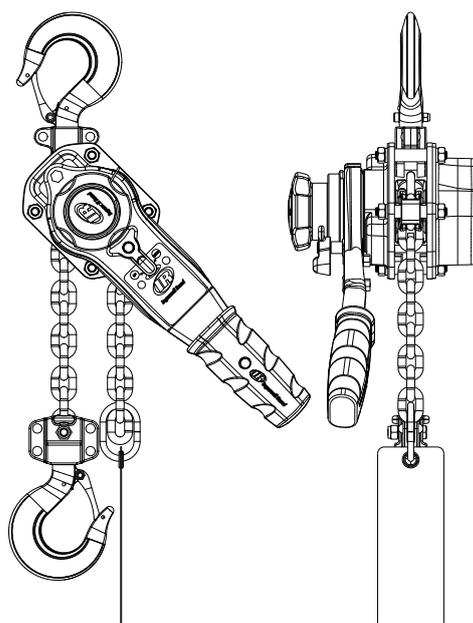


# Product Maintenance Information



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## Lever Chain Hoists KL Series



(Dwg. MHP3278)



**Save These Instructions**



Form 48496368  
Edition 1  
September 2012  
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Only allow **Ingersoll Rand** trained technicians to perform maintenance on this product. For additional information contact **Ingersoll Rand** factory or nearest Distributor.

**For additional supporting documentation refer to Table 1 'Product Information Manuals' on page 2. Manuals can be downloaded from <http://www.ingersollrandproducts.com>.**

The use of other than genuine **Ingersoll Rand** replacement parts may result in safety hazards, decreased performance and increased maintenance and will invalidate all warranties.

Original instructions are in English. Other languages are a translation of the original instructions. Refer all communications to the nearest **Ingersoll Rand** Office or Distributor.

**Table 1: Product Information Manuals**

Publication	Part/Document Number	Publication	Part/Document Number
Product Safety Information Manual	48488993	Product Information Manual	48488878
Product Parts Information Manual	48489009		

## INSPECTION

Frequent inspections should be performed on equipment in regular service. Refer to Product Information Manual.

### ■ Periodic Inspection

Refer to Table 2 'Inspection Classifications' on page 2 for suggested inspection classifications for Periodic Inspection Intervals. Select conditions most appropriate to application.

**Table 2: Inspection Classifications**

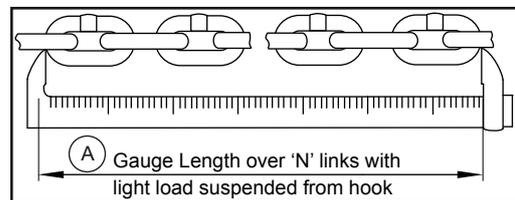
Conditions	Usage	Load Characterization
<b>Normal</b>	<=25% duty cycle	Regular
<b>Heavy</b>	>25% duty cycle	Usually medium loads, frequent maximum loads
<b>Severe</b>	Loads normally less than 50% of rated load with running time up to continuous; or, Loads normally above 50% of rated load with running time up to 50% of work period.	

Maintain written records of periodic inspections to provide an accumulative basis for continuing evaluation. Inspect all items listed in 'Frequent Inspection' in the Product Information Manual. Also inspect the following at the suggested intervals recommended in Table 5 'Periodic Maintenance/Inspection Interval' on page 3.

- Fasteners.** Check rivets, capscrews, nuts, cotter pins and other fasteners on hooks and hoist body. Replace if missing and tighten or secure if loose.
- All Components.** Inspect for wear, damage, distortion, deformation and cleanliness. If external evidence indicates the need, disassemble. Check gears, shafts, bearings, sheaves, chain guides, springs and covers. Replace worn or damaged parts. Clean, lubricate and reassemble.
- Hooks.** Inspect hooks for cracks. Use magnetic particle or dye penetrant to check for cracks. Inspect hook retaining parts. Tighten, repair or replace if necessary. Refer to the latest edition of ASME B30.10 (Hooks) for additional hook inspection information.
- Load Chain Sprocket.** Check for damage or excessive wear. Replace if necessary. Observe the action of load chain feeding through hoist. Do not operate a hoist unless load chain feeds through hoist and hook block smoothly and without audible clicking or other evidence of binding or malfunctioning.
- Brake.** Ensure proper operation. Brake must hold hoist rated capacity. If load test indicates the need, disassemble. Brake discs must be free of oil, any grease, unglazed and uniform in thickness. Refer to "MAINTENANCE" section for allowable brake disc wear. Check all other brake surfaces for wear, deformation or foreign deposits. Inspect gear teeth, pawl and pawl spring for damage. Check that brake pawl stops counterclockwise rotation of ratchet gear. Clean and replace damaged components as necessary.
- Supporting Structure.** Check for distortion, wear and continued ability to support hoist and rated load.
- Labels and Tags.** Check for presence and legibility. Replace if necessary.
- End Anchor.** Ensure both ends of load chain are securely attached. Secure if loose, repair if damaged, replace if missing. Check chain stoppers are correctly installed and functional.
- Trolley (if equipped).** Check that the trolley wheels track beam properly and trolley is correctly adjusted in accordance with manufacturer's literature. Check that wheels and beam are not excessively worn and inspect side plates for spreading due to bending. Do not operate hoist until problem has been determined and corrected.
- Load Chain.** Check the chain for stretching. Measure the load chain over five link sections all along chain, paying particular attention to the most frequently reeved links. Refer to Dwg. MHP0455 on page 2, **A**. Gauge Length over 'N' links with light load suspended from hook. When any five links in the working length reaches or exceeds the discard length, replace entire chain. Refer to Table 3 'Load Chain Normal and Discard Length' on page 2. Always use genuine **Ingersoll Rand** replacement chain. Zinc plated load chain is standard on Liftchain hoists.

**Table 3: Load Chain Normal and Discard Length**

Hoist Capacity ton	Chain Size		Normal Length		Discard Length	
	mm	inches	mm	inches	mm	mm
0.75	5.6 X 15.8	3.11	79	3.19	81	
1	5.6 X 15.8	3.11	79	3.19	81	
1.5	7.1 X 20.1	3.96	100.5	4.06	103	
3	10 X 28.0	5.5	140	5.65	143.5	
6	10 X 28.0	5.5	140	5.65	143.5	
9	10 X 28.0	5.5	140	5.65	143.5	



(Dwg. MHP0455)

### ■ Maintenance Schedule

After considering the previous section, regarding loading, it is possible to determine the necessary maintenance intervals. Given that the load spectrum has been determined and the duration of use has been recorded, the following chart is intended to be used to determine service intervals for major overhauls and unit gear box lubrication. Accordingly, the following table is given:

**Table 4: Service Intervals for Major Overhauls**

Load Spectrum (LF)	Characterization	Time Before Overhaul (hours)	Check Oil Level (*) (hours)
L1 - Light 0 < LF <= 0.50	Hoist is usually subject to very small loads and in exceptional cases only to maximum loads.	6300	400
L2 - Medium (normal) 0.5 < LF <= 0.63	Hoist is usually subject to small loads but rather often to maximum loads.	3200	
L3 - Heavy 0.63 < LF <= 0.80	Hoist is usually subject to medium loads but frequently to maximum loads.	1600	
L4 - Heavy 0.80 < LF <= 1.00	Hoist is usually subject to maximum or almost maximum loads.	800	

(\*) Operation specifics may warrant modification to this interval.

### ■ Periodic Maintenance

While the information in the preceding section is used for major service intervals, many items need to be checked at greater frequency depending on usage. The following information is provided for that purpose, but it is important to note that the information in the preceding section, regarding hours of service, is applicable in all conditions of use. Refer to Table 5 'Periodic Maintenance/Inspection Interval' on page 3.

**Table 5: Periodic Maintenance/Inspection Interval**

Item	Conditions		
	Normal	Heavy	Severe
Requirements of frequent inspection	Annually	Semi-annually	Quarterly
Evidence of loose bolts, nuts, rivets, snap rings	Annually	Semi-annually	Quarterly
Evidence of worn corroded, distorted, or cracked parts such as load blocks, suspension housing, levers, chain attachments, clevises, yokes, suspension bolts, shafts, gears, bearings, pins, rollers, and locking and clamping devices	Annually	Semi-annually	Quarterly
Evidence of damage to hook retaining nuts or collars or pins, and welds or rivets used to secure the retaining members	Annually	Semi-annually	Quarterly
Evidence of damage or excessive wear of load sprockets, or idler sprocket.	Annually	Semi-annually	Quarterly
Evidence of worn, glazed, or oil-contaminated friction disc; worn pawl, cams or ratchet; corroded, stretched, or broken pawl springs in brake mechanism.	Annually	Semi-annually	Quarterly
Evidence of damage to supporting structure, and/or trolley, if used.	Annually	Semi-annually	Quarterly
Product and safety label for legibility	Annually	Semi-annually	Quarterly
End connections of load chain, including overtravel restraints	Annually	Semi-annually	Quarterly

## TROUBLESHOOTING

This section provides basic troubleshooting information. Determination of specific causes to problems are best identified by thorough inspections performed by **Ingersoll Rand** trained technicians. The chart below provides a brief guide to common hoist and trolley symptoms, probable causes and remedies.

SYMPTOM	CAUSE	REMEDY
Load is not lifted	Overload	Reduce the load to nominal load
	Slip clutch not adjusted	Adjust slip clutch
	Load got stuck	Set the load free again
	Brake disc are worn	Do maintenance and exchange the brake disc
	Load chain is twisted	Align the load chain
	Defect of chain, gear or chain wheels	Do maintenance and replace defective parts by original spare parts
	Pawl does not engage properly	Check the pawl and replace it if necessary
	Selector - wrong position	Chose correct position of selector
It is difficult to lift the load	Pawl spring is missing	Do maintenance and replace defective parts by original spare parts
	Overload	Reduce the load to rated load
	Dirty chains, gear or chain wheels	Do maintenance, lubricate chains, gear and chain wheels
Load is lifted with interruptions	Defect of chain, gear or chain wheels	Do maintenance and replace defective parts by original spare parts
	Pawl spring is missing or defective	Do maintenance and replace defective parts by original spare parts
Hoist does not lift without load	Brake spring is missing	Do maintenance and replace defective parts by original spare parts
Hoist does not lift the whole distance long	Hook stuck, chain is twisted	Place hooks and chains in correct position
The brake remains closed (stuck)	the hoist was unloaded without lowering the load	Suspend the load again, lower the load, unload the hoist
	The load hook was pulled against the housing and got stuck there.	Release the hook, suspend the load again, lower the load, unload the hoist.
Hoist does not lower the load	Brake too tight	Turn the selector to position " " represents "DN" and move the hand lever while pulling the chain at the load side.
	Brake without function due to rust	Effect periodic inspection and replace rusty parts.
Load slips down partially during lowering	Foreign-object between the brake discs	Remove the foreign-object, clean the surface (Do not lubricate)
Load slips down during lowering	Brake discs are missing, installed incorrectly or worn	Replace the brake discs. Or install it correctly
Selector does not function	Defect or deformation	Check and replace, if necessary.
Load slips down when the selector is switched to free-wheeling mechanism.	Chain spring is missing or defective.	Do maintenance and replace defective parts by original spare parts.
Load hook latch does not work	Latch broken.	Replace hook latch.
	Load hook bent or twisted.	Inspect load hook as described in "INSPECTION" section. Replace if necessary.

# INSPECTION REPORT

**Ingersoll Rand Lever Chain Hoist**

<b>Model Number:</b>	<b>Date:</b>
<b>Serial Number:</b>	<b>Inspected by:</b>

<b>Reason for Inspection: (Check Applicable Box)</b>	
1. Scheduled Periodic Inspection ( ___ Quarterly ___ Semiannually ___ Yearly)	<b>Operating Environment:</b> Normal ___ Heavy ___ Severe ___
2. Discrepancy(s) noted during Frequent Inspection	
3. Discrepancy(s) noted during maintenance	
4. Other: _____	

Refer to the Product Information and Parts Information Manual and "INSPECTION" section for the general inspection criteria. Also, refer to appropriate National Standards and Codes of Practice. If in doubt about an existing condition, contact the nearest **Ingersoll Rand** distributor or the factory for technical assistance.

COMPONENT	CONDITION		CORRECTIVE ACTION		NOTES
	Pass	Fail	Repair	Replace	
Fasteners					
Gears					
Shafts					
Bearings			---		
Load Bearing Wheel					
Hook Block/Double-Reeved Pocket Wheel					
Chain Guides					
Springs			---		
Covers, Housings					
Hooks			---		
Top	Actual Hook Throat Width: _____ inches / _____ mm (Refer to Table 3 'Load Chain Normal and Discard Length' on page 2 for minimum/maximum acceptable widths.)				
	Hook Twist			---	(maximum 10%)
	Hook Crack Test Method Used: Dye Penetrant _____ Magnetic Particle _____ Other: _____				
Bottom	Actual Hook Throat Width: _____ inches / _____ mm (Refer to Table 3 'Load Chain Normal and Discard Length' on page 2 for minimum/maximum acceptable widths.)				
	Hook Twist			---	(maximum 10%)
	Hook Crack Test Method Used: Dye Penetrant _____ Magnetic Particle _____ Other: _____				
Hook Latch			---		
Brake (100% Load Test)			---		
Brake (Visual Inspection)					
Tail Pin (End Anchor)					
Load Chain:			---		
Working length(s) maximum wear: _____ inches / _____ mm (Refer to Table 3 'Load Chain Normal and Discard Length' on page 2.)					
Supporting Structure					
Labels and Tags			---		
Other Components (List in NOTES section)					

Testing:	Pass	Fail	NOTES
Operational (No Load)			
Operational (100% Load)			
Operational (Maximum Test Load*)			

\* Maximum test load should never exceed 125% of rated capacity.  
This form may be photocopied and used as an inspection record.

# MAINTENANCE

- Never perform maintenance on the hoist while it is supporting a load.

Before performing maintenance, tag controls:

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

- Only allow personnel instructed in service and repair of this hoist to perform maintenance.
- After performing any maintenance on the hoist, dynamically test hoist to 100% of its rated capacity, in accordance with ASME B30.16 standards, before returning hoist to service. Testing to more than 100% of rated capacity may be required to comply with standards and regulations set forth in areas outside of the USA.
- Use of other than genuine Ingersoll Rand replacement parts may result in safety hazards, decreased performance and increased maintenance and may invalidate all warranties.

## General

Correct disassembly (to prevent loss or damage of good parts), repair, assembly, testing and adjusting are critical to proper product operation. Maintenance procedures are technical in nature and require training and experience to accomplish correctly. In addition, repair and testing require specialized equipment that is not typically found at the hoist-mounting site. Proper use, inspections and maintenance increase the life and usefulness of your Ingersoll Rand equipment. During assembly, lubricate gears, nuts, capscrews and all machined threads with applicable lubricants. Use of antiseize compound and/or thread lubricant on capscrew and nut threaded areas prevents corrosion and allows for easy disassembly of components. It is extremely important that anyone involved with maintaining the hoist be familiar with the servicing procedures of these products, and be physically capable of conducting the procedures. These personnel shall have skills that include:

- Proper and safe use and application of mechanics' common hand tools as well as special Ingersoll Rand or recommended tools.
- 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.

## Maintenance Intervals

Refer to Table 5 'Periodic Maintenance/Inspection Interval' on page 3 for recommended maintenance schedule.

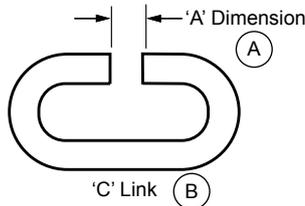
## Load Chain Replacement

### WARNING

- To prevent a falling load, which can cause death, injury or property damage, the hook must be on left fall of load chain and right fall must be attached to hoist body with anchor pin and anchor hanger. Right and left designations are as viewed from the hand chain side of the hoist.

### NOTICE

- For ease of installation, do not remove old chain from hoist. Use the old chain to feed new chain through hoist.
- Remove the chain stopper (35).
  - Remove capscrew and locknut (40), if equipped.
  - Remove load hook for 0.75T to 3T hoists. Remove hook pin (34) for 6 ton and 9 ton hoists.
  - Using an abrasive wheel, cut a section from the last link as shown in Dwg. MHP0817 on page 5, A. 'A' dimension; B. 'C' Link. Use a 'C' link which is the same size as the chain. Refer to Table 6 "'C' Link Dimension' on page 5.



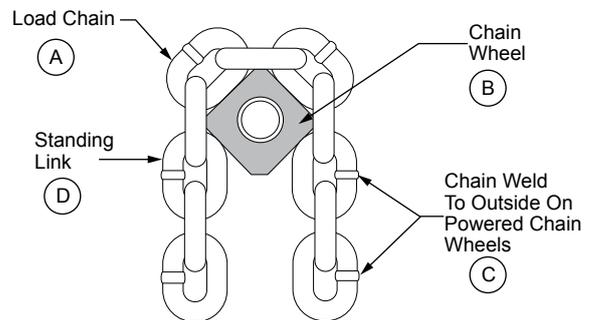
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Table 6: 'C' Link Dimension

Hoist Capacity	Chain Size mm	'A' Dimension	
		in.	mm
0.75 ton	5.6 X 15.8	0.315	8
1 ton	5.6 X 15.8	0.315	8
1.5 ton	7.1 X 20.1	0.394	10
3 ton	10.0 X 28.0	0.551	14
6 ton	10.0 X 28.0	0.551	11
9 ton	10.0 X 28.0	0.551	14

### CAUTION

- Do not distort link in any manner. Link must be able to pass over the chain sprocket and idler wheels without binding.
- Connect new chain to old chain by hooking end of new chain onto 'C' link. The last link of the chain must be in the same direction as the first, if not, cut off the last link. The end link must be a standing link (perpendicular to the axle of hoist sprockets). Make certain welds and links on new chain match positioning of welds and links on chain being replaced.
  - Slowly run hoist in lower direction, running off old chain and reeving new chain over the chain wheel. **The first link of new chain over the chain wheel must be a standing link.** Refer to Dwg. MHP0472 on page 5.



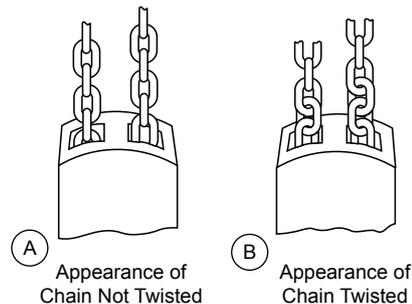
(Dwg. MHP0472)

Illustrations may not be a true representation of actual pocket wheel. Use for instructions only.

- Reinstall Bottom hook assembly to load side of chain. Reinstall chain stopper to free end of chain.

## Determining Twisted, Kinked or 'Capsized' Load Chain

Ensure chain is not twisted, kinked or 'capsized' during installation. Refer to Dwg. MHP0020 on page 5, A. Appearance of Chain Not Twisted; B. Appearance of Chain Twisted.



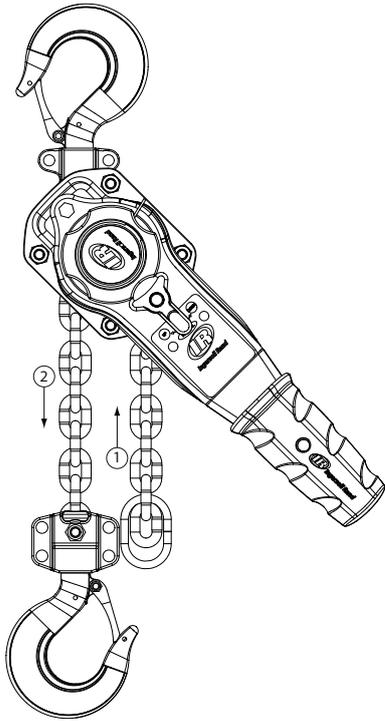
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## Chain Reeving

### WARNING

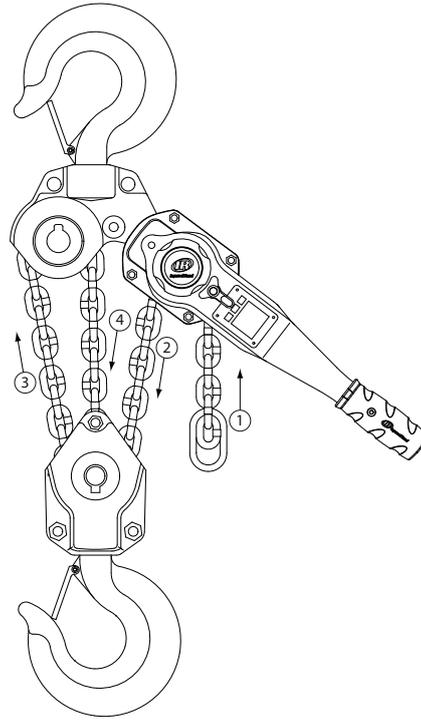
- Ensure chain does NOT become twisted during reeving. All chain welds must align while chain is hanging free.

### Single Reeve (0.75 to 3 Ton Hoist)



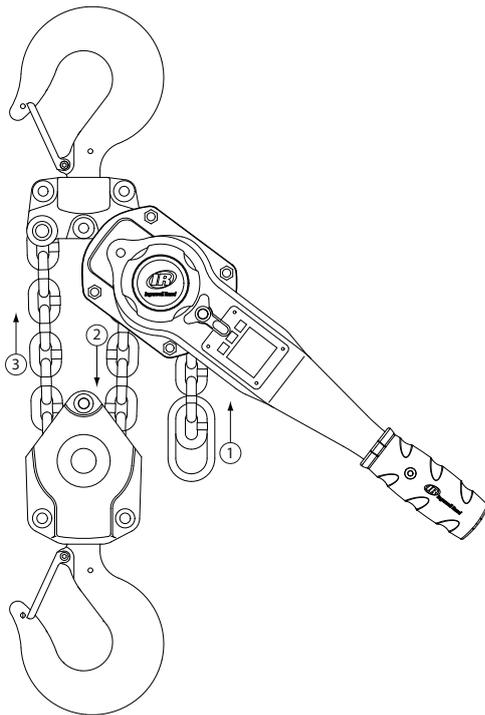
(Dwg. MHP3289)

### Triple Reeve (9 Ton Hoist)



(Dwg. MHP3293)

### Double Reeve (6 Ton Hoist)



(Dwg. MHP3292)

## ■ Disassembly

### ■ General Disassembly Instructions

The following instructions provide necessary information to disassemble, inspect, repair, and reassemble product. Parts drawings are provided in Product Parts Information Manual unless otherwise noted.

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

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

1. Never disassemble product 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, product is designed to permit easy disassembly and reassembly. The use of heat or excessive force should not be required.
4. Keep work area as clean as practical, to prevent dirt and other foreign matter from getting into bearings or other moving parts.
5. When grasping a part in a vise, always use leather-covered or copper-covered vise jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded members, machined surfaces and housings.
6. Do not remove any part that is a press fit in or on a subassembly unless removal of that part is necessary for repairs or replacement.

### ■ Free Chain Knob Disassembly

1. Remove retainer ring (1) and free knob center cap (2).
2. Pull out split pin (3) and remove castle nut (4).
3. Remove twisting spring housing (5), spring I (6), free knob (7), spring II (8) and cam guide (11) from pinion shaft (44).

### ■ Lever Disassembly

1. Remove nut & washer (15) brake cover assembly (16).
2. Hold lever handle assembly (13) by hand, turn change gear (14) counterclockwise and remove brake cover assembly (16) from the hoist.
3. Remove capscrew & washer (12) and nut & washer (17), to separate lever handle assembly (13) and brake cover assembly (16).
4. Remove change gear (14) from brake cover assembly (16).
5. Remove change pawl (18), push pin (19) and push spring (20) from lever handle assembly (13).

### ■ Brake End Disassembly

1. Remove fused brake disc (23) and brake hub (24) from pinion shaft (44).
2. Remove snap ring (25), brake pawl (26) and brake spring (27).

### ■ Gear End Disassembly

1. Remove the three locknuts & washers (47) from gear cover assembly (46).
2. Remove gear cover assembly (46).
3. Remove disc gear (45).

- Remove pinion shaft washer (43) and load gear (42).

### ■ Load Sheave Disassembly

- Remove side plate B assembly (38), and remove caged bearing II (37) from side plate B assembly (38).
- Remove hook pin (34) and top hook assembly (32).
- Remove load chain guide (31) and chain stripper (29).
- Remove load chain (39) and load sheave (36).
- Remove caged bearing (30) from side plate A assembly (28).

### ■ Hooks Disassembly (6 and 9 ton)

- Remove capscrews, locknuts and washers.
- Separate plates and remove hook.
- Lift out sheave assembly. Carefully slide idler sheave shaft from idler sheave and remove rollers.

## ■ Cleaning, Inspection and Repair

Use the following procedures to clean, inspect, and repair the components of the hoist system.

### ■ Cleaning



- Bearings that are loose, worn or rotate in the housing must be replaced. Failure to observe this precaution will result in additional component damage.**

Clean all hoist component parts in an acid free solvent (except for the brake disc). The use of a stiff bristle brush will facilitate the removal of accumulated dirt and sediments on the gears and frames. Dry each part using low pressure, filtered compressed air.

### ■ Inspection

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

- Inspect all gears for worn, cracked, or broken teeth.
- Inspect shafts for ridges caused by wear. If ridges caused by wear are apparent on shafts, replace the shaft.
- Inspect all threaded items and replace those having damaged threads.
- Measure the thickness of the brake discs. If brake discs do not have uniform thickness or are less than the discard dimension shown in Table 7 'Brake Disc Chart' on page 7, replace brake discs.

Table 7: Brake Disc Chart

Hoist Model	Normal		Discard	
	inches	mm	inches	mm
KL075	0.31	8.0	0.26	6.5
KL075V	0.31	8.0	0.26	6.5
KL100	0.31	8.0	0.26	6.5
KL100V	0.31	8.0	0.26	6.5
KL150	0.31	8.0	0.26	6.5
KL150S	0.31	8.0	0.26	6.5
KL150V	0.31	8.0	0.26	6.5
KL150VS	0.31	8.0	0.26	6.5
KL300	0.31	8.0	0.26	6.5
KL300S	0.31	8.0	0.26	6.5
KL300V	0.28	7.0	0.24	6.0
KL300VS	0.28	7.0	0.24	6.0
KL600	0.31	8.0	0.26	6.5
KL600V	0.28	7.0	0.24	6.0
KL900	0.31	8.0	0.26	6.5
KL900V	0.28	7.0	0.24	6.0

- Inspect ratchet pawls and springs on side plate assembly. Replace parts if pawls and or springs are damaged or fail to operate.

### ■ Repair

Actual repairs are limited to the removal of small burrs and other minor surface imperfections from gears and shafts. Use a fine stone or emery cloth for this work. Do not use steel wool.

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

## ■ Assembly

### ■ Load Sheave Assembly

- Install caged bearing I (30) into side plate A assembly (28).
- Install load sheave (36), chain stripper (29) and load chain guide (31) onto side plate A assembly (28).
- Install caged bearing II (37) into side plate B assembly (38), and put them onto side plate A assembly (28).
- Put top hook assembly (32) between side plate A assembly (28) and side plate B assembly (38), then install hook pin (34).

### ■ Gear End Assembly

Follow steps 1 through 4 described in 'Load Sheave Assembly'.

- Install load gear (42) on load sheave (36). Install pinion shaft washer (43) onto load gear (42).
- Apply grease to pinion shaft (44), and put it through pinion shaft washer (43) into load sheave (36).
- Install disc gear (45) so gear teeth are correctly timed and end shafts are located in bearing sleeves in side plate. Refer to 'Gear Timing' on page 7.
- Apply a thick coat of grease as recommended in the "LUBRICATION" section to all gear teeth. Install gear cover (46) assembly over gears to engage gear end shafts.
- Secure gear cover assembly (46) with nuts & washers (47).

### ■ Brake End Assembly

Follow steps 1 through 4 described in 'Load Sheave Assembly', and steps 1 through 5 described in 'Gear End Assembly'.

- Fasten two sets of brake spring (27) and brake pawl (26) with snap ring (25).
- Install brake hub (24) and fused brake disc (23) in order onto pinion shaft (44).
- Install brake cover assembly (16) onto side plate A assembly (28), and secure it with nuts & washers (15).
- Install change gear (14) onto pinion shaft (44).

### ■ Lever Assembly

Follow steps 1 through 4 described in 'Load Sheave Assembly', steps 1 through 5 described in 'Gear End Assembly' and steps 1 through 4 described in 'Brake End Assembly'.

- Install push spring (20), push pin (19) and change pawl (18) onto lever handle assembly (13) in order.
- Put lever handle assembly (13) onto brake cover assembly (16), and fasten capscrew and washer (12) and nut & washer (17).

### ■ Free Chain Knob Assembly

Follow steps described in 'Load Sheave Assembly', 'Gear End Assembly', 'Brake End Assembly' and 'Lever Assembly'.

- Install cam guide (11) on pinion shaft (44).
- Install spring II (8) on change gear (14).
- Turn free knob (7) 120° clockwise while pressing it lightly on change gear (14).
- Place selector to the UP or DOWN position to temporarily retain the free knob (7).
- Install spring I (6) into free knob (7), make sure one end of spring I (6) hook onto the slot of free knob (7).
- Hook the other end of spring I (6) onto the slot of twisting spring housing (5), and turn twisting spring housing 120° counterclockwise and press it toward the free knob (7) and install it onto the pinion serration.
- Fasten twisting spring housing (5) in place with the castle nut (4) and split pin (3).
- Put free knob center cap (2) into the free knob (7), and snap retainer ring (1) into free knob (7).

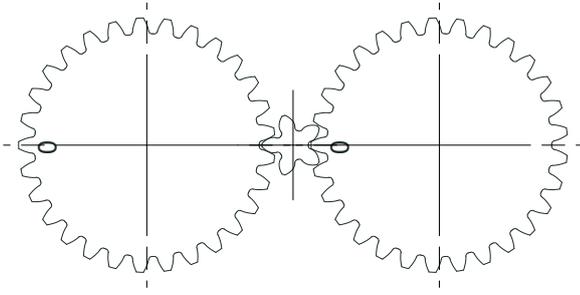
### ■ Bottom Hook Assembly (6 and 9 ton)

- Grease and install the rollers in the groove provided in the bore of the idler sheave.
- Install idler sheave shaft through the idler sheave bore. Ensure rollers remain in position.
- Carefully place the assembled parts between the plates.
- Install hook between plates and clamp plate halves together with capscrews, lockwashers and nuts.

### ■ Gear Timing

For proper operation, timing marks on the gears must be in the correct positions. The timing marks are circular impressions on the faces of gears.

Refer to Dwg. MHP3270 on page 8.



(Dwg. MHP3270)

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### ■ Load Test

Prior to initial use, all new, extensively repaired, or altered hoists shall be load tested by or under the direction of a person trained in the operation and maintenance of this hoist, and a written report furnished confirming the rating of the hoist. Test hoist to 125% of the rated hoist capacity. Testing to more than 125% will be required to set overload clutch and may be necessary to comply with standards and regulations set forth in areas outside of the USA.

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**SERVICE NOTES**

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