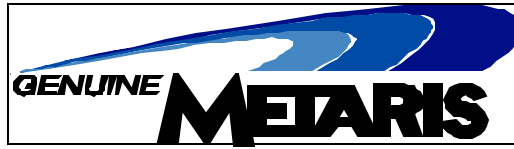


**GENUINE** **METARIS**



**METARIS VANE PRODUCT**  
PUMPS AND COMPONENTS CATALOG

**YOUR SOURCE FOR HIGH QUALITY  
VANE PUMPS & COMPONENTS**



Metaris has been producing vane pumps and components for over fifteen years.

Our products are precision engineered and manufactured to be interchangeable with Vickers® and Caterpillar®.

Metaris vane, gear and piston pumps and components are distributed by leading dealers in over 50 countries worldwide.



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*All items listed are Metaris manufactured: OEM part #'s are displayed for reference purposes only.*

*Metaris Vane Pumps and Components are interchangeable with Vickers®;  
Metaris is not affiliated or authorized by Eaton Vickers®.*

# V10/V20 SERIES

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>
V10	*	1	P	6	P	1	C	*	*	20	***	L

## 1 Vane Pump

- 10 Series
- 20 Series

## 2 Integral Valve Option

- \* Omit if not required
- F Flow control & relief
- P Priority valve & relief

## 3 Mounting

- 1 2 bolt flange SAE "A" size

## 4 Inlet Port Connections

- H 10 size 1" OD tube connection
- K 10 size 1.312" - 12 UN 2B thd. connection
- P 10 size 1" NPT pipe thd. connection
- S 10 size 1.3123" - 12 straight thd. connection
- T 10 size 1.1875" - 12 straight thd. connection
- E 20 size 1.5 dia. 2 bolt flange connection
- F 20 size 1.156 dia. 2 bolt flange connection
- P 20 size 1.250" NPT pipe thd. connection
- R 20 size 1" NPT pipe thd. connection
- S 20 size 1.625" - 12 UN 2B thd. connection

## 5 SAE Rated Capacity in US gpm

### V 10 size

- 1 1 gpm at 1200 rpm & 100 psi
- 2 2 gpm at 1200 rpm & 100 psi
- 3 3 gpm at 1200 rpm & 100 psi
- 4 4 gpm at 1200 rpm & 100 psi
- 5 5 gpm at 1200 rpm & 100 psi
- 6 6 gpm at 1200 rpm & 100 psi
- 7 7 gpm at 1200 rpm & 100 psi

### V 20 size

- 6 6 gpm at 1200 rpm & 100 psi
- 7 7 gpm at 1200 rpm & 100 psi
- 8 8 gpm at 1200 rpm & 100 psi
- 9 9 gpm at 1200 rpm & 100 psi
- 11 11 gpm at 1200 rpm & 100 psi
- 12 12 gpm at 1200 rpm & 100 psi
- 13 13 gpm at 1200 rpm & 100 psi

## 6 Outlet Port Connections

## 7 Shafts

- 1 Straight keyed
- 3 Threaded w ith woodruff key
- 4 Threaded
- 11 9 tooth splined
- 12 13 tooth splined (V10 only)
- 15 13 tooth splined
- 27 Tang drive
- 34 Threaded
- 38 11 tooth splined
- 62 SAE "A" spline (V20 only)

## 8 Position of Primary Outlet Port

- A Opposite inlet port (viewed from cover end of pump)
- B 90° CCW from inlet (viewed from cover end of pump)
- C In line w ith inlet port (viewed from cover end of pump)
- D 90° CW from inlet (viewed from cover end of pump)

## 9 Flow Rate through Orifice in Cover

- 1 1 US gpm (V10)
- 2 2 US gpm (V20)
- 8 8 US gpm (V20)

## 10 Pressure Setting

- A 250 psi
- B 500 psi
- C 750 psi
- D 1000 psi
- E 1250 psi
- F 1500 psi
- G 1750 psi
- H 2000 psi
- J 2250 psi
- K 2500 psi

## 11 Design

- 20 Subject to change  
(installation dimensions w ill remain the same)

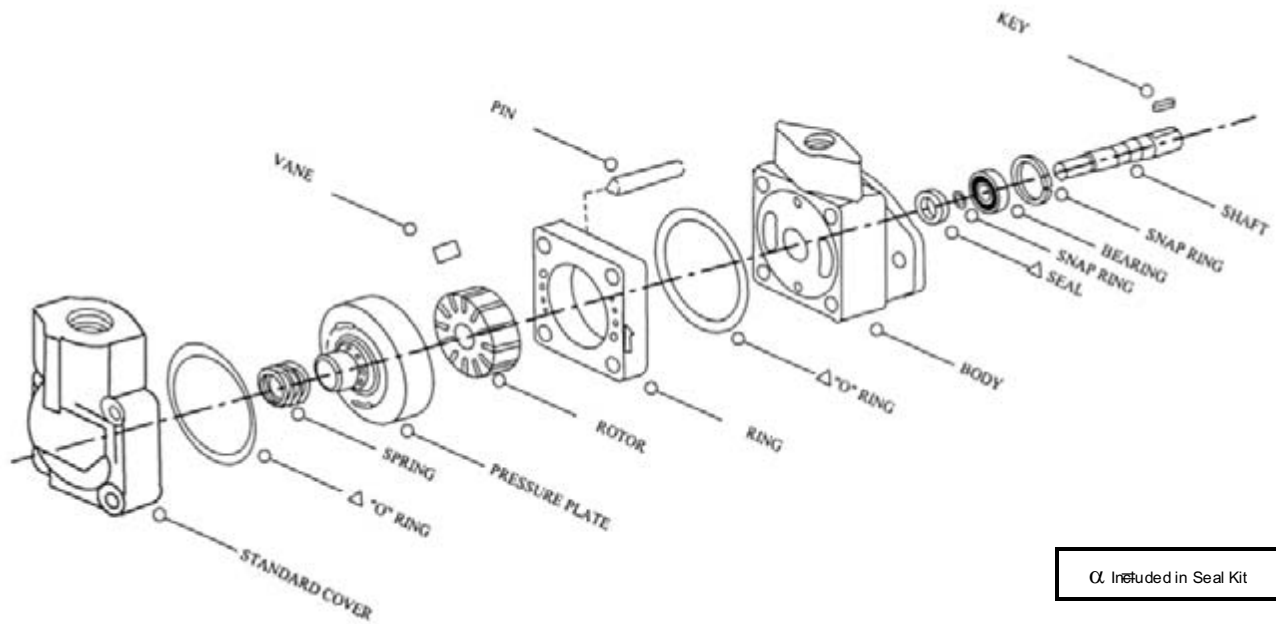
## 12 Special Features Suffix

## 13 Shaft Rotation

- \* Omit for R/H rotation (clockw ise)
- L L/H rotation (counter clockw ise)

	Mode	Priority Cover			Flow Control Cover		Standard Cover
		Primary	Secondary	Tank	Pressure	Tank	Pressure
K	V10	9/16-18 str. Thd.	3/4-16 str. Thd.	9/16-18 str. Thd.	**	**	**
P	V0	**	**	**	3/4-16 str. Thd.	1/2 - npt Thd.	1/2 - npt Thd.
P	V20	**	**	**	3/4-16 str. Thd.	1/2 - npt Thd.	3/4 - npt Thd.
R	V10	**	**	**	**	**	1.062-12 str. Thd.
S	V20	**	**	**	3/4-16 str. Thd.	1 1/6-12 str. Thd.	1.062-12 str. Thd.
S	V10	**	**	**	**	**	3/4-16 str. Thd.
T	V10	**	**	**	3/4-16 str. Thd.	3/4-16 str. Thd.	
T	V20	3/4-16 str. Thd.	7/8-14 str. Thd.	3/4-16 str. Thd.	**	**	
V	V10 & 20	**	**	**	**	**	.875-14 str. Thd.

# V10/V20 VANE PUMP PARTS INFORMATION



Pump SE	C. Kit	Rotor	Vanes	Ring	Seal	Seal Kit	Bearing	PR. PL.	Spring	Body	Cover	Shaft No	
V10	1	923471	317681	923499	317674	263585	923548	148423	374343	345262	352699	372863	Shaft 1 No. 374338
	2	923470			317675	Viton	Viton						Shaft 3 No. 374340
	3	923496			317676	388205	919772						Shaft 11 No. 374339
	4	923469	351247	923500	317677								Shaft 12 No. 375480
	5	923468			317678								Shaft 38 No. 387481
	6	923497	357268	923501	355641								
	7	923498			331813								

V20	5	924076	358328	923328	388284	229235	922733	098574	359287	28422	V20	313657	V20
	6	923480			328150	Viton	Viton				280689		Shaft 1 No. 280372
	7	923481	358330	923493	328152	279499	919805						Shaft 3 No. 280504
	8	923483			331791								Shaft 6 No. 297330
	9	923484			331789								Shaft 11 No. 280515
	10	923620	358332	923478	374309								Shaft 15 No. 294922
	11	923482			328156								Shaft 38 No. 328096
	12	923486	358334	923479	331806								
	13	923487			331807								

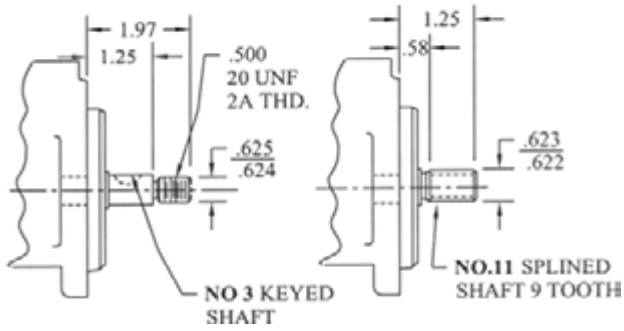
## Rear Cover Bolt Torque

V10	40 Ft/Lbs
V20	80 Ft/Lbs

## Changing Cartridge Rotation

Assemble the ring using the location pins for alignment making sure the arrow on the perimeter points in the proper direction of rotation. Install the rotor on the shaft and insert vanes in the rotor slots. Be certain the radius edges of the vanes are towards the cam ring.

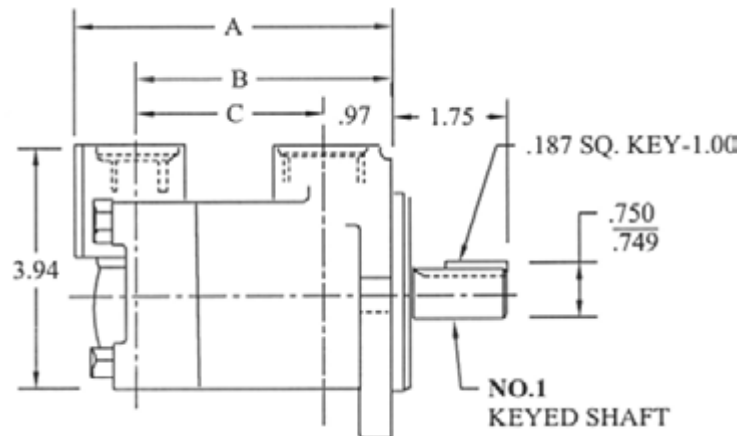
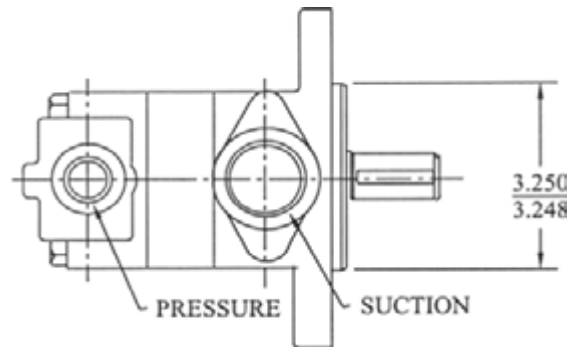
Optional Shafts



DIMENSION (inches)

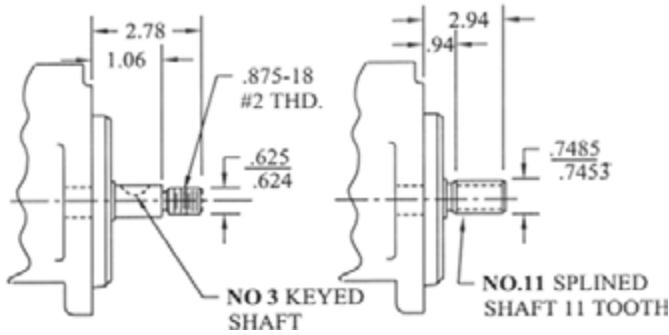
DELIVERY @ 1200 RPM & 100 PSI	DIMENSION		
	A	B	C
1 GPM	4.55	3.62	2.65
2 GPM	4.55	3.62	2.65
3 GPM	4.55	3.62	2.65
4 GPM	4.80	3.87	2.90
5 GPM	4.85	3.87	2.90
6 GPM	5.00	4.07	3.10
7 GPM	5.00	4.07	3.10

Weight 10 - 15 lbs  
 Pressure: 1/2" NPT  
 Suction: 1" NPT  
 Optional BSPT/SAE Ports available.



# V20 SINGLE PUMP INSTALLATION DIMENSIONS

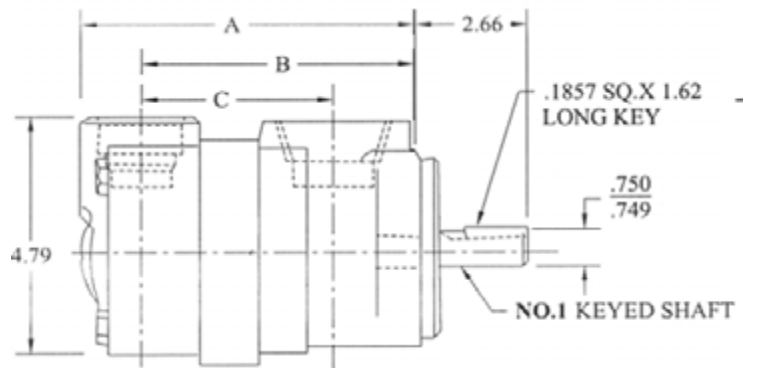
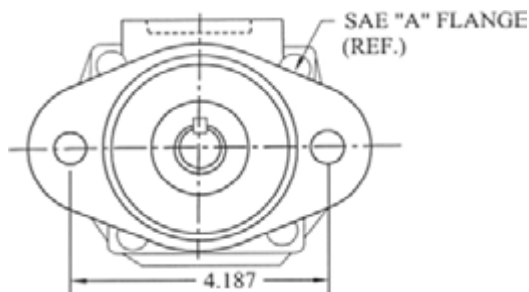
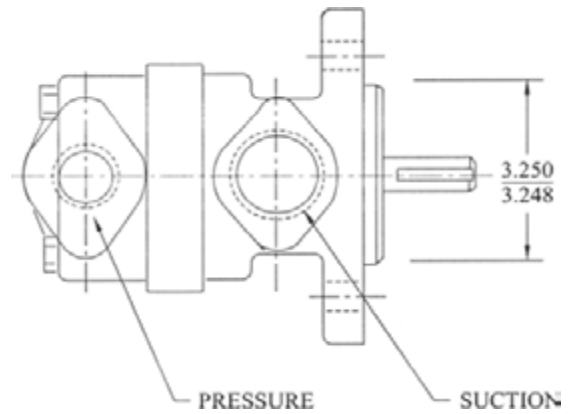
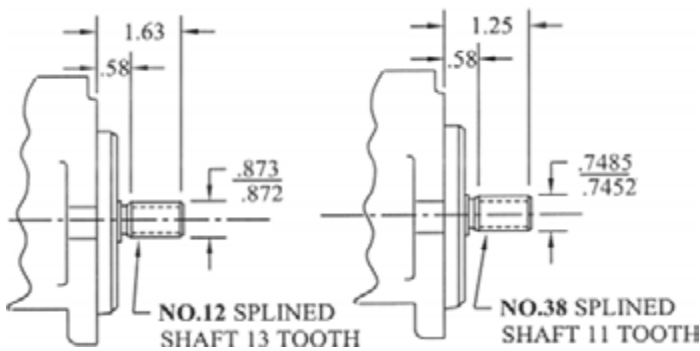
## Optional Shafts



## DIMENSION (inches)

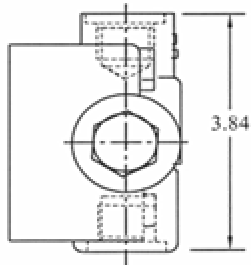
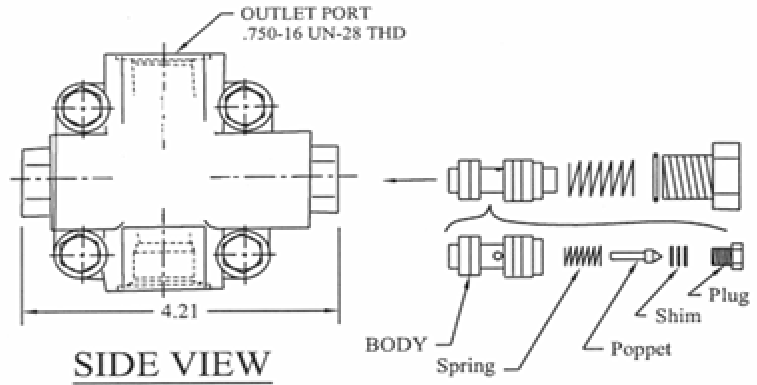
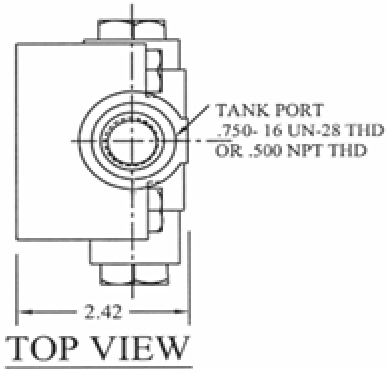
DELIVERY @ 1200 RPM & 100 PSI	DIMENSION		
	A	B	C
6	4.93	4.02	2.80
7	5.18	4.27	3.05
8	5.18	4.27	3.05
9	5.18	4.27	3.05
11	5.38	4.47	3.25
12	5.52	4.61	3.39
13	5.52	4.61	3.39

Weight 16 - 18 lbs  
 Pressure: 3/4" NPT  
 Suction: (V20) 1-1/4" NPT  
 Optional BSPT/SAE Ports available.



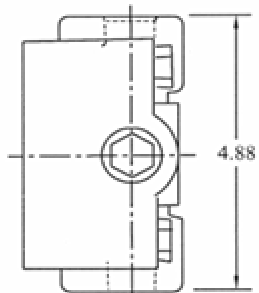
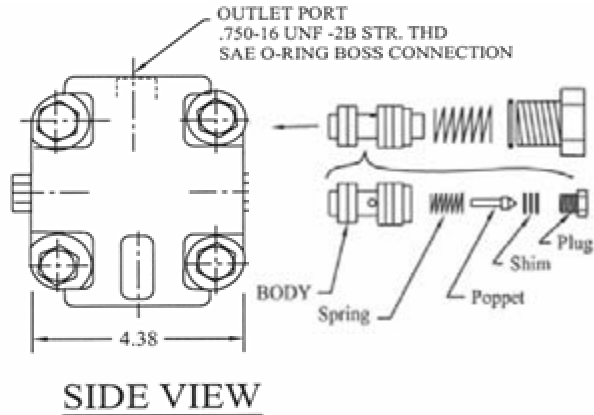
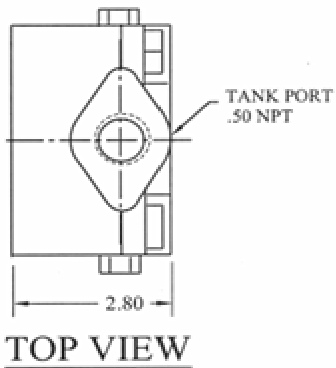
# FLOW CONTROL VALVE FOR V10 /V20F

## V10F



FLOW RATE ORIFICE		RELIEF VALVE NUMBER / PRESSURE SETTING			
2	-2 USgpm	A-	250psi	H-	2000psi
3	-3 USgpm	B-	500psi	J-	2250psi
4	-4 USgpm	C-	750psi	K-	2500psi
5	-5 USgpm	D-	1000psi		
6	-6 USgpm	E-	1250psi		
7	-7 USgpm	F-	1500psi		
8	-8 USgpm	G-	1750psi		

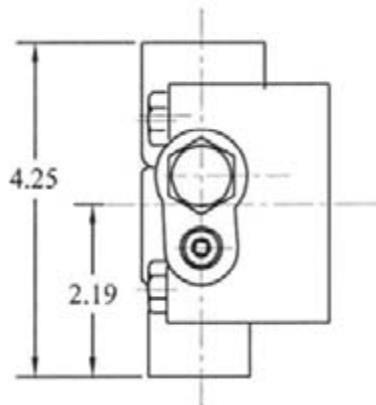
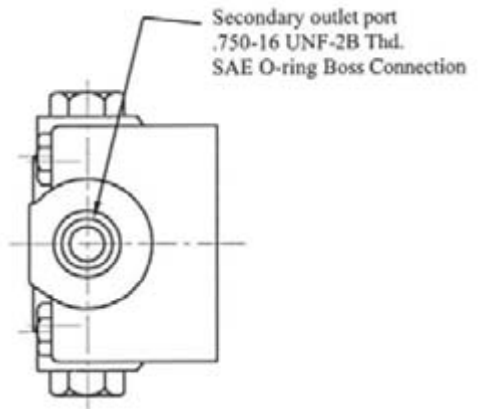
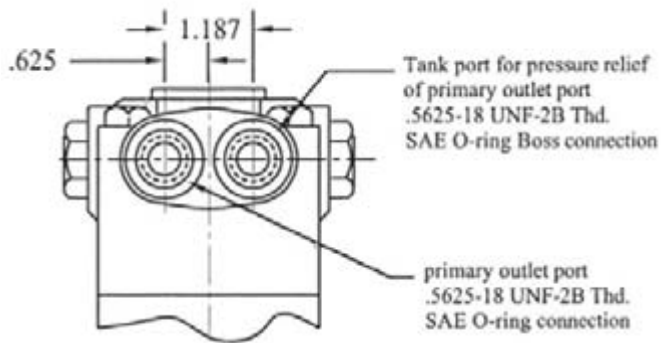
## V20F



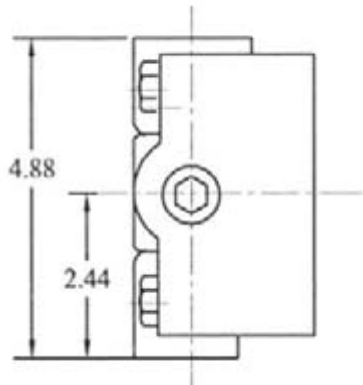
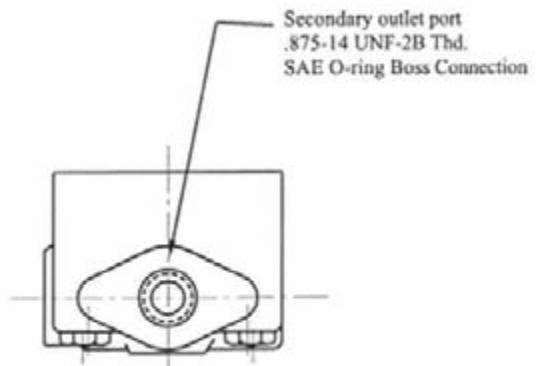
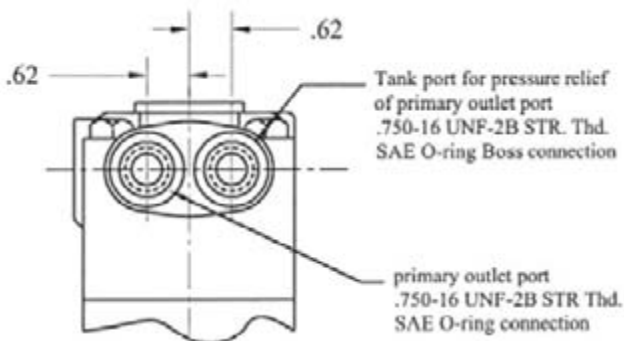
FLOW RATE ORIFICE		RELIEF VALVE NUMBER / PRESSURE SETTING			
2	-2 USgpm	A-	250psi	H-	2000psi
3	-3 USgpm	B-	500psi	J-	2250psi
4	-4 USgpm	C-	750psi	K-	2500psi
5	-5 USgpm	D-	1000psi		
6	-6 USgpm	E-	1250psi		
7	-7 USgpm	F-	1500psi		
8	-8 USgpm	G-	1750psi		



# PRO RITY COVERS FOR V10 /V20

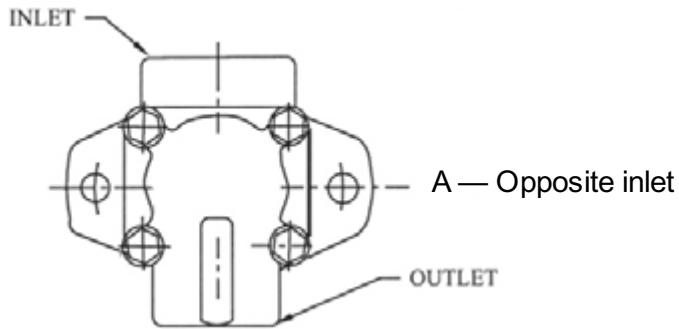
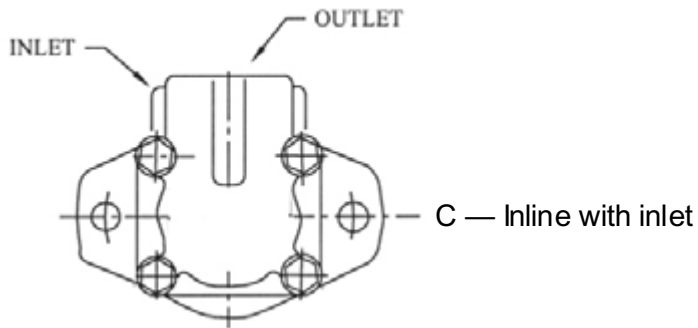


FLOW RATE ORIFICE		RELIEF VALVE SETTING	
2	-2 USgpm	A-	250psi
3	-3 USgpm	B-	500psi
4	-4 USgpm	C-	750psi
5	-5 USgpm	D-	1000psi
6	-6 USgpm	E-	1250psi
7	-7 USgpm	F-	1500psi
		G-	1750psi
		H-	2000psi
		J-	2250psi
		K-	2500psi



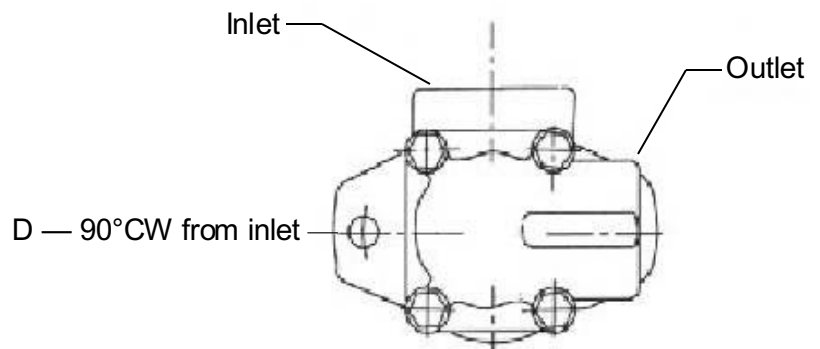
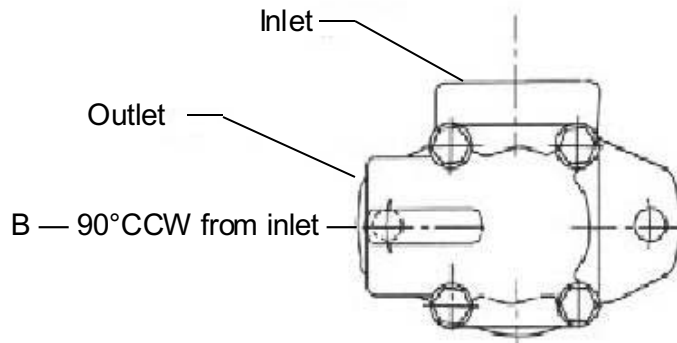
FLOW RATE ORIFICE		RELIEF VALVE SETTING	
2	-2 USgpm	A-	250psi
3	-3 USgpm	B-	500psi
4	-4 USgpm	C-	750psi
5	-5 USgpm	D-	1000psi
6	-6 USgpm	E-	1250psi
7	-7 USgpm	F-	1500psi
8	-8 USgpm	G-	1750psi
		H-	2000psi
		J-	2250psi
		K-	2500psi

# OPTIONAL PORT POSITION V10 /V20



V20 — Torque bolts to 80 ft/lbs

V10 — Torque bolts to 40 ft/lbs



**NOTE:** Remove rear cover bolts. Rotate cover for proper port position.

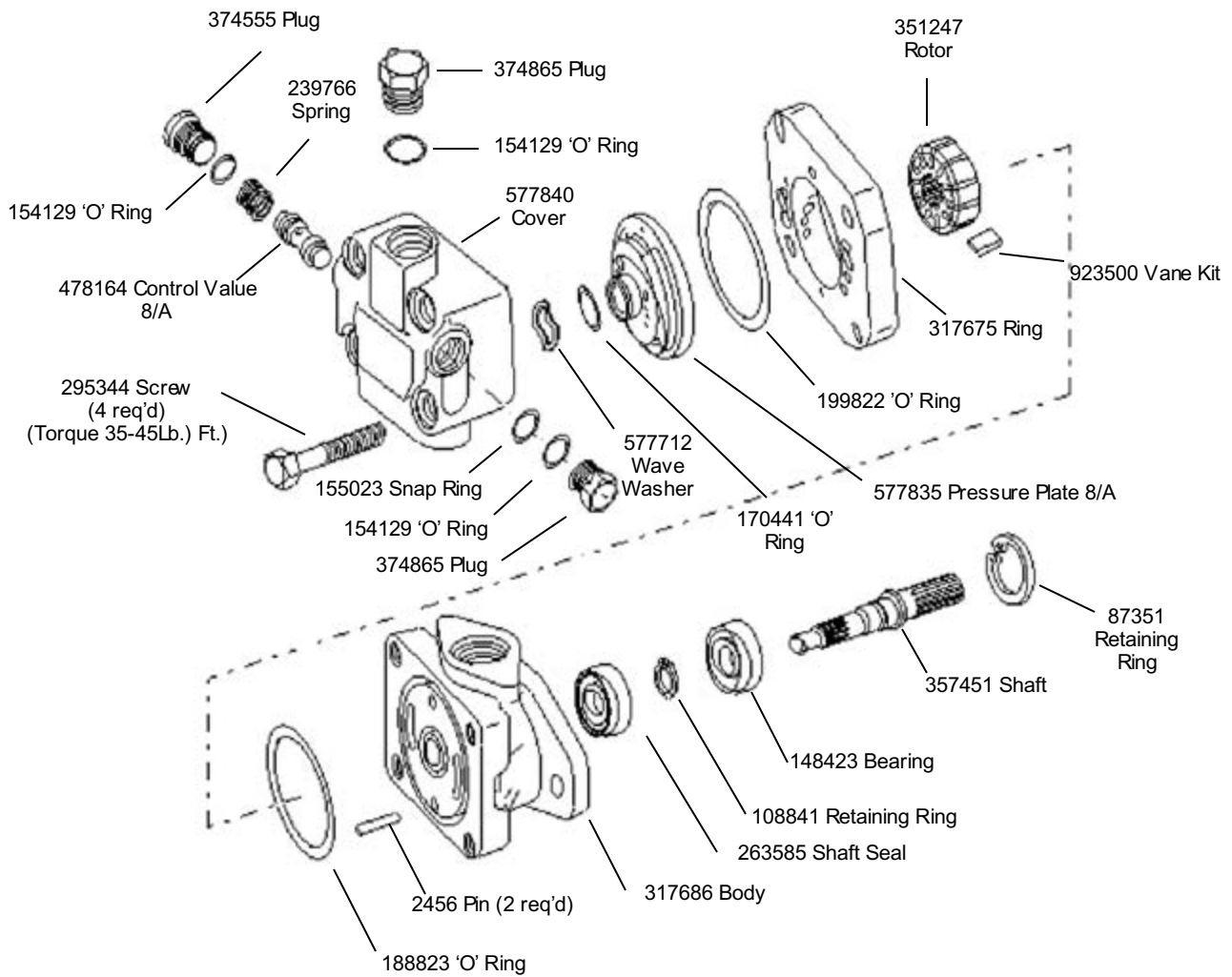
V10	NF	1	S	8	T	38	A	4	D	R
1	2	3	4	5	6	7	8	9	10	11
V20NF	*	*	*	T	*	*	*	**	***	L

- 1 Model Series**  
V10
- 2 Series**  
NF
- 3 Pump Mounting**  
1 2 bolt 3.25 pilot
- 4 Inlet Body Porting**  
P 1.25 npt  
S 1.625-12 straight thread
- 5 V10 Ring Capacity @ 1200 rpm**  
2 grm      5 grm  
3 grm      6 grm  
4 grm      7 grm
- 6 Flow Control Cover**  
Pressure port .75-16 str. Thd
- 7 Shaft Extension Type**  
1 Standard Straight keyed  
3 Threaded  
6 Straight Stub  
10 Threaded Stub  
11 Spline  
38 Spline
- 8 Outlet Pressure Port Position**  
A Opposite inlet port  
B 90° CCW from inlet port  
C Inline with inlet port  
D 90° CW from inlet cover
- 9 Flow Rate thru Orifice in Cover**  
2 grm  
3 grm  
4 grm  
5 grm

- 10 Control Value Pressure Setting**  
C - 750 psi      H - 2000 psi  
D - 1000 psi     J - 2250 psi  
E - 1250 psi     K - 2500 psi  
F - 1500 psi     L - 2750 psi  
G - 1750 psi
- 11 Rotation (viewed from Shaft end)**  
L ccw  
R cw



V10NF Pump



**NOTE: Seal Kit 920372**

1	2	3	4	5	6	7	8	9	10	11
V20NF	*	*	*	T	*	*	*	**	***	L

**1 Model Series**  
V20NF- Vane pump, 20 size with flow control valve cover & internal drain

**2 Pump Mounting**

- 1 2 Bolt
- 2 Footmount-body inlet port @ 12 o'clock (viewed from shaft end)
- 3 Power take-off
- 4 Face
- 23 Body inlet port @ 3 o'clock
- 26 Body inlet port @ 6 o'clock
- 29 Body inlet port @ 9 o'clock

**3 Inlet Body Port**

- D 1.312-12 (See straight thread)
- F 2 bolt flange
- P 1.25 N.P.T.
- S 1.625-12 (straight thread)

**4 Ring Capacity @ 1200 rpm**

5 - 5 gpm	8 - 8 gpm	11 - 11 gpm
6 - 6 gpm	9 - 9 gpm	12 - 12 gpm
7 - 7 gpm	10 - 10 gpm	13 - 13 gpm

**5 Flow Control Cover**  
(Pressure port - .750-16 straight thread)

**6 Shaft Extension Type**

For 10-13 gpm units

- 1 Straight Keyed (standard)
- 3 Threaded
- 6 Straight Stub
- 10 Threaded Straight Stub
- 11 Splined
- 38 Splined

For 7-9 gpm units

- 101 Straight Keyed (standard)
- 103 Threaded
- 138 Splined

For 5-6 gpm units

- 203 Threaded
- 238 Splined

**7 Outlet Pressure Port Position**  
(Viewed from cover end)

- A Opposite inlet port
- B 90° CCW from inlet port
- C In line with inlet port
- D 90° CW from inlet port

**8 Flow Rate thru Orifice in Cover**

2 - 2 gpm	7 - 7 gpm
3 - 3 gpm	8 - 8 gpm
4 - 4 gpm	9 - 9 gpm
5 - 5 gpm	10 - 10 gpm
6 - 6 gpm	

**9 Control Valve Pressure Setting**

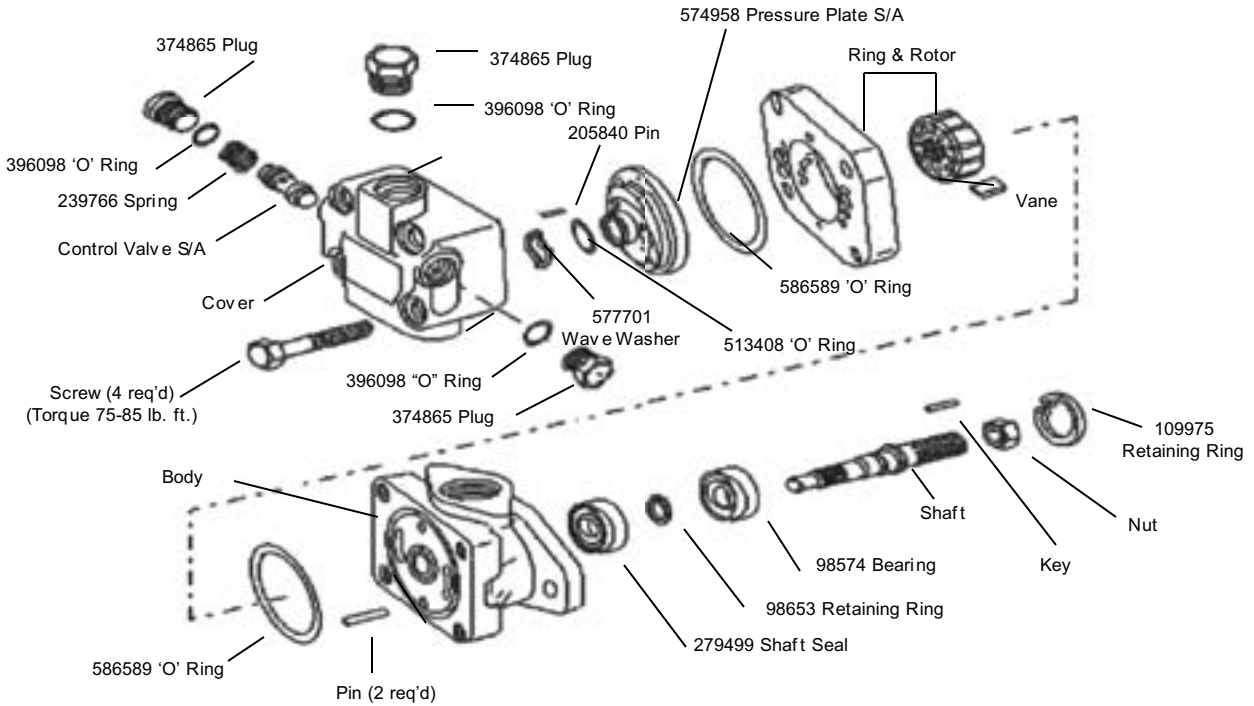
C - 750 psi	H - 2000 psi
D - 1000 psi	J - 2250 psi
E - 1250 psi	K - 2500 psi
F - 1500 psi	L - 2750 psi
G - 1750 psi	

**10 Design**

**11 Special Suffix Feature**  
(Omit if not required)

**12 Left Hand Rotation**  
(Viewed from shaft end)  
(Omit for right hand rotation)





Model	Body
V20NF - *** T - ***C-22	232794
V20NF - *** T - ***D-22	232795
V20NF - *** T - ***E-22	232796
V20NF - *** T - ***F-22	232797
V20NF - *** T - ***G-22	232798
V20NF - *** T - ***H-22	232799
V20NF - *** T - ***J-22	233019
V20NF - *** T - ***K-22	233020
V20NF - *** T - ***L-22	266200

Model	Body
V20NF - 1D	583170
V20NF - 4D	583172
V20NF - 1F	297228
V20NF - 1P	280689
V20NF - 4P	308628
V20NF - 1S	294266

Model	Body
V20NF - *** T - **2* -22	452272
V20NF - *** T - **3* -22	452240
V20NF - *** T - **4* -22	452242
V20NF - *** T - **5* -22	452069
V20NF - *** T - **6* -22	452244
V20NF - *** T - **7* -22	574959
V20NF - *** T - **8* -22	452071
V20NF - *** T - **9* -22	478133
V20NF - *** T - **10* -22	4522747

Model	Shaft	Key	Nut
V20NF - ***T - 1	280372	5881	—
V20NF - ***T - 3	280504	1615	132260
V20NF - ***T - 6	297330	1609	—
V20NF - ***T - 10	324043	1609	—
V20NF - ***T - 11	280515	—	—
V20NF - ***T - 38	328096	—	—
V20NF - ***T - 101	478142	5881	—
V20NF - ***T - 103	478136	1615	132260
V20NF - ***T - 138	478122	—	—
V20NF - ***T - 203	502682	1615	132260
V20NF - ***T - 238	502235	—	—

Model	Pin	Screw	Vane Kit	Ring & Rotor	Cartridge Kit
V20NF - **5T	2161	11165	923651	503157	923656
V20NF - **6T				452235	923657
V20NF - **7T	2478	9431	923652	452261	923658
V20NF - **8T				574954	923659
V20NF - **9T				452264	923660
V20NF - **10T	16662	96168	923653	452267	923661
V20NF - **11T				574945	923662
V20NF - **12T	9603	96168	923654	452270	923663
V20NF - **13T				452245	923664

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
F3	V	2010	*	*	*	F	*	S	*	S	1	**	12	L

## 1 Special Seals

## 2 Vane Pump

## 3 Series Designation

## 4 Cover Type

- \* Omit for standard cover
- F Flow control cover
- P Priority valve cover

## 5 Mounting

- 1 2 bolt flange SAE "B" size
- 2 Foot bracket

## 6 Foot Bracket

Mounting position with respect to inlet port position when viewed from the shaft end

- 3 Inlet port position at 3 o'clock
- 6 Inlet port position at 6 o'clock
- 9 Inlet port position at 9 o'clock
- omit Inlet port position at 12 o'clock

## 7 Inlet Port Connections

- F 4 Bolt flange 2" dia. SF

## 8 Ring Capacity (shaft end)

- at 1200 rpm (US gpm)
- 7 7 gpm at 1200 rpm & 100 psi
- 8 8 gpm at 1200 rpm & 100 psi
- 9 9 gpm at 1200 rpm & 100 psi
- 11 11 gpm at 1200 rpm & 100 psi
- 12 12 gpm at 1200 rpm & 100 psi
- 13 13 gpm at 1200 rpm & 100 psi

## 9 Outlet Port (shaft end)

- S 1.062-12 un- 2b thread

## 10 Ring Capacity (cover end)

- at 1200 rpm (US gpm)
- 1 1 gpm at 1200 rpm & 100 psi
- 2 2 gpm at 1200 rpm & 100 psi
- 3 3 gpm at 1200 rpm & 100 psi
- 4 4 gpm at 1200 rpm & 100 psi
- 5 5 gpm at 1200 rpm & 100 psi
- 6 6 gpm at 1200 rpm & 100 psi
- 7 7 gpm at 1200 rpm & 100 psi

## 11 Outlet port (cover end)

Code Std. cover Flow control cover

Code	pressure tank	
	pressure	tank
P	1/2" npt	3/4" St.Thd
R	1.062 - 12 St. Thd.	1/2" npt
S	3/4" St. Thd.	-----
T	-----	3/4" St. Thd.

## 12 Shafts

- 1 Straight keyed
- 3 Threaded with woodruff key
- 11 9 tooth splined

## 13 Outlet Port Position

\* Viewed from Rear Cover end of Pump

\* With no.1 outlet (shaft end) opposite Inlet port

- AA No. 2 Outlet 135° CCW from Inlet
- AB No. 2 Outlet 45° CCW from Inlet
- AC No. 2 Outlet 45° CW from Inlet
- AD No. 2 Outlet 135° CW from Inlet

\* With no.1 outlet (shaft end) 90° CCW from Inlet port

- BA No. 2 Outlet 135° CCW from Inlet
- BB No. 2 Outlet 45° CCW from Inlet
- BC No. 2 Outlet 45° CW from Inlet
- BD No. 2 Outlet 135° CW from Inlet

\* With no.1 outlet (shaft end) inline with Inlet port

- CA No. 2 Outlet 135° CCW from Inlet
- CB No. 2 Outlet 45° CCW from Inlet
- CC No. 2 Outlet 45° CW from Inlet
- CD No. 2 Outlet 135° CW from Inlet

\* With no.1 outlet (shaft end) 90° CW from Inlet port

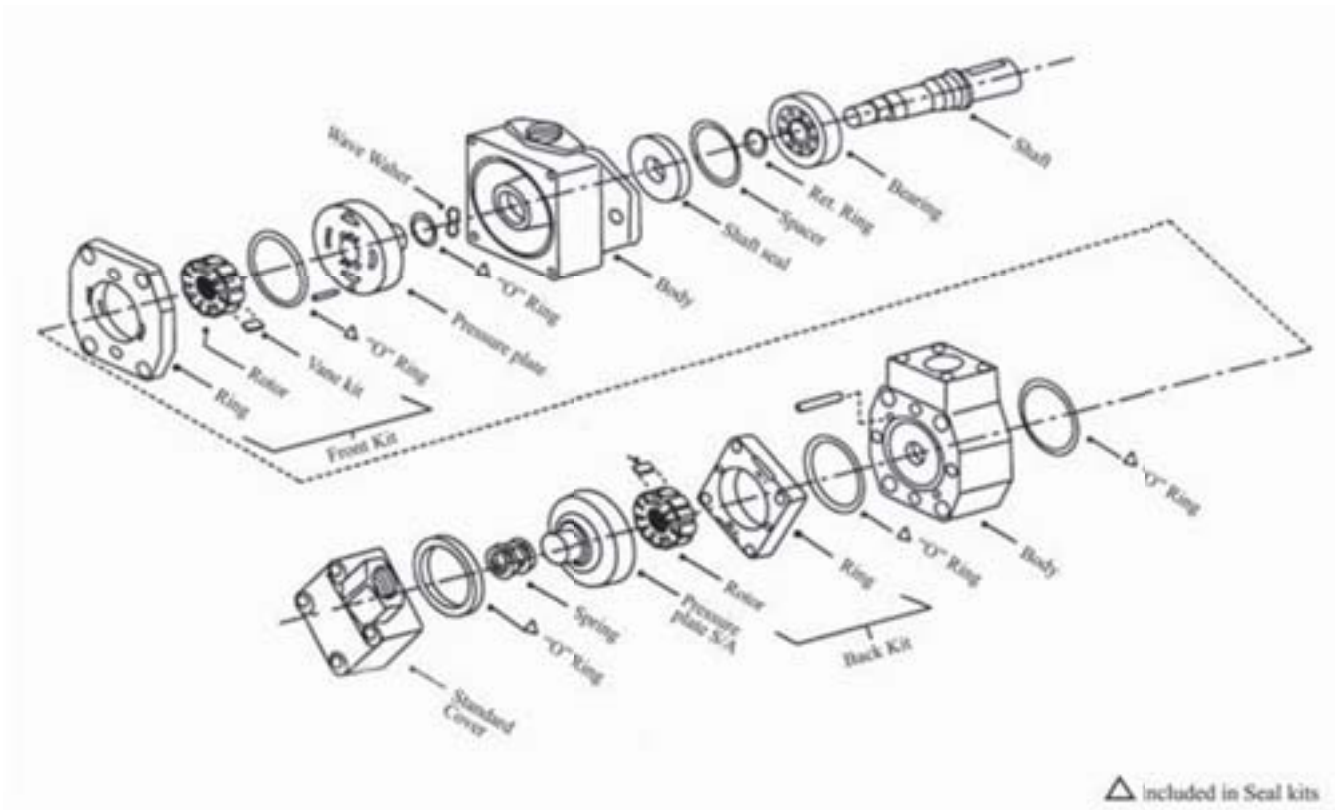
- DA No. 2 Outlet 135° CCW from Inlet
- DB No. 2 Outlet 45° CCW from Inlet
- DC No. 2 Outlet 45° CW from Inlet
- DD No. 2 Outlet 135° CW from Inlet

## 14 Design

## 15 Shaft Rotation (viewed from shaft end)

- \* Omit for R/H rotation (clockwise)
- L L/H rotation (counter clockwise)

# V2010 DOUBLE VANE PUMP SERVICE PARTS INFORMATION



PUMP	FRONT C. KIT	FRONT ROTOR	FRONT VANE	FRONT RING	FRONT PR. PL.	BACK C. KIT	BACK ROTOR	BACK VANE	BACK RING	BACK PR. PL.
V2010	6 923474	358339	923493	328152	358347	1 923471	317681	923499	317674	373795
	7 923494			328152		2 923470			317675	
	8 923495			331791		3 923496			317676	
	9 923462	331789	4 923469	351247		923500	317677			
	11 923475	358336	923478	328156		5 923468	317678			
	12 923476	358337	923479	331806		6 923497	357286	923501	355641	
	13 923477			331807		7 923498			331813	

PUMP	SEAL KIT	SEAL	BEARING	BODY	SHAFT NO.
V2010	923577	229236	82938	357292	SHAFT I. NO. 351249
					SHAFT II. NO. 321215

## Bolt Torques

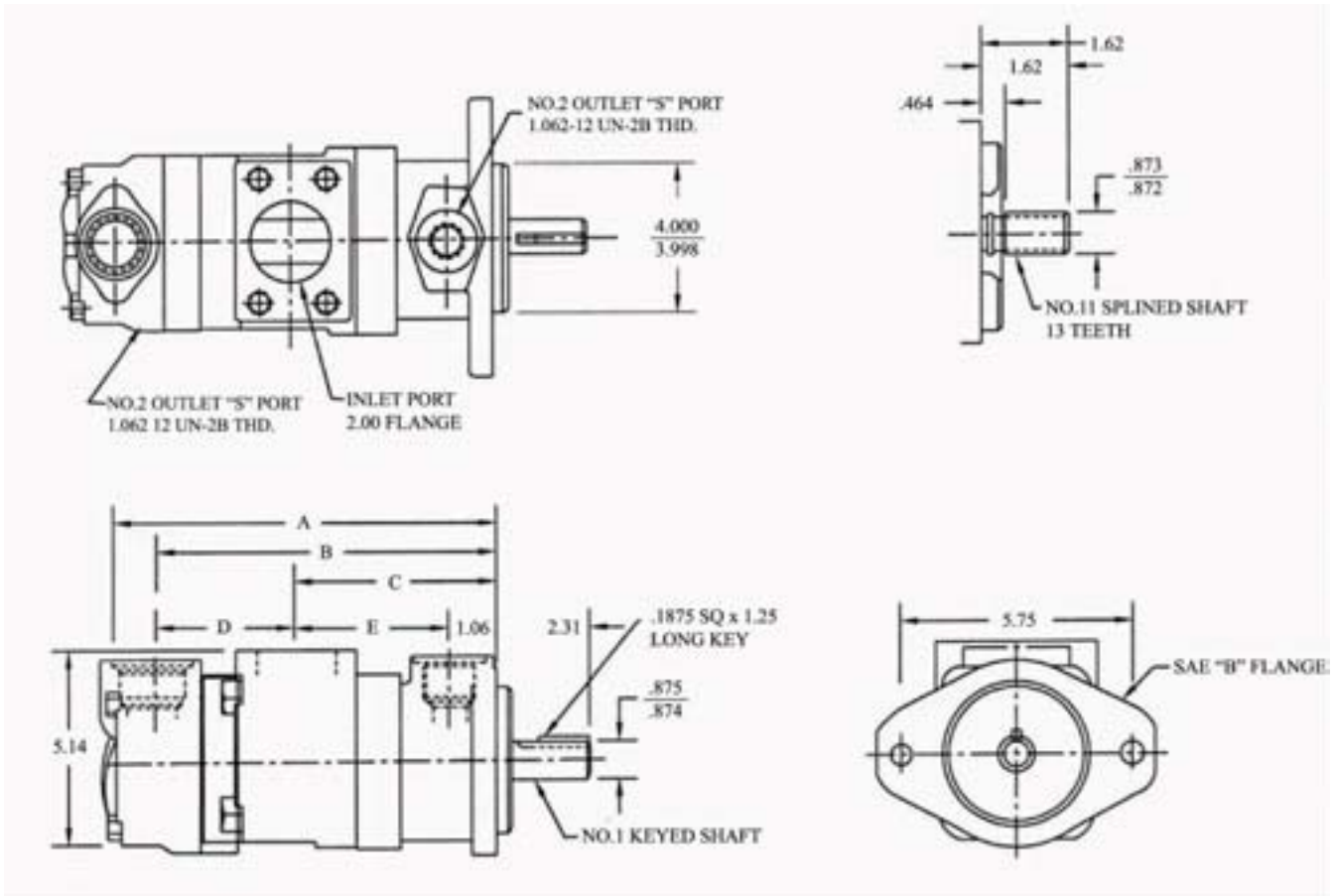
	FRONT SECTION	BACK SECTION
V2010	85 LBS/FT.	45 LBS/FT.

### Changing Cartridge Rotation

Reposition the ring 90° from its original position using the location pins for alignment, making sure that the arrow on the perimeter points in the proper direction of rotation. Install the rotor on the shaft and insert vanes in the rotor slots. Be certain that the radius edges of the vanes are towards the cam ring.



# V2010 DOUBLE VANE PUMP INSTALLATION DIMENSIONS



## Dimensions

Rated Delivery GPM @1200 rpm & 100 psi		Dimensions				
Shaft End	Cover End	A	B	C	D	E
7, 8 or 9	1, 2 or 3	8.39	7.45	4.46	2.99	3.40
7, 8 or 9	4 or 5	8.64	7.70	4.46	3.24	3.40
7, 8 or 9	6 or 7	8.84	7.90	4.46	3.44	3.40
11	1, 2 or 3	8.59	7.65	4.65	2.99	3.59
11	4 or 5	8.84	7.90	4.65	3.24	3.59
11	6 or 7	9.04	8.10	4.65	3.44	3.59
12 or 13	1, 2 or 3	8.73	7.79	4.79	2.99	3.73
12 or 13	4 or 5	8.97	8.03	4.79	3.24	3.73
12 or 13	6 or 7	8.23	8.03	4.79	3.44	3.73
Weight 30 lbs.						

# METARIS VANE PUMP

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
F3	V	2020	*	*	*	F	*	S	*	*	*	**	12	*	30	L

## 1 Special Seals

## 2 Vane Pump

## 3 Series Designation

## 4 Cover Type

- \* Omit for standard cover
- F Flow control cover
- P Priority valve cover

## 5 Mounting

- 1 2 bolt flange SAE "A" size
- 2 Foot bracket

## 6 Foot Bracket

Mounting position with respect to inlet port position when viewed from the shaft end

- 3 inlet port position at 3 o'clock
- 6 inlet port position at 6 o'clock
- 9 inlet port position at 9 o'clock
- omit inlet port position at 12 o'clock

## 7 Inlet Port Connections

- F 4 Bolt flange 1.5 dia.

## 8 Ring Capacity (shaft end)

at 1200 rpm (US gpm)

- 6 6 gpm at 1200 rpm & 100 psi
- 7 7 gpm at 1200 rpm & 100 psi
- 8 8 gpm at 1200 rpm & 100 psi
- 9 9 gpm at 1200 rpm & 100 psi
- 11 11 gpm at 1200 rpm & 100 psi
- 12 12 gpm at 1200 rpm & 100 psi
- 13 13 gpm at 1200 rpm & 100 psi

## 9 Outlet Port (shaft end)

- S 1.062-12 un- 2b thread

## 10 Ring Capacity (shaft end)

at 1200 rpm (US gpm)

- 6 6 gpm at 1200 rpm & 100 psi
- 7 7 gpm at 1200 rpm & 100 psi
- 8 8 gpm at 1200 rpm & 100 psi
- 9 9 gpm at 1200 rpm & 100 psi
- 11 11 gpm at 1200 rpm & 100 psi
- 12 12 gpm at 1200 rpm & 100 psi
- 13 13 gpm at 1200 rpm & 100 psi

## 11 Outlet Port (cover end)

Code Std. cover Flow control cover

	<i>pressure</i>		<i>tank</i>
P	—	3/4" St.Thd	1/2" npt
S	1.062-12 St. Thd	3/4" St.Thd	1.062-12 St. Thd
T	—	3/4" St.Thd	3/4" St. Thd

## 12 Shafts

- 1 Straight keyed
- 3 Threaded with woodruff key
- 11 9 tooth splined
- 38 Spline

## 13 Outlet Port Position

\* Viewed from Rear Cover End OF Pump

\* With no.1 outlet (shaft end) opposite Inlet port

- AA No. 2 Outlet opposite inlet.
- AB No. 2 Outlet 90° CCW from Inlet
- AC No. 2 Outlet in line with Inlet
- AD No. 2 Outlet 90° CW from Inlet

\* With no.1 outlet (shaft end) 90° CCW from Inlet port

- BA No. 2 Outlet opposite inlet.
- BB No. 2 Outlet 90° CCW from Inlet
- BC No. 2 Outlet in line with Inlet
- BD No. 2 Outlet 90° CW from Inlet

\* With no.1 outlet (shaft end) In line with Inlet port

- CA No. 2 Outlet opposite inlet.
- CB No. 2 Outlet 90° CCW from Inlet
- CC No. 2 Outlet in line with Inlet
- CD No. 2 Outlet 90° CW from Inlet

\* With no.1 outlet (shaft end) 90° CW from Inlet port

- DA No. 2 Outlet opposite inlet.
- DB No. 2 Outlet 90° CCW from Inlet
- DC No. 2 Outlet in line with Inlet
- DD No. 2 Outlet 90° CW from Inlet

## 14 Flow Rate through Orifice in Cover (US gpm)

## 15 Pressure Setting

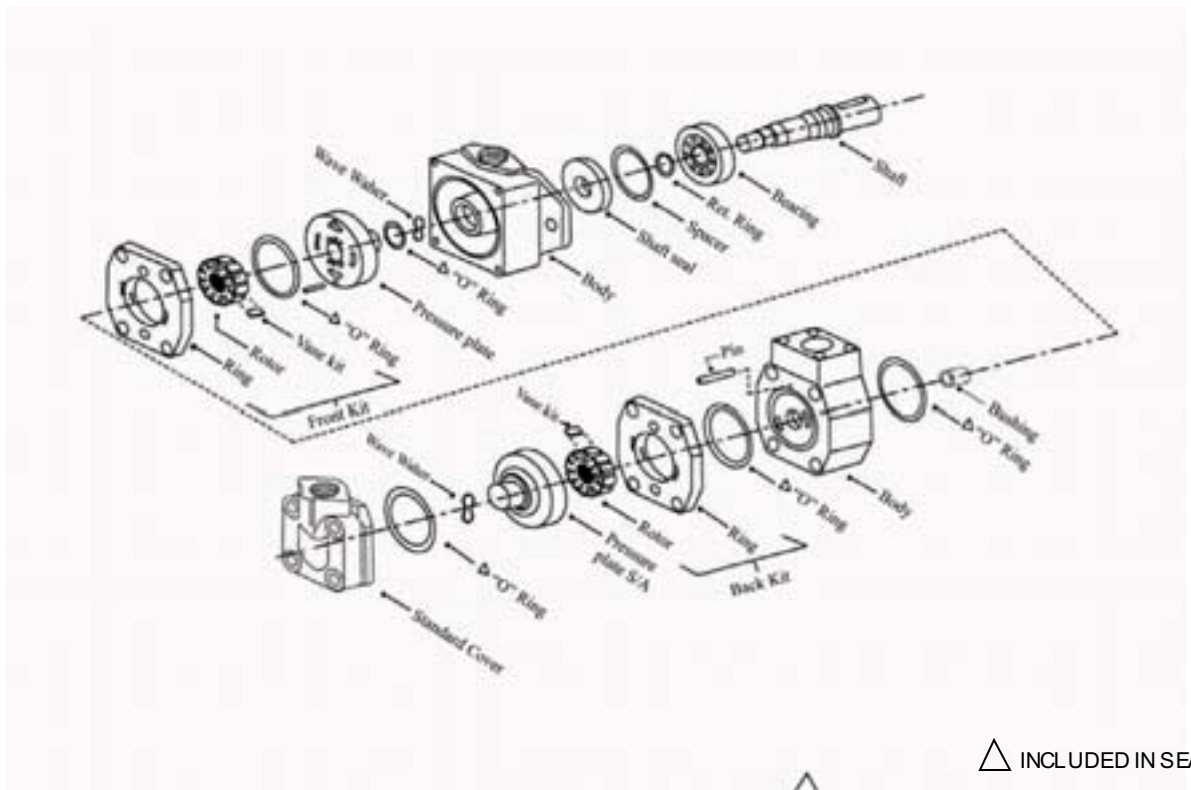
- A 250 psi
- B 500 psi
- C 750 psi
- D 1000 psi
- E 1250 psi
- F 1500 psi
- G 1750 psi
- H 2000 psi
- J 2250 psi
- K 2500 psi

## 16 Design

## 17 Shaft Rotation (viewed from shaft end)

- \* Omit for R/H rotation (clockwise)
- L L/H rotation (counter clockwise)

# V2020 DOUBLE VANE PUMP SERVICE PARTS INFORMATION



△ INCLUDED IN SEAL KIT

PUMP	FRONT C. KIT	FRONT ROTOR	FRONT VANES	FRONT RING	FRONT PR. PL.	BACK C. KIT	BACK ROTOR	BACK VANES	BACK RING	BACK PR. PL.
V2020	6 923474	358339	923493	328152	358347	6 923480	358328	923485	328150	358347
	7 923494	358335	923493	328152		7 923481	358330	923493	328152	
	8 923495			331791		8 923483			331791	
	9 923462			331789		9 923484			331789	
	11 923475	358336	923478	328156		11 923482	358332	923478	328156	
	12 923476	358337	923479	331806						
	13 923477			331807						

PUMP	SEAL KIT	SEAL	BEARING	BODY	SHAFT NO.
V2020	923174	229236	82938	308681	SHAFT I. NO. 308686 SHAFT II. NO. 308926

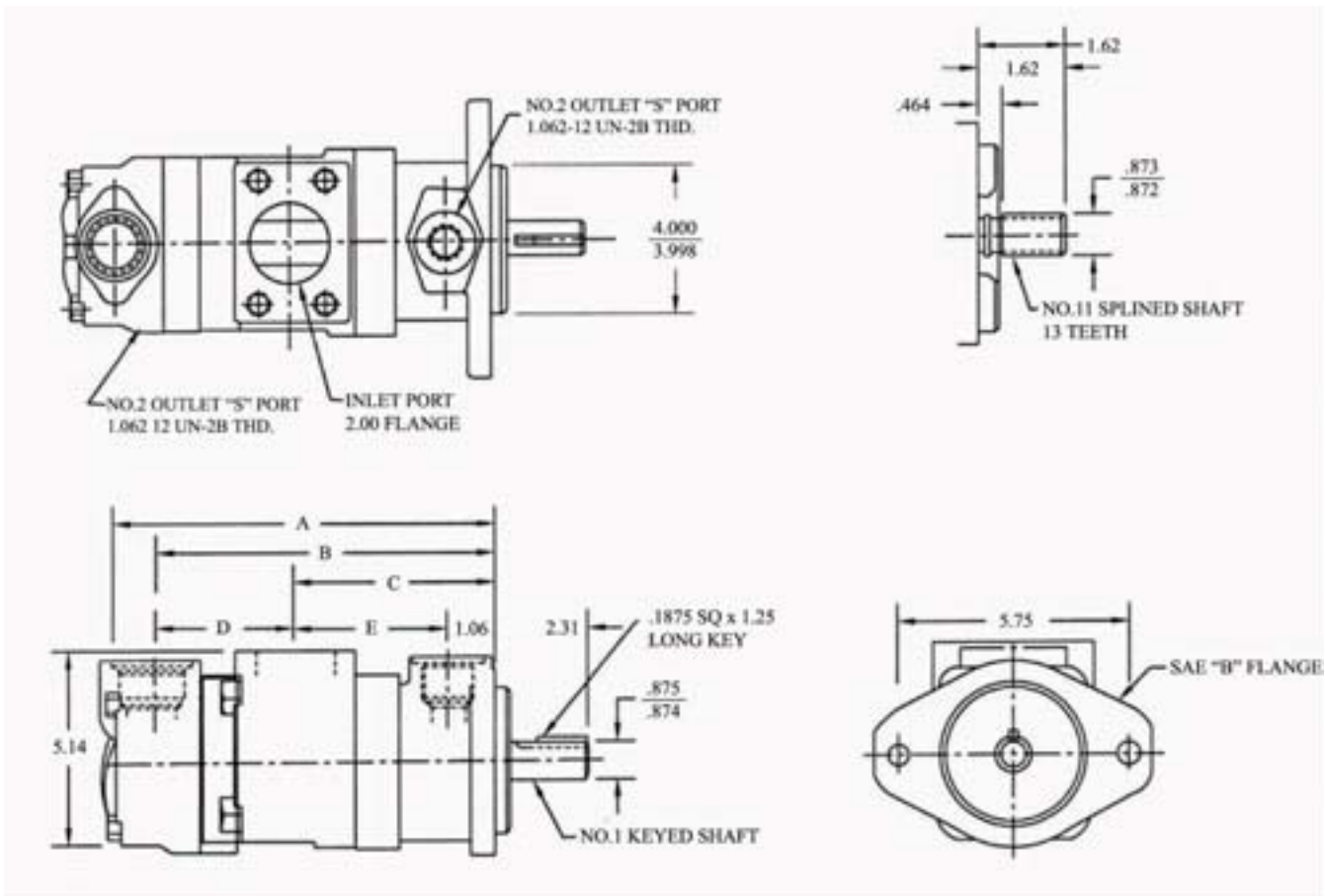
## Bolt Torques

V2020	81 LBS.FT.
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## Changing Cartridge Rotation

Reposition the ring 90° from its original position using the location pins for alignment, making sure that the arrow on the perimeter points in the proper direction of rotation. Install the rotor on the shaft and insert vanes in the rotor slots. Be certain that the radius edges of the vanes are towards the cam ring.

# V2020 DOUBLE VANE PUMP INSTALLATION DIMENSIONS



## Dimensions

Rated Delivery GPM @1200 rpm & 100 psi		Dimensions				
Shaft End	Cover End	A	B	C	D	E
7, 8 or 9	6	8.41	7.39	4.49	2.90	3.43
7, 8 or 9	7, 8 or 9	8.66	7.64	4.49	3.15	3.43
11	6	8.61	7.59	4.69	2.90	3.63
11	7, 8 or 9	8.86	7.84	4.69	3.15	3.63
11	11	9.05	8.03	4.69	3.35	3.63
12 or 13	6	8.75	7.73	4.82	2.90	3.76
12 or 13	7, 8 or 9	8.99	7.97	4.82	3.15	3.76
12 or 13	11	9.19	8.17	4.82	3.35	3.76
Weight 35 lbs.						

1	2	3	4	5	6	7	8	9	10	11	12
VTM 42	**	**	**	**	F	S	*	*	14	S**	

**1** Vane Type

**2** Mobile Application

**3** Capacity

- 10 1.0 US gpm
- 15 1.5 US gpm
- 20 2.0 US gpm
- 40 4.0 US gpm
- 50 5.0 US gpm
- 60 6.0 US gpm

**4** Controlled Flow

(1500 rpm @ 100 psi)

- 07 0.7 US gpm
- 15 1.5 US gpm
- 20 2.0 US gpm
- 25 2.5 US gpm
- 30 3.0 US gpm
- 35 3.5 US gpm
- 40 4.0 US gpm
- 45 4.5 US gpm
- 50 5.0 US gpm
- 55 5.5 US gpm
- 60 6.0 US gpm
- 65 6.5 US gpm
- 75 7.5 US gpm

**5** Relief Valve Setting

- 02 250 psi
- 03 300 psi
- 05 500 psi
- 07 750 psi
- 08 850 psi
- 10 1000 psi
- 12 1250 psi
- 15 1500 psi
- 17 1750 psi
- 20 2000 psi
- 35 3500 psi

**6** Filter Parts

**7** Inlet Screen

**8** Reservoir or Manifold

- 7 70 cu. In. Reservoir
- 11 115 cu. In. Reservoir
- NO Shipping closure

**9** Pump Rotation

(Viewed from shaft end)

- R Clockwise
- L Counter-clockwise

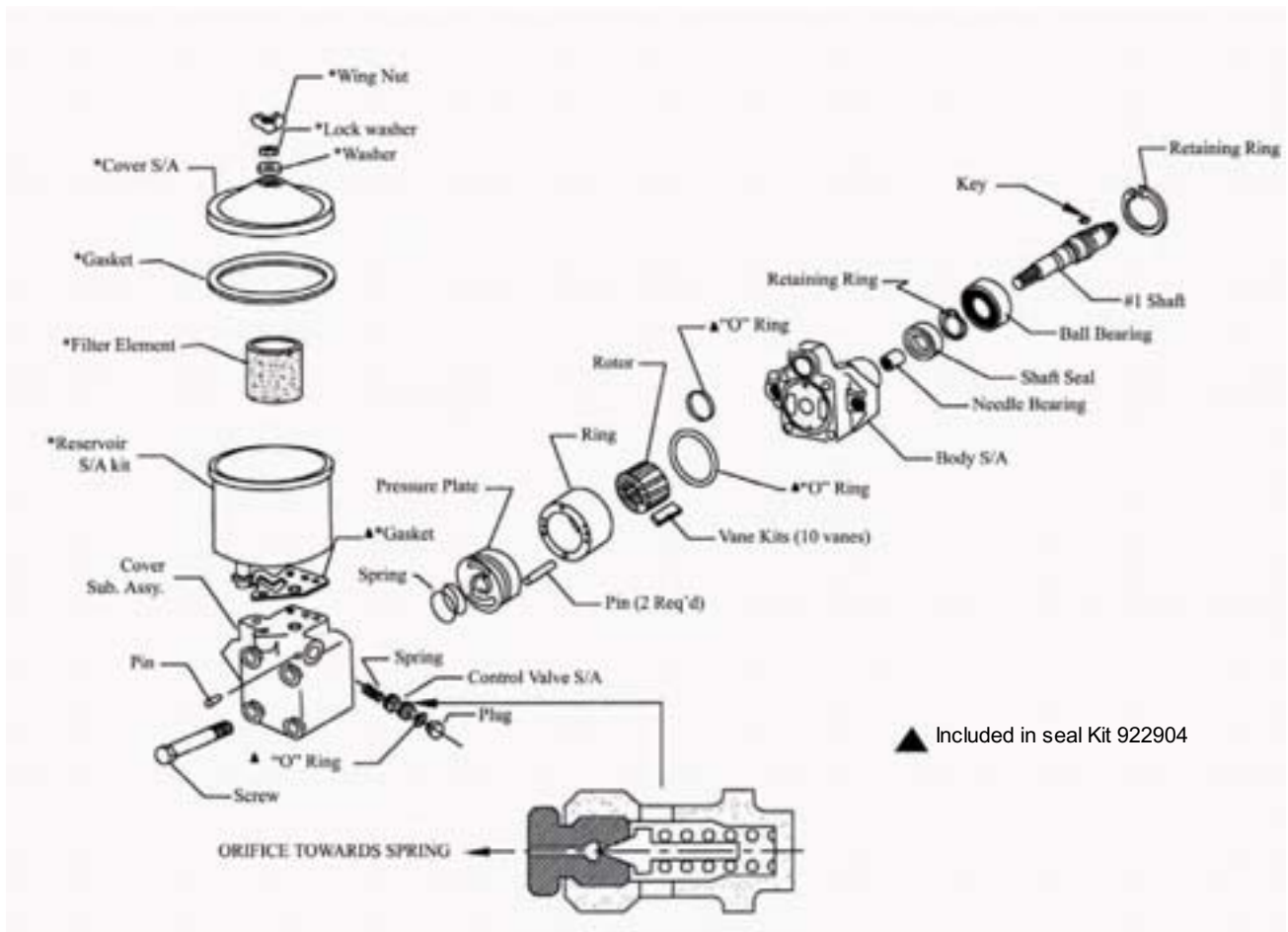
**10** Shaft No.1

**11** Design

**12** Special Features



VTM 42 Pump



▲ Included in seal Kit 922904

MODEL	CARTRIDGE	ROTOR	VANE KIT (10 Vanes)	RING	PIN (2 req'd)	PRESSURE PLATE	SPRING
VTM** - 10	923087	213860	912139	296594	217308	276396	289281
VTM** - 15	923088			296595			
VTM** - 20	923089			296596			
VTM** - 40	923090			296597			
VTM** - 30	923091	213859	922594	296598	154364		245507
VTM** - 60	923092			296599			

MODEL	CONTROL VALVE S/A	RELIEF VALVE SETTING
VTM**.**.02	229613	250PSI
VTM**.**.03	255515	300PSI
VTM**.**.05	233018	500PSI
VTM**.**.06	247615	600PSI
VTM**.**.07	232794	750PSI
VTM**.**.08	397339	850PSI
VTM**.**.10	232795	1000PSI
VTM**.**.12	232796	1250PSI
VTM**.**.15	232797	1500PSI
VTM**.**.17	232798	1750PSI
VTM**.**.20	232799	2000PSI

Model	Reservoir S/A Kit	Seal Kit	Body S/A Kit	Needle Bearing	Shaft Seal	Retaining Ring	Ball Bearing	#1 Shaft	Key	Retaining Ring	Filter Element
VTM-42	70 Cu.in. 923837	922904	923951	222440	263585	193732	148423	250435	1606	172376	213984
VTM-42	115 Cu.in. 923838										

### Cartridge Kit Rotation

To change the cartridge kit rotation slide cam ring over rotor and vanes, making sure all the radius edges of vanes is toward cam ring. Insert locating pins through cam ring, position cam ring so that the arrow on cam ring is pointing in the proper direction.

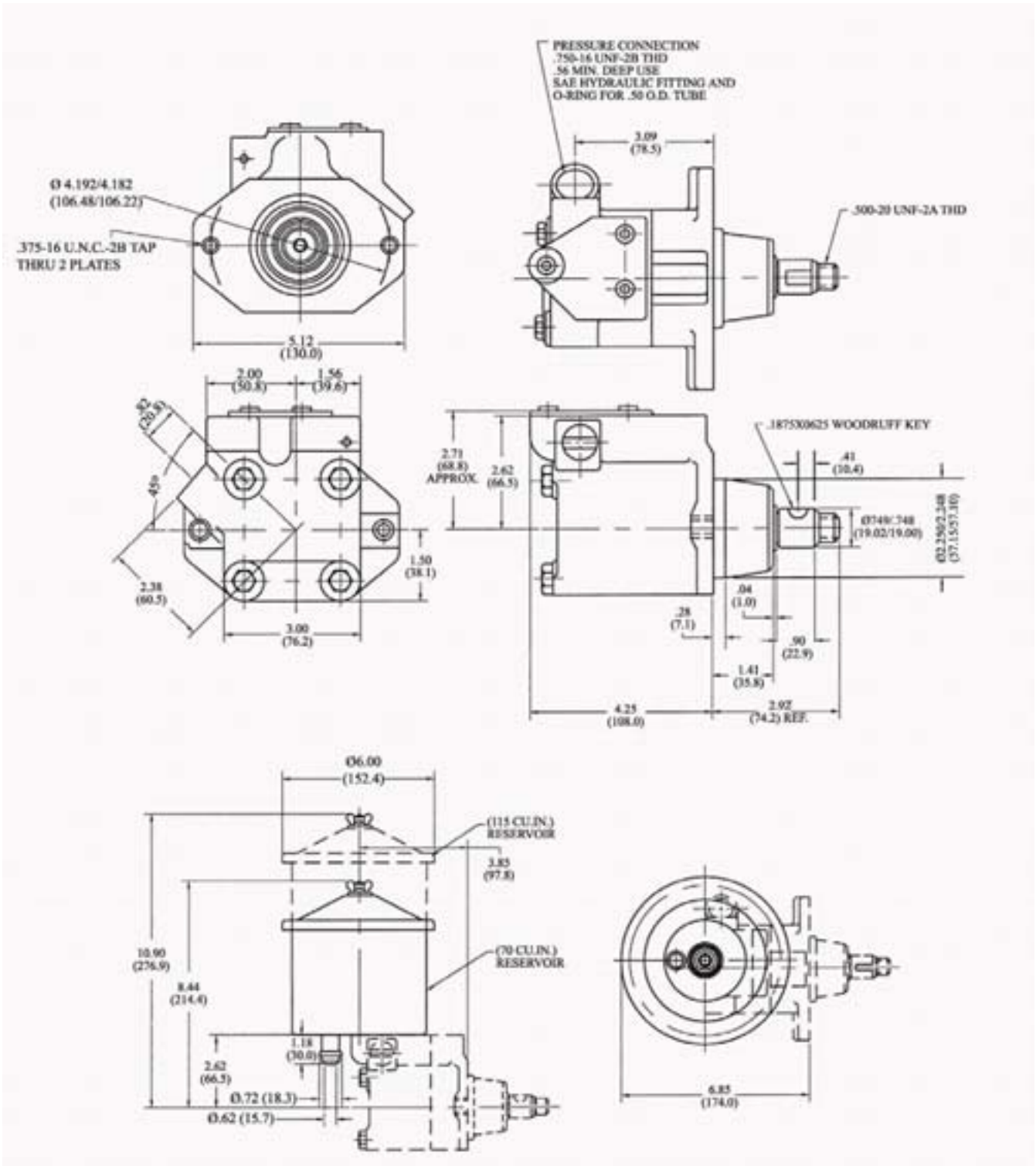
### Flow Control Relief Valve

When installing control relief valve install hex head first into the cover bore seating on the spring. Press plug fully in and insert lock pin.

### \*\*WARNING\*\*

\*\*Failure to follow these steps could cause serious malfunctions and pressures to rise to dangerous levels.\*\*

# VIM 42 POWER STEERING PUMP INSTALLATION DIMENSIONS

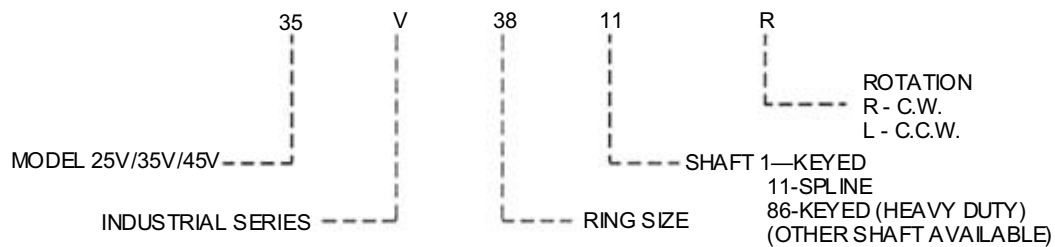


# HIGH PERFORMANCE INDUSTRIAL SINGLE INTRA-VANE PUMP

- High Volumetric Efficiency
- Maximum 3000 psi Operating Pressure
- Twelve Vane Design for Quiet Operation
- Hydraulically Balanced for Extended Life
- Versatile
- Compact



## ◆ Single Pump Ordering Specifications

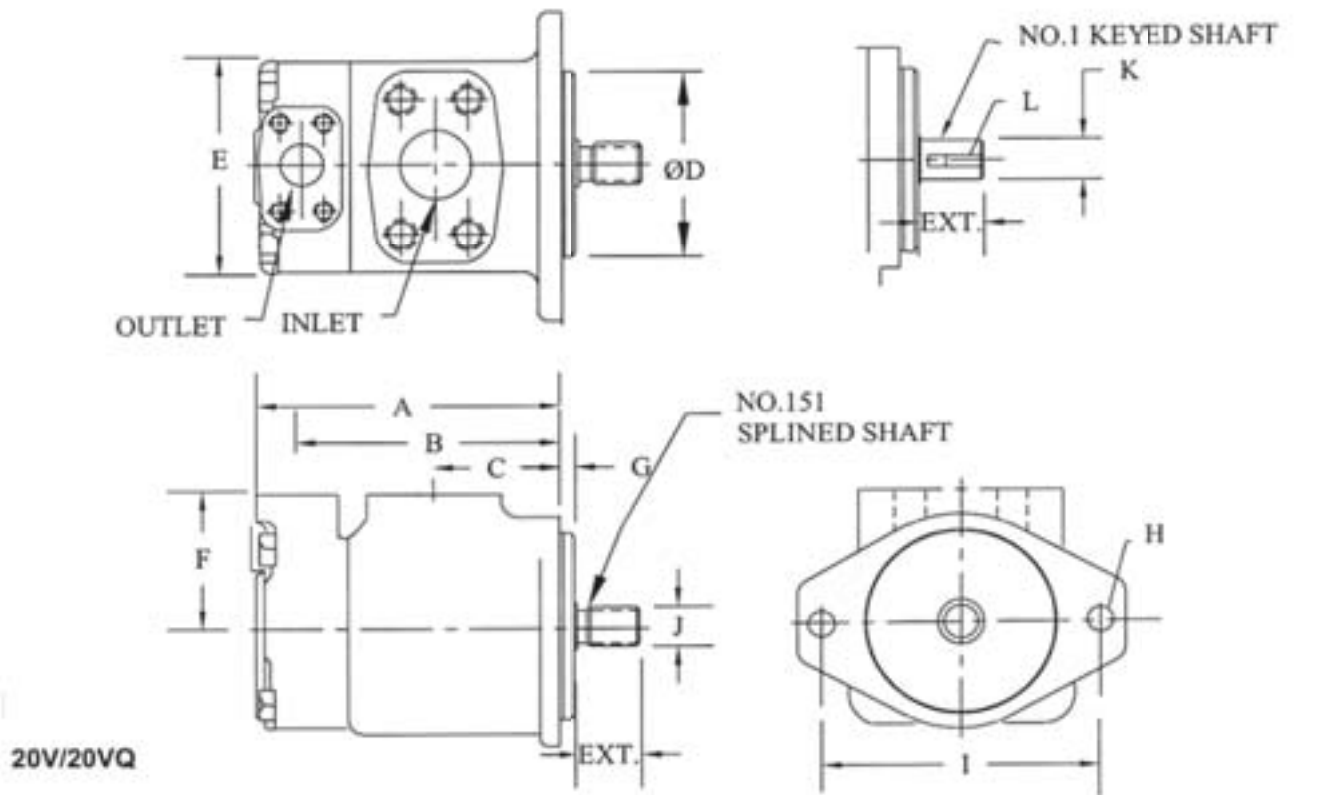
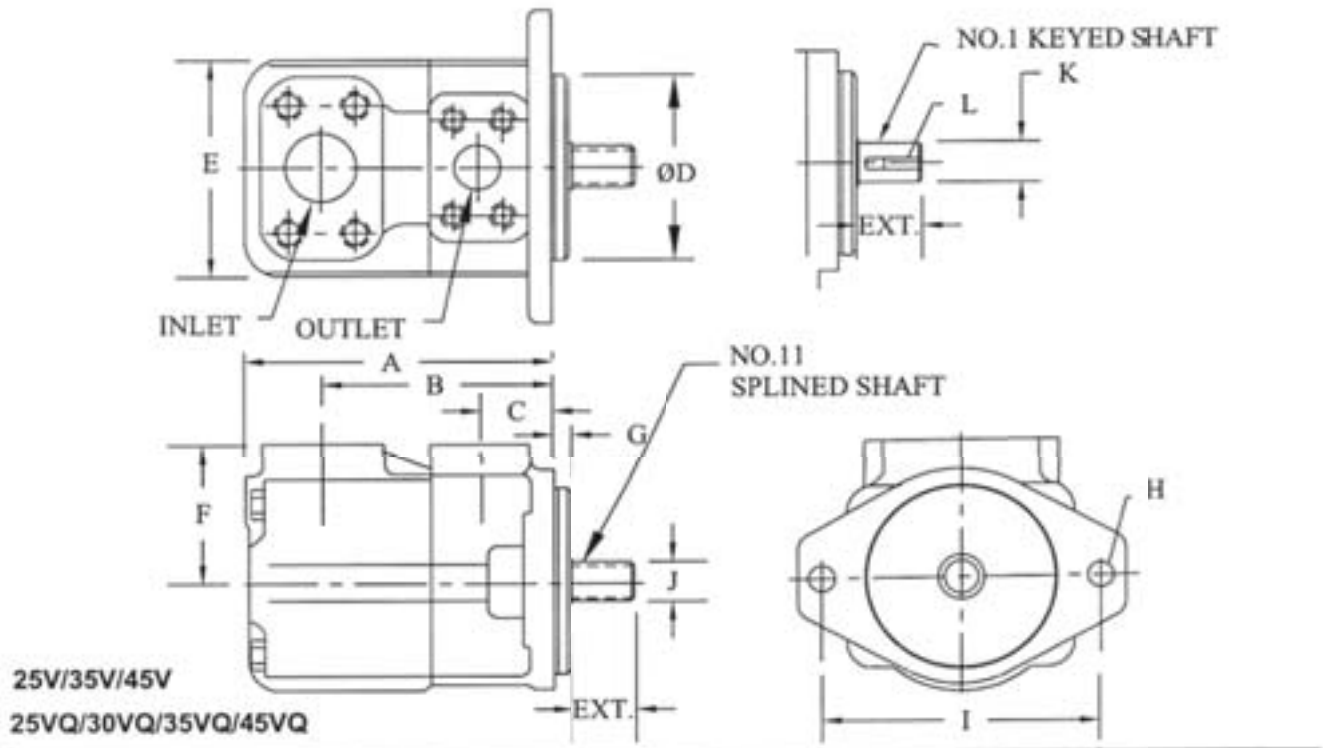


Values based on using anti-wear type petroleum oil 150 SUS at 100° F and 0 psi inlet pressure.

MODEL SERIES	FLOW IN GPM @ 1200 RPM & 100 PSI	DISPL. in <sup>3</sup> /r	MAXIMUM SPEED (RPM)	MAXIMUM PRESSURE (PSI)	TYPICAL DELIVERY GPM @ max. speed & pressure	TYPICAL INPUT POWER (HP) @ max. speed & pressure	WEIGHT (lbs.)
20V	5	1.10	1800	3000	7.5	15.00	26
	8	1.67	1800	3000	12	22.78	
	11	2.22	1800	3000	15	30.28	
	12	2.47	1800	3000	16.4	33.69	
	14	2.78	1800	3000	18.4	37.91	
25V	12	2.47	1800	2500	16.4	30.75	32
	14	2.78	1800	2500	18.4	34.50	
	17	3.39	1800	2500	22.8	40.00	
	21	4.13	1800	2500	28	45.60	
35V	21	4.13	1800	2500	28	45.60	50
	25	4.94	1800	2500	33	61.00	
	30	5.91	1800	2500	40.8	73.00	
	35	6.83	1800	2500	48	82.40	
	38	7.37	1800	2500	51.2	88.30	
45V	42	8.41	1800	2500	55.0	101.00	75
	50	9.85	1800	2500	67	117.00	
	60	11.75	1800	2500	82	139.00	



# MOBILE & INDUSTRIAL SINGLE PUMP INSTALLATION DIMENSIONS



# MOBILE & INDUSTRIAL SINGLE PUMP INSTALLATION DIMENSIONS

## Dimension Chart

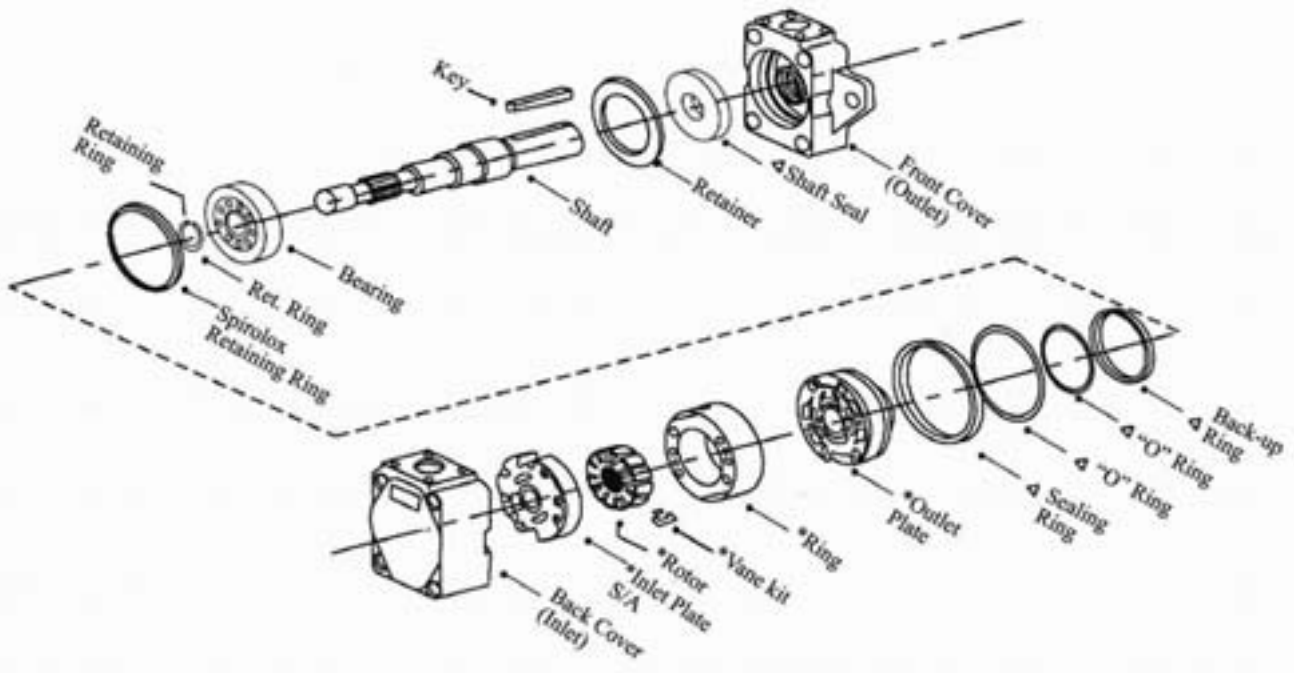
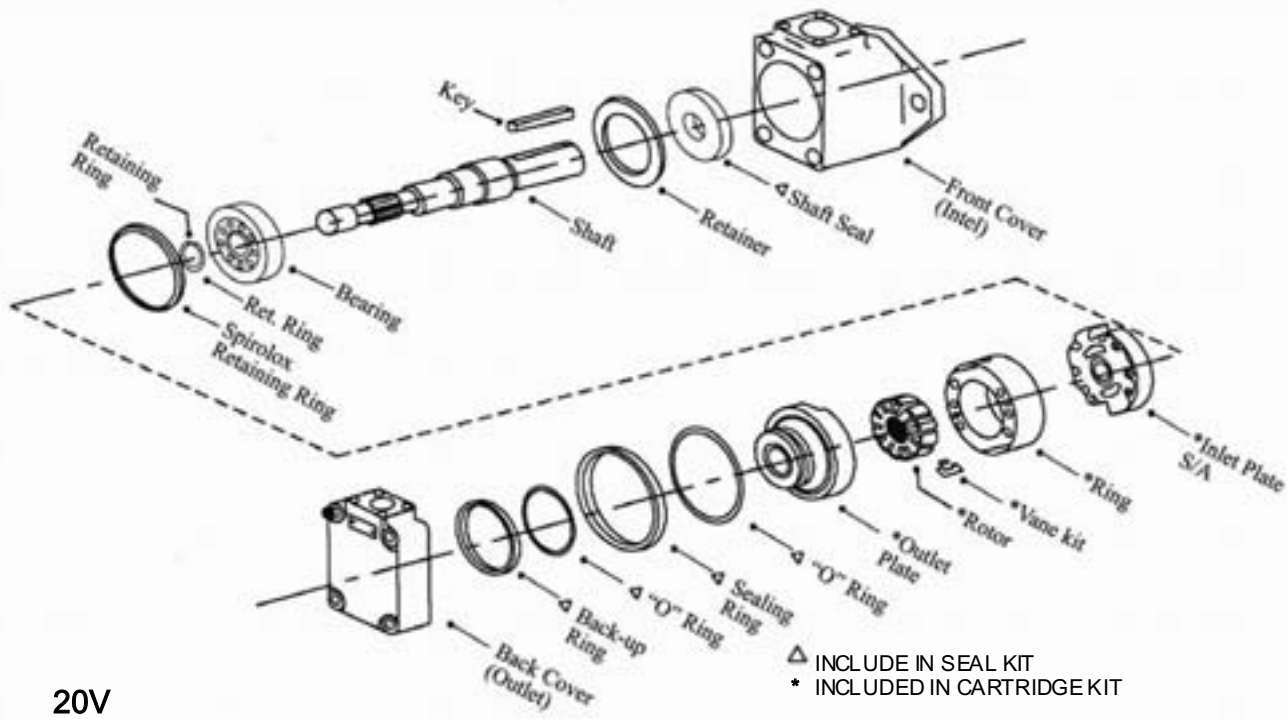
	2520	3520	3525	4520	2525	4535
A	9.84	10.79	11.30	11.97	13.80	13.90

	20 Series	25 Series	30 Series	35 Series	45 Series
A	6.12	6.38	6.96	7.28	8.50
B	5.22	4.75	4.85	4.94	6.02
C	2.50	1.50	1.50	1.50	1.69
D	4"Ø SAE 'B'	4"Ø SAE 'B'	4"Ø SAE 'B'	5"Ø SAE 'C'	5"Ø SAE 'C'
E	4"	4.62	4.62	5.51	6.36
F	3.00	3.00	3.00	3.25	3.69
G	.375	.375	.375	.375	.500
H	.56	.56	.56	.688	.688
I	5.75	5.75	5.75	7.125	7.125
J	.875Ø 13th 1.75 EXT	.875Ø 13th 1.75 EXT	.875Ø 13th 1.75 EXT	1.25Ø 14th 2.31 EXT	1.25Ø 14th 2.44 EXT
K	.875Ø EXT 2.13	.875Ø EXT 2.31	.875Ø EXT 2.31	1.25Ø EXT 2.88	1.25Ø EXT 2.44
L	KEY .187	KEY .187	KEY .187	KEY .3125	KEY .3125
Inlet	1-1/2" FL	1-1/2" FL	1-1/2" FL	2" FL	3" FL
Outlet	3/4" FI	1" FL	1-1/4 FL	1-1/4 FL	1-1/2 FL
Weight	32 lbs	32 lbs	36 lbs	50 lbs	75 lbs

## Shafts Description & Codes

Pump Style	Code	Description	Major Dia.	Ext.
20V /VQ	1	3/16 Square Keyed	0.875	2.310
	151	13T 16/32 Splined	0.875	1.750
25V /VQ	1	13/16 Square Keyed	0.875	2.312
	3	#15 Woodruff Key	0.875	2.440
30 V /VQ	11	13T 16/32 Splined	0.875	1.750
	25	14T 12/24 Splined	1.250	1.750
	127	14T 12/24 Splined	1.250	2.310
35V /VQ	1	5/16 Square Keyed	1.250	2.880
	11	14T 12/24 Splined	1.250	2.310
	19	14T 12/24 X-Long Splined	1.250	3.050
	86	5/16 Heavy-Duty Square Keyed	1.375	3.380
45V /VQ	1	15/16 Square Keyed	1.250	2.440
	11	14T 12/24 Splined	1.248	2.440
	19	14T 12/24 X-Long Splined	1.248	3.060
	86	3/8 Heavy-Duty Square Keyed	1.500	3.440

# INDUSTRIAL SINGLE VANE PUMP SERVICE PARTS INFORMATION



## Cartridge Chart

PUMP	CARTRIDGE KITS		ROTOR	VANE KIT	RING	INLET PLATE	OUTLET PLATE	SHAFTS	
20V	5	02-102518	402690	02-136720	333624	584383	585382	1	497109
	8	02-102519			333625				
	11	02-102520	403539	02-136721	333626	584384	151	497113	
	12	02-102521			353901				
	14	02-102522			353902				
25V	12	02-102532	584618	941214	326984	591016	588690	1	238755
	14	02-102533			326985			11	238929
	17	02-102534			326986			86	419882
	21	02-102535			326988				
35V	21	02-102551	575478	941019	394961	576265	575479	1	233624
	25	02-102552			319396			11	242287
	30	02-102553			319397			86	392669
	35	02-102554			319398				
	28	02-102555			319399				
45V	42	02-102572	578900	941049	297510	578903	580921	1	233369
	50	02-102574			297502			11	242885
	60	02-102575			297503			86	361760

PUMP	BUNA SEAL KIT	VITON SEAL KIT	BUNA SHAFT SEAL	VITON SHAFT SEAL	SECONDARY SHAFT SEAL	BEARING	FRONT COVER	BACK COVER
20V	497125	981322	394976	429286	429283	1704	02-102335	250824
25V	922850	919656	394976	429286	429283	1705	942353	224309
35V	922851	919262	394973	429284	429281	38441	942355	234248
45V	919850	919632	394974	429285	429282	131812	942356	229633

## Bolt Torques

PUMP SE	COVER BOLT ( FT. LB. )	CARTRIDGE KIT ( IN. LB.)
20V	50	30
25V	50	40
35V	100	90
45V	100	100

### **Cartridge Kit Rotation**

To change Cartridge Kit rotation, reverse the location of the inlet and the outlet support plates. Hand tighten the cartridge screws and use pump cover to align all the parts. Remove the cover and tighten the cartridge screws to the designated value. Sharp edge of vanes must lead in direction of rotation.

### **Filtration**

For satisfactory service life, use full flow filtration to provide fluid which meets ISO cleanliness code 16/13 or better.

### Cartridge Chart

PUMP	FRONT CART. KIT	ROTOR	VANE	RING
2520V	12 02-102532	584618	941214	326984
	14 02-102533			326985
	17 02-102534			326986
	21 02-102535			326988
3520V	21 02-102551	575478	94019	394961
	25 02-102552			319396
	30 02-102553			319397
	35 02-102554			319398
	38 02-102555			319399
3525V	21 02-102551	575478	941019	394961
	25 02-102552			319396
	30 02-102553			319397
	35 02-102554			319398
	38 02-102555			319399
4520V	42 02-102572	578900	941049	297510
	50 02-102574			297502
	60 02-102575			297503
4525V	42 02-102572	283871	922701	297510
	50 02-102574			297502
	60 02-102575			297503
4535V	42 02-102572	283871	922701	297510
	50 02-102574			297502
	60 02-102575			297503

	REAR CART. KIT	ROTOR	VANE	RING	SHAFTS
	2 02-102506	402690	922741	388693	1 254964
	5 02-102507			333624	11 254848
	8 02-102508			333625	
	11 02-102509			333626	
	12 02-102510			353901	
14 02-102511	353902				
	2 02-102506	402690	922741	388693	1 258249
	5 02-102507			333624	11 258250
	8 02-102508			333625	86 394517
	11 02-102509			333626	
	12 02-102510			353901	
14 02-102511	353902				
	12 02-102536	584618	941214	326984	1 243448
	14 02-102537			326985	11 243449
	17 02-102538			326986	86 394036
	21 02-102539			326988	
	2 02-102506	402690	922741	388693	1 255533
	5 02-102507			333624	11 255536
	8 02-102508			333625	86 361761
	11 02-102509			333626	
	12 02-102510			353901	
14 02-102511	353902				
	12 02-102536	584618	941214	326984	1 233524
	14 02-102537			326985	11 233527
	17 02-102538			326986	86 361762
	21 02-102539			326988	
	25 02-102556	575478	941019	319396	1 289083
	30 02-102557			319397	11 289084
	35 02-102558			319398	86 361763
	38 02-102559			319399	

PUMP	BUNA SEAL KIT	VITON SEAL KIT	BUNA SHAFT SEAL	VITON SHAFT SEAL	SECONDARY SHAFT SEAL	BEARING	FRONT COVER	MIDDLE COVER	BACK COVER
2520V	922856	919303	394976	429286	429283	001705	942353	251263	250824
3520V	922859	919304	394973	429284	429281	038441	942355	250818	250824
3525V	922862	919305	394973	429284	429281	038441	942355	230189	231532
4520V	922863	919616	394974	429285	429282	131812	942356	252283	250824
4525V	922865	919345	394974	429285	429282	131812	942356	370071	231532
4535V	922866	919346	394974	429285	429282	131812	942356	270640	270679

### Bolt Torques

	2520V	3520V	3525V	4520V	4525V	4535V
FRONT HOUSING FT. LB.	75	150	150	275	275	
REAR COVER FT. LB.	50	50	75	50	75	275
FRONT C. KIT IN. LB.	40	90	90	100	100	100
BACK C. KIT IN. LB.	25	25	40	25	40	90

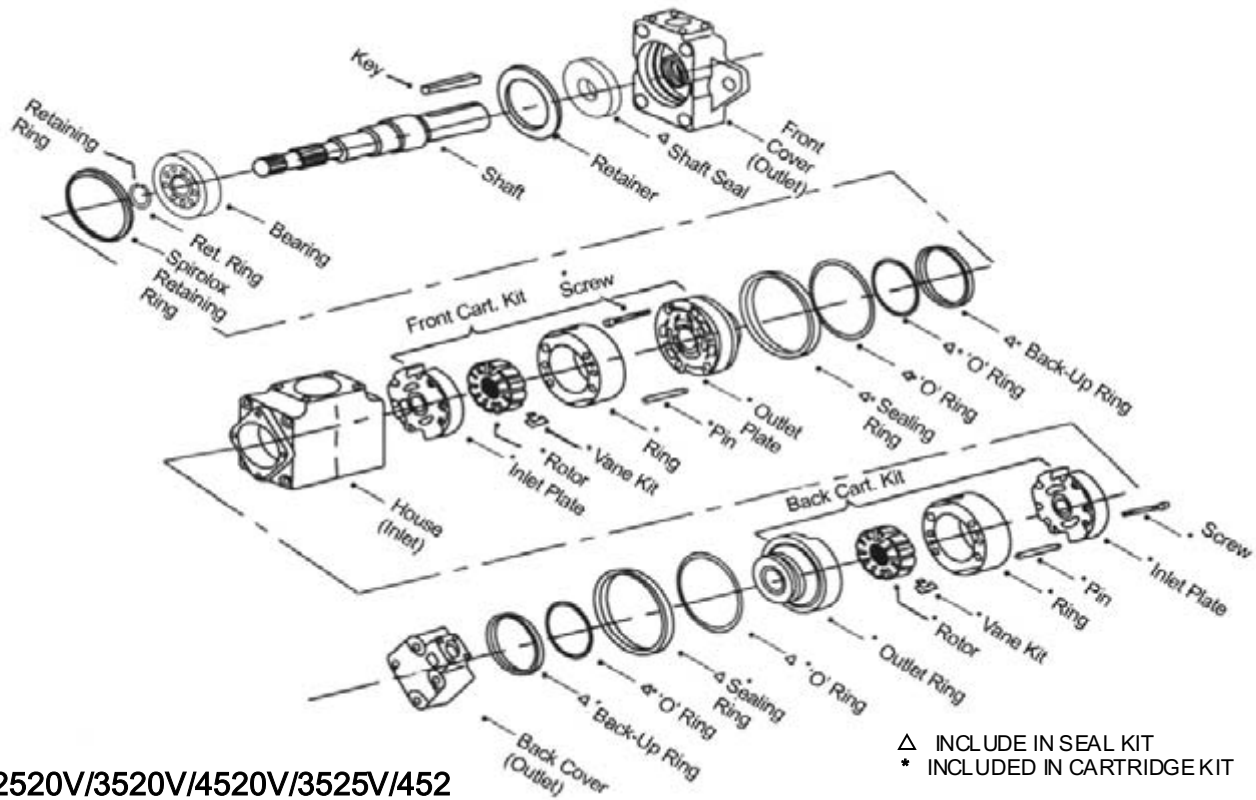
### Cartridge Kit Rotation

To change Cartridge Kit rotation, reverse the location of the inlet and the outlet support plates. Hand tighten the cartridge screws and use pump cover to align all the parts. Remove the cover and tighten the cartridge screws to the designated value. Sharp edge of vanes must lead in direction of rotation.

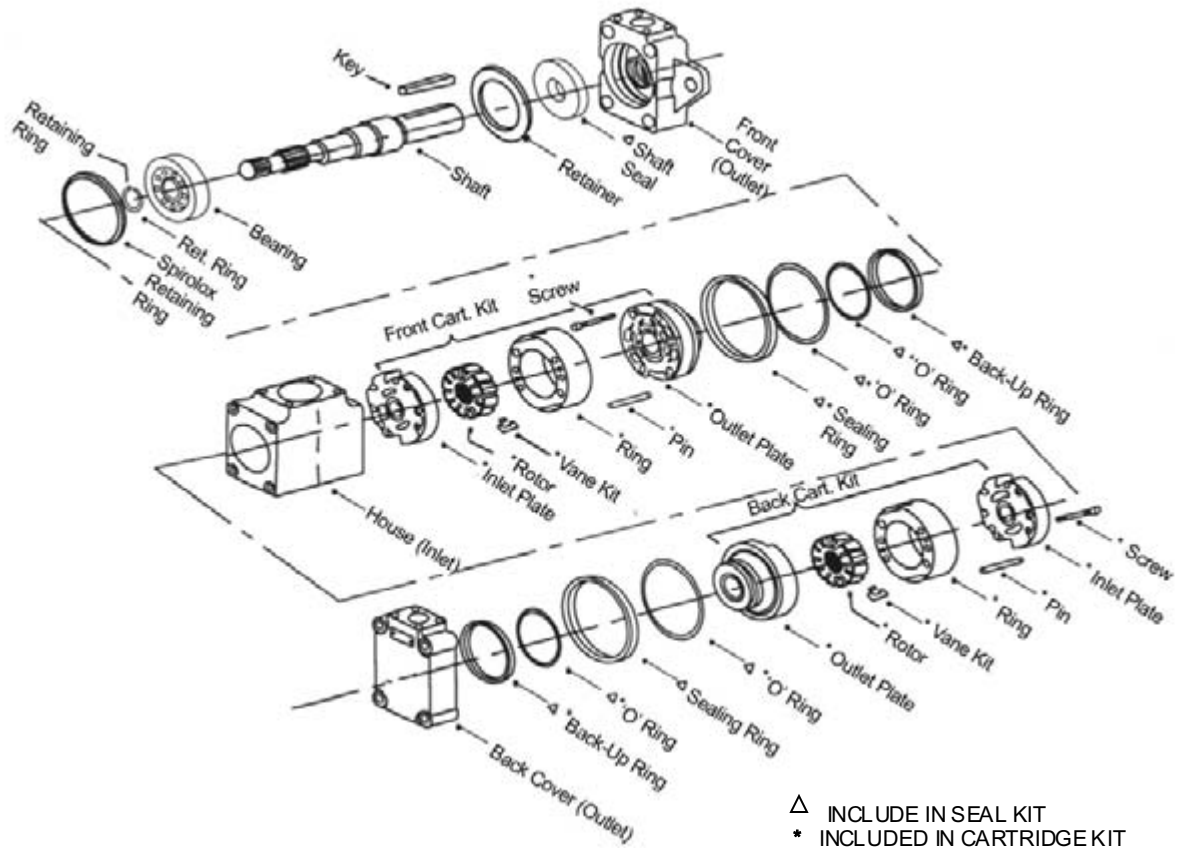
### Filtration

For satisfactory service life, use full flow filtration to provide fluid which meets ISO cleanliness code 16/13 or better.

# INDUSTRIAL DOUBLE VANE PUMP SERVICE PARTS INFORMATION



2520V/3520V/4520V/3525V/452



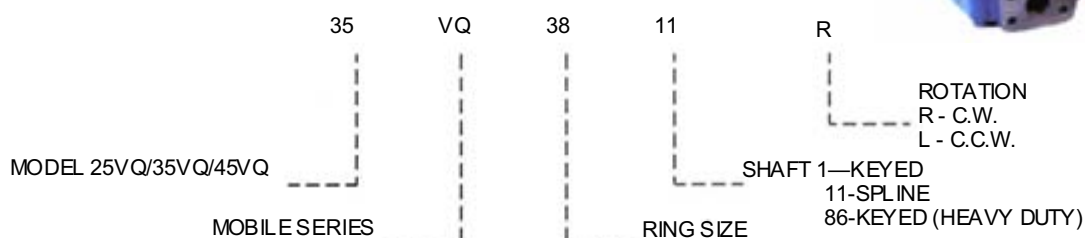
4535V

# HIGH PERFORMANCE MOBILE SINGLE INTRA-VANE PUMP

- High Volumetric Efficiency Operating Pressure
- High Operating Speeds
- Pressure Balanced Brass Flex Plates
- Versatile
- Compact
- Contaminant Tolerant



## Single Pump Ordering Specifica-



Values based on using anti-wear type petroleum oil 150 SUS at 100° F and 0 psi inlet pressure.

MODEL SERIES	FLOW IN GPM @ 1200 RPM & 100 PSI	DISPL. in <sup>3</sup> /r	MAXIMUM SPEED (RPM)	MAXIMUM PRESSURE (PSI)	TYPICAL DELIVERY GPM @ max. speed & pressure	TYPICAL INPUT POWER (HP) @ max. speed & pressure	WEIGHT (lbs.)
20VQ	5	1.10	2700	3000	11.0	24.0	26
	8	1.67	2700	3000	17.0	35.0	
	11	2.22	2700	3000	23.0	47.5	
	12	2.41	2700	2300	22.5	38.0	
	14	2.80	2700	2000	30.0	39.0	
25VQ	12	2.45	2700	3000	23.0	55.0	32
	14	2.77	2700	3000	27.0	62.5	
	17	3.37	2500	3000	31.0	69.5	
	19	3.72	2500	3000	35.0	76.0	
30VQ	24	4.70	2700	3000	23.0	55.0	36
	28	5.50	2500	3000	31.0	69.5	
35VQ	21	4.12	2500	3000	38.0	83.0	50
	25	4.98	2500	3000	45.0	101.0	
	30	5.96	2500	3000	55.0	117.5	
	35	6.88	2400	3000	60.0	132.0	
	38	7.42	2400	3000	65.0	140.0	
45VQ	42	8.46	2200	2500	66.5	122.5	75
	47	9.54	2200	2500	71.0	131.00	
	50	9.90	2200	2500	79.0	141.00	
	57	11.20	2200	2500	92.0	160.00	
	60	11.80	2200	2500	96.0	170.00	

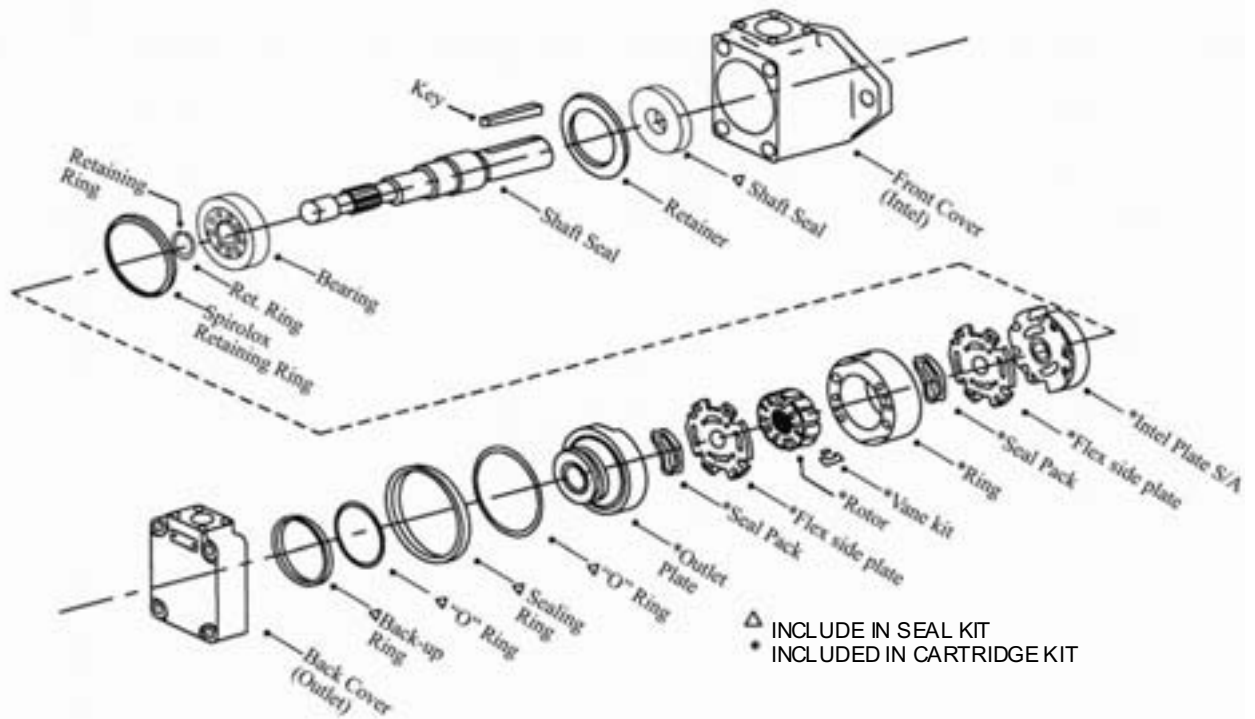
# HIGH PERFORMANCE MOBILE TANDEM INTRA-VANE PUMP

Performance Data- Typical Flows at 120° F, 10 W oil (128SUS), 0 PSI inlet Flow in Gallons per Minute (GPM)

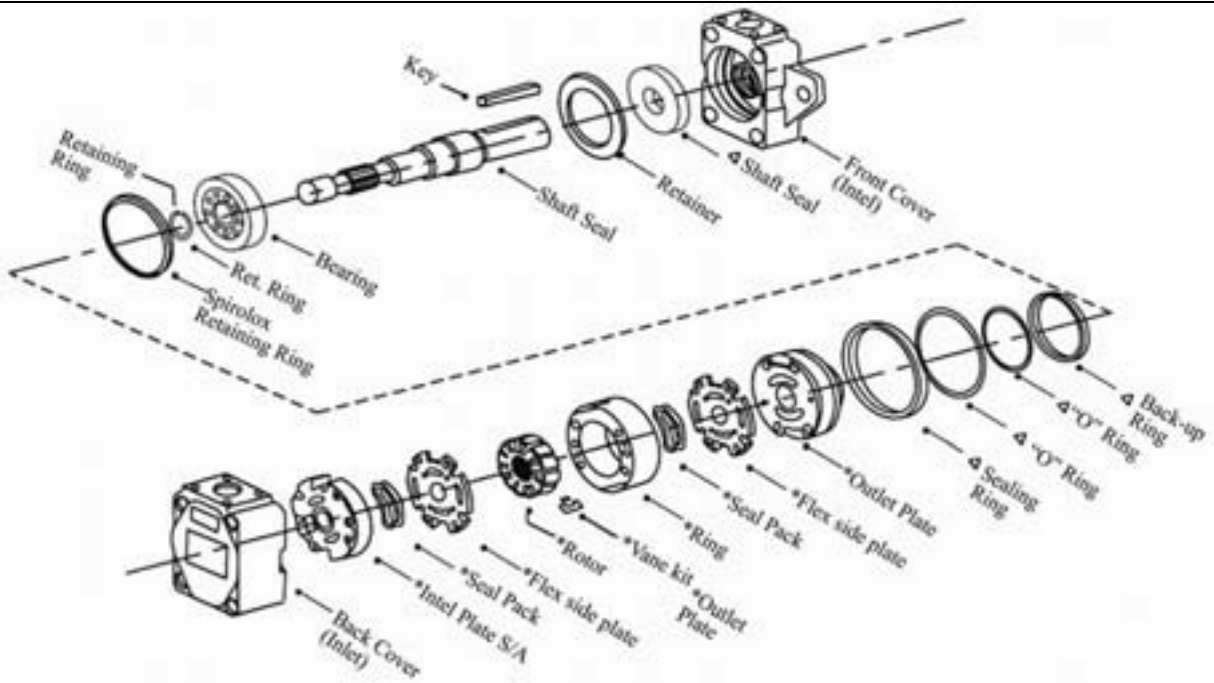
Pump Model	Displacement (in <sup>3</sup> /rev.)	R.P.M.	100 P.S.I. (INPUT H.P.)	1500 P.S.I. (INPUT H.P.)	3000 P.S.I. (INPUT H.P.)	
20 VQ	5 (1.10)	1200	5.0 (0.4)	4.3 (5.0)	4.0 (10.0)	
		1800	7.5 (1.5)	7.0 (8.5)	7.0 (16.5)	
		2400	10.0 (2.0)	10.2 (12.0)	9.5 (22.0)	
	8 (1.67)	1200	8.0 (1.0)	7.0 (8.0)	6.5 (16.5)	
		1800	12.0 (1.7)	11.5 (12.0)	10.5 (23.0)	
		2400	16.0 (2.8)	16.0 (17.0)	14.9 (32.0)	
	11 (2.22)	1200	11.0 (1.2)	9.8 (11.0)	8.5 (21.5)	
		1800	16.5 (2.8)	15.4 (18.0)	14.2 (31.0)	
		2400	22.0 (3.0)	21.0 (22.0)	20.0 (42.0)	
	12 (2.41)	1200	12.0 (1.5)	11.0 (12.5)	9.8 (22.0)	MAX. PSI 2300
		1800	18.0 (3.0)	17.2 (19.0)	16.0 (34.0)	
		2400	24.0 (3.0)	23.4 (23.5)	22.2 (45.0)	
14 (2.80)	1200	14.0 (2.0)	12.9 (13.5)	12.0 (27.5)	MAX. PSI 2200	
	1800	21.0 (3.0)	18.5 (20.0)	19.0 (39.5)		
	2400	28.0 (3.5)	27.0 (27.0)	26.4 (52.5)		
25 VQ	12 (2.47)	1200	12.0 (1.0)	9.5 (12.0)	7.5 (24.0)	
		1800	18.0 (2.5)	16.0 (17.0)	13.5 (35.0)	
		2400	24.0 (3.0)	22.5 (24.0)	20.0 (46.0)	
	14 (2.77)	1200	14.0 (2.0)	11.5 (13.5)	9.5 (26.5)	
		1800	21.0 (3.0)	18.0 (20.0)	16.0 (39.0)	
		2400	28.0 (3.5)	25.0 (25.0)	23.0 (52.0)	
	17 (3.37)	1200	17.0 (2.0)	14.0 (16.5)	12.0 (32.0)	
		1800	25.5 (3.0)	22.0 (24.0)	20.0 (47.0)	
		2400	34.0 (3.5)	31.0 (32.0)	29.0 (62.0)	
	19 (3.72)	1200	19.0 (3.0)	17.0 (20.0)	15.0 (39.0)	
		1800	28.5 (3.5)	25.5 (28.0)	24.0 (58.0)	
		2400	38.0 (4.5)	35.0 (36.0)	32.0 (70.0)	
21 (4.12)	1200	21.0 (2.0)	17.5 (20.0)	15.5 (39.0)		
	1800	31.5 (3.8)	28.0 (29.0)	25.5 (59.0)		
	2400	42.0 (4.5)	39.0 (39.0)	36.5 (76.0)		
30 VQ	24 (4.70)	1200	24.0 (2.2)	21.0 (22.0)	19.0 (46.0)	
		1800	36.0 (3.3)	33.0 (33.0)	31.5 (71.0)	
		2400	48.0 (4.4)	45.0 (47.0)	42.5 (95.0)	
	28 (5.50)	1200	28.0 (2.6)	26.0 (22.0)	23.5 (58.0)	
		1800	42.0 (5.0)	39.0 (33.0)	37.5 (77.0)	
		2400	56.0 (6.5)	52.5 (47.0)	49.5 (98.0)	
35 VQ	21 (4.12)	1200	21.0 (2.0)	17.5 (20.0)	15.5 (39.0)	
		1800	31.5 (3.8)	28.0 (29.0)	25.5 (59.0)	
		2400	42.0 (4.5)	39.0 (39.0)	36.5 (76.0)	
	25 (4.94)	1200	25.0 (2.5)	20.5 (23.0)	17.5 (46.0)	
		1800	37.0 (4.0)	33.5 (36.0)	30.0 (69.0)	
		2400	50.0 (4.5)	42.0 (46.5)	42.5 (92.0)	
	30 (5.96)	1200	30.0 (4.0)	25.0 (28.5)	25.5 (56.0)	
		1800	45.0 (5.0)	40.0 (43.0)	37.0 (82.0)	
		2400	60.0 (6.0)	55.0 (56.0)	52.5 (110.0)	
	35 (6.88)	1200	35.0 (4.0)	29.0 (33.0)	25.0 (67.0)	
		1800	52.5 (5.0)	46.0 (51.0)	42.0 (95.0)	
		2400	70.0 (5.5)	62.5 (64.0)	60.0 (125.0)	
38 (7.42)	1200	38.0 (4.5)	32.0 (35.5)	29.0 (69.0)		
	1800	57.0 (5.5)	50.5 (52.0)	47.0 (102.0)		
	2400	76.5 (6.0)	68.0 (69.0)	65.0 (136.0)		
45 VQ	42 (8.46)	1200	42.0 (4.0)	34.5 (39.5)	30.0 (68.0)	
		1800	63.0 (60.0)	56.5 (58.0)	52.0 (104.0)	
		2400	77.0 (7.0)	70.5 (72.0)	66.5 (123.0)	
	47 (9.45)	1200	47.0 (4.0)	39.0 (22.0)	34.0 (46.0)	
		1800	70.0 (5.0)	64.0 (33.0)	60.5 (71.0)	
		2400	94.0 (9.0)	86.0 (47.0)	80.5 (95.0)	
	50 (9.90)	1200	50.0 (4.0)	42.0 (48.0)	38.5 (78.0)	
		1800	75.0 (6.0)	65.5 (70.0)	62.0 (116.0)	
		2400	91.5 (8.0)	81.5 (86.0)	79.0 (141.0)	
	57 (11.20)	1200	57.0 (5.0)	49.0 (22.0)	45.5 (92.0)	
		1800	85.5 (7.5)	76.5 (33.0)	71.5 (125.0)	
		2400	104.5 (8.0)	94.5 (47.0)	89.5 (160.0)	
	60 (11.80)	1200	60.0 (5.5)	51.0 (55.0)	47.0 (94.0)	MAX. PSI 2500
		1800	90.0 (7.0)	80.0 (82.0)	75.5 (138.0)	
		2400	110.0 (8.5)	99.0 (101.0)	96.0 (170.0)	



# MOBILE SINGLE VANE PUMP SERVICE PARTS INFORMATION



20VQ



25VQ/30VQ/35VQ/45VQ

# MOBILE SINGLE VANE PUMP SERVICE PARTS INFORMATION

## Cartridge Chart

PUMP	CARTRIDGE KITS	ROTOR	VANE	RING	FLEX PLATE	INLET PLATE	OUTLET PLATE	SHAFTS	
20VQ	5 497115	402690	922741	333624	416423	419502	497134	1 151	497109 497113
	8 497118			333625					
	11 497120	403539	922743	333626		419501			
	12 497121			353901					
	14 497122			353902					
25VQ	12 416439	270597	922710	326984	923956	430805	419079	1 3 11 25 127	238755 242747 238929 270187 424457
	14 416440			326985					
	17 416441			326986					
	19 421232			326987					
	21 416442			326988					
30VQ	24 417052	262152	922642	234470	923956	430805	419079	SAME AS 25VQ	
	28 416452			224525					
35VQ	21 413420	262154	922700	394961	923953	430806	412003	1 11 19	233624 242287 275270
	25 413421			319396					
	30 413422			319397					
	35 413418			319398					
	38 413419			319399					
45VQ	42 416435	283271	922701	297510	923954	430807	415382	1 11 19	233369 242885 265575
	47 421234			297718					
	50 416436			297502					
	57 421233			306772					
	60 416437			297503					

PUMP SE	BUNA SEAL KIT	VITON SEAL KIT	BUNA SHAFT SEAL	VITON SHAFT SEAL	SECONDARY SHAFT SEAL	BEARING	FRONT COVER	BACK COVER
20VQ	497123	451471	394976	429286	429283	001704	02-102335	250824
25VQ	920021	920023	394976	429286	429283	1705	942353	224309
30VQ	920021	920023	394976	429286	429283	1705	942354	224526
35VQ	920015	920029	394973	429284	429281	38441	942355	234248
45VQ	920025	920027	394974	429282	429285	131812	942356	229633

## Bolt Torques

PUMP	COVER BOLT ( FT. LB. )	CARTRIDGE KIT ( IN. LB. )
20VQ	50	30
25VQ	50	45
30VQ	50	45
35VQ	100	100
45VQ	100	105

### Cartridge Kit Rotation

To change Cartridge Kit rotation, reverse the location of the inlet and the outlet support plates. Hand tighten the cartridge screws and use pump cover to align all the parts. Remove the cover and tighten the cartridge screws to the designated value. Sharp edge of vanes must lead in direction of rotation.

### Filtration

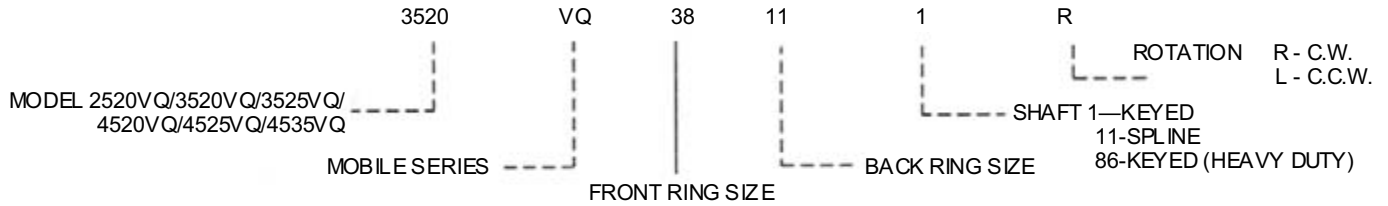
For satisfactory service life, use full flow filtration to provide fluid which meets ISO cleanliness code 16/13 or better.

# HIGH PERFORMANCE MOBILE TANDEM INTRA-VANE PUMP

- Maximum 3000 psi Operating Pressure
- High Operating Speeds
- Pressure Balanced Brass Flex Plates
- Versatile
- Compact
- Contaminant Tolerant



## Double Pump Ordering Specifications

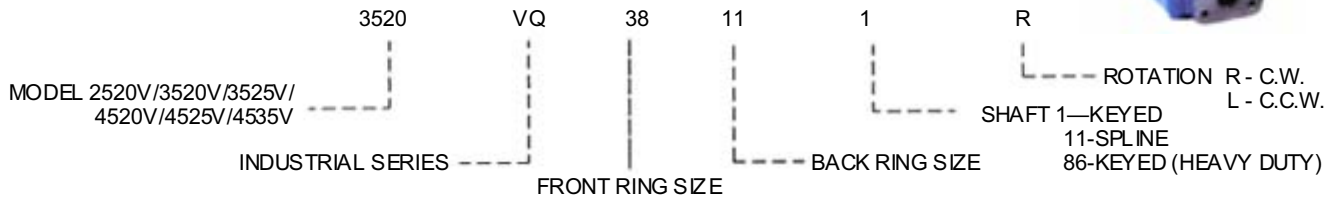


Values based on using anti-wear type petroleum oil 150 SUS at 100° F and 0 PSI inlet pressure

Series	GPM Shaft End Pump	Displacement Cu. Inches/Rev	Max RPM	Min PSI	Typical Delivery GPM at Max. Speed & Pressure	Typical Input HP at Max Speed & Pressure	GPM Shaft End Pump	Displacement Cu. Inches/Rev	Max RPM	Min PSI	Typical Delivery GPM at Max Speed & Pressure	Typical Input HP at Max Speed & Pressure	Weight in Lbs.
2520VQ	12	2.45	2700	3000	23.0	55.0	5	1.10	2700	3000	11.0	24.0	45
	14	2.76	2700	3000	27.0	62.5	8	1.67	2700	3000	17.0	35.0	
	17	3.37	2500	3000	31.0	69.5	11	2.22	2700	3000	23.0	47.5	
	19	3.72	2500	3000	38.0	76.0	12	2.41	2700	2300	25.5	38.0	
3520VQ	21	4.12	2500	3000	38.0	83.0	5	1.10	2500	3000	10.0	22.0	75
	25	4.98	2500	3000	45.0	101.0	8	1.67	2500	3000	16.0	32.5	
	30	5.96	2500	3000	55.0	117.5	11	2.22	2500	3000	21.0	44.0	
	35	6.88	2400	3000	60.0	132.0	12	2.41	2500	2300	23.5	35.0	
3525VQ	21	4.12	2500	3000	38.0	83.0	12	2.45	2500	3000	21.0	51.0	76
	25	4.98	2500	3000	45.0	101.0	14	2.76	2500	3000	24.0	58.0	
	30	5.96	2500	3000	55.0	117.5	17	3.37	2500	3000	31.0	69.0	
	35	6.88	2400	3000	60.0	132.0	21	4.12	2500	3000	38.0	83.0	
4520VQ	42	8.46	2200	2500	66.5	122.5	5	1.10	2200	3000	8.50	19.5	94
	47	9.54	2200	2500	71.0	131.0	8	1.67	2200	3000	13.5	28.5	
	50	9.90	2200	2500	79.0	141.0	11	2.22	2200	3000	18.0	38.5	
	57	11.20	2200	2500	92.0	160.0	12	2.41	2200	2300	20.5	31.0	
4525VQ	42	8.46	2200	2500	66.5	122.5	12	2.45	2200	3000	18.0	44.0	101
	47	9.54	2200	2500	71.0	131.0	14	2.76	2200	3000	21.0	51.0	
	50	9.90	2200	2500	79.0	141.0	17	3.37	2200	3000	26.5	61.0	
	57	11.20	2200	2500	92.0	160.0	21	4.12	2200	300	33.0	73.0	
4535VQ	42	8.41	2200	2500	66.5	122.5	21	4.12	2200	3000	33.0	73.0	118
	47	9.54	2200	2500	71.0	131.0	25	4.98	2200	3000	38.5	89.0	
	50	9.85	2200	2500	79.0	141.0	30	5.96	2200	3000	47.0	104	
	57	11.20	2200	2500	92.0	160.0	35	6.88	2200	3000	55.0	120	
4535VQ	60	11.75	2200	2500	96.0	170.0	38	7.42	2200	3000	59.0	130	118

# TADEM INTRA-VANE PUMP

- Maximum 3000 psi Operating Pressure
- Twelve Vane Design for Quiet Operation
- Hydraulically Balanced for Extended Life
- Versatile
- Compact



Values based on using anti-wear type petroleum oil 150 SUS at 100° F and 0 PSI inlet pressure.

Series	GPM Shaft End Pump	Displacement Cu. Inches/Rev	Max RPM	Min PSI	Typical Delivery GPM at Max. Speed & Pressure	Typical Input HP at Max Speed & Pressure	GPM Shaft End Pump	Displacement Cu. Inches/Rev	Max RPM	Min PSI	Typical Delivery GPM at Max Speed & Pressure	Typical Input HP at Max Speed & Pressure	Weight In Lbs.
2520V	12	2.47	1800	2500	16.4	30.75	5	1.10	1800	3000	7.2	17.00	45
	14	2.78	1800	2500	18.4	34.50	8	1.67	1800	3000	11.1	25.00	
	17	3.39	1800	2500	22.8	35.80	11	2.22	1800	3000	13.1	34.00	
	21	4.13	1800	2500	28.8	31.00	12	2.41	1800	2500	17.4	29.75	
							14	2.78	1800	2000	18.6	34.50	
3520V	21	4.13	1800	2500	28.8	31.00	5	1.10	1800	3000	7.20	17.00	72
	25	4.94	1800	2500	33.9	61.00	8	1.67	1800	3000	11.1	25.00	
	30	5.91	1800	2500	40.8	73.00	11	2.22	1800	3000	13.1	34.00	
	35	6.83	1800	2500	48.0	82.40	12	2.41	1800	2500	17.4	29.75	
	38	7.37	1800	2500	51.2	88.30	14	2.78	1800	2500	18.6	34.50	
3525V	21	4.13	1800	2500	28.8	31.00							76
	25	4.94	1800	2500	33.9	61.00	12	2.41	1800	2500	16.0	30.75	
	30	5.91	1800	2500	40.8	73.00	14	2.81	1800	2500	18.6	34.50	
	35	6.83	1800	2500	48.0	82.40	17	3.39	1800	2500	22.5	35.80	
	38	7.37	1800	2500	51.2	88.30	21	4.13	1800	2500	27.5	45.60	
4520V	42	8.41	1800	2500	55.0	101.00	5	1.10	1800	3000	7.2	17.00	94
	50	9.85	1800	2500	57.0	110.00	8	1.67	1800	3000	11.1	25.00	
	60	11.75	1800	2500	67.0	117.00	11	2.22	1800	3000	13.1	34.00	
							12	2.41	1800	2500	17.4	29.75	
							14	2.78	1800	2500	18.4	34.50	
4525V	42	8.41	1800	2500	55.0	101.00	12	2.47	1800	2500	16.4	30.75	101
	50	9.85	1800	2500	57.0	110.00	14	2.78	1800	2500	18.4	34.50	
	60	11.75	1800	2500	67.0	117.00	17	3.39	1800	2500	22.8	35.80	
							21	4.13	1800	2500	27.5	45.60	
4535V	42	8.41	1800	2500	55.0	101.00	21	4.13	1800	2500	28.8	31.00	118
	50	9.85	1800	2500	57.0	110.00	25	4.94	1800	2500	33.9	61.00	
	60	11.75	1800	2500	67.0	117.00	30	5.19	1800	2500	40.8	73.00	
							35	6.83	1800	2500	48.0	82.40	
							38	7.37	1800	2500	51.2	88.30	

## Cartridge Chart

PUMP	FRONT CARTRIDGE KIT	ROTOR	VANE	RING	FLEX PLATE	REAR CARTRIDGE KIT	ROTOR	VANE	RING	FLEX PLATE	SHAFTS		
2520VQ	12 416439	270597	922710	326984	923956	2 417052	402690	922741	388683	923955	1 254964		
	14 416440			326985		5 417053			333624		11 254848		
	17 416441			326986		8 417054			333625		25 293360		
	19 421232			326987		9 423096			374799				
	21 416442			326988		11 416427			403539		922743	333626	
						12 416428						353901	
		14 416429			353902								
3520VQ	21 413420	262154	922700	394961	923953	2 417052	402690	922741	388683	923955	1 258249		
	25 413421			319396		5 417053			333624		11 254848		
	30 413422			319397		8 417054			333625		86 394517		
	35 413418			319398		9 423096			374799		113 413022		
	38 413419			319399		11 416427			403539		922743	333626	114 413434
						12 416428						353901	
		14 416429			353902								
3525VQ	21 413420	262154	922700	394961	923953	12 421244	270597	922710	326984	923956	1 243448		
	25 413421			319396		14 421235			326985		11 243449		
	30 413422			319397		17 421236			326986		19 247019		
	35 413418			319398							111 413023		
	38 413419			319399									
4520VQ	42 416435	283871	922701	297510	923954	2 417052	402690	922741	388683	923955	1 255533		
	47 421234			297718		5 417053			333624		11 255536		
	50 416436			297502		8 417054			333625		86 361761		
	57 421233			306772		9 423096			374799		114 413436		
	60 416437			297503		11 416427			403539		922743	333626	
						12 416428						353901	
		14 416429			353902								
4525VQ	42 416435	283871	922701	297510	923954	12 421244	270597	922710	326984	923956	1 233524		
	47 421234			297718		14 421235			326985		11 233527		
	50 416436			297502		17 421236			326986		86 361762		
	57 421233			306772		21 421238			326988		114 413024		
	60 416437			297503									
4535VQ	42 416435	238871	922701	297510	923954	21 421239	262154	922700	394961	923953	1 289083		
	47 421234			297718		25 421240			319396		11 289084		
	50 416436			297502		30 421241			319397		86 361763		
	57 421233			306772		35 421242			319398		114 413027		
	60 416437			297503		38 421243			319399				

PUMP	BUNA SEAL KIT	VITON SEAL KIT	BUNA SHAFT SEAL	VITON SHAFT SEAL	SECONDARY SHAFT SEAL	BEARING	FRONT COVER	MIDDLE COVER	BACK COVER
2520VQ	920040	920042	394976	429286	429283	001705	942353	251263	250824
3520VQ	920048	920050	394973	429284	429281	038441	942355	250818	250824
3525VQ	920056	920058	394973	429284	429281	038441	942355	230189	231532
4520VQ	920060	920062	394974	429285	429282	131812	942356	252283	250824
4525VQ	920068	920070	394974	429285	429282	131812	942356	370071	231532
4535VQ	920072	920074	394974	429285	429282	131812	942356	270640	270679

## Bolt Torques

	2520VQ	3520VQ	3525VQ	4520VQ	4525VQ	4535VQ
FRONT HOUSING FT. LB.	75	150	150	275	275	275
REAR COVER FT. LB.	50	50	75	50	75	n/a
FRONT C. KIT IN. LB.	45	100	100	105	105	105
BACK C. KIT IN. LB.	30	30	45	30	45	100

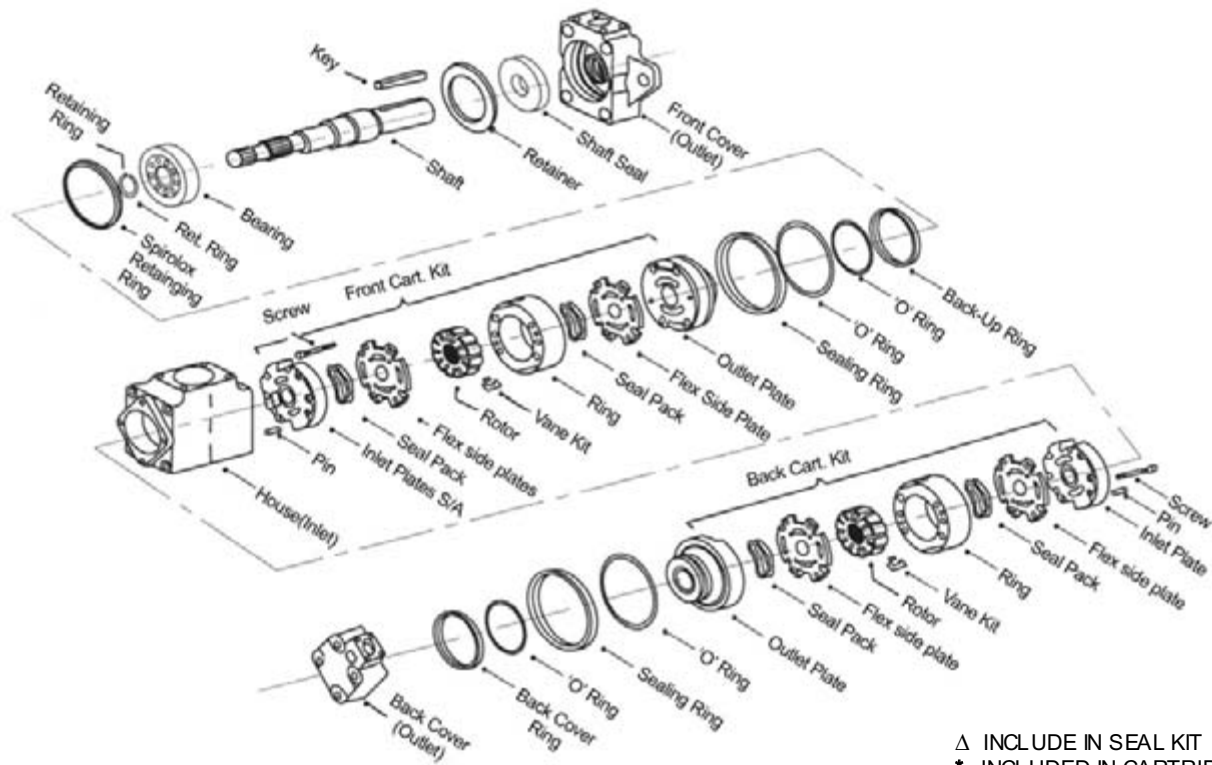
### Cartridge Kit Rotation

To change Cartridge Kit rotation, reverse the location of the inlet and the outlet support plates. Hand tighten the cartridge screws and use pump cover to align all the parts. Remove the cover and tighten the cartridge screws to the designated value. Sharp edge of vanes must lead in direction of rotation.

### Filtration

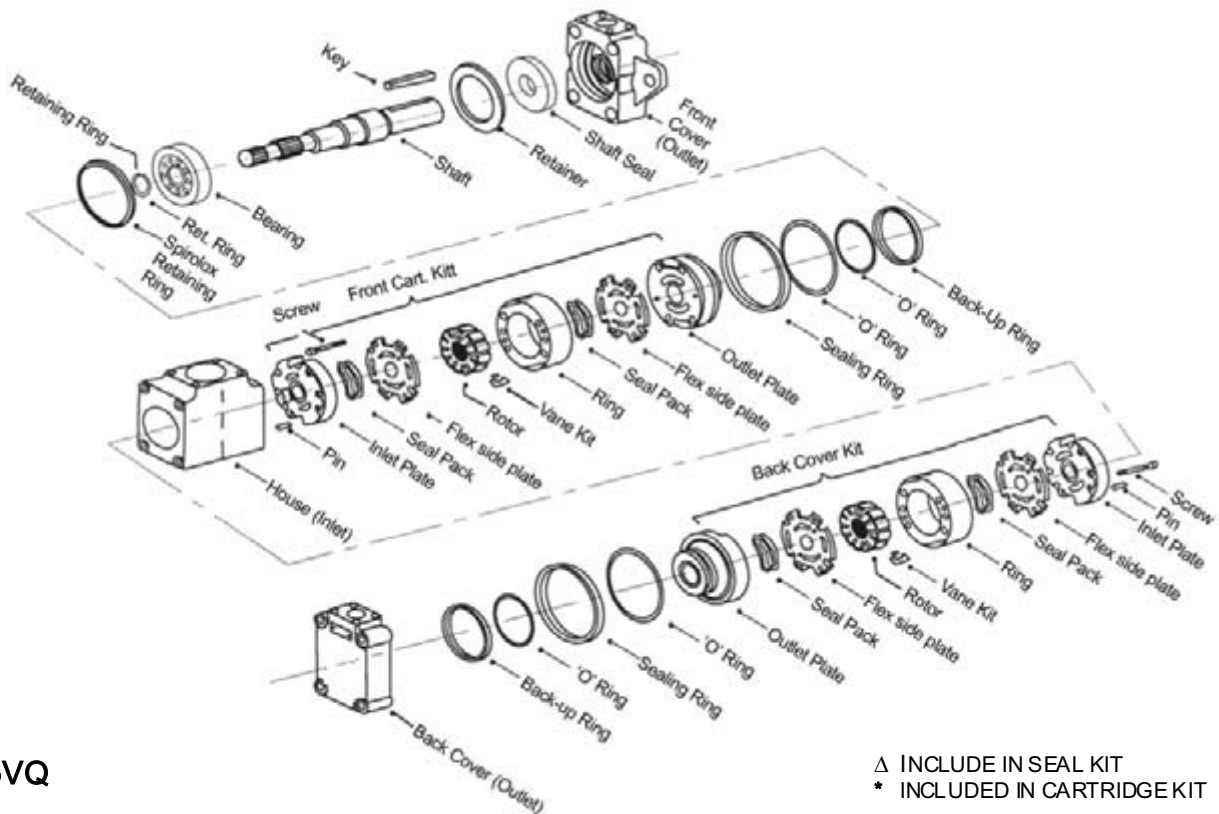
For satisfactory service life, use full flow filtration to provide fluid which meets ISO cleanliness code 16/13 or better.

# MOBILE DOUBLE VANE PUMP SERVICE PARTS INFORMATION



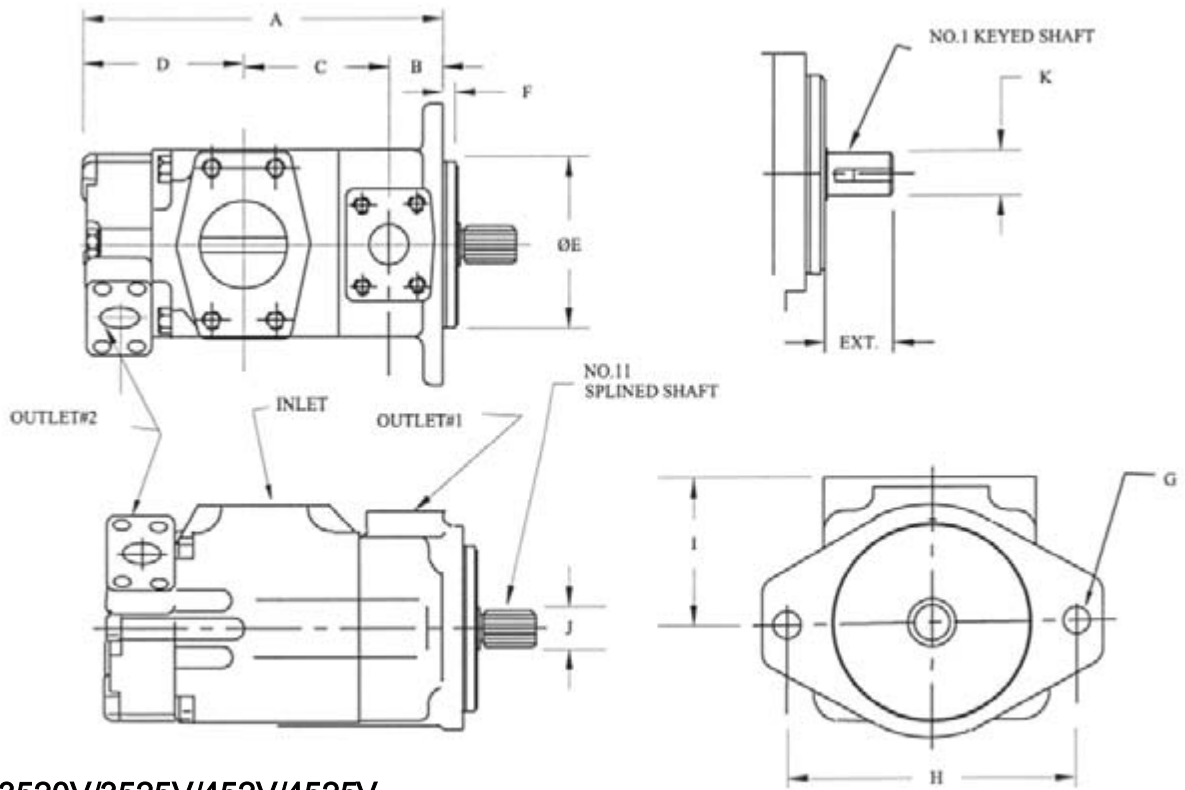
Δ INCLUDE IN SEAL KIT  
 \* INCLUDED IN CARTRIDGE KIT

2520VQ/3520VQ/4520VQ/3525VQ/4525VQ

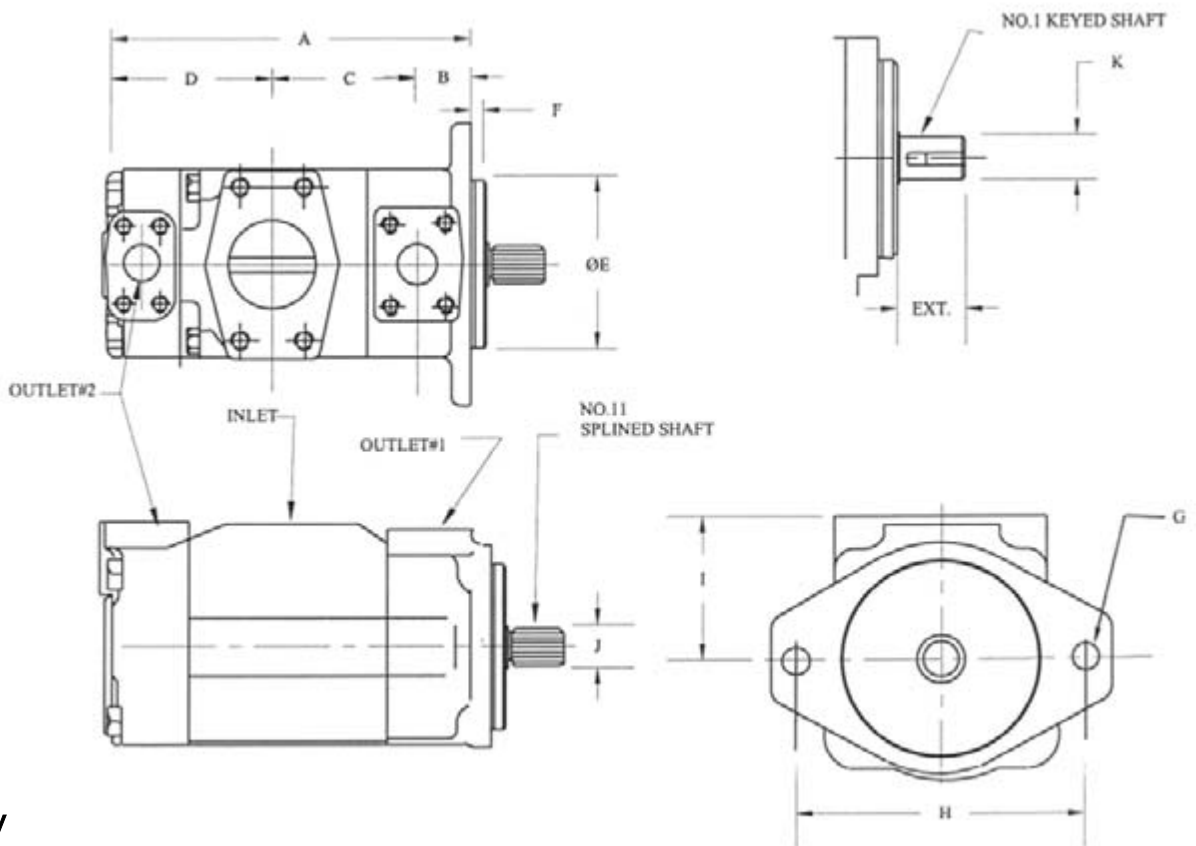


Δ INCLUDE IN SEAL KIT  
 \* INCLUDED IN CARTRIDGE KIT

4535VQ

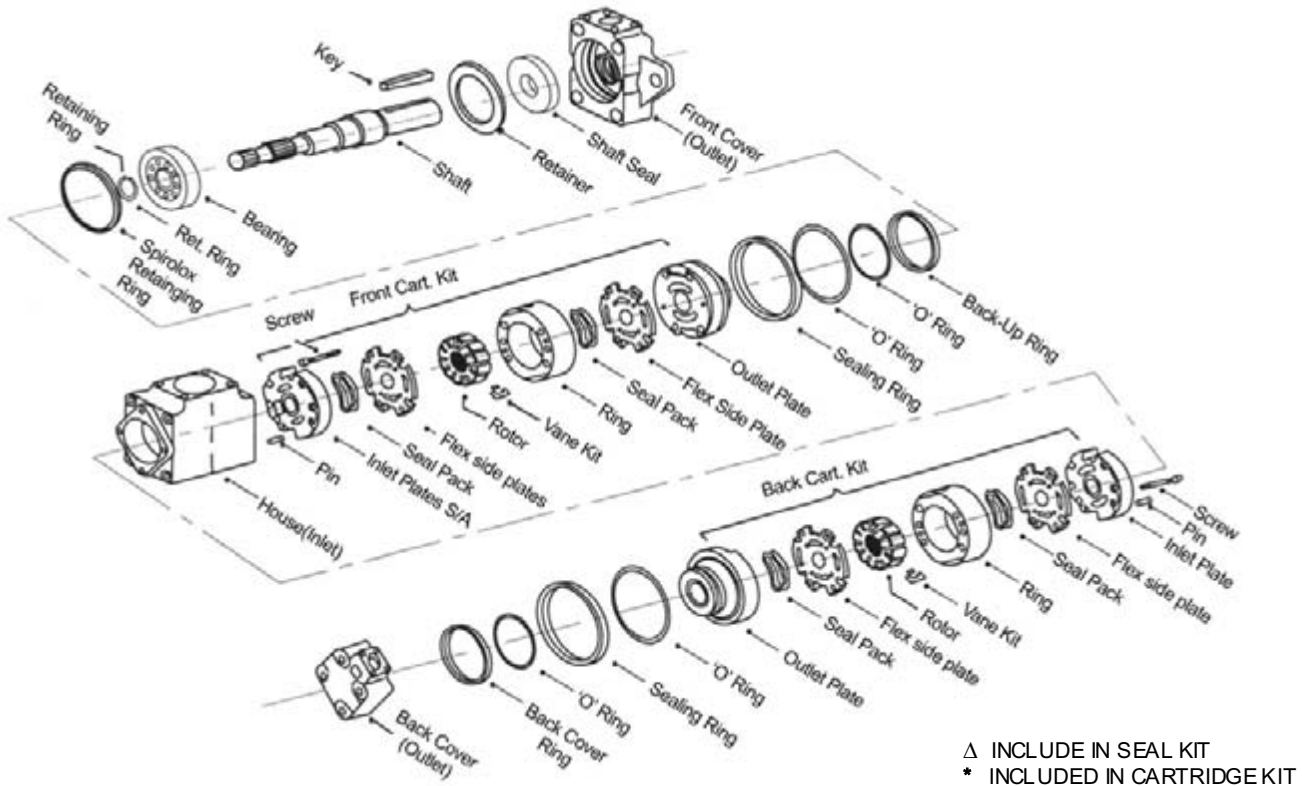


250V/3520V/3525V/452V/4525V

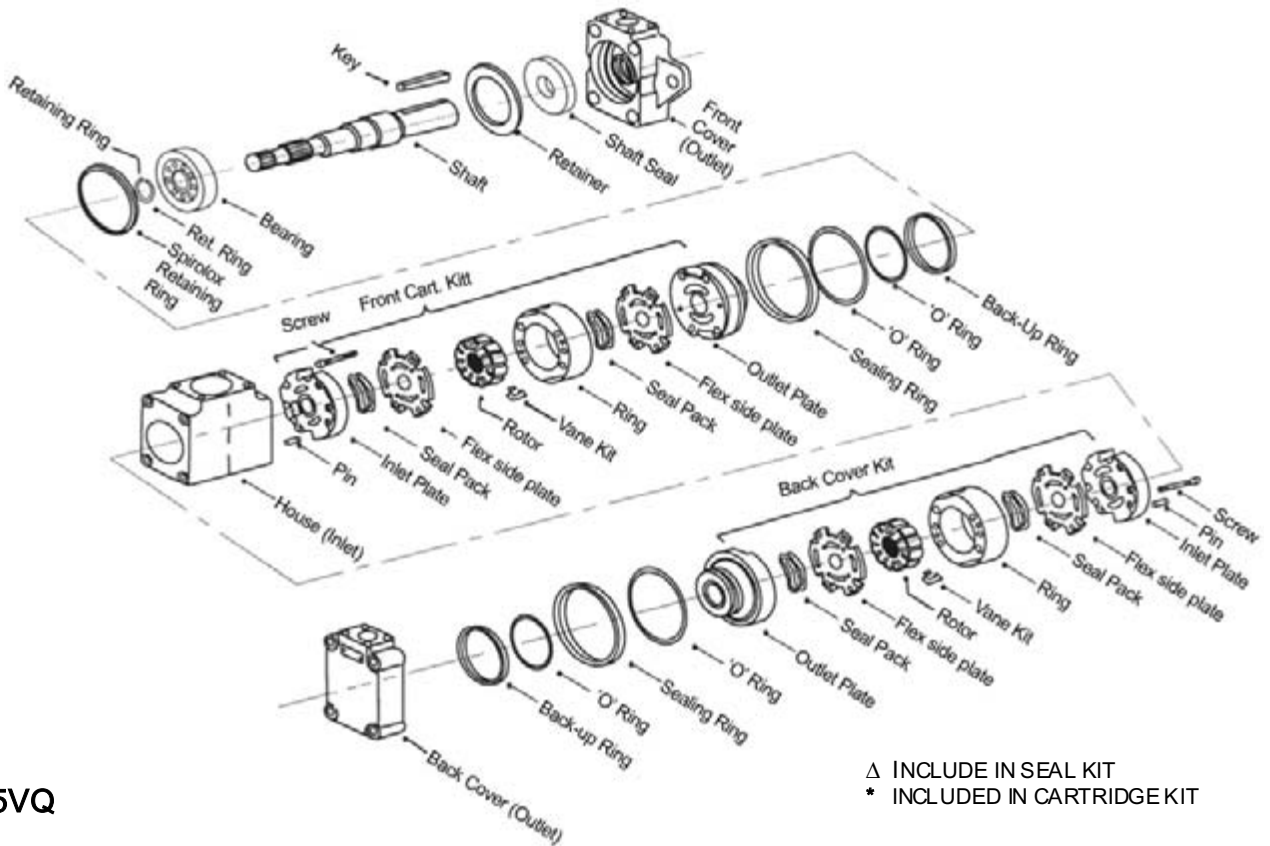


4535V

# MOBILE DOUBLE VANE PUMP SERVICE PARTS INFORMATION



2520VQ/3520VQ/4520VQ/3525VQ/4525VQ



4535VQ



# METARIS HIGH PRESSURE 32 SERIES PUMPS & CARTRIDGE KITS

Size	GPM @ 1200 rpm @ 100 psi	Displ. Cm <sup>3</sup> /R (IN <sup>3</sup> /R)	Max R.P. Min.	Max Continuous Bar (psi)	Max Peak Bar (psi)
35VQH	30	97,7 (5.96)	2500	228 (3300)	248 (3600)
	35	112,8 (6.88)	2400	228 (3300)	248 (3600)
	38	121,6 (7.42)	2400	228 (3300)	248 (3600)
45VQH	50	162,3 (9.90)	2200	228 (3300)	248 (3600)
	57	190,2 (11.61)	2200	228 (3300)	248 (3600)
	60	193,4 (11.80)	2200	207 (3000)	248 (3600)

Metaris VQH cartridge kits employ a new 2-piece rotor design as well as hardened Cam Ring and Vanes that improve efficiency and pressure capability. All pumps are supplied with ductile iron housing assemblies.

Pump Model
35VQH
45VQH
3520 VQH
3525 VQH
4520VQH
4525 VQH
4535 VQH
3520 VQHV 10
3525 VQHV 10/V20
4520VQHV10/V20
4525 VQHV 10/V20
4535 VQHV 10/V20

OEM Parts (Partial Listing)
6E666
6E2387
6E2369
6E6659
6E2063
104-3128
121-2501
100-2870
100-2961
133-2176
136-4815
150-6721
154-6632
162-9246

Cartridge Sizes
45VQH50/57/60GPM
35VQH30/35/38GPM



To identify properly cartridge and pump, use the 3 following pages as follows:

### *Dimensions and Flow*

Find out pump type and flow in the dimensions chart, look the figure engraved on the ring as shown (gallons/min. at 1200rpm).

### *Support Bushing and Shaft Rotation*

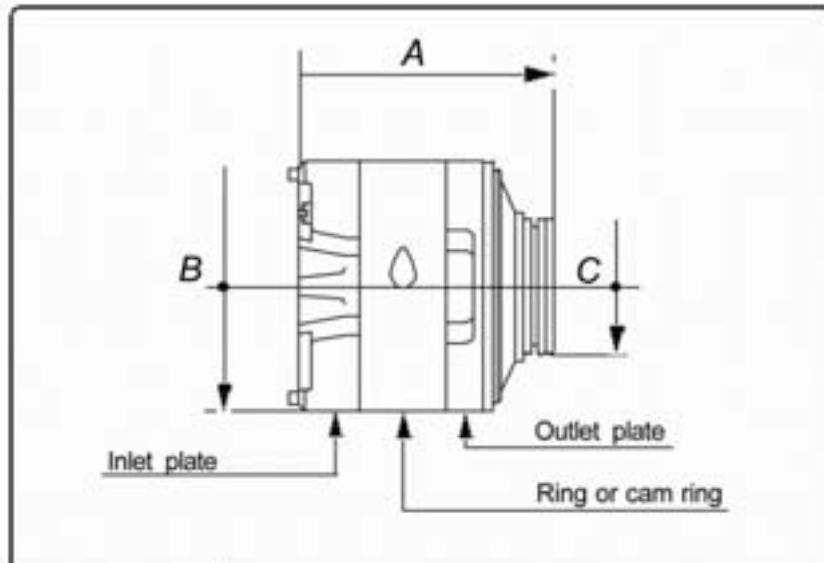
Locate support bushing to know whether the cartridge belongs to a single or double pump. On this page there are also some clues to identify shaft rotation.



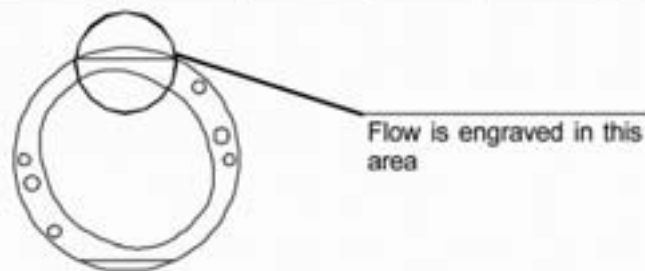
## **VQ Cartridge Kit**



## **V Cartridge Kit**



DIMENSIONS in mm.	PUMP TYPE				
	20V	25V	30V	35V	45V
<b>A</b>	81,8	99,5	110,5	118,4	140,5
<b>B</b>	82,6	96,8	96,8	114,25	133,3
<b>C</b>	47,15	52,15	52,15	72,15	80,15
<b>WEIGHT</b> aprox. in Kg.	2,300	3,800	4,100	6,400	10,200
<b>FLOW</b> in Gal. at 1.200 rpm	2	8	24	21	42
	5	12	28	25	47
	8	14		30	50
	9	17		35	57
	11	19		38	60
	12	21			
	14				

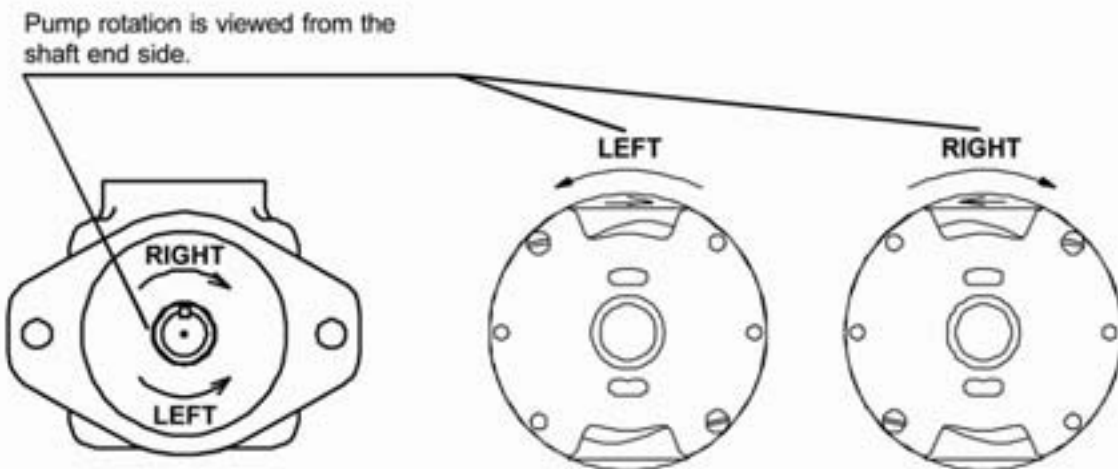
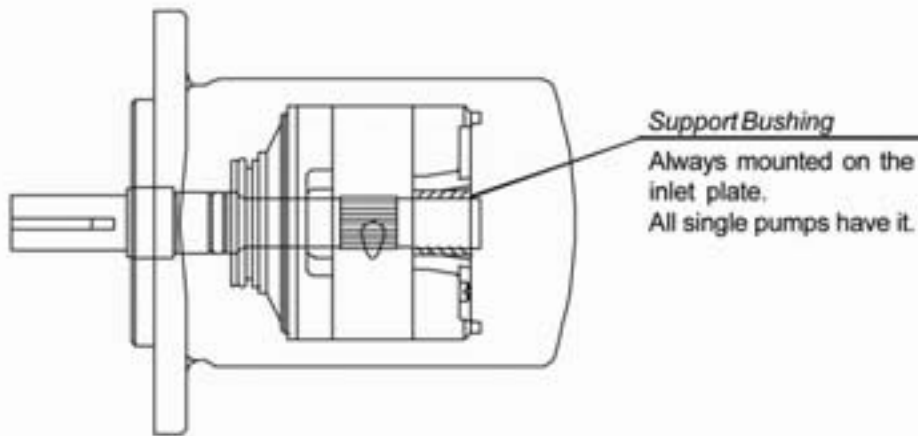


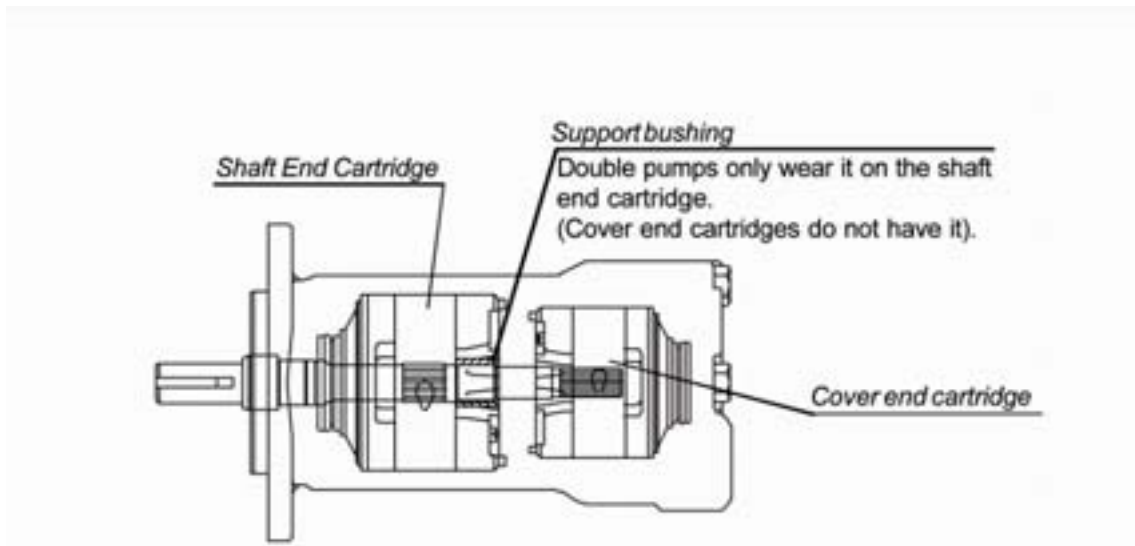
## PUM P R O T A T I O N

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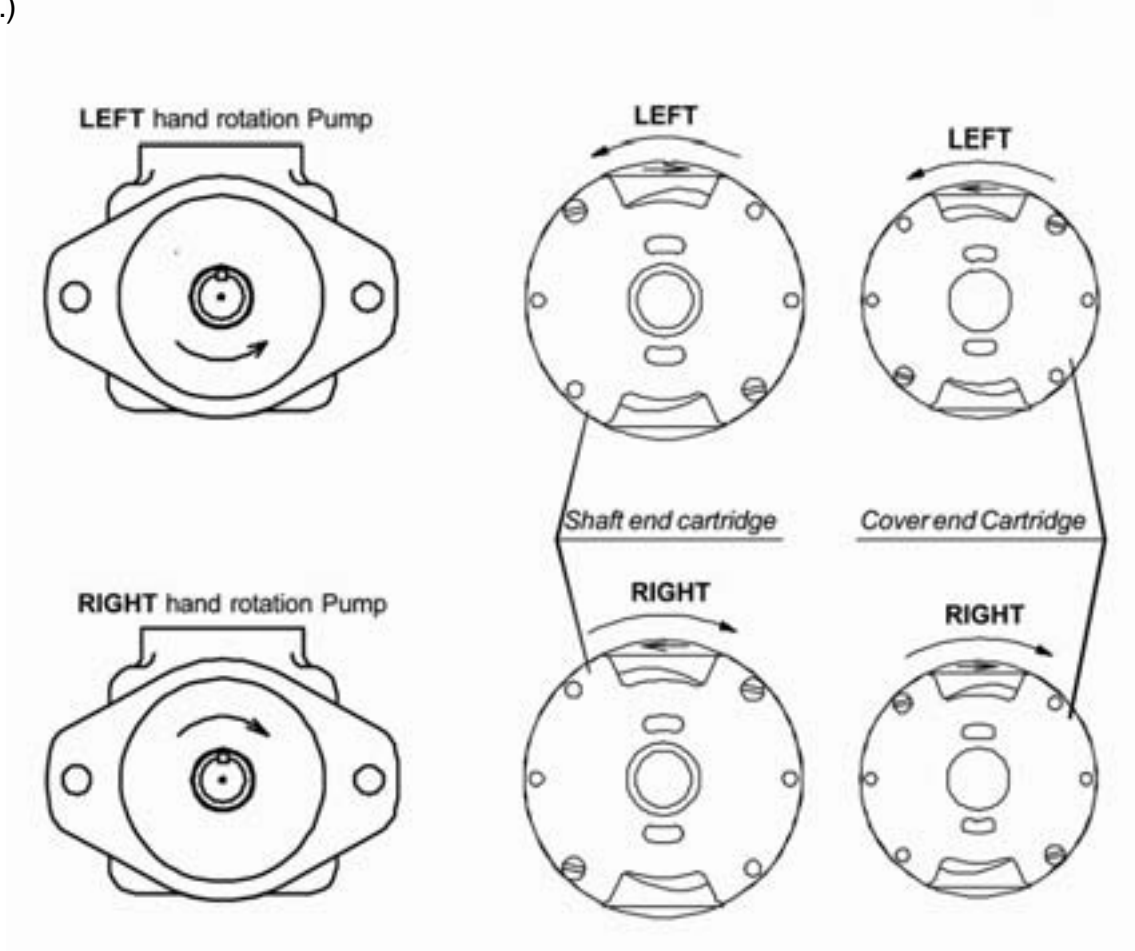
To determine pump rotation look at it from the shaft end side. So, if clockwise it is right hand rotation, on the contrary, it is left hand rotation.

When taking out cartridge and putting it on to the outlet plate take into account that rotation is seen on the other way round; an arrow engraved in the ring or cam ring shows the real turning sense. (See pictures).





Double pump special feature is that their 2 cartridges are opposite to each other, therefore when putting them on the outlet plate, they will apparently have opposite turning sense. The arrow in the ring shows the correct rotation. (Pump and cover end cartridge rotation always coincide.)



## CHANGE OF CARTRIDGE ROTATION

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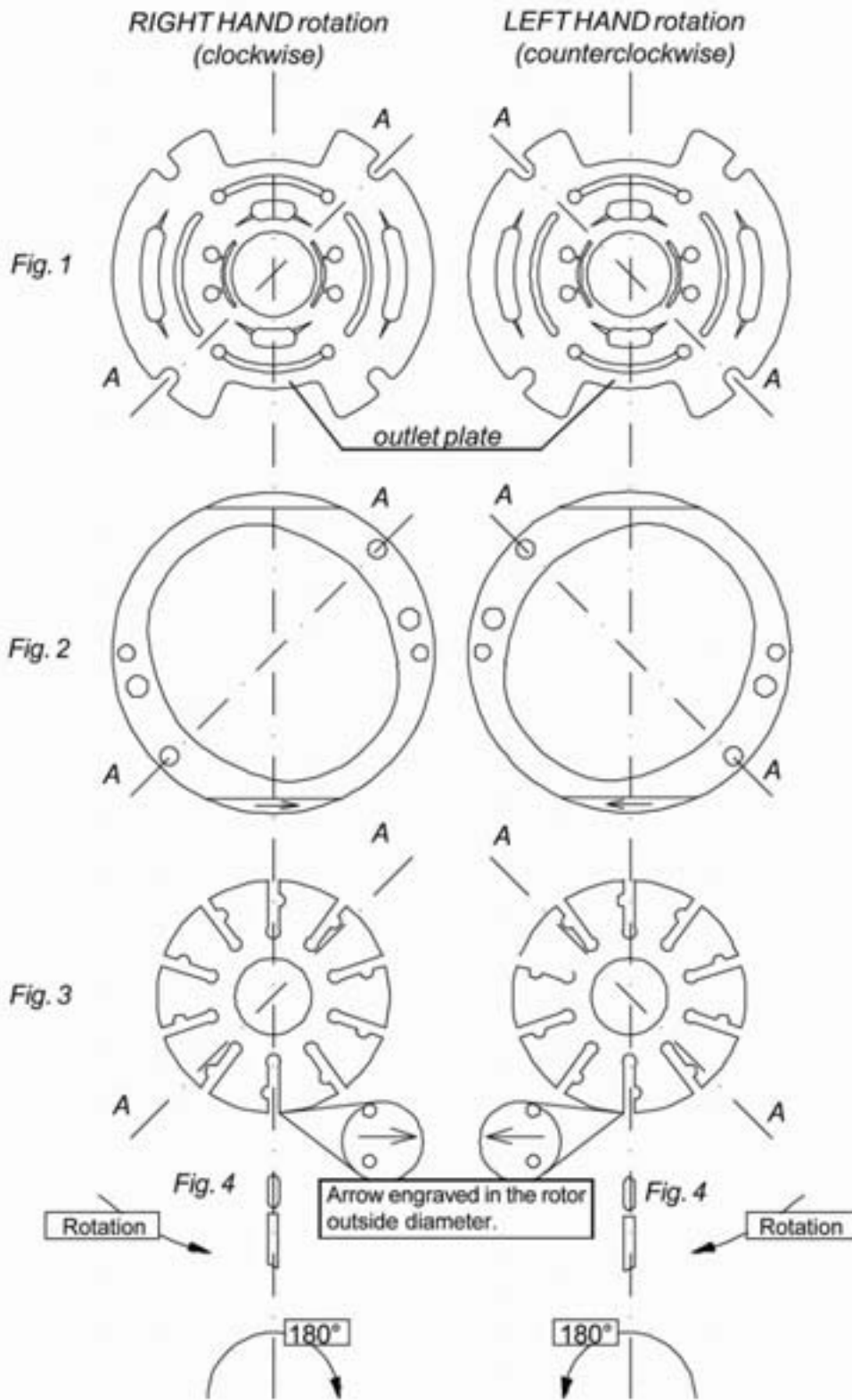
The cartridge is a high precision component (mechanized in tolerances within thousandth of millimeter), any abrasive impurity can injure it in a few minutes or damage it to shorten its performance, before disassembling it is necessary that working place, tools and worker hands are completely clean and neat.

Please avoid any nicks or scratches, however insignificant, taking special care with all edge sides, ring seat points and inlet and outlet plates.

1. Lean the cartridge, holding it tightly, at the work bench on the outlet plate. Loosen the 2 screws which fix the kit, take them out as well as the pins (if there are any). Take out inlet plate shifting it laterally, as due to the protective oil it may be gummed up. Place it at the bench on a clean paper.
2. Do the same with vanes, rotor and ring. Place the rotor, once disassembled, onto the outlet plate with arrow showing the required turning sense (see detail in the circle, fig. 3), afterwards, put inserts into vanes (fig. 4), and finally, introduce them in the slots, well at the bottom, with vane closing edge in forward rotation, as arrow shows in the corresponding picture.
3. Be sure there is no small dirty particles at the surface, of the flex plate, rotor, vane and cam ring surface, put ring on to the outlet plate, placing it in the required turning sense. Make coincide chamber edges, in which flow and arrow are engraved, with inlet or admission port.
4. Set inlet plate, pins and the 2 screws as shown in the pictures, taking into account that these last ones must be in opposite position to the one they had before disassembling. (To do so, just turn ring, rotor and vanes 180°). Fasten the screws moderately and dip the whole cartridge kit into clean hydraulic oil for a while. After these steps it is ready to be assembled.

Please pay good attention to the cartridge and pump rotation, as they do not always coincide. Be very careful to identify them properly.





## RECOMMENDATIONS FOR PUMP & CARTRIDGE REPAIRS

To have a successful cartridge replacement be sure to follow these warnings:



1. Check if due to the use there is a tread on the cartridge seat zone (dark area in the picture). If so, deepness must not be higher than 0.01 mm. (This could be observed even with a fingernail), being most convenient in such a case grinding or changing the pump body with this fault, as otherwise noise and performance values won't be the right ones. (In case you can't grind the seat, Metaris has available for sale new castings).
2. Look at the cartridge to be replaced, if wear is normal just change oil in tank circuit and change or clean filters.
3. Should the used cartridge show seizure in rotor, outlet and inlet plates, disassemble the pump completely. Check that the key is in good condition (it could be cut out). Then, put the shaft between points to make sure it is not twisted or crooked. Change it in case of any fault.

Take all the oil out of the circuit and other parts. Clean the tank carefully. If there is available any used cartridge mount it and start the machine for at least 15 minutes, driving all controls. To do so, spend the least possible amount of oil, since it will have to be replaced after this operation, although it could be reused again, after being filtrated in a filter no bigger than 5microns, as it still keeps additives.

Replace or clean all filters, mount the new cartridge and fill the tank to the level with new oil.

### Cartridge Repairs Minimal Clearance between CAM Ring and Rotor

MODEL	Inches	Millimetres
20V	0.0007	0.018
25V	0.0008	0.020
30V	0.0012	0.030
35V	0.0011	0.028
45V	0.0014	0.036

\* Vane length must be from 0,005 to 0,010 mm. (0,0002 to 0,0004 inches) less than rotor thickness.



Tighten Torques for Pump Screws

	<i>Reference</i>	<i>Tighten Torque in lb. / ft.</i>	
<b>Single Pumps</b>	25V	50 — 60	
	35V	140—160	
	45V	255—275	
<b>Double Pumps</b>	25-20V	Inlet Body Cover	65 — 75 40 — 50
	35-20V	Inlet Body Cover	140 — 160 40 — 50
	35-25V	Inlet Body Cover	140 — 160 65 — 75
	45-20V	Inlet Body Cover	255 — 275 40 — 50
	45-25V	Inlet Body Cover	255 — 275 65 — 75
	45-35V	Inlet Body Cover	255 — 275
<b>Tighten all screws to the proper torques</b>			

## WEAR CHARACTERISTICS

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Frosting and ripple on the cam ring is a sign of contamination of the fluid in the system.

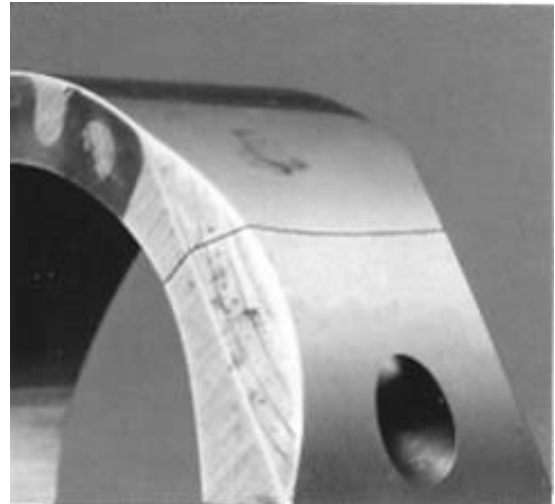
**Note:** *Replace the cartridge*



---

The crack in the cam ring has been caused by overpressure.

**Note:** *Replace the cartridge*



---

Discoloration and ripple of the cam ring indicates excessive system temperature.

**Note:** *Replace the cartridge*



Notched cam ring and erosion marks; indicates poor inlet conditions, either low pressure or aeration.

**Note:** *Replace the cartridge*



Minute cracks and ring smear indicates poor lubricity.

**Note:** *Replace the cartridge*

*Check the fluid*



Heat checked cam ring surface indicates aerated inlet oil and/or excessive temperature or poor fluid condition.

**Note:** *Replace the cartridge*

*Check the fluid*

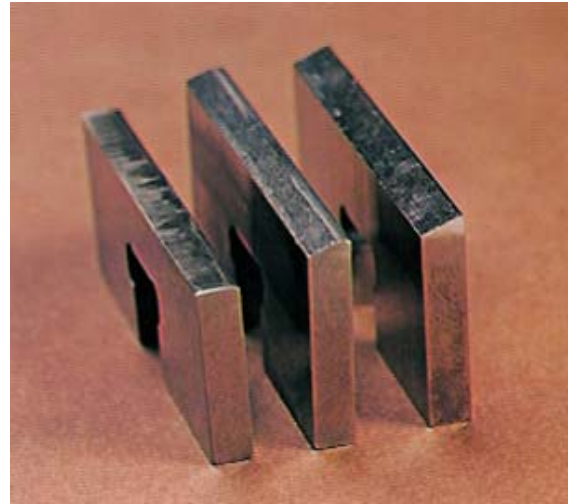


## WEAR CHARACTERISTICS

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Comparison of new vane tip on the right side with a van subjected to aeration on the left side and a vane subjected to contamination.

**Note:** *Replace the cartridge*



---

Galled vane indicates the unit was subjected to over-pressure and/or over-temperature.

**Note:** *Replace the cartridge*



---

Appearance of a frosted vane on the right compared to a new vane on the left, subjected to fluid contamination.

**Note:** *Replace the cartridge*



Rotor smear indicates over-pressure or low inlet pressure. The vane slots can also become worn or scored by contamination of the fluid.

**Note:** *Replace the cartridge*



---

Flex plate erosion indicates poor inlet condition, either low pressure or aeration.

**Note:** *Replace the cartridge*



---

Dark color and erosion indicates excessive system temperature.

**Note:** *Replace the cartridge*



## WEAR CHARACTERISTICS

---

Burnt oil residue on the flex plates indicates excessive system temperature.

**Note:** *Replace the cartridge*



The discoloration on the flexible side plates is a normal condition. It is the result of the close clearances maintained between the rotor and the flexible plates, this indicates that the pump is operating correctly.



The fretting and corrosion on the spline drive has been caused by lack of lubrication.

**Note:** *Replace the shaft*



Seal area is badly scored caused by wear from the shaft seal (also check for cracks).

**Note:** *Replace the shaft*



Worn drive splines as been caused by lack of lubrication to the teeth.

**Note:** *Replace the shaft*



## TROUBLESHOOTING GUIDE

TROUBLE	PROBABLE CAUSE	REMEDY
PUMP NOT DELIVERING FLUID	DRIVEN IN THE WRONG DIRECTION OF ROTATION	THE DRIVE DIRECTION MUST BE CHANGED
	COUPLING OR SHAFT SHEARED OR DISENGAGED	DISASSEMBLE THE PUMP AND CHECK THE SHAFT AND CARTRIDGE FOR DAMAGE
	INTAKE PIPE IN RESERVOIR RESTRICTED	CHECK ALL STRAINERS AND FILTERS FOR DIRT OR SLUDGE. CLEAN IF NECESSARY
	FLUID VISCOSITY TOO HEAVY TO PICK UP PRIME	COMPLETELY DRAIN THE SYSTEM AND ADD NEW FLUID OF THE PROPER VISCOSITY
	AIR LEAKS AT THE INTAKE LINE ( PUMP NOT PRIMING )	CHECK THE INLET CONNECTION TO DETERMINE WHERE THE LEAK IS AND TIGHTEN ANY LOOSE CONNECTION. SEE THAT THE FLUID LEVEL IS ABOVE THE INTAKE LINE IN THE RESERVOIR. CHECK THE MINIMUM DRIVE SPEED IT MAY BE TOO LOW TO PRIME THE PUMP
	RELIEF VALVE IN THE SYSTEM STUCK OPEN	LOCATE AND REPLACE IF NECESSARY
INSUFFICIENT PRESSURE BUILD-UP	VANES STUCK IN THE ROTOR SLOTS	DISASSEMBLE THE PUMP AND CHECK FOR DIRT OR METAL CHIPS ON THE ROTOR CLEAN OR REPLACE ANY DAMAGED PARTS FLUSH THE FLUID SYSTEM IF NECESSARY
	SYSTEM RELIEF VALVE SET TOO LOW	USE A PRESSURE GAUGE AND ADJUST THE RELIEF VALVE SETTING
COMPLETE LOSS OF FLOW FROM PUMP	RELIEF VALVE MAY BE STUCK OPEN PERMITTING FREE FLOW OF FLUID TO THE TANK	INSPECT RELIEF VALVE AND CLEAN OR REPLACE IF NECESSARY
	BROKEN INLET OR PRESSURE LINE	LOCATE AND REPLACE
PUMP MAKING NOISE	PUMP INTAKE PARTIALLY BLOCKED	SERVICE THE INTAKE STRAINER
	AIR LEAKS AT THE INTAKE OR SHAFT SEAL	INSPECT ALL INLET CONNECTION AND SHAFT SEAL TO DETERMINE WHERE THE AIR IS BEING DRAWN IN. TIGHTEN ALL CONNECTION AND REPLACE THE SEAL IF REQUIRED. SEE THAT THE FLUID IS ABOVE THE INTAKE IN THE RESERVOIR.
	PUMP DRIVE SPEED TOO SLOW OR FAST	OPERATE THE PUMP AT THE CORRECT SPEED
	COUPLING MISALIGNMENT	CHECK SHAFT SEAL, BEARING AND OTHER PARTS FOR WEAR, REALIGN THE COUPLED SHAFTS

### Trouble Shooting Tips

Proper maintenance can keep hydraulic problems to a minimum, keeping good records of ongoing problems will help analyze any areas that require special attention to avoid costly unexpected breakdowns. For help in troubleshooting see the guide on the last page.











### WARRANTY

Metaris Inc. and Metaris Corp. hereinafter “Metaris”, warrants all of its products to be free from defects in material and workmanship under normal operating conditions and proper application in accordance with the specifications for operation as described by the manufacturer for the period of twelve (12) months in service.

### LIMITATIONS ON WARRANTY

This warranty is expressly in lieu of any other warranties expressed or implied. Buyers sole and exclusive remedy under this Warranty shall be limited to the repair, replacement or exchange of products under warranty at our option, F.O.B. our factory, or designated service centre.

No special, incidental, consequential or other damage shall be recoverable. Metaris shall not be liable for consequential damages or contingent liabilities including, but not limited to, loss of life, personal injury, loss of crop, loss due to water or fire damage, loss of business income, down time costs and trade or other commercial loss arising out of failure of the product. Metaris will in no event be liable for any sum in excess of the price received by it for the product for which liability is claimed or asserted.

No products shall be returned without prior authorization from Metaris. Buyers and their Agents shall prepay all transportation charges for the return of such products to Metaris factory or designed service centre. There will be no acceptance of any charges for labour and/or parts incidental to the removal or remounting of products repaired or replaced under Warranty.

The above Warranty does not cover conditions over which Metaris has no control, including, without limitation, contamination, pressure in excess of recommended maximum, products damaged or subject to accident abuse or misuse after shipment from our factory, products altered or repaired by anyone other than Metaris personnel, authorized Metaris factory personnel or persons so designated in writing by Metaris prior to commencement of said work.

A return goods authorization number must be obtained from Metaris or a Metaris authorized service centre, or a Metaris authorized agent prior to any products being returned for Warranty.



## **METARIS BRAND REPLACEMENT PARTS**

Our extensive inventory assures you of prompt shipping of pumps and parts anywhere in the world.

Our parts are 100% interchangeable with OEM products. We are committed to high quality, zero defects, and getting your orders out correctly, and on time.

Whatever your application, Metaris has a high quality replacement product 100% backed by our commitment to service.

**We want to be the supplier for all your vane product needs.**



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