# IMPORTANT INFORMATION:

• A copy of our "Safe Operating Practices" Manuals are always available free of charge either by downloading it from our Technical Publications website @ www.airwinch.com or by contacting the Factory at (800) 866-5457 for North America and (206) 624-0466 for International. The Safe Operating Practices manual must be read prior to anyone operating a **Ingersoll-Rand** winch or hoist. The manual form numbers are as follows:

"Safe Operating Practices Non-Man Rider™ Winches" Manual, Form No. MHD56250
"Safe Operating Practices for Man Rider™ Winches" Manual, Form No. MHD56251
"Safe Operating Practices for Pneumatic, Hydraulic and Electric Hoists" Manual, Form No. MHD56295

• Available winch options may require additional supplements to the basic winch manual.

• For Man Rider™ winches ensure a copy of the Man Rider™ supplement is made available to the operator prior to winch operation.

**Winch Man Rider™ Supplements:**

| Model: | Publication No. |
|---|---|
| FA2, FA2.5, FH2, FH2.5 | MHD56046 |
| FA5 | MHD56042 and MHD56220 |
| FA10 | MHD56252 |
| FA2.5A | MHD56236 |
| FA2B and HU40A | MHD56207 |
| FH10MR | MHD56212 |
| Fulcrum Electric | MHD56277 |
| LS500HLP/ LS1000HLP | SAM0004 |

| Model: | Publication No. |
|---|---|
| LS500RLP | SAM0011 |
| LS1000RLP | SAM0012 |
| LS150RLP | SAM0082 |
| LS150RLP/500/ 1000 | SAM0115 |
| LS150RLP and LS150PLP-PH | SAM0120 |
| LS500RLP-E | SAM0122 |
| LS150RLP-DP5M-F | SAM0184 |
| LS150HLP | SAM0222 |

• We strongly recommend that ALL maintenance on **Ingersoll-Rand** equipment be carried out by personnel certified by **Ingersoll-Rand**, or by **Ingersoll-Rand** Authorized Service Centers.

• Contact the Factory if in doubt about installation, operation, inspection and maintenance instructions.

• Use only Genuine **Ingersoll-Rand** parts when maintaining or repairing a winch, hoist or any component of a winch or hoist.

• ANSI / ASME recommends that a winch or hoist (or any components of a winch or hoist) that has been repaired be tested prior to being placed into service:

* **Winches -** ANSI / ASME B30.7 (BASE MOUNTED DRUM HOISTS) Refer to section 7.2.2 - Testing.
* **Hoists -** ANSI / ASME B30.16 (OVERHEAD HOISTS - UNDERHUNG) Refer to section 16.2.2 - Testing.

**Form MHD56298**
**Edition 2**
**November 2004**
**71441844**


Ingersoll-Rand®

Form MHD56269

# Fulcrum™

# Winches

## HYDRAULIC WINCH MODELS

## PARTS, INSTALLATION AND MAINTENANCE MANUAL

**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 installation, operation and maintenance of these products.**

**⚠WARNING**

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

**Always operate, inspect and maintain this hydraulic winch in accordance with applicable safety codes and regulations.**

**Form MHD56269**
**Edition 1**
**June 2003**
**71424816**


Ingersoll-Rand®

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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 winch.

## Danger, Warning, Caution and Notice

Throughout this manual there are steps and procedures which, if not followed, may result in an 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**

**• The supporting structures and load attaching devices used in conjunction with this winch must provide an adequate safety factor to handle the rated load, plus the weight of the winch and attached equipment. This is the customer's responsibility. If in doubt, consult a registered structural engineer.**

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 material handling equipment or assist in hooking on or arranging a load should be instructed in safe rigging procedures. From a safety standpoint, one factor is paramount: conduct all pulling operations in such a manner that if there were an equipment failure, no personnel would be injured. This means 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 user, not the manufacturer. Many OSHA requirements are not concerned or connected with the manufactured product but are, rather, associated with the final installation. It is the owner's and user's responsibility to determine the suitability of a product for any particular use. It is recommended that all applicable industry, trade association, federal, state and local regulations be checked. Read all operating instructions and warnings before operation.

**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 Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016.

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.

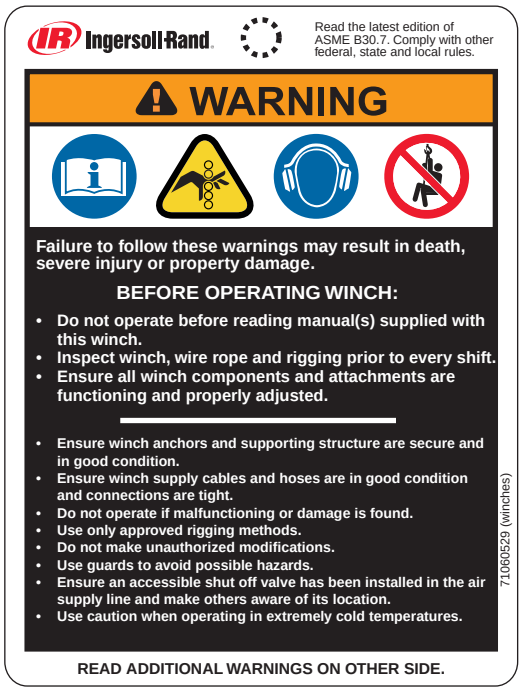
Safe Operating Instructions are provided to make an operator aware of unsafe practices to avoid and are not necessarily limited to the following list. Refer to specific sections in the manual for additional safety information.

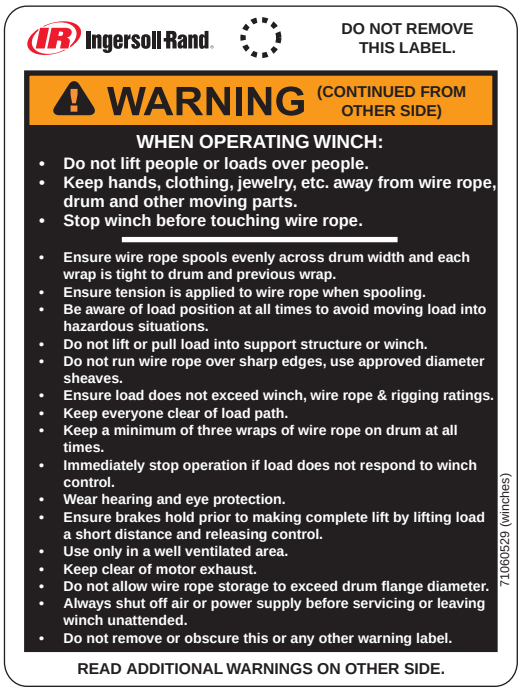
3. Only allow personnel trained in safety and operation of this product to operate and maintain this winch.
4. Only operate a winch if you are physically fit to do so.
5. When a **"DO NOT OPERATE"** sign is placed on winch, or controls, do not operate winch until sign has been removed by designated personnel.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

# LABELS AND TAGS

Each winch is supplied with the labels and tags shown. If a label or tag is not attached to winch, order a new one and install it.

Refer to parts list for part number. Read and obey all label and tag instructions and other safety information attached to this winch. Labels and tags are shown smaller than actual size.



## Description of Operation

**Fulcrum Hydraulic Winches** are hydraulic powered, planetary geared units designed for lifting applications. 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.

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.

# INSTALLATION

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

Winches are supplied from the factory with the correct grade and quantity of lubricating oil. Before operation check oil levels and adjust as necessary. Use the proper type of oil as recommended in the "LUBRICATION" section.

**⚠WARNING**

**• 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 Tables 1 on page 5.

Care must be taken when moving, positioning or mounting the winch. Use lifting holes provided in winch uprights. Do not lift winch by the motor. Ensure winch, when lifted, is properly balanced. Determine weight of your winch by referring to "SPECIFICATIONS" section. Lift winch 3 to 4 inches (75 to 100 mm) off ground and verify winch is balanced and secure before continuing lift.

**⚠WARNING**

**• Do not use motor lifting eye bolt to lift winch.**

Mount winch so axis of drum is horizontal.

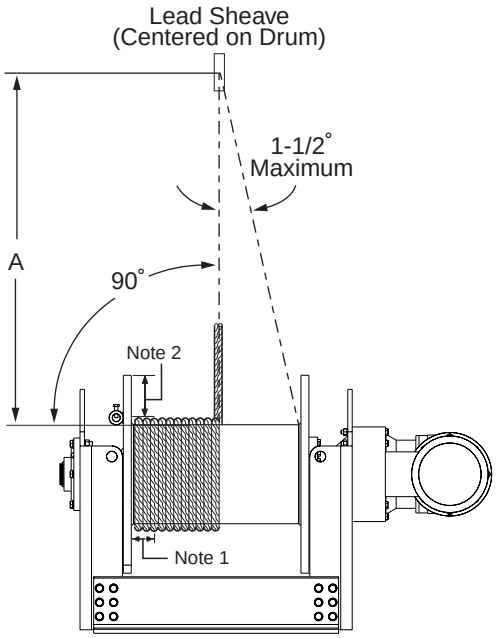
1. The winch mounting surface must be flat and of sufficient strength to handle rated load plus weight of winch and attached equipment. An inadequate foundation may cause distortion or twisting of winch uprights and side rails resulting in winch damage.
2. Make sure mounting surface is flat to within 0.005 inch (0.127 mm) per inch (25 mm) of drum length. Shim if necessary. Refer to Table 1.

**Table 1–Mounting Surface Tolerance**

| Drum Length | | Mounting Surface Minimum Flatness | |
|---|---|---|---|
| **inch** | **mm** | **inch** | **mm** |
| 18 | 457 | 0.09 | 2.3 |
| 24 | 610 | 0.12 | 3.0 |
| 30 | 762 | 0.15 | 3.8 |
| 36 | 914 | 0.18 | 4.6 |
| 42 | 1067 | 0.21 | 5.3 |
| 48 | 1220 | 0.24 | 6.0 |
| 54 | 1372 | 0.27 | 6.8 |

3. Mounting bolts must be Grade 8 or better (class 8.8 or 10.9 for metric bolts). Use self-locking nuts or nuts with lockwashers.
4. Tighten mounting bolts evenly and torque to specifications provided in "CAPSCREW (BOLT) TORQUE CHART" on page 25.
5. The oil level should be checked prior to initial use by removing the oil level plug. The oil level is correct when the surface of the oil is level with the lowest point of the threaded hole.
6. Maintain a fleet angle between sheave and winch of no more than 1-1/2°. The lead sheave must be on a center line with drum and, for every inch (25 mm) of drum length, be at least 1.6 feet (0.5 metre) from the drum. Refer to Dwg. MHP2197 on page 6.
7. Do not weld to any part of winch.

**Wire Rope Takeoff**




(Dwg. MHP2197)

Note: Drawings may not reflect angle of motor on every winch model.

**A** = 48 feet (15 metres) for 30 inch long drum.

Notes:
1. Maintain a minimum of 3 tight wraps of wire rope on drum at all times.
2. Ensure wire rope does not exceed top layer requirement. Refer to “SPECIFICATIONS” section.
3. If drum is grooved ensure wire rope diameter is correctly sized to match.

## Wire Rope

**⚠ CAUTION**

**• Maintain at least 3 tight wraps of wire rope on drum at all times.**
**• Install wire rope for overwind operation (normal application). Refer to Dwg. MHP2179 on page 6.**

### Wire Rope Selection

Consult a reputable wire rope manufacturer or distributor for assistance in selecting 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 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 static or dead load but also loads resulting from acceleration, retardation and shock load. Consideration must also be given to the size of winch wire rope drum, sheaves and method of reeving. Wire rope construction should be 6 X 19 or 6 X 37 IWRC EIPS right regular lay. Refer to page 7 for recommended wire rope sizes.

Note: Maximum wire rope diameter is limited by size of wire rope anchor hole.

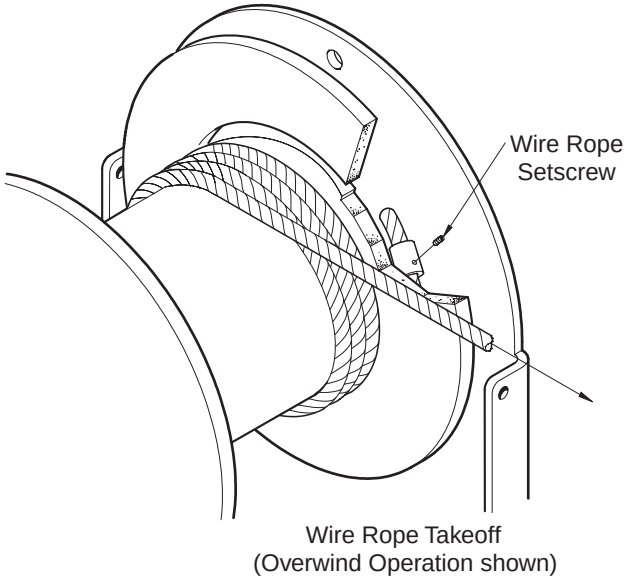
### Installing Wire Rope

Refer to Dwg. MHP2179 on page 6.
1. Cut wire rope to length in accordance with wire rope manufacturer’s instructions.
2. Feed end of wire rope through drum flange slot and into wire rope anchor hole in drum. Ensure approximately 1 inch (25 mm) of wire rope extends beyond anchor hole.
3. Secure wire rope in place with setscrew.

**⚠ CAUTION**

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

**Wire Rope Installation - Overwind Operation**




(Dwg. MHP2179)

### Safe Wire Rope Handling Procedures

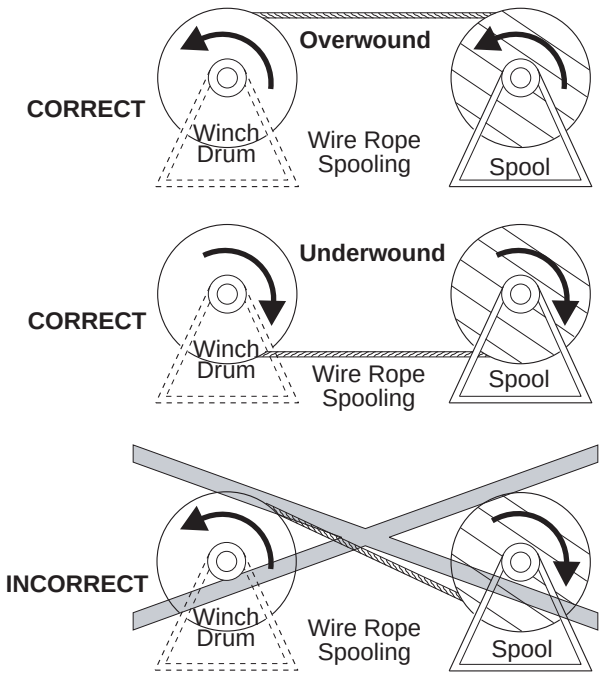
1. Always use gloves when handling wire rope.
2. Never use wire rope that is frayed or kinked.
3. Never use wire rope as a sling.
4. Always ensure wire rope is correctly spooled and the first layer is tight against drum.
5. Always follow wire rope manufacturers’ recommendation on use and maintenance of wire rope.

### Wire Rope Spooling

Refer to Dwg. MHP2450 on page 7.
To compensate for uneven spooling and decrease in line pull capacity as drum fills up, use as short a wire rope as practical. When rewinding apply tension to the end of wire rope to eliminate slack. This helps achieve level winding and tight spooling.

Support wire rope spool and have wire rope come off top of spool and over top of winch drum. This will prevent damage to wire rope.

**Spooling Wire Rope onto Winch Drum**




(Dwg. MHP2450)

### Rigging

Make sure all wire rope blocks, tackle and fasteners have a sufficient safety margin to handle 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 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 wire rope over a sharp edge. Use a correctly sized sheave.
4. When a lead sheave is used, it must be aligned with center of drum. The diameter of lead sheave must be at least 18 times diameter of wire rope. Refer to Dwg. MHP2197 on page 6.
5. Always maintain at least three full, tight wraps of wire rope on 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 @ 2100 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

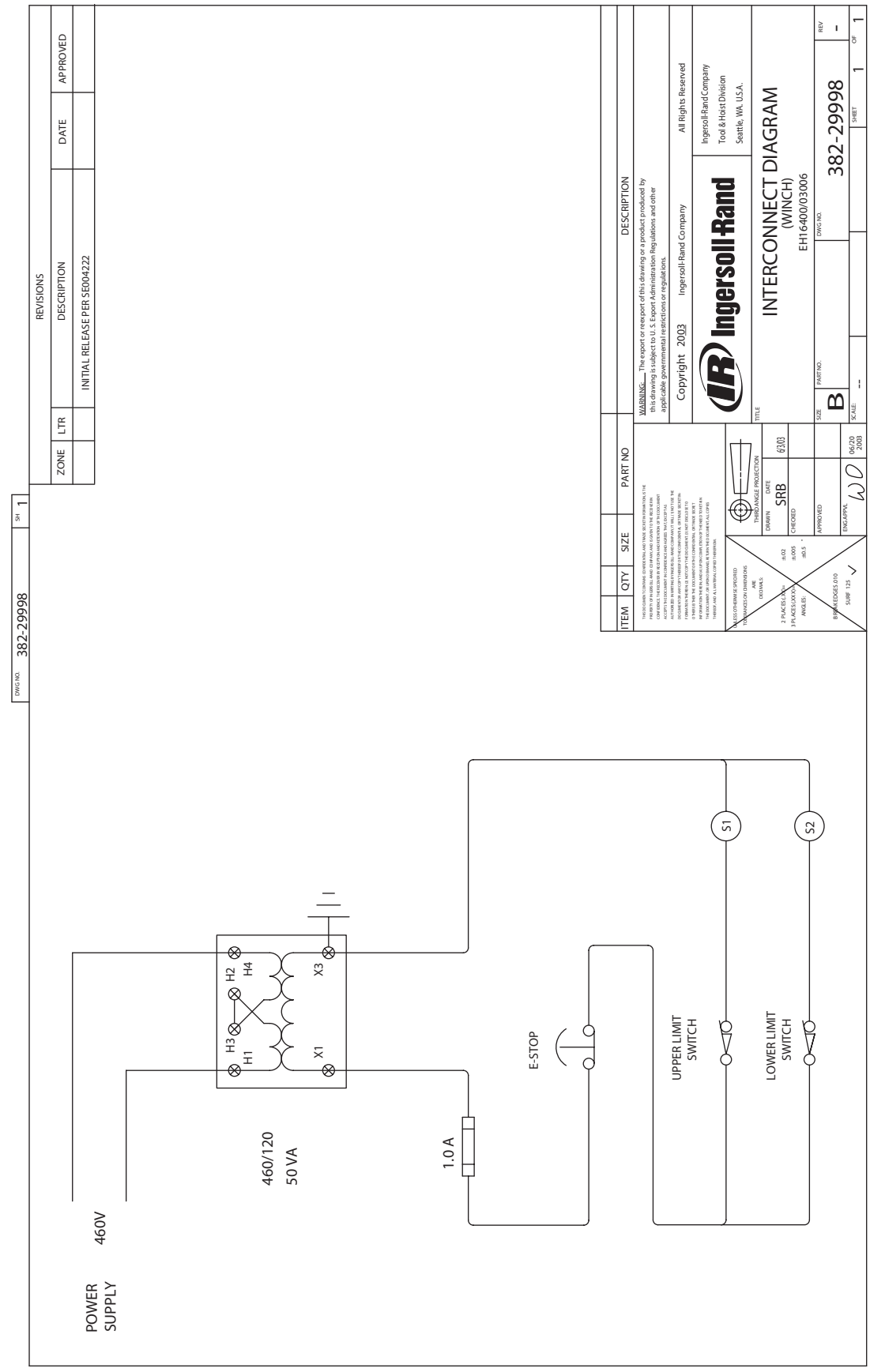
Winches are tested for proper operation prior to leaving the factory. Before the winch is placed into service the following initial operating checks should be performed.

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.

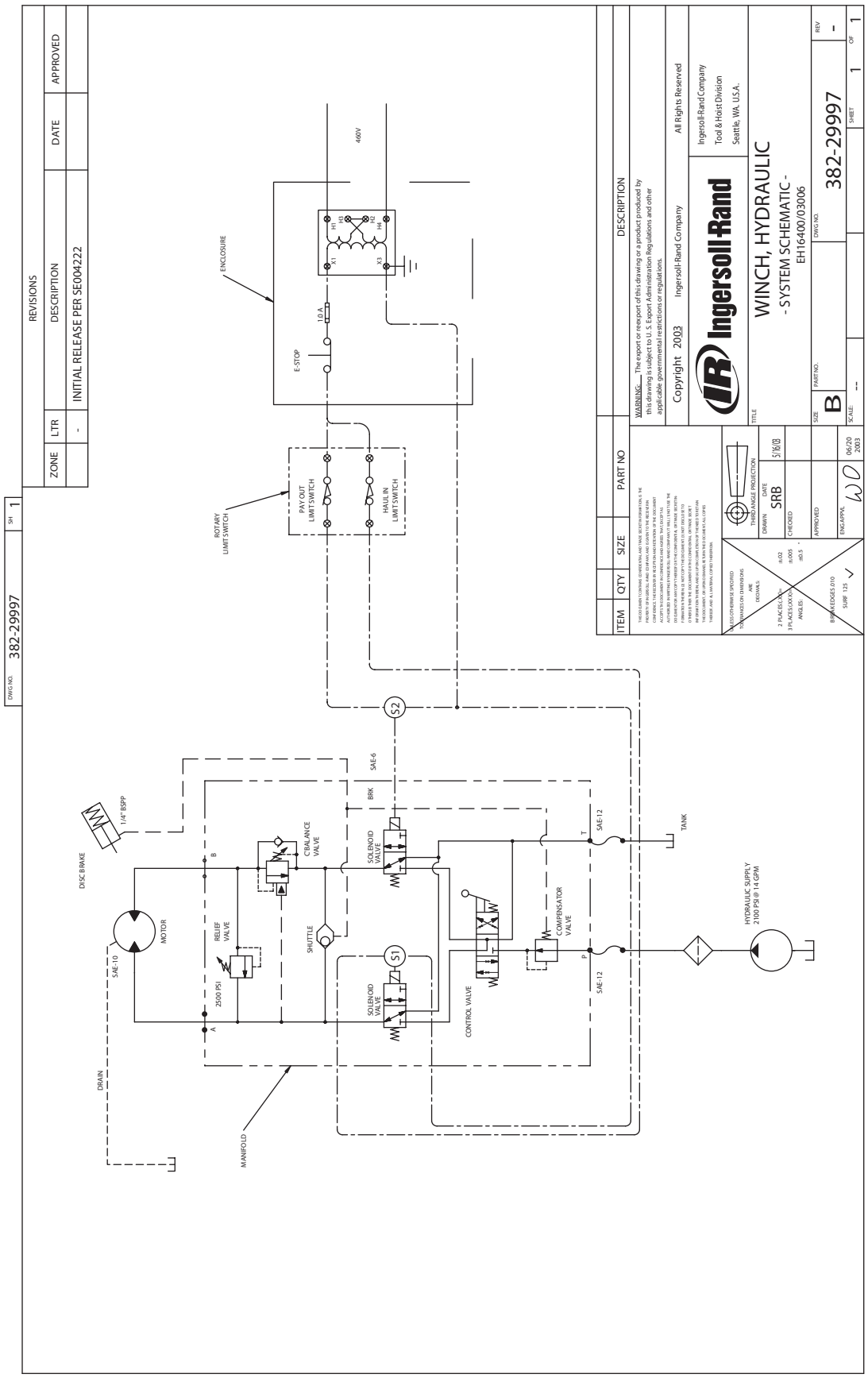
1. Give the winch an inspection conforming to the requirements of "Winches Not in Regular Use" in the "INSPECTION" section.
2. Operate the winch for 10 seconds in both directions to prime all lines.
3. The winch is now ready for normal use.

# CONNECTION DIAGRAM




(Engineering Dwg. 382-29998)

# SCHEMATIC




(Eng. Dwg. 382-29997)

# OPERATION

The four most important aspects of winch operation are:

4. Follow all safety instructions when operating the winch.
5. Allow only personnel trained in safety and the operation of this product to operate the winch.
6. Subject each winch to a regular inspection and maintenance procedure.
7. Be aware of the winch capacity and weight of load at all times.

**⚠WARNING**

**• 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 sheave blocks which are allowed to come into 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.

## 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.

# LUBRICATION

## General

Use of a thread lubricant or an antiseize compound is recommended for threaded shafts, capscrews and nuts. Unless otherwise stated, remove old lubricant, clean the part with an acid free solvent and apply a new coating of lubricant to the part before assembly.
Lubricate grease fittings and wire rope monthly. The lubrication intervals 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 lubrication types 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.

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**

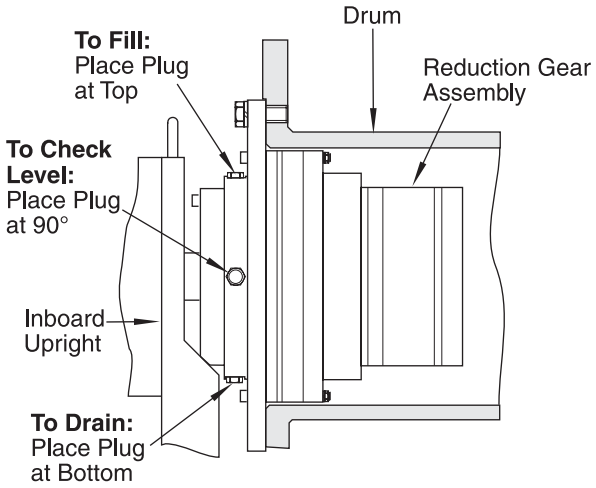
**• Do not over fill. Excess oil will reduce operating efficiency and increase oil temperature.**

**To check oil level:**
Position one of the removable 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 removable 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 sufficient 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.

### 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 specified by the wire rope manufacturer.**

2. Apply a wire rope lubricant **Ingersoll-RandLUBRI-LINK-GREEN®** or 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 the American Society of Mechanical Engineers 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 the safety, operation and maintenance of this equipment. ASME B30.7 states inspection intervals depend upon the nature of the critical components of the equipment and the severity of usage.
Careful inspection on a regular basis will reveal potentially dangerous conditions while still in the early stages, allowing corrective action to be taken before the condition becomes dangerous.
Deficiencies revealed through inspection, or noted during operation, must be reported to designated personnel instructed in safety, operation and maintenance of this equipment. A determination as to whether a condition constitutes a safety hazard must be decided, and the correction of noted safety hazards accomplished and documented by written report before placing the equipment in service.

### Records and Reports

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

### 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 winches in continuous service, frequent inspection should be made at the beginning of each shift. In addition, visual inspections by operators should be conducted during regular operation for indications of damage or evidence of malfunction.

4. WINCH. Prior to operation, visually inspect winch uprights, siderails, bearings, guards and drum for indications of damage. Any discrepancies noted must be reviewed and inspected further by authorized personnel instructed in the operation, safety and maintenance of this winch.
5. WIRE ROPE. Visually inspect all wire rope which can be expected to be in use during the day's operations. Inspect for wear and 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 discrepancies have been reviewed and inspected further by personnel familiar with wire rope maintenance. Lubricate if necessary. Refer to "LUBRICATION" section.
6. 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.

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."**

7. BRAKE. During winch operation test brake. Brake must hold load without slipping. Brake must release when winch motor is operated. If brake does not hold load, or does not release properly, the brake must be adjusted or repaired.
8. WIRE ROPE REEVING. Check reeving and ensure wire rope is properly secured to the drum. Do not operate the winch unless the wire rope feeds onto and off of the drum smoothly.
9. LUBRICATION. Refer to the "LUBRICATION" section for recommended procedures and lubricants.
10. PENDANT (optional feature). Ensure operation of pendant buttons is smooth and that winch is responsive to pendant control. Pendant buttons must operate without sticking and freely spring return to neutral when released.
11. LIMIT DEVICES (optional feature). Check that they are correctly adjusted and operate properly.

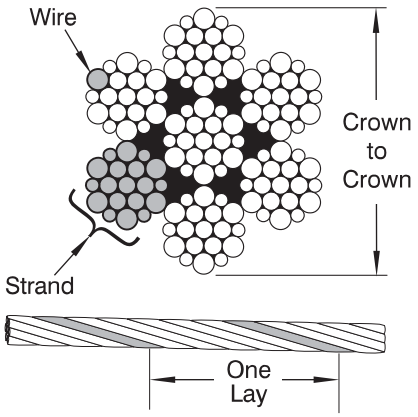
## Periodic Inspection

Periodic inspection intervals for winch use under various conditions are 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 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:

12. UPRIGHTS AND SIDERAILS. Check for deformed, cracked or corroded main components. Replace damaged parts if necessary.
13. FASTENERS. Check capscrews and nuts on winch, including mounting bolts. Replace if missing or damaged and tighten if loose.
14. DRUM. Check for cracks, wear or damage. Replace if necessary.
15. ALL COMPONENTS. Inspect for wear, damage, distortion and cleanliness. If external evidence indicates the need, for example poor performance or excessive noise, disassemble and inspect. Check reduction gear assembly, drum shaft, bearings, sheaves, guards, etc. Replace worn or damaged parts.
16. BRAKE. Check brake functions correctly. Only minimum maintenance is required. Refer to "MAINTENANCE" section for brake adjustment and repair.
17. SUPPORTING STRUCTURE. Check for distortion, wear and continued ability to support the winch and rated load.
18. LABELS AND TAGS. Check for presence and legibility. Replace if damaged or missing.
19. ELECTRICAL COMPONENTS. Check for loose wires, corrosion or other signs of deterioration.
20. WIRE ROPE. In addition to the items in a frequent inspection, inspect for the following:
    a. Buildup of dirt and corrosion. Clean if necessary.
    b. Loose or damaged end connection. Replace if loose or damaged.
    c. Check wire rope anchor is secure.
    d. Changes in the size of the wire rope diameter. Periodically measure the diameter of the wire rope from crown-to-crown throughout the life of the wire rope. The actual diameter should be recorded when the wire rope is under equivalent loading and in the same operating section. If the actual diameter of the wire rope has decreased more than 1/64 in. (0.4 mm) a through 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.




(Dwg. MHP0056)

21. DRUM GUARD (optional feature). Verify fasteners are tight and in good condition. Ensure guard is not damaged and is in good condition. Repair or replace if guard is damaged.

## Winches Not in Regular Use

1. A winch that has been idle for a period of one month or more, but less than six months, shall be given an inspection conforming with the requirements of "Frequent Inspection" before being placed into service. Also, activate the manual brake release lever while briefly operating the winch to make sure the brake fully releases.
2. A winch that has been idle for a period of more than six months shall be given a complete inspection conforming with the requirements of "Periodic Inspection".
3. Standby winches shall be inspected at least semiannually in accordance with the requirements of "Frequent Inspection". If abnormal operating conditions apply winches may require a more frequent inspection.

## Testing

Prior to initial use, all new, altered or repaired winches shall be tested to ensure proper operation. Refer to 'Testing' on page 19 of "MAINTENANCE" section for additional information.

# INSPECTION AND MAINTENANCE REPORT

## Ingersoll-Rand Fulcrum Series Hydraulic Winches

| | |
|---|---|
| **Model Number:** | **Date:** |
| **Serial Number:** | **Inspected By:** |

**Reason for Inspection: (Check Applicable Box)**

| | | |
|---|---|---|
| | 1. Scheduled Periodic Inspection:<br>_____ Quarterly _____ Semiannually _____ Yearly | **Operating Environment:**<br><br>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. Testing to more than 125% of rated load may be required to comply with standards and regulations set forth in areas outside the USA.

This form 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. |
| 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. |

# MAINTENANCE

**⚠WARNING**

**• Before performing maintenance, disconnect the load from the winch. A moving load can cause death, injury or property damage.**
**• Disconnect electrical power source before performing any maintenance. Accidental operation or contact with exposed power supply can cause death, injury or property damage.**
**• Before performing maintenance, tag controls:**
**WARNING - DO NOT OPERATE - EQUIPMENT BEING REPAIRED.**
**• Only allow service personnel trained in safety and service on this winch to perform maintenance.**
**• After performing any maintenance on 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.**

## Maintenance Intervals

The Maintenance Interval chart is based on intermittent operation of winch eight hours each day, five days per week. If winch operation exceeds eight hours per day, or use is under HEAVY or SEVERE conditions, more frequent maintenance should be performed. Refer to 'Periodic Inspection' on page 14 in "INSPECTION" section for interval guidance.

| INTERVAL | MAINTENANCE CHECK |
|---|---|
| Start of each shift<br><br>(Operator or Maintenance Personnel) | Make a thorough visual inspection of winch for damage. Do not operate winch if damaged. |
| | Operate winch at low RPM in both directions. Winch must operate smoothly without sticking, binding or abnormal noises. Check operation of brake. |
| 3 Months (Maintenance Personnel) | Check electrical connections are clean, tight and undamaged. |
| Yearly<br><br>(Maintenance Personnel) | Inspect winch drum shaft and bearing for wear and damage. Repair or replace as necessary. |
| | Check all supporting members, including 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 non-filtered 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 necessary information to disassemble, inspect, repair, and assemble winch. Parts drawings are provided in parts section. If a winch is being completely disassembled for any reason, follow the order of topics as they are presented. It is recommended that all maintenance work on winch be performed in a clean dust free work area.
In the process of disassembling winch, observe the following:

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

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

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

## Cleaning, Inspection and Repair

### Cleaning

Clean all winch component parts in solvent (except brake friction plates). The use of a stiff bristle brush will facilitate removal of accumulated dirt and sediments on housings, frame and drum. If bearings have been removed it may be necessary to scrape old Loctite® from surfaces. Dry each part using low pressure, filtered compressed air.

### Inspection

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

1. Inspect all components for wear or damage.
2. Inspect bearings for wear, scoring, or galling.
3. Inspect shafts for ridges caused by wear. If ridges caused by wear are apparent on shafts, replace shaft.
4. Inspect all threaded items and replace those having damaged threads.

### Repair

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

1. Worn or damaged parts must be replaced. Refer to 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. Cost of the part is often minor in comparison with cost of redoing job.
3. Smooth out all nicks, burrs, or galled spots on shafts, bores, bearings or machined surfaces.
4. Polish edges of all shaft shoulders to remove small nicks which may have been caused during handling.
5. Remove all nicks and burrs caused by lockwashers.

## Assembly

### General Instructions

- Use all new gaskets and seals.
- Replace worn parts.
- Assemble parts using match marks created during disassembly. Compare replacement parts with originals to identify installation alignments.

## Testing

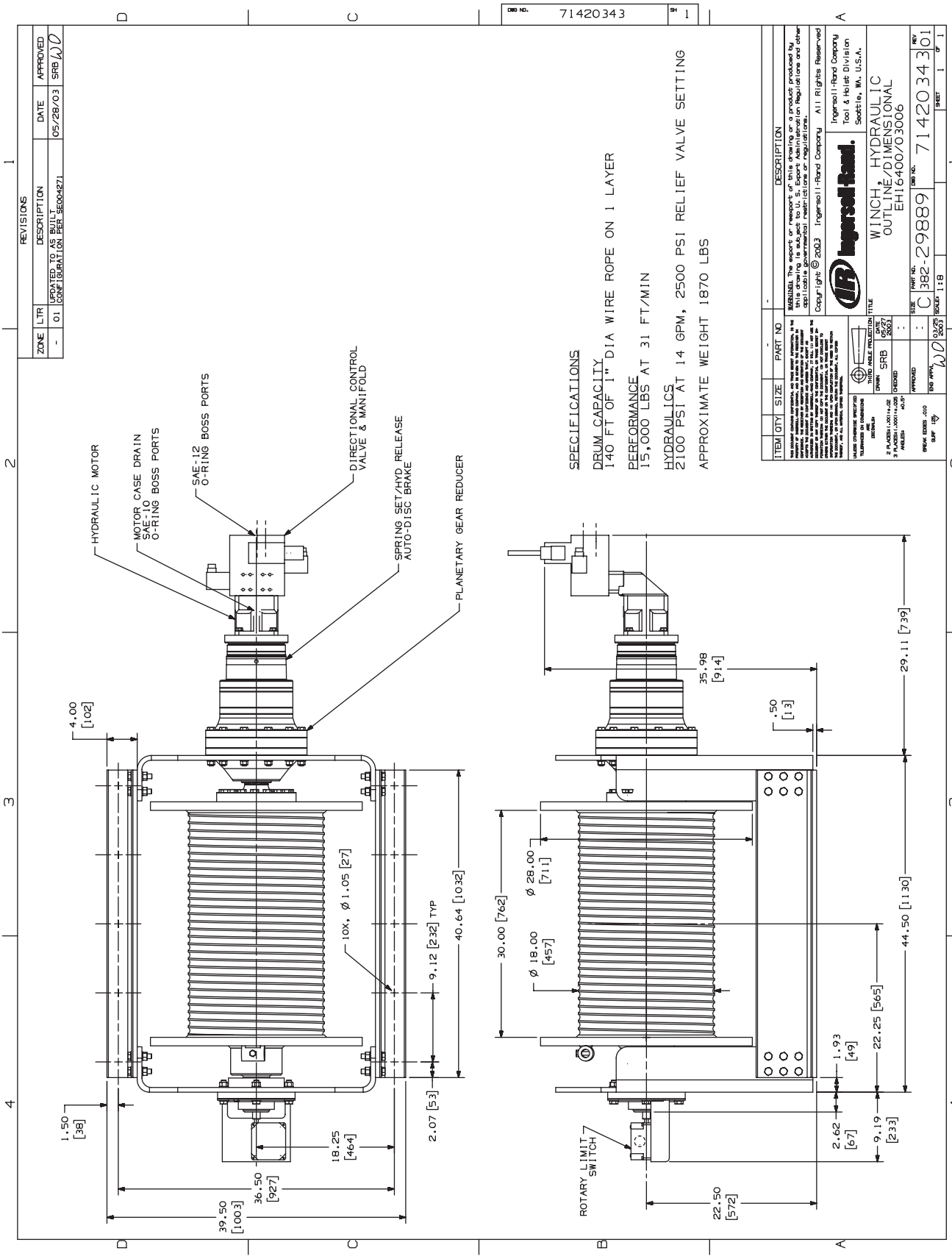
Prior to initial use, all new, altered or repaired winches shall be tested to ensure proper operation.

6. Operate winch for several minutes in both directions with no load.
7. Check operation of brake.
8. Check operation of limit switches, and locking or safety devices when provided.
9. Check winch is securely mounted before beginning operation. Refer to "INSTALLATION" section.
10. Install guards and ensure warning labels are present and legible.

### Load Testing

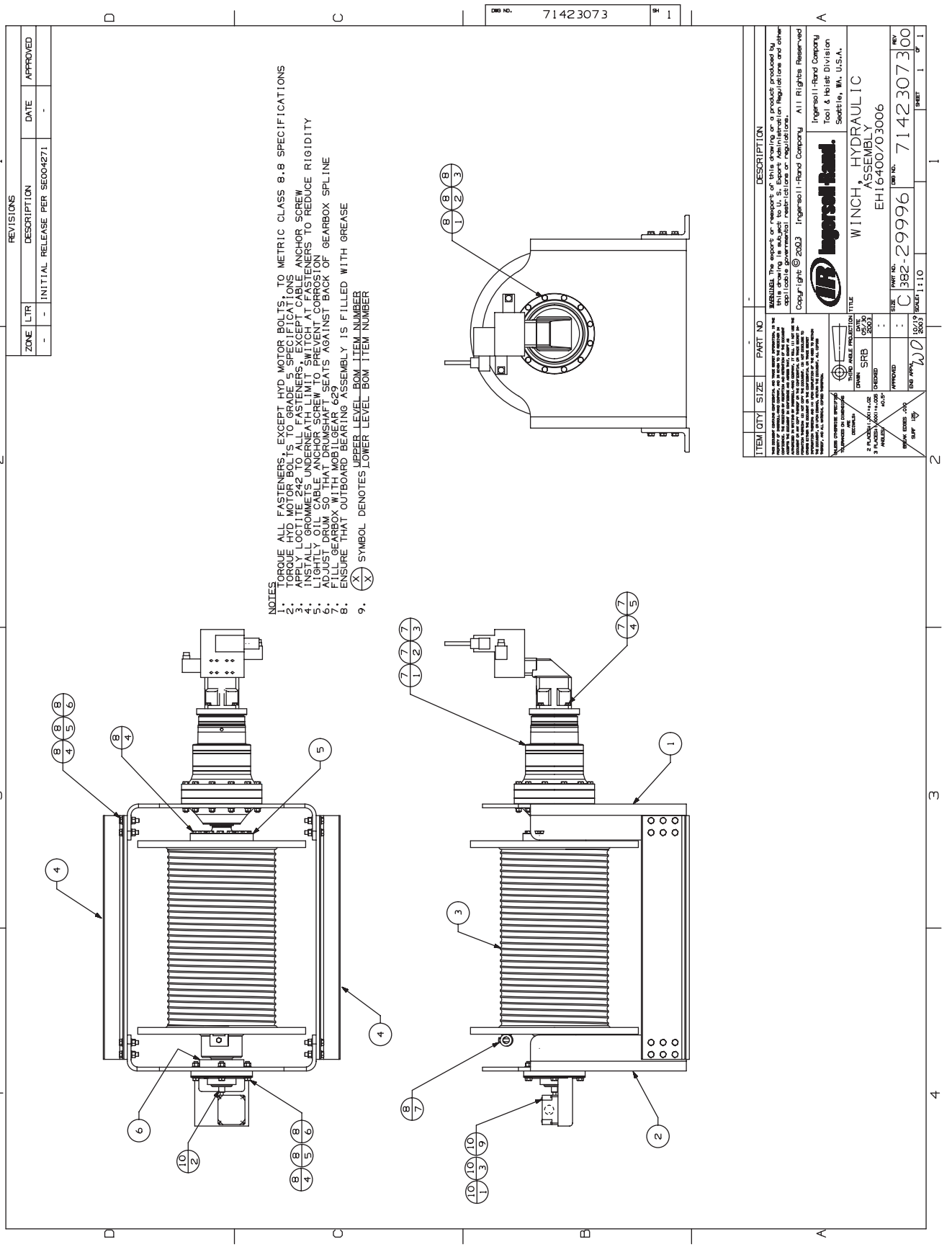
Prior to initial use, all new, extensively repaired, or altered winches shall be load tested by or under the direction of a person knowledgeable in test procedures and operation of the winch, and a written report furnished confirming the rating of the winch. Test winch to 125% of the rated line pull.

# DIMENSIONAL DRAWING




(Eng. Dwg. 382-29889)

# FULCRUM HYDRAULIC WINCH ASSEMBLY DRAWING



# FULCRUM HYDRAULIC WINCH ASSEMBLY PARTS LIST

Main Assembly Dwg: 29996

| Item | Qty | Part Number | Description |
|---|---|---|---|
| 01 | 1 | 29115-1 | UPRIGHT, INBOARD |
| 02 | 1 | 29115-2 | UPRIGHT, OUTBOARD |
| 03 | 1 | 382-29918-G30 | DRUM, GROOVED |
| 04 | 2 | 29143-30 | SIDERAIL |
| 05 | 1 | 29142 | SHAFT,DRUM |
| 06 | 1 | 71377857 | BEARING |
| 07 | 1 | 382-29915 | DRIVE SECTION, |
| 08 | 1 | 382-30008 | COMMON PARTS |
| 09 | 1 | Contact Factory | TAGS/LABELS KIT |
| 10 | 1 | 382-29916 | LIMIT SWITCH ASSY |

## Part# 382-29915 Drive Section
## No Assembly Drawing

| Qty | Part Number | Description |
|---|---|---|
| 1 | 71420855 | MOTOR |
| 1 | 71420863 | REDUCER |
| 1 | 71420913 | MANIFOLD |
| 4 | 50183 | SCREW |
| 4 | 50182 | WASHER |
| 1 | 71423420 | FTG - AEROQUIP |
| 1 | 71423438 | FTG - AEROQUIP |
| 1 | 28611-7 | HOSE ASSEMBLY |

## Part# 382-30008 Common Parts
## No Assembly Drawing

| Qty | Part Number | Description |
|---|---|---|
| 12 | 71423404 | SCREW |
| 12 | 71390421 | WASHER,FLAT |
| 12 | 71390439 | NUT |
| 44 | 71373005 | SCREW |
| 56 | 71373013 | WASHER,FLAT |
| 28 | 71020895 | NUT |
| 1 | 71366439 | SCREW |

## Part# 382-29916 Limit Switch Assembly
## No Assembly Drawing

| Qty | Part Number | Description |
|---|---|---|
| 1 | 382-29927 | MOUNTING BRACKET, |
| 1 | 382-29929 | COUPLING, |
| 1 | 71420939 | LIMIT SWITCH |
| 1 | 382-30009 | ENCLOSURE,MOD |
| 1 | 71423297 | BACKPAN |
| 1 | 71262125 | TRANSFORMER |
| 4 | 71324115 | SCREW |
| 4 | 71268890 | LOCKWASHER |
| 4 | 71390777 | SCREW, SOCHD |
| 1 | 71381545 | BUTTON, E- |
| 1 | 71405609 | LEGEND PLATE |
| 1 | 71268007 | CONTACTS |

## Part# Contact Factory Tags and Labels List
## No Assembly Drawing

| Qty | Part Number | Description |
|---|---|---|
| 1 | 29452 | KIT,WARNING TAG |
| 1 | CONTACT FACTORY | NAMEPLATE |
| 5 | 71028849 | RIVET |
| 1 | 71109102 | LABEL, LOGO |
| 1 | 71107148 | TAG, OIL LEVEL |
| 1 | 71125751 | LABEL, WARNING VOLTAGE |
| 1 | 71411078 | LABEL, PRODUCT |

# SERVICE NOTES

# SERVICE NOTES

# CAPSCREW (BOLT) TORQUE CHART

| Bolt Diameter (inches) | Grade 5 Tightening Torque | | | | Grade 8 Tightening Torque | | | |
|---|---|---|---|---|---|---|---|---|
| | Dry Threads | | Lubricated Threads | | Dry Threads | | Lubricated Threads | |
| | ft lb | Nm | ft lb | Nm | ft lb | Nm | ft lb | Nm |
| No. 10–24 | 3.5 | 5 | 3 | 4 | 5 | 7 | 4 | 5 |
| No. 10–32 | 4 | 5 | | | 7 | 9 | | |
| 1/4–20 | 8 | 11 | 6 | 8 | 12 | 16 | 9 | 12 |
| 1/4–28 | 10 | 13 | 7 | 9 | 14 | 19 | 10 | 13 |
| 5/16–18 | 17 | 23 | 13 | 18 | 25 | 34 | 18 | 24 |
| 5/16–24 | 19 | 26 | 14 | 19 | 27 | 37 | 20 | 27 |
| 3/8–16 | 31 | 42 | 23 | 31 | 45 | 61 | 35 | 47 |
| 3/8–24 | 35 | 47 | 26 | 35 | 50 | 68 | 37 | 50 |
| 7/16–14 | 50 | 68 | 37 | 50 | 70 | 95 | 55 | 74 |
| 7/16–20 | 55 | 74 | 41 | 56 | 80 | 108 | 60 | 81 |
| 1/2–13 | 75 | 101 | 57 | 77 | 106 | 144 | 80 | 108 |
| 1/2–20 | 86 | 117 | 65 | 88 | 120 | 160 | 90 | 122 |
| 9/16–12 | 110 | 150 | 82 | 111 | 154 | 209 | 115 | 156 |
| 9/16–18 | 121 | 164 | 91 | 123 | 171 | 232 | 130 | 176 |
| 5/8–11 | 150 | 203 | 113 | 153 | 212 | 287 | 160 | 217 |
| 5/8–18 | 170 | 230 | 130 | 176 | 240 | 325 | 180 | 244 |
| 3/4–10 | 267 | 362 | 200 | 271 | 376 | 510 | 282 | 382 |
| 3/4–16 | 300 | 406 | 223 | 302 | 420 | 569 | 320 | 434 |
| 7/8–9 | 430 | 583 | 322 | 437 | 606 | 822 | 455 | 617 |
| 7/8–14 | 474 | 643 | 355 | 481 | 670 | 908 | 502 | 681 |
| 1–8 | 644 | 873 | 483 | 655 | 909 | 1232 | 682 | 925 |
| 1–12 | 704 | 954 | 528 | 716 | 1000 | 1355 | 746 | 1011 |
| 1 1/8–7 | 794 | 1076 | 596 | 808 | 1288 | 1746 | 966 | 1310 |
| 1 1/8–12 | 1023 | 1387 | 767 | 1040 | 1444 | 1958 | 1085 | 1471 |
| 1 1/4–7 | 1120 | 1518 | 840 | 1139 | 1820 | 2467 | 1363 | 1848 |
| 1 1/4–12 | 1425 | 1932 | 1069 | 1450 | 2012 | 2728 | 1510 | 2047 |
| 1 1/2–6 | 1940 | 2630 | 1460 | 1980 | 3160 | 4284 | 2360 | 3200 |
| 1 1/2–12 | 2200 | 2982 | 1640 | 2223 | 3560 | 4826 | 2660 | 3606 |

| Metric Coarse Thread Torque | | | | |
|---|---|---|---|---|
| Size | Class 8.8/9.8 | | Class 10.9 | |
| | Dry | Lub. | Dry | Lub. |
| M6x1 | 9-10 | 6-7 | 11-12 | 8-9 |
| M8x1.25 | 21-23 | 16-18 | 26-30 | 20-22 |
| M10x1.5 | 41-47 | 31-35 | 53-60 | 39-45 |
| M12x1.75 | 71-81 | 54-61 | 91-103 | 68-77 |
| M14x2 | 115-130 | 86-98 | 147-166 | 110-125 |
| M16x2 | 165-187 | 124-140 | 227-257 | 170-193 |
| M20x2.5 | 321-364 | 241-273 | 443-502 | 332-376 |
| M22x2.5 | 439-497 | 329-373 | 605-686 | 454-514 |
| M24x3 | 556-630 | 417-473 | 767-869 | 575-652 |
| M30x3.5 | 1103-1250 | 827-938 | 1521-1724 | 1141-1293 |

| Metric Fine Thread Torque | | | | |
|---|---|---|---|---|
| Size | Class 8.8/9.8 | | Class 10.9 | |
| | Dry | Lub. | Dry | Lub. |
| M8x1 | 22-25 | 17-19 | 28-32 | 21-24 |
| M10x1.25 | 44-49 | 33-37 | 56-63 | 42-47 |
| M12x1.25 | 78-89 | 59-67 | 100-113 | 75-85 |
| M14x1.5 | 125-141 | 93-106 | 159-180 | 119-135 |
| M16x1.5 | 176-200 | 132-150 | 243-276 | 183-207 |
| M18x1.5 | 257-291 | 193-219 | 355-402 | 266-302 |
| M20x1.5 | 358-406 | 268-304 | 494-559 | 370-420 |
| M22x1.5 | 484-548 | 363-411 | 667-756 | 500-567 |
| M24x2 | 609-690 | 456-517 | 839-951 | 630-713 |
| M30x2 | 1227-1390 | 920-1043 | 1692-1918 | 1269-1438 |

Notes:
1. Definitions:
   **DRY:** Cadmium plate, zinc plate, and oiled fasteners.
   **LUBRICATED:** Molysulfide paste, carnaba wax, molysulfide grease and copper-based anti-sieze coated fasteners.
2. All torque values foot-pounds unless noted.
3. SAE Grade 5 equivalent to ASTM A325 Type 2 and ASTM A449.
4. SAE Grade 8 equivalent to ASTM A354 Grade BD, ASTM A490 Type 1.
5. If mixing fasteners use lowest torque value.
6. Torque values 75 to 85% of fastener proof load ref.

# PARTS ORDERING INFORMATION

The use of other than **Ingersoll-Rand** 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**
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 Hoists and Winches (Products) to be free of defects in material and workmanship for a period of two years 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 two 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**
**Global Logistics**
P.O. Box 618
510 Hester Drive
White House, TN 37188
Phone: (615) 474-8665
Fax: (615) 672-0854

**Technical Support**

**Ingersoll-Rand**
P.O. Box 24046
2724 Sixth Avenue South
Seattle, WA 98124-0046
Phone: (206) 624-0466 or
(206) 273-FAST (3278)
Fax: (206) 624-6265

**Web Site:**
www.airwinch.com

**Annandale, NJ**
P.O. Box 970
1467 Route 31 South
Annandale, NJ 08801
Phone: (908) 238-7000
Fax: (908) 238-7048

## 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:

**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

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

**Europe, Middle East and Africa**
**Ingersoll-Rand**
111, avenue Roger Salengro
59450 Sin Le Noble, France
Phone: (33) 3-27-93-08-08
Fax: (33) 3-27-93-08-00

**Asia Pacific Operations**
**Ingersoll-Rand, Ltd.**
42 Benoi Road
Jurong, Singapore 629903
Phone: 65-861-1555
Fax: 65-862-1373

**Russia**
**Ingersoll-Rand**
Presnensky Val
19, Moscow, Russia 123557
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Fax: (7) 095-737-01-48

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