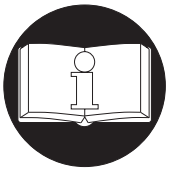
force 5™ HYDRAULIC WINCHES

PARTS, OPERATION AND MAINTENANCE SUPPLEMENT*

MODEL FH10

*** This supplement should be used in conjunction with supporting documentation for the hydraulic motor, disc brake and controls as applicable.**



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

⚠WARNING

Do not use this winch for lifting, supporting, or transporting people or lifting or supporting loads over people.

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

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

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INGERSOLL-RAND
MATERIAL HANDLING

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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

⚠ 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.

NOTICE

• Lifting and handling equipment is subject to different regulations in each country. These regulations may not be specified in this manual.

Ingersoll-Rand Material Handling winches are manufactured in accordance with the latest ASME B30.7 standards.

The National Safety Council, Accident Prevention Manual for Industrial Operations, Eighth Edition and other recognized safety sources make a common point: Employees who work near suspended loads or assist in hooking on 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 or pulling 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.

The Occupational Safety and Health Act of 1970 generally places the burden of compliance with the owner/employer, 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.

Rigging: It is the responsibility of the operator to exercise caution, use common sense and be familiar with proper rigging techniques. Refer to ASME B30.9 for rigging information, American National Standards Institute, 1430 Broadway, New York, NY 10018.

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 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.

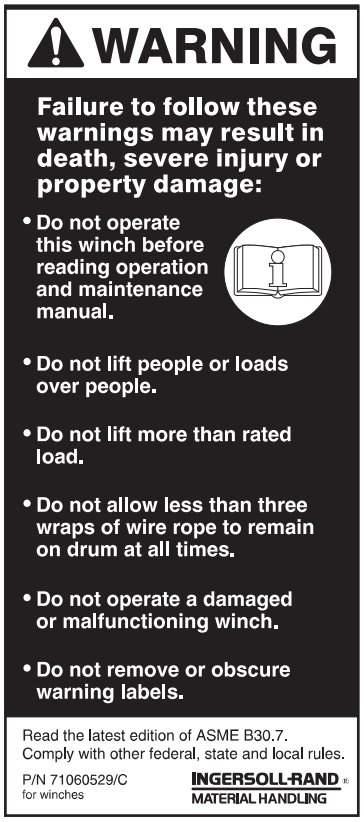
Ingersoll-Rand recognizes that most companies who use winches have a safety program in force at their facility. In the event that some conflict exists between a rule set forth in this publication and a similar rule already set by an individual company, the more stringent of the two should take precedence.

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 personnel trained in safety and operation of this winch to operate and maintain this product.
2. Only operate a winch if you are physically fit to do so.
3. When a “DO NOT OPERATE” sign is placed on the winch, or controls, do not operate the winch until the sign has been removed by designated personnel.
4. Before each shift, check the winch for wear and damage. Never use a winch that inspection indicates is worn or damaged.
5. Never lift a load greater than the rated capacity of the winch. Refer to “SPECIFICATIONS” section.
6. Keep hands, clothing, etc., clear of moving parts.
7. Never place your hand in the throat area of a hook or near wire rope spooling onto or off of the winch drum.
8. Always rig loads properly and carefully.
9. Be certain the load is properly seated in the saddle of the hook. Do not tipload the hook as this leads to spreading and eventual failure of the hook.
10. Do not “side pull” or “yard”.
11. Make sure everyone is clear of the load path. Do not lift a load over people.
12. Never use the winch for lifting or lowering people, and never allow anyone to stand on a suspended load.
13. Ease the slack out of the wire rope when starting a lift or pull. Do not jerk the load.
14. Do not swing a suspended load.
15. Never suspend a load for an extended period of time.
16. Do not leave a load suspended when the winch is unattended or not in use.
17. Pay attention to the load at all times when operating the winch.
18. After use, or when in a non-operational mode, the winch should be secured against unauthorized and unwarranted use.
19. The operator must maintain an unobstructed view of the load at all times.
20. Never use the winch wire rope as a sling.

WARNING LABELS

Each unit is shipped from the factory with the warning labels shown. If the labels are not attached to your unit, order new labels and install them. Refer to the parts list for the part number. Labels are not shown actual size.



SPECIFICATIONS

Model Code Explanation

Example: FH10-24XK1P — **FH10 - 24 X K 1 P**

Series (Capacity):

FH10 = **Force 5 Hydraulic Winch**

Drum Flange Height:

- = **Standard flange: 38 inch (965 mm) diameter**

Drum Length (Distance between drum flanges):

24 = **24 inch (610 mm) [Standard]**
30 = 30 inch (760 mm)
36 = 36 inch (915 mm)
40 = 40 inch (1014 mm)

Drum Brake:

M = Manual Drum Brake
X = **None**

Disc Brake:

K = **Automatic Disc Brake**
X = None

Control:

1 = **Winch mounted lever throttle (Standard)**
2 = Customer provided

Options: *

7 = Drum Grooving (Number = wire rope size in sixteenths, e.g. 7 = 7/16 inch)
C = Low Temperature Components; specify -10° C (14° F) or -20° C (-4° F)
D = Drum Divider Flange (includes additional wire rope anchor)
-E = Compliance with European Machinery Directive (includes Emergency Stop and Overload Protection)
G = Drum Guard
L = Drum Locking Pin
M1 = Material Traceability (Typical material results)
M2 = Material Traceability (Actual material results)
M3 = Material Traceability (Actual material results for these parts in finished as delivered condition)
P = **Marine 812 top coat**
Q = Special paint; please specify
S = Rotary Limit Switch (2)
U = Underwound
W = Witness; please specify
X = Testing; please specify
Z = Sand blast and Carbozinc primer only

*** Notes:**

(1) Documentation, witness testing and material traceability available; must be requested at time of order. Specify options or contact the factory or your nearest **Ingersoll-Rand** distributor for information.

(2) Not covered in this manual. Contact the factory or your nearest **Ingersoll-Rand** distributor for information.

General Specifications
based on 149:1 Gear Reduction Ratio

Utility Rating 5:1 design factor	**Full drum line pull**	22,000 lbs	9,979 kg
	Mid drum line speed (fpm)	70 fpm	21.3 mpm
Drum barrel diameter		20 inches	508 mm
Drum flange diameter		38 inches	965 mm
Inlet pressure (nominal) 3000 psig max		2,775 psig	19140 kPa/191 bar
Flow at rated load (nominal)		70 gpm	265 litres per minute
Hose size		Refer to “INSTALLATION” section for recommended hose sizes	
Approximate Shipping weight (24 in. long drum without wire rope)		3550 lb	1610 kg

Contact factory for optional motor information.

FH10 Drum Wire Rope Storage Capacities ft. (m)

Drum Length		**Rope Diameter**							
inches	**mm**	**3/4 inch**	**20 mm**	**7/8 inch**	**22 mm**	**1 inch**	**26 mm**	**1-1/8 inch**	**28 mm**
24	610	2488	731	1962	592	1332	398	1026	377
30	762	3130	921	2470	746	1679	503	1295	476
36	914	3772	1110	2980	900	2026	606	1564	574
40	1016	4200	1236	3319	1002	2258	676	1744	640

Storage capacities are based on ASME B30.7 Standards which requires 1/2 inch (13 mm) minimum clear flange above last layer. Storage capacities shown may vary from those shown elsewhere.

Description of Operation

FH10 winches are hydraulic powered, planetary geared units designed for lifting and pulling applications. FH10 winches are supplied with either an automatic disc brake, a manual externally mounted drum band brake, or a combination of both.
The output from an externally mounted hydraulic motor is transmitted through a coupling and shaft to the planetary reduction gear assembly.
The FH10 winch disc brake assembly consists of friction plates splined to a hub which in turn is connected to the drive shaft from the motor. The brake friction plates are clamped to the drum shaft through a spring applied piston.
The winch brake typically consists of a fail-safe disc brake and a counterbalance valve. The brake is disengaged in the lowering (payout) direction only. In the raise (haul-in) direction, the brake remains engaged, and an internal sprag clutch provides fail-safe load lifting, preventing momentary downward load drifting at the instant the winch control valve (refer to manufacturer’s provided information) is shifted to raise the load. The brake release oil pressure is provided by fluid pressure ported from the winch motor to the brake housing.
The counterbalance valve will prevent a runaway load condition. Should the load try to drop faster than the winch is paying out, over-running the winch motor, the valve will sense a low pressure condition at the motor inlet, and restrict fluid flow from the motor outlet. This creates a fluid back-pressure on the winch motor, causing the motor to quickly slow down, stopping the runaway load.
The counterbalance valve should be preset to operate a minimum of 130% of the maximum oil pressure induced by the rated winch load.
The drum band brake operates by applying a friction force between the drum brake and with winch drum. The manual brake requires and operator to engage and disengage the brake using a handwheel located on top of the brake band.

Traceability

Load bearing parts are documented to provide traceability. The documentation includes chemical and physical properties of the raw material, heat treating, hardening, tensile and charpy tests as required for the part. Units with M2 or M3 in the model code have traceable load-bearing components. Components with part numbers ending in CH are charpy parts for use under extreme cold conditions. Traceability requirements must be stated when reordering these parts for continued certification.

INSTALLATION

Prior to installing the winch, carefully inspect it for possible shipping damage.
Winches are supplied fully lubricated from the factory. Before operation check oil levels and adjust as necessary. Use the proper type of oil as recommended in the "LUBRICATION" section.

⚠ CAUTION

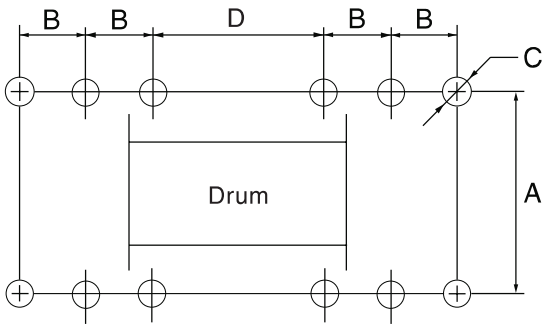
• Owners and users are advised to examine specific, local or other regulations, including American National Standards Institute and/or OSHA Regulations which may apply to a particular type of use of this product before installing or putting winch to use.

Mounting

Refer to Dwg. MHP0920 on Page 7, and Table 1
Care must be taken when moving, positioning or mounting the winch. In most cases, lifting lugs have been provided to assist in handling the winch. If the lug locations are improper for your specific installation, great care should be taken to ensure that the winch, when lifted, will be properly balanced. Determine the weight of your winch by referring to the "SPECIFICATIONS" section. Lift the winch 3 to 4 inches (75 to 100 mm) off the ground. Verify winch is balanced and secure before continuing lift. Mount the winch so the axis of the drum is horizontal. If the winch is to be mounted in an inverted position, the motor case must be rotated to position the vent cap at the top.

1. The winch mounting surface must be flat and of sufficient strength to handle the rated load plus the weight of the winch and attached equipment. An inadequate foundation may cause distortion or twisting of the winch uprights and side rails resulting in winch damage.
2. Make sure the mounting surface is flat to within 0.005 inch (0.127 mm) per inch of drum length. Shim if necessary.
3. Mounting bolts must be 7/8 inch (22 mm) Grade 8 or better. Use self-locking nuts or nuts with lockwashers.

Winch Bolt Hole Mounting Dimensions

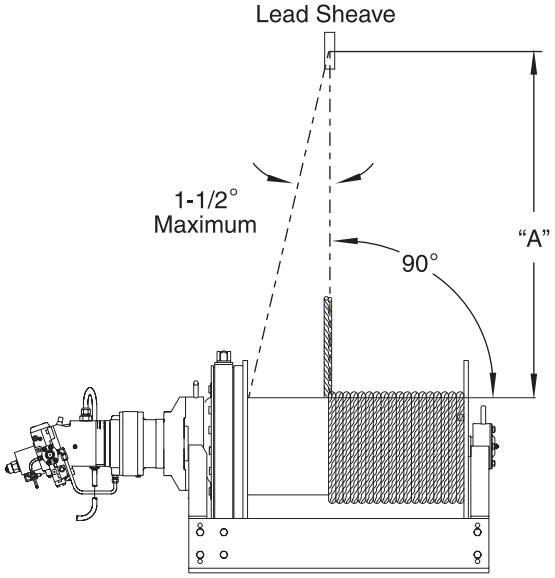


(Dwg. MHP0920)

Table 1 – Winch Bolt Hole Mounting Dimensions

Dimension		Drum Length (inches)			
		24	30	36	40
'A'	in	42.25			
	mm	1073			
'B'	in	6.00	8.00		
	mm	152	203		
'C'	in	15/16			
	mm	24			
'D' (with drum brake)	in	14	12	16	22
	mm	356	305	406	559
'D' (without drum brake)	in	10	8	12	18
	mm	254	203	305	457

4. Tighten 7/8 inch (22 mm) mounting bolts evenly and torque to 600 ft. lbs. (813 Nm) for dry thread fasteners. If the fasteners are plated, lubricated or a thread locking compound is used, torque to 460 ft. lbs. (624 Nm).
5. Maintain a fleet angle between the sheave and winch of no more than 1-1/2°. The lead sheave must be on a center line with the drum and, for every inch (25 mm) of drum length, be at least 1.6 feet (0.5 metre) from the drum. The diameter of the lead sheave must be at least 18 times the diameter of the wire rope. Refer to Dwg. MHP1739 on Page 7.



(Dwg. MHP1739)

Drum Length (inches)	'A' Minimum Distance *	
	feet	metres
24	38.4	11.7
30	48	14.6
36	57.6	17.5
40	64	19.5

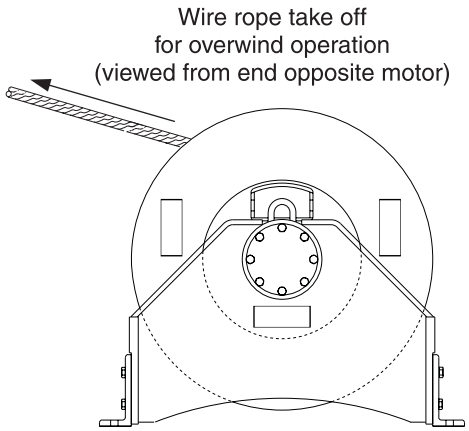
* 'A' = 1.6 feet (0.5 metre) per inch of drum length.

6. Do not weld to any part of the winch.

Wire Rope

CAUTION

• Maintain at least 3 tight wraps of wire rope on the drum at all times.
• Install the wire rope to come off the drum for overwind operation. Refer to Dwg. MHP1737 on Page 8.



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NOTICE

• Some applications may require underwind operation. Consult the factory prior to use.

Wire Rope Selection

Consult a reputable wire rope manufacturer or distributor for assistance in selecting the appropriate type and size of wire rope and, where necessary, a protective coating. Use a wire rope which provides an adequate safety factor to handle the actual working load and that meets all applicable industry, trade association, federal, state and local regulations.

When considering wire rope requirements the actual working load must include not only the static or dead load but also loads resulting from acceleration, retardation and shock load. Consideration must also be given to the size of the winch wire rope drum, sheaves and method of reeving. Wire rope construction should be 6 X 19 or 6 X 37 IWRC right lay to permit correct installation of wire rope anchor. Refer to Table 2 for minimum and maximum recommended wire rope diameters.

Table 2 – Minimum and Maximum Wire Rope Size

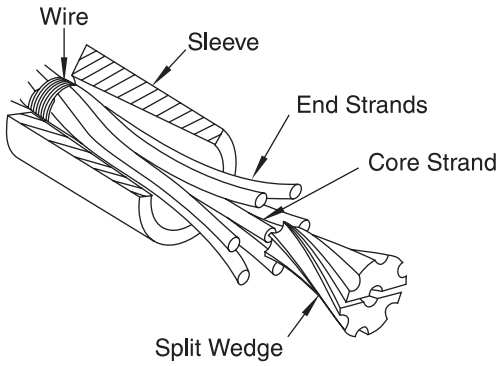
Model	Minimum		Maximum	
	inch	mm	inch	mm
FH10	3/4	20	1-1/8	28

Smaller wire rope sizes may be acceptable on custom designed drums.

Installing Wire Rope

Refer to Dwg. MHP0166 on Page 8.

1. Cut wire rope to length in accordance with the wire rope manufacturer's instructions.
2. Feed the end of the wire rope into the anchor hole in the drum and pull through approximately one foot (305 mm) of wire rope.



(Dwg. MHP0166)

3. Wrap the wire rope with wire a distance from the end equal to the wedge length plus one inch (25 mm).
4. Slide the sleeve over the end of the wire rope so the larger diameter of the taper bore is nearest the end of the wire rope.
5. Spread the end strands of the wire rope and insert the split wedge until it is below the end of the wire rope.
6. Pull the sleeve over the wire rope end until tight. Check that the wire rope strands stay in the slots located on the split wedge.
7. Pull the wire rope anchor into position in the drum anchor pocket.

CAUTION

• Make sure the first wrap of wire rope is tight and lays flush against the drum flange.

Safe Wire Rope Handling Procedures

1. Always use gloves when handling wire rope.
2. Never use wire rope which is frayed or kinked.
3. Never use wire rope as a sling.
4. Always ensure wire rope is correctly spooled and the first layer is tight against the drum.

Wire Rope Spooling

To compensate for uneven spooling and the decrease in line pull capacity as the drum fills up, use as short a wire rope as practical. When rewinding apply tension to the end of the wire rope to eliminate line slack. This helps achieve level winding and tight spooling.

Rigging

Make sure all wire rope blocks, tackle and fasteners have a sufficient safety margin to handle the required load under all conditions. Do not allow wire rope to contact sharp edges or make sharp bends which will cause damage to wire rope, use a sheave. Refer to the wire rope manufacturer's handbook for proper sizing, use and care of wire rope.

Safe Installation Procedures

1. Do not use wire rope as a ground (earth) for welding.
2. Do not attach a welding electrode to winch or wire rope.
3. Never run the wire rope over a sharp edge. Use a correctly sized sheave.
4. Always maintain at least three full, tight wraps of wire rope on the drum.

Hydraulic System

Hydraulic Hoses

In order to maintain maximum efficiency of the winch, select the size of hydraulic lines according to the maximum volume of oil to be used. Refer to **Table 3 - Hydraulic Hose Recommendations**. If the hydraulic lines used are too small, they may cause excessive back pressure generating heat and inefficiency within the hydraulic system.
The sizes in Table 3 are to be used as a guide only. If trouble is experienced due to the use of long hoses, it may be necessary to use hoses which are one size larger.

Table 3 – Hydraulic Hose Recommendations

Oil Flow @ 3000 psig max		Pressure Lines (inside diameter)	
gpm	**l/min**	**inch**	**mm**
10-30	27-114	1.25	32
31-60	115-227	1.5	38
61-90	228-303	2	51
90-120	304-454	2.5	63

Hydraulic Fluid

The most frequent cause of malfunction or failure of hydraulic equipment is the presence of contaminants in the hydraulic fluid. Reduce contaminants by using clean hydraulic fluid, and changing the fluid before it deteriorates. When the hydraulic fluid is changed, also clean out the hydraulic reservoir. At a minimum, the required oil cleanliness level is ISO 18/13 or better.

Periodic checks which may be performed by the operator to test hydraulic fluid cleanliness include:
1. Check for a major change in color or noticeable thickening which are signs of severe deterioration and indicate the need to change the fluid.
2. Check oil for foaming and aeration which may indicate low oil level in the hydraulic tank, leaks, faulty hydraulic line connections or moisture build up in the oil.

ISO VG 30, 46 and 68 oils will give good results under normal temperature conditions. The use of an oil having a high viscosity index will minimize cold-start trouble and reduce the length of warm-up periods. A high viscosity index will minimize changes in viscosity with corresponding changes in temperature.
Under continuous operating conditions the temperature of the oil at any given point in the hydraulic system should not be allowed to exceed 180° F (82° C).

⚠ CAUTION

• Do not substitute synthetic fluids unless it has been determined that winch, motor and hydraulic system seals are compatible.

Use a premium anti-wear (AW) hydraulic fluid in the hydraulic system. The following specifications are intended to serve as a general guide in selecting suitable oils.

Temperature		Recommended Hydraulic Oil
Fahrenheit	**Celsius**	
above 32° F	0° C	ISO VG 46 (SUS 230-240 @ 100° F)
0° to 32° F	-17.7° to 0° C	ISO VG 32 (SUS 160-165 @ 100° F)
below 0° F	below -17.7° C	Consult local oil company representative for oil having a maximum viscosity of 7,400 SSU's at the minimum temperature encountered.

Filters

Filters should be equipped with dirty filter indicators, which should be checked daily. Replace filters if indicators show filter is dirty. It is also recommended that filters be changed if hydraulic oil is changed or a major component (pump, valve, motor, etc.) is repaired or replaced.

When the winch is installed with its own hydraulic system or when there is no filter in the existing circuit, a partial flow micro-filter should be installed between the control valve and the reservoir. This filter should be rated at Beta 200=6µm. Filters must include an integral 50 psi (345 kPa/3.45 bar) bypass check valve which will open when the filter element is filled to 80% capacity. Refer to 'Filter Maintenance' in the "MAINTENANCE" section for servicing information.

Hydraulic Connections

When repairing or servicing any hydraulic lines or fittings in the system, always flush each line and connection of all foreign contaminants before making the final connection. Always cap or plug open connections or lines. Verify port connections match motor and installation information provided.

Pump

Ensure the pump used with the winch motor is capable of producing pressure and volume as specified for the winch.

Control Valve

The control valve used to operate the winch must be a four-way, spring return to neutral, open center valve having a motor spool directing all work port flow to the reservoir (return lines) when the valve spool is in the neutral position. This control valve should have good metering characteristics in order to provide smooth winch control. A built in relief valve, suitable for maximum operating pressure and flow, should also be installed in the control valve and/or hydraulic system.

Motor

For optimum performance and maximum durability of parts, ensure hydraulic supply does not exceed recommended pressures and flows. When feasible the motor should be installed as near as possible to the pump.
Motor case drain lines must be ported to the reservoir and must not exceed 30 psi (207 kPa/2 bar).

Disc Brake

Disc brake is shipped with petroleum based cooling oil installed. Prior to operation, ensure oil level is checked. If oil is low fill to manufacturer's recommendations.

Initial Operating Checks

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

1. When first operating the winch it is recommended that the winch be driven slowly in both directions for a few minutes.

For winches that have been in storage for a period of more than one month the following start-up procedure is required.

1. Give the winch an inspection conforming to the requirements of "Winches Not in Regular Use" in the "INSPECTION" section.
2. Operate the winch for 10 seconds in both directions to prime all lines.
3. The winch is now ready for normal use.

OPERATION

The four most important aspects of winch operation are:
1. Follow all safety instructions when operating the winch.
2. Allow only people trained in safety and operation of this winch to operate this equipment.
3. Subject each winch to a regular inspection and maintenance procedure.
4. Be aware of the winch capacity and weight of load at all times.

⚠WARNING

• The winch is not designed or suitable for lifting, lowering or moving people. Never lift loads over people.

⚠ CAUTION

• To avoid damage to the rigging, the structure supporting the rigging and the winch, do not "two-block"* the end of the wire rope.

***** Two blocking occurs when the winch wire rope is multi reeved using two separate blocks which are allowed to come in contact with each other during winch operation. When this occurs, extreme forces are exerted on the wire rope and sheave blocks which may result in equipment and/or rigging failure.

Operators must be physically competent. Operators must have no health condition which might affect their ability to act, and they must have good hearing, vision and depth perception. The winch operator must be carefully instructed in his duties and must understand the operation of the winch, including a study of the manufacturer's literature. The operator must thoroughly understand proper methods of hitching loads and should have a good attitude regarding safety. It is the operator's responsibility to refuse to operate the winch under unsafe conditions.

Hydraulic System

Efficient operation of the winch requires attention to the hydraulic oil system. The most important elements to ensure proper operation of the hydraulic system are:
1. **Oil Temperature.** The presence of hot fluid in a hydraulic system is a primary cause of poor operation, component failure and system downtime. The fluid used in any hydraulic system is formulated for operation within a temperature range of 32° to 140° F (0° to 60° C). If the temperature is frequently exceeded component and system operation will be degraded.
2. **Oil Cleanliness.** Hydraulic system cleanliness is extremely important to ensure safe, continued operation of components. Dirty or contaminated hydraulic fluid may cause components to break down, operate erratically or damage valuable equipment.

Warm Up Procedure

⚠ CAUTION

• A warm up procedure is recommended at each start-up under normal operating conditions, and is essential at ambient temperatures below 40° F (4° C).

To warm up the hydraulic oil and system, run the pump with the winch control valve in neutral long enough to sufficiently warm up the system.

Once the system has warmed up, operate the winch, without a load, at slow speeds in both directions several times to prime all lines with warm hydraulic fluid.

Winch Controls

Ensure control valve handle movement is consistent with direction of winch drum rotation. Refer to manufacturer's literature for additional information.

Winch Brakes

Manual Drum Brake

Refer to Dwg. MHP0627 on Page 32.
The manual drum brake may be applied by turning the handwheel (104) in a clockwise direction and released by turning handwheel counterclockwise. The brake must be kept properly adjusted to hold the required load. Refer to the "MAINTENANCE" section for adjustment instructions.

Automatic Disc Brake

The winch brake typically consists of a fail-safe disc brake and a counterbalance valve. The brake is disengaged in the lowering (payout) direction only. In the raise (haul-in) direction, the brake remains engaged, and an internal sprag clutch provides fail-safe load lifting, preventing momentary downward load drifting at the instant the winch control valve (refer to manufacturer's information) is shifted to raise the load. The brake release oil pressure is provided by fluid pressure ported from the winch motor to the brake housing.

The counterbalance valve will prevent a runaway load condition. Should the load try to drop faster than the winch is paying out, over-running the winch motor, the valve will sense a low pressure condition at the motor inlet, and restrict fluid flow from the motor outlet. This creates a fluid back-pressure on the winch motor, causing the motor to quickly slow down, stopping the runaway load.
The counterbalance valve should be preset to operate a minimum of 130% of the maximum oil pressure induced by the rated winch load.

Drum Locking Pin (optional feature)

Refer to Dwg. MHP0874 on Page 34.
The drum locking pin is mounted to the winch on the outboard upright, (opposite end to the motor). It should be engaged if a load is temporarily suspended. The drum locking pin is operated by rotating a pin between two slots, one shallow and the other deep.
To engage:
1. Rotate the drum flange (80) to align one of the twelve holes with the lock pin (136). Pull out, straight away from the outboard upright, pull rod (140) and rotate 90°. Align pin (135) with the deep groove in gland and allow the spring loaded lock pin (136) to insert into the drum flange hole.

To disengage:

1. Pull out, straight away from the outboard upright, pull rod (140) and rotate 90°. Align pin (135) with the shallow groove in gland. Ensure locking pin (136) is clear of the drum (80) flange.

⚠ WARNING

• Ensure that all braking mechanisms are engaged and all personnel are clear of the winch load and rigging before disengaging the locking pin.
• Extremely difficult locking pin release is an indication that the load is held by the locking pin and the braking mechanisms are not functioning properly. Do not release the locking pin until load control is established.

LUBRICATION

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

The lubrication intervals recommended in this manual are based on intermittent operation of the winch eight hours each day, five days per week. If the winch is operated almost continuously or more than the eight hours each day, more frequent lubrication will be required. Also, the lubricant types and change intervals are based on operation in an environment relatively free of dust, moisture, and corrosive fumes. Use only those lubricants recommended. Other lubricants may affect the performance of the winch. Approval for the use of other lubricants must be obtained from your **Ingersoll-Rand** distributor. Failure to observe this precaution may result in damage to the winch and/or its associated components.

INTERVAL	LUBRICATION CHECKS
Monthly	Lubricate components supplied by grease fittings.
	Inspect and clean or replace oil filter.
	Check reduction gear oil level.
Yearly	Drain and refill winch reduction gear oil.

Note: Intervals are based on winch operation in a normal environment as described in the “INSPECTION” section. In ‘Heavy’ or ‘Severe’ operating conditions adjust lubrication intervals accordingly.

Recommended Lubricants

Reduction Gear Assembly

Gear Oil

Temperature	Gear Oil Type
-4° to 125° F (-20° to 52° C)	ISO VG 100 (SAE 75W90)

Grease

Temperature	Type Grease
-20° to 50° F (-30° to 10° C)	EP 1 multipurpose lithium-based grease
30° to 120° F (-1° to 49° C)	EP 2 multipurpose lithium-based grease

Component Lubrication

General Lubrication

Correct lubrication is one of the most important factors in maintaining efficient winch operation.

1. The recommended grade of oil must be used at all times since the use of unsuitable oil may result in excessive temperature rise, loss of efficiency and possible damage to internal components. Refer to the “Recommended Lubricants” section.
2. Drain and replace oil in the reduction gear after the first 50 hours of initial winch operation. Thereafter, drain and replace oil according to the operating environment as defined by the “Periodic Inspection” interval table in the “INSPECTION” section, or more frequently if desired.
3. Always inspect removed oil for evidence of internal damage or contamination (metal shavings, dirt, water, etc.). If indications of damage are noted, investigate and correct before returning winch to service.
4. After winch operation, allow oil to settle before topping off.
5. Always drain oil into a suitable container and dispose of in an environmentally safe manner.

Oil Capacities

Component	Quantity
Reduction Gear Assembly	5 qts (4.8 litres)

Reduction Gear Assembly

Refer to Dwg. MHP1770 on Page 14.
The reduction gear assembly is filled and shipped with oil from the factory. Check oil level before initial winch operation.

To ensure correct performance, highest efficiency and long life, it is essential that the lubricating oil be maintained at the correct level. Rotate the drum until one of the plugs is located at top dead center then add oil up to the level plug hole. Oil capacity for the reduction gear assembly is 5 quarts (4.8 litres).

⚠ CAUTION

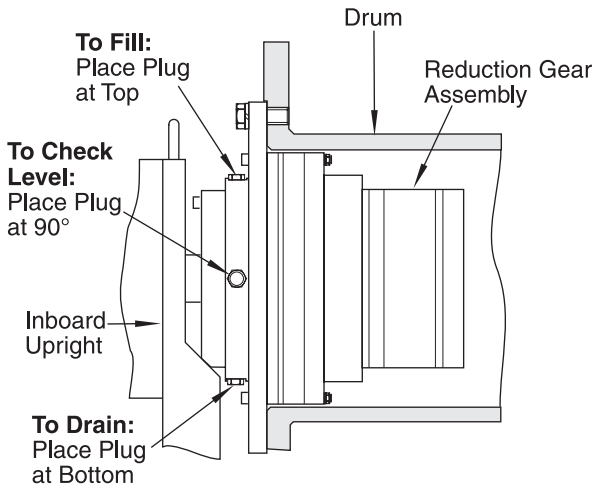
• Do not over fill. Excess oil will reduce operating efficiency and increase oil temperature.

To check oil level:
Position one of the removeable plugs at the top. Remove plug, then slowly operate winch to rotate the plug hole to the 3 or 9 o’clock position. Check if oil runs out. Slowly reverse the procedure until plug hole is returned to the top position. Install plug.

To drain oil, then fill:
Position one of the removeable plugs at the top. Place a large pan container below reduction gear to collect oil. Remove plug, then slowly operate winch to rotate the plug hole to the 6 o’clock (bottom) position and allow sufficeint time for oil to drain out into container. Slowly reverse the procedure until plug hole is returned to the top position. Fill with fresh oil and install plug.

The recommended grade of oil must be used at all times since the use of unsuitable oil may result in excessive temperature rise, loss of efficiency and possible damage to the gears. Refer to “Recommended Lubricants” in this section.
Use only high quality gear lubricants in the reduction gear assembly such as high grade 3EP type gear oil or their equivalents.

Reduction Gear Lubrication Plug Locations



(Dwg. MHP1770)

Automatic Disc Brake

Refer to the manufacturer's literature for lubrication requirements.

Seals and Bearings

If winch or components are disassembled, clean all parts thoroughly and coat bearings and seals with clean grease. Refer to "Recommended Lubricants" in this section. Use sufficient grease to provide a good protective coat. Lubricate grease fittings monthly with 2 or 3 pumps of a grease gun.

Drum Locking Pin (optional feature)

Refer to Dwg. MHP0874 on Page 34.
Lubricate at least once every year, depending on the environment and duty cycle. Clean all parts thoroughly and coat with clean grease. Pack the gland cavity with grease. Refer to "Recommended Lubricants" in this section. Use sufficient grease to provide a good protective coat.
Lubrication will help to prevent rust and allow easier locking pin operation.

Wire Rope

Follow the wire rope manufacturer's instructions. At a minimum, observe the following guidelines.

1. Clean with a brush or steam to remove dirt, rock dust or other foreign material on the surface of the wire rope.

⚠ CAUTION

• Do not use an acid-based solvent. Only use cleaning fluids and lubricants specified by the wire rope manufacturer.

2. Apply a wire rope lubricant, **LUBRI-LINK-GREEN**® or an ISO VG 100 (SAE 30W) oil.
3. Brush, drip or spray lubricant weekly, or more frequently, depending on severity of service.

INSPECTION

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

WARNING

• All new, altered or modified 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 winch 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 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. 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 review.

Wire Rope Reports

Records should be maintained as part of a long range wire rope inspection program. Records should include the condition of wire rope removed from service. Accurate records will establish a relationship between visual observations noted during frequent inspections and the actual condition of wire rope as determined by periodic inspections.

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 damage or evidence of malfunction.

1. WINCH. Prior to operation, visually inspect winch housings, controls, brakes, side rails and drum for indications of damage. Do not operate the winch unless the wire rope feeds onto the drum smoothly, and any discrepancies noted have been reviewed and inspected further by personnel instructed in the operation, safety and maintenance of this winch.
2. WIRE ROPE. Visually inspect all wire rope which can be expected to be in use during the day's operations. Inspect for damage indicated by distortion of wire rope such as kinking, "birdcaging," core protrusion, main strand displacement, corrosion, broken or cut strands. If damage is evident, do not operate winch until the damage has been reviewed and inspected further by personnel instructed in the operation, safety and maintenance of this winch.

NOTICE

• The full extent of wire rope wear cannot be determined by visual inspection. At any indication of wear inspect the wire rope in accordance with instructions in "Periodic Inspection."

3. HYDRAULIC SYSTEM. Check hydraulic lines, fittings, valves and other components for deterioration, leakage or wear. Tighten, repair or replace as necessary. Check reservoir sight gauge for proper hydraulic oil level. Check dirt alarms at both pressure and return line filters for visual indication of dirty filter.
4. CONTROLS. During operation of winch, verify response to control is quick and smooth. If winch responds slowly or movement is unsatisfactory, do not operate winch until all problems have been corrected.
5. BRAKES. During winch operation test brakes. Brakes must hold load without slipping. Automatic brakes must release when winch motor throttle is operated. If brakes do not hold load, or do not release properly, the brakes must be adjusted or repaired.

Periodic Inspection

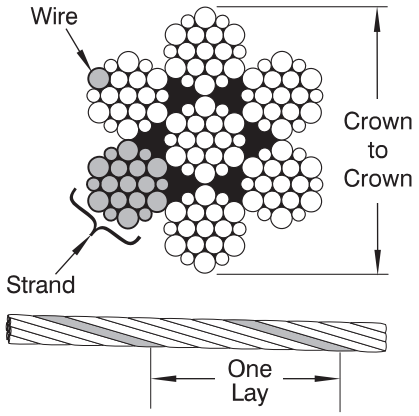
Periodic inspection intervals for winch use under various conditions is listed below:

NORMAL	HEAVY	SEVERE
yearly	semiannually	quarterly

Disassembly may be required as a result of frequent inspection findings or in order to properly inspect the individual components. Disassembly steps are described in the "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. SIDE RAILS and UPRIGHTS. Check for deformed, cracked or corroded main components. Replace damaged parts.
2. FASTENERS. Check retainer rings, split pins, capscrews, nuts, and other fasteners on winch, including mounting bolts. Replace if missing or damaged and tighten if loose.
3. DRUM AND SHEAVES. Check for cracks, wear or damage. Replace if necessary.

4. WIRE ROPE. In addition to Frequent Inspection requirements, also inspect for the following:
    a. Build-up of dirt and corrosion. Clean with steam or a stiff wire brush to remove dirt and corrosion if necessary.
    b. Loose or damaged end connection. Replace if loose or damaged.
    c. Check wire rope anchor is secure in drum.
    d. Verify wire rope diameter. Measure the diameter of the wire rope from crown-to-crown throughout the life of the wire rope. Recording of the actual diameter should only be done with the wire rope under equivalent loading and in the same operating section as accomplished during previous inspections. If the actual diameter of the wire rope has decreased more than 1/64 inch (0.4 mm) a thorough examination of the wire rope should be conducted by an experienced inspector to determine the suitability of the wire rope to remain in service. Refer to Dwg. MHP0056, on Page 16.



(Dwg. MHP0056)

5. ALL COMPONENTS. Inspect for wear, damage, distortion, deformation and cleanliness. If external evidence indicates damage, disassemble as required to conduct a detailed inspection. Inspect gears, shafts, bearings, sheaves, springs and covers. Replace worn or damaged parts. Clean, lubricate and reassemble.
6. BRAKES. Individually test brakes installed to ensure proper operation. Brakes must hold a 125% rated load at full drum without slipping. If indicated by poor operation or visual damage, disassemble and repair brake(s). Check all brake surfaces for wear, deformation or foreign deposits. If brake lining thickness is less than minimum, as described in the "MAINTENANCE" section, replace brakes. Clean and replace components as necessary.
7. FOUNDATION OR SUPPORTING STRUCTURE. Check for distortion, wear and continued ability to support winch and rated load. Ensure winch is firmly mounted and that fasteners are in good condition and tight.
8. LABELS AND TAGS. Check for presence and legibility of labels. Replace if damaged or missing.
9. GUARDS (optional feature). Check guards are in place and secure.

Winches 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 the requirements of "Periodic Inspection" before being place in service.
3. Standby equipment shall be inspected at least semiannually in accordance with the requirements of "Frequent Inspection". In abnormal operating conditions equipment should be inspected at shorter intervals.

INSPECTION AND MAINTENANCE REPORT

Ingersoll-Rand Force 5 Series Hydraulic Winch

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	
Uprights and Side Rails					
Drum Band Brake (125% Load Test)					
Automatic Disc Brake (125% Load Test)					
Drum Band Brake (Visual Inspection)					
Disc Brake (Visual Inspection)					
Motor					
Limit Switches					
Controls					
Fasteners					
Reduction Gears					
Labels and Tags			- - -		
Shafts					
Guards					
Wire Rope Anchor			- - -		
Other Components (list in NOTES section)					

TESTING	Pass	Fail	NOTES
Operational (No Load)			
Operational (10%)			
Operational (Maximum Test Load *)			

* Maximum test load is 125% of rated line pull at full drum.

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

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 winch symptoms, probable causes and remedies.

SYMPTOM	CAUSE	REMEDY
Load continues to move when winch is stopped.	Drum brake is slipping.	Check drum brake adjustment and brake band lining wear.
	Winch is overloaded.	Reduce load to within rated capacity.
	Control valve may not be correct type. The correct control valve should have all ports open to reservoir when the spool is in the neutral position.	If the motor ports in the valve are blocked by the spool (closed center) when the control valve is in the neutral position, remove valve and replace with correct tandem center (A & B to tank) or float center motor spool (P, A & B to tank) valve.
	There is excessive back pressure acting on the reverse port of the winch motor and disc brake charge port.	Install pressure gauges in motor lines. Run the pump at its maximum RPM and, with the control valve in the neutral position, read the pressure gauges. If the pressure is greater than 140 psig (9.8 kg/cm²) it is too high. Check hose and control valve size. Replace if necessary.
Winch does not lift or pull load.	Motor may be damaged.	Remove and disassemble motor as recommended by the motor manufacturer. Examine all parts and replace any that are worn or damaged.
	No oil supply to winch.	Check oil supply line connections and hoses.
	Winch is overloaded.	Reduce load to within rated capacity.
	Insufficient oil supply.	Verify oil supply pressure and volume at winch inlet meets the specified requirements. Clean oil filter.
	Motor variable displacement may be set too low.	Adjust displacement to a higher setting. Refer to motor manufacturer's literature.
	System not delivering full pressure to winch.	Confirm pump is running and on stroke. Check upline flow controls are set as required to run the winch.
	Relief valve dumps full pressure.	Confirm no downline restrictions of valves are blocking free flow back to tank.
	Relief valve set too low.	Install pressure gauges in motor lines and apply a stall pull on the winch. If pressure is low, increase relief valve setting until recommended pressure is obtained.
	Relief valve is partially open.	Remove relief valve and visually inspect, repair or replace worn or damaged parts. Clean all parts thoroughly in a suitable solvent. Reassemble, reinstall and reset relief valve pressure setting.
	Oil level in reservoir too low. Suction line may be restricted or have an air leak causing cavitation at the inlet pump. 'Whining' noise at pump is an indication of this problem.	Check oil level in reservoir. Check suction line externally and internally for damage. Replace suction line if damaged. If cavitation has occurred it is recommended that the pump be disassembled and inspected for worn, pitted and damaged parts. Repair and replace parts as necessary.
Control lever moves but winch does not operate.	Motor may be damaged.	Remove and disassemble motor as recommended by the motor manufacturer. Examine all parts and replace any that are worn or damaged.
	Insufficient oil supply.	Verify oil supply pressure and volume at winch inlet meets the specified requirements. Clean oil filter.
	Drum locking pin (optional feature) is engaged.	Disengage drum locking pin.
Winch runs slow.	Improper hose or fitting sizes.	Check fittings, connections and hoses for correct size and length. Replace parts that may cause restricted oil flow. Inspect oil filter.
	Motor variable displacement set too high.	Lower motor variable displacement setting. Refer to motor manufacturer's literature.
	Motor may be damaged.	Remove and disassemble motor as recommended by the motor manufacturer. Examine all parts and replace any that are worn or damaged.

SYMPTOM	CAUSE	REMEDY
Lower (payout) speed is slower than lifting (haul-in) speed.	Control valve may be restricted in its travel.	Check the travel of the control valve spool. The spool travel should be the same in both directions.
	Oil may be too thick causing a high resistance to rotation at the brake plates causing relief valve to by-pass.	Change to lighter weight oil in the disc brake assembly.
	Damaged ‘O’ Ring in brake assembly.	Disassemble, inspect and replace brake ‘O’ Rings. Refer to manufacturer’s literature for service/maintenance requirements. If allowed by manufacturer, test brake by attaching a pressurizing instrument, such as a ‘Porta-Power’, to brake port and pressurize to 300 psig (2069 kPa/20.7 bar) (or allowable maximum pressure). Allow brake to hold pressure for an adequate period of time to ensure pressure does not bleed down.

Automatic Disc Brake:

Brake fails to release.	Low oil supply pressure.	Ensure the oil pressure at the inlet to the disc brake is at least 300 psig (2069 kPa/20.7 bar)
	Worn or damaged piston seals.	Inspect the brake breather. If oil escapes from the brake breather when attempting to release the brake, the brake seals must be replaced.
	No release pressure at the brake port.	Check line between motor and brake.
	Sticking brake piston.	Apply 300 psig (2069 kPa/20.7 bar) to the brake release port and check for brake disc movement. If brake discs do not move, disassemble and inspect the disc brake as described in the manufacturer’s literature.

WARNING

• Never perform maintenance on the winch while it is supporting a load.
• Before performing maintenance, tag controls:

DANGER - DO NOT OPERATE -
EQUIPMENT BEING REPAIRED

• Only allow personnel trained in safety and maintenance on this winch to perform service.
• After performing any maintenance on the winch, test winch to 125% of its rated capacity before returning to service. Testing to more than 125% of rated capacity may be required to comply with standards outside the USA.
• Turn off system and depressurize lines before performing any maintenance.

Maintenance Intervals

The Maintenance Interval chart is based on intermittent operation of the winch eight hours each day, five days per week. If winch 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 winch for damage. Do not operate the winch if damaged.
	Operate the winch at low RPM in both directions. Winch must operate smoothly without sticking, binding or abnormal noises. Check the operation of the brake(s).
3 Months (Maintenance Personnel)	Inspect the drum brake friction linings. Clean or replace parts as required. Adjust drum brake as necessary.
Yearly (Maintenance Personnel)	Inspect the winch gearing, shafts and bearings for wear and damage. Repair or replace as necessary.
	Check all the supporting members, including the foundation, fasteners, nuts, sheaves and rigging, etc. for indications of damage or wear. Repair or replace as required.

Reduction Gear Assembly

It is recommended that the first oil change be done after approximately 50 hours initial operation. Always inspect removed oil for evidence of internal damage (metal shavings, dirt, water, etc.).

Check the oil in the reduction housing as recommended in the "LUBRICATION" section. If low, replenish. The oil should be changed at least once every year. Refer to the "LUBRICATION" section for recommended oil.

Adjustments

Automatic Disc Brake Adjustment

Disc brake adjustment is not required. If the disc brake does not hold the rated load disassemble and repair.
Refer to manufacturers literature for service and maintenance requirements.

Manual Drum Brake Adjustment

Refer to Dwg. MHP0627 on Page 32.

1. Release wire rope tension on the drum.
2. Rotate handwheel (104) counterclockwise to release brake bands.
3. Loosen nut (120) and turn adjustment screw (127) to provide 1/16 to 1/8 inch (1.6 to 3.2 mm) gap between band lug and end of adjustment screw when brake is applied.
4. When correct gap is obtained tighten nut (120).
5. Check brake band is partially lifted from drum circumference to reduce drag when brake is not in use.

CAUTION

• When any part of the brake lining thickness measures 0.062 inch (2 mm) or less, brake bands (128) must be replaced.

Hydraulic System General Maintenance

Hydraulic systems operate efficiently when properly maintained. The following information should be developed into a routine maintenance procedure to ensure the hydraulic system and components are operated efficiently.

Hydraulic Motor

Inspect as recommended by motor manufacturer. Establish a schedule as part of an overall maintenance schedule.

Reservoir

Maintain fluid level at all times. The fluid should be checked after the first 10 hours of initial operation. If satisfactory, routine checks should be made each 100 hours of operation to verify that the fluid (class and type) meets the requirements of the pump.

Change fluid every 1000 to 2000 hours of operation depending upon severity of application and operating environment. If manufacturers requirements recommend fluid changes sooner, follow those recommendations.

Spare Parts

Spare filter elements should be available to allow filter replacement as necessary to maintain a clean hydraulic oil supply.

Other spare parts (hoses, fittings, etc.) should also be available to limit equipment downtime in the event that repairs are necessary.

Cleanliness

Keep equipment clean. A thick layer of dirt acts as insulation, causing the hydraulic system to retain heat resulting in higher operating temperatures.
If the system is opened for inspection or repair, a clean work area prevents foreign contaminants from entering the system and damaging component internal parts.

Filter Maintenance

Filters must be maintained. The key to good filtration is good filter maintenance. It should be recorded when filter life indicates replacement to help establish a scheduled service cycle. Replacing the filter routinely before it effects operation of the winch, reduces unexpected down time and potential component wear. A system may be equipped with the best filters available, and the filters positioned properly so they can do the most good, but, if the filters are not replaced when dirty, the money spent for the filters and their installation will have been wasted. A filter that gets dirty after 1 day of service and then is not cleaned until 29 days later allows 29 days of nonfiltered fluid. A filter is only as good as the maintenance given to it.

Service Suggestions:

1. Set up a filter maintenance schedule and follow it carefully.
2. Replace the original filter cartridge after 50 hours of operation.
3. Change or clean filters as required or indicated by visual indicators on filters supplied with such devices.
    a. Average Operating Environment - replace filter cartridge after each 500 hours of operation.
    b. Dirty Operating Environment - replace filter cartridge after each 250 hours of operation.
4. Clean suction strainers after first 10 hours of operation and then every 100 hours thereafter.
5. Inspect filter elements that have been removed from the system for signs of other system damage.
6. Do not return to the system any fluid that has leaked out.
7. Always keep supplies of fresh fluid covered tightly.
8. Use clean containers, hoses and funnels when filling reservoir. Use of a filter cart when adding fluid is highly recommended.
9. Use common sense precautions to prevent entry of dirt into components that have been temporarily removed from the system.
10. Make sure that all clean-out holes, filler caps and breather cap filters on the reservoir are properly fastened.
11. Do not run the system unless all normally provided filtration devices are in place.
12. Make certain that the fluid used in the system is a type recommended by the manufacturers of the system or components.

The above recommendations are based on an open system equipped with micro-air breathers. Open systems without micro-air breathers are not recommended. Visual inspection cannot be used to determine cartridge replacement. Particles below 40 microns are not visible to the human eye.
Before changing from one type of fluid to another (for example, from a petroleum-base to a fire-resistant fluid) consult component and filter manufacturers on the selection of the fluid and the filters that should be used. Follow recommended flushing procedures when changing fluids. Also consult ANSI B93.5M-1979 “Practice for the Use of Fire Resistant Fluids for Industrial Hydraulic Fluid Power Systems.”

Disassembly

General Disassembly Instructions

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

If a winch is being completely disassembled for any reason, follow the order of the topics as they are presented.
It is recommended that all maintenance work on the winch be performed in a clean dust free work area.
In the process of disassembling the winch, observe the following:

1. Never disassemble the winch any further than is necessary to accomplish the 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 plastic mallet, for example, is sufficient to break the seal.
3. Do not heat a part with a flame to free it for removal, unless the part being heated is already worn or damaged beyond repair and no additional damage will occur to other parts.

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

4. Keep the work area as clean as practical, to prevent dirt and other foreign matter from getting into bearings or other moving parts.
5. All seals and ‘O’ rings should be discarded once they have been removed. New seals and ‘O’ rings should be used when assembling the winch.
6. When grasping a part in a vise, always use leather-covered or copper-covered vise jaws to protect the surface of the 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 the 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 the bearing with a sleeve slightly smaller than the outside diameter of the bearing. 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.

Removing Winch

Refer to Dwg. MHP1751 on Page 28 and Dwg. MHP0875 on Page 30.

1. Remove the wire rope from the drum.
2. Operate the winch to position reduction gear drain plug (406) at its lowest position.
3. Relieve pressure in the hydraulic lines by operating the winch control several times after the pump has been disconnected.

⚠WARNING

• Shut off, bleed down and disconnect the hydraulic supply line before performing any disassembly procedures.
• The weight of a winch with a 24 inch long drum and no wire rope is 3550 lbs (1610 kgs). Exercise caution when lifting and moving winch.

4. Disconnect and tag the hydraulic lines.

5. Remove the winch from its mounting and take to a suitable work area before beginning disassembly.
6. Drain oil from the reduction gear assembly by removing one plug (406) when positioned at its lowest point. Refer to Dwg. MHP0567, on Page 14, in the “LUBRICATION” section.
7. If the winch is equipped with a drum band brake the winch outboard end (opposite the motor end) must be elevated to prevent draining oil from contaminating the brake band lining.

Motor Removal

1. Disconnect case drain line from motor or cartridge valve manifold.
2. Disconnect both main motor port lines.
3. Loosen and remove four hex jam nuts (8) and four hex nuts (5) from motor mounting studs (or remove four motor mounting capscrews).
4. Carefully extract the motor (motor and manifold assembly) from the disc brake paying special attention not to damage motor shaft splines. Pay careful attention that the disc brake assembly does not slide out.
5. Replace four hex nuts (5) and four hex jam nuts (8) on motor mounting studs (or replace four capscrews) to prevent accidental dropping of the disc brake.

Frame Disassembly

Refer to Dwg. MHP1751 on Page 28.
1. Support the drum (96).
2. Remove capscrews (182) and lockwashers (181) which secure the side rails (98) to the inboard upright (42). Drive out dowel pins (183).
3. Remove inboard upright (42).
4. Remove capscrews (4) from drum shaft (41). Drive out dowels (40). Pry drum shaft (41) from upright (42).
5. Remove ‘O’ ring (43).

Manual Drum Brake Disassembly

If your winch does not have a band brake go to step 7.
Refer to Dwg. MHP0627 on Page 32 and Dwg. MHP1751 on Page 28.
1. Remove nuts (102), lockwashers (103) and U-bolts (109).
2. Remove nut (110), handwheel (104), bearing (111) and tube (112).
3. Pull out brake screw (114). Catch spring (113) as brake screw clears.
4. Remove capscrews (116) and lockwashers (117). Remove anchor (118) and plate (122).
5. Slide brake band halves (128) off drum (96).
6. Remove capscrews (124) and nuts (115) and separate brake band halves.
7. Remove capscrews (196) and lockwashers (3).
8. Tap end cover (193) loose and remove.
9. Remove capscrews (192).
10. Remove shaft retainer (191).
11. Remove spacer (189).
12. Remove the remaining capscrews (182) and lockwashers (181) which attach the side rails (98) to the outboard upright (184). Drive out the remaining dowel pins (183) and remove side rails (98).
13. Pull outboard upright (184) away from drum (96).
14. Remove bearing (188) and seal (187).

Reduction Gear Removal

Refer to Dwg. MHP1751 on Page 28.
1. Position the drum (96) vertically (with the reduction gear assembly facing up).
2. Remove capscrews (4) holding the drum adapter (52) onto the drum.
3. Install two 1/2 -13 NC x 2 inch capscrews into the threaded holes in the outer bolt pattern ring of the drum adapter (52). Use these capscrews as jacking bolts to break the seal. Attach suitable lifting eyes to each of the bolts and lift the reduction gear assembly out of the drum and place on a clean work surface.
4. Remove all plugs (406) from reduction gear.
5. Remove capscrews (50) and nuts (48). Using a hammer and punch, tap dowel pins (51) into support (405). With a plastic mallet, tap adapter (52) until it is free of support (405).
6. Replace plugs (406) and loosely tighten.

NOTICE

• It is extremely important to maintain a clean work area when the reduction gear assembly is disassembled.

Reduction Gear Disassembly

Refer to Dwg. MHP0875 on Page 30.
1. Place the reduction gear assembly on a clean work bench. Have a couple of wooden blocks available to prevent assembly from rolling around. There will also be a small amount of oil remaining in housing, so have some absorbent material readily available.
2. Using a hammer and punch, drive spring pins (404) in, until they are completely in input housing (424). A 7 inch (180 mm) long, 0.625 inch (16 mm) bolt with a square end makes a suitable punch. Using a punch smaller than 0.625 inch (16mm) may damage spring pin and bore.
3. Remove capscrews (401) and using a plastic mallet, tap seal support (400) until loose and remove.
4. Remove oil seal (402) and ‘O’ ring (403).
5. Remove capscrews (425).
6. Using a plastic mallet tap support (405) and ring gear (409) to separate.
7. Remove ‘O’ ring (408) and bearing (407).
8. Pull out planetary support (410) assembly.
9. From planet gear side reach into planetary support hub and remove retainer ring (420). Spacer (422) may be on shaft (445) or still in spacer (418). Remove at this time.
10. Push spacer (418) out of planetary support and remove ‘O’ ring (419).

NOTICE

• Do not disassemble planetary gears from their housings unless required to replace damaged parts. The following disassembly directions 11 and 12 apply only to the planetary gears (415) housed in the planetary support (410). For information on the other planetary assemblies (430 and 440) contact your Ingersoll-Rand distributor or the factory.

11. Place planetary support (410) in a container. Holding the planet gear (415) with one hand, slowly push the planet gear shaft (417) out of the support. Carefully remove the planet gear. When thrust bearings (413) become free squeeze together with fingers. Once spring pins (412) are free they may fly out or roller bearings (414) might start to fall out. Remove planet gear assembly and carefully place in container.
12. Slide thrust bearings (413) off ends of planet gear (415) and push out all roller bearings (414) into container.
13. Separate ring gear (409) from input housing (424) and remove 'O' ring (408).
14. Remove spacer (423).
15. Remove capscrews (439).
16. Separate input housing (424) from ring gear (436) and remove 'O' ring (434).
17. Remove retainer ring (427) from input housing (424) and pull out cylinder roller bearing (426).
18. Remove sun gear (429) and spacer (428), separate the two.
19. Remove planetary assembly (430).
20. Remove sun gear (433) and spacer (422), separate the two.
21. Remove retainer ring (435) from sun gear (433).
22. Tap out dowel pins (437). Separate ring gear (436) from input housing (438) and remove 'O' ring (434).
23. Drive out dowel pins (443). Remove capscrews (448) and separate input housing (438) from ring gear (444) and end cover (446).
24. Remove planetary assembly (440) and 'O' ring (442).
25. Remove 'O' ring (442) and shaft (445).
26. Remove capscrews (452) and separate front cover (450). Remove thrust plate (449) and gasket (447).
27. Remove adjusting screw (453).

Drum Locking Pin Disassembly

Refer to Dwg. MHP0874 on Page 34.

1. Ensure pull rod (140) is engaged in the gland deep groove to relieve spring compression.
2. Depress the lock pin (136) into the gland cavity to allow access to the retainer ring (138).
3. Remove retainer ring (138) from pull rod (140). Release spring tension by slowly removing the lock pin (136) from gland cavity.

Cleaning, Inspection and Repair

Clean all winch component parts in solvent (except the drum brake bands and disc brake friction plates). The use of a stiff bristle brush will facilitate the removal of accumulated dirt and sediments on the housings, frame and drum. If bushings have been removed it may be necessary to carefully remove old Loctite® from the bushing bores. Dry each part using low pressure, filtered compressed air. Clean the drum brake band using a wire brush or emery cloth. Do not wash the drum brake band in liquid. If the drum brake band lining is oil soaked, it must be replaced.

Inspection

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

1. Inspect all gears for worn, cracked, or broken teeth.
2. Inspect all bushings for wear, scoring, or galling.
3. Inspect shafts for ridges caused by wear. If ridges caused by wear are apparent on shafts, replace the shaft.
4. Inspect all threaded items and replace those having damaged threads.
5. Inspect the drum band brake lining for oil, grease and glazing. If the drum band brake lining is oil-soaked replace the brake bands as a set. Remove glazed areas of band brake lining by sanding lightly with a fine grit emery cloth.
6. Measure the thickness of the drum band brake lining. If the drum brake band lining thickness is less than 0.062 inch (2 mm) anywhere along the edges, replace the brake bands (128) as a set.
7. Inspect all hydraulic hose and piping components and connections. Replace any damaged parts.

Repair

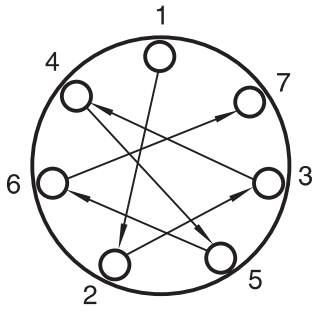
Actual repairs are limited to the removal of small burrs and other minor surface imperfections from gears and shafts. Use a fine stone or emery cloth for this work.

1. Worn or damaged parts must be replaced. Refer to the 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. Examine all gear teeth carefully, and remove nicks or burrs.
5. Polish the edges of all shaft shoulders to remove small nicks which may have been caused during handling.
6. Remove all nicks and burrs caused by lockwashers.

Assembly

General Instructions

- Use all new gaskets and seals.
- Replace worn parts.
- Assemble parts using match marks attached during disassembly. Compare replacement parts with originals to identify installation alignments.
- Lubricate all internal parts with a mixture of half oil (as recommended in the "LUBRICATION" section) and half molybdenum disulfide lubricant compound (e.g. STP).
- When torquing capscrews and the pattern contains over three capscrews, use a crossing tightening sequence. Refer to Dwg. MHP0990 on Page 23.
  Tighten capscrews in three steps to prevent warping and provide a tight seal.
  1. Snug all capscrews.
  2. Tighten all capscrews to 1/2 final torque value (using a crossing pattern).
  3. Tighten to final torque (using a crossing pattern).



(Dwg. MHP0990)

Reduction Gear Assembly

Refer to Dwg. MHP0875 on Page 30.

NOTICE

• During assembly of components apply a light coat of Loctite® 242 to all threaded fasteners. Clean all mating surfaces. 'O' rings can be held in place with a coating of EP grease applied to groove.
• It is extremely important to maintain a clean work area when the reduction gear assembly is reassembled. During reassembly clean each part thoroughly and lightly coat with the appropriate lubricant as described in "Recommended Lubricants" of the "LUBRICATION" section.

1. If removed, install the planetary gears (415) into the planetary support (410) as follows:
   a. Install a pair of spring pins (412) into the holes in the planetary support (410).
   b. Install and center roller spacer (416) in planet gear (415) bore.
   c. Place 40 roller bearings (414) in each side of the planet gear (415), a light coat of grease will help to hold them in place. Place a thrust bearing (413) on each side of the planetary gear assembly and squeeze.
   d. Depress one spring pin (412) and slide planetary gear assembly over it. Depress the other side and tip the gear assembly into the planetary support. Rotate gear assembly around spring pins until shaft hole aligns.
   e. Push planet gear shaft (417) into place. Repeat for remaining two gear assemblies.
   f. Ensure each planet gear (415) rotates freely, without sticking or binding.
2. Fasten thrust plate (449) to front cover (450) with screws (453) and loosely tighten.
3. Place a new gasket (447) on end cover (446). Install capscrews (452) through front cover (450), gasket (447) and into end cover (446) and tighten.
4. Lubricate and install new 'O' ring (442) into groove on end cover (446). Apply a bead of Loctite® 515 sealant to mating surface.
5. Install ring gear (444) on end cover (446), align spring pin holes. Apply a bead of Loctite® 515 sealant to mating surface.
6. Lubricate and install new 'O' ring (442) into input housing (438).
7. Slide shaft (445) into planetary assembly (440). Insert this assembly into ring gear (444).
8. Install assembled parts on input housing (438), align spring pin holes. Drive spring pins (443) through end cover (446), ring gear (444) and input housing (438) until flush.
9. Insert capscrews (448) through end cover (446) and into input housing (438) and torque to 50 ft. lbs. (67 Nm).
10. Lubricate and install new 'O' ring (434) into groove on input housing (438). Apply a bead of Loctite® 515 sealant to mating surface.
11. Install ring gear (436) on input housing (438), align spring pin holes.
12. Install retaining ring (435) onto sun gear (433) and slide down shaft (445) into planetary assembly (440).
13. Install spacer (422) into sun gear (433).
14. Install planetary assembly (430) into ring gear (436).
15. Slide sun gear (429) onto shaft (445) and into planetary assembly (430). Insert spacer (428) into sun gear (429).
16. Insert bearing (426) into input housing (424). Install retainer ring (427).
17. Lubricate and install new 'O' ring (434) into groove on input housing (424). Apply a bead of Loctite® 515 sealant to mating surface.
18. Install input housing (424) onto ring gear (436), align spring pin holes. Drive spring pins (437) through input housing (438), ring gear (436) and input housing (424) until flush.
19. Insert capscrews (439) through input housing (438) and into input housing (424) and torque to 145 ft. lbs. (195 Nm).
20. Insert spacer (423) into input housing (424) with bevel facing housing.
21. Lubricate and install new 'O' ring (419) onto outer groove on spacer (418). Insert spacer (422) into center recess in spacer (418). Place this assembly into planetary support (410) from the planet gear end.
22. Insert retainer ring (420) in planetary support to hold spacer assembly in place.
23. Lubricate and install new 'O' ring (408) into groove in input housing (424). Apply a bead of Loctite® 515 sealant to mating surface.
24. Install ring gear (409) on input housing (424), align spring pin holes.
25. Insert planetary support assembly into ring gear (409).
26. Lubricate and install new 'O' ring (408) into groove in support (405). Apply a bead of Loctite® 515 sealant to mating surface.
27. Install support (405) on ring gear (409), align spring pin holes. Drive spring pins (404) through support (405), ring gear (409) and input housing (424) until flush.
28. Insert capscrews (425) through input housing (424) into support (405) and torque to 220 ft. lbs. (295 Nm).
29. Insert ball bearing (407) into support (405).
30. Insert oil seal (402) into seal support (400) (lip facing out).
31. Lubricate and install new 'O' ring (403) in groove in support (405). Apply a bead of Loctite® 515 sealant to mating surface.
32. Align bolt holes with seal support (400) and support (405).
33. Insert capscrews (401) through seal support, into support and tighten.
34. Turn adjusting screw (453) in until end play is eliminated then back it out two turns.

Reduction Gear Installation

Refer to Dwg. MHP1751 on Page 28.

NOTICE

• During assembly of components apply a light coat of Loctite® 242 to all threaded fasteners.
• Clean all mating surfaces. 'O' rings can be held in place with a coating of EP grease applied to groove.

1. Place drum (96) in vertical position, with reduction gear side facing up.
2. Remove plugs (406) from reduction gear support (405). Apply a bead of Loctite® 515 sealant on the reduction gear surface that mates with the adapter (52).

3. Place adapter (52) on reduction gear and align bolt holes. There is one place on the adapter with no hole, this should be positioned over one of the plug (406) holes. This becomes the drain/fill location (the other 3 plugs will be blocked). Install capscrews (50) through adapter (52) and attach nuts (48), torque to 205 ft. lbs. (278 Nm). With a hammer and punch, drive spring pins (404) into adapter (52) until about 1/16 inch (1.5 mm) below the surface.
4. Apply a bead of Loctite® 515 sealant to surface of the drum (96) where the adapter (52) will mate.
5. Install two 1/2 in.-13 NC x 2 in. capscrews with suitable lifting eyes into the threaded holes in the outer bolt pattern ring of the drum adapter (52). Lift the reduction gear assembly into drum (96). Align the bolt holes and install capscrews (4) through adapter (52) and into drum (96), torque to 205 ft. lbs. (278 Nm).
6. Place drum in horizontal position.

Manual Drum Brake Assembly (optional feature)

If your winch does not have this option go to next section.
Refer to Dwg. MHP0627 on Page 32.

1. Clamp top of brake bands (128) together with a C-clamp.
2. Slide this assembly over drum (96).
3. Install capscrew (124) and nut (115) through bottom blocks on brake bands (128) and tighten.
4. Remove C-clamp.
5. Install brake screw (114) through lugs on top of brake bands (128), with spring (113) located between lugs.
6. Slide tube (112) over brake screw (114) followed by bearing (111).
7. Thread handwheel (104) onto brake screw (114) and loosely tighten.
8. Thread nut (110) onto brake screw (114) until 1/4 inch (6.5 mm) of threads are exposed.
9. Place anchor (118) over rear lug on bands (128). Rotate bands (128) until bolt holes in anchor align with holes in rear side rail (98).
10. Install capscrews (116) and lockwashers (117) through anchor (118), side rail (98) and into plate (122) and tighten.
11. Install adjustment screw (127) through nut (120) and into support (126). Expose 1/4 inch (6.5 mm) of threads.
12. Install capscrews (119) and lockwashers (117) through side rail (98) and into support (126) and tighten.
13. Tighten handwheel (104) all the way tight. Screw adjustment screw up or down until there is 1/16 to 1/8 in. (1.6 to 3.2 mm) clearance between screw (127) and lug on brake band (128).
14. When handwheel is loosened, brake band (128) should NOT touch drum surface. If band does touch drum then decrease gap in 1/16 inch (1.5 mm) increments until band does not touch.
15. With handwheel (104) fully tightened, place capscrews (106) through lockwashers (107) and bracket (108) into brake band (128). Tighten loosely.
16. Place U-bolt (109) over tube (112) and through bracket (108). Place lockwashers (103) and nuts (102) onto U-bolt (109) and tighten loosely.
17. Move bracket (108) up or down until tube (112) is level. Tighten capscrews (106) and nuts (102).

Frame Assembly

Refer to Dwg. MHP1751 on Page 28.

NOTICE

• During assembly of components apply a light coat of Loctite® 242 to all threaded fasteners.
• Clean all mating surfaces. 'O' rings can be held in place with a coating of EP grease applied to groove.

1. Install oil seal (187) in outboard upright (184) with lip toward drum.
2. Pack bearing (188) with grease and install in outboard upright (184).
3. Install outboard upright (184) on the drum end. Ensure assembly is kept centered on seal and journal during this step.
4. Install shaft retainer (191). Secure by installing capscrews (192) and torque to 30 ft. lbs. (41 Nm).
5. Install spacer (189).
6. Apply a bead of Loctite® 515 sealant to the mating surface of the outboard upright (184) and install end cover (193). Secure with capscrews (196) and lockwashers (3), torque to 30 ft. lbs. (41 Nm).
7. Lubricate and install 'O' ring (43) onto drum shaft (41).
8. Insert drum shaft (41) into inboard upright, aligning dowel pin holes.
9. Install dowel pins (40) flush or slightly below surface of drum shaft (41).
10. Install capscrews (4) and torque to 125 ft. lbs. (170 Nm).
11. Install inboard upright (42) onto reduction gear input shaft. Ensuring that splines on drum shaft (41) align with splines on reduction gear.
12. Install side rails (98) to uprights (42 and 184) and loosely secure using capscrews (182) and lockwashers (181).
13. Tap dowel pins (183) into position until flush with the side rails.
14. Tighten the capscrews (182) evenly. Torque to 140 ft. lbs. (190 Nm).

Motor Input Shaft Installation

1. Install input shaft (7) and mount motor and brake to motor adapter.

Reconnecting Winch

1. Remove reduction gear fill plug and fill with 5 quarts (4.8 litres) oil. Refer to "LUBRICATION" section.
2. Move winch back to mounted site and fasten in place. Refer to "INSTALLATION" section.
3. Reconnect all hydraulic lines. Slowly run winch.
4. Install wire rope. Refer to "INSTALLATION" section.

Testing

Operational Test

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

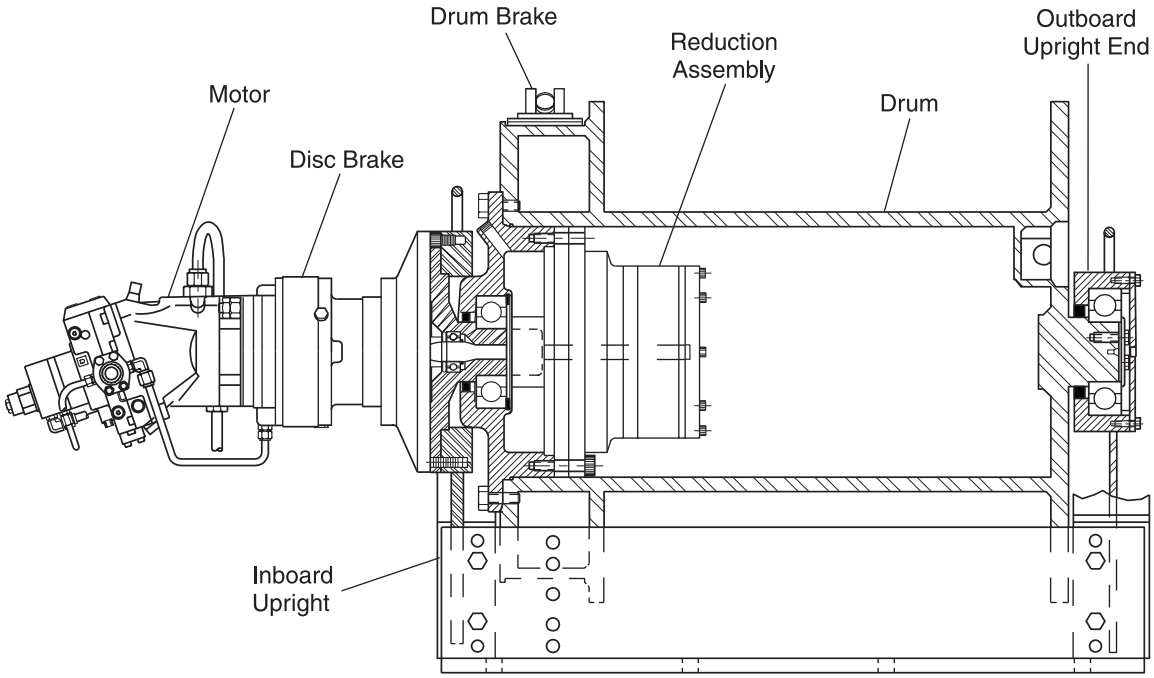
1. Check oil level in reduction gear assembly and disc brake are correct. Top off levels as required before operation as described in the "LUBRICATION" section.
2. Run winch with no load. Confirm leak free connections.

3. Install 0-3,000 psi pressure gauges with gauge snubbers teed into the winch at or near the motor A and B ports. Run winch with no load, record pressure in both directions. Confirm winch raises when pulling throttle, and lowers when pushing throttle and that contols operate smoothly and winch responds without sticking, binding or hesitation.
4. New Drum Brake Band Lining Run-in Procedure: All new drum brake band linings require a 'run-in' period. Operate the winch without load in the payout direction while gradually applying the brake. Allow the brake to slip for approximately one minute. Winch motor may stall as drum brake band lining fully engages. Do not allow brake to overheat.
5. Check operation of brakes. Adjust band brake if necessary as described in the "MAINTENANCE" section.
6. Check operation of limit switches, locking mechanisms and all safety devices when equipped.
7. Check foundation mounting fasteners are secure.
8. Install drum guard when provided.

Load Test

Prior to initial use, all new, extensively repaired, or altered winches shall be load tested by or under the direction of a person knowledgeable in the operation of this winch and a written report furnished confirming the rating of the winch. Test loads shall not be less than 100% of rated line pull and should not exceed 125% of the rated line pull. Testing to more than 125% of rated capacity may be required to comply with standards outside of the USA.

WINCH DRAWINGS AND PARTS LISTS TABLE OF CONTENTS



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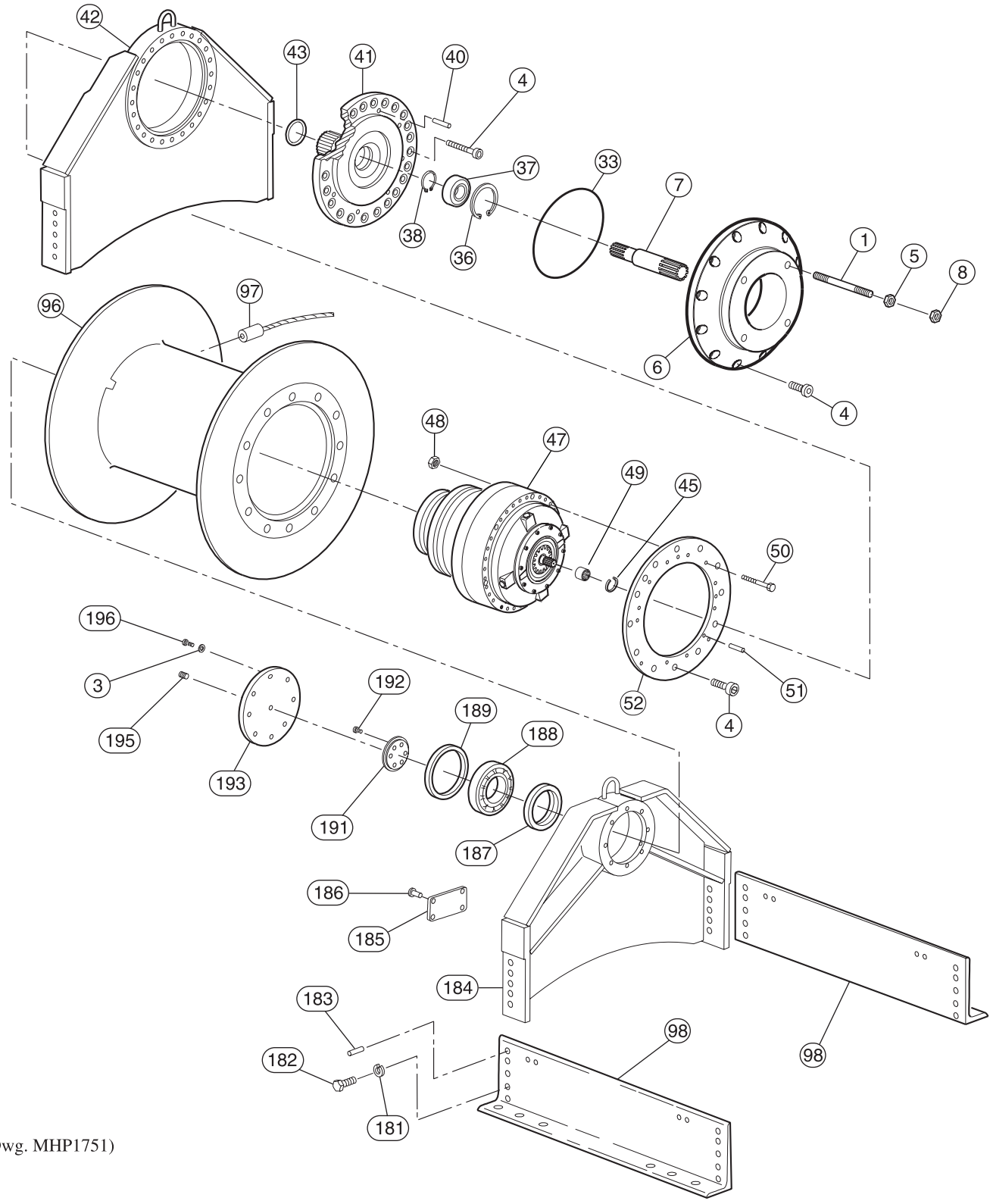
Description **Page No.**

DRUM, BASE AND REDUCTION GEAR ASSEMBLY DRAWING



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DRUM, BASE AND REDUCTION GEAR ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY.	PART NO.	ITEM NO.	DESCRIPTION OF PART	TOTAL QTY.	PART NO.
1	Threaded Stud	4	71338495	52	Adapter †	1	11617
3	Lockwasher	8	50181	96	Drum	1	**
4	Capscrew	42	71323166	97	Wire Rope Anchor - 3/4 inch	1	52000
5	Nut	4	50826		Wire Rope Anchor - 7/8 inch		52308
6	Motor Adapter	1	14227		Wire Rope Anchor - 1 inch		52325
7	Input Shaft	1	Contact Factory		Wire Rope Anchor - 1-1/8 inch		71087316
				98	Side Rail	1	**
8	Jam Nut	4	50159	181	Lockwasher	8	51012
• 33	'O' Ring	1	71337968	182	Capscrew	8	50902
36	Retainer Ring	1	52678	183	Dowel Pin	12	53770
• 37	Bearing	1	50998	184	Upright, Outboard †	1	11657
38	Retainer Ring	1	51192	185	Nameplate	1	71106967-R
40	Pin, Dowel	2	51468	186	Screw, Drive	4	50915
41	Drum Shaft †	1	14167	• 187	Seal	1	52535
42	Upright, Inboard †	1	11658	• 188	Bearing	1	52534
• 43	'O' Ring	1	52536	189	Spacer	1	11613
45	Retainer Ring	1	52541	191	Shaft Retainer	1	11612
47	Reduction Gear Assembly	1	11626	192	Capscrew	6	50183
48	Nut	18	50812	193	End Cover	1	11614
49	Coupling †	1	11901	195	Plug	1	54292
50	Capscrew	18	53769	196	Capscrew	8	51086
51	Dowel Pin	3	51468				

• Recommended spare

** Refer to DRUM ASSEMBLY AND SIDE RAIL PARTS LIST.

DRUM ASSEMBLY PARTS LIST

DRUM (ITEM 96) WITH BAND BRAKE	TOTAL QTY.	PART NO.	DRUM (ITEM 96) WITHOUT BAND BRAKE	TOTAL QTY.	PART NO.
Drum (24 inches long) †	1	11943-5	Drum (24 inches long) †	1	11608-5
Drum (30 inches long) †		11943-6	Drum (30 inches long) †		11608-6
Drum (36 inches long) †		11943-7	Drum (36 inches long) †		11608-7
Drum (40 inches long) †		11943-8	Drum (40 inches long) †		11608-8

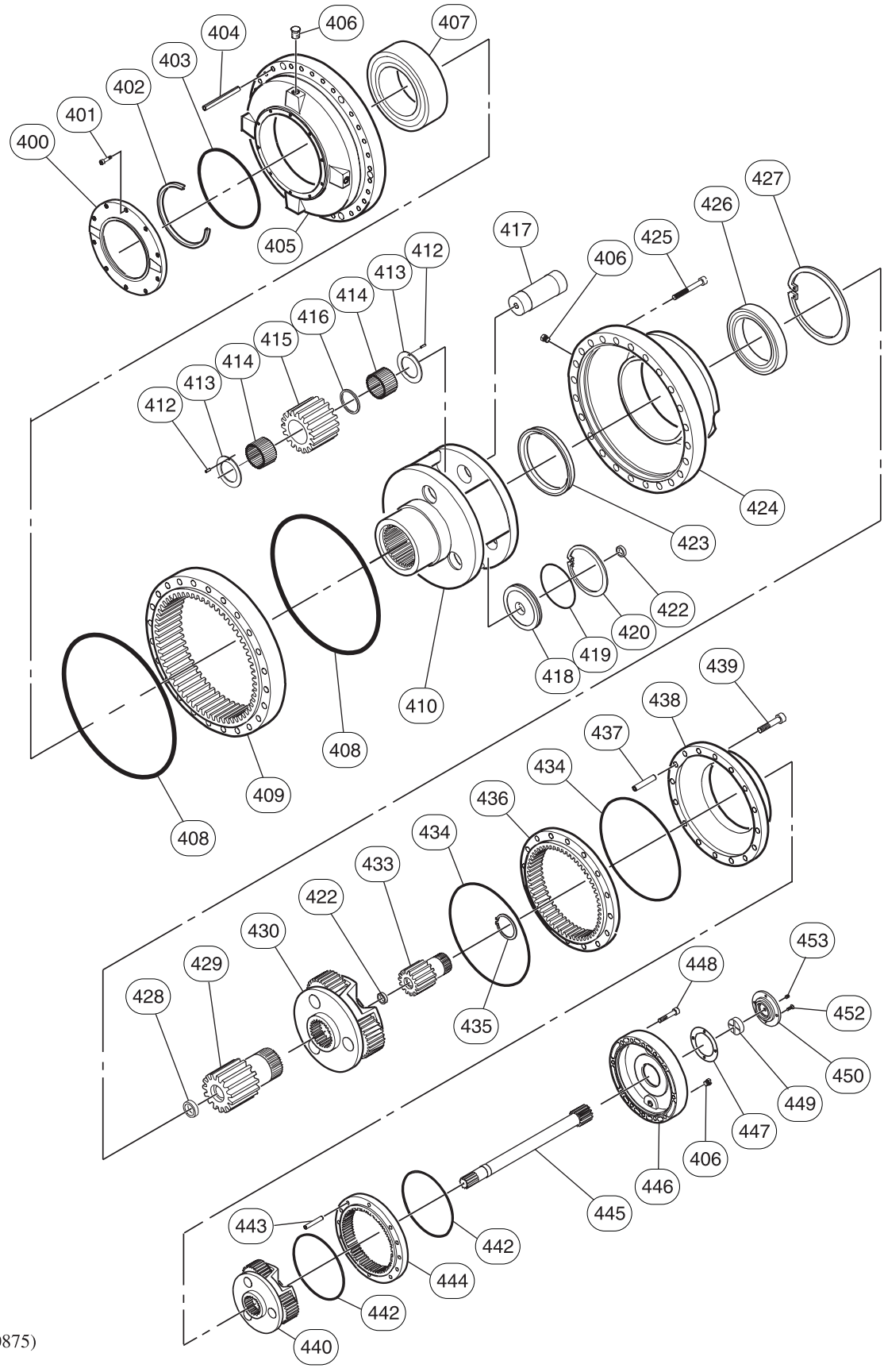
SIDE RAIL PARTS LIST

SIDE RAIL (ITEM 98) WITH BAND BRAKE	TOTAL QTY.	PART NO.	SIDE RAIL (ITEM 98) WITHOUT BAND BRAKE	TOTAL QTY.	PART NO.
for 24 inch Drum †	2	11988-5	for 24 inch Drum †	2	11698-5
for 30 inch Drum †		11988-6	for 30 inch Drum †		11698-6
for 36 inch Drum †		11988-7	for 36 inch Drum †		11698-7
for 40 inch Drum †		11988-8	for 40 inch Drum †		11698-8

Contact your nearest Ingersoll-Rand distributor or the factory for additional replacement part information.

† These parts also come in a cold weather version. For winches with a —C in the model code, adding CH to the end of these part numbers is required to retain winch certification. Example: Order Drum (24 inches long) (item 96) part number 11943-5 as part number 11943-5CH.

REDUCTION GEAR ASSEMBLY DRAWING



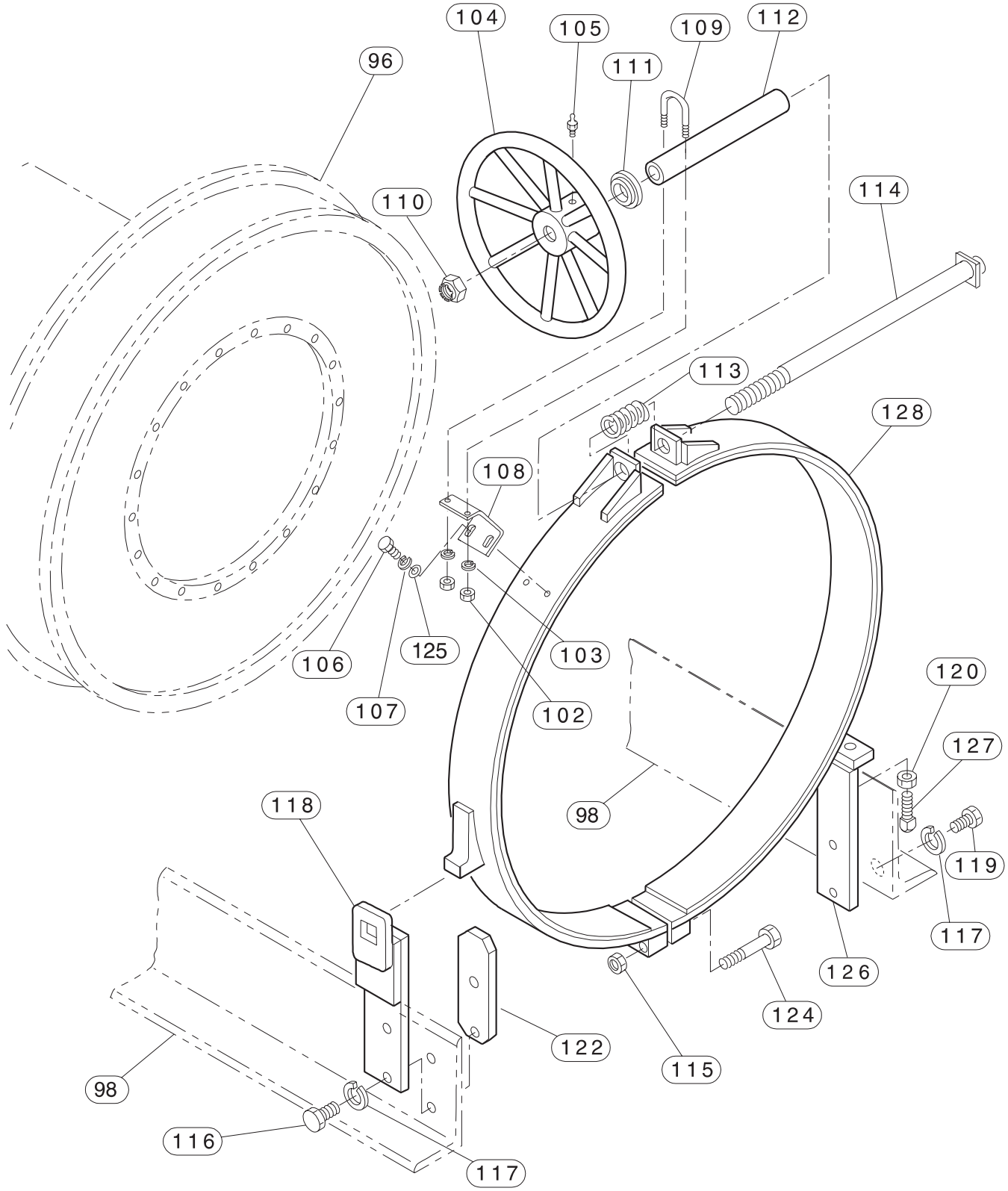
(Dwg. MHP0875)

REDUCTION GEAR ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY.	PART NO.
47	Reduction Gear Assembly (includes items 400 through 453)	1	11626
400	Seal Support	1	154–1773
401	Capscrew	5	154–2522
• 402	Oil Seal	1	71308175
• 403	'O' Ring	1	71308183
404	Spring Pin	3	154B2240
405	Support	1	26.477
406	Plug	15	71068571
407	Bearing	1	71308191
• 408	'O' Ring	2	71308209
409	Ring Gear	1	154–1420
410	Planetary Support	1	154–1852
412	Spring Pin	6	71139018
413	Thrust Bearing	6	154–1681
414	Roller Bearings	240	154–2301
415	Planet Gears	3	154–1731
416	Roller Spacer	3	154–1473
417	Planet Gear Shaft	3	154–1551
418	Spacer	1	09.214
• 419	'O' Ring	1	71308217
420	Retainer Ring	1	154–2465
422	Spacer	2	20.091
423	Spacer	1	154–1507
424	Input Housing	1	154–1770
425	Capscrew	3	154B2235
426	Cylinder Roller Bearing	1	71308233
427	Retainer Ring	1	71308241
428	Spacer	1	20.092
429	Sun Gear	1	17.227
430	Planetary Assembly	1	P0144
433	Sun Gear	1	17.226
• 434	'O' Ring	2	71106728
435	Retainer Ring	1	71068597
436	Ring Gear	1	71068639
437	Spring Pin	3	71106710
438	Input Housing	1	71068589
439	Capscrew	12	154–2546
440	Planetary Assembly	1	P0093
• 442	'O' Ring	2	52149
443	Spring Pin	4	71068472
444	Ring Gear	1	71068548
445	Shaft	1	17.224
446	End Cover	1	154–1798
• 447	Gasket	1	71308225
448	Capscrew	8	154–2528
449	Thrust Plate	1	154–1711
450	Front Cover	1	154–1802
452	Screw	4	154–2576
453	Adjusting Screw	1	154–2601

• Recommended spare.

DRUM BRAKE (OPTIONAL) ASSEMBLY DRAWING



(Dwg. MHP0627)

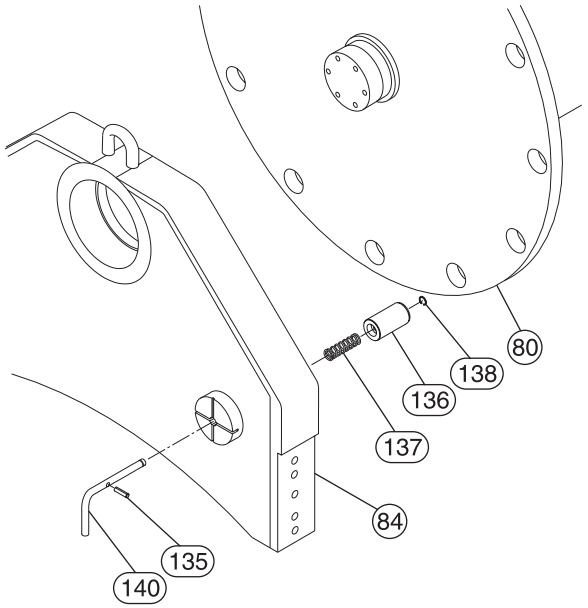
DRUM BRAKE (OPTIONAL) ASSEMBLY PARTS LIST

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY	PART NO.
96	Drum (for use with brake band)	1	Refer to Drum Assembly and Side Rail Parts List
98	Side Rail	2	
102	Nut	2	Order item 109, ‘U’ Bolt
103	Lockwasher	2	Order item 109, ‘U’ Bolt
104	Handwheel	1	12183
105	Lube Fitting	1	51469
106	Capscrew	4	50853
107	Lockwasher	4	50200
108	Bracket	1	12203
109	‘U’ Bolt (includes items 102 and 103)	1	52701
110	Nut	1	51775
111	Bearing	1	52707
112	Tube	1	12204
113	Spring	1	52717
114	Brake Screw	1	12182
115	Nut	4	51750
116	Capscrew	2	54221
117	Lockwasher	4	51012
118	Anchor	1	12096
119	Capscrew	2	52841
120	Nut	1	50205
122	Plate	1	12084
124	Capscrew	4	54896
125	Washer	2	50177
126	Support	1	12094
127	Adjustment Screw	1	54424
• 128	Brake Band †	1 set	12083

• Recommended spare

† These parts also come in a cold weather version. For winches with a —C in the model code, adding CH to the end of these part numbers is required to retain winch certification. Example: Order Brake Band (item 128) part number 12083 as part number 12083CH.

DRUM LOCKING PIN (OPTIONAL) ASSEMBLY DRAWING AND PARTS LIST

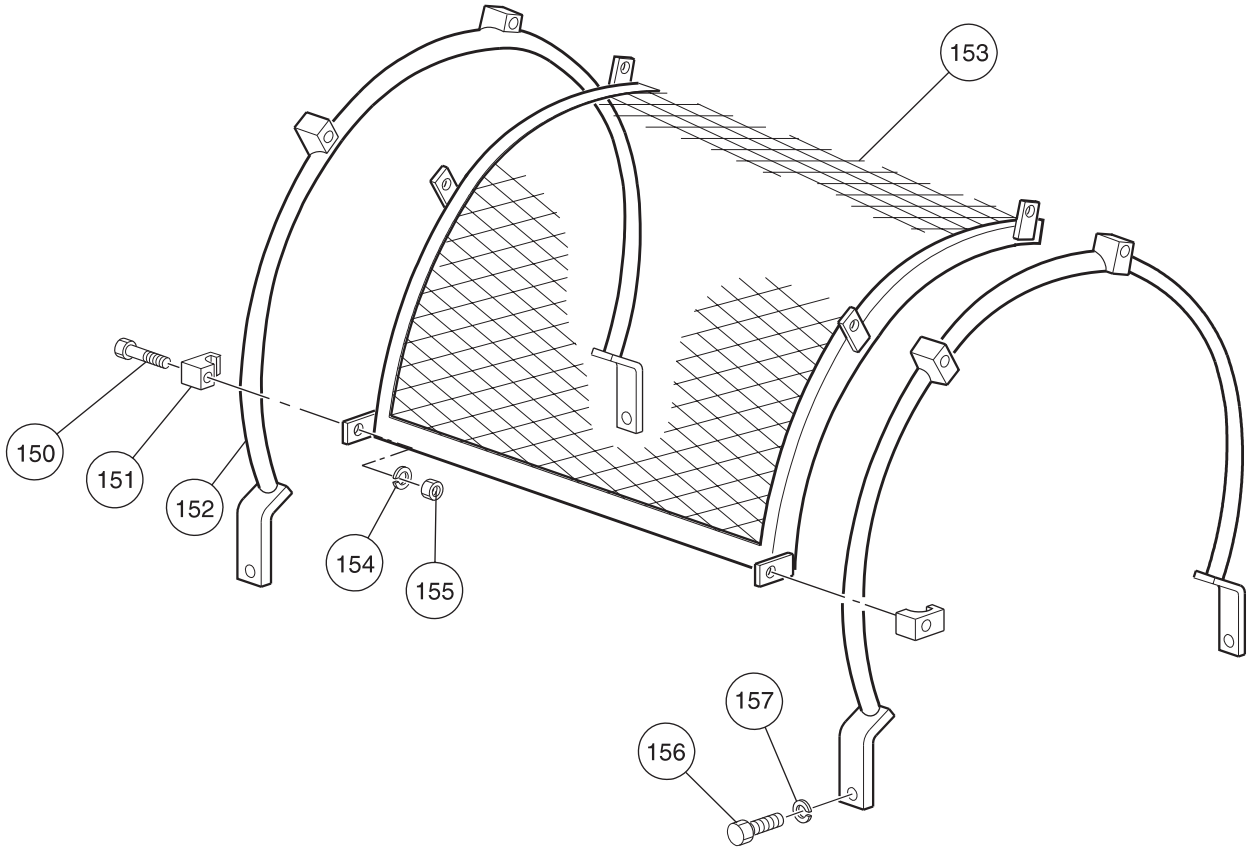


(Dwg. MHP0874)

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY.	PART NO.
Drum with band brake			
80	Drum (24 inch) †	1	Contact Factory
	Drum (30 inch) †		
	Drum (36 inch) †		
	Drum (40 inch) †		
Drum without band brake			
80	Drum (24 inch) †	1	Contact Factory
	Drum (30 inch) †		
	Drum (36 inch) †		
	Drum (40 inch) †		
Common Parts:			
84	Outboard Upright †	1	24119
135	Pin	1	71001135
136	Lock Pin	1	24121
137	Spring	1	71080881
138	Retainer Ring	1	54370
140	Pull Rod	1	21073

† These parts also come in a cold weather version. For winches with a —C in the model code, adding CH to the end of these part numbers is required to retain winch certification. Example: Order Outboard Upright (item 84) part number 24119 as part number 24119CH.

DRUM GUARD (OPTIONAL) ASSEMBLY DRAWING AND PARTS LIST

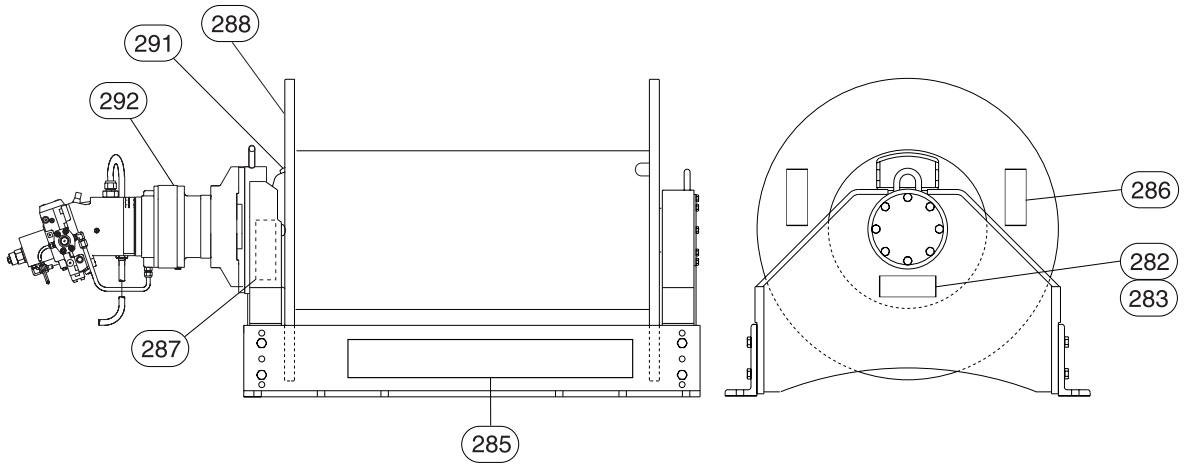


(Dwg. MHP0205)

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY.	PART NO.
---	Drum Guard Assembly (24 inch long drum)*	1	11987–5
	Drum Guard Assembly (30 inch long drum)*		11987–6
	Drum Guard Assembly (36 inch long drum)*		11987–7
	Drum Guard Assembly (40 inch long drum)*		11987–8
150	Capscrew	8	71126742
151	Clamp	8	10399
152	Support	2	11947
153	Drum Guard (24 inch long drum)	1	11948–5
	Drum Guard (30 inch long drum)		11948–6
	Drum Guard (36 inch long drum)		11948–7
	Drum Guard (40 inch long drum)		11948–8
154	Lockwasher	8	50200
155	Nut	8	50198
156	Capscrew	4	50973
157	Lockwasher	4	50181

* Assembly includes items 150 through 157.

LABEL DRAWING AND PARTS LIST



(Dwg. MHP1738)

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY.	PART NO.
- - -	Label Kit (includes items 282 through 292) (24 in. and 30 in. long Drums)	1	Contact factory
- - -	Label Kit (includes items 282 through 292) (36 in. and 40 in. long Drums)		
282	Nameplate	1	71106967-R
283	Rivet	4	71028849
285	Ingersoll-Rand Label (24 in. and 30 in. long Drums)	1	71106272
	Ingersoll-Rand Label (36 in. and 40 in. long Drums)		71109102
286	Overwind Label	2	71109516
287	Warning Label (Refer to page 4 for sample)	1	71060529
288	Warning Label (Refer to page 4 for sample)	1	71107130
291	Oil Level Label	1	71043616
292	Caution Tag	1	71107148

ACCESSORIES

DESCRIPTION OF PART	PART NO.
Lubricant	LUBRI-LINK-GREEN
Touch-up Paint (Yellow)	FAP-237Y

SERVICE NOTES

PARTS ORDERING INFORMATION

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

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 winch outboard upright.

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.
• Sections of this manual may not apply to your winch.

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.
Winches which 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 winch is provided inside the back cover of this manual.

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

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) 3-27-93-08-00

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

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

Technical Support

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

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
23192 Commerce Drive
Farmington Hills, MI 48335
Phone: (248) 476-6677
Fax: (248) 476-6670

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

Los Angeles, CA
11909 E. Telegraph Road
Santa Fe Springs, CA
90670-0525
Phone: (562) 948-4189
Fax: (562) 948-1828

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

Canada
National Sales Office
Regional Warehouse
Toronto, Ontario
51 Worcester 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 2P9
Phone: (403) 438-5039
Fax: (403) 437-3145

Montreal, Quebec
3501 St. Charles Blvd.
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, USA
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 Asia Pacific Inc.
Suite 1201-3, 12/F
Central Plaza
18 Harbour Road
Wanchai, Hong Kong
Phone: (852) 9794 1673
Fax: (852) 9794 7895

Russia
Ingersoll-Rand
Kuznetsky Most 21/5
Entrance 3
Moscow 103895 Russia
Phone: 7-501-923-91-34
Fax: 7-501-924-46-25

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