

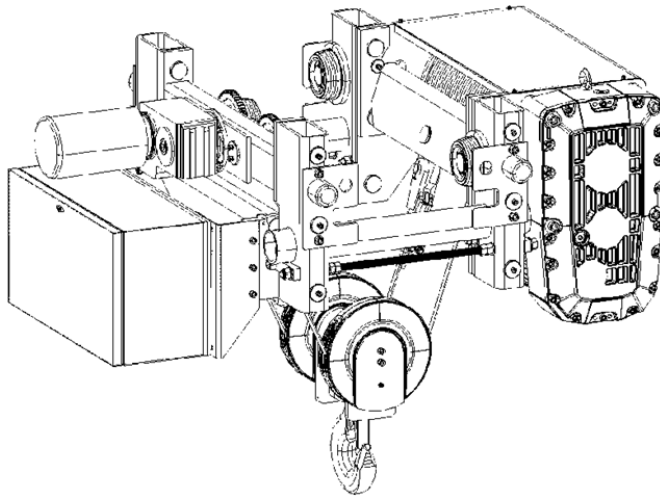


## **EURO TYPE WIRE ROPE HOISTS** (RATED LOADS UP TO 12.5 METRIC TON)

# **MANUAL BOOK** V19.07

**For**

**INSTALLATION & OPERATION & SERVICE**



**Follow all instructions and warnings for inspecting, maintaining, and operating this hoist.**

**The use of any hoist presents some risk of personal injury or property damage. That risk is greatly increased if proper instructions and warnings are not followed. Before using this hoist, each operator should become thoroughly familiar with all warnings, instructions, and recommendations in this manual.**

**Retain this manual for future reference and use.**

**Forward this manual to operator. Failure to operate equipment as directed in manual may cause injury.**

**SHANGHAI MAXLOAD CRANES & HOISTS CO. , LTD.**

**Add:** 5588-1718th, Caoan Road, Jiading Distict, Shanghai China.

**Tel:** 0086 (021)5999 9072

**Phone:** 0086 156 1824 5535

**Mail:** market@chnhoist.com

**Web:** www.chnhoist.com

**Mail:** market@chnhoist.com **Web:**www.chnhoist.com

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## FORWARD

This book contains important information to help you install, operate, maintain and service your new MLER electric hoist. We recommend that you study its contents thoroughly before putting the hoist into use. Safety (see Section I, Paragraph 1-3) should be read with particular care and attention. Then, through proper installation, application of correct operating procedures, and by practicing the recommended maintenance suggestions you can expect maximum lifting service from the hoist.

It will likely be a long time before parts information found in Section IX is needed. Therefore, after the hoist is installed and you have completely familiarized yourself with operation and preventative maintenance procedures, we suggest that this book be carefully filed for future reference.

When ordering replacement parts from this book, it will be necessary that you include you're your order: The Hoist Serial Number and Model Number that are found on the nameplate attached to the motor end of hoist (Figure 4-1). For your convenience, a space has been provided on the front cover of this Manual for entering this information. We recommend that you fill it out immediately so it is readily at hand when needed.

The contents of this manual are of necessity, general in nature and may cover features not incorporated on your hoist; or, you may have ordered features not covered by this manual. Therefore, the user must exercise care in applying instructions given in this manual. If specific information not in this manual is required, contact the factory.

THE INFORMATION CONTAINED IN THIS BOOK IS FOR INFORMATIONAL PURPOSES ONLY AND WE DOES NOT WARRANT OR OTHERWISE GUARANTEE (IMPLIEDLY OR EXPRESSLY) ANYTHING OTHER THAN THE COMPONENTS THAT MAXLOAD CRANES & HOISTS

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## **SECTION I – GENERAL DESCRIPTION**

### **1-1. GENERAL.**

MLER electric hoists are wire rope and drum type hoists that are manufactured with an integral trolley. These hoists are all low headroom models with the drum and upper block (or dead-end anchor depending on the reeving type) on opposite sides of the beam suspending the trolley. There are three basic frame sizes: the “3” Frame handles capacities up to 3.2ton; the “4” Frame handles capacities up to 6.3ton; and the “5” Frame handles capacities up to 12.5ton. All frames have an integral trolley with two different flange width ranges available: 200mm through 350mm or 300mm through 550mm wide with a maximum flange thickness of 50mm. The hoist motor is 2-speed with a 6:1 ratio between high and low speeds as standard. The Motor Driven trolley has two available speeds with 1-speed, 2-speed, or Variable Frequency control.

### **1-2. BASIC CONSTRUCTION.**

MLER hoists consist of a rugged steel frame which houses a lifting drum and serves as the suspension for carrying the entire hoist load. An aluminum Gearbox, attached to one end of the drum frame, houses a triple-reduction gear train. The first two reductions are helical with the third being spur. Attached to the Gearbox is a 2-speed hoisting motor with a 6:1 ratio between the high and low speeds. A 200% torque DC motor brake is attached to the motor. A single control panel contains both the hoist and trolley electrical system controls. Hoisting wire rope and a covered lower block assembly are used for lifting loads. A rotary geared limit switch is used to limit travel both up and down. A secondary block operated limit switch (purchased separately) is used to limit the travel of the lower block when raising. A push button control station (purchased separately) for operating the hoist is suspended on a wire strain cable attached to the hoist or C track.

### **1-3. SAFETY.**

#### **a) Organizational Information**

The operating, service and maintenance personnel must have read and understood the operation, service & parts manual before they start work. The user has a duty to ensure that operation is safe and hazard-free. This can be assisted by a number of measures including:

- Providing and publishing the operating instructions
- Testing the product prior to commissioning and after major modifications
- Performing the routine tests and inspections
- Logging test results in the Inspection Schedule and keeping the Inspection Schedule in a safe place
- Keeping a recording of elapsed service life

Only reliable, trained and properly appointed personnel may carry out work on or with the hoist. The user has a duty to supervise the safety conscious handling of the hoist by his personnel.

#### **b) Safety Information for the User**

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# WARNING

A thorough knowledge of these assembly, operating and service instructions by operating and maintenance personnel is an essential of safe working practice.

Any and all arresting devices must be released before the start of operation. The rotary "Emergency Stop" switch must be turned off in case of danger.

At the end of work load carrying devices such as grippes and magnets must be detached, the empty hook pulled up and the hoist moved to its park position. Any arresting device must be engaged and the rotary "Emergency Stop" switch turned off.

The relevant safety regulations and official requirements, specifically the operating regulations for hoists, must be followed when operating and servicing the hoist. Anyway, the following instructions still apply unless expressly contradicted by local regulations.

1. The user must ensure that hoists and their supporting structures are inspected and tested by an expert before first-time commissioning and before re-commissioning following major modifications.
2. The user must ensure that hoists and their supporting structures are inspected and tested at least once a year by an expert. He must also have them inspected by an expert at other times as the need arises depending on the conditions of use and internal company circumstances.
3. The inspection and test before first-time commissioning referred to in Point 1 includes examining for proper assembly and operational readiness.
4. During the inspection referred to in Point 2 the user must determine the elapsed proportion of the theoretical service life of hoists. He should appoint an expert to do this if necessary.
5. The user must ensure that records are kept of the results of the tests on hoists carried out in accordance with Points 1 to 4.
6. The results of tests on the hoist must be logged in an Inspection Schedule.
7. The user may only entrust the assembly, servicing and unsupervised operation of the hoist to insured persons who are suitable and familiar with it.
8. Insured persons may not assemble, service or operate hoists unsupervised unless they have been appointed by the user for this purpose.
9. The User must ensure that the operating instructions supplied by the manufacturer is available and accessible to those insured persons to whom the assembly, servicing or unsupervised operation of the hoist has been entrusted.
10. If internal company circumstances so require, the user must produce readily understandable operating procedures in the language of the insured persons and based on the operating instructions supplied by the manufacturer, setting out measures for safe operation in accordance with company circumstances.
11. The insured persons must observe these operating instructions and procedures.

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12. When assembling the hoist, the user must ensure that its control stand is positioned or protected such that the hoist operator is not put at risk by the hoist, load carrying devices or the load itself.
  13. The user must ensure that the hoist is only mounted on structures and suspensions which are capable of safely accepting the anticipated forces.
  14. The user must ensure that the hoist is assembled, positioned or attached such that its position cannot be accidentally changed by the forces which occur during operation.
  15. The user must ensure that the hoist is assembled or positioned such that load carrying devices is not drawn across edges and the wire rope is not deflected to the side when it enters the hoist.
  16. The hoist operator must ensure that load carrying devices is not drawn across edges.
  17. The user and hoist operator must ensure that the safe working load of the hoist is not exceeded.
  18. Where loads are lifted by several hoists together, then the user must ensure that the hoists are selected and positioned such that individual hoists are not overloaded even when the load is unevenly distributed.
  19. The hoist operator must test emergency stop equipment – except slipping clutches – at the beginning of each working shift.
  20. If the hoist operator finds obvious defects with the hoist including the load carrying devices, rollers, equipment and supporting structure, he must rectify these immediately. If this is not his responsibility or if he does not possess the necessary skills he must take the hoist out of service if necessary and report the defect to the user.
  21. The user must ensure that loads are not slung by being wrapped around with the wire rope.
  22. Insured persons must not sling loads by wrapping the wire rope around them.
  23. The hoist operator must not initiate any load movement until he is satisfied that the load is safely slung and that personnel have cleared the danger area, or after he has received a sign from the slinger.
  24. The hoist operator must keep all movements by the loads and load carrying devices under observation.
  25. If the hoist operator cannot observe all movements by the load or load carrying devices from the control stand, then the user must take precautions to ensure that persons are not at risk from the load or load carrying devices.
  26. Where work is to be carried out on or beneath loads lifted with hoists, the user must ensure that the loads are additionally secured against dropping on stable supports before work commences.
  27. Where work is to be carried out on or beneath loads lifted with the hoist, the hoist operator must additionally secure the loads against dropping on stable supports before work commences.
  28. The hoist operator must not leave the control stand of the hoist when the load is suspended.

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29. If contrary to Point 28 the hoist operator has to leave the control stand when the load is suspended, then the user must create the conditions whereby the danger area beneath the load can be protected.
30. If contrary to Point 28 the hoist operator has to leave the control stand when the load is suspended, then he must protect the danger area beneath the load.
31. The hoist operator must not carry persons with the load or load carrying devices.
32. The user must ensure that the hoist is not used to handle molten substances.
33. The hoist must not be used to handle loads which are jammed or which can become caught, snagged or obstructed as they move.
34. The hoist operator must not drive the hoist against emergency limits as part of normal operating practice.
35. The user must take the hoist out of service at the end of its theoretical service life.
36. Contrary to Point 35 the hoist may continue in operation provided an expert
- a) confirms that there are no objections to continued operation, and
  - b) the conditions for continued operation have been established. These conditions must be recorded in the Inspection Schedule.
37. The user must ensure that continued operation complies with the conditions according to Point 36 b).
38. Insured persons may not carry out service and inspection work unless they are satisfied that the hoist has been switched off and locked out. They may only carry out service work that can not be done from the ground from work stands or staging.
39. The user must direct and supervise the following safety precautions for all repairs and modifications to the hoist and for work in areas where persons may be at risk from the hoist:
- a) The hoist must be switched off and locked out.
  - b) If there is a risk from falling objects, then the danger area beneath the hoist must be protected with barriers or by posting safety assistants.
  - c) If the safety precautions described in a) and b) are not appropriate or not relevant or adequate for company reasons, then the user must direct and supervise other or additional safety precautions.
40. Following repairs or modifications, or work carried out within its danger area, the hoist may only be put into service when the user has approved the resumption of operation. Before giving his approval, the user or his representative must satisfy themselves that
- a) the work has definitely been completed
  - b) the complete hoist is in a safe condition
  - c) all personnel involved in the work have cleared the danger area.

**c) General Guidance on Hazards**

The product is designed to be operated on industrial power systems. There are hazardous live

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bare parts and moving/rotating parts in the interior of the product while it is in operation. Serious injury to persons and damage to property may result from

- the prohibited removal of covers
- improper use
- incorrect operation
- inadequate servicing and maintenance.

Failure to observe the safety information given in these instructions may cause injury or even death. The product may constitute a danger to life and limb if it is operated or used by untrained or inadequately trained persons or if it is not operated for its intended purpose.

The user must ensure that his operator and maintenance personnel receive training in good time before they work with or on the product.

Owing to the risk of injury, e. g. from becoming caught or pulled into the product, these personnel must wear no loose clothing, loose long hair or jewelry, including rings (!).

No work of any kind with or on the product may be carried out by persons who are under the influence of narcotics, alcohol or medication which affects their ability to react.

Contact with concentrated acids or alkalis can attack plastic housings and cause dangerous corrosion of metal parts; any parts affected in this way must be promptly replaced. The product must not be used in areas subject to explosion hazards unless specifically prepared for this purpose.

During operation:

All actions specified in the instructions both before, during and after commissioning, and guidance on general safety, especially those affecting operational safety and accident prevention, must be strictly followed; failure to do so may cause accidents with fatal consequences.

The use of prohibited or unsuitable tools or equipment can cause injury. The movement or rotation of parts can cause pinch and/or shear hazards both on the product and between the product and parts of its surrounding area; adequate safety distances from moving or rotating parts should be maintained at all times to prevent persons from reaching into them and clothing, parts of the body or hair from being caught.

Extreme heat (e. g. from welding), sparks produced when using cleaning agents and naked flame in the vicinity of materials that are flammable or which can distort in heat (e. g. wood, plastics, oils, greases, electrical plant or cables) must be avoided, otherwise there is a risk of fire with the release of hazardous gases or damage to insulation etc.



## SECTION II – INSTALLATION

# WARNING

Only qualified personnel properly supervised shall mount the hoist and trolley on the monorail and perform final pre-operation inspection.

### 2-1. GENERAL.

MLER electric hoists are lubricated and tested before being shipped from the factory. To place a hoist in service, adjust appropriately for the beam flange width (Paragraph 2-2), connect to electrical service (Paragraph 2-3) and perform pre-operation tests and checks (Paragraph 2-4).

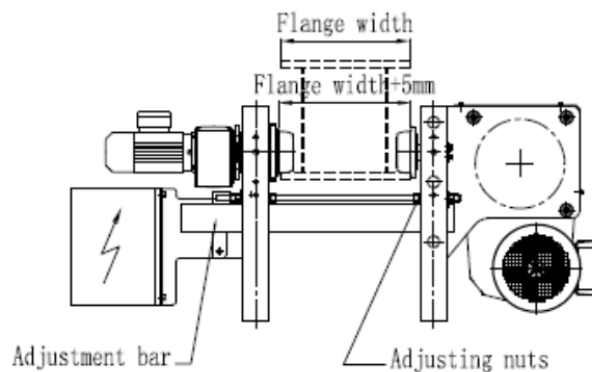
# WARNING

Working in or near exposed energized electrical equipment presents the danger of electric shock.

**TO AVOID INJURY:**

**DISCONNECT POWER AND IMPLEMENT LOCKOUT/TAGOUT PROCEDURE BEFORE REMOVING COVER OR SERVICING THIS EQUIPMENT.**

### 2-2. SUSPENDING HOIST.



**FIGURE 2-1. Trolley Wheel Spacing.**

**a) OPEN-END BEAM:** If the trolley can be installed directly from the end of the supporting beam, adjust the spacing between the trolley wheel flanges to be 5mm greater than the exact width of the beam flange (See Figure 2-1). And the electrical conduit/cable must not be constrained when attempting to adjust the trolley sides in or out.

The trolley width shall be adjusted by loosening the jam nuts on the traverse drive side of the threaded rods at each end of the hoist. If necessary, lubricate the frame alignment bars with penetrating oil before attempting to adjust trolley width. The trolley side may then be pushed

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or driven into position by turning the adjusting nuts on the treaded rods. Adjust nuts on each side of the hoist simultaneously to avoid binding. After adjusting the trolley to the proper width, tighten all adjusting nuts and re-secure the electrical conduit/cable. Verify that the geared wheels mesh properly with the traverse drive pinions. Using proper equipment, carefully lift the trolley and hoist and install on the end of the beam. Lubricate the wheel gear and pinion (**WG**, Section IV, Paragraph 4-3).

## NOTICE

**Loosen all electrical cable or conduit attached to the frame and alignment bars before adjusting trolley width. Ensure that the electrical cable is not stretched, pinched, twisted or otherwise damaged when adjusting trolley width.**

**b) CLOSED-END BEAM:** For trolleys which are to be mounted along the span of a beam not having open ends, the trolley must be adjusted in the same manner as described above to a width that allows clearance between the axles and the beam flange. Using proper lifting equipment, the trolley and hoist must then be lifted to the beam where it is to be installed. Once in position, adjust the spacing between the trolley wheel flanges to be 5mm greater than the exact width of the beam flange (See Figure 2-1). After tightening all adjusting bolts, and all electrical conduit/cable clamps, carefully set the trolley on the beam. Lubricate the wheel gear and pinion (**WG**, Section IV, Paragraph 4-3).

### 2-3. CONNECTING HOIST TO ELECTRICAL SERVICE.

Electrical service to the hoist may be power cable or a guarded system having sliding shoe or wheel type collectors.

## WARNING

**Be certain that electrical power supply is OFF and locked in the open position before attempting any electrical connections to the hoist. This equipment must be effectively grounded according to applicable codes. If the grounding method used is through the trolley wheels, then each section of track must be grounded by metal-to-metal connection to the building ground. Certain environments may prevent proper grounding by this means. In this case a separate grounding conductor should be provided.**

- a) Follow local electrical codes including the grounding provisions thereof when providing electrical service to the hoist.
- b) Make electrical connections using the appropriate wiring diagrams furnished with the hoist. All electrical connections, including connections to collectors or power cord shall be made

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only by qualified electricians.

## CAUTION

Power supply to hoist and trolley must be the same voltage, frequency, and phase that are specified on the hoist and trolley nameplate.

### 2-4. PRE-OPERATION CHECKS.

a) Check Push Button Operation and Phasing. To properly check the phase of the hoist, follow these steps:

- (1) With "POWER OFF" operate all the pushbuttons and determine that they do not bind or stick in any position.

## WARNING

If any push button binds or sticks in any position – DO NOT TURN POWER ON – determine the cause and correct the malfunction before operating.

- (2) Connect hoist to power source.

## WARNING

On three phase hoists it is possible to have "Reverse Phasing" causing the block to lower when the "UP" button is depressed. When this condition exists the automatic limit switch is inoperative and hoist operation will be dangerous.

- (3) Operate "UP" button briefly to determine direction of hook travel.
  - (4) If hook raises when "UP" button is depressed, phasing is correct.
  - (5) If hook **lowers** when "UP" button is depressed, **hoist is "Reverse Phased."** TURN AND LOCK POWER OFF and check the pushbutton wiring. If the pushbutton was wired properly, correct the problem by interchanging any two leads at power source connection. Do not change internal wiring of hoist.
- b) Check Limit Switch Operation.

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## **WARNING**

Damage to the hoist, a dropped load, and injury may result if limit switches fail due to improper use.

**TO AVOID INJURY:**

**UNDER NORMAL OPERATING CONDITIONS, STOP HOIST TRAVEL BEFORE ENGAGING LIMIT SWITCHES. LIMIT SWITCHES ARE SAFETY DEVICES AND SHOULD NOT BE USED AS NORMAL OPERATING CONTROL.**

## **WARNING**

Some hoists may be shipped with the electrical controls loose (disconnected) and will not have the upper and lower limit switches connected. **DO NOT OPERATE HOIST UNTIL LIMIT SWITCHES ARE PROPERLY CONNECTED AND ADJUSTED.** Failure to do so may allow hoist to be operated beyond proper travel limits, which can cause load to drop, resulting in damage to equipment or injury.

(2) A geared rotary type upper and lower limit switch is provided as standard. This switch is adjustable and although roughly preset by the factory, it should be adjusted at time of installation to the desired high and low limits of lower block travel. Refer to SECTION VII, Paragraph 7-2.

d) Check Lower Block and Hoisting Wire rope. Depress "DOWN" push button and run lower block to its lowest position. No less than two wraps shall remain on the drum with the loaded hook in its lowest position. Also check to see that the lower block and rope do not twist excessively. If it does twist to the extent that two ropes rub against each other, disengage the swaged rope end from the frame anchor and twist the rope four or five turns in a direction opposite to that which the block turns. Reconnect rope to the frame anchor, holding firmly to eliminate rope twisting back to its original position. Operate hoist up and down a few times. If lower block still rotates excessively repeat process until twisting is corrected.

e) Lubricate Hoisting Wire rope. For longer wire rope life, it is recommended that the wire rope be lubricated at time of installation by applying a heavy coating of lubricant **CL** (Paragraph 4-7) as outlined in SECTION IV, Paragraph 4-3.

f) When first using the hoist and trolley, operate with lighter loads through full travel before applying maximum load.

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## **SECTION III – OPERATION**

### **3-1. GENERAL.**

Operation of MLER hoists is controlled by a convenient pendant push button station. With it, the hoist can be controlled to give fast lifting and lowering; or controlled to lift or lower the load in small increments, providing accurate spotting. The push button station has a built-in interlock to prevent depressing opposing buttons simultaneously. When first using the hoist, break in by operating under lighter loads to full travel before applying maximum load.

### **3-2. PUSH BUTTON OPERATION.**

- a) Depress push button marked “UP” to raise load.
- b) Depress push button marked “DOWN” to lower load.
- c) Depress push button marked “RIGHT” to traverse one direction.
- d) Depress push button marked “LEFT” to traverse in the opposite direction.

## **CAUTION**

**Excessive “jogging” will cause premature burning of contact tips, motor overheating, and premature brake wear.**

- e) On two-speed hoist or trolley motions, partial depression of a button operates hoist or trolley at slow speed; depressing button completely operates hoist or trolley at full speed.

### **3-3. OPERATING PRECAUTIONS.**

Safe operation of an overhead hoist is the operator’s responsibility. Basic rules listed in **SECTION I** Paragraph 1-3 that can make an operator aware of dangerous practices to avoid and precautions to take for his own safety and the safety of others. Observance of these rules in addition to frequent examinations and periodic inspection of the equipment may save injury to personnel and damage to equipment.

## **WARNING**

**Equipment covered herein is not designed or suitable as a power source for lifting or lowering persons.**

## **WARNING**

**DO NOT operate hoist with the hoisting rope out of the drum grooves. Such operation may result in dropping the load that can cause damage to equipment and injury to operator or other personnel.**

**DO** Use common sense and best judgment whenever operating a hoist.

## SECTION IV – LUBRICATION

### 4-1. GENERAL.

The lubrication services outlined in Paragraphs 4-3 thru 4-6 should be performed before initial operation of the hoist. The lubrication services outlined in Paragraphs 4-2 thru 4-6 should be performed at regular intervals at least every six (6) months, coinciding with spring and fall seasons is recommended. The reason for this is that on hoists installed outside or in unheated areas a “cold test” oil is required in such (below freezing) climates making seasonal changes necessary.

### 4-2. CHANGING GEARBOX OIL.

Gearbox are delivered ready to use with an oil filling. When changing lubricants gearbox housings must be thoroughly cleaned.

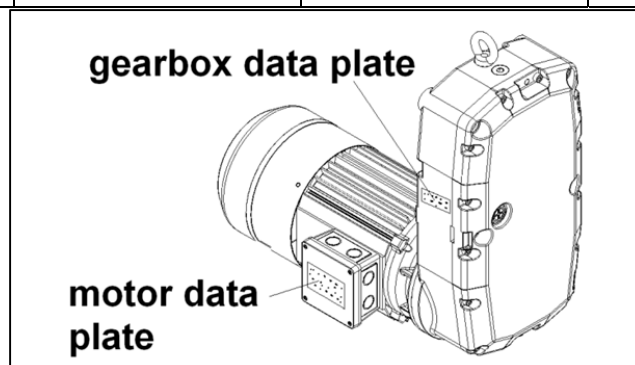
- a) Add 5% solution of Mobilsol A (or equivalent) to the oil and run for a short time. This will clean components and hold particles in suspension for draining.
- b) Remove oil drain plug from bottom of Gearbox and drain oil out. Dispose of oil in accordance with local environmental codes.

**WARNING**

**Avoid skin contact with Mobilsol A. In case of skin contact: dry wipe the skin, cleanse the area with a waterless hand cleaner and follow by washing thoroughly with soap and water.**

- c) Reinstall drain plug.
- d) Remove oil level plug from front of Gearbox cover.
- e) Refill through filler hole to proper level (bottom of oil level plug hole) using GBOT (Paragraph 4-7). The amount of oil required depends on overall size of Gearbox; you can easily find gearbox type in the name plate attached in gearbox, and note the corresponding lubricant quantities on the table below.

Gearbox type	GH3201	GH5000A	GH12500
Lubricant quantities	1400 cm <sup>3</sup>	4000 cm <sup>3</sup>	5000 cm <sup>3</sup>



**FIGURE 4-1. Gearbox type Illustration.**

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**4-3. LUBRICATION OF WIRE ROPE.**

Hoists are shipped from the factory without an exterior coating of grease on hoisting wire rope. It is recommended, where conditions permit, that the wire rope be thoroughly coated at installation and kept well lubricated with **CL** (Paragraph 4-7).

**4-4. LUBRICATION OF LIMIT SWITCH.**

Provide a light film of grease **MPG** (Paragraph 4-7) on bevel gear of rotary geared limit switch.

**4-5. LUBRICATION OF GEARED TROLLEY WHEELS AND PINIONS.**

At installation and periodically apply grease **WG** (Paragraph 4-7) to the traverse drive pinions and the gears of the trolley wheels.

**4-6. LUBRICATION OF ROPE GUIDE**

- a) Maintenance. Once properly installed the following actions are required:
  - (1) Periodically re-grease with **MPG** (Paragraph 4-7) using the grease fitting provided (Figure 5-3, Item 6).
  - (2) Every 6 months the rope guide should be removed per Section V, Paragraph 5-5, cleaned and inspected. When the rope guide is reassembled, the rope guide should be thoroughly greased with **MPG** (Paragraph 4-7) and the hoist run up and down to lubricate both the drum and the wire rope.

**NOTES**

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4-7. LUBRICANT SPECIFICATIONS.

<b>GBOH</b>	<b>Brand</b>	<b>Type</b>
<b>Gear Box Oil Hoist Gear Box</b>	<b>Mobil</b>	<b>SHC 632</b>
	<b>Shell</b>	<b>Gear Oil HDS 460</b>
	<b>Texaco</b>	<b>Pinnacle 320</b>

<b>SG</b>	<b>Brand</b>	<b>Type</b>
<b>Spline grease</b>	<b>Mobil</b>	<b>Mobilux EP111</b>

<b>WG</b>	<b>Brand</b>	<b>Type</b>
<b>Wheel Gear and Ponion Grease</b>	<b>Mobil</b>	<b>Mobiltac 375 NC</b>

<b>WL</b>	<b>Brand</b>	<b>Type</b>
<b>Wire Rope Lubricant</b>	<b>Mobil</b>	<b>Mobilarma 798</b>
	<b>Shell</b>	<b>Tellus 32</b>

<b>GO</b>	<b>Brand</b>	<b>Type</b>
<b>General Oil</b>	<b>Mobil</b>	<b>DTE Oil Heavy</b>
	<b>Shell</b>	<b>Rotella 10W</b>

<b>MPG</b>	<b>Brand</b>	<b>Type</b>
<b>Multipurpose Grease</b>	<b>Mobil</b>	<b>Mobilith AW</b>
	<b>Shell</b>	<b>Retinax LC</b>

<b>GBOT</b>	<b>Brand</b>	<b>Type</b>
<b>Gear Box Oil Traverse Gear Box</b>	<b>Mobil</b>	<b>SHC 632</b>
	<b>Shell</b>	<b>Gear Oil HDS 460</b>
	<b>Texaco</b>	<b>Pinnacle 320</b>



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## SECTION V – INSPECTION AND PREVENTATIVE MAINTENANCE

### 5-1. GENERAL.

All MLERhoists are inspected and tested at the factory. Regular in-service inspection and preventative maintenance programs not only help reduce overall maintenance costs but may also prevent service shutdowns by forewarning of problems that could cause these shutdowns. Regular inspections, periodic minor adjustments, regular cleaning and lubrication and replacement of worn parts can help preserve good performance and operation of your hoist.

Many factors influence the inspection and preventative maintenance program required for your hoist. Frequency and severity of service and material handled, local environmental conditions and various applicable codes are some of the factors that the user must consider to adjust inspection and maintenance program outlined in this section to meet his specific conditions.

The inspection and maintenance services outlined in this section are considered minimum.

Recommended in the schedule are minimum inspection and maintenance intervals based on average daily use in a normal environment. Average daily use is based on 1000 total operational hours per year maximum and intermittent operation of the hoist eight hours per day, five days per week with a maximum 50 percent "on" time and the average loading not exceeding 65 percent of rated load. For more details regarding hoist duty cycles, please reference FEM 9. 683.

Environmental conditions in which the hoist operates are also important considerations for the user when adjusting hoist inspection and maintenance programs to local conditions. Frequency of inspection and maintenance must be increased if hoist is subjected to severe atmospheric environmental conditions, such as corrosive vapors, extreme heat or cold, cement or dust and other airborne contaminants. The user should carefully consider all environmental conditions and adjust frequency and degree of maintenance for his local conditions.

Various codes also regulate inspection and maintenance programs. Attention must be given to applicable local codes which may include mandatory rules relating to hoist inspection and maintenance. The user should become familiar with all applicable codes for his area and be guided accordingly.

Listed on the Recommended Inspection and Maintenance Schedule are inspection frequencies and requirements. Perform these inspections regularly as scheduled and additional inspections as may be required for activity, service, and environment of your hoist. The hoist operator must be responsible for determining the operating conditions and severity of service.

**Inspection Schedule and Maintenance Report Form** show on page 20 of this manual is a recommended Inspection Schedule and Maintenance Report form that lists various components of the hoist. The form also includes trolley components, runway components, and miscellaneous items. This form is suggested as a guide for inspection reports. Inspections are recommended each month and should be performed thoroughly enough to inform the hoist user of deficiencies for any item listed. This form does not supersede the Inspection and Maintenance Schedule listed on

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page 12 of this manual but may be used to record scheduled inspection and maintenance services required. The user should revise the inspection interval, add additional units or provide a similar form to suit particular conditions that may exist. However, written, dated and signed inspection reports should be maintained particularly on critical items such as hoist hooks, hoisting rope, sheaves, drums and brakes. Periodic review of old inspection reports can point out service life of hoist components, forecasting need for adjustment, repair or replacement of these components. As a matter of expedience, appointed maintenance personnel inspecting hoist can also take care of minor adjustments, repairs and cleaning, where required. Note column on Inspection Schedule and Maintenance Report form headed **Corrective Action and Notes**. When corrective action is made during inspection, note condition of part or unit as inspected in appropriate **Condition** column with a check mark (✓). Note "during inspection" corrective action taken and date in space provided. In this manner, items requiring further attention will be checked (✓) without showing corrective action. This will advise the designated person responsible for hoist operation and safety, who reviews the reports that deficiencies exist. The designated person will check all deficiencies as

## **WARNING**

**Deficiencies may be hazardous to personnel and equipment. Do not operate a hoist having deficiencies unless a designated qualified person has determined that these deficiencies DONOT constitute a safety hazard.**

listed and re-examine or otherwise determine whether they constitute a safety hazard.

Written, dated and signed inspection reports for many items are mandatory under local safety codes. It is strongly recommended that the Inspection Schedule and Maintenance Report, shown herein, be completed by a qualified person designated with the responsibility for hoist operation and safety or an inspector appointed by this person. Inspection records can point out the service life of hoist components and help forecast the need for adjustments, repairs, and ordering of replacement parts. File and review these reports after each inspection.

<b>RECOMMENDED INSPECTION AND MAINTENANCE SCHEDULE</b>	
<b>Time interval</b>	<b>Inspection or Maintenance</b>
Daily or start of each shift (visual)	* Check operation of all functional mechanisms including limit switch operation, brakes and control. Check hoist wire rope for kinks, abrasions, corrosion or broken wires or evidence of improper spooling on drum. Inspect hooks, blocks and all load bearing components for damage.
1 Month	* HOIST WIRE ROPE – Inspect per Paragraph 5-6 and lubricate per Paragraph 4-3.
1-3 Months	* ELECTRICAL CONTROLS – Inspect per Paragraph 5-4. Check hoist Gearbox oil level– add oil as required per Paragraph 4-2. e.
6 Months	* LOWER BLOCK –Inspect per Paragraph 5-2. * UPPER BLOCK –Inspect per Paragraph 5-3. * ROPE GUIDE-Inspect per Paragraph 5-5.
6 Months or 500-750 hours “on” time	* Inspect electrical controls per Paragraph 5-4. Change hoist Gearbox oil – Fill with oil per Paragraph 4-2. e. Lubricate wire rope per Paragraph 4-3. Lubricate hook block. Lubricate limit stop lever per Paragraph 4-4. Add a light film of MPG grease (Paragraph 4-7) to the bevel gear in the screw type limit switch.
Annually	* Motor brake and actuating mechanisms. Inspect and adjust per Paragraph 5-10. Inspect hooks with crack detecting procedures per Paragraph 5-2.
3 years	Drain and refill hoist Gearbox per Paragraph 4-2.
5 years or 5000 hours “on” time	* Complete inspection, disassembly, and maintenance required. It is recommended that your MLER repair Station be contacted for this service.

## INSPECTION SCHEDULE AND MAINTENANCE REPORT

HOIST SERIAL NO. (Manufacturer's) _____	CUSTOMER CRANE IDENTITY NO. _____
RATED LOAD _____	LOCATION IN PLANT _____
HOISTTYPE _____	THIS INSPECTION IS: MONTHLY <input type="checkbox"/> ANNUAL <input type="checkbox"/>
VOLTAGE _____	SEMI-ANNUAL <input type="checkbox"/> OR _____
INSPECTED BY: _____	DATE: _____

COMPONENT, UNIT OR PART AND LOCATION		※INSPECTION INTERVAL			CONDITION (Check column best indicating condition when part or unit is inspected. Use note column to the right if condition is not listed below. )						CORRECTIVE ACTION NOTES		
		MONTHLY	SEMI-ANNUAL	ANNUAL	GOOD	ADJUSTMENT	REPAIR	REPLACEMENT	LUBRICATION	CLEANING OR PAINTING			
LOCATION	COMPONENT, UNIT OR PART											DATE	
		HOIST MACHINERY	Motor	<input type="radio"/>									
Motor Brake	<input type="radio"/>												
Gears, Shafts, & Bearings	<input type="radio"/>												
Upper Block	<input type="radio"/>												
Lower Block	<input type="radio"/>												
Hook & Throat Opening	●			★								Record hook throat opening	
Hoist Rope	●												
Rope Drum			<input type="radio"/>										
Rope Guide			<input type="radio"/>										
Limit Switches	<input type="radio"/>												
WIRING & RESISTORS	Pushbutton		<input type="radio"/>										
	Wiring		<input type="radio"/>										
	Hoist		<input type="radio"/>										
	Trolley		<input type="radio"/>										
TROLLEY	Motor	<input type="radio"/>											
	Brake (when so equipped)	<input type="radio"/>											
	Gears, Shafts, & Bearings	<input type="radio"/>											
	Frame			<input type="radio"/>									
	Wheels		<input type="radio"/>										
	Bumpers		<input type="radio"/>										
OTHERS	General Condition		<input type="radio"/>										
	Load Attachment Chains	●											
	Rope Slings & Connections	●											
	Change Gearbox Lubricant			<input type="radio"/>									
	Grounding Faults		<input type="radio"/>										
※ See text for Daily & Weekly Requirements							● Signed & Dated Report						
○ Inspection Interval							★ Magnetic particle or equivalent examination required						

Typical Inspection Schedule and Maintenance Report form.

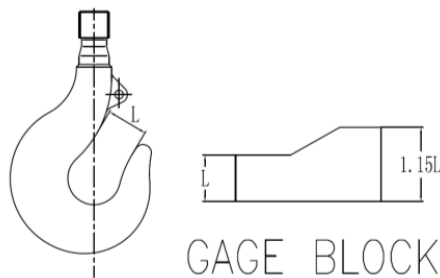
User must adjust Inspection Interval and components to suit his individual conditions and usage.

# WARNING

Do not operate a hoist having unusual vibrations, sounds, or with anything wrong or apparently wrong. Danger may be present that the hoist operator cannot see. Determine and correct the cause of unusual conditions and make certain hoist can be operated safely.

## 5-2. INSPECTION OF LOWER BLOCK.

- a) Check lubrication of all parts. Also lubricate the shank of the hook that passes through the crosshead. If the thrust bearing is removed, apply **MPG** grease (Section IV, Paragraph 4-7).
- b) Check each sheave to insure rope grooves smooth and free from burrs, or other surface defects.
- c) Check each sheave for freedom of rotation; replace bearings if defective.
- d) Make certain that the spring pin holding the hook nut to the hook is securely in position.
- e) If hook is equipped with a hook latch or rotational lock, check to determine that they are in good operating condition.
- f) Check throat opening of the hook. (Refer to Figure 5-2. ) It is recommended that upon receipt of the hoist, a measurement be made and recorded of the hook throat opening. The hook must be replaced if the throat opening exceeds 15 percent of the original opening, or if the hook is twisted more than 10 degrees from the unbent plane. We suggest that a gage block properly identified to the hoist, similar to the one shown in Figure 5-2, be made for each hook for use in these measurements.



**FIGURE 5-2 Gage Block.**

- g) Hooks showing signs of cracks must be replaced. Hooks should be inspected at least once per year using magnetic particle, or other suitable nondestructive test methods.
- h) Check wear of the hook, especially at the saddle and replace if worn more than 10% of original dimensions.

## 5-3. INSPECTION OF UPPER BLOCK.

- a) Check upper block sheaves (when hoist is so equipped) for wear, damage and freedom of rotation. If sheaves do not rotate freely, disassemble block and inspect bearings. Replace

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worn or damaged bearings, washers, pins, or sheaves.

b) Make certain that all sheaves, bearing and hanger pins are free of foreign material.

Bearings without grease fittings are lubricated for the life of the bearing and require no further lubrication.

c) Make certain that the rope retention bolts are not bent, loose or otherwise distorted; bolts must have close clearance to sheave flange to keep rope in sheave grooves.

#### **5-4. INSPECTION OF ELECTRICAL CONTROLS.**

Arrangement of electrical control equipment varies with the type of control, physical space and the optional control features ordered with the hoist. Note the location in the electrical enclosure of the control circuit fuse, transformer, limit stop switches and the hoist contactors. Trolley contactors and optional hoist and trolley fuses are also located in this enclosure. Use wiring diagrams furnished with hoist to determine electrical components on your hoist; then determine component location and identity on your hoist.

## **WARNING**

**Be certain that main power switch is locked in open position (OFF) before opening hinged control enclosure cover mounted to the counterweight.**

a) Open hinged control panel enclosure cover mounted to the counterweight and inspect wiring and terminals. Terminals should be securely crimped to wires and insulation sound. Terminal screws should be tight.

b) Check condition of contactor assembly, transformer, and upper limit switches.

## **WARNING**

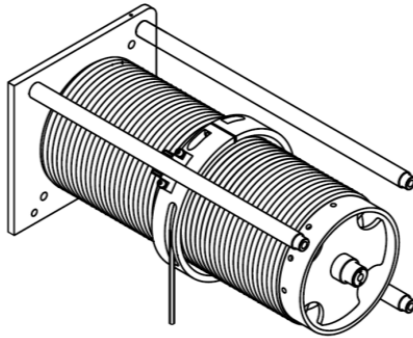
**Check to be certain main power switch is locked in open position (OFF) before removing brake cover.**

#### **5-5. INSPECTION OF ROPE GUIDE.**

a) General. The rope guide is intended to help prevent the rope from "back-winding" and to hold the rope in the proper groove. Side pulling and excessive load swing will severely damage the rope guide and must be avoided.

## **WARNING**

**Side pulling and excessive load swing will severely damage the rope and rope guide. Failure of these components may result in injury.**



**Figure 5-3. Rope Guide Assembly.**

b) Disassembly. Refer to Figure 5-3. For further assistance in locating components refer to the parts list in Section IX.

- (1) Remove socket head cap screws and lock washers. Take off mounting bracket.
- (2) Remove shoulder bolts and compression springs. The two halves of the rope guide body cannot be pulled off the drum separately. When reassembling be sure that the half with the rope slot is on the top half of the drum.

## **WARNING**

**Once shoulder bolts are removed, the halves will separate and, if not properly supported, the halves could fall.**

- (3) Thoroughly clean and inspect all components.
- (4) Follow steps in reverse to reassemble. Be sure to re-grease the rope guide with **MPG** (Paragraph 4-7) after assembling.

### **5-6. ROPE INSPECTION, MAINTENANCE AND REPLACEMENT.**

## **WARNING**

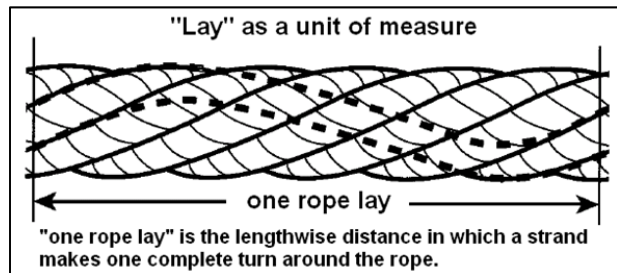
**Wire Rope improperly handled or abused can create a SAFETY HAZARD. Read and comply with inspection, maintenance and replacement information given herein.**

a) Inspection. Wire rope on your hoist is one of the most important components requiring frequent inspection and maintenance. All wire ropes will eventually deteriorate to a point where they are not safe and will require replacement. Wire rope should be thoroughly inspected at regular monthly intervals by an authorized person and a determination made when further use of the rope would constitute a safety hazard. Each inspection should include a written dated and signed report of rope condition. Reports should be filed and reviewed each month and any rope deterioration carefully noted. Inspections revealing but not limited to the following conditions should

cause inspector to question remaining strength of rope and consider replacement:

- (1) Eight ("A" Frame) or eighteen ("B" and "C" Frame) randomly distributed broken wires in one strand. (See Figure 5-4)
- (2) Wear of one-third of the original diameter of outside individual wires.
- (3) Kinking, crushing, or bird caging.

Figure 5-4. Description of One



Rope Lay.

- (4) Heat damage from any cause.
- (5) Reductions from nominal diameter of more than 1/7 of the rope. See figure 5-5 for proper measurement techniques.

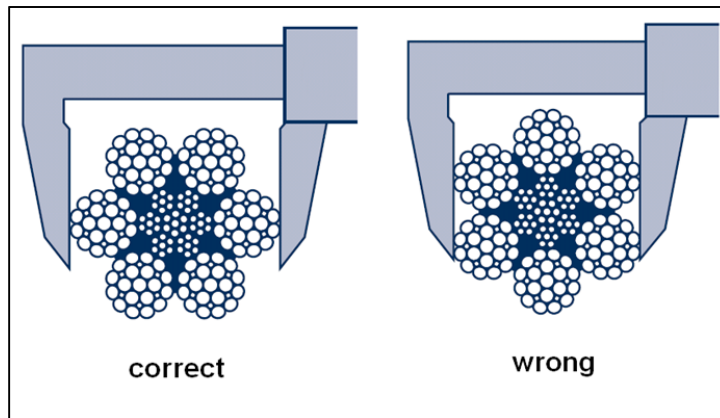


Figure 5-5. Correct Method of Measuring Rope.

- (6) Rope corrosion, internal or external.
- (7) Effects from improper lubrication.
- (8) Rope being idle for one month or more due to shut down or inactivity. Special attention should be exercised when inspecting rope normally hidden during inspecting procedures. Please refer to the Wire Rope User's Manual—for illustrations and definitions when following the above guidelines for rope inspection. This manual may be obtained from MAXLOAD CRANES & HOISTS.

b) Maintenance. Keep rope well lubricated to help reduce internal friction and prevent corrosion. Lubricant, as described in Paragraph 4-3, should be applied as a part of the regular maintenance program. Special attention is required to lubricate sections of rope over equalizing sheaves and other hidden areas. Avoid dragging ropes in dirt or around sharp objects that will scrape, nick, crush, or induce sharp bends in the rope.

## WARNING

Use only factory-approved rope with waded wire rope socket.



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c) Replacement. When recommended by an authorized inspector, the rope should be replaced. Replacement rope assemblies are shipped from the factory carefully coiled to prevent damage by kinking. Care must be taken to avoid twisting or kinking when uncoiling and handling during reeving. Before replacing rope, check condition of grooves in sheaves and drums to determine if they are excessively worn. When first using hoist after rope replacement, break in rope by operating under lighter loads to full travel before applying maximum load.

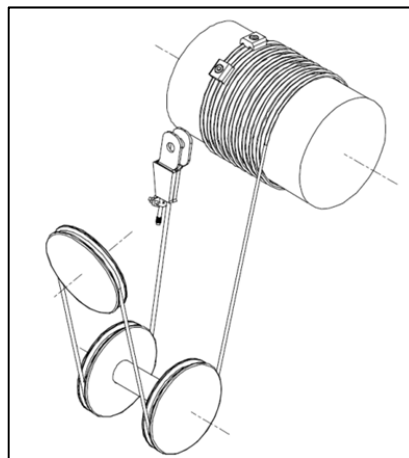
#### **5-7. ROPE REEVING.**

a) General. Place reel on stand with shaft through the center of reel so rope can be pulled straight out with reel rotating.

## **CAUTION**

**It is imperative that rope reel or coil rotates as rope unwinds. If coil or reel does not rotate the wire will be twisted as it is uncoiled and kinking will result. A kinked rope may be damaged and unsafe for maximum service.**

b) Before removing the old rope, refer to reeving diagram, Figure 5-6. To assist with re-reeving your hoist, refer to the reeving diagram and corresponding paragraph that describes the reeving procedure.



**FIGURE 5-6. Reeving Diagram – 4 Part Single-Reeved.**

c) Removing old rope. Please, refer to the Section IX Parts lists to assist in locating components referred to in the following paragraphs.

- (1) Lower the lower block to a scaffold 2 meters below hoist to relieve tension on wire rope. (Lower block may be lowered to the floor if desired; however, to handle less weight and for ease of reeving, adequate scaffold below the hoist is recommended. )

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## CAUTION

**Be certain all personnel are clear of hoist as components, hardware, and wire rope are removed from hoist.**

- (2) Disconnect geared limit switch.
- (3) Remove retaining rings from lower blocksheave pin.
- (4) Remove outer lower block sheavecovers.
- (5) Remove lower block sheaves and wire rope.
- (6) Remove two (2) rope retention bolts and nuts from upper block yoke.
- (7) Remove two (2) bolts and key plate to allow removal of upper block sheave pin.
- (8) Securely grasp the upper block sheave before carefully sliding the sheave pin out. Note that two spacers will also be released as the pin is removed.
- (9) Remove wire rope from sheave.
- (10) Remove retaining rings or cotter pins from dead end anchor pin. Securely grasp the swaged wire rope and, in some cases, spacers before removing the pin.
- (11) Remove Rope Guide.
- (12) Make certain all personnel are clear of hoist and operate hoist "DOWN" to completely unwind all wire rope from drum. Stop hoist so all rope clamps are accessible. Remove rope clamps and wire rope from drum.

## WARNING

**Winding rope on rope drums with power can be hazardous. Keep hands safe distance from drum; wear gloves and use extreme care when winding rope.**

### d) Installing new rope.

- (1) Thread rope to drum from trolley frame side then secure with rope clamps as follows:
  - (a) Make sure that the rope clamp groove size utilized as marked directly above the groove matches the rope size for your hoist.
  - (b) With the rope lying in the bottom of the drum groove, begin by tightening the rope clamp at the tail end of the rope.
  - (c) With tension on the rope keeping it properly seated in the drum groove, torque the remaining two (2) rope clamps in sequence.
- (2) With all personnel clear of hoist – TURN ON POWER.
- (3) Operate hoist "UP" guiding six (6) wraps of new rope into drum grooves with gloved hand.
- (4) Re-install rope guide over rope in rope drum grooves as shown in Figure 5-3. and outlined in Section V, Paragraph 5-6. Continue lubricating as rope is spooled onto the drum until about

8 meters remain unwound.

(5) With outer lower block covers removed, thread the wire rope through the sheaves of the upper and lower block as shown in Figure 5-6.

(6) Attach swaged rope end to the dead end anchor pin fastening cotter pins or retaining rings as required.

(7) Replace the lower block sheave covers.

(8) Lubricate wire rope per Paragraph 4-3.

c) Checking for and removal of rope twisting.

(1) To remove rope twist in four part single reeved hoists:

(a) Observe direction block tends to rotate.

(b) Lower the block to a low position and TURN OFF (lock out) POWER.

(c) Remove swaged fitting from anchor pin and rotate rope several turns in a direction tending to correct block rotation.

(d) TURN ON POWER; raise and lower the block several times to feed the correcting twist in the rope through the reeving.

#### 5-8. INSPECTION OF ROPE DRUM AND SHAFT.

a) To remove the rope drum, remove the rope guide and hoisting wire rope, as outlined in Section V, Paragraphs 5-5. and 5-7. c. respectively.

## WARNING

The hoist must be removed from service and placed on the ground for any maintenance that requires removal of the output shaft assembly or drum.

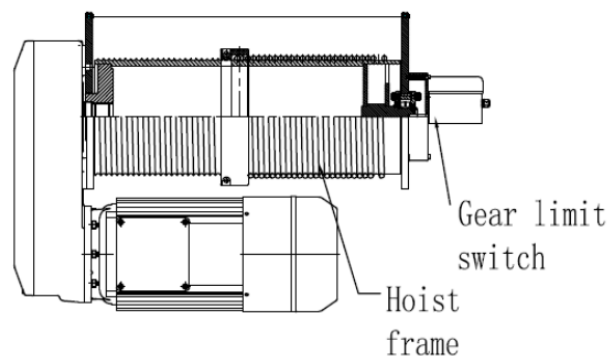


Figure 5-7. Drum Frame & Geared Limit Switch.

b) Remove the Geared Limit Switch or disconnect the wires so that the electrical cable will not inhibit removal of the drum. (See Figure 5-7).

c) Remove the unit from service, place it on the ground, and provide adequate means to support the drum before removing the frame rod nuts at the outboard drum frame end (Figure 5-7). The

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hardware attaching the drum frame to the hoist and trolley frame may then be removed.

d) Keeping the drum level, remove the drum from the splined output shaft at the gear box end.

### 5-9. INSPECTION OF HOIST GEARING.

a) General. The hoist gear box is a triple reduction splash lubricated vertically split cast aluminum box and cover. The first two high-speed reductions are helical and the third low speed output reduction is spur. The gear shafts are supported with ball bearings housed in the back of the box and in the cover. The input helical pinion is cut directly into the motor shaft. An oil seal housed in the gear box at the motor input seals the motor shaft as it passes into the gear box. Since the entire motor shaft is submerged in oil, anytime the motor is removed, the oil must be drained from the gear box. All pinions are integral with their shafts while the gears are keyed and pressed onto their shafts. The output shaft passes through an oil seal in the back of the gear box and drives the drum by means of a crowned spline. One end of the rope drum is supported on this output shaft.

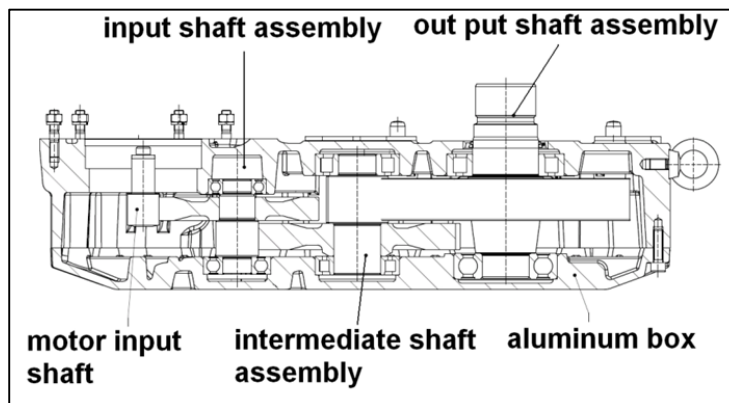


Figure 5-8. Hoist Gearbox Assembly.

b) Inspection and Disassembly.

#### Gearbox.

- (1) Lower hook block to the floor and relieve all load from ropes.
- (2) Make sure power to hoist is off and locked out.

## **WARNING**

**Before disassembly, prevent rope drum from free spinning by wedging drum in place with a block of wood, and resting lower block on work surface so all weight is off rope drum. Rope may also be removed from hoist drum.**

- (3) Drain the oil from the gear box per Section IV, Paragraph 4-2.
- (4) Provide adequate means to support the gear box cover. Once the cover is supported, remove all bolts, screws and washers holding the cover to the gear box. Carefully draw the cover directly away from the gearbox, as damage to this surface will prevent the gasket from

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sealing properly. As the cover is removed, ensure that all gear and shaft assemblies remain in the box.

## **WARNING**

**The hoist must be removed from service and repaired on the ground for any maintenance that requires removal of the output shaft assembly or drum.**

(5) If it is necessary to remove the output shaft assembly from the gear box, the rope drum must first be removed from the hoist. See Section V, Paragraph 5-7.

## **WARNING**

**If output shaft assembly is pulled out of the gear box with the cover, it will disengage from the drum allowing the drum to drop. Be certain all shaft assemblies stay in the box.**

Only once the output shaft is free of the rope drum, can the output shaft assembly be safely removed from the gear box. Provide an adequate means to support this shaft and gear assembly before removing.

(6) The pinion shaft and gear assemblies may be removed as necessary.

(7) Inspect all gears, pinions, bearings, and the output shaft spline for wear, pitting, or mechanical damage. Replace as necessary. See Section IX, Figure 9-2 for replacement parts. It is recommended that gears and pinions only be replaced as sets. Thoroughly clean the output shaft external spline teeth before reassembly.

(8) Assembly is opposite of removal. Use a new gasket. Do not attempt to assemble the cover to the gear box without a gasket, as the spacing between bearings will be reduced. Severe damage to the hoist will occur if no gasket or the wrong gasket is used. Refill gear box with new lubricant per Section IV, Paragraph 4-2 before use. Using **SG** (Paragraph 4-7), grease the spline teeth on the output shaft before reinstalling rope drum.

(9) Test hoist per Section V, Paragraph 5-13 to ensure proper lubrication.

### **Hoist Motor.**

(1) Lower hook block to the floor and relieve all load from ropes.

(2) Make sure power to hoist is off and locked out.

(3) Drain the oil from the gear box per Section IV, Paragraph 4-2.

(4) Disconnect the wiring and conduit from the motor junction box.

(5) Provide a means to support the hoist motor. And it must be held level while removing and installing.

(6) Once the motor is properly supported, remove the hardware fastening it to the gear box.

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Carefully withdraw the motor horizontally straight out from the gearbox. Do not tip or move the motor from side to side.

(7) Replace the motor shaft seal using an appropriate seal driver. It is recommended that a new seal be installed each time the motor is removed from the box.

**IMPORTANT!**

(8) Before installing the motor, pack the gear teeth with **MPG** grease (Paragraph 4-7) and wrap the gear teeth with a number of layers of Teflon tape to protect the seal lip from being damaged by the gear teeth. Coat the seal lip and the motor shaft with **MPG** grease.

**NOTICE**

**Failure to use a factory replacement seal will cause premature seal failure due to specific lip material requirements that must be met.**

(9) Install the motor to the gear box. The motor shaft must be in line with the seal bore and perpendicular to the mounting surface before attempting to insert the shaft through the seal. The motor shaft must remain horizontal and not rock up and down or side-to-side while installing the motor or seal damage will occur. It may be necessary to rotate the rope drum slightly to align the gear teeth to mesh with the teeth on the motor shaft. Ensure that the motor seats properly into the rabbet fit machined in the gear box. Fasten the motor to the gear box.

(10) Reconnect the conduit and power leads to the motor. See Section VIII and refer to the specific wiring diagrams shipped with your hoist.

(11) Refill gear box with lubricant per Section IV, Paragraph 4-2.

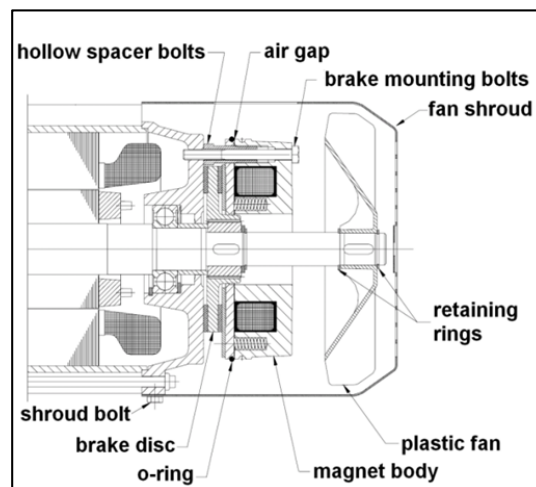
(12) Test hoist to ensure proper operation per Section V, Paragraph 5-13.

**5-10. INSPECTION OF MOTOR BRAKE AND ACTUATING MECHANISM.**

a) General Operation. The hoist brake is an electro-magnetically released, spring set non-adjustable brake. Torque is generated by compressing a friction disk between the stationary motor end bell and the spring loaded brake armature. The friction disk is fixed to the motor shaft and rotates with the motor shaft. When the magnet coil is energized, the armature plate is pulled

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across the air gap. The friction disk is carried by a splined hub that permits axial movement when



the brake is released. This axial movement releases both sides of the friction disk from their mating stationary surfaces and allows the friction disk to rotate freely when the brake is energized. When power is removed from the magnetic coil, the compression springs push the armature against the friction disk and the other side of the friction disk against the motor end bell generating the torque necessary to stop the hoist machinery and hold the load. It will be necessary to compensate for the friction disk wear when a greater amount of hook movement (drift) is noticed when stopping. There is no torque adjustment of the brake. Friction disk wear can only be compensated for by resetting air gap.

**Figure 5-9. Motor Brake**

b) Friction Disk Inspection and Air Gap Adjustment.

- (1) Lower hook block to the floor and relieve all load from ropes.
- (2) Make sure power to the hoist is off and locked out.
- (3) Remove the four (4) bolts attaching the fan shroud to the motor and remove the fan shroud. See Figure 5-9.
- (4) Carefully roll the large O-ring from the groove over the air gap back toward the magnet body. Do not excessively stretch this O-ring.
- (5) Measure the air gap using feeler gages. If the air gap exceeds the maximum value shown in Table 5-1, the air gap must be reset.
- (6) To measure the thickness of the friction disk, it is necessary to remove the brake body from the motor end bell. Remove the three brake mounting bolts and draw the brake body away from the friction disk. Carefully set the brake body down on the motor shaft directly in front of the fan. Draw the friction disk away from the end bell and measure the thickness over the friction surfaces. If the friction disk thickness is less than the minimum shown in Table 5-1, it must be replaced. See Section IX, Figure 9-10. If the friction disk thickness is within the allowable, reassemble the brake body to the motor end bell and torque the mounting bolts

to the value shown in Table 5-1. Reset the air gap whenever the friction disk is replaced.

Hoist	"3" Frame	"4" Frame	"5" Frame
Mounting Bolt Torque	10 Nm	25 Nm	25 Nm
Nominal Air Gap	0.3 mm	0.3 mm	0.4 mm
Maximum Air Gap	0.9 mm	1.0 mm	1.1 mm
Minimum Brake Disk Thickness	9.5 mm	11.5 mm	12.5 mm

**Table 5-1. Motor Brake Data.**

(7) To reset the air gap, begin by releasing the (3) mounting bolts 1/2 turn. Turn the hollow spacer bolts into the magnet body approximately 1/4 turn. Retighten all three mounting screws. Measure the air gap at a minimum of three places around the circumference. Threading the hollow spacer bolts into the magnet body will decrease the air gap while backing these spacer bolts out of the magnet body will increase the air gap. Repeat this step as necessary until the required air gap is achieved. The air gap must be the same all the way around the brake. Once the air gap is correct, torque the mounting bolts to the value shown in Table 5-1.

(8) Replace the large O-ring over the air gap and reassemble the fan shroud to the motor.

(9) Test hoist per Section V, Paragraph 5-13 to ensure proper brake operation.

c) Brake Disassembly.

(1) Lower hook block to the floor and relieve all load from ropes.

(2) Make sure power to the hoist is off and locked out.

(3) Remove the four (4) bolts attaching the fan shroud to the motor and remove the fan shroud. See Figure 5-9.

(4) Remove the snap ring behind the plastic fan. Carefully remove the fan from the motor shaft. Remove the snap ring in front of where the fan was mounted.

(5) Disconnect the two wires from the terminal block on the magnetic body.

(6) Remove the three mounting bolts that attach the brake body to the motor end bell and remove the brake body from the motor. Remove the friction disk from the motor shaft.

(7) Clean and inspect all components and working surfaces. Replace all damaged or worn components as necessary. Measure friction disk thickness and replace if less than the minimum thickness shown in Table 5-1.

d) Brake Re-assembly.

(1) Install the friction disk on the splined hub. The friction disk must slide on the splined hub and seat against the end bell of the motor.

(2) Install the brake body to the motor end bell using the three (3) mounting bolts. The air gap must be reset as described in Section V, Paragraph 5-10. b. Torque the mounting bolts to the values shown in Table 5-1. Install the large O-ring in the groove over the air gap. Ensure this O-ring is not pinched in the air gap.

(3) Connect the brake leads to the terminal block on the brake body.



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(4) Install the forward fan mounting retaining ring and install the fan. Install the rear retaining ring. Install the fan shroud and bolts.

(5) Test hoist per Section V, Paragraph 5-13.

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### 5-11. INSPECTION OF HOIST TRAVERSE DRIVE.

- a) General. The traverse drive consists of four single flange wheels, two on each side of the beam, carried directly by the hoist frame. These wheels rotate on sealed ball bearings supported by fixed pins. Pinions drive two opposing wheels with gear teeth cut into the flange.
- b) Ensure that the hoist is properly fitted to the beam. The hoist must be centered on the beam with clearance between the sides of the bottom of the beam flange and the inside faces of the wheel flanges. Proper clearance must exist along the entire length of beam that the hoist can traverse. An amount of 60mm to 70mm clearance per side is recommended for a total of 5 to 6mm wider than the beam flange. If too little or too much clearance is determined, adjust trolley per Section II, Paragraph 2-2.

## CAUTION

**Ensure that the cross shaft is properly positioned and locked into place by means of the clamp collars. Failure to do so may allow the drive shaft to contact the rope on the rope drum or the hoist Gearbox.**

- c) Inspect wheel treads, flanges, and gear teeth for wear. Check for adequate lubrication (**WG**, Section IV, Paragraph 4-7) on the wheel gear and pinion mesh. Check wheel bearings for any signs of wear, including rough rotation and signs of lubricant leakage. Replace all damaged or missing items. Wheels must always be changed in opposing pairs and drive wheels should be changed when the drive pinions are replaced.
- d) Examine the drive pinions. Check pinions for gear tooth wear and proper alignment with wheel gear. Drive pinions must be replaced as sets and should be replaced along with the drive wheels.
- e) Inspect the traverse gearbox and motor. Look for signs of rough operation, mechanical damage or lubricant leaks. Inspect the hollow bore and hexagonal drive shaft for wear. Verify that the four bolts that hold the gearbox to the trolley frame and the four bolts that hold traverse motor to the gearbox are all present and tight. Replace and tighten as necessary. The factory recommends complete replacement of the traverse gearbox. However, gearbox service may be available from your local authorized MAXLOAD CRANES & HOISTS repair center.

### 5-12. TESTING GEARED LIMIT SWITCH.

- a) General. The rotary geared limit switch is the primary upper limit switch and must be tested before operation.

Test the geared limit switch by raising the lower block until it stops. Ensure that the geared limit switch stopped the hoist. If this is not the case see Section VII, Paragraph 7-2 for adjusting the geared limit switch. Replace geared limit switch cover when testing and adjusting is complete.

### 5-13. TESTING HOIST.

a) Before placing hoist in service, hoist should be tested to insure safe operation when hoist has been disassembled and reassembled. To test, suspend hoist from an overhead supporting member of sufficient strength to support the weight of the hoist and the rated load. Connect hoist to power supply as shown on hoist nameplate and perform the checks listed in b) and c) below.

b) Check hoist as outlined in PREOPERATIONCHECKS, SECTION II, Paragraph 2-4.

c) Check hoist with rated load.

(1) Attach rated load to lower hook.

(2) Depress "UP" push button and raise load. When push button is released, hoist should stop immediately and hold load at that level.

(3) Depress "DOWN" push button, lower load a short distance and release button. Hoist should stop immediately and hold load at that level.

**NOTE:**

If load drifts downward slowly in step 2 or 3 above, motor brake requires adjustment – see Motor Brake Adjustment – SECTION VII, Paragraph 7-1.

**5-14. Recommended tightening torques.**

Item	Tightening torque			
	Class 8. 8		Class 10. 9	
	(Nm)	(Ft lb)	(Nm)	(Ft lb)
<b>M4</b>	2. 7	2. 0	4. 0	2. 9
<b>M5</b>	5. 4	4. 0	7. 9	5. 8
<b>M6</b>	9. 3	6. 8	14	10. 3
<b>M8</b>	23	17	33	24
<b>M10</b>	45	33	66	48. 5
<b>M12</b>	77	56. 6	115	84. 6
<b>M14</b>	125	92	180	132
<b>M16</b>	190	140	280	206
<b>M18</b>	275	202	390	287
<b>M20</b>	385	283	550	404
<b>M22</b>	530	390	750	552
<b>M24</b>	660	485	950	699
<b>M27</b>	980	721	1400	1030
<b>M30</b>	1350	993	1900	1398

It is recommended that the self-locking nut(Nylon nut) is replaced always when removed.

## SECTION VI – TROUBLE SHOOTING

**6-1.** This section contains possible causes and solutions to common hoist problems. Please attempt to remedy your hoist problems by following these steps before contacting the factory. Whenever servicing electrical components be sure to shut off and lock out power following proper lock out/tag out procedures.

# WARNING

**Working in or near exposed energized electrical equipment presents the danger of electric shock.**

**TO AVOID INJURY:**

**DISCONNECT POWER AND IMPLEMENT LOCKOUT/TAGOUT PROCEDURE BEFORE REMOVING COVER OR SERVICING THIS EQUIPMENT.**

SECTION VI – TROUBLE SHOOTING		
TROUBLE	PROBABLE CAUSE	REMEDY
6-1 Hoist Will Not Operate.	<ul style="list-style-type: none"> <li>a. No power to hoist.</li> <li>b. Wrong Voltage.</li> <li>c. Loose or broken wire connections in hoist electrical system.</li> <li>d. Contactor assembly not functioning.</li> <li>e. No control voltage.</li> <li>f. Motor burned out.</li> </ul>	<ul style="list-style-type: none"> <li>a. Check switches, circuit breakers or fuses and connections in power supply lines. Check power collectors.</li> <li>b. Check voltage required on motor data plate against power supply.</li> <li>c. Shut off and lock out power supply; remove electrical cover on hoist and check wiring connections. Also check connections in pushbutton station and limit switches.</li> <li>d. See that necessary jumper wires are properly installed. Verify that the contactor armatures are free to move. If binding occurs, replace contactor. Check for burned out contactor coils.</li> <li>e. Check transformer fuse. If blown, check for grounding and/or shorts in the push button station. Check the transformer coil for signs of overheating. Replace transformer if burned out. Verify the transformer secondary is the same voltage as the coils to which it is connected.</li> <li>f. Replace motor. Check input power supply. Check hoist motor connections.</li> </ul>

**SECTION VI – TROUBLE SHOOTING**

<b>TROUBLE</b>	<b>PROBABLE CAUSE</b>	<b>REMEDY</b>
6-2 Hook Moves in Wrong Direction.	<ul style="list-style-type: none"> <li>a. Reverse phasing on three phase hoists.</li> <li>b. Hoist wired incorrectly.</li> </ul>	<ul style="list-style-type: none"> <li>a. Interchange any two power supply line leads. Refer to Section II, Paragraph 4. b.</li> <li>b. Check wiring connections with appropriate wiring diagram.</li> </ul>
6-3 Hook Will Raise But Not Lower.	<ul style="list-style-type: none"> <li>a. Lower electrical circuit open.</li> <li>b. Contactor assembly not functioning</li> <li>c. Down, push button is inoperative.</li> </ul>	<ul style="list-style-type: none"> <li>a. Check for loose connections. See that necessary jumper wires are properly installed on contactor.</li> <li>b. See that necessary jumper wires are properly installed. Verify that the contactor armatures are free to move. If binding occurs, replace contactor. Check for burned out contactor coils.</li> <li>c. Check push button contacts and wires.</li> </ul>
6-4 Hook Will Lower, But Not Raise.	<ul style="list-style-type: none"> <li>a. Excessive load.</li> <li>b. Hoist electrical circuit open.</li> <li>c. Contactor assembly not functioning.</li> <li>d. Up, down button inoperative.</li> </ul>	<ul style="list-style-type: none"> <li>a. Reduce loading to rated load of hoist as shown on nameplate.</li> <li>b. Check for loose connections. See that necessary jumper wires are properly installed on contactor.</li> <li>c. See that necessary jumper wires are properly installed. Verify that the contactor armatures are free to move. If binding occurs, replace contactor. Check for burned out contactor coils.</li> <li>d. Check push button contacts and wires.</li> </ul>
6-5 Hoist Will Not Lift Rated Load.	<ul style="list-style-type: none"> <li>a. Low voltage.</li> </ul>	<ul style="list-style-type: none"> <li>a. See that the power supply current is the same voltage listed on motor data plate. Check hoist motor connections. Check size of power supply lines.</li> </ul>
6-6 Hoist Motor Overheats.	<ul style="list-style-type: none"> <li>a. Excessive load.</li> <li>b. Excessive duty-cycle.</li> <li>c. Wrong voltage or frequency.</li> <li>d. Defective motor or worn bearings in hoist frame.</li> <li>e. Brake not adjusted properly.</li> </ul>	<ul style="list-style-type: none"> <li>a. Reduce loading to rated load as shown on nameplate.</li> <li>b. Reduce frequency of lifts or amount of jogging.</li> <li>c. Check current rating on motor data plate against power supply. Check hoist and inspect for defective, worn or damaged parts.</li> <li>d. Disassemble hoist and inspect for defective, worn or damaged parts.</li> <li>e. Adjust brake per Section VII, Paragraph 7-1.</li> </ul>
6-7 Load Drifts Excessively When Hoist is Stopped.	<ul style="list-style-type: none"> <li>a. Excessive Load.</li> <li>b. Motor brake not holding.</li> </ul>	<ul style="list-style-type: none"> <li>a. Reduce loading to rated load as shown on nameplate.</li> <li>b. With No Load, check hoist for drift. If drifting is excessive, inspect motor brake (Section V, Paragraph 5-10) and adjust as outlined in Section VII, Paragraph 7-1.</li> </ul>

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**SECTION VI – TROUBLE SHOOTING**

<b>TROUBLE</b>	<b>PROBABLE CAUSE</b>	<b>REMEDY</b>
6-8 Hoist Operates Intermittently.	a. Collectors make poor contact.  b. Loose connections.	a. Check collectors for free movement of spring arm, weak spring or electrical connections.  b. Check all wiring for loose connections.

## SECTION VII – ADJUSTMENTS

**7-1. MOTOR BRAKE ADJUSTMENT.** These brakes are designed so that adjustment is seldom required. If, after a period of service, the load hook “drifts” downward more than usual for your hoist before coming to a stop, the motor brake may require adjustment to compensate for brake disc wear.

# WARNING

**Check to be certain main power switch is locked in open position (OFF) before removing brake cover.**

Refer to Figure 5-9 and proceed as outlined in Section V, Paragraph 5-10.

### 7-2. GEARED ROTARY LIMIT SWITCH ADJUSTMENT.

The geared rotary type limit switch is standard equipment and is located on the drum end opposite the Gearbox end.

The geared limit switch consists of a gearbox and switch combination which is located within a housing. The switching point adjustment of each contact is infinitely made on the cam disc (1) by means of a self- locking worm gear (2).

The switching point distance is infinitely adjustable within the range of usable revolutions. One revolution of the controllable worm corresponds to a revolution of  $2,464^\circ$  of the cam disc. The adjustment can be made in both directions. The switching points are independently adjustable. Locking of any parts after adjustment is not necessary. Instructions for adjusting limit switch are inside cover and are repeated below (see Figure 7-1).

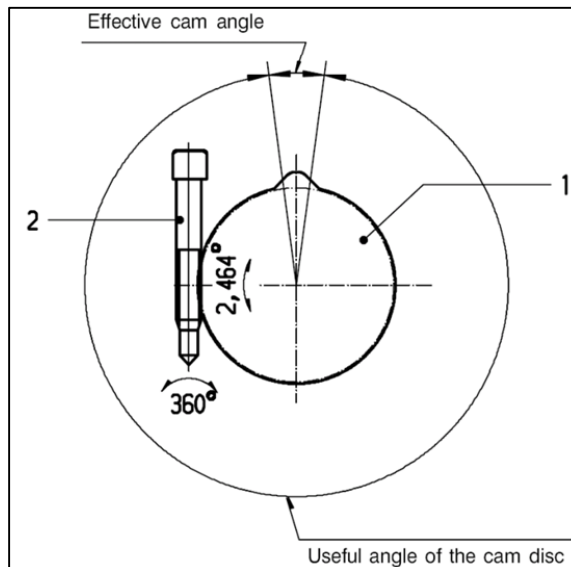


Figure 7-1. Geared Limit Switch Adjustment

# WARNING

**Check limit switch operation carefully, without load, before placing hoist in service. If misadjusted, SEVEREDAMAGE AND/OR A DROPPED LOADCOULD RESULT. Allow 800mm for hook drift in both directions. Never allow less than three (3) complete wraps of rope on drumwith hook in lowest position.**

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## **WARNING**

**Be certain that electrical power supply is OFF and locked in the open position before removing limit switch cover.**

### **7-3. SHORTENING OF PUSHBUTTON CABLE.**

## **WARNING**

**Be certain that electrical power supply is OFF and locked in the open position before attempting shortening of pushbutton cable.**

- a) Loosen screws at cable connectors and clamps at top of cable.
- b) Adjust steel support cable to proper length and tighten screws.
- c) Loosen upper cable grip and pull excess cable into connection box at hoist.
- d) Tighten cable grip and cut off excess cable.
- e) Strip cable sheath and connect wires with the same type of terminals previously furnished (care must be taken to match previous wire color coding with wire markers in accordance with wiring diagram furnished with hoist. )



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**SECTION VIII – WIRING DIAGRAMS**