

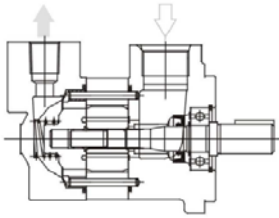
V10 Vane Pumps



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V10



V10F



V10P

V10 Ordering Code

V10	-1	S	3	S	-1	C	20	R
Series	Flange	Inlet Port Connections	Code	Outlet Port Connections	Shafts	Outlet Positions	Design	Rotation
V10	2 Bolt Flange	P-1" NPT Thread S-1.3125-12 Straight Thread (1 5/16" UNO) B-G1" Thread	1, 2, 3, 4 5, 6, 7	P-1/2" NPT Thread S-0.750-16 Straight Thread (3/4" UNO) B-G1/2" Thread	1-3/4" Str. Keyed 11-9T Splined 38-11 Tooth - 3/4" OD	Viewed from cover end of pump A - Opposite Inlet Port B - 90°CCW from Inlet C - Inline with Inlet D - 90° CW from Inlet	20	Viewed from shaft end of pump L - Left Hand for counter clockwise R - Right Hand for clockwise

V10F & V10P Ordering Code

V10	F	-P	13	S	-1	A	8H	22	R
Series	Integral Valves	Inlet Port Connections	Code	Outlet Port Connections	Shafts	Outlet Positions	Integral Valves	Design	Rotation
V10	F: Flow Control & Relief P: Priority Valve & Relief	D: 1 5/16-12str. Thread (V20 Only) P: 1" NPT Thread (v10 only) 1 1/4" NPT Thread (V20 only) S: 1 5/16-12 Straight Thread (V10 only) 1 5/8" T: 1 3/16-12 Straight Thread (V10 only)	1 2 3 4 5 6 7	See Chart Below	1-3/4" Straight Keyed 3: Threaded with Woodruff Key 11: Splined V10 Only 12: Splined V10 Only 38: Splined See Charts	Viewed from cover end of pump A - Opposite Inlet Port B - 90°CCW from Inlet C - Inline with Inlet D - 90°CW from Inlet	Orifice No. Flow Rate LPM 2-8 3-11 4-15 5-19 6-23 7-27 8-30 Relief Valve Setting MPa A - 1.7 B - 3.5 C - 5.2 D - 7 E - 8.6 F - 10 G - 12.1 H - 14 J - 15.5 K - 17.5	22	Viewed from shaft end of pump L - Left Hand for counter clockwise R - Right Hand for clockwise

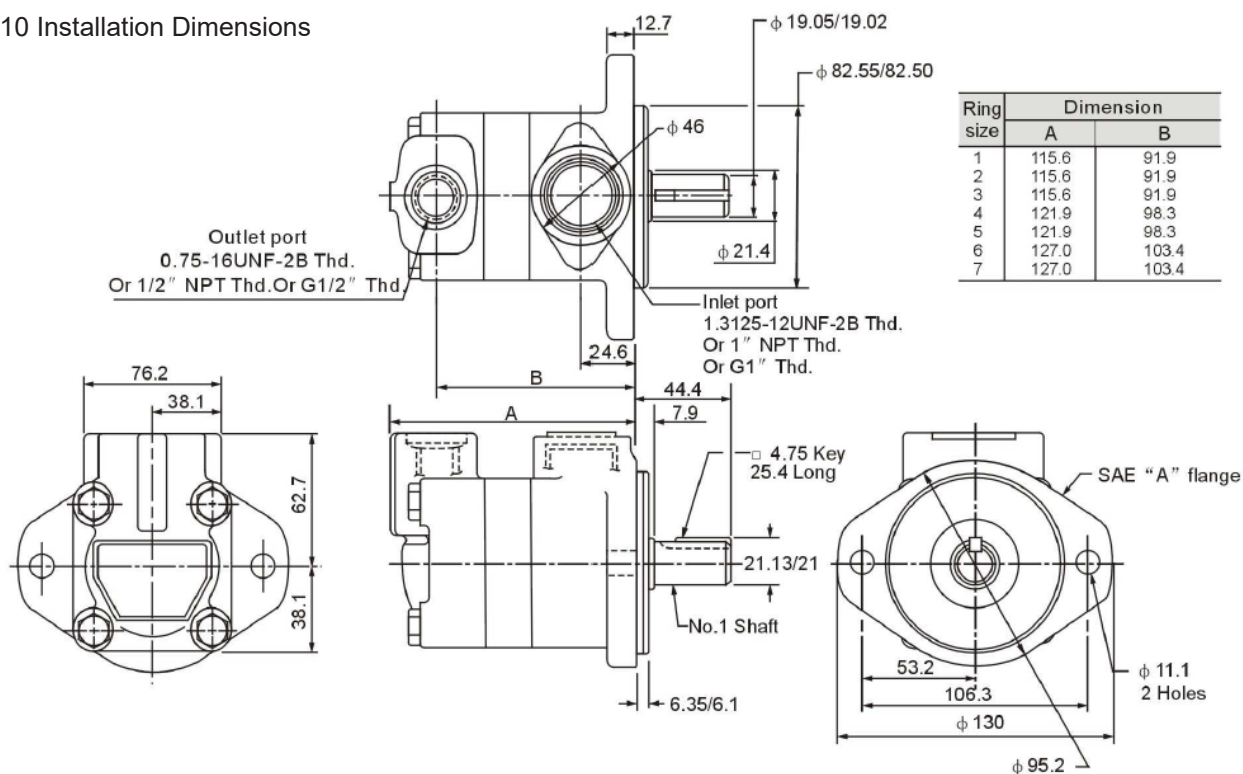
Porting

Code	Flow Control Cover (V10F)		Priority Valve Cover (V10P)		
	Pressure	Tank	Primary Outlet	Secondary Outlet	Tank
K	-	-	9/16-18 (V10P)	3/4-16 (V10P)	9/16-18 (V10P)
P	9/16-18 (V10F & V20F)	1/2" NPT (V10F & V20F)	-	-	-
S	3/4-16 (V10F)	1-1/16-12 (V20F)			
T	3/4-16 (V10F)	3/4-16 (V10F)	3/4-16 (V20P)	7/8-14 (V20P)	3/4-16 (V20P)

V10 Specifications

V10 Specifications		Using anti-wear oil or phosphate ester fluid		Using water glycol fluid		Using water-in-oil emulsion	
Ring Size Delivery US GPM @ 1200rpm	Displacement cc/rev	Max Pressure MPa	Max Speed rpm	Max Pressure MPa	Max Speed rpm	Max Pressure MPa	Max Speed rpm
1	3.3	17.2	4800	12.4	1800	10.3	1800
2	6.6	17.2	4500	12.4	1800	10.3	1800
3	9.8	17.2	4000	12.4	1800	10.3	1800
4	13.1	17.2	3400	12.4	1800	10.3	1800
5	16.4	17.2	3200	12.4	1800	10.3	1800
6	19.5	15.2	3000	12.4	1800	10.9	1800
7	22.8	13.8	2800	12.4	1800	10.9	1800

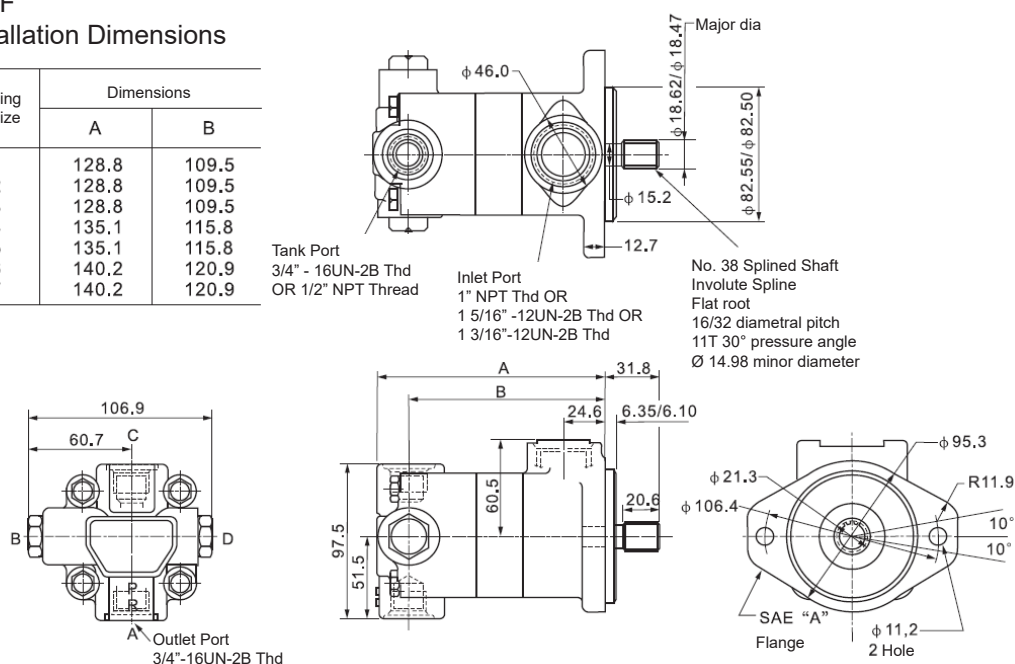
V10 Installation Dimensions



Model	Delivery Usgpm @ 1200 rpm 100psi	Displacement	Max rpm	Max MPa	Typical delivery Usgpm @ max speed & pressure	Typical input HP@max speed & pressure
V10F V10P	1	3.3	4800	17.2	3.6	7
	2	6.6	4500	17.2	7.3	13.6
	3	9.8	4000	17.2	9.4	17.8
	4	13.1	3400	17.2	10.9	20.4
	5	16.4	3200	17.2	12.8	22.8
	6	19.5	3000	15.2	14.6	24.5
	7	22.8	2800	13.8	16	24
V20F V20P	6	19.5	3400	17.2	16.1	29
	7	22.8	3000	17.2	16.7	29.5
	8	26.6	2800	17.2	17.7	32.5
	9	29.7	2800	17.2	19.8	35.5
	11	36.4	2500	17.2	22.9	37.5
	12	39	2400	15.2	23	36
	13	42.5	2400	15.2	25.9	39

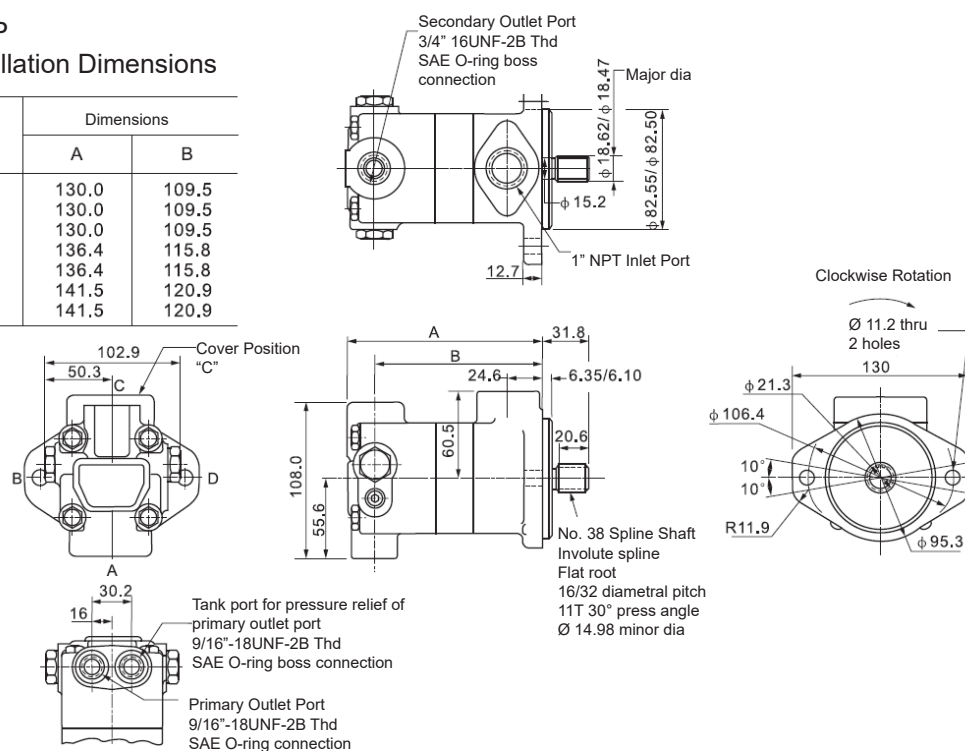
V10F Installation Dimensions

Ring Size	Dimensions	
	A	B
1	128.8	109.5
2	128.8	109.5
3	128.8	109.5
4	135.1	115.8
5	135.1	115.8
6	140.2	120.9
7	140.2	120.9

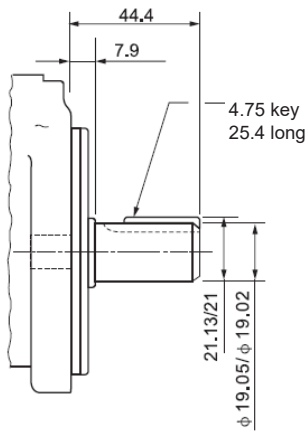


V10P Installation Dimensions

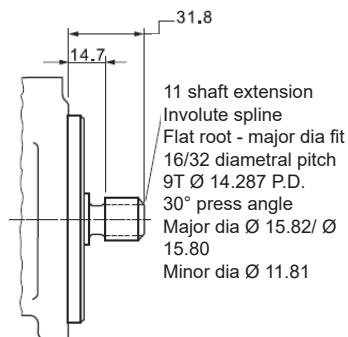
Ring Size	Dimensions	
	A	B
1	130.0	109.5
2	130.0	109.5
3	130.0	109.5
4	136.4	115.8
5	136.4	115.8
6	141.5	120.9
7	141.5	120.9



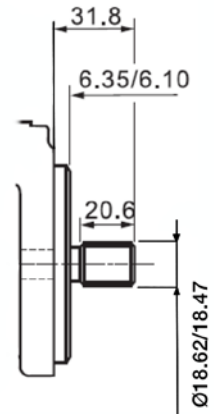
1 - 3/4" Straight Keyed Shaft



11 - SAE A 5/8" 9T Splined



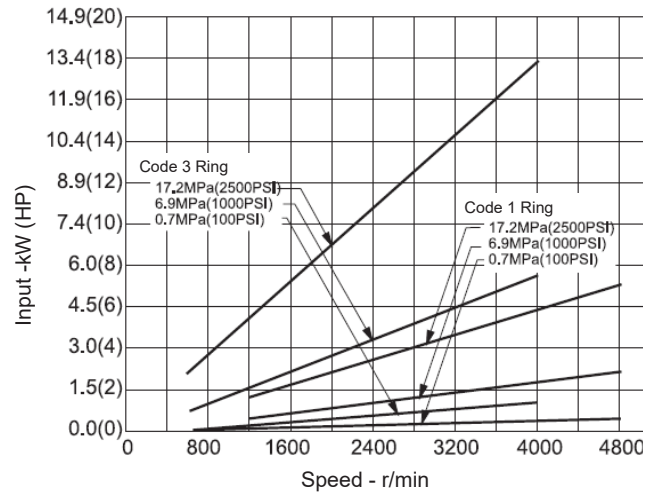
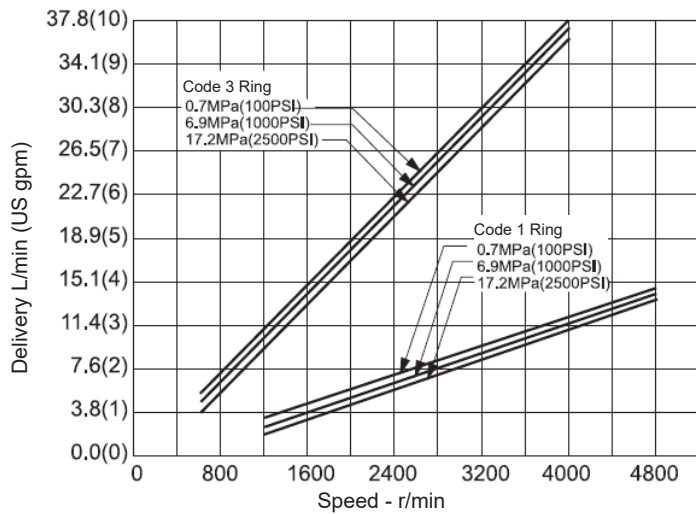
38 - 3/4" 11T Splined



V10 Performance Characteristics

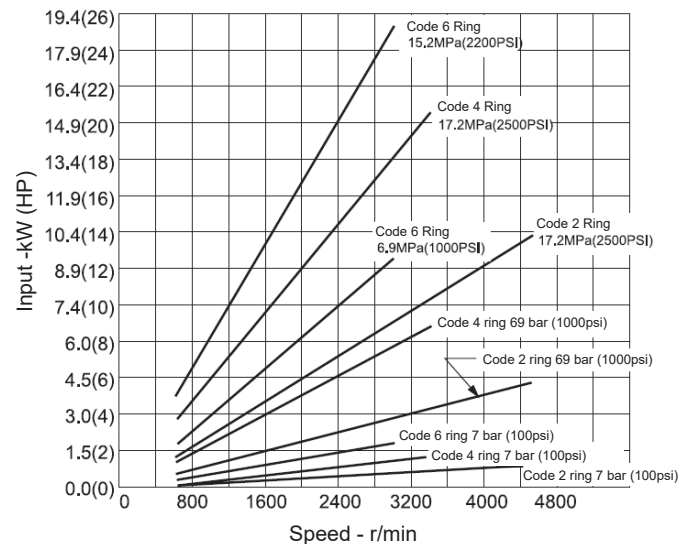
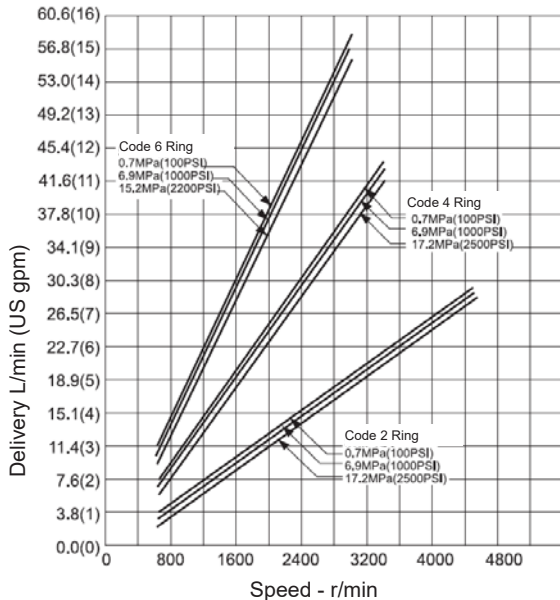
V10

Code 1 & 3 Rings



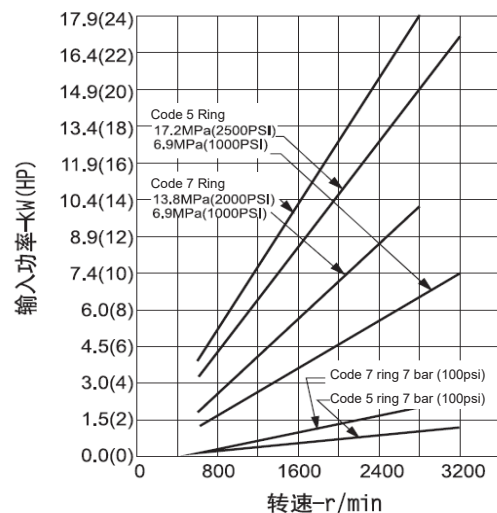
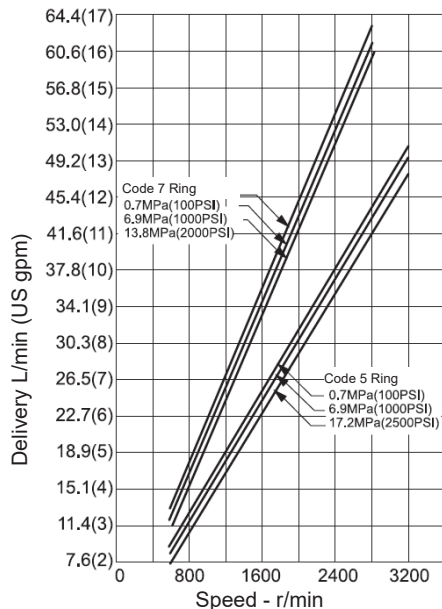
V10

Code 2, 4 & 6 Rings

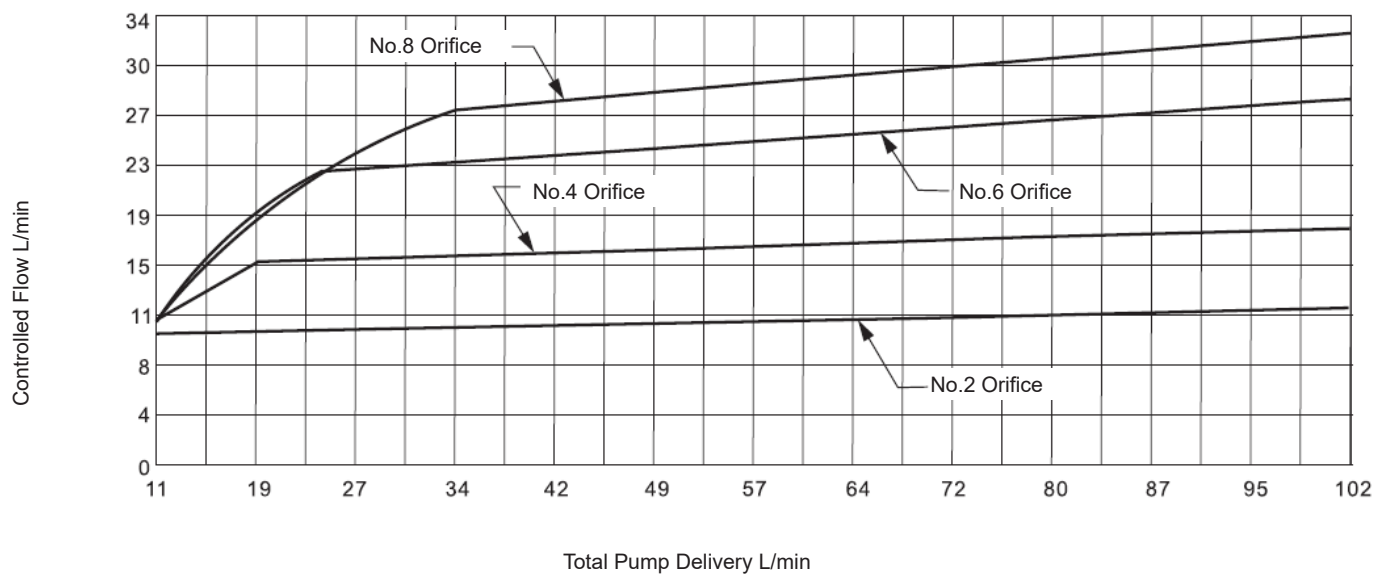


V10

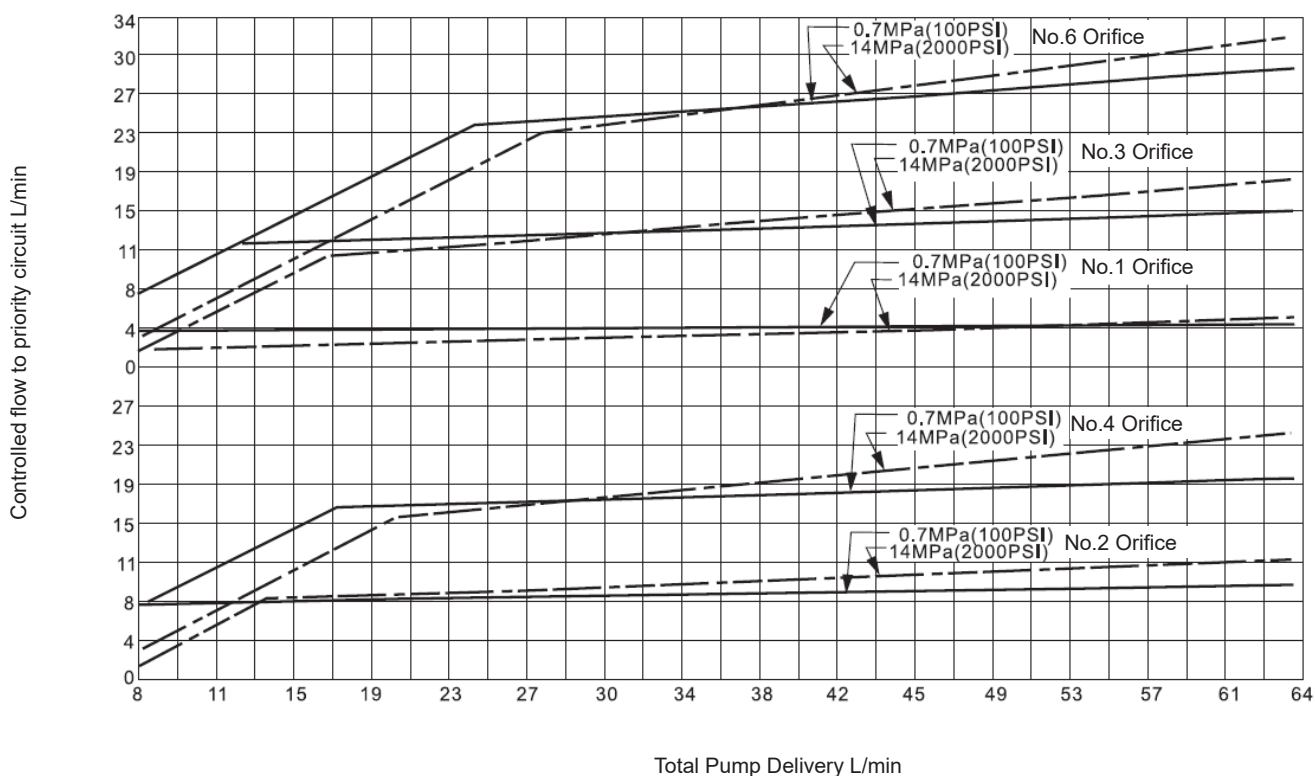
Code 5 & 7 Rings



V10F Flow Control Model



V10P Flow Control Model



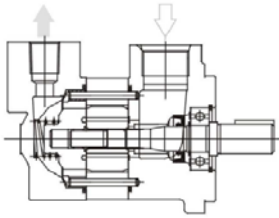
V20 Vane Pumps



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V20



V20F



V20P

V20 Ordering Code

V20	-1	S	6	S	-1	C	10	R
Series	Flange	Inlet Port Connections	Code	Outlet Port Connections	Shafts	Outlet Positions	Design	Rotation
V20	2 Bolt Flange	P-1 1/4" NPT Thread S-1.625-12 Straight Thread (1 5/8" UNO) B-G1 1/4" Thread	6, 7, 8, 9, 10, 11, 12, 13, 14	P-3/4" NPT Thread S-1.065-16 Straight Thread (1 1/6" UNO) B-G3/4" Thread	1-3/4" Str. Keyed 11-3/4" 11T Splined 38-3/4" 11T Splined Heavy Duty 62 - SAE A 5/8" 9T Splined	Viewed from cover end of pump A - Opposite Inlet Port B - 90°CCW from Inlet C - Inline with Inlet D - 90° CW from Inlet	10	Viewed from shaft end of pump L - Left Hand for counter clockwise R - Right Hand for clockwise

V20F & V20P Ordering Code

V20	F	-P	13	S	-1	A	8H	22	R
Series	Integral Valves	Inlet Port Connections	Code	Outlet Port Connections	Shafts	Outlet Positions	Integral Valves	Design	Rotation
V20	F: Flow Control & Relief P: Priority Valve & Relief	D: 1 5/16-12str. Thread P: 1 1/4" NPT Thread S: 1 5/8" - 12 Straight Thread	6 7 8 9 10 11 12 13	See Chart Below	1-3/4" Straight Keyed 3: Threaded with Woodruff Key 11: Splined 38: Splined See Charts	Viewed from cover end of pump A - Opposite Inlet Port B - 90°CCW from Inlet C - Inline with Inlet D - 90°CW from Inlet	Orifice No. Flow Rate LPM Relief Valve Setting MPa A - 1.7 B - 3.5 C - 5.2 D - 7 E - 8.6 F - 10 G - 12.1 H - 14 J - 15.5 K - 17.5	22	Viewed from shaft end of pump L - Left Hand for counter clockwise R - Right Hand for clockwise

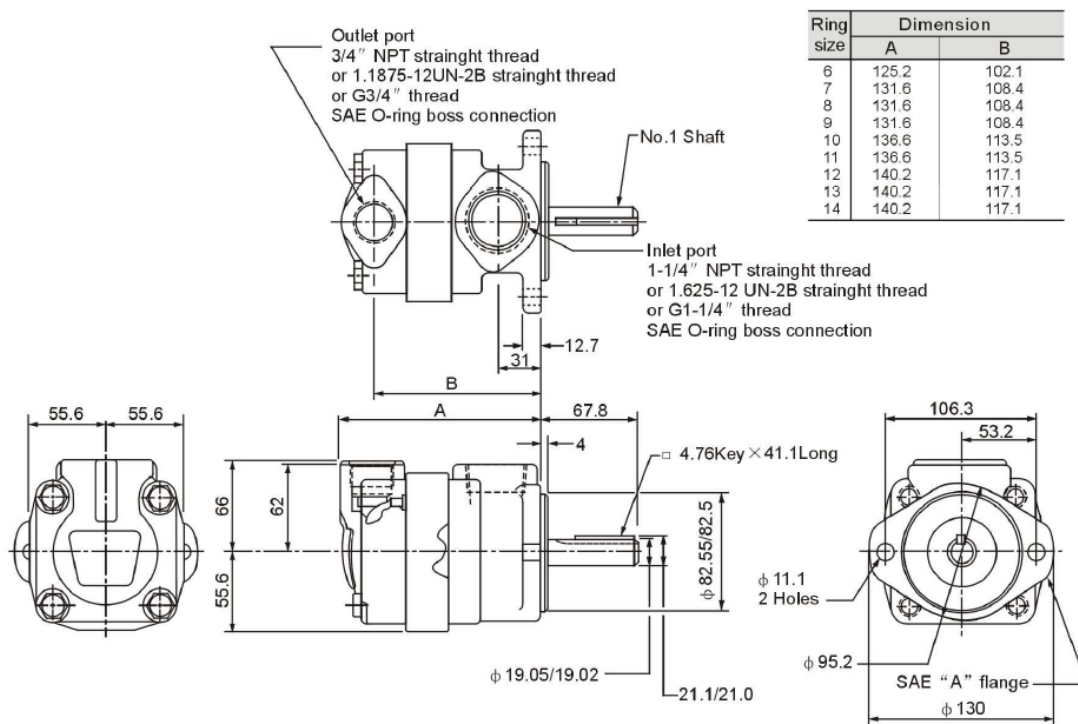
Porting

Code	Flow Control Cover (V10F)		Priority Valve Cover (V10P)		
	Pressure	Tank	Primary Outlet	Secondary Outlet	Tank
K	-	-	9/16-18 (V10P)	3/4-16 (V10P)	9/16-18 (V10P)
P	9/16-18 (V10F & V20F)	1/2" NPT (V10F & V20F)	-	-	-
S	3/4-16 (V10F)	1-1/16-12 (V20F)			
T	3/4-16 (V10F)	3/4-16 (V10F)	3/4-16 (V20P)	7/8-14 (V20P)	3/4-16 (V20P)

V20 Specifications

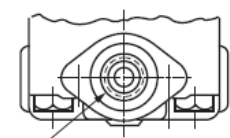
V20 Specifications		Using anti-wear oil or phosphate ester fluid		Using water glycol fluid		Using water-in-oil emulsion	
Ring Size Delivery US GPM @ 1200rpm	Displacement cc/rev	Max Pressure MPa	Max Speed rpm	Max Pressure MPa	Max Speed rpm	Max Pressure MPa	Max Speed rpm
6	19.5	17.2	3400	12.4	1800	10.9	1800
7	22.8	17.2	3000	12.4	1800	10.9	1800
8	26.5	17.2	2800	12.4	1800	10.9	1800
9	29.7	17.2	2800	12.4	1800	10.9	1800
10	30	17.2	2800	12.4	1800	10.9	1800
11	36.4	17.2	2500	10.9	1800	9.3	1800
12	39	15.2	2400	10.9	1800	9.3	1800
13	42.4	15.2	2400	10.9	1800	9.3	1800

V20

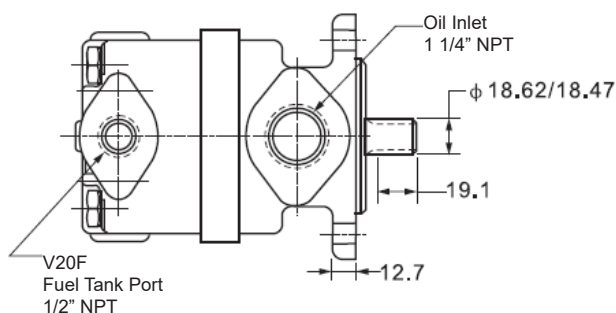


V20F/V20P Specifications

Model	Delivery Usqpm @ 1200 rpm 100psi	Displacement	Max rpm	Max MPa	Typical delivery Usqpm @ max speed & pressure	Typical input HP@max speed & pressure
V10F V10P	1	3.3	4800	17.2	3.6	7
	2	6.6	4500	17.2	7.3	13.6
	3	9.8	4000	17.2	9.4	17.8
	4	13.1	3400	17.2	10.9	20.4
	5	16.4	3200	17.2	12.8	22.8
	6	19.5	3000	15.2	14.6	24.5
	7	22.8	2800	13.8	16	24
V20F V20P	6	19.5	3400	17.2	16.1	29
	7	22.8	3000	17.2	16.7	29.5
	8	26.6	2800	17.2	17.7	32.5
	9	29.7	2800	17.2	19.8	35.5
	11	36.4	2500	17.2	22.9	37.5
	12	39	2400	15.2	23	36
	13	42.5	2400	15.2	25.9	39

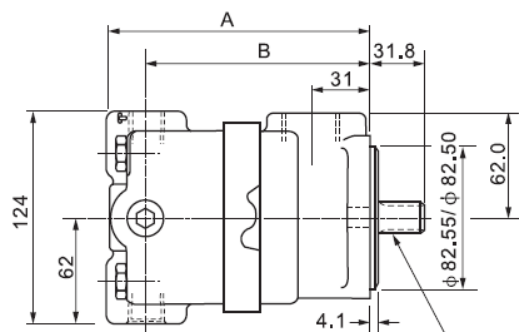
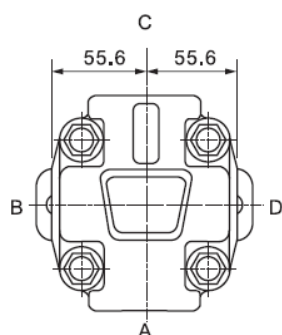


V20P
Second Oil Outlet
7/8" 14UNF 2B Stragith Thread
SAE Oring Seal Joint

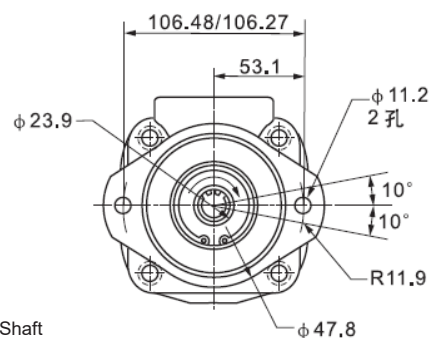


V20F
Fuel Tank Port
1/2" NPT

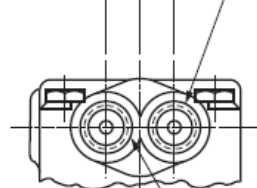
Ring Size	Dimensions	
	A	B
6	149.6	125.7
7	156.0	132.1
8	156.0	132.1
9	156.0	132.1
11	161.0	136.9
12	164.3	140.5
13	164.3	140.5



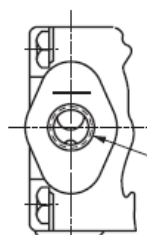
No. 38 Splined Shaft
Involute Spline
Flat Root
16/32 Diameter Pitch
11T -30° Pressure Angle
Minor Diameter Ø14.98



V20P
Fuel Tank Port
3/4" 16UNF 2B Threaded
SAE Oring Seal Fitting

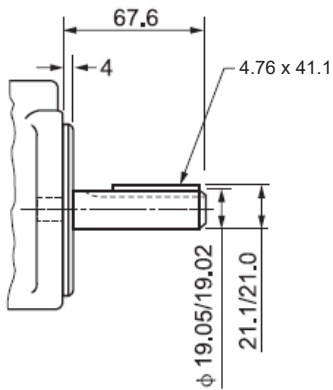


V20P
First Oil Outlet
3/4" 16 UNF 2B Threaded
SAE Oring Seal Connector

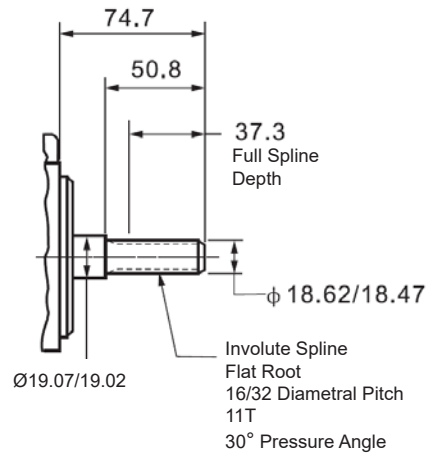


V20P
Oil Outlet
3/4" 16 UNF 2B Threaded
SAE Oring Seal Connector

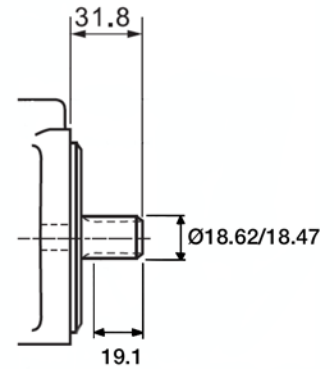
1 - 3/4" Straight Keyed Shaft



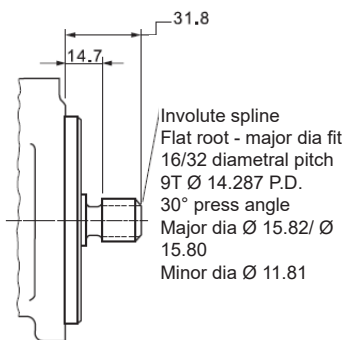
11 - 3/4" 11T Splined



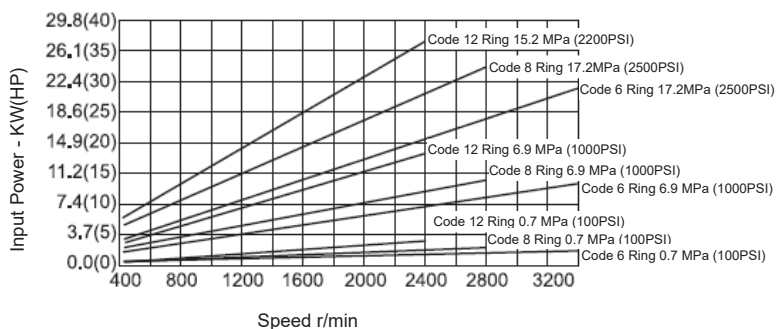
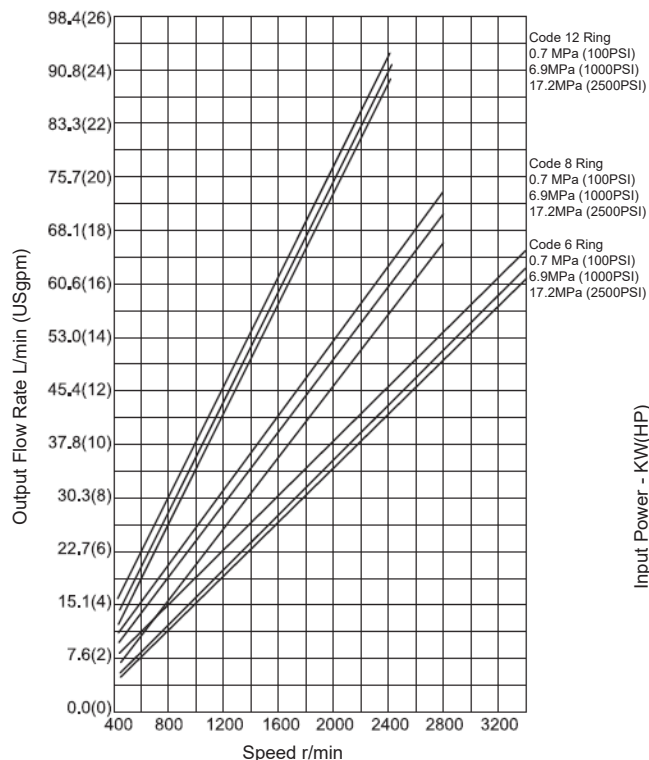
38 - 3/4" 11T Splined



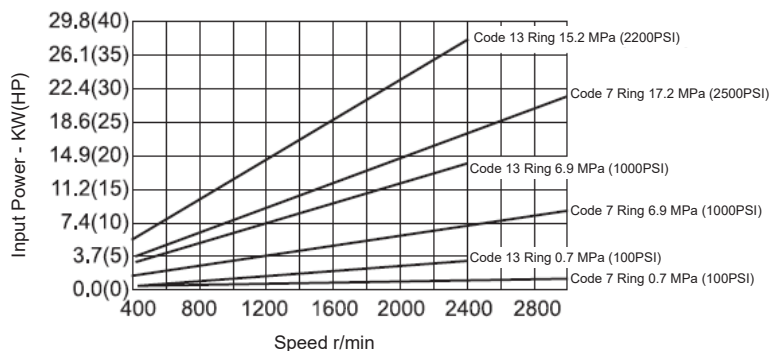
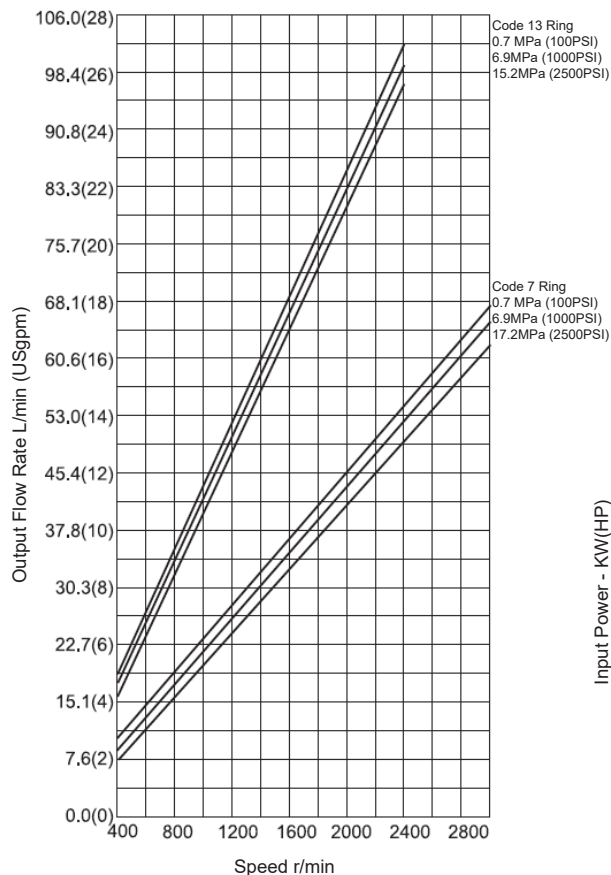
62 - SAE A 5/8" 9T Splined



V20 Code 6, 8 & 12 Rings

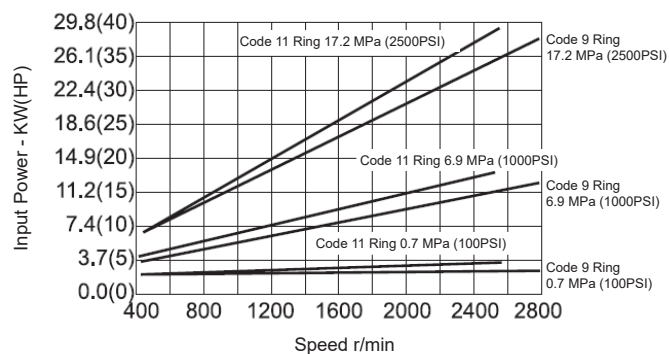
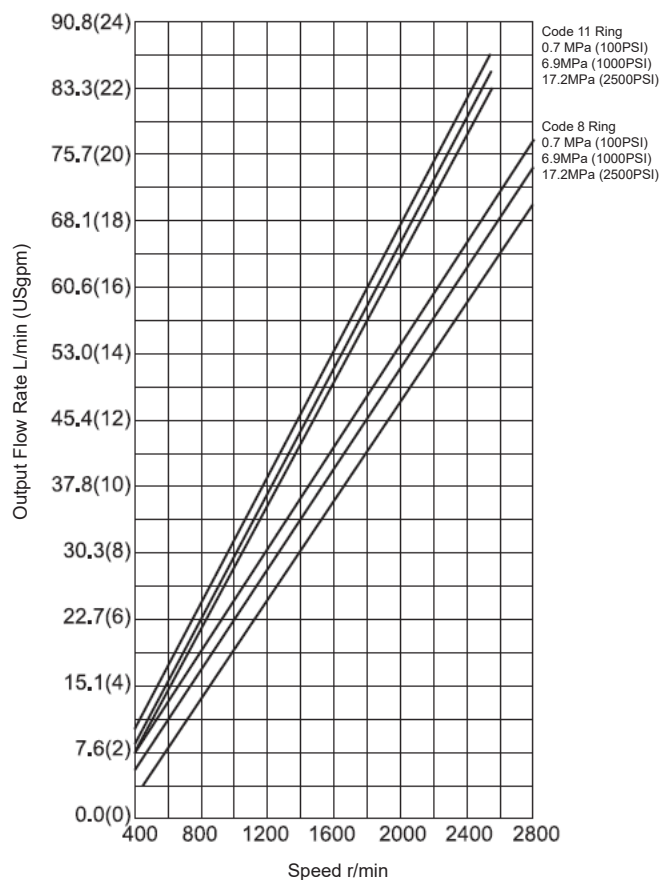


V20 Code 7 & 13 Rings



V20

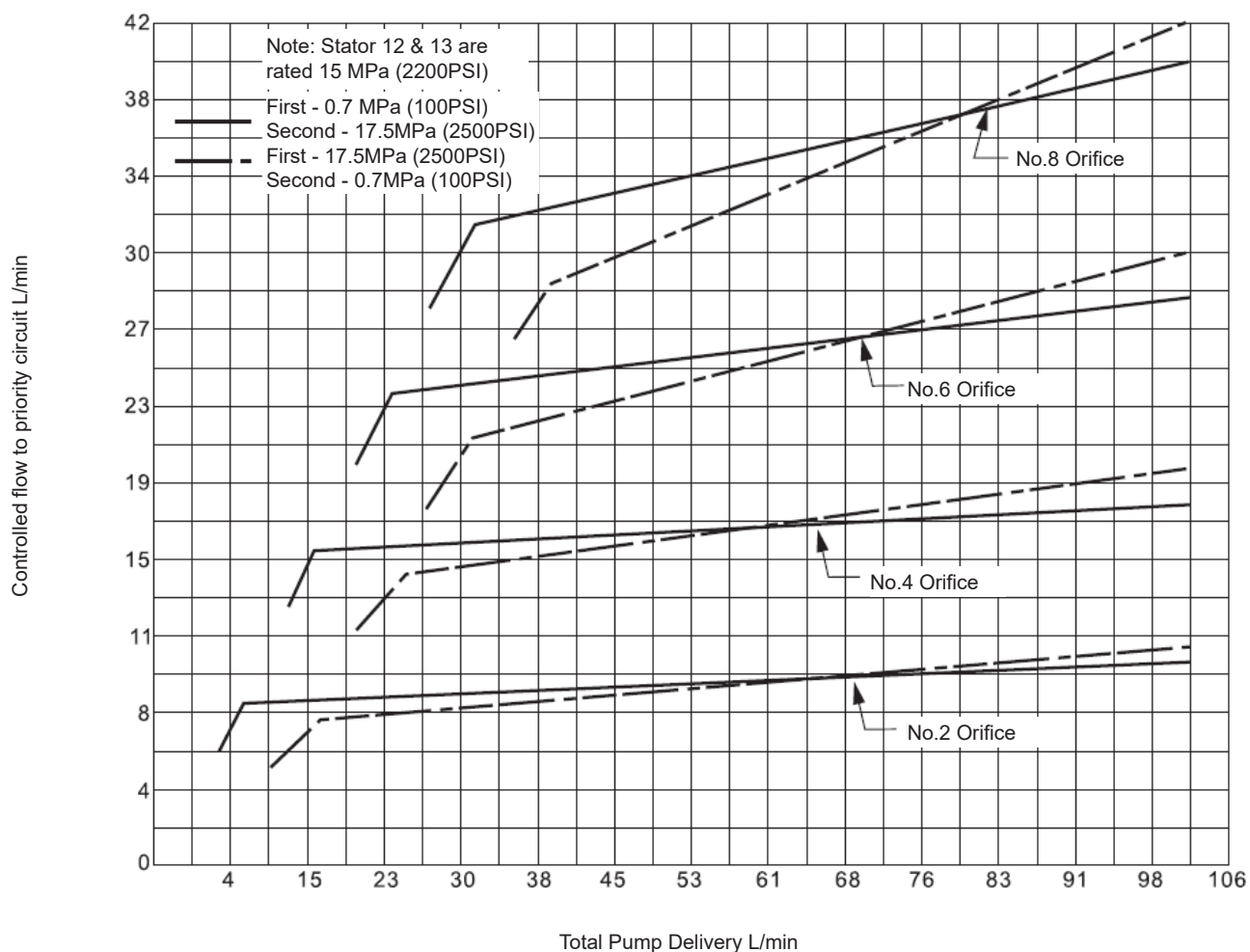
Code 9 & 11 Rings



V20F Flow Control Model



V20P Priority Flow Control Model



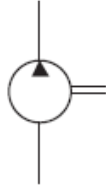
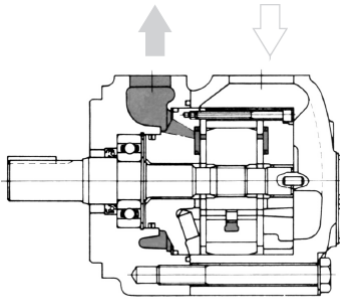
Single VQ Vane Pumps



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VQ Ordering Code

25VQ	21	A	(F)	-1	C	20	L
Series	Cartridge Code	Port Connections	Mounting	Shafts	Outlet Position	Design	Rotation
20VQ	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	A - SAE 4 Bolt Flange	Omit - Flange Mounting F - Foot Mounting	1 - Str Key 151 - Spline	Viewed from cover end of pump	30	View from shaft end of pump L - Left hand for counter clock wise Omit - Right hand for clock wise
25VQ	10, 12, 14, 15, 17, 19, 21			A - Opposite inlet port	20		
35VQ	21, 25, 30, 32, 35, 38, 45			B - 90 CCW from inlet			
45VQ	42, 45, 50, 57, 60, 66, 75			C - Inline with inlet D - 90 CW from inlet			

Single VQ Vane Pump Specifications

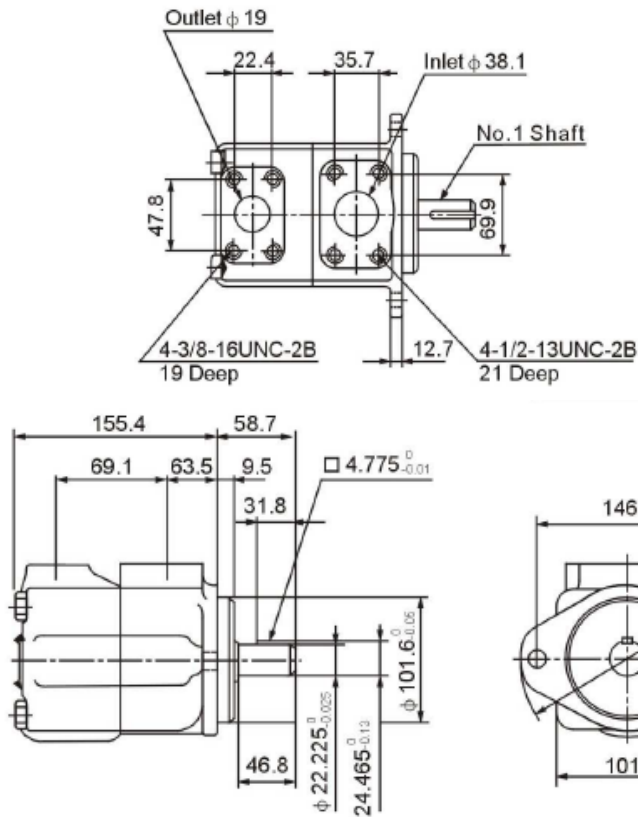
Specifications

Model	Code	Displacement mL/r	Max Speed r/min	Max Pressure MPa	Typical del. L/min max speed & pressure	Typical input kW max speed & pressure	Weight kg
20VQ	2	7	2700	21	16.4	7.2	11.8
	3	11.7	2700	21	24.4	10.8	
	4	15	2700	21	32.7	14.4	
	5	18	2700	21	42.3	17.9	
	6	19	2700	21	50.6	21.5	
	7	22	2700	21	58.8	23.7	
	8	27	2700	21	56.4	25.1	
	9	30	2700	21	73.4	26	
	10	31.5	2700	21	81.7	26.8	
	11	36	2700	21	88.5	27.7	
	12	40	2700	16	96.5	28.4	
	14	45	2700	14	115.4	29.1	
25VQ	10	32.5	2700	21	81.4	35.2	14.5
	12	38.3	2700	21	88.5	41	
	14	43.3	2700	21	103.8	46.6	
	15	47.3	2500	21	109.4	48.1	
	17	52.5	2500	21	119.2	51.8	
	19	60	2500	21	133.5	55.2	
	21	65	2500	21	146.2	61.9	
35VQ	21	64	2500	21	145.5	63.7	22.7
	25	79.2	2500	21	173.1	75.3	
	30	95	2500	21	211.5	87.7	
	32	101	2500	21	220.2	92.2	
	35	109	2400	21	230.8	98.5	
	38	118	2400	21	250	104.4	
	45	140	2400	21	271.2	99.8	
45VQ	42	134	2400	17.5	255.8	91.4	34.1
	45	147	2200	17.5	271.2	99.8	
	50	156	2200	17.5	303.8	105.2	
	57	180	2200	17.5	343.7	120.2	
	60	189	2200	17.5	369.2	126.8	
	66	208	2200	17.5	408.7	142.4	
	75	237	2200	14	460	120.2	

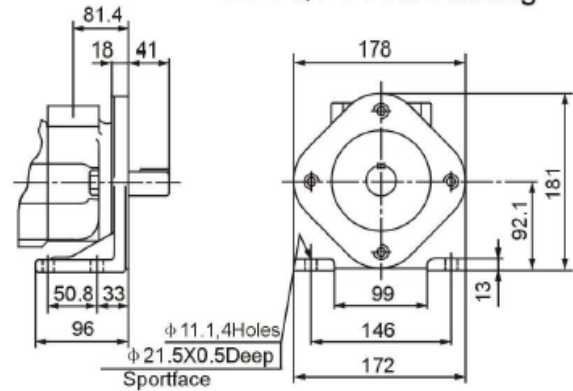
Performance constants: SAE 10W fluid ▲82°C (180°F), and pump inlet ▲PSIG (14.7PSIA)

Note: Outlet pressure must always be higher than inlet pressure.

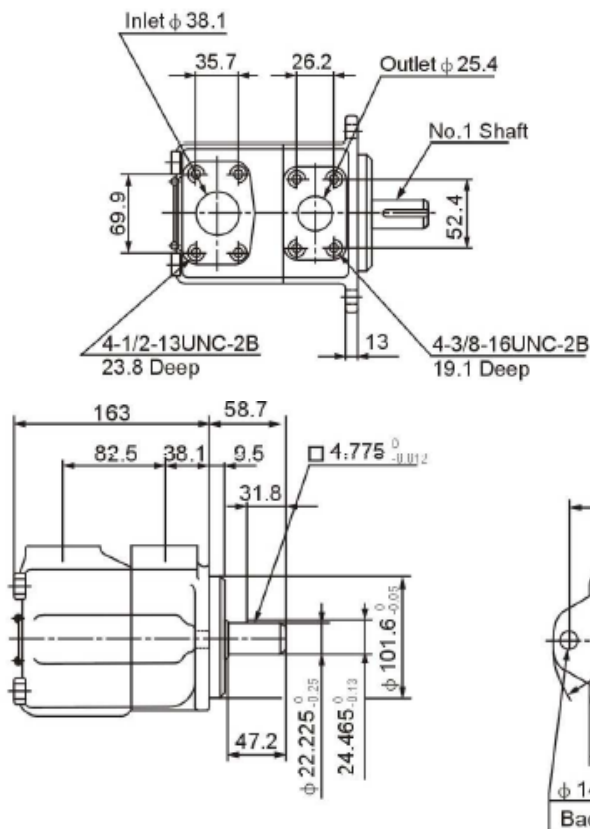
20VQ Flange Mounting



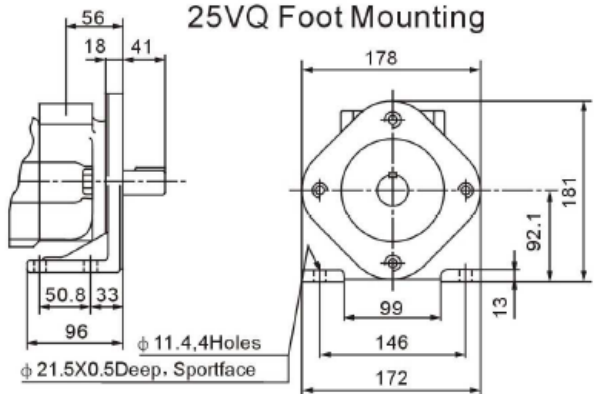
20VQ Foot Mounting



25VQ Flange Mounting

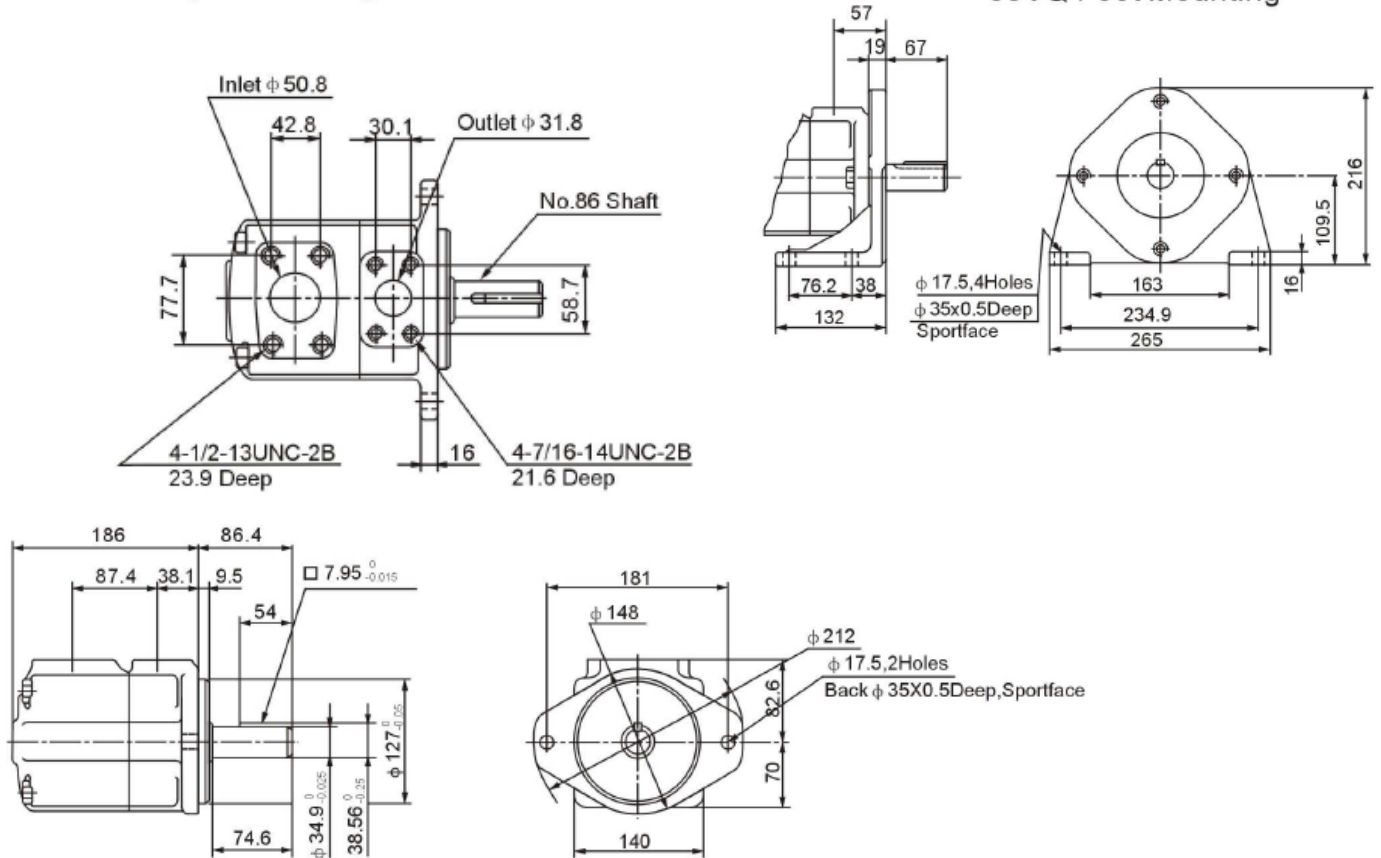


25VQ Foot Mounting



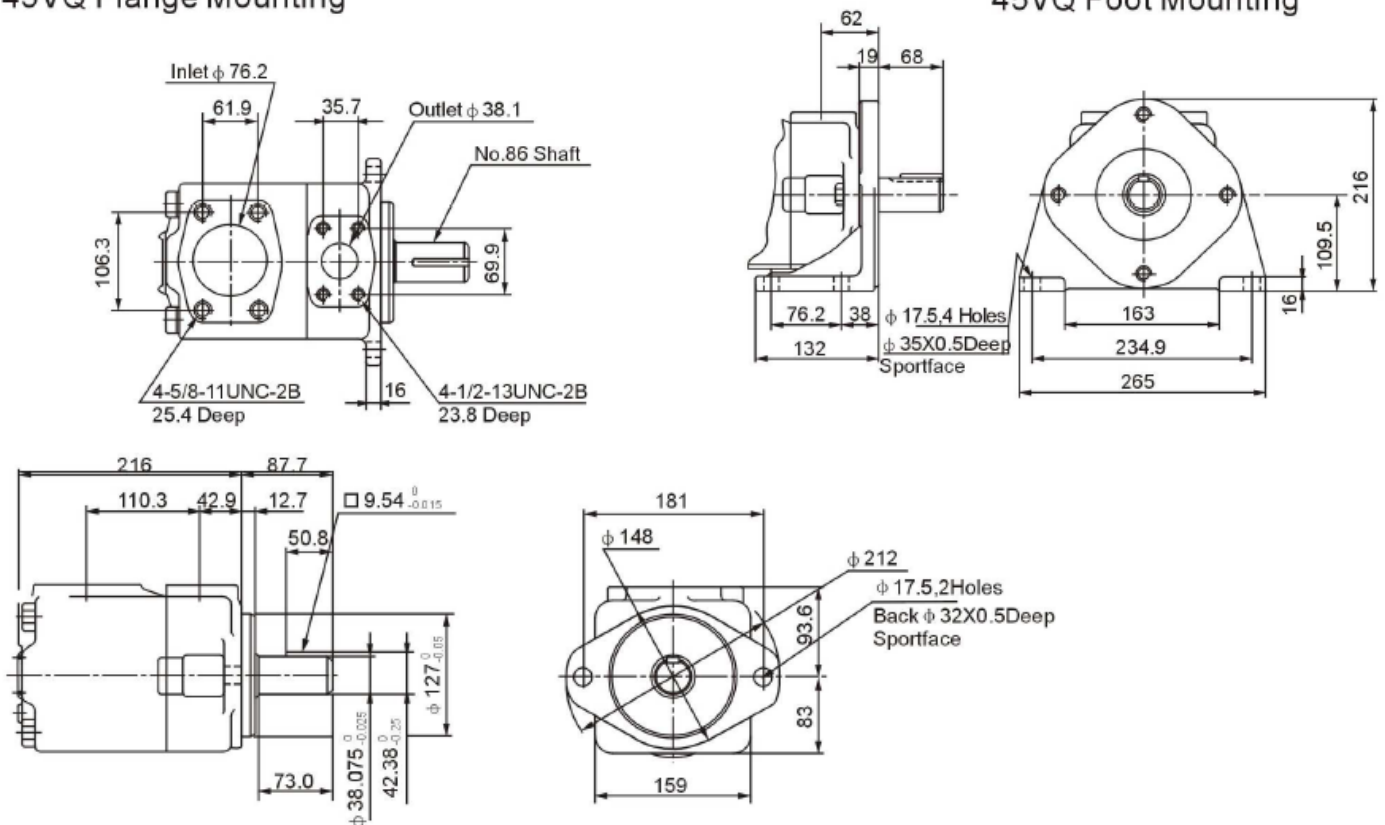
35VQ Flange Mounting

35VQ Foot Mounting

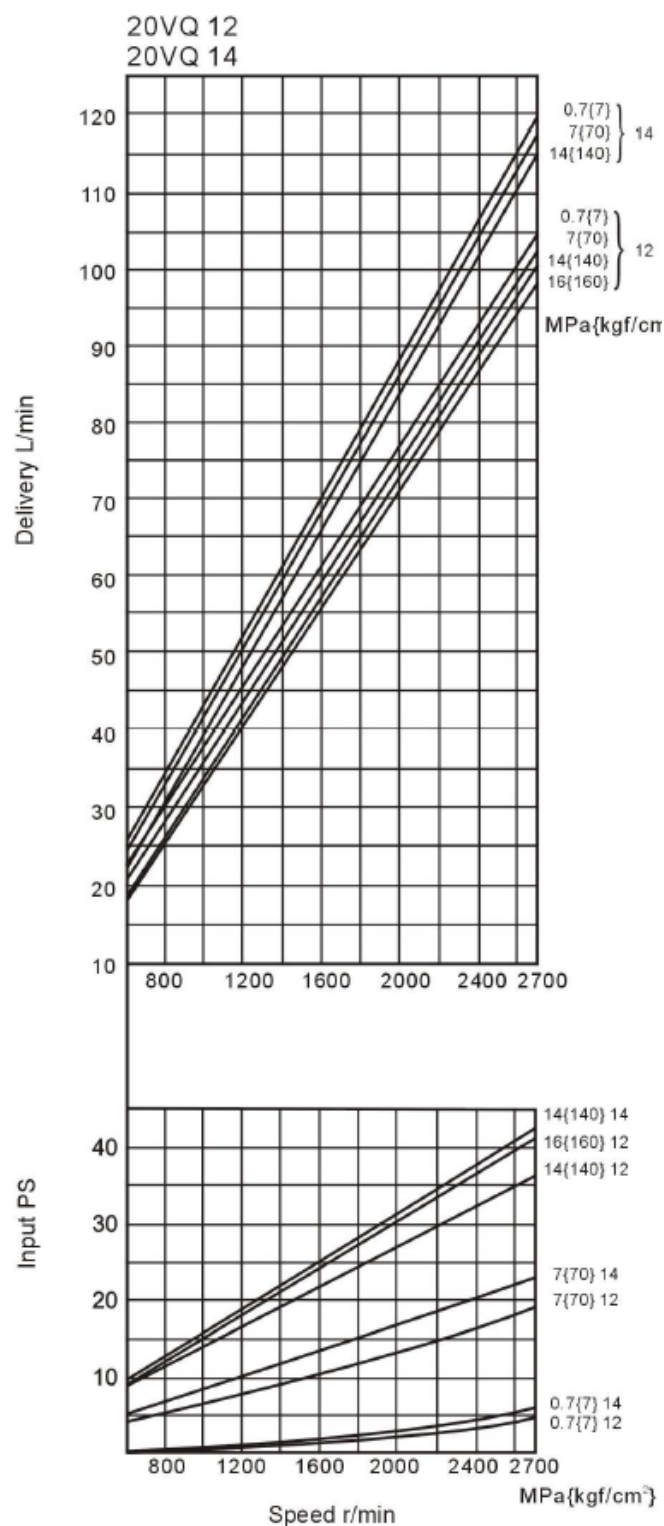
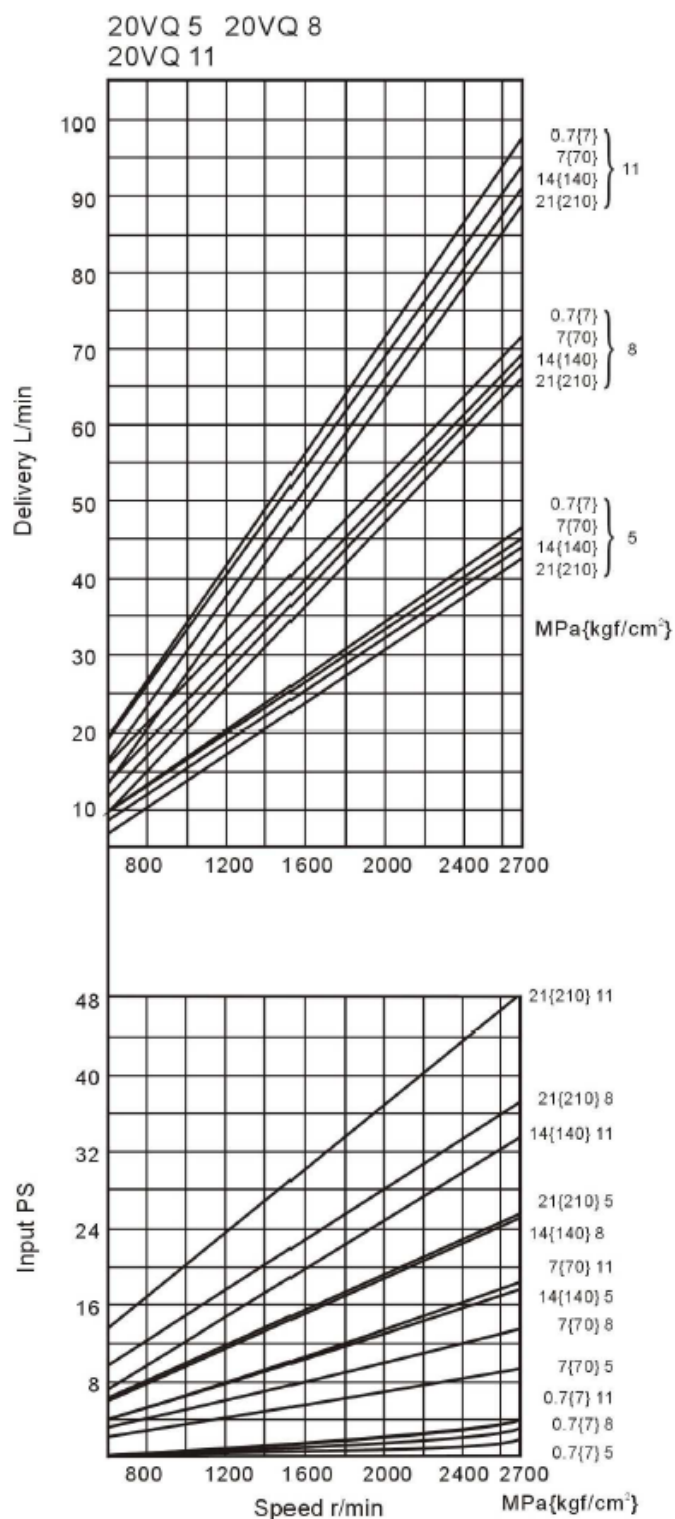


45VQ Flange Mounting

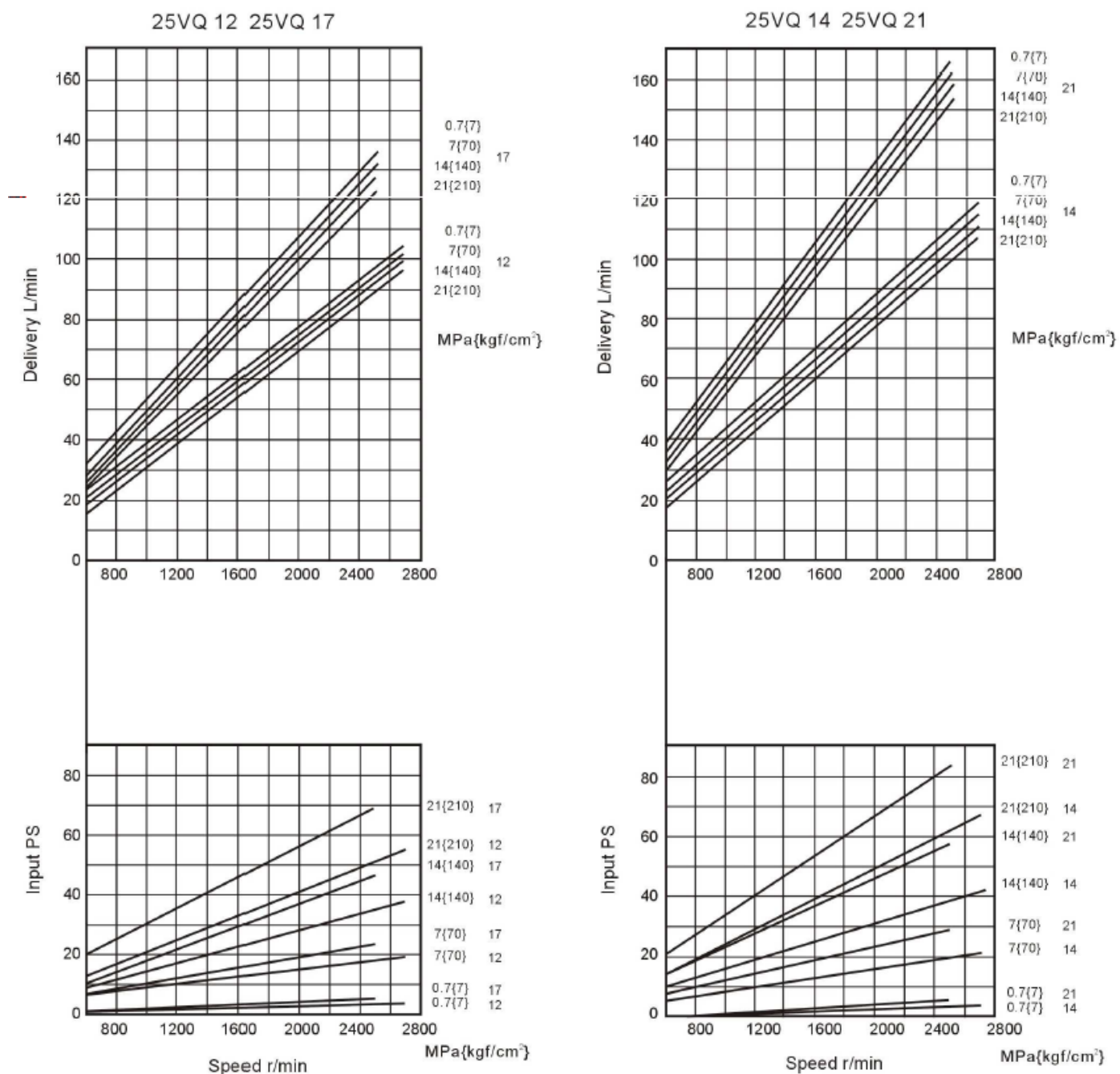
45VQ Foot Mounting



20VQ Series Flow Input Power Type

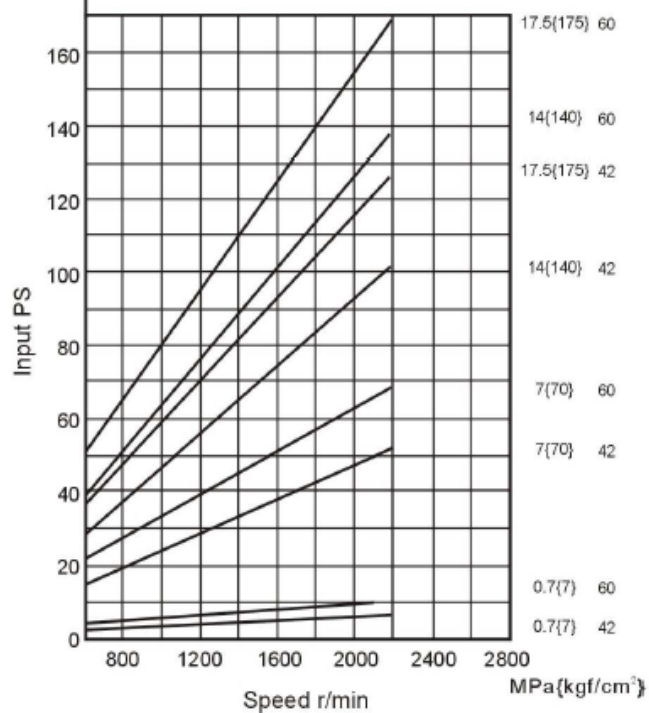
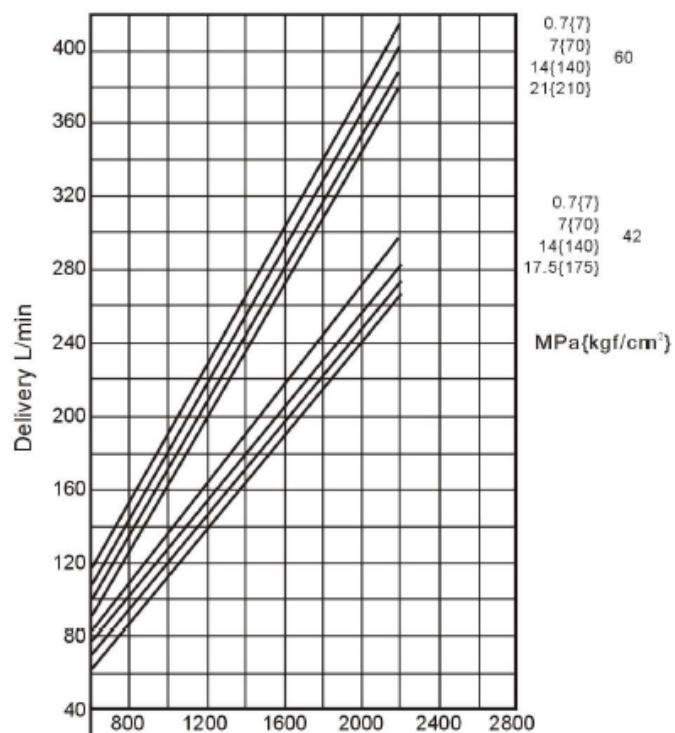


25VQ Series Flow Input Power Type

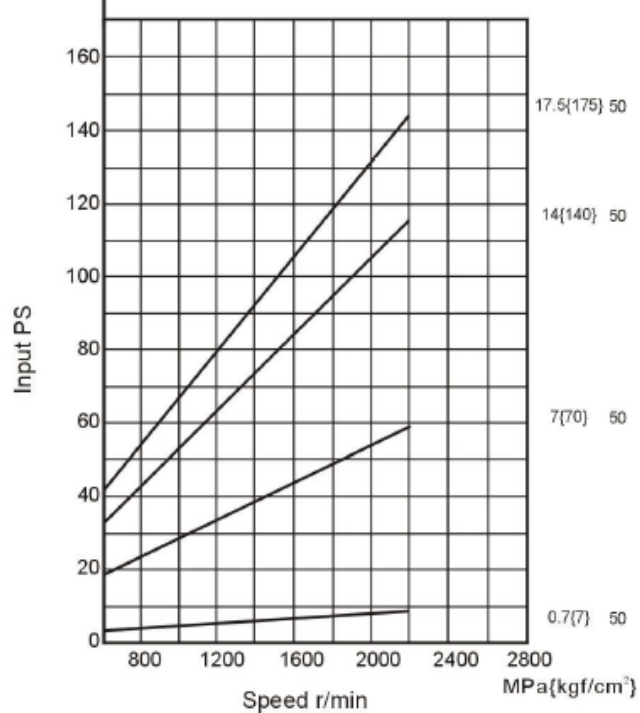
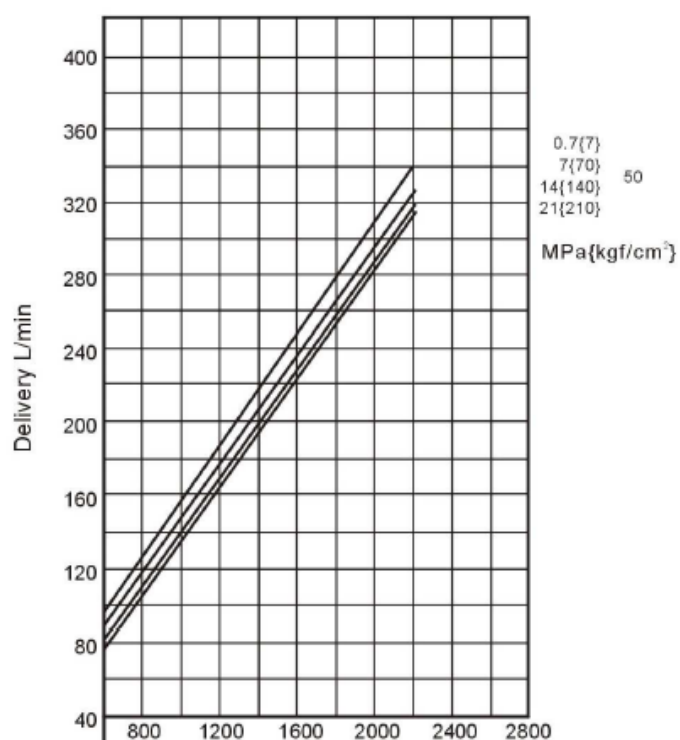


45VQ Series Flow Input Power Type

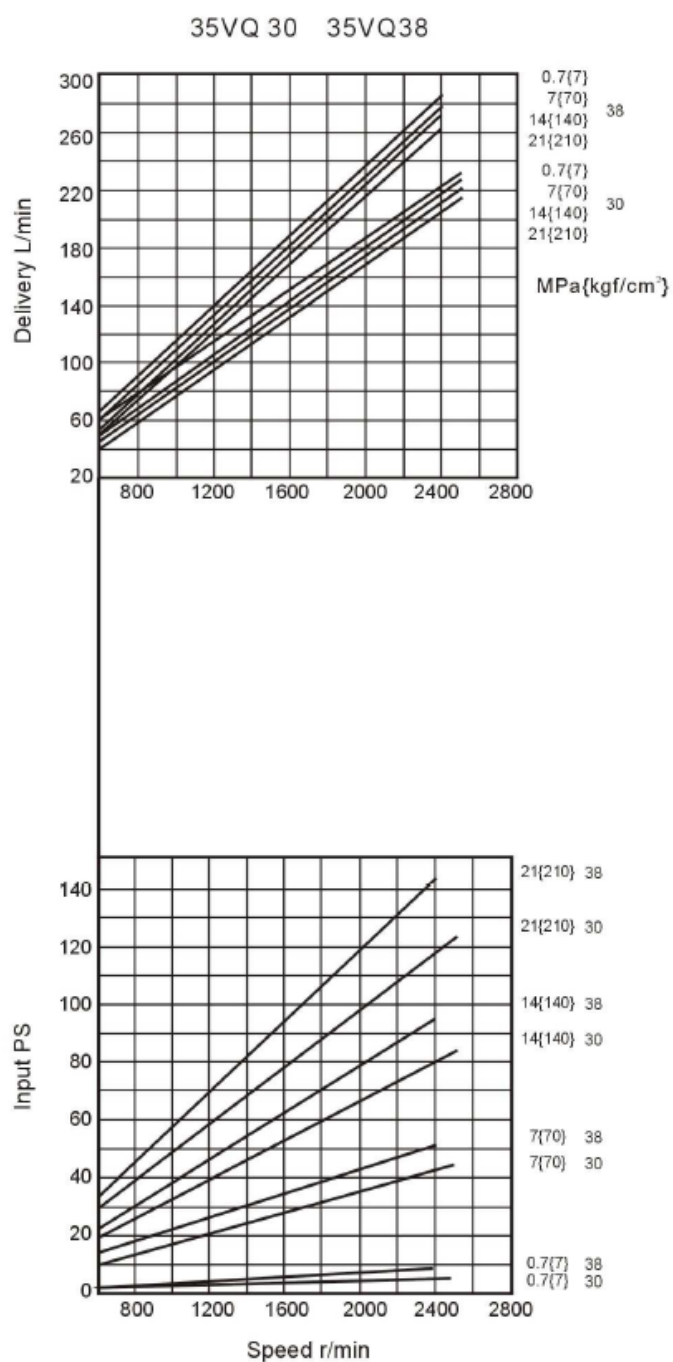
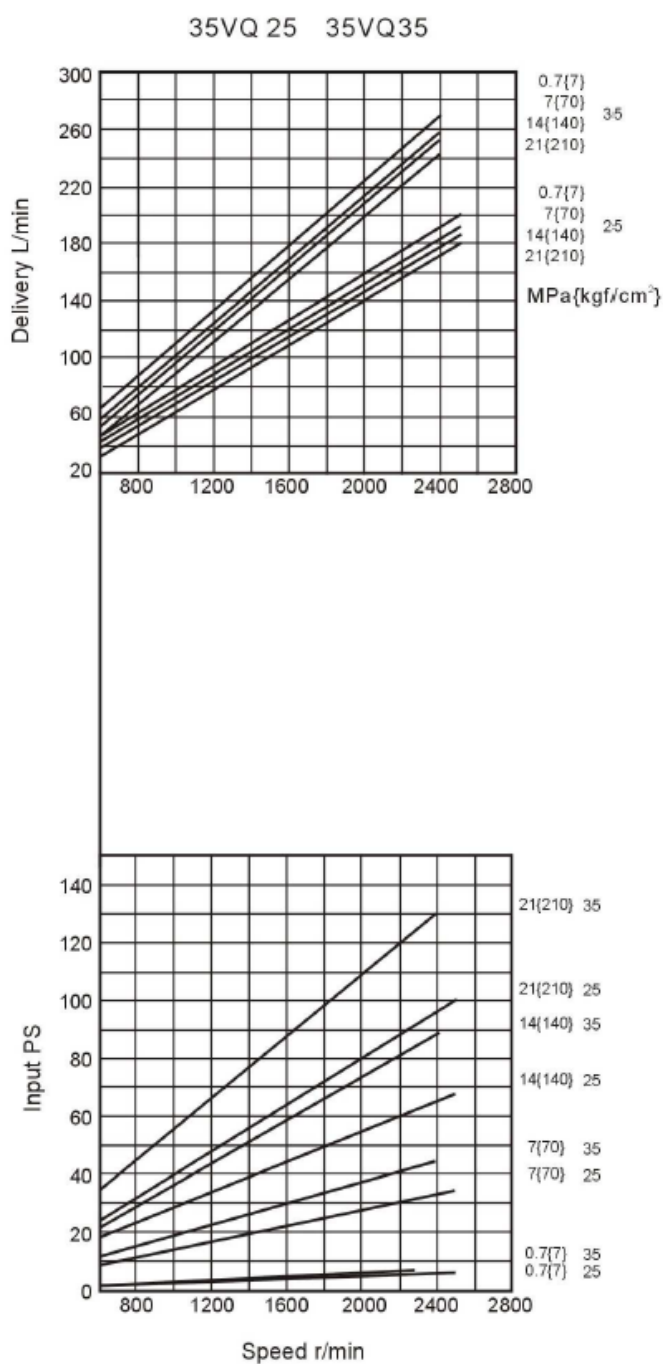
45VQ 42 45VQ60



45VQ 50



35VQ Series Flow Input Power Type



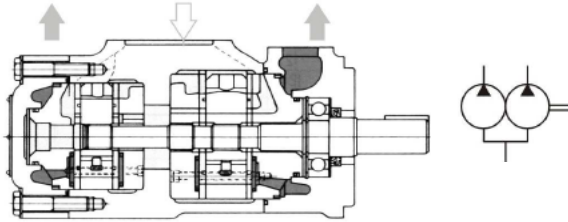
Double VQ Vane Pumps



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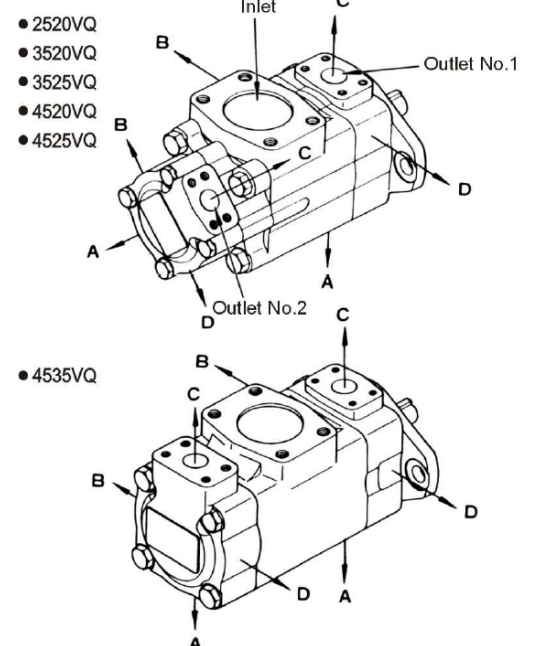


Double VQ Ordering Code

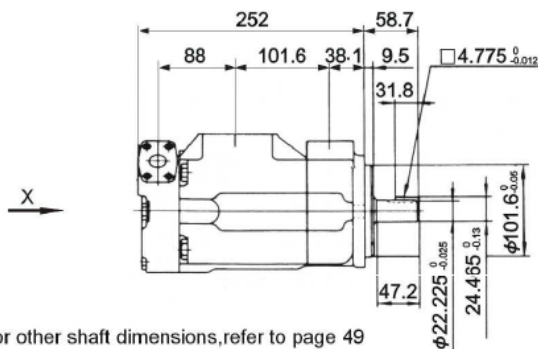
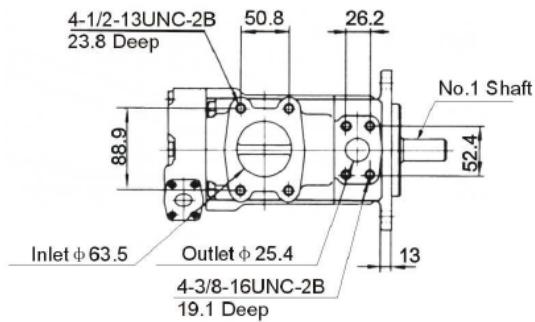
2520VQ	21	A	14	(F)	1	CC	20	
Series	Front Section Cartridge Code	Port Connection	Rear Section Cartridge Code	Mounting	Shaft	Port Connections	Design	Rotation
2520VQ	10, 12, 14, 15, 17, 19, 21	A - SAE 4 Bolt Flange	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	Omit - Flange Mounting F - Foot Mounting	1 - Straight Keyed 86 - HD Straight Keyed 11 - Splined	CC - Standard See Port Orientation Table Below	20	Viewed from shaft end of pump Omit - Right Hand, Clockwise L - Left Hand, Counter Clockwise
3520VQ	21, 25, 30, 32, 35, 38, 45		2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14					
3525VQ	21, 25, 30, 32, 35, 38, 45		10, 12, 14, 15, 17, 19, 21					
4520VQ	42, 45, 50, 57, 60, 66, 75		2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14					
4525VQ	42, 45, 50, 57, 60, 66, 75		10, 12, 14, 15, 17, 19, 21					
4535VQ	42, 45, 50, 57, 60, 66, 75		21, 25, 30, 32, 35, 38, 45					

Port Orientation Table (Viewed from Cover End of Pump)

Port Orientation		All Series (Except 4535VQ)	Series 4535VQ
With No. 1 Outlet opposite inlet	AA	No 2 outlet 135° CCW from inlet	No 2 outlet opposite inlet
	AB	No 2 outlet 45° CCW from inlet	No 2 outlet 90° CCW from inlet
	AC	No 2 outlet 45° CW from inlet	No 2 outlet inline with inlet
	AD	No 2 outlet 135° CW from inlet	No 2 outlet 90° CW from inlet
With No. 1 Outlet 90° CCW from inlet	BA	No 2 outlet 135° CCW from inlet	No 2 outlet opposite inlet
	BB	No 2 outlet 45° CCW from inlet	No 2 outlet 90° CCW from inlet
	BC	No 2 outlet 45° CW from inlet	No 2 outlet in line with inlet
	BD	No 2 outlet 135° CW from inlet	No 2 outlet 90° CW from inlet
With No. 1 outlet inline with inlet	CA	No 2 outlet 135° CCW from inlet	No 2 outlet opposite inlet
	CB	No 2 outlet 45° CCW from inlet	No 2 outlet 90° CCW from inlet
	CC	No 2 outlet 45° CW from inlet	No 2 outlet in line with inlet
	CD	No 2 outlet 135° CW from inlet	No 2 outlet 90° CW from inlet
With No. 1 outlet 90° CW inlet	DA	No 2 outlet 135° CCW from inlet	No 2 outlet opposite inlet
	DB	No 2 outlet 45° CCW from inlet	No 2 outlet 90° CCW from inlet
	DC	No 2 outlet 45° CW from inlet	No 2 outlet in line with inlet
	DD	No 2 outlet 135° CW from inlet	No 2 outlet 90° CW from inlet

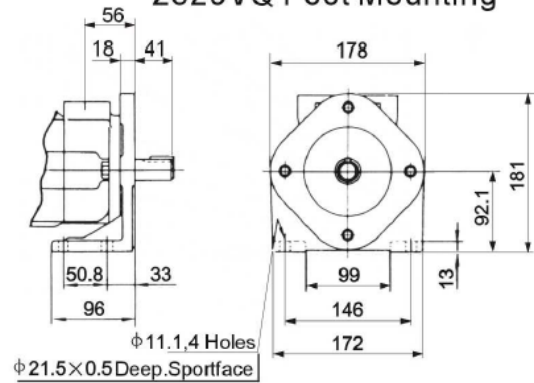


2520VQ Flange Mounting

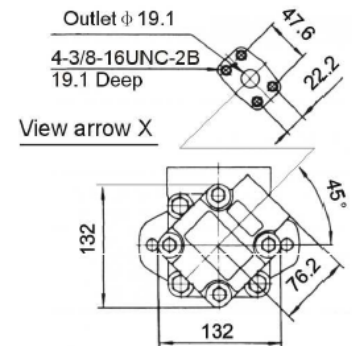
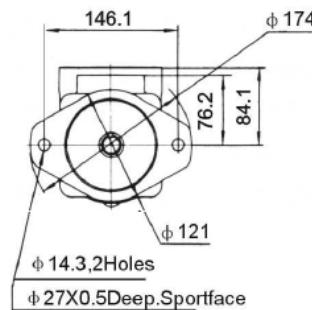


For other shaft dimensions, refer to page 49

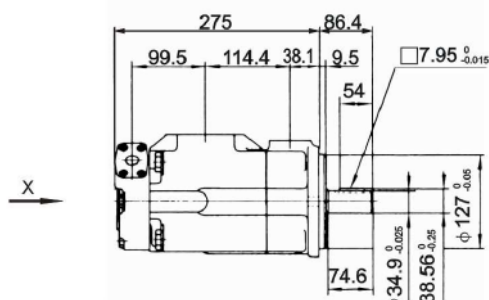
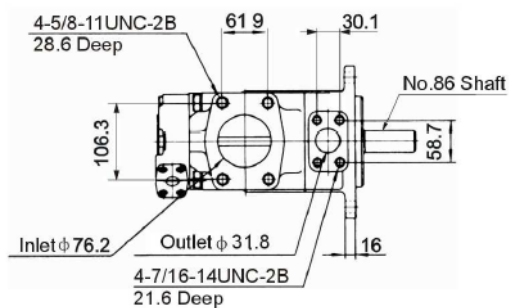
2520VQ Foot Mounting



For other dimensions, refer to "Flange Mounting" type.

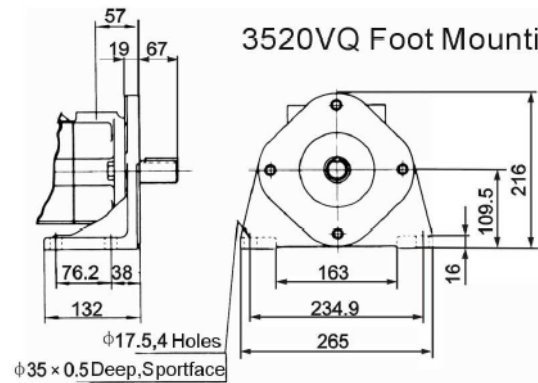


3520VQ Flange Mounting

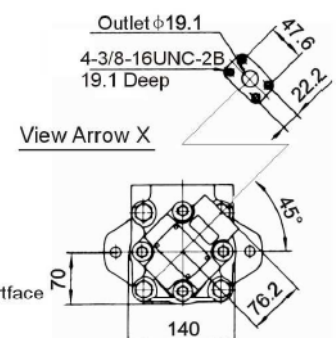
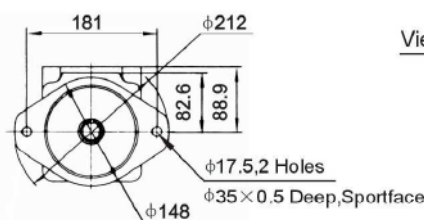


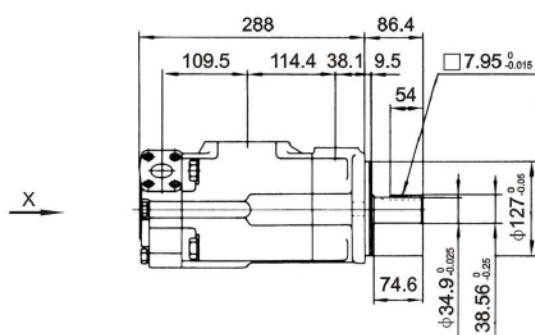
For other shaft dimensions, refer to page 49

3520VQ Foot Mounting



For other dimensions, refer to "Flange Mounting" type.





3525VQ Foot Mounting

Technical drawing showing the dimensions of the 3525VQ Foot Mounting. The drawing includes a side view and a top view.

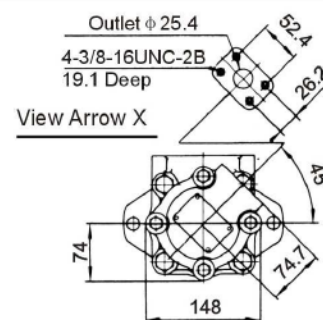
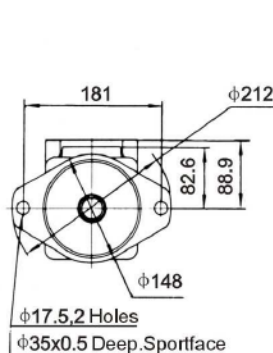
Side View Dimensions:

- Top flange width: 57
- Top flange thickness: 19
- Top flange offset: 67
- Base width: 76.2
- Base thickness: 38
- Total base width: 132

Top View Dimensions:

- Central hole diameter: $\phi 17.5, 4 \text{ Holes}$
- Base width: 163
- Base length: 234.9
- Total base length: 265
- Mounting hole offset from center: 109.5
- Mounting hole diameter: $\phi 35 \times 0.5 \text{ Deep, Sportface}$
- Mounting hole offset from edge: 16
- Total mounting hole offset: 216

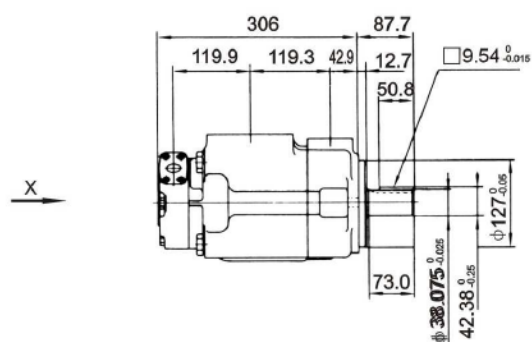
For other dimensions, refer to "Flange Mounting" type.



For other shaft dimensions, refer to page 49

Technical drawing of a Tee fitting with the following dimensions and labels:

- Top left: 4-5/8-11UNC-2B, 31.8 Deep
- Top center: 69.9
- Top right: 35.7
- Right side: No.86 Short
- Right side (vertical): 69.9
- Bottom right: 16
- Bottom center: 4-1/2-13UNC-2B, 23.8 Deep
- Bottom left: Inlet ϕ 88.9
- Bottom center: Outlet ϕ 38.1
- Left side (vertical): 120.7

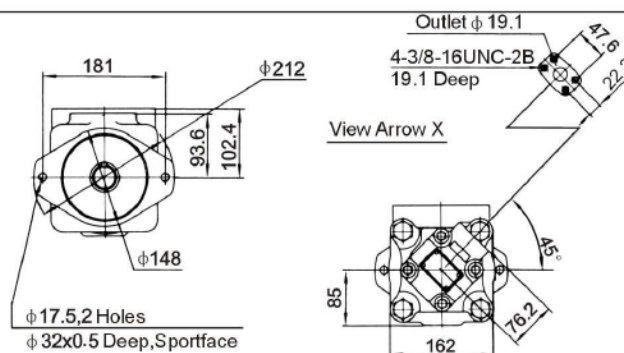


4520VQ Foot Mount

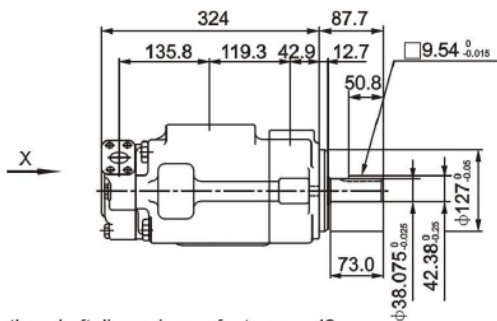
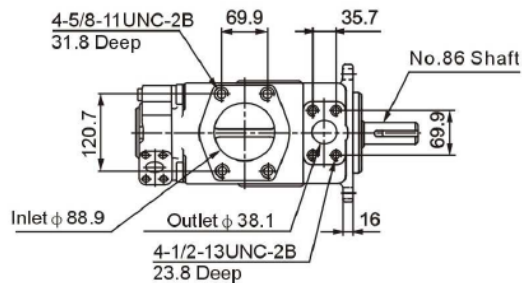
Technical drawing showing two views of the 4520VQ Foot Mount with dimensions:

- Side View (Left):**
 - Overall width: 132
 - Top flange width: 62
 - Top flange height: 19
 - Mounting flange width: 68
 - Base width: 76.2
 - Base offset: 38
- Front View (Right):**
 - Overall width: 265
 - Inner width: 234.9
 - Inner width offset: 163
 - Mounting flange height: 109.5
 - Base height: 16
 - Overall height: 216
- Annotations:**
 - $\phi 17.5, 4 \text{ Holes}$ (pointing to the front view)
 - $\phi 35 \times 0.5 \text{ Deep, Sportface}$ (pointing to the side view)

For other dimensions, refer to "Flange Mounting" type.

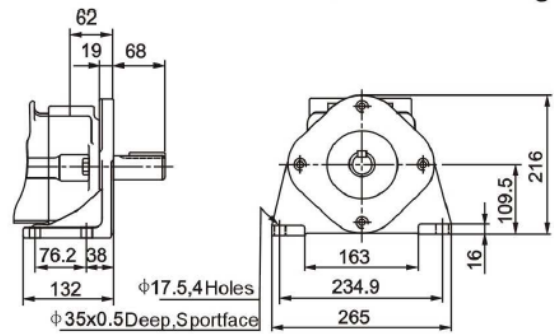


4525VQ Flange Mounting

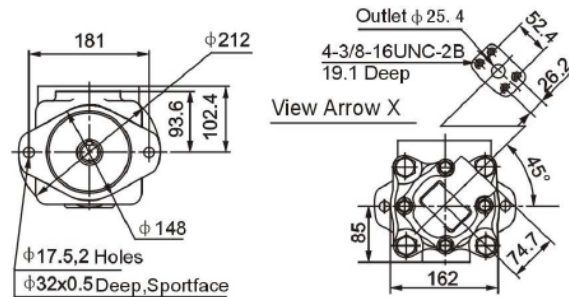


For other shaft dimensions, refer to page 49

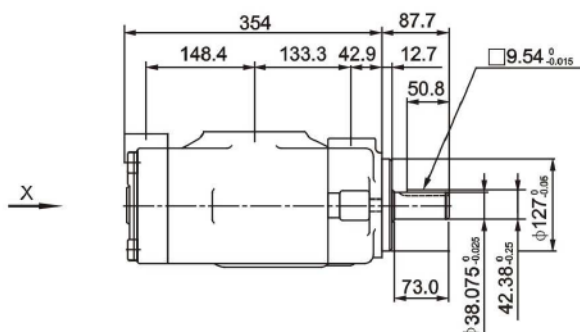
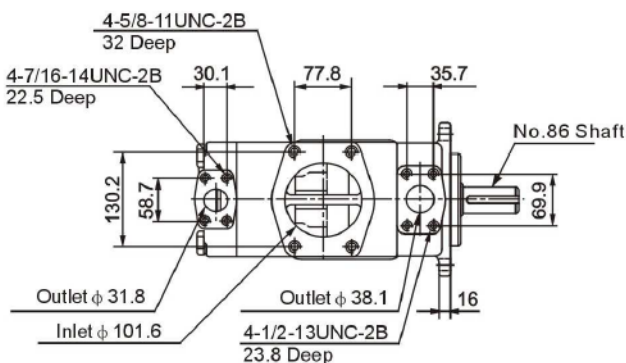
4525VQ Foot Mounting



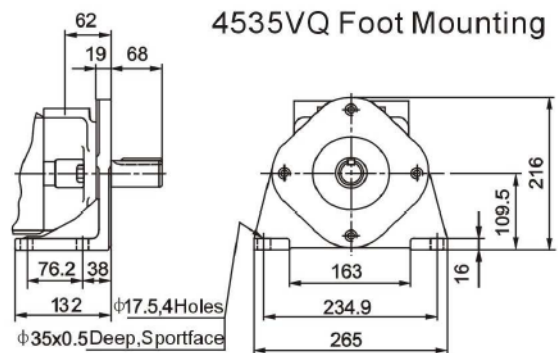
For other dimensions, refer to "Flange Mounting" type.



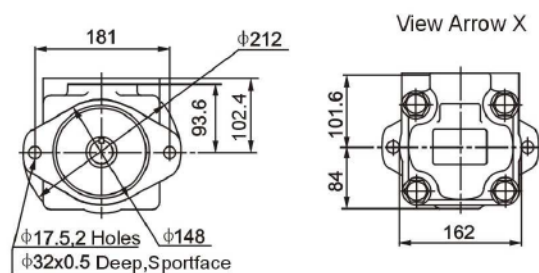
4535VQ Flange Mounting

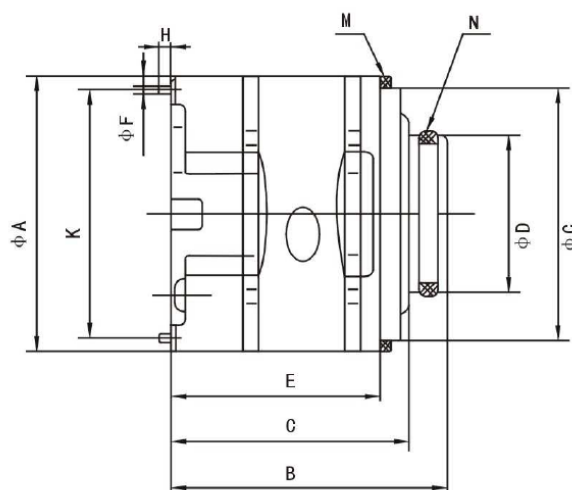


4535VQ Foot Mounting



For other dimensions, refer to "Flange Mounting" type.





VQ Series Cartridge Kits Code

(F3-)	PC-	20VQ	-5	-R	-10
Prefix	Cartridge Kit	Series	Code	Rotation	Design
Omit - using antiwear oil water glycol fluid F3 - Phosphated ester fluid	PC - Single Pump cartridge kits Double Pump shaft end pump cartridge kits PCT - Double Pump cover end pump cartridge Kits	20VQ 25VQ 35VQ 45VQ	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14 10, 12, 14, 15, 17, 19, 21 21, 25, 30, 32, 35, 38, 45 42, 45, 50, 57, 60, 66, 75	Viewed from shaft end of pump R - Right hand for clockwise L - Left hand for counter clockwise	10

Series	A	B	C	D	E	F	G	H	K	M	N
20VQ	82.5	81.5	70.1	47	61.5	4.8	76.2	7	73.6	82.76 x 76.26 x 3.5	40 x 3.5
25VQ	96.8	98.8	87	52.2	71.2	4.8	90.5	7	88.19	97 x 91 x 3.5	44 x 3.53
35VQ	114.3	117.7	105	72.2	90.3	6.4	108	7	103.94	114.5 x 108.5 x 3.5	63.09 x 3.53
45VQ	133.35	141.1	129.6	80.2	105.5	6.4	127	11	133.35	133.6 x 127.6 x 3.5	71 x 3.55

Inner Spline Dentiform Parameter of Rotor					
Series	Pitch	Number of Teeth	Pressure Angle	Major Diameter	Minor Diameter
20VQ	48/96	30	45°	16.617	15.56
25VQ	48/96	40	45°	21.9	20.86
35VQ	40/80	37	45°	24.38	23.1
45VQ	12/24	14	30°	32.59	27.60