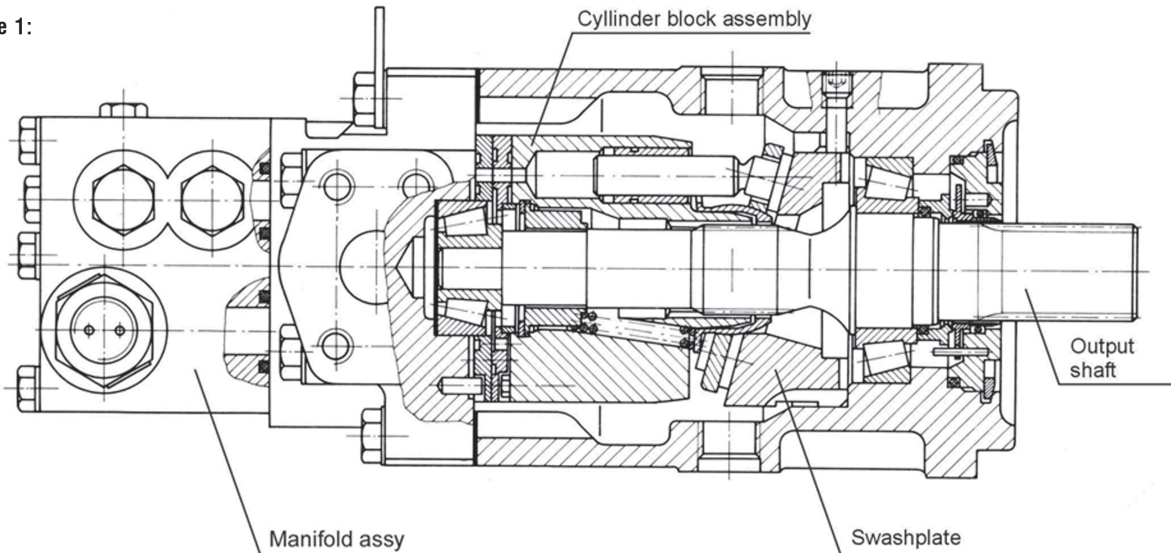


GENERAL DESCRIPTION

Axial piston fixed displacement motors, Series 20, are of swash plate construction with preset displacement, and are intended for closed circuit operation. The output speed is proportional to the flow rate of the input fluid. The output torque is proportional to the differential between high and low pressure sides of the fluid circuit. The direction of motor (output) shaft rotation depends upon which port the fluid enters the motor.

Figure 1:



FEATURES

Axial piston fixed displacement motors, Series 20, are well-engineered and easy to handle. The full-length shaft with a highly efficient tapered roller bearing arrangement offers a high loading capacity for external radial forces. High case pressures can be achieved without leakage even at the lowest temperatures by using suitable shaft seals. The modular construction of the units simplifies the production of a wide variety of model options while limiting the number of different components involved. Light weight, short version available on request.

Figure 2:

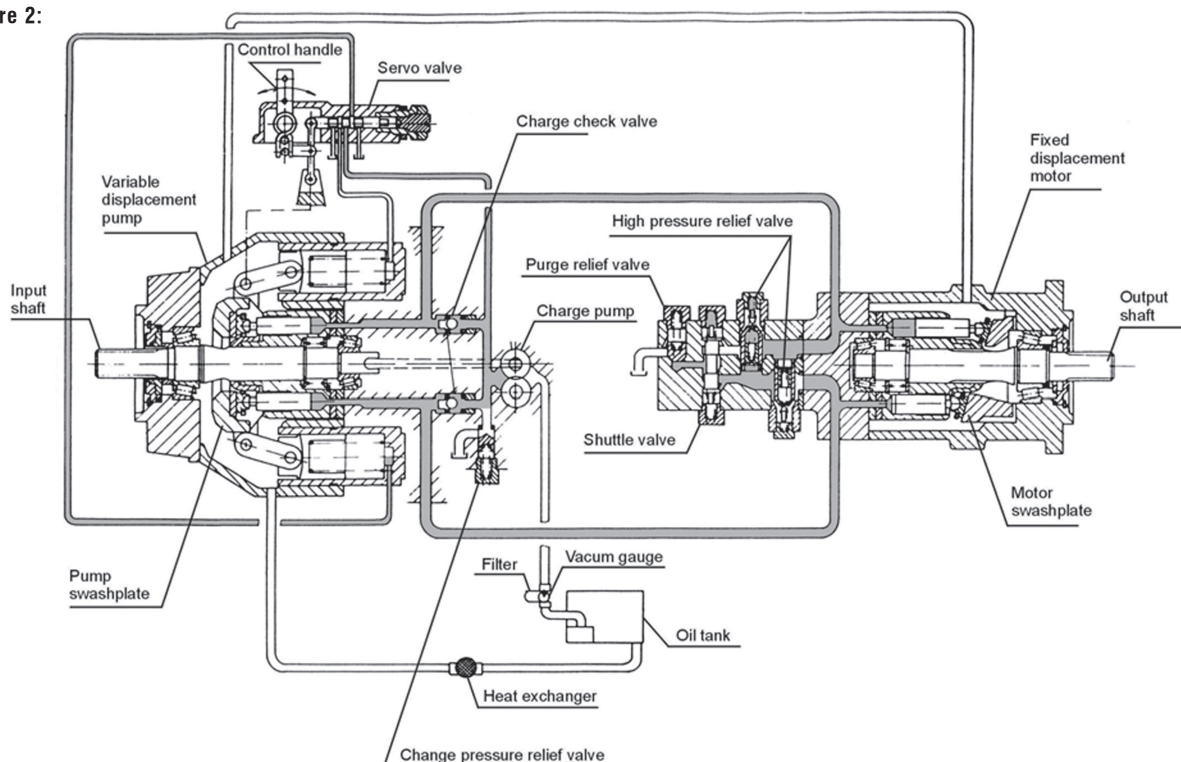
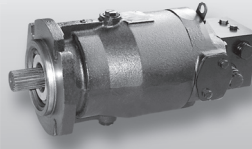


Figure 2 shows schematically the function of a hydrostatic transmission using an axial piston variable displacement pump a fixed displacement motor.



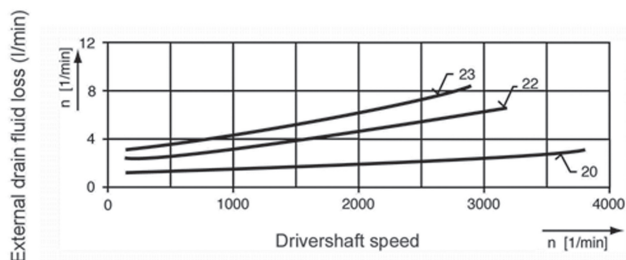
TECHNICAL DATA

Table 1:

	Dimensions	Frame Size							
		MF-20	MF-21	MF-22	MF-23	MF-24	MF-25	MF-26	MF-27
Max. displacement per revolution of the fixed motor	cm ³	33,3	51,6	69,8	89,0	118,7	165,8	227,3	333,7
Max. flow	dm ³ min ⁻¹	119,54	159,96	196,14	230,51	278,94	348,18	429,59	557,28
Displacement per revolution of the charge pump	cm ³	12,3	12,3	18,03	18,03	18,8	32,8	32,8	65,5
Max. pressure	MPa	35							
Nominal pressure	MPa	21							
Max. pressure of control	MPa	3,5							
Charge pressure	MPa	0,8 - 2,0							
Max. pressure in case	MPa	0,25 continuous 0,5 intermittent							
Maximum speed +	min ⁻¹	3590	3100	2810	2590	2350	2100	1890	1670
Minimum speed	min ⁻¹	500							
Nominal speed	min ⁻¹	1500							
Kinematic viscosity range of working fluid	mm ² s ⁻¹	1000 12 - 600 25 - 35							
-starting									
-operating									
-optimum									
Kind of working fluid		mineral oil							
Operating temperature	°C	-40 to +50							
Max. temperature of working fluid in tank	°C	80							
Purity of working fluid	microns	10 µm							
Maximum swash plate angle	degrees	±18°							
Weight	kg	30	35	40	47	70	124	152	197

+ for higher speeds contact our Application department

Figure 3. External drain fluid loss for frame sizes 20 – 23

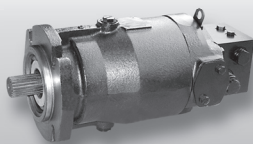


$$Q_e = \frac{V_M \cdot n \cdot \eta_v}{1000} \quad (\text{l/min}) \text{ Motor input flow}$$

$$M_e = \frac{15,9 \cdot V_M \cdot \Delta p \cdot \eta_{mh}}{100} \quad (\text{Nm}) \text{ output torque}$$

$$P_e = \frac{M_g \cdot n}{9550} = \frac{Q_e \cdot \Delta p \cdot \eta_t}{600} \quad (\text{kW}) \text{ output power}$$

V_M – displacement (cm³) per revolution
 Δp – difference high and low pressure (MPa)
 n – speed (min⁻¹)
 η_v – volumetric efficiency
 η_{mh} – mechanical – hydraulic efficiency
 η_t – total efficiency



DIMENSIONS

Table 3. Dimensions (mm)

Frame size	A	C	C ₁	D	D ₁	D ₂	D ₃	D ₄	D ₅	F	H
MF-20	15,7 ±1,5	56	190	162	146	140	127 - 0,05	108	25,4	15 + 0,8 - 0,3	340
MF-21	15,7 ±1,5	56	190	162	147	154	127 - 0,05	108	25,4	15 + 0,8 - 0,3	360
MF-22	15,7 ±1,5	56	194	162	194	161	127 - 0,05	108	25,4	15 + 0,8 - 0,3	380
MF-23	17,2 ±1,5	56	194	162	194	180	127 - 0,05	108	25,4	15 + 0,8 - 0,3	395
MF-24	25	75	214	229	204	200	152,4 - 0,05	121	25,4	21,3 + 0,8 - 0,3	442
MF-25	25	77	285	317,5	254	230	165,1 - 0,05	127	36,5	20,5 + 0,8 - 0,3	542
MF-26	27	77	281	317,5	273	271,5	165,1 - 0,05	127	36,5	20,6 + 0,8 - 0,3	572
MF-27	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	36	252	315	227	11	25	214	7/8-14 UNF-2B	88,7	82	18	19
MF-21	36	270	354	295	9	32	235		97	88	18	19
MF-22	36	291	382	315	12	30	255,3		108	98	18	19
MF-23	36	306	400	331	6	44	272,3		117	107	18	19
MF-24		362	481	388,7			305		125	109		21
MF-25		387	524	442,5			330		136,5	136		21
MF-26		410	547				346		139,7	152		21
MF-27		447	588	483,5			387		154	161		21

Frame size	U ₁	W	b	B ₁	d	d ₁	h	H ₁	k
MF-20	7/8-14 UNF-2B	3/8-16 UNC-2B	162	82,5	34,5 - 0,17	M10		71	48
MF-21			171	85,8	34,5 - 0,17	M10	103	76	48
MF-22			172	86	34,5 - 0,17	M10	100,6	87	48
MF-23			192	96	37,68 - 0,18	M10	115	96	48
MF-24			214	107	44 - 0,18	M14		100	67
MF-25		5/8-11 UNC-2B	260	130	44 - 0,18	M14		124	67
MF-26			292	146	44 - 0,18	M14	170	138	67
MF-27			317	159	64,7 - 0,18	M16	183	146	67

Frame size	I	I ₁	x	z		m	n	X ₁ , X ₂ , X ₃
MF-20	12,5 0,2	min.20	156	7/8-14 UNF-2B	45°	52,4	26,2	7/16-20 UNF-2B
MF-21	12,5 0,2	min.20	160		45°	52,4	26,2	
MF-22	12,5 0,2	min.20	165		45°	52,4	26,2	
MF-23	12,5 0,2	min.20	170		45°	52,4	26,2	
MF-24	12,5 0,2	min.30	175		45°	52,4	26,2	
MF-25	16 0,2	min.30	219	15/16-12 UN-2B	45°	79,4	36,5	
MF-26	16 0,2	min.30	228,5		45°	79,4	36,5	
MF-27	16 0,2	min.40	278		45°	79,4	36,5	

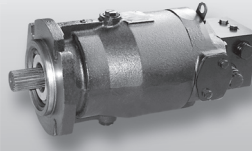
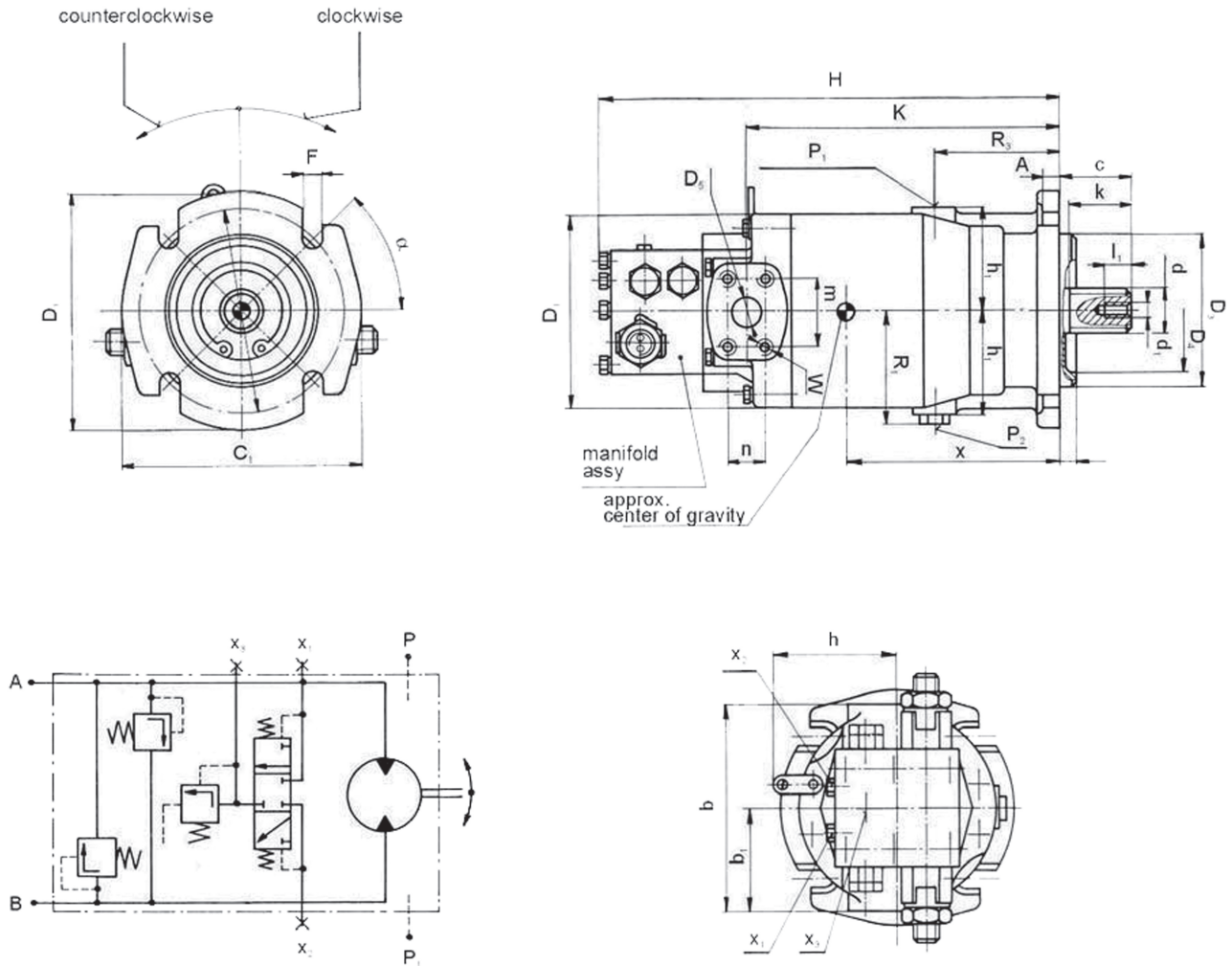


FIGURE 4: OUTLINE DRAWING MOTOR CONFIGURATION WITH MANIFOLD ASSY



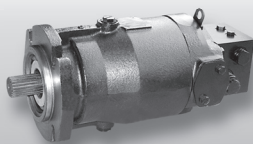
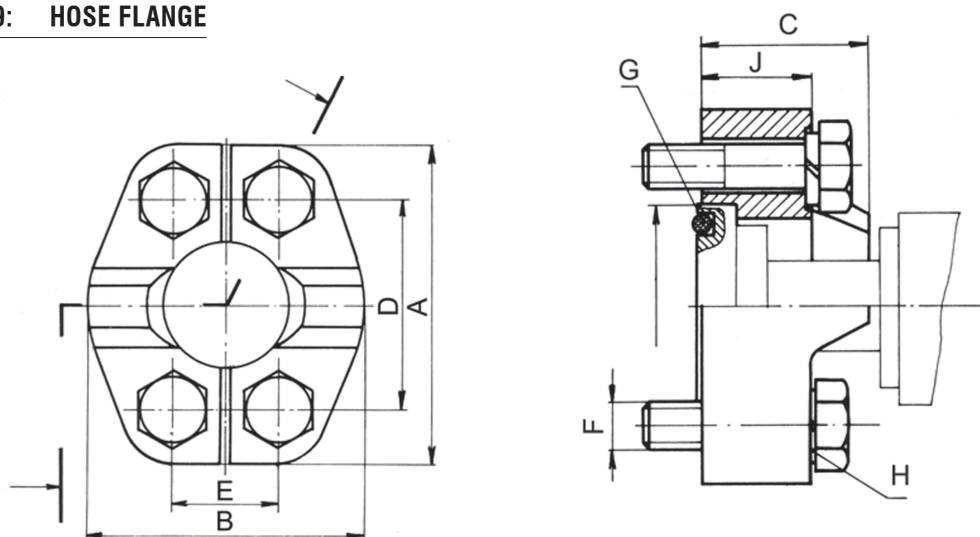


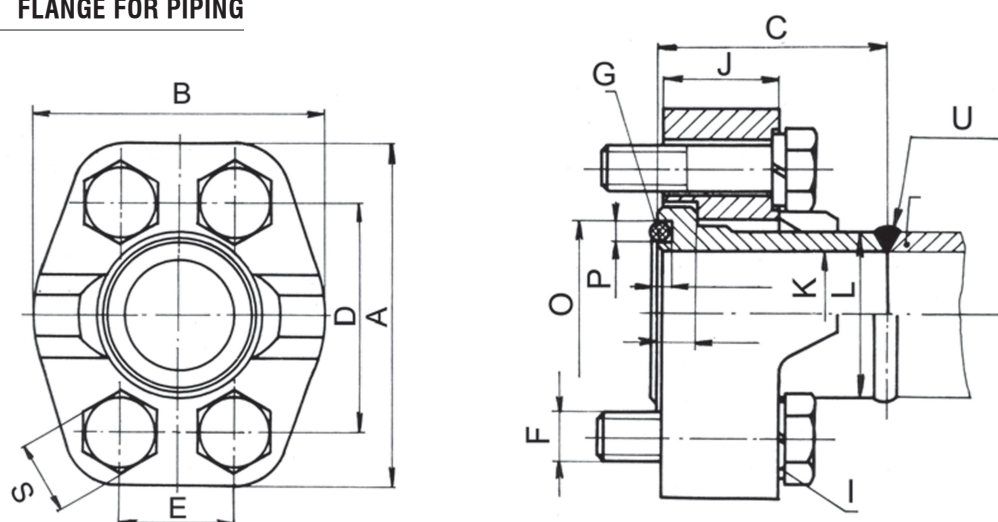
FIGURE 9: HOSE FLANGE



Dimensions (mm)

Frame size	A	B	C	D-0,1	E-0,1	F	H	J
MF-20 - 24	81	70	35	52,4	26,2	3/8-16 UNC-2A	Washer 10,2	22,5
MF-25 - 27	112	95	46	79,4	36,5	5/8-11 UNC-2A	Washer 16	30

FIGURE 10: FLANGE FOR PIPING



Dimensions (mm)

Frame size	A	B	C	D-0,1	E-0,1	F	H	J
MF-20 - 24	81	70	40	52,4	26,2	3/8-16 UNC-2A	Washer 10	22,5
MF-25 - 27	112	95	65	79,4	36,5	5/8-11 UNC-2A	Washer 16	30

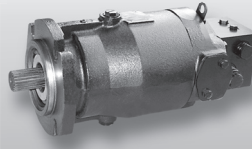
Frame size	K	L	M-0,1	N-0,1	O	P + 0,2	U
MF-20 - 24	28	38	8	2,8	39,7±0,05	4	V5 - 104
MF-25 - 27	38	50	12,6	2,8	53,9±0,01	4	V6 - 158

Note:

Flange according to SAE J 518 c

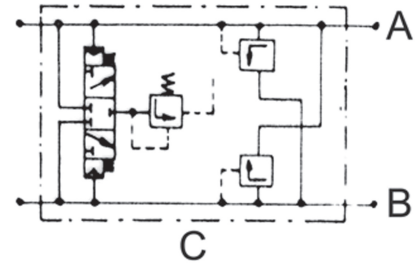
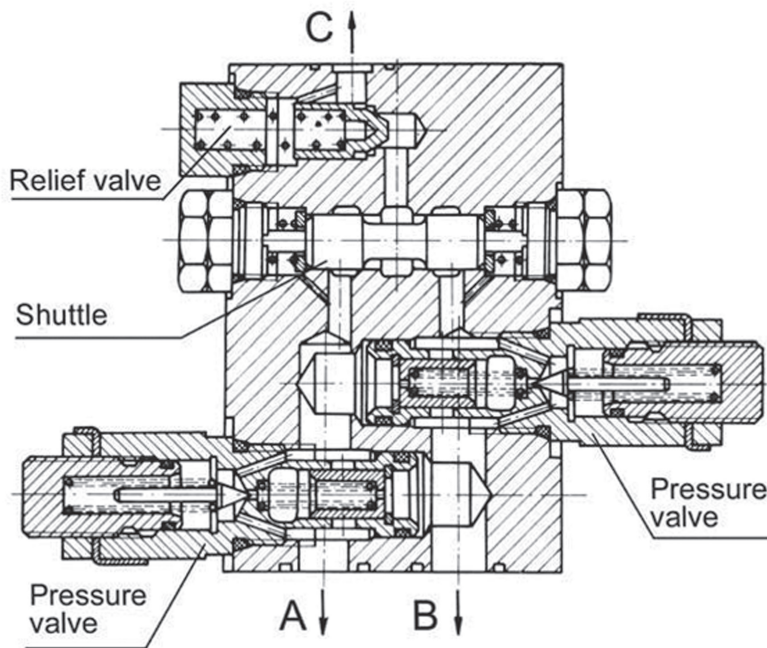
Frame size 20 - 24: size 1, 5000 psi, torque for screw tightening 3/8 - 16 UNC2A: 37 - 42 Nm.

Frame size 25 - 27: size 1 1/2, 6000 psi, torque for screw tightening 5/8 - 11 UNC2A: 158 - 181 Nm.



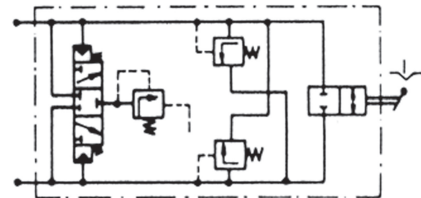
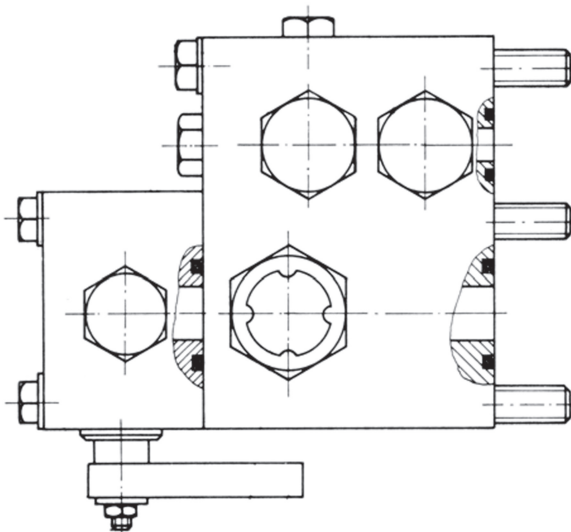
MANIFOLD ASSY

Manifold assy consist of control elements that serve 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, to charge the volume losses hydrostatic circuit as well to secure rinsing of transmissions case.



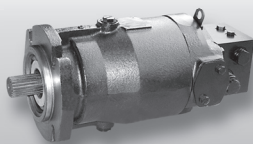
MANIFOLD ASSY WITH BY-PASS VALVE

Manifold assy with by-pass valve secures all the functions as manifold assy. On the back side there is a built in by-pass valve designed for interconnection of high pressure lines in closed hydrostatic circuit.



AXIAL PISTON MOTORS MF

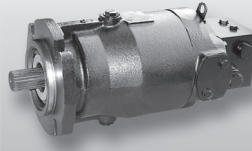
SERIES 20 CLOSED CIRCUIT



TYPE DESIGNATION

1	2	3	4	5	6	7	8	9																																																		
MF	XX	X	X	X	XX	XX	XX	XXX																																																		
1. <table border="1" style="display: inline-table; text-align: left; width: 80px;"><tr><td style="width: 40px;">MF</td><td>Motor Fixed</td></tr></table>	MF	Motor Fixed							9. <table border="1" style="display: inline-table; text-align: left; width: 120px;"><tr><td style="width: 40px;">000</td><td>Standart</td><td>●</td></tr><tr><td>XXX</td><td>Special production number</td><td>○</td></tr></table>	000	Standart	●	XXX	Special production number	○																																											
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	5. <table border="1" style="display: inline-table; text-align: left; width: 250px;"><thead><tr><th colspan="3">Manifold assy</th></tr></thead><tbody><tr><td>A</td><td>Manifold assy with by-pass valve</td><td>○</td></tr><tr><td>B</td><td>Manifold assy without by-pass valve</td><td>●</td></tr><tr><td>C</td><td>Without manifold assy with cover plate</td><td>○</td></tr><tr><td>D</td><td>Without manifold assy with by-pass valve</td><td>○</td></tr><tr><td>N</td><td>Without manifold assy</td><td>○</td></tr></tbody></table>	Manifold assy			A	Manifold assy with by-pass valve	○	B	Manifold assy without by-pass valve	●	C	Without manifold assy with cover plate	○	D	Without manifold assy with by-pass valve	○	N	Without manifold assy	○				6. <table border="1" style="display: inline-table; text-align: left; width: 300px;"><thead><tr><th colspan="4">Pressure setting of low-pressure valve in the manifold assy</th></tr></thead><tbody><tr><td>11</td><td>1,1 MPa (1,1 $\pm$ 0,05 MPa at 3,8 dm³.min⁻¹)</td><td></td><td>○</td></tr><tr><td>13</td><td>1,3 MPa (1,3 $\pm$ 0,05 MPa at 3,8 dm³.min⁻¹)</td><td></td><td>●</td></tr><tr><td>16</td><td>1,6 MPa (1,3 $\pm$ 0,05 MPa at 3,8 dm³.min⁻¹)</td><td></td><td>○</td></tr><tr><td>00</td><td colspan="2">without manifold assy</td><td>○</td></tr></tbody></table>	Pressure setting of low-pressure valve in the manifold assy				11	1,1 MPa (1,1 $\pm$ 0,05 MPa at 3,8 dm ³ .min ⁻¹)		○	13	1,3 MPa (1,3 $\pm$ 0,05 MPa at 3,8 dm ³ .min ⁻¹)		●	16	1,6 MPa (1,3 $\pm$ 0,05 MPa at 3,8 dm ³ .min ⁻¹)		○	00	without manifold assy		○															
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- - standard design
- - available



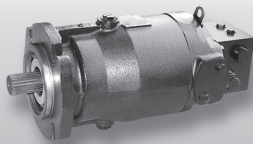
SPARE PARTS FOR FIXED PISTON MOTOR

MF 20, MF 21, MF 22, MF 23, MF 24, MF 25, MF 26, MF 27

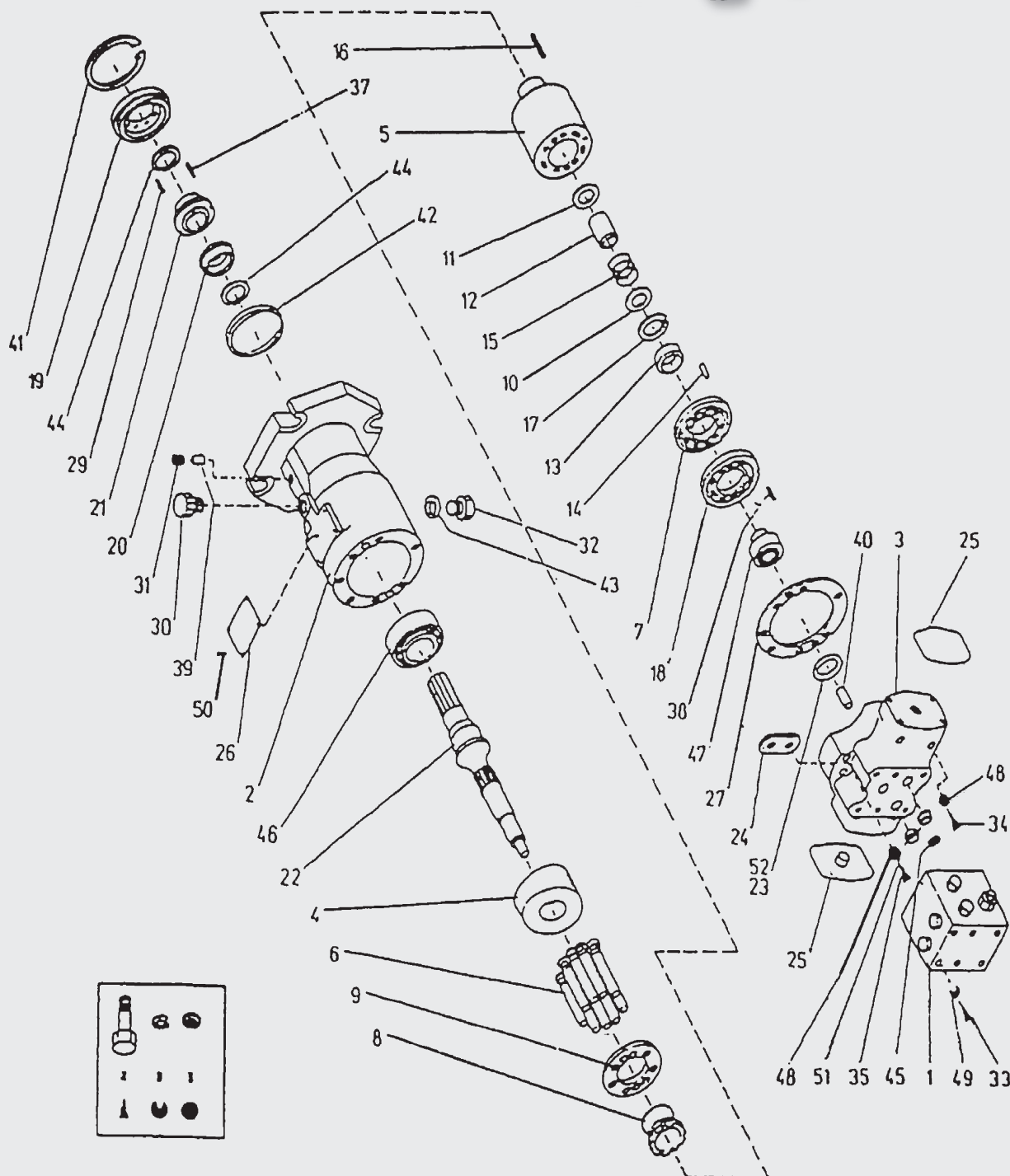
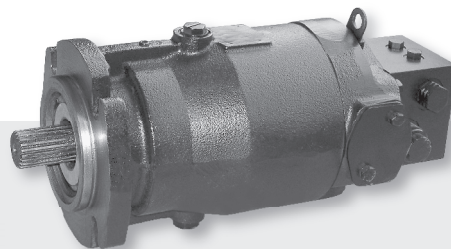
At your inquiry is needed to give number of spare parts from sketch and size of the motor.

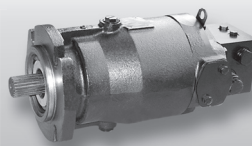
1 – Manifold Assy 35 Mpa	27 – End Cap Gasket
2 – Motor Housing	29 – Seal Spring
3 – End Cap	30 – Plug
4 – Swash Plate	31 – Plug
5 – Cylinder Barrel	32 – Hex Head Plug
6 – Piston Assembly	33 – Hex Head Screw
7 – Bearing Plate	34 – End Cap Screw
8 – Retainer Guide	35 – Hex Head Screw
9 – Slipper Retainer	37 – Drive Screw
10 – Spring Retainer	38 – Pin
11 – Spring Retainer	39 – Pin
12 – Spring Guide	40 – Pin
13 – Bearing Plate Pilot	41 – Retaining Ring
14 – Pin	42 – O Ring
15 – Cylinder Barrel Spring	43 – O ring
16 – Retainer Spring	44 – O Ring
17 – Reatining Ring	45 – O Ring
18 – Valve Plate	46 – Front Bearing
19 – Seal Retainer	47 – Rear Bearing
20 – Rotating Seal	48 – Washer
21 – Stationary Seal	49 – Washer
22 – Drive Shaft	50 – Drive Screw
23 – Shim	51 – O Ring
24 – Loop	52 – Washer
25 – Cap	

AXIAL PISTON MOTORS MF SERIES 20 CLOSED CIRCUIT



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SPARE PARTS FOR MANIFOLD ASSEMBLY (VALVE BLOCK) FOR FIXED PISTON MOTOR

MF 20, MF 21, MF 22, MF 23, MF 24, MF 25, MF 26, MF 27

At your inquiry is needed to give number of spare parts from sketch of manifold assembly and size of the motor.

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			

