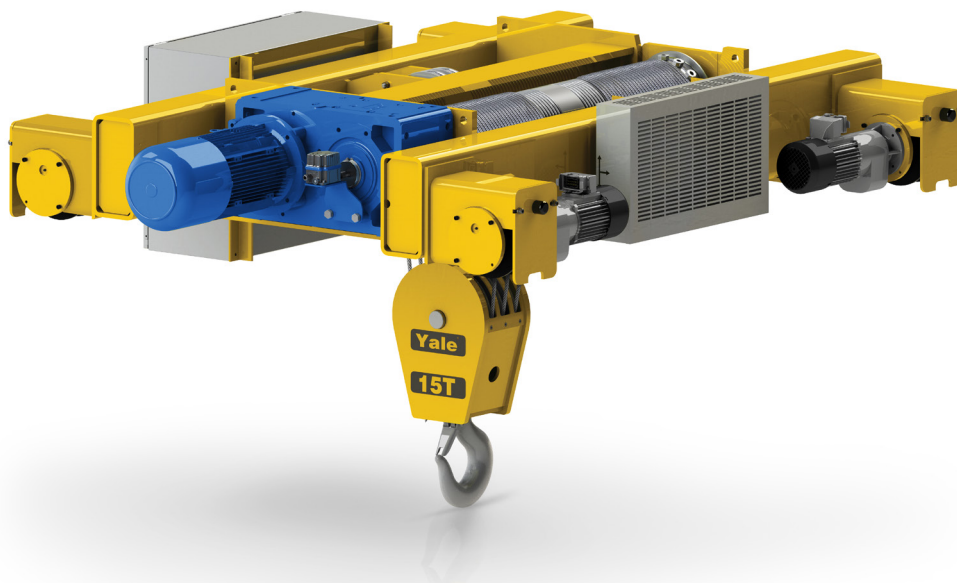


OPERATING & MAINTENANCE MANUAL



Yale[®] LODEKING[™] LT

HIGH CAPACITY ELECTRIC WIRE ROPE HOISTS
Capacities from 10 to 25 Tons

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RECOMMENDED SPARE PARTS

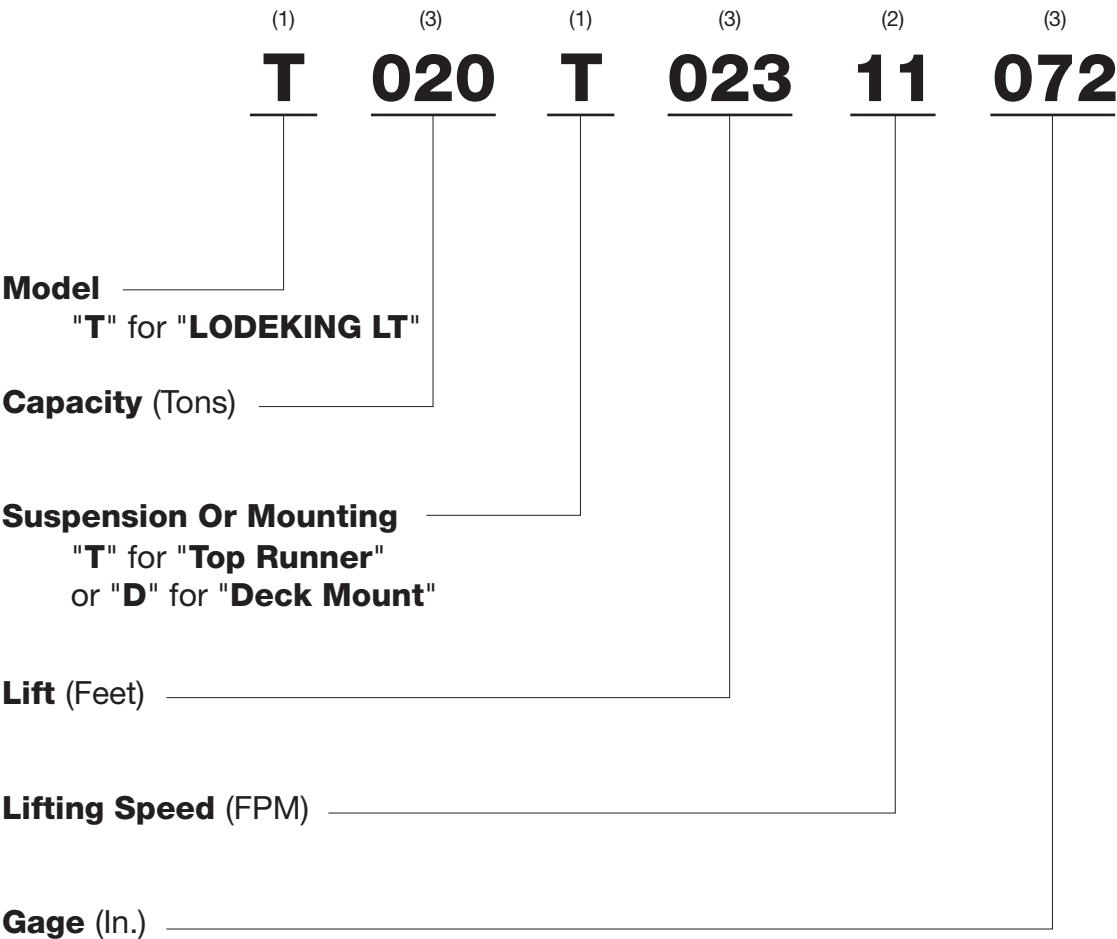
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LODEKING LT MODEL NUMBER SYSTEM

Example: Model # T025T02511072
25-ton LODEKING LT
Top running suspension
23 ft. of lift (11 st./min. hoist speed)
11 ft./min. hoist speed
Gage is 72 in.



SAFE HOISTING PRACTICES

For your own safety and that of your fellow workers, Material Handling Equipment must be used as recommended by the Manufacturer. Failure to heed the following recommendations could endanger your life. Use good common sense and judgement at all times. Safety is the responsibility of the operator of the equipment. You must be competent and attempt to foresee and avoid all hazardous conditions. To be safe as possible, the hoist must be given proper preventive maintenance and testing as described in the ANSI B30.2 Overhead and Gantry Cranes.

WARNING

When installing traverse motors on trucks, apply loctite 243 to motor mounting bolts and torqued per the table below.

Truck	Bolt Size	Required Torque
115 mm	M6 x 1.0 x 20	7.5 to 8 ft-lbs
160 mm	M6 x 1.0 x 25	
200 mm	M8 x 1.25 x 30	18 to 20 ft-lbs
260 mm	M8 x 1.25 x 40	
305 mm	M12 x 1.75 x 45	62 to 68 ft-lbs

BEFORE OPERATING HOIST

1. Do not operate hoist unless you are properly trained, physically fit, and authorized to do so. You must be familiar with all operating controls of the hoist, warnings and instructions on the hoist, the safe hoisting practices listed in this manual, ANSI B30.16 Safety Code For Overhead Hoists, and all pertinent Federal, State, and local regulations before beginning operation.
2. Do not allow unqualified personnel to operate the hoist.
3. Test all controls and limit switches and make sure hoist is well lubricated at beginning of each shift. Make sure needed lubrication, adjustments, or repairs are made by appointed personnel before operations are begun.
4. Be familiar with the equipment and its proper care. Do not operate hoist if adjustments or repairs are necessary, if any damage or undue wear is known or suspected, or if any warning, operating, or capacity instructions normally attached to hoist are damaged, obscured or missing. Report these items promptly to the proper person and also notify next operator when changing shifts.
5. Do not operate hoist if it is functioning improperly.
6. Do not operate hoist with an out-of-order sign attached until sign has been removed by a properly authorized person.
7. Do not adjust or repair hoist unless qualified for maintenance of hoist.
8. Be sure the power supply is disconnected before maintenance and repair procedure is performed.
9. Do not use the wire rope as a ground for welding.
10. Do not touch a welding electrode to the wire rope.

APPLYING THE LOAD

11. Never wrap the wire rope around the load, or allow it to drag under load.
12. Always use slings or other approved devices to attach load.
13. Be sure the sling is properly seated in the saddle of the hook. Do not allow hook latch to support any part of load.
14. Do not apply a load to tip of hook, or in such a way as to cause bending, or prying forces on the hook or hook support block.
15. Be sure wire ropes are not kinked or twisted or that multiple part ropes are not twisted about each other.
16. Do not operate hoist if wire rope is not seated properly in the grooves of the drum or sheaves.
17. Do not load hoist with less than two wraps of rope on the drum.
18. Center hoist unit over the load before lifting. Avoid side pull.
19. Never pick up a load beyond the rated capacity appearing on the hoist, except for properly authorized tests.
20. Do not use a load limiting device to measure the maximum load to be lifted. It is a safety device only.

MOVING THE LOAD

21. Do not engage in any activity which will divert your attention while operating hoist.
22. Respond to signals from designated personnel only, except for stop signals.
23. Never lift a load with the hoist until you and all other personnel are clear of load.
24. Make sure load has proper clearance before moving.
25. Inch the hoist slowly into engagement with a load, but avoid excessive plugging, inching, and quick reversals of load.
26. Do not lift load more than a few inches until it is well balanced in the sling or lifting device.
27. Each time a load approaching rated capacity is handled, check load brake action by raising load just clear of supports and continuing only after you are sure brake is operating properly.
28. Do not transport load over personnel.
29. Never carry personnel on the hook or the load.
30. Avoid swinging of load or load hook when traveling the hoist.
31. On trolley mounted hoists, DO NOT run hoist or traverse trucks into end stops, other hoists/cranes, or any other obstructions on the beam. Improper and careless operation can result in a hazardous condition for operator and load.
32. Do not use limit devices as a normal means of stopping the hoist. These are emergency devices only.
33. Do not exceed the maximum duty cycle specified by the manufacturer.

PARKING

34. Do not leave load suspended in the air for extended or unattended periods.
35. Keep load block above head level when not in use.

SAFETY LAWS FOR PASSENGER ELEVATORS

The safety laws for passenger elevators specify construction details that are not incorporated in Yale Hoists. We recommend that passenger elevator operation equipment be used that meets all state and national safety codes. Yale Hoists will not accept responsibility for applications of Yale Hoists on passenger elevators.

WARNING

DO NOT USE YALE HOISTS OR TROLLEYS FOR PASSENGER ELEVATOR APPLICATIONS.

INSPECTION, PREVENTIVE MAINTENANCE AND TESTING

A preventive maintenance program should be initiated for this hoist immediately after it is entered into service. The preventive maintenance program should comply with recommendations in the applicable Yale Parts and Instruction Manual, and all pertinent Federal, State and Local regulations. Regular inspections, maintenance and testing required should be followed for the life of the hoist and written inspection records kept as specified. Sample inspection checklists are included in back of this manual. Extra inspection checklists can be obtained from your nearest authorized Yale Distributor.

REPAIR PARTS ORDERING INFORMATION

This parts and instruction manual contains information required to install and maintain your Yale LodeKing Series Electric Hoist. To insure prompt service, each repair parts order should be placed with your local distributor, and must contain the following information:

Please give all information listed below in items 1 through 4. This will enable your distributor to fill your order promptly.

1. Give complete data from hoist nameplate, including hoist serial number, model number, voltage, frequency, and hertz.
2. Give part numbers, description and quantity of parts required.
3. Give correct shipping destination.
4. For ordering motor repair parts, give all data on the hoist, gearcase and motor nameplates.

HOIST SERIAL NUMBERS

The hoist serial number is stamped on the nameplate. The nameplates also designate the model number, capacity, speed, current characteristics, and service rating of the hoist or trolley.

RETURN OF PARTS

If it becomes necessary to return the complete hoist or certain parts to the factory, a letter requesting such a return is necessary. This letter should contain an explanation for requesting the return. A return authorization will be issued giving you clearance for returning the hoist or parts to the factory.

YALE HOIST DUTY SERVICE CLASSIFICATIONS

Yale Hoist Duty Class	Typical Areas of Application	Operational Time Ratings			
		Uniformly Distributed Work Periods		Infrequent Work Period Hoist Running 50% Time	
		(3) Max. on Time Min./Hr.	(4) Max. No. of Starts/Hr.	(5) Max. Time From Cold Start Min.	(6) Max. No. of Starts
H3	General Machine Shop, fabricating, assembly, storage and warehousing. Where loads and utilization are randomly distributed, with total running time of equipment not exceeding 15-25% of the work period.	15	150	30	200
H4	High volume handling in steel warehousing, general machine shops, fabricating, assembly, mills and foundries. Total running time does not exceed 35% of work period. Loads at or near rated capacity frequently handled.	30	300	30	300

DECK MOUNT INSTALLATION INSTRUCTIONS

1. It is the responsibility of the Crane Builder to ensure that the trolley system meets all applicable standards and guidelines available from but not limited to ANSI, HMI and CMAA in terms of load ratings, duty cycles and factors of safety.
2. CMCO does not participate in or condone field modification or product usage in a manner inconsistent with the design function. It is the responsibility of the crane builder to ensure compliance with CMCO specifications and guidelines for mounting and operation of this equipment.
3. Refer to drawing C45570401 LodeKing Deck Mount Clearance Diagram and the specific order clearance diagram for details such as frame loading, mounting pad dimensional specifications and overall unit envelope dimensions.
4. Weld on shear blocks shall be attached by a qualified welder using a weld that has been sized properly for the application, and welded per AWS D14 Specifications.
5. The weld on shear blocks and the angle iron feet shall not be subject to loading in the vertical direction. The shear block systems is designed to resist hoist motion in the horizontal direction only. Hoist frame loading in areas not approved by CMCO is prohibited.
6. Welding the shear blocks while still attached to the hoist frame is not recommended due to the possibility of stray voltage from the welding operation damaging the electrical components present on the hoist.
7. The trolley mounting surfaces shall be flat and in the same plane within 0.015".
8. Hoist frame loading in areas not approved by CMCO is prohibited.
9. Deck mount angles to shear block mounting bolts shall be installed with Loctite, and torqued to 300-325 ft-lbs. Bolts shall be checked at least yearly for signs of loosening.

INSTALLATION INSTRUCTIONS

Before the unit is shipped from the factory it is rigidly tested and carefully adjusted for proper operation. However, the following points must be checked to insure correct installation and avoid damage to the hoist.

1. **ROPE AND DRUM:** Check the hoist rope for any signs of damage and make sure it lies properly in the grooves of the drum and sheaves. Make sure the rope is well lubricated.
2. **LUBRICATION:** Every attempt has been made to ship the hoist with the proper amount of lubricating oil in the gearcase. Before placing the unit-in operation, check the level on the sight gauge. The oil should be level with the level hole. If more oil is needed, consult the Lubrication Chart. Also make sure breather plug hole is cleared.

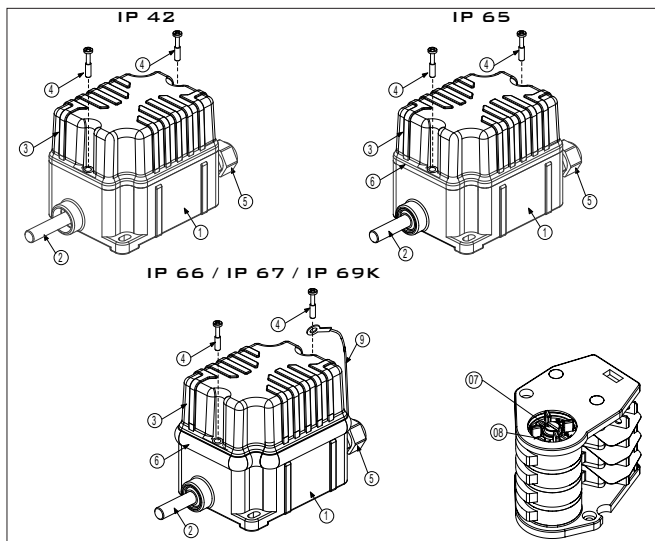
3. **CURRENT SUPPLY:** make sure the electric current supply corresponds with the rating listed on the hoist nameplate. Make sure duty cycle capabilities of hoist are fully understood by all operators.
4. **ELECTRICAL CONNECTIONS:** Open the control box and check all the electrical connections to be sure they are tight and that none of the hardware vibrated loose during shipment.
5. **PUSH BUTTON CONTROL:**

CAUTION

THE HOIST MUST BE GROUNDED. TO DO THIS CONNECT A SUITABLE GROUND WIRE IN THE SUPPLY WIRING TO A SOLID GROUND AND TO THE SUPPLY GROUNDING LUG SUPPLIED IN THE HOIST CONTROL PANEL.

WARNING

TO INSURE CORRECT OPERATION OF THE SAFETY LIMIT STOPS, IT IS VERY IMPORTANT THAT THE HOOK TRAVEL IS IN THE HOISTING DIRECTION WHEN THE 'UP' BUTTON IS PRESSED. IF IT IS NOT, INTERCHANGE ANY TWO OF THE MOTOR LEADS IN THE MOTOR CONDUIT BOX. DO NOT CHANGE PUSHBUTTON WIRING. INTERCHANGING WIRES ON THE LINE SIDE OF THE INVERTER WILL NOT AFFECT SHAFT ROTATION DIRECTION. IF THE HOIST IS OPERATED WITH INCORRECT POWER CONNECTIONS, THE SAFETY LIMIT STOPS WILL BE INEFFECTIVE AND SERIOUS DAMAGE AND DANGEROUS ACCIDENTS MAY RESULT.



GEARED LIMIT SWITCH USE AND MAINTENANCE INSTRUCTIONS

Base rotary limit switch is an electromechanical device for low voltage control circuits (EN 60947-1, EN 60947-5-1) to be used as electrical equipment on machines (EN 60204-1) in compliance with the fundamental requirements of the Low Voltage Directive 2006/95/CE and of the Machine Directive 2006/42/CE.

The limit switch is designed for use in industrial environments under even severe climatic conditions (operational temperature from 40°C to +80°C, suitable for use in tropical environment). The equipment is not suitable for use in environments with potentially explosive atmosphere, corrosive agents or a high percentage of sodium chloride (saline fog). Oils, acids or solvents may damage the equipment; avoid using them for cleaning. Do not connect more than one phase to each switch. Do not oil or grease the control elements or the switches.

The installation of the limit switch shall be carried out by expert and trained personnel. Wiring shall be properly done according to the current instructions. Prior to the installation and the maintenance of the limit switch, the main power of the machinery shall be turned off.

Steps for the proper installation of the limit switch

- Loosen the fixing screw (04) and remove the cover (03).
- Connect the limit switch shaft (02) to the reduction gear shaft avoiding any misalignment between the two shafts.
- Fix the limit switch firmly in place to prevent abnormal vibrations of the equipment during operation; use only the fixing holes on the base (01) to fix the equipment.
- Tighten the cable clamp (05) into appropriate place.
- Insert the cable into the limit switch through the cable clamp (05).
- Strip the cable to a length suitable for wiring the switches.
- Tape the stripped part of the cable.
- Clamp the wire into the cable clamp (05).
- Connect the switches according to the contact scheme printed on the switches or to the wiring scheme on the back of the instructions (use 6.3 mm Faston taps).
- Adjust the operating point of the cams; for proper adjustment, loosen the central screw (07) of the cam set, adjust the operating point of each single cam by turning its screw (08) (the numbers on the screws refer to the cams counting from bottom to top), then tighten the central screw (07).
- Insert the free end of the no-drop wire (09) into one of the screws (04), then close the limit switch using the screws (04); check the proper positioning of the rubber (06) in the cover (03) and tighten the screws (04) with a torque of 80/100 cNm.

Periodic maintenance steps

- Check the proper tightening of the screws (04) and cover (03).
- Check the proper tightening of the central screw (07) holding the cams.
- Check the wiring conditions (in particular where wires clamp into the switch).
- Check the conditions of the rubber (06) fit between the cover (03) and the base (01) and check the tightening of the cable clamp (05) around the cable.
- Check that the limit switch enclosure (01, 03) is not broken.
- Check the alignment between the limit switch shaft (02) and the reduction gear shaft.
- Check that the limit switch is properly fixed.
- If there is an anti-moisture plug, check its conditions.

In case any component of the limit switch is modified, the validity of the markings and the guarantee on the equipment are annulled. Should any component need replacement, use original spare parts only.

TER declines all responsibility for damages caused by the improper use or installation of the equipment.

TECHNICAL SPECIFICATIONS

Conformity to Community Directives	2006/95/CE 2006/42/CE
Conformity to Standards	EN 60204-1 EN 60947-1 EN60947-5-1 EN 60529
Ambient temperature	Storage -40°C/+80°C Operational -40°C/+80°C
Protection degree	IP 42 IP 65 IP 66 / IP 67 / IP 69K
Insulation category	Class II
Cable entry	Cable clamp M16
Maximum speed	800 rev/min
Markings	C

TECHNICAL SPECIFICATIONS OF THE SWITCHES

Utilisation category	AC 15
Rated operational current	3 A
Rated operational voltage	250 V
Rated thermal current	10 A
Rated insulation voltage	300 V~
Mechanical life	1x10 ⁶ operations
Terminal referencing	According to EN 50013
Connections	6.3 mm Faston taps
Markings	C X

TECHNICAL SPECIFICATIONS UL OF THE ROTARY LIMIT SWITCHES

Certified rotary limit switches	PFA9042AXXXXXXX PFA9067AXXXXXXX
Switches Electrical Ratings	B300, R300
Rotary limit switch Enclosure	Type 1 PFA9042AXXXXXXX Type 3 PFA9067AXXXXXXX
Conductors	Copper (CU) 60/75°C

⚠ WARNING

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

⚠ WARNING

Check limit switch operation carefully, without load, before placing hoist in service. If misadjusted, SEVERE DAMAGE AND/OR A DROPPED LOAD COULD RESULT. Allow 3" for hook drift in both directions. Never allow less than three (3) complete wraps of rope on drum with hook in lowest position.

WHEN ADJUSTING LIMIT SWITCHES

⚠ WARNING

HAZARDOUS VOLTAGE. CAN CAUSE DEATH, SERIOUS PERSONAL INJURY, OR PROPERTY DAMAGE.

DISCONNECT POWER BEFORE WORKING ON THIS EQUIPMENT.

EACH STEP OUTLINED BELOW MUST BE FOLLOWED FOR PROTECTION AGAINST ELECTRICAL SHOCK AND INJURY FROM MOVING COMPONENTS.

⚠ WARNING

AT LEAST THREE WRAPS OF ROPE MUST REMAIN ON THE DRUM IN THE LOWEST POSITION.

⚠ WARNING

MAKE SURE GEARED LIMIT SWITCH TRIPS FIRST, ALLOWING THE ROD OR WEIGHT TYPE SWITCH TO ACT AS THE BACKUP LIMIT.

BASIC SUSPENSIONS

The basic hoist suspension type is a top running motorized trolley for double rails. Before mounting on beam or rail, make sure supporting structure has adequate strength to safely support the loading which will be imposed.

On top running motorized trolleys, make sure rail size is correct for wheels and that distance between rails is correct for trolley throughout entire rail lengths.

PREVENTATIVE MAINTENANCE SCHEDULE

The required periods between inspections will vary due to the wide range of duty cycles and operating conditions encountered with equipment. The following recommended inspection periods are based on duty of specified service rating with single shift operation (40 hours per week) under normal environmental conditions. If the hoist is used under adverse environmental conditions it should be inspected more frequently.

DAILY INSPECTION

Inspect the following items before operating hoist:

- ELECTRICAL CONNECTIONS:** Check for worn or frayed wires, loose connections, and damage to, or improper operation of, push button assembly.
- LIMIT SWITCH:** Check the upper and lower limit switch by running the hook without load, and at the slowest speed obtainable, to the maximum up and maximum down positions. Then test with increasing speeds up to maximum. The switch should shut the hoist off before the bottom block contacts the rod or weight type limit switch at the upper extreme. Three wraps of rope should remain on the drum at the shut-off point at the lowest extreme. If adjustment is necessary, refer to geared limit switch section.
- HOOK:** Check for cracks or deformation. Check for damaged or missing latch. A bent or twisted hook indicates overloading or abuse of unit. Other load bearing components of the hoist or trolley should be inspected if overloading is apparent or suspected. The bottom hook must swivel freely.
- WIRE ROPE:** Check for proper seating in drum grooves. Check for wear, unstranding, fraying, kinks, or broken wires in the wire rope, and condition of end connections. (If damage is noted, see wire rope instructions under monthly inspection.)
- HOOK DRIFT:** With a load, the hook should stop promptly when the push button is released. Hook drift of more than 2 inches indicates the motor brake is malfunctioning. (See quarterly and annual inspection instructions for more details.)
- UNUSUAL CONDITIONS:** Excessive noise, oil leaks, etc. should be investigated.

CAUTION

DO NOT OPERATE THE HOIST IF ABOVE INSPECTION INDICATES THAT MAINTENANCE IS NEEDED.

MONTHLY INSPECTION

- ALL ITEMS UNDER DAILY INSPECTION.**
- LUBRICATION:** Check the level and condition of the gearcase lubricant. The level must be maintained at the gearcase sight gauge. If the level is low, check for leaks. Replace gaskets and shaft seals if necessary. An excessively black color lubricant indicates a chemical change in the lubricant caused by excessive heat, which in turn is caused by heavy duty cycles. Lubricant that is very black in color must be replaced to prevent shortened life of drive components. Lubricate wire rope and other points as required. Refer to lubrication chart.

CAUTION

FOR OPTIMUM LUBRICATION AND COOLING, OIL LEVEL MUST BE MAINTAINED AT THE SIGHT GAUGE LEVEL.

- HOOK:** Check hook retaining nuts and collars, and means used to secure them. Replace hook if throat opening allows safety latch to disengage from throat opening, or if there is 10 degrees or more twist from normal plane of hook.
- PUSH BUTTON:** Check the ground connections to be sure that the wire cores from the push button cable and the power cord are secured. Tighten the grounding screw and replace the lockwasher if it is missing.
- BEARINGS:** Check all bearings for noisy operation, which is an indication of wear.
- HARDWARE:** Check for loose bolts, nuts and rivets, including hoist and traverse motor mounting bolt torque (see page 4 for bolt torque specification).
- WIRE ROPE:** Check conditions of wire rope using inspection checklist. Refer to wire rope inspection.
- WARNING LABELS:** Check for absence or illegibility of warning decals and tags and replace if necessary.

WARNING

NEVER ALLOW WIRE ROPE TO OPERATE DRY.

- SUPPORTING STRUCTURE OR TROLLEY:** Should be checked for continued ability to support the imposed loads. Check for loose suspension or support bolts, axle nuts, etc.
- INSPECTION CHECKLIST:** Fill out inspection checklist at the back of this manual, sign, date and file for future reference.

PRE-OPERATION INSPECTION CHECKLIST

Item	Inspection Instruction
☐ Tagged Crane or Hoist	Check that crane or hoist is not tagged with an out-of-order sign.
☐ Control Devices	Test run that all motions agree with control device markings.
☐ Brakes	Check that all motions do not excessive drift and that stopping distance is normal.
☐ Hook	Check for damage, cracks, nicks, gouges, deformations of the throat opening, wear on saddle or load bearing point, and twist. Refer to the manual furnished by the original crane manufacturer.
☐ Hook Latch	If a hook latch is required, check for proper operation.
☐ Wire Rope	Check for broken wires, broken strands, kinks, and any deformation or damage to the rope structure.
☐ Reeving	Check that the wire rope is properly reeved and that rope parts are not twisted about each other.
☐ Limit Switches	Check that the upper limit device stops the lifting motion of the hoist load block before striking any part of the hoist or crane.
☐ Oil Leakage	Check for any sign of oil leakage on the crane and on the floor beneath the crane.
☐ Unusual Sounds	Check for any unusual sounds from the crane or hoist mechanism while operating the crane or hoist.
☐ Warning and Safety Labels	Check that warning and other safety labels are not missing and are legible.
☐ Housekeeping and Lighting	Check area for accumulation of material to prevent tripping or slipping. Also check area for poor lighting.

QUARTERLY INSPECTION

- ALL ITEMS UNDER DAILY AND MONTHLY INSPECTION.**
- MOTOR BRAKE:** Check for excessive or uneven disc wear. Check for excessive magnet gap. Lubricate linkage as required.

ANNUAL INSPECTION

1. **ALL ITEMS UNDER DAILY, MONTHLY AND QUARTERLY INSPECTION.**
2. **EQUALIZE SHEAVE, IDLER SHEAVE, AND PINS.**
Check for cracked or worn sheaves, pins and bearings.
3. **HOOKS:** Magnetic particle or other suitable crack detecting inspection should be performed if need is indicated by external appearance. Check for loose retaining nuts and collars.
4. **LOAD BEARING PARTS:** Check for worn, cracked or distorted parts, such as suspension housings, outriggers, clevises, yokes, hook blocks, suspension bolts, shafts, locking devices and bearings on hoist (also on trolley, if so equipped).
5. **MOTOR BRAKE:** Check for excessive or uneven disc wear. On direct acting, check for excessive magnet gap. Lubricate linkage as required.

CAUTION

PRIOR TO TESTING, ALL SUPPORTING STRUCTURES, ANCHORAGES, AND/OR SUSPENSIONS MUST BE APPROVED BY THE APPOINTED PERSON FOR THE TEST LOADS USED.

6. **WIRING AND TERMINALS:** See that all connections are tight. Terminals are to be securely crimped to wires and the insulation sound. Bent terminals can usually be straightened to provide a tight fit. Replace terminals or wire if necessary.
7. **SHEAVES AND DRUMS:** Inspect rope sheaves and drums for excessive wear. When the groove of a sheave or rope drum becomes worn excessively it should be replaced. Worn grooves on the drum or sheave can greatly reduce the useful life of the hoisting rope.
8. **BEARING LUBRICATION:** The motor, sheave, and outer drum bearings are a pre-lubricated, sealed design and normally will not need to be lubricated.
9. **INSPECTION CHECKLIST:** Fill out inspection checklist at the back of this manual, sign, date and file for future reference.

FUNCTION TESTING AFTER REPAIR

CAUTION

PRIOR TO TESTING, ALL SUPPORTING STRUCTURES, ANCHORAGES, AND/OR SUSPENSIONS MUST BE APPROVED BY THE APPOINTED PERSON FOR THE TEST LOADS USED.

After repair or replacement of parts, function test hoist by operating unloaded hoist into both upper and lower limits, first with slowest speed possible, then with increasing speeds up to maximum. Limit switch mechanisms must be adjusted so they will trip in sufficient time to prevent damage to any part of the hoisting arrangement. See instructions for adjustment of limit switches. Then test operation of hoist and brake by lifting 100% of rated load. (A normal load lifted may be substituted if no load bearing parts were altered.) If hoist is equipped with a load limiting device, and load bearing parts have been altered, the first test load should be only 100% of rated load. The test should be prepared by the person responsible and kept on file for future reference.

WIRE ROPE INSPECTION

All wire rope should be inspected once a month and a signed and dated inspection report maintained. The inspection checklists at the back of this manual can be used to record these inspections. Wire rope should be replaced if any of the following conditions are noted:

1. Twelve randomly distributed broken wires in one rope lay, or four broken wires in one strand in one rope lay.
2. Wear of one-third (1/3) of the original diameter of outside individual wires.
3. Kinking, crushing, birdcaging or any distortion of the wire rope structure.
4. Evidence of heat damage.



Broken Wires



Kinked



Bird Cage

5. Reductions from nominal diameter of more than the following values:

Truck	Bolt Size	Required Torque
115 mm	M6 x 1.0 x 20	7.5 to 8 ft-lbs
160 mm	M6 x 1.0 x 25	
200 mm	M8 x 1.25 x 30	
260 mm	M8 x 1.25 x 40	18 to 20 ft-lbs
305 mm	M12 x 1.75 x 45	62 to 68 ft-lbs

6. Rope clamps should be checked to ensure bolts are properly torqued.

CAUTION

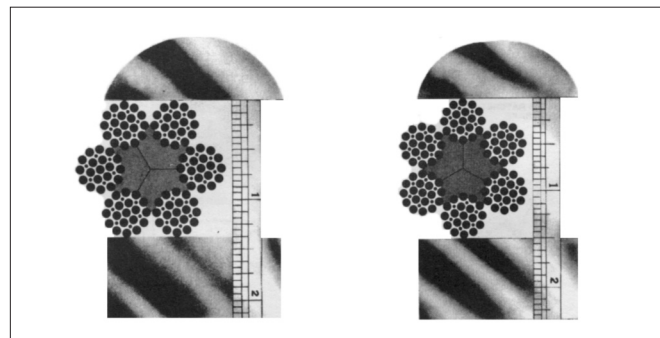
REPLACEMENT WIRE ROPE SHOULD BE THE SAME SIZE, GRADE AND CONSTRUCTION AS THE ORIGINAL WIRE ROPE. BEFORE REPLACING WIRE ROPE, READ REEVING PROCEDURE. AFTER WIRE ROPE REPLACEMENT CHECK FOR PROPER LIMIT SWITCH OPERATION.

WARNING

ROPE PILE-ON HOISTING DRUM WILL SEVERELY DAMAGE THE HOISTING ROPE. IF THIS CONDITION IS NOTED, THE HOISTING ROPE SHOULD BE INSPECTED ACCORDING TO THE ABOVE PARAGRAPH ON WIRE ROPE INSPECTION. IF DAMAGED ROPE IS FOUND, CHECK DRUM AND FRAME MEMBERS FOR DAMAGE.

HOW TO MEASURE WIRE ROPE

The correct diameter of a wire rope is the diameter of a circumscribed circle which will enclose all the strands. It is the largest cross-sectional measurement. The measurement should be made carefully with calipers. The illustrations below show the correct



Wrong Way

Right Way

GENERAL INSTRUCTIONS

PROCEDURE FOR REEVING WIRE ROPE ON DRUM

DOUBLE REEVED UNITS

Note: Rotary cam limit switch must be set for three (3) safety wrap.

1. The rope lays off the drum on the side closest to the equalizer sheave/running sheave.
2. Anchor the rope in the drum on one side. Install rope retainer.
3. Stretch out rope to make sure there are no twists or kinks.
4. Reeve the free end of the rope through the bottom block and all sheaves.
5. Anchor the free end of the rope in the other side of the drum. Install rope retainer.
6. Push the "UP" button to reeve both sides of the drum, making sure there is enough force on the rope to insure proper reeving in all drum grooves.

Note: When the bottom block is raised to the upper limit, the block should be at the midpoint of the ungrooved portion of the drum and even with idler sheave. If this is not so, the unit is reeved incorrectly.

WARNING

ALL UNITS WITH A LOWER LIMIT SWITCH MUST HAVE A MINIMUM OF THREE WRAPS OF WIRE ROPE ON THE DRUM WHEN THE BOTTOM BLOCK IS IN THE LOWEST POSITION.

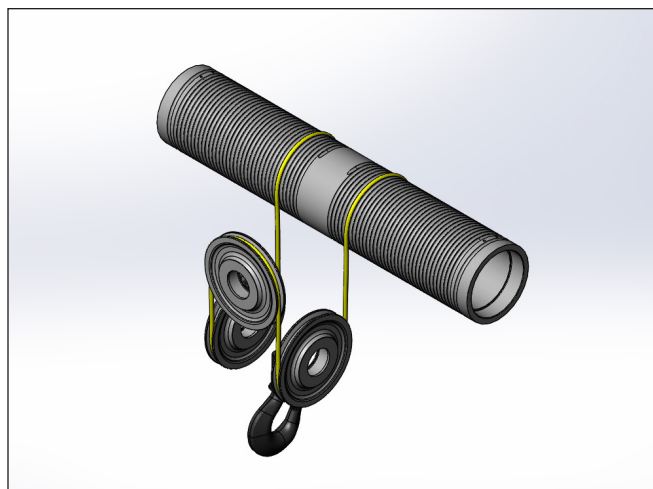
REEVING TYPES

Yale powered wire rope hoists and winches are reeved in various ways to gain desired advantages. Proper reeving insures maximum life of the hoist drum, wire rope, and bottom block assembly while obtaining the best characteristics of capacity, lift, and speed for the basic unit.

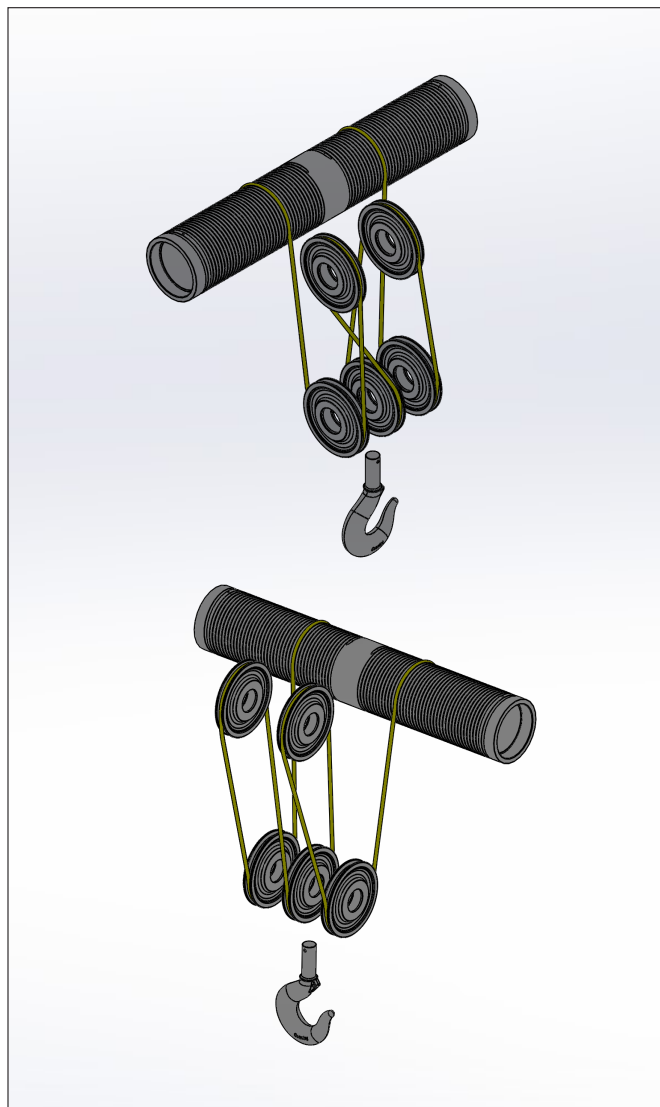
Reeving is “double”, i.e. two ropes coming from the drum. Close headroom hoists are double reeved. “Part” designates the number of times the rope runs between the hoist and bottom block. For example: With 2 part double reeving, the rope runs from the rope drum to the bottom block, up to the equalizer sheave, back to the bottom block, then back to the rope drum, indicating 4 “parts” of rope supporting the load.

The drawings below show the characteristics of each principal method of reeving.

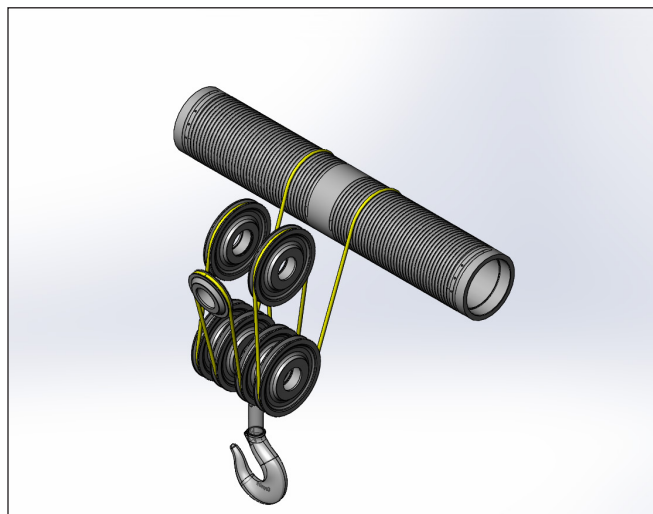
Advantages of double reeved units include minimum lateral hook drift (keeping load in the same approximate position in relation to the drum and beam) and a lower hoist headroom requirement.



**4 PART REEVING
10 TON CAPACITY**



**6 PART REEVING
15 TON CAPACITY**



**8 PART REEVING
20 & 25 TON CAPACITY**

LUBRICANT SPECIFICATIONS

LUBRICANT SPECIFICATIONS		AMBIENT TEMPERATURE		
		-20° to +50° F (-29 to +10°C)	50° to 125° F (10° to 52°C)	125° to 250°F (52° to 121°C)
CL	No Specification			
Cable Lubricant Wire Rope Lubricant	Amoco® Oil Co.	----- Amovis® 5-X -----		
	Mobil® Oil Corp.	----- Mobilarma® 798 -----		
	Sun® Oil Corp.	----- Sunoco® Wire Robe Lubricant -----		
	Texaco® Inc.	Crater A	Texclad® 2	
	GO	AGMA Lubricant	No. 1	No. 2
General Oil General Oiling to Prevent Rust- ing an Provide Limited Lubrica- tion for Points Not Considered Normal Wear Points	Viscosity @ 100° F	193-235 SUS	284-347 SUS	
	Viscosity Index	60 Min.	60 Min.	
	Pour Point	-20°F (-29°C)	10°F (-12°C)	
	Amoco® Oil Co.	Rykon® Oil 46	American Industrial Oil® 68	
	Mobil® Oil Corp.	-----Mobil® DTE Oil Heavy-----		
	Shell® Oil Co.	Rotella® 10W	Rotella® 10W-30	
	Sun® Oil Co.	Sunvis® 932	Sunvis® 968	
	Texaco® Oil Inc.	Rando® Oil 46	Rando® Oil 68	
	MPG	NLGI Grease	No.1	No. 2
Multipurpose Grease Grease Lubricated Wear Points Provided	6ASTM Worked Penetration	310-340	265-295	
	Dropping Point	360°F (182°C)	360°F (182°C)	
	Base	Lithium	Lithium	
	Amoco® Oil Co.	Amolith® Grease 1 EP	Amolith® Grease No. 2 EP	
	Mobil® Oil Corp.	Mobilith® AW1	Mobilith® AW 2	
	Shell® Oil Co.	-----Retinax LC-----		
	Sun® Oil Co.	Presitge® 741 EP	Sunoco® Multipurpose 2	
	Texaco Oil Inc.	Multifak® EP 1	Multifak® EP 2	

INSPECTION SCHEDULE AND MAINTENANCE REPORT

CRANE SERIAL NO. (MFGRS.) _____
 CAPACITY _____
 TYPE _____
 VOLTAGE _____

CUSTOMER CRANE IDENTITY NO. _____
 LOCATION IN PLANT _____
 THIS INSPECTION IS ☐ MONTHLY ☐ SEMI-ANNUAL ☐ ANNUAL
 INSPECTED BY _____ DATE _____

COMPONENT, UNIT OR PART AND LOCATION		*RECOMMENDED INSPECTION INTERVAL			CONDITION (Check column best indicating condition when part or unit is inspected. Use note column to the right if condition is not listed below.)						CORRECTIVE ACTION NOTES
Location	Component, Unit or Part	Monthly	Semi-Annual	Good	Adjustment Required	Repair Required (Loose Parts Or Wires)	Replacement Required (Worn Or Damaged)	Lubrication Required (Low Oil Or Grease Rust Or Corrosion)	Cleaning Or Painting Required	DATE	
LOCATION											
HOIST	Motor	○									
	Motor Brake	○									
	Mechanical Load Brake	○									
	Overload Clutch	○									
	Couplings	○									
	Gears, Shafts & Bearings	○									
	Upper Block	○									
	Lower Block	○									
	Hook & Throat Opening	●								Record Hook Throat Opening	
	Hoist Rope	●		X							
	Rope Drum		○								
	Guards		○								
	Limit Switch	○									
	CONTROL PANELS & PUSHBUTTON	Trolley Panel	○								
Hoist Panel		○									
Pushbutton			○								
Wiring			○								
TROLLEY	Motor	○									
	Brake (When so Equip.)	○									
	Couplings	○									
	Gears, Shafts & Bearings	○									
	Frame			○							
	Wheels		○								
	Bumpers		○								
	Guards		○								
	Conductors	○									
	Collectors	○									
RUNWAYS	Monorail Joints		○								
	Monorail		○								
	Main Conductors	○									
	Main Collectors	○									
MISC	General Condition		○								
	Load Attach. Chains	●									
	Rope Slings & Connect.	●									
	Change Gearcase Lub.			○							
	Grounding Faults		○								

* See text for daily & weekly requirements
 ○ Inspection interval

● Signed & dated report required - OSHA
 X Magnetic particle or equivalent examination required.

Typical Inspection Schedule and Maintenance Report form. User must adjust inspection interval and components to suit their individual conditions and usage.

DISASSEMBLY

CAUTION

BEFORE DOING MAINTENANCE WORK ON THIS HOIST, READ THE FOLLOWING INSTRUCTIONS THOROUGHLY. REFER TO THE REPLACEMENT PARTS SECTION FOR PARTS IDENTIFICATION.

To completely disassemble the hoist, follow the disassembly procedures in the order listed.

To disassemble any one specific part of the hoist, follow the instructions for that specific section.

1. REMOVE HOIST ROPE, BOTTOM BLOCK OR BOTTOM HOOK.

- Remove or readjust rotary cam limit to negate lower limit (see instructions (a) through (f)).
- Operate hoist in down direction until no cable remains on the drum. Remove rope clamps and pull rope from the drum.
- Remove power from the hoist.
- Free the rope from the upper block
- Remove shafts holding the sheaves in the yoke or frame and remove cable (where applicable).

2. REMOVE MOTOR BRAKE (DIRECT ACTING).

CAUTION

DISCONNECT ALL POWER TO THE HOIST BY DISCONNECTING THE POWER FEED LINE BEFORE ATTEMPTING SERVICE OR REPAIR.

- Disconnect encoder cable from encoder.
- Remove fan shroud screws and remove shroud.
- Loosen set screws holding encoder to shaft and remove encoder.
- Remove screws holding fan to shaft and remove fan.
- Disconnect brake cable within motor terminal box and remove cable from terminal box.
- Remove four socket head screws holding brake to motor. Remove brake.

3. REMOVE GEAR CASE.

- Ensure the hoist is in the down direction and clear all rope from the hoist drum.
- Block or support drum to prevent movement after the outboard bearing support is removed. Remove (4) M20 SHCS and (2) M20 shoulder screws from the bearing support and remove the stub shaft from the drum bearing. Be careful that the drum does not move off the drive splined shaft.
- Slide drum drive side end from spline shaft to remove the drum. After blocking or supporting the gearbox, remove the (8) M16 HHB.
- The gearbox and motor assembly are now free from the trolley frame, and may be removed by pulling the gearbox out from the mating pilot on the frame.

CAUTION

THE GEAR CASE ASSEMBLIES CAN BE VERY HEAVY. IF POSSIBLE, IT IS BEST TO SUPPORT THEIR WEIGHT PRIOR TO REMOVAL.

4. REMOVE LIMIT SWITCH, TRAVELING NUT OR GEARED.

- Geared Upper and Lower Limit Switch
 - Disconnect all power from hoist.
 - Remove the cover from the limit switch and disconnect the wiring. Note the color coding or tag the wires so they can be reconnected correctly. Loosen the cord fitting and remove the cord.
 - Remove the bolts and lockwashers that hold the limit switch assembly to the bracket. Remove the limit switch assembly from the bracket.
- Upper Block Limit Switch
 - Disconnect all power from the hoist.
 - Remove bolts holding the limit switch bracket to the hoist and remove the limit switch assembly.
 - Loosen the clamping screw holding the hub on the limit switch shaft and remove the hub and lever assembly. Note its position carefully so it can be reinstalled correctly.
 - Remove the screws holding the limit switch to the bracket.
 - Remove the limit cover and disconnect the wiring. Note the color coding or tag the wires so they can be reconnected correctly. Loosen the cord fitting and remove the cord from the limit switch.

5. REMOVE CONTROLS OR CONTROL BOX.

- Remove all power from the hoist.
- Disconnect and tag all wires coming into the control box.
- Remove nuts, bolts and lockwashers holding control panel in the box.
- Remove control panel.
- Disconnect all flex conduit, limit switch cord, push-button cord and power leads from control box.
- Remove nuts and lockwashers holding control box and remove. Control box may be heavy and should be supported before removing.

REASSEMBLY

The assembly sequence is basically the reverse of the disassembly sequence previously described. The following special instructions should be observed during reassembly.

- Before the gear case is assembled, all internal parts should be inspected for damage or excessive wear. Replace parts as required.
- Be sure the drum drive shaft is free of paint or other material which would interfere with installation. Lubricate the shaft with Never-Seez® to prevent galling. Reinstall inner and outer retaining rings to prevent shaft movement.
- Be sure the motor brake is properly adjusted before it is installed on the motor.
- Attach gear case to frame using (8) M16 x 70mm bolts (see parts manual section for part number) torqued to 200 ft-lbs max (275 N·m). Apply a medium strength thread locker such as Loctite 243 on the bolts prior to installation.
- Prior to drum installation, lubricate drum splines with a recommended Number 2 multipurpose grease as outlined in the lubrication chart on page 11. Install the drum onto the drive shaft splines taking care to support the drum.
- Lubricate the drum stub shaft on the outboard bearing support with a recommended Number 2 multipurpose grease as outlined in the lubrication chart on page 11. Install outboard bearing support ensuring that the shoulder screws are used in the correct position. Torque the (4) M20 SHCS to 375 ft-lbs max (500 N·m). Apply a medium strength thread locker such as Loctite 243 on the bolts prior to installation.

WARNING

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

7. Re-reeve as follows:

INSTALLING NEW ROPE:

1. Thread both ropes to drum from upper block side then secure with rope clamps as follows:
 - a. Make sure that the rope clamp groove size, as marked on top of the clamp above the groove, matches the rope size for your hoist (12mm on LodeKing LT 10T, 15T, 20T and 13mm on 25T).
 - b. With the rope lying in the bottom of the drum groove, begin by tightening the rope clamp at the tail end of the rope. Torque the clamp bolt to 25-30 ft-lbs (34-40 N·m) for the 10T/15T/20T units, 60-70 ft-lbs (80-95 N·m) on the 25T.
 - c. Applying tension to the rope and keeping it properly seated in the drum groove, install the remaining two clamps to the specified torque above.
2. With all personnel clear of hoist - TURN ON POWER.
3. Operate hoist "UP" guiding six (6) wraps of new rope into drum grooves with gloved hand.
4. With outer lower block covers removed, thread the wire rope through the sheaves of the upper and lower block as shown on Reaving Diagrams referenced on page 10 of manual.
5. Replace the lower block sheave covers.
6. Lubricate cable with recommended lubricant.

WARNING

Geared limit switch must be reset after replacing wire rope. Check limit switch operation carefully, without load, before placing hoist in service. **SEVERE DAMAGE AND/OR A DROPPED LOAD COULD RESULT.** Allow 3" for hook drift in both directions. Do not allow less than three (3) complete wraps of rope on drum with hook in lowest position.

WARNING

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

TROUBLESHOOTING

LOAD DRIFTS OR DROPS

Possible Cause	Remedy
Motor brake slipping*	Adjust brake. Check for oil on brake discs.
Motor brake not closing*	Adjust for proper clearance. See brake instructions.

* With vector control, the inverter will fault and warning horn will sound in the event of any brake related issues. If these conditions are observed (Brake slip or failure to set), see the hoist inverter manual to troubleshoot inverter related brake faults and the brake manual for proper adjustment of brake.

BRAKE COIL BURNED OUT

Possible Cause	Remedy
Wrong coil	Replace with proper voltage coil.
Motor brake too tight	Adjust brake. See brake instructions.

HOIST DOES NOT OPERATE

Possible Cause	Remedy
Blown or loose fuse	Replace or tighten fuse
Tripped breaker	Reset breaker
Lose terminal screws	Check and tighten all loose screws
Low voltage	Check voltage at line side of mainline contactor (when provided) or line side of hoist fuse base.
Low voltage or no voltage to push button circuit	Check voltage at output side of transformer. Wrong voltage tap may have been selected. For example: 460 volt tap used when line voltage is 230 volt. Check control circuit fuse.
Defective push button	Check contact points at push button to see if points touch. If not, replace.
Defective push button cord. (Wire may be pinched, broken or bare.)	Check for lack of continuity or short to ground.
Motor brake coil burned	Replace. Check to make sure coil is proper coil for voltage applied.
Defective stator	Rewind stator
Rotor loose on shaft	Replace

MOTOR OVERHEATS, EXCESSIVE AMPERAGE DRAW

Possible Cause	Remedy
Defective stator	Replace or rewind stator
Worn motor bearings	Replace
Bent rotor shaft	Replace
Rotor dragging in stator	Tighten motor bolts. Check for foreign matter between rotor and stator. Check for worn motor bearings.
Stator loose in frame	Rewind stator if necessary. Reposition and anchor in accordance with motor manufacturers instructions.
Low voltage	Check with local utility company and/or increase wire size.

MOTOR NOISY

Possible Cause	Remedy
Motor bolts loose	Tighten
Rotor dragging in stator	Check for bent rotor shaft or worn bearings. Replace worn or damaged parts.
Motor bearings loose	Replace bearings

TRANSFORMER OVERHEATS OR BURNS OUT

Possible Cause	Remedy
Wrong tap used on primary side	Replace transformer if necessary. Primary tap must match line voltage.
Shorted transformer	Replace
Shorted control circuit	Correct short

HOIST SHOCKS OPERATOR

Possible Cause	Remedy
Hoist not grounded	Ground hoist
Power leads or control wires shorted to hoist frame.	Repair or replace
Grounded motor	Replace
Slight electrical leakage from any of the electrical components on hoist.	Make sure hoist is properly grounded.

HOIST GEAR DRIVE

GENERAL INSTRUCTIONS

Recycling (keeping in mind the instructions in force):

- The elements of casing, gear pairs, shafts and bearings of gear reducer must be transformed into steel scraps. The elements in grey cast iron will be subjected to the same treatment if there is no particular instruction;



- The worm wheels are made in bronze and must be treated adequately

- Exhausted oils must be recycled and treated according to the instructions.

The paragraphs marked with present symbol contain dispositions to be strictly respected in order to assure personal **safety** and to avoid any **heavy damages** to the machine or to the system (e.g.: works on live parts, on lifting machines, etc.); the responsible for the installation or maintenance must scrupulously **follow all instructions contained in present handbook**.



1 - GENERAL SAFETY INSTRUCTIONS

Gear reducers and gearmotors present dangerous parts because they may be:

- Live
- At temperature higher than +50°C
- Rotating during the operation
- Eventually noisy (sound levels > 85 dB(A))



An incorrect installation, an improper use, the removing or disconnection of protection devices, the lack of inspections and maintenance, improper connections may cause severe personal injury or property damage. Therefore the component must be moved, installed, commissioned, handled, controlled, serviced and repaired **exclusively by responsible qualified personnel** (definition to IEC 364).

It is recommended to pay attention to all instructions of present handbook, all instructions relevant to the system, all existing safety laws and standards concerning correct installation.

Attention! Components in non-standard design or with constructive variations may differ in the details from the ones described here following and may require additional information.

Attention! For the installation, use and maintenance of the electric motor (standard, brake or non-standard motor) and/or the electric supply device (frequency converter, soft-start, etc.) and accessories, if any (flow indicators, independent cooling unit, thermostat, etc) consult the attached specific documentation. If necessary, require it.

Attention! For any clarification and/or additional information consult Rossi and specify all name plate data.

Gear reducers and gearmotors of present handbook are normally suitable for installations in industrial areas: **additional protection measures**, if necessary for different employs, must be adopted and assured by the person responsible for the installation.

IMPORTANT: the components supplied by Rossi must be **incorporated into machinery and should not be commissioned before the machinery in which the components have been incorporated conforms to:**

- Machinery directive 2006/42/EC and subsequent datings; in particular, possible safety guards for shaft ends not being used and for eventually accessible fan cover passages (or other) are the Buyer's responsibility;
- Electromagnetic compatibility (EMC)» directive 2004/108/ EC and subsequent datings.

When operating on gear reducer (gearmotor) or on components connected to it **the machine must be at rest:** disconnect motor (including auxiliary equipments) from power supply, gear reducer from load, be sure that safety systems are on against any accidental starting and, if necessary, pre-arrange mechanical locking devices (to be removed before commissioning).

If deviations from normal operation occur (temperature increase, unusual noise, etc.) immediately switch off the machine. The products relevant to this handbook correspond to the technical level reached at the moment the handbook is printed. ROSSI MOTORIDUTTORI reserves the right to introduce, without notice, the necessary changes for the increase of product performances.

2 - OPERATING CONDITIONS

Gear reducers are designed for industrial applications according to name plate data, at ambient temperature 0 ÷ 40°C (with peaks at -10°C and +50°C), maximum altitude 1,000 m.

Not allowed running conditions: application in aggressive environments having explosion danger, etc. Ambient conditions must comply with specifications stated on name plate.

3 - HOW SUPPLIED

3.1 - RECEIPT

At receipt verify that the unit corresponds to the one ordered and has not been damaged during the transport, in case of damages, report them immediately to the courier.

Avoid commissioning gear reducers and gearmotors, that are even if slightly damaged.

3.2 - NAME PLATE

Every gear reducer presents a name plate in anodised aluminium containing main technical information relevant to operating and constructive specifications and defining, according to contractual agreements, the application limits (see fig. 1); the name plate must not be removed and must be kept integral and readable. All name plate data must be specified on eventual spare part orders.

3.3 - PAINTING

Products are painted according to the painting table shown on page 20. Before adding further coats of paint (use dual-compound paints only), properly protect the seal rings (which must neither be damaged nor painted), degrease and sand the gear reducer (or gearmotor) surfaces.

4 - STORING

Surroundings should be sufficiently clean, dry and free from excessive vibrations ($v_{eff} \leq 0,2 \text{ mm/s}$) to avoid damage to bearings (excessive vibration should also be guarded during transit, even if within wider range) and ambient storage temperature should be $0 \div 40^\circ\text{C}$: peaks of 10°C above and below are acceptable.

The gear reducers filled with oil must be positioned according to the mounting position mentioned on the order during transport and storage.

Every six months rotate the shafts (some revolutions are sufficient) to prevent damage to bearings and seal rings. Assuming normal surroundings and the provision of adequate protection during transit, the unit is protected for storage up to 1 year.

For a 2 year storing period in normal surroundings it is necessary to pay attention also to following instructions:

- Generously grease the sealings, the shafts and the unpainted machined surfaces, if any, and periodically control conservation state of the protective anti-rust oil.
- For gear reducers and gearmotors supplied without oil: completely fill the gear reducers with lubrication oil and the specified level before commissioning.

For storages longer than 2 years or in aggressive surroundings or outdoors, consult Rossi.

5 - INSTALLATION

5.1 - GENERAL

Before the installation, verify that:

- There were no damages during the storing or the transport.
- Design is suitable to the environment (temperature, atmosphere, etc.)
- Electrical connection (power supply, etc.) corresponds to motor name plate data.
- Used mounting position corresponds to the one stated in name plate.

Attention! When lifting and transporting the gear reducer or gearmotor use through holes or tapped holes of the gear reducer casing; be sure that load is properly balanced and provide lifting systems, and cables of adequate section. If necessary, gear reducer and gearmotor masses are stated in Rossi technical catalogues.

Be sure that the structure on which gear reducer or gearmotor is fitted is plane, levelled and sufficiently dimensioned in order to assure fitting stability and vibration absence (vibration speed v_{eff} 3,5 mm/s for PN 15 kW and v_{eff} 4,5 mm/s for PN > 15 kW are acceptable), keeping in mind all transmitted forces due to the masses, to the torque, to the radial and axial loads.

For the dimensions of fixing screws of gear reducer feet and the depth of tapped holes consult the Rossi technical catalogues.

Carefully select the length of fixing screws when using tapped holes for gear reducer fitting, in order to assure a sufficient meshing thread length for the correct gear reducer fitting to the machine without breaking down the threading seat.

Attention! Bearing life and good shaft and coupling running depend on alignment precision between the shafts. Carefully align the gear reducer with the motor and the driven machine (with the aid of shims if need be, for gear reducers size ≥ 400 use level tapped holes), interposing flexible couplings whenever possible.

Incorrect alignment may cause **breakdown of shafts and/or bearings** (which may cause overheatings) which may represent **heavy danger for people**.

Do not use motor eyebolts when lifting the gearmotors. Position the gear reducer or gearmotor so as to allow a free passage of air for cooling both gear reducer and motor (especially at their fan side).

Avoid: any obstruction to the air flow; heat sources near the gear reducer that might affect the temperature of cooling air and of gear reducer (for radiation); insufficient air recycle and applications hindering the steady dissipation of heat.

Mount the gear reducer or gearmotor so as not to receive vibrations.

Mating surfaces (of gear reducer and machine) must be clean and sufficiently rough (approximately $Ra \geq 6,3 \mu\text{m}$) to provide a good friction coefficient: remove by a scraper or solvent the eventual paint of gear reducer coupling surfaces.

When external loads are present use pins or locking blocks, if necessary.

When fitting gear reducer and machine and/or gear reducer and eventual flange **B5** it is recommended to use **locking adhesives** on the fastening screws (also on flange mating surfaces).

Before wiring-up the gearmotor make sure that motor voltage corresponds to input voltage. If direction of rotation is not as desired, change parameter B03-04 to change rotation.

If overloads are imposed for long periods or if shocks or danger of jamming are envisaged, then motor-protection, electronic torque limiters, fluid couplings, safety couplings, control units or other similar devices should be fitted.

Motor is provided with thermal switch connected to the upward motion (no thermal probes/thermistors). Motor is also protected from overload via tuning to the VG+S4 inverter.

Use varistors and/or RC filters to limit voltage peaks due to contactors.

When gear reducer is equipped with a backstop device¹, provide a protection system where a backstop device breaking could cause personal injury or property damage.

Whenever a leakage of lubricant could cause heavy damages, increase the frequency of inspections and/or envisage appropriate control devices (e.g.: remote level gauge, lubricant for food industry, etc.).

In polluting surroundings, take suitable precautions against lubricant contamination through seal rings or other.

For outdoor installation or in a hostile environment (atmospheric corrosivity category **C3** according to ISO 12944-2), protect the gear reducer or gearmotor with a proper dual-compound anticorrosion paint; added protection may be afforded by applying water-proof grease (especially around the rotary seating of seal rings and at shaft end access points).

Gear reducers and gearmotors should be protected whenever possible and by appropriate means from solar radiation and extremes of weather: protection **becomes essential** when high or low speed shafts are vertically disposed or when the motor is installed vertical with fan uppermost.

For ambient temperature greater than $+40^\circ\text{C}$ or less than 0°C , consult Rossi.

When gear reducer or gearmotor is supplied with water cooling by coil or independent cooling unit, see ch 7.

¹) The presence on gear reducer of backstop device is stated by the arrow near the low speed shaft, indicating the free rotation, excluding shaft mounted gear reducers where B or C designs are stated (see Rossi technical catalogues).

6 – LODEKING LT HOIST GEARCASE LUBRICATION RECOMMENDATIONS

LodeKing LT hoist gearboxes are shipped from the factory prefilled with a high quality Mobilgear 600 XP 460 mineral oil based lubricant in the following quantities:

Hoist Capacity	Rossi Gearbox	Quantity (gallons)
10T/15T/20T	MR160	4.8
25T	MR180	5
All capacities with Optional Secondary Holding Brake	MR180 Long Case	6.2

The unit should be filled from the orange breather/filler plug on top of the case. Ensure that the unit has cooled sufficiently before removing the fill plug. A sight glass is provided on the side of the transmission, behind the motor. Ensure that the oil level is halfway up the provided sight glass. Exact oil quantity required to fill the unit shall be determined by the sight gage. Do not overfill the unit!

RECOMMENDED OILS:

Columbus McKinnon recommends 460 ISO viscosity grade oil, either mineral or PAO based synthetic depending on operating temperature. Acceptable oil types are listed below:

Manufacturer	PAO Synthetic Oil (ISO VG 460)	Mineral Oil (ISO VG 460)
AGIP	Blasia SX	Blasia
ARAL	Degol PAS	Degol BG
BP	Energyn EPX	Energol GP XP
Castrol	Alphasyn EP	Alpha SP
Fuchs	Renolin Unisys CLP	Renolin CLP
Klüber	Klübersynth GEM4	Klüberoil GEM1
Mobil	Mobil SHC Gear	Mobilgear 600 XP
Shell	Omal S4 GX	Omal S2 G
Texaco	Pinnacle	Meropa
Total	Carter SH	Carter EP

Synthetic oil with a PAO basis and proper viscosity and additive packages are recommended when it is necessary to increase oil change interval, decrease operating oil temperature or increase the ambient temperature range

OIL CHANGE INTERVAL:

Initial Oil Change shall occur at 1000 operating hours, or one year, whichever occurs first

Operating Oil Temperature		Oil Change Interval	
°F	°C	Mineral Oil	Synthetic PAO Oil
< 149	< 65	4000	12500
149-176	65-80	2000	9000
176-203	80-95	1000	6000
203-230	95-110	Not Recommended	3000

Oil change intervals assume a pollution free environment. It may be necessary to reduce the oil change intervals based on contaminants introduced into the gearbox from the operational environment.

REGARDLESS OF OPERATING HOURS:

- Replace the mineral oil every three years after the initial oil change
- Replace or Regenerate the synthetic oil every 5 years

Do not mix different brands of synthetic oil! If a synthetic oil change involves switching to a different lubricant manufacturer, ensure that the gearbox is flushed completely before refilling.

Regardless of oil base, Oil sampling and analysis is recommended on a yearly basis as a preventative maintenance tool. An oil sample analysis will indicate a trend in wear particles and contaminants (dirt and water) within the gearcase, as well as give an indication of the "health" of the oil additive packages. Consult your local oil supplier for further details.

7 - COMMISSIONING

Carry out an overall check, making particularly sure that the gear reducer is filled with lubricant.

Where star-delta starting is being used, input voltage must match the motor lower voltage (connection).

For asynchronous three-phase motor, if the direction of rotation is not as desired, invert two phases at the terminals.

Before running gear reducers fitted with backstop device, make sure that the direction of rotation in machine, gear reducer and motor all correspond correctly.



Attention! One or more startings in the false direction, even if short, could irretrievably damage the backstop device, the coupling seats and/or the electric motor.

A running-in period is advisable:

- Of approx. 400 ÷ 1,600 h for gear reducers with worm gear pairs in order to reach maximum efficiency
- Of approx. 200 ÷ 400 h for gear reducers with bevel and/or cylindrical gear pairs in order to reach maximum functionality.

The temperature of both gear reducer and lubricant may well rise beyond normal values during running-in. After the running-in period it may be necessary to verify the gear reducer fastening bolt tightness.

8 - MAINTENANCE

8.1 - GENERAL

At machine rest, verify at regular intervals (more or less frequently according to environment and use):

- All external surfaces are clean and air passages to the gear reducer or gearmotors are free, in order that cooling remains fully effective.
- Oil level and deterioration degree (check with cold gear reducer at rest).
- The correct fastening screws tightening.

During the operation check:

- noise level
- vibrations
- seals
- etc.



Attention! After a running period, gear reducer (excluding the shaft mounted gear reducers) is subject to a light internal overpressure which may cause burning liquid discharge. Therefore, before loosening whichever plug wait until gear reducer has become cold; if not possible, take the necessary protection measures against burning due to warm oil contact. In all cases, always proceed with great care.

Maximum oil temperatures indicated in lubrication table (see ch.6.2) do not represent a hindrance to the gear reducer regular running.

Oil change. Execute this operation at machine rest and cold gear reducer.

Pearrange a proper drain oil collection, unscrew both the drain plug and the filler plug in order to facilitate oil draining; dispose the exhaust lubricant in compliance with the laws in force.

Wash the inside part of gear reducer housing using the same oil type suitable for the running; the oil used for this wash can be applied for further washings after proper filtering by 25 µm of filtration standard.

Fill in the gear reducer again up to level.

It is always recommended to replace the seal rings (see ch. 9.3) When dismantling the cap (whenever gear reducers are provided with), reset the sealing with adhesive on cleaned and degreased mating surfaces.

8.2 - SEAL RINGS

It is always recommended that the seal rings are replaced with new ones when they are removed or during periodic checks of gear reducer; in this case, the new ring should be generously greased and positioned so that the seal line does not work on the same point of sliding contact as the previous ring.

Oil seals must be protected against heat radiation, also during the shrink fitting of parts, if applicable.

Duration depends on several factors such as dragging speed, temperature, ambient conditions, etc.; as a rough guide, it can vary from 3,150 to 25,000h.

8.3 - BEARINGS

Since there are many different types of bearings in a gear reducer (roller, tapered roller, straight roller, etc.) and each bearing works with different loads and speeds depending on the input speed, the nature of the load of the driven machine, the transmission ratio, etc., and with different lubricants (oil bath, oil splash, grease, oil circulation, etc.), it is not possible to define any periodical maintenance and replacement of bearings in advance.

If a precautionary maintenance is required, **undertake periodical checks to verify noise level and vibration with the help of appropriate diagnostic equipment and instruments**. If the measured values worsen even slightly it is necessary to stop gear reducer or gear motor and after having inspected inside the unit replace the bearings which are subject to breakdown.

8.4 - SOUND LEVELS

Most of the Rossi product range is characterised by **sound pressure levels L_{pA}** (mean value of measurement, assuming nominal load and input speed $n_1 = 1,400 \text{ min}^{-1}$, at 1 m from external profile of gear reducer standing in free field on a reflecting surface, according to draft proposal ISO/CD 8579) **lower or equal to 85 dB(A)**.

The table indicates the products which can exceed a.m. threshold. For further information about sound levels of every single product see Rossi technical catalogues.

Machine / Train of gears	i_n	Size
Parallel shaft	R I	$\leq 3,15$ ≥ 160
	R 2I	≥ 4 ≥ 200
	R 3I	all ≥ 320
	R 4I	all ≥ 400
		≤ 160 ≥ 500
		≥ 200 ≥ 630
Right angle shaft	R CI	all ≥ 320
	R C2I	≤ 63 ≥ 400
		≥ 71 ≥ 500
	R C3I	all ≥ 630
Right angle shaft	R C	1 ≥ 250

8.5 PERIODIC BRAKE MAINTENANCE

Verify, at regular intervals, that air-gap and backlash g (see Fig. 9) of release lever pullers, if any, are included between values stated in Tab. 3 (remove the wear dust of friction surface, if any). It is not necessary to set the backlash g if motor is equipped with manual release with automatic clearance taking-up.

Excessive air-gap value makes brake noise level rise, miss of electric release and decrease of braking

torque up to zero due to the clearance taking up of release lever pullers; g dimension in Fig. 9 has always

to correspond to the values stated in Tab. 3; too high g value makes difficult or inefficacious the use of release lever.

Adjust the **air-gap** (see Fig. 9) by releasing the nuts **32** and by screwing the fastening screws **25** (it is necessary to act through a hole of the flywheel, if present) in order to reach minimum air-gap (see Tab. 3) measuring by a thickness gauge in 3 positions at 120°

near the guiding bushes **28**. Tighten nuts **32** keeping in position fastening screws **25**. Verify the obtained air-gap value.

If the brake is provided (code «RF» on name plate) with removable thin spacers placed under the brake fastening studs, adjust air-gap simply removing one series of thin spacers after having partially loosen (without disassembling) the brake fixing bolts (see Fig. 11); adjustment through thickness **25** gauge and brake dismounting are no longer required. The brake is supplied with two series of thin spacer of different color (yellow and red) to allow two adjustment operations.

After several adjustments of air-gap, verify that brake disk thickness is not lower than the **minimum** value stated in Tab. 3; if necessary, replace the brake disk (refer to Fig. 9).

Release lever rod is **not** to be left permanently installed (to avoid dangerous or inappropriate use).

Tightening torques M_s for terminal block connections

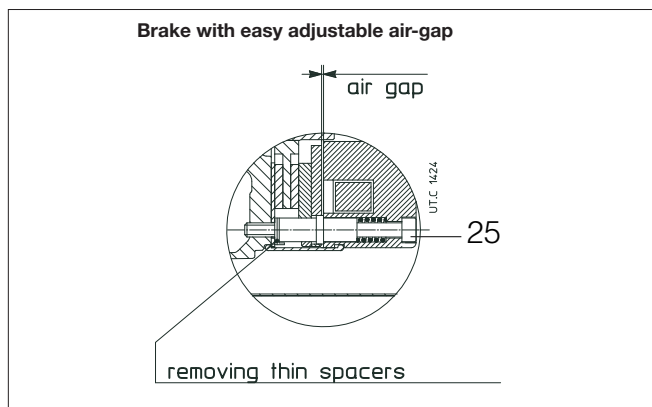
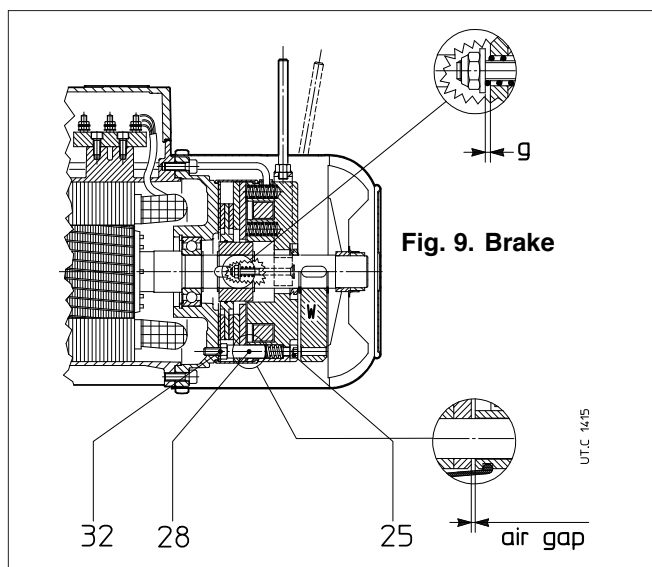
M_s N m	Thread			
	M4	M5	M6	M8
Min	0,8	1,8	2,7	5,5
Max	1,2	2,5	4	8

Periodic Maintenance

Brake Size	Motor Size	mm	Air-gap	mm
BZ 07	132,160S	0,7	0,40 ÷ 0,40	7,5

1) Backlash of release lever pullers (if any)

2) Minimum thickness of brake disk.



Trouble	Possible Causes	Corrective Actions
Excessive oil temperature	Inadequate lubrication: – Excessive or insufficient oil quantity; – Unsuitable lubricant (different type, too viscous, exhausted, etc.)	Check: – Oil level (gear reducer at rest) or quantity – Lubricant type and/or state (see ch. 6.2 lubrication table); replace if necessary
	Wrong mounting position	Change mounting position
	Too tightened taper roller bearings	Consult Rossi
	Worm gear reducer with excessive load during running-in	Reduce the load
	Excessive ambient temperature	Increase the cooling or correct the ambient temperature
	Obstructed passage of air	Eliminate obstructive material
	Slow or missing air recycle	Arrange auxiliary ventilation
	Radiance	Screen gear reducer and motor properly
	Inefficiency of auxiliary bearing lubrication system	Check the pump and the pipes
	Worn, faulty or badly lubricated bearings	Consult Rossi
	Inefficient or out of service oil cooling system: obstructed filter, insufficient oil (exchanger) or water (coil) flow rate, pump out of service, water temperature 20 °C, etc.	Check pump, pipes, oil filter and safety devices efficiency (pressure switches, thermostats, flow indicators, etc.)
Anomalous noise	One or more teeth with: – Dents or spillings – Excessive flank roughness	Consult Rossi
	Worn, faulty or badly lubricated bearings	Consult Rossi
	Taper roller bearings with excessive clearance	Consult Rossi
	Vibrations	Check the fastening and the bearings
Lubricant leaking	Seal ring with worn, bakelized, damaged or false mounted seal lip	Replace seal ring (see ch. 8.3)
	from seal rings	Restore the raceway
	Mounting position differs from the one stated on the name plate	Position the gear reducer correctly
Oil leaking from filler plug	Too much oil	Check oil level/quantity
	Incorrect mounting position	Check mounting position
	Inefficient vent valve	Clean/replace filler plug with vent valve
Low speed shaft not rotating even with high speed shaft/motor running	Broken key	Consult Rossi
	Completely worn gear pair	Consult Rossi
Lubricant leaking from joints (covers or half-casing joints)	Defective oil seals	Consult Rossi
Water in the oil	Defective cooling coil or heat exchanger	Consult Rossi

Motor: see specific instructions.

NOTE

When consulting Rossi state:

- All data of gear reducer or gearmotor name plate
- Nature and duration of failure
- When and under which conditions the failure occurred
- During the warranty period, in order not to lose validity, do not disassemble nor tamper the gear reducer or gearmotor without approval by Rossi.

This manual contains important information to help you install, operate, maintain and service your new top running trolley. We recommend that you study its contents thoroughly before putting the trolley into use. With proper installation, application of correct operating procedures, and practicing the recommended maintenance suggestions you will be assured of the maximum service from your trolley.

The trolley described in this manual are intended for indoor service. Trolleys to be used for outdoor service require special considerations.

IMPORTANT: When ordering replacement parts be sure to include Catalog, Part and Serial Numbers of the endtrucks and or drive gearmotor along with individual part numbers of components needed as identified elsewhere in this manual.

Information given in this manual is subject to change without notice.

GENERAL DESCRIPTION

GENERAL

These top running trolleys are designed to operate on parallel crane runway beams with ASCE Rail from 25# to 105# rail or square bar. Specific rail range is wheel diameter dependant. Motors are designed for operation on three phase power supplies from 190 to 415 V-50 Hz and 200 to 575 V-60 Hz. Trolley motors and brakes are designed and intended strictly for variable frequency control operated by pushbutton pendant or radio control. Pendant may be located and suspended from an independent festoon or attached directly to the hoist and trolley.

Basic Construction

Trolleys have a drive and trailer wheel on each side which run on the runway rails. The wheels are double flanged, flat tread with an integral rotating axle supported by anti-friction bearings. The trolley is driven by a helical gearmotor and brake. This drive engages the drive wheel by a splined connection.

INSTALLING TROLLEY

The installation of the crane on the runway shall be performed only by a qualified crane installer.

For information regarding attaching, lifting and moving the loads during installation, refer to ANSI B30.2-latest edition, Chapter 2-3 Overhead and Gantry Cranes (Single or Multiple Girder, Top Running Trolley Hoist; other applicable codes.

WARNING

BEFORE INSTALLING THE CRANE ON THE RUNWAY, LOCK THE RUNWAY CONDUCTOR DISCONNECT SWITCH IN THE OPEN (OFF) POSITION.

Prior to the start of any crane erection the building should be measured to confirm span and clearances. These measurements should be checked against the corresponding crane measurements to insure correctness of "fit". After assuring that the crane fits the building, determine orientation of crane position with respect to the runway. In addition, verify building and runway power supply to ensure it matches the power requirements of the crane.

These types of cranes are usually lifted into position on the runway in one piece. Total weight of this crane should be checked against lifting equipment selected for erection of this crane.

Immediately after the crane is placed on the runway rails check the wheel flange clearances to the rail. Clearance between the side of rail head and inside flange of wheel should be between a total of 3/4" and 1-1/8", depending on the wheel and rail combination and whether or not the truck is centered on the rail. Total wheel float should not be less than the 3/4" as recommended by CMAA Specifications #70 and #74.

WARNING

Before attempting any electrical connections the main power switch feeding the runway conductors must be LOCKED IN THE OPEN (OFF) POSITION.

NOTICE

A FUSED DISCONNECT SWITCH OR CIRCUIT BREAKER MUST BE INSTALLED AND ELECTRICALLY POSITIONED BETWEEN BUILDING POWER SUPPLY AND CRANE RUNWAY CONDUCTOR SYSTEM. THIS DISCONNECT MUST BE LOCKABLE IN THE OPEN POSITION, IN-SIGHT AND IN-REACH FOR THE CRANE OPERATOR, AND CLEARLY LABELED. A SECOND LOCKABLE DISCONNECT IS REQUIRED ON THE BRIDGE CRANE, ELECTRICALLY POSITIONED BETWEEN THE RUNWAY CONDUCTOR SYSTEM AND BRIDGE CONTROLS. REFER TO ARTICLE 610 OF NFPA NO. 70 NATIONAL ELECTRIC CODE, OSHA REGULATION 1910.179, ANSI/ASME B30.2 AND B30.17, LOCAL, STATE AND PROVINCIAL STANDARDS AND REGULATIONS FOR SPECIFIC REQUIREMENTS.

CAUTION

IN ACCORDANCE WITH ARTICLE 610 OF NFPA NO. 70 NATIONAL ELECTRIC CODE A SEPARATE BONDING CONDUCTOR MUST BE RUN FOR GROUND. GROUNDING THROUGH THE WHEELS TO GIRDERS AND RUNWAY STEEL IS NOT PERMITTED.

CAUTION

GEARMOTORS PROVIDED WITH THIS TROLLEY ARE INTENDED FOR VARIABLE FREQUENCY CONTROL ONLY. THE BRAKE USED ON THE GEARMOTOR IS A HOLDING BRAKE WITH NO PROVISION FOR TORQUE ADJUSTMENT. SEVERE LOAD SWING WILL RESULT WITHOUT THE CONTROLLED DECELERATION WHEN STOPPING PROVIDED BY THE VARIABLE FREQUENCY CONTROL. THE USE OF CONTACTOR, ACROSS THE LINE STARTING, CONTROLS IS NOT PERMITTED, WILL RESULT IN DAMAGE AND PREMATURE FAILURE OF THESE UNITS AND VOID ANY WARRANTY.

NOTICE

PRIOR TO PLACING THE CRANE INTO SERVICE, THE CRANE SHALL RECEIVE AN INITIAL INSPECTION. THIS INSPECTION SHOULD BE PERFORMED BY A QUALIFIED PERSON IN ACCORDANCE WITH ANSI/ ASME B30.2 OR B30.17, LOCAL, STATE AND PROVINCIAL STANDARDS AND REGULATIONS.

START-UP AND PRE-OPERATIONAL INSPECTION

After the crane has been installed on the runway and the crane, hoist and trolley has been connected to electrical service but prior to placing into service, as a minimum the following inspections should be made by a qualified person.

1. Check the main collector system for proper adjustment to maintain proper contact with conductors. Check along runway for possible interference if power is supplied by a cable reel or festooned cable.

WARNING

LOCK MAIN RUNWAY DISCONNECT SWITCH IN OPEN POSITION BEFORE ATTEMPTING TO ADJUST MAIN COLLECTORS OR CONDUCTORS.

2. Check the cross and pushbutton festoon conductors for adjustment, including cable loop depth, and tracking.
3. Check oil level in both drive gearcases and axle bearing grease fittings (if provided) for proper lubrication. If lubrication is required refer to the LUBRICATION SECTION of this manual.
4. Inspect crane to make certain that all bolted connections and attachments are properly tightened and that all electrical connections are secure.
5. Inspect and adjust the motor brake air gap. Refer to the MAINTENANCE SECTION of this manual.
6. The hoist/trolley should be inspected as instructed in the hoist/trolley manufacturers instruction manual. For a double girder crane inspect the clearance between wheel flanges and the girder rail per manufacturers requirements. If hoist is equipped with adjustable limit switches, confirm settings meet the applications requirements.
7. Inspect the alignment of the trolley end stops to the trolley.
8. Turn power on at both disconnects and mainline. Inspect hoist for reverse phase condition by ensuring push button operation corresponds to intended direction of travel and correct if necessary per manufacturer's instructions.
9. Operate the trolley to verify both motors operate in the same direction.
10. With no load, operate hoist/trolley back and forth the full length of girder. During the operation ensure and verify proper clearances from obstructions per CMAA, ASME B30.2, ASME B30.17 and OSHA requirements.
11. Load testing the crane should be performed in accordance with ANSI/ASME B30.2, local, state and/or provincial codes and regulations. A written report should be prepared during the performance of this test and placed on file.

OPERATION

OPERATOR QUALIFICATIONS

Safe and efficient crane operation requires skill, extreme care, good judgment, alertness, concentration and knowledge of and rigid adherence to proven safety rules and practices. No person should be permitted to operate a crane or hoist:

1. Who does not possess the above characteristics.
2. Who is not qualified or has handicaps that could adversely affect such operation.
3. Who has not been properly instructed.
4. Who has not been informed and does not have a thorough knowledge of all applicable safe operating practices, including those in this book as well as of rigging equipment and practices.

NOTICE

SEE APPLICABLE NATIONAL, STATE AND LOCAL SAFETY CODES AND REGULATIONS FOR ADDITIONAL REQUIREMENTS RELATING TO SAFE OPERATING PRACTICES, INCLUDING ANSI B30.2 OR ANSI B30.17 - LATEST EDITION.

OPERATING RULES

Operating rules listed below are an earnest effort to encourage SAFETY and are not intended to take precedence over individual plant safety rules and regulations or rules set forth by various applicable codes.

A good operator operates his crane as smoothly as possible and knows and follows the suggested rules below for safe, efficient crane handling.

OPERATING PRECAUTIONS

WARNING

THESE TROLLEY HOISTS ARE NOT DESIGNED NOR INTENDED TO BE USED FOR SUPPORT OR TRANSPORT OF PEOPLE OR FOR TRANSPORTING LOADS OVER PEOPLE.

Safe operation of an overhead hoist is the operator's responsibility. Listed below are some basic rules that can make an operator aware of dangerous practices to avoid and precautions to take for his own safety and the safety of others. Observance of these rules in addition to frequent examinations and periodic inspection of the equipment may save injury to personnel and damage to the equipment.

ALWAYS center trolley over load when hoisting.

DO NOT stand and DO NOT cause or allow others to stand or get under any load the trolley is supporting.

DO keep clear, and make sure others keep clear, of any load the trolley is supporting.

DO NOT attempt to operate trolley before completing tests and adjustments.

DO NOT run hoist/crane into end stops, other hoists/cranes, or any other obstructions.

ALWAYS be sure load is clear of obstruction before traversing load.

CAUTION

IF TROLLEY IS MOUNTED ON A RAIL, THEN END STOPS MUST BE INSTALLED TO PREVENT TROLLEY FROM RUNNING OFF THE END OF THE RAIL RESULTING IN INJURY TO THE OPERATOR AND OTHERS AND DAMAGES TO THE LOAD AND OTHER PROPERTY. END STOPS FOR THE TROLLEY MUST ALSO BE INSTALLED.

Refer to hoist and trolley instruction manuals for safety warnings on hoists and trolleys.

Read and comply with ANSI B30.2 or B30.17-latest edition.

Read and comply with all local, state and national safety codes.

CAUTION

MAKE SURE ALL INSTALLATION AND START-UP INSPECTION HAVE BEEN MADE IN ACCORDANCE WITH INSTRUCTIONS FURNISHED WITH THE HOIST AND TROLLEY BEFORE TURNING ON THE POWER.

LEARNING THE CONTROLS

After making certain the crane is completely and properly installed, with the crane connected to the electrical service and all the installation and start-up inspections made, the crane operator(s) should learn and become acquainted with the controls.

On cranes having any or all motions electrically operated, the operator should locate the runway disconnect and make sure this switch is locked open (POWER OFF). The operator should now operate the various push buttons to get the "feel" and determine that they do not bind or stick in any position. The operator should become familiar with push button location for their respective motions as well as "start" and "stop" buttons (normally the top two green and red buttons), which operate the crane main line contactor. The mainline contactor will shut off power to all motions.

WARNING

IF ANY PUSH BUTTON BINDS OR STICKS IN ANY POSITION - DO NOT TURN THE POWER ON - DETERMINE THE CAUSE OF THE MALFUNCTION AND CORRECT IT BEFORE OPERATING THE CRANE.

LEARNING THE CONTROLS WHILE OPERATING CRANE WITH NO LOAD

Having inspected and tried the control, the crane operator is now ready to try the crane under power.

CAUTION

ALWAYS ALLOW THE TROLLEY TO COME TO A COMPLETE STOP BEFORE CHANGING DIRECTION. ABRUPT CHANGE OF TROLLEY DIRECTION WHILE IN MOTION MAY CAUSE ADVERSE OPERATING CHARACTERISTICS OR DAMAGE TO TROLLEY AND DRIVE COMPONENTS.

STEP 1.

Close the crane runway disconnect switch.

STEP 2.

Close the crane disconnect switch mounted on the crane. The crane main disconnect switch is located in the bridge panel and is operable from the front of the panel without opening the panel. The switch is operated by rotating the handle. The "OFF" and "ON" positions of the switch are marked on the switch assembly.

The bridge control panel also contains a 3-pole mainline contactor. This contactor is connected in the electrical system on the load side of the crane main disconnect switch, so that all the crane power flows through this contactor. The mainline contactor is opened and closed (turned off and on) by means of the stop - start buttons on the pendant push button station. This stop-start circuit, as well as other control circuits, typically operate at 115 volts. This 115 volt control circuit voltage is obtained from a transformer mounted in the bridge control panel.

STEP 3.

Press the start or green push button which will close the mainline contactor, applying power to all control devices. The crane is now ready for use.

STEP 4.

The drive motors on the trolley are controlled by inverters, programmable variable frequency control. Standard programming on Yale provided controls is two step infinitely variable. The motion buttons on the pushbutton for the crane, typically labeled "FWD" and "REV" are two step buttons, for this programming. The first step is the initial starting speed of the crane and it also performs a speed hold function. The second step of the button performs an acceleration function.

To operate the crane, press the button for desired direction, FWD or REV, to the first step. The crane will start moving and accelerate to its programmed starting speed. Press the same button further to the second step and the crane will accelerate up to full speed. If the crane reaches a desired speed during this acceleration, back the button off to the first step to hold that speed. If the crane is traveling too fast and you wish to slow it down, release the motion button completely and the crane will start to decelerate. Once the desired slower speed is obtained, press button to the first step to hold that speed. To bring the crane to a stop release the motion button completely, the crane will decelerate to a stop and the holding brakes will set.

Practice operating the crane in both directions, accelerating to intermediate and full speeds, decelerating to a slower speed, and bringing it to a stop. Get acquainted with the operating characteristics of this crane, acceleration, deceleration and stopping distances, to ensure smooth load movement, accurate load positioning, and to minimize load swing.

NOTICE

IF DEFAULT SETTINGS FOR THE TROLLEYS VARIABLE FREQUENCY CONTROL, INVERTER, DOES NOT MEET YOUR SPECIFIC REQUIREMENTS IT CAN BE RE-PROGRAMMED. PROGRAMMING OF THE INVERTER SHALL BE DONE BY A QUALIFIED CRANE TECHNICIAN PER THE MANUFACTURER'S INSTRUCTION MANUAL. EACH CRANE HAS A MAXIMUM SPEED SETTING BASED ON ITS CAPACITY, SPAN, DUTY CLASSIFICATION, ETC. DO NOT EXCEED MAXIMUM SPEED FOR WHICH THE CRANE WAS SPECIFIED WHEN ORDERED.

STEP 5.

The trolley motion buttons are typically labeled "Left" and "Right". The hoist motion buttons are typically labeled "Up" and "Down". Practice and become acquainted with these controls.

STEP 6.

Once the operator(s) are acquainted and comfortable operating the crane and the hoist/trolley, they shall learn the Pre-Shift inspection procedure. Refer to the INSPECTION section of this manual.

WARNING

IF, WHEN DEPRESSING THE HOIST "UP" BUTTON, THE HOOK SHOULD LOWER - STOP AT ONCE - DO NOT ATTEMPT TO OPERATE AGAIN. REPORT THIS CONDITION TO THE PROPER SUPERVISOR FOR CORRECTION WITH THE INSTRUCTIONS FURNISHED WITH YOUR HOIST MANUAL BY A QUALIFIED CRANE TECHNICIAN.

Set lower limit switches of the hoist and insure proper functioning per the Hoist Manufacturer's Manual.

When operating the hoist in the up direction CAREFULLY OBSERVE the relationship of the hook block and the bottom of the hoist frame. The hoist upper limit switch, when working properly, should cause the hoist up motion to stop and/or reverse direction.

WARNING

DO NOT CONTACT OR STRIKE THE HOIST FRAME WITH THE HOOK BLOCK. IF THE HOIST MOTION IS NOT INTERRUPTED BY THE LIMIT SWITCH, STOP THE HOIST BY REMOVING YOUR FINGER FROM THE BUTTON AND/OR DEPRESSING THE STOP BUTTON. DO NOT ATTEMPT FURTHER OPERATION UNTIL THE LIMIT SWITCH IS OPERABLE. CONSULT THE HOIST MANUFACTURER'S INSTRUCTIONS.

NOTICE

JOGGING IS THE RAPID AND REPEATED PRESSING OF A MOTION PUSHBUTTON (HOIST/TROLLEY) TO GET THE EQUIPMENT TO MOVE IN SHORT INCREMENTS OR "INCHING". ALTHOUGH JOGGING MAY BE NECESSARY TO POSITION A LOAD, EXCESSIVE JOGGING WILL CAUSE PREMATURE WEAR AND FAILURE OF MOTORS, BRAKES AND CONTROLS. IT WILL ALSO CAUSE THE MOTORS TO QUICKLY OVERHEAT, RESULTING IN THEIR THERMAL PROTECTION TO DISABLE TROLLEY MOTION UNTIL COOLED.

WARNING

THIS EQUIPMENT IS NOT DESIGNED OR SUITABLE AS A POWER SOURCE FOR LIFTING, LOWERING, OR TRANSPORT OF PERSONS.

OPERATING THE CRANE

Once the crane has successfully passed its Start-up and Pre-Operational (Initial) inspection, and all the crane operators have been successfully trained and/or licensed, it is now ready to be placed into service.

WARNING

DO NOT OPERATE A CRANE, HOIST OR TROLLEY HAVING UNUSUAL VIBRATIONS, SOUNDS, WARNINGS OR WITH ANYTHING WRONG OR APPARENTLY WRONG. DANGER MAY BE PRESENT THAT THE CRANE OPERATOR CANNOT SEE. DETERMINE AND CORRECT THE CAUSE OF THE UNUSUAL CONDITIONS AND MAKE CERTAIN THAT THE CRANE CAN BE OPERATED SAFELY.

STEP 1.

Turn power on to the crane, disconnects and mainline. If not already done so, perform Pre-Shift Inspection, refer to the Inspection Section of this manual.

STEP 2.

Move the crane to the load making certain the load hook is high enough to clear any obstruction in its path. Position the hoist and trolley so that the load hook is centered over the load. Lower the load hook for load attachment. For larger sized loads, the use of a rigging or load director may need to be used to direct the lift and movement of the load. This person should use the proper hand signals as shown in this manual. The crane operator should respond only the signals of the designated person directing the load, except for emergency stop as shown on the next page: **OPERATOR HAND SIGNALS**.

WARNING

PRIOR TO ATTACHING OR LIFTING A LOAD, KNOW THE WEIGHT OF THE LOAD AND THE BELOW THE HOOK LIFTING DEVICES (SPREADER OR LIFTING BEAMS, MAGNETS, GRABS, SLINGS, ETC.). THE TOTAL WEIGHT OF THE LOAD AND LIFTING DEVICES SHALL NOT EXCEED THE RATED CAPACITY OF THE HOIST AND/OR CRANE.

STEP 3.

Attach load to load hook. Slowly raise the hook until the slack has been taken out of the below the hook devices. When the floor man signals and the operator is satisfied the load is secure in the sling, lift the load slowly until clear. Now, hoisting speed can be increased and maintained until the load is clear of all obstructions or the floor man gives the signal to stop.

STEP 4.

Starting slowly and increasing speed as distance permits, move the trolley toward the point where the load is to be lowered. Decelerate and stop by releasing the push button. Final spotting is accomplished by pressing the button to the first step to creep into position.

STEP 5.

Learn to judge the stopping distance of the trolley, both with light and full loads. This will enable you to "spot" loads with the minimum amount of jogging and excessive load swing.

OPERATOR HAND SIGNALS



USE MAIN HOIST

Tap fist on head, then use regular signals.



USE WHIPLINE (AUXILIARY HOIST)

Tap elbow with one hand, then use regular signals.



HOIST

With forearm vertical and forefinger pointing up, move hand in small horizontal circle.



LOWER

With arm extended downward and forefinger pointing down, move hand in small horizontal circle.



RAISE BOOM

Arm extended and fingers closed up with thumb pointing upward.



LOWER BOOM

Arm extended and fingers closed with thumb pointing downward.



RAISE BOOM & LOWER LOAD

Arm extended and thumb pointing up, flex fingers in and out as long as load movement is required.



LOWER BOOM & RAISE LOAD

Arm extended and thumb pointing down, flex fingers in and out as long as load movement is required.



SWING

Arm extended, with fingers in direction of swing of boom.



EXTEND BOOM (TELESCOPING BOOMS)

With both fists in front of body with thumbs pointing outward.



RETRACT BOOM (TELESCOPING BOOMS)

With both arms extended and palms down with thumbs pointing toward each other.



MOVE SLOWLY (EXAMPLE - "HOIST SLOWLY")

Use one hand to give any motion signal and place the other hand motionless in front of the hand giving the motion signal.



EXTEND BOOM (TELESCOPING BOOMS)

ONE HAND SIGNAL: One fist in front of the chest with the thumb tapping the chest.



RETRACT BOOM (TELESCOPING BOOMS)

ONE HAND SIGNAL: One fist in front of the chest with the thumb pointing outward and heel of fist tapping the chest.



STOP

Arm extended and palm down, move arm horizontally back and forth.



EMERGENCY STOP

With both arms extended and palms down, move arms horizontally back and forth.



TRAVEL

ONE TRACK - LAND CRANES ONLY

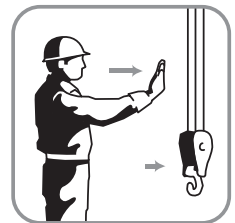
Indicate track to be locked by raising fist on that size. Rotate other fist in front of body in direction that opposite track is to travel (from the crane operator's perspective).



TRAVEL

BOTH TRACKS - LAND CRANES ONLY

Use both fists in front of body, making a circular motion about each other, indicating direction of travel, forward or backward.



TRAVEL/ BRIDGE TRAVEL

With arm extended forward & hand open & slightly raised, making a pushing motion in the direction of travel.



DOG EVERYTHING

Clasp hands in front of the body.



MULTIPLE TROLLEYS

Hold up one finger for block marked "1" and two fingers for block marked "2". Regular hand signals to follow.



MAGNET IS DISCONNECTED

Crane operator spreads both hands apart with palms up.



TROLLEY TRAVEL

With palm up, fingers closed and thumb pointing in the direction of motion, jerk hand horizontally.

WARNING

NEVER LEAVE AN UNATTENDED LOAD HANGING FROM THE CRANE. LOAD MUST BE SAFELY PLACED ON FLOOR PRIOR TO THE CRANE OPERATOR LEAVING THE CONTROLS.

When crane is not in use, during the work period, it should be parked in a safe location, such as the end of the bay or a location that will not interfere with the movement of people, materials and equipment. Turn power off to the mainline contactor of the crane. Store the pendant against a wall or column to prevent damage from traffic. At the end of the work period or day, park crane as described herein and turn power off at both disconnects.

RESPONSIBILITY FOR SAFE OPERATION

Each crane operator should be held directly responsible for the safe operation of his crane. The crane operator should STOP the crane and refuse to handle loads when:

1. There is any doubt as to **SAFETY**.
2. Any unusual vibrations or sounds are noticed before or when starting the lift or traverse motions.
3. There are arguments or disagreements with the floor man or hitchers.
4. The operator feels ill or is not alert.

INSPECTION

Overhead cranes are subject to four levels of inspection; Initial, Pre-Shift, Frequent and Periodical in accordance with the latest editions of ANSI/ASME B30.2 and CMAA 78. These inspections are necessary to ensure the equipment is safe for use and operating at its required performance level. Inspection criteria described herein are general requirements. Specific inspection criteria will be based on the options and accessories provided with your crane. Refer to the manufacturer's maintenance manual for the hoist/trolley and its specific inspection criteria.

INITIAL INSPECTION

New, re-installed, altered, repaired and modified cranes shall be inspected prior to initial use. Inspection of all altered, repaired or modified cranes may be limited to the provisions affected by the work as determined by a qualified crane technician. Inspections shall include, but not limited to, clearances, operating speeds, lubrication, control settings, safety devices, etc. Refer to START UP and PRE-OPERATIONAL INSPECTION elsewhere in this manual.

PRE-SHIFT INSPECTION

A pre-shift inspection shall be performed by the crane operator or designated person at the beginning of each shift, or the first time the crane is used during each shift. This is a visual and operational inspection to ensure the equipment is in good working order. Items to be checked include limit switches, brakes, electrical equipment and all safety devices. Crane is to be operated without a load to check for any unusual sounds, vibrations, or anything that may be apparently wrong. Any discrepancies or suspected discrepancies shall be immediately reported to crane operator's supervisor. Below is a check list which can be used for this inspection.

FREQUENT INSPECTION

Frequent inspections are to be performed by a qualified designated person. Inspection intervals vary by class of service, for Class C Service cranes they are to be performed monthly at a minimum. Hooks and wire rope or load chain are to be inspected in monthly intervals as a minimum and recorded including date, serial/trace numbers and a signature. Frequent inspections also include a thorough operational inspection. Items to be inspected include limit switches, lubrication levels in all gearcases, wheels, bearings, etc., brakes, electrical equipment and all safety devices. Crane is to be operated without a load to check for any unusual sounds, vibrations, or anything that may be apparently wrong. The designated person shall determine if conditions found are a hazard and a more detailed inspection is necessary. Refer to the typical Inspection Schedule and Maintenance Report in this manual.

NOTICE

CRANES THAT HAVE BEEN SITTING IDLE FOR A PERIOD BETWEEN ONE TO SIX MONTHS SHALL RECEIVE THE FREQUENT INSPECTION PRIOR TO ITS USE.

PERIODIC INSPECTION

Periodic inspections are to be performed by a qualified designated person. Inspection intervals vary by class of service. For Class D Service crane, they are to be performed annually at a minimum. Frequency of this inspection may have to be increased based on the severity of the duty cycle and environmental conditions the crane is subjected to. A written, dated and signed inspection report shall be provided and maintained on file. All worn, damaged or malfunctioning parts are to be repaired or replaced to maintain a SAFE operational crane. Refer to the typical Inspection Schedule and Maintenance Report found elsewhere in this manual.

Items to be inspected include but are not limited to:

1. All functional operating mechanisms for misadjustment interfering with crane operation.
2. Operating parts for excessive wear.
3. All safety devices for malfunction.
4. All connections and mountings for loose bolts, nuts and other fasteners for tightness.
5. All structural members and welds for deformation, cracks or corrosion.
6. All electrical apparatus, including control contactors, limit switches, push button stations for signs of pitted contact points, wear or deterioration.
7. All hoists and trolleys installed on the crane in accordance with the manufacturer's recommendation.

WARNING

ALWAYS LOCK MAIN SWITCH IN THE OPEN POSITION (OFF) BEFORE INSPECTION.

NOTICE

CRANES THAT HAVE BEEN SITTING IDLE FOR SIX MONTHS OR GREATER SHALL RECEIVE A COMPLETE PERIODIC INSPECTION PRIOR TO ITS USE.

MAINTENANCE

GENERAL

Maintenance services required on top running cranes are, for the most part, simple periodic inspections and adjustments. Procedures for lubrication, routine adjustments and replacement of parts, if required, are described in the following paragraphs.

LUBRICATION

AXLE BEARINGS

Axle bearings on the 7.9" (200 mm) and 10.2" (260 mm) diameter wheels require periodical lubrication. To access grease fittings, remove the rail sweep. Fitting is located on the pilot diameter of each bearing cage, four total per endtruck as shown in figures 3 & 4. Lubricate with NLGI #2 General Purpose Grease, every three months. Replace rail sweep upon completion. Using a torque wrench, tighten all bolts to 72 ft. lbs. torque for all size end trucks. Frequency of and type of lubrication used may be adjusted based the severity of the duty cycle and operating environment.

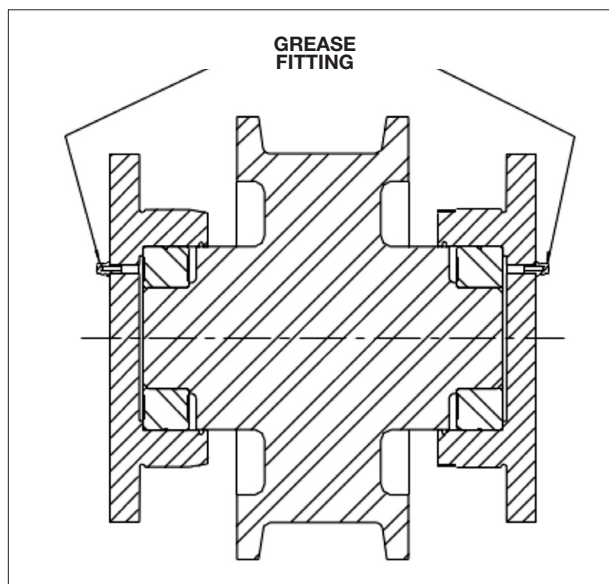


Figure 3: Trailer Wheel

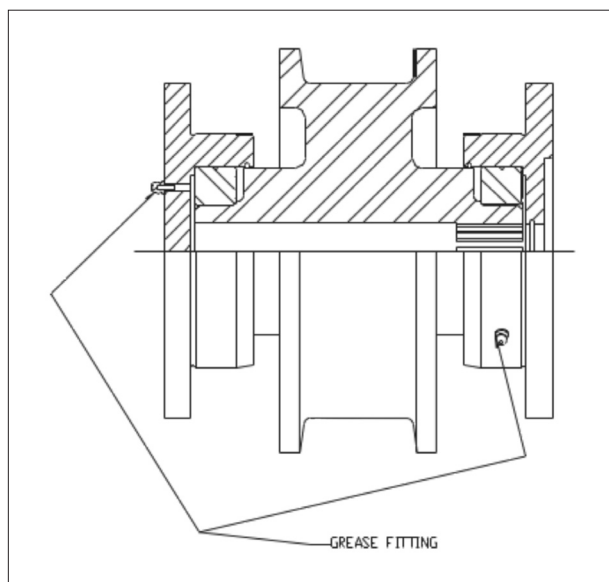


Figure 4: Drive Wheel

GEARMOTOR (Endtruck)

The gearcase lubricant should be changed after 10,000 hours of use, based on moderate (Class D) service. Lubrication frequency will need to be increased dependant on the severity of service. Oil required is Aral Degol BG 220 gear oil (suitable substitutes are Texaco Pinnacle 220 & Shell Omala 220). Do not mix lubricant types (this applies in particular to mineral and synthetic lubricants). Too much lubricant can lead to overheating. Gearcase is not provided with, nor requires a vent plug.

Motor Horsepower	KW	Gearcase Oil Capacity (liters)
0.75	.55	.18
1.0	.75	.18
1.5	1.2	.40
2.0	1.5	.55
3.0	2.2	.55

TO CHANGE GEARCASE OIL:

1. Disconnect and lock out power supply.
2. Unplug motor connection.
3. Unbolt complete gearmotor from endtruck. Gearmotors weigh up to approximately 75 lbs.
4. Remove drain/filler plug on top of gearcase as shown in figure 5. Tip motor to drain oil in to proper container. Properly dispose of used oil.
5. Fill gearcase with correct amount of oil per chart above and replace drain/filler plug.
6. Apply loctite 243 to motor mounting bolts, mount complete gearmotor back on endtruck and torque mounting bolts (see table below).

Truck	Bolt Size	Required Torque
115 mm	M6 x 1.0 x 20	7.5 to 8 ft-lbs
160 mm	M6 x 1.0 x 25	
200 mm	M8 x 1.25 x 30	18 to 20 ft-lbs
260 mm	M8 x 1.25 x 40	
305 mm	M12 x 1.75 x 45	62 to 68 ft-lbs

7. Re-install motor plug
8. Turn power back on to crane and test run, checking for any signs of leaks.

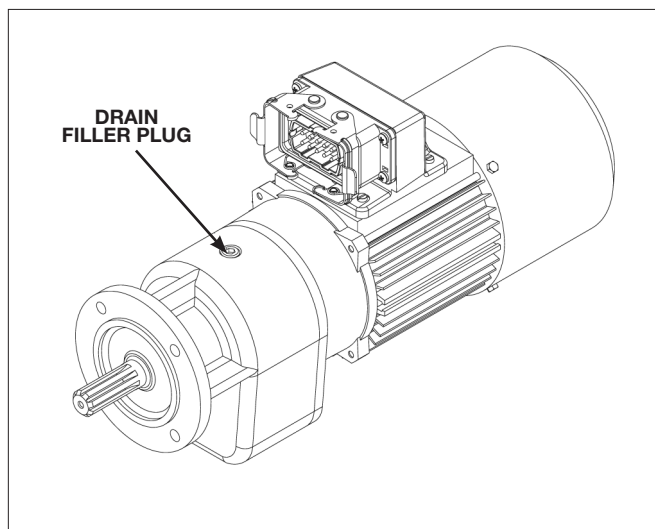


Figure 5: Gearcase Drain/Filler Plug

HOIST & TROLLEY

For hoist and trolley lubrication instructions refer to the manufacturer's manuals.

WHEEL AND BEARING REMOVAL & REPLACEMENT

Refer to parts illustration Figure 7.

To remove the wheels follow the steps below:

1. Remove load and below the hook devices from hook. Move hoist and trolley to opposite end of crane from end work is being done.

WARNING

MAKE SURE THAT TRUCK IS ADEQUATELY SUPPORTED SO THAT IT CANNOT DROP WHEN WHEEL IS REMOVED. DUE TO THE WEIGHT OF THE WHEELS AND BEARING CAGES, MAKE SURE THAT THE PROPER EQUIPMENT IS IN PLACE TO SAFELY REMOVE THE WHEELS AND BEARING CAGES FROM THE END TRUCK. ALSO LOCK MAIN RUNWAY DISCONNECT SWITCH IN THE OPEN POSITION (OFF) WHEN WORKING ON WHEELS ADJACENT TO RUNWAY CONDUCTORS.

2. Disconnect power and lock out.
3. Remove load from wheel axle. This can be accomplished by jacking or lifting at the girder(s). Jacking or lifting only one end of the truck may permanently damage the crane.
4. If working on driver wheel, unplug motor leads from gearmotor and remove gearmotor from bearing cage. Remove rail sweep from endtruck and bolts from bearing cages.
5. Jack endtruck to height that will allow bearing cage to roll out from end of endtruck.
6. Roll wheel, bearings and bearing caps assembly from under endtruck and remove from runway. Be careful not to drop bearing caps, bearings and wheel from runway height.
7. Remove bearing caps, bearings should stay on wheel axle.
8. Remove bearings from axle. Depending on the condition of the bearings and axles, a bearing puller may be required. Be careful not to damage bearing fits on axle.
9. Inspect axle bearing diameter and wheel tread diameter and flange for excessive wear, spalling and work hardening on the tread and flange, nicks and gouges on bearing diameters, etc. Replace wheel if necessary.
10. Prior to re-assembling bearings to axle, pack the roller bearings with grease. Use NLGI #2 general purpose grease unless the severity of the duty cycle and/or operating environment warrants otherwise. Press bearings onto wheel axle, ensure they are fully seated.
11. Assemble both bearing caps onto bearings.
12. Place wheel assembly onto runway rail and roll it into place in the endtruck. Orient the grease fitting (if provided) on bearing cap, pointing towards the rail sweep.
13. Carefully lower endtruck, ensuring bearing caps and the endtruck pilot diameters align properly. Install and tighten bearing cap bolts.
14. Lower endtruck onto runway rail.
15. Re-install rail sweep and gearmotor. Connect motor power plug. Refer to page 30 for torque specifications.
16. Turn power back on to crane and inspect crane for proper operation.

MOTOR BRAKES

Standard motor brakes are DC rectified solenoid activated, spring set disc type brakes. Brake is intended to be used strictly as a holding brake and does NOT have any torque adjustment for decelerating and stopping the crane. Deceleration and stopping is to be provided by the variable frequency (inverter) motor control.

BRAKE AIR GAP INSPECTION

To inspect brake air gap refer to figure 6:

1. Disconnect and lock out power supply
2. Remove brake cover
3. Carefully roll the o-ring back towards the magnet body exposing the air gap between the armature plate and magnet. Use feeler gauge and measure the gap between the armature plate and magnet. If gap exceeds maximum allowed, replace the brake.

Motor Horsepower	KW	Normal Air Gap	Maximum Air Gap	Brake Mounting Bolt Torque
0.75	.55	0.2 mm (.008 in.)	0.3mm (.012 in.)	3 Nm (2.2 ft. lbs.)
1.0	.75			
1.5	1.2			
2.0	1.5			
3.0	2.2			
			0.4 mm (.016 in.)	

4. Roll o-ring back into place and re-install brake cover.
5. Turn power back on to crane and test brakes for proper operation.

BRAKE RECTIFIER REMOVAL AND REPLACEMENT

Rectifier is located inside the motor conduit box cover. To replace follow these steps:

1. Disconnect and lock out power supply.
2. Unplug motor leads and open conduit box.
3. Remove rectifier and unplug wires.
4. Plug wires into replacement rectifier.
 - a. Connect brake leads to DC side of rectifier, terminals marked "+" & "-".
 - b. Connect leads from the plug to the AC side, two terminals marked "~".
5. Re-assemble in reverse order disassembly.
6. Turn power onto crane and test for proper operation.

BRAKE REMOVAL AND REPLACEMENT

If brake air gap exceeds the maximum allowed, or is not functioning properly, the brake may need to be replaced. Follow these instructions.

1. Turn power off to crane and lock out
2. Unplug motor leads, open motor conduit box and disconnect brake leads from rectifier
3. Remove brake cover
4. Remove retaining ring and fan (if applicable).
5. Remove (3) mounting bolts holding brake magnet body in place. Pull brake leads from motor, remove magnet, brake coil and rotor.
6. Re-assemble in reverse order, and tighten mounting bolts to specified torque.
7. Turn power back on to crane and test brakes for proper operation.

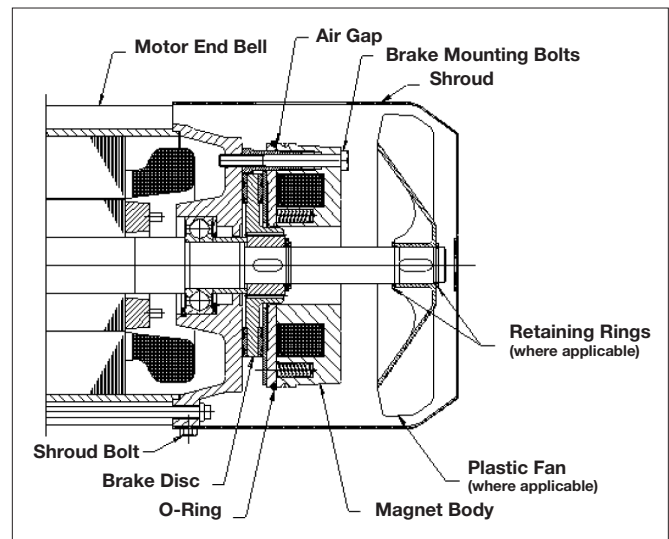


Figure 6: Motor Brake

ELECTRICAL

1. Gearmotors

- a. The gearmotors are inverter duty. If gearmotor requires any service or repairs, other than what is described in this manual, the complete gearmotor must be replaced.
- b. For hoist and trolley motors, consult the hoist and trolley literature.

2. Control Panel

- a. All connections should be checked frequently for tightness.

3. Hoist and Trolley

Panel, brakes, limit switches, etc. Consult hoist and trolley literature for maintenance and spare parts information.

HOIST MOTION 460V 15/20HP ROSSI MOTORS

POWER SUPPLY

L1 L2 L3

HFU

HL1 HL2 HL3

CONNECT PER NAMEPLATE FOR PROPER VOLTAGE

PRIMARY

SECONDARY

HFU

HL1 HL2 HL3

92 G

IMPULSE YG+ SERIES 4 INVERTER

RED A+ 412 VDC

BLK B+ 0 VDC

WHI C+ 0 VDC

BLK A- 0 VDC

GRN B- 0 VDC

BLK C- 0 VDC

SHIELD AND GROUND DRAIN

GROUND

END ONLY

92

SAFE INTERFACE CARD

DB1 DB2 DB3 DB4 DB5 DB6 DB7 DB8 DB9 DB10 DB11 DB12 DB13 DB14 DB15 DB16 DB17 DB18 DB19 DB20 DB21 DB22 DB23 DB24 DB25 DB26 DB27 DB28 DB29 DB30 DB31 DB32 DB33 DB34 DB35 DB36 DB37 DB38 DB39 DB40 DB41 DB42 DB43 DB44 DB45 DB46 DB47 DB48 DB49 DB50 DB51 DB52 DB53 DB54 DB55 DB56 DB57 DB58 DB59 DB60 DB61 DB62 DB63 DB64 DB65 DB66 DB67 DB68 DB69 DB70 DB71 DB72 DB73 DB74 DB75 DB76 DB77 DB78 DB79 DB80 DB81 DB82 DB83 DB84 DB85 DB86 DB87 DB88 DB89 DB90 DB91 DB92 DB93 DB94 DB95 DB96 DB97 DB98 DB99 DB100 DB101 DB102 DB103 DB104 DB105 DB106 DB107 DB108 DB109 DB110 DB111 DB112 DB113 DB114 DB115 DB116 DB117 DB118 DB119 DB120 DB121 DB122 DB123 DB124 DB125 DB126 DB127 DB128 DB129 DB130 DB131 DB132 DB133 DB134 DB135 DB136 DB137 DB138 DB139 DB140 DB141 DB142 DB143 DB144 DB145 DB146 DB147 DB148 DB149 DB150 DB151 DB152 DB153 DB154 DB155 DB156 DB157 DB158 DB159 DB160 DB161 DB162 DB163 DB164 DB165 DB166 DB167 DB168 DB169 DB170 DB171 DB172 DB173 DB174 DB175 DB176 DB177 DB178 DB179 DB180 DB181 DB182 DB183 DB184 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CONNECT TO HOIST CONTROL

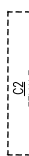


ELECTROMOTIVE G-SERIES 3 PROGRAMMING									
10-15T UNITS (2 x 1.5HP MOTORS w/ 200mm WHEEL)									
TRAILER SET	NO. 1	NO. 2	NO. 3	NO. 4	NO. 5	NO. 6	NO. 7	NO. 8	NO. 9
45 FPM	2	0	0	3	-	FIA	300	100	
60 FPM	2	0	0	3	-	FIA	400	100	
75 FPM	2	0	0	3	-	FIA	500	100	
80 FPM	2	0	0	3	-	FIA	533	100	
90 FPM	2	0	0	3	-	FIA	600	100	
100 FPM	2	0	0	3	-	FIA	666	100	
125 FPM	2	0	0	3	-	FIA	833	100	

NOTES:
 1. SET UP THE VARIABLE FREQUENCY DRIVES USING THE TABLE ABOVE.
 2. SELECT THE CORRECT TROLLEY SPEED.
 3. CHANGE EACH PARAMETER (COLUMN) TO THE VALUE IN THE SELECTED ROW.
 4. "-" ON TABLE INDICATES NO PROGRAMMING NEEDED (DEFAULT IS DESIRED)
 5. 4. FIA: ENTER COMBINED FULL LOAD AMPS OF BOTH MOTORS.

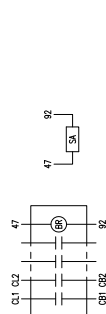
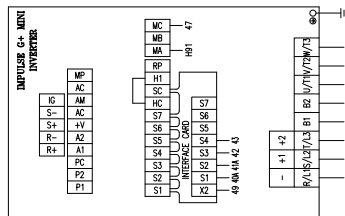
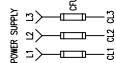


NOTE ALTERNATE WIRING
FOR TROLLEY MOTOR #2.
TROLLEY MOTOR #2 IS NEAREST
THE HOIST MOTOR AND GEARBOX.

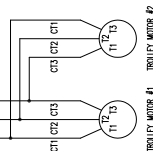
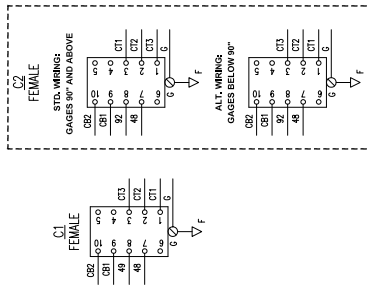
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FIRST USED ON: PH12-3 FROM: 45451201

WIRE #	DEVICE CONNECTED
1	GPU
2	GPU
3	INVERTER, BR
4	GPU
5	INVERTER, BR
6	GPU
7	INVERTER, BR
8	GPU
9	INVERTER
10	C1, C2, C3
11	C1, C2
12	C1, C2
13	INVERTER
14	INVERTER
15	INVERTER
16	INVERTER
17	INVERTER
18	INVERTER
19	INVERTER
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92	INVERTER
93	INVERTER
94	INVERTER
95	INVERTER
96	INVERTER
97	INVERTER
98	INVERTER
99	INVERTER
100	INVERTER



NOTE ALTERNATE WIRING
FOR TROLLEY MOTOR #2.
TROLLEY MOTOR #2 IS NEAREST
THE HOIST MOTOR AND GEARBOX.



ELECTROMOTIVE G-NINI PROGRAMMING							
20-2ST UNITS [2 x 2HP MOTORS w/ 260mm WHEEL]							
TROLLEY	45 FPM	0001	00	01.04	E22.01	B02.01	B02.02
	SPEED	FPM				FIA	44.9 15.0
	60 FPM	0001	00	03	-	FIA	59.9 15.0
	75 FPM	0001	00	03	-	FIA	74.8 15.0
	80 FPM	0001	00	03	-	FIA	79.8 15.0
	90 FPM	0001	00	03	-	FIA	89.8 15.0
	100 FPM	0001	00	03	-	FIA	100 15.0

ELECTROMOTIVE G-MINI PROGRAMMING									
20-25T UNITS (2 x SHIP MOTORS w/ 260mm WHEEL)									
TROLLEY	A01	A01.03	A01.04	E01.04	E01.04	E22.01	B02.01	B02.02	
45 FPM	0001	00	03	-	FLA	31.1	10.4		
60 FPM	0001	00	03	-	FLA	41.5	10.4		
75 FPM	0001	00	03	-	FLA	51.8	10.4		
80 FPM	0001	00	03	-	FLA	55.3	10.4		
90 FPM	0001	00	03	-	FLA	62.2	10.4		
100 FPM	0001	00	03	-	FLA	69.1	10.4		
125 FPM	0001	00	03	-	FLA	82.9	10.4		

NOTES:

NOTES

1. SELECT THE CORRECT TROLLEY SPEED.
2. CHANGE EACH PARAMETER (COLUMN) TO THE VALUE IN THE SELECTED ROW
3. *-* ON TABLE INDICATES NO PROGRAMMING NEEDED (DEFAULT IS DESIRED)
4. FLA: ENTER COMBINED FULL LOAD AMPS OF BOTH MOTORS.

REFERENCES

WARNING:

WARNING:
THIS EQUIPMENT MUST BE EFFECTIVELY GROUNDED
ACCORDING TO APPLICABLE CODES.

AVERTISSEMENT:

AVERTISSEMENT:
CET EQUIPMENT DOIT ETRE MIS A LA TERRE EN
ACCORDANCE AVEC LES NORMES EN VIGUEUR.

BR - BRAKE RELAY
 SA - SURGE ABSORBER
 C - CONNECTOR
 TR - TERMINAL BOARD

ACCORDANCE AVEC LES NORMES EN VIGUEUR.

SYMBOL DESIGNATIONS

SYMBOL DESIGNATIONS

COBR - DYNAMIC BRAKING RESISTOR
CTAS - MOTOR TEMPERATURE ACTIVATED SWITCH
LSR - TROLLEY TRAVEL LIMIT SWITCH RIGHT

LSR - TROLLEY TRAVEL LIMIT SWITCH RIGHT
LSL - TROLLEY TRAVEL LIMIT SWITCH LEFT
BR - BRAKE RELAY

BR - BRAKE RELAY
SA - SURGE ABSORBER
C - CONNECTOR
TR - TERMINAL BOARD

NOTE:
TRAVEL LIMIT SWITCHES (TILS) ARE OPTIONAL
IF TILS IS PROVIDED REMOVE JUMPERS
40 TO 40A AND 41 TO 41A SHOWN

* NOTE:

TRAVEL LIMIT SWITCHES (TTLs) ARE ON IF TTL IS PROVIDED REMOVE JUMPER 40 TO 40M AND 41 TO 41A SHOWN

TO THE HONORABLE

SYMBOL DESIGN

GROUND

CTAS - MOT 1.00 TOTAL

of EN
LSL - TROL
LSL - TROLBR - BRAKE
CA - CLUTCH

C - CONNECT

TB - TERMINAL

FIRST USED ON: PH12-3 FROM: 454501

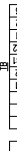
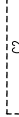
TROLLEY MOTION:

ELECTROMOTIVE G+SERIES 4 PROGRAMMINGELECTROMOTIVE G+SERIES 4 PROGRAMMING

NOTES:



NOTE ALTERNATE WIRING



NOTE:

SYMBOL DESIGNATIONS

1

FIRST USED ON: PH12-3 FROM: 45451201

PARTS LIST

The parts lists and illustrations in this section of the manual cover parts for models of YALE "LodeKing LT" Electric hoists. A typical hoist is shown as the basis for the exploded parts illustrations; therefore, certain variations may occur from the information given. For this reason, always correspond with:

1. Hoist Model Number from identification plate.
2. Serial number of the hoist stamped below identification plate.
3. Catalog Number
4. Voltage, phase, hertz from the identification plate.
5. Hoist Capacity
6. Length of lift.
7. Part number of part from parts list.
8. Number of parts required.
9. Part name from parts list.
10. Hoist Serial Number.

Certain parts of your hoist will, in time, require replacement under normal wear conditions. Other items such as gaskets, fasteners, insulators, etc., may be damaged or lost during disassembly. It is suggested that these parts be purchased for your hoist as spares for future use. These parts are listed at the end of this manual.

The numbers assigned to parts of our various assemblies in our Parts List are the part numbers used in manufacturing. Some of these itemized parts are not for individual sale, but must be grouped with other related replacement items.

NOTICE

WHEN ORDERING PARTS OR INFORMATION ON THIS EQUIPMENT, ALWAYS INCLUDE MODEL AND SERIAL NUMBER ON ORDER.

WARNING

Using "Commercial" or other manufacturer's parts to repair LodeKing Hoists may cause load loss.

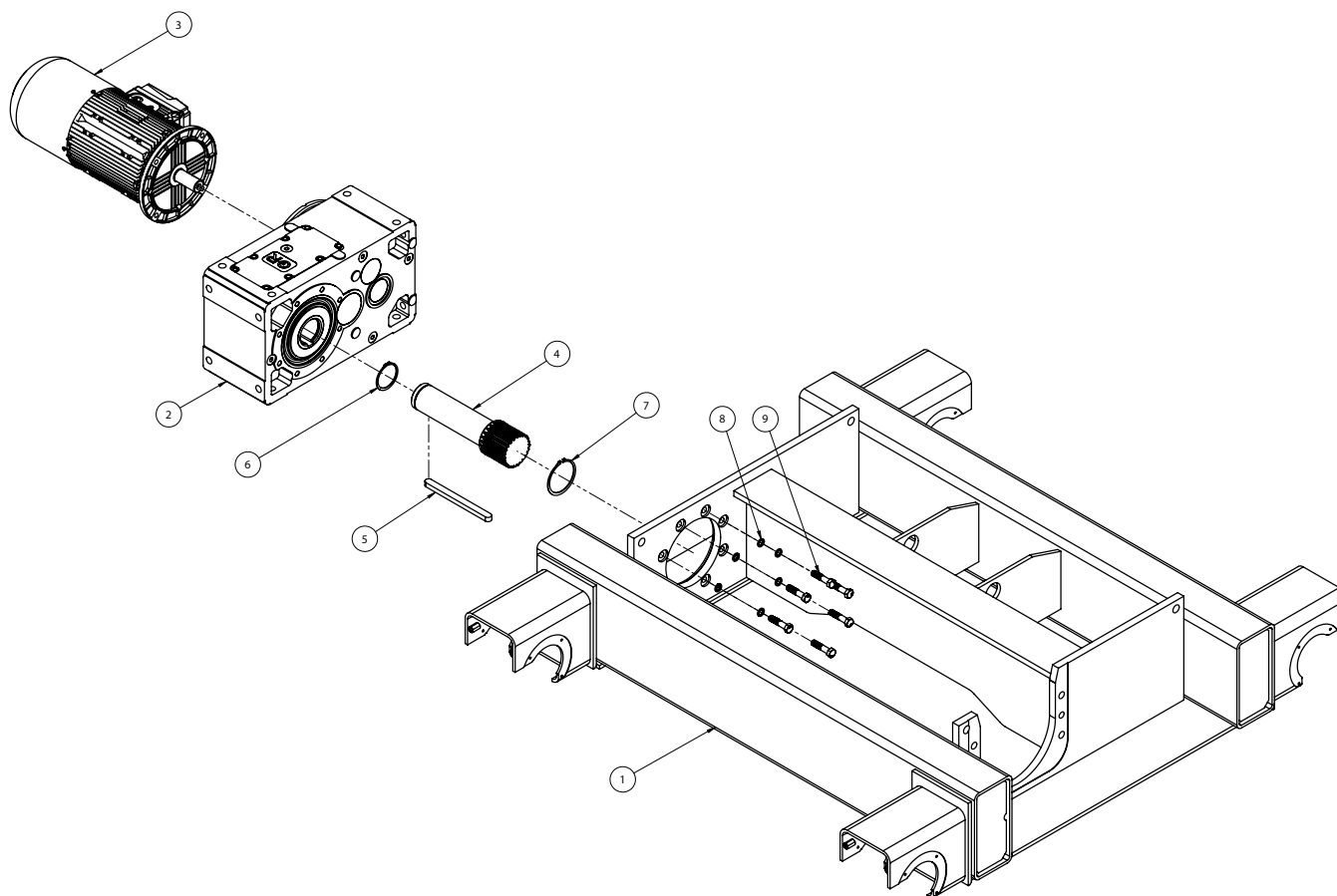
TO AVOID INJURY:

Use only YALE Hoist supplied parts. Parts may look alike but YALE Hoist parts are made of specific materials or processed to achieve specific properties.

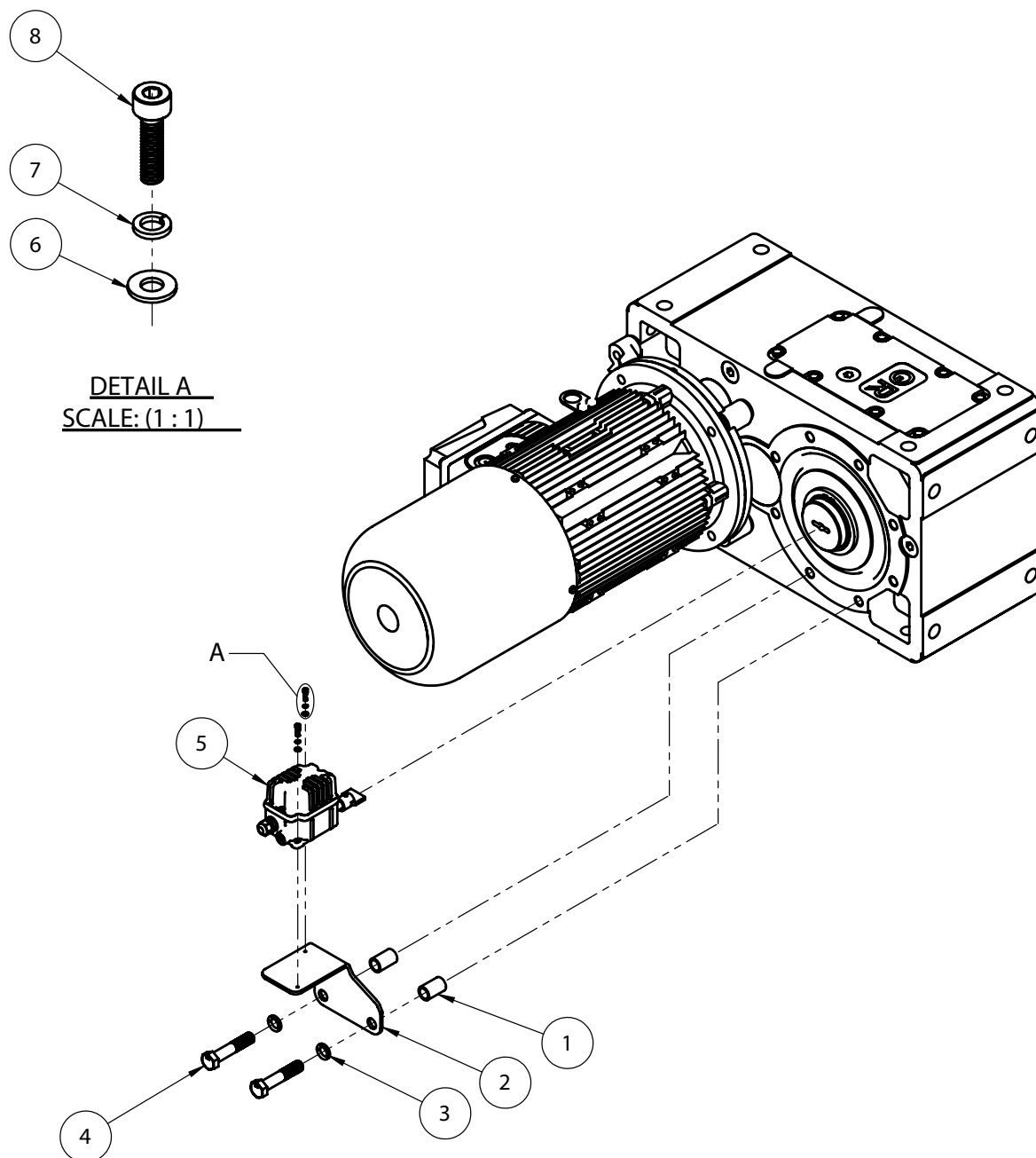


LIST OF PART ILLUSTRATIONS

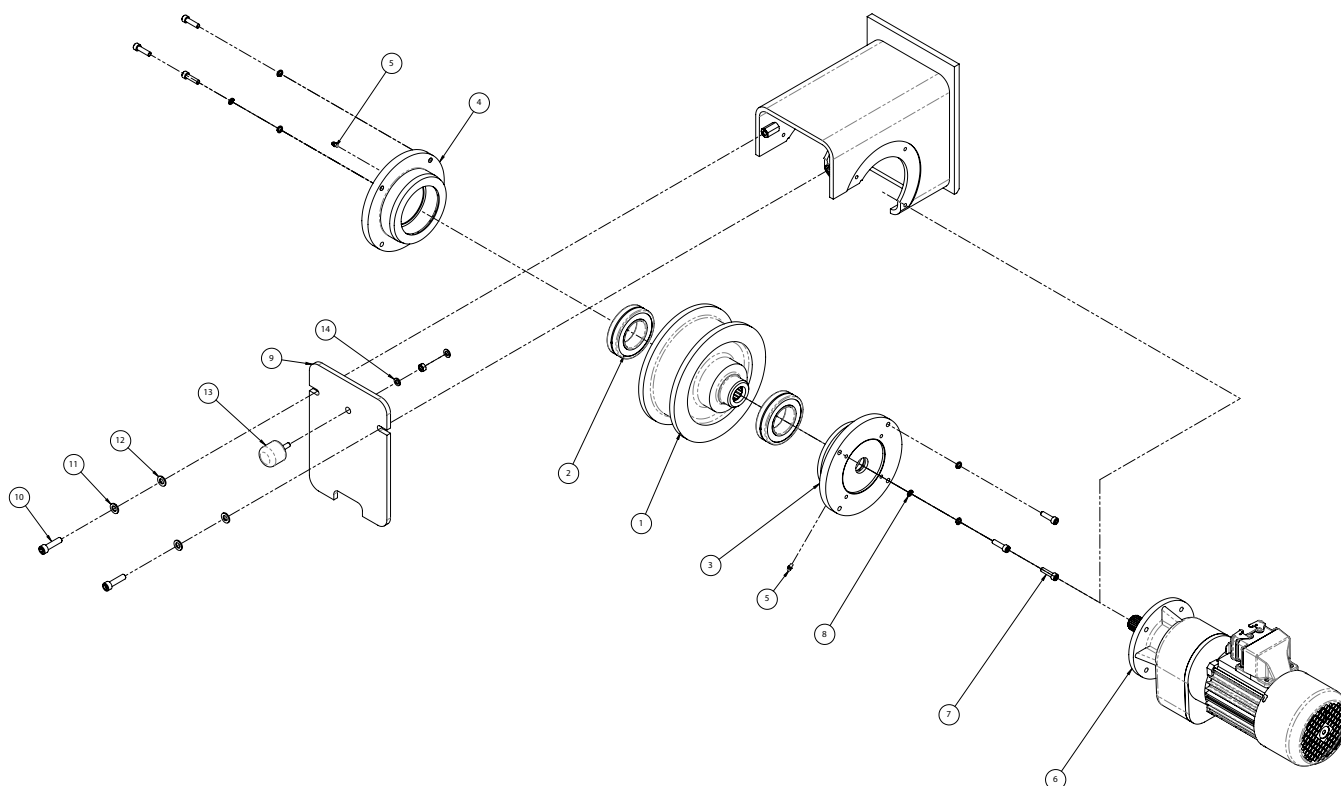
TITLE	FIGURE NO.	PAGE NO.
GEARBOX MOUNTING ASSEMBLY	7	37
RCLS GROUP ASSEMBLY	8	38
WHEEL BLOCK ASSEMBLY	9	39
10T UPPER REEVING ASSEMBLY	10	40
15T UPPER REEVING ASSEMBLY	11	41
20T & 25T UPPER REEVING ASSEMBLY	12	42
DRUM & BEARING SUPPORT ASSEMBLY	13	43
UPLS GROUP ASSEMBLY	14	44
10T LOWER BLOCK ASSEMBLY	15	45
15T LOWER BLOCK ASSEMBLY	16	46
20T/25T LOWER BLOCK ASSEMBLY	17	47
SHEAVE COMPARISON	18	48
DECKMOUNT	19	49

GEARBOX MOUNTING ASSEMBLY

FIGURE 7

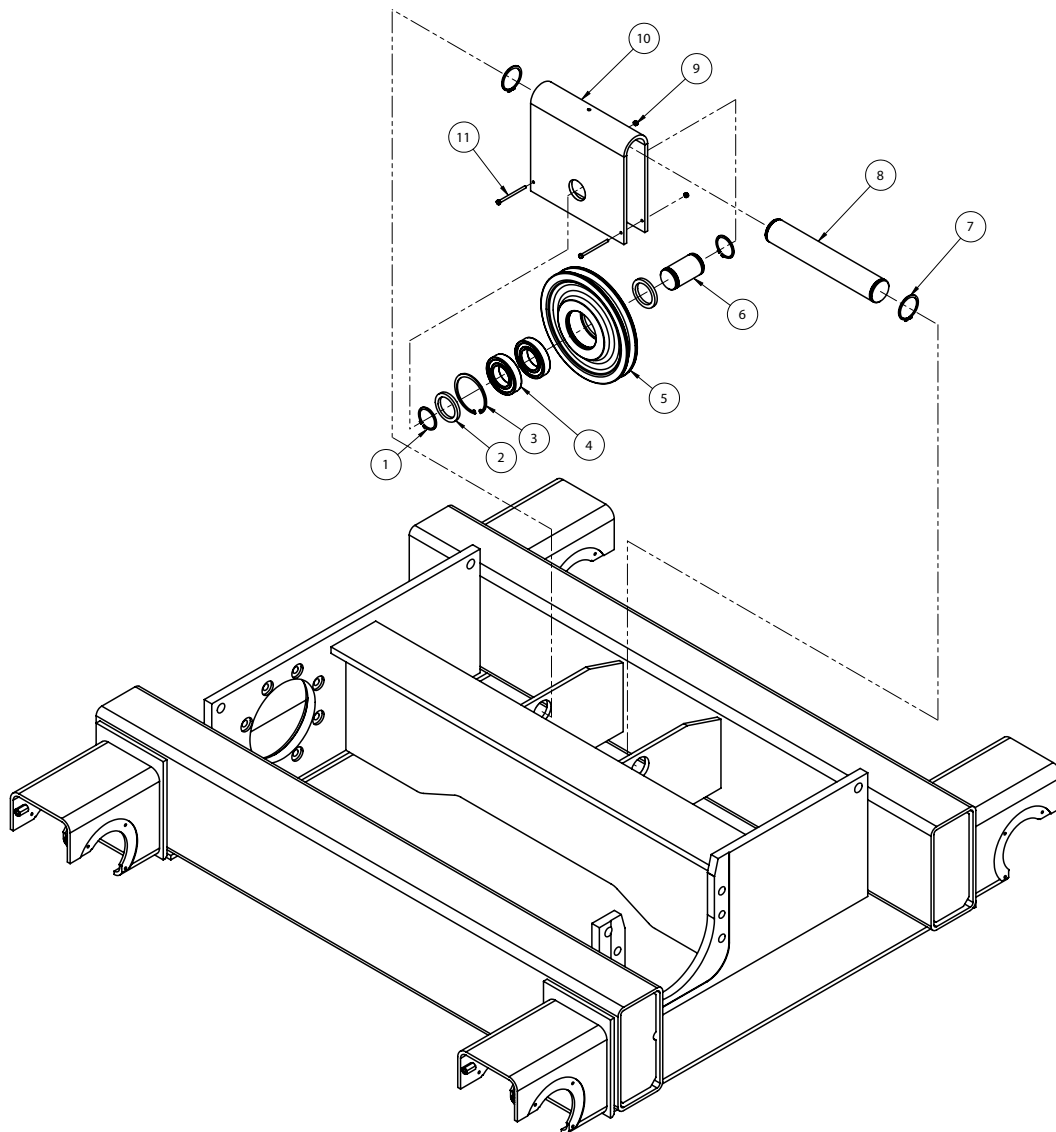
Item Number	Description	Quantity	Part Number			
			10T	15T	20T	25T
1	Trolley Frame Assembly	1	455122XX	455176XX	455169XX	455155X
2	Gearbox	1	454963XX			
3	Motor	1	454964XX			
4	Drive Shaft, Splined	1	23601901	23623301	23604801	
5	Key, Drive Shaft	1	23569202		23569201	
6	Outer Retaining Ring	1	10119449			11858101
7	Inner Retaining Ring	1	11852826			
8	M16 Lockwasher	8	11852804			
9	M16 Hex Head Bolt	8	C11852850		C11852851	

RCLS GROUP ASSEMBLY

FIGURE 8

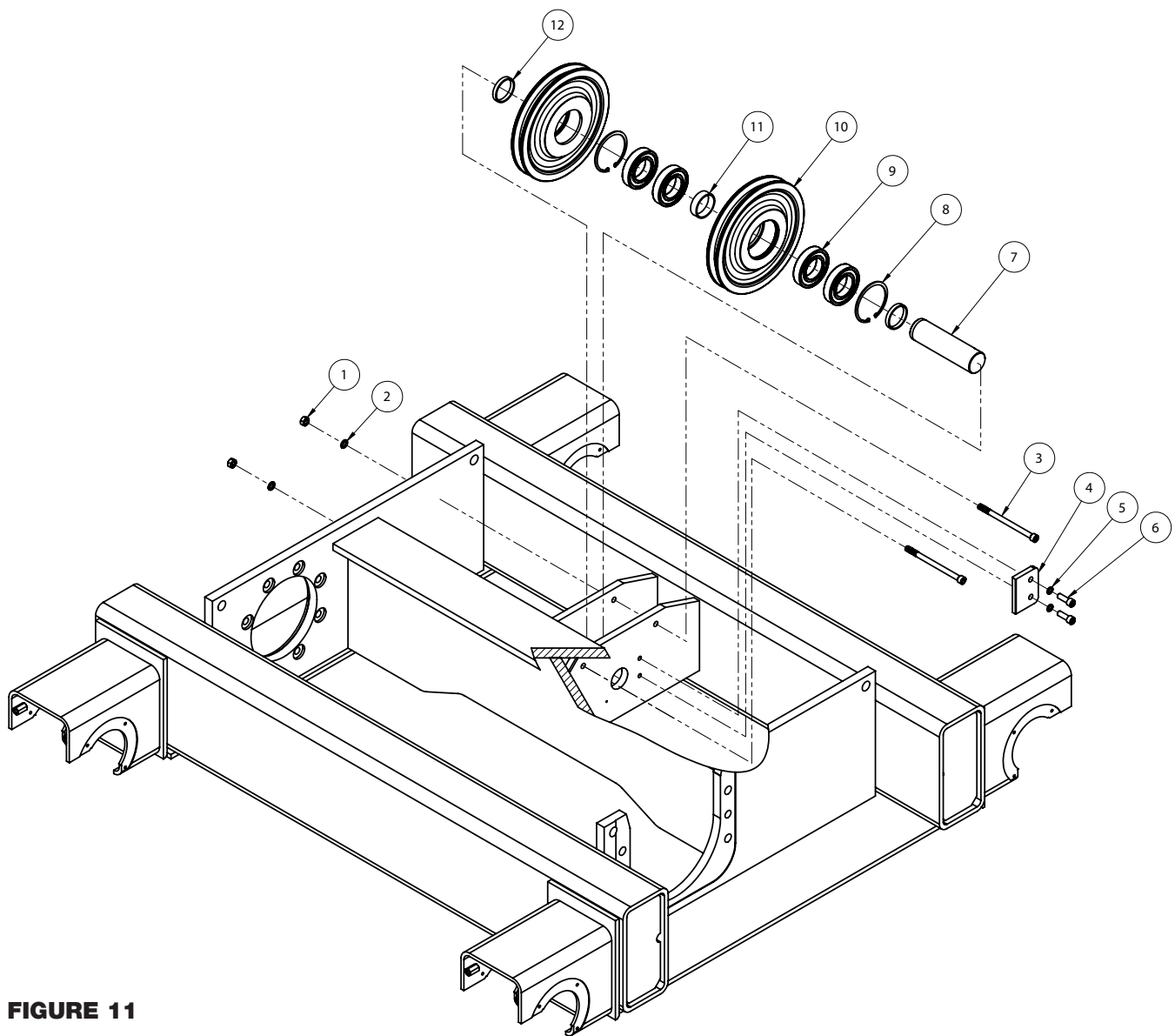
Item Number	Description	Quantity	Part Number			
			10T	15T	20T	25T
1	RCLS Spacers	2	11859101			
2	RCLS Mounting Plate	1	23623601			23621201
3	RCLS Bracket Bolt Lock Washer	2	11852804			
4	RCLS Bracketed Mounting Bolt	2	11852839			
5	RCLS with Drive Coupling	1	236217XX			
6	RCLS Flat Washer	2	11852828			
7	RCLS Lock Washers	2	11852829			
8	RCLS Mounting Bolt	2	11852827			

WHEEL BLOCK ASSEMBLY

FIGURE 9

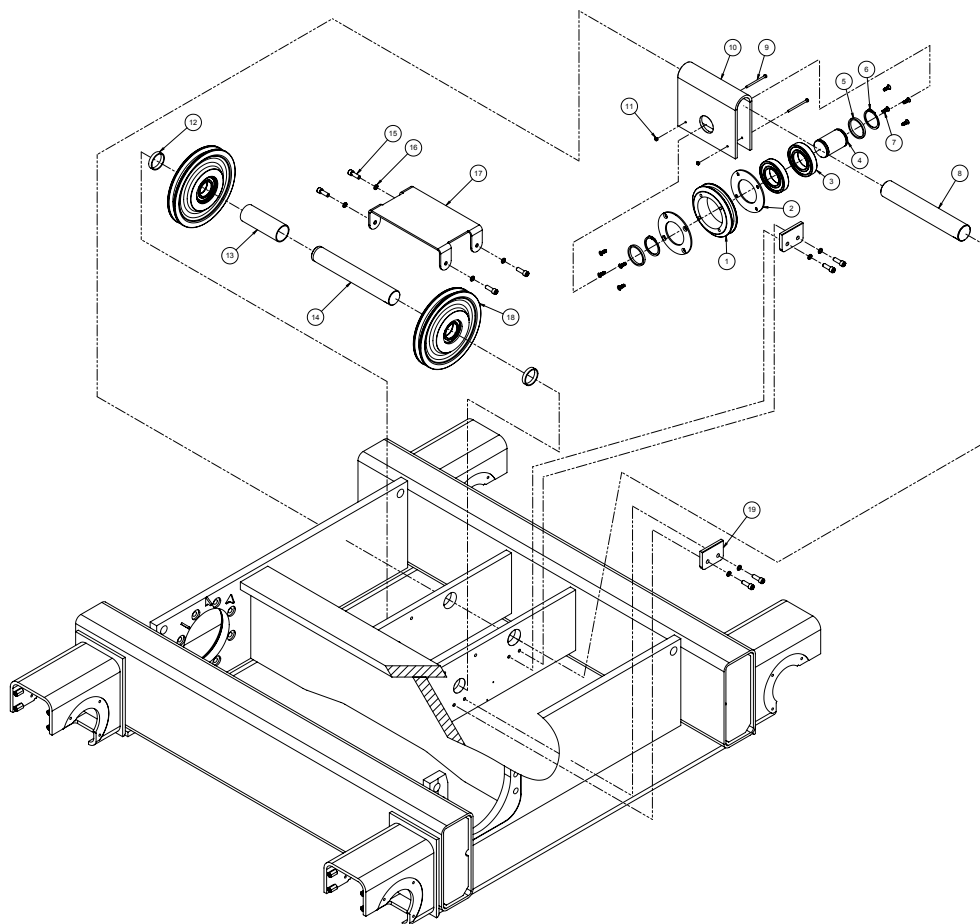
			Part Number			
Item Number	Description	Quantitiy	10T	15T	20T	25T
1	Wheel, Driver or Trailer	4	234877XX		234878XX	
2	Bearing	8	10380106			
3	Bearing Cap, Open	2	23488101		23488201	
4	Bearing Cap, Closed	6	23488102		23488202	
5	Grease Zerk	12	N06099			
6	Trolley Gear Motor	2	453191XX		451520XX	
7	Bearing Cap SHCS	24	11802728		11802729	
8	Bearing Cap Lockwasher	24	11803202		11803203	
9	Rail Sweep	4	23488901		23601301	
10	Rail Sweep SHCS	8 for 10T and 15T 16 for 20T and 25T	11802729			
11	Rail Sweep Lockwasher	8 for 10T and 15T 16 for 20T and 25T	11803203			
12	Rail Sweep Flatwasher	8 for 10T and 15T 16 for 20T and 25T	11803101			
13	Bumper	4	11680704		11680703	
14	Bumper Flat Washer	4	11803102		11803101	

10T UPPER REEVING ASSEMBLY

FIGURE 10

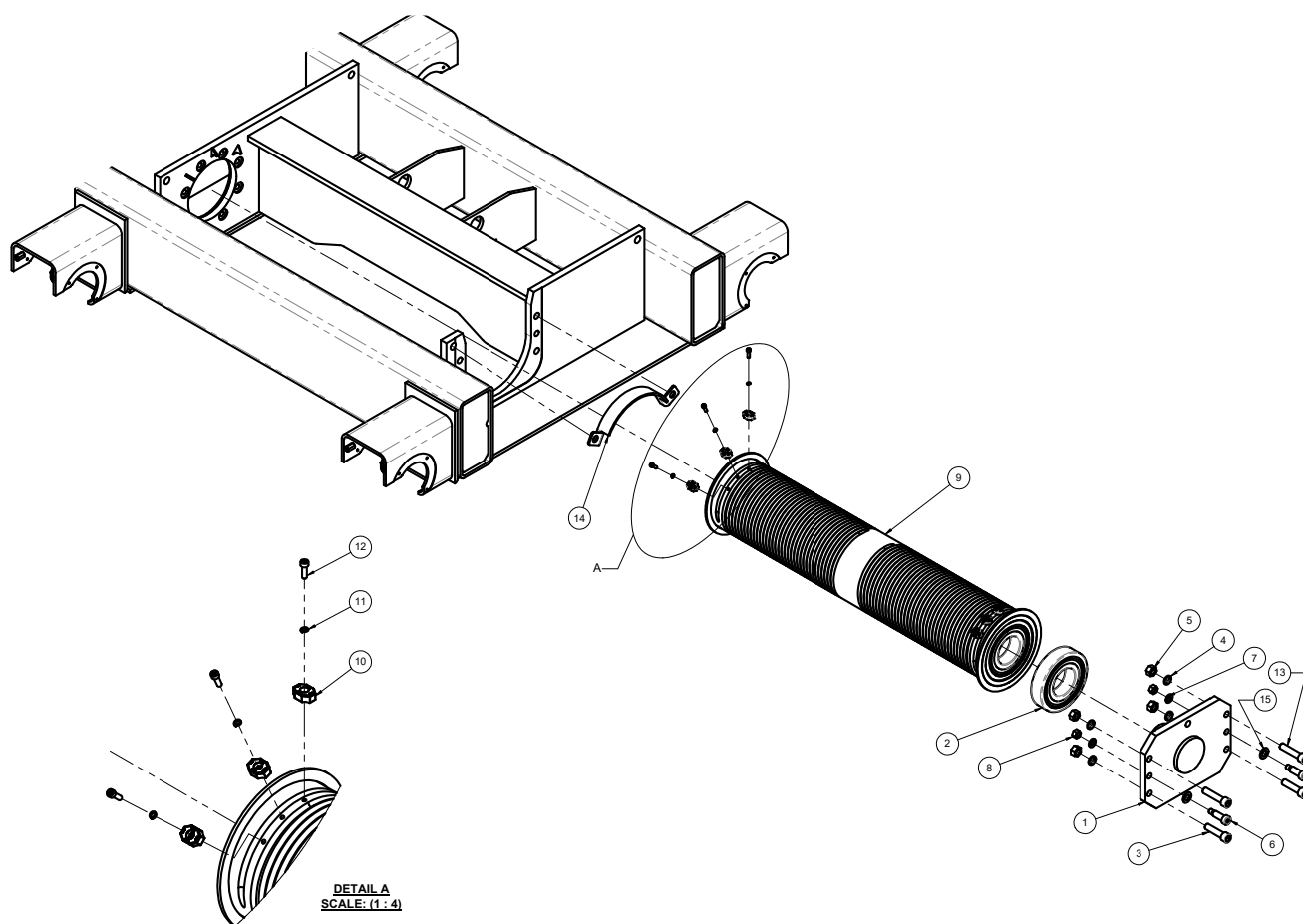
Item Number	Description	Quantity	Part Number
1	External Retaining Ring	2	10119421
2	Washer, Inner Spacer	2	11802001
3	Internal Retaining Ring	1	10008303
4	Ball Bearing	2	10377703
5	Sheave, 12mm	1	33291501
6	Sheave Pin	1	23386901
7	External Retaining Ring	2	10119419
8	Yoke Pin	1	23387001
9	Hex Head Lock Nut	2	11803001
10	Upper Block Yoke	1	33291601
11	Hex Head Bolt	2	11802507

15T UPPER REEVING ASSEMBLY

FIGURE 11

Item Number	Description	Quantity	Part Number
1	Hex Head Nut	2	11802906
2	Lock Washer	2	11803401
3	SHCS, M12	2	11852836
4	Staking Plate	1	1139401
5	Lock Washer	2	11852809
6	SHCS	2	11852808
7	Sheave Pin	1	23619602
8	Internal Retaining Ring	1	10008303
9	Ball Bearing	2	10377703
10	Sheave, 12mm	1	33291501
11	Sheave Spacer	1	23577403
12	Sheave Spacer	2	23577401

20/25T UPPER REEVING ASSEMBLY

FIGURE 12

Item Number	Description	Quantity	Part Number	
1	Equalizer Sheave	1	23621001	
2	Sheave Plate	2	23637401	
3	Ball Bearing	2	10377714	
4	Equalizer Pin	1	33370901	
5	Sheave Spacer	2	23637601	
6	External Retaining Ring	2	11852844	
7	Sheave Plate Flathead Bolts	8	11852843	
8	Equalizer Yoke Pin	1	23619501	
9	Hex Head Bolt	2	11802507	
10	Upper Block Yoke	1	33355901	
11	Hex Head Lock Nut	2	11803001	
12	Sheave Spacer, Outer	2	23577405	23637601
13	Sheave Spacer, Inner	1	23577407	23637603
14	Sheave Pin	2	23619501	33370701
15	SHCS	8	11852808	
16	Hi Collar Lock Washer	8	11852809	
17	Sheave Cover	1	23601402	
18	Running Sheave (see page 48 for Sheave Breakdown)	2	33292101	33356101
19	Staking Plate	2	11839401	

DRUM & BEARING SUPPORT ASSEMBLY

FIGURE 13

Item Number	Description	Quantity	Part Number			
			10T	15T	20T	25T
1	BEARING SUPPORT FLANGE	1	23604901		23632001	
2	DRUM BEARING	1		23607901		
3	M20 SHCS	2	11852801		11852822	
4	M20 LOCKWASHER	4		11852807		
5	M20 HEX NUT	4		11852805		
6	M20 SHOULDER BOLT	2	11852802		11852833	
7	M16 FLAT WASHER	2		11803104		
8	M16 HEX NUT	2		11852806		
9	DRUM ASSEMBLY	1		236047XX		236194XX
10	ROPE CLAMP	6		23380301		23631401
11	LOCK WASHER	6		11803202		11803204
12	SHCS	6		11802705		11802713
13	M20 SHCS	2	11852822		11852833	
14	OUTBOARD ROPEGUARD	1		33370201		
15	M20 Flat Washer	2			18803502	

UPLS GROUP ASSEMBLY

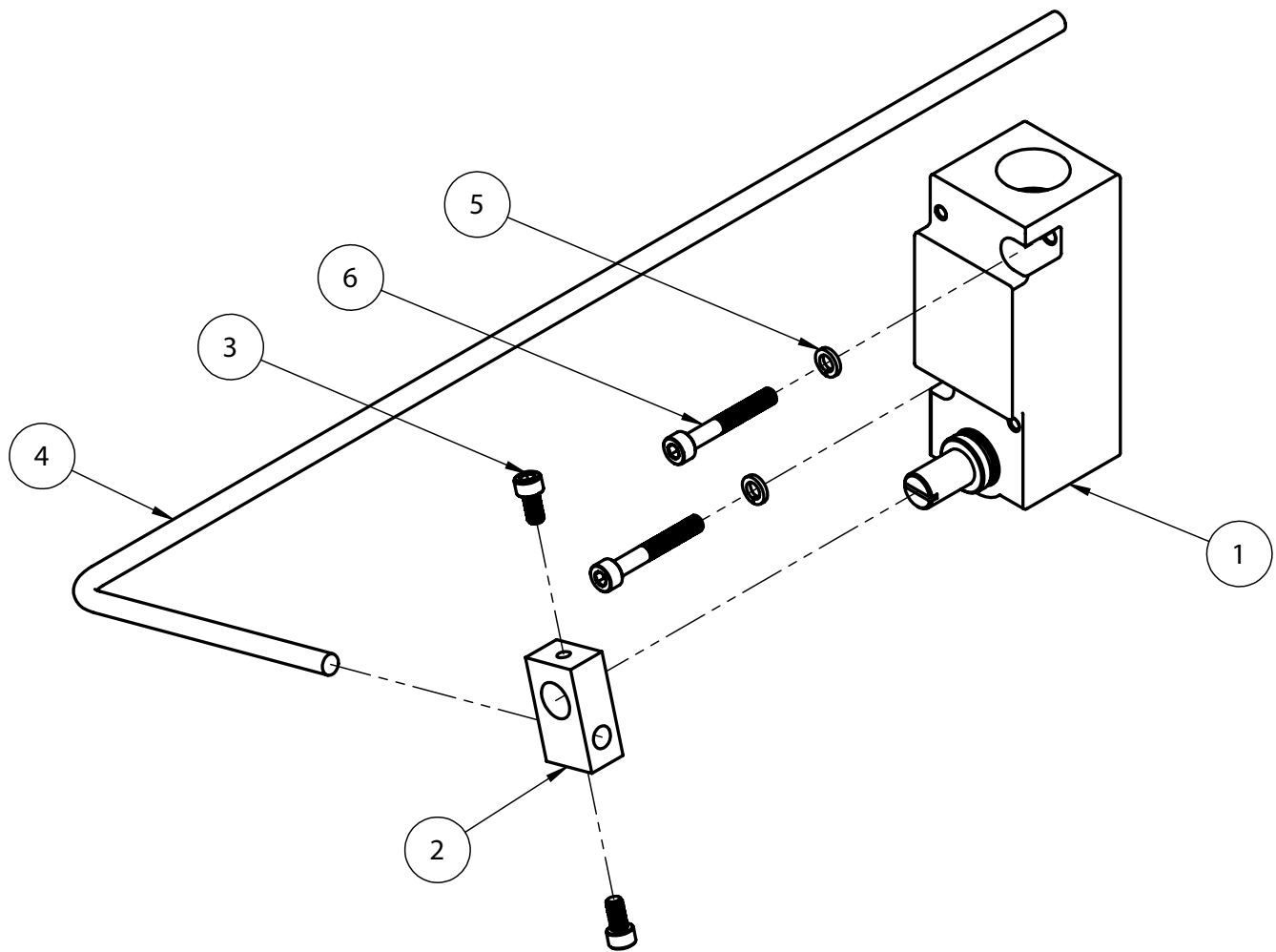
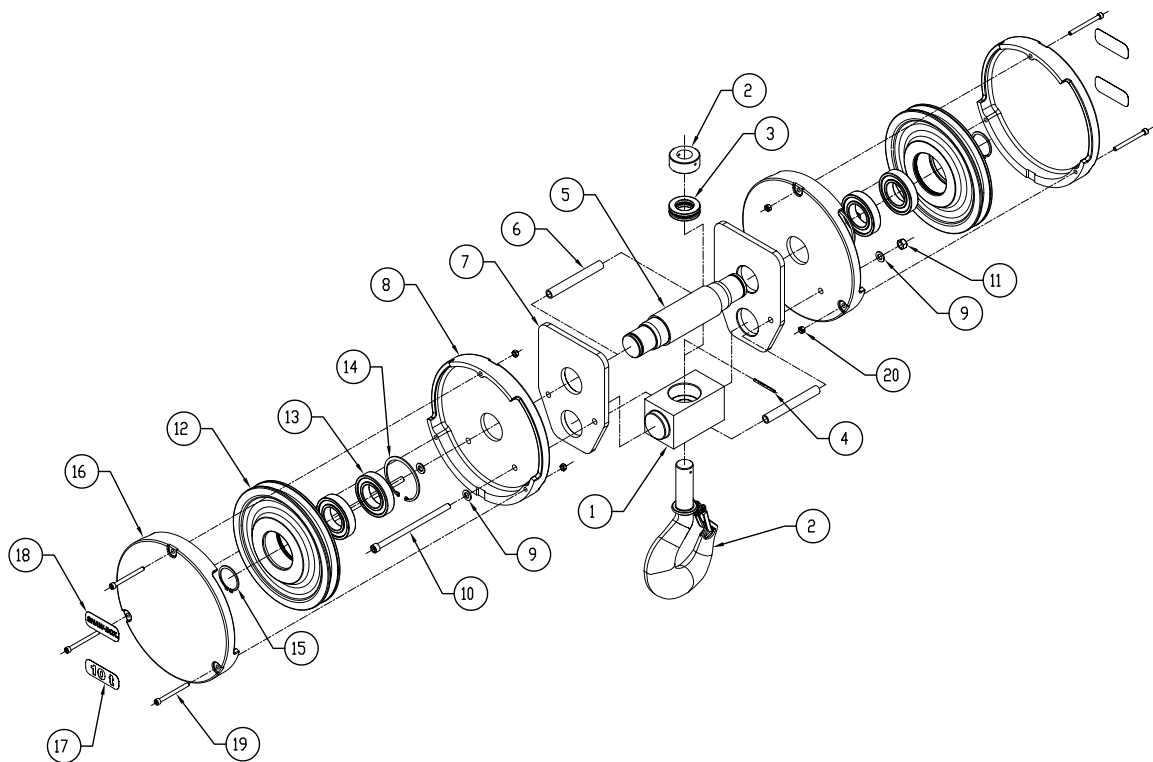
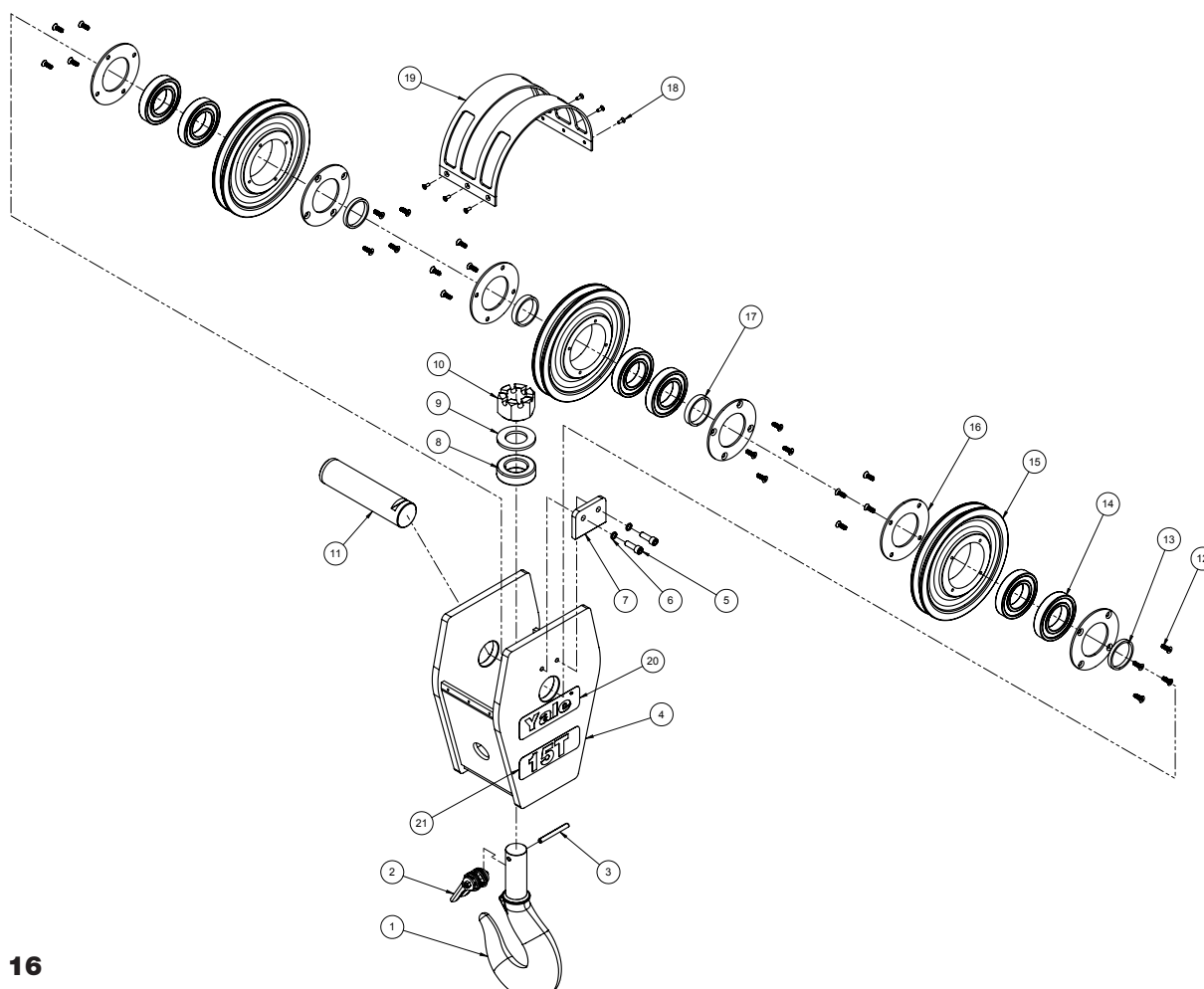


FIGURE 14

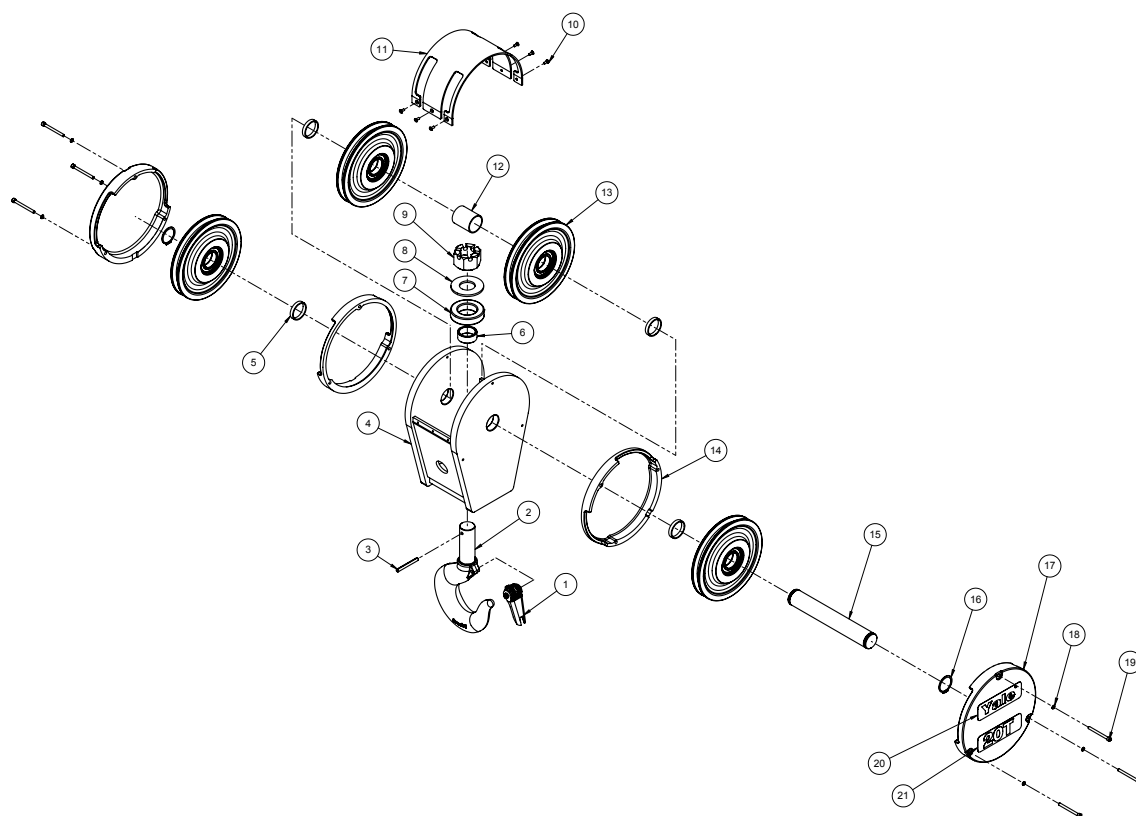
			Part Number			
Item Number	Description	Quantity	10T	15T	20T	25T
1	Limit Switch	1	11697002			
2	Limit Switch Hub	1	23336501			
3	10-32 SHCS	2	10264647			
4	Limit Switch Rod	1	23600501	23600502	23615502	
5	M5 Lock Washer	2	11852835			
6	M5 SHCS	2	11852834			

10T LOWER BLOCK ASSEMBLY

FIGURE 15

Item Number	Description	Quantity	Part Number
1	Trunion Crosshead	1	23389301
2	Hook and Nut Assembly	1	23389201
3	Thrust Bearing	1	10380430
4	Roll Pin	1	10171691
5	Sheave Pin	1	23389401
6	Spacer Tube	2	11802201
7	Lower Block Strap	2	11802101
8	Inner Sheave Cover	2	33291802
9	Flat Washer, M12	4	11803103
10	Socket Head Cap Screw, M12	2	11802710
11	Locknut, M12	2	11803003
12	Rope Sheave	2	33291501
13	Ball Bearing	4	10377703
14	Internal Retaining Ring	2	10008303
15	External Retaining Ring	2	10119421
16	Outer Sheave Cover	2	33291812
17	Capacity Label	2	23391542
18	Yale Label	2	23382802
19	Socket Head Cap Screw, M8	6	11802709
20	Locknut, M8	6	11803002

15T LOWER BLOCK ASSEMBLY

FIGURE 16

Item Number	Description	Quantity	Part Number
1	Hook	1	23615401
2	Latch Kit	1	23556301
3	Roll Pin	1	10171654
4	Lower Block Weldment	1	33356301
5	SHCS	2	11852808
6	Lock Washer	2	11852809
7	Staking Plate	1	11839401
8	Thrust Bearing	1	23554300
9	Thrust Washer	1	23554100
10	Hook Nut	1	23554401
11	Sheave Pin	1	23622501
12	Sheave Plate Flathead Bolts	24	11852843
13	Outer Sheave Spacer	2	23637601
14	Sheave Bearing	6	10377714
15	Running Sheave	3	33370401
16	Sheave Plate	6	23637401
17	Inner Sheave Spacer	2	23637605
18	Cover Bolts	6	11852816
19	Block Colver	1	23622801
20	Yale Logo Tag	2	23391502
21	Capacity Tag	2	23391555

20/25T LOWER BLOCK ASSEMBLY

FIGURE 17

Item Number	Description	Quantity	Part Number	
			20T	25T
1	Hook Latch Kit	1	23556301	23556302
2	Hook	1	23622601	23619901
3	Roll Pin	1	10171654	
4	Lower Block Weldment	1	33356401	33356501
5	Outer Sheave Spacer	4	23577402	23637601
6	Shank Spacer	1	23554201	Not Used
7	Thrust Bearing	1	23554301	
8	Thrust Washer	1	23554101	23554102
9	Hook Nut	1	23554401	23554402
10	Cover Bolts	6	11852816	
11	Block Top Cover	1	23622901	
12	Inner Sheave Spacer	1	23577406	23637602
13	Running Sheave (see page 48 for Sheave Breakdown)	4	33292101	33356101
14	Inner Block Cover	4	33292101	33356101
15	Sheave Pin	1	23623001	23623002
16	External Retaining Ring	2	10119421	11852844
17	Outer Block Cover	2	33291812	
18	Lockwasher	6	11852815	
19	Socket Head Cap Screw	6	11852814	
20	Logo Tag	2	23391502	
21	Capacity Tag	2	23391560	23391565

SHEAVE COMPARISON

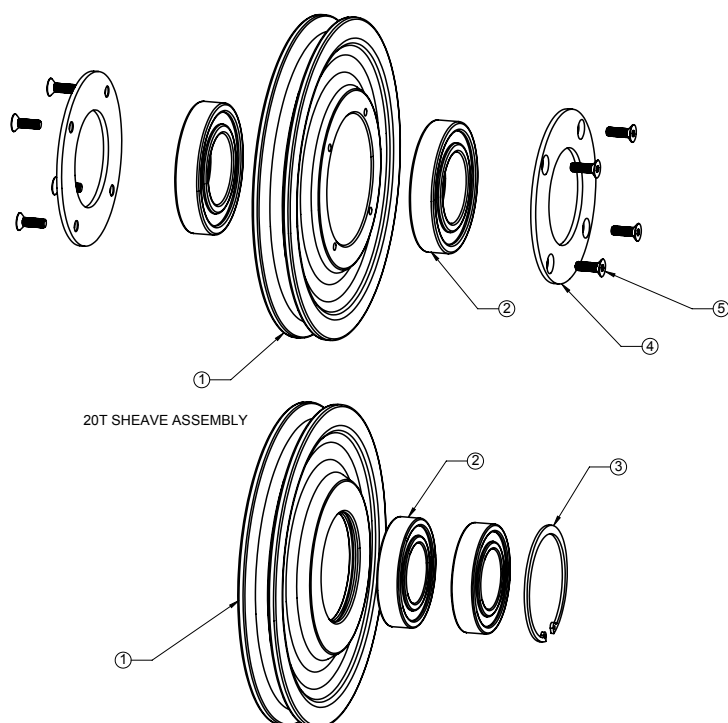
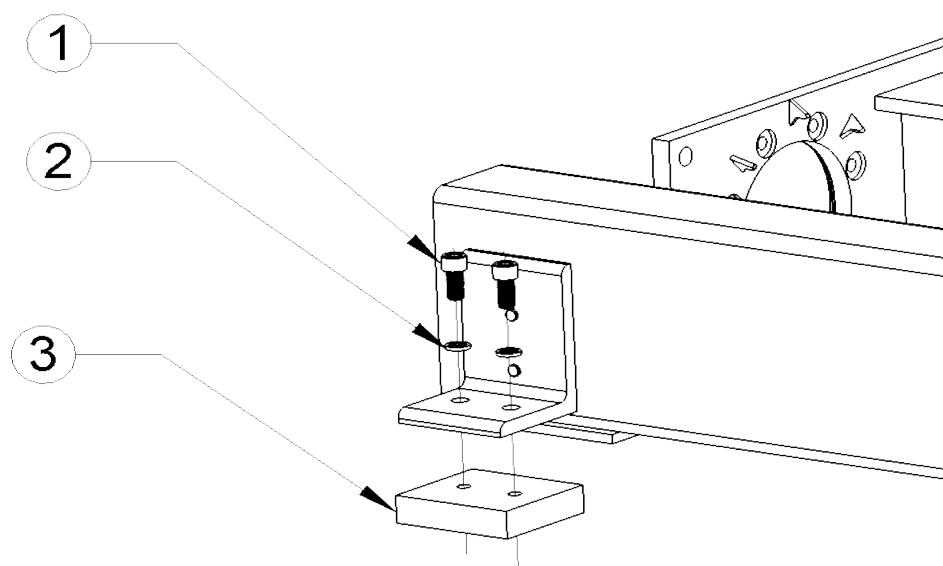


FIGURE 18

Item Number	Description	Quantity	Part Number	
			20T (33292101 Assembly)	25T (33356101 Assembly)
1	Sheave Blank	1	33291501	23619701
2	Bearing	2	10377703	10377714
3	Internal Retaining Ring	1	10008303	N/A
4	Sheave Plate	2	N/A	23637401
5	Sheave Plate Flathead Bolts	8	N/A	11852843

DECK MOUNT EXPLODED VIEW

FIGURE 19

Item Number	Description	Quantity	Part Number			
			10T	15T	20T	25T
1	SHCS, M20 X 2.5, 40MM Long	8	C11865901			
2	M20 Lock Washer, HI Collar	8	11852807			
3	Shear Block	4	C23658401			

NOTES



RECOMMENDED SPARE PARTS FOR YOUR YALE CRANE

Certain parts of your crane will, in time, require replacement under normal wear conditions. It is suggested that the following parts be purchased for your crane as spares for future use.

- Hook
- Latch Kit
- Hook Nut
- Bottom Block Sheave
- Bottom Block Sheave Bearing
- Wire Rope Assembly
- Driver Wheel
- Trailer Wheel
- Wheel Bearing

Note: When ordering parts always furnish the part number and the manufacturer's serial number.

WARRANTY

LIMITATION OF WARRANTIES, REMEDIES AND DAMAGES

INDEMNIFICATION AND SAFE OPERATION

Buyer shall comply with and require its employees to comply with directions set forth in instructions and manuals furnished by Seller and shall use and require its employees to follow such instructions and manuals and to use reasonable care in the use and maintenance of the goods. Buyer shall not remove or permit anyone to remove any warning or instruction signs on the goods. In the event of personal injury or damage to property or business arising from the use of the goods, Buyer shall within 48 hours thereafter give Seller written notice of such injury or damage. Buyer shall cooperate with Seller in investigating any such injury or damage and in the defense of any claims arising therefrom.

If Buyer fails to comply with this section or if any injury or damage is caused, in whole or in part, by Buyer's failure to comply with applicable federal or state safety requirements, Buyer shall indemnify and hold Seller harmless against any claims, loss or expense for injury or damage arising from the use of the goods.

CMCO Warranty (HOISTS)

- a. Columbus McKinnon Corporation ("Seller") warrants to the original end user ("Buyer") that, for a period of one (1) year from the date of Seller's delivery of the goods (collectively, the "Goods") to the carrier, the Goods will be free from defects in workmanship and materials.
- b. IN THE EVENT OF ANY BREACH OF SUCH WARRANTY, SELLER'S SOLE OBLIGATION SHALL BE EXCLUSIVELY LIMITED TO, AT THE OPTION OF SELLER, REPAIR OR REPLACEMENT, F.O.B. SELLER'S POINT OF SHIPMENT, OF ANY GOODS THAT SELLER DETERMINES TO HAVE BEEN DEFECTIVE OR, IF SELLER DETERMINES THAT SUCH REPAIR OR REPLACEMENT IS NOT FEASIBLE, TO A REFUND OF THE PURCHASE PRICE UPON RETURN OF THE GOODS TO SELLER. NO CLAIM AGAINST SELLER FOR ANY BREACH OF (i) SUCH WARRANTY WITH RESPECT TO THE ELECTRICAL COMPONENTS OF ANY GOOD SHALL BE VALID OR ENFORCEABLE UNLESS BUYER'S WRITTEN NOTICE THEREOF IS RECEIVED BY SELLER WITHIN ONE (1) YEAR FROM THE DATE OF SELLER'S DELIVERY TO THE CARRIER AND (ii) SUCH WARRANTY WITH RESPECT TO THE MECHANICAL COMPONENTS OF ANY GOOD SHALL BE VALID OR ENFORCEABLE UNLESS BUYER'S WRITTEN NOTICE THEREOF IS RECEIVED BY SELLER WITHIN ONE (1) YEAR FROM THE DATE THE DATE ANY ALLEGED CLAIM ACCRUES. EXCEPT FOR THE WARRANTY SET FORTH ABOVE, SELLER MAKES NO OTHER WARRANTIES WITH RESPECT TO THE GOODS, WHETHER EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, QUALITY AND/OR THOSE ARISING BY STATUTE OR OTHERWISE BY LAW OR FROM ANY COURSE OF DEALING OR USE OF TRADE, ALL OF WHICH ARE HEREBY EXPRESSLY DISCLAIMED.

- c. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER OR ANY THIRD PARTY WITH RESPECT TO ANY GOOD, WHETHER IN CONTRACT, TORT OR OTHER THEORY OF LAW, FOR LOSS OF PROFITS OR LOSS OF USE, OR FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, DIRECT OR INDIRECT DAMAGES, HOWSOEVER CAUSED. SELLER'S MAXIMUM LIABILITY TO BUYER WITH RESPECT TO THE GOODS SHALL IN NO EVENT EXCEED THE PRICE PAID BY BUYER FOR THE GOODS THAT ARE THE SUBJECT OF THE APPLICABLE CLAIM.
- d. Seller shall not be liable for any damage, injury or loss arising out of the use of the Goods if, prior to such damage, injury or loss, such Goods are: (1) damaged or misused following Seller's delivery to the carrier; (2) not maintained, inspected, or used in compliance with applicable law and Seller's written instructions and recommendations; or (3) installed, repaired, altered or modified without compliance with such laws, instructions or recommendations.
- e. This warranty is limited and provided only to the original end user. Each Good must be registered within sixty (60) days of receipt of each product to establish eligibility. Please register at <https://www.columbusmckinnon.com/en-us/warranty-registration/> or submit registration card via US mail.
- f. Any action against Seller for breach of warranty, negligence or otherwise must be commenced by Buyer within one (1) year after: (a) the date any alleged claim accrues; or (b) the date of delivery of the Goods to Buyer, whichever is earlier.

WARNING

Alterations or modifications of equipment and use of non-factory repair parts can lead to dangerous operation and injury.

TO AVOID INJURY:

- Do not alter or modify equipment.
- Do use only factory replacement parts.

LodeKing LT High Capacity Electric Wire Rope Hoists, 10 to 25 Tons
Operating and Maintenance Manual

Phone 800.888.0985 • 716.689.5400 • www.columbusmckinnon.com



COLUMBUS McKINNON FAMILY OF BRANDS

