OPERATION MANUAL

This operation manual is intended as an instruction manual for trained personnel who are in charge of installation, maintenance, repair etc.

Hoist Serial Number: _____

Date Purchased: _____

Before equipment use, please read this operation manual

2721 NE 4th Ave Pompano FL, 33064 | (954) 367-6116

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1.0 WARRANTY

Every product is thoroughly inspected and tested before it is shipped from the factory. If any problem develops within one year, return the product prepaid to the factory. If an inspection reveals that the problem is caused by defective workmanship or material, repairs will be made without charge and the product will be returned with the shipping prepaid.

Excluded Items

This warranty does not cover:

- Deterioration caused by normal wear, abuse, chemical or abrasive actions, improper maintenance or excessive heat.
- Problems resulting from repairs, modifications, or alterations made by people other than factory or ACI representatives.
- If the product has been abused or damaged due to an accident.
- If repair parts or accessories other than ACI equipment are used on the product; they are warranted only to the extent that they are warranted by the manufacturer of said parts or accessories.

Remarks

EXCEPT AS STATED HERE, ACI MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES FOR A PARTICULAR PURPOSE.

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

To avoid injury:

DO NOT alter or modify equipment.
DO NOT use equipment to lift, support or otherwise transport people.
DO NOT suspend unattended loads over people.

2.0 SAFETY PRECAUTIONS

2.1 Safety Alert Symbols

Throughout this manual are steps and procedures that can prevent hazardous situations, the following symbols are used to identify the degree or level of hazard seriousness.

DANGER, WARNING AND CAUTION NOTICE

Symbol	Description
DANGER	**Danger** Indicates an imminently hazardous situation which, if not avoided, **will result in death or serious injury** and property damage.
WARNING	**Warning** Indicates an imminently hazardous situation which, if not avoided, **could result in death or serious injury** and property damage.
CAUTION	**Caution** Indicates a potentially hazardous situation which, if not avoided, **may result in minor or moderate injury** or property damage.
NOTICE	**Notice** Notifies people of installation, operation or maintenance information which is important but not directly hazard related.

WARNING

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

NOTICE

It is the responsibility of the owner/user to install, inspect, test, maintain, and operate a hoist in accordance with ASME B30.16, Safety Standard for Overhead Hoists, OSHA Regulations, and ANSIINFPA 70, National Electrical Code. If the hoist is installed as part of a total lifting system, such as an overhead crane or monorail, it is also the responsibility of the owner/user to comply with the applicable ASME B30 volume that addresses that type of equipment used in the system.

Further, It is the responsibility of the owner/user to have all personnel that will install, inspect, test, maintain, and operate a hoist read the contents of this manual and applicable portions of ASME B30.16, Safety Standard for Overhead Hoists, OSHA Regulations, and ANSIINFPA 70, National Electrical Code. If the hoist is installed as part of a total lifting system, such as an overhead crane, the applicable ASME B30 volume that addresses that type of equipment must also be read by all personnel. Any ANSI Standards referenced in this manual may be obtained from the American National Standards Institute, 1430 Broadway, New York, New York 10018.

⚠WARNING

These general instructions deal with the normal installation, operation, and maintenance situations encountered with the equipment described herein. The instructions should not be interpreted to anticipate every possible contingency or to anticipate the final system, crane, or configuration that uses this equipment.

This manual includes instructions and parts information for a variety of hoist types. Therefore, all instructions and parts information may not apply to anyone type or size of specific hoist. Disregard those portions of the instructions that do not apply.

Record hoist serial number on the front cover of this manual for identification and future reference to avoid referring to the wrong manual for information or instructions on installation, operation, inspection, maintenance, or parts.

Use only ACI authorized replacement parts in the service and maintenance of this hoist.

2.2 Important Information and Warnings

- Equipment described in this manual is not designed for and should not be used for lifting, supporting, or transporting humans.
- To ensure the good working order and reliable operation of your hoist keep strictly to the requirements of the maintenance and operation given in this Manual.
- Keep strictly to the requirements for safe operation in order to prevent dangers from the personnel and damages of the electric hoist.
- The repairs shall be furnished only with spare parts supplied by the manufacturer.
- The connection of the electric hoist with the power supply shall be furnished only by a qualified electrician.
- Assemblage and putting the electric hoist into use shall only be done by qualified persons, authorized by ACI Hoist and Crane.
- Modifications to upgrade, rerate, or otherwise alter this equipment shall be authorized only by the original equipment manufacturer or qualified professional engineer.
- Equipment described in this manual may be used in the design and manufacture of cranes or monorails. Additional equipment or devices may be required for the crane or monorail to comply with applicable crane design and safety standards. The crane designer, crane manufacturer, or user is responsible to funish these additional items for compliance. Refer to ASME B30.17, Safety Standard for Top-Running Single Girder Cranes; ASME B30.2 Safety Standard for Top-Running Double-Girder Cranes; and ASME B30.11 Safety Standard for Underhung Cranes and Monorails. If a below-the-hook lifting device or sling is used with a hoist, refer to ASME B30.9, Safety Standard for Slings, or ASME B30.20, Safety Standard for Below-the-Hook Lifting Devices.
- Hoists and cranes, used to handle hot molten material may require additional equipment or devices. Refer to ANSI Z241.2, Safety Requirements for Melting and Pouring of Metals in the Metalcasting Industry.
- The hoists are not designed to operate in chemically aggresive and explossive environment.
- Failure to read and comply with any of the limitations noted herein can result in serious bodily injury or death, and/or property damage.

Working in or near exposed energized electrical equipment presents the danger of electric shock.

⚠WARNING

Hazardous voltages are present in the control enclosure, other electrical components, and connections between these components.

Before performing any mechanical or electrical maintenance on the equipment, disconnect the main switch supplying power to the equipment; and implement lockout/tagout procedure. Refer to ANSI z244.1, personnel protection - lockout/tagout of energy sources.

DO NOT operate the equipment without control enclosure cover or covers in place.

Only trained and competent personnel should inspect and repair this equipment.

⚠WARNING

Before installing, removing, inspecting, 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 applicable ASME B30 volumes.

Additional WARNINGS are listed in various portions of this manual. Personnel shall read and follow these WARNINGS. Failure to read and comply with these WARNINGS as well as other instructions or any limitations noted in this manual and applicable ASME B30 volumes could result in serious bodily injury or death, and/or property damage.

2.3 General Safe Operation Requirements

- Read and observe the instructions and warnings contained in this manual. Read and observe any instructions and warning tags attached to the hoist.
- Check for any damage to the hoist during shipment. If any damage has occurred, place a claim with the carrier. DO NOT install a damaged hoist.
- Locate any vent plugs attached to or included with the hoist and trolley. Remove solid shipping plug or plugs and replace with a vent plug.
- Check wire rope for damage and spooling on drum. Be sure rope is properly seated in drum grooves and sheaves. Make sure both of rope ends are tightly secured.
- After each rope replacement as well as after repair and reassembling of the electric hoist check the phasing and the limit switch adjustment for upper and lower position of the loading hook.
- Be certain that Power supply to hoist and trolley has the same voltage, frequency, and phase that are specified on the hoist and trolley nameplate.
- At reaching the maximum permissible axial stroke of the electric motor rotor, readjust the brake.
- While carrying maintenance and repair activities for electric repairs/maintenance, make sure that there is no load on the hook; the power supply switch is turned off and unauthorized switching on is eliminated.
- Check the loading hook for cracks and deformations as well as the good working order of the fuse for self-release of the load.
- Check the bearing screw joints to avoid them eventually self-unwind.
- Check the reliable connection of cable protective conductors to the grounding terminals in the electric board as well as the transformer and the electric.
- If hoist has a trolley, check that the crane bridge beam or monorail beam is level, straight, and clean. Check that trolley stops are installed, or install trolley stops, at the open end or ends of the beam to prevent the trolley from traveling off the beam. Trolley stops that engage trolley wheels are not recommended. Check that trolley stops will prevent overhanging parts of the hoist and trolley from interfering with other equipment beyond the ends of the beam or monorail.
- In all cases of disassembly of the push button cover the outer surfaces of the metal screws which fasten its housing with electrical insulating material.
- Daily, before starting work, check the operation of the brake and the limit switch.
- Do not use the limit switch as an operational one in any case.

⚠WARNING

Damage to the hoist, a dropped load, and injury may result if limit switches fail due to improper use.

Under normal operating conditions, stop hoist travel before engaging limit switches. Limit switches are safety devices and should not be used as normal operating control.

- Do not leave the lifted load out of sight.
- Do not exceed the rated capacity.
- Do not lift loads at an angle and do not drag them.
- Do not try to detach firmly fixed loads (e.g. frozen to the ground)
- Do not change or modify the electric diagram. Do not use the push buttons and limit switches for other purposes but those indicated.
- End positions in vertical and horizontal movement can be used only if an operating limit switch is provided.
- Equipment covered herein is not designed or suitable as a power source for lifting or lowering persons. Lifting and moving of loads over the personnel is not allowed.
- Warning signs and barriers shall be utilized on the floor beneath the crane or area where the hoist will be installed.

3.0 GENERAL DESCRIPTION

3.1 General

ACI wire rope hoists are designed to be operated as independent load-lifting devices or as units to be implemented in other material handling equipment. The hoists are either stationary or movable, designed to operate indoors or outdoors under shelter. The operation and overloading conditions are stated in the passport of the unit. At the present ACI offers following wire rope models:

BM Base Mount

DG Double Girder

LH Low Headroom

DL Double Girder Low Headroom

DN Double Girder Nested

MS Motorized Standard Headroom Trolley

Generally, the electric hoist consists of two modules - lifting mechanism and travelling mechanism (Trolley). The movable hoists are manufactured with an integral trolley while the stationary hoists (Base/Lug Mount) are fixed to a plane and consist only of a lifting mechanism.

Regarding the mutual allocation of the lifting mechanism and the travelling mechanisms both normal headroom and low headroom modifications are available. On hoists with normal headroom the lifting mechanism is situated under the travelling mechanism while the lifting mechanism on the low headroom hoists are situated sideways of the travelling mechanism.

3.2 Lifting Mechanism

The lifting mechanism includes following parts (Figure 3.2.1):

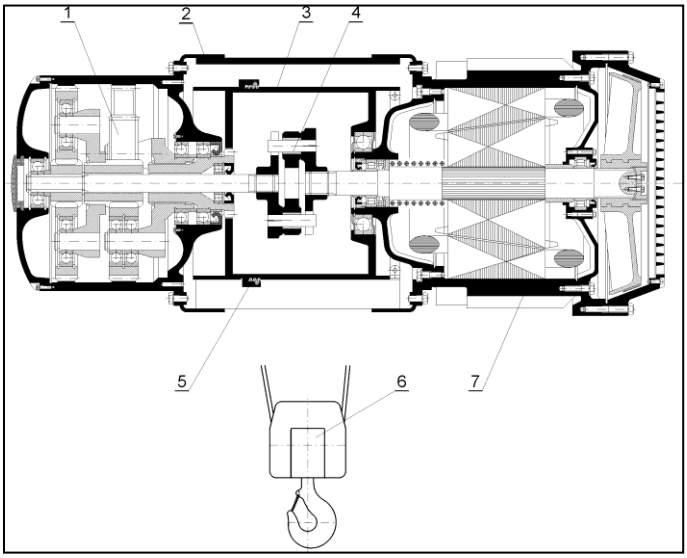


Figure 3.2.1

1. Planetary reducer
2. Body housing
3. Drum
4. Clutch
5. Rope guide
6. Hook- block
7. Electric motor with a built-in brake

Planetary reducer

A two-stage planetary reducer is placed outside the drum. Gear wheels are heat treated and are made from high-grade steel. They are oil-lubricated and camped on rolling ball-bearings.

Body

The housing is an integral welding structure formed by two steel flanges connected with profiled longitudinal beams.

Drum

A hallow shaft connects planetary reducer to the drum. The drum is supported by rolling bearings which prevent groove connection between the drum and the reducer.

Elastic Clutch

An elastic clutch minimizes resistance of axial shift of the rotor and transmits the electric motor torque to the gear box.

Rope guide

The rope guide is essential to extend the cable life and reduce maintenance costs. The rope guide consists mainly of two parts – a guide nut and a tensioning spring which ensures that the rope runs firmly on the rope drum. The rope guide is designed to allow for a ± 4° vertical wire rope deviation. The rope guide actuates the upper and lower end limit switches. No special tools are required for the replacement of the rope guide.

Hook- block

A hook block allows for a considerable amount of flexibility and safety in lifting operations. Semi-lids of the block cover the rollers and have the necessary hardness and strength against impact with stationary solid objects.

Electric motor with a built-in brake

The motor used in ACI hoist is a TEFC (Totally Enclosed Fan Cooled) conical rotor construction, 3 phase induction type. The motor is constructed with a small fan on the rear shaft of the motor, covered by a housing. This fan draws air over the motor fins, removing excess heat and cooling the motor. The enclosure is "Totally Enclosed". This ordinarily means that the motor is dust tight. This fan-cooled externally mounted, tapered rotor motor is designed for high duty cycle factors.

Energizing the motor causes the axial forces in the magnetic field to pull in the rotor into its correct running position and it operates like a normal induction motor. When the motor is shut off, the return spring pushes the rotor assembly, including the brake disc back into the conical brake surface, braking the motor and the load. This safe and simple braking arrangement which does not require additional coil or electric circuitry is very reliable and needs very little or almost no maintenance. Conical rotor brake has only one moving part, which is very easily accessible, and serviceable.

Control Box

Control box is a separate assembly unit including circuit closers for control of the lifting mechanism and traveling mechanism, reducing transformer, push button and some other elements concerning special executions (main circuit closer, rectifier for the auxiliary brake, electronic block for the load limiter, etc.).

Standard hoist and trolley motors are reconfigurable for 230 volt or 460 volt, three phase, 60 Hz. operation. Hoist and trolley with other voltages and frequencies will be provided as an option. The voltage used in the operating circuit is safe 110 V obtained by means of reducing transformer. Control is executed by pendant push button in which electric and mechanical interlock among the buttons for several of movements of the lifting mechanism and the electric trolley is provided.

For protection against short circuit in the operating circuit a safety fuse is provided. On customer's request two fuses can be provided. In the same circuit the limit switch is connected for both directions of movement of the hook. When the first stage of the switch for a given direction is actuated the movement of the hook in the opposite direction is not blocked and actuating the second stage blocks the movement in both directions because the main contactor switches off. A latchkey for switching of the operating circuit is provided in the electrical equipment of the electric hoist.

3.3 Trolley Traveling Mechanism

Hoist can be suspended to a trolley to provide horizental motion along a beam. Suspension of hoist from a trolley can be as followed:

- Stiff suspension - normal headroom at number of rope falls 2/1 and 4/1.The lifting mechanism is assembled under the travelling mechanism (Figure 3.3.1A)
- Swinging - the lifting mechanism swings in certain limits around an axis parallel to the monorail track (Figure 3.3.1B)
- Joint - in addition apart from the lifting mechanism the travel wheels pairs can rotate around a vertical axis (Figure 3.3.1B I)

- Stiff suspension - 2/1 and 4/1, low headroom – the lifting mechanism is assembled laterally to the rail track. Thus decreasing of the headroom is achieved (Figure 3.3.2)
- Lifting mechanism with double rail trolley (Figure 3.3.3)

Construction of a normal headroom hoist is shown in figure 2. It consists of: electric motor (2), gear box (3), geared wheel (4) and plain wheel (5).

The lifting mechanism (1) is fixed to the trolley by the frame (8). Some electric hoists are provided with trolleys (7 and 9).

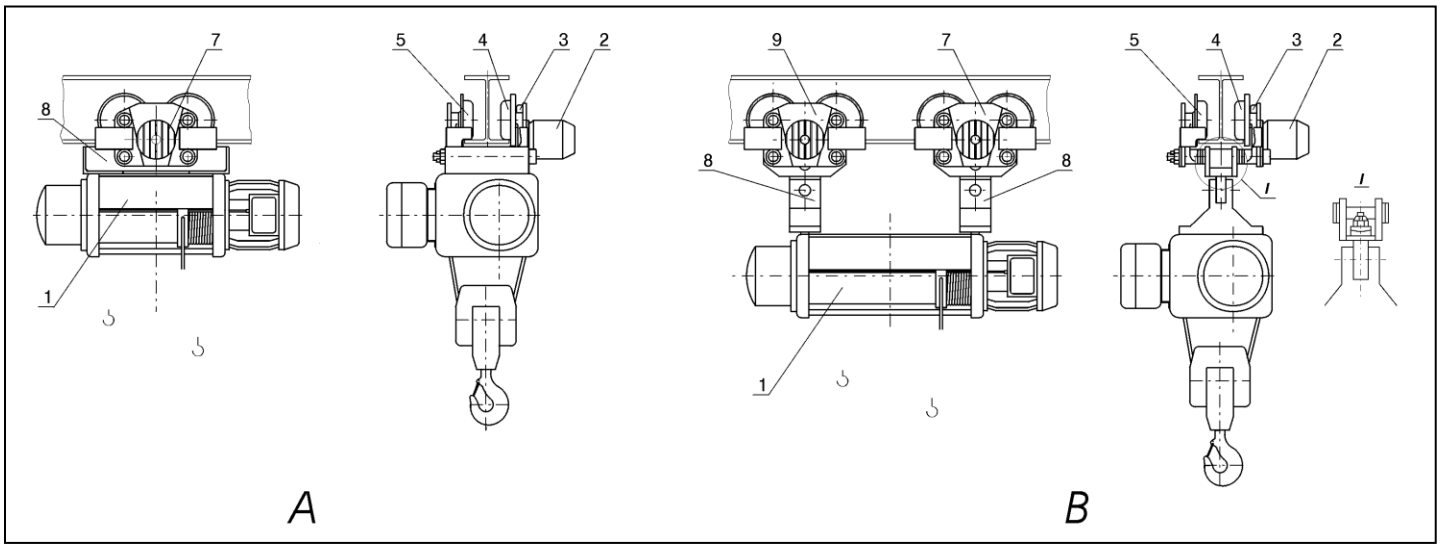


Figure 3.3.1

For the low headroom hoists (Figure 3.3.2) a counterweight box is provided (6).

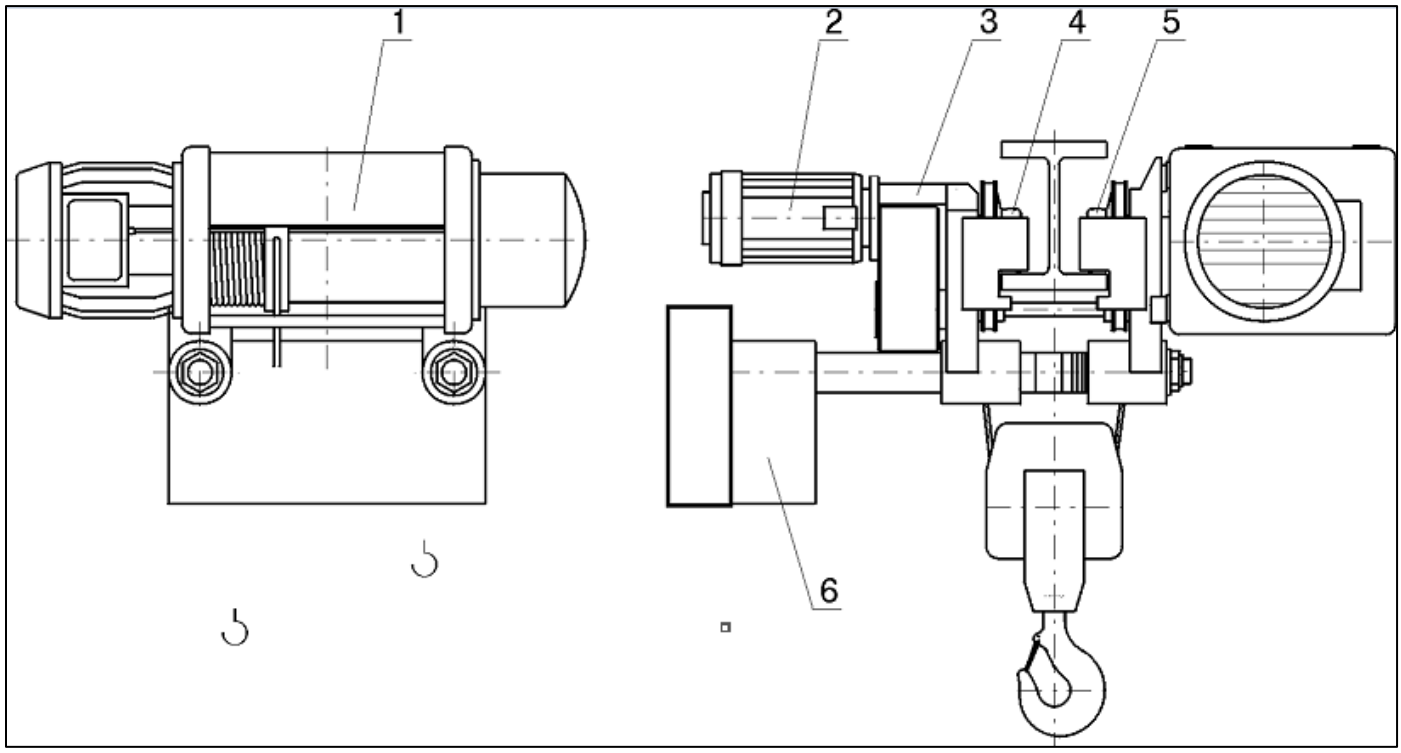


Figure 3.3.2

Double rail (Double Girder) trolley (Figure 3.3.3).

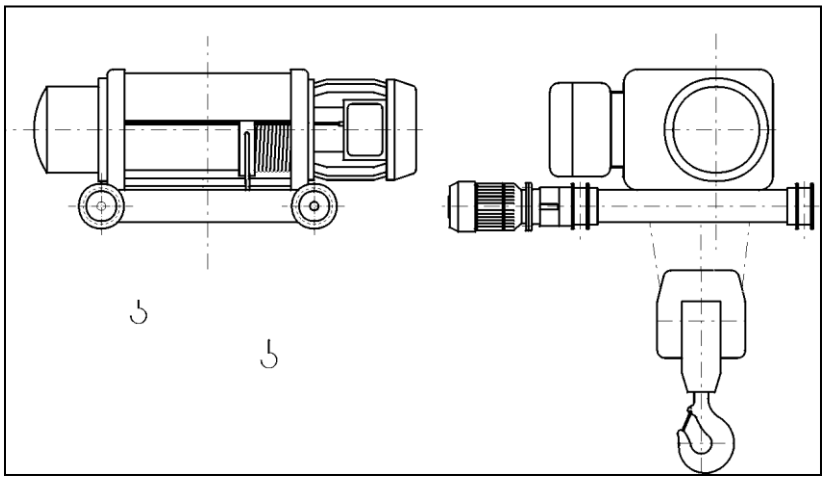


Figure 3.3.3

3.4 Optional Items

Following devices are available as optional features on all complete hoists.

Latch Key

Intended to protect the hoist against unnecessary operation.

Thermo-protection

Bi-metallic, automatic thermostats are built into the motor windings- one per each phase and winding. This thermostat will cause the motor control to be de-energized when the temperature of the motor winding exceeds a predetermined temperature limit. It provides full running protection against motor overheating. The motor control will continue to be de-energized and the only possible motion is lowering until the temperature of the winding is reduced below the temperature cutoff point and then the hoist will be operate as before.

NOTICE

If the thermo-protection actuates and the lowering of the load is indispensable, it must be done at the higher lowering speed with minimum switching.

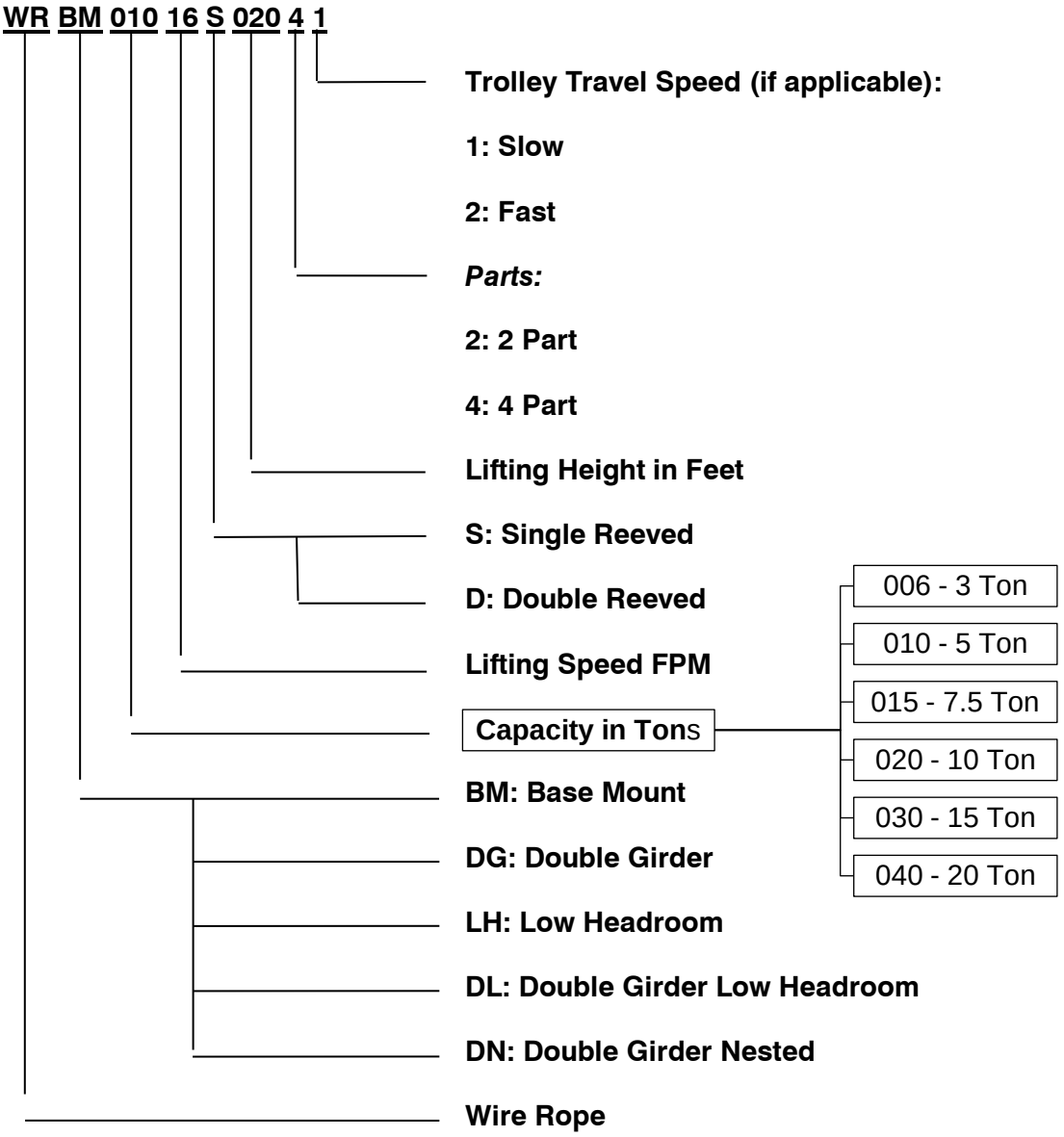
Load Limiter

An overload cutoff device is designed to interrupt the hoist lifting circuit if the load exceeds more than 10% of the rated capacity.

Emergency button

An emergency button switches off the main contactor when emergency situation accur.

3.5 Model Numbering



Example of Model Number: WRBM01016S0204

Wire Rope Hoist, Base Mount, 5 Ton, 16 FPM, Single Reeving, 20 ft. Lift, 4 Part

4.0 INSTALLATION

ACI electric hoists are lubricated and tested before being shipped from the factory. To place a hoist in service, install onto beam by adjusting appropriately for the flange width, connect to electrical service and perform pre-operation tests and checks.

⚠WARNING

Only qualified personnel with proper supervision shall install the hoist on the monorail and perform the final pre-operation inspection.

Before installing, removing, inspecting, 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 applicable ASME B30 volumes.

Additional WARNINGS are listed in various portions of this manual. Personnel shall read and follow these WARNINGS. Failure to read and comply with these WARNINGS as well as other instructions or any limitations noted in this manual and applicable ASME B30 volumes could result in serious bodily injury or death, and/or property damage.

4.1 Prior to Installing Hoist

⚠CAUTION

Prior to installing the hoist check for any damage to the hoist during shipment.

DO NOT install a damaged hoist.

- Read and observe the instructions and warnings contained in this manual. Read and observe any instructions and warning tags attached to the hoist.
- Locate any vent plugs attached to or included with the hoist and trolley. Remove solid shipping plug or plugs.
- Check that the crane, monorail, or other supporting structure where the hoist will be installed has a load rating capable to handle loads equal to the rated load capacity of the hoist.
- If hoist is to be installed on an existing crane, the crane should be run to a location where It will cause the least interference with other cranes and operations in the area; and all controllers placed in the off position.
- If the hoist is to be installed on an existing crane, and the crane runway remains energized because of other cranes operating on the same runway; stops or a signal person(s), located full-time at a visual vantage point for observing the approach of an active crane(s), shall be provided to prohibit contact by the active crane(s) with the idle crane.
- If personnel will be required to work on the runway during installation, a guard or barrier shall be installed between adjacent runways for the length of the established work area to prevent contact between persons performing installation and a crane on the adjacent runway.
- If personnel are required to work at elevations in excess of 6 feet above floor or ground level, a fall prevention policy and procedure shall be developed, documented, and implemented prior to installation being started.

- Check power supply that will be furnished to the hoist and trolley. It must be the same as shown on the hoist and trolley serial plate.
- Check wire rope for damage and spooling on drum. Be sure rope is properly seated in drum grooves and sheaves. Make sure both of rope ends are tightly secured.
- After each rope replacement as well as after repair and reassembling of the electric hoist check the phasing and the limit switch adjustment for upper and lower position of the loading hook.
- While carrying maintenance and repair activities for electric repairs/maintenance, make sure that there is no load on the hook; the power supply switch is turned off and unauthorized switching on is eliminated.
- Check the loading hook for cracks and deformations as well as the good working order of the fuse for self-release of the load.
- Check the bearing screw joints to avoid them eventually self-unwind.
- Check the reliable connection of cable protective conductors to the grounding terminals in the electric board as well as the transformer and the electric.
- If hoist has a trolley, check that the crane bridge beam or monorail beam is level, straight, and clean. Check that trolley stops are installed, or install trolley stops, at the open end or ends of the beam to prevent the trolley from traveling off the beam. Trolley stops that engage trolley wheels are not recommended. Check that trolley stops will prevent overhanging parts of the hoist and trolley from interfering with other equipment beyond the ends of the beam or monorail.

⚠WARNING

The main switch (disconnect) supplying power to the crane, monorail, or other piece of equipment where the hoist is to be installed, shall be de-energized. Lock and tag the main switch in the de-energized position in accordance with ANSI Z244.1.

4.2 Installation of Hoist

Fixing the Rope

Depending on the size of the electric hoist and the conditions of packing, the hook-block may be delivered disassembled from the rope. After installing the hook-block, the rope must be tight and shouldn't be twisted. Fix the rope ends as in the following order:

Fixing the rope end to the body (See Figure 4.2.1)

Fix the rope of diameter "d" in the wedge bush 2, so that its bearing section would lie on the vertical side of the wedge 1. To secure the rope ends from falling out, a clamping element 3 is mounted by nuts at the end of the rope.

The distance between the rope end and the wedge bush 2 shall be at least 3.9 inches the maximum distance is:

- 9.8 inches for 0.5 and 1 ton hoist capacity
- 13.8 inches for 2, 3, 4 and 5 ton hoist capacity
- 17.7 inches for 8 ton hoist capacity

The distance between the clamp 3 and the rope end shall be 1.97 inches.

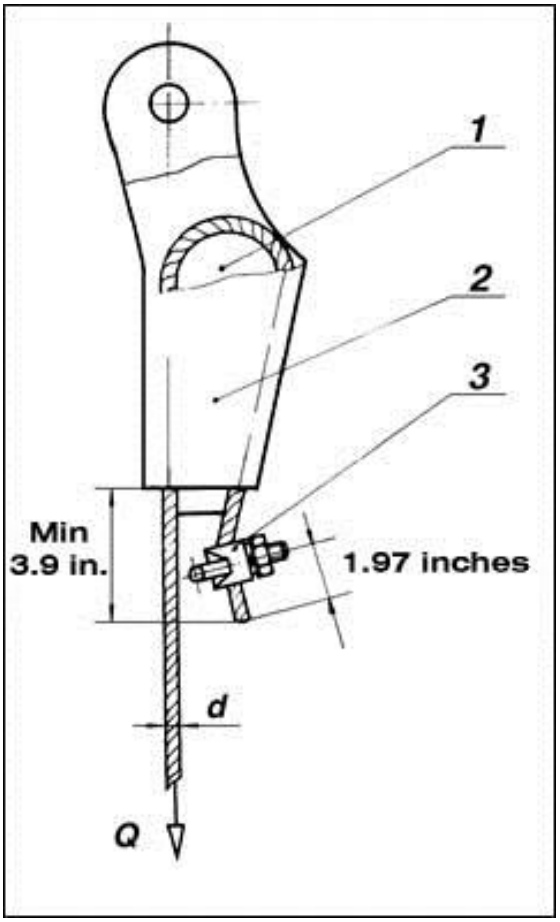


Figure 4.2.1

Table 4.2.1

Clamp's Dia.	Nut size,	Tightening moment, ft.lb
3/16	3/16	7.5
1/4	1/4	15
5/16	5/16	30
3/8	5/16	45
1/2	1/2	65
5/8	9/16	95
3/4	9/16	130
7/8	5/8	225
1	13/16	225
1-1/4	13/16	360
1-3/8	7/8	360
1-5/8	15/16	360

Fixing the rope to the drum

Fix the rope end 3 to the drum by clamps 2 and fasten each of them by two bolts 1. The sizes and strength classes of the bolts are given in Table 4.2.2. The bolts tightening moments are given in Table 4.2.1.

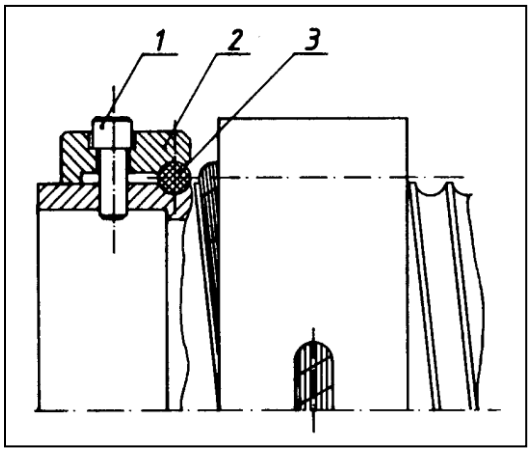


Figure 4.2.2

Table 4.2.2

Effort in rope Fall (Ton)	Bolt size	Strength class
0.5	M6 (1/4 In)	8.8 (Grade 5)
1	M10 (3/8 In)	8.8 (Grade 5)
1.6	M10 (3/8 In)	8.8 (Grade 5)
2.5	M12 (1/2 In)	8.8 (Grade 5)
4	M16 (5/8 In)	8.8 (Grade 5)

Mounting the rope

While mounting the rope through the hook and the roller of the reeving system make sure the rope won't twist. The load block on new hoists or after installation of replacement rope may turn when a load is applied or released. Such load block turning may cause the lines of rope to twist about each other. Do not operate the hoist in this condition. This indicates a twist was induced into the rope during installation. Remove the rope from the hoist, lay the rope out to remove any twist, and re-install on the hoist.

Instructions for mounting wire rope on the hoist are outlined below in Figure 4.2.3.

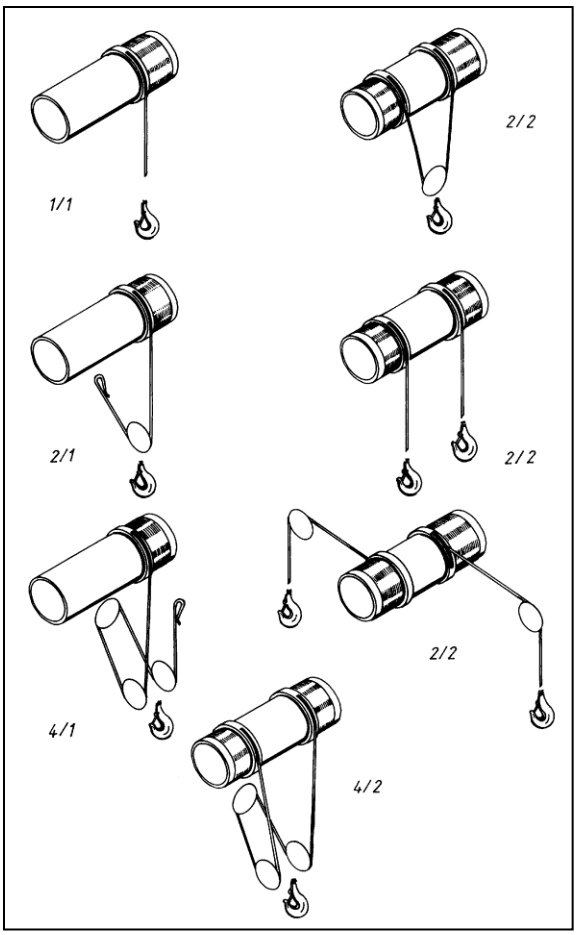


Figure 4.2.3

4.3 Installation of Base Mount Electric Hoists

There are two options to install a base mount electric hoist to a plane:

- On to a horizontal plane (standing modification). (Figure 4.3.1 A & D)
- Under a horizontal plane (under hung modification). (Figure 4.3.1 B)

On request the stationary electric hoists may be manufactured to be installed on a wall (Figure 4.3.1 B).

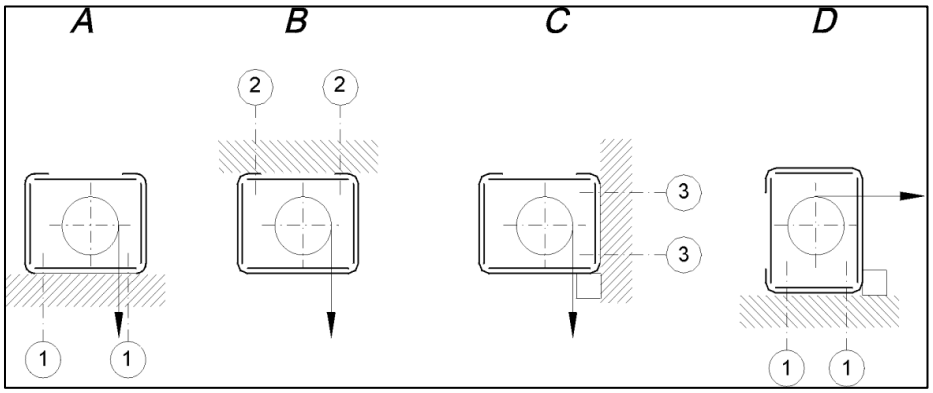


Figure 4.3.1

Different fastening types are shown on Figure 4.3.2. Pos.1, 2, and 3 refer to the different type of encircled assembly number shown on Figure 4.3.1.

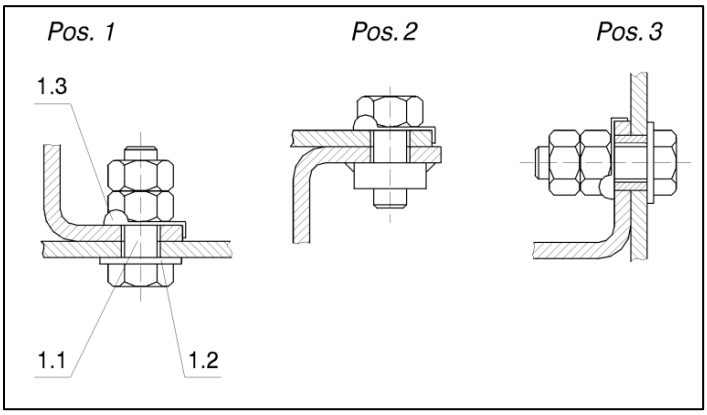


Figure 4.3.2

Required bolts and washer sizes and information about hole diameter of the body are listed in Table 4.3.1.

For the under horizontal plane, only the hole diameter of the body is shown. Customer selects the bolt and the nut. The strength grade shouldn't be less than 5. Tightening moment is given in Table 4.2.1.

Table 4.3.1

Type	Pos. Nr	Name	1 ton		3-5 ton		7.5 ton		10 ton		15 ton & up	
			Size	Qty	Size	Qty	Size	Qty	Size	Qty	Size	Qty
On to horizontal plane		Hole diameter, mm	ϕ15	4	ϕ21	4	ϕ21	4	ϕ25	4	ϕ25	4
	1.1	Bolt – strength 8.8	M14	4	M20	4	M20	4	M24	4	M27	4
	1.2	Washer	B14	4	B20	4	B20	4	B24	4	B27	4
	1.3	Fixing washer	M14	4	M20	4	AT20	4	M24	4	M27	4
Under horizontal plane		Hole diameter, mm	ϕ15	4	ϕ17	4	ϕ17	4	ϕ21	4	ϕ25	4

The holes for fixing to a vertical plane are not shown, but the fastening elements are according to Figures 4.3.1 and 4.3.2, according to the body holes and according to the strength grade requirement for the bolt and the nut as per the standing position.

The lateral deflection of the rope towards drum channel axis influences the time for wearing of the wires and it should be as low as possible. When installing the hoist, level the plane so that lateral deflection of the rope doesn't exceed 3.5 ° (Figure 4.3.3).

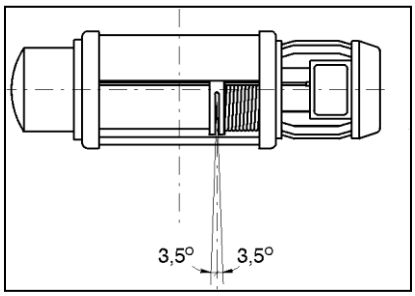


Figure 4.3.3

4.4 Monorail Track

Trolley or trolleys are mounted on hoist unit and shipped as one unit. Trolleys have drop-forged, high tensile steel wheels accurately machined with shielded ball bearings for smooth operation and will operate on:

- Standard S-shapes flanges (3.5 inch to 8.5 inch)
- I beams/ W-shapes having flat flanges (3.5 inch to 8.5 inch)
- Stainless steel I beam/ W shapes flat flanges (4 inch to 12 inch).

Bear in mind the following:

- Don’t use smaller beam size than is listed.
- Check that there are no obstructions to the operation of the hoist including the path of the rope.
- Do not paint the surface where the travel wheels roll as the paint hinders the good engagement between the wheels and the track.
- To ensure normal operation of the travelling mechanism, regularly cleanse the railway track from oils, greases, ice. etc.
- During operation be aware of cracks and wear of the monorail track.
- Place trolley hoist in correct position relative to bridge beam or monorail, orienting it for proper end approach in accordance with specification requirements. Be sure collectors and conductors are properly positioned and aligned.
- Place trolley hoist unit in position on bridge beam or monorail. Check that trolley bumpers, if provided, meet trolley stops on beam, and reposition if necessary.

4.5 Adjusting trolley width and Installing Hoist Trolley on Beam

If trolley hoist is mounted on a skid, do not remove it immediately. The skid will hold the trolley hoist unit in an upright position until assembled on the crane or monorail.

Before installing the trolley hoist on beam, trolley width must be adjusted. Check trolley wheel spacing between wheel flange even if the unit was ordered for a specific beam size or beam flange width.

The simplest way to mount the trolley hoist on the beam, if crane or building construction permits it, is to remove the trolley stops on an open end of the beam, run the trolley onto the beam, and replace the trolley stops. If this method is not possible because of crane or building interference, mount the trolley hoist according to the following instructions:

- Place trolley hoist in correct position relative to bridge beam or monorail, orienting it for proper end approach in accordance with specification requirements. Be sure collectors and conductors are properly positioned and aligned.
- Check that trolley bumpers, if provided, meet trolley stops on beam, and reposition if necessary.

Adjust the trolley width and install it on to beam according to the following instructions:

Standard Headroom Hoist Trolley

- Measure the flange width of the beam where the trolley will be installed.
- Remove cotter pin from nut in the end of trolley stud, unscrew the nut, and slide the stud out of the side plate assembly.
- Slide stack of inner adjusting spacer (Washer) over the stud. The dimension must be at least 1/32 inch (0.7 mm) to 5/32 inch (4 mm) greater than the beam flange width. Rearrange washers, if necessary, to achieve proper spacing.
- Position wheels of the side plate assembly on the beam flange.
- Replace side plate assembly by sliding it back over the trolley stud.
- Secure the stud with nut and cotter pin.

4.6 Low Headroom Hoist Trolley

- Measure the flange width of the beam where the trolley will be installed.
- Unscrew the nut and the lock washer from rod.
- Adjust the distance between the wheels by sliding the side plate assembly in or out on the rod. The wheel distance must be at least 1/32 inch (0.7 mm) to 5/32 inch (4 mm) greater than the beam flange width.

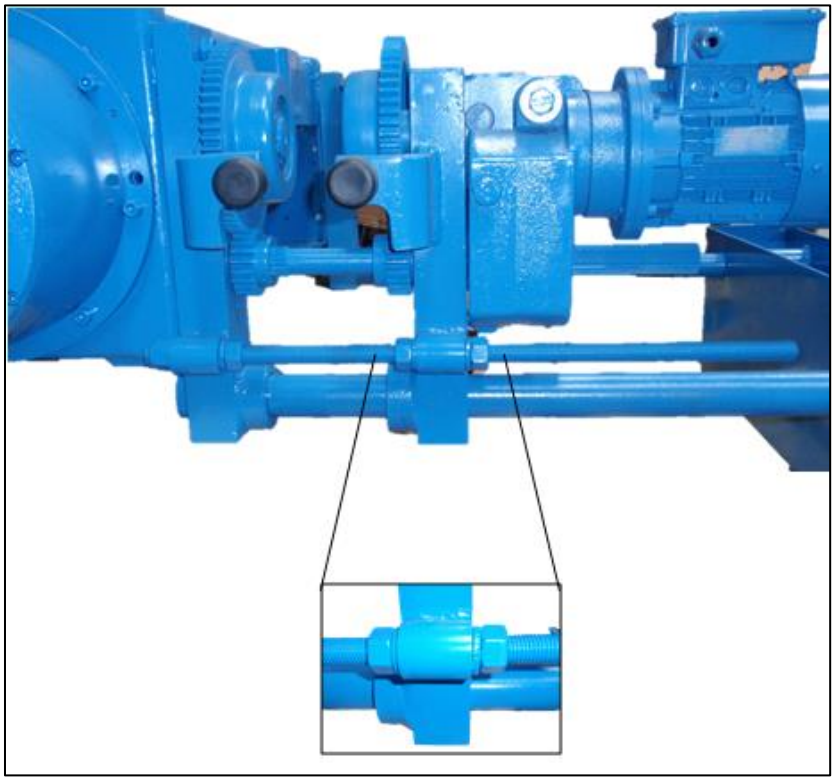


Figure 4.6.1

- Position the trolley wheels on the beam from bellow and adjust the side plate assembly to dimension measured as above.
- Secure the stud with nut and block washer.
- After installation of the low headroom hoist trolley, the unit should be balance. Counterweight box is specially designed for this purpose (Figure 4.6.2). It is recommended, after putting the balancing material (metal scrap) in the box, to cover it with concrete with thickness about 1 inch. The weight of the counterweight box (concrete layer included) is according to Table 4.6.1.

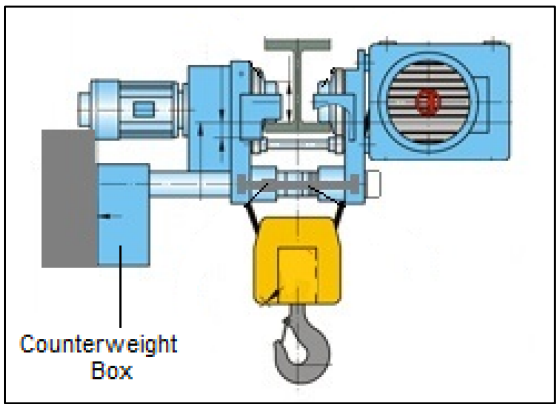


Figure 4.6.2

Table 4.6.1

Capacity, ton	Reeving		Necessary Counterweight, In Pounds						
			H1	H2	H3	H4	H5	H6	H7
1	2/1	Box weight	18	22	26	33	44	-	-
		With basic speed	49	55	66	66	66	-	-
	4/1	Box weight	-	-	26	33	44	-	-
		With basic speed	-	-	60	66	77	-	-
3 or 5	2/1	Box weight	26	31	33	35.2	44	-	-
		With basic speed	154	176	188	232	254	-	-
	4/1	Box weight	-	-	33	35	44	-	-
		With basic speed	-	-	187	220	243	-	-
7.5	2/1	Box weight	35	38	40	40	49	-	-
		With basic speed	188	199	221	265	287	-	-
	4/1	Box weight	-	-	40	40	49	-	-
		With basic speed	-	-	165	199	232	-	-
10	2/1	Box weight	-	40	44	44	49	-	-
		With basic speed	-	375	386	485	551	-	-
	4/1	Box weight	-	-	44	44	49	-	-
		With basic speed	-	-	364	463	518	-	-
15	2/1	Box weight	-	64	73	82	90	97	99
		With basic speed	-	584	639	692	772	849	904
	4/1	Box weight	-	-	-	82	90	97	99
		With basic speed	-	-	-	672	739	805	871

4.7 Connecting Power Supply to Hoist

Electrical service to the hoist may be power cable, conductor bar with sliding shoe, or festoon system with wheel type trolleys. Follow ANSI/NFPA 70, state, and local electrical codes including the grounding provisions thereof when providing electrical service to the hoist.

Make electrical connections using the appropriate wiring diagrams furnished with the hoist (see attachment, wiring Diagram). Only qualified journeyman electricians shall make any electrical connections, including connections to collectors or power cord. Power supply to hoist and trolley must be the same voltage, frequency, and phase that are specified on the hoist and trolley nameplate.

⚠ DANGER

Disconnect power and lockout disconnecting means before connecting power supply to hoist.

The electric hoist is connected to the power supply by the circuit breaker Q1 and the safety fuses F1, F2 and F3 (Figure 4.7.1). The circuit breaker is designed to break off the unloaded electric circuit of all the poles while carrying maintenance and repair activities. It is recommended to install the circuit breaker in the electric board of the working place or mount it in some inaccessible place.

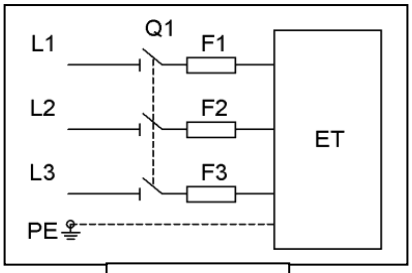


Figure 4.7.1

The power supply cable is connected to the hoist as shown on Figure 3.10. The three phases of the power supply cable 1 are connected to terminals, marked as positions 10, 11 and 12 and marked with symbols L1, L2 and L3.

The rest connections between the separate electric modules are made by the manufacturer as follows: cable to the electric motor of the hoisting unit, cable to the control switch 4, cable to the load limiter 5. Terminals 6 represent the connections of the power supply circuit, terminals 8 - of the operating circuit. Separating plate 7 is placed between the terminals of the power supply circuit and the operating circuit.

Before energizing the power supply, and inspecting and testing the hoist prior to initial operational use, check that all electrical connections are in accordance with the wiring diagram located in hoist control enclosure. If the power supply that will be connected to the hoist is not the same as shown on the hoist serial number plate, DO NOT connect power supply to hoist.

ASME B30.16 requires that all new, altered, or modified hoists be inspected by a designated person prior to initial use to verify that the equipment and installation comply with applicable provisions of the standard. Such an inspection should be performed at this time, using ASME B30.16 as the basis for inspection procedures.

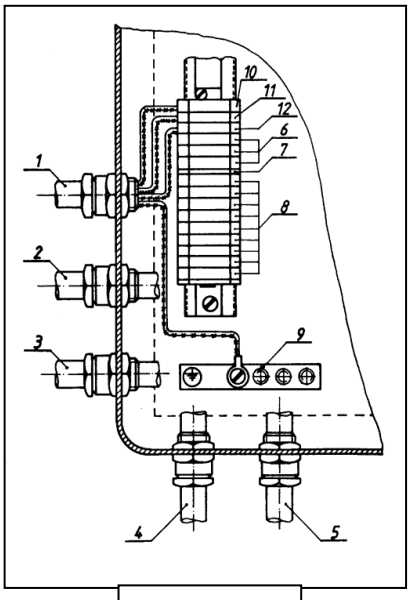


Figure 4.7.2

4.8 Before Operating the Hoist:

- Before energizing the power supply, and inspecting and testing the hoist prior to initial operational use, check that all electrical connections are in accordance with the wiring diagram located in hoist control enclosure.
- ASME B30.16 requires that all new, altered, or modified hoists be inspected by a designated person prior to initial use to verify that the equipment and installation comply with applicable provisions of the standard. Such an inspection should be performed at this time, using ASME B30.16 as the basis for inspection procedures.
- Energize the power supply to the hoist.
- Conduct Operational Test 5.4.1
- Check operation of the end limit switch and adjust the lever system.

4.8.1 Checking the end limit switch function

The end limit switch terminates the motion of the lifting mechanism in both directions in accordance with the disposition of the two limiting rackets 1 and 3 (fig. 4.8.1.1) along the bar 2. The bar actuates the end limit switch disposed in the electric panel.

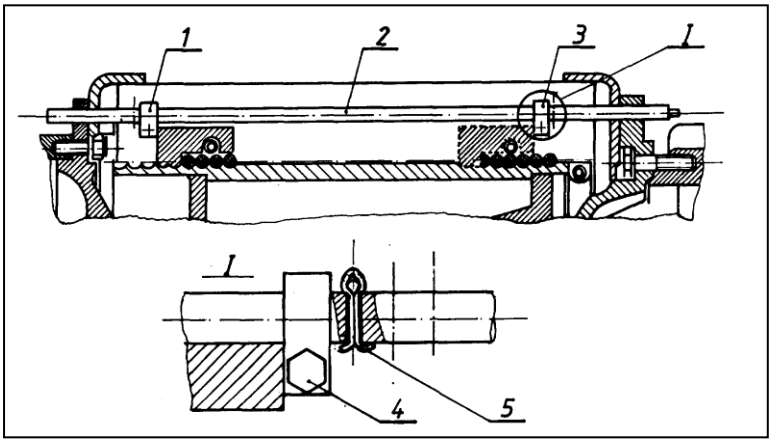


Figure 4.8.1.1

All checking of limit switches should be accomplished without a load on the hook. All checking of limit switches should be accomplished by using the low speed of multiple-speed hoists, or inched into the limit if the hoist is a single-speed unit. The check is performed as you put the hook-block about its medium position in relation to the lifting height. After that with the button pressed "upward" put the bar of the limit switch into motion by hand in the direction of the movement of the rope guide, corresponding to "upward" direction; the movement of the hook-block shall cease.

The lever system of the limit switch is adjusted for using the entire lifting height. Adjustment for other intermediate positions of the hook, i.e. using the limit switch as operational one is not allowed.

- Daily, before starting work, check the operation of the brake and the limit switch.
- Do not use the limit switch as an operational one in any case.

⚠WARNING

Damage to the hoist, a dropped load, and injury may result if limit switches fail due to improper use.

Under normal operating conditions, stop hoist travel before engaging limit switches. Limit switches are safety devices and should not be used as normal operating control.

4.8.2 Adjusting the lever system actuating the end limit switch

If during operation adjustment of the emergency end limit switch is needed, it may be effected by changing the location of the limiting rackets 1 and 3 on the bar 2 (fig.4.8.1.1). The limiting racket 1, located from the side of the electric motor, adjusts the distance between the floor and the lowest point of the load hook - lower end position. The limiting racket 3 adjusts the distance between the lowest point of the hoist and the roller block - upper end position.

After adjusting the two limiting rackets fasten the bolts 4 and secure them by with cotter pins 5.

Checking the adjustments:

- For upper end position of the hook-block:

  The unloaded hook shall move upwards until the end limit switch actuates. In this case maximum brake path is realized.

- For lower end position of the hook-block:

  The unloaded hook shall move downwards until the end limit switch actuates. In this case maximum brake path is realized.

The second stage of the end limit switch is of emergency function and switches off the main contractor. In this case:

- The distance between the lowest point of electric hoist and the highest point of the roller block should be at least 3.9 inches.
- The distance between the floor and the lowest point of the hook shall be at least 3.9 inches and there must be at least 3 full winding of the rope on the drum.

4.8.3 Checking the Lubrication of the Electric Hoist

ACI Wire rope hoists are lubricated and tested before being shipped from factory. Type, specifications and quantity of the lubricants are given in Table 6.6.2. Before operating the hoist, it's necessary to check the lubrication of the hoist and if needed grease the points, shown in the lubrication scheme - Table 6.6.1.

4.8.4 Hoist Load Test

- Complete hoists are load tested by ACI in accordance with ASME B30.16. Exceptions to this procedure could occur if special design features of the hoist do not permit it to be placed in the ACI hoist load test stand. In such cases, the purchaser shall be notified of this fact, and it is the responsibility of the owner/user to load test the hoist in accordance with ASME B30.16.
- Hoists furnished in an uncompleted condition (i.e. less controls, less motor, less wire rope, etc.) as hoist components, and winch units are not load tested by ACI. Therefore, it is the responsibility of the owner/user to load test the final lifting system using such hoist components or winches in accordance with ASME B30.16.
- If the hoist is installed on a crane, load testing of the crane in accordance with, as applicable, ASME B30.2, ASME B30.11, or ASME B30.17 may be required.
- If a load test in accordance with one of the B30 Standards is not required, the hoist should still be operated with a load on the hoist hook prior to being released for operating purposes.
    - Attach a load to the hoist hook. Load shall not exceed the rated load capacity of the hoist.
    - Before lifting the load, operate the hoist in the raising direction to take any slack out of the hoist wire rope.
    - Raise the load a few inches and stop the hoist. If brakes stop and hold the load, continue raising and lowering the load several feet, stopping the hoist several times in each direction to check that the hoist braking system stops and holds the load.

- If the hoist braking system stops and holds the load, the hoist operates in accordance with the control devices, and no unusual sounds are present during operation, the hoist is ready to be released for operating purposes.
- If the hoist braking system does not stop and hold the load, the hoist does not operate in accordance with the control devices, or any unusual sounds are present during operation, the hoist is not ready to be released for operating purposes; and corrective action must be taken.

- All personnel that will operate the hoist shall read the OPERATION section of this manual, the WARNINGS contained in this manual, and instruction and WARNING labels on the hoist before operating the hoist or lifting system.

5.0 OPERATION

The operator of the hoist must be well acquainted with this Manual and be instructed on the requirements for safe operation. The operator's clothing should be in accordance with the working conditions. While operation is being procedure, the requirements of the respective country shall be observed and followed. The operator should always have at hand the Assembly and Operation Manual or a copy from the Requirements for safe Operation, which must be placed near power supply circuit breaker or on an easy and accessible place.

Operation of an overhead hoist involves more than activating the buttons or levers of the hoists control device. It is indicated by ASME B30 that the use of overhead hoists is subject to certain hazards that cannot be met by mechanical means, but only by the exercise of intelligence, care, common sense, and experience in anticipating the motions that will occurs as a result of acting the hoist controls. Certain precautions and warnings are to be taken before moving the load, and this includes the proper rigging of loads to the hoist hook.

⚠WARNING

Hoist operators shall be required to read to the operation section of this manual, the warnings contained in this manual, instruction and warning labels on the hoist or lifting system , and the operation section of ASME b30.16; and to be familiar with the hoist and hoist controls before being authorized to operate the hoist or lifting system.

Hoist operators should be trained in proper rigging procedures to be followed in the attachment of loads to the hoist hook.

Hoist operators should be trained to be aware of potential malfunctions of the equipment that require adjustment or repair , and to be instructed to stop operation if such malfunction occur, and to immediately advise their supervisor so corrective action can be taken.

Hoist operators should have normal depth perception, field of vision, reaction time, manual dexterity, and coordination.

Hoist operators should not be subject to seizures, loss of physical control, physical defects, or emotional instability that could result in actions of the operator being a hazard to the operator or others.

Hoist operators should not operate a hoist or lifting system when under the influence of alcohol, drugs, or medication.

Overhead hoists are intended only for vertical lifting service of freely suspended unguided loads. Do not use hoist for loads that are not lifted vertically, loads that are not freely-suspended, or loads that are guided. If such conditions exists, contact ACI Hoist & Crane.

5.1 General Information

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

- The operator shall know hand signals used for hoist and crane operations if a signal-person is used in the operation, and accept signals of only persons authorized to give hand signals **EXCEPT** to obey a stop signal regardless who gives it.
- The operator shall **NOT** adjust or repair a hoist unless qualified and authorized to perform maintenance.
- The operator shall **NOT** use a hoist load limiting devices as a means to measure the load.

5.2 General DO'S and DO NOT'S

- **DO** establish a regular inspection schedule and maintain a record of all inspections performed with special attention directed to the wire ropes, hooks, and breaks.
- **DO** remove the hoist from service and perform necessary maintenance and repair.
- **DO** follow recommended maintenance procedures for taking a hoist out of service to inspect and perform maintenance and repair.
- **DO** use the original hoist manufacture's recommended parts when repairing a hoist and replacing worn or damaged parts.
- **DO NOT** allow unqualified or unauthorized personnel to operate, inspect, maintain, or repair the hoist.
- **DO NOT** operate a hoist that is damaged or has any actual or suspected mechanical or electrical malfunction.
- **DO NOT** attempt to lengthen wire rope or repair damaged wire rope.
- **DO NOT** use the wire rope, any part of the hoist, or the load block and hook as a ground for welding.
- **DO NOT** allow a welding electrotrode to be touched to the wire rope.

⚠WARNING

DO NOT walk under a suspended load.

DO NOT perform any work on a suspended load that requires a worker to be positioned under the suspended load.

If it is essential that a worker be positioned under a suspended load to perform work in the suspended load; such work shall not be started or performed until other auxiliary supporting means are placed under the suspended load. Failure to use other auxiliary supporting means could result in serious bodily injury or death, and/or property damage.

5.3 Before Operating the Hoist and Applying the Load

- Be familiar with all operating controls of the hoist.
- Be familiar with the OPERATION procedures of this manual, the **WARNINGS** are embraced in this manual, also the procedure of instructions and warnings labels on the hoist and lifting system.
- Be instructed in the operations being performed.
- **DO NOT** operate hoist if any damage or malfunctions exist; and SHOULD report any damages or malfunctions to the supervisor.
- **DO NOT** operate if tagged with an out of order sign.
- **DO NOT** use the hoist wire rope as a sling to wrap around the load.
- Attach the load to the hoist hook by proper means such as slings or lifting devices.
- Only attach the load to the hoist hook that does NOT exceed the rated load capacity of the hoist.
- Confirm that the size of the attachment of the sling or the other lifting device to be used is compatible to the size of the hoist hook.
- Confirm that the attachment part of the sling or other lifting device is properly seated in the base, bowl, or saddle of the hoist hook.
- Confirm that the hook latch operates properly and that the hook latch properly bridged and closes the hook throat opening.
- Confirm that the latch of the hoist hook will not support any part of the load.
- Confirm that the load or any part if the load will not be applied to and /or not supported by the tip of the hook.
- Confirm that load will be properly balanced when it is lifted.
- Confirm that the hoist wire is not kinked or twisted, and that the wire rope parts are not twisted about each other.
- Confirm that hoist wire rope is properly seated in the drum grooves and sheaves.
- Notify personnel in the area that a load will be lifted and verify that all personnel are clear of the load.
- Confirm that when the load is lifted, it will clear all material, machinery, or other obstructions in the area.

5.4 While Operating the Hoist and Moving the Load

- **DO NOT** engage in any activity that will divert the attention of the operator.
- **DO NOT** lift, lower, or transport a load and hoist until the operator and all other personnel are cleared load and the path of the load.
- Confirm that the load and hoist will clear all obstacles before moving or rotating the load.
- Avoid moving loads over personnel.
- **DO NOT** lift, lower, or transport personnel by the hoist, trolley, hoist hook, or load.
- Slowly inch the hook into engagement with the load to eliminate wire rope slack and reduce impact loading of the hoist.
- Avoid unnecessary inching and quick reversals of direction.
- Only lift the load a few inches to confirm that the load is properly balanced before continuing with the lift.

- Only lift the load a few inches to confirm hoist braking system is functioning properly before continuing with the lift.
- Avoid swinging of the load or hoist hook when the hoist is travelling.
- Avoid sharp contact between trolleys or between trolleys and stop.
- **DO NOT** use hoist limit switches or devices as a normal means of stopping the hoist.
- **DO NOT** lower the load beyond the point where less than two wraps of wire rope remain at each anchorage on the drum, unless a lower limit device is provided, which case no less than one wrap of wire rope shall remain at each anchorage on the drum.

5.5 When Parking the Load

- **DO NOT** lower a load with the hoist until the operator and all other personnel are clear of the load and the path of the load.
- Confirm that the load will clear all obstacles before lowering the load.
- Block loads before landing if slings or other lifting devices must be removed from under the landed load.
- Exercise care when removing a sling from under a landed and blocked load.
- **DO NOT** leave a suspended load unattended unless specific precautions to prevent the load from inadvertent lowering have been instituted and are in place.
- Position the hoist load block and hook above head level for storage when the hoist is not in use.

5.6 Before Each Shift or Before the First Time the Hoist is to be Used Each Shift

- Visually inspect wire rope for broken wires, broken strands, kinks, and type of deformation or damage of the rope structure.
- Visually inspect hooks for nicks, gouges, deformation of the throat opening, and wear on saddle or load bearing point, and twisting.
- Visually inspect hook latches for proper operation or damages that does not allow proper operation.
- Replace warning labels if missing or illegible.
- Report any damages or malfunctions to the supervisor.
- **DO NOT** operate hoist if any damages or malfunction exist.
- **DO NOT** operate hoist if it's tagged with an out or order sign.

6.0 MAINTENANCE AND INSPECTION PROCEDURES

Hoists shall be maintained, inspected, and tested in accordance with the manual furnished by the crane manufacturer and in accordance with the intervals and requirements of, as applicable, ASME B30.2, ASME 830.11, or ASME B30.17.

6.1 Prior to maintenance or inspection

Before maintenance or inspections are performed on a hoist, trolley or crane the following precautions shall be taken as applicable.

- The hoist, trolley, or crane to be inspected, tested, or repaired shall be run to a location where it will cause the least interference with other hoists, cranes, and operations in the area.
- If a load is attached to the hoist hook, it shall be landed.
- All controllers shall be placed in the off position.
- If hoist is trolley suspended, the trolley shall be blocked to prevent trolley movement.
- If hoist is installed on a crane, the crane shall be blocked to prevent crane movement.

⚠ DANGER

Hazardous voltages are present in the control box, other electrical components, and connections between these components.

The main switch (disconnect) of the hoist, crane, or lifting system shall be de-energized. Lock and tag the main switch in the de-energized position in accordance with ANSI Z244.1.

- Warning signs and barriers shall be utilized on the floor beneath the hoist, crane, or lifting system where overhead maintenance, repair, or inspection work creates a hazardous area on the floor beneath the hoist, crane, or lifting system.
- If the crane runway or monorail remains energized because other hoists or cranes on the same runway or monorail are in operation, rail stops or a signal person(s), located full-time at a visual vantage point for observing the approach of an active hoist(s) or an active crane(s), shall be provided to prohibit contact by the active hoist(s) or crane(s) with the idle hoist or crane; with persons performing maintenance, repair, or inspection; and with equipment used in performing the maintenance, repair, or inspection.
- A guard or barrier shall be installed between adjacent runways for the length of the established work area to prevent contact between persons performing maintenance, repair, or inspection and a crane on the adjacent runway.
- Safe access to the hoist, crane, or lifting system, such as scaffolding, work platforms, etc., shall be provided for personnel that will perform maintenance, repair, or inspection. If personnel are required to work at elevations in excess of 6 feet above floor or ground level, a fall prevention policy and procedure shall be developed, documented, and implemented by the owner/user.
- After maintenance, repair, or inspection work is completed, and before the hoist, crane, or lifting system is returned to normal operation:
    - Any guards on the hoist, crane, or lifting system that were removed to perform maintenance, repair, or inspection work shall be reinstalled.
    - Any safety devices on the hoist, crane, or lifting system that were deactivated to perform maintenance, repair, or inspection work shall be reactivated.

- Any parts that were replaced and other loose material shall be removed.
- All equipment used in the maintenance, repair, or inspection work shall be removed.

- Warning signs, barriers, and guards shall be removed only by authorized personnel.

Lock and tag on the main switch (disconnect) of the hoist, crane, or lifting device shall be removed only by the person that locked and tagged the main switch originally, or an authorized person.

6.2 Inspection

All ACI hoists are inspected and tested at the factory. Regular in-service inspection and preventative maintenance programs not only help reduce overall maintenance costs but may also prevent service shutdowns by forewarning of problems that could cause these shutdowns.

Regular inspections, periodic minor adjustments, regular cleaning and lubrication and replacement of worn parts can help preserve good performance and operation of the hoist.

Many factors influence the inspection and preventative maintenance program required for the hoist. Frequency and severity of service and material handled, local environmental conditions and various applicable codes are some of the factors that the user must consider to adjust inspection and maintenance program outlined in this section to meet the specific conditions.

Inspection procedure for hoists in regular service is divided into two general classifications as outlined in ASME B30.16. These two general classifications are based upon the intervals at which inspections should be performed. The intervals are dependent upon the nature of the critical components of the hoist, and the degree of exposure of hoist components and parts to wear and deterioration. The degree of exposure is dependent upon hoist activity, and severity of hoist service. Environmental conditions in which the hoist operates are also important considerations for the user, when adjusting hoist inspection and maintenance programs to local conditions. Frequency of inspection and maintenance must be increased if hoist is subjected to severe atmospheric environmental conditions, such as corrosive vapors, extreme heat or cold, cement or dust and other airborne contaminants. The user should carefully consider all environmental conditions and adjust frequency and degree of maintenance for his local conditions. Various codes also regulate inspection and maintenance programs. Attention must be given to applicable federal standards, OSHA regulations, national standards, state and local codes which may include mandatory rules relating to hoist inspection and maintenance. The user should become familiar with all applicable codes for his area and be guided accordingly.

These two general classifications of hoist inspection are designated as frequent and periodic. In addition, daily inspections are required to be performed by the operator at the start of each shift, or at the time the hoist is first used during each shift.

FREQUENT INSPECTION: Frequent inspections are visual inspections and examinations by the operator or other designated personnel with records not required. Nominal inspection intervals are as follows:

Normal service - monthly

Heavy service - weekly to monthly

Severe service - daily to weekly

PERIODIC INSPECTION: Periodic inspections are visual and audio inspections and examinations by designated personnel making records of external conditions to provide the basis for a continuing evaluation of the hoist and components. If the external inspection indicates the need, some disassembly may be required to make a more detailed inspection and examination. Nominal inspection intervals are as follows:

Normal service - annually

Heavy service - semiannually

Severe service – quarterly

The inspection and maintenance intervals outlined in this section are considered a minimum. Recommended in the schedule are minimum inspection and maintenance intervals based on average daily use in a normal environment.

ACI Wire Rope hoist was designed to meet a specific duty classification as described by the FEM "Rules for the Design of Serial Lifting Equipment" and is to be used in accordance with the duty rating identified on the equipment nameplate. For more details regarding hoist duty cycles and average daily use, please reference FEM Section IX, Series Lifting Equipment or the Hoist Duty Classification page in this manual.

Listed on the Recommended Inspection and Maintenance Plan are inspection frequencies and requirements. Perform these inspections regularly as scheduled and additional inspections as may be required for activity, service, and environment of the hoist. The hoist operator must be responsible for determining the operating conditions and severity of service.

⚠WARNING

The inspection intervals listed above are nominal recommendations for reference purposes only. They are based on single shift operation under normal operating conditions and normal environmental conditions. Actual operating and environmental conditions should be reviewed by a qualified person and inspection intervals established on the recommendations of the qualified person.

Definitions of service from ASME B30.16 are as follows:

Normal service - involves operation of the hoist with randomly distributed loads within the rated load limit, or uniform loads less than 65% of rated load, for not more than 25% of the time for a single work shift.

Heavy service - involves operation of the hoist within the rated load limit that exceeds normal service.

Severe service - involves operation of the hoist in normal service or heavy service with abnormal operating conditions.

A hoist that is not in regular service, that has been idle for a period of one month or more, but less than one year, shall be inspected in accordance with the requirements for frequent inspection before being placed into service.

A hoist that is not in regular service, that has been idle for a period of one year or more, shall be inspected in accordance with the requirements for periodic inspection before being placed into service.

6.3 Recommended Inspection and Maintenance Plan

Shown below on table 6.3.1 is a recommended Inspection and Maintenance plan that lists various components of the hoist that shall be checked in certain time.

Table 6.3.1

Item	On Initial Putting into Operation	Daily	First 3 months	First year	Annually
Brakes	X	X			
End Limit	X	X			
Control Device	X	X			
Hook		X			
Hook Latch		X			
Wire Rope		X			
Reeving		X			
Rope Guide			X		X
Roller Block			X		X
Bearing Screw Joints			X		X
Welded Joints			X		X
Bumpers			X		X
Trolley				X	
Electrical Equipment			X		X
Anticorrosion Protection				X	

6.3.1 Daily inspections by operator

Required daily inspection items to be performed by the operator at the start of each shift, or at the time the hoist is first used during each shift are shown in Table 6.3.1.1.

Table 6.3.1.1
Daily Inspections by the Operator

INSPECTION ITEM	DESCRIPTION OF INSPECTION CHECK POINTS
Tagged Hoist	Check that hoist is not tagged with an out-of-order sign.
Control Devices	Check that travel motions agree with control device markings
Hook	Check for damage, cracks, nicks, gouges, deformation of the throat opening, wear on saddle or load bearing point, and twist. Refer to HOOK section of this manual.
Hook Latch	Check that hook latch is not missing and that it operates properly.
Wire Rope	Check for broken wires, broken strands, kinks, and any type of deformation or damage to the rope structure. Refer to WIRE ROPE section of this manual.
Reeving	Check that wire rope is properly reeved and that rope parts are not twisted about each other. Refer to WIRE ROPE section of this manual.
Brakes	Check that hoist and trolley motions do not have excessive drift. If load dragging or increased stopping distance are observed, adjust the axial rotor stroke of the electric motor.
Limit Switches	Check that gravity type upper limit switch stops lifting motion of the hoist load block before striking any part of the hoist. If supplied, check that the upper geared limit device stops lifting motion of the hoist load block two inches below the weight of the gravity type limit switch. If supplied, check that the lower geared limit device stops lowering motion of the hoist hook with two wraps of wire rope at each anchorage on the drum (unless the lower geared limit device is set for one wrap at each anchorage).
Oil Leakage	Check for any sign of oil leakage on the hoist and on the floor area beneath the hoist.
Unusual Sounds	Check for any unusual sounds from the hoist and hoist mechanism while operating the hoist.
Warning Label	Check that warning label is not missing and that it is legible.

⚠WARNING

If any damage or malfunctions are noted by the daily inspection items of table 5.2, the operator shall not operate the hoist, and shall immediately advise the supervisor so corrective action can be taken. If the hoist is tagged with an out-of-order sign, the operator shall not operate the hoist.

Hoist operators should be trained to be aware of malfunctions of the equipment during operation, and to immediately stop operation if such malfunctions occur, and to immediately advise the supervisor so corrective action can be taken.

6.3.2 Frequent and periodic inspections

Recommended items to be checked for deficiencies or damage during frequent and periodic inspections are shown in Table 3. Detailed inspection procedures for some items will be found in specific sections of this manual. These inspections may be performed with the hoist in its normal location and do not require that the hoist be disassembled. Covers and other items normally supplied to allow inspection of components should be opened or removed for these inspections. Any deficiencies or damage such as those listed in Table 3 shall be examined by a designated person to determine whether they constitute a hazard, or whether any disassembly is necessary for a more detailed examination. The hoist operator should make observations during regular operation for any deficiencies or damage that might appear between inspections.

Records of the condition of critical components such as wire rope, hooks, and brakes observed during frequent and periodic inspections should be established. This record should also record replacement, maintenance, and repair information. Use of this recorded information will allow a preventative maintenance program to be established for replacement of wearing components on a regular basis, thereby eliminating or reducing unscheduled downtime situations.

⚠WARNING

If any damage or malfunctions are noted by the frequent or periodic inspection items of table 3, the hoist shall be tagged with an out-of-order sign and shall not be returned to regular operation until maintenance and repair of the damage or deficiencies found during the inspection have been corrected.

Table 6.3.2.1
Frequent and Periodic Inspection

INSPECTION ITEMS	DEFICIENCIES OR DAMAGE TO LOOK FOR
All functional operating mechanisms	Maladjustment that interferes with operating mechanisms proper operation and unusual sounds
Control devices	Improper operation
Limit switch devices	Maladjustment or malfunction
Hook	Chemical damage, cracks, deformation, excessive throat opening, excessive twist, and wear on load bearing surface
Hook latch	Missing or damage that prevents proper operation
Hook retaining members (Nuts, collars, pins, etc.)	Not properly secured (tightened), damaged or missing parts
Wire rope reeving	Reeving not in accordance with the WIRE ROPE section of this manual
Wire rope	Broken wires, broken strands, wear, twist, kinks, distortion of rope structure, end connections, deposits of foreign material, heat damage, and in adequate lubrication
WARNING label	Missing or illegible
Control device markings	Missing or illegible
Lubricant levels	Lubricant must be added or replaced
Fastening devices (bolts, nuts, pins, etc.)	Not properly secured (tightened), damaged or missing parts
Drums and sheaves	Cracks, damage to groves, and excessive wear
Motor brake	Drift and excessive wear
Load brake	Drift
Load block, suspension frame	Cracks, damage and distortion
Supporting structure and trolley	Cracks, damage and distortion
Trolley wheels	Flat spots, damage excessive wear
Electrical apparatus	Pitting, deterioration, wear and improper operation
Wiring and fittings	Loose connections, abraded, cut, or nicked insulation

6.4 Tests

All new complete hoists, less trolley or trolleys, are load tested by ACI in accordance with ASME 830.16. Hoists furnished in an uncompleted condition (i.e. Jess controls, less motor, less wire rope, etc.) as hoist components, and winch units are not load tested by ACI. Therefore, it is the responsibility of the owner/user to load test the final lifting system using such hoist components or winches in accordance with ASME 830.16. If the hoist is installed on a crane, load testing of the crane in accordance with, as applicable, ASME 830.2, ASME 830.11, or ASME 830.17 may be required.

Testing of hoists after original installation is required when the hoist has been altered or repaired; has been idle for a period of 12 months or longer; or in accordance with specific testing requirements established by the owner/user. General testing requirements are outlined in ASME 830.16 and should be followed. ASME B30.16 lists two types of hoist tests as follows:

1. Operational test
2. Load Test

ASME B30.16 uses the words **SHALL** and **SHOULD** in listing requirements, and defines these two words as follows:

- **SHALL -** indicates that the rule is mandatory and must be followed.
- **SHOULD -** indicates that the rule is a recommendation, the advisability of which depends on the facts in each situation.

6.4.1 Operational Test

All altered or repaired hoists, or hoists that have not been used within the preceding 12 months, **SHALL** be tested by the owner/user before being placed in operational service. The operational test is performed without a load on the hook and includes: (1) operation of control devices; (2) lifting and lowering; (3) operation of brakes; and (4) operation and setting of limit switch devices.

Operational test steps are as follows:

1. Check hoist travel for correct hook motion (hoist motor is properly phased). Since motor rotation of a three-phase AC motor can be changed by reversing any two of the lines feeding power to the motor, the direction of hook motion must be checked to verify that it is correct in accordance with the hoist control device markings.

To check hook motion direction or motor phasing:

MOMENTARILY activate the **UP** button or lever of the hoist control device and observe the direction of hook motion. If direction of hook travel agrees with the direction marking of the hoist control device activated (i.e., hook direction is UP when the hoist UP control device is activated), hoist motor is properly phased and proceed to step 5. If the direction of hook travel does not agree with the direction marking of the hoist control device activated (i.e., hook direction is DOWN when the hoist UP control device is activated), hoist motor is improperly phased and must be corrected. DO NOT USE HOIST until motor phasing is corrected.

⚠WARNING

DO NOT operate hoist if direction of hook motion does not agree with the direction marking on the hoist control device activated.

⚠WARNING

DO NOT attempt to correct an improperly phased hoist by changing any wiring in the hoist control device or at the hoist contactors; or by changing the markings on the hoist control device.

To correct hoist motor phasing:

DANGER

a. Disconnect power and lockout disconnecting means before reconnecting (reversing) power lines to hoist.

b. Only a qualified electrician should reconnect the power lines to the hoist.

c. Interchange any two lines supplying power to the hoist.

d. Re-energize power supply to the hoist.

e. Re-check hoist travel for correct hook motion. If direction of hook travel agrees with the direction marking of the hoist control device activated (i.e., hook direction is UP when the hoist UP control device is activated), hoist motor is properly phased and proceed to step 5. If the direction of hook travel does not agree with the direction marking of the hoist control device activated (i.e., hook direction is DOWN when the hoist UP control device is activated), hoist motor is improperly phased and must be corrected by repeating steps a through e.

If hoist has a motorized trolley, check trolley travel motion for agreement with the direction marking of the trolley control device.

To check trolley motion direction or trolley motor phasing:

MOMENTARILY activate one button or lever of the trolley control device and observe the direction of trolley motion. If direction of trolley travel agrees with the direction marking of the trolley control device activated (i.e., trolley direction is EAST when the trolley EAST control device is activated), trolley motor is properly phased. If the direction of trolley travel does not agree with the direction marking of the trolley control device activated (i.e., trolley direction is RIGHT when the trolley LEFT control device is activated), trolley motor is improperly phased and must be corrected. DO NOT USE TROLLEY until motor phasing is corrected.

WARNING

DO NOT operate trolley if direction of trolley motion does not agree with the direction marking on the trolley control device activated.

WARNING

DO NOT attempt to correct an improperly phased trolley by changing any wiring in the trolley control device or at the trolley contactors; or by changing the markings on the trolley control device.

To correct trolley motor phasing:

⚠ DANGER

a. Disconnect power and lockout disconnecting means before reconnecting (reversing) power lines to trolley.

b. Only a qualified electrician should reconnect the power lines to the trolley.

c. Interchange any two lines supplying power to the trolley motor only. DO NOT reverse main power leads to the hoist as this will also effect the phasing of the hoist motor.

d. Re-energize power supply to the hoist.

e. Re-check trolley travel for correct trolley motion. If direction of trolley travel agrees with the direction marking of the trolley control device activated (i.e., trolley direction is LEFT when the trolley LEFT control device is activated), trolley motor is properly phased. If the direction of trolley travel does not agree with the direction marking of the trolley control device activated (i.e., trolley direction is RIGHT when the trolley LEFT control device is activated), trolley motor is improperly phased and must be corrected by repeating steps a through e.

Operate hoist in the raising and lowering direction, without load on the hook, and stop motion to check operation of the motor brake. The drift of the hook should not exceed one inch in either direction. If hook drift exceeds one inch, the motor brake requires adjustment. Refer to the MOTOR BRAKE section of this manual for instructions on motor brake adjustment.

Check operation of limit switches as follows:

a. All checking of limit switches should be accomplished without a load on the hook. All checking of limit switches should be accomplished by using the low speed of multiple-speed hoists, or inched into the limit if the hoist is a single-speed unit.

⚠ DANGER

Disconnect power and lockout disconnecting means before adjusting limit switches. Limit switches should be adjusted using a continuity tester or other type of tester that will indicate open or closed circuits without the need of electrical power.

b. Hoists with the standard gravity type upper limit switch:

- Check the gravity type upper limit switch by operating the hoist in the lifting direction. While the load block is raising, lift the weight of the upper gravity type limit switch manually until motion of the load block stops. Lifting the weight higher should cause the load block to lower until the weight is released. If raising motion does not stop when the weight is lifted, STOP hoist motion as the upper gravity limit switch requires adjustment or replacement. The lowering motion achieved by lifting the weight after raising motion of the load block has stopped is a reverse plugging feature to minimize the possibility of the load block striking the hoist frame or drum if the motor brake is out of adjustment. If adjustment of the gravity type upper limit switch is required, refer to the LIMIT SWITCHES section of this manual.

- Operate hoist in the lifting direction to a point where the block is about 12 inches below the hoist drum. If the hoist has more than one speed, continue to raise at low speed or; if hoist is a single-speed unit, inch the load block in the lifting direction until motion of the load block stops to check that load block stops when

- Striking the weight of the gravity upper limit switch before striking any other part of the hoist. If the load block will hit any part of the hoist prior to striking the weight of the gravity type limit switch, STOP hoist motion as

the upper gravity limit switch requires adjustment or replacement. If adjustment of the gravity type upper limit device is required, refer to the LIMIT SWITCHES section of this manual.

- Operate the hoist in the lowering direction until the load block reaches its lowest point of travel. At this location of the load block two wraps of wire rope must remain at each anchorage on the hoist drum. IF LESS THAN TWO WRAPS REMAIN AT EACH ANCHORAGE ON THE DRUM, DO NOT USE THE HOIST AT THIS LOCATION. Contact ACI Hoist & Crane or the distributor of the hoist.

c. If a geared limit switch is specified and furnished on the hoist, operate hoist in the lowering direction until motion of the load block stops to check lower geared limit device circuit. While lowering the load block, watch the wire rope paying off the drum. If all the wire rope will pay off the drum before the lower geared limit device stops load block motion, STOP hoist motion as the lower geared limit device requires adjustment. The hoist lower geared limit device is set at the factory to stop lower travel of the load block with two wraps of wire rope remaining at each anchorage on the drum. ASME B30.16 allows one wrap of wire rope remaining at each anchorage on the drum when a lower limit device is used. It is recommended that the lower geared limit device be set to prevent the load block from resting on the floor and allowing the hoisting ropes to go slack. If adjustment of the lower geared limit device is required, refer to the LIMIT SWITCHES section of this manual.

d. If a geared limit switch is specified and furnished on the hoist, operate hoist in the raising direction to a point where the block is about 12 inches below the hoist drum. If the hoist has more than one speed, continue to raise at low speed or; if hoist is a single-speed unit, inch the load block in the raising direction until motion of the load block stops to check upper geared limit switch circuit. If the load block will hit the weight of the gravity type upper limit switch before the upper geared limit device stops load block motion, STOP hoist motion as the upper geared limit device requires adjustment. The hoist upper geared limit device is set at the factory to stop upper hook travel when the top of the load block is two inches below the weight of the gravity type limit switch. If adjustment of the upper geared limit device is required, refer to the LIMIT SWITCHES section of this manual.

⚠WARNING

Geared upper limit device must be adjusted so that when it is tripped, there is a minimum of 2 inches between the top of the load block and the gravity type upper limit switch.

⚠WARNING

Never operate hoist without the protection of properly functioning limit switches.

6.4.2 Load Test:

All hoists in which load suspension parts have been altered, replaced, or repaired SHALL be dynamically tested by the owner/user before being placed in operational service. The toad test shall be conducted under the direction of a designated person and a record of the test should be made. The test load applied to the hoist shall be at least equal to the rated load capacity of the hoist, or greater as approved by the hoist manufacturer. Functions to be performed during the load test include: (1) operation of control devices; (2) lifting and lowering; and (3) operation of brakes.

Load test steps are as follows:

1. Attach test load to the hoist hook. Test load shall be at least equal to the rated load capacity of the hoist. ACI will authorize the use of a hoist test load equal to 125% of the rated load capacity of the hoist for load test purposes only.

2. Before lifting the load, operate the hoist in the lifting direction to take any slack out of the hoist wire rope.

3. Lift the load a few inches and stop the hoist. If brakes stop and hold the load, continue lifting and lowering the load several feet, stopping the hoist several times in each direction to check that the hoist braking system stops and holds the load.

4. If the hoist braking system stops and holds the load, the hoist operates in accordance with the control devices, and no unusual sounds are present during operation, the hoist is ready to be released for operating purposes.

5. If the hoist braking system does not stop and hold the load, the hoist does not operate in accordance with the control devices, or any unusual sounds are present during operation, the hoist is not ready to be released for operating purposes; and corrective action must be taken.

6.5 Repair

If maintenance, adjustment, replacement of parts, or repair of the hoist is required because of any damage or malfunctions noted during the daily, frequent, or periodic inspections outlined in the Inspection section of this manual; because of conditions found during a hoist test as outlined in the Test section of this manual; or based upon specific instructions outlined in other sections of this manual; the hoist shall be taken out of service, and maintenance performed as required.

Repairs include removal of small defects noticed during the inspections, such as: damages of the cables or light activities as replacement of contactors and relays. They don't include harder and more responsible activities that must be coordinated with the producer, such as: change in the electric diagram or implementation of additional devices.

The possible failures in the electric equipment and troubleshooting are listed in Table 22.

⚠ DANGER

Hazardous voltages are present in the control box, other electrical components, and connections between these components.

The main switch (disconnect) of the hoist, crane, or lifting system shall be de-energized. Lock and tag the main switch in the de-energized position in accordance with ANSI Z244.1.

⚠ CAUTION

DO NOT use cotter pins, groove pins, or locknuts that have been removed during disassembly. They may be damaged during removal and will not function properly if reused. Always install components using new cotter pins, groove pins, or locknuts

Follow the instructions outlined in various sections of this manual for specific components or portions of the hoist where maintenance or adjustment is required. Refer to the parts identification pages for the specific portion of the hoist where maintenance or adjustment is being performed and to identify any part numbers requiring replacement.

If any instructions are not clear; or if any additional information is required in reference to adjustment, maintenance, or identification of parts; contact ACI Hoist & Crane or the distributor of the hoist.

6.6 Lubrication and adjustment

All moving parts of the hoist or trolley for which lubrication is specified should be inspected, checked and lubricated on a regular basis. The method used to deliver lubricant should be checked for proper delivery of the lubricant. This section applies to the hoist and trolley only. If the hoist is installed as part of a crane or as part of a lifting system, lubrication instructions covered in the manual furnished by the crane lifting system manufacture should be followed.

Hoist and trolley drive unit gear are enclosed and provided a liberal oil reservoir from which gears and bearings inside the housing are splash- lubricated. Check oil level in gear housings periodical, with intervals determined by used and operating conditions, refer to the Inspection section of this manual.Hoist and trolley machinery must be stationary when inspecting, checking, adding, or changing lubricants. The main switch (disconnected) of the hoist, crane, or lifting system must be de- energized. Lock and tag the main switch in the de-energized position. (According to ANSI Z244.1).

⚠WARNING

Before inspecting, checking, adding, or changing lubricants of the hoist or trolley, refer to the maintenance and inspection procedures section of this manual.

⚠CAUTION

DO NOT use lubricants that do not meet the specifications of the recommended

⚠WARNING

Never use gear oils in the gear housings if they contain additives for friction reduction. Gear oils that contain friction reduction additives will effect the operation of the load brake, and could render the load brake inoperative.

⚠WARNING

All lubricants:

- May cause mild eye irritation- avoid contact with eyes.
- May cause moderate skin irritation- avoid prolonged or repeated contact with skin. Wash thoroughly after handling.
- Are slightly combustible; keep away from extreme heat and open flame.

The necessary maintenance as regards the lubricants is given in Table 6.6.1. And select lubricant from Table 6.6.2.

Table 6.6.1

Fig. 6.6.1		□ On initial putting into operation						Type of lubrication
			□ After 3 months of operation					
				□ After 12 months of operation				
					□ After every 12 months			
Pos	Point of lubrication					□ After each 36 months		
1	Reducer for lifting	□	□	□		□	Change oil	pour it
2	Splined joint reducer-drum					□	Change grease	filling with grease
3	Drum - rope grooves			□	□		Clean and grease	by brush
4	Rope guide - spring channel and leading profile edge	□	□	□	□		Clean and grease	by brush
5	Rope		□	□	□		Clean and grease	filling with grease
6	End limit switch lever system	□	□	□	□		Clean and grease	by brush
7	Bearings of the roller for the rope, the					□	Change grease	filling with grease
8	Splines of the clutch					□	Change grease	filling with grease
9	Bearings drum - lifting electric motor					□	Change grease	filling with grease
10	Bearings of the lifting electric motor					□	Change grease	filling with grease
11	Axles of the wedge bush and the		□	□	□		Clean and grease	by brush
12	Bearings of the motor of the travelling mechanism					□	Change grease	filling with grease
13	Travelling mechanism reducer	□				□	Change oil	pour it
14	Grooves ewducwr-shaft-travel wheel					□	Change grease	by brush
15	Jointed connection between the hoisting and travelling mechanism		□	□	□		Change grease	filling with grease
16	Bearing of the travel wheels					□	Change grease	filling with grease
17	Bearings of the guiding rollers of the travelling mechanism					□	Change grease	filling with grease
18	Tooth rim of the driving travel wheel			□	□		Change grease	filling with grease

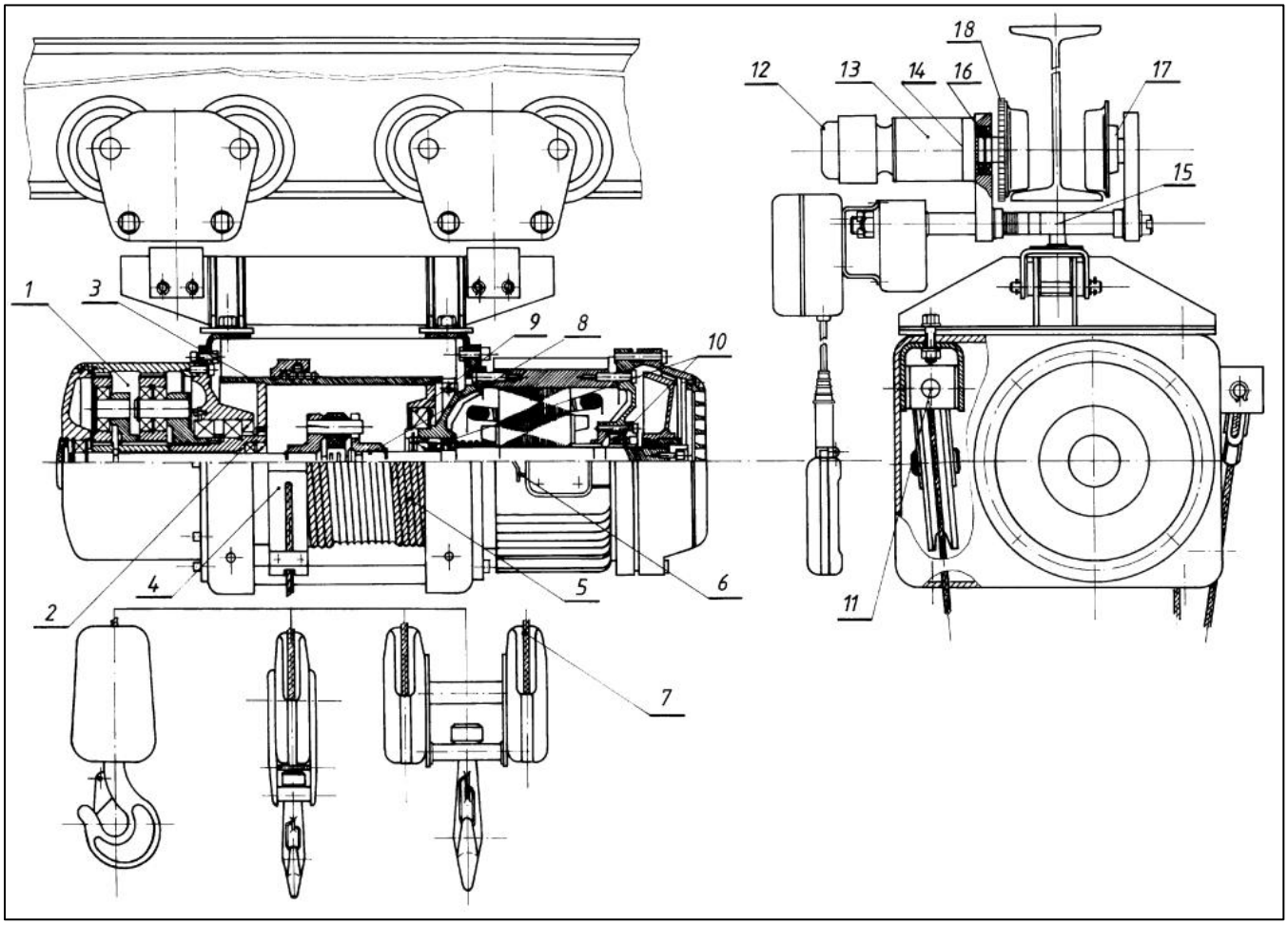


Figure 6.6.1

Table 6.6.2

Place to lubricate, fig. 6.6.1			Recommended materials	Equivalent to	Type & amount of lubrication			
#	Type of lubricant	Lubricant features						
10, 12	Grease	Dripping temperature - not lower than 356°F (180°C)	**Operation temperature -13°F(-25°C) to +329°F (+165°C)**	**Ambient temperature 15°F (-9°C) to 60°F (+16°C)**	Pos.			
					10		12	
			Fuchs RenoLit DurapLex 2, Shell Alvania EP Fett 2, Esso Unirex N2,	AGMA 4EP	Capacity	Oz	Capacity	Oz
			Operation temperature -40°F (-40°C) to +428°F (220°C)		3 5 7.5 10 15 20	2.1 2.1 2.1 2.6 3.2 3.2	3 5 7.5 10 15 20	1.8 1.8 1.8 1.8 3.5 3.5
			Fuchs Wacker Siliconfett Mittel, Aero Shell Grease 15A Siliconfett, Fuchs Wacker Siliconfett 300 mittel.					
7, 9, 16, 17	Grease	Dripping temperature - not lower than 356°F (180°C) Penetration: 220-430	**Operation temperature -13°F (-25°C) to +176°F (+80°C)**		Capacity	Quantity (oz)		
						Pos.		
						7	9	16	17
			MOBIL-MOBILPLEX 48, BP Energrease HT 3.		3 5 7.5 10 15 20	1.8 1.8 1.8 2.1 2.8 2.8	0.9 0.9 0.9 1.4 2.1 2.1	4.2 4.2 4.2 8.5 16.9 16.9	0.7 0.7 1.4 1.4 2.1 2.1
			Operation temperature -40°F (-40°C) to +176°F (+ 80°C)	**Ambient temperature 50°F (10°C) to 125°F (52°C)**					
			MOBIL-MOBILLUX 2, Fuchs RenoLit FLM 2.	AGMA 8 Comp.					
2, 8, 14	Grease	Dripping temperature - not lower than 356°F (180°C) Penetration: 300÷340 Applicable to heavy duty splined joints	**Operation temperature 13°F (-25°C) to +248 (+ 120°C)**		Capacity	Quantity (oz)		
						Pos.		
						2	8	14
			Aral Fett P64037, Aralub PMD1, BP Mehrzweckfett L21M, Esso Mehrzweckfett M, Mobil Grease Spezial, Texaco Molytex Grease EP2, Fuchs Renolit FLM2,		3 or 5 7.5 10 15	2.1 2.1	0.15-.21 0.15-.21 0.15-.21 0.15-.21	0.35 0.35 0.35 0.35
			Operation temperature -58°F (-50°C) to +302°F(+150°C)					
			Fuchs Renolit FLM2.					

#	Type of lubricant	Lubricant features	Recommended materials		Type & amount of lubrication						
					Quantity (oz)						
					Pos.						
			Operation temperature 13°F (-25°C) to +176°F (+ 80°C)	Capacity	3	4	5	6	11	15	18
3, 4, 5, 6, 11, 15, 18	Grease	Dripping temperature - not lower than 203°F (95°C) Penetration: 220÷430	Aralub FDPO, BP Energrease HT-EPOO Esso Getriebfliessfett Shell Special H Mobil Gargoyle Fett 1200 W	3 5 7.5 10 15 20	2.1 2.1 2.1 2.6 3.2 3.2	2.1 2.1 2.1 2.6 3.2 3.2	2.1 2.1 2.1 2.6 3.2 3.2	0.2 0.2 0.2 0.2 0.2 0.2	1.4 1.4 1.4 1.4 1.4 1.4	0.5 0.5 0.7 0.7 0.9 0.9	1.4 1.4 1.4 1.8 2.1 2.1
			Operation temperature -40°F (-40°C) to +248°F (+ 120°C)								
			Fuchs Renolit 500 EP								
				Capacity	Quantity (Liter)						
					Pos.						
					1				13		
1, 13	Oil	Viscosity acc. to ISO 220 (150) Viscosity 220 cst at 140°F (40°C) Freezing temperature -25° (-40°) Temperature of inflammation 190°C (180°) Classification acc. to the expolitation levels as per API not lower then GL-4 Applicable to planetary reducers	Mobil-Mobilgear 632, Mobil-Mobilube GX90, BP-Hypogear 90 EP, Shell Spirax Heavy Duty 90, EP 220 (Klueber, Syntheso), D220 EP, Esso S220), (Shell - Tivela-82)	3 5 7.5 10 15 20	0.8 0.8 0.8 1.2 2.0 2.0				0.6 0.6 0.6 1.0 1.75 1.75		

6.7 Maintenance and Adjustment of Motor Brake

To ensure safe brake operation it's important to maintain the air gap between the ferodo disk and the friction surface (with the brake unactuated) in certain limits. The initial (minimum) axial stroke of the rotor of the electric motors with a built-in conical brake is determined by the plant-manufacturer. Brake ferodo wears out during exploitation and as a result the axial stroke of the rotor respectively the stopping distance increases. That's why you should make regular checks and if necessary to adjust the brake; at reaching the limit for wearing out you should change ferodo lining in order to recover the initial position of the rotor.

Adjustment of the brake disc, i.e. the axial stroke of the rotor of the electric motor can be done in the following way:

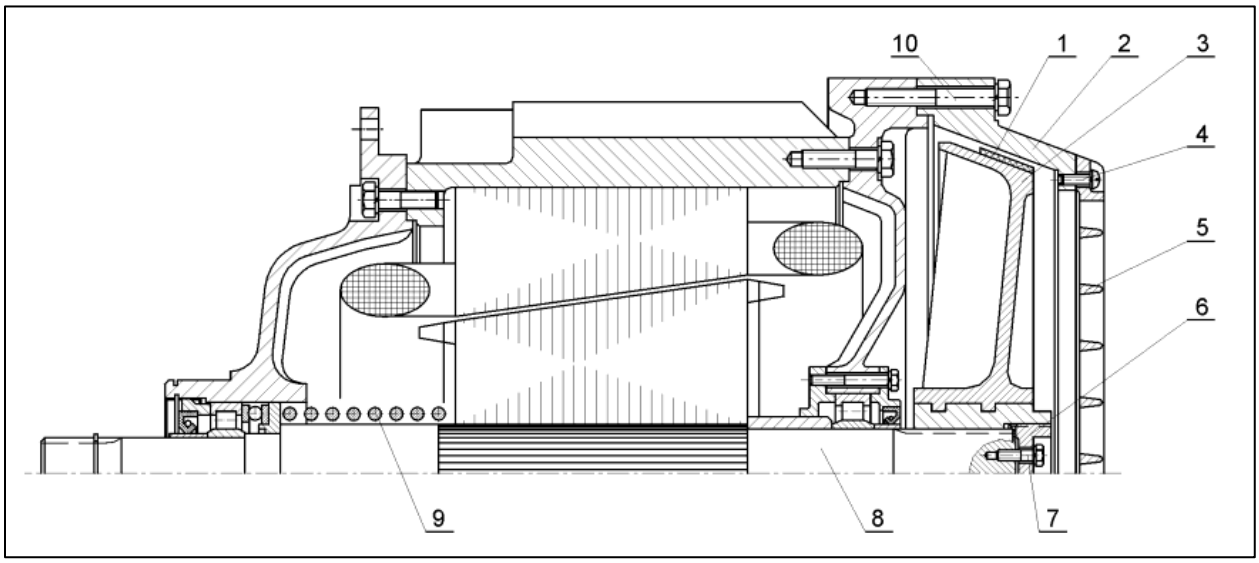


Figure 6.7.1

1. Adjustment is carried out with unloaded hoist
2. Remove grid (5) fixed with screws (4)
3. Unscrew bolts (7) fixing the adjusting nut 6 to the shaft 8 of the electric motor
4. Screw the adjusting nut with a special key for support
5. Unscrew the adjusting nut (6) until normal axial stroke (i.e 0.5- 1mm). The axial stroke of the rotor in this position is L=2n, where "2" is the thread pitch and "n" is the number of revolutions recorded at unwinding the adjusting nut
6. Unscrew the adjusting nut to 1/4 or 1/2 revolutions in order to establish normal axial stroke
7. Screw both fixing bolts pos. (7) of the adjusting nut (6)
8. Place the grid (5) and fasten with screws (4)

When the ferodo cone is worn out and its thickness reaches 1 to 2 mm it should be replaced with a new one and the adjustment done in accordance with the above method.

7.0 TROUBLESHOOTING

The possible failures in the electrical components and the methods for corrections are listed in Table 7.1.

Table 7.1

#	Problem	Cause	Correction
1	Equipment won't switch on	A safety fuse of the reducing transformer has burnt	Replace the fuse
		Mains lead fuse has burnt	Replace the fuse
		Breakage in the operational circuit	Check the wiring diagram and fix the broken circuit
		Contactor coil burnt or ruptured	Replace the contactor
		End limit switch activated or blocked	Check and set to normal position
2	Lifting motor will not operate when control button pressed	Conical brake is stuck	Take off the fan grid and press the shaft sever times while the hoist is turned off and unloaded.
		Mechanical blocking in the electric hoist or the motor	Disassemble and remove the blockage
3	Fuses burn out when the motor is switched on	Winding breakthrough to frame mass. Check with a megaohm-meter	Re-wind motor
		Breakthrough between phases	Re-wind motor
4	Electric motor is unusually noisy	Bearings are worn	Replace bearings
5	Electric motor drones and does not rotate when loaded	Only two of the phases are being activated	Check the mains
			Check the operation of the contactors. Change the contact bridges or contactor springs if necessary
			Check the state of the stator coil
		Working voltage is lower than minimum required	Check the supply voltage with voltmeter
6	Motor overheats	Load is exceeding the hoist load rating	Reduce load to accepted rating
		Voltage is asymmetric	Turn off the hoist until symmetry resumes
		Voltage is above admissible ratings	Check the supply voltage with voltmeter
		Operation usage has been exceeded	Reduce operation frequency
7	Electric motor continues working when push button switched off	Contactor contact tips have welded	Replace the contact bridges
		Contactors' magnet system is stuck	Check the counteracting springs and clean the magnet's front surfaces
		Push button contacts have welded	Replace the contacts
8	Limit switch does not actuate properly but switches off the main contactor	Incorrect phasing of the supply cable	Exchange and of the two phases
		Limiting rackets on the bar have loosened	Adjust and tighten the limiting rackets
		Contactor for relevant direction is stuck	Free the contactor or replace as necessary
		Limit switch is blocked	Check the limit switch, mend if possible, otherwise replace

8.0 WIRING DIAGRAMS

Generally, for the control of the electric hoists reversive electric diagrams are used.

Meaning of designations are as follows:

L1. **L2**, **L3** - electric network phases

S1 - stop button

T1 - transformer

F1, **F2**, **F3** - safety fuses

Q - Main contactor

Push buttons:

S2 - control cut-out switch button for LOWERING

S3 - control cut-out switch button for LIFTING

S4 - control cut-out switch button for RIGHT movement

S5 - control cut-out switch button for LEFT movement

S6 - end switch

M - Electric motor

K1-K8 – contactors

K9 – contactor time relay

B1 - load limiter electronic block

The function of the contactors is shown in the wiring diagrams by putting the following symbols under the coil signs:

Symbols	Contactor function
↑↑	Contactor for “LIFT” at basic-speed – K1
↑	Contactor for “LIFT” at micro-speed – K3
↓↓	Contactor for “LOWER” at basic-speed – K2
↓	Contactor for “LOWER” at micro-speed – K4
← ←	Contactor for “LEFT” at basic-speed – K5
← ← ←	Contactor for “LEFT” at basic- and micro-speed – K5
→ →	Contactor for “RIGHT” at basic-speed – K6
→→ →	Contactor for “RIGHT” at basic- and micro-speed – K6
↔ ↔	Contactor for “LEFT” and “RIGHT” at basic-speed – K7
↔	Contactor for “LEFT” and “RIGHT” at micro-speed – K8

The symbols under the motor designation denote:

↑ o ↓	Electric motor for lifting mechanism
←o→	Electric motor for travelling mechanism

Variant A of the electric wiring diagrams applies when thermal protection is available

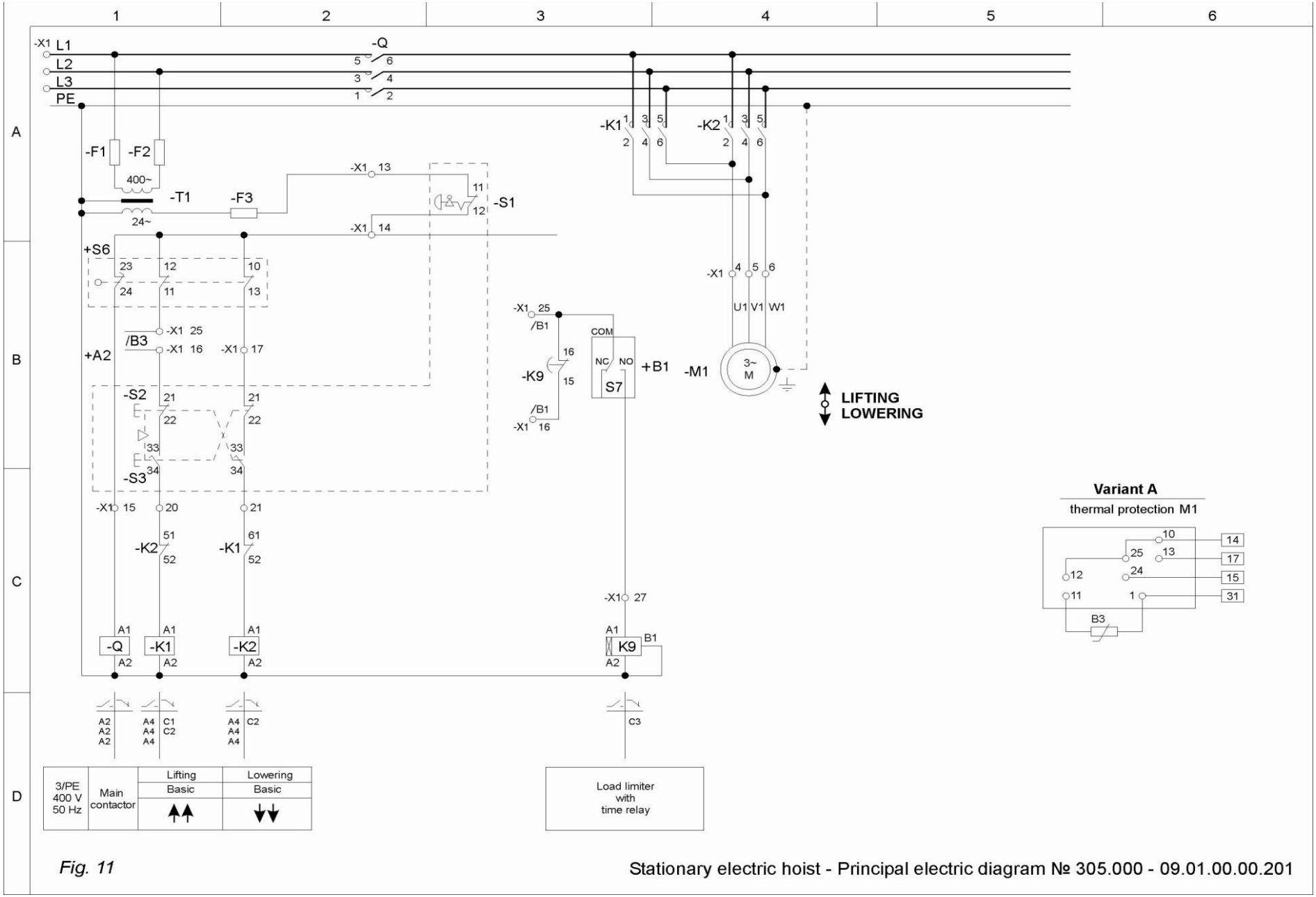


Fig. 11

Stationary electric hoist - Principal electric diagram № 305.000 - 09.01.00.00.201

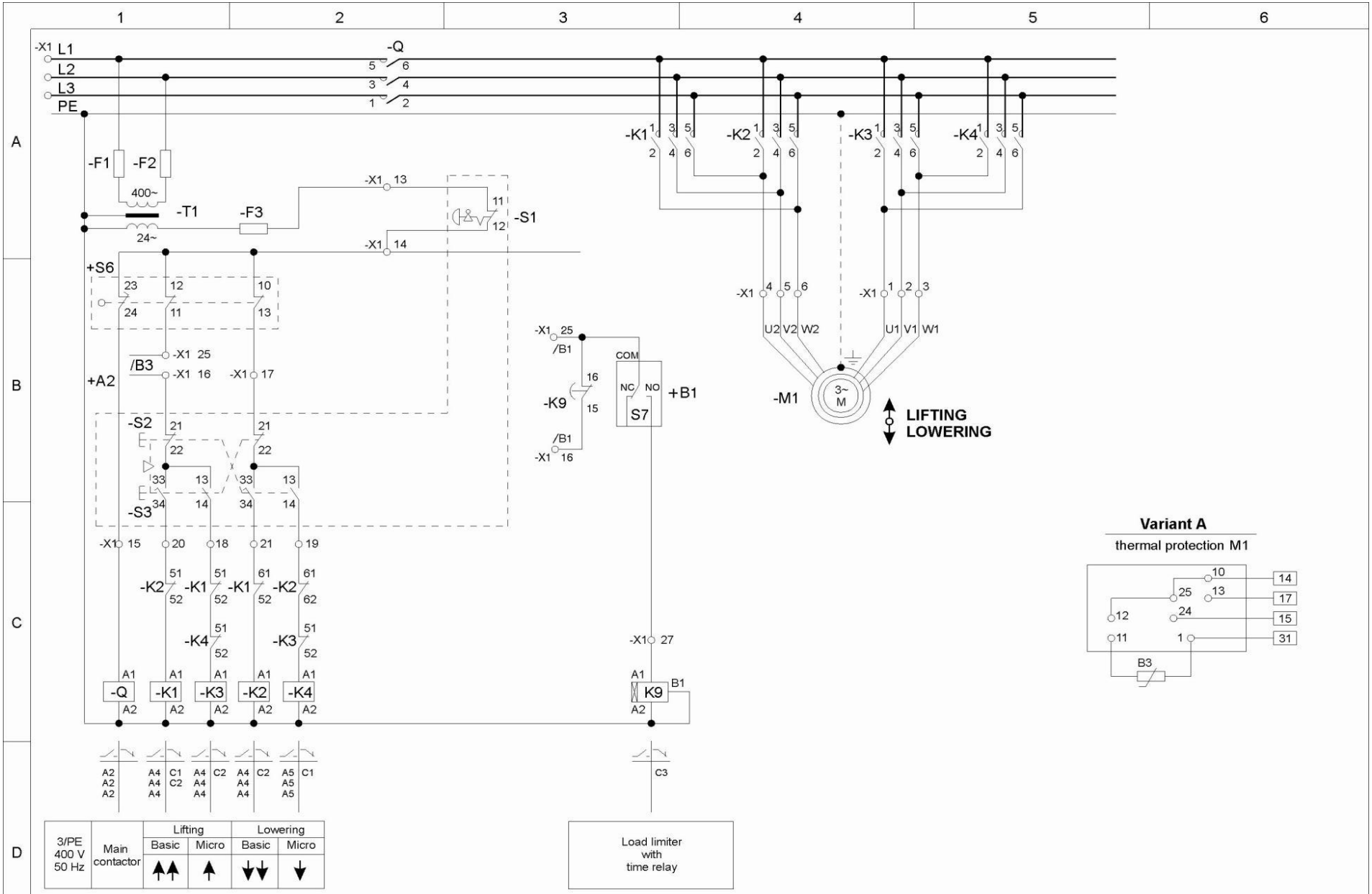


Fig. 12

Stationary electric hoist - Principal electric diagram № 305.000 - 09.02.00.00.201

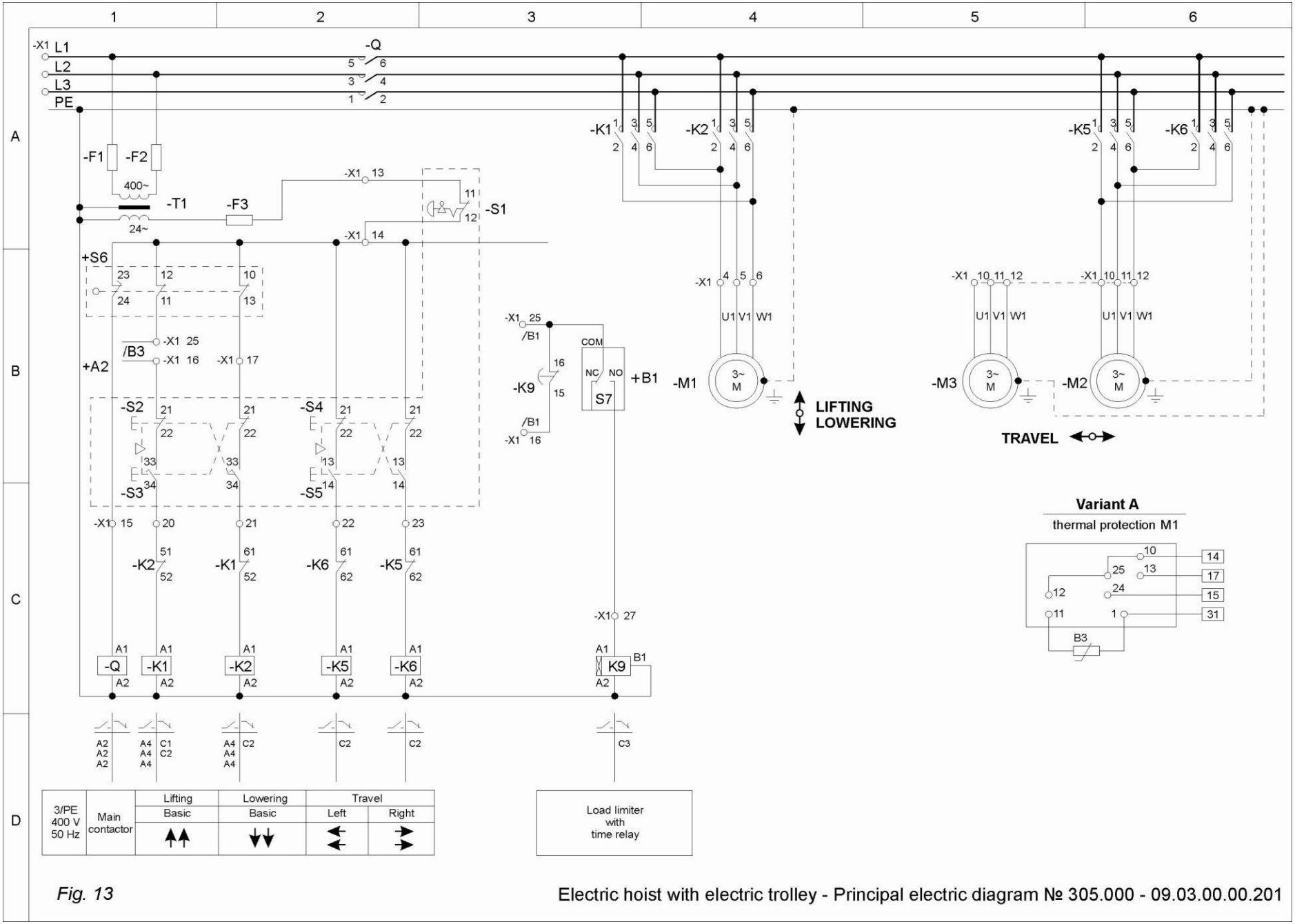


Fig. 13

Electric hoist with electric trolley - Principal electric diagram № 305.000 - 09.03.00.00.201

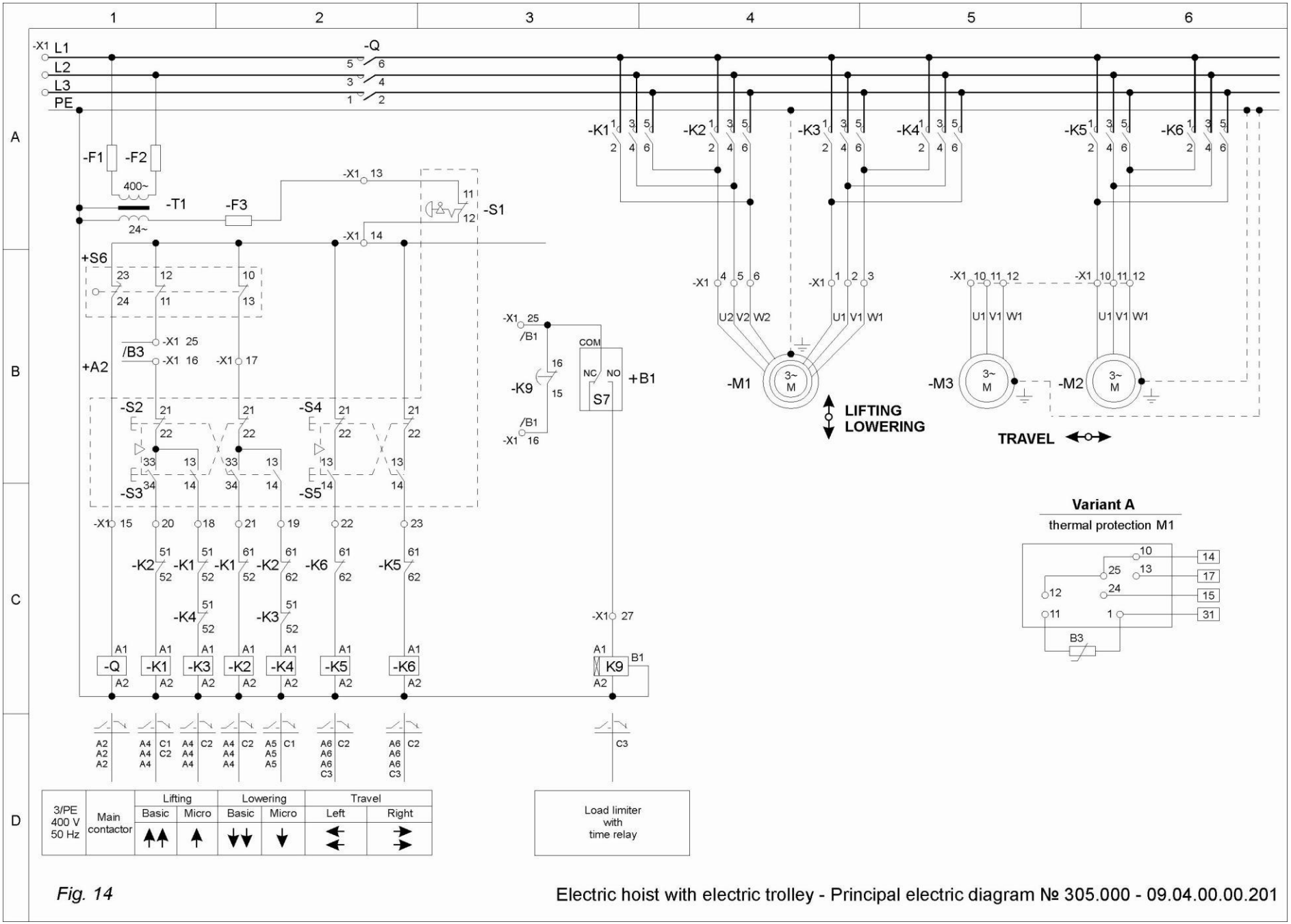


Fig. 14

Electric hoist with electric trolley - Principal electric diagram № 305.000 - 09.04.00.00.201

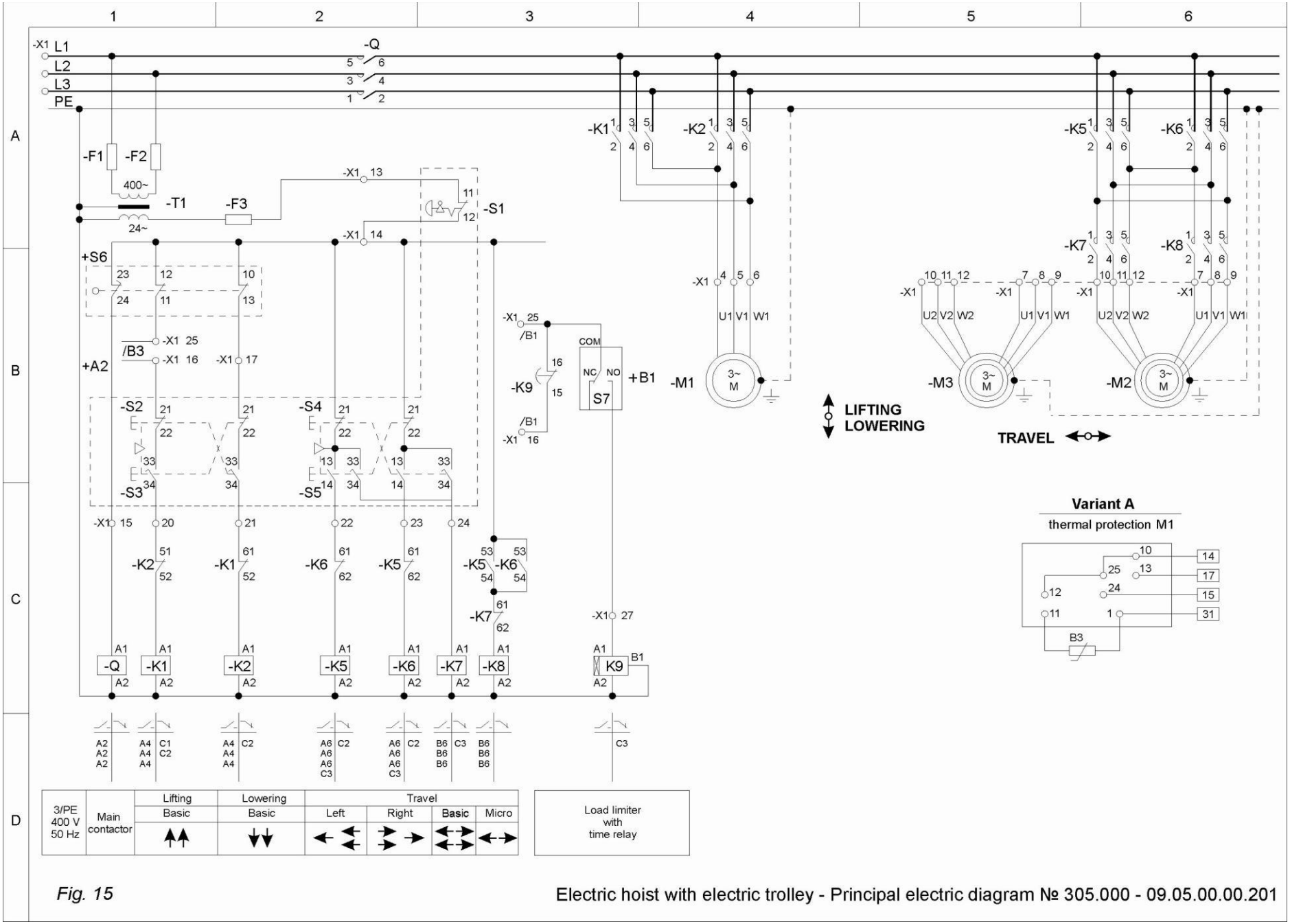


Fig. 15

Electric hoist with electric trolley - Principal electric diagram № 305.000 - 09.05.00.00.201

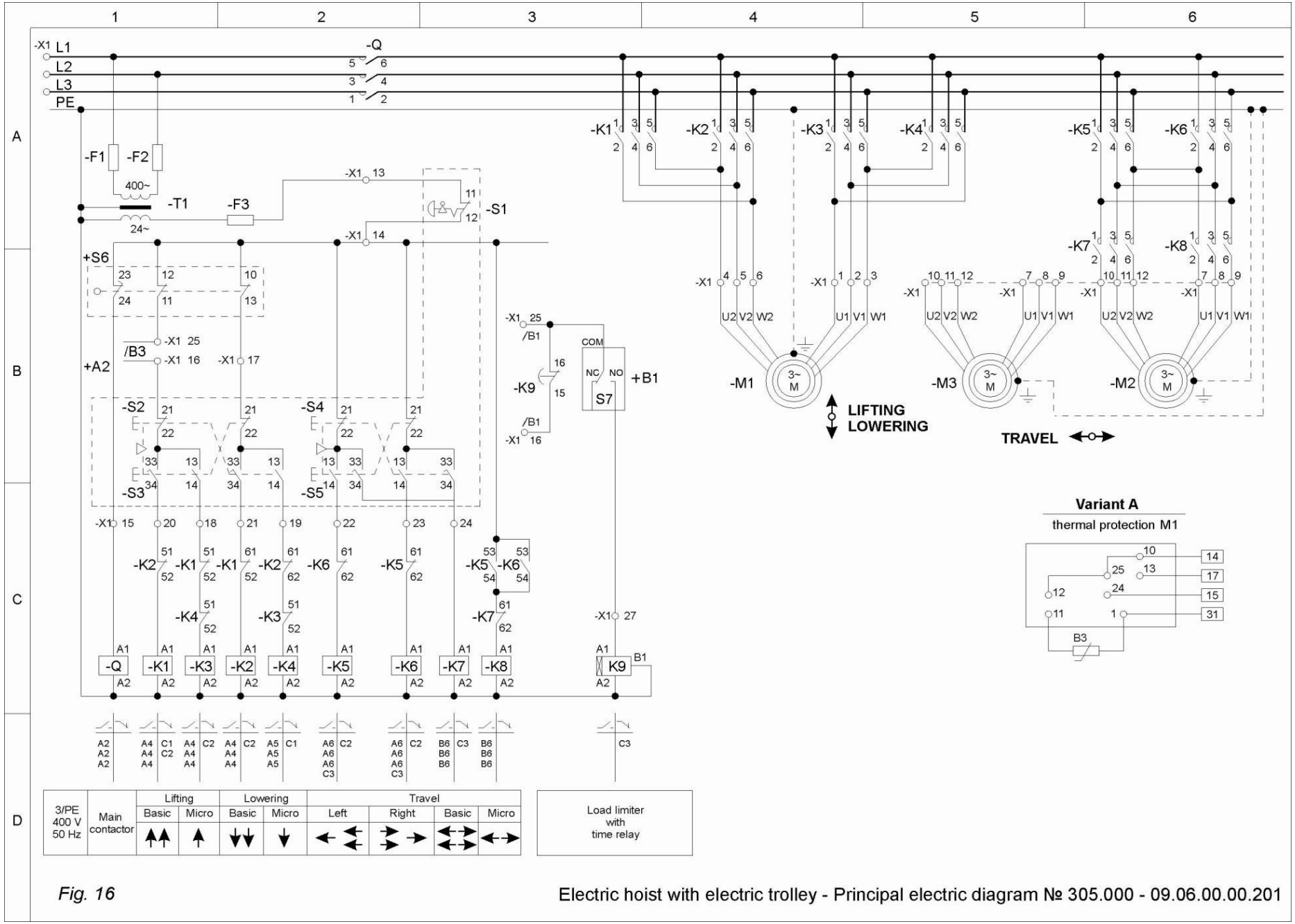


Fig. 16

Electric hoist with electric trolley - Principal electric diagram № 305.000 - 09.06.00.00.201