Fixed Displacement Swing Drive Motor

JMF Axial Piston Motor
Peak Pressure: 385 bar
Displacement 29~250 cc/r

EATON
Powering Business Worldwide

Table of Contents

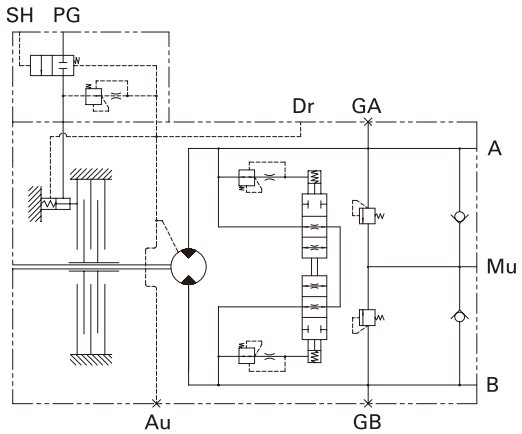
General Introduction

Features & Benefits

- Fixed displacement axial piston motor for swing applications
- Displacement from 29cc to 250cc is available and rated pressure is up to 320 bar
- Integrated fail-safe mechanical parking brake, brake release valve, shockless relief and anti-reverse valves
- Compact integrated planetary reduction gearbox
- Smooth and precise positioning eliminates mechanical shocks
- High performance and reliability proven by high market acceptance
- Higher mechanical and volumetric efficiency helps reduce power loss

Typical Applications

- Excavator and mini excavator
- Concrete pump
- Crane
- Drilling



Circuit diagram

Model Code

JMF	151	R	R	04	05	01	01	1	17	00	A	00	A
1,2,3	4,5,6	7	8	9,10	11,12	13,14	15,16	17	18,19	20,21	22	23,24	25

• Available option ● Preferred option ▲ Need consult

029	030	033	036	043	047	048	053	064	068	080	151	195	233	250
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•	•	•	•	•	•	•	•							

1,2,3	Swing Drive Motor	
4,5,6	Displacement	
	029	29cc
	030	30 cc
	033	33 cc
	036	36 cc
	043	43 cc
	047	47 cc
	048	48 cc
	053	53 cc
	064	64 cc
	068	68 cc
	080	80 cc
	151	151 cc
	195	195 cc
	233	233 cc
	250	250 cc
7	Mounting flange of motor	
	R	Integrated gearbox
	P	Motor only
8	Output shaft	
	R	Gearbox shaft
	S	Spline w/o gearbox
9,10	Main port size	
	01	BSP G3/8 (JIS PF 3/8)
	02	BSP G1/2 (JIS PF 1/2)
	03	JIS Flange Typel ϕ13, 8-M8X1.5 bolts
	04	JIS Flange Typel ϕ20, 8-M10X1.5 bolts
	05	JIS Flange Typel ϕ25, 8-M10X1.5 bolts
	06	JIS Flange Typel ϕ26, 8-M10X1.5 bolts
11,12	Relief valve setting	
	00	None
	01	190 bar
	02	220 bar
	03	230 bar
	04	240 bar
	05	250 bar
	06	280 bar
	07	290 bar
	08	300 bar
	09	320 bar
	10	175 bar
	11	200 bar
	12	260 bar
	13	270 bar
	14	180 bar
	15	270 bar
	16	210 bar

The following 25-digit coding system has been developed to identify standard configuration options for the Fixed Displacement Swing Drive Motor. Use this model code to specify a motor with the desired features. All 25 digits of the code must be present to release a new product number for ordering.

• Available option ● Preferred option ▲Need consult

029	030	033	036	043	047	048	053	064	068	080	151	195	233	250			
•	•	•	•	•	●	•	•	•	•	•	•	•	•	•	**13,14**	Parking brake	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		00	None
																01	Built-in
															15,16	Brake release valve (Release pressure)	
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		00	None
•	•	•	•	•	•	•	•						•	•		01	4 bar
								•	•		•					02	5 bar
												•				03	8 bar
																04	9 bar
										•						05	13 bar
															17	Anti-reverse valve	
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		0	None
					•	•		•	•	•	•	•	•	•		1	Built-in
															18,19	Gear ratio	
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		00	None
											•					17	17
•	•	•	•	•	•	•	•	•	•	•	•		▲			19	19
																20	20
												▲				22	22
														▲		24	24
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		##	Special Ratio
															20,21	Special requirements	
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		00	None
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		##	Special specification required
															22	Painting	
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		A	Primer
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		B	Eaton blue
															23,24	Identification number	
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		00	Eaton standard
															25	Design number	
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		A	First design

Performance

Model	Motor Displacement	Max. Output Torque	Gear Ratio	Reducer Max. speed	Max. Flow	Normal Pressure*	Peak pressure	Mechanical Brake Torque(Motor)	Time Delay Valve	Anti-reverse valve	Output Pinion		Mass	Typical vehicle application
	cc/rev	N.m		rpm	l/min	bar	bar	N.m			Module	Number	kg	Ton
029	29	1929	19.5	63	35.6	230	276	137	●	X	7	13	75	5~6
030	30	2118	19.5	60	35.6	230	276	137	●	X	7	13	75	5~6
033	33	2277	19.5	63	40	230	276	137	●	X	7	13	75	5~6
036	36	2569	19.5	51	36	230	276	137	●	X	7	13	75	5~6
043	43	2873	19.5	72	60	230	276	137	●	X	8	12	75	5~7
047	47	3182	19.5	74	68	230	276	137	●	●	8	12	77	7~8
048	48	3182	19.5	74	68	230	276	137	●	●	8	12	77	7~8
053	53	3034	19.5	78	81	230	276	137	●	X	8	12	77	7~8
064	64	4565	19.0	107	130	280	336	245	●	●	10	12	112	12~14
068	68	4850	19.0	101	130	280	336	245	●	●	10	12	112	12~14
080	80	5727	19.0	95	140	280	336	300	●	●	10	12	116	14
151	151	9977	17.6	84	225	280	336	579	●	●	12	13	237	22, 45
195	195	18331	22.0	58	250	320	385	864	●	●	14	14	400	30~33
233	233	23166	22.0	56	288	320	385	1049	●	●	14	15	440	33~36
250	250	24858	22.0	52	288	320	385	1049	●	●	14	15	440	33~36, 120

● - Standard X - Not available

* Normal Pressure is the max. relief valve setting pressure
** For 32cc, 39cc, gearbox integrated option is not available. Please consult AP product marketing for further information.

Technical Data

1	Operation temperature rating	-20°C - +95°C	
2	Oil viscosity recommendation		
		Gear oil: 80W-90	Hydraulic oil: VG-46
	Viscosity at 40°C	143 mm²/s	46mm²/s
	Viscosity at 100°C	16mm²/s	7mm²/s
3	Oil cleanliness minimum requirements	NAS 9, or ISO 4406 (20/18/15)	
4	Case pressure	2 bar max.	

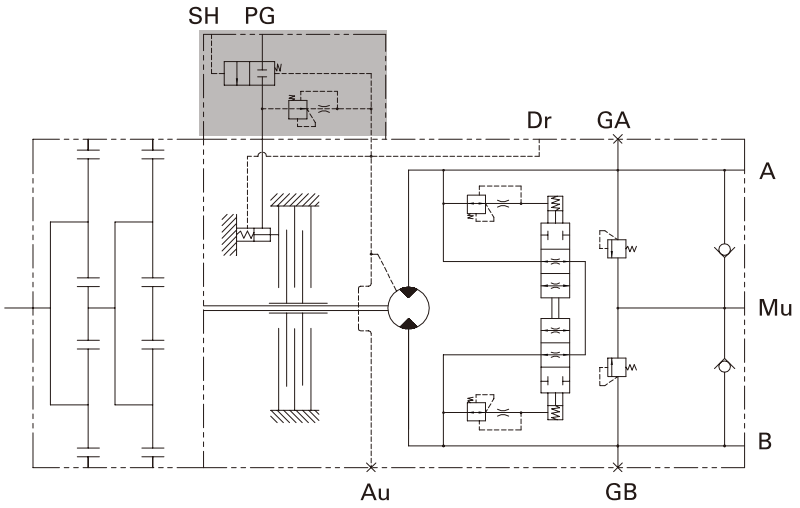
Parking Brake & Brake Release Valve

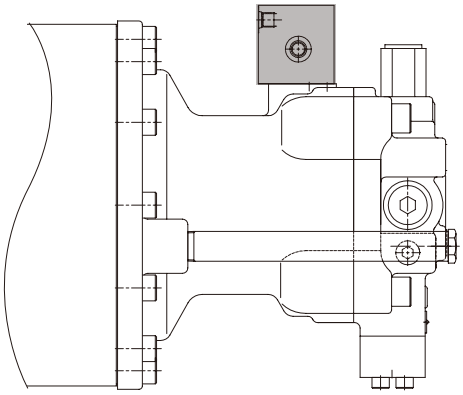
The Parking Brake and Brake Release Valve is incorporated into the system to provide controlled operation and reduction of wear to the Swing Motor.

The Swing Parking Brake consists of multiple wet friction plates. The brake is applied via a spring force and removed by pilot pressure.

- Parking Brake - OFF [disengaged]
  When SH port receives a hydraulic signal from a Hydraulic Remote Control (HRC), the spool in the Delay Valve shifts, opening the PG port. The pilot signal from PG is transferred to the chamber of the brake plate piston which overcomes the spring force and instantaneously lifts the friction plates disengaging the brake.

- Parking Brake - ON [engaged]
  When SH port receives no hydraulic signal from a HRC, spring force shifts the spool in the Delay Valve back to its neutral position, blocking the PG port. The pilot signal from PG to the brake plate piston is lost and the pressure in the pistons chamber starts to discharge to the Drain port through the Delay Valve Orifice. The orifice is sized to ensure a six second time period is achieved, giving time for the Swing Motor to completely stop before the friction plates engage with the brake.



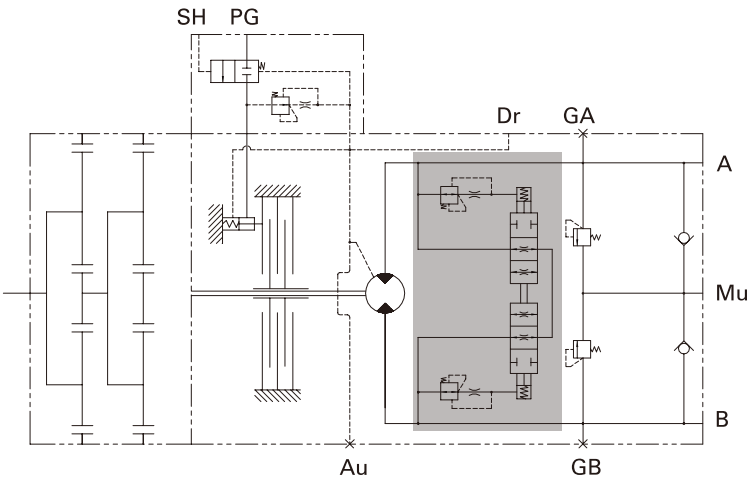


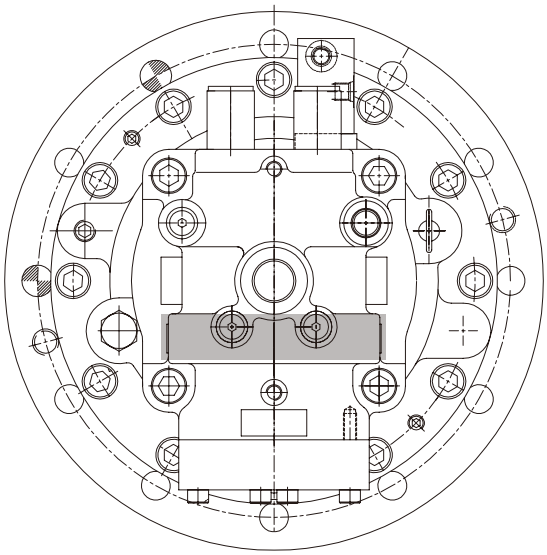
Anti-Reverse Valve

The Anti-Reverse Valve is incorporated into the system to prevent uncontrolled reverse rotation and bounce back of the Swing Motor during the stopping cycle. Benefits of this functionality are to prevent loss of load from the bucket and reduction of mechanical stresses or accelerated wear on the motor shaft and work circuit pinions.

- Starting the swing operation
  When ports A and B are open, the upstream poppet of the Anti-Reverse Valve shifts to produce flow through an orifice to the spool end spring chamber. The spool in the Anti-Reverse Valve shifts from its Neutral position blocking its by-pass orifice allowing smooth operation of the Swing Motor.

- Stopping the swing operation
  When ports A and B are blocked, there is no flow to the motor preventing any further swing movement. However, due to swing inertia of the excavator's upper body the motor will continue to rotate, inducing pressure in the downstream port. The pressure on the upstream side of the motor decays whereas downstream continues to rise until it overcomes the mechanical advantage of the work circuit, at such point the compressed oil will force the motor to reverse. Concurrently, the Anti-Reverse Valve compensates for the fluctuating loads across the motor until equilibrium is achieved and the spool returns to its neutral position.

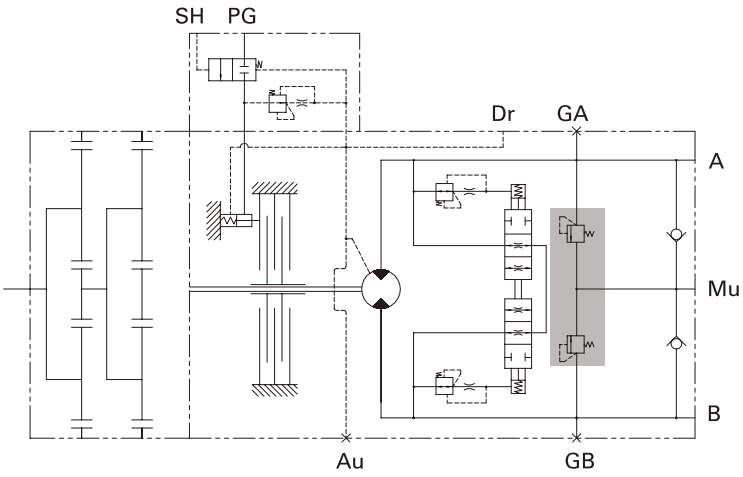


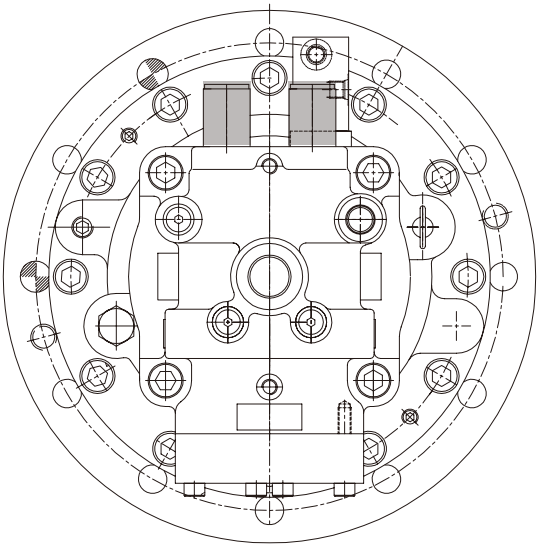


Relief Valves

Relief Valves are incorporated into the system to prevent internal damage of the Swing Motor and Brake Swing.

When ports A and B are blocked, there is no flow to the motor preventing any further swing movement. However, due to swing inertia of the excavator's upper body the motor will continue to rotate which induces excessive over pressure in the downstream port. The Relief Valves function is to discharge the rising port pressure from the high pressure port to the low pressure port of the motor.

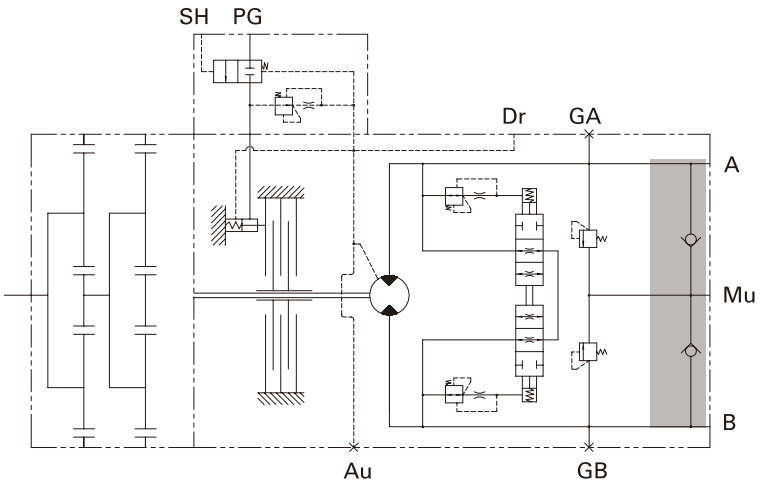


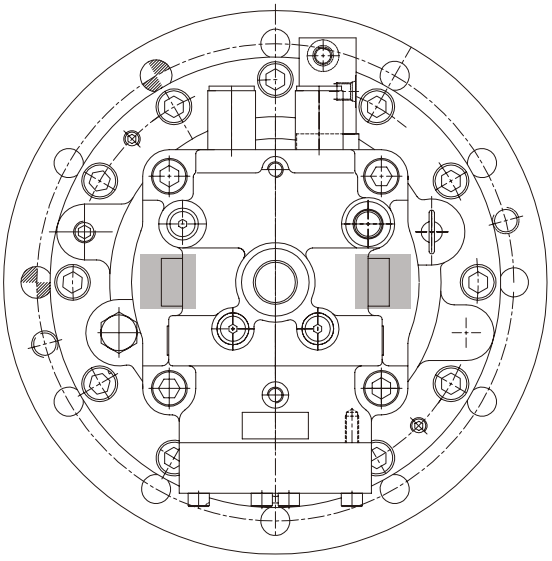


Anti-Cavitation Valves

Anti-Cavitation Valves are incorporated into the system to prevent internal damage of the Swing Motor and Brake Swing.

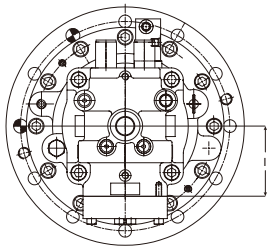
When ports A and B are blocked, there is no flow to the motor preventing any further swing movement. However, due to swing inertia of the excavator's upper body the motor will continue to rotate, starving the motors upstream port of oil which induces Cavitation. The Anti-Cavitation Valves function is to scavenge oil from the tank line through MU Port to supplement insufficient oil volume until the motor completely stops.

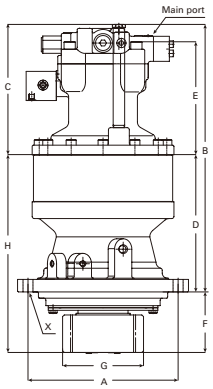




Installation Dimensions

JMF029~250





Unit: mm

Model	øA	B	C	D	E	F	øG	H	I	X	Main Port
029	275	405	210	194	184	98	112	292	72	7-ø17	2-G1/2 (2-PF1/2)
030	275	405	210	194	184	98	112	292	72	7-ø17	2-G1/2 (2-PF1/2)
033	275	405	210	194	184	98	112	292	72	7-ø17	2-G1/2 (2-PF1/2)
036	275	402	208	194	178	98	112	292	72	7-ø17	2-G1/2 (2-PF1/2)
043	275	399	205	194	178	106	120.8	300	72	7-ø17	2-G1/2 (2-PF1/2)
047	275	410.5	216.5	194	189.5	105	120.8	299	72	7-ø17	2-G1/2 (2-PF1/2)
048	275	442.5	249.5	193	189.5	127	109.4	320	75	7-ø18	2-G1/2 (2-PF1/2)
053	275	410.5	216.5	199	189.5	106.2	117.8	305.2	72	7-ø17	2-G1/2 (2-PF1/2)
064	290	468	234	234	196	113	143	347	97	9-ø18	ø13 Flange
068	290	468	234	234	196	113	143	347	97	9-ø18	ø13 Flange
080	290	496	248	248	208	115	143	363	97	9-ø18	ø13 Flange
151	360	632	298	334	248	143	194	477	121	11-ø22	ø20 Flange
195	430	737	342	395	258	184	232	579	112	12-ø26	ø25 Flange
233	430	804	393	411	345	205	238	616	148	12-ø26	ø26 Flange
250	430	804	393	411	345	205	238	616	148	12-ø26	ø26 Flange

Gearbox Output Shaft

Dimension, mm

29/30/33/36		
Spur gear		
Number of teeth	13	
Module	7	
Pressure angle	20°	
Pitch diameter	Φ91	
Add modification coefficient	0.5	
Span measurement	55.331	0 -0.08
Span number	3	

43/47/48		
Spur gear		
Number of teeth	12	
Module	8	
Pressure angle	20°	
Pitch diameter	Φ96	
Add modification coefficient	0.55	
Span measurement	39.78	-0.08 -0.19
Span number	2	

53		
Spur gear		
Number of teeth	12	
Module	8	
Pressure angle	20°	
Pitch diameter	Φ96	
Add modification coefficient	0.35	
Span measurement	38.685	-0.085 -0.140
Span number	2	

64/68/80		
Spur gear		
Number of teeth	12	
Module	10	
Pressure angle	20°	
Pitch diameter	Φ120	
Add modification coefficient	0.43	
Span measurement	48.914	-0.084 -0.328
Span number	2	

151		
Spur gear		
Number of teeth	13	
Module	12	
Pressure angle	20°	
Pitch diameter	Φ156	
Add modification coefficient	0.74	
Span measurement	61.4	-0.10 -0.50
Span number	2	

195		
Spur gear		
Number of teeth	14	
Module	14	
Pressure angle	27°	
Pitch diameter	Φ196	
Add modification coefficient	0.5	
Span measurement	71.68	0 -0.20
Span number	2	

233/250		
Spur gear		
Number of teeth	15	
Module	14	
Pressure angle	27°	
Pitch diameter	Φ210	
Add modification coefficient	0.2	
Span measurement	107.5	0 -0.40
Span number	3	

Motor Output Shaft

29/30/33/36/43/47/48		
Involute spline		
Number of teeth	15	
Pitch	16/32	
Pressure angle	30°	
Pitch diameter	Φ23.8125	
Major diameter	Φ24.8±0.1	
Minor diameter	Φ21.336	
Over pin(Φ3.048)	Φ28.209	
	Φ28.272	

64/80		
Involute spline		
Number of teeth	16	
Module	1.667	
Pressure angle	20°	
Pitch diameter	Φ26.667	
Displacement(3)	13.586	-0.062
		-0.118
Over pin(Φ3)	Φ32.851	-0.129
		-0.217

151		
Involute spline		
Number of teeth	16	
Module	2.5	
Pressure angle	20°	
Pitch diameter	Φ40	
Displacement(3)	20.379	-0.061
		-0.118
Over pin(Φ4.5)	Φ49.227	-0.129
		-0.217

151		
Involute spline		
Number of teeth	13	
Pitch	8/16	
Pressure angle	30°	
Pitch diameter	Φ41.275	
Major diameter	Φ43.71	
Minor diameter	Φ36.626	
Form diameter	Φ38.125	
Base diameter	Φ35.745	
Over pin(Φ3.048)	Φ50.104	+11
		0

233/250		
Involute spline		
Number of teeth	20	
Pitch	2.5	
Pressure angle	20°	
Pitch diameter	Φ50	
Displacement(3)	20.519	-0.061
		-0.118
Over pin(Φ4.5)	Φ59.446	-0.135
		-0.228

Application Description

Swing Function

- Starting the swing operation
  When the Swing Motors Delay Valve receives a hydraulic signal from a Hydraulic Remote Control (HRC), the Parking Brake is disengaged. Simultaneously a control valve receives the same signal which opens A and B ports, consequently shifting the Anti-Reverse Valve from Neutral giving full operation of the Swing Motor.
- Stopping the swing operation
  When the HRC is in neutral, the Delay Valve commences its six second discharge before the Parking Brake engages with the Swing Motor. This delay gives adequate time for the Anti-Reverse Valve, the Anti-Cavitation Valves and the Relief valves to control the system inertia bring the Swing Motor to a controlled stop.

Troubleshooting

General Precautions

- If you experience abnormal operation of the Swing Motor, consider all elements within the work circuit that could potentially effect the Swing Motor's performance.
- If deemed necessary to disassemble the Swing Motor it is critical to do so in a clean environment, in order to ensure no contamination is introduced during the reassembly process.
- In the event of disassembly, note that the internal hydraulic components of the Swing Motor are precision manufactured and as a result must be handled with care to avoid irreversible damage.

Diagnosis & Maintenance

- If the motor is making an unusual sound. Unscrew the plug from the case drain and check whether the recommended level of oil is present. Top up the oil level if required. Check the quality of the oil, if impurities are found replace the oil to optimize the life of the Swing Motor.
- If you still experience abnormal operation of the motor, measure the pressure through out the work circuit to assess whether or not the motor is at fault.

Application Data Sheet

Contact: _____ Date: _____

Company/Location: _____ Model / Application: _____

Distributor/Eaton Contact: _____ Annual Usage: _____

Prototype / Production Date: _____

Machine Specifications:

Available Horsepower @ RPM: _____ hp @ _____ rpm

Vehicle / Component Weight: _____ lbs / kg

Machine Life Goal: _____ hours

Machine Usage Environment: _____

Machine Temperature Range: _____ °F / °C

Type of Hydraulic Circuit: _____ Open/Closed

Main Relief Set Pressure: _____ psi / bar

Main Relief Set Flow Rate: _____ gpm / lpm

Max Working Pressure: _____ psi / bar

Max Flow per Motor: _____ gpm / lpm

Hydraulic Oil Type: _____

Hydraulic Oil Temp Range: _____ °F / °C

Current Swing Drive (mfg, model): _____

Hydraulic Schematic Available: _____ Y or N

Current Swing Drive Motor Info: _____ in^3/ rev / cc / rev

Requested Specifications:

Max Pinion Output Speed: _____ rpm

Swing Drive Lifetime: _____ hours

Max Pinion Output Torque Required: _____ ft-lbs / Nm

Motor Brake Required: _____ Parking / Service / No

Swing Mass: _____ lbs / kg

Motor Brake Torque Required: _____ ft-lbs / Nm

Accelerating Torque Required: _____ ft-lbs / Nm

Brake Release Pressure: _____ psi / bar

Pinion Teeth: _____ Teeth

Counterbalance Valve Pressure: _____ psi / bar

Pinion Pitch Diameter: _____ in / mm

Anti-Shock Valve Pressure: _____ psi / bar

Pinion Pressure Angle: _____ Degrees

Motor Displacement: _____ in^3 / rev / cc / rev

Pinion Diametral Pitch: _____ Teeth / inch

Gear Ratio: _____ :1

Slew / Pinion Ratio: _____

Shaft Type Required: _____

Slew/Pinion Center Distance: _____ in / mm

Backlash Adjustment Method: _____

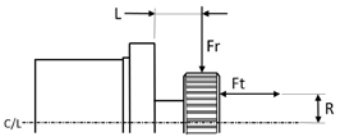
Max External Loads:

Max Separation Force (Fr): _____ lbs / N

Thrust Force (Ft): _____ lbs / N

Hub Face to Pinion Centerline (L): _____ in / mm

Thrust Force Location (R): _____ in / mm



Motor Duty Cycle Information:

Pressure/Torque	Speed	Direction	% Duty

Additional Information:

Notes

Eaton
Hydraulics Group USA
14615 Lone Oak Road
Eden Prairie, MN 55344
USA
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Document No. E-MOPI-MC019-E5
December 2015