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INTRODUCTION

- o This instructions manual is addressed to:
 - o the crane owner;
 - o the building yard manager;
 - o the crane operator;
 - o the technicians in charge of traverse, installation, use, survey, maintenance and final dismantling;
- o The purpose of this manual is to explain the use of the crane as stated by the design studies and by its technical characteristics, by supplying:
 - suggestions for the building yard development;
 - draft, installation, assembling, adjustment and use instructions;
 - information about the personnel training;
 - suggestions about maintenance interventions;
 - an easier order of spare parts;
- o The instruction manual is supplied as memorandum and it is reserved to personnel with proven experience and properly trained. If this personnel is not required to our office or our agents and does not belong to our assistance service, we advise our customers to make sure about their capabilities before charging them with the crane assembling.
- o Moreover we remind you of the observance and the keeping of the state specific regulations together with of the instructions of this manual itself.
- o The instruction manual shall be considered to be part of the apparatus and it **shall keep for future references** up to the final dismantling.
- o The yard manager shall keep the manual in the building yard, it shall always be available to be looked up, stored in a dry and sure place. In case of damaging, a new copy may be required.
- o The manual complies with the technique situation at the marketing moment and it cannot be considered to be inadequate only because it is later updated according to our latest experiences.
- o **MANTIS CRANES** reserved the right to update its production and the manual itself without being compelled to update previous production and manuals.
- o The manual is sent to the user on signing the sales contract and in any case before the crane gets to the building yard.
- o In case of assignment of the apparatus, we ask the user to send us the address of the new owner so that we can send him directly supplements to the manual itself, if any.

- o MANTIS CRANES refuses all responsibility due to:
 - 1) Improper use or from not trained personnel;
 - 2) Employment of physically unsuitable personnel or not trained according to our instructions;
 - 3) Different use from the instructions of this manual;
 - 4) Building yard development and geologic characteristics of the ground on which the crane is placed ;different from the given instructions
 - 5) Current feeding defects;
 - 6) Maintenance shortage;
 - 7) Modifications and repairs not authorised by us;
 - 8) Use of non-original spare parts and not conforming to the model this manual refers to;
 - 9) Complete or partial non-observance of what specified in the instructions of this manual;
 - 10) Exceptional events (natural calamity).

1 - OPERATING CONDITIONS

-DESCRIPTION-

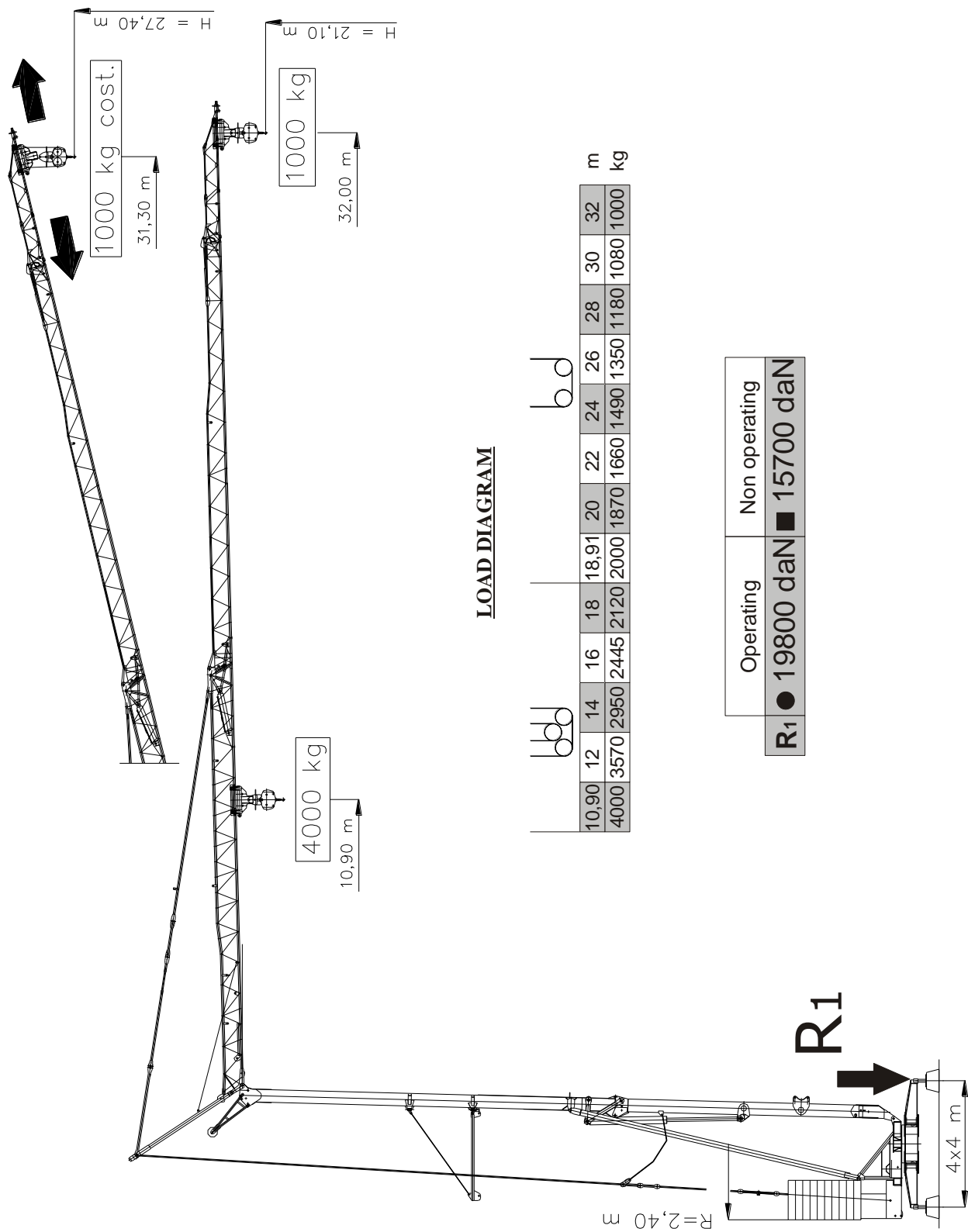
-Self-erecting tower crane with lower swivel, model H.S. 32.10, installed in a fixed position with 4 screw-mechanism stabilizers. The crane can otherwise be installed, on clients' specific request, on tracks and seating on 4 two-wheel carriages.

-Provided with a lifting mechanism consisting of a block, counterblock and a hook and chain for hoisting.

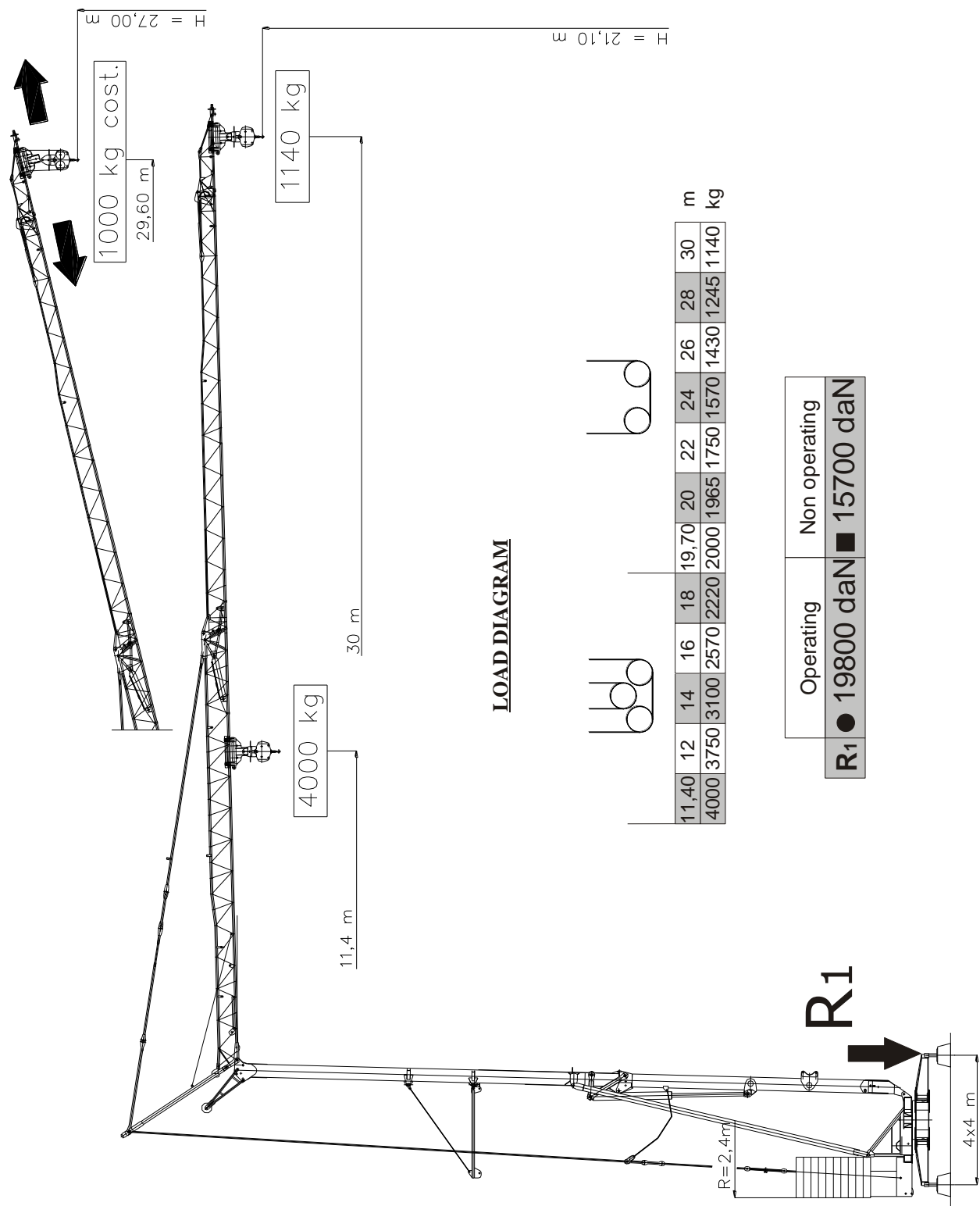
-Assembly of the crane is done by totally hydraulic means and is possible in any direction.

-It must be stated that this apparatus is designed for professional use and that any eventual hoisting accessories such as the pads under the stabilizers are not to be considered part of the apparatus even if we supplied them, as their use is not covered in this manual.

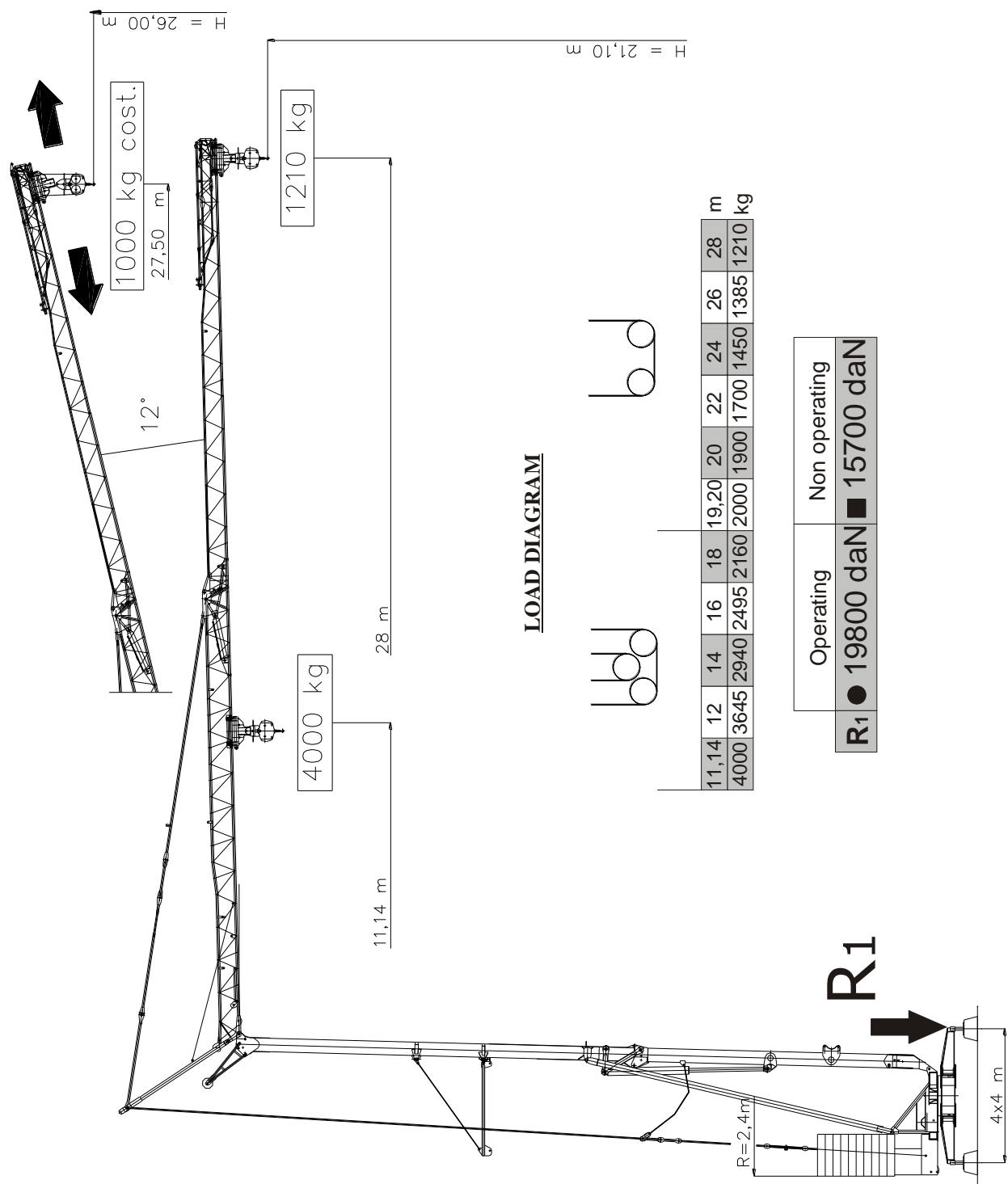
USE CONFIGURATION: 32 m JIB



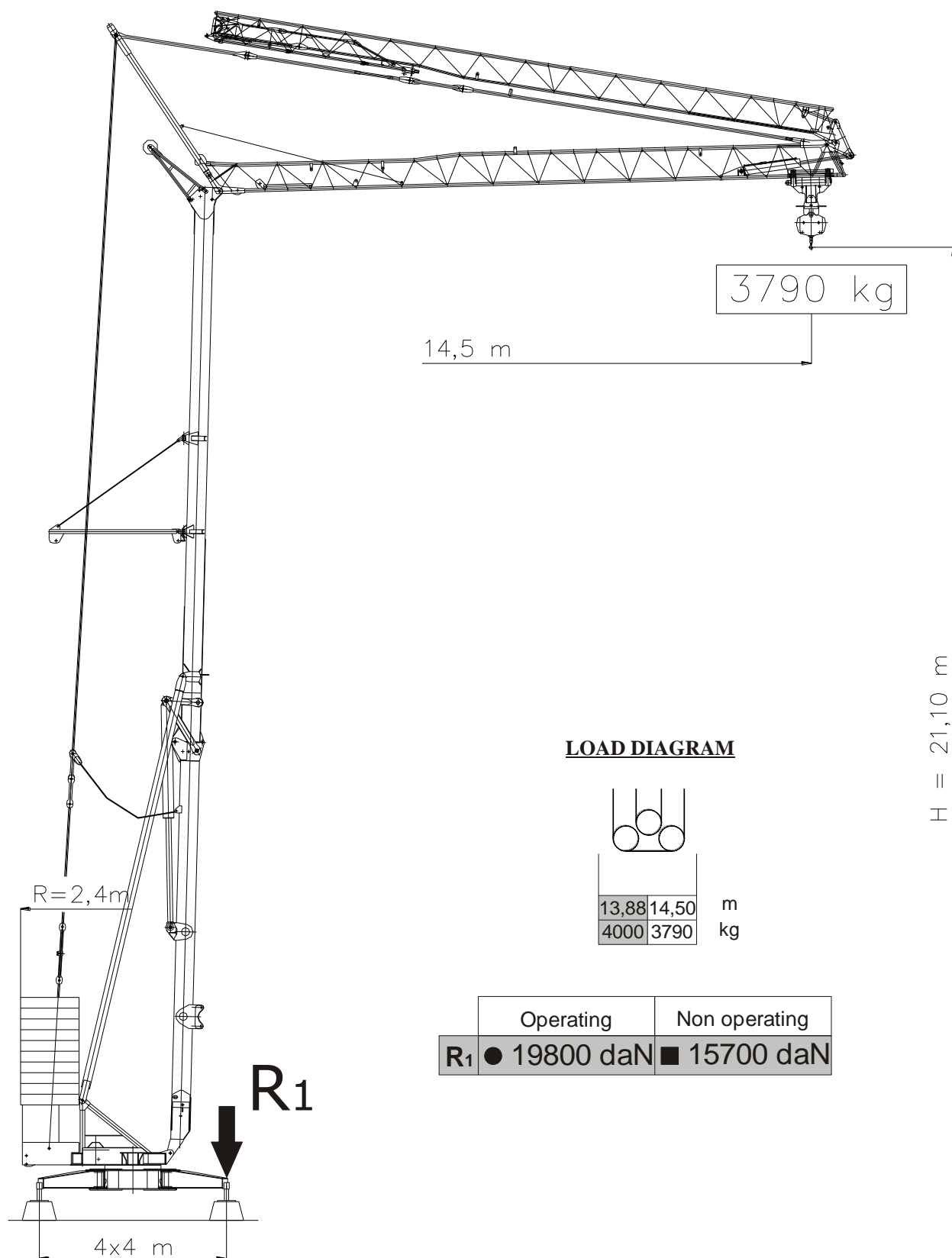
USE CONFIGURATION: 30 m JIB



USE CONFIGURATION: 28 m JIB



USE CONFIGURATION: REFOLDED JIB



-CLASSIFICATION-

-This apparatus has been designed and built according to the laws DIN 15018-15019-15020 in hoisting class H1 and stress group B2-B3.

-INTENDED WORK ENVIRONMENT-

The apparatus can be used in all capacities in an environment with a temperature ranging from a minimum of -20 C to a maximum of +40 C, and in winds of up to 72 km/h during operation and winds of up to 150 km/h when not in operation.

-WARNING-

Crane must be assembly in non-windy conditions.
It is not possible to use the apparatus in explosive, corrosive, or fire-prone areas.

-POSSIBLE MOVEMENTS-

-Possible working movements of the crane are:

- a) raising and lowering of the hoisting mechanism (vertical movement);
- b) translation of the trolley (horizontal movement of the hoisting mechanism);
- c) rotation (360-degree spin of the hoisting mechanism);
- d) optional translation on tracks (horizontal machine movement).

-INSTALLATION LIMITS -

-It is not possible to use the apparatus in:

- conditions which interfere with other devices;
- conditions impeded by any nature of object which does not permit the crane to turn itself into the direction of the wind once the crane is not being used;
- in the vicinity of electric lines.

-CONTROL POSITION-

The apparatus is not supplied with a fixed control position. The control position can be changed by moving the pendant key-pad and control box with the operator: so, it is necessary to underline that it is **FORBIDDEN** to stay in the rotation arc of the rotating platform which bears the counterweight ballast.

-It is very important that the operator of the crane always keeps in sight:

- a) the object being raised;
- b) the object's hook-up man;
- c) the man who is responsible to give commands if it is a third party and all the moving parts of the crane.

If the object being carried is not visible at all times, the man responsible for giving orders must be an expert in this type of function and must be orally in contact with the crane operator and the commands must be given according to a pre-established standard code.

-CONTROL EQUIPMENT-

The control equipment for the use of the apparatus is composed of:

- a) general line knife switch positioned on the electrical control box
- b) pendant key-pad and control box buttons or levers
- c) hydraulic mechanisms for the set up of the crane controlled by the keypad or control box

-On the inside of the apparatus there is a modal selector indicating OPER/ASSEMBLY.

-MEANS OF STOPPING-

As described for the control equipment, the same also have the function of stopping of any movement: for stop a given movement, all you need to do is release the button (or the lever) and the movement will gradually stop automatically by means of sensors on the inside of the equipment.

However in any situation of immanent danger, on the keypad or control box there is a button marked, “STOP”. Pressing this, all power is cut to all motors, which control movement. In this case, the stopping of the movement is instantaneous. In order to restart operation it is necessary to press the “CLOSE CIRCUIT” button. There is also a general switch marked “Line” placed on the door of the electric box that switches off everything. This must be switched off at the end of the work day.

-POSSIBLE LOADS-

Possible loads to be hoisted or moved are those seen in the load diagrams. They must be supplied with a place to be hooked or they must be properly braced. Loose loads must be placed in a suitable container, the mass of which must be deducted from the total weight allowed in the load diagrams.

It is forbidden to raise or move dangerous loads.

The surface of the load exposed to the wind must not exceed $1,5\text{m}^2$ for a tip load and 3m^2 for any other load.

-HOISTING ACCESSORIES-

In general, all hoisting accessories, which are used in a simple and passive manner between the hook and the load, are accepted.

The following are NOT ACCEPTED:

- o those that can cause dynamic interference or those that may cause accidental overloads
- o those that prohibit the free movement of the load itself
- o those that can allow the instantaneous release of the load
- o accessories which have their own motor and therefore require a control cable
- o selfloading accessories

-IMPORTANT-

The weight of the accessories between the hook and the load must be subtracted from the total weight of the load as seen in the load diagrams

-NON OPERATING CRANES-

At the end of the day or whenever the crane is not to be used, the following must be adhered to:

- o release the rotation by freeing the rotation of the motor by turning the handle clockWise, and in this way, you can permit the crane to allow itself to turn into the direction of the wind;
- o raise the hook of the hoisting mechanism and arrange it near the raising jib;
- o bring the empty trolley towards the tower;
- o switch off the large knife switch “LINE” located on the door of the electrical cabinet;
- o if the crane is supplied translating on tracks, lock the crane on the tracks using the appropriate tongs.

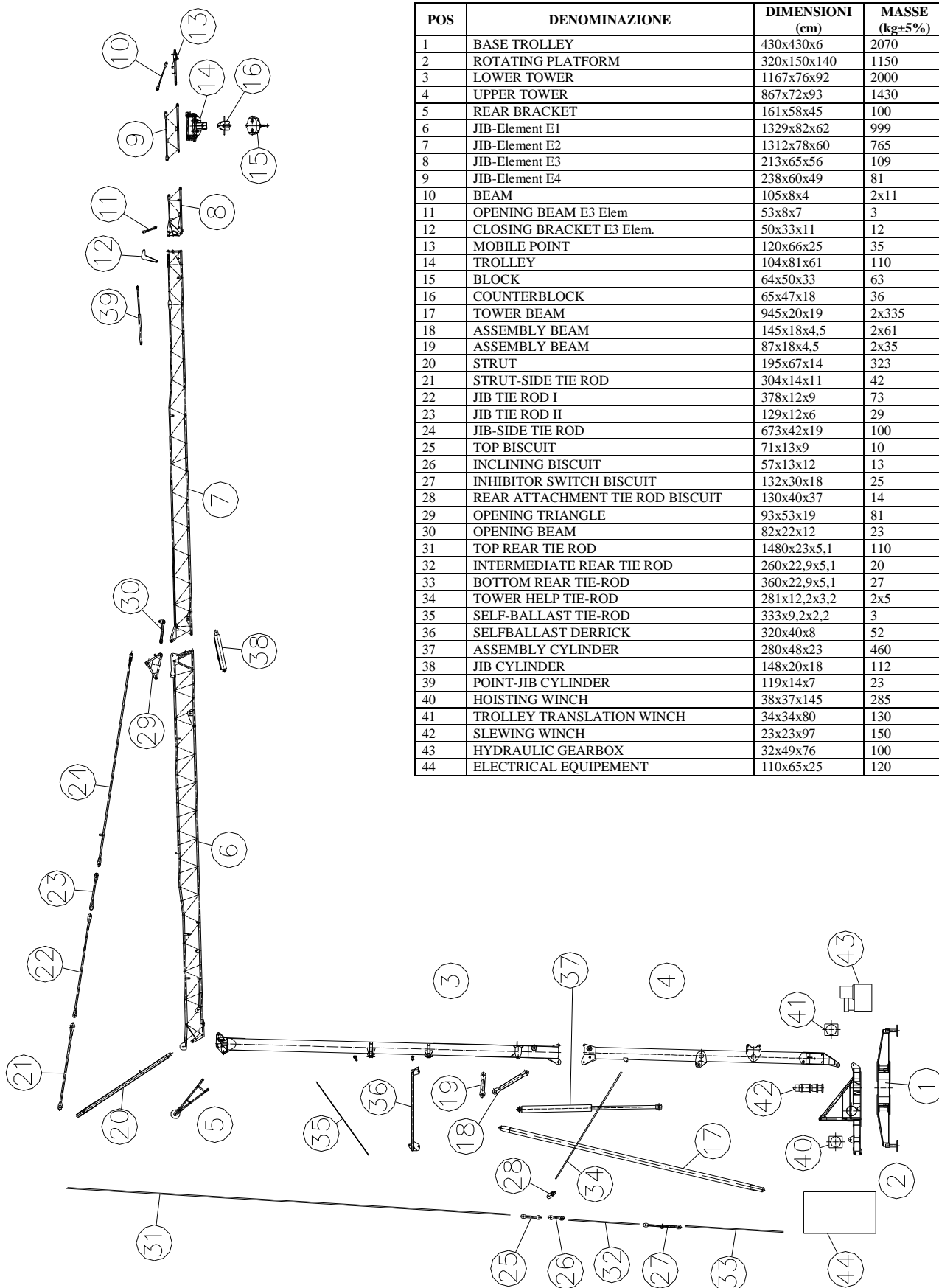
-USES NOT PERMITTED-

- o -never raise loads weighing more than the crane;
- o -do not raise in “FAST” loads greater than those allowed;
- o -do not pull on the incline or undertake tow loads;
- o -do not raise loads attached on the bottom;
- o -do not raise loads that are possibly iced to the ground;
- o -do not suddenly discharge the load (using accessories that provide for the automatic release of the load);
- o -do not bring the load to the ground too fast (faster than “DOWN”);
- o -do not roughly raise the load by lifting it with faster speed than “UP”;
- o -do not raise loads from unstable loading platforms such as floaters or dangerous rigs;
- o -do not raise the load from a point other than the balance point in situations where repercussions can be caused;
- o -do not allow the load to swing in order to let it down out of the operating radius;
- o -do not manoeuvre the crane with dangerous obstacles present;
- o -do not rest the block on the ground ;
- o -do not leave objects hanging from the hook of the crane when the crane is not in operation;
- o -never use a counter movement if the previous movement is not yet finished;
- o -never pass with a load over top of people, or if this is unavoidable, warn the people with the horn first;
- o -do not manoeuvre with the load not in sight;
- o -do not lean other items including signs etc. against the crane where visibility may be diminished or surface area exposed to the wind may be increased;
- o -do not hoist loads with a surface area greater than those established previously;
- o -do not use the crane if it is not functioning properly;
- o -do not use the end of the swing as a way of systematically dropping the load in a pre-established place;
- o -avoid the continual hoisting of loads which are near to the maximum accepted weights for load;
- o -do not frequently use the “STOP” button to stop the motion of the crane.

2 – TECHNICAL SPECIFICATION

DIMENSIONS AND WEIGHT OF THE MAIN PARTS

| POS | DENOMINAZIONE | DIMENSIONI (cm) | MASSE (kg±5%) |
|-----|---------------------------------|-----------------|---------------|
| 1 | BASE TROLLEY | 430x430x6 | 2070 |
| 2 | ROTATING PLATFORM | 320x150x140 | 1150 |
| 3 | LOWER TOWER | 1167x76x92 | 2000 |
| 4 | UPPER TOWER | 867x72x93 | 1430 |
| 5 | REAR BRACKET | 161x58x45 | 100 |
| 6 | JIB-Element E1 | 1329x82x62 | 999 |
| 7 | JIB-Element E2 | 1312x78x60 | 765 |
| 8 | JIB-Element E3 | 213x65x56 | 109 |
| 9 | JIB-Element E4 | 238x60x49 | 81 |
| 10 | BEAM | 105x8x4 | 2x11 |
| 11 | OPENING BEAM E3 Elem | 53x8x7 | 3 |
| 12 | CLOSING BRACKET E3 Elem. | 50x33x11 | 12 |
| 13 | MOBILE POINT | 120x66x25 | 35 |
| 14 | TROLLEY | 104x81x61 | 110 |
| 15 | BLOCK | 64x50x33 | 63 |
| 16 | COUNTERBLOCK | 65x47x18 | 36 |
| 17 | TOWER BEAM | 945x20x19 | 2x335 |
| 18 | ASSEMBLY BEAM | 145x18x4,5 | 2x61 |
| 19 | ASSEMBLY BEAM | 87x18x4,5 | 2x35 |
| 20 | STRUT | 195x67x14 | 323 |
| 21 | STRUT-SIDE TIE ROD | 304x14x11 | 42 |
| 22 | JIB TIE ROD I | 378x12x9 | 73 |
| 23 | JIB TIE ROD II | 129x12x6 | 29 |
| 24 | JIB-SIDE TIE ROD | 673x42x19 | 100 |
| 25 | TOP BISCUIT | 71x13x9 | 10 |
| 26 | INCLINING BISCUIT | 57x13x12 | 13 |
| 27 | INHIBITOR SWITCH BISCUIT | 132x30x18 | 25 |
| 28 | REAR ATTACHMENT TIE ROD BISCUIT | 130x40x37 | 14 |
| 29 | OPENING TRIANGLE | 93x53x19 | 81 |
| 30 | OPENING BEAM | 82x22x12 | 23 |
| 31 | TOP REAR TIE ROD | 1480x23x5,1 | 110 |
| 32 | INTERMEDIATE REAR TIE ROD | 260x22,9x5,1 | 20 |
| 33 | BOTTOM REAR TIE-ROD | 360x22,9x5,1 | 27 |
| 34 | TOWER HELP TIE-ROD | 281x12,2x3,2 | 2x5 |
| 35 | SELF-BALLAST TIE-ROD | 333x9,2x2,2 | 3 |
| 36 | SELFBALLAST DERRICK | 320x40x8 | 52 |
| 37 | ASSEMBLY CYLINDER | 280x48x23 | 460 |
| 38 | JIB CYLINDER | 148x20x18 | 112 |
| 39 | POINT-JIB CYLINDER | 119x14x7 | 23 |
| 40 | HOISTING WINCH | 38x37x145 | 285 |
| 41 | TROLLEY TRANSLATION WINCH | 34x34x80 | 130 |
| 42 | SLEWING WINCH | 23x23x97 | 150 |
| 43 | HYDRAULIC GEARBOX | 32x49x76 | 100 |
| 44 | ELECTRICAL EQUIPEMENT | 110x65x25 | 120 |



-STRUCTURE-

- o *BASE TROLLEY*: composed of a framework of metal plating, soldered, and balanced on 4 screw-mechanism stabilizers.
- o *ROTATING PLATFORM*: made of structural steel connected to the base by means of a bolted fifth wheel and carrying: the counter-ballast and the connecting rod attachment, to which the tower is levered.
- o *TOWER*: square in cross section and made of two single beams hinged together. Rotates with the rotating platform.
- o *JIB*: strutted and triangular in cross section. Made of square, solid drawn, and round tubes, fulcrumed to the apex of the tower.
- o *TROLLEY*: in structural steel and struts, travels on four wheels resting on the lower tracks of the jib.
- o *TIE RODS*: behind the tower in metal cable.

-EXTERNAL PROTECTION-

On the entirety of the structure, except the base trolley and certain parts of the trolley and the block there is undergone a galvanization by submersion. On the ungalvanized surfaces, a highly rust resistant paint is applied.

-HOISTING MECHANISM-

Composed of a principle block with two pulleys to which the hook is attached in a rotating manner by a step bearing . The running blocks are coloured in black and yellow diagonal stripes.

-HOOK SPECIFICS-

| | |
|-------------------|-----------|
| WEIGHT CAPACITY | 4 t. |
| TYPE | UNI 4395 |
| RELEASE MECHANISM | Installed |

-CHAIN SPECIFICS-

| | | |
|-----------------------------|------------------------------|----|
| TYPE AND DIMENSION | for ring diam. Ø 22 – 75x120 | mm |
| NUMBER OF CARRYING SECTIONS | 1 | |
| ULTIMATE TENSILE STRENGTH | 20100 | kg |
| ATTACHMENT TYPE | spinning shank | |

-CABLE TIE-ROD CHARACTERISTICS-***TOP REAR TIE-ROD Pos. 31 diagram, page 13***

| | |
|----------------------------------|---------------------------------|
| Material: | Steel R=196 daN/mm ² |
| Cable Diameter: | 38 mm. |
| External wire element diameters: | 0,71 mm. |
| Composition: | 324 (right wound) |
| Minimum UTS: | 142000 daN |
| Coating: | Galvanized |
| Length: | 14800 mm. |

INTERMEDIATE REAR TIE-ROD Pos. 32 diagram, page 13

| | |
|----------------------------------|---------------------------------|
| Material: | Steel R=196 daN/mm ² |
| Cable Diameter: | 38 mm. |
| External wire element diameters: | 0,71 mm. |
| Composition: | 324 (right wound) |
| Minimum UTS: | 142000 daN |
| Coating: | Galvanized |
| Length: | 2600 mm. |

BOTTOM REAR TIE-ROD Pos. 33 diagram, page 13

| | |
|----------------------------------|---------------------------------|
| Material: | Steel R=196 daN/mm ² |
| Cable Diameter: | 38 mm. |
| External wire element diameters: | 0,71 mm. |
| Composition: | 324 (right wound) |
| Minimum UTS: | 142000 daN |
| Coating: | Galvanized |
| Length: | 3600 mm. |

TOWER SUPPORTING TIE-ROD Pos. 34 diagram, page 13

| | |
|----------------------------------|---------------------------------|
| Material: | Steel R=196 daN/mm ² |
| Cable Diameter: | 18 mm. |
| External wire element diameters: | 1,10 mm. |
| Composition : | 171 (right wound) |
| Minimum UTS: | 29800 daN |
| Coating: | Galvanized |
| Length: | 2x2810 mm. |

SELF-BALLAST TIE-ROD Pos. 35 diagram, page 13

| | |
|----------------------------------|-----------------------------------|
| Material: | Steel R=216 daN/mm ² |
| Cable Diameter: | 13 mm. |
| External wire element diameters: | 0,79 mm. |
| Composition : | 253 unfraying stand (right wound) |
| Minimum UTS: | 15600 daN |
| Coating: | Galvanized |
| Length: | 3330 mm. |

-CABLE CHARACTERISTICS-***HOISTING WIRE ROPE installation chart page 17***

| | |
|------------------------------------|-------------------------------------|
| Material: | Steel R= 196 daN/mm ² |
| Cable diameter: | 10 mm. |
| External wire element diameters: | 0,64 mm. |
| Composition: | 133 unfraying strands (right wound) |
| Minimum UTS: | 7210 daN |
| Coating: | Galvanized |
| Length: | 145 m. |
| Device to prevent cable derailing: | flanges plus paracables |

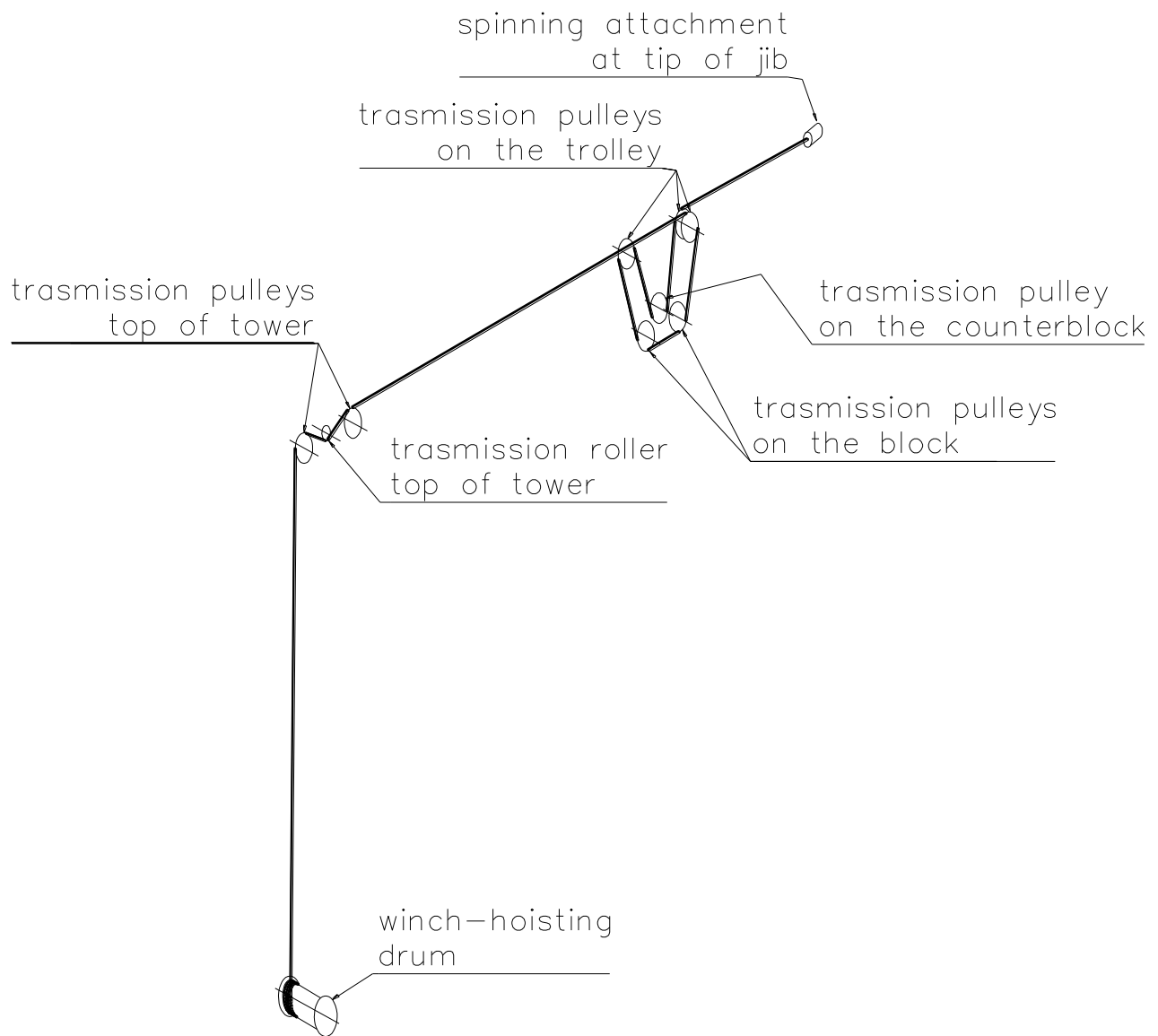
TROLLEY TRANSLATION WIRE ROPE installation chart page 18

| | |
|------------------------------------|---------------------------------|
| Material: | Steel R=196 daN/mm ² |
| Cable diameter: | 7 mm. |
| External wire element diameters: | 0,56 mm. |
| Composition: | 114 (right wound) |
| Minimum UTS: | 3350 daN |
| Coating: | Galvanized |
| Length: | 86+53 m. |
| Device to prevent cable derailing: | flanges plus paracables |

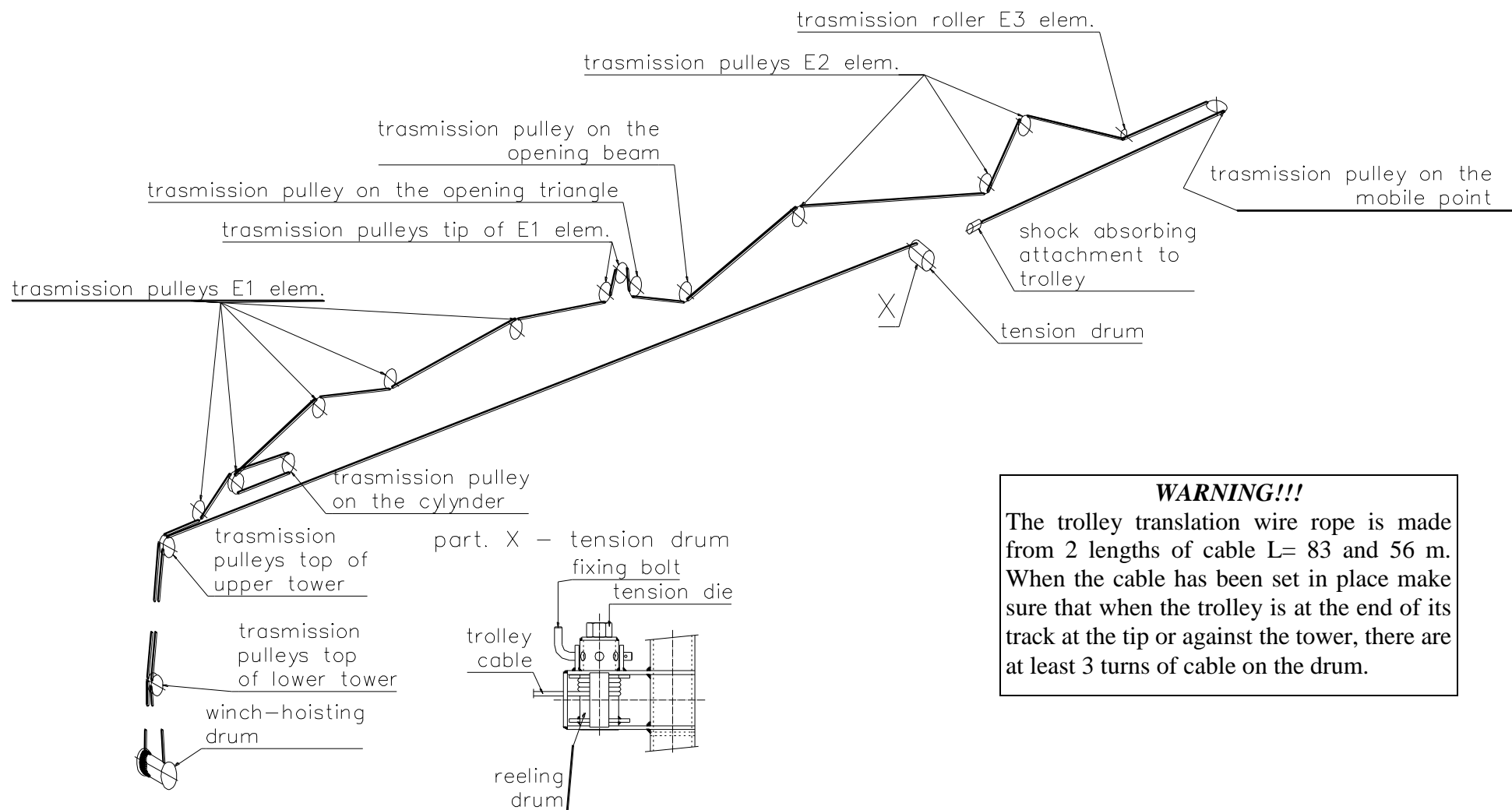
SELF LOADING BALLAST WIRE ROPE- installation chart page 19

| | |
|------------------------------------|-------------------------------------|
| Material: | Steel R= 196 daN/mm ² |
| Cable diameter: | 12 mm. |
| External wire element diameters: | 0,70 mm. |
| Composition: | 133 unfraying strands (right wound) |
| Minimum UTS: | 10400 daN |
| Coating: | Galvanized |
| Length: | 31 m. |
| Device to prevent cable derailing: | paracables |

HOISTING WIRE ROPE INSTALLATION DIAGRAM



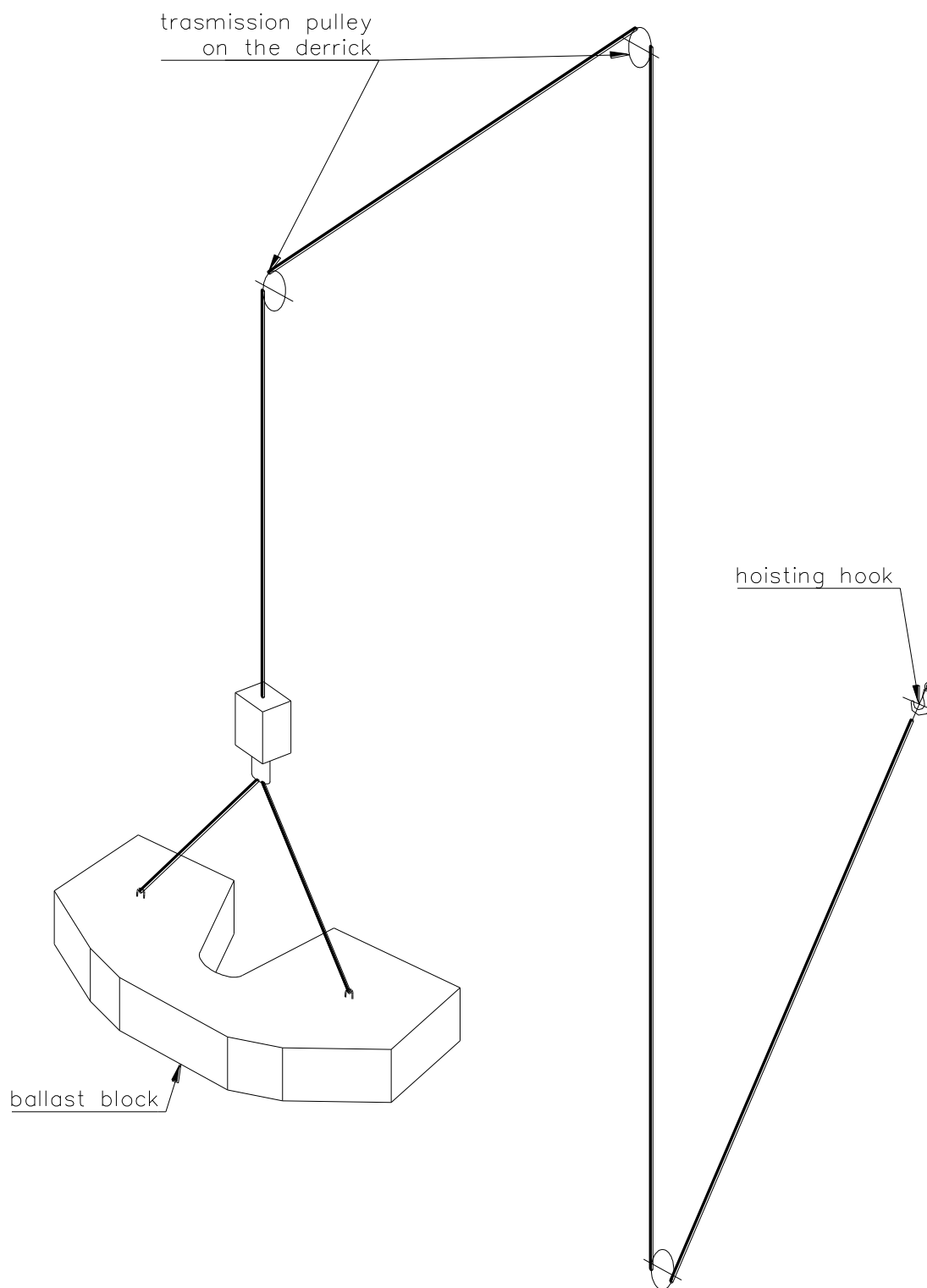
-TROLLEY TRANSLATION WIRE ROPE INSTALLATION DIAGRAM-



WARNING!!!

The trolley translation wire rope is made from 2 lengths of cable L= 83 and 56 m. When the cable has been set in place make sure that when the trolley is at the end of its track at the tip or against the tower, there are at least 3 turns of cable on the drum.

-SELF LOADING BALLAST ROPE INSTALLATION DIAGRAM-



WARNING!!

The selfloading of the counterballast blocks must be done while hoisting at a very slow speed.

-DEVICE CHARACTERISTICS-

HOISTING MECHANISM: located on the rotating platform

| | | |
|----------------|----------------------------------|----------------------------------------|
| MOTOR | Power RPM Braking torque | kW 2,2/8,8/10,3 rpm 1400 daNm 20 |
| REDUCTION GEAR | Parallel Axle Reduction ratio | R= 1/30 |
| DRUM | Ø primitive | cm 29 |
| BELT-PULLEY | Ø primitive | cm 23-24,5 |

| | | LOAD AND SPEED OF USAGE | |
|-------------|---------|-----------------------------------------------------------------------|---------------------------|
| PERFORMANCE | LIFT II | up to 1300 kg from 1300 kg to 2000 kg microunits up to 2000 kg | 48 rpm 24 rpm 6 rpm |
| | LIFT IV | up to 2600 kg. from 2600 kg to 4000 kg microunits up to 4000 kg | 24 rpm 12 rpm 3 rpm |

This device is classified as a 1Am/1Bm under DIN 15020.

This device is designed to raise and lower the hoisting mechanism. It consists of a reduction gearmotor with a brake controlled by INVERTER; a grooved drum upon which the service cable is wrapped; a series of different sized pulleys for the carrying of the cable.

Except for the hoisting mechanism (block), which is supplied with appropriate safety shields, the other moving parts are situated in inaccessible positions for which certain safety shields have been omitted.

On the hoisting mechanism the following have been installed:

- stop switch RAISE-LOWER of the load
- governor of MAXIMUM LOAD
- governor of SPEED IN FUNCTION OF THE LOAD TO BE RAISED please see chapter on "SAFETY DEVICES".

TROLLEY MOVEMENT

| | | |
|----------------|--------------------------------|------------------------------------|
| MOTOR | Power RPM Braking torque | kW 1,8/1,1 rpm 1400 daNm 3,5 |
| REDUCTION GEAR | Worm gear Reduction ratio | R= 1/35 |
| DRUM | Ø primitive | cm. 29,2 |
| BELT-PULLEY | Ø primitive | cm. 14 |

| | |
|-------------|-------------------------------------|
| | SPEED |
| PERFORMANCE | m/m' 30 (with progressive start-up) |

This device is classified as a class 1Bm under DIN 15020

This device is designed to move the hoisting mechanism (trolley) horizontally. It consists of a reduction gearmotor with a brake controlled by inverter; a grooved drum upon which the service cable is wrapped; a series of pulleys for the carrying of the cable.

Being on the jib and in a position that is inaccessible during crane use, certain shields are omitted.

On the device are installed 3 stop switches “FAR END-NEAR END”. Please see the chapter on “SAFETY DEVICES”.

Six stop mechanisms are also installed which are built of metal brackets and rubber pads.

ROTATION: located on the rotating platform

| | | |
|----------------|------------------------------------|----------|
| MOTOR | Power | kW 2,5 |
| | RPM | rpm 1400 |
| | Braking torque | daNm 1,6 |
| REDUCTION GEAR | epicycloidal gears reduction ratio | R= 1/150 |

| | |
|-------------|------------------------------------------|
| | SPEED |
| PERFORMANCE | rpm 0,2-0,95 (with progressive start-up) |

This device is designed to allow the angular movement of the hoisting mechanism in an arc of 360 degrees. The device consists of a ratiomotor with a controlled brake electronically, of a reducer complete with pinions and of a ball bearing fifth wheel.

There are approved shields on the toothed pinion which gears with the fifth wheel.

There is a stop switch “ROTATION” installed on the device. Please see the chapter on “SAFETY DEVICES”.

WARNING!!!

When the crane is not in service, the rotation must be released by turning clockwise the handle on the top of the brake thus freeing the platform to turn into the direction of the wind. Please see the chapter on “BRAKES”.

CRANE TRANSLATION: housed under the fixed carriage's side beams.

N.B! The track crane translation devices are supplied on specific request only, therefore these mechanism are not part of the standard crane.

| | | |
|----------------|-------------------------------------------------|-------------------------------------------|
| MOTORS | Power Rpm Braking torque | n°2x 1,1 daNm rpm 700 n°2x 1,1 daNm |
| REDUCTION GEAR | Spur gears, belts and pulley reduction ratio | R= 1/14,5 |
| WHEELS | diameter | n°8x 200 mm |

| | |
|-------------|----------|
| | SPEED |
| PERFORMANCE | 30 m/min |

The mechanism consist of 4 two-wheel carriages carrying 2 electric motors with brake set out diagonally which, by means of belts and pulleys, integrate the motor motion with that of the wheeled carriages thereby allowing the horizontal motion of the whole apparatus.

-The devices are equipped with safety guards in conformity with current standards.

-Also fitted are 2 “BACK/FORWARD” limit switches, see the “SAFETY DEVICES” chapter, and 4 damping stops placed at the end of each rail.

-ASSEMBLY OF THE CRANE- items:

the hydraulic pump on the rotating platform;
the hydraulic cylinder between the two tower elements;
three hydraulic cylinders on the jib

| | | |
|-------------------------------------------------|-------------------------------|------------------------------------------|
| MOTOR | Power RPM | kW 3 RPM 1410 |
| PUMP | Throughput RPM | litres/min 7 a 1500 rpm RPM 3000 max. |
| CYLINDER TOWER | Liner Ø i Stem Ø Stroke | mm 200 mm 110 mm 2220 |
| CYLINDER JIB | Liner Ø i Stem Ø Stroke | mm 160 mm 60 mm 1040 |
| CYLINDER POINT JIB | Liner Ø i Stem Ø Stroke | mm 60 mm 35 mm 870 |
| CYLINDER TENSION WIRE ROPE | Liner Ø i Stem Ø Stroke | mm 80 mm 30 mm 700 |
| SUPPLY HOSES OIL CYLINDER TOWER | Type Length | 5/16" n° 1 binate mm 12700 |
| SUPPLY HOSES OIL CYLINDER JIB | Type Length | 5/16" n° 1 binate mm 23800+9900 |
| SUPPLY HOSES OIL CYLINDER POINT JIB | Type Length | 1/4" n° 1 binate mm 15400 |
| SUPPLY HOSES OIL CYLINDER TENSION WIRE CABLE | Type Length | 5/16" n° 1 binate mm 23800+2000 |

This device is designed to raise the tower and unfold the jib by the pumping of its cylinders. The device is composed of: a main hydraulic pump composed of an electric motor, a pump and electrovalves for the control of the movements; three hydraulic cylinders, one between the towers and the others on the jib.

-FIFTH WHEEL-

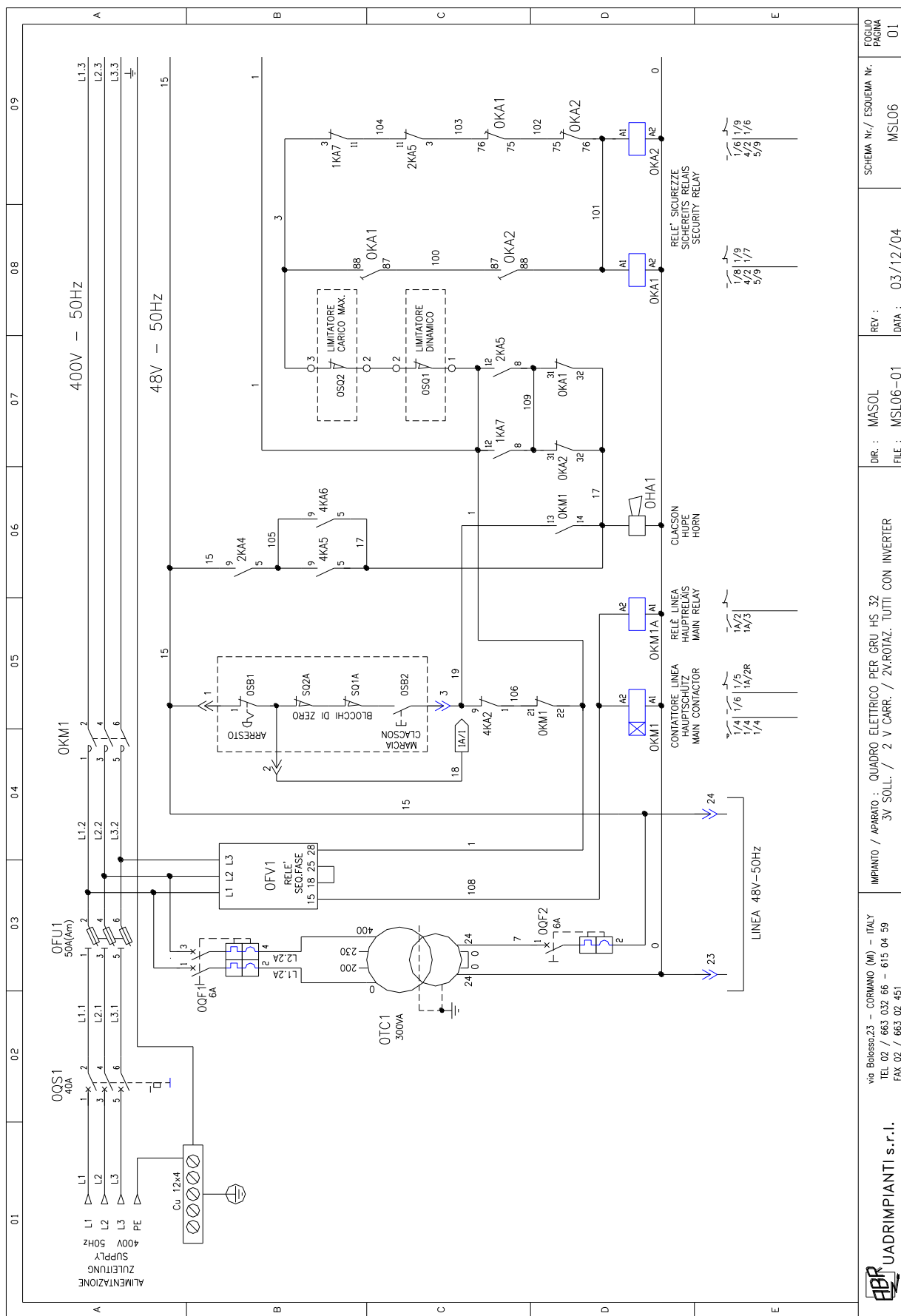
Type: **“TORRIANI” mod. 1200.2.25.00.D1** or equivalent

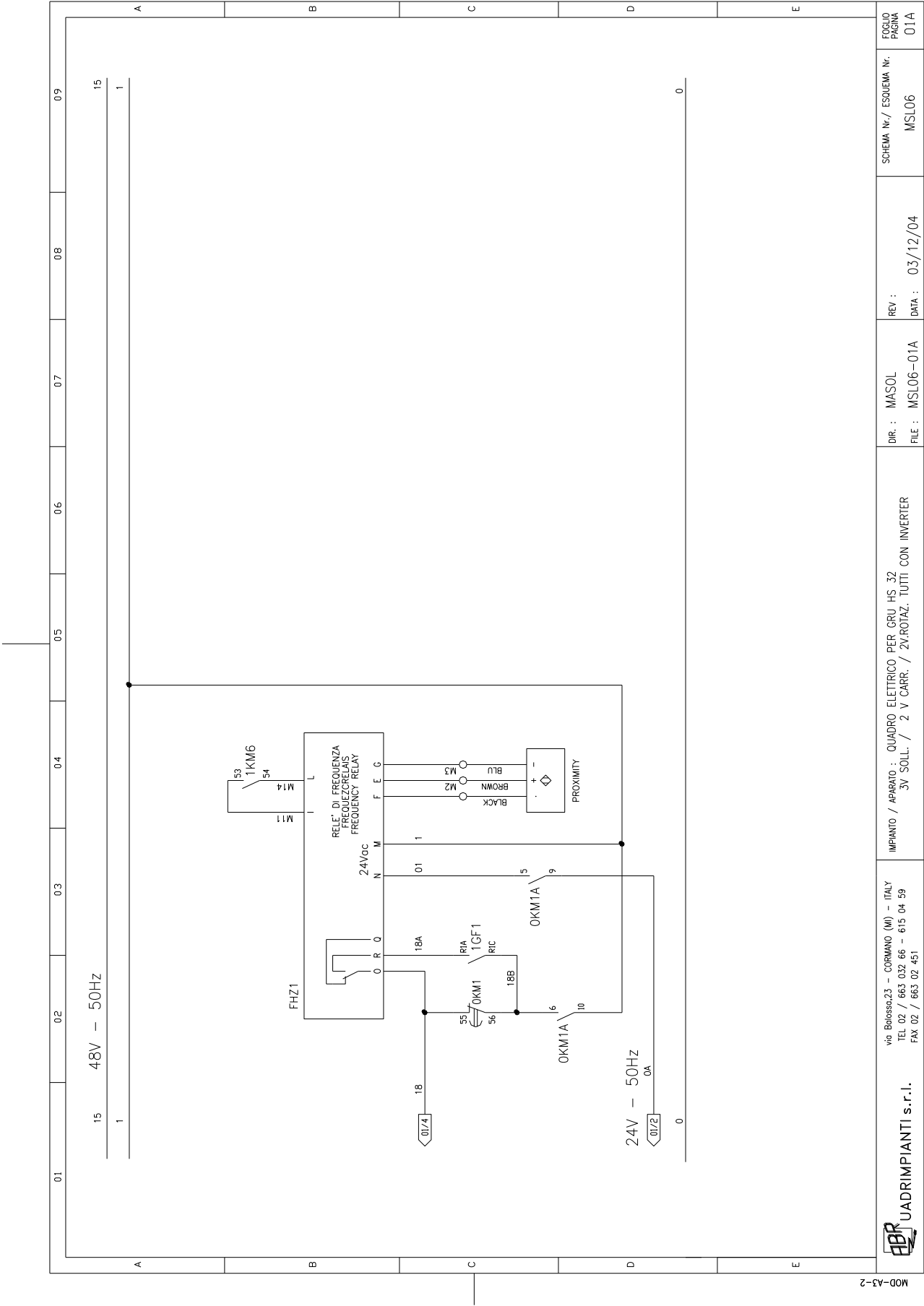
Dimensions: external diameter 1200 mm modul 8 -Z = 148;

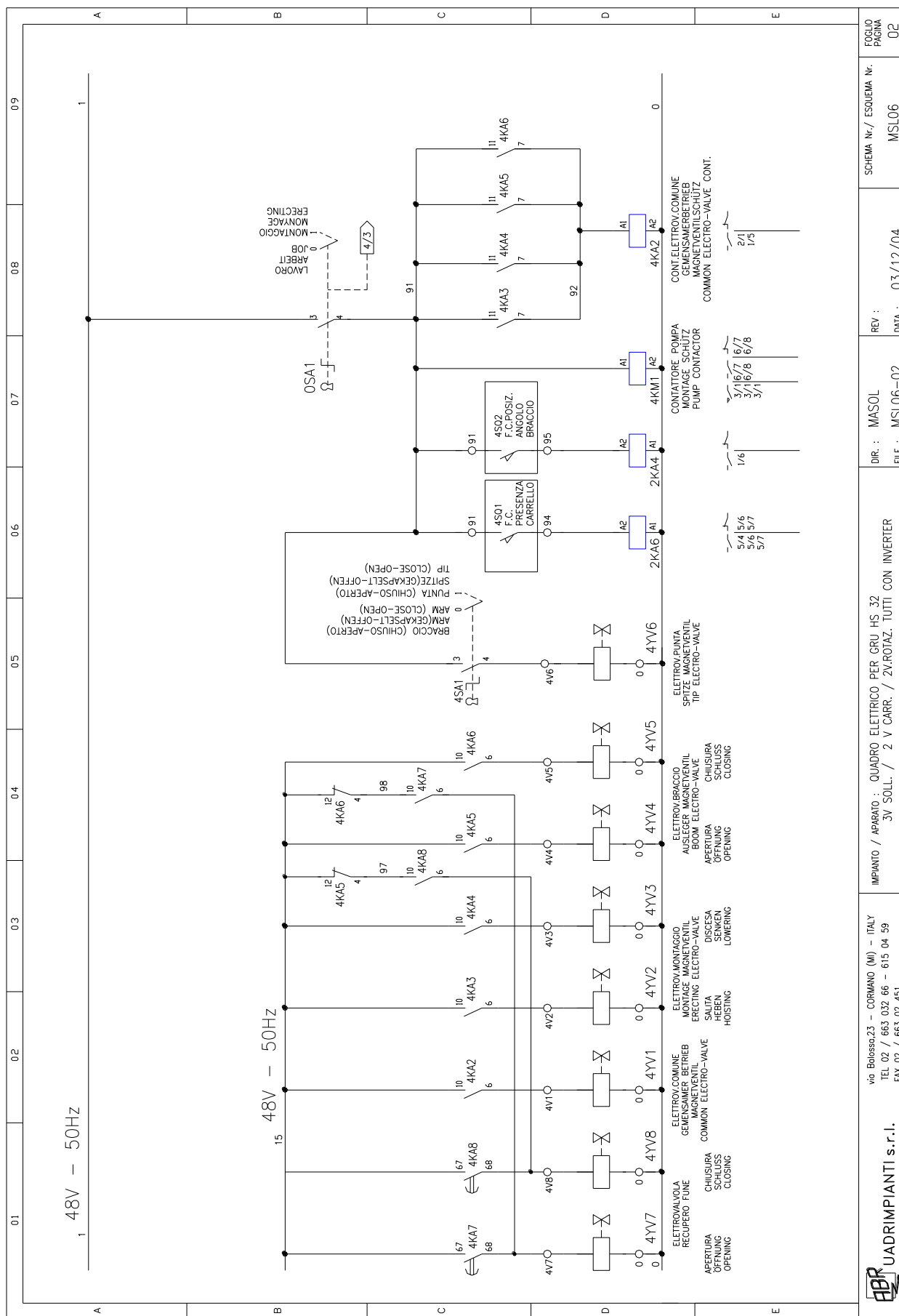
Pinch bolts of 10K quality with a tightening torque equal to 36 daNm.

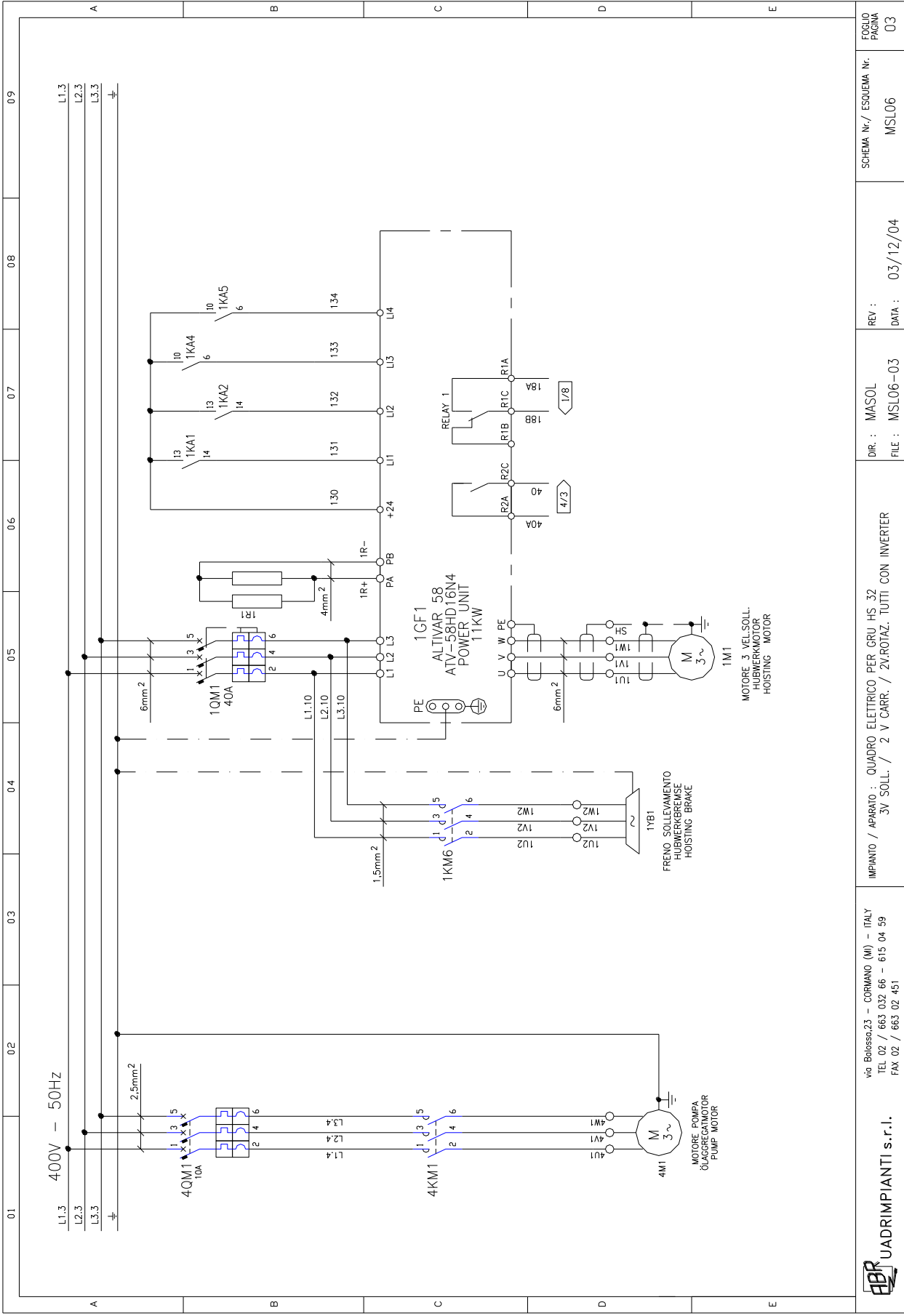
| | | | | | | | | | | | | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|----|----|----|----|----|----|---|---------------------------------|---|--------------------------|---|-----------------------------------|--|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | A | B | C | D | E | | |
| <div>3V SOLLEVAMENTO CON INVERTER</div> <div>2V CARRELLO CON INVERTER</div> <div>2V ROTAZIONE CON INVERTER</div> <div>CLIENTE : MA.SOL.</div> <div>DATA : 03/12/04</div> <div>SCHEMA Nr : MSL06</div> <div>SCHEMA ELETTRICO : pag. 01÷07</div> <div>MORSETTIERA : pag. 08</div> <div>TOPOGRAFICO : pag. 09</div> <div>PULSANTIERA : pag. 10</div> <div>LISTA MATERIALI : pag. 11÷12</div> | | | | | | | | | | Foglio PAGINA 00 | | | | | |
| IMPIANTO / APPARATO : QUADRO ELETTRICO PER GRU TIPO H.S.32 3V SOLL. / 2 V CARR. / 2V ROTAZ. TUTTI CON INVERTER | | | | | | | | | | DIR. : MASOL FILE : MSL06-00 | | REV : DATA : 03/12/04 | | SCHEMA Nr. / ESQUEMA Nr. MSL06 | |
| via Boissac,23 - CORMANO (MI) - ITALY TEL 02 / 663 032 66 - 615 04 59 FAX 02 / 663 02 451 | | | | | | | | | | UADRIMPIANTI s.r.l. | | | | | |

MOD-A3-2









MOD-A3-2



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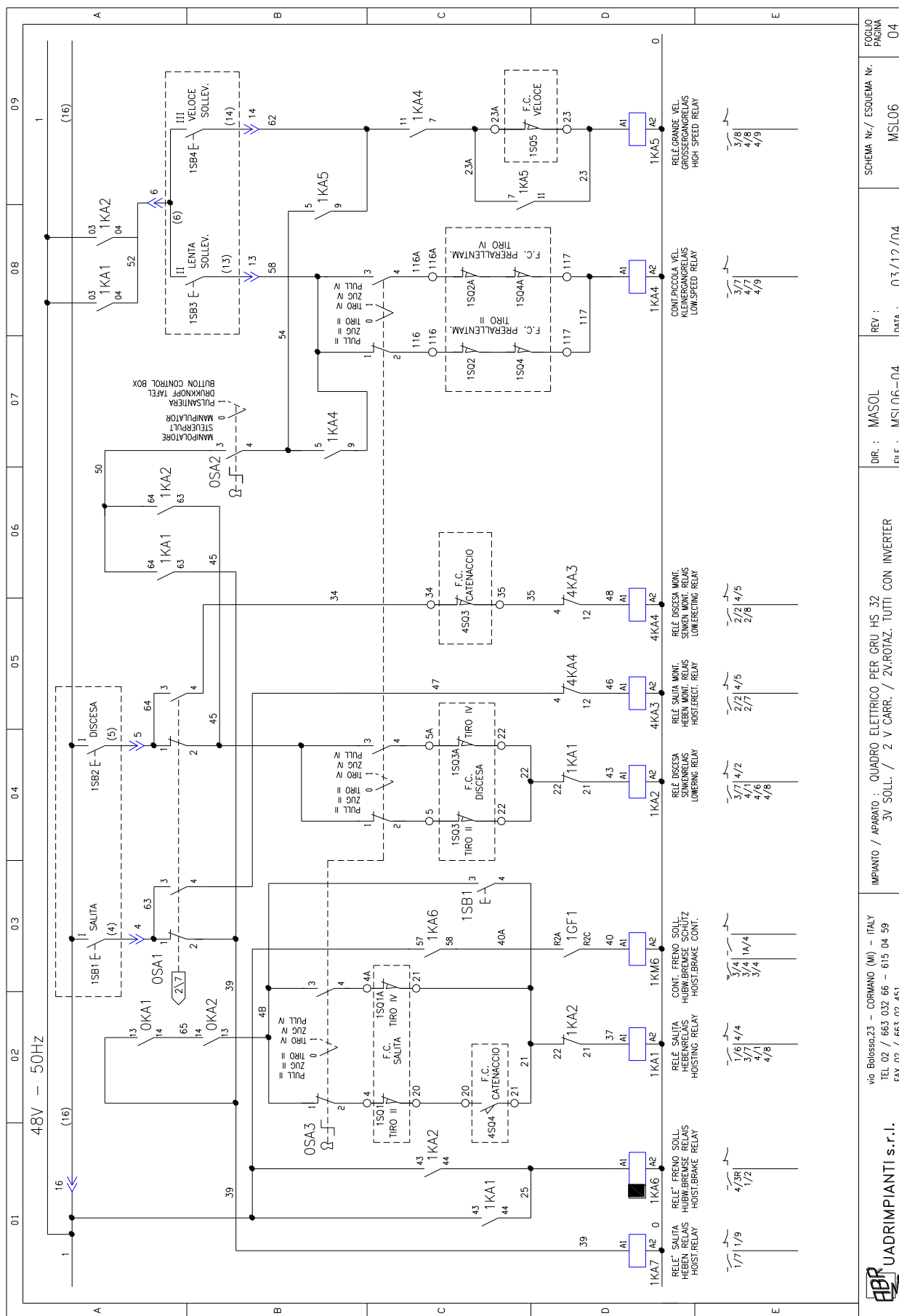
IMPIANTO / APPARATO : QUADRO ELETTRICO PER GRU HS 32
3V SOLL. / 2 V CARR. / 2V.ROT. TUTTI CON INVERTER

DIR. : MASOL
FILE : MSL06-03

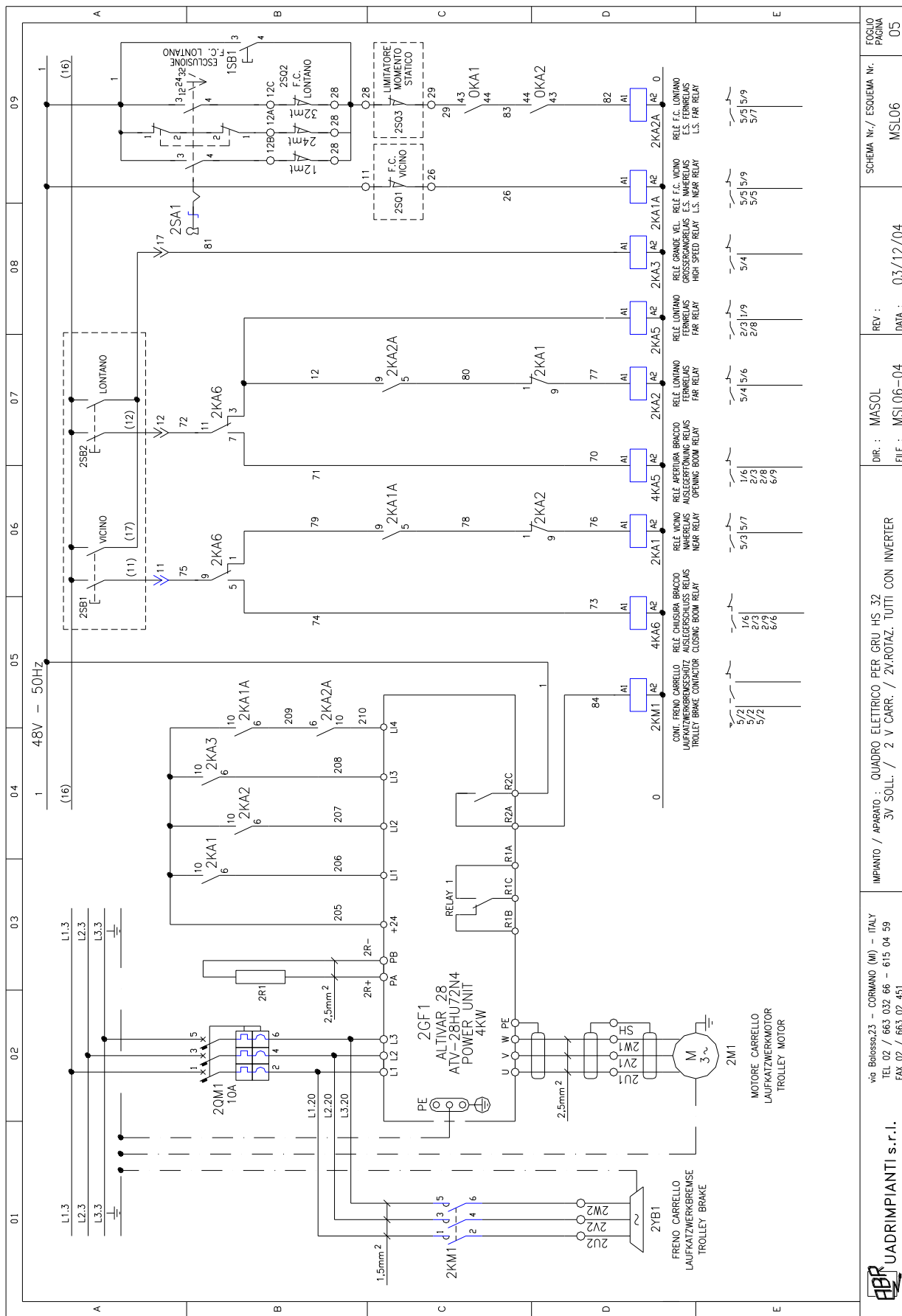
REV. :
DATA : 03/12/04

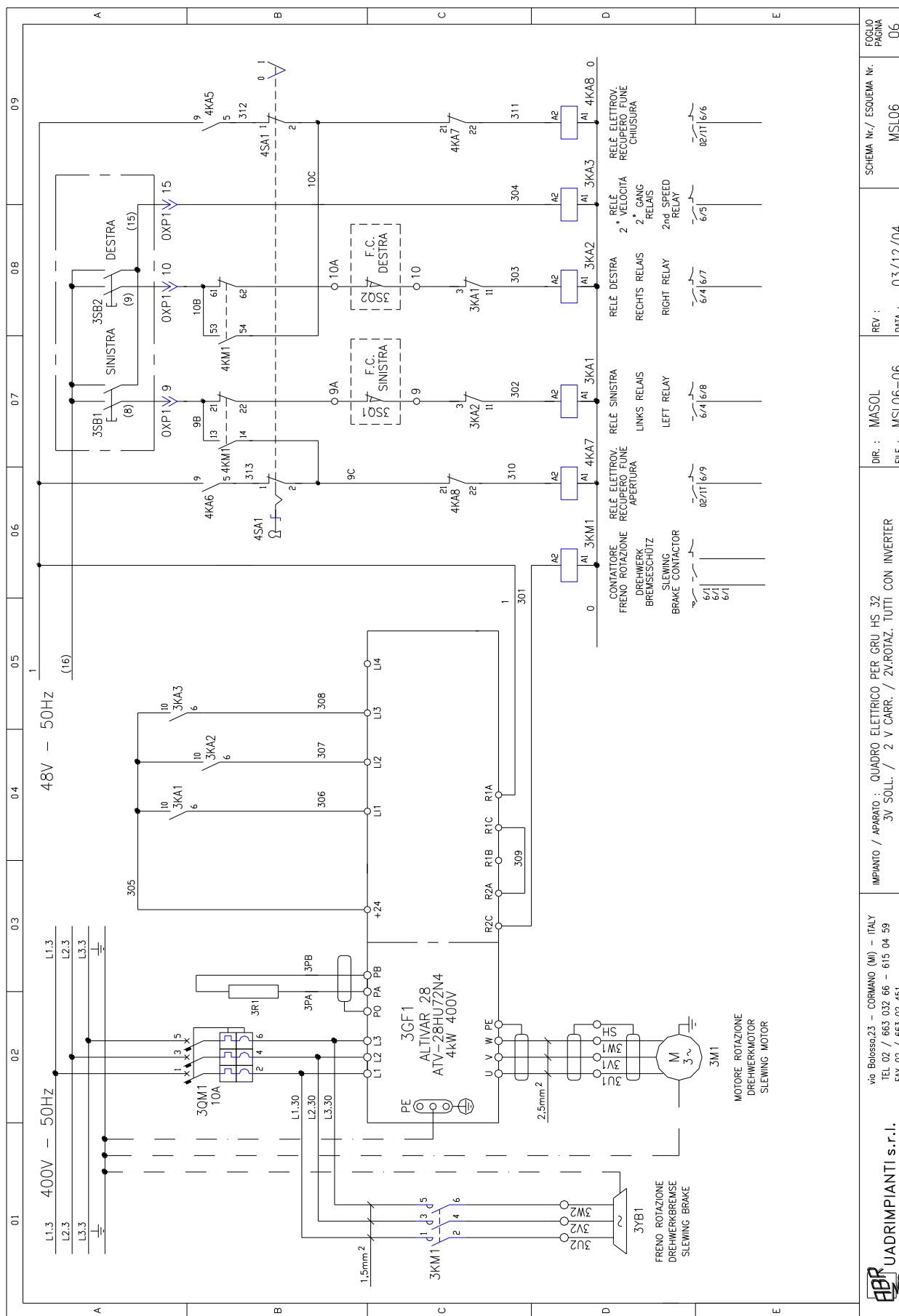
SCHEMA Nr./ ESQUEMA Nr.
MSL06



FOLIO
PAGINA
03



MOD-A3-2



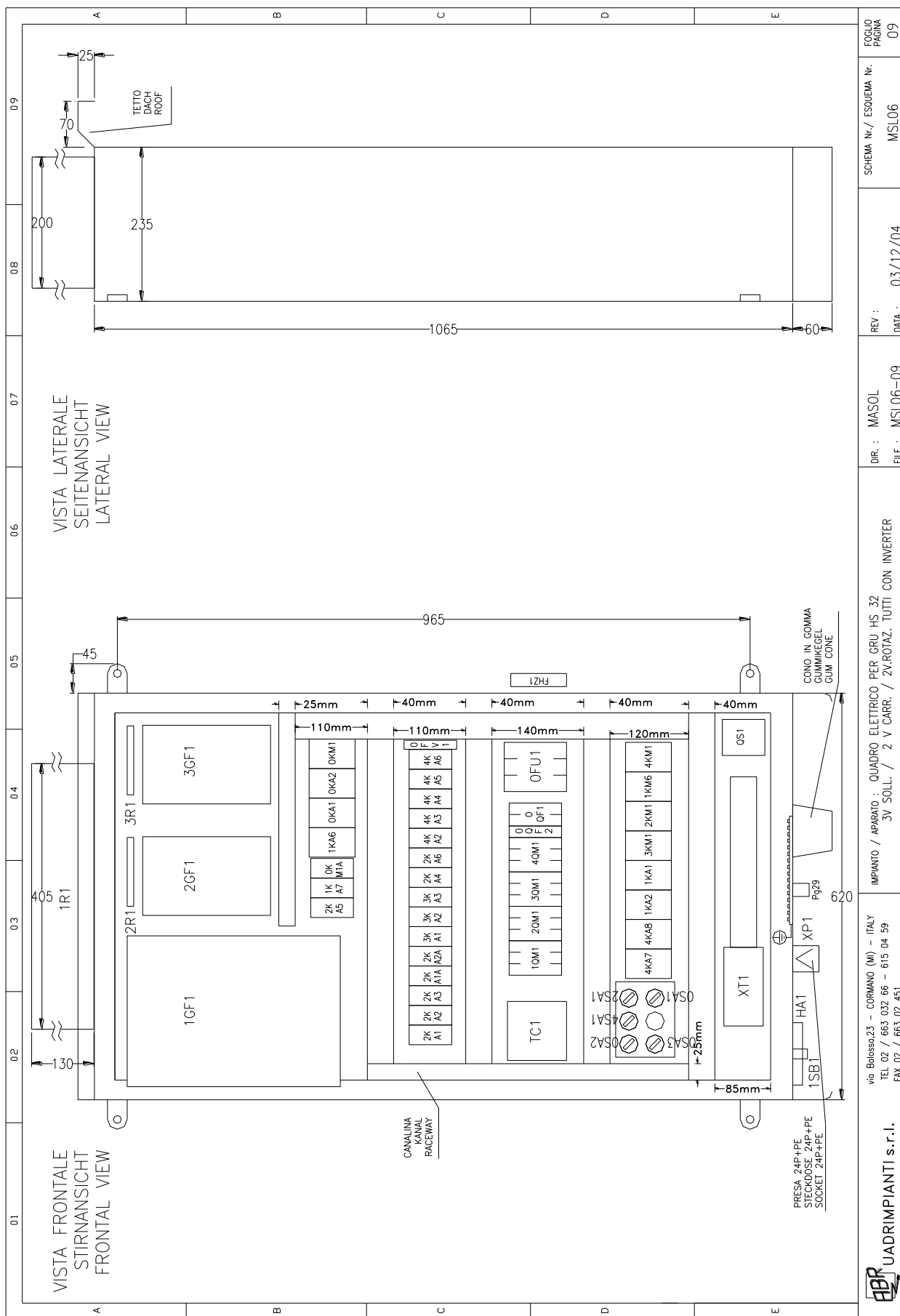


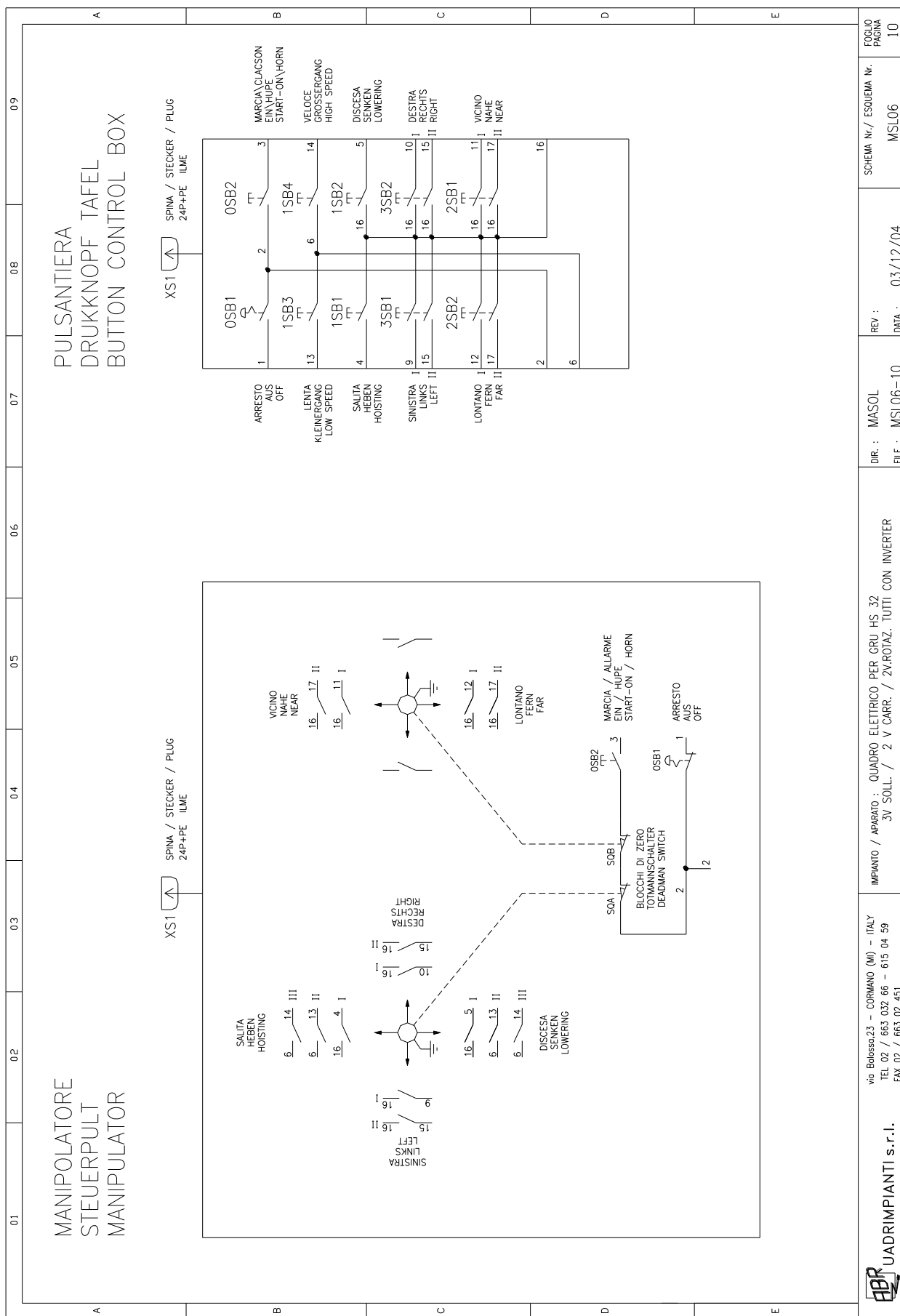
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|--|--|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|--|--|---|---|---|---|---|--------------|-------------------------|-------|--------|--------|--------|----------------------|---------------------------------------|---------------------------------|---------------------|---------------------|---------------------------------------------------------------------------------------|
| 01 | | | | | | | | | | 02 | | | | | | | | | | 03 | | | | | | | | | | 04 | | | | | | | | | | 05 | | | | | | | | | | 06 | | | | | | | | | | 07 | | | | | | | | | | 08 | | | | | | | | | | 09 | | | | | | | | | | A | B | C | D | E | FOLIO PAGINA | SCHEMA Nr./ ESQUEMA Nr. | REV : | DATA : | DIR. : | FILE : | IMPianto / APARATO : | vía Bolosso,23 - CORMANO (MI) - ITALY | TEL 02 / 663 032 66 - 615 04 59 | FAX 02 / 663 02 451 | UADRIMPIANTI s.r.l. |  |
| 01 | | | | | | | | | | 02 | | | | | | | | | | 03 | | | | | | | | | | 04 | | | | | | | | | | 05 | | | | | | | | | | 06 | | | | | | | | | | 07 | | | | | | | | | | 08 | | | | | | | | | | 09 | | | | | | | | | | A | B | C | D | E | FOLIO PAGINA | SCHEMA Nr./ ESQUEMA Nr. | REV : | DATA : | DIR. : | FILE : | IMPianto / APARATO : | vía Bolosso,23 - CORMANO (MI) - ITALY | TEL 02 / 663 032 66 - 615 04 59 | FAX 02 / 663 02 451 | UADRIMPIANTI s.r.l. |  |

PAGINA PER TRASLAZIONE

MOD-A3-2







| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 |
|--------------------------------|---------------|------------------|-------------------------------------------------------|----|----|--------------------------------------------|-----------|----|
| DESCRIZIONE | FORNITORE | MODELLO | CARATTERISTICHE | | | RIFERIMENTO | COD. MAG. | QT |
| INTERRUTTORE GENERALE | BRETER | LA 3-40-1753 | 3 POLI 40A | | | OSI | | 1 |
| FINITURA CON BLOCCO-PORTA | BRETER | LFS 2-L-6-1753 | 2 POSIZIONI "0-1" GIALLO-ROSSA | | | OSI | | 1 |
| INTERRUTT. AUTOMATICO MODULARE | SCHNEIDER | C60N 24239 | 6A 1 POLO CURVA "C" 10kA | | | 00F2 | | 1 |
| INTERRUTT. AUTOMATICO MODULARE | SCHNEIDER | C60N 24267 | 6A 2 POLI CURVA "C" 10kA | | | 00F1 | | 1 |
| INTERRUTT. AUTOMATICO MODULARE | SCHNEIDER | C60N 24282 | 10A 3 POLI CURVA "C" 10kA | | | 20M1-30M1-40M1 | | 3 |
| INTERRUTT. AUTOMATICO MODULARE | SCHNEIDER | C60H 24938 | 40A 3 POLI CURVA "D" 15kA | | | 10M1 | | 1 |
| PORTAFUSIBILE SEZIONABILE | SCHNEIDER | SBI 15711 | 3 POLI PER FUSIBILI 14x51 | | | 0FU1 | | 1 |
| FUSIBILI CILINDRICO | FERRAZ | 17551 | 50AaM 14x51 RITARDATI | | | 0FU1 | | 3 |
| CONTATTORE DI POTENZA | SCHNEIDER | LC1 D12E7 | 3 POLI 12A 5,5kW 48VAC | | | 4KM1 | | 1 |
| CONTATTORE DI POTENZA | SCHNEIDER | LC1 D09E7 | 3 POLI 9A 4kW 48VAC | | | 1KM6-2KM1-3KM1 | | 3 |
| CONTATTORE DI POTENZA | SCHNEIDER | LC1 D32E7 | 3 POLI 40A 15kW 48VAC | | | 0KM1 | | 1 |
| CONTATTORE AUSILIARI | SCHNEIDER | CAD 32E7 | 3 NO + 2 NC 10A 48VAC | | | 1KA6-0KA1-0KA2-1KA2-1KA1-4KA7-4KA8 | | 7 |
| CONTATTI AUSILIARI | SCHNEIDER | LADN11 | 1 NO + 1 NC 10A | | | 1KM6-1KA1-1KA2-4KM1 | | 4 |
| CONTATTI AUSILIARI | SCHNEIDER | LAD022 | 2 NO + 2 NC 10A | | | 0KA1-0KA2 | | 2 |
| CONTATTI TEMPORIZZATI | SCHNEIDER | LAD00 | 1 NO + 1 NC 10A RITARDATI DISECCITAZIONE 0,1-3s | | | 1KA6 | | 1 |
| CONTATTI TEMPORIZZATI | SCHNEIDER | LADT0 | 1 NO + 1 NC 10A RITARDATI ECCITAZIONE 0,1-3s | | | 0KM1-4KA7-4KA8 | | 2 |
| RELÈ AD INNESCO | FINDER | 55.34.8.048.0040 | 4 CONTATTI DI SCAMBIO 5A 48VAC | | | 2KA5-1KA7-0KM1A-2KA1-2KA2-2KA6-2KA1A-2KA2A | | 8 |
| RELÈ AD INNESCO | FINDER | 55.34.8.048.0040 | 4 CONTATTI DI SCAMBIO 5A 48VAC | | | 3KA1-3KA2-3KA3-2KA4-4KA2-4KA3-4KA4 | | 8 |
| RELÈ AD INNESCO | FINDER | 55.34.8.048.0040 | 4 CONTATTI DI SCAMBIO 5A 48VAC | | | 1KA5-1KA4-4KA5-4KA6 | | 4 |
| RELÈ AD INNESCO | FINDER | 94.84.30 | 14 CONTATTI 12A 300VAC | | | 2KA5-1KA7-0KM1A-2KA1-2KA2-2KA6-2KA1A-2KA2A | | 8 |
| RELÈ AD INNESCO | FINDER | 94.84.30 | 14 CONTATTI 12A 300VAC | | | 3KA1-3KA2-3KA3-2KA4-4KA2-4KA3-4KA4 | | 8 |
| RELÈ AD INNESCO | FINDER | 94.84.30 | 14 CONTATTI 12A 300VAC | | | 1KA5-1KA4-4KA5-4KA6 | | 4 |
| RELÈ CONTROLLO FASE | SCHNEIDER | RM4TG20 | SEQUENZA E MANCANZA FASE 3 FASE 400v | | | 0FV1 | | 1 |
| RELÈ CONTROLLO FREQUENZA | FRANCESCHI M. | FM532 | U _{in} =18÷28Vac duty cycle 50% reg.0,5-5Vdc | | | FHZ1 | | 1 |



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UADRIMPIANTI s.r.l.

IMPIANTO / APPARATO : QUADRO ELETTRICO PER GRU HS 32
 3V SOLL. / 2 V CARR. / 2V.ROT. TUTTI CON INVERTER

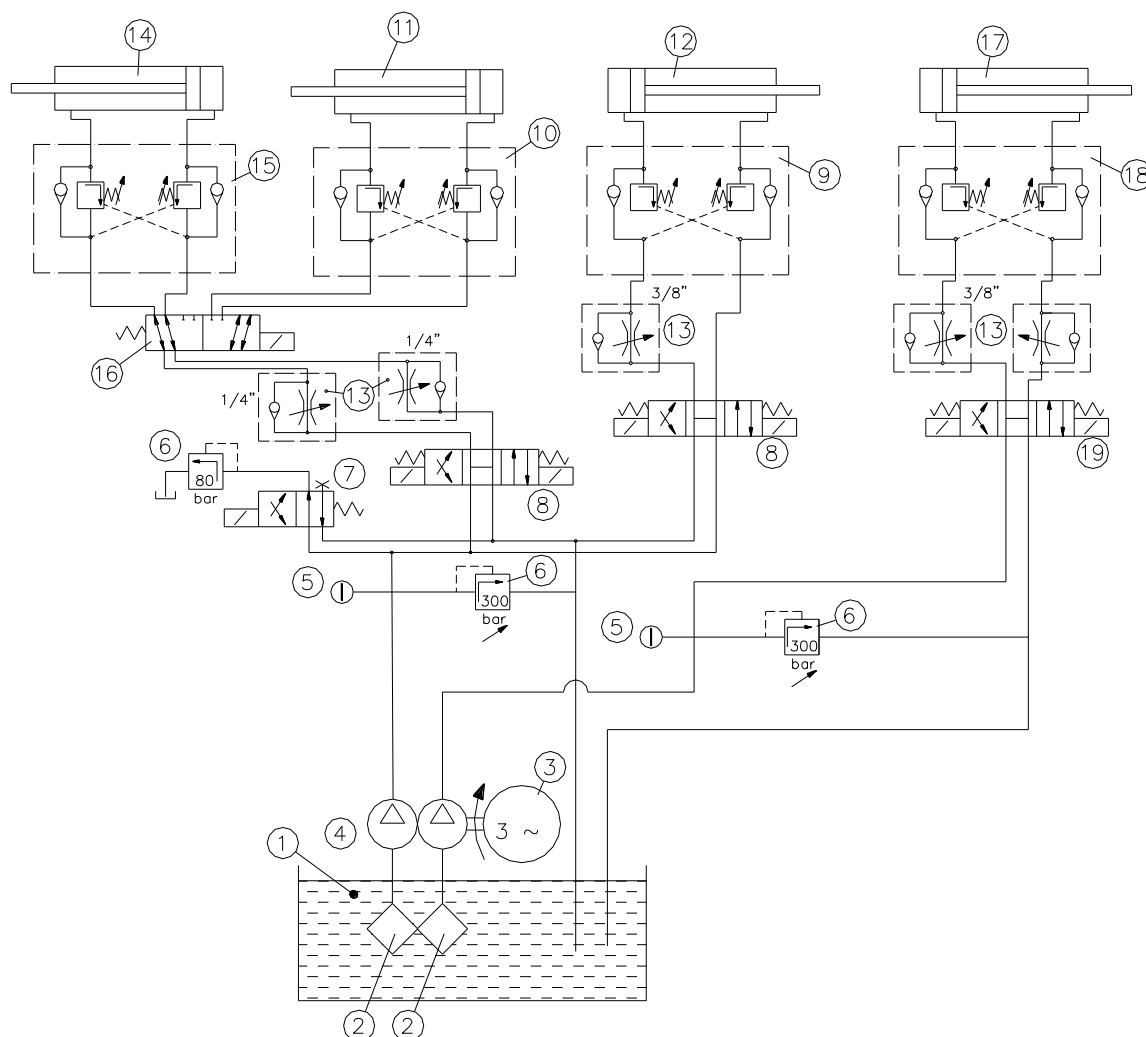
DIR. : MASOL
 FILE : MSL06-11

SCHEMA Nr./ ESQUEMA Nr.
 MSL06

FOGLIO
 PAGINA
 11

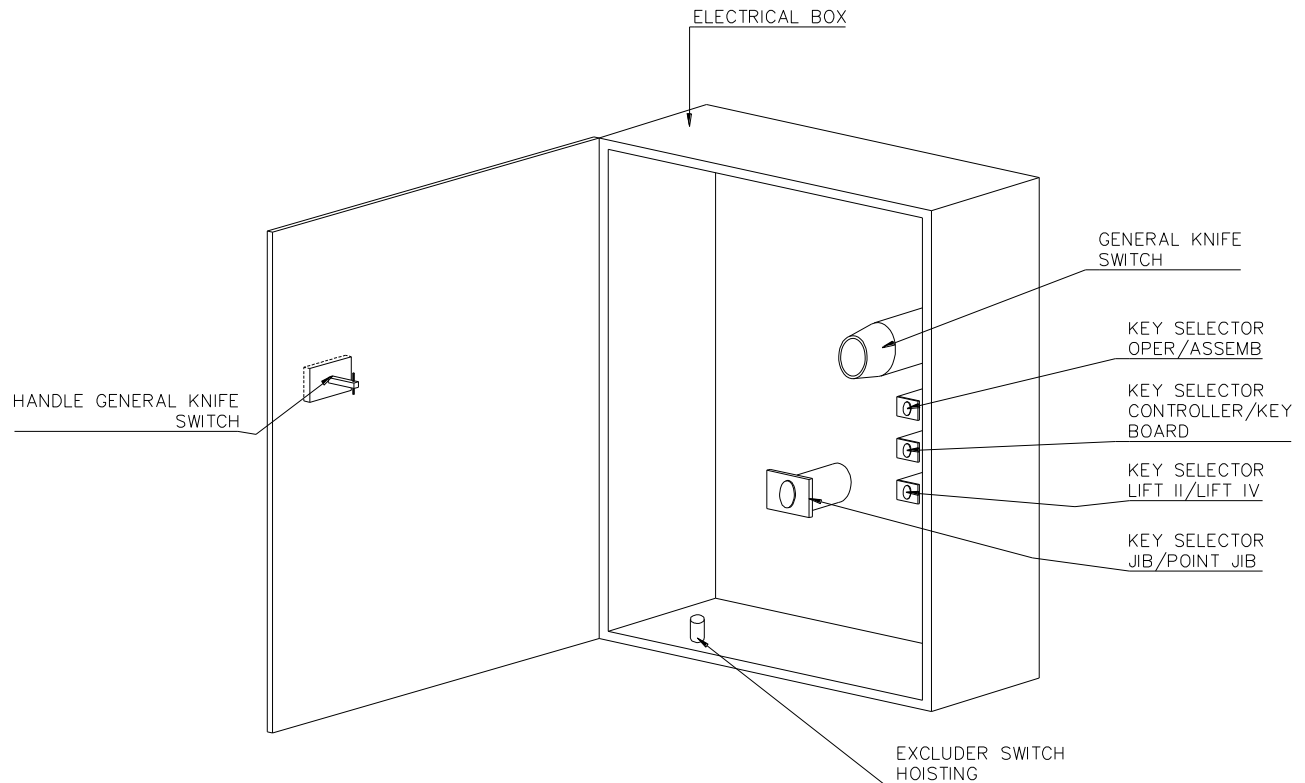
MOD-A3-2

MOD-A3-2

-HYDRAULICS SYSTEM CHART-

| Pos. | DENOMINAZIONE | MODELLO |
|------|------------------------------------------|------------------------|
| 1. | Serbatoio | SCH 60 _ LT. 60 |
| 2. | Filtro | MPA 25/60 |
| 3. | Motore elettrico | HP4-Kw 3-4 poli-pos.B5 |
| 4. | Pompa volumetrica multipla ad ingranaggi | 7 lt./min. a 1500 giri |
| 5. | Manometro radiale ϕ 63 | scala 0-400 bar |
| 6. | Valvola limitatrice di pressione | VHP 20/350 |
| 7. | Elettrovalvola | DHI 0630 _ 24/50 |
| 8. | Elettrovalvola | DHI 0713 _ 24/50 |
| 9. | Valvola di bilanciamento | OWC 3/8 |
| 10. | Valvola di bilanciamento | OWC 1/4 |
| 11. | Cilindro apertura punta braccio | |
| 12. | Cilindro principale montaggio | |
| 13. | Strozzatore unidirezionale | 3/8"-1/4" |
| 14. | Cilindro apertura braccio | |
| 15. | Valvola di bilanciamento | OWC 1/4 |
| 16. | Valvola deviatrice di flusso | ADL 06/6 |
| 17. | Cilindro tensione fune | |
| 18. | Valvola di bilanciamento | |
| 19. | Elettrovalvola | |

-CONTROL DEVICES-



TECHNICAL DESCRIPTION

GENERAL KNIFE SWITCH: 3 pole switch, complete with external handle in highly resistant thermoplastic material with international indelible symbols and indications.

OPERATING/ASSEMBLY KEY SELECTOR: 2 position (normal mode) selector.

Operating temperature: from -25 C to +70 C

Protective coating: IP66

JIB/POINT JIB KEY SELECTOR: 2 position (normal mode) selector.

Operating temperature: from -25 C to +70 C

Protective coating: IP66

LIFT II/LIFT IV KEY SELECTOR: 2 position (normal mode) selector.

Operating temperature: from -25 C to +70 C

Protective coating: IP66

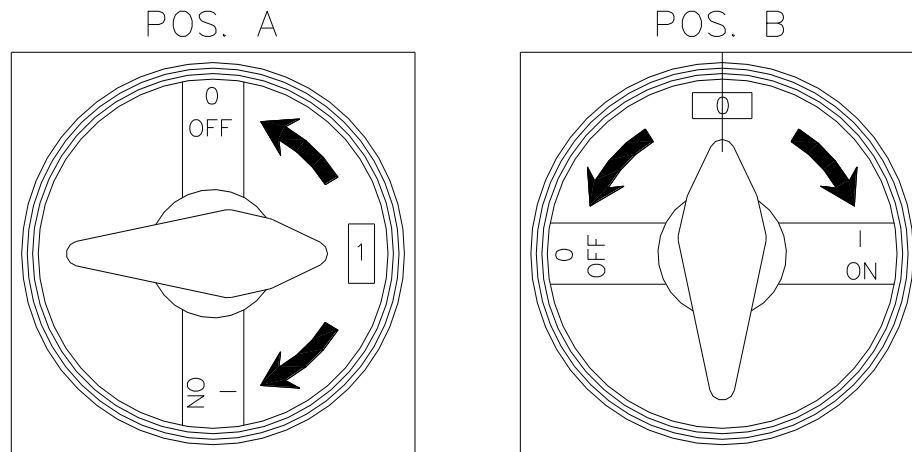
MANIPULATOR/PUSH BUTTON KEY SELECTOR: 2 position (normal mode) selector.

Operating temperature: from -25 C to +70 C

Protective coating: IP66

-OPERATION-

GENERAL KNIFE SWITCH

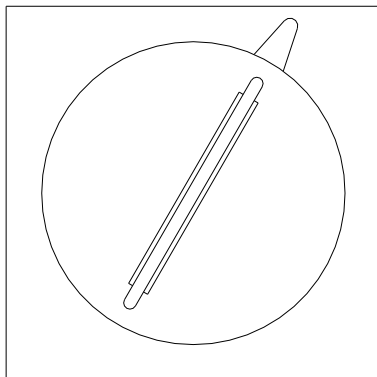


CONTROL HANDLE: Closing the door of the electrical cupboard with the control handle in position B as the diagram on the left turn the handle in position A. In this way, you trigger a pin and close the contacts of the switch and thus close the electrical circuit and give current to the workings of the control box.

The handle will also inhibit the opening of the box while the controls are live.

To cut off current to the electrical control box, all you need do is turn the handle to position B.

OPER. ASSEMBLY

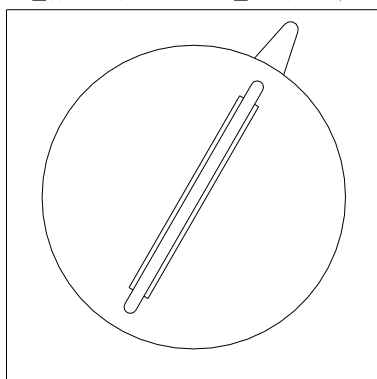


OPERATING-ASSEMBLY SELECTOR

This selector has the job of restoring and cutting off power to the **HOISTING-TROLLEY MOVEMENT** and **HYDRAULIC COMPRESSOR**: actually, with the selector positioned towards “ASSEMBLY” current is restored to the motor controls and to the **HYDRAULIC COMPRESSOR** and current is taken away from the motor controls of **HOISTING** and **TROLLEY MOVEMENT**.

And vice-versa with the selector positioned to “OPER.”, it takes current away from the “HYDRAULICS COMPRESSOR” and restores power to the motor controls of **HOISTING** and **TROLLEY MOVEMENT**.

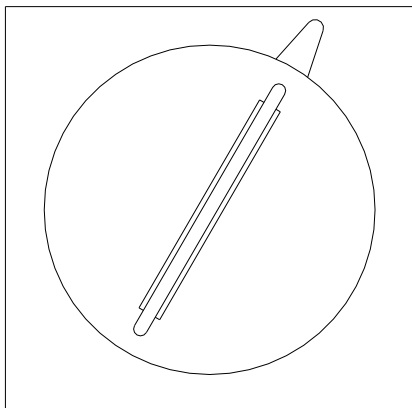
LIFT II LIFT IV



SELECTOR LIFT II° - LIFT IV°

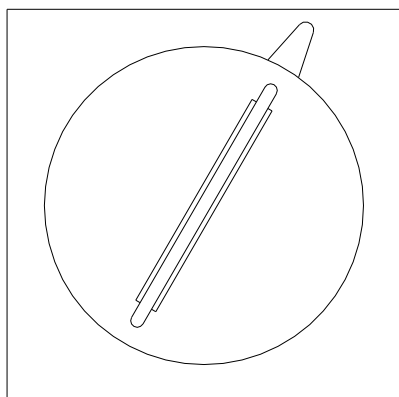
Its function is to automatically activate the lift limit switches in the lift II° (main block only) or with lift IV° (with main as well as secondary block) configurations.

KEY CONTR.

**KEYBOARD/CONTROLLER SELECTOR**

The apparatus can be controlled by keyboard or controller; this selector automatically switches from one system to the other without having to change the connections manually.

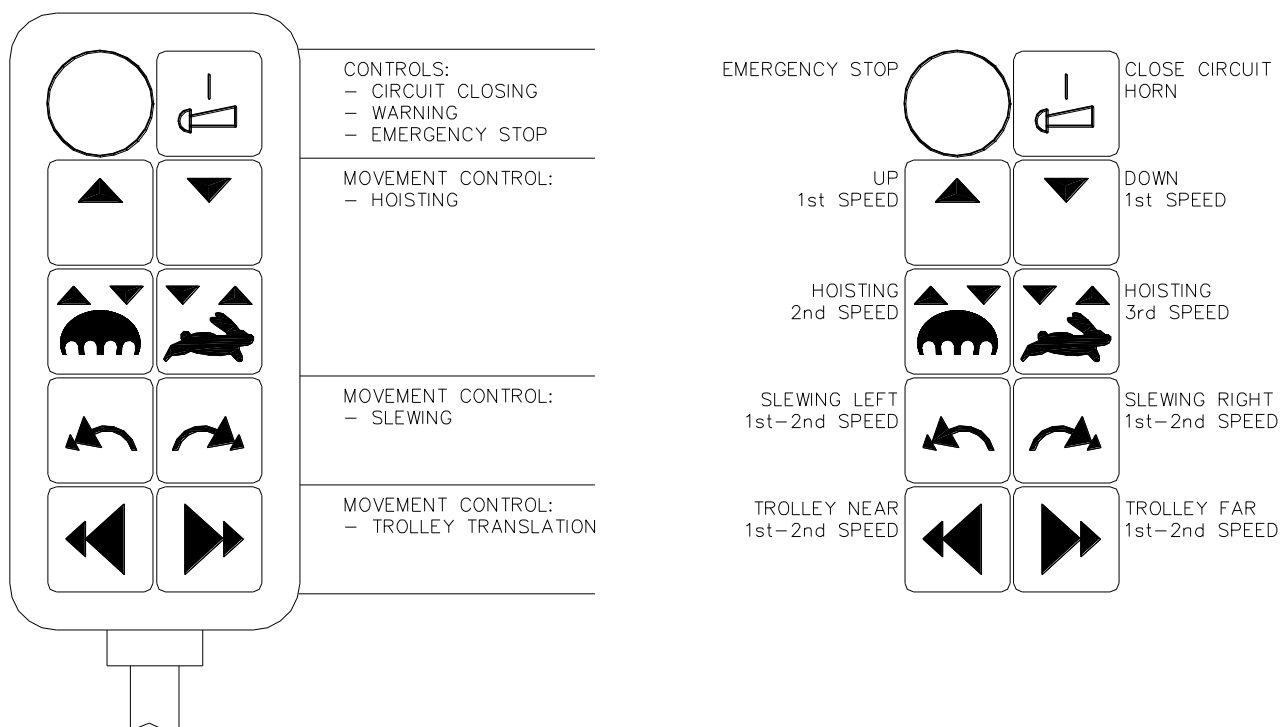
JIB POINT—JIB

**JIB/POINT JIB SELECTOR**

This selector has the function of restoring and cutting off automatically the oil flow at the opening-jib cylinders, for separately control the jib cylinder or the POINT-JIB cylinder.

EXCLUDER SWITCH “HOISTING”

This switch allows the “HOISTING” stop switch to be excluded until the assembly is completed without manual intervention in a way which allows the block to be fixed to the trolley with the hook to allow the crane to haul.

-CONTROL KEY PAD-**TECHNICAL DESCRIPTION**

One line pendant push-button keypad.

External casing in highly resistant thermoplastic material.

Sunken buttons to prevent accident with international and indelible symbols and indications.

-Button colours:

- CLOSING CIRCUIT -- HORN (green)
- EMERGENCY STOP (red)
- all others (black)

Mechanical block between two extremes.

Contact points in silver-nickel.

Stop button well exposed.

ISOLATED CURRENT

-660 V

OPERATING TEMPERATURE

-30 C → +70 C

PROTECTIVE COATING

-IP65

-OPERATION-

Turn off the general knife switch on the door of the electrical control box.

Pressing the “GEAR-ALARM” button, the electrical circuit closes allowing the predisposition of the device’s movements.

A warning sound (HORN) acknowledges that the device is ready to be used.

HOISTING Movements:

to raise or lower the hook, press the “RAISE-HOISTING” button or the “LOWER-HOISTING”. These buttons are composed of two levels: when pressed to the first level, this allows the raising and lowering at a very slow speed. Pressing deeper to the second level, this is how to obtain the 2nd hoisting speed.

While holding the “RAISE” or “LOWER” buttons, press the “FAST-HOISTING” button and then release. This is the 3rd hoisting speed.

To stop the movements in progress, just let go of the “RAISE” or “LOWER” buttons, the speed with automatically and gradually slow down until the motion is stopped.

ROTATION Movements:

to rotate the jib left or right, press the “RIGHT” or “LEFT” button. These buttons are composed of two levels: when pressed to the first level, the brake is released and the movement gradually begins; pressing deeper to the second level, the jib begins to rotate at a normal speed.

All movement stops automatically and gradually by releasing the button.

TROLLEY TRASLATION Movement:

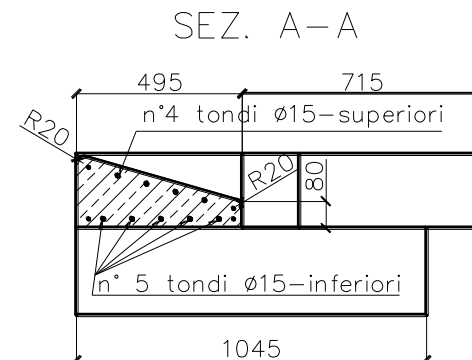
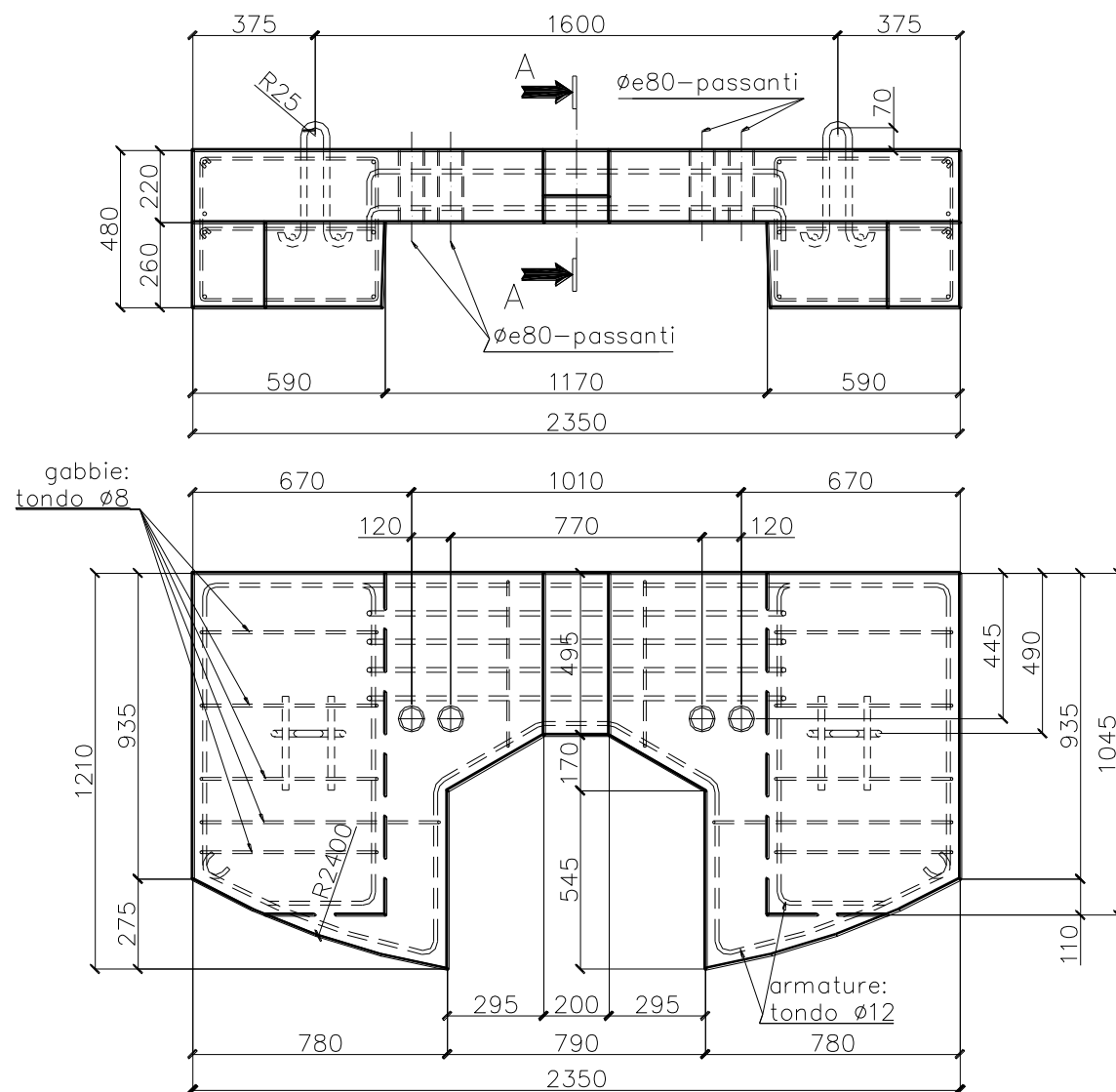
to horizontally move the trolley and thus the load, press the “FAR-END” button to move the load towards the end of the jib, or press the “NEAR-END” button to bring it closer to the tower.

These buttons are composed of two levels: when pressed to the first level, this allows the far and near lowering at a very slow speed. Pressing deeper to the second level, this is how to obtain the maximum speed.

To stop all motion of the trolley, let go of the button, the speed with automatically and gradually slow down until the motion is stopped.

The “STOP” button takes away power from all mechanisms that create movement and brings them to an immediate halt. It is a safety switch and thus must be pressed only in case of danger.

TYPE 1 BALLAST BLOCK- (Supplied with the crane)



TYPE 1 BALLAST BLOCK

Make: piece 1
 Volume: $m^3 0,772$
 Density: $kg/m^3 3370$
 Weight: $kg 2600$

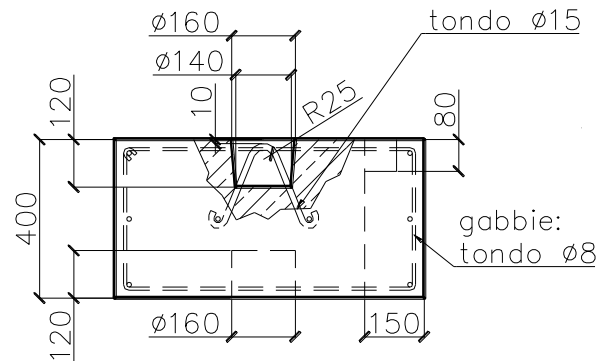
Reinforcements: double in round $\phi 12$ mm
 Cement: $680-300 kg/m^2$

The weight of the block must not be less than the established value. During the preparation of the blocks, watch carefully the arrangement of the re-bar reinforcements. The concrete must be vibrated and all the edges must be rounded.

All dimensions are in mm.

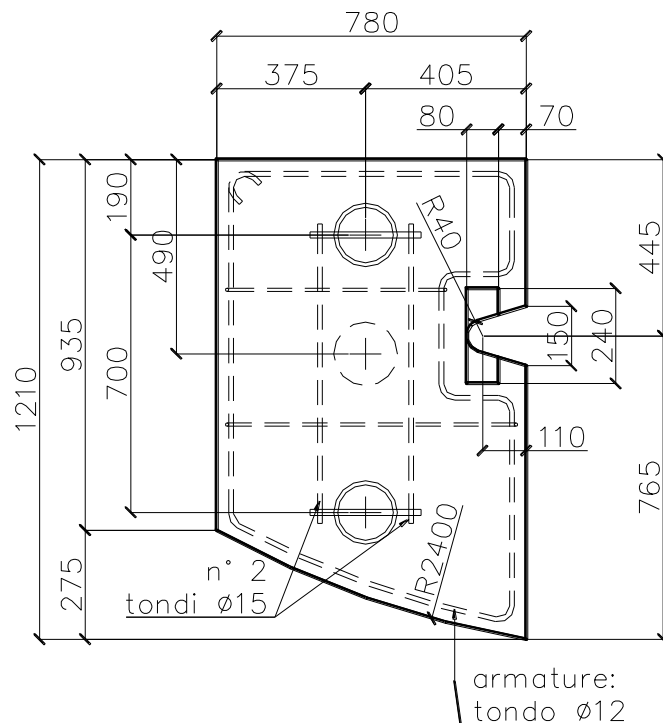
Warning!! The weight of the block must be written in a permanent manner in the outside of the block itself.

TYPE 2 BALLAST BLOCK- (Supplied with the crane)



TYPE 2 BALLAST BLOCK

| | |
|---------------|-------------------------|
| Make: | piece 2 right |
| | piece 2 left |
| Volume: | m ³ 0,333 |
| Density: | kg/ m ³ 3300 |
| Unit weight: | kg 1100 |
| Total weight: | kg 4400 |



Reinforcements: double in round Ø 12 mm
 Cement: 680-300 kg/m²

The weight of the block must not be less than the established value. During the preparation of the blocks, watch carefully the arrangement of the re-bar reinforcements. The concrete must be vibrated and all the edges must be rounded. All dimensions are in mm.

Warning!! The weight of the block must be written in a permanent fashion in the outside of the block itself.

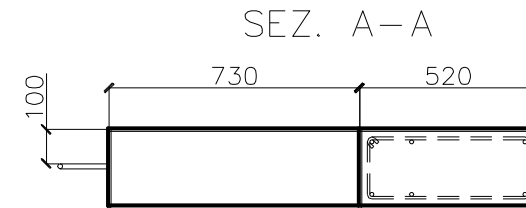
Technical drawing of a beam-to-column connection. The drawing shows a top view and a side view.

Top View Dimensions:

- Overall length: 1600
- Overall width: 225
- Central column diameter: $\varnothing 160$
- Side column diameter: $\varnothing 80$
- Beam width: 225
- Central plate (passante) width: 280
- Side plate (passante) width: 280
- Central plate (passante) thickness: 70
- Side plate (passante) thickness: 70
- Central plate (passante) material: tondo $\varnothing 20$

Side View Dimensions:

- Overall length: 1600
- Overall width: 225
- Central column diameter: $\varnothing 160$
- Side column diameter: $\varnothing 80$
- Beam width: 225
- Central plate (passante) width: 280
- Side plate (passante) width: 280
- Central plate (passante) thickness: 70
- Side plate (passante) thickness: 70
- Central plate (passante) material: tondo $\varnothing 20$



| | |
|--------------|-------------------------|
| Make: | piece 13 |
| Volume: | m ³ 0,532 |
| Density: | kg/ m ³ 2350 |
| Unit weight: | kg 1250 |
| Total weight | kg 16250 |

The weight of the block must not be less than the established value. During the preparation of the blocks, watch carefully the arrangement of the re-bar reinforcements. The concrete must be vibrated and all the edges must be rounded. All dimensions are in mm.

gradini:
tondo Ø15

n°1 sup.
n°1 inf.
tondo Ø12

1250

940

310

920

510

920

2350

150

390

150

430

590

730

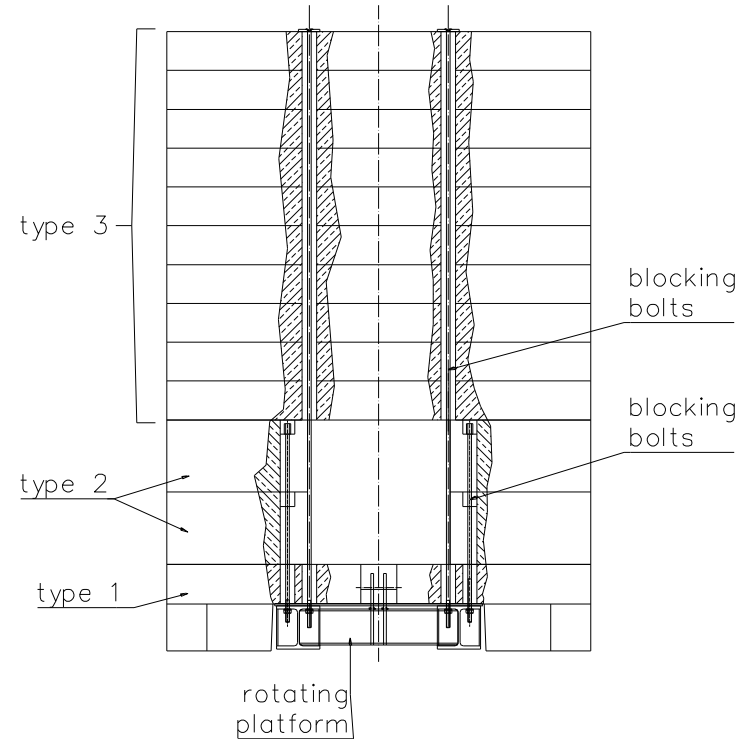
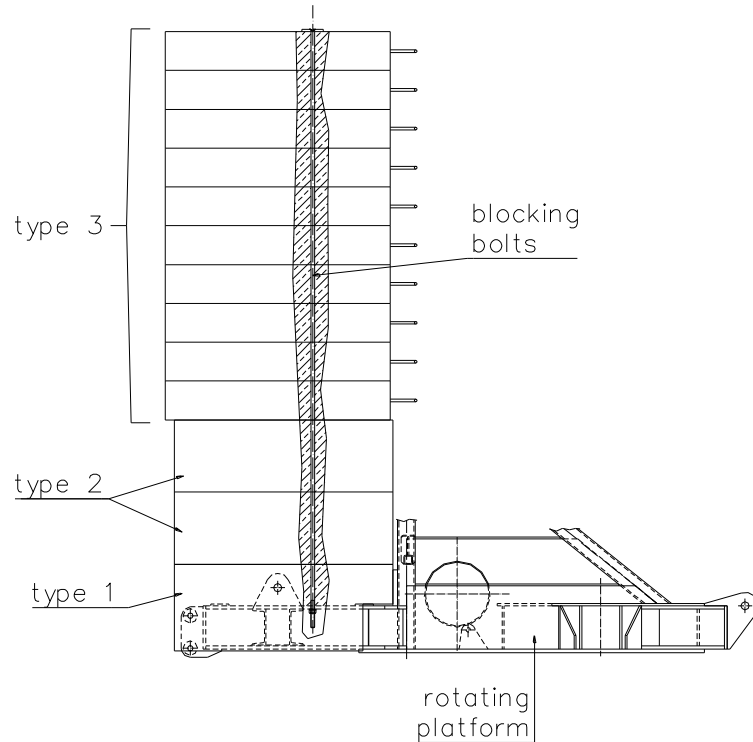
520

R75

R2400

gabbie:
tondo Ø8

n°3 sup. - n°3 inf.
tondo Ø12



BALLAST BLOCKS COMPOSITION

Block type 1 (supplied by us)

for construction see page 45

Block type 2 (supplied by us)

for construction see page 46

Block type 3 (supplied separately)

for construction see pag. 47

For trimmed jib of 32/30/28/14,50 m.

N°1 type [1] block / N°4 type [2] blocks / N° 13 type [3] blocks

- MINIMUM TOTAL WEIGHT 23250 kg

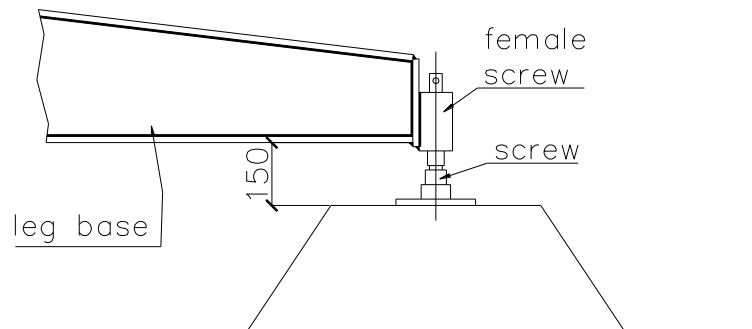
Warning!

Type 1-2 blocks must be attached and fixed with the relative blocking bolts before the crane is assembled because they insure the stability of the crane during assembly: therefore once attached they are never removed.

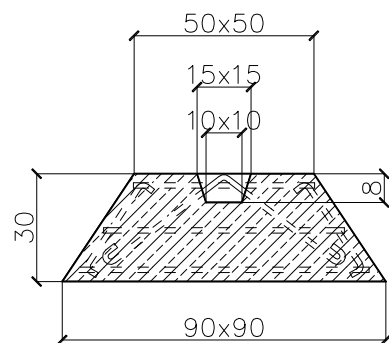
Type 3 blocks get attached with selfballasting derricks supplied with the crane (or through another machine, but they must be attached before the jib is extended.

3 - WORK-ZONE PREPARATION

Try to unscrew the screw as little as possible.



THE MAXIMUM LOAD ON EACH STABILIZER IS 19800 daN



**MINIMUM DIMENSIONS ADVISED
FOR A GROUND CAPACITY 2 kg/cm²**

Construct: 4 pieces

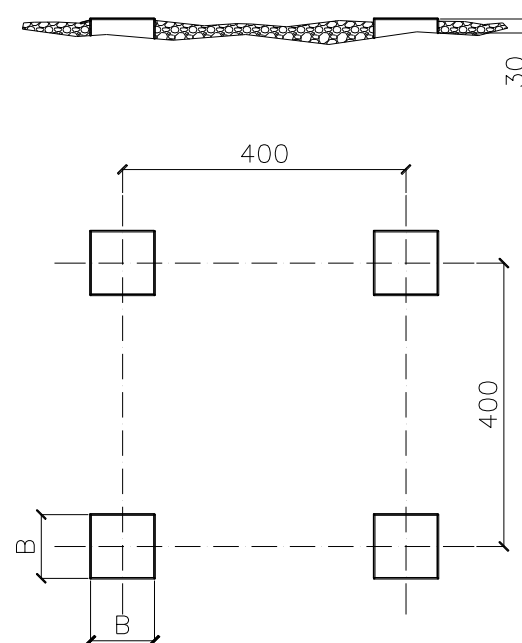
Dressing: cement--425-300 kg/m³

Reinforcement: round Ø 1,5cm

Dimensions are in cm

RESTING SURFACES

NB! It's very important to set up the crane solidly on a flat surface.

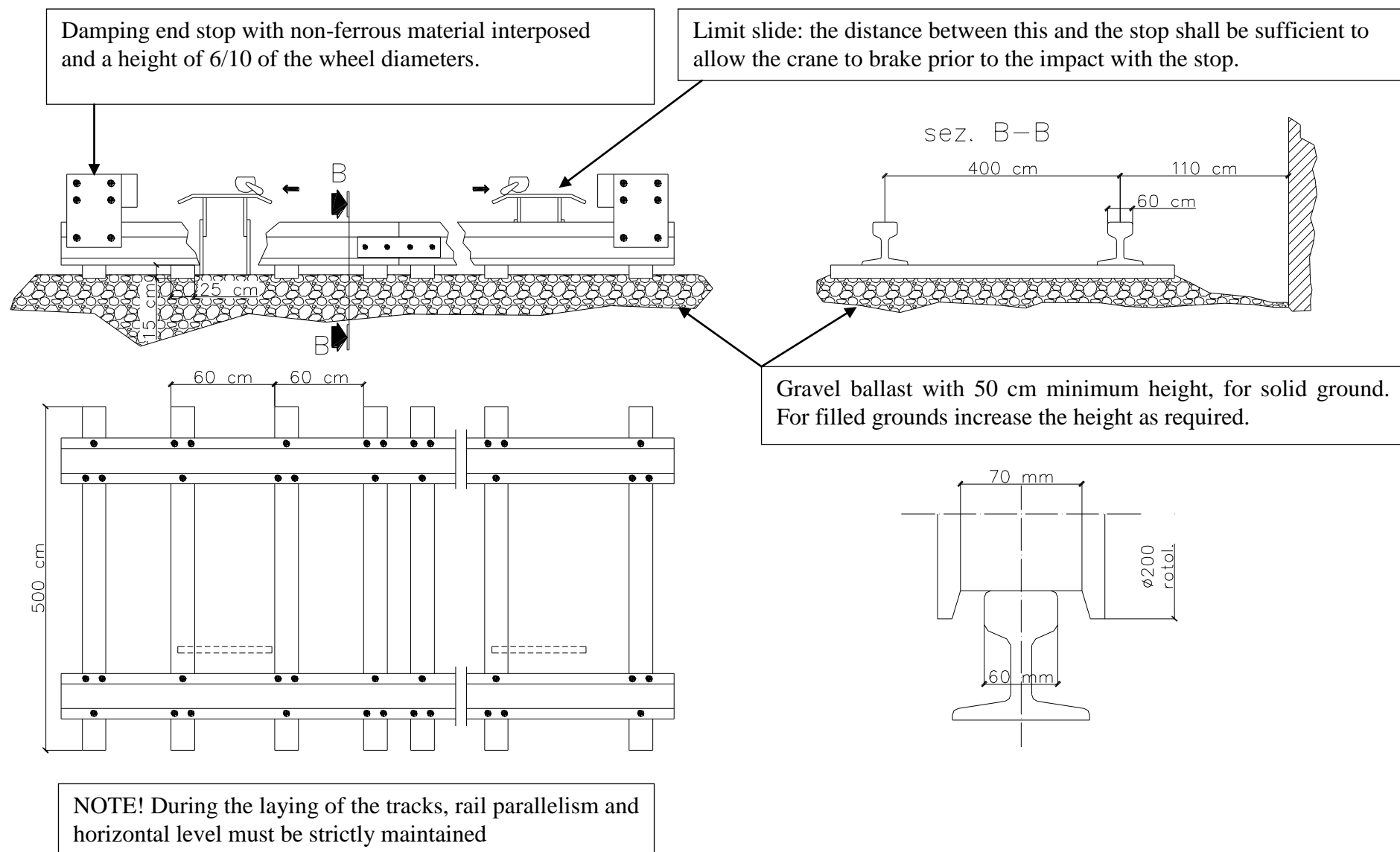


PREPARATION OF THE SURFACE

The surface upon which the crane is to rest must be solid and compact and you must place concrete pads between the stabilizers and the ground.

In order to establish a firm base, it is advisable to dig a hole BxB cm deep to be established in respect to the type of terrain.

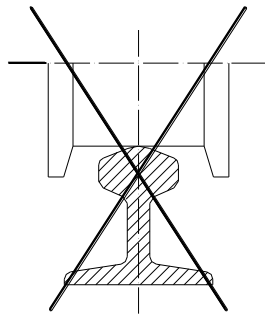
CHANeways FOR TRACK TRANSLATORY CRANES (optional)



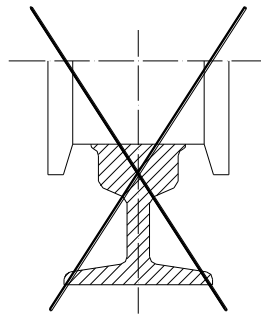
-TRACKS: they must be made with burr-free rails.

The distance between the rails must be constant for the whole length. Any distance variations must not exceed ± 5 mm from nominal size. The rails must be perfectly horizontal; level differences greater than 1 mm on 1m are not admissible on either side. The tracks must be well-set down over their whole length and must be fitted with damping end stops (see page 50).

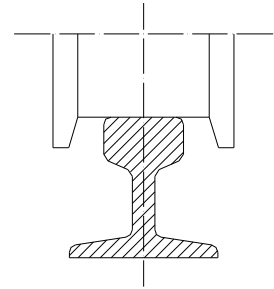
-RAILS: railway type rails with junction plates and foundation bolts, fish plates and bolts for securing them to the sleepers. The weight must be 36 kg/m. and the head width must be 60 mm.



new rail
(thoughtless)



over-worn rail
(unusable)



slightly worn rail
(adequate)

-SLEEPER: on hardwood, 15x25 cm section and 500 cm minimum length.

-BALLAST: 50 cm minimum height for compact solid ground. If the ground capacity is lower than 2 kg/cm^2 , increase ballast height as necessary.

-MECHANICAL LIMIT STOPS: compliant with current safety standards, they are placed at the end of each rail.

-LIMIT SWITCHES: located at the track ends, they consist of appropriate slides that activate the limit switch located at the base of the crane prior to the crane's impact with the mechanical stops.

During the crane-stopping, ensure that the switch lever does not come down from the slide (see page 50).

ELECTRICAL SUPPLY

On the work-zone, provide a grounded 4-pole socket for 50 A and 380V current.

WORK-ZONE SWITCHBOARD

Supplied with a differential carrier to start the motors.

CIRCUIT BREAKER

Automatic magnetothermic at 50 A for the start of motors.

REQUIRED POWER

The power company must be supplied a power of 15 kW and a 380V – 50 Hz current.

PHASE CONTROL

Variations in current must not exceed more than or lack less than $\pm 5\%$ of the normal setting.

POWER SUPPLY CABLE

You have to provide a cable with 5 conductors for triphase 380V operations, of which 3 conductors are for the current, 1 neutral conductor and 1 is for the grounding.

Therefore, you must provide a power cable type “U1000SC12N” or type “HO7RNF”. To avoid loss of current and damage to equipment, you should choose the length of cable according to the following table:

| Line lenght | 30 m | 90 m | 120 m |
|-------------------------|----------------------|-----------------------|-----------------------|
| Cross section for 380 V | 5x 6 mm ² | 5x 10 mm ² | 5x 16 mm ² |

GROUNDING SYSTEM

For grounding the apparatus both on the resting surfaces and on the trolley tracks, please refer a qualified electrician; however and make the grounding in accordance with the laws.

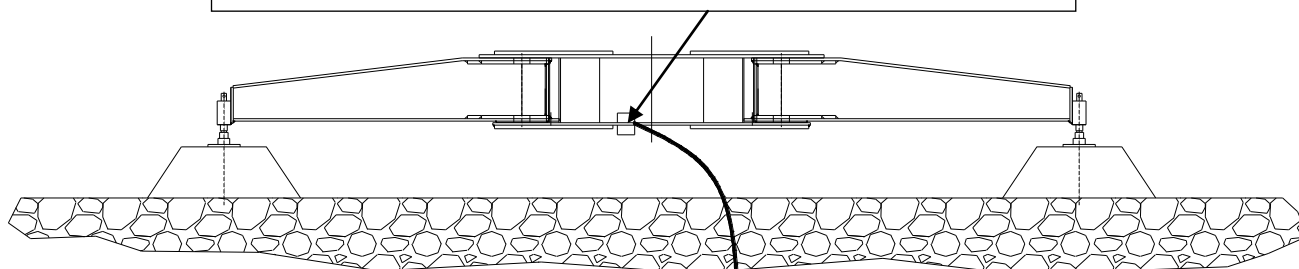
Follow closely the indications on page 53/54.

As concerns protection against electrical storms, once made the grounding system, the crane itself (being a metallic structure) shall safely diffuse any eventual electrical storms.

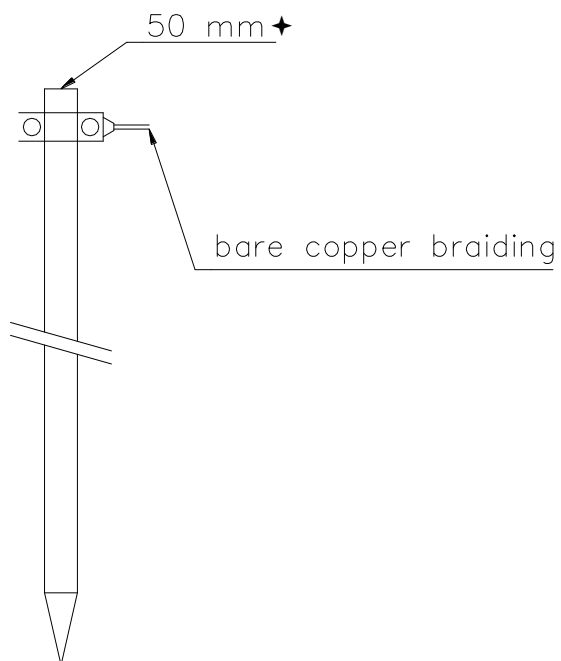
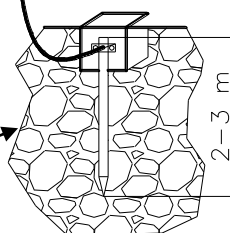
However, for more detailed information about electrical storms, please see CEI 81-2.

GROUNDING SYSTEM FOR FIXED POSITION CRANE

The contact surfaces between the terminal and the crane base must be clean and scraped before fixing.



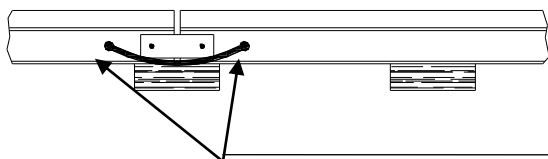
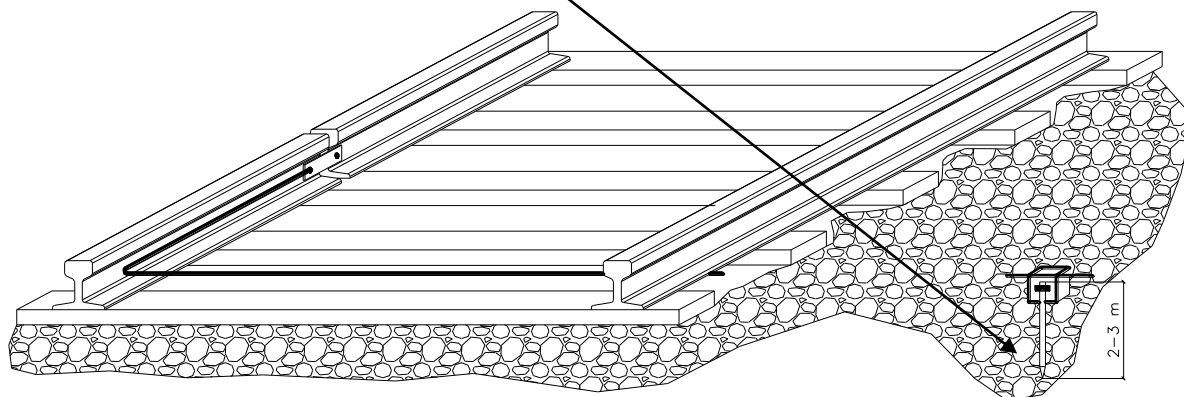
The earth in which the grounded electrode gets placed must not be sandy or filled and must be maintained moist by adding water into the tube.



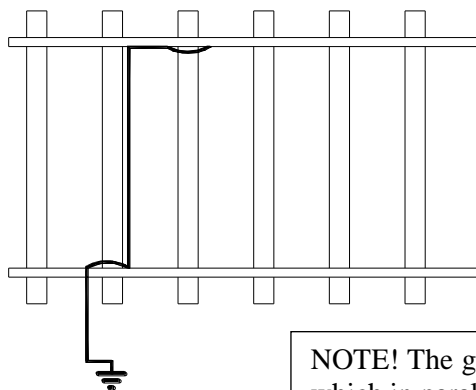
NB! The grounding system must be done with 2 diametrically opposed ground electrode that, when parallel, give a resistance not exceeding 20 ohm.

GROUNDING SYSTEM FOR TRANSLATING CRANE

The earth in which the grounded electrode gets placed must not be sandy or filled and must be maintained moist by adding water into the tube. It is advisable to ground each rail.



The contact surfaces between tracks and terminals must be scraped and clean before securing them.



NOTE! The grounding must be made with 2 ground plates diametrically opposite which in parallel produce a resistance not exceeding 20 ohm.

BALLAST

In C.A. for quantity, characteristics and weights see page 45-46-47.
For spacing and attachment see page 48.

SET-UP MEANS

The set-up of the crane is done by itself and other means are not necessary. If you wish to load the ballast with other machine, this must be suitable (in capacity and jib) to hoist the blocks.

HAULAGE MEANS

Self-propelled vehicles approved to haul a kg 15000 truck and provided with tow hook.

TEST LOADS

IMMOBILE LOADS: consisting of nominal loads as described on page 5-6-7-8 for each use configuration, 33% increased: this test is executed without movement of any kind.

MOBILE LOADS: consisting of nominal loads mentioned above, increased by 25%: this test is conducted using normal movements.

NOMINAL LOADS FOR SAFETY DEVICE CALIBRATION: consisting of nominal loads for every use configuration: the calibration of the safety devices must be done by increasing the loads by 10% so these overloads will verify that the devices inhibit the movements.

PROTECTIVE ENCLOSURE OF THE SPINNING LOAD

Delimit the crane rotation with an enclosure of some sort. Follow the standard guidelines for the establishment of this barrier.

WORK-ZONE SIGNS

Beyond the information signs supplied with the crane, it is advisable to install signs indicating the presence of a crane in the work-zone, including:

WARNING: HANGING LOADS.

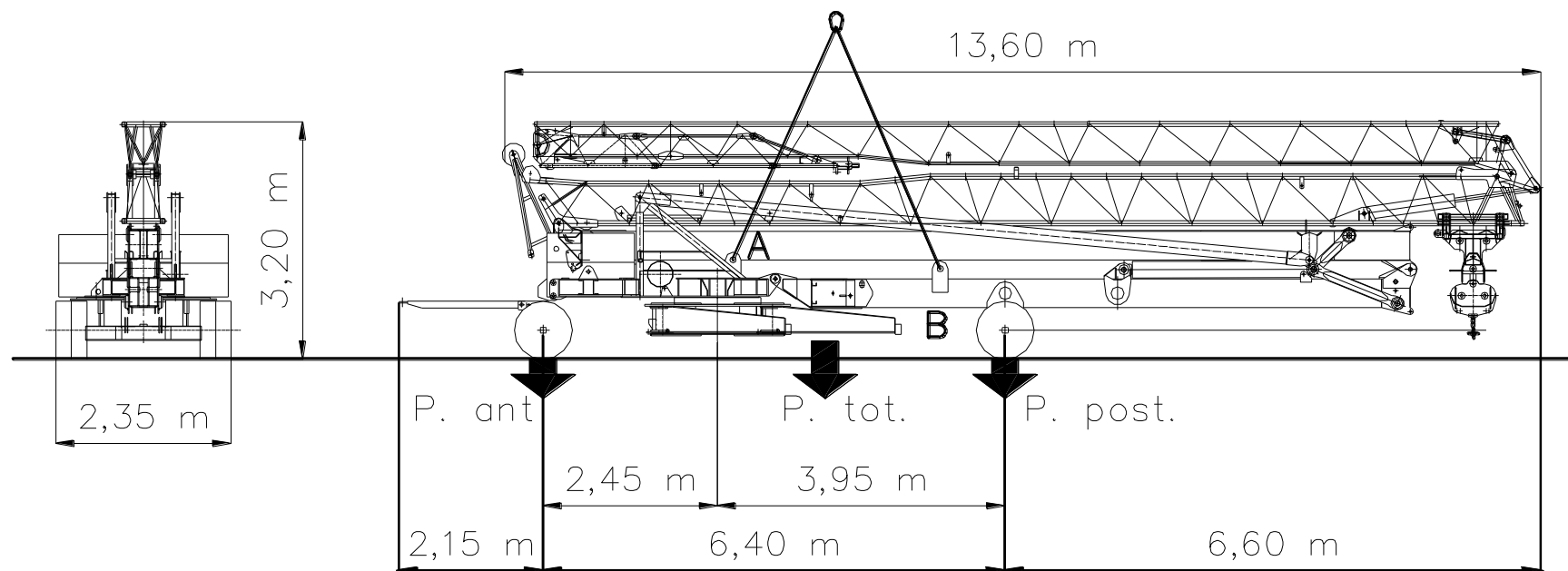
DANGER: TRACKED VEHICLES.

HARD HAT REQUIRED.

POSITION GROUNDED ELECTRODE.

4 - INSTRUCTIONS FOR HAULAGE AND MOVING

DIAGRAM OF HAULAGE CRANE



| | |
|------------------------|----------|
| P. ant. | 8300 kg |
| P. post | 11100 kg |
| Movable counterballast | 7000 kg |
| Total weight | 19400 kg |

ANCHOR POINTS

The anchor points shown on sketch as -A- and -B- are the points marked with suitable plates showing a chain, in which the machine must be tied for lifting. It is obligatory the use of accessories adequate to the weight lifted.

| | Type | Air pressure | Tightening of hub bolts | Max. load capacity |
|-------|---------------------|--------------|-------------------------|--------------------|
| Front | 215/75 R 17.5 (n°4) | 7 bar | 11 daNm | 9000 kg |
| Rear | 215/75 R 17.5(n°4) | 7 bar | 11 daNm | 12000 kg |

The standard crane is supplied with rubber wheels to position the crane in the yard, see chart of crane in haulage on page 56. For this reason, HAULAGE-movements must be made within the work-zone and not on public ways.

Before the displacement, it's necessary to inspect the ground: it should be compact and solid to avoid the sinking of the crane.

The hooking device is supplied with a steering mechanism on the rear axle. Only on this axle may be attached the hauling means which must be suitable for this type of hauling.

Maximum haulage speed is 15 Km/h.

To move the crane from one work-zone to another on public ways, the crane must be carried on a flatbed that is suitable for carrying it according to all the necessary laws for vehicle traffic (T.U.).

PARTICULAR WARNINGS

Before starting to move the trailed crane, **MAKE SURE** that the movable parts are secured to the crane as seen in the haul diagrams in the following places:

- 1-Attachment of the base trolley to the rotating platform by means of a pin.
- 2-Attachment of the 1st jib element to the tower by means of a pin.
- 3-Attachment of the 2nd jib element to the 1st jib element by means of a pin.
- 4-Attachment of the legs to the base by means of a pin.
- 5-Attachment of the block to the trolley by means of a pin.
- 6-Attachment rear bracket to the tower by means of a pins.

CHECK the tire pressure and the tightening of the hub bolts as described in the chart on page 50.

CAUTION!!

As regards the tightening of the hub bolts, they must be checked before starting the haul and after approximately 1 km they must be rechecked to avoid trouble.

PARKING

When the crane is parked, it is important to remember:

- a) to engage the parking brake on the rear axle.
- b) to place wedges under the tires.

HAULAGE OPERATIONS NOT ADMITTED

Beyond what has previously been said, the crane must not be trailed:

- a) faster than allowed;
- b) when the wheels are buried in the ground;
- c) when improperly attached;
- d) with insufficient tire air pressure;
- e) if the moving parts have not been properly secured;
- f) if people are riding on the crane or nearby in dangerous places.

5 - POSITIONING AND SET-UP INSTRUCTIONS

As previously stated in the chapter, “INTRODUCTION” the position and the set-up of the crane must be undertaken by experienced and well informed personnel.

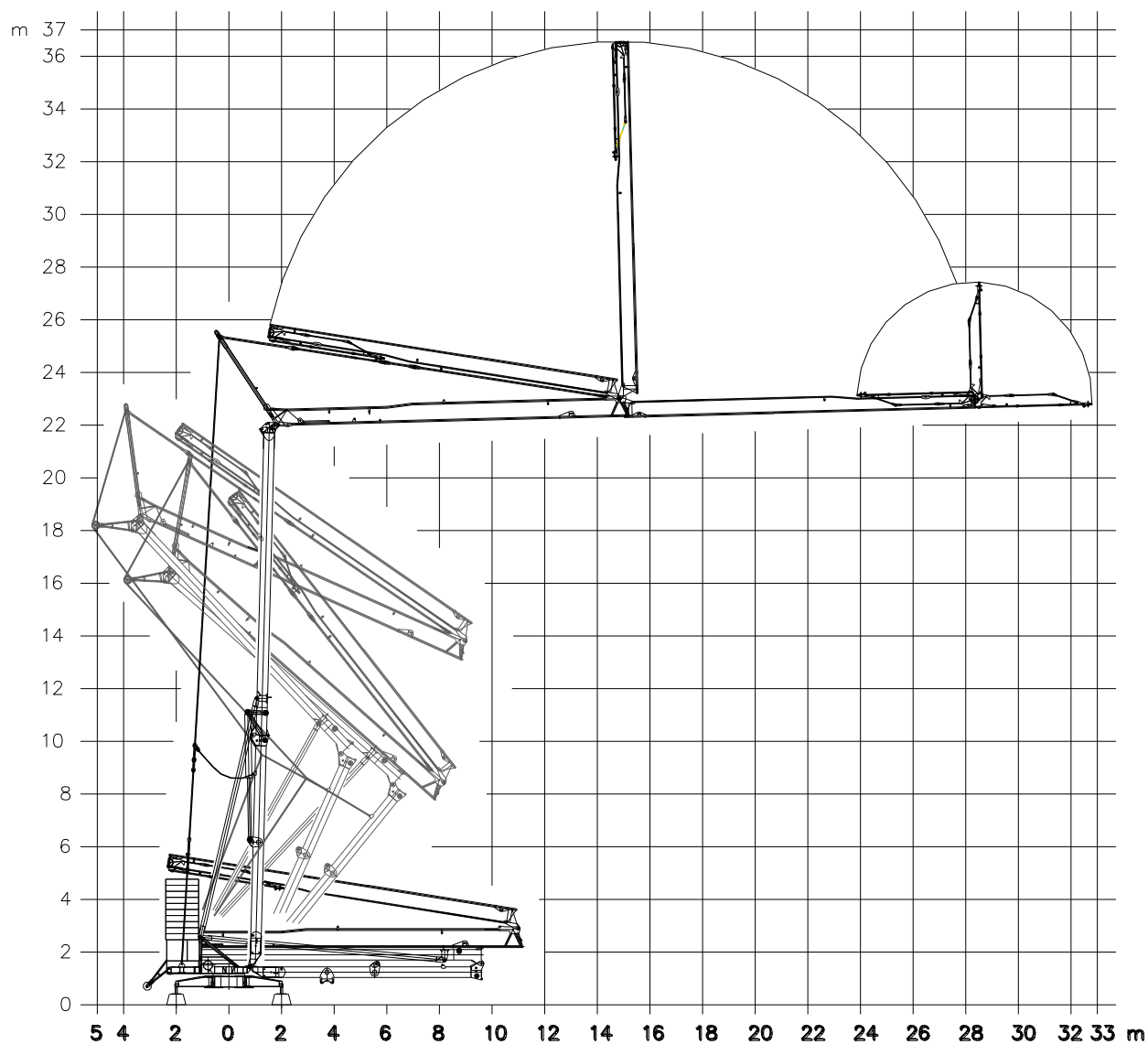
If these people are not from our company or directly sent by us, please make sure that they are capable of the specified jobs.

WARNING!!!

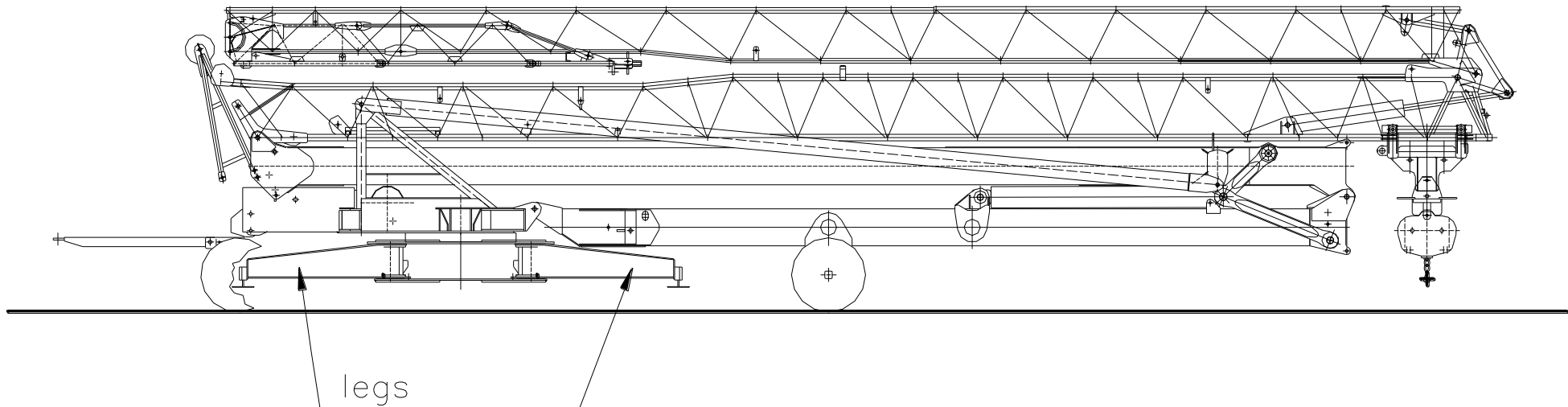
Before the crane positioning, make sure that there are no OBSTACLES TO THE INSTALLATION as described in chapter 1 “OPERATING CONDITIONS” and consult the assembly dimensions on the chart page 54 and we remind that the assembly must be made without wind.

For electrical connection and grounding system, please see chapter 3 “PREPARATION OF THE WORK-ZONE”.

For the set-up order please follow the following chart.

ASSEMBLY DIMENSIONS

BEGINNING THE ASSEMBLY PROCEDURES



-After checking solidity of the ground and establishing a flat plane, position the crane while keeping in mind the necessary set-up dimensions indicated in the chart on page 60.

-Connect the crane to the yard switchboard as described in the chapter “WORK-ZONE PREPARATION” keeping in mind that the crane is furnished with a power cable and a 4-polar plug for 380V triphase connection, so you must supply a power cable with the appropriate socket and capable of handling 32A.

-Open the door of the switchboard and place:

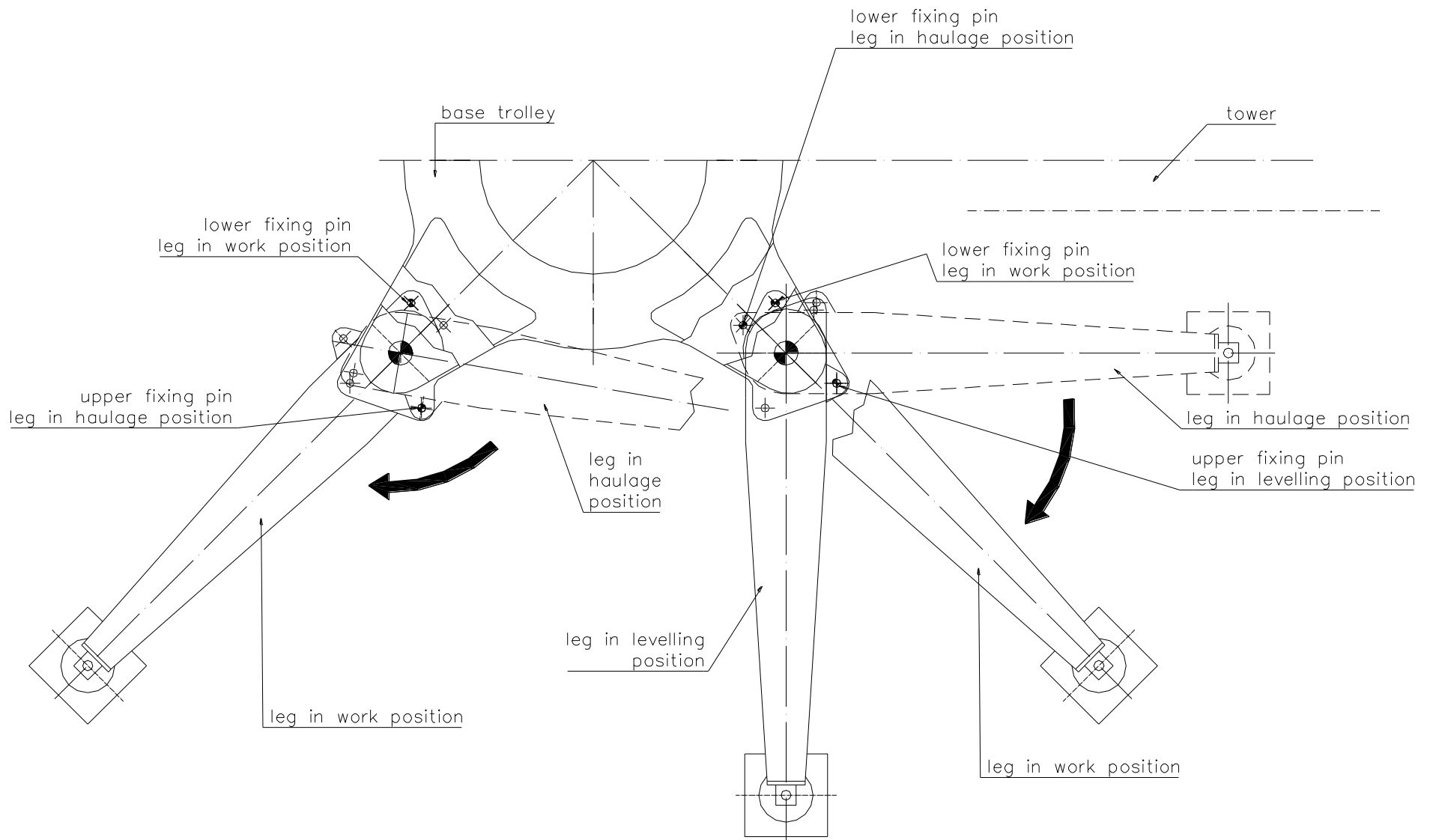
a) the OPER/ASSEMBLY key selector to ASSEMBLY.

b) close the door and reactivate the general knife switch

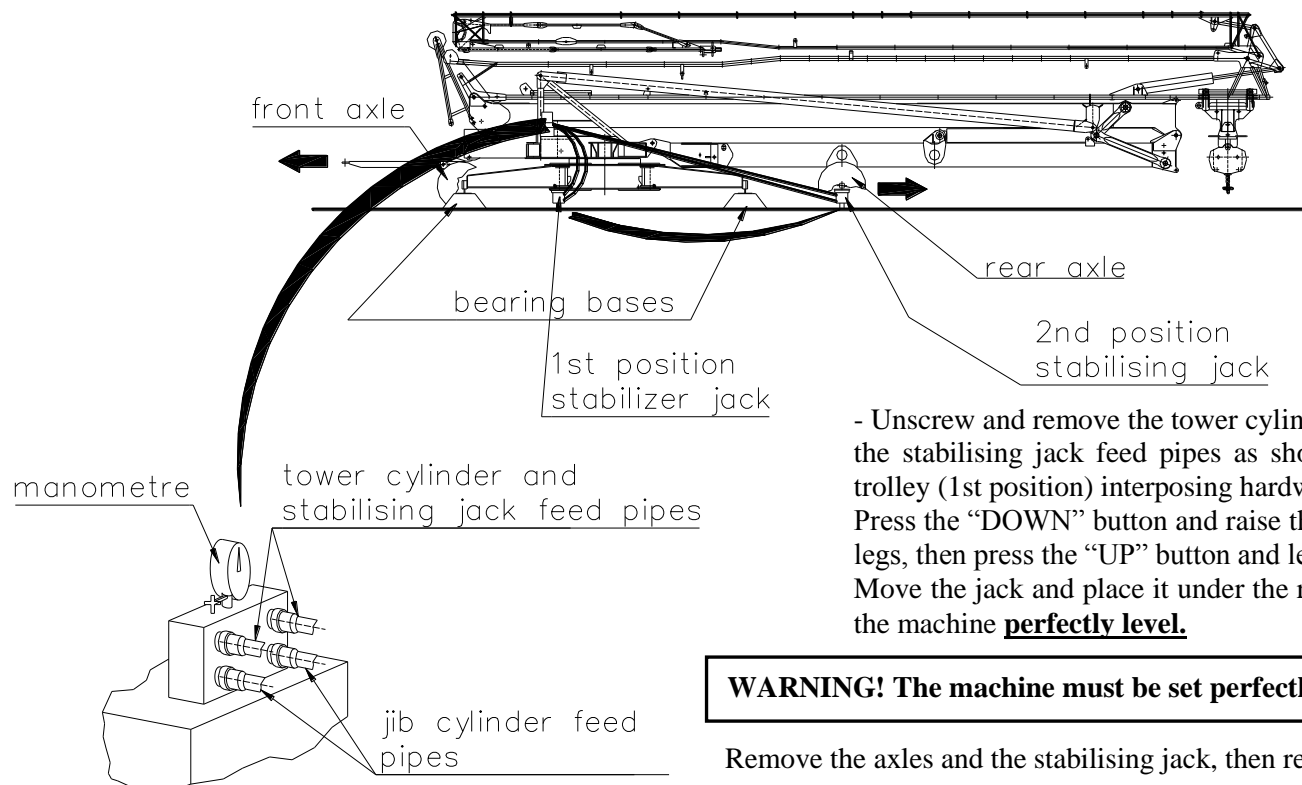
As concerns the description and detail of a) and b) please see the chapter “TECHNICAL DESCRIPTION” on page 40.

-Turn the four legs on the underside of the base trolley and secure them in the operating position using the supplied connecting rods and pins as shown in page 62.

BASE TROLLEY-LEGS' POSITION



LEVELLING OF THE CRANE



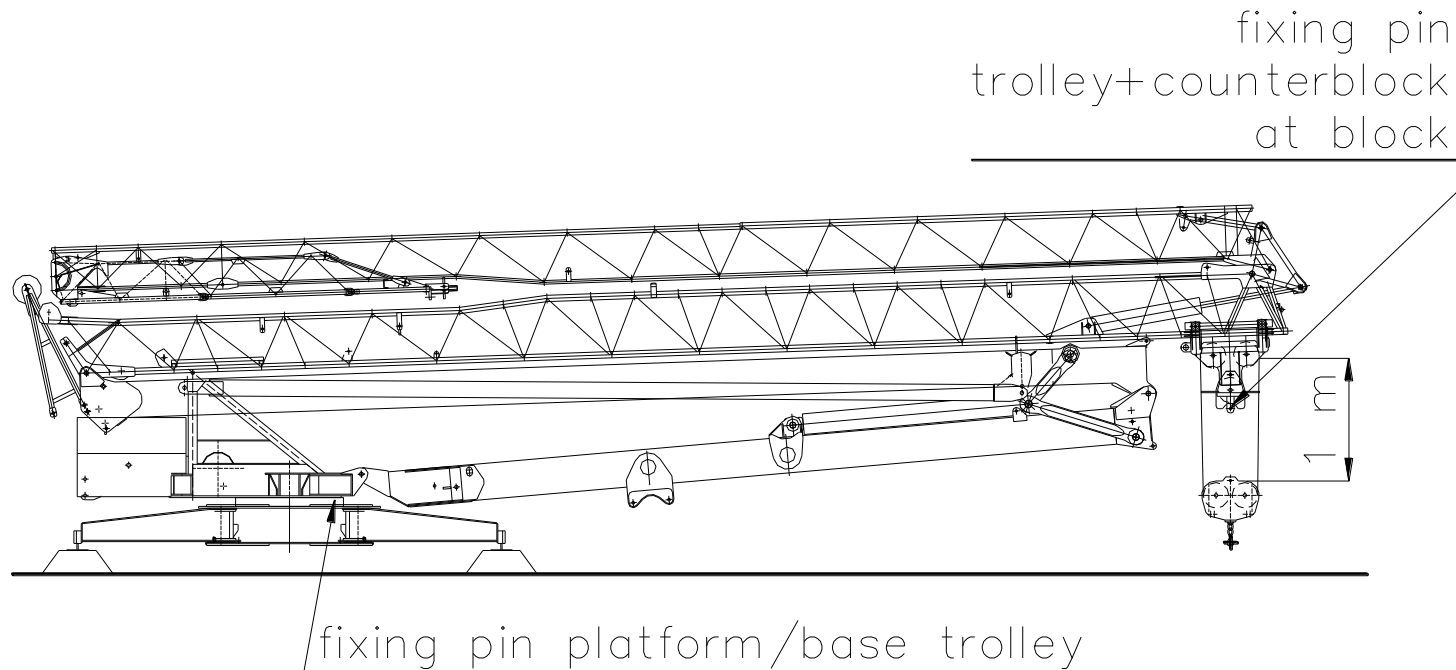
- Unscrew and remove the tower cylinder feed pipes from the hydraulic unit and replace them with the stabilising jack feed pipes as shown here beside. Place the stabilising jack under the base trolley (1st position) interposing hardwood planks between it and the ground. Press the “DOWN” button and raise the machine so that the bearing bases can be placed under the legs, then press the “UP” button and let the machine sit on the bases. Move the jack and place it under the rear axle (2nd position) repeating the same operations to set the machine **perfectly level**.

WARNING! The machine must be set perfectly level and the wheels must not touch the ground.

Remove the axles and the stabilising jack, then reconnect the tower cylinder feed pipes to the hydraulic unit.

NOTE: the crane can also be set level without the help of the stabilising jack, as follow:

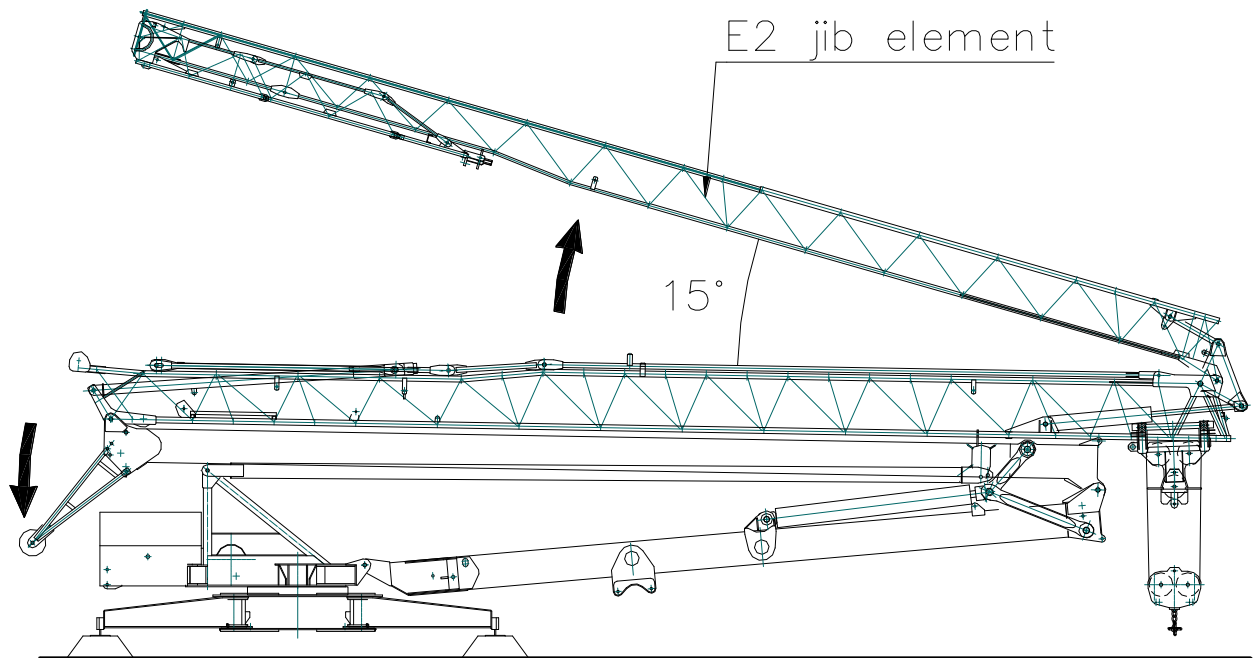
- open the ballast-side legs, and fix them in their work position, as shown page 56.
- open the tower-side legs in levelling position as shown page 56, and place at their tip the bearing bases.
- pushing “UP” button the crane raises ballast-side; stop this operation when you see that the front tires get away from the ground.
- remove the front axle from the structure by means of proper pin.
- prearrange at the tip of the ballast-side legs the bearing bases, then pushing “DOWN” button let down the crane; continue this operation until the tower-side legs get free.
- open the tower-side legs and fix them in their work position, placing at their tip the bearing bases.
- start again the “UP” movement until the four legs will rest on the relative bases getting perfectly level the crane.



- Having put in level the crane proceed as follow:
- Remove the following pin: trolley+counterblock/block, platform/base trolley

NOTE! Ever you want to use the 28/30 m jib version, at this point it will be necessary to remove the E4 (or E3-E4) elements and fix the mobile point to the end of the E2 jib element using the appropriate pins.

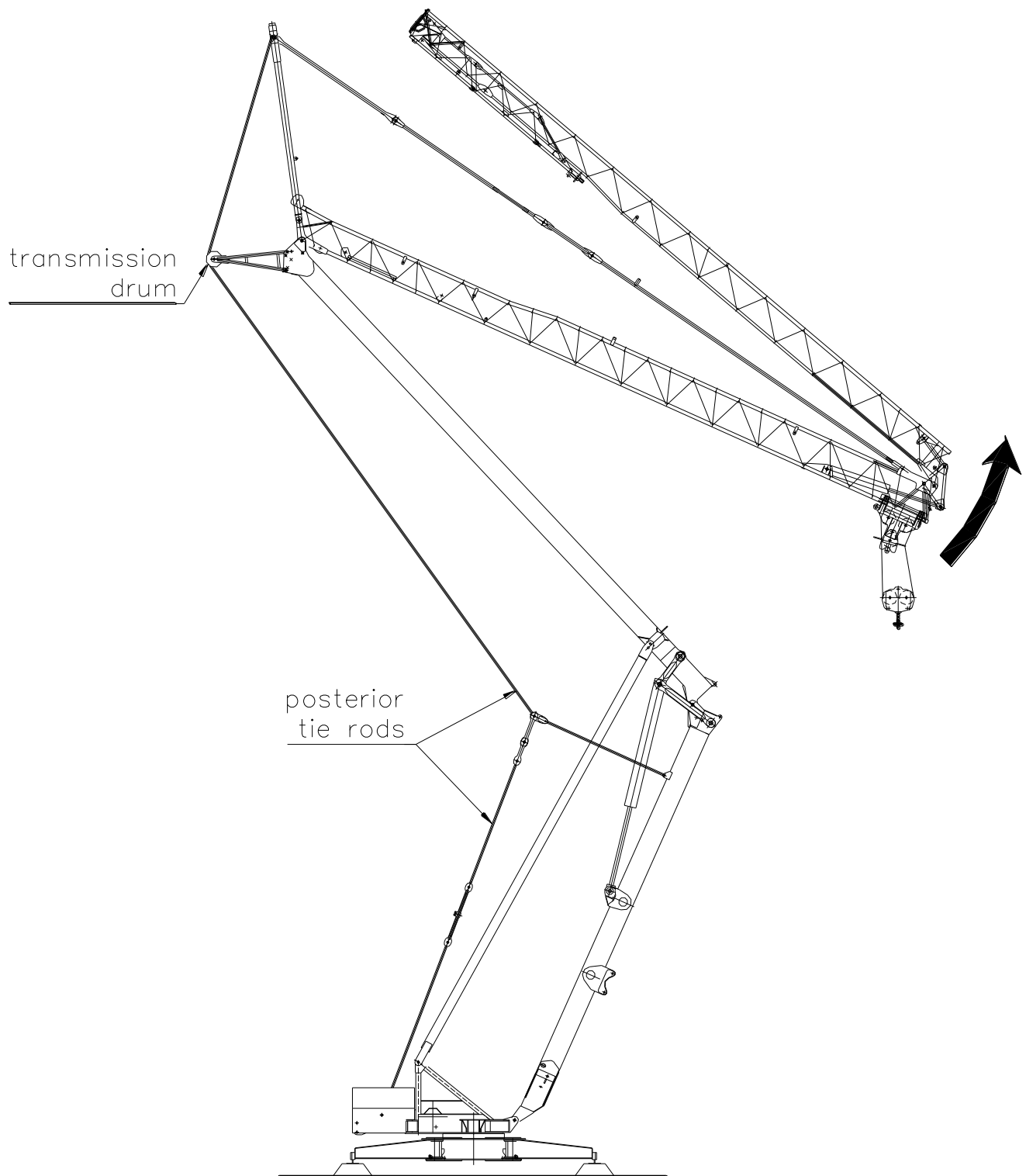
- At this point, by acting upon the tension drum located on the trolley, stretch the trolley translation cable as described in the “TECHNICAL DESCRIPTION - TROLLEY TRANSLATION CABLE” chapter, page 18.
- At the end of this operation, open the panel and place the OPER/ASSEMBLY switch on the OPER position; then press the DOWN button and lower the block till it's about 1 m. from the trolley. Replace the switch on the ASSEMBLY position and close the panel.



- Rotate the rear bracket until it's possible to secure it to the tower using the appropriate pins, as shown in sketch. Carefully ensure that the rear draw-bolt is fitted into the idler on the end of the rear bracket
- Press the "FAR" button and lift the E2 jib element (about 15° see sketch) to allow the aperture of the strut and stop the movement at once.

IMPORTANT!! The assembly of the crane must be begun with the E2 element jib in position 15°; for no reason the set up operations should be made with the jib totally extended or totally refolded.

JIB-RAISING PHASE

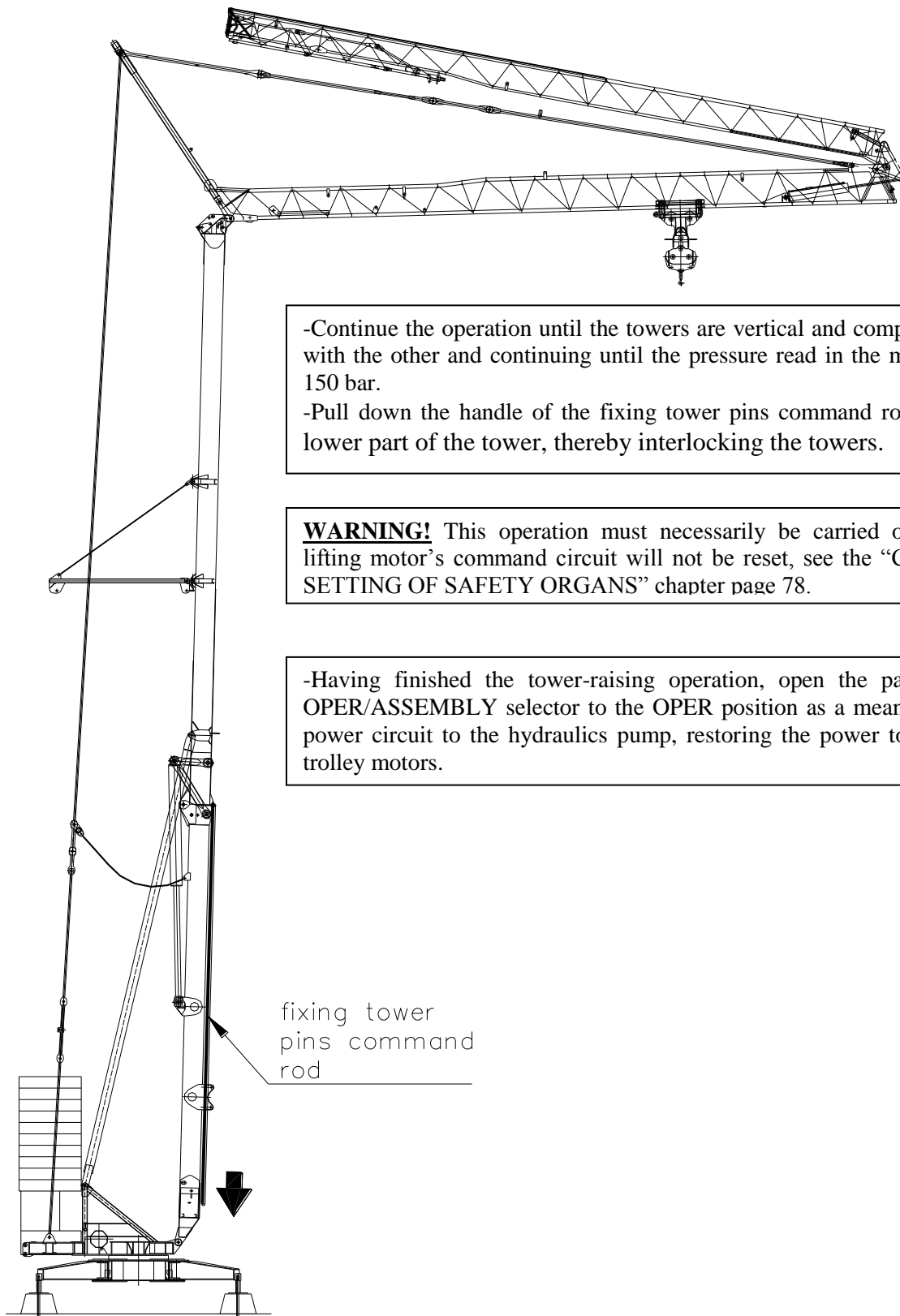


Start again the assembly and the raising of the tower, pressing the UP button; visually check that the rear tie-rods unfolding.

Particularly check that the tie-rods be exactly situated in the transmission drum at the tip of the rear bracket.

You'll see that the tie-rods, under tension, permit the raising of tower and jib contemporaneously.

FINAL PHASES OF TOWER RAISING



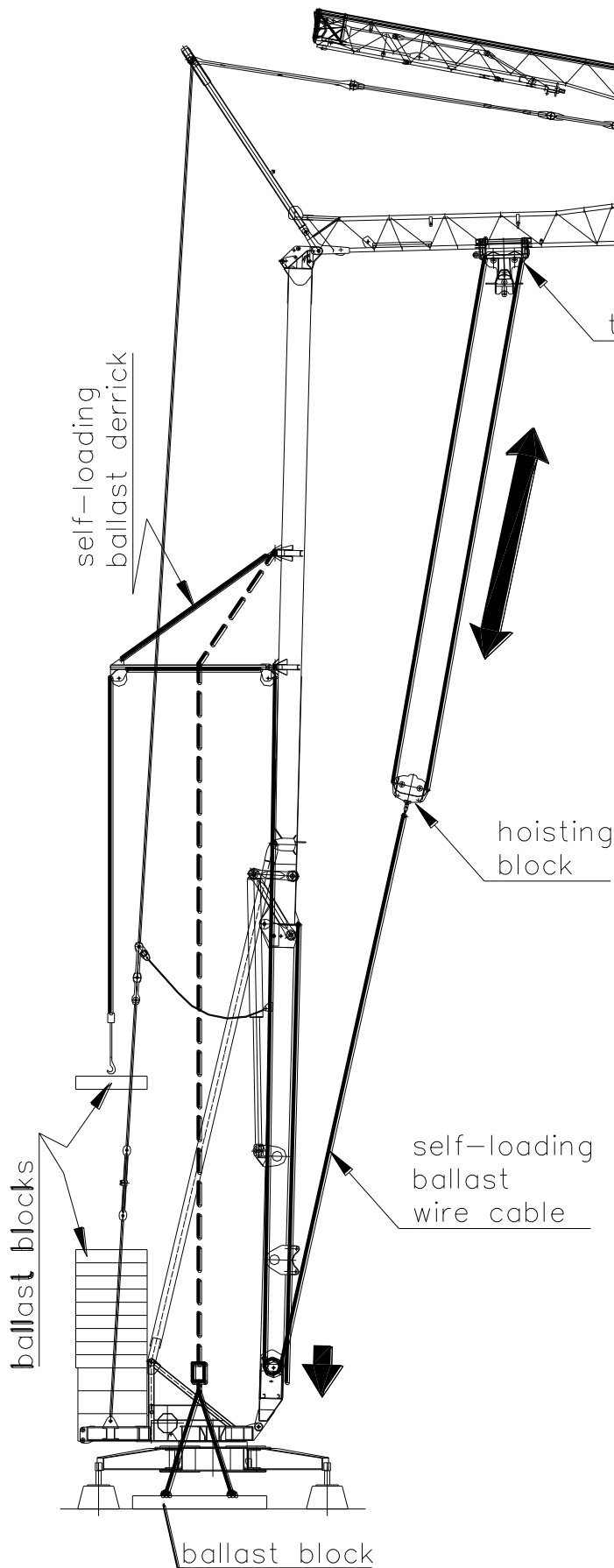
-Continue the operation until the towers are vertical and completely in line, one with the other and continuing until the pressure read in the manometer reaches 150 bar.

-Pull down the handle of the fixing tower pins command rod located on the lower part of the tower, thereby interlocking the towers.

WARNING! This operation must necessarily be carried out, otherwise the lifting motor's command circuit will not be reset, see the "CHECKING AND SETTING OF SAFETY ORGANS" chapter page 78.

-Having finished the tower-raising operation, open the panel and turn the OPER/ASSEMBLY selector to the OPER position as a means to eliminate the power circuit to the hydraulics pump, restoring the power to the hoisting and trolley motors.

SELF-LOADING BALLAST



Pressing the NEAR and DOWN buttons, bring back the trolley against the tower and lower the block with the hook until it's possible insert in the hook itself the U-bolt of the ballasting cable (see chapter on "TECHNICAL SPECIFICATIONS" - SELF-LOADING BALLAST CABLE INSTALLATION CHART on page 19).

-Control the position:

a) of the cable loop.

b) of the set-up of the cable accessories (block - two jib tie rod for hoisting ballast blocks).

-Bring the ballast blocks near the crane so that they can be hooked in a vertical position.

-Hook on the ballast block and press the UP button only in 1st SPEED. Move the ballast blocks manually and stack them perfectly one on top of the other.

-Repeat the operation until all the blocks are placed.

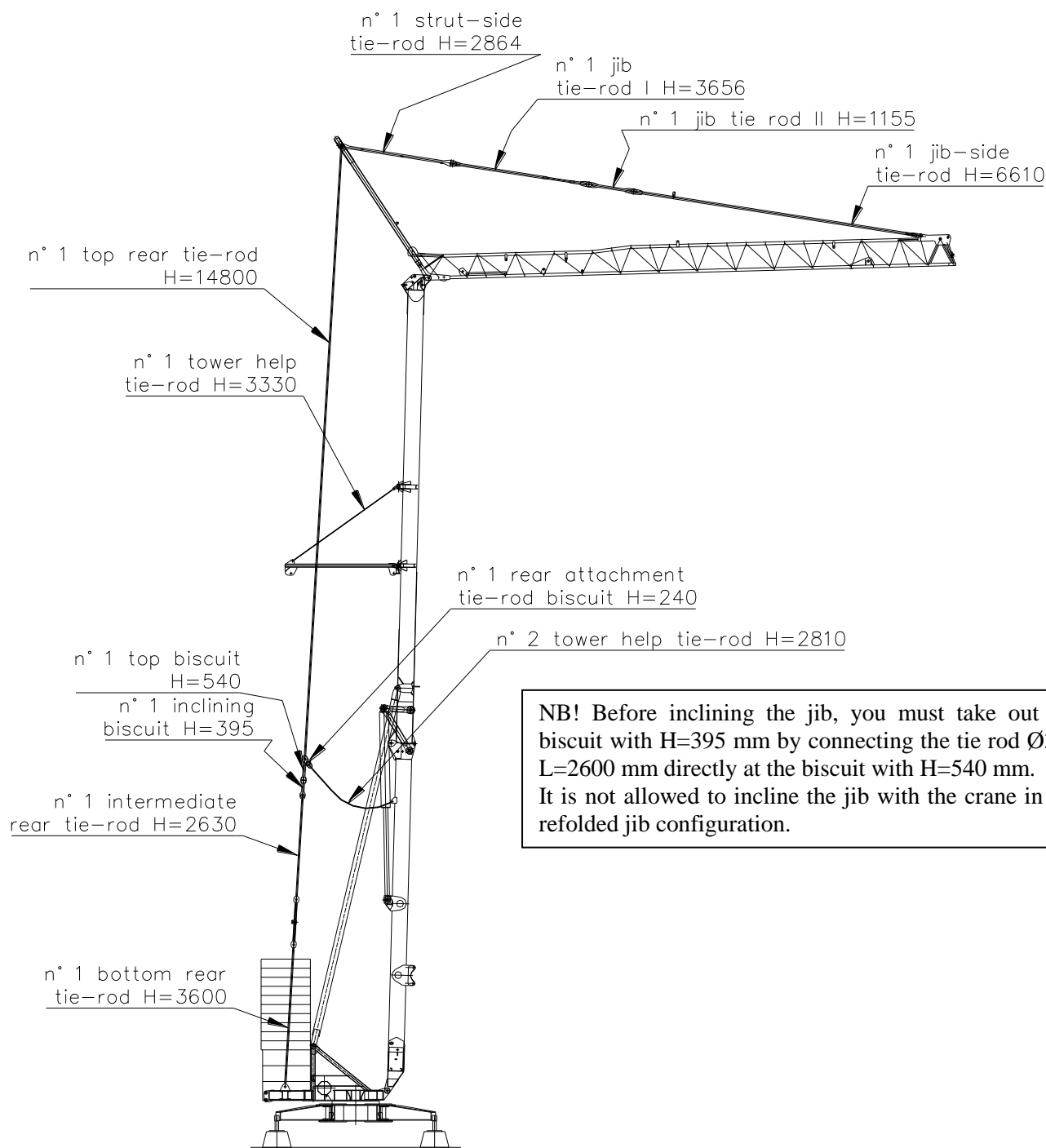
See page 45-6-47-48-49 for details.

-It's possible to use another lifting machine for loading the ballast, but it must be suitable (in capacity and jib) to hoist the block.

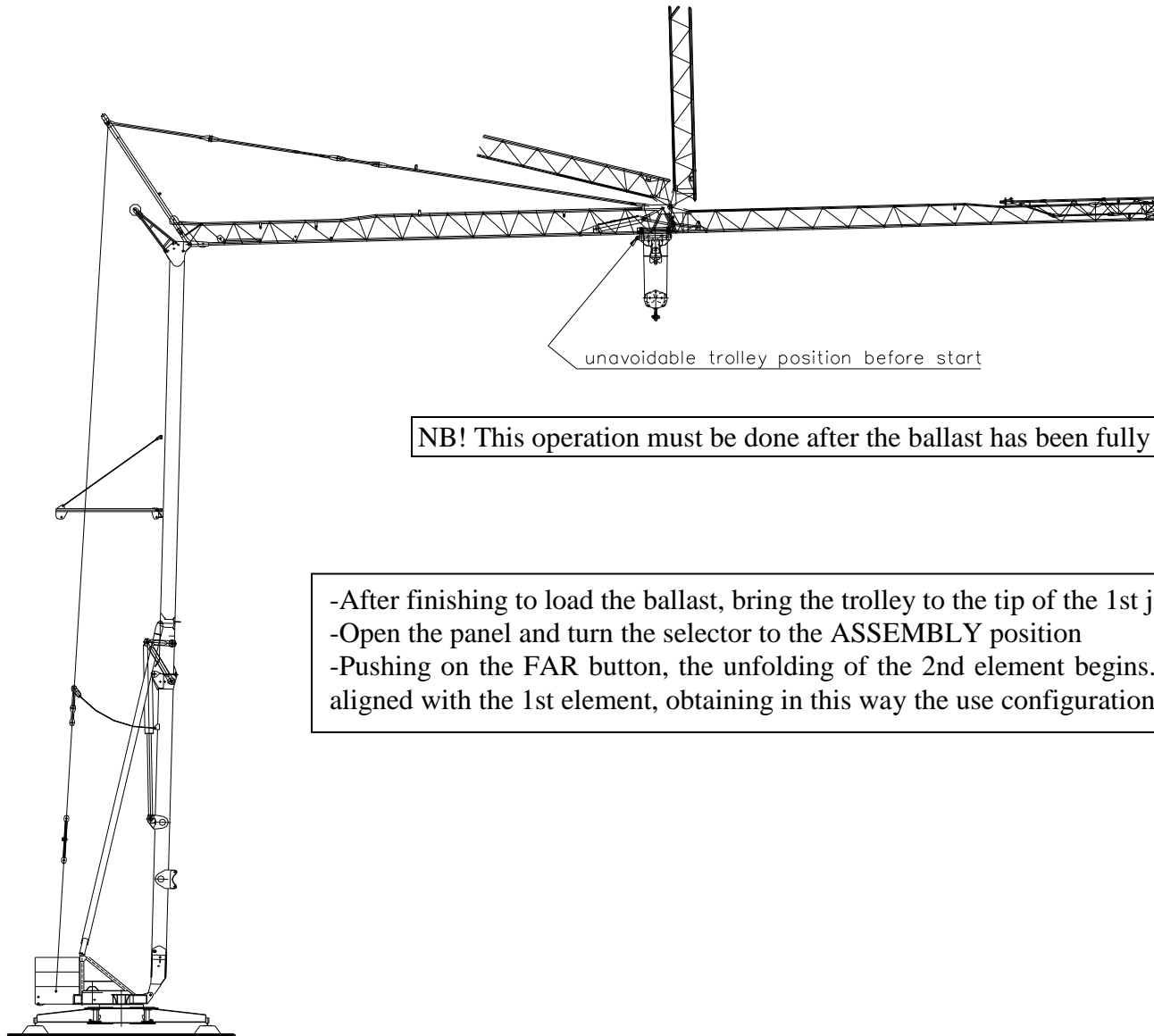
-Once finished the loading of the ballast blocks, you'll see that the type [3] blocks stick out at the back of 10 cm in comparison with the type [1] blocks.

-Now the crane is now ready to be used in a refolded jib configuration, except for the calibration operations which are described in the chapters, "SAFETY DEVICES" and "BRAKES".

POSITION AND ATTACHMENT TIE RODS DIAGRAM

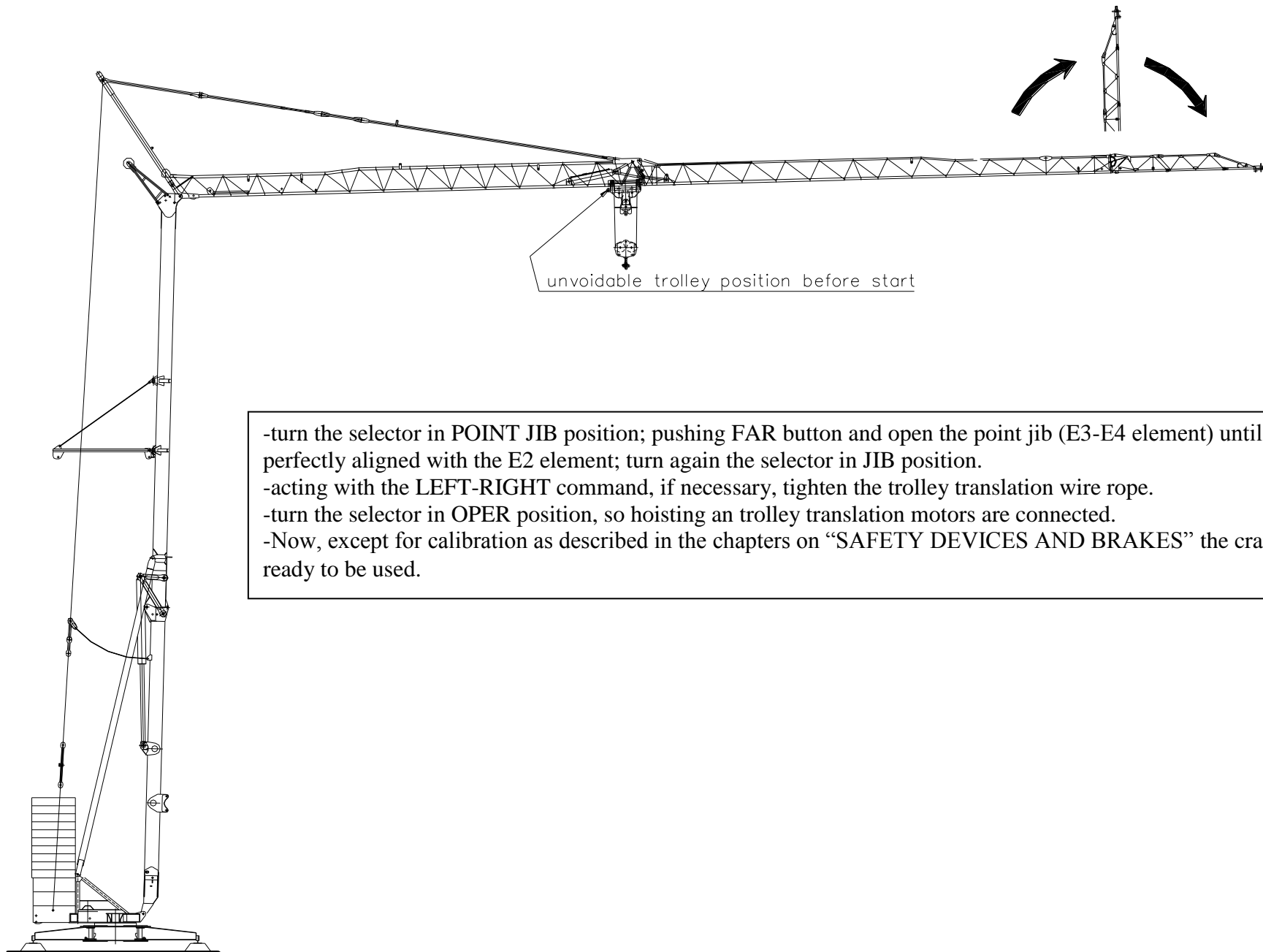


ALIGNING AND EXTENSION JIB



NB! This operation must be done after the ballast has been fully loaded and the crane properly prepared.

- After finishing to load the ballast, bring the trolley to the tip of the 1st jib element.
- Open the panel and turn the selector to the ASSEMBLY position
- Pushing on the FAR button, the unfolding of the 2nd element begins. Continue until the 2nd element is perfectly aligned with the 1st element, obtaining in this way the use configuration with 28 m jib length.



- turn the selector in POINT JIB position; pushing FAR button and open the point jib (E3-E4 element) until it's perfectly aligned with the E2 element; turn again the selector in JIB position.
- acting with the LEFT-RIGHT command, if necessary, tighten the trolley translation wire rope.
- turn the selector in OPER position, so hoisting and trolley translation motors are connected.
- Now, except for calibration as described in the chapters on "SAFETY DEVICES AND BRAKES" the crane is ready to be used.

-POSITIONING OF PLATES- On consignment the machine is supplied with the following plates already fixed on the machine itself:

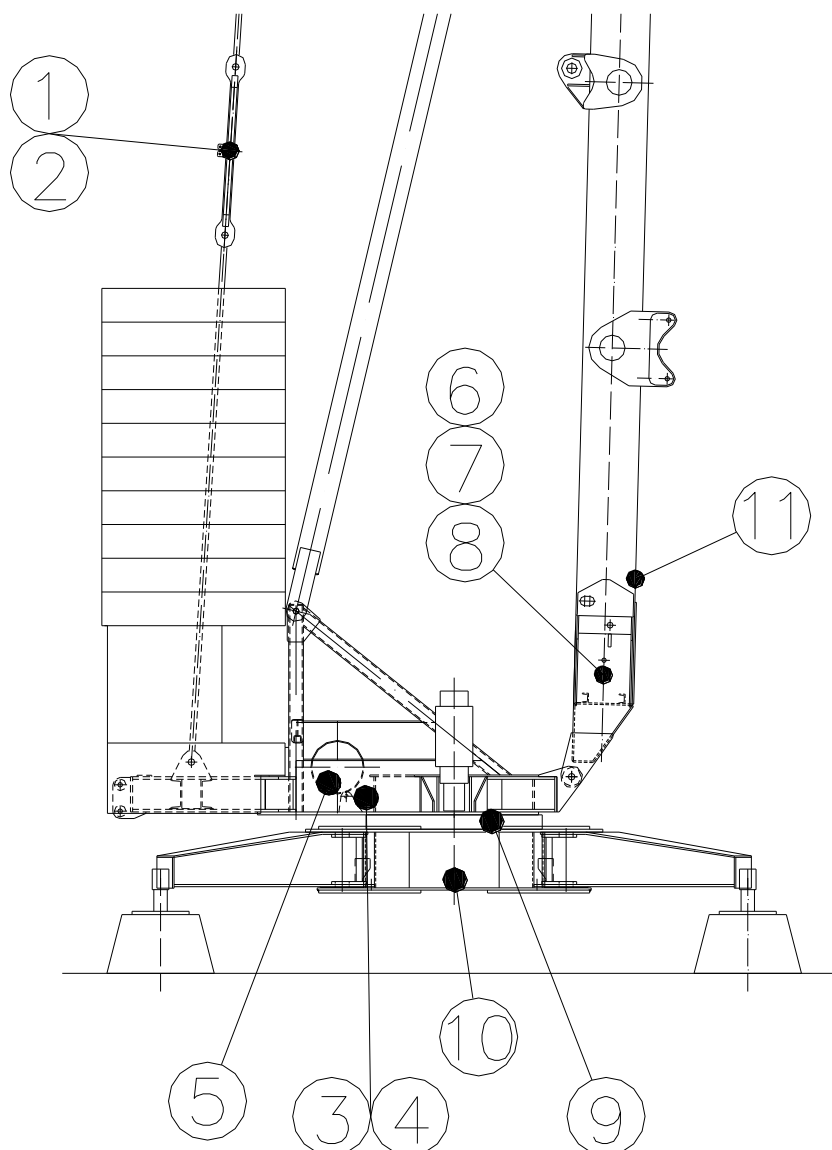
- a) Capacity plates fixed on the jib kg 1000 – kg 2000 – kg 4000.
The case with the parts contains two plates of 1140 kg and 1210 kg, which must absolutely be fixed to the jib, whenever the customer uses a crane with a 30 m or 28 m jib length.
- b) Summarising plate with capacities, main characteristics, mechanisms, type of the device with works-number, operating instructions and limits of the crane → fixed on the wing of the switchboard.
- c) plate with the type of the machine, its height, max. range, max. and min. range capacity and the ballast value → fixed to the ballast.

-The risks and the precaution to be kept in evidence are shown in the chapter “FORECAST USE CONDITIONS”, therefore please refer to the chapter itself; they are also shown on the plate fixed on the switchboard.

-The operator must put on the protective helmet as individual protection means.

6 - SAFETY DEVICES, INSPECTION AND CALIBRATION

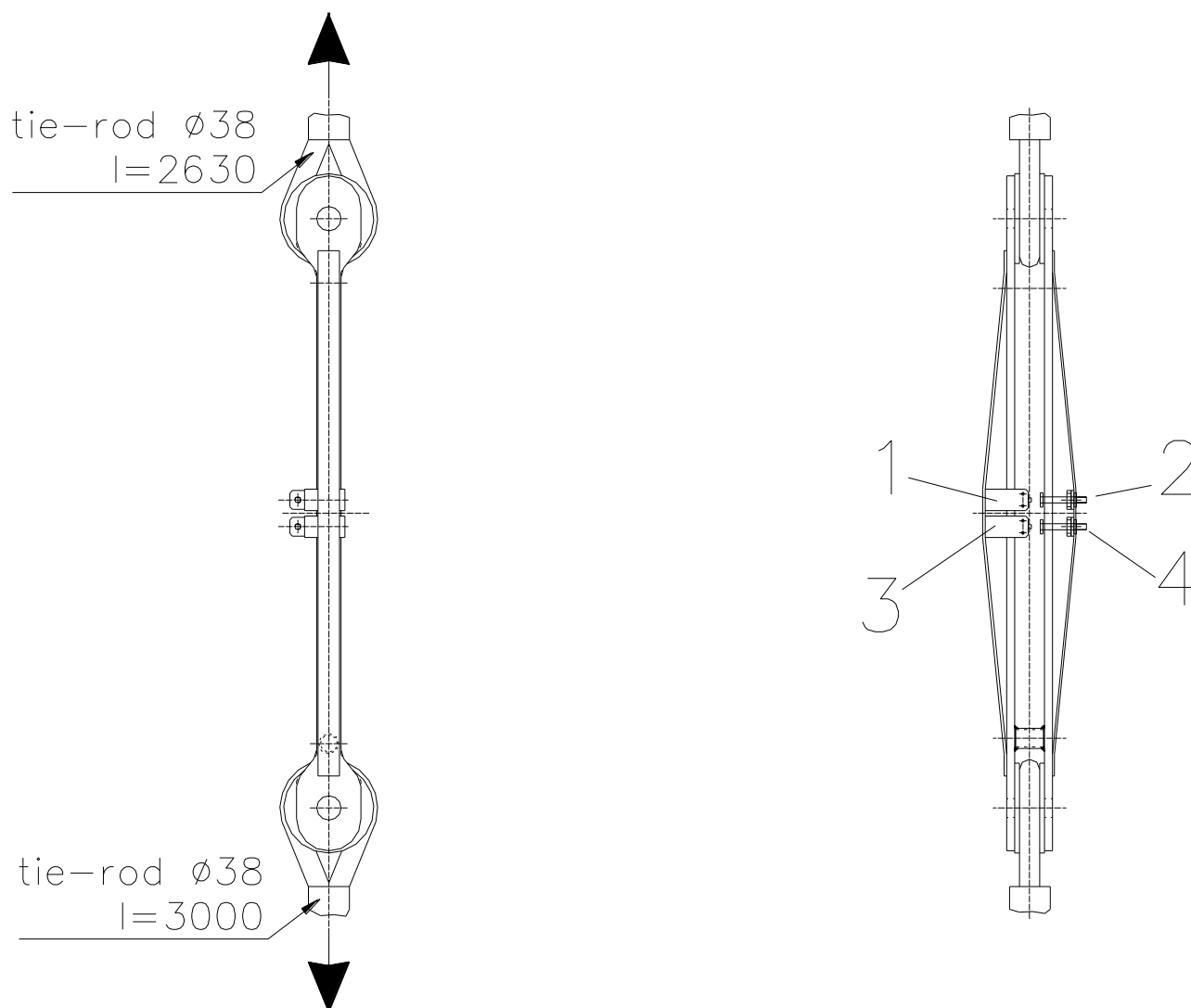
SAFETY DEVICES POSITION



PAGE LISTINGS

| | |
|------------------------------------------------------|------------|
| 1) Moment inhibitors - load movement along the jib | page 74-75 |
| 2) Moment inhibitors - load at the tip of the jib | page 74-75 |
| 3) Max load inhibitor | page 76-77 |
| 4) Speed inhibitor in function of load | page 76-77 |
| 5) Hoisting stopper (UP - DOWN) | page 78 |
| 6/7/8) Trolley translation stopper (NEAR - FAR) | page 79 |
| 9) Slewing stopper (RIGHT LEFT) | page 80 |
| 10) Crane translation limit switches (FORWARD- BACK) | page 81 |
| 11) Tower closure limit switches | page 82 |

**MOMENT INHIBITORS
LOAD MOVEMENT ALONG THE JIB
LOAD AT THE TIP OF THE JIB**



WARNING!! The efficiency of these devices must be checked every time before starting work

- MOMENT INHIBITORS-

LOAD MOVEMENT ALONG THE JIB: installed on the rear bottom tie rod and made up of a microswitch in position 1 as shown in the diagram on page 74.

This device takes action (opens the circuit) when the weight of the load on the block exceeds the allowed limits according to the diagram, cutting off the power to the electromagnetic TROLLEY FAR switch. The operator thus can use the crane:

- in vertical movement of hoisting (UP/DOWN)
- in horizontal movement of the trolley (NEAR) to bring the trolley back to the tower.

ADJUSTMENT: raise at the middle of the jib the maximum tip load, (see load diagram for the jib configuration used – pag 5/6/7/8) augmented by 10%. Move the trolley towards the tip and adjust the screw pos. 2 (see diagram page 76) which controls the opening of the switch contacts in pos. 1 in a way that this allows the opening of the contacts about one meter before the trolley reaches the end of the jib. Once you have obtained the desired result, turn the lock nut on the adjustment screw (pos. 2) as far as it will go.

LOAD AT THE TIP OF THE JIB: This is installed on the rear bottom tie rod and is made of a microswitch in pos. 3 as shown in the diagram on page 74. It works (opens the circuit) when the load on the block exceeds the allowed weight, cutting off the power to the electromagnetic UP and TROLLEY FAR switches. An audible sound (horn) signals the excessive weight condition.

The operator has the following possibilities:

- lower the load with the DOWN control.
- bring the load towards the tower with the NEAR control.

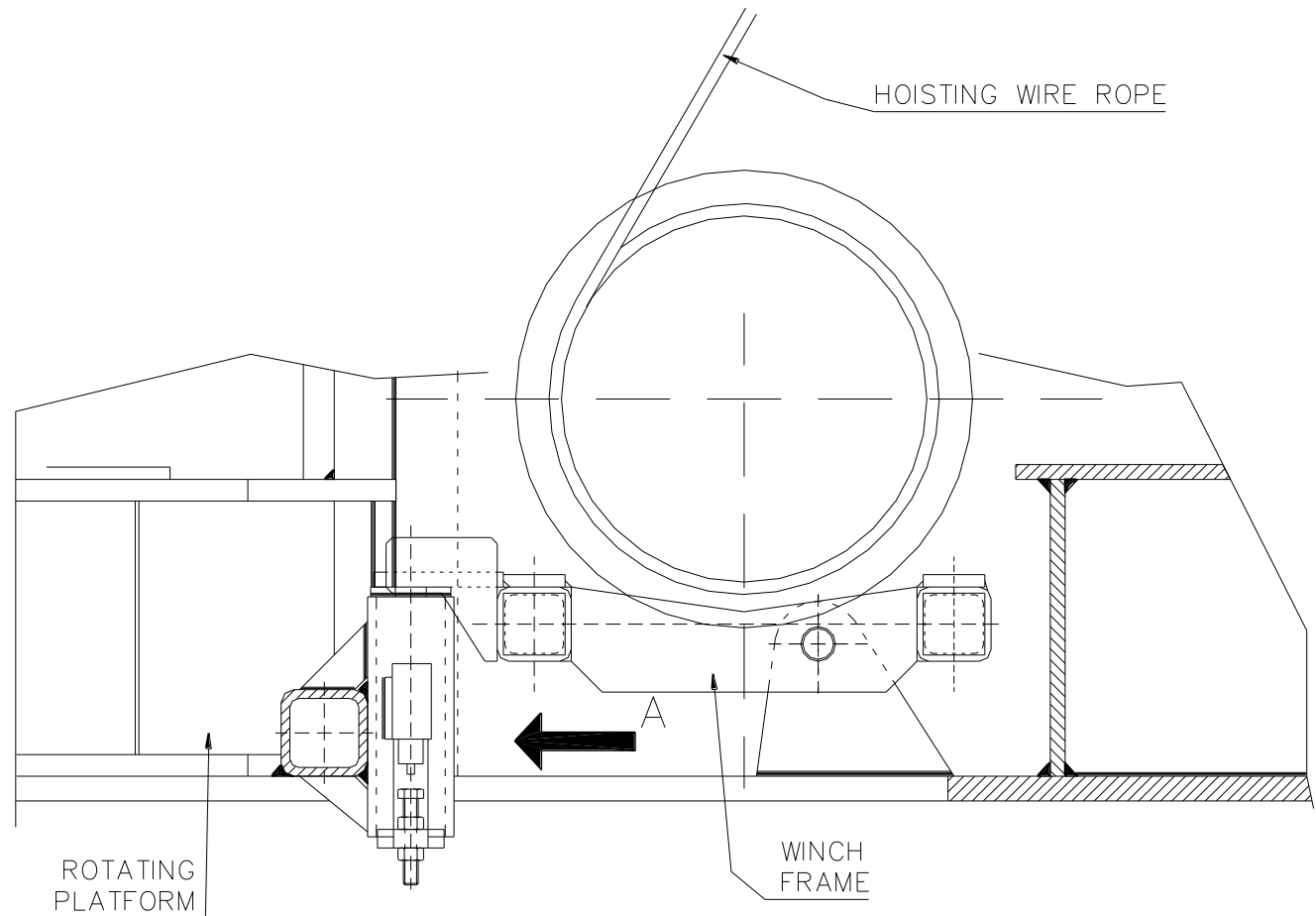
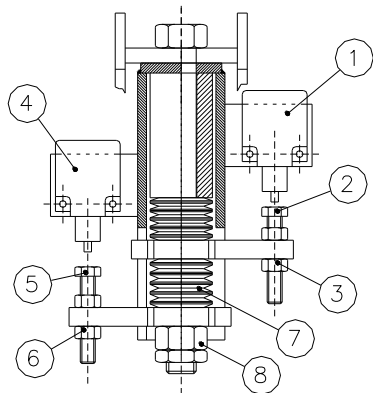
ADJUSTMENT: bring the trolley to the tip of the jib and load the block with the maximum load (in accordance with the jib configuration), augmented by 10%. Raise the load a little so it doesn't rest on the ground and adjust the screw (pos. 4) so that the contacts of the microswitch (pos. 3) are slightly open and thus interrupt the movements of UP and TROLLEY FAR. Lower the load and then re-raise it with the correct maximum load. In these conditions, the hoisting ought be made without interruption. Once obtained the desired result, tighten lock nut placed on the adjustment screw (pos. 4).

IMPORTANT!!

The devices listed above must be calibrated each time the configuration changes, and it's strictly forbidden to adjust them to hoist a load bigger than the maximum.

MAX LOAD INHIBITOR
SPEED INHIBITOR WHILE CARRYING LOAD

VIEW BY –A–



WARNING!!! The efficiency of these devices must be checked each time before beginning a work shift, taking care that the Belleville washers (pos. 7) are well closed through the tightening of the nut and the lock nut (pos 8).

MAX LOAD INHIBITOR

Installed on the hoisting mechanism (winch) as shown on page 20 this device is composed of a microswitch (pos 1) as shown in the diagram on page 76.

It takes effect (opens the circuit) when the load on the block is bigger than the allowed weight, blocking the UP and FAR movements.

A horn signals that the load weighs too much.

The operator may only lower the load to the ground with the DOWN command.

ADJUSTMENT: bring the trolley to the minimum distance from the tower; load the block with the max allowed weight, augmented by 10%; raise the load a little so it doesn't rest on the ground and adjust the screw (pos. 2 on page 76-77) so that the contacts of the microswitch (pos. 1) are slightly open and thus interrupting the movements of UP and TROLLEY FAR. Lower the load and then re-raise it with the correct maximum load. In these conditions, the hoisting ought to take place without interruption. Once satisfied with the results obtained, tighten the lock nut (pos 3) against the adjustment screw (pos. 2).

SPEED INHIBITOR IN FUNCTION OF LOAD

Installed on the hoisting mechanism (winch) as shown on page 20 this device is composed of a microswitch (pos 4) as shown in the diagram on page 78.

It takes effect (braking the HOISTING 3rd SPEED movement) when the hoisting wire rope undergoes a dynamic increment on account of the excessive hoisting speed with load bigger than the allowed one for the speed itself.

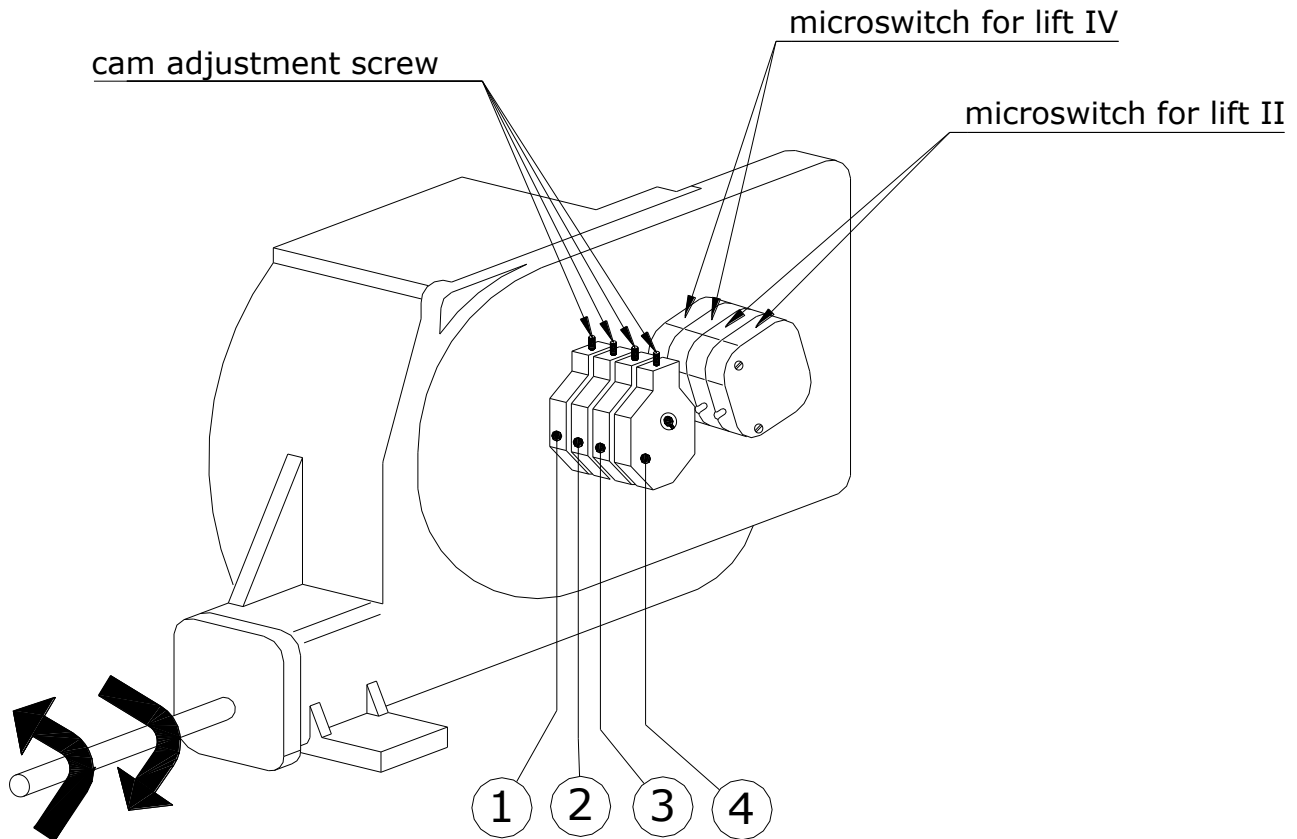
The operator may only work with slow vertical movements.

ADJUSTMENT: bring the trolley near the tower, tip of the jib and load the block with the equivalent of 10% more than the allowed value for the maximum speed (1300 kg on page 20); in this case the maximum hoisting speed must definitely not be allowed. To make this trip the switch, use the adjustment screw (pos 4) to make sure that the contacts of the microswitch open automatically at this speed and weight. Then lower the load and re-raise it with the correct weight (the limit). In these conditions the fast raising of the max load should happen without interruption of the microswitch. When finished, tighten the nut (pos 6) on the adjustment screw (pos 5). This device must be rechecked after adjusting the MAXIMUM LOAD INHIBITOR.

WARNING!!

Once calibrated, it is absolutely forbidden to manipulate this devices in order to supersede the limits of safe use.

HOISTING STOPPER - RAISING/LOWERING OF THE LOAD



This device is installed on the hoisting mechanism (winch) as shown on page 20 and made up of a worm reduction unit, complete with 4 cams that act on their respective microswitches as above indicated.

It takes effect (opens the contacts) when the cams that spin proportionately to the turns of the winch drum and therefore proportionately to the amount of wire rope that has been wrapped on the drum, come in contact with the microswitches and interrupt the raising or lowering of the load.

ADJUSTMENT: Prearrange the block in LIFT IV configuration (block + counterblock) and turn the selector in the switchboard on LIFT IV position.

Raise the block until it's one meter from the trolley. Using the adjustment screw, free the cam (pos. 1) until it stops the UP movement (coming in contact with its microswitch). Then fix the cam itself. Lower the block to the desired lower limit (keeping in mind that it doesn't touch the ground) and set the cam pos. 2 as above.

Prearrange the block in LIFT II configuration and turn the selector in LIFT II position.

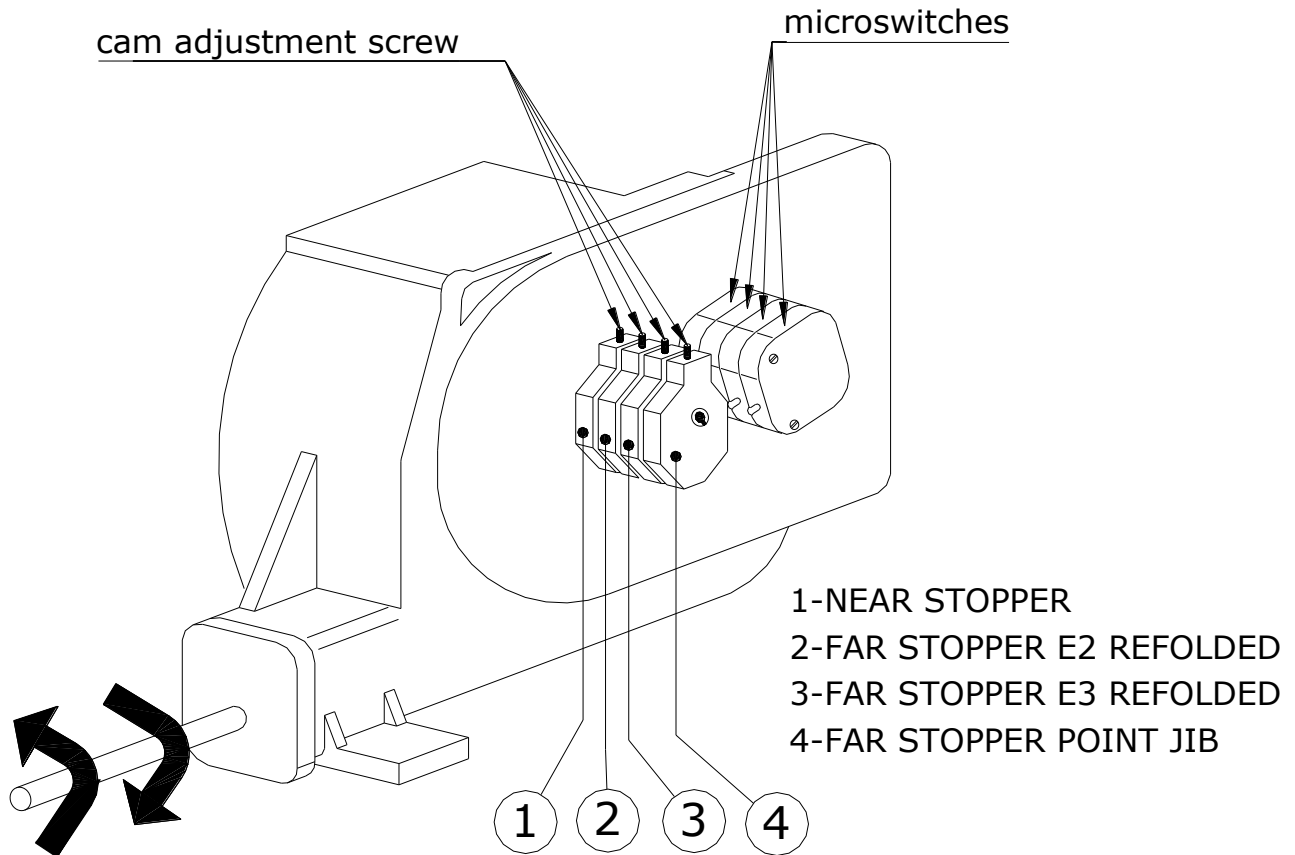
Repeat the operations previously described acting before on the cam pos. 3, then on the cam pos. 4.

IMPORTANT!!!

It is necessary that at every times and in all operations there are always three turns of wire rope on the drum.

The efficiency of this device must be monitored every time before starting a work-shift.

TROLLEY TRANSLATION STOPPER



This device is installed on the trolley translation mechanism as shown on page 20 and made up of a worm reduction unit, complete with 4 cams that act on their respective microswitches as above indicated.

It takes effect (opens the contacts) when the cams that spin proportionately to the turns of the drum and therefore proportionately to the amount of wire rope that has been wrapped on the drum itself, come in contact with the microswitches and interrupt the raising or lowering of the load.

ADJUSTMENT

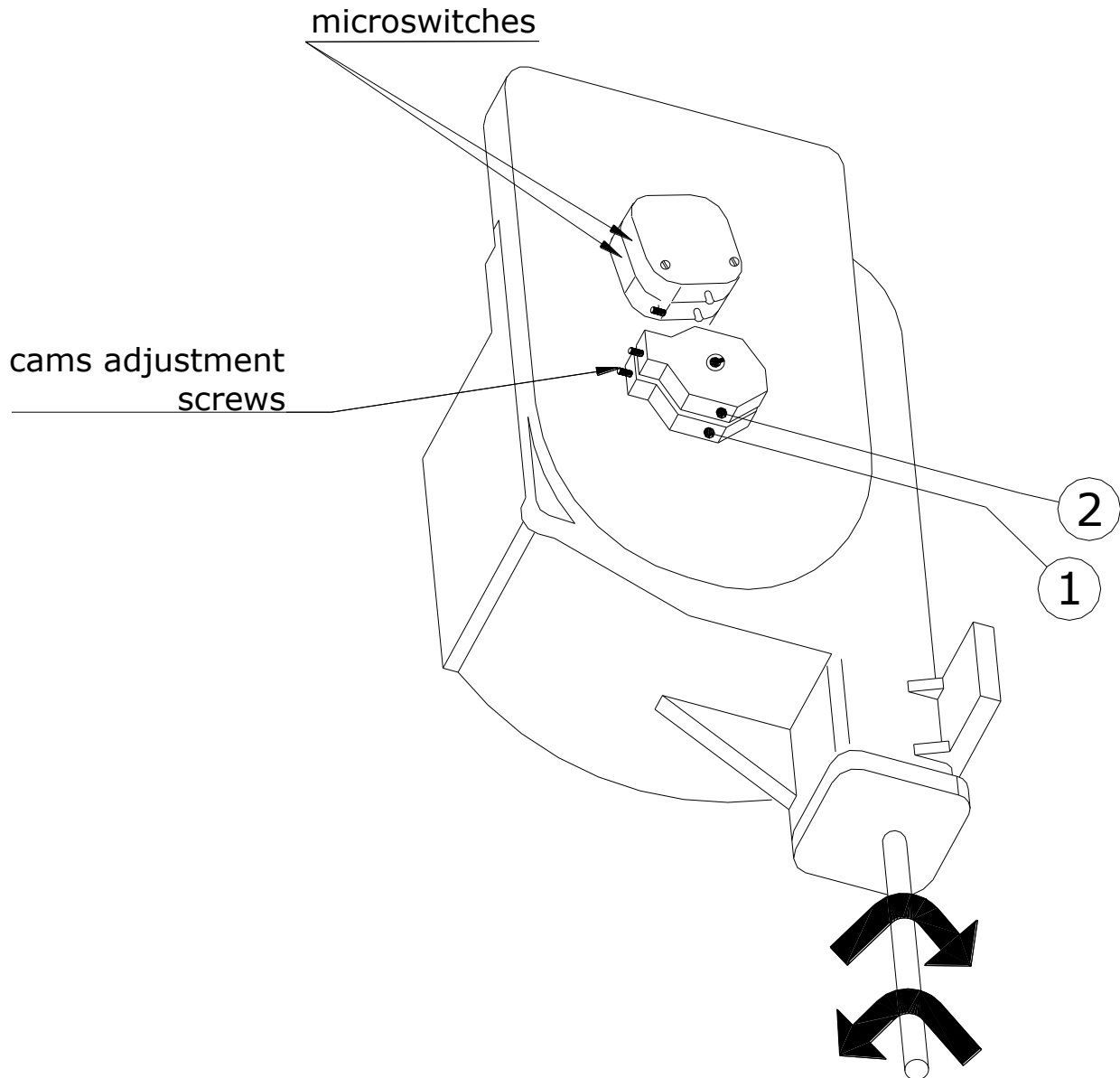
Bring the trolley towards the tower and free the cam pos. [1] acting on the adjustment screw until it stops the NEAR movement (coming in contact with its microswitch). Then fix the cam itself.

Repeat the operation for the others three positions, freeing the cams through the adjustment screws until they stop the FAR movement.

In every configuration, the cams that don't intervene are disconnected.

IMPORTANT!! Make sure that the stopping switches stop the trolley before it collides with the rubber bumpers.

SLEWING STOPPER - LEFT RIGHT



This device is installed on the rotating mechanism as shown on page 20 and is composed of a worm reduction unit complete with a pinion that meshes with the fifth wheel and with 2 cams which act upon their respective microswitches as described above.

It takes effect (opens the contacts) when the cams come in contact with their respective microswitches and interrupt the LEFT RIGHT movement of the crane.

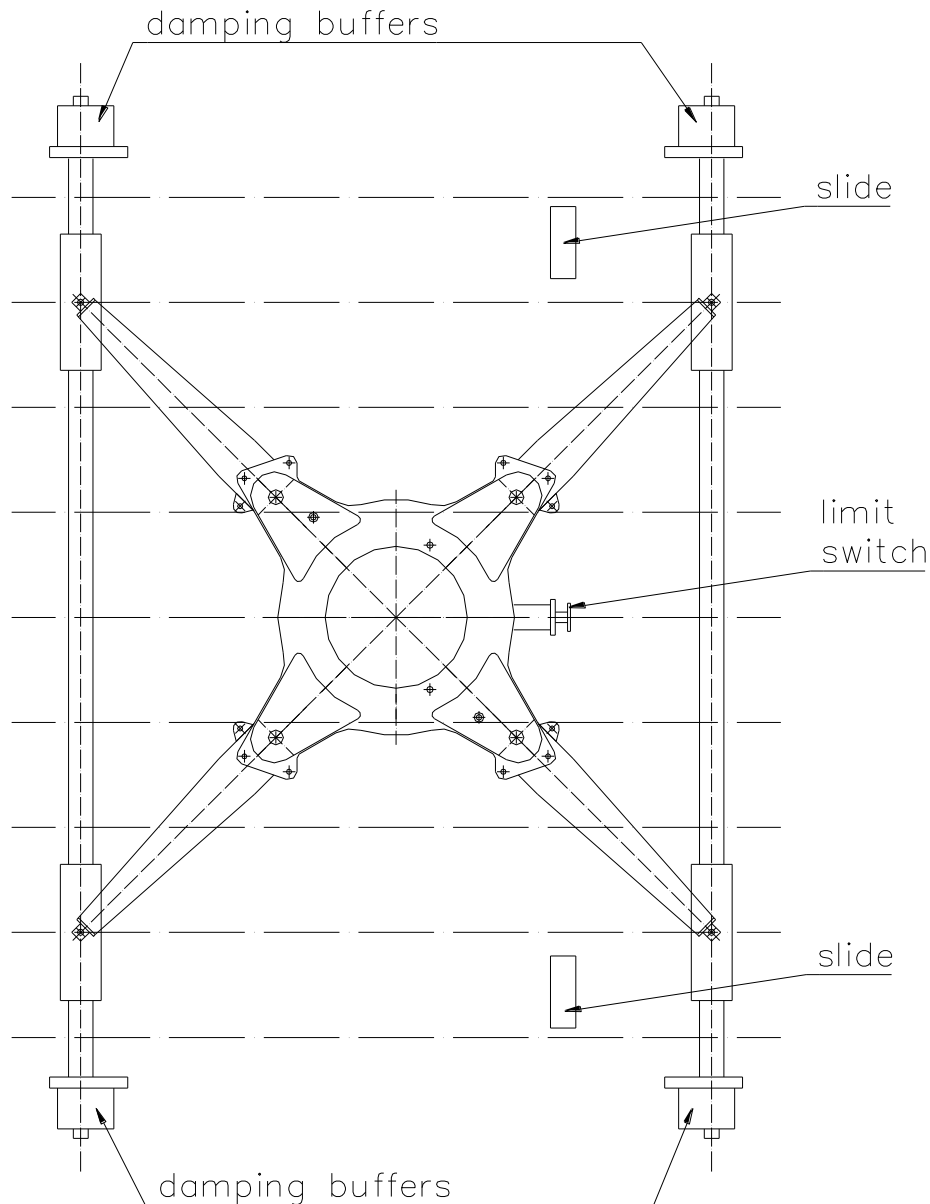
ADJUSTMENT rotate the crane in one direction three complete turns and, using the adjustment screw, free the cam number 1 until it interrupts the movement in that sense and comes in contact with its microswitch.

Repeat the process spinning the crane in the other direction and this time use cam number 2.

IMPORTANT!!

The efficiency of this device must be monitored every time before starting the work-shift.

FORWARD/BACK CRANE TRANSLATION LIMIT SWITCHES (optional)



-Installed on the crane translation mechanism as listed on page 20 and consisting of a lever switch with twin action wheel at pos. 1 secured to the undercarriage as shown above.

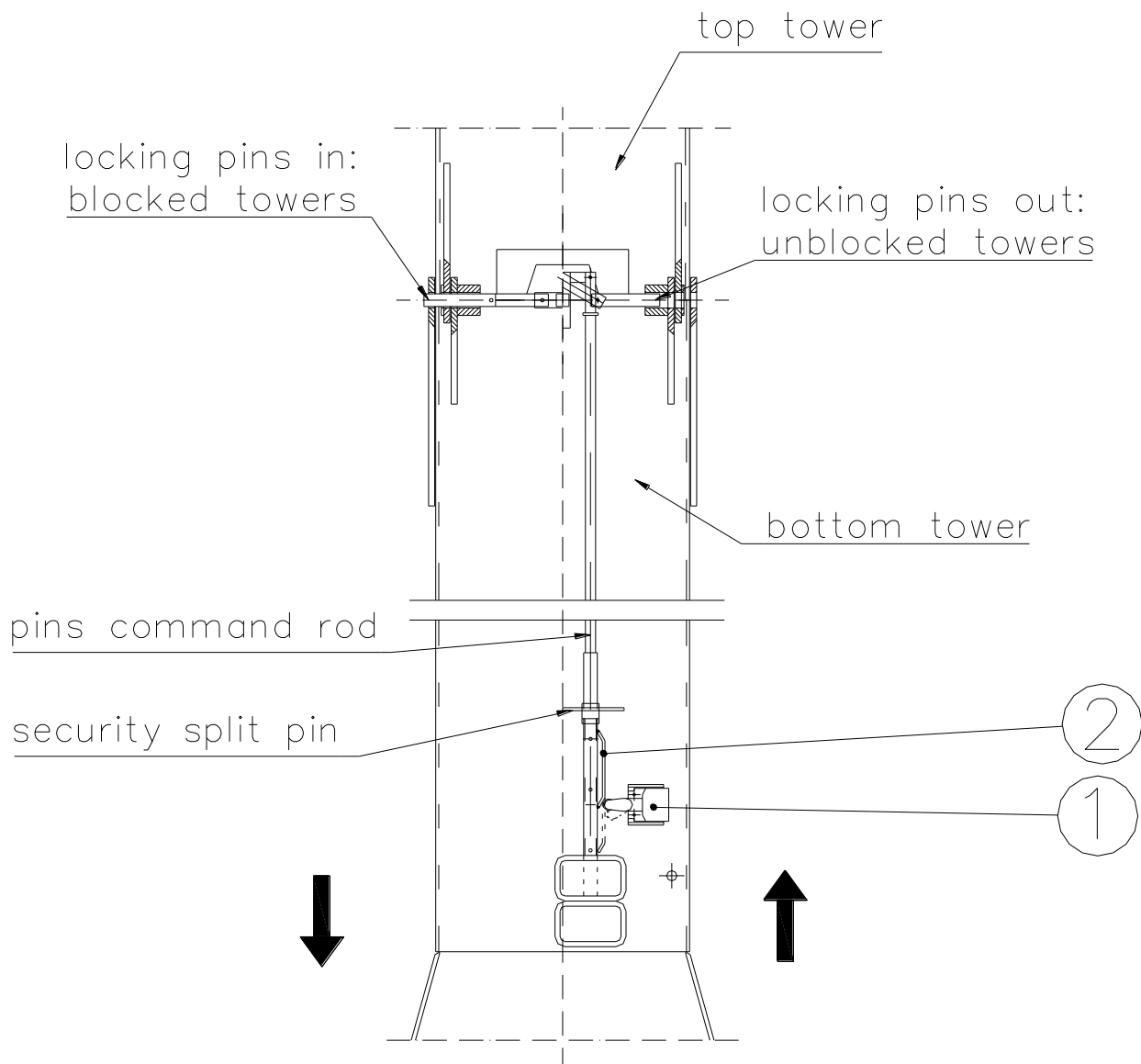
-It cuts in (contacts open) when the horizontal movement of a crane translating on track reaches the ends of the track, thereby interrupting the TRANSLATION FORWARD or TRANSLATION BACK movements.

ADJUSTMENT! Bring the crane with its horizontal motion close to the slides located at the ends of the track and adjust the slides' height so that they interfere with wheeled lever of switch 1 and open the contacts, thereby interrupting the motion.

Ensure there is at least 1 cm. extrastroke to the rotation of the wheel carrying jib.

IMPORTANT! The emergency action and consequent movement stoppage must as our before the translation carriages hit the damping buffers located at the ends of the track. Its efficiency must be checked every time before the start of a working shift.

TOWERS' CLOSURE LIMIT SWITCHES



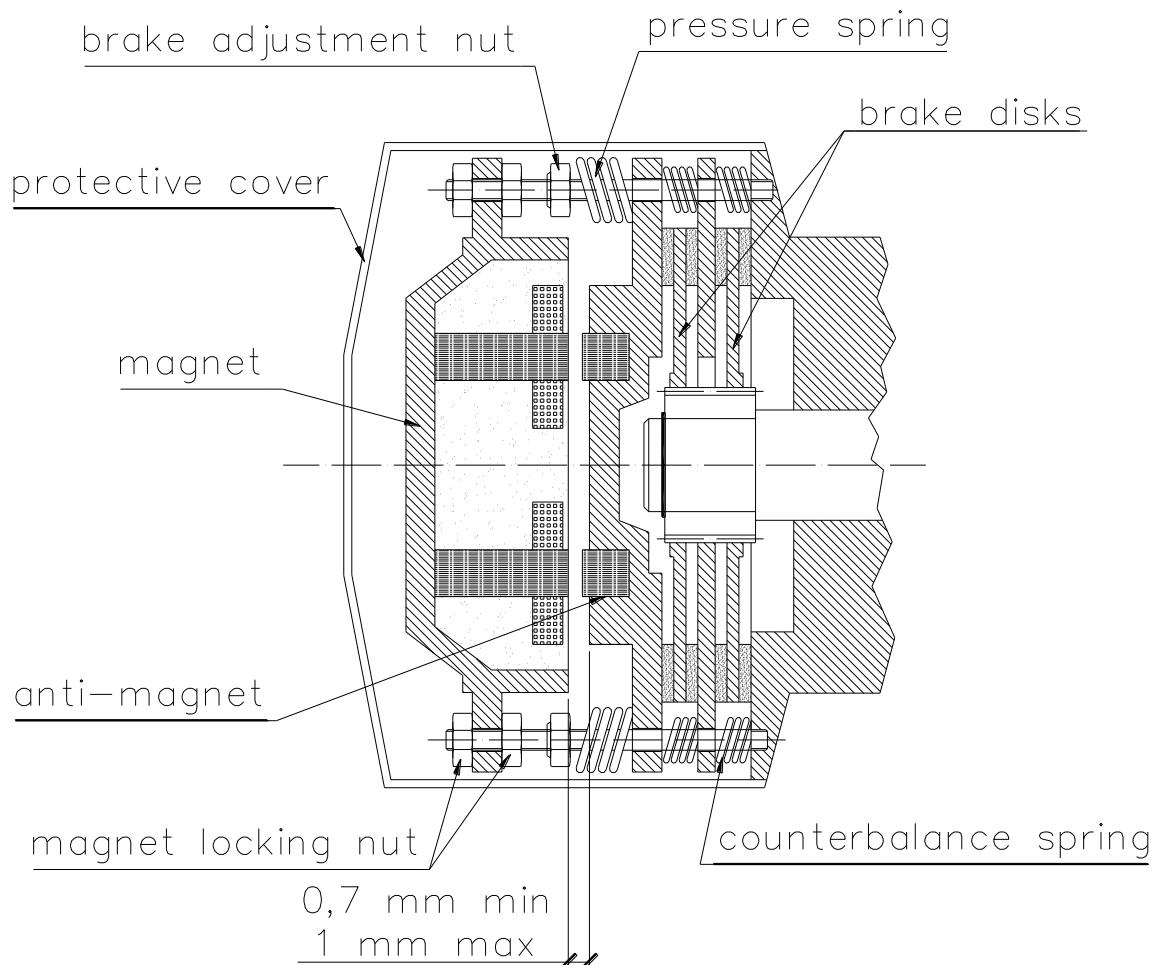
- The device installed at the base of the bottom tower consists of a microswitch at pos. 1 as shown in the sketch.

- It takes effect (contacts open) when, using the handle to pull down the pin command rod, the slide at pos. 2 interferes with the wheel of microswitch 1, opening the contacts and reset the lifting motor's circuit once the mains switch inside the panel has been placed on "WORK", thereby allowing the "UP" movement. Therefore this device will only allow the hoisting if the towers are interlocked; otherwise every hoisting operation isn't allowed.

7 - BRAKES, ADJUSTMENT AND CALIBRATION

HOISTING BRAKE MECHANISM

Type 140 MSDD- on motor kW 2,2-8,8-10,3
 breaking torque daNm 20



BREAKING ADJUSTMENT Remove the protective covers and use the adjustment nuts (tighten to increase and unscrew to reduce the braking effect).

After adjustment, be sure to check that the anti-magnet body runs freely on the guide rail post and that it is attracted to the magnet body without hums or buzzes.

The distance between the magnet bodies (airgap) must be a minimum of 0,7 mm and a maximum of 1 mm measured with a thickness gauge in at least three points along the circumference.

CHECKING THE PROPER OPERATION - After every adjustment and once a week, check that the distance of the airgap is within 0.7-1 mm. When this distance is greater than the above values, set it correctly with the adjustment nuts.

IMPORTANT!!

It is absolutely forbidden to manually disconnect the brake to make a suspended load come down to the ground.

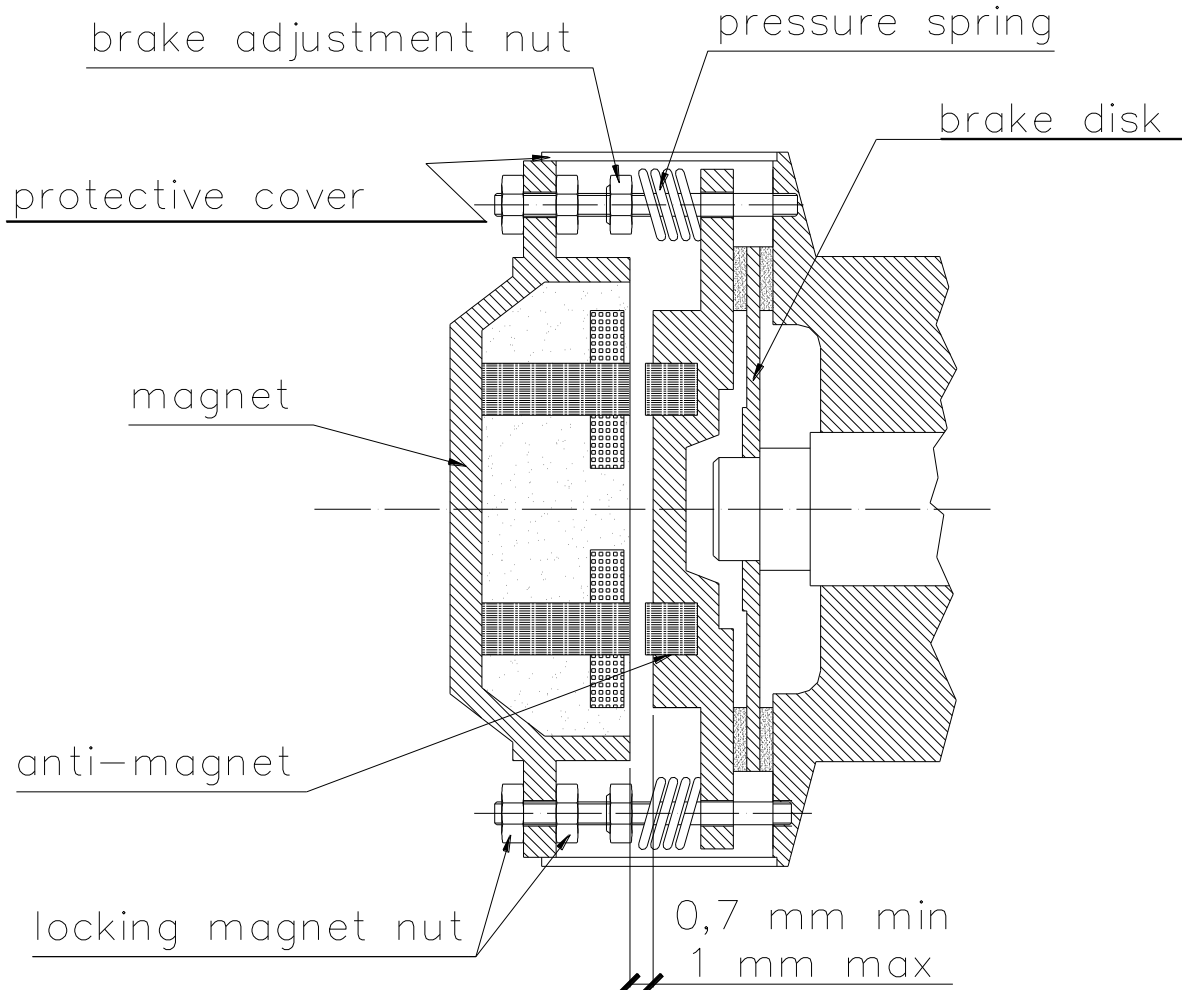
TROLLEY AND TRAVELLING TRANSLATION BRAKE MECHANISM

Type 100 S- on motor

kW 1,1/2,2

kW 1,1

breaking torque daNm 3,5



BREAKING ADJUSTMENT: Remove the protective cover and use the adjustment nuts (tighten to increase and unscrew to reduce the braking effect).

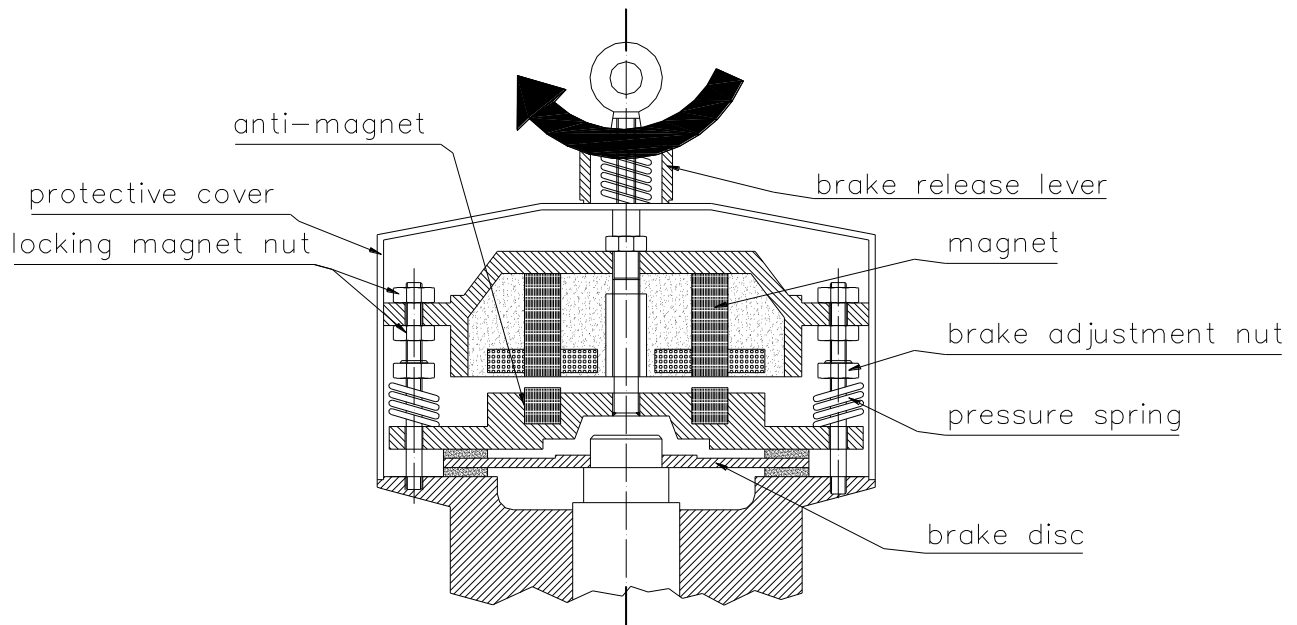
After adjustment, be sure to check that the anti-magnet body runs freely on the guide rail post and that it is attracted to the magnet body without hums or buzzes.

The distance between the magnet bodies (airgap) must be a minimum of 0.7mm and a maximum of 1mm measured with a thickness gauge in at least three points along the circumference.

CHECKING THE PROPER OPERATION - After every adjustment and once a week, check that the distance of the airgap is within 0.7-1 mm. When this distance is greater than the above values, set it correctly with the adjustment nuts.

ROTATION BRAKE DEVICE

Type 100 S- for motor daNm 3,5
 Braking torque daNm 1,6



This device is situated on the motor and acts as a static brake.

BREAKING ADJUSTMENT Remove the protective cover and use the adjustment nuts (tighten to increase and unscrew to reduce the braking effect).

After adjustment, be sure to check that the anti-magnet body runs freely on the guide rail post and that it is attracted to the magnet body without hums or buzzes.

The distance between the magnet bodies (airgap) must be a minimum of 0.7mm and a maximum of 1mm measured with a thickness gauge in at least three points along the circumference.

CHECKING THE PROPER OPERATION - After every adjustment and once a week, check that the distance of the airgap is within 0.7-1 mm. If this is not the case, adjust the distance using the adjustment nuts.

IMPORTANT!!!

When the crane is not in service you must release the rotation by turning the brake release lever clockwise as indicated by the arrow in the diagram above. In this way, you free the brake disk so that the crane can turn itself into the direction of the wind.

8 – USE AND SET-UP CRANE INSTRUCTIONS

OPERATIONS THAT MUST BE DONE EVERY WORK-SHIFT

- 1) Check that the inclination of the crane hasn't changed.
- 2) Check the levelling.
- 3) Check that all movements of the key-pad are fully functioning (see page 38 for key-pad information).
- 4) Check that the brakes are fully operational.
- 5) Check that the stopping devices work properly.

CORRECT USE OF THE CONTROLS

As regards the correct usage of the controls, please see the chapter on “TECHNICAL SPECIFICATIONS”. For information on the control devices, please see the chapter on “OPERATING CONDITIONS”. The crane operator is responsible for knowing all FORBIDDEN MANEUVERS OF THE CRANE, even those that are not shown on the diagrams on the electrical cabinet.

INSTRUCTIONS FOR ADJUSTING AND CALIBRATING THE TIMERS

As concerns the calibration of the crane's movement timers, these are shown on the electrical diagram on page 25/38 thus the timers are not to be concerned.

SETTING “OUT OF SERVICE” THE CRANE

The necessary steps for setting a crane out of operation are listed in the chapter “OPERATING CONDITIONS” - “NON OPERATING CRANE” on page 11. These instructions must be adhered to strictly.

9 - DISASSEMBLY INSTRUCTIONS

As previously stated in the “INTRODUCTION” chapter, the disassembly of the crane must be undertaken by competent and instructed personnel.

Before proceeding with any operation of the dismantling, make sure that there are no **installation limits** as described in chapter “OPERATING CONDITIONS”. Please note the diagram on page 60 and then point the crane in the proper direction for the disassembly.

The disassembly must be done in the following order:

- 1- Bring the trolley to the tip of the first jib element as shown in the diagram on page 70 and raise the block and hook about 1 meter from the trolley.
- 2- Open the panel and set the OPER/ASSEMBLY selector to ASSEMBLY.
- 3- Turn the selector “JIB/POINT-JIB” on POINT-JIB position; then, using the NEAR button, fold the point jib. Replace the selector on JIB position.
- 4- Acting on the NEAR button, refold the E2 jib element until it's at 15° to E1 element jib (see chart pag. 67-68).

IMPORTANT!! The folding of the jib must happen peremptorily before unloading the ballast.

- 5- Open the switchboard and turn the selector to the OPER position. Using the NEAR and DOWN button, bring the trolley back towards the tower and lower the block until the hook can be inserted in the U-bolt of the self-loading ballast wire rope. Discharge the ballast blocks following the operations on page 68.

CAUTION!! Type 1/2 ballast blocks, as shown in the chapter on “TECHNICAL SPECIFICATIONS” BALLAST BLOCKS COMPOSITION on page 45-46-47-48 should never be removed, because they are necessary for the stability of the crane during set-up and disassembly.

- 6- Having unloaded the ballast, bring the trolley to the end of the 1st jib element and raise the block about 1 meter from the trolley. Re-open the switchboard and turn the selector to OPER.
- 7- Release the towers by pushing up the pins' command rod handle and fitting the security split pin in the appropriate hole, as shown on page 82.
- 8- Using the “UP” control, pressurize the oil in the hydraulic tower cylinder, until it reaches 150 bar (read the manometer of the hydraulic gearbox) and then release the “UP” button.
- 9- Using the “DOWN” button, start the towers' refolding and continue until the towers are completely refolded.
- 10- Using the NEAR button, finish to fold the E2 jib element until it's placed against E1 element.

- 11- Manually pull the rear bracket towards to high and fix it with the appropriate pins at the tower (see pag.64). Then , fix with the appropriate pins the jib elements (see pag. 63).
 - 12- Pressing the excluder switch hoisting located on the switchboard (as shown on page 40), and acting on the “UP” button, lift the block until it’s possible to secure it to the trolley.
 - 13- Fit and secure the axles (front and rear) using the appropriate pins; unscrew and remove the tower cylinder feed pipes from the hydraulic gearbox and replace them with the stabilising jack feed pipes.
 - 14- Place the jack under the base-trolley (see sketch on page 63) interposing hardwood planks between it and the ground; then press the DOWN button to raise the machine getting free the bearing bases placed at the ends of the legs; then remove the bases and press the “UP” button so that the jack retrieves and the machine sits on the front axle tyres. Move the jack and place it under the rear axle (see sketch on page 63) and repeat the operations described above.
 - 15- At this point the crane is sitting on the tyres. Proceed by cutting off the power supply, remove the supply cable from the work-zone switchboard and remove the grounded electrodes. Place the legs haulage position, as shown in the sketch on page 62. The crane is thus ready for haulage within the work-zone or to be loaded on an approved vehicle (tractor and low semi-trailer).
If the crane is fitted with braked and tired axles, before towing, fit the appropriate warning signs and connect the lighting and braking system to the tractor, checking their perfect operation as well as the correct tyre pressure, referring to the description as per chapter “TOWING AND MOVEMENT INSTRUCTIONS”
 - 16- The operator must wear a protective helmet and proper protection during the disassembly procedure.
- The important things to keep in mind during the disassembly are:
- a) Disassembly must be executed in absence of wind.
 - b) Before beginning disassembly, the trolley must be brought to the end of the 1st jib element as described in part 1 of this chapter. Otherwise the trolley translation wire rope can be broken.
 - c) The folding of the jib upon itself must be executed before the discharging of the ballast blocks. It’s indispensable to leave the stabilizing ballast blocks on the crane as described in part 5 of this chapter.
 - d) Before opening the towers, recharge the pressure in the hydraulics system as described in part 8 of this chapter and on the plate on the hydraulic gearbox.
 - e) During disassembly, do not use the block and hook for hoisting operations, except when unloading the ballast.

10- MAINTENANCE INSTRUCTIONS

For all maintenance operations, the crane must be placed out of service. Therefore, before any maintenance operation the power must be disconnected and the crane must be disassembled.

MAINTENANCE INSTRUCTIONS FOR IN SERVICE CRANES

DAILY MAINTENANCE:

Beyond the OPERATIONS TO EFFECT EVERY WORKSHIFT (see page 86) of the USE AND SETUP CRANE INSTRUCTION chapter, make sure:

- of the efficiency of the grounding.
- that the wire rope are wrapped normally on the drums.
- to grease, especially at the beginning, the gearing of the fifth wheel which later becomes a part of the weekly maintenance.

WEEKLY MAINTENANCE:

- a) cleaning of the microswitch contacts on the inside of the switchboard, using a fine garnet paper or a special spray.
- b) cleaning and greasing of the wire ropes along their entire length using the proper grease to avoid entrance of water, dust and other particles.
- c) check and adjust the brake motors.
- d) check the oil level in the reduction gears.

MONTHLY MAINTENANCE:

- a) checking visually the condition of the wire ropes and tension of the trolley translation wire rope.
- b) check the thickness of the braking surfaces.
- c) check the state of the electrical cables.
- d) check the fuses inside the switchboard.
- e) if the crane is placed on tracks, check: the tracks' condition, the wheels' condition especially on the edges, the ballast conditions.

MAINTENANCE AT EVERY DISASSEMBLY:

- a) check and grease the pins.
- b) check the pulleys and their bearings.
- c) check the state of the tires especially around the edges.
- d) check the condition of the mechanisms (hoisting winch - trolley translation) and their efficiency.
- e) check the state of the fifth wheel and its gearing.
- f) check the tightness of the fixing bolts of the fifth wheel with a diametric wrench according to the following table.

This must be done at least once a year

TYPE BOLT
TIGHTEN TORQUE IN daNm

| Bolt diam. | 8.8 | 10.9 |
|------------|-----|------|
| M 16 | 19 | 26 |
| M 18 | 26 | 36 |
| M 20 | 37 | 52 |
| M 24 | 64 | 90 |
| M 27 | 95 | 135 |
| M 30 | 130 | 180 |

GUIDE TO THE REPLACEMENT OF PARTS SUBJECT TO WEAR

The following is a list of the parts of the crane that are subject to wear and the criteria for replacement:

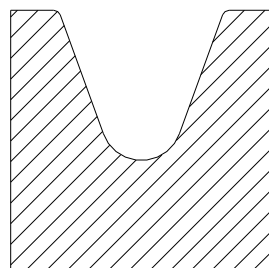
1) WIRE ROPES

The wire ropes must be replaced when:

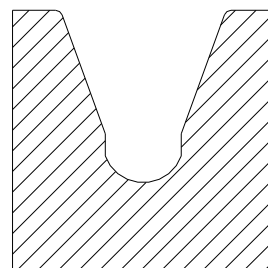
- a) **broken filaments**: bear in mind that often when filaments are broken it's difficult to notice the break. For best results, degrease the rope and manually bend it over its entire length to look for broken filaments.
- b) **use**: heavy wear of the filaments comes before breakage. Beyond a certain limit the worn filament must be considered as a broken filament. This limit is reached when the filament diameter seems reduced to half its original diameter.
- c) **Other signs of wear**: apart from what was mentioned previously, the cable must be replaced:
 - when its diameter is reduced to 10% of the original.
 - when a strand is completely broken.
 - when the cable has stains or permanent bends due to stress.
 - when the core comes out of the cable itself.
 - when the cable under tension has one or more slack strands.

2) PULLEYS

The pulleys must be replaced when the groove is different from its original state as shown in the diagram below.



CORRECT GROOVE



WORN GROOVE

If you don't substitute the pulleys in the cases above advised, the wire ropes will get worn and damaged.

3) BEARINGS

The bearings must be replaced in the following cases:

- a) when they have too much clearance between the rings.
- b) when they make strange noises-either a buzz or whistling.
- c) when they make strange movements with jerking sounds.
- d) when they have a blockage in the rings that prohibits rotational movement.

4) BRAKES

The brake disks must be replaced when they are too consumed.

5) ELECTRICAL PARTS

The electrical system is very important and microswitches and contacts must be carefully checked; they must be replaced when they flood or continue to flutter.

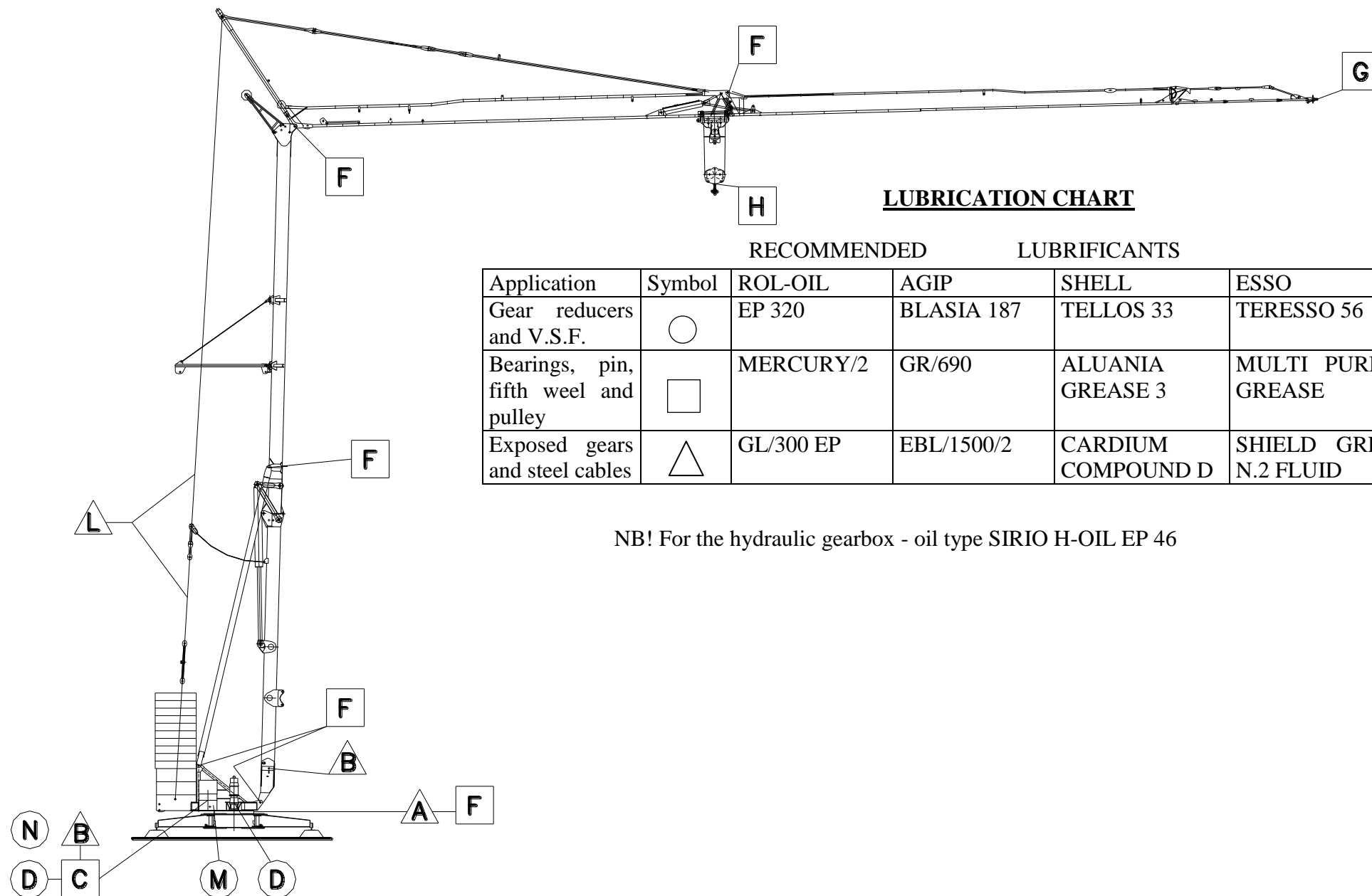
EVALUATION CRITERIA

- a) Check the structure of the crane every day. It must look geometrically sound and **"VISUALLY UNTOUCHED"** without any deformation of the elements that make it up.
- b) As regards the protection against rust, the structure has been galvanized and therefore requires no particular attention except for the base trolley.
- c) Check that the electrical cables are in a good state; particular attention must be given to the power supply cable and the key-pad cable: Change them when they show signs of excessive wear.

In any event, we advise you to have the crane checked by us or other qualified personnel within ten years of purchase.

STORAGE AND RETRIEVAL

During the non-operative period, we advise to leave the crane disassembled and placed on its stabilizers, with its hydraulics raised above the ground in a covered location not exposed to the elements.



LUBRICATION CHART

RECOMMENDED LUBRIFICANTS

| Application | Symbol | ROL-OIL | AGIP | SHELL | ESSO |
|---------------------------------------|--------|-----------|------------|--------------------|-------------------------|
| Gear reducers and V.S.F. | ○ | EP 320 | BLASIA 187 | TELLOS 33 | TERESSO 56 |
| Bearings, pin, fifth wheel and pulley | □ | MERCURY/2 | GR/690 | ALUANIA GREASE 3 | MULTI PURPOSE GREASE |
| Exposed gears and steel cables | △ | GL/300 EP | EBL/1500/2 | CARDIUM COMPOUND D | SHIELD GREASE N.2 FLUID |

NB! For the hydraulic gearbox - oil type SIRIO H-OIL EP 46

LUBRICATION PLANS

WEEKLY

A - Grease the teeth of the rotating fifth wheel and of the rotation pinions.

B - Grease the hoisting wire ropes and trolley translation.

C - Grease the bearings of the hoisting winch.

D - Check the oil levels in the rotation/hoisting reduction gears.

MONTHLY

E - Grease inside the rotation fifth wheel with the “TECALMIT” pump.

- Grease the pulleys’ bearings.

D - Adjust the oil level of the rotation/hoisting reduction gears.

AT EVERY ASSEMBLY

F - Grease all pivot pins.

G - Grease the spinner at the tip of the jib.

H - Grease the hook bearings.

L - Grease the steel tie rods if they are not galvanized.

M - Check and adjust the oil levels of the hydraulics gearbox.

N - Check and adjust the oil level of the hoisting reduction gear.

NB! The reduction gear of the trolley translation is permanently lubricated and doesn’t need further lubrication

11 - INSTRUCTIONS FOR NORMAL REPAIRS

-LIST OF COMMON PROBLEMS

1) ALL MOVEMENTS DON'T WORK

- Check the fuses of the main switch selector of the work-zone.
- Check the power supply cables.
- Check that all cables are still attached to the main switch selector.
- Check line and protection fuses of the transformer inside the electrical cabinet.

2) ONE OR MORE MOVEMENTS OF THE CRANE DON'T WORK

- Check that when the lever or button on the control-pad is pressed, its corresponding microswitch in the electrical cabinet reacts:

a) if the corresponding microswitch does:

- check the attachment of the motor, a wire may be loose;
- taking off the protective cover from the motor brake, check that the brake disks are not stuck to the motor plate. In this case, unstick them and clean them with fine sandpaper;
- check the phases of the brake magnet;
- if those in question are the “UP” and “TROLLEY FAR” movements, check the moment and max-load inhibitor devices (see page 75-77);
- if those in question are the “UP” and “DOWN” movements, check the hoisting stopper (see page 78)
- if those in question are the “TROLLEY NEAR - FAR” movements, check the trolley movement stopper (see page 79);

b) if the corresponding microswitch doesn't react:

- check the contacts of the key-pad and clean them all. Make sure that the exit cable corresponds to the blocked movement and that it hasn't come off or loose or become interrupted;
- check the fuses;

c) if the main knife switch doesn't take effect pressing “CLOSE CIRCUIT”:

- check the contacts of the key-pad and protection fuses;
- check the cable to the key-pad;

-If still unable to find the problem, please contact one of our agents or us giving the following:

- model number of the crane;
- serial number;
- year built;

12 - FURTHER DANGERS

As this crane is a moving machine (hoisting and moving) designed to carry loads over distance, and even though it was built according to the highest concerns of safety, it still presents certain dangers.

These are the dangerous conditions described in the chapter on “OPERATING CONDITIONS”--INSTALLATION LIMITS--CONTROL POSITION--USES NOT PERMITTED.

In order to establish a standard relationship between manoeuvrer and loader or receiver, here we have listed a series of standard commands.

RAISING:

Raising movement of his hand in a spiral motion

LOWERING:

Arm movement towards the ground

MINIMAL RAISE OR LOWERING:

Vertical movement of the hands according to the situation.

TRANSLATION:

Arm movement in the direction of movement

POSITIONING:

Horizontal arm movement according to the situation

STOPPING:

Horizontal arm movement at chest level

IMMINENT STOPPING

Two quick horizontal movements of the arms at chest level

13 - PERSONNEL TRAINING

This chapter is dedicated to the professional training of the personnel that will use this crane with the exclusion of the functions of assembly and disassembly and maintenance operations. Only specialized individuals may attempt these operations.

This training must take place according to the UNI-ISO 9926/1 and UNI-ISO 9936/3 laws.

OPERATOR CAPACITIES

The operator must have a fine and developed sense of:

- a) attention
- b) reflex speed to instantly convert a command into manoeuver
- c) reaction speed
- d) good eyesight and tracking -- distance, depth and height
- e) good balance sense of hanging and balanced loads
- f) understanding of weights and speeds
- g) time sense
- h) agility
- i) manual skills
- j) trustworthiness

As regards that which limits these tasks, they are:

- a) limited vision
- b) dizziness
- c) mental illnesses--epilepsy, etc.
- d) physical handicaps that hinder his/her capacity

TARGETS OF THE TRAINING PROCESS

The training process is deemed finished when that person has a firm grip of not only the theoretical and practical uses of the apparatus but also when he or she is fully conscious of the dangers and responsibilities of using such a machine. The goal of the training process is to arrive at the modern work-zone concept, "WORK SAFELY".

TRAINING PROCEDURE

The training must take place with theoretical and practical courses taught by qualified professionals in the sector or from selected related associations in a way in which the trainee can thoroughly learn these theoretical and practical skills.

TECHNICAL SKILLS LIST

- a) professional role
- b) hoisting technology
- c) in service and out of service apparatus
- d) use of the apparatus and safety rules
- e) code of conduct
- f) communication
- g) moving materials
- h) Inspection maintenance and accidents
- i) knowledge of the present manual

PRACTICAL SKILLS LIST

- a) operating drills
- b) moving drills
- c) use, tests, maintenance, emergency situation drills

14 - DISMANTLING OF THE APPARATUS

The crane, once entered in the market and installed in the work-zone, it's subject to inspection and periodic verification by public authorities of the related sector. Thus, when you dismantle the crane, the relevant authorities must be notified.

Upon dismantling, cancel and destroy the identification tags and all other documentation relative to the crane from MASOL S.R.L. with the exception of Public documents, which should be returned to the Public Entity itself.

The crane is made up of:

- a) ferric materials - the structure
- b) ferric materials and cast iron - devices where oil or grease is involved
- c) ferric, copper, rubber, and plastic materials - electrical system
- d) ferric and rubber materials- the wheels and axles

If the dismantling is done by a third part, we advice you to use authorized companies that comply with the laws of storage and disposal of special materials and those to be disposed of.

- If you undertake the dismantling yourselves, we advice that you:

- a) sort by type:
 - ferric materials which make up almost the totality of the crane;
 - cast iron;
 - copper;

These materials are traded and bought and sold in specific metallurgy markets and can be sold to steel mills and metal plants where they can be reused and resold.

b) sort by type:

- plastic materials;
- rubber;
- store oil and grease in tin containers.

For these types of materials, classified as special materials comparable with urban waste (plastic materials and rubber) or as special waste (oil and grease), there are specific legal restrictions for disposal. We advice you to seek professional companies who specialize in the disposal of these materials.

15 – SPARE PARTS AND ACCESSORIES

IMPORTANT!!

We remind you that the use of non-original MA.SOL. spare parts or those which are not specific to the model of the present manual, annuls immediately the guarantees and brings great risks and danger to the proper operation of the crane.

Any request for spare parts, must be accompanied by:

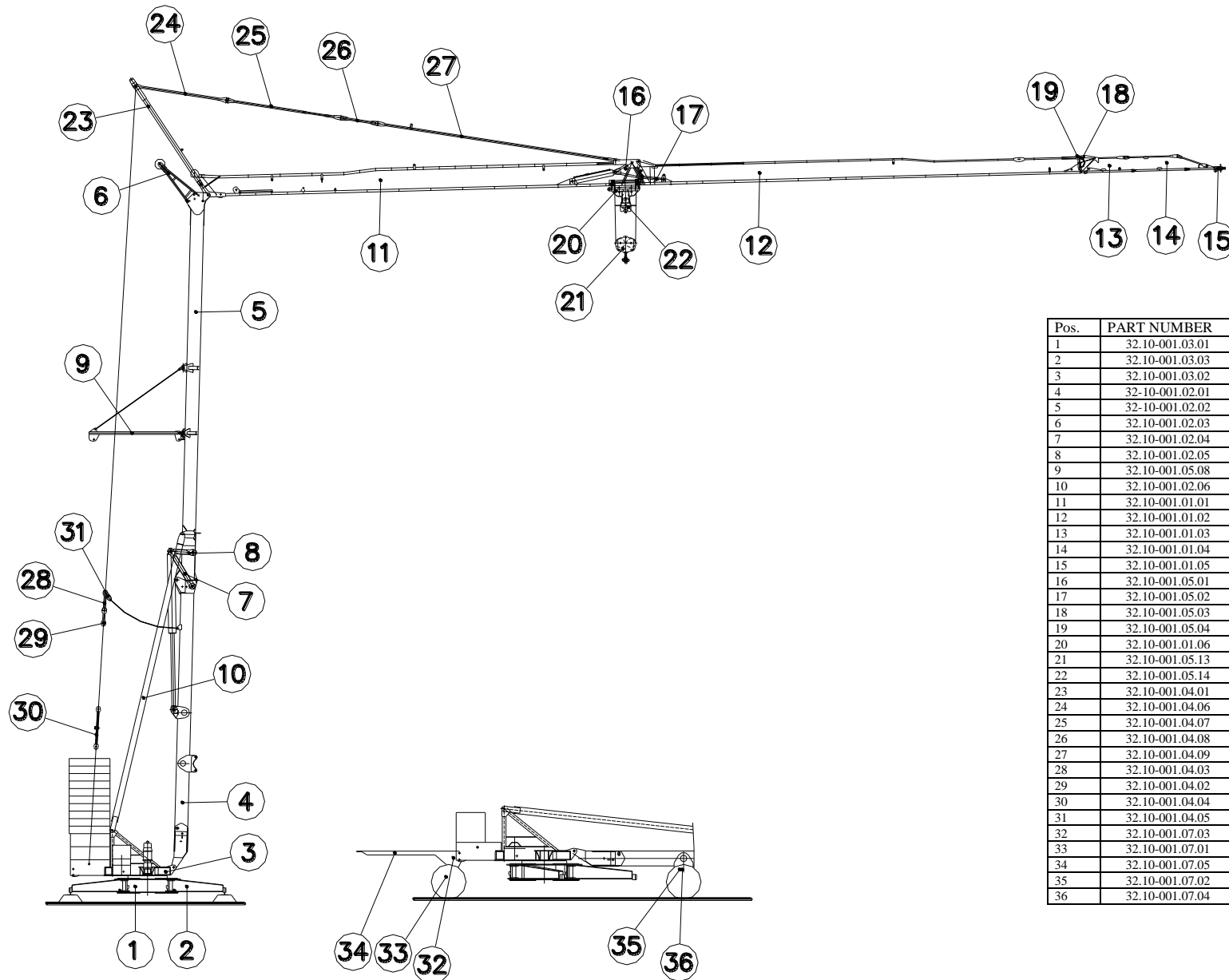
- a) (precisely): **MODEL NUMBER**
SERIAL NUMBER
YEAR OF CONSTRUCTION
- DESCRIPTION OF THE GOODS**
PART NUMBER
QUANTITY

Addressing to:

MA.SOL. s.r.l.
Via Buonarroti 26/3
26024 - Paderno Ponchielli - (CR)
tel 0374-367098 -67428
fax 0374-367128

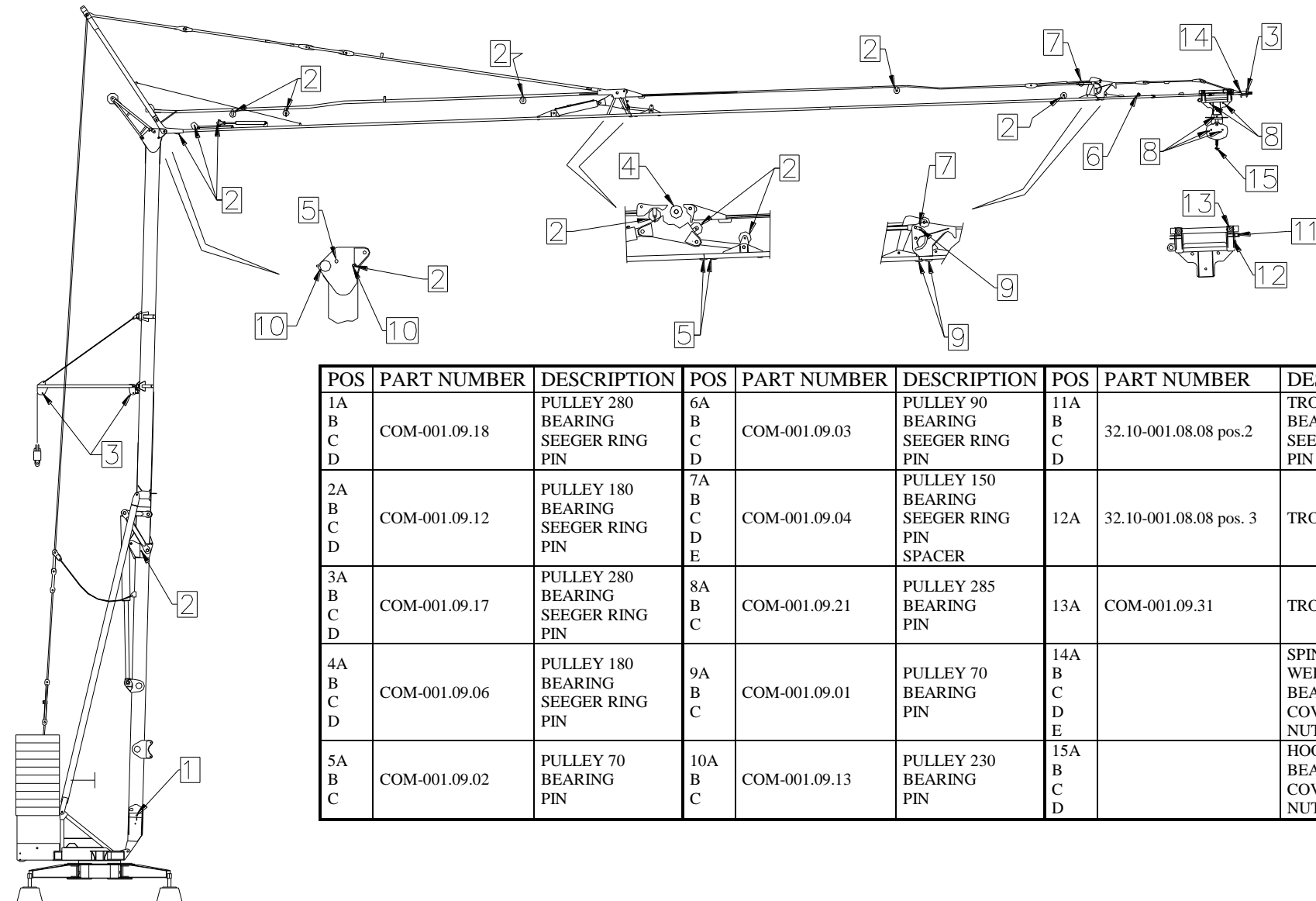
- The shipment of spare pieces is usually undertaken through a courier service, in an attempt to reduce the delivery time.

LIST OF PARTS



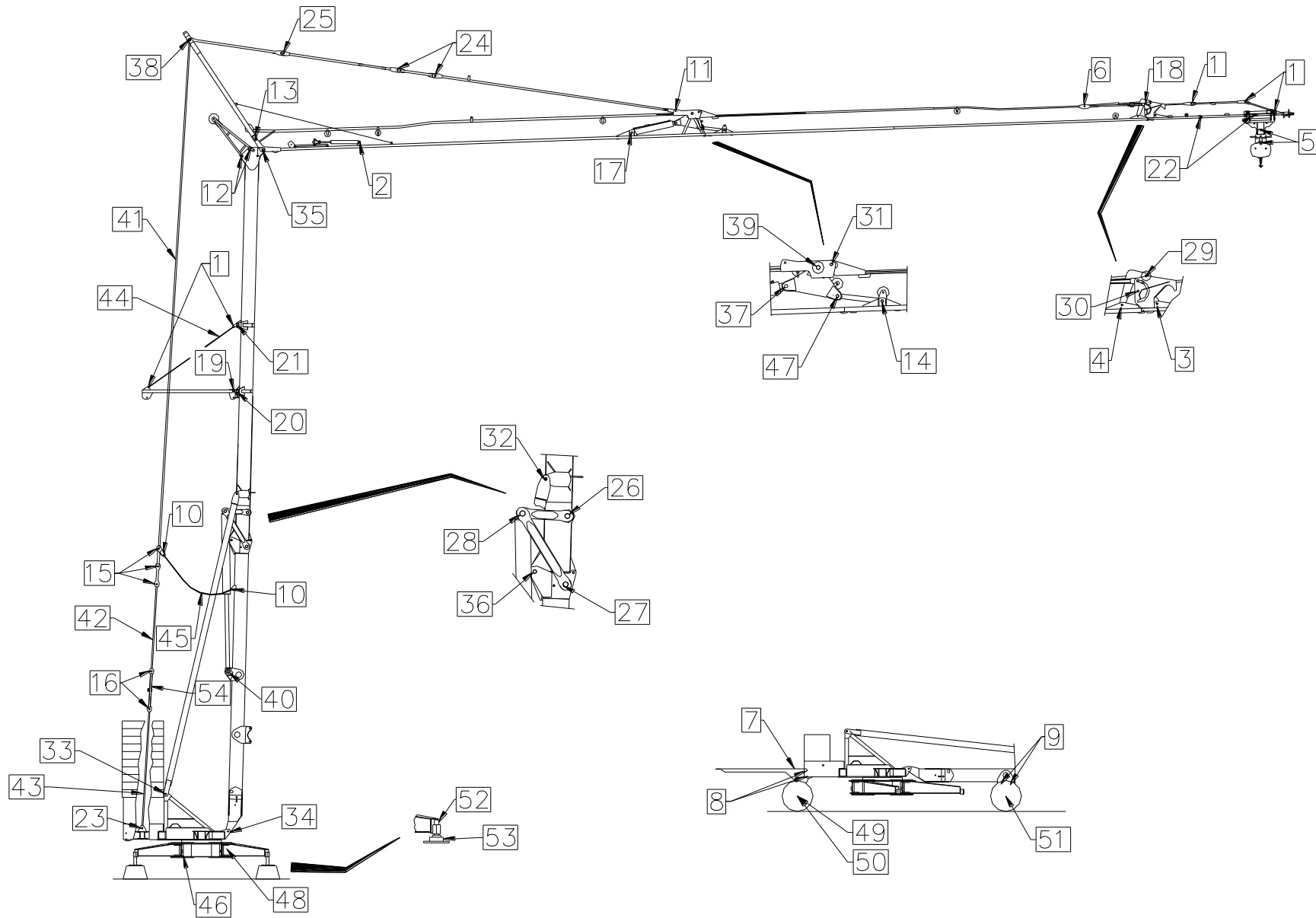
| Pos. | PART NUMBER | DESCRIPTION |
|------|-----------------|---------------------------------|
| 1 | 32.10-001.03.01 | Base trolley |
| 2 | 32.10-001.03.03 | Leg |
| 3 | 32.10-001.03.02 | Rotating platform |
| 4 | 32.10-001.02.01 | Lower tower |
| 5 | 32.10-001.02.02 | Upper tower |
| 6 | 32.10-001.02.03 | Rear bracket |
| 7 | 32.10-001.02.04 | Assembly beam |
| 8 | 32.10-001.02.05 | Assembly beam |
| 9 | 32.10-001.05.08 | Self – loading ballast derrick |
| 10 | 32.10-001.02.06 | Tower beam |
| 11 | 32.10-001.01.01 | JIB – Element E1 |
| 12 | 32.10-001.01.02 | JIB – Element E2 |
| 13 | 32.10-001.01.03 | JIB – Element E3 |
| 14 | 32.10-001.01.04 | JIB – Element E4 |
| 15 | 32.10-001.01.05 | Mobile point |
| 16 | 32.10-001.05.01 | Opening triangle |
| 17 | 32.10-001.05.02 | Opening beam |
| 18 | 32.10-001.05.03 | Opening beam E3 element |
| 19 | 32.10-001.05.04 | Closing bracket E3 element |
| 20 | 32.10-001.01.06 | Trolley |
| 21 | 32.10-001.05.13 | Block |
| 22 | 32.10-001.05.14 | Counterblock |
| 23 | 32.10-001.04.01 | Strut |
| 24 | 32.10-001.04.06 | Strut-side tie rod |
| 25 | 32.10-001.04.07 | Jib tie rod I |
| 26 | 32.10-001.04.08 | Jib tie rod II |
| 27 | 32.10-001.04.09 | Jib-side tie rod |
| 28 | 32.10-001.04.03 | Top biscuit |
| 29 | 32.10-001.04.02 | Inclining biscuit |
| 30 | 32.10-001.04.04 | Inhibitor switch biscuit |
| 31 | 32.10-001.04.05 | Rear attachment tie rod biscuit |
| 32 | 32.10-001.07.03 | Goose neck |
| 33 | 32.10-001.07.01 | Front axle |
| 34 | 32.10-001.07.05 | HAULAGE steering mechanism |
| 35 | 32.10-001.07.02 | Rear axle |
| 36 | 32.10-001.07.04 | Axle adapter |

PULLEYS AND PINS



| POS | PART NUMBER | DESCRIPTION | POS | PART NUMBER | DESCRIPTION | POS | PART NUMBER | DESCRIPTION |
|-------------------|---------------|---------------------------------------------|------------------------|---------------|-------------------------------------------------------|-------------------------|------------------------|---------------------------------------------------------------------|
| 1A B C D | COM-001.09.18 | PULLEY 280 BEARING SEEGER RING PIN | 6A B C D | COM-001.09.03 | PULLEY 90 BEARING SEEGER RING PIN | 11A B C D | 32.10-001.08.08 pos.2 | TROLLEY LATERAL RAIL BEARING SEEGER RING PIN |
| 2A B C D | COM-001.09.12 | PULLEY 180 BEARING SEEGER RING PIN | 7A B C D E | COM-001.09.04 | PULLEY 150 BEARING SEEGER RING PIN SPACER | 12A | 32.10-001.08.08 pos. 3 | TROLLEY LATERAL RAIL |
| 3A B C D | COM-001.09.17 | PULLEY 280 BEARING SEEGER RING PIN | 8A B C | COM-001.09.21 | PULLEY 285 BEARING PIN | 13A | COM-001.09.31 | TROLLEY WHEEL |
| 4A B C D | COM-001.09.06 | PULLEY 180 BEARING SEEGER RING PIN | 9A B C | COM-001.09.01 | PULLEY 70 BEARING PIN | 14A B C D E | | SPINNING ATTACHMENT PIN WEDGE 1000 kg BEARING COVER NUT |
| 5A B C | COM-001.09.02 | PULLEY 70 BEARING PIN | 10A B C | COM-001.09.13 | PULLEY 230 BEARING PIN | 15A B C D | | HOOK 4000 kg BEARING COVER NUT |

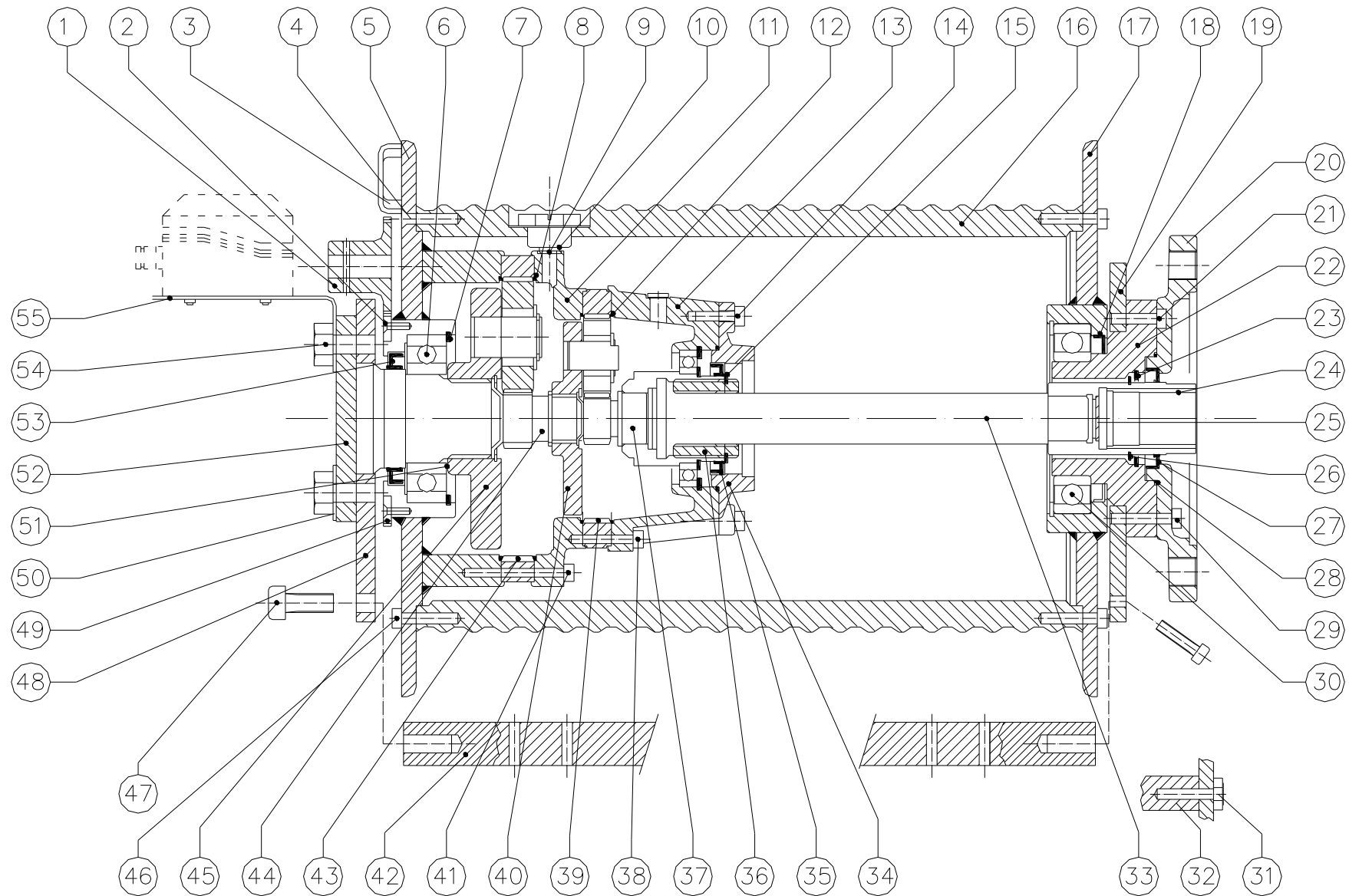
MECHANICAL PINS



MECHANICAL PINS

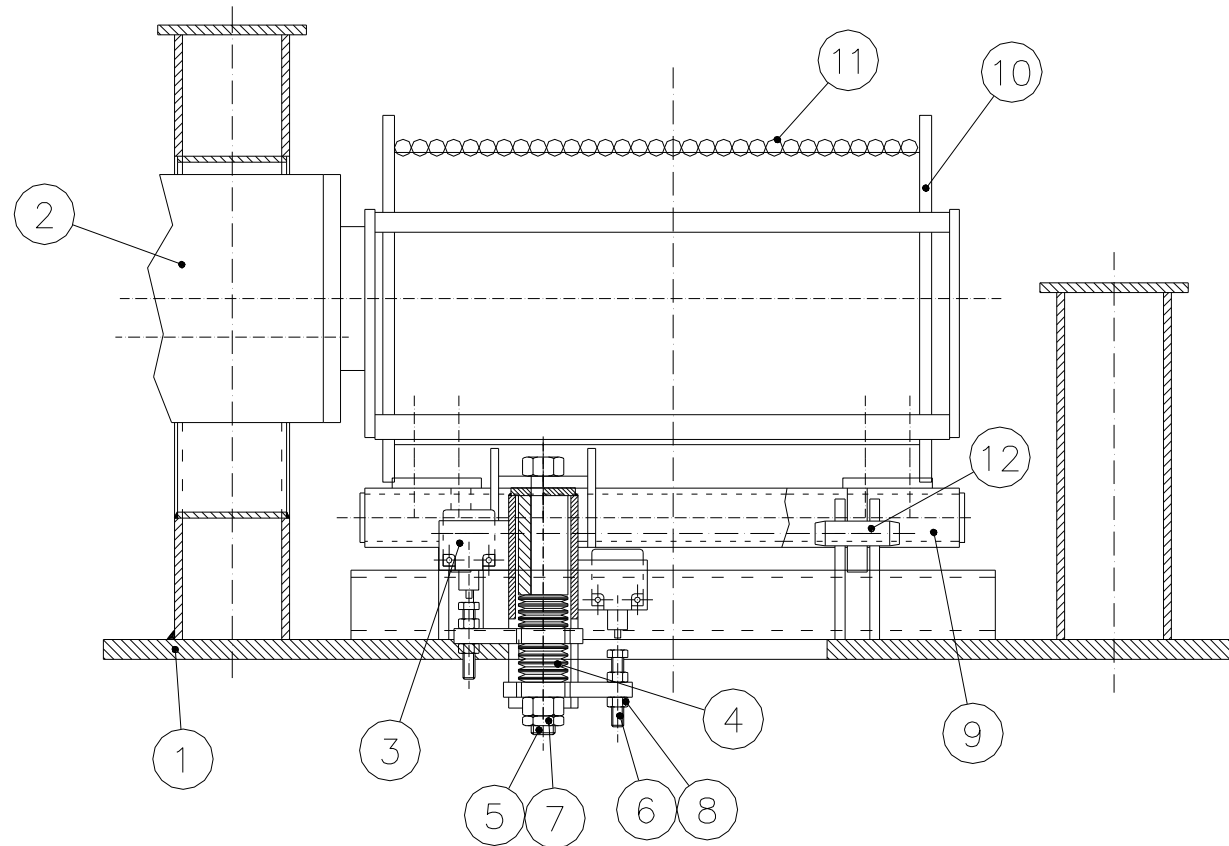
| POS. | CODICE | DESCRIZIONE | POS. | CODICE | DESCRIZIONE |
|----------------|-------------------------|----------------------------------------------------------|----------------|-------------------------|--------------------------------------------------------|
| 1 | 32.10-001.08.01 pos. 1 | Fix. Pin: beam-mobile point, E2-E3, self-loading ballast | 28 A B C | 32.10-001.08.04 pos. 3 | Fix. Pin: assembly beam-cylinder Washer Ring nut |
| 2 | 32.10-001.08.01 pos. 2 | Fix. Pin: cylinder tension wire rope | 29 A B C | 32.10-001.08.03 pos. 1 | Fix. Pin: point jib cylinder Washer Nut |
| 3 | 32.10-001.08.01 pos. 3 | Pin: opening beam E3 element | 30 A B C | 32.10-001.08.03 pos. 2 | Pin: E2-E3 element hinge Washer Nut |
| 4 | 32.10-001.08.01 pos. 4 | Pin: closing racket E3 element | 31 A B C | 32.10-001.08.03 pos. 3 | Pin: E1-E2 element hinge Washer Nut |
| 5 | 32.10-001.08.01 pos. 5 | Fix. Pin: counterblock and trolley | 32 A B C | 32.10-001.08.03 pos. 4 | Pin: top hinge of tower beam Washer Nut |
| 6 | 32.10-001.08.01 pos. 6 | Fix. Pin: point jib cylinder | 33 A B C | 32.10-001.08.03 pos. 5 | Pin: lower hinge of tower beam Washer Nut |
| 7 | 32.10-001.08.01 pos. 9 | HAULAGE steering pin | 34 A B C | 32.10-001.08.03 pos. 6 | Pin: hinge tower-platform Washer Nut |
| 8 | 32.10-001.08.01 pos. 10 | Attachment pin: front axle | 35 A B C | 32.10-001.08.03 pos. 7 | Pin: hinge tower-jib Washer Nut |
| 9 | 32.10-001.08.01 pos. 11 | Attachment pin: rear axle | 36 A B C | 32.10-001.08.03 pos. 8 | Pin: hinge towers Washer Nut |
| 10 | 32.10-001.08.01 pos. 15 | Perno tiranti aiuto | 37 A B C | 32.10-001.08.03 pos. 9 | Fix. Pin cylinder-opening triangle Washer Nut |
| 11 | 32.10-001.08.01 pos. 16 | Pin: tower help tie rod | 38 A B C | 32.10-001.08.03 pos. 10 | Pin: tip strut Washer Nut |
| 12 | 32.10-001.08.01 pos. 17 | Pin: Rear bracket hinge | 39 A B C | 32.10-001.08.03 pos. 11 | Pin: hinge triangle Washer Nut |
| 13 | 32.10-001.08.01 pos. 18 | Lower strut pin | 40 A B C | 32.10-001.08.03 pos. 12 | Fix. Pin: tower-cylinder Washer Nut |
| 14 | 32.10-001.08.01 pos. 19 | Fix. Pin: beam-E2 element | 41 | 32.10-001.04.10 pos. 1 | Top rear tie rod |
| 15 | 32.10-001.08.01 pos. 20 | Attachment pin rear tie rod | 42 | 32.10-001.04.10 pos. 2 | Intermediate rear tie rod |
| 16 | 32.10-001.08.01 pos. 21 | Attachment pin rear tie rod | 43 | 32.10-001.04.10 pos. 3 | Bottom rear tie rod |
| 17 | 32.10-001.08.01 pos. 22 | Fix. Pin cylinder jib-E1 | 44 | 32.10-001.04.10 pos. 5 | Derrick tie rod |
| 18 | 32.10-001.08.01 pos. 23 | Fix. Pin E2-E3 element | 45 | 32.10-001.04.10 pos. 4 | Help tower tie rod |
| 19 | 32.10-001.08.02 pos. 1 | Fix. Pin: derrick | 46 | 32.10-001.08.06 pos. 3 | Fix. Pin: leg |
| 20 | 32.10-001.08.02 pos. 2 | Pin: lower hinge of derrick | 47 | 32.10-001.08.06 pos. 4 | Fix. Pin: opening beam to triangle |
| 21 | 32.10-001.08.02 pos. 3 | Pin: top hinge of derrick | 48 A B | 32.10-001.08.05 | Leg pin Ring nut |
| 22 | 32.10-001.08.02 pos. 4 | Pin: jointing lower beam | 49 | | Bearing |
| 23 | 32.10-001.08.02 pos. 22 | Fix. Pin: tie-rod to platform | 50 | | Tyre |
| 24 | 32.10-001.08.02 pos. 23 | Fix. Pin: jib tie-rod | 51 | | Tyre |
| 25 | 32.10-001.08.02 pos. 24 | Fix. Pin: jib tie-rod | 52 | | Stabilizer screw |
| 26 A B C | 32.10-001.08.04 pos. 1 | Fix. Pin: top assembly beam Washer Ring nut | 53 | | Bearings bases |
| 27 A B C | 32.10-001.08.04 pos. 2 | Fix. Pin: lower assembly beam Washer Ring nut | 54 | | Moment inhibitor |

HOISTING MECHANISM – TYPE WINCH: SW12L-EL

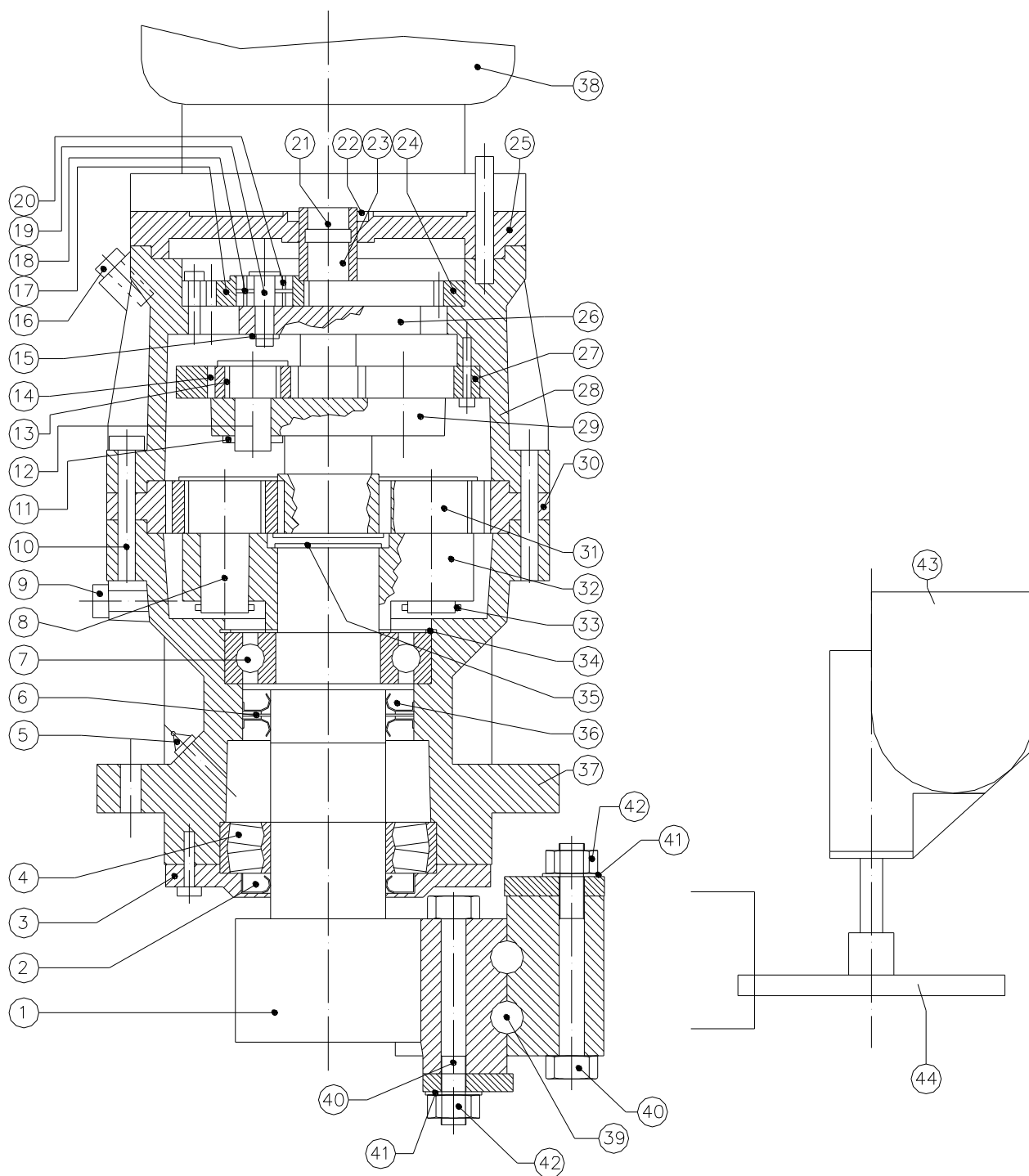


| POSITION | CODE | DESCRIPTION | POSITION | CODE | DESCRIPTION |
|----------|------|----------------------------|----------|------|------------------------------|
| 1 | | Stopper pinion | 29 | | Screw TCEI M10x35 8.8 |
| 2 | | Screw TSPEI M6x16 10.9 | 30 | | Ball bearing |
| 3 | | Radancia | 31 | | Screw TE M10x25 10.9 |
| 4 | | Screw TSPEI M8x25 10.9 | 32 | | Top bar |
| 5 | | Reducer-side flange | 33 | | Transmission shaft |
| 6 | | Ball Bearing | 34 | | Motor coupling flange |
| 7 | | Seeger Ring | 35 | | Oil retainer |
| 8 | | Packing OR 2-171 | 36 | | Grooved joint |
| 9 | | Gummed washer | 37 | | Solar 2ST R1:5.77 |
| 10 | | Plug screw TCEI | 38 | | Screw TCEI M10x40 12.9 |
| 11 | | Intermediate flange | 39 | | Gear rim 1ST |
| 12 | | Packing OR 147x2,62 | 40 | | Satellite bearing RE11 |
| 13 | | ST RE 110/210/240 | 41 | | Screw TCEI M10x60 |
| 14 | | Screw TCEI M10x30 8.8 | 42 | | Fixing plate |
| 15 | | Shaft seeger ring | 43 | | Gear rim RE 300 |
| 16 | | Threaded drum Right | 44 | | Solar 2ST R 5,3 |
| 17 | | Motor-side flange | 45 | | Satellite bearing RE31 |
| 18 | | Oil retainer | 46 | | Screw TCEI M8x25 12.9 |
| 19 | | Motor-side winch's support | 47 | | Screw TCEI M10x25 12.9 |
| 20 | | Attachment flange | 48 | | Reducer-side winch's support |
| 21 | | Screw TCEI M8x16 8.8 | 49 | | Stopper gear rim |
| 22 | | Carrying flange winch | 50 | | Washer C50 |
| 23 | | Seeger ring | 51 | | Thickness |
| 24 | | Input joint ME 132 | 52 | | Anti-slewing flange |
| 25 | | Plug | 53 | | Oil retainer |
| 26 | | Shaft seeger ring | 54 | | Screw TE M12x25 10.9 |
| 27 | | Oil retainer | 55 | | Stopper's support |
| 28 | | Packing OR 2-154 | | | |

HOISTING MECHANISM – TYPE WINCH: SW12L-EL



| POSIZIONE | CODICE | DENOMINAZIONE |
|-----------|--------|-------------------|
| 1 | | Rotating platform |
| 2 | | Motor |
| 3 | | Microswitch |
| 4 | | Belleville washer |
| 5 | | Screw |
| 6 | | Screw |
| 7 | | Nut |
| 8 | | Nut |
| 9 | | Frame |
| 10 | | Drum |
| 11 | | Wire rope |
| 12 | | Fixing pin |

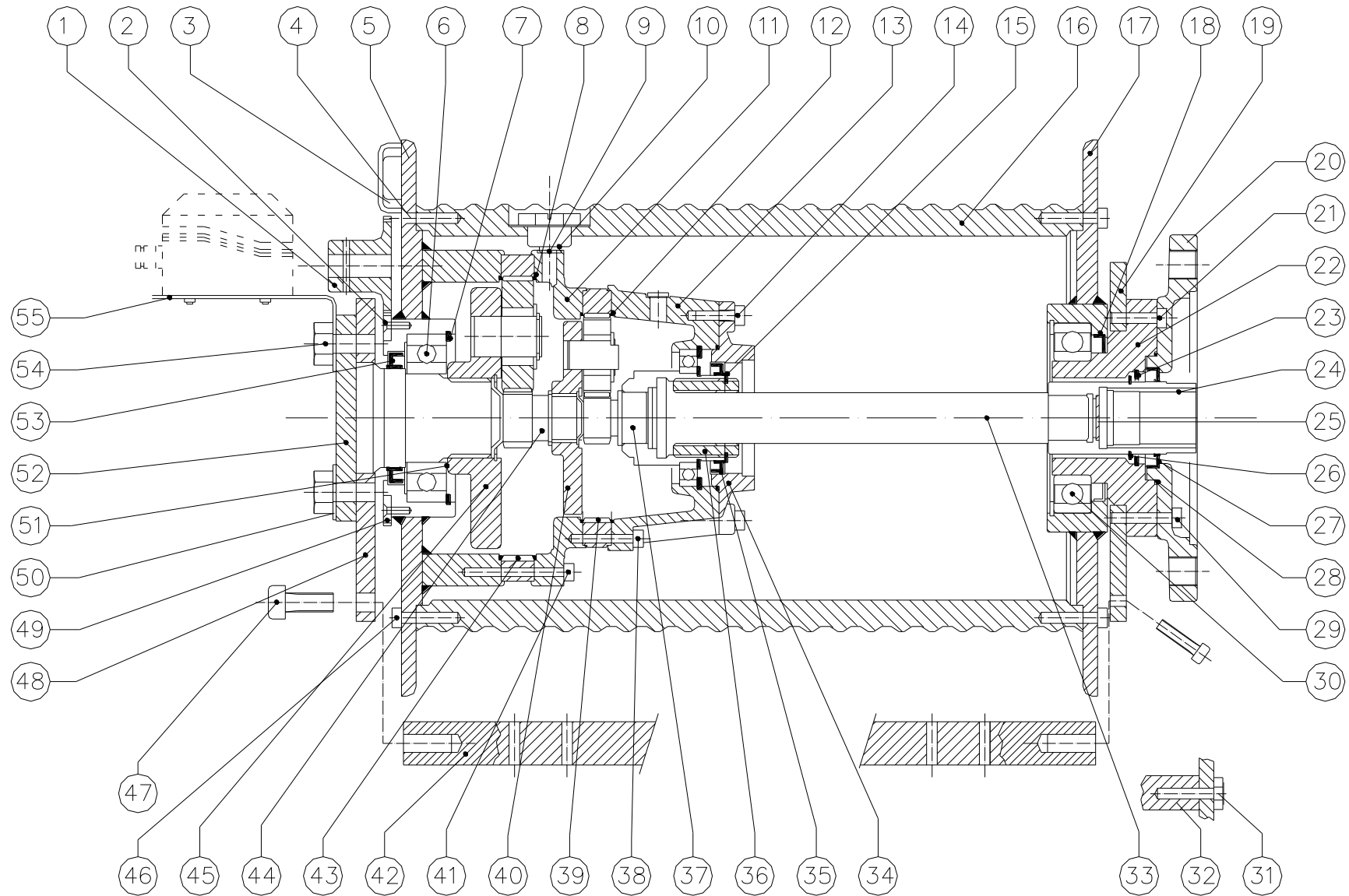


SLEWING MECHANISM

Reduction gear TYPE CL13

| Pos. | PART NUMBER | DESCRIPTION |
|------|-------------|--------------------------|
| 1 | | Drain pinion |
| 2 | | Oil retainer |
| 3 | | Drain cover |
| 4 | | Ball bearing |
| 5 | | Lubricator |
| 6 | | Seeger ring |
| 7 | | Ball bearing |
| 8 | | Reduction pin III |
| 9 | | Drain plug |
| 10 | | Ball bearing |
| 11 | | Washer |
| 12 | | Reduction pin II |
| 13 | | Ball bearing |
| 14 | | Reduction satellite II |
| 15 | | Washer |
| 16 | | Filling plug |
| 17 | | Reduction satellite I |
| 18 | | Seeger ring |
| 19 | | Reduction pin I |
| 20 | | Ball bearing |
| 21 | | Balance |
| 22 | | Oil retainer |
| 23 | | Reduction pinion I |
| 24 | | Reduction ring I |
| 25 | | Motor attachment flange |
| 26 | | Flange pinion |
| 27 | | Reduction ring II |
| 28 | | Casing |
| 29 | | Flange pinion |
| 30 | | Reduction ring III |
| 31 | | Reduction satellite III |
| 32 | | Satellite bearing flange |
| 33 | | Washer |
| 34 | | Seeger ring |
| 35 | | Seeger ring |
| 36 | | Oil retainer |
| 37 | | Casing |
| 38 | | Rotation motor |
| 39 | | Rotating fifth wheel |
| 40 | | Fifth wheel fixing screw |
| 41 | | Washer |
| 42 | | Nut |
| 43 | | Slewing stopper |
| 44 | | Stopper pinion |

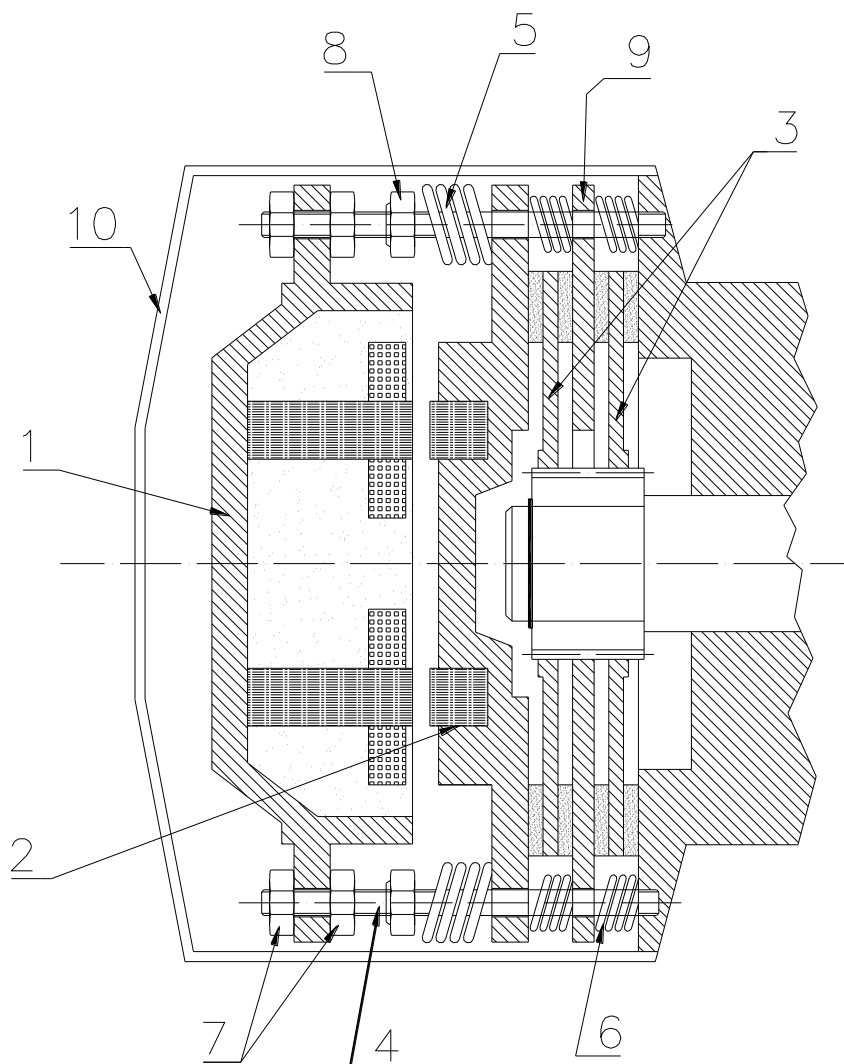
TROLLEY TRANSLATION MECHANISM DINAMIC OIL



TROLLEY TRANSLATION MECHANISM DINAMIC OIL

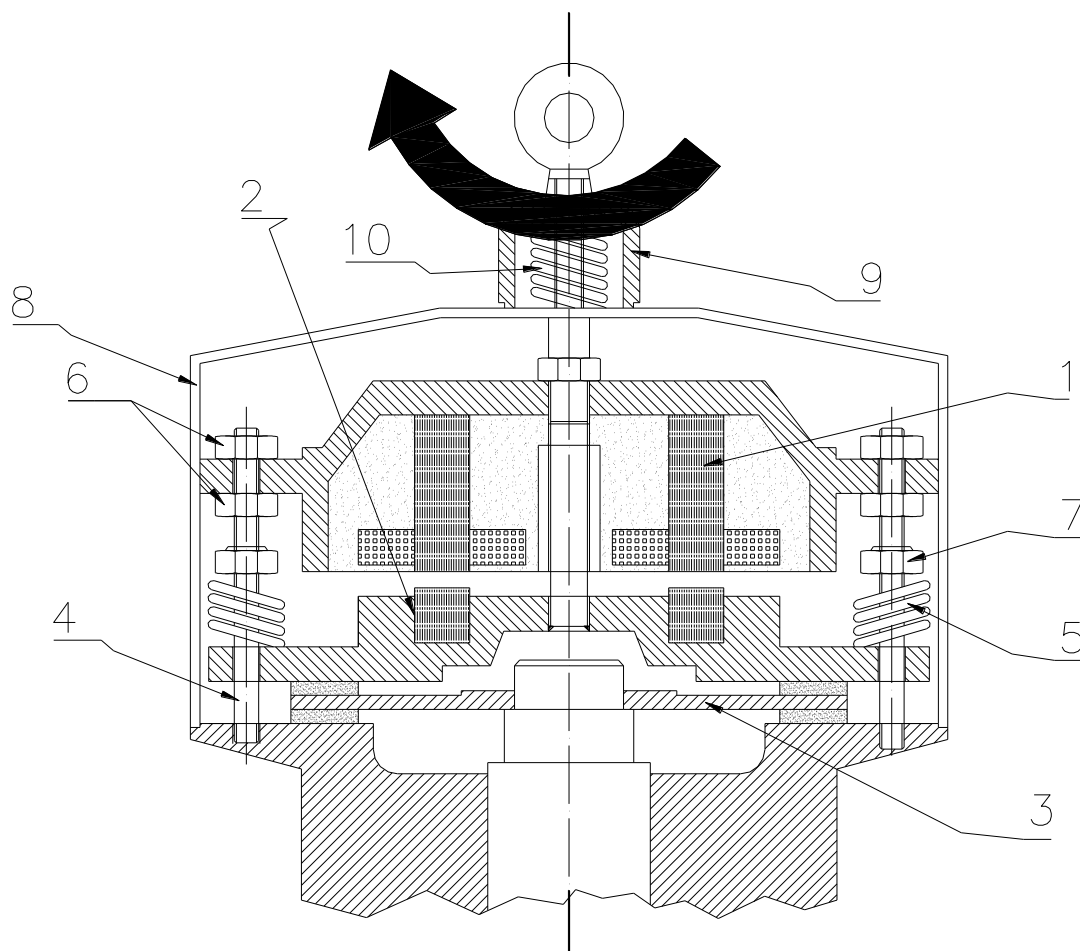
| POSITION | CODE | DESCRIPTION | POSITION | CODE | DESCRIPTION |
|----------|------|----------------------------|----------|------|------------------------------|
| 1 | | Stopper pinion | 29 | | Screw TCEI M10x35 8.8 |
| 2 | | Screw TSPEI M6x16 10.9 | 30 | | Ball bearing |
| 3 | | Radancia | 31 | | Screw TE M10x25 10.9 |
| 4 | | Screw TSPEI M8x25 10.9 | 32 | | Top bar |
| 5 | | Reducer-side flange | 33 | | Transmission shaft |
| 6 | | Ball Bearing | 34 | | Motor coupling flange |
| 7 | | Seeger Ring | 35 | | Oil retainer |
| 8 | | Packing OR 2-171 | 36 | | Grooved joint |
| 9 | | Gummed washer | 37 | | Solar 2ST R1:5.77 |
| 10 | | Plug screw TCEI | 38 | | Screw TCEI M10x40 12.9 |
| 11 | | Intermediate flange | 39 | | Gear rim 1ST |
| 12 | | Packing OR 147x2,62 | 40 | | Satellite bearing RE11 |
| 13 | | ST RE 110/210/240 | 41 | | Screw TCEI M10x60 |
| 14 | | Screw TCEI M10x30 8.8 | 42 | | Fixing plate |
| 15 | | Shaft seeger ring | 43 | | Gear rim RE 300 |
| 16 | | Threaded drum Right | 44 | | Solar 2ST R 5,3 |
| 17 | | Motor-side flange | 45 | | Satellite bearing RE31 |
| 18 | | Oil retainer | 46 | | Screw TCEI M8x25 12.9 |
| 19 | | Motor-side winch's support | 47 | | Screw TCEI M10x25 12.9 |
| 20 | | Attachment flange | 48 | | Reducer-side winch's support |
| 21 | | Screw TCEI M8x16 8.8 | 49 | | Stopper gear rim |
| 22 | | Carrying flange winch | 50 | | Washer C50 |
| 23 | | Seeger ring | 51 | | Thickness |
| 24 | | Input joint ME 132 | 52 | | Anti-slewing flange |
| 25 | | Plug | 53 | | Oil retainer |
| 26 | | Shaft seeger ring | 54 | | Screw TE M12x25 10.9 |
| 27 | | Oil retainer | 55 | | Stopper's support |
| 28 | | Packing OR 2-154 | | | |

HOISTING BRAKE MECHANISM



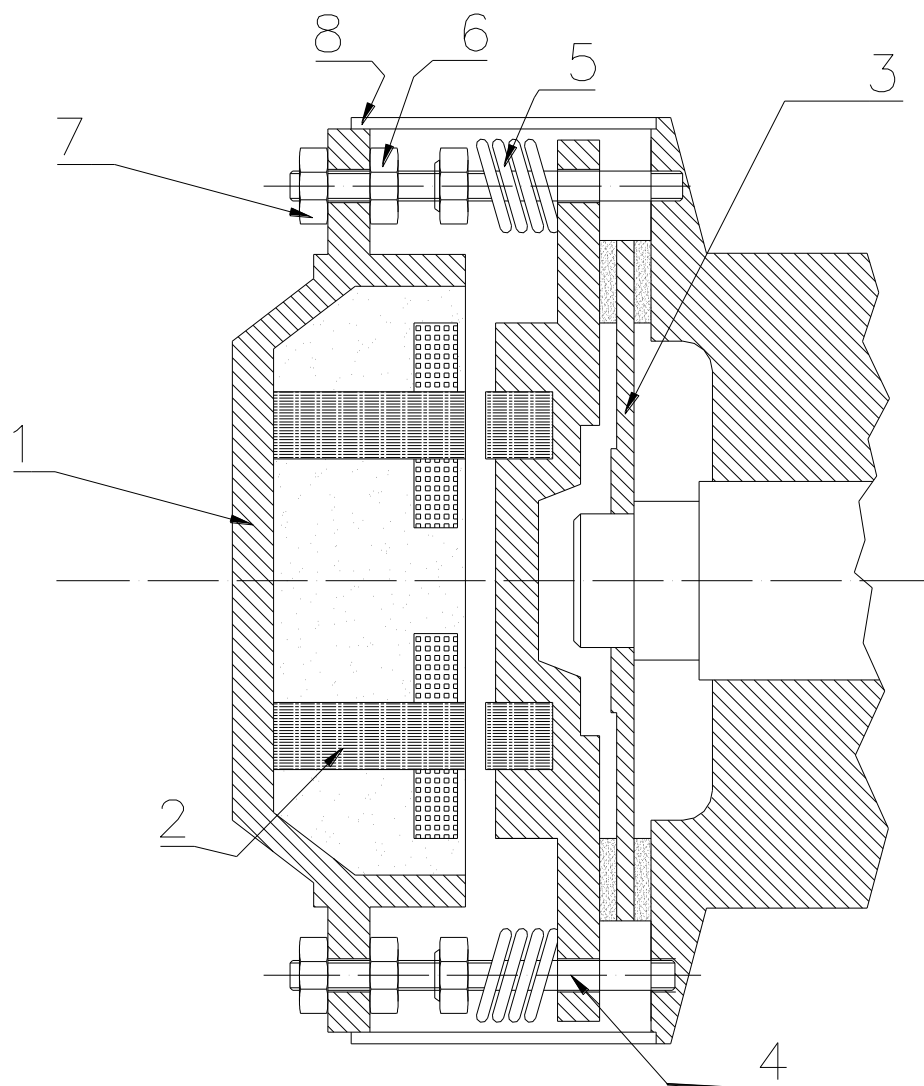
| Pos. | Part number | Description |
|------|-------------|-----------------------|
| 1 | | Magnet |
| 2 | | Counter-magnet |
| 3 | | Disk |
| 4 | | Stud-bolt |
| 5 | | Pressure spring |
| 6 | | Counterbalance spring |
| 7 | | Nut |
| 8 | | Nut |
| 9 | | Spacer flange |
| 10 | | Protective cover |

SLEWING BRAKE DEVICE



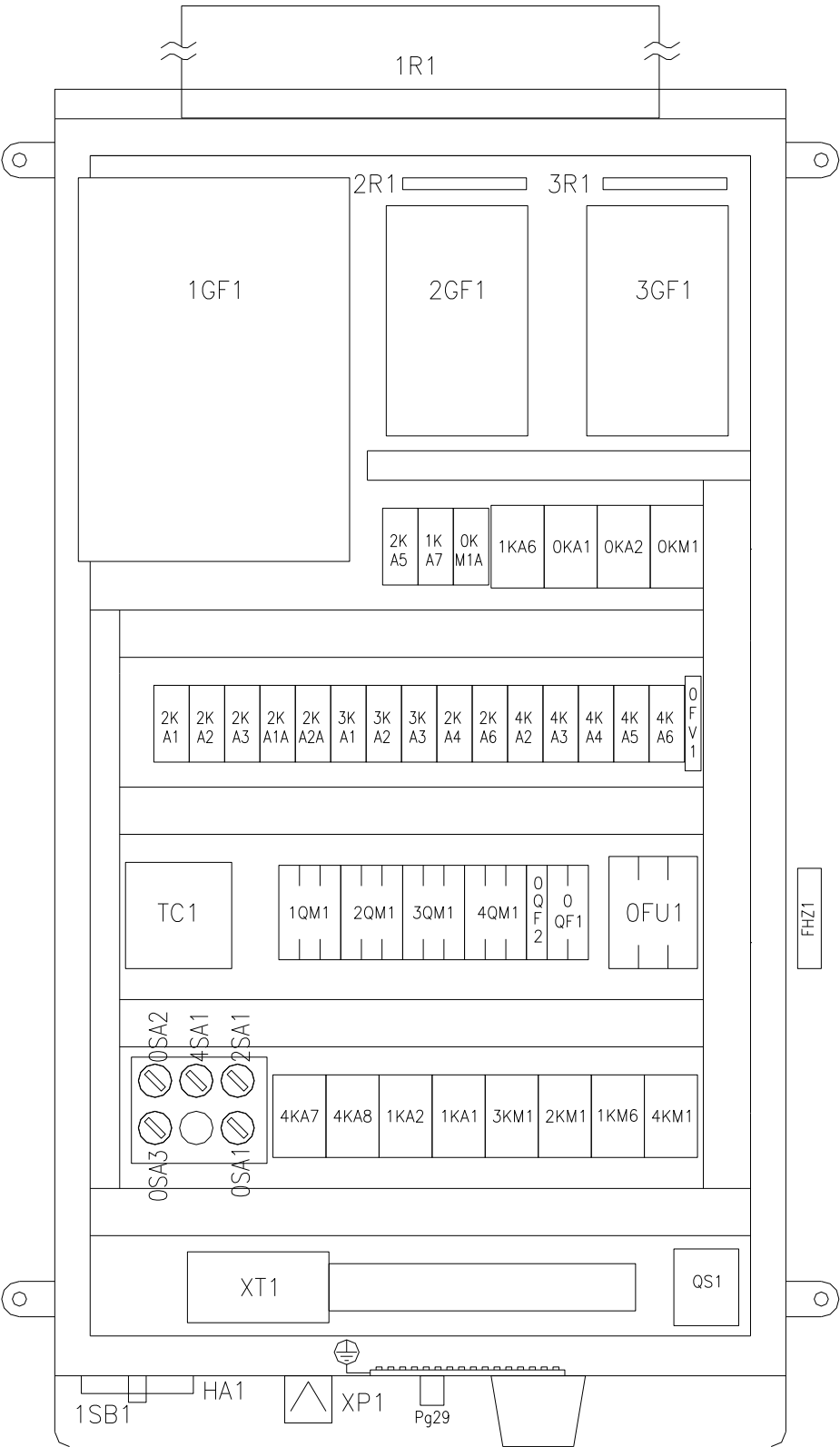
| Pos. | Part number | Description |
|------|-------------|------------------|
| 1 | | Magnet |
| 2 | | Counter-magnet |
| 3 | | Disk |
| 4 | | Stud-bolt |
| 5 | | Spring |
| 6 | | Nut |
| 7 | | Nut |
| 8 | | Protective cover |
| 9 | | Release handle |
| 10 | | Handle spring |

TROLLEY TRANSLATION BRAKE MECHANISM



| Pos. | Part number | Description |
|------|-------------|------------------|
| 1 | | Magnet |
| 2 | | Counter-magnet |
| 3 | | Disk |
| 4 | | Stud-bolt |
| 5 | | Spring |
| 6 | | Nut |
| 7 | | Nut |
| 8 | | Nut |
| 9 | | Protective cover |

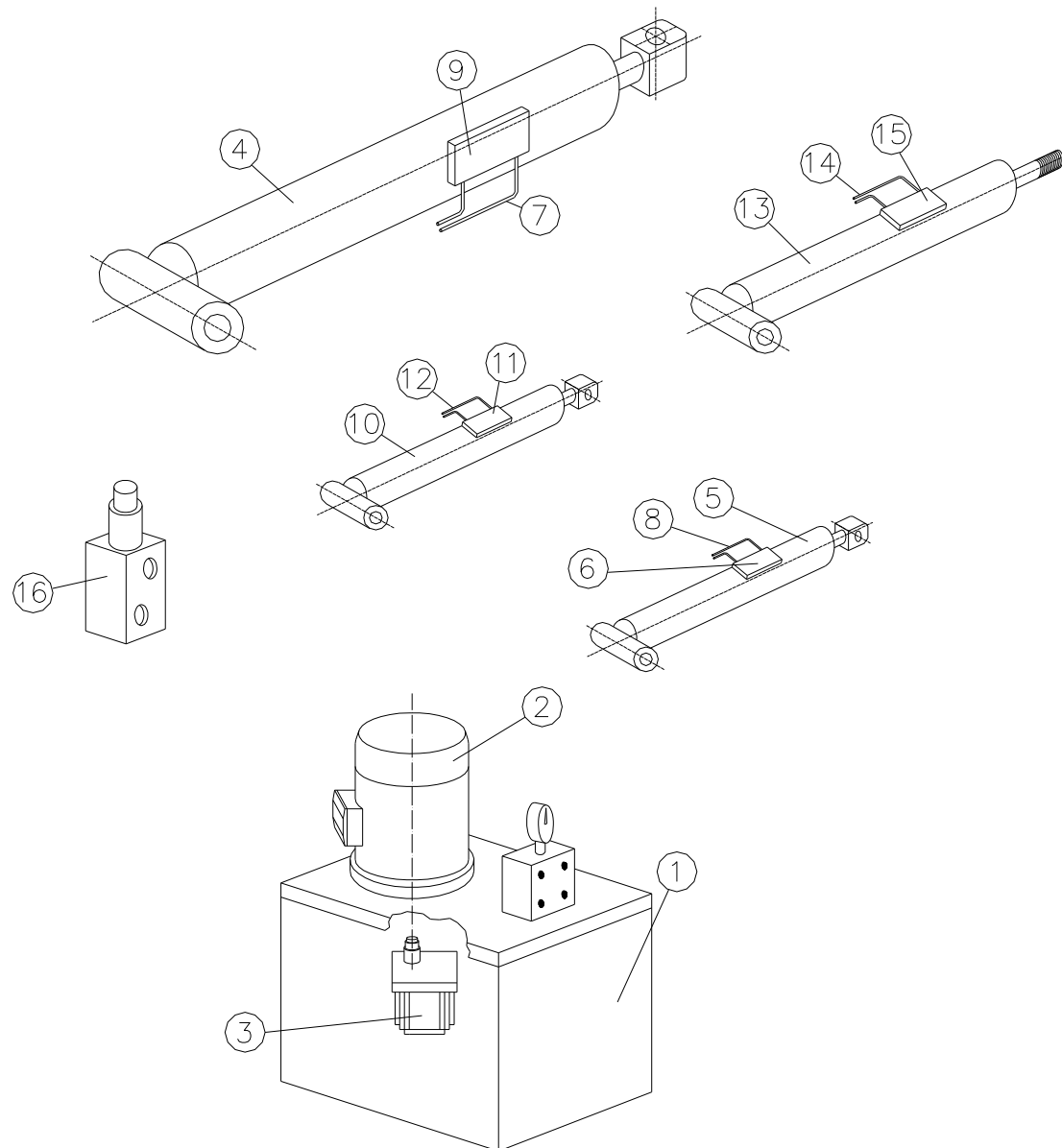
ELECTRIC EQUIPMENT



SWITCHBOARD'S PARTS

| POSIZIONE | CODICE | DENOMINAZIONE |
|-------------------------------------------|---------------|----------------------------------|
| QS1 | | Interruttore generale |
| QS1 | | Blocco-porta |
| 0QF2 | | Interruttore automatico modulare |
| 0QF1 | | Interruttore automatico modulare |
| 2QM1-3QM1-4QM1 | | Interruttore automatico modulare |
| 1QM1 | | Interruttore automatico modulare |
| 0FU1 | | Portafusibile sezionabile |
| 0FU1 | | Fusibili cilindro |
| 4KM1 | | Contatore di potenza |
| 1KM6-2KM1-3KM1 | | Contatore di potenza |
| 0KM1 | | Contatore di potenza |
| 1KA6-0KA1-0KA2-1KA2-1KA1-4KA7-4KA8 | | Contatore ausiliari |
| 1KM6-1KA1-1KA2-4KM1 | | Contatti ausiliari |
| 0KA1-0KA2 | | Contatti ausiliari |
| 1KA6 | | Contatti temporizzati |
| 0KM1-4KA7-4KA8 | | Contatti temporizzati |
| 2KA5-1KA7-0KM1A-2KA1-2KA2-2KA6-2KA1A2KA2A | | Relé ad innesto |
| 3KA1-3KA2-3KA3-2KA3-2KA4-4KA2-4KA3-4KA4 | | Relé ad innesto |
| 1KA5-1KA4-4KA5-4KA6 | | Relé ad innesto |
| 2KA5-1KA7-0KM1A-2KA1-2KA2-2KA6-2KA1A2KA2A | | Relé ad innesto |
| 3KA1-3KA2-3KA3-2KA3-2KA4-4KA2-4KA3-4KA4 | | Relé ad innesto |
| 1KA5-1KA4-4KA5-4KA6 | | Relé ad innesto |
| 0FV1 | | Relé controllo fase |
| FHZ1 | | Relé controllo frequenza |
| 0TC1 | | Trasformatore monofase |
| 0SA1-0SA2-0SA3-4SA1 | | Testa selettore |
| 2S2B | | Testa pulsante |
| 0SA1-0SA2-0SA3-4SA1-2SB1-2SA1 | | Corpo con contatto |
| 0SA1-0SA3-2SA1 | | Contatto per pulsanti |
| 0SA1-0SA3-2SA1 | | Contatto per pulsanti |
| 2SA1 | | Testa selettore |
| 1GF1 | | Inverter |
| 2GF1-3GF1 | | Inverter |
| 1R1 | | Resistenza di frenatura |
| 2R1-3R1 | | Resistenza di frenatura |
| 0HA1 | | Clacson |
| XP1 | | Presa |

HYDRAULICS SYSTEM AND CYLINDERS



| Pos | CODE | Description |
|-----|------|----------------------------|
| 1 | | Hydraulics gearbox |
| 2 | | Motor |
| 3 | | Pump |
| 4 | | Assembly cylinder |
| 5 | | Jib opening cylinder |
| 6 | | Overcenter valve |
| 7 | | Oil supply tubes |
| 8 | | Oil supply tubes |
| 9 | | Overcenter valve |
| 10 | | Point jib opening cylinder |
| 11 | | Overcenter valve |
| 12 | | Oil supply tubes |
| 13 | | Cylinder tension wire rope |
| 14 | | Oil supply tubes |
| 15 | | Overcenter valve |
| 16 | | Switch-flow valve |