



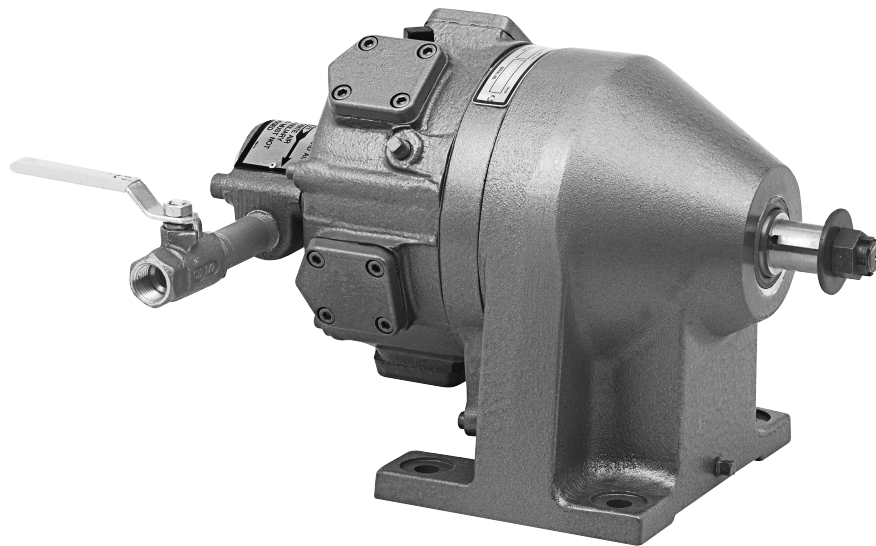
Instruction Manual

PL70-1045EN

04/16/2019

## MA2 Series

Radial Piston Power Motors



For additional product information visit our website at:  
<https://dotcotool.com/product-category/cleco-tools/cleco-air-motors/cleco-ma2-series-radial-piston-air-motors/>

## For this Instruction Manual

This Instruction Manual is the Original Instruction Manual intended for all persons who will operate and maintain these tools.

This Instruction Manual

- provides important notes for the safe and efficient use of these tools.
- describes the function and operation of the MA2 series tools.
- serves as a reference guide for technical data, service intervals and spare parts ordering.
- provides information on optional equipment.

### Identification text:

MA2	represents all models of the radial piston power motor as described in this manual
→	indicates a required action
•	indicates a list
<..>	indicates a reference number from the exploded parts drawings
<b>Arial</b>	indicates an important feature or instruction written in <b>Arial Bold</b>

### Identification graphic:

→	indicates a directional movement
↓	indicates a function or force

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**Cleco®**  
Nomenclature

**PL70-1045EN**  
04/16/2019

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
<b>Single Direction Valving</b>													
MA2S356M	246	490	65	88	30	41	40	18.1	65	1.84	7.5:1	1700	771
MA2S352M	61	120	262	355	122	165	40	18.1	62	1.76	30.4:1	1700	771
<b>Reversible Valving</b>													
MA2R355M	119	240	133	180	61	83	43	19.5	54	1.53	15.3:1	1700	771
MA2R353M	60	120	262	355	122	165	43	19.5	58	1.64	30.4:1	1700	771
<b>without Valving</b>													
MA2W404M	119	240	133	180	61	83	43	19.5	54	1.53	15.3:1	1700	771
MA2W403M	60	120	262	355	122	165	43	19.5	58	1.64	30.4:1	1700	771

\* Note: All models assume overhung load located at 0.625" (15.88mm) from the face of the motor.

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

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# 1 Safety

## 1.1 Warnings and notes

Warning notes are identified by a signal word and a pictogram.

- The signal word indicates the severity and probability of the impending danger.
- The pictogram indicates the type of danger.

-----  
**WARNING!**



**WARNING** identifies a potentially **hazardous** situation which, if not avoided, may result in serious injury.

-----

-----  
**CAUTION!**



**CAUTION** identifies a potentially **hazardous** situation which, if not avoided, may result in minor or moderate injury or property and environmental damage.

-----

-----  
**NOTE**



**NOTE** identifies general information which may include application tips or useful information but no hazardous situations.

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Important information that must be read and understood by all personnel installing, operating or maintaining this equipment.

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## 1.2 Basic requirements for safe working practices



All personnel involved with the installation, operation or maintenance of these tools must read and understand all safety instructions contained in this manual. Failure to comply with these instructions could result in serious injury or property damage.

These safety instructions are not intended to be all inclusive. Study and comply with all applicable National, State and Local regulations.

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### CAUTION! Work Area:



- Ensure there is enough space in the work area.
- Keep the work area clean.
- Keep the work area well ventilated.

### Personnel Safety:

- Inspect the air supply hoses and fittings. Do not use damaged, frayed or deteriorated hoses.
- Make sure the air supply hose is securely attached to the tool.
- Install adequate guards for all moving parts of the power motor or it's application.

### Safety working with and around power motors:

- Make sure the motor is securely mounted to the application.
  - Make sure the output spindle is fully engaged with the application.
  - Disconnect the air supply before servicing the motor
- 

## 1.3 Operator training

All personnel must be properly trained before operating the MA2 tools. The MA2 tools are to be repaired by fully trained personnel only.

## 1.4 Personal protective equipment

When working



- Wear eye protection to protect against flying metal splinters.
- Wear hearing protection

Danger of injury by being caught by moving equipment.



- Wear a hairnet
- Do not wear close fitting clothing
- Do not wear jewelry

### **1.5 Designated use**

The MA2 is designed exclusively as a power source to be integrated into an application.

- Do not modify the MA2, any guard or accessory.
- Use only with accessory parts which are approved by the manufacturer.
- Do not use in any improper manner that can cause damage to the motor.

### **1.6 Codes and standards**

It is mandatory that all national, state and local codes and standards be followed.

### **1.7 Noise and vibration**

No data available on this equipment.



## Scope of Supply, Transport and Storage

**2 Scope of supply, transport and storage****2.1 Items supplied**

Check shipment for transit damage and ensure that all items have been supplied:

- 1 MA2
- 1 PL70-1045EN instruction manual
- 1 Declaration of Conformity (if applicable)
- 1 Lubrication sheet
- 1 Warranty statement

**2.2 Transport**

Transport and store the MA2 in the original packaging. The packaging is recyclable.

**2.3 Storage**

For short term storage (less than 2 hours) and protection against damage:

→ Place the MA2 in a location on the workbench to avoid accidental startup.

For storage longer than 2 hours:

→ Disconnect the air supply from the MA2

Object	Time Period	Storage Temperature
MA2 without air supply	No guideline	-13°F to 104°F (-25°C to 40°C)

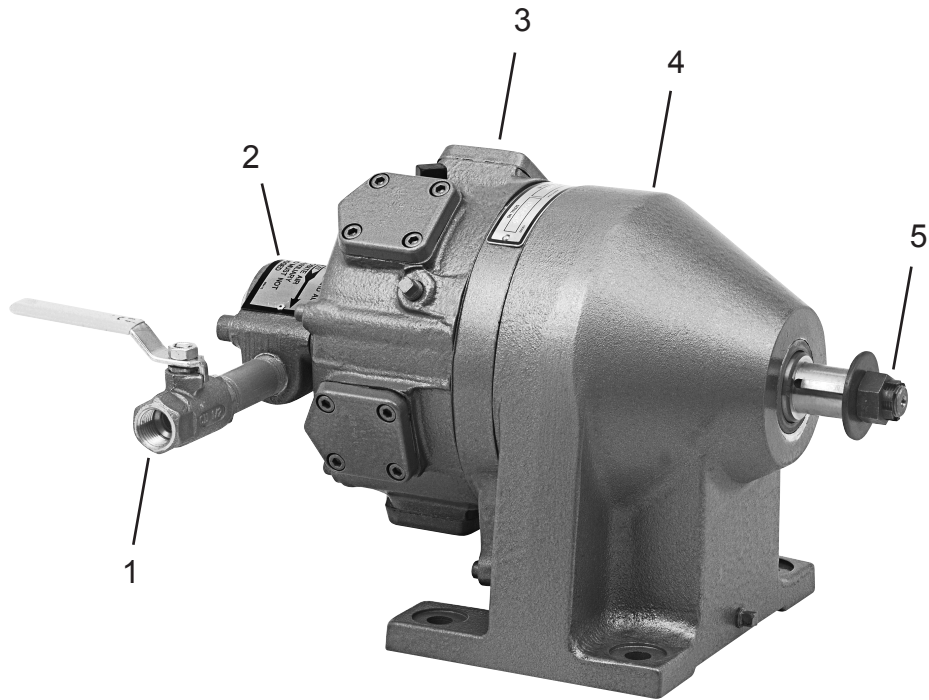
### 3 Product description

#### 3.1 General description

- Pneumatic powered radial piston power motor
- 1.5 Horsepower
- No valving, single direction valving and reversible valving options

#### 3.2 Operation and functional elements

This section describes the operational and functional elements of the MA2.



Ref.	Description
1	Air Inlet
2	Valve Chest
3	Motor Assembly
4	Gearing Assembly
5	Output Shaft

**4 Accessories**

# Cleco®

## Before Initial Operation

### 5 Before initial operation

#### 5.1 Ambient conditions

Ambient temperature: 41°F (5°C) to a maximum of 104°F (40°C)

Acceptable relative humidity: 25% to 90%, non-condensing

#### 5.2 Air supply

Parameter	Description
Air Hose	Minimum inside diameter: 1/2" (12,7 mm) Maximum length: 16.4' (5 m)
Working pressure range	58 to 101.5 psi (400 to 700 kPa) Recommended: 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.

**NOTE**



To attain consistent results, maintain a constant working pressure using a suitable air line unit consisting of a filter, lubricator and regulator.

- The inside diameter of the air hose must be free of residue, clean if necessary.
- If a line lubricator is used, it should be filled daily

#### 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

#### 5.3 Connecting the air supply to the tool

---

**WARNING!**



The air hose can disconnect from the motor by itself and whip around uncontrollably.

- Turn off the compressed air before connecting to the motor.
  - Securely connect the air hose to the motor.
  - Turn on the compressed air.
-

#### **5.4 Tool set up**

The motor must be configured for the application.

## 6 First operation

### 6.1 Putting into use

The MA2 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 MA2 motors faster than 65% of free speed. Install a filter/lubricator unit in the air line as close as possible to the MA2 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 MA2 motor.

## 7 Troubleshooting

<b>Malfunction</b>	<b>Possible causes</b>	<b>Remedy</b>
Tool does not start	Improper air supply	→ Make sure there is adequate air pressure at the tool air inlet
	Motor dry from lack of lubrication	→ Check the oil levels in the motor case and gear case. Add oil as necessary.
	Broken gears	→ Tool disassembly required (parts replacement)
Tool runs slow and lacks torque	Improper air supply	→ Make sure there is adequate air pressure at the tool air inlet
	Motor dry from lack of lubrication	→ Check the oil levels in the motor case and gear case. Add oil as necessary.

## 8 Maintenance

CAUTION!



Danger of injury from accidental start up.  
Turn off the compressed air before performing any maintenance.

### 8.1 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.

Maintenance Interval	Designation
Daily	<ul style="list-style-type: none"><li>→ Visual inspection of air supply hose and connections</li><li>→ Inspect airline filter, regulator and lubricator for proper operation</li><li>→ Check the tool for excessive vibration or unusual noises</li><li>→ Visual inspection of all external components of the tool</li></ul>
Weekly	<ul style="list-style-type: none"><li>→ Inspect the air hose for damage or wear</li><li>→ inspect the output spindle for damage or wear</li><li>→ Inspect the breather cap to make sure it is not plugged, clean or replace</li><li>→ Remove the motor case drain plug to allow water and condensate to drain out</li><li>→ Check oil levels in the motor case and gear case, add as necessary</li></ul>



## 8.2 Lubricants

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 1-1/3 quarts of oil are required to fill the motor and 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 MA2 for proper oil level, remove the oil level plug (64AA6) in the motor case. If oil does not flow from the hole, add the proper oil until oil begins to flow. Securely install the oil level plug.

Remove the oil drain plug in the gear case (64AA6) occasionally and drain off accumulated water before adding new oil.

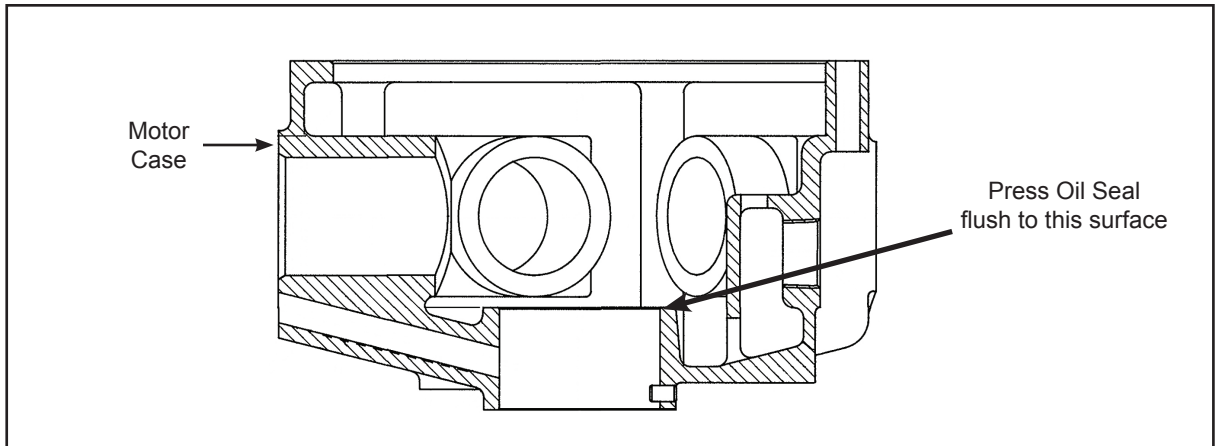
Excessive use of oil is usually due to:

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

## 9 Repair instructions

### 9.1 Motor case assembly

Place the motor case face up (cylinder opening up) on a table. Press the oil seal (60G144) into the counterbore until it is flush with the inside edge of the counterbore.

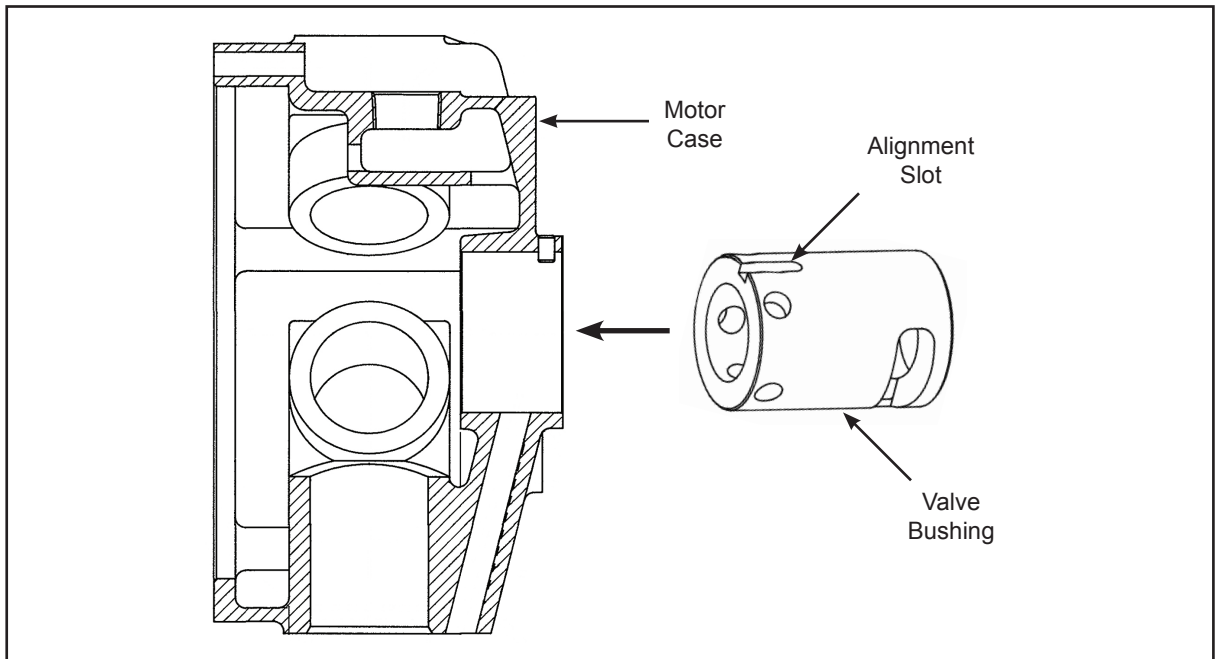


Install the valve bushing (200MAA502) into the motor case counterbore until it bottoms out against the oil seal. The valve bushing has a slot to enable proper alignment during assembly.

**NOTE**

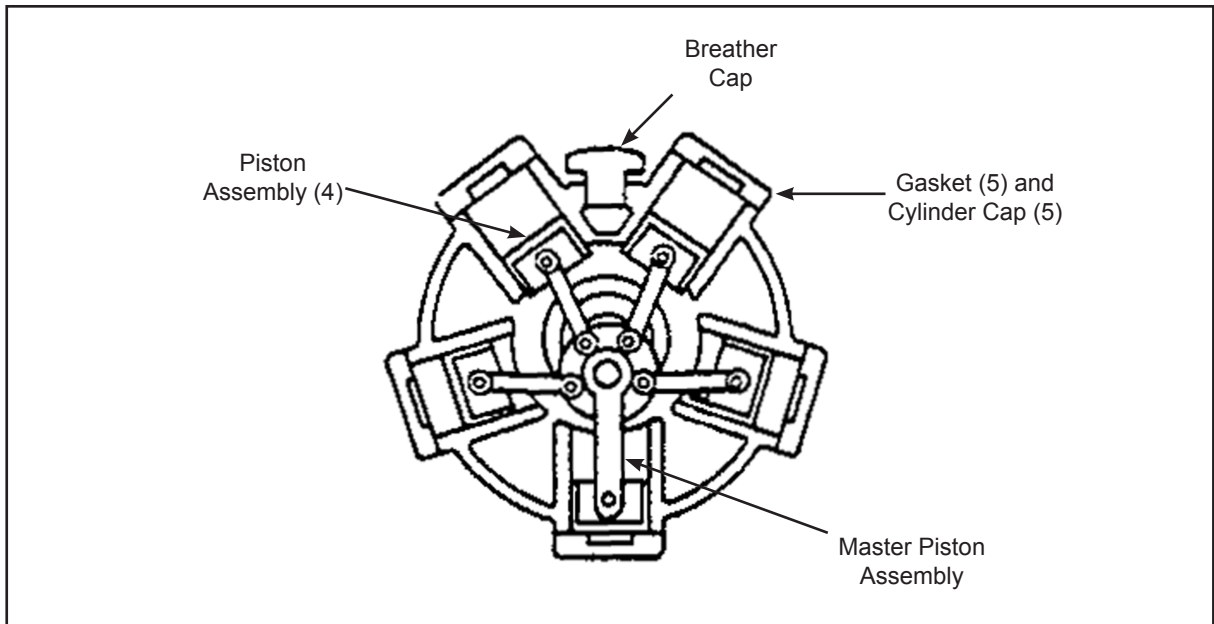


***The valve bushing must be placed in a freezer, for a period of time, before assembling into the motor case. This will cause the bushing to contract allowing easier assembly into the motor case.***



## 9.2 Piston assembly

- Lightly oil all cylinder holes in the motor case.
- Insert the master piston assembly directly across from the breather cap hole. Make sure the couterbored holes in the master connecting rod are up.
- Insert the other four piston assemblies from the outside. Slide them in to line up with the hole in the master connecting rod. Tap them in until they bottom out.
- Install all piston pins and secure with the retaining ring (65W23). Line up the flat on the retaining ring with the center of the piston hole.
- Position the gaskets and cylinder caps over the cylinder holes and secure using the 75P7 screws. Tighten all screws to 7 ft. lbs. (9.5 Nm) torque.

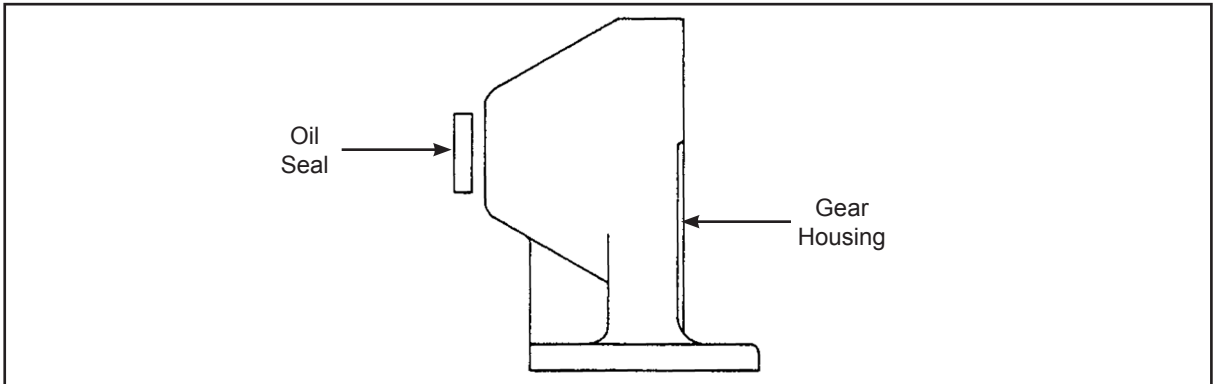


- Install the distributor valve and crankshaft into the motor case. Rotate the crankshaft to insure that all pistons are operating freely.
- Remove the distributor and crankshaft.

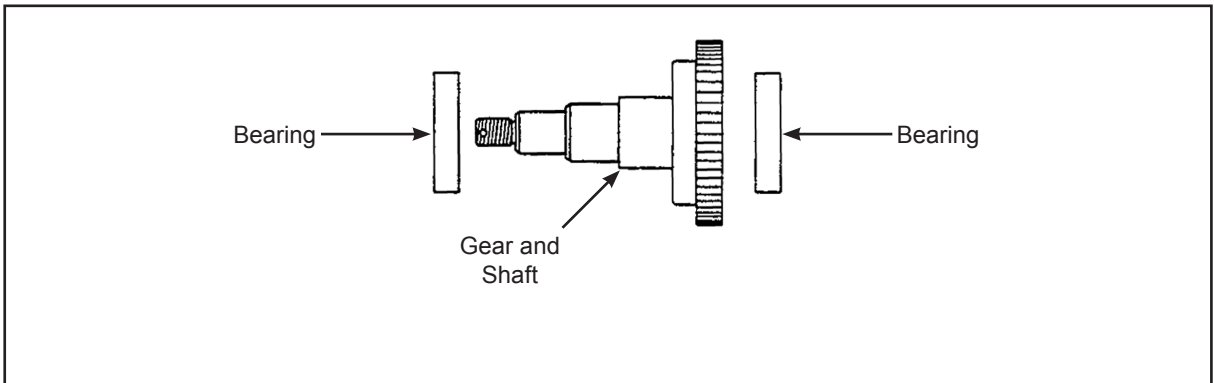
# Cleco® Repair Instructions

## 9.3 Gearing assembly

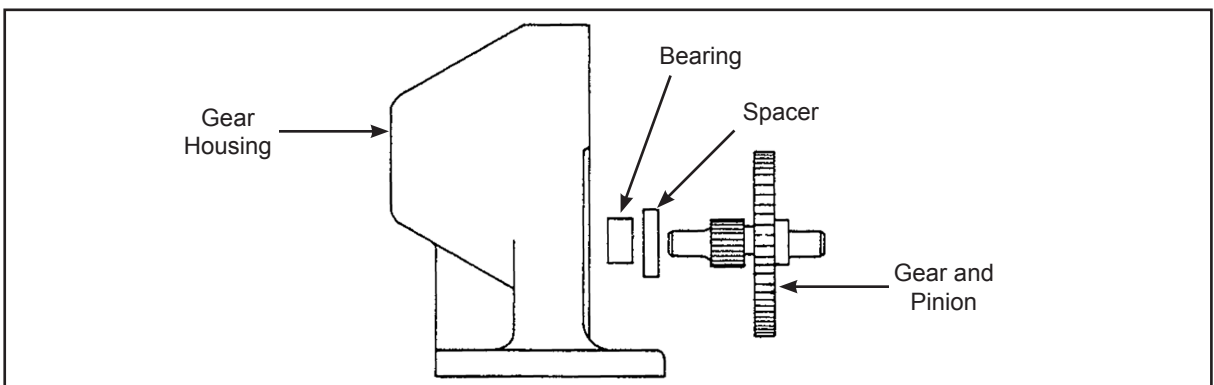
- Install the oil seal (60G147) into the counterbore of the gear housing.



- Place one bearing (12J17) in the geared end of the gear and shaft and a second bearing (12J17) onto the threaded end of the shaft. Press both bearings onto the the shaft until they bottom out.
- Insert the gear and shaft into the gear housing and through the oil seal. Carefully tap the shaft until it bottoms out.



- Install one bearing (120RA22) into the small counterbore in the gear housing until it bottoms out.
- Place one spacer (MA2G35) on the small gear end of the gear and pinion. Insert the gear and pinion into the bearing in the gear housing. Make sure the small gear on the gear and pinion engages fully with the gear and shaft.



### 9.3 Gearing assembly (continued)

- Press the large diameter shaft end of the pinion gear into a 12J17 bearing until it bottoms out.
- Install the retaining ring (65W24) into the bearing housing (MA2G20)
- Place the pinion gear and bearing assembly into the bearing housing and tap in until it bottoms out against the retaining ring.
- Place the key (35B229) into the keyslot on the crankshaft.
- Place the bearing housing with pinion gear on a suitable support and press the crankshaft into the pinion gear.

**CAUTION!**



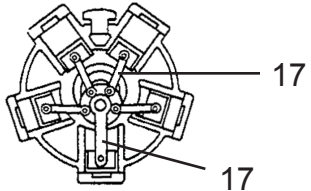
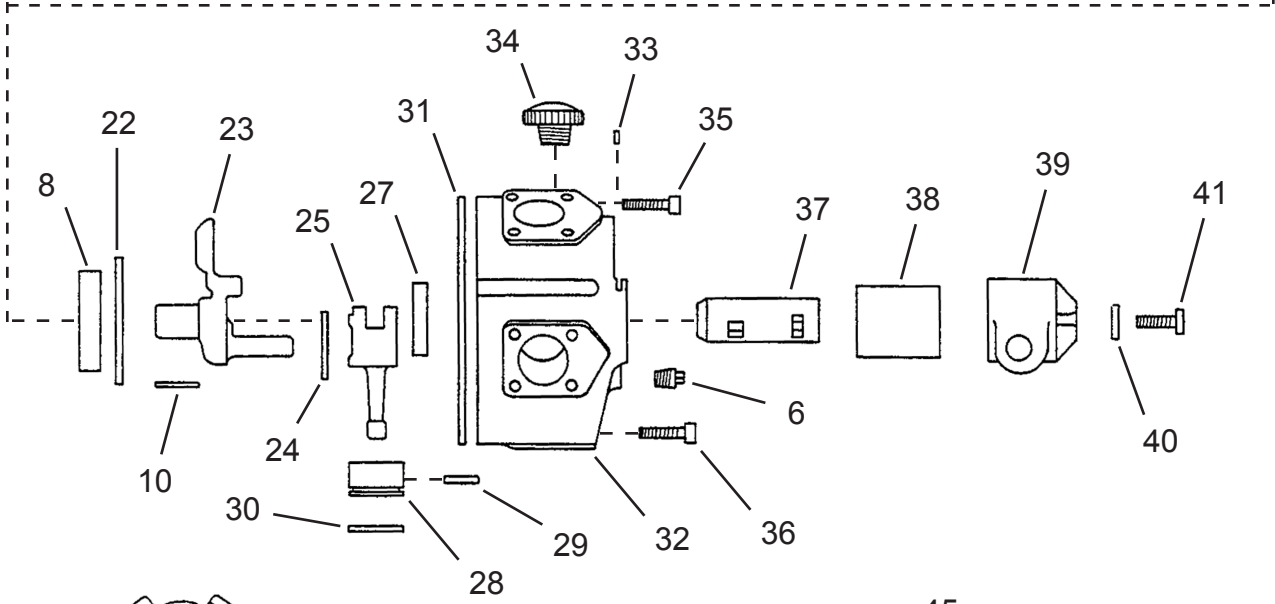
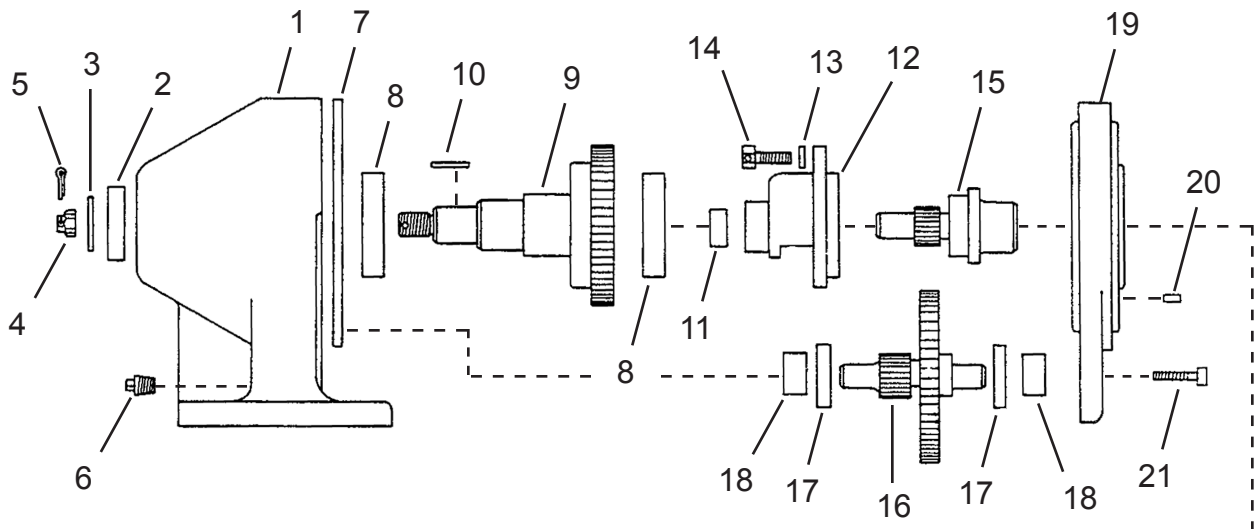
***Use care not to press the crankshaft to far causing the pinion gear and bearing to pull out of the bearing housing. The bearing must seat against the retaining ring inside the bearing housing.***

- Press the bearing (120RA21) into the small diameter end of the bearing housing (MA2G39) until there is a .156" clearance between the outside of the housing and the bearing.
- Place the spacer (MA2G35) on the counterbore of the bearing housing (MA2G20).
- Assemble the bearing housing (MA2G39) to the bearing housing (MA2G20) and secure with three washers (W161) and screws (75B54). Tighten the screws to 21 ft. lbs. (28 Nm) torque.
- Place the gear housing gasket (MA2G25) over the gear housing.
- Position the bearing housing assembly over the gear housing. Make sure the pinion gear engages with the gear and pinion and the gear and pinion shaft is located through the spacer and bearing.
- Secure the bearing housing assembly with two screws (B129N). Tighten the screws to 7 ft. lbs. (9.5 Nm) torque.
- Place the gear housing assembly (shaft end down) on a suitable support and assemble the motor case gasket (MA219).
- Place the motor case assembly (breather cap hole at the top) on the gear housing assembly and secure with the five screws. Tighten the screws to 7 ft. lbs. (9.5 Nm) torque.

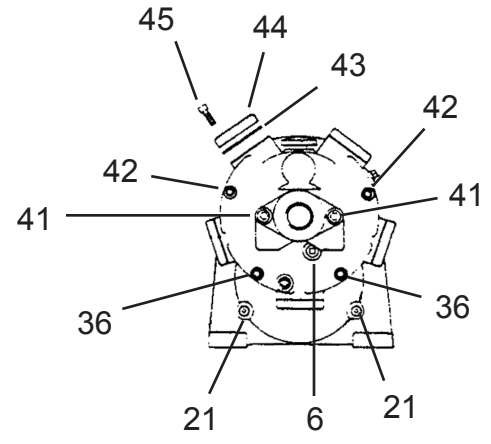
Screw positions:

- 75P29 (1): top of motor case
- 75P169 (2): bottom of motor case
- 75P170 (2): towards the top of motor case
- Oil the valve bushing and install the distributor valve (low side of the slot located over the crankshaft).
- Slide the valve chest over the bushing (air ports down). Assemble to the motor case using two washers (95G33) and screws (75P61). Tighten the screws to 21 ft. lbs. (28 Nm) torque.
- Apply air the motor to make sure it operates.
- Add 2-1/2 pints of oil through the breather cap hole in the motor case. Install the breather cap.

10.1 Power Unit



Piston  
Assembly



**10.1 MA2 Series Geared Power Motor**

Ref	Number	#	X	EN	
				Description	
1	MA2G1	1			Gear Housing
2	60G147	1	3		Oil Seal
3	W218PT	1	2		Output Shaft Washer
4	50E7	1	2		Output Shaft Hex Nut
5	P101K	1	3		Cotter Pin
6	64AA6	2			Square Head Pipe Plug (1/8")
7	MA2G25	1	3		Gear Housing Gasket
8	526576	3	6		Ball Bearing
9	MA2G40	1			Gear and Shaft
10	35B229	2	4		Square Key (3/16 x 3/16 x 1)
11	120RA21	1	2		Needle Bearing
12	MA2G39	1			Bearing Housing
13	W161PT	3	3		Lockwasher (3/8")
14	75B54	3			Hex Head Cap Screw (3/8-16 x 1)
15	Table 10.1	1			Pinion Gear
16	Table 10.1	1			Gear and Pinion
17	MA2G35	2			Spacer
18	120RA22	2	4		Needle Bearing
19	MA2G20	1			Bearing Housing (includes Ref. 20)
20	62L46	1	2		Pin
21	B129N	2			Socket Head Cap Screw (1/4-20 x 1-1/4)
22	65W24	1	1		Retaining Ring
23	MA230A	1			Crankshaft
24	65W23	1	2		Retaining Ring
25	MA226A	1			Master Connecting Rod
26	MA227	4			Connecting Rod
27	60G144	1	3		Oil Seal
28	MA224	5			Piston
29	62C46	9			Piston Pin
30	65A258	5			Piston Ring
31	MA219	1	3		Motor Case Gasket
32	MA218	1			Motor Case (includes Ref. 33)
33	62L47	1	2		Pin
34	540805	1	1		Breather Cap
35	B117B	1			Socket Head Cap Screw (1/4-20 x 2-1/4)
36	75P169	2			Socket Head Cap Screw (1/4-20 x 4)
37	MA213	1			Distributor Valve
38	200MAA502	1			Distributor Valve Bushing
39	533686	1			Valve Chest
40	95G33	2			Brass Washer
41	75P61	2			Socket Head Cap Screw (3/8-16 x 2-1/2)
42	75P170	2			Socket Head Cap Screw (1/4-20 x 5)
43	MA223	5	15		Cylinder Cap Gasket
44	MA222	5			Cylinder Cap
45	B125Z	20			Cylinder Cap Screw

(#) Quantity

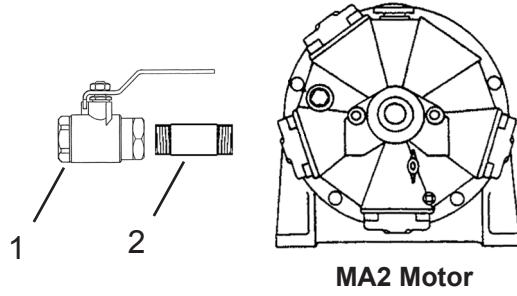
(X) Recommended Spare Parts (quantity shown based on 1-5 tools in operation)

**Table 10.1**

Ref.	Description	#	MA2S352M	#	MA2R353M	#	MA2R355M	#	MA2S356M	#	MA2W403M	#	MA2W404M
--	Gear Ratio		30.4:1		30.4:1		15.3:1		7.5:1		30.4:1		15.3:1
--	Valving		Single		Reversible		Reversible		Single		Without		Without
15	Pinion Gear	1	MA2G37	1	MA2G37	1	MA2G37B	1	MA2G37C	1	MA2G37	1	MA2G37B
16	Gear and Pinion	1	MA2G38	1	MA2G38	1	MA2G38B	1	MA2G38C	1	MA2G38	1	MA2G38B

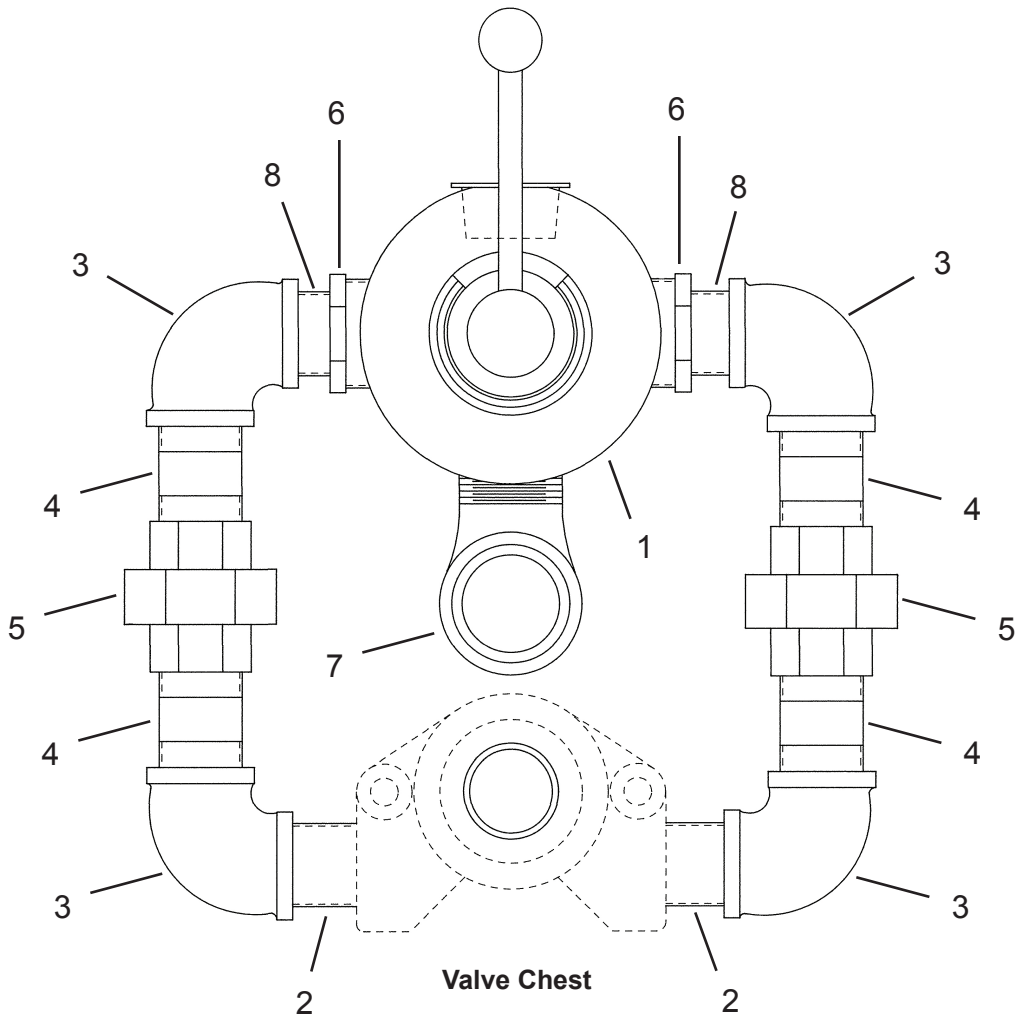
**10.2 Single Direction Valving**

**Models**  
MA2S352M  
MA2S356M



**10.3 Reversible Valving**

**Models**  
MA2R353M  
MA2R355M





**10.2 Single Direction Valving**

Ref	Number	#	X	EN
				Description
1	90A37	1		Air Control Valve
2	63F4	1		Pipe Nipple (1/2" NPT x 3)

(#) Quantity

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

**10.3 Reversible Valving**

Ref	Number	#	X	EN
				Description
1	539526	1		4-Way Air Control Valve
2	F572	2		Pipe Nipple (1/2" NPT x 1-1/2)
3	F598	4		90° Elbow (1/2" NPT)
4	F656	4		Pipe Nipple (1/2" NPT x 2)
5	64Z3	2		Union (1/2" NPT)
6	F545	2		Hex Bushing (3/4" NPT Male to 1/2" NPT Female)
7	F584	1		90° Street Elbow (3/4" NPT)
8	F517	2		Pipe Nipple (1/2" NPT x 1-1/8")

(#) Quantity

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

# 11 Technical data

## 11.1 MA2 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
<b>Single Direction Valving</b>													
MA2S356M	246	490	65	88	30	41	40	18.1	65	1.84	7.5:1	1700	771
MA2S352M	61	120	262	355	122	165	40	18.1	62	1.76	30.4:1	1700	771
<b>Reversible Valving</b>													
MA2R355M	119	240	133	180	61	83	43	19.5	54	1.53	15.3:1	1700	771
MA2R353M	60	120	262	355	122	165	43	19.5	58	1.64	30.4:1	1700	771
<b>without Valving</b>													
MA2W404M	119	240	133	180	61	83	43	19.5	54	1.53	15.3:1	1700	771
MA2W403M	60	120	262	355	122	165	43	19.5	58	1.64	30.4:1	1700	771

\* Note: All models assume overhung load located at 0.625" (15.88mm) from the face of the motor.

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

## 12 Service

### 12.1 Replacement parts

**NOTE**



Use only original Cleco replacement parts. Failure to comply can result in reduced power and increased service requirements. The tool warranty may be voided if replacement parts are not manufactured or approved by Apex Tool Group.

### 12.2 Tool repairs

Only qualified and trained personnel are to repair this equipment.

### 12.3 Warranty repairs

All warranty repairs are to be performed by an authorized Apex Tool Group service center. Contact your local representative for assistance with warranty repair claims.

## 13 Disposal

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**CAUTION!** Injuries and environmental damage from improper disposal.



Components and auxiliary materials of the tool pose risks to health and the environment.

- Capture auxiliary materials (oils, greases) when drained and dispose of them properly.
- Separate the packaging components and dispose of them properly.
- Comply with all applicable local regulations.



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

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## POWER TOOLS SALES & SERVICE CENTERS

Please note that all locations may not service all products.

Contact the nearest Cleco® Sales & Service Center for the appropriate facility to handle your service requirements.

-  Sales Center
-  Service Center

### NORTH AMERICA | SOUTH AMERICA

**DETROIT, MICHIGAN**    
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Parque Industrial Querétaro  
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