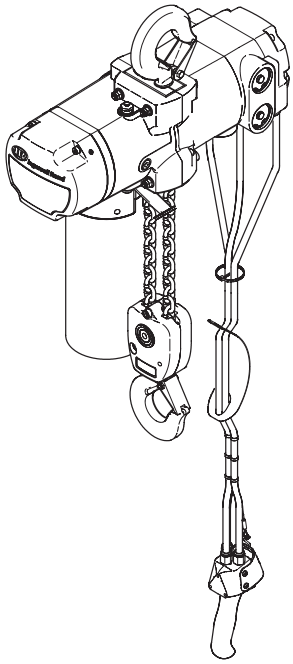
Product Maintenance Information

Compact Lift Air Chain Hoist
Models
CL125K, CL250K and CL500K



(Dwg. MHP2967)

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Ingersoll Rand
Industrial Technologies

Form MHD56408
Edition 1
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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 1on page 2 for Product Information Manuals.
Manuals can be downloaded from 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.

The original language of this manual is English.

Refer all communications to the nearest **Ingersoll Rand** Office or Distributor.

Table 1: Product Manuals

Publication	Part/Document Number	Publication	Part/Document Number
Product Safety Manual	MHD56295	Product Parts Information Manual	MHD56407
Product Information Manual	MHD56406		

OPERATIONAL CONDITIONS, INSPECTION AND REPAIRS

The **CLK Series** air chain hoist has been developed and classified in accordance with the guidance set for by FEM/ISO. Service life of hoist is approximately ten years, but the actual life is dependent on conditions of service. In accordance with those procedures this series of lifting devices are classified as a mechanism; it has been qualified with a 1Am/M4 mechanism classification. Accordingly, time between overhaul is a factor of the relative duration and mass of the lifted loads. The theoretical time between overhauls for normal loading, L2 load spectrum is 3200 hours; this corresponds to 800 full-load hours. The implication of this classification on maintenance is further detailed in the section entitled 'State of Loading'.

The **CLK Series** hoist has also been designated with an Air Chain Hoist Duty Service Classification of A4. According to ASME HST-5, 1999, Performance Standards for Air Chain Hoists, an A4 rating includes hoists designed for 'Loads normally less than 50% of rated load with a running time up to continuous; or Loads normally above 50% of rated load with running time up to 50% of work period'. Regardless, the next section should be used to determine the necessary maintenance intervals.

■ State of Loading

When considering maintenance intervals and operational life it is necessary to consider the conditions of service to which the hoist is subjected. The following factors influence mechanical performance of the hoist, and should be considered in the course of determining service intervals and product life-cycle.

These include:

- Operational Time: Actual running time (determine by when the chain is actually in motion) of hoist per hour or per work period.
- Load Distribution: Actual distribution or proportion of full or partial loads to be handled by equipment.
- Work Distribution: Work may be concentrated during a short span, or uniformly distributed over a work period. Work distribution is not a principle factor when determining mechanical wear, but needs to be considered when calculating operational time and periodic maintenance.
- Environmental Conditions: **CLK Hoists** are designed to operate in ambient temperatures between -4° F (-20° C) and 122° F (50° C), and in atmospheres with increased concentration of dust and soot, and high humidity. The product is suitable for ATEX environments as noted on the product identification plate, located on end of the hoist. When protected from weathering, the hoist is suitable for permanent installation in outdoor locations, although maintenance may be increased. The **CLK series hoist** is not designed for permanent installation in outdoor marine environments.

■ *Load Factor*

Some hoist installations, such as assembly line operation, lifted load is repetitive and easily recorded. Other the load is random and not easily characterized. The Mean Effective Load Factor, also referred to as the Load Spectrum, refers to a theoretical single load value that has the same effect on the hoist as various loads lifted by the hoist during a specified time period. The mean effective load factor, LF, can be expressed as:

$$LF = \sqrt[3]{W_1^3 P_1 + W_2^3 P_2 + W_2^3 P_3 + \ldots + W_n^3 P_n}$$

Where:

LF = Mean Effective Load Factor (Load Spectrum): Mean effective load factor is the ratio of mean effective load to rated load.

W = Load Magnitude: Load Magnitude is the ratio of the hoist operating load to the hoist rated capacity. No load operation must be included in this calculation. It is also necessary to take into account the weight of any dead load used to facilitate rigging the load to the hoist hook.

P = Load Probability: Load probability is the ration of running time under each load magnitude to the total hoist running time. The sum of all of load probabilities used in the above equation must equal 1.0.

NOTICE

- **Randomly distributed loads - A unit subjected to a random distribution of loading will be assumed to lift load distributed evenly within the rated load of the hoist in decreasing step of 20% of the previous load value. For the purposes of maintenance, such units should be assumed to have a mean effective load factor of 0.65.**

■ 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
Normal	< = 25% duty cycle	Regular
Heavy	> 25% duty cycle	Usually medium loads, frequent max. loads
Severe	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.

1. **Fasteners.** Check all rivets, split pins, capscrews and nuts. Replace if missing or tighten if loose.
2. **All Components.** Inspect for wear, damage, distortion, deformations and cleanliness. If external evidence indicates damage, disassemble as required to conduct a detailed inspection. Check gears, shafts, bearings, sheaves, chain guides, springs and covers. Replace worn or damaged parts. Clean, lubricate and reassemble.
3. **Hooks.** Inspect hooks carefully for cracks using magnetic particle or other suitable non-destructive method. Inspect hook retaining parts. Tighten or repair if necessary.

Table 3: Hook Throat Normal and Discarded Width

Hoist Model	Capacity (metric tons)	Throat Width *		Discard Width *	
		in.	mm	in.	mm
CL125K	0.060	0.945	24	1.087	27.6
CL250K	0.125				
CL500K	0.250				

* Dimensions are without latch.

4. **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.
5. **Motor.** If performance is poor, disassemble motor and check for wear or damage to bearings and shafts. Parts should be cleaned, lubricated and reassembled. Replace worn or damaged parts.
6. **Brake.** Raise a load equal to rated capacity of hoist a few inches (cms) off the floor. Verify hoist holds the load without drift. If drift occurs, disassemble. Remove brake discs as described in "MAINTENANCE" on page 6. Check and clean brake parts each time hoist is disassembled. Replace brake disc if thickness is less than 7.0 mm (0.275 in.).

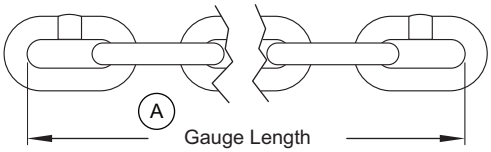
⚠ WARNING

- **Worn or improperly functioning brakes may cause excessive heat build up and sparks.**

7. **Supporting Structure.** Check for distortion, wear and continued ability to support hoist and rated load.
8. **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.
9. **Load Chain End Anchors.** 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.
10. **Load Chain.** Check the chain for stretching. Measure the load chain over eleven link sections all along chain, paying particular attention to the most frequently worked links. Refer to Dwg. MHP3118 on page 3, **A.** Gauge Length. When any eleven links in the working length reaches or exceeds the discard length, replace entire chain. Refer to Table 4 "Load Chain Normal and Discard Length" on page 3. Always use genuine **Ingersoll Rand** replacement chain. Zinc plated load chain is standard on hoists.

Table 4: Load Chain Normal and Discard Length

Hoist Model	Chain	Normal Length		Discard Length	
		in.	mm	in.	mm
CL125K	4 x 12 DAT	5.197	132.0	5.276	134.0
CL250K					
CL500K					



(Dwg. MHP3118)

11. **Chain Container (optional feature).** Check for damage or excessive wear and that chain container is securely attached to the hoist. Secure or replace if necessary.
12. **Limit Switch.** Check limit switches function correctly.
13. **Emergency Stop.** During hoist operation verify emergency shut-off by activating button. All operation must stop quickly. Stop button must reset properly.
14. **Labels and Tags.** Check for presence and legibility. Replace if necessary.

■ Records and Reports

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

■ 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:

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.	6,300	400
L2 - Medium (normal) 0.5 < LF < = 0.63	Hoist is usually subject to small loads but rather often to maximum loads.	3,200	
L3 - Heavy 0.63 < LF < = 0.80	Hoist is usually subject to medium loads but frequently to maximum loads.	1,600	
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 suspension housing, 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 excessive wear, or damage, to load sprockets	Annually	Semi-annually	Quarterly
Evidence of excessive wear on motor or load brake	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	Annually	Semi-annually	Quarterly

INSPECTION REPORT

Ingersoll Rand CLK Air Hoist

Model Number:		**Date:**
Serial Number:		**Inspected by:**
Reason for Inspection: (Check Applicable Box)		
	1. Scheduled Periodic Inspection (___ Quarterly ___ Semiannually ___ Yearly)	**Operating Environment:** Normal ___ Heavy ___ Severe ___ Calculated Load Factor Run Time ___ hours Since Last Overhaul Total ___ hours
	2. Discrepancy(s) noted during Frequent Inspection	
	3. Discrepancy(s) noted during maintenance	
	4. Other: _____	

Refer to the Performance Information Manual for frequent "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 factory for technical assistance.

COMPONENT	CONDITION		CORRECTIVE ACTION		NOTES
	Pass	Fail	Repair	Replace	
Fasteners					
Gears					
Shafts					
Bearings			---		
Load Bearing Sheave					
Hook Block/Double-Reeved Pocket Wheel					
Chain Guides					
Springs			---		
Covers, Housings					
Hooks			---		
Top	Actual Hook Throat Width: _____ inches / _____ mm (Refer to Table 1 in Product Information Manual 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 1 in Product Information Manual 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 4 "Load Chain Normal and Discard Length" on page 3)					
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.

TROUBLESHOOTING

This section provides basic troubleshooting information. Specific causes to problems are best identified by thorough inspections performed by personnel instructed in safety, operation and maintenance of this equipment. The chart below provides a brief guide to common hoist and trolley symptoms, probable causes and remedies.

Symptom	Cause	Remedy
Hoist will not operate.	No air supply to hoist, or too little CFM or PSI.	Check PSI (bar) at hoist inlet. Refer to "SPECIFICATIONS" section in Product Information Manual for correct CFM (cu.m/min) and PSI (bar).
	Pendant lever sticking.	Check pendant lever and restore free movement.
	Pendant malfunction.	Check PSI (bar) at pendant. Minimum operating pressure in pendant line is 60 PSI (4 bar).
	Hoist is overloaded.	Reduce load to within rated capacity.
	Motor is damaged.	Repair or replace. Refer to "MAINTENANCE" section on page 6.
	Limit switch sticking.	Check limit switch button moves freely. Clean and lubricate if sticking.
	Brake is not releasing.	Check brake release circuit and PSI (bar) at brake inlet (60 PSI (4 bar) minimum).
Load continues to move when hoist is stopped. 'UP' direction.	Pendant lever sticking.	Check lever and restore free movement.
Load continues to move when hoist is stopped. 'DOWN' direction.	Pendant lever sticking.	Check lever and restore free movement.
	Hoist is overloaded.	Reduce load to within rated capacity.
	Brake is slipping.	Check brake springs and brake disc linings for wear. Refer to the "MAINTENANCE" section on page 6.
Hoist will not lift rated capacity.	Hoist is overloaded.	Reduce load to within rated capacity.
	No air supply to hoist or too little CFM or PSI (cu. m/min or bar).	Check PSI (bar) at hoist inlet. Refer to "SPECIFICATIONS" section in Product Information Manual Form for correct CFM (cu.m/min) and PSI (bar).
	Brake is not releasing.	Check brake release circuit and PSI (bar) at brake inlet (60 PSI (4 bar) minimum).
	Exhaust is restricted.	Inspect vents and clean or replace muffling material.
	Motor is damaged.	Check for worn motor bearings.
Hook lowers but will not raise.	Hoist is overloaded.	Reduce load to within rated capacity.
	No air supply to hoist or too little CFM or PSI (cu. m/min or bar).	Check supply pressure at hoist inlet with hoist running at maximum lifting speed with no load.
	Pendant malfunction.	With up lever depressed verify airflow from pendant to hoist.
Load chain jumps on sprocket or is making a snapping sound.	Worn or rusted chain.	Refer to "OPERATIONAL CONDITIONS, INSPECTION AND REPAIRS" section on page 2 to determine wear limit. Replace if necessary.
	Incorrect chain.	Replace with correct chain.
	Worn pocket wheel or chain guide.	Replace worn parts.
	Capsized hook.	Correct as described in "MAINTENANCE" section on page 6.
	Hoist not in line with load.	Align hoist with load. Do not "yard" or "side pull".
	Incorrectly reeved load chain.	Check load chain is correctly reeved.
	No oil on load chain.	Lubricate load chain.
Trolley (optional feature) Trolley will not stop or trolley wheels slip.	Damaged beam.	Repair or replace beam.
	Excessive oil, grease or paint on track of beam.	Clean off oil, grease or paint.
	Trolley not spaced for beam clearance.	Check trolley spacing. Refer to the manufacturer's literature.
Air-powered trolley does not operate.	Pendant lever sticking.	Check lever and restore free movement.
	No air supply to trolley or too little CFM or PSI (cu. m/min or bar).	Check pressure at trolley inlet. Refer to manufacturer's specifications.

WARNING

- **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 Ingersoll Rand trained technicians to perform maintenance.**
- **After performing any maintenance on the hoist dynamically test the hoist to 100% of its rated capacity, in accordance with ASME B30.16 standards, before returning hoist to service. Static test at 125% of rated load required to validate brake.**
- **Shut off air system and depressurize air lines before performing any maintenance.**
- **Use of other than genuine Ingersoll Rand replacement parts may result in safety hazards, decreased performance and increased maintenance and will invalidate all warranties.**

■ Maintenance

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:

1. Proper and safe use and application of mechanics common hand tools as well as special **Ingersoll Rand** or recommended tools.
2. Safety procedures, precautions and work habits established by accepted industry standards.

Ingersoll Rand cannot know of, or provide all the procedures by which product operations or repairs may be conducted and the hazards and/or results of each method. If operation or maintenance procedures not specifically recommended by the manufacturer are conducted, it must be ensured that product safety is not endangered by the actions taken. If unsure of an operation or maintenance procedure or step, personnel should place the product in a safe condition and contact supervisors and/or the factory for technical assistance.

■ *Maintenance Intervals*

Refer to Table 5 'Maintenance Interval Chart' on page 3 for recommended maintenance schedule.

■ Adjustments

■ *Disc Brake*

Disc brake adjustment is not required.

If disc brake does not hold rated load, disassemble and repair. If brake slippage occurs during tests prior to placing hoist in service or during normal use of hoist, follow hoist disassembly procedure and check disc brake assembly (90) thickness. Disc brake assembly thickness should be a minimum of 7.00 mm [0.275 in]. If this dimension is less than recommended, the disc brake assembly (90) must be replaced. Use the following procedure to replace the disc brake assembly.

Disassembly:

1. Remove the air supply from the hoist.
2. Position the hoist with the brake end facing up.
3. Loosen and remove the four capscrews (1) and lockwashers (2) in an alternating pattern to evenly decrease the spring force between the piston housing (3) and the piston (6). Set the capscrews and lockwashers (2) to the side.
4. Remove the piston housing (3) and six springs (4). Slide the piston (6) off the gear case (14).
5. Remove the brake disc assembly (90) from the hex shaft. Inspect the brake disc assembly for wear. If brake disc assembly thickness is uneven or less than 7.00 mm [0.275 in], replace the brake disc assembly.
6. Remove, discard and replace brake 'O' rings (7), (10), and (11).
7. For brake service only, no further disassembly is required.

Assembly:

1. Clean all parts removing all brake dust and any other contaminants.
2. Install replacement brake 'O' rings (7), (10), and (11). Apply 'O' ring lubricant to 'O' ring and 'O' ring contact surfaces prior to assembly.
3. Slide brake disc assembly (90) over hex shaft.
4. Align three holes in piston (6) with the three pins (87) extending from the gear case brake friction surface and slide over 'O' rings until piston brake friction surface contacts the disc brake assembly (90).
5. Position six springs into the counter bores on the piston (6). A small amount of 'O' ring lubricant may be used on the end of the springs to assist in positioning the springs into their respective counter bores.
6. Align the piston housing (3) with the piston (6) and press firmly down on the piston housing until it contacts the piston. While maintaining pressure on the piston housing, Insert the four capscrews (1) and lockwashers (2) and tighten in an alternating pattern. Torque to 4.5-5.5 Nm (40.0-48.5 in-lbs).

■ *Load Chain Replacement*

WARNING

- **NEVER splice a load chain except when installing a new load chain by the following method. Always discard link used to connect old chain with new.**

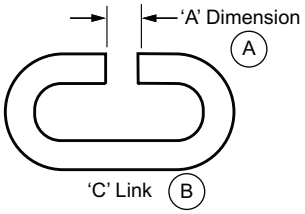
Excessive chain wear cannot be detected by casual observation. Chain is case hardened and once the case hardening is worn through, wear will progress rapidly and the strength of the chain will be considerably reduced. Further, the chain will no longer fit the chain sprocket properly, greatly increasing the chance of malfunction and chain breakage. One pocket wheel will outlast several chains if chain is replaced as recommended. The use of a worn chain will cause the chain sprocket to wear rapidly. If the chain is visibly damaged, examine pocket wheel, chain guide and splitter. Install a new pocket wheel if the old one is visibly worn. Install a new guide if old one is broken or distorted.

It is suggested that a short length of load chain be available when replacing hoist load chain. Feeding a short length of load chain through bottom block assembly or power head assembly prior to installing new load chain may simplify installation. Weld on perpendicular load chain must always face away from hoist pocket wheel. Refer to Dwg. MHP0472 on page 7, **A.** Load Chain; **B.** Chain Wheel; **C.** Chain Weld To Outside On Powered Chain Wheels; **D.** Standing Link.

NOTICE

- **For ease of installation, do not remove old chain from hoist. Use the old chain to feed new chain through hoist.**

1. Hoist must be hung and connected to air supply. Reduce air pressure to 60 psi (4 bar).
2. Remove chain container, if used.
3. Disconnect chain end from hoist body if attached.
4. Remove capscrew (101) and chain stop (100), if equipped.
5. Remove load hook.
6. Run hoist slowly in lifting direction until chain free end is approximately 2 ft (60 cm) from hoist.
7. Using an abrasive wheel, cut a section from the last link as shown in Dwg. MHP0817 on page 6, **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 6.



(Dwg. MHP0817)

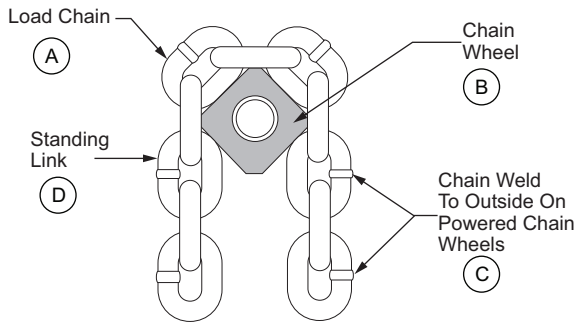
Table 6: 'C' Link Dimension

Hoist Model	Chain Size	'A' Dimension	
	mm	in.	mm
CL125K	4 x 12	0.236	6
CL250K			
CL500K			

CAUTION

- **Do not distort link in any manner. Link must be able to pass over the chain sprocket and idler wheels without binding.**

8. Connect new chain to old chain by hooking end of new chain onto 'C' link. Make certain welds and links on new chain match positioning of welds and links on chain being replaced.
9. Slowly run hoist in raise 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 7.



(Dwg. MHP0472)

NOTE: Dwg. MHP0472 is a reference only, pocket wheel may differ in look.

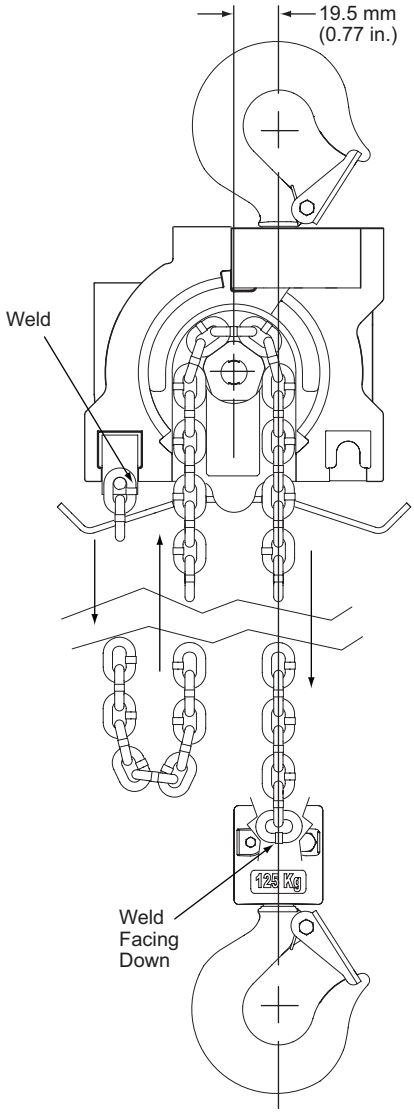
10. Reinstall load hook to load side of chain. Connect free end of chain to hoist body.

WARNING

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

Refer to Dwg. MHP3113 on page 7 for single reeve and MHP3114 on page 7 for double reeve.

Single Reeve



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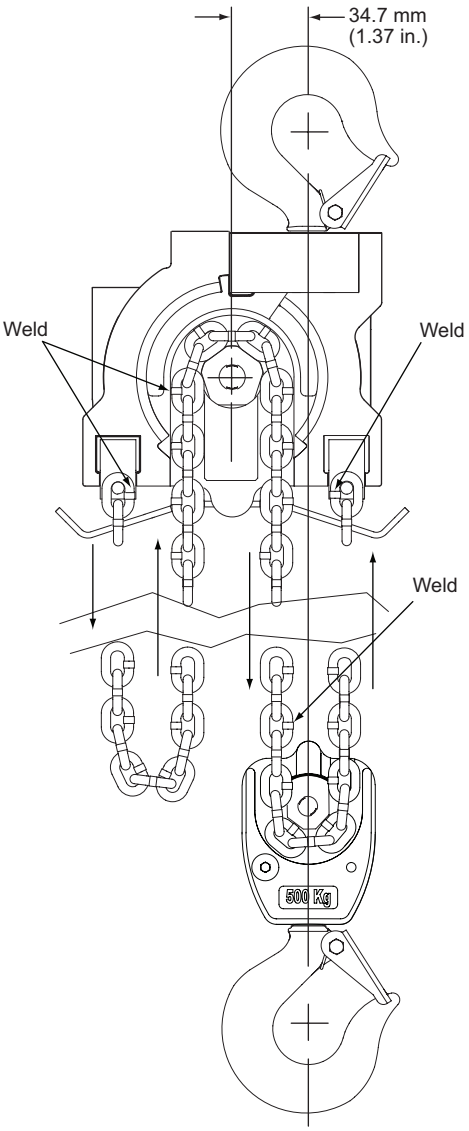
Double Reeve



(Dwg. MHP3114)

To feed load chain through bottom hook assembly:

1. Install the 'C' link in the last link of the load chain extending from the hoist (A). Connect the new load chain to the 'C' link. The end link must be a standing link (perpendicular to the axle of hoist sprockets).
2. Run the hoist to feed the chain through the hoist body and down to (C) on the hook block.
3. The axis of the pocket wheel (27) in the hook block assembly must be perpendicular to the rotational axis of the pocket wheel (27) of the hoist
4. Insert the last link of the load chain in the opening to bottom block (C). The first link must be inserted parallel to the axis. The sprocket of bottom hook assembly and the following standing links must have the welds turned to the outside position with the sprocket. Refer to Dwg. MHP0472 on page 7.
5. After exiting the bottom hook assembly at (D), position the standing link of the chain at (D) in the slot of the attachment link (44) and press spring pin (43) through to capture the load end of the chain.
6. Assemble attachment link (44) into the pocket under the loaded side of the hoist. Slide a shoulder screw (48) through capturing the attachment link. Thread a flange nut (31) onto the shoulder screw until it contacts the screw shoulder. Thread a jam nut (30) onto the shoulder screw and torque to 4.5-5.5 Nm (40.0-48.5 in-lbs).

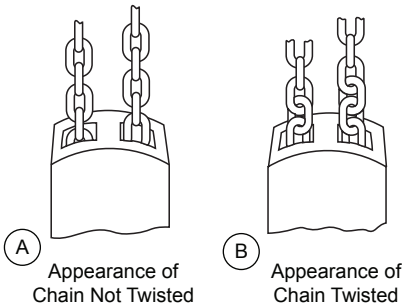
WARNING

- **The chain must not be twisted at any point.**

7. On the free end of the load chain, position the standing link of the chain in the slot of the attachment link (44) and press spring pin (43) through to capture the free end of the chain.
8. Assemble the attachment link (44) into the pocket opposite the loaded side of the hoist. Slide a shoulder screw (48) through capturing the attachment link. Thread a flange nut (31) onto the shoulder screw until it contacts the screw shoulder. Thread a jam nut (30) onto the shoulder screw and torque to 4.5-5.5 Nm (40.0-48.5 in-lbs).

Determining Twisted, Kinked or 'Capsized' Load Chain

Ensure chain is not twisted, kinked or 'capsized' during installation. Refer to Dwg. MHP0020 on page 8, **A.** Appearance of Chain Not Twisted; **B.** Appearance of Chain Twisted.



(Dwg. MHP0020)

Disassembly

General Disassembly Instructions

Refer to the Product Parts Information Manual for drawings and item numbers referenced in the "MAINTENANCE" section, unless otherwise noted.

The following instructions provide the necessary information to disassemble, inspect, repair, and assemble the hoist. Parts drawings are provided in the Product Parts Information Manual.

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

1. Never disassemble the hoist any further than is necessary to accomplish the needed repair. A good part can be damaged during the course of disassembly.
2. Never use excessive force when removing parts. Tapping gently around the perimeter of a cover or housing with a 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 the part being heated is already worn or damaged beyond repair and no additional damage will occur to other parts. In general, the hoist is designed to permit easy disassembly and assembly. The use of heat or excessive force should not be required.
4. Keep the work area as clean as practical, to prevent dirt and other foreign matter from getting into bearings or other moving parts.
5. All seals, gaskets and '0' rings should be discarded once they have been removed. New seals, gaskets and '0' rings should be used when assembling the hoist.
6. When grasping a part in a vise, always use leather-covered or copper-covered vise jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded members, machined surfaces and housings.
7. Do not remove any part which is a press fit in or on a subassembly unless the removal of that part is necessary for repairs or replacement.
8. When removing ball bearings from shafts, it is best to use a bearing puller. When removing bearings from housings, drive out the bearing with a sleeve slightly smaller than the outside diameter of the bearing. The end of the sleeve or pipe which contacts the bearing must be square. Protect bearings from dirt by keeping them wrapped in clean cloths.

Hoist Disassembly

NOTICE

• It is recommended to remove load chain and chain bucket for a complete hoist disassembly.

1. Shut off, bleed down air supply then disconnect and tag air lines.
2. Remove hoist from its mounting and place in clean work area on a sturdy workbench.
3. Position several blocks of wood on the work bench and stand the hoist in a vertical position with the motor end up.

Chain Bag Container Disassembly

Refer to Dwg. MHP2788
1. Remove capscrews (201) and lockwashers (2) and pull chain bag container sub-assembly from the hoist.
2. Remove capscrews (204), lockwashers (203) and nuts (202) that secure brackets (203) to chain bag container (209).

Bottom Hook Disassembly

Model CL125K and CL250K Single Fall
Refer to Dwg. MHP2961
1. Remove capscrews (116) and nuts (122).
2. Separate the two halves of the bottom blocks (102) and remove the load chain (99).
3. Remove the bottom hook (115), keepers (113), thrust washers (111,112) and thrust bearing (110). Slide the thrust washers and thrust bearing down the bottom hook shank shoulder to remove the keepers. Slide the thrust washers and thrust bearing off of the bottom hook shank.

Model CL500K Double Fall Disassembly
Refer to Dwg. MHP2969
1. Remove capscrews (116), lockwashers (109), capscrew (103) and nut (122).
2. Separate the two halves of the bottom blocks (108) and remove the load chain (99).
3. Remove the pocket wheel (107) and thrust washers (105).
4. Remove the bottom hook (115), keepers (113), thrust washers (111,112), thrust bearing (110). Slide the thrust washers and thrust bearing down the bottom hook shank shoulder to remove the keepers. Slide the thrust washers and thrust bearing off of the bottom hook shank.

Top Hook Disassembly

Model CL125K and CL250K Single Fall and CL500K Double Fall
Refer to Dwg. MHP2951
1. Remove two jam nuts (30) and two flange nuts (31) and slide the two shoulder screws (48) from the hoist.
2. Pull the top hook (93) sub-assembly from the pocket in the top of the hoist. Remove the capscrew (98) and separate the left hook block (96) from the right hook block (95) to remove the top hook (93).
3. Pull the alignment plate (97) from the pocket in the top of the hoist.

Valve Disassembly

Refer to Dwg. MHP2952
1. Position the hoist with the valve end facing up.
2. Remove capscrews (85) and pull the limit switch lever (84) from the hoist.
3. Remove capscrews (67) and lockwashers (2) from the valve cover (65). Pull the valve sub-assembly from the rear of the hoist.
4. Lift the motor gasket (81) off of the motor housing (47).
5. Using a pick, remove the '0' ring (11) from the counter bore of the motor housing (47).
6. Remove the retaining ring (50) from the valve chest (57). Remove the inlet cap (52), buffer (53), spring (54) and washer (55) from the valve chest. Remove the '0' ring (51) from the inlet cap. Repeat for other side.
7. Remove the retaining ring (50), muffler screen (56) and muffler (25) from the rear of the valve cover (65).
8. Remove the retaining ring (50), valve cap (83) and '0' ring (51) from the bottom of the valve chest (57).
9. Remove the capscrews (1) and lockwashers (2) from the valve cover (65) and separate the valve cover from the valve chest (57). Remove the gasket (64) and pull the muffler (79) out of the valve chest.
10. Slide the limit switch shaft (63) out of the valve chest (57) and remove the pivot arm sub-assembly from the bottom of the valve chest.
11. Inspect the pivot arm sub-assembly for wear. If necessary, press the dowel pin (39) out of the lower pivot arm (82) and upper pivot arm (80) to separate the two.
12. Slide the valve (62) out of the valve cartridge (61).
13. Remove the capscrew (85) from the valve chest (57). Slide the valve cartridge (61) from the valve chest and remove the four s (60) from the valve cartridge.
14. Remove the retaining ring (50) shuttle valve cartridge (59) and ball (58) from the valve chest (57). Remove the '0' ring (51) from the shuttle valve cartridge.
15. Remove the retaining ring (50) and muffler screen (56) from the valve chest (57).
16. Press the bushing (71) from the valve chest (57).

Motor Disassembly

Refer to Dwg. MHP2952
1. Pull the dowel pin (78) from the rear endplate (77) protruding from the motor housing (47).
2. Pull the motor sub-assembly out of the motor housing (47) bore.
3. Remove the motor clamp '0' ring (69) from the motor housing (47) bore.
4. Orient the motor sub-assembly with the rotor (75) spade end facing up. Hold the cylinder (74) and using a rubber hammer carefully tap the rotor spade end until the press on the front rotor bearing (70) releases. This will allow the rotor and rear endplate (77) to fall free. Remove the front rotor bearing from the front endplate (73).
5. Remove the six vanes (76) from the rotor.
6. Position the rotor and rear endplate in a press on the rear endplate face with the rotor spade end facing down. Press the rotor out of the rear rotor bearing (70). Remove the rear rotor bearing from the rear endplate.

Brake Disassembly

Refer to Dwg. MHP2953
1. Position the hoist with the brake end facing up.
2. Loosen and remove the four capscrews (1) and four lockwashers (2) in an alternating pattern to evenly decrease the spring force between the piston housing (3) and the piston (6).
3. Remove the piston housing (3) and six springs (4). Slide the piston (6) off the gear case (14).
4. Remove the set screw (5) from the piston housing (3).
5. Remove the brake disc assembly (90) from the hex shaft protruding from the gear case (14).
6. Remove brake '0' ring (7) from the piston (6).
7. Using a pick, remove the '0' ring (11) from the counter bore of the gear case.

Transmission Disassembly

Refer to Dwg. MHP2953 and MHP2951
1. Position the hoist so the bottom is facing up.
2. Remove the magnetic drain plug (29) from the gear housing (34). Invert the hoist over a container and drain the fluid from the transmission. Remove the fill plug (35) and breather plug (36) from the gear housing.
3. Position the hoist so the motor housing (47) is facing up.
4. Remove the external retaining ring (17) from the pocket wheel (27).
5. Remove the four capscrews (1) and four lockwashers (2) form the motor housing (47).
6. Separate the motor housing from the gear case (34).
7. Using a pick, remove the '0' ring (11) from the counter bore of the gear housing (34).
8. Remove the two dowel pins (39) from the splitter (38) and slide the splitter out of the pocket wheel (27).
9. Remove the chain guide (40) from the gear housing (34).
10. Position the hoist so the gear case (14) is facing up.
11. Remove the four capscrews (86) and four lockwashers (2) from the gear case (14). Turn the gear case approximately 45 degrees. While pushing on the hex protruding from the gear case, pull the gear case from the gear housing (34).
12. Using a pick, remove the '0' ring (11) from the counter bore of the gear housing (34).
13. Remove the gear frame assembly (16) from the pocket wheel (27).
14. Pull the pocket wheel (27) sub-assembly from the gear housing (34).

Pocket Wheel Disassembly

Refer to Dwg. MHP2951 and MHP2953
1. Remove the bearing (28) (inner race press) from the pocket wheel (27).
2. Support the pocket wheel (27) in a press with the gear end facing down and press the seal (15) out of the pocket wheel.

Gear Case Disassembly

Refer to Dwg. MHP2951
1. Remove the two '0' rings (7) and '0' ring (10) from the gear case (14).
2. Support the gear case (14) with the gear end facing down and press the seal (15) out of the gear case.
3. It is not recommended the three dowel pins (87) be removed from the gear case (14). If the dowel pins are damaged, the gear case, seal (15) and three dowel pins should be replaced.

Motor Housing Disassembly

Refer to Dwg. MHP2951
1. Remove the retaining ring (41) from the motor housing (47).
2. Position the motor housing (47) in a press with the motor bore facing up and press the bearing (42) from the motor housing.
3. Press the bushing (71) from the motor housing (47).

Gear Housing Disassembly

Refer to Dwg. MHP2951
1. Remove the '0' ring (7) from the gear housing (34).
2. It is not recommended the two dowel pins (37) be removed from the gear housing (34). If the dowel pins are damaged, the gear housing and two dowel pins should be replaced.

Cleaning, Inspection and Repair

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

Cleaning

⚠ CAUTION

• 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 solvent except for the brake. The use of a stiff bristle brush will facilitate the removal of accumulated dirt and sediments on the gears and frames. If bushings have been removed it may be necessary to carefully scrape old Loctite® from the bushing bore. Dry each part using low pressure, filtered compressed air.

Inspection

All disassembled parts should be inspected to determine their fitness for continued use. Pay particular attention to the following:
1. Inspect all gears for worn, cracked, or broken teeth.
2. Inspect all bushings for wear, scoring, or galling.
3. Inspect all bearings for play, distorted races, pitting and roller or ball wear or damage. Inspect bearings for freedom of rotation. Replace bearings if rotation is rough or bearings are excessively worn.
4. Inspect shafts for ridges caused by wear. If ridges caused by wear are apparent on shafts, replace the shaft. Inspect all surfaces on which oil seal lips seat. These surfaces must be very smooth to prevent damage to the seal lip.
5. Inspect all threaded items and replace those having damaged threads.
6. Inspect the brake for warpage or other damage, and replace as necessary.
7. Measure the thickness of the brake. The brake must show an even wear pattern. If the brake is 0.275 in. (7 mm) or less, replace.

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.

1. Worn or damaged parts must be replaced. Refer to the applicable Product Parts Information manual for specific replacement parts information.
2. Inspect all remaining parts for evidence of damage. Replace or repair any part which is in questionable condition. The cost of the part is often minor in comparison with the cost of redoing the job.
3. Smooth out all nicks, burrs, or galled spots on shafts, bores, pins, or bushings.
4. Examine all gear teeth carefully, and remove nicks or burrs.
5. Polish the edges of all shaft shoulders to remove small nicks which may have been caused during handling.
6. Remove all nicks and burrs caused by lockwashers.
7. Replace all gaskets, oil seals, and '0' rings removed during hoist disassembly.

Hoist Assembly

Gear Housing Sub-assembly

Refer to Dwg. MHP2951
1. Press two dowel pins (37) into gear housing (34) until dowel pins bottom out in the holes.
2. Apply '0' ring lubricant to '0' ring (7) and the internal '0' ring groove of the gear housing (34). Insert '0' ring into gear housing '0' ring groove.

Motor Housing Sub-assembly

Refer to Dwg. MHP2951
1. Support the motor housing (47) with the chain guide end facing up. Press bushing (71) into motor housing until flush with surface.
2. Press the bearing (42) (outer race press) into the motor housing (47) until it contacts the shoulder.
3. Insert the retaining ring (41) into the groove of the motor housing (47).

Gear Case Sub-assembly

Refer to Dwg. MHP2951
1. Support the gear case (14) in a press with the gear end facing up. With the lip side facing up, press seal (15) into the gear case until flush with surface.
2. Invert the gear case (14) in the press so the gear end is facing down. Press three dowel pins (87) into the gear case until the dowel pins bottom out in the holes.
3. Apply '0' ring lubricant to '0' rings (10), two (7) '0' rings and the '0' ring grooves of the gear case (14). Insert '0' rings into gear case '0' ring grooves.

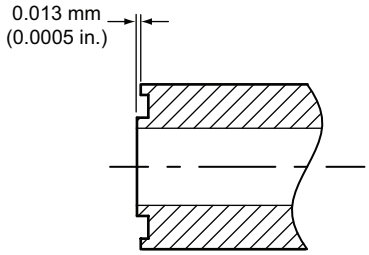
Pocket wheel Sub-assembly

Refer to Dwg. MHP2951 and MHP2953
1. Support the pocket wheel (27) in a press with the gear end facing up. With the lip side facing up, press seal (15) into the pocket wheel until flush with surface.
2. Invert the pocket wheel (27) in the press so the gear end is facing down. Press the bearing (28) (inner race press) onto the pocket wheel until it contacts the shoulder.

Motor Sub-assembly

Refer to Dwg. MHP2952
1. Prior to assembly, soak six vanes (76) in IR #10 oil or equivalent air line lube.
2. Support rotor (75) body in a press with the spade end facing down. Position the rear endplate (77) over the rear rotor shaft. Using an offset punch, press bearing (70) (inner race press) onto rotor shaft. Rotor should spin freely with no drag on the endplate. Refer to Dwg. MHP3115 on page 10.

Motor Bearing Offset Punch



(Dwg. MHP3115)

3. Invert the motor sub-assembly and position cylinder (74) over the rotor (75) aligning the exhaust holes to the correct orientation. When looking at the motor assembly from the spade end of the rotor, the dowel pin hole in the rear endplate (77) and cylinder should be at bottom center and the exhaust holes in the cylinder should be in the upper right quadrant.
4. Install six vanes (76) into the rotor (75) slots. Coat all surfaces liberally with IR #10 oil or equivalent air line lube.
5. Support the rear shaft of the rotor (75) in a press. Position the front endplate (73) over the front rotor shaft. Using the offset punch, press bearing (70) (inner race press) onto rotor shaft.
6. Insert the dowel pin (78) into the motor sub-assembly. Place the motor sub-assembly in a 'V' block. The rotor (75) should spin freely in assembly with no drag between parts.

Pivot Arm Sub-assembly

Refer to Dwg. MHP2952

1. Support the lower pivot arm (82) in a press with the chamfer in the small hole facing up. Position the upper pivot arm (80) into the slot of the lower pivot arm and insert the dowel pin (39) into the hole. Using a punch, press the dowel pin until it contacts the face supporting the lower pivot arm in the press.

Valve Sub-assembly

Refer to Dwg. MHP2952

1. Support the valve chest (57) in a press with the motor bore side facing up. Press the bushing (71) into the valve chest until flush with the surface.
2. Insert the muffler screen (56) into the exhaust bore of the valve chest (57). Insert the retaining ring (50) into the groove of the valve chest (57).
3. Apply '0' ring lubricant to two '0' rings (51) and the '0' ring grooves of the shuttle valve cartridge (59). Insert '0' rings into shuttle valve cartridge '0' ring grooves.
4. Insert the ball (58) into the shuttle valve bore of the valve chest (57). Assemble the shuttle valve cartridge (59) and '0' rings (51) into the shuttle valve cartridge bore of the valve chest. Insert the retaining ring (50) into the groove of the valve chest (57).
5. Apply '0' ring lubricant to four '0' rings (60) and the '0' ring grooves of the valve cartridge (61). Insert '0' rings into valve cartridge '0' ring grooves.
6. Apply a liberal amount '0' ring lubricant to the valve cartridge bore of the valve chest (57) and outside diameter of the valve cartridge (61). Align the valve cartridge with the valve cartridge bore of the valve chest with the flat section facing down and using constant pressure, slide the valve cartridge into the valve chest until it is centered. Thread the capscrew (85) into the valve chest through the alignment hole in the valve cartridge and torque to 4.5-5.5 Nm [40.0-48.5 in-lbs].
7. Position the valve chest (57) with the bottom hole facing up. Coat the valve cartridge (61) bore and outside diameter of the valve (62) with IR #10 oil or equivalent air line lube. Orient the hole in the valve vertically and slide the valve into the valve cartridge.
8. Apply '0' ring lubricant between the joint of the lower pivot arm (82) and upper pivot arm (80). Insert the pivot arm sub-assembly into the valve chest (57) opening allowing the upper pivot arm to engage the vertically oriented hole in the valve (62).
9. Apply IR #10 oil or equivalent air line lube to the inside diameter of the bushing (71) pressed into the valve chest (57). With the valve chest hole still facing up, orient the flat on the limit switch shaft (63) facing up and slide the limit switch shaft into the valve chest and internal hex of the lower pivot arm (82). Carefully actuate the limit switch shaft to check for smooth valve operation. There should be no drag between the parts.
10. Apply '0' ring lubricant to the '0' ring (51) and '0' ring counter bore of the valve chest (57). Insert '0' ring into valve chest '0' ring counter bore. Insert the valve cap (83) into the valve chest and using constant pressure, push the valve cap into the valve chest. Insert the retaining ring (50) into the groove of the valve chest (57).
11. Taking care to prevent the limit switch shaft (63) from becoming disengaged from the lower pivot arm (82), position the valve chest (57) with the motor bore end facing down.
12. Insert the muffler (79) into the valve chest (57). Push the muffler into the slot until it is completely below the surface. Position the gasket (64) and valve cover (65) onto the valve chest. Install the two capscrews (1) and lockwashers (2) through the valve cover (65) and torque to 2.7-3.3 Nm [24.0-29.0 in-lbs].
13. Insert the muffler (25) and muffler screen (56) into the exhaust bore of the valve cover (65). Insert the retaining ring (50) into the groove of the valve cover (65).
14. Insert washer (55), buffer (53) and spring (54) into valve chest (57). Apply '0' ring lubricant to '0' ring (51) and the '0' ring groove of the inlet cap (52). Insert '0' ring into valve cap '0' ring groove. Insert the inlet cap (52) into the valve chest and using constant pressure, push the inlet cap into the valve chest. Insert the retaining ring (50) into the groove of the valve chest (57). Repeat for other side.
15. Position the limit switch lever (84) over the limit switch shaft (63). Apply thread locking adhesive to two capscrews (85) and thread into limit switch shaft. Torque to 2.7-3.3 Nm [24.0-29.0 in-lbs].

Neutered Hoist Body Assembly

Refer to Dwg. MHP2951 and MHP2953

1. Support the pocket wheel (27) sub-assembly in a press with the gear end facing down. Position the gear housing (34) sub-assembly over the bearing (28) and using constant pressure, press the gear housing onto the bearing until it contacts the shoulder.
2. Align the holes of the splitter (38) with the holes of the gear housing (34) and slide the splitter into the groove of the pocket wheel (27). Insert two dowel pins (39) through the splitter and gear housing.
3. Assemble the chain guide (40) into the gear housing (34).
4. Apply '0' ring lubricant to the '0' ring (11) and '0' ring counter bore of the gear housing (34). Insert '0' ring into gear housing '0' ring counter bore.
5. With the pocket wheel (27) still supported, slide the motor housing (47) sub-assembly over the bearing (42) until the gear housing (34) and motor housing contact.
6. Assemble the retaining ring (68) onto the pocket wheel (27).
7. Install the four capscrews (1) and lockwashers (2) through the motor housing (47) and torque to 4.5-5.5 Nm [40.0-48.5 in-lbs].
8. Position the gear case assembly on a work surface with the motor housing (47) facing down.
9. Coat the lip of seal (15) in the pocket wheel (27) sub-assembly and the seal contact surfaces of the gear frame assembly (16) with '0' ring lubricant. With the slotted shaft end facing down and taking care not to damage the seal, slide the gear frame assembly into the pocket wheel (27) until the bearing contacts the shoulder.
10. Apply '0' ring lubricant to the '0' ring (11) and '0' ring counter bore of the gear housing (34). Insert '0' ring into gear housing '0' ring counter bore.
11. Coat the lip of seal (15) in the gear case (14) sub-assembly and the seal contact surfaces of the gear frame assembly (16) with '0' ring lubricant. With the gear end facing down and taking care not to damage the seal, slide the gear case sub-assembly over the hex end of the shaft and into the gear housing (34) until it contacts the shoulder.
12. Install the four capscrews (86) and lockwashers (2) through the gear case (14) and torque to 4.5-5.5 Nm [40.0-48.5 in-lbs].
13. Invert the hoist body sub-assembly so the motor housing (47) is facing up.
14. Coat rotor (75) spade end and the gear frame assembly (16) slotted shaft end with IR # 80179138 Grease. Wipe all excess from the motor bore in the motor housing (47).
15. Place motor clamp '0' ring (69) in the bore of the motor housing (47).
16. Remove the dowel pin (78) from the motor sub-assembly and replace with an extended pin approximately twice as long. Position the extended dowel pin in the motor housing (47) alignment hole and slide the motor sub-assembly into the motor housing. If necessary the hex end of the gear frame assembly (16) shaft can be rotated to align the slot with the spade end of the rotor (75). Remove the extended dowel pin and replace with the dowel pin (78).
17. Apply '0' ring lubricant to the '0' ring (11) and '0' ring counter bore of the motor housing (47). Insert '0' ring into motor housing '0' ring counter bore.
18. Position motor gasket (81) over the rear endplate (77) protruding from the motor housing (47).
19. Apply IR #10 oil or equivalent air line lube to the inside diameter of the bushing (71) pressed into the motor housing (47).
20. Pilot the valve sub-assembly over the rear endplate (77) protruding from the motor housing (47) while aligning the limit switch shaft (63) with the bushing (71). Install the four capscrews (67) and lockwashers (2) through the valve cover (65). Torque the four capscrews (67) and two capscrews (1) and tighten in an alternating pattern. Torque to 4.5-5.5 Nm [40.0-48.5 in-lbs].
21. Slide brake disc assembly (90) over hex shaft.
22. Apply '0' ring lubricant to '0' ring (7) and the '0' ring groove of the piston (6). Insert '0' ring into piston '0' ring groove.
23. Apply '0' ring lubricant to the '0' ring (11) and '0' ring counter bore of the gear case (14). Insert '0' ring into gear case '0' ring counter bore.
24. Align three holes in piston (6) with the three dowel pins (87) extending from the gear case brake friction surface and slide over '0' rings until piston brake friction surface contacts the disc brake assembly (90).
25. Position six springs into the six counter bores on the piston (6). A small amount of '0' ring lubricant may be used on the end of the springs to assist in positioning the springs into their respective counter bores.
26. Apply thread locking adhesive or equivalent to set screw (5) and thread into piston housing (3). Torque to 2.7-3.3 Nm [24.0-29.0 in-lbs]. Remove any excess thread locking adhesive from the piston housing.
27. Align the piston housing (3) with the piston (6) and press firmly down on the piston housing until it contacts the piston. While maintaining pressure on the piston housing, Insert the four capscrews (1) and lockwashers (2) and tighten in an alternating pattern. Torque to 4.5-5.5 Nm [40.0-48.5 in-lbs].

28. Align the holes in the nameplate (91) with the holes on the front of the piston housing (3) and adhere it in place. Tap four rivets (12) to secure the nameplate to the piston housing.
29. Apply IR # SMB-441 thread sealant to the threads of all plugs. Thread the magnetic drain plug (29) into the bottom hole of the gear housing (34) and the level plug (35) into the side hole of the gear housing. Torque the two plugs to hand tight plus 1 to 1 ½ turns.
30. Fill the transmission through the top fill hole with 39.0 ml [1.3 oz] of Dexron VI ATF.
31. Apply IR #SMB-441 thread sealant to the threads of the breather plug (36) and thread into the gear housing (34). Care must be taken to prevent the leaking fluid from the breather plug.
32. Clean all surfaces of the hoist of any contaminants such as grease or oil and if necessary, apply two appropriate capacity labels (46) on the motor housing (47) and the warning label (33) to the gear case (34).

Pendant Hose Attachment

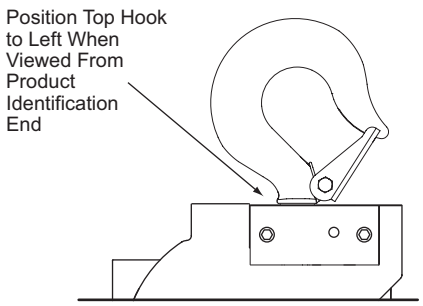
Refer to Dwg. MHP2964 and MHP2952
1. Apply IR # SMB-441 thread sealant to the threads of three adapters (137) and thread into the valve cover (65). Torque to hand tight plus 1 to 1-1/2 turns.
2. Apply IR # SMB-441 thread sealant to the threads of three adapters (137) and thread into the pendant assembly (114). Torque to hand tight plus 1 to 1-1/2 turns.
3. When looking at the neutered hoist body assembly from the valve cover (65) end the 'UP' inlet is on the right and the 'DOWN' inlet is on the left. The 'UP' and 'DOWN' inlets are over their corresponding button on the pendant assembly (114). The supply line is in the center on both the neutered hoist body assembly and pendant assembly. Torque all connections to 18.00-20.00 Nm [159.00-177.00 in-lbs].
4. Attach the supply line with the warning card closest to the pendant assembly (114) to the center inlet of both the neutered hoist body assembly and pendant assembly. Attach the 'UP' and 'DOWN' inlets to both the neutered hoist body assembly and pendant assembly.
5. Attach s-hook (138) to the pendant assembly (114) and strain relief in hose assembly (139) closest the pendant assembly and crimp both ends to secure to both.
6. Slide the support (66) through the end of the strain relief in the hose assembly (139) closest the neutered hoist body assembly. Assemble the two lockwashers (2) to the two capscrews (86). Insert the two capscrews and two lockwashers through the support and thread into the valve cover (65) to secure the strain relief to the neutered hoist body assembly. Torque to 4.5-5.5 Nm [40.0-48.5 in-lbs].

Top Hook Assembly

Model CL125K and CL250K Single Fall

Refer to Dwg. MHP3116 on page 11 and Dwg. MHP2951.
1. Apply IR # 67 grease to top hook (93) shank.
2. Assemble top hook (93) into hook block (95) and hook block (96). Slide two shoulder screws (48) through holes to align the hook blocks. Thread capscrew (98) into hook blocks and torque to 9.0-11.0 Nm [79.5-97.5 in-lbs]. Remove the two shoulder screws and rotate the top hook in the sub-assembly, there should be no drag between the parts.

Single Fall Top Hook Position



Product Identification End View

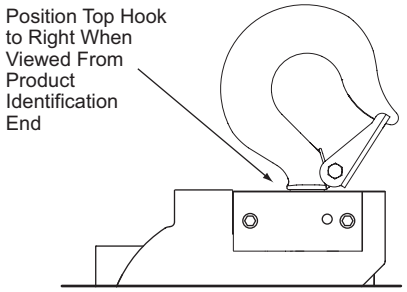
(Dwg. MHP3116)

3. There are two mounting options available when mounting the top hook (93) to the hoist. Refer to Dwg. MHP3113 on page 7 for centerline of hoist.
   a. Swivel Mount - Place the alignment plate (97) into the pocket on top of the hoist with the diameter closest to the centerline of the hoist.
   b. Rigid mount - Place the alignment plate (97) into the pocket on top of the hoist with the square shape closest to the centerline of the hoist.
4. Insert the top hook sub-assembly into the pocket on top of the hoist with the top hook (93) closest to the centerline of the hoist. If a rigid mount is being utilized, be sure the hook is oriented in one of the desired 90 degree increments.
5. Assemble two shoulder screws (48) into the gear housing (34) through the hook sub-assembly and motor housing (47). Thread two flange nuts (31) onto the shoulder screws until they contact the screw shoulder. Thread two jam nuts (30) onto the shoulder screws and torque to 4.5-5.5 Nm [40.0-48.5 in-lbs].
6. Insert two plugs (13) into the two lower left reeving points when looking from valve cover (65) end of the hoist.

Model CL500K Double Fall

Refer to Dwg. MHP3117 on page 11 and Dwg. MHP2951.
1. Apply IR # 67 grease to top hook (93) shank.
2. Assemble top hook (93) into hook block (95) and hook block (96). Slide two shoulder screws (48) through holes to align the hook blocks. Thread capscrew (98) into hook blocks and torque to 9.0-11.0 Nm [79.5-97.5 in-lbs]. Remove the two shoulder screws and rotate the top hook in the sub-assembly, there should be no drag between the parts.

Double Fall Top Hook Position



Product Identification End View

(Dwg. MHP3117)

1. There are two mounting options available when mounting the top hook (93) to the hoist. Refer to Dwg. MHP3114 on page 7 for centerline of hoist.
   a. Swivel Mount - Place the alignment plate (97) into the pocket on top of the hoist with the diameter farthest from the centerline of the hoist.
   b. Rigid mount - Place the alignment plate (97) into the pocket on top of the hoist with the square shape farthest from the centerline of the hoist.
2. Insert the top hook sub-assembly into the pocket on top of the hoist with the top hook (93) farthest from the centerline of the hoist. If a rigid mount is being utilized, be sure the hook is oriented in one of the desired 90 degree increments.
3. Assemble two shoulder screws (48) into the gear housing (34) through the hook sub-assembly and motor housing (47). Thread two flange nuts (31) onto the shoulder screws until they contact the screw shoulder. Thread two jam nuts (30) onto the shoulder screws and torque to 4.5-5.5 Nm [40.0-48.5 in-lbs].

Bottom Hook Assembly

Model CL125K and CL250K Single Fall
Refer to Dwg. MHP2961
1. Apply IR # 67 grease to all surfaces of thick thrust washer (112), thrust bearing (110) and thin thrust washer (111).
2. Assemble thick thrust washer (112) onto the bottom hook (115) shank to the hook shoulder with the chamfer side facing away from the hook. Assemble the thrust bearing (110) and thin thrust washer (111) onto the bottom hook shank.
3. Apply IR # 67 grease to the bottom hook (115) shank and assemble the two keepers (113) to the bottom hook shank. Slide the thick thrust washer (112), thrust bearing (110) and thin thrust washer (111) up to capture the keeper on the bottom hook shank.
4. Place bottom hook (115) sub-assembly into bottom block (102).
5. Turn the last link of the load chain (99) so the weld is facing down and insert into the bottom block (102). Attach the other bottom block and position two nuts into the cast hex shapes of the bottom blocks and thread the two capscrews (116) into the nuts. Torque to 9.0-11.0 Nm [79.5-97.5 in-lbs]. The hook should rotate freely in the assembly with no drag between the parts.
6. Clean all surfaces of the bottom blocks (102) of any contaminants such as grease or oil and if necessary, apply two appropriate capacity labels (104) into the label window.

Model CL500K Double Fall
Refer to Dwg. MHP2969
1. Apply IR #67 grease to all surfaces of two thrust washer (105) and assemble to the pocket wheel (107). Assemble pocket wheel sub-assembly into the bushing of bottom block (108).
2. Apply IR #67 grease to all surfaces of thick thrust washer (112), thrust bearing (110) and thin thrust washer (111).
3. Assemble thick thrust washer (112) onto the bottom hook (115) shank to the hook shoulder with the chamfer side facing away from the hook. Assemble the thrust bearing (110) and thin thrust washer (111) onto the bottom hook shank.
4. Apply IR # 67 grease to the bottom hook (115) shank and assemble the two keepers (113) to the bottom hook shank. Slide the thick thrust washer (112),

thrust bearing (110) and thin thrust washer (111) up to capture the keeper on the bottom hook shank.
5. Place bottom hook (115) sub-assembly into bottom block (108).
6. Attach the other bottom block (108). Assemble two lockwashers (109) to the two capscrews (116). Assemble the two capscrews and the two lockwashers into the bottom block bottom holes. Assemble capscrew (103) and nut (122) through top hole. Torque to 9.0-11.0 Nm [79.5-97.5 in-lbs]. The hook should rotate freely in the assembly with no drag between the parts.
7. Clean all surfaces of the bottom blocks (108) of any contaminants such as grease or oil and if necessary, apply two capacity labels (104) into the label window.

Chain Bag Container Assembly

Refer to Dwg. MHP2788

1. Hold the chain bag container (209) with the seam facing the assembler. Orient the bracket (203) to be assembled to the right side of the bag so the two bottom holes are closest the assembler. Assemble two capscrews (204) through the bracket and chain bag container. Assemble two washers (203) and nuts (202) to the two capscrews and torque to 4.5-5.5 Nm [40.0-48.5 in-lbs]. Repeat the assembly for the left side with the exception that the two mounting holes on the bracket are to be away from the assembler.
2. Position the chain bag container on the hoist with the seam facing the center line of the hoist. Assemble the two lockwashers (2) to the two capscrews (201). Insert the two capscrews and two lockwashers through the brackets (203) and thread into the gear housing (34) and motor housing (47) to secure the chain bag container sub-assembly to the hoist. Torque to 4.5-5.5 Nm [40.0-48.5 in-lbs].

PENDANT DISASSEMBLY AND REASSEMBLY

Pendant Disassembly

Refer to Dwg. MHP2916 and MHP3106.
Pendant removed from service with all hoses and strain relief removed.
1. Remove four screws (117) and remove pendant guard (123).
2. Drive pin (125) out and remove 'UP' and 'DOWN' levers (119, 120).
3. Remove retaining screw (116).
4. Remove valve assemblies by tapping housing on non marring surface such as a wood block to unseat valve assemblies.
5. Separate valve (129) from valve bushing (122) and spring (121).

For general repair of the pendant handle no further disassembly is required.

Cleaning, Inspection and Repair

Cleaning

CAUTION

- **Do not dip cushioned handle into solvent when cleaning other components. Damage to handle will occur.**

Remove and discard all '0' rings and clean components in solvent.

Inspection

All disassembled parts should be inspected to determine their fitness for continued use.

Pay attention to the following:
1. Inspect all bushings and valves for wear, scoring or galling.
2. Specifically inspect the valve tips for wear.
3. Inspect the housing, 'UP' and 'DOWN' levers for damage.
4. Inspect all threads for damage.

Repair

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

1. Worn or damaged parts must be replaced. Refer to the applicable Product Parts Information manual for specific replacement parts information.
2. Inspect all remaining parts for evidence of damage. Replace or repair any parts in questionable condition.
3. Smooth out all nicks, burrs and galled spots on parts as necessary.
4. Remove any nicks due to lockwashers.
5. Replace all '0' rings.

Pendant Assembly

1. Lube all '0' rings.
2. Slide valves (129) into valve bushings (122) taking care not to nick '0' rings.
3. Install springs (121) onto ends of valves and slip valve, valve bushing and spring into pendant housing.
4. Install retaining screw (116).
5. Install 'UP' and 'DOWN' levers (119, 120) and then tap pin (125) into place.
6. Check for proper movement and return to original position of lever and valves.
7. Install guard (123) using four screws (117).
8. Reconnect to hoist and supply air and check for leaks in static position. There should be no audible leakage. Actuate hoist several times, again there should be no detectable leakage. The pendant should have no delay in activation or deactivation of the hoist.

Optional Emergency Stop Disassembly

Refer to Dwg. MHP3106.
If optional Emergency Stop device is incorporated into pendant the following additional instructions apply:

Emergency Stop Disassembly

Pendant removed from service with all hoses and strain relief removed.
1. Remove two screws (146), two screws (1) and four lockwashers (2) and remove from main pendant assembly.
2. Remove E-Stop threaded button (141). Note this will minimize spring tension (147).
3. Remove retaining ring (142), (there will still be some spring pressure) and valve cap (148).
4. Remove valve (144).

Cleaning, Inspection and Repair

Cleaning

CAUTION

- **Do not dip cushioned handle into solvent when cleaning other components. Damage to handle will occur.**

Remove and discard all '0' rings and clean components in solvent.

Inspection

All disassembled parts should be inspected to determine their fitness for continued use.

Pay attention to the following:
1. Inspect housing bore and valve for wear, scoring or galling.
2. Inspect the housing, E-stop button and spring for damage.
3. Inspect all threads for damage.

Repair

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

1. Worn or damaged parts must be replaced. Refer to the applicable Product Parts Information manual for specific replacement parts information.
2. Inspect all remaining parts for evidence of damage. Replace or repair any parts in questionable condition.
3. Smooth out all nicks, burrs and galled spots on parts as necessary.
4. Remove any nicks due to lockwashers.
5. Replace all '0' rings.

Emergency Stop Assembly

1. Lube all '0' rings and housing bore with Parker '0' ring lube.
2. Slide valve (144) into bore of housing (145) taking care not to nick '0' rings.
3. Install spring (147) into valve and install end cap (148) into housing.
4. Install retaining ring (142).
5. Thread E-Stop button (141) into housing until button makes contact with housing shoulder. Hand tighten only.
6. Ensure three '0' rings (161) are in their respective counter bores, align to spring pins and reinstall Emergency stop assembly to pendant housing using two screws (146), two screws (1) and four lockwashers (2). Torque to 4.5-5.5 Nm [40.0-48.5 in-lbs].
7. Reconnect hoses and strain relief and test for proper function of Emergency stop. Depress 'UP' and 'DOWN' lever and then actuate Emergency stop button. Supply airflow should stop. Twist to reset button, supply air should be restored with pendant controls working as normal.

TORQUE CHART

Standard Coarse Thread Torque

Size	SAE Grade 5			SAE Grade 8		
	Dry	Lubricated	PTFE	Dry	Lubricated	PTFE
1/4-20	8-10	6-7	4	12-14	9-10	5-6
5/16-18	17-20	13-15	8-9	25-28	18-21	11-13
3/8-16	31-35	23-26	14-16	44-49	33-37	20-22
7/16-14	49-56	37-42	22-25	70-79	52-59	31-36
1/2-13	75-85	57-64	34-38	106-121	80-90	48-54
9/16-12	109-123	82-92	49-55	154-174	115-130	69-78
5/8-11	150-170	113-128	68-77	212-240	159-180	95-108
3/4-10	267-302	200-227	120-136	376-426	282-320	169-192
7/8-9	429-487	322-365	193-219	606-687	455-515	273-309
1-8	644-729	483-547	290-328	909-1030	681-772	409-463
1 1/8-7	794-900	596-675	357-405	1288-1460	966-1095	580-657
1 1/4-7	1121-1270	840-952	504-571	1817-2059	1363-1545	818-927

Standard Fine Thread Torque

Size	SAE Grade 5			SAE Grade 8		
	Dry	Lubricated	PTFE	Dry	Lubricated	PTFE
1/4-20	10-11	7-8	4-5	14-15	10-12	6-7
5/16-24	19-22	14-16	9-10	27-31	20-23	12-14
3/8-24	35-40	26-30	16-18	49-56	37-42	22-25
7/16-20	55-63	41-47	25-28	78-88	58-66	35-40
1/2-20	85-96	64-72	38-43	120-136	90-102	54-61
9/16-18	121-137	91-103	55-62	171-194	128-146	77-87
5/8-18	170-193	127-144	76-87	240-272	180-204	108-122
3/4-16	297-337	223-253	134-152	420-476	315-357	189-214
7/8-14	474-537	355-403	213-242	669-758	502-568	301-341
1-12	704-798	528-599	317-359	995-1127	746-845	448-507
1 1/8-12	1023-1159	767-869	460-572	1444-1637	1083-1227	650-736
1 1/4-12	1425-1615	1069-1211	641-727	2012-2280	1509-1710	905-1026

Metric Coarse Thread Torque

Size	Class 8.8/9.8			Class 10.9		
	Dry	Lubricated	PTFE	Dry	Lubricated	PTFE
M6x1	9-10	6-7	4	11-12	8-9	5-6
M8x1.25	21-23	16-18	9-11	26-30	20-22	12-13
M10x1.5	41-47	31-35	19-21	53-60	39-45	24-27
M12x1.75	71-81	54-61	32-36	91-103	68-77	41-46
M14x2	115-130	86-98	52-59	147-166	110-125	66-75
M16x2	165-187	124-140	74-84	227-257	170-193	102-116
M20x2.5	321-364	241-273	144-164	443-502	332-376	199-226
M22x2.5	439-497	329-373	197-224	605-686	454-514	272-309
M24x3	556-630	417-473	250-284	767-869	575-652	345-391
M30x3.5	1103-1250	827-938	496-563	1521-1724	1141-1293	685-776

Metric Fine Thread Torque

Size	Class 8.8/9.8			Class 10.9		
	Dry	Lubricated	PTFE	Dry	Lubricated	PTFE
M8x1	22-25	17-19	10-11	28-32	21-24	13-14
M10x1.25	44-49	33-37	20-22	56-63	42-47	25-28
M12x1.25	78-89	59-67	35-40	100-113	75-85	45-51
M14x1.5	125-141	93-106	56-64	159-180	119-135	72-81
M16x1.5	176-200	132-150	79-90	243-276	183-207	110-124
M18x1.5	257-291	193-219	116-131	355-402	266-302	160-181
M20x1.5	358-406	268-304	161-183	494-559	370-420	222-252
M22x1.5	484-548	363-411	218-247	667-756	500-567	300-340
M24x2	609-690	456-517	274-310	839-951	630-713	378-428
M30x2	1227-1390	920-1043	552-626	1692-1918	1269-1438	761-863

Notes:

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

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