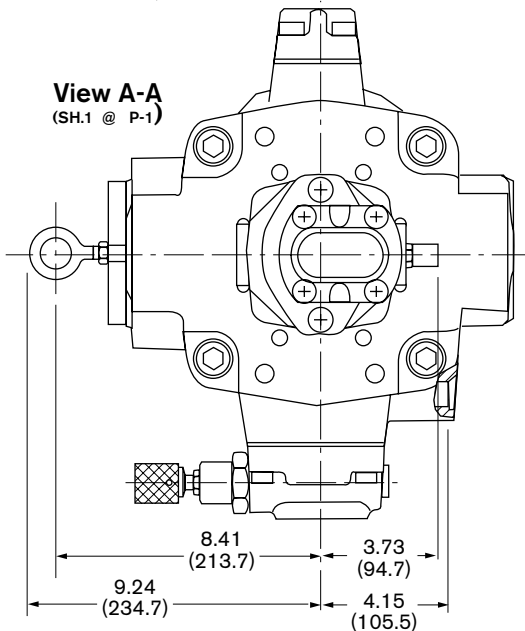
**Detail METRIC1**



**Detail SAE1**

**View B-B**  
(SH.1 @ G-1)

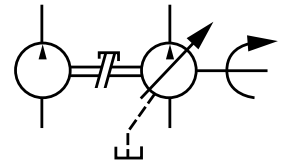
**View A-A**  
(SH.1 @ P-1)



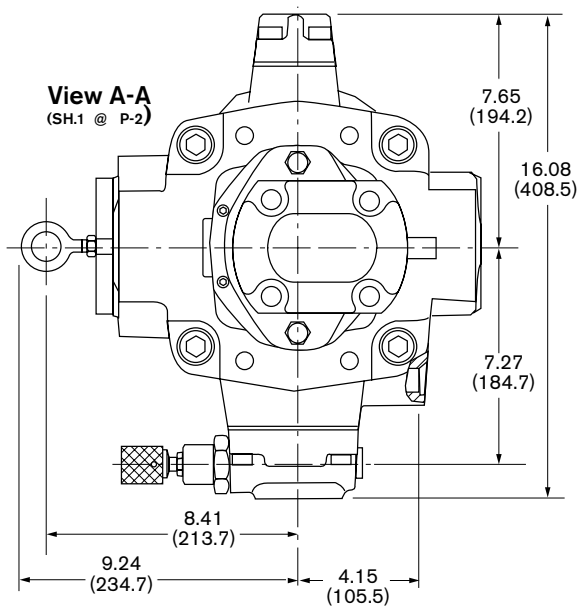
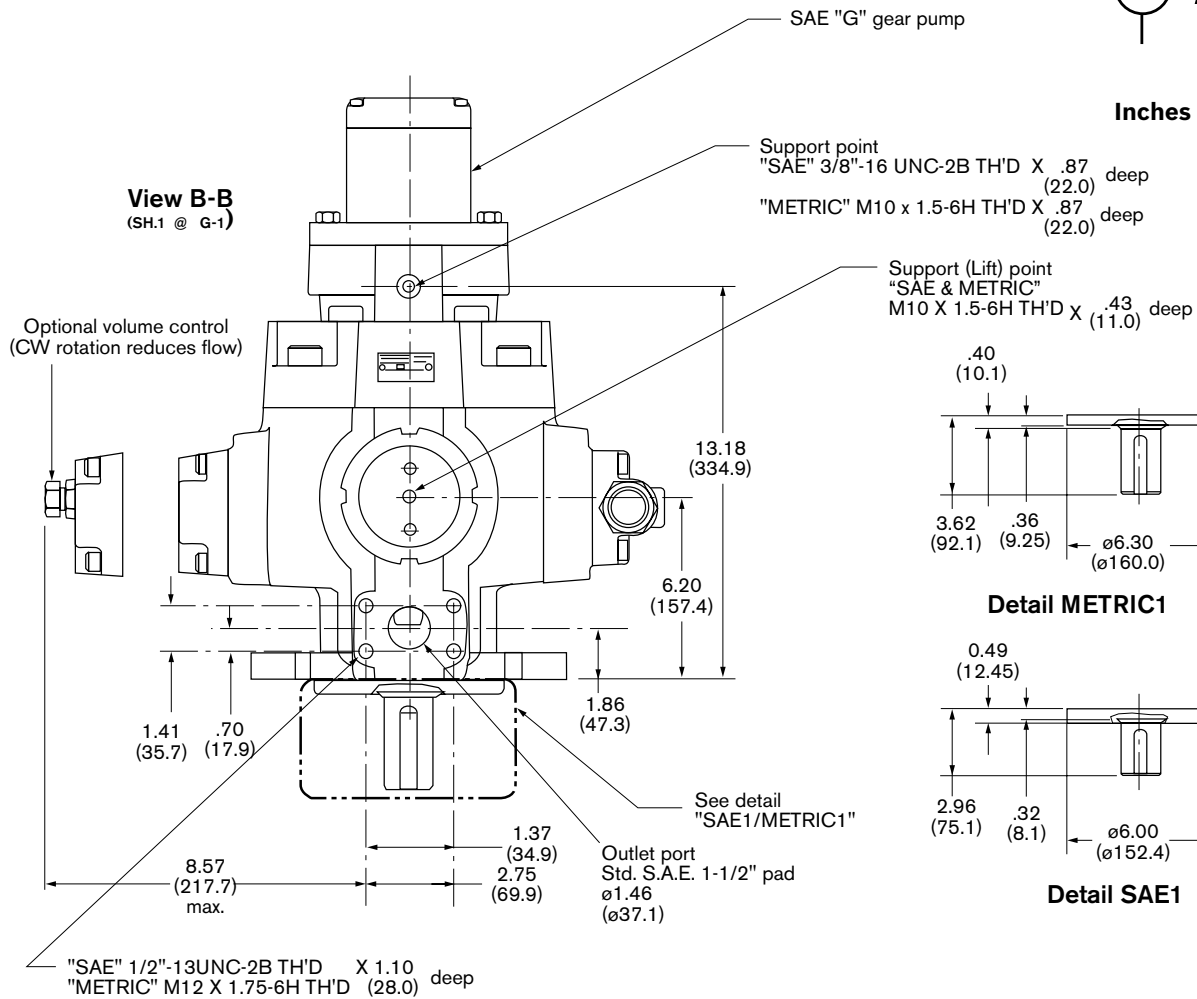
Gear Pump Theoretical Displacement	Dimension				Total Weight (Vane Pump + Gear Pump)
	A	B	C	D	
in3/rev (cc/rev)	in (mm)	in (mm)	in (mm)	in (mm)	lbs. (Kg)
0.24 (4)	1.571 (39.9)	3.346 (85.0)	15.66 (397.8)	17.44 (443.2)	252 (114.3)
0.34 (5.5)	1.618 (41.1)	3.445 (87.5)	15.71 (399.0)	17.55 (445.8)	252.2 (114.4)
0.49 (8)	1.697 (43.2)	3.606 (91.6)	15.79 (401.0)	17.70 (449.6)	252.4 (114.5)
0.67 (11)	1.850 (47.0)	3.803 (96.6)	15.94 (404.9)	17.86 (453.3)	252.6 (114.6)
0.85 (14)	1.870 (47.5)	4.0 (101.6)	15.96 (405.4)	18.05 (458.5)	252.8 (114.7)
0.98 (16)	1.870 (47.5)	4.134 (105.0)	15.96 (404.8)	18.22 (463.0)	252.9 (114.7)
1.16 (19)	1.870 (47.5)	4.330 (110.0)	15.96 (405.4)	18.42 (468.0)	253.1 (114.8)
1.37 (22.5)	2.169 (55.1)	4.543 (115.4)	16.26 (413.1)	18.63 (473.4)	253.4 (114.9)



**VPV 100/130/164 to an 'F' gear pump, S.A.E. & metric combination (continued)**



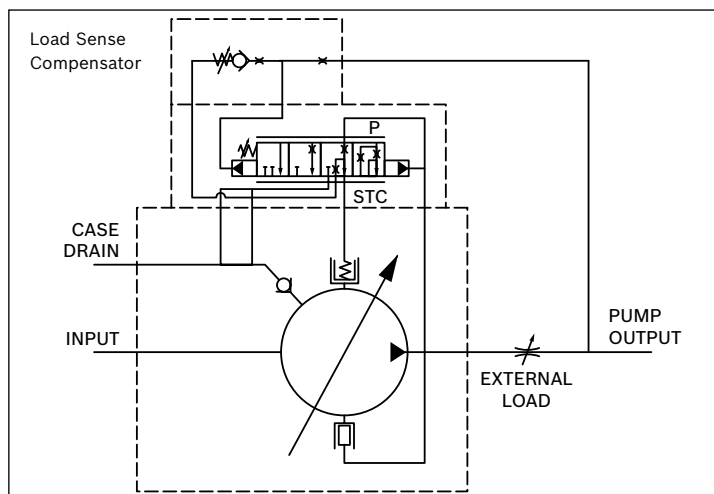
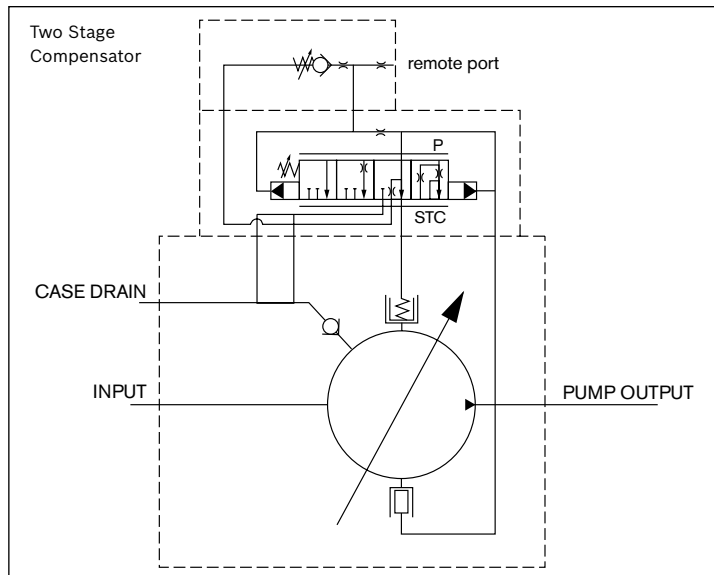
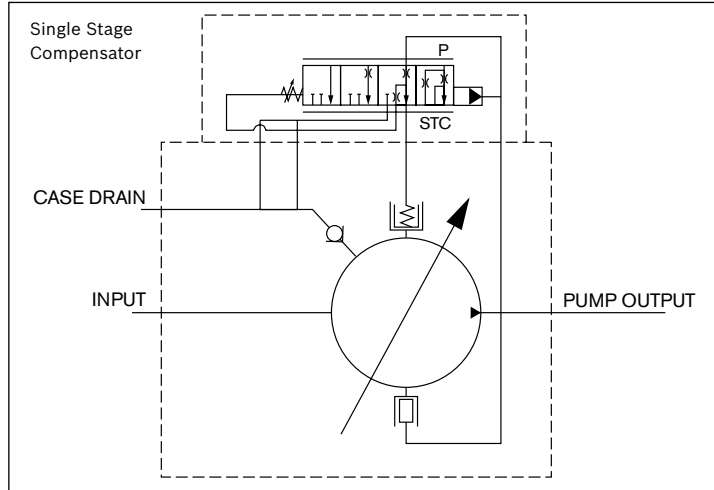
**Inches (millimeters)**



Gear Pump Theoretical Displacement	Dimension				Total Weight (Vane Pump + Gear Pump)
	A	B	C	D	
in <sup>3</sup> /rev (cc/rev)	in (mm)	in (mm)	in (mm)	in (mm)	lbs. (Kg)
1.37 (22.5)	2.40 (61.0)	5.07 (128.5)	17.0 (430.8)	19.60 (498.4)	271.4 (123.1)
1.71 (28)	2.48 (63.0)	5.26 (133.7)	17.04 (432.8)	19.80 (503.0)	271.8 (123.3)
1.95 (32)	2.54 (64.5)	5.40 (137.2)	17.10 (434.4)	19.90 (506.6)	272.3 (123.5)
2.32 (38)	2.62 (66.5)	5.62 (142.6)	17.18 (436.4)	20.16 (512.1)	272.6 (123.6)
2.75 (45)	2.74 (69.5)	5.87 (149.2)	17.30 (439.4)	20.40 (518.5)	273.1 (123.9)
3.42 (56)	2.95 (75.2)	6.31 (160.2)	17.51 (444.8)	20.85 (529.7)	274.1 (124.3)

## VPV Controls

Schematics shown illustrate VPV 45–164 controls with shock clipper integrated and no exterior plumbing required.



The case drain shows an integrated check valve not present in VPV 16, 25 and 32. All controls leave the factory pre-set at 500 PSI.

### Single Stage Compensator

The single stage control for normal pressure compensation is a good choice where speed is important and remote capability is not required. This control available on VPV 16, 25 and 32.

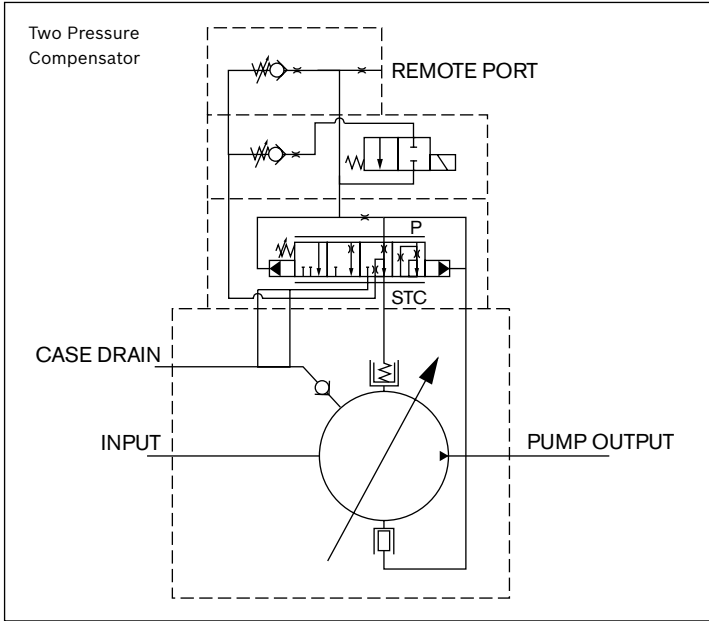
### Two Stage Compensator

The two stage pressure compensators are the platform for most VPV controls. A remote port is standard and may, or may not be enabled according to the circuit design. This is the smoothest of the standard pressure controls, and is the standard pressure compensator for VPV 45–164.

### Load Sense Compensator

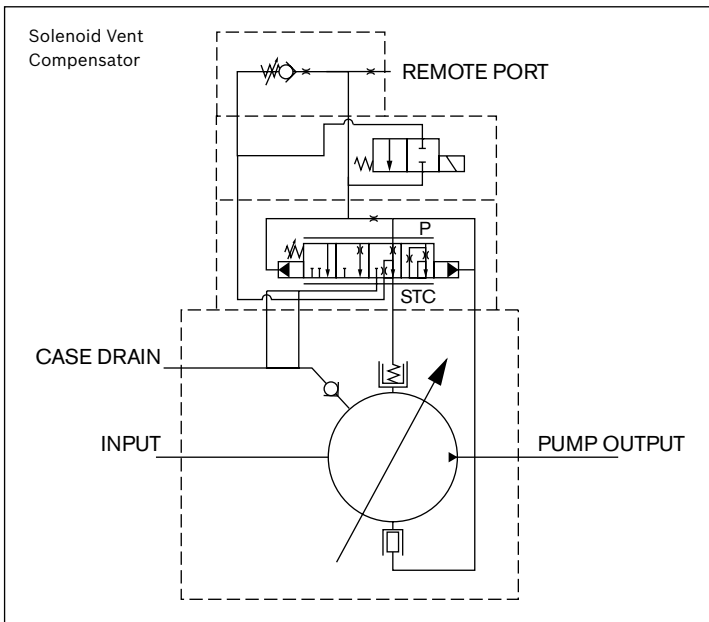
Load sense allows the user to maintain constant flow regardless of changes in load or in pump shaft rotational speed. The Whisper™ Pump load sense accomplishes this by using an external orifice and continually senses a pressure drop of 100 PSI across this orifice. The minimum  $\Delta P$  is 100 PSI, however the pressure drop can be adjusted to meet circuit requirements. Consult factory.

**VPV Controls (continued)**



**Two Pressure Compensator**

Solenoid two-pressure compensators are available in normally open (normally low, energize to high) and normally closed (normally high, energize to low) versions. These two-pressure controls can greatly reduce horsepower demand and heat generation during periods of idle cycle time, or when the machine operating cycle does not require maximum pressure.



**Solenoid Vent Compensator**

Solenoid vented compensators are similar to the two-pressure controls, except that there is no adjustment possible. By venting the compensator the pump will go to minimum deadhead.

## Comparison of sound levels

<b>Source of Sound</b>	<b>Intensity (dB)</b>	
Threshold.....	<b>0</b>	
Rustling leaves.....	<b>10</b>	Barely audible
Broadcast studio .....	<b>20</b>	
Typical bedroom at night.....	<b>30</b>	Very quiet
Typical living room.....	<b>40</b>	
Office, classroom .....	<b>50</b>	← VPV16 @ 1200 rpm & 500 psi, deadhead (49 dB)
Normal conversation.....	<b>60</b>	Moderate
Automobile interior.....	<b>70</b>	
Urban street.....	<b>80</b>	← VPV130 @ 1800 rpm & 3000 psi, full flow (76 dB) Noisy
Heavy truck (15 m) .....	<b>90</b>	Very noisy
Shout (1.5 m) .....	<b>100</b>	
Construction site .....	<b>110</b>	
Loud rock music .....	<b>120</b>	Threshold of pain
Jet airplane.....	<b>150</b>	Intolerable
Rocket engine .....	<b>180</b>	

## Troubleshooting for VPV Whisper Pumps™

Some of the most common difficulties that could be experienced in the field are listed here with potential causes and their remedies.

<b>Trouble</b>	<b>Potential Cause</b>	<b>Remedy</b>
<b>Excessive pump noise</b>	1) Coupling misalignment.	1) Align the pump and motor shaft to within .006 of an inch total indicator reading. The tighter the alignment, the quieter the pump will be.
	2) The continuous pressure is significantly below 200 psi for 140 bar pumps, or 300 psi for 210 bar pumps.	2) The pumps have been sound tuned at rated pressure. Consult factory or raise minimum pressure 200 psi for single stage compensators in 2000 psi rated pumps, or 300 psi for 3000psi rated pumps.
	3) Fluid in the reservoir is low and the pump is sucking air.	3) Fill the reservoir so that the fluid level is well above the end of the suction line during all of the working cycle.
	4) Restricted inlet.	4) If a suction strainer is used, check it for obstructions or dirt. We do not recommend the use of strainers as they tend to be a leading cause of cavitation which manifests as excessive noise. Check also for shop rags left in the reservoir.
	5) Air leak in the suction line.	5) Tighten all fittings. If it still leaks, smear grease over the joints to locate the leak.
	6) Suction line has too many elbows, or is too long.	6) The suction line should be as short and as straight as possible to reduce the resistance to flow.
	7) Air in the fluid.	7) The return line should terminate below the fluid level to prevent splashing.
	8) Suction line is too small.	8) Suction line should always be equal in size to the suction port. Never reduce it.
	9) Vane does not move freely.	9) Contamination in the fluid or a burr in the vane slot can cause a vane to bind up. Proper filtration and/or deburring of the vane slots is required.
	10) Vane is installed incorrectly.	10) VPV pumps with B0x design utilize vanes with offset tip geometry. Vane orientation is extremely important and if installed improperly, can cause premature wear and reduced operating life. The leading edge is identified as the low side of the vane taper. Please refer to catalog page 85 for further illustration.
	11) A vane is missing.	11) Make sure all vane slots have a vane in them.
	12) Port plates installed incorrectly.	12) Port plates must be installed properly or excessive noise or reduced performance may occur. Plates must be installed with the directional arrows on the plates matching the intended rotation indicated on the pump housing. VPV pumps are RH (CW) only as viewed from the drive shaft end of the pump.
<b>Pump will not prime</b>	1) Shaft rotation in the wrong direction.	1) When installing a pump, always jog the electric motor to check for proper shaft rotation. Rotation should only be clockwise (right hand) for VPV pumps.
	2) Air leak in the suction line.	2) Make sure all fittings are tight.

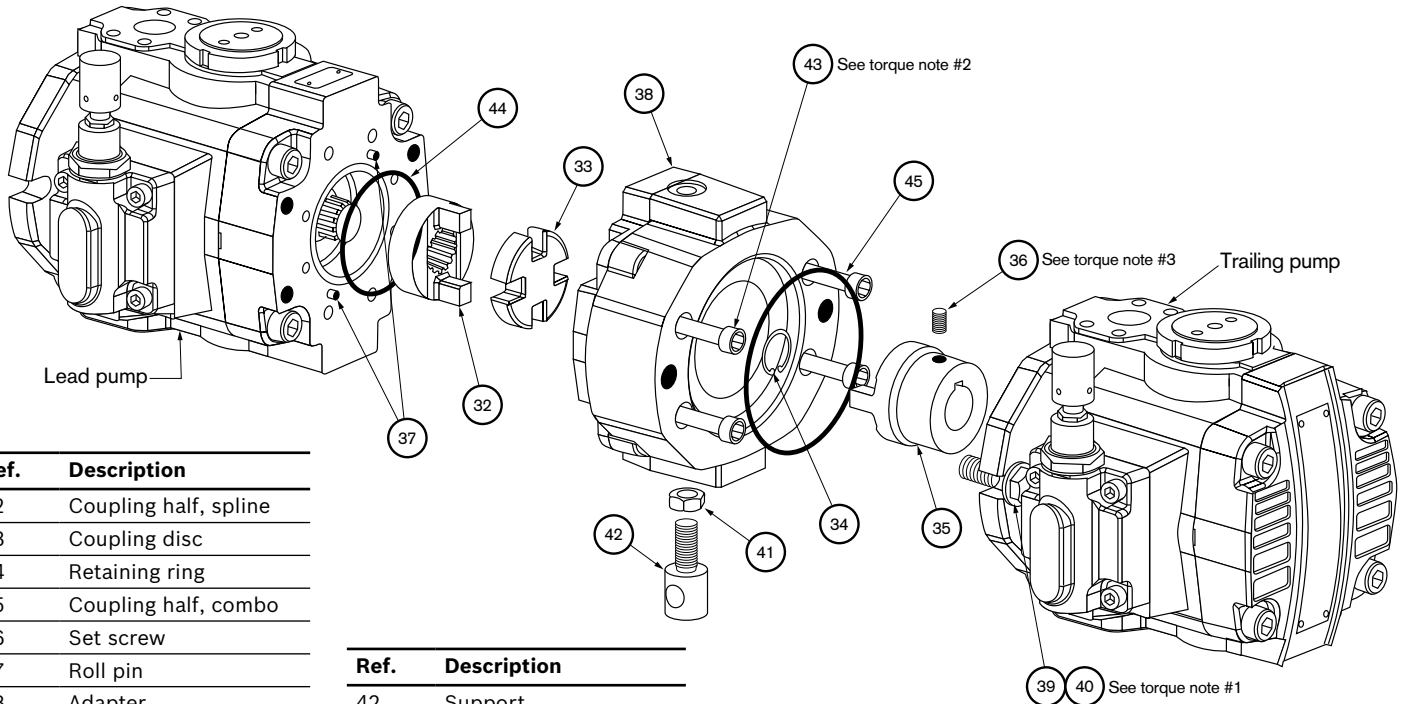
*continued on next page*

**Troubleshooting for VPV Whisper Pumps™ (continued)**

<b>Trouble</b>	<b>Potential Cause</b>	<b>Remedy</b>
<b>Pump will not prime (cont.)</b>	3) Pump is air bound.	3) Use an air bleed valve to void the pump and suction line of air.
	4) Fluid level in the reservoir is too low.	4) Fill the reservoir so that the fluid level is well above the end of the suction line.
	5) Stroke limiter is turned in too far.	5) Flow should not be reduced more than 50% of maximum. Turn CW to restrict flow, (see page 83).
	6) Suction port dust plug left in place.	6) Remove plug.
<b>Pump is unstable</b>	1) Contamination in the compensator.	1) Thoroughly clean the control orifices and check filtration.
	2) Pressure ring is not moving properly.	2) Control piston should be checked for freedom of movement.
<b>Pump is too hot</b>	1) Case drain line is installed too close to the pump inlet line.	1) The case drain and pump inlet should be separated by a baffle in the reservoir.
	2) Reservoir is undersized. Rule of thumb is a minimum of 3 to 5 times max. pump output flow.	2) Add a cooler.



**Adapter kits for VPV combinations using ‘P1’ pumps**



Ref.	Description
32	Coupling half, spline
33	Coupling disc
34	Retaining ring
35	Coupling half, combo
36	Set screw
37	Roll pin
38	Adapter
39	Washer
40	Hex head cap screw
41	Jam nut

Ref.	Description
42	Support
43	Soc. head cap screw
44	O-ring, ASA-043
45	O-ring

**ADAPTER KITS – Consult factory for other possible pump combinations**

List Number	Description
9 511 230 520	VPV 16 to VPV 16 Metric
9 511 230 518	VPV 16 to VPV 16 SAE
R978711779	VPV 16 to “F” Gear SAE Key
9 511 230 673	VPV 16 to “F” Gear SAE Spline
9 511 230 522	VPV 25/32 to VPV 25/32 Metric
9 511 230 523	VPV 25/32 to VPV 25/32 SAE
9 511 230 524	VPV 25/32 to VPV 16 Metric
9 511 230 525	VPV 25/32 to VPV 16 SAE
R978711780	VPV 25/32 to “F” Gear SAE Key
9 511 230 674	VPV 25/32 to “F” Gear SAE Spline
R978711792	VPV 25/32 to “G” Gear SAE Key
9 511 230 531	VPV 45/63/80 to VPV 16 Metric
9 511 230 532	VPV 45/63/80 to VPV 16 SAE
9 511 230 529	VPV 45/63/80 to VPV 25/32 Metric
9 511 230 530	VPV 45/63/80 to VPV 25/32 SAE
9 511 230 527	VPV 45/63/80 to VPV 45/63/80 Metric
9 511 230 528	VPV 45/63/80 to VPV 45/63/80 SAE
R978711781	VPV 45/63/80 to “F” Gear SAE Key
9 511 230 675	VPV 45/63/80 to “F” Gear SAE Spline
R978711782	VPV 45/63/80 to “G” Gear SAE Key
R978711833	VPV 45/63/80 to SAE “B” Spline
9 511 230 541	VPV 100/130/164 to VPV 16 Metric
9 511 230 542	VPV 100/130/164 to VPV 16 SAE
9 511 230 539	VPV 100/130/164 to VPV 25/32 Metric

**ADAPTER KITS – Consult factory for other possible pump combinations**

List Number	Description
9 511 230 540	VPV 100/130/164 to VPV 25/32 SAE
9 511 230 537	VPV 100/130/164 to VPV 45/63/80 Metric
9 511 230 538	VPV 100/130/164 to VPV 45/63/80 SAE
9 511 230 535	VPV 100/130/164 to VPV 100/130/164 Metric
9 511 230 536	VPV 100/130/164 to VPV 100/130/164 SAE
R978711804	VPV 100/130/164 to SAE “B” Spline
9 511 230 682	VPV 100/130/164 to SAE “C” Spline
R978711783	VPV 100/130/164 to “F” Gear SAE Key
R978711808	VPV 100/130/164 to “G” Gear SAE Key

Torque Note #1		
Torque to	2000 lb/in (225 Nm)	“VPV 100/130/164”
Torque to	1800 lb/in (204 Nm)	“VPV 45/63/80”
Torque to	1050 lb/in (119 Nm)	“VPV 25/32”
Torque to	780 lb/in (88 Nm)	“VPV 16” & Type ‘G’ gear pump
Torque to	550 lb/in (62 Nm)	Type ‘F’ gear pump
Torque Note #2		
Torque to	2300 lb/in (260 Nm)	“VPV 100/130/164”
Torque to	850 lb/in (96 Nm)	“VPV 45/63/80”
Torque to	550 lb/in (62 Nm)	“VPV 25/32” & Type ‘G’ gear pump
Torque to	400 lb/in (46 Nm)	“VPV 16” & Type ‘F’ gear pump
Torque Note #3		
Torque to	800 lb/in (90 Nm)	“VPV 100/130/164”
Torque to	330 lb/in (37 Nm)	“VPV 45/63/80”
Torque to	280 lb/in (31.5 Nm)	“VPV 25/32” & Type ‘G’ gear pump
Torque to	200 lb/in (22.5 Nm)	Type ‘F’ gear pump

## Through drive horsepower limitations

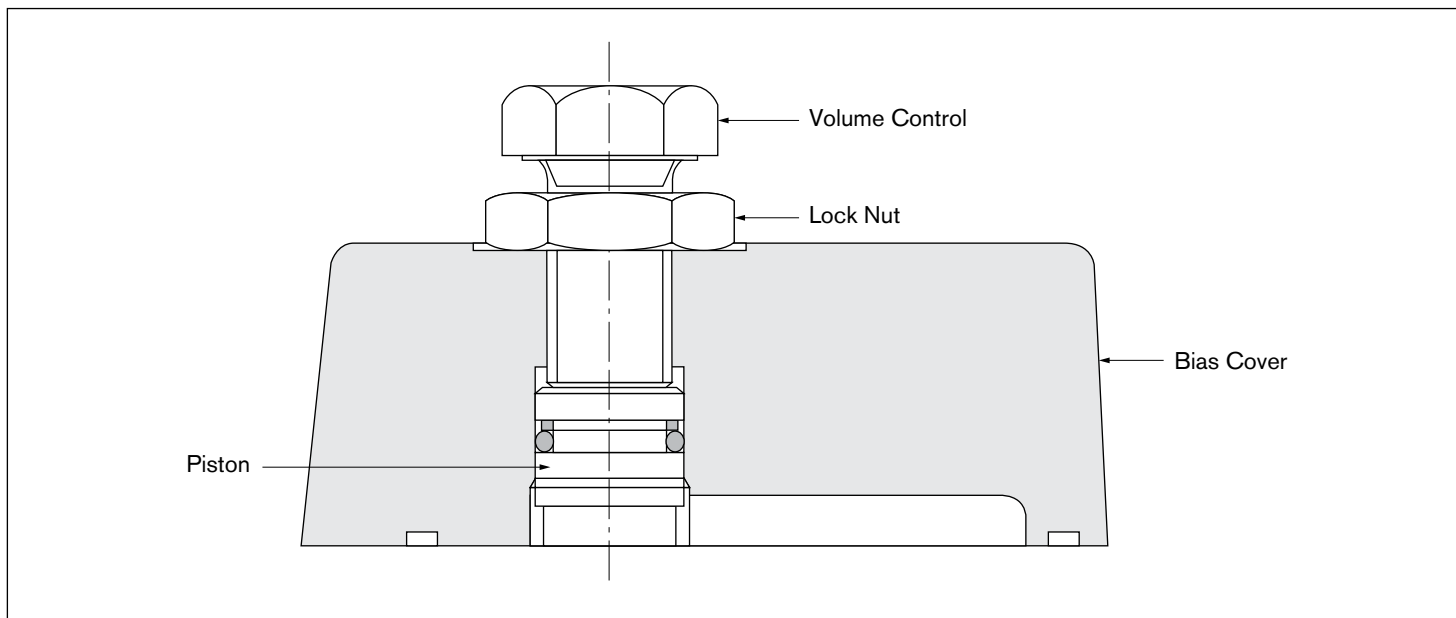
The VPV pumps can be coupled with other VPV pumps, Bosch Rexroth gear pumps or other pumps with standard SAE or metric mounting patterns. (VPV pumps can be coupled without losing use of stroke limiter.) VPV combination pumps are rated to carry the load of an additional pump(s) equal to the maximum load the lead VPV pump can generate (see chart).

<b>Pump</b>	<b>Flow @ 1750 RPM (gpm)</b>	<b>Maximum pressure (psig)</b>	<b>Pump #1 input horsepower (hp)</b>	<b>Maximum input power for other pumps (hp)</b>
VPV 16	8.03	3000	17.6	17.6
VPV 25	12.6	3000	25.3	25.3
VPV 32	15.4	3000	30.7	30.7
VPV 45	21.8	3000	43.3	43.3
VPV 63	29.6	3000	58.5	58.5
VPV 80	37.2	3000	74.6	74.6
VPV 100	46.2	3000	88.8	88.8
VPV 130	60.0	3000	117.6	117.6
VPV 164	75.8	3000	156.5	156.5

### Examples:

VPV 100 @ 3045 psig + VPV 63 @ 3045 psig + VPV 25 @ 3045 psig  
 88.8 hp ≥ 58.5 hp + 23.3 hp

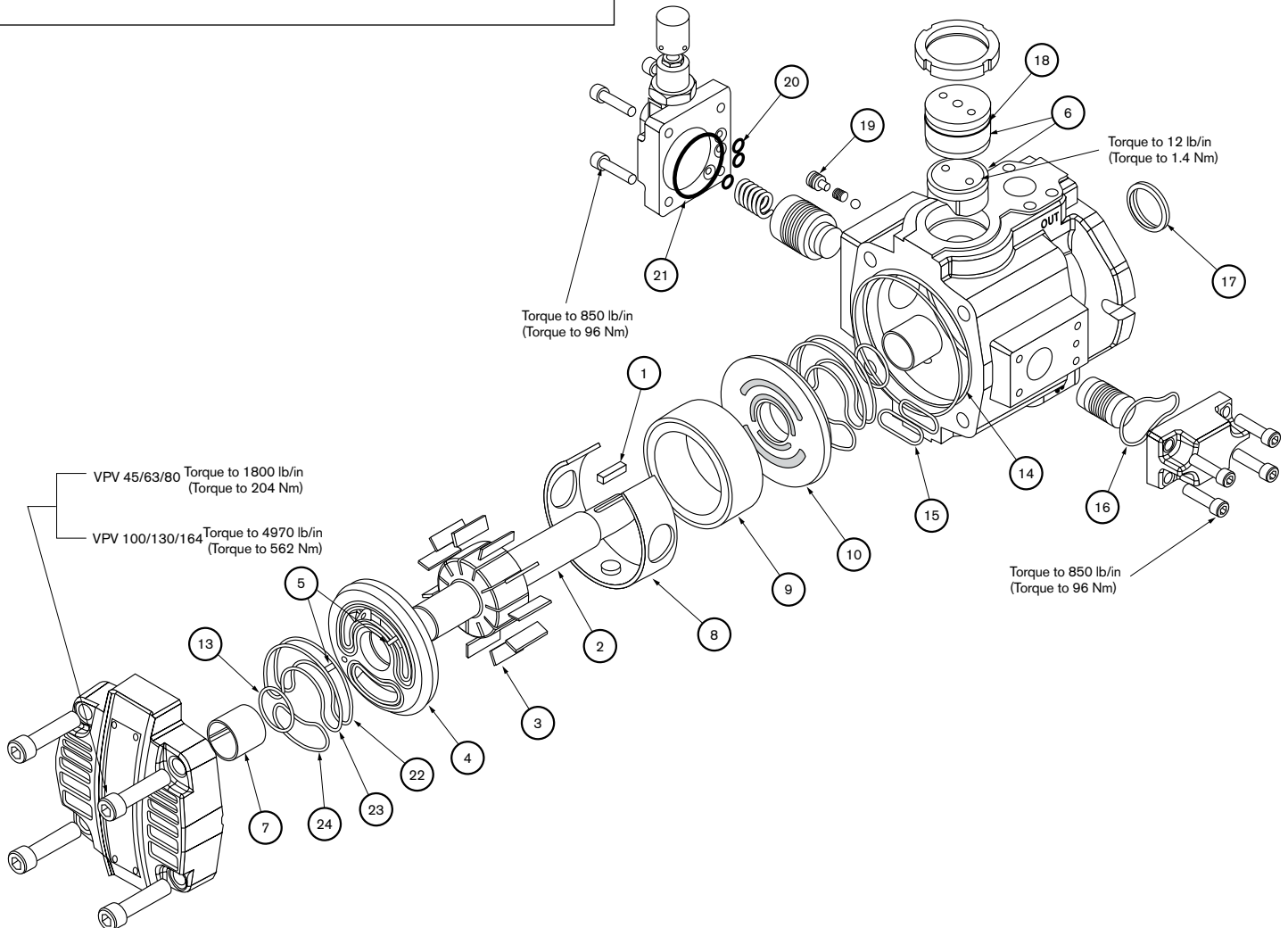
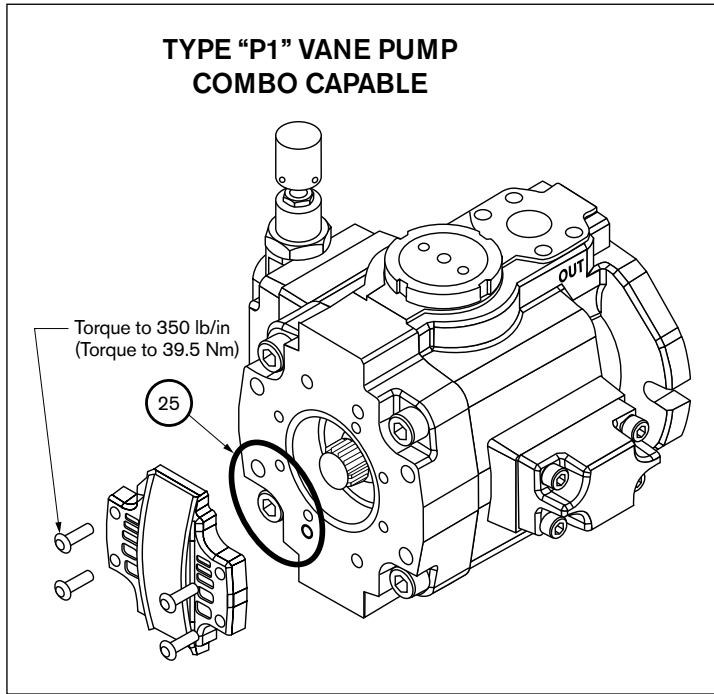
VPV 116 @ 3045 psig + VPV 16 @ 1500 psig + VPV 16 @ 1500 psig  
 17.6 hp ≥ 8.7 hp + 8.7 hp

**VPV stroke limiter adjustment**

<b>Pump model</b>	<b>Nominal stroke</b>	<b>Decrease in flow per turn</b>	<b>Minimum flow attainable</b>
VPV 16	1.9 mm (0.075")	53%	<0%
VPV 25	2.0 mm (0.080")	50%	0%
VPV 32	2.5 mm (0.099")	40%	20%
VPV 45	1.9 mm (0.077")	80%	<0%
VPV 63	2.7 mm (0.106")	56%	8%
VPV 80	3.4 mm (0.132")	44%	26%
VPV 100	3.0 mm (0.117")	50%	17%
VPV 130	3.8 mm (0.150")	40%	34%
VPV 164	4.7 mm (0.186")	32%	47%

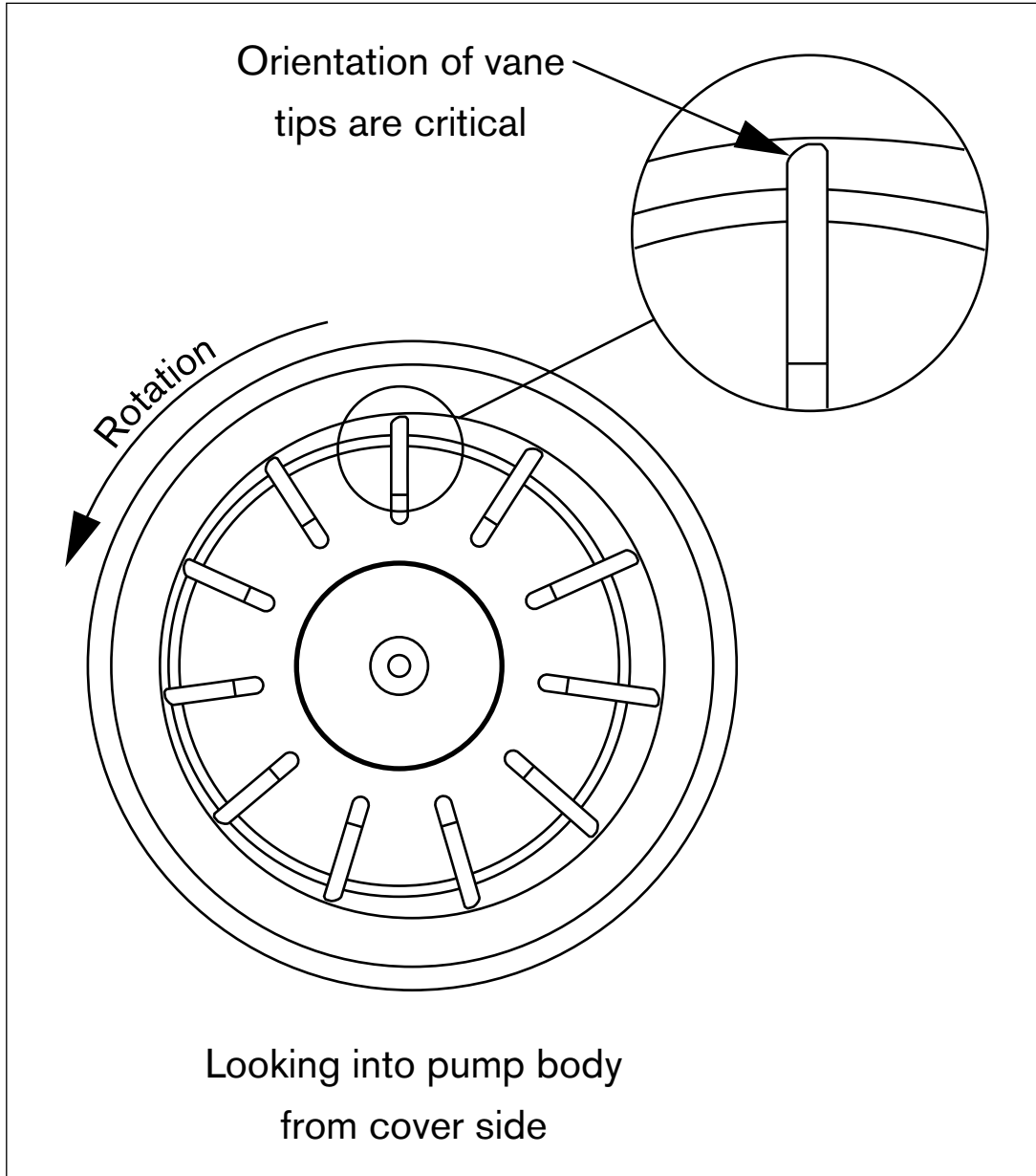
- ▶ During initial start-up, volume should be at least 50% of maximum flow.
- ▶ Only make adjustments to volume control with pump running at full flow and low pressure while observing output flow.

**3000 PSI cutaway – VPV 45–164**

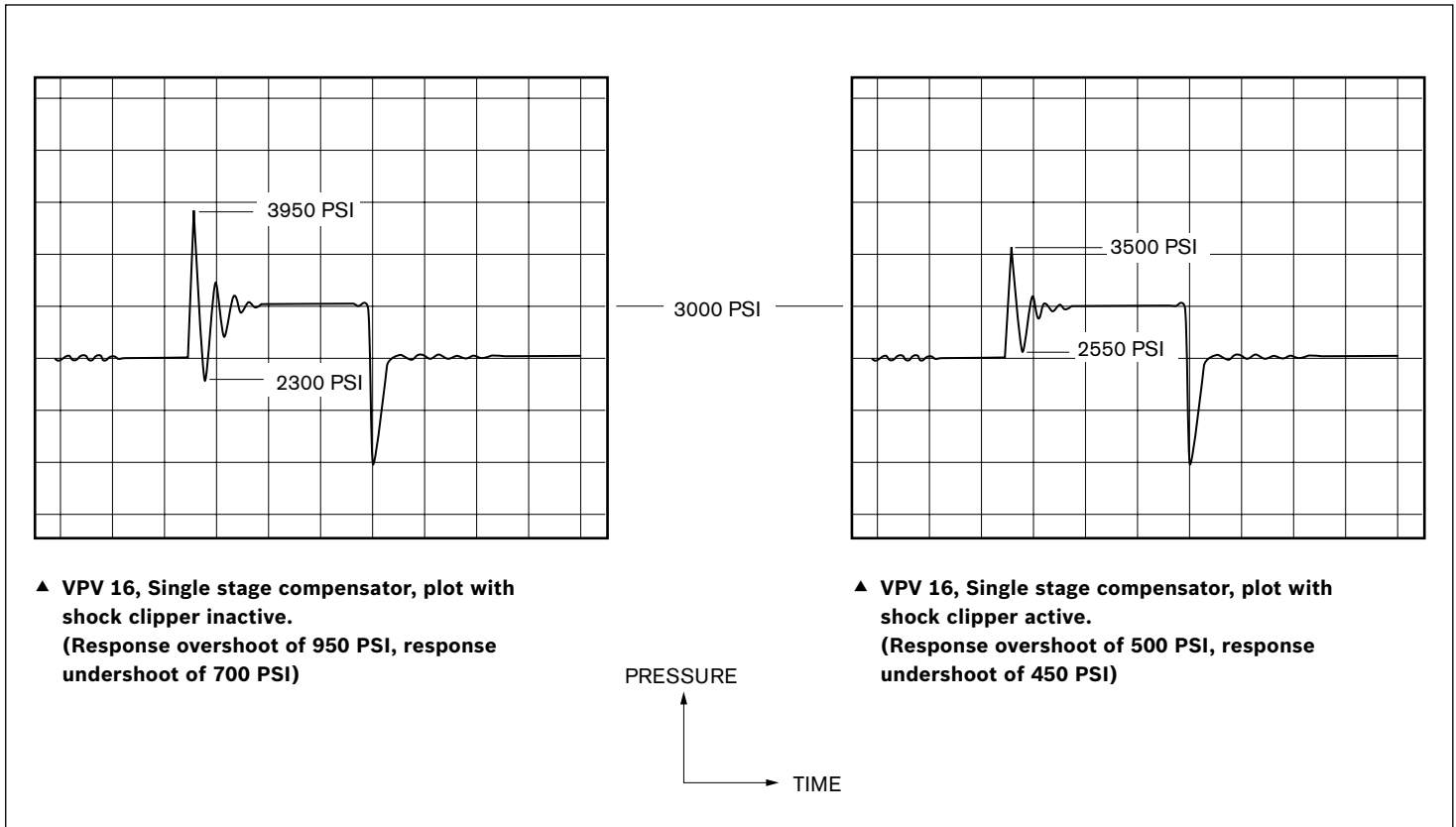
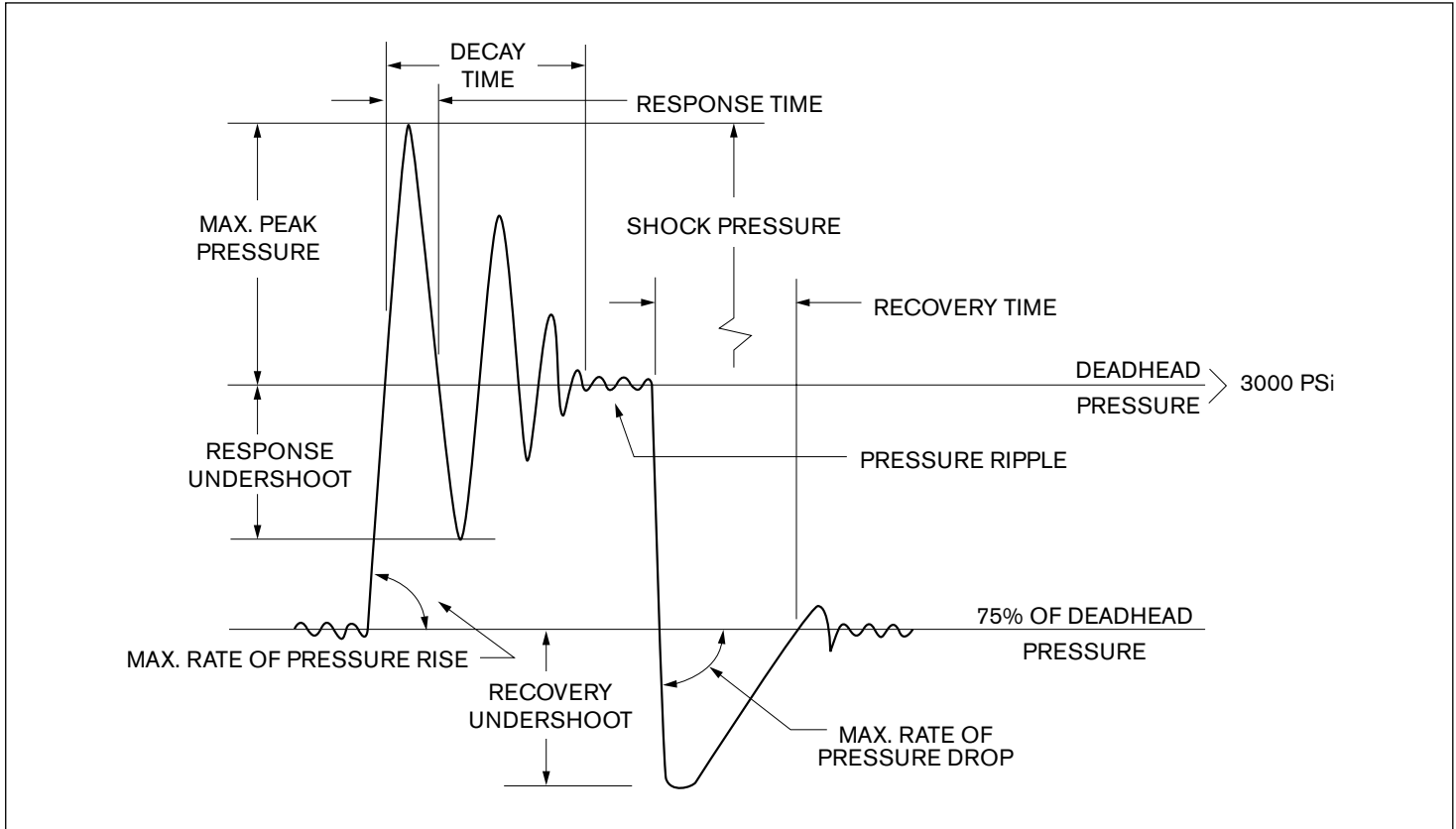


## Vane tip orientation

Orient vanes as shown when servicing VPV Whisper™ Pumps.



**Reaction characteristics and shock clipper function**





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