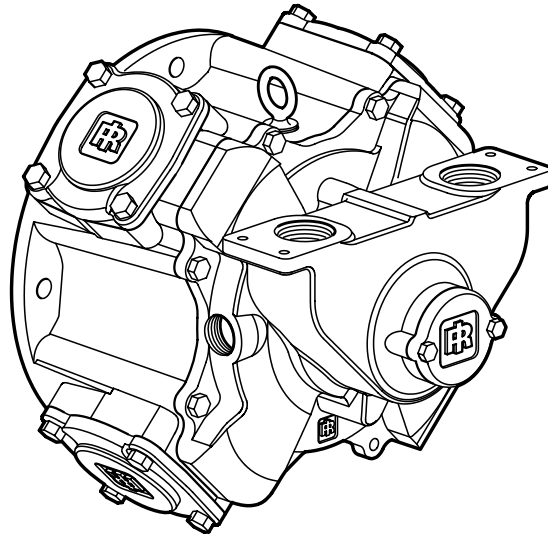
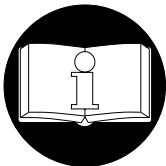


PARTS, OPERATION AND MAINTENANCE MANUAL

MMP150 AIR MOTOR



(Dwg. MHP2002)



READ THIS MANUAL BEFORE USING THIS PRODUCT. This manual contains important safety, installation, operation and maintenance information. Make this manual available to all persons responsible for the installation, operation and maintenance of this product.

Always operate, inspect and maintain this motor in accordance with American National Standards Institute Safety Code (ASME B30.7) and any other applicable safety codes and regulations.

SAFETY INFORMATION

This manual provides important information for all personnel involved with the safe installation, operation and proper maintenance of this product. Even if you feel you are familiar with this or similar equipment, you should read this manual before operating the motor.

Danger, Warning, Caution and Notice

Throughout this manual there are steps and procedures which, if not followed, may result in a hazard. The following signal words are used to identify the level of potential hazard.

DANGER

Danger is used to indicate the presence of a hazard which *will* cause *severe* injury, death, or substantial property damage if the warning is ignored.

WARNING

Warning is used to indicate the presence of a hazard which *can* cause *severe* injury, death, or substantial property damage if the warning is ignored.

CAUTION

Caution is used to indicate the presence of a hazard which *will* or *can* cause injury or property damage if the warning is ignored.

NOTICE

Notice is used to notify people of installation, operation, or maintenance information which is important but not hazard-related.

Safety Summary

Ingersoll-Rand motors are manufactured in accordance with the latest ASME B30.7 standards.

The Occupational Safety and Health Act of 1970 generally places the burden of compliance with the user, not the manufacturer. Many OSHA requirements are not concerned or connected with the manufactured product but are, rather, associated with the final installation. It is the owner's and user's responsibility to determine the suitability of a product for any particular use. It is recommended that all applicable industry, trade association, federal, state and local regulations be checked. Read all operating instructions and warnings before operation.

This manual has been produced by **Ingersoll-Rand** to provide dealers, mechanics, operators and company personnel with information required to install, operate, maintain and repair the products described herein.

It is extremely important that mechanics and operators be familiar with servicing procedures of these products, or like or similar products, and are physically capable of conducting the procedures. These personnel shall have a general working knowledge that includes:

1. Proper and safe use and application of mechanics common hand tools as well as special **Ingersoll-Rand** or recommended tools.
2. Safety procedures, precautions and work habits established by accepted industry standards.

Ingersoll-Rand cannot know of, or provide all the procedures by which product operations or repairs may be conducted and the hazards and/or results of each method. If operation or maintenance procedures not specifically recommended by the manufacturer are conducted, it must be ensured that product safety is not endangered by the actions taken. If unsure of an operation or maintenance procedure or step, personnel should place the product in a safe condition and contact supervisors and/or the factory for technical assistance.

SAFE OPERATING INSTRUCTIONS

The following warnings and operating instructions have been adapted in part from American National (Safety) Standard ASME B30.7 and are intended to avoid unsafe operating practices which might lead to injury or property damage.

Ingersoll-Rand recognizes that most companies who use these motors have a safety program in force at their facility. In the event that some conflict exists between a rule set forth in this publication and a similar rule already set by an individual company, the more stringent of the two should take precedence.

Safe Operating Instructions are provided to make an operator aware of dangerous practices to avoid and are not necessarily limited to the following list. Refer to specific sections in the manual for additional safety information.

1. Only allow people, trained in safety and operation of this product, to operate and maintain this motor.
2. Only operate motor if you are physically fit to do so.
3. When a "**DO NOT OPERATE**" sign is placed on the motor, or controls, do not operate the motor until the sign has been removed by designated personnel.
4. Before each shift, the operator should inspect the motor for wear and damage. Never use a motor that inspection indicates is worn or damaged.
5. Keep hands, clothing, etc., clear of moving parts.
6. After use, or when in a non-operational mode, the motor should be secured against unauthorized and unwarranted use.

SPECIFICATIONS

Description

The MMP150 motor may be operated with air or natural gas. Natural gas operation will require modification to motor parts.

The motor crankshaft has an internal spline, refer to "SPECIFICATIONS" section, which allows connection to a variety of applications.

Model Code Explanation

Example: MMP150-A-0-B-2-A

MMP150 - A - 0 - B - 2 - A

Series:

MMP150 Air Motor

Interface/Shaft Options:

- A = **Standard Spline**
- B = NEMA 215TC
- C = Hydraulic SAE "B" Adapter
- D = Keyed Shaft (Fenner RM410)

Mounting Options:

- 0 = **None**
- 1 = Base Mount

Control Options:

- A = None
- B = Manual Valve**
- C = Panel Mount Valve
- D = Pendant
- E = Accu-Trol™

Rotary Valve Bias Options:

- 0 = Equal, Bias Rotation*
- 1 = CCW (counter-clockwise), Standard Bias Rotation*
- 2 = CW (clockwise), Reverse Bias Rotation***

Power Options:

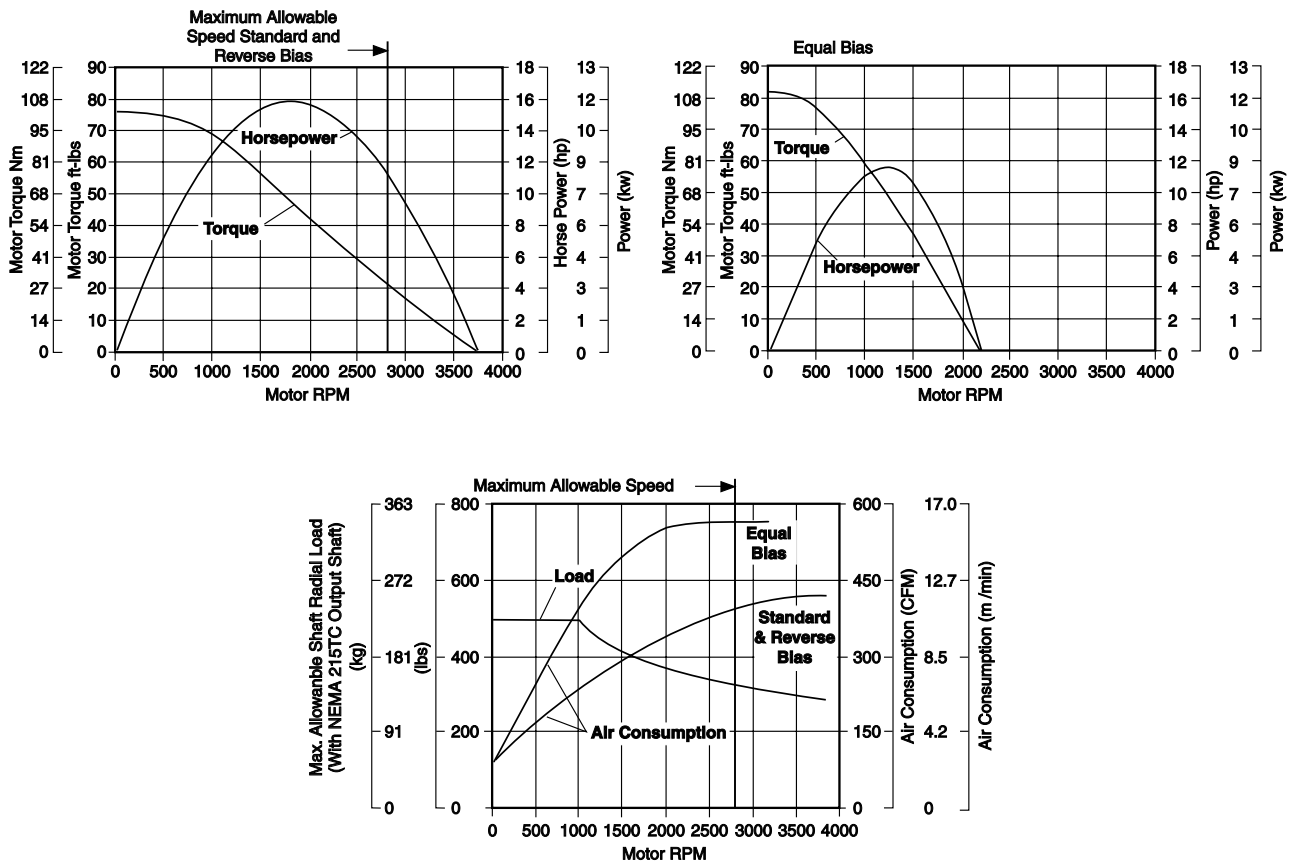
- A = Air**
- B = Natural Gas

* As viewed from crankshaft end of motor.

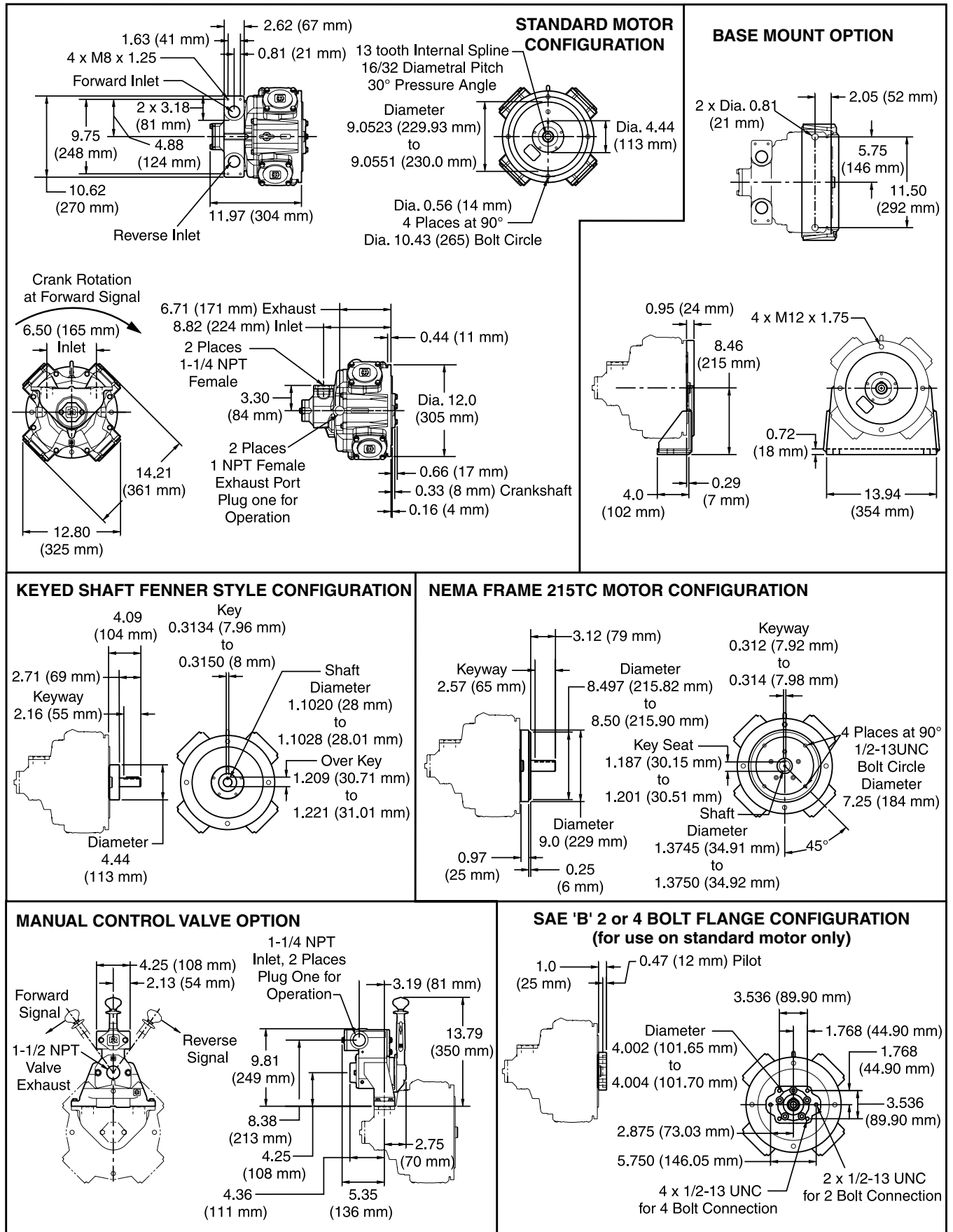
General Specifications

Air System	Rated Operating Pressure	90 psig	6.3 bar/630 kPa
	Air Consumption (at rated pressure and load)	425 scfm	12 cu.m/min
	Air Consumption (equal bias)	550 scfm	16 cu.m/min
	Air Motor Pipe Inlet Size	1-1/4 inch NPT	
	Minimum Air System Hose Size	1.25 inches	32 mm
Motor Performance	Motor Horsepower	16 HP	12 KW
	Motor Horsepower (equal bias)	11.5 hp	9 KW
	Speed at Maximum Power (standard and reverse bias)	1800 rpm	
	Maximum Power (equal bias)	1200 rpm	
	Maximum Free Speed (standard and reverse bias)	3800 rpm	
	Maximum Free Speed (equal bias)	2200 rpm	
	Starting Torque (standard and reverse bias)	61 ft lbs	82.7 Nm
	Starting Torque (equal bias)	75 ft lbs	101.7 Nm
	Stall Torque (standard and reverse bias)	78 ft lbs	105.8 Nm
	Stall Torque (equal bias)	83 ft lbs	112.5 Nm

Performance Graphs



(Dwg. MHP2000)



(Dwg. MHP2004)

INSTALLATION

Prior to installing the motor, carefully inspect it for possible shipping damage.

⚠ CAUTION

- Owners and users are advised to examine specific, local or other regulations, including American National Standards Institute and/or OSHA Regulations which may apply to a particular type of use of this product before installing or putting motor to use.

Mounting

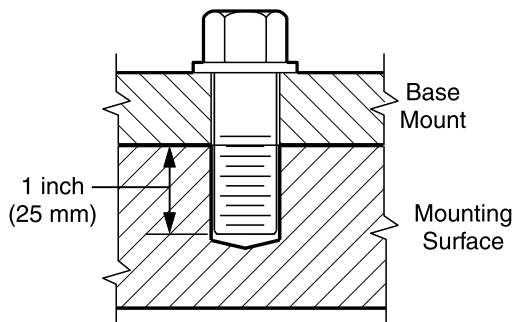
⚠ WARNING

- Use motor eyebolt only when lifting motor. Motor eyebolt is designed to hold only weight of motor.

The MMP150 air motor may be mounted in any orientation. The lubrication free design removes any consideration for maintaining an oil sump or vent cap orientation. However; if using a motor mounted control valve operator safety and ease of operation should be considered.

Base Mounted Installation:

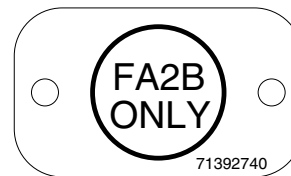
1. Surface must be flat and of sufficient strength to handle the motor and any components attached or connected to it.
2. Mounting bolts must be 3/4 inch (18 mm) Grade 8 or better. If mounting surface is threaded the minimum depth of thread engagement should 1 inch (25 mm). Refer to Dwg. MHP2019 on page 6. For mounting into drilled holes, use self-locking nuts and lockwashers to secure fasteners.
3. Refer to Dwg. MHP2004 on page 5 for bolt hole location dimensions.



(Dwg. MHP2019)

NOTICE

- Control valves supplied with motors will have label 71392740 attached. Label is only applicable if motor is used in an Ingersoll-Rand winch application. Refer to Dwg. MHP2335 on page 6.



(Dwg. MHP2335)

Air Supply

The air supply should be clean and filtered to ensure optimum motor performance and minimize wear. Foreign particles are the primary cause of motor wear and breakdown. Using an air filter will improve overall motor performance and reduce unscheduled downtime.

Maximum air consumption is 425 scfm (12 cu. m/min) at rated operating pressure of 90 psig (6.3 bar/630 kPa) at the motor inlet. If air supply varies from recommended, motor performance will change. Refer to 'Performance Graphs' on page 4.

Air Lines

The inside diameter of motor air supply lines must be at least 1-1/4 inch (32 mm) to achieve maximum performance. Use of smaller diameter lines will result in reduced performance (lower speeds). Before making final connections, all air supply lines should be purged with clean, moisture-free air or nitrogen before connecting to motor inlet. Supply lines should be as short and straight as installation conditions permit. Long transmission lines and excessive use of fittings, elbows, tees, globe valves etc. cause a reduction in pressure due to restrictions and surface friction in the lines.

Air Line Lubricator

Refer to Dwg. MHP0191 on page 7.

An air line lubricator is not required with the MMP150 air motor when supplying air source is either a portable compressor or air compressor system without an air dryer or coalescing filter located between the compressor and motor. However, using an air line lubricator will extend piston ring life.

The lubricator must have an inlet and outlet at least as large as the inlet on the motor directional control valve. Install air line lubricator as close to air inlet on motor as possible.

Air Spring Operation

Air motors are often used as 'Air Springs.' This refers to operating the motor against normal motor rotation. When used for this purpose an 'Air Line Lubricator' is required.

Lubricator Settings

Without Lubricator	With Lubricator	Air Spring Operation
(drops per minute)		
0	3-6	6-8

Do not exceed values stated.

⚠ CAUTION

- Shut off air supply before filling air line lubricator, if equipped.

If equipped, the airline lubricator should be replenished daily with ISO VG 32 (10W SAE) oil. Refer to “Lubricator Settings” on page 6 chart for settings.

For optimum performance and maximum parts durability, provide a lubricated air supply. The air motor should be installed as near as possible to the compressor or air receiver. Recommended pressures and volumes are measured at the point of entry to the air motor directional control valve.

Air Line Filter

Refer to Dwg. MHP0191 on page 7.

Place strainer/filter as close as practical to motor air inlet port, but upstream from lubricator, to prevent dirt from entering motor. The filter/strainer should provide 50 micron filtration and include a moisture trap. Clean the filter/strainer periodically, as experience dictates, to maintain its operating efficiency. Refer to manufacturer’s literature for cleaning/replacing recommendations.

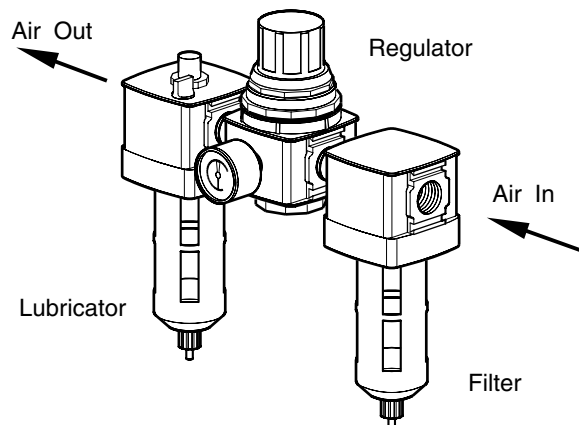
Air Pressure Regulator

Refer to Dwg. MHP0191 on page 7.

If an air pressure regulator is used, install between lubricator and filter as shown.

Moisture in Air Lines

Moisture that reaches air motor through air supply lines provides piston rings lubrication. Over prolonged periods of operation, depending upon moisture content in the air, water will build up in bottom of motor housing. This accumulation must be drained to maximize bearing life. Refer to ‘Draining Motor Housing’ on page 8 in the “OPERATION” section.



(Dwg. MHP0191)

Mufflers

Ensure muffler is installed in at least one exhaust port on rotary housing. The motor rotary housing has two exhaust ports. Installation of two mufflers in rotary housing is optional. Check mufflers periodically to ensure they are functioning correctly.

Natural Gas Operation (optional feature)

⚠ WARNING

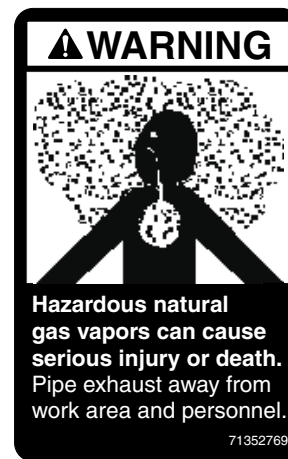
- Ensure all fittings and connections are tight. Inspect all connections with suitable leak detection equipment.
- At first notice of any unusual odors or noticeable leaks, cease motor operation until source is identified and corrected.
- Natural gas exhaust must be piped away from motor.
- All motor control options are required to be natural gas compliant.

The MMP150 motor may be run using natural gas. However, motor modifications are required for this usage. Refer to parts section for additional information.

Use of natural gas will reduce motor life.

Natural gas exhausting from the motor must be piped away.

Natural Gas Warning Label



Initial Motor Operating Checks

Motors are tested for proper operation prior to leaving factory. Before motor is placed into service the following initial operating checks should be performed.

1. When first running motor, inject light oil into inlet connection to provide initial lubrication.
2. When first operating, it is recommended that motor be driven slowly in both directions for a few minutes.

For motors that have been in storage the following start-up procedures are required.

1. Give motor an inspection conforming to the requirements of ‘Motors Not in Regular Use’ in “INSPECTION” section.
2. Pour a small amount of ISO VG 32 (10W SAE) oil in motor inlet port.
3. Operate motor (unloaded) for 10 seconds in both directions to flush out any impurities.
4. The motor is now ready for normal use.

OPERATION

It is recommended that user and owner check all appropriate and applicable regulations before placing this product into use.

The four most important aspects of motor operation are:

1. Follow all safety instructions when operating the motor.
2. Allow only people trained in safety and operation of this motor to operate this equipment.
3. Subject each motor to a regular inspection and maintenance procedure.
4. Be aware of motor capacity at all times.

Operators must be physically competent. Operators must not have a health condition which might affect their ability to act, and they must have good hearing, vision and depth perception. The motor operator must be carefully instructed in his duties and must understand the operation of the motor, including a study of the manufacturer's literature. It is the operator's responsibility to refuse to operate the motor under unsafe conditions.

Air Motor

Draining Motor Housing

During normal operation moisture can collect in the motor housing. This accumulation should be drained regularly. Excess moisture in the housing will decrease bearing life. In addition, freezing moisture can lead to damaged motor components.

Refer to Dwg. MHP2005 on page 22. To drain, locate and remove plug (29) in bottom of motor housing (28). Any fluid drained should be disposed of in an environmentally safe manner.

Air Spring Operation

Air Spring operation occurs when air motor is operated in a manner allowing load to overpower the motor, causing it to turn backwards against the inlet air supply.

This type of operation is not uncommon for motor operation and air motors are designed to withstand this type of usage for limited periods.



- If the MMP150 motor is used for air spring operations inline lubrication is required. Set inline lubricator to provide a minimum of 6-8 drops per minute. Refer to "LUBRICATION" section for recommended lubricants.

Air Spring Operation Duty Cycle

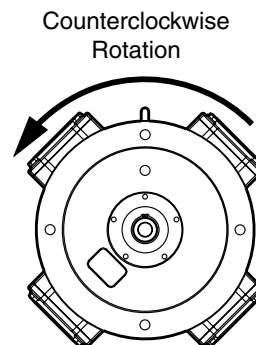
Motor Speed (rpm)	Maximum Continuous Duty Cycle (minutes)	Minimum Idle Time Between Duty Cycles (minutes)
600	5 minutes	20*
1200	3 minutes	

* Minimum idle time can be replaced by 10 minutes powered forward operation.

Crankshaft Rotation

Rotary valve (15) is available in three versions to control direction of crankshaft rotation. Crankshaft rotation is determined as viewed from the crankshaft side of motor. Refer to Dwg. MHP2016 on page 8.

Crankshaft Rotation



(Dwg. MHP2016)

Counterclockwise (standard). Rotary valve supplies full airflow in counterclockwise direction; reduced airflow in clockwise direction.

Clockwise (optional feature). Rotary valve supplies full airflow in clockwise direction; reduced airflow in counterclockwise direction.

Equal (optional feature). Rotary valve supplies full air flow in both directions.

Motor Controls

A spring loaded, motor or remote mounted, manual throttle control valve is available; remote pendant controls are also available. Reference the model code on motor nameplate and compare it to "SPECIFICATIONS" section of this manual to determine configuration. The throttle control provides operator control of motor speed and direction of operation.

Operate throttle control using smooth, even movements. Do not slam or jerk throttle controls during operation.

Motor Mounted Air Throttle

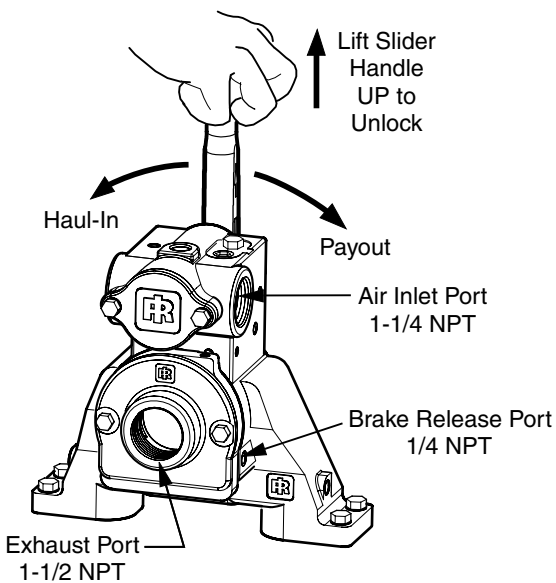
Refer to Dwg. MHP1809 on page 9.

The spring loaded, live air, manual control throttle valve mounts to the rotary housing.

To operate control valve, place palm of hand on control knob and wrap fingers around flange of sliding handle. Squeeze fingers, lifting sliding handle up to unlock control lever. Shift control lever in desired direction to drive motor in forward or reverse direction. As viewed from the exhaust flange end, move control throttle handle to the right (clockwise) to drive motor in clockwise direction and to the left (counterclockwise) to drive motor in counterclockwise direction. Avoid sudden movements of control valve to ensure smooth motor operation.

When released, handle will return to neutral or center position. The sliding handle will drop down to engage and lock control handle in place.

Throttle Control Valve Operation



(Dwg. MHP1809)

Panel Mounted Control Valve (optional feature)

Refer to Dwg. MHP2007 on page 26 and MHP2010 on page 29. Provides for remote motor control at a fixed location up to 20* feet (6 metres) away from motor. Air hoses connect control valve to motor to provide remote operation.

Pilot pressure from panel mounted control valve activates pilot air valve located on motor. Motor pilot air valve controls motor speed and direction of operation. Operation direction is determined by direction control valve lever is shifted.

* For distances greater than 20 feet (6 metres) contact **Ingersoll-Rand** Technical Sales for control suitability.

Remote Pilot Pendant Throttle (optional feature)

Refer to Dwg. MHP2235 on page 27 and MHP2010 on page 29. Provides for remote motor control at distances up to 50* feet (15 metres) away from motor. Pilot air hoses connect pendant to motor pilot air valve to provide motor operation. Pendant control is a two lever movable control station which controls motor forward and reverse operation.

Direction of operation is determined by the pendant lever depressed. Air is directed from pendant into pilot valve. The pilot valve spool shifts to direct control air into motor to operate in desired direction. Pendant handle has two arrows (cast into body), one points up the other down. Up arrow is used for counterclockwise motor rotation (refer to drawing MHP2016 on page 8). Down arrow reverses motor rotation.

Depress pendant levers using smooth, even movements. To operate the motor using the pendant:

1. To operate in the reverse direction, depress the 'RIGHT' lever.
2. To operate in the forward direction, depress the 'LEFT' lever.
3. To throttle operating speed regulate the amount lever is depressed. Depress lever completely for maximum speed; depress lever partially for slower speeds.

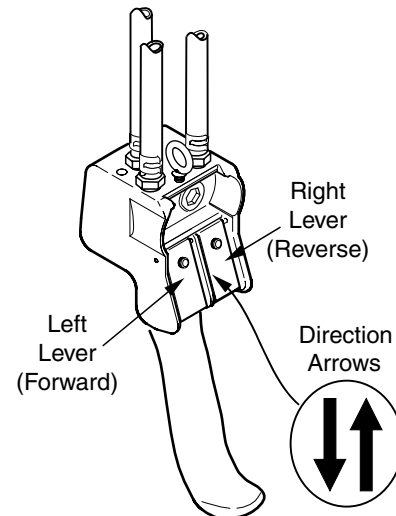
4. To stop motor operation release lever. Lever will spring return to off and motor will stop.

NOTICE

• **Pendant forward and reverse levers provide variable speed operation. For low speed operation push appropriate lever slightly; for full speed operation push appropriate lever fully.**

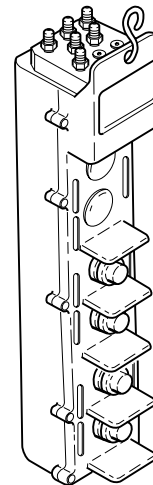
* To ensure accurate motor control when remotely operating the motor at distances greater than 50 feet (15 metres) contact **Ingersoll-Rand** Technical Sales for control suitability.

Pendant Operation



(Dwg. MHP2333)

Accu-Trol™ Pendant Control (optional feature)



(Dwg. MHP2075)

For information on Accu-Trol™ operation and maintenance, refer to Form MHD56014.

INSPECTION

Inspection information is based in part on American National Standards Institute Safety Codes (ASME B30.7).

⚠ WARNING

- All new or repaired equipment should be inspected and tested by personnel instructed in safety, operation and maintenance of this equipment to ensure safe operation at rated specifications before placing equipment in service.
- Never use a motor that inspection indicates is damaged.

Frequent and periodic inspections should be performed on equipment in regular service. Frequent inspections are visual examinations performed by operators or personnel trained in safety and operation of this equipment and include observations made during routine equipment operation. Periodic inspections are thorough inspections conducted by personnel trained in the safety, operation and maintenance of this equipment.

ASME B30.7 states inspection intervals depend upon the nature of the critical components of the equipment and the severity of usage. The inspection intervals recommended in this manual are based on intermittent operation of the motor eight hours each day, five days per week, in an environment relatively free of dust, moisture, and corrosive fumes. If the motor is operated almost continuously or more than eight hours each day, more frequent inspections will be required.

Careful inspection on a regular basis will reveal potentially dangerous conditions while still in the early stages, allowing corrective action to be taken before condition becomes dangerous. Deficiencies revealed through inspection, or noted during operation, must be reported to designated personnel instructed in safety, operation and maintenance of this equipment. A determination as to whether a condition constitutes a safety hazard must be decided, and the correction of noted safety hazards accomplished and documented by written report before placing the equipment in service.

Records and Reports

Inspection records, listing all points requiring periodic inspection should be maintained for all load bearing equipment. Written reports, based on severity of service, should be made on the condition of critical parts as a method of documenting **periodic** inspections. These reports should be dated, signed by the person who performed the inspection, and kept on file where they are readily available for authorized review.

Frequent Inspection

On equipment in continuous service, frequent inspection should be made by operators at the beginning of each shift. In addition, visual inspections should be conducted during regular operation for indications of damage or evidence of malfunction (such as abnormal noises).

1. MOTOR. During operation check motor housing for excess heat build up. Housing should not be hot to the touch. Listen for grinding or knocking noises in motor. There should be no grinding or knocking noises. If equipped with a lubricator, check lubricated air supply provides a minimum of 3 drops per minute (6-8 for Air Spring Operation) of ISO VG 32 (10W SAE) oil. Operate motor slowly in both directions to verify operation.
2. NATURAL GAS OPERATION (optional feature). Check all connections and fittings with a suitable leak detector. Repair all leaks.

NOTICE

- Operating motor with natural gas will reduce motor life. Frequency of inspections should be increased. Refer to Inspection Intervals on page 10.
- Natural gas may contain high levels of sulphur, which will result in sulfuric acid ('Sour Gas') in air system. This acid is very corrosive and will cause motor seals, 'O' rings, rotating shafts and bearings to deteriorate at a greater rate than those exposed to compressed air.

Periodic Inspection

Motor periodic inspection intervals vary depending on conditions listed below:

Dry Air (Lube-free)

NORMAL	HEAVY	SEVERE
quarterly	monthly	weekly

Natural Gas - Normal

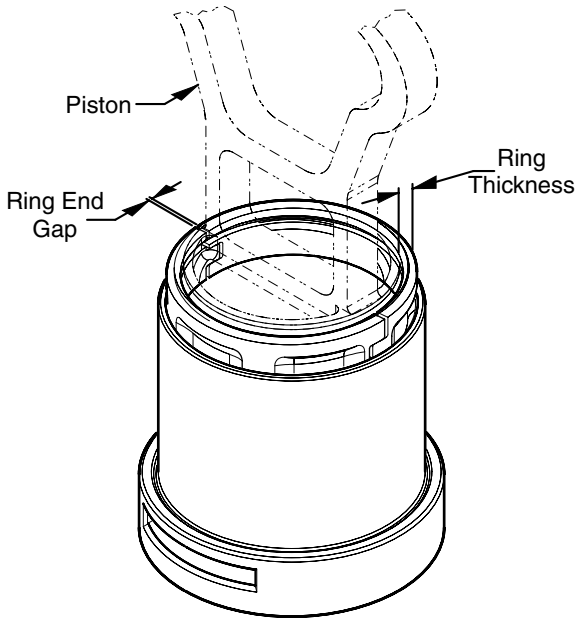
NORMAL	HEAVY	SEVERE
semiannually	quarterly	monthly

Natural Gas - 'Sour Gas'

NORMAL	HEAVY	SEVERE
quarterly	monthly	weekly

Disassembly may be required as a result of frequent inspection findings or in order to properly inspect individual components. Disassembly steps are described in "MAINTENANCE" section. Maintain written records of periodic inspections to provide an accumulative basis for continuing evaluation. Inspect all items listed in 'Frequent Inspection.' Also inspect the following:

1. AIR MOTOR. Inspect piston rings for signs of uneven wear. With rings installed on piston, and piston in cylinder liner, measure end gap. If total gap (sum of both sides) is 0.09 inch (2.3 mm) or more, replace rings. If rib of ring (thickest section) is less than 0.135 inch (3.4 mm), replace rings. Refer to Dwg. MHP2084 on page 11. Refer to 'Inspection' on page 16 in "MAINTENANCE" section for additional inspections when motor is disassembled.



(Dwg. MHP2084)

2. **FASTENERS.** Check retainer rings, capscrews, nuts and other fasteners on motor, including mounting bolts. Replace if missing or damaged and tighten if loose.

Motors Not in Regular Use

1. Equipment which has been idle for a period of one month or more, but less than six months, shall be given an inspection conforming to the requirements of 'Frequent Inspection' before being placed in service.
2. Equipment which has been idle for a period of over six months shall be given a complete inspection conforming with requirements of 'Periodic Inspection' before being placed in service.
3. Standby equipment shall be inspected at least semiannually in accordance with requirements of 'Frequent Inspection'. In abnormal operating conditions equipment should be inspected at shorter intervals.

TROUBLESHOOTING

This section provides basic troubleshooting information. Determination of specific causes to problems are best identified by thorough inspections performed by personnel instructed in safety, operation and maintenance of this equipment. The chart below provides a brief guide to common motor symptoms, probable causes and remedies.

SYMPTOM	CAUSE	REMEDY
Motor will not operate.	No air supply to motor.	Check air supply line connections and hoses.
	Shipping plugs may still be in place.	Remove shipping plugs in control valve.
Motor continues to move when operation is stopped.	Motor controls sticking.	Check pendant/throttle levers return to normal (neutral) positions when released. Disassemble, inspect and repair the pilot air control valve. Verify spool adjustment.
	Throttle moves but motor does not operate.	Motor may be damaged. Insufficient air supply. Air leak.
Motor runs slow.	Improper hose or fitting sizes.	Check fittings, connections and hoses for correct size and length. Replace parts that may cause restricted air flow. Inspect air line filter.
	Motor may be damaged.	Remove and disassemble motor. Inspect all parts and replace all worn or damaged parts.
	Ice in exhaust ports and/or air lines.	Check aftercoolers and traps. Add airline antifreeze to air supply.
	Motor piston ring wear.	If running lube-free and/or moisture free, inspect piston rings.
	Excessive water in motor.	Drain water in motor. Refer to 'Draining Motor Housing' in "OPERATION" section.
Air lines freeze.	Water in air supply.	Install or drain air system moisture traps, moisture collecting air receivers and compressor aftercoolers. After corrective action has been taken, disconnect lines at motor inlet and purge with clean, dry air or nitrogen.
Motor runs hot or makes excessive noise during operation.	Damaged or broken motor internal parts.	Disassemble and repair motor.
	Moisture in motor housing.	Drain motor housing.

INSPECTION AND MAINTENANCE REPORT

Ingersoll-Rand MMP150 Motor

Model Number:	Date:	
Serial Number:	Inspected By:	
Reason for Inspection: (Check Applicable Box)		
	1. Scheduled Periodic Inspection: _____ Quarterly _____ Semiannually _____ Yearly	Operating Environment: Normal _____ Heavy _____ Severe _____
	2. Discrepancies noted during Frequent Inspection	
	3. Discrepancies noted during Maintenance	
	4. Other: _____	

Refer to Parts, Operation and Maintenance Manual "INSPECTION" section for general inspection criteria. Also, refer to appropriate National Standards and codes of practice. If in doubt about an existing condition, contact the nearest **Ingersoll-Rand** Distributor or the factory for technical assistance.

COMPONENT	CONDITION		CORRECTIVE ACTION		NOTES
	Pass	Fail	Repair	Replace	
Motor					
Controls					
Mufflers					
Labels and Tags			---		
Mounting					
Shafts					
Other Components (list in NOTES section)					

TESTING	Pass	Fail	NOTES
Operational			

* Maximum test load is 125% of rated motor capacity.

This page may be copied and used as an Inspection/Maintenance Record.

LUBRICATION

To ensure continued satisfactory operation, all points requiring lubrication must be serviced with correct lubricant at proper time interval as indicated for each assembly.

The **MMP150** air motor is designed without an oil sump. The only lubrication necessary for operation is that provided by a lubricated air supply.

Inspection intervals recommended in this manual are based on intermittent operation of the motor eight hours each day, five days per week. If the motor is operated almost continuously or more than eight hours each day, more frequent inspection will be required. Use only those lubricants recommended. Other lubricants may affect motor performance. Approval for use of other lubricants must be obtained from your **Ingersoll-Rand** distributor. Failure to observe this precaution may result in damage to the motor and/or its associated components.

INTERVAL	LUBRICATION CHECKS
Start of each shift	If installed, check flow and level of air line lubricator (adjust flow to provide a minimum of 3 drops per minute at maximum motor speed).
Monthly	Inspect and clean or replace air line filter.

General Lubrication

NOTICE

- **Always collect lubricants in suitable containers and dispose of in an environmentally safe manner.**

Motor Assembly

Only lubricant necessary in air motor is a good quality ISO VG 32 (10W SAE) oil. This lubricant is **ONLY** used with an inline air lubricator.

Air motor does not require an air line lubricator when supplying air source is either a portable air compressor or air compressor system without an air dryer or coalescing filter located between compressor and motor. Though not required for normal operation, the use of an inline filter-lubricator will increase life of motor.

When installed, airline lubricator should be in air supply line as close as possible to motor inlet, but no more than 10 feet (3 metres) away.

CAUTION

- **Air motor is designed without an oil sump. Do not fill motor housing with lubricant.**

MAINTENANCE

WARNING

- **Never perform maintenance on the motor while it is under a load.**
- **Before performing maintenance, tag controls:**
WARNING - DO NOT OPERATE - EQUIPMENT BEING REPAIRED.
- **Only allow personnel trained in safety and service on this motor to perform maintenance.**
- **Turn off air system and depressurize air lines before performing any maintenance.**
- **After performing any maintenance on the motor, test motor before returning to service.**

INTERVAL	MAINTENANCE CHECK
Start of each shift (Operator or Maintenance Personnel)	Make a thorough visual inspection of the motor for damage. Do not operate the motor if damaged.
	Operate the motor at low RPM in both directions. Motor must operate smoothly without sticking, binding or abnormal noises.
Yearly (Maintenance Personnel)	Inspect motor shafts, bearings and piston rings for wear and damage. Repair or replace as necessary.

Thermoplastic Coating

Thermoplastic coating is an extremely tough and durable coating designed to take the toughest treatment without chipping or peeling. Special steps must be taken to protect coating when parts are removed, replaced and if excessive environmental or operational conditions have damaged the coating.

Cleaning Parts

The area to be coated must be clean and free from loose coating. Remove any surface corrosion. To paint thermoplastic coated parts, parts must be sand blasted in order to 'rough up' surface for proper paint adhesion. Sand blasting will not remove thermoplastic coating (abrasive material will bounce off). Loose coating can be removed by cutting with a sharp cutting tool (chisel, putty knife or knife).

Heat Source



- When using an open flame be aware of the materials around work area. Some solvents, lubricants and materials are extremely flammable.
- Drain all components of lubricants, water or any other fluids. Remove, or open all vents and drains. Components will be hot and may discharge hot fluids or gases. Allow sufficient time for components to cool, or cool off components, prior to handling. Gaskets, 'O' rings, and any components that may be damaged should be removed prior to applying coating.

Thermoplastic coating is heat applied. The surface of the component to which thermoplastic coating is being applied must be maintained at a temperature of 150° to 170° F (66° to 77° C). A small propane torch (**Ingersoll-Rand** Part No. 71308886) or heat gun (**Ingersoll-Rand** Part No. 71308894) can be used.

NOTICE

- When using a heat source always keep it moving. Small circles work best. Failure to do so will result in a scorched area at the repair.

The choice of heat gun or propane torch depends on size of area to be coated and amount of time available to accomplish the task. The propane torch heats the surface faster, but is hard to control and can scorch the coating. The heat gun is slower, easier to control and generally results in a better looking finish.

Repairing Surfaces

For minor repairs to the thermoplastic coating conduct the following:

1. If the underlying surface is not corroded and scratch is less than 1/16 inch (1.6 mm) wide, the surrounding thermoplastic coating can be heated until material flows together. For clean surfaces with damage greater than 1/16 inch (1.6 mm) heat the area and then apply thermoplastic coating powder (**Ingersoll-Rand** Part No. 71308902 [2 oz. (56.7 g)]) to fill the area. Continue heating until coating liquidizes and flows together with existing coating.
2. Corrosion in damaged area must be removed. Sandblast or wire brush the area to remove corrosion. If corrosion exists, ensure corrosion has not penetrated below surface of existing thermoplastic coating. This can usually be easily determined by checking to see if coating is loose around corroded area. Cut away coating as necessary to expose corrosion for removal. If damaged area is less than 1/16 inch (1.6 mm) wide the surrounding thermoplastic coating can be heated until material flows together. For surfaces with damage greater than 1/16 inch (1.6 mm) heat area and then apply thermoplastic coating powder (**Ingersoll-Rand** Part No. 71308902 [2 oz. (56.7 g)]) to fill the area. Continue heating until coating liquidizes and flows together with existing coating.
3. Allow repaired area to cool. Quenching with water is acceptable. Inspect the repair. Rough spots, minor scorching and excess coating deposits can be wet sanded to remove imperfections. To return the gloss finish, reheat surface carefully.

For large bare surfaces or new parts:

Coating these components can be done more economically and with better end results by using an electrostatic powder application process or flamespray process. Contact **Ingersoll-Rand** Technical Assistance for more information.

Disassembly

General Disassembly Instructions

The following instructions provide the necessary information to disassemble, inspect, repair, and assemble the motor. **Parts drawings are provided in the parts section.**

It is recommended that all maintenance work on the motor be performed in a clean, dust-free work area.

In the process of disassembling the motor, observe the following:

1. Never disassemble motor any further than is necessary to accomplish needed repair. A good part can be damaged during the course of disassembly.
2. Never use excessive force when removing parts. Tapping gently around the perimeter of a cover or housing with a soft hammer, for example, is sufficient to break the seal.
3. Do not heat a part with a flame to free it for removal, unless part being heated is already worn or damaged beyond repair and no additional damage will occur to other parts.

In general, the motor is designed to permit easy disassembly and assembly. The use of heat or excessive force should not be required.

4. Keep work area as clean as practical, to prevent dirt and other foreign matter from getting into bearings or other moving parts.
5. All seals, gaskets and 'O' rings should be discarded once they have been removed. New seals, gaskets and 'O' rings should be used when assembling the motor.
6. When grasping a part in a vise, always use leather-covered or copper-covered vise jaws to protect surface of part and help prevent distortion. This is particularly true of threaded members, machined surfaces and housings.
7. Do not remove any part which is a press fit in or on a subassembly unless removal of that part is necessary for repairs or replacement.
8. When removing ball bearings from shafts, it is best to use a bearing puller. When removing bearings from housings, drive out bearing with a sleeve slightly smaller than the outside bearing diameter. The end of the sleeve or pipe which contacts the bearing must be square. Protect bearings from dirt by keeping them wrapped in clean cloths.

Motor Removal

Refer to Dwg. MHP2005 on page 22.

1. Relieve pressure in air lines and motor air components by operating motor control several times after air supply has been turned off.



- Shut off, bleed down and disconnect air supply line before performing any disassembly procedures.

2. Disconnect and tag air lines.
3. Use lifting eyebolt installed in motor housing to lift motor.

WARNING

- The air motor weighs approximately 134 lbs (61 kg). Adequately support air motor before removing motor mounting capscrews.

4. Remove four capscrews (33) and washers (32) securing motor assembly to component. Using a hoist to support motor, pull motor straight away.

WARNING

- Motor eyebolt is **ONLY** for lifting motor. Do **NOT** use to lift motor and attached components.

Control Valve Removal

Refer to Dwg. MHP2006 on page 24.

1. Turn off air supply to valve and disconnect main air supply line at motor.
2. Disconnect auxiliary air line(s) from fitting(s) located on control valve.
3. Remove muffler and/or exhaust piping.
4. Remove capscrews (151) and washers (149) and lift off control valve assembly.
5. Remove and discard gaskets (146).

Control Valve Disassembly

Refer to Dwg. MHP2006 on page 24.

Handle Removal

If handle is not damaged it is not necessary to disassemble completely.

1. Carefully pry off plug (135).
2. Remove capscrew (101) and washer (102).

NOTICE

- Observe spring (137) connection during disassembly. This spring is under tension and is required to return handle to neutral position.

3. Carefully pull handle assembly (130) from reverse valve (143). Remove spring (137).
4. Using a suitable wrench, remove handle post (132) from valve hub (136). Separate spring (133) and slide handle (134).
5. Separate handle post (132) and knob (131).

Reverse Valve Removal

1. Remove capscrews (138), (125) and washers (124) from seal bracket (139). Remove seal bracket from housing. Remove and discard 'O' rings (141) and (142).
2. Remove capscrews (101) and washers (102) from exhaust flange (155). Remove flange from housing. Remove and discard 'O' ring (142).
3. Move reverse valve (143) out exhaust flange side of housing until ball (116) is visible on reverse valve. Allow ball (116) to drop out of bushing (144) and remove ball (116).
4. Remove bushing (144) out exhaust flange side of housing.

NOTICE

- Dowel pin (145) allows the bushing to be removed only from the exhaust flange side of housing. Ball (116) retains reverse valve (143) in bushing (144).
- Do not remove reverse valve (143), bushing (144) and ball (116) at the same time, damage may occur to bushing.

Piston Removal

1. Remove capscrews (101) and washers (102) from piston cover (119). Remove cover and discard gasket (118).
2. Remove capscrews (101) and washers (102) from poppet cover (103). Remove cover and discard gasket (104).
3. Remove the following items from housing poppet bore: spring (105), poppet cap (106) and poppet seal (107).
4. From poppet side, push piston (122) out of housing. Remove 'O' rings (121) and (123) and discard.

Pilot Valve Removal

If pilot valve is not damaged it is not necessary to disassemble completely.

1. Remove plug (112).
2. Remove pilot valve assembly (items 109, 111 and 113 through 115) as an assembly.
3. Pilot seat (114) is threaded into valve housing (117). Using a large flat tipped screwdriver, engage slots in pilot seat and remove.
4. Using finger pressure, hold pilot rod in pilot seat. Remove retainer ring (115).
5. Separate spring (109) and pull pilot rod out of pilot seat. Remove and discard 'O' rings (111).

Motor Disassembly

Refer to Dwg. MHP2005 on page 22.

WARNING

- The air motor weighs approximately 134 lbs (61 kg). Adequately support air motor before removing motor mounting capscrews.

CAUTION

- Motor eyebolt is **ONLY** for lifting motor. Do **NOT** use to lift entire motor and attached components.

NOTICE

- Internal components of the motor are machined to very close tolerances. Ensure that work area and parts are kept very clean to prevent damage or contamination of components.
- Motor capscrews are 13 mm (wrench size for M8 capscrews).

1. Use a suitable hoist to support the motor assembly.
2. Place motor on a suitable clean bench with rotary housing assembly (9) facing up.
3. Remove capscrews (2) and washers (3) from rotary housing cover (4). Remove cover and gasket (5). Discard gasket.
4. Remove capscrews (2) and washers (3). Lift rotary housing assembly (9) up off motor housing (28). Remove and discard gasket (13).
5. Remove retainer (6) and press rotary valve (15) out of housing.

6. Pull bearings (14) and (7) out of rotary housing.
7. Press rotary valve bushing (12) out of rotary housing.
8. Remove capscrews (2) and washers (3) from cylinder caps (17). Remove caps and gaskets (18). Discard gaskets.
9. Lift out cylinders (19). Piston rings (21) will fall free when clear of cylinder. Remove and discard 'O' ring (22).
10. Carefully rotate crankshaft (25) until piston assembly (23) is centered in motor housing (28). Lift piston assembly straight up. Repeat for remaining piston assembly.
11. Remove capscrews (2) and washers (3).
12. Remove plate (45) and discard gasket (44).
13. Remove retainer (42) and discard seal (43).
14. Remove retainer ring (31) and press crankshaft (25) out of motor housing (28).
15. Remove retainer ring (26) and press out bearing (27).

NOTICE

• For Fenner style motors follow disassembly instructions 1 through 10 and 16 through 17.

16. Remove capscrews (10), retainer ring (8) and bearing (7) from plate (45).
17. Remove plate (45) and discard gasket (44).
18. Remove retainer ring (31) and press crankshaft (25) from motor housing (28) taking care not to lose key (20) from crankshaft.
19. Remove retainer ring (26) and press out bearing (27).

Cleaning, Inspection and Repair

Cleaning

Clean all motor component parts in solvent.

NOTICE

• Do not clean any motor bearings with solvent.

The use of a stiff bristle brush will facilitate removal of accumulated dirt and sediments on housing. Dry each part using low pressure, filtered compressed air.

Inspection

All disassembled parts should be inspected to determine their fitness for continued use. Pay particular attention to the following:

Inspect **bushing** for

- wear, scoring or galling. If evident, replace.

Inspect **shafts** for

- ridges caused by wear. If evident, replace.
- scoring or galling.

Inspect **all threaded items** for

- damaged threads. If evident, replace.

Inspect **motor cylinder bores** for

- wear. Cylinders can be lightly honed. For any large scratches or wear patterns, replace cylinder assembly.

Inspect **motor rotary valve (15) and rotary bushing** for

- clearance between valve and bushing. Nominal gap is 0.00125-0.00225 inch (0.0318-0.0572 mm) per side for a total of 0.0025-0.0045 inch (0.0635-0.1143 mm). If gap is greater than 0.0025 inch (0.064 mm) per side, or greater than 0.005 inch (0.127 mm) total replace rotary bushing.
- rotary valve and bushing should not come into contact. If contacting, bushing may be honed to eliminate the interference. Bearings on end of rotary valve may be cause of

contact; check bearings (7) and (14) for excessive play and proper press fit. Replace bearings if required.

- any time bushing or valve is replaced, replace bearings.

Inspect **piston/connecting rod assembly** for

- wear, scoring. Replace if either condition exists.
- connecting rod should operate smoothly without binding and without excessive side to side play.

Inspect **bearings** for

- all motor bearings are factory lubricated and sealed. Inspect for loss of grease and evidence of grit, dirt or other contaminants. If dry or contaminated, replace the bearing.
- Inspect crankshaft roller bearings (needle). At any indication of damage, or contamination replace bearings.

Inspect **crank pin bushing**, located in rotary valve, for

- wear, scoring or damage. Replace if either condition exists.
- if bushing is not flush with outside face of rotary valve or is damaged it should be removed and replaced.

Repair

Actual repairs are limited to the removal of small burrs and other minor surface imperfections from shafts, housings and machined surfaces. Use a fine stone or emery cloth for this work.

1. Worn or damaged parts must be replaced. Refer to applicable parts listing for specific replacement parts information.
2. Inspect all remaining parts for evidence of damage. Replace or repair any part which is in questionable condition. The cost of the part is often minor in comparison with the cost of redoing the job.
3. Smooth out all nicks, burrs, or galled spots on shafts, bores, pins, or bushings.
4. Polish edges of all shaft shoulders to remove small nicks which may have been caused during handling.
5. Remove all nicks and burrs caused by lockwashers.
6. Examine crankshaft spline carefully, and remove nicks or burrs.

Assembly

General instructions

- use new gaskets and seals.
- replace worn parts.
- assemble parts using match marks applied during disassembly. Compare replacement parts with originals to identify installation alignments.

NOTICE

• Coat inside of cylinders, motor housing cylinder bores and 'O' rings with lightweight grease (synthetic PTFE-based silicone lubricant recommended).

Thermoplastic Coated Parts Assembly

⚠ CAUTION

• During application of thermoplastic coating to assemblies use a flame to localize heat. Do not heat entire assembly. Assemblies contain gaskets, 'O' rings and other components that may be damaged by exposure to excessive heat.

1. When assembling parts already coated, mating areas can be heated to soften coating enough to flow together and seal parts.

- When installing a new component in an assembly, remove coating from existing parts as necessary to ensure parts mate correctly.
- Install fasteners and torque as required. Apply coating to bare areas as described in "Thermoplastic Coating" repairing surfaces instructions in the "MAINTENANCE" section for areas larger than 1/16 inch (1.6 mm).
- Allow repaired area to cool. Quenching with water is acceptable. Rough spots, minor scorching and excess coating deposits can be wet sanded to remove imperfections. To return the gloss finish, reheat surface carefully.

Motor Assembly

Refer to Dwg. MHP2005 on page 22.

- Press bearing (27) into motor housing (28) and secure with retainer ring (26).
- Press crankshaft (25) through bearing (27) and secure with retainer ring (31). Crankshaft should rotate freely.

NOTICE

• For Fenner and NEMA style motors be sure key (20) is inserted into crankshaft (25).

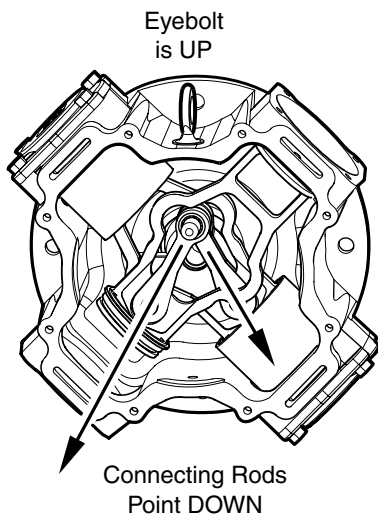
- Lubricate 'O' rings (22) and place in grooves on piston heads.

NOTICE

• Ensure piston needle roller bearings are contaminant-free. Lubricate bearings with a molybdenum-lithium based grease ("Lubriplate, Mo-Lith #2" recommended).

- With eyebolt on motor housing oriented UP, place a piston assembly (23) on crankshaft pin with connecting rod pointing DOWN. Refer to Dwg. MHP1837 on page 17.

Piston to Crankshaft Assembly



(Dwg. MHP1837)

- Place a piston ring set (21) over one piston and compress with fingers. When correctly installed, rings snap together. Insert one cylinder (19) through motor housing and over these rings. Repeat for other piston.

NOTICE

• For Fenner style motor piston ring (21) is one piece.

- Orient stud on cylinder to the back of motor. This will align ports in cylinder with those in motor housing.
- Place a gasket (18) and cylinder cap (17) on each cylinder. There is a recess in cap for cylinder stud to fit in, to maintain cylinder alignment during operation. Loosely secure with washers (3) and capscrews (2). Repeat for opposite cylinder.
- Rotate crankshaft and repeat steps 2 through 7 for the other piston assembly.
- Once both piston assemblies and liners are installed, tighten capscrews (2).
- Check rotation of crankshaft assembly. Assembly should rotate smoothly without sticking, binding or knocking of the piston heads on the top of the cylinders. Correct any problems before continuing assembly.
- Press rotary valve bushing (12) into rotary housing (9). Ensure pin in housing and slot in bushing align correctly. Press until bushing is flush.
- Press bearing (14) into rotary housing.
- Install retainer ring (8) into rotary housing.
- Press rotary valve (15) through bearing (14) and into rotary housing.
- Press bearing (7) onto rotary valve and into rotary housing. Secure with retainer ring (6).

CAUTION

• During installation of bearing (7), support both the inner and outer race of bearing.

- Check rotation of rotary valve. Rotation should be smooth without sticking or binding. Correct any problems before continuing assembly.
- Position pin in crankshaft (25) at the top (closest to eyebolt). Place gasket (13) on motor housing. Lift rotary housing onto motor housing (counterweight of the rotary valve will rotate to the bottom). Align pin in the crankshaft with hole in rotary valve and place both housings together.
- Secure with washers (3) and capscrews (2).
- Align gasket (5) and rotary housing cover (4) with holes in rotary housing (9) and secure with washers (3) and capscrews (2).
- Insert seal (43) into plate (45) and secure with retainer (42). For Fenner style motor insert bearing (7) and retainer ring (8) into plate (45).
- Carefully insert seal tool (46) through plate and seal. This expands seal to fit over crankshaft (25).

NOTICE

• Fenner style motors will not have seal (43), retainer ring (42) or washer (3).

- Place gasket (44) into recess in motor housing (28).
- Using finger pressure place plate assembly over crankshaft and push. As crankshaft comes through seal, installation tool will be pressed out.
- Secure plate with capscrews (2) and washers (3). For Fenner style motor secure plate (45) with capscrews (10).
- Place gasket (5) onto rotary housing cover. Place this assembly onto rotary housing (9) and secure with washers (3) and capscrews (2).

Control Valve Assembly

Refer to Dwg. MHP2006 on page 24.

Reverse Valve Assembly

1. Insert reverse valve (143) into bushing (144) with ball slot oriented UP.
2. Insert bushing (144) and reverse valve (143) into valve housing (117) from exhaust flange side, ensuring that groove in bushing is aligned with pin (145).
3. Lubricate 'O' ring (142) and place it in groove in exhaust flange (155).
4. Secure exhaust flange (155) to valve housing with capscrews (101) and washers (102).
5. Insert 'O' ring (141) into seal bracket (139). Lubricate 'O' ring (142) and place into groove in seal bracket.
6. Place seal bracket over end of reverse valve. Using finger pressure, press until seal is seated on reverse valve and seal bracket is seated on valve housing. Secure with washers (124) and capscrews (125) and (138).

Pilot Valve Assembly

1. Lubricate and install 'O' rings (111) on pilot shaft (113).
2. Insert this assembly into pilot seat (114).
3. Using fingers, keep pilot rod located fully in pilot seat and place spring (109) over end. Secure with retainer ring (115).
4. Drop ball (116) through pilot valve hole. Do not grease ball.
5. Pilot Valve Assembly (items 109, 111 and 113 through 115) is installed as an assembly.
6. Apply thread sealant Loctite 567® to pilot seat (114), place pilot valve assembly into valve housing. Use a large flat tipped screw driver to engage slots in pilot seat and tighten until pilot assembly is 1/8 in. (3.175 mm) from housing bore.
7. Insert plug (112) and tighten.

Piston Assembly

1. Lubricate and install 'O' rings (121) and (123) on piston (122).
2. Insert assembled piston into valve housing (117) from handle side.

3. Secure with gasket (118), piston cover (119), washers (102) and capscrews (101).
4. Place poppet seal (107) into poppet cap (106). Place this assembly into valve housing and seat on piston (122).
5. Place spring (105) over this assembly.
6. Secure with gasket (104), poppet cover (103), washers (102) and capscrews (101).

Handle Assembly

1. Grease valve hub (136) shaft and place slide handle (134) over valve hub (136). Insert spring (133) into slide handle (and over valve hub).
2. Screw handle post (132) over this assembly and tighten.
3. Place knob (131) on handle post (132) and tighten.
4. Place spring (137) over reverse valve handle end in seal bracket.

NOTICE

• **Spring (137) will have to be 'Cocked' over stud in seal bracket. This will ensure handle returns to neutral.**

5. Place handle assembly over reverse valve end. Slide handle will have to be lifted slightly to allow pin to fit into slot in seal bracket.
6. Secure handle assembly to reverse valve with washer (102) and capscrew (101). Press plug (135) into handle assembly to cover capscrew. Check control handle movement. Correct any discrepancies.

Testing

Operational Test

Prior to initial use, all new or repaired motors shall be tested to ensure proper operation.

To initially 'break in' new or overhauled motors, operate motor without load, in both directions, for 15 minutes at 100-200 RPM. Motor should operate smoothly without sticking, binding or knocking. Correct any problem before mounting motor to any component.

PARTS ORDERING INFORMATION

The use of other than **Ingersoll-Rand** replacement parts may adversely affect the safe operation and performance of this product.

For your convenience and future reference it is recommended that the following information be recorded.

Model Number _____

Serial Number _____

Date Purchased _____

When ordering replacement parts, please specify the following:

1. Complete model number and serial number as it appears on the nameplate.
2. Part number(s) and part description as shown in this manual.
3. Quantity required.

The nameplate is located on the motor housing.

NOTICE

- **Continuing improvement and advancement of design may cause changes to this equipment which are not included in this manual. Manuals are periodically revised to incorporate changes. Always check the manual edition number on the front cover for the latest issue.**
- **Sections of this manual may not apply to your motor configuration.**

Refer all communications to the nearest **Ingersoll-Rand** Office or Distributor.

Return Goods Policy

Ingersoll-Rand will not accept any returned goods for warranty or service work unless prior arrangements have been made and written authorization has been provided from the location where the goods were purchased.

Motors that have been modified without **Ingersoll-Rand** approval, mishandled or overloaded will not be repaired or replaced under warranty. A printed copy of the warranty which applies to this motor is provided inside the back cover of this manual.

Disposal

When the life of the unit has expired, it is recommended that the unit be disassembled, degreased and parts separated as to materials so that they may be recycled.

For additional information contact:

Ingersoll-Rand
P.O. Box 24046
2724 Sixth Avenue South
Seattle, WA 98124-0046 USA
Phone: (206) 624-0466
Fax: (206) 624-6265

or

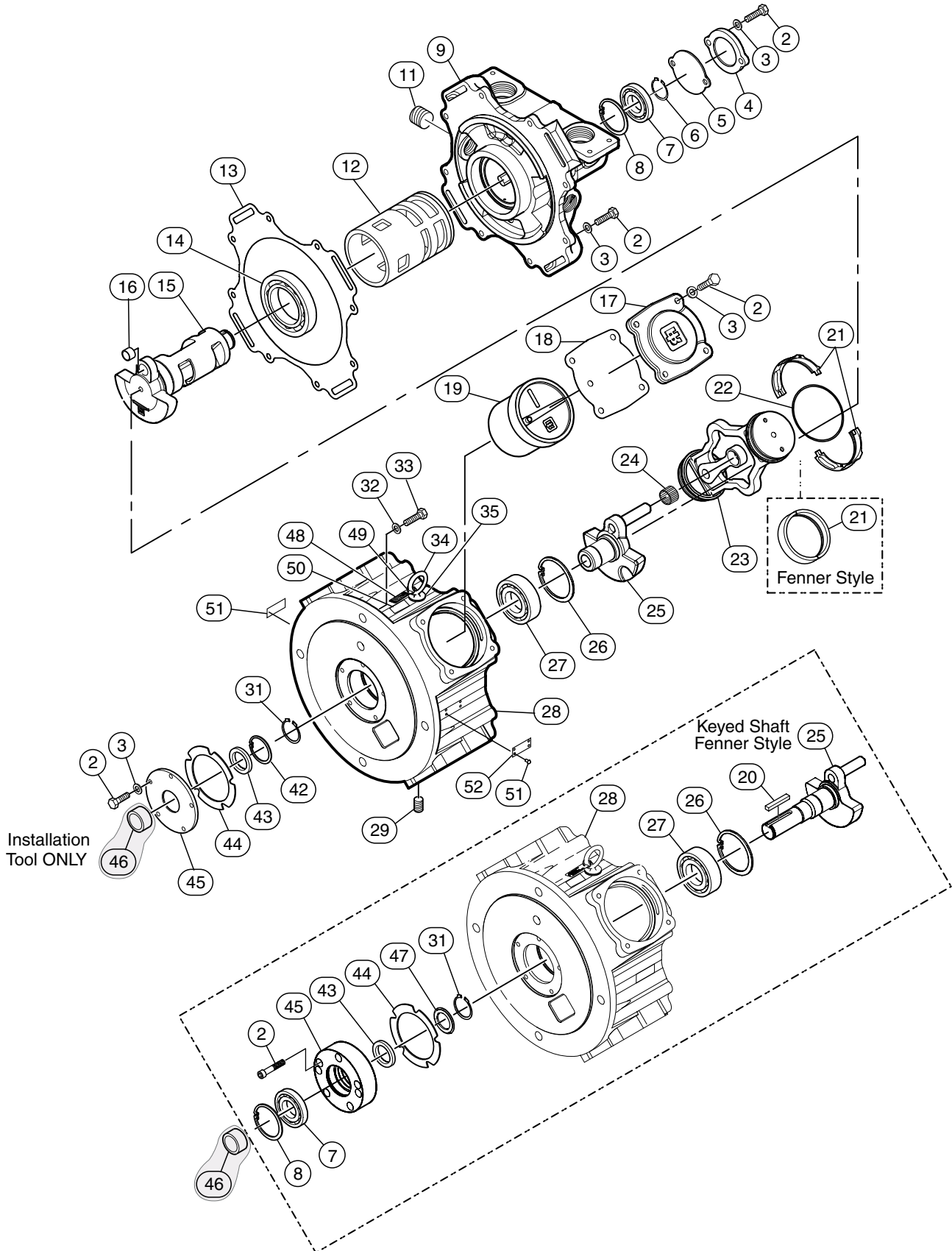
Ingersoll-Rand
Douai Operations
111, avenue Roger Salengro
59450 Sin Le Noble, France
Phone: (33) 3-27-93-08-08
Fax: (33) 3-27-93-08-00

SERVICE NOTES

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MOTOR ASSEMBLY PARTS DRAWING



(Dwg. MHP2005)

MOTOR ASSEMBLY PARTS LIST

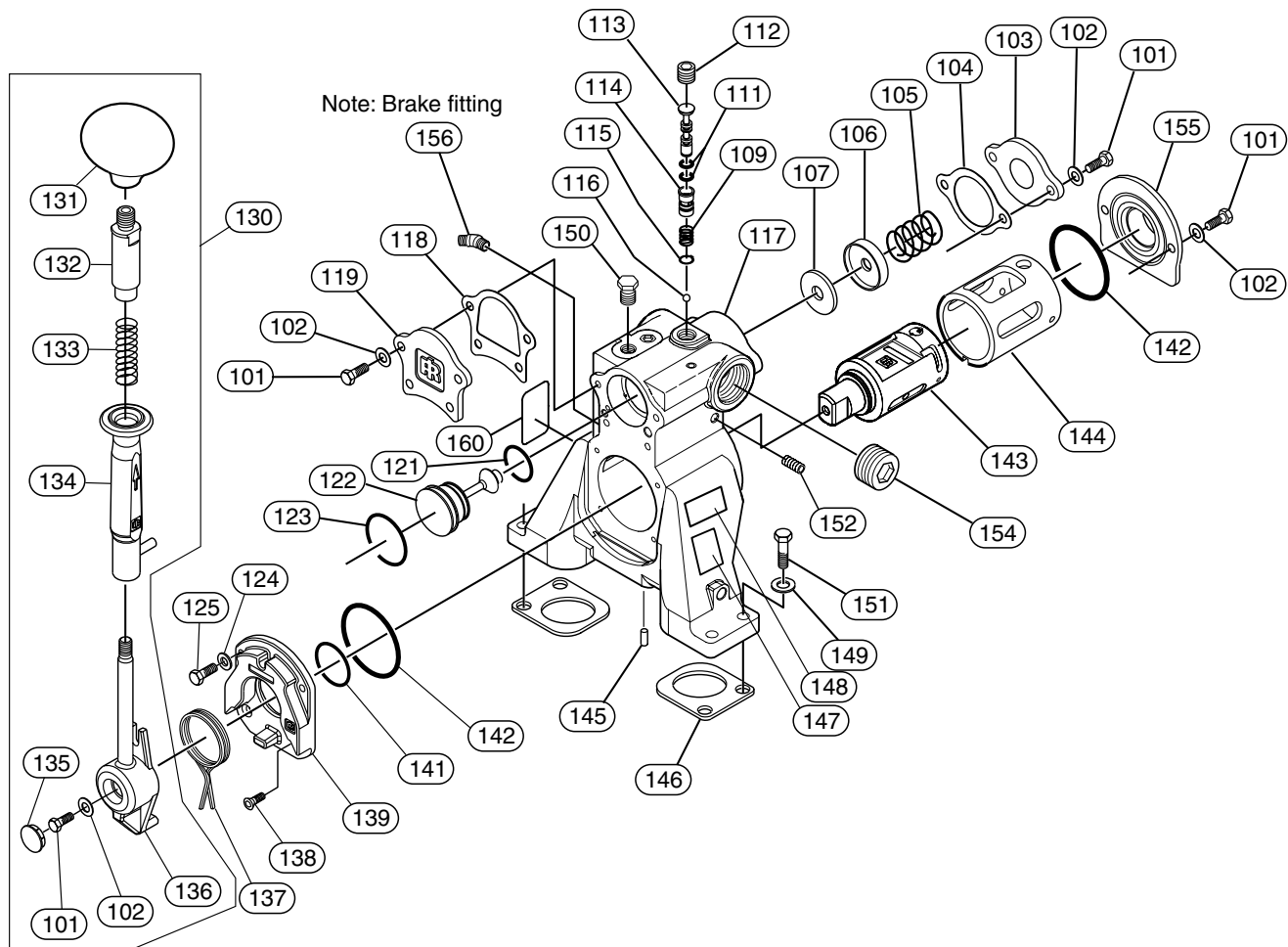
Item No.	Description of Part	Total Qty	Part Number			
			Keyed Shaft**	Air	Natural Gas	NEMA
1	Motor Assembly (includes items 2 through 35)	1	MMP150			
2	Capscrew	31 (26)	71348973			
3	Washer	31 (26)	71303408			
4	Rotary Housing Cover	1	26660			
5	Gasket, Rotary Housing	1	26653		26653-1	
6	Retainer Ring	1	71345458			
7	Bearing	1 (2)	53071			
8	Retainer Ring	1 (2)	71345441			
9	Rotary Housing	1	26684			
10	Capscrew	5	71342059	---		
11	Pipe Plug	1	52304			
12	Rotary Valve Bushing (includes items 5 through 8, 13 and 14)	1	27241			
13	Gasket, Manifold	1	26652		26652-1	
14	Bearing	1	71342083			
15	Rotary Valve-Clockwise (includes item 16) *	1	Contact Factory	27174		Contact Factory
	Rotary Valve-Counter-Clockwise (includes item 16) *		27174-1		Contact Factory	
	Rotary Valve-Equal (includes item 16) *		27174-3	Contact Factory		
16	Bushing	1	71345466	71345466	71356034	
17	Cylinder Cap	4	26659			
18	Gasket, Cylinder Cap	4	26651		26651-1	
19	Cylinder	4	26662			
20	Key	1	26655	---		26655
21	Piston Rings (available only as kit, includes item 22)	4 (2) Set	28755	27166	27194	Contact Factory
22	'O' Ring (available only as kit, includes item 21)	1 Set				
23	Piston Assembly (includes items 21 (qty 4), 22 (qty 2) and 24)	2	25726-2	25726		
24	Piston Bearing	2	71287130			
25	Crankshaft	1	27864-2	26676		27270
26	Retainer Ring	1	52678			
27	Bearing	1	71348007			
28	Motor Housing	1	26732			
29	Plug	1	54292			
31	Retainer Ring	1	51192			
32	Washer	4	52914			
33	Capscrew	4	71342067			
34	Eyebolt	1	71342109			
35	Washer	1	50182			
42	Retainer Ring	1	71348460			
• 43	Seal	1	71359574	71359574	71348395	71359574
• 44	Gasket	1	26981-1		26981	26981-1
45	Plate	1	27230	26975		27268
46	Seal Installation Tool	1	27001			
47	Seal	1	27440			
48	Label, Do Not Lift	1	71355655			
49	Wire Tie	1	54235			
50	Label, Do Not Fill With Oil	1	71347314			
51	Label, Exhaust	1	71042196			
52	Label, Nameplate	1	K5B-301-R			
53	Rivet	4	71028849			

• Recommended spares for 1 motor, 2 years of normal service.

* Refer to 'Motor Rotation' on page 8 for Rotary Valve (item 15) configuration information. Includes bushing (item 16).

** Fenner RM410 Style Mount.

MANUAL CONTROL VALVE ASSEMBLY PARTS DRAWING



(Dwg. MHP2006)

MANUAL CONTROL VALVE ASSEMBLY PARTS LIST

Item No.	Description of Part	Total Qty	Part Number	Item No.	Description of Part	Total Qty	Part Number
100	Control Valve Assembly	1	K5C2	130	Handle Assembly (includes 101, 102 and 131 through 136)	1	27239
101	Capscrew	9	71342034				
102	Washer	9	71303408				
103	Cover, Poppet	1	26997	131	Ball	1	71348353
104	Gasket, Poppet – Air	1	27064	132	Handle Post	1	26951
	Gasket, Poppet – Natural Gas		27064-1	133	Spring	1	71348346
105	Spring, Poppet	1	71351068	134	Handle, Slide	1	**
106	Cap, Poppet	1	28734	135	Plug	1	**
107	Seal, Poppet – Air	1	26991	136	Valve Hub	1	26948
	Seal, Poppet – Natural Gas		26991-1	137	Spring	1	26966
108	Plug	2	54292	138	Capscrew	2	71394407
109	Spring, Pilot Rod	1	71351076	139	Seal Bracket	1	28733-S
111	'O' Ring-Air	2	71126825	141	'O' Ring, Air	1	71357198
	'O' Ring-Natural Gas		71357487		Seal, Natural Gas		71342554
112	Plug	1	71267561	142	'O' Ring, Air	2	51651
113	Pilot Shaft (includes item 114)	1	28696		'O' Ring, Natural Gas		71342547
114	Seat, Pilot (includes item 113)	1	28696	143	Reverse Valve	1	27925-SX
115	Retainer Ring	1	71351092	144	Bushing	1	26686
116	Ball	1	71127575	145	Pin	1	71146674
117	Valve Housing	1	*		146	Gasket, Air	2
118	Gasket, Cover - Air	1	26998	146	Gasket, Natural Gas		27115-1
	Gasket, Cover – Natural Gas		26999-1		147	Label, Warning-Natural Gas Vapors	1
119	Cover, Piston	1	26998	148	Label, Throttle Direction	1	71352777
121	'O' Ring-Air	1	52537	149	Washer	4	54843
	'O' Ring-Natural Gas		71357495	150	Plug	1	71366348
122	Piston	1	28735-S	151	Capscrew	4	71351944
123	'O' Ring, Air	1	71355796	152	Breather	1	51559
	'O' Ring, Natural Gas		71351050	154	Plug	1	71263297
124	Washer	2	71271985	155	Exhaust Flange	1	26691
125	Capscrew	2	71348338	156	Fitting, Elbow	1	27973

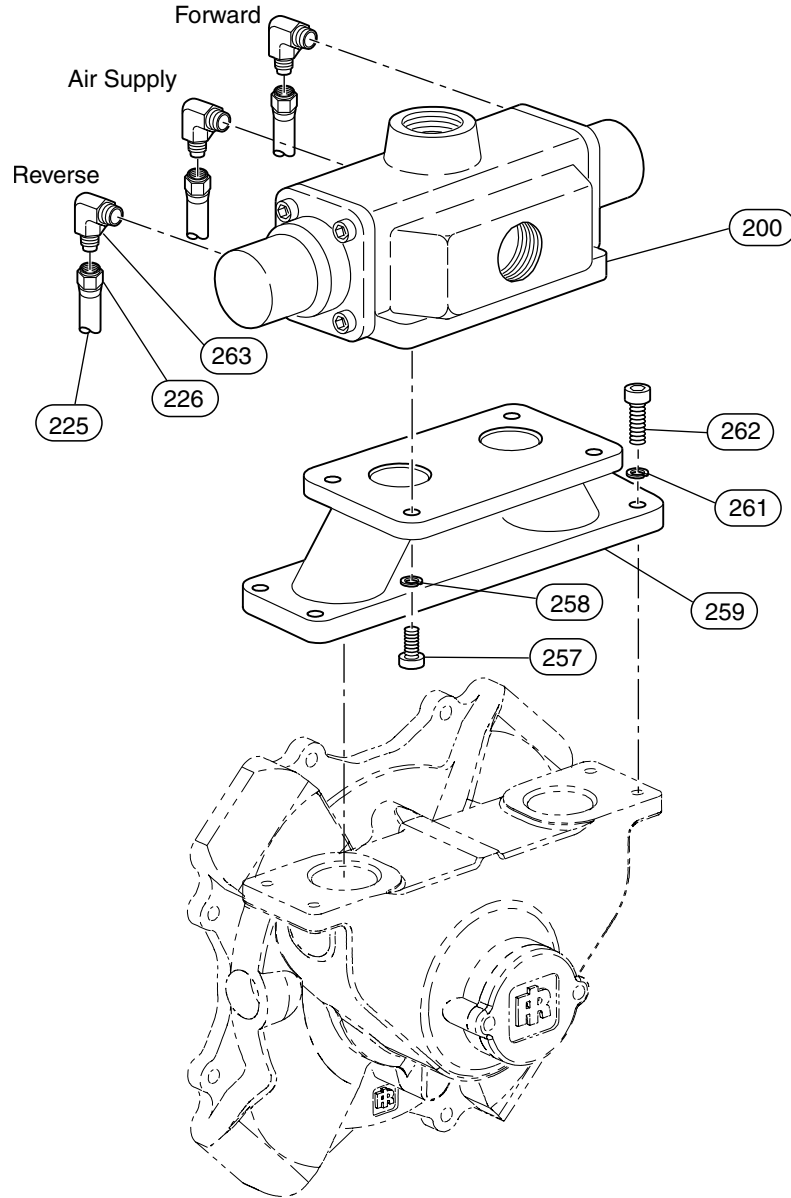
Kit Description	Part Number
• Control Valve Service Kit – Air (includes items 104, 107, 111, 115, 118, 121, 123, 141, 142 and 146)	27240
Control Valve Service Kit – Natural Gas (includes items 104, 107, 111, 113, 115, 118, 121, 123, 141, 142, 144, and 146)	27240-1
Pilot Shaft Kit (includes items 109, 111, 113 - 115)	28696
Seal Bracket Kit (includes items 124, 125, 138, 139, 141 and 142)	28733-S
Piston Kit (includes items 106, 107, 121 - 123)	28735-S

- Recommended spares for 1 motor, 2 years of normal service.

Note: Contact factory for information on converting Normal Air Control Valve to Natural Gas compatible.

- * Not sold separately, order item 100.
- ** Not sold separately, order item 130.

REMOTE PILOT AIR CONTROL ASSEMBLY DRAWING AND PARTS LIST

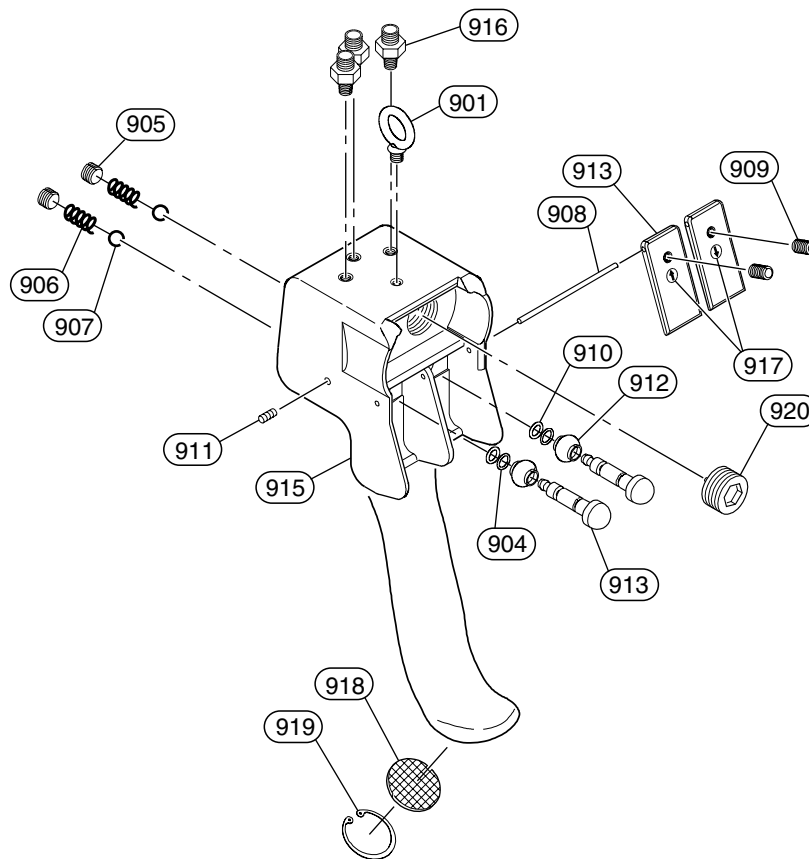


(Dwg. MHP2007)

Item No.	Description of Part	Total Qty	Part Number	Item No.	Description of Part	Total Qty	Part Number
200	Valve Assembly	1	26170	259	Manifold	1	13881
225	Hose, Bulk	As req'd	50923-XX	261	Washer	4	50200
226	Fitting, Hose End	As req'd	51029	262	Capscrew	4	50829
257	Capscrew	4	54681	263	Fitting, Elbow	3	52182
258	Lockwasher	4	50893				

XX Order in even feet increments; i.e., 50923-02 = 2 feet (0.6 metres). Metres listed for reference only.

PENDANT CONTROL ASSEMBLY DRAWING AND PARTS LIST

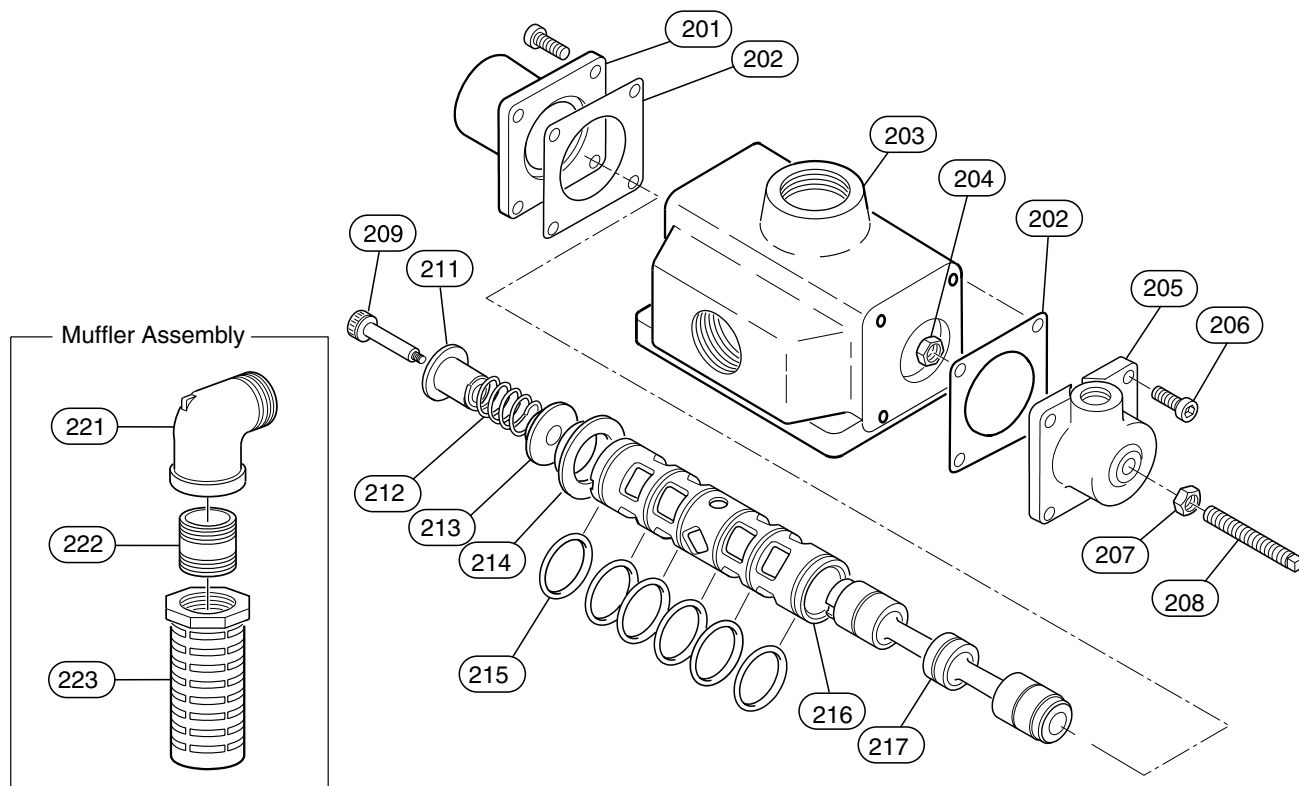


(Dwg. MHP2235)

Item No.	Description of Part	Total Qty	Part Number	Item No.	Description of Part	Total Qty	Part Number
820	Pendant Assembly	1	PHS2E	914	Lever	2	95790122
901	Lifting Eye	1	64222332	●915	Pendant Handle*	1	Order item 820
●904	'O' Ring	2 (5)	58209229	916	Fitting	3 (5)	71078158
905	Plug	2 (4)	65107741	917	Label Kit	1	95790111
906	Spring	2 (4)	69128541	918	Exhaust Washer	1	95790114
●907	Ball	2 (5)	69401625	919	Retainer Ring	1	47713030
908	Pin	1	95790040	●920	Plug	1	65129541
909	Setscrew	2	42008607	**	Label: Read the Manual	1	96180098
●910	'O' Ring	2 (3)	58235329	**	Label: Do Not Use for Lifting Personnel	1	96180100
911	Setscrew	2 (3)	42008307				
912	Protector	2 (3)	95790107				
913	Valve	2 (3)	95790104				

- Recommended spares for 1 motor, 2 years of normal service.
- * Not sold separately. Order new Pendant.
- ** Not Illustrated.
- () Quantity Required for Pendants with Emergency Stop.

CONTROL AIR VALVE ASSEMBLY DRAWING AND PARTS LIST



(Dwg. MHP2009)

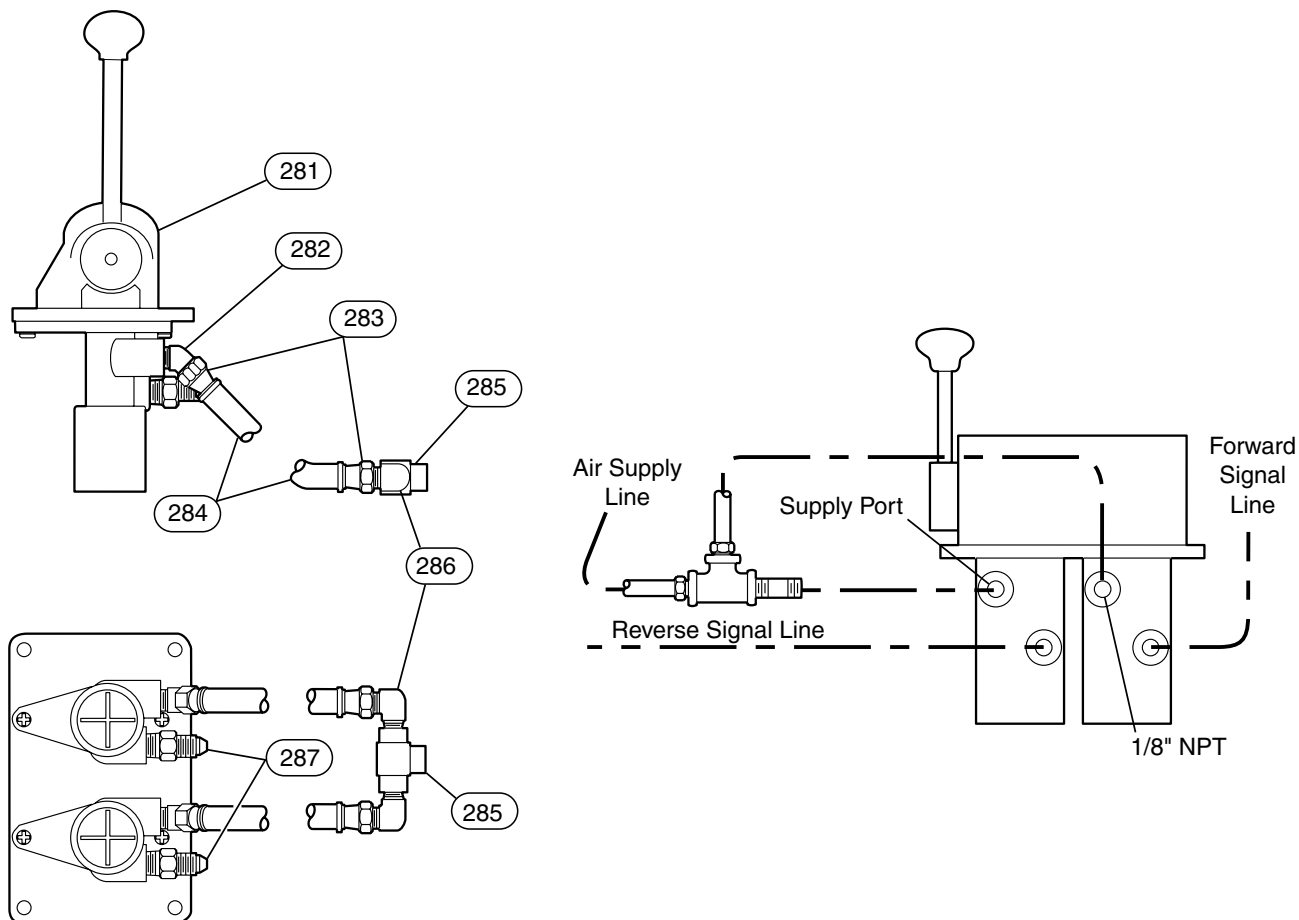
Item No.	Description of Part	Total Qty	Part Number	Item No.	Description of Part	Total Qty	Part Number
200	Valve Assembly *	1	26170	211	Guide	1	52233
201	End Cap	1	52241	212	Spring	1	52240
202	Gasket	2	52457	213	Washer	1	52239
203	Valve Body	1	**	214	Spacer	1	52238
204	Nut	1	50176	215	'O' Ring	6	71356398
205	End Cap (Inlet Side) †	1	11778	216	Valve Sleeve	1	**
206	Cap screw	8	71327738	217	Valve Spool	1	**
207	Nut	1	71069132	221	Fitting, Elbow	1	71330112
208	Adjusting Screw	1	71327720	222	Fitting, Nipple	1	71057483
209	Shoulder Screw	1	54710	223	Muffler	1	52472

Kit Description	Part Number
<ul style="list-style-type: none"> Control Valve Service Kit (includes items 202 (qty 2) and 215 (qty 6)) 	71356398

- Recommended spares for 1 motor, 2 years of normal service.

- * Valve Assembly (200) includes items 201–217.
- ** Valve Body (203), Valve Sleeve (216) and Valve Spool (217) are not sold separately. To replace these items order Valve Assembly (200).
- † End Cap (item 205) includes items 204, 207 and 208.

PANEL CONTROL ASSEMBLY DRAWING AND PARTS LIST

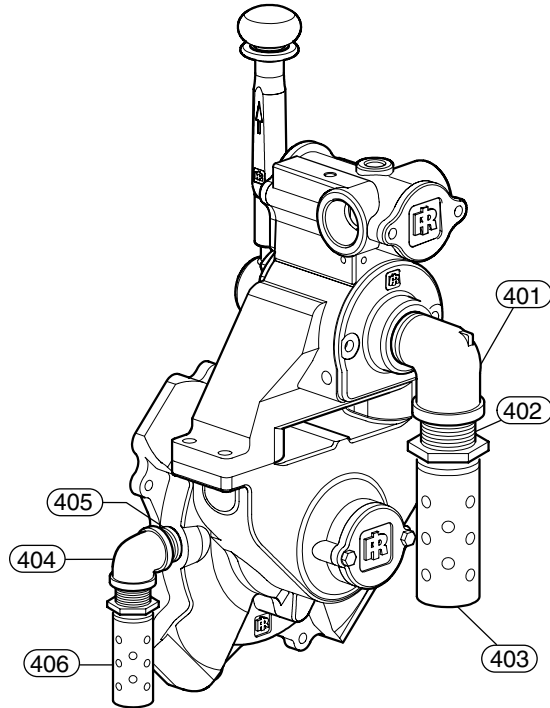


(Dwg. MHP2010)

Item No.	Description of Part	Total Qty	Part Number
281	Control Valve	1	UWD-A686
282	Fitting, Elbow	2	71048284
283	Fitting, Hose End	4	51029
284	Hose (bulk) *	As required	50923-XX
285	Fitting, Tee	1	54678
286	Fitting, Elbow	2	52182
287	Fitting, Connector	2	71048268

* Add hose length (feet/metres). Maximum length = 20 ft (6 metres). Contact Technical Sales for information on control applicability for lengths greater than 20 feet (6 metres). Metres are for reference only; order quantities in feet.

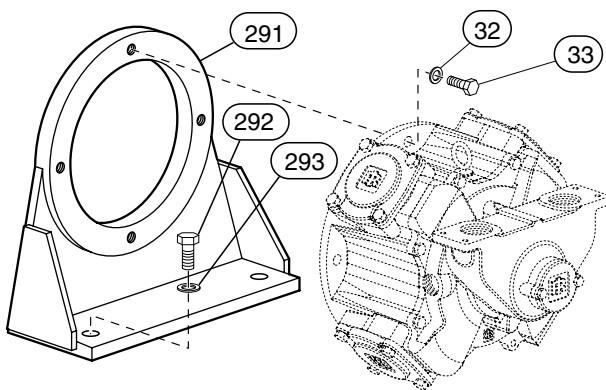
MOTOR MUFFLER ASSEMBLY DRAWING AND PARTS LIST



(Dwg. MHP1855)

Item No.	Description of Part	Total Qty	Part Number
401	Fitting, Elbow	1	71273676
402	Fitting, Nipple	1	71057483
403	Muffler	1	52472
404	Fitting, Elbow	1	50928
405	Fitting, Nipple	1	54267
406	Muffler	1	50592

BASE MOUNT ASSEMBLY DRAWING AND PARTS LIST



(Dwg. MHP2011)

Item No.	Description of Part	Total Qty	Part Number
32	Washer	4	52914
33	Capscrew	4	71342067
290	Base Mount Kit (includes items 291 – 293)	1	24195
291	Base Mount	1	27396
292	Capscrew	2	*
293	Washer	2	*

* Capscrew (292) and washer (293) shown for reference only. Refer to 'Base Mounted Installation' on page 6 of "INSTALLATION" section for additional information.

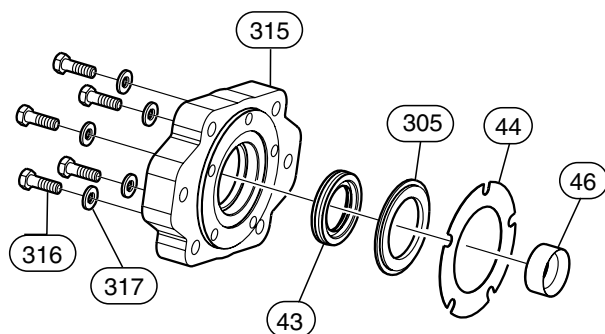
MOTOR ASSEMBLY SPARE PARTS KITS

Kit Description	Part Number
Natural Gas Motor (only) Conversion Kit (includes items 3, 5, 13, 16, 18, 21, 22 and 41 through 46)	26974
• Piston Ring Kit – Normal Operation (includes items 21 (qty 8) and 22 (qty 4) for 1 motor)	27166
Piston Ring Kit – Natural Gas Operation (includes items 21 (qty 8) and 22 (qty 4) for 1 motor)	27194
Piston Ring Kit – Fenner Style (includes items 21 (qty 4) and (qty 4) for 1 motor)	28755
• Gasket Kit – Normal Operation and Fenner Style (includes items 5, 13 and 18 (qty 4))	26679
Gasket Kit – Natural Gas Operation (includes items 5, 13 and 18 (qty 4))	27193

- Recommended spares for 1 motor, 2 years of normal service.

MOUNTING KIT ASSEMBLY DRAWING AND PARTS LIST

Hydraulic SAE 'B' Mounting Kit
(For a standard motor only)



(Dwg. MHP2086)

Item No.	Description of Part	Total Qty	Part Number
314	Hydraulic SAE 'B' Mounting Kit (includes items 43, 44, 46, 305, 315, 316 and 317)	1	26726
43	Seal	1	71359574
44	Gasket	1	26981-1
46	Seal Installation Tool	1	27001
305	Seal	1	27440
315	Motor Adapter	1	27271
316	Capscrew	5	71348973
317	Washer	5	71303408

ACCESSORIES

Description of Accessory	Part Number
Thermoplastic Powder (4 ounces)	71308902
Muffler (quantity of 2 required for '-E' Option motors)	52472
Lubricant (16 fluid ounces)	LUBRI-LINK-GREEN
Filter 1-1/2 inch NPT	F35-0B-C28
Regulator - 1-1/2 inch NPT	R40-0B-G00
Lubricator 1-1/2 inch NPT	L40-0B-000
Liquidator 2 inch FNPT (not shown on drawing)	8834-W1-000
Pipeline Strainer 1-1/4 FNPT (not shown on drawing)	K4U-A267AT

KITS

Description of Kit	Part Number
Motor - Natural Gas Conversion Kit	26974
Piston Ring Kit - Standard	27166
Piston Ring Kit - Natural Gas	27194
Motor Gasket Kit - Standard	26679
Motor Gasket Kit - Natural Gas	27193
Control Valve Service Kit - Standard	27240
Control Valve Service Kit - Natural Gas	27240-1
Pilot Valve Service Kit - Standard	71356398
Hydraulic SAE 'B' Mounting Kit (For a standard motor only)	26726
Base Mount Kit	27195

SERVICE NOTES

SERVICE NOTES

LIMITED WARRANTY

Ingersoll-Rand Company (I-R) warrants to the original user its Products to be free of defects in material and workmanship for a period of one year from the date of purchase. **I-R** will repair, without cost, any Product found to be defective, including parts and labor charges, or at its option, will replace such Products or refund the purchase price less a reasonable allowance for depreciation, in exchange for the Product. Repairs or replacements are warranted for the remainder of the original warranty period.

If any Product proves defective within its original one year warranty period, it should be returned to any Authorized Hoist and Winch Service Distributor, transportation prepaid with proof of purchase or warranty card.

This warranty does not apply to Products which **I-R** has determined to have been misused or abused, improperly maintained by the user, or where the malfunction or defect can be attributed to the use of non-genuine **I-R** parts.

I-R makes no other warranty, and all implied warranties including any warranty of merchantability or fitness for a particular purpose are limited to the duration of the expressed warranty period as set forth above. I-R's maximum liability is limited to the purchase price of the Product and in no event shall I-R be liable for any consequential, indirect, incidental, or special damages of any nature rising from the sale or use of the Product, whether based on contract, tort, or otherwise.

Note: Some states do not allow limitations on incidental or consequential damages or how long an implied warranty lasts so that the above limitations may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which may vary from state to state.

IMPORTANT NOTICE

It is our policy to promote safe delivery of all orders. This shipment has been thoroughly checked, packed and inspected before leaving our plant and receipt for it in good condition has been received from the carrier. Any loss or damage which occurs to this shipment while enroute is not due to any action or conduct of the manufacturer.

Visible Loss or Damage

If any of the goods called for on the bill of lading or express receipt are damaged or the quantity is short, do not accept them until the freight or express agent makes an appropriate notation on your freight bill or express receipt.

Concealed Loss or Damage

When a shipment has been delivered to you in apparent good condition, but upon opening the crate or container, loss or damage has taken place while in transit, notify the carrier's agent immediately.

Damage Claims

You must file claims for damage with the carrier. It is the transportation company's responsibility to reimburse you for repair or replacement of goods damaged in shipment. Claims for loss or damage in shipment must not be deducted from the **Ingersoll-Rand** invoice, nor should payment of **Ingersoll-Rand** invoice be withheld awaiting adjustment of such claims as the carrier guarantees safe delivery.

You may return products damaged in shipment to us for repair, which services will be for your account and form your basis for claim against the carrier.

United States Office Locations

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Offices and distributors in principal cities throughout the world. Contact the nearest **Ingersoll-Rand** office for the name and address of the distributor in your country or write/fax to:

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Rexdale, Ontario
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Fax: (416) 213-4510
Order Desk
Fax: (416) 213-4506

Edmonton, Alberta

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