



INSTALLATION AND MAINTENANCE MANUAL LM CHAIN HOIST

LOADMATE® LM10

English

STD-R-KHA-F-CQD-ENG



R&M Materials Handling, Inc. | 4501 Gateway Boulevard, Springfield, Ohio 45502 | PH: 1-937-525-5100 | FAX: 1-937-325-5319

This document and the information contained herein, is the exclusive property of R&M Materials Handling, Inc., and represents a non-public, confidential and proprietary trade secret that may not be reproduced, disclosed to third parties, altered or otherwise employed in any manner whatsoever without the express written consent of R&M Materials Handling, Inc. Copyright © (2010) R&M Materials Handling, Inc. All rights reserved.

THIS PAGE INTENTIONALLY LEFT BLANK

HOOSIER CRANE
SERVICE COMPANY





CAUTION: Read the instructions supplied with the product before installation and commissioning.



CAUTION: Keep the instructions in a safe place for future reference.

Table of contents

1	INTRODUCTION	5
1.1	Contact Information	5
1.2	Warranty	5
1.3	Disclaimer	5
1.4	Safety	6
1.5	Placards and Instructions	8
2	INSTALLATION	9
2.1	General	9
2.2	Lubrication	9
2.3	Mounting	10
2.4	Load Hook Throat Opening	10
2.5	Electrical Connection	11
2.6	Three Phase Power Connections	12
3	INITIAL START-UP	13
3.1	General	13
3.2	Correcting the Direction of Hook Travel	13
3.3	Operational Checks – No Load	14
3.4	Operational Checks – With Load	14
4	HOIST OPERATION	15
5	LOW HEADROOM TROLLEY	16
5.1	Description – Technical Characteristics (low headroom trolley)	16
5.1.1	Technical Characteristics	16
5.1.2	Environmental Data	17
5.1.3	Optional equipment	17
6	SWIVEL TROLLEY	18
6.1	Description – Technical Characteristics (swiveling trolley to 3.2 tons)	18
6.1.1	Technical Characteristics	18
6.2	Installation of Swivel Trolley	19
6.3	Electric Swivel Trolley	20
6.3.1	Swiveling trolley (3.2 tons)	21
6.3.2	Swiveling trolley (3.2 to 5.0 tons) (NOT LOCALLY AVAILABLE)	21
6.3.3	Procedure to adjust swivel trolley guide rollers	22
7	MAINTENANCE	23
7.1	Basic Hoist Construction	23
7.2	Motor / Body	23
7.3	Hoist Motor Brake and Load-Limiting Device	24
7.4	Slip Clutch Adjustment	24
7.4.1	Slip Clutch Adjustment after Installation	25
7.4.2	Hoist Motor Brake Adjustment	26
7.4.3	Replacement Criteria for Motor Brakes	27
7.5	Load Chain	28
7.5.1	General	28
7.5.2	Maintenance Inspection	28
7.5.3	Load Chain Specifications (see <i>Figure 13</i>)	30
7.5.4	Removing the Load Chain	30
7.5.5	Installing the Load Chain	31

7.6	Fall Stop Assembly	33
7.6.1	General	33
7.6.2	Removing fall stop (<i>Figure 16</i>).....	33
7.6.3	Fall Stop Installation (<i>Figure 16</i>).....	33
7.7	Chain Container	34
7.7.1	Removing Chain Container (<i>Figure 17</i>).....	34
7.7.2	Installing Chain Container (<i>Figure 17</i>).....	34
7.8	Vinyl Chain Bag (optional)	35
7.8.1	Installing Vinyl Chain Bag (<i>Figure 18</i>)	35
7.9	Limit Switches	36
7.9.1	Upper and Lower Travel Safety Limit Switch.....	36
7.9.2	Upper and Lower Rotary Travel Limit Switch (Optional Only on 3-Phase units).....	37
7.10	Hooks	38
7.10.1	General	38
7.10.2	Hook Inspection	39
7.10.3	Top Hook	40
7.11	Control Changes and Fuses	41
7.12	Single-Speed Solo Hoist – 208 Volt Wiring Diagram	43
7.13	Single-Speed Solo Hoist – 230 Volt Wiring Diagram	44
7.14	Single-speed Solo Hoist – 460 Volt Wiring Diagram	45
7.15	Two-Speed Solo Hoist - 208 Volt Wiring Diagram.....	46
7.16	Two-Speed Solo Hoist - 230 Volt Wiring Diagram.....	47
7.17	Two-Speed Solo Hoist - 460 Volt Wiring Diagram.....	48
7.18	Two-Speed Solo Hoist – 575 Volt Wiring Diagram.....	49
7.19	Single-Speed Hoist – Modular Crane – 208 Volt Diagram	50
7.20	Single-Speed Hoist – Modular Crane – 230 Volt Diagram	51
7.21	Single-Speed Hoist – Modular Crane – 460 Volt Diagram	52
7.22	Two-Speed Hoist – Modular Crane – 208 Volt Diagram	53
7.23	Two-Speed Hoist – Modular Crane – 230 Volt Diagram	54
7.24	Two-Speed Hoist – Modular Crane – 460 Volt Diagram	55
7.25	Two-Speed Hoist – Modular Crane – 575 Volt Diagram	56
7.26	Wiring Diagram – 3 Button – Push Button.....	57
7.27	Wiring Diagram – 5 Button – Push Button.....	58
7.28	Wiring Diagram – 7 Button – Push Button.....	59
8	PREVENTATIVE MAINTENANCE	60
8.1	Maintenance and Inspection Table.....	60
8.2	Lubrication	61
8.3	Recommended technical support for various spare parts	62
8.4	Screw Tightening Torque (lb-ft) Specifications	62
8.5	Troubleshooting	63
9	PARTS ILLUSTRATION.....	64
9.1	Hoist Body.....	64
9.2	Gear Mechanism With Motor Brake	66
9.3	Lifting Assembly.....	68
9.4	Controls.....	70
9.5	Upper and Lower Limit Switch	72
9.6	Double Brake Mechanism.....	73
9.7	Low Headroom Trolley.....	74
9.7.1	Low Headroom Trolley (Drive Components)	74
9.7.2	Low Headroom Trolley (Suspension Components).....	76
9.8	Electric trolley (Swiveling trolley 0 to 3.2 Tons (3200 Kg))	78
9.9	Push Button Assembly – Horizontal Pairs of Buttons.....	80
9.10	Push Button Assembly – Horizontal Pairs of Buttons.....	81
9.11	Push Button Assembly – Vertical Pairs of Buttons (Option)	82
9.12	Push Button Assembly – Vertical Buttons (Option)	84

1 INTRODUCTION

1.1 Contact Information

Please do not hesitate to use the following contact information in the event that you may need assistance:

R&M MATERIALS HANDLING, INC.

4501 Gateway Boulevard

Springfield, OH 45502

General Telephone: 937 - 328-5100

Toll Free Telephone (US): 800 - 955-9967

General Fax: 937 - 325-5319

Parts Department Fax (US): 800 - 955-5162

Parts Dept. Fax (other): 937 - 328-5162

Website: www.rmhoist.com

1.2 Warranty

All sales are subject to the [R&M Materials Handling, Inc.](#) Standard Terms and Conditions of Sale (Revision 101707), a copy of which is available at www.rmhoist.com or upon request from [R&M Materials Handling, Inc.](#) customer service/sales representatives and the terms of which are incorporated as if fully rewritten herein.

1.3 Disclaimer

This Manual has been prepared by **R&M MATERIALS HANDLING, INC.** to provide information and suggestions for hoist installation, maintenance, and inspection personnel. This manual should be used in conjunction with the **LoadMate® Electric Chain Hoist Operator's Manual** to teach safe operating practices to all personnel associated with hoist operations and maintenance.

It is **NOT** intended that the recommendations in this manual take precedence over existing plant safety rules and regulations or OSHA regulations. However, a thorough study of the following information should provide a better understanding of proper installation, maintenance, and inspection procedures that are to be followed in order to afford a greater margin of safety for people and machinery in the area of hoist operations.

It must be recognized that this is a manual of recommendations for the Hoist Installation, Maintenance, and Inspection personnel and its use is permissive not mandatory. It is the responsibility of the hoist owner to make personnel aware of all federal, state, and local codes and regulations. The owner is responsible for providing instruction and insuring that certain installation, maintenance, and inspection personnel are properly trained.

1.4 Safety

Read and understand this manual before using the hoist.

Important issues to remember during installation, operation, maintenance, and inspection are provided at the hoist control stations, at various locations on the hoist, in this manual, and in the [LoadMate® Electric Chain Hoist Operator's Manual](#). These issues are indicated by **DANGER**, **WARNING**, or **CAUTION** instructions or placards that alert personnel to potential hazards, proper operation, load limitations, and more.



DANGER: Indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.



WARNING: Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.



CAUTION: Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Taking precedence over any specific rule, however, is the most important rule of all:

“USE COMMON SENSE”

It is a responsibility of the hoist owner / user to establish programs to:

1. Train and designate hoist operators, and
2. Train and designate hoist inspectors / maintenance personnel.

The words **SHALL** and **SHOULD** are used throughout this manual in accordance with definitions in the ASME B30 standards as follows:

SHALL indicates a rule is mandatory and must be followed.

SHOULD indicates a rule is a recommendation, the advisability of which depends on the facts in each situation.

Hoist operation, hoist inspection, and hoist maintenance personnel training programs should be based on requirements in accordance with the latest edition of:

- **ASME B30.16 Safety Standard for Overhead Hoists (Underhung)**

Such training should also provide information for compliance with any Federal, State, or Local Code requirements, and existing plant safety rules and regulations.

If an overhead hoist is installed as part of an overhead crane or monorail system, training programs should also include requirements in accordance with the latest editions, as applicable, of:

- **ASME B30.2 Safety Standard for Overhead and Gantry Cranes, Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist**
- **ASME B30.11 Safety Standard for Monorails and Underhung Cranes**
- **ASME B30.17 Safety Standard for Overhead and Gantry Cranes, Top Running Bridge, Single Girder, Underhung Hoist.**



NOTICE:

It is a responsibility of the owner / user to install, inspect, test, maintain, and operate a hoist in accordance with the ASME B30.16 Safety Standard, OSHA Regulations, and ANSI / NFPA 70, National Electric Code. If the hoist is installed as part of a total lifting system, it is also the responsibility of the owner / user to comply with the applicable ASME B30 volume that addresses other types of equipment used in the system.



Further, it is the responsibility of the owner / user to require that all personnel who will install, inspect, test, maintain, and operate a hoist read the contents of this manual, [LoadMate® Electric Chain Hoist Operator's Manual](#), ASME B30.16 Safety Standards for Overhead Hoists (Underhung), OSHA Regulations, and ANSI / NFPA 70, National Electric Code. If the hoist is installed as part of a total lifting system, all personnel must also read the applicable ASME B30 volume that addresses other types of equipment used in the system.



DANGER: Failure to read and comply with any one of the limitations noted in this manual can result in product failure, serious bodily injury or death, and / or property damage.

R&M MATERIALS HANDLING, INC. has no direct involvement or control over the hoist's operation and application. Conforming to good safety practices is the responsibility of the owner, the user, and its operating personnel.

Only those Authorized and Qualified Personnel who have shown that they have read and have understood this manual and the [LoadMate® Electric Chain Hoist Operator's Manual](#) should be permitted to operate the hoist.

The owner / user **SHALL** insure that all Operators read and understand the [LoadMate® Electric Chain Hoist Operator's Manual](#) prior to operating the hoist.

1.5 Placards and Instructions

READ and OBEY all Danger, Warning, Caution, and Operating Instructions on the hoist and in this manual and [LoadMate® Electric Chain Hoist Operator's Manual](#). Make sure that all placards are in place and legible.

Failure to comply with safety precautions in this manual and on the hoist is a safety violation that may result in serious injury, death, or property damage.

2 INSTALLATION



DANGER: Before installing, removing, inspection, or performing any maintenance on a hoist, the main switch shall be de-energized. Lock and tag the main switch in the de-energized position in accordance with ANSI Z244.1. Follow other maintenance procedures outlined in this manual and ASME B30.16.

2.1 General

Prior to installation, the unit shall be checked thoroughly for damage during shipment or handling at the job site.

Each complete electric chain hoist is load tested at the factory at 125% of the nameplate-rated capacity.

All hoists are designed for the type of mounting specified by the purchaser. The adequacy of the supporting members (monorail beams, cranes, hangers, supports, framing, etc.) is the responsibility of user / owner and shall be determined or verified by qualified personnel.

Read the instructions contained in this manual and the [LoadMate® Electric Chain Hoist Operator's Manual](#) as well as any other related manuals. Observe the warning tags attached to the unit before the installation is started.

2.2 Lubrication

The hoist gear case comes completely pre-lubricated with grease.

Note: Open trolley wheel gearing has not been greased at the factory. See the trolley manual for proper gear lubricant to use before installing hoist.

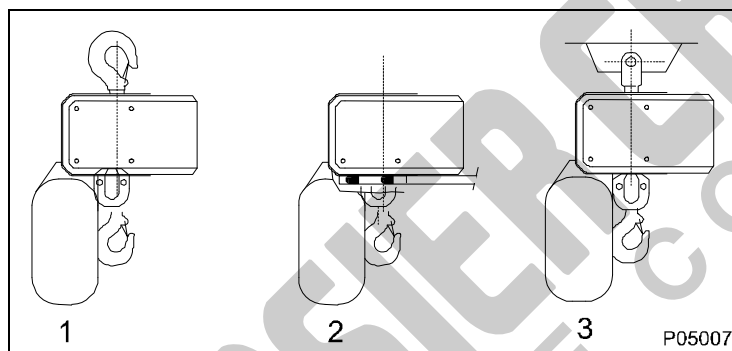
The load chain requires lubrication prior to first use. Chain lubricant is included with shipment of each new chain hoist.

2.3 Mounting

Below are three types of mounting:

1. Hook Mounted
2. Base Mounted
3. Coupling Mounted
4. Trolley Mounted – NOT SHOWN – is accomplished via a Hook or Trolley Coupling to the Trolley Assembly.

Figure 1. Mounting Types



For all trolley-mounted hoists, refer to appropriate trolley manual for trolley installation instructions.

After a trolley-mounted hoist has been assembled to a beam, check for balance. Each trolley-mounted hoist is balanced at the factory for “as shipped” condition. Any auxiliary devices (radio control, lights, hose reels, etc.) furnished and mounted by “others” may require additional counterweight. Hoists must hang straight without a load or there will be a noticeable “kick” when a load is applied to hook. An unbalanced hoist / trolley may result in damage to equipment.

2.4 Load Hook Throat Opening



CAUTION: ANSI B30.16-1998 recommends that the throat opening of a load hook be measured and recorded prior to putting a hoist into service and that a gage be made to provide a quick visual inspection for a bent hook as required during routine inspections. Record this information before initial start-up. See Section 7.10 for more detailed hook information.

2.5 Electrical Connection

The user / owner must provide the main power supply hardware (cable, conductor bar, fuses, disconnect switch, etc.).



CAUTION: Make sure that the power supply voltage is the same as that shown on hoist serial plate / nameplate.



CAUTION: Make sure that fuses and other current overload devices are in place to protect the power supply.



CAUTION: Make sure that power cable or conductors have sufficient capacity to maintain the hoist supply voltage by ± 5 percent of nominal voltage under all operating conditions. Poor voltage regulation may cause motor overheating or sluggishness, and chattering / inoperative motor brake(s) and controls.



CAUTION: Do not use power supply cables with solid conductors.



WARNING: Failure to properly ground the hoist presents the danger of electric shock.

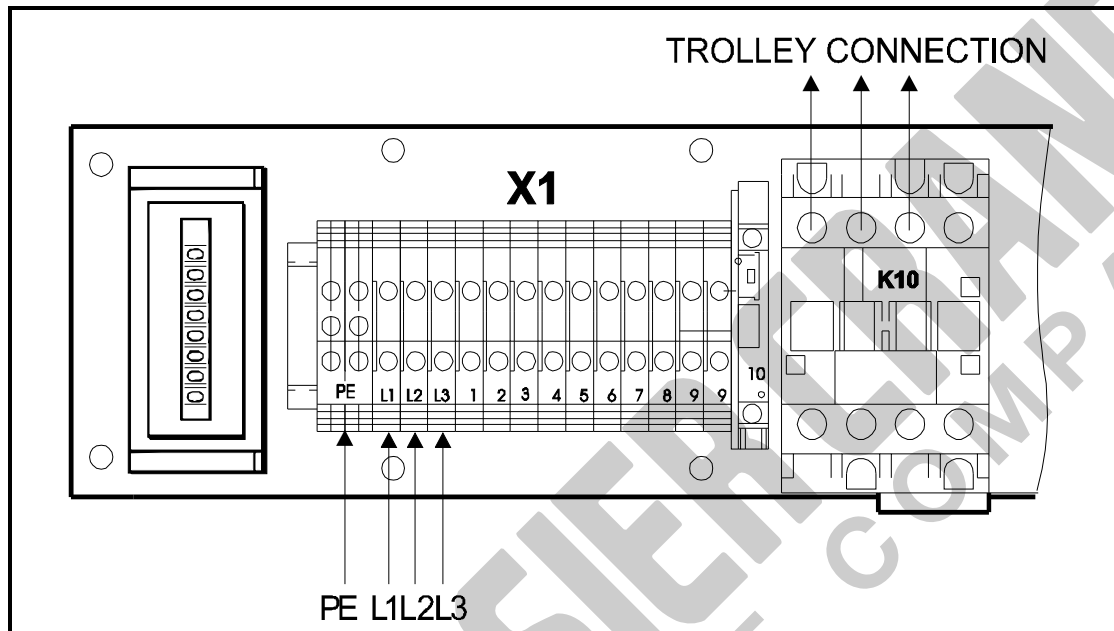


WARNING: An improper or insufficient ground connection creates an electrical shock hazard when touching any part of the hoist or trolley.



2.6 Three Phase Power Connections

Figure 2. Three Phase Control Box Power Connections



Minimum cable sections:

Power supply: AWG 16 (1.50 mm²)

Auxiliary current: AWG 18 (0.75 mm²)

Control box/hoist: AWG 18 (1.00 mm²)



3 INITIAL START-UP

**WARNING:**

Before connecting power to hoist, check all “motion” buttons on pendant control assembly to make sure that they operate freely without binding or sticking. Check pendant cable and strain relief connection to ensure that they are not damaged.

3.1 General

Initial start-up procedures are as follows:

- Read all attached **WARNING** tags and placards affixed to hoist.
- Oil load chain generously over entire length of chain.
- Make sure that load chain is not twisted. If so, untwist load chain before using.
- Make sure fall stop is placed at least 6” [150 mm] from last chain link on free end.
- Install chain container.
- If furnished, make sure that trolley wheels have proper spacing in relation to beam flange. See appropriate trolley manual for details.
- Check direction of hook travel to make certain that it corresponds to respective control button that is depressed. That is, does hook travel “UP” when **UP BUTTON** is depressed? If OK, go to section 3.3. If not, proceed to section 3.2 for correcting direction of travel.

3.2 Correcting the Direction of Hook Travel



WARNING: DO NOT change control leads in pushbutton enclosure or at motor relays. DO NOT change nameplates on pushbutton assembly. The upper/lower safety limit switch is wired in series with “UP” control circuit as furnished from factory. Changing pushbutton control leads or nameplates will prevent the upper safety travel limit switch from functioning properly.

Reversing any two power leads of a three-phase AC motor will reverse the direction of rotation.

- Reverse any two leads of a three-phase power at the main power source or at connections to motor. **Do not change internal wiring of hoist.**
- After changing two of the main power leads, recheck direction of rotation. Press “UP” button only. If hook travel goes in “UP” direction, proceed to section 3.3. If not, redo section 3.2.

3.3 Operational Checks – No Load

- Check hoist motor brake function. Run empty load block up or down to check that load block does not drift more than 1.0 inch [25mm]. If so, adjust brake as described in Section 7.3 of this manual.
- Run empty load block down to check that fall stop (located on free end of load chain) makes proper contact with upper / lower travel safety limit switch and that limit switch functions properly.
- Run empty load block up to check that load block makes proper contact with upper / lower travel safety limit switch and that limit switch functions properly.
- Run empty load block up and down several times while checking for proper tracking of load chain.

3.4 Operational Checks – With Load

- After completion of no-load operational tests, the user /owner should perform a full load test even though each complete hoist is load tested at factory.
- Lift a near capacity load about one (1) foot [30cm] above floor level. Check that the brake holds load. Also, check stopping capability of brake when lifting to a stop and lowering to a stop.
- Move trolley the full length of monorail or crane beam. Check for any binding of trolley wheels on flange and/or interference at splice joints, hanger connections / bolts, etc.
- Check contact with stops. Contact with stops **SHALL** only be made with trolley bumpers. Stops that are designed to make contact with wheels **SHALL NOT** be used.



4 HOIST OPERATION



WARNING: BEFORE PROCEEDING WITH THE NORMAL OPERATION OF THIS HOIST, THE OPERATOR/(S) SHALL BE TRAINED IN ACCORDANCE WITH THE [LoadMate® Electric Chain Hoist Operator's Manual](#) AS SUPPLIED WITH THIS HOIST.



WARNING: FAILURE TO READ AND COMPLY WITH ANY ONE OF THE LIMITATIONS NOTED IN THIS MANUAL AND THE [LoadMate® Electric Chain Hoist Operator's Manual](#) FURNISHED WITH THIS HOIST CAN RESULT IN PRODUCT FAILURE, SERIOUS BODILY INJURY OR DEATH, AND / OR PROPERTY DAMAGE.

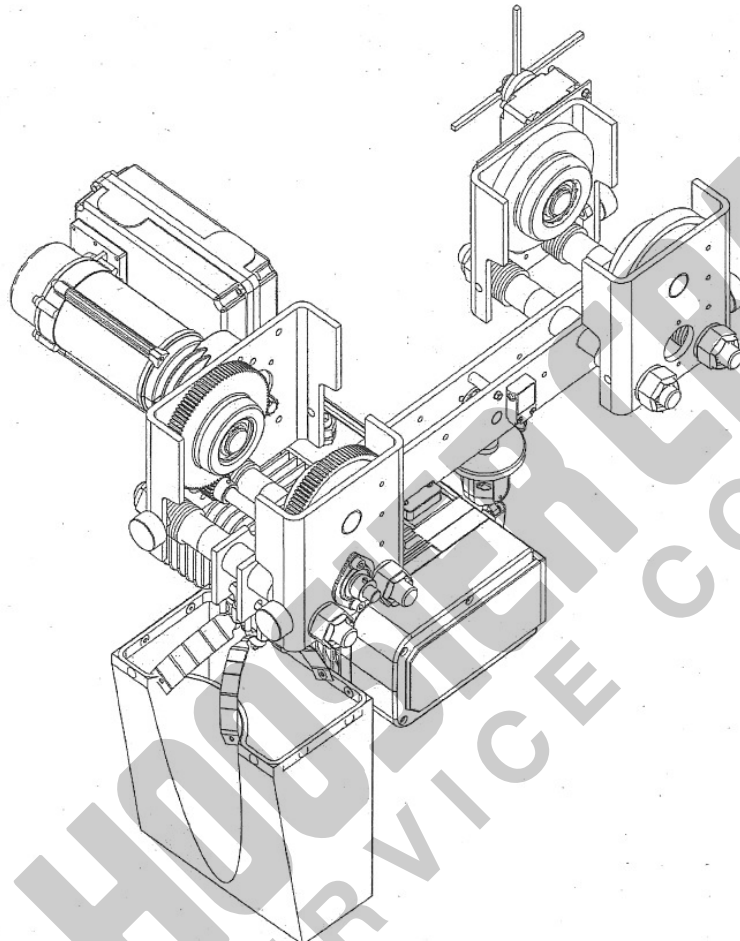


WARNING: REFER TO SECTION 1.0 OF THIS MANUAL FOR CONTACT INFORMATION IF ADDITIONAL ASSISTANCE IS NEEDED.



5 LOW HEADROOM TROLLEY

Figure 3. Low headroom trolley



5.1 Description – Technical Characteristics (low headroom trolley)



NOTE: The trolley you have just purchased must be used only with the nominal load indicated on the rating plate.



NOTE: The trolley's service life will depend upon the level of duty, the average operating time, the number of starts and the maintenance applied to it.

5.1.1 Technical Characteristics

The low headroom trolley can be used for loads from 60 kg up to 5000 kg with all our electrical chain hoists. It can be driven with an inverter drive unit or a dual or single speed unit.

5.1.2 Environmental Data

Ambient temperature:	-10°C to +40°C
Protection degree:	IP55 as standard
Sound level:	70 decibels at 1 m

5.1.3 Optional equipment

- **Limit Switch:** This cuts off the directional movement when the trolley reaches the end of its run.
- **Electric Actuation Device:** This actuates the supply line; the slide block must not exceed the rolling profile (A).
- **Brush:** This allows for earthing, due to the brush rubbing on the profile element.
- **Raceway Stops:** Not supplied: These must be fitted on the profile element, at the end of the trolley run.



6 SWIVEL TROLLEY

6.1 Description – Technical Characteristics (swiveling trolley to 3.2 tons)



NOTE: The trolley you have just purchased must be used only with the nominal load indicated on the rating plate.



NOTE: The trolley's service life will depend on the level of duty, the average operating time, the number of starts and the maintenance applied to it.

6.1.1 Technical Characteristics

	Type 1	Type 2
	30 Hz ≤1000 kg	100 Hz >1000 kg
Fem Class	H4	H4
IP	IP55	IP55
Insulation class	F	F
Duty factor	40%	40%
Operating temperature	-10 °C, +40 °C	-10 °C, +40 °C
Power supply frequency	60 Hz	60 Hz
Standard speed	20/5 m/min 80/20 fpm	20/5 m/min 80/20 fpm
Default acceleration time (Deceleration time)	2.5 s	2.5 s
Thermal protection for motor	Option	Option
Thermal protection for frequency converter	Std.	Std.
Noise level	70 db	70 db

6.2 Installation of Swivel Trolley

The service life of the trolley depends upon the way it is installed. The instructions in this manual must be followed carefully for the installation, use and maintenance of the hoist. Any use contrary to these instructions can be dangerous. Do not use hoist until this manual has been fully read and understood. Always keep this manual near the hoist, available to the operator and the person in charge of maintenance.

Make sure that the safety rules are followed (harness, clearance of work areas, posting of instructions to be followed in the area, etc.).

The Trolley can be mounted on any type of standard profile (see: setting of the flange width).



NOTE: Check the width of the runaway rail and adapt the spacing of the flanges of the trolley as indicated by the tables.

Make sure:

- That the profile is secured.
- That the profile is suitable to the loads to be supported.
- That the dimensions are compatible with the trolley that is to be installed.
- That the electrical characteristics of the mains network conform to those of the motor.

Carry out:

1 – Disassembly of the trolley:

- Remove the side plate on the counterweight side.
- Position the trolley on the beam.
- Refit the side plate.
(see: Tightening torques)

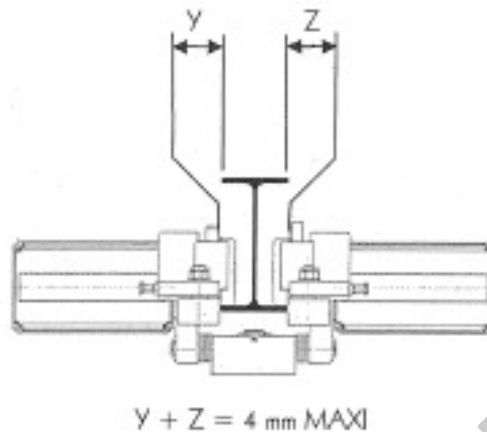
2 – Without disassembly of the trolley:

- Install the trolley on the profile, by the end.
- Fit the travel limit stops (not provided) at the end of the runway.
- Check that the nuts are correctly tightened.
(see: Tightening torques)

After these checks, perform the following test with care:

1. Drive in **one** direction with the slow speed for a few seconds.
2. Accelerate up to the high speed and keep the high speed for 5-10 seconds.
3. Follow the same procedure in the other direction.
4. If the trolley drives in the wrong direction, swap the cables (blue and white) of the motor or the wires on D1 and D2.
5. Check the function of the slow down and end limit switches.

Figure 4. Drive wheel and idler wheel/side plates



Adjust drive wheel and idler wheel/side plates as shown above.

6.3 Electric Swivel Trolley

Figure 5. Electric swivel trolley

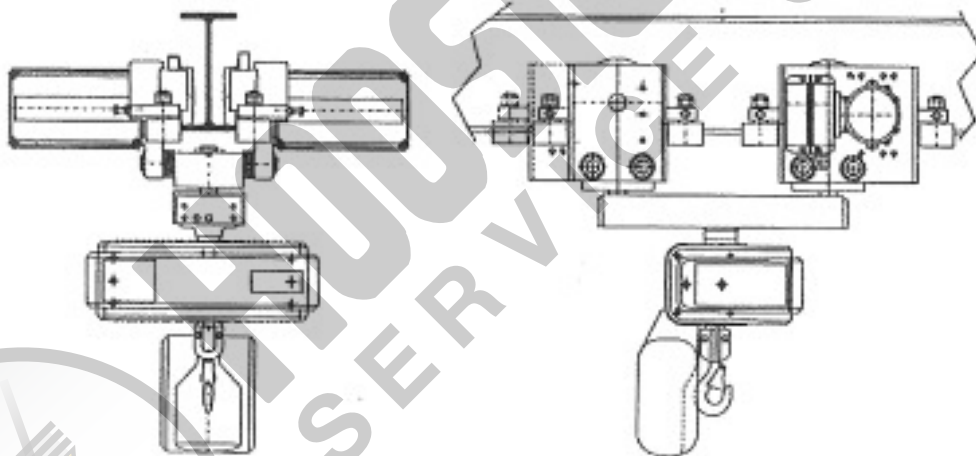
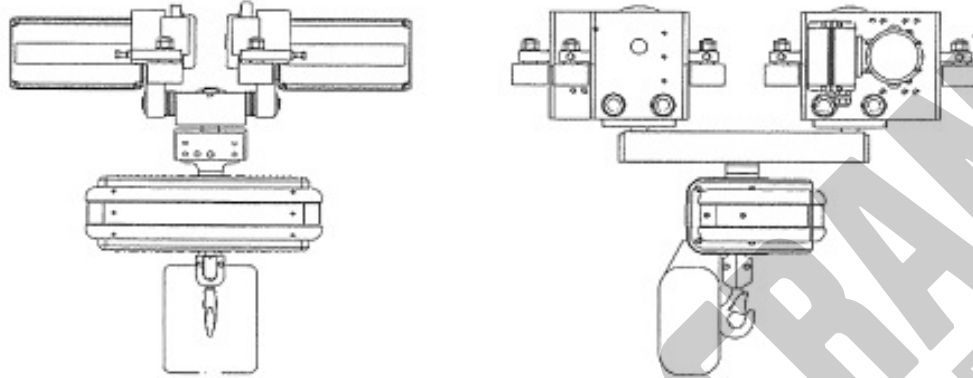


Table 1. Electric swivel trolley

HOIST TYPE	SWIVELING TROLLEY TYPE	CAPACITY	NUMBER OF WHEELS	WHEEL DIAMETER	MOTOR TYPE
C05	SWIV32	0 – 1 ton	4	100	2 x TMU 1 (35 Hz)
C10	SWIV32	0 – 2 tons	4	100	2 x TMU 2 (100 Hz)
C16-20-25	SWIV32	0 – 3.2 tons	4	100	2 x TMU 2 (100 Hz)

6.3.1 Swiveling trolley (3.2 tons)

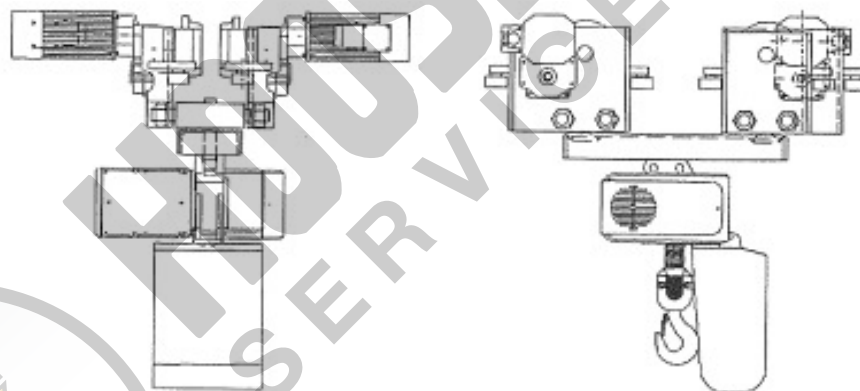
Figure 6. Swiveling trolley (3.2 tons)



- CAPACITY MAX 3.2 TONS (3200 KG)
- RAY OF CURVE MINI 2.6 FEET

6.3.2 Swiveling trolley (3.2 to 5.0 tons) (NOT LOCALLY AVAILABLE)

Figure 7. Swiveling trolley (3.2 to 5.0 tons)

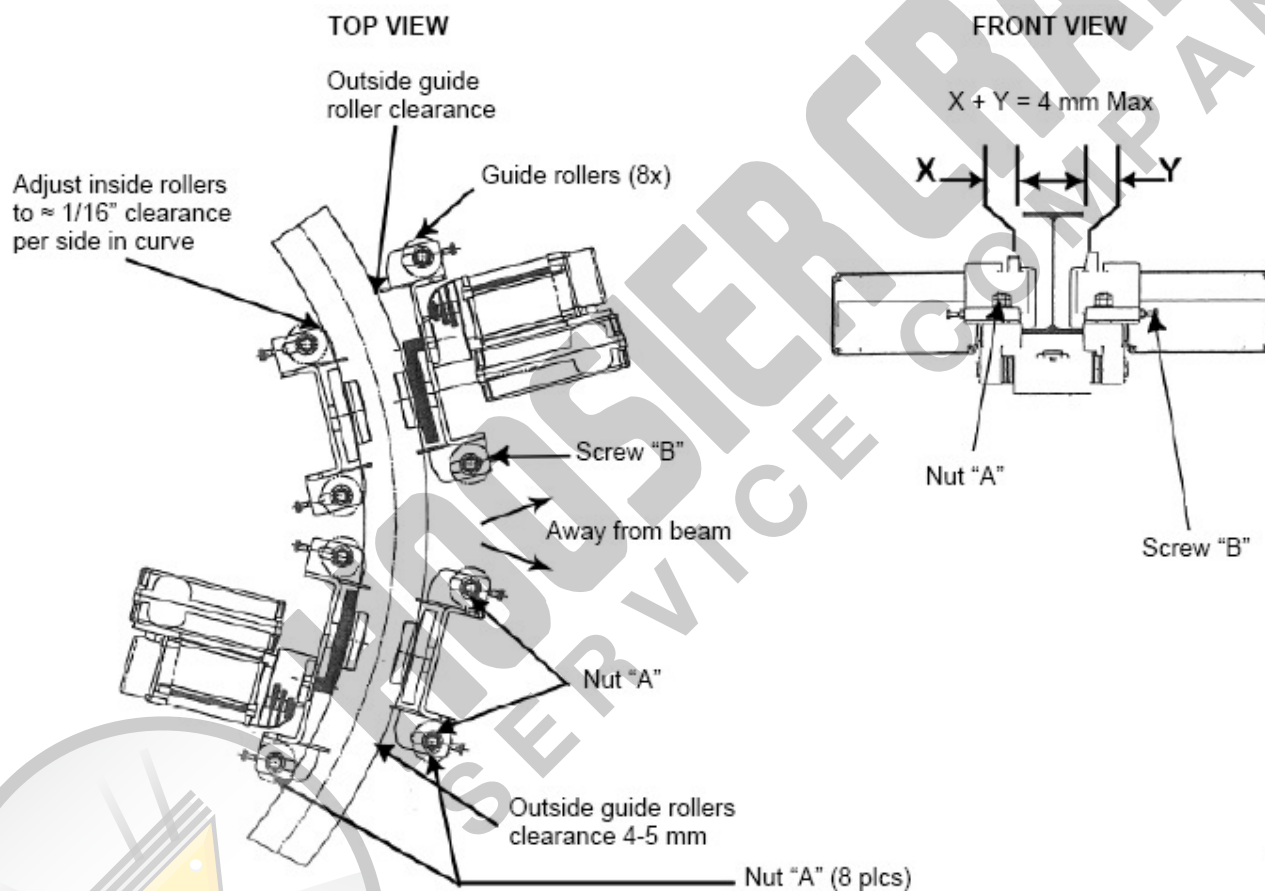


- CAPACITY MAX 3.2 TO 5 TONS (3200 TO 5000 KG)
- RAY OF CURVE MINI 3.9 FEET

6.3.3 Procedure to adjust swivel trolley guide rollers

1. Loosen nut "A" (8 plcs).
2. Adjust guide rollers the maximum distance away from beam.
3. Place swivel trolley on beam.
4. Move trolley to curve section of beam.
5. Adjust guide rollers allowing approximately 3/16" (4-5 mm) clearance per side using screw "B."
6. Tighten nut "A" (8 plcs).

Figure 8. Swivel trolley guide rollers

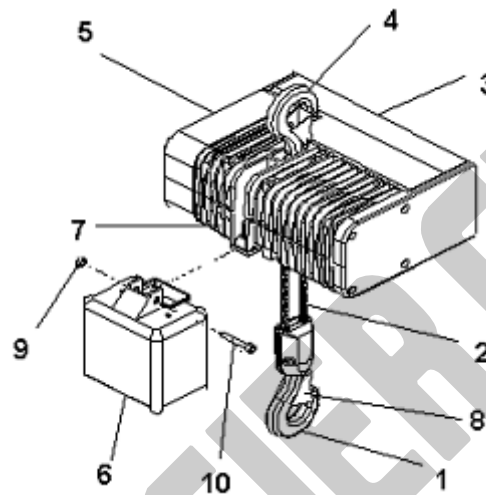


NOTE: Adjustments should be made with swivel trolley in radius of monorail.

7 MAINTENANCE

7.1 Basic Hoist Construction

Figure 9. Basic Hoist Components



1. LOAD BLOCK ASSEMBLY (2-FALL SHOWN)
2. LOAD CHAIN
3. ELECTRICAL CONTROL ENCLOSURE
4. TOP HOOK
5. HOIST GEAR BOX ASSEMBLY
6. CHAIN CONTAINER & HARDWARE
7. HOIST BODY / MOTOR
8. LOAD HOOK SAFETY LATCH
9. FASTENER
10. PIN

7.2 Motor / Body

The hoist motors are designed to provide dependable hoisting service. The standard motors are enclosed for IP55 rated protection against normal hazards of dust and moisture. The motor bearings are sealed and do not require further greasing.

The hoist body is constructed of aluminum and requires no maintenance. Remove from service and replace the hoist body if damaged.

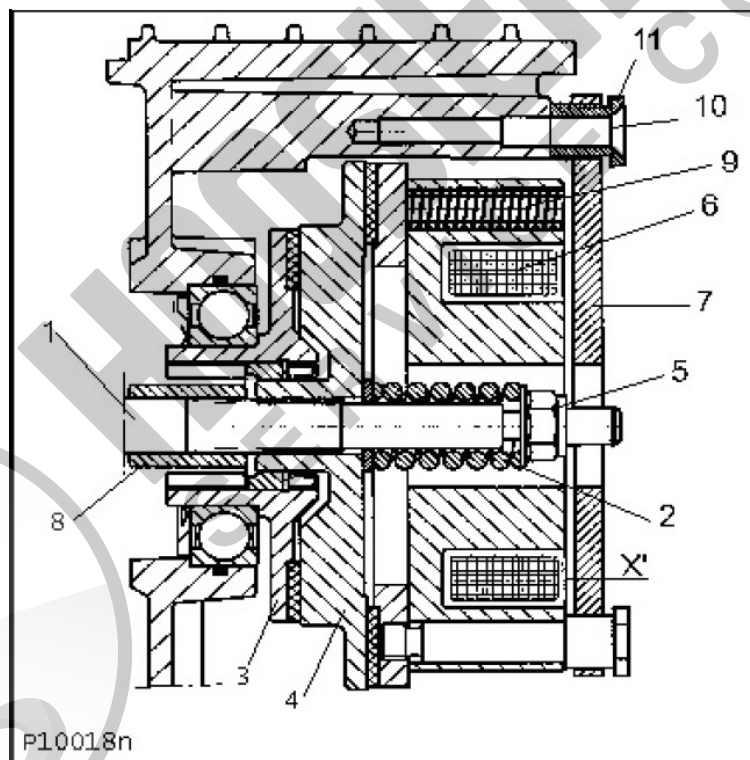
7.3 Hoist Motor Brake and Load-Limiting Device

The hoisting motor is equipped with a D.C. electromagnetic disc brake. The brake brings the load to a smooth and quick stop and holds the load when the motor is not energized. An energized coil releases the hoist brake to allow the hoisting motor to run freely when in use.

The load-limiting device is a slip clutch and it is integrated into the design of the hoist motor brake. Even if the clutch slips, once power is removed, the brake will engage to stop and hold the load.

7.4 Slip Clutch Adjustment

Figure 10. Slip Clutch Adjustment



**CAUTION:**

SEE Figure 10.



Make sure the motor is not running before placing tool on the nut (ITEM 5) to adjust it. Do not touch any moving components.



The slip-clutch generates heat when slipping. ITEMS 3 & 4 absorb this heat. When these items become too hot, clutch adjustment may be difficult due to unstable behavior of friction surfaces. If this happens, allow brake & clutch assembly to cool before trying to re-adjust slip-clutch.



Decreasing torque too much when adjusting slip-clutch will allow a suspended load to free-fall when trying to lift. If this occurs, release the motion button and the brake will engage to stop and hold the load.

7.4.1 Slip Clutch Adjustment after Installation

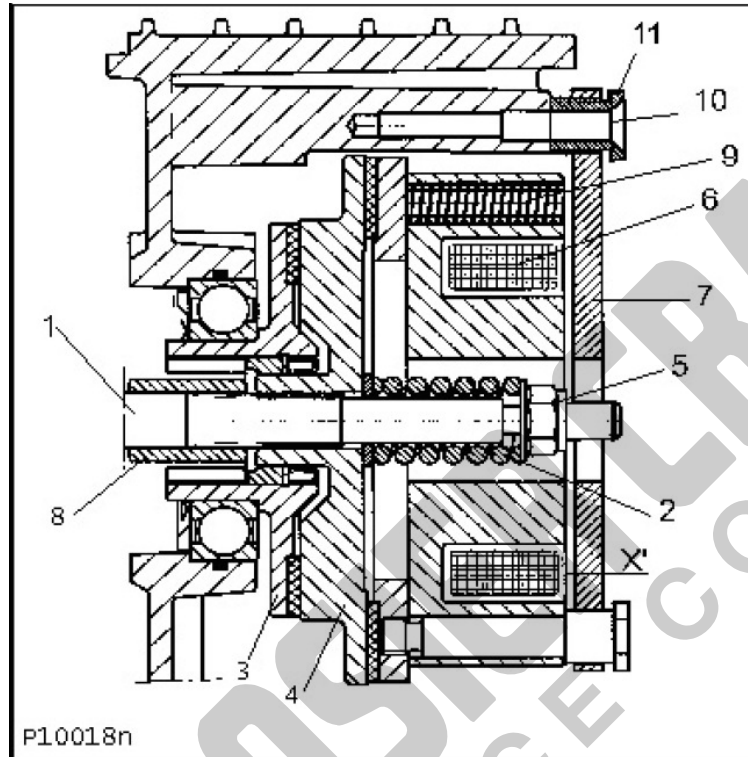
1. Hook a load of at least 110 percent but not more than 125 percent of nameplate capacity.
2. Remove plastic cap from inspection hole in brake cover.
3. Raise load at slow speed and fast speed to test slip clutch operation.
4. Insert a socket (13mm) through inspection hole, and slide it over nut (ITEM 5 - Figure 10).
5. Turn nut in required direction:
 - Turn nut **clockwise to increase** the torque.
 - Turn nut **counterclockwise to decrease** the torque.
6. Repeat steps 3 and 4 until load can be barely lifted in fast speed. **CAUTION: DO NOT OVERHEAT.** If overheated, clutch may not adjust due to instability of friction surfaces.
7. Once adjustment is completed, install plastic cap.
8. Check function of clutch at 100 percent of nameplate-capacity while in fast speed.

NOTICE:

The slip clutch / Torque Limiter is a safety device to prevent overloading of the hoist. This device is not intended for use as means to measure the weight of load being lifted.

7.4.2 Hoist Motor Brake Adjustment

Figure 11. Cross Section of Hoist Motor Brake



If maximum air gap of brake has been reached or will be exceeded before next inspection, readjust air gap.

Minimum air gap
 $X = 0.008" [0.2 \text{ mm}]$

Maximum air gap
 $X = 0.020" [0.5 \text{ mm}]$

Before adjusting brake, remove load. Per ANSI Z244.1, lockout and tag main disconnect switch in de-energized position. Follow other maintenance procedures outlined in this manual and ASME B30.16.

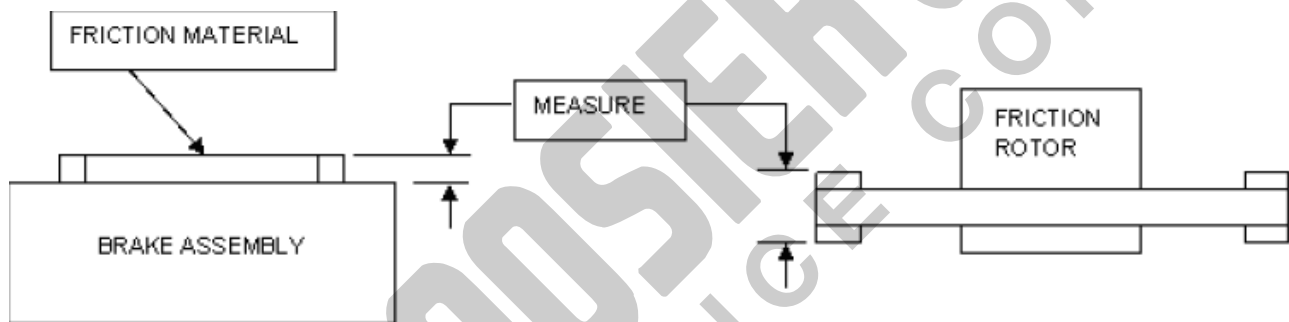
1. Remove brake cover and gasket.
2. With a feeler gauge, check three (3) places near each mounting bolts to measure air gap (X) between brake thrust disc (item 7) and coil (item 6).
3. To adjust air gap use a 0.008" feeler gauge and proceed as follows:
 - A. Slightly loosen motor brake mounting screws (item 10), so that adjusting nut (item 11) still touches brake housing.
 - B. To reduce air gap, turn adjusting nut (item 11) counterclockwise.
 - C. To increase air gap, turn adjusting nut (item 11) clockwise.
 - D. Check air gap after adjusting the brake. Make certain the (3) screws (item 10) are tightened per Torque specification. See Section 8.4.
4. Check brake operation. Run load block up and down several times without a load to test operation of brake. Then, lift a capacity load about one foot above floor, stop, and check that brake holds load.
5. Install gasket and brake cover.

7.4.3 Replacement Criteria for Motor Brakes

Table 2. Replacement criteria for motor brakes

	THICKNESS AS NEW	REPLACE WHEN
LM 01	0.260 inches (6.6 mm)	0.220 inches (5.6 mm)
LM 05	0.370 inches (9.4 mm)	0.330 inches (8.4 mm)
LM 10	0.055 inches (1.4 mm)	0.016 inches (0.4 mm)
LM 16	0.406 inches (10.3 mm)	0.366 inches (9.3 mm)
LM 20	0.406 inches (10.3 mm)	0.366 inches (9.3 mm)
LM 25	0.406 inches (10.3 mm)	0.366 inches (9.3 mm)

Figure 12. Replacement criteria for motor brakes



LM 01 / 05 / 10 MODELS

LM 16 / 20 / 25 MODELS



7.5 Load Chain

7.5.1 General



CAUTION: A hoist **SHALL NEVER** be used if the load chain shows any evidence of mechanical damage or excessive wear. Never use the load chain as a sling. Use only original equipment chain as supplied by a factory authorized source. Improper load chain storage or installation can render the load chain unusable prior to the first lift.

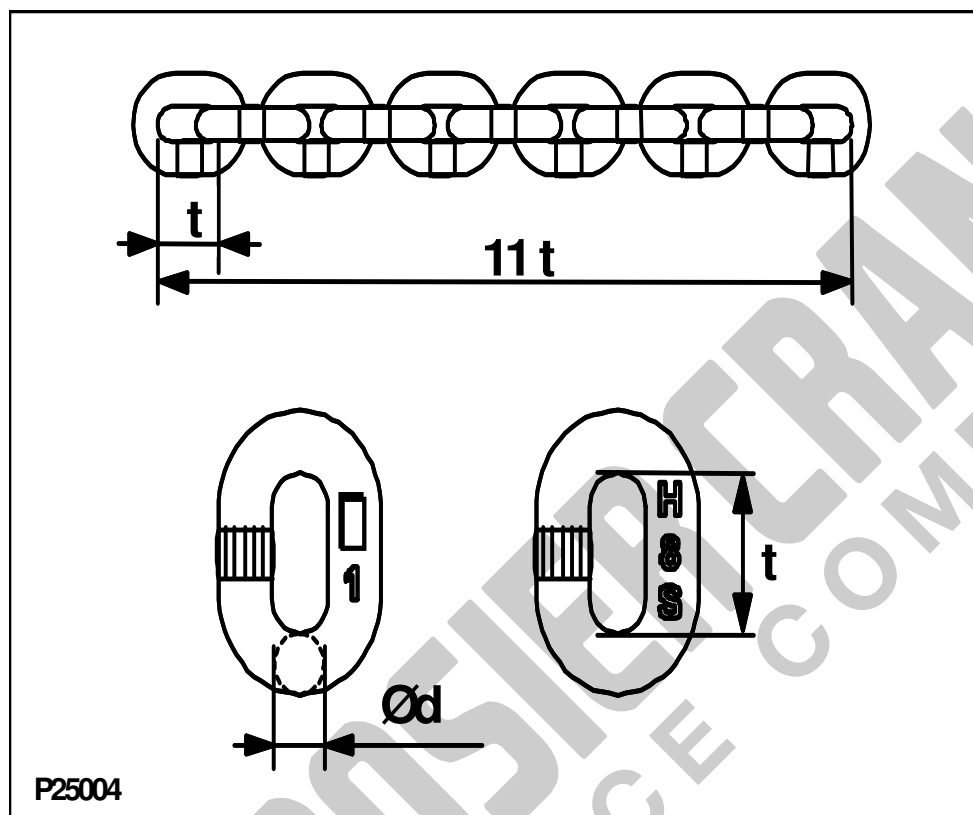
7.5.2 Maintenance Inspection

A qualified person **SHALL** be designated to routinely conduct an in-depth inspection of the load chain (See Section 8 – Preventative Maintenance for schedule recommendations). This designated person **SHALL** inspect load chain using good judgment in evaluating the remaining service life. Any deterioration of load chain resulting in appreciable loss of original strength **SHALL** be noted and evaluated.

An in-depth inspection **SHALL** include a written record that is dated and signed by the inspector.



Figure 13. Chain Dimensions



Measure the following chain dimensions at several points on chain: (Figure 13)

- Dimensions of one link ($d \times t$) where, d = diameter and t = pitch
- Length over 11 links ($11 t$)

Replace load chain if any one of these dimensions exceeds maximum allowed wear.

Maximum allowed wear:

Minimum link diameter allowed	(d):	0.240" [6.1 mm]	MINIMUM
Maximum pitch allowed	(t):	0.736" [18.7 mm]	MAXIMUM
Maximum length allowed	(11t):	7.862" [199.7 mm]	MAXIMUM



NOTE: If load chain needs replaced, then inspect chain guide and chain (load) wheel on hoist and idler sprocket in 2-fall load block for excessive wear. A chain sprocket showing evidence of scored pockets or sharp edges generated from wear **SHALL** be replaced. A worn chain sprocket or idler sprocket can greatly reduce the life of load chain.

7.5.3 Load Chain Specifications (see *Figure 13*)

Chain type:	Standard Load Chain
Diameter (d) / pitch (t):	0.268" (6.8 mm) / 0.701" (17.8 mm)
Class:	DAT
Grade:	H8S or HE G80 RAS
Maximum working stress:	19,595 lbs/in ² (135.1 N/mm ²)
Hardened surface:	580 or 700 HV (Vickers Hardness)
Thickness:	0.006" (0.14 mm) to 0.011" (0.28 mm)
Standard:	DIN 5684 - 8
Marking (10 x t):	1 or 16 H 8 S or A 8
Maximum working load, 1 fall:	2200 lbs. (1000 kg)
Breaking load:	13,062.05 psf (58.1 kN)
Maximum breaking stress:	116 030 lbs/in ² (800 N/mm ²)
Total braking elongation:	>10% min.
Weight for 100 links:	2.38 lbs. (1.08 kg)

7.5.4 Removing the Load Chain

1-FALL CHAIN

1. Remove load from hook block assembly.
2. Remove load block assembly from load chain. Some disassembly of 1-fall load block is required.
3. Attach the chain insert tool to the end of bottom block end of the chain.
4. Run hoist in "UP" direction until all of chain is in container. Stop the hoist with the insertion tool remaining in the hoist ready for the new chain.
5. Remove chain container with all of old chain in chain container.
6. Remove fall stop from old chain and save for use with new chain.

2-FALL CHAIN

1. Remove load from hook block assembly.
2. Run hoist in "UP" direction until hook block assembly is about 1.0 foot [30cm] from hoist body.
3. Unfasten load chain from chain anchor mounted on hoist body.
4. Remove load block assembly from load chain by allowing chain to run through it. Attach the chain insertion tool to the bottom block end of the chain.
5. Run hoist in "UP" direction until all of the chain is in the container. Stop the hoist with the insertion tool remaining in the hoist ready for the new chain.
6. Remove chain container with old chain.
7. Remove fall stop from old chain and save for use with new chain.

7.5.5 Installing the Load Chain

Figure 14. Chain installation

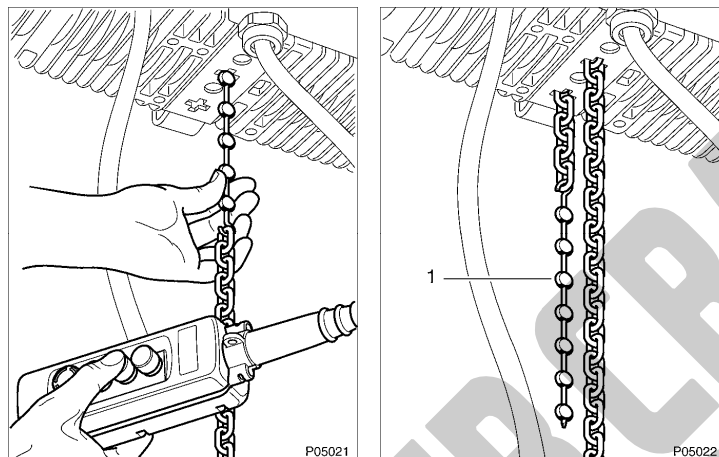
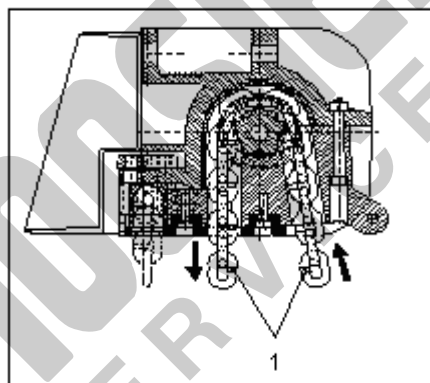


Figure 15. Chain orientation



1-FALL CHAIN INSTALLATION

1. Attach last link of chain onto hook of CHAIN INSERTION TOOL (item 1, Figure 14).
2. If the insertion tool is not in the hoist (removal procedure), insert other end of CHAIN INSERTION TOOL into chain opening closest to chain container side.



CAUTION: Make sure the chain weld on chain link faces inward toward chain wheel pocket on hoist load sprocket. See Figure 15.

3. Run hoist "DOWN" in slow speed to feed chain through chain sprocket and out other side.
4. Attach fall stop at least 6.0 inches [150 mm] from end of chain (chain container side). Attach load block assembly on other end of load chain. Refer to Figure 15 for details.
5. Make sure that load chain is not twisted or deformed.
6. Attach chain container.

2-FALL CHAIN INSTALLATION

1. If the chain insertion tool is not in the hoist (removal procedure), attach last link of chain onto hook of CHAIN INSERTION TOOL (item 1, *Figure 14*).
2. Insert other end of CHAIN INSERTION TOOL into chain opening closest to chain container.



CAUTION: For a 2-Fall load block assembly, make sure the chain weld on chain link faces inward toward chain wheel pocket on hoist and away from idler sprocket of hook block assembly. See figure 5.6. Follow steps outlined below:

3. Run hoist in slow speed to feed chain through chain sprocket. Continue running until about 2.0 feet [60cm] of chain is available out the other side.
4. Slide chain onto idler sprocket of load block making sure not to twist chain while inserting it. Link weld must face away from idler sprocket on load block assembly.
5. Attach chain anchor and chain to hoist body. Tighten chain anchor bolts per recommended torque settings in Section 8.4.
6. Attach fall stop 6.0 inches [150 mm] from end of chain (chain container side). See *Figure 16* for details.
7. Make sure that chain is not twisted or kinked.
8. Attach chain container

After chain installation:

1. Without a load, run chain up and down a few times to make sure load chain is not twisted. If so, remove chain twist.
2. Lubricate load chain.

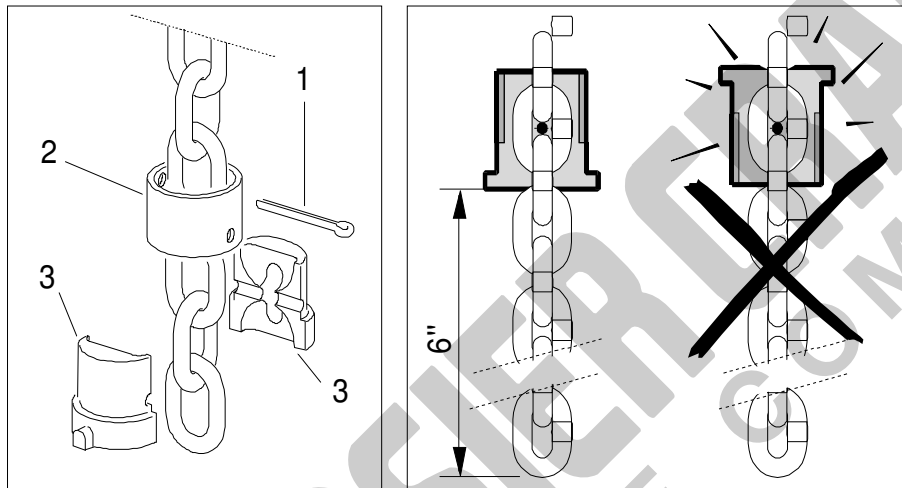


7.6 Fall Stop Assembly

7.6.1 General

The slack fall stop is a safety stop, not a functional stop. The fall stop must be located at least six (6.0) inches [150mm] from end of last chain link.

Figure 16. Cross Section of Slack Fall Stop



7.6.2 Removing fall stop (Figure 16)

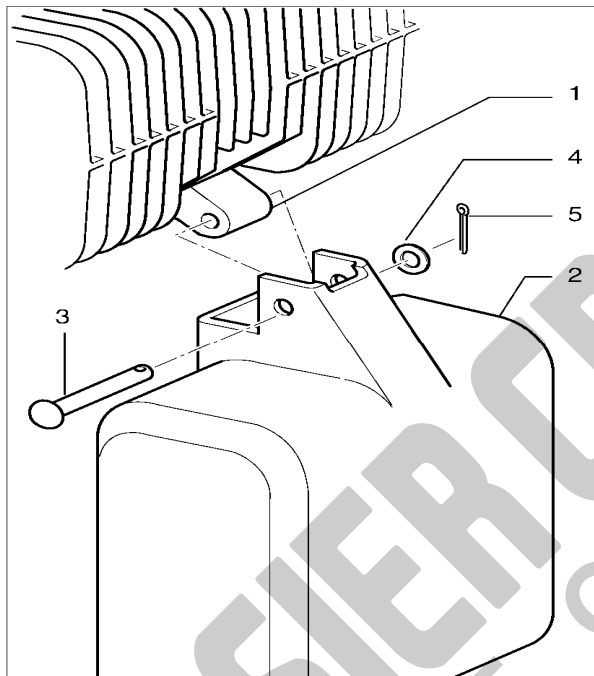
1. Remove cotter pin (item 1).
2. Slide up the tube (item 2).
3. Remove the two fall stop halves (item 3).
4. Slide tube (item 2) off load chain.

7.6.3 Fall Stop Installation (Figure 16)

1. Slide tube (item 2) onto load chain.
2. Position two fall stop halves (item 3) on a chain link so that the fall stop will be at least 6 inches [150mm] from end of load chain.
3. Slide tube (item 2) down over two fall stop halves (item 3).
4. Insert and secure cotter pin (item 1).

7.7 Chain Container

Figure 17. Chain Container Installation



CAUTION: Chain container must be installed for effective operation of travel limit switch.

7.7.1 Removing Chain Container (Figure 17)

1. Remove cotter pin (item 5) from end of pin (item 3).
2. Pull pin (item 3) out while supporting chain container (item 2).
3. Remove chain container (item 2).

7.7.2 Installing Chain Container (Figure 17)

1. Insert load chain into chain container (item 2). Position chain container (item 2) onto hoist mounting bracket (item 1).
2. Align holes and insert pin (item 3) through container (item 2) and hoist mounting bracket (item 1).
3. Place washer (item 4) onto pin (item 3).
4. Insert and secure cotter pin (item 5).

7.8 Vinyl Chain Bag (optional)

Figure 18. Vinyl Chain Bag Installation Connection



7.8.1 Installing Vinyl Chain Bag (Figure 18)

1. Insert load chain into vinyl chain bag. Position vinyl chain bag onto hoist mounting bracket.
2. Align holes and insert cotter pin through appropriate bag connection holes for the specific model.
 - 2.1. Use **Item 1** connection holes for the **Model 10** hoist.
3. Place washer onto pin.
4. Insert and secure cotter pin.

7.9 Limit Switches

7.9.1 Upper and Lower Travel Safety Limit Switch

The Upper and Lower Travel Limit Switch is an automatic reset type switch and connected to the control circuit. The switch housing is recessed into the underside of hoist body.

The upper and lower limit switches are emergency protection devices and are not to be used as a continuous stop.

The hook block activates the upper limit switch as it contacts the limit switch that is located on bottom side of hoist body. Once the switch is activated, the "UP" circuit is opened. The fall stop activates the lower limit switch when hook block is lowered to its lowest travel position. The limit switch is activated and opens the "down" circuit.

The lower limit position is adjustable between the lowest travel and maximum lift. It is adjusted by repositioning the fall stop assembly on free end of load chain. The fall stop **SHALL** always be located at least 6 inches [150mm] from end of last chain link. The upper limit position is adjustable only when an additional fall stop assembly is added between the hook block assembly and the hoist body.



7.9.2 Upper and Lower Rotary Travel Limit Switch (Optional Only on 3-Phase units)

The rotary limit switch is adjustable and provides over-travel protection for the upper and lower limits of hoist travel. The limit switch is connected to the control circuit.



Note: Not available on Single Phase – 115 Volt Models

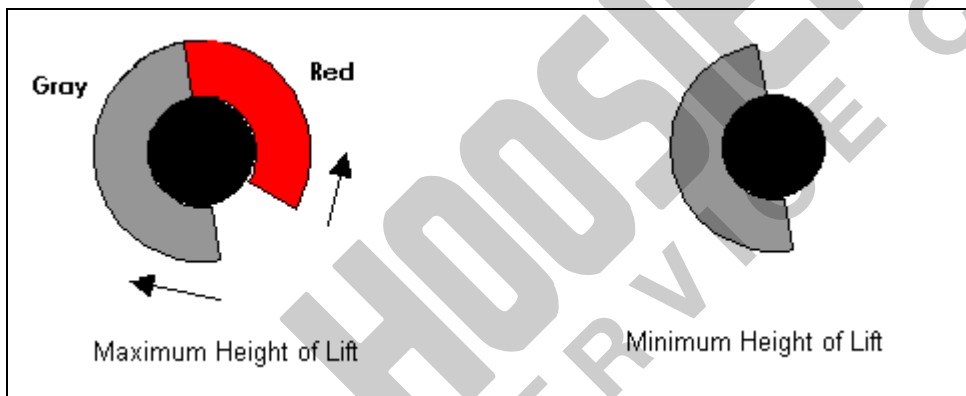


Note: Rotary limit switch assembly cannot be added to a Hoist. The Hoist must have the rotary limit switch assembly provided at time of initial production.

Adjustment

The position of the air-gap between the two discs (red – gray) determines the stopping place. This position can be found by gently turning the two discs. The length of air gap determines length of reset play in opposite direction.

Figure 19. Air Gap Adjustment



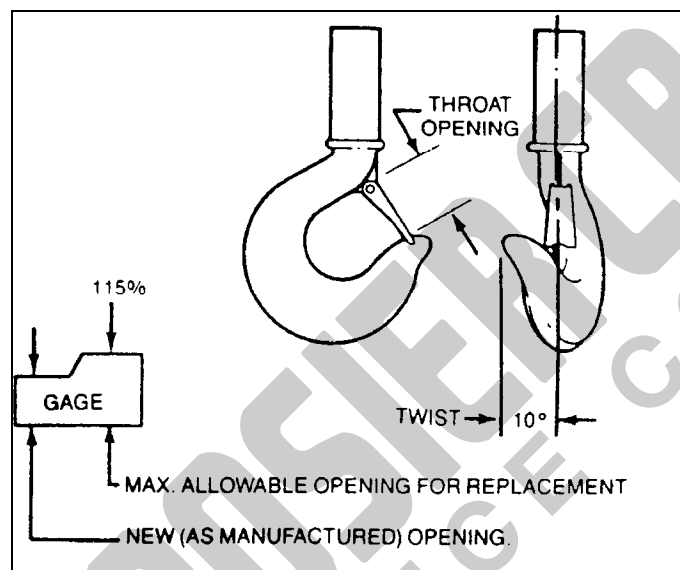
To reset the rotary limit once it has tripped, the load block assembly must travel approximately 11" [27cm] in opposite direction.

7.10 Hooks





7.10.1 General

Check hooks for deformation or cracks. Hooks must be replaced if throat opening has increased by more than 15%, or if throat opening has more than 10-degree twist from plane of straight hook.

Figure 20. Measuring Hook Deformation



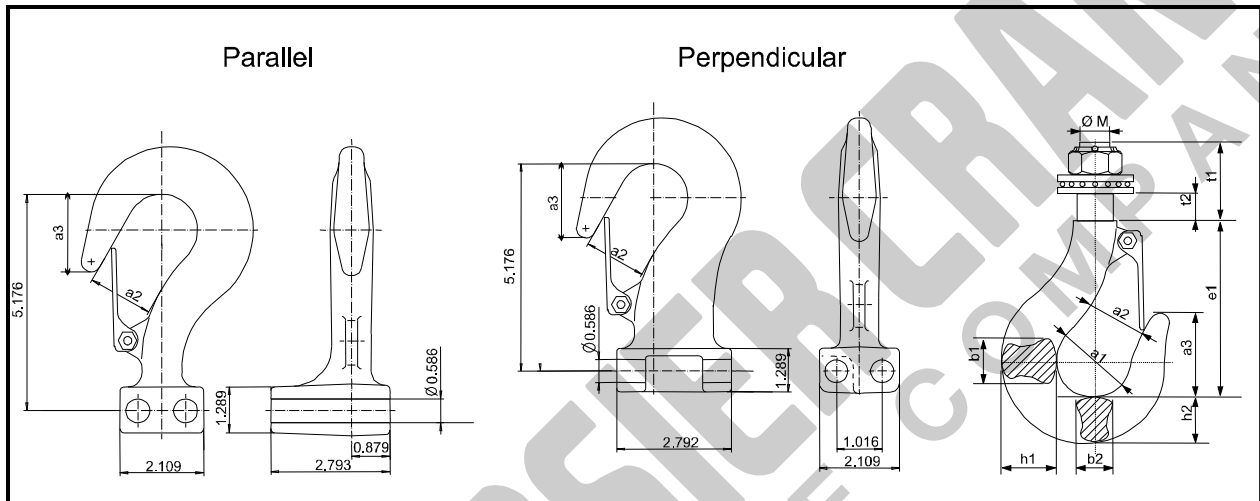
Due to many types and sizes of hooks that can be furnished and/or specified by the user / owner, it is recommended that user / owner measure the actual throat opening of hook as originally furnished. See Figure 20. Record the throat dimension on above sketch. Retain as a permanent record. This record can then be used for determining when hook must be replaced due to deformation or excessive throat opening.

-  **CAUTION:** Abuse or overloading of hoist is indicated when any hook is twisted or has a throat opening in excess of normal. Other load bearing components **SHALL** be checked for damage.
-  **CAUTION:** Safety latches **SHALL** be replaced if missing, bent, or broken.
-  **CAUTION:** A safety latch **SHALL** function properly at all times.
-  **CAUTION:** Repairing hooks by welding or reshaping is strictly forbidden.

7.10.2 Hook Inspection

The wear on the top hook and the load hook **SHALL** be checked routinely. Measure the throat opening (dimension a_2 - FIGURE 21). If the throat opening exceeds the maximum opening allowed, replace the hook. Damaged safety latches shall be replaced immediately.

Figure 21. Hook Dimensions



LOAD CAPACITY (LBS)	TEST LOAD	FALLS	MINIMUM FAILURE LOAD	CLASS
1389	2778	1	8752	025T
2205	4409	1	11023	025T
2756	5512	2	17361	05T
4409	8818	2	22046	05T

HOOK DIMENSIONS – INCHES										
ϕM	ϕa_1	a_2	a_3	b_1	b_2	e_1	h_1	h_2	t_1	t_2
0.630	1.417	1.024	1.614	0.866	0.748	3.780	1.102	0.945	1.496	0.512
0.630	1.417	1.024	1.614	0.866	0.748	3.780	1.102	0.945	1.496	0.512
0.787	1.693	1.339	1.929	1.142	0.945	4.134	1.457	1.221	1.496	0.551
0.787	1.693	1.339	1.929	1.142	0.945	4.134	1.457	1.221	1.496	0.551

Initial Dimension – a_2

1.024 inches

1.339 inches

Max. Allowed Dimension

1.178 inches maximum

1.540 inches maximum

Mark: ISO 2766

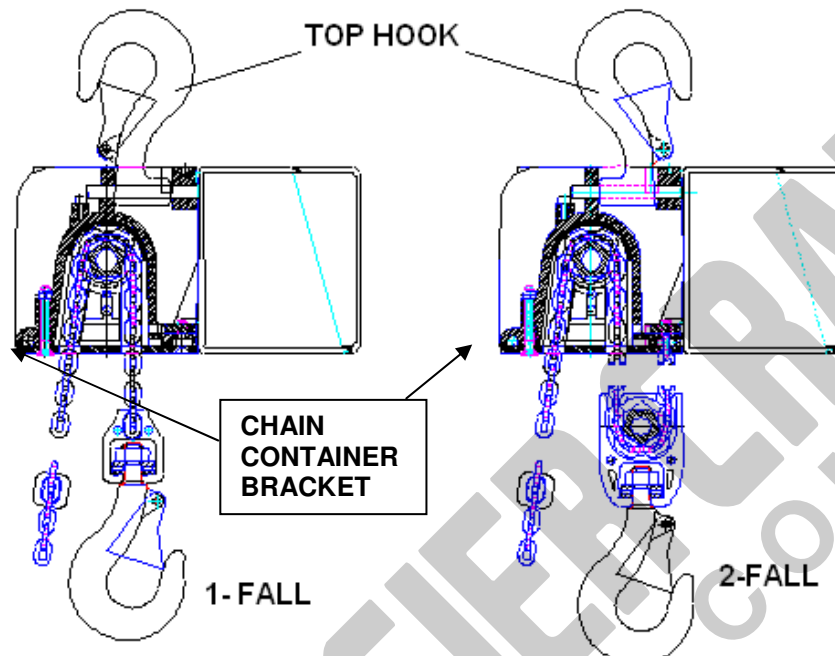
DIN Model Number: 15401

DIN 15400 Class: T

DIN 15401 Material: 35 CD 4

7.10.3 Top Hook

Figure 22. Top Hook Orientation



CAUTION: Before removing Top Hook, de-energize the power to the hoist per ANSI Z244.1 and make certain that any load is removed from the load hook. Also support the total weight of the hoist, including chain, prior to removing the Top Hook.

Removing Top Hook

1. Place hoist on workbench. Protect limit switches on bottom side of hoist.
2. Remove screw and locking plate.
3. Pull pins out and remove hook.



CAUTION: Proper installation of top hook is critical for hoist balance.

Installing Top Hook

1. Place hoist on workbench. Protect limit switches on bottom side of hoist.
2. Determine number of chain falls: 1-fall or 2-fall. Reference Figure 22.
3. Select proper placement of top hook relative to number of chain falls:
 - If 1-fall, align top hook so that tip of hook faces toward chain container.
 - If 2-fall, align top hook so that tip of hook faces away from chain container.
4. Place hook into the slot on hoist body. Verify that top hook saddle and load hook saddle are in line with each other. Install pins and locking plate. Secure locking plate with screw.

7.11 Control Changes and Fuses

The layouts and wiring diagrams found within this section are for standard hoist controls. Single speed hoists are available for 208, 230, and 460 volt three-phase power supplies; but not for 575 volts.

Two-speed hoists are available for 208, 230, 460, and 575 volt, three-phase power supplies. The two-speed hoists can only be connected to the specified voltage on the hoist serial plate.

Control Circuit Fuse

The control circuit fuse holder is located on terminal strip **X1**. The fuse holder top flips up to facilitate changing a defective fuse.

Table 3. Control Circuit Fuse

POWER SUPPLY	CONTROL VOLTAGE	FUSE SIZE
3 – PHASE	115 VAC	630 mA

Three-phase Single-speed Voltage Changes:

The Single-speed models may be changed to accommodate 208/230/460 volt power supplies. A hoist supplied with a motorized trolley CANNOT be reconnected.



Note: Motorized trolley drives are not voltage re-connectable. Consult the motorized trolley manual if a voltage change over is required.

Refer to the respective Single-speed wiring diagrams and make the following connections for the following voltages:

208 / 230 VOLT (SEE 208/230 VOLT SINGLE SPEED CONTROL LAYOUT & WIRING DIAGRAM)

1. Connect motor brake lead (-) to terminal strip X1 terminal 14. Connect (+) to K21 terminal 4.
2. Motor Leads:
 - a. T1 & T7 connect to main line contactor K10 terminal 1.
 - b. T2 & T8 connect to DOWN contactor K22 terminal 2.
 - c. T3 & T9 connect to DOWN contactor K22 terminal 6.
 - d. T4 connect to terminal strip X1 terminal 11.
 - e. T5 connect to terminal strip X1 terminal 12.
 - f. T6 connect to terminal strip X1 terminal 13.
 - g. Jumper wires on terminal strip X1 to connect terminals 11, 12, and 13.
3. Control transformer connections:
 - a. Jumper connections terminals 230 to 230 and terminals 01 to 02. See control panel layouts and wiring diagrams.

460 VOLT (REFER TO 460 VOLT SINGLE SPEED WIRING DIAGRAM)

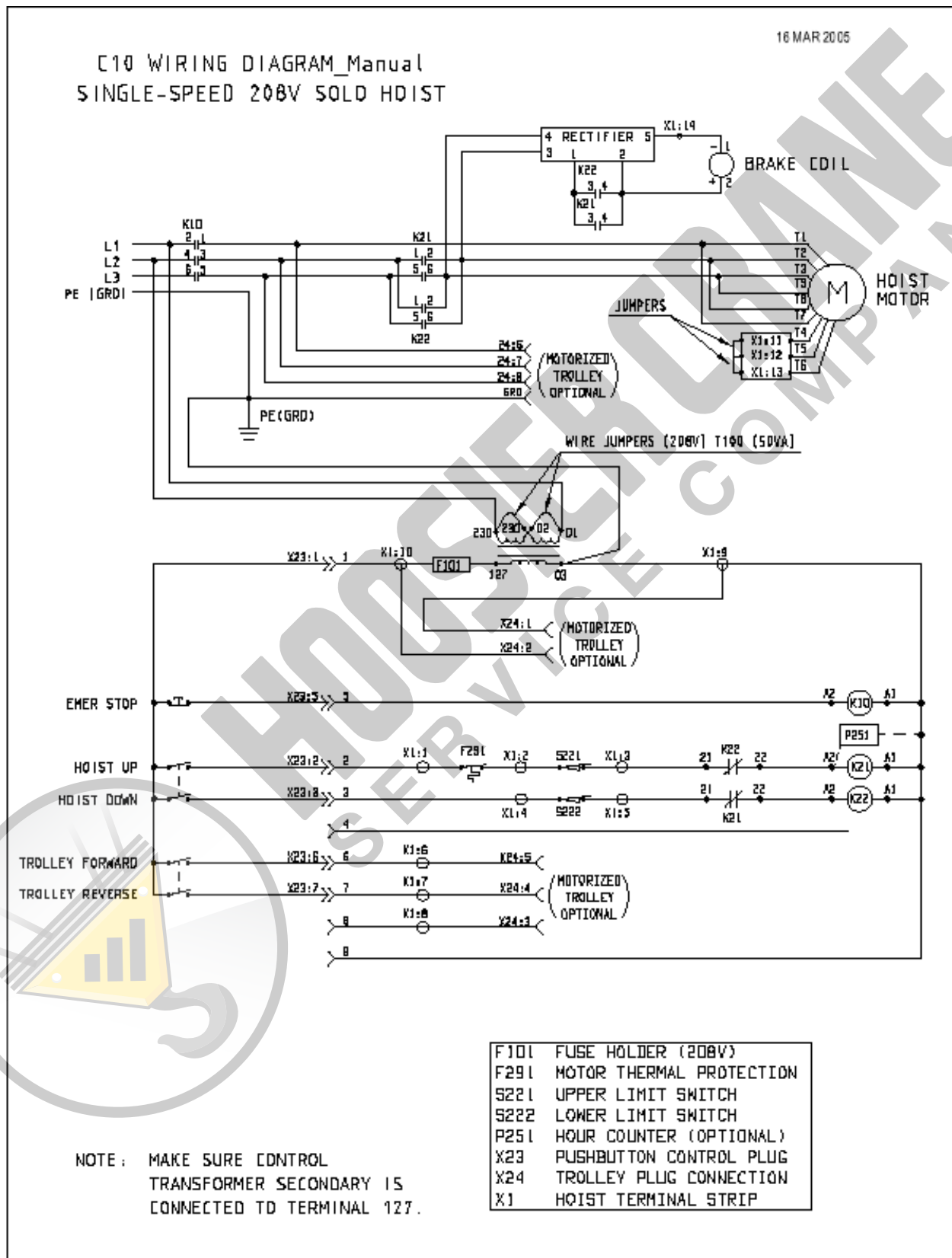
1. Connect motor brake lead (-) to contactor K21 terminal 2.
2. Motor leads:
 - a. T1 connect to main line contactor K10 terminal 1.
 - b. T2 connect to DOWN contactor K22 terminal 2.
 - c. T3 connect to DOWN contactor K22 terminal 6.
 - d. T4 & T7 connect to terminal strip X1 terminal 11.
 - e. T5 & T8 connect to terminal strip X1 terminal 12.
 - f. T6 & T9 connect to terminal strip X1 terminal 13.
3. Control transformer connections:
 - a. Jumper connections for 460 volt (see wiring diagram).

Table 4. Wiring Diagram

	Power & Motor Supply	Pendant Plug X23 Description	Pin No:	Tag strip X1 Terminal No:	Control Panel Description	Plug Pin No:
L1	Hoist power supply	Common	1	10	SD: low speed	2
L2	Hoist power supply	Hoist UP	2	1	Hoist UP	
L3	Hoist power supply	Hoist DOWN	3	4	Hoist DOWN	
K21-2	+ brake	Hoist FAST	4	6	D2: Trolley FWD	5
K21-4	- brake	Emergency stop	5	7	D1: Trolley REV	4
K10-1	T1, T7 motor supply	Trolley FWD	6	8	F: Trolley Fast	3
K22-4	T3, T9 motor supply	Trolley REV	7	9	Control voltage	1
K22-6	T2, T8 motor supply	Trolley FAST	8	1-2	Thermal protection	
X1-11	T4 motor supply			2-3	Upper limit switch	
X1-12	T5 motor supply			4-5	Lower limit switch	
X1-13	T6 motor supply			K10	Mainline contactor	
	Ground Terminals Description			K21	Hoist UP contactor	
PE	Motor			K22	Hoist DOWN Contactor	
PE	Control panel			K25	Hoist FAST	
PE	Trolley connection			T100	Control Transformer	
PE	Power supply			9	Counter (option)	
				K22-22	Counter (option)	
				F100	630 mA	

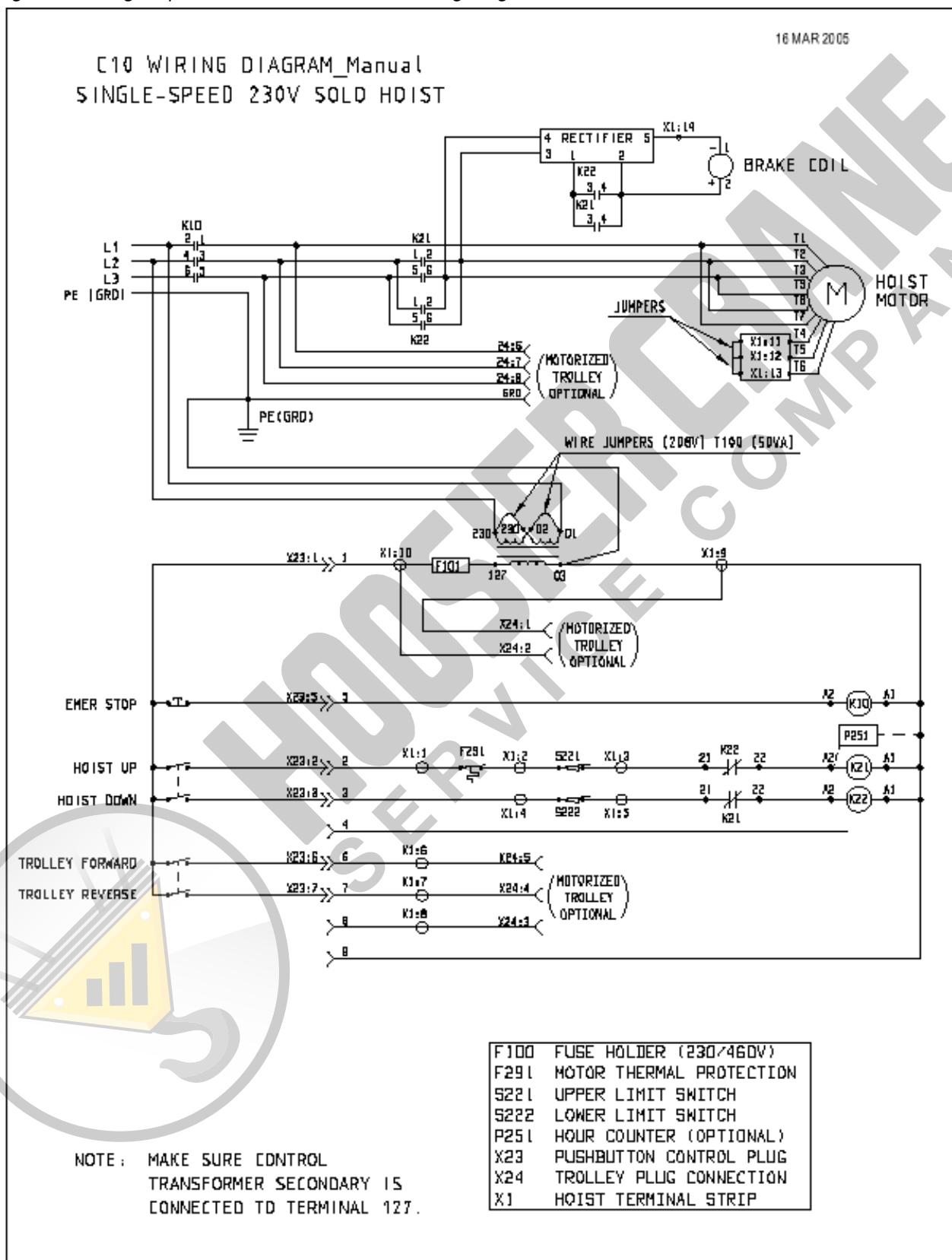
7.12 Single-Speed Solo Hoist – 208 Volt Wiring Diagram

Figure 23. Single-speed solo hoist – 208 volt wiring diagram



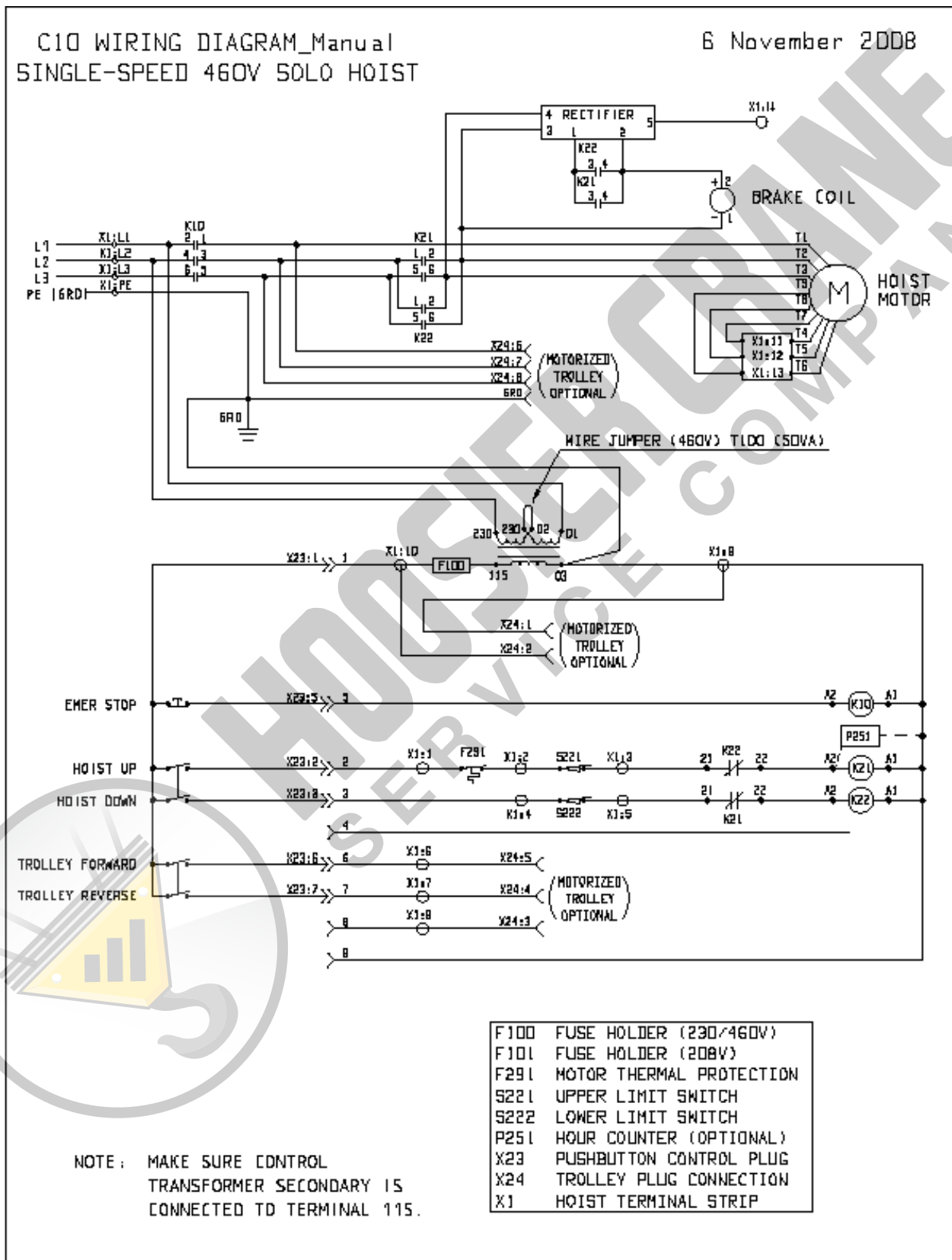
7.13 Single-Speed Solo Hoist – 230 Volt Wiring Diagram

Figure 24. Single-speed solo hoist – 230 volt wiring diagram



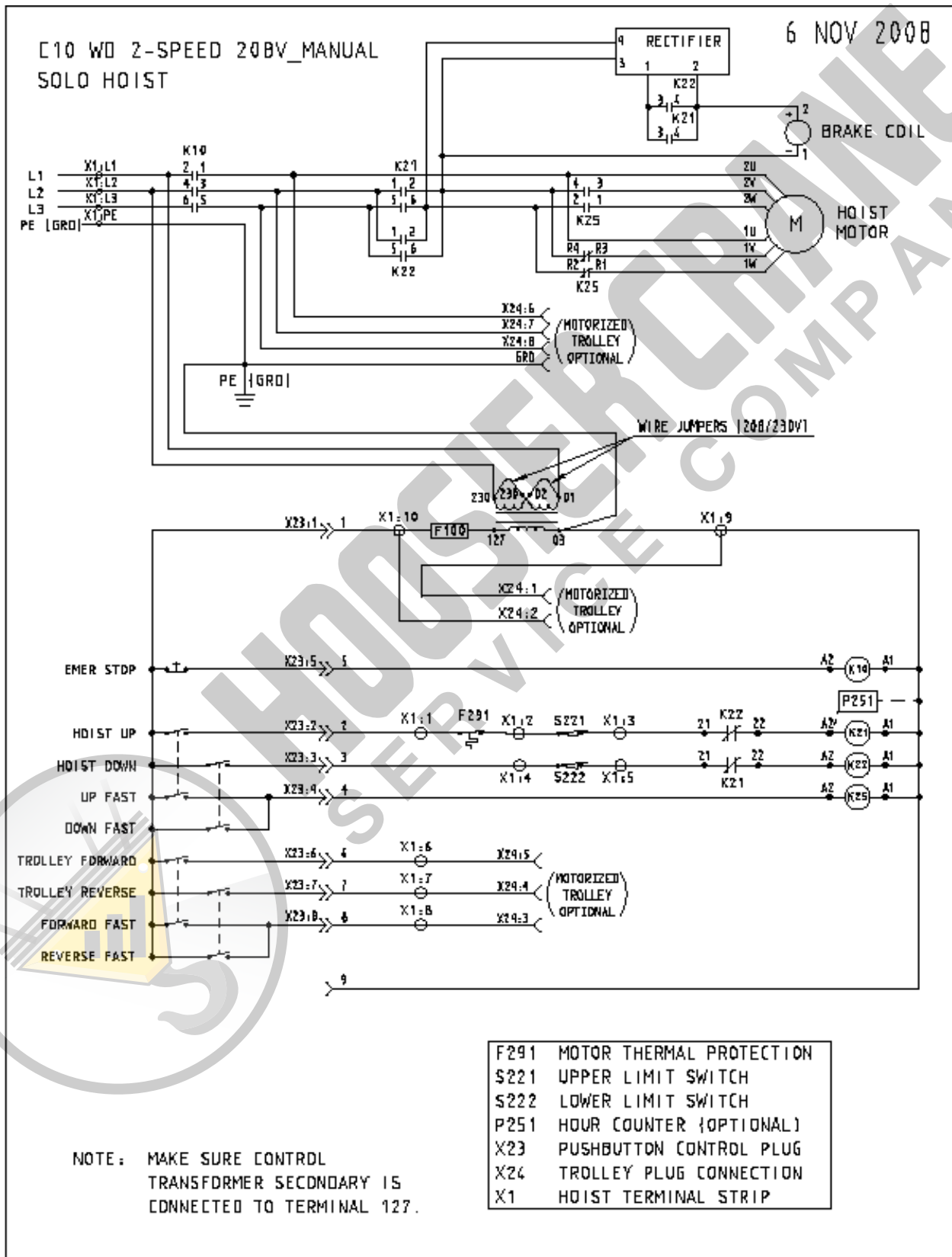
7.14 Single-speed Solo Hoist – 460 Volt Wiring Diagram

Figure 25. Single-speed solo hoist – 460 volt wiring diagram



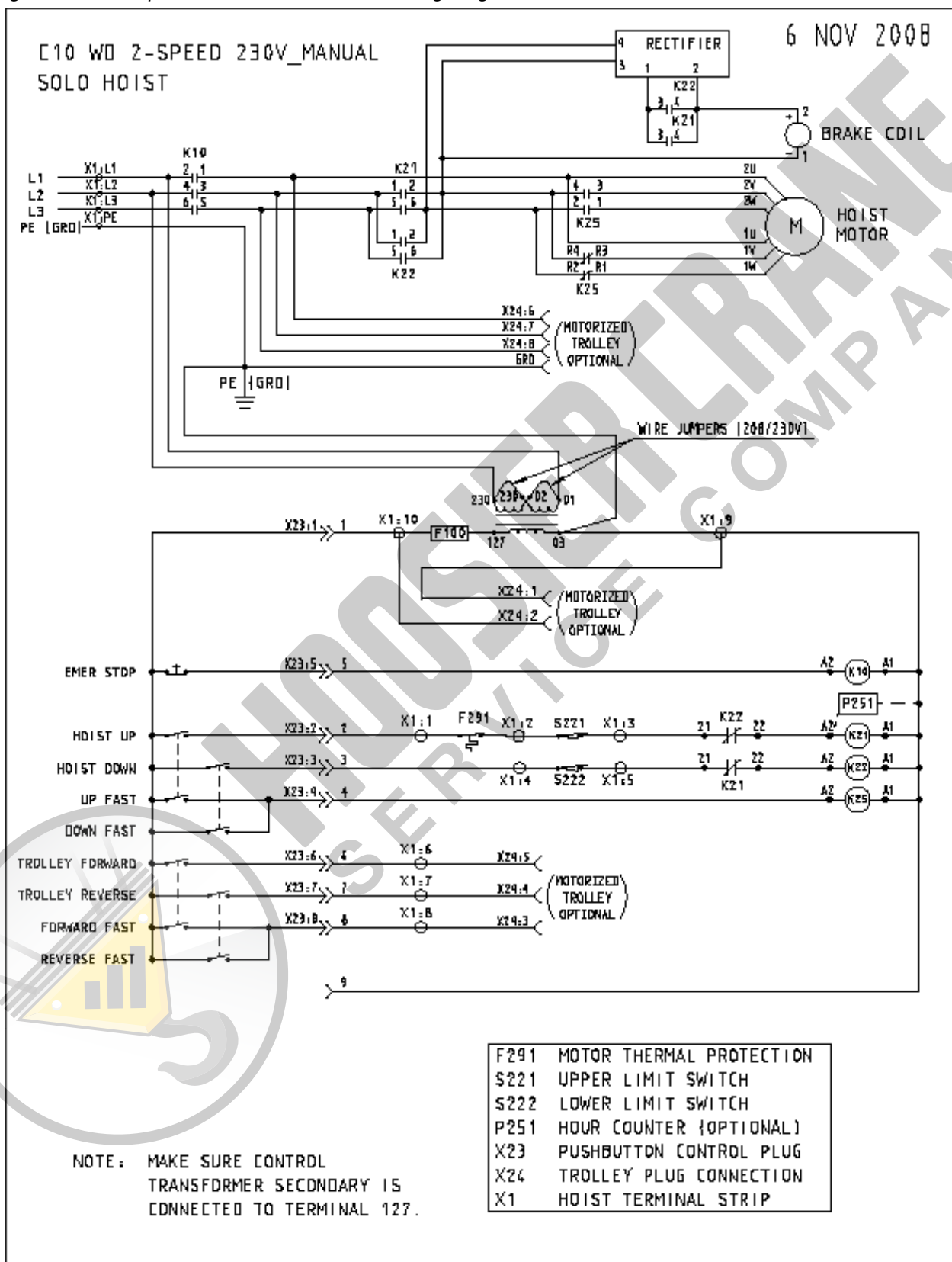
7.15 Two-Speed Solo Hoist - 208 Volt Wiring Diagram

Figure 26. Two-speed solo hoist – 208 volt wiring diagram



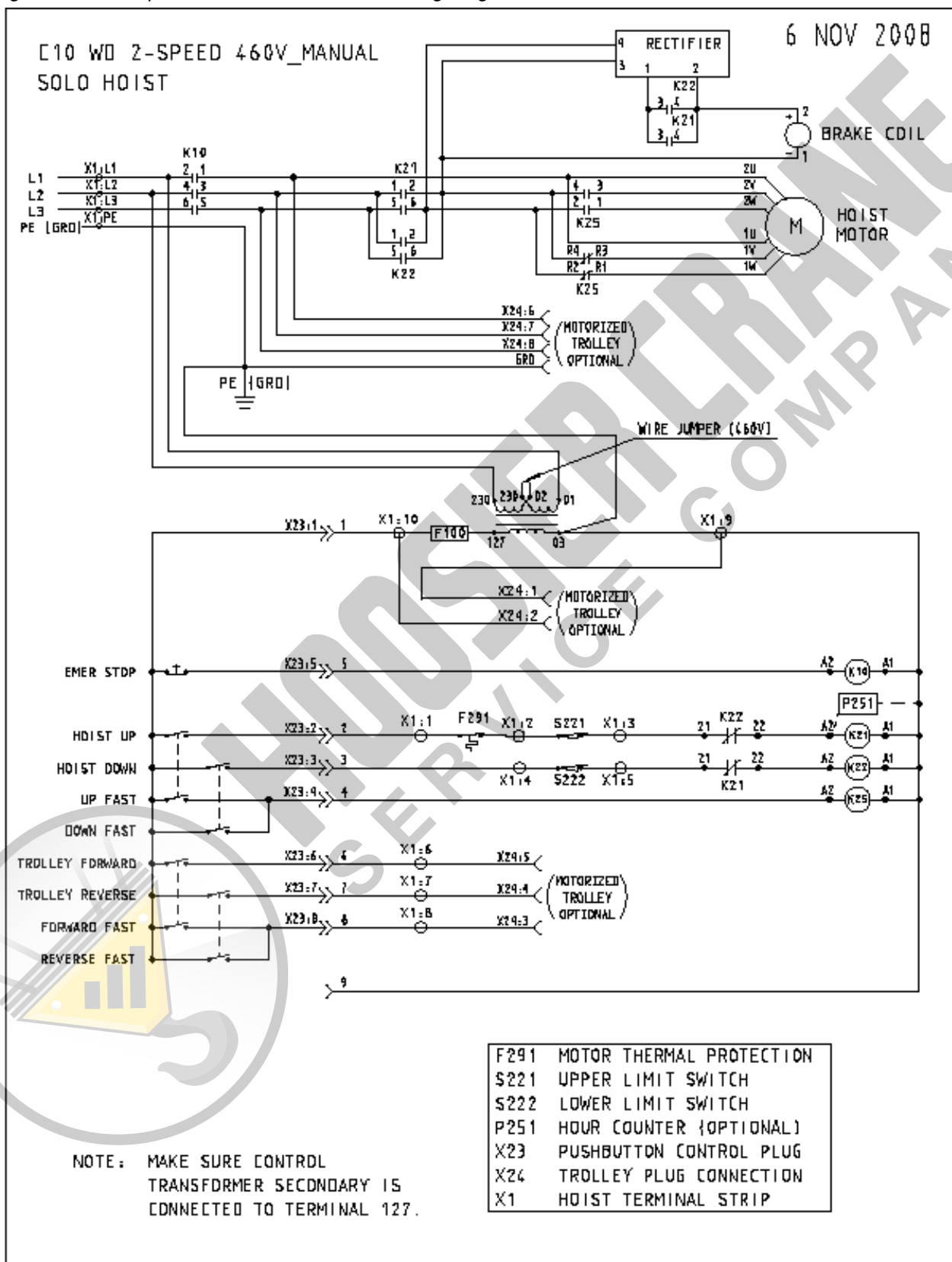
7.16 Two-Speed Solo Hoist - 230 Volt Wiring Diagram

Figure 27. Two-speed solo hoist – 230 volt wiring diagram



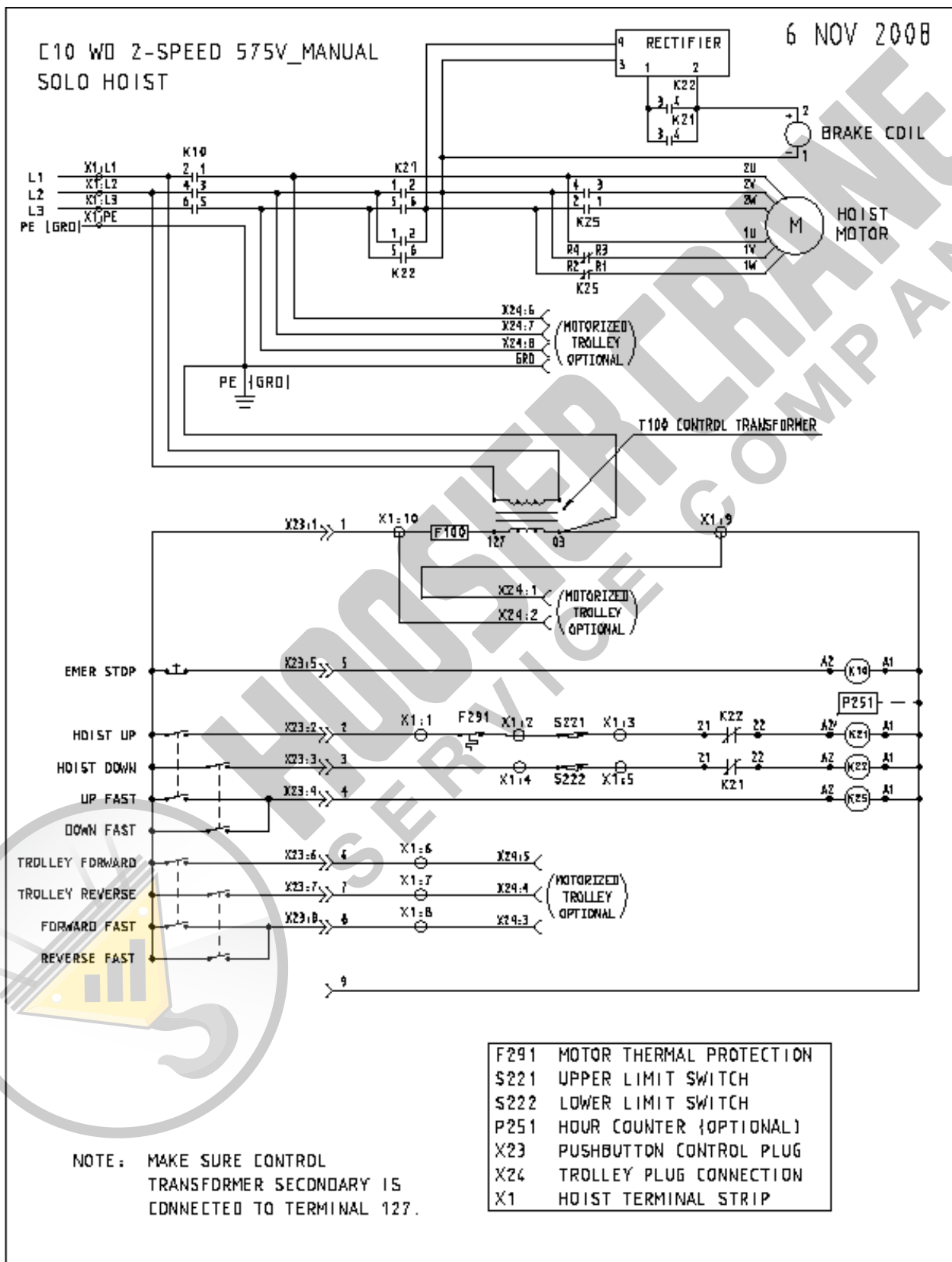
7.17 Two-Speed Solo Hoist - 460 Volt Wiring Diagram

Figure 28. Two-speed solo hoist – 460 volt wiring diagram



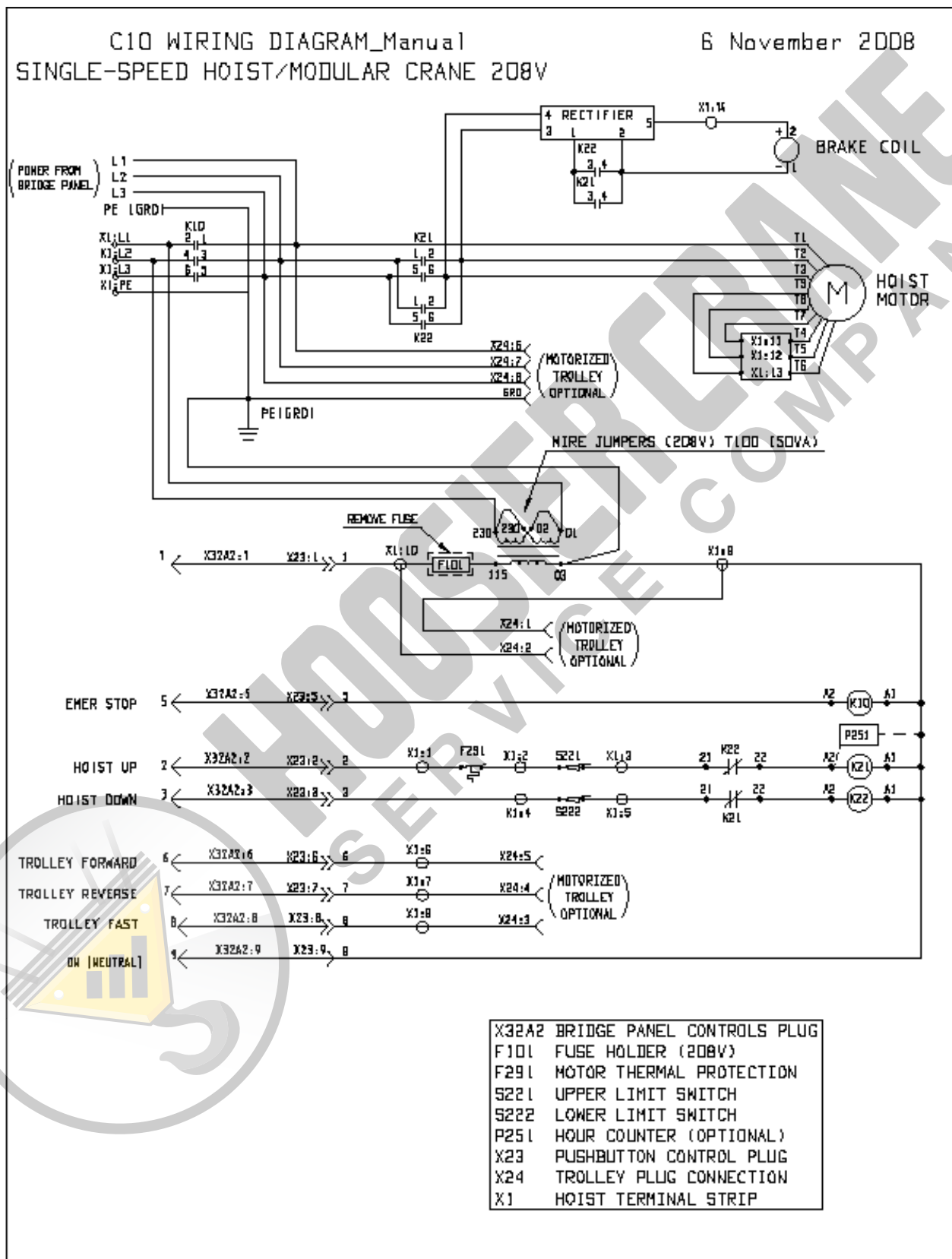
7.18 Two-Speed Solo Hoist – 575 Volt Wiring Diagram

Figure 29. Two-speed solo hoist – 575 volt wiring diagram



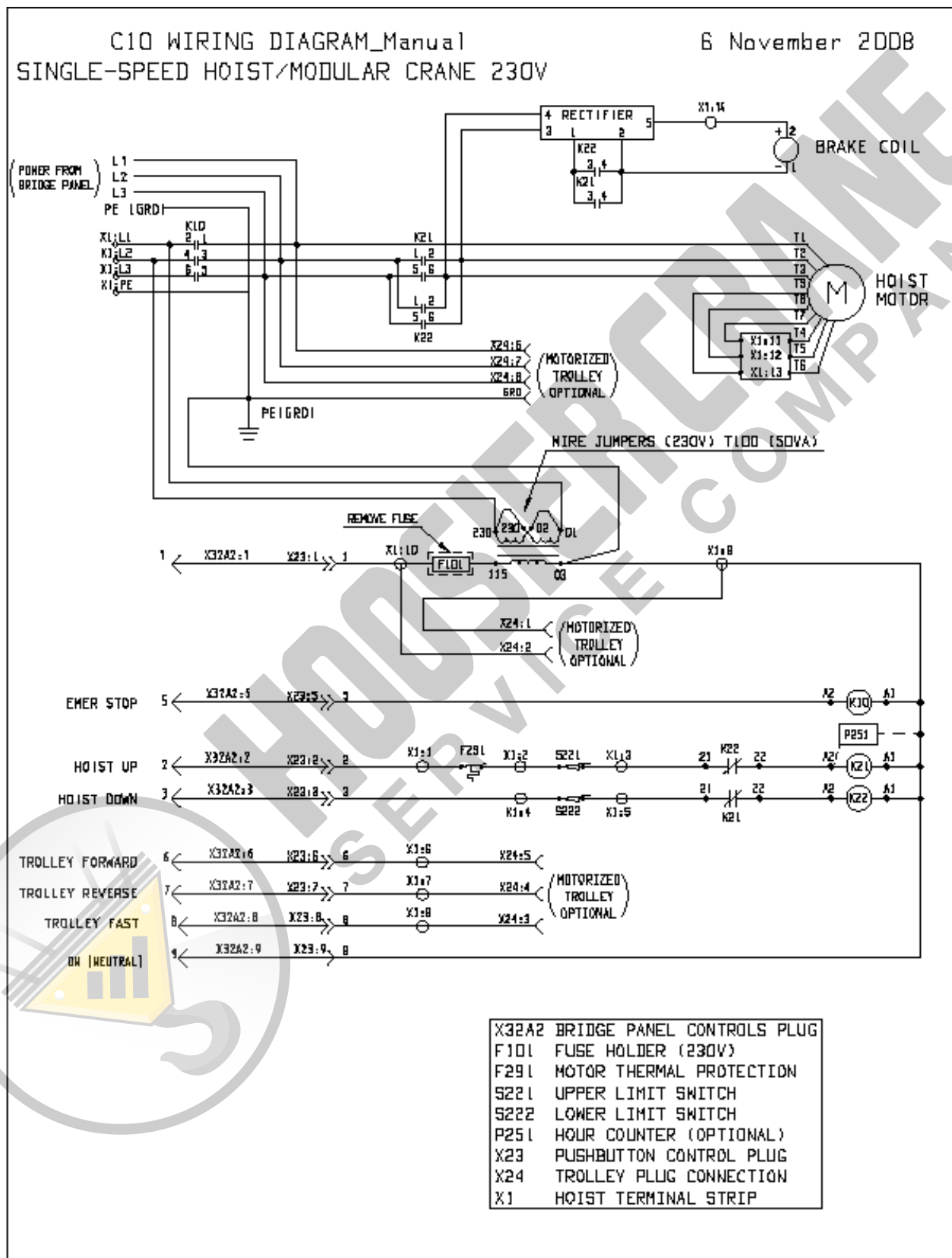
7.19 Single-Speed Hoist – Modular Crane – 208 Volt Diagram

Figure 30. Single-speed hoist – modular crane – 208 volt diagram



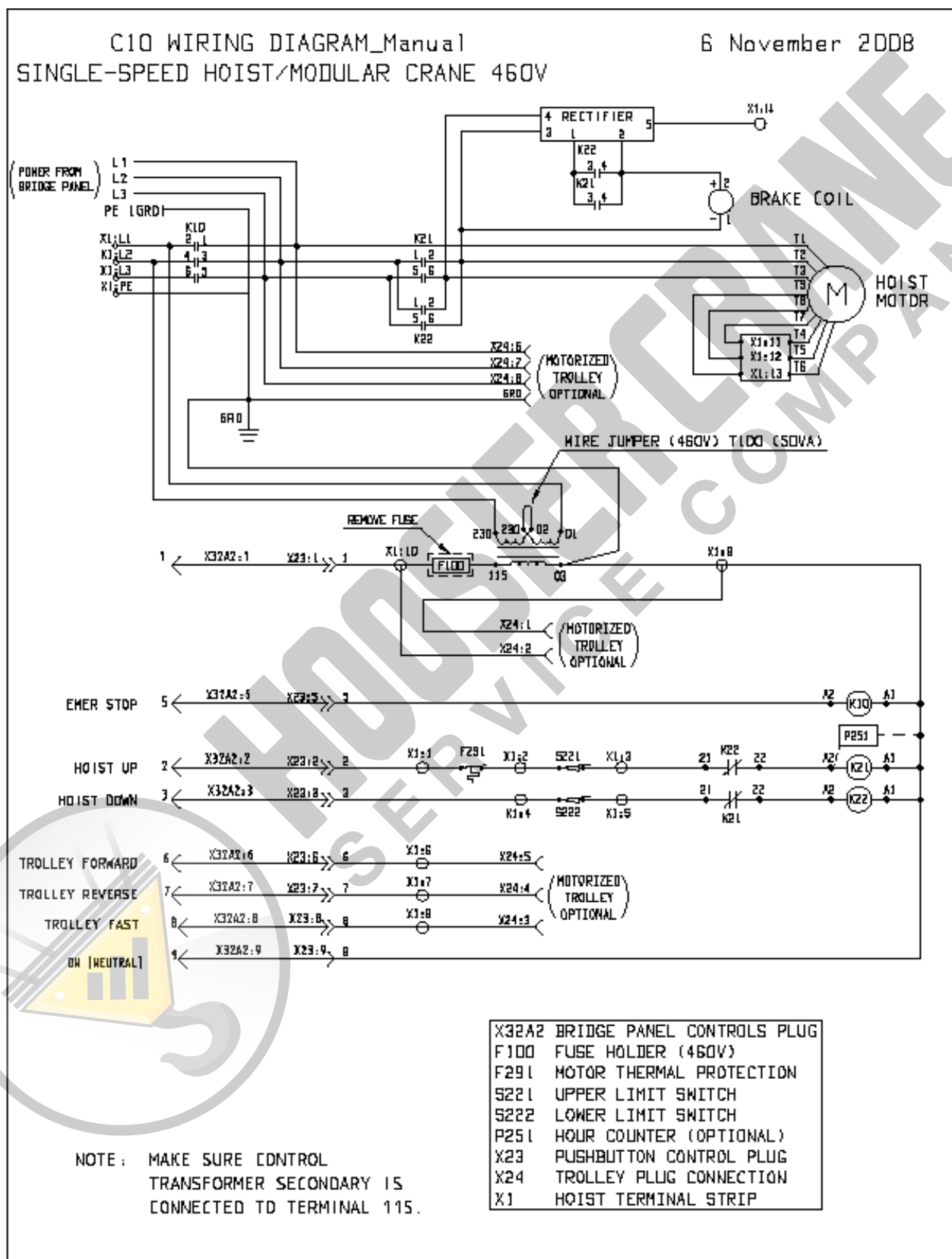
7.20 Single-Speed Hoist – Modular Crane – 230 Volt Diagram

Figure 31. Single-speed hoist – modular crane – 230 volt diagram



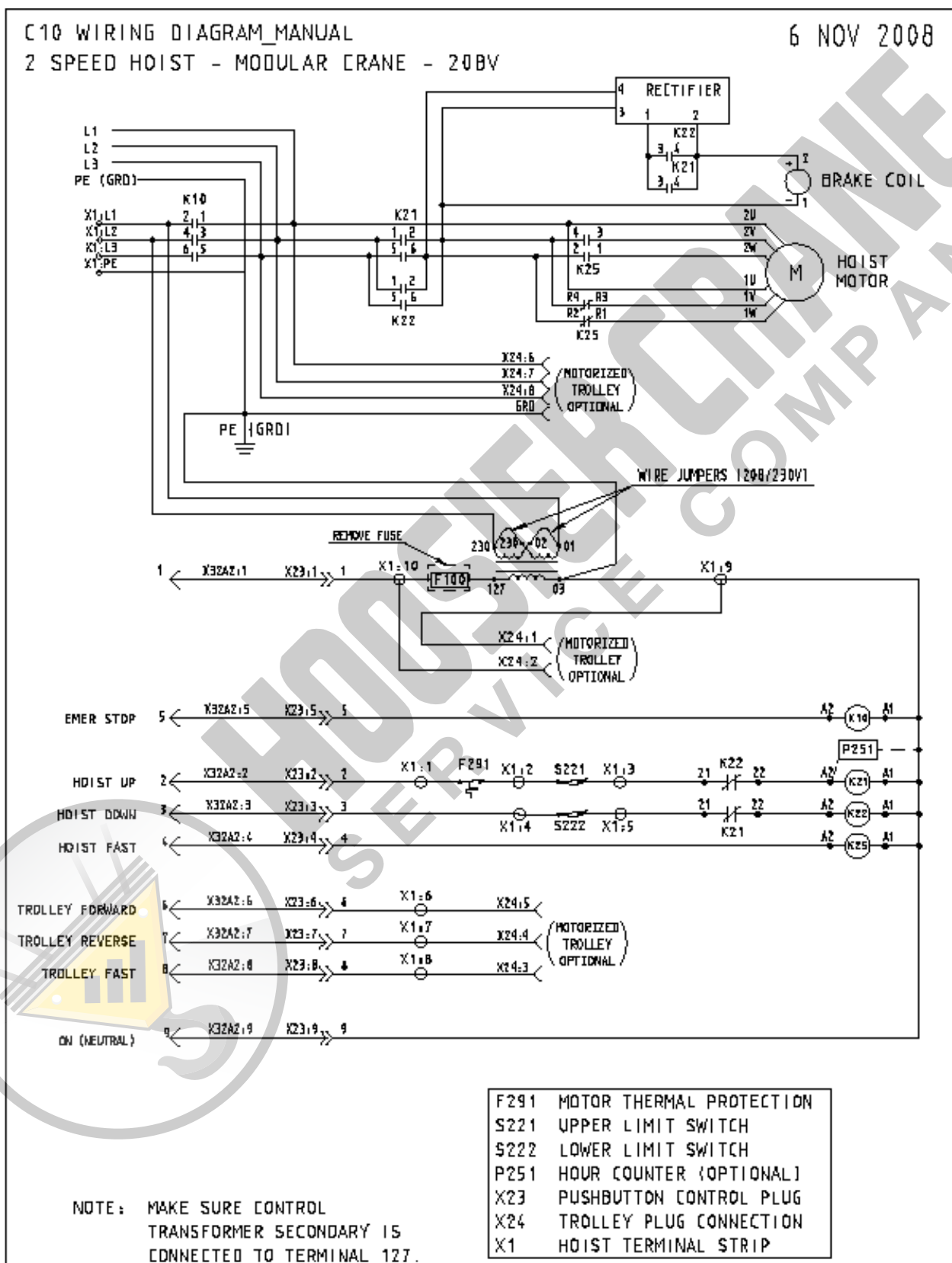
7.21 Single-Speed Hoist – Modular Crane – 460 Volt Diagram

Figure 32. Single-speed hoist – modular crane – 460 volt diagram



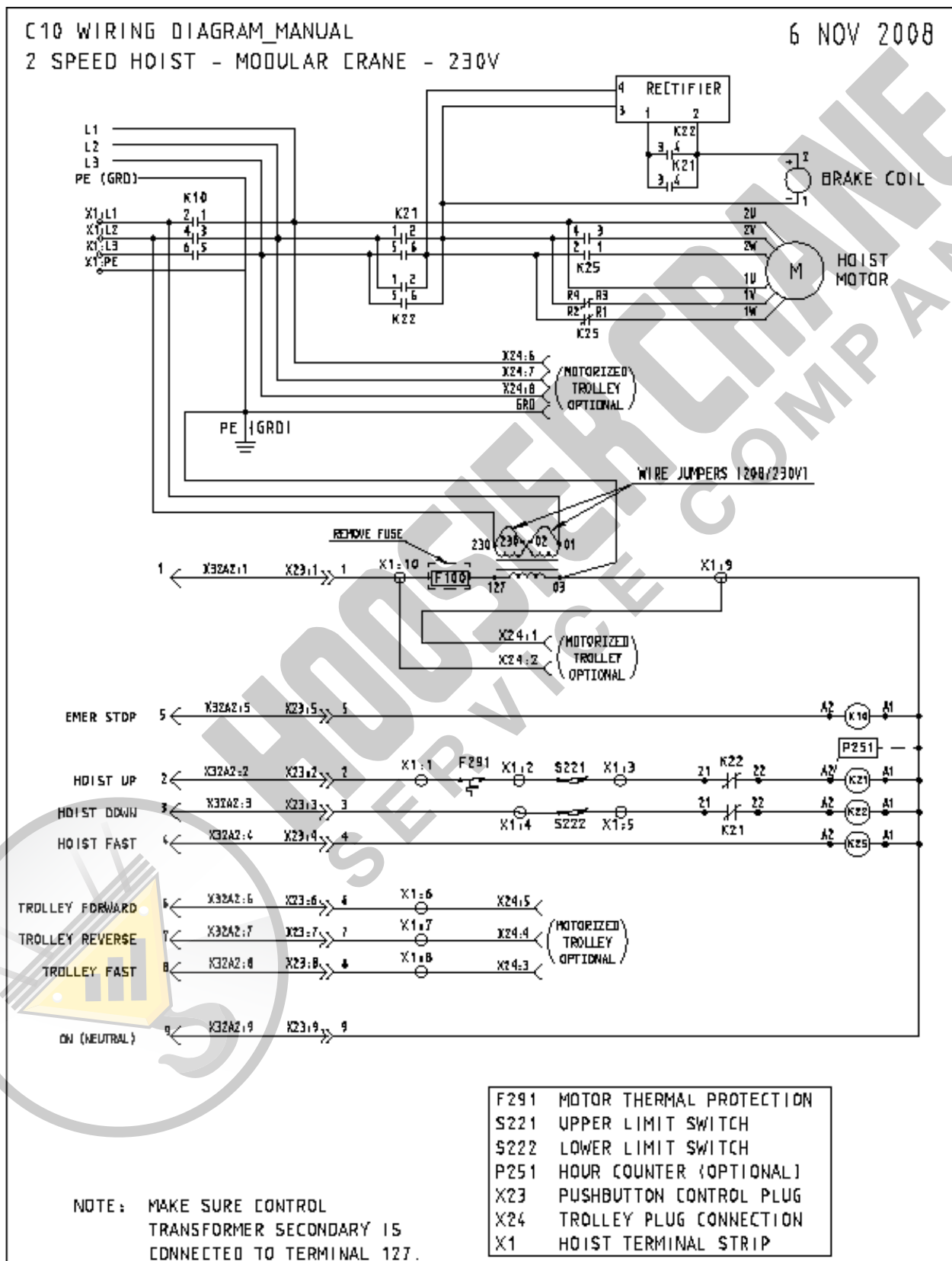
7.22 Two-Speed Hoist – Modular Crane – 208 Volt Diagram

Figure 33. Two-speed hoist – modular crane – 208 volt diagram



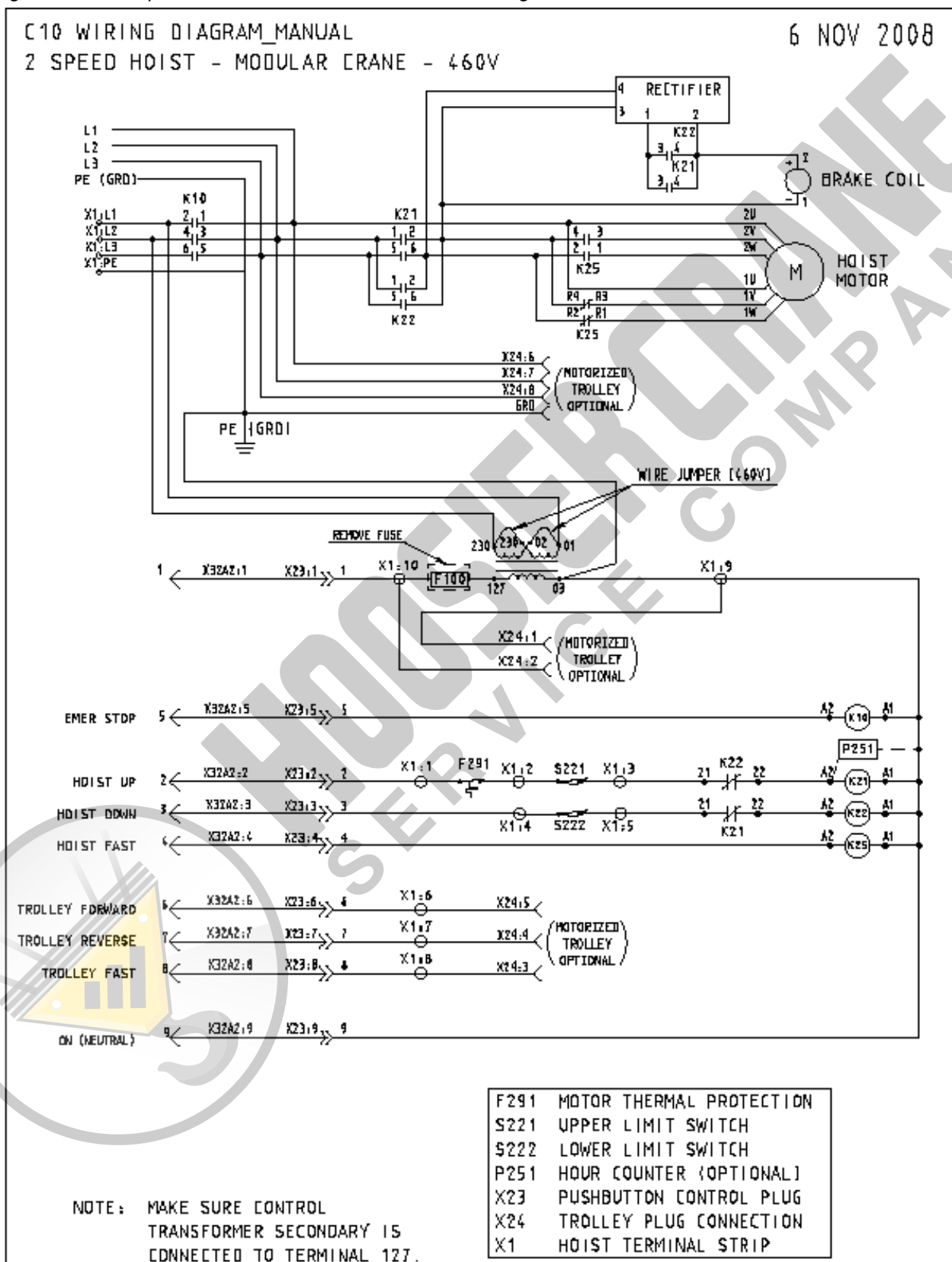
7.23 Two-Speed Hoist – Modular Crane – 230 Volt Diagram

Figure 34. Two-speed hoist – modular crane – 230 volt diagram



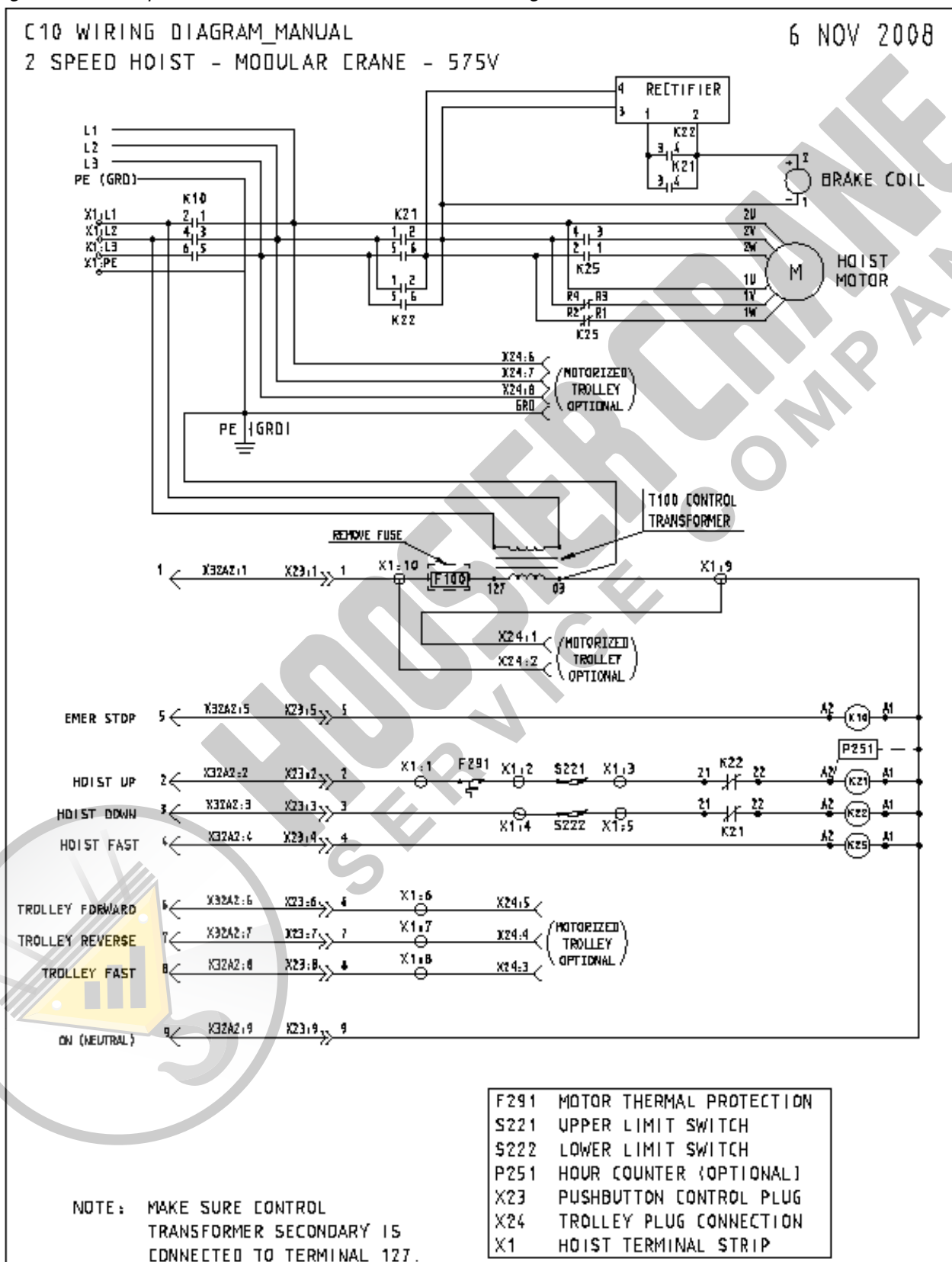
7.24 Two-Speed Hoist – Modular Crane – 460 Volt Diagram

Figure 35. Two-speed hoist – modular crane -460 volt diagram



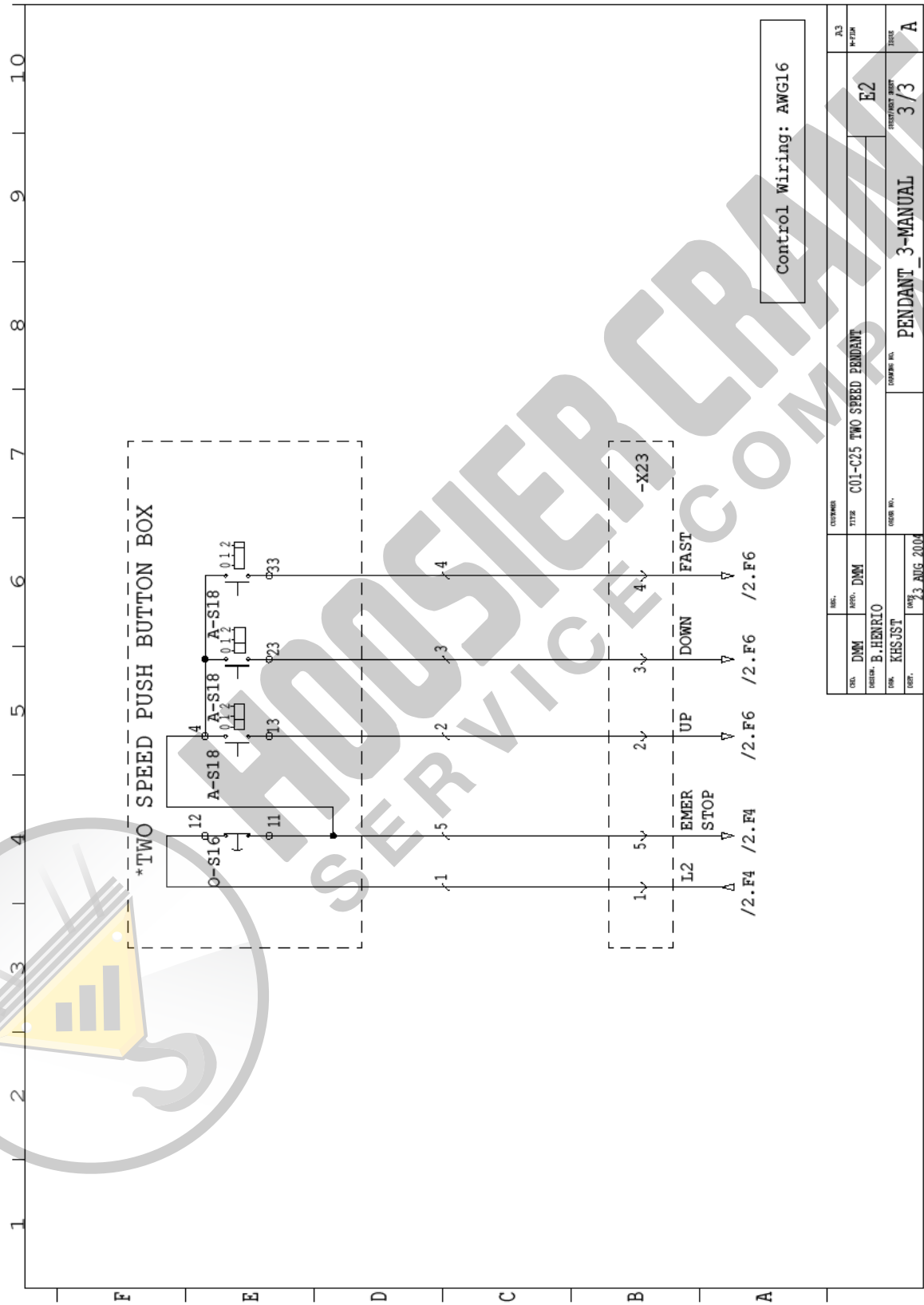
7.25 Two-Speed Hoist – Modular Crane – 575 Volt Diagram

Figure 36. Two-speed hoist – modular crane – 575 volt diagram



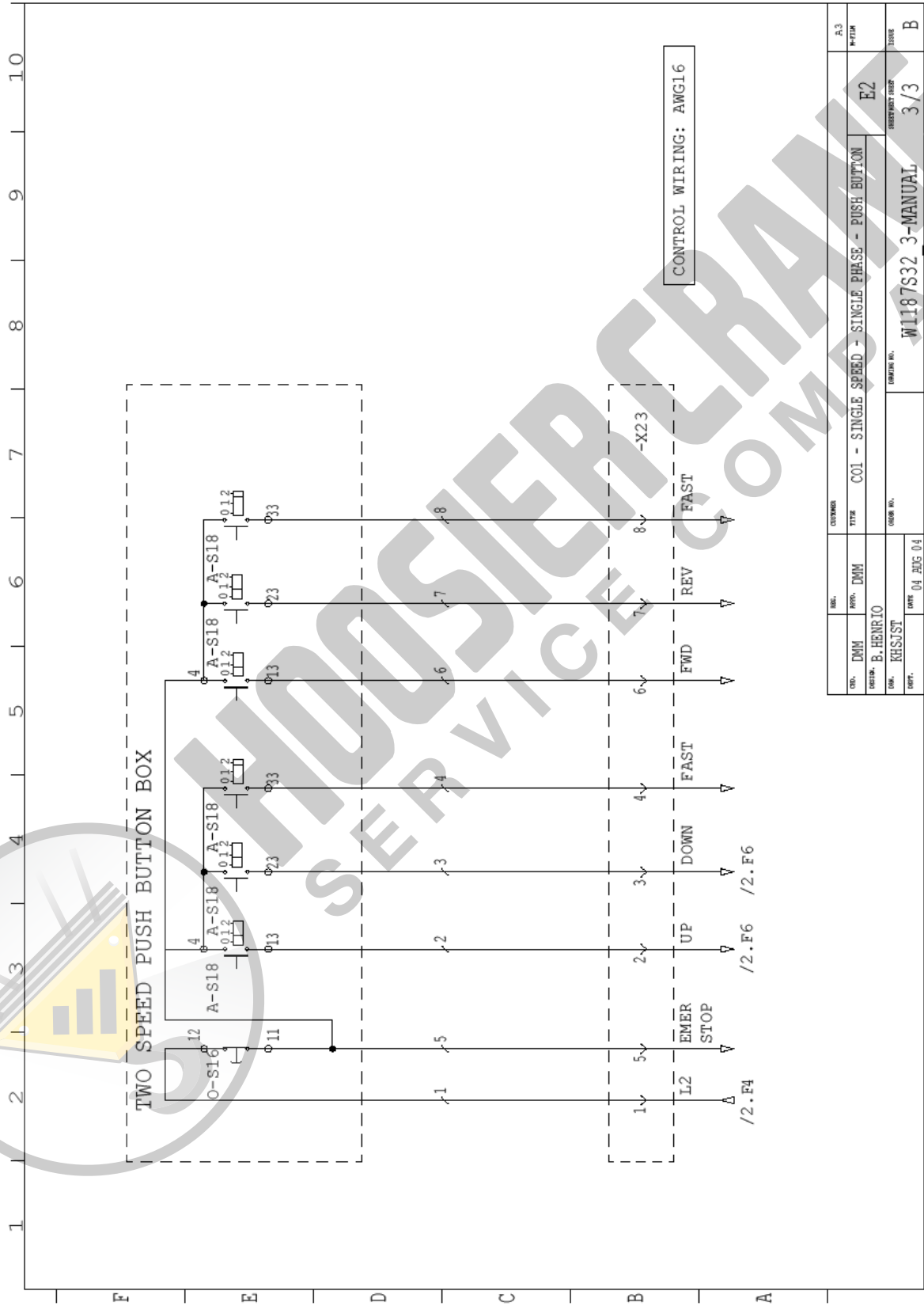
7.26 Wiring Diagram – 3 Button – Push Button

Figure 37. Wiring diagram – 3 button – push button



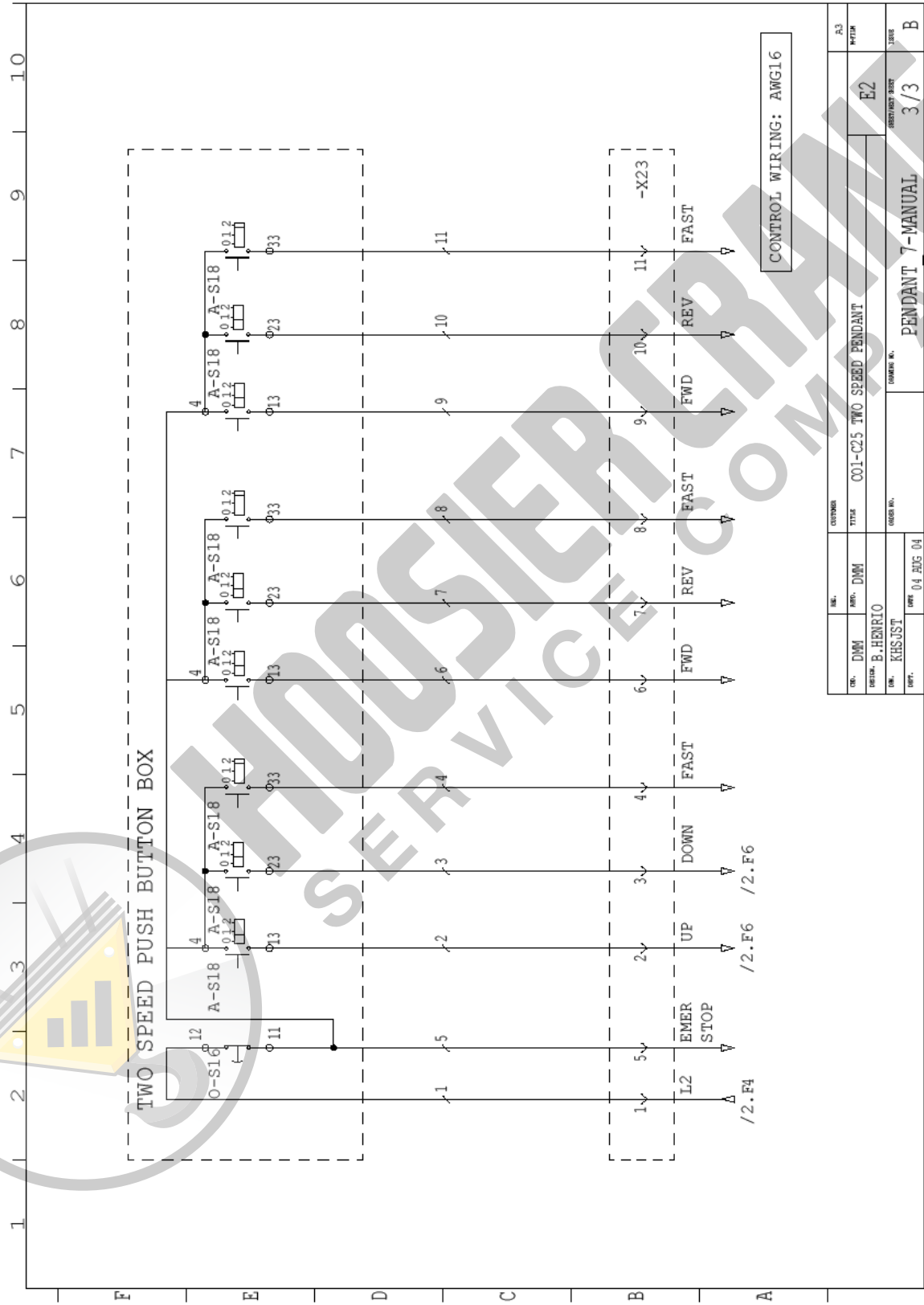
7.27 Wiring Diagram – 5 Button – Push Button

Figure 38. Wiring diagram – 5 button – push button



7.28 Wiring Diagram – 7 Button – Push Button

Figure 39. Wiring diagram – 7 button – push button



8 PREVENTATIVE MAINTENANCE

8.1 Maintenance and Inspection Table

Table 5. Maintenance Schedule

INSPECTION CHECK	INTERVAL	QUALIFIED PERSON
BRAKE OPERATION FOR HOLDING AND RELEASING	DAILY	OPERATOR
LOAD CHAIN FOR DAMAGE	DAILY	OPERATOR
SUSPENSION SUPPORT OF P/ B ASSEMBLY	DAILY	OPERATOR
CLEANLINESS & LUBRICATION OF LOAD CHAIN	MONTHLY	OPERATOR
UPPER / LOWER LIMIT SWITCHES	DAILY	OPERATOR
CHECK LOAD CHAIN FOR WEAR – MEASURE AND RECORD	EVERY 3 MONTHS	QUALIFIED INSPECTOR
CHECK HOOKS FOR WEAR MEASURE AND RECORD	EVERY 3 MONTHS	QUALIFIED INSPECTOR
CHECK LOAD BLOCK HARDWARE TO VERIFY TIGHTNESS	EVERY 3 MONTHS	OPERATOR
CHECK TOP HOOK / COUPLING HARDWARE FOR TIGHTNESS	EVERY 3 MONTHS	OPERATOR
CHECK SLIP CLUTCH & HOIST BRAKE ADJUSTMENT	EVERY 3 -6 MONTHS	QUALIFIED MECHANIC
CHECK LUBRICATION OF OPEN WHEEL GEARING	EVERY 3 -6 MONTHS	QUALIFIED MECHANIC
CHECK WIRE TERMINALS TIGHTNESS	SEMI-ANNUALLY	QUALIFIED MECHANIC
LUBRICATE 2-FALL LOAD BLOCK SPROCKET	ANNUALLY	OPERATOR
CHECK ALL HARDWARE FOR TIGHTNESS AND CORROSION	ANNUALLY	QUALIFIED MECHANIC
CLEAN MOTOR COOLING FINS	ANNUALLY	QUALIFIED MECHANIC
LUBRICATE ALL GEARING	ANNUALLY	QUALIFIED MECHANIC
INSPECT LOAD BLOCK THRUST BEARING	ANNUALLY	QUALIFIED MECHANIC



CAUTION: INSPECTION AND MAINTENANCE INTERVALS SHOULD BE ADJUSTED BASED UPON OWNER / USER KNOWLEDGE OF APPLICATION, ENVIRONMENT, AND FREQUENCY OF USE TO PREVENT DAMAGE TO PEOPLE, EQUIPMENT, AND FACILITIES.

8.2 Lubrication

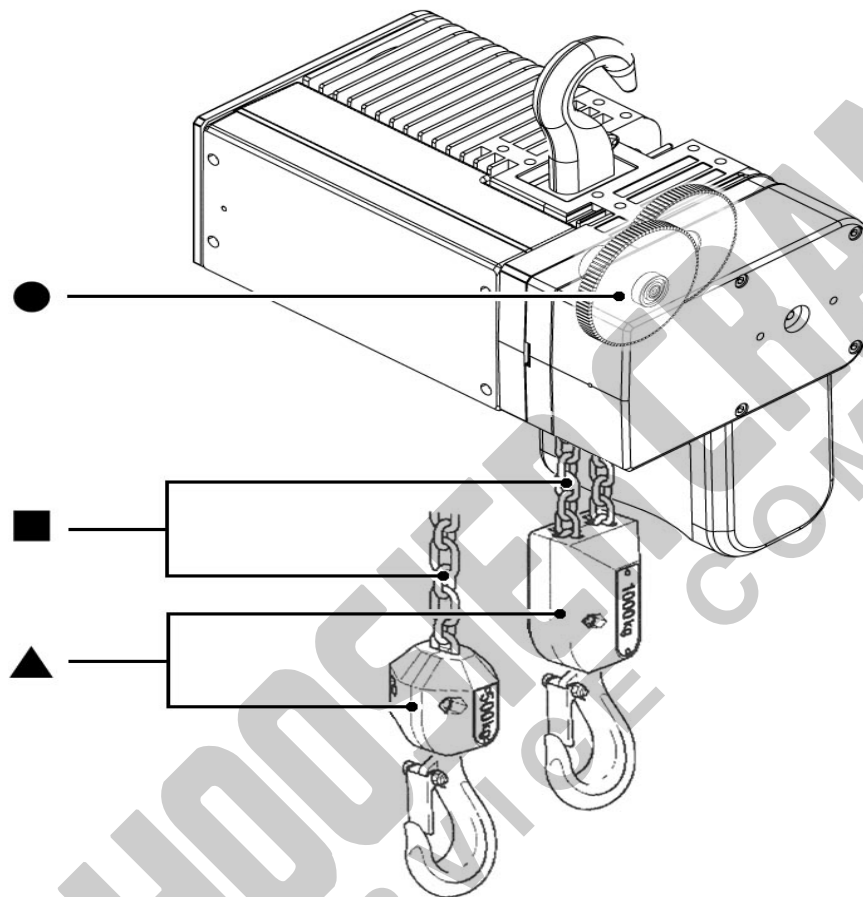


Table 6. Lubrication Specifications

LUBRICATION POINT	SPECIFICATIONS	ACCEPTABLE LUBRICANTS	QUANTITY
Chain ■	Oil or Liquid grease	Chain lubricating fluid (Ceplattyn or similar) EP-90	As required
Idler sprocket Slide bearing + bearing ▲	Grease (without MoS2) KP 2 (DIN 51 502) Soap-based lithium Approx. drip point + 500 °F Worked penetration 509-563 °F Operating temperature - 4 °F - +266 °F	BP: BP Energrease LS - EP 2 Esso: Unirex N2 Mobil: Mobilgrease HP Shell: Shell Alvania EP Grease 2	As required
Gears ●	KP 0 K grease (DIN 51502) Soap-based lithium + MoS 2 Approx. drip point + 180 °C Worked penetration 355 - 385 °C Operating temperature -30 °C to + 130 °C	Mobil: Mobilgrease special BP: Multi-purpose grease L 21 M Shell: Shell Retimax AM Texaco: Molytex grease EP 2	0.05 liter

Open Wheel Gearing: EP1 Mobilux or equivalent.

8.3 Recommended technical support for various spare parts

Table 7. Recommended Technical Support for Various Spare Parts

SPARE PART	REPLACED BY
Upper chain guide	Qualified Electrician & Mechanic
Output shaft	Qualified Electrician & Mechanic
PG cable gland	Qualified Electrician
Gear shaft + nuts	Qualified Mechanic
Motor end cap	Qualified Mechanic
Gearing (1st/2nd stage)	Qualified Electrician & Mechanic
Brake & end cap sealing	Qualified Mechanic
Other seals and O-rings	Qualified Mechanic
Brake-limiter	Qualified Electrician
Brake end cap	Qualified Mechanic
Lower chain guide	Qualified Mechanic
Rubber buffer	Qualified Mechanic
Electric box	Qualified Electrician
PC-board	Qualified Electrician
Plugs	Qualified Electrician
Chain	Qualified Mechanic
Chain bucket	Qualified Mechanic
Slack fall stop	Qualified Mechanic
Suspension hook	Qualified Mechanic
Hook block assembly	Qualified Mechanic
Control box	Qualified Electrician



NOTE: Once a part has been replaced, perform an operational check of hoist per Sections 3.3 and 3.4.

8.4 Screw Tightening Torque (lb-ft) Specifications

Table 8. Screw Tightening Torque Specifications

TYPE	M5	M6	M8	M10	M12
STANDARD SCREWS	4	7	18	35	61
SELF-TAPPING SCREWS	4	6	15	30	53

8.5 Troubleshooting

Table 9. Troubleshooting

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Hoist does not lift or lower load	Emergency stop button is activated	Deactivate button
	Blown fuse	Replace the fuse
	Motor thermal protection activated	Allow motor to cool down
	Pendant plug pin pushed out	Reinstall plug pin
	Contactor terminal screws loose	Tighten screws
	Mainline switch shut off	Turn switch on
Hoist does not lift load	Overload condition	Reduce load
	Slip clutch worn or incorrectly adjusted	Replace wear items or readjust slip clutch torque
	Brake not releasing	Check brake coil resistance. Check air gap setting. Adjust if necessary. Check rectifier output voltage.
Load drifts more than 4 inches [100mm]	Brake lining worn Air gap on brake is too wide	Replace wear items as necessary Adjust air gap setting
Travel direction does not correspond to that indicated on push button	Power supply incorrectly connected	See SECTION 3
Abnormal noises while lifting or lowering	Load chain and its components are not lubricated	Clean and lubricate load chain.
	Load chain is worn	Replace chain
	Chain wheel or chain guide is worn	Replace chain wheel or chain guide
	Idler sprocket is worn	Replace idler sprocket
	A supply phase is missing	Connect the three phases
	Twist or kink in load chain	Remove twist or kink

9 PARTS ILLUSTRATION

9.1 Hoist Body

Figure 40. Hoist body

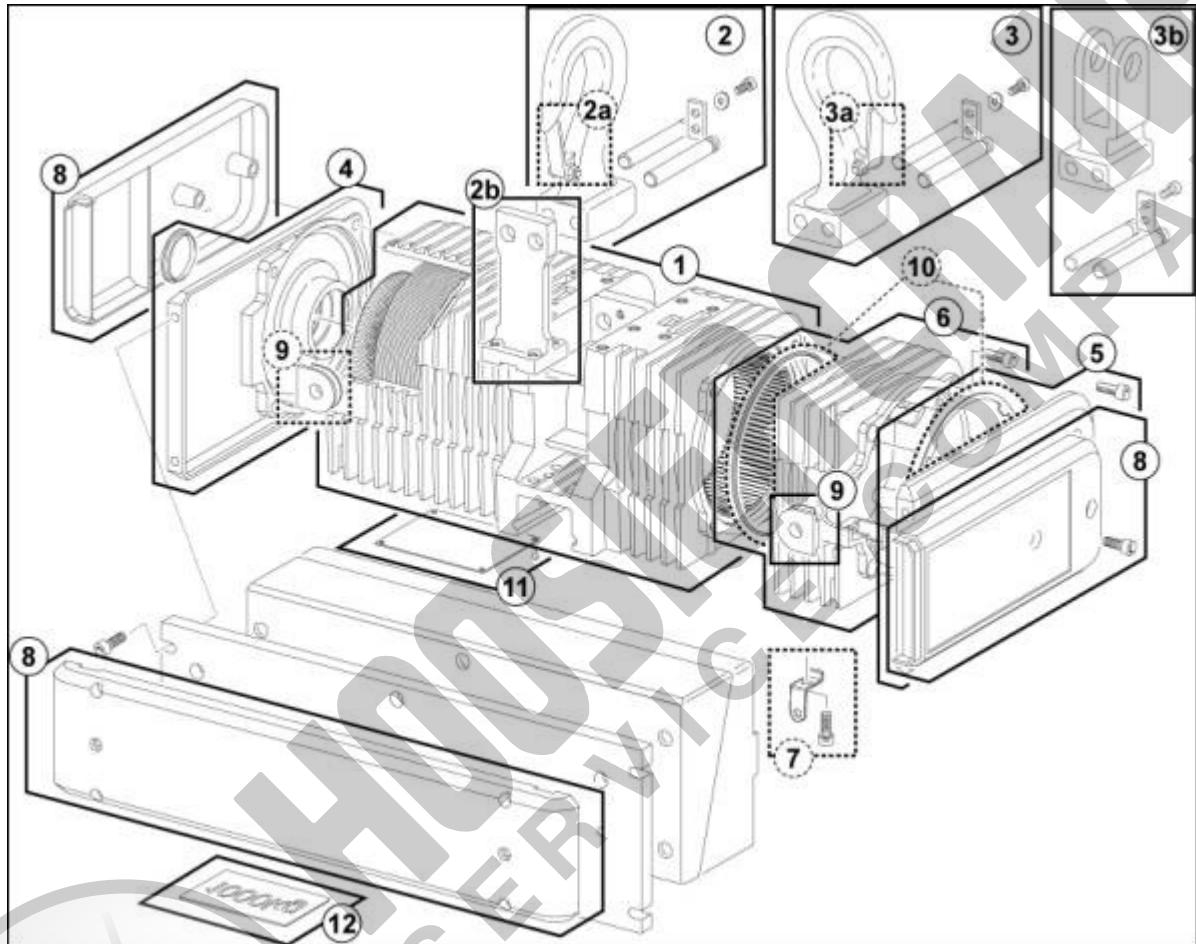
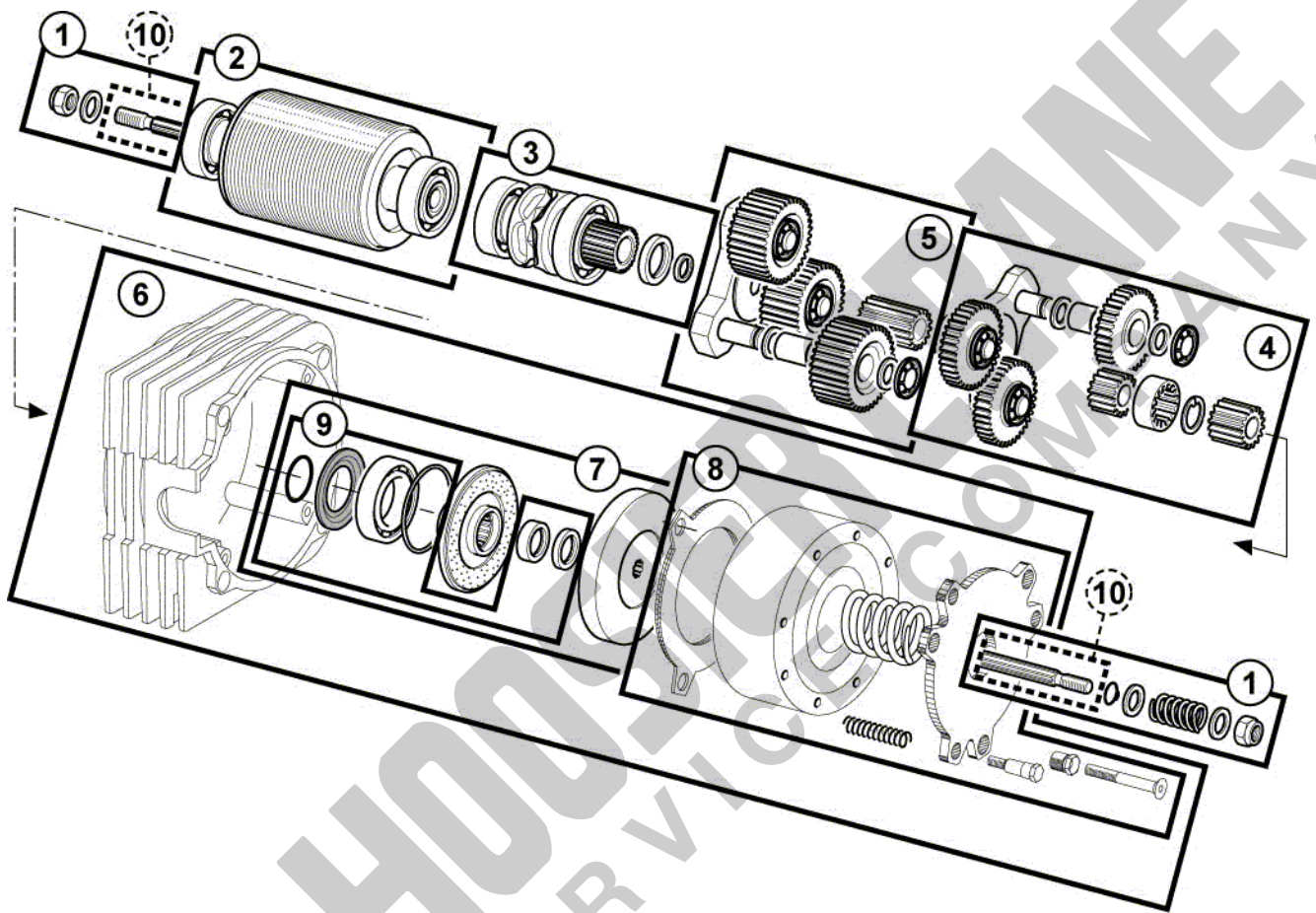


Table 10. Hoist Body Parts List

ITEM	PART NUMBER	DESCRIPTION	QTY
1		STATOR	1
2	2249955	SUSPENSION HOOK ASSEMBLY - PERPENDICULAR MOUNTING	1
2a	2242017	SAFETY LATCH – STEEL PLATE TYPE	1
2b	2242011	SUSPENSION MEMBER	1
2c	2249921	SUSPENSION BRACKET ASSEMBLY WITH AXLE AND SCREWS – PERPENDICULAR MOUNTING (NOT SHOWN)	1
3	2249954	SUSPENSION HOOK ASSEMBLY – PARALLEL MOUNTING	1
3a	2242017	SAFETY LATCH – STEEL PLATE TYPE	1
3b	2249920	SUSPENSION BRACKET ASSEMBLY WITH AXLE AND SCREWS – PARALLEL MOUNTING	1
	52312841	SUSPENSION BRACKET ASSEMBLY WITH AXLE AND SCREWS – PERPENDICULAR MOUNTING (FOR RPT TROLLEY)	1
4	2249904	MOTOR END CAP ASSEMBLY	1
5	2249903	BRAKE END CAP ASSEMBLY	1
6	2240011	BRAKE CAP ASSEMBLY	1
7	2218000	PUSHBUTTON CABLE FASTENING BRACKET	1
8	2406879002	STICKERS AND COVERS LM 10	1
9	2218004	CABLE GUIDE	1
10	2240013	SEALING RING AND O-RING FOR BRAKE CAP	1
11	-	MOTOR DATA PLATE	1
12	2213309008	CAPACITY STICKER – 500 kg	1
12	2213309009	CAPACITY STICKER – 1000 kg	1
12	2213309016	CAPACITY STICKER – 1500 kg	1
12	2213309010	CAPACITY STICKER – 2000 kg	1
12	2213309002	CAPACITY STICKER – ½ ton	1
12	2213309003	CAPACITY STICKER – 1 ton	1
12	2213309014	CAPACITY STICKER – 1.5 ton	1
12	2213309004	CAPACITY STICKER – 2 ton	1

9.2 Gear Mechanism With Motor Brake

Figure 41. Gear mechanism with motor brake



ITEM	QTY	PART NO.	DESCRIPTION
1	1	2249940	Slipping clutch spring with motor shaft
2	1	2245025	Rotor assembly - 1 and 2-speed type
3	1	2249941	Chain sprocket assembly
4	1	2249937	Planetary gear train - 1st step -
5	1	2249938	Planetary gear train - 2nd step - 8M/MN (reducing 58)
5	1	2249951	Planetary gear train - 2nd step - 16M/mn (reducing 29)
6	1	2241074	Brake assembly complete with brake cap – 190 VDC / 380-480 VAC
6	1	2241073	Brake assembly complete with brake cap – 100 VDC / 208-230 VAC
6	1	2241072	Brake assembly complete with brake cap – 230 VDC / 575 VAC
7	1	2249972	Slipping clutch friction assembly
8	1	2248001	Brake, complete 190 VDC / 380-480 VAC
8	1	2248000	Brake, complete 100 VDC / 208-230 VAC
8	1	2248003	Brake, complete 230VDC / 575 VAC
9	1	2240012	Set of seals for brake cap
10	1	2241501	Motor shaft

THIS PAGE INTENTIONALLY LEFT BLANK

HOOSIER CRANE
SERVICE COMPANY



9.3 Lifting Assembly

Figure 42. Lifting assembly

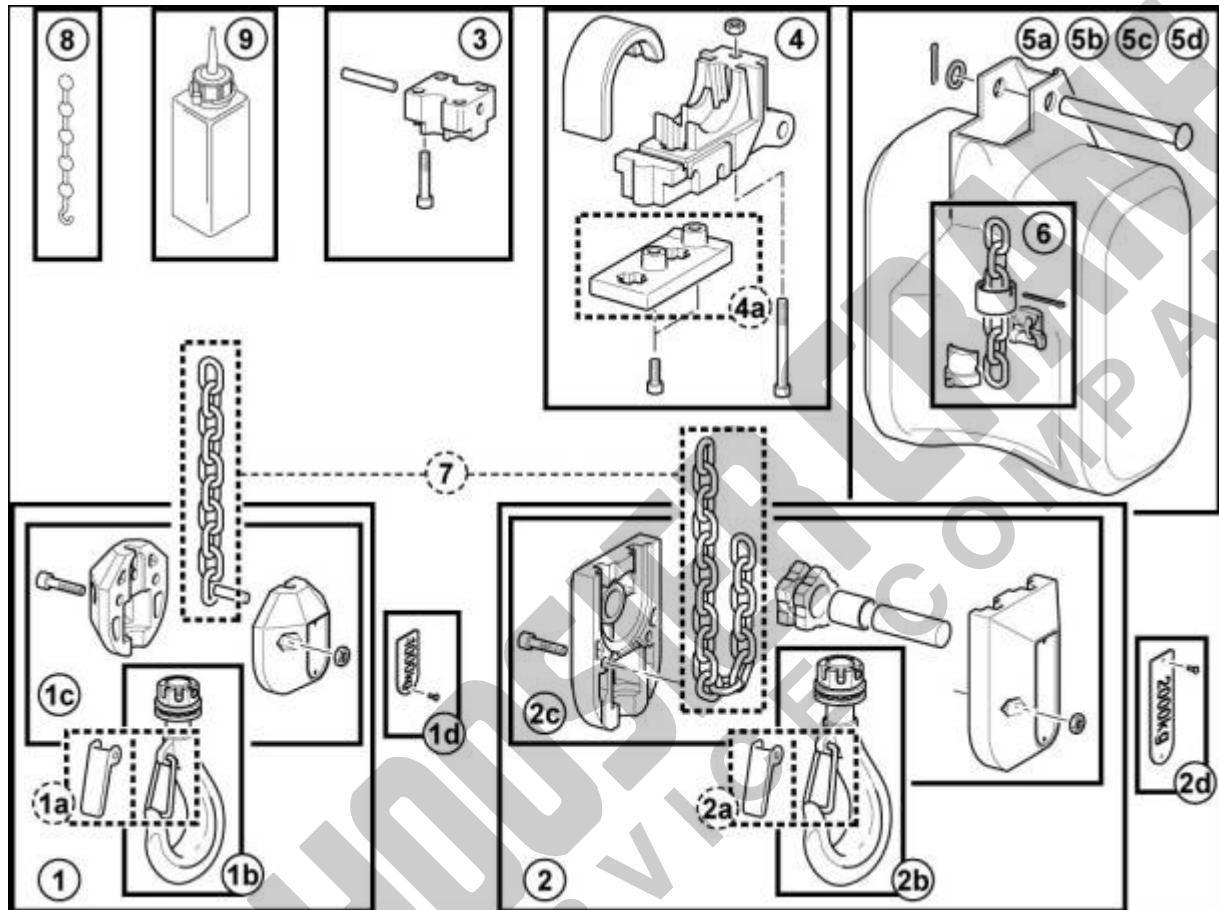


Table 11. Lifting Assembly Parts List

ITEM	PART NUMBER	DESCRIPTION	QTY
1	2249983	1-FALL LIFTING HOOK BLOCK – STANDARD TYPE	1
1	2242018	1-FALL LIFTING HOOK BLOCK – SELF-LOCKING TYPE	1
1a	001515	SAFETY LATCH – STEEL WIRE TYPE - 1 FALL	1
1a	2212017	SAFETY LATCH – STEEL PLATE TYPE - 1 FALL	1
1b	2217004	1-FALL LIFTING HOOK – STANDARD TYPE	1
1b	2247015	1-FALL LIFTING HOOK – SELF-LOCKING TYPE	1
1c	2249976	SET OF 2 HALF-CASINGS WITH AXLE AND SCREWS	1
1d	2213333002	CAPACITY STICKER – ½ TON – 1 FALL	1
1d	2213333004	CAPACITY STICKER – 1 TON – 1 FALL	1
1d	2213333009	CAPACITY STICKER – 500 kg – 1 FALL	1
1d	2213333011	CAPACITY STICKER – 1000 kg – 1 FALL	1
2	2249984	2-FALL LIFTING HOOK BLOCK – STANDARD TYPE	1
2	2242028	2-FALL LIFTING HOOK BLOCK – SELF-LOCKING TYPE	1
2a	001513	SAFETY LATCH – STEEL WIRE TYPE – 2 FALLS	1
2a	2242017	SAFETY LATCH – STEEL PLATE TYPE – 2 FALLS	1
2b	2242021	2-FALL LIFTING HOOK – STANDARD TYPE	1
2b	2267015	2-FALL LIFTING HOOK – SELF-LOCKING TYPE	1
2c	2249978	SET OF 2 HALF-CASINGS WITH AXLE, RETURN SPROCKET AND SCREWS	1
2d	2213333004	CAPACITY STICKER – 1 TON – 2 FALLS	1
2d	2213333005	CAPACITY STICKER – 2 TON – 2 FALLS	1
2d	2213333011	CAPACITY STICKER – 1000 kg – 2 FALLS	1
2d	2213333012	CAPACITY STICKER – 2000 kg – 2 FALLS	1
3	2243523	CHAIN ANCHOR ASSEMBLY	1
4	52293746	UPPER AND LOWER CHAIN GUIDE ASSEMBLY WITH RUBBER BUFFER	1
4a	2244008	RUBBER BUFFER	1
	2244011	UPPER CHAIN GUIDE	1
5a	2249925	CHAIN BUCKET – 25FT [8M] MAXIMUM CHAIN LENGTH	1
5b	2249926	CHAIN BUCKET – 50FT [16M] MAXIMUM CHAIN LENGTH	1
5c	2249932	CHAIN BUCKET – 75FT [30M] MAXIMUM CHAIN LENGTH	1
5d	2249933	CHAIN BUCKET – 150FT [50M] MAXIMUM CHAIN LENGTH	1
6	2249942	SLACK FALL STOP ASSEMBLY	1
7a	2243500	LOAD CHAIN – GALVANIZED TYPE	*
7b	2243501	LOAD CHAIN – BLACK TYPE	*
7c	2243502	LOAD CHAIN – STAINLESS STEEL TYPE	*
8	2241045	LOAD CHAIN INSERTION TOOL	1
9	9995008	CHAIN LUBRICANT	1



*** NOTE: REFER TO CHAIN HOIST LIFT AND NUMBER OF FALLS FOR CHAIN QUANTITY**

9.4 Controls

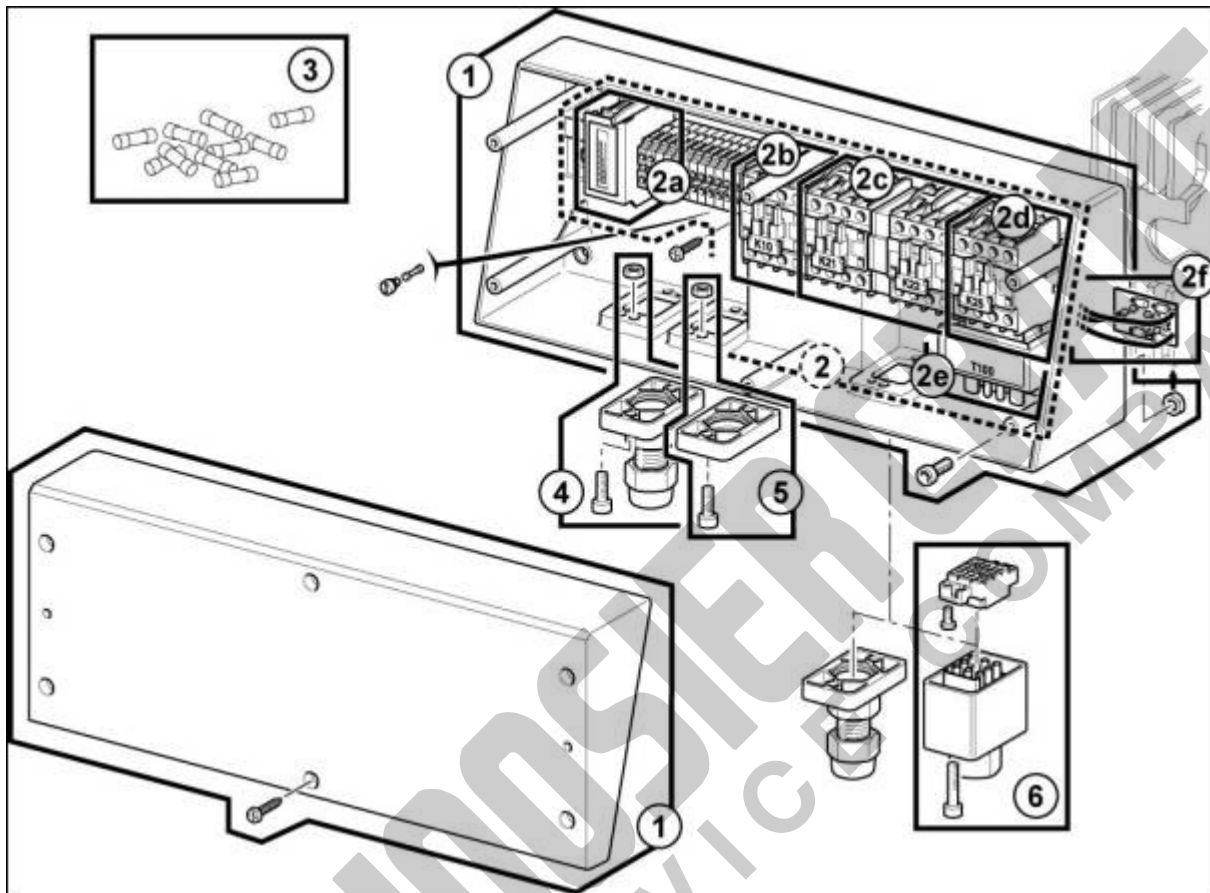


Table 12. Controls Parts List

ITEM	PART NUMBER	DESCRIPTION	QTY
1	2249965	ELECTRIC CUBICLE (LID, COVER AND SCREWS)	1
2	2243016	PRINTED CIRCUIT BOARD – 2 SPEED HOISTING + ON-OFF – 575V 60 Hz 115V AC	1
2	2243017	PRINTED CIRCUIT BOARD – 2 SPEED HOISTING + ON-OFF – 460V 60 Hz 115V AC	1
2	2243018	PRINTED CIRCUIT BOARD – 2 SPEED HOISTING + ON-OFF – 230V 60 Hz 115V AC	1
2	52339762	PRINTED CIRCUIT BOARD – SINGLE SPEED HOISTING + ON-OFF – 208/230V/460V 60 Hz 115V AC RECONNECTABLE	1
2a	2213028	HOUR COUNTER 115V AC 60 Hz	1
2b	7983055	EMERGENCY STOP CONTACTOR K10 115V AC	1
2c	7983056	REVERSING CONTACTOR K21 or K22 115V AC (coef. 2)	1
2d	7983057	SELECTING CONTACTOR K25 115V AC	1
2e	7983029	TRANSFORMER 400V 50&60Hz 115V AC	1
2e	7983027	TRANSFORMER 575V 60Hz 115V AC	1
2e	7983026	TRANSFORMER 230V/460V 60Hz 115V AC	1
2f	2243060	RECTIFIER 230V/400V/460V500V/575V	1
2f	2243061	RECTIFIER 230V/460V - RECONNECTABLE	1
3	52330744	SET OF 10 FUSES (115V)	1
4	2249947	CABLE GLAND ASSEMBLY	1
5	2219814	CLOSING PLATE ASSEMBLY	1
6	2249945	CONNECTING PLUG SET FOR PUSHBUTTON BOX	1
6	2249946	CONNECTING PLUG SET FOR PUSHBUTTON FOR TROLLEY	1
6	2249982	CONNECTING PLUG SET FOR POWER SUPPLY	1



9.5 Upper and Lower Limit Switch

Figure 43. Upper and lower limit switch

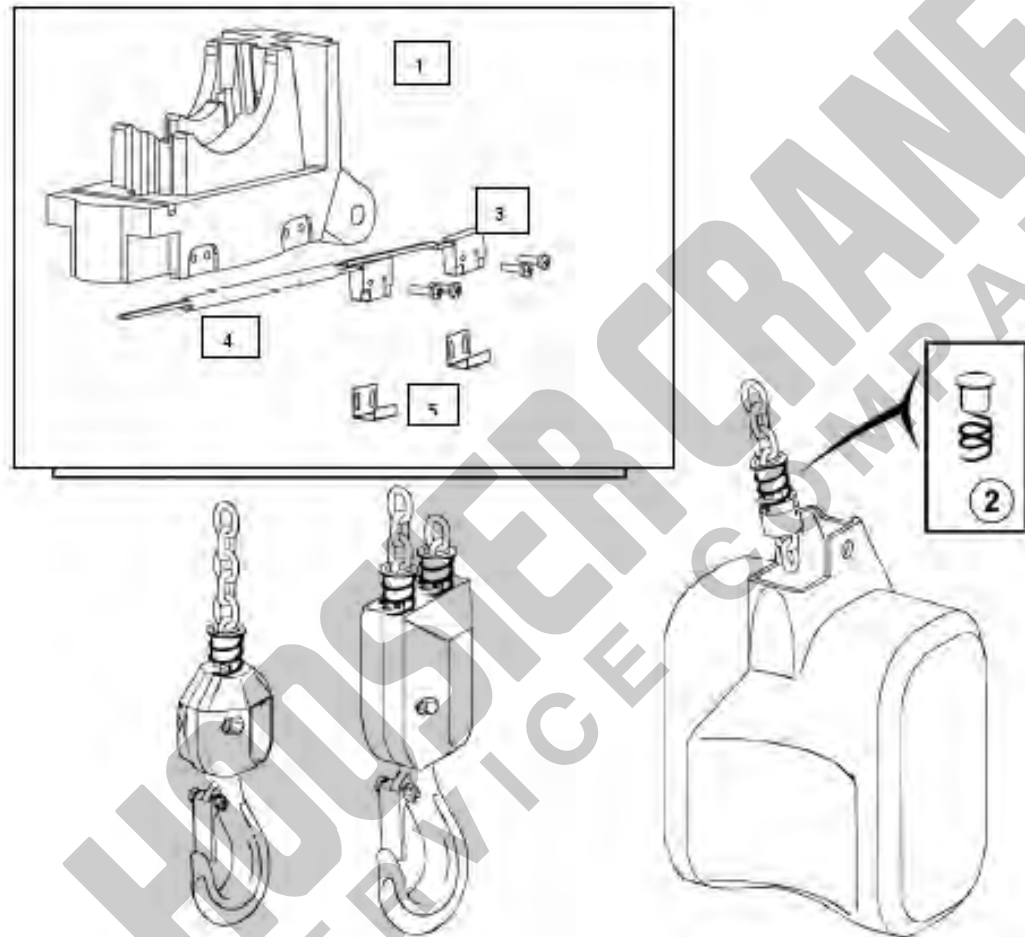


Table 13. Chain Guide Assembly with Limit Switches Parts List

ITEM	PART NUMBER	DESCRIPTION	QTY
1	2243050	MICRO-SWITCHES ASSEMBLY	1
2	52295974	SPRING ASSEMBLY AND SUPPORT	1
3	7291040	MICRO SWITCHES	1
4	-	CABLE GUIDE	1
5	52337705	SLIDES	2



CAUTION: Cut off the main power supply before doing any work on the electrical cubicle.

9.6 Double Brake Mechanism

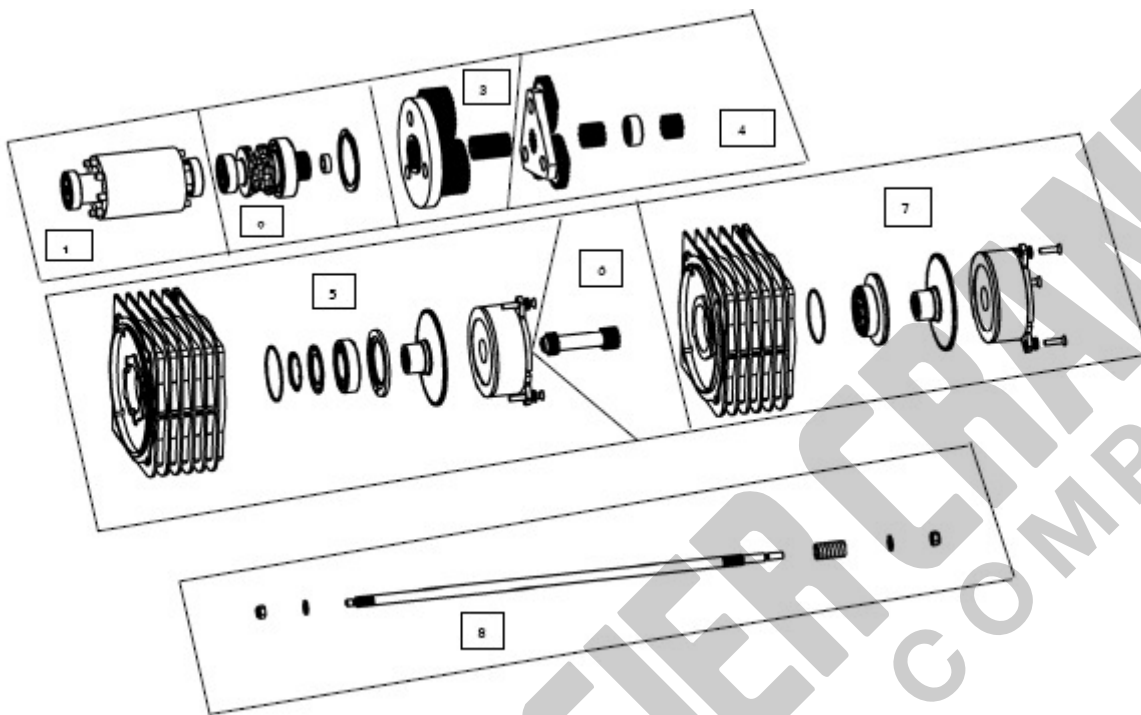


Table 14. Double Brake Mechanism Parts List

ITEM	PART NUMBER	DESCRIPTION	QTY
1	2245025	ROTOR ASSEMBLY	1
2	2249941	CHAIN SPROCKET ASSEMBLY	1
3	2249938	PLANETARY GEAR TRAIN - 2 nd STEP - 8M/MN (REDUCING 58)	1
3	2249951	PLANETARY GEAR TRAIN - 2 nd STEP - 16M/mn (REDUCING 29)	1
4	2249937	PLANETARY GEAR TRAIN – 1 ST STEP	1
5	2249006	BRAKE ASSEMBLY COMPLETE WITH BRAKE CAP – 1 ST BRAKE – 190 VDC / 380-480 VAC	1
5	2249016	BRAKE ASSEMBLY COMPLETE WITH BRAKE CAP – 1 ST BRAKE – 100 VDC / 208-230 VAC	1
6	2249054	PINION	1
7	2249007	BRAKE ASSEMBLY COMPLETE WITH BRAKE CAP – 2 nd BRAKES – 190 VDC / 380-480 VAC	1
7	2249017	BRAKE ASSEMBLY COMPLETE WITH BRAKE CAP – 2 nd BRAKES – 100 VDC / 208-230 VAC	1
8	2249051	DOUBLE BRAKE MOTOR SHAFT	1

9.7 Low Headroom Trolley

9.7.1 Low Headroom Trolley (Drive Components)

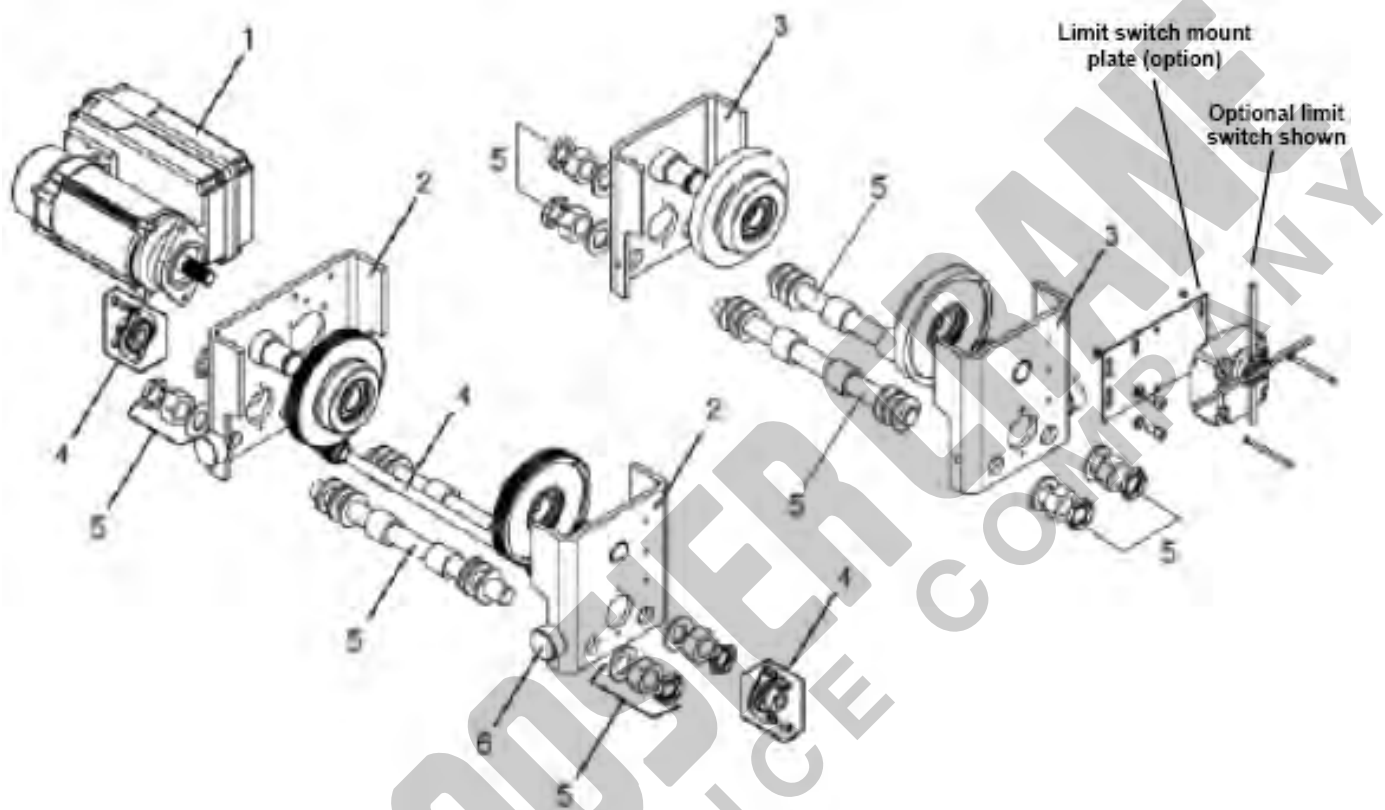


Table 15. Low Headroom Trolley Short Outreach (Drive Components)

ITEM	DESCRIPTION			C10 SHORT	
				QTY	CODE
1	Complete 2-speed motor drive 115Vc	460V	≤ 2 Ton (2000 Kg)	1	52306026
		575V		1	52306027
		208/230V		1	52306028
	Complete inverter motor drive 115Vc	460V	> 1 Ton (1000 Kg)	1	52299090
		575V 208/230V	> 1 Ton ≤ 2 Ton	1	52304881
2	Geared drive side plates			2	52391073
3	Ungeared idler side plates			2	52391072
4	Pinion drive assy			1	52311194
5	XHEAD assy 2.28 - 4.33 in. (set of 4)			4	556902
	XHEAD assy 4.45 - 6.69 in. (set of 4)			4	556903
	XHEAD assy 7.00 – 9.45 in. (set of 4)			4	556904
	XHEAD assy 9.76 – 12.20 in. (set of 4)			4	556905
6	Rubber buffer			4	558993
*	Transformer for inverter trolley	460V		1	52304748
		575V		1	52304749
		208/230V		1	52304746
*	Transformer mounting bracket			1	2309848001

* Not shown in diagram



9.7.2 Low Headroom Trolley (Suspension Components)

Figure 44. Low headroom trolley (suspension components)

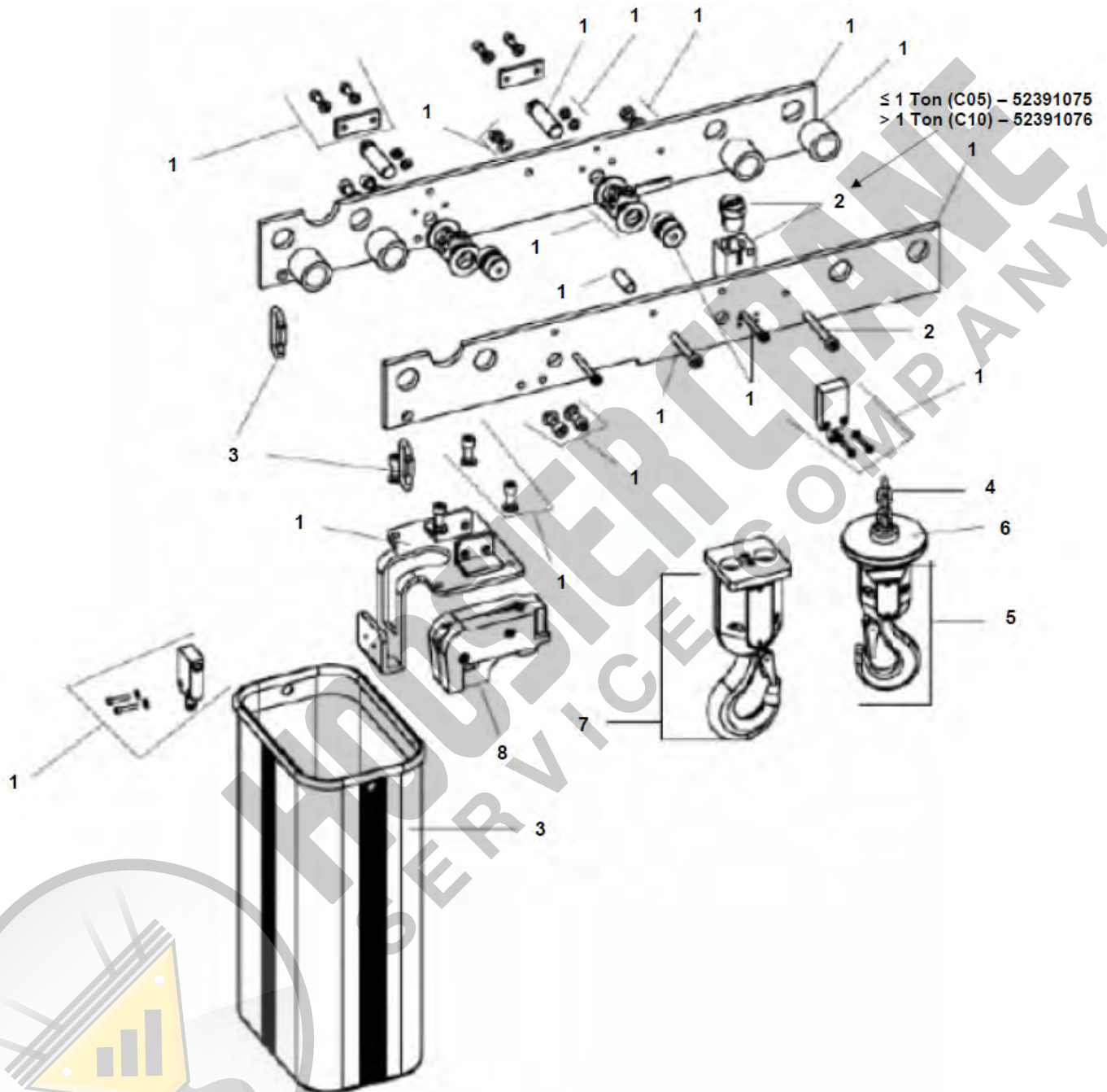


Table 16. Low Headroom Trolley (Suspension Components)

ITEM	DESCRIPTION		C10 SHORT	
			QTY	CODE
1	LH Short Outreach Frame Assy		1	52391066
2	Fixed point assy (not applicable for 1-fall hoists)		1	52391076
3	Chain bag (from 0 to 30 m)	to 65 ft.	1	52333407
		66 to 130 ft.	1	52328053
4	Lifting chain galva. (Length: HOL + 5 ft.)		-	2243500
5	Lower hook block assy 1 fall		1	52387611
6	Counterweight for 1 fall hook		1	557939
7	Lower hook block assy 2 falls		1	52387610
8	Chain guide		1	52425117

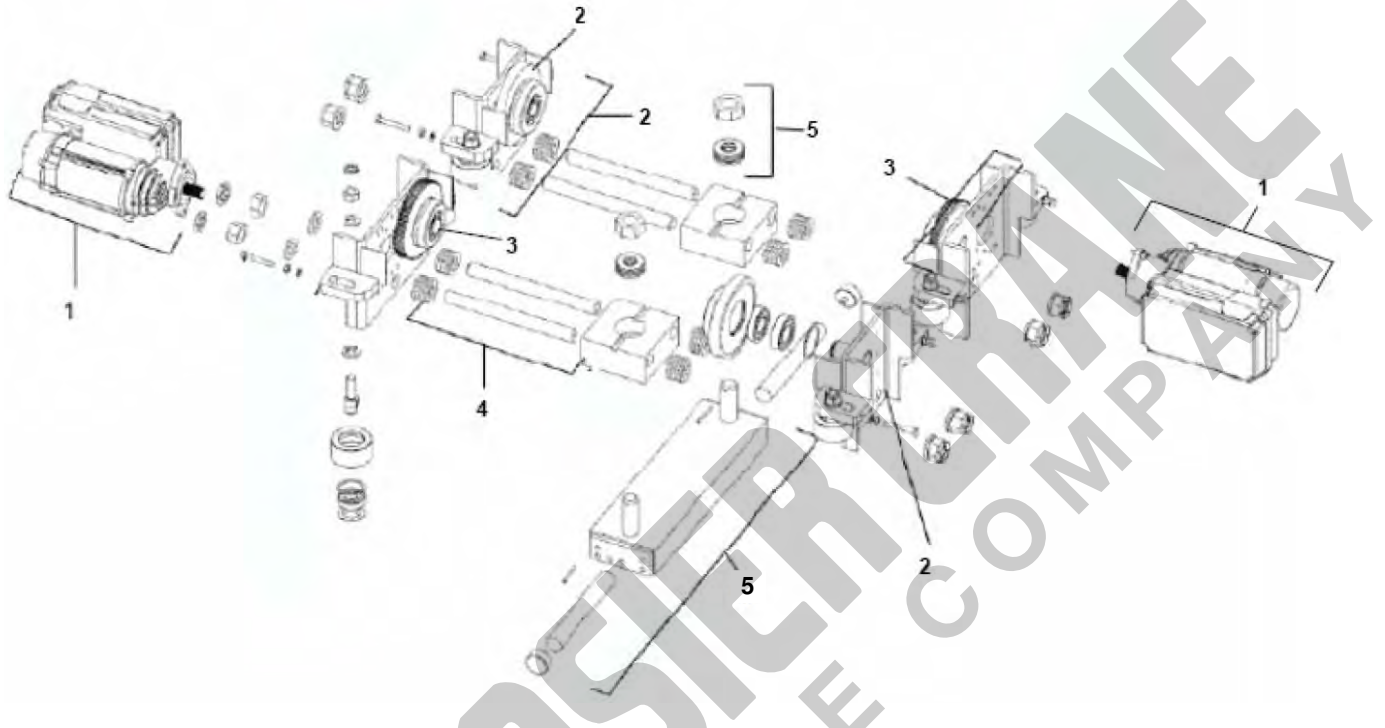


NOTE: When hoists are mounted on a low headroom trolley, they are supplied with aluminum chain guide.



9.8 Electric trolley (Swiveling trolley 0 to 3.2 Tons (3200 Kg))

Figure 45. Electric trolley (swiveling trolley 0 to 3.2 tons (3200 Kg))



NOTE: ECH is attached to swivel trolley through a mechanical connection. No top hook connection available.



Table 17. Electric trolley (Swiveling trolley 0 to 3.2 Tons (3200 Kg))

ITEM	DESCRIPTION			QTY	CODE
1	Complete 2-speed motor drive 115Vc	460V	≤ 3.2 Ton (3200 Kg)	2	52306026
		575V		2	52306027
		208/230V		2	52306028
	Complete inverter motor drive 115Vc	460V	≤ 1 Ton (1000 Kg)	2	52299090
		575V 208/230V	> 1 Ton ≤ 3.2 Ton	2	52304881
2	Idler side plate			2	52326596
3	Drive side plate			2	52326597
4	Swivel CHRD Kit 2.60 – 4.33 in. (set of 4)			1	556966
	Swivel CHRD Kit 2.60 – 4.33 in. (set of 4)			1	556967
	Swivel CHRD Kit 2.60 – 4.33 in. (set of 4)			1	556968
	Swivel CHRD Kit 2.60 – 4.33 in. (set of 4)			1	556969
5	Cross bar set for C05			1	52326598
	Cross bar set for C10			1	52326599
	Cross bar set for C16/20/25			1	52326602



9.9 Push Button Assembly – Horizontal Pairs of Buttons

Figure 46. Push button assembly – horizontal pairs of buttons

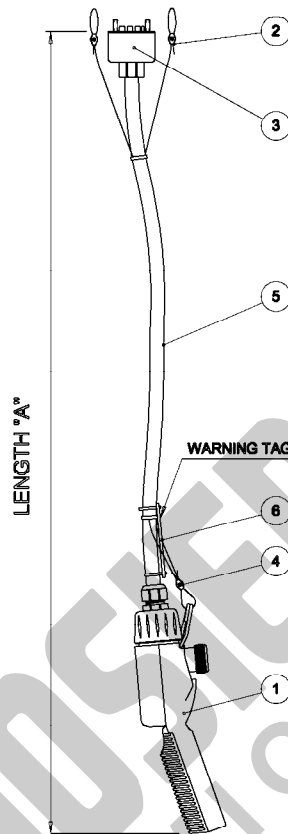


Table 18. Push Button Assembly (Horizontal Pairs of Buttons) Parts List

ITEM	PART NUMBER	DESCRIPTION	QTY
-	2309765010	P/B ASSEMBLY 10 FT, E-STOP, TWO SPEED HOIST	1
-	2309765015	P/B ASSEMBLY 15 FT, E-STOP, TWO SPEED HOIST	1
-	2309765020	P/B ASSEMBLY 20 FT, E-STOP, TWO SPEED HOIST	1
-	2309767010	P/B ASSEMBLY 10 FT, E-STOP, TWO SPEED HOIST, TWO SPEED TROLLEY	1
-	2309767015	P/B ASSEMBLY 15 FT, E-STOP, TWO SPEED HOIST, TWO SPEED TROLLEY	1
-	2309767020	P/B ASSEMBLY 20 FT, E-STOP, TWO SPEED HOIST, TWO SPEED TROLLEY	1
1a	52301832	P/B ENCLOSURE ASSEMBLY – E-STOP – TS HOIST	1
1b	2213466004	P/B ENCLOSURE ASSEMBLY – E-STOP – TS HOIST, TWO SPEED TROLLEY	1
2	2218000	UPPER SUSPENSION KIT	1
3	7285036	P/B ASSEMBLY - PLUG KIT	1
4	558073	SUSPENSION UNIT	1
5	52292266	PUSH BUTTON ELECTRICAL CABLE 16 GAUGE / 12 CONDUCTOR RPC	1
6	2309414005	R&M OPERATOR'S WARNING TAG - ENGLISH	1

9.10 Push Button Assembly – Horizontal Pairs of Buttons

Figure 47. Push button assembly – horizontal pairs of buttons

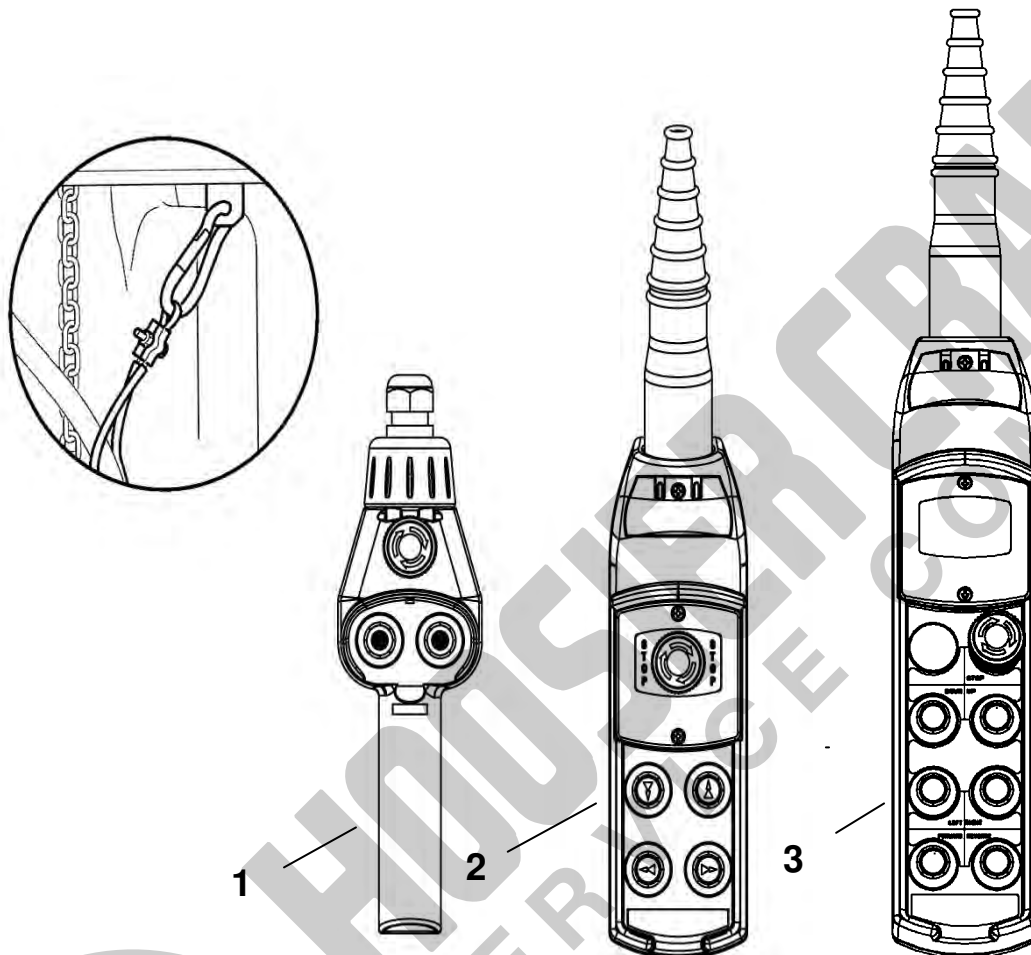


Table 19. Push Button Assembly – Horizontal Pairs of Buttons Parts List

ITEM	PART NUMBER	DESCRIPTION	QTY
1	52301832	PISTOL GRIP P/B CONTROL ASSEMBLY – TWO SPEED	1
2	2213466004	P/B CONTROL ASSEMBLY – TWO SPEED – 5 BUTTON	1
3	2213466005	P/B CONTROL ASSEMBLY – TWO SPEED – 7 BUTTON	1

9.11 Push Button Assembly – Vertical Pairs of Buttons (Option)

Figure 48. Push button assembly – vertical pairs of buttons

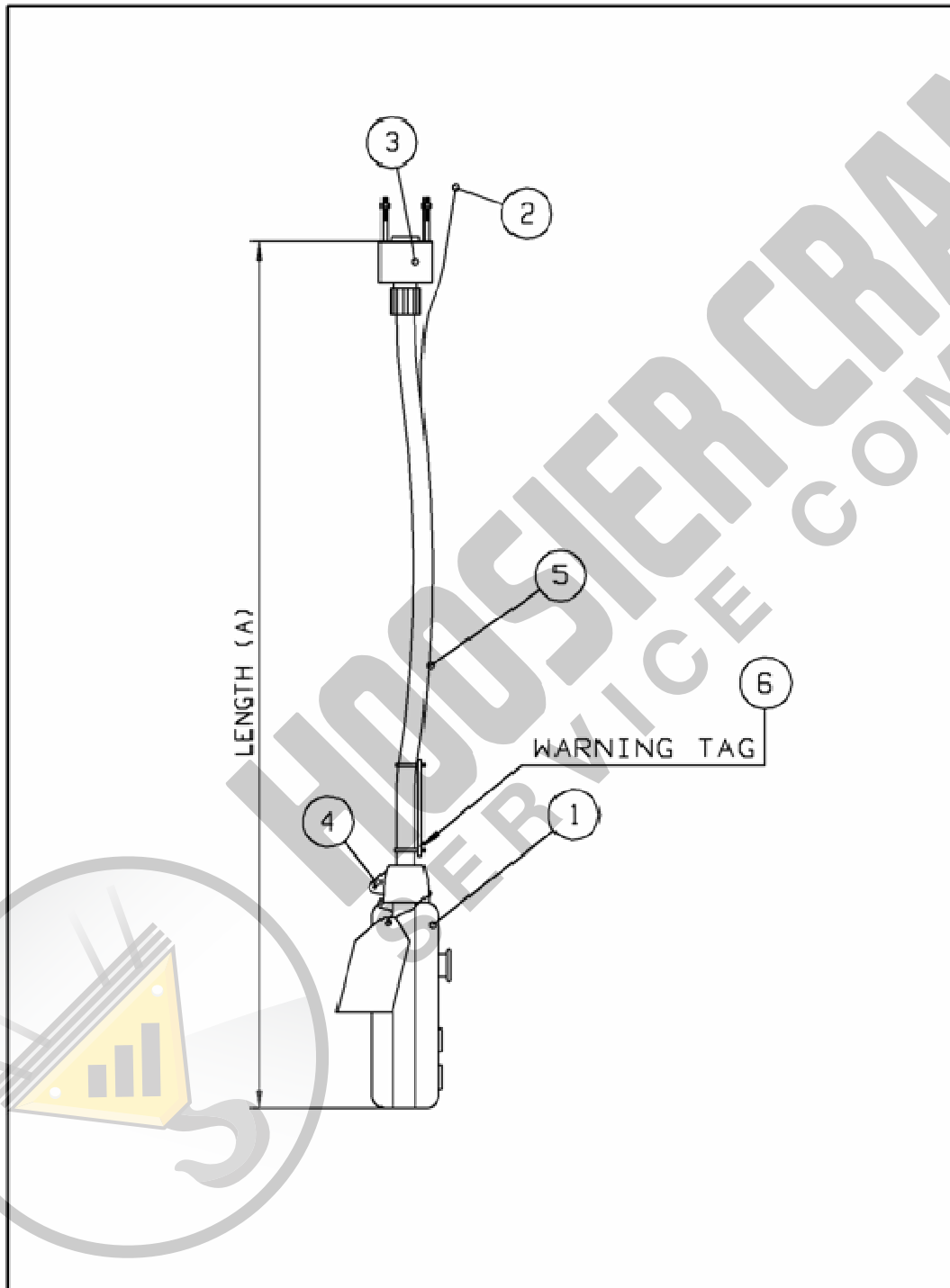


Table 20. Push Button Assembly – Vertical Pairs of Buttons (Option) Parts List

ITEM	PART NUMBER	DESCRIPTION	QTY
-	2309673010	E-STOP, SINGLE SPEED HOIST – 10 FT P/B ASSEMBLY	1
-	2309673015	E-STOP, SINGLE SPEED HOIST – 15 FT P/B ASSEMBLY	1
-	2309673020	E-STOP, SINGLE SPEED HOIST – 20 FT P/B ASSEMBLY	1
-	2309674010	E-STOP, TWO SPEED HOIST – 10 FT P/B ASSEMBLY	1
-	2309674015	E-STOP, TWO SPEED HOIST – 15 FT P/B ASSEMBLY	1
-	2309674020	E-STOP, TWO SPEED HOIST – 20 FT P/B ASSEMBLY	1
1	2212932011	E-STOP, SS HOIST PUSHBUTTON ENCLOSURE ASSEMBLY	1
1	2212932012	E-STOP, TS HOIST PUSHBUTTON ENCLOSURE ASSEMBLY	1
2	2218000	UPPER SUSPENSION KIT	1
3	7285036	PLUG KIT	1
4	558073	SUSPENSION UNIT	1
5	52292266	PUSH BUTTON ELECTRICAL CONTROL CABLE	1
6	2309414005	R&M PUSHBUTTON WARNING TAG - ENGLISH	1



9.12 Push Button Assembly – Vertical Buttons (Option)

Figure 49. Push button assembly – vertical buttons

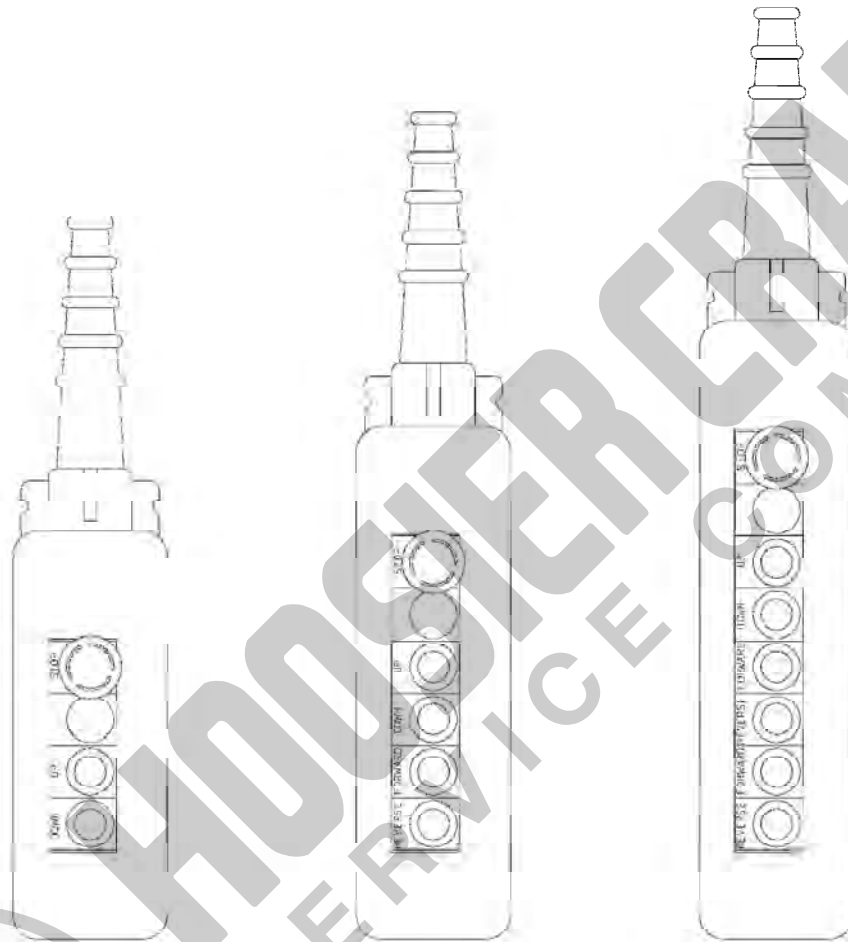


Table 21. Push Button Assembly - Vertical Buttons (Option) Parts List

ITEM	PART NUMBER	DESCRIPTION	QTY
1	2212932011	3 BUTTON P/B TELEMECANIQUE – S*, 1H	1
1	2212932012	3 BUTTON P/B TELEMECANIQUE – S*, 2H	1
2	2212932032	5 BUTTON P/B TELEMECANIQUE – S*, 1H, 2T	1
2	2212932033	5 BUTTON P/B TELEMECANIQUE – S*, 2H, 2T	1
3	2212932034	7 BUTTON P/B TELEMECANIQUE – S*, 2H, 2T, 2B	1
3	2212932035	7 BUTTON P/B TELEMECANIQUE – S*, 1H, 2T, 1B	1
3	2212932036	7 BUTTON P/B TELEMECANIQUE – S*, 2H, 2T, 1B	1
3	2212932037	7 BUTTON P/B TELEMECANIQUE – S*, 1H, 2T, 2B	1

THIS PAGE INTENTIONALLY LEFT BLANK

HOOSIER CRANE
SERVICE COMPANY

