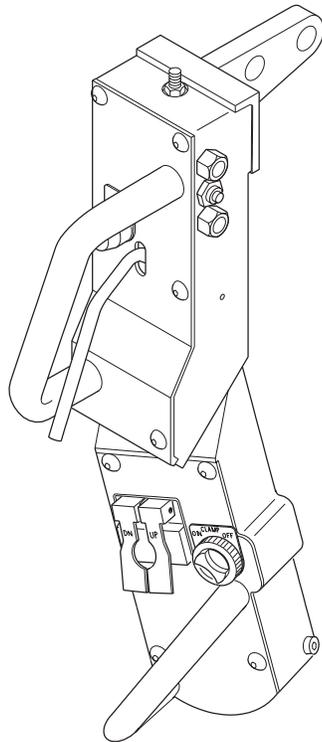


PARTS, OPERATION AND MAINTENANCE MANUAL for END EFFECTORS ROTARY ACTION HANDLER



(Dwg. MHP1570)



(Dwg. MHP2039)



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

⚠ WARNING

This equipment is intended for industrial use only and should not be used for lifting, supporting, or transporting people or lifting or supporting loads over people.

Always operate, inspect and maintain this unit in accordance with applicable safety codes and regulations.

Form MHD56163

Edition 1

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ZIMMERMAN
HANDLING SYSTEMS

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 product.

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

Personal protective and safety equipment should be used and maintained in accordance with the manufacturer's instructions.

WARNING

- **Do not use this unit or attached equipment for lifting, supporting, or transporting people or lifting or supporting loads over people.**
- **The supporting structures and load-attaching devices used in conjunction with these units must provide a safety factor of at least three times the rated capacity of the unit. This is the customer's responsibility. If in doubt, consult a registered structural engineer.**
- **If system air pressure is lost, lower the load immediately. The operator must stay out of the vertical path of the load.**

NOTICE

- **Lifting equipment is subject to different regulations in each country. These regulations may not be specified in this manual.**

Employees who work near suspended loads or assist in positioning or arranging a load should be instructed to keep out from under the load. From a safety standpoint, one factor is paramount: conduct all lifting operations in such a manner that if there were an equipment failure, no personnel would be injured. This means keep out from under a raised load and keep out of the line of force of any load.

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 the information required to install, operate, maintain and repair the products described herein.

It is extremely important that mechanics and operators be familiar with the 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 are intended to avoid unsafe operating practices which might lead to injury or property damage.

Ingersoll-Rand recognizes that most companies who use material handling equipment have a safety program in force at their facility. If you are aware 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.

The manual supports a fully installed system. Operators should be familiar with the operation of the controls before using the system.

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 personnel trained in, safety and operation on this product to operate and maintain the system.
2. Only operate unit if you are physically fit to do so.
3. When a **“DO NOT OPERATE”** sign is placed on the system, do not operate the unit until the sign has been removed by designated personnel.
4. Before each shift, check the unit for wear and damage. Never use a unit that inspection indicates is worn or damaged.
5. Never lift a load greater than the rated capacity of the unit. Refer to **“SPECIFICATIONS”** section.
6. When unit is suspended from a wire rope, ensure load is centered. Do not **“side pull”** or **“yard”**.
7. Never operate a unit which is suspended from twisted, kinked or damaged wire rope.
8. Pay attention to the load at all times when operating the unit.
9. Make sure everyone is clear of the load path. Do not lift a load over people.
10. Never use the unit for lifting or lowering people, and never allow anyone to stand on a suspended load.
11. Never weld or cut a load suspended by the unit.
12. Remove load and shut off air supply before performing any maintenance.
13. Do not transfer a roll with the core in the vertical position.
14. Do not turn continuously in one direction when using the Rotary Action Handler.
15. Do use good posture when operating the Rotary Action Handler.
16. Do check the interlock for proper operation at the first operation of the unit.
17. Do check air connections for leakage.
18. Do ensure the nose assembly fully engages the roll.

SPECIFICATIONS

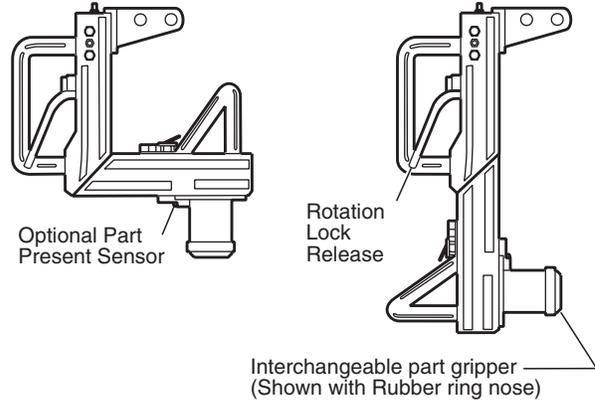
Description

The Rotary Action Handler performs virtually effortless 90° horizontal-to-vertical product orientation and can handle loads up to 300 lbs (136 kg). Its versatility is enhanced by a variety of nose end part grippers, including a nondestructive rubber ring nose. The rubber ring nose eliminates damage to core material and bar codes while improving the holding power for workplace safety.

When handling rolls with two different inside diameters, a step nose is available.

Rotary Action Handlers are supplied with a part present visual indicator to signal safe roll pickup and also an interlock system to prevent accidental release of the roll.

The Rotary Action Handler is designed to be supported by an Air Balancer and operated with an integral control system.



(Dwg. MHP1821)

Model Code Explanations

Rotary Action Handler Body Example: RAHZA108BFC

	RAH	ZA	108	B	F	C
Series						
RAH = Rotary Action Handler						
Controls						
EA = 2PS to handle fixed roll weights (1)						
ZA = Up/Down Lever control						
ZP = Up/Down Lever control with Part Clamp Switch						
Capacity and Core Length						
Cast Aluminum Body						
104 = up to 100 lbs (45.5 kg) 2-4 inch (51-102 mm) core length						
4-8 inch (102-203 mm) core length						
8-12 inch (203-304 mm) core length						
2** = up to 300 lbs (136 kg) ** Core Length (ins) available lengths 12, 14, 16, 18, 20, 22 and 24						
Fabricated Steel Body						
105 = up to 300 lbs (136 kg) 2-4 inch (51-102 mm) core length						
106 = up to 300 lbs (136 kg) 4-8 inch (102-203 mm) core length						
107 = up to 300 lbs (136 kg) 8-12 inch (203-304 mm) core length						
108 = up to 300 lbs (136 kg) 12-16 inch (305-406 mm) core length						
109 = up to 300 lbs (136 kg) 16-20 inch (406-508 mm) core length						
110 = up to 300 lbs (136 kg) 20-24 inch (508-610 mm) core length						
Options						
B = Adjustable Bail						
F = Food Grade Paint						
C = Side Clamp (2)						

(1) Only applicable for rolls of 100 lbs. (45.5 kg) or less
 (2) Available on fabricated steel body only

Rotary Action Handler Nose Example: NOSE300SDG

Description

NOSE = Interchangeable Part Gripper

Diameter

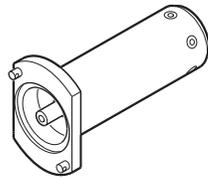
- 200 = 2 inch
- 300 = 3 inch**
- 400 = 4 inch
- 500 = 5 inch
- 600 = 6 inch
- 800 = 8 inch
- 075 = 75 mm
- 094 = 94 mm
- 110 = 110 mm
- 140 = 140 mm
- 143 = 143 mm
- 300600 = 3 inch / 6 inch diameter step nose

Options

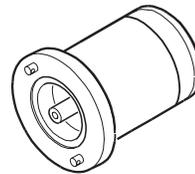
- S** = Step Nose (two different core diameters)
- D** = Dual Pressure Ring Nose
- P** = Single Pressure Ring Nose
- G** = Six Gripper Pin Nose
- I** = Interchangeable Nose
- 3** = 3 Gripper Pin Nose

NOSE 300 S D G I

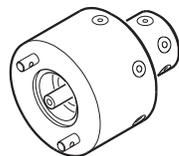
Contact factory for available nose lengths. Typically 2 to 6.125 inches (51 to 155 mm) on 100 lb. (45.5 kg) units.



Gripper Pin Assembly



Pressure Ring Assembly



Stepped Gripper Pin Assembly



Stepped Pressure Ring Assembly

(Dwg. MHP1884)

INSTALLATION

Prior to installing unit, 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 the unit into use.
- A falling load can cause injury or death. Before installing, read "SAFETY INFORMATION".

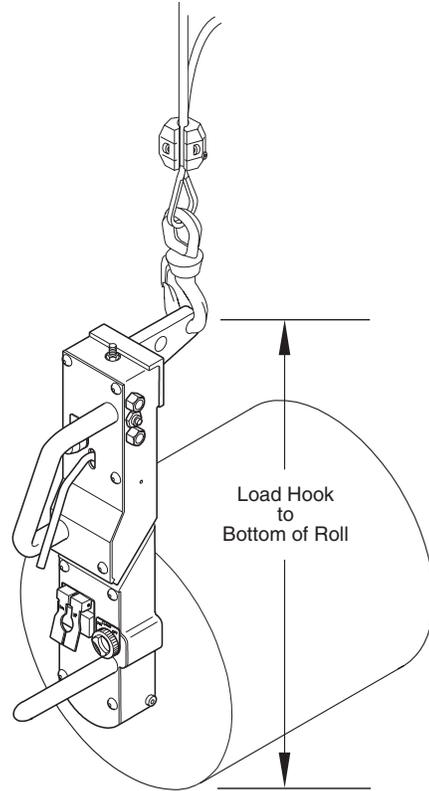
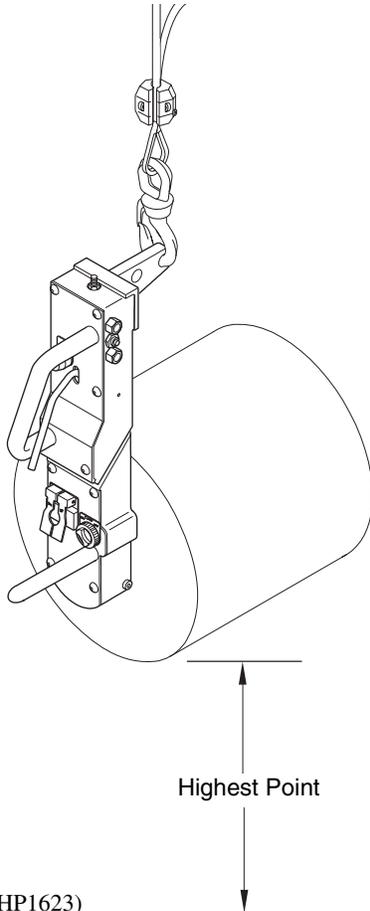
Ensure unit is properly installed. A little extra time and effort in doing so can contribute a lot toward preventing accidents, injuries and will help achieve the best service possible.

Always make certain the supporting member from which the unit is suspended is strong enough to support the weight of the unit plus the weight of a maximum rated load plus a generous factor of at least 300% of the combined weights. If in doubt, contact a registered structural engineer.

Positioning the Load Hook

To correctly install and position load hook to wire rope you must determine the following:

1. Highest point which load must clear from floor (Dimension 1). Refer to Dwg. MHP1623 on page 6.
2. Distance from hook throat to bottom of roll (Dimension 2). Refer to Dwg. MHP1624 on page 6.



(Dwg. MHP1624)

3. Add dimension 1 to dimension 2, then add 3-1/2 inches (89 mm).
4. Measuring from the floor with the wire rope fully retracted, install hook using the dimension established in step 3, to the floor. Refer to Balancer Parts, Operation and Maintenance Manual form ZBSMO195 for hook installation information.

Mounting The Unit

Insert load hook through lifting eye in Rotary Action Handler. Ensure Rotary Action Handler lifting eye is fully seated in load hook and that hook latch is resting on hook tip. Lifting bale is normally supplied with two or more holes. Select hole which provides optimal horizontal balance for roll being lifted.

Air System

The air supply system should be purged for a minimum of 30 seconds prior to the connection of the Balancer and Rotary Action Handler. This will remove any debris from the air lines and help prevent damage to the controls at start up. Zim-Air Balancers require 1/8 of a cubic ft. of air per cycle.

⚠ WARNING

- Do not exceed 100 psig (6.9 bar/690 kPa) inlet pressure. Do not use a lubricator of any kind. Oil will damage internal components.
- The air supply must be clean and free from water and water vapor.

Air Lines

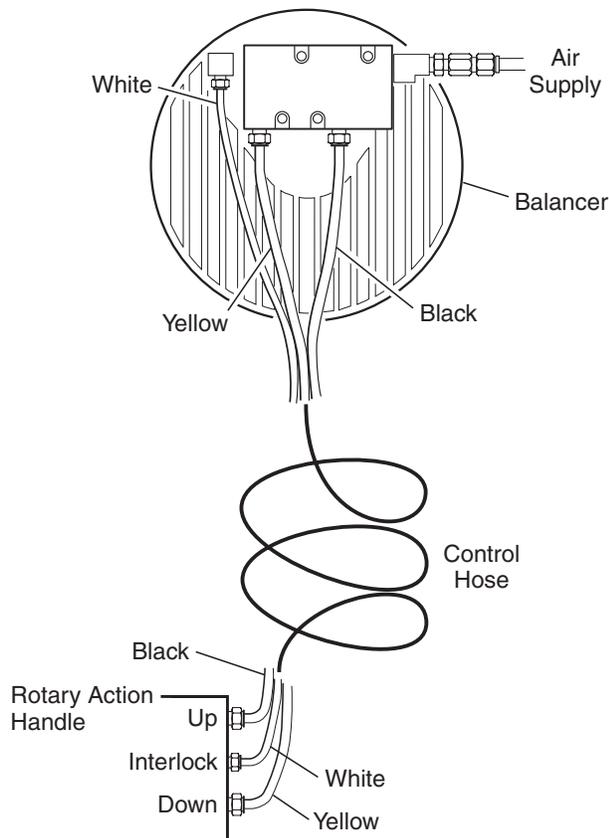
The inside diameter of unit air supply lines must not be smaller than 3/8 inch (10 mm) based on a maximum of 100 feet (30 m) of air line between air supply and unit. Contact factory for recommended air line sizes for distances greater than 100 feet (30 m). Before making final connections, all air supply lines should be purged. Supply lines should be as short and straight as installation conditions will 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. If quick-disconnect fittings are used at the inlet of the unit, they must have at least a 3/16 inch (10 mm) air passage. Use of smaller fittings will reduce performance.

Connection of Air Lines

ZA Control

Refer to Dwg. 1817 on page 7.

The control tube is pre-assembled tubing connected to the Rotary Action Handler. Control tubes are black, yellow 3/8 inch (4.5 mm) and white 5/32 inch (3.9 mm) precoiled assemblies. The yellow tube must be connected to the down port of the ZA manifold on the balancer. The black tube must be attached to the up port of the ZA manifold of the balancer. The white tube must be installed in the pilot port of the balancer.



(Dwg. MHP1817)

2PS Control

The EA regulator used with the 2PS Control has a fail safe check valve that blocks the balancer port below 50 psig (3.4 bar/340 kPa), which prevents the Rotary Action Handler from drifting down if air supply pressure is lost.

Refer to Dwg. MHP1820 on page 9.

Control tubing is a tri-coil assembly. A black 3/8 inch (9.5 mm) tube supplies air to the Rotary Action Handler. A 5/32 inch (3.9 mm) tube supplies the pilot signal to the 2PS valve. Rotary Action Handlers with an optional hi-lo circuit utilize a yellow 3/8 inch (9.5 mm) tube, otherwise not used.

Air Line Filter

It is recommended that an air line strainer/filter be installed as close as practical to the unit air inlet port. The strainer/filter should provide 5 micron filtration and include a moisture trap. Clean the strainer/filter monthly to maintain its operating efficiency.

To maintain dry air, the frequency for draining the filter should also be based on the condition of the air supply. We suggest the filter be drained weekly at first. Depending on air supply condition, a proper filter drain schedule should be established.

Moisture in Air Lines

Moisture that reaches the unit through supply lines is the chief factor in determining the length of time between service overhauls. Moisture traps can help to eliminate moisture. Other methods, such as an air receiver which collects moisture before it reaches the unit controls or an aftercooler at the compressor that cools the air prior to distribution through the supply lines, are also helpful.

OPERATION

Description Of Operation

Rotary Action Handler

The Rotary Action Handler is an integrated group of components designed to maximize the interaction of man and machine. These components can be mounted to an overhead rail system on which the **Zimmerman** Balancer travels. The Balancer has a wire rope with load hook attached to the Rotary Action Handler. The operator controls the system by use of the **Zimmerman ZA** (Zim-Air) up and down control or the **Zimmerman 2PS** (2 Position Sensor) zero gravity control. The clamp is actuated by a rotary switch or part present switch. Rotation is accomplished by manual operation.

The system renders the rolls virtually weightless through the balancer's compressed air operation. The rail system or Manipulator Arm provides for ease of horizontal movement. This combination requires little physical strength to operate and reduces operator fatigue.

The Rotary Action Handler should not be left suspended when not in use. Lower device to the floor or a suitable location out of the work area.

When maneuvering the Rotary Action Handler, the roll core must be in the horizontal position to prevent accidental slippage of material on the roll.

Balancer

Energy used to power the balancer is compressed air, a minimum of 60 psig (3.1 bar/310 kPa) is required. Air is controlled by an external control package. Compressed air pushes against the piston, causing it to move laterally.

The piston pushes the reel assembly causing the reel to move laterally as well as rotate which winds the wire rope into the balancer, raising the Rotary Action Handler. Compressed air is released through the controls to atmosphere and the reel rotates in the opposite direction lowering the Rotary Action Handler.

The balancer reaches maximum capacity when 100 psig (6.9 bar/690 kPa) is applied. As air pressure decreases the unit capacity decreases proportionally. If 80 psig (5.5 bar/552 kPa) is applied to the balancer, maximum balancer operational capacity is 80% of rated capacity.

For additional information, refer to the Balancer Parts, Operation and Maintenance manual.

Control Types

The Rotary Action Handler uses the **Zimmerman ZA** (Zim-Air) or **2PS** (2 Position Sensor) control package.

ZA Control

Refer to Dwgs. MHP1819 on page 10 and MHP1817 on page 7. The Zim-Air control package utilizes an up/down control block, connected to the manifold mounted to the balancer. The top of the

manifold has two flow control valves. The two flow control valves labeled "UP" and "DN" control the speed with which a load will raise and lower. The center screw control is for "hook balance adjustment" to maintain the Rotary Action Handler in a floating condition when it does not have a load on it.

Air is supplied through the manifold to the control block. When the "UP" lever is depressed, air passes through a passage in the block and into the balancer piston chamber resulting in the balancer raising the load. Lowering the load is accomplished by depressing the "DN" lever, which releases air in the balancer to atmosphere through the block, and lowers the load.

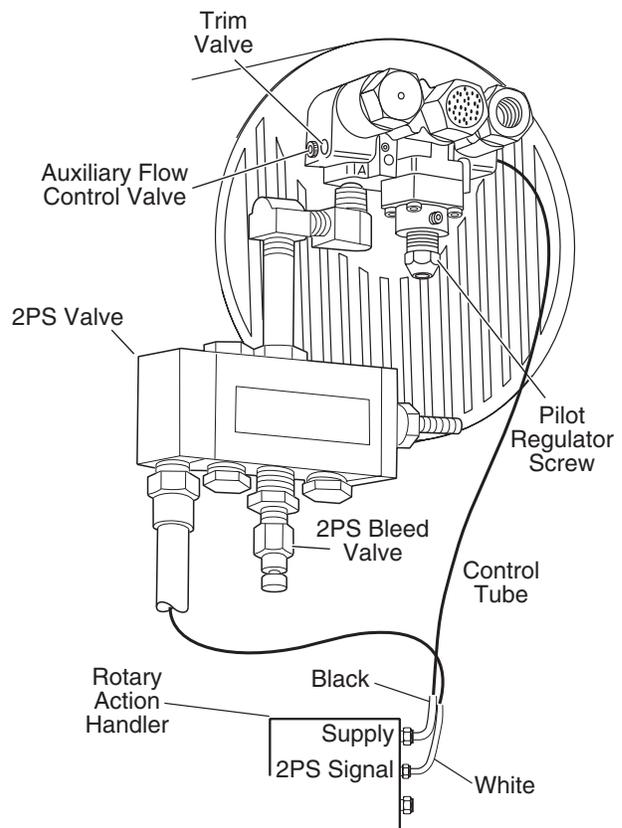
WARNING

- **Extreme care must be used until all control adjustments are complete. The 2PS control may not support weight of empty handling device, or may raise device at a potentially hazardous rate.**

2PS (2 Position Sensor)

This style control utilizes the EA Regulator and Two Position Sensor Valve. The 2PS control is only suitable for units handling rolls of 100 lbs (45.5 kg) or less.

The Two Position Sensor (2PS) Valve is a pilot operated, four way, spring return valve. Refer to Dwg. MHP1820 on page 8. Pilot signal is sent to the valve by a switch mounted on the Rotary Action Handler, or by a pilot line from the clamp circuit.



(Dwg. MHP1820)

The Two Position Sensor Valve controls balancer operation when Rotary Action Handler is empty by bleeding air pressure from the EA Regulator to atmosphere.

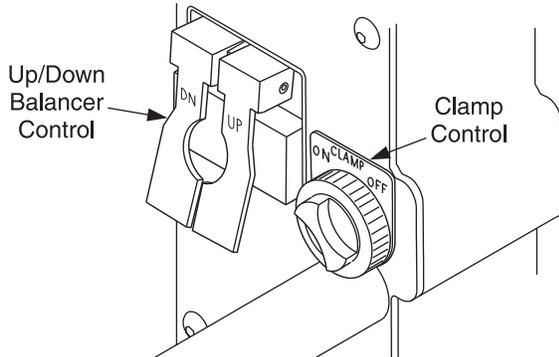
The pilot signal shifts the 2PS valve to a blocked port giving the EA Regulator full balancing control of the Rotary Action Handler and load. Once the load is placed and released, the spring return will overcome the pilot signal shifting the valve back to a bleed condition balancing the empty Rotary Action Handler.

Rotary Action Handler Operation

⚠ WARNING

• If system air pressure is lost, lower the load immediately. The operator must stay out of the path of the load. The clamp may lose the force required to hold the load which can cause severe injury or property damage. Rotate nose assembly to horizontal.

The “UP” and “DN” levers allow adjustable speed control. As the lever is depressed further, the operational speed increases. Use the lever to ‘throttle’ the speed to ensure controlled movement of the Rotary Action Handler.

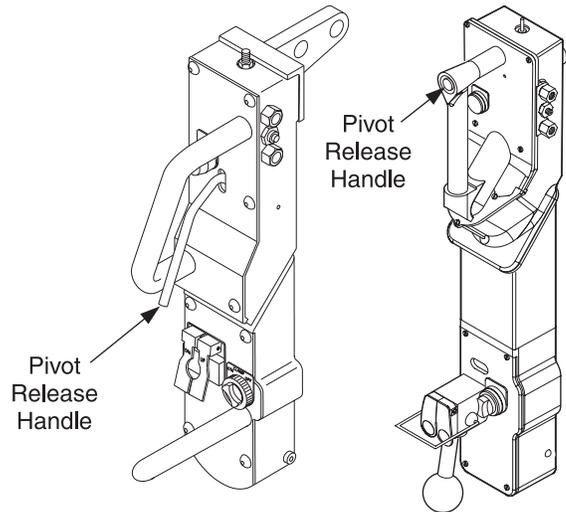


(Dwg. MHP1571)

⚠ CAUTION

• Do not wrap control hoses around wire rope. Damage to hoses and failure of unit may result.

Proper turning of the handler prevents premature wear of the balancer wire rope and control lines. Do not attempt to continuously turn in one direction; rather reverse direction with each cycle.



(Dwg. MHP1578)

Raising and lowering of the Rotary Action Handler is dependent on the type of control circuit on the handling device. The **Zim-Air (ZA)** type control requires manual lever operation to raise and lower the Rotary Action Handler. If the Rotary Action Handler has a 2 Position Sensor (2PS) control, the device is in zero gravity with or without a load and requires the operator to push up or down to raise and lower the Rotary Action Handler.

1. Move Rotary Action Handler to the pick up point, and position it over the roll for pick up. The nose assembly should be rotated as necessary to pick the roll. Actuate pivot release handle or depress the pivot release button on the upper portion of the handler and rotate the lower housing.

⚠ CAUTION

- To prevent uncontrolled movement use both hands on the Rotary Action Handler when activating pivot release handle or button.
2. Slowly lower Rotary Action Handler and engage the roll until completely seated on nose assembly. Rotate clamp switch to “Clamp On” position and wait until green light is illuminated and gripper pins or clamp ring fully engage.

⚠ CAUTION

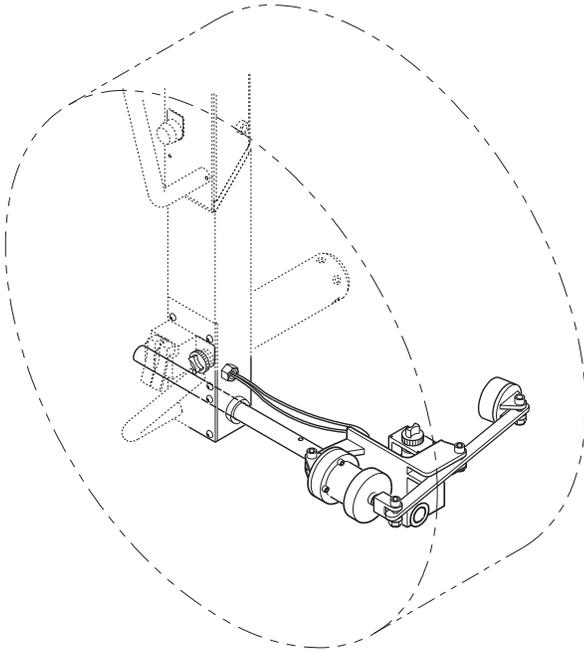
- Ensure nose assembly fully engages roll prior to attempting to raise from the pick up point.
3. Raise Rotary Action Handler and rotate load to a horizontal position for maneuvering to the set down point.
 4. At the set down point, rotate load as necessary to place, and lower the roll completely.
 5. Rotate clamp switch to the “Clamp Off” position to unclamp and disengage the roll. Maneuver the Rotary Action Handler back to the pick up point and repeat steps.

Side Clamp (optional feature)

Refer to Dwg. MHP1879 on page 10.

The side clamp is an optional accessory only available on Model RAH1** steel fabricated units. The side clamp prevents material from slipping off the core by applying a lateral force to the roll pressing the material to the core. The side clamp can be switched on and off independently of the nose clamp.

The side clamp is controlled by a two position switch.



(Dwg. MHP1879)

Operation Adjustments

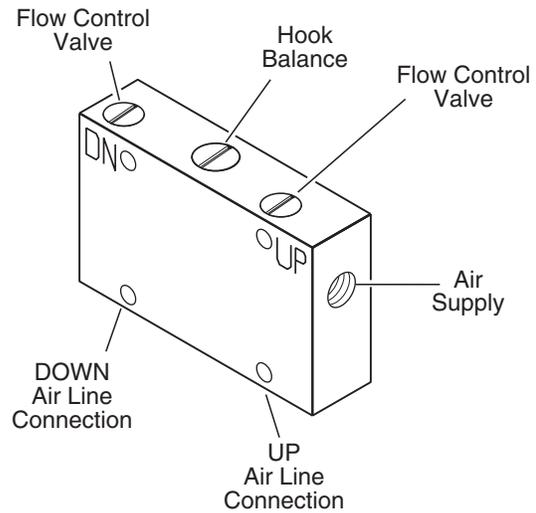
⚠ WARNING

- Air supply pressure must be a minimum of 60 psig (4.1 bar/410 kPa) and a maximum of 100 psig (6.9 bar/690 kPa). Excessive air pressure may damage the balancer or controls.
- Prior to adjustment of the controls, ensure air is off and wire rope is slack.
- The interlock should not be adjusted until all control adjustments have been completed. The interlock may not function properly if it is set before the controls.

ZA Control

Refer to Dwg. MHP1819 on page 10.

1. On top of the ZA manifold are two screw type flow controls. Turn the “UP” and “DOWN” flow control screws clockwise until fully closed. Then turn each flow control screw counterclockwise one full turn.



(Dwg. MHP1819)

2. The center screw is for hook balance adjustment. The screw head should be flush with the top of the manifold body.

⚠ WARNING

- The screw type flow control and hook balance adjustment screws on the ZA manifold should never extend above the manifold body. Thread engagement will be minimal and could result in the screw being discharged from the manifold.

3. Turn on air supply. Adjust supply pressure to highest maintainable; do not exceed 100 psig (6.9 bar/690 kPa).
4. Raise Rotary Action Handler to the “UP” stop.
5. Depress “DOWN” lever on the ZA control block. Adjust “DOWN” flow control screw, by turning counterclockwise, until desired down speed is reached.
6. Depress “UP” lever on the ZA control block. Adjust “UP” flow control screw, by turning counterclockwise, until desired speed is achieved.
7. To set hook balance, adjust hook balance screw, by turning clockwise, until empty handling device begins to rise. Slowly adjust screw, by turning counterclockwise, until device stops moving.

2PS Control

Refer to Dwg. MHP1820 on page 8.

⚠ WARNING

- Extreme care must be used until all control adjustments are complete. The 2PS control may not support the weight of the empty handling device, or may raise device at a potentially hazardous rate.

⚠ WARNING

- The 2PS control utilizes 2 push button release. This control is NOT equipped with an interlock valve. Care must be used when maneuvering load to NOT actuate release buttons.

2PS Controls are not available with an Interlock.

1. Set pilot regulator screw with 1/2 inch (12 mm) of thread visible.
2. On left side of regulator (farthest from the balancer as the control is installed) locate trim valve screw and adjust, by turning clockwise, until closed. Turn screw counterclockwise one and a half turns.
3. Locate auxiliary flow control screw (closest to the balancer as the control is installed) and adjust, by turning screw counterclockwise, until screw head protrudes from regulator body 1/8 inch (3 mm).
4. Adjust 2PS bleed valve screw, by turning clockwise, until closed, then turn counterclockwise two turns.
5. Turn on air supply to system. Adjust supply pressure to 60 psig (4.1 bar/410 kPa) minimum, but do not exceed 100 psig (6.9 bar/690 kPa).
6. Turn on air supply to handling device.
7. Engage roll with the nose assembly.
8. Adjust pilot regulator to balance (support) Rotary Action Handler and roll. Adjust pilot regulator screw, by turning clockwise, to increase balancing capacity. Turn screw counterclockwise to reduce balancing capacity. When balanced, equal effort will be required to raise and lower the device and load together.
9. Disengage load at place point.
10. Adjust bleed valve screw at the 2PS valve to balance the empty Rotary Action Handler. Turn the bleed valve screw clockwise to increase balancing capacity. Turn the bleed valve screw counterclockwise to decrease balancing capacity. When the empty Rotary Action Handler is properly balanced, it will require equal effort to raise and lower the device.

Interlock (Safety Circuit)

CAUTION

- **The interlock should not be adjusted until all control adjustments have been completed.**

NOTICE

- **It may be necessary to actuate clamp and unclamp button several times to obtain the correct interlock setting.**
- **Interlock is only present on ZA controlled Rotary Action Handlers.**

1. With empty Rotary Action Handler device suspended by the balancer, adjust interlock adjustment screw, by turning counterclockwise, until 3/4 inch (38 mm) of thread is visible.
2. While cycling clamp and unclamp functions, turn interlock adjustment screw clockwise until both clamp and unclamp circuits function.
3. Cycle clamp/unclamp switch several times to ensure smooth operation and that the interlock valve is shifting completely.
4. Raise empty Rotary Action Handler to its up stop. Depress 'UP' lever for 3 to 4 seconds to simulate a load on the balancer.
5. Actuate clamp and unclamp circuits. Clamp should not open. Air may be heard discharging to the atmosphere.
6. If clamp does open, repeat this adjustment procedure until clamp does not open with Rotary Action Handler at the up stop.
7. Once interlock valve is adjusted correctly, hold interlock stem with a suitable pair of pliers and tighten 3/8 inch jam nut on interlock adjustment screw to prevent setting from changing.

Yarding

CAUTION

- **Do not operate unit if load is not centered under wire rope. Yarding of the wire rope will cause premature wire rope wear.**

Wire rope should not be yarded more than 10 degrees from vertical.

Excessive yarding will cause increased wear on unit and decrease working life of related components.

INSPECTION

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 unit 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. Inspection intervals will depend upon the nature of the critical components of the equipment and the severity of usage.

Careful inspection on a regular basis will reveal potentially dangerous conditions while still in the early stages, allowing corrective action to be taken before the 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 Inspections

For equipment in continuous service, frequent inspections should be made by operators at the beginning of each shift.

1. OPERATION. Check for visual signs or abnormal noises (grinding, etc.) which could indicate a potential problem. Make sure all controls function properly. Check Rotary Action Handler swivels freely through 90 degrees.
2. INTERLOCK (Safety Circuit). ZA Controls only. Test operation with no load. Raise empty handling device to the "UP" stop. With "UP" lever depressed for 3 to 4 seconds (to simulate load), actuate clamp and unclamp circuit. Clamp should not open. Refer to "OPERATION" section, 'Interlock' for correction instructions.

3. AIR SYSTEM. Visually inspect all connections, fitting, hoses and components for indication of air leaks. Repair any leaks or damage, tighten any loose connections.
4. BALANCER. Inspect per recommendations in Balancer Parts, Operation and Maintenance Manual form ZBSMO195.

Periodic Inspection

Frequency of periodic inspection depends on the severity of usage:

NORMAL	HEAVY	SEVERE
yearly	semiannually	quarterly

Disassembly may be required for HEAVY or SEVERE usage. Keep accumulative written records of periodic inspections to provide a basis for continuing evaluation.

Inspect all items in "Frequent Inspection". Also inspect the following:

1. FASTENERS. Check all rivets, split pins, capscrews and nuts. Replace if missing or tighten if loose.
2. ALL COMPONENTS. Inspect for wear, damage, deterioration, deformation and cleanliness. If external evidence indicates the need, disassemble. Check handles, housings, bearings, springs and covers. Replace worn or damaged parts. Clean, lubricate and reassemble.
3. SUPPORTING STRUCTURE. Check for distortion, wear and continued ability to support load.
4. LABELS AND TAGS. Check for presence and legibility of labels. Replace if damaged or missing.
5. BALANCER. Follow inspection recommendations in Balancer Parts, Operation and Maintenance Manual form ZBSMO195.
6. INDICATOR LIGHT. Check indicator light illuminates in the "Clamp On" position. Replace light if burned out.

Units Not in Regular Use

1. Units which have been idle for a period of one month or more, but less than one year, should be given an inspection conforming with the requirements of "Frequent Inspection" prior to being placed into service.
2. Units which have been idle for a period of more than one year should be given an inspection conforming with the requirements of "Periodic Inspection" prior to being placed into service.
3. Standby units should be inspected at least semiannually in accordance with the requirements of "Frequent Inspection". In abnormal operating conditions, units should be inspected at shorter intervals.

INSPECTION AND MAINTENANCE REPORT

Ingersoll-Rand End Effectors

Rotary Action Handler

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 the 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	
Fasteners/Fittings			---		
Hoses					
Pivot Assembly			---		
Air Cylinder					
Gripper Pins or Pressure Ring(s)					
Covers/Housings					
Controls/Switches			---		
Indicator Light			---		
Balancer					Refer to Balancer Parts, Operation and Maintenance Manual
Handles					
Labels and Tags			---		
Other Components (list in NOTES section)					

This page may be photocopied and used as an Inspection/Maintenance record.

TROUBLESHOOTING

Refer to the Balancer Parts, Operation and Maintenance Manual for Balancer/Control specific problems. The following table is for Rotary Action Handler specific problems. This section provides basic troubleshooting information. 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 symptoms, possible causes and remedies.

Symptom	Possible Cause	Remedy
Clamp indicator light does not illuminate and/or the gripper pins do not extend when clamp switch is in the clamp position or roll is fully engaged.	Air supply on Rotary Action Handler is off. Interlock valve is not set correctly.	Turn on air supply at Rotary Action Handler. Refer to Interlock (safety circuit) in the "OPERATION" section.
	Air line to clamp indicator or gripper pins is clogged or restricted.	Refer to "MAINTENANCE" section (Maintenance for Rotary Action Handler Disassembly).
	Part present switch is not contacting roll or not actuating.	Refer to "MAINTENANCE" section.
	Clamp switch incorrectly connected.	Refer to "PARTS" section for schematic drawings.
Rotation lock lever does not allow Rotary Action Handler to rotate.	Rotate pivot bearing binding or damaged.	Refer to "MAINTENANCE" section.
	Rotate lock lever binding or damaged.	
Clamp indicator light does not extinguish and/or gripper pins do not retract with clamp switch in the unclamp position.	The weight of the roll has not been completely removed from the Rotary Action Handler.	Refer to Interlock (safety circuit) in the "OPERATION" section.
	Clamp switch incorrectly connected.	Refer to "PARTS" section for schematic drawings.
	The Interlock valve is not set correctly.	Refer to "OPERATION" section.
	Air line to clamp indicator or gripper pins is clogged or restricted.	Refer to "MAINTENANCE" section.
Rotary Action Handler does not rotate.	Internal hoses may be bound.	Rotate handle in opposite direction to untwist hoses.

MAINTENANCE

⚠ CAUTION

- Use of replacement parts other than Ingersoll-Rand original parts could result in damage to the unit and void the warranty.

⚠ WARNING

- Turn off air supply to unit and be sure wire rope is slack before attempting any disassembly operations.
- Never perform maintenance on the unit while it is supporting a load.
- Before performing maintenance, tag controls:

**WARNING - DO NOT OPERATE -
EQUIPMENT BEING REPAIRED**

- Only allow personnel trained in safety and maintenance on this unit to perform service.

Maintenance Intervals

The Maintenance Interval chart is based on intermittent operation of the Rotary Action Handler eight hours each day, five days per week. If Rotary Action Handler operation is more than eight hours per day, or in HEAVY or SEVERE environments, more frequent maintenance should be performed. Refer to “Periodic Inspection” in the “INSPECTION” section for additional information.

INTERVAL	MAINTENANCE CHECK
Start of each shift (Operator or Maintenance Personnel)	Make a thorough visual inspection of the Rotary Action Handler for damage. Do not operate if damaged.
	Operate the unit through the normal range of movements. Unit must operate smoothly without sticking, binding or abnormal noises.
3 Months (Maintenance Personnel)	Inspect interlock. Clean or replace parts as required.
	Check pivot assembly.
Yearly (Maintenance Personnel)	Inspect bearings for wear and damage. Repair or replace as necessary.
	Check all the supporting members, including the balancer, fasteners, nuts, etc. for indications of damage or wear. Repair or replace as required.

Adjustments

Refer to “OPERATION” section for all adjustments.

Disassembly

Rotary Action Handler (up to 100 lbs (45.5 kg) capacity)

Model RAH1** with Aluminum body

NOTICE

- Air lines are connected to the cover assemblies. Use care when removing covers.

Refer to Dwg. MHP1569 on page 20.

1. Remove capscrews (38) from upper handler cover (36) on housing (5).
2. Carefully remove cover.
3. Label and disconnect air line from clamp indicator light (34).
4. Remove capscrews (38) from lower handler cover (16) on housing (9).
5. Carefully remove cover.
6. Label and disconnect air lines to clamp selector switch (18).
7. Label and disconnect all air lines from lower handler assembly.
8. Carefully pull air lines through pivot assembly.
9. Loosen setscrew (23) in pivot locknut (28).
10. Place Rotary Action Handler in a soft jawed vise.
11. Remove nut (28) in lower assembly from pivot pin (29).
12. Separate lower assembly from upper assembly. Note position of rotation ball (7) stop.
13. Remove 3 bearing retainer capscrews (38) and retainers (44).

Rotary Action Handler (up to 300 lbs (136 kg) capacity)

Model RAH1** with fabricated steel body

NOTICE

- Air lines are connected to the cover assemblies. Use care when removing covers.

Refer to Dwg. MHP1868 on page 24.

1. Remove capscrews (38) from upper handler cover (36) on housing (5).
2. Carefully remove cover.
3. Label and disconnect air line from clamp indicator light (34).
4. Remove capscrews (38) from lower handler cover (16) on housing (9).
5. Carefully remove cover.
6. Label and disconnect air lines to clamp selector switch (18).
7. Label and disconnect all air lines from lower handler assembly.
8. Carefully pull air lines through pivot assembly.
9. Bend lockwasher (30) tab out of locknut (28) slot.
10. Place rotary handler in a soft jawed vise.
11. Remove nut (28) and tapered roller bearing from lower housing pivot pin.
12. Separate lower assembly from upper assembly. Note position of rotation ball (7) stop.
13. Remove washers and thrust bearing from pivot pin.

Rotary Action Handler (up to 300 lbs (136 kg) capacity)

Model RAH2** with Aluminum body

NOTICE

• **Air Lines are connected to the cover assemblies. Use care when removing covers.**

Refer to Dwg. MHP2003 on page 22.

1. Remove capscrews (38) from upper handler cover (36) on housing (5).
2. Carefully remove cover (36).
3. Label and disconnect air line from clamp indicator light (34).
4. Label and disconnect air line from pivot switch (123).
5. Remove capscrews (38) from lower handler cover (16) on housing (9).
6. Carefully remove cover (38).
7. Label and disconnect air lines from ZA control block (19).
8. Label and disconnect air lines from clamp selector switch (18).
9. Remove setscrew (23) in pivot retainer (28) on opposite side of handler from covers.
10. Place Rotary Action Handler in a soft jawed vise.
11. Remove capscrews (140) from pivot detent cylinder (43).
12. Label and disconnect air lines from pivot detent cylinder (43).
13. Remove pivot detent cylinder (43).

Intermediate Housing (up to 300 lbs (136 kg) capacity)

Model RAH2** with Aluminum body

Refer to Dwg. 2003 on page 22.

1. Remove capscrews (10) and washer (124) from lower housing (9).
2. Separate intermediate housing (149) from lower housing (9).
3. Remove pivot retainer (28) from intermediate housing (149).

Pivot (up to 100 lbs (45.5 kg) capacity)

Model RAH1** with Aluminum body

Refer to Dwg. MHP1569 on page 20.

1. Remove upper (36) and lower (16) covers from housings (5) and (9).
2. Remove nut (2), spring (31) and shoulder screw (42) from pivot handle (32).

NOTICE

• **Pivot handle is spring loaded, observe how spring is mounted for correct installation during assembly.**

3. Carefully pull pivot handle assembly (32) and thrust washer (25) out of housing (5). Separate bearing (24) and shot pin (33) from pivot handle.
4. Disconnect and label air hoses in lower housing, and pull through pivot pin (29) to the upper housing (5).
5. Remove setscrew (23) and nut (28). Separate housings, catching steel ball (7).
6. Remove screws (38) and retainers (44). Remove pivot pin (29), bearing (27) and thrust washer (26).
7. Repair or replace parts as necessary.

Pivot (up to 300 lbs (136 kg) capacity)

Model RAH1** with fabricated steel body

Refer to Dwg. MHP1868 on page 24.

1. Remove upper (36) and lower (16) covers from housings (5) and (9).
2. Remove capscrew (42) from pivot handle (32). Remove nut (96) and washer (95) from shot pin (33).

NOTICE

• **Pivot handle is spring loaded, observe how spring is mounted for correct installation during assembly.**

3. Carefully pull pivot handle assembly (32) and thrust washer (25) out of housing (5). Remove spring (94).
4. Disconnect and label air hoses in lower housing, and pull through lower housing pivot pin to the upper housing (5).
5. Bend lockwasher (30) tab out of locknut (28) slot and remove lockwasher and locknut. Remove tapered roller bearing. Separate housings, catching steel ball.
6. Remove thrust washers (93) and (98) and needle bearing (99).
7. Repair or replace parts as necessary.

Pivot (up to 300 lbs (136 kg) capacity)

Model RAH2** with Aluminum body

Refer to Dwg. 2003 on page 22.

1. Remove pivot pin (29) in upper housing (5) from pivot retainer (28).
2. Remove pivot pin (29).
3. Separate upper housing (5) from intermediate housing assembly((149). Note position of rotation ball stop (7).
4. Remove bearing spacer (26) from upper housing (5).
5. Remove bearings (146) from upper housing (5).
6. Remove pivot spacer (148) from upper housing (5).
7. Remove bearing retainer ring (147) from upper housing (5).

Upper Housing (up to 300 lbs (136 kg) capacity)

Model RAH2** with Aluminum body

Refer to Dwg. 2003 on page 22.

1. Remove detent bushing (144) from upper housing (5).
2. Remove capscrews (140) from Interlock valve (141).
3. Label and disconnect air lines from Interlock valve (141).
4. Remove Interlock valve (141).
5. Remove nuts (2) from bale capscrews (45).
6. Remove bale (1).
7. Remove indicator light (34) from upper housing cover (36).
8. Remove setscrew (70) from nose cone (69).
9. Carefully remove nose cone (69) from pivot plunger rod (48) the plunger rod is spring loaded.
10. Remove pivot plunger rod (48) from upper handle (37).
11. Remove nut (68) from upper handle (37).
12. Remove capscrew (41) and washer (39) from base of upper handle (37).
13. Remove ball actuator (120) from pivot valve (123).
14. Remove jam nut from top of pivot valve (123).
15. Remove capscrew (121) from bracket (122).

Lower Housing (up to 300 lbs (136 kg) capacity)

Model RAH2** with Aluminum body

Refer to Dwg. 2003 on page 22.

1. Remove capscrews (8) and washers (97) from ZA control block (19).
2. Remove ZA control block from lower housing cover (16).
3. Remove knurl nut from clamp selector switch (18).
4. Remove clamp selector switch (18) and clamp selector valve (15) from lower housing cover (16).

Air Cylinder (with Clamp Shaft)

Model RAH1** with Aluminum body



- Turn main air “Off” and lock it out.
- Turn clamp selector switch to the “Off” position.

Refer to Dwg. MHP1569 on page 20.

1. Remove four capscrews (38) from lower cover (16).
2. Turn cover to the right for access.
3. Disconnect and label tubing from the air cylinder (13).
4. Remove four mounting capscrews (14) from air cylinder (13).
5. Remove air cylinder and clamp shaft (72).
6. Remove clamp shaft (3/8-24 thread) from air cylinder rod.
7. Repair or replace parts as necessary.

Air Cylinder (up to 300 lbs (136 kg) capacity)



- Turn main air “Off” and lock it out.
- Turn clamp selector switch to the “Off” position.

Air Cylinder (with clamp shaft)

Model RAH2** with Aluminum body

Refer to Dwg. 2003 on page 22.

1. Remove capscrews (38) from lower handler cover (16).
2. Rotate cover to the right for access.
3. Label and disconnect tubing from air cylinder (13).
4. Remove four capscrews (14) from air cylinder (13).
5. Remove air cylinder (13) and clamp shaft (72).
6. Remove clamp shaft (3/8-24) from air cylinder rod.
7. Repair or replace parts as necessary.

Nose Assembly (up to 300 lbs (136 kg) capacity)

Model RAH2** with Aluminum body

Refer to Dwg. 2003 on page 22.

1. Remove capscrews (14) from air cylinder (13).
2. Remove air cylinder (13) and clamp shaft (72) from lower housing (9).
3. Remove pins (11) from lower housing (9).
4. Remove nose assembly (71) from lower housing (9).

Gripper Pin (up to 300 lbs (136 kg) capacity)

Model RAH2** with Aluminum body

Refer to Optional Nose Assembly Parts Drawing MHP1887 on page 29.

1. Remove pin retainer (85) from nose (71).
2. Remove spring (86) from nose (71).
3. Remove gripper pin (87).

Pressure Ring (up to 300 lbs (136 kg) capacity)

Model RAH2** with Aluminum body

Refer to Optional Nose Assembly Parts Drawing MHP1887 on page 29.

1. Remove pin retainer ring (83,88,89) from nose (71).
2. Push clamp shaft (72) into center of nose from opposite end of normal installation until pressure pins extend from nose (71).
3. Remove pressure pin (80).

Cleaning, Inspection and Repair

Examine disassembled components and fasteners for wear or damage. If worn or damaged, do not reuse. During reassembly all damaged and worn components should be replaced to prevent component failure which may result in injury or property damage.

It is recommended that lockwashers be discarded and replaced with new ones after each use.

Use the following procedures to clean, inspect and repair the Rotary Action Handler and associated components.

Cleaning

Thoroughly clean all Rotary Action Handler components in solvent. The use of a stiff bristle brush will facilitate the removal of accumulated dirt and sediments on the housings. Wipe off each part after cleaning. Remove all old Loctite® residue.

Inspection

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

1. Inspect all threaded items and replace those having damaged threads.
2. Inspect bearing (27) or (146) for freeness of rotation and wear. Replace bearing if rotation is rough or bearing is worn.
3. Inspect pivot handle (32) and spring. Replace if bent, distorted or worn.
4. Inspect air lines for cracks, cuts and leakage.
5. Inspect air fittings for cracks, leakage and security.
6. Inspect maneuvering handles for wear and security.
7. Check that indicator light is functioning.
8. Inspect shot pin (33) for rough surfaces and wear.
9. Inspect pivot latch pin for cracks, wear, and full engagement into pivot stop.
10. Check to ensure there is no excess movement or play in the lower housing.
11. Check to ensure lower housing swivels freely.
12. Check to ensure there are no pinched air hoses at pivot pin.
13. Ensure clamp switch (18) is actuated.

Repair

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

1. Worn or damaged parts must be replaced. Refer to parts section for specific replacement parts information.
2. Inspect all remaining parts for evidence of wear or damage. Replace or repair any parts which are in questionable condition. The cost of the part is often minor in comparison with the cost of redoing the job.
3. When fastening clamp shaft to air cylinder, always use Loctite® 243 on capscrew threads.

Assembly

Rotary Action Handler (up to 100 lbs (45.5 kg) capacity)

Model RAH1** with Aluminum body.

NOTICE

- Engage pivot lock pin in pivot stop for ease in reassembly.

Refer to Dwg. MHP1569 on page 20.

1. Lubricate thrust washer (26) and insert into upper housing (5).
2. Lubricate bearing (27) and insert into upper housing. Secure with retainers (44) and capscrews (38).
3. Place steel ball (7) into groove in lower housing (9) and place upper housing over lower housing.
4. Insert pivot pin (29) through upper housing and secure with nut (28). Tighten nut and lock with setscrew (23).
5. Lubricate bearing (24) and place on shot pin (33). Insert this assembly into pivot handle (32).
6. Position this assembly in upper housing. Insert thrust washer (25) between housing and pivot handle.
7. Insert shoulder screw (42) through housing, thrust washer, pivot handle and spring (31).

NOTICE

- Spring (31) provides return pressure to pivot handle.

8. Install and tighten shoulder screw (42).
9. Carefully pull air lines through pivot assembly.
10. Connect all air lines in lower handler assembly.
11. Connect all air lines in upper handler assembly.
12. Install lower and upper covers (16) and (36) and secure with capscrews (38).

Rotary Action Handler (up to 300 lbs (136 kg) capacity)

Model RAH1** with fabricated steel body.

Refer to Dwg. MHP1868 on page 24.

1. Lubricate bearings (27) and (99) with light grease.
2. Install thrust washer (98), thrust bearing (99) and thrust washer (93) on lower housing pivot pin.
3. Install bearing cup (20) in upper housing (5).
4. Place steel ball (7) into groove in lower housing (9) and place upper housing over lower housing.
5. Install bearing cone (27) on pivot pin.

6. Install lockwasher (30) and locknut (28). Tighten locknut to remove slack but allow free rotation of the upper and lower housings.
7. Bend one of the lockwasher tabs into a locknut slot.

NOTICE

- Ensure tang on lockwasher in upper housing engages a slot on the pivot pin.
- Tighten pivot spanner nut securely, but not so much that lower housing assembly will not swivel.

Air Cylinder (with Clamp Shaft)

Model RAH1** with Aluminum body

1. Install clamp shaft (72) to air cylinder (13) rod.
2. Install air cylinder (13) and clamp shaft.
3. Install four mounting capscrews (14) to air cylinder (13).
4. Connect tubing to air cylinder.
5. Turn cover to the right to secure.

WARNING

- Ensure air hoses are connected properly prior to installing cover.

6. Install five capscrews (38) in lower cover (16).
7. Turn main air supply “On.”
8. Turn lamp selector switch to “On” position. Indicator will turn green and gripper should expand.

Testing

Prior to testing Rotary Action Handlers, various control valves must be adjusted. Refer to ‘Operation Adjustments’ on page 10 for these adjustments.

Rotary Action Handler

With NO load:

1. Lift pivot release handle or press pivot release button and rotate lower housing 90° in either direction. Lower body should rotate smoothly with no binding and lock in position.
2. Actuate ‘UP’ lever. Unit should rise smoothly. Actuate ‘DOWN’ lever. Unit should lower smoothly. If movement direction does not match levers, correct before placing unit in service.
3. Actuate clamp control. Gripper pins or pressure ring on nose assembly should extend. When unclamped, pins or pressure ring should retract.

With Load:

1. Place a test load equal to 100% of capacity.
2. Lift pivot release handle and or press pivot release button rotate lower housing 90° in both directions. Lower body should rotate smoothly with no binding and lock in position.
3. Actuate ‘UP’ lever. Unit should rise smoothly. Actuate ‘DOWN’ lever. Unit should lower smoothly. If movement direction does not match levers, correct before placing unit in service.
4. Actuate clamp control. Gripper mechanism on nose assembly should extend. When unclamped mechanism should retract.

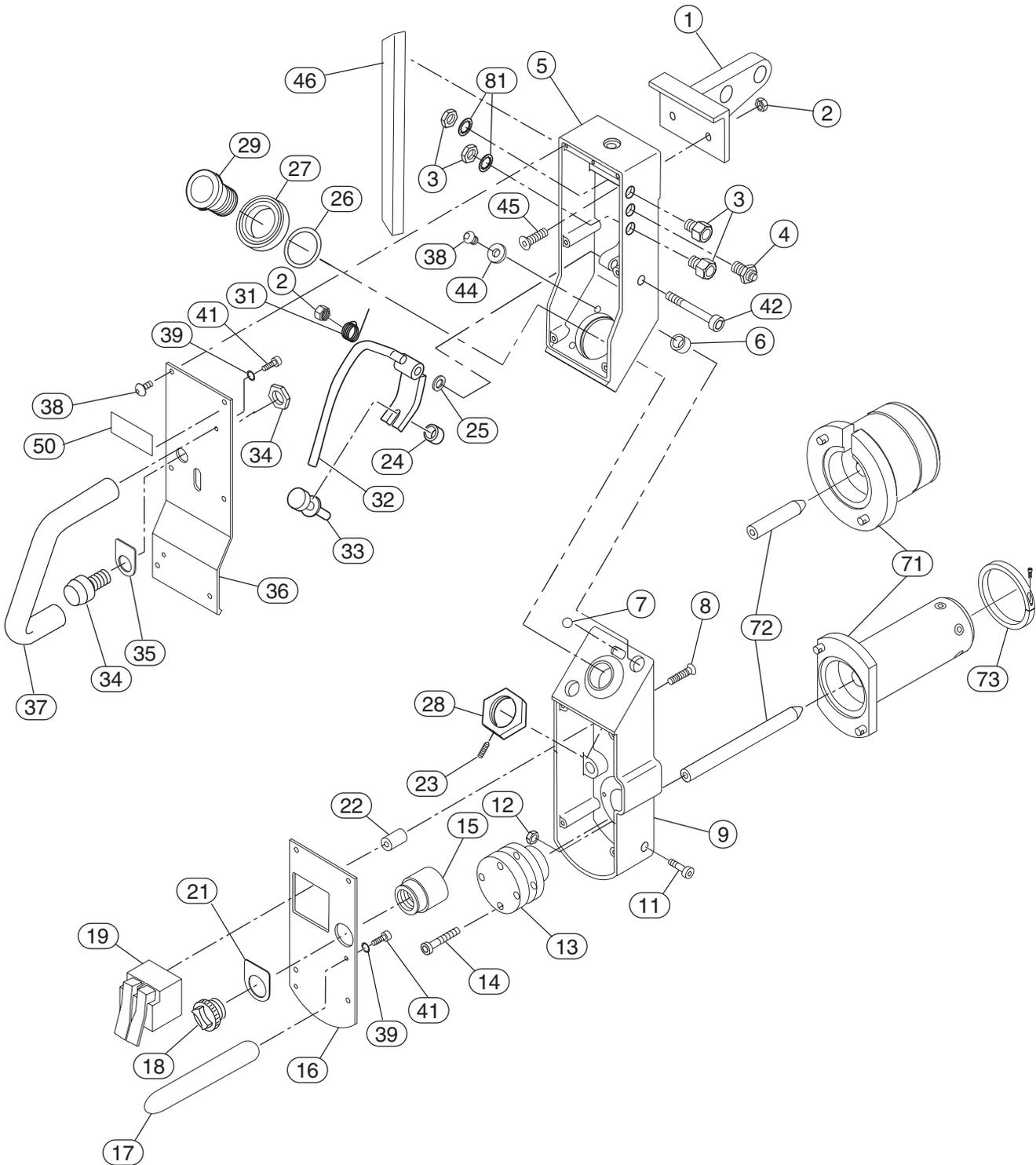
NOTICE

• Interlock valve will not allow clamp control to release while handler is supporting a load.

1. To test, engage nose assembly in a load and lift 2-3 inches (51-76 mm) off the floor. Actuate clamp control to the unclamp position. Load should remain secured to Rotary Action Handler. For adjustments refer to 'Operation Adjustments' on page 10.

ROTARY ACTION HANDLER ASSEMBLY PARTS DRAWING

Capacities up to 100 lbs (45.5 kg)
Model RAH1** Aluminum Housing



(Dwg. MHP1569)

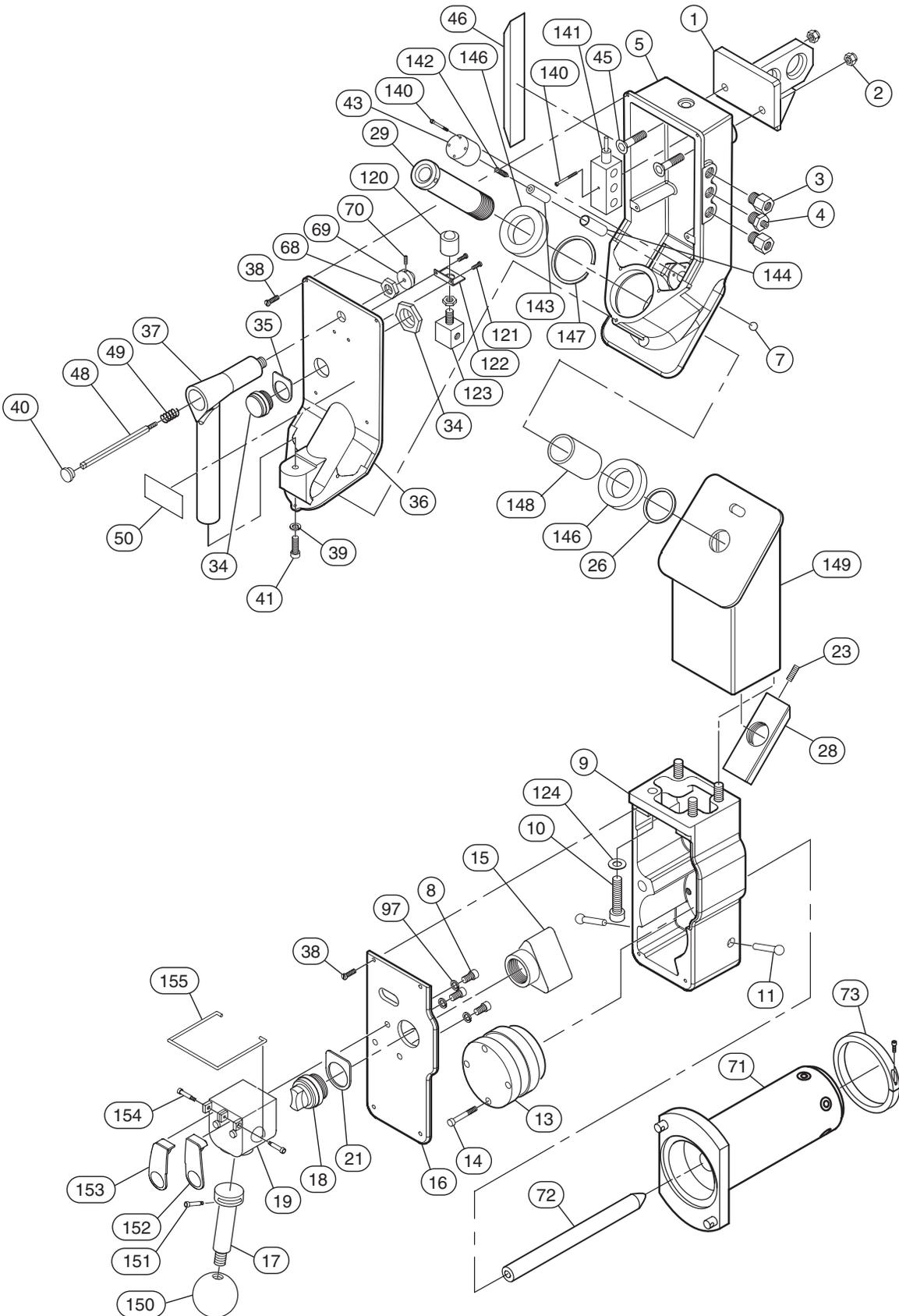
ROTARY ACTION HANDLER ASSEMBLY PARTS LIST

Item No.	Description of Part	Qty Total	Part Number	Item No.	Description of Part	Qty Total	Part Number
1	Bale	1	*	26	Thrust Washer	1	41029
2	Nut	3	75518	27	Bearing	1	65024
3	Fitting, Bulkhead	2	93955	28	Nut	1	40720
4	Fitting, Union	1	93956	29	Pivot Pin	1	40719
5	Housing, Upper	1	41121	31	Spring	1	76509
6	Bushing	2	65023	32	Pivot Handle	1	40722
7	Steel Ball	1	93890	33	Shot Pin	1	40750
8	Capscrew	2	70453	34	Indicator Light	1	93861
9	Housing, Lower	1	41118	35	Plate 'Clamped'	1	40808
11	Capscrew	1	70468	36	Cover	1	41119
12	Nut	1	75552	37	Handle, Upper	1	40723
13	Air Cylinder	1	60544	38	Capscrew	13	70423
14	Capscrew	4	70213	39	Washer	4	74535
15	4-Way Valve	1	90346	41	Capscrew	4	70209
16	Cover	1	41120	42	Shoulder Screw	1	71426
17	Handle, Lower	1	40862	44	Retainer	3	41032
18	Clamp, Selector Switch	1	92700	45	Capscrew	2	70932
19	ZA Control Block	1	40870	46	Bumper Strip (optional)	2	40927
21	Plate 'Clamp ON/OFF'	1	40875	50	Serial # Plate	1	10518
22	Spacer	2	41122	71*	Nose Assembly	1	Refer to chart on page 29
23	Setscrew, Nylon Tip	1	70223	72*	Clamp Shaft	1	
24	Bearing	1	95029	73*	Stop Collar (optional)	1	
25	Thrust Washer	1	65026	81	Lockwasher	2	

* Contact Factory. Provide work order, fixture number or serial number.

ROTARY ACTION HANDLER ASSEMBLY PARTS DRAWING

Capacities up to 300 lbs (136 kg)
Model RAH2** Aluminum Housing



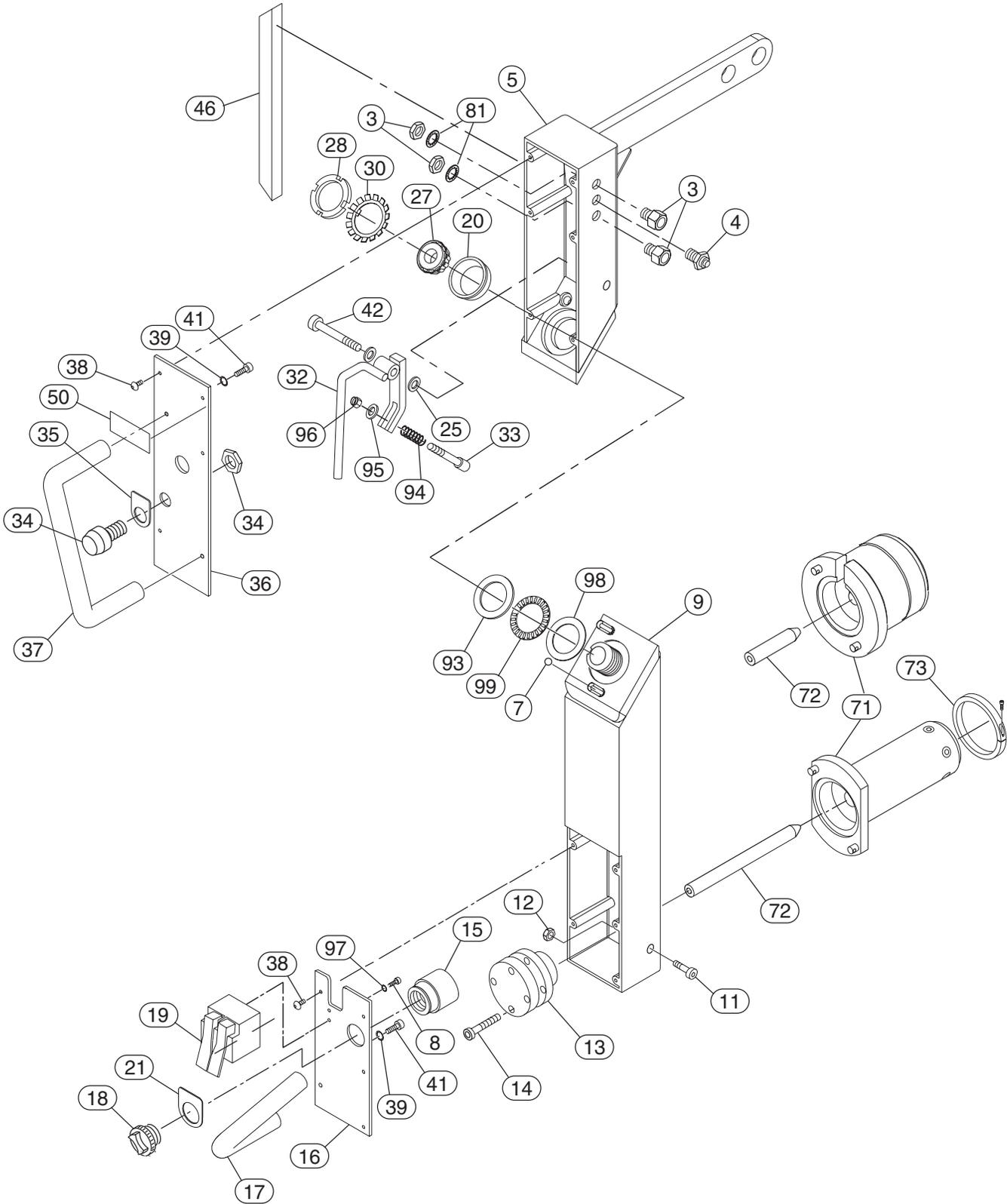
(Dwg. MHP2003)

ROTARY ACTION HANDLER ASSEMBLY PARTS LIST

Item No.	Description of Part	Qty Total	Part Number	Item No.	Description of Part	Qty Total	Part Number
1	Bale 12 inch Core Length	1	54029475	50	Serial # Plate	1	10518
	Bale 14 inch Core Length		54029483	68	Jam Nut	1	54029251
	Bale 16 inch Core Length		54029491	69	Nose Cone	1	54029095
	Bale 18 inch Core Length		54029509	70	Setscrew	1	54029335
	Bale 20 inch Core Length		54029517	71	Nose Assembly	1	Refer to chart on page 29
	Bale 22 inch Core Length		54029525	72	Clamp Shaft	1	
	Bale 24 inch Core Length		54029533	73	Stop Collar (optional)	1	
2	Nut	2	75616	97	Lockwasher	3	70402
3	Fitting, Bulkhead	2	93955	120	Ball Actuator	1	54029178
4	Fitting, Union	1	93956	121	Screw	2	54029343
5	Housing, Upper	1	54025606	122	Bracket	1	54029186
7	Steel Ball	1	54029640	123	Valve	1	93849
8	Capscrew	3	70402	124	Washer	4	74540M
9	Housing, Lower	1	54025648	140	Capscrew	5	54029350
10	Capscrew	4	54027651	141	Adjustable Interlock	1	99064
11	Pin	2	93891	142	Capscrew	1	54030002
13	Air Cylinder	1	540299160	143	Detent Pin	1	54029228
14	Capscrew	4	54029293	144	Bushing	1	54029236
15	4-Way Valve	1	90346	146	Bearing	2	65024
16	Cover, Lower	2	54025663	147	Retainer Ring	1	54029202
17	Handle, Lower	1	54029111	148	Pivot Spacer	1	54029145
18	Clamp, Selector Switch	1	92700	149	Housing, Intermediate 12 in. Core length	1	54029400
19	ZA Control Block	1	54029582		Housing, Intermediate 14 in. Core length		54029418
21	Plate 'Clamp' ON/OFF	1	40875		Housing, Intermediate 16 in. Core length		54029426
23	Setscrew	1	54029368		Housing, Intermediate 18 in. Core length		54029434
26	Spacer	1	41029		Housing, Intermediate 20 in. Core length		54029442
28	Pivot Pin Retainer	1	54029129		Housing, Intermediate 22 in. Core length		54029459
29	Pivot Pin	1	54029137		Housing, Intermediate 24 in. Core length		54029467
34	Indicator Light	1	93861				
35	Plate 'Clamped'	1	40808				
36	Cover, Upper	1	54025622				
37	Handle, Upper	1	54029087				
38	Capscrew	7	54029285				
39	Lockwasher	1	54027776				
40	Cap	1	93850				
41	Screw	1	54027941	150	Ball, Knob	1	93854
43	Pivot Detent Cylinder	1	54029210	151	Screw, Shoulder	1	70022
45	Capscrew	2	54029384	152	Lever, UP Green	1	18609
46	Bumper Strip (optional)	2	40927	153	Lever, DOWN Red	1	18607
48	Plunger Rod	1	54029103	154	Screw, Shoulder	2	67513
49	Spring	1	54029194	155	Guard	1	18622

FABRICATED HANDLER ASSEMBLY PARTS DRAWING

Capacities up to 300 lbs (136 kg)
Model RAH1** Steel Fabricated Housing



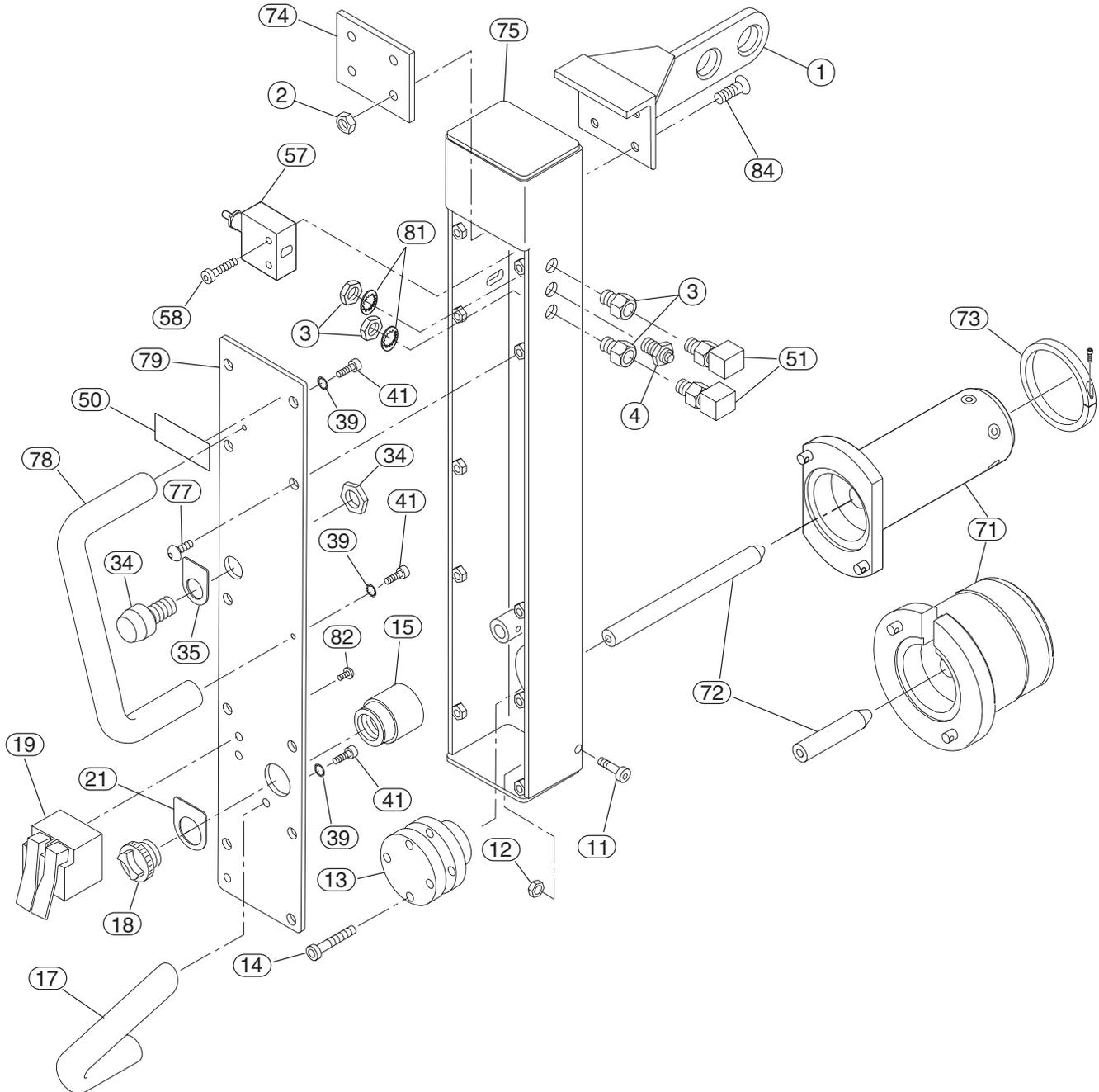
(Dwg. MHP1868)

FABRICATED HANDLER ASSEMBLY PARTS LIST

Item No.	Description of Part	Qty Total	Part Number	Item No.	Description of Part	Qty Total	Part Number
3	Fitting, Bulkhead	3	93955	33	Shot Pin	1	40834
4	Fitting, Union	1	93956	34	Indicator Light	1	93861
5	Housing, Upper	1	95891	35	Plate 'Clamped'	1	40808
7	Steel Ball	1	99039	36	Cover, Upper	1	40827
8	Screw	2	70423	37	Handle, Upper	1	40836
9	Housing, Lower	1	*	38	Screw	10	70925
11	Shoulder Screw	2	70468	39	Lockwasher	4	74735
12	Nut	2	75552	41	Capscrew	4	70209
13	Air Cylinder	1	60544	42	Shoulder Screw	1	71441
14	Capscrew	4	70213	46	Bumper Strip (optional)	2	40927
15	4-Way Valve	1	90346	50	Serial # Plate	1	*
16	Cover, Lower	1	40856	71*	Nose Assembly	1	Refer to chart on page 29
17	Handle, Lower	1	40862	72*	Clamp Shaft	1	
18	Clamp, Selector Switch	1	92700	73*	Stop Collar (optional)	1	
19	ZA Control Block	1	40870	81	Lockwasher	2	74538
20	Bearing, Cup	1	65013	93	Thrust Washer	1	65015
21	Plate 'Clamp' ON/OFF	1	40875	94	Spring	1	76504
25	Washer	2	65026	95	Washer	1	74503
27	Bearing, Cone	1	65014	96	Nut	1	75503
28	Locknut	1	75556	97	Lockwasher	2	74522
30	Lockwasher	1	74534	98	Thrust Washer	1	65017
32	Pivot Handle	1	40830	99	Thrust Bearing	1	65016

* Contact Factory. Provide work order, fixture number or serial number.

FIXED HANDLER ASSEMBLY PARTS DRAWING



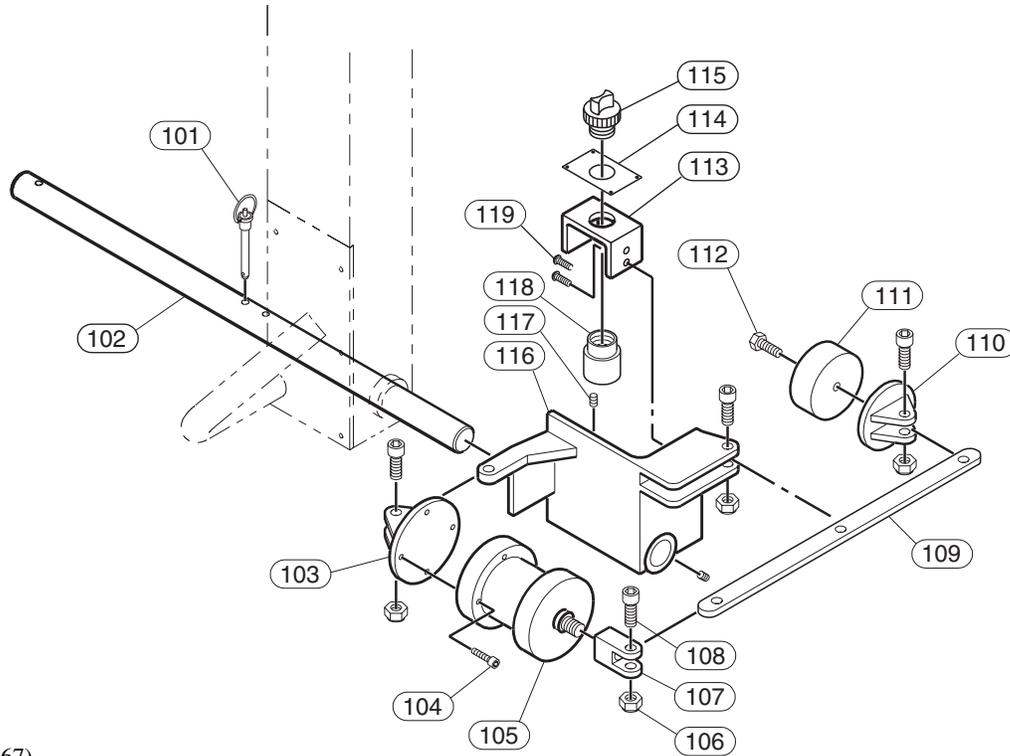
(Dwg. MHP1572)

FIXED HANDLER ASSEMBLY PARTS LIST

Item No.	Description of Part	Qty Total	Part Number	Item No.	Description of Part	Qty Total	Part Number
1	Bale	1	*	50	Serial # Plate	1	10518
2	Nut	4	75518	51	Fitting, Elbow	2	10375
3	Fitting, Bulkhead	2	93955	57	Interlock Valve	1	99064
4	Fitting, Bulkhead Union	1	93956	58	Capscrew	2	70016
11	Capscrew	2	70468	71*	Pin Nose Assy (includes item 72)	1	Refer to chart on page 29
12	Nut	2	75552				
13	Air Cylinder	1	60544				
14	Capscrew	4	70214	72*	Clamp Shaft	1	
15	4-Way Valve	1	90346	73*	Stop Collar (optional)	1	
17	Lower Handle	1	40862	74	Mounting Plate	1	97222/004
18	Clamp Selector Switch	1	92700	75	Handler Housing	1	97222/001
19	ZA Control Block	1	40870	77	Screw	10	70925
21	Plate 'Clamp ON/OFF'	1	40875	78	Upper Handle	1	40836
34	Indicator Light	1	93861	79	Cover	1	97222/002
35	Plate 'Clamped'	1	40808	81	Lockwasher	2	74538
39	Lockwasher	4	74535	82	Screw	2	70423
41	Capscrew	4	70209	84	Capscrew	4	70931

* Contact Factory. Provide work order, fixture number or serial number.

OPTIONAL ROLL CLAMP ASSEMBLY PARTS DRAWING AND LIST



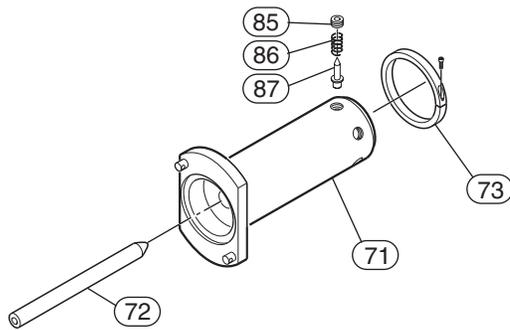
(Dwg. MHP1867)

Item No.	Description of Part	Qty Total	Part Number	Item No.	Description of Part	Qty Total	Part Number
100*	Clamp Assembly (incl's items 101 to 119)	1	*	110	Pad Mount	1	95668-2
101	Detent Pin	1		111	Bumper	1	93096
102	Adjustable Shaft	1	84009	112	Capscrew (5/16-18 x 3/4 lg Hex Hd)	1	*
103	Cylinder Mount	1	95668-3	113	'U' Bracket	1	90466
104	Capscrew	4	70214	114	Legend Plate	1	40875
105	Cylinder	1	*	115	Selector Switch	1	92700
106	Nut	4	75518	116	Bracket	1	90466
107	Rod Clevis	1	81476	117	Setscrew	2	*
108	Capscrew	4	71441	118	4-Way Valve	1	90346
109	Arm	1	81521	119	Screw	2	70423

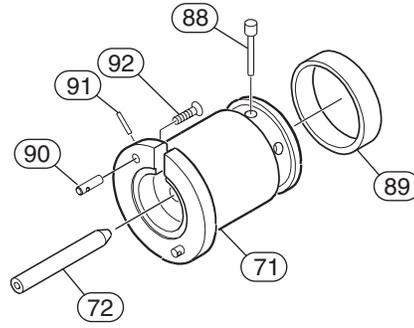
* Contact Factory. Provide work order, fixture number or serial number.

OPTIONAL NOSE ASSEMBLY PARTS DRAWING

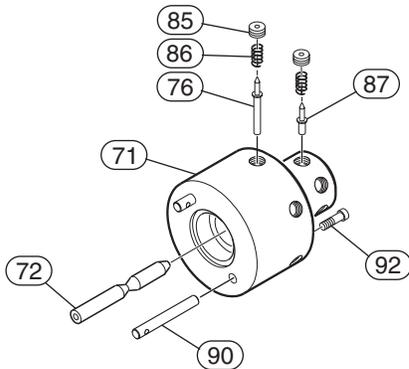
Gripper Pin Assembly



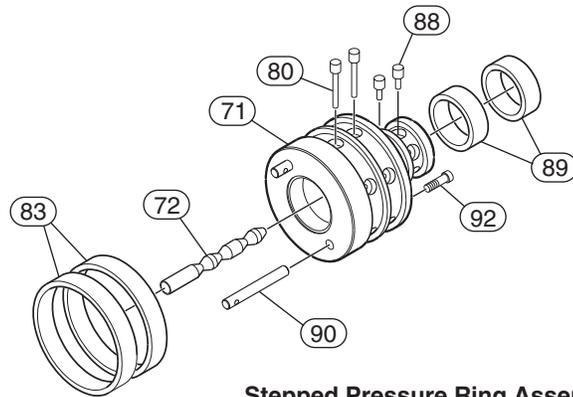
Pressure Ring Assembly



Stepped Gripper Pin Assembly



Stepped Pressure Ring Assembly



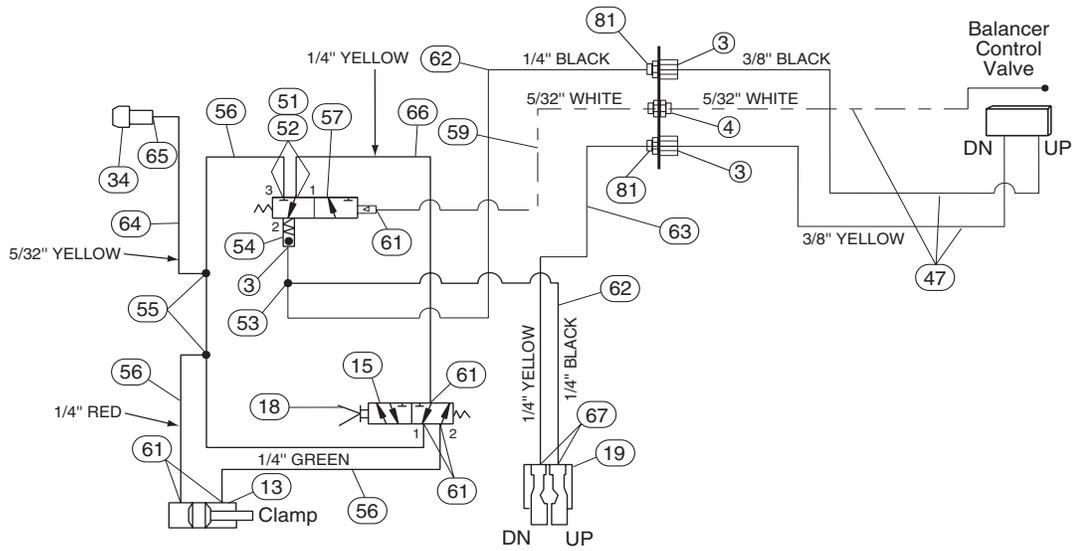
(Dwg. MHP1887)

Nose Dia.	Nose (item 71)	Clamp Shaft (item 72)	Stop Collar (optional) (item 73)	All		Pressure Ring Assembly				Gripper Pin Assembly										
				Pin Nose Mount (item 90)	Screw (item 92)	Pressure Pin (item 80)	Ring (item 83)	Ring (item 89)	Pressure Pin (item 88)	Gripper Pin (item 76)	Pin Retainer (item 85)	Spring (item 86)	Gripper Pin (item 87)	Pin (item 91)						
3 in. with six pins	Contact Factory	Contact Factory	99015	41293	70488	—	—	—	—	—	41289	76512	41533	—						
3 in. with ring			41467	71797	*	—	—	41851	41829	—	—	—	—	—						
6 in. with three pins			Specify Length	Specify Length	41337 (4.5 in.)	70915	—	—	—	—	—	41289	76512	41619	—					
6 in. with ring					41967	*	—	—	41852	41673	—	—	—	—	—	—				
75 mm with three pins			Specify Length	Specify Length	Contact Factory	41293	70488	—	—	—	—	—	41289	76512	41533	—				
75 mm with ring										—	—	41850	41794	—	—	—	—	—	—	
94 mm with three pins										—	—	—	—	—	—	—	41289	76512	41346	—
94 mm with ring										—	70443	—	—	41994	41982	—	—	—	—	—
110 mm with three pins										—	—	—	—	—	—	—	41289	76512	41815	—
110 mm with ring										66699045 D02	*	—	—	41852	43185002	—	—	—	—	—
3 in. / 6 in. Step nose with pins			41617	41618	N/A	41128	70915	—	—	—	—	41619 (6)	41289	76512	41533 (6)	—				
3 in. / 6 in. Step nose with rings			43124001	43124002				41673 (12)	41852 (2)	41851 (2)	41829 (12)	—	—	—	—	—				

*Contact Factory. Provide work order, fixture number or serial number.

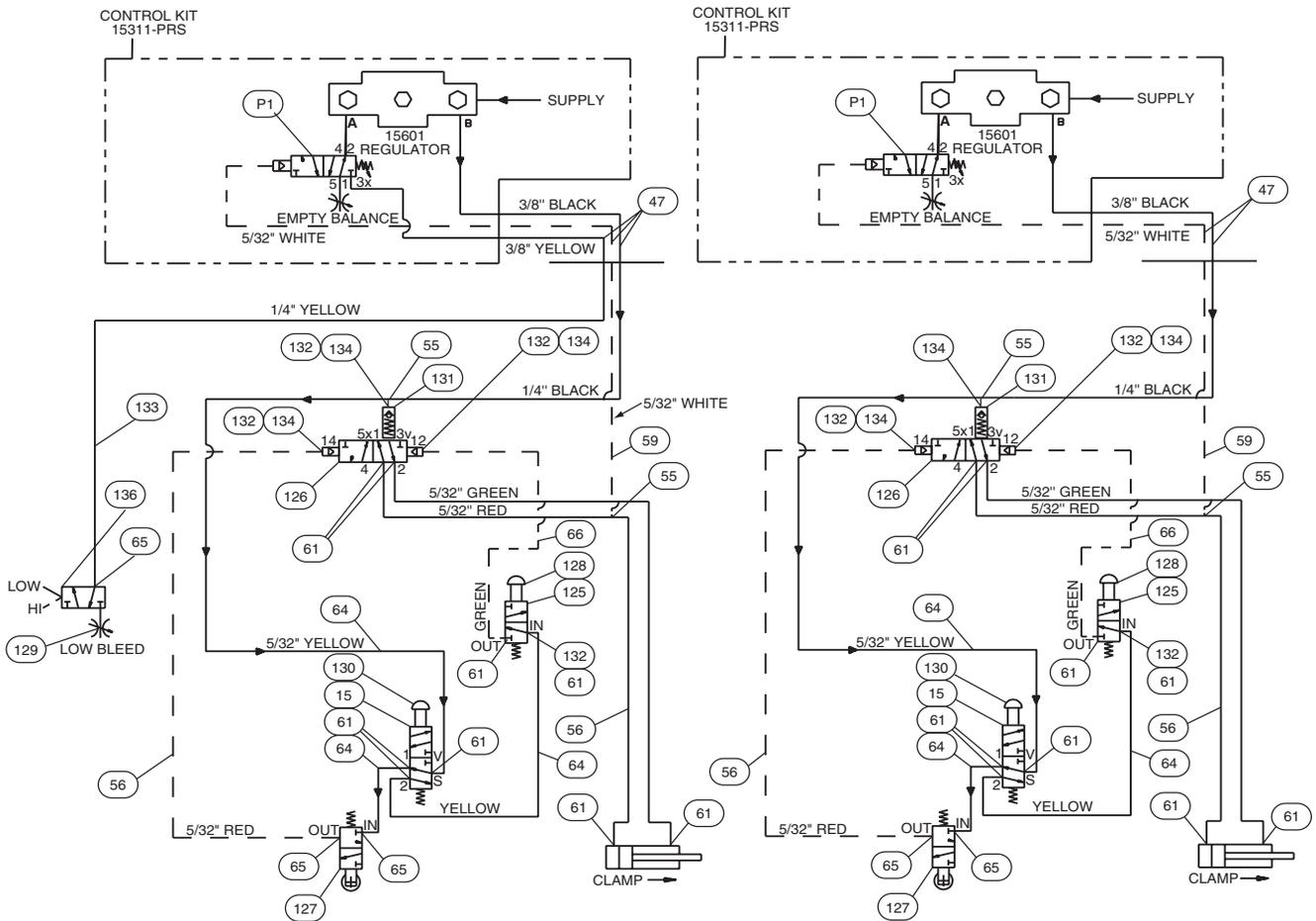
SCHEMATIC PARTS DRAWING

RAH1** ZA Control with Interlock



RAH1** EA-2PS Pressure Control with Dual (HI-LO) Weight Sensor Clamp

RAH1** EA-2PS Pressure Control



(Dwg. MHP1898)

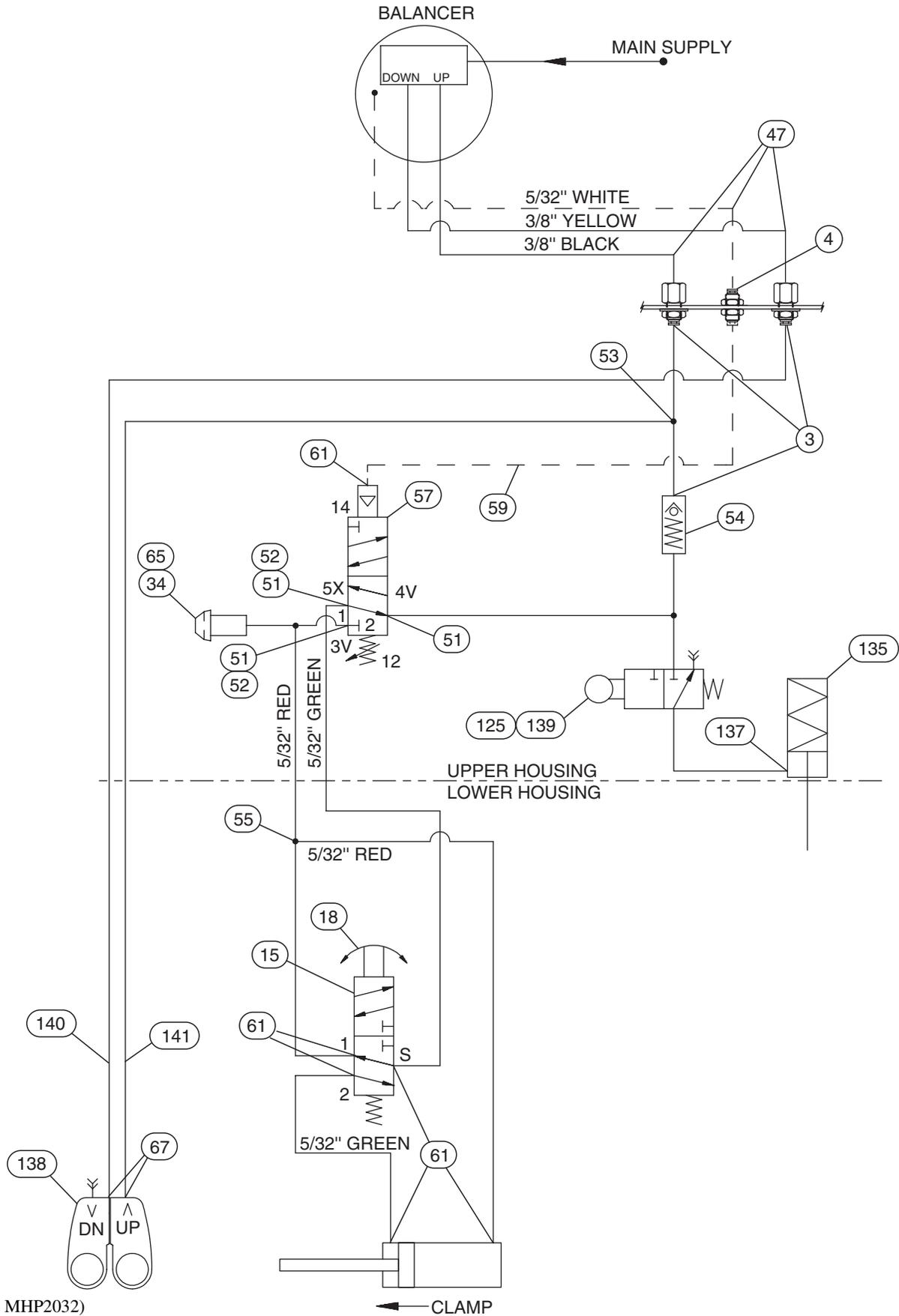
SCHEMATIC PARTS LIST

Item No.	Description of Part	Qty Total	Part Number	Item No.	Description of Part	Qty Total	Part Number
3	Fitting, Bulkhead	2	93955	63	Tube, White 1/4	As Req'd	93961-W
4	Fitting, Union	1	93956	64	Tube, Yellow 5/32		93960-Y
13	Air Cylinder	1	60544	65	Fitting, Elbow	1	93975
15	4-Way Valve	1	90346	66	Tube, Green 5/32	As Req'd	93960-G
19	ZA Control Block	1	40870	67	Fitting, Elbow	2	93972
34	Indicator Light	1	93861	81	Lockwasher	2	74538
47	Control Hose (Tri Coil)	As Req'd	10812	125	Selector Valve	2	93849
51	Fitting, Elbow	4	10375	126	Pilot Valve	1	93851
52	Connector, 1/4 NPT Tube	2	93964	127	Roller Limit Valve	1	93877
53	Fitting, Tee	1	93974	128	Needle Valve	1	93850
54	Check Valve	1	13270	129	Needle Valve	1	93983
55	Fitting, Tee	2	93973	130	Pushbutton	1	90347
56	Tube, Red 5/32	As Req'd	93960-R	131	Check Valve 1/8	1	10723
• 57	Interlock Valve	1	99064	132	Fitting, Elbow 1/8	4	1973
59	Tube, White 5/32	As Req'd	93960-W	133	Tube, Orange 5/32	As Req'd	93960-O
61	Connector, 1/8 NPT Tube	6	93963	134	Fitting, Elbow	3	93969
62	Tube, Green 1/4	As Req'd	93961-G	136	Toggle Valve	1	93894

• Recommended spare

SCHEMATIC PARTS DRAWING

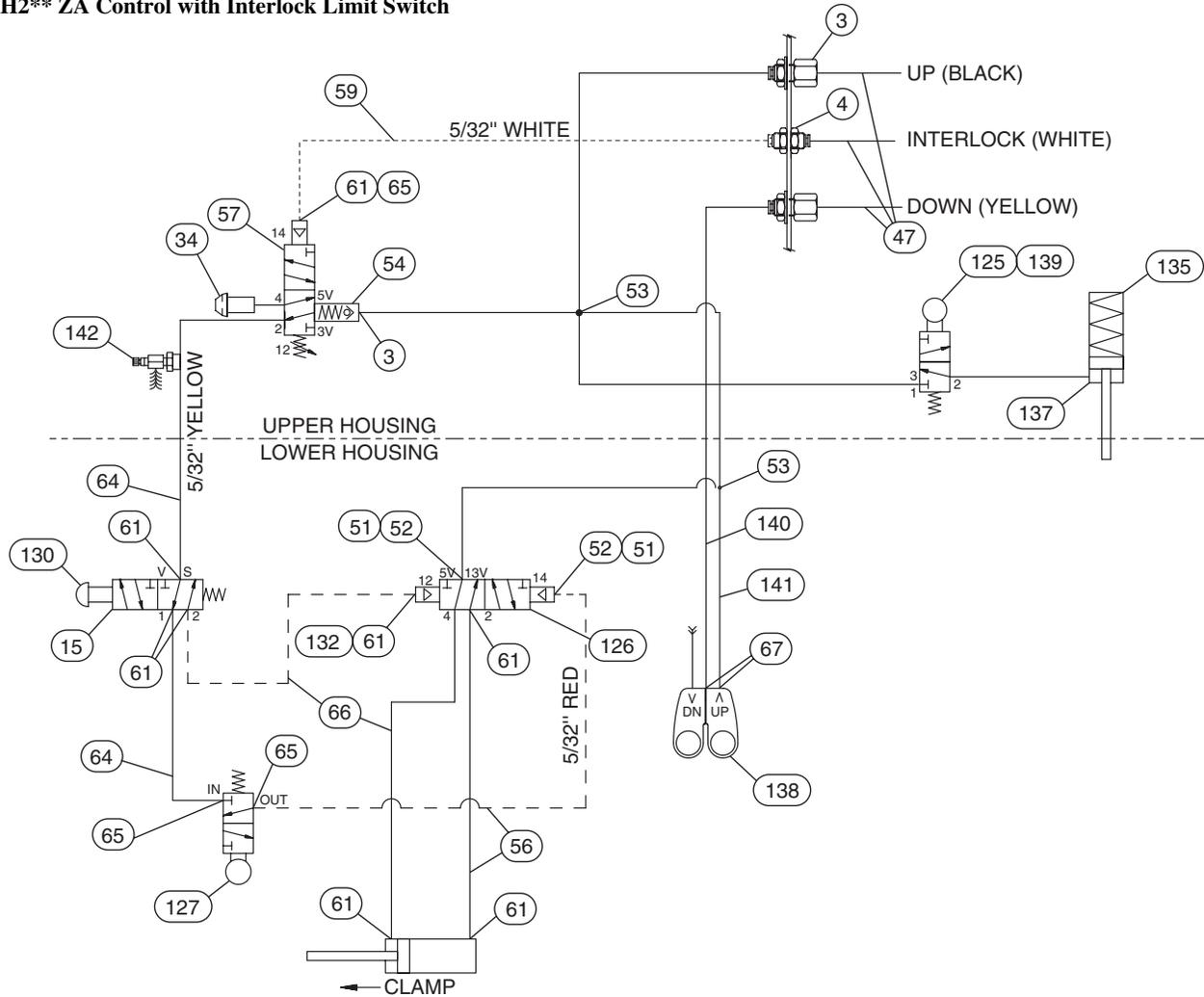
RAH2** ZA Control with Interlock Manual Switch



(Dwg. MHP2032)

SCHEMATIC PARTS DRAWING AND LIST

RAH2** ZA Control with Interlock Limit Switch



(Dwg. MHP2033)

Item No.	Description of Part	Qty Total	Part Number		Item No.	Description of Part	Qty Total	Part Number	
			MHP2032	MHP2033				MHP2032	MHP2033
3	Fitting, Bulkhead	3	93955		64	Tube, Yellow 5/32	AR	---	93960-Y
4	Fitting, Union	1	93956		65	Fitting, Elbow	1/3	93975	
15	4-Way Valve	1	90346		66	Tube, Green 5/32	AR	---	93960-G
18	Selector Switch	1	92700	---	67	Fitting, Elbow	2	93972	
34	Indicator Light	1	93861		125	Selector Valve	1	93894	
47	Control Hose (Tri-Coil)	AR	10812		126	Double Pilot Valve	1	---	93851
51	Fitting, Elbow	4/2	10375		127	Part Present Switch	1	---	93877
52	Fitting, Connector 1/4 NPT Tube	3/2	93964		130	Push Button	1	---	90347
53	Fitting, Tee	2	93974		132	Fitting, Elbow	2	---	1973
54	Check Valve	1	13270		135	Air Cylinder	1	54029210	
55	Fitting, Tee	2	93973	---	137	Fitting	1	54029657	
56	Tube, Red 5/32	AR	---	93960-R	138	ZA Manifold	1	54029582	
57	Interlock Valve	1	99064		139	Ball Actuator	1	54029178	
59	Tube, White 5/32	AR	93960-W		140	Tube, Yellow 1/4	AR	93961-Y	
61	Fitting, Connector 1/8 NPT Tube	7/11	93963		141	Tube, Black 1/4	AR	93961-B	
					142	Trim Valve	1	---	13419

PARTS ORDERING INFORMATION

These units are designed and constructed to provide long, trouble-free service. In time it may become necessary to order and install new parts to replace those that have been subjected to wear.

The use of replacement parts other than **Ingersoll-Rand** Material Handling may result in decreased performance, and may, at the company's option invalidate the warranty.

For prompt service and genuine **Ingersoll-Rand** Material Handling parts, provide your nearest Distributor with the following:

1. Complete Model description.
2. Part number and part description as shown in this manual.
3. Quantity required.

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

Model Description _____

Date Purchased _____

Serial Number _____

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.

NOTICE

• **Continuing improvement and advancement of design may produce changes to this unit 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.**

Disposal

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

For additional information contact:

**Ingersoll-Rand
Zimmerman Handling Systems**
1872 Enterprise Drive
Rochester Hills, MI 48309
Phone: (248) 293-5700
Fax: (248) 293-5800

or

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

For additional information on the following products order the publication by the referenced Part/Document Number listed:

Publication	Part/Document Number	Publication	Part/Document Number
Z-Balancer	ZBSM0195	Z-Rail System	MHD56159
Manipulator Arm	MHD56162	Valu-Trak Rail System	MHD56161

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 **I-R** Material Handling 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 en route 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

Technical Support

**Ingersoll-Rand
Zimmerman Handling
Systems**
1872 Enterprise Drive
Rochester Hills, MI 48309
Phone: (248) 293-5700
Fax: (248) 293-5800

For Order Entry and Order Status:

**Ingersoll-Rand
Distribution Center**
P.O. Box 618
510 Hester Drive
White House, TN 37188
Phone: (615) 672-0321
Fax: (615) 672-0801

Web Site:
www.ingersoll-rand.com

Regional Sales Offices

Chicago, IL
888 Industrial Drive
Elmhurst, IL 60126
Phone: (630) 530-3800
Fax: (630) 530-3891

Detroit, MI
1872 Enterprise Drive
Rochester Hills, MI 48309
Phone: (248) 293-5700
Fax: (248) 293-5800

Houston, TX
450 Gears Road
Suite 210
Houston, TX 77067-4516
Phone: (281) 872-6800
Fax: (281) 872-6807

Los Angeles, CA
13107 Lakeland Road
Santa Fe Springs, CA
90670
Phone: (562) 777-0808
Fax: (562) 777-0818

Philadelphia, PA
P.O. Box 425
900 E. 8th Ave., Suite 103
King of Prussia, PA 19406
Phone: (610) 337-5930
Fax: (610) 337-5912

International Office Locations

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:

**Ingersoll-Rand
Zimmerman Handling
Systems**
1872 Enterprise Drive
Rochester Hills, MI 48309
Phone: (248) 293-5700
Fax: (248) 293-5800

**Canada
National Sales Office
Regional Warehouse
Toronto, Ontario**
51 Worchester Road
Rexdale, Ontario
M9W 4K2
Phone: (416) 213-4500
Fax: (416) 213-4510
Order Desk
Fax: (416) 213-4506

**Regional Sales Offices
Edmonton, Alberta**
1430 Weber Center
5555 Calgary Trail N.W.
Edmonton, Alberta
T6H 5P9
Phone: (780) 438-5039
Fax: (780) 437-3145

Montreal, Quebec
3501 St. Charles Blvd.
Suite 104
Kirkland, Quebec
H9H 4S3
Phone: (514) 695-9040
Fax: (514) 695-0963

British Columbia
1200 Cliveden Avenue
Delta, B. C.
V3M 6G4
Phone: (604) 523-0803
Fax: (604) 523-0801

**Latin America Operations
Ingersoll-Rand
Production Equipment Group**
730 N.W. 107 Avenue
Suite 300, Miami, FL
33172-3107
Phone: (305) 559-0500
Fax: (305) 222-0864

**Europe, Middle East and
Africa
Ingersoll-Rand
Material Handling
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

**Asia Pacific Operations
Ingersoll-Rand Ltd.**
Suite 1201-3 12/F
Central Plaza
18 Harbour Road
Wanchai, Hong Kong
Phone: (852) 2527 0183
Fax: (852) 2527 5976

**Russia
Ingersoll-Rand**
Kuznetsky Most 21/5
Entrance 3
Moscow 103895 Russia
Phone: (7) 501 923 9134
Fax: (7) 501 924 4625