INSTALLATION AND MAINTENANCE MANUAL LM CHAIN HOIST

LOADMATE® LM10 STEPLESS CHAIN HOIST

English

STD-R-KHA-F-CQD-ENG

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

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

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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 ensuring 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** ensure 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.

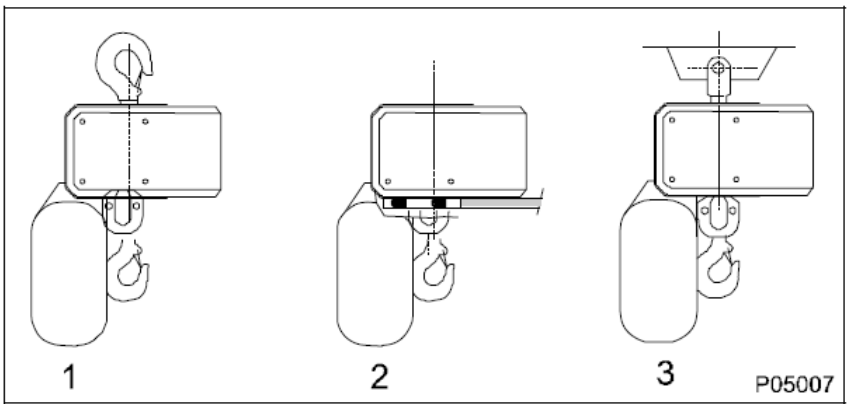
The load chain requires lubrication prior to first use. Chain lubricant is included with shipment of each new chain hoist.

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 7.11 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.

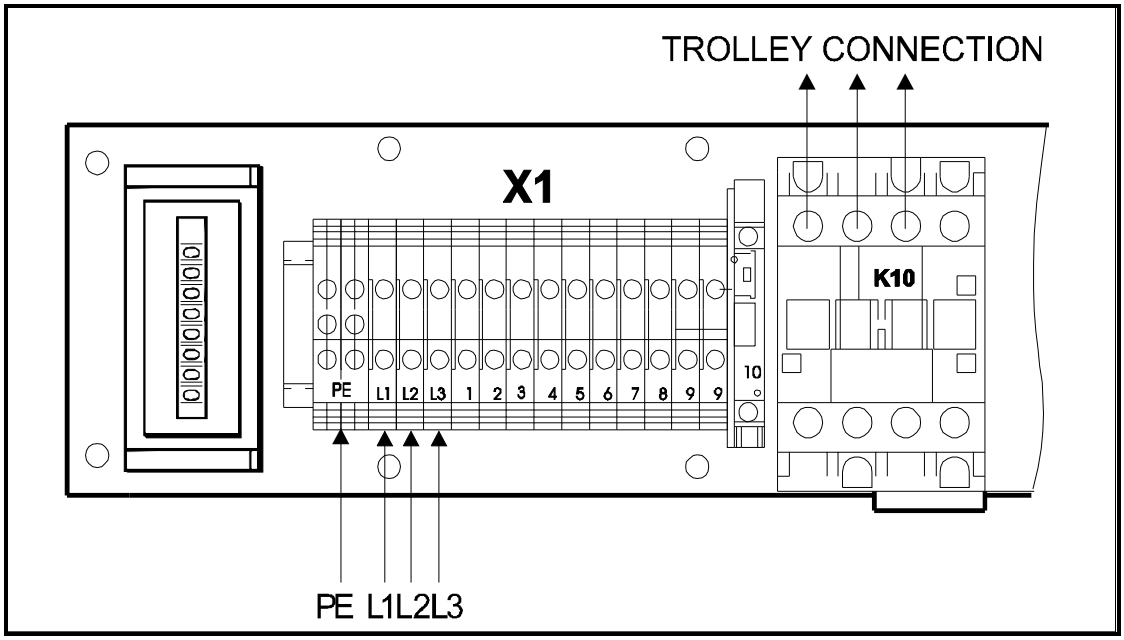
CAUTION: Do not use power supply cables with solid conductors.

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 mm^2)
Auxiliary current:	AWG 18 (0.75 mm^2)
Control box/hoist:	AWG 18 (1.00 mm^2)

2.7 Electricity

WARNING: In case of IT network, remove the filter FU1 before any operation

WARNING: Before any operation on the electric box, check that the hoist supply is disconnected.

WARNING: An isolator switch should be installed at a maximum of 6 meters from the hoist.

2.8 Specific Instructions for Inverter

CAUTION: Check that the device cover is properly installed.

CAUTION: High voltages are present in this device. Switch the power off and after the display turns off, wait 5 minutes before opening the cover.

CAUTION: Insulation resistance test with a megger multimeter requires special precautions.

CAUTION: Do not make any measurements inside the device when it is connected to the main supply.

CAUTION: Do not touch the components on the circuit boards. Electrostatic discharge may cause damage or destroy the IC-circuits.

CAUTION: Check all ventilation holes are clear and unobstructed.

CAUTION: Check that hot air coming from the brake resistors does not cause any danger.

CAUTION: It is forbidden to use radiophones or portable phones near this device with the doors open.

CAUTION: Drive is not intended to be used in a low-voltage public network, which supplies domestic premises. Radio frequency interference is expected if used in such a network.

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 Start-Up Procedure

If any problems or malfunctions occur during the start-up, refer to Chapter *"Troubleshooting"*, to find out the reason. All problems must be solved before continuing.

WARNING: High voltages inside device. Wait for at least five minutes after the supply voltage has been switched off before service actions. Display in operating condition (lights on) indicates a dangerous voltage on the DC-bus. When display turns off, the DC-bus voltage is about 100V. Note also that there is a dangerous voltage in the braking resistor always when the DC-bus is charged.

WARNING: Do not connect any voltage to the output terminals (U, V, W). Otherwise, the inverter will be damaged.

WARNING: The overload protection protects both the supply and the motor cables. The supply fuses provide short circuit protection.

3.2 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 3.4. If not, proceed to section 3.3 for correcting direction of travel.

3.3 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 3.4. If not, redo section 3.3.

3.4 Checks before the first test run

- Turn on power from main switch and control voltage switch.
- Within about 1 second the control panel should have display.
- In a fault situation the red "FAULT" status indicator blinks and the display shows a fault code instead of frequency.
- Check that green "RUN" status indicator is off.
- Check that external connections and selected control parameters are according to application.

CAUTION: The supply cable must be equipped with a power switch or an isolator in conformity with the regulation.

3.5 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 5.3 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.

3.6 Test run without load

- Make sure that movement will not cause any danger to the environment or to the crane itself. Avoid driving close to the limit areas.
- Check limit switches manually if possible.
- Check the run commands on the display panel and correct the hoisting direction. The arrow rotates clockwise if S1 is applied and counter-clockwise if S2 is applied.
- Drive direction S1 at minimum speed for 5 to 10 seconds. Accelerate to full speed. Run 5 to 10 seconds. Stop. Repeat the same in direction S2. Check the frequency display to make sure that the frequency changes through the whole operational frequency range from minimum to nominal speed.
- Check motor operation (acceleration, deceleration and braking): accelerate to full speed direction S1, change to full speed direction S2 and full speed direction S1 again and stop.
- Check limit switch functions: drive direction S1 slowly and check the limit switch operations. Re-check using full speed. Repeat the same check for direction S2.

3.7 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.

3.8 Test run with load

- Make sure that movement will not cause any danger to the environment or to the crane itself.
- Drive in both directions at minimum and maximum speeds.

3.9 Test run with overload

If an overload test has to be performed during crane commissioning, minimum frequency should be raised for duration of the commissioning to 20Hz. Minimum frequency can be changed with parameters P1.1.4. After testing, minimum frequency should be changed back to its original value.

3.10 After the test run

- Record all parameter value changes in the parameter list.
- Make sure all remarks and setting values are recorded.

☞ **NOTE: It is recommended to store the parameter settings in file User parameters, see Section *5.5.8.1 User Parameters.***

☞ **NOTE: The supply cable and main isolator switch must be supplied by the customer.**

4 HOIST OPERATION

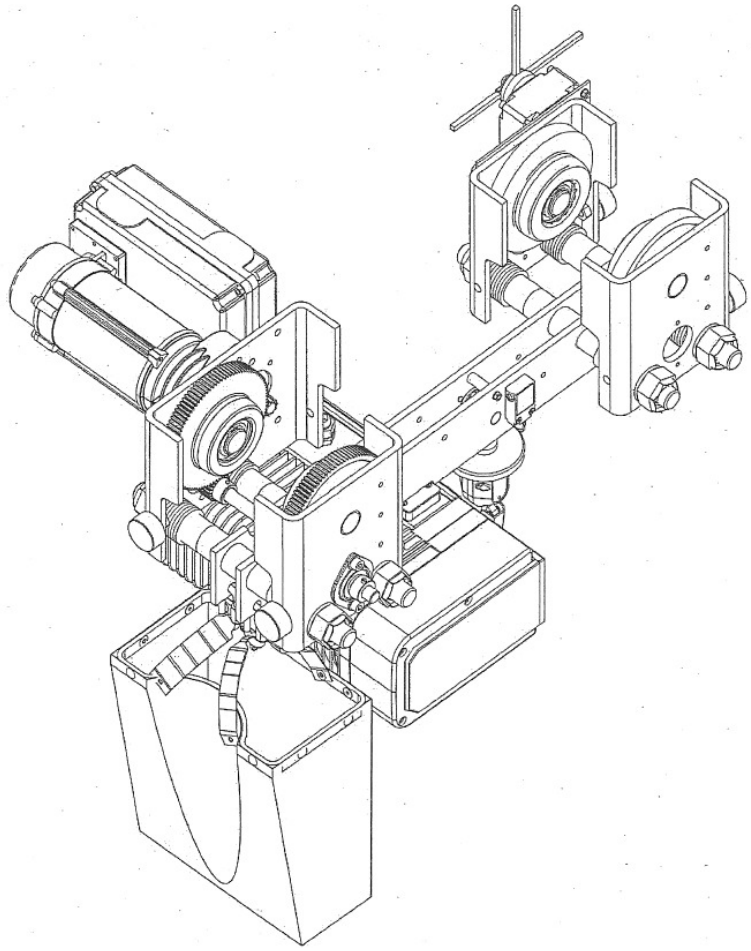
WARNING: BEFORE PROCEEDING WITH THE NORMAL OPERATION OF THIS HOIST, THE OPERATOR/(S) SHALL BE TRAINED IN ACCORDANCE WITH THE LoadMate® Electric Chain Hoist Operator's Manual AS SUPPLIED WITH THIS HOIST.

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.

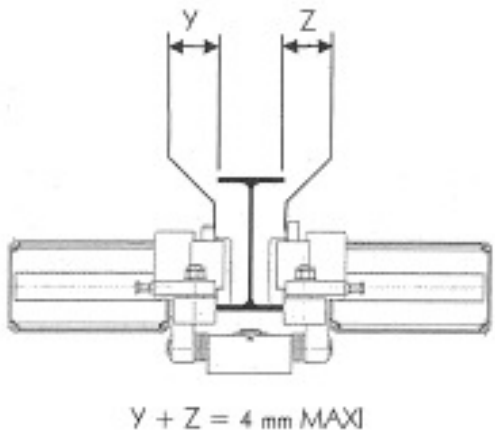
Carry out:

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

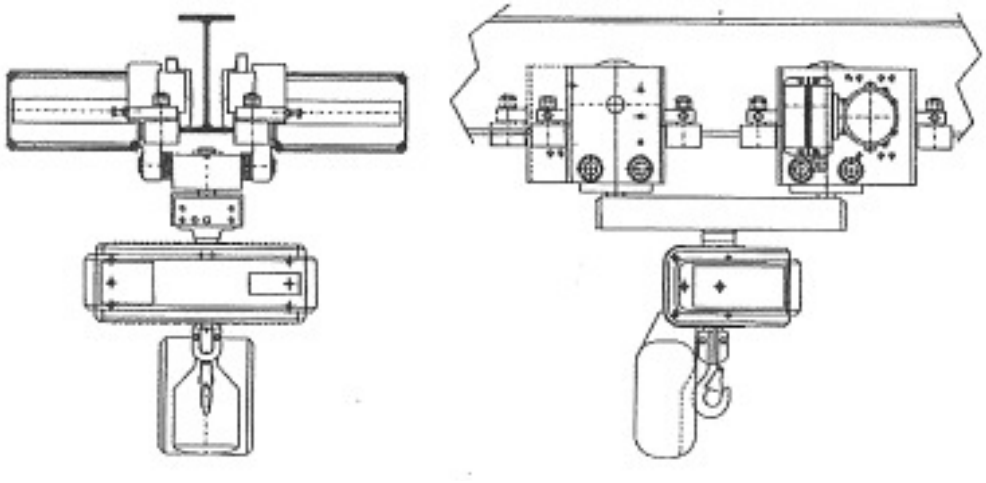
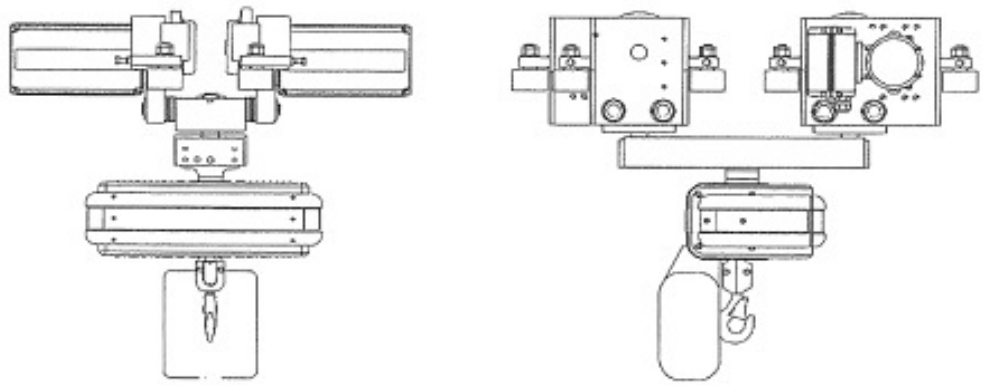


Table 1. Electric swivel trolley

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)

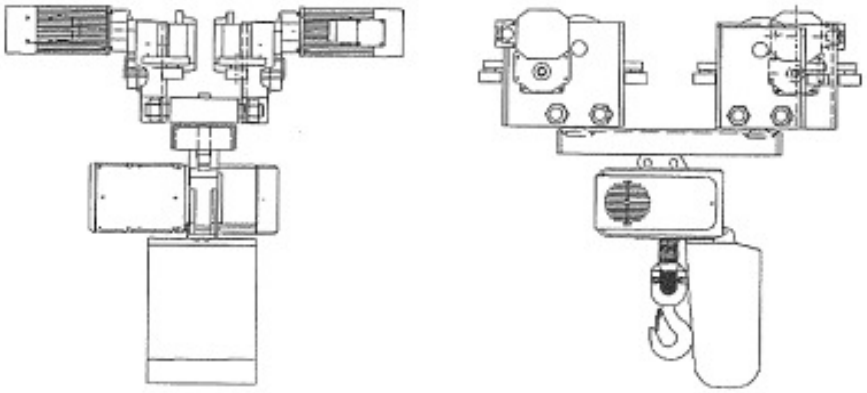
Figure 6. Swiveling trolley (3.2 tons)



- **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)

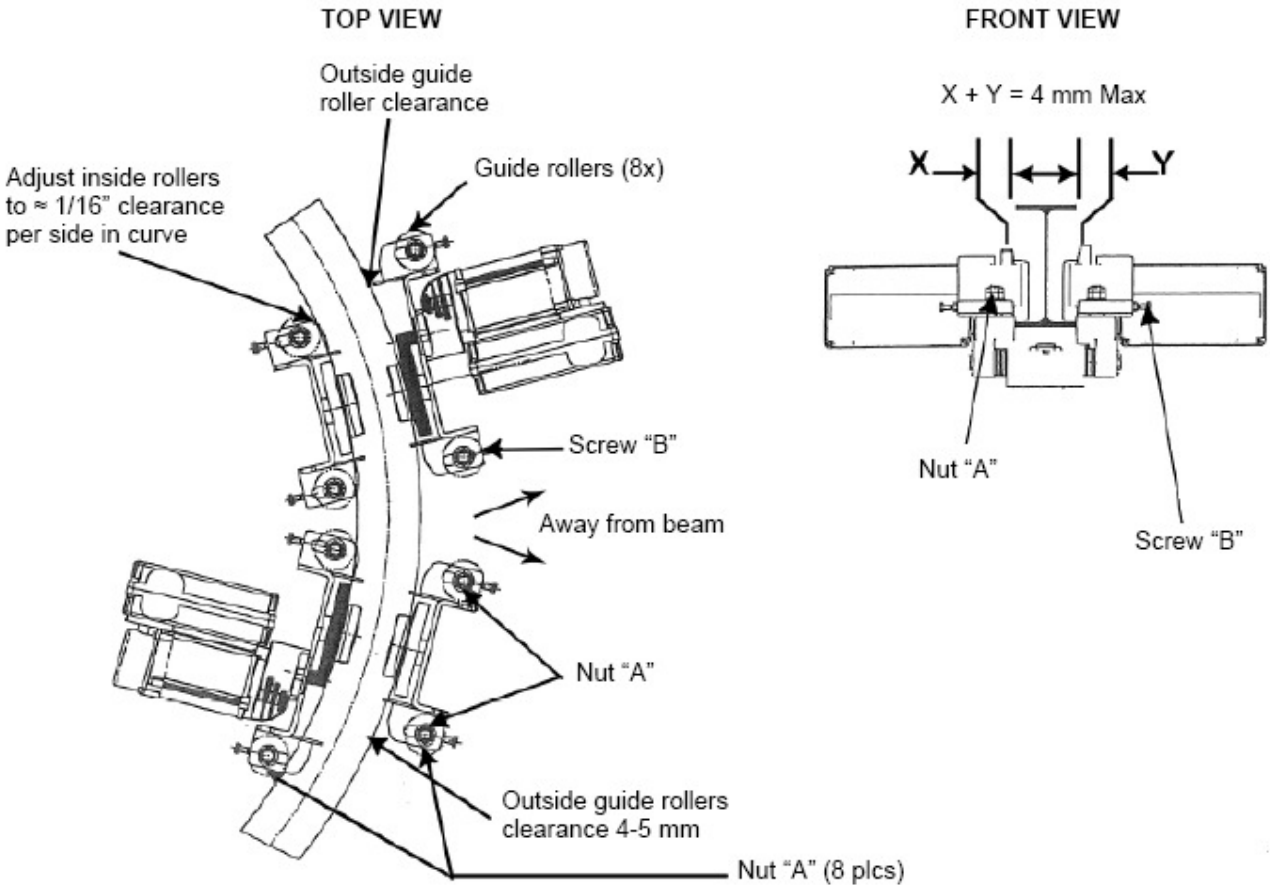


- **CAPACITY MAX 3.2 TO 5 TONS (3200 TO 5000 KG)**
- **RAY OF CURVE MINI 3.9 FEET**

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

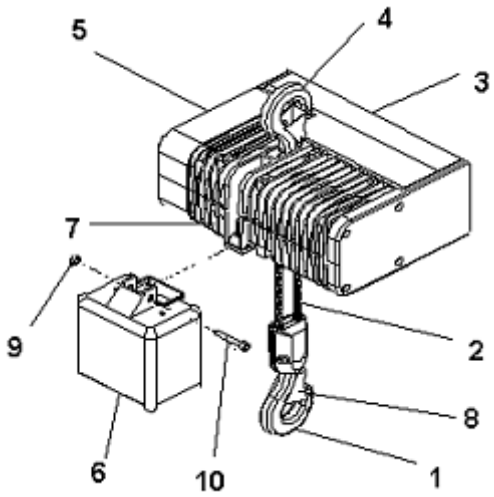


NOTE: Adjustments should be made with swivel trolley in radius of monorail.

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.

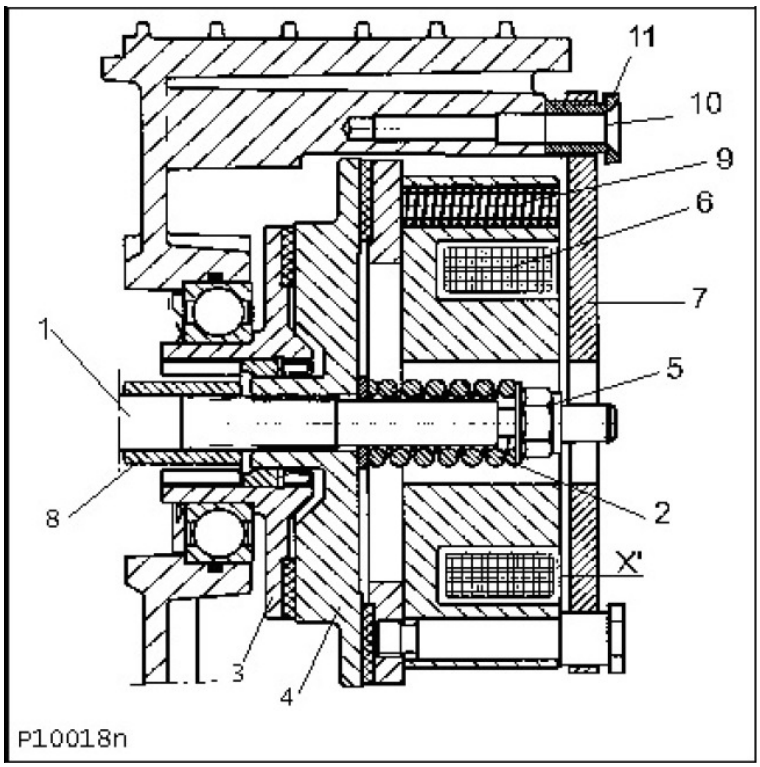
7.3 Hoist Motor Brake and Load-Limiting Device

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 4 - Slip Clutch Adjustment.**

☞ **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

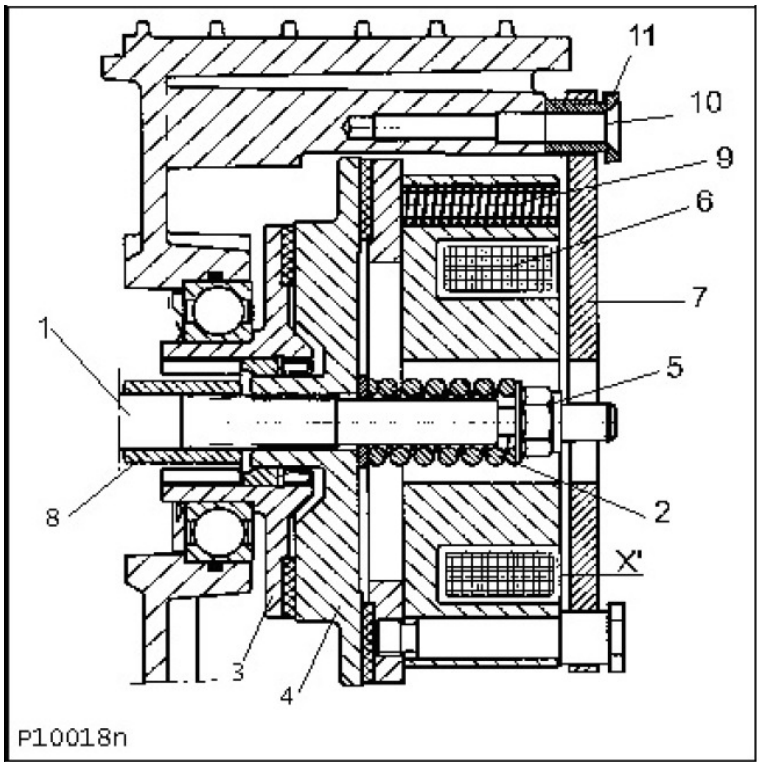
1. Hook a load of at least 110 percent but not more than 125 percent of nameplate capacity.
2. Remove plastic cap from inspection hole in brake cover.
3. Raise load at slow speed and fast speed to test slip clutch operation.
4. Insert a socket (13mm) through inspection hole, and slide it over nut (ITEM 5 - Figure 4).
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	Maximum air gap
X = 0.008" [0.2 mm]	X = 0.020" [0.5 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 6.4.

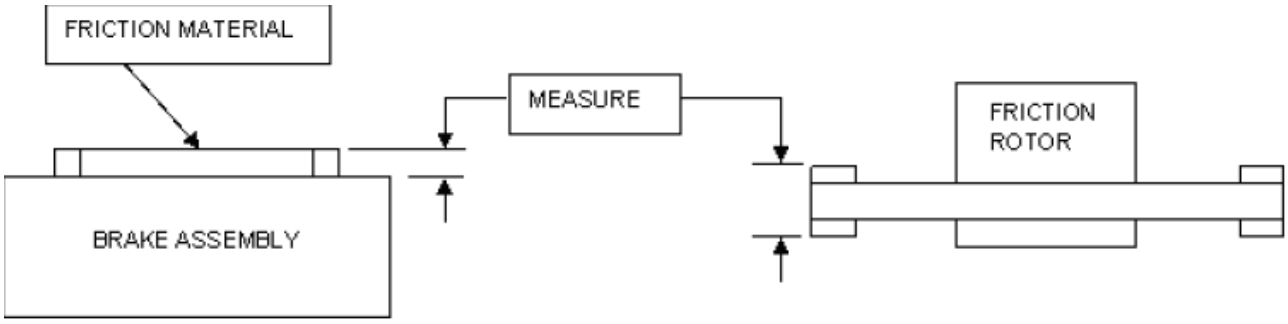
4. Check brake operation. Run load block up and down several times without a load to test operation of brake. Then, lift a capacity load about one foot above floor, stop, and check that brake holds load.

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)**



LM 01 /05 / 10 MODELS **LM 16 / 20 / 25 MODELS**

7.5 Electricity (Inverter)

7.5.1 Technical data – D2S INVERTER

Table 3. Technical Data for D2S Inverter

Power class	002
Power (kVA) at 400V	3.5
Output current In (A)	5.0
Max. current 1min (A)	7.6
Overload ability	1.5 x In, 1min/10min
Max. output voltage	Equals to supply voltage
Supply	
Supply voltage	380-415Vac (M) or 440-480Vac (C)
Allowable voltage fluctuation	+/- 10%
Nominal supply frequency	50/60Hz +/- 5%
Signal input levels	
Digital controls	S1, S2, DID3, DID4, DID5: 42 … 240Vac; 15mA
Control features	
Control method	Open loop vector control
Frequency control range	0 ... 250Hz
Frequency command	Electronic potentiometer, 2-step controller or 0 … 10V analog signal
Limit switch functions	Stop limit inputs for both directions
Speed control range	s_N ... 100% (s_N= motor nominal slip)
Speed accuracy	1% of nominal speed at speed range 10 ... 100% 1/3 of motor nominal slip at speed below 10%
Braking torque	150%
Protections	
Motor overload protection	Thermistor or Klixon thermostat based temperature measurement
Overload protection	Fault is detected if the current momentarily exceeds 280% of rated current
Undervoltage / blown fuse	Fault is detected if DC voltage drops below 333V
Overvoltage protection	Fault is detected if DC voltage exceeds 911V
Momentary power loss	Immediate fault stop
Inverter overtemperature	Temperature sensor on the heat sink
Ground fault	Provided by electronic circuitry
Ambient conditions	
Ambient temperature	-10°C ... +50°C (14°F ... 122°F) for ED°40%
Storage temperature	-40°C ... +70°C (-31°F ... 158°F) dry
Humidity	<95%RH (no condensation)
Altitude	Maximum 1000m at In. Above 1000m: In reduces 1% per each 100m. Above 3000m: consult factory.
Vibration	Operation: maximum displacement amplitude 3mm at 2-9Hz. Maximum acceleration amplitude 0.5g (5m/s²) at 9-200Hz Conforms to LV and EMC directives.

7.5.2 Basic description

Table 4. Basic Description

Inverter	The specific crane features for the inverter hardware and the special software are achieved by combining the experience and know-how of crane applications with the latest technology.
Crane user interface	Interface with pre-designed locations for typical crane functions. The main part of this interface is carried out by a terminal strip, which has separated sections for signals with main, control and electronics voltage levels.
Brake control	Includes the brake contactor for disk brakes.
Electrical Braking	Includes a braking transistor and a braking resistor.
Control methods	Can be controlled by • the electronic potentiometer control with 2-step pushbuttons. • the multistep control with 2-step controllers. • the automation control using any control device with an 0-10V output (computer, radio, PLC)
Limit switch functions	Built-in slowdown stop limit switch (S12, S22) functions for both running directions.
Protections	Includes a motor thermal protection, which is based on motor temperature measurement by Klixon placed in motor windings. A great number of other protections included are shown in the technical data.

7.5.3 Main components

Table 5. Main Components

A1	Inverter
A3	Overspeed monitor
K1	Main contactor
K7	Brake contactor
T100	Control voltage transformer
G1	Rectifier
R1	Braking resistor unit
Z1, Z3	Ferrite rings (Depending on EMC level, optional)
FU1	Filtering capacitors (Depending on EMC level, optional)
X1	Terminals

Table 6. The Most Important External Components

M1	Hoisting motor
Y1	Mechanical brake
B5	Speed sensor
B6	Thermal sensor for motor protection
	Control devices (switches, pushbuttons etc.)
S11, S21, S12, S22	Limit switches

7.5.4 Control methods

Table 7. Three different control methods:

1	**EP**	Electronic potentiometer function. Stepless control using a 2-step controller.
2	**MS**	Multistep control (2 steps) Requires programmable digital inputs for speed reference steps
3	**AU**	Automation control for any control device with an output in the range of 0 – 10V E.g. radio controls, process computers.

All control methods are available without any changes in the hardware or software.

The control mode is selected by parameter P1.1.11 Input set. The parameter assigns digital inputs S1, S2 and DID3-DID5. It is not possible to change the functions of the inputs separately. The state of inputs can be checked from parameter V2.3.

Table 8. Control Modes

Control Mode		**MS2 (stop-lim)**	**EP2 (stop-lim)**	**AU (Ain1)**	**Must not be used**
Parameter P1.1.11		0	2	7	1,3,4,5,6
Signal	Terminal				
S1	DID1	S1	S1	S1	-
S2	DID2	S2	S2	S2	-
DID3	DID3	MAX	AP	S11/S21	-
DID4	DID4	S12	S12	S12	-
DID5	DID5	S22	S22	S22	-

S1	Drive command direction S1		S2	Drive command direction S2
AP	Acceleration command		MAX	Maximum frequency
S12	Stop-limit forward		S22	Stop-limit reverse
S11/S21	Common slowdown limit			

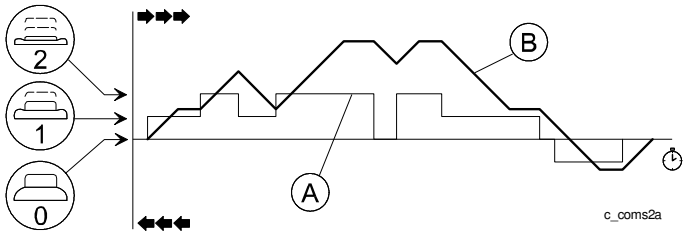
Table 9. Desired speed levels for multi-step control mode are selected with following parameters

Speed	**Parameter**	**Input**
Minimum	P1.1.4	S1/S2
Maximum	P1.1.5	MAX

7.5.5 Description of the control modes

7.5.5.1 MS2-control

Figure 12. MS2-Control

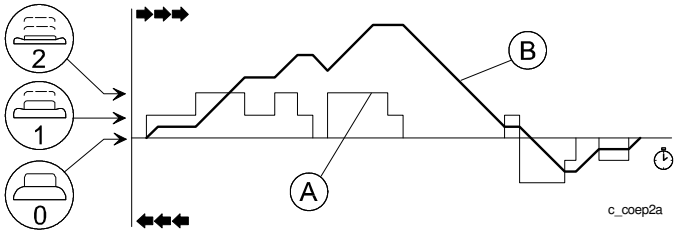


- A. Pushbutton / controller position
- B. Speed

- 0) “decelerate to zero”
- 1) step 1 “drive minimum speed”
- 2) step 2 “drive maximum speed”

7.5.5.2 EP2-control

Figure 13. EP2-Control

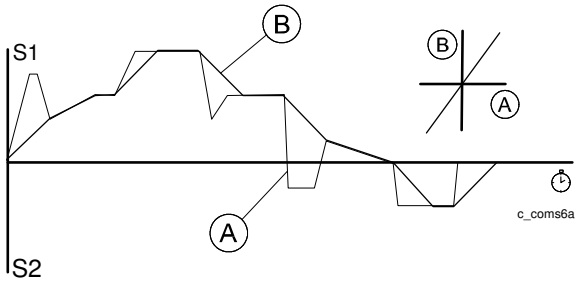


- A. Pushbutton / controller position
- B. Speed

- 0) “decelerate to zero”
- 1) while starting “drive minimum speed”
- while running “hold speed”
- 2) while running “accelerate”
- while running at maximum speed “hold speed”

7.5.5.3 AU/PO-control

Figure 14. AU/PO-Control



- A. Reference
- B. Speed

NOTE: AU control may be used with control device with an output in the range of 0 V – 10 V (for example radio or PLC).

NOTE: PO control may be used with a controller with potentiometer.

The operation is as follows :

Driving command S1 or S2 is given separately and means “drive minimum speed”

The speed linearly follows the analog input signal.

7.5.5.4 Stop-limit operation

Normally inputs (S12 and S22) are "high" (limit switch closed, voltage present in the input). When either of these signals goes “down” (no voltage in the input), the motion is stopped by switching the motor current off immediately and by opening the relay contact ROD1 (mechanical brake closes).

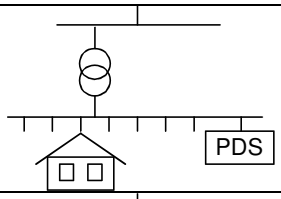
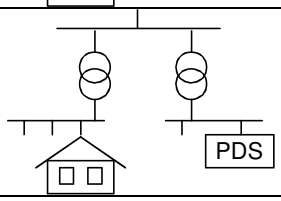
Restart may occur only after one second. Restart is only allowed to the direction opposite to the stop-limit switch circuit being off. If both of these inputs are off restart is not permitted. Restart may be initiated only by a run command changing from off to on (= before restart both run commands must be off after the one-second time has passed).

7.5.6 EMC

The abbreviated "EMC" stands for the Electromagnetic Compatibility. According to the European EMC directive "the apparatus shall be so constructed that:

- The electromagnetic disturbance it generates does not exceed a level allowing other apparatus to operate as intended
- The apparatus has an adequate level of intrinsic immunity of electromagnetic disturbance to enable it to operate as intended."

Table 10. Electromagnetic Compatibility (EMC)

Declaration of conformity	With the declaration of conformity the manufacturer informs that device is manufactured to fulfill required EMC standards.	
CE-mark	The CE marking is a declaration by a manufacturer or importer located in the European Economic Area that a product complies with the safety and health requirements of the directive in question. The manufacturer demonstrates for the authorities that the product complies with the safety requirements within the EU.	
Environments	Immunity and emission requirements are divided in two levels in the product standard according to the environments.	
	First environment means environment that includes domestic premises and also establishments directly connected to a low-voltage power supply network.	
	Second environment means environment that includes all establishments other than those directly connected a low-voltage power supply network	

7.5.6.1 EMC levels

Three kinds of EMC levels are available in D2S INVERTER product family, they are S, N and 0 level.

- **S-level:** No manufacturer's EMC solution is adopted and products will be used in other market areas than European Union (EU) when local power supply system is the grounded network.
- **N-level:** Manufacturer's EMC solution is adopted to fit for Second Environment and products will be used in EU when local power supply system is the grounded network.
- **0-level:** No manufacturer's EMC solution is adopted, products can be used in either EU or other market areas when local power supply system is the non-grounded network.

7.5.6.2 Fulfilled EMC-standards

Immunity — All D2S INVERTER products fulfill the immunity requirements defined in the EN 61800-3 Amendment 11 (2000) for the second environment.

Emissions — D2S INVERTER - N level products fulfill the emission requirements (lower than specification) of the EN 61800-3 A11 2000 for the second environment.

D2S INVERTER - 0 level products fulfill the emission requirements (they might exceed the limit of N level products) of the EN 61800-3 A11 2000 for the second environment

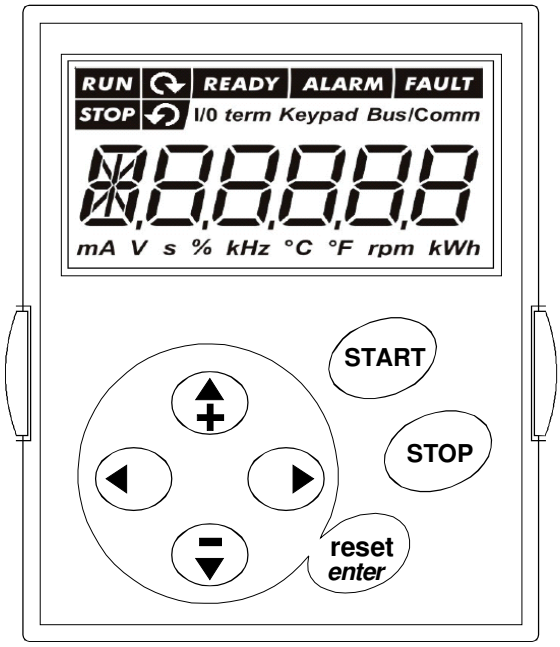
CAUTION: The involved products are designed for Second Environment (Industrial Environment) only. The disturbances emitting from the basic products are not filtered to the required level of residential, commercial and light industrial (e.g. offices, gasoline station, retailer shops, etc.) environment (First Environment). In this sense, these products should not be used in First environments. If you still want to use them in First environments, additional requirements are needed, please contact R&M MATERIALS HANDLING, INC.

CAUTION: EMC filters in N level products might cause disturbances on fault (leakage) current relay

7.5.7 Parameter adjustments

7.5.7.1 The display panel

Figure 15. Display Panel



The display panel is used for :

Displaying the drive identification, electrical values, operating or fault parameters

Altering the parameter settings

Drive status indications:

RUN	Motor is running, blinks when ramping down.
	Direction of motor rotation.
STOP	Motor is not running.
READY	Power is on. In case of a fault, the symbol will not light up.
ALARM	Drive is running outside of certain limit.
FAULT	Fault is active

Control place indications:

I/O term	I/O-terminals are the selected control place
Keypad	Keypad is the selected control place (not used)
Bus/Comm	Control through Profibus is selected (not used)

Button description

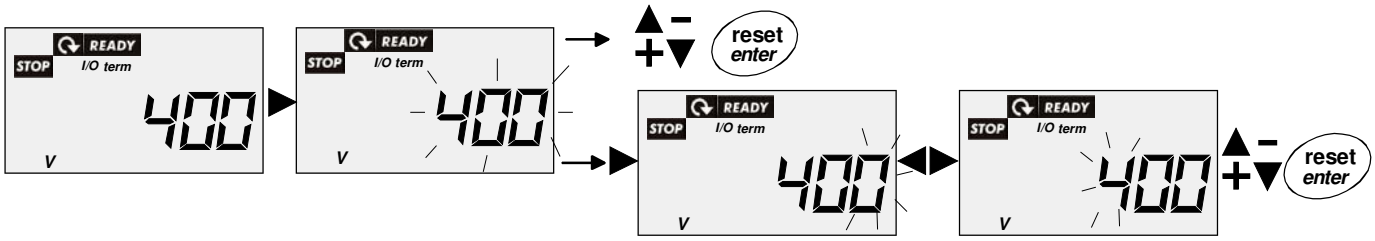
	Browse the main menu and the pages of submenus Edit values
	Move in menu Move cursor Enter and exit edit mode
START	Start button
STOP	Stop button
reset *enter*	Active faults reset Fault history reset Confirmation of selections

7.5.7.2 Navigation on the control keypad

Editing numerical settings

⚠ WARNING! Changing parameter settings during running may cause a hazardous situation. Parameter settings must not be changed during running.

a) Pushing ► button takes you into the edit mode.
As an indication, the parameter value starts to blink.
b) Two different methods are available to change values.
One is to set with ▲▼buttons till your desired value.
Another is to select desired digit and edit it. First push ► button,
the digit before decimal point will blink, then use ►◄ buttons to select
desired digit, set value with ▲ ▼ buttons.
C) Accept and exit with “reset/enter” button.



7.5.8 Storing and restoring parameters

7.5.8.1 User parameters

- File “User parameters” is stored in inverter’s control unit.
- User parameters should be saved after final set up.
- The whole customized parameter set can be stored with parameter P3.3.1 by option 1(=Store user parameters)
- Select Option number 1, then press “Enter”
- User parameters can be restored with parameter P3.3.1 by option 2 (=Load user parameters).
- Select Option number 2, then press “Enter”
- After restoring always check the motor parameters.

7.5.8.2 Factory parameters

- File “Factory parameters” is stored in inverter’s control unit.
- Factory parameters are saved at the factory according to the order and they should not be changed, the values are the same as those in parameter list delivered with inverter.
- Factory parameters can be restored with parameter P3.3.1 by option 4 (=Load factory parameters).
- Select Option number 4, then press “Enter”
- After restoring always check the motor parameters.

7.5.9 Parameter descriptions

7.5.9.1 General Description

Parameters are assorted to Groups. All Groups are not always listed in control panel. Groups are shown in the control panel according to password level and selected functions. This feature makes the viewable parameter menu simple and only needed parameters are shown.

Letter front of the code number describes variable type.

P = Parameter	**V = Value**	**F = Active Fault**
G = Group	**M = Menu**	**H = Fault History**
	S = System	

7.5.9.2 Parameter descriptions

Table 11. Parameter Setting and Descriptions

P1 Parameters					
G 1.1 General Parameters					
Code	Name	Min	Max	Unit	Description
P1.1.1	Password	0	9999		
P1.1.2	Acceleration Time	0.0	20.0	s	Time it will take to accelerate from zero to the set maximum frequency
P1.1.3	Deceleration Time	0.0	20.0	s	Time it will take to decelerate from max frequency to zero.
P1.1.4	Minimum Freq	0.00	Max freq	Hz	The set minimum operating frequency.
P1.1.5	Maximum Freq	Min freq	120.00	Hz	The maximum frequency may not be higher than the motor nominal frequency for listed motors.
P1.1.6	Reverse Plugging	50	100	%	See Chapter "Reverse plugging"
P1.1.7	Stop Function	0	1		Stopping mode selection 0 = Brake 1 = Ramping, default Ramping: When the drive command is switched off the motion is stopped according to the set deceleration ramp. Brake: When the drive command is switched off the motor current is cut off, then the motion is stopped by the mechanical brake.
P1.1.8	MSFreq2/Slowdown	0	100	%	Slowdown frequency and Multistep frequency2, • Setting “100%” equals maximum frequency, • if the setting is lower than minimum frequency then it equals the minimum frequency
P1.1.9	Multistep Freq 3	0	100	%	3rd preset speed. • Setting “100%” equals maximum frequency, • if the setting is lower than minimum frequency then it equals the minimum frequency
P1.1.10	Multistep Freq 4	0	100	%	4th preset speed. • Setting “100%” equals maximum frequency, • if the setting is lower than minimum frequency then it equals the minimum frequency
P1.1.11	Input set	0	7		Control mode selection, see Chapter "control methods" 0 = MS2 (stop-limit) 1 = MS2/MS3 (slow-limit) 2 = EP2 (stop-limit) 3 = EP2 (slow-limit) 4 = EP3 5 = MS4 6 = MS5 7 = AU (Ain)

G1.2 Motor Parameters					
Code	Name	Min	Max	Unit	Description
P1.2.1	Motor Nominal Voltage	200	500	V	Nominal motor voltage Un from motor nameplate.
P1.2.2	Motor Selection	0	13		0 = Not Used 1 = Free Travel (see Note 1) 2 = MF06MA100 3 = MF06MA200 4 = MF06LA100 5 = MF06LA200 (MF06LA200, 0.45kW/400V; 0.55kW/460V) 6 = MF06LA20P (MF06LA200, 0.65kW/400V; 0.75kW/460V) 7 = Not Used 8 = Not Used 9 = Not Used 10 = Not Used 11 = Not Used 12 = Not Used 13 = Free Hoist (see Note 2) **Note1**: When one of listed motors is selected, Parameters group G1.2.4, G1.2.5 and G1.2.6 are not viewable. Parameters group G1.2.4, G1.2.5 can be viewed after P1.2.2 is set back to 1 ‘‘free travel’’ **Note 2:** Parameters group G1.2.6 “Brake Control” can only be viewed when parameter P1.2.2 is set to 13 “free hoist”
P1.2.3	Number of Motors	0	10	pcs	The parameter is not active if value 0,1 or 13 in P1.2.2 is selected
G1.2.4 Motor Nominal Values, see note1					
Code	Name	Min	Max	Unit	Description
P1.2.4.1	Motor Nominal Frequency	0.00	120.00	Hz	Nominal motor frequency (fn) from motor nameplate
P1.2.4.2	Motor Nominal current	0.0		A	Disc brake motors: Number of motors * In (Motor nominal current) Compact brake motors: Number of motors * In or Number of motors * 2,3A, if In<2,3A DC-current during starting = Motor Nominal current P1.2.4.2. * Start Current P1.2.6.1 DC-current during stoping = Motor Nominal current P1.2.4.2.
P1.2.4.3	Motor Nominal Flux Current	0.0		A	Motor nominal flux current (Io), same as no-load current or magnetizing current from motor nameplate. In multimotor drives nominal flux currents must be summed up.
P1.2.4.4	Current Limit	0.0		A	Defines the maximum motor current from the inverter. If the output current exceeds the value set in parameter P1.2.4.4 the output frequency is lowered until the current drops below the current limit. Typical value is 1.5 times motor(s) nominal (1,5xIn). In multimotor drives nominal currents must be summed up. **Must not be set over inverters max 1min. current.**
P1.2.4.5	Motor Cos Phi	0.00	1.00		From motor nameplate (Power factor)
P1.2.4.6	Autotuning	0	4		See Chapter "Autotuning" 0 = Not Done 1 = Tuning 2 = Failed 3 = Done 4 = Modified

G1.2.5 U/f Settings, see Note 1					
Code	Name	Min	Max	Unit	Description
P1.2.5.1	Zero Frequency Voltage	0.00	40.00	%	Output voltage at zero frequency, % of motor nominal voltage.
P1.2.5.2	U/f Middle point Voltage	0.00	100.00	%	Voltage in the selected middle point frequency, % of motor nominal voltage.
P1.2.5.3	U/f Middle point Frequency	0.00	120.00	Hz	Middle point frequency.
P1.2.5.4	Torque Boost	0	1		Torque maximization 0 = Off 1 = On Torque boost is adjustable with parameters P1.2.5.5 “IrAdd Motor” and P1.2.5.6 “IrAdd Generator” when “Free Travel” or “Free Hoist” is selected with parameter P1.2.2 “Motor Selection”
P1.2.5.5	IrAdd Motor	0	100		With small speeds and heavy load the drive may not have enough voltage to produce sufficient torque. Raising the value of parameter increases the voltage. Default value is 30% in traveling and 100% in hoisting.
P1.2.5.6	IrAdd Generator	0	100		If motor voltage at generator area is too high, reducing value of parameter decreases the voltage. Default value is 50% in traveling and 0% in hoisting.
P1.2.5.7	Rs Voltage Drop	0	512		Relative value of motor stator impedance voltage drop. Value of this parameter is calculated by formula given below. Motor Nom Flux current x Measured motor resistance (phase to phase) x 2217 Motor nominal voltage
G1.2.6 Brake Control, see Note 2					
Code	Name	Min	Max	Unit	Description
P1.2.6.1	Start Current	0	200	%	To adjust DC-current during starting. See P1.2.4.2 Traveling with compact brake motors 130%, otherwise 80%. Hoisting 100%.
P1.2.6.2	Brake Opening Delay	0.00	10.00	s	Defines the opening delay of mechanical brake. “Start Freq S1” or “Start Freq S2” is commanded during “Brk Opening Del”. After delay, output frequency increases according to the acceleration parameters. Default 0.05s
P1.2.6.3	Start DC-Time	0.00	5.00	s	Defines duration of the “Start Current”
P1.2.6.4	Stop DC-Time	0.00	5.00	s	Defines the function and the duration of the DC-braking time when stopping the motor. If “Stop DC-Time” = 0 the DC-braking is not used.
P1.2.6.5	Stop DC-Frequency	0.00	250.00	Hz	Defines the DC-braking starting frequency
P1.2.6.6	Start Frequency S1	0.0	100.0	%	Defines the output frequency during brake opening delay in the S1 direction.
P1.2.6.7	Start Frequency S2	0.0	100.0	%	Defines the output frequency during brake opening delay in the S2 direction.
P1.2.6.8	Brake Stop Frequency	0.00	Max Freq	Hz	Defines the output frequency when the relay output ROD1 for brake control opens during stopping
P1.2.6.9	Minimum Frequency Bias S2	0.00	Min Freq	Hz	Helps to define the Minimum frequency in down direction for hoisting. Minimum frequency in down direction is “Min Frequency” - “Minimum Frequency Bias S2”.

G1.3 I/O Parameters					
Code	Name	Min	Max	Unit	Description
P1.3.1	ROA1	0	12		State of relay output ROA1 (See Chapter "Relay output") 0 = Not Used 1 = Fault 2 = External Brake Control 3 = Run, current is fed to the motor, default 4 = Drive is ready to operate 5 = Drive is NOT ready to operate 6 = Fan. DC-link voltage is above braking chopper operating value –70V. Relay is closed minimum 300s. 7 = Emergency Stop, relay is activated in case of faults F1 Overcurrent, F2 Overvoltage, F3 Earth Fault. Relay is deactivated when the power is switched off. 8 = Reverse Plugging. Direction request is different than direction of actual frequency. 9 = At Speed. The Drive has reached the speed reference request. 10 = S2 Active. Motor actual speed direction is S2. 11 = Temp1. Relay is activated when temperature is 20ºC (68F) or below. Relay is inactivated when temperature is 23ºC (73F) or above. 12 = Temp2. Relay is activated when temperature is 40ºC (104F) or above. Relay is inactivated when temperature is 37ºC (98F) or below.
P1.3.2	Ain1 Minimum Voltage	0.000	10.000	V	Minimum value of analog input Ain1 for AU-control
P1.3.3	Ain1 Maximum Voltage	0.000	10.000	V	Maximum value of analog input Ain1 for AU-control
P1.3.4	Aout Function	0	5		0 = Not Used 1 = Motor Freq (100%*Normal Motor Frequency) 2 = Motor Curr (100%*Normal Motor Current) 3 = Motor Volt (100%*Normal Motor Voltage) 4 = DC-link Volt (1000V) 5 = MotorFreqABS (Absolute value of Motor Frequency)
P1.3.5	Aout Zero Current	0.00	Aout Nom Curr	mA	
P1.3.6	Aout Nominal Current	Aout Zero Curr	100.00	mA	
G1.4 Not used					
Code	Name	Min	Max	Unit	Description
P1.4.1					0 = Default value 1 = must not be used 2 = must not be used
P1.4.2					Not used
P1.4.3					Not used
P1.4.4					Not used
P1.4.5					Not used
G1.5 Expert					
Code	Name	Min	Max	Unit	Description
P1.5.1	Slowdown Mode	0	2		0 = Slow 1 = Fast, default 2 = Fast Power Up (See Chapter "Slowdown-limit operation")
P1.5.2	S-Curve	0.00	0.50	s	The start and end of the acceleration and end of deceleration ramp can be smoothed with this parameter. Setting value 0.00-0.50 seconds for this parameter produces an S-shaped acceleration/deceleration.
P1.5.3	Ramp Stretching	0.00	50.0		See Chapter "Ramp Stretching". Not used in hoisting
P1.5.4	Switching Frequency				Must not be changed from factory setting
P1.5.5	Brake Chopper				1, default Must not be changed

M2 Monitoring					
Code	Name	Min	Max	Unit	Description
V2.1	K7	0	1		State of relay output ROD1, which controls brake contactor
V2.2	ROA1	0	1		State of relay output ROA1
V2.3	DID states	.00000	.11111		State of digital input DID1-DID5
V2.4	Ain1 Input	0.00	10.00	V	Value of analog input Ain1
V2.5	Motor Current			A	Measured motor current
V2.6	Motor Voltage			V	Calculated motor voltage
V2.7	Heat Sink Temperature			℃	Temperature of heat sink.
V2.8	DC-link Voltage			V	Actual value of measured DC-link voltage.
V2.9	Frequency Reference			Hz	
V2.10	Output Frequency			Hz	Output frequency to the motor
M3 System Menu					
Code	Name	Min	Max	Unit	Description
S3.3 Copy parameters					
P3.3.1	Parameter sets				0 = Select 1 = Store user parameters 2 = Load user parameters 3 = Store factory parameters 4 = Load factory parameters 5 = Reset parameters 6 = Fault 7 = Wait 8 = OK
S3.5 Security					
P3.5.2	Parameter lock				0 = Change Enabled 1 = Change Disabled
S3.6 Keypad settings					
P3.6.1	Default page				Display goes to Default page after Timeout time. If value 0 is selected, this feature is not active. Default value 2.10 “Output Frequency”
P3.6.3	Timeout time	0	65535	s	Display goes to Default page after Timeout time.
S3.7 Hardware settings					
P3.7.2	Fan control				0 = Continuous, default 1 = Temperature
P3.7.3					Not used
P3.7.4					Not used
S3.8 System info					
S3.8.1 Counters menu					
C3.8.1.1	MWh counter		KWh		
C3.8.1.2	Operating days Counter		hh:mm:ss		
C3.8.1.3	Operating hours Counter		hh:mm:ss		
S3.8.2 Trip counters					
T3.8.2.1	MWh trip counter		KWh		
P3.8.2.2	Clear MWh trip counter				
T3.8.2. 3	Operating days trip counter				
T3.8.2.4	Operating hours trip Counter		hh:mm:ss		
P3.8.2.5	Clear operating time Counter				
S3.8.3 Software info					
I3.8.3.1	Software package				
I3.8.3.2	System SW version				

I3.8.3.3	Firmware interface			
I3.8.3.4	System load			
S3.8.4 Application info				
A3.8.4.1	Application			
A3.8.4.1.1	Application id			
A3.8.4.1.2	Application version			
A3.8.4.1.3	Firmware interface			
S3.8.5 Hardware info				
I3.8.5.2	Unit voltage			
I3.8.5.3	Brake chopper			
I3.8.5.4	Brake resistor			
S3.8.6 Options				
S3.8.6.1	NXOPT			
E3.8.6.1.1	Status			
E3.8.6.1.2	Program version			
S3.9 (not used)				
S3.10 (not used)				

M4 Active faults

The memory of active faults can store the maximum of 10 faults in the order of appearance.

By pushing the ⊙ button you will enter the Fault history section.

M5 Fault history

The fault memory can store a maximum of 5 faults in the order of appearance. The number of faults currently in the fault history is shown on the value line of the main page. The latest fault carries the indication H5.1, the second latest H5.2 etc. If there are 5 uncleared faults in the memory, the next occurring fault will erase the oldest from the memory.

Pressing the Enter button for about 2 to 3 seconds resets the whole fault history.

☞ **Note 1:** when one of listed motors is selected, Parameters group G1.2.4, G1.2.5 and G1.2.6 are not viewable. Parameters group G1.2.4, G1.2.5 can be viewed after P1.2.2 is set back to 1 ‘’free travel’’

☞ **Note 2**: Parameters group G1.2.6 “Brake Control” can only be viewed when parameter P1.2.2 is set to 13 “free hoist”

7.5.9.3 Reverse Plugging

When opposite drive command is active while the inverter is operating, the deceleration/acceleration ramp can be shorter than the normal ramp. Reverse plugging function is “on” if the driving frequency > 30% of the “Max Freq” (not the “Motor Nom Freq”). Reverse plugging function goes “off state” in opposite direction to original direction when driving frequency > 95% of reference frequency.

The value can be set between 50 to 100%. 100% corresponds that the ramp is the same as the normal ramp. 50% corresponds that the ramp is a half of the normal ramp. The default value is 80%.

7.5.9.4 Relay output

Inverter has one programmable relay output (ROA1) and one relay output for brake control (ROD1). Relay output functions for ROA1 are listed below.

Table 12. Relay Output

Par value	Name	Description
0	Not Used	
1	Fault	Relay is activated when fault is on.
2	Brake Control	External brake ON/OFF-control. Default value in relay output ROD1 (K7 control).
3	Run	Relay is activated when current is fed to motor.
4	Ready	Relay is activated when Drive is ready to operate.
5	Ready Inverted	Relay is activated when Drive is not ready to operate.
6	Fan	Relay is activated when DC-link voltage is above braking chopper operating level - 70V. Relay is closed for a minimum of 300s.
7	Emergency Stop	Relay is activated in case of F1 Overcurrent, F2 Overvoltage or F3 Earth Fault. Relay is deactivated when the power is switched off.
8	Reverse Plugging	Relay is activated when direction requested is different than direction of actual frequency.
9	At Speed	Relay is activated when ramp generator output has reached speed reference request.
10	S2 Active	Relay is activated when motor actual speed direction is S2.
11	Temp 1	Relay contact is activated when temperature is 20°C (68F) or below. Relay is inactivate when temperature is 23°C (73F) or above.
12	Temp 2	Relay contact is activated when temperature is 40°C (104F) or above. Relay is inactivate when temperature is 37°C (98F) or below.

7.5.10 Factory default parameters

Table 13. Default Factory Parameters

400V 100Hz		
Label	**Code**	**Default**
G 1.1. General Parameters		
P 1.1.1	Password	0
P 1.1.2	Accel Time	1.5
P 1.1.3	Decel Time	0.5
P 1.1.4	Min Freq	12
P 1.1.5	Max Freq	100
P 1.1.6	Reverse Plugging	100
P 1.1.7	Stop Function	Ramping
P 1.1.8	MSFreq2/Slowdown	20
P 1.1.9	Multistep Freq 3	50
P 1.1.10	Multistep Freq 4	50
P 1.1.11	Input set	EP2
G 2.2. Motor Parameters		
P 1.2.1	Motor Nom Volt	400
P 1.2.2	Motor Selection	Free Hoist
P 1.2.3	Number of Motors	1
G 1.2.4 Motor Nominal Values		
P 1.2.4.1	Motor Nom Freq	100
P 1.2.4.2	Motor Nom Curr	4.4
P 1.2.4.3	Nom Flux Curr	2.6
P 1.2.4.4	Current Limit	7
P 1.2.4.5	Motor Cos Phi	0.69
P 1.2.4.6	Autotuning	Not Done
G 1.2.5 U/f Settings		
P 1.2.5.1	Zero Freq Volt	4.2
P 1.2.5.2	U/f Mid Volt	4.5
P 1.2.5.3	U/f Mid Freq	3
P 1.2.5.4	Torque Boost	On
P 1.2.5.5	IrAdd Motor	100
P 1.2.5.6	IrAdd Generator	0
P 1.2.5.7	Rs Voltage Drop	99
G 1.2.6 Brake Control		
P 1.2.6.1	Start Current	100
P 1.2.6.2	Brk Opening Del	0.05
P 1.2.6.3	Start DC-Time	0.1
P 1.2.6.4	Stop DC-Time	0.2
P 1.2.6.5	Stop DC-Freq	2
P 1.2.6.6	Start Freq S1	4
P 1.2.6.7	Start Freq S2	3
P 1.2.6.8	Brake Stop Freq	3.5
P 1.2.6.9	Min Freq Bias S2	3
G 1.3. I/O Parameters		
P 1.3.1	ROA1	Not Used
P 1.3.2	Ain1 Min Volt	0
P 1.3.3	Ain1 Max Volt	10
P 1.3.4	Aout Function	Motor Curr
P 1.3.5	Aout Zero Curr	0
P 1.3.6	Aout Nom Curr	10
G 1.4 Protection		
P 1.4.1	Motor Thermal Prot	Not Used
P 1.4.2	-	0
P 1.4.3	-	40
P 1.4.4	-	45
P 1.4.5	-	100
G 1.5 Expert		
P 1.5.1	Slow Down Mode	Fast
P 1.5.2	S-Curve	0
P 1.5.3	Ramp Stretching	0
P 1.5.4	Switching Freq	8
P 1.5.5	Brake Chopper	Run

460V 120Hz		
Label	**Code**	**Default**
G 2.1. General Parameters		
P 1.1.1	Password	0
P 1.1.2	Accel Time	1.5
P 1.1.3	Decel Time	0.5
P 1.1.4	Min Freq	12
P 1.1.5	Max Freq	120
P 1.1.6	Reverse Plugging	100
P 1.1.7	Stop Function	Ramping
P 1.1.8	MSFreq2/Slowdown	20
P 1.1.9	Multistep Freq 3	50
P 1.1.10	Multistep Freq 4	50
P 1.1.11	Input set	EP2 StopLim
G 2.2. Motor Parameters		
P 1.2.1	Motor Nom Volt	460
P 1.2.2	Motor Selection	Free Hoist
P 1.2.3	Number of Motors	1
G 1.2.4 Motor Nominal Values		
P 1.2.4.1	Motor Nom Freq	120
P 1.2.4.2	Motor Nom Curr	4.4
P 1.2.4.3	Nom Flux Curr	2.6
P 1.2.4.4	Current Limit	7
P 1.2.4.5	Motor Cos Phi	0.69
P 1.2.4.6	Autotuning	Not Done
G 1.2.5 U/f Settings		
P 1.2.5.1	Zero Freq Volt	4.2
P 1.2.5.2	U/f Mid Volt	4.5
P 1.2.5.3	U/f Mid Freq	3
P 1.2.5.4	Torque Boost	On
P 1.2.5.5	IrAdd Motor	100
P 1.2.5.6	IrAdd Generator	0
P 1.2.5.7	Rs Voltage Drop	99
G 1.2.6 Brake Control		
P 1.2.6.1	Start Current	100
P 1.2.6.2	Brk Opening Del	0.05
P 1.2.6.3	Start DC-Time	0.1
P 1.2.6.4	Stop DC-Time	0.2
P 1.2.6.5	Stop DC-Freq	2
P 1.2.6.6	Start Freq S1	4
P 1.2.6.7	Start Freq S2	3
P 1.2.6.8	Brake Stop Freq	3.5
P 1.2.6.9	Min Freq Bias S2	3
G 1.3. I/O Parameters		
P 1.3.1	ROA1	Not Used
P 1.3.2	Ain1 Min Volt	0
P 1.3.3	Ain1 Max Volt	10
P 1.3.4	Aout Function	Motor Curr
P 1.3.5	Aout Zero Curr	0
P 1.3.6	Aout Nom Curr	10
G 1.4 Protection		
P 1.4.1	Motor Thermal Prot	Not Used
P 1.4.2	-	0
P 1.4.3	-	40
P 1.4.4	-	45
P 1.4.5	-	100
G 1.5 Expert		
P 1.5.1	Slow Down Mode	Fast PowerUp
P 1.5.2	S-Curve	0
P 1.5.3	Ramp Stretching	0
P 1.5.4	Switching Freq	8
P 1.5.5	Brake Chopper	Run

7.5.11 Speed supervision

Overspeed Monitor is a hoist motion speed supervision unit, which reads the pulse frequency from the hoist motor sensor bearing (48ppr). This pulse frequency is compared with a fixed oscillator frequency. As a result of frequency comparison, there are two different speed supervision functions :

- overspeed supervision (rush control)
- stall supervision

Overspeed supervision is totally implemented by hardware.

Switch S1 multiplies the overspeed detection frequency set by switch S2. There are 3 values available as multiplier from switch S1. x0.5/x1/x2.

Switch S2 sets the detection frequency. Value can be selected stepless between values 1.5

and 3 kHz.

With switches S1 and S2 the overspeed detection frequency can be set between values 0.75

and 6 kHz.

Overspeed detection level should be set to 120% of nominal speed of motor.

Stall supervision stops the motion if there are no pulses coming from the sensor within set time after the brake is open. Stall supervision time can be set with switch S3 between values 0.1 and 10 s. Time should be set to value 1s, line between 0.1 and 2.

Led L1 indicates the state of incoming pulse. Green light means: pulse is down. Red light means :

pulse is up.

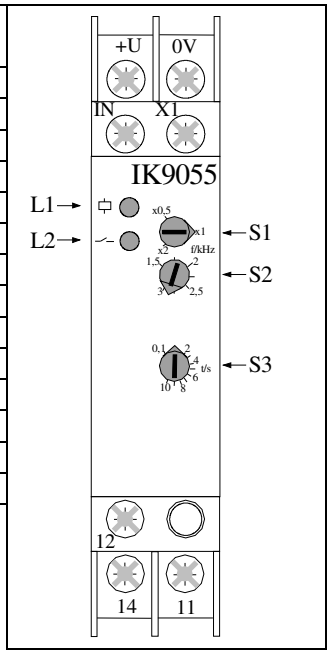
Led L2 indicates the state of output relay of Overspeed Monitor. Green led means: Hoisting is ok and relay between terminals 11 and 14 is closed. Orange led means: Overspeed or stall fault is detected and relay between terminals 11 and 14 is open

7.5.11.1 Overspeed Monitor adjustment

- Check maximum hoisting speed of application.
- Set with parameter P1.1.5. maximum Freq to value “Set up driving freq” from table
- Set parameter V2.10. visible on display
- Set switch S1 to value x0.5 and switch S2 to value 3 kHz.
- Drive with maximum speed
- Decrease value of switch S2 inch by inch until Overspeed Monitor trips.
- This should happen with value about “Estimated detection freq” from table
- Set switch S1 to value x1
- Set with parameter P1.1.5. maximum Freq back to original value according the application
- Set stall supervision time with switch S3 to value 1s.
- Check setting by driving at maximum speed to both directions, Overspeed Monitor should not trip

Table 14. Overspeed Monitor Adjustment

Max hoisting speed in application		Set up driving freq	Estimated detection freq
m / min	feet / min		
8,0	26,2	60,00	2,7
7,5	24,6	56,25	2,5
7,0	23,0	52,50	2,3
6,5	21,3	48,75	2,1
6,0	19,7	45,00	1,9
5,5	18,0	41,25	1,7
5,0	16,4	37,50	1,5
4,5	14,8	33,75	1,3
4,0	13,1	30,00	1,1
3,5	11,5	26,25	0,9
3,0	9,8	22,50	0,7
2,5	8,2	18,75	0,5
2,0	6,6	15,00	0,3
1,5	4,9	11,25	0,1



Hoisting speed	
m / min	**Frequency / Hz**
8,0	100
7,5	93,75
7,0	87,5
6,5	81.25
6,0	75
5,5	68,75
5,0	62,5
4,5	56,25
4,0	50
3,5	43,75
3,0	37,5
2,5	31,25
2,0	25
1,5	18,75
1,0	12,5
0,5	6.25

7.5.12 Drawings

Table 15. Description of terminals X1

BOTTOM LEVEL			UPPER LEVEL		
No	**Name**	**Description, signal level**	**No**	**Name**	**Description, signal level**
	PE				
91	L11	Power supply to trolley, phase 1	L1	L1	Power supply, phase 1
92	L12	Power supply to trolley, phase 2	L2	L2	Power supply, phase 2
93	L13	Power supply to trolley, phase 3	L3	L3	Power supply, phase 3
B+	R+	Braking resistor	U/T1	U/T1	Motor output, phase 1
R-	R-	Braking resistor	V/T2	V/T2	Motor output, phase 2
			W/T3	W/T3	Motor output, phase 3
	PE				
DOLD, OVERSPEED MONITOR					
1	OLE	Control voltage fuse			
1	OLE	External control voltage, 48/115/230Vac	6	MT S1	Motor trolley, direction 1
1	OLE	External control voltage, 48/115/230Vac	7	MT S2	Motor trolley, direction 2
2	ROS	Relay output of speed detection device	8	MT SP2	Motor trolley, SP2/AP
3	DID4 (S12)	Stop limit signal, direction 1	9	ONE	Neutral of external control voltage OLE
4	DID5 (S22)	Stop limit signal, direction 2	9	ONE	Neutral of external control voltage OLE
5	ES	External Stop	10		
	PE				

Table 16. Description of terminals X2

No	Name	Description, signal level
2	ROS	Relay output of speed detection device
2	ROS	Relay output of speed detection device
3	DID4 (S12)	Stop limit signal, direction 1
4	DID5 (S22)	Stop limit signal, direction 2

7.6 Load Chain

7.6.1 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.**

7.6.2 Maintenance Inspection

A qualified person **SHALL** be designated to routinely conduct an in-depth inspection of the load chain (See Section 6 – 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.

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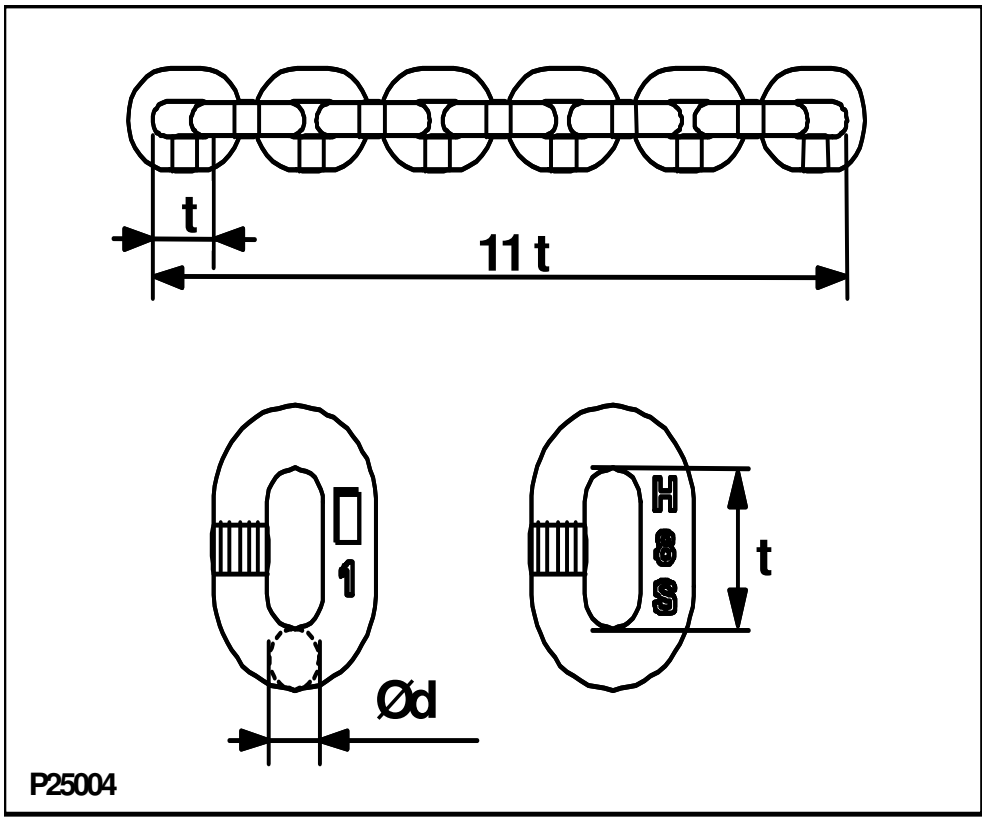
Figure 16. Chain Dimensions



Measure the following chain dimensions at several points on chain: (*Figure 16*)

- Dimensions of one link (d x 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

NOTICE:

☞ **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.**

7.6.3 Load Chain Specifications (see *Figure 16*)

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)

7.6.4 Removing the Load Chain

1-FALL CHAIN

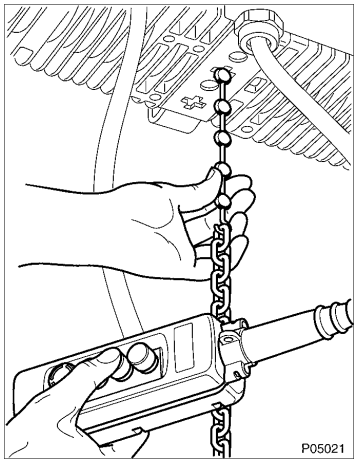
1. Remove load from hook block assembly.
2. Remove load block assembly from load chain. Some disassembly of 1-fall load block is required.
3. Attach the chain insert tool to the end of bottom block end of the chain.
4. Run hoist in “UP” direction until all of chain is in container. Stop the hoist with 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.

7.6.5 Installing the Load Chain

Figure 17. Chain Installation



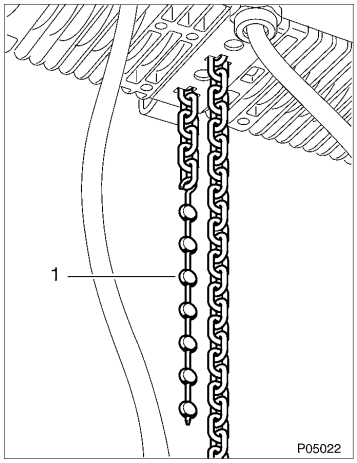
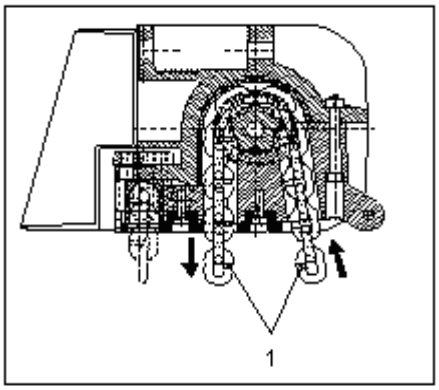


Figure 17-A. Chain Orientation



1-FALL CHAIN INSTALLATION

1. Attach last link of chain onto hook of CHAIN INSERTION TOOL (item 1, Figure 17).
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 17-A.**

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 17-A 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 17)*.
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 17-A. 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 18* for details.
7. Make sure that chain is not twisted or kinked.
8. Attach chain container

After chain installation:

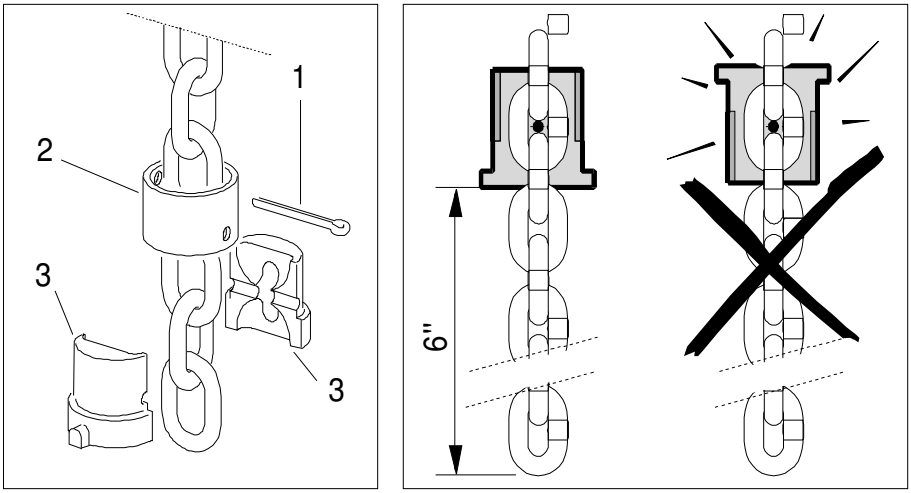
1. Without a load, run chain up and down a few times to make sure load chain is not twisted. If so, remove chain twist.
2. Lubricate load chain.

7.7 Fall Stop Assembly

7.7.1 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 18. Cross Section of Slack Fall Stop



7.7.2 Removing fall stop (*Figure 18*)

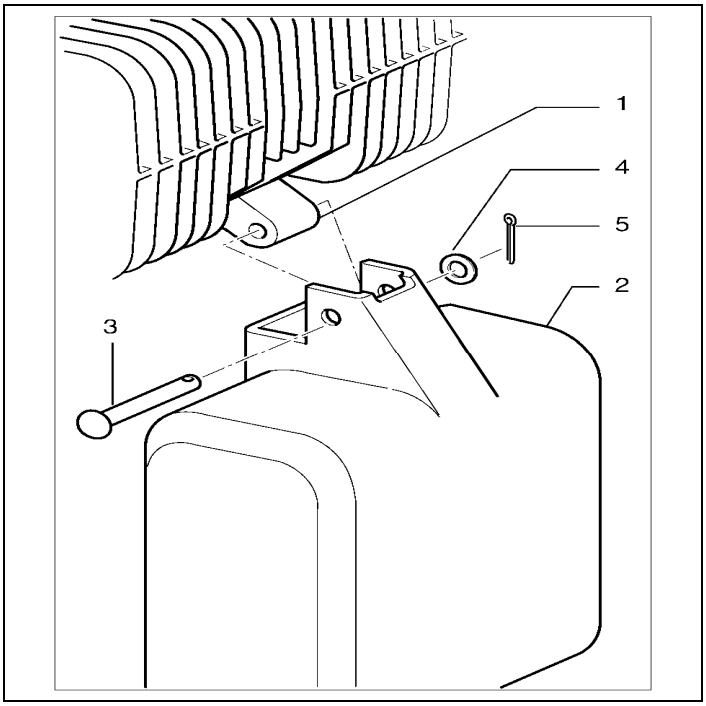
1. Remove cotter pin (item 1).
2. Slide up the tube (item 2).
3. Remove the two fall stop halves (item 3).
4. Slide tube (item 2) off load chain.

7.7.3 Fall Stop Installation (*Figure 18*)

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).

7.8 Chain Container

Figure 19. Chain Container Installation



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

7.8.1 Removing Chain Container (*Figure 19*)

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).

7.8.2 Installing Chain Container (*Figure 19*)

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).

7.9 Vinyl Chain Bag (optional)

Figure 20. Vinyl Chain Bag Installation Connection

7.9.1 Installing Vinyl Chain Bag (*Figure 20*)

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.

7.10 Limit Switches

7.10.1 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.

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

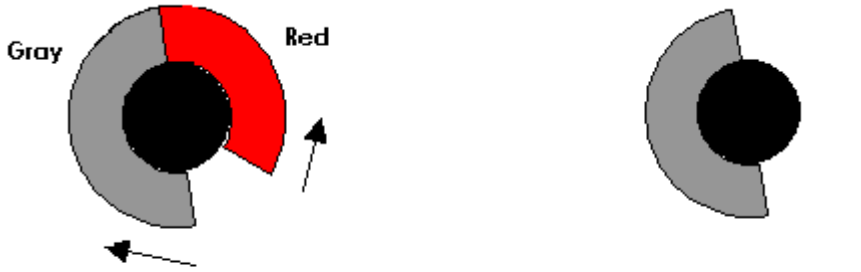
The rotary limit switch is adjustable and provides over-travel protection for the upper and lower limits of hoist travel. The limit switch is connected to the control circuit.

> ☞ **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 21. Adjustment



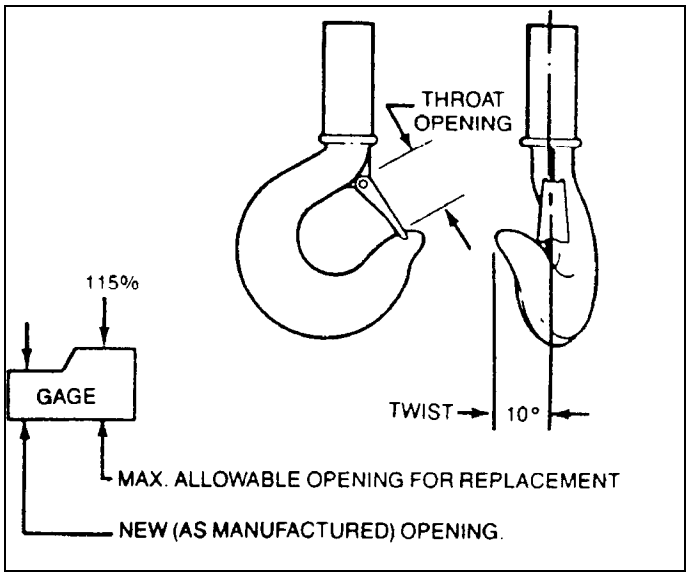
To reset the rotary limit once it has tripped, the load block assembly must travel approximately 11” [27cm] in opposite direction.

7.11 Hooks

7.11.1 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 22. 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 22.* 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.

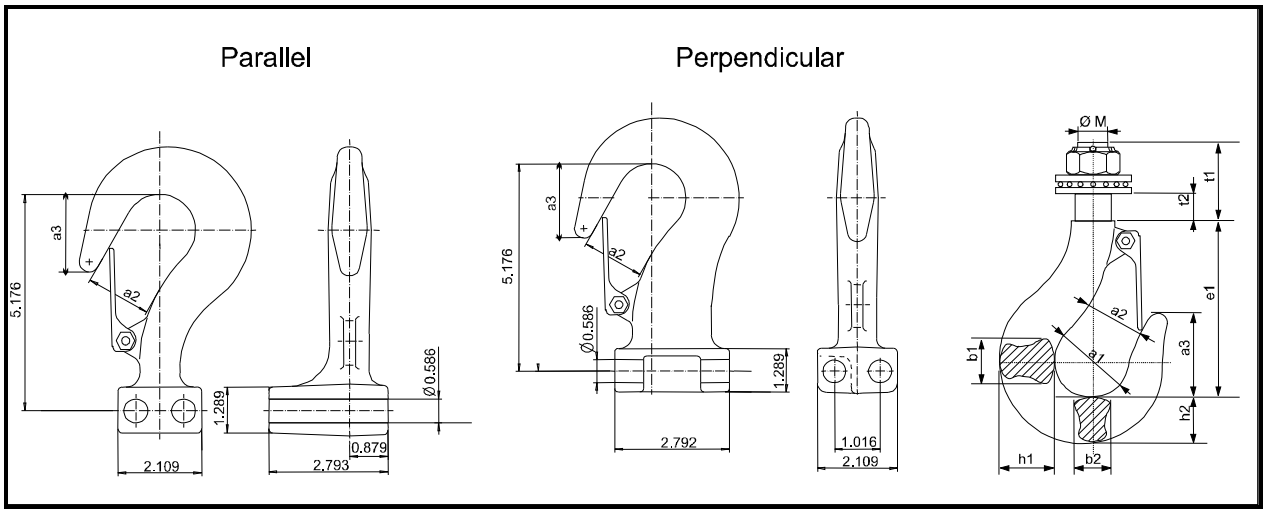
CAUTION: A safety latch SHALL function properly at all times.

CAUTION: Repairing hooks by welding or reshaping is strictly forbidden.

7.11.2 Hook Inspection

The wear on the top hook and the load hook SHALL be checked routinely. Measure the throat opening (dimension a2 - FIGURE 23). If the throat opening exceeds the maximum opening allowed, replace the hook. Damaged safety latches shall be replaced immediately.

Figure 23. Hook Dimensions



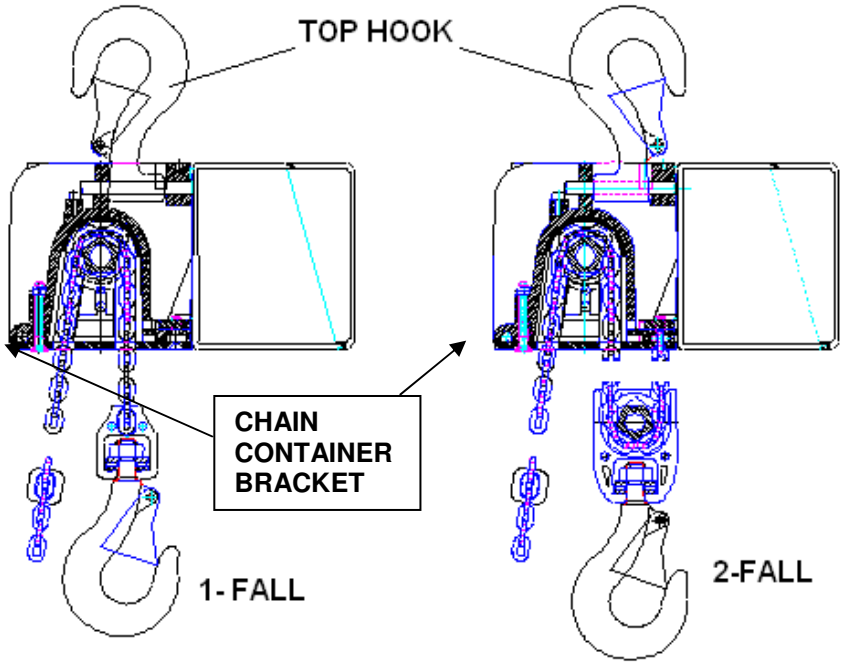
LOAD CAPACITY (LBS)	TEST LOAD	FALLS	MINIMUM FAILURE LOAD	CLASS
1389	2778	1	8752	025T
2205	4409	1	11023	025T
2756	5512	2	17361	05T
4409	8818	2	22046	05T

HOOK DIMENSIONS – INCHES										
ØM	Øa1	a2	a3	b1	b2	e1	h1	h2	t1	t2
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 – a2	Max. Allowed Dimension	Mark: ISO 2766
1.024 inches	1.178 inches maximum	DIN Model Number: 15401
1.339 inches	1.540 inches maximum	DIN 15400 Class: T
		DIN 15401 Material: 35 CD 4

7.11.3 Top Hook

Figure 24. 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 24.
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.

7.12 Control Changes and Fuses

The layouts and wiring diagrams found within this section are for standard hoist controls. Stepless hoists are available for 460 volt three-phase power supplies only.

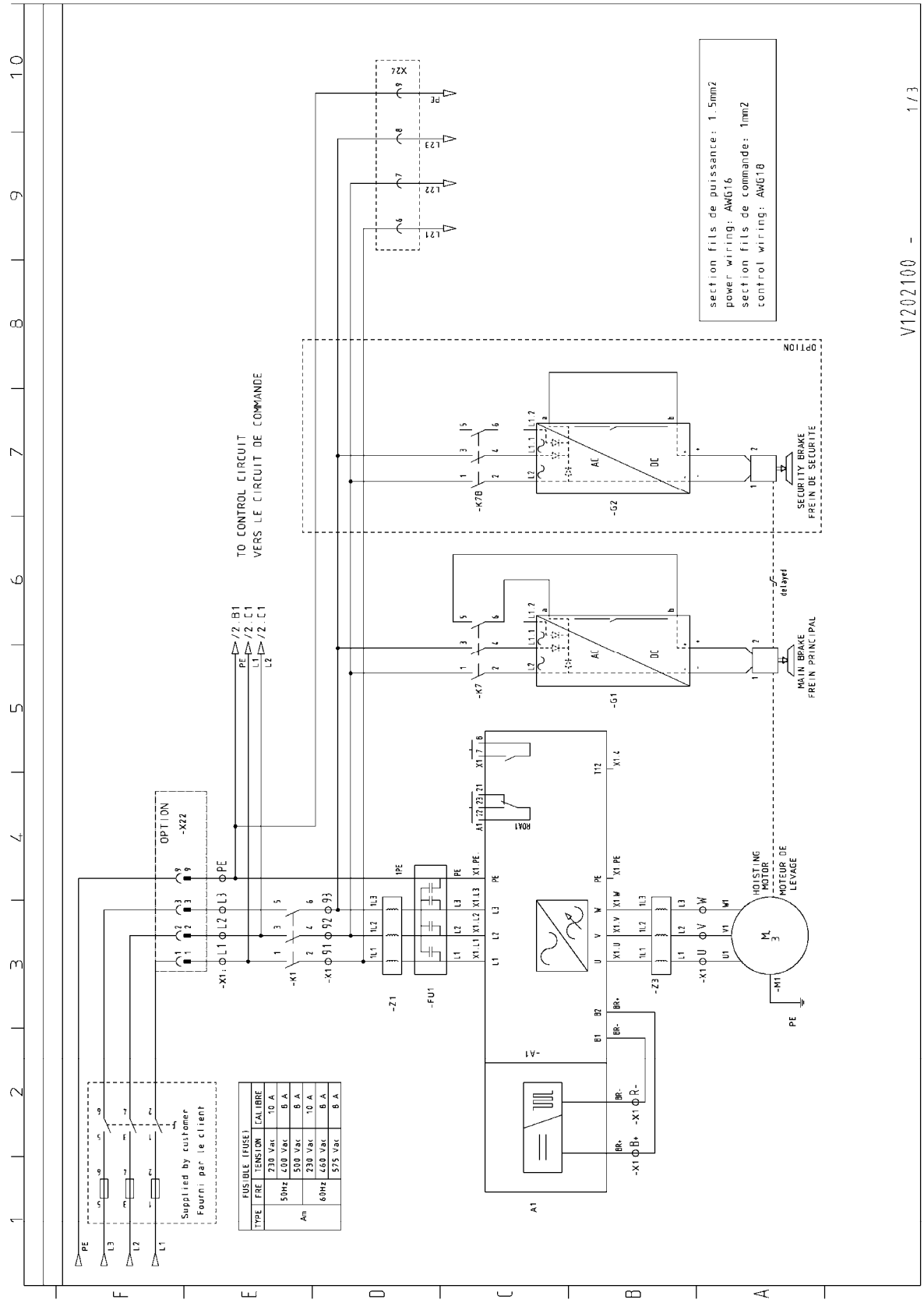
Control Circuit Fuse

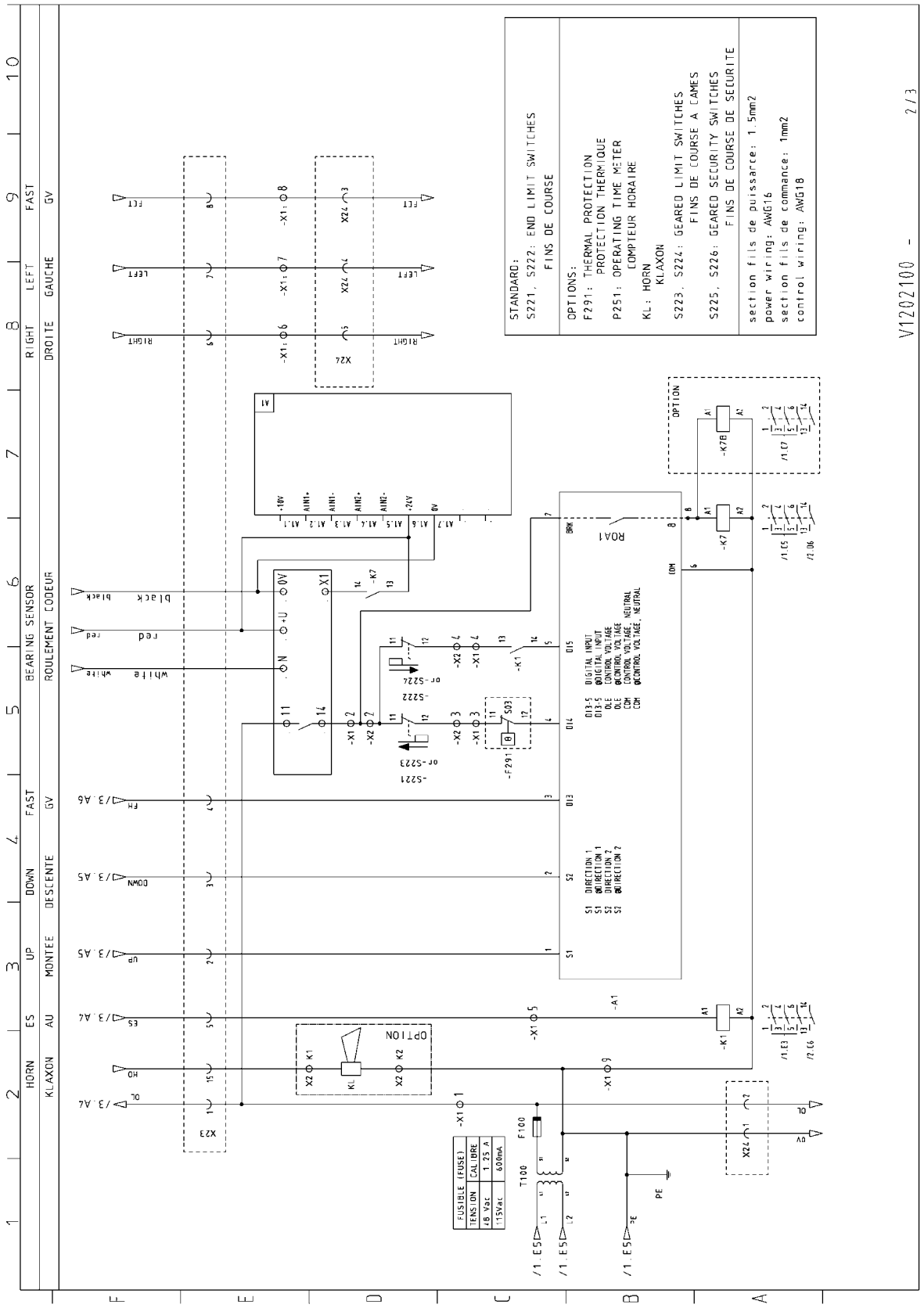
The control circuit fuse holder is located on terminal strip **X1**. The fuse holder top flips up to facilitate changing a defective fuse.

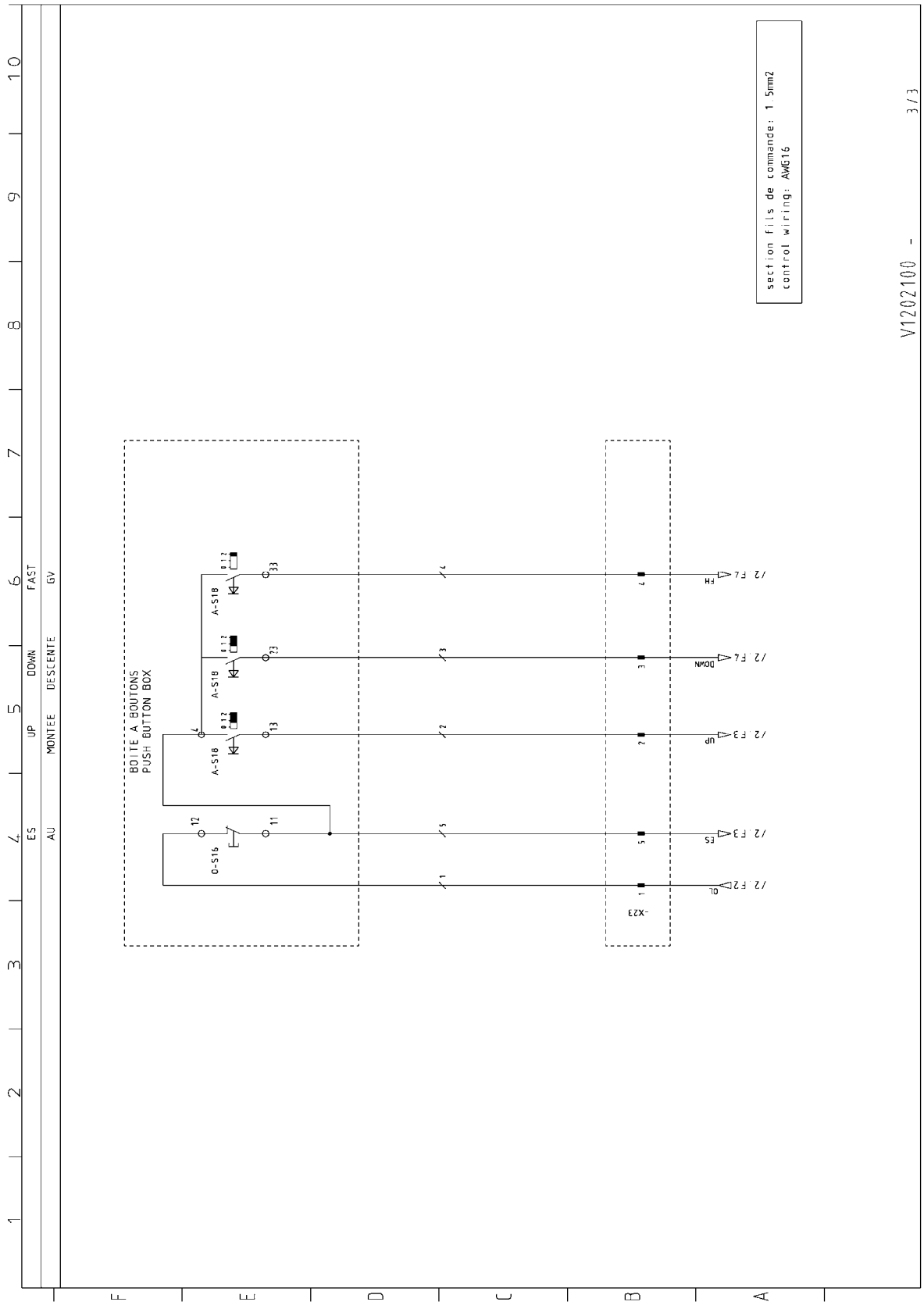
Table 17. Control Circuit Fuse

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

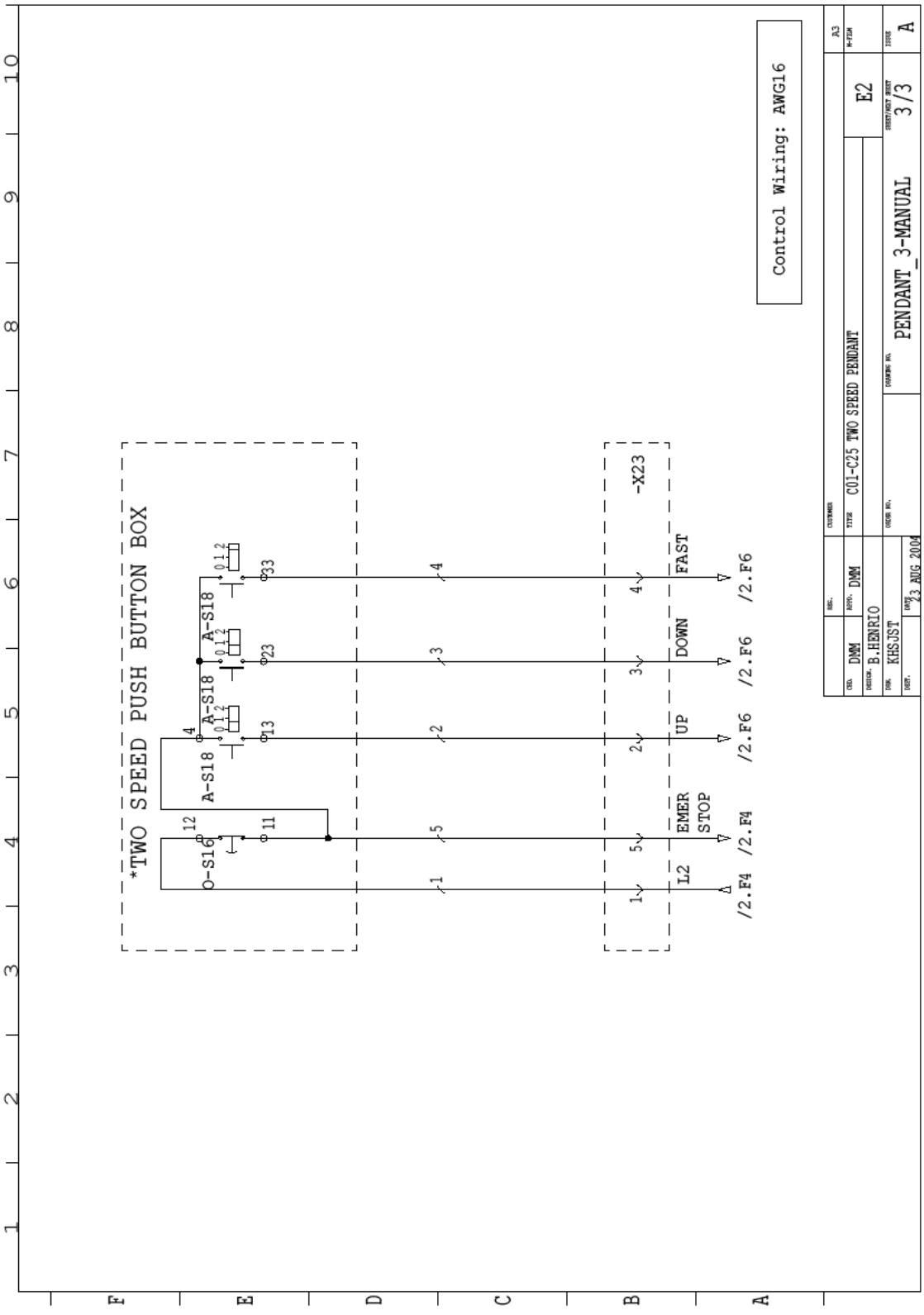
7.13 Stepless Solo Hoist – 460 Volt Wiring Diagram (page 1 of 3)



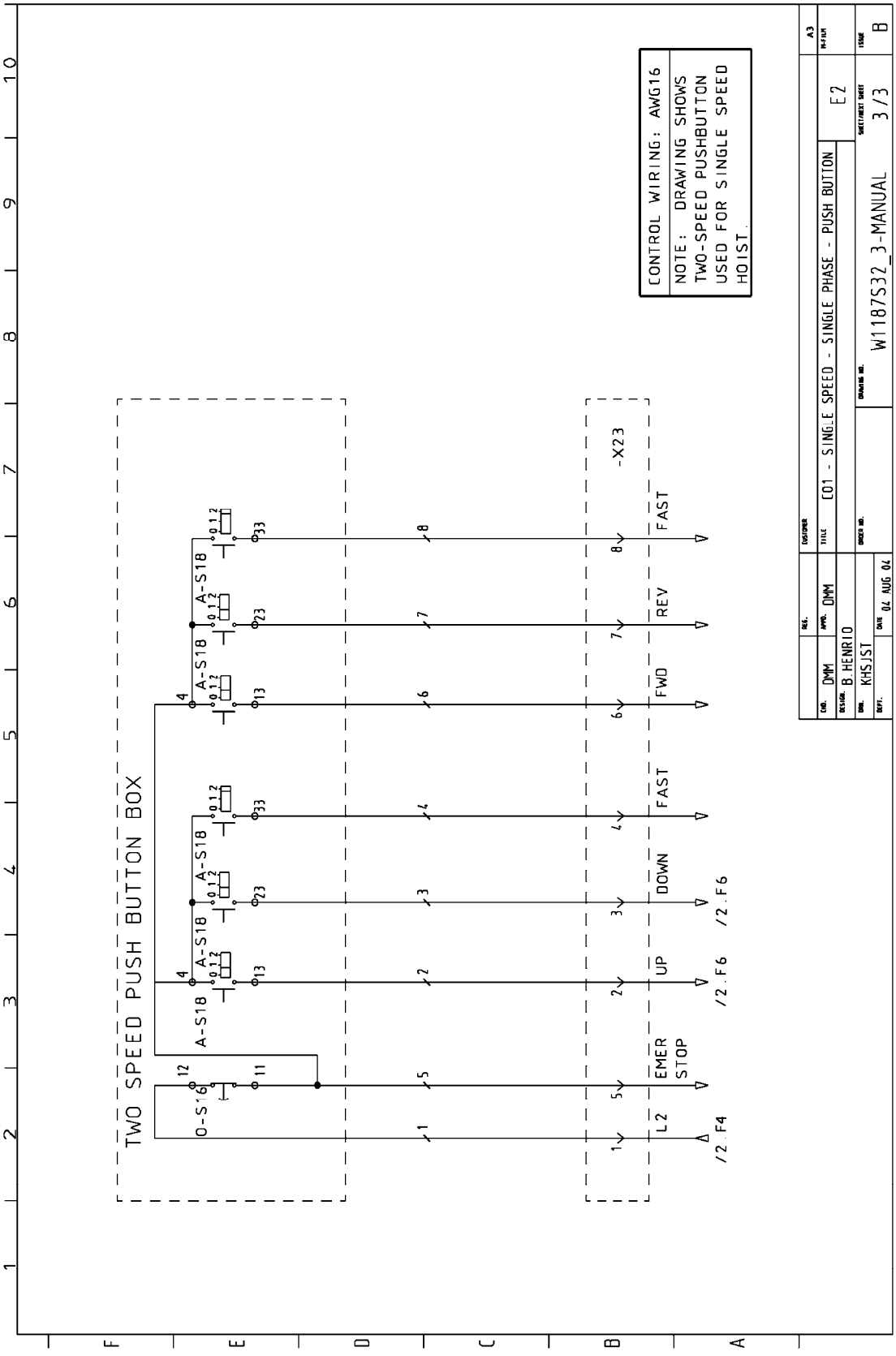




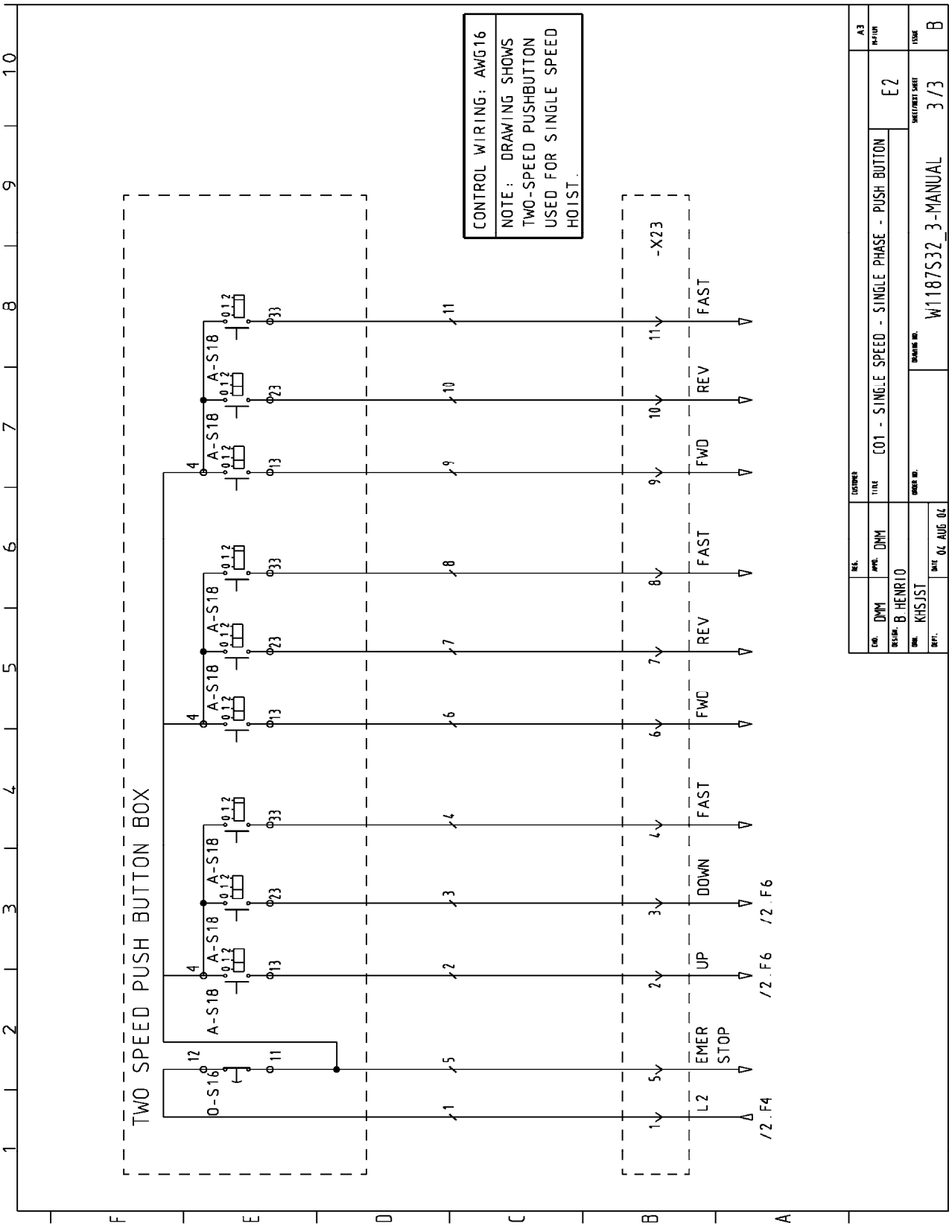
7.14 Wiring Diagram – 3 Button – Push Button



7.15 Wiring Diagram – 5 Button – Push Button



7.16 Wiring Diagram – 7 Button – Push Button



8 PREVENTATIVE MAINTENANCE

8.1 Maintenance and Inspection Table

Table 18. 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

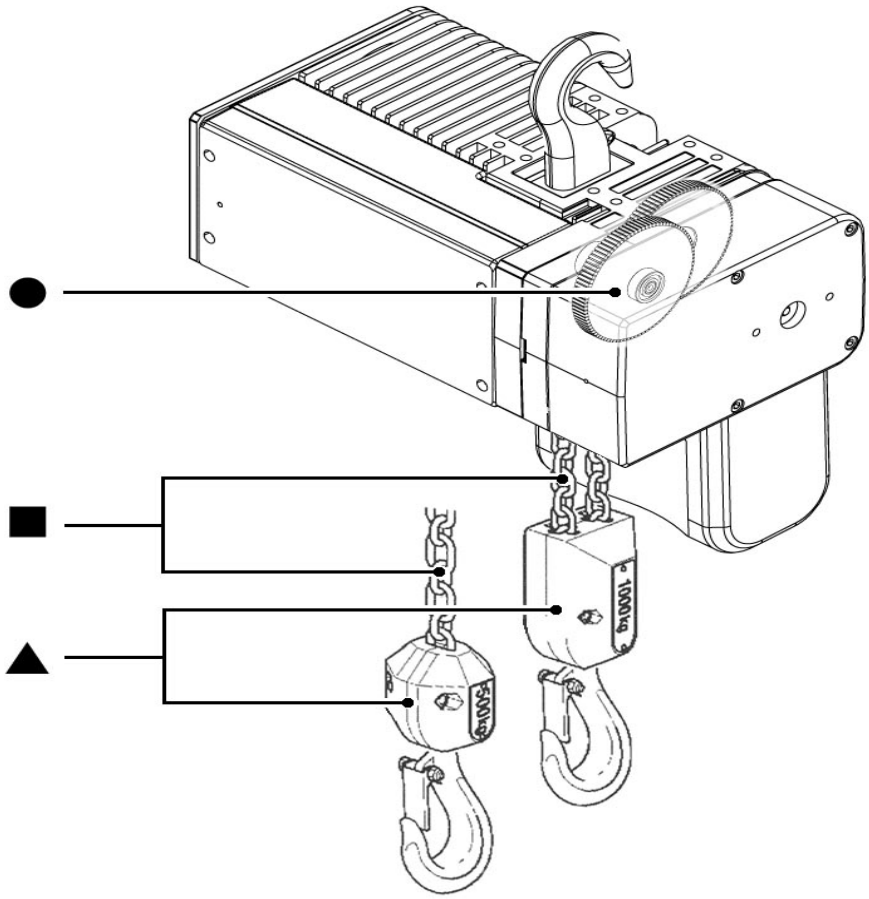


Table 19. Lubrication Specifications

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 Alvanio 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 20. 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

☞ **Once a part has been replaced, perform an operational check of hoist per Sections 3.5 and 3.7**

8.4 Screw Tightening Torque (lb-ft) Specifications

Table 21. Screw Tightening Torque Specifications

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

8.5 Troubleshooting

Table 22. Troubleshooting

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Hoist does not lift or lower load	Inverter problem	See technical documentation
	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 2
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

WARNING: High voltages inside the frequency converter. Wait for at least five minutes after the supply voltage has been switched off before service actions. The display in the operating condition (lights on) indicates a dangerous voltage on the DC-bus. When display turns off, the DC-bus voltage is approximately 100V. Note also that there is always a dangerous voltage in the braking resistor when the DC-bus is charged.

8.6 Field repair actions

The purpose of troubleshooting and field repair actions is primarily to determine whether the drive or external devices in fact cause the problems. After that, the next step is to detect the possibly damaged components inside the drive. If any damage inside the drive is caused by the environment (motor failure, brake failure, power supply problems etc.) it is very important to repair/change faulty items to prevent reoccurring problems.

The best way to repair a faulty inverter is to replace it with a new one. If the fault can be located, it is also possible to replace some of the components. When replacing an inverter or a Control unit with a new one, the parameter list of the existing drive is needed so that the parameter settings can be copied to new the one.

8.7 Typical functional problems

- **Inverter does not start when mains are connected.**
  Check mains voltage between terminal L1, L2 and L3

- **Indicator "Ready" is on and indicator "Fault" is off, but motor does not run.**
  Check control mode selection
  Check voltage at run command terminals
  Check state of digital inputs from parameter V2.3

- **Indicator "Ready" is on and indicator "Run" is on, but motor does not run.**
  Check motor cable connection

- **Motor runs poorly**
  Check that load is not over nominal
  Check that all cables are connected correctly and the junctions are reliable
  Check that all motor dependant parameters are correct
  Check the voltage of the slowdown limit switch input
  Check state of digital inputs from parameter V2.3
  Check that motor's brake opens completely
  Check that minimum speed parameters do not have too small values
  For traveling application: check u/f-curve tuning and/or Autotuning. If the main girder is new, it might be necessary to drive trolley several times with no load from end to end, before beginning of u/f-curve tuning and/or Auto tuning.

- **Some parameters are not accessible or changing is not possible**
  Check that password has value **2156**
  Check that parameter value is inside the limits
  Parameter value can not be changed in RUN state
  Parameter value change must be confirmed with "Enter" button

8.8 Inverter fault codes

If any of the following failures are found, the inverter displays the fault code and closes the mechanical brake causing the movement to stop. If several faults occur one after another, the latest one is displayed, the others are stored to fault history page.

When inverter fault supervision trips, the FAULT indicator turns on and the blinking fault code "Fx xx" (x= fault accounting number, xx = fault code number) appears on the display.

The drive includes an automatic fault reset operation; the fault code stays on the display until the fault is removed and the controller released back to 0-position. Some of the fault codes require to switch the power off before run is possible, for example F1 (overcurrent).

All faults are stored in the Fault History menu except F51 Stop-Limit, from there they can be seen if necessary. The fault history stores the last 5 fault codes.

Table 23. Inverter Fault Codes

Fault code	Fault	Possible cause	Checking	A	B
F 1	Overcurrent	Inverter has measured too high current (over 4*I_N peak or over 2.8* I_N rms) in the motor output: sudden heavy load increase short circuit in the motor or cable not suitable motor wrong motor parameters	Reset: switch power off and restart after the lamps of display are off. Check: brake operation motor type and power rating parameters motor cable connection motor insulation motor loading		X
F 2	Overvoltage	DC-bus voltage has exceeded 135% maximum level, 911Vdc deceleration time is too short supply voltage raised >1.35 x Un (high overvoltage spikes at mains or not sinusoidal wave form)	Reset has an additional 5s time delay. Check: adjust the deceleration time P1.1.3 longer measure main supply voltage level and wave form while not driving braking resistor cable braking resistor type and resistance braking chopper operation		X
F 3	Earth fault	Current measurement has sensed unbalance in motor phase currents. Supervision level is 5% of inverter nominal current not symmetric load insulation failure in the motor or the cable	Reset has an additional 5s time delay. Check: motor insulation motor cable insulation (phase-ground, phase-phase)		X
F 6	External Stop	ES signal inactive	Check: ES external connections Control mode selection P1.1.11 State of input DID5, V2.3. Thermal protection of motor is normally connected to ES signal, check motor temperature.	X	
F 9	Undervoltage	DC-bus voltage has dropped below 333Vdc mains supply voltage interrupted inverter fault can also cause an undervoltage trip external fault during run may cause an undervoltage trip	In case of temporary supply voltage break, reset the fault and start again. Check mains input. If mains supply is correct, an internal failure has occurred. Contact authorized service center.	X	
F 11	Output phase supervision	Current supervision has sensed that at least one of the motor phases has no current	Check: motor cable connections measure motor phase currents and compare to display value		X
F 13	Inverter under-temperature	Temperature of heat sink is below acceptable operating level -10°C (14°F)	Check ambient temperature cubicle heating	X	

Table 20 Inverter Fault Codes (continued)

Fault code	Fault	Possible cause	Checking	A	B
F 14	Inverter over-temperature	Temperature of heat sink is over acceptable operating level +90°C (194°F). Over-temperature warning is issued when the heat sink temperature exceeds +85°C (185°F)	Check: ambient temperature inverter cooling fan operation cooling air flow through heat sink heat sink is not dirty	X	
F 16		Parameter P1.4.1 has value "1" or "2"	Change Parameter P1.4.1 to value "0"		X
F 22 F 23	EEPROM checksum fault	Parameter save error interference fault component failure (control unit)	After power off the inverter will automatically reset parameter settings. The drive does not work properly nor enable driving after this fault. Check: all parameter settings. +24V voltage output loading If the fault comes again, contact authorized service center.		x
F 25	Microprocessor watchdog-fault	interference fault component failure (control unit)	Reset: switch power off and restart after the lamps of display are off. If the fault comes again, contact service center.	X	
F 39	Device removed	Option board removed.	Reset the fault Check option board connection	X	
F 40	Device unknown	Unknown option board or drive.	Check board and drive type.		X
F 41	IGBT temperature	IGBT transistors is calculated to be over heated long duration overload lowered cooling high environment temperature	Reset: switch power off and restart after the lamps of keypad are off. Check: motor loading brake operation inverter heatsink inverter cooling fan operation environment temperature		x
F 44	Device changed	Option board changed.	Reset the fault	X	
F 45	Device added	Option board added.	Reset the fault	X	
F 51	Stop limit	S12 or S22 signal is inactive	Reset: keep controller at zero >300ms. Check control mode selection P1.1.11 Check the state of inputs DID4 and DID5, V2.3 Hoisting application: check Dold settings	X	
F 56	Generator side current limit	The inverter cannot stop with the set ramp stretching, it will stop by brake and show F56 Too short deceleration time	Reset has an additional 5 s time delay. Check: deceleration time	X	
F 60	Parameter fault	"Motor selection" parameter P1.2.2 has value = "Not Used"	Download parameters again		X
F 73	Both drive commands active	S1 and S2 signals on over 500ms in same time The inverter stops according "Stop Function" parameter Short circuit in pendent cable	Check: digital I/O cabling		X

A = Can be done by the user

B = Can be done only by manufacturer authorized personnel

9 PARTS ILLUSTRATION

9.1 Hoist Body

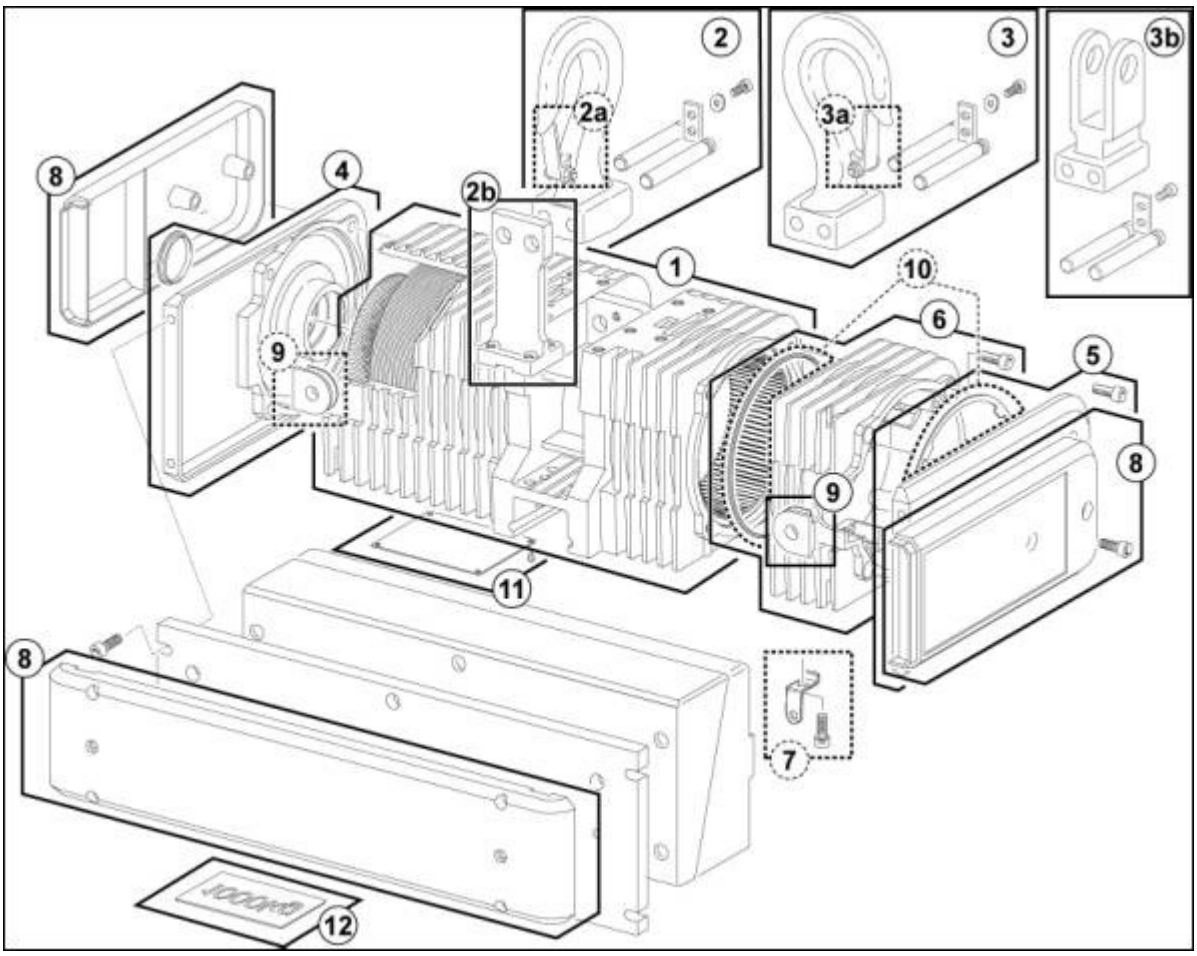


Table 24. Hoist Body Parts List

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 (Stepless)

Figure 25. Stepless Hoist Brake Mechanism

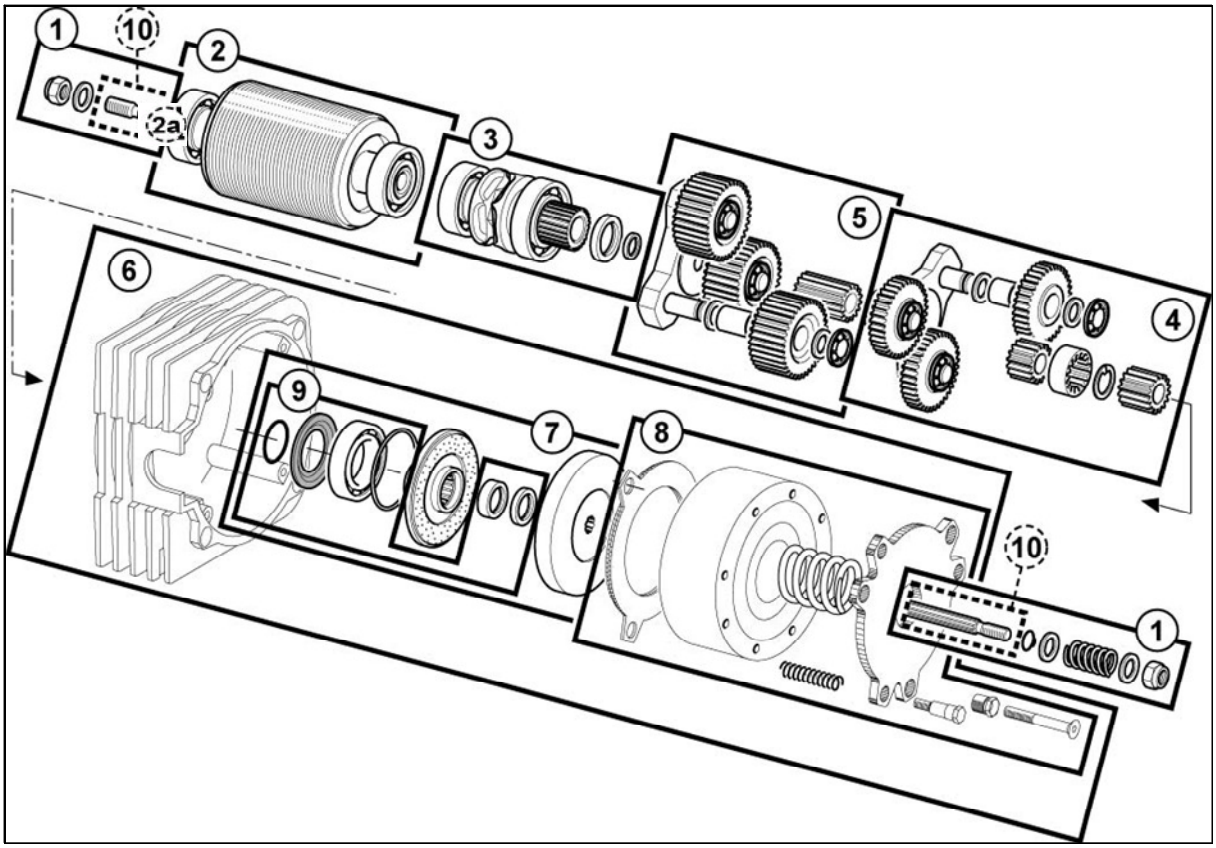


Table 25. Stepless Hoist Brake Mechanism Parts

POS	QTY	CODE	DESCRIPTION
1	1	2249940	Slipping clutch spring with motor shaft
2	1	52326386	Rotor assembly – stepless speed rotor
2a	1	52315226	Bearing with integrated pulse sensor
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 - 190V/400V
7	1	2249972	Slipping clutch friction assembly
8	1	2248001	Brake, complete 190V/400V
9	1	2240012	Set of seals for brake cap
10	1	2241501	Motor shaft

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9.3 Lifting Assembly

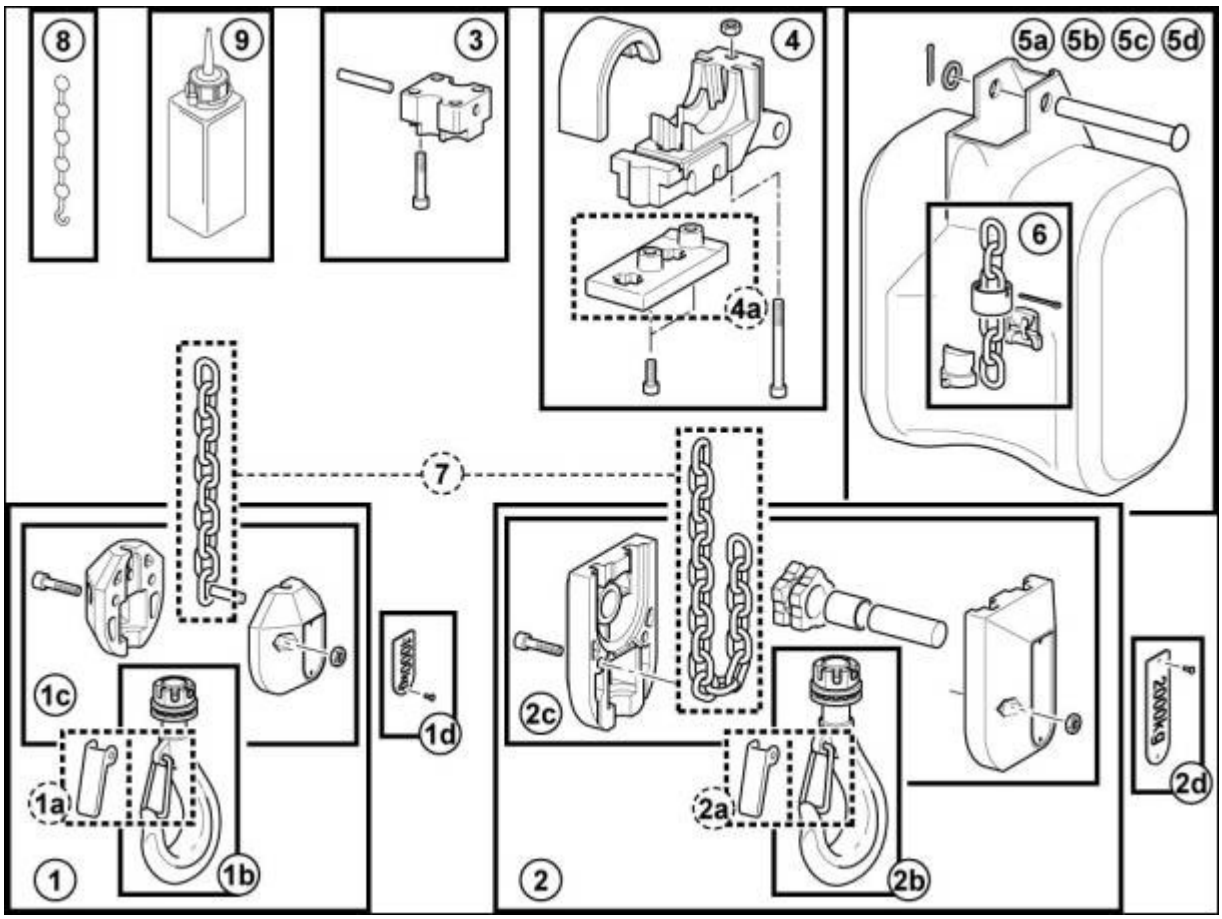


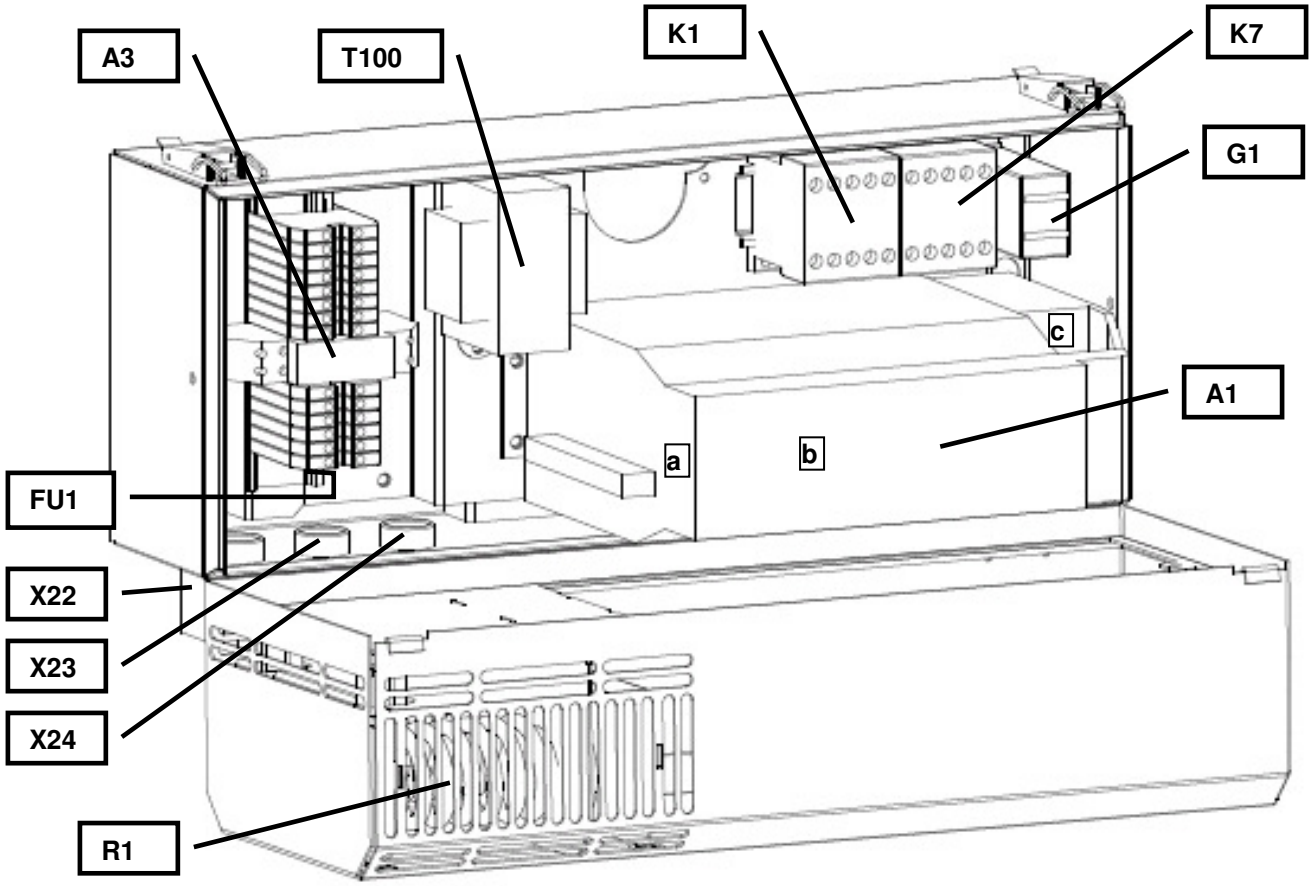
Table 26. Lifting Assembly Parts List

ITEM	PART NUMBER	DESCRIPTION	QTY
1	2249905	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	2249906	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	2242060	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

Figure 26. Stepless Hoist Electric Box



NOTE: Inverter includes only one I/O Extension board slot.

Table 27. Stepless Hoist Electric Box Parts List

POS.	QTY	CODE	DESCRIPTION	REMARKS
	1	52326394	Electric cubicle without plug X24	400V/48V
	1	52326393	Electric cubicle without plug X24	400V/115V
	1	52326392	Electric cubicle without plug X24	400V/230V
	1	52326395	Electric cubicle without plug X24	460V/115V
	1	52317988	Empty electric cubicle	
A1	1	52319630	Inverter	
A1a	1	52305691	I/O extension board	
A1b	1	52314515	Display Panel	
A1c	1	52320763	Fan	
K1 / K7	1	7983061	Contactor LC1K0910E7	48V
K1 / K7	1	1123051	Contactor LC1K0910F7	115V
K1 / K7	1	1123113	Contactor LC1K0910P7	230V
G1	1	1115062	Brake control unit	
A3	1	52318159	Overspeed monitor	
T100	1	7983021	Transformer	400V/48V
T100	1	7983029	Transformer	400V/115V
T100	1	7983028	Transformer	400V/230V
T100	1	7983026	Transformer	460V/115V
R1	1	52318160	Braking resistor	65 ohm
FU1 + Z1	1	52296673	Input filter for EMC level (N)	
Z3	1	52297604	Input filter for EMC level (N)	
X22a	1	52326514	Round cable gland	
X22b	1	52326515	Flat cable gland	
X22c	1	52326516	Connection plug set for power supply	
X23	1	52326517	Connection plug set for push-button box	
X24a	1	52326518	Connection plug set for trolley	
X24b	1	52326519	Cap	

9.5 Chain Guide Assembly – With Limit Switches

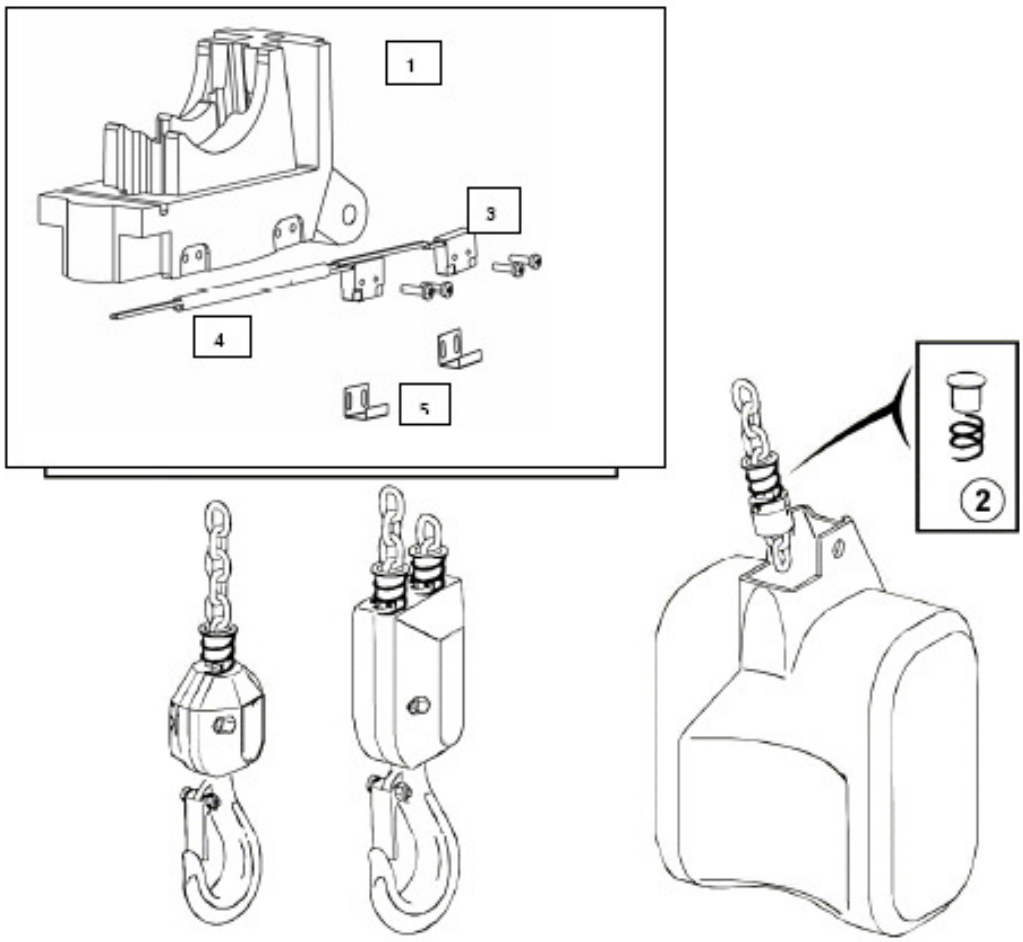


Table 28. Chain Guide Assembly with Limit Switches Parts List

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

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

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9.6 Low Headroom Trolley

9.6.1 Low Headroom Trolley (Drive Components)

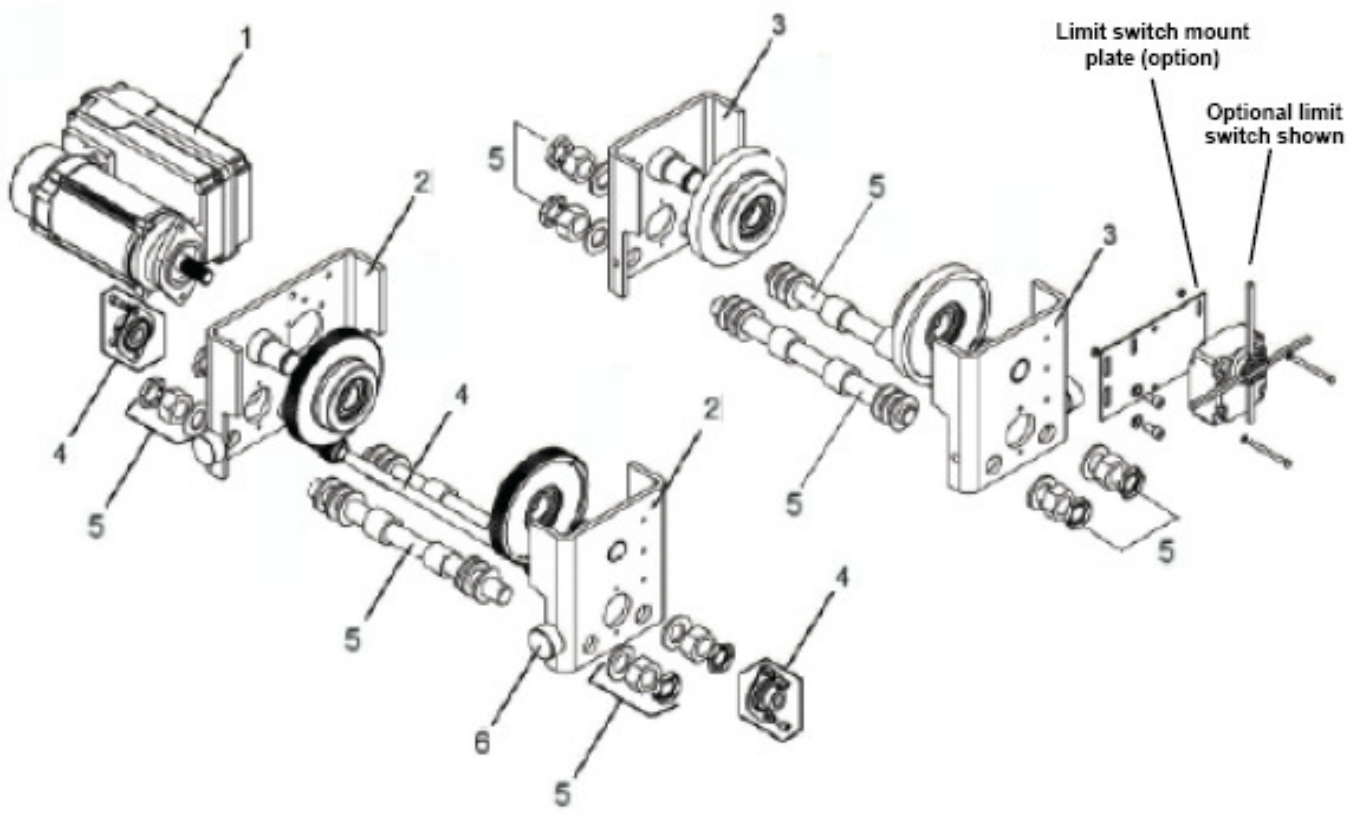


Table 29. Low Headroom Trolley Short Outreach (Drive Components)

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

9.6.2 Low Headroom Trolley (Suspension Components)

Figure 27. Low headroom trolley (suspension components)

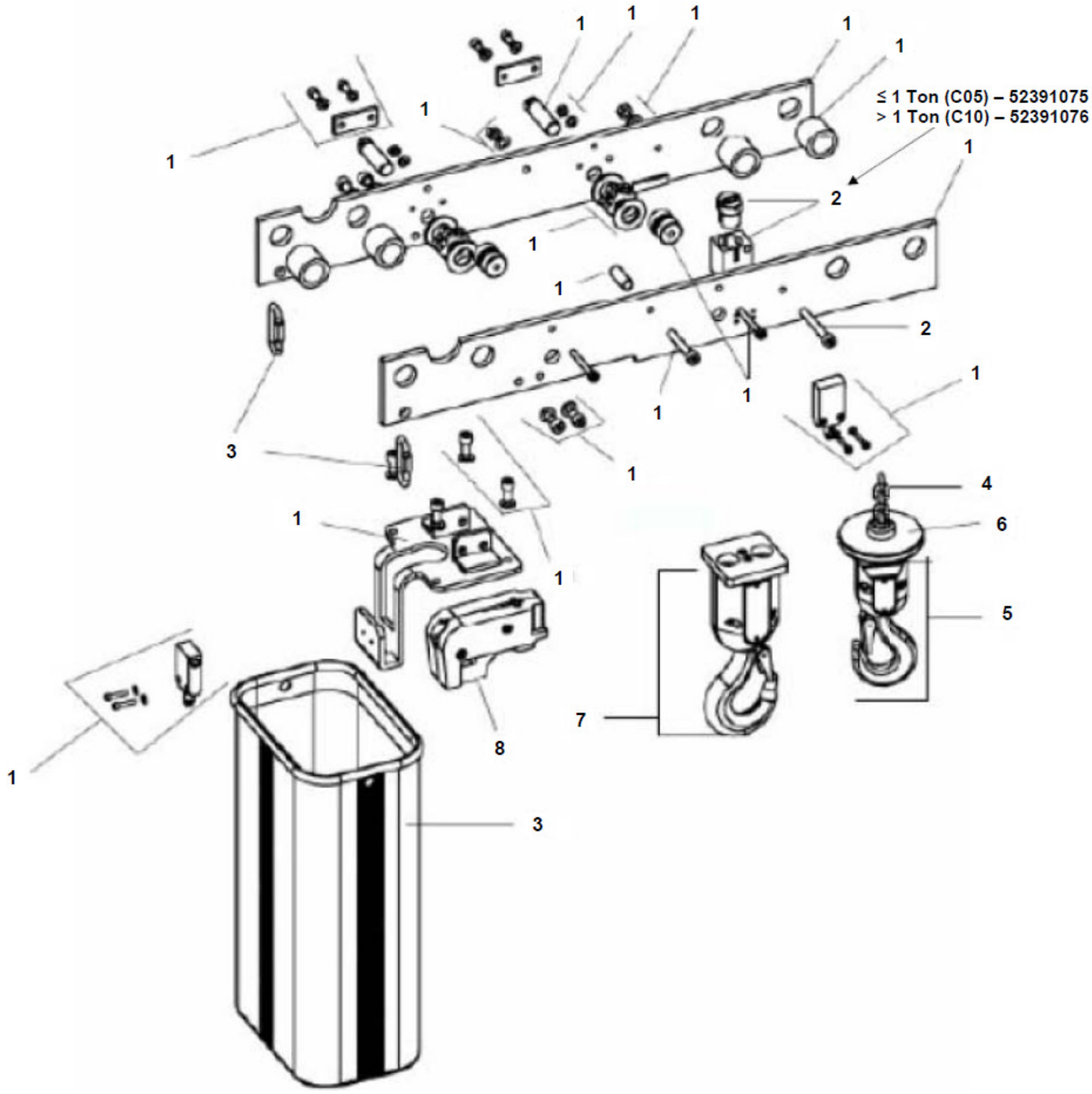


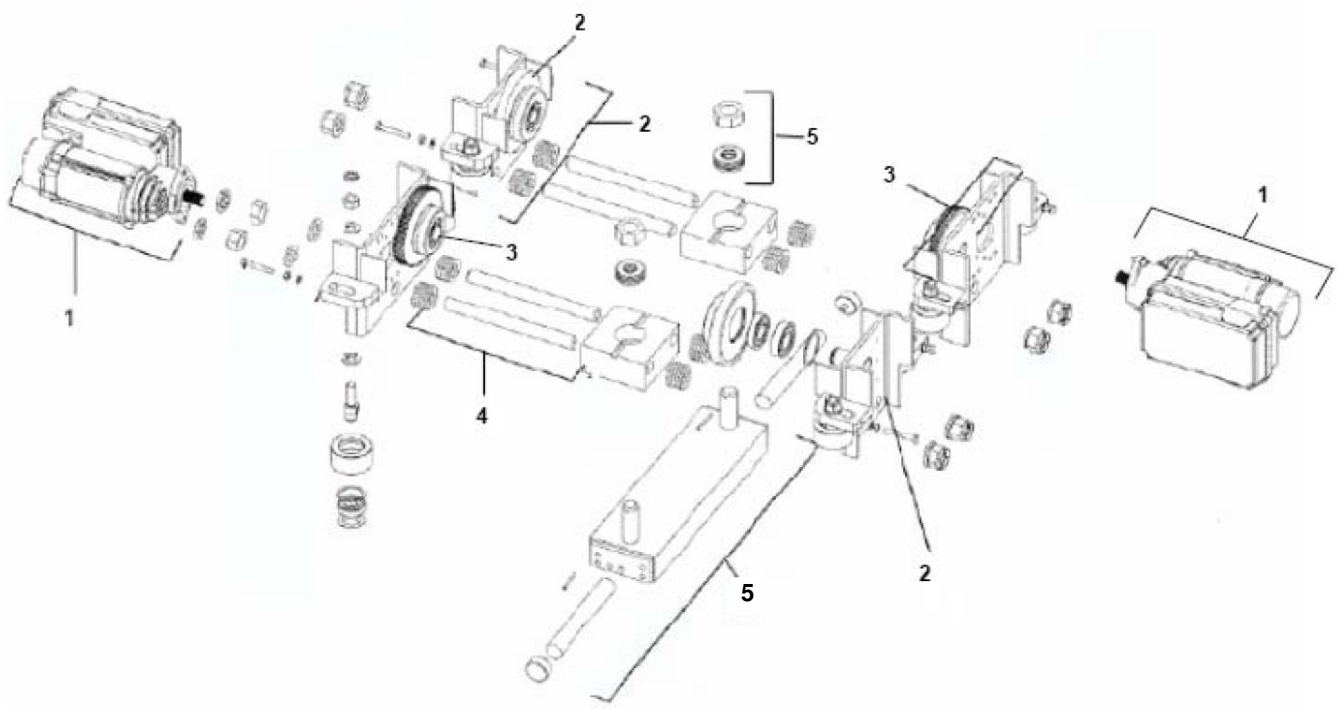
Table 30. Low Headroom Trolley (Suspension Components)

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 to130 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.

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

Figure 28. 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 31. 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 575V 208/230V	≤ 1 Ton (1000 Kg)	2	52299090
			> 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

9.8 Push Button Assembly – Horizontal Pairs of Buttons

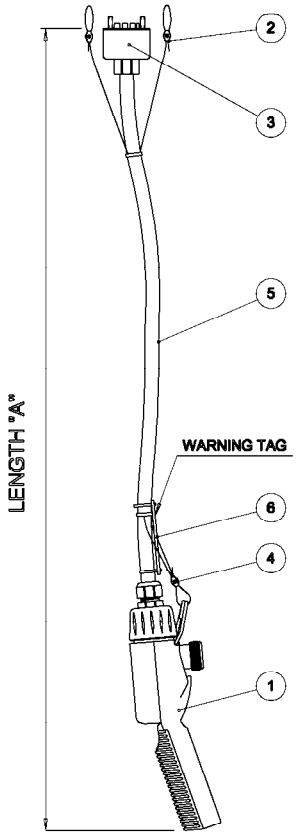


Table 32. Push Button Assembly (Horizontal Pairs of Buttons) Parts List

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

9.9 Push Button Assembly – Horizontal Pairs of Buttons

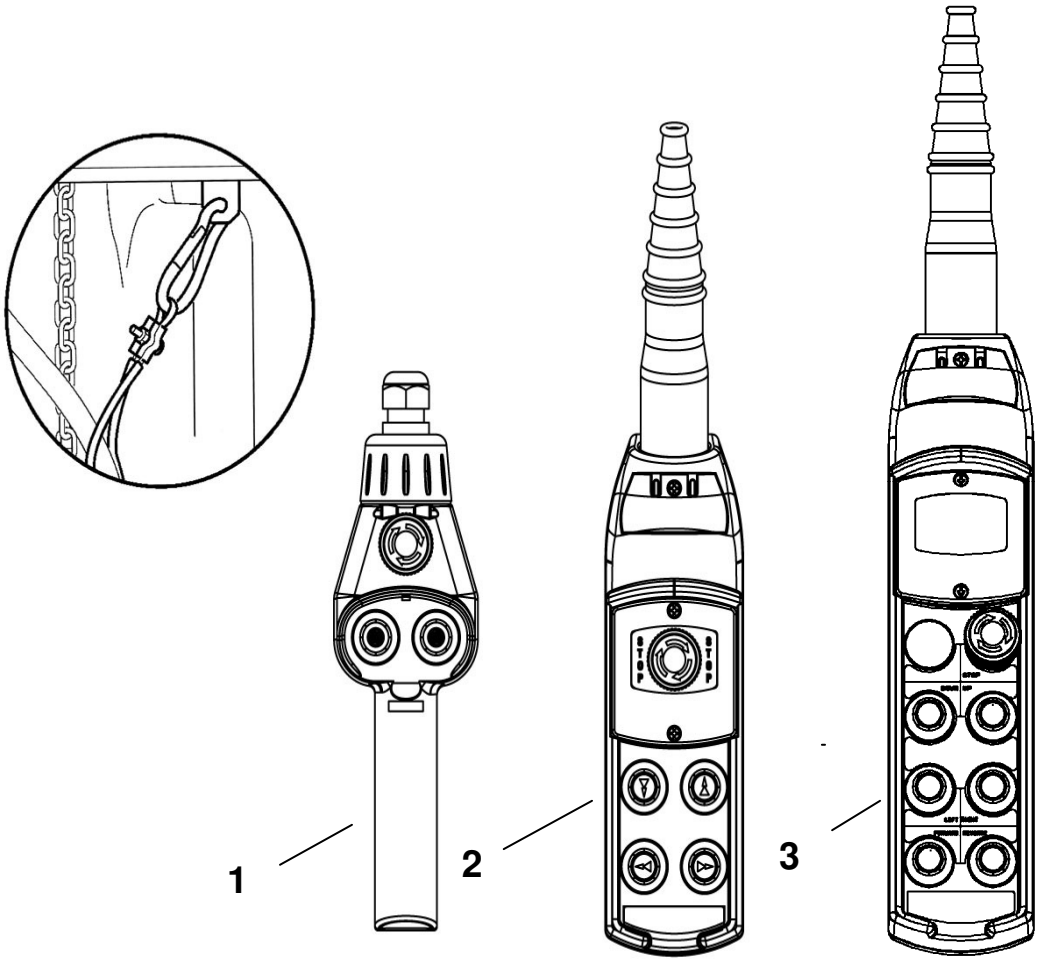


Table 33. Push Button Assembly – Horizontal Pairs of Buttons Parts List

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

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

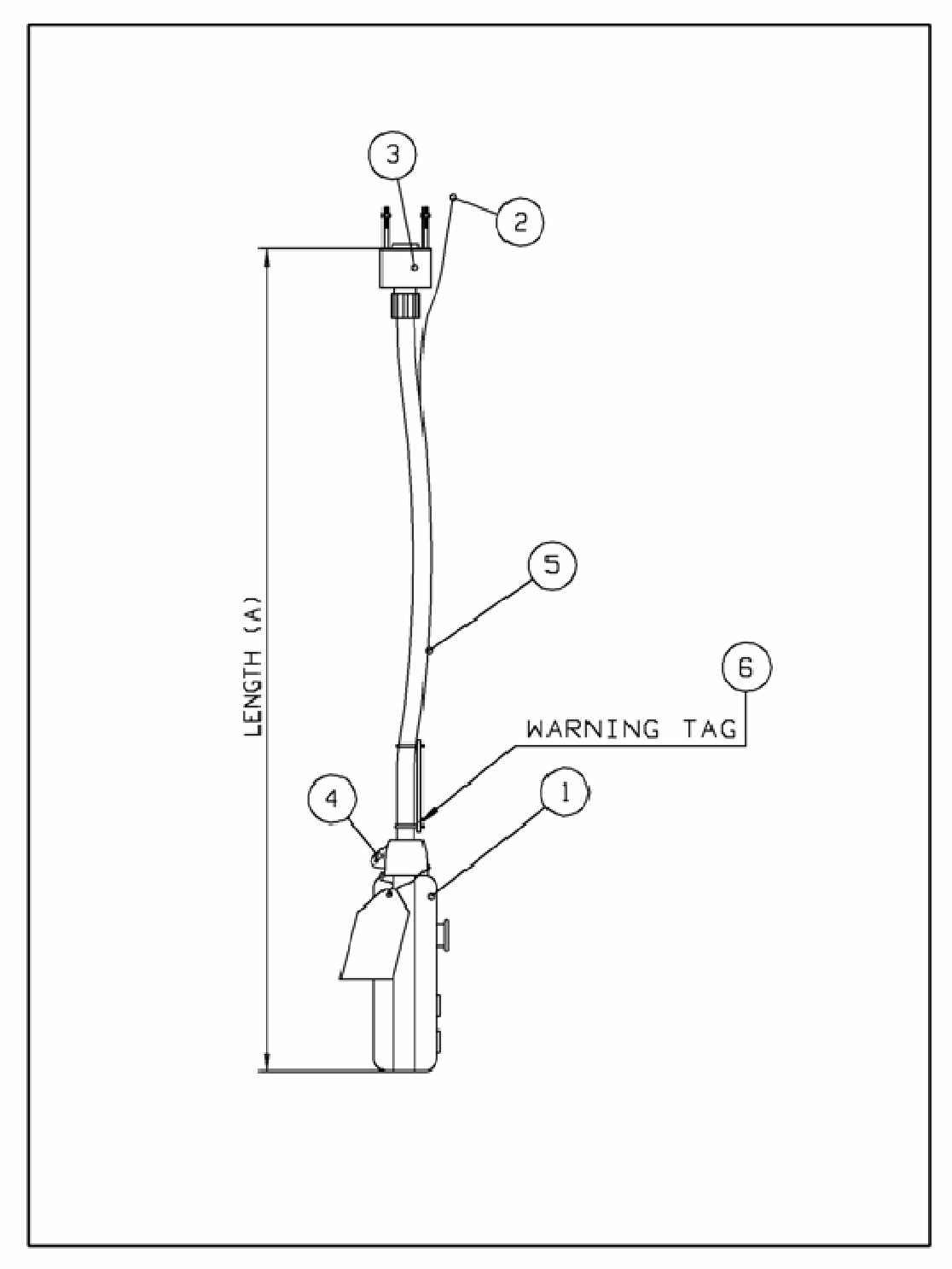


Table 34. Push Button Assembly – Vertical Pairs of Buttons (Option) Parts List

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

9.11 Push Button Assembly – Vertical Buttons (Option)

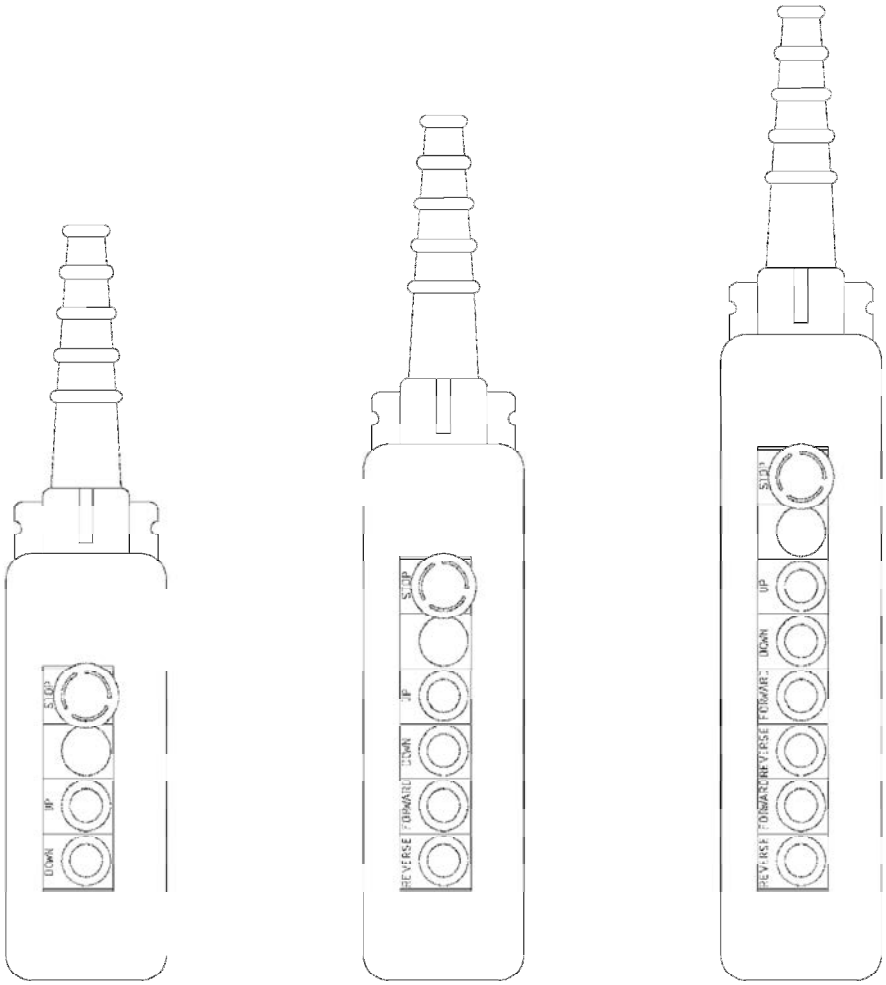


Table 35. Push Button Assembly - Vertical Buttons (Option) Parts List

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

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