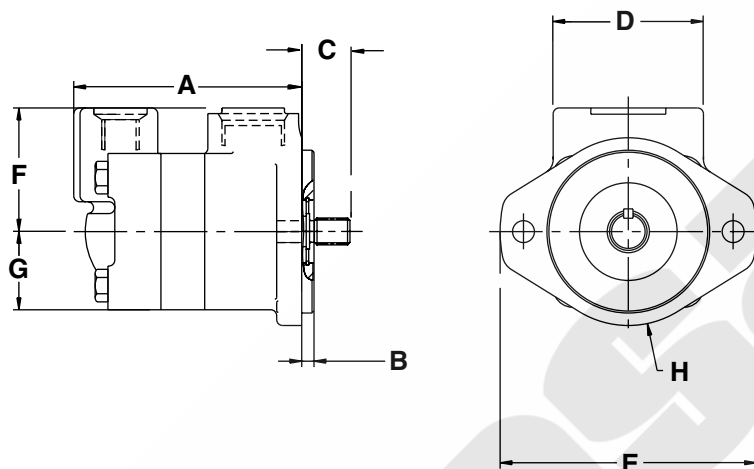
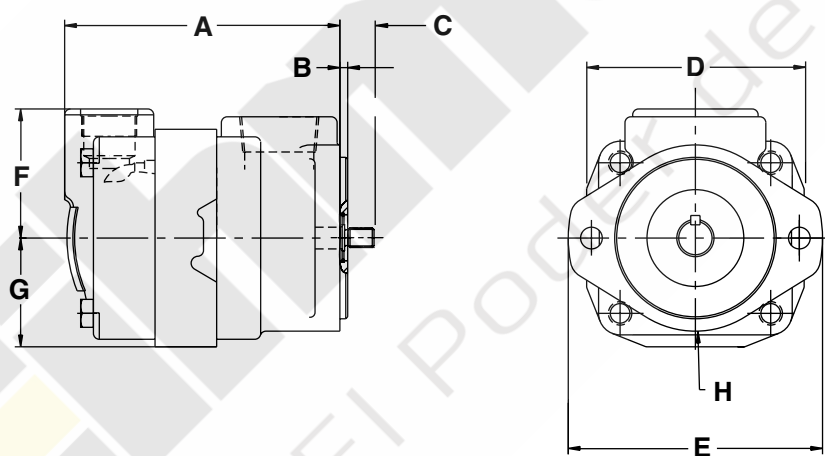


SDV 10/20 Medium Pressure Single Vane Pumps

SDV10



SDV20



Dimensions, inch (mm)

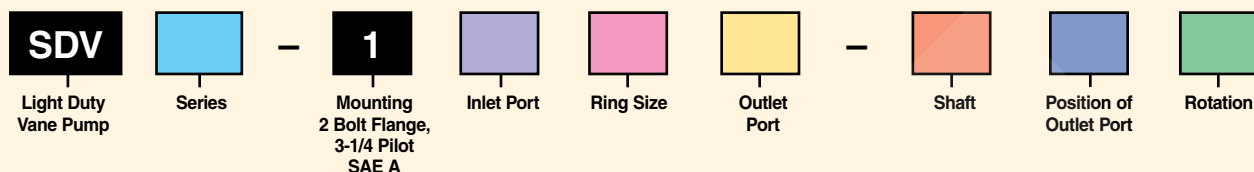
Ring Size	A*	B	C Max	D	ØE	F	G	ØH
SDV10	4.55 (115.6) to 5.00 (127.0)	0.250 (6.35)	1.75 (44.4)	3.00 (76.2)	5.12 (130.00)	2.47 (62.7)	1.50 (38.1)	3.75 (95.2)
SDV20	4.93 (125.2) to 5.52 (140.2)	0.173 (4.4)	2.66 (67.6)	4.38 (111.2)	5.12 (130.00)	2.60 (66.0)	2.19 (55.6)	3.75 (95.2)

* Depending on ring size



Vane Pumps

SDV 10/20 Model Ordering Code



Code	Series
10	Size 10, 1-7 GPM (3.8-26.5 LPM)
20	Size 20, 6-13 GPM (22.7-49.2 LPM)

Code	Inlet Port Connection	
	SDV10	SDV20
P	1" NPTF Thread	1 1/4" NPTF Thread
S	1 5/16"-12 UNF-2B Thread	1 5/8"-12 UNF-2B Thread
B	G1" (BSPP)	G1 1/4" (BSPP)

Code	Ring Size ***
1*	1 GPM (3.8 LPM)
2*	2 GPM (7.6 LPM)
3*	3 GPM (11.4 LPM)
4*	4 GPM (15.1 LPM)
5*	5 GPM (18.9 LPM)
6	6 GPM (22.7 LPM)
7	7 GPM (26.5 LPM)
8**	8 GPM (30.3 LPM)
9**	9 GPM (34.1 LPM)
10**	10 GPM (37.9 LPM)
11**	11 GPM (41.6 LPM)
12**	12 GPM (45.4 LPM)
13**	13 GPM (49.2 LPM)

* SDV10 only
 ** SDV20 only
 *** Delivery at 1200 RPM and 100 PSI

Code	Outlet Port Connection	
	SDV10	SDV20
P	1/2" NPTF Thread	3/4" NPTF Thread
S	3/4"-16 UNF-2B Thread	1 1/16"-12 UNF-2B Thread
B	G1/2" (BSPP)	G3/4" (BSPP)

Code	Shaft
1	Straight Keyed
11	Splined
38	11 Teeth - 3/4" OD
62*	Splined

* SDV20 only

Code	Position of Outlet Port*
A	Opposite Inlet Port
B	90° CCW from Inlet
C	In Line with Inlet
D	90° CW from Inlet

* Viewed from cover end of pump

Code	Rotation*
Omit	CW
L	CCW

* As viewed from shaft end.

SDV2010 Medium Pressure Double Vane Pumps



The SDV Series are a fixed displacement vane pump, ideal for low to mid pressure applications. The double pump provides the flexibility of two different displacements within one housing. The

compact design and low noise features make them well suited for filter carts, test stands, remote pilot pumps, and for hi/lo circuits.

Pump Performance Data

Series SDV2010	-7	-8	-9	-11	-12	-13
Displacement* in ³ /rev (cc/rev)	1.6 - 2.8 (26.1 - 45.6)	1.8 - 3.0 (29.8 - 49.3)	2.0 - 3.2 (33.0 - 52.5)	2.4 - 3.6 (39.7 - 59.2)	2.6 - 3.8 (42.3 - 61.8)	2.8 - 4.0 (45.7 - 65.2)
Max. continuous pressure PSI (BAR)	2500 (175)	2500 (175)	2500 (175)	2500 (175)	2200 (150)	2200 (150)
Max. speed RPM	1800	1800	1800	1800	1800	1800

* Range calculated by adding displacement for SDV20 to range of displacements for SDV10.

Series SDV2020	-7	-8	-9	-11	-12	-13
Displacement* in ³ /rev (cc/rev)	2.6 - 3.2 (42.3 - 52.5)	2.8 - 3.4 (46.0 - 56.2)	3.0 - 3.6 (49.2 - 59.4)	3.4 - 4.4 (55.9 - 72.8)	3.6 - 4.6 (58.5 - 75.4)	3.8 - 4.8 (61.9 - 78.8)
Max. continuous pressure PSI (BAR)	2500 (175)	2500 (175)	2500 (175)	2500 (175)	2200 (150)	2200 (150)
Max. speed RPM	1800	1800	1800	1800	1800	1800

* Range calculated by adding displacement for SDV20 (shaft end) to range of SDV20 (cover end).

Double Pump Model Series**	Displacement Range* in ³ /rev (cc/rev)	Max. Outlet Pressure PSI (BAR)	Rated Drive Speed RPM	Flow @ 0 PSI @ 1800 RPM GPM (LPM)	Input Horsepower @2500 PSI @1800 RPM HP (KW)
SDV2010-1F7	10.28 - 17.95 (26.1 - 45.6)	2500 (175)	1800	12.4 - 21.6 (46.9 - 81.8)	19.3 - 34.4 (14.4 - 25.7)
SDV2010-1F8	11.73 - 19.41 (29.8 - 49.3)	2500 (175)	1800	14.2 - 23.4 (53.8 - 88.6)	22.4 - 37.5 (16.7 - 28.0)
SDV2010-1F9	12.99 - 20.67 (33.0 - 52.5)	2500 (175)	1800	15.7 - 24.9 (59.4 - 94.3)	25.0 - 40.1 (18.6 - 29.9)
SDV2010-1F11	15.63 - 23.31 (39.7 - 59.2)	2500 (175)	1800	18.9 - 28.1 (71.5 - 106.4)	31.5 - 46.6 (23.5 - 34.7)
SDV2010-1F12	16.65 - 24.33 (42.3 - 61.8)	2200 (150)	1800	20.2 - 29.4 (77.5 - 111.3)	33.3 - 48.4 (24.8 - 36.1)
SDV2010-1F13	17.99 - 25.67 (45.7 - 65.2)	2200 (150)	1800	21.8 - 31.0 (82.5 - 117.3)	36.1 - 51.2 (26.9 - 38.2)

*Based on combinations with SDV10 sizes.

**Complete model code required, see catalog on CD.

Double Pump Model Series**	Displacement Range* in ³ /rev (cc/rev)	Max. Outlet Pressure PSI (BAR)	Rated Drive Speed RPM	Flow @ 0 PSI @ 1800 RPM GPM (LPM)	Input Horsepower @2500 PSI @1800 RPM HP (KW)
SDV2020-1F7	16.65 - 25.67 (42.3 - 65.2)	2500 (175)	1800	20.1 - 25.0 (76.1 - 94.6)	30.9 - 38.5 (23.0 - 28.7)
SDV2020-1F8	18.11 - 27.13 (46.0 - 68.9)	2500 (175)	1800	21.9 - 26.7 (82.9 - 101.1)	34.0 - 41.6 (25.4 - 31.0)
SDV2020-1F9	19.37 - 28.39 (49.2 - 72.1)	2500 (175)	1800	23.4 - 28.2 (88.6 - 106.7)	36.6 - 44.2 (27.3 - 33.0)
SDV2020-1F11	22.01 - 31.02 (55.9 - 78.8)	2500 (175)	1800	26.6 - 37.5 (100.7 - 142.0)	43.1 - 61.8 (32.1 - 46.1)
SDV2020-1F12	23.03 - 32.05 (58.5 - 81.4)	2200 (150)	1800	27.8 - 38.7 (105.2 - 146.5)	44.9 - 63.6 (33.5 - 47.4)
SDV2020-1F13	24.37 - 33.39 (61.9 - 84.8)	2200 (150)	1800	29.4 - 40.3 (111.3 - 152.6)	47.7 - 66.4 (35.6 - 49.5)

*Based on combinations of SDV20 pumps.

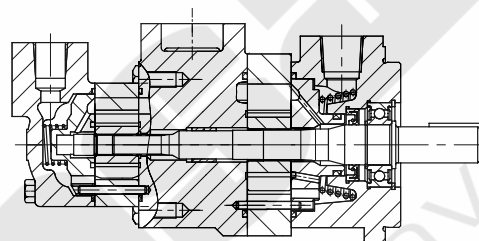
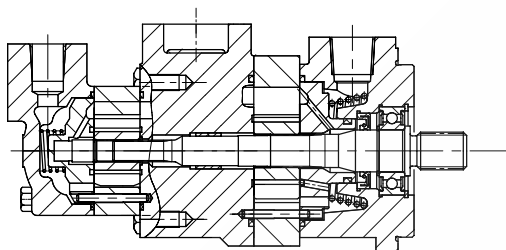
**Complete model code required, see catalog on CD.

SDV2010 Medium Pressure Double Vane Pumps

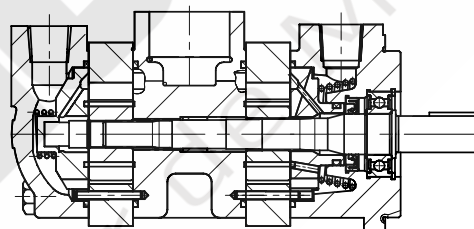
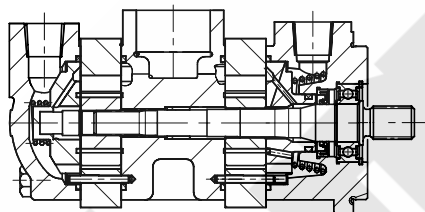
Benefits/Features

- Two compact frame sizes available
- Low noise
- 100% tested
- Easy to convert or repair

SDV2010



SDV2020

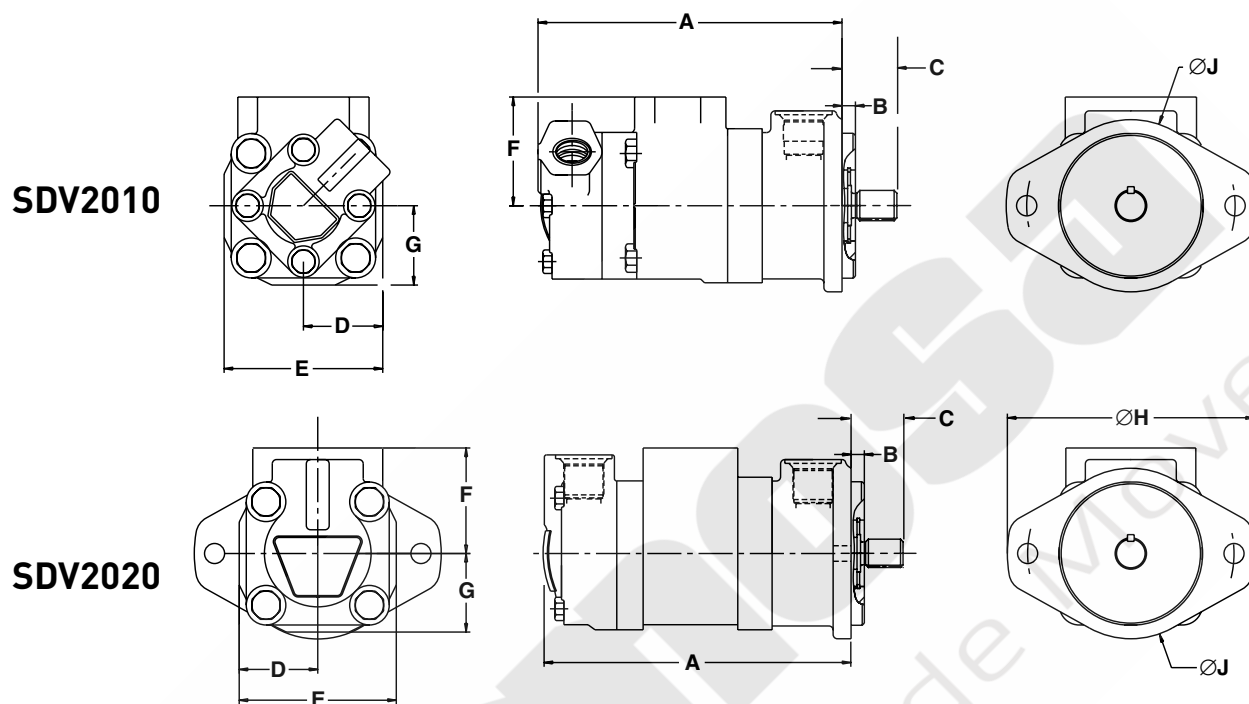


Pump Performance Data

SDV10	Output Flow (l/min)		Output Flow (GPM)		Input Power (kW)		Input Power (HP)	
Size	0 BAR	150 BAR	0 PSI	2000 PSI	7 BAR	150 BAR	80 PSI	2500 PSI
1	5.9	3.9	1.6	1.0	0.10	1.44	0.14	1.93
2	11.9	9.9	3.1	2.6	0.21	3.60	0.28	4.83
3	17.6	15.6	4.7	4.1	0.31	5.70	0.41	7.65
4	23.6	20.2	6.2	5.3	0.41	7.36	0.55	9.87
5	29.5	26.1	7.8	26.1	0.51	9.52	0.69	12.77
6	35.1	30.9	9.3	8.2	0.61	11.27	0.82	15.11
7	41.0	36.8	10.8	9.7	0.71	13.43	0.96	18.01

SDV20	Output Flow (l/min)		Output Flow (GPM)		Input Power (kW)		Input Power (HP)	
Size	0 BAR	150 BAR	0 PSI	2000 PSI	7 BAR	150 BAR	80 PSI	2500 PSI
6	35.1	31.5	9.27	8.32	0.50	10.80	0.7	14.5
7	41.0	35.6	10.84	9.42	0.60	12.20	0.9	16.4
8	47.7	42.3	12.60	11.18	0.70	14.50	1.0	19.5
9	53.5	48.1	14.12	12.70	0.80	16.50	1.1	22.1
11	65.5	62.1	17.31	16.41	1.00	21.30	1.4	28.6
12	70.2	66.0	18.55	17.44	1.10	22.60	1.5	30.4
13	76.3	72.1	20.16	19.05	1.20	24.70	1.2	33.2

SDV2010 Medium Pressure Double Vane Pumps



Dimensions, inch (mm)

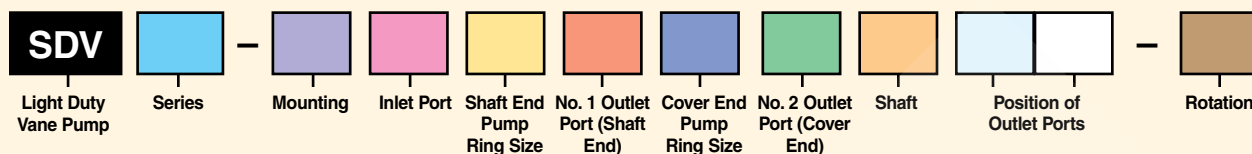
Ring Size	A*	B	C	D	E	F	G	ØH	ØJ
SDV2010	8.39 (213.1) to 9.17 (232.9)	0.37 (9.4)	2.31 (58.7)	2.19 (55.6)	4.38 (111.2)	3.00 (76.2)	2.19 (55.6)	8.88 (174.8)	4.75 (120.7)
SDV2020	8.41 (213.6) to 9.19 (233.4)	0.37 (9.4)	2.31 (58.7)	2.19 (55.6)	4.38 (111.2)	2.94 (74.7)	2.19 (55.6)	8.88 (174.8)	4.75 (120.7)

* Depending on ring size



Vane Pumps

SDV 2010 Model Ordering Code



Code	Series
2010	SDV20/SDV10 Combination
2020	SDV20/SDV20 Combination

Code	Mounting
1	2 Bolt Flange, 4" Pilot (Standard)
6*	2 Bolt Flange, 3¼" Pilot

* Available on SDV2020 only.

Code	Inlet Port Connection	
	SDV2010	SDV2020
F	4 Bolt Flange 1½" Dia.	4 Bolt Flange 2" Dia.

Code	Shaft End Pump Ring Size*
7	7 GPM (26.5 LPM)
8	8 GPM (30.3 LPM)
9	9 GPM (34.1 LPM)
11	11 GPM (41.6 LPM)
12	12 GPM (45.4 LPM)
13	13 GPM (49.2 LPM)

* Delivery at 1200 RPM and 100 PSI.

Code	Shaft End Pump Outlet Port
S	1 1/16"-12 UNF-2B Thread
B	G3/4" BSPP

Code	Ring Size ***
1*	1 GPM (3.8 LPM)
2*	2 GPM (7.6 LPM)
3*	3 GPM (11.4 LPM)
4*	4 GPM (15.1 LPM)
5*	5 GPM (18.9 LPM)
6	6 GPM (22.7 LPM)
7	7 GPM (26.5 LPM)
8**	8 GPM (30.3 LPM)
9**	9 GPM (34.1 LPM)
11**	11 GPM (41.6 LPM)

* SDV2010 only

** SDV2020 only

*** Delivery at 1200 RPM and 100 PSI (6.9 BAR)

Code	Cover End Pump Outlet Port	
	SDV2010	SDV2020
S	3/4"-16 UNF-2B Thread	1 1/16"-12 UNF-2B Thread
B	G1/2" (BSPP)	G3/4" (BSPP)

Code	Shaft
1	Straight Keyed
11	Splined

Code	Position of Outlet Port No. 1*
A	Opposite Inlet Port
B	90° CCW from Inlet
C	In Line with Inlet
D	90° CW from Inlet

* Viewed from cover end of pump

Code	Position of Outlet Port No. 2*
A	135° CCW from Inlet
B	45° CCW from Inlet
C	45° CW from Inlet
D	135° CW from Inlet

* Viewed from cover end of pump

Code	Rotation*
Omit	CW
L	CCW

* As viewed from shaft end.

T7A Series High Performance Small Displacement Single Vane Pumps



The T Series fixed displacement vane pump is the highest performance pump of its kind. The balanced design and double lip vane technology are key features in providing a contamination resistant and reliable pump. High pressure

capabilities, extremely low noise, precise flow repeatability, and it's ability for fast pressure cycle changes make it the perfect fluid source for industrial applications.

Pump Performance Data

Series T7AS	Displacement in ³ /rev (cc/rev)	Max. Outlet Pressure PSI (BAR)	Rated Drive Speed RPM	Flow @ 1800 RPM GPM (LPM)
B06	0.37 (6)	4000 (280)	3600	2.73 (10.3)
B10	0.61 (10)	4000 (280)	3600	4.68 (17.7)
B11	0.67 (11)	4000 (280)	3600	5.22 (19.8)
B13	0.79 (13)	4000 (280)	3600	6.08 (23.0)
B17	1.04 (17)	4000 (280)	3600	8.18 (31.0)
B20	1.22 (20)	4000 (280)	3600	9.43 (35.7)
B22	1.34 (22)	4000 (280)	3600	10.68 (40.4)
B25	1.53 (25)	3500 (240)	3000	11.84 (44.8)

Series T7ASW	Displacement in ³ /rev (cc/rev)	Max. Outlet Pressure PSI (BAR)	Rated Drive Speed RPM	Flow @ 1800 RPM GPM (LPM)
B26	1.59 (26)	4350 (300)	3600	12.39 (46.9)
B28	1.71 (28)	4350 (300)	3600	13.32 (50.4)
B30	1.83 (30)	4350 (300)	3600	14.26 (54.0)
B32	1.95 (32)	4350 (300)	3600	15.12 (57.2)
B34	2.07 (34)	4000 (280)	3000	16.13 (61.1)
B36	2.20 (36)	4000 (280)	3000	17.14 (64.9)
B40	2.44 (40)	4000 (280)	3000	19.01 (72.0)

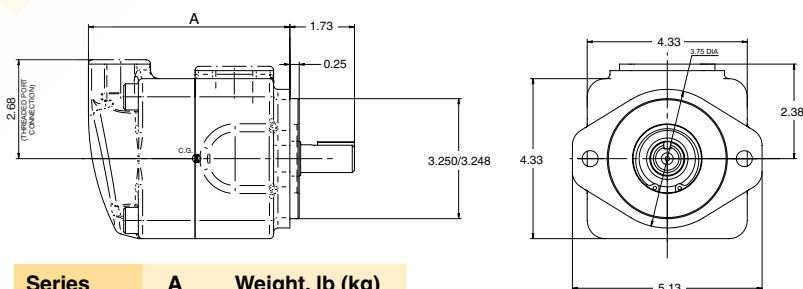
Markets

Material Handling	Lift Trucks
Recycling	Compactors

Applications

Benefits/Features

- Fully balanced pump
- 12-vane design for low pressure ripple
- Cam ring construction allows easy displacement changes
- Wide range of shafts
- SAE flanges or threaded ports
- Port orientations every 90°

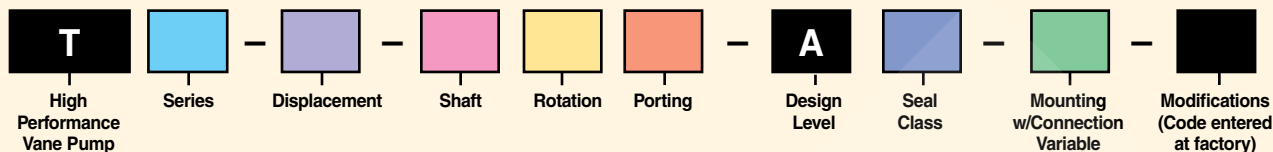


Series	A	Weight, lb (kg)
T7AS	5.45	20.9 (9.5)
T7ASW	6.33	23.9 (11.3)



Vane Pumps

T7A Model Ordering Code



Code	Series Standard Mounting
7AS	SAE A 2-Bolt Flange (J744)
7ASW	SAE A 2-Bolt Flange (J744) Higher Displacement

7AS Codes	Displacement in ³ /rev (cc/rev)	7ASW Codes	Displacement, in ³ /rev (cc/rev)
B06	0.35 (5.73)	B26	1.59 (26.06)
B10	0.60 (9.83)	B28	1.71 (28.02)
B11	0.67 (10.98)	B30	1.83 (29.99)
B13	0.78 (12.78)	B32	1.94 (31.79)
B17	1.05 (17.21)	B34	2.07 (33.92)
B20	1.21 (19.83)	B36	2.20 (36.05)
B22	1.37 (22.45)	B40	2.44 (39.98)
B25	1.52 (24.91)		

Code	Shaft Type	
	7AS	7ASW
1	Keyed (non SAE) 0.75 Dia.	Keyed (non SAE) 0.75 Dia.
3	Splined 16/32 (SAE B) 13 Teeth	Splined 16/32 (SAE B) 13 Teeth
4	Splined 16/32 (non SAE) 9 Teeth	Splined 16/32 (non SAE) 11 Teeth

Code	Rotation*
R	CW
L	CCW

*As viewed from shaft end.

Code	Porting Combinations*
00	
01	
02	
03	

* P = Pressure Port; S = Suction Port

Code	Seal Class
1	S1 (Buna N)
5	S5 (fluorocarbon)*

*Not available for 7ASW

Code	Mounting w/Connection Variables					
	7AS			7ASW		
	Type	Suction Port (S)	Pressure Port (P)	Type	Suction Port (S)	Pressure Port (P)
00	4-Bolt SAE Flange (J518) UNC Thread	1" SAE	3/4" SAE	4-Bolt SAE Flange (J518) UNC Thread	1 1/4" SAE	3/4" SAE
02	SAE Thread	1 5/16" (SAE16)	1 1/16" (SAE 12)	SAE Thread	1 5/8" (SAE20)	1 1/16" (SAE 12)
03	NPTF Thread	1 1/4" NPTF	3/4" NPTF	SAE & NPTF Threads	1 1/4" NPTF	1 1/16" (SAE 12)

T6 Series Single, Double & Triple High Performance Vane Pumps



The T Series fixed displacement vane pump is the highest performance pump of its kind. The balanced design and double lip vane technology are key features in providing a contamination resistant and reliable pump. High pressure and speed capabilities,

extremely low noise, and a cartridge designed to prime in cold weather conditions, make this fluid power source ideal for mobile applications.

Pump Performance Data

Single Pump Model Series	Displacement in ³ /rev (cc/rev)*	Max. Outlet Pressure** PSI (BAR)	Rated Drive Speed** RPM	Flow @1800 RPM and 0 PSI* GPM (LPM)	Input Horsepower @ 1800 RPM and 2000 PSI* HP (KW)
T6CM	0.66 - 6.10 (10.8 - 100)	4000 (280)	2800	5.14 - 47.56 (19.3 - 180.0)	8.45 - 57.95 (6.3 - 43.2)
T6DM	2.90 - 9.64 (47.5 - 158)	3500 (240)	2500	22.64 - 75.14 (85.7 - 284.4)	29.31 - 90.58 (21.9 - 67.5)
T6EM	8.07 - 13.85 (132.3 - 227)	3500 (240)	2200	62.92 - 108.00 (238.2 - 408.8)	78.44 - 129.09 (58.5 - 96.3)

* Available range based on various combinations of displacements

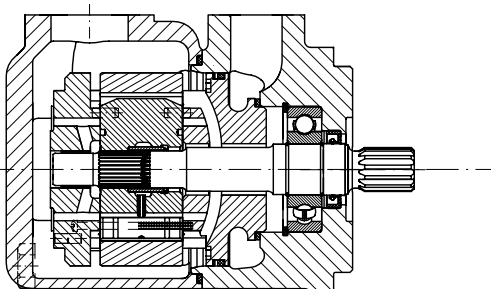
**Lower for larger displacements. See catalog.

Markets

Industrial	Injection Molding
Construction	Wheel Loader, ADTs, Fan Drives
Recycling	Shredders, Balers, Compactors, Vacuum Truck Systems, Refuse Trucks - ASL, Rear Loaders

Applications

T6 Series Single, Double & Triple High Performance Vane Pumps



Benefits/Features

- Mobile cartridge designed for cold start-ups
- Wide range of displacements
- Low noise provides machine operator safety
- Speed range from 400 to 2800 rpm
- Large flow within a small envelope
- Double shaft seal option allows direct mounting to gearboxes

Pump Performance Data

T6CM/CP	Output Flow (lpm) @ 1800 RPM			Output Flow (GPM) @ 1800 RPM			Input Power (kW)			Input Power (HP)		
	0 BAR	140 BAR	280 BAR	0 PSI	2000 PSI	3500 PSI	7 BAR	140 BAR	280 BAR	100 PSI	2000 PSI	3500 PSI
B03	19.3	13.6	—	5.1	3.6	—	1.6	6.3	—	2.1	8.5	—
B05	31.0	25.0	21.2	8.2	6.6	5.6	1.7	8.9	14.6	2.3	12.0	19.6
B06	38.2	32.6	28.4	10.1	8.6	7.5	1.8	10.7	17.6	2.4	14.3	23.6
B08	47.3	41.6	37.5	12.5	11.0	9.9	1.9	12.8	21.3	2.5	17.1	28.5
B10	61.3	55.6	51.5	16.2	14.7	13.6	2.1	16.0	26.8	2.8	21.4	36.0
B12	66.6	60.9	56.8	17.6	16.1	15.0	2.1	17.2	29.0	2.8	23.1	38.9
B14	82.9	76.8	73.1	21.9	20.3	19.3	2.3	20.9	35.5	3.1	28.0	47.6
B17	104.8	99.2	95.0	27.7	26.2	25.1	2.5	26.0	44.4	3.4	34.8	59.5
B20	114.7	109.0	103.7	30.3	28.8	27.4	2.7	28.3	48.4	3.6	37.9	64.9
B22	126.4	120.7	116.6	33.4	31.9	30.8	2.8	30.9	53.1	3.8	41.5	71.2
B25	142.7	137.0	132.9	37.7	36.2	35.1	3.0	34.7	59.6	4.0	46.5	79.9
B28	159.8	154.1	151.0	42.23	40.7	39.9	3.2	38.6	57.2	4.3	51.7	76.7
B31	180.0	174.1	171.5	47.56	46.0	45.3	3.4	43.3	64.2	4.6	58.0	86.1

** T6CP not available in sizes B03 through B12

T6DM	Output Flow (lpm) @ 1800 RPM			Output Flow (GPM) @ 1800 RPM			Input Power (kW)			Input Power (HP)		
	0 BAR	140 BAR	300 BAR	0 PSI	2000 PSI	3500 PSI	7 BAR	140 BAR	300 BAR	100 PSI	2000 PSI	3500 PSI
B14	85.5	77.2	71.2	22.6	20.4	18.8	3.0	21.9	36.8	4.0	29.3	49.3
B17	104.8	96.5	90.5	27.7	25.5	23.9	3.2	26.2	44.4	4.3	35.2	59.6
B20	118.9	110.5	104.5	31.4	29.2	27.6	3.4	29.5	50.1	4.5	39.5	67.2
B24	143.1	134.7	128.7	37.8	35.6	34.0	3.7	35.0	59.9	4.9	47.0	80.3
B28	161.6	153.3	146.9	42.7	40.5	38.8	3.9	39.3	67.3	5.2	52.7	90.2
B31	176.8	168.8	162.4	46.7	44.6	42.9	4.0	42.8	73.5	5.4	57.4	98.6
B35	199.8	191.5	185.5	52.8	50.6	49.0	4.3	48.1	82.7	5.8	64.5	110.9
B38	216.5	208.2	202.1	57.2	55.0	53.4	4.5	52.0	89.4	6.0	69.7	119.9
B42	244.9	236.6	230.5	64.7	62.5	60.9	4.8	58.5	100.8	6.5	78.4	135.2
B45	262.3	254.0	247.9	69.3	67.1	65.5	5.0	62.4	107.8	6.7	83.7	144.6
B50	284.3	276.3	271.8	75.1	73.0	71.8	5.3	67.6	100.3	7.1	90.6	134.5

Note: See catalog on CD for additional cartridge options and specific displacement operating parameters.

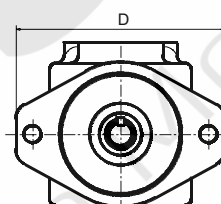
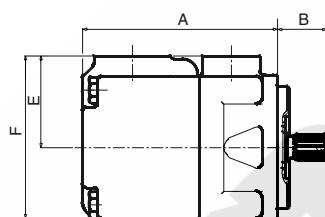
T6 Series Single, Double & Triple High Performance Vane Pumps

Pump Performance Data

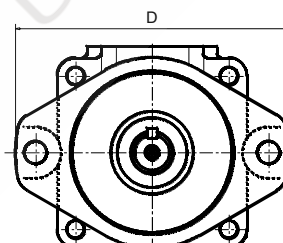
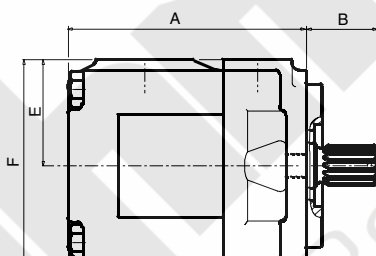
T6EM	Output Flow (lpm) @ 1800 RPM			Output Flow (GPM) @ 1800 RPM			Input Power (kW)			Input Power (HP)		
Size	0 BAR	140 BAR	240 BAR	0 PSI	2000 PSI	3500 PSI	7 BAR	140 BAR	300 BAR	100 PSI	2000 PSI	3500 PSI
042	238.1	228.6	221.4	62.9	60.4	58.5	6.0	58.5	84.9	8.1	78.4	113.8
045	256.2	246.8	239.6	67.7	65.2	63.3	5.1	61.2	105.5	6.9	82.1	141.5
050	285.4	275.5	268.7	75.4	72.8	71.0	5.4	67.9	117.2	7.3	91.0	157.2
052	296.7	286.9	280.1	78.4	75.8	74.0	5.6	70.5	121.8	7.5	94.5	163.3
062	353.9	344.4	337.2	93.5	91.0	89.1	6.3	83.7	144.9	8.4	112.2	194.3
066	383.8	374.3	367.1	101.4	98.9	97.0	6.6	90.5	156.9	8.8	121.4	210.4
072	408.8	399.3	392.1	108.0	105.5	103.6	6.9	96.3	166.9	9.2	129.1	223.8

Note: See catalog on CD for additional cartridge options and specific displacement operating parameters.

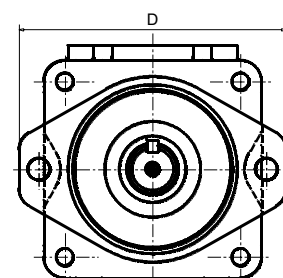
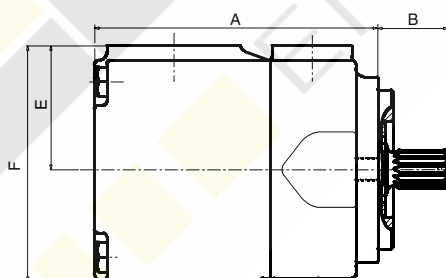
T6CM



T6DM



T6EM



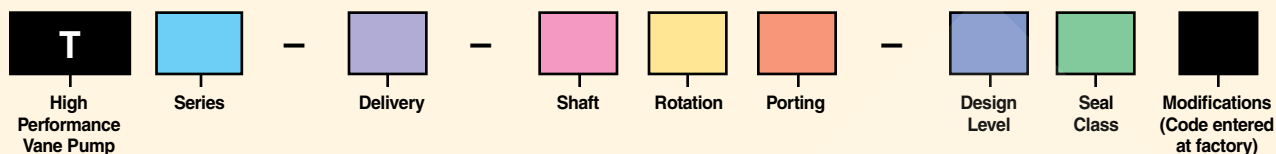
Dimensions, inch (mm)

Series	A	B	D	E	F	Weight, lb (kg)
T6CM	6.36 (161.5)	2.81 (71.4)	6.87 (174.5)	3.00 (76.2)	5.31 (134.9)	34.0 (15.5)
T6DM	7.28 (184.9)	3.29 (83.6)	8.36 (212.3)	3.25 (82.6)	6.17 (156.7)	53.0 (24.0)
T6EM	8.87 (225.3)	3.58 (90.9)	8.39 (213.1)	3.88 (98.6)	7.38 (187.5)	95.4 (43.4)



Vane Pumps

T6 Model Ordering Code



Code	Series Description
6CM	Size C, Mobile 1 Shaft Seal
6CP	Size C, Mobile 2 Shaft Seals
6DM	Size D, Mobile 1 Shaft Seal
6DP	Size D, Mobile 2 Shaft Seals
6EM	Size E, Mobile 1 Shaft Seal
6EP	Size E, Mobile 2 Shaft Seals

Delivery					
6C Codes	Delivery** GPM (LPM)	6D Codes	Delivery ** GPM (LPM)	6E Codes	Delivery** GPM (LPM)
B03*	3.42 (12.9)	B14	15.09 (57.1)	042	41.94 (158.8)
B05*	5.45 (20.6)	B17	18.45 (69.8)	045	46.15 (174.7)
B06*	6.76 (25.6)	B20	20.93 (79.2)	050	50.25 (190.2)
B08*	8.36 (31.6)	B24	25.20 (95.4)	052	52.25 (197.8)
B10*	10.81 (40.9)	B28	28.44 (107.7)	062	62.36 (236.1)
B12*	11.76 (44.5)	B31	31.16 (118.0)	066	67.62 (256.0)
B14	14.58 (55.2)	B35	35.19 (133.2)	072	72.00 (272.5)
B17	18.48 (70.0)	B38	38.14 (144.4)		
B20	20.23 (76.6)	B42	43.12 (163.2)		
B22	22.28 (83.9)	B45	46.19 (174.9)		
B25	25.14 (95.2)	B50	50.09 (189.6)		
B28	27.90 (105.6)				
B31	31.70 (120.0)				

* Not available on T6CP
 ** At 0 PSI (0 BAR) and 1200 RPM

Code	Shaft Type			
	6CM	6CP	6DM, 6DP	6EM, 6EP
1	Keyed SAE B		Keyed SAE C	Keyed SAE CC
2	Keyed (non SAE)	Keyed (non SAE)	Keyed (non SAE)	Keyed (non SAE)
3	Splined SAE B	Splined SAE C	Splined***	Splined***
4	Splined SAE BB		Splined (non SAE)	Splined SAE CC
T			Splined SAE J718c	Splined SAE J718c

* SAE C for 6*M, non SAE for 6*P

Code	Rotation*
R	CW
L	CCW

* As viewed from shaft end.

Code	Porting Combinations*
00	
01	
02	
03	

* P = Pressure Port; S = Suction Port

Code	Design Level
A	T6CP only
B	T6EM, T6EP
C	All Others

Code	Seal Class
1	S1 (Buna N)
4	S4 (EPDM)
5	S5 (fluorocarbon)

Pumps are also available in thru-drive version. See Catalog on CD.

= Not Available

T7 Series Single, Double & Triple High Performance Vane Pumps



The high performance T Series fixed displacement vane pumps have been specially designed to provide high flows within a small envelope. The balanced design and double lip vane technology are key features in providing

a contamination resistant and reliable pump. High pressure and speed capabilities, extremely low noise, and a cartridge designed to prime in cold weather conditions, make this fluid power source ideal for Mobile applications.

Pump Performance Data

Double Pump Model Series	Displacement in ³ /rev (cc/rev)*	Max. Outlet Pressure** PSI (BAR)	Rated Drive Speed RPM	Flow @1800 RPM and 0 PSI* GPM (LPM)	Input Horsepower @ 1800 RPM and 2000 PSI* HP (KW)
T6CCM	1.32 - 12.20 (21.6 - 200)	4000 (280)	2800	10.3 - 95.1 (39.0 - 360.0)	16.9 - 115.9 (12.6 - 86.4)
T6DCM	3.56 - 15.74 (58.3 - 258)	4000 (280)	2500	27.8 - 122.7 (105.2 - 464.5)	37.8 - 148.5 (28.2 - 110.7)
T6ECM	8.73 - 19.95 (143.1 - 327)	4000 (280)	2200	68.1 - 155.6 (257.8 - 589.0)	86.9 - 187.0 (64.8 - 139.4)
T6EDM	10.97 - 23.49 (179.7 - 385)	3500 (240)	2200	85.5 - 183.1 (147.6 - 693.1)	107.7 - 219.7 (80.3 - 163.8)

* Available range based on various combinations of displacements

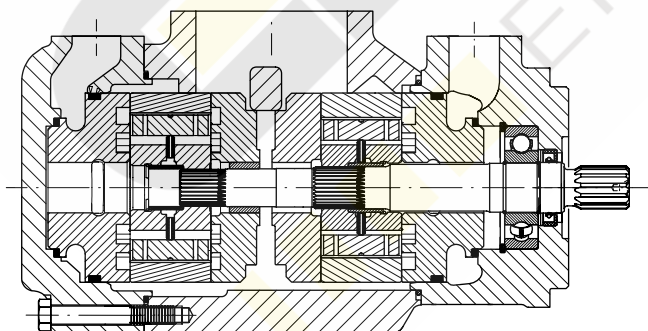
**Lower for larger displacements. See catalog.

Markets

Industrial	Injection Molding
Construction	Wheel Loader, Fan Drives
Recycling	Shredders, Balers, Compactors, Vacuum Truck Systems, Refuse Trucks - ASL, Rear Loaders

Applications

T Series Double



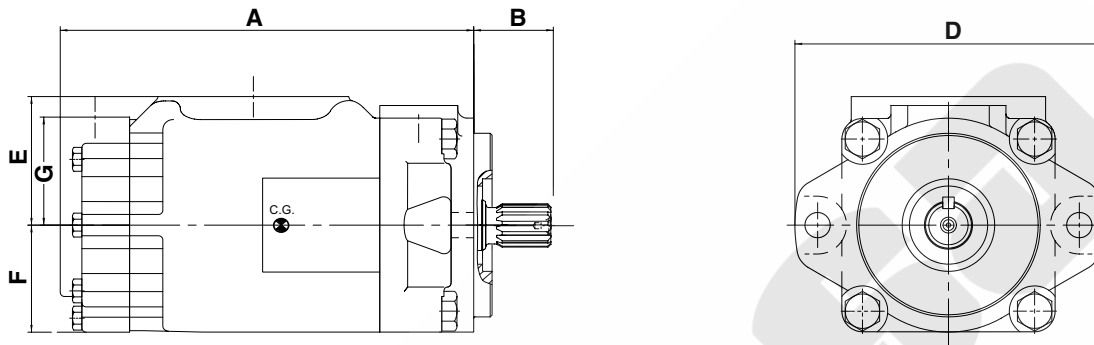
Benefits/Features

- Low noise
- SAE or ISO standards
- One-piece shaft (no internal torque limitations)
- One inlet
- 32 porting orientations available
- Wide displacement possibility
- High power to weight ratio
- Wide range of options for shafts, threads and pilots
- Mobile cartridge design for cold start conditions



Vane Pumps (Mobile & Industrial)

T7 Series Single, Double & Triple High Performance Vane Pumps

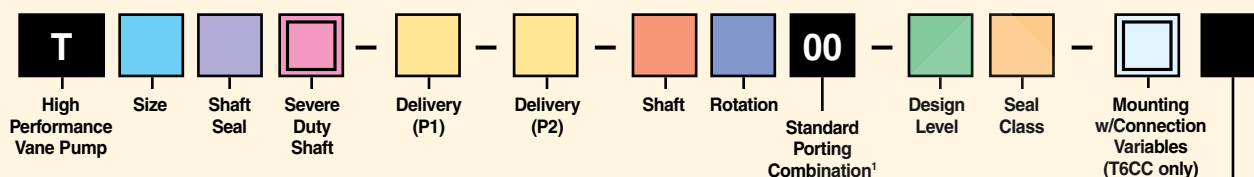


Dimensions, inch (mm)

Series	A	B max	D	E	F	Weight, kg (lb)
T6CCM	10.46 (265.7)	2.81 (71.4)	6.87 (174.5)	3.31 (84.1)	2.88 (73.2)	57.3 (26.0)
T6DCM	11.26 (286.0)	3.29 (83.6)	8.36 (212.3)	3.50 (88.9)	2.92 (74.2)	80.7 (36.7)
T6ECM	13.06 (331.7)	3.58 (90.9)	8.39 (213.1)	4.03 (102.4)	3.50 (88.9)	121.0 (55.0)
T6EDM	14.22 (361.2)	3.58 (90.9)	8.39 (213.1)	4.03 (102.4)	3.50 (88.9)	145.5 (66.1)

Vane Pumps

T7 Model Ordering Code



Size Code
6CC
6DC
6EC
6ED

Code	Shaft Seal
M	Mobile 1 Seal
P	Mobile 2 Seals

Code	Severe Duty
Omit	Standard
W*	Severe Duty

*Available on T6CCM and T6DCM only.

Size	Delivery (See Table Below)	
	P1	P2
6CC	Use Codes for 6C	Use Codes for 6C
6DC	Use Codes for 6D	Use Codes for 6C
6EC	Use Codes for 6E	Use Codes for 6C
6ED	Use Codes for 6E	Use Codes for 6D

Code	Shaft (See catalog on CD for severe duty options)				
	6CCM	6CCP	6DCM	6DCP 6ECP, 6EDP	6ECM 6EDM
1	Keyed (non SAE)		Keyed SAE C		Keyed SAE CC
2			Keyed (non SAE)		Keyed (non SAE)
3	Splined SAE BB	Splined (non SAE)	Splined SAE C	Splined (non SAE)	Splined SAE C
4		Splined SAE BB	Splined (non SAE)		Splined SAE CC
5	Splined SAE B				
6		Splined (non SAE)			
T					Splined SAE J718c

Modifications
(Code entered
at factory)

Code	Rotation*
R	CW
L	CCW

*As viewed from shaft end.

Code	Design Level
D	T6CC only
C	All Others

Code	Seal Class
1	S1 (Buna N)
4	S4 (EPDM)
5	S5 (fluorocarbon)

Code	Connection Variables		
	T6CC		
	P1	P2	S
00	1"	1"	3"
01	1"	3/4"	3"
10	1"	1"	2 1/2"
11	1"	3/4"	2 1/2"

P = Pressure Port; S = Suction Port

Delivery

6C Codes	Delivery* GPM (LPM)	6D Codes	Delivery* GPM (LPM)	6E Codes	Delivery* GPM (LPM)
B03	3.42 (12.9)	B14	15.09 (57.1)	042	41.94 (158.8)
B05	5.45 (20.6)	B17	18.45 (69.8)	045	46.15 (174.7)
B06	6.76 (25.6)	B20	20.93 (79.2)	050	50.25 (190.2)
B08	8.36 (31.6)	B24	25.20 (95.4)	052	52.25 (197.8)
B10	10.81 (40.9)	B28	28.44 (107.7)	062	62.36 (236.1)
B12	11.76 (44.5)	B31	31.16 (118.0)	066	67.62 (256.0)
B14	14.58 (55.2)	B35	35.19 (133.2)	072	72.00 (272.5)
B17	18.48 (70.0)	B38	38.14 (144.4)		
B20	20.23 (76.6)	B42	43.12 (163.2)		
B22	22.28 (84.3)	B45	46.19 (174.9)		
B25	25.14 (95.2)	B50	50.09 (189.6)		
B28	27.90 (105.6)				
B31	31.70 (120.0)				

* At 0 PSI (0 BAR) and 1200 RPM

¹Many other combinations are available See catalog on CD.

□ = Not Available

□ = Omit if not required or to select standard option coded "omit".

T67 Series High Performance Vane Pumps



The high performance T Series fixed displacement vane pumps have been specially designed to provide high flows within a small envelope. The balanced design and double lip vane technology are key features in providing a contamination resistant and reliable pump. High pressure and

speed capabilities, extremely low noise, and a cartridge designed to prime in cold weather conditions, make this fluid power source ideal for mobile applications.

Pump Performance Data

Triple Pump Model Series	Displacement in ³ /rev (cc/rev)*	Max. Outlet Pressure** PSI (BAR)	Rated Drive Speed RPM	Flow @1800 RPM and 0 PSI* GPM (LPM)	Input Horsepower @ 1800 RPM and 2000 PSI* HP (KW)
T6DCCM	4.22 - 21.85 (69.1 - 358)	4000 (280)	2500	32.9 - 170.3 (124.5 - 644.7)	46.2 - 206.5 (34.5 - 154.0)
T6EDCM/S	11.63 - 29.60 (190.5 - 485)	4000 (280)	2200	90.7 - 230.7 (343.3 - 873.3)	116.2 - 277.6 (86.7 - 207.0)

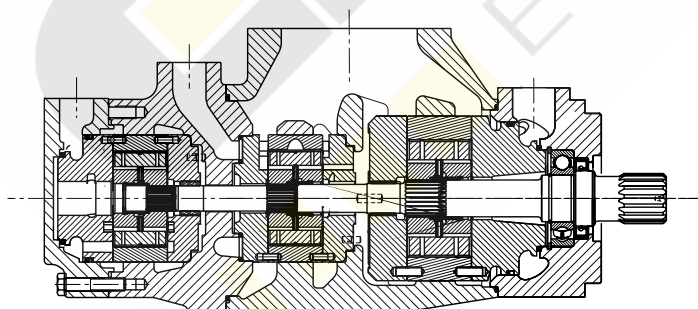
* Available range based on various combinations of displacements.

** Lower for larger displacements. See catalog.

Markets

Industrial	Injection Molding
Construction	Wheel Loader, Fan Drives
Recycling	Shredders, Balers, Compactors, Vacuum Truck Systems, Refuse Trucks - ASL, Rear Loaders

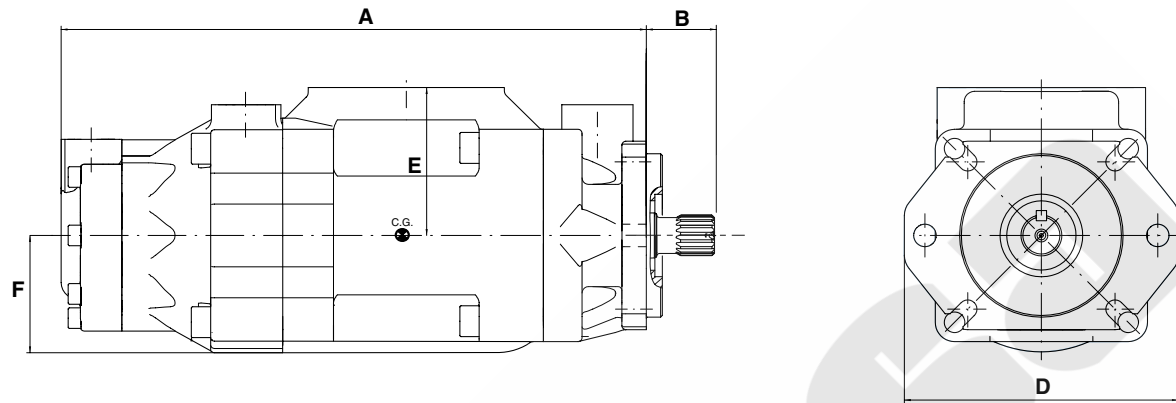
Applications



Benefits/Features

- Low noise
- SAE or ISO standards
- One-piece shaft (no internal torque limitations)
- One inlet
- 128 porting orientations available
- Many displacement combinations per stage
- High power to weight ratio
- Wide range of options for shafts, threads and pilots
- Mobile cartridge design for cold start conditions

T67 Series High Performance Vane Pumps



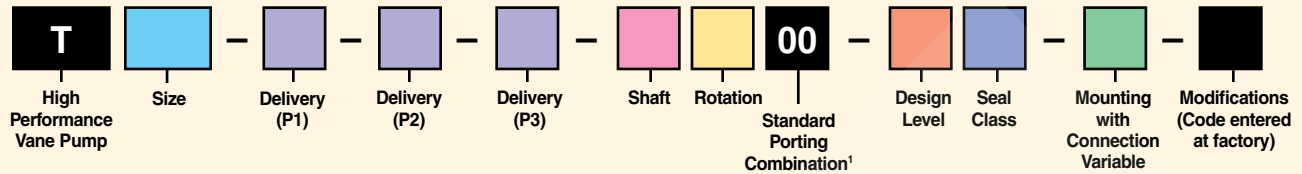
Dimensions, inch (mm)

Series	A	B max.	D	E	F	Weight, lb (kg)
T6DCC	15.90 (403.9)	3.53 (89.7)	8.36 (212.3)	5.00 (127.0)	3.35 (85.1)	134.5 (61.1)
T6EDC	18.42 (467.9)	3.94 (100.1)	10.75 (273.1)	—	—	220.4 (100.2)



Vane Pumps

T67 Model Ordering Code



Size Code
6DCCM
6EDCS
6EDCM

Note: T6EDCS (SAE pilot)
T6EDCM (ISO pilot)

Size	Delivery (See Table Below)		
	P1	P2	P3
6DCCM	Use Codes for 6D	Use Codes for 6C	Use Codes for 6C
6EDCS 6EDCM	Use Codes for 6E	Use Codes for 6D	Use Codes for 6C

Code	Shaft		
	6DCCM	6EDCM	6EDCS
1	Keyed (non SAE)	Keyed ISO G45N - 3019-2	
2	Keyed SAE CC		Keyed SAE D&E
3	Splined SAE C	Splined SAE D&E	Splined SAE D&E
4	Splined SAE CC		
6	Splined (non SAE)		

Code	Rotation*
R	CW
L	CCW

*As viewed from shaft end.

Code	Design Level
A	6EDC
B	6DCC

Code	Seal Class
1	S1 (Buna N)
4	S4 (EPDM)
5	S5 (fluorocarbon)

Code	Connection Variables
Code	6DCCM
M0	P3 = 1" Metric
M1	P3 = 3/4" Metric
00	P3 = 1" UNC
01	P3 = 3/4" UNC
Code	6EDC/S/M
F0*	P3 = 1" SAE
F1*	P3 = 3/4" SAE
P0**	P3 = 1" SAE
P1**	P3 = 3/4" SAE

*"F" is standard

**"P" 4 holes for external support

Delivery

6C Codes	Delivery* GPM (LPM)	6D Codes	Delivery * GPM (LPM)	6E Codes	Delivery* GPM (LPM)
B03	3.42 (12.9)	B14	15.09 (57.1)	042	41.94 (158.8)
B05	5.45 (20.6)	B17	18.45 (69.8)	045	46.15 (174.7)
B06	6.76 (25.6)	B20	20.93 (79.2)	050	50.25 (190.2)
B08	8.36 (31.6)	B24	25.20 (95.4)	052	52.25 (197.8)
B10	10.81 (40.9)	B28	28.44 (107.7)	062	62.36 (236.1)
B12	11.76 (44.5)	B31	31.16 (118.0)	066	67.62 (256.0)
B14	14.58 (55.2)	B35	35.19 (133.2)	072	72.00 (272.5)
B17	18.48 (70.0)	B38	38.14 (144.4)		
B20	20.23 (76.6)	B42	43.12 (163.2)		
B22	22.28 (83.3)	B45	46.19 (174.9)		
B25	25.14 (95.2)	B50	50.09 (189.6)		
B28	27.90 (105.6)				
B31	31.70 (120.0)				

* At 0 PSI (0 BAR) and 1200 RPM

*Many other combinations are available See catalog on CD.

□ = Not Available

T6H/T7H Hybrid Technology Variable Piston Fixed Vane Pumps



The hybrid pump is a combination of fixed displacement vane pump B, C, D cartridges combined with a variable cartridge of PV20 or PV29 piston pump. The cartridges are driven by a common shaft without

coupling in between they have a large common suction port and two or three independent outlet ports: one for the piston, one or two for the vane pump.

Pump Performance Data

Single Pump Model Series***	Displacement in ³ /rev (cc/rev)*	Max. Outlet Pressure** PSI (BAR)	Rated Drive Speed** RPM	Flow @1800 RPM and 0 PSI* GPM (LPM)	Input Horsepower @ 1800 RPM and 2000 PSI* HP (KW)
T6H20B	0.35 - 5.67 (5.7 - 92.9)	3500 (240)	2600	23.76 - 44.78 (89.9 - 169.5)	31.5 - 56.1 (23.5 - 41.8)
T6H20C	0.66 - 8.72 (10.8 - 142.9)	3500 (240)	2600	26.14 - 68.56 (99.0 - 259.5)	36 - 85.5 (26.8 - 63.8)
T6H29B	0.35 - 6.83 (5.7 - 111.9)	3000 (210)	2400	31.76 - 52.78 (120.2 - 199.8)	41 - 65.5 (30.6 - 48.8)
T6H29C	0.66 - 9.88 (10.8 - 161.9)	3000 (210)	2400	34.14 - 76.56 (129.2 - 289.8)	45.5 - 95 (33.9 - 70.8)
T6H29D	2.90 - 13.42 (47.5 - 219.9)	3000 (210)	2400	51.64 - 104.14 (195.5 - 394.2)	66.3 - 127.6 (49.4 - 95.2)
T6H29DB	32.46 - 16.47 (53.2 - 269.9)	3000 (210)	2400	56.78 - 151.7 (214.9 - 574.2)	70.3 - 156.1 (52.4 - 116.4)

* Piston pump at full displacement.

** Lower for larger displacements; see catalog.

*** See catalog on CD for complete information.

Pump Performance Data

Tables show data by cam ring size for van portion only (does not include piston portion).

T6H**B	Output Flow (lpm) @ 1800 RPM			Output Flow (GPM) @ 1800 RPM			Input Power (kW) @ 1800 RPM			Input Power (HP) @ 1800 RPM		
	0 BAR	140 BAR	320 BAR	0 PSI	2000 PSI	4350 PSI	7 BAR	140 BAR	320 BAR	100 PSI	2000 PSI	4350 PSI
B02	10.4	8.8	6.8	2.76	2.33	1.8	0.6	3.0	6.0	0.74	4.02	8.1
B03	17.6	16.0	14.0	4.66	4.23	3.7	0.6	4.7	9.6	0.85	6.24	12.93
B04	23.1	21.4	19.4	6.09	5.66	5.13	0.7	5.9	12.3	0.94	7.9	16.55
B05	28.6	27.0	25.0	7.56	7.13	6.6	0.8	7.2	15.1	1.02	9.62	20.29
B06	35.7	34.0	32.0	9.42	8.99	8.46	0.8	8.8	18.6	1.13	11.79	25
B07	40.5	38.9	36.9	10.7	10.27	9.74	0.9	9.9	21.1	1.2	13.29	28.26
B08	44.8	43.2	41.2	11.84	11.41	10.88	0.9	10.9	23.2	1.27	14.62	31.15
B10	57.2	55.6	53.6	15.12	14.69	14.16	1.1	13.8	29.4	1.46	18.45	39.48
B12	73.8	72.2	70.2	19.5	19.07	18.54	1.3	17.6	37.7	1.72	23.55	50.58
B15	90.0	88.4	86.6	23.78	23.35	22.88	1.5	21.3	42.8	1.97	28.55	57.35

*At 280 BAR (4060 PSI)

Markets

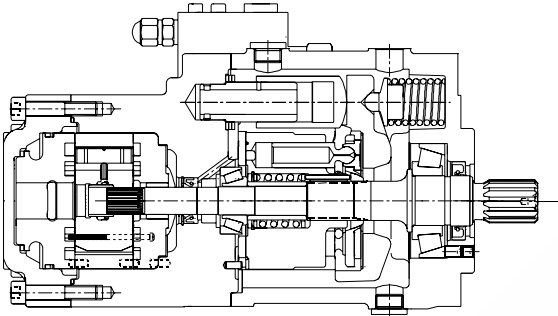
Industrial

Applications

Injection Molding

T6H/T7H Hybrid Technology Variable Piston Fixed Vane Pumps

Pump Performance Data



Benefits/Features

- Very compact
- High pressure ratings
- Low noise
- Independent outlets for fixed and variable flow allow simultaneous cycles
- Internal or external drain
- Choice of controls
- Wide range of acceptable fluids

Tables show data by cam ring size for vane portion only (does not include piston portion).

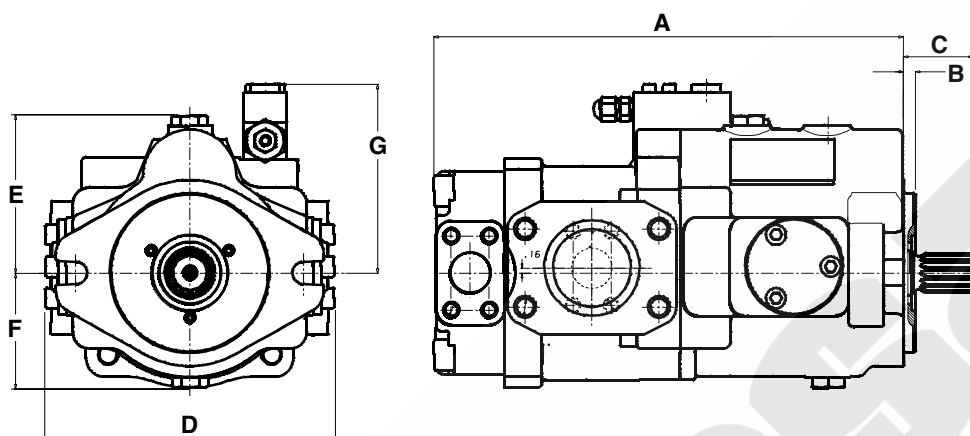
T6H**C	Output Flow (lpm) @ 1800 RPM			Output Flow (GPM) @ 1800 RPM			Input Power (kW) @ 1800 RPM			Input Power (HP) @ 1800 RPM		
Size	0 BAR	140 BAR	320 BAR	0 PSI	2000 PSI	3500 PSI	7 BAR	140 BAR	320 BAR	100 PSI	2000 PSI	3500 PSI
*03	19.5	13.7	—	5.14	3.61	—	1.6	6.3	10.0	2.11	8.45	13.38
*05	31.0	25.2	21.0	8.18	6.65	5.56	1.7	8.9	14.6	2.29	12	19.59
*06	38.3	32.6	28.4	10.13	8.6	7.51	1.8	10.6	17.6	2.4	14.28	23.57
*08	47.5	41.7	37.6	12.55	11.02	9.93	1.9	12.8	21.3	2.54	17.11	28.53
*10	61.4	55.6	51.5	16.22	14.69	13.6	2.1	15.9	26.8	2.76	21.38	36
*12	66.8	61.0	56.9	17.64	16.11	15.02	2.1	17.2	29.0	2.84	23.05	38.92
*14	82.8	77.0	72.9	21.88	20.35	19.26	2.3	20.9	35.5	3.09	27.99	47.56
*17	105.0	99.2	95.0	27.73	26.2	25.11	2.6	26.0	44.4	3.43	34.81	59.51
*20	114.8	109.0	103.8	30.34	28.81	27.42	2.7	28.2	48.4	3.58	37.86	64.85
*22	126.5	120.7	116.6	33.43	31.9	30.81	2.8	30.9	53.1	3.76	41.47	71.16
*25	142.7	136.9	132.8	37.71	36.18	35.09	3.0	34.6	59.6	4.01	46.46	79.9
*28	159.8	154.1	151.2	42.23	40.7	39.94	3.2	38.6	57.2	4.27	51.74	76.73
*31	180.0	174.2	171.3	47.56	46.03	45.27	3.4	43.2	64.2	4.58	57.95	86.06

*At 210 BAR (3000 PSI)

T6H29D	Output Flow (lpm) @ 1800 RPM			Output Flow (GPM) @ 1800 RPM			Input Power (kW) @ 1800 RPM			Input Power (HP) @ 1800 RPM		
Size	0 BAR	140 BAR	320 BAR	0 PSI	2000 PSI	3500 PSI	7 BAR	140 BAR	320 BAR	100 PSI	2000 PSI	3500 PSI
014	85.7	77.4	71.2	22.64	20.46	18.82	3.0	21.9	36.8	4.02	29.31	49.34
017	104.8	96.5	90.3	27.68	25.50	23.86	3.2	26.2	44.5	4.31	35.20	59.64
020	118.8	110.6	104.4	31.39	29.21	27.57	3.4	29.5	50.1	4.53	39.52	67.21
024	143.1	134.9	128.7	37.81	35.63	33.99	3.7	35.1	59.9	4.91	47.02	80.32
028	161.5	153.2	147.0	42.66	40.48	38.84	3.9	39.3	67.3	5.19	52.68	90.23
031	176.9	168.7	162.5	46.75	44.57	42.93	4.1	42.8	73.5	5.43	57.45	98.58
035	199.8	191.6	185.4	52.79	50.61	48.97	4.3	48.1	82.7	5.78	64.50	110.91
038	216.5	208.3	202.1	57.21	55.03	53.39	4.5	51.9	89.4	6.04	69.66	119.94
042	244.8	236.6	230.4	64.68	62.5	60.86	4.8	58.4	100.8	6.47	78.37	135.19
045	262.3	254.0	247.8	69.29	67.11	65.47	5.0	62.5	107.8	6.74	83.75	144.61
050	284.4	276.2	271.7	75.14	72.96	71.78	5.3	67.5	100.3	7.08	90.58	134.54

* At 3000 PSI

T6H/T7H Hybrid Technology Variable Piston Fixed Vane Pumps



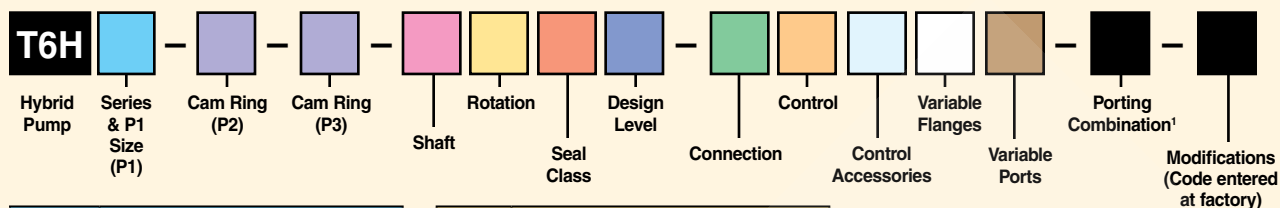
Dimensions, inch (mm)

Series	A	B max	C Max.	D Max	E	F	G Max.	Weight, kg (lb)
T6H20B/C	12.64 (321.1)	0.31 (7.9)	2.75 (69.8)	8.86 (225.0)	4.54 (115.3)	3.19 (81.0)	6.77 (172.0)	81.6 (37.1)
T6H29B/C	13.27 (337.1)	0.375 (9.5)	3.31 (84.1)	9.056 (230.0)	4.91 (124.7)	3.59 (91.2)	5.9 (149.9)	108.0 (49.1)
T6H29D	14.70 (373.4)	0.375 (9.5)	3.31 (84.1)	9.06 (230.1)	4.92 (125.0)	3.59 (91.2)	5.9 (149.9)	132.2 (60.1)
T6H29DB	19.30 (490.2)	0.375 (9.5)	3.31 (84.1)	9.06 (230.1)	4.95 (125.7)	3.59 (91.2)	5.9 (149.9)	158.7 (72.1)



Vane Pumps

T6H/T7H Model Ordering Code



Code	P1 Size
20B 20C	2.62 in ³ /rev (42.9 cc/rev)
29B 29C 29D 29DB	3.78 in ³ /rev (62.0 cc/rev)

Size	P2 & P3 Cam Ring Size (See Table Below)	
	P2	P3*
T6H20B	Use B Codes	
T6H20C	Use C Codes	
T6H29B	Use B Codes	
T6H29C	Use C Codes	
T6H29D	Use D Codes	
T6H29DB	Use D Codes	Use B Codes

*P3 required for double pumps (DB) only.
Omit for single pumps.

Code	Shaft	
	T6H20	T6H29
1	Keyed SAE BB	Keyed SAE C
3	Splined SAE C	Splined SAE C
4	Splined SAE BB	
5	Keyed SAE C	

Code	Rotation*
R	CW
L	CCW

*As viewed from shaft end.

Code	Seal Class
1	S1 (Buna N)
5	S5 (fluorocarbon)

Code	Design Level
C	T6H20C
B	All Other Sizes

Code	Connection (Drain + Vent.)
0	Ext. Drain + UNF Thread
2	Ext. Drain + BSPP Thread
3	Int. Drain + UNF Thread
4	Int. Drain + BSPP Thread

Code	Control
C	Compensator
F	RC Pilot Operated Compensator
L	RC Pilot Operated Compensator, Load Sensing
X*	RC Pilot Operated Compensator with Vent Valve 24 VDC

*Use with external drain only.

Code	Control Accessories
0	Maximum Flow
9	90% Max Flow
8	80% Max Flow
7	70% Max Flow
6	60% Max Flow
5	50% Max Flow

Code	Variable Flange Connection
0	SAE 4 Bolt Flange (J518c), UNC Thread
M	SAE 4 Bolt Flange (J518c), Metric Thread

Code	Variable Port		
	B & C P2	D P2	DB P3
0	1"	1 1/4"	1"
1	3/4"		3/4"

Cam Ring Codes

B Codes	Delivery GPM (LPM)	C Codes	Delivery GPM (LPM)	D Codes	Delivery GPM (LPM)
B02	1.84 (7.0)	*03	3.42 (12.9)	014	15.09 (57.1)
B03	3.11 (11.8)	*05	5.45 (20.6)	017	18.45 (69.8)
B04	4.06 (15.4)	*06	6.75 (25.6)	020	20.93 (79.2)
B05	5.04 (19.1)	*08	8.37 (31.7)	024	25.20 (95.4)
B06	6.28 (23.8)	*10	10.81 (40.9)	028	28.44 (107.7)
B07	7.13 (27.0)	*12	11.76 (44.5)	031	31.16 (118.0)
B08	7.89 (29.9)	*14	14.58 (55.2)	035	35.19 (133.2)
B10	10.08 (38.1)	*17	18.48 (70.0)	038	38.14 (144.4)
B12	13.00 (49.2)	*20	20.23 (76.6)	042	43.12 (163.2)
B15	15.85 (60.0)	*22	22.29 (84.4)	045	46.19 (174.9)
		*25	25.14 (95.2)	050	50.09 (189.6)
		*28	28.15 (106.6)		
		*31	31.70 (120.0)		

* 0 = uni-rotational; B = bi-rotational

¹Several combinations are available. See Catalog on CD.

■ = Not Available



Motors

Page

(M) = Mobile **(I)** = Industrial **(B)** = Mobile & Industrial

(M)	F11 Small Frame Fixed Displacement Bent-Axis Pumps/Motors	103-106
(M)	F12 Large Frame Fixed Displacement Bent-Axis Pumps/Motors	107-110
(M)	F1 Fixed Displacement Bent-Axis Truck Pumps/Motors	111-112
(M)	V12 Small Frame Variable Displacement Bent-Axis Motors	113-116
(M)	V14 Large Frame Variable Displacement Bent-Axis Motors	117-120
(M)	T12 Dual Displacement Bent-Axis Motors	121-124
(B)	M3/M4 High Performance Vane Motors	125-127
(B)	M5 High Performance Fan Drive Vane Motors	128-130
(B)	MR-MRE Low Speed High Torque Small Displacement Radial Piston Motors	131-134
(B)	MRT-MRTE-MRTF Low Speed High Torque Large Displacement Radial Piston Motors	131,135-137
(B)	MRD-MRDE, MRV-MRVE Low Speed High Torque Variable Displacement Radial Piston Motors	131,138-140
(B)	Gold Cup Open & Closed Circuit Pumps & Motors for Hydrostatic Transmissions	63-74



ENGINEERING YOUR SUCCESS.

F11 Small Frame Fixed Displacement Bent-Axis Motors



F11 is the well-proven, bent-axis, fixed displacement heavy-duty motor Series. They can be used in numerous applications on both open and closed loop circuits where high speed and extreme shaft loads are required.

Motor Performance Data

Model Series	Displacement in ³ /rev (cc/rev)	Outlet Pressure PSI (BAR)	Continuous Drive Speed RPM	Flow @ Rated RPM GPM (LPM)
F11005	0.30 (4.9)	5000 (350)	12800	14 (53.0)
F11006	0.37 (6.0)	5000 (350)	10200	16 (60.6)
F11010	0.60 (9.8)	5000 (350)	10200	26 (98.4)
F11012	0.76 (12.5)	5000 (350)	9400	31 (117.3)
F11014	0.87 (14.3)	5000 (350)	9000	34 (128.7)
F11019	1.16 (19.0)	5000 (350)	8100	40 (151.4)

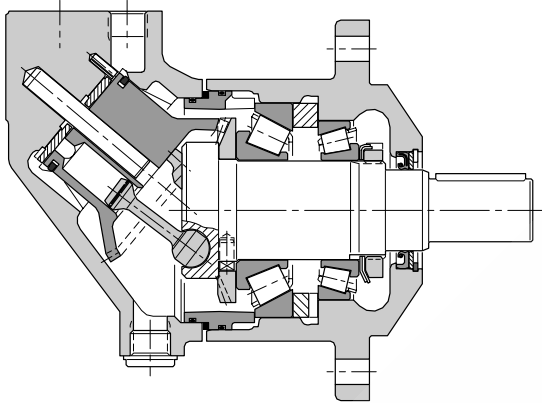
Markets

Applications

Forestry	Saw Drives, Feller Bunchers, Skidder, Forwarder, Cranes, Mowers / Cutters
Industrial	Aircraft Test Stands
Marine	Deck Cranes, Constant Tension Winches, Hatch Covers
Oil & Gas	Nitrogen Pumps, Frac Trucks, Coil Tubing
Construction	Skid Steer, Off-Highway Trucks, Fan Drives, Cranes, Dust Collector, Excavator
Mining	Drill Rigs, Top Drives, Loaders, Subsurface Loaders, Tunneling Equipment
Material Handling	Conveyor Drives, Truck Mounted Cranes, Mixers
Recycling	Shredders, Vacuum Truck Systems
Military	Fan Drives

F11 Small Frame Fixed Displacement Bent-Axis Motors

Performance Characteristics

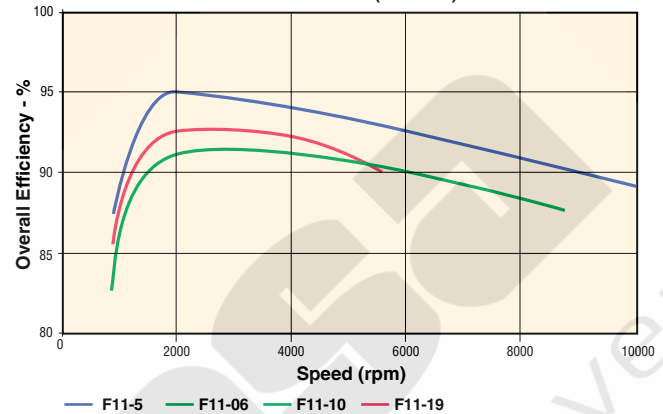


Benefits/Features

- F11 motors can be used at unusually high shaft speeds
- Operating pressures to 6091.59 PSI (420 BAR)
- Compact, lightweight motor and pump
- Laminated piston ring provides low internal leakage and thermal shock resistance
- F11 Series have very few moving parts
- Heavy duty roller bearings

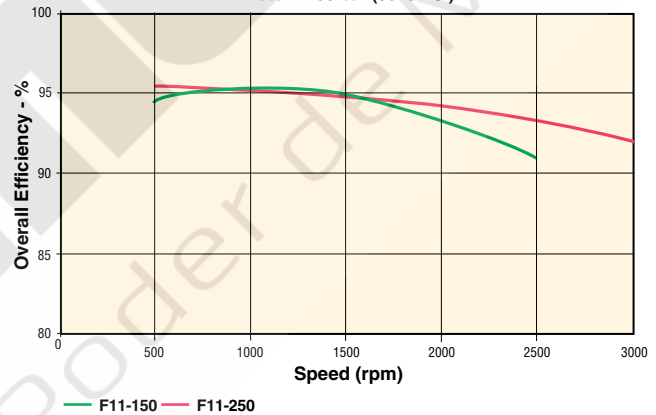
F11 Series Overall Efficiency

Motor - 250 bar (3625 PSI)



F11 Series Overall Efficiency

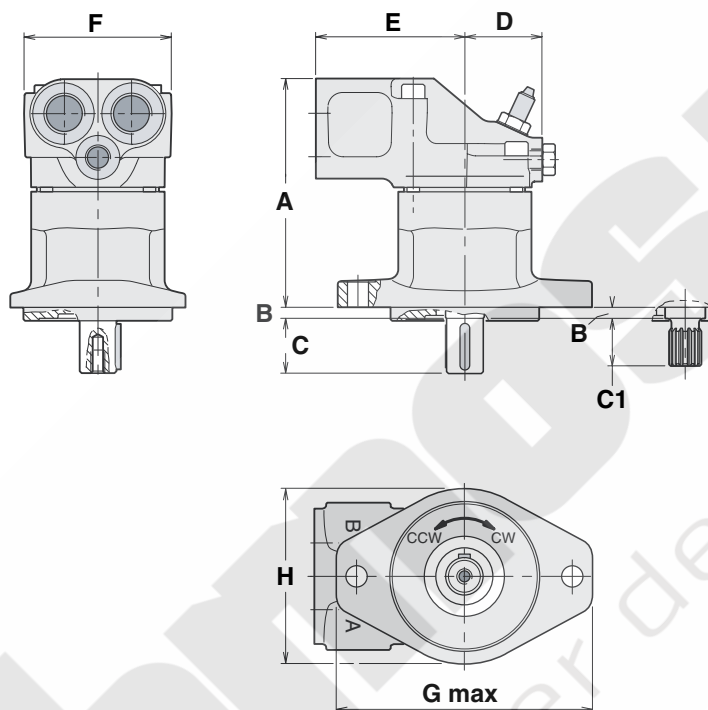
Motor - 250 bar (3625 PSI)



F11 Small Frame Fixed Displacement Bent-Axis Motors

F11-14

(SAE versions)



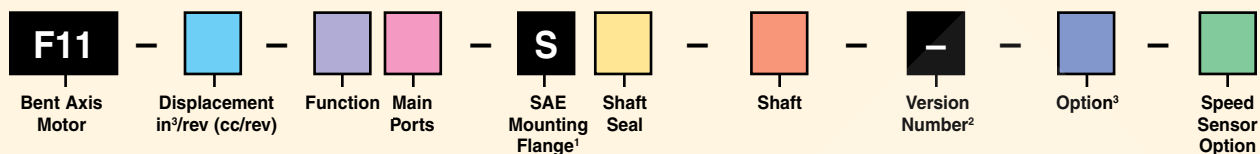
Dimensions, inch (mm)

Series	A max	B	C	C1	D	E	F	G max	H
F11-10 F11-14	6.21 (175.7)	0.31 (7.9)	1.50 (38.1)	1.30 (33.0)	2.09 (53.1)	4.02 (102.1)	3.98 (101.1)	6.85 (174.0)	4.72 (119.9)
F11-19	7.13 (181.1)	0.31 (7.9)	1.50 (38.1)	1.30 (33.0)	2.48 (63.0)	3.46 (87.9)	4.49 (114.0)	6.93 (176.0)	4.84 (122.9)



Motors

F11 Model Ordering Code



Code	Displacement in ³ /rev (cc/rev)
005*	0.30 in ³ /rev (4.9 cc/rev)
006*	0.37 in ³ /rev (6.0 cc/rev)
010*	0.60 in ³ /rev (9.8 cc/rev)
012*	0.76 in ³ /rev (12.5 cc/rev)
014	0.87 in ³ /rev (14.3 cc/rev)
019	1.16 in ³ /rev (19.0 cc/rev)

* ISO or CETOP mounting options, see catalog on CD

Code	Function	005	006	010	012	014	019
M	Motor	x	x	x	—	—	x
H	Motor, High Pressure	x	—	x	x	x	x
S	Motor, High Speed	—	—	x	—	—	x

* Internal drain

Code	Main Ports	005	006	010	012	014	019
U	SAE, UN Threads	x	x	x	x	x	x
B	BSP Threads	x	x	x	x	x	x
F	SAE 6000 psi (413.7 bar) Flange*	—	—	x	x	x	—

* Metric female threads

** UNF threads

x: Available —: Not Available

¹NOTE: CETOP and ISO mounting also available. See catalog on CD.

²Assigned by factory for special versions

³None (see catalog on CD)

Code	Shaft Seal	005	006	010	012	014	019
N	NBR*, Low Pressure	x	x	x	—	—	x
V	FPM**, High Pressure, High Temperature	—	x	x	x	x	x
S	FPM**, Saw Motor	—	x	x	—	—	x

* NBR - Nitrile rubber

** FPM - Fluorocarbon rubber

Code	Shaft	005	006	010	012	014	019
T	SAE Key	—	—	—	—	x	x
S	SAE Spline	x	x	x	x	x	x
K	Metric Key	x	x	x	x	x	x
D	DIN 5480 Spline	x	x	x	x	x	x

For metric options, see catalog on CD.

Code	Option	005	006	010	012	014	019
MVR	Make-up valve clockwise	—	—	x	x	x	x
MVL	Make-up valve counter clockwise	—	—	x	x	x	x

Code	Speed Sensor	005	006	010	012	014	019
P	Prepared for Speed Sensor	—	—	—	x	x	x

Order speed sensor kit# 3785190 separately

F12 Large Frame Fixed Displacement Bent-Axis Motors



Series F12 is the high performance bent-axis, fixed displacement heavy-duty motor series. They can be used in numerous applications at unusually high shaft speeds.

Motor Performance Data

Model Series	Displacement in ³ /rev (cc/rev)	Maximum Outlet Pressure PSI (BAR)	Rated Drive Speed RPM	Flow GPM (LPM)
F12-030	1.83 (30.0)	6000 (420)	6700	44 (166.6)
F12-040	2.44 (40.0)	6000 (420)	6100	53 (200.6)
F12-060	3.64 (59.6)	6000 (420)	5300	68 (257.4)
F12-080	4.91 (80.4)	6000 (420)	4800	85 (321.8)
F12-090	5.68 (93.0)	6000 (420)	4600	—
F12-110	6.72 (110.1)	6000 (420)	4400	105 (397.5)
F12-125	7.63 (125.0)	6000 (420)	4200	—
F12-150	9.15 (150.0)	5000 (350)	3200	103 (139.9)
F12-250	14.77 (242.0)	5000 (350)	2700	154 (583.0)

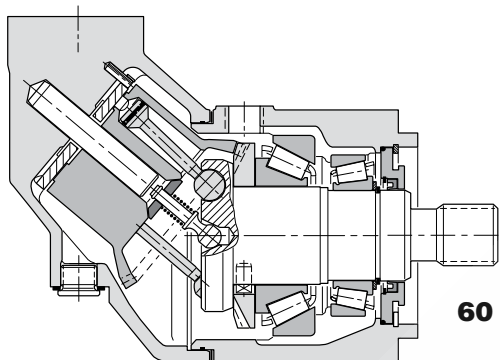
Markets

Applications

Forestry	Saw Drives, Feller Bunchers, Skidder, Forwarder, Cranes, Mowers / Cutters
Industrial	Aircraft Test Stands
Marine	Deck Cranes, Constant Tension Winches, Hatch Covers
Oil & Gas	Nitrogen Pumps, Frac Trucks
Construction	Skid Steer, Off-Highway Trucks, Fan Drives, Cranes, Dust Collector, Excavator
Mining	Drill Rigs, Top Drives, Loaders, Subsurface Loaders, Tunneling Equipment
Material Handling	Conveyor Drives, Truck Mounted Cranes, Mixers
Recycling	Shredders, Vacuum Truck Systems
Military	Fan Drives

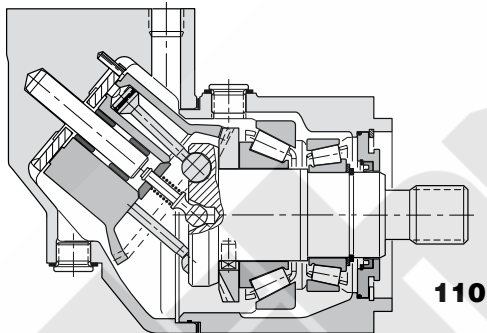
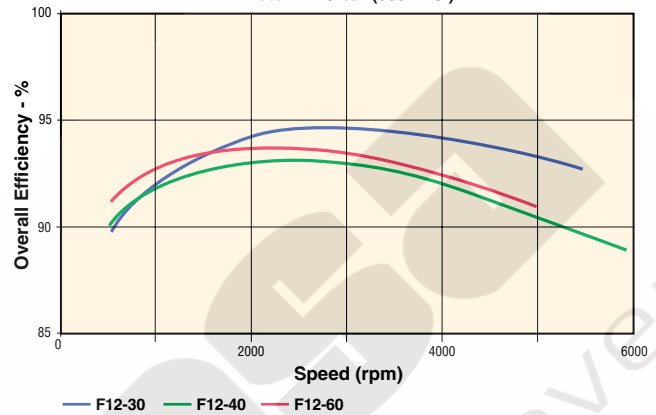
F12 Large Frame Fixed Displacement Bent-Axis Motors

Performance Characteristics



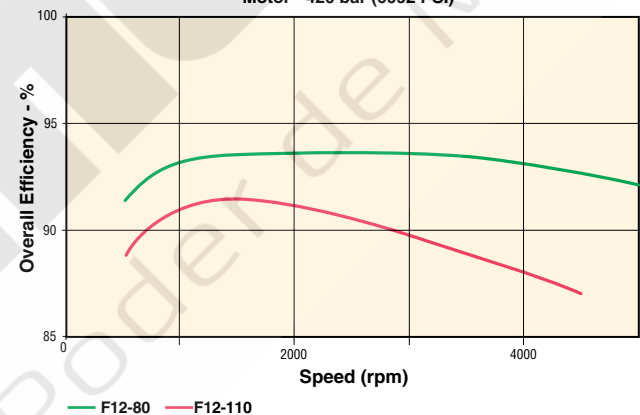
F12 Series Overall Efficiency

Motor - 420 bar (6092 PSI)



F12 Series Overall Efficiency

Motor - 420 bar (6092 PSI)

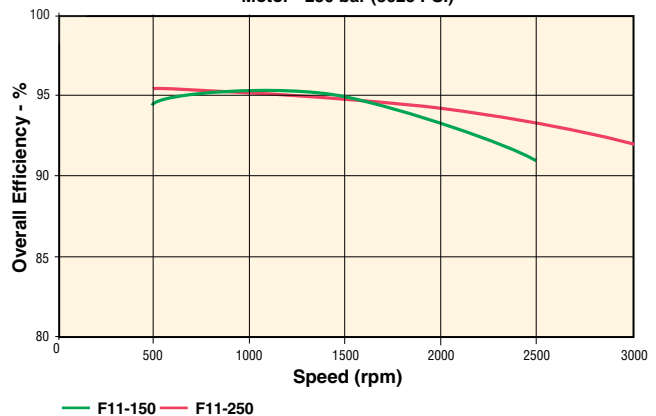


Benefits/Features

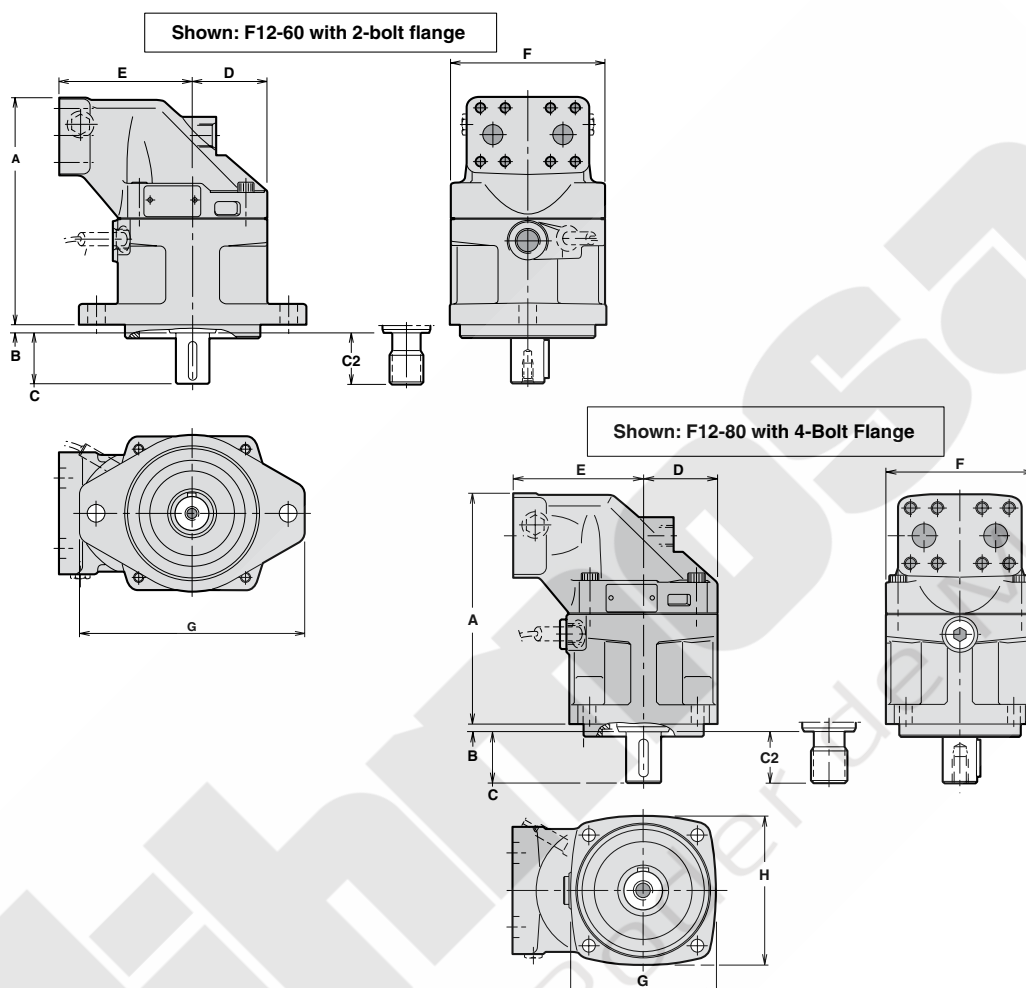
- Operating pressures to 6961.81 PSI (480 BAR)
- Compact, lightweight motor and pump
- Laminated piston ring provides low internal leakage and thermal shock resistance
- F12 Series have very few moving parts
- Heavy duty roller bearings

F12 Series Overall Efficiency

Motor - 250 bar (3625 PSI)



F12 Large Frame Fixed Displacement Bent-Axis Motors



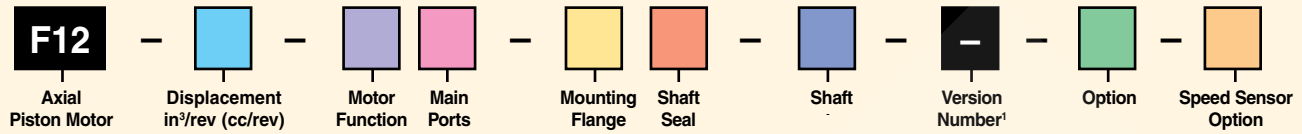
Dimensions, inch (mm)

Series 2-BOLT	A	B	C	C2	D	E	F	G	
F12-30	7.46 (189.5)	0.31 (7.9)	1.5 (38.1)	1.3 (33.0)	2.32 (58.9)	3.94 (100.1)	4.80 (121.9)	6.93 (176.0)	
F12-40	7.76 (197.1)	0.3) (7.9)	1.89 (48.0)	1.89 (48.0)	2.56 (64.0)	4.33 (110.0)	5.28 (134.1)	8.46 (214.9)	
F12-60	8.43 (214.1)	0.31 (7.9)	1.89 (48.0)	1.89 (48.0)	2.76 (70.1)	4.92 (125.0)	5.67 (144.0)	8.46 (214.9)	
Series 4-BOLT	A	B	C	C2	D	E	F	G	H
F12-30	7.46 (189.5)	0.31 (7.9)	1.50 (38.1)	1.30 (33.0)	2.32 (58.9)	3.94 (100.1)	4.80 (121.9)	4.65 (118.1)	4.65 (118.1)
F12-40	7.76 (197.1)	0.31 (7.9)	1.89 (48.0)	1.89 (48.0)	2.56 (65.0)	4.33 (110.0)	5.28 (134.1)	5.83 (148.1)	5.67 (144.0)
F12-60	8.43 (214.1)	0.31 (7.9)	1.89 (48.0)	1.89 (48.0)	2.76 (70.1)	4.92 (125.0)	5.67 (144.0)	5.83 (148.1)	5.67 (144.0)
F12-80	9.45 (240.0)	0.31 (7.9)	2.13 (54.1)	2.13 (54.1)	3.05 (77.5)	5.31 (134.9)	6.10 (154.9)	6.10 (154.9)	6.10 (154.9)
F12-90	9.45 (240.0)	0.31 (7.9)	2.13 (54.1)	2.13 (54.1)	3.05 (77.5)	5.31 (134.9)	6.10 (154.9)	6.10 (154.9)	6.10 (154.9)
F12-110	10.39 (263.9)	0.31 (7.9)	2.64 (67.1)	2.63 (66.8)	3.35 (85.1)	5.71 (145.0)	6.69 (169.9)	8.03 (204.0)	7.87 (199.9)
F12-125	10.39 (263.9)	0.31 (7.9)	2.64 (67.1)	2.63 (66.8)	3.35 (85.1)	5.71 (145.0)	6.69 (169.9)	8.03 (204.0)	7.87 (199.9)



Motors

F12 Model Ordering Code



Code	Displacement in³/rev (cc/rev)
030	1.83 in³/rev (30.0 cc/rev)
040	2.44 in³/rev (40.0 cc/rev)
060	3.65 in³/rev (59.8 cc/rev)
080	4.91 in³/rev (80.4 cc/rev)
090	5.68 in³/rev (93.0 cc/rev)
110	6.72 in³/rev (110.1 cc/rev)
125	7.63 in³/rev (125.0 cc/rev)
150	9.15 in³/rev (150.0 cc/rev)
250	14.77 in³/rev (242.0 cc/rev)

Code	Motor Function	30	40	60	80	90	110	125	150	250
M	Motor	x	x	x	x	x	x	x	x	—
H	Motor-High Pressure	—	—	—	—	—	—	—	x	—
Q	Quiet	—	—	—	—	—	—	—	—	x

Code	Main Ports	30	40	60	80	90	110	125	150	250
S	SAE Flange Code 62 6000 PSI (413.7 BAR)	x	x	x	x	x	x	x	—	—
U*	SAE, UN Threads	x	x	x	x	x	x	x	—	—
F	SAE 6000 PSI Flange	—	—	—	—	—	—	—	x	x

* Reduced pressure rating 350 bar

Code	Mounting Flange	30	40	60	80	90	110	125	150	250
S	SAE 4 bolt	x	x	x	x	x	x	x	x	x
T	SAE 2 bolt	x	x	x	—	—	—	—	—	—
X	SAE D 4 bolt	—	—	—	x	x	—	—	—	—

NOTE: ISO and cartridge mounting also available. See catalog on CD.

x: Available —: Not Available

¹Assigned by factory for special versions

²Order speed sensor kit# 3785190 separately.

Code	Shaft Seal	30	40	60	80	90	110	125	150	250
N	NBR*, Low Pressure	x	x	x	x	x	x	x	x	—
V	FPM**, High Pressure, High Temperature	x	x	x	x	x	x	x	x	x

* NBR - Nitrile rubber

** FPM - Fluorocarbon rubber

Code	Shaft	30	40	60	80	90	110	125	150	250
S	SAE Spline (std)	x	x	x	x	x	x	x	x	x
U	SAE Spline (opt.)	—	—	—	x	x	—	—	—	—
T	SAE Key (std)	x	x	x	x	x	x	x	x	—
K	Metric Key	—	—	—	—	—	—	—	x	x
F	SAE Spline	—	—	—	—	—	—	—	—	x
D	Spline, DIN 5480	—	—	—	—	—	—	—	—	x

Code	Option	30	40	60	80	90	110	125	150	250
000	Standard	x	x	x	x	x	x	x	x	x
L01	Integr. Flushing Valve	x	x	x	x	x	—*	—*	—	—
MVL	Make-up valve counter clockwise rotation	x	—	—	—	—	—	—	—	—
MVR	Make-up valve clockwise rotation	x	—	—	—	—	—	—	—	—

* F12-110 accessory valve block. See page 36 of catalog on CD.

Code	Speed Sensor Option	30	40	60	80	90	110	125	150	250
0	Standard	x	x	x	x	x	x	x	x	x
P	Prepared for Speed Sensor	x	x	x	x	x	x	x	—	—

F1 Fixed Displacement Bent-Axis Truck Motors



F1 Motors are used on applications that do not require high shaft sideloading. Their light weight, compact size and efficient design make them the first choice on many mobile applications including winches, augers and spreaders.

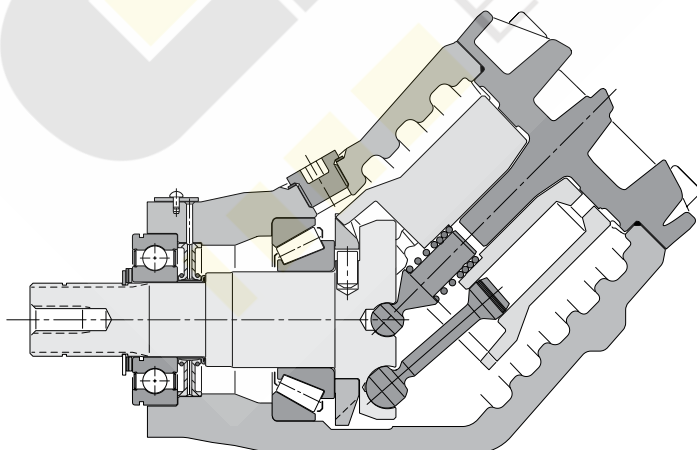
Motor Performance Data

Model Series	Displacement in ³ /rev (cc/rev)	Maximum Cont. Pressure PSI (BAR)	Rated Drive Speed RPM	Max. Theoretical Torque in-lb (m-kg)	Maximum Output Power @ Rated Speed HP (KW)
F1-25-M	1.56 (25.6)	3600 (250)	2300	719 (82.8)	27 (20.1)
F1-41-M	2.50 (40.9)	3600 (250)	2000	1154 (133.0)	36 (26.8)
F1-51-M	3.12 (51.1)	3600 (250)	1800	1439 (165.8)	41 (30.6)
F1-61-M	3.63 (59.5)	3600 (250)	1700	1678 (193.2 g)	45 (33.6)
F1-81-M	4.98 (81.6)	3600 (250)	1500	2300 (265.0)	55 (41.0)
F1-101-M	6.28 (102.9)	3600 (250)	1400	2904 (334.6)	64 (47.7)

Markets

Applications

Forestry	Knuckle Boom Loader, Cranes, Mowers / Cutters
Construction	Off-Highway Trucks, Fan Drives
Mining	Dump Trucks
Material Handling	Truck Mounted Cranes, Lift Trucks
Recycling	Vaccum Truck Systems, Refuse Trucks - ASL, Rear Loaders
Military	Fan Drives



Benefits/Features

- Higher self-priming speeds
- Operating pressures to 5801.51 PSI (400 BAR)
- New frame sizes to meet market requirements
- Higher overall efficiency
- Increased reliability
- Reduced noise level
- Smaller installation dimensions



Motors

F1 Model Ordering Code



Fixed
Displacement
Bent Axis
Motor

Frame
Size

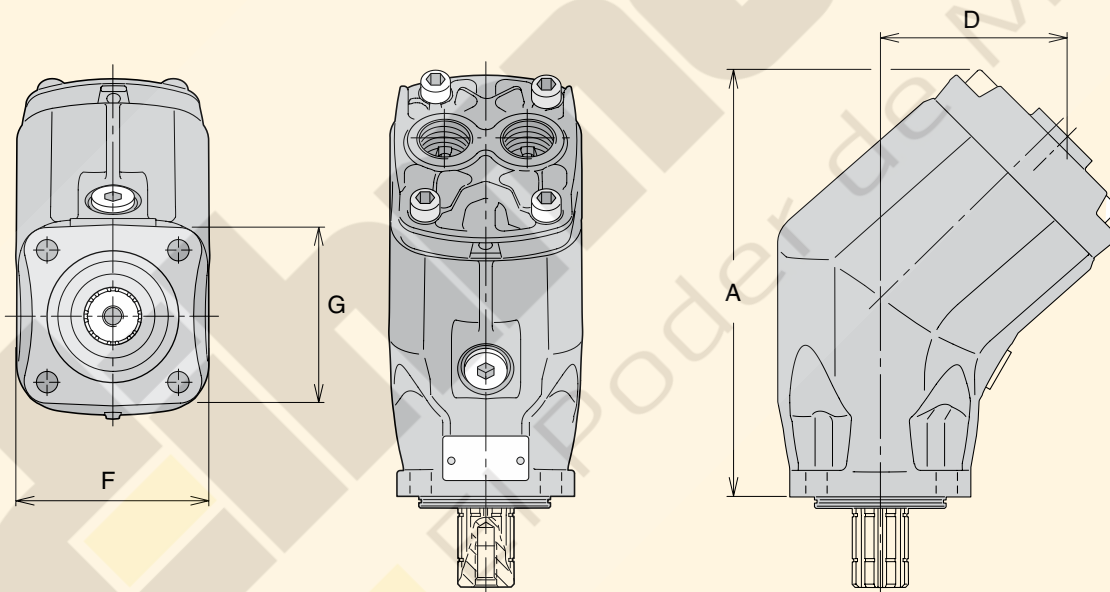
Code	Frame Size
25	1.56 in ³ /rev (25.6 cc/rev)
41	2.50 in ³ /rev (40.9 cc/rev)
51	3.12 in ³ /rev (51.1 cc/rev)
61	3.66 in ³ /rev (59.5 cc/rev)
81	4.98 in ³ /rev (81.6 cc/rev)
101	6.28 in ³ /rev (102.9 cc/rev)

NOTES:

1. Pressure port on 25, 41, 51 and 61 sizes is 3/4". Pressure port on 81 and 101 sizes is 1".
2. Suction fitting must be ordered separately.
3. Use seven digit number when placing order.

Ordering Code	Ordering No.
F1-25-M	378 1724
F1-41-M	378 1740
F1-51-M	378 1750
F1-61-M	378 1760
F1-81-M	378 1780
F1-101-M	378-1800

F1 Fixed Displacement Bent-Axis Truck Pumps/Motors



Dimensions, inch (mm)

Series	A	B	C	D	E	F	G
F1-25 F1-41 F1-51 F1-61	8.07 (205)	0.27 (7)	2.17 (55)	5.10 (129.5)	2.22 (56.5)	4.25 (108)	4.29 (109)
F1-81 F1-101	10.20 (259)	0.27 (7)	2.17 (55)	5.67 (144)	2.48 (63)	4.65 (118)	4.33 (110)

V12 Small Frame Variable Displacement Bent-Axis Motors



Series V12 is a bent-axis, variable displacement motor. It is intended for both open and closed circuits, mainly in mobile applications, but the V12 can also be utilized in a wide variety of other applications.

Motor Performance Data

Model Series	Displacement	Outlet Pressure	Drive Speed	Flow @ Rated RPM
V12-60	3.66 (60)	6000 (420)	5600	57 (215.8)
V12-80	4.88 (80)	6000 (420)	5000	66 (249.8)

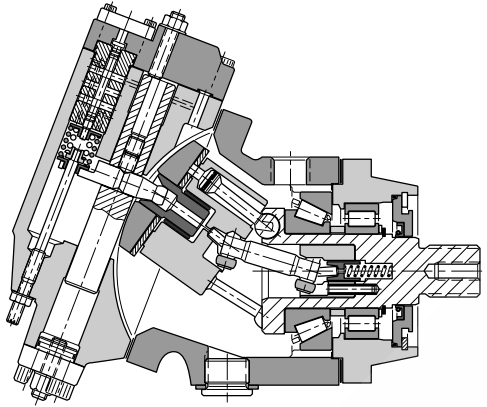
Markets

Applications

Forestry	Feller Bunchers, Skidder, Forwarder, Cranes
Marine	Deck Cranes, Constant Tension Winches
Construction	Wheel Loader, Cranes, Excavator
Mining	Drill Rigs, Top Drives, Loaders, Subsurface Loaders, Tunneling Equipment
Power Gen	Turbine Start
Material handling	Conveyor Drives, Truck Mounted Cranes, Mixers
Recycling	Shredders
Military	Fan Drives

V12 Small Frame Variable Displacement Bent-Axis Motors

Performance Characteristics

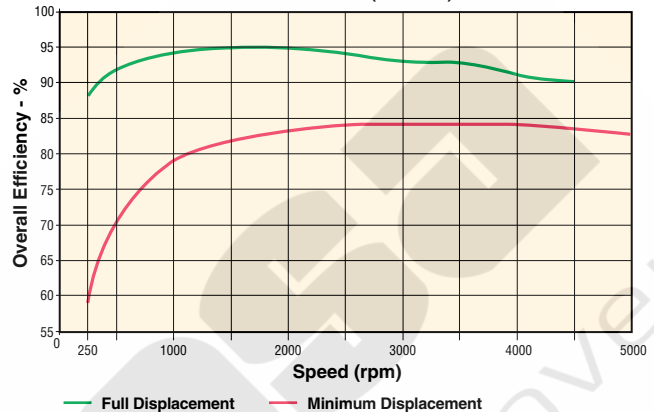


Benefits/Features

- Tolerates very high speeds due to low weight pistons with laminated piston rings and a compact design of the rotating parts
- High output power; the overall efficiency remains high throughout the entire displacement range
- The 9-piston design provides high start-up torque and smooth motor operation
- Wide displacement ratio (5:1)
- Broad range of controls and accessory valves for most applications
- Small envelope size and a high power-to-weight ratio
- ISO, cartridge and SAE versions
- Low noise levels due to a very compact and sturdy design with smooth fluid passages
- Positive piston locking, strong synchronizing shaft, heavy-duty bearings and small number of parts add up to a compact and robust motor with long service life and proven reliability.

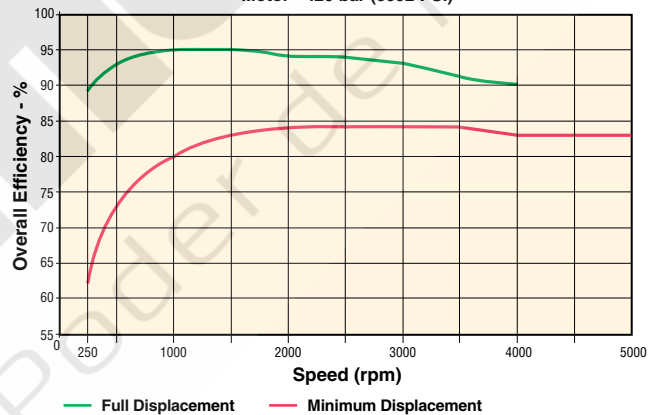
V12-60 Series Overall Efficiency

Motor - 420 bar (6092 PSI)

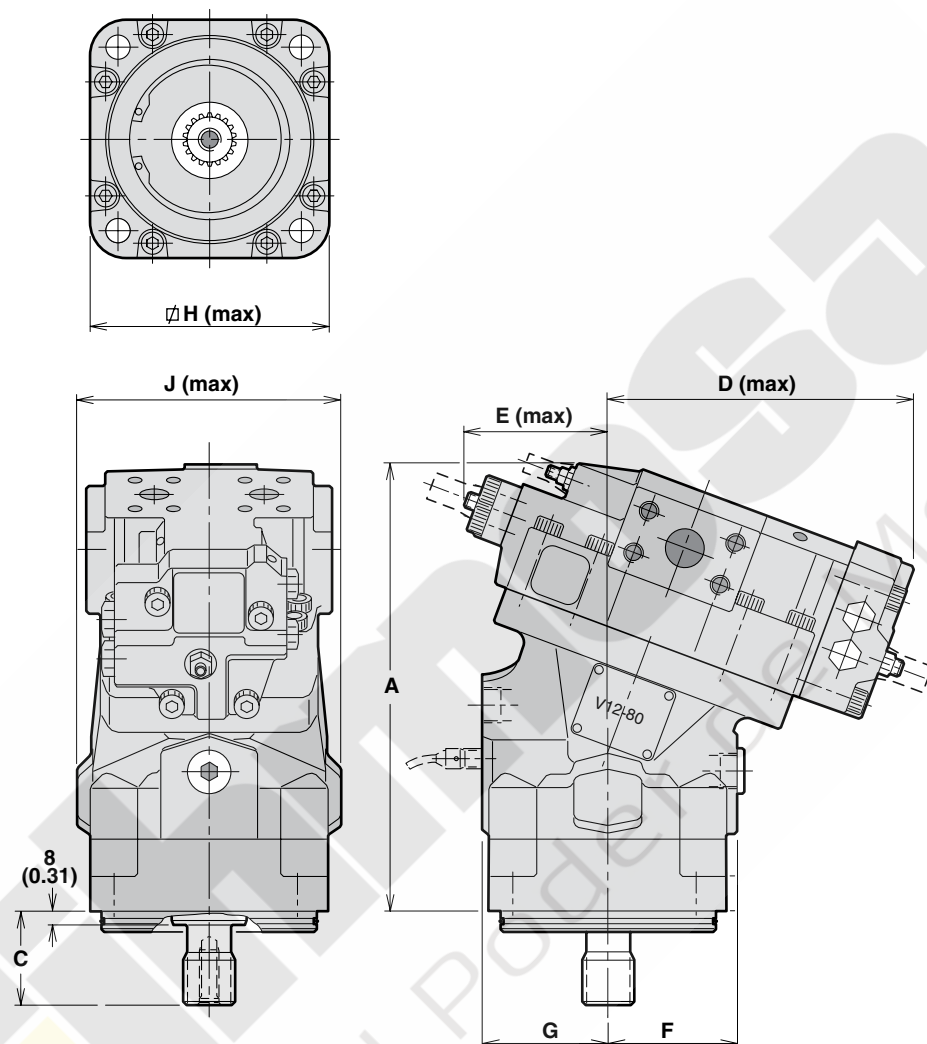


V12-80 Series Overall Efficiency

Motor - 420 bar (6092 PSI)



V12 Small Frame Variable Displacement Bent-Axis Motors



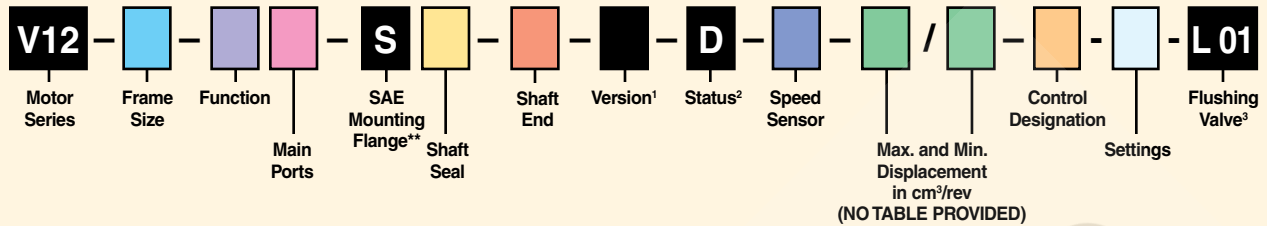
Dimensions, inch (mm)

Series	A	C max	D max	E max	F	G	H max	J max
V12-60	10.51 (267)	2.19 (55.6)	7.40 (188)	3.43 (87)	3.03 (77)	2.99 (76)	5.87 (149)	6.26 (159)
V12-80	11.02 (280)	2.19 (55.6)	7.60 (193)	3.54 (90)	3.15 (80)	3.07 (78)	5.87 (149)	6.50 (165)



Motors

V12 Model Ordering Code



Code	Frame Size
60	3.66 in³/rev (60 cm³/rev)
80	4.88 in³/rev (80 cm³/rev)

Code	Function
M	Motor; normal end cap position (EO, EP, HO & HP only)
T	Motor; normal end cap position (AC & AH only)

Code	Main Ports*
S	SAE Flange; UN Threads, Side Ports
U	SAE Flange; UN Threads, Rear Ports

Code	Shaft Seal	60	80
H	NBR (Nitrile)	x	x
V	FPM (High Temperature Fluorocarbon)	(x)	(x)

Code	Shaft End***	60	80
S	Spline (SAE J498b)	(x)	(x)

Code	Speed Sensor
0	No Sensor
S	Speed Sensor (not installed)
P	Prepared for Speed Sensor

Code	Control	60	80
AC I 01 I	Pressure Compensator, internal pilot pressure, internal servo supply	x	x
AC E 01 I	Pressure Compensator, external pilot pressure, internal servo supply	(x)	(x)
AH I 01 I	Pressure Compensator, hydraulic override internal pilot pressure, internal servo supply	x	x
AH E 01 I	Pressure compensator, hydraulic override, external pilot pressure, internal servo supply	(x)	(x)
EOL 01 I	Electrohydraulic, two-position, 12 VDC, internal servo supply	x	x
EOL 01 E	Electrohydraulic, two-position, 12 VDC, external servo supply	(x)	(x)
EOH 01 I	Electrohydraulic, two-position, 24 VDC, internal servo supply	x	x
EPL 01 I	Electrohydraulic, proportional, 12 VDC, internal servo supply	x	x
EPL 01 E	Electrohydraulic, proportional, 12 VDC, external servo supply	(x)	(x)
EPH 01 I	Electrohydraulic, proportional, 24 VDC, internal servo supply	x	x
EPH 01 E	Electrohydraulic, proportional, 24 VDC, external servo supply	(x)	(x)
HOS 01 I	Hydraulic, two-position, standard version, internal servo supply	x	x
HOS 01 E	Hydraulic, two-position, standard version, external servo supply	(x)	(x)
HPS 01 I	Hydraulic, proportional, standard version, internal servo supply	x	x
HPS 01 E	Hydraulic, proportional, standard version, external servo supply	(x)	(x)

Settings
AC, AH: Threshold Pressure: 2175.57, 2900.76, or 3625.94 PSI (150, 200 or 250 bar) Modulating Pressure: 217.56, 362.59, 725.19 PSI (015, 025 or 050 bar)
EO, EP: Threshold Current: 400 mA (12 VDC), 200 mA (24 VDC) Modulating Current: 000 (EO), 600 mA (EP 12 VDC), 300 mA (EP 24 VDC)
HO, HP: Threshold Pressure: 145.14 PSI (010 bar) Modulating Pressure: 000 (HO), 217.56 or 362.59 PSI (HP) (000 (HO), 015 or 025 bar (HP))

x = standard; (x) = option

* Main ports also available with metric threads. See CD.

** Cartridge and ISO options available. See CD.

*** DIN shaft ends also available. See CD.

¹ Factory issued for special versions

² Control pressure setting; max and min displacement screws sealed

³ Integrated flushing valve with standard nozzle. See CD for options.

V14 Large Frame Variable Displacement Bent-Axis Motors



Series V14 is a new generation of variable displacement, bent-axis motors, a further development of our well known V12 motor. It is designed for both open and closed circuit transmissions with focus on high performance machines.

Motor Performance Data

Model Series	Displacement in ³ /rev (cc/rev)	Outlet Pressure PSI (BAR)	Drive Speed RPM	Flow GPM (LPM)
V14-110	6.71 (110)	6000 (420)	5700	99 (374.8)
V14-160	9.76 (160)	6000 (420)	5000	127 (480.8)

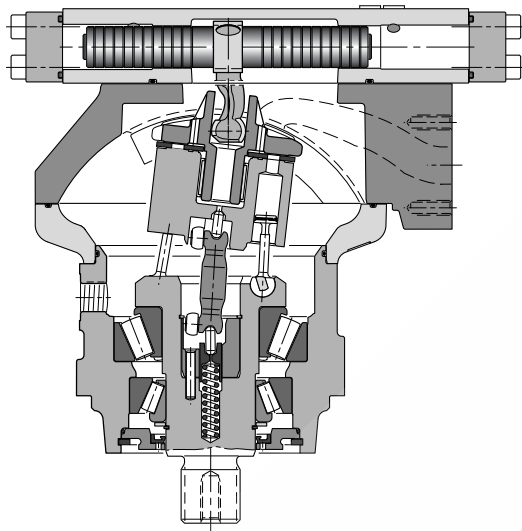
Markets

Applications

Forestry	Feller Bunchers, Skidder, Forwarder, Cranes
Marine	Deck Cranes, Constant Tension Winches
Construction	Wheel Loader, Cranes, Excavator
Mining	Drill Rigs, Top Drives, Loaders, Subsurface Loaders, Tunneling Equipment
Power Gen	Turbine Start
Material handling	Conveyor Drives, Truck Mounted Cranes, Mixers
Recycling	Shredders
Military	Fan Drives

V14 Large Frame Variable Displacement Bent-Axis Motors

Performance Characteristics



Applications

- Excavators
- Forestry machines
- Mining and drilling machines
- Wheel loaders
- Winch drives

Optional equipment

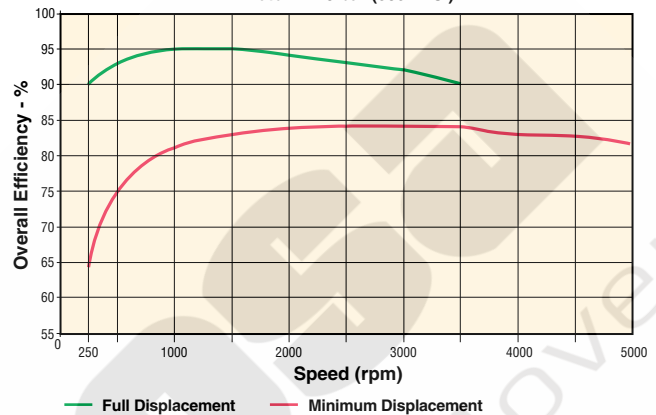
- Integrated sensors for speed and displacement
- Integrated flushing and pressure relief valves

Additional benefits

- Improved speed capability
- Improved control performance
- Reduced number of parts
- Stronger shaft bearing support.

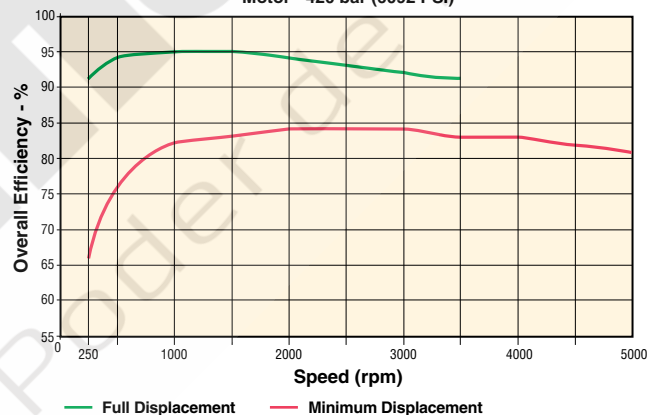
V14-110 Series Overall Efficiency

Motor - 420 bar (6092 PSI)

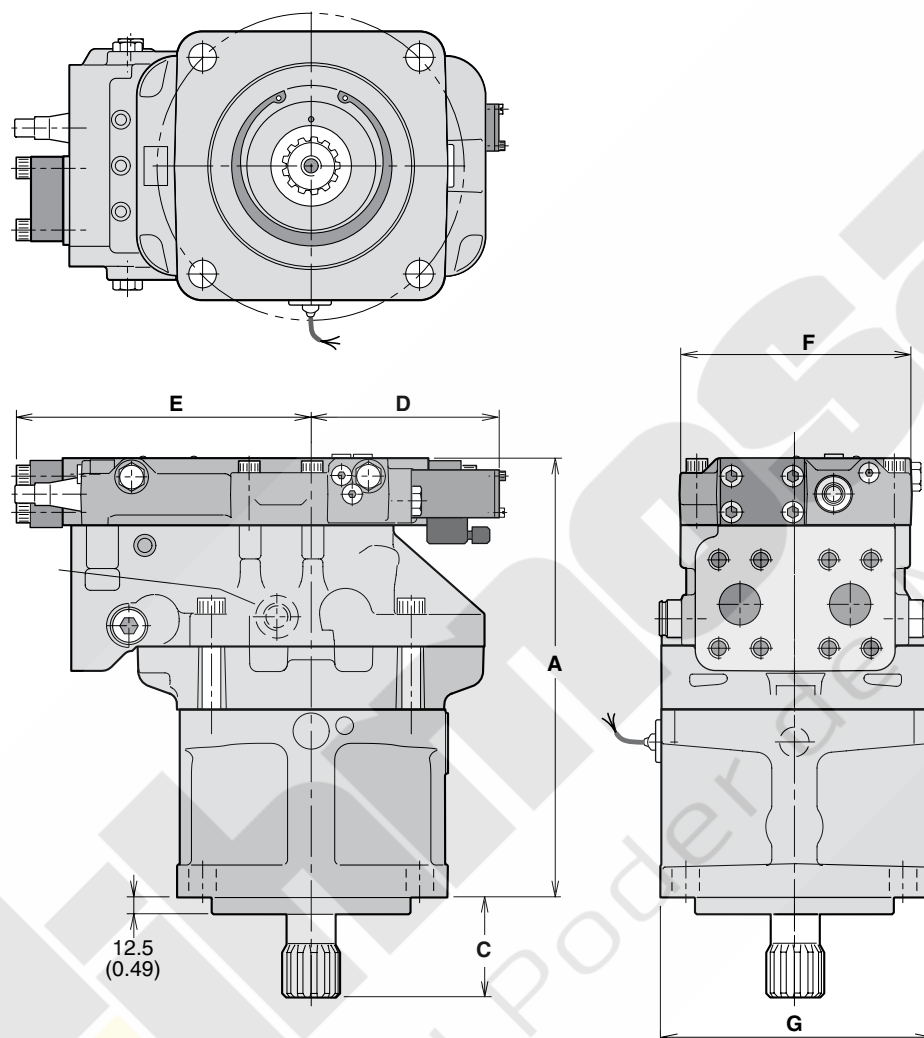


V14-160 Series Overall Efficiency

Motor - 420 bar (6092 PSI)



V14 Large Frame Variable Displacement Bent-Axis Motors



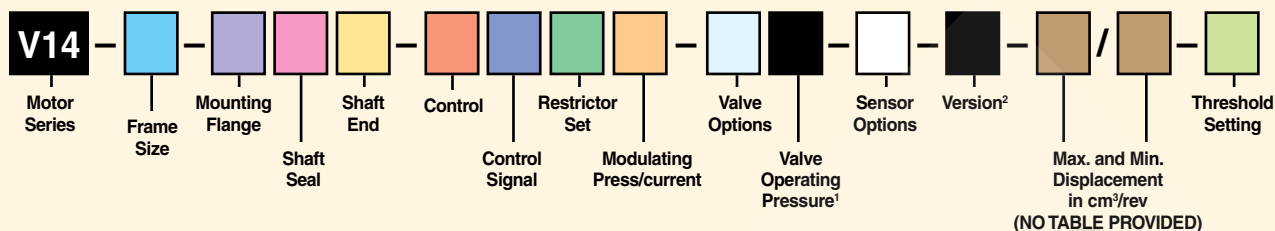
Dimensions, inch (mm)

Series	A	C	D	E	F	G
V14-110	11.54 (293)	2.93 (74.5)	5.91 (150)	8.19 (208)	6.85 (174)	8.03 (204)
V14-160	12.91 (328)	2.95 (75)	5.47 (139)	8.62 (219)	6.85 (174)	7.87 (200)



Motors

V14 Model Ordering Code



Code	Frame Size
110	6.71 in³/rev (110 cm³/rev)
160	9.76 in³/rev (160 cm³/rev)

Code	Mounting Flange
S	SAE version
I	ISO version
C*	Cartridge version

* 110 only

Code	Shaft Seal
H	NBR (Nitrile)
V	FPM (High Temperature Fluorocarbon)

Code	Shaft End
S	SAE (SAE Version)
C	DIN (ISO Version)
D	DIN (ISO Version)

Code	Control
AC	Pressure Compensator
AD	Press. Compensator with electrohydraulic override and brake defeat valve
AH	Pressure Compensator with hydraulic override
EO	Electrohydraulic, two-position
EP	Electrohydraulic, proportional
HO	Hydraulic, two-position
HP	Hydraulic, proportional

Code	Control Signal
E	External Pressure (HO, HP)
I	Internal Pressure (AC, AD, AH)
H	24 VDC (EO, EP)
L	12 VDC (EO, EP)

Code	Control Restrictor Set (orifice dia. in mm)
1	0.7
2	0.8
3	1.0 (standard)
4	1.2

Code	Control Modulating Pressure/Current
N	AC: 0 bar EP: Non-selectable current
A	217.56 PSI (15 bar) (AC, HP)
B	362.59 PSI (25 bar) (AC, HP)
C	725.19 PSI (50 bar) (AC)

Code	Valve Options
N	None
L	Flushing Valve
P	Pressure Relief Valve

Code	Sensor Options
N	None
C	Prepared for Setting Piston Position and Shaft Speed Sensors (EP, HP)
D	Setting Piston Position and Shaft Speed Sensors (EP, HP)
L	Setting Piston Position Sensor (EP, HP)
P	Prepared for Speed Sensor
S	Speed Sensor
T	Prepared for Setting Piston Position Sensor

Code	Threshold Setting
***	Select pressure between 1450.38-5076.32 PSI (100-350 bar) (AC, AD, AH only)
400	400 mA - 12 VDC (EO, EP only)
200	200 mA - 24 VDC (EO, EP only)
10	145.14 PSI (10 bar) (HO, HP only)

¹ Pressure Relief Valve opening pressure (bar)

Alternately: Flushing Valve restrictor

² Factory issued for special versions

T12 Dual Displacement Bent-Axis Motors



The T12 two-displacement motor is tailor-made for track drives. It allows a high ratio between high and low speed and installs as easily as a fixed displacement motor. Max speed ratio is 3.33-to-1. The T12 is a cartridge motor based on the well proven V12 series. The specially designed end cap with dual side ports permits a very short installation. A simple setting device moves the cylinder barrel to the maximum or

minimum displacement position. The setting is controlled by an external hydraulic pilot signal. A brake valve can be fitted without increasing the axial length of the motor. The twin ports have the same mounting pattern as those of the F12 and V12 motors. The F12/V12 accessory valve program also fits the T12 motor. As an option, integrated pressure relief valves can be included.

Motor Performance Data

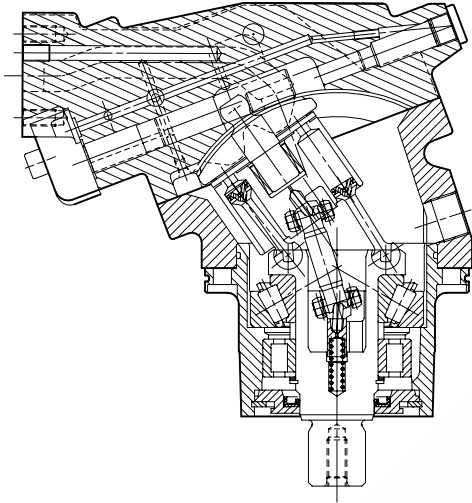
Model Series	Displacement in ³ /rev (cc/rev)	Outlet Pressure PSI (BAR)	Drive Speed RPM	Flow @ Rated RPM GPM (LPM)
T12-60	3.66 (60)	6000 (420)	5600	57 (215.8)
T12-80	4.88 (80)	6000 (420)	5000	66 (249.8)

Markets

Applications

Forestry	Feller Bunchers, Skidder, Forwarder
Construction	Dozers, Excavator

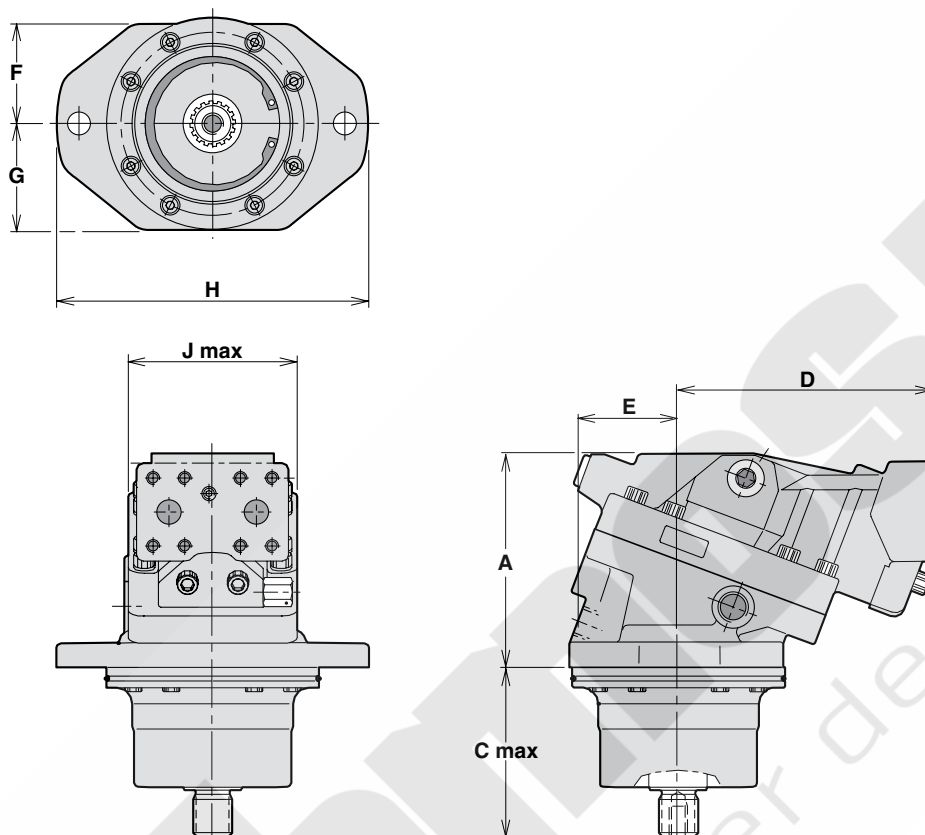
T12 Dual Displacement Bent-Axis Motors



Benefits/Features

- Designed for Track drive applications the 3.33 to 1 speed ratio provides versatility
- Cartridge mount allows very short installation dimension
- Optional valve blocks do not add to length F12/V12 accessory valves will fit T12 motor

T12 Dual Displacement Bent-Axis Motors



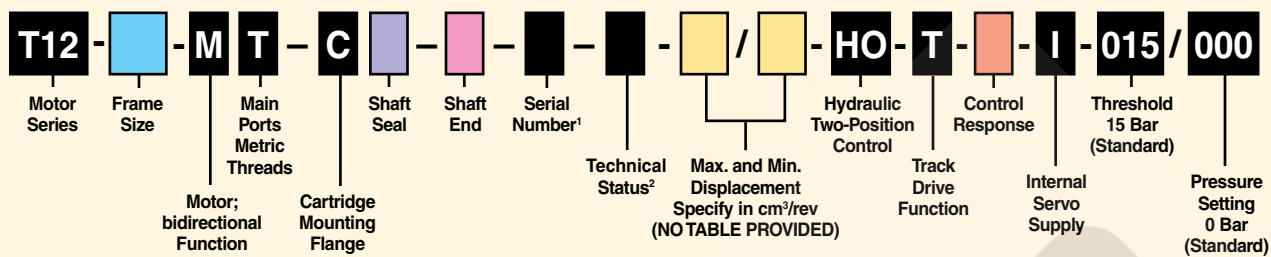
Dimensions, inch (mm)

Series	A	C max	D	E	F	G	ØH	J max
T12-60	6.46 (164)	5.20 (132)	7.52 (191)	—	3.09 (78.5)	3.29 (83.5)	9.09 (231)	5.00 (127)
T12-80	6.30 (160)	6.12 (155.5)	8.07 (205)	3.07 (78)	3.52 (89.5)	3.92 (99.5)	10.35 (263)	5.35 (136)



Motors

T12 Model Ordering Code



Code	Frame Size
060	3.66 in ³ /rev (60 cm ³ /rev)
080	4.88 in ³ /rev (80 cm ³ /rev)

Code	Shaft Seal
H	NBR (Nitrile)
V	FPM (High Temperature Fluorocarbon)

Code	Shaft End
C	Spline DIN 5480 (Std)
D	Spline DIN 5480

Code	Control Response
01	Fast (Standard)
02	Slow (Optional)

¹ Assigned for special versions

² Assigned by factory

M3/M4 High Performance Vane Motors



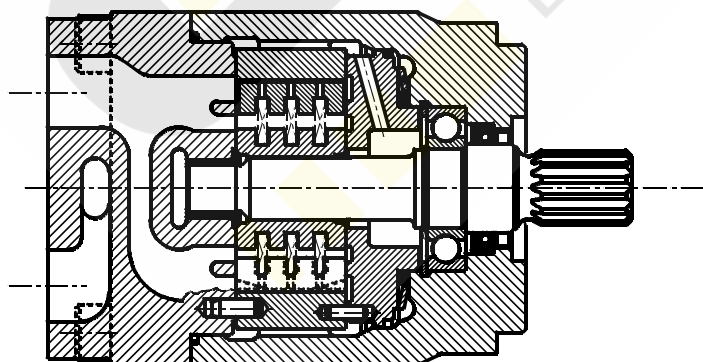
The M3 and M4 Series vane motors are fixed displacement and designed especially for severe duty applications. The balance vane cartridge concept provides high volumetric efficiency, longer life, lower noise, and a high starting torque efficiency. The double motor is ideal for applications to obtain three-speed operation.

Motor Performance Data

Single Pump Model Series	Displacement in ³ /rev (cc/rev)	Max. Outlet Pressure* PSI (BAR)	Rated Drive Speed* RPM	Torque (in-lb/PSI)
M3B	0.56 - 2.26 (9.2 - 37.1)	3000 (210)	4000	0.08 - 0.38
M4C	1.49 - 4.89 (24.4 - 80.1)	2500 (175)	4000	0.24 - 0.78
M4SC	1.49 - 4.89 (24.4 - 80.1)	3400 (235)	4000	0.24 - 0.78
M4D	3.97 - 8.81 (65.1 - 144.4)	2500 (175)	4000	0.63 - 1.40
M4SD	3.97 - 8.81 (65.1 - 144.4)	3400 (235)	4000	0.63 - 1.40
M4E	9.69 - 13.55 (158.8 - 222)	2500 (175)	3600	1.54 - 2.16
M4SE	9.69 - 13.55 (158.8 - 222)	2800 (190)	3600	1.54 - 2.16

Double Pump Model Series	Displacement in ³ /rev (cc/rev)	Max. Outlet Pressure* PSI (BAR)	Rated Drive Speed* RPM	Torque @2000 RPM and 2500 PSI
M4DC	5.46 - 13.70 (89.5 - 224.5)	2500 (175)	4000	0.87 - 2.18
M4SDC	5.46 - 13.70 (89.5 - 224.5)	3400 (235)	4000	0.87 - 2.18

* Intermittent conditions are to be less than 10% of each minute.

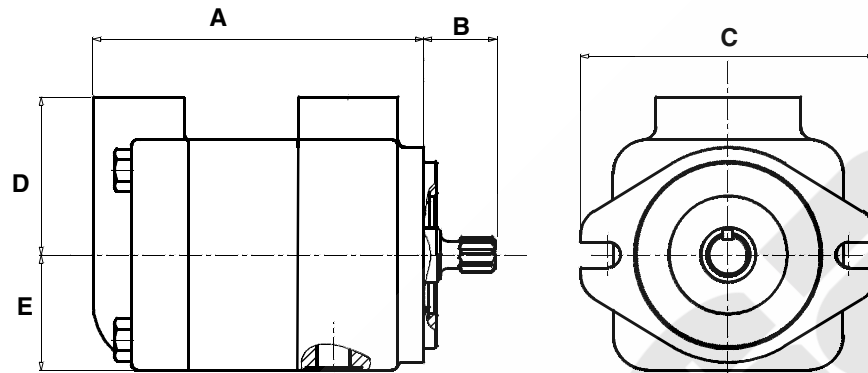


Benefits/Features

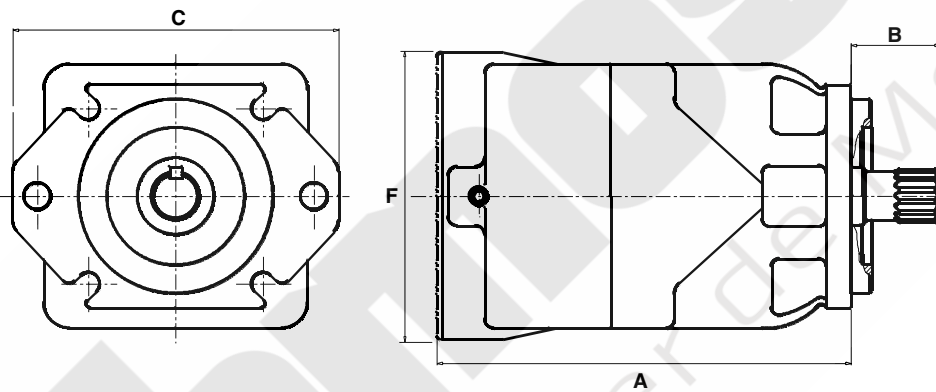
- Low ripple torque
- Low starting torque
- Low noise
- Bi-rotational technology
- Various pilot, threaded port and porting configurations
- External/internal drain option
- Many displacement combinations for double motor

M3/M4 High Performance Vane Motors

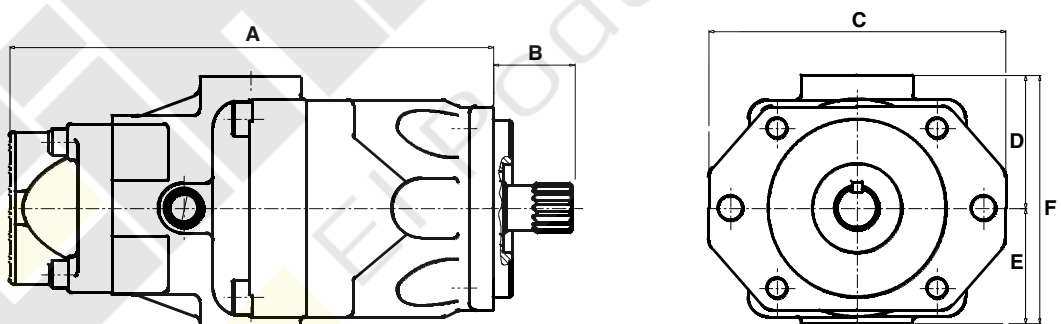
M3



M4 Single



M4 Double

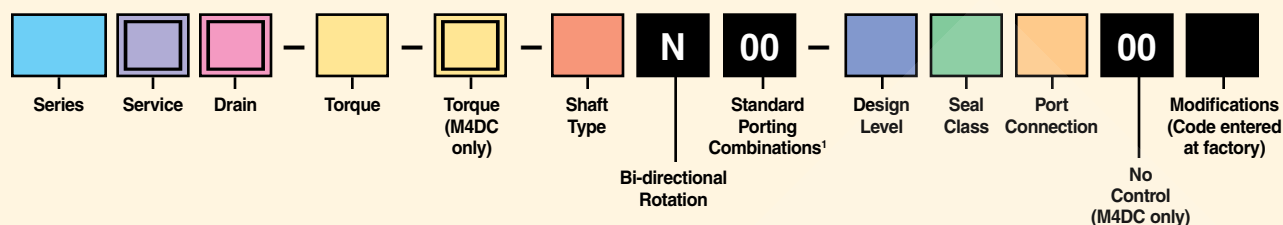


Dimensions, inch (mm)

Series	A	B	C	D	E	F	Weight, lb (kg)
M3B	5.74 (145.8)	2.19 (55.6)	5.12 (130.0)	—	—	4.75 (120.7)	17.6 (8.0)
M4C	7.23 (183.6)	2.81 (71.4)	6.93 (176.0)	—	—	4.75 (120.7)	34.0 (15.5)
M4D	8.01 (203.5)	2.19 (55.6)	8.36 (212.3)	—	—	—	59.5 (27.0)
M4E	10.66 (270.8)	3.31 (84.1)	8.38 (212.9)	—	—	—	99.0 (45.0)
M4DC	13.63 (346.2)	2.19 (55.6)	8.36 (212.3)	3.75 (95.3)	3.25 (82.6)	7.0 (177.8)	88.0 (40.0)

Motors

M3/M4 Model Ordering Code



Series	
M3B	
M4C	
M4D	
M4E	
M4DC	

Code	Service
Omit	Standard
S*	Severe Duty

* Not available on M3B

Code	Drain
Omit	External
1	Internal

Series	Torque Codes (See Table Below)		
	Single Pumps	Double Pumps A1 - B1	Double Pump A2 - B2
M3B	Use M3B Codes		
M4C	Use M4C Codes		
M4D	Use M4D Codes		
M4E	Use M4E Codes		
M4DC		Use M4D Codes	Use M4C Codes

Code	Shaft Type			
	3B	4C/4CS	4D/4DS, 4DC	4E/4ES
1	Keyed (non SAE)	Keyed SAE B	Keyed SAE C	Keyed SAE C
2		Keyed (non SAE)		
3	Splined SAE A	Splined SAE B	Splined SAE C	Splined SAE C
4	Splined SAE B			

Torques

M3B Codes	Torque, in-lb/PSI	M4C Codes	Torque, in-lb/PSI	M4D Codes	Torque, in-lb/PSI	M4E Codes	Torque, in-lb/PSI
009	0.08	024	0.24	062	0.63	153	1.54
012	0.11	027	0.28	074	0.75	185	1.86
018	0.19	031	0.33	088	0.88	214	2.16
027	0.30	043	0.45	102	0.96		
036	0.38	055	0.57	113	1.13		
		067	0.69	128	1.28		
		075	0.78	138	1.40		

Code	Design Level
A	M4C only
B	M3B, M4D, M4E, M4DC

Code	Seal Class
1*	S1 Buna N
4**	S4 EPDM
5 †	S5 Fluorocarbon

* Not available on M4E.

** Available on M3B only.

† Must be ordered for severe duty motors.

Code	Port Connection	
	M3B	M4C/M4D/M4E M4DC
00	SAE Threaded Port SAE Drain	
01	SAE 4 Bolt Flange BSPP Drain	SAE Threaded Port SAE Drain
02	BSPP Threaded Port BSPP Drain	SAE 4 Bolt Flange UNC Threaded SAE Drain
04		SAE 4 Bolt Flange UNC Threaded BSPP Drain
M4*		SAE 4-Bolt Flange Metric Thread BSPP Drain

* Not available on M4DC.

= Omit if not required
 = Not Available

¹ Other combinations available. See catalog on CD.

M5 High Performance Fan Drive Vane Motors



Keep the M5 fixed displacement vane motors in mind when your application requires radial and/or axial shaft loads. The fan-drive version comes equipped with a rugged double row bearing that can eliminate the need for external supports. An integrated proportional valve option

provides speed control for fan circuits. Both fan-drive and standard versions use the same high performance cartridge, giving repeatable speed at specified flows.

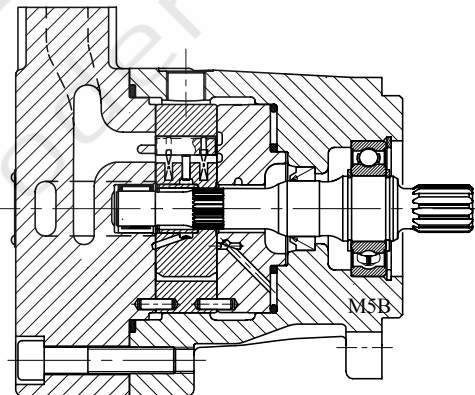
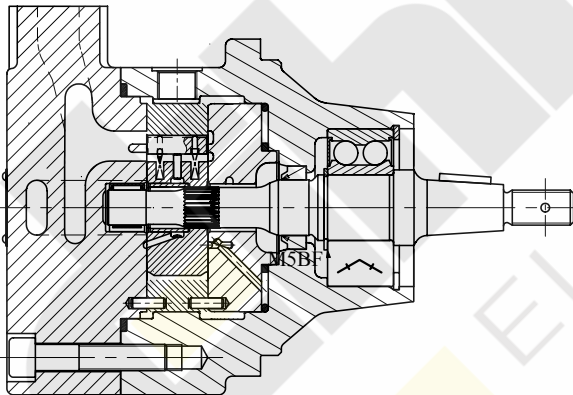
Motor Performance Data

Single Pump Model Series	Displacement in ³ /rev (cc/rev)	Max. Outlet Pressure* PSI (BAR)	Rated Drive Speed* RPM	Torque (in-lb/PSI)
M5AF	0.38 - 1.53 (6.3 - 25)	4350 (300)	6000	0.060 - 0.242
M5B/S	0.73 - 2.75 (12 - 45)	4600 (320)	6000	0.116 - 0.437
M5BF	0.73 - 2.75 (12 - 45)	4600 (320)	6000	0.116 - 0.437

Markets

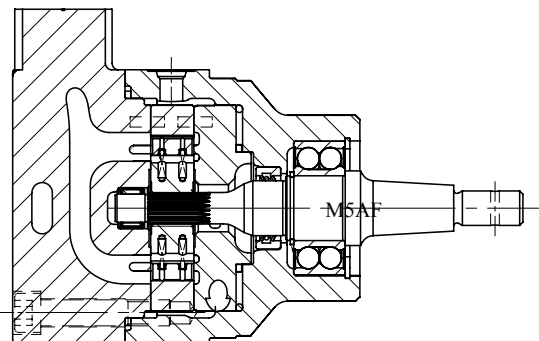
Construction Fan Drives

Applications

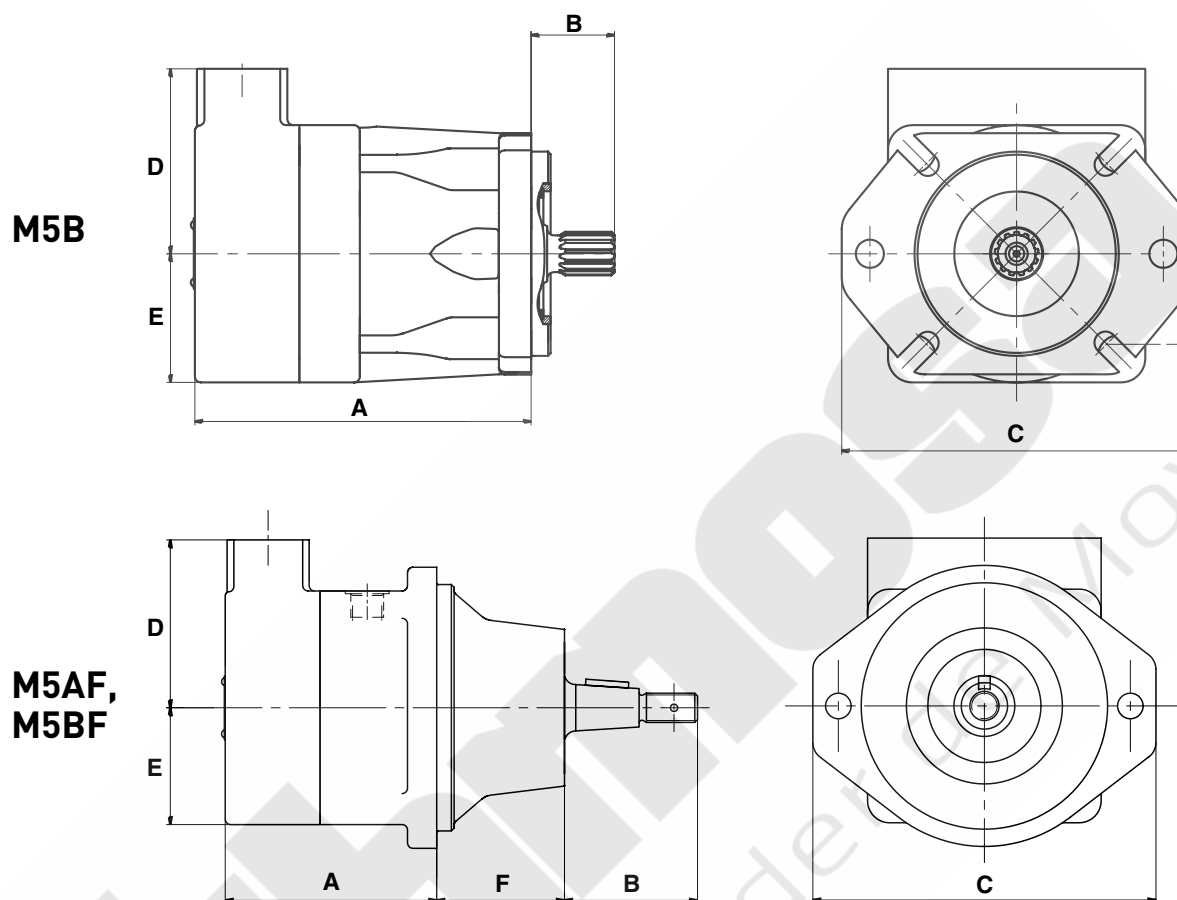


Benefits/Features

- Low noise
- Designed for severe duty applications
- High efficiency
- High starting torque
- Low torque ripple
- Long life
- Interchangeable rotating groups
- Cross port check valve on M5BF/1



M5 High Performance Fan Drive Vane Motors



Dimensions, inch (mm)

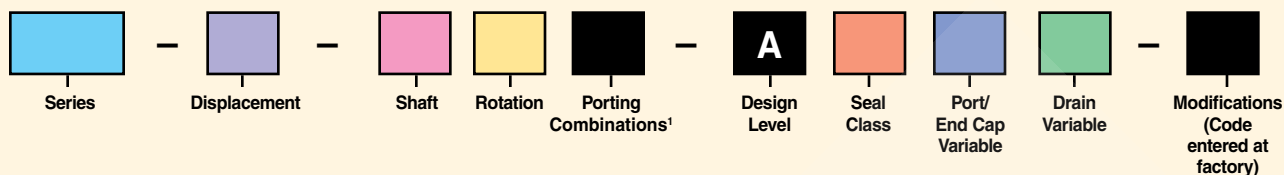
Series	A	B	C	D	E	F	Weight, lb (kg)
M5AF	3.58 (90.9)	2.97 (75.4)	—	3.62 (91.9)	2.52* (64.1)	2.74 (69.6)	33.0 (15.0)
M5B	6.59 (167.4)	2.75 (69.8)	6.85 (174.0)	3.62 (91.9)	2.52 (64.1)	—	40.8 (18.5)
M5BF	4.56 (115.8)	2.87 (72.9)	7.40 (188.0)	3.62 (91.9)	2.52 (64.1)	2.75 (69.8)	40.8 (18.5)

* For relief valve option, add 2.66" (67.6 mm) max.



Motors

M5 Model Ordering Code



Code	Series Description
M5AF	Fan Motor, External Drain
M5AF1	Fan Motor, Internal Drain
M5B	ISO Flange
M5BS	SAE Flange
M5BF	Fan Motor, External Drain
M4BF1	Fan Motor, Internal Drain

M5AF Codes	Displacement in³/rev (cm³/rev)	M5B/M5BF Codes	Displacement in³/rev (cm³/rev)
006	0.38 (6.2)	012	0.73 (12)
010	0.61 (10)	018	1.10 (18)
012	0.76 (11.1)	023	1.40 (22.9)
016	0.98 (16.1)	028	1.71 (28)
018	1.10 (18)	036	2.20 (36.1)
025	1.52 (24.9)	045	2.75 (45.1)

Code	Shaft Type		
	M5AF/1	M5B/S	M5BF/1
1	Taper (non SAE)	Keyed SAE B J744	Keyed Taper (non SAE)
2	Keyed (non SAE)	Keyed ISO E25M - 3019-2	Keyed SAE C J744c
3		Splined SAE B J498	
4		Splined SAE BB J498	
W			Keyed ISO G32N

Code	Rotation
N*	Bi-directional
R**	CW
L**	CCW

* Not available on M5AF1, M5BF1.

** Viewed from shaft end; not available on M5B, M5BS.

Code	Seal Class
1	S1 Buna N
5	S5 Fluorocarbon

Code	Port/End Cap Variables	
	M5AF End Cap Variables**	M5B/S, M5BF/1 Port Variables
0	4 Bolt SAE Flange (J518) UNC Thread	3/4" SAE 4 Bolt Flange (J518c), UNC Thread†
M	4 Bolt SAE Flange (J518) Metric Thread	3/4" SAE 4 Bolt Flange (J518c), Metric Thread
Y	Metric Threaded Ports (ISO 6149) M22x1.5	
W	SAE Str. Threaded Ports 1-1/6"-12 UNF-2B	
A*	4 Bolt SAE Flange (J518) Metric Thread, 3045.79 PSI (210 bar)	
B*	4 Bolt SAE Flange (J518) Metric Thread, 2030.53 PSI (140 bar)	
C*	4 Bolt SAE Flange (J518) Metric Thread, 1015.26 PSI (70 bar)	

* Motors with proportional pressure relief valve only (external drain and uni-rotational only)

** All uni-rotational motors have an internal check valve included.

† Not available on M5BF1.

Code	Drain Variables				
	M5AF	M5AF1	M5B/S	M5BF	M5BF1
2	9/16" SAE		9/16" SAE	9/16" SAE	
3	M12 x 1.5 Metric		M18 x .06 Metric	M18 x .06 Metric	
X		No Drain			No Drain

¹ Several combinations available. See catalog on CD

= Not Available

Calzoni



MR-MRE Low Speed High Torque Small Displacement Radial Piston Motors

The outstanding performance of this robust product is the result of our original, patented design. Used widely in the injection molding, mining, off shore drilling, oil field, and marine markets, the Parker Calzoni motor is produced in sizes from 32cc up to 23034cc per revolution. The efficiency of our design allows for

a smaller installed product for the same displacement vs. our competitors. Since there are no internal connecting rods, we have greatly reduced frictional drag as well as most thrust loading. By creating a static balance on the shaft we have extended the expected lifetime as well.



MRT-MRTE-MRTF Low Speed High Torque Large Displacement Radial Piston Motors



MRD-MRDE, MRV-MRVE Low Speed High Torque Variable Displacement Radial Piston Motors

Performance Data

Series	Displacement in ³ /rev (cc/rev)	Max. Pressure PSI (BAR)	Max. Speed RPM	Torque (in-lb/PSI)
MR	1.96 - 425.16 (32.1 - 6967.2)	4350 (300)	1400	0.025 - 5.665
MRE	20.28 - 502.01 (332.4 - 8226.4)	3600 (250)	750	0.270 - 6.657
MRT	433.27 - 1190.45 (7100 - 19508)	4350 (300)	150	5.75 - 15.79
MRTE/MRTF	476.47 - 1405.62 (7808 - 23034)	3600 (250)	130	6.32 - 18.64

Series	Displacement in ³ /rev (cc/rev)	Max. Pressure PSI (BAR)	Max. Speed RPM	Min. Torque (in-lb/PSI)	Max. Torque (in-lb/PSI)
MRD/MRV	18.56 - 419.05 (304.1 - 6867)	4350 (300)	1100	0.123 - 1.823	0.244 - 3.646
MRDE/MRVE	20.28 - 501.98 (332.4 - 8226)	3600 (250)	1000	0.135 - 2.187	0.270 - 4.374

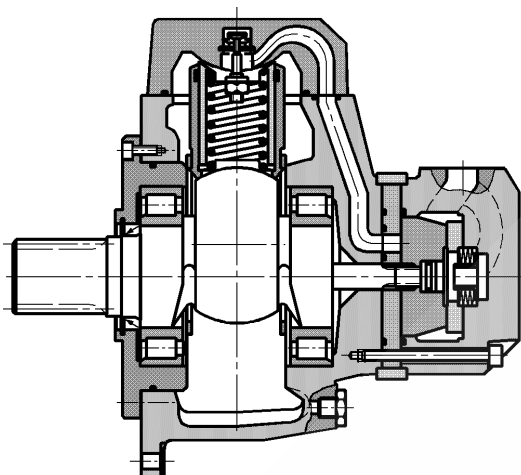


MR-MRE Low Speed High Torque Small Displacement Radial Piston Motors

Performance Data

Series	Displacement in ³ /rev (cc/rev)	Max. Pressure PSi (BAR)	Max. Speed RPM	Torque (in-lb/PSI)
MR33	1.96 (32.1)	4350 (300)	1800	0.025
MR57	3.44 (56.4)	4350 (300)	1600	0.046
MR73	4.43 (72.6)	4350 (300)	1200	0.061
MR93	5.65 (92.6)	4350 (300)	1150	0.076
MR110	6.65 (109.0)	4350 (300)	1100	0.087
MR125	7.61 (124.7)	4350 (300)	900	0.102
MR160	9.75 (159.7)	4350 (300)	900	0.129
MR190	11.69 (191.6)	4350 (300)	850	0.155
MR200	12.16 (199.2)	4350 (300)	800	0.163
MR250	15.31 (250.9)	4350 (300)	800	0.203
MR300	18.56 (304.4)	4350 (300)	750	0.244
MR350	21.33 (349.5)	4350 (300)	640	0.283
MR450	27.56 (451.6)	4350 (300)	600	0.366
MR600	37.10 (607.9)	4350 (300)	520	0.493
MR700	43.09 (706.9)	4350 (300)	500	0.575
MR1100	68.7 (1125.8)	4350 (300)	330	0.910
MR1600	97.54 (1598.4)	4350 (300)	260	1.292
MR1800	110.43 (1809.6)	4350 (300)	250	1.465
MR2400	139.93 (2293.1)	4350 (300)	220	1.937
MR2800	170.38 (2792.0)	4350 (300)	215	2.263
MR3600	221.93 (3636.8)	4350 (300)	180	2.944
MR4500	274.77 (4502.7)	4350 (300)	170	3.346
MR6500	394.24 (6460.5)	4350 (300)	130	5.267
MR7000	425.16 (6967.2)	4350 (300)	130	5.665
MRE330	20.28 (332.4)	3600 (250)	750	0.270
MRE500	30.38 (497.9)	3600 (250)	600	0.403
MRE800	49.08 (804.2)	3600 (250)	450	0.651
MRE1400	83.57 (1369.5)	3600 (250)	280	1.109
MRE2100	127.61 (2091.2)	3600 (250)	250	1.693
MRE3100	189.40 (3103.7)	3600 (250)	215	2.512
MRE5400	329.6 (5401.2)	3600 (250)	160	4.374
MRE8200	502.0 (8226.4)	3600 (250)	130	6.657

MR-MRE Low Speed High Torque Small Displacement Radial Piston Motors

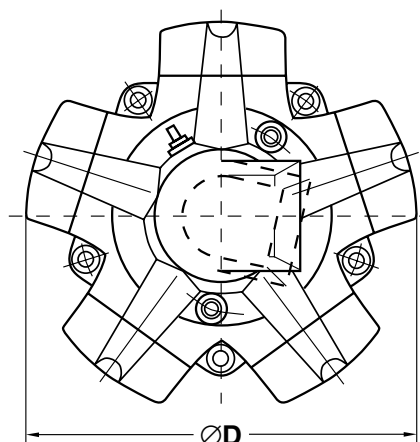
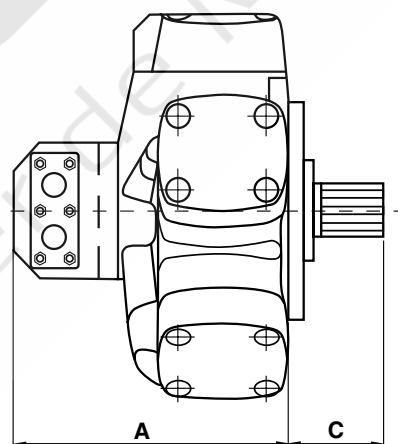


Benefits/Features

- 5-piston design
- Wide range of displacements
- Starting torque from 90-95% theoretical
- Total efficiency up to 96%
- Resistance to thermal shocks
T = 176°F
- Speed feedback accessories optional

Dimensions, inch (mm)

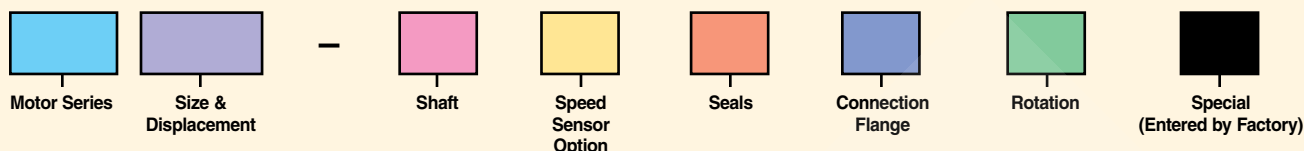
Series	A	C Max.	D
MR33 MR57	7.72 (196.1)	2.25 (57.2)	9.27 (235.5)
MR73 MR93 MR110	9.0 (228.6)	2.70 (68.6)	9.84 (249.9)
MR125 MR160 MR190	9.53 (242.1)	2.64 (67.1)	12.33 (313.2)
MR200 MR250 MR300 MRE330	9.53 (242.1)	3.19 (81.0)	12.91 (327.9)
MR350 MR450 MRE500	10.98 (178.9)	3.82 (97.0)	14.49 (368.0)
MR600 MR700 MRE800	11.77 (299.0)	3.98 (101.1)	15.95 (405.1)
MR1100 MRE1400	13.43 (341.1)	4.61 (117.1)	18.5 (469.9)
MR1600 MR1800 MRE2100	14.72 (373.9)	5.20 (132.1)	21.97 (558.0)
MR2400 MR2800 MRE3100	18.35 (466.1)	6.02 (152.9)	25.28 (642.1)
MR3600 MR4500 MRE5400	19.27 (489.5)	8.27 (210.1)	30.16 (766.1)
MR6500 MR7000 MRE8200	22.28 (565.9)	9.06 (230.1)	34.02 (864.1)





Motors

MR/MRE Model Ordering Code



Code	Motor Series
MR	Standard 3626 PSI (250.0 BAR) Max. Continuous
MRE	Expanded 3026 PSI (208.6 BAR) Max. Continuous

Size & Displacement			
Code	Displacement in ³ (cm ³)	MR	MRE
33A	1.96 (32.1)	x	—
57A	3.44 (56.4)	x	—
73B	4.43 (72.6)	x	—
93B	5.65 (92.6)	x	—
110B	6.65 (109.0)	x	—
125C	7.61 (124.7)	x	—
160C	9.75 (159.8)	x	—
190C	11.69 (191.6)	x	—
200D	12.16 (199.3)	x	—
250D	15.31 (250.9)	x	—
300D	18.56 (304.5)	x	—
330D	20.28 (332.3)	—	x
350E	21.33 (349.5)	x	—
450E	27.56 (451.6)	x	—
500E	30.38 (497.8)	—	x
600F	37.10 (608.0)	x	—
700F	43.09 (706.1)	x	—
800F	49.08 (804.3)	—	x
1100G	68.7 (1126)	x	—
1400G	83.6 (1370)	—	x
1600H	97.5 (1598)	x	—
1800H	110.4 (1809)	x	—
2100H	127.6 (2091)	—	x
2400I	139.9 (2292)	x	—
2800I	170.4 (2792)	x	—
2100I	189.4 (3104)	—	x
3600L	221.9 (3636)	x	—
4500L	274.8 (4503)	x	—
5400L	329.6 (5401)	—	x
6500M	394.2 (6460)	x	—
7000M	408.7 (6697)	x	—
8200M	502.0 (8226)	—	x

Code	Shaft
N1	Spline Ex DIN 5463
D1	Spline DIN 5480
F1	Female Spline DIN 5480
P1	Shaft with Key
B1	Spline B.S. 3550

Code	Speed Sensor Option
N1	None
Q1	Encoder Drive
C1	Mechanized Tachometer Drive
T1	Tachometer Drive
M1	Incremental Elcis Encoder, Uni-directional*
B1	Incremental Elcis Encoder, Bi-directional*

* 500 pulse/rev

Code	Seals
N1	NBR Mineral Oil
F1	NBR, 218 PSI (15.0 BAR) Shaft Seal
V1	Fluorocarbon
U1	No Shaft Seal (for Brake)

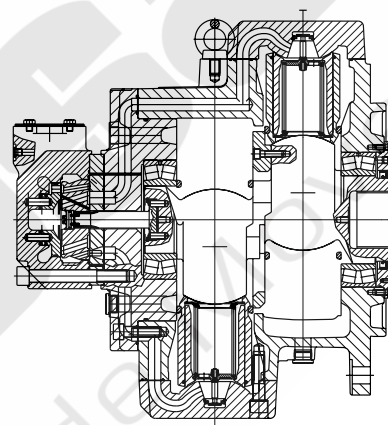
Code	Connection Flange
N1	None
C1	Standard DENISON Calzoni
S1	Standard SAE Metric
T1	Standard SAE UNC
G1	SAE 6000 PSI (413.7 BAR) Metric
L1	SAE 6000 PSI (413.7 BAR) UNC

Code	Rotation
N	Standard Rotation (CW: Inlet in A; CCW: Inlet in B)
S	Reversed Rotation (CW: Inlet in B; CCW: Inlet in A)

MRT-MRTE-MRTF Low Speed High Torque Large Displacement Radial Piston Motors

Performance Data

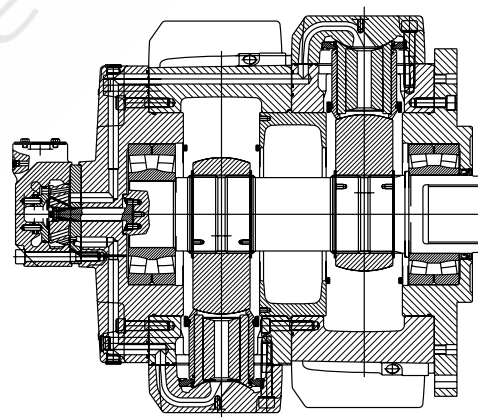
Series	Displacement in ³ /rev (cc/rev)	Max. Pressure PSI (BAR)	Max. Speed RPM	Torque (in-lb/PSI)
MRT7100	433.29 (7100.4)	4350 (300)	150	5.75
MRTF7800	476.50 (7808.4)	3600 (250)	130	6.32
MRTE8500	519.76 (8517.3)	3600 (250)	120	6.90
MRT9000	549.54 (9005.4)	4350 (300)	130	7.29
MRTF9900	604.37 (9903.9)	3600 (250)	120	8.02
MRTE10800	659.20 (10802.4)	3600 (250)	110	8.75
MRT14000	854.94 (14010)	4350 (300)	80	11.34
MRTF15500	932.20 (15276)	3600 (250)	75	12.36
MRTE16500	1009.46 (16542)	3600 (250)	70	13.39
MRT17000	1022.70 (16759)	4350 (300)	70	14.58
MRTF18000	1099.95 (18025)	3600 (250)	65	14.59
MRT19500	1190.45 (19508)	4350 (300)	60	15.79
MRTE20000	1207.54 (19788)	3600 (250)	60	16.01
MRTF21500	1298.04 (21271)	3600 (250)	55	17.21
MRTE23000	1405.62 (23034)	3600 (250)	50	18.64



10-Piston Design

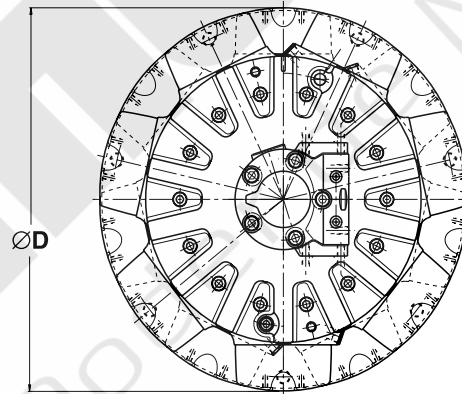
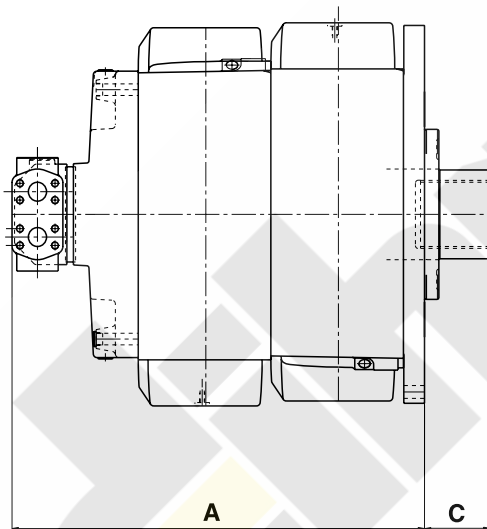
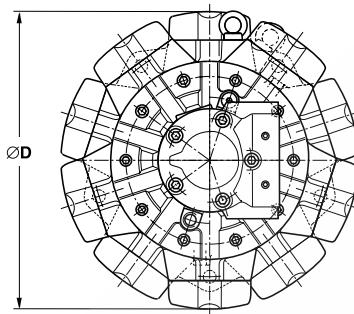
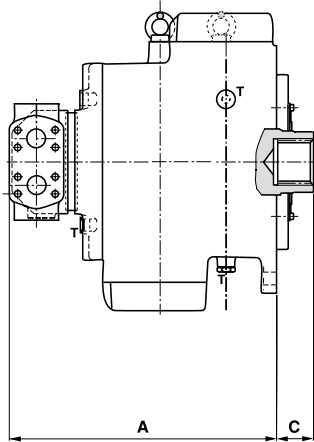
Benefits/Features

- Hydraulically balanced 10 and 14-piston twin row design
- Wide range of displacements
- Starting torque from 91% theoretical
- Total efficiency up to 96%
- Speed feedback accessories optional



14-Piston Design

MRT-MRTE-MRTF Low Speed High Torque Large Displacement Radial Piston Motors

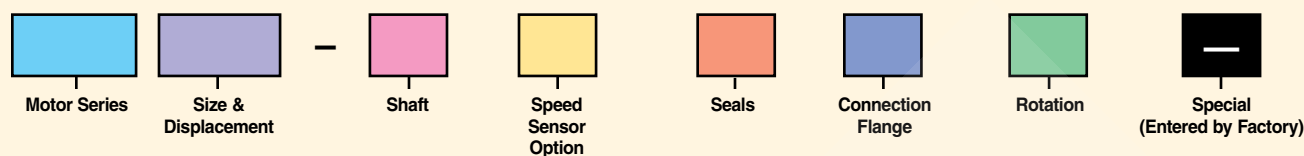


Dimensions, inch (mm)

Series			A	C Max.	D
MRT7100	MRTE8500	MRTF7800	27.106	1.969	30.157
MRT9000	MRTE10800	MRTF9900	(688.5)	(50.0)	(766.0)
MRT1400	MRTE16500	MRTF1550	44.705	3.15	39.921
MRT17000	MRTE20000	MRTF18000	(1135.5)	(80.0)	(1014.0)
MRT19500	MRTE23000	MRTF21500			

Motors

MRT-MRTE-MRTF Model Ordering Code



Code	Motor Series
MRT	Standard 3626 PSI (250.0 BAR) Max. Continuous
MRTE	Expanded
MRTF	3026 PSI (208.6 BAR) Max. Continuous

Size & Displacement				
Code	Displacement in ³ (cm ³)	MRT	MRTE	MRTF
7100P	433.3 (7103)	x	—	—
7800P	476.5 (7808)	—	—	x
8500P	529.8 (8518)	—	x	—
9000P	549.5 (9005)	x	—	—
9800P	604.4 (9904)	—	—	x
10800P	659.2 (10802)	—	x	—
14000Q	854.9 (14009)	x	—	—
15500Q	832.3 (15278)	—	—	x
16500Q	1009.5 (16543)	—	x	—
17000Q	1022.7 (16759)	x	—	—
18000Q	1100.0 (18026)	—	—	x
19500Q	1190.5 (19509)	x	—	—
20000Q	1207.5 (19787)	—	x	—
21500Q	1298.0 (21270)	—	—	x
23000Q	1405.6 (23034)	—	x	—

Code	Shaft
D1	Spline DIN 5480
F1	Female Spline DIN 5480

Code	Speed Sensor Option
N1	None
Q1	Encoder Drive
C1	Mechanized Tachometer Drive
T1	Tachometer Drive
M1	Incremental Elcis Encoder, Uni-directional*
B1	Incremental Elcis Encoder, Bi-directional*

* 500 pulse/rev

Code	Seals
N1	NBR Mineral Oil
F1	NBR, 218 PSI (15.0 BAR) Shaft Seal
V1	Fluorocarbon
U1	No Shaft Seal (for Brake)

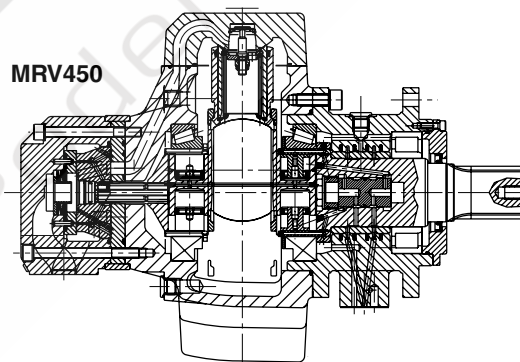
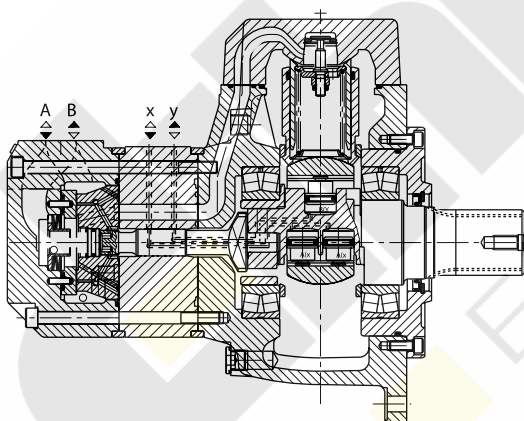
Code	Connection Flange
S1	Standard SAE Metric
G1	SAE 6000 PSI (413.7 BAR) Metric
M1	SAE 6000 PSI (413.7 BAR) Metric Special Timing

Code	Rotation
N	Standard Rotation (CW: Inlet in A; CCW: Inlet in B)
S	Reversed Rotation (CW: Inlet in B; CCW: Inlet in A)

MRD-MRDE, MRV-MRVE Low Speed High Torque Variable Displacement Radial Piston Motors

Performance Data

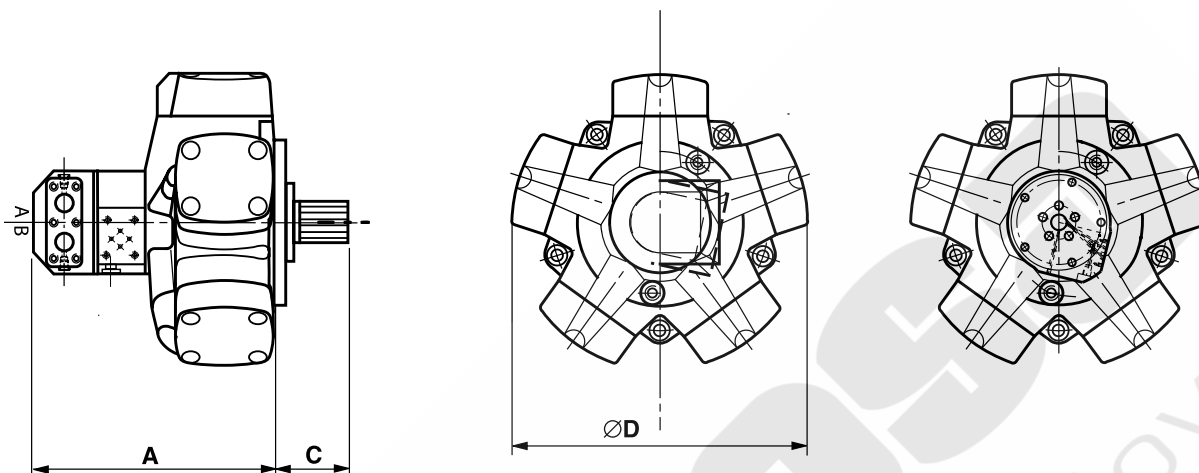
Series	Displacement in ³ /rev (cc/rev)	Max. Pressure PSI (BAR)	Max. Speed RPM	Min-Max Torque (in-lb/PSI)
MRD300 —	18.56 (304.1)	4350 (300)	1000	0.123 0.244
MRD450 —	27.56 (451.6)	4350 (300)	850	0.183 0.366
— MRV450	27.56 (451.6)	4350 (300)	850	0.107 0.366
MRD700 MRV700	43.14 (706.9)	4350 (300)	700	0.275 0.575
MRD1100 MRV1100	68.70 (1125.8)	4350 (300)	580	0.412 0.910
MRD1800 MRV1800	110.43 (1809.6)	4350 (300)	400	0.733 1.465
MRD2800 MRV2800	170.38 (2792.0)	4350 (300)	280	1.130 2.263
MRD4500 MRV4500	274.77 (4502.7)	4350 (300)	250	1.823 3.646
MRDE330 —	20.28 (332.4)	3600 (250)	1000	0.135 0.270
MRDE500 —	30.38 (497.9)	3600 (250)	800	0.201 0.403
MRDE800 MRVE800	20.28 (804.2)	3600 (250)	650	0.313 0.651
MRDE1400 MRVE1400	83.57 (1369.5)	3600 (250)	550	0.501 1.109
MRDE2100 MRVE2100	127.61 (2091.2)	3600 (250)	370	0.847 1.693
MRDE3100 MRVE3100	189.40 (3103.7)	3600 (250)	280	1.257 2.512
MRDE5400 MRVE5400	329.60 (5401.2)	3600 (250)	210	2.187 4.374



Benefits/Features

- 5-piston design
- Displacement ratios of 1:2 or 1:3
- Starting torque from 90-95% theoretical
- Total efficiency up to 96%
- Resistance to thermal shocks
T = 176°F
- Speed feedback accessories optional

MRD-MRDE, MRV-MRVE Low Speed High Torque Variable Displacement Radial Piston Motors



Dimensions, inch (mm)

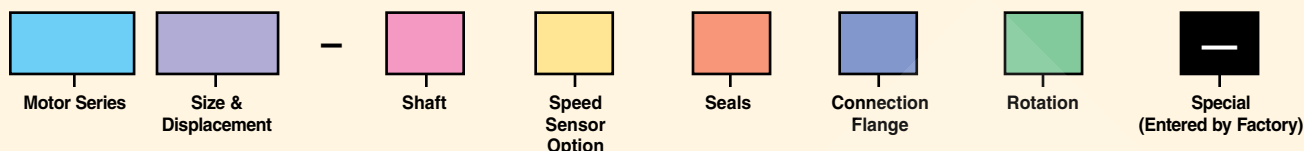
Series	A	C Max.	D
MRD300 MRDE330	11.10 (281.9)	3.19 (81.0)	12.91 (327.9)
MRD450 MRDE500	12.95 (328.9)	3.82 (97.0)	14.49 (368.0)
MRV450	16.06 (407.9)	4.33 (110.0)	14.49 (368.0)
MR*700 MR*E800	13.74 (349.0)	3.98 (101.1)	15.94 (404.9)
MR*1100 MR*E1400	15.79 (401.1)	4.61 (117.1)	18.50 (469.9)
MR*1800 MR*E2100	17.09 (434.1)	5.20 (132.1)	21.97 (558.0)
MR*2800 MR*E3100	20.71 (526.0)	6.02 (152.9)	25.28 (642.1)
MR*4500 MR*E5400	20.71 (526.0)	8.27 (210.1)	30.16 (766.1)

* MRD and MRV



Motors

MRD-MRDE, MRV-MRVE Model Ordering Code



Code	Motor Series
MRD	Dual, Standard 3626 PSI (250.0 BAR) Max. Continuous
MRDE	Dual, Expanded 3026 PSI (208.6 BAR) Max. Continuous
MRV	Variable, Standard 3626 PSI (250.0 BAR) Max. Continuous
MRVE	Variable, Expanded 3026 PSI (208.6 BAR) Max. Continuous

Size & Displacement					
Code	Displacement in ³ /rev (cc/rev)	MRD	MRDE	MRV	MRVE
300 D 150	18.56 / 9.28 (304.1 / 152.1)	x	—	—	—
330 D 165	20.28 / 10.14 (332.4 / 166.2)	—	x	—	—
450 E 133	27.56 / 8.12 (451.6 / 133)	—	—	x	—
450 E 225	27.56 / 13.78 (451.6 / 225.8)	x	—	—	—
500 E 250	30.38 / 15.19 (497.9 / 248.9)	—	x	—	—
700 F 235	43.14 / 14.38 (706.9 / 235.6)	x	—	x	—
800 F 270	49.08 / 16.36 (804.2 / 268.1)	—	x	—	x
1100 G 375	68.70 / 22.90 (1125.8 / 375.3)	x	—	x	—
1400 G 450	83.57 / 27.86 (1369.5 / 456.5)	—	x	—	x
1800 H 600	110.43 / 36.81 (1809.6 / 603.2)	x	—	x	—
2100 H 700	127.61 / 42.54 (2091.2 / 697.1)	—	x	—	x
2800 I 930	170.38 / 56.79 (2792.0 / 930.7)	x	—	x	—
3100 I 1035	189.40 / 63.14 (3103.7 / 1034.6)	—	x	—	x
4500 L 1500	274.77 / 91.59 (4502.7 / 1500.9)	x	—	x	—
5400 L 1800	329.60 / 109.87 (5401.2 / 1800.4)	—	x	—	x
7000 M 2300	425.15 / 141.72 (6967 / 2322.4)	x	—	x	—
8200 M 2750	501.98 / 167.33 (8226 / 2742.1)	—	x	—	x

Code	Shaft
N1	Spline Ex DIN 5463
D1	Spline DIN 5480
F1	Female Spline DIN 5480
P1	Shaft with Key
B1	Spline B.S. 3550

Code	Speed Sensor Option
N1	None
Q1	Encoder Drive
C1	Mechanized Tachometer Drive
T1	Tachometer Drive
M1	Incremental Elcis Encoder, Uni-directional*
B1	Incremental Elcis Encoder, Bi-directional*

*500 pulse/rev

Code	Seals
N1	NBR Mineral Oil
F1	NBR, 218 PSI (15.0 BAR) Shaft Seal
V1	Fluorocarbon
U1	No Shaft Seal (for Brake)

Code	Connection Flange
N1	None
C1	Standard Denison Calzoni
S1	Standard SAE Metric
T1	Standard SAE UNC
G1	SAE 6000 PSI (413.7 BAR) Metric
L1	SAE 6000 PSI (413.7 BAR) UNC

Code	Rotation
N	Standard Rotation (CW: Inlet in A; CCW: Inlet in B)
S	Reversed Rotation (CW: Inlet in B; CCW: Inlet in A)



Power Units

Page

(M) = Mobile **(I)** = Industrial **(B)** = Mobile & Industrial

(I)	D-Pak 5 Gallon 0.9 - 2.7 GPM	143-144
(I)	H-Pak 10-40 Gallon, 0.9 - 9.6 GPM	145-152
(I)	V-Pak 10-40 Gallon, 2 - 15.6 GPM	145-152
(I)	V-Pak Low Profile 80 Gallon, 15-36 GPM	145-152



ENGINEERING YOUR SUCCESS.

Power Units (Industrial)



D-Pak 5 Gallon



D-Pak style power units are ideal for many industrial applications. The space saving vertical style units are available with gear pumps and are designed for quiet and leak-free operation. Standard Parker filtration on each unit will help ensure a long service life.

Power Unit Performance Data

Model Series	Tank (Gal)	Pump Flow, GPM (LPM) @ 1725 RPM	Electric Motor HP (KW)	Maximum Pressure PSI (BAR)
D-Pak	5	0.9 - 2.7 (3.4 - 10.2)	0.5 - 3 (0.37 - 2.24)	3000 (210)

Markets

Industrial

Applications

Presses, Shears, Test Equipment, Simulators

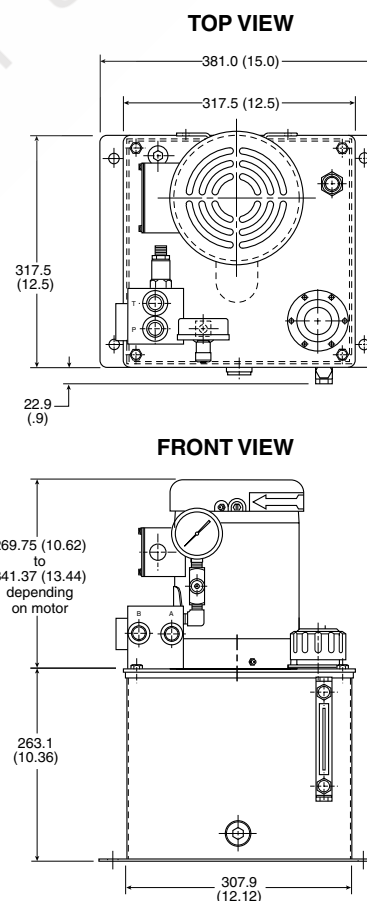
Features

- Vertical design
- Submerged pump
- Spare return ports
- Precision pump mounting adapters
- Suction strainer
- Glycerine filled pressure gage with shut off
- Oil level gage with thermometer
- Relief valve
- Breather and fill cap
- SAE drain plug
- Parker connector technology

Benefits

- Saves floor space
- Quieter operation, elimination of potential leak point
- Longer pump life
- Protects pump from contamination
- Improved diagnostics
- Helps to maintain trouble-free performance
- Protects against system shock
- Easy to fill reservoir
- Prevents leaks

* Stainless units & other options available on request





Power Units

D-Pak Model Ordering Code

D5

Reservoir
18.9 Liters
(5 Gal)



Pressure
Control



Pump Flow

W

No Motor
(See Note)
**



Electric
Motor



Manifold



Directional
Control
Valve



*Manapak
Control
Valves

P

Options
and
Accessories

Code	Pressure Control
Omit	System Pressure Relief Valve Only
B	System Pressure Relief Valve with Unloading Valve (2-Way 120VAC) N.O. (Energize coil to close)
J	System Pressure Relief Valve with Unloading Valve (2-Way 24VDC) N.O. (Energize coil to close)

Code	Pump Flow Used
0.9	331-9110-267
1.3	331-9110-011
1.8	331-9110-010
2.7	331-9110-101

Code	Electric Motor Description HP (KW) - RPM - Frame - Phase
U1	.5 (.37) - 1725 - 56 C - 1
T1	1 (.75) - 1725 - 56 C - 1
T3	1 (.75) - 1725 - 56 C - 3
G	2 (1.5) - 1725 - 56 C - 3
K	3 (2.2) - 1725 - 56 C - 3

Single phase electric motors are rated as follows:
115/230V, 1PH, TEFC - 60 Hz 1800 RPM

Three phase electric motors are rated as follows:
200-230/460V, 3PH, TEFC - 60 Hz 1800 RPM

Consult factory for other motor speeds (RPM) and voltages.

** Use W prefix when no motor is required on unit.
When ordering, W must be followed by motor model
code equivalent. Motor coupling will have interface
for a 56C frame motor.

Code	Porting Block/Subplate or Manifold Type	Supply/Return Port or Actuator Port Size	Other
O	Pressure and Return Port Block with Safety Relief Valve	P & T Ports SAE-10 Str. Thr'd	Convertible to S3 Option
S3	D03 Single Station Subplate with Safety Relief Valve	A & B Ports SAE-8 Str. Thr'd	Spare P & T SAE-10 Ports
M33	D03 Multistation Parallel Circuit Manifold with Safety Relief Valve	A & B Ports SAE-8 Str. Thr'd	Spare G Port SAE-6

Manifolds are mounted vertically. Bottom station is number 1.

Code	Directional Control Valve Model Number	NFPA Mounting Pad	Nominal Flow GPM (LPM)	Description	Circuit Symbol
B	D1VW001CN***	D03	7 (26.5)	Double (Spr. Ctr)	
C	D1VW004CN***	D03	7 (26.5)	Double (Spr. Ctr)	
T	D1VW008CN***	D03	7 (26.5)	Double (Spr. Ctr)	

Units less valves will be supplied with station cover plates installed.

Code	Manapak Control Valves Function	Valve Model Number	NFPA Mounting Pad	Nominal Flow GPM (LPM)	Circuit Symbol
1	Flow Control Meter-Out	FM2DDKN	D03	7 (26.5)	
3	Pilot Operator Check	CPOM2DDN	D03	7 (26.5)	

Manapak valves mounted in order of callout.
First valve will be nearest DCV; last valve will be on manifold.

Code	Options and Accessories		
	Function	Model Number	Technical Data
B1*	Exchanger	RM-08-2-2	Air/Oil: 0.7 HP (52 kW) Rej. @ 3 GPM (11.4 LPM)
H	Pressure Filter	15P110QXRS	Microglass II Element Vis. Ind. - 50 PSI (3.4 bar) Bypass - 2 PSI (0.14 bar) Diff. @ 3 GPM (11.4 LPM)
K	Check Valve Pump Outlet	DT370MOMF05	5 PSI (0.34 bar) Cracking Pressure 7 PSI (0.48 bar) Diff. @ 3 GPM (11.4 LPM)
L	Bypass Check (on Heat Exch)	C1020S65	65 PSI (4.5 bar) Cracking Pressure
O	Return Filter	12AT10C 45LPM (12 GPM)	Cellulose Element Ind. Gage - 15 PSI (1.03 bar) Bypass Max. Oil Flow
R1	Combination Float/Temp. Switch N.O. Float Up	8767820-1	Fixed Temp at 65°C (149°F) Close @ Low Level and/or 65°C (149°F) (N.O.)
R2	Combination Float/Temp. Switch Float Up	876782-02	Fixed Temp at 65°C (149°F) Open @ Low Level and/or 65°C (149°F) (N.C.)

*Heat rejection based on flow given with a 40°F differential
between transfer medium.

= Omit if not required

Power Units



H-Pak & V-Pak



V-Pak Low Profile

H-Pak and V-Pak style power units are ideal for many industrial applications. These space saving vertical style units are available with gear or piston pumps and are designed for quiet and leak-free operation. Standard Parker filtration on each unit will help ensure a long service life. Also available in V-Pak Low Profile.

Performance Data

Model Series	Tank (Gal)	Pump Flow, GPM (LPM) @ 1725 RPM	Electric Motor HP (KW)	Max. Pressure PSI (BAR)
H-Pak	10, 20, 30, 40	0.9 - 9.6 (2.2 - 36.3)	0.5 - 20 (0.37 - 14.9)	3000 (210)
V-Pak	10, 20, 30, 40	2.0 - 15.6 (7.6 - 59.1)	2 - 20 (1.4 - 14.9)	3000 (210)
V-Pak Low Profile	80	36.1 (136.7)	7.5 - 40 (5.6 - 30)	3000 (210)

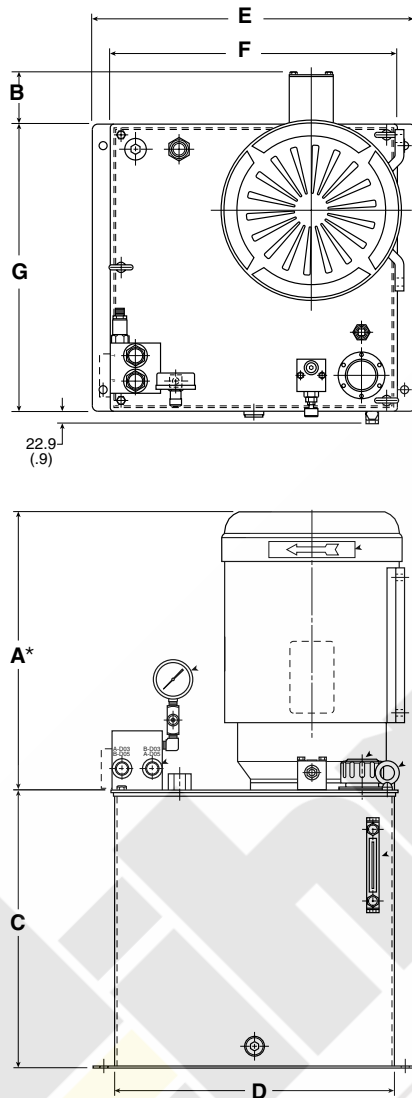
Markets

Industrial	Presses, Shears, Test Equipment, Simulators
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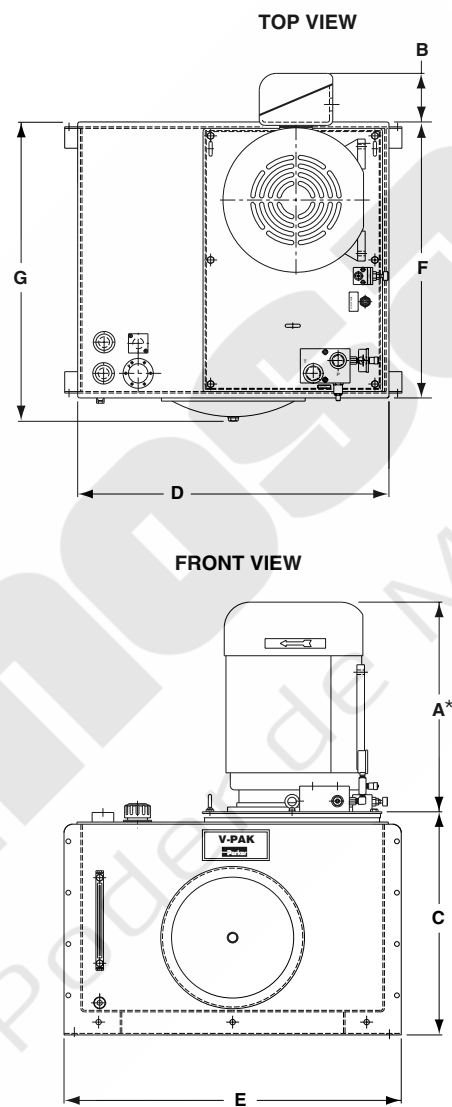
Applications

* Stainless units & other options available on request

H-Pak and V-Pak



Low Profile V-Pak



Dimensions, inch (mm)

Series	H1/V1	H2/V2	H3/V3	H4/V4	V8
A*†	10.5 (267) to 16.3 (414)	10.5 (267) to 19.3 (492)	11.8 (298) to 19.3 (492)	11.8 (298) to 19.3 (492)	16.6 (451) to 24.7 (627)
B*	0.8 (19) 2.6 (67)	0.8 (19) to 3.4 (85)	0.8 (19) to 3.4 (85)	0.8 (19) to 3.4 (85)	1.88 (48) to 5.7 (144)
C	15.4 (390)	19.4 (492)	23.6 (600)	28.9 (733)	28.6 (725)
D	16.1 (410)	19.5 (495)	19.5 (495)	19.5 (495)	36.0 (914)
E	19.0 (483)	22.5 (572)	22.5 (572)	22.5 (572)	39.0 (991)
F	16.6 (422)	20.0 (508)	20.0 (508)	20.0 (508)	32.3 (819)
G	16.6 (422)	20.0 (508)	20.0 (508)	20.0 (508)	34.6 (879)

* Depending on motor option

† Reference dimensions consult factory if critical to application

Power Units

H-Pak Model Ordering Code



Reservoir



Pressure Control



Pump Flow



No Motor
(See Note)
**



Electric Motor



Manifold

Code	Reservoir Size Gallons (Liters)
H1*	10 (37.9)
H2	20 (75.7)
H3	30 (113.6)
H4	40 (151.4)

*Available up to 7.5 KW (10 HP) motor only.

Code	Pressure Control*
Omit	System Pressure Relief Valve Only
B	System Pressure Relief Valve with Unloading Valve (2-Way 120VAC) N.O. (Energize coil to close)
J	System Pressure Relief Valve with Unloading Valve (2-Way 24VDC) N.O. (Energize coil to close)

Code	Pump Flow Used
0.9	331-9110-267
1.3	331-9110-011
1.8	331-9110-010
2.7	331-9110-101
3.2	334-9111-069
4.5	334-9111-068
5.1	334-9111-067
6.3	334-9111-048
9.6	334-9111-065

Code	Electric Motor Description HP (KW) - RPM - Frame - Phase
U1*	.5 (.37) - 1725 - 56C - 1
T1	1 (.75) - 1725 - 56C - 1
T3	1 (.75) - 1725 - 56C - 3
G	2 (1.5) - 1725 - 56C - 3
K	3 (2.2) - 1725 - 56C - 3
L	5 (37.5) - 1725 - 184TC - 3
M	7.5 (5.6) - 1725 - 213TC - 3
N	10 (7.5) - 1725 - 215TC - 3
P †	15 (11.2) - 1725 - 254TC - 3
S †	20 (14.9) - 1725 - 256TC - 3

* U1 leadtime is 2 weeks

Single phase electric motors are rated as follows:
115/230V, 1PH, TEFC - 60 Hertz 1800 RPM

Three phase electric motors are rated as follows:
208-230/460V, 3PH, TEFC - 60 Hertz 1800 RPM

Consult factory for other motor speeds (RPM) and voltages.

† Available with H2, H3 and H4 tanks only.

** Use W prefix when no motor is required on unit.
When ordering, W must be followed by motor model code equivalent to frame size of motor to be used.

Code	Porting Block/Subplate or Manifold Type	Supply/Return Port or Actuator Port Size	Other
O	Pressure and Return Port Block with Safety Relief Valve	P & T Ports SAE-10 Str. Thr'd	Convertible to S3 Option
S3	D03 Single Station Subplate with Safety Relief Valve	A & B Ports SAE-8 Str. Thr'd	Spare P & T SAE-10 Ports
S5	D05 Single Station Subplate with Safety Relief Valve	A & B Ports SAE-10 Str. Thr'd	Spare P & T SAE-12 Ports
M33 M35	D03 Multistation Parallel Circuit Manifold with Safety Relief Valve	A & B Ports SAE-8 Str. Thr'd	Spare G Port SAE-6
M53 M55	D05 Multistation Parallel Circuit Manifold with Safety Relief Valve	A & B Ports SAE-8 Str. Thr'd	Spare G Port SAE-6

Manifolds are mounted vertically. Bottom station is number 1.

 = Omit if not required



Power Units

H-Pak Model Ordering Code



Directional Control Valve



*Manapak Control Valves



Options and Accessories

Code	Valve Model Number	NFPA Mounting Pad	Nominal Flow GPM (LPM)	Description	Circuit Symbol
B	D1VW001CN***	D03	7 (26.5)	Double (Spr. Ctr)	
C	D1VW004CN***	D03	7 (26.5)	Double (Spr. Ctr)	
F	D3W1CN**	D05	20 (75.7)	Double (Spr. Ctr)	
G	D3W4CN**	D05	15 (56.8)	Double (Spr. Ctr)	
T	D1VW008CN***	D03	7 (26.5)	Double (Spr. Ctr)	
W	D3W8CN**	D05	15 (56.8)	Double (Spr. Ctr)	

Units less valves will be supplied with station cover plates installed.

Code	Function	Valve Model Number	NFPA Mounting Pad	Nominal Flow GPM (LPM)	Circuit Symbol
1	Flow Control	FM2DDKN	D03	7 (26.5)	
2	Flow Control	FM3DDKN	D05	12 (45.4)	
3	Pilot Operator Check	CPOM2DDN	D03	7 (26.5)	
4	Pilot Operator Check	CPOM3DDN	D05	12 (45.4)	

*Manapak valves mounted in order of callout.

First valve will be nearest DCV; last valve will be on manifold.

Code	Function	Model Number	Technical Data
B1*	Return Heat Exchanger	RM-08-1-2	Air/Oil: .7 HP (0.52 kW), Rej. @ 7 GPM (26.5 LPM) 0.37 - 3.7 kW Motors only
B2*	Return Heat Exchanger	RM 190-1-2	Air/Oil: 1.5 HP (1.1 kW), Rej. @ 7 GPM (26.5 LPM) 5.6 - 11.2 kW Motors only
H	Pressure Filter	15P110QXRS	Microglass II Element, Vis. Ind. - 50 PSI (3.49 bar) Bypass - 4 PSI (0.27 bar), Diff. @ 7 GPM (26.5 LPM)
K	Check Valve Pump Outlet	"DT" & "C" Series	5 PSI (0.34 bar) Cracking Pressure 25 PSI (1.72 bar) Diff. @ 15 GPM (56.8 LPM)
L	Bypass Check (on Heat Exch)	C1220S65	(65 PSI) 4.5 bar Cracking Pressure
O	Return Filter	12AT10C 12 GPM (45 LPM)	Cellulose Element, Ind. Gage - 15 PSI (1.03 bar) Bypass
R1	Combination Float/Temp. Switch N.O. Float Up	876782-01	Fixed Temp at 65°C (149°F) Close @ Low Level and/or 65°C (149°F) (N.O.)
R2	Combination Float/Temp. Switch Float Up	876782-02	Fixed Temp at 65°C (149°F) Open @ Low Level and/or 65°C (149°F) (N.C.)

*Heat rejection based on flow given with a 40°F differential between transfer medium.



= Omit if not required

Power Units

V-Pak Model Ordering Code



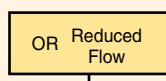
Reservoir



Pressure Control



Pump Control



Pump Flow



No Motor
(See Note)
**



Electric Motor



Manifold

Code	Reservoir Size Gallons (Liters)
V1*	10 (37.9)
V2	20 (75.7)
V3	30 (113.6)
V4	40 (151.4)

*Available up to 10 HP (7.5 kW) motor only.

Code	Pressure Control
Omit	Single Pressure Remote Compensator
B	Single Pressure Remote Compensator with Low Pressure Standby
BJ	Single Pressure Remote Compensator with Low Pressure Standby, 24 VDC
C	Bi-Pressure Remote Compensator
CJ	Bi-Pressure Remote Compensator, 24VDC
D	Bi-Pressure Remote Compensator with Low Pressure Standby
DJ	Bi-Pressure Remote Compensator with Low Pressure Standby, 24VDC
F	Provision for Customer Supplied Remote Control Relief Valve

Code	Pump Control
Omit	Std. Remote Compensator
A*	Load Sense Flow Control
H**	Horsepower Limiting

*A_SAE-6 sense port line will be supplied in topline.

** Horsepower setting will be at max. flow & pressure obtainable with motor selected. Lead time is four weeks for shaded items.

Code	Pump Flow Rate @1800 RPM	Pump Used and Description
7	7 GPM (29.5 LPM)	PVP16 - Std. Remote Compensator
*	Specify in GPM	Destroyed Max. Volume – 2 GPM Min.
15	15.6 GPM (59 LPM)	PVP33 - Std. Remote Compensator
**	Specify in GPM	Destroyed Max. Volume – 8 GPM Min.

*Unless otherwise specified, units are shipped at max. flow rate 7.8 GPM (29.5 LPM) at 1800 RPM. When reduced flow setting is required, specify pump setting in .5 GPM (1.9 LPM) increments. Example: 5, 5.5, 6, 6.5 with a 2 GPM (7.6 LPM) minimum flow.

**Unless otherwise specified, units are shipped at max. flow rate 15.6 GPM (59 LPM) at 1800 RPM. When reduced flow setting is required, specify pump setting in .5 GPM (1.9 LPM) increments. Example: 11, 11.5, 12, 12.5 with a 8 GPM (30.3 LPM) minimum flow.

Example: V*12**-- = Std. Pump Destroyed to 12 GPM (45.4 LPM)
V*A11.5**-- = Load Sense Pump Destroyed to 11.5 GPM (43.5 LPM)

Code	Electric Motor Description HP (KW) - RPM - Frame - Phase
G	2 (1.5) - 1725 - 56C - 3
K	3 (2.2) - 1725 - 56C - 3
L	5 (3.75) - 1725 - 184TC - 3
M	7.5 (5.6) - 1725 - 213TC - 3
N	10 (7.5) - 1725 - 215TC - 3
P †	15 (11.2) - 1725 - 254TC - 3
S †	20 (14.9) - 1725 - 256TC - 3

Electric motors are 208-230/460V, 60 Hz 3PH 1800 RPM TEFC. Consult factory for other motor speeds (RPM) and voltages.

†Available with V2, V3 and V4 tanks only.

** Use W prefix when no motor is required on unit. When ordering, W must be followed by motor model code equivalent to frame size of motor to be used.

Code	Porting Block/Subplate or Manifold Type	Supply/Return Port or Actuator Port Size	Other
O	Pressure and Return Port Block with Safety Relief Valve	P & T Ports SAE-10 Str. Thr'd	Convertible to S3 Option
S3	D03 Single Station Subplate with Safety Relief Valve	A & B Ports SAE-8 Str. Thr'd	Spare P & T SAE-10 Ports
S5	D05 Single Station Subplate with Safety Relief Valve	A & B Ports SAE-10 Str. Thr'd	Spare P & T SAE-12 Ports
M33 M35	D03 Multistation Parallel Circuit Manifold with Safety Relief Valve	A & B Ports SAE-8 Str. Thr'd	Spare G Port SAE-6
M53 M55	D05 Multistation Parallel Circuit Manifold with Safety Relief Valve	A & B Ports SAE-8 Str. Thr'd	Spare G Port SAE-6

Manifolds are mounted vertically. Bottom station is number 1.



= Omit if not required



Power Units

V-Pak Model Ordering Code

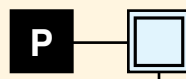
continued on next page



Directional Control Valve



*Manapak Control Valves



Options and Accessories

Code	Directional Control Valve Model Number	NFPA Mounting Pad	Nominal Flow GPM (LPM)	Description	Circuit Symbol
B	D1VW001CN***	D03	7 (26.5)	Double (Spr. Ctr)	
C	D1VW004CN***	D03	7 (26.5)	Double (Spr. Ctr)	
F	D3W1CN**	D05	20 (75.7)	Double (Spr. Ctr)	
G	D3W4CN**	D05	15 (56.8)	Double (Spr. Ctr)	

Units less valves will be supplied with station cover plates installed.

Code	Manapak Control Valves Function	Valve Model Number	NFPA Mounting Pad	Nominal Flow GPM (LPM)	Circuit Symbol
1	Flow Control	FM2DDKN	D03	7 (26.5)	
2	Flow Control	FM3DDKN	D05	12 (45.4)	
3	Pilot Operator Check	CPOM2DDN	D03	7 (26.5)	
4	Pilot Operator Check	CPOM3DDN	D05	12 (45.4)	

*Manapak valves mounted in order of callout.

First valve will be nearest DCV; last valve will be on manifold.

Code	Options and Accessories		
	Function	Model Number	Technical Data
A*	Pump Case Heat Exchanger	RM-08-4-2	Air/Oil: 0.7 HP (0.52 kW), Rej. @ .5 GPM (1.9 LPM) 2-15 HP (1.5 - 11.2 kW) Motors
B1*	Return Heat Exchanger	RM-08-1-2	Air/Oil: 0.7 HP (0.52 kW), Rej. @ 7 GPM (26.5 LPM) 2-5 HP (1.5 - 3.7 kW) Motors only
B2*	Return Heat Exchanger	RM 190-1-2	Air/Oil: 1.5 HP (1.1 kW), Rej. @ 7 GPM (26.5 LPM) 7.5-15 HP (5.6 - 11.2 kW) Motors only
H	Pressure Filter	15P110QXRS	Microglass II Element, Vis. Ind. - 50 PSI (3.49 bar) Bypass - 4 PSI (0.27 bar), Diff. @ 7 GPM (26.5 LPM)
K	Check Valve Pump Outlet	"DT" & "C" Series	5 PSI (0.34 bar) Cracking Pressure 25 PSI (1.72 bar) Diff. @ 15 GPM (56.8 LPM)
L	Bypass Check (on Heat Exch)	C1220S65	(65 PSI) 4.5 bar Cracking Pressure
N	Return Filter	40CN110B	Microglass II Element, Visual 25 PSI (1.72 bar) Indicator 3 PSI (0.21 bar) Diff. @ 7 GPM (26.5 LPM)
O	Return Filter	12AT10C 12 GPM (45 LPM)	Cellulose Element, Ind. Gage - 15 PSI (1.03 bar) Bypass
R1	Combination Float/Temp. Switch N.O. Float Up	876782-01	Fixed Temp at 65°C (149°F) Close @ Low Level and/or 65°C (149°F) (N.O.)
R2	Combination Float/Temp. Switch Float Up	876782-02	Fixed Temp at 65°C (149°F) Open @ Low Level and/or 65°C (149°F) (N.C.)

*Heat rejection based on flow given with a 40°F differential between transfer medium.

= Omit if not required

Power Units

V-Pak Model Ordering Code



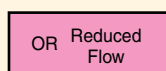
Reservoir Size
80 Gallons
(302.8 Liters)



Pressure Control



Pump Control



Pump Flow



No Motor
(See Note)
**



Electric Motor



Manifold

Code	Pressure Control
Omit	Single Pressure Remote Compensator
B	Single Pressure Remote Compensator with Low Pressure Standby
BJ	Single Pressure Remote Compensator with Low Pressure Standby, 24 VDC
C	Bi-Pressure Remote Compensator
CJ	Bi-Pressure Remote Compensator, 24VDC
D	Bi-Pressure Remote Compensator with Low Pressure Standby
DJ	Bi-Pressure Remote Compensator with Low Pressure Standby, 24VDC
F	Provision for Customer Supplied Remote Control Relief Valve

Code	Pump Control
Omit	Std. Remote Compensator
A*	Load Sense Flow Control

*Unless otherwise specified, a SAE-6 37° flared port will be supplied for customer connection.

**Consult factory for horsepower and hi-lo pump control options. Lead time is four weeks.

Code	Pump Flow Rate @ 1800 RPM	Pump Used and Description
15	15.6 GPM (59 LPM)	PVP33 - Std. Remote Compensator
23	23.0 GPM (87 LPM)	PVP48 - Std. Remote Compensator
36	36.1 GPM (137 LPM)	PVP76 - Std. Remote Compensator
*	Specify in GPM	Destroked (Reduced) Flow

*Unless otherwise specified, units are shipped at max. flow rate (GPM) at 1800 RPM.

When reduced flow setting is required,

Reduced flows from 22.5 to 8.0 GPM (85.2 to 30.3 LPM), specify in 0.5 GPM increments.

Reduced flows from 35.0 to 24.0 GPM (132.5 to 90.8 LPM), specify in 1.0 GPM (3.8 LPM) increments.

Example: V*9.5*-- = PVP33 Pump destroked to 9.5 GPM (36.0 LPM)
V*A31*-- = PVP76 Load Sense Pump destroked to 31.0 GPM (177.3 LPM)

NOTE:

- Manifolds are mounted vertically. Bottom station is number 1.
- M5-3 and 5 station available. M8-2 station available.

Code	Electric Motor Description HP (kW) - RPM - Frame - Type
M	7.5 (5.6) - 1800 - 213TC - TEFC
N	10 (7.5) - 1800 - 215TC - TEFC
P	15 (11.2) - 1800 - 254TC - TEFC
S	20 (14.9) - 1800 - 256TC - TEFC
Q	25 (18.6) - 1800 - 284TC - TEFC
R	30 (22.4) - 1800 - 286T - TEFC
V	40 (29.8) - 1800 - 324T - TEFC

Electric motors are 230/460V, 60 Hz 3PH. Consult factory for other motor speeds (RPM) and voltages.

**Use W prefix when no motor is required on unit.

When ordering, W must be followed by motor model code equivalent to frame size of motor to be used.

Example: V815WM*** = 302.8 L (80 gal) reservoir, std PVP33 unit to accept a 7.5 HP (5.6KW)/213TC C-face frame motor.

Code	Porting Block/Subplate or Manifold Type	Supply/Return Port or Actuator Port Size	Other
O	Pressure and Return Port Block with Safety Relief Valve	P Port SAE-16 T Port SAE-20	None
S5	D05 Single Station Subplate with Safety Relief Valve	A & B Ports SAE-10 Str. Thr'd	None
M5* ⁽²⁾	D05 Multistation Parallel Circuit Manifold with Safety Relief and Pump Compensator Valves	A & B Ports SAE-8 Str. Thr'd	None
M82 ⁽³⁾	D08 Two Parallel Circuit Manifold with Safety Relief and Pump Compensator Valves	A & B Ports SAE-16 Str. Thr'd	Y Port SAE-8 Str. Thr'd

*When ordering Multi-Station Manifolds, the number of stations must be specified. If valves are to be mounted, specify the valves and sequence, if the model code exceeds 25 digits, call factory.

Example: V815QM53BCB1

3 Station D05 Manifold
Station #1: B
Station #2: C
Station #3: B1

Example: V815QM55B1B1CBC

5-Station D05 Manifold
Station #1: B1
Station #2: B1
Station #3: C
Station #4: B
Station #5: C

= Omit if not required



Power Units

V-Pak Model Ordering Code



Directional Control Valve



*Manapak Control Valves



Options and Accessories

Code	Directional Control Valve Model Number	NFPA Mounting Pad	Nominal Flow GPM (LPM)	Description	Circuit Symbol
B	D1VW001CN***	D03	7 (26.5)	Double (Spr. Ctr)	
C	D1VW004CN***	D03	7 (26.5)	Double (Spr. Ctr)	

Code	Manapak Control Valves Function	Valve Model Number	NFPA Mounting Pad	Nominal Flow GPM (LPM)	Circuit Symbol
1	Flow Control	FM2DDKN	D03	7 (26.5)	
3	Pilot Operator Check	CPOM2DDN	D03	7 (26.5)	

*Manapak valves mounted in order of callout.
First valve will be nearest DCV; last valve will be on manifold.

Code	Options and Accessories		
	Function	Model Number	Technical Data
A*	Continuous Pump Case Cooling	RM-08-2-2	Air/Oil: Max. Oil Flow 4.5 GPM (17 LPM), 0.8 HP (0.6 kW) Heat Rejection
B*	Continuous Pump Case Cooling	RM-19-2-2	Air/Oil: Max. Oil Flow 4.5 GPM (17 LPM) 1.5 HP (1.1 kW) Heat Rejection
C*	Filter/Cooling Loop	ACC-22-2-1PH 40CN205Q	Air Oil w/1 PH Motor: Oil Flow 4.5 GPM (17 LPM), 4.5 HP (3.3 kW) Heat Rejection
H	Pressure Filter	P210QM250NN1	10 Micron Microglass II Dual Element, Mechanical Indicator
K	Check Valve Pump Outlet	493-16-D1-2	5 PSI (0.3 bar) Cracking Pressure
L	Bypass Check	C2020S65	65 PSI (4.6 bar) Cracking Pressure
N	Return Filter	40CN210Q	10 Micron Microglass II Dual Element, Mechanical Indicator** (8 PSID)
QS	Return Filter	80CN110QE2GS24-4	10 Micron Microglass II Single Element Electrical Indicator (25 PSI)
R1	Combination Float/Temp. Switch N.O. Float Up	877501	Fixed Temp at 65°C (149°F) Close @ Low Level and/or 65°C (149°F) (N.O.)
R2	Combination Float/Temp. Switch N.C. Float Up	877502	Fixed Temp at 65°C (149°F) Open @ Low Level and/or 65°C (149°F) (N.C.)

*Heat rejection data is based on 100 SSU oil leaving the cooler 22°C (72°F) higher than the ambient air temperature used for cooling.

Option A available from 7.5 HP (0.6 kW) thru 25 HP (18.5 kW).

Option C not available with option A or B.

**Based on max. 36 GPM (136 LPM) w/150 SUS oil.

= Omit if not required

Reference

Page

(M) = Mobile **(I)** = Industrial **(B)** = Mobile & Industrial

SAE Flanges and Shafts

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Formulas & Conversions

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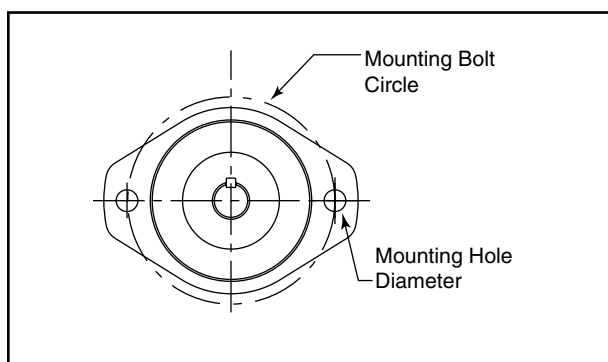
Offer of Sale

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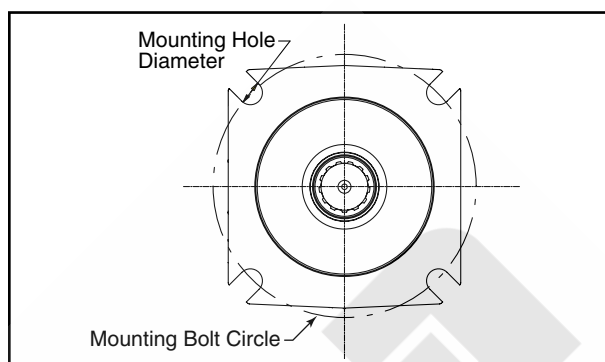
ENGINEERING YOUR SUCCESS.

SAE Flanges & Shafts



**NFPA Standard
Two-Bolt Pump/Motor Mounting Flanges**

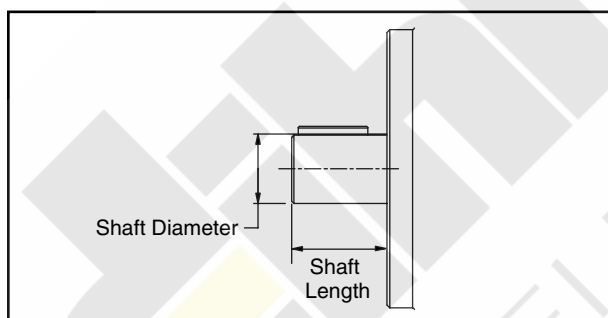
Flange Code	SAE No.	SAE hp Rating ¹	Mtg. Bolt Circle	Mtg. Hole Dia.	Pilot Dia.	Pilot Ht.
50-2	N/A	N/A	3 ¹ / ₄	1 ³ / ₃₂	1	1 ¹ / ₄
82-2	A	10	4 ³ / ₁₆	7 ¹ / ₁₆	3 ¹ / ₄	1 ¹ / ₄
101-2	B	25	5 ³ / ₄	9 ¹ / ₁₆	4	3 ¹ / ₈
127-2	C	50	7 ¹ / ₈	1 ¹ / ₁₆	5	1 ¹ / ₂
152-2	D	100	9	1 ³ / ₁₆	6	1 ¹ / ₂
165-2	E	200	12 ¹ / ₂	1 ¹ / ₁₆	6 ¹ / ₂	5 ¹ / ₈
177-2	F	300	13 ²⁵ / ₃₂	1 ¹ / ₁₆	7	5 ¹ / ₈



**NFPA Standard
Four-Bolt Pump/Motor Mounting Flanges**

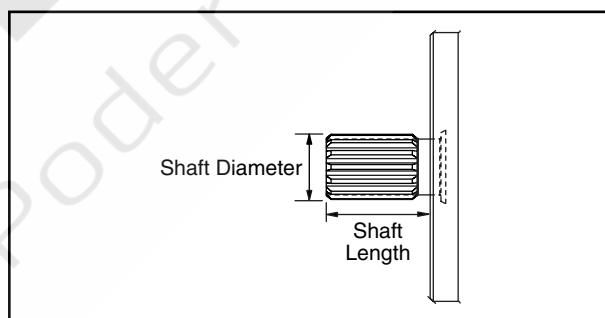
Flange Code	SAE No.	SAE hp Rating ¹	Mtg. Bolt Circle	Mtg. Hole Dia.	Pilot Dia.	Pilot Ht.
101-4	B	25	5	9 ¹ / ₁₆	4	3 ¹ / ₈
127-4	C	50	6 ³ / ₈	1 ¹ / ₁₆	5	1 ¹ / ₂
152-4	D	100	9	1 ³ / ₁₆	6	1 ¹ / ₂
165-4	E	200	12 ¹ / ₂	1 ¹ / ₁₆	6 ¹ / ₂	5 ¹ / ₈
177-4	F	300	13 ²⁵ / ₃₂	1 ¹ / ₁₆	7	5 ¹ / ₈

¹ 1750 rpm electric motor



**NFPA Standard
Straight Shafts without Thread**

Shaft Code	SAE Ref. ²	Shaft Dia.	Short Shaft Length	Long Shaft Length	Key Width
13-1	N/A	1 ¹ / ₂	3 ¹ / ₄	N/A	1 ¹ / ₈
16-1	A	5 ¹ / ₈	1 ⁵ / ₁₆	2	5 ¹ / ₃₂
22-1	B	7 ¹ / ₈	1 ⁵ / ₁₆	2 ¹ / ₂	1 ¹ / ₄
25-1	B-B	1	1 ¹ / ₂	2 ³ / ₄	1 ¹ / ₄
32-1	C	1 ¹ / ₄	1 ¹ / ₈	3	5 ¹ / ₁₆
38-1	C-C	1 ¹ / ₂	2 ¹ / ₈	3 ¹ / ₄	3 ¹ / ₈
44-1	D, E	1 ³ / ₄	2 ⁵ / ₈	3 ⁵ / ₈	7 ¹ / ₁₆



**NFPA Standard
30° Involute Spline Shafts**

Shaft Code	SAE Ref. ²	Shaft Dia.	Shaft Length	Spline Specifications
13-4	N/A	1 ¹ / ₂	3 ¹ / ₄	9T, 20/40 DP
16-4	A	5 ¹ / ₈	1 ⁵ / ₁₆	9T, 16/32 DP
22-4	B	7 ¹ / ₈	1 ⁵ / ₁₆	13T, 16/32 DP
25-4	B-B	1	1 ¹ / ₂	15T, 16/32 DP
32-4	C	1 ¹ / ₄	1 ¹ / ₈	14T, 12/24 DP
38-4	C-C	1 ¹ / ₂	2 ¹ / ₈	17T, 12/24 DP
44-4	D, E	1 ³ / ₄	2 ⁵ / ₈	13T, 8/16 DP
50-4	N/A	2	3 ¹ / ₈	15T, 8/16 DP

² Indicates matching SAE front flange for each shaft diameter.



Formulas & Conversions

Formulas

PRESSURE (psi)	=	$\frac{\text{FORCE (pounds)}}{\text{UNIT AREA (square inches)}}$	CYLINDER AREA (in ²)	=	$\pi \times \text{RADIUS}^2 \text{ (inches)}$
FLOW RATE (gpm)	=	$\frac{\text{VOLUME (gallons)}}{\text{UNIT TIME (minutes)}}$		=	$\frac{\pi}{4} \times \text{DIAMETER}^2 \text{ (inches)}$
HORSEPOWER (hp)	=	$\frac{\text{PRESSURE (psig)} \times \text{FLOW (gpm)}}{1714}$	CYLINDER FORCE (lbs)	=	$\text{PRESSURE (psig)} \times \text{NET AREA (in}^2\text{)}$
VELOCITY	=	$\frac{0.3208 \times \text{FLOW RATE THROUGH I.D. (gpm)}}{\text{INTERNAL AREA (square inches)}}$	CYLINDER VELOCITY (ft/sec)	=	$\frac{231 \times \text{FLOW RATE (gpm)}}{12 \times 60 \times \text{NET AREA (in}^2\text{)}}$
SPECIFIC GRAVITY	=	$\frac{\text{WEIGHT OF ONE CUBIC FOOT OF FLUID}}{\text{WEIGHT OF ONE CUBIC FOOT OF WATER}}$	CYLINDER VOLUME	=	$\frac{\pi \times \text{RADIUS}^2 \text{ (in)} \times \text{STROKE (in)}}{231}$
FLOW (gpm)	=	$\frac{\text{RPM} \times \text{PUMP DISPLACEMENT (in}^3\text{/rev)}}{231}$	CYLINDER FLOW RATE (gpm)	=	$\frac{12 \times 60 \times \text{VELOCITY (ft/sec)} \times \text{NET AREA (in}^2\text{)}}{231}$
HORSEPOWER INPUT	=	$\frac{\text{FLOW RATE OUTPUT (gpm)} \times \text{PRESSURE (psig)}}{1714 \times \text{EFFICIENCY}}$	TORQUE (in-lbs)	=	$\frac{\text{PRESSURE (psig)} \times \text{F.M. DISPLACEMENT (in}^3\text{/rev)}}{2\pi}$
OVERALL EFFICIENCY (%)	=	$\frac{\text{OUTPUT HORSEPOWER}}{\text{INPUT HORSEPOWER}} \times 100$		=	$\frac{\text{HORSEPOWER} \times 63025}{\text{RPM}}$
OVERALL EFFICIENCY (%)	=	$\text{VOLUMETRIC EFF.} \times \text{MECHANICAL EFF.}$		=	$\frac{\text{FLOW RATE (gpm)} \times \text{PRESSURE (psig)} \times 36.77}{\text{RPM}}$
VOLUMETRIC EFFICIENCY (%)	=	$\frac{\text{ACTUAL FLOW RATE OUTPUT (gpm)}}{\text{THEORETICAL FLOW RATE OUTPUT (gpm)}} \times 100$	TORQUE/100 psig (in-lbs)	=	$\frac{\text{F.M. DISPLACEMENT (in}^3\text{/rev)}}{0.0628}$
MECHANICAL EFFICIENCY (%)	=	$\frac{\text{ACTUAL TORQUE TO DRIVE}}{\text{THEORETICAL TORQUE TO DRIVE}} \times 100$	SPEED (RPM)	=	$\frac{231 \times \text{FLOW RATE (gpm)}}{\text{F.M. DISPLACEMENT (in}^3\text{/rev)}}$
B ₁₀ BEARING LIFE (hr)	=	$\frac{\text{RATED LIFE (hr)} \times \text{RATED SPEED (rpm)} \times \left(\frac{\text{RATED PRESSURE (psig)}}{\text{NEW PRESSURE (psig)}} \right)^3}{\text{NEW SPEED (rpm)}}$	MOTOR HORSEPOWER (hp)	=	$\frac{\text{TORQUE OUTPUT (in-lbs)} \times \text{RPM}}{63025}$
DISPLACEMENT (cfr)	=	$\frac{\text{FLOW RATE (gpm)} \times 231}{\text{PUMP RPM}}$	TORQUE (in-lbs)	=	$\text{LEVER LENGTH (inch)} \times \text{PULL (lbs)}$
TORQUE (in-lbs)	=	$\frac{\text{HORSEPOWER} \times 63025}{\text{RPM}}$	PISTON AREA (in ²)	=	$\text{ID}^2 \times 0.7854$
TORQUE (in-lbs)	=	$\frac{\text{PRESSURE (psig)} \times \text{PUMP DISPLACEMENT (in}^3\text{/rev)}}{2\pi}$	VELOCITY	=	$\frac{0.3208 \times \text{FLOW (gpm)}}{\text{AREA OF PASSAGE (in}^2\text{)}}$

The Universal Gas Law

$$P_1 V_1 T_2 = P_2 V_2 T_1$$

Common Conversions

To Convert	Into	Multiply by	To Convert	Into	Multiply by
BAR	PSI	14.5	PSI	BAR	0.06896
cc	in ³	0.06102	in ³	cc	16.39
°C	°F	(°C × 9/5) + 32	°F	°C	(°F - 32) / 1.8
KG	lbs	2.205	lbs	Kg	0.4535
KW	HP	1.341	HP	KW	0.7457
liters	gallons	0.2642	gallons	liters	3.785
mm	inches	0.03937	inch	mm	25.4
Nm	lb-ft	0.7375	lb-ft	Nm	1.356

Thermal Formulas

NOTE: ONE BRITISH THERMAL UNIT (BTU) IS THE AMOUNT OF HEAT REQUIRED TO RAISE THE TEMPERATURE OF ONE POUND OF WATER 1° FAHRENHEIT. ONE HORSEPOWER = 2545 BTU/HR.		
RESERVOIR COOLING CAPACITY BASED ON ADEQUATE AIR CIRCULATION	HEAT (BTU/HR) = 2 × TEMPERATURE DIFFERENCE BETWEEN RESERVOIR WALLS AND AIR (°F) × AREA OF RESERVOIR (sq. ft.)	BTU/HR = 2.0 × πT × A
HEAT IN HYDRAULIC OIL (approx.) DUE TO SYSTEM INEFFICIENCY (SG = 0.89 - 0.92)	HEAT (BTU/HR) = FLOW RATE (gpm) × 210 × TEMPERATURE DIFFERENCE (°F)	BTU/HR = Q × 210 × πT

Electric Motors

INPUT HP TO ELEC. MOTOR	=	$\frac{\text{PUMP INPUT HP}}{\text{ELECTRIC MOTOR EFFICIENCY}}$
WATTS	=	$\text{ELECTRIC MOTOR INPUT HP} \times 746$

$$E = I \times R \quad \text{POWER (W)} = I \times E \quad \text{POWER (W)} = I^2 \times E$$

where: E = VOLTAGE I = CURRENT R = RESISTANCE W = WATTS

SERIES

$$E_{\text{Total}} = E_{r1} + E_{r2} + E_{r3}$$

$$I_{\text{Total}} = I_{r1} = I_{r2} = I_{r3}$$

$$R_{\text{Total}} = R_1 + R_2 + R_3$$

PARALLEL

$$E_{\text{Total}} = E_{r1} + E_{r2} = E_{r3}$$

$$I_{\text{Total}} = I_{r1} + I_{r2} + I_{r3}$$

$$R_{\text{Total}} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$$

Offer of Sale



The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, Hydraulics Group, and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods or work described will be referred to as "Products".

1. Terms and Conditions. Seller's willingness to offer Products, or accept an order for Products, to or from Buyer is expressly conditioned on Buyer's assent to these Terms and Conditions and to the terms and conditions found on-line at www.parker.com/saleterms/. Seller objects to any contrary or additional term or condition of Buyer's order or any other document issued by Buyer.

2. Price Adjustments; Payments. Prices stated on the reverse side or preceding pages of this document are valid for 30 days. After 30 days, Seller may change prices to reflect any increase in its costs resulting from state, federal or local legislation, price increases from its suppliers, or any change in the rate, charge, or classification of any carrier. The prices stated on the reverse or preceding pages of this document do not include any sales, use, or other taxes unless so stated specifically. Unless otherwise specified by Seller, all prices are F.O.B. Seller's facility, and payment is due 30 days from the date of invoice. After 30 days, Buyer shall pay interest on any unpaid invoices at the rate of 1.5% per month or the maximum allowable rate under applicable law.

3. Delivery Dates; Title and Risk; Shipment. All delivery dates are approximate and Seller shall not be responsible for any damages resulting from any delay. Regardless of the manner of shipment, title to any products and risk of loss or damage shall pass to Buyer upon tender to the carrier at Seller's facility (i.e., when it's on the truck, it's yours). Unless otherwise stated, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyer's request beyond the respective dates indicated will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's changes in shipping, product specifications or in accordance with Section 13, herein.

4. Warranty. Seller warrants that the Products sold hereunder shall be free from defects in material or workmanship for a period of eighteen months from the date of delivery to Buyer. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

5. Claims; Commencement of Actions. Buyer shall promptly inspect all Products upon delivery. No claims for shortages will be allowed unless reported to the Seller within 10 days of delivery. No other claims against Seller will be allowed unless asserted in writing within 60 days after delivery or, in the case of an alleged breach of warranty, within 30 days after the date within the warranty period on which the defect is or should have been discovered by Buyer. Any action based upon breach of this agreement or upon any other claim arising out of this sale (other than an action by Seller for any amount due to Seller from Buyer) must be commenced within thirteen months from the date of tender of delivery by Seller or, for a cause of action based upon an alleged breach of warranty, within thirteen months from the date within the warranty period on which the defect is or should have been discovered by Buyer.

6. LIMITATION OF LIABILITY. UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.

7. Contingencies. Seller shall not be liable for any default or delay in performance if caused by circumstances beyond the reasonable control of Seller.

8. User Responsibility. The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.

9. Loss to Buyer's Property. Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

10. Special Tooling. A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the Products, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

11. Buyer's Obligation; Rights of Seller. To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest. Seller shall have a security interest in, and lien upon, any property of Buyer in Seller's possession as security for the payment of any amounts owed to Seller by Buyer.

12. Improper Use and Indemnity. Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

13. Cancellations and Changes. Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.

14. Limitation on Assignment. Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.

15. Entire Agreement. This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of the agreement. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.

16. Waiver and Severability. Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidity of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

17. Termination. This agreement may be terminated by Seller for any reason and at any time by giving Buyer thirty (30) days written notice of termination. In addition, Seller may by written notice immediately terminate this agreement for the following: (a) Buyer commits a breach of any provision of this agreement (b) the appointment of a trustee, receiver or custodian for all or any part of Buyer's property (c) the filing of a petition for relief in bankruptcy of the other Party on its own behalf, or by a third party (d) an assignment for the benefit of creditors, or (e) the dissolution or liquidation of the Buyer.

18. Governing Law. This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement. Disputes between the parties shall not be settled by arbitration unless, after a dispute has arisen, both parties expressly agree in writing to arbitrate the dispute.

19. Indemnity for Infringement of Intellectual Property Rights. Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that a Product sold pursuant to this Agreement infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If a Product is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to Products delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

20. Taxes. Unless otherwise indicated, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of Products.

21. Equal Opportunity Clause. For the performance of government contracts and where dollar value of the Products exceed \$10,000, the equal employment opportunity clauses in Executive Order 11246, VEVRAA, and 41 C.F.R. §§ 60-1.4(a), 60-741.5(a), and 60-250.4, are hereby incorporated.

System Requirements

To view the DVD, the following are required:

- **Pentium® 3-class processor**
- **Win 2000, Win XP, Win Vista or Win 7**
- **32 MB of RAM**
- **1 GB of available hard-disk space**
- **DVD player**

Acrobat Reader

Catalog files are viewed using Adobe Acrobat Reader. If you do not have Acrobat Reader installed on your PC, Win Vista, Win 7 and most Win XP systems will give you an web install option for Acrobat Reader on the bottom of the DVD install menu.

You must have Acrobat 6.0 or higher to take advantage of the search feature described in the next section.

To View the DVD

The DVD is self-loading. Just place it in your DVD drive. Acrobat Reader will open (or install), and the opening page will appear on your monitor. From this page you can navigate to the following sections.

- **Search* takes you to the search feature. When the search window opens, type a word(s) or code* and press enter. A list of pages where that word appears is shown. Select one and click the View button. Repeat as needed.**
- **Product Information or Contents takes you to the selection of catalogs and products on the DVD.**
- **Product Overview takes you to a .pdf file of this Hydraulic Pump Division Product Range.**

- **Warning/Offer of Sale takes you to these legal documents.**
- **Getting Started provides a summary of how to navigate using Acrobat Reader.**
- **Contact Us provides you with phone, fax and online information.**

Text links are easily identified by blue type. The catalog files are fully bookmarked to make navigation quick and easy. Each catalog also has a bookmark which will take you to the Parker web home page *if you are online while you are viewing the DVD.*

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Hydramosa
El Poder de Mover



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