

Variable Displacement Axial Piston Pump Preferences for Open Loop Hydraulic Systems

2. AXIAL PISTON PUMPS

2.1 MEDIUM PRESSURE SERIES



Series	Geometric Displacement [cm ³ /rev]	Operating Pressure		Maximum Shaft Speed [min ⁻¹]
		Rated [bar]	Peak [bar]	
PPV100-16	16.3	280	350	3600
PPV100-37	37.1			2700
PPV100-56	56.3			2500
PPV100-71	70.7			2300
PPV100-100	100.5			2100
PPV100-145	145.2			1800
PPV100-180	180.7			1800

2.2 LIGHT HEAVY DUTY SERIES



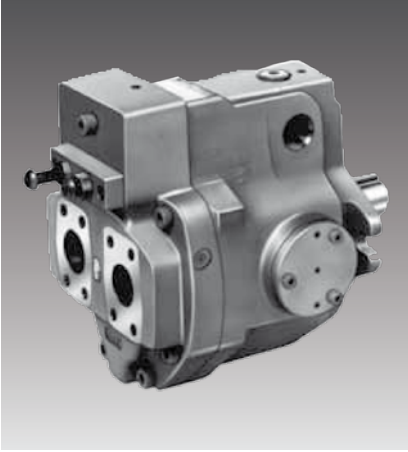
Series	Geometric Displacement [cm ³ /rev]	Operating Pressure		Maximum Shaft Speed [min ⁻¹]
		Rated [bar]	Peak [bar]	
PPV101-45	45.0	320	350	2700
PPV101-80	80.0			2400
PPV101-112	112.0			2200
PPV101-140	140.0			2200
PPV101-200	200.0	350	400	1900

2.3 HEAVY DUTY SERIES



Series	Geometric Displacement [cm ³ /rev]	Operating Pressure		Maximum Shaft Speed [min ⁻¹]
		Rated [bar]	Peak [bar]	
PPV102-63	63.0	350	400	1800
PPV102-112	112.0			1800
PPV102-180	180.0			1800
PPV102-280	280.0			1500
PPV102-360	2x 180.0			1800
PPV102-560	2x 280.0			1500

2.4 LIGHT MEDIUM PRESSURE SERIES



Series	Geometric Displacement [cm ³ /rev]	Operating Pressure		Maximum Shaft Speed [min ⁻¹]		
		Rated [bar]	Peak [bar]			
PPV103-10	10.0	160	210	1800		
PPV103-16	15.8			1800		
PPV103-22	22.2		160	1800		
PPV103-37	36.9		210	1800		
PPV103-56	56.2			1800		
PPV103-70	70.0	250	280	1800		
PPV103-90	91.0			1800		
PPV103-145	145.0			250	280	1800
						1800



2.1 MEDIUM PRESSURE SERIES CONTENT

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ORDERING CODE

2.1.1 Pressure Compensator

PPV100 - 16 - F R 01 K K - 10 80 - XXXX

Axial Piston Pump
Medium Pressure Series

Size

16	16.3 cm ³ /rev
37	37.1 cm ³ /rev
56	56.3 cm ³ /rev
71	70.7 cm ³ /rev
100	100.5 cm ³ /rev
145	145.2 cm ³ /rev
180	180.7 cm ³ /rev

Mounting Type

F Flange Mounting

Shaft Rotation

R Right Hand (clockwise)
viewed from shaft end

Control Type

01 Pressure Compensator

Setting Range

K 50 - 350 bar

Shaft Extension

K Keyed Shaft

Design Number

10 Design Number

Design Standard

None Japanese Standard "JIS"
80 European Design Standard
950 North American Standard (Size 16 / 37 / 56 / 71 only)
954 North American Standard (Size 100 / 145 / 180 only)

Modification Number

XXXX Determined by Manufacturer

2.1.2 Constant Power Control

PPV100 - 37 - F R 09 - 11 A 4 - K - 10 80 - XXXX

Axial Piston Pump
Medium Pressure Series

Size

37	37.1 cm ³ /rev
56	56.3 cm ³ /rev
71	70.7 cm ³ /rev
100	100.5 cm ³ /rev
145	145.2 cm ³ /rev
180	180.7 cm ³ /rev

Mounting Type

F Flange Mounting

Shaft Rotation

R Right Hand (clockwise)
viewed from shaft end

Control Type

09 Constant Power (Torque) Control

Power Setting

5.5	5.5 kW
7.5	7.5 kW
11	11 kW
15	15 kW
18.5	18.5 kW
22	22 kW
30	30 kW
37	37 kW
45	45 kW
55	55 kW
75	75 kW
90	90 kW
110	110 kW

Frequent Power

A 50 Hz
B 60 Hz

Electric Motor Pole Number

4 4 Poles
6 6 Poles

Shaft Extension

K Keyed Shaft

Design Number

10 Design Number

Design Standard

None Japanese Standard "JIS"
80 European Design Standard
950 North American Standard (Size 16 / 37 / 56 / 71 only)
954 North American Standard (Size 100 / 145 / 180 only)

Modification Number

XXXX Determined by Manufacturer

2.1.3 Load Sensing Control

PPV100 – 16 – F R 14 K – 10 80 – XXXX

Axial Piston Pump
Medium Pressure Series

Size

16	16.3 cm ³ /rev
37	37.1 cm ³ /rev
56	56.3 cm ³ /rev
71	70.7 cm ³ /rev
100	100.5 cm ³ /rev
145	145.2 cm ³ /rev
180	180.7 cm ³ /rev

Mounting Type
F Flange Mounting

Shaft Rotation
R Right Hand (clockwise)
viewed from shaft end

Control Type
14 Load Sensing Control

Shaft Extension
K Keyed Shaft

Design Number
10 Design Number

Design Standard
None Japanese Standard "JIS"
80 European Design Standard
950 North American Standard (Size 16 / 37 / 56 / 71 only)
954 North American Standard (Size 100 / 145 / 180 only)

Modification Number
XXXX Determined by Manufacturer

TECHNICAL INFORMATION

2.1.4 Specifications

Pump Size			16	37	56	71	100	145	180
Geometric Displacement		[cm ³ /rev]	16.3	37.1	56.3	70.7	100.5	145.2	180.7
Pressure	Rated	[bar]	280						
	Peak		350						
Shaft Speed	Min.	[rpm]	600						
	Max.		3600	2700	2500	2300	2100	1800	1800
Power (1500 rpm, 280 bar)		[kW]	13	29	43	54	77	112	139
Torque (280 bar)		[Nm]	73	165	251	315	448	647	805
Pre-fill Oil Volume		[cm ³]	400	700	900	1300	1700	2400	3200
Approx. Mass Pressure Compensator		[kg]	14.5	19.5	25.7	35.0	44.6	60.0	70.4
Approx. Mass Power Control			–	23.0	29.0	38.0	48.0	63.0	74.2
Approx. Mass Load Sensing			17.5	22.5	28.7	38.0	47.6	63.0	73.4

2.1.5 Hydraulic Fluids

The Pump series is prepared for

HL Petroleum Base Oil
(Normal Mineral Oil)
and

HLP R&O type hydraulic oils
(Rust and Oxidation inhibitor).

2.1.6 Viscosity Range

Normal operating viscosity:
20 - 400 cSt (mm²/s)

2.1.7 Temperature Range

0 up to +60 °C

Note:

The highest fluid temperature will be at the drain port of the pump, up to 20 °C higher than in the reservoir.

2.1.8 Specification and Design Numbers for Special Fluids

Type of Fluid	Operating Pressure [bar]		Shaft Speed [rpm]		Temperature Range [°C]	Viscosity Range [cSt]	Design Standard* ²
	Rated	Intermittent	Rated	Max.			
Water Glycols Water > 35 % Polymer dilution (HFC)	210	210	1200	1800* ¹	0 - 50	20 - 200	30
Phosphate Ester synthetic (HFD-R)	210	210	1200	1800* ¹	0 - 60		06
Polyol Ester synthetic (HFD-U)	210	250	1200	1800	0 - 60		450

*1 – At 1500 rpm or more shaft speed, an overhead reservoir is required.

*2 – Use field "Design Standard" in Ordering Codes 2.1.1, 2.1.2, 2.1.3.

2.1.9 Seals

The pump series is equipped with Fluorocarbon (FKM) shaft seals and Nitrile (NBR) O-Rings as standard.

If a special hydraulic fluid is used, the seal material may be changed.

2.1.10 Filtration

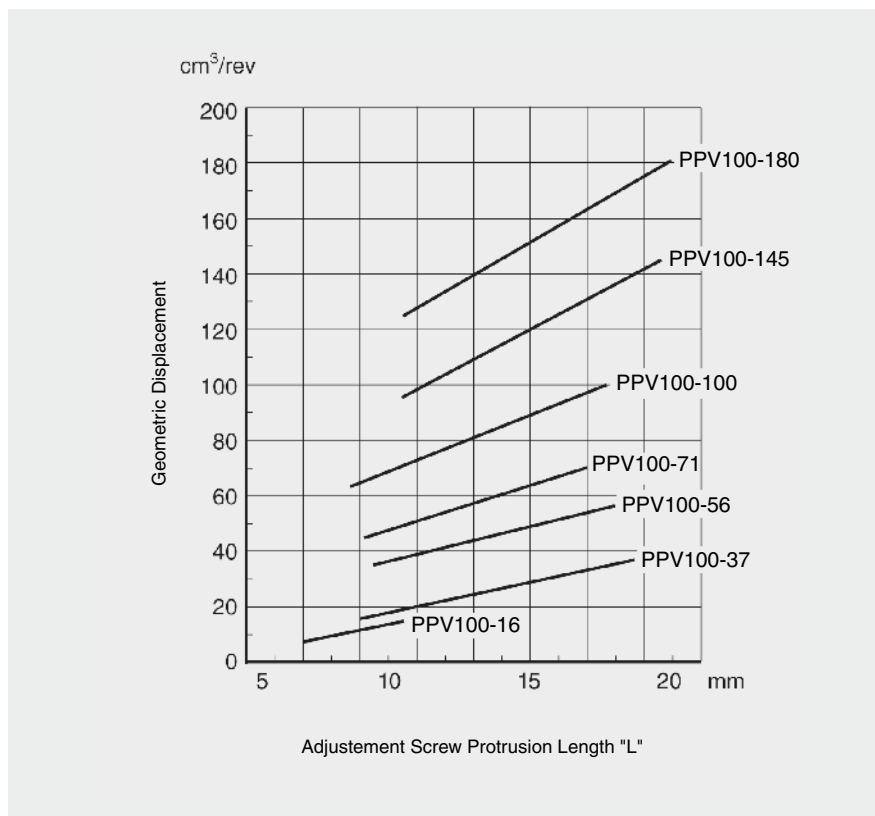
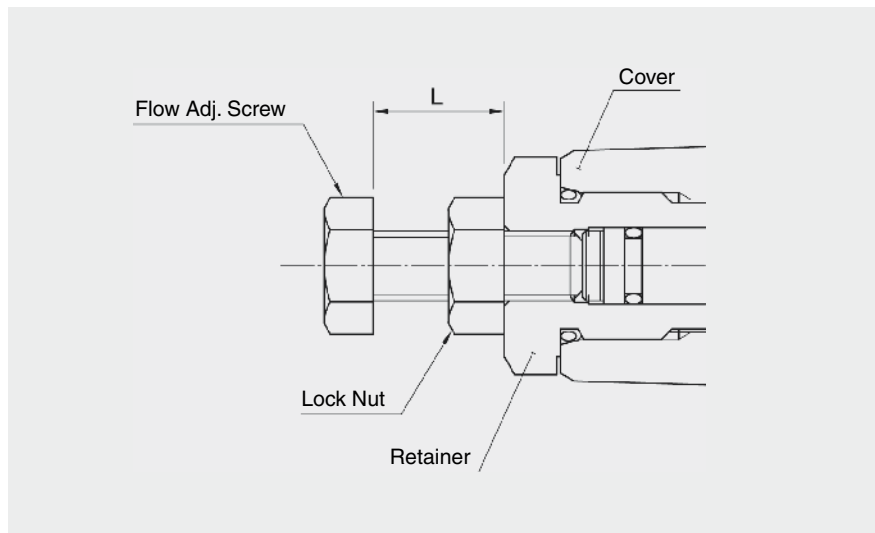
For maximum pump and system component life time, the system should be protected from contamination by effective filtration.

Maintain the degree of contamination within NAS 1638 Grade 10 (21/19/16 ISO 4406:1999) or better.

2.1.11 Adjustments

The units are set to a minimum of discharge pressure and maximum delivery volume setting.
Adjust pressure and volume setting to meet your system requirements.

Pump Size	Volume		Pressure
	Volume Adjustment Screw Sensitivity	Minimal Adjustable Displacement	Pressure Adjustment Screw Sensitivity
	[cm ³ per turn]	[cm ³ /rev]	[bar per turn]
PPV100-16	1.4	8	55
PPV100-37	3.3	16	
PPV100-56	4.2	35	
PPV100-71	4.9	45	63
PPV100-100	6.2	63	
PPV100-145	9.4	95	
PPV100-180	10.3	125	57

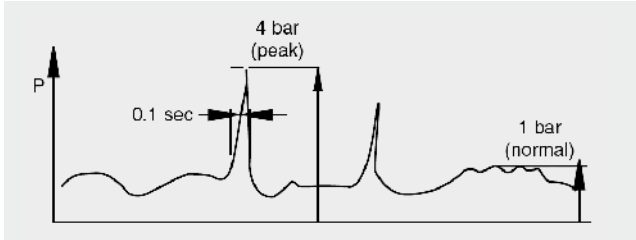


2.1.12 Installation Notes

The pump should be mounted horizontally with the case drain piping initially rising above the level of the pump before continuing to the tank as shown in the illustration below. Do not connect the drain line to the suction line.

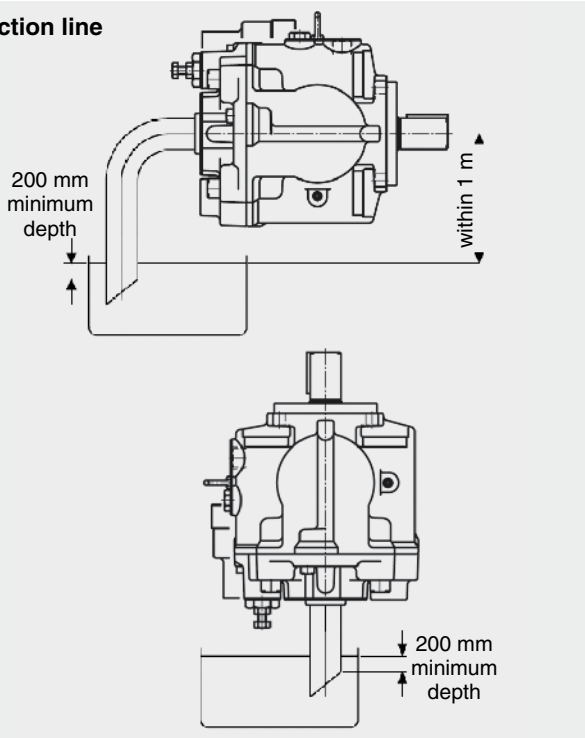
The uppermost drain port should be used and the drain piping should be equal or larger in size than the drain port to minimise pressure in the pump case.

The pump case pressure should not exceed 1 bar as shown in the illustration below (peak pressure should never exceed 4 bar).

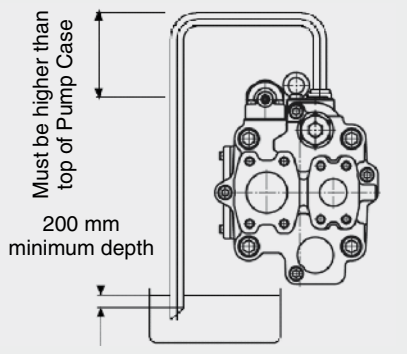


Mounting the pump above the tank

Suction line



Drain line



Cautions:

- The distance between suction and drain pipes must be 200 mm minimum.
- Suction and drain pipes must be immersed by 200 mm minimum from the lowest oil level under operating conditions.
- Height from the oil level to the centre of the shaft must be within 1 m.
- The oil in the pump case must be refilled when the pump has not been operated for one month or longer.

Mounting the pump vertically

For applications requiring vertical installation (shaft up) please connect piping as shown in the illustration below.

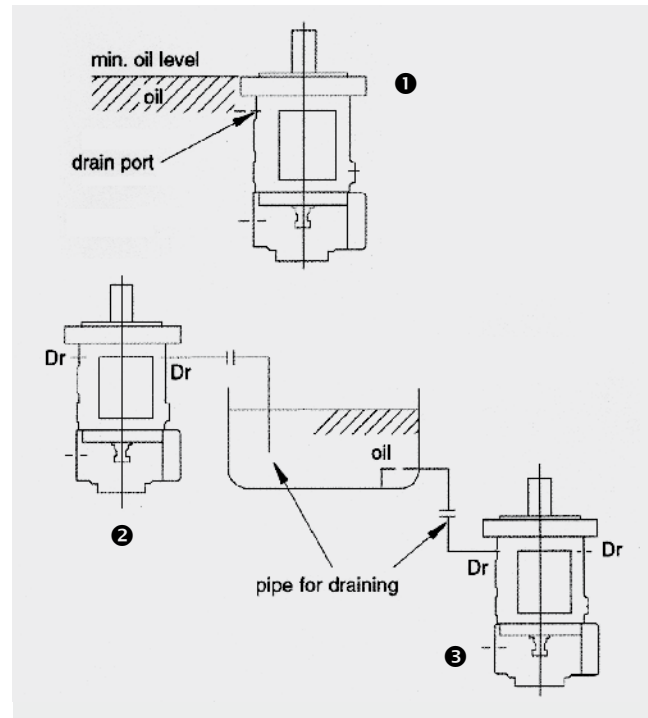
The oil level in the tank should be higher than the pump-mounting flange as shown in illustration ① below.

If the oil level in the tank is lower than the pump mounting flange, than the drain line should be installed as shown in illustration ②.

When installing the pump in the tank and submerged in the oil, open the drain ports to provide adequate lubrication to the internal components.

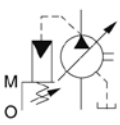
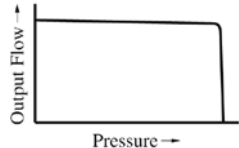
When installing the pump outside the tank run piping for the drain to the tank (see illustration ③).

If the drain line rises above the level of oil fill the lines with oil before operation.

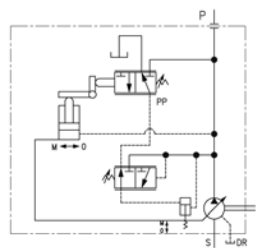
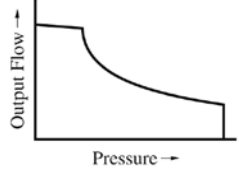


CONTROL OPTIONS

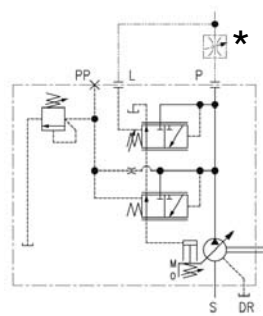
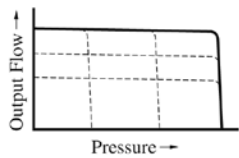
2.1.13 Pressure Compensator

Control Type		Graphic Symbols	Performance Characteristics	Explanation
01	Pressure Compensator Type			<ul style="list-style-type: none"> When the system pressure increases and comes close to the preset cut-off pressure, the pump flow decreases automatically while maintaining the set pressure as it is.

2.1.14 Power (Torque) Compensator

Control Type		Graphic Symbols	Performance Characteristics	Explanation
09	Constant (Torque) Control Type			<ul style="list-style-type: none"> This type of control can control the pump input power according to the motor output. When the system increases, the pump swash plate tilt angle (output flow) decreases, in correspondence to predetermined shaft input values. This type of control can enable one pump to act as two pumps (low-pressure and large-flow / high-pressure and small-flow). Therefore, the motor capacity can be reduced.

2.1.15 Load Sensing Compensator

Control Type		Graphic Symbols	Performance Characteristics	Explanation
14	Load Sensing Type			<ul style="list-style-type: none"> This is an energy-saving type control which maintains the pump flow and load pressure at the absolute minimum necessary level to operate the actuator. This type of control automatically regulates the output flow so that the inlet-outlet differential pressure of the flow control valve at the output side is constant. To do so, the load pressure must be introduced to the load sensing port "L" of the pump through the external piping. This type of control provides the remote control of the full cut-off pressure by connecting a remote control relief valve to the pilot port "PP". Standard differential pressure setting is 15 bar. Differential pressure adjustment range is 10 to 30 bar.

*A flow control valve is not included with the pump. Install the valve separately.

2.1.16 Availability of Control Type

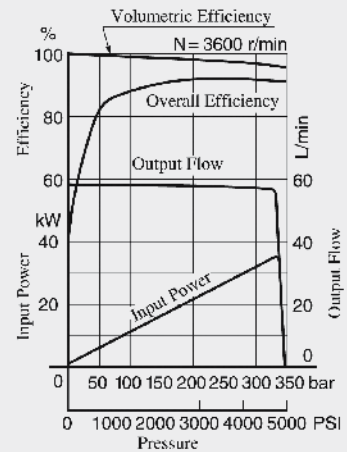
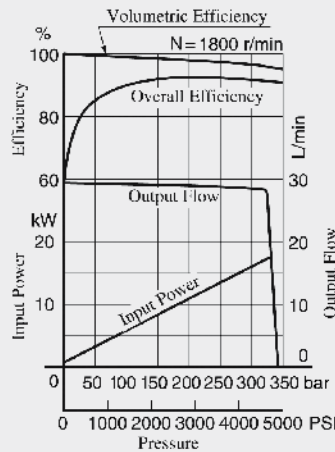
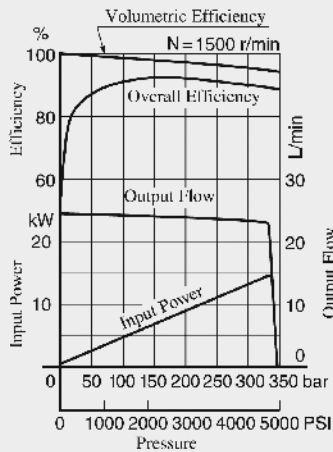
Model Numbers	Geometric Displacement cm ³ /rev	01 Pressure Compensator Type	09 Constant Power (Torque) Control Type	14 Load Sensing Type
PPV100-16	16.3	●	✕	●
PPV100-37	37.1	●	●	●
PPV100-56	56.3	●	●	●
PPV100-71	70.7	●	●	●
PPV100-100	100.5	●	●	●
PPV100-145	145.2	●	●	●
PPV100-180	180.7	●	●	●

Model Numbers	Input Power Setting kW																							
	Pole Number of Electric Motor: 4P											Pole Number of Electric Motor: 6P												
		11	15	18.5	22	30	37	45	55	75	90	110	5.5	7.5	11	15	18.5	22	30	37	45	55	75	
PPV100-37	50 Hz	●	●	●									●	●	●									
	60 Hz	●	●	●	●									●	●	●								
PPV100-56	50 Hz		●	●	●	●								●	●	●	●							
	60 Hz			●	●	●	●								●	●	●	●						
PPV100-71	50 Hz			●	●	●	●								●	●	●	●						
	60 Hz				●	●	●	●								●	●	●	●					
PPV100-100	50 Hz				●	●	●	●	●							●	●	●	●					
	60 Hz					●	●	●	●							●	●	●	●	●	●			
PPV100-145	50 Hz					●	●	●	●	●						●	●	●	●	●	●	●	●	●
	60 Hz						●	●	●	●	●						●	●	●	●	●	●	●	●
PPV100-180	50 Hz						●	●	●	●	●						●	●	●	●	●	●	●	●
	60 Hz							●	●	●	●	●						●	●	●	●	●	●	●

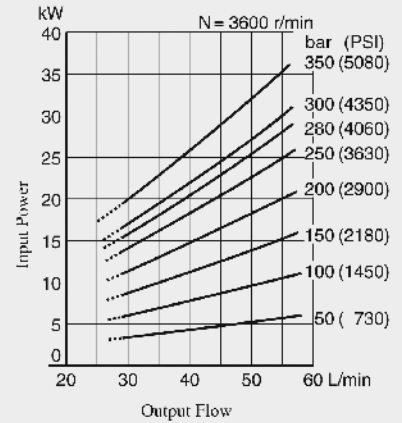
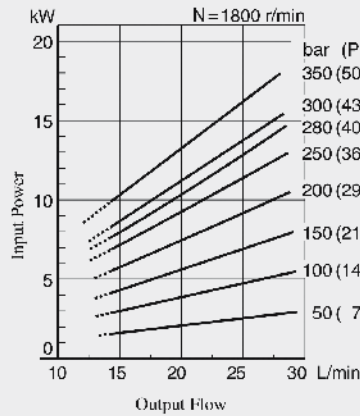
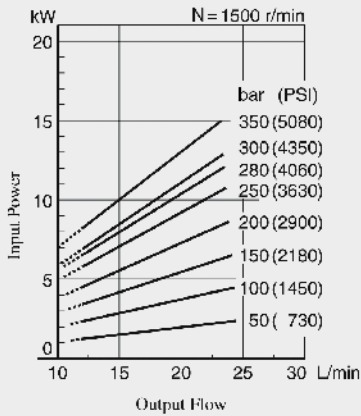
PERFORMANCE DATA

2.1.17 PPV100-16

● Performance Characteristic Curve

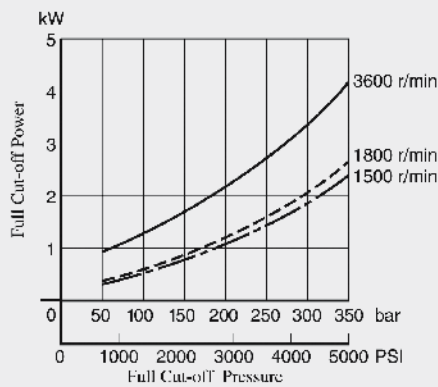


● Input Power

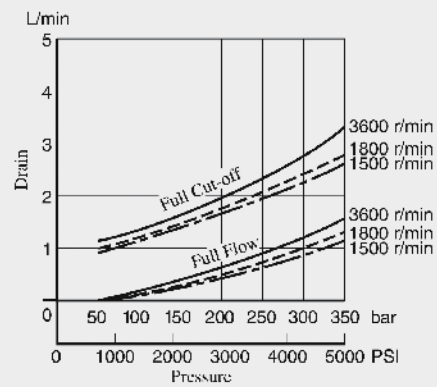


Note) The dotted line in the graph indicates less than minimum adjustable flow.

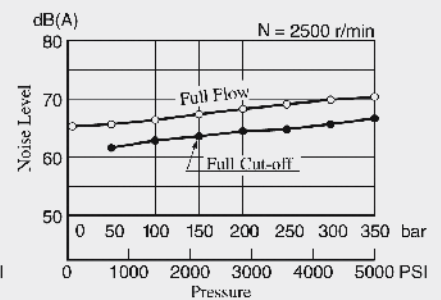
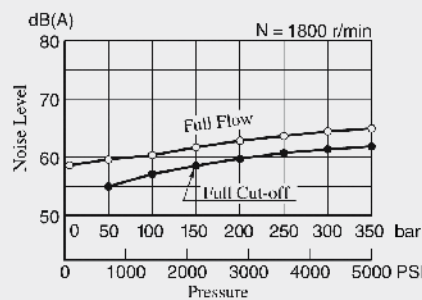
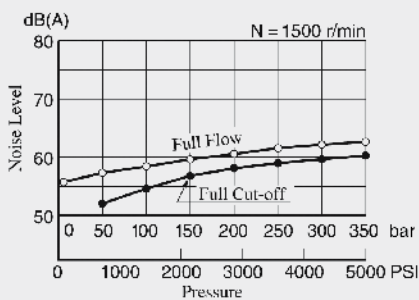
● Full Cut-off Power



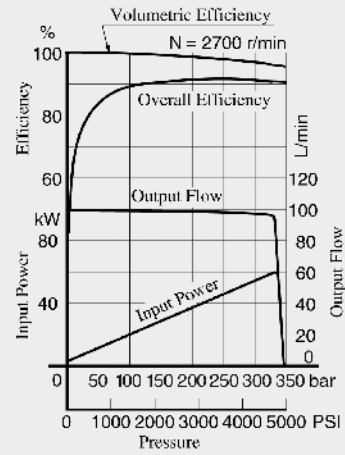
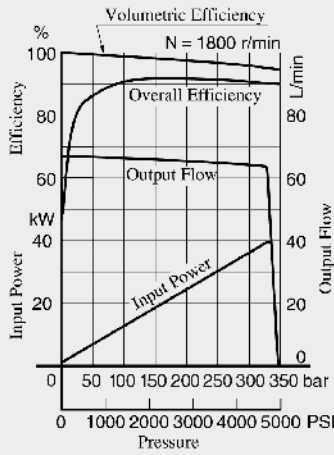
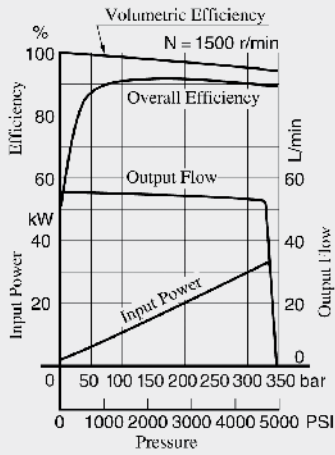
● Drain



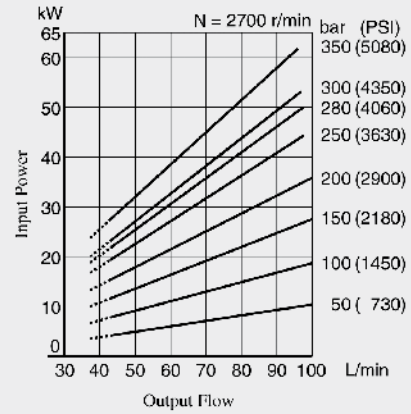
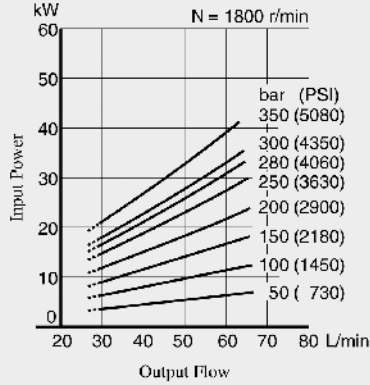
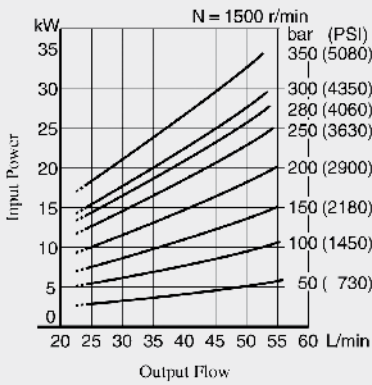
● Noise Level (One metre horizontally away from pump head cover)



● Performance Characteristic Curve

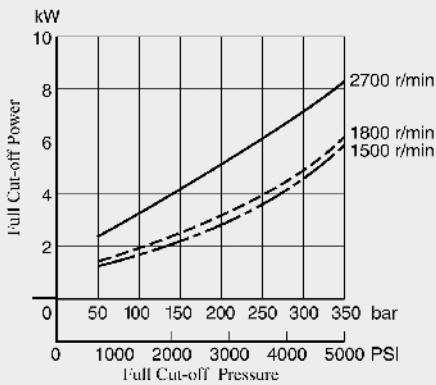


● Input Power

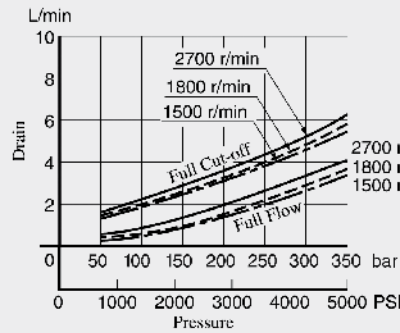


Note) The dotted line in the graph indicates less than minimum adjustable flow.

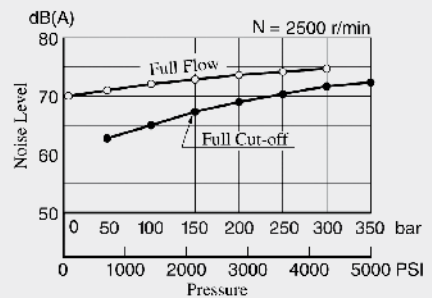
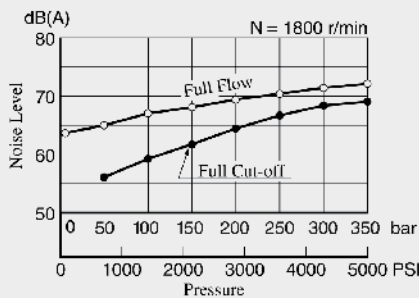
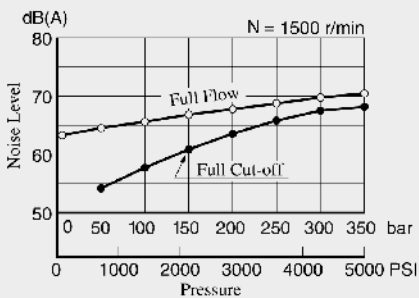
● Full Cut-off Power



● Drain

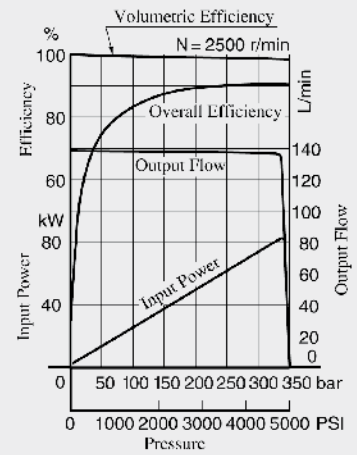
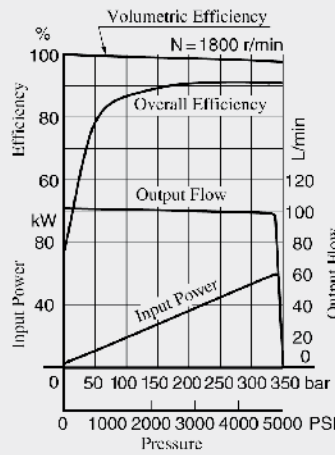
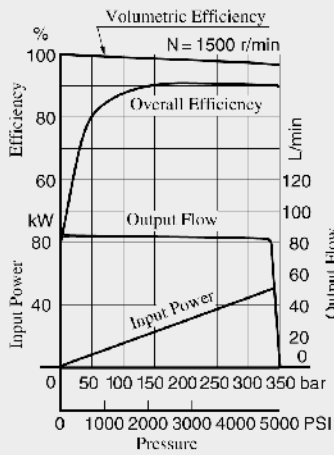


● Noise Level (One metre horizontally away from pump head cover)

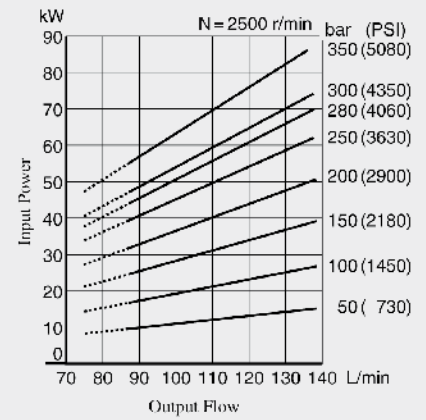
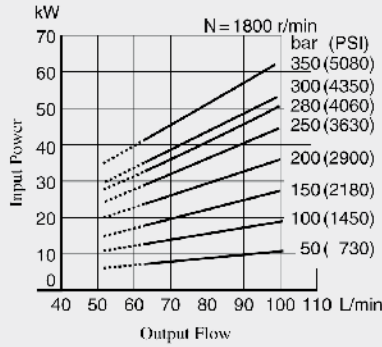
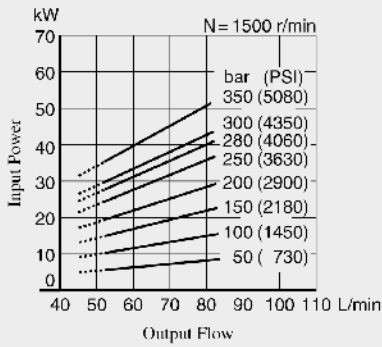


2.1.19 PPV100-56

● Performance Characteristic Curve

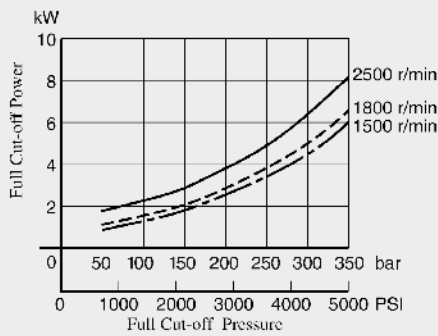


● Input Power

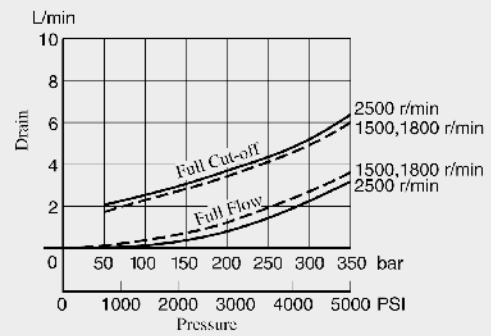


Note) The dotted line in the graph indicates less than minimum adjustable flow.

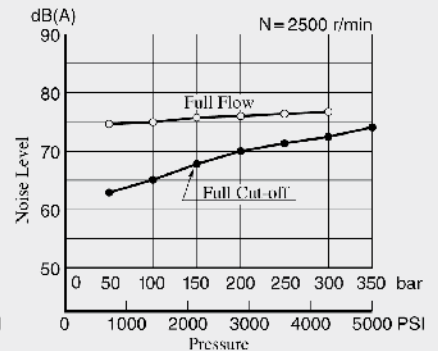
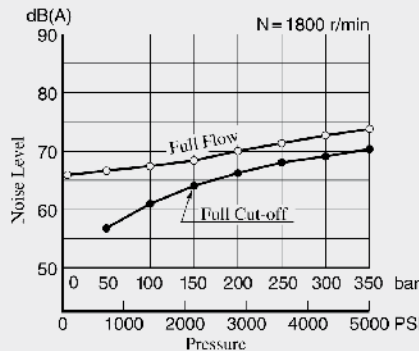
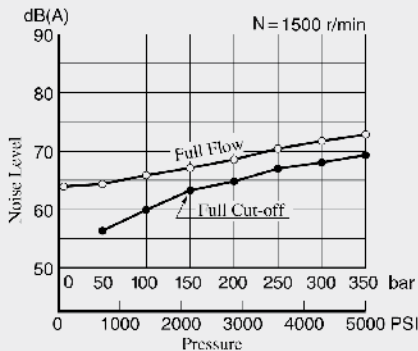
● Full Cut-off Power



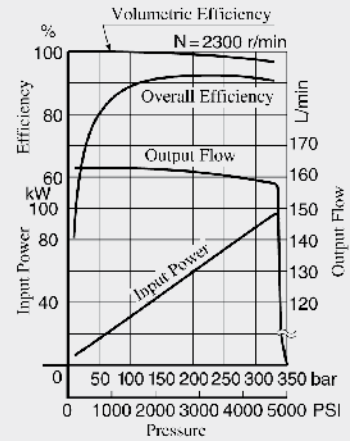
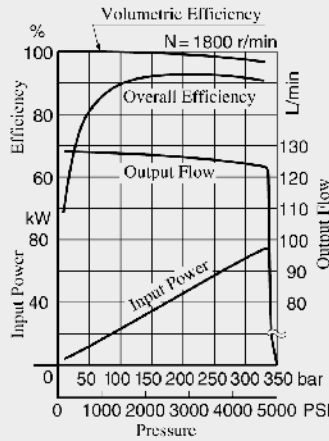
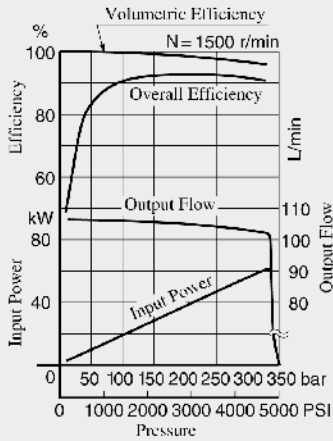
● Drain



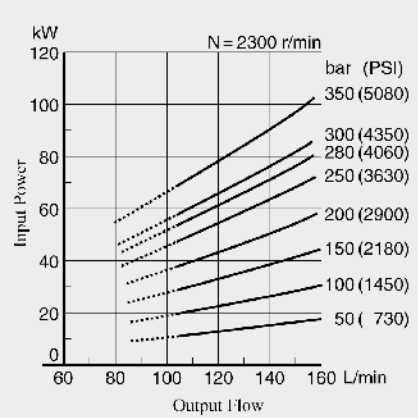
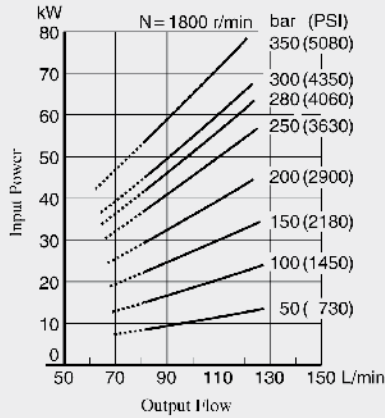
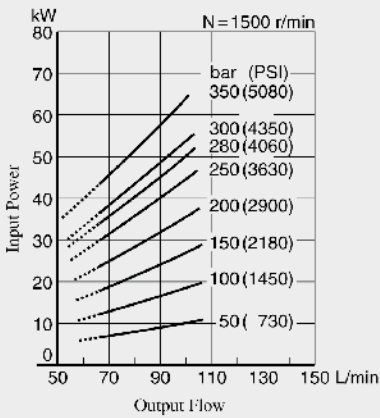
● Noise Level (One metre horizontally away from pump head cover)



● Performance Characteristic Curve

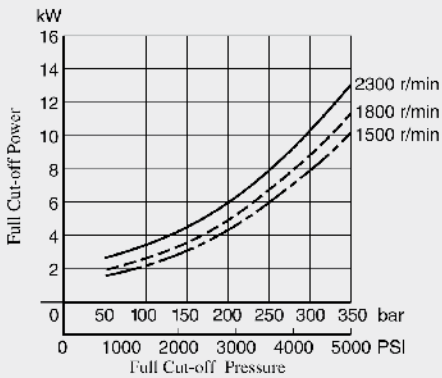


● Input Power

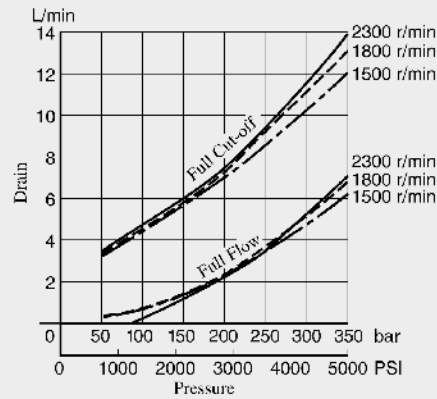


Note) The dotted line in the graph indicates less than minimum adjustable flow.

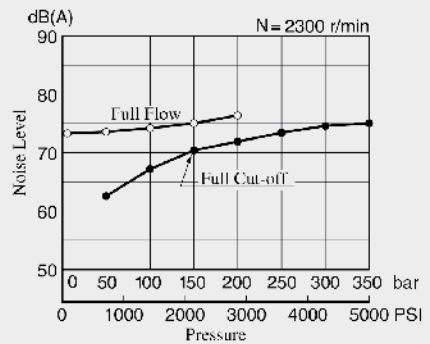
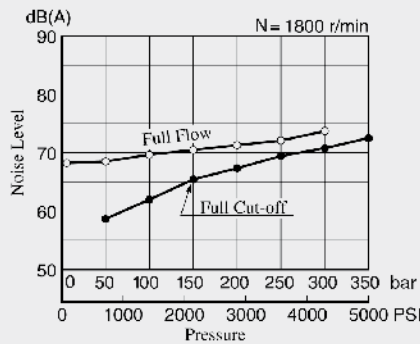
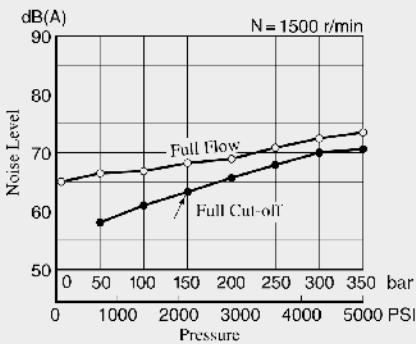
● Full Cut-off Power



● Drain

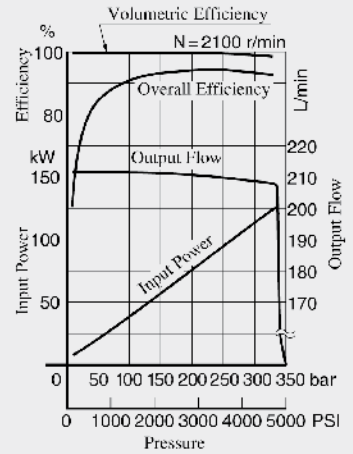
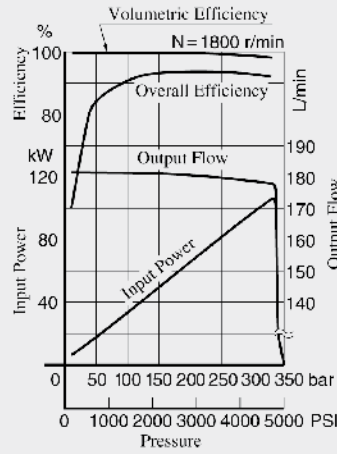
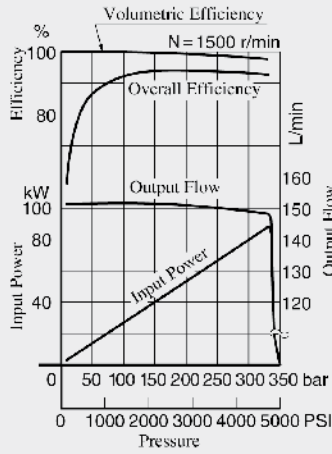


● Noise Level (One metre horizontally away from pump head cover)

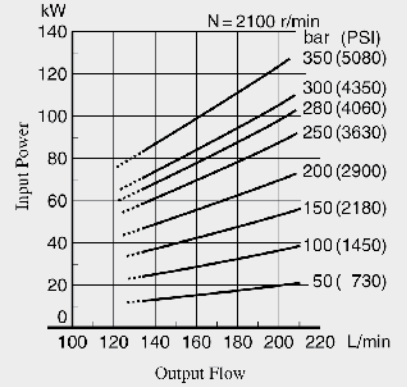
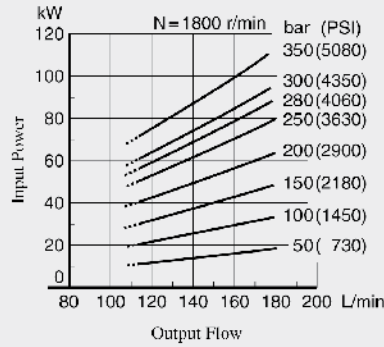
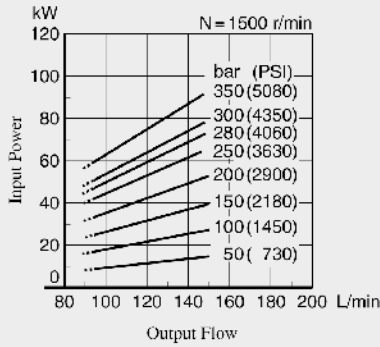


2.1.21 PPV100-100

● Performance Characteristic Curve

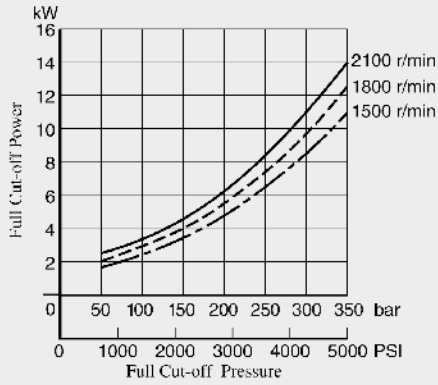


● Input Power

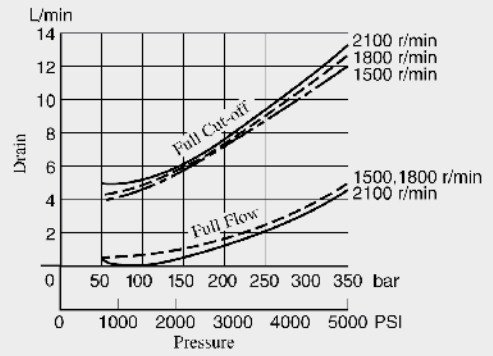


Note) The dotted line in the graph indicates less than minimum adjustable flow.

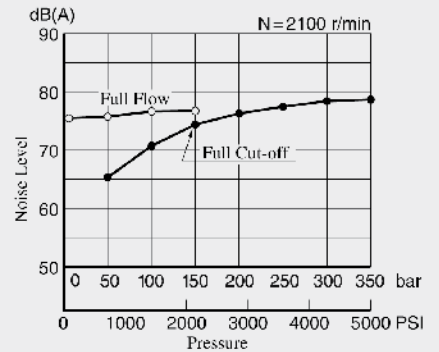
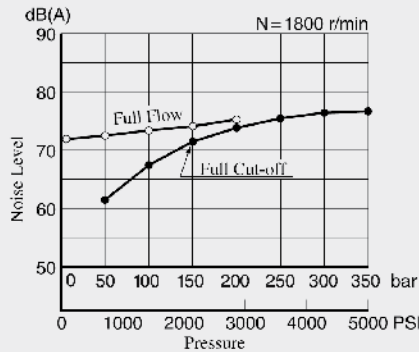
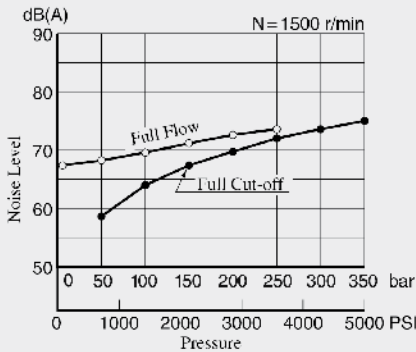
● Full Cut-off Power



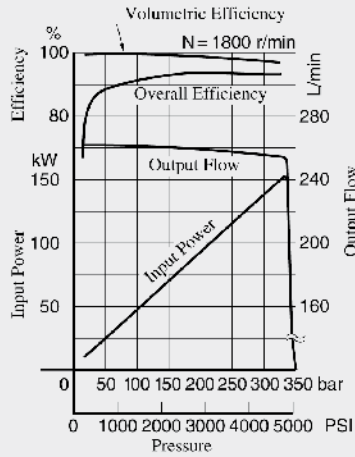
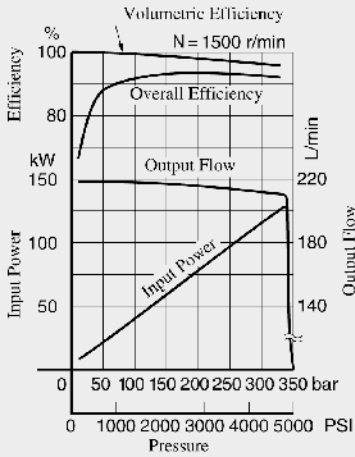
● Drain



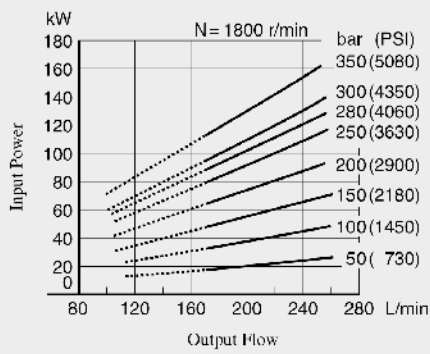
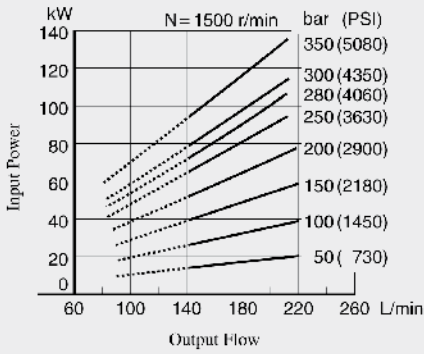
● Noise Level (One metre horizontally away from pump head cover)



● Performance Characteristic Curve

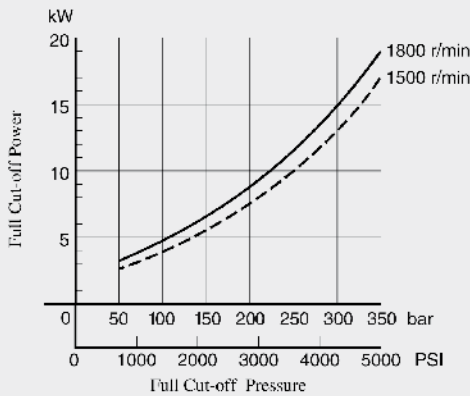


● Input Power

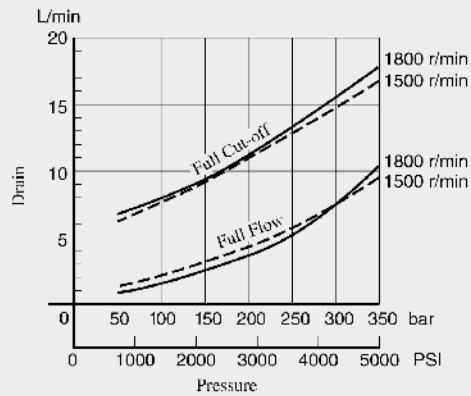


Note) The dotted line in the graph indicates less than minimum adjustable flow.

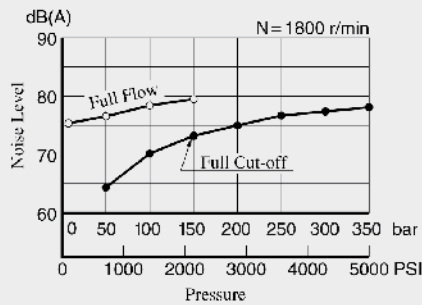
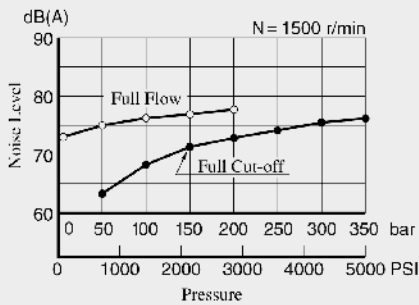
● Full Cut-off Power



● Drain

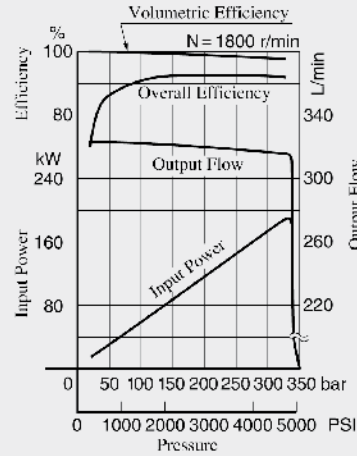
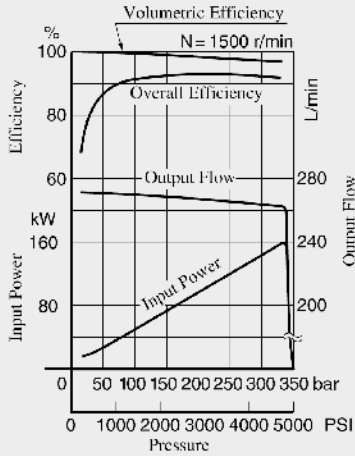


● Noise Level (One metre horizontally away from pump head cover)

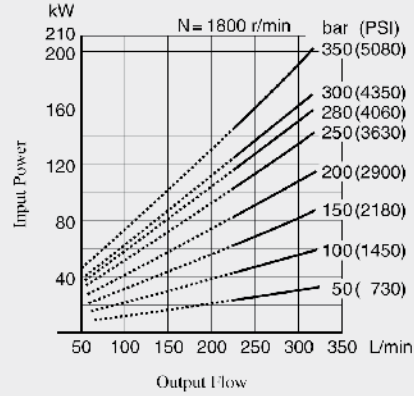
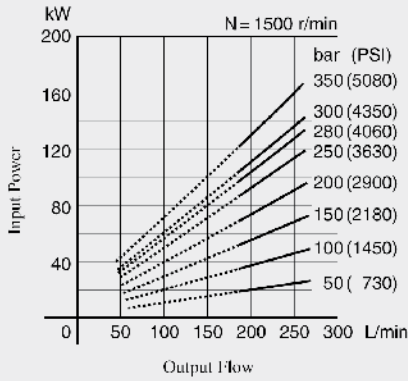


2.1.23 PPV100-180

● Performance Characteristic Curve

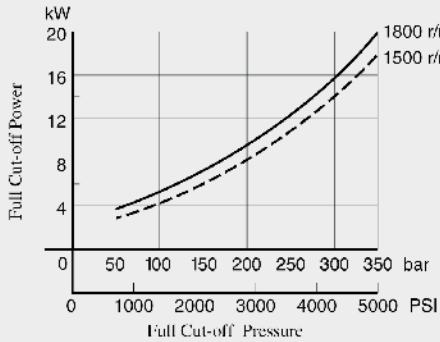


● Input Power

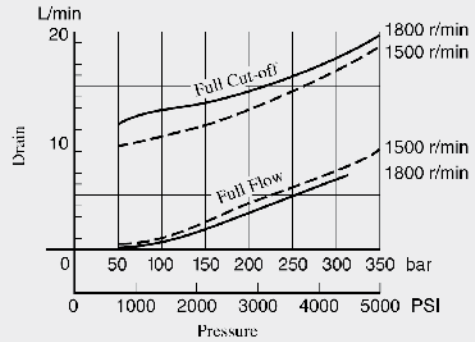


Note) The dotted line in the graph indicates less than minimum adjustable flow.

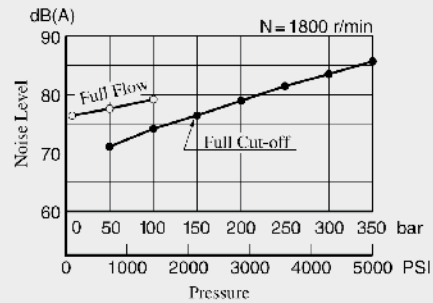
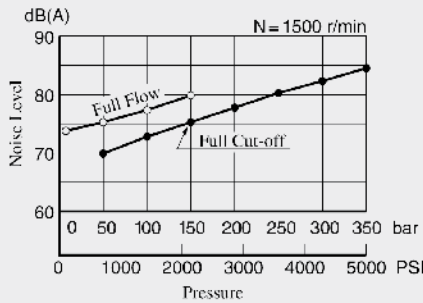
● Full Cut-off Power



● Drain



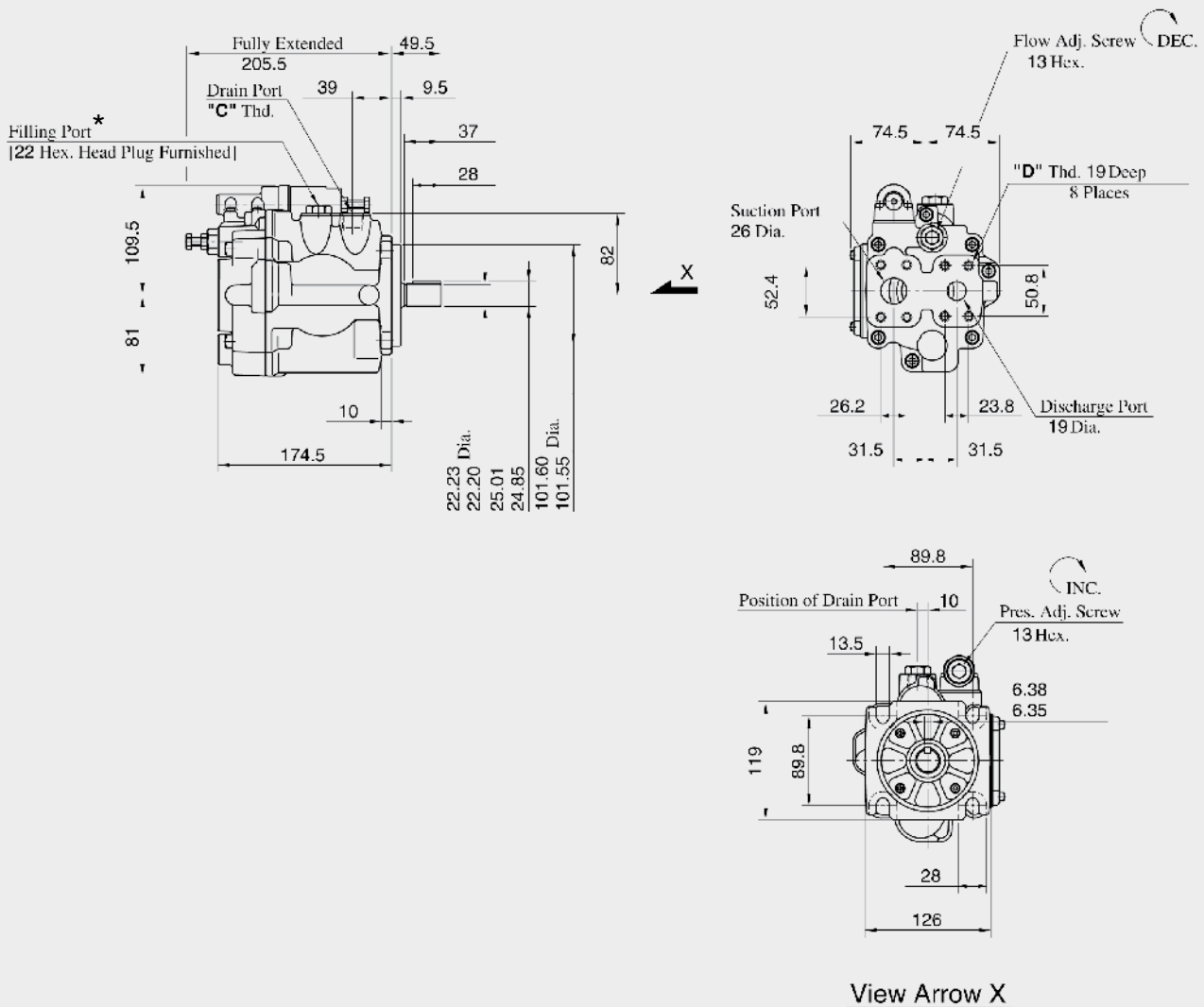
● Noise Level (One metre horizontally away from pump head cover)



DIMENSIONS

2.1.24 PPV100-16

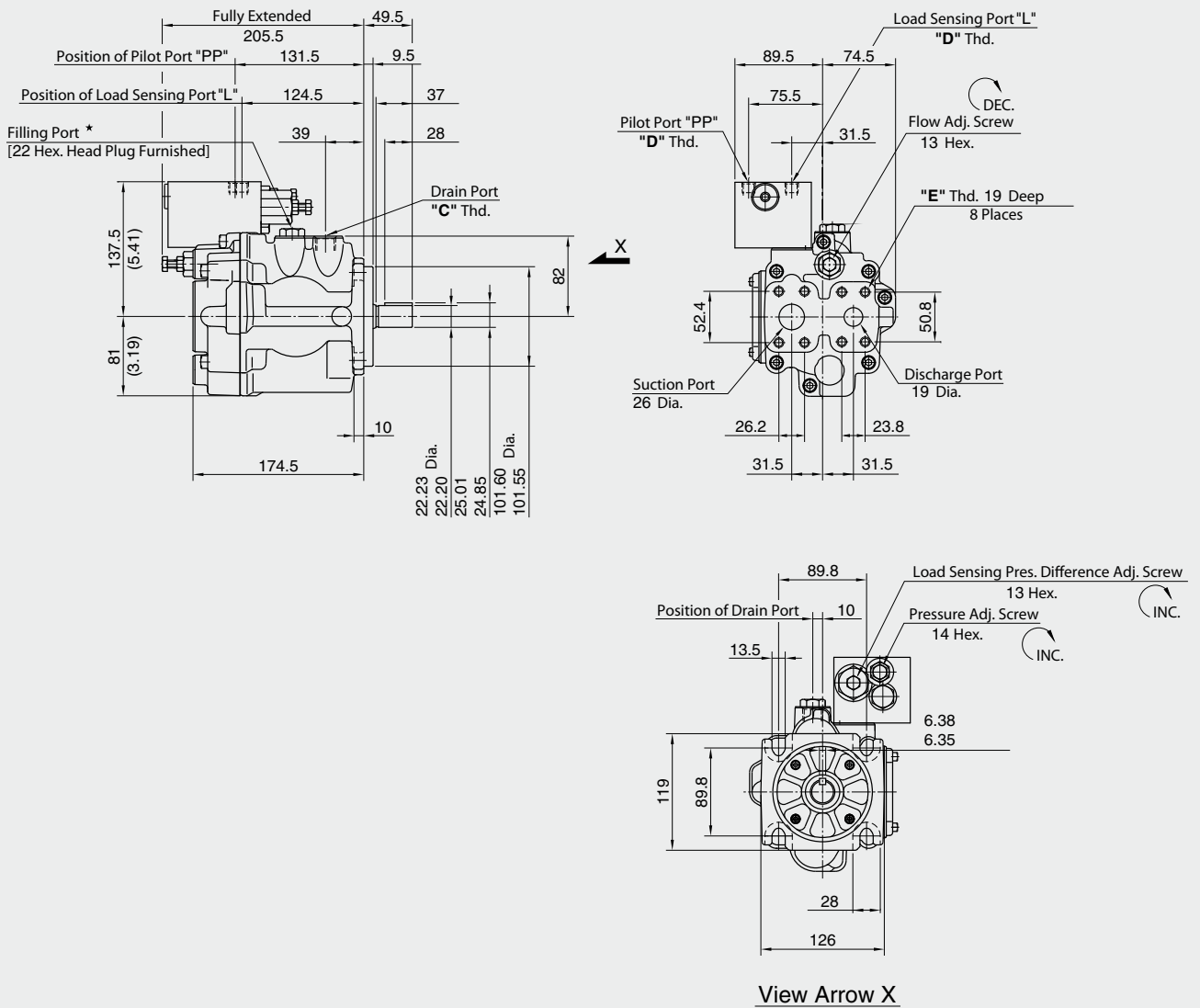
PPV100-16 with Pressure Control 01



* Install the pump so that the "Filling port" is at the top.

Model Numbers	"C" Thread	"D" Thread
PPV100-16 ... 10 Japanese Standard	Rc 1/2	M10
PPV100-16 ... 1080 European Standard	1/2 BSP.F	
PPV100-16 ... 10950 North American Standard	SAE #10	3/8-16 UNC

PPV100-16 with Load Sensing Control 14

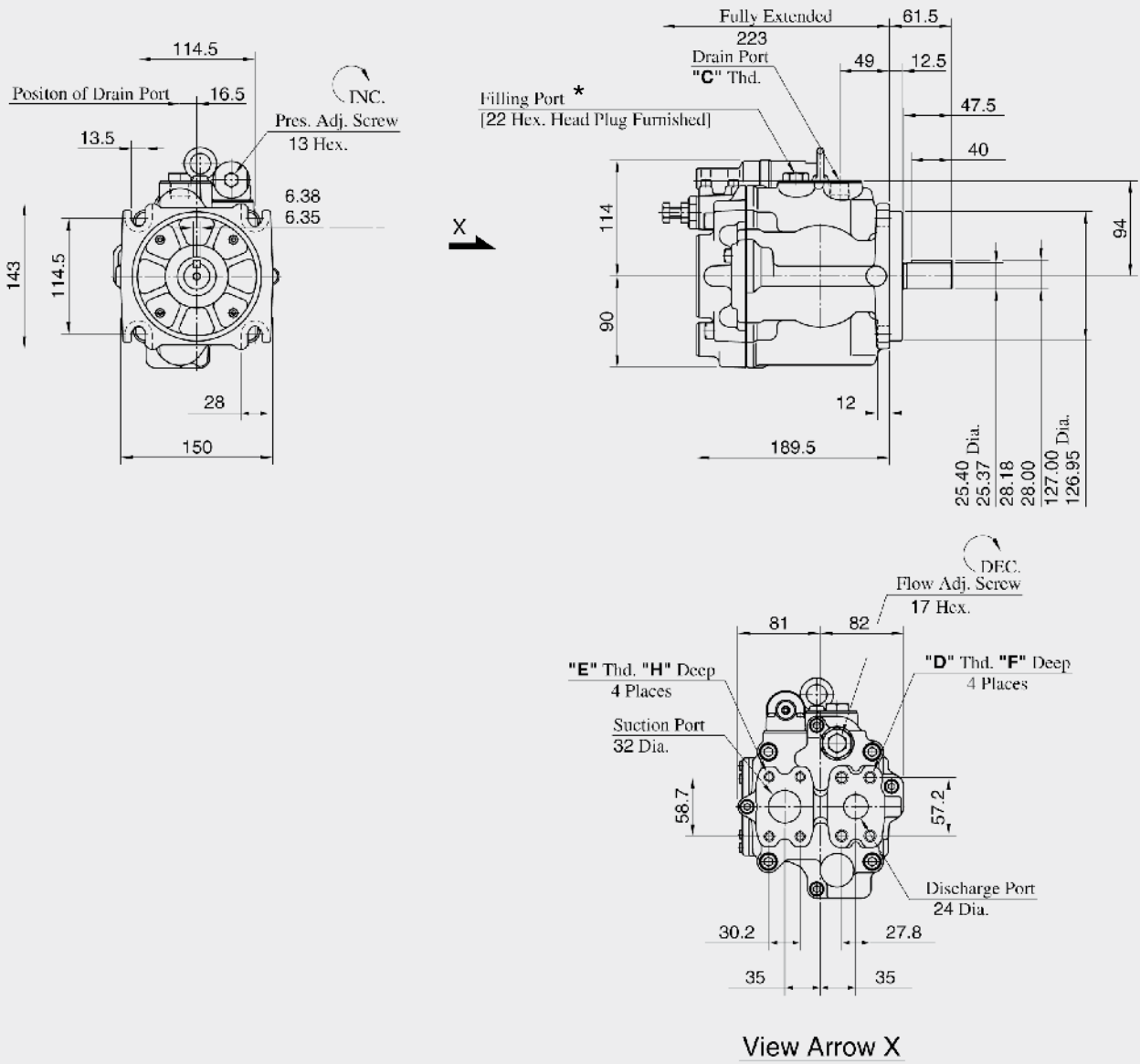


* Install the pump so that the "Filling port" is at the top.

Model Numbers	"C" Thread	"D" Thread	"E" Thread
PPV100-16 ... 10 Japanese Standard	Rc 1/2	Rc 1/4	M10
PPV100-16 ... 1080 European Standard	1/2 BSP.F	1/4 BSP.F	
PPV100-16 ... 10950 North American Standard	SAE #10	SAE #4	3/8-16 UNC

2.1.25 PPV100-37

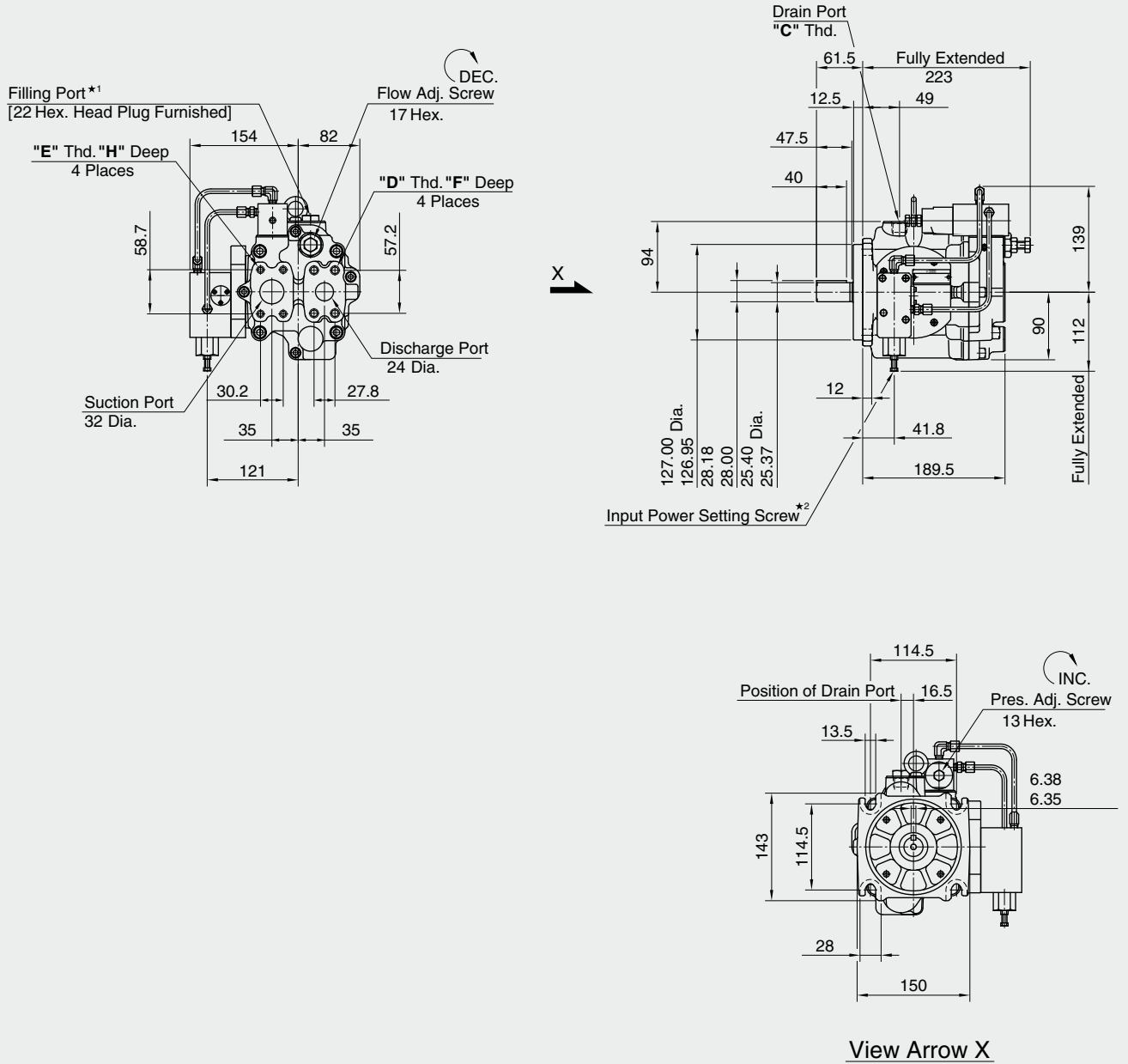
PPV100-37 with Pressure Control 01



* Install the pump so that the "Filling port" is at the top.

Model Numbers	"C" Thread	"D" Thread	"E" Thread	F mm	H mm
PPV100-37... 10 Japanese Standard	Rc 1/2	M12	M10	22	18
PPV100-37 ... 1080 European Standard	1/2 BSP.F				
PPV100-37 ... 10950 North American Standard	SAE #10	7/16-14 UNC	7/16-14 UNC	21	20

PPV100-37 with Constant Power Control 09

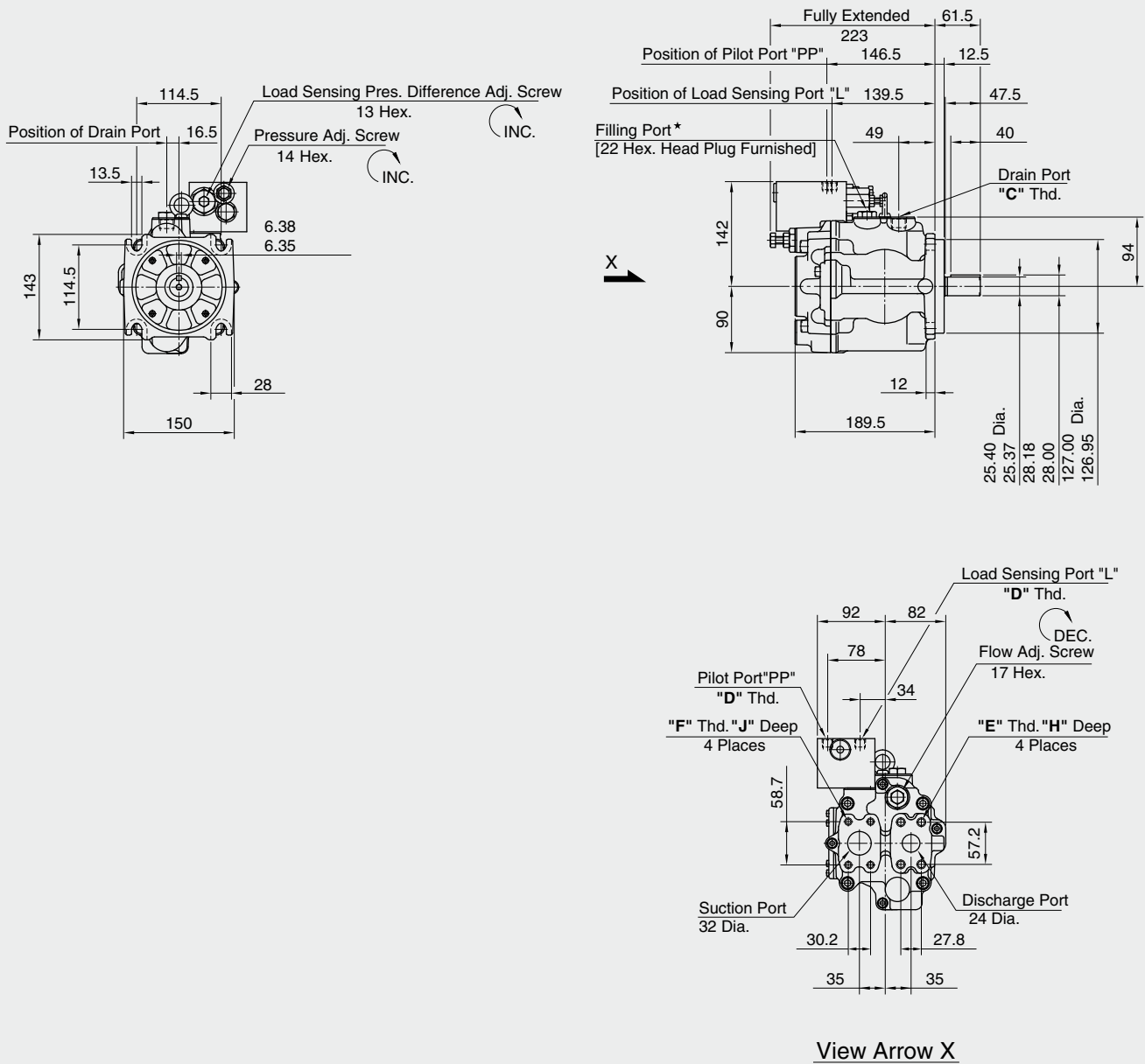


*¹ Install the pump so that the "Filling port" is at the top.

*² Do not touch the screw because it is adjusted at the time of shipment.

Model Numbers	"C" Thread	"D" Thread	"E" Thread	F mm	H mm
PPV100-37... 10 Japanese Standard	Rc 1/2	M12	M10	22	18
PPV100-37 ... 1080 European Standard	1/2 BSP.F				
PPV100-37 ... 10950 North American Standard	SAE #10	7/16-14 UNC	7/16-14 UNC	21	20

PPV100-37 with Load Sensing Control 14

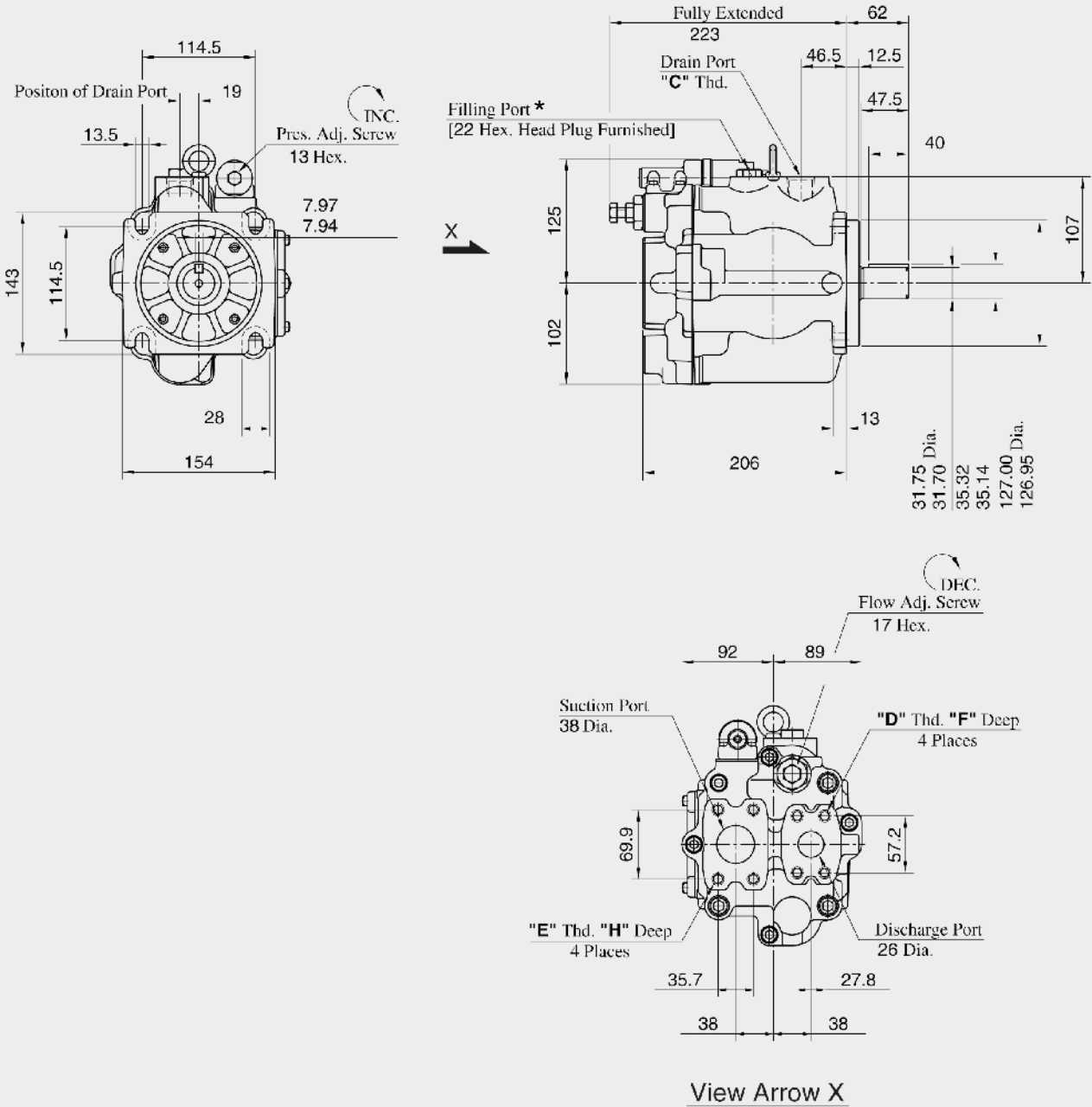


View Arrow X

Model Numbers	"C" Thread	"D" Thread	"E" Thread	"F" Thread	H mm	J mm
PPV100-37... 10 Japanese Standard	Rc 1/2	Rc 1/4	M12	M10	22	18
PPV100-37 ... 1080 European Standard	1/2 BSP.F	1/4 BSP.F				
PPV100-37 ... 10950 North American Standard	SAE #10	SAE #4	7/16-14 UNC	7/16-14 UNC	21	20

2.1.26 PPV100-56

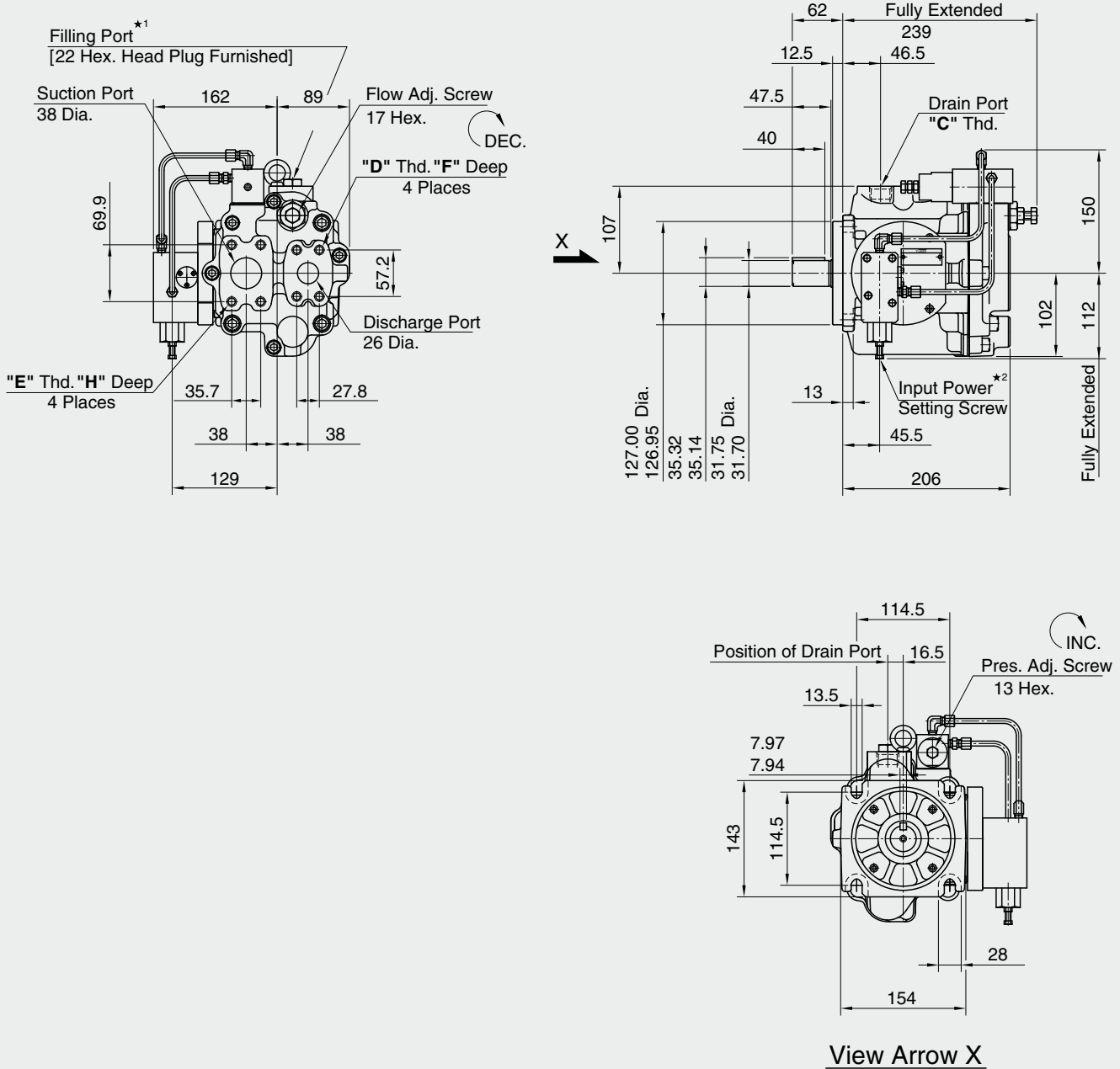
PPV100-56 with Pressure Control 01



* Install the pump so that the "Filling port" is at the top.

Model Numbers	"C" Thread	"D" Thread	"E" Thread	F mm	H mm
PPV100-56 ... 10 Japanese Standard	Rc 3/4	M12	M12	22	22
PPV100-56 ... 1080 European Standard	3/4 BSP.F				
PPV100-56 ... 10950 North American Standard	SAE #12	7/16-14 UNC	1/2-13 UNC	20	21

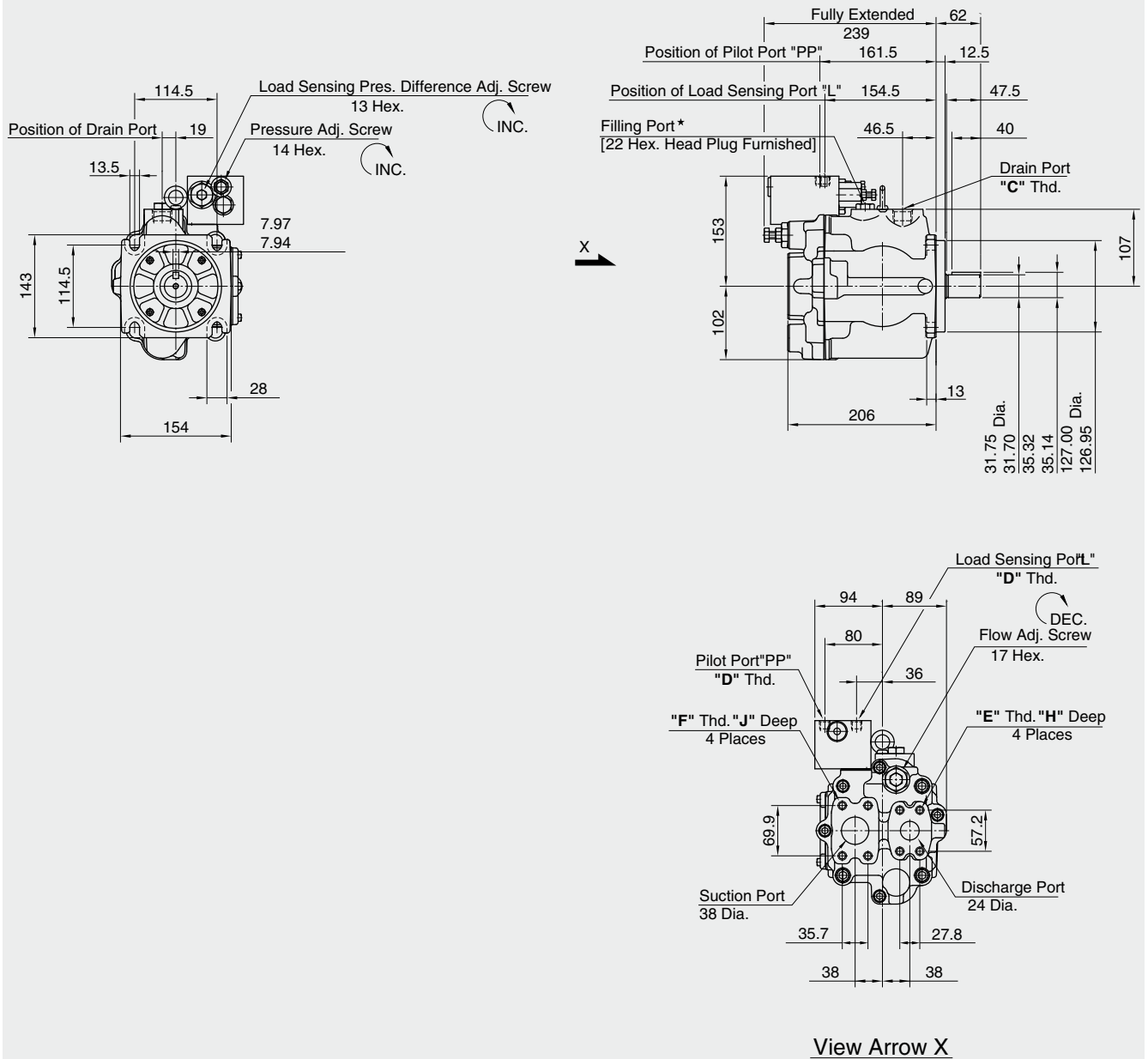
PPV100-56 with Constant Power Control 09



*1 Install the pump so that the "Filling port" is at the top.
 *2 Do not touch the screw because it is adjusted at the time of shipment

Model Numbers	"C" Thread	"D" Thread	"E" Thread	F mm	H mm
PPV100-56 ... 10 Japanese Standard	Rc 3/4	M12	M12	22	22
PPV100-56 ... 1080 European Standard	3/4 BSP.F				
PPV100-56 ... 10950 North American Standard	SAE #12	7/16-14 UNC	1/2-13 UNC	20	21

PPV100-56 with Load Sensing Control 14

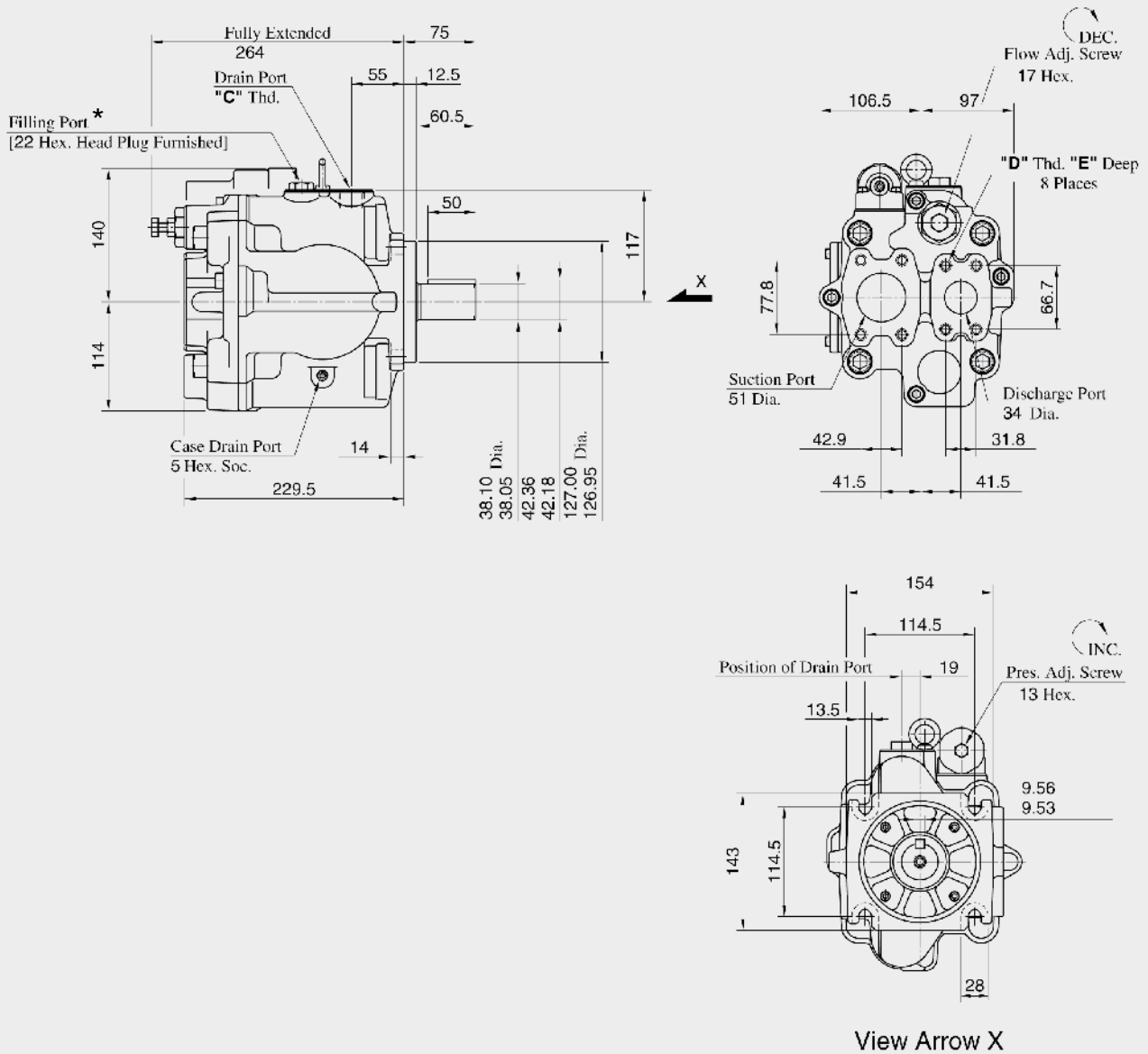


* Install the pump so that the "Filling port" is at the top.

Model Numbers	"C" Thread	"D" Thread	"E" Thread	"F" Thread	H mm	J mm
PPV100-56 ... 10 Japanese Standard	Rc 3/4	Rc 1/4	M12	M12	22	22
PPV100-56 ... 1080 European Standard	3/4 BSP.F	1/4 BSP.F				
PPV100-56 ... 10950 North American Standard	SAE #12	SAE #4	7/16-14 UNC	1/2-13 UNC	20	21

2.1.27 PPV100-71

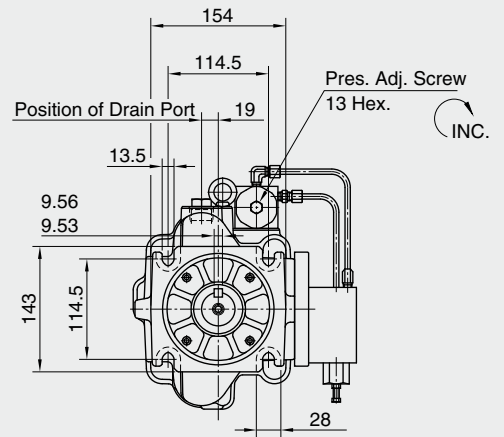
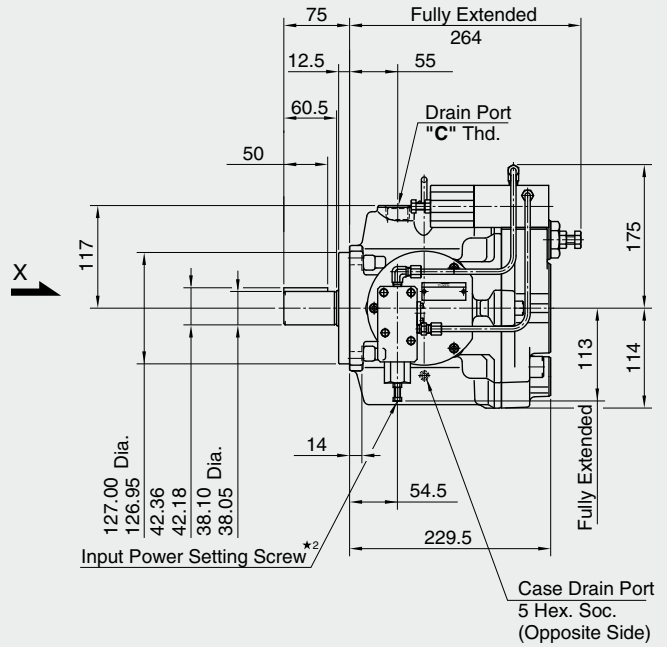
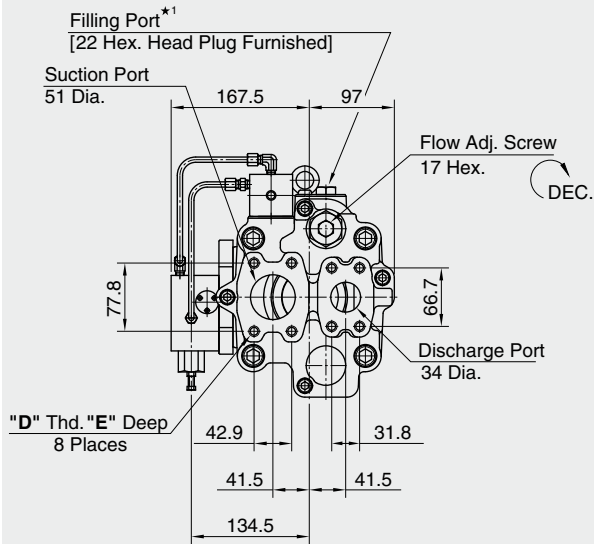
PPV100-71 with Pressure Control 01



* Install the pump so that the "Filling port" is at the top.

Model Numbers	"C" Thread	"D" Thread	E mm
PPV100-71 ... 10 Japanese Standard	Rc 3/4	M12	19
PPV100-71 ... 1080 European Standard	3/4 BSP.F		
PPV100-71 ... 10950 North American Standard	SAE #12	1/2-13 UNC	21

PPV100-71 with Constant Power Control 09

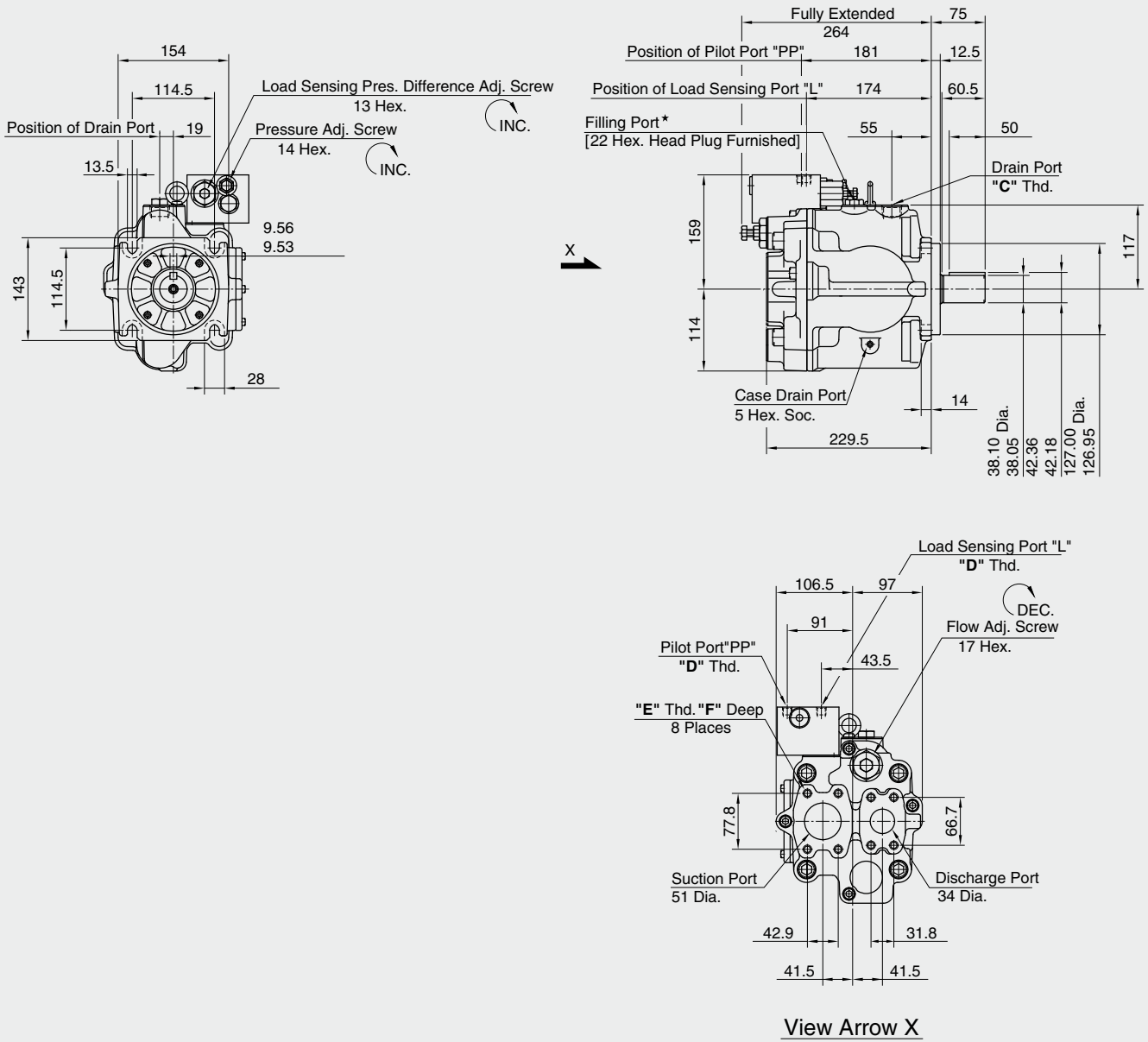


View Arrow X

*1 Install the pump so that the "Filling port" is at the top.
 *2 Do not touch the screw because it is adjusted at the time of shipment.

Model Numbers	"C" Thread	"D" Thread	E mm
PPV100-71 ... 10 Japanese Standard	Rc 3/4	M12	19
PPV100-71 ... 1080 European Standard	3/4 BSP.F		
PPV100-71 ... 10950 North American Standard	SAE #12	1/2-13 UNC	21

PPV100-71 with Load Sensing Control 14

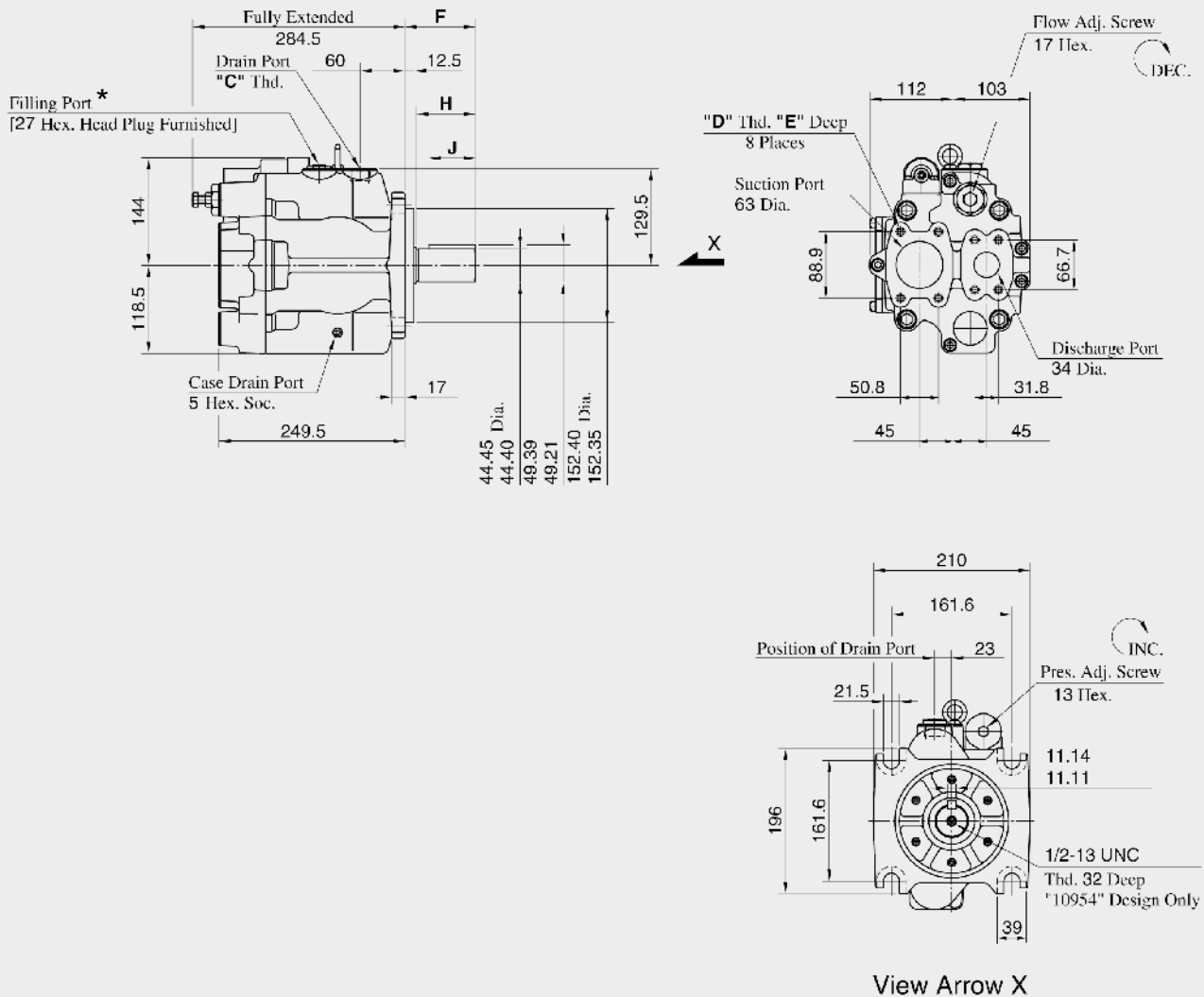


* Install the pump so that the "Filling port" is at the top.

Model Numbers	"C" Thread	"D" Thread	E mm	F mm
PPV100-71 ... 10 Japanese Standard	Rc 3/4	Rc 1/4	M12	19
PPV100-71 ... 1080 European Standard	3/4 BSP.F	1/4 BSP.F		
PPV100-71 ... 10950 North American Standard	SAE #12	SAE #4	1/2-13 UNC	21

2.1.28 PPV100-100

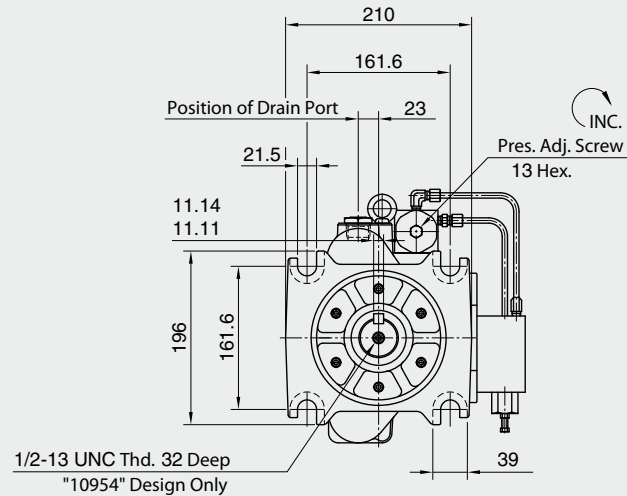
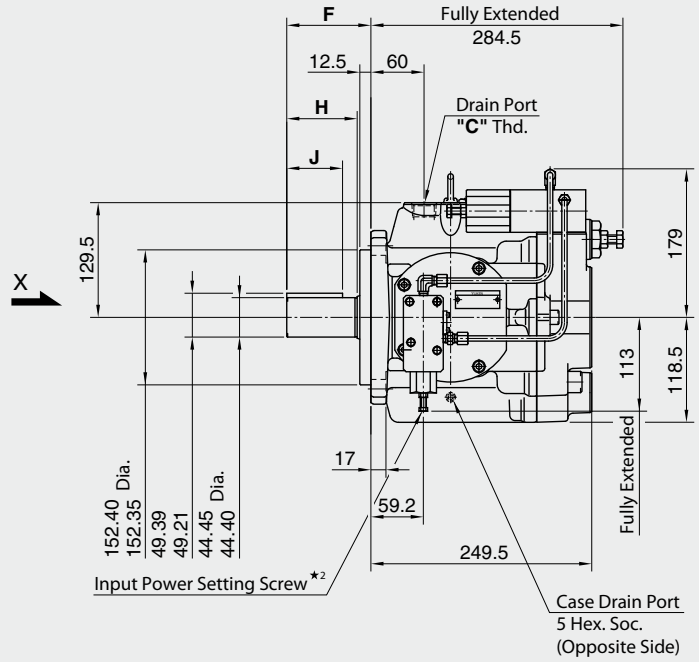
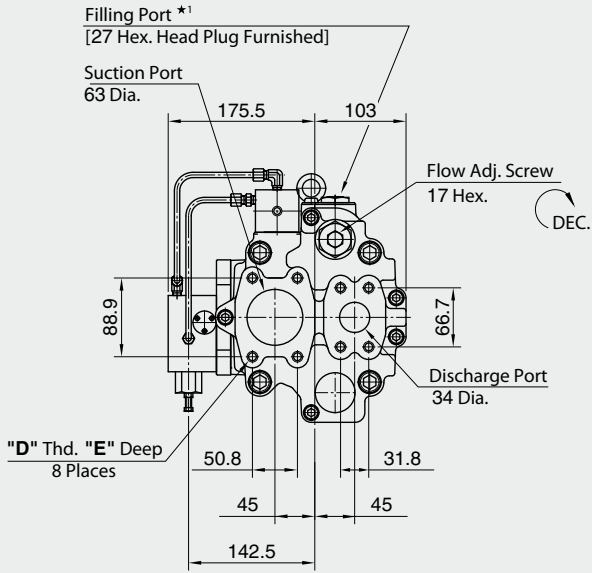
PPV100-100 with Pressure Control 01



* Install the pump so that the "Filling port" is at the top.

Model Numbers	"C" Thread	"D" Thread	E mm	F mm	H mm	J mm
PPV100-100 ... 10 Japanese Standard	Rc 3/4	M12	19	95	81	63
PPV100-100 ... 1080 European Standard	3/4 BSP.F					
PPV100-100 ... 10954 North American Standard	SAE #12	1/2-13 UNC	21	74.6	60.6	50

PPV100-100 with Constant Power Control 09

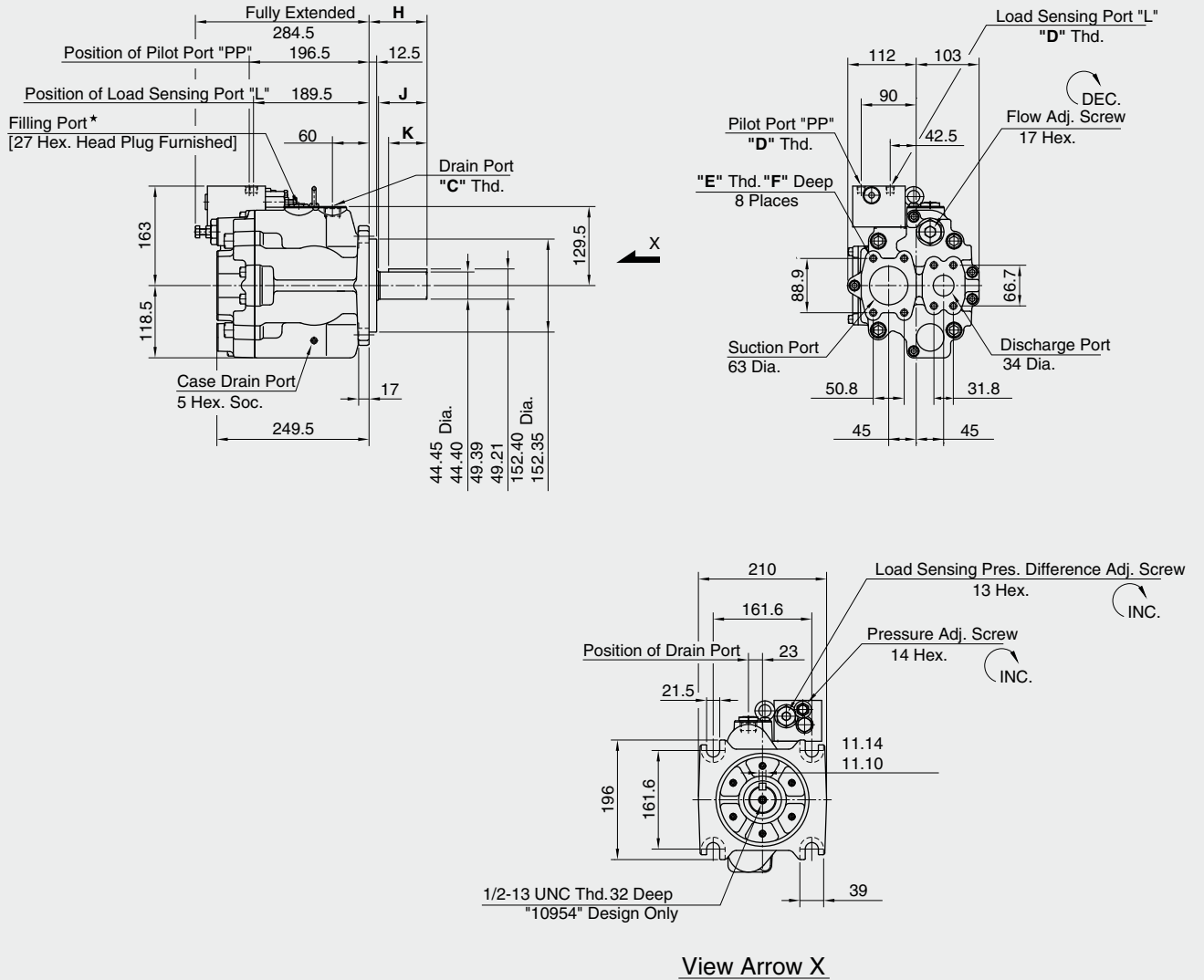


View Arrow X

*1 Install the pump so that the "Filling port" is at the top.
 *2 Do not touch the screw because it is adjusted at the time of shipment

Model Numbers	"C" Thread	"D" Thread	E mm	F mm	H mm	J mm
PPV100-100 ... 10 Japanese Standard	Rc 3/4	M12	19	95	81	63
PPV100-100 ... 1080 European Standard	3/4 BSP.F					
PPV100-100 ... 10954 North American Standard	SAE #12	1/2-13 UNC	21	74.6	60.6	50

PPV100-100 with Load Sensing Control 14

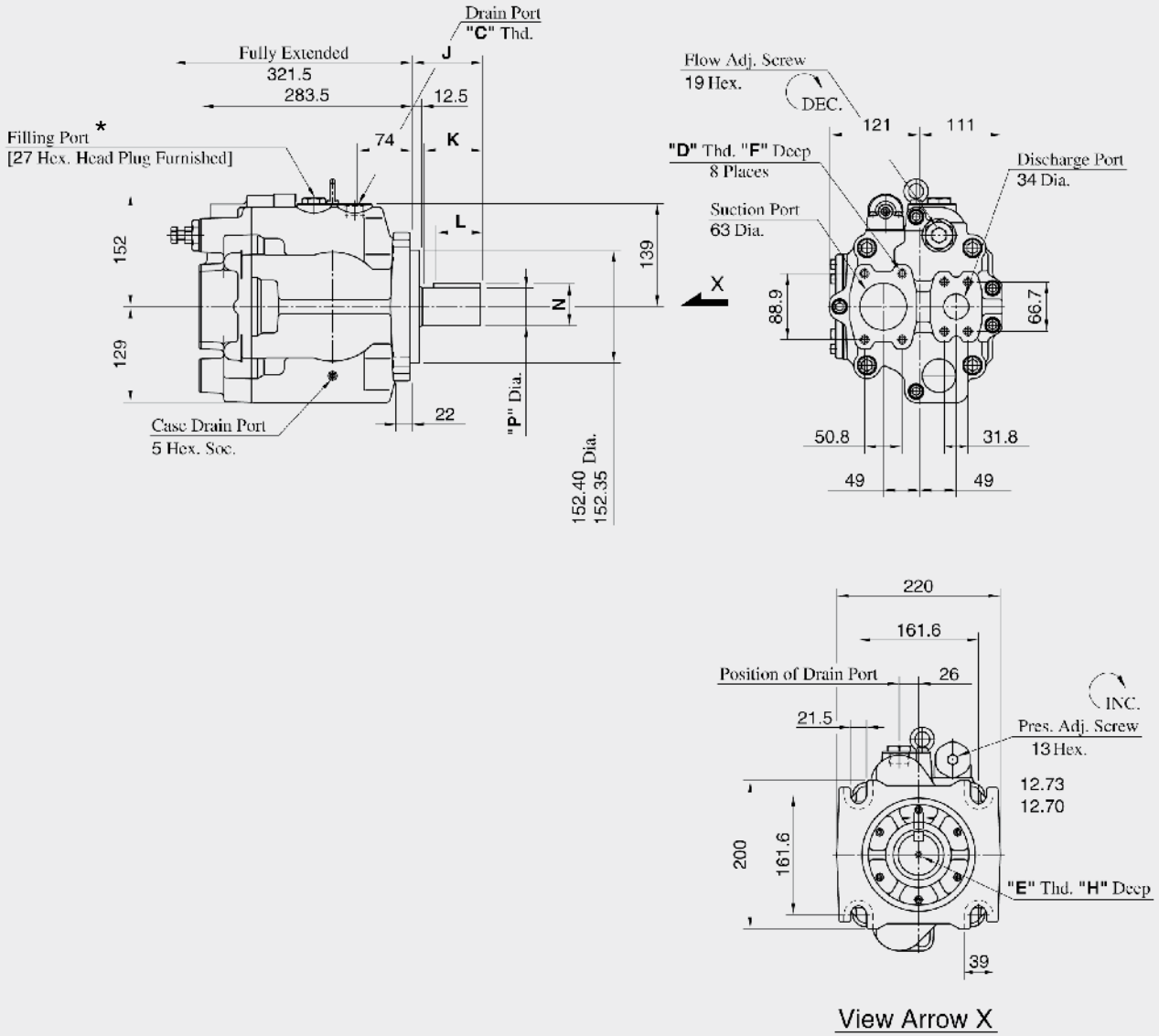


* Install the pump so that the "Filling port" is at the top.

Model Numbers	"C" Thread	"D" Thread	"E" Thread	F mm	H mm	J mm	K mm
PPV100-100 ... 10 Japanese Standard	Rc 3/4	Rc 1/4	M12	19	95	81	63
PPV100-100 ... 1080 European Standard	3/4 BSP.F	1/4 BSP.F					
PPV100-100 ... 10954 North American Standard	SAE #12	SAE #4	1/2-13 UNC	21	74.6	60.6	50

2.1.29 PPV100-145

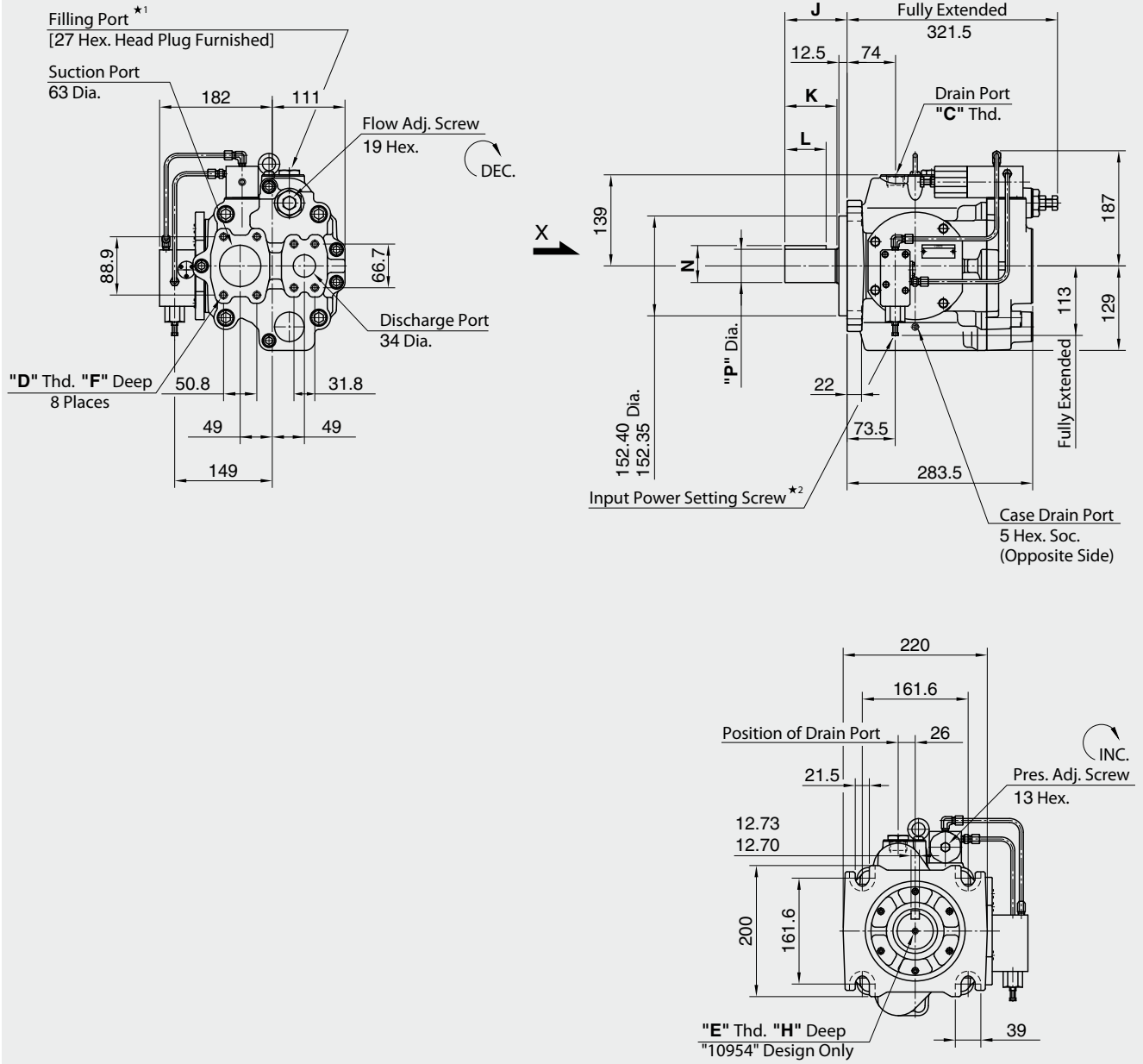
PPV100-145 with Pressure Control 01



* Install the pump so that the "Filling port" is at the top.

Model Numbers	Thread Size			Dimensions in mm						
	C	D	E	F	H	J	K	L	N	P
PPV100-145 ... 10 Japanese Standard	Rc 3/4	M12	-	22	-	95	81	63	49.39	44.45
PPV100-145 ... 1080 European Standard	3/4 BSPF								49.21	44.40
PPV100-145 ... 10954 North American Standard	SAE #12	1/2-13 UNC		21	32	74.6	60.6	50	49.39 49.21	44.45 44.40

PPV100-145 with Constant Power Control 09

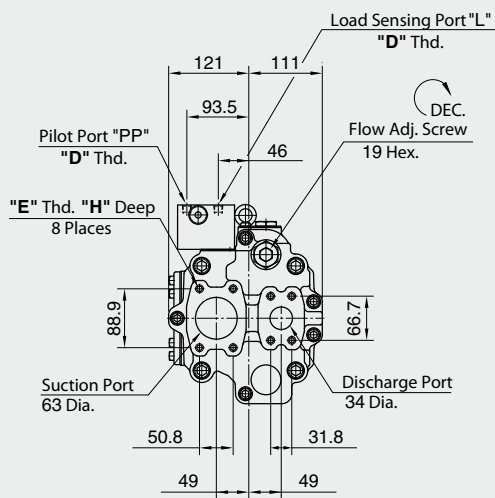
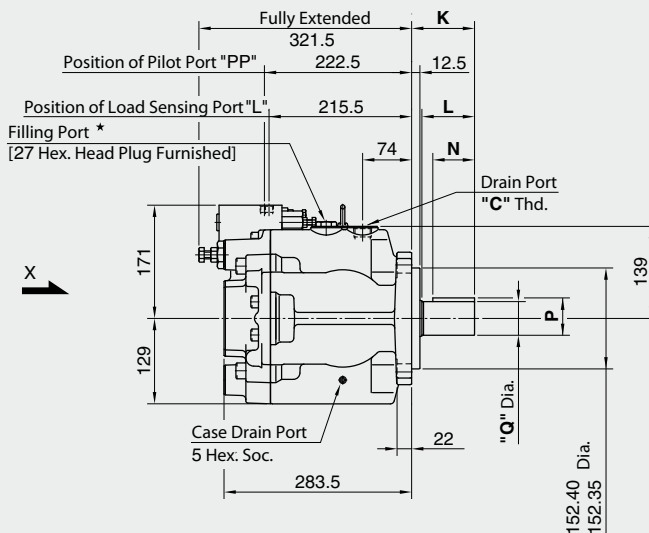
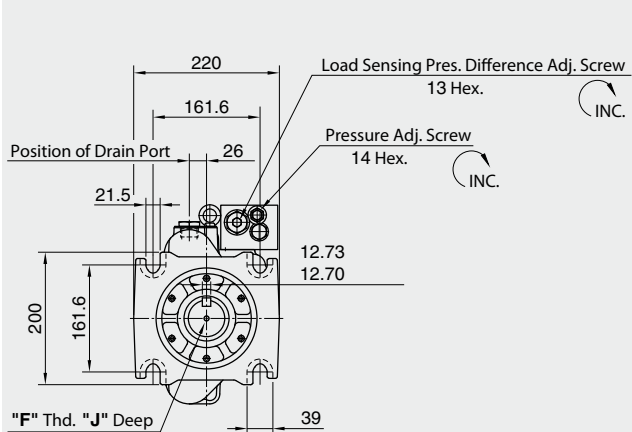


View Arrow X

*1 Install the pump so that the "Filling port" is at the top.
 *2 Do not touch the screw because it is adjusted at the time of shipment.

Model Numbers	Thread Size			Dimensions in mm						
	C	D	E	F	H	J	K	L	N	P
PPV100-145 ... 10 Japanese Standard	Rc 3/4	M12	-	19	-	95	81	63	56.43	50.80
PPV100-145 ... 1080 European Standard	3/4 BSP.F								56.25	50.75
PPV100-145 ... 10954 North American Standard	SAE #12	1/2-13 UNC		21	32	74.6	60.6	50	49.39 49.21	44.45 44.40

PPV100-145 with Load Sensing Control 14



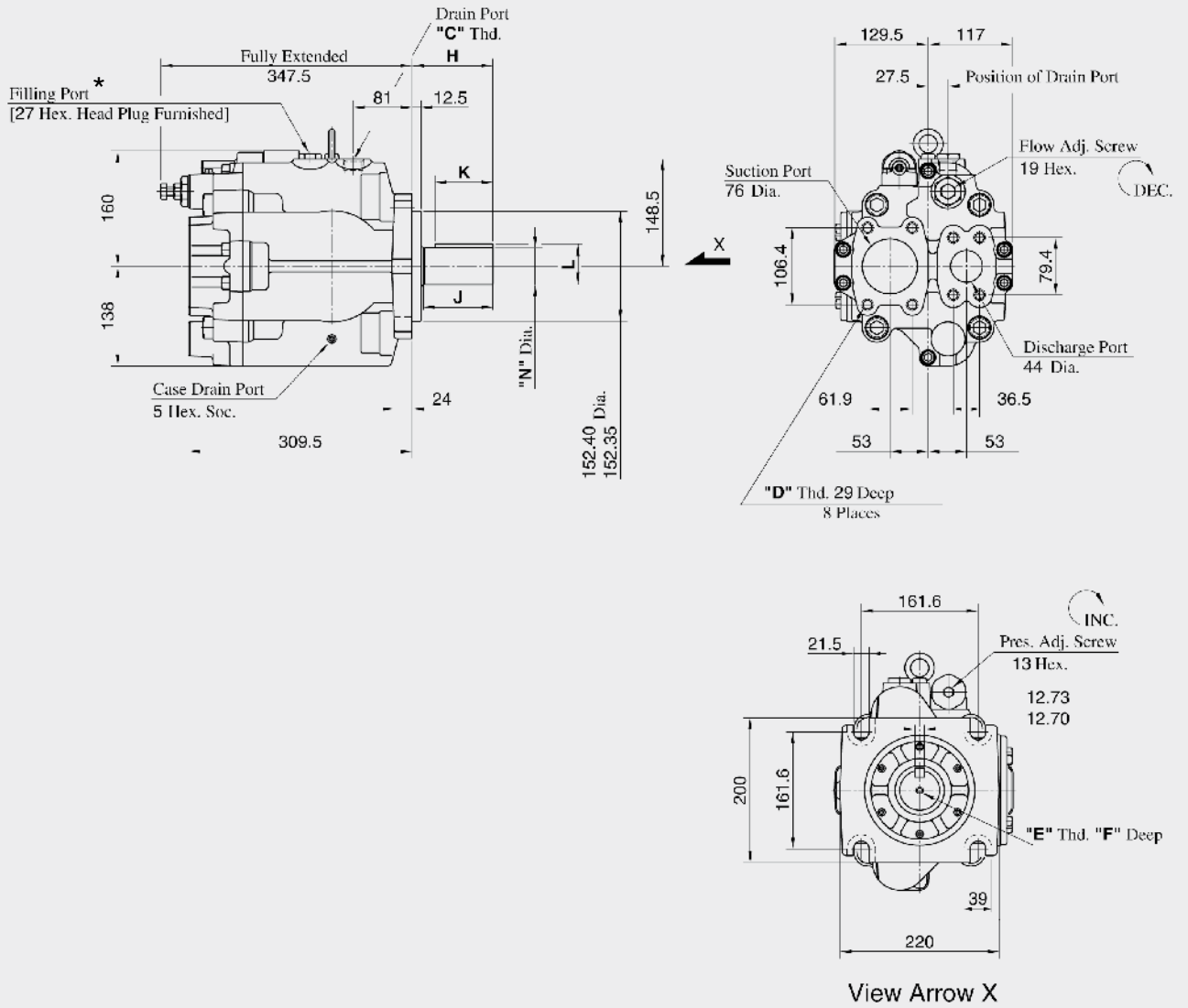
View Arrow X

* Install the pump so that the "Filling port" is at the top.

Model Numbers	Thread Size				Dimensions in mm						
	C	D	E	F	H	J	K	L	N	P	Q
PPV100-145 ... 10 Japanese Standard	Rc 3/4	Rc 1/4	M12	-	19	-	95	81	63	56.43	50.80
PPV100-145 ... 1080 European Standard	3/4 BSPF	1/4 BSPF									
PPV100-145 ... 10954 North American Standard	SAE #12	SAE #4	1/2-13 UNC		21	32	74.6	60.6	50	49.39 49.21	44.45 44.40

2.1.30 PPV100-180

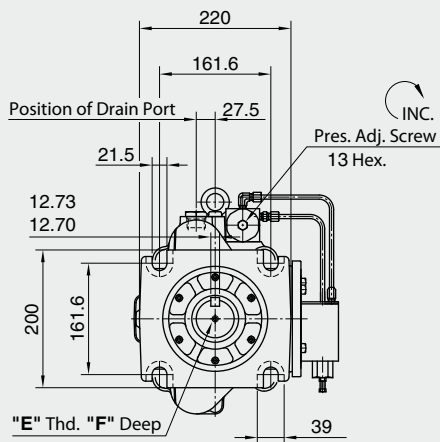
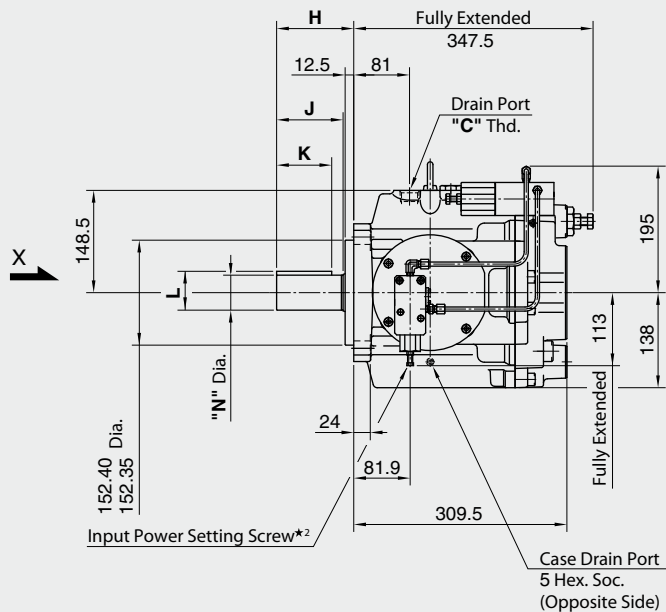
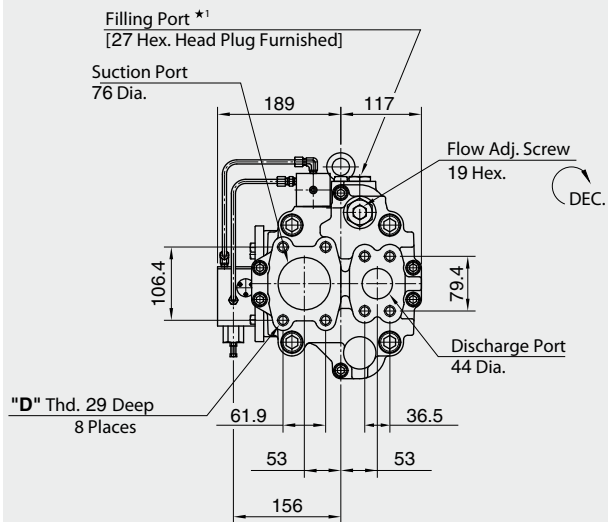
PPV100-180 with Pressure Control 01



* Install the pump so that the "Filling port" is at the top.

Model Numbers	Thread Size			Dimensions in mm					
	C	D	E	F	H	J	K	L	N
PPV100-180 ... 10 Japanese Standard	Rc 3/4	M16	-	-	112	97.5	80	56.43	50.80
PPV100-180 ... 1080 European Standard	3/4 BSP.F							56.25	50.75
PPV100-180 ... 10954 North American Standard	SAE #12	5/8-11 UNC	1/2-13 UNC	32	74.6	60.6	50	49.39 49.21	44.45 44.40

PPV100-180 with Constant Power Control 09

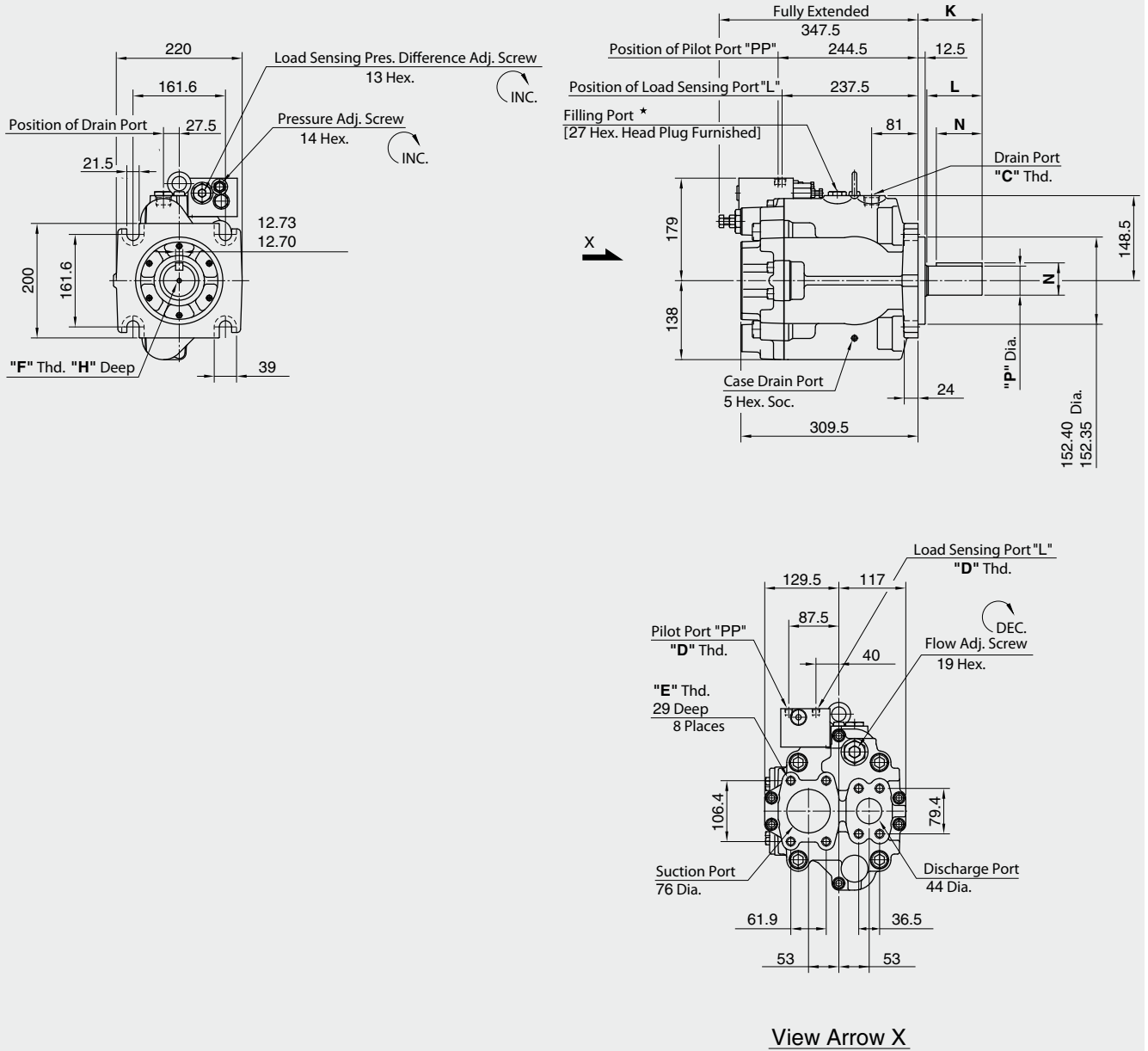


View Arrow X

*1 Install the pump so that the "Filling port" is at the top.
 *2 Do not touch the screw because it is adjusted at the time of shipment

Model Numbers	Thread Size			Dimensions in mm					
	C	D	E	F	H	J	K	L	N
PPV100-180 ... 10 Japanese Standard	Rc 3/4	M16	-	-	112	97.5	80	56.43	50.80
PPV100-180 ... 1080 European Standard	3/4 BSPF							56.25	50.75
PPV100-180 ... 10954 North American Standard	SAE #12	5/8-11 UNC	1/2-13 UNC	32	99.8	85.3	70	49.39 49.21	44.45 44.40

PPV100-180 with Load Sensing Control 14



* Install the pump so that the "Filling port" is at the top.

Model Numbers	Thread Size				Dimensions in mm					
	C	D	E	F	H	J	K	L	N	P
PPV100-180 ... 10 Japanese Standard	Rc 3/4	Rc 1/4	M16	-	-	112	97.5	80	56.43	50.80
PPV100-180 ... 1080 European Standard	3/4 BSP.F	1/4 BSP.F							56.25	50.75
PPV100-180 ... 10954 North American Standard	SAE #12	SAE #4	5/8-11 UNC	1/2-13 UNC	32	99.8	85.3	70	49.39 49.21	44.45 44.40



2.2 LIGHT HEAVY DUTY SERIES CONTENT

Ordering Code 2.2.1 Light Heavy Duty Series
2.2.2 Torque Limiter Settings

Technical Information 2.2.3 Specifications
2.2.4 Hydraulic Fluids
2.2.5 Viscosity Range
2.2.6 Temperature Range
2.2.7 Parameter for fire-resistant fluids compared to mineral oil
2.2.8 Seals
2.2.9 Filtration
2.2.10 Adjustments
2.2.11 Allowable Input and Thrudrive torques
2.2.12 Thrudrive Limitations
2.2.13 Installation Notes

Control Options 2.2.14 Load Sensing and Pressure Cut-off
2.2.15 LS and PC with Integrated Unloading Valve
2.2.16 LS and PC with Integrated Proportional Relief Valve
2.2.17 LS and PC with Torque Limiter
2.2.18 Pressure Cut-off
2.2.19 PC with Integrated Unloading Valve
2.2.20 PC with Integrated Proportional Relief Valve
2.2.21 PC with Torque Limiter
2.2.22 Electrical Displacement Control
2.2.23 Pilot Operated Displacement Control

Performance Data 2.2.24 PPV101-45
2.2.25 PPV101-80
2.2.26 PPV101-112
2.2.27 PPV101-140
2.2.28 PPV101-200

Dimensions 2.2.29 PPV101-45
2.2.30 PPV101-80
2.2.31 PPV101-112 / -140
2.2.32 PPV101-200
2.2.33 Electrical Displacement Control
2.2.34 Unloading Valve Module

ORDERING CODE

2.2.1 Light Heavy Duty Series

PPV101 - 45 / B - 1 0 R M M - P 0 - - XXXX

Axial Piston Pump

Light Heavy Duty Series

Size	45	45 cm ³ /rev
	80	80 cm ³ /rev
	112	112 cm ³ /rev
	140	140 cm ³ /rev
	200	200 cm ³ /rev

Design Series: B

Seal Type

-	NBR
V	FPM
W	NBR, Water Glycol

Open circuit: 1

Thru drive and porting

0	Single pump, side ported
A	SAE A thru drive, side ported
B	SAE B thru drive, side ported
BB	SAE BB thru drive, side ported
C	SAE C thru drive, side ported
D	SAE D thru drive, side ported
E	SAE E (only size 200)
R	Single pump, rear ported
S	Single pump with plastic cover
N	Single pump with steel cover

Shaft Rotation

R	Right Hand (clockwise)	viewed from shaft end
L	Left Hand (counter-clockwise)	

Mounting flange and shaft

S	SAE spline & mount
M	ISO key & mount (not 200)
F	SAE D mount with SAE F spline shaft
K	SAE key & mount
T*	SAE B spline & 2 bolt mount (45 only)
	SAE CC spline & SAE D 4 bolt mount (112/140 only)
U*	SAE B key & 2 bolt mount (45 only)
C*	SAE C spline & 2 bolt mount (112/140 only)
R*	SAE C spline & SAE D 4 bolt mount (112/140 only)
X*	SAE C key & 2 bolt mount (112/140 only)
W*	SAE CC spline & SAE C 2 bolt mount (112/140 only)

* Non standard options

Flange Porting threads

M	Metric threads
S	UNC threads

Control configuration

P	Remote Pressure Compensator
L	Load Sensing and Pressure Control

Additional pressure control

0	No additional control
N	With integrated unloading valve, normally closed
M	With integrated unloading valve, normally open
V	With integrated remote control valve
1	Load sensing control with bleed off orifice plugged

Solenoid voltage for integral unloading valve (N and M option)

Blank	all options except N and M
115A	115 V AC 50 / 60 Hz
230A	230 V AC 50 / 60 Hz
12D	12 V DC
24D	24 V DC

Additional control options

Blank	No additional limiter
-------	-----------------------

Torque limit control

/1-L**	Low setting range
/1-M**	Medium setting range
/1-H**	High setting range

** Settings see next page

Displacement control

/1-E0	Electrical displacement control (pilot pressure required)
/1-Q0	Pilot operated displacement control

Modification Number

XXXX	Determined by Manufacturer
------	----------------------------

2.2.2 Torque Limiter Settings

Shaft Speed 1450 rpm (50 Hz, 4 Pole Electric Motor)						
Power (kW)	Torque (Nm)	Pump Size				
		45	80	112	140	200
7.5	49	L4				
11	72	L1	L6			
15	99	M2	L3			
18.5	122	H4	L1	L4		
22	145	H3	M4	L3	L6	
30	198		H4	M3	L2	
37	244		H2	M1	M3	L3
45	296		H1	H4	M2	L2
55	362			H2	H4	M3
75	494				H1	H6
90	593					H4
110	724					H2

For other shaft speeds or different power settings please contact HADAC

TECHNICAL INFORMATION

2.2.3 Specifications

Pump Size		45	80	112	140	200
Geometric Displacement	[cm ³ /rev]	45.0	80.0	112.0	140.0	200.0
Pressure	Rated	[bar]	320			350
	Peak	[bar]	350			400
Shaft Speed	min.	[rpm]	600			
	max.	[rpm]	2700	2400	2200	2200
Power (1500 rpm, 280 bar)	[kW]	35*	62	86*	108*	154
Torque (280 bar)	[Nm]	201*	357	499*	624*	891
Pre-fill Oil Volume	[cm ³]	600	800	1400	1400	3000
Approx. Mass	[kg]	25.0	35.0	65.0	65.0	100.0

* Depending on the design of the shaft the max. allowed torque or power can be lower - see chapter 2.2.11

2.2.4 Hydraulic Fluids

H, HL	Mineral Oil
HEES, HETG	Fatty Acid Ester (Polyol Ester)
HFC	Water glycol
HLP, HLPD, HV, HVLP	High Quality, Anti-Wear, Mineral Based Hydraulic Fluid (at pressure above 200 bar)

For HFD-Fluids please contact HYDAC

2.2.5 Viscosity Range

Minimal viscosity:	10	cSt (mm ² /s)
Normal operating viscosity:	10 - 200	cSt (mm ² /s)
Maximal viscosity:	1000	cSt (mm ² /s)

2.2.6 Temperature Range

-20 up to +95 °C

Note:

The highest fluid temperature will be at the drain port of the pump, up to 20 °C higher than in the reservoir.

2.2.7 Parameter for fire-resistant fluids compared to mineral oil

parameter:-	fluid type:-		
	mineral oil	polyol ester	water glycol
Maximum Pressure (bar)	320	320	210
Recommended Temperature Range (°C)	20 ~ 60	30 ~ 60	10 ~ 50
Cavitation susceptibility	○	△	△
Expected life expectancy compared to mineral oil	100%	50% ~ 100%	20% ~ 80%

○ recommended

△ usable (higher density)

2.2.8 Seals

Hydraulic Fluid Type (see Ordering Code)	Generic Fluid Type	Shaft Seal Material	General Seal Material (O-Rings)
–	Mineral Oil	FPM	NBR
V	HEES, HFD	FPM	FPM
W	Water Glycol	NBR	NBR

2.2.9 Filtration

For maximum pump and system component life time, the system should be protected from contamination by effective filtration.

Maintain the degree of contamination within 20/18/15 ISO 4406:1999 (NAS 1638 Grade 9) or better.

2.2.10 Adjustments

Pump Size	Volume		Pressure
	Volume Adjustment Screw Sensitivity	Minimal Adjustable Displacement	Adjustment Screw Internal Hex size
	[cm ³ per turn]	[cm ³ /rev]	[mm]
PPV101-45	4.9	16	8
PPV101-80	6.0	35	
PPV101-112	11.5	56	10
PPV101-140	12.0	70	
PPV101-200	15.3	100	

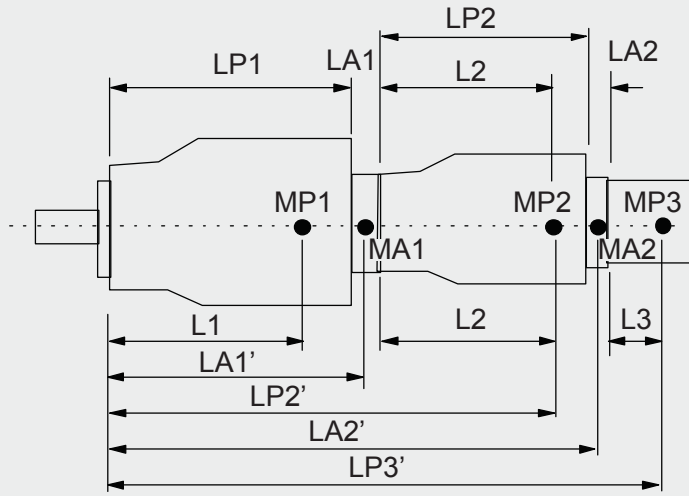
2.2.11 Allowable Input and Thrudrive torques

Pump Model		45			80		112		140		200		
maximum allowable input torque[Nm]		150	225		400		981*1		981*1		1000	1800	
mounting flange	type	SAE B	SAE B-B	ISO 100	SAE C	ISO 125	SAE C and D	ISO 180	SAE C and D	ISO 180	SAE E	SAE E	
	bolts	2	2	2	2	2	2 and 4	4	2 and 4	4	4	4	
input shaft	type	SAE B-B	SAE B-B	ISO 25mm	SAE C	ISO 32mm	SAE C, C-C and D	ISO 45mm	SAE C, C-C and D	ISO 45mm	SAE D	SAE F	
	form	Spline	Spline & Key	Key	Spline & Key	Key	Spline & Key	Key	Spline & Key	Key	Spline & Key	Spline	
allowable through drive torque	SAE A	61											
	SAE B	150											
	SAE B-B	225											
	SAE C					400							
	SAE C-C							680					
	SAE D									699			
	SAE E											699	

*1 In case of reduced torque input shafts
 SAE C shaft Input Torque reduced to 400 Nm
 SAE CC shaft Input Torque reduced to 680 Nm

2.2.12 Thrudrive Limitations

Apart from predefined maximum throughput limitations, one must also ensure that to prevent a possible excessive bending moment occurring that the maximum combined bending moment of the combination is not exceeded as determined in the following expression



MPX = mass of pump [kg]
 LPX = length of pump [mm]
 Lx = distance of CofG from pump mounting face [mm]
 MAX = mass of adaptor kit [kg]
 LAX = width of adaptor kit [mm]

$$\text{Bending Moment} = ((L1 \cdot mP1) + (LA1' \cdot mA1) + (LP2' \cdot mP2) + (LA2' \cdot mA2) + LP3' \cdot mP3) + \dots / 102 [\text{Nm}]$$

$$((L1 \cdot mP1) + (LP1 + (LA1/2)) \cdot mA1 + (LP1 + LA1 + L2) \cdot mP2 + (LP1 + LA1 + LP2(LA2/2)) \cdot mA2 + (LP1 + LA1 + LP2 + LA2) \cdot mP3) + \dots) / 102$$

Pump overall length [mm] (Lp)

Size	Single Pump	Stock Pump
	Type "0"	Type "S"
45	244	244
80	272	272
112 / 140	308	308
200	359	359

Pump CofG from mount [mm] (L)

Size	Single Pump	Stock Pump
	Type "0"	Type "S"
45	120	120
80	130	130
112 / 140	150	150
200	190	190

Pump approximate weight [kg] (MP)

Size	Without torque limiter		With torque limiter	
	Single Pump	Stock Pump	Single Pump	Stock Pump
Size	Type "0"	Type "S"	Type "0"	Type "S"
45	25	28	27	30
80	35	38	37	40
112 / 140	65	69	67	71
200	95	103	97	105

Adaptor Kits weight (Ma) & Width (La)

Size	Adaptor Kit	Weight (Max.)	Width (Lax)
45	SAE "A"	0	0
	SAE "B" & "BB"	2	20
80	SAE "A"	0	0
	SAE "B" & "BB"	3	20
	SAE "C"	4	24.5
112 / 140	SAE "A"	0	0
	SAE "B" & "BB"	3	25
	SAE "C" & "CC"	5	30
	SAE "D"	10	43
200	SAE "A"	1	6
	SAE "B" & "BB"	8	25
	SAE "C" & "CC"	8	30
	SAE "D"	10	38
	SAE "E"	15	38

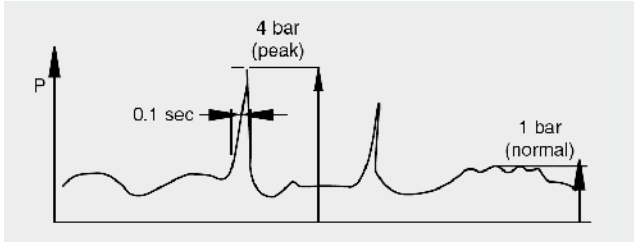
Size	Maximum Permissible Bending Moment (Nm)
45	137
80	244
112 / 140	462
200	930

2.2.13 Installation Notes

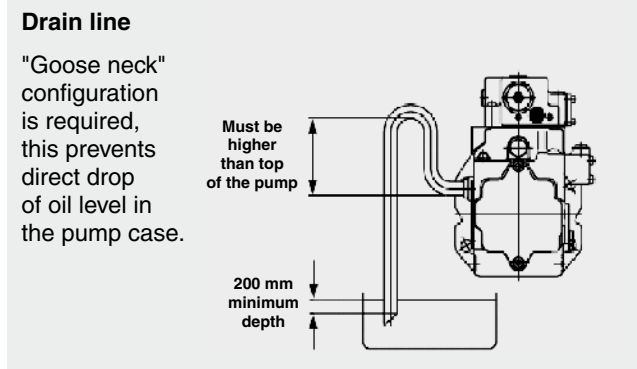
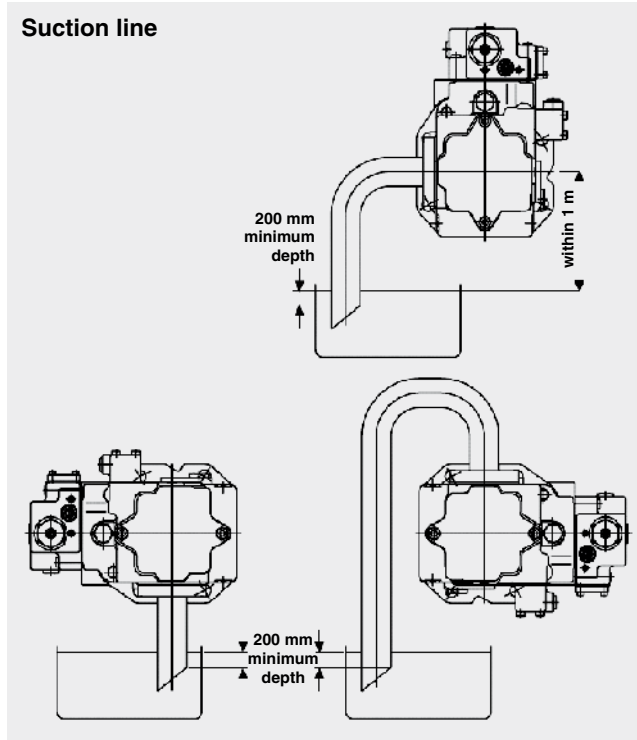
The pump should be mounted horizontally with the case drain piping initially rising above the level of the pump before continuing to the tank as shown in the illustration below. Do not connect the drain line to the suction line.

The uppermost drain port should be used and the drain piping should be equal or larger in size than the drain port to minimise pressure in the pump case.

The pump case pressure should not exceed 1 bar as shown in the illustration below (peak pressure should never exceed 4 bar).



Mounting the pump above the tank



Cautions:

- Suction and drain pipes must be immersed by 200 mm minimum from the lowest oil level under operating conditions.
- Height from the oil level to the centre of the shaft must be within 1 m.
- The oil in the pump case must be refilled when the pump has not been operated for one month or longer.

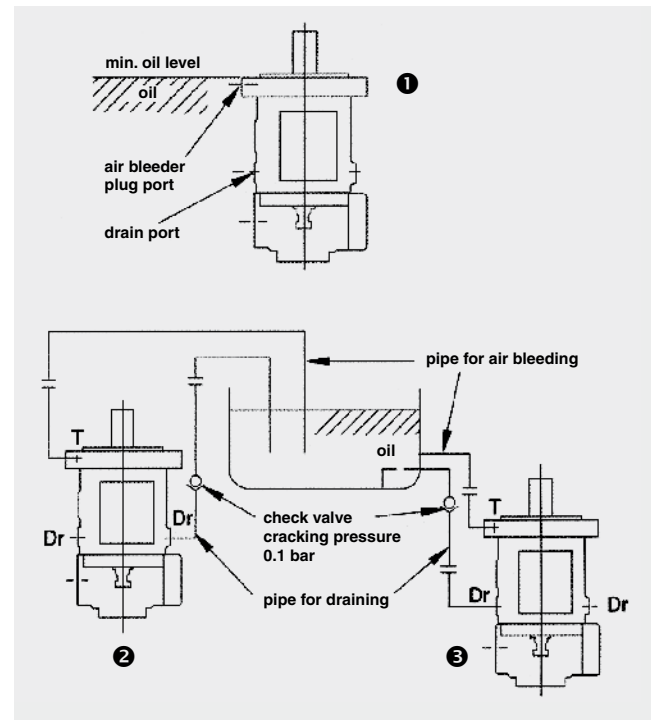
Mounting the pump vertically

For applications requiring vertical installation (shaft up) please remove the air bleed plug and connect piping as shown in the illustration below.

The oil level in the tank should be higher than the pump-mounting flange as shown in illustration ❶ below. If the oil level in the tank is lower than the pump mounting flange then forced lubrication is required through the air bleed port 1 ~ 2 l/min.

When installing the pump in the tank and submerged in the oil, open the drain port and air bleed port to provide adequate lubrication to the internal components.

When installing the pump outside the tank run piping for the drain and air bleed ports to tank (see illustration ❸). If the drain or air bleed piping rise above the level of oil (see illustration ❷) fill the lines with oil before operation.



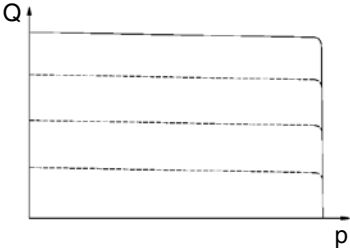
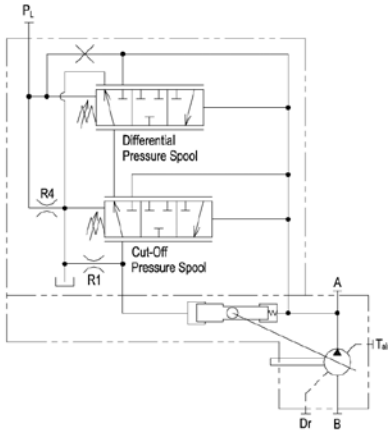
A check valve with cracking pressure of 0.1 bar should be fitted to the case drain line as shown.

Recommended check valves:

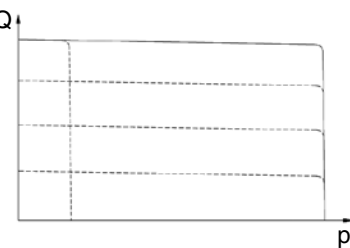
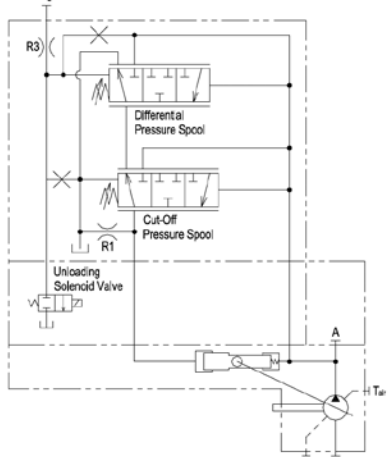
Size	Type	Material
PPV 101-45	RV-12-01.X/0-0.1bar	3474099
PPV 101-80 to PPV 101-200	RV-16-01.X/0-0.1bar	858636

CONTROL OPTIONS

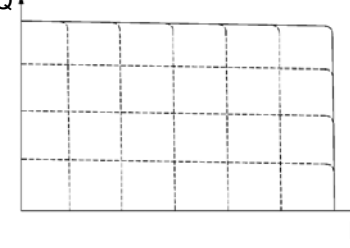
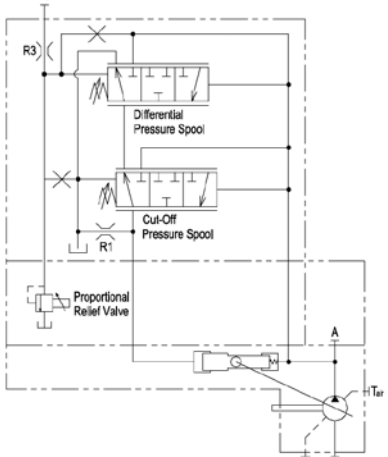
2.2.14 Load Sense and Pressure Cut-off – LO/L1

Regulator Code	Control Curves	Hydraulic Circuit
<p>Pump displacement is controlled to match the flow requirements as a function of the system differential pressure (load pressure vs. delivery pressure).</p> <p>In addition, there is a pressure cut-off function incorporated into the control. With the L1 option, the bleed-off orifice R4 is plugged.</p> <p>Factory setting of differential pressure spring is 15 bar.</p> <p>The adjustment range is from 10 to 30 bar</p>		

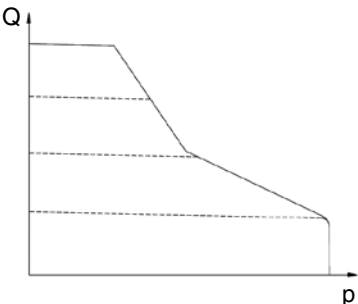
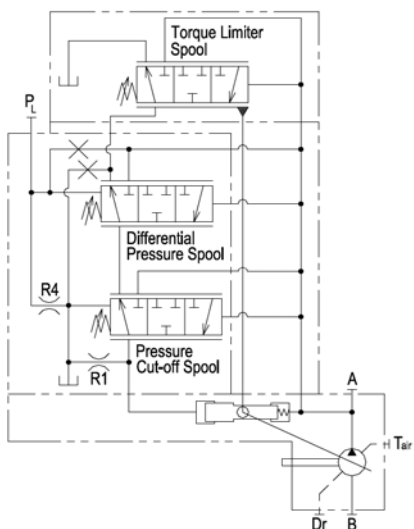
2.2.15 Load Sense and Pressure Cut-off with Integrated Unloading Valve – LN / LM

Regulator Code	Control Curves	Hydraulic Circuit
<p>An integrated unloading valve is sandwiched between the Load Sense regulator and pump to effectively de-stroke the swashplate when an electric signal is provided.</p> <p>At type LM the unloading valve must be energized to prevent the Load Sense line from draining</p>		

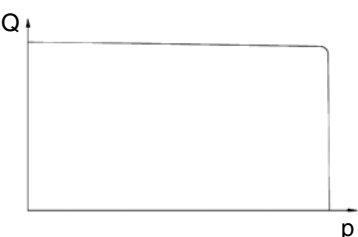
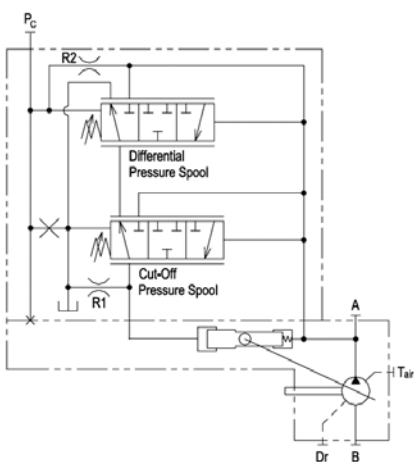
2.2.16 Load Sense and Pressure Cut-off with Integrated Proportional Relief Valve – LV

Regulator Code	Control Curves	Hydraulic Circuit
<p>An integrated proportional relief valve is sandwiched between the Load Sense regulator and pump to control the maximum pressure setting by varying an electric signal to the valve.</p> <p>A separate amplifier is required.</p>		

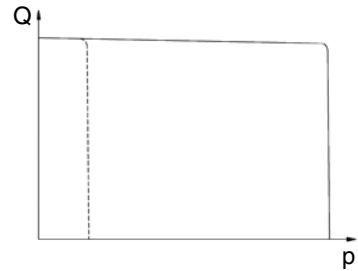
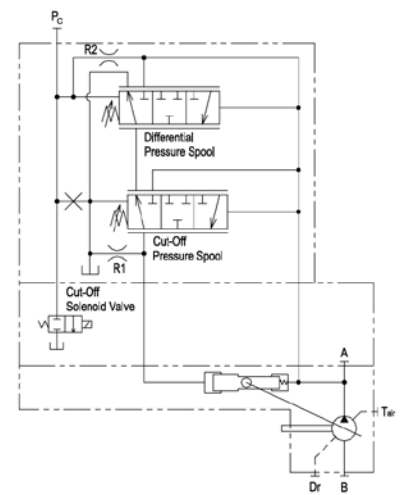
2.2.17 Load Sense and Pressure Cut-off with Torque Limiter – LO/1

Regulator Code	Control Curves	Hydraulic Circuit
<p>LO/L1 control functions as previously noted.</p> <p>In response to a rise in delivery pressure the swashplate angle is decreased, restricting the input torque. This regulator prevents excessive load against the prime mover.</p> <p>The torque limit control module is comprised of two springs that oppose the spool force generated by the system pressure. By turning an outer and inner spring adjustment screw, the appropriate input torque limit can be set.</p>		

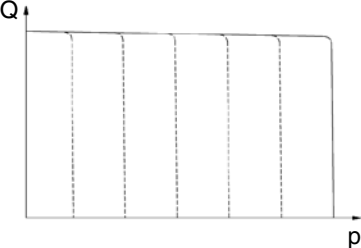
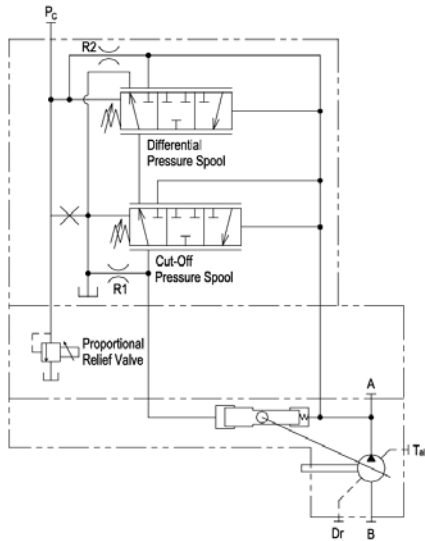
2.2.18 Pressure Cut-off – PO

Regulator Code	Control Curves	Hydraulic Circuit
<p>As system pressure rises to the cut-off setting, the swashplate de-strokes to prevent the system pressure from exceeding the compensator setting. It is imperative that a safety relief valve is installed in the system.</p> <p>Note: By connecting the PC port to a remote pressure control, variable pump pressure control can be achieved.</p>		

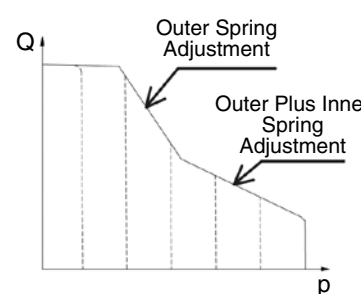
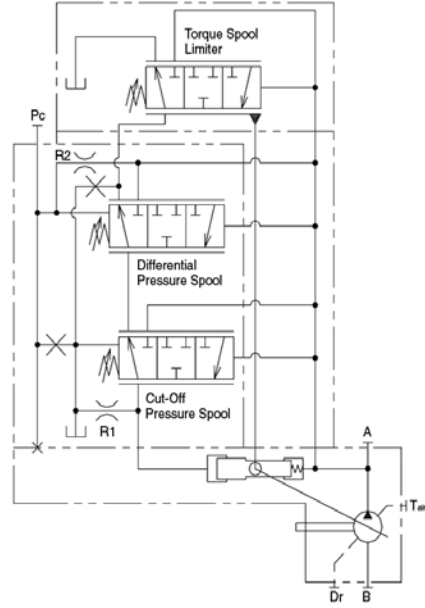
2.2.19 Pressure Cut-off with Integrated Unloading Valve – PN / PM

Regulator Code	Control Curves	Hydraulic Circuit
<p>An integrated unloading valve is sandwiched between the Pressure Cut-off regulator and pump to effectively de-stroke the swashplate when an electric signal is provided.</p> <p>At type PM the unloading valve must be energized to prevent the Pressure cut-off from draining.</p>		

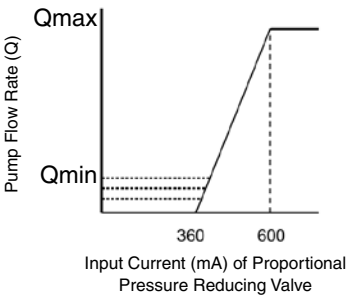
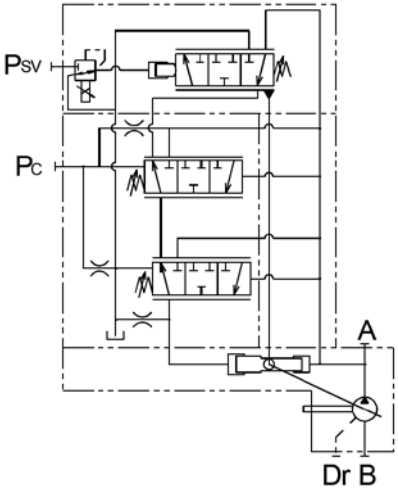
2.2.20 Pressure Cut-off with Integrated Proportional Relief Valve – PV

Regulator Code	Control Curves	Hydraulic Circuit
<p>An integrated proportional relief valve is sandwiched between the Pressure Cut-off regulator and the pump to control the maximum pressure setting by varying an electric signal to the valve.</p> <p>A separate amplifier is required.</p>		

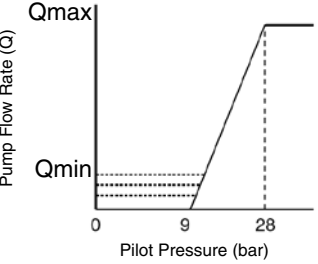
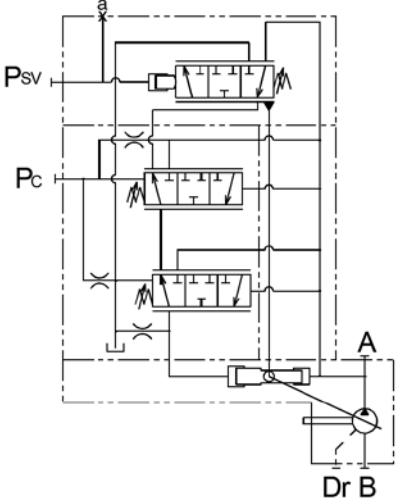
2.2.21 Pressure Cut-off with Torque Limiter – P0/P1

Regulator Code	Control Curves	Hydraulic Circuit
<p>P0/P1 control functions as previously noted.</p> <p>In response to a rise in delivery pressure the swashplate angle is reduced, restricting the input torque. This regulator prevents excessive load against the prime mover.</p> <p>The torque limit control module is comprised of two springs that oppose the spool force generated by the system pressure. By turning an outer and inner spring adjustment screw, the appropriate input torque limit can be set.</p> <p>Note: By connecting the PC port to a remote pressure control, variable pump pressure control can be achieved.</p>		

2.2.22 Electrical Displacement Control – /1-E0

Regulator Code	Control Curves	Hydraulic Circuit
<p>Varying the input current signal to the pump controller's electronic proportional pressure reducing valve (PPRV) allows the user to control the pump displacement.</p> <p>As the current signal to the PPRV increases, the pump displacement increases proportionally.</p> <p>Note: An external pressure supply of 40 bar is required at the PSV port (50 bar max).</p>		

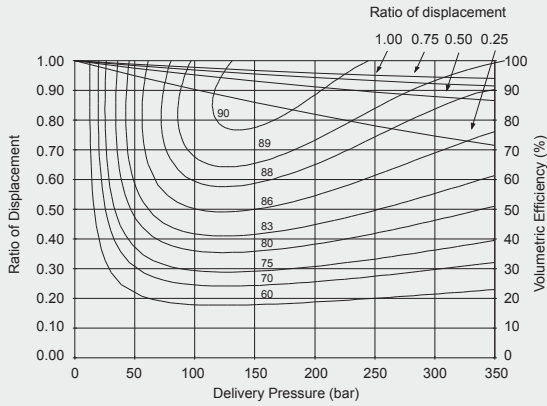
2.2.23 Pilot Operated Displacement Control – /1-Q0

Regulator Code	Control Curves	Hydraulic Circuit
<p>Varying the input pressure signal to the PSV port allows the user to control the pump displacement.</p> <p>As the pressure signal to the PSV increases, the pump displacement increases proportionally.</p>		

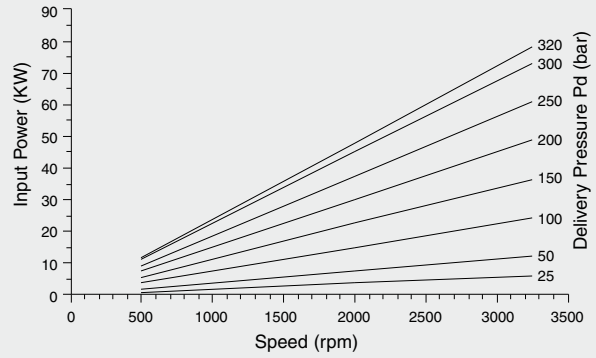
PERFORMANCE DATA

2.2.24 PPV101-45

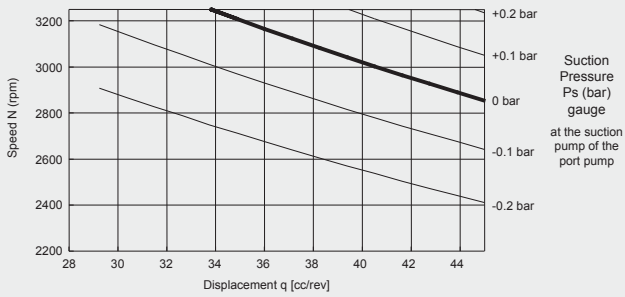
- **Performance Curve** (speed range 1500 rpm and 1800 rpm with atmospheric inlet), test temperature 50 °C, viscosity 31 cSt (ISO VG 46)



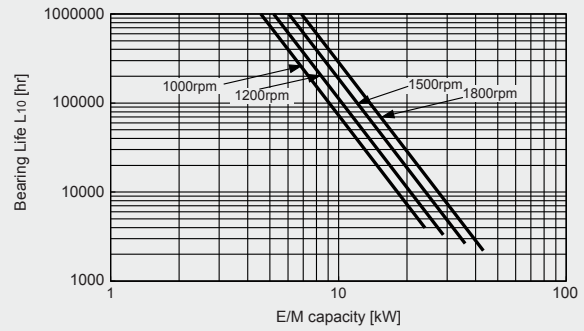
- **Power Curve**
Note: atmospheric inlet, full displacement



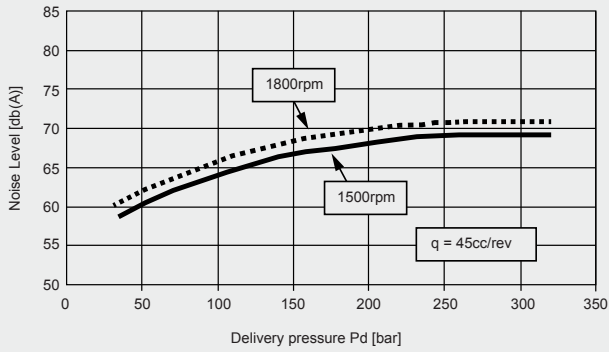
- **Self Priming Capability**



- **Bearing Life**
Note: service and other life factors have unity value

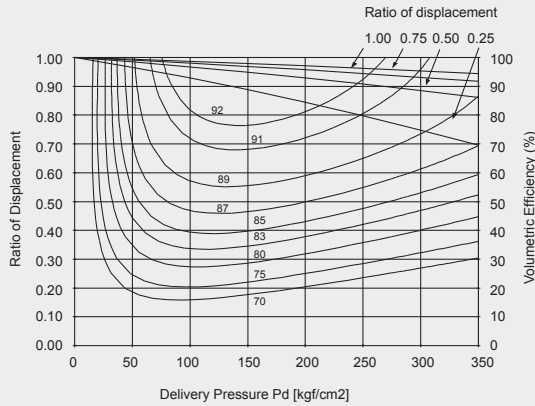


- **Noise Level**

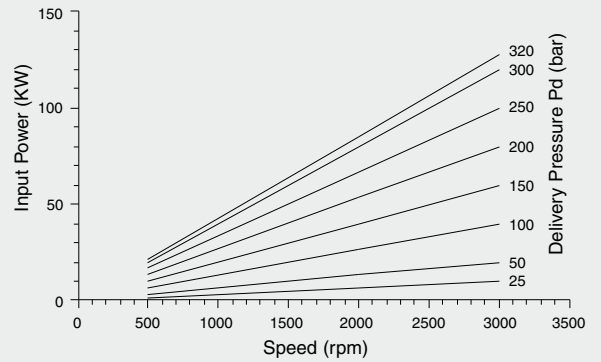


2.2.25 PPV101-80

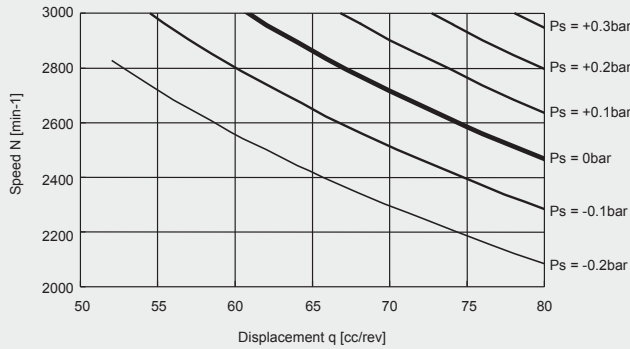
- **Performance Curve** (speed range 1500 rpm and 1800 rpm with atmospheric inlet), test temperature 50 °C, viscosity 31 cSt (ISO VG 46)



- **Power Curve**
Note: atmospheric inlet, full displacement

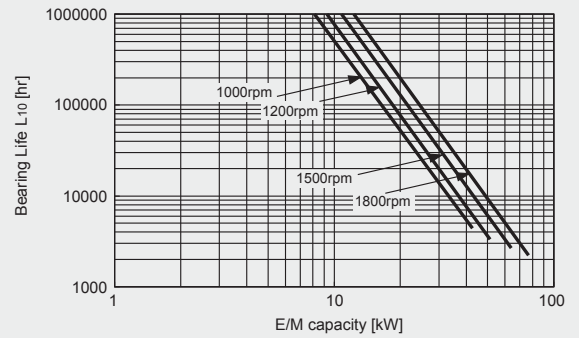


- **Self Priming Capability**

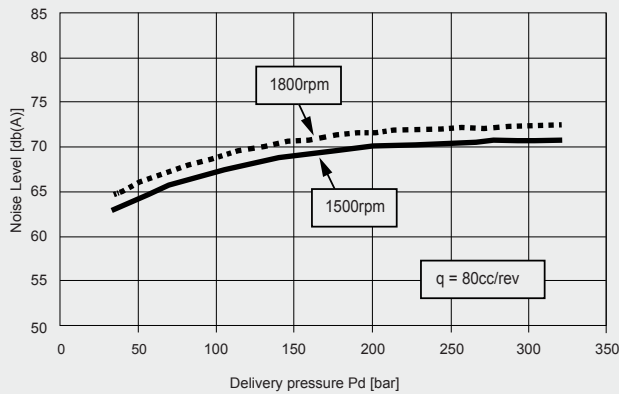


- **Bearing Life**

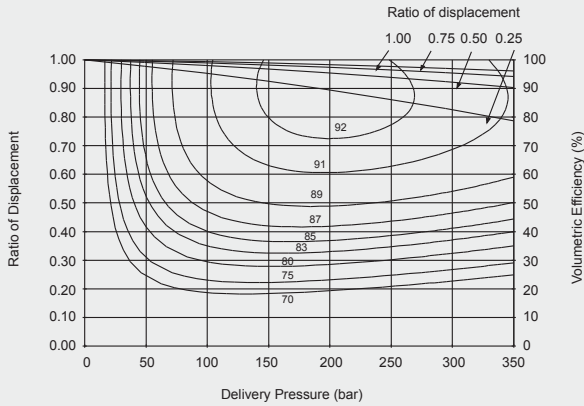
Note: service and other life factors have unity value



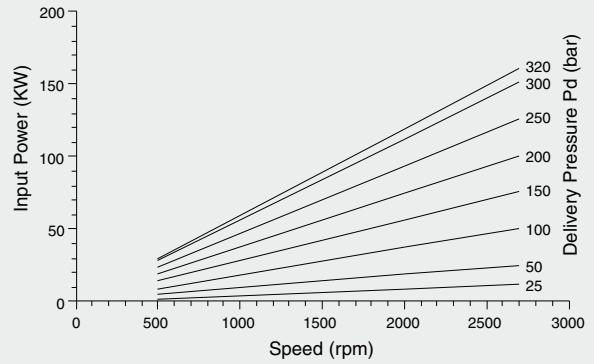
- **Noise Level**



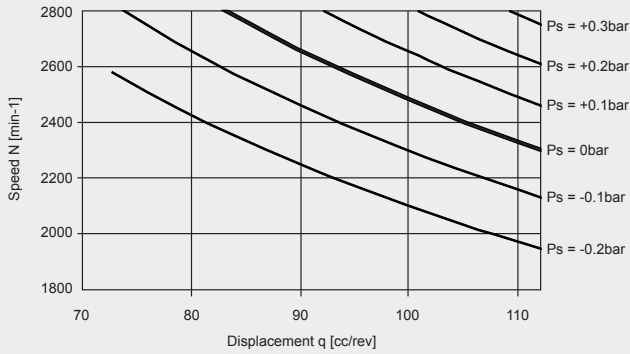
- **Performance Curve** (speed range 1500 rpm and 1800 rpm with atmospheric inlet), test temperature 50 °C, viscosity 31 cSt (ISO VG 46)



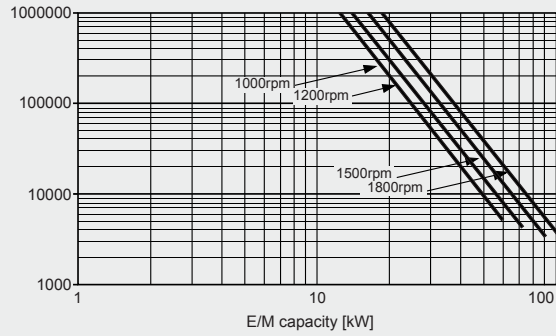
- **Power Curve**
Note: atmospheric inlet, full displacement



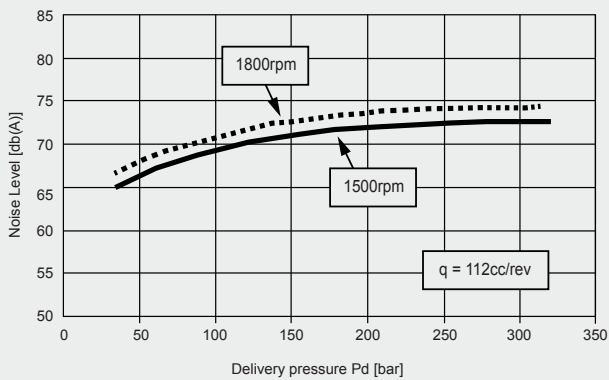
- **Self Priming Capability**



- **Bearing Life**
Note: service and other life factors have unity value

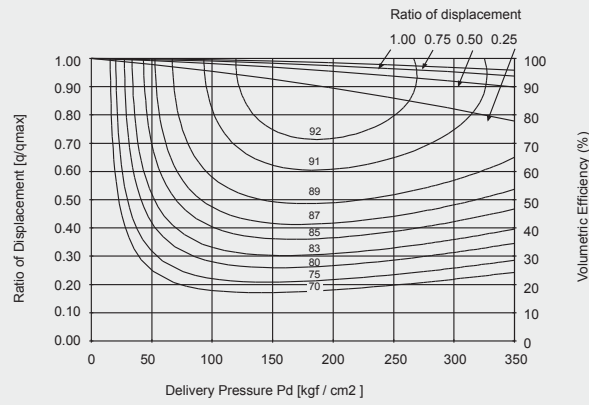


- **Noise**

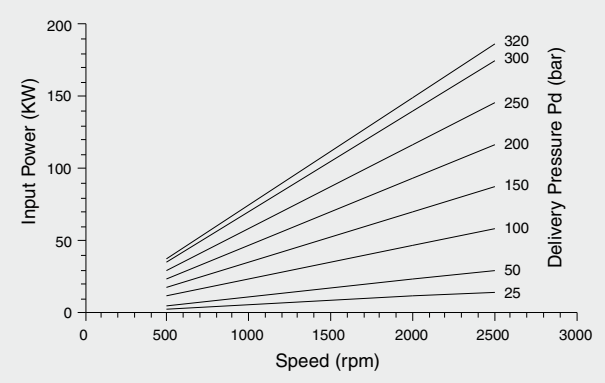


2.2.27 PPV101-140

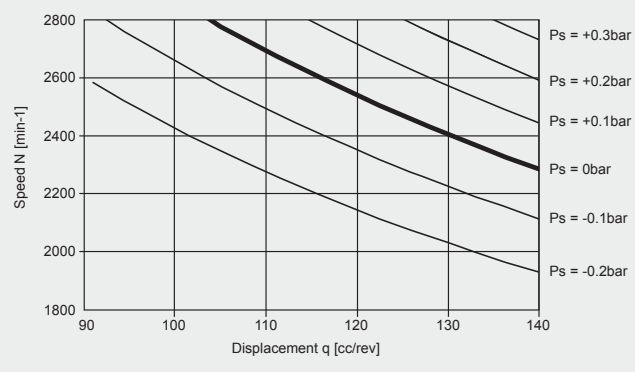
- **Performance Curve** (speed range 1500 rpm and 1800 rpm with atmospheric inlet), test temperature 50 °C, viscosity 31 cSt (ISO VG 46)



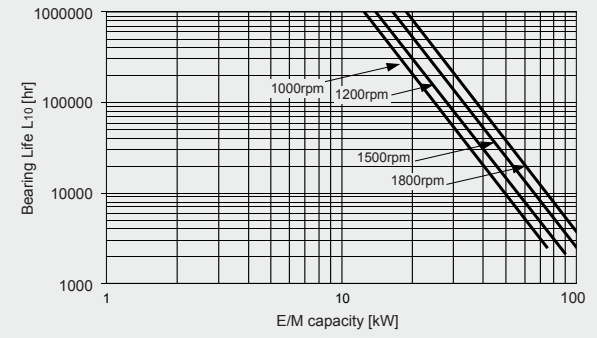
- **Power Curve**
Note: atmospheric inlet, full displacement



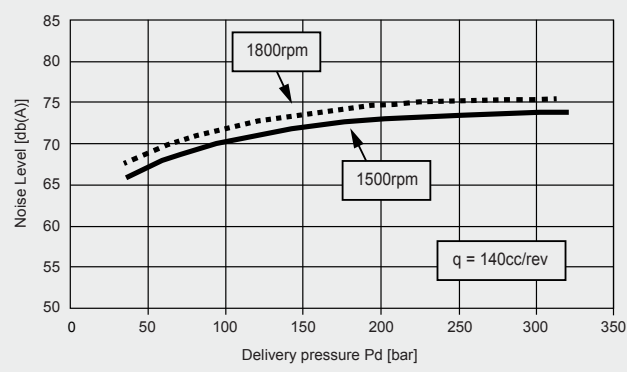
- **Self Priming Capability**



- **Bearing Life**
Note: service and other life factors have unity value

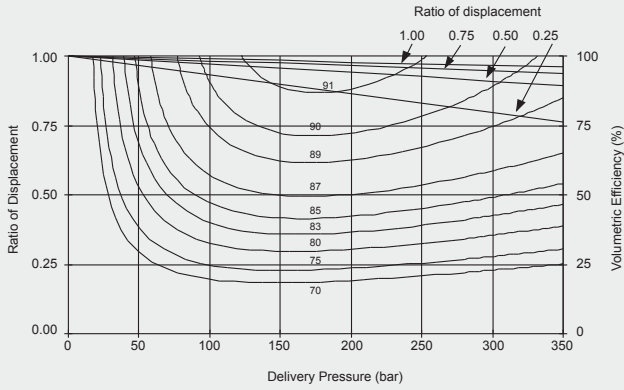


- **Noise**

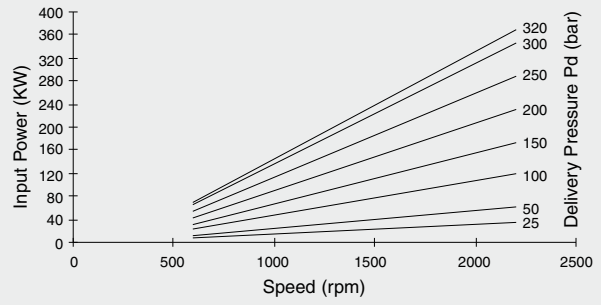


2.2.28 PPV101-200

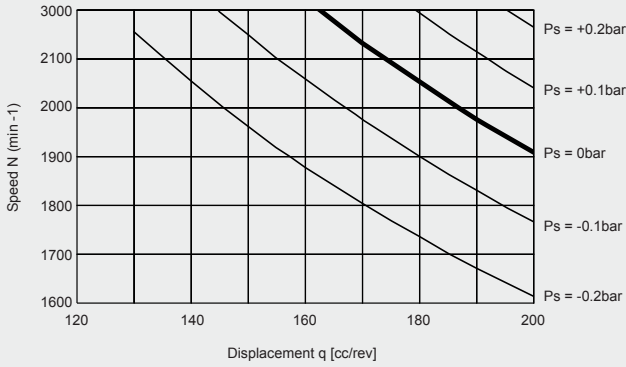
- **Performance Curve** (speed range 1500 rpm and 1800 rpm with atmospheric inlet), test temperature 50 °C, viscosity 31 cSt (ISO VG 46)



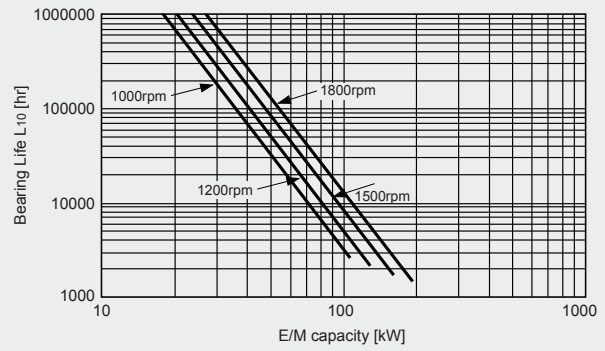
- **Power Curve**
Note: atmospheric inlet, full displacement



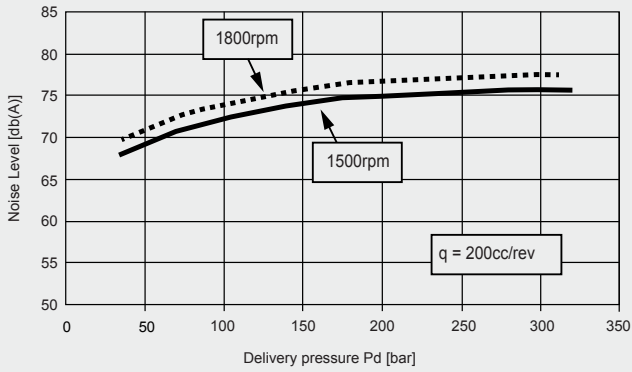
- **Self Priming Capability**



- **Bearing Life (Industrial Situation)**
Note: service and other life factors have unity value



- **Noise**



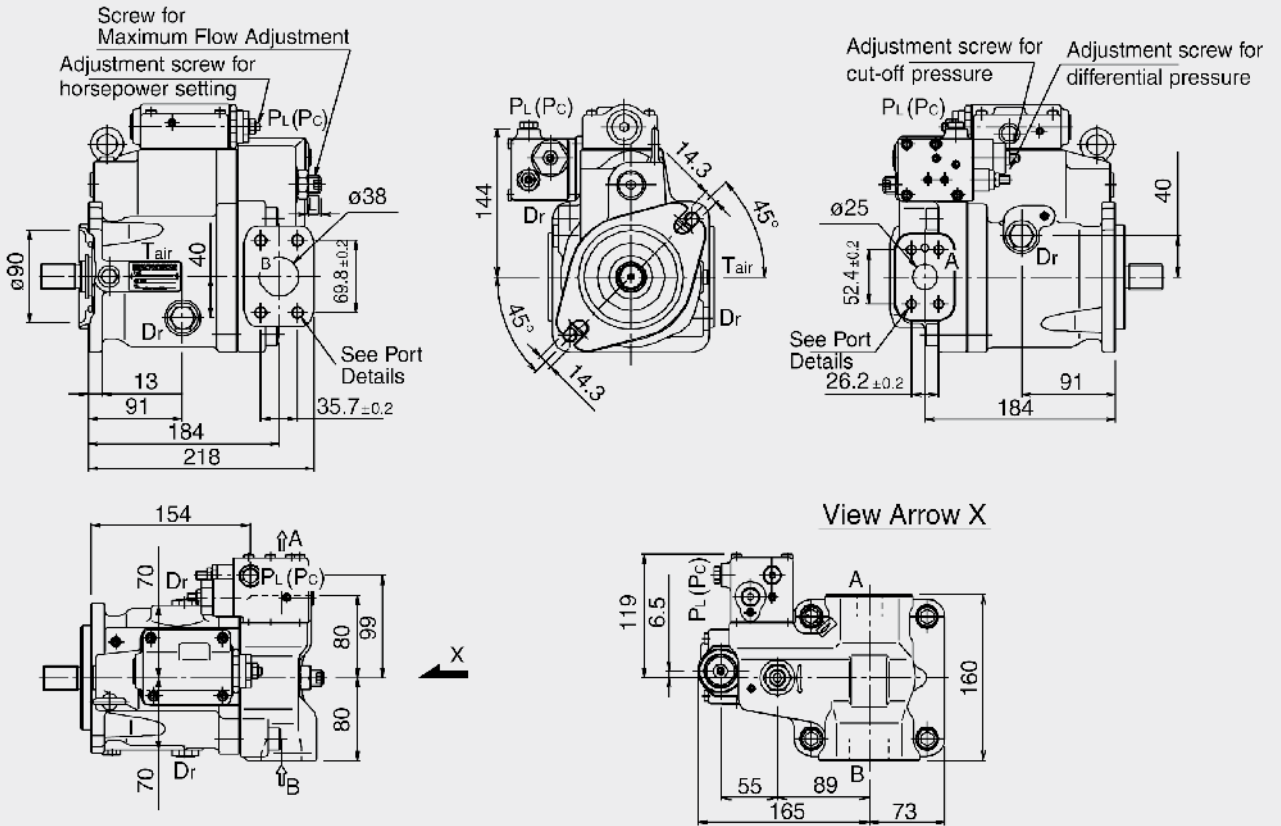
DIMENSIONS

2.2.29 PPV101-45

PPV101-45 with Cut-Off / Load Sense Control and Torque Limit Module (clockwise rotation)

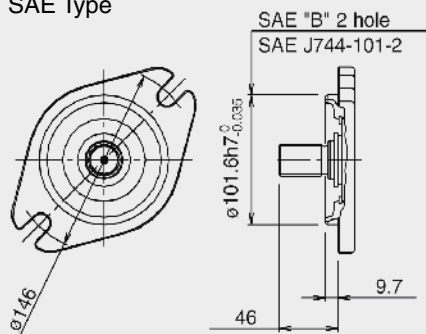
Note: for counter clockwise rotation, the suction port "B" and the delivery port "A" are reversed

Single Pump "0"

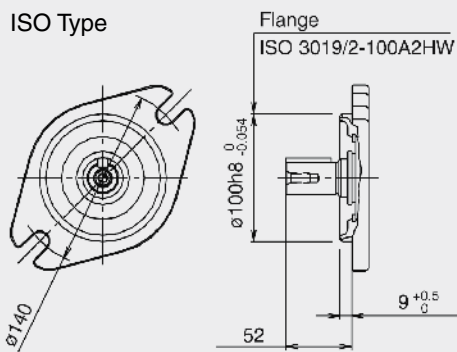


Mounting Flange and Shaft Options

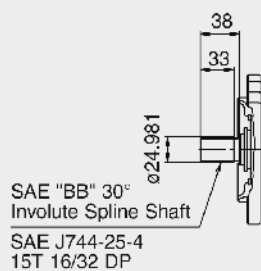
SAE Type



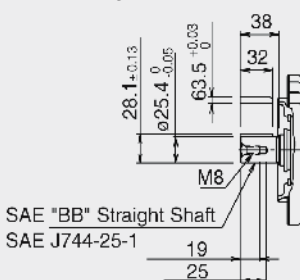
ISO Type



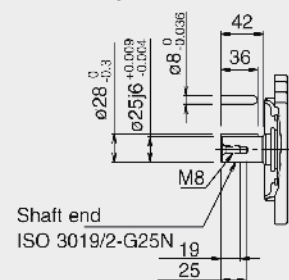
SAE Spline Shaft



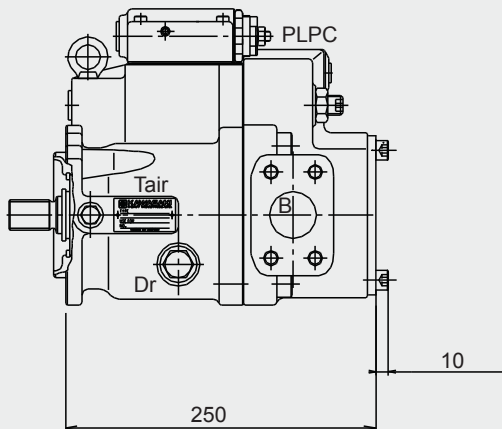
SAE Straight Shaft



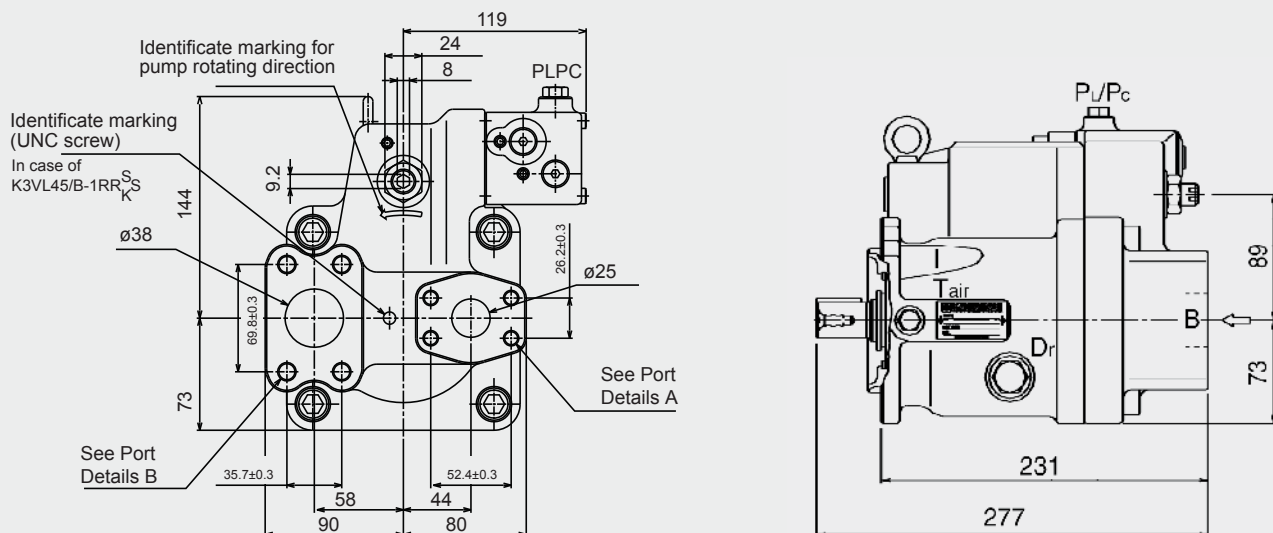
ISO Straight Shaft



Single Pump "N"



Rear Port Option



Porting Details

Main SAE Flanged Ports:

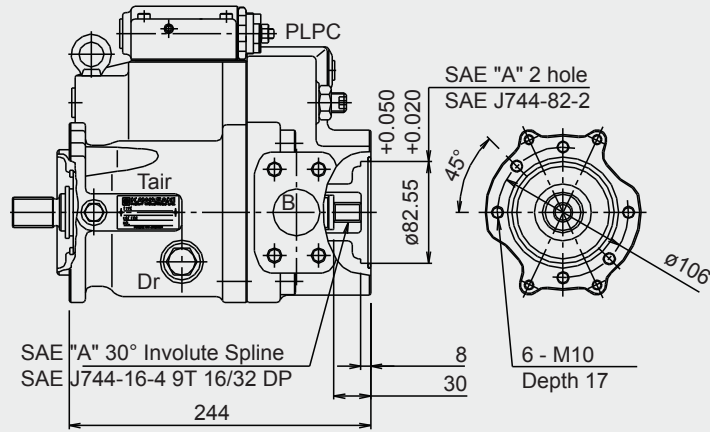
Des.	Port name	Port Size	Tightening Torque (Nm)	Flange Threads
UNF Threaded Version ("S" in position 9 of model code):				
A	Delivery Port	SAE J518C Std pressure (code 61) 1"	57	3/8-16UNC-2B x 18 mm
B	Suction Port	SAE J518C Std pressure (code 61) 1½"	98	1/2-13UNC-2B x 22 mm
Metric Version ("M" in position 9 of model code):				
A	Delivery Port	SAE J518C Std pressure (code 61) 1"	57	M10 x 17
B	Suction Port	SAE J518C Std pressure (code 61) 1½"	98	M12 x 20

Auxiliary Ports:

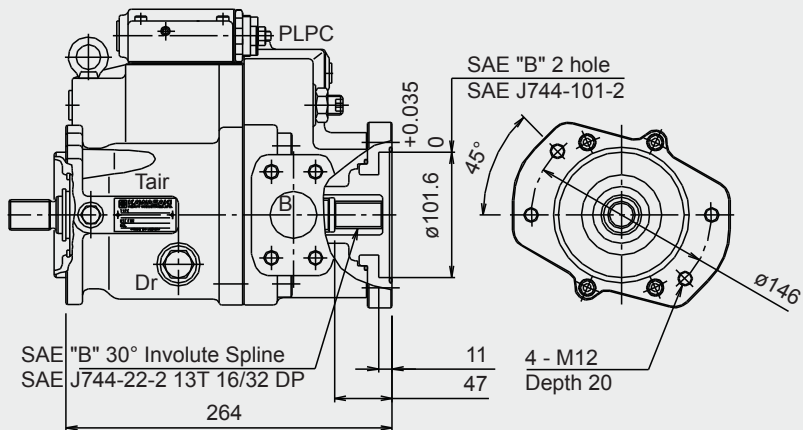
Des.	Port name	Port Size	Tightening Torque (Nm)
SAE Version ("S", "K", "U" or "T" in position 8 of model code):			
Dr	Drain Port (x2)	SAE J1926/1 Straight thread O ring boss, ½" OD Tube 3/4-16UNF-2B	98
PL PC	Load Sensing Port Pressure Control Port	SAE J1926/1 Straight thread O ring boss, ¼" OD Tube 7/16-20UNF-2B	12
Tair	Air Bleeder Port	SAE J1926/1 Straight thread O ring boss, ¼" OD Tube 7/16-20UNF-2B	12
ISO Version ("M" in position 8 of model code):			
Dr	Drain Port (x2)	M22 x 1.5 DIN 3852	98
PL PC	Load Sensing Port Pressure Control Port	M14 x 1.5 DIN 3852	25
Tair	Air Bleeder Port	M14 x 1.5 DIN 3852	25

Through Drive Options

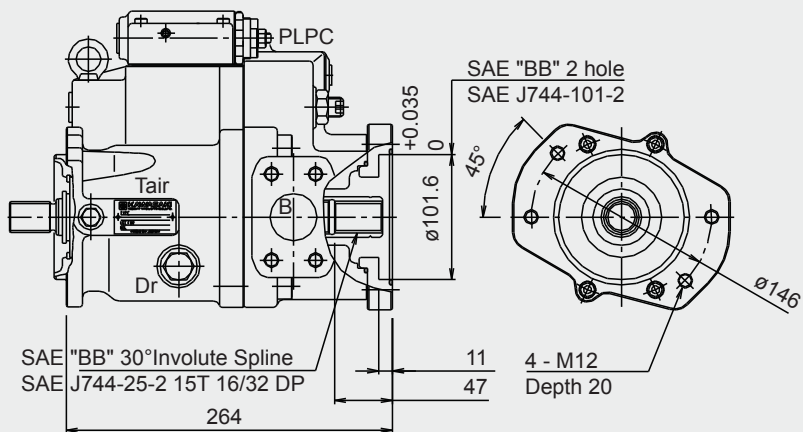
Through Drive "A"



Through Drive "B"



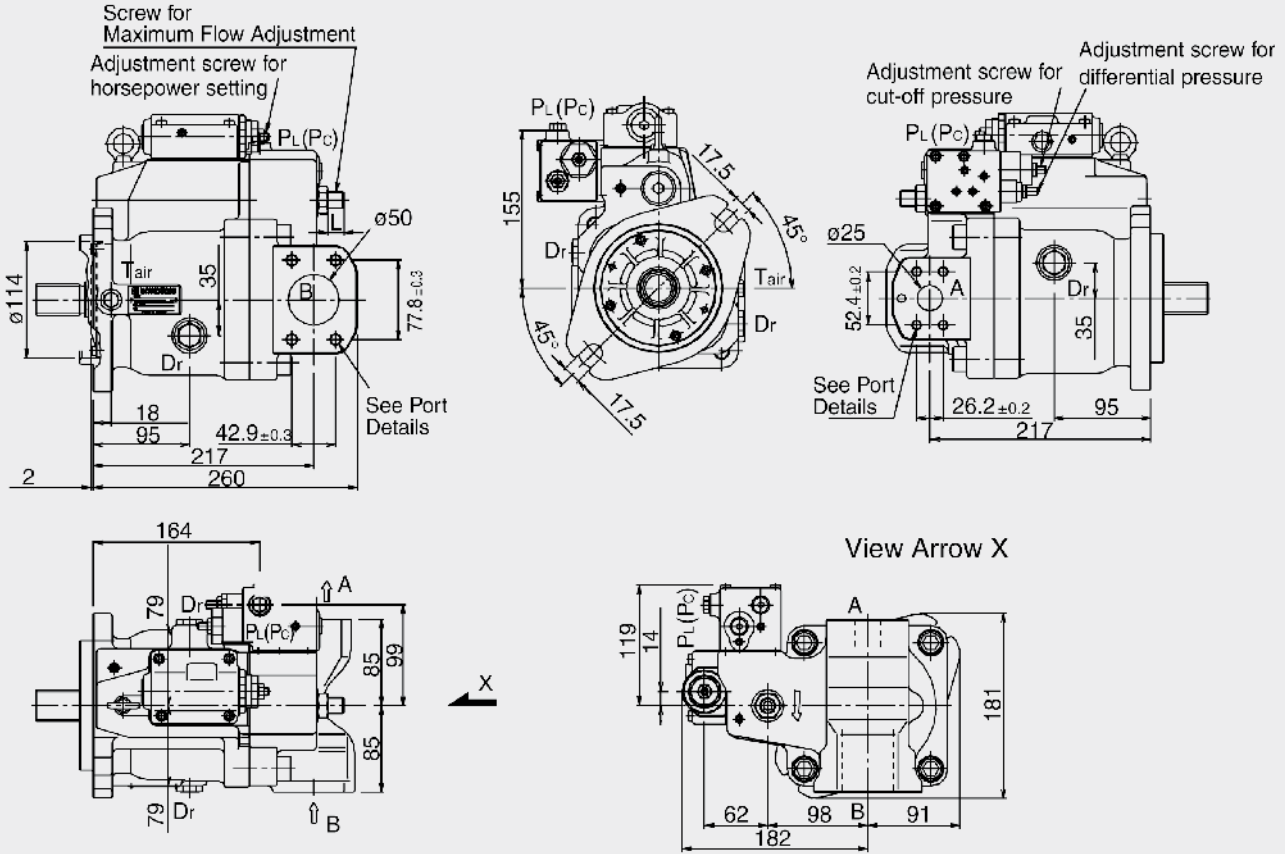
Through Drive "BB"



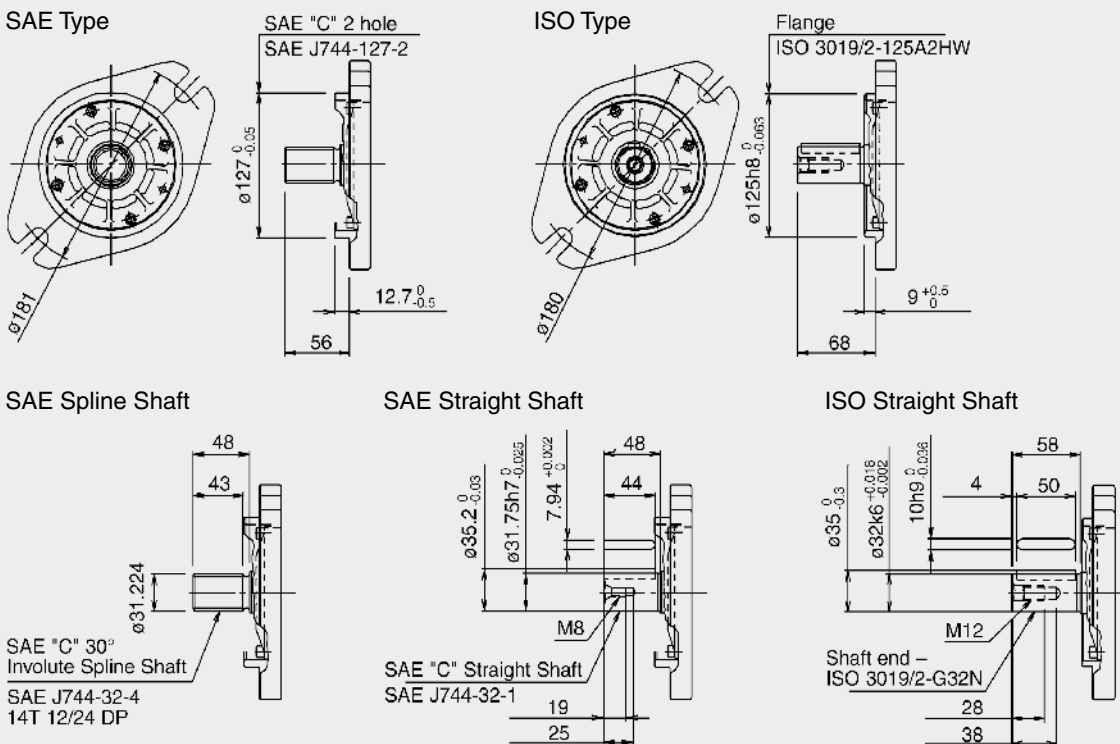
PPV101-80 with Cut-Off / Load Sense Control and Torque Limit Module (clockwise rotation)

Note: for counter clockwise rotation, the suction port "B" and the delivery port "A" are reversed.

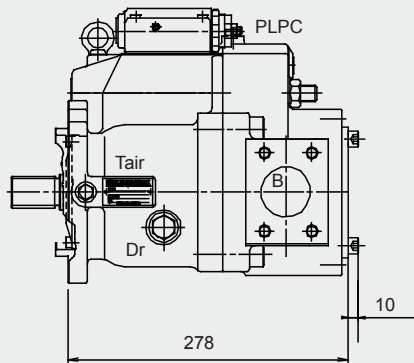
Single Pump "0"



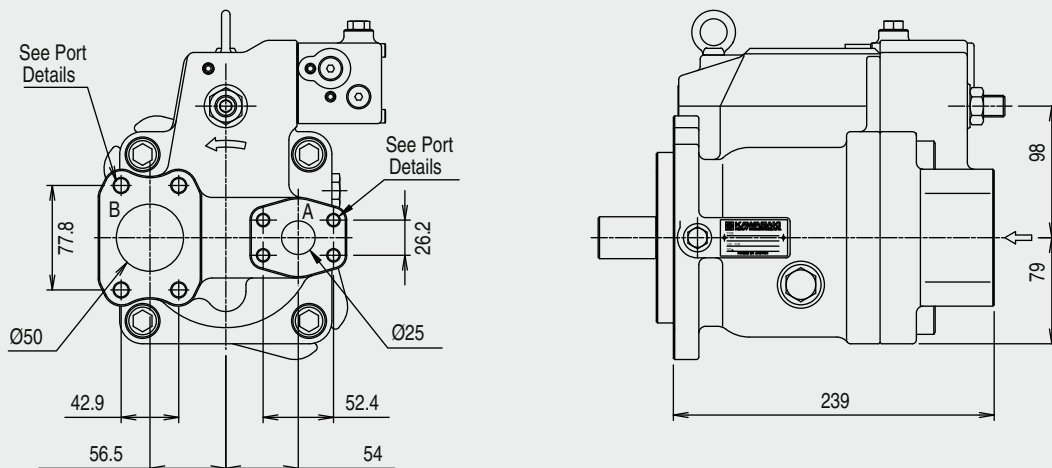
Mounting Flange and Shaft Options



Single Pump "N"



Rear Port Option



Porting Details

Main SAE Flanged Ports:

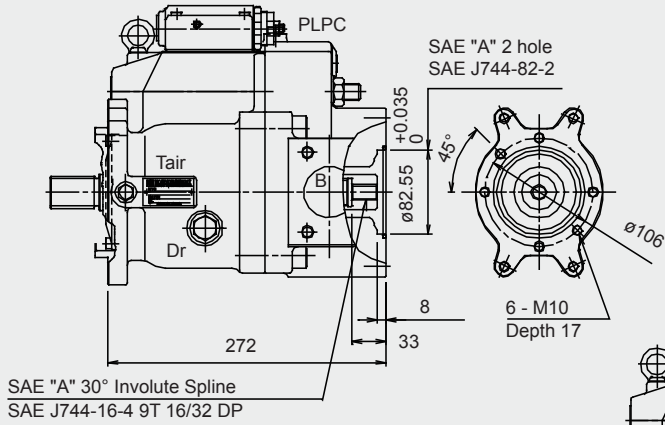
Des.	Port name	Port Size	Tightening Torque (Nm)	Flange Threads
UNF Threaded Version ("S" in position 9 of model code):				
A	Delivery Port	SAE J518C Std pressure (code 61) 1"	57	3/8-16UNC-2B x 18 mm
B	Suction Port	SAE J518C Std pressure (code 61) 2"	98	1/2-13UNC-2B x 22 mm
Metric Version ("M" in position 9 of model code):				
A	Delivery Port	SAE J518C Std pressure (code 61) 1"	57	M10 x 17
B	Suction Port	SAE J518C Std pressure (code 61) 2"	98	M12 x 20

Auxiliary Ports:

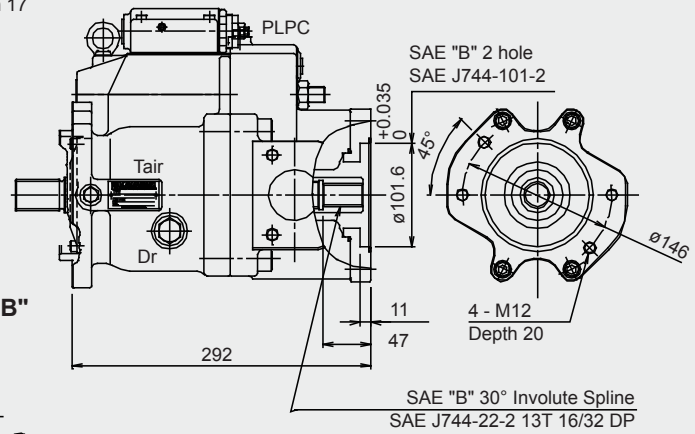
Des.	Port name	Port Size	Tightening Torque (Nm)
SAE Version ("S", "K" in position 8 of model code):			
Dr	Drain Port (x2)	SAE J1926/1 Straight thread O ring boss, 1/2" OD Tube 3/4-16UNF-2B	98
PL PC	Load Sensing Port Pressure Control Port	SAE J1926/1 Straight thread O ring boss, 1/4" OD Tube 7/16-20UNF-2B	12
Tair	Air Bleeder Port	SAE J1926/1 Straight thread O ring boss, 1/4" OD Tube 7/16-20UNF-2B	12
ISO Version ("M" in position 8 of model code):			
Dr	Drain Port (x2)	M22 x 1.5 DIN 3852	98
PL PC	Load Sensing Port Pressure Control Port	M14 x 1.5 DIN 3852	25
Tair	Air Bleeder Port	M14 x 1.5 DIN 3852	25

Through Drive Options

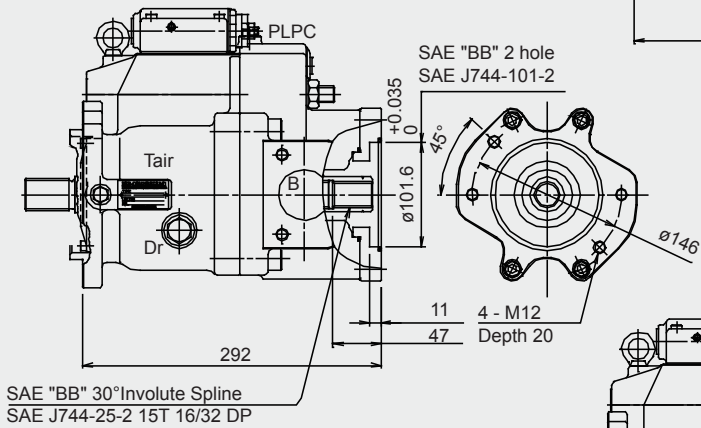
Through Drive "A"



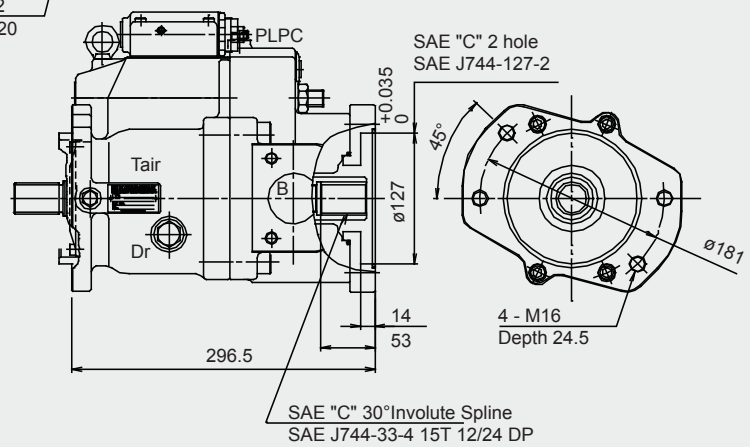
Through Drive "B"



Through Drive "BB"



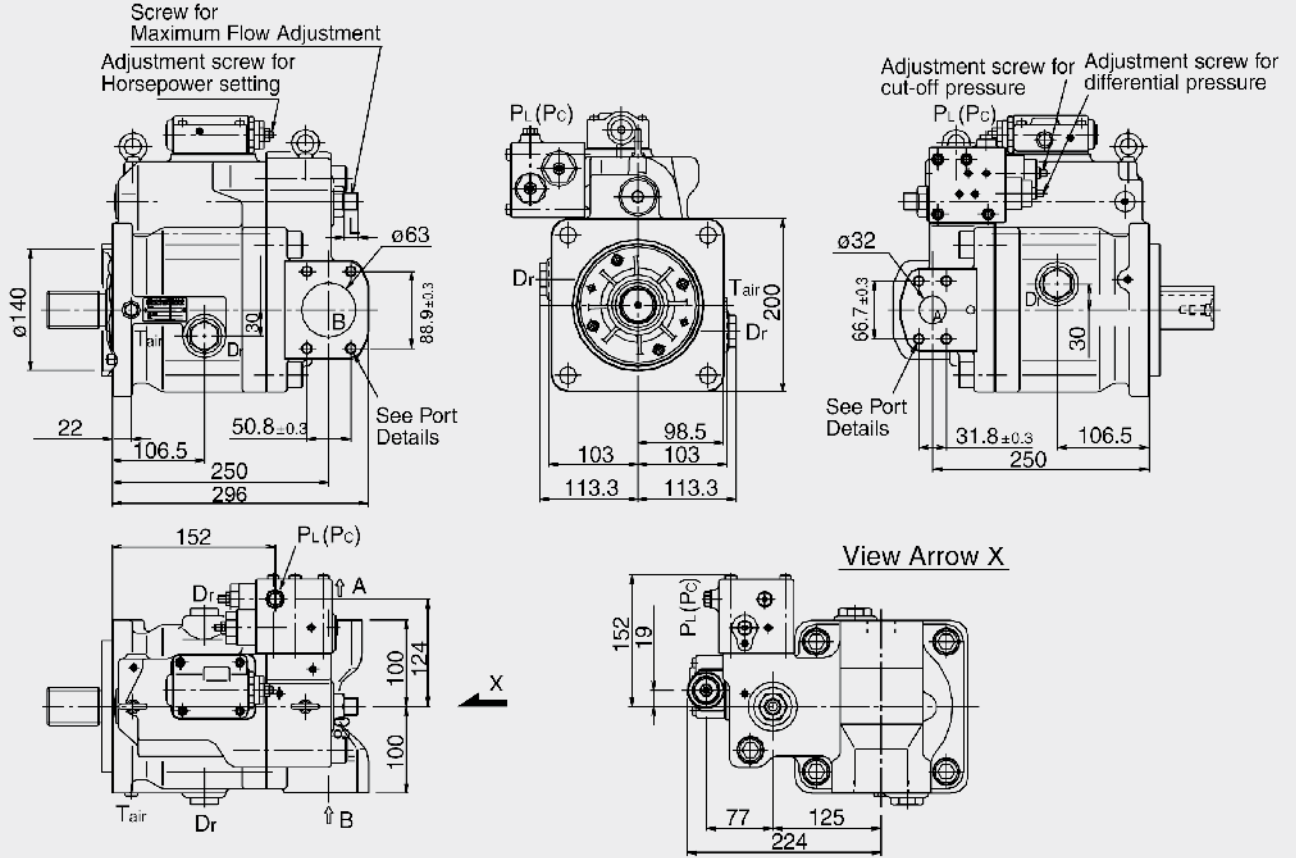
Through Drive "C"



PPV101-112 / -140 (4 Bolt) with Cut-Off / Load Sense Control and Torque Limit Module (clockwise rotation)

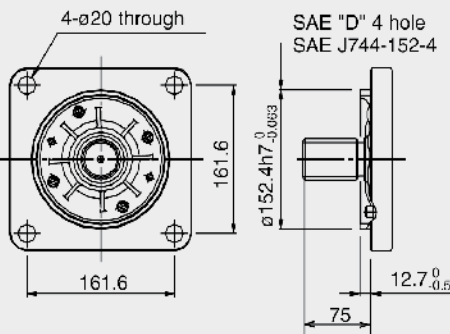
Note: for counter clockwise rotation, the suction port "B" and the delivery port "A" are reversed.

Single Pump "0"

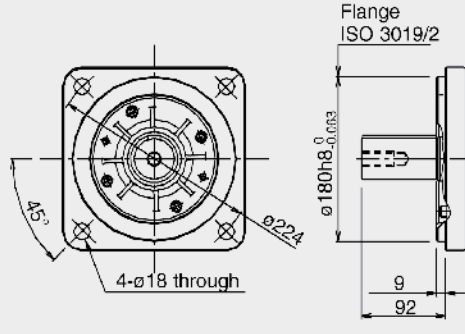


Standard Mounting Flange (SAE D 4 BOLT) and Shaft Options

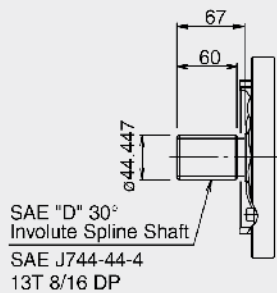
SAE "D" Type



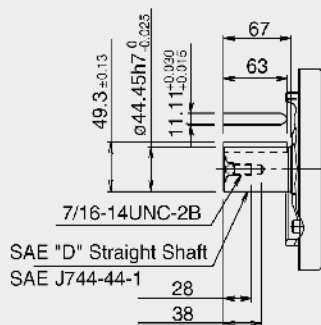
ISO Type



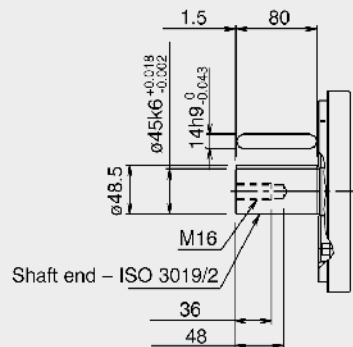
SAE Spline Shaft



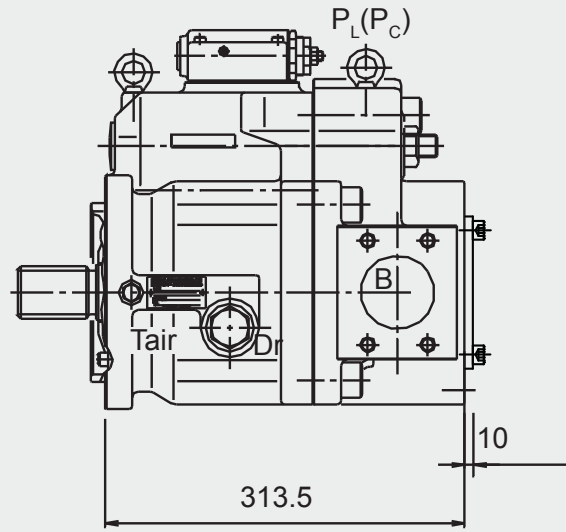
SAE Straight Shaft



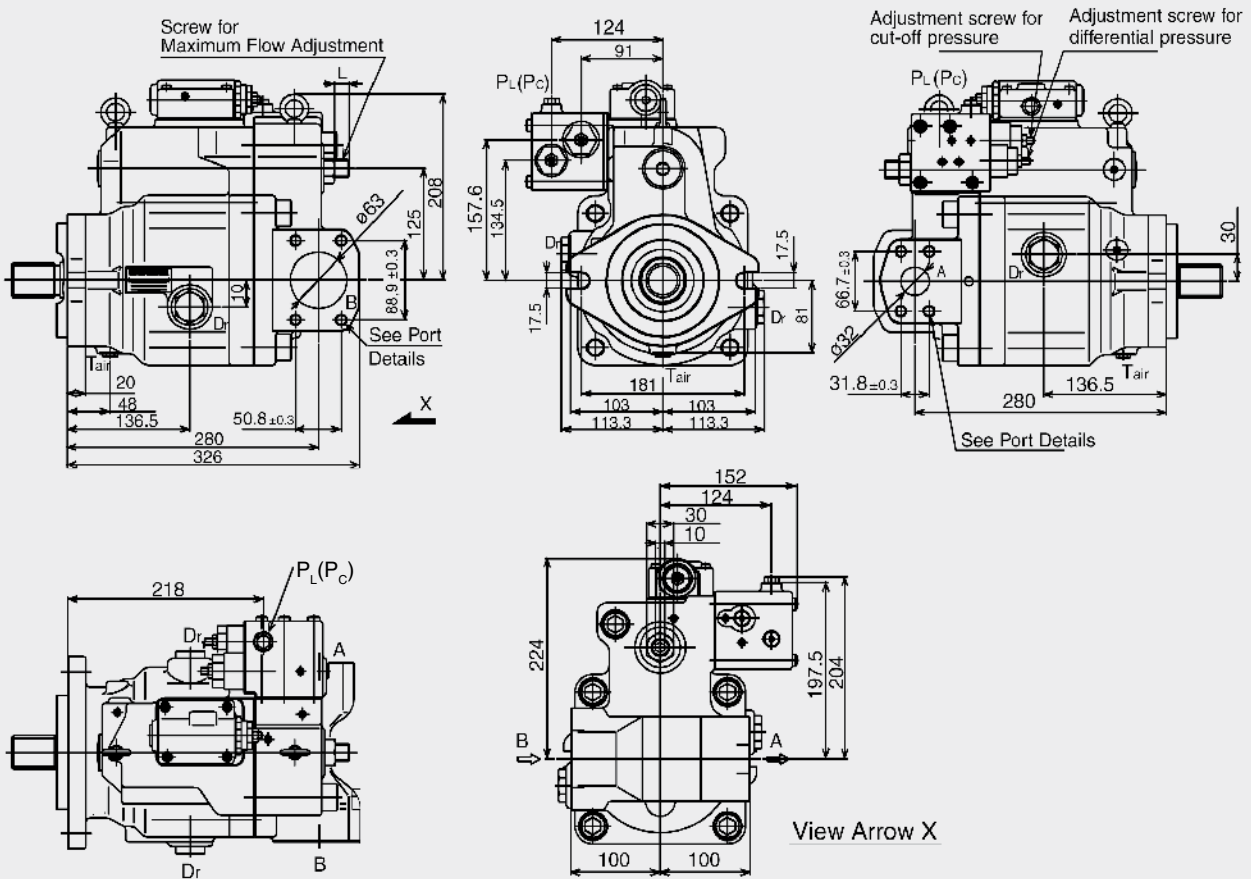
ISO Straight Shaft



Single Pump "N"

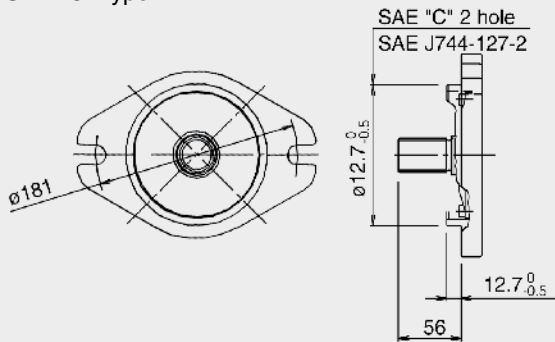


(2 Bolt) Installation

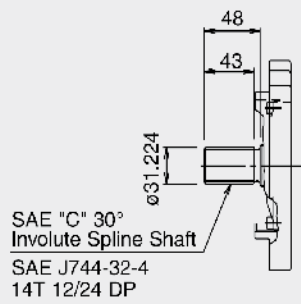


Mounting Flange (2 Bolt) and Shaft Options

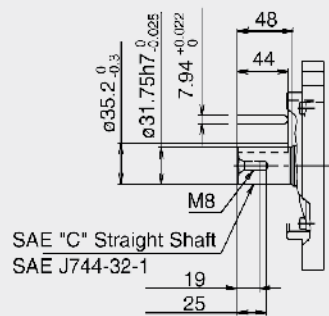
SAE "C" Type



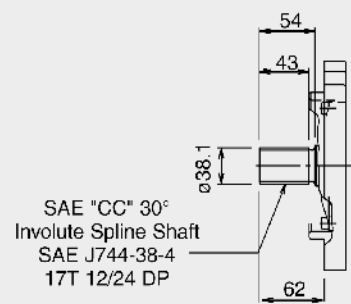
SAE "C" Spline Shaft



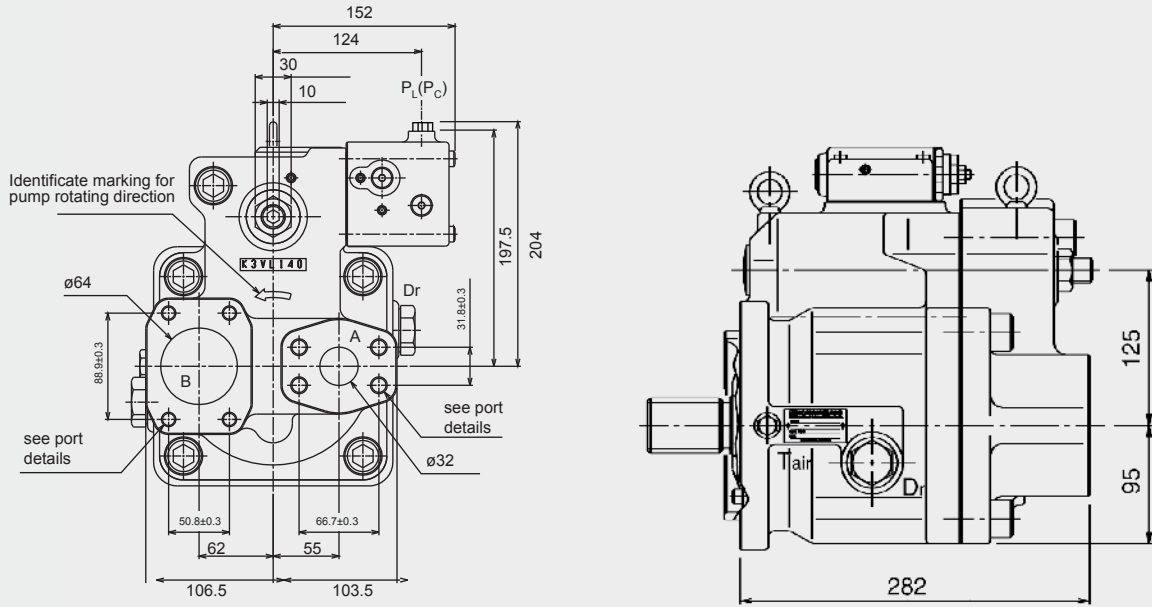
SAE "C" Straight Shaft



Shaft Detail – SAE "CC" Spline



Rear Port Option



Porting Details

Main SAE Flanged Ports:

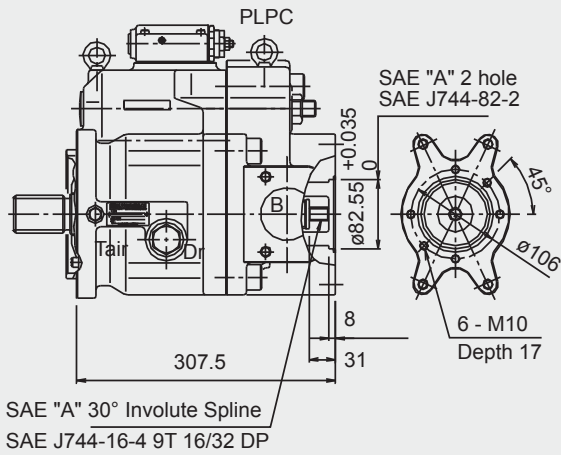
Des.	Port name	Port Size	Tightening Torque (Nm)	Flange Threads
UNF Threaded Version ("S" in position 9 of model code):				
A	Delivery Port	SAE J518C high pressure (code 62) 1¼"	98	1/2-13UNC-2B x 22 mm
B	Suction Port	SAE J518C Std pressure (code 61) 2½"	98	1/2-13UNC-2B x 22 mm
Metric Version ("M" in position 9 of model code):				
A	Delivery Port	SAE J518C high pressure (code 62) 1¼"	157	M14 x 19
B	Suction Port	SAE J518C Std pressure (code 61) 2½"	98	M12 x 17

Auxiliary Ports:

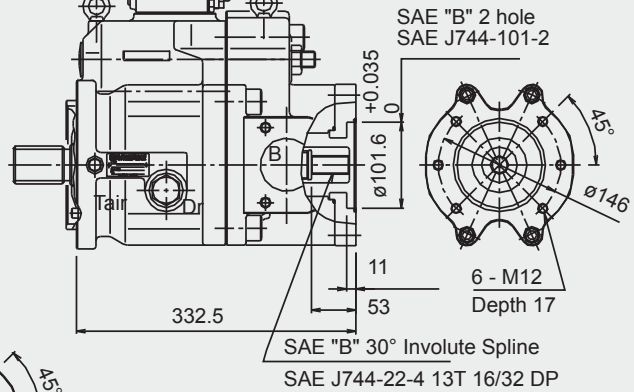
Des.	Port name	Port Size	Tightening Torque (Nm)
SAE Version ("S", "K", "C", "R", "X", "U" or "T" in position 8 of model code):			
Dr	Drain Port (x2)	SAE J1926/1 Straight thread O ring boss, ¾" OD Tube 1 1/16-12UNF-2B	167
PL PC	Load Sensing Port Pressure Control Port	SAE J1926/1 Straight thread O ring boss, ¼" OD Tube 7/16-20UNF-2B	12
Tair	Air Bleeder Port	SAE J1926/1 Straight thread O ring boss, ¼" OD Tube 7/16-20UNF-2B	12
ISO Version ("M" in position 8 of model code):			
Dr	Drain Port (x2)	M27 x 2 DIN 3852	167
PL PC	Load Sensing Port Pressure Control Port	M14 x 1.5 DIN 3852	25
Tair	Air Bleeder Port	M14 x 1.5 DIN 3852	25

Trough Drive Option

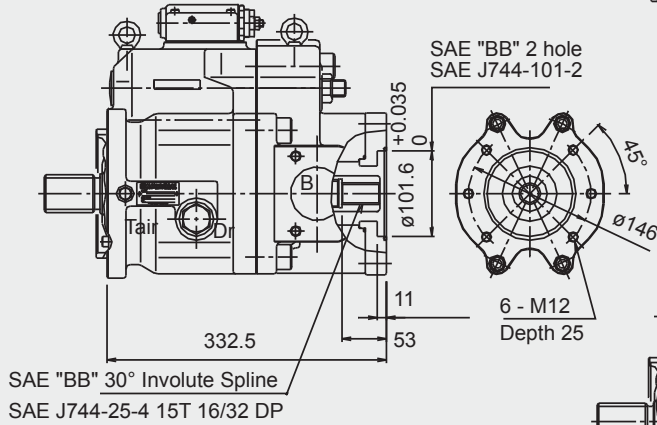
Through Drive "A"



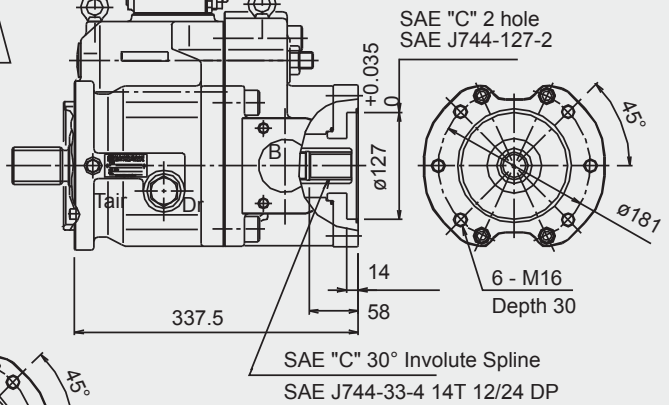
Through Drive "B"



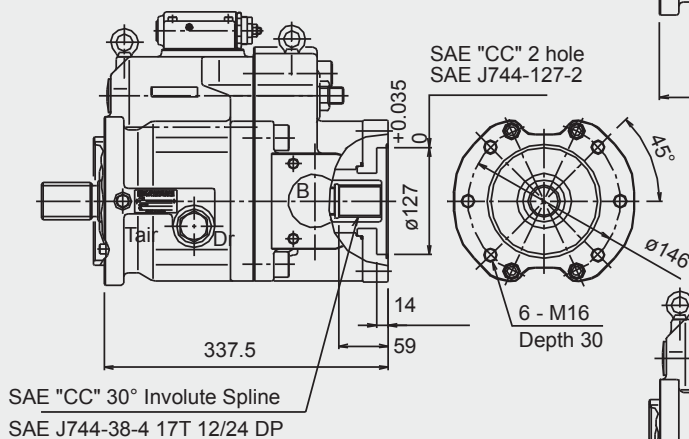
Through Drive "BB"



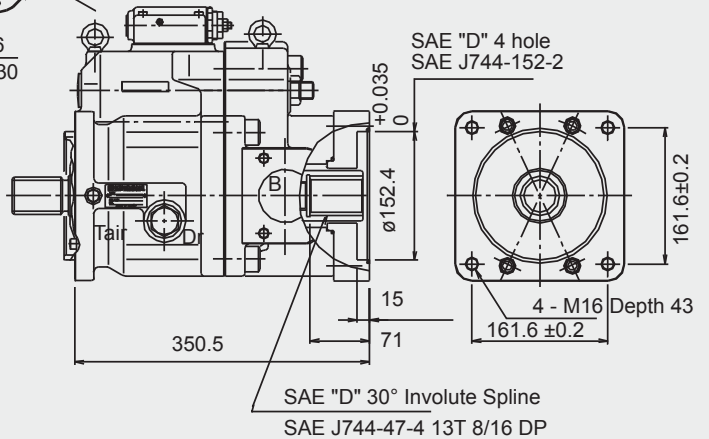
Through Drive "C"



Through Drive "CC"



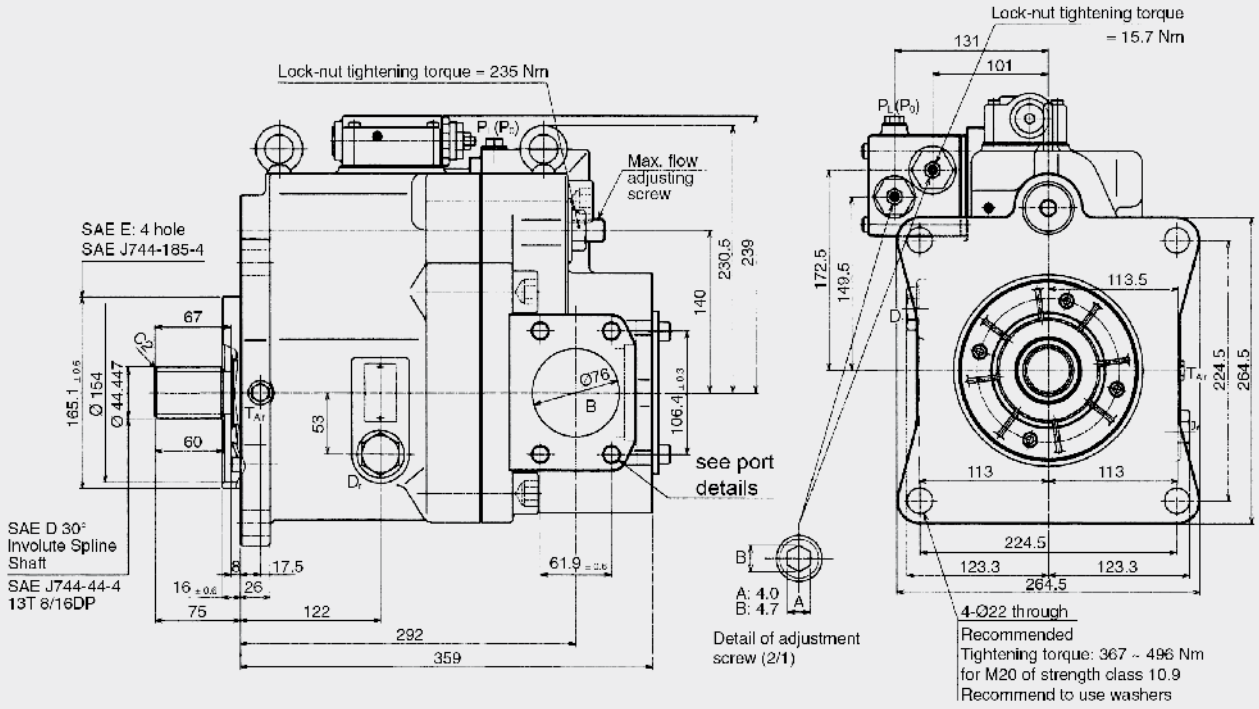
Through Drive "D"

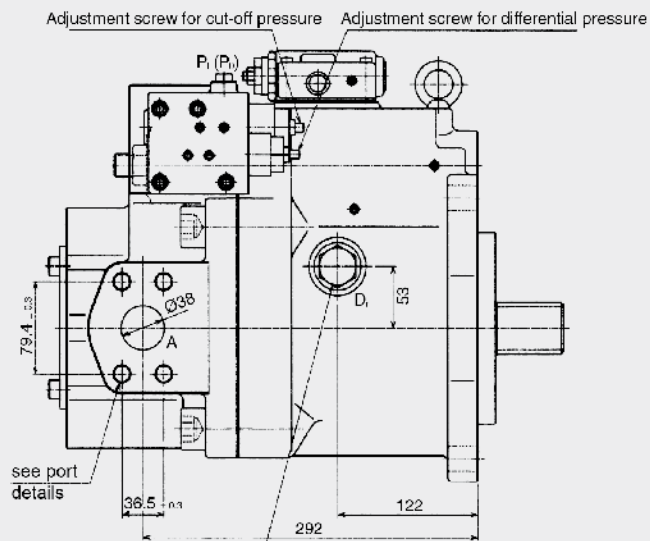


PPV101-200 with Cut-Off / Load Sense Control and Torque Limit Module (clockwise rotation)

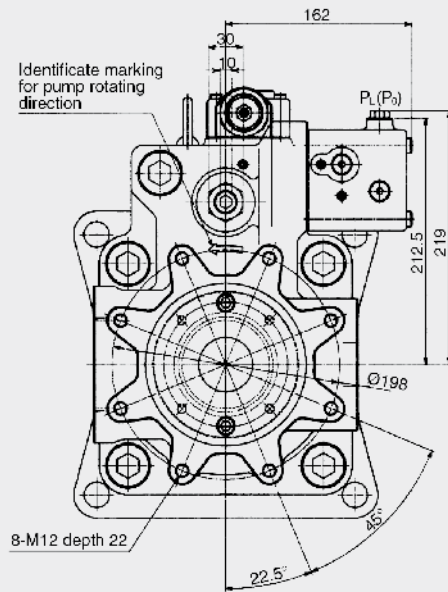
Note: for counter clockwise rotation, the suction port "B" and the delivery port "A" are reversed.

Single Pump "N"



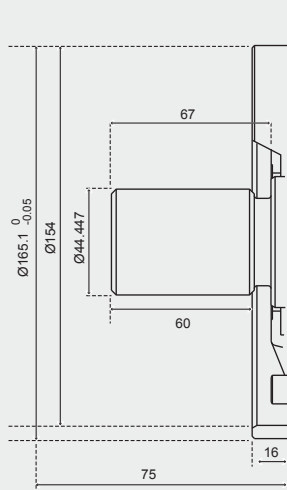


Fill the casing with oil before operation.

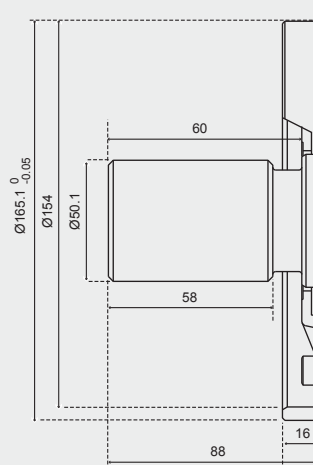


Mounting Flange and Shaft Options

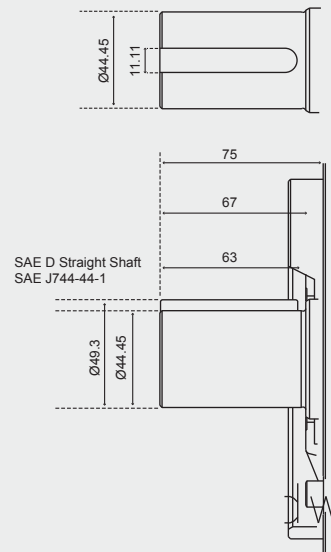
SAE Spline "D" Shaft



SAE Spline "F" Shaft



SAE Straight Shaft



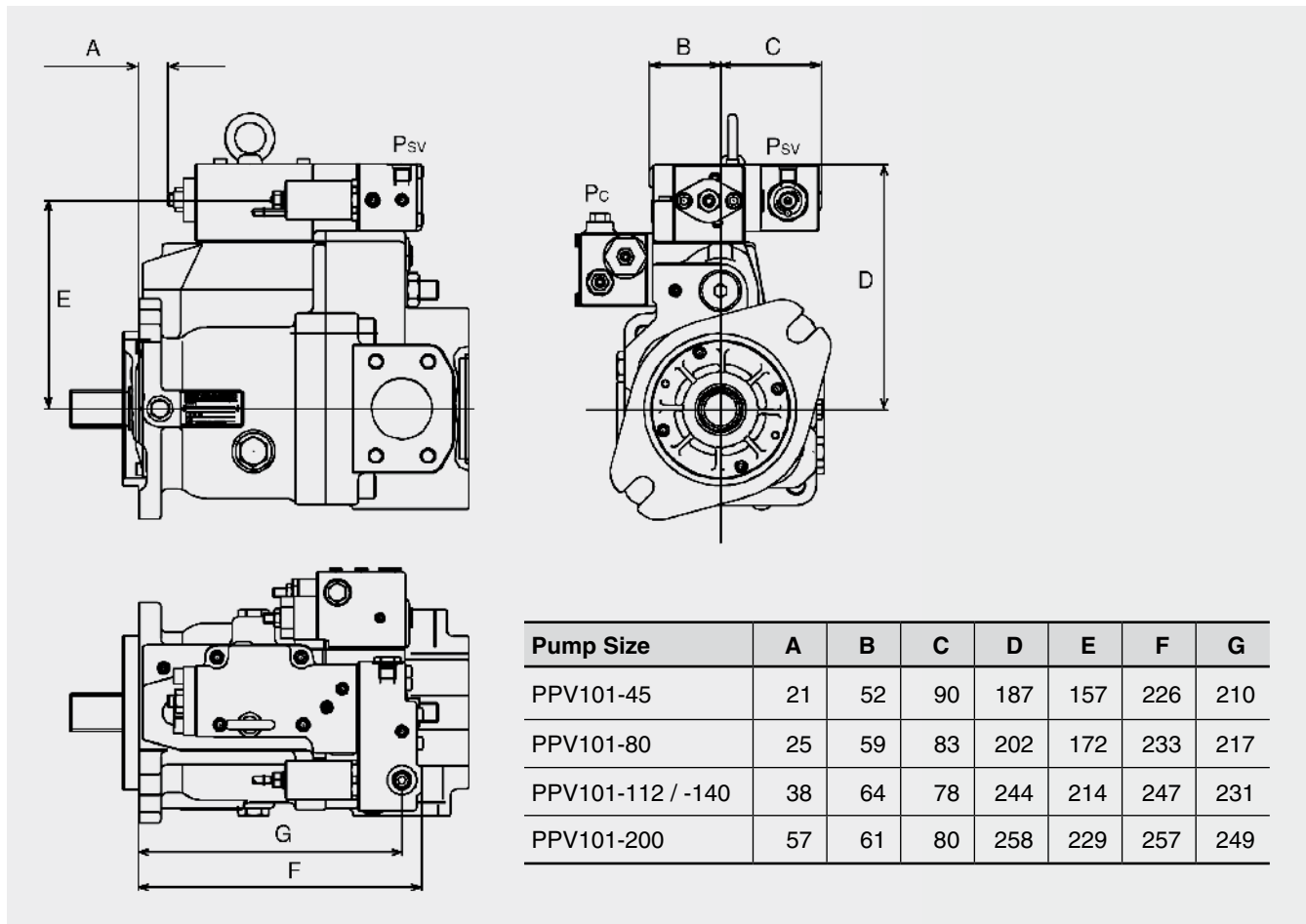
Porting Details

Des.	Port name	Port Size	Tightening Torque (Nm)	Flange Threads
UNC Threaded Version ("S" in position 9 of model code):				
A	Delivery Port	SAE J518C high pressure (code 62) 1½"	235	5/8-11UNC-2B
B	Suction Port	SAE J518C Std pressure (code 61) 3"	235	5/8-11UNC-2B
Metric Version ("M" in position 9 of model code):				
A	Delivery Port	SAE J518C high pressure (code 62) 1½"	235	M16 x 24
B	Suction Port	SAE J518C Std pressure (code 61) 3"	235	M16 x 24

Auxiliary Ports:

Des.	Port name	Port Size	Tightening Torque (Nm)
SAE Version ("S", "K" in position 8 of model code):			
Dr	Drain Port (x2)	SAE J1926 Straight thread O ring boss, ¼" OD Tube 1.1/16-12UNF-2B	167
PL	Load Sensing Port	SAE J1926 Straight thread O ring boss, ¼" OD Tube 7/16-20UNF-2B	12
PC	Pressure Control Port	SAE J1926 Straight thread O ring boss, ¼" OD Tube 7/16-20UNF-2B	12
Tair	Air Bleed Port	SAE J1926 Straight thread O ring boss, ¼" OD Tube 7/16-20UNF-2B	12

2.2.33 Electrical Displacement Control



2.2.34 Unloading Valve Module

Unloading Valve Module (*N, M)

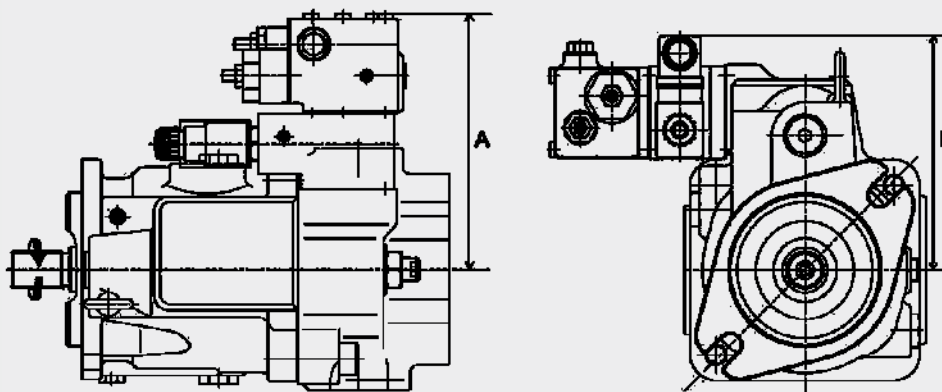
Pump Size	A	B
PPV101-45	169	155
PPV101-80	169	166
PPV101-112 / -140	202	190
PPV101-200	212	205

Proportional Pressure Module (*V)

Pump Size	A	B
PPV101-45	179	233
PPV101-80	179	244
PPV101-112 / -140	212	280
PPV101-200	222	295

A = Distance between the centre line of the pump and the top of the bolt head for the cut-off regulator.

B = Distance between the centre line of the pump and top of the solenoid valve.





2.3 HEAVY DUTY SERIES CONTENT

Ordering Code	<ul style="list-style-type: none"> 2.3.1 Heavy Duty Series 2.3.2 Heavy Duty Series Compensator 2.3.3 Standard Gear Pump Arrangement
Technical Information	<ul style="list-style-type: none"> 2.3.4 Specifications 2.3.5 Hydraulic Fluids 2.3.6 Viscosity Range 2.3.7 Temperature Range 2.3.8 Parameter for fire-resistant fluids 2.3.9 Seals 2.3.10 Filtration 2.3.11 Adjustments 2.3.12 Installation Notes
Control Options	<ul style="list-style-type: none"> 2.3.13 Variable delivery positive displacement control 2.3.14 Variable delivery negative displacement control 2.3.15 Variable delivery electrical displacement control 2.3.16 Power control 2.3.17 Power and negative displacement control 2.3.18 Power and positive displacement control 2.3.19 Power and electrical displacement control 2.3.20 Pressure compensated control 2.3.21 Pressure compensation and load sense control 2.3.22 Power and pressure compensation 2.3.23 Power, pressure compensation and negative displacement control 2.3.24 Power, pressure compensation and positive displacement control 2.3.25 Power, pressure compensation and electrical displacement control 2.3.26 Power, pressure compensation and load sense control
Performance Data	<ul style="list-style-type: none"> 2.3.27 PPV102-63 2.3.28 PPV102-112 2.3.29 PPV102-180 / -360 2.3.30 PPV102-280 / -560
Dimensions	<ul style="list-style-type: none"> 2.3.31 PPV102-63 / -112 / -180 / -280 2.3.32 PPV102-360 / -560 2.3.33 Regulators 2.3.34 Drain Port 2.3.35 Suction and Delivery Port 2.3.36 Thru Drive for Optional Gear Pumps

ORDERING CODE

2.3.1 Heavy Duty Series

PPV102 - 112 - 1 0 N R S - 4000 - - - XXXX

Axial Piston Pump
Heavy Duty Series

Size

63	63 cm ³ /rev
112	112 cm ³ /rev
180	180 cm ³ /rev
280	280 cm ³ /rev
360	2 x 180 cm ³ /rev
560	2 x 280 cm ³ /rev

Fluid Type

-	Mineral oil
W	Water glycol
Z	Phosphate ester

Open circuit: 1

Gear Pumps, Thru Drive and Pressure Assist Options

0	No gear pump, no pressure assist port
1	10 cm ³ /rev with build in relief valve, 40 bar setting (50 bar max), not for 360 and 560 pumps
2	15 cm ³ /rev with build in relief valve, 40 bar setting (50 bar max), not for 360 and 560 pumps
3	No gear pump, with pressure assist port
6	With pressure assist port, SAE A thru drive, 13 T spline
H	With pressure assist port, SAE A thru drive, 9 T spline
7	Without pressure assist port, SAE A thru drive, 13 T spline
G	Without pressure assist port, SAE A thru drive, 9 T spline
A	SAE B thru drive for 280, 360 and 560 only

Mounting Type

N	Flange Mounting
---	-----------------

Shaft Rotation (viewed from shaft end)

R	Right Hand (clockwise)
L	Left Hand (counter-clockwise), 360 and 560 only

Series

S	Low pulsation (Standard)
---	--------------------------

Mounting Orientation

-	Standard horizontal mounting
V	Vertical mounting (shaft up only)

Compensator Ordering Code (see next page)

Confluent Block (360 and 560 only)

Blank	Single pump
0	360 and 560 without confluent block
R	Rear Outlet Type
S	Side Outlet Type

Auxiliary Gear Pump (360 and 560 only)

Blank	Without gear pump
1	With gear pump, see Standard Gear Pump Arrangements

Modification Number
XXXX Determined by Manufacturer

2.3.2 Heavy Duty Series Compensator

4 0 0 0

Power / Pressure Control

- 0 No Power and no Pressure Control
- 1 Power Control
- 4 Pressure Control
- 7 Power and Pressure Control

Displacement Control

- 0 No Displacement Control
- P Positive Displacement Control
- N Negative Displacement Control
- E Electrical Positive Displacement Control
- L Load Sensing

Power Control Mode

- 0 No Power Control
 - L Low Setting Range
 - M Medium Setting Range
 - H High Setting Range
- } see table Power Setting Code

Power Setting Code

- 0 No Power Control
- 1-4 Power Setting Code – see table Power Setting Code

Power Setting Code

Standard compensator code @ 1500 rpm shaft speed,
pumps without auxiliary gear pump

Motor Power [kW]	Pump Frame Size [cm ³]					
	63	112	180	280	360	560
11	L4					
15	L1					
18.5	M2					
22	M1	L3				
30	H2	M3	L3			
37		M1	L1			
45		H5	M4			
55		H3	M2	L2		
75			H4	M4	L2	
90			H2	M2	M4	
110				H4	M2	L3
132				H2	H4	L1
160					H2	M3
200						M1
250						H4
280						H2

For other shaft speeds or different power settings please contact HYDAC

Power Control Adjustment Range @ 1500 rpm shaft speed

Power Control Mode	Pump Frame Size [cm ³]					
	63	112	180	280	360	560
L Low Setting Range	10.6 - 18.9	19.1 - 30.7	29.9 - 45.6	46.8 - 75.0	59.9 - 91.1	93.5 - 160.0
M Medium Setting Range	15.6 - 22.4	27.1 - 45.6	43.9 - 75.0	67.3 - 113.5	87.9 - 134.5	137.2 - 239.2
H High Setting Range	22.0 - 33.8	37.0 - 62.1	55.0 - 96.5	90.0 - 150.1	109.4 - 192.9	197.3 - 300.3

2.3.3 Standard Gear Pump Arrangements

Pump Size and Ordering Code											Gear Pump Displacement			
PPV102-63	-	1	1	#	#	S	-	####	-	#			10	cm ³ /rev
PPV102-112	-	1	1	#	#	S	-	####	-	#			10	cm ³ /rev
PPV102-180	-	1	1	#	#	S	-	####	-	#			10	cm ³ /rev
PPV102-280	-	1	2	#	#	S	-	####	-	#			15	cm ³ /rev
PPV102-360	-	1	A	#	#	S	-	####	-	#	-	1	25.3	cm ³ /rev
PPV102-560	-	1	A	#	#	S	-	####	-	#	-	1	32.5	cm ³ /rev

Note: The "#" denotes any available selection for the pump. See 2.3.1 Ordering Code for the pump.

TECHNICAL INFORMATION

2.3.4 Specifications

Pump Size		63	112	180	280	360	560
Geometric Displacement	[cm ³ /rev]	63	112	180	280	360	560
Pressure	Rated [bar]	350					
	Peak [bar]	400					
Shaft Speed	min. [rpm]	600					
	max. self priming [rpm]	1800	1800	1800	1500	1800	1500
	max. boosted* [rpm]	3250	2700	2300	2000	2300	2000
Power (1500 rpm, 350 bar)	[kW]	61	108	173	270	347	539
Torque (350 bar)	[Nm]	388	688	1101	1720	2210	3430
Pre-fill Oil Volume	[cm ³]	1000	1200	2900	3200	6000	6500
Approx. Mass	[kg]	48	68	86	160	160	300

* required boost pressure p = 1 bar

2.3.5 Hydraulic Fluids

H, HL	Mineral Oil
HEES, HETG	Fatty Acid Ester (Polyol Ester)
HFC	Water glycol
HLP, HLPD, HV, HVLP	High Quality, Anti-Wear, Mineral Based Hydraulic Fluid (at pressure above 200 bar)

For HFD fluids please contact HYDAC

2.3.6 Viscosity Range

Minimal viscosity: 10 cSt (mm²/s)

Normal operating viscosity: 10 - 200 cSt (mm²/s)

Maximal viscosity: 1000 cSt (mm²/s)

2.3.7 Temperature Range

-20 up to +80 °C

Note:

The highest fluid temperature will be at the drain port of the pump, up to 20 °C higher than in the reservoir.

2.3.8 Parameter for fire-resistant fluids

	Fluid Type			
	Mineral Oil	Phosphate Ester	Polyol Ester	Water Glycol*
Maximum continuous Pressure (bar)	350			207
Temperature Range (°C)	-20 ~ +80	0 ~ +60	0 ~ +60	10 ~ 50
Cavitation Resistance	○	△	△	△
Percentage pump life compared to mineral oil	100	60 ~ 100	50 ~ 100	20 ~ 80

- = Optimum
 △ = Acceptable but with reduced pump life
 * = Do not exceed the rated speed.
 Maximum speed for 280cc pumps using water glycol is 1500 rpm

2.3.9 Seals

Hydraulic Fluid Type (see Ordering Code)	Generic Fluid Type	Shaft Seal Material	General Seal Material (O-Rings)
–	Mineral Oil	FPM	NBR
W	Water Glycol	NBR	NBR

2.3.10 Filtration

For maximum pump and system component life time, the system should be protected from contamination by effective filtration.

Maintain the degree of contamination within 20/18/15 ISO 4406:1999 or NAS 1638 Grade 9.

2.3.11 Adjustments

Pump Size	Volume	
	Volume Adjustment Screw Sensitivity per ¼ turn	Min. adjustable Displacement
	[cm³]	[cm³/rev]
PPV102-63	1.54	22.5
PPV102-112	2.86	56
PPV102-180	3.81	87
PPV102-280	5.10	140
PPV102-360	3.81	2x 87
PPV102-560	5.10	2x 140

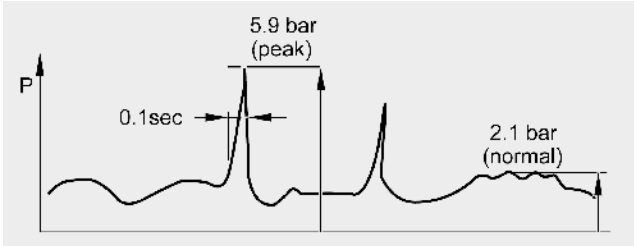
2.3.12 Installation Notes

Recommended Pump Mounting

The pump should be mounted horizontally with the case drain piping initially rising above the level of the pump before continuing to the tank as shown in the illustration below. Do not connect the drain line to the suction line.

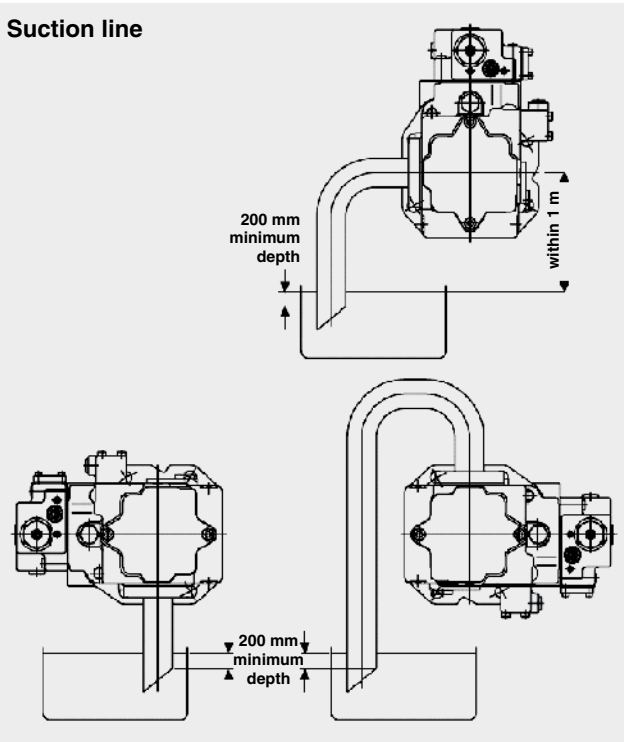
The uppermost drain port should be used and the drain piping should be equal or larger in size than the drain port to minimise pressure in the pump case.

The pump case pressure should not exceed 2.1 bar as shown in the illustration below (peak pressure should never exceed 5.9 bar).



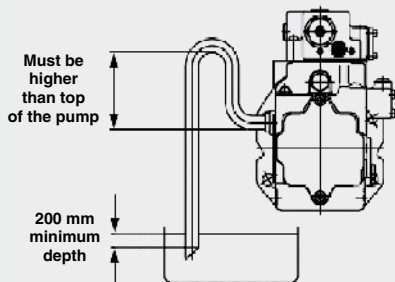
Mounting the pump above the tank

Suction line



Drain line

"Goose neck" configuration is required, this prevents direct drop of oil level in the pump case.



Cautions:

- Suction and drain pipes must be immersed by 200 mm minimum from the lowest oil level under operating conditions.
- Height from the oil level to the centre of the shaft must be within 1 m.
- The oil in the pump case must be refilled when the pump has not been operated for one month or longer.

Mounting the pump vertically (shaft up)

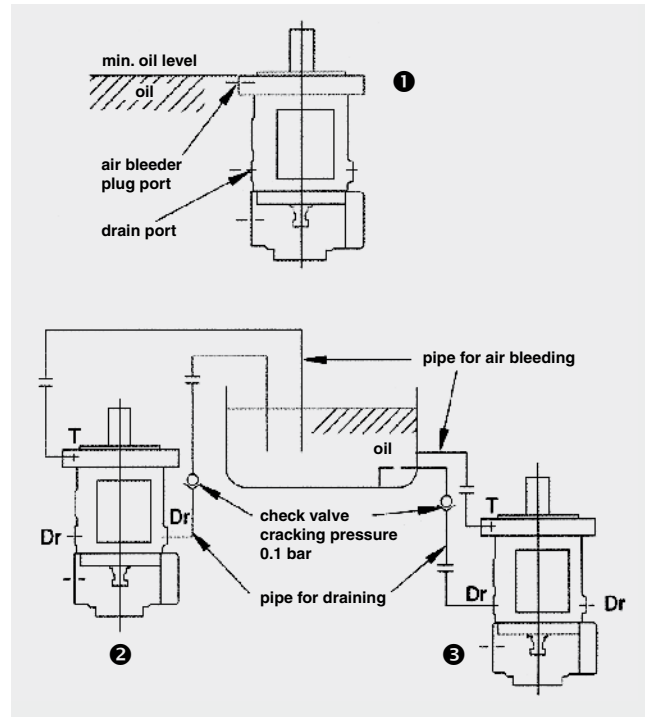
For applications requiring vertical installation (shaft up) the pump must be provided with additional means to lubricate the front bearing. Do not use a standard pump for this type of application (mounting orientation "V" type should be used).

The oil level in the tank should be higher than the pump-mounting flange as shown in illustration ❶ below.

If the oil level in the tank is lower than the pump mounting flange then forced lubrication is required through the air bleed port 1 ~ 2 l/min.

When installing the pump in the tank and submerged in the oil, open the drain port and air bleed port to provide adequate lubrication to the internal components.

When installing the pump outside the tank run piping for the drain and air bleed ports to tank (see illustration ❷). If the drain or air bleed piping rise above the level of oil (see illustration ❸) fill the lines with oil before operation.



A check valve with cracking pressure of 0.1 bar should be fitted to the case drain line as shown.

Recommended check valves

Model Number	Type	Material
PPV102-63	RV-12-0.1X/0 - 0.1 bar	3474099
PPV102-112 to PPV102-280	RV-16-0.1X/0 - 0.1 bar	858636
PPV102-360 to PPV102-560	RV-20-0.1X/0 - 0.1 bar	706734

CONTROL OPTIONS

2.3.13 Variable Delivery Positive Displacement Control – 0P

Regulator Code	Control Curves	Hydraulic Circuit
<p>Infinitely variable adjustment of the delivery flow is possible by the pilot hydraulic pressure.</p> <p>An increase in pilot signal will result in an increase in displacement, hence the positive control.</p>	<p>Range of displacement control 2.5 – 100 %</p>	

2.3.14 Variable Delivery Negative Displacement Control – 0N

Regulator Code	Control Curves	Hydraulic Circuit
<p>Infinitely variable adjustment of the delivery flow is possible by the pilot hydraulic pressure.</p> <p>An increase in pilot signal will result in a decrease in displacement, hence the negative control.</p>	<p>Range of displacement control 15 – 100 %</p>	

2.3.15 Variable Delivery Electrical Displacement Control – 0E

Regulator Code	Control Curves	Hydraulic Circuit
<p>Infinitely variable adjustment of the delivery flow is possible by using the pilot voltage (utilising a solenoid operated proportional pressure reducing valve).</p> <p>The pilot voltage is used as a power source for the solenoid operated proportional pressure reducing valve; a 10cc gear pump is available external piping. This regulator requires an amplifier to provide the electrical signal.</p>	<p>Range of displacement control 2.5 – 100 %</p>	

2.3.16 Power Control – 10##

Regulator Code	Control Curves	Hydraulic Circuit
<p>In response to a rise in delivery pressure, the swashplate tilting angle is decreased, limiting the input torque. This regulator prevents excessive load against the prime mover.</p>		

2.3.17 Power and Negative Displacement Control – 1N

Regulator Code	Control Curves	Hydraulic Circuit
<p>In response to a rise in delivery pressure, the swashplate tilting angle is decreased, limiting the input torque. This regulator prevents excessive load against the prime mover.</p> <p>By adding a pilot signal to the Pi port the discharge flow can be infinitely adjusted within the range of the pump.</p> <p>An increase in pilot signal will result in a decrease in flow, hence the negative control.</p>	<p>Range of displacement control 15 – 100 %</p>	

2.3.18 Power and Positive Displacement Control – 1P

Regulator Code	Control Curves	Hydraulic Circuit
<p>This regulator combines the Power Control with Positive Displacement Control.</p> <p>By adding a pilot signal to the Pi port the discharge flow can be infinitely adjusted within the range of the pump.</p> <p>An increase in pilot signal will result in an increase in flow, hence the Positive control.</p>	<p>Range of displacement control 15 – 100 %</p>	

2.3.19 Power and Electrical Displacement Control – 1E

Regulator Code	Control Curves	Hydraulic Circuit
<p>This regulator combines the Power Control with Electrical Displacement control.</p> <p>A proportional reducing valve is added to the regulator so the discharge flow can be infinitely adjusted within the range of the pump.</p> <p>An increase in electrical signal to the proportional reducing valve will result in an increase in flow.</p> <p>This regulator requires an amplifier to provide the electrical signal.</p>	<p>(mA) Current π</p> <p>Range of displacement control 2.5 – 100 %</p>	

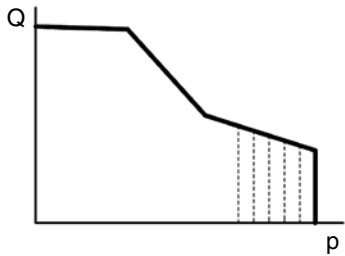
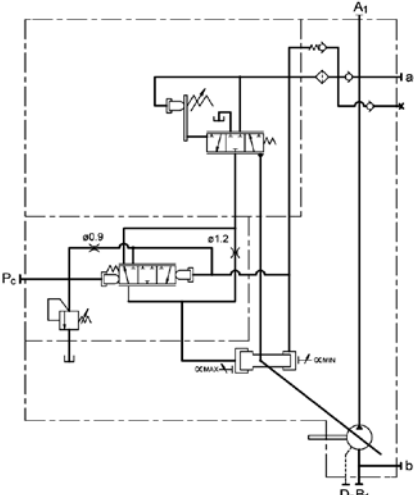
2.3.20 Pressure Compensated Control – 4000

Regulator Code	Control Curves	Hydraulic Circuit
<p>This regulator maintains a constant pressure regardless of the discharge flow.</p> <p>It is imperative that a safety relief valve is installed in the circuit.</p> <p>Note: Standard factory pressure setting is 200 bar with an adjustable range of 80 bar to 315 bar. For pressure settings above 315 bar please state clearly on the order.</p>	<p>Range of displacement control 0 – 100 %</p>	

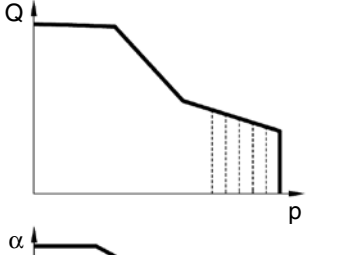
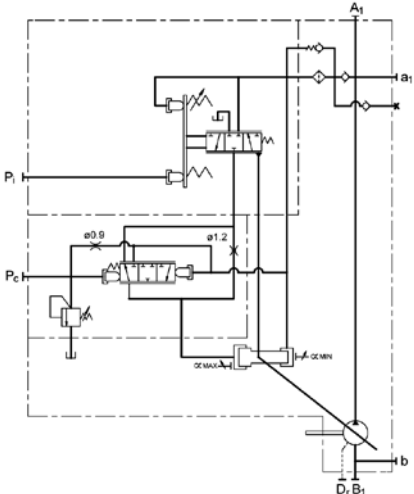
2.3.21 Pressure Compensation and Load Sense Control – 4L00

Regulator Code	Control Curves	Hydraulic Circuit
<p>This regulator controls the pump displacement to match the flow requirements as a function of the load sensing differential pressure with a factory setting of 25 bar Δp with an adjustment range from 10 to 30 bar. Also provides the facility for pressure limiting.</p> <p>Note: Standard factory pressure setting is 200 bar with an adjustable range of 80 bar to 315 bar. For pressure settings above 315 bar please state clearly on the order.</p>	<p>Range of displacement control 0 – 100 %</p>	

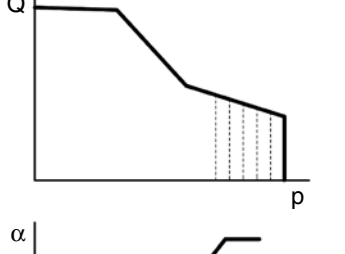
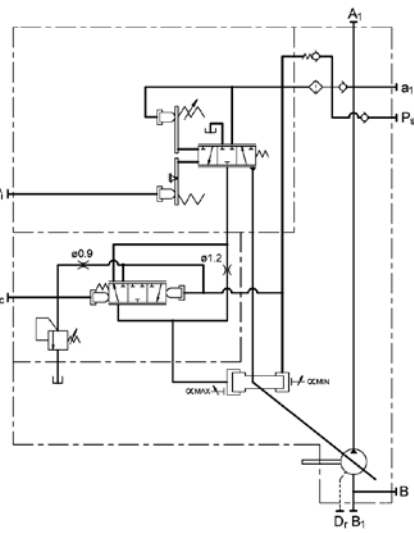
2.3.22 Power and Pressure Compensation – 70

Regulator Code	Control Curves	Hydraulic Circuit
<p>This regulator combines the Power Control with Pressure Compensation Control.</p> <p>Note: Standard factory pressure setting is 320 bar with an adjustable range of 80 bar to 350 bar.</p>		

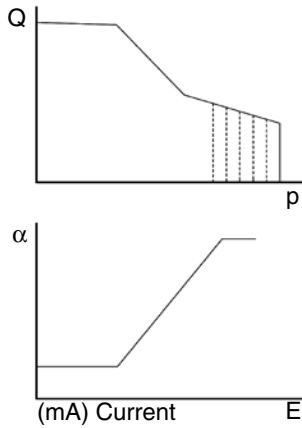
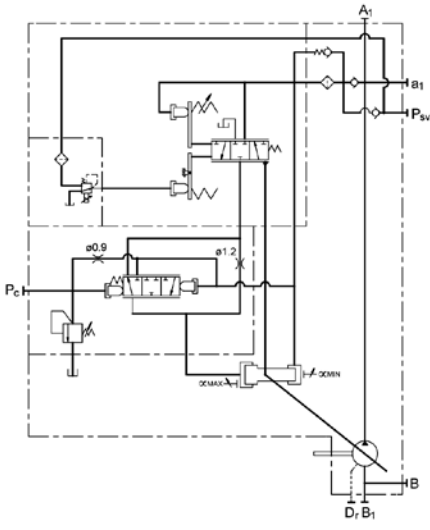
2.3.23 Power, Pressure Compensation and Negative Displacement Control – 7N

Regulator Code	Control Curves	Hydraulic Circuit
<p>This regulator combines the Power Control with Pressure Compensation Control.</p> <p>By adding a pilot signal to the Pi port the discharge flow can be infinitely adjusted within the pump range.</p> <p>An increase in pilot signal will result in a decrease in flow, hence the Negative Control.</p> <p>Note: Standard factory pressure setting is 320 bar with an adjustable range of 80 bar to 350 bar.</p>	 <p data-bbox="598 1368 933 1424">Range of displacement control 15 – 100 %</p>	

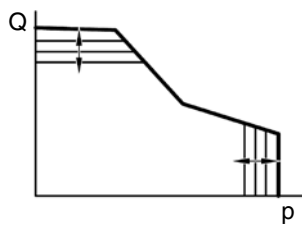
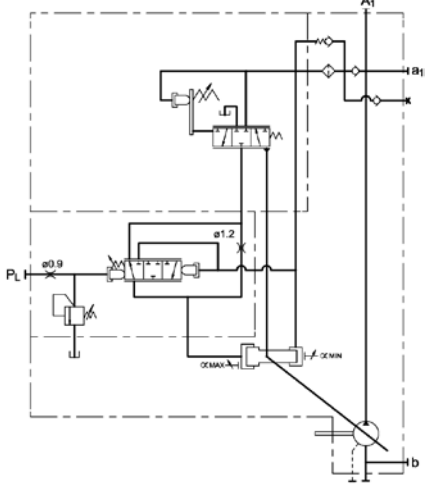
2.3.24 Power, Pressure Compensation and Positive Displacement Control – 7P

Regulator Code	Control Curves	Hydraulic Circuit
<p>This regulator combines the Power Control with Pressure Compensation Control.</p> <p>By adding a pilot signal to the Pi port the discharge flow can be infinitely controlled within the range of the pump displacement.</p> <p>An increase in pilot signal will result in an increase in flow, hence the Positive Control.</p> <p>Note: Standard factory pressure setting is 315 bar with an adjustable range of 80 bar to 350 bar.</p>	 <p data-bbox="598 2069 933 2130">Range of displacement control 2.5 – 100 %</p>	

2.3.25 Power, Pressure Compensation and Electrical Displacement Control – 7E

Regulator Code	Control Curves	Hydraulic Circuit
<p>This regulator combines the Power Control with Pressure Compensation and Electrical Displacement Control.</p> <p>A proportional reducing valve is added to the regulator so the discharge flow can be infinitely adjusted within the pump range.</p> <p>An increase in electrical signal to the proportional reducing valve results in an increase in flow.</p> <p>This regulator requires an amplifier to provide the signal.</p> <p>Note: Standard factory pressure setting is 200 bar with an adjustable range of 80 bar to 315 bar. For pressure settings above 315 bar please state clearly on the order.</p>	 <p>Range of displacement control 2.5 – 100 %</p>	

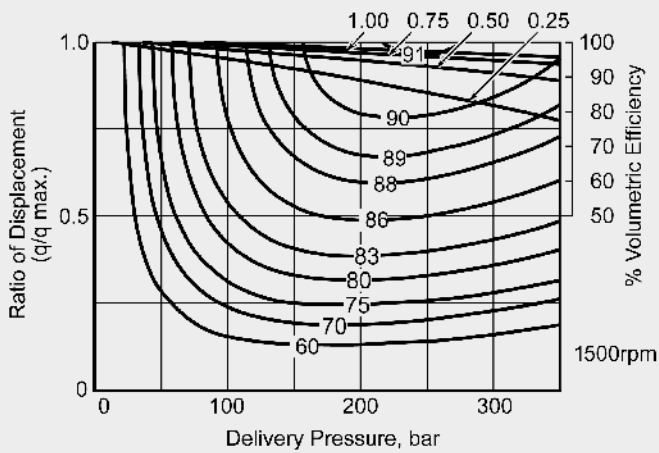
2.3.26 Power, Pressure Compensation and Load Sense Control – 7L

Regulator Code	Control Curves	Hydraulic Circuit
<p>This regulator combines the Power Control and Load Sense Control.</p> <p>Load sense factory setting 25 bar Δp. Adjustment range 10 to 30 bar.</p> <p>Note: Standard factory pressure setting is 200 bar with an adjustable range of 80 bar to 315 bar. For pressure settings above 315 bar please state clearly on the order.</p>	 <p>Range of displacement control 0 – 100 %</p>	

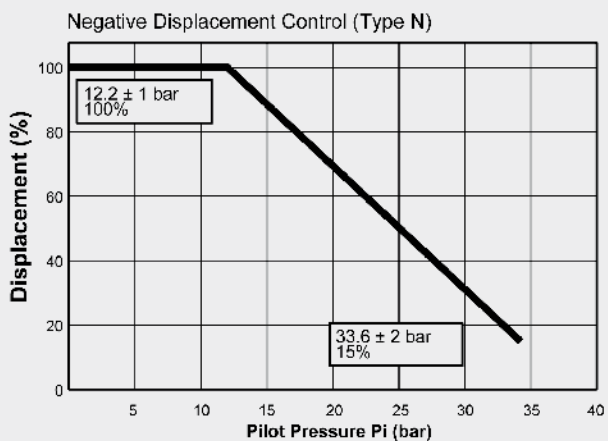
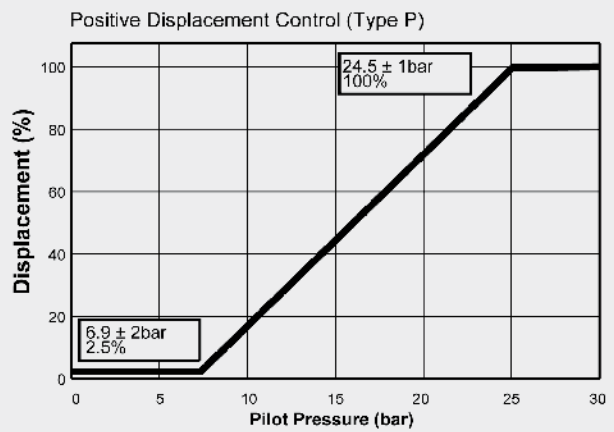
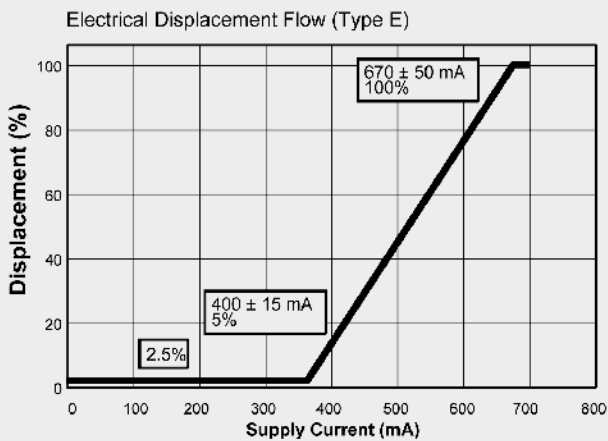
PERFORMANCE DATA

2.3.27 PPV102-63

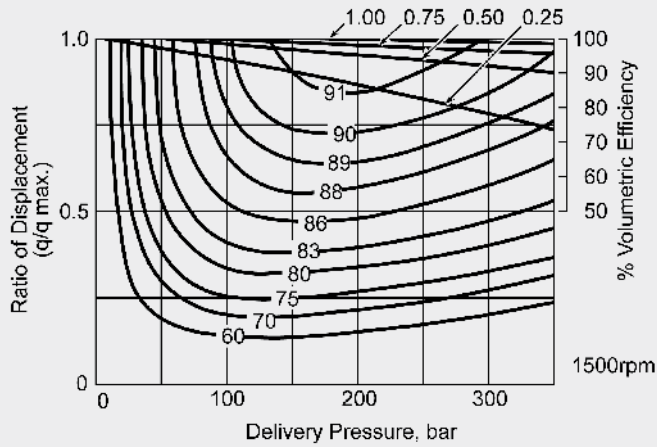
● Performance Curves



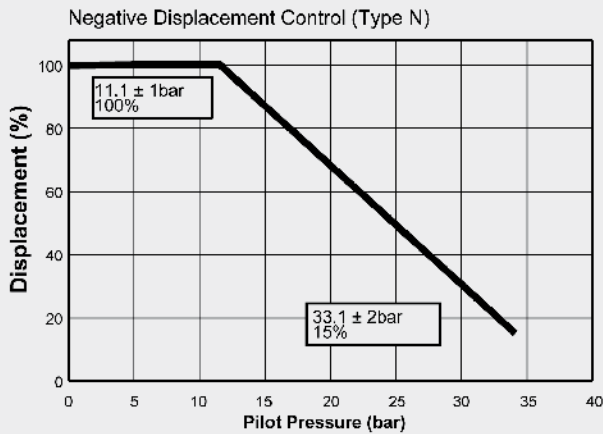
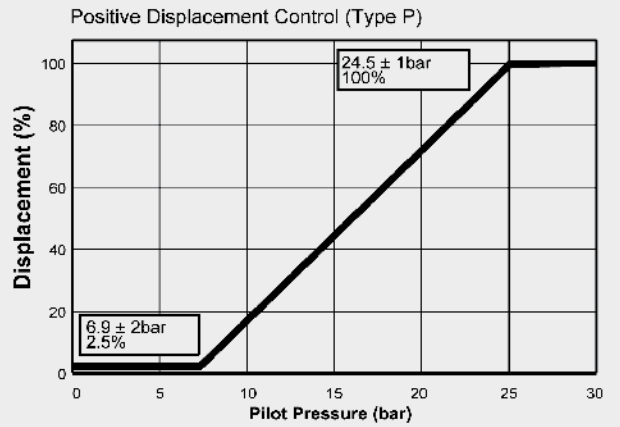
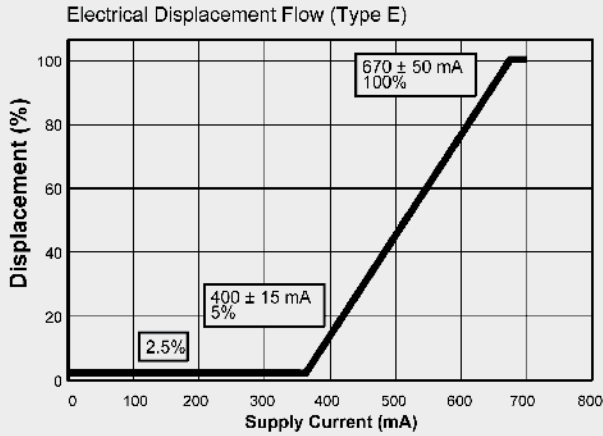
● Displacement Control Curves



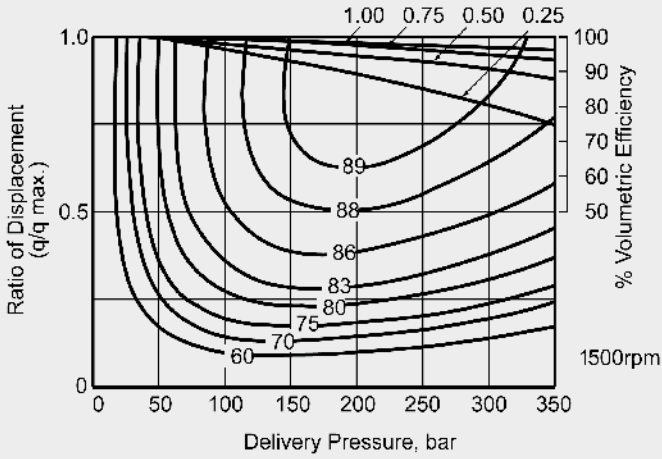
● Performance Curves



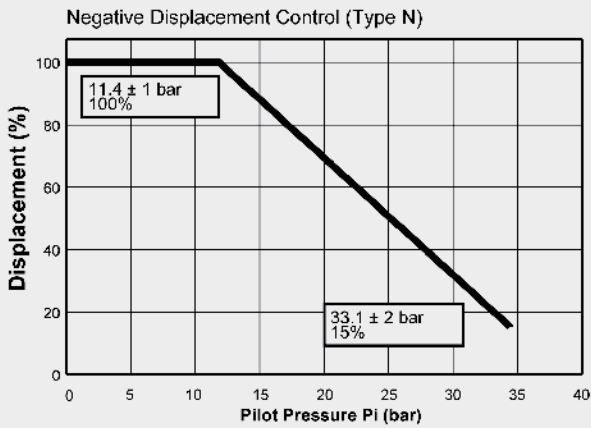
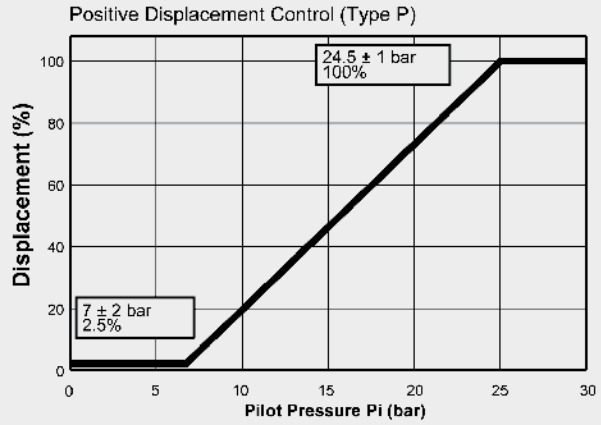
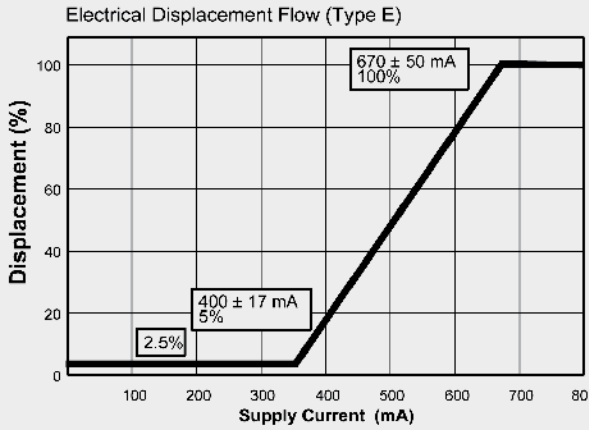
● Displacement Control Curves



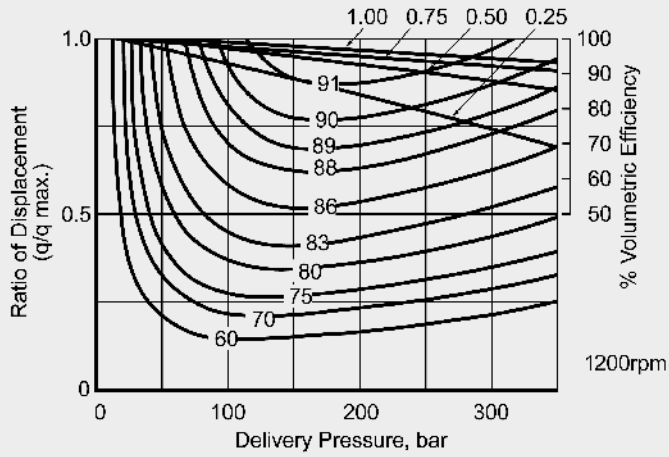
● Performance Curves



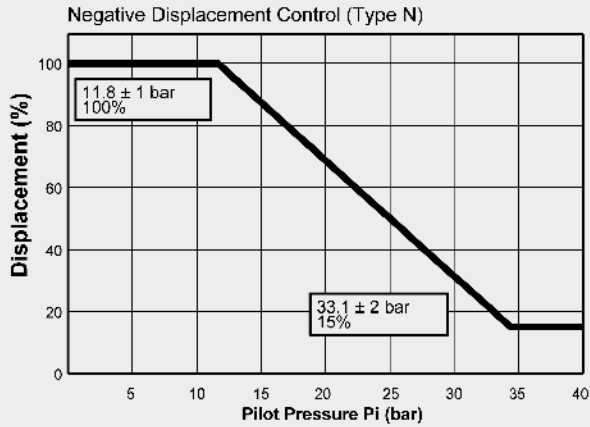
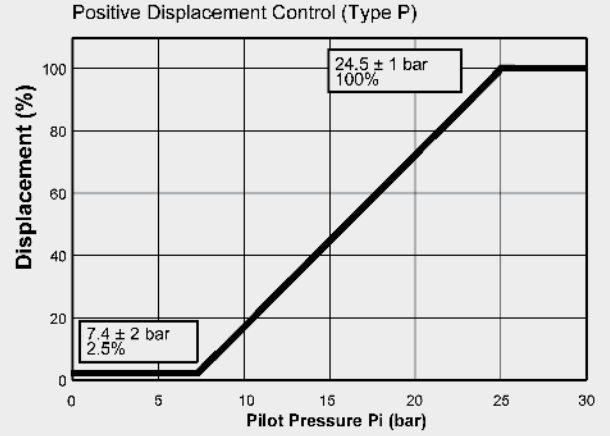
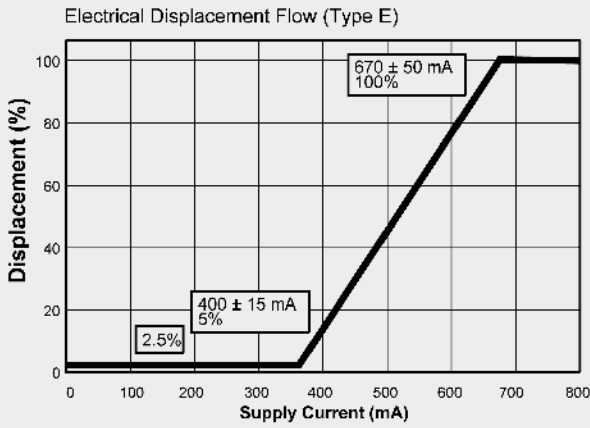
● Displacement Control Curves



● Performance Curves

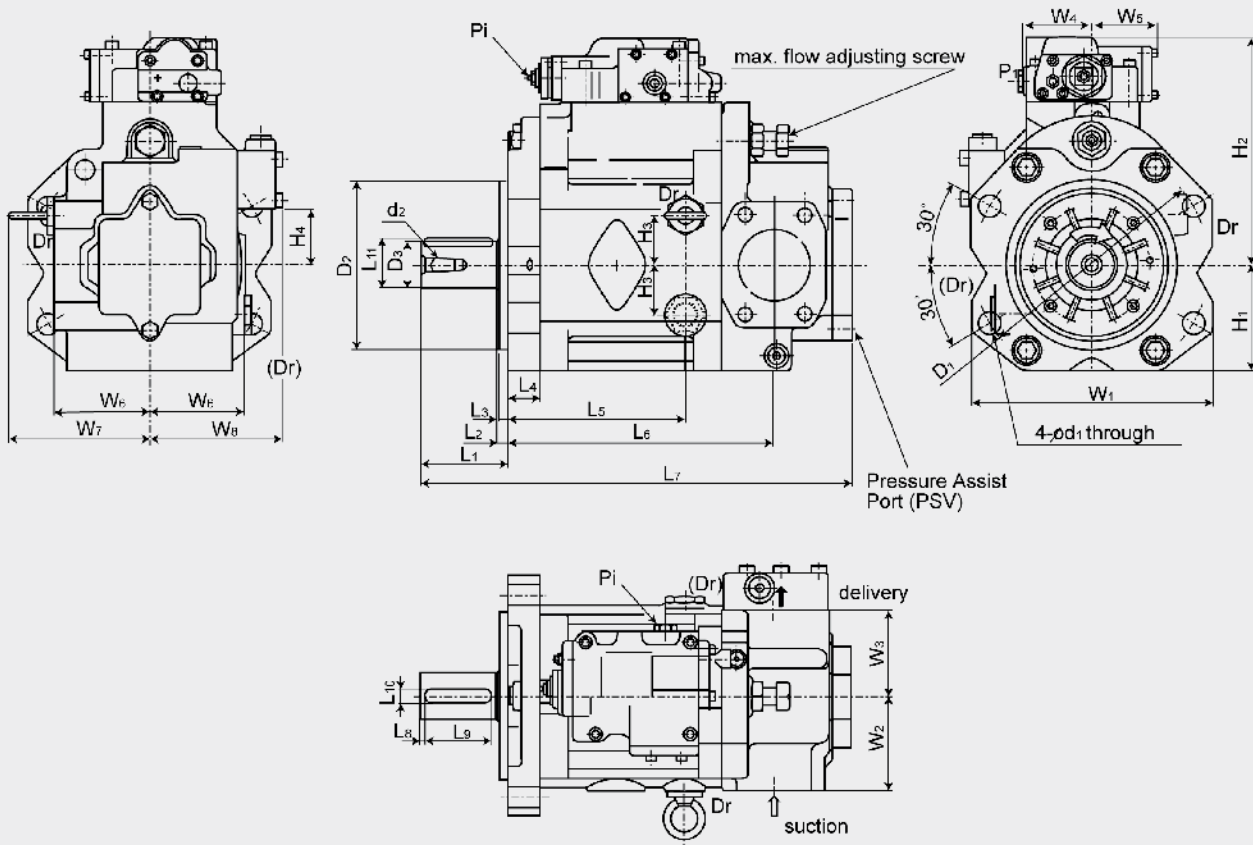


● Displacement Control Curves



DIMENSIONS

2.3.31 PPV102-63 / -112 / -180 / -280



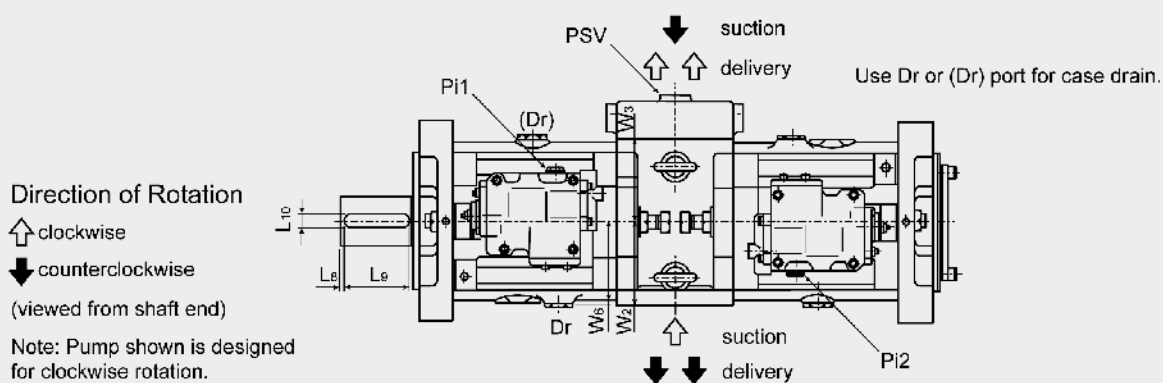
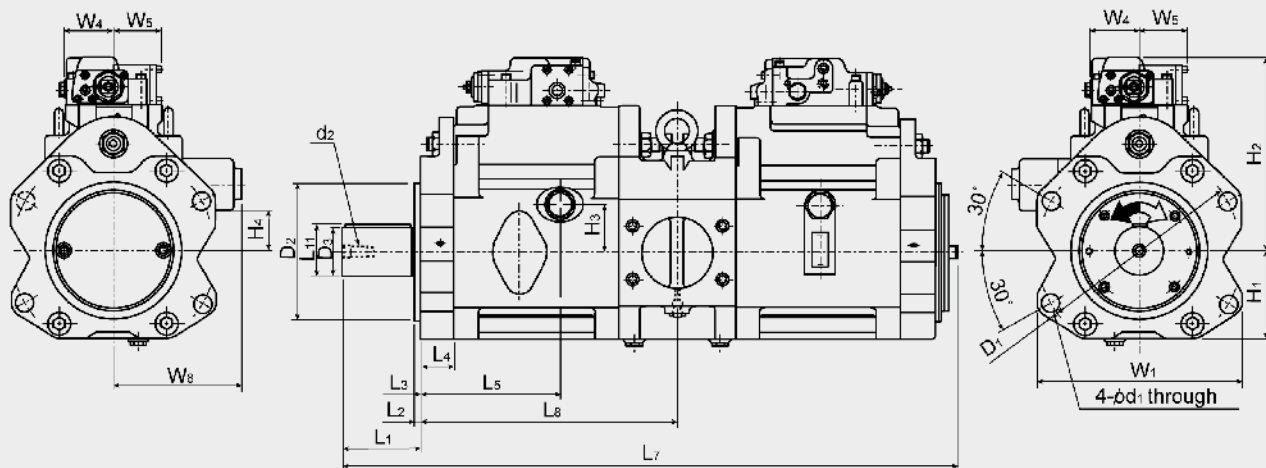
Dimensions (in mm) of single pumps without gear pump

Pump size	D ₁	D ₂	D ₃	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆
63	180	125 ^{-0.050} _{-0.090}	32 ^{k6}	68	10	8	27	138	210
112	224	160 ^{-0.050} _{-0.090}	40 ^{k6}	92	10	8	33	167	249
180	250	180 ^{-0.050} _{-0.090}	50 ^{k6}	92	10	8	36	190	285
280	300	200 ^{-0.050} _{-0.090}	55 ^{k6}	92	10	8	50	203	351

Pump size	L ₇	L ₈	L ₉	L ₁₀	L ₁₁	H ₁	H ₂	H ₃	H ₄
63	349	4	5	10	35	89	195	37	41
112	419	5	70	12	43	100	220	41	49
180	466	5	70	14	53.5	112	245	53	58
280	539	5	70	16	59	127	286	70	68

Pump size	W ₁	W ₂	W ₃	W ₄	W ₅	W ₆	W ₇	W ₈	d ₁	d ₂
63	190	70	70	72	69	76	115	113	18	M12
112	234	90	80	72	69	90	138	125	22	M12
180	256	100	92	72	69	101	149	139	22	M16
280	300	120	120	72	69	118	-	167	26	M16

2.3.32 PPV102-360 / -560



Dimensions (in mm) of double pumps without gear pump

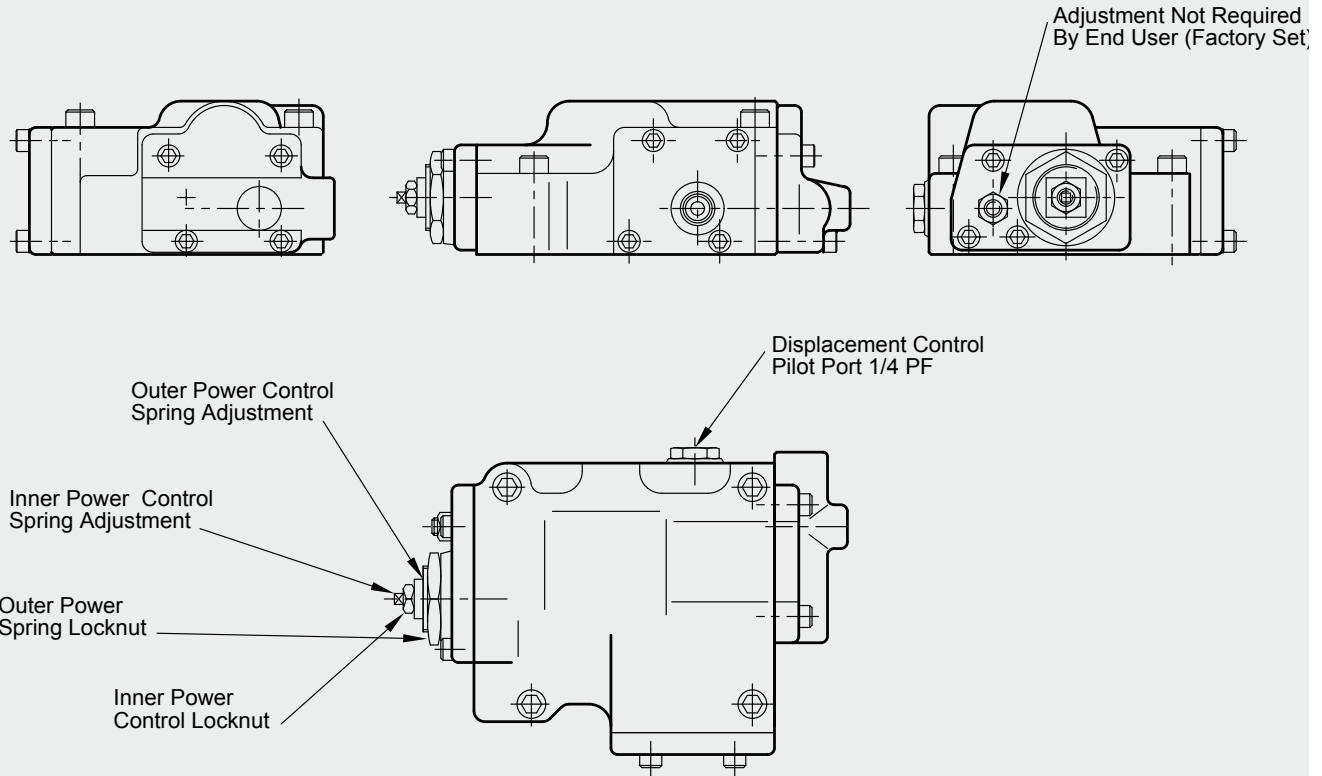
Pump size	D ₁	D ₂	D ₃	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆
360	250	180 ^{-0.050} _{-0.090}	60 ^{k6}	115	10	8	36	190	311
560	300	200 ^{-0.050} _{-0.090}	70 ^{k6}	115	10	9	50	203	374

Pump size	L ₇	L ₈	L ₉	L ₁₀	L ₁₁	H ₁	H ₂	H ₃	H ₄
360	786	5	95	18	64	112	245	53	51
560	896	5	95	20	74.5	127	286	70	59

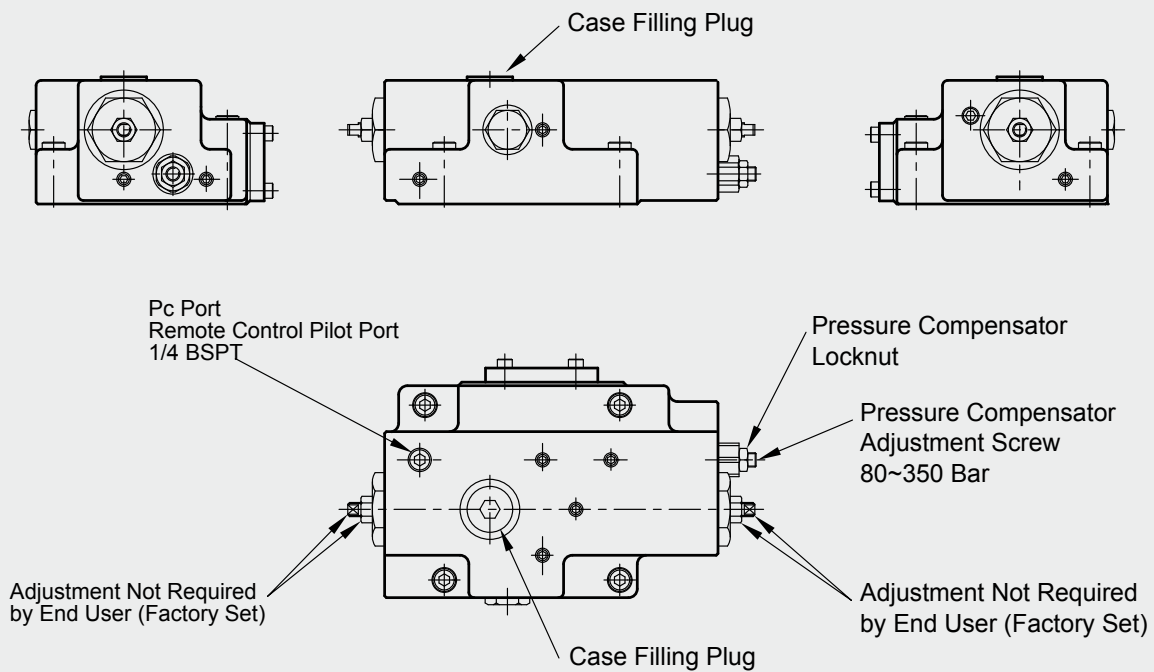
Pump size	W ₁	W ₂	W ₃	W ₄	W ₅	W ₆	W ₈	d ₁	d ₂
360	256	100	100	72	69	101	165	22	M16
560	300	120	120	72	69	118	185	26	M16

2.3.33 Regulators

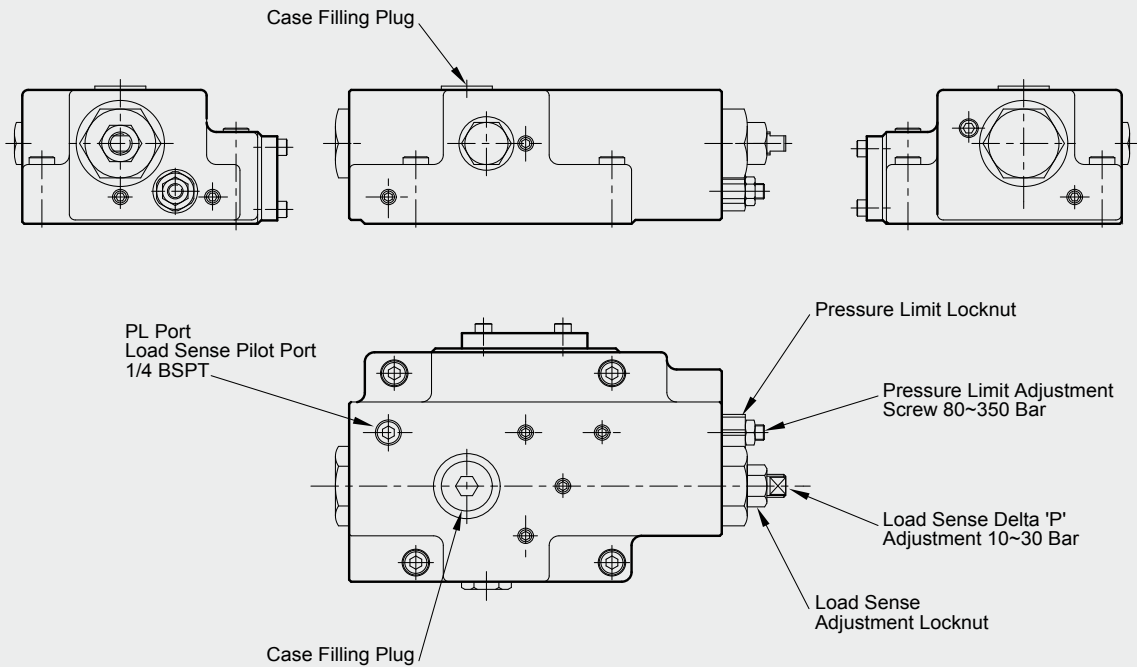
Type 1 Power control, Positive & negative displacement control



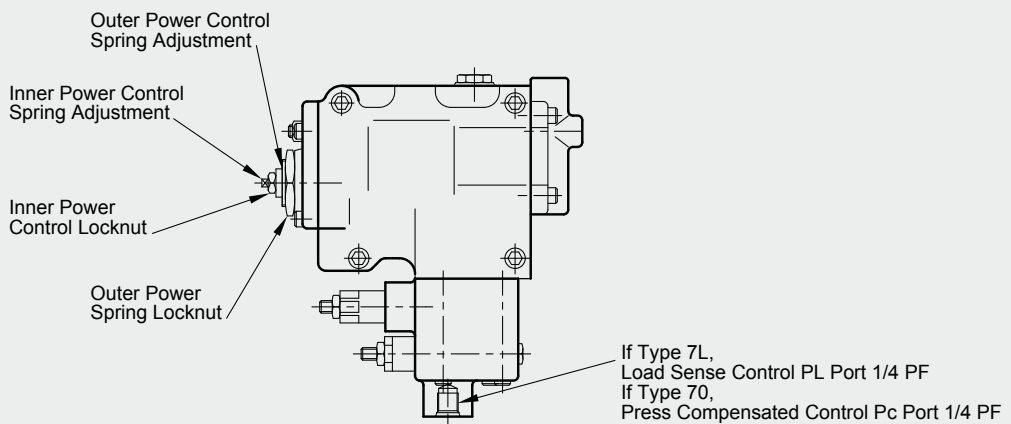
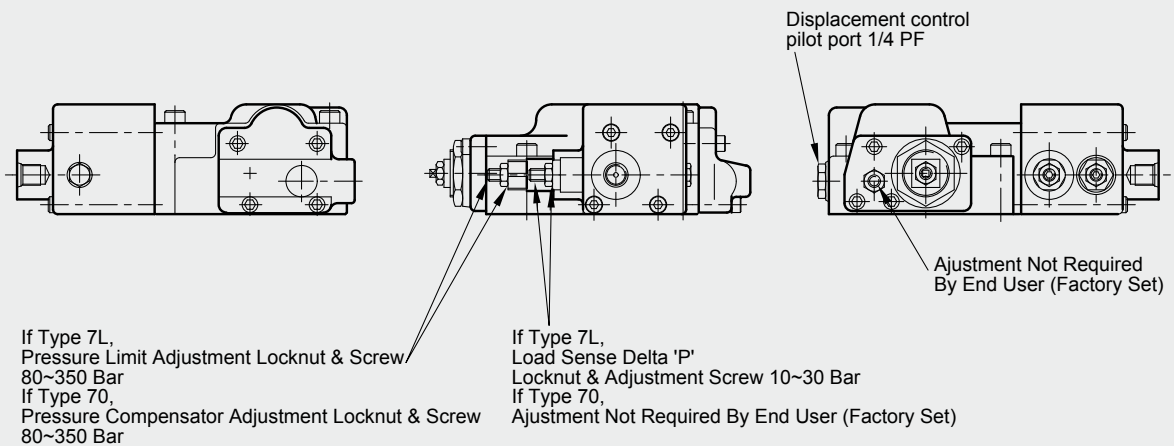
Type 4 Pressure compensator control



Type 4L Load sense & pressure limiting control



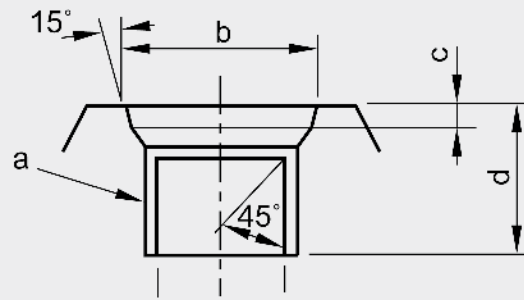
Type 7 Power control, Negative or positive displacement control, Pressure compensating or load sense control



2.3.34 Drain Port

Dimensions of drain ports (in mm)

Pump size	a	b	c	d
63	PF 1/2	22.6	2.5	19
112	PF 3/4	30.8	3.5	20
180 / 360	PF 3/4	30.8	3.5	20
280 / 560	PF 3/4	30.8	3.5	20



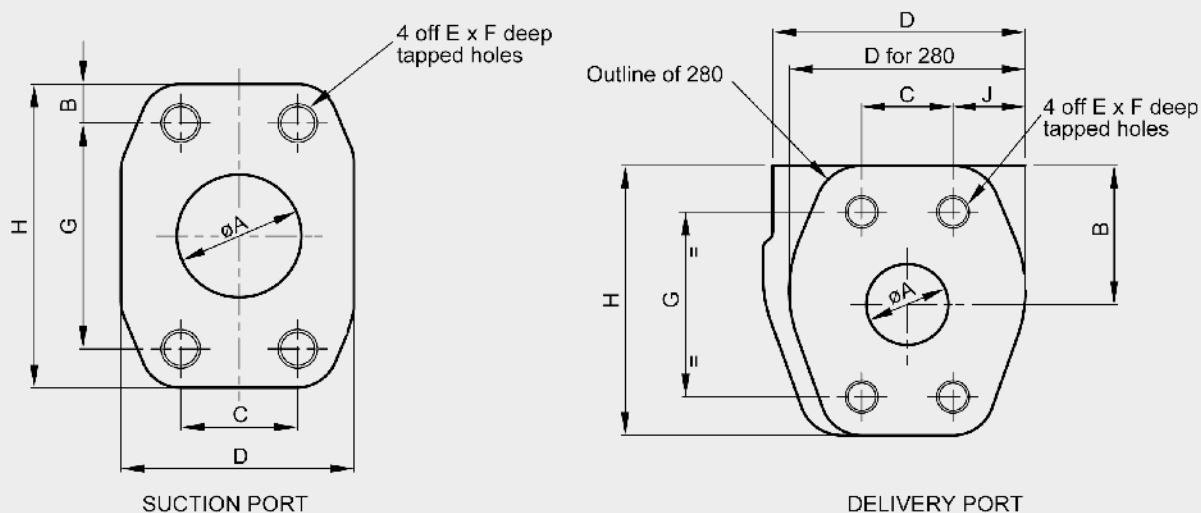
Additional Porting Information

Port	Size
P _c and P _L for 4000 regulators	1/4 BSPT
P _c and P _L for type 7 regulators	1/4 PF
P _i type P displacement control	1/4 PF
All gauge ports	1/4 PF
Vertical mount air bleed 63, 112, 180 cc displacements	1/8 PF
Vertical mount air bleed 280 cc displacements	1/4 PF

Additional "O" Ring Information

Port	"O" Ring Size	Hardness
PF 1/8"	7.8 ID x 1.90 sec	90 shore
PF 1/4"	10.8 ID x 2.4 sec	90 shore
PF 1/2"	17.8 ID x 2.4 sec	90 shore
PF 3/4"	23.7 ID x 3.5 sec	90 shore

2.3.35 Suction and Delivery Port



Suction Port

Size	A	B	C	D	E	F	G	H
63	38	12	35.7	71	M12 x 1.75	18	69.9	94
112	64	12	50.8	91	M12 x 1.75	18	88.9	113
180	76	15	61.9	108	M16 x 2.0	24	106.4	136
280	89	15.5	61.9	123	M16 x 2.0	24	120.7	152
360	102	15	77.8	152	M16 x 2.0	24	130.2	162
560	102	18	77.8	152	M16 x 2.0	24	130.2	170

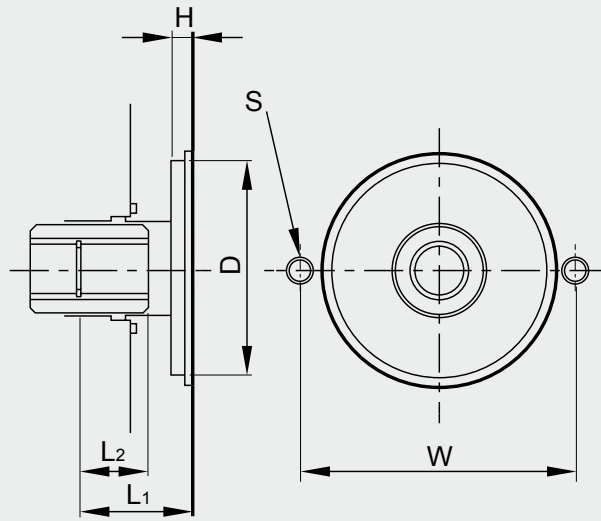
Delivery Port

Size	A	B	C	D	E	F	G	H	J
63	25	41	27.8	77	M10 x 1.5	18	57.2	83.5	22
112	32	49	31.8	91	M12 x 1.75	18	66.7	98	30
180	38	58	36.5	111.5	M16 x 2.0	24	79.4	112	36
280	38	70	36.5	96	M16 x 2.0	24	79.4	112	30
360	32	51	31.8	80	M12 x 1.75	22	66.7	102	23
560	38	59	36.5	83	M16 x 2.0	24	79.4	117	16

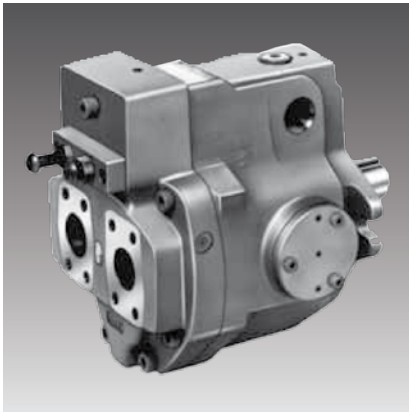
When using confluent block:

360	51	62	44.5	148	M20 x 2.5	30	96.8	124	26
560	51	72	44.5	180	M20 x 2.5	30	96.8	140	23

2.3.36 Thru Drive for Optional Gear Pump



Size		63, 112, 180, 280		280, 360, 560
Install from code	Without assist pressure port	7	G	A
	With assist pressure port	6	H	
Dimensions (SAE "A" Type for 63, 112, 180 and 280) (SAE "B" Type for 280, 360 and 560)	D	82.5		101.6
	H	8		11
	W	106		146
	S	2-M10 depth 16		2-M12 depth 20
	L ₁	43	34	43
	L ₂	26	18	26
Dimensions of Spline	Rule	SAE flat root, side fit		
	Number of teeth	13	9	13
	Diametral pitch	16/32		
	Pressure angle	30°		
	Root diameter	22.225 ^{+0.279} ₋₀	16.535 ^{+0.279} ₋₀	22.225 ^{+0.279} ₋₀
	Measurement between pins	16.589 ⁺⁰ _{-0.067}	10.089 ⁺⁰ _{-0.095}	16.589 ⁺⁰ _{-0.067}
	Pin diameter	2.743		
Allowable max. torque (Nm)		214	60	214



2.4 LIGHT MEDIUM PRESSURE SERIES CONTENT

Ordering Code	2.4.1 Pressure Compensator
	2.4.2 Remote Pressure Compensator
	2.4.3 Constant Power Control
	2.4.4 Max Operating Pressure for Constant Power Control

Technical Information	2.4.5 Specifications
	2.4.6 Hydraulic Fluids
	2.4.7 Viscosity Range
	2.4.8 Temperature Range
	2.4.9 Specification and Design Numbers for Special Fluids
	2.4.10 Seals
	2.4.11 Filtration
	2.4.12 Adjustments
	2.4.13 Installation Notes

Control Options	2.4.14 Pressure Compensator
	2.4.15 Remote Pressure Compensator
	2.4.16 Constant Power Control
	2.4.17 Availability of Control Type

Performance Data	2.4.18 PPV103-10
	2.4.19 PPV103-16
	2.4.20 PPV103-22
	2.4.21 PPV103-37
	2.4.22 PPV103-56
	2.4.23 PPV103-70
	2.4.24 PPV103-90
	2.4.25 PPV103-145

Dimensions	2.4.26 PPV103-10
	2.4.27 PPV103-16 / 22
	2.4.28 PPV103-37
	2.4.29 PPV103-56
	2.4.30 PPV103-70
	2.4.31 PPV103-90
	2.4.32 PPV103-145

ORDERING CODE

2.4.1 Pressure Compensator

PPV103 - 16 - F R 01 B S K - 32 80 - XXXX

Axial Piston Pump
Light Medium Pressure Series

Size

10	10.0 cm ³ /rev
16	15.8 cm ³ /rev
22	22.2 cm ³ /rev
37	36.9 cm ³ /rev
56	56.2 cm ³ /rev
70	70.0 cm ³ /rev
90	91.0 cm ³ /rev
145	145.0 cm ³ /rev

Mounting Type

F Flange Mounting

Shaft Rotation

R Right Hand (clockwise)
viewed from shaft end

Control Type

01 Pressure Compensator

Pressure Setting Range

B 12 - 70 bar
C 12 - 160 bar for size 16/22/37/56
15 - 160 bar for size 70/90/145
20 - 160 bar for size 10
H 12 - 210 bar for size 16/37/56
18 - 210 bar for size 70/90/145
20 - 210 bar for size 10
K 20 - 280 bar for size 70/90/145

Port Position

S Side Port (not for size 10)
Blank Axial Port (not for size 10/70/90/145)
- Ports radial and axial (only size 10)

Shaft Extension

K Keyed Shaft

Design Number

12 size 10
32 size 16/22/37/56
60 size 70/90/145

Design Standard

None Japanese Standard "JIS"
80 European Design Standard
950 North American Standard

Modification Number

XXXX Determined by Manufacturer

2.4.2 Remote Pressure Compensator

PPV103 - 16 - F R 07 S K - 32 80 - XXXX

Axial Piston Pump —
Light Medium Pressure Series

Size —

10	10.0 cm ³ /rev
16	15.8 cm ³ /rev
22	22.2 cm ³ /rev
37	36.9 cm ³ /rev
56	56.2 cm ³ /rev
70	70.0 cm ³ /rev
90	91.0 cm ³ /rev
145	145.0 cm ³ /rev

Mounting Type —
 F Flange Mounting

Shaft Rotation —
 R Right Hand (clockwise)
 viewed from shaft end

Control Type —
 07 Remote Pressure Compensator

Port Position —
 S Side Port (not for size 10)
 Blank Axial Port (not for size 10/70/90/145)
 - Ports radial and axial (only size 10)

Shaft Extension —
 K Keyed Shaft

Design Number —
 12 size 10
 32 size 16/22/37/56
 60 size 70/90/145

Design Standard —
 None Japanese Standard "JIS"
 80 European Design Standard
 950 North American Standard

Modification Number —
 XXXX Determined by Manufacturer

2.4.3 Constant Power Control

PPV103 - 16 - F R 09 A 16M S K - 32 80 - XXXX

Axial Piston Pump

Light Medium Pressure Series

Size

16	15.8 cm ³ /rev
37	36.9 cm ³ /rev
56	56.2 cm ³ /rev
70	70.0 cm ³ /rev
145	145.0 cm ³ /rev

Mounting Type

F Flange Mounting

Shaft Rotation

R Right Hand (clockwise)
viewed from shaft end

Control Type

09 Constant Power Control

Input Power Setting

A	3.7 kW (size 16/37/56) 15.0 kW (size 70/145)
B	5.5 kW (size 16/37/56) 18.5 kW (size 70/145)
C	7.5 kW (size 37/56) 22.0 kW (only size 145)
D	11.0 kW (size 37/56) 30.0 kW (only size 145)
E	2.2 kW (only size 16) 15.0 kW (only size 56) 22.0 kW (only size 70) 37.0 kW (only size 145)
F	1.5 kW (only size 16) 18.5 kW (only size 56) 30.0 kW (only size 70) 45.0 kW (only size 145)
G	22.0 kW (only size 56) 55.0 kW (only size 145)
H	75.0 kW (only size 145)

Pressure Setting Range

7M	70 bar
10.5M	105 bar
14M	140 bar
16M	160 bar
17.5M	175 bar
21M	210 bar

only required for size 16/37/56 max Operating Pressure depending on Input Power see 2.4.4

Port Position

S Side Port (size 70/145)
Blank Axial Port (size 16/37/56)

Shaft Extension

K Keyed Shaft

Design Number

32 size 16/37/56
60 size 70/145

Design Standard

None Japanese Standard "JIS"
80 European Design Standard
950 North American Standard

Modification Number

XXXX Determined by Manufacturer

2.4.4 Specifications

Model	Maximum Operating Pressure [bar]								
	1.5 kW	2.2 kW	3.7 kW	5.5 kW	7.5 kW	11 kW	15 kW	18.5 kW	22 kW
PPV103-16	105	160	210	210					
PPV103-37			160	210	210	210			
PPV103-56			105	140	175	210	210	210	210

TECHNICAL INFORMATION

2.4.5 Specifications

Pump Size			10	16	22	37	56	70	90	145	
Geometric Displacement		[cm ³ /rev]	10.0	15.8	22.2	36.9	56.2	70.0	91.0	145.0	
Pressure	Rated	[bar]	160					250			
	Peak		210		160	210		280 / 250*			
Shaft Speed	Min.	[rpm]	600								
	Max.		1800								
Power (1500 rpm, 160 bar)		[kW]	5	7	8.5**	17	25	31	38	62	
Torque (160 bar)		[Nm]	32	45	55**	108	159	198	242	395	
Pre-fill Oil Volume		[cm ³]	370	600	600	1200	1200	2100	2500	3300	
Approx. Mass Pressure Compensator		[kg]	8.5	16.5	16.5	28.0	35.0	58.5	72.5	92.5	
Remote Pressure Compensator			8.5	21.0	21.0	29.0	36.0	60.3	77.5	94.0	
Approx. Mass Power Control			—	29.0	—	37.0	44.0	72.8	—	110	

* 250 bar with control types "07" and "09"

** size 22 at 140 bar

2.4.6 Hydraulic Fluids

The Pump series is prepared for

HL Petroleum Base Oil
(Normal Mineral Oil)
and

HLP R&O type hydraulic oils
(Rust and Oxidation inhibitor).

2.4.7 Viscosity Range

Normal operating viscosity:
20 - 400 cSt (mm²/s)

2.4.8 Temperature Range

0 up to +60 °C

Note:

The highest fluid temperature will be at the drain port of the pump, up to 20 °C higher than in the reservoir.

2.4.9 Specification and Design Numbers for Special Fluids

Type of Fluid	Size	Operating Pressure [bar]		Shaft Speed [rpm]		Temperature Range [°C]	Viscosity Range [cSt]	Design Number*2
		Rated	Intermittent	Rated	Max.			
Water Glycols Water > 35 % Polymer dilution (HFC)	16-56	140	160 / 140*1	1200	1800*2	0 - 50	20 - 200	30
	70-145	210	210					30
Phosphate Ester synthetic (HFD-R)	16-56	140	160 / 140*1	1200	1800*2	0 - 60	20 - 200	06
	70-145	210	210					06
Polyol Ester synthetic (HFD-U)	16-56	160	160	1800	1800	0 - 60	20 - 200	450
	70-145	210	210					450

*1 – size 22

*2 – As the specific gravities of water-glycol fluids and phosphate ester type fluids are higher than one, an overhead reservoir is required when pumps are operated at 1500 r/min or more

2.4.10 Seals

The pump series is equipped with Fluorocarbon (FKM) shaft seals and Nitrile (NBR) O-Rings as standard.

If a special hydraulic fluid is used, the seal material may be changed.

2.4.11 Filtration

For maximum pump and system component life time, the system should be protected from contamination by effective filtration.

Maintain the degree of contamination within NAS 1638 Grade 10 (21/19/16 ISO 4406:1999) or better.

2.4.12 Adjustments

The units are shipped with minimum discharge pressure and maximum delivery volume setting.
Adjust pressure and volume setting to meet your system requirements.

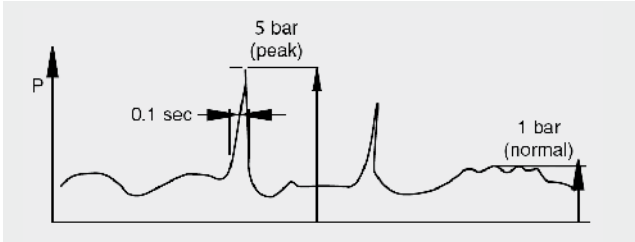
Pump Size	Volume		Pressure
	Volume Adjustment Screw Sensitivity [cm ³ per turn]	Minimal Adjustable Displacement [cm ³ /rev]	Pressure Adjustment Screw Sensitivity [bar per turn]
PPV103-10*01B	1.1	2.0	29
PPV103-10*01C/H	1.1	2.0	54
PPV103-16*01B	1.4	4.0	35
PPV103-16*01C	1.4	4.0	65
PPV103-16*01H	1.4	4.0	79
PPV103-22*01B	2.0	6.0	35
PPV103-22*01C	2.0	6.0	65
PPV103-37*01B	2.9	10	35
PPV103-37*01C	2.9	10	65
PPV103-37*01H	2.9	10	79
PPV103-56*01B	3.9	12	35
PPV103-56*01C	3.9	12	65
PPV103-56*01H	3.9	12	79
PPV103-70*01B	4.4	30	23
PPV103-70*01C	4.4	30	32
PPV103-70*01H	4.4	30	40
PPV103-70*01K	4.4	30	47
PPV103-90*01B	4.8	56	23
PPV103-90*01C	4.8	56	32
PPV103-90*01H	4.8	56	40
PPV103-90*01K	4.8	56	47
PPV103-145*01B	7.2	83	23
PPV103-145*01C	7.2	83	32
PPV103-145*01H	7.2	83	40
PPV103-145*01K	7.2	83	47

2.4.13 Installation Notes

The pump should be mounted horizontally with the case drain piping initially rising above the level of the pump before continuing to the tank as shown in the illustration below. Do not connect the drain line to the suction line.

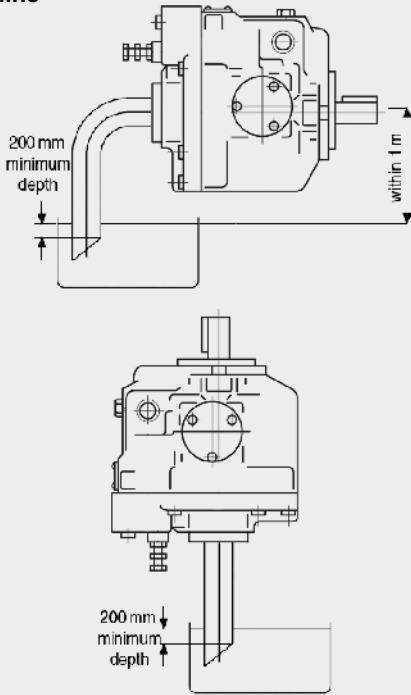
The uppermost drain port should be used and the drain piping should be equal or larger in size than the drain port to minimise pressure in the pump case.

The pump case pressure should not exceed 1 bar as shown in the illustration below (peak pressure should never exceed 5 bar).



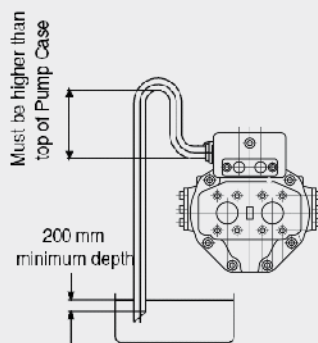
Mounting the pump above the tank

Suction line



Drain line

"Goose neck" configuration is required, this prevents direct drop of oil level in the pump case.



Cautions:

- Suction and drain pipes must be immersed by 200 mm minimum from the lowest oil level under operating conditions.
- Height from the oil level to the centre of the shaft must be within 1 m.
- The oil in the pump case must be refilled when the pump has not been operated for one month or longer.

Mounting the pump vertically

For applications requiring vertical installation (shaft up) please connect piping as shown in the illustration below.

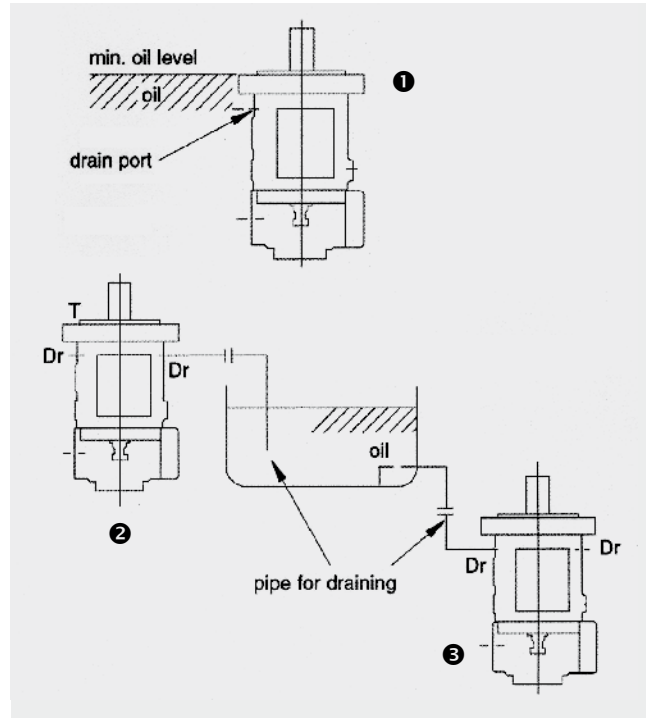
The oil level in the tank should be higher than the pump-mounting flange as shown in illustration ① below.

If the oil level in the tank is lower than the pump mounting flange, than the drain line should be installed as shown in illustration ②.

When installing the pump in the tank and submerged in the oil, open the drain ports to provide adequate lubrication to the internal components.

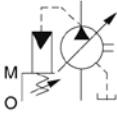
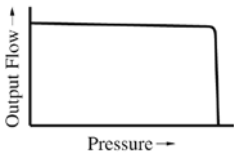
When installing the pump outside the tank run piping for the drain to the tank (see illustration ③).

If the drain line rises above the level of oil fill the lines with oil before operation.

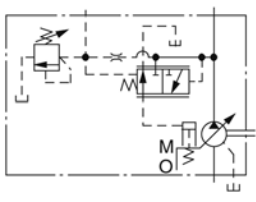
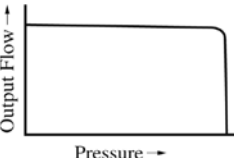


CONTROL OPTIONS

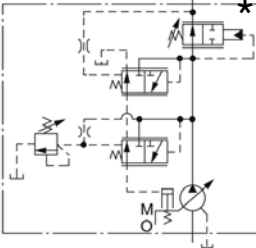
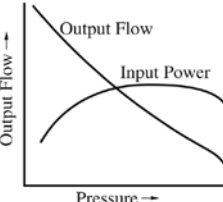
2.4.14 Pressure Compensator

Control Type	Graphic Symbols	Performance Characteristics	Explanation
01 Pressure Compensator Type			<ul style="list-style-type: none"> When the system pressure increases and comes close to the preset cut-off pressure, the pump flow decreases automatically while maintaining the set pressure as it is.

2.4.15 Remote Pressure Compensator

Control Type	Graphic Symbols	Performance Characteristics	Explanation
07 Remote Pressure Compensator Type			<ul style="list-style-type: none"> The pump is used in combination with the pilot relief valve or multistage pressure control valve. By controlling the pilot pressure, the full cut-off pressure can be remote-controlled according to your requirements.

2.4.16 Constant Power Control

Control Type	Graphic Symbols	Performance Characteristics	Explanation
09 Constant Power Control Type			<ul style="list-style-type: none"> Pump input power can be controlled in accordance with the motor output. When the discharge pressure rise, the output flow decreases corresponding to the preset input power. The pump can act for function of two pumps, low-pressure large-flow and high-pressure small-flow. Therefore, the motor capacity can be reduced.

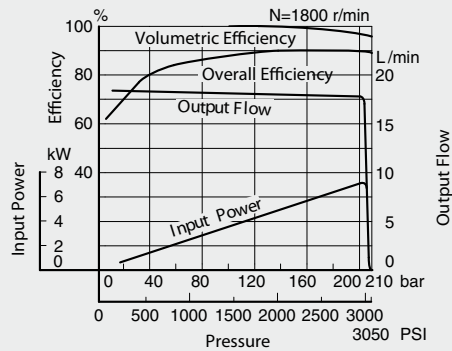
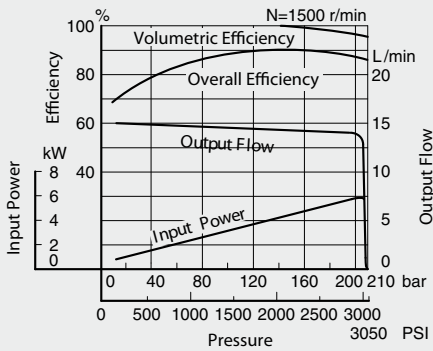
2.4.17 Availability of Control Type

Model Numbers	Geometric Displacement cm ³ /rev	01 Pressure Compensator Type	07 Load Sensing Type	09 Constant Power (Torque) Control Type
PPV103-10	10.0	•	•	✕
PPV103-16	15.8	•	•	•
PPV103-22	22.2	•	•	✕
PPV103-37	36.9	•	•	•
PPV103-56	56.2	•	•	•
PPV103-70	70.0	•	•	•
PPV103-90	91.0	•	•	✕
PPV103-145	145.0	•	•	•

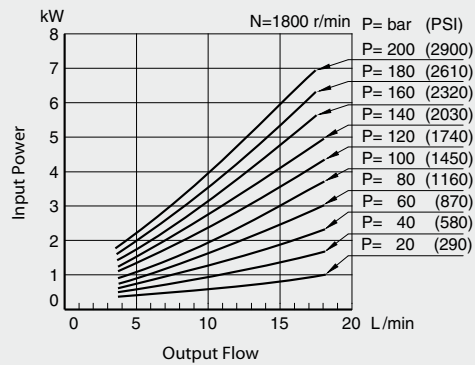
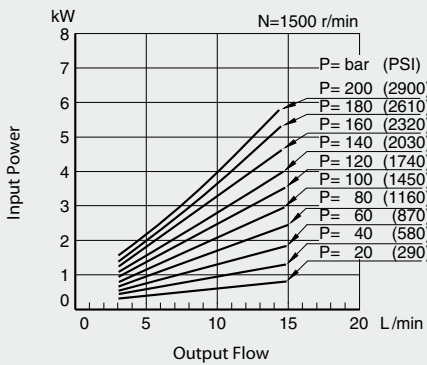
PERFORMANCE DATA

2.4.18 PPV103-10

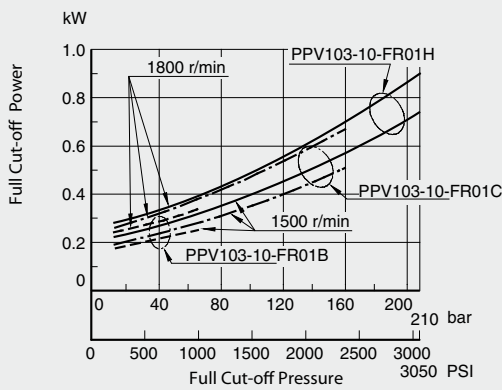
● Performance Characteristic Curve



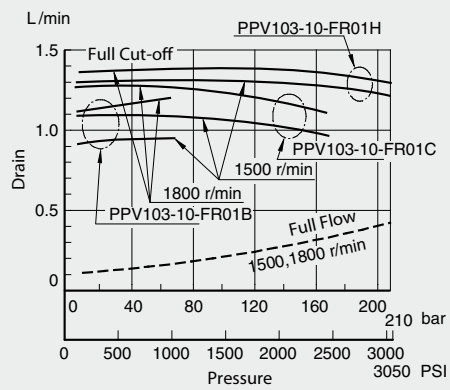
● Input Power



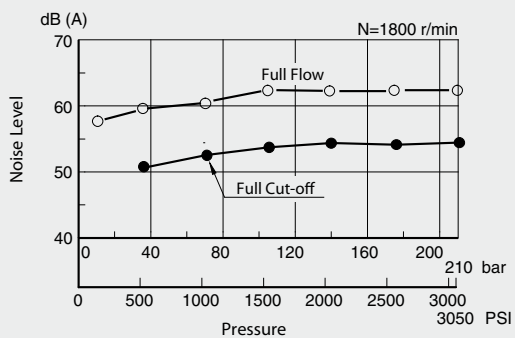
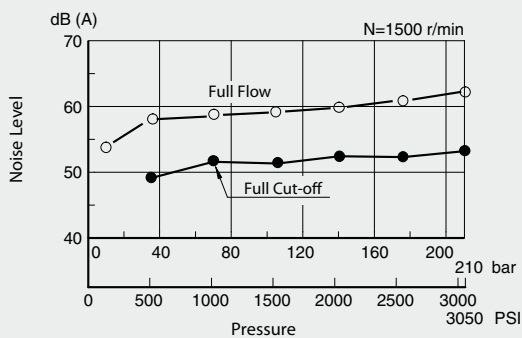
● Full Cut-off Power



● Drain

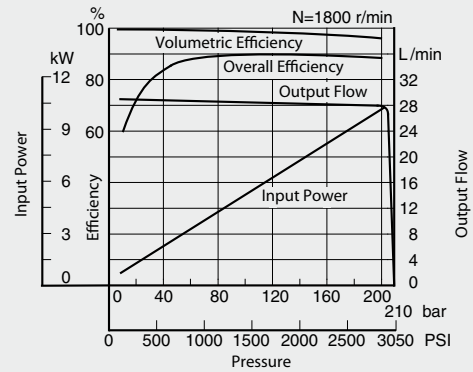
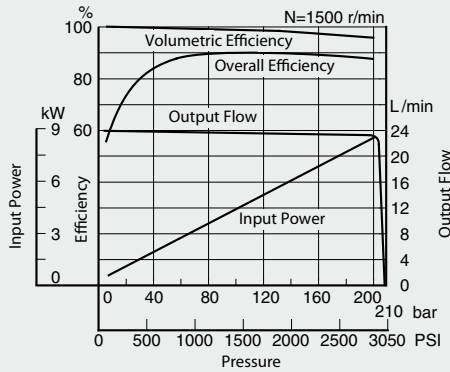


● Noise Level (One metre horizontally away from pump head cover)



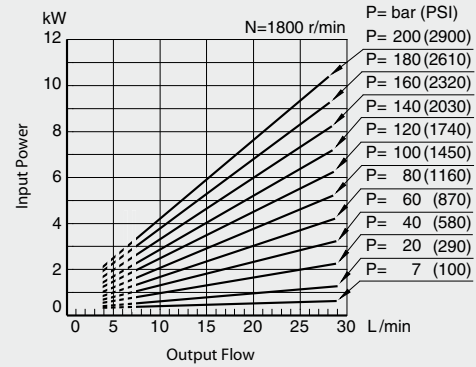
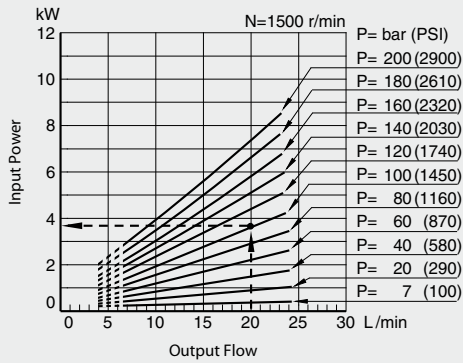
2.4.19 PPV103-16

● Performance Characteristic Curve

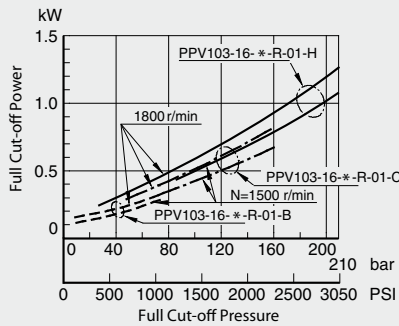


● Input Power

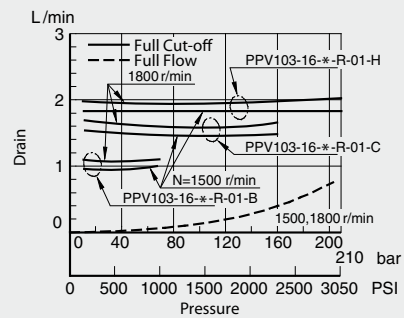
Example: At a pressure of under 100 bar (1450 PSI), a flow 20 L/min, and rotation 1500 r/min, the axial input becomes about 3.7 kW as shown the dotted line in the graph.



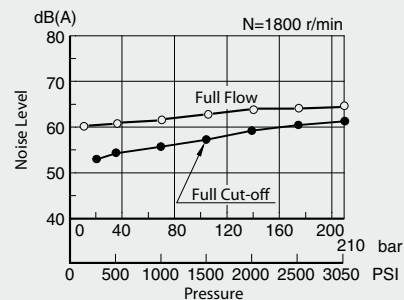
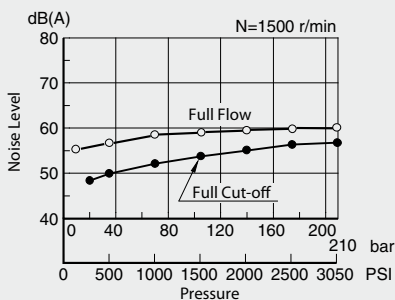
● Full Cut-off Power



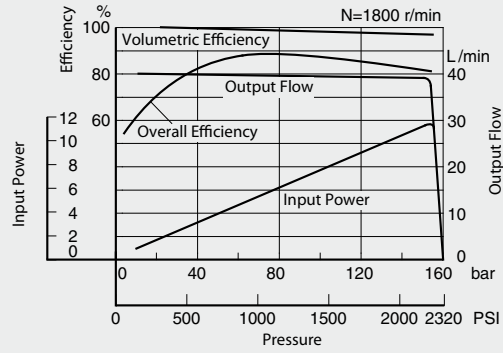
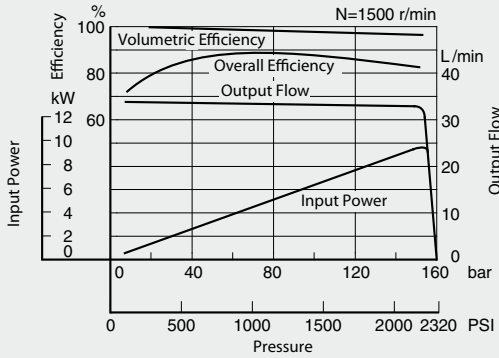
● Drain



● Noise Level (One metre horizontally away from pump head cover)

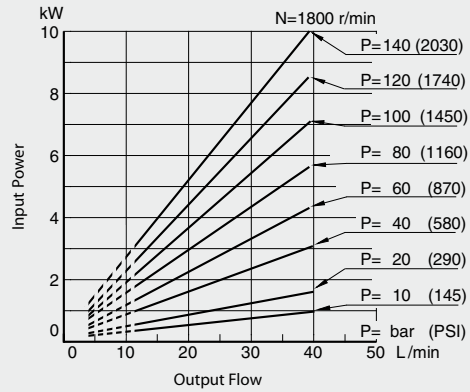
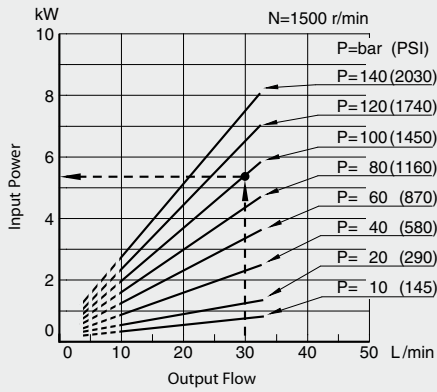


● Performance Characteristic Curve

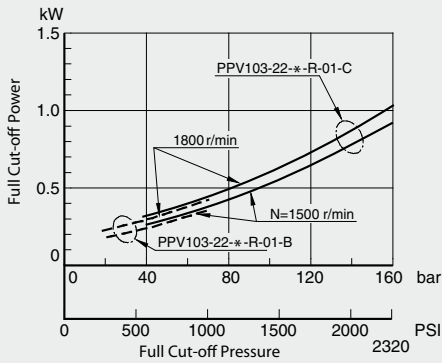


● Input Power

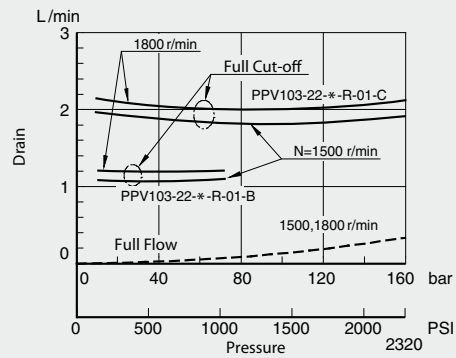
Example: At a pressure of under 100 bar (1450 PSI), a flow 30 L/min, and rotation 1500 r/min, the axial input becomes about 5.4 kW as shown the dotted line in the graph.



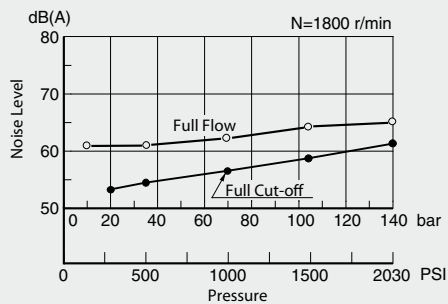
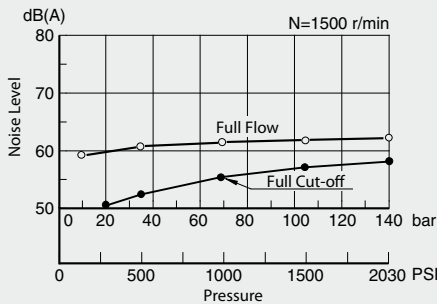
● Full Cut-off Power



● Drain

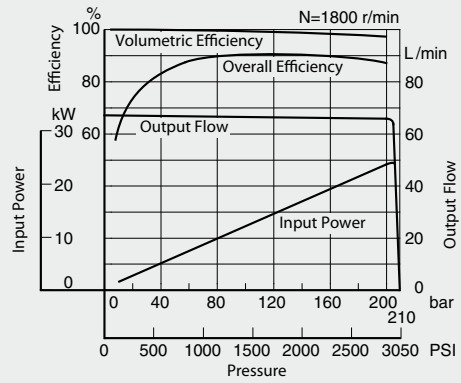
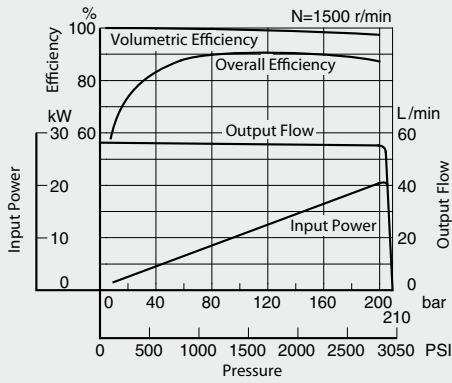


● Noise Level (One metre horizontally away from pump head cover)



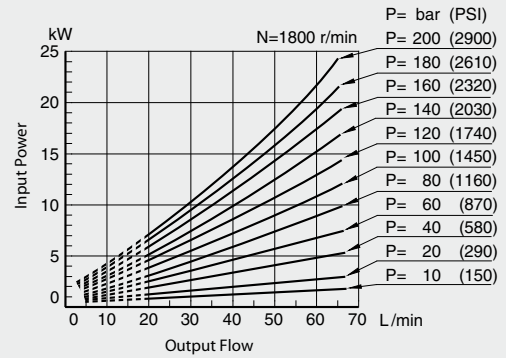
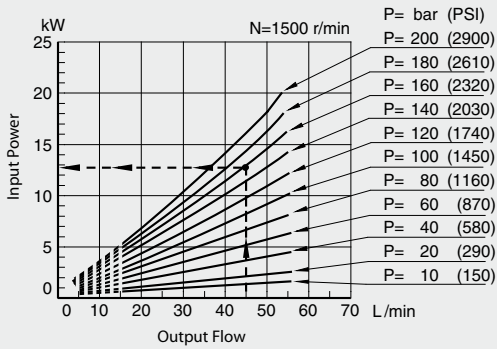
2.4.21 PPV103-37

● Performance Characteristic Curve

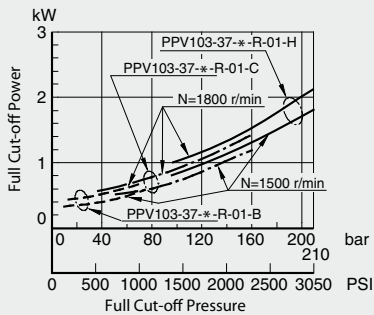


● Input Power

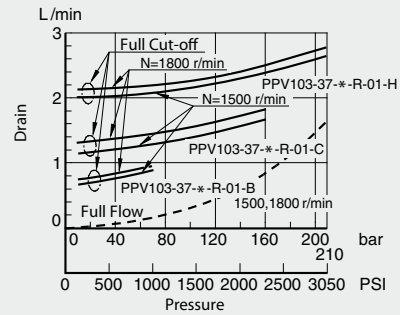
Example: At a pressure of under 160 bar (2320 PSI), a flow 45 L/min, and rotation 1500 r/min, the axial input becomes about 12.6 kW as shown the dotted line in the graph.



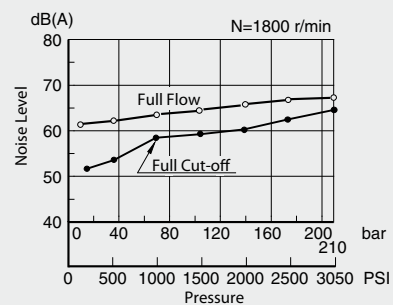
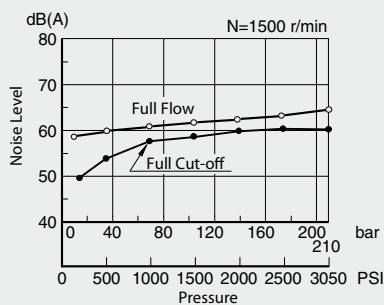
● Full Cut-off Power



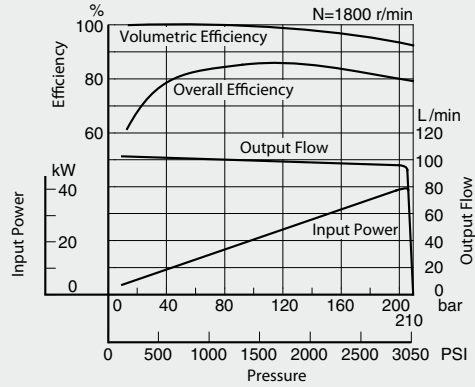
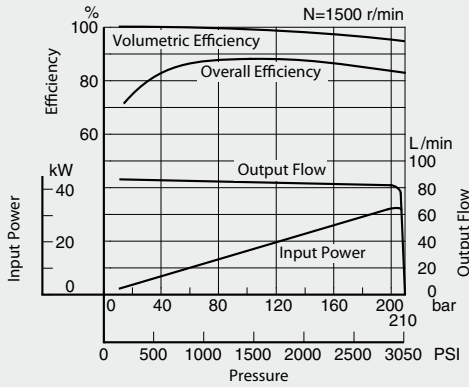
● Drain



● Noise Level (One metre horizontally away from pump head cover)

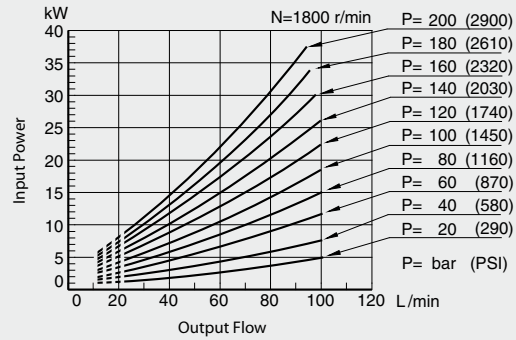
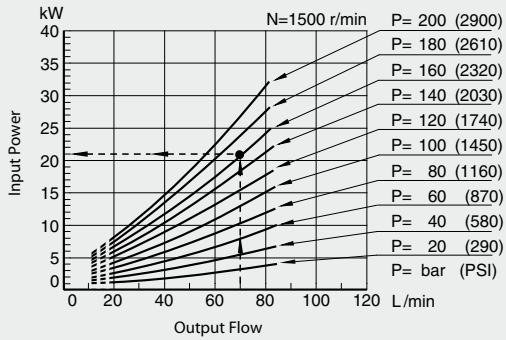


● Performance Characteristic Curve

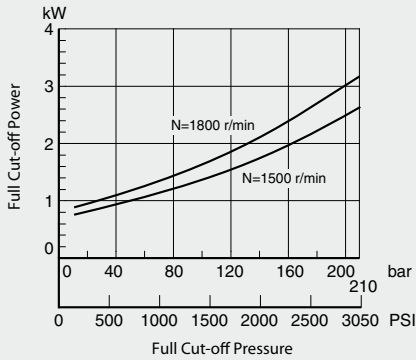


● Input Power

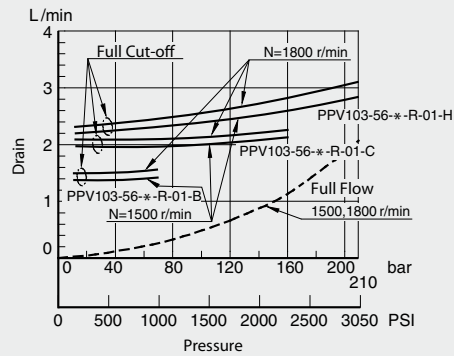
Example: At a pressure of under 160 bar (2320 PSI), a flow 70 L/min, and rotation 1500 r/min, the axial input becomes about 20.8 kW as shown the dotted line in the graph.



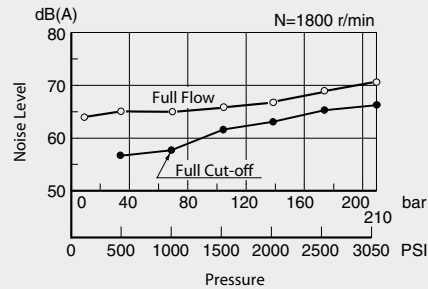
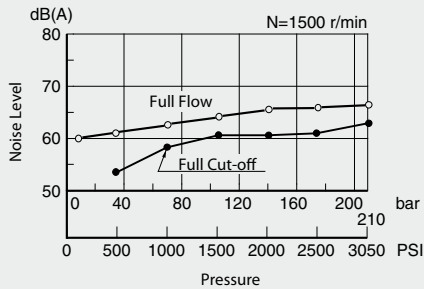
● Full Cut-off Power



● Drain

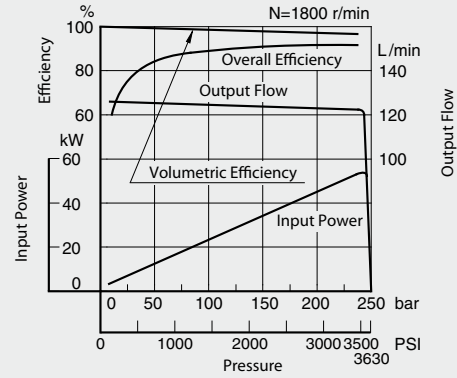
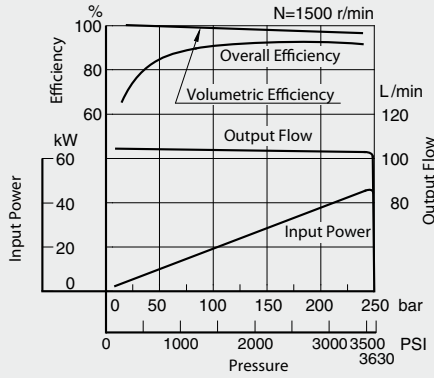


● Noise Level (One metre horizontally away from pump head cover)



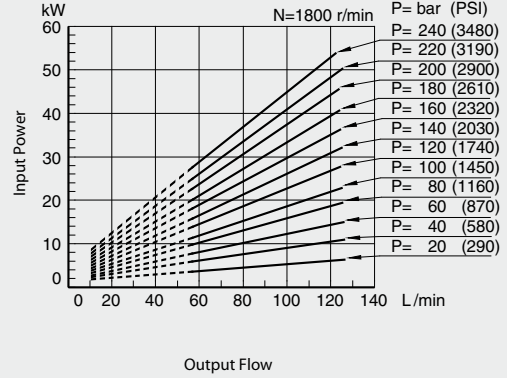
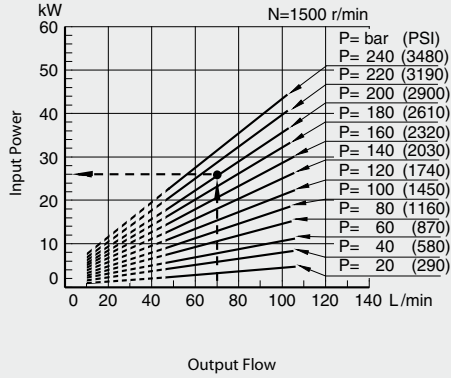
2.4.23 PPV103-70

● Performance Characteristic Curve

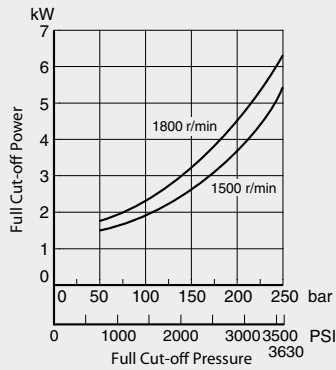


● Input Power

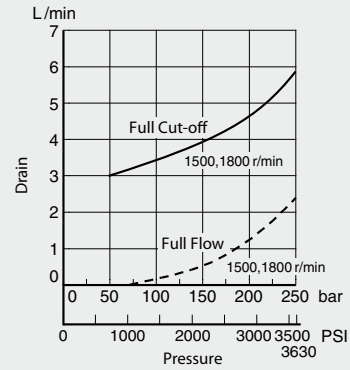
Example: At a pressure of under 200 bar (2900 PSI), a flow 70 L/min, and rotation 1500 r/min, the axial input becomes about 26 kW as shown the dotted line in the graph.



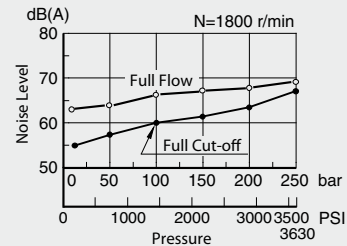
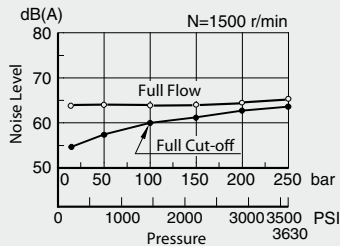
● Full Cut-off Power



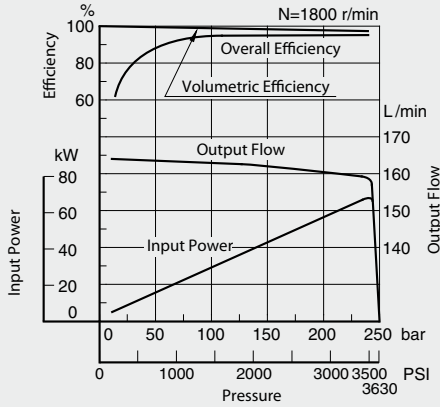
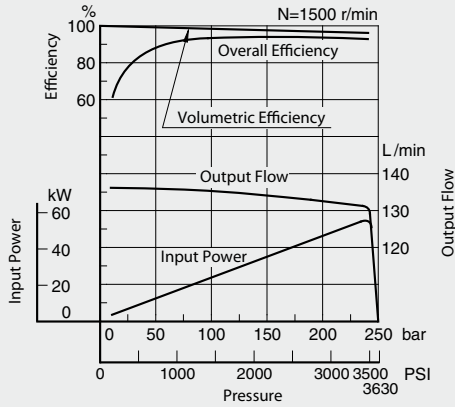
● Drain



● Noise Level (One metre horizontally away from pump head cover)

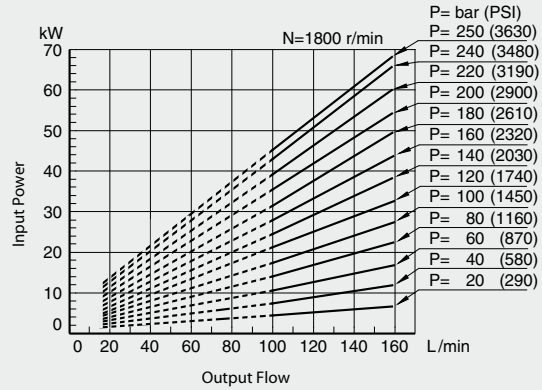
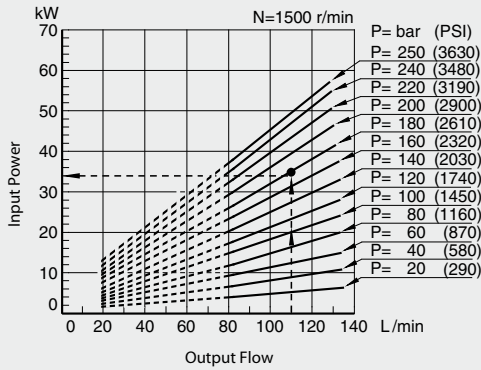


● Performance Characteristic Curve

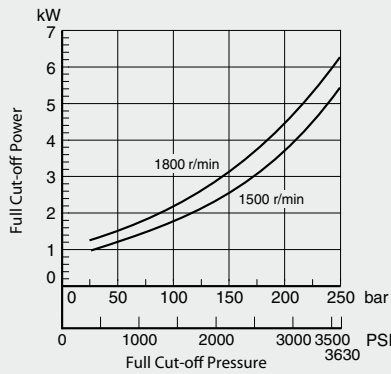


● Input Power

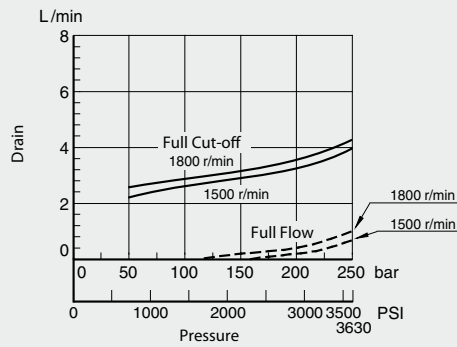
Example: At a pressure of under 180 bar (2610 PSI), a flow 110 L/min, and rotation 1500 r/min, the axial input becomes about 34 kW as shown the dotted line in the graph.



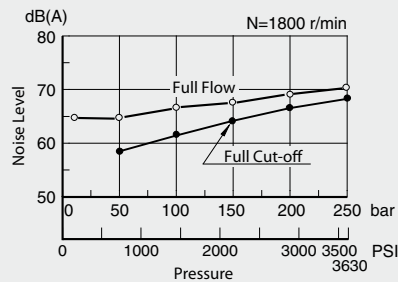
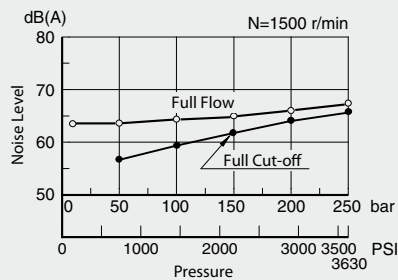
● Full Cut-off Power



● Drain

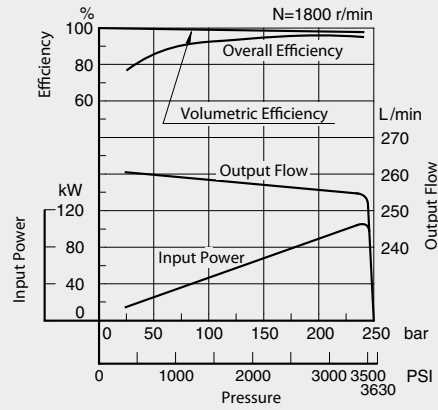
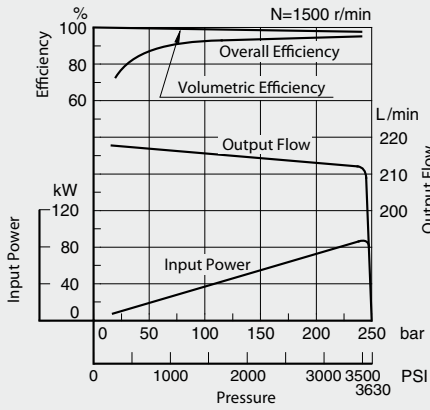


● Noise Level (One metre horizontally away from pump head cover)



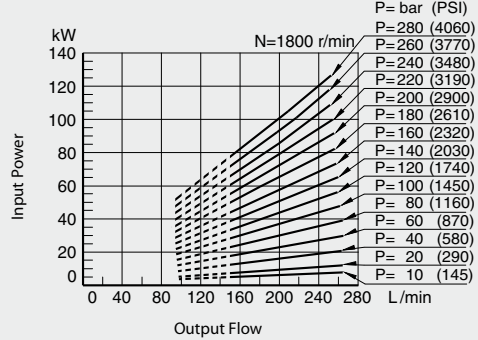
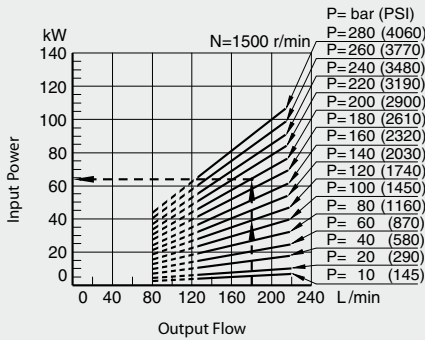
2.4.25 PPV103-145

● Performance Characteristic Curve

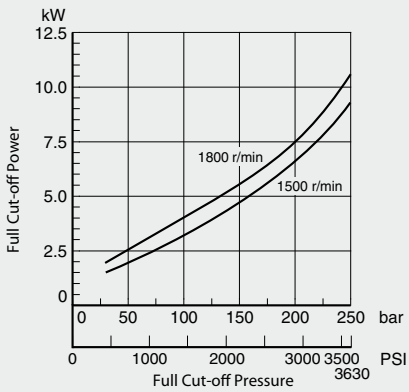


● Input Power

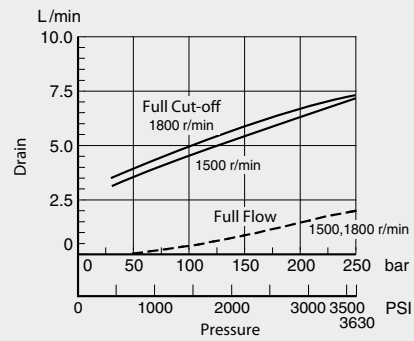
Example: At a pressure of under 200 bar (2900 PSI), a flow 180 L/min, and rotation 1500 r/min, the axial input becomes about 64 kW as shown the dotted line in the graph.



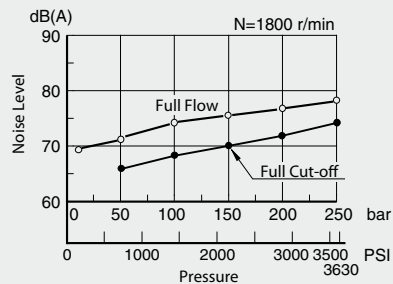
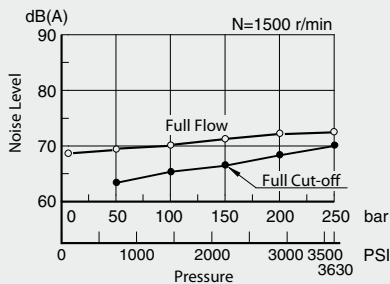
● Full Cut-off Power



● Drain



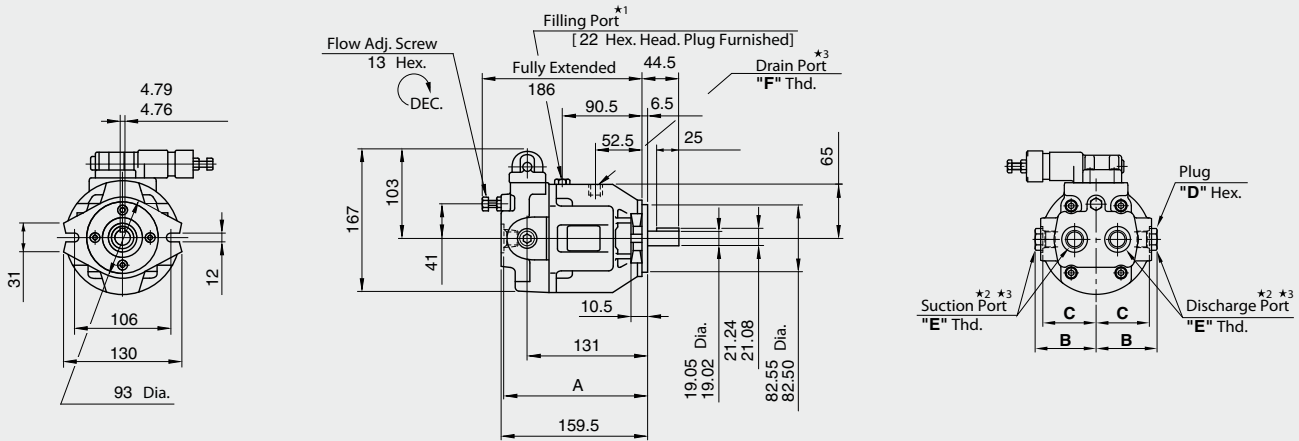
● Noise Level (One metre horizontally away from pump head cover)



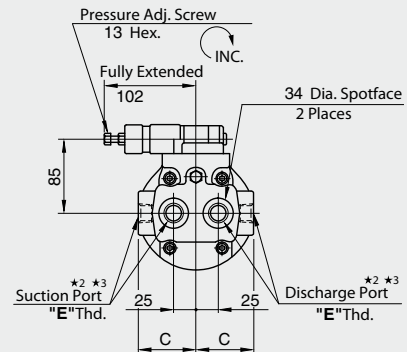
DIMENSIONS

2.4.26 PPV103-10

PPV103-10 with Pressure Control 01



PPV103-10 ... 12 Japanese Standard



Model Numbers	Dimensions mm				Thread Size	
	A	B	C	D	E	F
PPV103-10 ... 12 Japanese Standard	156	–	64.5	27	1/2 Rc	3/8 Rc
PPV103-10 ... 1280 European Standard	159	72	64	27	1/2 BSP.F	3/8 BSP.F
PPV103-10 ... 12950 North American Standard	157	71	62	22	SAE #8	SAE #6

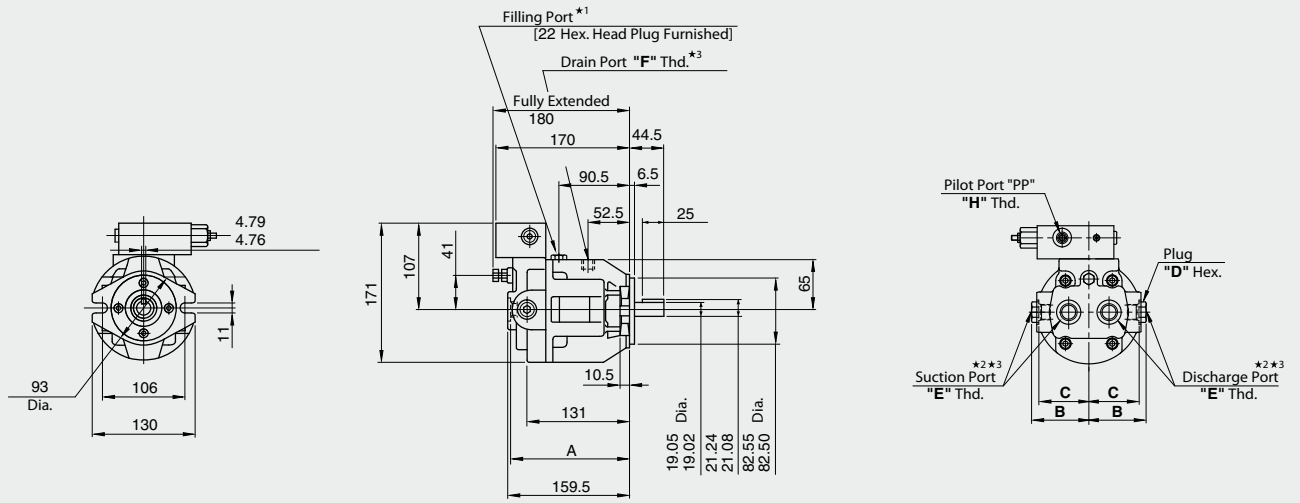
Model Numbers	Tightening Torque Nm	
	Suction Port & Discharge Port	Drain Port
PPV103-10 ... 12	65-75	40-50
PPV103-10 ... 1280	56-62	33-36
PPV103-10 ... 12950	47-51	40-50

*1 Install the pump so that the "Filling port" is at the top.

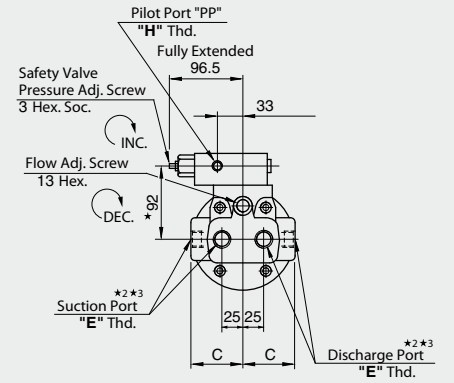
*2 Use either port of two suction and discharge ports at your option. Keep the remaining ports plugged.

*3 As the tightening torques of suction, discharge and drain port fittings, conform to table

PPV103-10 with Remote Pressure Control 07



PPV103-10 ... 12 Japanese Standard



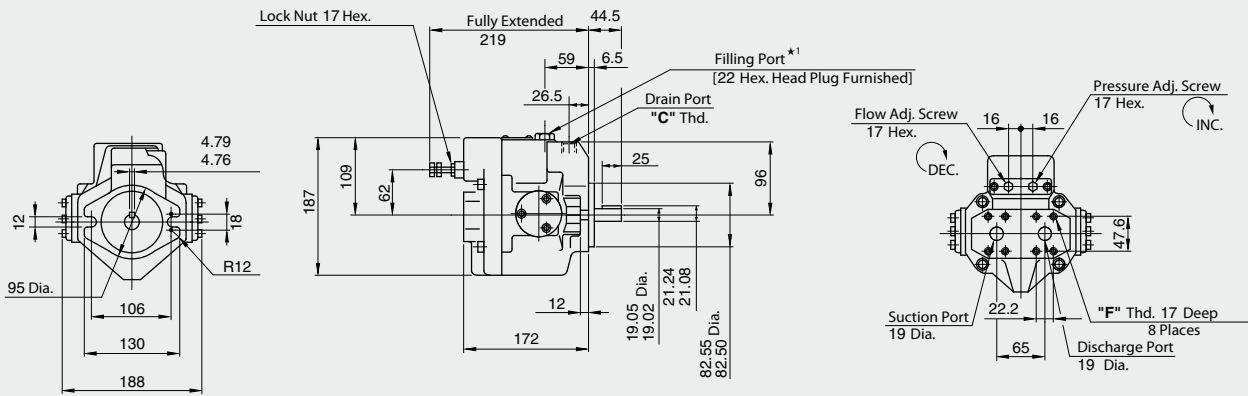
Model Numbers	Dimensions mm				Thread Size		
	A	B	C	D	E	F	H
PPV103-10 ...07 12 Japanese Standard	156	-	64.5	22	1/2 Rc	3/8 Rc	1/4 Rc
PPV103-10 ...07 1280 European Standard	159	72	64	22	1/2 BSP.F	3/8 BSP.F	1/4 BSP.Tr
PPV103-10 ...07 12950 North American Standard	157	71	62	27	SAE #8	SAE #6	SAE #4

*1 Install the pump so that the "Filling port" is at the top.

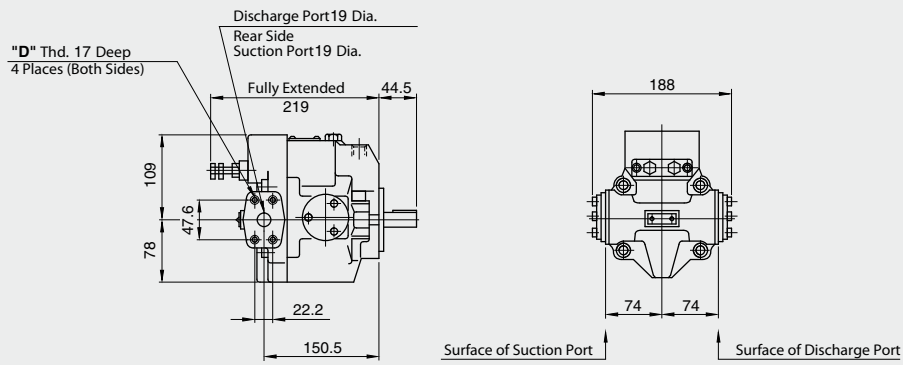
*2 Use either port of two suction and discharge ports at your option. Keep the remaining ports plugged.

*3 As the tightening torques of suction, discharge and drain port fittings, see table on page 90

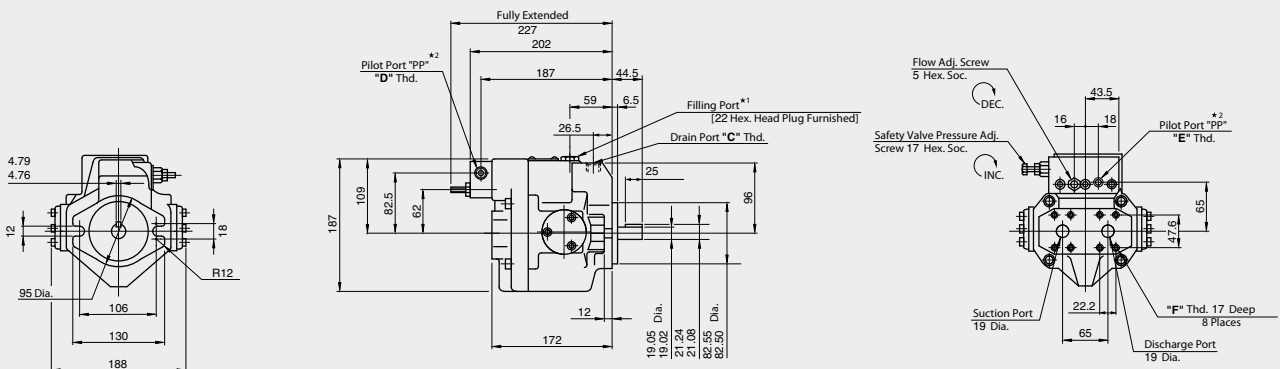
PPV103-16 / -22 with Pressure Control 01



Sideport Option



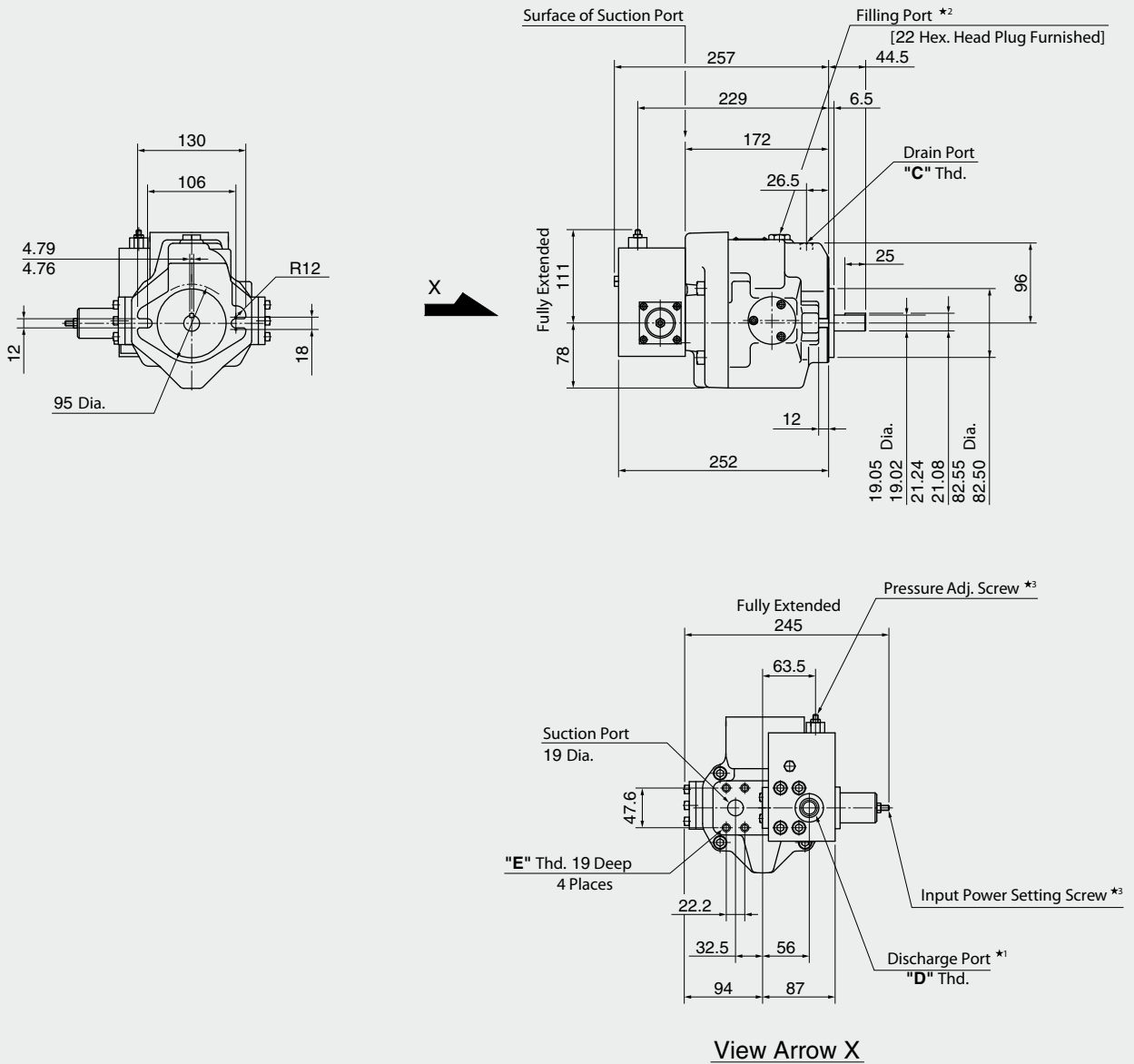
PPV103-16 / -22 with Remote Pressure Control 07



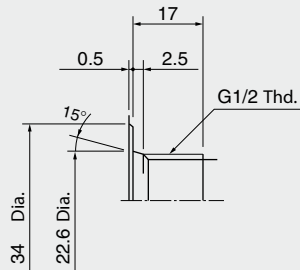
- *1 Install the pump so that the "Filling port" is at the top.
- *2 Use either port of two pilot ports at your option. Keep the remaining port plugged.

Model Numbers	"C" Thread	"D" Thread	"E" Thread	"F" Thread
PPV103-16 / -22 ... 32	Rc 3/8	Rc 3/8	Rc 1/4	M10
PPV103-16 / -22 ... 3280	3/8 BSP.F	3/8 BSP.F	1/4 BSP.Tr	
PPV103-16 / -22 ... 3290	SAE #8	SAE #6	SAE #4	3/8-16 UNC

PPV103-16 with Constant Power Control 09



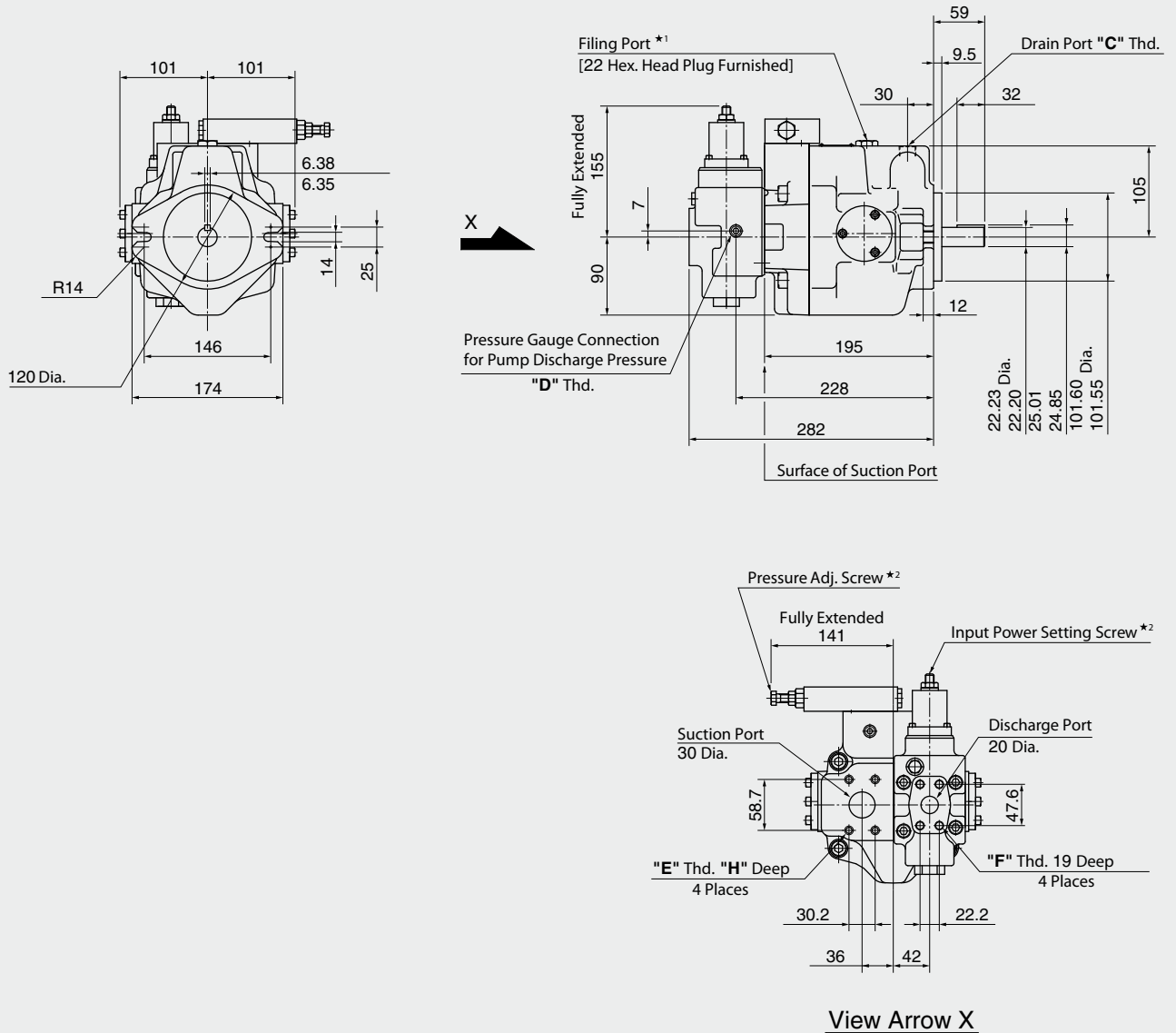
*1 Detail of Discharge Port (For Japanese Standard)



*2 Install the pump so that the "Filling port" is at the top.
 *3 Do not touch the screw because it is adjusted at the time of shipment.

Model Numbers	"C" Thread	"D" Thread	"E" Thread
PPV103-16 / -22 ... 32	Rc 3/8	G 1/2 *1	M10
PPV103-16 / -22 ... 3280	3/8 BSP.F	1/2 BSP.F	
PPV103-16 / -22 ... 3290	SAE #8	SAE #8	3/8-16 UNC

PPV103-37 with Constant Power Control 09

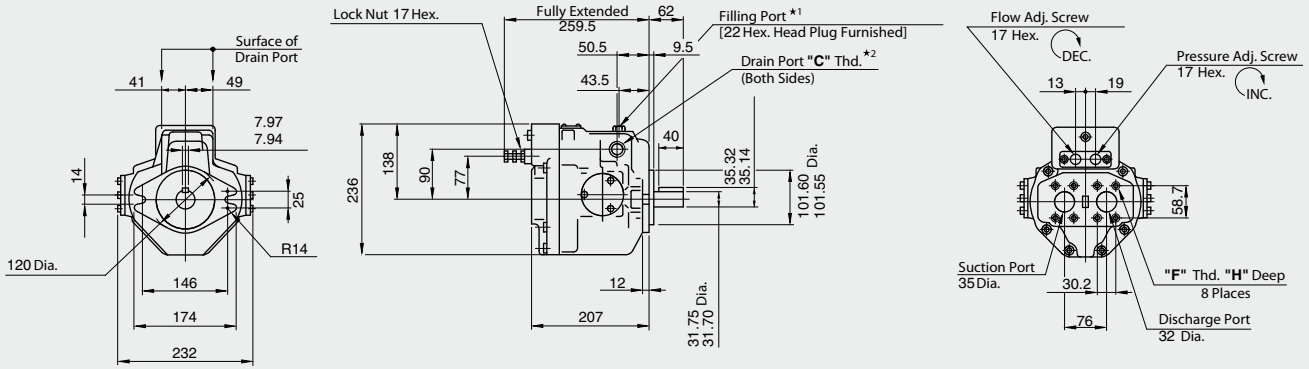


*1 Install the pump so that the "Filling port" is at the top.

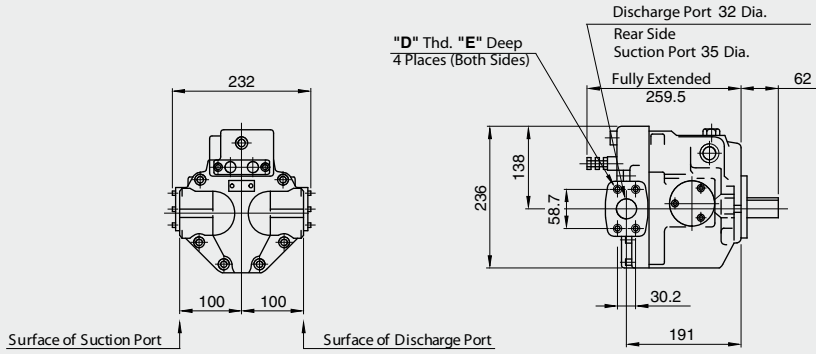
*2 Do not touch the screw because it is adjusted at the time of shipment.

Model Numbers	"C" Thread	"D" Thread	"E" Thread	"F" Thread	"H" mm
PPV103-37 ... 32	Rc 1/2	Rc 1/4	M10	M10	19
PPV103-37 ... 3280	1/2 BSP.F	1/4 BSP.Tr			
PPV103-37 ... 3290	SAE #10	SAE #4	7/16-14 UNC	3/8-16 UNC	20

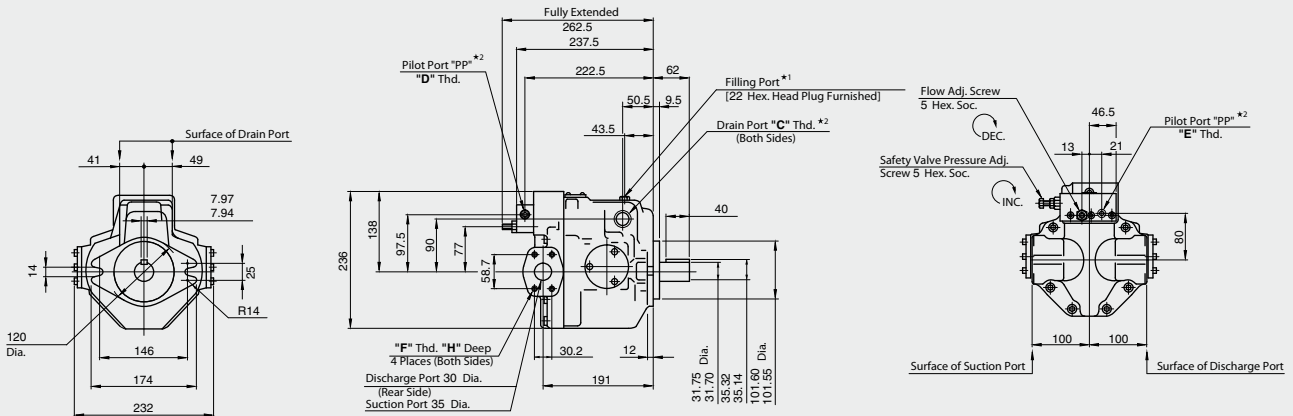
PPV103-56 with Pressure Control 01



Sideport Option



PPV103-56 with Remote Pressure Control 07

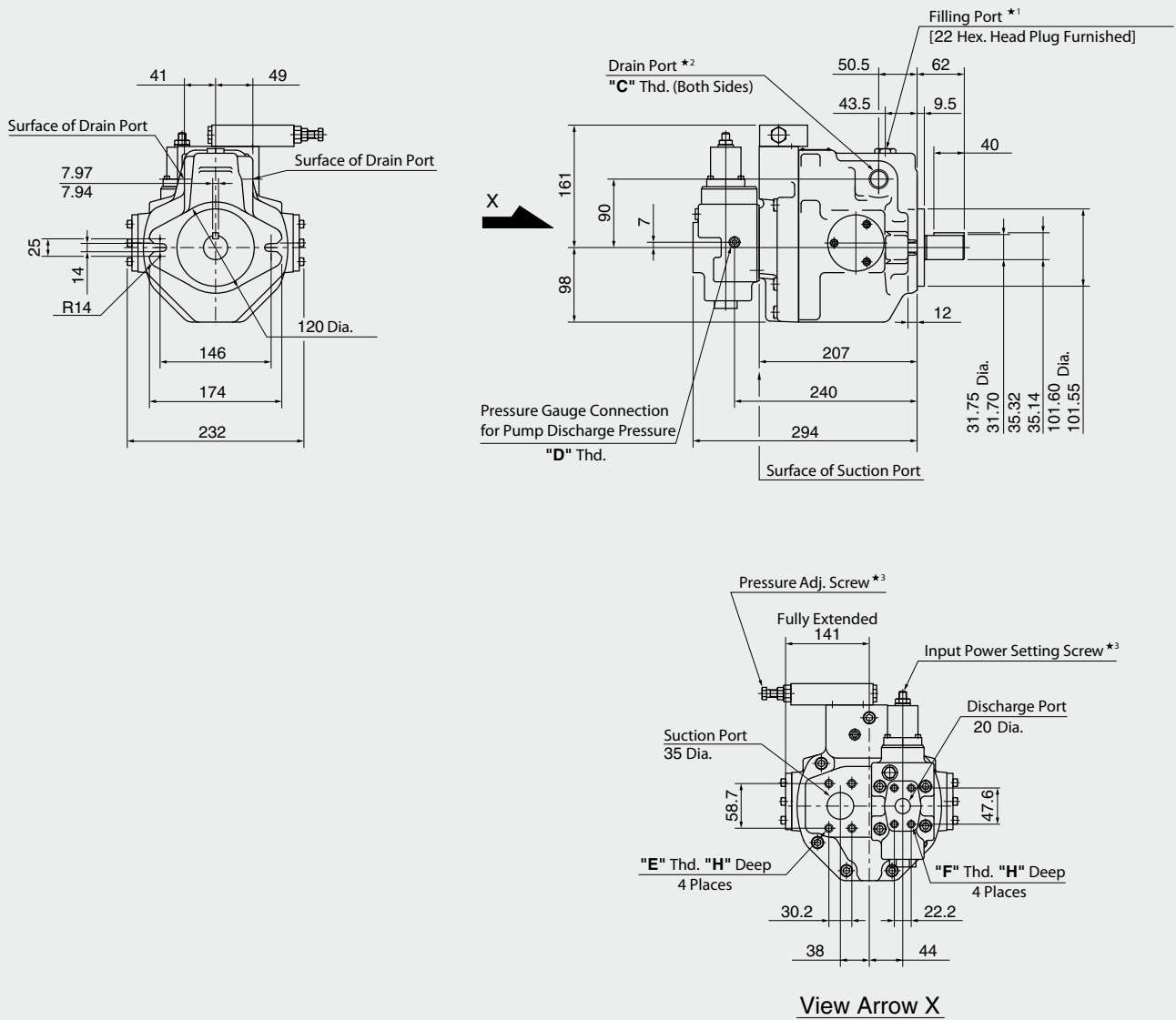


*1 Install the pump so that the "Filling port" is at the top.

*2 Use either port of two pilot ports at your option. Keep the remaining port plugged.

Model Numbers	"C" Thread	"D" Thread	"E" Thread	"F" Thread	"H" mm
PPV103-56 ... 32	Rc 3/4	Rc 3/8	Rc 1/4	M10	19
PPV103-56 ... 3280	3/4 BSP.F	3/8 BSP.F	1/4 BSP.Tr		
PPV103-56 ... 3290	SAE #12	SAE #6	SAE #4	7/16-14 UNC	20

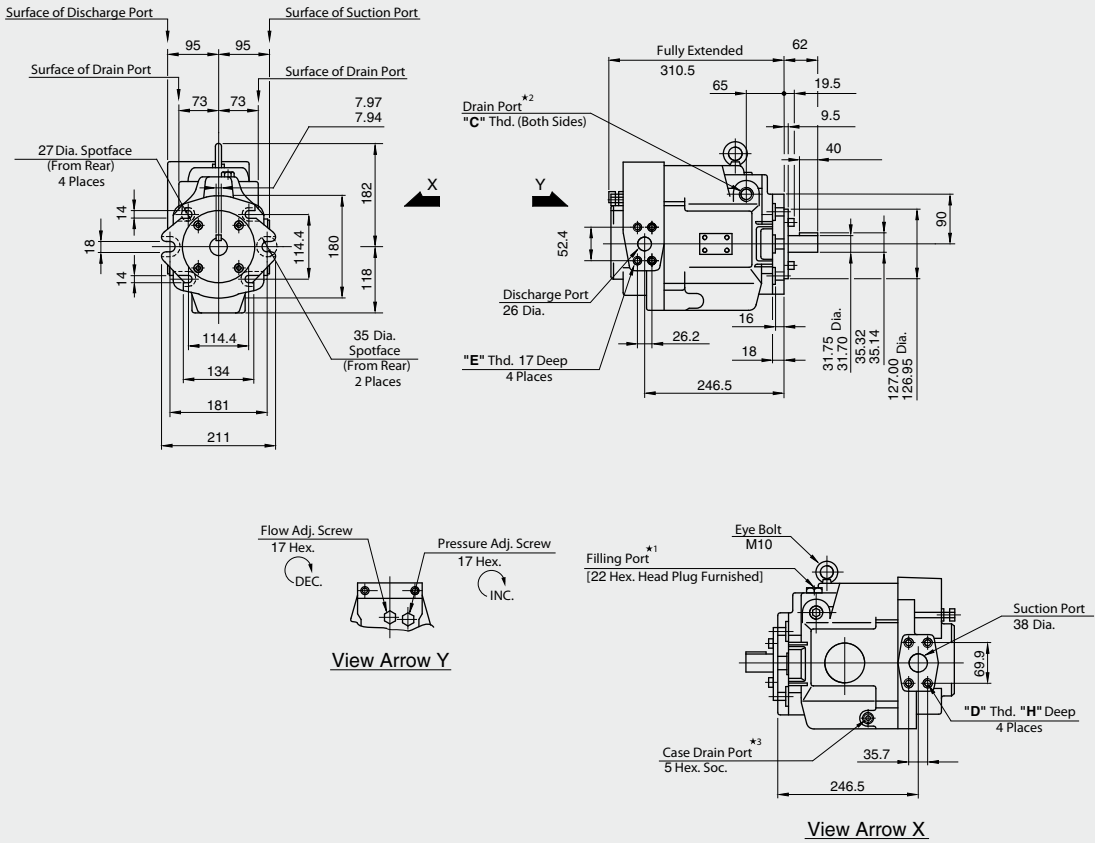
PPV103-56 with Constant Power Control 09



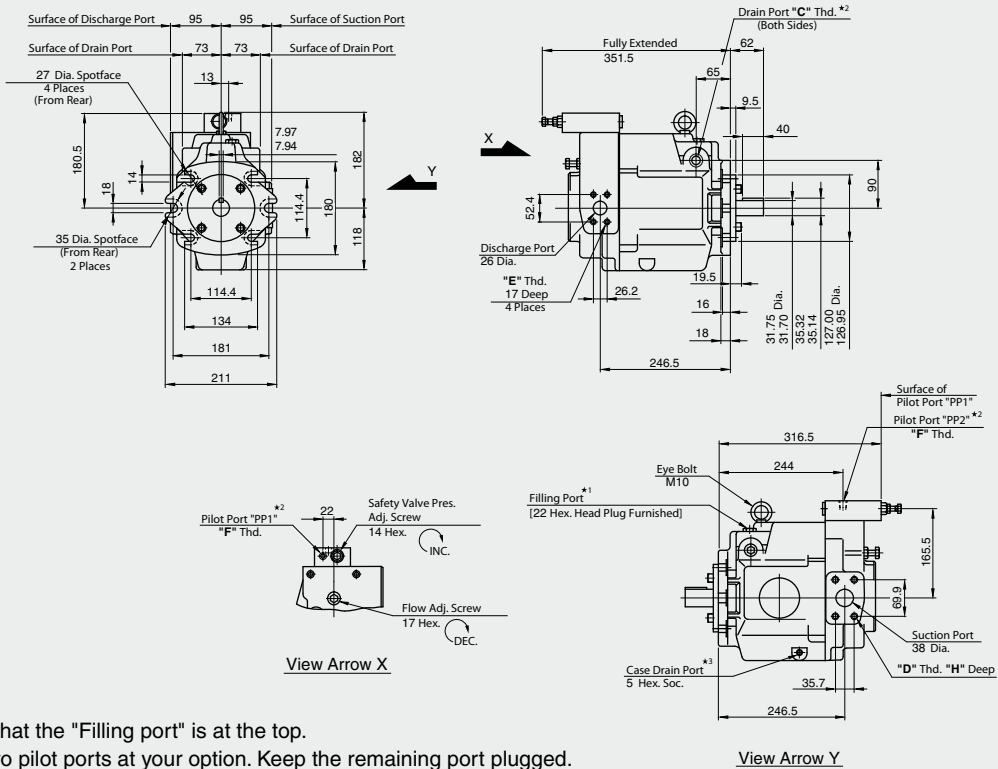
- *1 Install the pump so that the "Filling port" is at the top.
- *2 Use either port of two pilot ports at your option. Keep the remaining port plugged.
- *3 Do not touch the screw because it is adjusted at the time of shipment.

Model Numbers	"C" Thread	"D" Thread	"E" Thread	"F" Thread	"H" mm
PPV103-56 ... 32	Rc 3/4	Rc 1/4	M10	M10	19
PPV103-56 ... 3280	3/4 BSP.F	1/4 BSP.Tr			
PPV103-56 ... 3290	SAE #12	SAE #4	7/16-14 UNC	3/8-16 UNC	20

PPV103-70 with Pressure Control 01



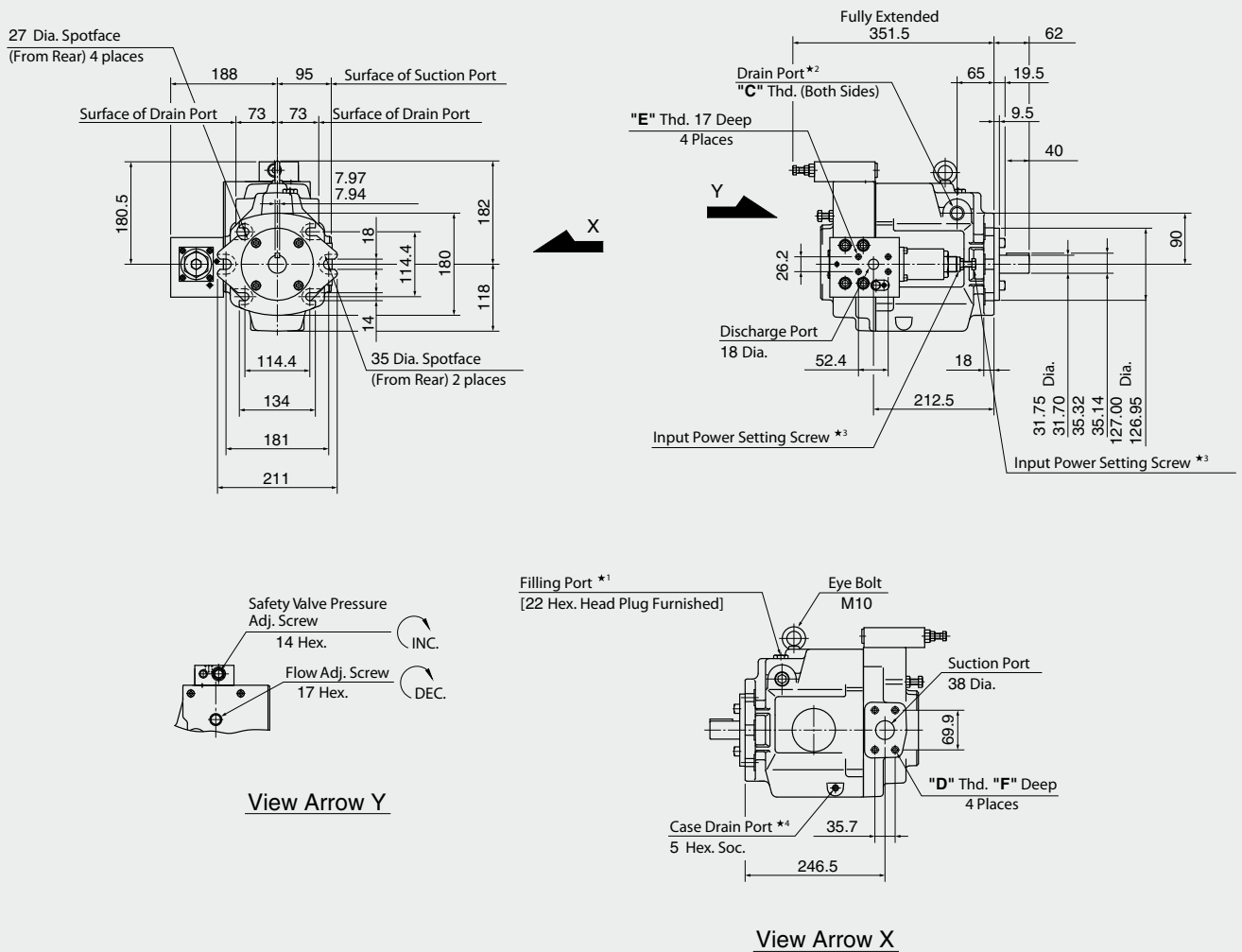
PPV103-70 with Remote Pressure Control 07



- *1 Install the pump so that the "Filling port" is at the top.
- *2 Use either port of two pilot ports at your option. Keep the remaining port plugged.
- *3 Case drain port is available for use when draining hydraulic fluid from pump casing.

Model Numbers	"C" Thread	"D" Thread	"E" Thread	"F" Thread	"H" mm
PPV103-70 ... 60	Rc 3/4	M12	M10	Rc 1/4	19
PPV103-70 ... 6080	3/4 BSP.F			1/4 BSP.Tr	
PPV103-70 ... 60950	SAE #12	1/2-13 UNC	3/8-16 UNC	SAE #4	21

PPV103-70 with Constant Power Control 09

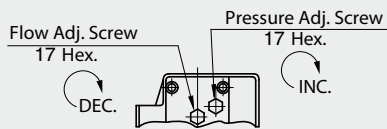
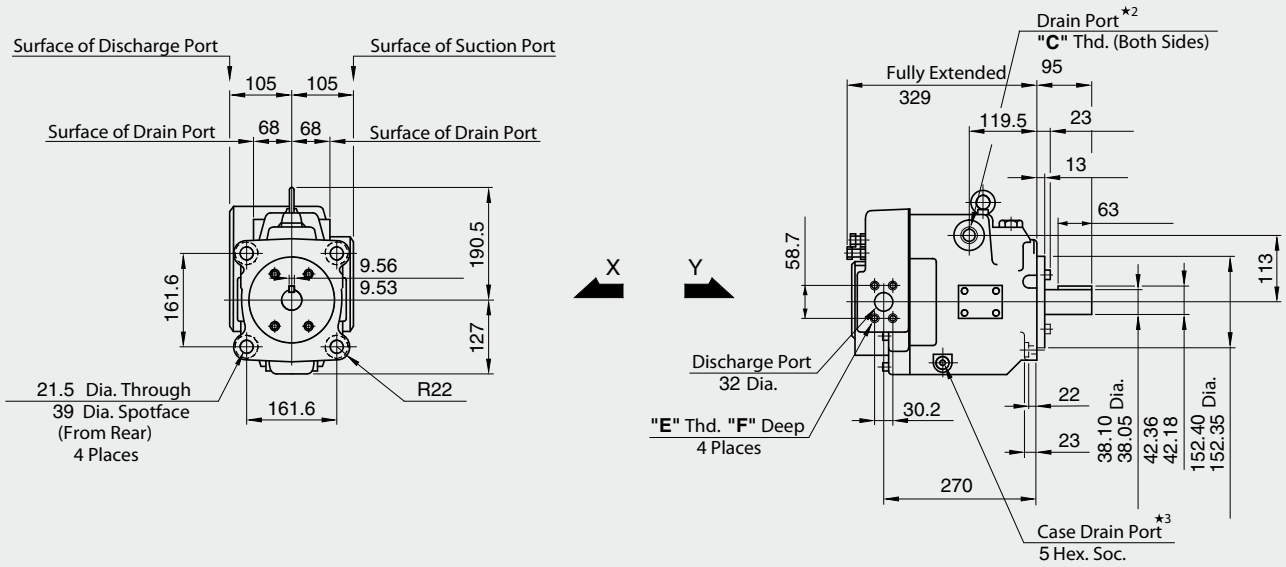


- *1 Install the pump so that the "Filling port" is at the top.
- *2 Use either port of two pilot ports at your option. Keep the remaining port plugged.
- *3 Do not touch the screw because it is adjusted at the time of shipment.
- *4 Case drain port is available for use when draining hydraulic fluid from pump casing.

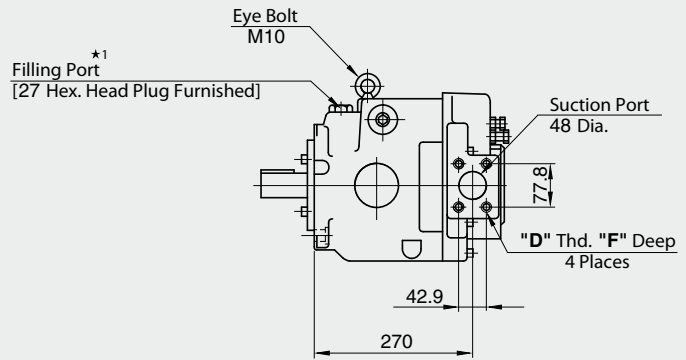
Model Numbers	"C" Thread	"D" Thread	"E" Thread	"F" mm
PPV103-70 ... 60	Rc 3/4	M12	M10	19
PPV103-70 ... 6080	3/4 BSP.F			
PPV103-70 ... 60950	SAE #12	1/2-13 UNC	3/8-16 UNC	21

2.4.31 PPV103-90

PPV103-90 with Pressure Control 01



View Arrow Y

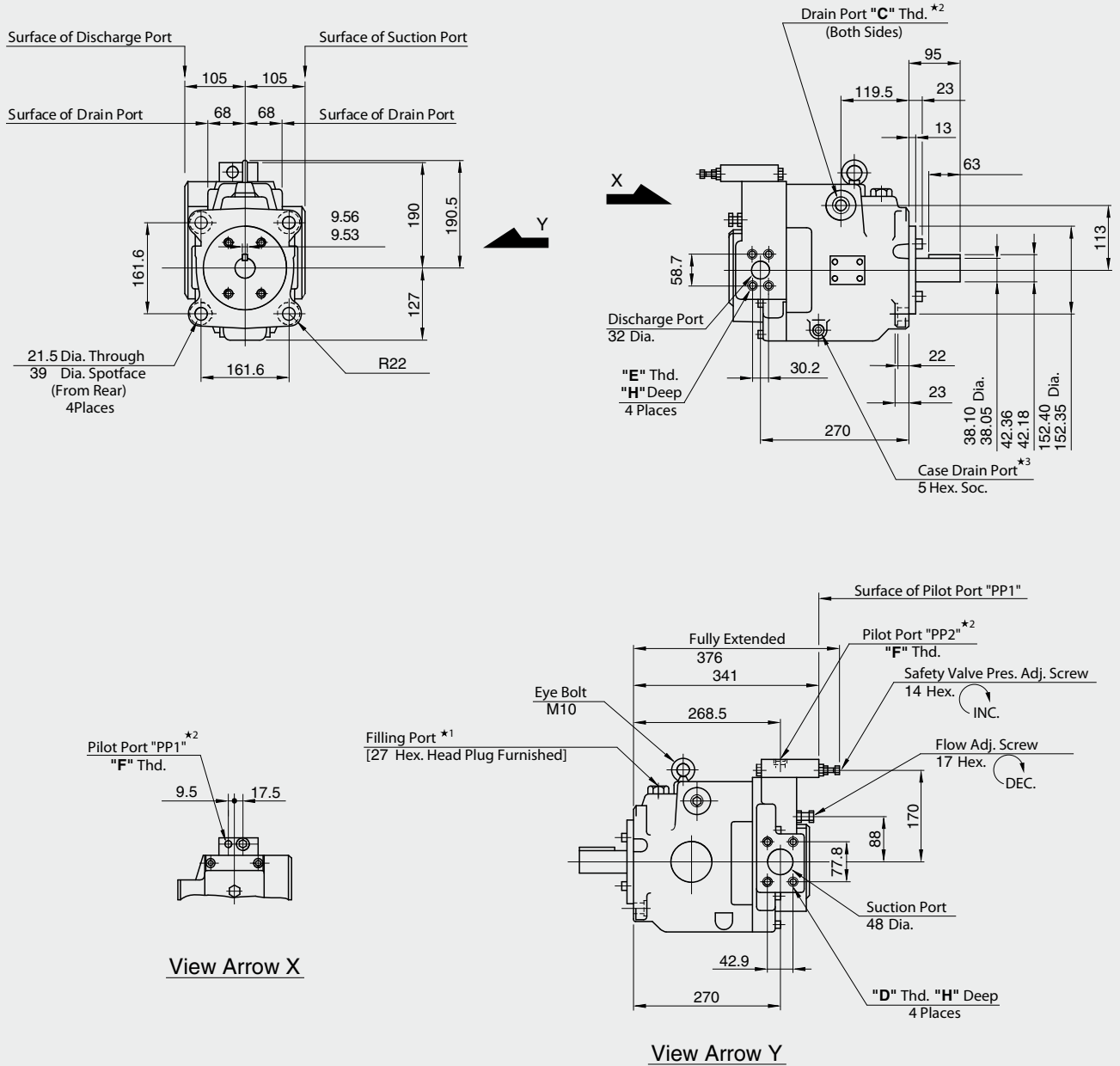


View Arrow X

- *₁ Install the pump so that the "Filling port" is at the top.
- *₂ Use either port of two pilot ports at your option. Keep the remaining port plugged.
- *₃ Case drain port is available for use when draining hydraulic fluid from pump casing.

Model Numbers	"C" Thread	"D" Thread	"E" Thread	"F" mm
PPV103-90 ... 60	Rc 3/4	M12	M10	19
PPV103-90 ... 6080	3/4 BSP.F			
PPV103-90 ... 60950	SAE #12	1/2-13 UNC	7/16-14 UNC	21

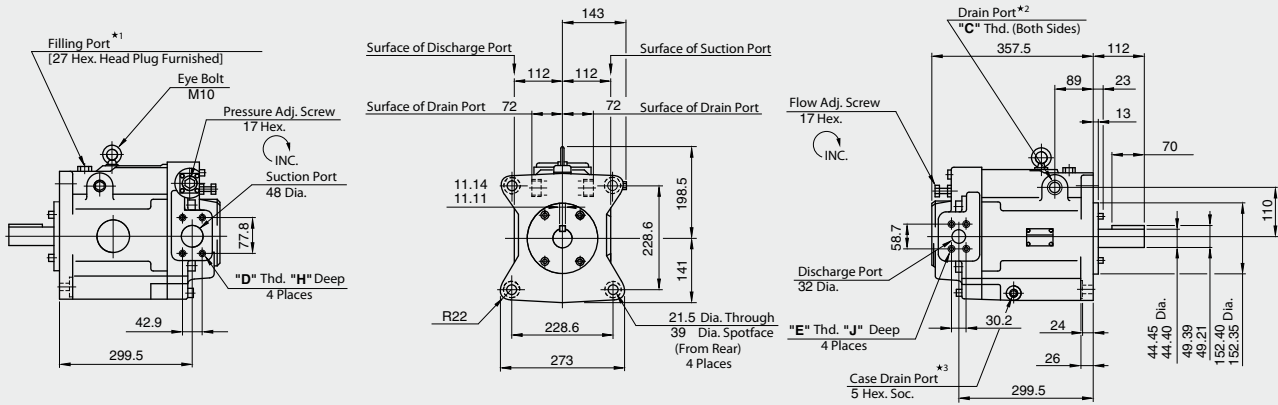
PPV103-90 with Remote Pressure Control 07



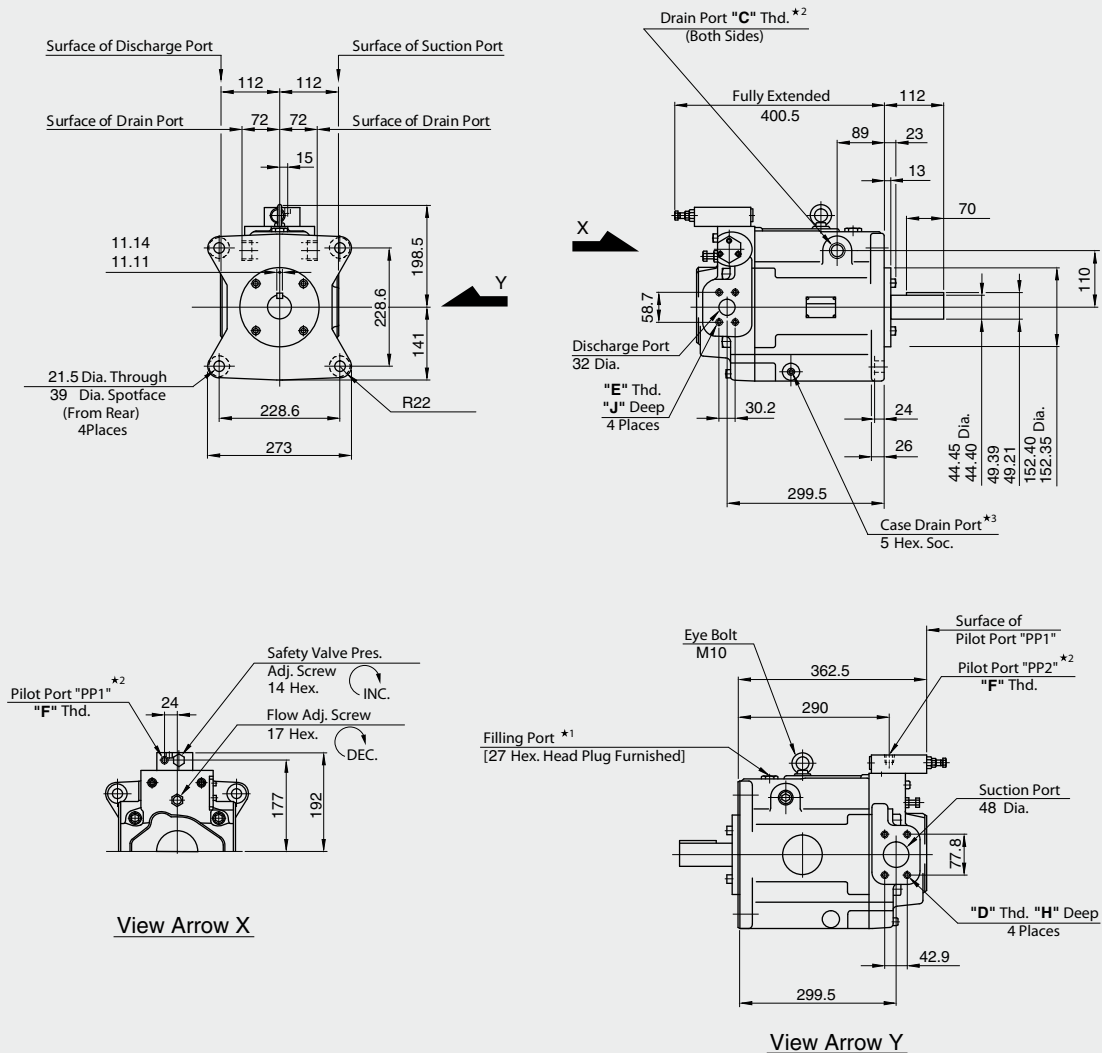
- *1 Install the pump so that the "Filling port" is at the top.
- *2 Use either port of two pilot ports at your option. Keep the remaining port plugged.
- *3 Case drain port is available for use when draining hydraulic fluid from pump casing.

Model Numbers	"C" Thread	"D" Thread	"E" Thread	"F" Thread	"H" mm
PPV103-90 ... 60	Rc 3/4	M12	M10	Rc 1/4	19
PPV103-90 ... 6080	3/4 BSP.F			1/4 BSP.Tr	
PPV103-90 ... 60950	SAE #12	1/2-13 UNC	7/16-14 UNC	SAE #4	21

PPV103-145 with Pressure Control 01



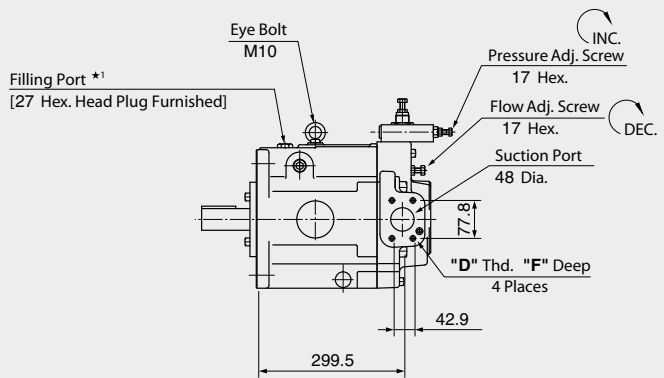
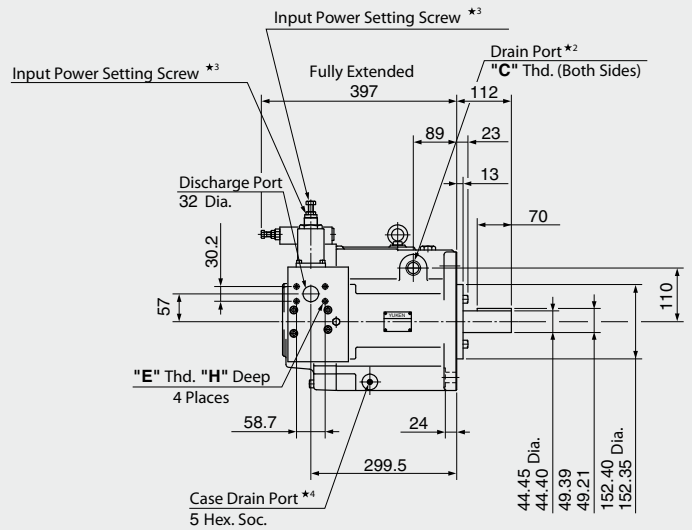
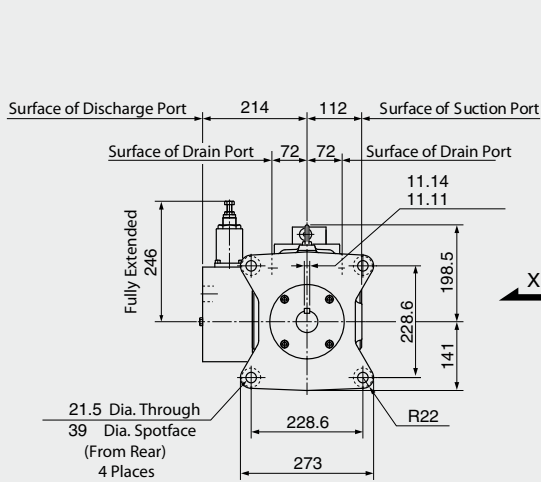
PPV103-145 with Remote Pressure Control 07



- *1 Install the pump so that the "Filling port" is at the top.
- *2 Use either port of two pilot ports at your option. Keep the remaining port plugged.
- *3 Case drain port is available for use when draining hydraulic fluid from pump casing.

Model Numbers	"C" Thread	"D" Thread	"E" Thread	"F" Thread	"H" mm	"J" mm
PPV103-145 ... 60	Rc 3/4	M12	M10	Rc 1/4	19	19
PPV103-145 ... 6080	3/4 BSP.F			1/4 BSP.Tr		
PPV103-145 ... 60950	SAE #12	1/2-13 UNC	7/16-14 UNC	SAE #4	21	20

PPV103-145 with Constant Power Control 09



View Arrow X

- *1 Install the pump so that the "Filling port" is at the top.
- *2 Use either port of two pilot ports at your option. Keep the remaining port plugged.
- *3 Do not touch the screw because it is adjusted at the time of shipment.
- *4 Case drain port is available for use when draining hydraulic fluid from pump casing.

Model Numbers	"C" Thread	"D" Thread	"E" Thread	"F" mm	"H" mm
PPV103-145 ... 60	Rc 3/4	M12	M10	19	19
PPV103-145 ... 6080	3/4 BSP.F				
PPV103-145 ... 60950	SAE #12	1/2-13 UNC	7/16-14 UNC	21	20