High Quality Replacement Units & Parts

GENUINE METARIS 20 SERIES PUMPS & MOTORS

Aftermarket Sundstrand® PV & MF Series

Technical Information

GENUINE METARIS
A Hydraulex Global Company

HYDRAULEX GLOBAL
The Right Replacement, Right Now

Pumps & Motors

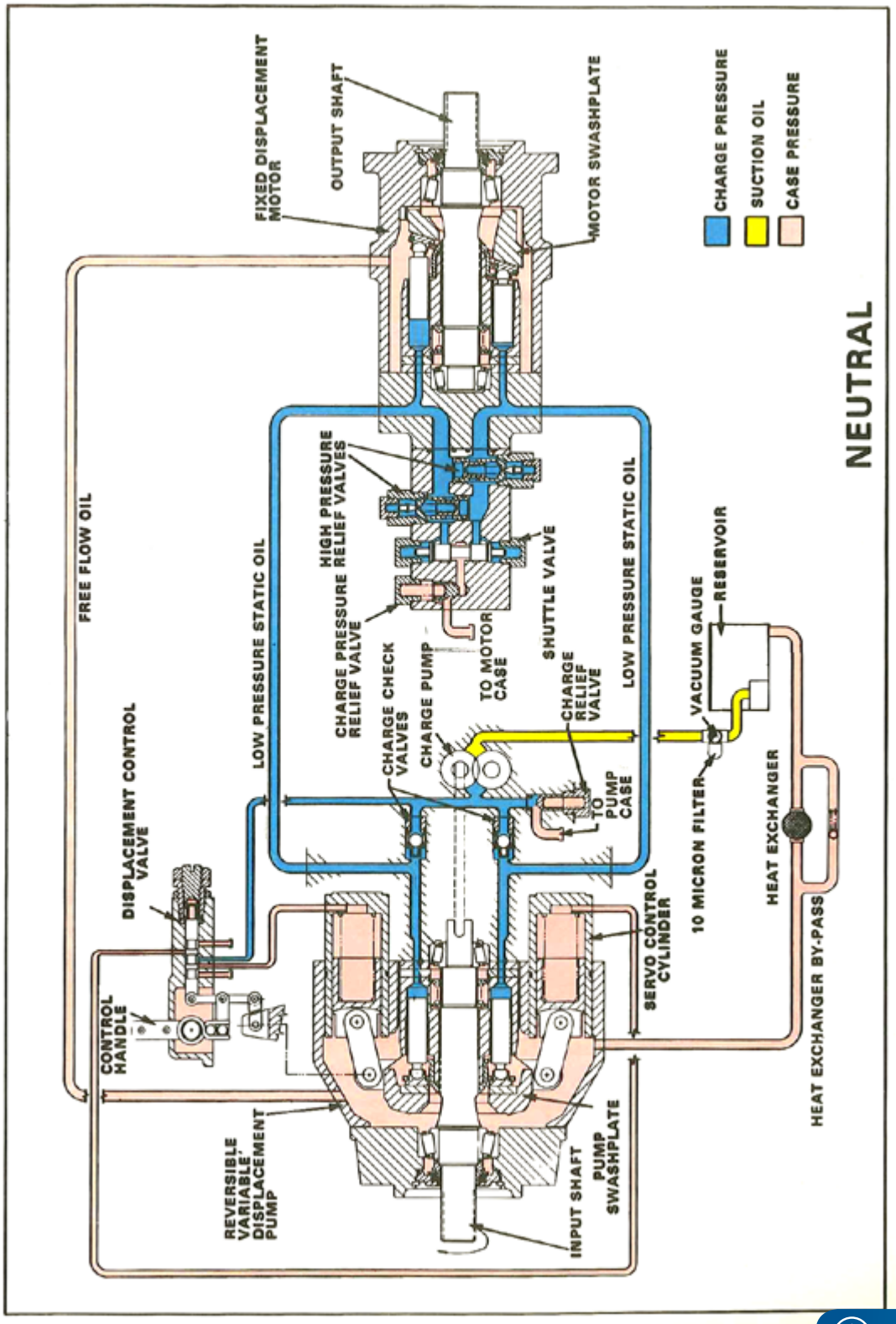
Contents

All measurements are in millimeters (mm) unless otherwise marked.

All manufacturers names, symbols and descriptions in this document are used for reference purposes only, and it is not implied that any parts listed is the product of these manufacturers.

Theory of Operations - Closed Circuit

Schematic - Neutral



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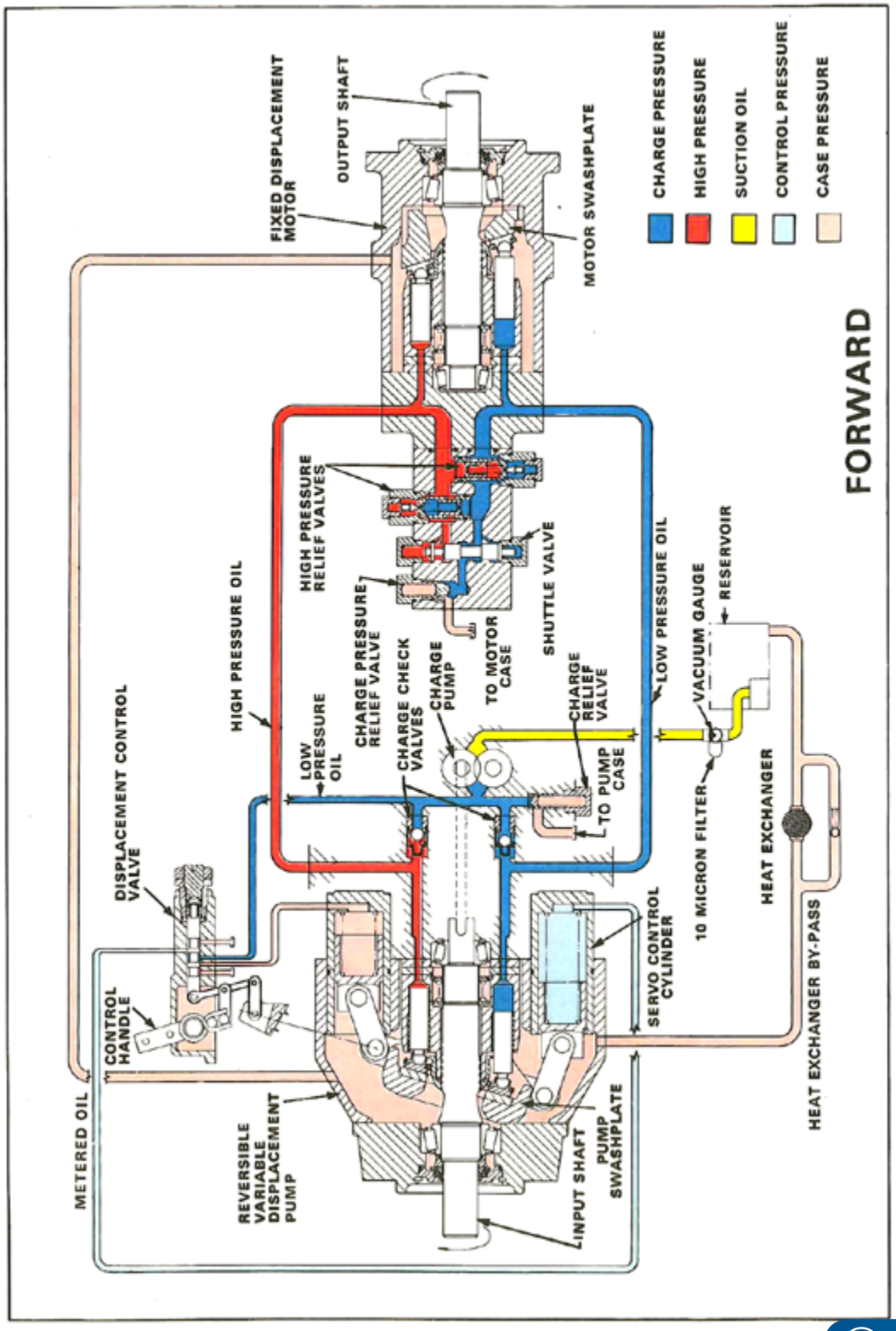
Theory of Operations - Closed Circuit

Schematic - Forward



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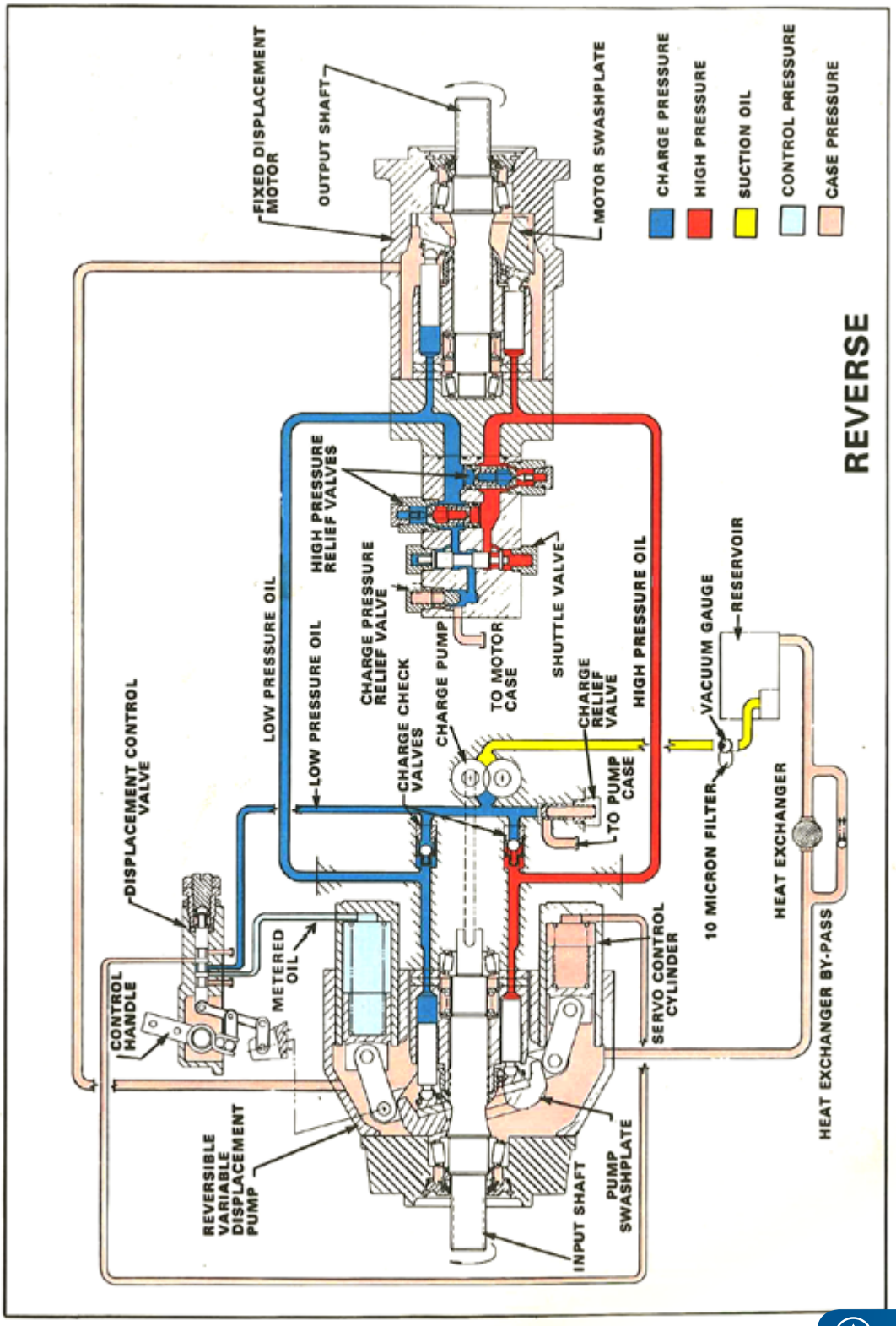
Theory of Operations - Closed Circuit

Schematic - Reverse



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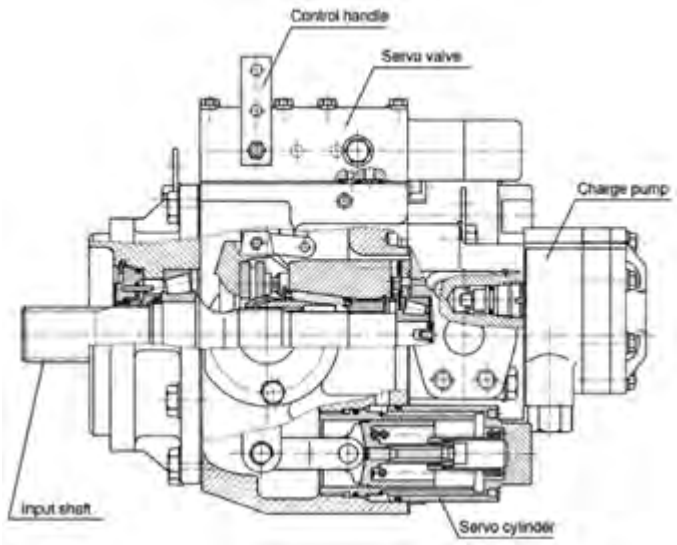
General

PV Series (Variable Pump)



Description

Series 20 axial piston variable displacement pumps utilize a swash plate construction with variable flow capability suitable for closed circuit hydrostatic transmissions. The flow rate is proportional to the pump's driven speed displacement, which in turn, is determined by the swash plate angle. Flow direction is reserved by tilting the swash plate to the opposite side of the neutral or zero displacement position.

Our 20 series aftermarket replacement pumps are engineered for quality, durability and versatility. Components used are designed for high efficiency output. For example, the full length shaft utilizes a tapered roller bearing arrangement which offers a high loading capacity for external radial forces. The hydro-mechanical servo displacement control maintains the selected swash plate position and therefore, the pumps displacement. The swash plate automatically returns to the null position (zero flow) upon release of the control handle. Our units are easily serviceable and most all components are replaceable and stocked by Hydraulex Global.

Specifications

PV-			20	21	22	23	24	25	26	27
Max Displ.	cm^3/r		33.3	51.6	69.8	89.0	118.7	165.8	227.3	333.7
	in^3/r		(2.03)	(3.15)	(4.26)	(5.43)	(7.24)	(10.12)	(13.87)	(20.36)
Charge Pump Displ.	Option 1	cm^3/r	12.3	12.3	12.3	12.3	18.9	32.8	32.8	65.5
		in^3/r	(0.75)	(0.75)	(0.75)	(0.75)	(1.15)	(2.00)	(2.00)	(4.00)
	Option 2	cm^3/r	18.0	18.0	18.0	18.0	32.8	65.5	65.5	-
		in^3/r	(1.10)	(1.10)	(1.10)	(1.10)	(2.00)	(4.00)	(4.00)	-
Speed*	RPM	Min.	500	500	500	500	500	500	500	500
		Rated	3800	3500	3200	2900	2700	2400	2100	1900
Max Torque**	$KG{\cdot}M^2{\cdot}10^{-3}$		4.34	8.14	12.34	17.77	29.11	50.19	86.80	161.40
	$LBF{\cdot}FT^2{\cdot}10^{-3}$		(103.0)	(193.2)	(292.8)	(421.7)	(690.8)	(1191.0)	(2059.8)	(3830.0)
Approx. Weight	KG		45	55	63	78	124	164	212	270
	LB		(99)	(121)	(139)	(172)	(273)	(362)	(467)	(595)

• For higher speeds contact your Hydraulex Global technical sales associate.
•• Without Charge Pump.

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Model Code

PV Series

PV - 20 - AAA - R - A - A - B - 13 - B1 - 000

Series

Displacement
cm³/r (in³/r)

20 = 33.3 (2.03)
21 = 51.6 (3.15)
22 = 69.8 (4.26)
23 = 89.0 (5.43)
24 = 118.7 (7.24)
25 = 165.8 (10.12)
26 = 227.3 (13.87)
27 = 333.7 (20.36)

Type of Control

AAA = Without mechanical-hydraulic servo valve, with top cover only
BBB = Without mechanical-hydraulic servo valve, with joining piece and cover
MH = Mechanical hydraulic servo valve
MC = Mechanical-hydraulic servo valve with a pressure override valve (POR)
HDC = Hydraulic Dsiplacement Control
HDP = Hydraulic Displacement Control with pressure override valve (POR)

Rotation

R = Clockwise CW
L = Counter-Clockwise CCW
V = Reversible

Shaft

A = 14t, 12/24 Pitch, Ø31.20 (1.23")
B = 19t, 16/32 Pitch, Ø31.75 (1.25")
C = 21t, 16/32 Pitch, Ø34.50 (1.36")
D = 23t, 16/32 Pitch, Ø37.68 (1.48")
E = 27t, 16/32 Pitch, Ø44.03 (1.73")
F = 40t, 16/32 Pitch, Ø64.66 (2.55")
G = 3t, 8/16 Pitch, Ø43.71 (1.72")
I = 20t, 16/32 Pitch, Ø32.91 (1.30")
J = Cone 1:8, SAE J501, Ø41.27 (1.62")
K = Cone 1:8, SAE J501, Ø31.75 (1.25")
L = Parallel with Key, Ø34.925 (1.38")
M = Parallel with Key, Ø44.45 (1.75")
P = 15t, 16/32 Pitch, Ø25.40 (1.00")
R = 13t, 16/32 Pitch, Ø21.80 (0.86")

Ports

A = SAE J518c, Code 62, Size 1", 6000psi 7/16"-14UNC-2A
B = SAE J518c, Code 61, Size 1", 5000psi 3/8"-16UNC-2A
C = ISO 6162, DN25, Type II, 40 MPa M12
D = SAE J518c, Code 62, Size 3/4", 6000psi 3/8"-16UNC-2B
E = SAE J518c, Code 61, Size 3/4", 5000psi 3/8"-16UNC-2B
F = ISO 6162, DN19, Type II, 40 MPa M10

Charge Gear Pump cm³/r (in³/r)

B = 12.3 (0.75)
C = 18.0 (1.10)
D = 18.9 (1.15)
E = 32.8 (2.00)
F = 65.5 (4.00)
NN = Without Charge Pump

Pressure Setting of Gear Pump

13 = 1.3 MPa (1.3±0.05 MPa at 3.8 dm³ min⁻¹)
XX = Other
00 = Without Charge Pump
Other values according to mutual agreement, max 3.5 MPa

Orifice

A = Ø0.76 (0.030")
B = Ø0.91 (0.036")
C = Ø1.05 (0.041")
D = Ø1.36 (0.054")
E = Ø1.60 (0.063")
N = Without Orifice
1 = Orifice in channel "P"
2 = Orifice in channel "A", "B"
3 = Orifice in channel "P", "A", "B"
4 = Orifice in channel "A"
5 = Orifice in channel "B"
6 = Orifice in channel "P", "A"
7 = Orifice in channel "P", "B"
0 = Without Orifice

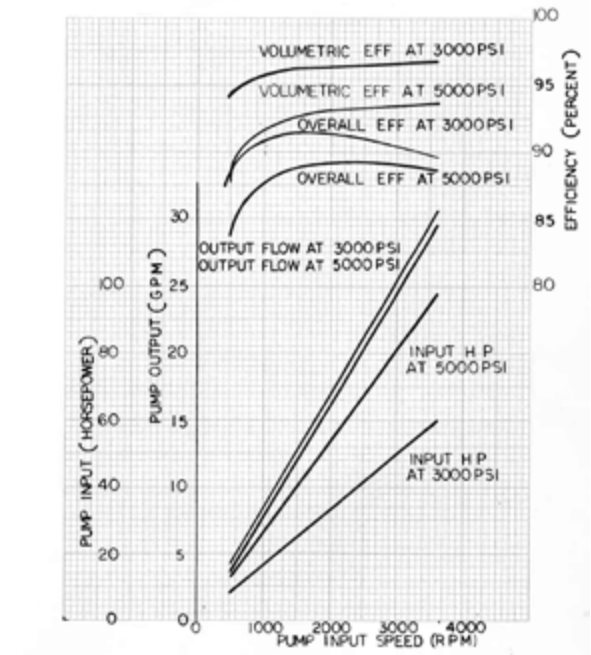
Design Code

000 = Standard
XXX = Special Production Number

PV Series Specifications

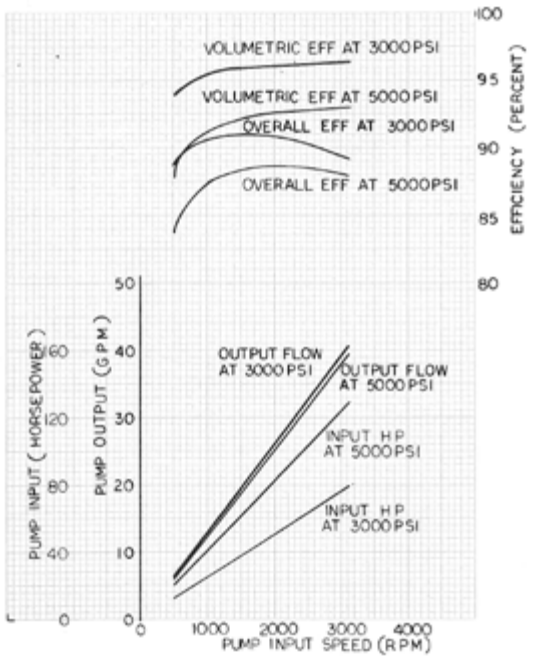
Performance Data - Variable Pump

PERFORMANCE 20 SERIES PUMP
18° SWASHPLATE ANGLE



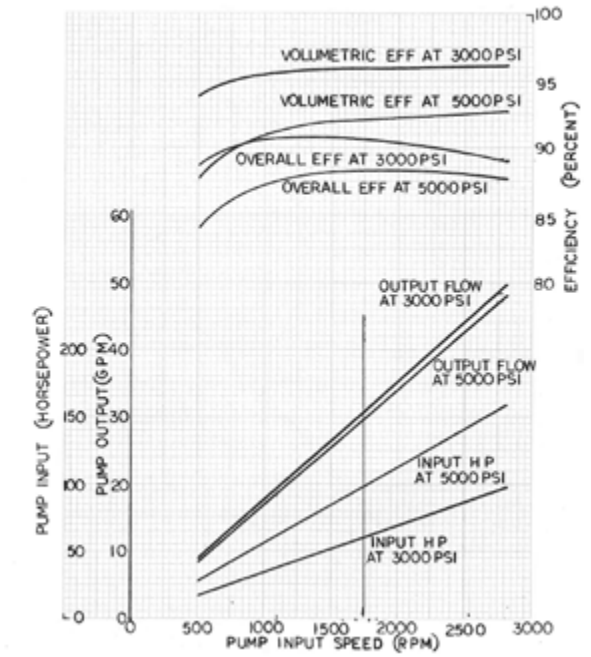
THESE CURVES DO NOT TAKE INTO ACCOUNT LOSSES DUE TO THE CHARGE PUMP

PERFORMANCE 21 SERIES PUMP
18° SWASHPLATE ANGLE



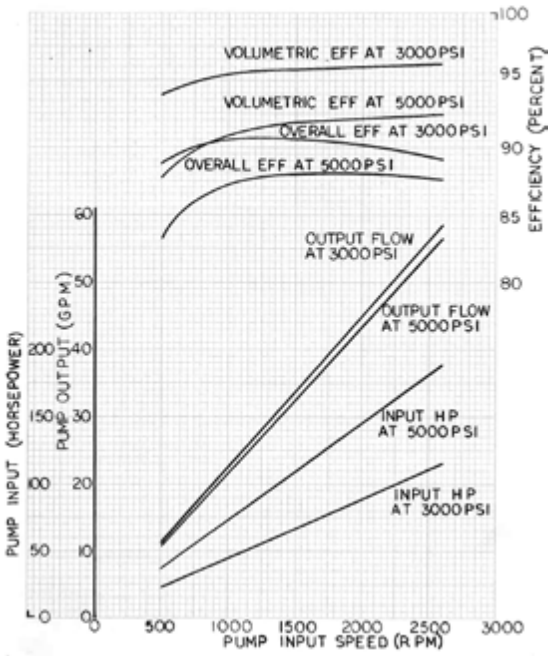
THESE CURVES DO NOT TAKE INTO ACCOUNT LOSSES DUE TO THE CHARGE PUMP

PERFORMANCE 22 SERIES PUMP
18° SWASHPLATE ANGLE



THESE CURVES DO NOT TAKE INTO ACCOUNT LOSSES DUE TO THE CHARGE PUMP

PERFORMANCE 23 SERIES PUMP
18° SWASHPLATE ANGLE

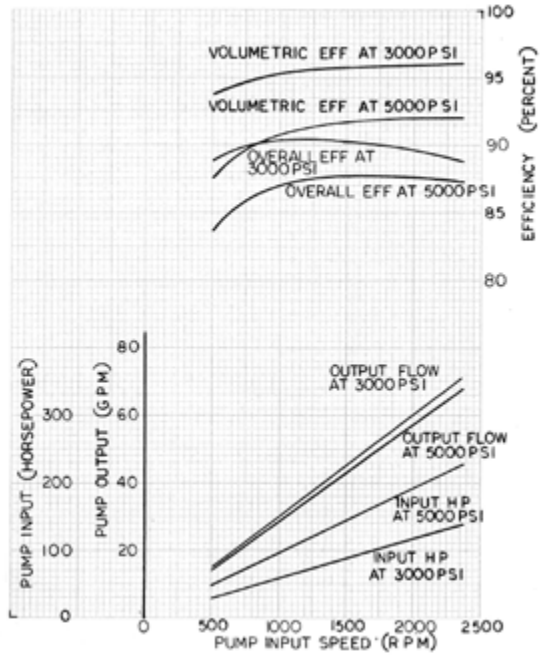


THESE CURVES DO NOT TAKE INTO ACCOUNT LOSSES DUE TO THE CHARGE PUMP

PV Series Specifications

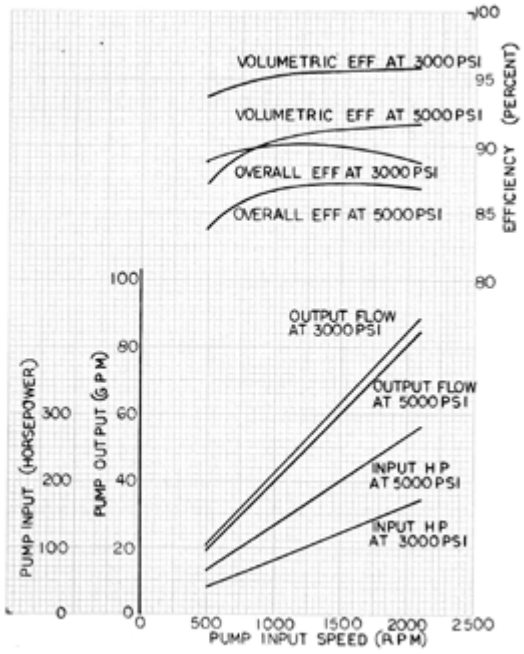
Performance Data - Variable Pump

PERFORMANCE 24 SERIES PUMP
18° SWASHPLATE ANGLE



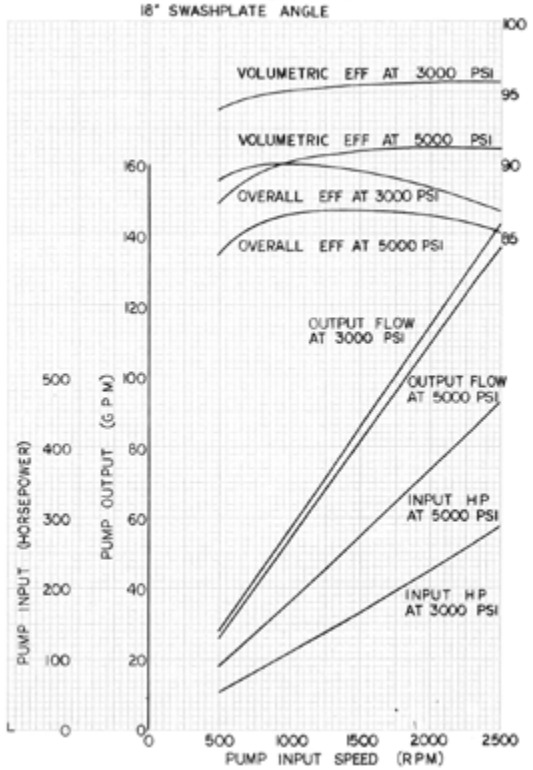
THESE CURVES DO NOT TAKE INTO ACCOUNT LOSSES DUE TO THE CHARGE PUMP

PERFORMANCE 25 SERIES PUMP
18° SWASHPLATE ANGLE



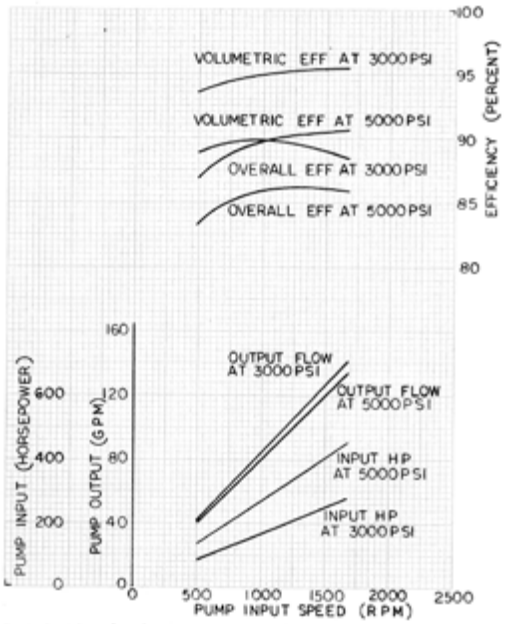
THESE CURVES DO NOT TAKE INTO ACCOUNT LOSSES DUE TO THE CHARGE PUMP

PERFORMANCE 26 SERIES PUMP
18° SWASHPLATE ANGLE



THESE CURVES DO NOT TAKE INTO ACCOUNT
DUE TO THE CHARGE PUMP

PERFORMANCE 27 SERIES PUMP
18° SWASHPLATE ANGLE



THESE CURVES DO NOT TAKE INTO ACCOUNT LOSSES DUE TO THE CHARGE PUMP

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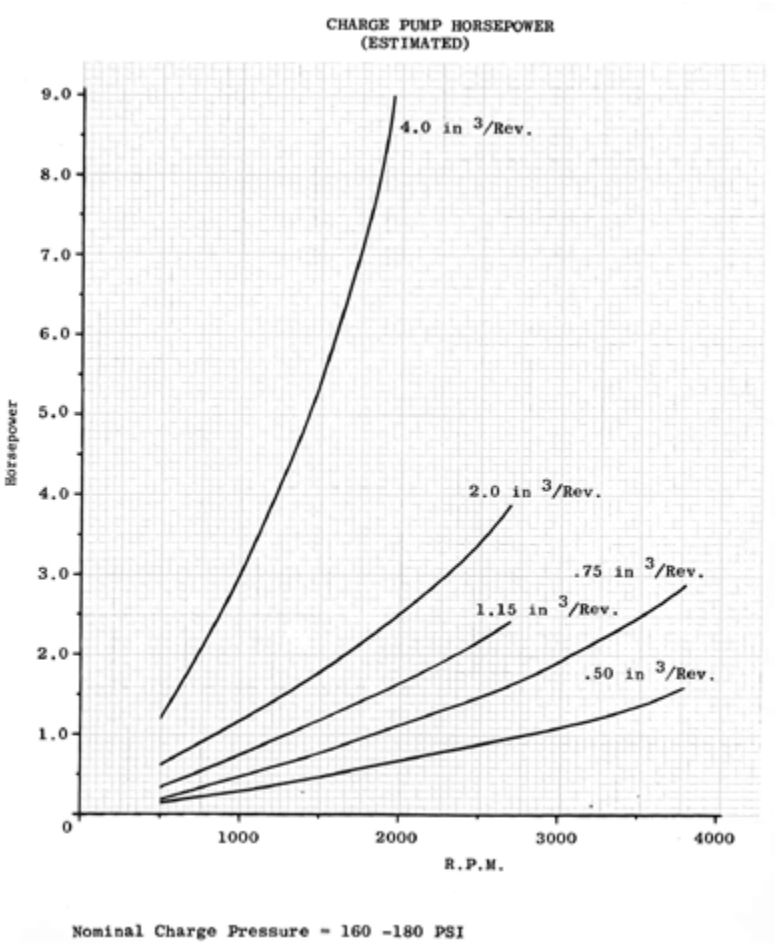
Performance Data - Charge Pump



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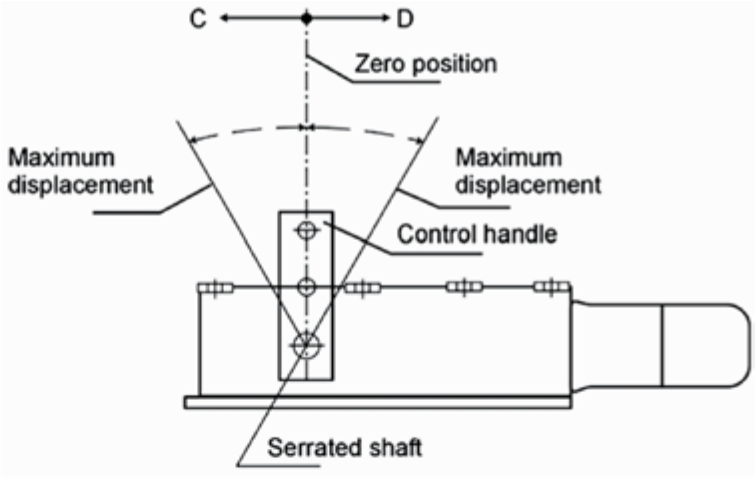
PV Series Specifications

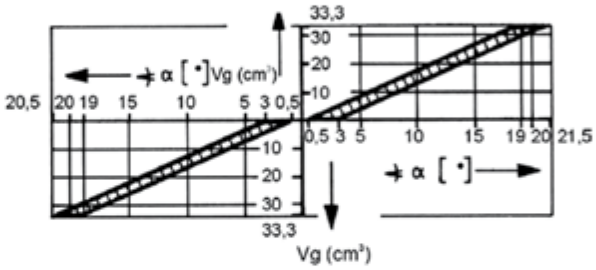
Performance Data - Servo

Servo Displacement Control (Linear Response)

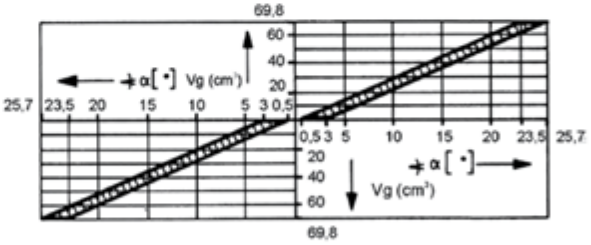
Regulated by the control handle on the servo valve, the swash plate can be infinitely varied in both directions with the help of the servo system. The pump displacement resulting from any control handle position can be established using the charts below. The angle of the control handle for stroke initiation and for the final position of the stroke can vary from unit to unit within the range of the tolerance band (see charts below).



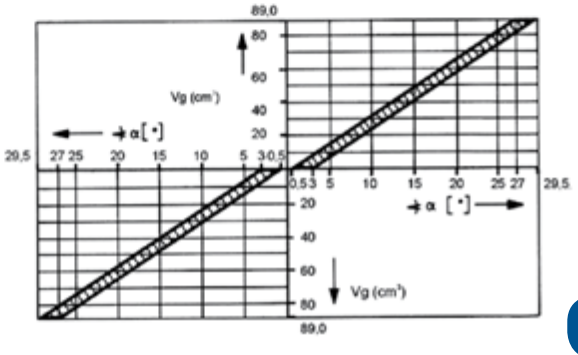
Frame size PV-20



Frame size PV-22



Frame size PV-23



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PV Series Specifications

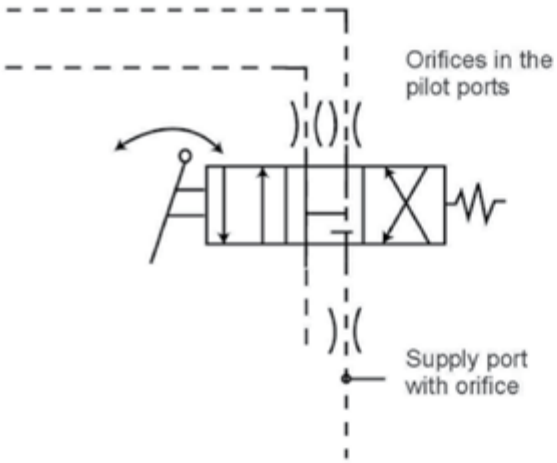
Performance Data - Reversing Time

Reversing Time

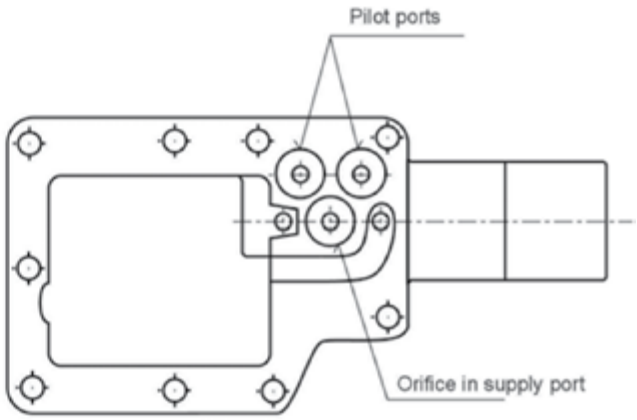
Time for the directional change of the flow from Qmax across 0 to Qmax depending on the size of the control orifice fitted in the supply port to the servo valve.
The values given assume movement of the control handle directly from one end position to the other.

Adjustment time of handle:	< minimum reversing time
Operating pressure:	21 MPa
Speed:	1450 min^{-1}
Viscosity:	35 $mm^2.s^{-1}$

Schematic diagram of servo valve with alternate orifice position.



Servo Valve counter-bored recessed for orifice insert.



The reversing time in one flow direction can be extended by inserting an orifice in one of the pilot ports only.

Frame Size	Diameter of orifice (mm)	Reversing Time (s)
PV-20	0.76 1.05 1.60 without orifice	3.78 2.16 1.14 0.60
PV-21	0.76 1.05 1.60 without orifice	4.14 2.34 1.20 0.66
PV-22	0.76 1.05 1.60 without orifice	6.06 3.42 1.74 0.96
PV-23	0.76 1.05 1.60 without orifice	6.24 3.54 1.80 1.02

Frame Size	Diameter of orifice (mm)	Reversing Time (s)
PV-24	0.76 1.05 1.60 without orifice	10.20 5.82 2.88 1.68
PV-25	0.76 1.05 1.60 without orifice	11.58 5.92 3.12 1.86
PV-26	0.76 1.05 1.60 without orifice	29.70 16.20 7.50 3.78
PV-27	0.76 1.05 1.60 without orifice	30.90 15.72 7.80 5.64

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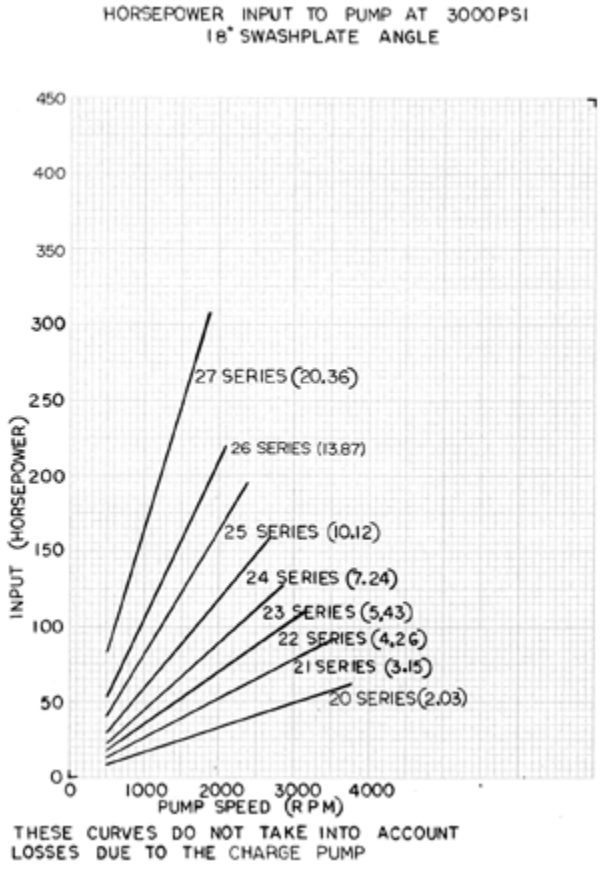
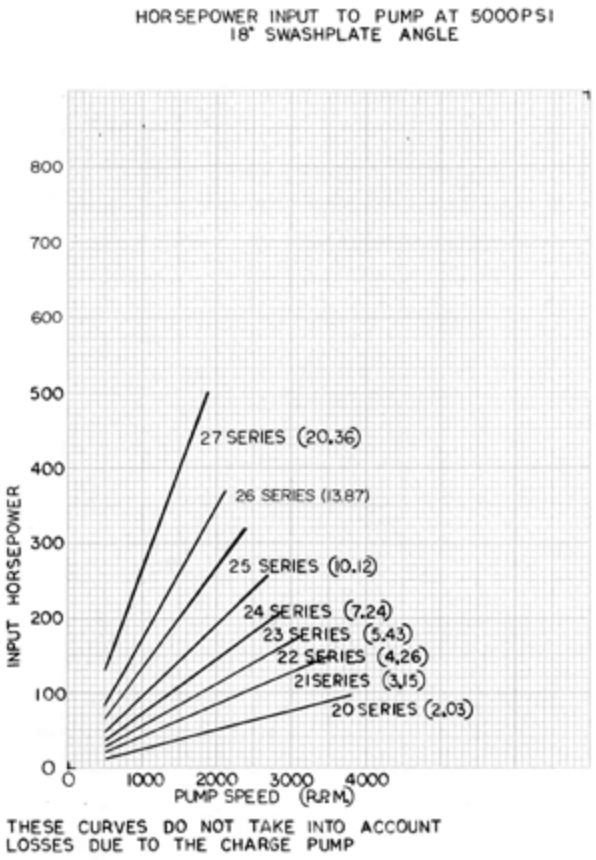
PV Series Specifications

Variable Pump - Horsepower Curves





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PV Series Dimensions

Dimensions

Frame Size		A	A_1	B	B_1	B_2	B_3	C	D	D_3	D_4	D_5	E	$F_{\pm 0.4}$	G
PV-20	Inches	(7.48)	(5.75)	(1.87)	(4.44)	(3.94)	(4.80)	(2.20)	(6.38)	(5)	(3.31)	(1)	(2.20)	(0.59)	(6.42)
	Millimeters	190	146	47.6	112.7	100	122	56	162	$127^{-0.005}$	84	25.4	56	15	163
PV-21	Inches	(7.52)	(5.75)	(1.89)	(4.88)	(4.33)	(5.16)	(2.20)	(6.38)	(5)	(3.31)	(1)	(2.76)	(0.59)	(6.77)
	Millimeters	191	146	48	124	110	131	56	162	$127^{-0.005}$	84	25.4	70	15	172
PV-22	Inches	(7.64)	(7.64)	(1.89)	(5.24)	(4.45)	(5.31)	(2.20)	(6.38)	(5)	(3.31)	(1)	(3.27)	(0.59)	(6.77)
	Millimeters	194	194	48	133	113	135	56	162	$127^{-0.005}$	84	25.4	83	15	172
PV-23	Inches	(7.64)	(7.64)	(1.93)	(5.94)	(4.87)	(5.75)	(2.20)	(6.38)	(5)	(3.31)	(1)	(3.54)	(0.59)	(7.50)
	Millimeters	194	194	49	150.8	123.8	146	56	162	$127^{-0.005}$	84	25.4	90	15	190.4
PV-24	Inches	(8.39)	(8.03)	(2.76)	(6.57)	(5.20)	(6.02)	(2.95)	(9.02)	(6)	(3.86)	(1)	(5.24)	(0.84)	(8.39)
	Millimeters	213	204	70	167	132	153	75	229	152.4	98	25.4	133	21.3	213
PV-25	Inches	(11.26)	(10)	(3.15)	(6.85)	(5.59)	(6.38)	(3.03)	(12.5)	(6.5)	(3.86)	(1)	(6.30)	(0.84)	(10.24)
	Millimeters	286	254	80	174	142	162	77	317.5	165.1	98	25.4	160	21.3	260
PV-26	Inches	(11.22)	(9.45)	(3.19)	(7.76)	(6.02)	(6.85)	(3.03)	(12.5)	(6.5)	(4.33)	(1)	(7.09)	(0.84)	(11.31)
	Millimeters	285	240	81	197	153	174	77	317.5	165.1	110	25.4	180	21.3	287.4
PV-27	Inches	(11.81)	(10.79)	(3.39)	(8.35)	(6.77)	(7.60)	(3.03)	(13.78)	(7)	(4.49)	(1)	(8.19)	(1.09)	(12.50)
	Millimeters	300	274	86	212	172	193	77	350	177.8	114	25.4	208	27.7	317.4

Frame Size		G_1	H	H_1	H_2	H_3	L	L_1	L_2	S	M	N	R_1	S_1	T
PV-20	Inches	(3.19)	(13.39)	(10.63)	(11.18)	(13.86)	(8.82)	(6.35)	(3.69)	(0.75)	(3.73)	(2.19)	(2.68)	(3.94)	(0.37)
	Millimeters	81.03	340	270	284	352	224	161.2	93.7	$19^{-0.25}$	94.7	55.6	68	100	$9.4^{+0.2}$
PV-21	Inches	(3.39)	(14.09)	(11.10)	(11.85)	(14.45)	(9.69)	(6.85)	(4.17)	(0.75)	(4.28)	(2.56)	(2.68)	(4.21)	(0.37)
	Millimeters	86	358	282	301	367	246	174	106	$19^{-0.25}$	108.7	65	68	107	$9.4^{+0.2}$
PV-22	Inches	(3.39)	(15)	(12.24)	(12.36)	(15)	(10.08)	(7.40)	(4.69)	(0.75)	(4.44)	(2.69)	(2.69)	(4.37)	(0.37)
	Millimeters	86	381	311	314	381	256	188	119	$19^{-0.25}$	112.7	68.3	68.3	111	$9.4^{+0.2}$
PV-23	Inches	(3.75)	(15.55)	(12.60)	(12.87)	(15.55)	(10.63)	(7.64)	(5)	(0.75)	(5.02)	(3.06)	(2.69)	(4.61)	(0.37)
	Millimeters	95.2	395	320	327	395	270	194	127	$19^{-0.25}$	127.6	77.8	68.3	117	$9.4^{+0.2}$
PV-24	Inches	4(.19)	(19.61)	(14.84)	(16.22)	(20.08)	(12.52)	(9.41)	(6.65)	(0.75)	(5.75)	(3.44)	(2.99)	(5.83)	(0.37)
	Millimeters	106.5	498	377	412	510	318	239	169	$19^{-0.25}$	146	87.3	76	148	$9.4^{+0.2}$
PV-25	Inches	(5.12)	(22.04)	(16.65)	(17.99)	(22.04)	(14.41)	(10.39)	(7.72)	(0.75)	(6.05)	(3.82)	(2.99)	(6.73)	(0.37)
	Millimeters	130	560	423	457	560	366	264	196	$19^{-0.25}$	153.7	97	76	171	$9.4^{+0.2}$
PV-26	Inches	(5.66)	(22.99)	(17.76)	(19.13)	(24.17)	(15.28)	(11.14)	(8.46)	(0.75)	(6.70)	(4.25)	(2.99)	(6.38)	(0.37)
	Millimeters	143.7	584	451	486	614	388	283	215	$19^{-0.25}$	170.3	108	76	162	$9.4^{+0.2}$
PV-27	Inches	(6.25)	(25.83)	(18.70)	(22.76)	(25.83)	(17.05)	(12.24)	(9.61)	(0.75)	(7.37)	(5)	(2.99)	(7.80)	(0.37)
	Millimeters	158.7	656	475	578	656	433	311	244	$19^{-0.25}$	187.2	127	76	198	$9.4^{+0.2}$

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PV Series Dimensions

Dimensions Cont.

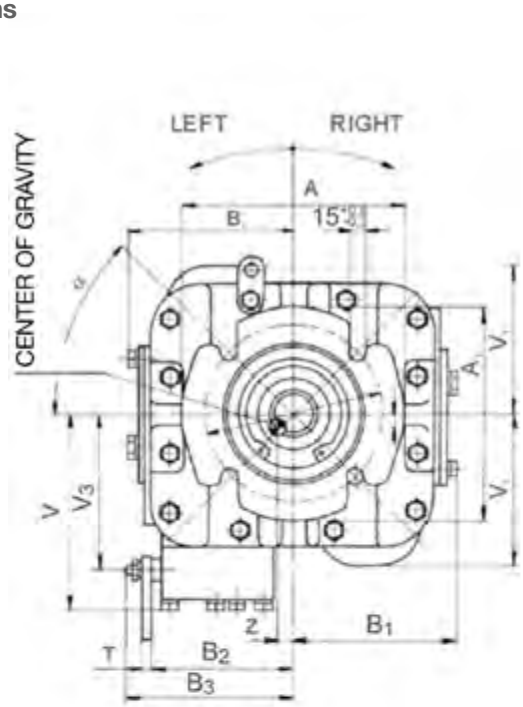
Frame Size		U	V	V_1	V_3	X	Y	Z	W	d	d_1	f
PV-20	Inches	(0.75)	(5.94)	(4.45)	(4.56)	(6.26)	(0.12)	(0.12)	3/8-16 UNC-2B	(1.36)	M10-5H	(0.63)
	Millimeters	19	151	113	115.9	159	3	3		$34.5^{-0.17}$		16
PV-21	Inches	(0.75)	(6.30)	(4.80)	(5.06)	(5.98)	(0.25)	(0.25)		(1.36)	M10-5H	(0.63)
	Millimeters	19	160	122	128.6	152	6.35	6.35		$34.5^{-0.17}$		16
PV-22	Inches	(0.75)	(6.50)	(4.84)	(5.06)	(5.75)	(0.37)	(0.37)		(1.36)	M10-5H	(0.63)
	Millimeters	19	165	123	128.6	146	9.5	9.5		$34.5^{-0.17}$		16
PV-23	Inches	(0.75)	(6.73)	(5.28)	(5.50)	(5.51)	(0.5)	(0.5)		(1.48)	M10-5H	(0.69)
	Millimeters	19	171	134	139.8	140	12.7	12.7		$37.7^{-0.18}$		17.5
PV-24	Inches	(0.83)	(7.32)	(6.06)	(6)	(6.81)	(0.55)	(0.55)		(1.73)	M14-5H	(0.93)
	Millimeters	21	186	154	152.3	173	14	14		44.03		23.5
PV-25	Inches	(0.83)	(7.83)	(6.89)	(6.50)	(8.62)	(0.63)	(0.63)	5/8-11 UNC-2B	(1.73)	M14-5H	(0.93)
	Millimeters	21	199	175	165.1	219	16	16		44.03		23.5
PV-26	Inches	(0.83)	(7.91)	(8.43)	(6.59)	(9.25)	(0.56)	(0.56)		(1.73)	M14-5H	(0.93)
	Millimeters	21	201	214	167.4	235	14.3	16.3		44.03		23.5
PV-27	Inches	(0.83)	(8.86)	(8.50)	(7.5)	(9.69)	(0.69)	(0.69)		(2.55)	M16	(0.98)
	Millimeters	21	225	216	190.5	246	17.5	17.5		64.66		25

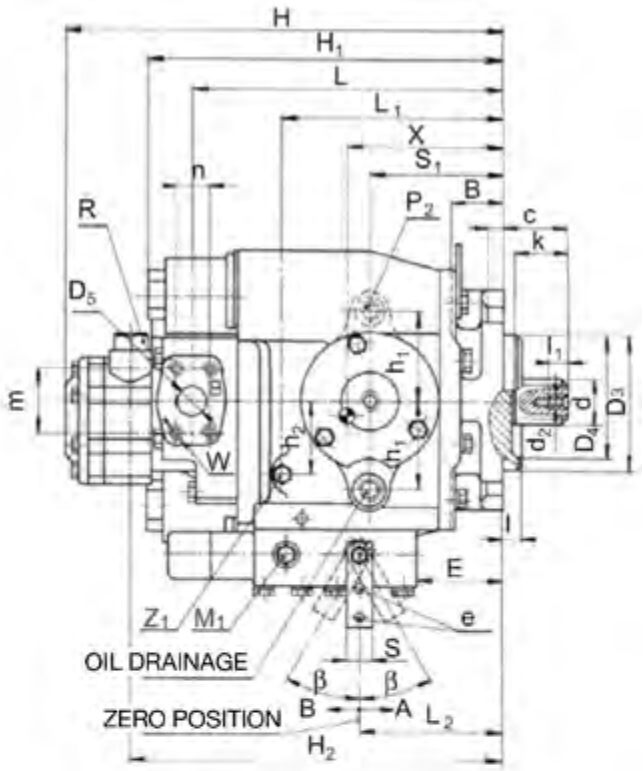
Frame Size		e	h_1	H_2	k	l	l_1	ά	m	n	
PV-20	Inches	(0.26)	(2.44)	(2.01)	(1.89)	(0.49)	(0.79) min 20	45°	(2.06)	(1.03)	H - with Charge Pump 12cm³ (sizes PV-20 - 23) 33cm³ (size PV-25) H3 - with Charge Pump 18cm³ (sizes PV-20 - 23) 33cm³ (size PV-24) 66cm³ (size PV-25)
	Millimeters	6.73	62	51.16	48	12.5			52.4	26.2	
PV-21	Inches	(0.26)	(2.68)	(2.13)	(1.89)	(0.49)			(2.06)	(1.03)	
	Millimeters	6.73	68	54	48	12.5			52.4	26.2	
PV-22	Inches	(0.26)	(2.81)	(2.38)	(1.89)	(0.49)			(2.06)	(1.03)	
	Millimeters	6.73	71.4	60.5	48	12.5			52.4	26.2	
PV-23	Inches	(0.26)	(3.06)	(2.56)	(1.89)	(0.49)			(2.06)	(1.03)	
	Millimeters	6.73	77.7	65	48	12.5			52.4	26.2	
PV-24	Inches	(0.26)	(3.48)	(2.69)	(2.64)	(0.49)	(1.18)		(2.06)	(1.03)	
	Millimeters	6.73	88.5	68.2	67	12.45	30		52.4	26.2	
PV-25	Inches	(0.26)	(3.86)	(2.91)	(2.64)	(0.61)	(1.18)		(3.13)	(1.44)	
	Millimeters	6.73	98	74	67	15.6	30		79.4	36.5	
PV-26	Inches	(0.26)	(3.94)	(3.13)	(2.64)	(0.61)	(1.44)		(3.13)	(1.44)	
	Millimeters	6.73	100	79.4	67	15.6	36.7		79.4	36.5	
PV-27	Inches	(0.26)	(4.57)	(3.75)	(2.64)	(0.61)	(1.18)		(3.13)	(1.44)	
	Millimeters	6.73	116	95.3	67	15.6	30		79.4	36.5	

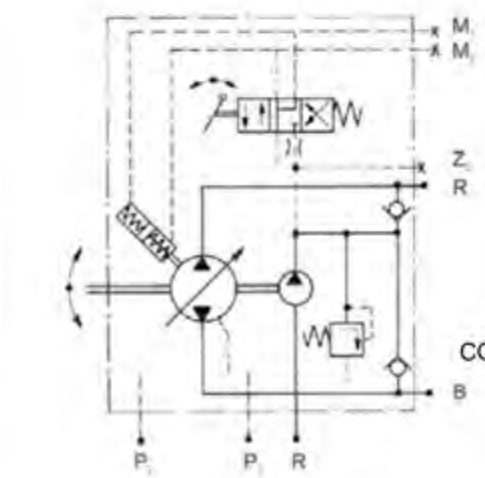
Frame Size	Port A & B	$P_{1,2}$ Drain	Port R Gear Pump	M_1, M_2, Z_2
PV-20 - 24	SAE Flange, 3000 psi 4 threads, 3/8-16 UNC-2B, 18 deep	7/8-14 UNF-2B	7/8-14 UNF-2B	7/16 UNF-2B SAE Straight Thread "O-ring" boss
PV-25	SAE Flange, size 1½ 4 threads, 6000 psi, 5/8-11 UNC-2B 35 deep	1 5/16-12 UNF-2B	1 5/16-12 UNF-2B	
PV-26		1⅞-12 UNF-2B SAE Straight Thread "O-ring" boss	1 5/16-12 UNF-2B	
PV-27			SAE Flange, size 1¼ 3000 psi, 4 threads 7/16-14 UNC-2B	

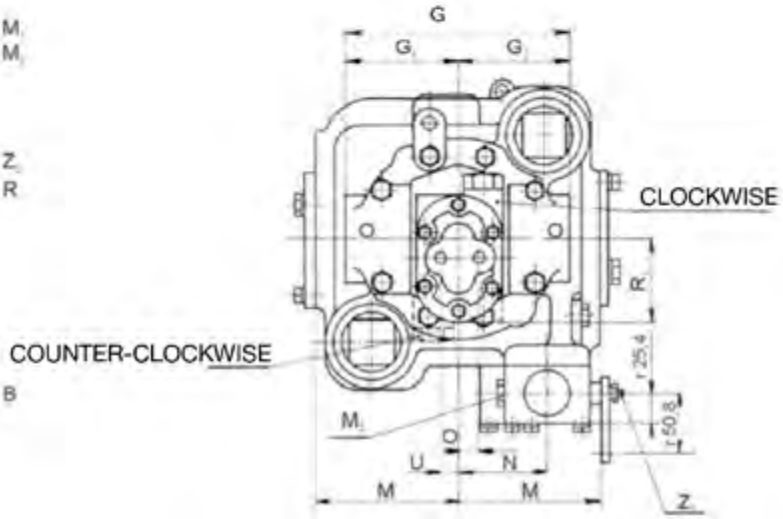
PV Series Dimensions

Dimensions









Deviating Control Lever of Servo Valve in direction:

A: Causes high pressure in 'A' orifice in clockwise pump
Causes high pressure in 'B' orifice in counter-clockwise pump

B: Causes high pressure in 'B' orifice in clockwise pump
Causes high pressure in 'A' orifice in counter-clockwise pump

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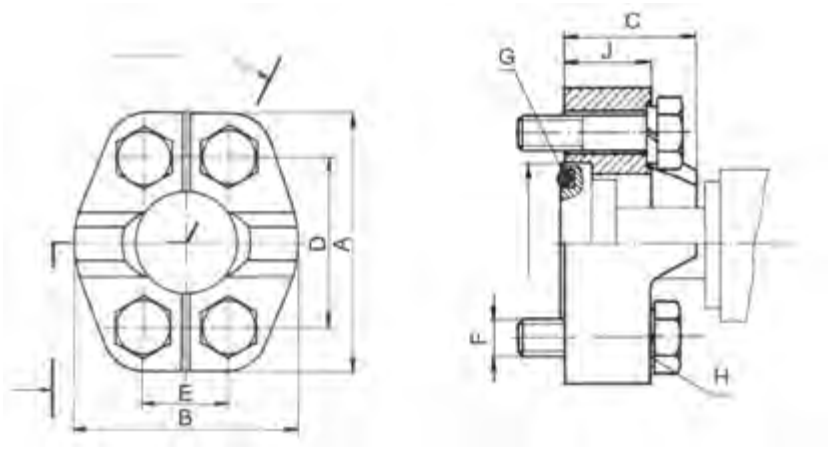
PV Series Dimensions

Dimensions - Hose Flange

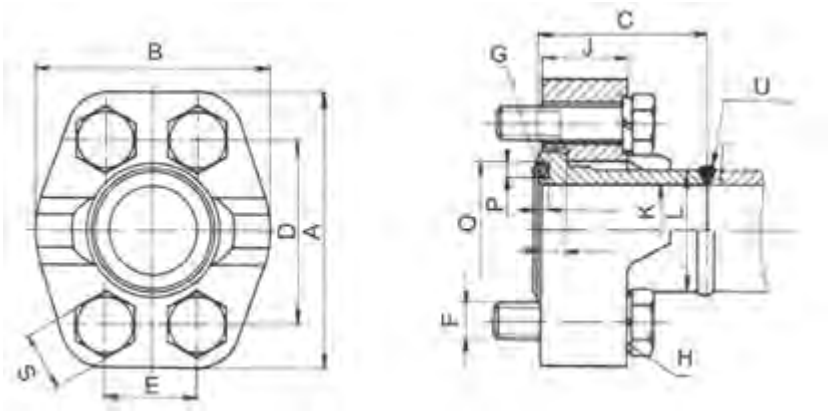
Frame Size		A	B	C	D$^{-0.1}$	E$^{-0.1}$	F	H	J
PV-20 - 24	Inches	(3.18)	(2.76)	(1.38)	(2.06)	(1.03)	3/8-16 UNC-2A	Washer 10.2	(0.89)
	Millimeters	81	70	35	52.4	26.2	3/8-16 UNC-2A	Washer 10.2	22.5
PV-25 - 27	Inches	(4.41)	(3.74)	(1.81)	(3.13)	(1.44)	5/8-11 UNC-2A	Washer 16	(1.18)
	Millimeters	112	95	46	79.4	36.5	5/8-11 UNC-2A	Washer 16	30



Dimensions - Flange for Piping

Frame Size		A	B	C	D$^{-0.1}$	E$^{-0.1}$	F	H	J
PV-20 - 24	Inches	(3.18)	(2.76)	(1.57)	(2.06)	(1.03)	3/8-16 UNC-2A	Washer 10	(0.89)
	Millimeters	81	70	40	52.4	26.2	3/8-16 UNC-2A	Washer 10	22.5
PV-25 - 27	Inches	(4.41)	(3.74)	(1.81)	(3.13)	(1.44)	5/8-11 UNC-2A	Washer 16	(1.18)
	Millimeters	112	95	46	79.4	36.5	5/8-11 UNC-2A	Washer 16	30

Frame Size		K	L	M$^{-0.1}$	N$^{-0.1}$	O	P$^{+0.2}$	U
PV-20 - 24	Inches	(1.10)	(1.50)	(.31)	(0.11)	(1.56)±0.05	(0.16)	V5 - 104
	Millimeters	28	38	8	2.8	39.7±0.05	4	V5 - 104
PV-25 - 27	Inches	(1.50)	(1.97)	(0.50)	(0.11)	(2.12)±0.01	(0.16)	V6 - 158
	Millimeters	38	50	12.6	2.8	53.9±0.01	4	V6 - 158



Note:
Flange according to SAE J 518c
Frame size 20 - 24: Size 1, 5000psi, torque for screw tightening 3/8-16 UNC-2A = 37-42 Nm
Frame size 25 - 27: Size 1½, 6000psi, torque for screw tightening 5/8-11 UNC-2A = 158-181 Nm

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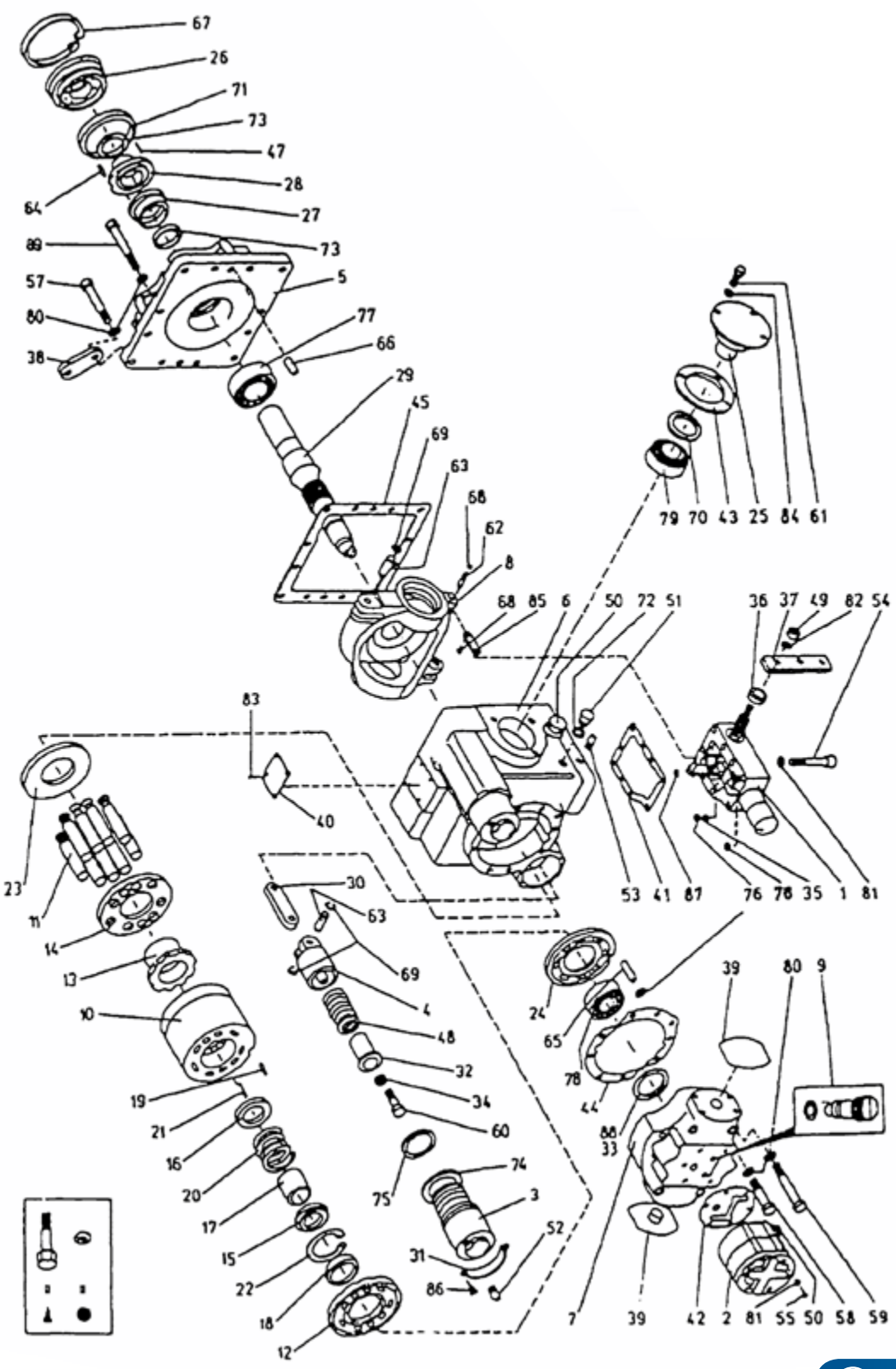
PV Series Replacement Parts

PV Series Component Breakdown



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PV Series Replacement Parts

PV Series 20-27 Replacement Parts Listing

1	Servo Valve Assembly	41	Control Valve Gasket
2	Charge Pump Assembly	42	Charge Pump Gasket
3	Servo Sleeve	43	Trunnion Bearing Shim Kit
4	Servo Piston	44	End Cap Gasket
5	Front Cover	45	Front Cover Gasket
6	Pump Housing	47	Seal Retainer Spring
7	End Cap	48	Servo Spring
8	Swash Plate	49	Control Handle Nut
9	Check Valve	51	Housing Plug
10	Cylinder Barrel	54	Control Mounting Bolt
11	Piston Assembly (Set of 3)	55	Charge Pump Mounting Bolt
12	Bearing Plate	57	Front Cover Bolt
13	Retainer (Ball) Guide	58	End Cap Screw Short
14	Slipper Retainer (Set Plate)	59	End Cap Screw Long
15	Spring Retainer	60	Servo Piston Spring Bolt
16	Spring Seat	61	Trunnion Bolt
17	Spring Guide	62	Pin - Swash Plate Feedback Link
18	Bearing Plate Pilot	63	Pin - Servo Piston Link
19	Pin	65	End Cap Dowel Pin
20	Cylinder Barrel Spring	66	Front Cover Dowel Pin
21	Retainer (Ball Guide) Spring - 6SP Type	67	Shaft Seal Retaining Ring
22	Retaining Ring	68	Swashplate Retaining Ring
23	Thrust Plate (Shoe Plate)	69	Servo Piston Pin Retaining Ring
24	Valve Plate	70	Trunnion Cover O-Ring
25	Trunnion	71	Shaft Seal Retainer O-Ring
	Shaft Seal Kit	72	Housing Plug O-Ring
26	Seal Retainer	73	Rotating Seal O-Ring
27	Rotating Seal	74	Servo Sleeve O-Ring Large
28	Stationary Seal	75	Servo Sleeve O-Ring Small
29	Drive Shaft	76	Orifice O-Ring
30	Servo Link	77	Front Bearing - Main Shaft
31	Sleeve Retainer	78	Rear Bearing - End Cap
32	Spring Guide - Servo Piston	79	Trunnion Bearing
33	End Cap Bearing Shim Kit	80	Front cover bolt Washer
34	Washer	81	Control Bolt Washer
35	Orifice	82	Control Handle Star Washer
36	Spacer	84	Trunnion Bolt Washer
37	Control Handle	85	Swashplate Feedback Link
38	Lifting Eye	86	Servo Sleeve Lock Torx Head Screw

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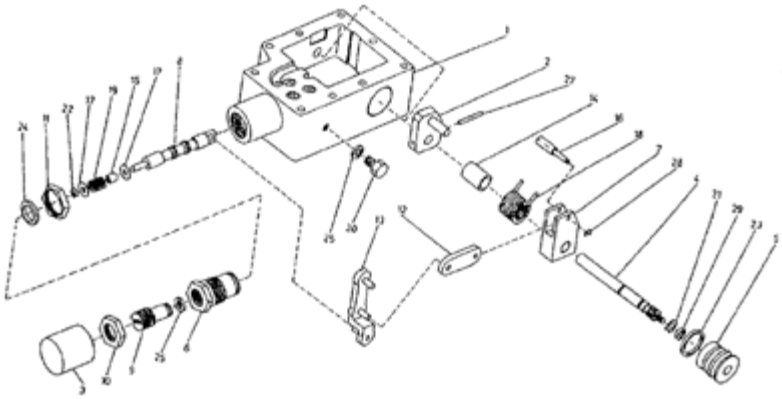
PV Series Replacement Parts

Servo Valve Assembly

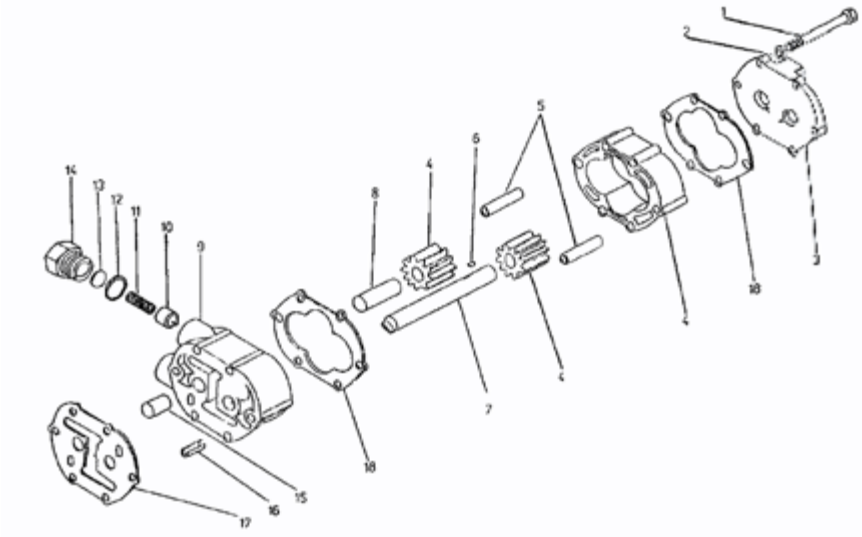
1	Control Valve Housing	9	Set Screw	16	Stop	23	O-ring
2	Lever Arm	10	Retaining Nut	17	Washer	24	O-ring
3	Cover	11	Retaining Nut	18	Torsion Spring	25	O-ring
4	Shaft	12	Link	19	Spring	26	O-ring
5	Bushing	13	Valve Link	20	Plug	27	Pin
6	Spring Bushing	14	Bushing	21	Retaining Ring	28	Retaining Ring
7	Shaft Link	15	Bushing	22	Retaining Ring	29	O-ring
8	Shuttle Valve						



PV Series Replacement Parts

Charge Pump Assembly

1	Hex Head Screw	6	Key	11	Spring	15	Pin
2	Washer	7	Drive Shaft	12	O-ring	16	Pin
3	End Cap	8	Pin	13	Shim	17	Charge Pump Gasket
4	Gear Set	9	Pump Housing	14	Plug	18	Gasket
5	Pin	10	Relief Valve				



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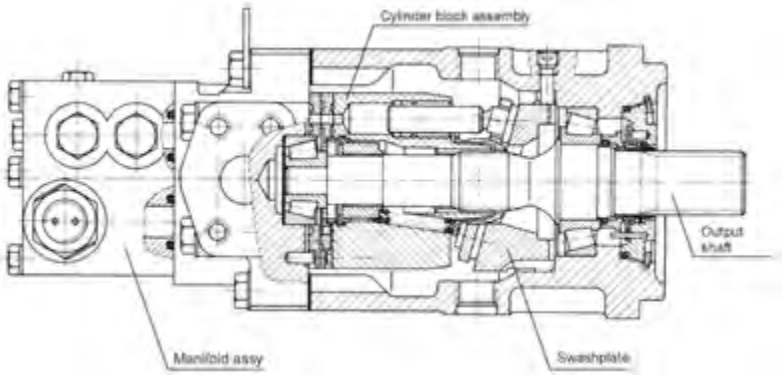
General

MF Series (Fixed Motor)



Description

Series 20 axial piston fixed displacement motors utilize a swash plate construction with preset displacement suitable for closed circuit hydrostatic transmissions. The output speed is proportional to the motor's input flow. The main pressure ports control the output torque, which is proportional based upon the differential pressure applied to them. In addition, the output shaft rotation is also controlled by the flow input to the main pressure ports.

Our 20 series aftermarket replacement motors are engineered for quality, durability and versatility. Components used are designed for high efficiency output. For example, the full length shaft utilizes a tapered roller bearing arrangement which offers a high loading capacity for external radial forces. Our units are easily serviceable and most all components are replaceable and stocked by Hydraulex Global.

Specifications

MF-			20	21	22	23	24	25	26	27
Max Displ.	cm^3/r		33.3	51.6	69.8	89.0	118.7	165.8	227.3	333.7
	in^3/r		(2.03)	(3.15)	(4.26)	(5.43)	(7.24)	(10.12)	(13.87)	(20.36)
Speed*	RPM	Min.	500	500	500	500	500	500	500	500
		Nom.	1500	1500	1500	1500	1500	1500	1500	1500
		Rated	3800	3500	3200	2900	2700	2400	2100	1900
Theoretical Torque	NM/Bar		0.53	0.82	1.11	1.42	1.89	2.64	3.62	5.31
	IN LB/1000psi		(323)	(500)	(677)	(867)	(1153)	(1611)	(2209)	(3240)
Max Torque	$KG{\cdot}M^2{\cdot}10^{-3}$		4.34	8.14	12.34	17.77	29.11	50.19	86.80	161.40
	$LBF{\cdot}FT^2{\cdot}10^{-3}$		(103.0)	(193.2)	(292.8)	(421.7)	(690.8)	(1191.0)	(2059.8)	(3830.0)
Approx. Weight	KG		30	35	40	47	70	124	152	197
	LB		(66)	(77)	(88)	(104)	(154)	(273)	(335)	(434)

• For higher speeds contact your Hydraulex Global technical sales associate.

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Model Code

MF Series

MF - 20 - A - B - A - 11 - 35 - 35 - 000

Series

Displacement cm³/r (in³/r)
20 = 33.3 (2.03)
21 = 51.6 (3.15)
22 = 69.8 (4.26)
23 = 89.0 (5.43)
24 = 118.7 (7.24)
25 = 165.8 (10.12)
26 = 227.3 (13.87)
27 = 333.7 (20.36)

Shaft
A = 14t, 12/24 Pitch, Ø31.20 (1.23")
B = 19t, 16/32 Pitch, Ø31.75 (1.25")
C = 21t, 16/32 Pitch, Ø34.50 (1.36")
D = 23t, 16/32 Pitch, Ø37.68 (1.48")
E = 27t, 16/32 Pitch, Ø44.03 (1.73")
F = 40t, 16/32 Pitch, Ø64.66 (2.55")
G = 3t, 8/16 Pitch, Ø43.71 (1.72")
I = 20t, 16/32 Pitch, Ø32.91 (1.30")
J = Cone 1:8, SAE J501, Ø41.27 (1.62")
K = Cone 1:8, SAE J501, Ø31.75 (1.25")
L = Parallel with Key, Ø34.925 (1.38")
M = Parallel with Key, Ø44.45 (1.75")
P = 15t, 16/32 Pitch, Ø25.40 (1.00")
R = 13t, 16/32 Pitch, Ø21.80 (0.86")

Ports
A = SAE J518c, Code 62, Size 1", 6000psi 7/16"-14UNC-2A
B = SAE J518c, Code 61, Size 1", 5000psi 3/8"-16UNC-2A
C = ISO 6162, DN25, Type II, 40 MPa M12
D = SAE J518c, Code 62, Size 3/4", 6000psi 3/8"-16UNC-2B
E = SAE J518c, Code 61, Size 3/4", 5000psi 3/8"-16UNC-2B
F = ISO 6162, DN19, Type II, 40 MPa M10

Design Code
000 = Standard
XXX = Special Production Number

Pressure Setting in Port B
11 = 11 MPa (1600)
14 = 14 MPa (2050)
35 = 35 MPa (5000)
40 = 40 MPa (5500)
42 = 42 MPa (6000)
00 = Without Pressure Valve

Pressure Setting in Port A
11 = 11 MPa (1600)
14 = 14 MPa (2050)
35 = 35 MPa (5000)
40 = 40 MPa (5500)
42 = 42 MPa (6000)
00 = Without Pressure Valve

Pressure Setting of Valve in Manifold Assembly
11 = 1.1 MPa (1.1±0.05 MPa at 3.8 $dm^3\ min^{-1}$)
13 = 1.3 MPa (1.3±0.05 MPa at 3.8 $dm^3\ min^{-1}$)
16 = 1.6 MPa (1.6±0.05 MPa at 3.8 $dm^3\ min^{-1}$)
00 = WIthout Manifold Assembly

Manifold Assembly
A = Manifold Assembly with Bypass Valve
B = Manifold Assembly without Bypass Valve
C = Without Manifold Assembly with Cover Plate
N = Without Manifold Assembly

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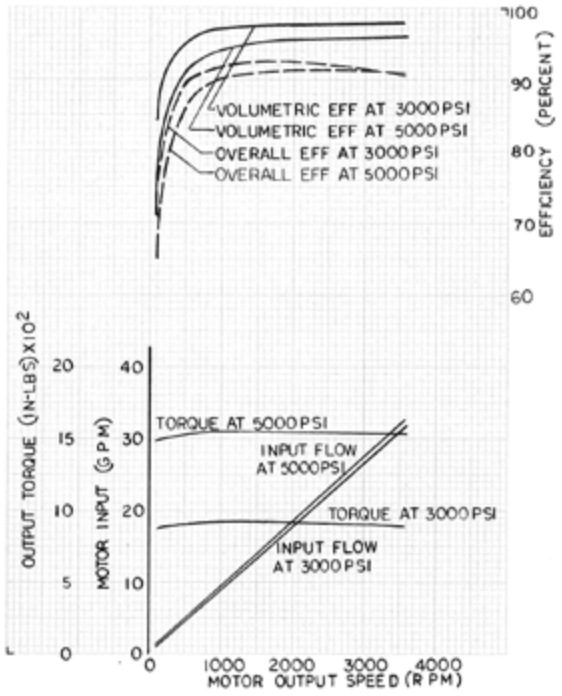
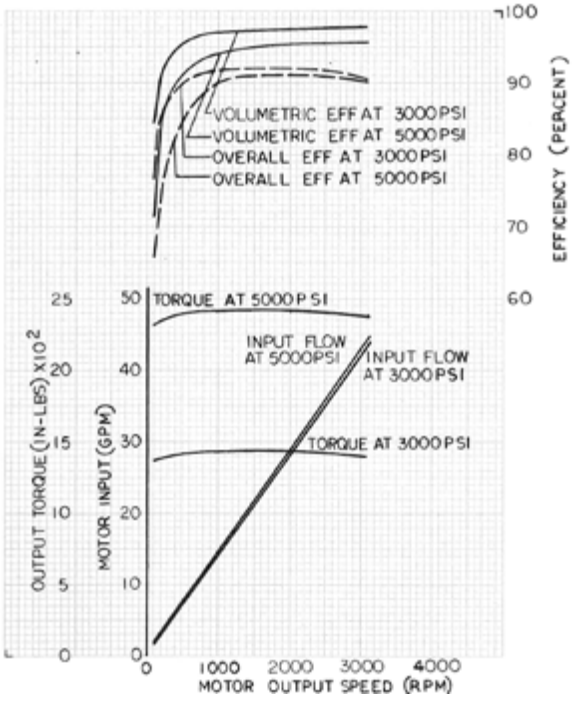
MF Series Specifications

Performance Data - Fixed Motor

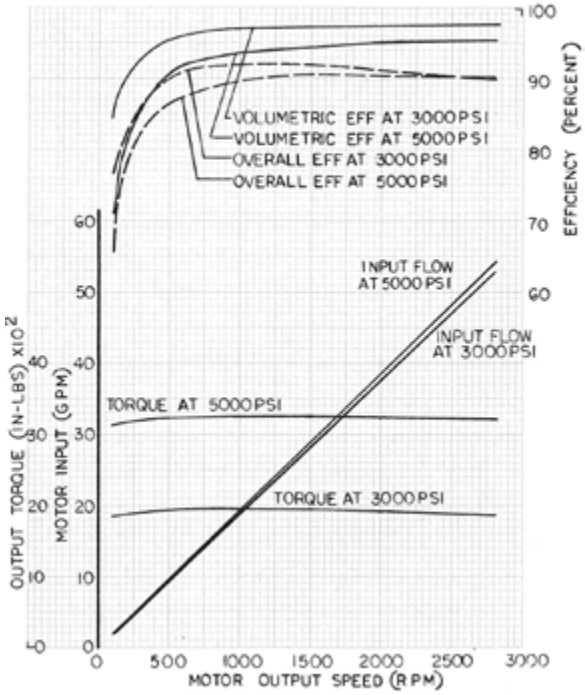
PERFORMANCE 20 SERIES MOTOR
18° SWASHPLATE ANGLE



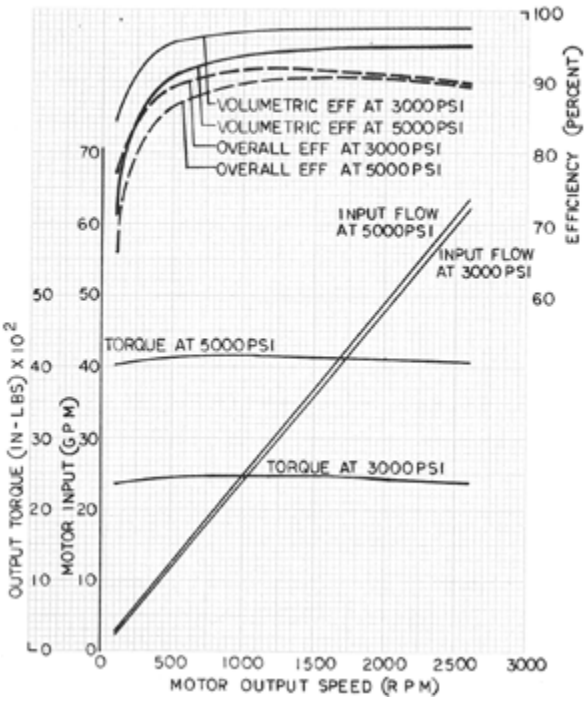
PERFORMANCE 21 SERIES MOTOR
18° SWASHPLATE ANGLE



PERFORMANCE 22 SERIES MOTOR
18° SWASHPLATE ANGLE



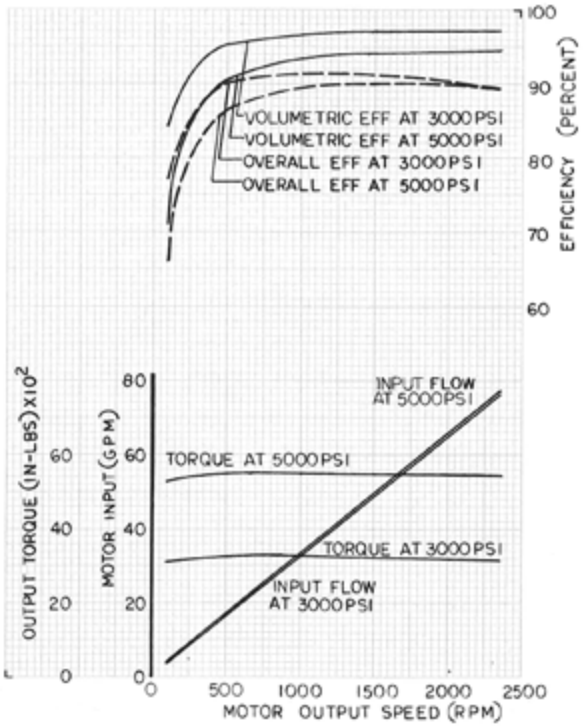
PERFORMANCE 23 SERIES MOTOR
18° SWASHPLATE ANGLE



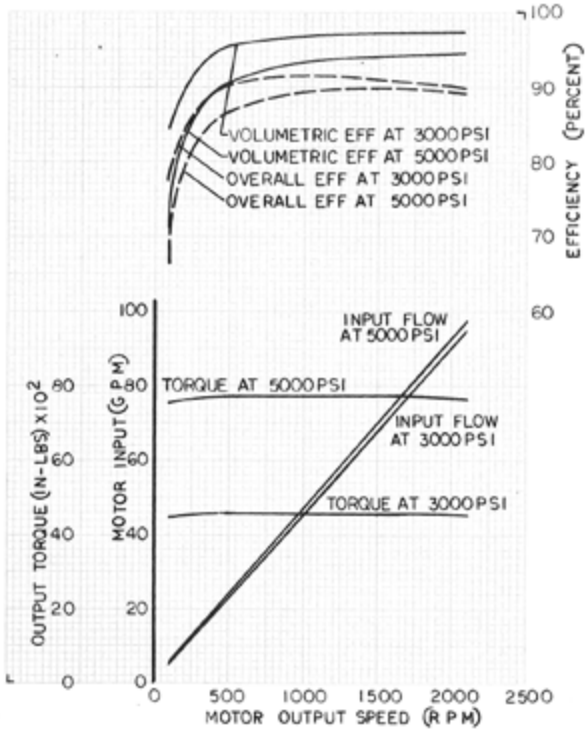
MF Series Specifications

Performance Data - Fixed Motor

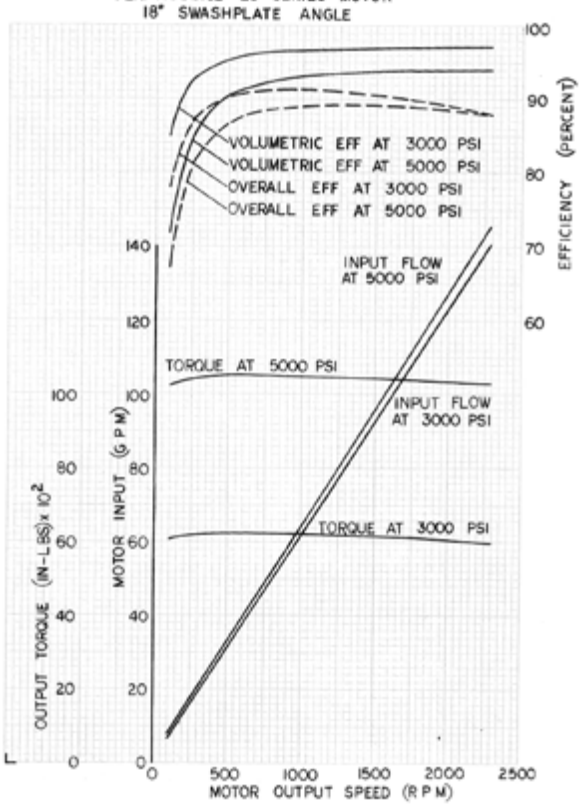
PERFORMANCE 24 SERIES MOTOR
18° SWASHPLATE ANGLE



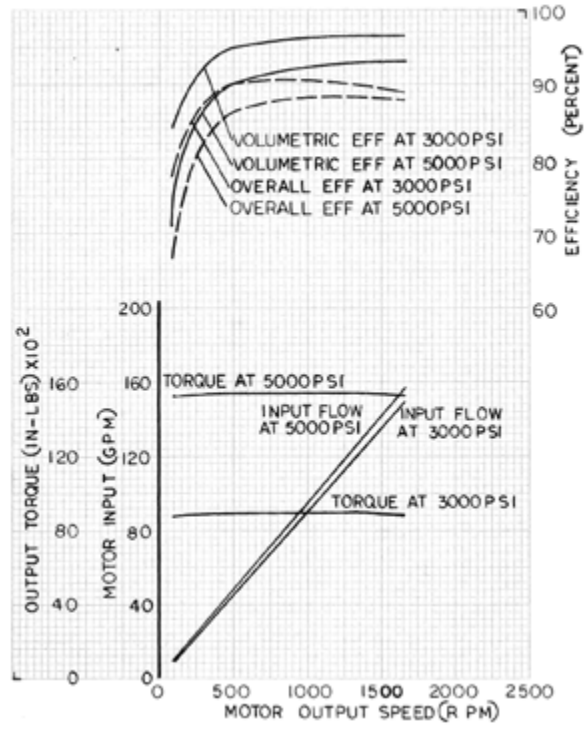
PERFORMANCE 25 SERIES MOTOR
18° SWASHPLATE ANGLE



PERFORMANCE 26 SERIES MOTOR
18° SWASHPLATE ANGLE



PERFORMANCE 27 SERIES MOTOR
18° SWASHPLATE ANGLE



MF Series Dimensions

Dimensions

Frame Size		A	C	C_1	D	D_1	D_2	D_3	D_4	D_5	F	H
MF-20	Inches	(0.62)	(2.20)	(7.48)	(6.38)	(5.75)	(5.51)	(5)	(4.25)	(1)	(0.59)	(13.39)
	Millimeters	$15.7^{\pm 1.5}$	56	190	162	146	140	$127^{-0.05}$	108	25.4	$15^{+0.8\ -0.3}$	340
MF-21	Inches	(0.62)	(2.20)	(7.48)	(6.38)	(5.79)	(6.06)	(5)	(4.25)	(1)	(0.59)	(14.17)
	Millimeters	$15.7^{\pm 1.5}$	56	190	162	147	154	$127^{-0.05}$	108	25.4	$15^{+0.8\ -0.3}$	360
MF-22	Inches	(0.62)	(2.20)	(7.64)	(6.38)	(7.64)	(6.34)	(5)	(4.25)	(1)	(0.59)	(14.96)
	Millimeters	$15.7^{\pm 1.5}$	56	194	162	194	161	$127^{-0.05}$	108	25.4	$15^{+0.8\ -0.3}$	380
MF-23	Inches	(0.68)	(2.20)	(7.64)	(6.38)	(7.64)	(7.09)	(5)	(4.25)	(1)	(0.59)	(15.55)
	Millimeters	$17.2^{\pm 1.5}$	56	194	162	194	180	$127^{-0.05}$	108	25.4	$15^{+0.8\ -0.3}$	395
FM-24	Inches	(0.98)	(2.95)	(8.43)	(9.02)	(8.03)	(7.87)	(6)	(4.76)	(1)	(0.84)	(17.40)
	Millimeters	25	75	214	229	204	200	$152.4^{-0.05}$	121	25.4	$21.3^{+0.8\ -0.3}$	442
MF-25	Inches	(0.98)	(3.03)	(11.22)	(12.5)	(10)	(9.05)	(6.5)	(5)	(1.44)	(0.81)	(21.34)
	Millimeters	25	77	285	317.5	254	230	$165.1^{-0.05}$	127	36.5	$20.5^{+0.8\ -0.3}$	542
MF-26	Inches	(1.06)	(3.03)	(11.06)	(12.5)	(10.75)	(10.69)	(6.5)	(5)	(1.44)	(0.81)	(22.52)
	Millimeters	27	77	281	317.5	273	271.5	$165.1^{-0.05}$	127	36.5	$20.6^{+0.8\ -0.3}$	572
MF-27	Inches	(1.50)	(3.03)	(11.73)	(13.78)	(11.73)	(11.50)	(7)	(5.51)	(1.44)	(1.06)	(23.74)
	Millimeters	38	77	298	350	298	292	$177.8^{-0.05}$	140	36.5	27	603

Frame Size		H_1	H_2	H_3	H_4	H_5	H_6	K	P_1, P_2, P_3	R	R_1	R_2	U_2
MF-20	Inches	(1.42)	(9.92)	(12.40)	(8.94)	(0.43)	(0.98)	(8.43)		(3.49)	(3.23)	(0.71)	(0.75)
	Millimeters	36	252	315	227	11	25	214		88.7	82	18	19
MF-21	Inches	(1.42)	(10.63)	(13.94)	(11.61)	(0.35)	(1.26)	(9.25)		(3.82)	(3.46)	(0.71)	(0.75)
	Millimeters	36	270	354	295	9	32	235		97	88	18	19
MF-22	Inches	(1.42)	(11.46)	(15.04)	(12.40)	(0.47)	(1.18)	(10.05)		(4.25)	(3.86)	(0.71)	(0.75)
	Millimeters	36	291	382	315	12	30	255.3		108	98	18	19
MF-23	Inches	(1.42)	(12.05)	(15.75)	(13.03)	(0.24)	(1.73)	(10.72)		(4.61)	(4.21)	(0.71)	(0.75)
	Millimeters	36	306	400	331	6	44	272.3	7/8-14 UNF-2B	117	107	18	19
MF-24	Inches		(14.25)	(18.94)	(15.30)			(12.01)		(4.92)	(4.29)		(0.83)
	Millimeters		362	481	388.7			305		125	109		21
MF-25	Inches		(15.24)	(20.63)	(17.42)			(12.99)		(5.37)	(5.35)		(0.83)
	Millimeters		387	524	442.5			330		136.5	136		21
MF-26	Inches		(16.14)	(21.54)				(13.62)		(5.50)	(5.98)		(0.83)
	Millimeters		410	547				346		139.7	152		21
MF-27	Inches		(17.60)	(23.15)	(19.04)			(15.24)		(6.06)	(6.34)		(0.83)
	Millimeters		447	588	483.5			387		154	161		21

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MF Series Dimensions

Dimensions Cont.

Frame Size		U_1	W	b	B_1	d	d_1	h	H_1	k
MF-20	Inches	7/8-14 UNF-2B	3/8-16 UNC-2B	(6.38)	(3.25)	(1.36)	M10		(2.80)	(1.89)
	Millimeters			162	82.5	$34.5^{-0.17}$			71	48
MF-21	Inches			(6.73)	(3.38)	(1.36)	M10	(4.06)	(2.99)	(1.89)
	Millimeters			171	85.8	$34.5^{-0.17}$		103	76	48
MF-22	Inches			(6.77)	(3.39)	(1.36)	M10	(3.96)	(3.43)	(1.89)
	Millimeters			172	86	$34.5^{-0.17}$		100.6	87	48
MF-23	Inches			(7.56)	(3.78)	(1.48)	M10	(4.53)	(3.78)	(1.89)
	Millimeters			192	96	$37.7^{-0.18}$		115	96	48
MF-24	Inches			(8.43)	(4.21)	(1.73)	M14		(3.94)	(2.64)
	Millimeters			214	107	$44^{-0.18}$			100	67
MF-25	Inches		5/8-11 UNC-2B	(10.24)	(5.12)	(1.73)	M14		(4.88)	(2.64)
	Millimeters			260	130	$44^{-0.18}$			124	67
MF-26	Inches			(11.50)	(5.75)	(1.73)	M14	(6.69)	(5.43)	(2.64)
	Millimeters			292	146	$44^{-0.18}$		170	138	67
MF-27	Inches			(12.48)	(6.26)	(2.55)	M16	(7.20)	(5.75)	(2.64)
	Millimeters			317	159	$64.7^{-0.18}$		183	146	67

Frame Size		l	l_1	x	z		m	n	x_1, x_2, x_3
MF-20	Inches	(0.49)	(0.79) min 20	(6.14)	7/8-14 UNF-2B	45°	(2.06)	(1.03)	7/16-20 UNF-2B
	Millimeters	12.5 $^{0.2}$		156			52.4	26.2	
MF-21	Inches	(0.49)		(6.30)			(2.06)	(1.03)	
	Millimeters	12.5 $^{0.2}$		160			52.4	26.2	
MF-22	Inches	(0.49)		(6.50)			(2.06)	(1.03)	
	Millimeters	12.5 $^{0.2}$		165			52.4	26.2	
MF-23	Inches	(0.49)		(6.69)			(2.06)	(1.03)	
	Millimeters	12.5 $^{0.2}$		170			52.4	26.2	
MF-24	Inches	(0.49)		(6.89)			(2.06)	(1.03)	
	Millimeters	12.5 $^{0.2}$		175			52.4	26.2	
MF-25	Inches	(0.63)	(1.18) min 30	(8.62)	15/16-12 UN-2B		(3.13)	(1.44)	
	Millimeters	16 $^{0.2}$		219			79.4	36.5	
MF-26	Inches	(0.63)		(9.0)			(3.13)	(1.44)	
	Millimeters	16 $^{0.2}$		228.5			79.4	36.5	
MF-27	Inches	(0.63)	(1.57) min 40	(10.94)			(3.13)	(1.44)	
	Millimeters	16 $^{0.2}$		278			79.4	36.5	

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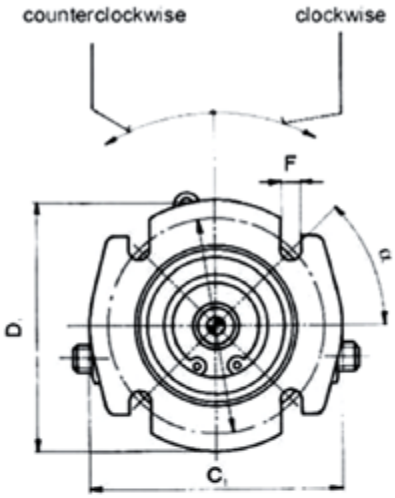
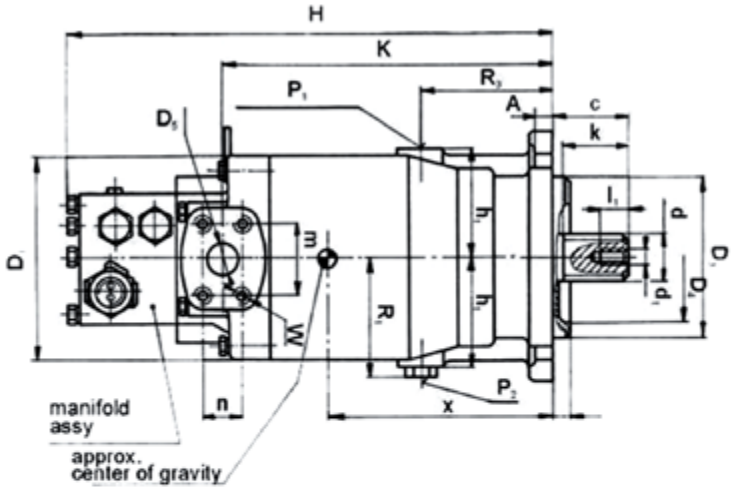
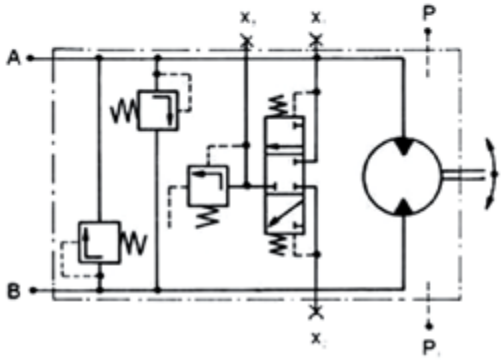
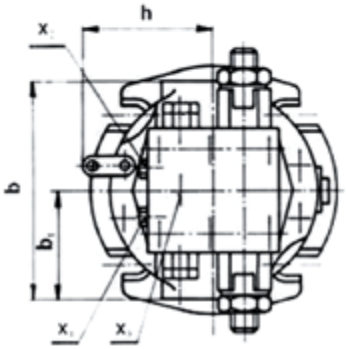
MF Series Dimensions

Dimensions









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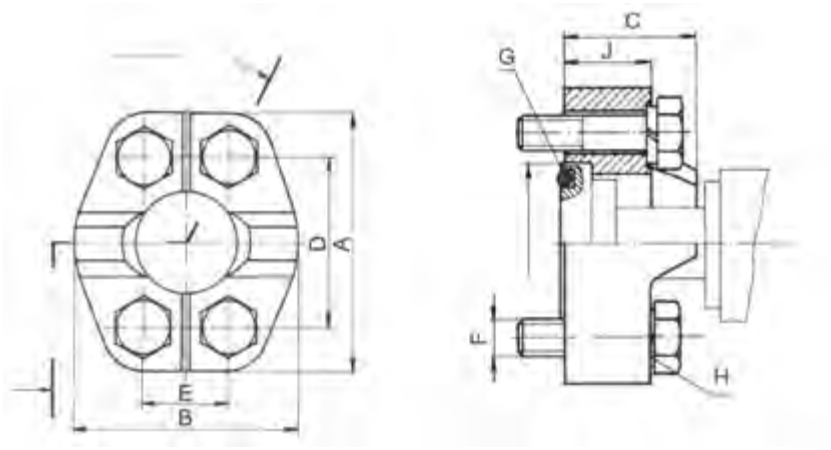
MF Series Dimensions

Dimensions - Hose Flange

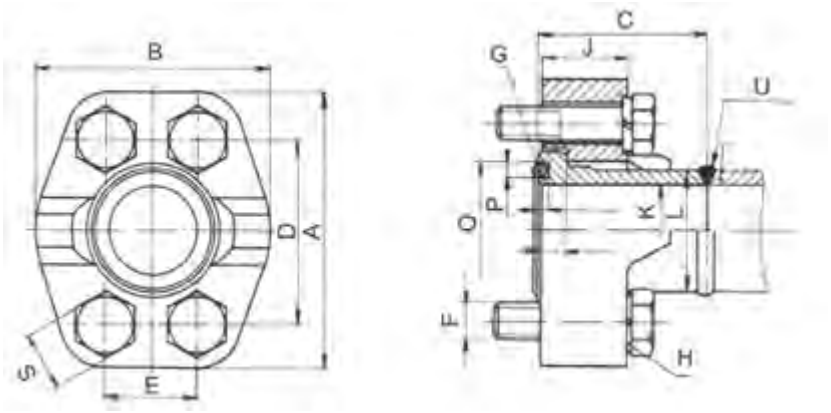
Frame Size		A	B	C	D$^{-0.1}$	E$^{-0.1}$	F	H	J
PV-20 - 24	Inches	(3.18)	(2.76)	(1.38)	(2.06)	(1.03)	3/8-16 UNC-2A	Washer 10.2	(0.89)
	Millimeters	81	70	35	52.4	26.2	3/8-16 UNC-2A	Washer 10.2	22.5
PV-25 - 27	Inches	(4.41)	(3.74)	(1.81)	(3.13)	(1.44)	5/8-11 UNC-2A	Washer 16	(1.18)
	Millimeters	112	95	46	79.4	36.5	5/8-11 UNC-2A	Washer 16	30



Dimensions - Flange for Piping

Frame Size		A	B	C	D$^{-0.1}$	E$^{-0.1}$	F	H	J
PV-20 - 24	Inches	(3.18)	(2.76)	(1.57)	(2.06)	(1.03)	3/8-16 UNC-2A	Washer 10	(0.89)
	Millimeters	81	70	40	52.4	26.2	3/8-16 UNC-2A	Washer 10	22.5
PV-25 - 27	Inches	(4.41)	(3.74)	(1.81)	(3.13)	(1.44)	5/8-11 UNC-2A	Washer 16	(1.18)
	Millimeters	112	95	46	79.4	36.5	5/8-11 UNC-2A	Washer 16	30

Frame Size		K	L	M$^{-0.1}$	N$^{-0.1}$	O	P$^{+0.2}$	U
PV-20 - 24	Inches	(1.10)	(1.50)	(.31)	(0.11)	(1.56)±0.05	(0.16)	V5 - 104
	Millimeters	28	38	8	2.8	39.7±0.05	4	V5 - 104
PV-25 - 27	Inches	(1.50)	(1.97)	(0.50)	(0.11)	(2.12)±0.01	(0.16)	V6 - 158
	Millimeters	38	50	12.6	2.8	53.9±0.01	4	V6 - 158



Note:
Flange according to SAE J 518c
Frame size 20 - 24: Size 1, 5000psi, torque for screw tightening 3/8-16 UNC-2A = 37-42 Nm
Frame size 25 - 27: Size 1½, 6000psi, torque for screw tightening 5/8-11 UNC-2A = 158-181 Nm

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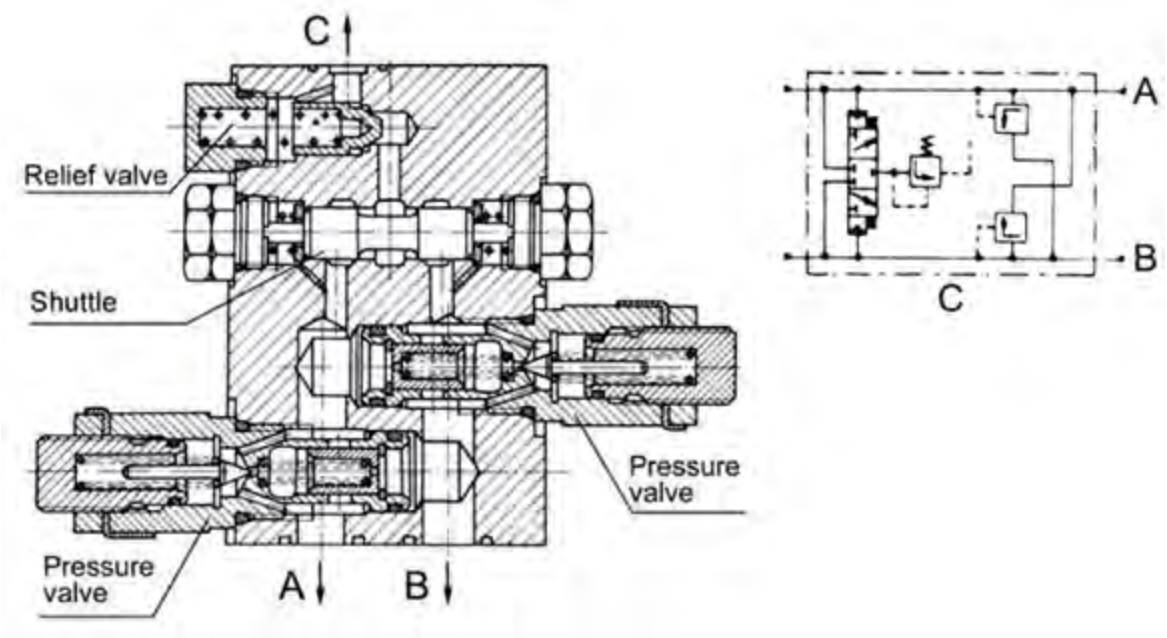
MF Series

Manifold Assembly

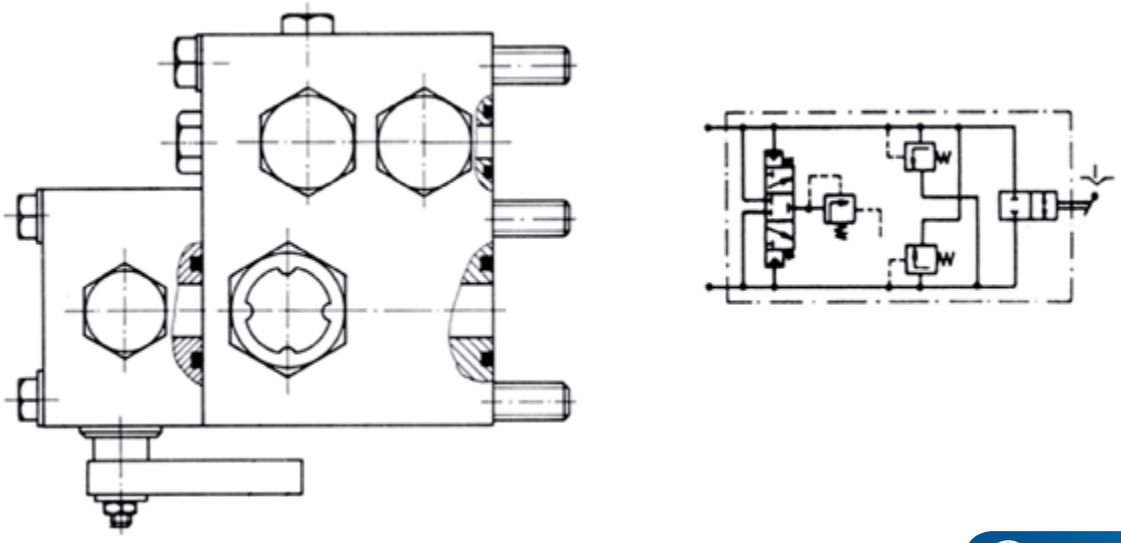
The Manifold Assembly consists of control elements that serve to restrict working pressure in the high pressure hydrostatic circuit, to exchange the heated working fluid in closed hydrostatic circuit, to charge the volume losses in closed hydrostatic circuit, as well to secure rinsing of transmissions case.



MF Series

Manifold Assembly with By-pass Valve

The Manifold Assembly with a bypass valve secures all the functions as a manifold assembly. On the back side there is a built in bypass valve designed for interconnection of high pressure lines in closed hydrostatic circuits.



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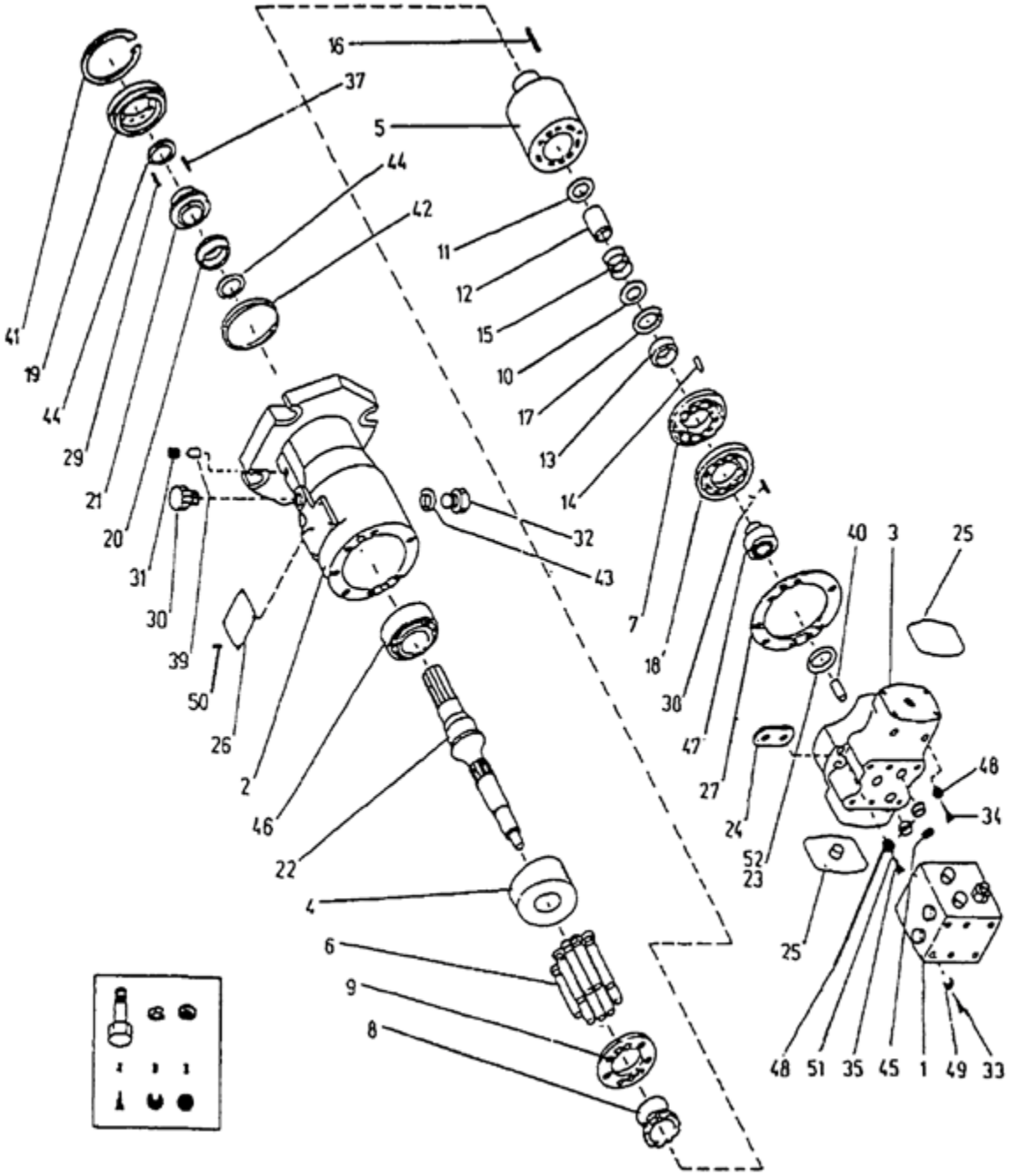
MF Series Replacement Parts

MF Series Component Breakdown



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MF Series Replacement Parts

MF Series 20-27 Replacement Parts Listing

1	Valve Block (Manifold Assembly)	23	End Cap Bearing Shim Kit
2	Motor Housing	24	Lifting Eye
3	End Cap	27	End Cap Gasket
4	Swash Plate	29	Shaft Seal Retainer Spring
5	Cylinder Barrel	30	Case Drain Plug
6	Piston Assembly (Set of 3)	31	Swashplate Pin Housing Plug
7	Bearing Plate	33	Manifold Block Hex Head Screw
8	Retainer (Ball) Guide	34	Long End Cap Screw
9	Slipper Retainer (Set Plate)	35	Short End Cap Screw
10	Spring Retainer	38	Valve Plate Pin
11	Spring Seat	39	Swashplate Pin
12	Spring Guide	40	End Cap Dowel Pin
13	Bearing Plate Pilot	41	Shaft Seal Retaining Ring
14	Pin	42	Shaft Seal Retainer O-Ring
15	Cylinder Barrel Spring	43	Case Drain Plug O-Ring
16	Retainer (Ball Guide) Spring - 6SP Type	44	Rotating Seal O-Ring
17	Retaining Ring	45	Manifold Block O-Ring Case Drain
18	Valve Plate	46	Front Bearing - Main Shaft
	Shaft Seal Kit	47	Rear Bearing - End Cap
19	Seal Retainer	48	End Cap Screw Washer
20	Rotating Seal	49	Manifold Block Screw Washer
21	Stationary Seal	51	Manifold Block O-Ring High Pressure
22	Drive Shaft		

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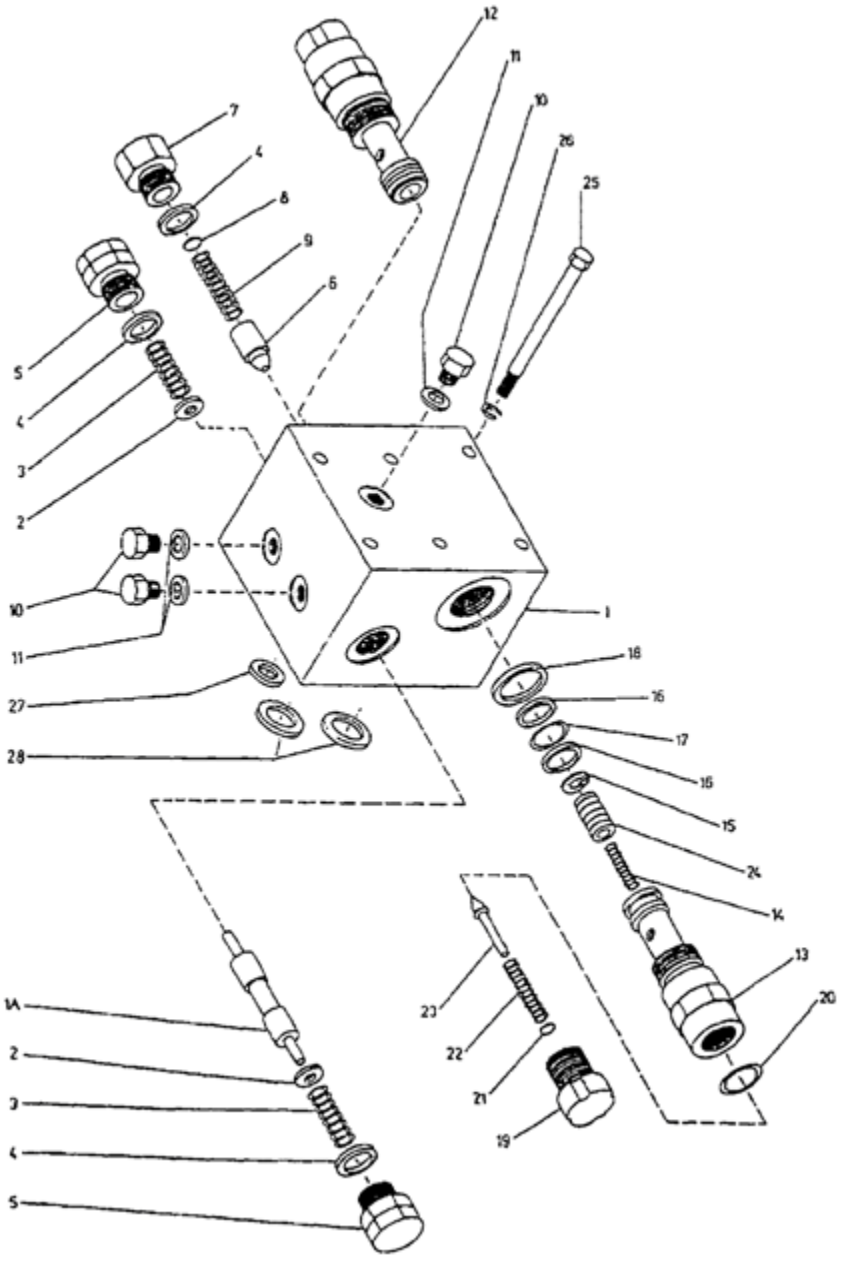
MF Series Replacement Parts

Manifold Assembly

1	Manifold Housing	8	Relief Valve Shim	15	Retaining Ring	22	Spring
1A	Shuttle Valve	9	Relief Valve Spring	16	Seat	23	Relief Valve
2	Washer	10	Plug	17	O-ring	24	Piston
3	Spring	11	O-ring	18	O-ring	25	Hex Head Screw
4	O-ring	12	High Pressure Valve	19	Plug	26	Washer
5	Plug	13	Valve Body	20	O-ring	27	O-ring
6	Relief Valve	14	Spring	21	Washer	28	O-ring
7	Plug						



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