

Instruction Manual
PL70-1052EN
08/05/2015

Cleco®

MM Series
Radial Piston Power Motors



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Cleco® Specifications

Model Number	Maximum Allowable RPM**		Stall Torque		Starting Torque		Weight		Air Consumption		Gear Ratio	Maximum Overhung Load @ Stall *	
	@ Max. HP	Free Speed	ft. lbs.	Nm	ft. lbs.	Nm	lbs.	kg	cfm	m3/min		lbs.	kg
Single Direction Valving													
MMS396M	1070	2100	138	187	82	111	210	95.3	348	9.86	----	2500	1134
MMS400M	206	400	715	970	424	575	226	102.5	336	9.52	5.2:1	2800	1270
Reversible Valving													
MMR397M	1010	2100	138	187	82	111	214	97.1	352	9.97	----	2500	1134
MMR401M	194	400	715	970	424	575	231	104.8	332	9.40	5.2:1	2800	1270
MMR399M	71	150	1952	2647	1157	1569	231	104.8	345	9.77	14.2:1	2800	1270
without Valving													
MMW421M	1010	2100	138	187	82	111	214	97.1	352	9.97	----	2500	1134
MMW423M	194	400	715	970	424	575	231	104.8	332	9.40	5.2:1	2800	1270
MMW422M	71	150	1952	2647	1157	1569	231	104.8	345	9.77	14.2:1	2800	1270

* Note: All models assume overhung load located at 1.000" (25.40mm) from the face of the motor.

**Note: These motors must be operated with sufficient load to prevent speed from exceeding maximum allowable speed.



The original language of this manual is English.

Product Safety Information:

Intended Use:

This pneumatic motor is to be used exclusively as a power source to be integrated into an application.

For additional product safety information refer to Apex Tool Group, LLC or Apex Tool Group GmbH & Co. OHG document CE-2005, General Safety Instructions for Air Motors.



The motor must not be modified in any manner unless approved in writing by Apex Tool Group, LLC or Apex Tool Group GmbH & Co. OHG. All safety devices must be properly installed and maintained in good working order.

Declaration of Incorporation:

We affirm that this machine complies with the basic requirements of the following directives (2006/42/EC) and is intended for installation / assembly in a / with other machine(s). Commissioning of the incomplete machine is prohibited until such time that the incomplete machine has been incorporated in a machine that complies with the EC Machinery Directive 2006/42/EC and for which there is an EC Declaration of Conformity in accordance with Appendix II A. We furthermore declare that the special technical documentation for the incomplete machine is in accordance with Appendix VII Part B. We undertake to have it passed on to the market surveillance body upon request by our representative for the compilation of technical documentation. The following Sections of Appendix I of Directive 2006/42/EC have been fulfilled: 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4, 1.5. Applied harmonized standards are ISO 12100-1: 2004-04, ISO 12100-2:2004-04.

The name, job function and address of the person authorized to compile the technical file.

Mr. Vishnu Irigireddy
Director of Global R&D- Mechanical Engineering
Apex Tool Group
670 Industrial Drive
Lexington, SC 29072

Signature: Vishnu Irigireddy
Date: August 05, 2015

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Disposal:



Observe local disposal guidelines for all components of this tool and its packaging.

Service and Repair:

Tool service and repair should be performed by an authorized Apex Tool Group, LLC or Apex Tool Group GmbH & Co. OHG Center. Refer to the last page of this manual for locations.

Air Supply Line:

Parameter	Description
Air Hose	Minimum inside diameter: 1/2" (12.7mm) Maximum length: 16.4' (5 m)
Working pressure range	Performance rated at: 90 psi (620 kPa)
Compressed air	Air quality according to ISO 8573-1, quality class 2.4.3 The compressed air must be clean and dry.

Lubrication:

For proper function and long service life, use of the correct lubricant is essential.

Oil identification

Fill the motor to the proper level before operating. Use engine oil API Service Classified "SC" in the following weights:

- Above 32° F: SAE 30W
- Below 32° F: SAE 10W

If the air line carries an excessive amount of water and a water trap cannot be installed, use a good grade of motor oil that will emulsify with water to prevent damage to vital parts of the motor.

Oil quantity

Approximately 1-1/2 quarts of oil is required to fill the motor case to the proper oil level. Approximately 1 quart

of oil is required to fill the gear case to the proper oil level. The oil must flow at all times to properly lubricate the motor components, gears and bearings.

To check the MM for proper oil level, open the oil level pet cock. If oil does not flow from the pet cock, add the proper oil until oil begins to flow. Securely tighten the oil level pet cock.

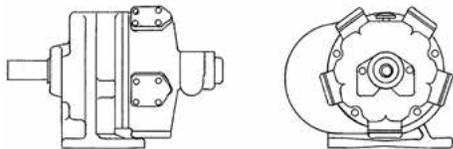
Remove the oil drain plug in the motor case occasionally and drain off accumulated water before adding new oil.

Excessive use of oil is usually due to:

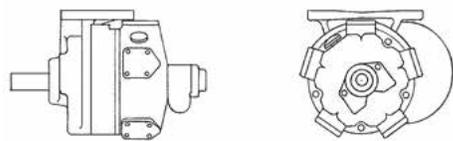
- Worn pistons
- Worn piston rings
- Worn distributing valve and bushing
- Damaged oil seals
- Clogged breather cap

Motor Mounting Options

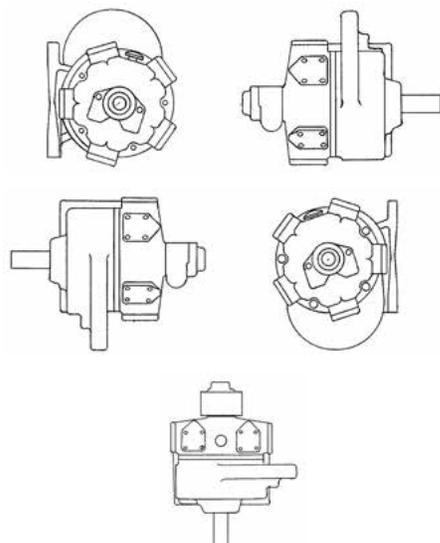
Floor Mounting



Ceiling Mounting



Wall Mountings



First operation

Putting into use

The MM series motors are a five cylinder radial piston type. This radial design, with its overlap of power impulses, provides even torque at all speeds and full power in either direction of rotation. At least two pistons are always on a power stroke.

These motors are designed for continuous service on 60-100 PSI air pressure. If overloaded beyond their power capacity, the motor will simply stall without causing any damage.

- Make sure the air line is clean and free of scale and dirt before connecting to the motor.
- Make sure all pipe fittings are securely tightened to prevent air leaks.
- Make sure the air supply is securely attached and the compressor is turned on.
- Make sure the output spindle is properly engaged with the application.
- Make sure all necessary guards are in place to protect operator from rotating mechanisms.

Continuous Operation: Do not operate the MM motors faster than 65% of free speed. Install a filter/lubricator unit in the air line as close as possible to the MM motor.

Intermittent Operation: The splash lubrication from the motor case will be adequate.

If an excessive amount of water is found in the air line, a water trap should be installed to trap as much as possible before it reaches the MM motor.

Maintenance

Service Schedule

Only qualified and trained personnel are permitted to perform maintenance on these motors.

Regular maintenance reduces operating faults, repair costs and downtime. In addition to the following service schedule, implement a safety related maintenance program that takes the local regulations for repair and maintenance for all operating phases of the motor into account.

Daily Maintenance

- Visual inspection of the air supply hose and connections.
- Inspect air regulator and water trap, if installed.

- Check the motor for loose mountings causing vibration or unusual noises.
- Visually inspect all external components of the motor.

Weekly Maintenance

- Inspect the air supply line for damage, wear, or loose connections.
- Inspect the output spindle for damage or wear
- Inspect the breather cap to make sure it is not plugged, clean or replace as necessary.
- Remove the motor case drain plug to allow water and condensate to drain out.
- Check the oil levels in the motor case and gear case, add oil as necessary.

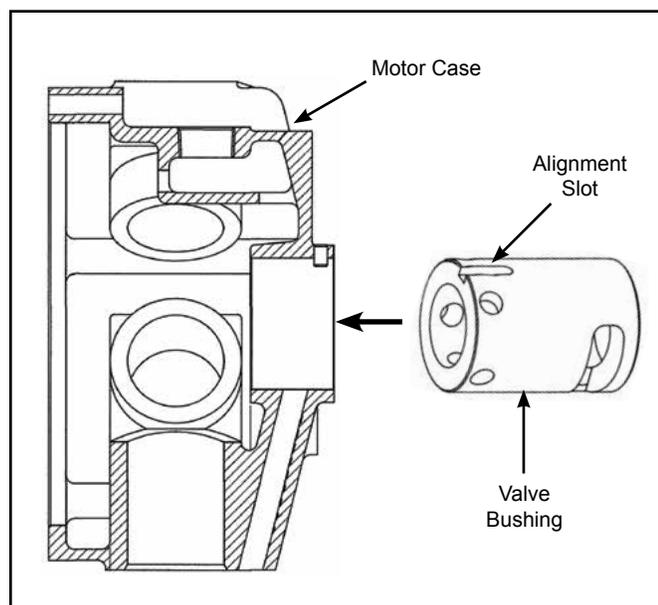
Repair Instructions:

Motor Case Assembly:

Install the pin (DP114) into the motor case until approximately 1/8" of the pin is exposed in the distributing valve bushing hole.

Install the valve bushing (200MAM502) into the motor case counter bore until it is flush with the inside edge of the counter bore. The valve bushing has a slot to enable proper alignment during assembly

NOTE: The valve bushing must be put in a freezer before assembling into the motor case. This will cause the bushing to contract allowing easier assembly into the motor case.



Direct Drive Models: Assembly

Install the piston rings into the grooves of the pistons. The step on the ring must be placed toward the open part of the piston.

Assemble a retainer into one end of the hole in the pistons.

Slip the bushing (MK33), chamfer down, over the crankshaft (drive end) until it bottoms out. Line up the oil holes with the groove in the crankshaft.

Put a light coating of oil on the bushing (MK28) and slide it over the bushing (MK33) on the crankshaft.

Tap the key (35D13) into the keyway on the crankshaft.

Place one connecting rod retainer over the bushing (MK28). Place the five connecting rods into the connecting rod retainer. Make sure the lettering on the rods are up. Place the other connecting rod retainer over the connecting rods and bushing (MK28).

Assemble the crankshaft (drive end) to the crankshaft (valve end). Line up the shaft groove with the hole in the crankshaft and insert the screw (MK32). Secure with the nut (50E5) and cotter pin.

Press the bearing (12J37) onto the crankshaft assembly until it bottoms out.

Place the crankshaft assembly into the motor case and tap into position.

Using the piston pins, attach the five pistons to the connecting rods and secure with the retainers (MK26).

Place a cylinder gasket on each of the cylinders. Oil the inside of the cylinders.

Compress the piston rings and slide a cylinder over each piston. Secure the cylinders using the washers (95G24) and screws (75A20). Tighten the screws to 45 ft. lbs. (61 Nm) torque.

Lightly oil the valve bushing and distributor valve. Insert the distributor valve into the valve bushing (locate in dowel pin).

Slide the valve chest over the bushing and secure with two washers (95G24) and screws (75A167). Tighten the screws to 45 ft. lbs. (61 Nm) torque.

Apply air to the unit and test run in one direction only.

Press the bearing (12GG2) into the frame until it bottoms out.

Place the bearing (12J15) onto the non-threaded end of the shaft until it bottoms out.

Tap the key (35D13) into the motor shaft keyway.

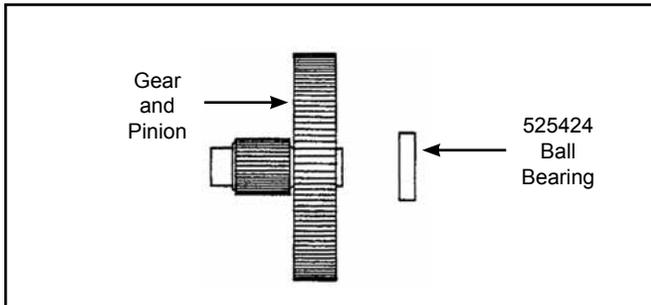
Place the shaft assembly into the crankshaft assembly and tap in until it bottoms out.

Place the gasket on the motor case and assemble the motor case to the motor frame, breather hole up. Secure with washers (95G24) and screws (75A12). Tighten the screws to 45 ft. lbs (61 Nm) torque.

Assemble the pipe plugs and drain cock. Fill the motor case with 1 quart of oil.

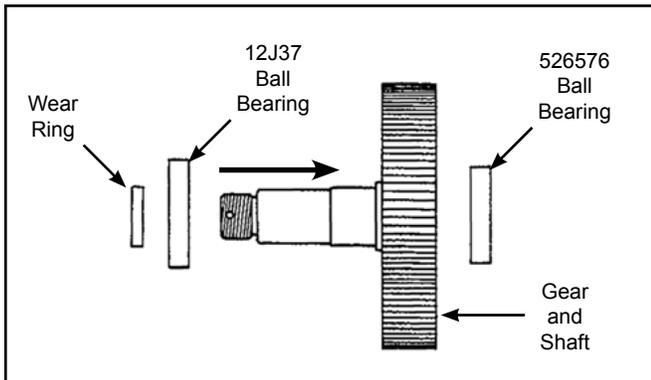
Geared Models: Assembly:

Press the ball bearing (525424) onto the large gear end of the gear and pinion.



Press a ball bearing (526576) onto the geared end of the gear and shaft until it bottoms out.

Press a ball bearing (12J37) and wear ring (MKGP40R) onto the threaded or keyed output shaft end until they bottom out.

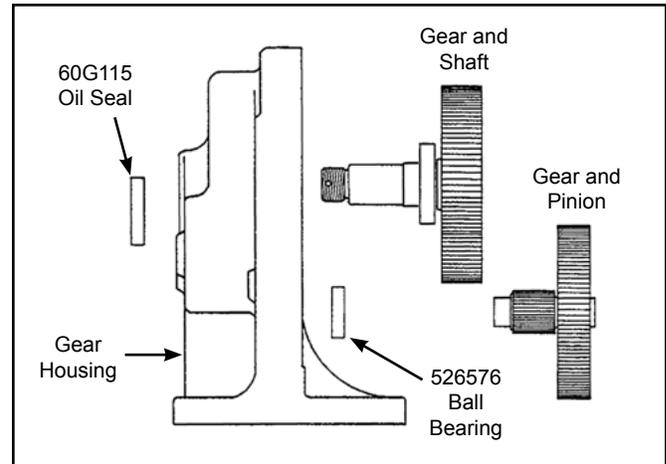


Press the oil seal (60G115) into the gear housing until it is flush with the outside edge of the housing.

Press the gear and pinion bearing (526576) into the gear housing until it bottoms out.

Insert the gear and shaft assembly into the gear housing and tap in until it bottoms out.

Install the gear and pinion assembly into the gear housing. Make sure the small diameter gear teeth fully engage the gear teeth of the gear and shaft.



Place the bearing housing (MK39) on the bearing housing (MK20) and secure with three washers (W125) and screws (75B4). Tighten the screws to 45 ft. lbs. (61 Nm) torque.

Place the gasket (HK25) over the gear housing and assemble the bearing housing. Make sure the pin in the bearing housing fits into the mating hole in the gear housing.

Press the bearing (12J37) onto the pinion gear until it bottoms out. Tap the key (35D13) into the pinion gear keyway. Insert the pinion gear assembly into the crankshaft assembly until it bottoms out.

Install the piston rings into the grooves of the pistons. The step on the ring must be placed toward the open part of the piston.

Assemble a retainer into one end of the hole in the pistons.

Slip the bushing (MK33), chamfer down, over the crankshaft (drive end) until it bottoms out. Line up the oil holes with the groove in the crankshaft

Put a light coating of oil on the bushing (MK28) and slide it over the bushing (MK33) on the crankshaft.

Tap the key (35D13) into the keyway on the crankshaft.

Place one connecting rod retainer over the bushing (MK28). Place the five connecting rods into the connecting rod retainer. Make sure the lettering on the rods are up. Place the other connecting rod retainer over the connecting rods and bushing (MK28).

Assemble the crankshaft (drive end) to the crankshaft (valve end). Line up the shaft groove with the hole in the crankshaft and insert the screw (MK32). Secure with the nut (50E5) and cotter pin.

Press the bearing (12J37) onto the crankshaft assembly

until it bottoms out.

Place the crankshaft assembly into the motor case and tap into position.

Using the piston pins, attach the five pistons to the connecting rods and secure with the retainers (MK26).

Place a cylinder gasket on each of the cylinders. Oil the inside of the cylinders.

Compress the piston rings and slide a cylinder over each piston. Secure the cylinders using the washers (95G24) and screws (75A20). Tighten the screws to 45 ft. lbs. (61 Nm) torque.

Lightly oil the valve bushing and distributor valve. Insert the distributor valve into the valve bushing (locate in dowel pin).

Slide the valve chest over the bushing and secure with two washers (95G24) and screws (75A167). Tighten the screws to 45 ft. lbs. (61 Nm) torque.

Apply air to the unit and test run in one direction only.

Place the gasket on the motor case and assemble the motor case to the motor frame, breather hole up. Secure with washers (95G24) and screws (75A12). Tighten the screws to 45 ft. lbs (61 Nm) torque.

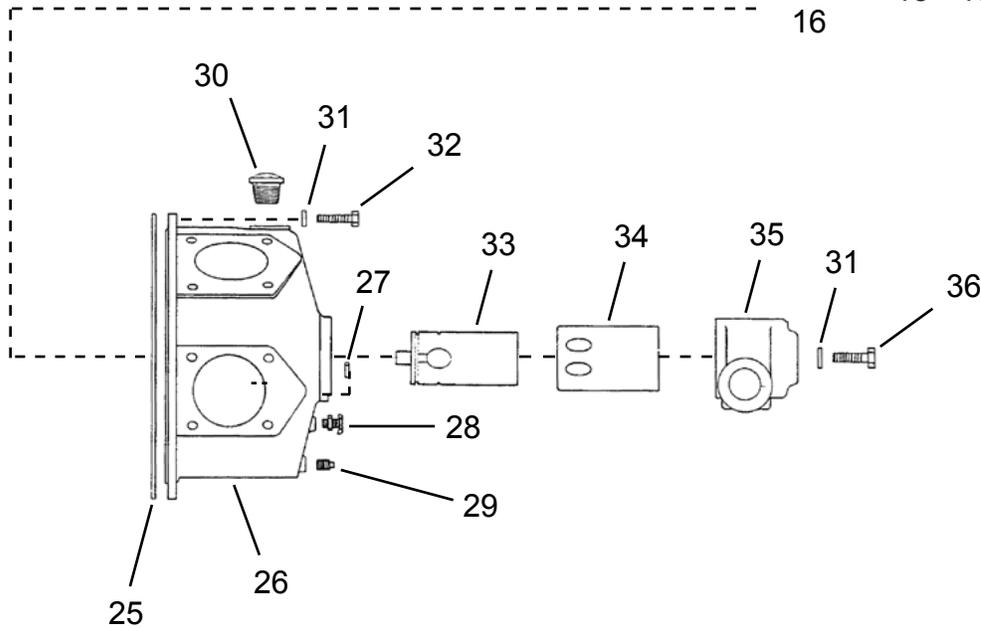
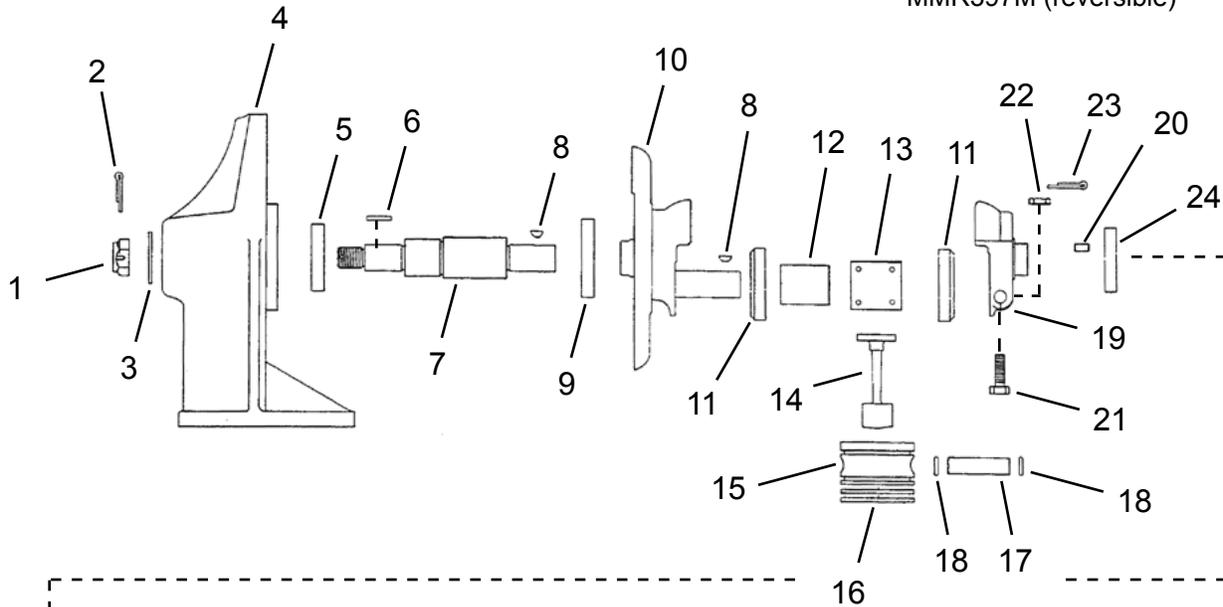
Assemble the pipe plugs and drain cock. Fill the motor case with 1-1/2 quarts of oil and the gear housing with 1 quart of oil.

Cleco®
MM Series Direct Drive Motor

“A”

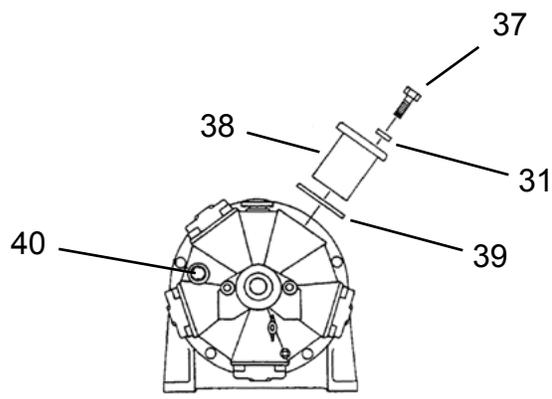
Models

MMW421M (without valving)
MMS396M (single direction)
MMR397M (reversible)



MOTOR ROTATES TOWARD AIR INLET

 OPEN OPPOSITE AIR INLET
 IS AUXILIARY EXHAUST
 AND MUST NOT BE PLUGGED



MM Series Direct Drive Motor

Illustration "A": MM Series Direct Drive Power Motor

Ref	Number	#	X	EN
				Description
1	50E11	1	2	Output Shaft Hex Nut
2	62E9	1	3	Cotter Pin
3	95A10	1	2	Output Shaft Washer
4	MKA7	1		Motor Frame
5	12GG2	1	2	Ball Bearing
6	35B207	1	3	Motor Shaft Key
7	MKA3	1		Motor Shaft
8	35D13	2	6	Woodruff Key
9	12J15	1	2	Ball Bearing
10	MK30Y	1		Crankshaft (Drive End)
11	MK29	2		Connecting Rod Retainer
12	MK33	1		Crankshaft Bushing
13	MK28	1		Connecting Rod Bushing
14	MK27	5		Connecting Rod
15	MM24	5		Piston
16	65A224	10	10	Piston Ring
17	MM25	5		Piston Pin
18	MK26	10	10	Piston Pin Retainer
19	MM31	1		Crankshaft (Valve End) (includes Ref. 20)
20	DP142	1		Crankshaft Pin
21	MK32	1	1	Crankshaft Bolt
22	50E5	1	1	Hex Castle Nut
23	P101J	1	3	Cotter Pin
24	12J37	1	2	Ball Bearing
25	MK19	1	3	Motor Case Gasket
26	MM18	1		Motor Case (includes Ref. 27)
27	DP114	1		Motor Case Pin
28	90C12	1	2	Drain Cock
29	64AA5	1		Pipe Plug
30	542139	1	2	Low Profile Breather Cap
31	95G24	27	27	Flat Washer
32	75A12	5	5	Motor Case Screw
33	MM13	1		Distributing Valve
34	200MAM502	1		Distributing Valve Bushing
35	533799	1		Valve Chest
36	75A167	2	2	Valve Chest Screw
37	75A20	20	20	Cylinder Screw
38	MM22	5		Cylinder
39	MM23	5	15	Cylinder Gasket
40	64A5	1		Pipe Plug
41	MBA15	1		Instruction Plate
42	530322	1		Name Plate
43	534820	1	Kit	Instruction and Name Plate Drive Screw (not shown) - kit contains 71 screws

(#) Quantity

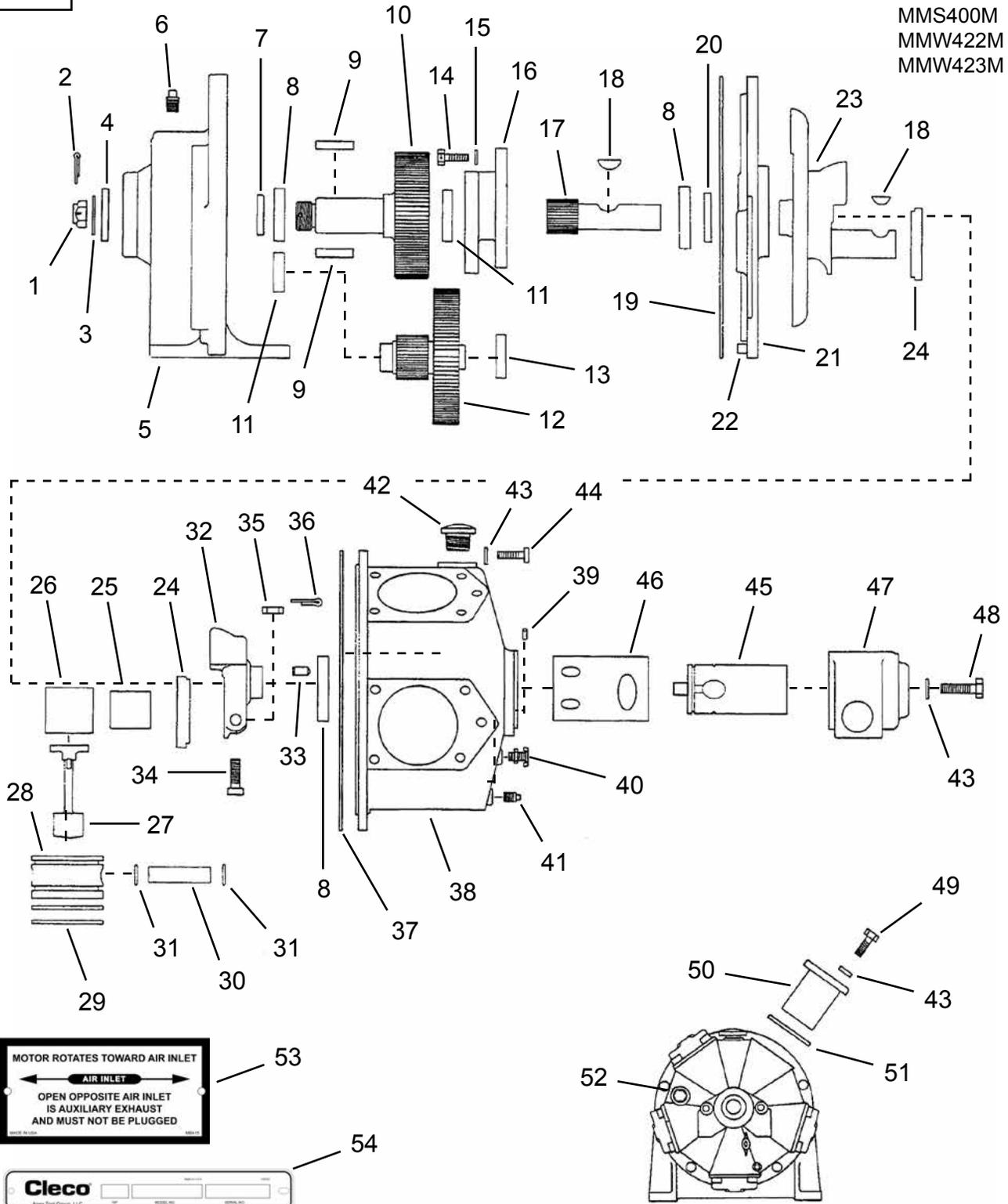
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Cleco®
MM Series Geared Motor

Models

- MMR399M
- MMR401M
- MMS400M
- MMW422M
- MMW423M

“B”



Cleco®
MM Series Geared Motor

PL70-1052EN
08/05/2015

Illustration "B": MM Series Geared Power Motor

Ref	Number	#	X	EN	
				Description	
1	MKU52	1	2	Output Shaft Hex Nut	
2	62E66	1	3	Cotter Pin	
3	95A11	1	2	Output Shaft Washer	
4	60G115	1	3	Oil Seal	
5	MKG1	1		Gear Housing (includes Ref. 6)	
6	B110E	1	2	Pipe Plug	
7	MKGP40R	1	3	Wear Ring	
8	12J37	3	6	Ball Bearing	
9	35B125	2	4	Gear and Shaft Key	
10	Table "B"	1		Gear and Shaft	
11	526576	2	4	Ball Bearing	
12	Table "B"	1		Gear and Pinion	
13	525424	1	2	Ball Bearing	
14	75B4	3	3	Bearing Housing Screw	
15	W125	3	3	Flat Washer	
16	MK39	1		Bearing Housing	
17	Table "B"	1		Pinion Gear	
18	35D13	2	6	Woodruff Key	
19	HK25	1	3	Bearing Housing Gasket	
20	60G116	1	3	Oil Seal	
21	MK20	1		Bearing Housing (includes Ref. 22)	
22	DP162	1		Pin	
23	MK30Y	1		Crankshaft (Drive End)	
24	MK29	2		Connecting Rod Retainer	
25	MK33	1	1	Crankshaft Bushing	
26	MK28	1	1	Connecting Rod Bushing	
27	MK27	5		Connecting Rod	
28	MM24	5		Piston	
29	65A224	10	10	Piston Ring	
30	MM25	5		Piston Pin	
31	MK26	10		Piston Pin Retainer	
32	MM31	1		Crankshaft (Valve End) (includes Ref. 33)	
33	DP142	1		Crankshaft Pin	
34	MK32	1	1	Crankshaft Bolt	
35	50E5	1	1	Hex Castle Nut	
36	P101J	1	3	Cotter Pin	

(#) Quantity

(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Table "B"

Ref.	Description	#	MMR399M MMW422M		MMS400M MMR401M MMW423M	
			#		#	
--	Gear Ratio		14.2:1		5.2:1	
--	Valving		Note 1		Note 1	
10	Gear and Shaft	1	MKG50S	1	MKG51S	
12	Gear and Pinion	1	MK38A	1	MKG38	
17	Pinion Gear	1	MK37	1	MKG37	

Note 1: MMW = no valving, MMS = Single Direction, MMR = Reversible

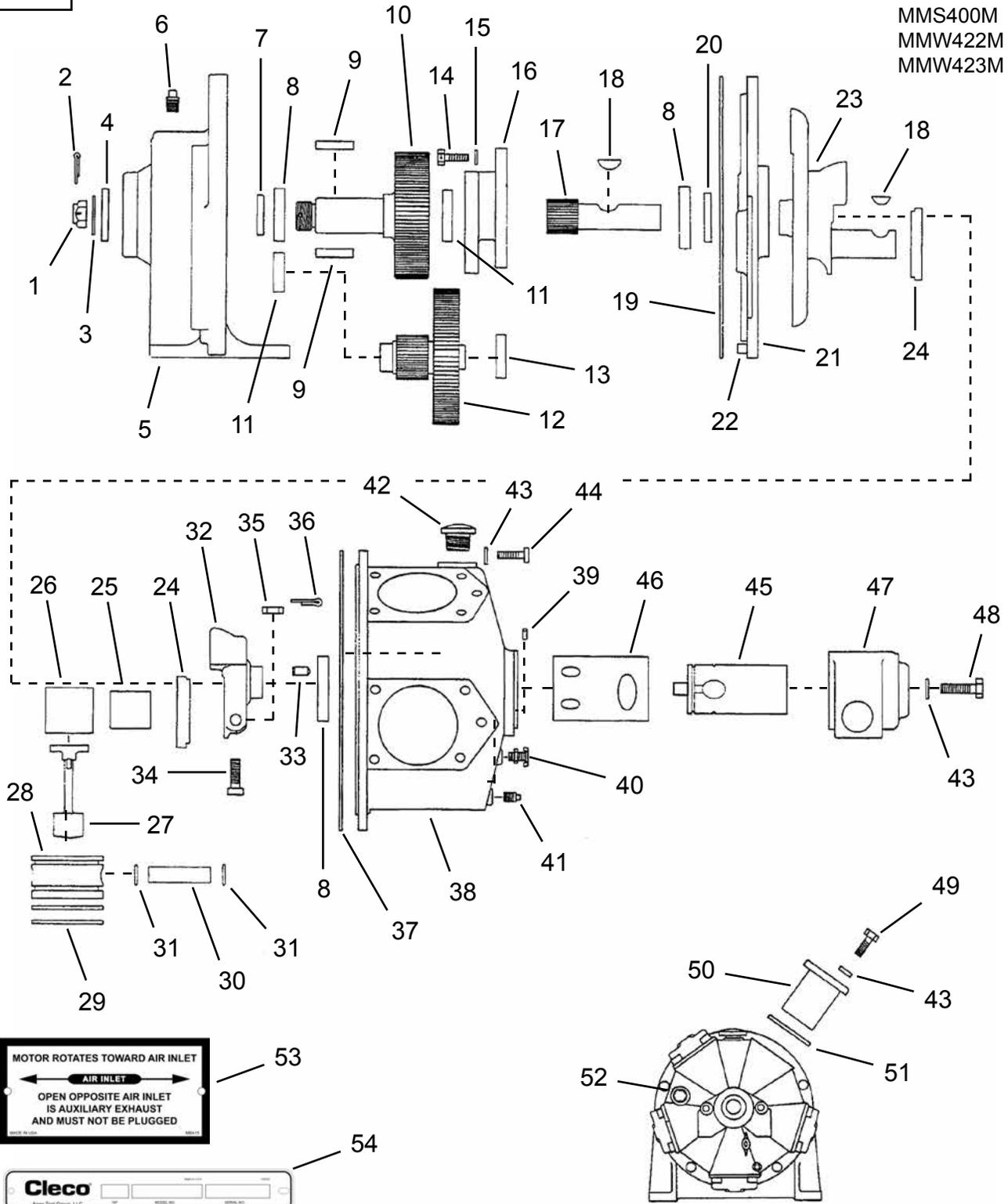


Cleco®
MM Series Geared Motor (continued)

Models

- MMR399M
- MMR401M
- MMS400M
- MMW422M
- MMW423M

"B"



MM Series Geared Motor (continued)

Illustration "B": MM Series Geared Power Motor (continued)

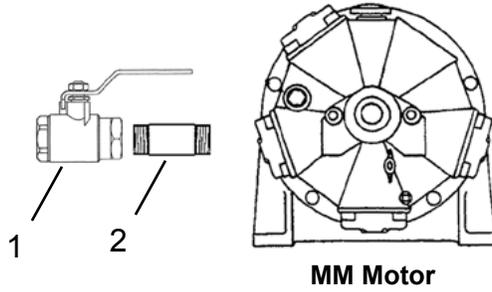
Ref	Number	#	X	EN
				Description
37	MK19	1	3	Motor Case Gasket
38	MM18	1		Motor Case (includes Ref. 39)
39	DP114	1		Motor Case Pin
40	90C12	2	4	Drain Cock
41	64AA5	1		Pipe Plug
42	542139	1	2	Low Profile Breather Cap
43	95G24	27	27	Flat Washer
44	B154M	5	5	Motor Case Screw
45	MM13	1		Distributing Valve
46	200MAM502	1		Distributing Valve Bushing
47	533799	1		Valve Chest
48	75A167	2	2	Valve Chest Screw
49	75A20	20	20	Cylinder Screw
50	MM22	5		Cylinder
51	MM23	5	15	Cylinder Gasket
52	64A5	1		Pipe Plug
53	MBA15	1		Instruction Plate
54	530322	1		Name Plate
55	534820	1	Kit	Instruction and Name Plate Drive Screw (not shown) - kit contains 71 screws

(#) Quantity

(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

“C” Single Direction Valving

Models
MMS396M
MMS400M



“D” Reversible Valving

Models
MMR397M
MMR399M
MMR401M

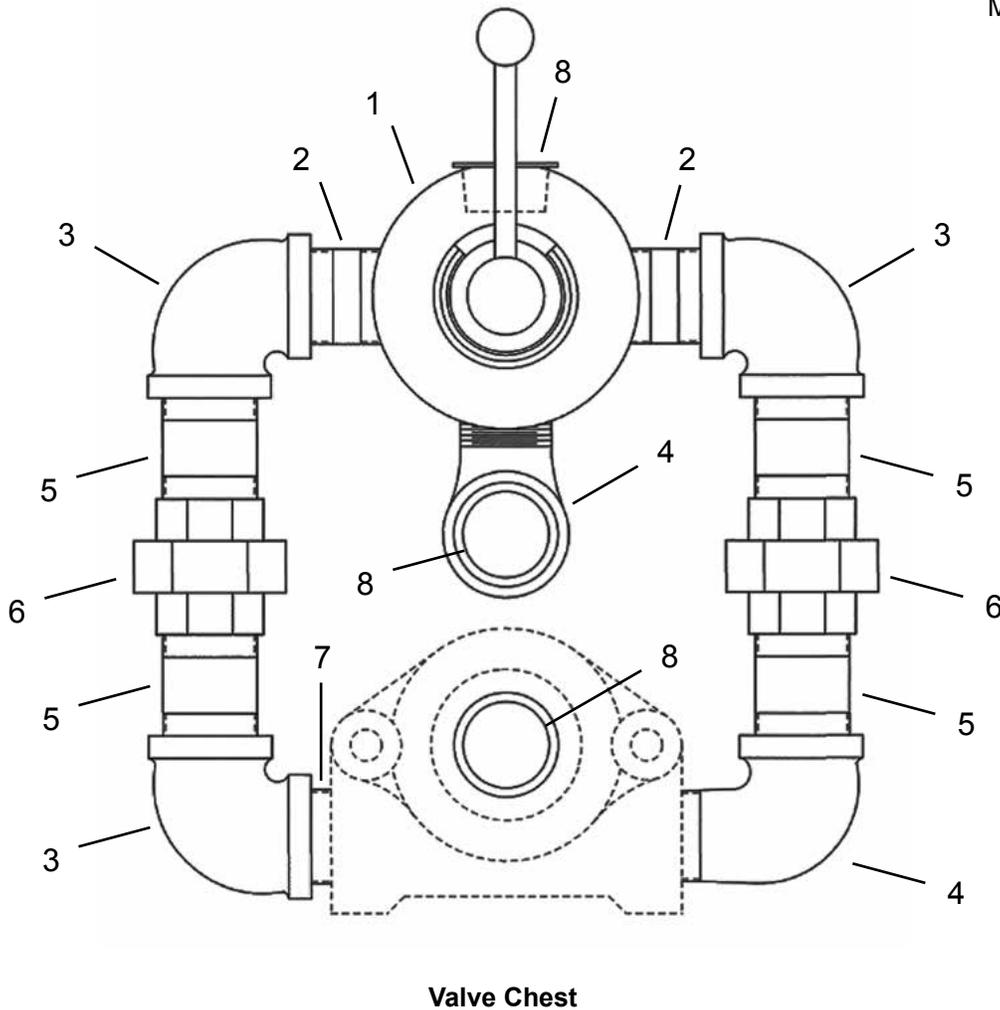


Illustration "C": Single Direction Valving

Ref	Number	#	X	EN
				Description
1	90A39	1		Air Control Valve
2	63J11	1		Pipe Nipple (1-1/4" NPT x 3" Long)

(#) Quantity

(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

Illustration "D": Reversible Valving

Ref	Number	#	X	EN
				Description
1	539527	1		4-Way Air Control Valve
2	63J16	2		Pipe Nipple (1-1/4" NPT x 2-1/2" Long)
3	818451	3		90° Elbow (1-1/4" NPT)
4	64D7	2		90° Street Elbow (1-1/4" NPT)
5	63J11	4		Pipe Nipple (1-1/4" NPT x 3" Long)
6	64Z5	2		Union (1-1/4" NPT)
7	63J15	1		Pipe Nipple (1-1/4" NPT x 1-5/8" Long)
8	532320	3		Plastic Plug Cap

(#) Quantity

(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

POWER TOOLS SALES & SERVICE CENTERS

Please note that all locations may not service all products.

Contact the nearest Apex Tool Group Sales & Service Center for the appropriate facility to handle your service requirements.

NORTH AMERICA | SOUTH AMERICA

Detroit, Michigan

Apex Tool Group
2630 Superior Court
Auburn Hills, MI 48236
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