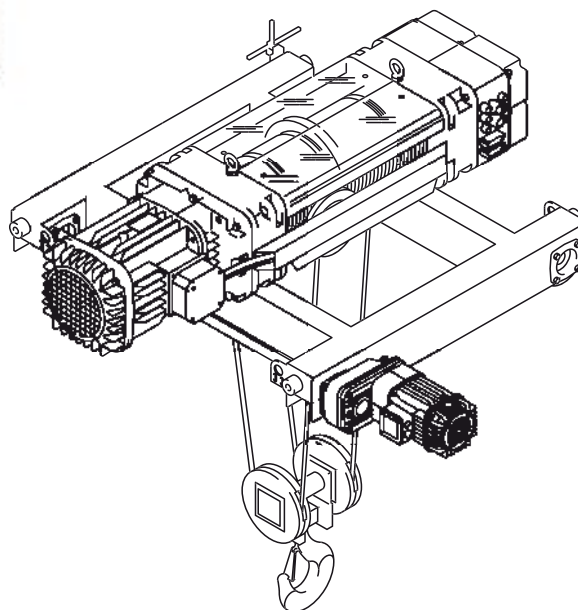
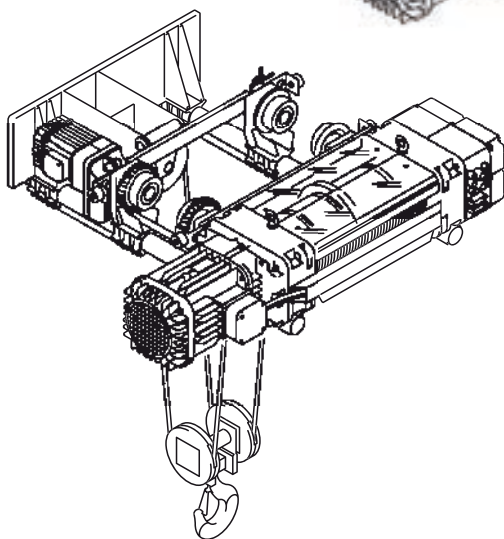
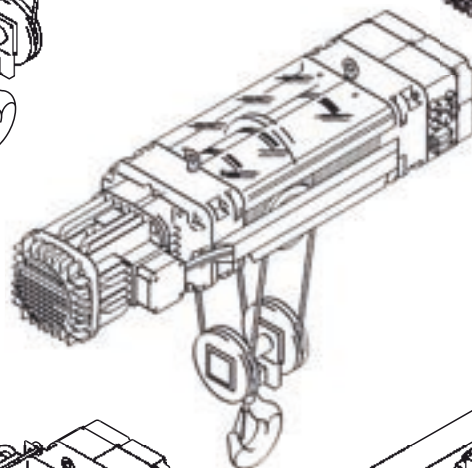
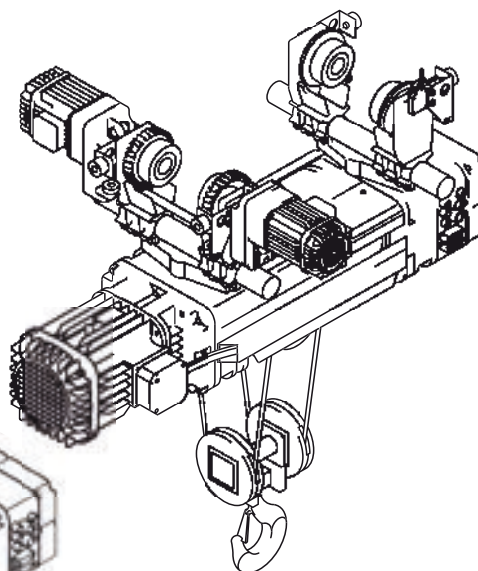
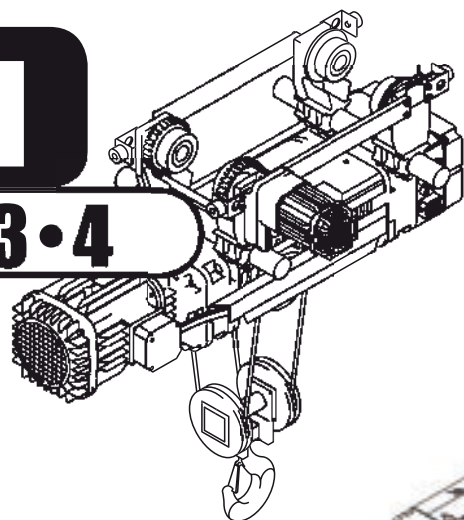


# INSTRUCTIONS FOR USE

*Electric Wire Rope Hoists • series DRH 1/2/3/4*  
*Electric Trolley • series DST/N/S - DST/R - DRT*

**DRH**

**1•2•3•4**



**INSTRUCTIONS FOR USE**  
*installation • use • maintenance*

# **INSTRUCTIONS FOR USE**

***Electric Wire Rope Hoists  
series DRH 1/2/3/4  
Electric Trolleys  
series DST/N/S - DST/R - DRT***

# **KMAN16MG05**

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## ➤ 1. - PRELIMINARY INFORMATION ◀

### 1.1 Contents and user of the manual

This technical publication, identified by the code MAN16MG05, refers to “Electrical wire rope hoists of the series DRH1/2/3/4 and related trolleys of the series DST/N-S- DST/R and DRT” built and put on the market by the company:


|   |  |   |
|---|--|---|
|  |  <b style="font-size: 2em; margin-left: 10px;">donati</b> | <b>Donati Sollevamenti s.r.l.</b><br>Via Quasimodo, 17 - 20025 Legnano (Milano) - Italy<br>Tel. +39 0331 14811 - Fax +39 0331 1481880<br>E-mail: info@donaticranes.com - www.donaticranes.com |
|---|--|---|

It refers to their “intended use”, to their technical functional and performance characteristics and to the relevant installation, use and maintenance instructions. It is intended for:

- the supervisor of the factory, workshop, building site
- the staff in charge of transporting, handling and installation of the equipment
- the operators of the hoists
- the maintenance staff

This manual must be kept by the person in charge of the above mentioned duties in a suitable place, so that it is always available for consultation and kept in the best possible condition.





If the manual is lost or becomes unusable, replacement documentation should be requested directly from the manufacturer by quoting the code of this manual.

|   |  |
|---|--|
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|---|--|

### 1.2 Symbols: meaning and use

In this manual certain symbols are used to focus the reader’s attention and underline some particularly important aspects of the subject.

The following table shows the list and meaning of the symbols used in the manual.

| SYMBOL  | MEANIN   | EXPLANATION, ADVICE, NOTES   |
|---|--|--|
|  | <b>Danger</b>                                    | <ul style="list-style-type: none"> <li>• Indicates a danger with risk of accident, possibly fatal.</li> <li>• Failure to follow the attached instructions can cause a situation of serious danger for the safety of the operator and for people in the vicinity!</li> <li>• <b>Follow the instructions scrupulously!</b></li> </ul>              |
|  | <b>Warning</b>                                   | <ul style="list-style-type: none"> <li>• Represents a warning note of attention of possible deterioration of the hoist or of a personal object of the operator.</li> <li>• <b>Important warning which requires one’s utmost care.</b></li> </ul>   |
|  | <b>Warning / Note</b>                            | <ul style="list-style-type: none"> <li>• Indicates a warning or a note about key functions or useful information.</li> </ul>   |
|  | <b>Visual observation<br/>Action to be taken</b> | <ul style="list-style-type: none"> <li>• A printed eye can indicate to the reader that:               <ol style="list-style-type: none"> <li>a) He should proceed to a visual observation</li> <li>b) He should proceed to the operating sequence.</li> <li>c) It is necessary to take a reading, to check a signal, etc.</li> </ol> </li> </ul> |

## 1.3 Cooperation with the user

The electric rope hoists and related trolleys are designed and produced taking into consideration the “Essential Requirements of Safety” in Attachment I of the Community Directive 2006/42/CE, denominated Machine Directive and are introduced into the market with CE marking and EC Declaration of Conformity - Attachment IIA.

**CE EC DECLARATION OF CONFORMITY**  
as defined by machinery directive 2006/42/EC - Annex IIA

The legal representative of the company:  
**donati**  
**DONATI SOLLEVAMENTI S.r.l.**  
Via Quasimodo, 17 - 20025 Legnano (MI) - Tel. 0331.1481.1 - Fax. 0331.1481.880

Declares under on own responsibility that the named machine:

|   |        |             |        |
|---|--------|-------------|--------|
| Bridge crane with hoist and trolley type: <input type="checkbox"/> Suspended <input type="checkbox"/> Risted  | Type : | Serial Nr : | Year : |
| Crane structure : <input type="checkbox"/> Single gear <input type="checkbox"/> Double gear                   | Type : | Serial Nr : | Year : |
| Jib crane: <input type="checkbox"/> Bracket <input type="checkbox"/> Arm <input type="checkbox"/> Column      | Type : | Serial Nr : | Year : |
| Electric hoist : <input type="checkbox"/> Wire rope <input type="checkbox"/> Chain                            | Type : | Serial Nr : | Year : |
| Trolley : <input type="checkbox"/> Electric <input type="checkbox"/> Mechanical <input type="checkbox"/> Push | Type : | Serial Nr : | Year : |
| Capacity (kg) :   |        |             |        |

Is in according to the Comuntary Directives

- Machine Directive 2006/42/CE
- Low voltage Directive 2014/35/EU
- Electromagnetic Compatibility Directive, 2014/30/EU

Main technical regulations considered:

EN ISO 12100 /2010 - Safety of the machinery  
EN ISO13849-1/2008 General principles for design  
EN 12077-2/2008 Limiting and indication device  
EN 60204 - 32/2009 - Safety of machinery electrical equipment of machines  
EN 60829/97 - Degrees of protection provided by enclosures (IP code)  
ISO 4301-1/88 - Lifting equipment classification  
ISO 4308 - 1/2003 - Selection of wire ropes (for wire rope hoists DRH series)  
UNI 9466/94 - Lifting appliances shell drum. Design requirements (for wire rope hoists DRH series)  
DIN 18401 - Lifting hooks for lifting appliances; Single hooks  
FEM 1.002/98 - Rules for the design of hoisting appliances  
FEM 9.911/86 - Classification of mechanisms  
FEM 9.661/86 - Dimensions and design of rope reeving components  
FEM 9.671/88 - Chain qualities, selection criteria and requirements (for chain hoists DMK series)  
FEM 9.761/93 - Lifting force limiters for controlling the loading of motorized series hoists mechanisms  
FEM 9.683/98 - Selection of lifting and travel motors  
FEM 9.788/93 - Measures for achieving safe working periods for serial hoists units (S.W.P.)  
FEM 9.941/96 - Graphical symbols for control devices

Person authorized to compile the technical file  
Name and surname: **Alberto Tagliabue**  
Address: **Via Quasimodo, 17 - 20025 Legnano (MI) - Italy**

*facsimile EC Declaration of Conformity  
Attachment II A*

Furthermore, the DRH series hoists and related trolleys conform to the following Directives:

- Low Voltage Directive (DBT) 2014/35/UE;
- Electromagnetic Compatibility Directive (EMC) 2014/30/UE.

## 1.4 The manufacturer's responsibility

With reference to the contents of this manual DONATI SOLLEVAMENTI S.r.l. declines any responsibility in case of:

- use of the hoist contrary to the national safety and accident prevention laws
- erroneous preparation of the building site or buildings in which the hoist is to be operated
- voltage and power supply faults
- lack of or erroneous observation of the instructions supplied in this manual
- non-authorized modifications to the machine
- use (of the machine) by untrained or unsuitable staff



- *The intended use and configurations of the hoist are the only ones allowed. Do not try to use the hoist disregarding the supplied instructions.*
- *The instructions in this manual do not replace but add to the obligations regarding the current legislation for accident prevention standards.*

## ➤ 2. - DESCRIPTION OF THE MACHINE AND TECHNICAL INFORMATION ◀

### 2.1 The electric wire rope hoist and related trolleys

#### 2.1.1 Intended use - Foreseen use - Designated use

The **electric wire rope hoist** is a machine generally used to lift vertically in the air a load by means of a hook or handling accessories suitable for the purpose.

When the hoist is coupled with a **trolley**, which runs at a height on one or two girders, it is capable of ensuring the integrated handling of lifting and horizontal movements of the load.

All the lifting movements (of ascent or descent) or travelling (right or left) **dmust be activated electrically** and can be controlled with a push- button panel or with a remote control system.

**The electric wire rope hoist and the related trolleys**, installed at a height, can be fitted with monorails or constitute the lifting unit of other machines in which they have been incorporated, such as: overhead travelling crane, gantry crane, jib crane, etc. both in single and double girder versions.

**The electric wire rope hoist**, positioned at a height or at ground-level, subject to appropriate safety checks and any necessary forms of protection (see paragraph 3.4) can moreover be used in different configurations in a fixed position.

#### 2.1.2 The range

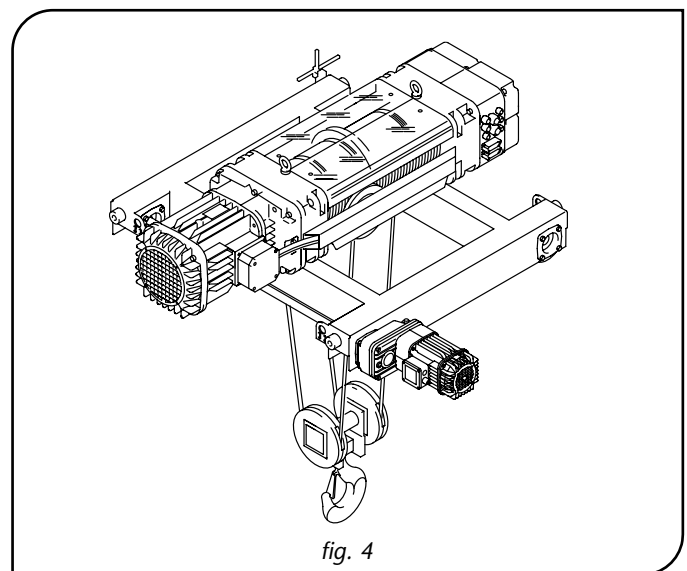
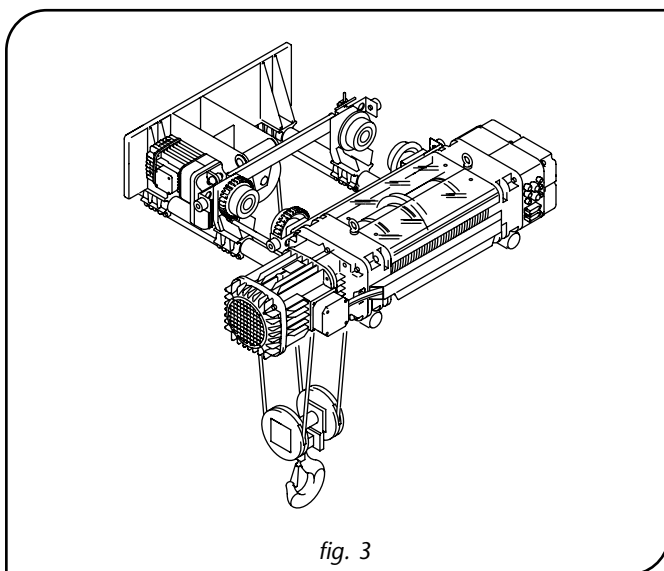
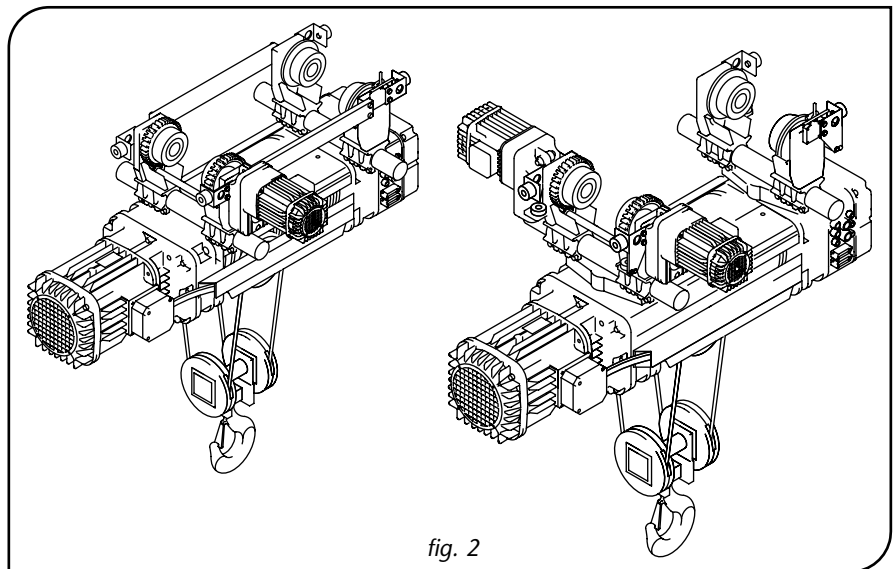
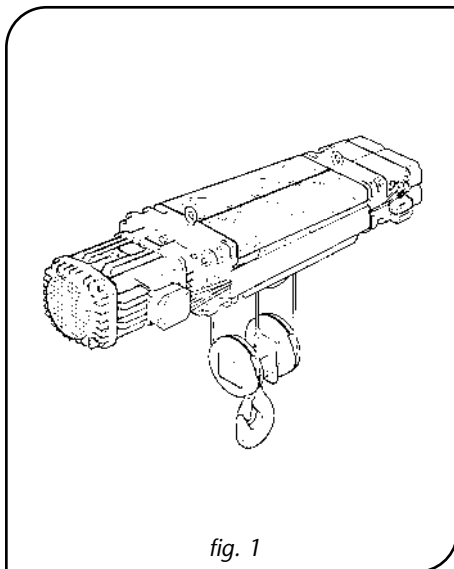
The range of DRH electric wire rope hoists series is produced in:

- 4 base series, DRH1 - 2 - 3 - 4, for capacities from 800 to 50.000 kg, in the FEM (ISO) service units - 1Bm (M3) - 1Am (M4) - 2m (M5) - 3m (M6).
  - At a lifting speed carried out with a 4 -pole motor:
    - 4 or 6 m/min for 4-fall wire rope hoists
    - 8 or 12 m/min for 2-fall wire rope hoists
    - 2,7 m/min for 6-fall wire rope hoists
    - 2 m/min for 8-fall wire rope hoists.
  - At two lifting speeds, with a 1/3 ratio, carried out with a 4/12 - pole motor:
    - 4/1, 3 or 6/2 m/min for 4-fall wire rope hoists
    - 8/2, 6 or 12/4 m/min for 2-fall wire rope hoists
    - 2,7/0,9 m/min for 6-fall wire rope hoists
    - 2/0,7 m/min for 8-fall wire rope hoists.
- 5 standard versions with short drum (C), normal drum (N), long drum (L) and extra long drum (X1) and (X2) for hook runs from 4 to 58 m.

Technical data and characteristics are explained in paragraph 2.2

The DRH electric wire rope hoists are available in the following standard configurations:

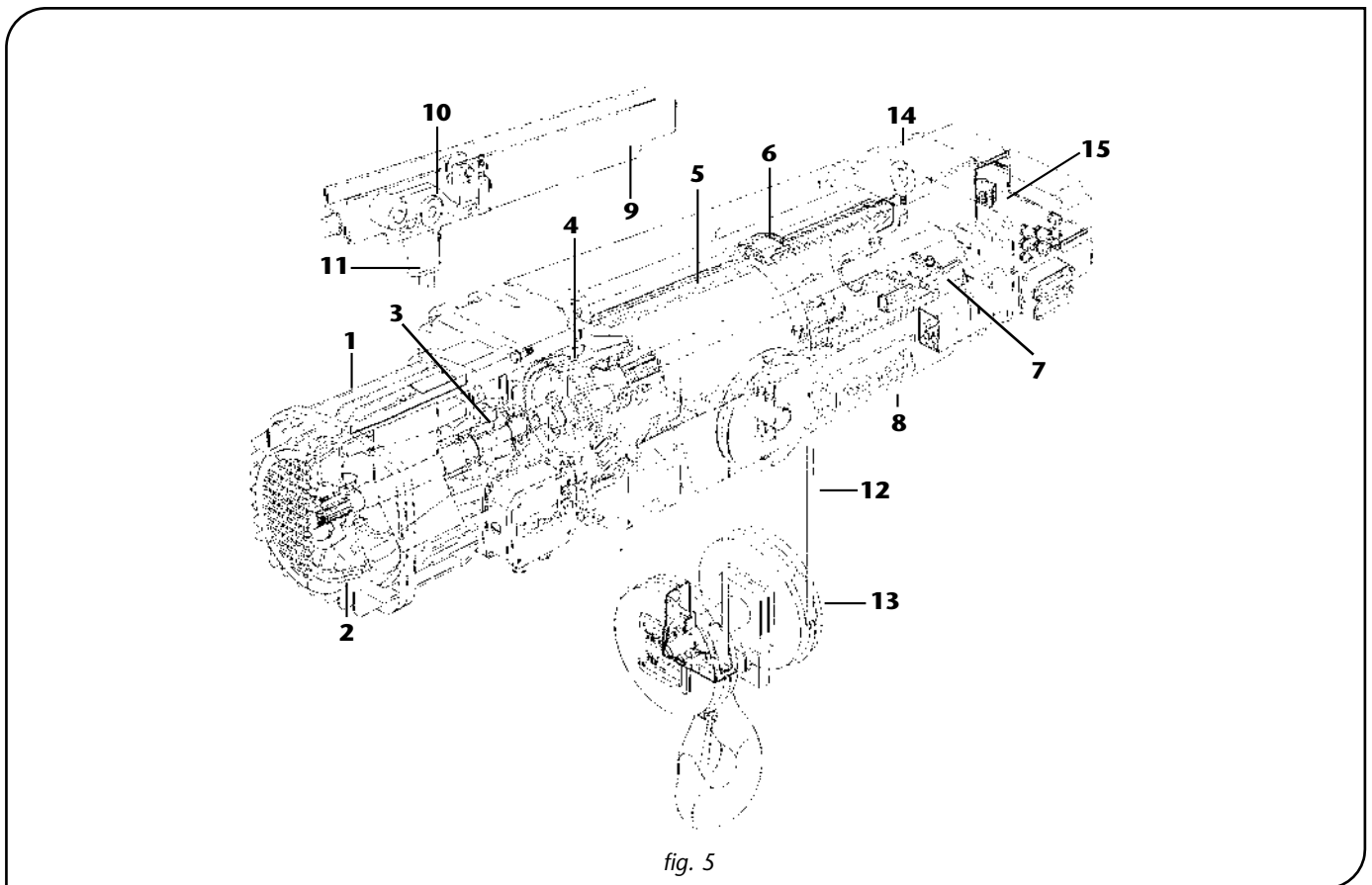
- **In fixed execution:** (fig. 1)  
Basic universal configuration, with fixing eye bolts which allow the hoist to be set down in any version, or to be adapted to suspended execution.
- **With electric trolley, single girder, type DST/N/S:** (fig. 2)  
The DRH hoist is supplied with suspended execution on the normal trolley and articulated for curvilinear girders, running on a single girder by electric drive.
- **With electric trolley, single girder, type DST/R:** (fig. 3)  
In order to exploit the hook's run the DRH hoist is supplied set down in execution on the reduced headroom trolley, running on a single girder by electric drive.
- **With electric trolley, double girder, type DRT:** (fig. 4)  
The DRH hoist can be assembled either in set down or suspended execution on the trolley, which runs along the two girders by electric drive.  
The trolley in the double girder configuration maximises the hook's run of the hoist.



### The conception and structure:

- The DRH electric wire rope hoists and related electric trolleys are produced according to the conception of modular components which, assembled together in relation to commercial needs, as well as the standard versions always available in the warehouse, allow various normalized and special executions to be carried out rapidly and economically.
- The basic components, motor, reducer and drum, thanks to the extreme compactness of the reducer group are assembled together in coaxial line, to ensure maximum use of the hook path and minimum lateral encumbrance of the hoist body.  
The components are connected by high-resistance bolted couplings which can be inspected and fitted with self-locking safety nuts to protect against unscrewing.
- The drum, on the equipment side, or from the side opposite the motoreducer, can be used for connection with cycle counters, selectors, screw limit switches, encoders, safety brakes, etc. Moreover the drum, being perfectly symmetrical, in special execution with right and left threading, allows the assembly of two motoreducer groups which permit doubling of the lifting speed while keeping the lifting capacity and vertical fall axis unvaried which, free from eccentricity, makes it particularly suitable for executions with high hook runs.
- The structure uses the most advanced technology based on production processes of high industrialization and allows the realization, by economies of scale, of totally reliable and technically innovative machines. A high level of quality is guaranteed and checked by the company quality control system according to standard UNI EN ISO 9001:2008.

### 2.1.3 DRH wire rope hoist parts (fig. 5)



#### 1 - Electrical lifting motor

- Three-phase asynchronous motor, self-braking conical rotor. Minimum protection IP55 - Insulation class F. It is fitted with a series of thermal probes to protect against overloads. Three-phase asynchronous motor DRH4 24kW cylindrical.

#### 2 - Lifting brake

- The conical brake is fitted with an asbestos-free friction gasket. The brake block, made up of a fan which ensures the cooling of the brake itself and of the motor, moves on its axis with the motor shaft, and the braking function is activated automatically in case of power failure.  
[RES. 1.2.6 - 4.1.2.6 c) - Attachment I Machine Directive]  
Electro-magnetic brake DRH4 24kW.

#### 3 - Joint

- It connects the self-braking motor and the reducer, allowing perfect axial running of the motor shaft.

#### 4 - Gearbox

- Coaxial, with 3 reduction stages, produced with cylindrical high-resistance steel gears, which are helical-toothed and heat treated. Designed to resist fatigue and wear and tear for life relating to the FEM service group [RES. 4.1.2.3 - Attachment I Machine Directive].  
It is entirely installed on ball bearings lubricated for life in an oil bath.

#### 5 - Drum shell

- The drum, made of steel tube and mechanically channelled, is supported by the reducer flange and the flange on the equipment side, with hubs with swivel broached holes on permanently lubricated bearings. The drum is designed following the standards ISO 4308-1/86 and UNI 9466 and also the FEM rules 9.661/86. The support flanges of the drum are fitted with cylindrical steel pins to fix the suspension and settingdown components of the hoist. Mechanically-made housings support the terminal head crossbar and the transmission pulley. The connection between the two flanges is made with bolted staybolts.

## 6 - Rope guide

- Formed by a threaded ring made of spheroidal graphite cast iron, the rope guide allows an optimal winding of the wire rope on the drum [RES. 4.1.2.4 - Attachment I Machine Directive]. An elastic system allows the automatic registration of clearance and wear and tear.  
The rope guide has sliding-block reaction arms made of brass which, acting on the stay bolts of the rope drum cover, act as actuators of the ascent and descent limit switches.

## 7 - Lifting limit switches

- A component with safety functions which limit, in case of emergency, the hook's ascent and descent run [RES. 4.1.2.6 a) - Attachment I Machine Directive]. It is formed of two precision micro switches which function according to the principle of "slow positive opening" and work on the auxiliary circuit of the control device of the lifting motor.

## 8 - Pulley crossbar

- Used in the executions at 4 falls, it is supported by two pivots which allow it to position along the vertical axis of the wire rope. It is fitted with a transmission pulley made of carbon steel with a mechanically channelled rope race and swivelling on ball bearings with permanent lubrication.

## 9 - Terminal head crossbar

- Used in the executions at 2 and 4 falls, it is supported by two pivots which allow it to move on the vertical axis of the wire rope. The overload device is located between the cross head plates.

## 8a/9a - Pulleys and terminal head support

- Used in the executions of 6 and 8 falls, consist of a welded structure and is designed with a junction plate to be located on the double girder carriage. It is equipped with pulleys made of carbon steel mechanically grooved and swivelling on bearings with permanent lubrication. The overload device is located on the support in the anchorage crosshead.

## 10 - The overload device

- All DRH electric wire rope hoists are fitted with overload devices, with a micro switch for an intervention threshold [RES. 4.2.1.4 - Attachment I Machine Directive]. The overload device constantly measures and checks the weight of the load and the dynamic and inertial effects due to handling. If the set calibration readings are exceeded, the micro switch on the device intervenes by opening the control circuit of the lifting control device.

## 11 - Rope terminal head and wedge

- The fixed head is made of spheroidal graphite cast iron and the minimum coefficient of use conforms with the FEM 9.661/86 regulation. A wedge fixes the wire rope to prevent unthreading.

## 12 - Rope

- Made of flexible high-resistance steel with a minimum coefficient of use chosen to conform with standard ISO 4308-1/86. On the 2-fall hoists with long drums and extra long 1st size (X1) and the 2- and 4-fall hoists with extra long drums 2nd size (X2) antirotating wire ropes are used.

## 13 - Hook block and hook

- Fitted with transmission pulleys made of carbon steel with a mechanically channelled rope race and rotating on permanently lubricated ball bearings. The load hook is made of high-resistance press-forged steel and is fitted on an oscillating transverse. It rotates on step bearings and is fitted with a safety device to prevent unhooking. [RES. 4.1.2.6 - Attachment I Machine Directive].

## 14 - Frame for electrical connections

- Available on request, fitted with a cable clamp, it allows the cabling of all the connections of the electrical equipment of the hoist and related trolley. The containment space of the electrical connections and/or related low voltage control equipment is fitted with a thermoplastic cover with IP55 degree of protection.

## 15 - Low voltage controls at 48 V - AC

- When the hoist is supplied with electrical controls, the ascent and descent and right and left functions of the related trolley are activated with electrical equipment including:
  - The transformer for the low voltage power supply of the control circuits
  - The general line contactor and the contactors/inverters for the control of the motors
  - The protection fuses of the motors and of the transformer
  - The terminal block for the connections of the auxiliary and power circuits.

The components are fitted on a hinged panel and fixed in the space located on the opposite side of the motor. The controls are activated by the pendant push-button panel powered in low voltage AC at 48V.

The push-button panel, of ergonomic shape, made of self-extinguishing shockproof thermoplastic, is water resistant to IP65 protection. The emergency stop function [RES. 1.2.4.3 - Attachment I Machine Directive], is produced with a mushroom-head push-button which using an intentional release action puts the control circuit in the forward position [RES. 1.2.3 - Attachment I Machine Directive].

The push-button panel is connected to the electrical equipment by a multipolar electrical cable fitted with tear proof metallic parts.

## 2.1.4 Trolley parts (fig. 6)

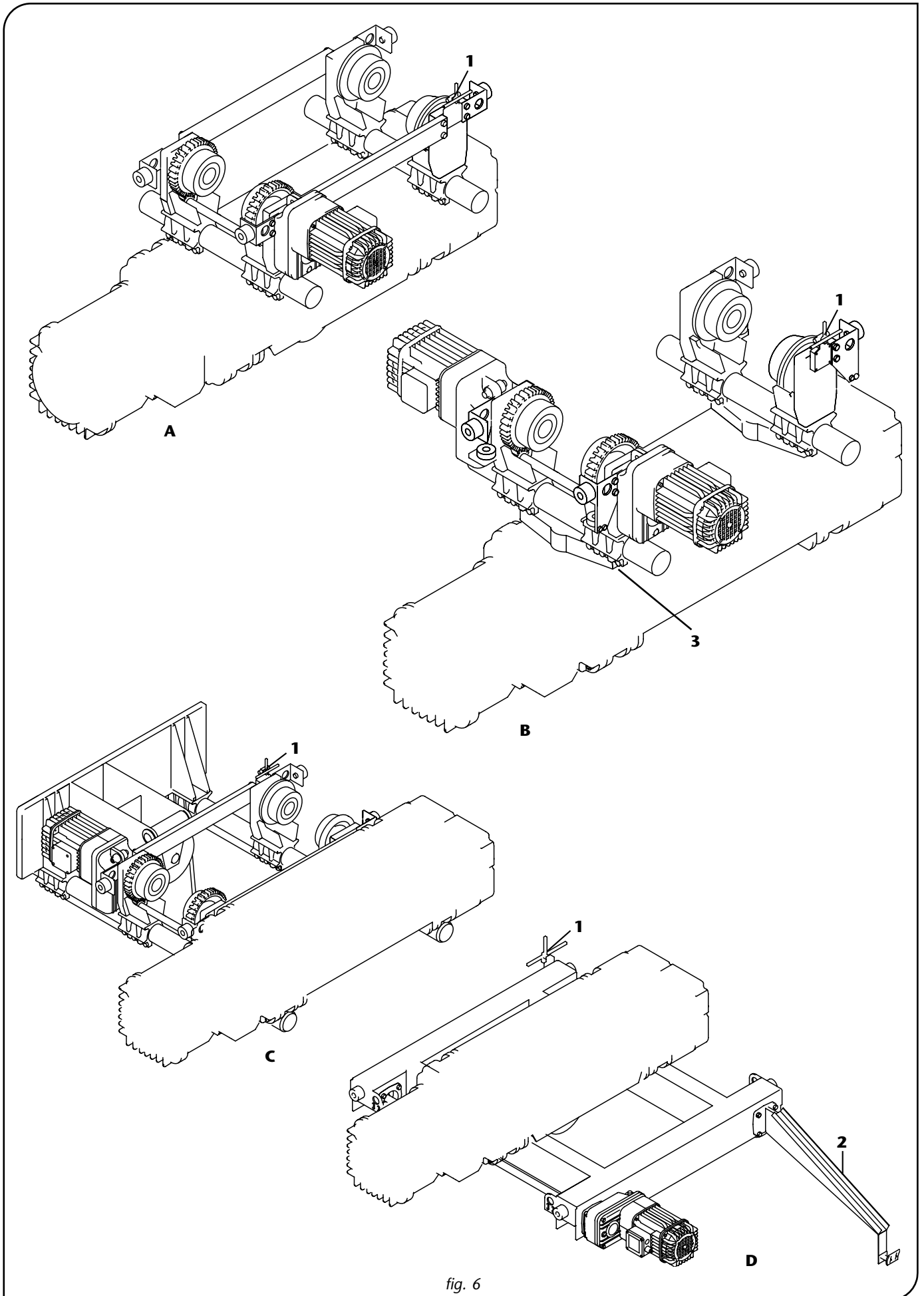


fig. 6

**A/B/C - Electric trolleys with single girder , types DST/N - S - R (Normal - Articulated- Lowered)**

- They are usually made up of an idler group and a drive wheel assembly, each one fitted with two press-forged steel wheels produced mechanically and installed on permanently lubricated ball bearings. The wheels of the drive wheel assembly face each other, fitted with toothed crown and connected together, in the normal version (N), by a transmission bar. The articulated version (S), is fitted with a double motoreducer, each of which gives movement directly to the wheel. The carrying plates are made of steel and fitted with antiderailment and antitilting systems (RES. 4.1.2.2 - Attachment I Machine Directive) and with rubber buffers. The traverse is ensured by one or two self-braking motors with conical induction with progressive starting and braking at one or two speeds and by one or two offset reducers with helical-toothed gears and permanent oil-bath lubrication.

**A - Electric trolley, normal single girder, type DST/N**

- In the normal version the trolley is fitted with circular-section carrying bars that support the hoist by hinge and pivot suspensions. The driving and idler plates are sliding and adjustable on the bars, in relation to the width of the sliding girders, by means of brackets fitted with bolted couplings. The two assemblies, driving and idler, are connected together with stiffening plates.

**B - Electric trolleys, articulated single girder, type DST/S**

- In the articulated version the trolley is fitted with circular section carrying bars which support the hoist using a bracket fitted with an articulated joint. The driving and idler plates are sliding and adjustable on the bars, in relation to the width of the sliding girders, by means of brackets fitted with bolted couplings. The two driving groups face each other on the same bar and are independent from the idler groups.

**C - Electric trolley, single girder, DST/R**

- In the reduced dimension version the trolley is fitted with circular section carrying bars which support the hoist in set down execution. The driving and idler plates are sliding and adjustable on the bars, in relation to the width of the sliding girders, by means of brackets fitted with bolted couplings. The trolley is fitted with a balance weight, laid on circular section carrying bars, to balance the eccentric mass of the hoist.

**D - Electric trolley, double girder, type DRT**

- It is formed by a steel frame which supports the wheels, two of which are driving and two are idler. The wheels are made of press-forged carbon steel and rotate on permanently lubricated ball bearings. The double girder trolley is fitted with devices which prevent derailment and tilting [RES. 4.1.2.2 – Attachment I Machine Directive] and with rubber buffers. The travelling movement is ensured by a self-braking motor, with conical induction with progressive starting and braking at one or two speeds and by a pendular reducer, with helical-toothed gears permanently lubricated by oil-bath, which power the movement of the driving wheels by means of the transmission bar. The hoist can either be assembled in suspended or set down execution.

**1 - Electric travelling limit switches**

- All travelling trolleys are fitted with limit switches on the girder or girders [RES.4.1.2.6 a) - Attachment I Machine Directive.

**2 - Towing arm**

- For all types of trolley a towing arm is available on request, adjustable in every direction, to connect the trolley/hoist to the power line and avoid the tearing of the conductors.

**3 - Oscillating bracket for hoists installed on DST/N trolley**

- Available on request to allow the oscillation of the hoist on the vertical axis of the sliding girder.

## 2.2 Technical information and service conditions

### 2.2.1 Safety reference list

In the planning and construction of the DRH electric wire rope hoists the following standards and principal technical regulations have been taken into account:

- EN-12100/2010 "Safety of machinery"
- EN ISO 13849-1:2008 "General principles for design"
- EN 12077-2:2008 "Limiting and indication device"
- EN 13001-1:2009 "General design criteria – Part 1: general requirements"
- EN 14492-2:2006 "Winches and hoists – Part 2: Hoists"
- EN 60204-32/2009 "Safety of electrical equipment of lifting machines"
- EN 60529/97 "Degrees of protection provided by enclosures (IP code)"
- ISO 4301-1/88 "Lifting equipment classification"
- ISO 4308-1/2003 "Selection of wire ropes (for wire rope hoists DRH series)"
- DIN 15401 "Lifting hooks for lifting appliances; Single hooks"
- UNI 9466 "Lifting appliances shell drum. Design requirements (for wire rope hoists DRH series)"
- FEM 1.001/98 "Rules for the design of hoisting appliances"
- FEM 9.511/86 "Classification of mechanisms"
- FEM 9.661/86 "Dimensions and design of rope reeving components"
- FEM 9.683/95 "Selection of lifting and travel motors"
- FEM 9.755/93 "Measures for achieving safe working periods for serial hoists units (S.W.P.)"
- FEM 9.761/93 "Lifting force limiters for controlling the loading of motorized series hoists mechanisms"
- FEM 9.941/95 "Graphical symbols for control devices"

### 2.2.2 Protection and insulation of electrical components

- Lifting and travelling motors: Protection IP55 - Insulation class "F"
- Lifting motor brake and traveling IP23
- Limit switch: Minimum protection IP65 - Maximum voltage 500 V
- Cables: CEI 20/22 II - Maximum insulation voltage 450-750 V

### 2.2.3 Electrical power supply

- The DRH electric wire rope hoists are designed, of series, to be powered with alternating electric current with three-phase voltage of: 400 V +/- 10% - 50Hz according to IEC 38-1.

### 2.2.4 Nominal conditions of use

- Temperature of use: minimum  $-10^{\circ}$  C; maximum  $+40^{\circ}$  C
- Maximum relative humidity: 80%
- Maximum altitude 1000m above sea level.
- The machine must be placed in a well-ventilated place, free from corrosive vapours (acid vapours, saline clouds, etc)



- *It is forbidden to use the machine in an explosive environment or one which is potentially so, or where the use of flameproof equipment is prescribed.*
- *It is necessary to allocate sufficient working space to ensure the safety of the operator and of the maintenance staff.*

### 2.2.5 Noise

- The level of acoustic pressure emitted by the hoist at full load is always less than a level of 80dB (A). The incidence of environmental characteristics like transmission from the ground through metallic structures, reflections caused by combined machines and walls is not included in the level indicated.
- The vibrations produced by the hoist are not hazardous to the health of personnel who work with it. Excessive vibration can be caused by a fault and should be immediately reported and eliminated the reliability of the hoist is not affected.

**2.2.6 Criteria and condition of use**

- Correctly determine the operating limits of the hoist in order to ensure the correct functioning and the complete correspondence to the operating systems of the work for which it is intended.
- The FEM 9.511 rule allows the classification of hoists according to the conditions of use.
- The necessary parameters to determine the limits of use for electric wire rope hoists are the following:

- 1) Actual lifting capacity;
- 2) Stress level;
- 3) Average duration of daily use.

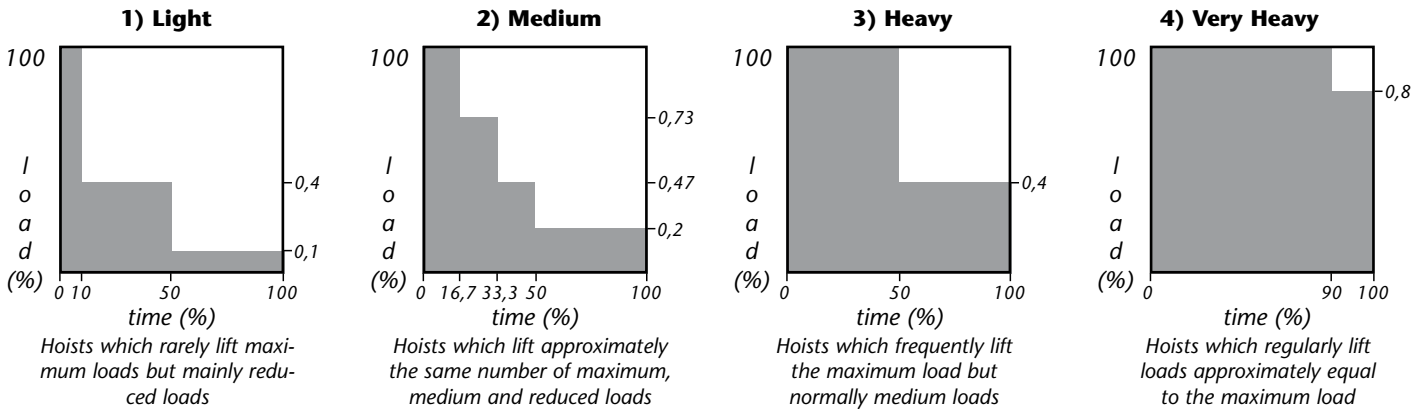
**1) Actual lifting capacity**

- This is determined by the heaviest load to be lifted.

|          |  |                              |
|----------|--|------------------------------|
| <b>!</b> | <i>The nominal lifting capacity of the hoist must be ≥ the actual lifting capacity</i> | <i>Lifting capacity = kg</i> |
|----------|--|------------------------------|

**2) Stress level**

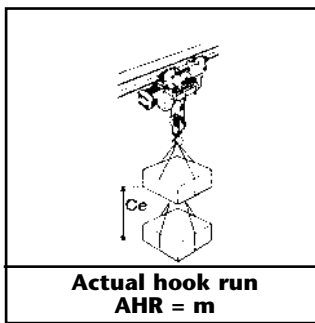
- The stress level is determined considering the actual entity of the loads lifted and it is ascribable to one of the four spectrums of load shown below which determine the type of service.



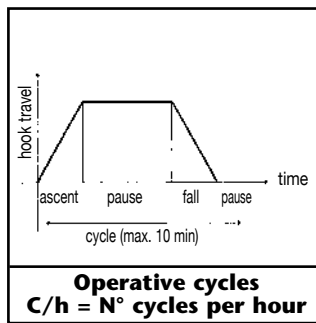
**3) Average duration of daily use - Tm=Hours**

- For **lifting** operations the average duration of use is calculated in the following way:

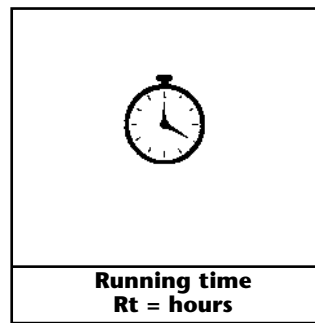
$$T_m \text{ (hours)} = \frac{AHR \times C/h \times Rt}{30 \times S}$$



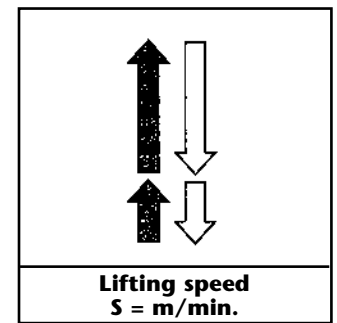
*It is the average of the actual runs of the load*



*It is the number of complete ascents and descents carried out in an hour*



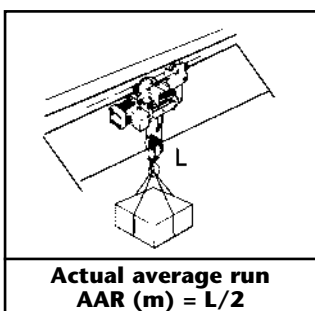
*Hoist running time in a whole day*



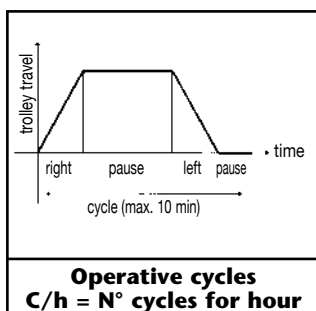
*It is the distance covered by the load in a minute*

- For **travel** operations the average duration of use is determined in the following way:

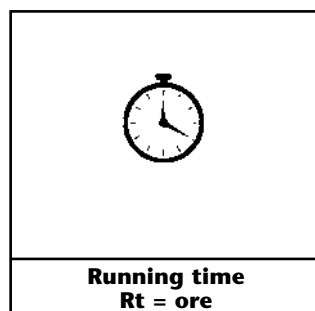
$$T_m \text{ (hours)} = \frac{AAR \times C/h \times Rt}{30 \times S}$$



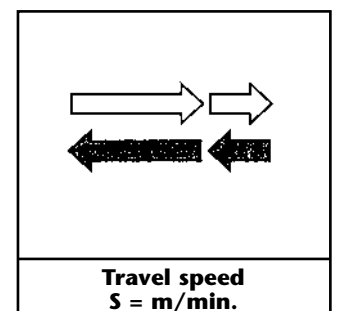
*It is the average of the length L of the trolley running beam*



*It is the number of complete runs (right/left) carried out in an hour*



*It is the running time of the trolley in a day*



*It is the distance covered by the trolley in a minute of continuous running*

### Choice criteria and condition of use:

- According to the type use, that determine the **stress level** and the **average duration of daily use**, for lifting and/or travelling, using the following table the identification group of the related mechanism are classified and then, according to the lifting capacity, the type of hoist is determined.
- Once the type of hoist is identified, it's important to check the related life time in terms of hours of service and of the total number of cycles in 10 years of operations.

| Classification and limit of use of the electromechanisms of lifting equipments |  |   |   |                     |                     |                     |                     |                     |
|--|--|---|---|---------------------|---------------------|---------------------|---------------------|---------------------|
| Use in base of the stress level (type of service)                              | 1) Light Load                          | Tm = Daily running time (hours)                               | ≤ 2   | ≤ 4                 | ≤ 8                 | ≤ 16                | > 16                |                     |
|  |  | Life of the mechanisms in 10 years operations (hours)         | 3200  | 6300                | 12500               | 25000               | 50000               | 100000              |
|  |  | N° maximum of cycle of work in 10 years operations (Σ cycles) | 250x10 <sup>3</sup>                           | 500x10 <sup>3</sup> | 100x10 <sup>4</sup> | 200x10 <sup>4</sup> | 400x10 <sup>4</sup> | > 4x10 <sup>6</sup> |
|  | 2) Medium Load                         | Tm = Daily running time (hours)                               | ≤ 1   | ≤ 2                 | ≤ 4                 | ≤ 8                 | ≤ 16                | > 16                |
|  |  | Life of the mechanisms in 10 years operations (hours)         | 1600  | 3200                | 6300                | 12500               | 25000               | 50000               |
|  |  | N° maximum of cycle of work in 10 years operations (Σ cycles) | 125x10 <sup>3</sup>                           | 250x10 <sup>3</sup> | 500x10 <sup>3</sup> | 100x10 <sup>4</sup> | 200x10 <sup>4</sup> | 400x10 <sup>4</sup> |
|  | 3) Heavy Load                          | Tm = Daily running time (hours)                               | ≤ 0,5   | ≤ 1                 | ≤ 2                 | ≤ 4                 | ≤ 8                 | ≤ 16                |
|  |  | Life of the mechanisms in 10 years operations (hours)         | 800   | 1600                | 3200                | 6300                | 12500               | 25000               |
|  |  | N° maximum of cycle of work in 10 years operations (Σ cycles) | 63x10 <sup>3</sup>                            | 125x10 <sup>3</sup> | 250x10 <sup>3</sup> | 500x10 <sup>3</sup> | 100x10 <sup>4</sup> | 200x10 <sup>4</sup> |
|  | 4) Very heavy Load                     | Tm = Daily running time (hours)                               | ≤ 0,25  | ≤ 0,5               | ≤ 1                 | ≤ 2                 | ≤ 4                 | ≤ 8                 |
|  |  | Life of the mechanisms in 10 years operations (hours)         | 400   | 800                 | 1600                | 3200                | 6300                | 12500               |
|  |  | N° maximum of cycle of work in 10 years operations (Σ cycles) | 32x10 <sup>3</sup>                            | 63x10 <sup>3</sup>  | 125x10 <sup>3</sup> | 250x10 <sup>3</sup> | 500x10 <sup>3</sup> | 100x10 <sup>4</sup> |
| Service group of the mechanisms of lifting and travelling                      | as per ISO 4301-1                      | <b>M3</b>   | <b>M4</b>                                     | <b>M5</b>           | <b>M6</b>           | <b>M7</b>           | <b>M8</b>           |                     |
|  | as per FEM 9.511                       | <b>1Bm</b>  | <b>1Am</b>                                    | <b>2m</b>           | <b>3m</b>           | <b>4m</b>           | <b>5m</b>           |                     |
| Intermittent use according to FEM 9.683/95                                     | Hoist mechanisms                       | Ratio of intermittance (RI%)                                  | 25  | 30                  | 40                  | 50                  | 60                  | 60                  |
|  |  | Maximum N° of start-ups per hour (A/h)                        | 150   | 180                 | 240                 | 300                 | 360                 | 360                 |
|  |  | Maximum N° of cycles per hour (C/h)                           | 25  | 30                  | 40                  | 50                  | 60                  | 60                  |
|  | Trolley mechanisms                     | Ratio of intermittance (RI%)                                  | 20  | 25                  | 30                  | 40                  | 50                  | 60                  |
|  |  | Maximum N° of start-ups per hour (A/h)                        | 120   | 150                 | 180                 | 240                 | 300                 | > 360               |
|  |  | Maximum N° of cycles per hour (C/h)                           | 20  | 25                  | 30                  | 40                  | 50                  | > 60                |
| Temporary use  | Running time at main speed (min)       | 15  | 15  | 30                  | 30                  | 60                  | > 60                |                     |
|  | Running time at low speed (min)        | 2,5   | 3   | 3,5                 | 4                   | 5                   | 6                   |                     |
|  | Maximum N° of start-ups per hour (A/h) | 10  | 10  | 10                  | 10                  | 10                  | 10                  |                     |
| Two-speed double-polarity motors   | Maximum N° of start-ups per hour (A/h) | Fast speed  | 1/3 (33.3% of total N° start-ups per hour)    |                     |                     |                     |                     |                     |
|  |  | Low speed   | 2/3 (66.7% of total N° start-ups per hour)    |                     |                     |                     |                     |                     |
|  | Tm = Daily running time (hours)        | Fast speed  | 2/3 (66.7% of the average daily running time) |                     |                     |                     |                     |                     |
|  |  | Low speed   | 1/3 (33.3% of the average daily running time) |                     |                     |                     |                     |                     |

#### Example:

Capacity = 6300 kg      Level of stress = 2) Medium Load      Actual hook run (AHR) = 2,5 m      N° of cycles per hour (C/h) = 8  
Daily running time (Rt) = 8 h      Lifting speed (S) = 4 m/min (4/1 rope falls)      N° of working days per year = D/y 220

#### 1) Calculation of the average daily running time:

$$T_m \text{ (hour)} = (\text{AHR} \times \text{C/h} \times \text{Rt}) / (30 \times \text{S}) = (2,5 \times 8 \times 8) / (30 \times 4) = 1,33 \text{ h}$$

In the table in section 2.2.7, in relation to the Capacity (6300 kg), at a Medium level of stress (2) and at an average daily running time (Tm = 1,33h) it is possible to determine the rope hoist, with 4/1 falls of rope, which is:

**Service Group FEM 1Am – Type DRH 24L1•M**

#### 2) Check of the time of life:

Hours of running 10 years       $T_m \times D/y \times 10 \text{ years} = 1,33 \times 220 \times 10 = 2933 \text{ (hours)} < \text{of the } 3200 \text{ (maximum hours possible)} \Rightarrow \text{ok}$   
N° of cycle of work in 10 years       $C/h \times \text{Rt} \times D/y \times 10 \text{ years} = 8 \times 8 \times 220 \times 10 = 140800 \text{ (cycles)} < \text{of the } 250000 \text{ (maximum hours possible)} \Rightarrow \text{ok}$

### Time of life of the lifting equipment:

- The time of life of the lifting equipment is determined from the **stress level**, the **real running hours** of each mechanism and the **number of cycles** of the complete machine. The **running hours** and **number of cycles**, in relation to the FEM/ISO of the lifting equipment selected are forecast to allow a safe life period of 10 years.
- After 10 years the lifting equipment could have finished the life of service in relation to the related group of service. For this reason at the due time of 10 years the equipment **SHOULD NOT be put any more in service without an inspection by DONATI SOLLEVAMENTI S.r.l.** expert technicians in order to check if the equipment has still some **remaining working life**, so able to work in safe condition for a further period, the equipment has to be subject to a deep technical control of all the parts.



- *The designation of the group of utilization of the wire rope hoist is shown on the label plate on the hoist (see paragraph 3.5.3 - List of labelling plates)*
- *DONATI SOLLEVAMENTI S.r.l. guarantees the safe and lasting utilization only if the DRH electric wire rope hoist is used according to the corresponding parameters for the group of utilization foreseen.*

2.2.7 Identification of hoists and related trolleys

| Configuration of ropes →<br>(single-grooved drum) |         |          | 8 falls<br>(8/1)                           |             |            | 6 falls<br>(6/1)                              |            | 4 falls<br>(4/1)                           |             |            |            | 2 falls<br>(2/1)                 |            |            |
|---|---------|----------|--|-------------|------------|---|------------|--|-------------|------------|------------|----------------------------------|------------|------------|
| Capacity<br>kg                                    | Letter  |          | DRH Type in relation<br>to FEM group (ISO) |             |            | DRH Type<br>in relation to<br>FEM group (ISO) |            | DRH Type in relation<br>to FEM group (ISO) |             |            |            | Tipo DRH<br>nel gruppo FEM (ISO) |            |            |
|   | reducer | capacity | 1Bm<br>(M3)                                | 1Am<br>(M4) | 2m<br>(M5) | 1Am<br>(M4)                                   | 2m<br>(M5) | 1Bm<br>(M3)                                | 1Am<br>(M4) | 2m<br>(M5) | 3m<br>(M6) | 1Am<br>(M4)                      | 2m<br>(M5) | 3m<br>(M6) |
| 800   | L       | D        |  |             |            |   |            |  |             |            |            |                                  |            | 12L3•D     |
| 800   | V       | D        |  |             |            |   |            |  |             |            |            |                                  |            | 12V3•D     |
| 1000  | L       | E        |  |             |            |   |            |  |             |            |            |                                  |            | 12L2•E     |
| 1000  | V       | E        |  |             |            |   |            |  |             |            |            |                                  |            | 12V2•E     |
| 1250  | L       | F        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•F     |
| 1250  | V       | F        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•F     |
| 1600  | L       | G        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•G     |
| 1600  | V       | G        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•G     |
| 2000  | L       | H        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•H     |
| 2000  | V       | H        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•H     |
| 2500  | L       | I        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•I     |
| 2500  | V       | I        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•I     |
| 3200  | L       | J        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•J     |
| 3200  | V       | J        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•J     |
| 4000  | L       | K        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•K     |
| 4000  | V       | K        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•K     |
| 5000  | L       | L        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•L     |
| 5000  | V       | L        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•L     |
| 6300  | L       | M        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•M     |
| 6300  | V       | M        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•M     |
| 8000  | L       | N        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•N     |
| 8000  | V       | N        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•N     |
| 10000   | L       | O        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•O     |
| 10000   | V       | O        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•O     |
| 12500   | L       | P        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•P     |
| 12500   | V       | P        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•P     |
| 16000   | L       | Q        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•Q     |
| 16000   | V       | Q        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•Q     |
| 20000   | L       | R        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•R     |
| 20000   | V       | R        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•R     |
| 25000   | L       | S        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•S     |
| 25000   | V       | S        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•S     |
| 32000   | L       | T        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•T     |
| 32000   | V       | T        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•T     |
| 40000   | L       | U        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•U     |
| 40000   | V       | U        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•U     |
| 50000   | L       | V        |  |             |            |   |            |  |             |            |            |                                  |            | 12L1•V     |
| 50000   | V       | V        |  |             |            |   |            |  |             |            |            |                                  |            | 12V1•V     |

|            |            |            |            |                        |
|------------|------------|------------|------------|------------------------|
| Size 1 DRH | Size 2 DRH | Size 3 DRH | Size 4 DRH | DRH4 cylindrical motor |
|------------|------------|------------|------------|------------------------|

Key and example of the identifying characteristics of the hoists and trolleys using codes

| DRH Hoist   | DST Trolley   | DRT Trolley  |
|---|---|--|
| <p>Size:<br/>1 - 2 - 3 - 4</p> <p>N° rope falls:<br/>2 = 2 falls (2/1)<br/>4 = 4 falls (4/1)<br/>6 = 6 falls (6/1)<br/>8 = 8 falls (8/1)</p> <p>Type of reducer:<br/>© M-Cylindrical = Slow<br/>4 m/min a 4/1 falls<br/>© S-Cylindrical = Fast<br/>3 m/min a 8/1 falls<br/>4 m/min a 6/1 falls<br/>6 m/min a 4/1 falls<br/>12 m/min a 2/1 falls<br/>L = Slow<br/>2 m/min a 8/1 falls<br/>2.7 m/min a 6/1 falls<br/>4 m/min a 4/1 falls<br/>8 m/min a 2/1 falls<br/>V = Fast<br/>6 m/min a 4/1 falls<br/>12 m/min a 2/1 falls</p> <p>0 = 1 Bm (M3)<br/>1 = 1 Am (M4)<br/>2 = 2 m (M5)<br/>3 = 3 m (M6)</p> | <p>Speed of hoist:<br/>S = 1 Speed<br/>W = 2 Speed</p> <p>Capacity letter:<br/>L = 5000 kg</p> <p>Type of drum:<br/>N = Normal<br/>C = Short<br/>L = Long<br/>1 = Extra long - X1<br/>(1ª size)<br/>2 = Extra long - X2<br/>(2ª size)<br/>X = Special</p> <p>Configuration type<br/>Monorail<br/>suspended</p> <p>Size:<br/>1 - 2 - 3 - 4</p> | <p>Speed of trolley: m/min<br/>E = 8<br/>F = 10<br/>G = 16<br/>H = 20<br/>D = 16/4<br/>W = 20/5</p> <p>Version:<br/>A = Normal<br/>B = Low headroom<br/>C = Articulated<br/>D = Oscillating</p> <p>Configuration type<br/>Double girder trolley</p> <p>Size:<br/>1 - 2 - 3 - 4</p> <p>Gauge: mm<br/>A = 1000<br/>B = 1200<br/>C = 1400<br/>D = 2240<br/>E = 2800<br/>X = Special</p> |

## 2.2.8 Characteristics and technical data

| Capacity<br>(kg) | FEM<br>Groupe<br>of the<br>hoist | Life and<br>service<br>reducers/<br>motors <sup>(1)</sup> | Type<br>DRH | Speed at 50 Hz<br>(m/min.) |         | Motor power<br>(kW) |         | Lifting height (m)<br>with rope drum <sup>(2)</sup> (3) |    |    |    |     | N°<br>falls | Rope <sup>(2)</sup><br>Ø/Type<br>(mm) | Type of trolley<br>on the hoist |                         |
|------------------|----------------------------------|---|-------------|----------------------------|---------|---------------------|---------|---|----|----|----|-----|-------------|---------------------------------------|---------------------------------|-------------------------|
|                  |                                  |   |             | 1 Speed                    | 2 Speed | 1 Speed             | 2 Speed | C   | N  | L  | X1 | X2  |             |                                       | monorail<br>DST – N/R           | double<br>girder<br>DRT |
| 800              | 3m                               | > 5m  | 12L3•D      | 8                          | 8/2,6   | 3                   | 3/1     | 8   | 12 | 24 | 34 | 45  | 2/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 3m                               | 3m  | 12V3•D      | 12                         | 12/4    | 3                   | 3/1     | 8   | 12 | 24 | 34 | 45  | 2/1         | 7B (7B)                               | 1                               | 1                       |
| 1000             | 3m                               | > 5m  | 14L3•E      | 4                          | 4/1,3   | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 3m                               | 5m  | 14V3•E      | 6                          | 6/2     | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 2m                               | 4m  | 12L2•E      | 8                          | 8/2,6   | 3                   | 3/1     | 8   | 12 | 24 | 34 | 45  | 2/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 3m                               | 4m  | 12L3•E      | 8                          | 8/2,6   | 3                   | 3/1     | 8   | 12 | 24 | 34 | 45  | 2/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 2m                               | 2m  | 12V2•E      | 12                         | 12/4    | 3                   | 3/1     | 8   | 12 | 24 | 34 | 45  | 2/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 3m                               | 4m  | 22V3•E      | 12                         | 12/4    | 5                   | 5/1,65  | 10  | 14 | 26 | 34 | 43  | 2/1         | 8M (8B)                               | 1                               | 1                       |
| 1250             | 3m                               | > 5m  | 14L3•F      | 4                          | 4/1,3   | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 3m                               | 4m  | 14V3•F      | 6                          | 6/2     | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 1Am                              | 3m  | 12L1•F      | 8                          | 8/2,6   | 3                   | 3/1     | 8   | 12 | 24 | 34 | 45  | 2/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 3m                               | 3m  | 12L3•F      | 8                          | 8/2,6   | 3                   | 3/1     | 8   | 12 | 24 | 34 | 45  | 2/1         | 7M (7A)                               | 1                               | 1                       |
|                  | 1Am                              | 1Am   | 12V1•F      | 12                         | 12/4    | 3                   | 3/1     | 8   | 12 | 24 | 34 | 45  | 2/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 2m                               | 3m  | 22V2•F      | 12                         | 12/4    | 5                   | 5/1,65  | 10  | 14 | 26 | 34 | 43  | 2/1         | 9B (9B)                               | 1                               | 1                       |
|                  | 3m                               | 3m  | 22V3•F      | 12                         | 12/4    | 5                   | 5/1,65  | 10  | 14 | 26 | 34 | 43  | 2/1         | 8M (8B)                               | 1                               | 1                       |
| 1600             | 3m                               | 5m  | 14L3•G      | 4                          | 4/1,3   | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 3m                               | 3m  | 14V3•G      | 6                          | 6/2     | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 1Am                              | 2m  | 12L1•G      | 8                          | 8/2,6   | 3                   | 3/1     | 8   | 12 | 24 | 34 | 45  | 2/1         | 7M (7A)                               | 1                               | 1                       |
|                  | 2m                               | 2m  | 12L2•G      | 8                          | 8/2,6   | 3                   | 3/1     | 8   | 12 | 24 | 34 | 45  | 2/1         | 7M (7A)                               | 1                               | 1                       |
|                  | 3m                               | 4m  | 22L3•G      | 8                          | 8/2,6   | 5                   | 5/1,65  | 10  | 14 | 26 | 34 | 43  | 2/1         | 8A (8A)                               | 1                               | 1                       |
|                  | 2m                               | 2m  | 22V2•G      | 12                         | 12/4    | 5                   | 5/1,65  | 10  | 14 | 26 | 34 | 43  | 2/1         | 9B (9B)                               | 1                               | 1                       |
|                  | 3m                               | 5m  | 32V3•G      | 12                         | 12/4    | 10                  | 10/3,3  | 10  | 14 | 28 | 37 | 47  | 2/1         | 12M (12A)                             | 2                               | 2                       |
| 2000             | 2m                               | 4m  | 14L2•H      | 4                          | 4/1,3   | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 3m                               | 4m  | 14L3•H      | 4                          | 4/1,3   | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 2m                               | 2m  | 14V2•H      | 6                          | 6/2     | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 3m                               | 4m  | 24V3•H      | 6                          | 6/2     | 5                   | 5/1,65  | 5   | 7  | 10 | 14 | 18  | 4/1         | 8M (8B)                               | 2                               | 1                       |
|                  | 1Am                              | 1Am   | 12L1•H      | 8                          | 8/2,6   | 3                   | 3/1     | 8   | 12 | 24 | 34 | 45  | 2/1         | 7A (7A)                               | 1                               | 1                       |
|                  | 2m                               | 3m  | 22L2•H      | 8                          | 8/2,6   | 5                   | 5/1,65  | 10  | 14 | 26 | 34 | 43  | 2/1         | 9B (9B)                               | 1                               | 1                       |
|                  | 3m                               | 3m  | 22L3•H      | 8                          | 8/2,6   | 5                   | 5/1,65  | 10  | 14 | –  | –  | –   | 2/1         | 8A                                    | 1                               | 1                       |
|                  | 1Am                              | 1Am   | 22V1•H      | 12                         | 12/4    | 5                   | 5/1,65  | 10  | 14 | 26 | 34 | 43  | 2/1         | 9B (9B)                               | 1                               | 1                       |
|                  | 2m                               | 4m  | 32V2•H      | 12                         | 12/4    | 10                  | 10/3,3  | 10  | 14 | 28 | 37 | 47  | 2/1         | 13B (13B)                             | 2                               | 2                       |
|                  | 3m                               | 4m  | 32V3•H      | 12                         | 12/4    | 10                  | 10/3,3  | 10  | 14 | 28 | 37 | 47  | 2/1         | 12M (12A)                             | 2                               | 2                       |
| 2500             | 1Am                              | 3m  | 14L1•I      | 4                          | 4/1,3   | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 3m                               | 3m  | 14L3•I      | 4                          | 4/1,3   | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7M (7A)                               | 1                               | 1                       |
|                  | 1Am                              | 1Am   | 14V1•I      | 6                          | 6/2     | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7B (7B)                               | 1                               | 1                       |
|                  | 2m                               | 3m  | 24V2•I      | 6                          | 6/2     | 5                   | 5/1,65  | 5   | 7  | 10 | 14 | 18  | 4/1         | 9B (9B)                               | 2                               | 1                       |
|                  | 3m                               | 3m  | 24V3•I      | 6                          | 6/2     | 5                   | 5/1,65  | 5   | 7  | 10 | 14 | 18  | 4/1         | 8M (8B)                               | 2                               | 1                       |
|                  | 1Am                              | 2m  | 22L1•I      | 8                          | 8/2,6   | 5                   | 5/1,65  | 10  | 14 | 26 | 34 | 43  | 2/1         | 9M (9A)                               | 1                               | 1                       |
|                  | 2m                               | 2m  | 22L2•I      | 8                          | 8/2,6   | 5                   | 5/1,65  | 10  | 14 | 26 | 34 | 43  | 2/1         | 9M (9A)                               | 1                               | 1                       |
|                  | 3m                               | 5m  | 32L3•I      | 8                          | 8/2,6   | 10                  | 10/3,3  | 10  | 14 | 28 | 37 | 47  | 2/1         | 12M (12B)                             | 2                               | 2                       |
|                  | 2m                               | 3m  | 32V2•I      | 12                         | 12/4    | 10                  | 10/3,3  | 10  | 14 | 28 | 37 | 47  | 2/1         | 13B (13B)                             | 2                               | 2                       |
| 3m               | 3m                               | 32V3•I  | 12          | 12/4                       | 10      | 10/3,3              | 10      | 14  | 28 | 37 | 47 | 2/1 | 12M (12A)   | 2                                     | 2                               |                         |
| 3200             | 1Am                              | 2m  | 14L1•J      | 4                          | 4/1,3   | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7M (7A)                               | 1                               | 1                       |
|                  | 1Bm                              | 1Bm   | 14V0•J      | 6                          | 6/2     | 3,5                 | 3,5/1,1 | 4   | 6  | 9  | 14 | 19  | 4/1         | 7M (7A)                               | 1                               | 1                       |
|                  | 2m                               | 2m  | 14L2•J      | 4                          | 4/1,3   | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7M (7A)                               | 1                               | 1                       |
|                  | 3m                               | 4m  | 24L3•J      | 4                          | 4/1,3   | 5                   | 5/1,65  | 5   | 7  | 10 | 14 | 18  | 4/1         | 8A (8A)                               | 2                               | 1                       |
|                  | 2m                               | 2m  | 24V2•J      | 6                          | 6/2     | 5                   | 5/1,65  | 5   | 7  | 10 | 14 | 18  | 4/1         | 9B (9B)                               | 2                               | 1                       |
|                  | 3m                               | 5m  | 34V3•J      | 6                          | 6/2     | 10                  | 10/3,3  | 5   | 7  | 10 | 14 | 19  | 4/1         | 12M (12A)                             | 3                               | 2                       |
|                  | 1Am                              | 1Am   | 22L1•J      | 8                          | 8/2,6   | 5                   | 5/1,65  | 10  | 14 | 26 | 34 | 43  | 2/1         | 9A (9A)                               | 1                               | 1                       |
|                  | 2m                               | 4m  | 32L2•J      | 8                          | 8/2,6   | 10                  | 10/3,3  | 10  | 14 | 28 | 37 | 47  | 2/1         | 13B (13B)                             | 2                               | 2                       |
|                  | 3m                               | 4m  | 32L3•J      | 8                          | 8/2,6   | 10                  | 10/3,3  | 10  | 14 | 28 | 37 | 47  | 2/1         | 12M (12A)                             | 2                               | 2                       |
|                  | 2m                               | 2m  | 32V2•J      | 12                         | 12/4    | 10                  | 10/3,3  | 10  | 14 | 28 | 37 | 47  | 2/1         | 13B (13B)                             | 2                               | 2                       |
|                  | 3m                               | 4m  | 42V3•J      | 12                         | 12/4    | 16                  | 16/5,3  | 12  | 16 | 32 | 45 | 58  | 2/1         | 15M (15A)                             | 3                               | 3                       |
| 4000             | 1Am                              | 1Am   | 14L1•K      | 4                          | 4/1,3   | 3                   | 3/1     | 4   | 6  | 9  | 14 | 19  | 4/1         | 7A (7A)                               | 1                               | 1                       |
|                  | 2m                               | 3m  | 24L2•K      | 4                          | 4/1,3   | 5                   | 5/1,65  | 5   | 7  | 10 | 14 | 18  | 4/1         | 9B (9B)                               | 2                               | 1                       |
|                  | 3m                               | 3m  | 24L3•K      | 4                          | 4/1,3   | 5                   | 5/1,65  | 5   | 7  | 10 | 14 | –   | 4/1         | 8A                                    | 2                               | 1                       |
|                  | 1Am                              | 1Am   | 24V1•K      | 6                          | 6/2     | 5                   | 5/1,65  | 5   | 7  | 10 | 14 | 18  | 4/1         | 9B (9B)                               | 2                               | 1                       |
|                  | 2m                               | 4m  | 34V2•K      | 6                          | 6/2     | 10                  | 10/3,3  | 5   | 7  | 10 | 14 | 19  | 4/1         | 13B (13B)                             | 3                               | 2                       |
|                  | 3m                               | 4m  | 34V3•K      | 6                          | 6/2     | 10                  | 10/3,3  | 5   | 7  | 10 | 14 | 19  | 4/1         | 12M (12A)                             | 3                               | 2                       |
|                  | 1Am                              | 3m  | 32L1•K      | 8                          | 8/2,6   | 10                  | 10/3,3  | 10  | 14 | 28 | 37 | 47  | 2/1         | 13B (13B)                             | 2                               | 2                       |
|                  | 2m                               | 3m  | 32L2•K      | 8                          | 8/2,6   | 10                  | 10/3,3  | 10  | 14 | 28 | 37 | 47  | 2/1         | 13M (13B)                             | 2                               | 2                       |
|                  | 3m                               | 3m  | 32L3•K      | 8                          | 8/2,6   | 10                  | 10/3,3  | 10  | 14 | 28 | 37 | 47  | 2/1         | 12A (12A)                             | 2                               | 2                       |
|                  | 1Am                              | 1Am   | 32V1•K      | 12                         | 12/4    | 10                  | 10/3,3  | 10  | 14 | 28 | 37 | 47  | 2/1         | 13B (13B)                             | 2                               | 2                       |
|                  | 2m                               | 3m  | 42V2•K      | 12                         | 12/4    | 16                  | 16/5,3  | 12  | 16 | 32 | 45 | 58  | 2/1         | 16B (16B)                             | 3                               | 3                       |
| 3m               | 3m                               | 42V3•K  | 12          | 12/4                       | 16      | 16/5,3              | 12      | 16  | 32 | 45 | 58 | 2/1 | 15M (15A)   | 3                                     | 3                               |                         |
| 5000             | 1Am                              | 2m  | 24L1•L      | 4                          | 4/1,3   | 5                   | 5/1,65  | 5   | 7  | 10 | 14 | 18  | 4/1         | 9M (9A)                               | 2                               | 1                       |
|                  | 1Bm                              | 1Bm   | 24V0•L      | 6                          | 6/2     | 5,5                 | 5,5/1,8 | 5   | 7  | 10 | 14 | 18  | 4/1         | 9M (9A)                               | 2                               | 1                       |
|                  | 2m                               | 2m  | 24L2•L      | 4                          | 4/1,3   | 5                   | 5/1,65  | 5   | 7  | 10 | 14 | 18  | 4/1         | 9M (9A)                               | 2                               | 1                       |
|                  | 3m                               | 5m  | 34L3•L      | 4                          | 4/1,3   | 10                  | 10/3,3  | 5   | 7  | 10 | 14 | 19  | 4/1         | 12M (12A)                             | 3                               | 2                       |
|                  | 2m                               | 3m  | 34V2•L      | 6                          | 6/2     | 10                  | 10/3,3  | 5   | 7  | 10 | 14 | 19  | 4/1         | 13B (13B)                             | 3                               | 2                       |
|                  | 3m                               | 3m  | 34V3•L      | 6                          | 6/2     | 10                  | 10/3,3  | 5   | 7  | 10 | 14 | 19  | 4/1         | 12M (12A)                             | 3                               | 2                       |
|                  | 1Am                              | 2m  | 32L1•L      | 8                          | 8/2,6   | 10                  | 10/3,3  | 10  | 14 | 28 | 37 | 47  | 2/1         | 13M (13A)                             | 2                               | 2                       |
|                  | 2m                               | 2m  | 32L2•L      | 8                          | 8/2,6   | 10                  | 10/3,3  | 10  | 14 | 28 | 37 | 47  | 2/1         | 13M (13A)                             | 2                               | 2                       |
|                  | 3m                               | 4m  | 42L3•L      | 8                          | 8/2,6   | 16                  | 16/5,3  | 12  | 16 | 32 | 45 | 58  | 2/1         | 15M (15A)                             | 3                               | 3                       |
|                  | 2m                               | 2m  | 42V2•L      | 12                         | 12/4    | 16                  | 16/5,3  | 12  | 16 | 32 | 45 | 58  | 2/1         | 16B (16B)                             | 3                               | 3                       |

| Capacity<br>(kg) | FEM<br>Groupe<br>of the<br>hoist | Life and<br>service<br>reducers/<br>motors <sup>(1)</sup> | Type<br>DRH | Data of the DRH electric wire rope hoists |         |                     |         |   |    |     |      |      |                     |                | Type of trolley<br>on the hoist |                         |
|------------------|----------------------------------|---|-------------|---|---------|---------------------|---------|---|----|-----|------|------|---------------------|----------------|---------------------------------|-------------------------|
|                  |                                  |   |             | Speed at 50 Hz<br>(m/min.)                |         | Motor power<br>(kW) |         | Lifting height (m)<br>with rope drum <sup>(2) (3)</sup> |    |     |      |      | Rope <sup>(2)</sup> |                | monorail<br>DST - N/R           | double<br>girder<br>DRT |
|                  |                                  |   |             | 1 Speed                                   | 2 Speed | 1 Speed             | 2 Speed | C   | N  | L   | X1   | X2   | N°<br>falls         | Ø/Type<br>(mm) |                                 |                         |
| 6300             | 1Am                              | 1Am   | 24L1•M      | 4   | 4/1,3   | 5                   | 5/1,65  | 5   | 7  | 10  | 14   | 18   | 4/1                 | 9A (9A)        | 2                               | 1                       |
|                  | 2m                               | 4m  | 34L2•M      | 4   | 4/1,3   | 10                  | 10/3,3  | 5   | 7  | 10  | 14   | 19   | 4/1                 | 13B (13B)      | 3                               | 2                       |
|                  | 3m                               | 4m  | 34L3•M      | 4   | 4/1,3   | 10                  | 10/3,3  | 5   | 7  | 10  | 14   | 19   | 4/1                 | 12M (12A)      | 3                               | 2                       |
|                  | 2m                               | 2m  | 34V2•M      | 6   | 6/2     | 10                  | 10/3,3  | 5   | 7  | 10  | 14   | 19   | 4/1                 | 13B (13B)      | 3                               | 2                       |
|                  | 3m                               | 4m  | 44V3•M      | 6   | 6/2     | 16                  | 16/5,3  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 15M (15A)      | 4                               | 3                       |
|                  | 1Am                              | 1Am   | 32L1•M      | 8   | 8/2,6   | 10                  | 10/3,3  | 10  | 14 | 28  | 37   | 47   | 2/1                 | 13A (13A)      | 2                               | 2                       |
|                  | 2m                               | 3m  | 42L2•M      | 8   | 8/2,6   | 16                  | 16/5,3  | 12  | 16 | 32  | 45   | 58   | 2/1                 | 16B (16B)      | 3                               | 3                       |
|                  | 3m                               | 3m  | 42L3•M      | 8   | 8/2,6   | 16                  | 16/5,3  | 12  | 16 | 32  | 45   | 58   | 2/1                 | 15A (15A)      | 3                               | 3                       |
| 1Am              | 1Am                              | 42V1•M  | 12          | 12/4                                      | 16      | 16/5,3              | 12      | 16  | 32 | 45  | 58   | 2/1  | 16B (16B)           | 3              | 3                               |                         |
| 8000             | 1Am                              | 3m  | 34L1•N      | 4   | 4/1,3   | 10                  | 10/3,3  | 5   | 7  | 10  | 14   | 19   | 4/1                 | 13B (13B)      | 3                               | 2                       |
|                  | 2m                               | 3m  | 34L2•N      | 4   | 4/1,3   | 10                  | 10/3,3  | 5   | 7  | 10  | 14   | 19   | 4/1                 | 13M (13B)      | 3                               | 2                       |
|                  | 3m                               | 3m  | 34L3•N      | 4   | 4/1,3   | 10                  | 10/3,3  | 5   | 7  | 10  | 14   | 19   | 4/1                 | 12A (12A)      | 3                               | 2                       |
|                  | 1Am                              | 1Am   | 34V1•N      | 6   | 6/2     | 10                  | 10/3,3  | 5   | 7  | 10  | 14   | 19   | 4/1                 | 13B (13B)      | 3                               | 2                       |
|                  | 2m                               | 3m  | 44V2•N      | 6   | 6/2     | 16                  | 16/5,3  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16B (16B)      | 4                               | 3                       |
|                  | 3m                               | 3m  | 44V3•N      | 6   | 6/2     | 16                  | 16/5,3  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 15M (15A)      | 4                               | 3                       |
|                  | 1Am                              | 2m  | 42L1•N      | 8   | 8/2,6   | 16                  | 16/5,3  | 12  | 16 | 32  | 45   | 58   | 2/1                 | 16M (16M)      | 3                               | 3                       |
|                  | 2m                               | 2m  | 42L2•N      | 8   | 8/2,6   | 16                  | 16/5,3  | 12  | 16 | 32  | 45   | 58   | 2/1                 | 16M (16M)      | 3                               | 3                       |
| 10000            | 1Am                              | 2m  | 34L1•O      | 4   | 4/1,3   | 10                  | 10/3,3  | 5   | 7  | 10  | 14   | 19   | 4/1                 | 13M (13A)      | 3                               | 2                       |
|                  | 1Bm                              | 1Bm   | 34V0•O      | 6   | 6/2     | 11                  | 11/3,6  | 5   | 7  | 10  | 14   | 19   | 4/1                 | 13M (13A)      | 3                               | 2                       |
|                  | 2m                               | 2m  | 34L2•O      | 4   | 4/1,3   | 10                  | 10/3,3  | 5   | 7  | 10  | 14   | 19   | 4/1                 | 13M (13A)      | 3                               | 2                       |
|                  | 3m                               | 4m  | 44L3•O      | 4   | 4/1,3   | 16                  | 16/5,3  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 15M (15A)      | 4                               | 3                       |
|                  | 2m                               | 2m  | 44V2•O      | 6   | 6/2     | 16                  | 16/5,3  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16B (16B)      | 4                               | 3                       |
|                  | 3m                               | 4m  | ⊙44S3•O     | 6   | 6/2     | 24                  | 24/7,8  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 15M (15A)      | 4                               | 3                       |
|                  | 1Am                              | 1Am   | 42L1•O      | 8   | 8/2,6   | 16                  | 16/5,3  | 12  | 16 | 32  | 45   | 58   | 2/1                 | 16A (16A)      | 3                               | 3                       |
|                  | 1Am                              | 1Am   | ⊙42S1•O     | 12  | 12/4    | 24                  | 24/7,8  | 12  | 16 | 32  | 45   | 58   | 2/1                 | 16A (16A)      | 3                               | 3                       |
| 12500            | 1Am                              | 1Am   | 34L1•P      | 4   | 4/1,3   | 10                  | 10/3,3  | 5   | 7  | 10  | 14   | 19   | 4/1                 | 13A (13A)      | 3                               | 2                       |
|                  | 2m                               | 3m  | 44L2•P      | 4   | 4/1,3   | 16                  | 16/5,3  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16B (16B)      | 4                               | 3                       |
|                  | 3m                               | 3m  | 44L3•P      | 4   | 4/1,3   | 16                  | 16/5,3  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 15A (15A)      | 4                               | 3                       |
|                  | 1Am                              | 1Am   | 44V1•P      | 6   | 6/2     | 16                  | 16/5,3  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16B (16B)      | 4                               | 3                       |
|                  | 2m                               | 3m  | ⊙44S2•P     | 6   | 6/2     | 24                  | 24/7,8  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16B (16B)      | 4                               | 3                       |
|                  | 3m                               | 3m  | ⊙44S3•P     | 6   | 6/2     | 24                  | 24/7,8  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 15A (15A)      | 4                               | 3                       |
| 16000            | 2m                               | 2m  | 36L2•Q      | 2,7                                       | 2,7/0,9 | 10                  | 10/3,3  | -   | 4  | 8,8 | 11,5 | 15   | 6/1                 | 13A1           | -                               | 3                       |
|                  | 1Am                              | 2m  | 44L1•Q      | 4   | 4/1,3   | 16                  | 16/5,3  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16M (16M)      | 4                               | 3                       |
|                  | 1Bm                              | 1Bm   | 44V0•Q      | 6   | 6/2     | 18                  | 18/6    | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16M (16M)      | 4                               | 3                       |
|                  | 2m                               | 2m  | 44L2•Q      | 4   | 4/1,3   | 16                  | 16/5,3  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16M (16M)      | 4                               | 3                       |
|                  | 1Am                              | 2m  | ⊙44S1•Q     | 6   | 6/2     | 24                  | 24/7,8  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16M (16M)      | 4                               | 3                       |
|                  | 2m                               | 2m  | ⊙44S2•Q     | 6   | 6/2     | 24                  | 24/7,8  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16M (16M)      | 4                               | 3                       |
| 20000            | 1Am                              | 1Am   | 36L1•R      | 2,7                                       | 2,7/0,9 | 10                  | 10/3,3  | -   | 4  | 8,8 | 11,5 | 15   | 6/1                 | 13A1           | -                               | 3                       |
|                  | 1Am                              | 1Am   | 44L1•R      | 4   | 4/1,3   | 16                  | 16/5,3  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16A (16A)      | 4                               | 3                       |
|                  | 1Am                              | 1Am   | ⊙44S1•R     | 6   | 6/2     | 24                  | 24/7,8  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16A (16A)      | 4                               | 3                       |
|                  | 2m                               | 2m  | 38L2•R      | 2   | 2/0,7   | 10                  | 10/3,3  | -   | -  | 6   | 8    | 10,8 | 8/1                 | 13A1           | -                               | 3                       |
|                  | 2m                               | 2m  | 44L2•R      | 4   | 4/1,3   | 16                  | 16/5,3  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16A1(16A)      | 4                               | 3                       |
| 25000            | 1Bm                              | 1Bm   | 44L0•S      | 4   | 4/1,3   | 18                  | 18/6    | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16A1           | -                               | 3                       |
|                  | 1Am                              | 1Am   | 38L1•S      | 2   | 2/0,7   | 10                  | 10/3,3  | -   | -  | 6   | 8    | 10,8 | 8/1                 | 13A1(13A1)     | -                               | 3                       |
|                  | 1Am                              | 1Am   | ⊙44M1•S     | 4   | 4/1,3   | 24                  | 24/7,8  | 6   | 8  | 11  | 17   | 24   | 4/1                 | 16,2A          | -                               | 3                       |
|                  | 2m                               | 2m  | 46L2•S      | 2,7                                       | 2,7/0,9 | 16                  | 16/5,3  | -   | 5  | 10  | 14   | 19   | 6/1                 | 16A            | -                               | 3                       |
|                  | 2m                               | 2m  | ⊙46S2•S     | 4   | 4/1,3   | 24                  | 24/7,8  | -   | 5  | 10  | 14   | 19   | 6/1                 | 16A            | -                               | 3                       |
| 32000            | 1Am                              | 1Am   | 46L1•T      | 2,7                                       | 2,7/0,9 | 16                  | 16/5,3  | -   | 5  | 10  | 14   | 19   | 6/1                 | 16A            | -                               | 3                       |
|                  | 1Am                              | 1Am   | ⊙46S1•T     | 4   | 4/1,3   | 24                  | 24/7,8  | -   | 5  | 10  | 14   | 19   | 6/1                 | 16A            | -                               | 3                       |
|                  | 2m                               | 2m  | 46L2•T      | 2,7                                       | 2,7/0,9 | 16                  | 16/5,3  | -   | 5  | 10  | 14   | 19   | 6/1                 | 16A1           | -                               | 3                       |
| 40000            | 1Am                              | 1Am   | 48L1•U      | 2   | 2/0,7   | 16                  | 16/5,3  | -   | 3  | 7   | 10   | 13,5 | 8/1                 | 16A            | -                               | 4                       |
|                  | 1Am                              | 1Am   | ⊙48S1•U     | 3   | 3/1     | 24                  | 24/7,8  | -   | 3  | 7   | 10   | 13,5 | 8/1                 | 16A            | -                               | 4                       |
|                  | 2m                               | 2m  | 48L2•U      | 2   | 2/0,7   | 16                  | 16/5,3  | -   | 3  | 7   | 10   | 13,5 | 8/1                 | 16A1           | -                               | 4                       |
| 50000            | 1Bm                              | 1Bm   | 48L0•V      | 2   | 2/0,7   | 18                  | 18/6    | -   | 3  | 7   | 10   | 13,5 | 8/1                 | 16A1           | -                               | 4                       |
|                  | 1Bm                              | 1Bm   | ⊙48S0•V     | 3   | 3/1     | 27                  | 27/9    | -   | 3  | 7   | 10   | 13,5 | 8/1                 | 16A1           | -                               | 4                       |

NOTE: (1) This column indicates the FEM reference group for evaluation of normal conditions and/or the life span of the motoreducer only. The classification of the whole hoist, in any case, is the one defined in the relative FEM service group shown in the adjacent column.

(2) Hoists with 2 falls of rope (2/1), a long (L) and extra long rope drum size 1 (X1) and hoists with 2 and 4 falls of rope (2/1 e 4/1) and an extra long rope drum size 2 (X2) use anti-twist ropes. The type of anti-twist rope is shown in brackets.

(3) The extra long drums size 1 (X1) and size 2 (X2) are supplied without the protective roof.

© Version DRH4 with cylindrical motor.

| Breaking load of the ropes (minimum granted kN) |        |        |        |         |         |         |         |           |       |       |       |       |       |       |       |       |       |       |       |       |       |
|---|--------|--------|--------|---------|---------|---------|---------|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Hoist type →<br>Ø Rope →                        | DRH1   |        |        | DRH2    |         |         | DRH3    |           |       | DRH4  |       |       |       |       |       |       |       |       |       |       |       |
|   | Ø 7 mm | Ø 8 mm | Ø 9 mm | Ø 12 mm | Ø 13 mm | Ø 15 mm | Ø 16 mm | Ø 16,2 mm | B     | M     | A     | A1    | B     | M     | A     | A1    | B     | M     | A     | A1    |       |
| Normal (kN)                                     | 30,4   | 42,1   | 48,1   | 42,0    | 61,6    | 53,1    | 69,6    | 74,6      | 121,7 | 138,7 | 102,0 | 142,5 | 163,4 | 154,0 | 189,7 | 219,2 | 176,9 | 215,9 | 236,0 | 268,0 | 296,0 |
| Non rotating (kN)                               | 35,3   | -      | 48,8   | 46,1    | 60,5    | 58,4    | -       | 76,6      | -     | 136,2 | 121,8 | -     | 159,8 | -     | -     | 212,7 | 184,4 | 242,1 | 255,0 | -     | -     |

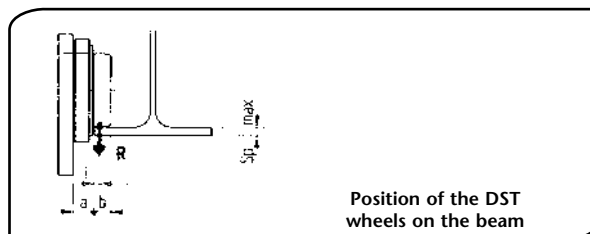
| Trolley data and motor power (maximums suppliable = kW) with one and two travel speeds |       |  |         |               |          |   |         |               |          |   |         |                |           |
|--|-------|--|---------|---------------|----------|---|---------|---------------|----------|---|---------|----------------|-----------|
| Electric travel trolley<br>Type - Size   |       | 1 Speed: 8 or 10 m/min. <sup>(1)</sup> |         |               |          | 1 Speed: 16 or 20 m/min. <sup>(1)</sup> |         |               |          | 2 Speed: 16/4 or 20/5 m/min. <sup>(1)</sup> |         |                |           |
|  |       | Reducer ratio with speed m/min         |         | Trolley motor |          | Reducer ratio with speed m/min          |         | Trolley motor |          | Reducer ratio with speed m/min              |         | Trolley motor  |           |
|  |       | 8                                      | 10      | Type 4 poles  | Power kW | 16                                      | 20      | Type 2 poli   | Power kW | 16/4  | 20/5    | Type 2/8 poles | Power kW  |
| DST - N/R Monorail   | 1 - 2 | ↑1                                     | ↑2      | 71 - 4        | 0,16     | ↑1                                      | ↑2      | 71 - 2        | 0,32     | ↑1  | ↑2      | 71 - D         | 0,32/0,07 |
|  | 3     | ↑1                                     | ↑2      | 80 - 4        | 0,25     | ↑1                                      | ↑2      | 80 - 2        | 0,50     | ↑1  | ↑2      | 80 - D         | 0,50/0,12 |
|  | 4     | ↑1                                     | ↑2      | 80 - 4        | 0,32     | ↑1                                      | ↑2      | 80 - 2        | 0,63     | ↑1  | ↑2      | 80 - D         | 0,63/0,15 |
| DRT double girder  | 1     | ↑1                                     | ↑2      | 71 - 4        | 0,16     | ↑1                                      | ↑2      | 71 - 2        | 0,32     | ↑1  | ↑2      | 71 - D         | 0,32/0,07 |
|  | 2     | ↑1                                     | ↑2      | 80 - 4        | 0,25     | ↑1                                      | ↑2      | 80 - 2        | 0,50     | ↑1  | ↑2      | 80 - D         | 0,50/0,12 |
|  | 3     | ↑1                                     | ↑2      | 80 - 4        | 0,32     | ↑1                                      | ↑2      | 80 - 2        | 0,63     | ↑1  | ↑2      | 80 - D         | 0,63/0,15 |
|  |       | ↑1                                     | ↑2      | 100 - 4       | 0,63     | ↑1                                      | ↑2      | 100 - 2       | 1,25     | ↑1  | ↑2      | 100 - D        | 1,25/0,31 |
| 4  | ↑1    | ↑2                                     | 100 - 4 | 0,63          | ↑1       | ↑2                                      | 100 - 2 | 1,25          | ↑1       | ↑2  | 100 - D | 1,25/0,31      |           |

NOTE: For application with double motoreducer see page 35.

(1) The lifting and travel speeds and related motors power refers to three-phase supply voltage with 50Hz frequency. In case of 60Hz frequency they have to be increased of 20%.

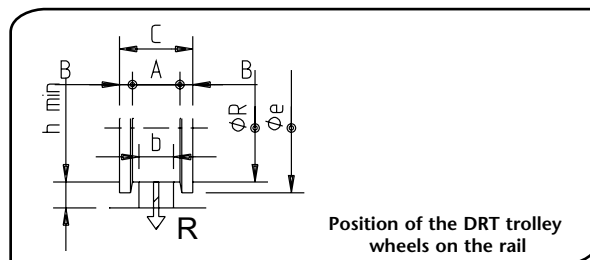
Position of the DST wheels on the beam

| DST N/S R | Ø R Wheel (mm.) | Dimensions (mm) |    |    | Thick max. (mm.) |
|-----------|-----------------|-----------------|----|----|------------------|
|           |                 | i               | a  | b  |                  |
| DST1      | 100             | 8               | 35 | 18 | 20               |
| DST2      | 125             | 12              | 35 | 29 | 23               |
| DST3      | 200             | 19              | 45 | 38 | 36               |
| DST4      | 250             | 22              | 50 | 43 | 42               |



Dimensions of the DRT wheels and relevant rails

| DRT  | Ø R Wheel (mm) | Dimensions (mm) |     |        |        |         |    |    |
|------|----------------|-----------------|-----|--------|--------|---------|----|----|
|      |                | Wheel           |     |        |        | Binario |    |    |
| A    | B              | C               | Ø e | h min. | b min. | b max.  |    |    |
| DRT1 | 125            | 50              | 15  | 80     | 150    | 30      | 30 | 40 |
| DRT2 | 160            | 55              | 19  | 93     | 190    | 30      | 30 | 45 |
| DRT3 | 200            | 60              | 20  | 100    | 230    | 30      | 40 | 50 |
| DRT4 | 250            | 70              | 20  | 110    | 280    | 40      | 50 | 60 |



Fissaggio dei paranchi a fune DRH in esecuzione sospesa ed appoggiata

**Fixing of hoists 2 and 4 ropes falls in suspended execution: Details of the hole and of the connection area of the universal eyebolt.**

The universal eyebolt suspension is supplied as a standard.  
For dimensions I e I1 see page DRH of set-down/suspended suspension

**Fixing in set-down execution hoists 2, 4, 6 and 8 ropes falls: Details of the support foot and of the connection area of the universal set-down eyebolt.**

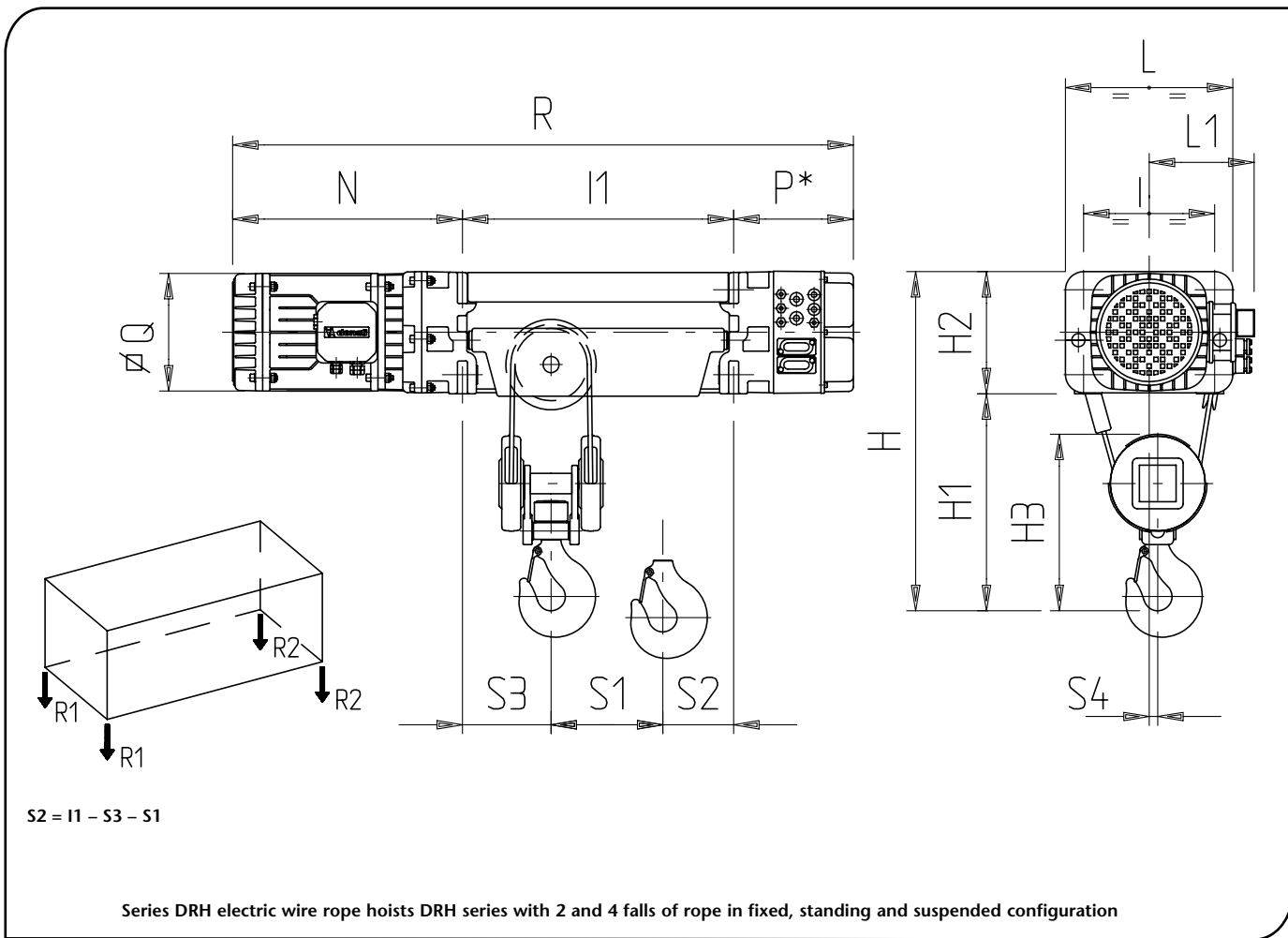
The universal eyebolt suspension is supplied as a standard.  
For dimensions I e I1 see page DRH of set-down/suspended suspension

NOTE: Fixing of hoists 2, 4, 6 and 8 ropes falls in set-down execution:

- With universal eyebolt, the headroom of hoist (H2), has to be increased of "B6" dimension.
- On trolley DRT3/4 with DRH6 and 8 ropes falls it's supplied the set-down staybolt as a standard.

| Rope falls N° | DRH | Overall dimensions (mm) |    |    |    |    |    |    |    |    |    |        |     |  |
|---------------|-----|-------------------------|----|----|----|----|----|----|----|----|----|--------|-----|--|
|               |     | A                       | A1 | B  | B1 | B2 | B3 | B4 | B5 | B6 | ØF | M      | G   |  |
| 2/1 - 4/1     | 1   | 20                      | 20 | 37 | 21 | 21 | 35 | 35 | 50 | 13 | 20 | 16x2   | 65  |  |
|               | 2   | 22                      | 22 | 42 | 31 | 31 | 40 | 40 | 55 | 13 | 25 | 20x2,5 | 70  |  |
|               | 3   | 32                      | 32 | 48 | 36 | 36 | 55 | 55 | 76 | 28 | 35 | 24x3   | 93  |  |
|               | 4   | 42                      | 42 | 60 | 38 | 46 | 70 | 70 | 89 | 29 | 45 | 30x3,5 | 108 |  |
| 6/1 - 8/1     | 3   | 32                      | 32 | 48 | 36 | -  | -  | -  | 48 | -  | 35 | 20X2,5 | 55  |  |
|               | 4   | 42                      | 42 | 60 | 38 | -  | -  | -  | 60 | -  | 45 | 27X3   | 57  |  |

2.2.9 Overall dimensions conical motors – Weights – Reactions on the supports see page 29



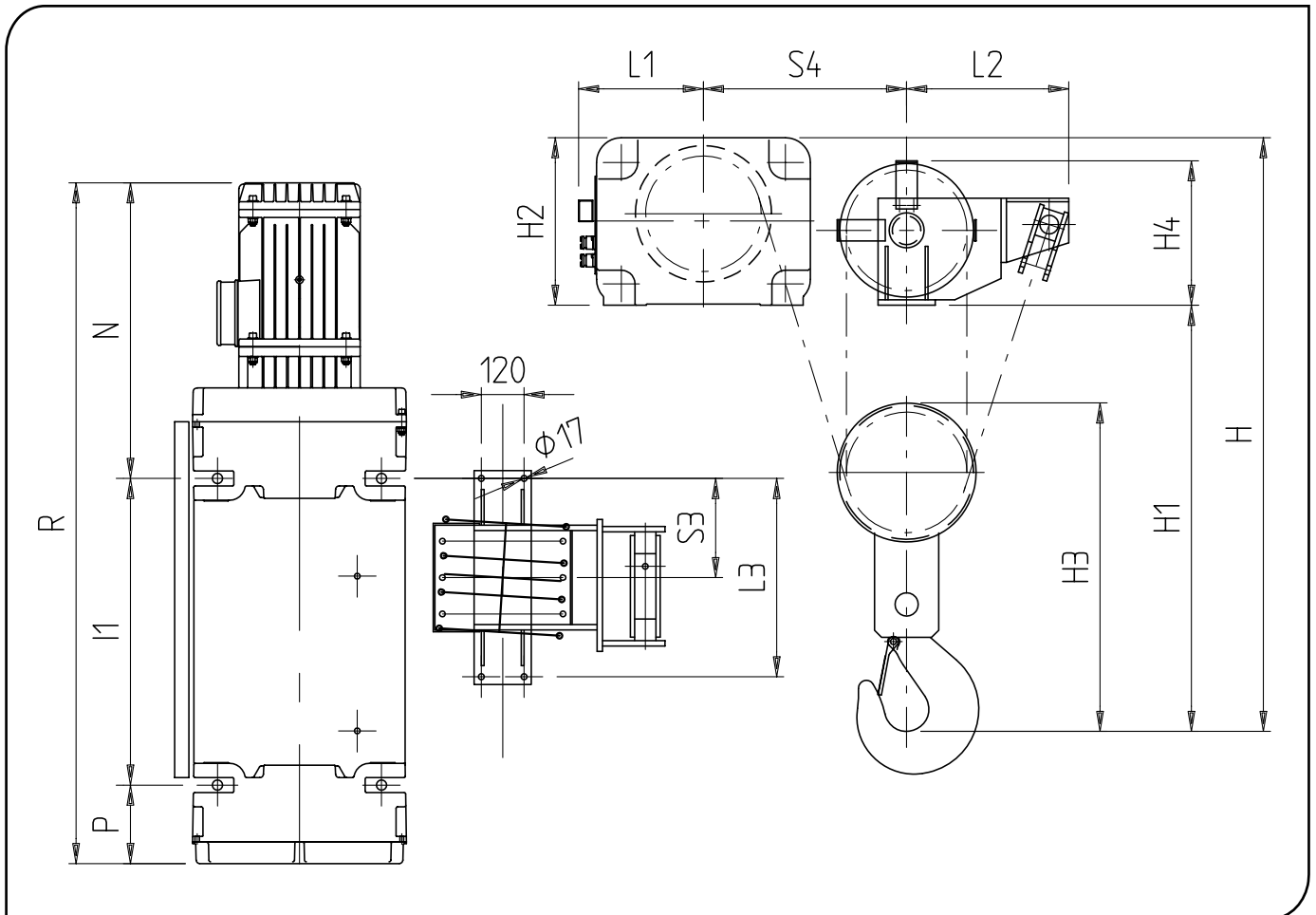
\* DRH3 and DRH4 with Low Voltage Control Box, the dimension P has to be: DRH3 = 330; DRH4 = 360

| Rope falls N° | DRH | Overall dimensions (mm) |     |     |     |     |     |     |      |     |     |    |
|---------------|-----|-------------------------|-----|-----|-----|-----|-----|-----|------|-----|-----|----|
|               |     | H                       | H1  | H2  | H3  | I   | L   | L1  | N    | P   | Q   | S4 |
| 2/1           | 1   | 690                     | 460 | 230 | 390 | 250 | 320 | 210 | 480  | 255 | 225 | 28 |
|               | 2   | 820                     | 550 | 270 | 445 | 290 | 370 | 235 | 525  | 270 | 260 | 30 |
|               | 3   | 1090                    | 710 | 380 | 595 | 370 | 480 | 290 | 705  | 205 | 300 | 40 |
|               | 4   | 1390                    | 920 | 470 | 750 | 460 | 600 | 360 | 855  | 220 | 340 | 45 |
|               | ⊙4  | 1390                    | 920 | 470 | 750 | 460 | 600 | 360 | 1015 | 220 | 340 | 45 |
| 4/1           | 1   | 650                     | 420 | 230 | 345 | 250 | 320 | 210 | 480  | 255 | 225 | 15 |
|               | 2   | 750                     | 480 | 270 | 390 | 290 | 370 | 235 | 525  | 270 | 260 | 19 |
|               | 3   | 1020                    | 640 | 380 | 540 | 370 | 480 | 290 | 705  | 205 | 300 | 23 |
|               | 4   | 1320                    | 850 | 470 | 700 | 460 | 600 | 360 | 855  | 220 | 340 | 25 |
|               | ⊙4  | 1320                    | 850 | 470 | 700 | 460 | 600 | 360 | 1015 | 220 | 340 | 25 |

| Rope falls N° | DRH | Drum C |      |     |     | Drum N |      |     |     | Drum L |      |     |     | Drum X1 |      |     |     | Drum X2 |      |     |     | Weight (kg) with drum type |      |      |      |      |
|---------------|-----|--------|------|-----|-----|--------|------|-----|-----|--------|------|-----|-----|---------|------|-----|-----|---------|------|-----|-----|----------------------------|------|------|------|------|
|               |     | I1     | R    | S1  | S3  | I1     | R    | S1  | S3  | I1     | R    | S1  | S3  | I1      | R    | S1  | S3  | I1      | R    | S1  | S3  | C                          | N    | L    | X1   | X2   |
| 2/1           | 1   | 400    | 1135 | 125 | 95  | 515    | 1250 | 185 | 95  | 890    | 1625 | 275 | 95  | 1200    | 1935 | 380 | 95  | 1530    | 2265 | 490 | 95  | 132                        | 141  | 160  | 180  | 200  |
|               | 2   | 480    | 1275 | 160 | 100 | 600    | 1395 | 220 | 100 | 1000   | 1795 | 310 | 100 | 1260    | 2055 | 400 | 100 | 1530    | 2325 | 490 | 100 | 180                        | 195  | 215  | 260  | 280  |
|               | 3   | 600    | 1510 | 195 | 130 | 740    | 1650 | 265 | 130 | 1260   | 2170 | 375 | 130 | 1550    | 2460 | 490 | 130 | 1940    | 2850 | 620 | 130 | 460                        | 490  | 565  | 590  | 620  |
|               | 4   | 722    | 1797 | 220 | 170 | 862    | 1937 | 290 | 170 | 1422   | 2497 | 400 | 170 | 1852    | 2927 | 580 | 170 | 2352    | 3427 | 750 | 170 | 855                        | 890  | 1010 | 1200 | 1250 |
|               | ⊙4  | 722    | 1957 | 220 | 170 | 862    | 2097 | 290 | 170 | 1422   | 2657 | 400 | 170 | 1852    | 3087 | 580 | 170 | 2352    | 3587 | 750 | 170 | 910                        | 945  | 1065 | 1255 | 1305 |
| 4/1           | 1   | 400    | 1135 | 70  | 150 | 515    | 1250 | 100 | 150 | 890    | 1625 | 160 | 165 | 1200    | 1935 | 230 | 165 | 1530    | 2265 | 300 | 165 | 140                        | 150  | 170  | 200  | 220  |
|               | 2   | 480    | 1275 | 105 | 180 | 600    | 1395 | 135 | 180 | 1000   | 1795 | 210 | 200 | 1260    | 2055 | 280 | 200 | 1530    | 2325 | 350 | 200 | 195                        | 205  | 235  | 280  | 300  |
|               | 3   | 600    | 1510 | 130 | 240 | 740    | 1650 | 160 | 240 | 1260   | 2170 | 240 | 270 | 1550    | 2460 | 280 | 270 | 1940    | 2850 | 350 | 270 | 515                        | 540  | 625  | 650  | 700  |
|               | 4   | 722    | 1797 | 150 | 300 | 862    | 1937 | 180 | 300 | 1422   | 2497 | 220 | 300 | 1852    | 2927 | 310 | 300 | 2352    | 3427 | 410 | 300 | 960                        | 960  | 1140 | 1350 | 1400 |
|               | ⊙4  | 722    | 1957 | 150 | 300 | 862    | 2097 | 180 | 300 | 1422   | 2657 | 220 | 300 | 1852    | 3087 | 310 | 300 | 2352    | 3587 | 410 | 300 | 1015                       | 1055 | 1195 | 1405 | 1455 |

© Hoist DRH4 with cylindrical motor

**Electric wire rope DRH series, 6 and 8 falls in set-down execution – Reactions on the support see page 29**

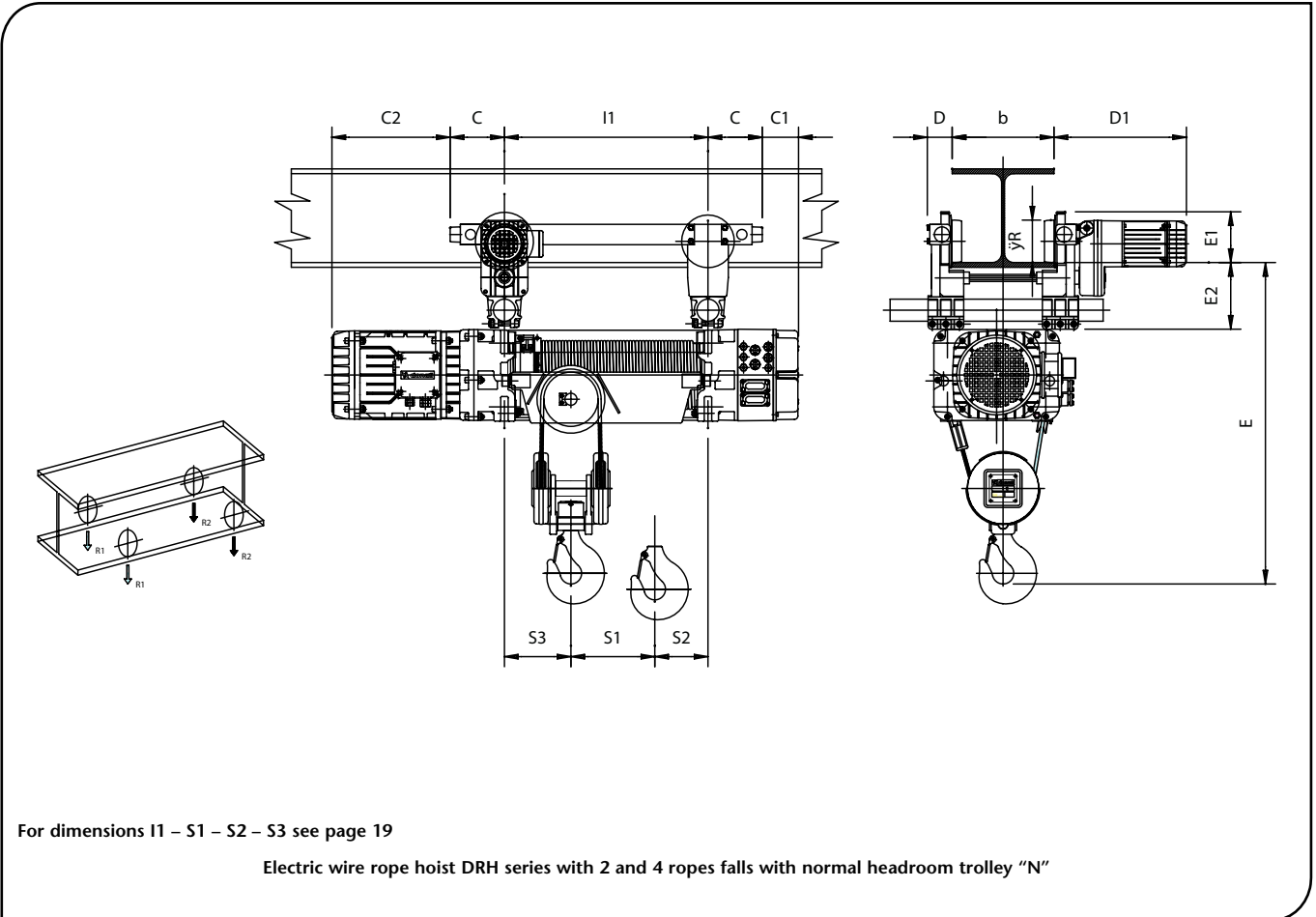


| Rope falls N° | DRH | Overall dimensions (mm) |      |     |     |     |     |     |     |      |     |
|---------------|-----|-------------------------|------|-----|-----|-----|-----|-----|-----|------|-----|
|               |     | H                       | H1   | H3  | H4  | L2  | L3  | S4  | L1  | N    | P   |
| 6/1           | 3   | 1435                    | 1055 | 777 | 330 | 350 | 330 | 415 | 290 | 705  | 205 |
|               | 4   | 1665                    | 1195 | 922 | 410 | 355 | 360 | 470 | 360 | 855  | 220 |
|               | ©4  | 1665                    | 1195 | 922 | 410 | 355 | 360 | 470 | 360 | 1015 | 220 |
| 8/1           | 3   | 1435                    | 1055 | 777 | 330 | 420 | 450 | 515 | 290 | 705  | 205 |
|               | 4   | 1665                    | 1195 | 922 | 410 | 455 | 556 | 570 | 360 | 855  | 220 |
|               | ©4  | 1665                    | 1195 | 922 | 410 | 455 | 556 | 570 | 360 | 1015 | 220 |

| Rope falls N° | DRH | Drum N |      |     | Drum L |      |     | Drum X1 |      |     | Drum X2 |      |     | Weight (kg) with drum type |      |      |      |
|---------------|-----|--------|------|-----|--------|------|-----|---------|------|-----|---------|------|-----|----------------------------|------|------|------|
|               |     | I1     | R    | S3  | I1     | R    | S3  | I1      | R    | S3  | I1      | R    | S3  | N                          | L    | X1   | X2   |
| 6/1           | 3   | 740    | 1650 | 165 | 1260   | 2170 | 165 | 1550    | 2460 | 165 | 1940    | 2850 | 165 | 595                        | 680  | 710  | 760  |
|               | 4   | 862    | 1937 | 180 | 1422   | 2497 | 180 | 1852    | 2970 | 180 | 2352    | 3427 | 180 | 1070                       | 1210 | 1420 | 1470 |
|               | ©4  | 862    | 2097 | 180 | 1422   | 2657 | 180 | 1852    | 3087 | 180 | 2352    | 3587 | 180 | 1125                       | 1265 | 1475 | 1525 |
| 8/1           | 3   | -      | -    | -   | 1260   | 2170 | 225 | 1550    | 2460 | 225 | 1940    | 2850 | 225 | -                          | 700  | 730  | 780  |
|               | 4   | 862    | 1937 | 278 | 1422   | 2497 | 278 | 1852    | 2927 | 278 | 2352    | 3427 | 278 | 1110                       | 1250 | 1460 | 1510 |
|               | ©4  | 862    | 2097 | 278 | 1422   | 2657 | 278 | 1852    | 3087 | 278 | 2352    | 3587 | 278 | 1165                       | 1305 | 1515 | 1565 |

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**Single girder DST/N/S trolleys for DRH electric wire rope hoists -2 rope falls version (2/1) and 4 rope falls version (4/1).  
Reactions on the support see page 30**

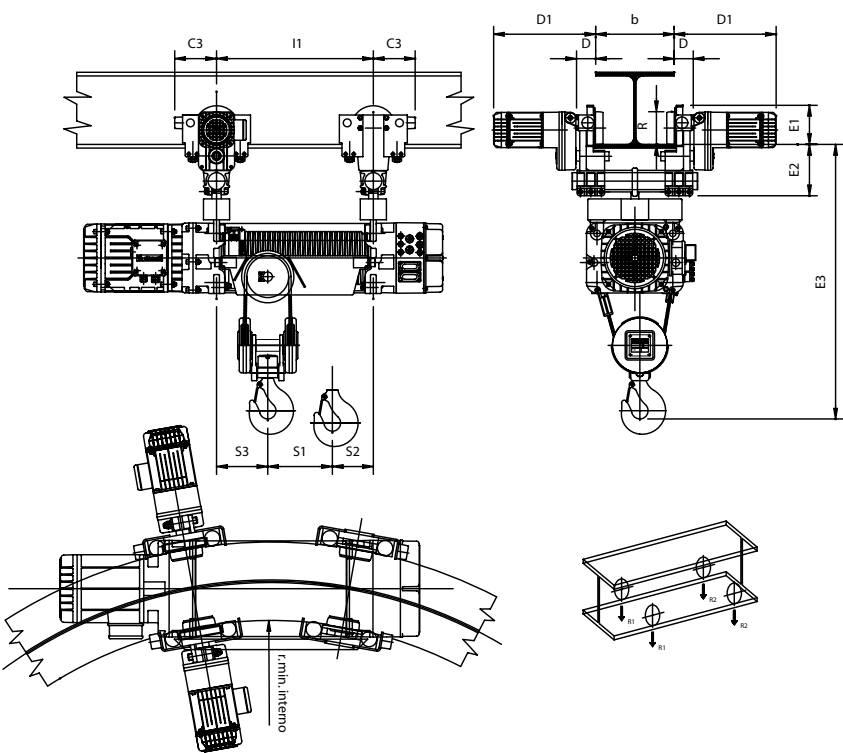


| Rope falls N° | Type DRH | Trolley DST N/S | Overall dimensions (mm) |      |     |     |     |      |     |     | Total weight (kg) with drum type |      |      |      |      |
|---------------|----------|-----------------|-------------------------|------|-----|-----|-----|------|-----|-----|----------------------------------|------|------|------|------|
|               |          |                 | C                       | C1   | C2  | D   | D1  | E    | E1  | E2. | C                                | N    | L    | X1   | X2   |
| 2/1           | 1        | 1               | 140                     | 115  | 340 | 66  | 393 | 870  | 130 | 180 | 215                              | 220  | 240  | 270  | 290  |
|               | 2        | 1               | 140                     | 130  | 385 | 66  | 393 | 1000 | 130 | 180 | 260                              | 270  | 295  | 326  | 346  |
|               | 3        | 2               | 160                     | 45   | 545 | 75  | 400 | 1290 | 148 | 195 | 575                              | 600  | 675  | 750  | 826  |
|               | 4        | 3               | 275                     | -55  | 580 | 95  | 464 | 1655 | 240 | 260 | 1120                             | 1155 | 1270 | 1480 | 1650 |
|               | ©4       | 3               | 275                     | -55  | 740 | 95  | 464 | 1655 | 240 | 260 | 1175                             | 1210 | 1325 | 1535 | 1705 |
| 4/1           | 1        | 1               | 140                     | 115  | 340 | 66  | 393 | 830  | 128 | 180 | 220                              | 230  | 250  | 280  | 300  |
|               | 2        | 2               | 160                     | 110  | 365 | 75  | 400 | 950  | 148 | 195 | 300                              | 310  | 335  | 380  | 400  |
|               | 3        | 3               | 275                     | -70  | 430 | 95  | 464 | 1290 | 240 | 260 | 775                              | 810  | 880  | 996  | 1070 |
|               | 4        | 4               | 325                     | -105 | 530 | 107 | 474 | 1620 | 295 | 300 | 1415                             | 1455 | 1590 | 1800 | 1970 |
|               | ©4       | 4               | 325                     | -105 | 690 | 107 | 474 | 1620 | 295 | 300 | 1470                             | 1510 | 1645 | 1855 | 2025 |

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**Single girder DST/N/S trolleys for DRH electric wire rope hoists – 2 rope falls version (2/1) and 4 rope falls version (4/1) Articulated**

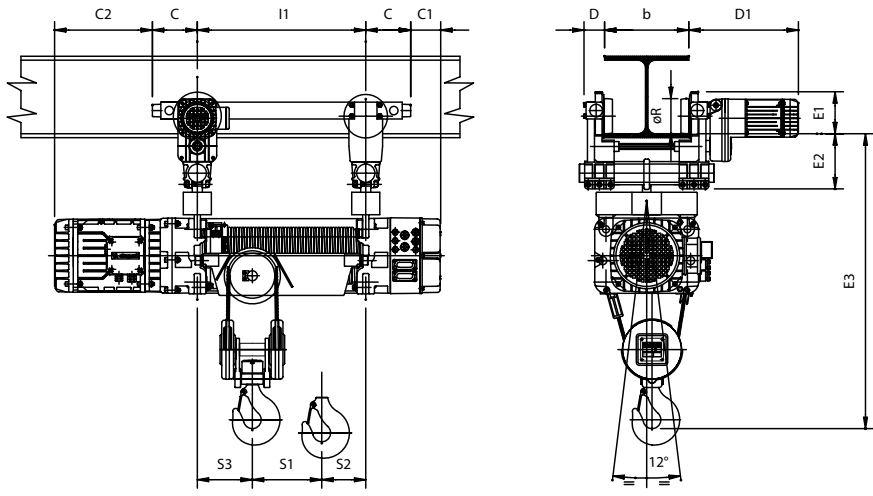
| Falls N° | Type DRH | Trolley DST N/S | Overall dimensions (mm) |        |      |
|----------|----------|-----------------|-------------------------|--------|------|
|          |          |                 | C3                      | r. min | E3   |
| 2/1      | 1        | 1               | 156                     | 1500   | 960  |
|          | 2        | 1               | 156                     | 1500   | 1090 |
|          | 3        | 2               | 160                     | 1600   | 1400 |
|          | 4        | 3               | 280                     | 1600   | 1860 |
| 4/1      | 1        | 1               | 156                     | 1500   | 920  |
|          | 2        | 2               | 160                     | 1600   | 1050 |
|          | 3        | 3               | 280                     | 1600   | 1490 |
|          | 4        | 4               | 327                     | 1800   | 1810 |



For dimensions I1 – S1 – S2 – S3 see page 19

Electric wire rope hoists DRH series with 2 and 4 ropes falls complete with articulated trolley "S"

**Single girder DST/N/S trolleys for DRH electric wire rope hoists – 2 rope falls version (2/1) and 4 rope falls version (4/1) Oscillating**



For dimensions I1 – S1 – S2 – S3 see page 19

Electric wire rope hoists DRH series with 2 and 4 ropes falls in oscillating execution

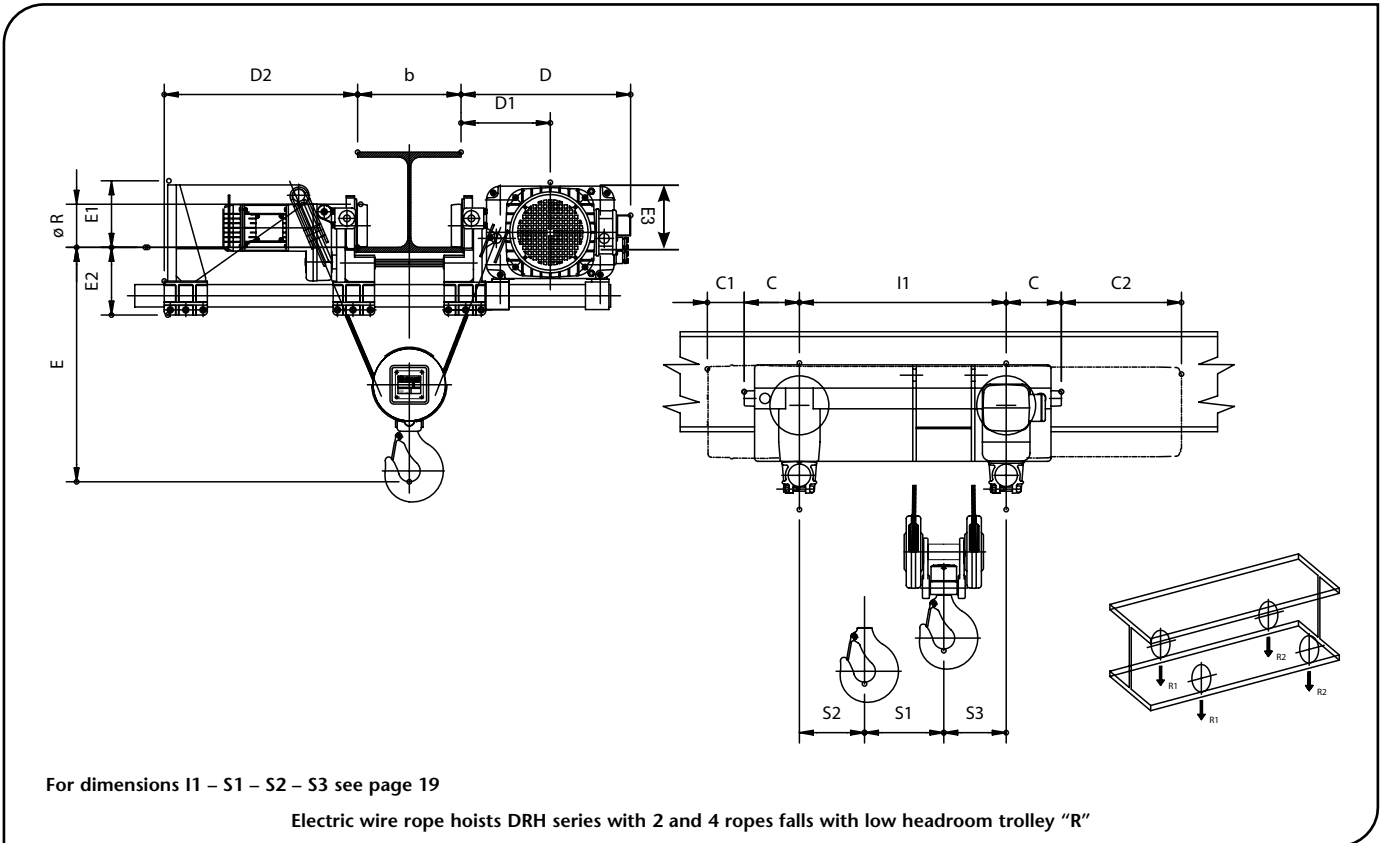
| BEAMS WIDTH CHARACTERISTICS TABLE FOR DST TROLLEYS |       |       |       |       |       |       |       |       |         |         |         |         |
|--|-------|-------|-------|-------|-------|-------|-------|-------|---------|---------|---------|---------|
| Carrello DST                                       | DST1N | DST2N | DST3N | DST4N | DST1R | DST2R | DST3R | DST4R | DST1S/O | DST2S/O | DST3S/O | DST4S/O |
| Min beamwidth (mm)                                 | 90    | 119   | 135   | 180   | 90    | 119   | 135   | 180   | 100     | 135     | 170     | 210     |
| Max thickness (mm)                                 | 20    | 23    | 36    | 42    | 20    | 23    | 36    | 42    | 20      | 23      | 36      | 42      |
| Min radius (mm)                                    | /     | /     | /     | /     | /     | /     | /     | /     | 1500    | 1600    | 1600*   | 1800    |

\* DST3S with DRH4 2 falls and X2 drum Minimum radius = 1800

Minimum beam's width = minimum beam width needed  
 Maximum thickness = maximum allowed beam bottom flange thickness

Minimum radius = minimum internal radius required for curved beams  
 N = normal; R = low headroom; S = articulated; O = oscillating

**Monorail DST/R trolleys for electric DRH wire rope hoists – 2 rope falls (2/1) and 4 rope falls versions (4/1)  
Reactions on the support see page 31**

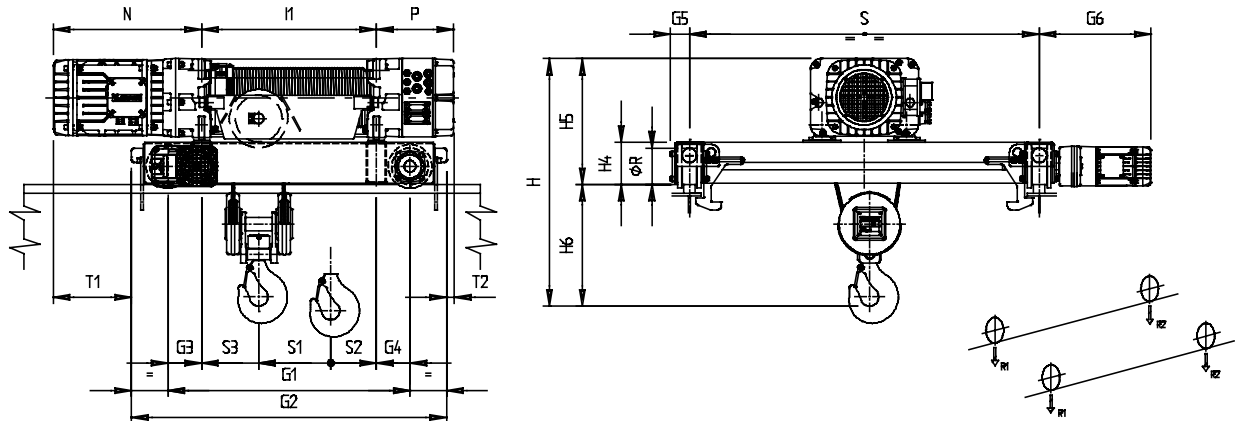


| Rope falls N° | Type DRH | Trolley DST-R | Overall dimensions (mm) |     |     |     |                 |     |     |     |     |      |     | Total weight (kg) with drum type |      |      |      |      |
|---------------|----------|---------------|-------------------------|-----|-----|-----|-----------------|-----|-----|-----|-----|------|-----|----------------------------------|------|------|------|------|
|               |          |               | D                       | D1  | D2  | E1  | E1 drum (x1-x2) | E2  | E3  | ØR  | C   | C1   | C2  | C                                | N    | L    | X1   | X2   |
| 2/1           | 1        | 1             | 440                     | 230 | 540 | 140 | 143             | 180 | 145 | 100 | 140 | 115  | 340 | 260                              | 270  | 280  | 360  | 390  |
|               | 2        | 1             | 485                     | 250 | 575 | 200 | 180             | 180 | 185 | 100 | 140 | 130  | 385 | 360                              | 370  | 395  | 460  | 490  |
|               | 3        | 2             | 605                     | 315 | 655 | 317 | 295             | 195 | 395 | 125 | 160 | 45   | 545 | 740                              | 770  | 870  | 1060 | 1160 |
|               | 4        | 3             | 755                     | 395 | 677 | 345 | 345             | 260 | 360 | 200 | 275 | -55  | 580 | 1510                             | 1550 | 1700 | 2120 | 2350 |
|               | ©4       | 3             | 755                     | 395 | 677 | 345 | 345             | 260 | 360 | 200 | 275 | -55  | 740 | 1565                             | 1605 | 1755 | 2175 | 2405 |
| 4/1           | 1        | 1             | 440                     | 230 | 540 | 140 | 143             | 180 | 145 | 100 | 140 | 115  | 340 | 270                              | 280  | 290  | 370  | 400  |
|               | 2        | 2             | 495                     | 265 | 560 | 195 | 175             | 195 | 180 | 125 | 160 | 110  | 365 | 415                              | 425  | 450  | 530  | 560  |
|               | 3        | 3             | 625                     | 335 | 622 | 280 | 260             | 260 | 260 | 200 | 275 | -70  | 430 | 985                              | 1005 | 1115 | 1346 | 1446 |
|               | 4        | 4             | 760                     | 405 | 630 | 345 | 345             | 300 | 350 | 250 | 325 | -105 | 530 | 1880                             | 1930 | 2120 | 2540 | 2764 |
|               | ©4       | 4             | 760                     | 405 | 630 | 345 | 345             | 300 | 350 | 250 | 325 | -105 | 690 | 1935                             | 1985 | 2175 | 2595 | 2819 |

© Hoist DRH4 with cylindrical motor

| Rope falls N° | Hook clearance E (mm) in relation to the width of the beam b (mm) and to the size of the DRH wire rope hoist |     |     |     |            |     |     |     |            |     |     |     |            |     |     |      |
|---------------|--|-----|-----|-----|------------|-----|-----|-----|------------|-----|-----|-----|------------|-----|-----|------|
|               | b = 180 mm   |     |     |     | b = 220 mm |     |     |     | b = 300 mm |     |     |     | b = 400 mm |     |     |      |
|               | 1  | 2   | 3   | 4   | 1          | 2   | 3   | 4   | 1          | 2   | 3   | 4   | 1          | 2   | 3   | 4    |
| 2/1           | 630  | 640 | 680 | 830 | 670        | 680 | 680 | 830 | 770        | 780 | 780 | 880 | 890        | 900 | 900 | 1000 |
| 4/1           | 480  | 500 | 610 | 790 | 530        | 550 | 610 | 790 | 620        | 650 | 650 | 790 | 740        | 770 | 770 | 850  |

**DRT double girder trolleys for electric DRH wire rope hoists – 2 rope falls (2/1) and 4 rope falls versions (4/1)**  
**Reactions on the supports see page 32**



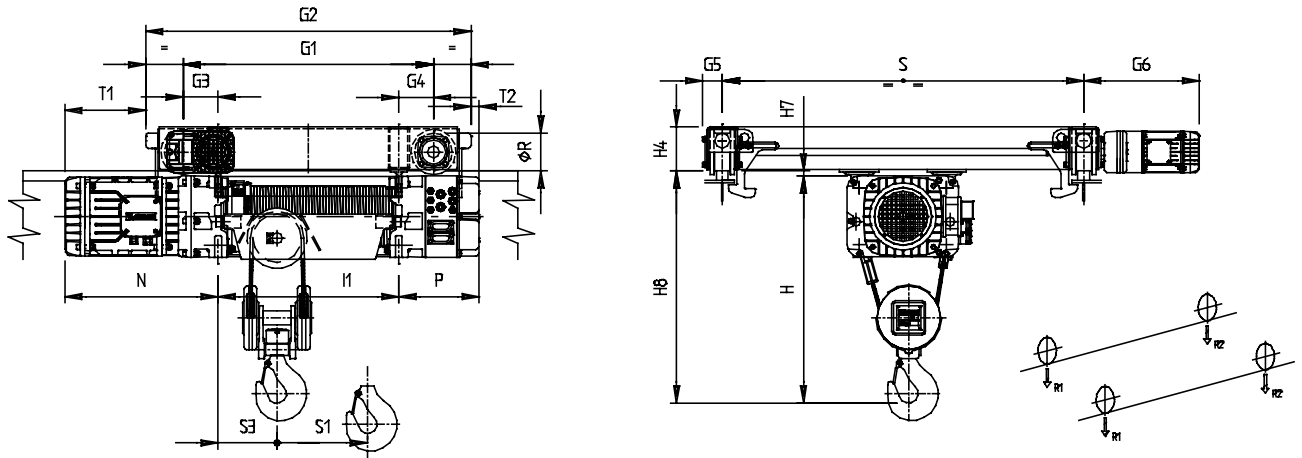
For dimensions I1 – S1 – S2 – S3 – N – P – H see page 19  
 H6 = H – H5

(\*) Foreseen gauge of standard production is S = 1000 mm.  
 on request it can be supplied with gauge S = 1200 mm.

Electric wire rope hoists DRH series with 2 and 4 ropes falls with double girder trolley DRT, hoist set-down execution

| Rope falls N°                              | Type DRH | Trolley DRT | Trolley gauge S (mm) | Type of drum DRH | Weight DRH + DRT (kg) | Overall dimensions (mm) |      |       |       |    |     |       |       |     |     |     |
|--|----------|-------------|----------------------|------------------|-----------------------|-------------------------|------|-------|-------|----|-----|-------|-------|-----|-----|-----|
|  |          |             |                      |                  |                       | G1                      | G2   | G3    | G4    | G5 | G6  | T1    | T2    | ØR  | H4  | H5  |
| 2/1<br>4/1                                 | 1        | 1           | 1000                 | C                | 236                   | 710                     | 940  | 155   | 155   | 66 | 392 | 210   | -15   | 125 | 145 | 391 |
|  |          |             |                      | N                | 250                   | 830                     | 1060 | 157.5 | 157.5 | 66 | 392 | 207,5 | -17,5 | 125 | 145 | 391 |
|  |          |             |                      | L                | 280                   | 1230                    | 1460 | 170   | 170   | 66 | 392 | 195   | -30   | 125 | 145 | 391 |
|  |          |             |                      | X1               | 306                   | 1500                    | 1730 | 150   | 150   | 66 | 392 | 215   | -10   | 125 | 145 | 391 |
|  | 2        | 1           | 1000                 | C                | 296                   | 710                     | 940  | 115   | 115   | 66 | 392 | 295   | 40    | 125 | 145 | 433 |
|  |          |             |                      | N                | 306                   | 830                     | 1060 | 115   | 115   | 66 | 392 | 295   | 40    | 125 | 145 | 433 |
|  |          |             |                      | L                | 350                   | 1230                    | 1460 | 115   | 115   | 66 | 392 | 295   | 40    | 125 | 145 | 433 |
|  |          |             |                      | X1               | 376                   | 1500                    | 1730 | 120   | 120   | 66 | 392 | 290   | 35    | 125 | 145 | 433 |
|  | 3        | 2           | 1000                 | C                | 716                   | 890                     | 1202 | 145   | 145   | 80 | 461 | 404   | -96   | 160 | 190 | 598 |
|  |          |             |                      | N                | 750                   | 1030                    | 1342 | 145   | 145   | 80 | 461 | 404   | -96   | 160 | 190 | 598 |
|  |          |             |                      | L                | 860                   | 1550                    | 1862 | 145   | 145   | 80 | 461 | 404   | -96   | 160 | 190 | 598 |
|  |          |             |                      | X1               | 946                   | 1840                    | 2152 | 145   | 145   | 80 | 461 | 404   | -96   | 160 | 190 | 598 |
|  | 4        | 3           | 1000                 | C                | 1240                  | 1060                    | 1446 | 170   | 170   | 90 | 520 | 492   | -143  | 200 | 228 | 720 |
|  |          |             |                      | N                | 1286                  | 1200                    | 1586 | 170   | 170   | 90 | 520 | 492   | -143  | 200 | 228 | 720 |
|  |          |             |                      | L                | 1480                  | 1760                    | 2146 | 170   | 170   | 90 | 520 | 492   | -143  | 200 | 228 | 720 |
|  |          |             |                      | X1               | 1656                  | 2210                    | 2596 | 180   | 180   | 90 | 520 | 482   | -153  | 200 | 228 | 720 |
|  | ©4       | 3           | 1000                 | C                | 1295                  | 1060                    | 1446 | 170   | 170   | 90 | 520 | 652   | -143  | 200 | 228 | 720 |
|  |          |             |                      | N                | 1341                  | 1200                    | 1586 | 170   | 170   | 90 | 520 | 652   | -143  | 200 | 228 | 720 |
|  |          |             |                      | L                | 1535                  | 1760                    | 2146 | 170   | 170   | 90 | 520 | 652   | -143  | 200 | 228 | 720 |
|  |          |             |                      | X1               | 1711                  | 2210                    | 2596 | 180   | 180   | 90 | 520 | 642   | -153  | 200 | 228 | 720 |
| <b>Trolley DRT3 with hoists DRH4 (25t)</b> |          |             |                      |                  |                       |                         |      |       |       |    |     |       |       |     |     |     |
| 4/1  | 4        | 3           | 1000                 | C                | 1350                  | 1060                    | 1446 | 170   | 170   | 90 | 520 | 492   | -143  | 200 | 235 | 727 |
|  |          |             |                      | N                | 1397                  | 1200                    | 1586 | 170   | 170   | 90 | 520 | 492   | -143  | 200 | 235 | 727 |
|  |          |             |                      | L                | 1617                  | 1760                    | 2146 | 170   | 170   | 90 | 520 | 492   | -143  | 200 | 235 | 727 |
|  |          |             |                      | X1               | 1822                  | 2210                    | 2596 | 180   | 180   | 90 | 520 | 482   | -153  | 200 | 235 | 727 |
|  |          |             |                      | X2               | 2055                  | 2710                    | 3096 | 180   | 180   | 90 | 520 | 482   | -153  | 200 | 235 | 727 |
|  | ©4       | 3           | 1000                 | C                | 1405                  | 1060                    | 1446 | 170   | 170   | 90 | 520 | 652   | -143  | 200 | 235 | 727 |
|  |          |             |                      | N                | 1452                  | 1200                    | 1586 | 170   | 170   | 90 | 520 | 652   | -143  | 200 | 235 | 727 |
|  |          |             |                      | L                | 1672                  | 1760                    | 2146 | 170   | 170   | 90 | 520 | 652   | -143  | 200 | 235 | 727 |
|  |          |             |                      | X1               | 1877                  | 2210                    | 2596 | 180   | 180   | 90 | 520 | 642   | -153  | 200 | 235 | 727 |
|  |          |             |                      | X2               | 2110                  | 2710                    | 3096 | 180   | 180   | 90 | 520 | 642   | -153  | 200 | 235 | 727 |

**DRT double girder trolleys for DRH wire rope hoist suspended execution - Version 2 rope falls and 4 rope falls**  
**Reactions on the supports see page 32**



For dimensions I1 – S1 – S2 – S3 – N – P – H see page 19  
 H = H5 + H6

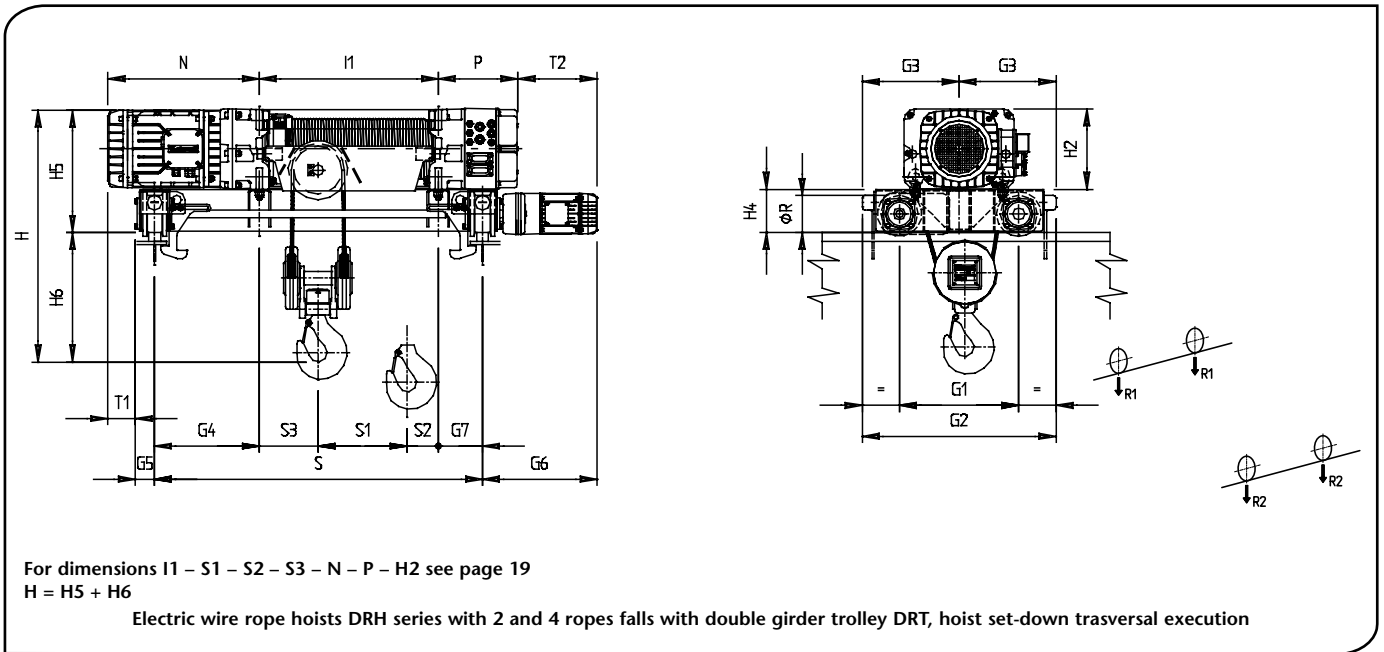
(\*) Foreseen gauge of standard production is S = 1000 mm.  
 on request it can be supplied with gauge S = 1200 mm.

Electric wire rope hoists DRH series with 2 and 4 ropes falls with double girder trolley DRT, hoist suspended execution

| Rope falls N° | Type DRH | Trolley DRT | Trolley gauge S (mm) | Type of drum DRH | Weight DRH + DRT (kg) | Overall dimensions (mm) |      |       |       |     |     |       |       |     |     |    |
|---------------|----------|-------------|----------------------|------------------|-----------------------|-------------------------|------|-------|-------|-----|-----|-------|-------|-----|-----|----|
|               |          |             |                      |                  |                       | G1                      | G2   | G3    | G4    | G5  | G6  | T1    | T2    | ØR  | H4  | H7 |
| 2/1<br>4/1    | 1        | 1           | 1000                 | C                | 236                   | 710                     | 940  | 155   | 155   | 66  | 392 | 210   | -15   | 125 | 145 | 13 |
|               |          |             |                      | N                | 250                   | 830                     | 1060 | 157.5 | 157.5 | 66  | 392 | 207,5 | -17,5 | 125 | 145 | 13 |
|               |          |             |                      | L                | 280                   | 1230                    | 1460 | 170   | 170   | 66  | 392 | 195   | -30   | 125 | 145 | 13 |
|               |          |             |                      | X1               | 306                   | 1500                    | 1730 | 150   | 150   | 66  | 392 | 215   | -10   | 125 | 145 | 13 |
|               | 2        | 1           | 1000                 | C                | 296                   | 710                     | 940  | 115   | 115   | 66  | 392 | 295   | 40    | 125 | 145 | 15 |
|               |          |             |                      | N                | 306                   | 830                     | 1060 | 115   | 115   | 66  | 392 | 295   | 40    | 125 | 145 | 15 |
|               |          |             |                      | L                | 350                   | 1230                    | 1460 | 115   | 115   | 66  | 392 | 295   | 40    | 125 | 145 | 15 |
|               |          |             |                      | X1               | 376                   | 1500                    | 1730 | 120   | 120   | 66  | 392 | 290   | 35    | 125 | 145 | 15 |
|               | 3        | 2           | 1000                 | C                | 716                   | 890                     | 1202 | 145   | 145   | 80  | 461 | 404   | -96   | 160 | 190 | 11 |
|               |          |             |                      | N                | 750                   | 1030                    | 1342 | 145   | 145   | 80  | 461 | 404   | -96   | 160 | 190 | 11 |
|               |          |             |                      | L                | 860                   | 1550                    | 1862 | 145   | 145   | 80  | 461 | 404   | -96   | 160 | 190 | 11 |
|               |          |             |                      | X1               | 946                   | 1840                    | 2152 | 145   | 145   | 80  | 461 | 404   | -96   | 160 | 190 | 11 |
|               | 4        | 3           | 1000                 | C                | 1240                  | 1060                    | 1446 | 170   | 170   | 90  | 520 | 492   | -143  | 200 | 228 | 11 |
|               |          |             |                      | N                | 1286                  | 1200                    | 1586 | 170   | 170   | 90  | 520 | 492   | -143  | 200 | 228 | 11 |
|               |          |             |                      | L                | 1480                  | 1760                    | 2146 | 170   | 170   | 90  | 520 | 492   | -143  | 200 | 228 | 11 |
|               |          |             |                      | X1               | 1656                  | 2210                    | 2596 | 180   | 180   | 90  | 520 | 482   | -153  | 200 | 228 | 11 |
|               | ©4       | 3           | 1000                 | C                | 1295                  | 1060                    | 1446 | 170   | 170   | 90  | 520 | 652   | -143  | 200 | 228 | 11 |
|               |          |             |                      | N                | 1341                  | 1200                    | 1586 | 170   | 170   | 90  | 520 | 652   | -143  | 200 | 228 | 11 |
|               |          |             |                      | L                | 1535                  | 1760                    | 2146 | 170   | 170   | 90  | 520 | 652   | -143  | 200 | 228 | 11 |
|               |          |             |                      | X1               | 1711                  | 2210                    | 2596 | 180   | 180   | 90  | 520 | 642   | -153  | 200 | 228 | 11 |
| ©4            | 3        | 1000        | X2                   | 1901             | 2710                  | 3096                    | 180  | 180   | 90    | 520 | 642 | -153  | 200   | 228 | 11  |    |

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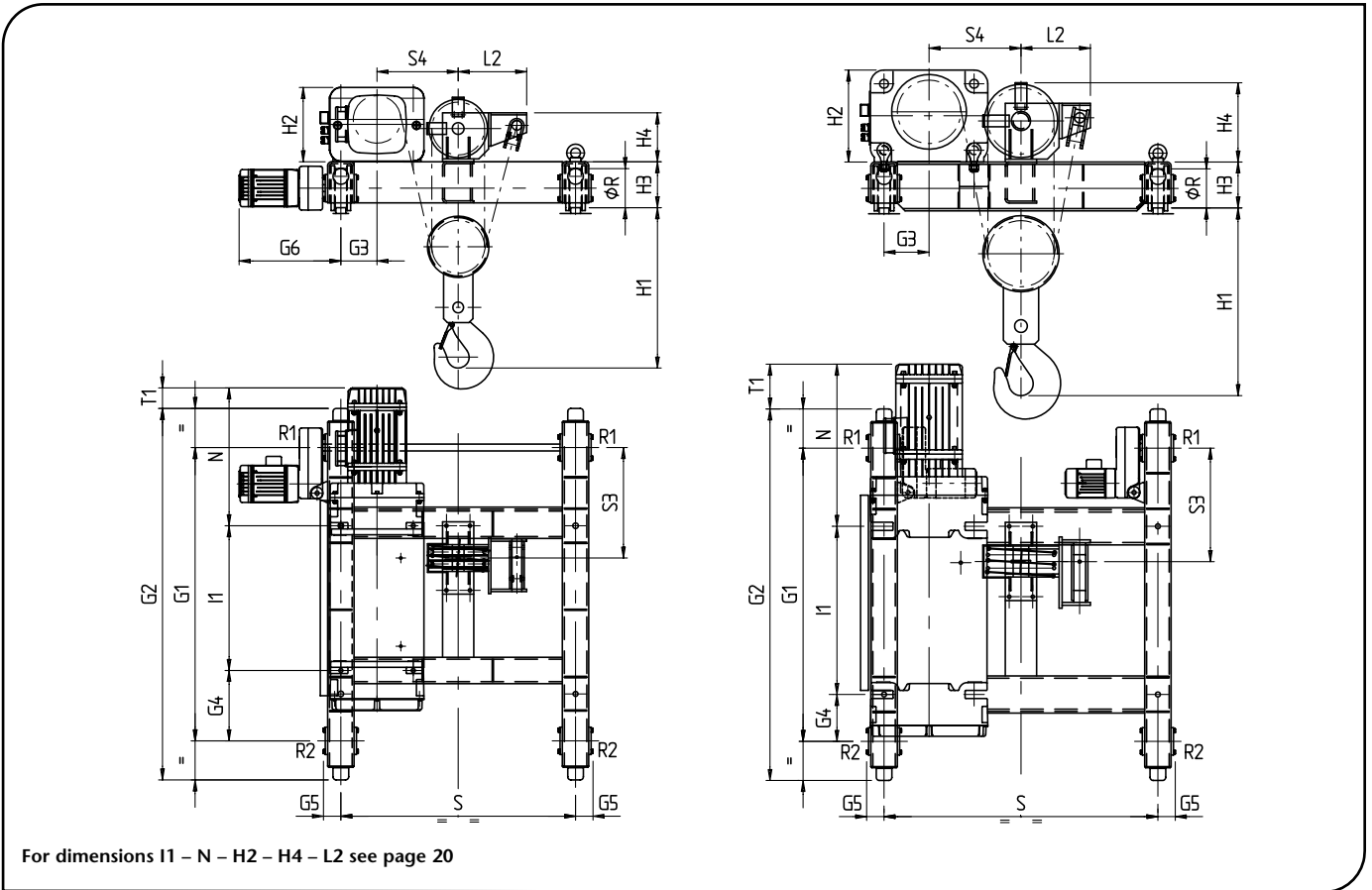
**DRT double girder trolley for DRH wire rope hoist in trasversal position with 2 rope falls (2/1) and 4 rope falls (4/1)  
Reactions on the supports see page 33**



| Rope falls N° | Type DRH | Trolley DRT | Trolley gauge S (mm) | Type of drum DRH | Weight DRH + DRT (kg) | Overall dimensions (mm) |      |     |     |     |     |     |     |     |     |     |        |        |     |
|---------------|----------|-------------|----------------------|------------------|-----------------------|-------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|--------|-----|
|               |          |             |                      |                  |                       | G1                      | G2   | G3  | G4  | G5  | G6  | G7  | T1  | T2  | ØR  | H4  | H5     | H6     |     |
|               |          |             |                      |                  |                       |                         |      |     |     |     |     |     |     |     |     |     | 2 tiri | 4 tiri |     |
| 2/1<br>4/1    | 1        | 1           | 1000                 | C                | 216                   | 400                     | 630  | 315 | 315 | 66  | 392 | 285 | 99  | 422 | 125 | 145 | 375    | 405    | 360 |
|               |          |             |                      | N                | 226                   | 400                     | 630  | 315 | 300 | 66  | 392 | 185 | 114 | 322 | 125 | 145 | 375    | 405    | 360 |
|               |          |             |                      | L                | 270                   | 710                     | 940  | 470 | 110 | 66  | 392 | 0   | 304 | 137 | 125 | 145 | 375    | 315    | 275 |
|               | 2        | 1           | 1000                 | C                | 276                   | 400                     | 630  | 315 | 267 | 66  | 392 | 253 | 192 | 375 | 125 | 145 | 415    | 485    | 425 |
|               |          |             |                      | N                | 286                   | 400                     | 630  | 315 | 252 | 66  | 392 | 148 | 207 | 270 | 125 | 145 | 415    | 485    | 425 |
|               |          |             |                      | L                | 346                   | 710                     | 940  | 470 | 200 | 66  | 392 | 0   | 259 | 122 | 125 | 145 | 415    | 405    | 335 |
|               | 3        | 2           | 1000                 | C                | 660                   | 500                     | 812  | 406 | 195 | 80  | 461 | 205 | 430 | 461 | 160 | 190 | 570    | 630    | 570 |
|               |          |             |                      | N                | 686                   | 500                     | 812  | 406 | 170 | 80  | 461 | 90  | 455 | 346 | 160 | 190 | 570    | 630    | 570 |
|               |          |             |                      | L                | 830                   | 890                     | 1202 | 601 | 140 | 80  | 461 | 0   | 485 | 256 | 160 | 190 | 570    | 520    | 450 |
|               | 4        | 3           | 1000                 | C                | 1190                  | 600                     | 986  | 493 | 140 | 90  | 520 | 140 | 625 | 440 | 200 | 228 | 698    | 768    | 722 |
|               |          |             |                      | N                | 1240                  | 600                     | 986  | 493 | 200 | 90  | 520 | 140 | 565 | 440 | 200 | 228 | 698    | 768    | 722 |
|               | ©4       | 3           | 1000                 | C                | 1245                  | 600                     | 986  | 493 | 140 | 90  | 520 | 140 | 785 | 440 | 200 | 228 | 698    | 768    | 722 |
| N             |          |             |                      | 1295             | 600                   | 986                     | 493  | 200 | 90  | 520 | 140 | 725 | 440 | 200 | 228 | 698 | 768    | 722    |     |

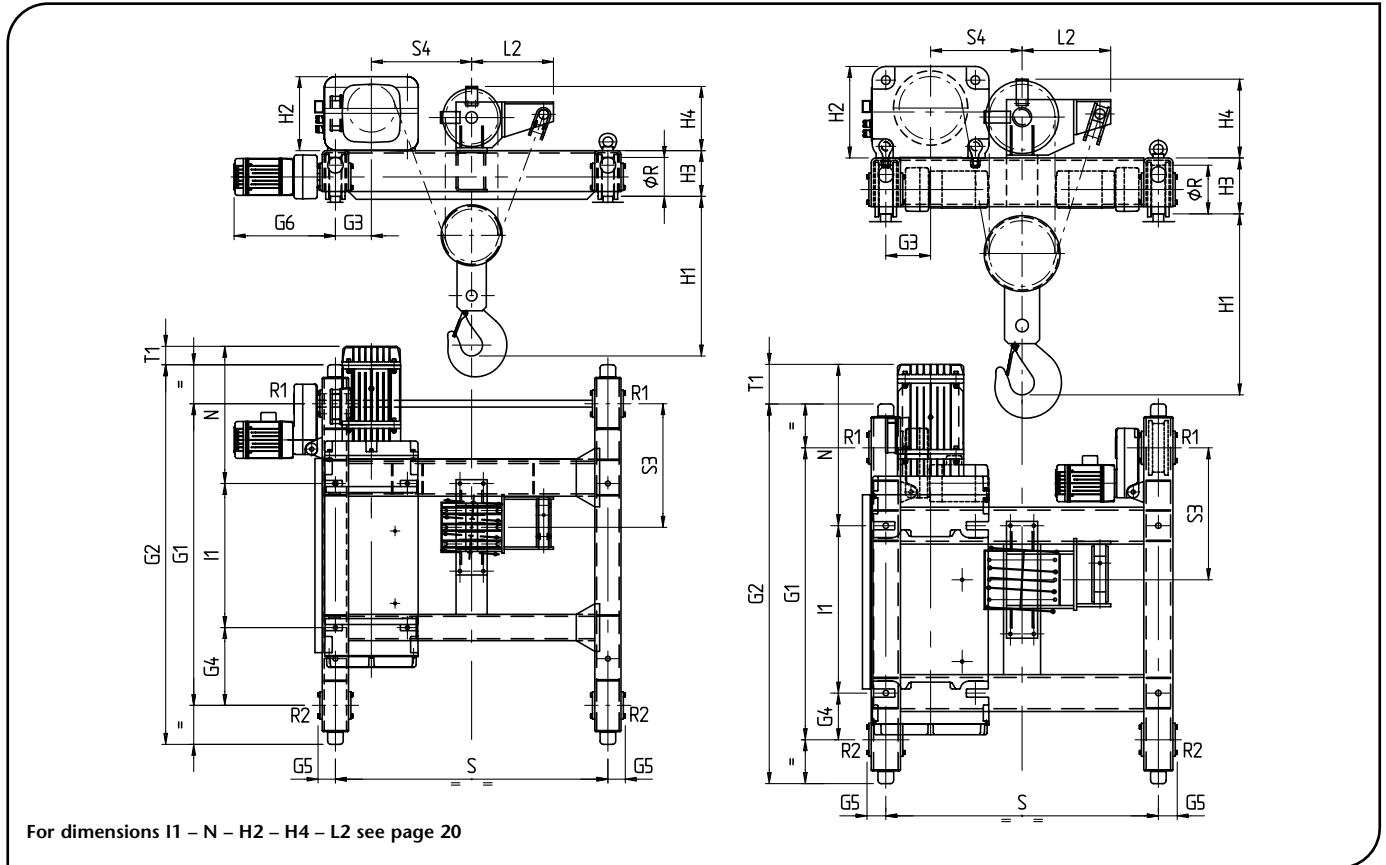
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**DRT double girder trolley for DRH wire rope hoist –Version with 6 rope falls (6/1)**  
**Reactions on the supports see page 33**



| Rope falls N° | Type DRH | Trolley DRT | Type of drum DRH | Trolley gauge S (mm) | Weight DRH + DRT (kg) | Overall dimensions (mm) |      |      |      |     |     |     |     |     |     |     |     |     |     |
|---------------|----------|-------------|------------------|----------------------|-----------------------|-------------------------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|               |          |             |                  |                      |                       | G1                      | G2   | G3   | G4   | G5  | G6  | S3  | S4  | T1  | H1  | H3  | ØR  |     |     |
| 6/1           | 3        | 3           | N                | 1200                 | 1120                  | 1500                    | 1900 | 185  | 360  | 90  | 520 | 565 | 415 | 105 | 820 | 235 | 200 |     |     |
|               |          |             |                  | 1400                 | 1140                  | 1500                    | 1900 | 185  | 360  | 90  | 520 | 565 | 515 | 105 | 820 | 235 | 200 |     |     |
|               |          |             | L                | 1200                 | 1290                  | 2070                    | 2470 | 185  | 400  | 90  | 520 | 575 | 415 | 95  | 820 | 235 | 200 |     |     |
|               |          |             |                  | 1400                 | 1310                  | 2070                    | 2470 | 185  | 400  | 90  | 520 | 575 | 515 | 95  | 820 | 235 | 200 |     |     |
|               |          |             | X1               | 1200                 | 1380                  | 2500                    | 2900 | 185  | 540  | 90  | 520 | 575 | 415 | 95  | 820 | 235 | 200 |     |     |
|               |          |             |                  | 1400                 | 1400                  | 2500                    | 2900 | 185  | 540  | 90  | 520 | 575 | 515 | 95  | 820 | 235 | 200 |     |     |
|               |          |             | X2               | 1200                 | 1510                  | 3000                    | 3400 | 185  | 410  | 90  | 520 | 575 | 415 | 95  | 820 | 235 | 200 |     |     |
|               |          |             |                  | 1400                 | 1530                  | 3000                    | 3400 | 185  | 410  | 90  | 520 | 575 | 515 | 95  | 820 | 235 | 200 |     |     |
|               |          |             | 4                | 3                    | N                     | 1400                    | 1800 | 1500 | 1900 | 230 | 240 | 90  | -   | 580 | 470 | 255 | 960 | 235 | 200 |
|               |          |             |                  |                      |                       | 2240                    | 2100 | 1500 | 1900 | 650 | 240 | 90  | -   | 580 | 470 | 255 | 960 | 235 | 200 |
|               |          |             |                  |                      |                       | 2800                    | 2400 | 1500 | 1900 | 930 | 240 | 90  | -   | 580 | 470 | 255 | 960 | 235 | 200 |
|               |          |             |                  |                      |                       | 1400                    | 2000 | 2070 | 2470 | 230 | 240 | 90  | -   | 590 | 470 | 245 | 960 | 235 | 200 |
|               | 2240     | 2300        |                  |                      |                       | 2070                    | 2470 | 650  | 240  | 90  | -   | 590 | 470 | 245 | 960 | 235 | 200 |     |     |
|               | 2800     | 2700        |                  |                      |                       | 2070                    | 2470 | 930  | 240  | 90  | -   | 590 | 470 | 245 | 960 | 235 | 200 |     |     |
|               | L        | 1400        |                  |                      | 2250                  | 2500                    | 2900 | 230  | 240  | 90  | -   | 590 | 470 | 245 | 960 | 235 | 200 |     |     |
|               |          | 2240        |                  |                      | 2500                  | 2500                    | 2900 | 650  | 240  | 90  | -   | 590 | 470 | 245 | 960 | 235 | 200 |     |     |
|               |          | 2800        |                  |                      | 2800                  | 2500                    | 2900 | 930  | 240  | 90  | -   | 590 | 470 | 245 | 960 | 235 | 200 |     |     |
|               | X1       | 1400        |                  |                      | 2390                  | 3000                    | 3400 | 230  | 240  | 90  | -   | 590 | 470 | 245 | 960 | 235 | 200 |     |     |
|               |          | 2240        |                  |                      | 2650                  | 3000                    | 3400 | 650  | 240  | 90  | -   | 590 | 470 | 245 | 960 | 235 | 200 |     |     |
|               |          | 2800        |                  |                      | 2950                  | 3000                    | 3400 | 930  | 240  | 90  | -   | 590 | 470 | 245 | 960 | 235 | 200 |     |     |
|               | X2       | 1400        | 2390             | 3000                 | 3400                  | 230                     | 240  | 90   | -    | 590 | 470 | 245 | 960 | 235 | 200 |     |     |     |     |
|               |          | 2240        | 2650             | 3000                 | 3400                  | 650                     | 240  | 90   | -    | 590 | 470 | 245 | 960 | 235 | 200 |     |     |     |     |
|               |          | 2800        | 2950             | 3000                 | 3400                  | 930                     | 240  | 90   | -    | 590 | 470 | 245 | 960 | 235 | 200 |     |     |     |     |
|               | ©4       | 3           | N                | 1400                 | 1855                  | 1500                    | 1900 | 230  | 240  | 90  | -   | 580 | 470 | 415 | 960 | 235 | 200 |     |     |
| 2240          |          |             |                  | 2155                 | 1500                  | 1900                    | 650  | 240  | 90   | -   | 580 | 470 | 415 | 960 | 235 | 200 |     |     |     |
| 2800          |          |             |                  | 2455                 | 1500                  | 1900                    | 930  | 240  | 90   | -   | 580 | 470 | 415 | 960 | 235 | 200 |     |     |     |
| 1400          |          |             |                  | 2055                 | 2070                  | 2470                    | 230  | 240  | 90   | -   | 590 | 470 | 405 | 960 | 235 | 200 |     |     |     |
| 2240          |          |             |                  | 2355                 | 2070                  | 2470                    | 650  | 240  | 90   | -   | 590 | 470 | 405 | 960 | 235 | 200 |     |     |     |
| 2800          |          |             |                  | 2755                 | 2070                  | 2470                    | 930  | 240  | 90   | -   | 590 | 470 | 405 | 960 | 235 | 200 |     |     |     |
| L             |          |             | 1400             | 2305                 | 2500                  | 2900                    | 230  | 240  | 90   | -   | 590 | 470 | 405 | 960 | 235 | 200 |     |     |     |
|               |          |             | 2240             | 2555                 | 2500                  | 2900                    | 650  | 240  | 90   | -   | 590 | 470 | 405 | 960 | 235 | 200 |     |     |     |
|               |          |             | 2800             | 2855                 | 2500                  | 2900                    | 930  | 240  | 90   | -   | 590 | 470 | 405 | 960 | 235 | 200 |     |     |     |
| X1            |          |             | 1400             | 2445                 | 3000                  | 3400                    | 230  | 240  | 90   | -   | 590 | 470 | 405 | 960 | 235 | 200 |     |     |     |
|               |          |             | 2240             | 2705                 | 3000                  | 3400                    | 650  | 240  | 90   | -   | 590 | 470 | 405 | 960 | 235 | 200 |     |     |     |
|               |          |             | 2800             | 3005                 | 3000                  | 3400                    | 930  | 240  | 90   | -   | 590 | 470 | 405 | 960 | 235 | 200 |     |     |     |
| X2            | 1400     | 2445        | 3000             | 3400                 | 230                   | 240                     | 90   | -    | 590  | 470 | 405 | 960 | 235 | 200 |     |     |     |     |     |
|               | 2240     | 2705        | 3000             | 3400                 | 650                   | 240                     | 90   | -    | 590  | 470 | 405 | 960 | 235 | 200 |     |     |     |     |     |
|               | 2800     | 3005        | 3000             | 3400                 | 930                   | 240                     | 90   | -    | 590  | 470 | 405 | 960 | 235 | 200 |     |     |     |     |     |

**DRT double girder trolley for DRH wire rope hoist –Version with 8 rope falls (8/1)**  
**Reactions on the supports see page 33**



| Rope falls N° | Trolley DRT | Carrello DRT | Type of drum DRH | Trolley gauge S (mm) | Weight DRH + DRT (kg) | Overall dimensions (mm) |      |      |     |     |     |     |     |     |     |     |     |     |
|---------------|-------------|--------------|------------------|----------------------|-----------------------|-------------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|               |             |              |                  |                      |                       | G1                      | G2   | G3   | G4  | G5  | G6  | S3  | S4  | T1  | H1  | H3  | ØR  |     |
| 8/1           | 3           | 3            | L                | 1400                 | 1400                  | 2070                    | 2470 | 185  | 400 | 90  | 520 | 635 | 515 | 95  | 820 | 235 | 200 |     |
|               |             |              |                  | 2240                 | 1480                  | 2070                    | 2470 | 605  | 400 | 90  | -   | 635 | 515 | 95  | 820 | 235 | 200 |     |
|               |             |              |                  | 2800                 | 1730                  | 2070                    | 2470 | 885  | 400 | 90  | -   | 635 | 515 | 95  | 820 | 235 | 200 |     |
|               |             |              | X1               | 1400                 | 1480                  | 2500                    | 2900 | 185  | 540 | 90  | 520 | 635 | 515 | 95  | 820 | 235 | 200 |     |
|               |             |              |                  | 2240                 | 1560                  | 2500                    | 2900 | 605  | 540 | 90  | -   | 635 | 515 | 95  | 820 | 235 | 200 |     |
|               |             |              |                  | 2800                 | 1820                  | 2500                    | 2900 | 885  | 540 | 90  | -   | 635 | 515 | 95  | 820 | 235 | 200 |     |
|               |             | X2           | 1400             | 1580                 | 3000                  | 3400                    | 185  | 650  | 90  | 520 | 635 | 515 | 95  | 820 | 235 | 200 |     |     |
|               |             |              | 2240             | 1750                 | 3000                  | 3400                    | 605  | 650  | 90  | -   | 635 | 515 | 95  | 820 | 235 | 200 |     |     |
|               |             |              | 2800             | 1950                 | 3000                  | 3400                    | 885  | 650  | 90  | -   | 635 | 515 | 95  | 820 | 235 | 200 |     |     |
|               |             | 4            | 4                | N                    | 1400                  | 2000                    | 1500 | 1950 | 230 | 240 | 97  | -   | 678 | 470 | 230 | 930 | 287 | 250 |
|               |             |              |                  |                      | 2240                  | 2400                    | 1500 | 1950 | 550 | 240 | 97  | -   | 678 | 570 | 230 | 930 | 287 | 250 |
|               |             |              |                  |                      | 2800                  | 2600                    | 1500 | 1950 | 830 | 240 | 97  | -   | 678 | 570 | 230 | 930 | 287 | 250 |
|               | L           |              |                  | 1400                 | 2300                  | 2060                    | 2510 | 230  | 240 | 97  | -   | 678 | 470 | 230 | 930 | 287 | 250 |     |
|               |             |              |                  | 2240                 | 2600                  | 2060                    | 2510 | 550  | 240 | 97  | -   | 678 | 570 | 230 | 930 | 287 | 250 |     |
|               |             |              |                  | 2800                 | 2800                  | 2060                    | 2510 | 830  | 240 | 97  | -   | 678 | 570 | 230 | 930 | 287 | 250 |     |
|               | X1          |              | 1400             | 2500                 | 2500                  | 2950                    | 230  | 240  | 97  | -   | 688 | 470 | 220 | 930 | 287 | 250 |     |     |
|               |             |              | 2240             | 2900                 | 2500                  | 2950                    | 550  | 240  | 97  | -   | 688 | 570 | 220 | 930 | 287 | 250 |     |     |
|               |             |              | 2800             | 3100                 | 2500                  | 2950                    | 830  | 240  | 97  | -   | 688 | 570 | 220 | 930 | 287 | 250 |     |     |
|               | X2          |              | 1400             | 2680                 | 3000                  | 3450                    | 230  | 240  | 97  | -   | 688 | 470 | 220 | 930 | 287 | 250 |     |     |
|               |             |              | 2240             | 3030                 | 3000                  | 3450                    | 550  | 240  | 97  | -   | 688 | 570 | 220 | 930 | 287 | 250 |     |     |
|               |             |              | 2800             | 3270                 | 3000                  | 3450                    | 830  | 240  | 97  | -   | 688 | 570 | 220 | 930 | 287 | 250 |     |     |
|               | 4⊕          | 4            | N                | 1400                 | 2055                  | 1500                    | 1950 | 230  | 240 | 97  | -   | 678 | 470 | 390 | 930 | 287 | 250 |     |
|               |             |              |                  | 2240                 | 2455                  | 1500                    | 1950 | 550  | 240 | 97  | -   | 678 | 570 | 390 | 930 | 287 | 250 |     |
|               |             |              |                  | 2800                 | 2655                  | 1500                    | 1950 | 830  | 240 | 97  | -   | 678 | 570 | 390 | 930 | 287 | 250 |     |
| L             |             |              | 1400             | 2355                 | 2060                  | 2510                    | 230  | 240  | 97  | -   | 678 | 470 | 390 | 930 | 287 | 250 |     |     |
|               |             |              | 2240             | 2655                 | 2060                  | 2510                    | 550  | 240  | 97  | -   | 678 | 570 | 390 | 930 | 287 | 250 |     |     |
|               |             |              | 2800             | 2855                 | 2060                  | 2510                    | 830  | 240  | 97  | -   | 678 | 570 | 390 | 930 | 287 | 250 |     |     |
| X1            |             | 1400         | 2555             | 2500                 | 2950                  | 230                     | 240  | 97   | -   | 688 | 470 | 380 | 930 | 287 | 250 |     |     |     |
|               |             | 2240         | 2955             | 2500                 | 2950                  | 550                     | 240  | 97   | -   | 688 | 570 | 380 | 930 | 287 | 250 |     |     |     |
|               |             | 2800         | 3155             | 2500                 | 2950                  | 830                     | 240  | 97   | -   | 688 | 570 | 380 | 930 | 287 | 250 |     |     |     |
| X2            |             | 1400         | 2735             | 3000                 | 3450                  | 230                     | 240  | 97   | -   | 688 | 470 | 380 | 930 | 287 | 250 |     |     |     |
|               |             | 2240         | 3085             | 3000                 | 3450                  | 550                     | 240  | 97   | -   | 688 | 570 | 380 | 930 | 287 | 250 |     |     |     |
|               |             | 2800         | 3325             | 3000                 | 3450                  | 830                     | 240  | 97   | -   | 688 | 570 | 380 | 930 | 287 | 250 |     |     |     |

**Reactions on the supports**

Series DRH electric wire rope hoists serie DRH with 2 and 4 falls of rope foot mounted and suspended configuration

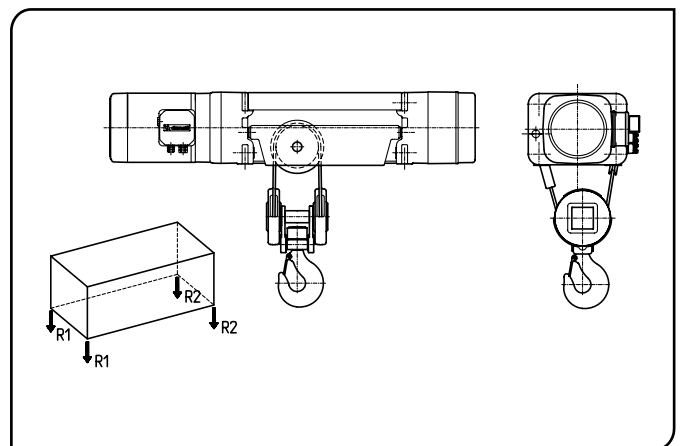
| Version with 2 falls of rope (2/1) |                     |                                |      |        |      |        |     |         |     |         |     |
|------------------------------------|---------------------|--------------------------------|------|--------|------|--------|-----|---------|-----|---------|-----|
| DRH                                | Hoist Capacity (kg) | Static reactions: R1; R2 = daN |      |        |      |        |     |         |     |         |     |
|                                    |                     | Drum C                         |      | Drum N |      | Drum L |     | Drum X1 |     | Drum X2 |     |
|                                    |                     | R1                             | R2   | R1     | R2   | R1     | R2  | R1      | R2  | R1      | R2  |
| 1                                  | 800                 | 349                            | 117  | 373    | 97   | 410    | 69  | 428     | 62  | 442     | 58  |
|                                    | 1000                | 425                            | 141  | 455    | 115  | 500    | 79  | 520     | 70  | 536     | 64  |
|                                    | 1250                | 521                            | 170  | 557    | 138  | 611    | 93  | 636     | 80  | 653     | 72  |
|                                    | 1600                | 654                            | 212  | 699    | 171  | 768    | 111 | 797     | 93  | 817     | 83  |
|                                    | 2000                | 806                            | 260  | 863    | 207  | 946    | 133 | 981     | 109 | 1004    | 95  |
| 2                                  | 1250                | 555                            | 160  | 586    | 136  | 634    | 99  | 662     | 93  | 677     | 88  |
|                                    | 1600                | 693                            | 197  | 732    | 165  | 792    | 116 | 823     | 107 | 841     | 99  |
|                                    | 2000                | 852                            | 238  | 898    | 199  | 972    | 136 | 1007    | 123 | 1028    | 112 |
|                                    | 2500                | 1050                           | 290  | 1107   | 240  | 1197   | 161 | 1237    | 143 | 1262    | 128 |
|                                    | 3200                | 1327                           | 363  | 1398   | 299  | 1512   | 196 | 1560    | 170 | 1589    | 151 |
| 3                                  | 2500                | 1133                           | 347  | 1193   | 302  | 1309   | 223 | 1342    | 203 | 1373    | 187 |
|                                    | 3200                | 1407                           | 423  | 1482   | 363  | 1623   | 259 | 1662    | 233 | 1699    | 211 |
|                                    | 4000                | 1721                           | 509  | 1812   | 433  | 1982   | 300 | 2029    | 266 | 2073    | 237 |
|                                    | 5000                | 2112                           | 618  | 2224   | 521  | 2430   | 352 | 2487    | 308 | 2539    | 271 |
|                                    | 6300                | 2621                           | 759  | 2760   | 635  | 3013   | 419 | 3082    | 363 | 3146    | 314 |
| 4                                  | 4000                | 1813                           | 614  | 1901   | 543  | 2097   | 407 | 2216    | 384 | 2272    | 353 |
|                                    | 5000                | 2195                           | 732  | 2302   | 642  | 2536   | 468 | 2670    | 430 | 2736    | 389 |
|                                    | 6300                | 2691                           | 886  | 2823   | 771  | 3109   | 545 | 3261    | 489 | 3339    | 436 |
|                                    | 8000                | 3341                           | 1086 | 3505   | 939  | 3857   | 647 | 4032    | 568 | 4127    | 498 |
|                                    | 10000               | 4104                           | 1323 | 4308   | 1136 | 4738   | 766 | 4941    | 660 | 5055    | 570 |

| Version with 4 falls of rope (4/1) |                     |                                |      |        |      |        |      |         |      |         |      |
|------------------------------------|---------------------|--------------------------------|------|--------|------|--------|------|---------|------|---------|------|
| DRH                                | Hoist Capacity (kg) | Static reactions: R1; R2 = daN |      |        |      |        |      |         |      |         |      |
|                                    |                     | Drum C                         |      | Drum N |      | Drum L |      | Drum X1 |      | Drum X2 |      |
|                                    |                     | R1                             | R2   | R1     | R2   | R1     | R2   | R1      | R2   | R1      | R2   |
| 1                                  | 1600                | 546                            | 324  | 617    | 258  | 708    | 176  | 757     | 143  | 787     | 123  |
|                                    | 2000                | 671                            | 399  | 759    | 316  | 871    | 213  | 929     | 171  | 965     | 145  |
|                                    | 2500                | 826                            | 494  | 935    | 389  | 1074   | 260  | 1145    | 205  | 1189    | 171  |
|                                    | 3200                | 1046                           | 624  | 1184   | 491  | 1360   | 324  | 1447    | 253  | 1501    | 209  |
|                                    | 4000                | 1296                           | 774  | 1468   | 607  | 1686   | 398  | 1792    | 308  | 1858    | 252  |
| 2                                  | 2500                | 847                            | 500  | 943    | 409  | 1078   | 289  | 1145    | 245  | 1187    | 213  |
|                                    | 3200                | 1065                           | 632  | 1188   | 514  | 1358   | 359  | 1439    | 301  | 1491    | 259  |
|                                    | 4000                | 1315                           | 782  | 1468   | 634  | 1678   | 439  | 1776    | 364  | 1839    | 311  |
|                                    | 5000                | 1627                           | 970  | 1818   | 784  | 2078   | 539  | 2197    | 444  | 2273    | 377  |
|                                    | 6300                | 2034                           | 1213 | 2273   | 979  | 2598   | 669  | 2743    | 547  | 2838    | 462  |
| 3                                  | 5000                | 1672                           | 1086 | 1870   | 900  | 2172   | 640  | 2281    | 544  | 2385    | 465  |
|                                    | 6300                | 2062                           | 1346 | 2308   | 1112 | 2683   | 779  | 2818    | 657  | 2945    | 555  |
|                                    | 8000                | 2572                           | 1686 | 2882   | 1388 | 3351   | 961  | 3520    | 805  | 3677    | 673  |
|                                    | 10000               | 3172                           | 2086 | 3558   | 1712 | 4137   | 1175 | 4346    | 979  | 4537    | 813  |
|                                    | 12500               | 3922                           | 2586 | 4403   | 2117 | 5118   | 1444 | 5378    | 1197 | 5613    | 987  |
| 4                                  | 8000                | 2654                           | 1826 | 2938   | 1561 | 3535   | 1035 | 3801    | 874  | 3956    | 744  |
|                                    | 10000               | 3237                           | 2243 | 3589   | 1910 | 4324   | 1246 | 4639    | 1036 | 4828    | 872  |
|                                    | 12500               | 3966                           | 2764 | 4403   | 2346 | 5310   | 1510 | 5686    | 1239 | 5919    | 1031 |
|                                    | 16000               | 4987                           | 3493 | 5543   | 2956 | 6690   | 1880 | 7153    | 1522 | 7445    | 1255 |
|                                    | 20000               | 6154                           | 4326 | 6845   | 3654 | 8268   | 2302 | 8828    | 1847 | 9190    | 1510 |
|                                    | 25000               | 7645                           | 5363 | 8502   | 4521 | 10261  | 2837 | 10944   | 2259 | 11391   | 1837 |

Series DRH electric wire rope hoists serie DRH with 6 and 8 falls of rope foot mounted configuration

| Version with 6 falls of rope (6/1) |                     |                                |      |        |      |         |      |         |      |
|------------------------------------|---------------------|--------------------------------|------|--------|------|---------|------|---------|------|
| DRH                                | Hoist Capacity (kg) | Static reactions: R1; R2 = daN |      |        |      |         |      |         |      |
|                                    |                     | Drum N                         |      | Drum L |      | Drum X1 |      | Drum X2 |      |
|                                    |                     | R1                             | R2   | R1     | R2   | R1      | R2   | R1      | R2   |
| 3                                  | 16000               | 6415                           | 1883 | 7179   | 1161 | 7385    | 970  | 7573    | 807  |
|                                    | 20000               | 7968                           | 2329 | 8917   | 1423 | 9172    | 1183 | 9403    | 977  |
| 4                                  | 25000               | 10246                          | 2788 | 11321  | 1784 | 11758   | 1451 | 12033   | 1202 |
|                                    | 32000               | 13015                          | 3519 | 14378  | 2227 | 14918   | 1791 | 15266   | 1469 |

| Version with 8 falls of rope (8/1) |                     |                                |      |        |      |         |      |         |      |
|------------------------------------|---------------------|--------------------------------|------|--------|------|---------|------|---------|------|
| DRH                                | Hoist Capacity (kg) | Static reactions: R1; R2 = daN |      |        |      |         |      |         |      |
|                                    |                     | Drum N                         |      | Drum L |      | Drum X1 |      | Drum X2 |      |
|                                    |                     | R1                             | R2   | R1     | R2   | R1      | R2   | R1      | R2   |
| 3                                  | 20000               | -                              | -    | 8400   | 1950 | 8750    | 1615 | 9050    | 1340 |
|                                    | 25000               | -                              | -    | 10501  | 2349 | 10929   | 1936 | 11310   | 1580 |
| 4                                  | 40000               | 13920                          | 6635 | 16506  | 4118 | 17484   | 3245 | 18139   | 2616 |
|                                    | 50000               | 17307                          | 8247 | 20529  | 5096 | 21734   | 3996 | 22548   | 3207 |

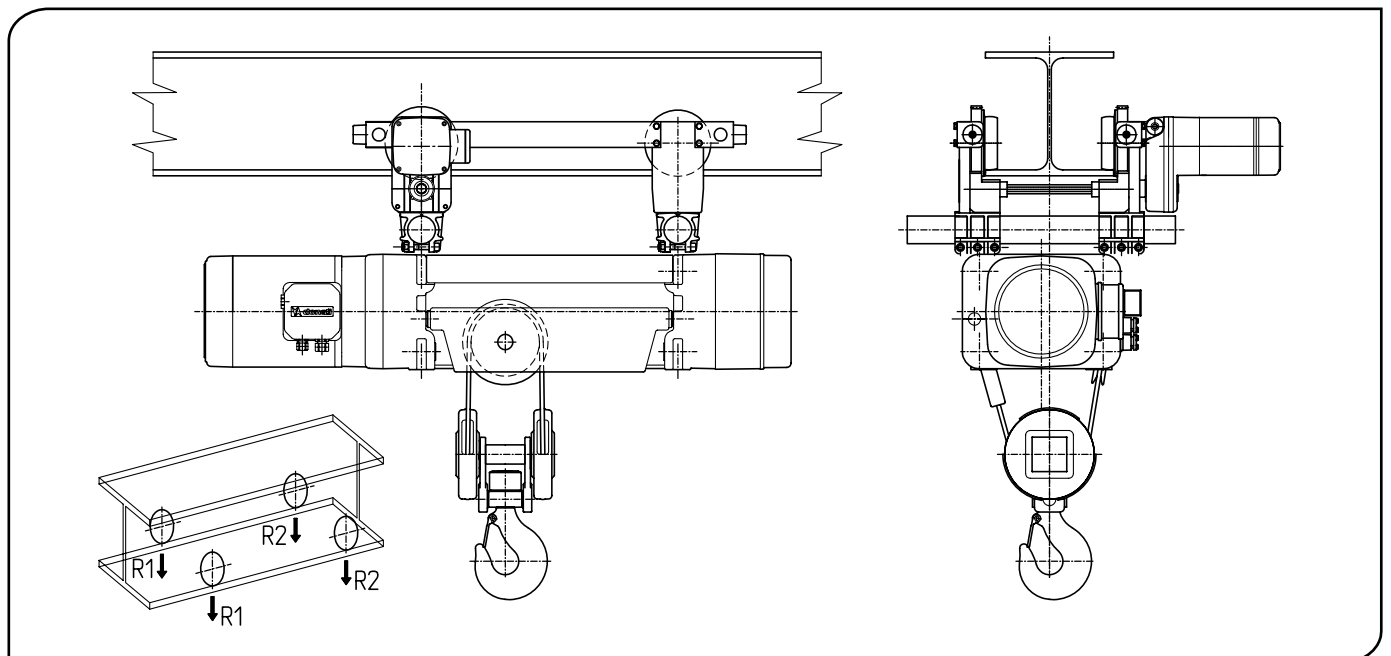


Single girder DST/N/S trolleys for DRH electric wire rope hoists – 2 rope falls version (2/1)

| DRH | Hoist Capacity (kg) | Static reactions: R1; R2 = daN |      |        |      |        |     |         |     |         |     |
|-----|---------------------|--------------------------------|------|--------|------|--------|-----|---------|-----|---------|-----|
|     |                     | Drum C                         |      | Drum N |      | Drum L |     | Drum X1 |     | Drum X2 |     |
|     |                     | R1                             | R2   | R1     | R2   | R1     | R2  | R1      | R2  | R1      | R2  |
| 1   | 800                 | 377                            | 131  | 400    | 110  | 437    | 83  | 445     | 90  | 450     | 95  |
|     | 1000                | 453                            | 155  | 481    | 129  | 527    | 93  | 535     | 100 | 541     | 104 |
|     | 1250                | 549                            | 184  | 583    | 152  | 638    | 107 | 646     | 114 | 658     | 112 |
|     | 1600                | 682                            | 226  | 726    | 184  | 795    | 125 | 804     | 131 | 822     | 123 |
|     | 2000                | 834                            | 274  | 889    | 221  | 973    | 147 | 988     | 147 | 1010    | 135 |
| 2   | 1250                | 581                            | 174  | 611    | 149  | 661    | 112 | 668     | 120 | 673     | 125 |
|     | 1600                | 720                            | 210  | 757    | 178  | 819    | 129 | 826     | 136 | 834     | 139 |
|     | 2000                | 878                            | 252  | 923    | 212  | 999    | 149 | 1006    | 156 | 1020    | 153 |
|     | 2500                | 1076                           | 304  | 1132   | 253  | 1224   | 174 | 1232    | 180 | 1255    | 168 |
|     | 3200                | 1353                           | 377  | 1423   | 312  | 1539   | 209 | 1554    | 209 | 1581    | 192 |
| 3   | 2500                | 1171                           | 367  | 1230   | 320  | 1346   | 242 | 1367    | 258 | 1387    | 275 |
|     | 3200                | 1445                           | 443  | 1519   | 381  | 1660   | 278 | 1680    | 295 | 1700    | 312 |
|     | 4000                | 1759                           | 529  | 1849   | 451  | 2019   | 319 | 2040    | 335 | 2072    | 341 |
|     | 5000                | 2150                           | 638  | 2261   | 539  | 2467   | 371 | 2490    | 385 | 2538    | 375 |
|     | 6300                | 2660                           | 778  | 2797   | 653  | 3050   | 438 | 3073    | 452 | 3145    | 418 |
| 4   | 4000                | 1901                           | 659  | 1990   | 588  | 2184   | 451 | 2242    | 498 | 2268    | 557 |
|     | 5000                | 2283                           | 777  | 2391   | 687  | 2624   | 511 | 2680    | 560 | 2731    | 594 |
|     | 6300                | 2780                           | 930  | 2913   | 815  | 3196   | 589 | 3250    | 640 | 3334    | 641 |
|     | 8000                | 3429                           | 1131 | 3595   | 983  | 3944   | 691 | 4002    | 738 | 4123    | 702 |
|     | 10000               | 4193                           | 1367 | 4397   | 1181 | 4825   | 810 | 4910    | 830 | 5050    | 775 |

Single girder DST/N/S trolleys for DRH electric wire rope hoists – 4 rope falls version (4/1)

| DRH | Hoist Capacity (kg) | Static reactions: R1; R2 = daN |      |        |      |        |      |         |      |         |      |
|-----|---------------------|--------------------------------|------|--------|------|--------|------|---------|------|---------|------|
|     |                     | Drum C                         |      | Drum N |      | Drum L |      | Drum X1 |      | Drum X2 |      |
|     |                     | R1                             | R2   | R1     | R2   | R1     | R2   | R1      | R2   | R1      | R2   |
| 1   | 1600                | 573                            | 337  | 644    | 271  | 735    | 190  | 760     | 180  | 788     | 162  |
|     | 2000                | 698                            | 412  | 785    | 330  | 898    | 227  | 933     | 207  | 967     | 183  |
|     | 2500                | 855                            | 505  | 963    | 402  | 1102   | 273  | 1148    | 242  | 1190    | 210  |
|     | 3200                | 1073                           | 637  | 1211   | 504  | 1387   | 338  | 1450    | 290  | 1502    | 248  |
|     | 4000                | 1323                           | 787  | 1494   | 621  | 1713   | 412  | 1795    | 345  | 1860    | 290  |
| 2   | 2500                | 881                            | 519  | 978    | 427  | 1112   | 306  | 1146    | 294  | 1186    | 264  |
|     | 3200                | 1100                           | 650  | 1223   | 532  | 1392   | 376  | 1441    | 349  | 1490    | 310  |
|     | 4000                | 1350                           | 800  | 1503   | 652  | 1712   | 456  | 1777    | 413  | 1838    | 362  |
|     | 5000                | 1663                           | 987  | 1853   | 802  | 2112   | 556  | 2198    | 492  | 2273    | 427  |
|     | 6300                | 2069                           | 1231 | 2308   | 997  | 2632   | 686  | 2745    | 595  | 2838    | 512  |
| 3   | 5000                | 1758                           | 1130 | 1959   | 946  | 2258   | 682  | 2313    | 685  | 2420    | 615  |
|     | 6300                | 2148                           | 1390 | 2398   | 1157 | 2768   | 822  | 2850    | 798  | 2980    | 705  |
|     | 8000                | 2658                           | 1730 | 2973   | 1432 | 3436   | 1004 | 3552    | 946  | 3710    | 825  |
|     | 10000               | 3258                           | 2130 | 3648   | 1757 | 4222   | 1218 | 4377    | 1121 | 4572    | 963  |
|     | 12500               | 4008                           | 2630 | 4493   | 2162 | 5204   | 1486 | 5410    | 1338 | 5648    | 1137 |
| 4   | 8000                | 2805                           | 1903 | 3090   | 1638 | 3685   | 1110 | 3801    | 1099 | 3982    | 1003 |
|     | 10000               | 3389                           | 2319 | 3741   | 1987 | 4474   | 1321 | 4639    | 1261 | 4855    | 1130 |
|     | 12500               | 4118                           | 2840 | 4555   | 2423 | 5460   | 1585 | 5686    | 1464 | 5945    | 1290 |
|     | 16000               | 5139                           | 3569 | 5695   | 3033 | 6840   | 1955 | 7152    | 1748 | 7471    | 1514 |
|     | 20000               | 6305                           | 4403 | 6997   | 3731 | 8417   | 2378 | 8828    | 2072 | 9216    | 1769 |

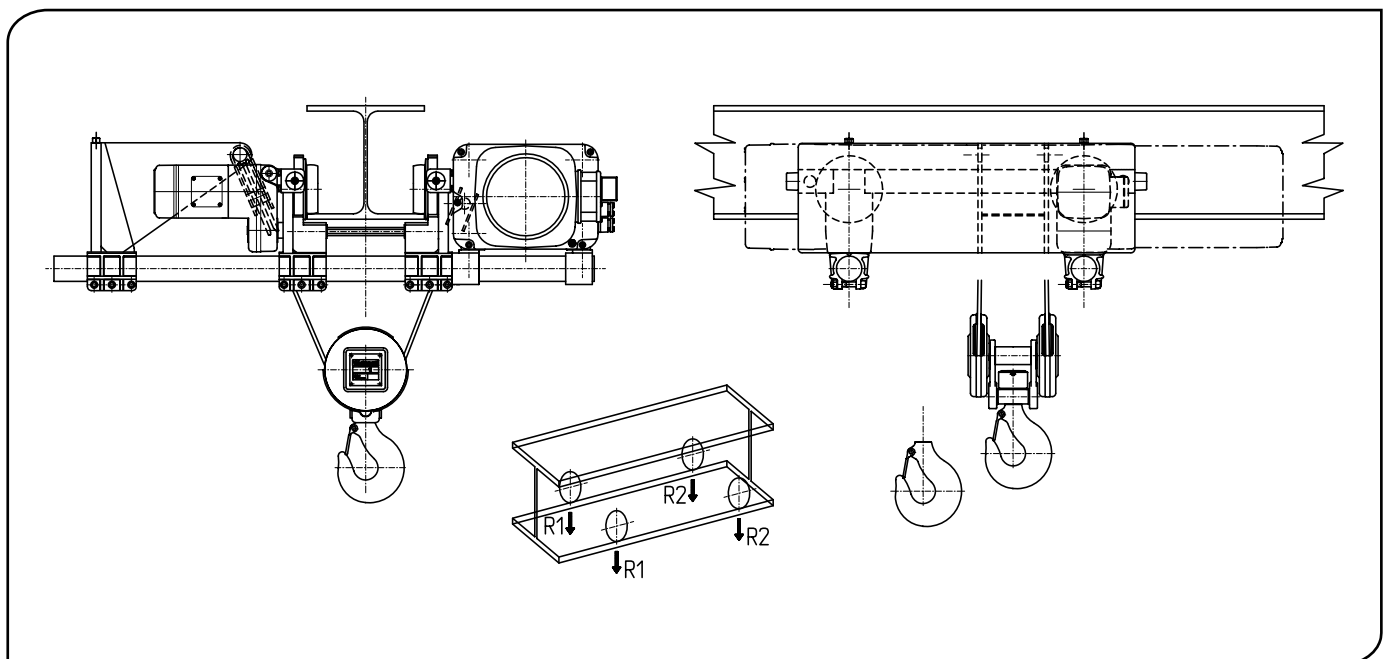


Single girder DST/R trolleys for DRH electric wire rope hoists – 2 rope falls version (2/1)

| DRH | Hoist         |        | Static reactions: R1; R2 = daN |        |      |        |     |         |     |         |     |  |
|-----|---------------|--------|--------------------------------|--------|------|--------|-----|---------|-----|---------|-----|--|
|     | Capacity (kg) | Drum C |                                | Drum N |      | Drum L |     | Drum X1 |     | Drum X2 |     |  |
|     |               | R1     | R2                             | R1     | R2   | R1     | R2  | R1      | R2  | R1      | R2  |  |
| 1   | 800           | 392    | 138                            | 416    | 119  | 451    | 89  | 475     | 105 | 482     | 113 |  |
|     | 1000          | 468    | 162                            | 498    | 137  | 540    | 100 | 565     | 115 | 572     | 123 |  |
|     | 1250          | 563    | 192                            | 600    | 160  | 652    | 113 | 675     | 130 | 684     | 136 |  |
|     | 1600          | 697    | 233                            | 742    | 193  | 808    | 132 | 830     | 150 | 847     | 148 |  |
|     | 2000          | 849    | 281                            | 906    | 229  | 987    | 153 | 1010    | 170 | 1035    | 160 |  |
| 2   | 1250          | 615    | 190                            | 644    | 166  | 695    | 128 | 710     | 145 | 716     | 154 |  |
|     | 1600          | 753    | 227                            | 790    | 195  | 852    | 146 | 870     | 160 | 877     | 168 |  |
|     | 2000          | 912    | 268                            | 957    | 228  | 1032   | 166 | 1050    | 180 | 1057    | 188 |  |
|     | 2500          | 1110   | 320                            | 1165   | 270  | 1257   | 191 | 1275    | 205 | 1290    | 205 |  |
|     | 3200          | 1387   | 393                            | 1457   | 328  | 1572   | 226 | 1588    | 242 | 1617    | 228 |  |
| 3   | 2500          | 1226   | 394                            | 1287   | 348  | 1411   | 274 | 1470    | 310 | 1495    | 335 |  |
|     | 3200          | 1500   | 470                            | 1576   | 409  | 1725   | 310 | 1780    | 350 | 1805    | 375 |  |
|     | 4000          | 1813   | 557                            | 1905   | 480  | 2084   | 351 | 2140    | 390 | 2165    | 415 |  |
|     | 5000          | 2205   | 665                            | 2317   | 568  | 2532   | 403 | 2590    | 440 | 2622    | 458 |  |
|     | 6300          | 2714   | 806                            | 2853   | 682  | 3115   | 470 | 3170    | 510 | 3228    | 502 |  |
| 4   | 4000          | 2031   | 724                            | 2121   | 654  | 2327   | 523 | 2450    | 610 | 2510    | 665 |  |
|     | 5000          | 2413   | 842                            | 2522   | 753  | 2767   | 583 | 2890    | 670 | 2950    | 725 |  |
|     | 6300          | 2910   | 995                            | 3044   | 881  | 3340   | 660 | 3460    | 750 | 3510    | 815 |  |
|     | 8000          | 3559   | 1196                           | 3726   | 1049 | 4088   | 762 | 4210    | 850 | 4298    | 877 |  |
|     | 10000         | 4323   | 1432                           | 4528   | 1247 | 4968   | 882 | 5090    | 970 | 5225    | 950 |  |

Single girder DST/R trolleys for DRH electric wire rope hoists – 4 rope falls version (4/1)

| DRH | Hoist         |        | Static reactions: R1; R2 = daN |        |      |        |      |         |      |         |      |  |
|-----|---------------|--------|--------------------------------|--------|------|--------|------|---------|------|---------|------|--|
|     | Capacity (kg) | Drum C |                                | Drum N |      | Drum L |      | Drum X1 |      | Drum X2 |      |  |
|     |               | R1     | R2                             | R1     | R2   | R1     | R2   | R1      | R2   | R1      | R2   |  |
| 1   | 1600          | 590    | 345                            | 660    | 280  | 748    | 197  | 782     | 203  | 813     | 187  |  |
|     | 2000          | 715    | 420                            | 802    | 338  | 911    | 234  | 955     | 230  | 992     | 208  |  |
|     | 2500          | 871    | 514                            | 979    | 411  | 1115   | 280  | 1170    | 265  | 1215    | 235  |  |
|     | 3200          | 1090   | 645                            | 1227   | 513  | 1400   | 345  | 1472    | 313  | 1527    | 273  |  |
|     | 4000          | 1340   | 795                            | 1511   | 629  | 1726   | 419  | 1818    | 367  | 1884    | 316  |  |
| 2   | 2500          | 920    | 538                            | 1017   | 446  | 1150   | 325  | 1184    | 331  | 1226    | 304  |  |
|     | 3200          | 1139   | 669                            | 1262   | 551  | 1430   | 395  | 1478    | 387  | 1530    | 350  |  |
|     | 4000          | 1389   | 819                            | 1542   | 671  | 1750   | 475  | 1815    | 450  | 1878    | 402  |  |
|     | 5000          | 1701   | 1007                           | 1892   | 821  | 2150   | 575  | 2235    | 530  | 2313    | 467  |  |
|     | 6300          | 2107   | 1251                           | 2347   | 1016 | 2670   | 705  | 2782    | 633  | 2878    | 552  |  |
| 3   | 5000          | 1829   | 1164                           | 2024   | 979  | 2336   | 722  | 2400    | 773  | 2513    | 710  |  |
|     | 6300          | 2219   | 1424                           | 2464   | 1189 | 2847   | 861  | 2938    | 885  | 3072    | 800  |  |
|     | 8000          | 2729   | 1764                           | 3038   | 1465 | 3515   | 1043 | 3640    | 1033 | 3804    | 919  |  |
|     | 10000         | 3329   | 2164                           | 3714   | 1789 | 4300   | 1258 | 4465    | 1208 | 4665    | 1058 |  |
|     | 12500         | 4079   | 2664                           | 4558   | 2195 | 5283   | 1525 | 5497    | 1425 | 5741    | 1232 |  |
| 4   | 8000          | 2960   | 1980                           | 3248   | 1717 | 3862   | 1198 | 3986    | 1284 | 4180    | 1203 |  |
|     | 10000         | 3543   | 2397                           | 3899   | 2066 | 4650   | 1410 | 4824    | 1446 | 5052    | 1330 |  |
|     | 12500         | 4273   | 2917                           | 4713   | 2502 | 5636   | 1674 | 5871    | 1649 | 6143    | 1490 |  |
|     | 16000         | 5293   | 3647                           | 5853   | 3112 | 7017   | 2043 | 7338    | 1932 | 7670    | 1713 |  |
|     | 20000         | 6460   | 4480                           | 7155   | 3810 | 8594   | 2466 | 9013    | 2257 | 9414    | 1968 |  |

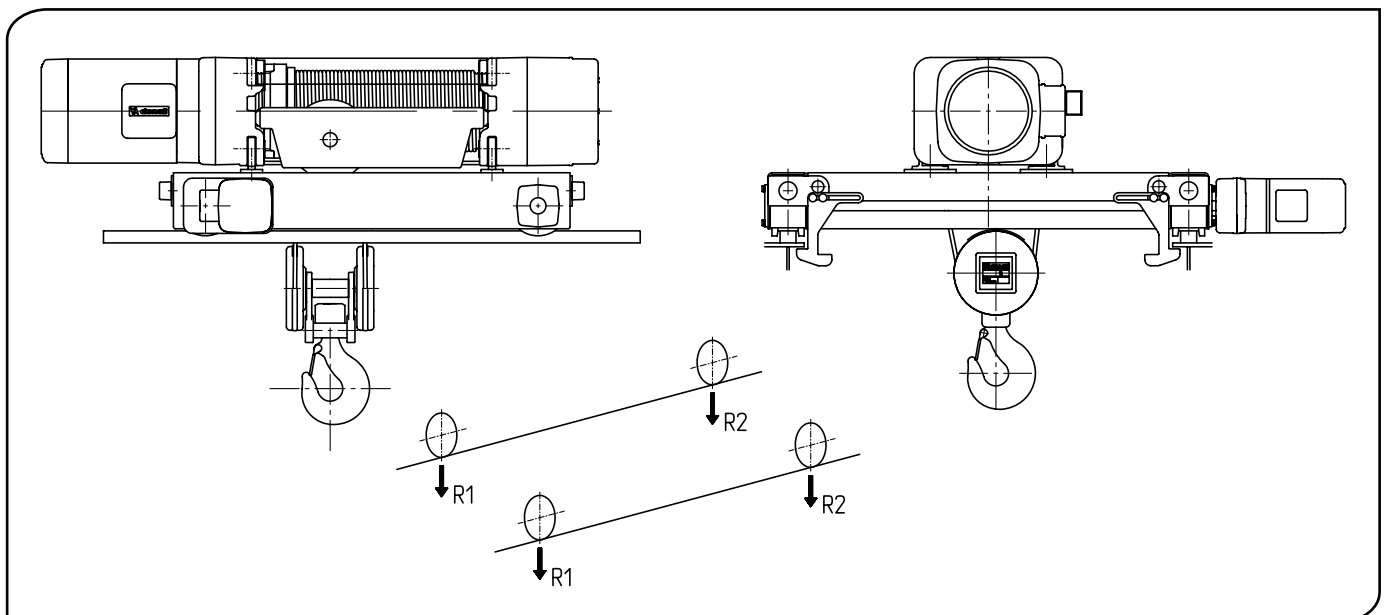


DRT double girder trolleys for electric DRH wire rope hoists set-down/suspended – 2 rope falls (2/1) and 4 rope falls versions (4/1)

| Version with 2 falls of rope (2/1) |                     |                                |      |        |      |        |      |         |      |         |     |  |
|------------------------------------|---------------------|--------------------------------|------|--------|------|--------|------|---------|------|---------|-----|--|
| DRH                                | Hoist Capacity (kg) | Static reactions: R1; R2 = daN |      |        |      |        |      |         |      |         |     |  |
|                                    |                     | Drum C                         |      | Drum N |      | Drum L |      | Drum X1 |      | Drum X2 |     |  |
|                                    |                     | R1                             | R2   | R1     | R2   | R1     | R2   | R1      | R2   | R1      | R2  |  |
| 1                                  | 800                 | 335                            | 179  | 369    | 162  | 404    | 131  | 430     | 113  | 457     | 101 |  |
|                                    | 1000                | 400                            | 214  | 428    | 193  | 482    | 153  | 514     | 129  | 545     | 113 |  |
|                                    | 1250                | 481                            | 258  | 515    | 231  | 580    | 180  | 618     | 150  | 654     | 129 |  |
|                                    | 1600                | 594                            | 320  | 637    | 284  | 718    | 217  | 765     | 178  | 808     | 150 |  |
|                                    | 2000                | 724                            | 390  | 776    | 345  | 875    | 260  | 932     | 211  | 984     | 174 |  |
| 2                                  | 1250                | 529                            | 236  | 562    | 211  | 626    | 164  | 662     | 151  | 676     | 142 |  |
|                                    | 1600                | 651                            | 289  | 691    | 257  | 770    | 196  | 801     | 177  | 829     | 164 |  |
|                                    | 2000                | 791                            | 349  | 839    | 309  | 935    | 230  | 972     | 206  | 1004    | 189 |  |
|                                    | 2500                | 955                            | 425  | 1025   | 373  | 1142   | 273  | 1185    | 243  | 1223    | 220 |  |
|                                    | 3200                | 1209                           | 531  | 1284   | 464  | 1430   | 335  | 1484    | 294  | 1530    | 263 |  |
| 3                                  | 2500                | 1084                           | 496  | 1146   | 449  | 1295   | 365  | 1368    | 340  | 1419    | 316 |  |
|                                    | 3200                | 1326                           | 604  | 1403   | 542  | 1583   | 417  | 1666    | 392  | 1726    | 369 |  |
|                                    | 4000                | 1602                           | 728  | 1696   | 649  | 1912   | 488  | 2006    | 452  | 2077    | 408 |  |
|                                    | 5000                | 1948                           | 882  | 2063   | 782  | 2323   | 577  | 2432    | 526  | 2515    | 470 |  |
|                                    | 6300                | 2397                           | 1083 | 2539   | 956  | 2858   | 692  | 2984    | 624  | 3085    | 550 |  |
| 4                                  | 4000                | 1737                           | 831  | 1825   | 763  | 2064   | 611  | 2218    | 585  | 2340    | 558 |  |
|                                    | 5000                | 2077                           | 991  | 2184   | 904  | 2467   | 708  | 2639    | 664  | 2776    | 622 |  |
|                                    | 6300                | 2518                           | 1200 | 2649   | 1089 | 2991   | 834  | 3186    | 767  | 3342    | 706 |  |
|                                    | 8000                | 3096                           | 1472 | 3259   | 1329 | 3677   | 998  | 3902    | 901  | 4082    | 816 |  |
|                                    | 10000               | 3775                           | 1793 | 3975   | 1613 | 4484   | 1191 | 4743    | 1606 | 4953    | 945 |  |

| Version with 4 falls of rope (4/1) |                     |                                |      |        |      |        |      |         |      |         |      |  |
|------------------------------------|---------------------|--------------------------------|------|--------|------|--------|------|---------|------|---------|------|--|
| DRH                                | Hoist Capacity (kg) | Static reactions: R1; R2 = daN |      |        |      |        |      |         |      |         |      |  |
|                                    |                     | Drum C                         |      | Drum N |      | Drum L |      | Drum X1 |      | Drum X2 |      |  |
|                                    |                     | R1                             | R2   | R1     | R2   | R1     | R2   | R1      | R2   | R1      | R2   |  |
| 1                                  | 1600                | 535                            | 383  | 587    | 338  | 675    | 265  | 734     | 219  | 783     | 186  |  |
|                                    | 2000                | 649                            | 469  | 713    | 412  | 821    | 319  | 892     | 261  | 960     | 218  |  |
|                                    | 2500                | 792                            | 576  | 870    | 505  | 1003   | 387  | 1090    | 313  | 1161    | 257  |  |
|                                    | 3200                | 992                            | 726  | 1090   | 635  | 1258   | 482  | 1366    | 387  | 1454    | 314  |  |
|                                    | 4000                | 1220                           | 898  | 1342   | 783  | 1549   | 591  | 1682    | 471  | 1790    | 378  |  |
| 2                                  | 2500                | 830                            | 568  | 908    | 495  | 1047   | 378  | 1109    | 329  | 1159    | 294  |  |
|                                    | 3200                | 1034                           | 714  | 1133   | 620  | 1307   | 468  | 1384    | 404  | 1446    | 357  |  |
|                                    | 4000                | 1268                           | 880  | 1391   | 762  | 1605   | 570  | 1699    | 489  | 1774    | 429  |  |
|                                    | 5000                | 1560                           | 1088 | 1713   | 940  | 1977   | 698  | 2092    | 596  | 2183    | 520  |  |
|                                    | 6300                | 1940                           | 1368 | 2133   | 1170 | 2460   | 866  | 2603    | 735  | 2716    | 637  |  |
| 3                                  | 5000                | 1668                           | 1200 | 1815   | 1060 | 2117   | 813  | 2251    | 722  | 2368    | 632  |  |
|                                    | 6300                | 2026                           | 1482 | 2223   | 1302 | 2593   | 987  | 2755    | 868  | 2897    | 753  |  |
|                                    | 8000                | 2508                           | 1850 | 2755   | 1620 | 3216   | 1214 | 3413    | 1060 | 3589    | 911  |  |
|                                    | 10000               | 3076                           | 2282 | 3381   | 1994 | 3948   | 1482 | 4187    | 1286 | 4403    | 1097 |  |
|                                    | 12500               | 3785                           | 2823 | 4164   | 2461 | 4863   | 1817 | 5155    | 1568 | 5420    | 1330 |  |
| 4                                  | 8000                | 2640                           | 1980 | 2862   | 1781 | 3425   | 1315 | 3683    | 1145 | 3907    | 1016 |  |
|                                    | 10000               | 3196                           | 2424 | 3470   | 2173 | 4158   | 1582 | 4466    | 1362 | 4730    | 1193 |  |
|                                    | 12500               | 3892                           | 2978 | 4230   | 2663 | 5074   | 1916 | 5444    | 1634 | 5758    | 1415 |  |
|                                    | 16000               | 4866                           | 3754 | 5295   | 3348 | 6357   | 2383 | 6814    | 2014 | 7198    | 1725 |  |
|                                    | 20000               | 5979                           | 4641 | 6512   | 4131 | 7823   | 2917 | 8380    | 2448 | 8844    | 2079 |  |
|                                    | *25000              | 7426                           | 5777 | 8088   | 5138 | 9720   | 3616 | 10410   | 3028 | 10990   | 2565 |  |

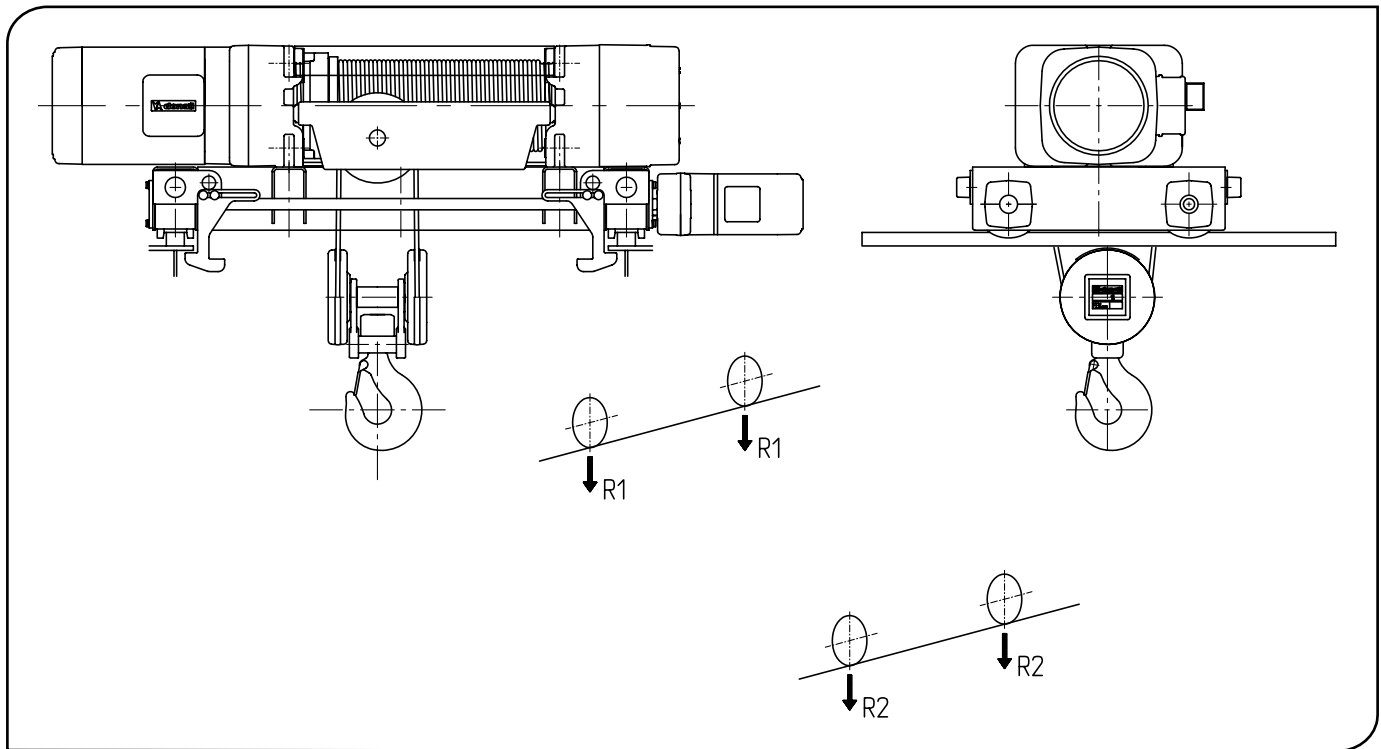
\* Only in set-down execution



DRT double girder trolley for DRH wire rope hoist in trasversal position with 2 rope falls (2/1) and 4 rope falls (4/1)

| Version with 2 falls of rope (2/1) |               |                                |      |        |      |        |     |
|------------------------------------|---------------|--------------------------------|------|--------|------|--------|-----|
| Hoist                              |               | Static reactions: R1; R2 = daN |      |        |      |        |     |
| DRH                                | Capacity (kg) | Drum C                         |      | Drum N |      | Drum L |     |
|                                    |               | R1                             | R2   | R1     | R2   | R1     | R2  |
| 1                                  | 800           | 305                            | 199  | 313    | 194  | 405    | 125 |
|                                    | 1000          | 364                            | 240  | 374    | 233  | 484    | 146 |
|                                    | 1250          | 438                            | 291  | 450    | 282  | 584    | 171 |
|                                    | 1600          | 541                            | 363  | 555    | 352  | 723    | 207 |
|                                    | 2000          | 659                            | 445  | 676    | 431  | 882    | 148 |
| 2                                  | 1250          | 482                            | 273  | 494    | 264  | 577    | 211 |
|                                    | 1600          | 593                            | 337  | 607    | 326  | 709    | 254 |
|                                    | 2000          | 720                            | 410  | 737    | 396  | 859    | 304 |
|                                    | 2500          | 878                            | 502  | 899    | 484  | 1046   | 367 |
|                                    | 3200          | 1100                           | 630  | 1125   | 608  | 1309   | 454 |
| 3                                  | 2500          | 1046                           | 507  | 1084   | 479  | 1266   | 369 |
|                                    | 3200          | 1282                           | 621  | 1329   | 584  | 1548   | 437 |
|                                    | 4000          | 1552                           | 751  | 1609   | 704  | 1871   | 514 |
|                                    | 5000          | 1890                           | 913  | 1959   | 854  | 2275   | 610 |
|                                    | 6300          | 2328                           | 1125 | 2414   | 1049 | 2800   | 735 |
| 4                                  | 4000          | 1802                           | 741  | 1810   | 755  | -      | -   |
|                                    | 5000          | 2162                           | 881  | 2168   | 897  | -      | -   |
|                                    | 6300          | 2630                           | 1063 | 2634   | 1081 | -      | -   |
|                                    | 8000          | 3242                           | 1301 | 3243   | 1322 | -      | -   |
|                                    | 10000         | 3962                           | 1581 | 3960   | 1605 | -      | -   |

| Version with 4 falls of rope (4/1) |               |                                |      |        |      |        |      |
|------------------------------------|---------------|--------------------------------|------|--------|------|--------|------|
| Hoist                              |               | Static reactions: R1; R2 = daN |      |        |      |        |      |
| DRH                                | Capacity (kg) | Drum C                         |      | Drum N |      | Drum L |      |
|                                    |               | R1                             | R2   | R1     | R2   | R1     | R2   |
| 1                                  | 1600          | 500                            | 408  | 515    | 398  | 670    | 265  |
|                                    | 2000          | 607                            | 501  | 625    | 488  | 815    | 320  |
|                                    | 2500          | 741                            | 617  | 763    | 600  | 996    | 389  |
|                                    | 3200          | 928                            | 780  | 955    | 758  | 1250   | 485  |
|                                    | 4000          | 1142                           | 966  | 1175   | 938  | 1540   | 595  |
| 2                                  | 2500          | 783                            | 605  | 805    | 588  | 949    | 474  |
|                                    | 3200          | 977                            | 761  | 1004   | 739  | 1182   | 591  |
|                                    | 4000          | 1198                           | 940  | 1231   | 912  | 1449   | 724  |
|                                    | 5000          | 1475                           | 1163 | 1515   | 1128 | 1782   | 891  |
|                                    | 6300          | 1834                           | 1454 | 1885   | 1408 | 2215   | 1108 |
|                                    | 8000          | 2328                           | 1850 | 2414   | 1810 | 2800   | 1400 |
| 3                                  | 5000          | 1633                           | 1197 | 1704   | 1139 | 2045   | 870  |
|                                    | 6300          | 2000                           | 1480 | 2087   | 1406 | 2504   | 1061 |
|                                    | 8000          | 2480                           | 1850 | 2589   | 1754 | 3105   | 1310 |
|                                    | 10000         | 3045                           | 2285 | 3179   | 2164 | 3812   | 1603 |
|                                    | 12500         | 3752                           | 2828 | 3916   | 2677 | 4696   | 1969 |
| 4                                  | 8000          | 2757                           | 1838 | 2847   | 1773 | -      | -    |
|                                    | 10000         | 3347                           | 2248 | 3455   | 2165 | -      | -    |
|                                    | 12500         | 4085                           | 2760 | 4215   | 2655 | -      | -    |
|                                    | 16000         | 5117                           | 3478 | 5280   | 3340 | -      | -    |
|                                    | 20000         | 6297                           | 4298 | 6497   | 4123 | -      | -    |



DRT double girder trolley for DRH wire rope hoist – Version with 6 rope falls (6/1) and 8 rope falls (8/1)

| Version with 6 falls of rope (6/1) |               |                                |      |        |      |         |      |         |      |
|------------------------------------|---------------|--------------------------------|------|--------|------|---------|------|---------|------|
| Trolley gauge S (mm)               | Capacity (kg) | Static reactions: R1; R2 = daN |      |        |      |         |      |         |      |
|                                    |               | Drum N                         |      | Drum L |      | Drum X1 |      | Drum X2 |      |
|                                    |               | R1                             | R2   | R1     | R2   | R1      | R2   | R1      | R2   |
| 1200                               | 16000         | 5360                           | 3200 | 6210   | 2435 | 6620    | 2070 | 6970    | 1785 |
|                                    | 20000         | 6610                           | 3950 | 7655   | 2990 | 8160    | 2530 | 8587    | 2168 |
| 1400                               | 16000         | 5367                           | 3203 | 6214   | 2441 | 6627    | 2073 | 6997    | 1788 |
|                                    | 20000         | 6615                           | 3955 | 7660   | 3000 | 8170    | 2530 | 8600    | 2170 |
|                                    | 25000         | 8250                           | 5150 | 9600   | 3900 | 10250   | 3375 | 10838   | 2857 |
|                                    | 32000         | 10400                          | 6500 | 12100  | 4900 | 12980   | 4150 | 13650   | 3545 |
| 2240                               | 25000         | 8350                           | 5200 | 9700   | 3950 | 10350   | 3400 | 10925   | 2900 |
|                                    | 32000         | 10500                          | 6550 | 12200  | 4950 | 13050   | 4200 | 13737   | 3588 |
| 2800                               | 25000         | 8450                           | 5250 | 9800   | 4050 | 10400   | 3500 | 11025   | 2950 |
|                                    | 32000         | 10600                          | 6600 | 12300  | 5050 | 13100   | 4300 | 13837   | 3638 |

| Version with 8 falls of rope (8/1) |               |                                |       |        |      |         |      |         |      |
|------------------------------------|---------------|--------------------------------|-------|--------|------|---------|------|---------|------|
| Trolley gauge S (mm)               | Capacity (kg) | Static reactions: R1; R2 = daN |       |        |      |         |      |         |      |
|                                    |               | Drum N                         |       | Drum L |      | Drum X1 |      | Drum X2 |      |
|                                    |               | R1                             | R2    | R1     | R2   | R1      | R2   | R1      | R2   |
| 1400                               | 25000         | -                              | -     | 9085   | 4115 | 9780    | 3460 | 10380   | 2910 |
|                                    | 40000         | 11500                          | 9500  | 13850  | 7300 | 14900   | 6350 | 16325   | 5043 |
|                                    | 50000         | 14400                          | 11600 | 17550  | 8600 | 18950   | 7300 | 20150   | 6200 |
| 2240                               | 25000         | -                              | -     | 9159   | 4081 | 9845    | 3435 | 10437   | 1938 |
|                                    | 50000         | 14340                          | 11860 | 17280  | 9020 | 18590   | 7860 | 20295   | 6248 |
| 2800                               | 25000         | -                              | -     | 9242   | 4123 | 9932    | 3478 | 10504   | 2971 |
|                                    | 40000         | 11650                          | 9650  | 14000  | 7400 | 15100   | 6450 | 16522   | 5141 |
|                                    | 50000         | 14400                          | 11900 | 17340  | 9060 | 18660   | 7890 | 20375   | 6288 |

### 2.2.10 Characteristics of the motors, fuses and power cables

| Hoist DRH        | Motor Type | Poles | Group FEM | Power (kW) | COS $\varphi$ | Ia - (A) 400V - 50Hz | In - (A) 400V - 50Hz | Power current fuse (A) 400V - 50Hz | Minimum section of power cables 400V - ( $\Delta$ U20V) |           |
|------------------|------------|-------|-----------|------------|---------------|----------------------|----------------------|------------------------------------|---|-----------|
|                  |            |       |           |            |               |                      |                      |                                    | $\phi$ mm <sup>2</sup>                                  | L = m     |
| 1                | 112K4RH1/3 | 4     | 1Am       | 3          | 0.75          | 40                   | 8                    | 16                                 | 2.5   | $\leq 30$ |
|                  |            |       | 2m        |            |               |                      |                      |                                    |   |           |
|                  |            |       | 3m        |            |               |                      |                      |                                    |   |           |
|                  | 112K5RH1/3 | 4/12  | 1Am       | 3/1        | 0.72/0.5      | 38/13                | 8/6.6                | 16                                 | 2.5   | $\leq 30$ |
|                  |            |       | 2m        |            |               |                      |                      |                                    |   |           |
|                  |            |       | 3m        |            |               |                      |                      |                                    |   |           |
| 2                | 132K4RH2/3 | 4     | 1Am       | 5          | 0.75          | 58                   | 12                   | 20                                 | 4   | $\leq 30$ |
|                  |            |       | 2m        |            |               |                      |                      |                                    |   |           |
|                  |            |       | 3m        |            |               |                      |                      |                                    |   |           |
|                  | 132K5RH2/3 | 4/12  | 1Am       | 5/1.65     | 0.78/0.5      | 50/17                | 12/10                | 20                                 | 4   | $\leq 30$ |
|                  |            |       | 2m        |            |               |                      |                      |                                    |   |           |
|                  |            |       | 3m        |            |               |                      |                      |                                    |   |           |
| 3                | 160K4RH3/2 | 4     | 1Am       | 10         | 0.8           | 110                  | 22                   | 32                                 | 6   | $\leq 30$ |
|                  |            |       | 2m        |            |               |                      |                      |                                    |   |           |
|                  |            |       | 3m        |            |               |                      |                      |                                    |   |           |
|                  | 160K5RH3/2 | 4/12  | 1Am       | 10/3.3     | 0.77/0.46     | 100/20               | 24/18                | 32                                 | 6   | $\leq 30$ |
|                  |            |       | 2m        |            |               |                      |                      |                                    |   |           |
|                  |            |       | 3m        |            |               |                      |                      |                                    |   |           |
| 4                | 180K4RH4/2 | 4     | 1Am       | 16         | 0.82          | 175                  | 34                   | 63                                 | 10  | $\leq 20$ |
|                  |            |       | 2m        |            |               |                      |                      |                                    |   |           |
|                  |            |       | 3m        |            |               |                      |                      |                                    |   |           |
|                  | 180K5RH4/2 | 4/12  | 1Am       | 16/5.3     | 0.78/0.42     | 170/55               | 38/30                | 63                                 | 10  | $\leq 20$ |
|                  |            |       | 2m        |            |               |                      |                      |                                    |   |           |
|                  |            |       | 3m        |            |               |                      |                      |                                    |   |           |
| 4<br>Cylindrical | 180C4RH4   | 4     | 1Am       | 24         | 0.88          | 330                  | 48                   | 80                                 | 16  | $\leq 20$ |
|                  |            |       | 2m        |            |               |                      |                      |                                    |   |           |
|                  |            |       | 3m        |            |               |                      |                      |                                    |   |           |
|                  | 180C5RH4   | 4/12  | 1Am       | 24/7.8     | 0.88/0.5      | 330/80               | 48/32                | 80                                 | 16  | $\leq 20$ |
|                  |            |       | 2m        |            |               |                      |                      |                                    |   |           |
|                  |            |       | 3m        |            |               |                      |                      |                                    |   |           |

| Trolley<br>DST<br>DRT   | Motor Type | Poles | Group FEM       | Power (kW) | COS $\varphi$ | Ia - (A) 400V - 50Hz | In - (A) 400V - 50Hz |
|-------------------------|------------|-------|-----------------|------------|---------------|----------------------|----------------------|
| DST 1<br>DST 2<br>DRT 1 | 71K3P      | 2/8   | 1Am<br>2m<br>3m | 0.32/0.07  | 0.7/0.55      | 3.8/1.2              | 1.0/0.8              |
|                         | 71C2P      | 2     | 1Am<br>2m<br>3m | 0.32       | 0.72          | 6                    | 1.0                  |
|                         | 71C4P      | 4     | 1Am<br>2m<br>3m | 0.16       | 0.5           | 4                    | 1.0                  |
| DST 3<br>DRT 2          | 80K3P      | 2/8   | 1Am             | 0.5/0.12   | 0.85/0.6      | 5.5/1.6              | 1.3/1.1              |
|                         | 80K2P      | 2     | 2m              | 0.50       | 0.8           | 5.6                  | 1.3                  |
|                         | 80K4P      | 4     | 3m              | 0.25       | 0.65          | 3.3                  | 0.9                  |
| DST 4<br>* DRT 3        | 80K3PL     | 2/8   | 1Am             | 0.63/0.15  | 0.82/0.57     | 6.8/1.9              | 1.6/1.3              |
|                         | 80K2PL     | 2     | 2m              | 0.63       | 0.75          | 7.7                  | 1.7                  |
|                         | 80K4PL     | 4     | 3m              | 0.32       | 0.65          | 3.9                  | 1.1                  |
| ** DRT 3<br>*** DRT 4   | 100K3P     | 2/8   | 1Am<br>2m<br>3m | 1.25/0.31  | 0.84/0.6      | 16/3.6               | 3.1/1.8              |
|                         | 100K2P     | 2     | 1Am<br>2m<br>3m | 1.25       | 0.83          | 16                   | 2.9                  |
|                         | 100K4P     | 4     | 1Am<br>2m<br>3m | 0.63       | 0.8           | 8.5                  | 1.7                  |

– The articulated DST trolley are realized with 2 motoreducers. Powers stated in the table have to be doubled.

\* The trolley DRT3 for hoists DRH4 at 6 ropes falls are realized with 2 motoreducers. The trolley DRT3 for hoist DRH3 at 8 ropes falls and only trolley gauge 2240-2800 is realized with 2 motoreducers. Powers stated in the table have to be doubled.

\*\* The trolley DRT3 for hoists DRH4 4 rope falls, DRH3 6 ropes falls (trolley gauge 1200-1400) and DRH3 8 ropes falls (trolley gauge 1400) are realized with only one motoreducer.

\*\*\* The trolley DRT4 for hoists DRH4 at 8 ropes falls are realized with 2 motoreducers. The powers stated in the table have to be doubled.

Example calculation of a fall in tension  $\Delta U$ , of the length and of the section of the power cable ( $\Delta U$  max 5%):

$$\begin{aligned} \Delta U &= 1.73 \cdot L \cdot I_a \cdot \cos\varphi / X \cdot \Phi & [V] \\ L &= \Delta U \cdot X \cdot \Phi / 1.73 \cdot \cos\varphi \cdot I_a & [m] \\ \Phi &= 1.73 \cdot L \cdot I_a \cdot \cos\varphi / \Delta U \cdot X & [mm^2] \end{aligned}$$

Values in the formula:

$$\begin{aligned} \Delta U &= \text{Fall in tension} & [V] \\ I_a &= \text{Start-up current} & [A] \\ L &= \text{Length of cable} & [m] \\ \Phi &= \text{Section of the cable} & [mm^2] \\ X &= \text{Conductivity} & \text{Cu}=57 \text{ m/Qmm} \\ \cos\varphi &= \text{Power factor} \end{aligned}$$

### ➤ 3. - SAFETY AND ACCIDENT PREVENTION ◀

The DRH electric wire rope hoists and related trolleys and accessories have been designed and manufactured using the most modern technical knowledge and can be used safely.

The dangers for persons working with the hoists can be totally eliminated and/or notably reduced only if the hoist is used by authorised staff who are appropriately trained and sufficiently prepared in accordance with the instructions in this documentation.



#### THE STAFF ARE RESPONSIBLE FOR THE FOLLOWING OPERATIONS:

Completing the hoist with any missing parts (electric controls) so as to conform to current legislation.

Setting up the hoist and, the managing of its functioning.






Execution of operations of different kinds on the hoist particularly in relation to maintenance, the checking and the repair of any of its components before starting up the machine, during its functioning or also after it stops.

Staff must be completely informed about the potential dangers in the execution of their duties, both regarding the functioning and the correct use of safety measures available on the machine.

These staff must, moreover follow the safety regulations carefully, as described in this chapter, to prevent dangerous situations occurring.

#### 3.1 Qualifications of qualified operators

The following table is designed to define more clearly the field of intervention and the consequent assumption of responsibility of every single operator, given their specific training and qualification obtained. It shows with a pictogram the professional figures necessary for every kind of intervention.

| PICTOGRAM   | OPERATOR PROFILE  |
|---|---|
| <br>OPERATOR                       | <b>Hoist operator:</b><br>Persons qualified to perform simple tasks, that is the driving of the hoist by use of the controls and the loading and unloading of the materials to be moved.  |
| <br>MECHANICAL MAINTENANCE OFFICER | <b>Mechanical maintenance officer:</b><br>Qualified persons able to intervene on the hoist in normal conditions, to carry out normal adjustments to the mechanisms, ordinary maintenance checks and mechanical repairs.   |
| <br>ELECTRICAL MAINTENANCE OFFICER | <b>Electrical maintenance officer:</b><br>Qualified persons able to intervene on the hoist in normal conditions and for normal interventions of an electrical nature, adjustments, maintenance and repairs. This person can operate with the presence of current in the control boards. |
| <br>MECHANICAL TECHNICIAN          | <b>Mechanical technician:</b><br>Qualified technician authorised to carry out operations of a complex and exceptional mechanical nature.  |
| <br>ELECTRICAL TECHNICIAN          | <b>Electrical technician:</b><br>Qualified technician authorised to carry out operations of a complex and exceptional electrical nature.  |

### 3.2 General safety regulations

Before putting the hoist into service it is necessary:












- To read the technical documentation carefully;
- To find out about the functioning and the positioning of the emergency stop device;
- To know which safety devices are installed on the hoist and where they are positioned;

Some activities to be carried out on functioning components (e.g. replacing a wire rope) expose the operators to situations of danger, so staff must be authorised and properly trained regarding the operating procedures to follow, the dangerous situations that could occur and the correct methods for preventing them.

### 3.3 Safety symbols

In the manual pictograms are used to underline or bring attention to potentially dangerous situations due to residual risks, or to actions which must be performed obligatorily according to the safety procedures shown in this manual.









#### PICTOGRAMS USED TO INDICATE DANGERS

| PICTOGRAM   | MEANING  |
|---|--|
|    | Warning danger from suspended loads being moved by the hoist.  |
|   | Warning danger of crushing due to mechanical machine-parts in movement.  |
|  | Warning danger of entanglement or dragging from machine-parts in motion (wire ropes, drum, pulleys, wheels, etc.)                        |
|  | Signals the presence of live voltage and is fixed to electrical equipment and on any structure which has live electrical voltage inside. |
|  | It is forbidden to transit, remain or manoeuvre under the suspended load.  |
|  | It is forbidden to touch wire ropes and pulleys in motion.<br>It is forbidden to tamper the overload device and to modify its values.    |
|  | It is forbidden to carry out manoeuvres during maintenance phases of moving machine-parts  |
|  | It is forbidden to remove the safety devices on a machine in motion.   |
|  | It is compulsory to wear protection gloves.  |
|  | Comply with the instructions as stated within the manual.  |
|  | The preventive checking of wire ropes, hooks, safety harnesses and accessories used for lifting and manoeuvring is compulsory.           |











### 3.4 Warning about remaining risks

Having carefully considered the possible dangers in all the operating phases of the DRH electric wire rope hoist and related travelling trolleys, necessary measures have been taken to eliminate, as far as possible, risks to the operators and/or limit or reduce the risks derived from dangers not totally eliminable at source. Nevertheless, despite all the precautions taken, the following remaining risks which are eliminable or reducible with the relevant prevention activities, still exist:

#### RISKS DURING USE

| DANGER/RISK   | BAN/WARNING   | OBLIGATION/PREVENTION   |
|---|---|---|
|  <p>Risk from danger of crushing during the manoeuvring of loads suspended when the operator or other staff are in relevant zones/ areas in the path of the load.</p>                              |  <ul style="list-style-type: none"> <li>• It is forbidden to lift loads while people are passing through the related manoeuvre area.</li> <li>• It is forbidden to transit, remain or manoeuvre under the suspended load.</li> </ul> |   <ul style="list-style-type: none"> <li>• The operator must follow the indications to obtain maximum safety by observing the indications in this manual.</li> <li>• Obligation to do periodical checks of the wire rope and the hook.</li> </ul> |
|   <p>Risk from dangers of entanglement and/or crushing after contact with wire ropes and pulleys in motion.</p> |  <ul style="list-style-type: none"> <li>• <b>Warning!</b> Exposure to the parts in motion can create dangerous situations.</li> <li>• It is forbidden to touch wire ropes and pulleys in motion.</li> </ul>                         |  <ul style="list-style-type: none"> <li>• Obligation to use protective gloves during the phases of positioning of the hook block for putting the load in the sling.</li> </ul>  |

#### RISKS DURING MAINTENANCE

| DANGER/RISK  | BAN/WARNING  | OBLIGATION/PREVENTION   |
|--|--|---|
|  <p>Risk from danger of electrocution-electric shock during maintenance of electrical equipment without having deactivated the electric power supply.</p>   |   <p>It is forbidden to intervene on electrical equipment before having switched off the hoist from the electric power line.</p>                                   |   <ul style="list-style-type: none"> <li>• Entrust electrical maintenance operations to qualified staff.</li> <li>• Carry out checks on electrical equipment prescribed in the manual.</li> </ul> |
|   <p>Risk from entanglement/ crushing in case of contact with the drum in rotation in the wire rope replacing phase.</p> |  <ul style="list-style-type: none"> <li>• <b>Warning!</b> Exposure to the parts in motion can create dangerous situations.</li> <li>• It is forbidden to turn the hoist on again if the removed protection has not been put back in place.</li> </ul> |   <ul style="list-style-type: none"> <li>• Entrust wire rope replacement operations to qualified maintenance staff.</li> <li>• Obligation to use protective gloves.</li> </ul>                    |

## 3.5 Safety measures and instructions

### 3.5.1 Control devices

The control of the DRH wire rope hoist and related trolley is generally carried out with a **push-button panel** (being part or not of the supply) which sends electric signals to a low voltage **control panel** to activate the related movements.

These movements are activated by means of the following buttons on the push-button panel (fig 7):

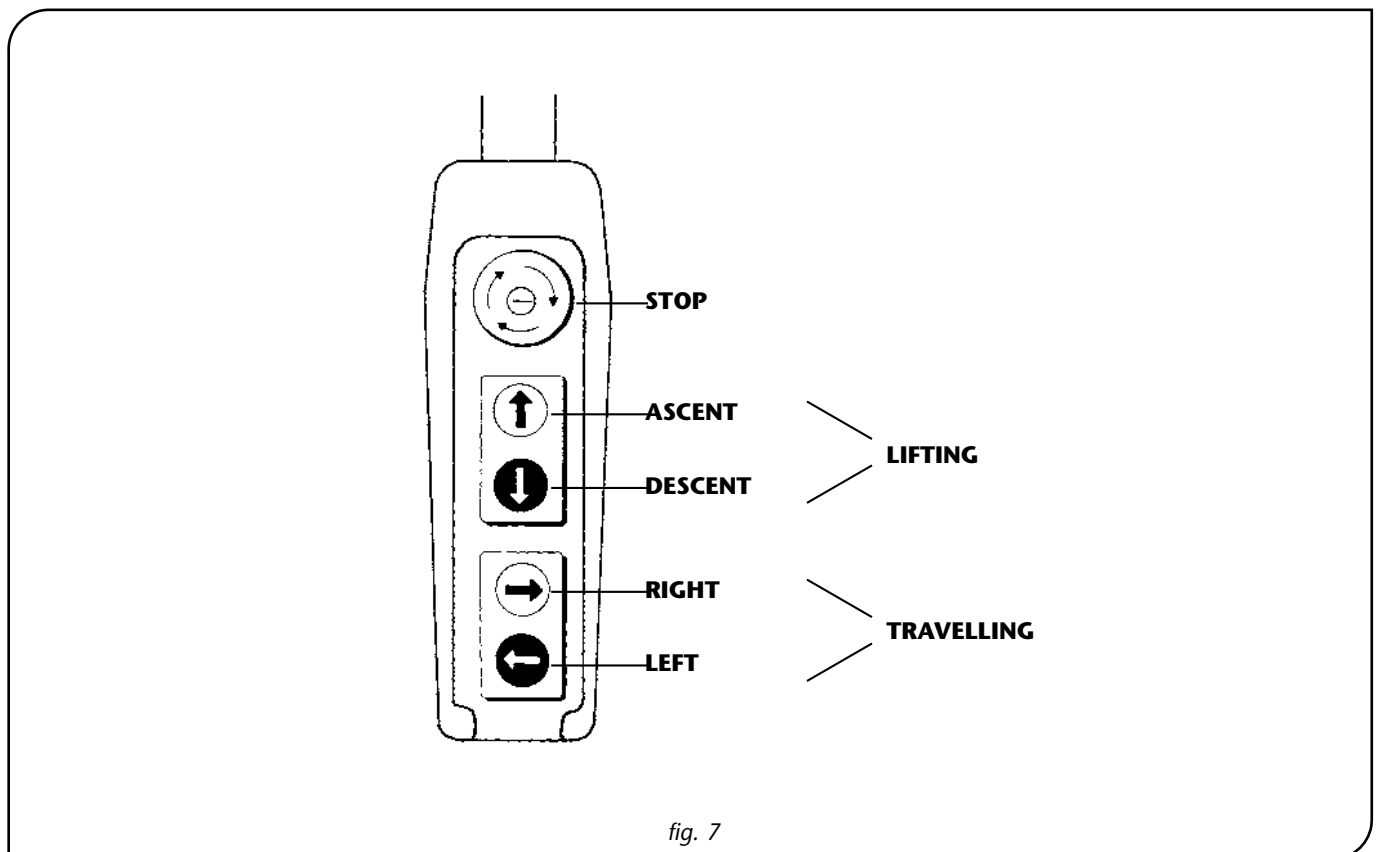
- **ascent** and **descent** buttons to control the **lifting of the hoist** (fast and/or slow)
- **right** and **left** buttons to control the transit of the **trolley** (fast and/or slow).

The buttons for the functions **ascent** and **right** have a **black symbol on a white background**, while those for **descent** and **left** have a **white symbol on a black background**. They start the function when they are kept pressed down and the controls of the auxiliary slow speeds, of lifting and of transit, can be activated with **separate buttons** or with two pushes, the first push for the command of the "slow" speed, the second push to command the "fast" one. To allow the functioning of the hoist it is necessary to bring the button for the emergency stop, located on the push-button panel, to a raised position for the gearing and then push the function button.

When the hoist is provided with a control panel, the push-button panel is of the pendant type and manoeuvrable by the operator from the ground.

The hoist can be controlled also by remote control, the functionality of the buttons is unvaried with respect to that of the push-button panel in pendant execution.

The control of the hoist can be carried out also with a fixed push-button panel (e.g. automatic cycles). In this case, the installer must check that the control ensures the maximum possible safety with particular attention to the visibility of the load.



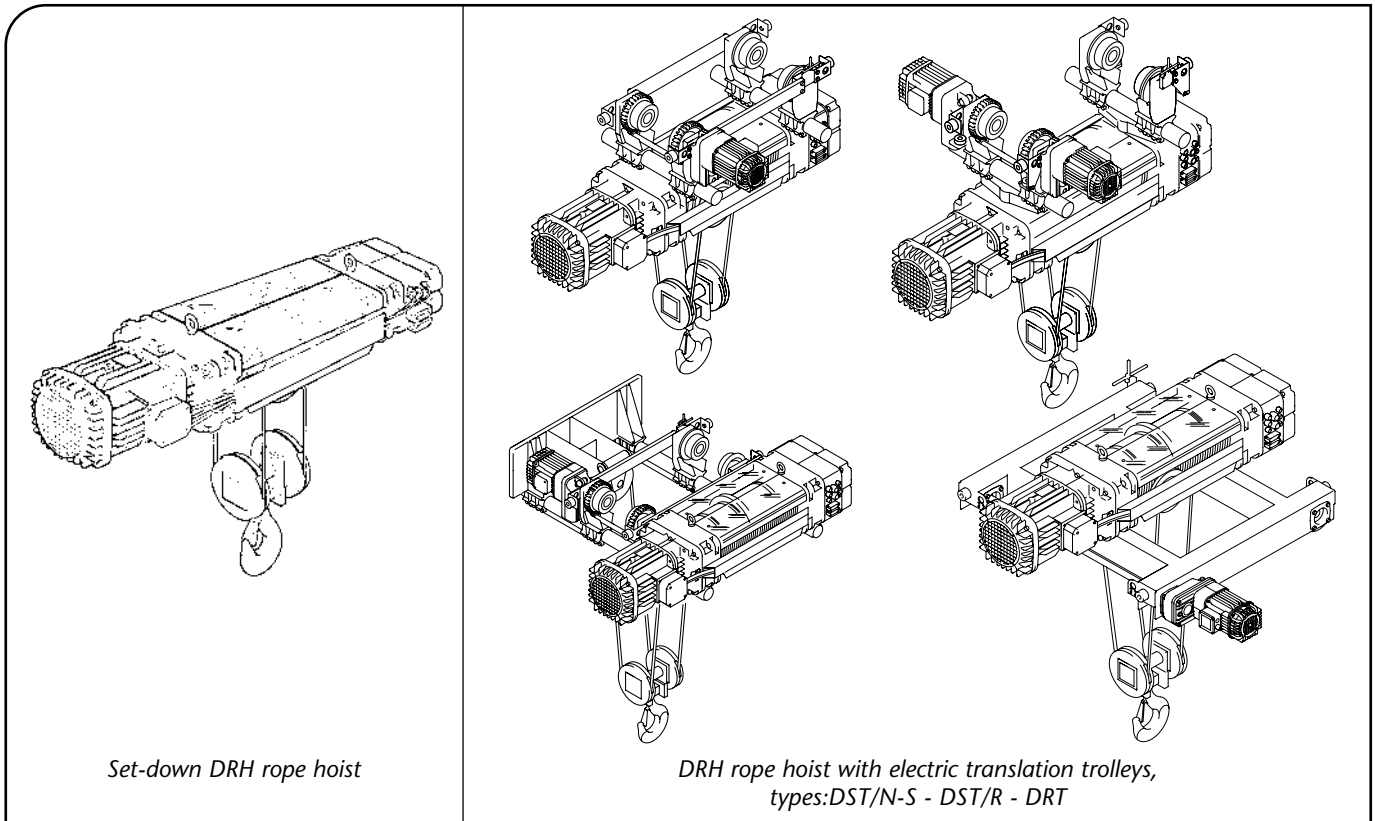
The electric wire rope hoist and related trolley, according to contractual agreements, can be supplied **complete with or without control devices and systems** (control panel with push-button panel).



*When the wire rope hoist is supplied without control devices or systems, it is forbidden to put it into service before it has been completed in conformity with the rules of the Machines Directive 2006/42/CE.*

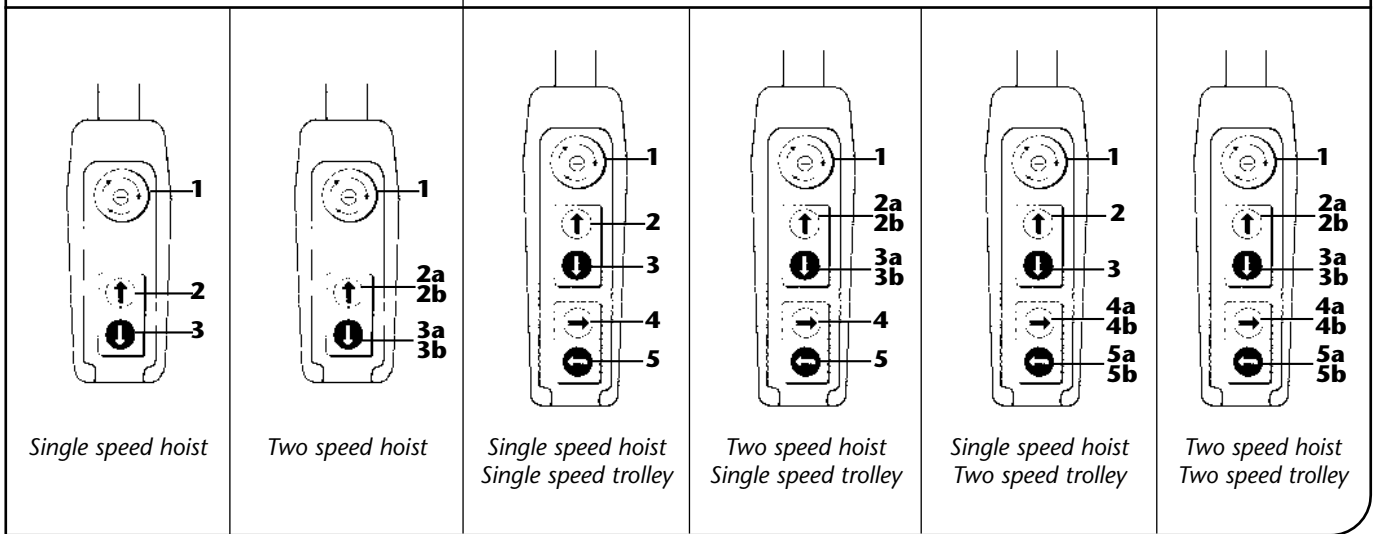


Different variants of the DRH rope hoist can be supplied (with or without a trolley, with one or two speeds) giving the following configuration for the devices on the pushbutton control panel:



Set-down DRH rope hoist

DRH rope hoist with electric translation trolleys, types: DST/N-S - DST/R - DRT



Single speed hoist

Two speed hoist

Single speed hoist  
Single speed trolley

Two speed hoist  
Single speed trolley

Single speed hoist  
Two speed trolley

Two speed hoist  
Two speed trolley

| Summary of functions of the push button panel in relation to the configuration of the hoist and/or trolley |   |   |
|--|---|---|
| Position   | Descriptions of the functions           | Utilisation of the functions  |
| 1  | Start/stop button                       | To start and stop use of the hoist  |
| 2  | Ascent button                           | To lift the load and stop at the desired position   |
| 2A   | Slow ascent button (click 1)            | For lifting and micrometric positioning   |
| 2B   | Fast ascent button (click 2)            | For large vertical ascents  |
| 3  | Descent button                          | For lowering the load and stopping at the desired position                                  |
| 3A   | Slow descent button (click 1)           | To start the descent and for micrometric positioning  |
| 3B   | Fast descent button (click 2)           | For large vertical descents   |
| 4  | Right translation button                | For horizontal movement of the trolley to the right   |
| 4A   | Slow right translation button (click 1) | To start translation to the right and for micrometric positioning along side another object |
| 4B   | Fast right translation button (click 2) | For large movements to the right  |
| 5  | Left translation button                 | For horizontal movement of the trolley to the left  |
| 5A   | Slow left translation button (click 1)  | To start translation to the right and for micrometric positioning along side another object |
| 5B   | Fast left translation button (2° click) | For large movements to the left   |

### 3.5.2 Safety and emergency devices

The DRH electric wire rope hoists and related trolleys are fitted with the following devices (fig.8):

- A) Mechanical **brakes** of negative type on the lifting and travelling motors, respectively for ascent/descent and right/left manoeuvres, which intervene automatically if the power supply fails.
- B) Electric lifting (B1) and travelling (B2) **limit switches** which limit the hook run of the hoist and the trolley run, respectively for the ascent/descent and right/left manoeuvres.
- C) The **overload device**, at an intervention threshold, installed on the anchorage of the hoist measures and checks constantly the reading of the load thus preventing overloads. If the imposed calibration readings are exceeded, the micro switch of the device intervenes by opening the control circuit of the control devices for dangerous movements.
- D) The **emergency stop**, situated on the push-button panel, is red and mushroom-shaped, and when it is pressed down completely it activates the **stop** function stopping any movement.

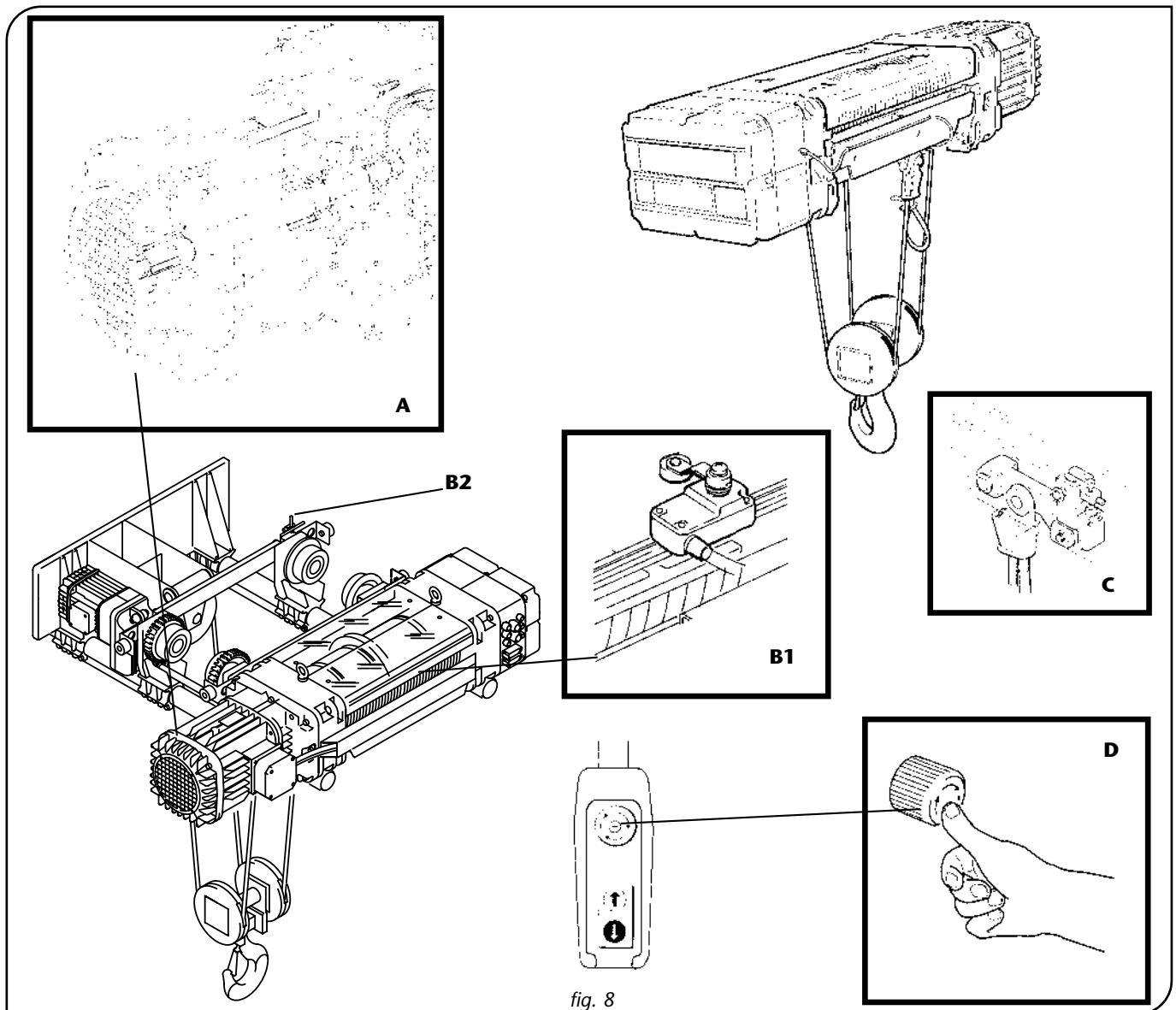


fig. 8



#### WARNING!

1) When the hoist and related trolley are supplied **WITHOUT** controls:

- The limit switches and overload device are not connected!  
Before putting into service the hoist, it is compulsory to connect the devices checking that the limit switches and overload device operate correctly, as described in paragraph 4.5 "Setting up the machine"

2) When the hoist and trolley are supplied with any control panel:

- The load limiter is connected in such a way that, on overload, is arrested only the upward movement. Therefore, in case of intervention of the limiter, the operator must operate exclusively the lower movement to disengage the load, taking care to avoid to control any other horizontal movement (translation, sliding, rotation).

**3.5.3 Warning and signalling devices - List of labels**

The DRH electric wire rope hoists and related trolleys are fitted with the following labels (fig. 9):

- Labels on the machine:
- label indicating the maximum lifting capacity of the hoist (fig. 9A)
- label of hoist data with the CE mark - (fig. 9B)
- label of trolley data (fig. 9C)
- label of overload device calibration details (fig. 9D)
- label of lifting motor (fig. 9E)
- label of travelling motor (fig. 9F)
- label of hook block with lifting capacity and FEM service group (fig. 9G)
- low tension equipment label when provided (fig. 9H)
- logotype of the manufacturer (fig. 9I).

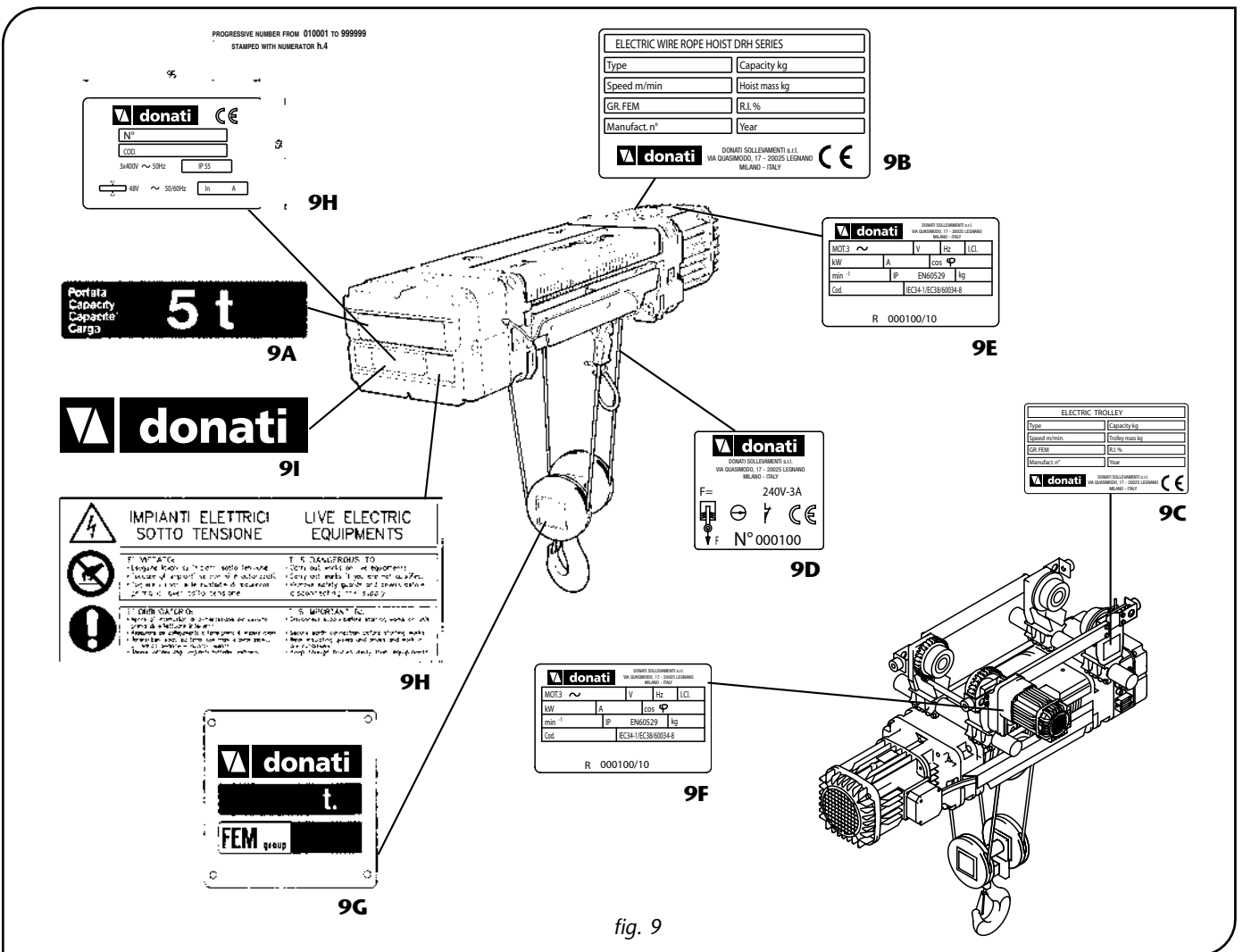



fig. 9

**Legibility and conservation of the labels**


The labels and the data written on them must always be kept legible and must be periodically cleaned. If a label deteriorates and/or is no longer legible, even only in one of the shown elements, then we recommend requesting another from the manufacturer, quoting the data contained in this manual or on the original label, and providing for its replacement.

## ➤ 4. - HANDLING - INSTALLATION - PUTTING INTO OPERATION ◀


### 4.1 General notes at delivery




- The DONATI DRH electric wire rope hoists and related trolleys are, as far as possible, delivered pre-assembled in their principal parts.
- The client can proceed independently to the installation phases of the hoist following the instructions contained in this chapter and allocating the assembly to specialized staff.




- The operations described in this chapter, because of their delicacy and importance, can cause, if badly performed, safety risks in particular for persons exposed during the installation and use phases of the hoist.
- The operations must be carried out by professionally qualified staff who specialise in industrial construction installing, with knowledge in electro mechanics, equipped with work equipment and personal protection conforming to the current safety and accident prevention legislation in the workplace, and who have first read carefully this publication.



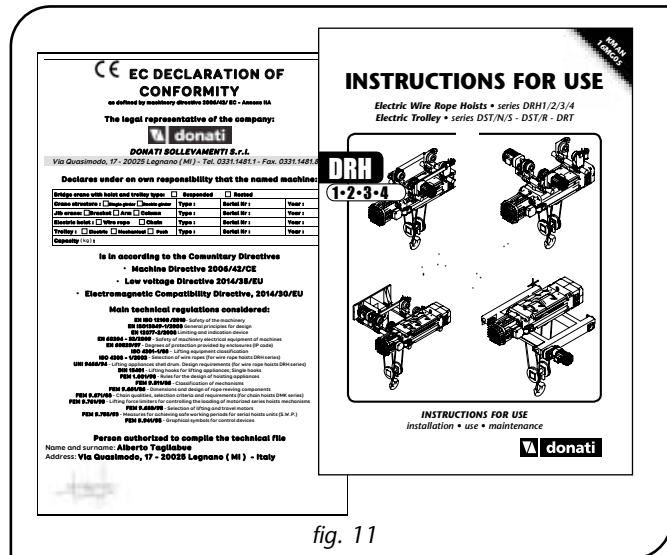
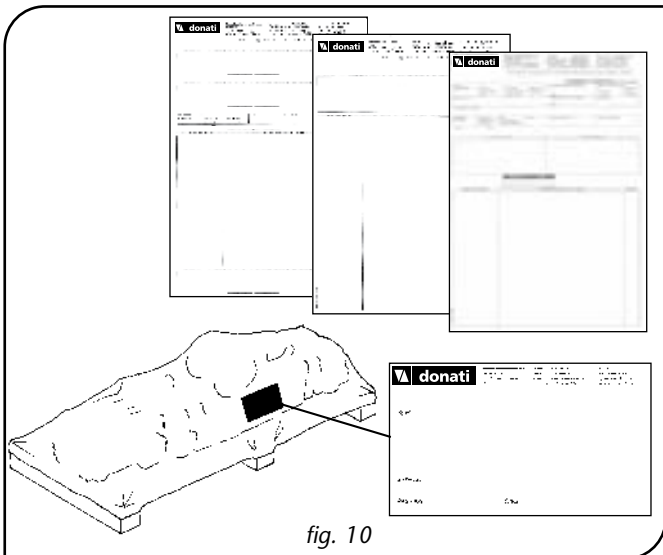
On receiving the supplied goods check and ensure that:



- The despatch data (receiver's address no. of items, no. of order, etc.) correspond to the accompanying documentation (transport documents and/or related packing-list) (fig. 10).
- Technical/legal documentation which comes with the hoist includes (fig. 11):
  - The instruction manual for the use of the DRH hoist to be installed.
  - The EC Declaration of Conformity.
- The packing, if it is part of the supply, is in good condition, in one piece and free from damage.



*In case of damage or missing parts tell the courier, note it on the accompanying document and notify DONATI SOLLEVAMENTI S.r.l. within eight days of receiving the goods.*



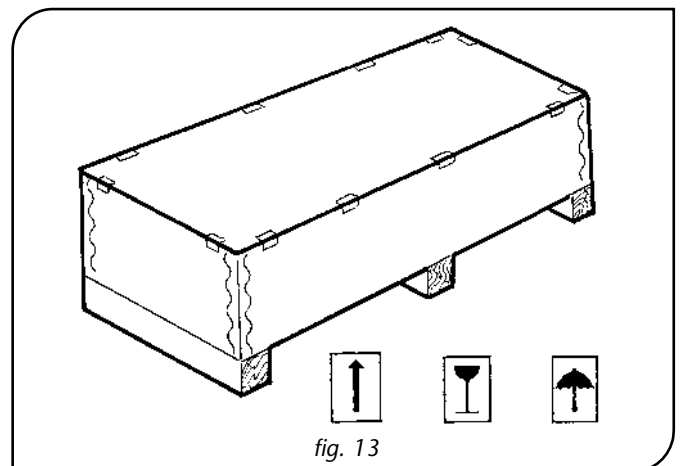
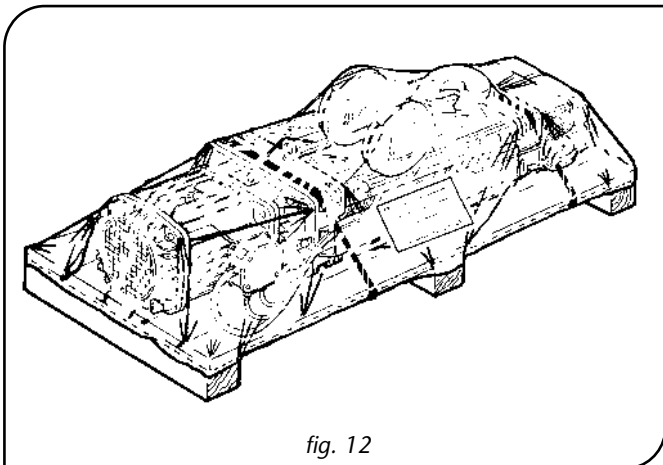
## 4.2 Packing, transportation and handling



*Before handling the DRH hoist it is useful to know that:*

### 4.2.1 Standard packing

- To facilitate the handling and assembling operations, the hoist is generally delivered attached to a pallet (fig. 12), and it is pre-assembled in its main parts. Consequently, packing and specific protection are excluded.
- In some cases the DRH hoist and related trolleys can be contained in a chest or a wooden cage, carrying signs and pictograms which give important information regarding its handling and transportation (fig 13).
- When the DRH hoists are delivered on pallets, they are generally covered by a polyethylene film to protect them from dust.
- Related accessories, being part of the supply, can be delivered inside cardboard boxes which, in relation to the mass to be handled, can be fitted with or without a pallet.
- The standard packing is not rainproof and is intended for overland destinations, not overseas, and for covered and not damp areas
- The items, stored in the right way, can be kept in a warehouse for a period of two years in covered areas in which the temperature is between  $-20^{\circ}\text{C}$  and  $+60^{\circ}\text{C}$  with relative humidity of 80%. For different environmental conditions it is necessary to provide special packing.



*Any special packing, rain-proofed and/or intended for overseas destinations, can be prepared on request.*

### 4.2.2 Transportation

- Transportation should be carried out by qualified haulage contractors able to ensure the correct handling of the transported material.
- During transportation, avoid putting weights on top of the DRH hoist or on other packed items, because they could cause them damage.
- During the transportation phases we recommend that the pallet, or chests / cages containing the hoist and related accessories, are not tilted or overturned to avoid dangerous variations in their centre of gravity and, therefore, to ensure the best stability.



*DONATI SOLLEVAMENTI S.r.l. takes no responsibility in the case of transportation by the client or haulage contractors chosen by the client*

#### 4.2.3 Handling points and handling equipment

- To allow easy and safe handling, in relation to the configuration of supply foreseen, the DRH wire rope hoists and related trolleys are fitted with the following handling points:

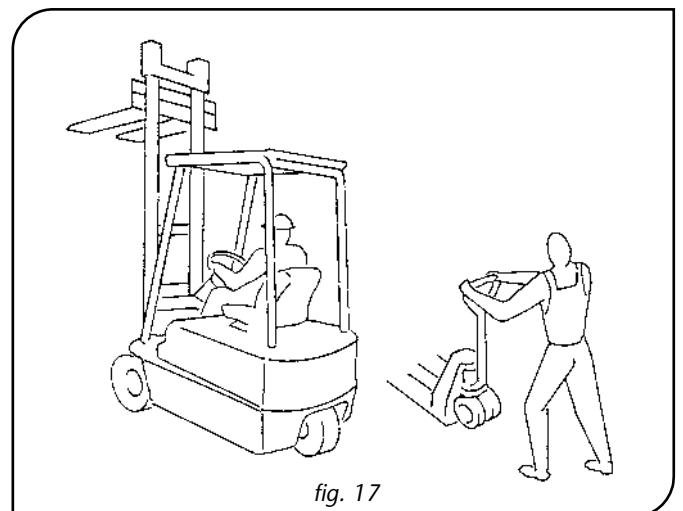
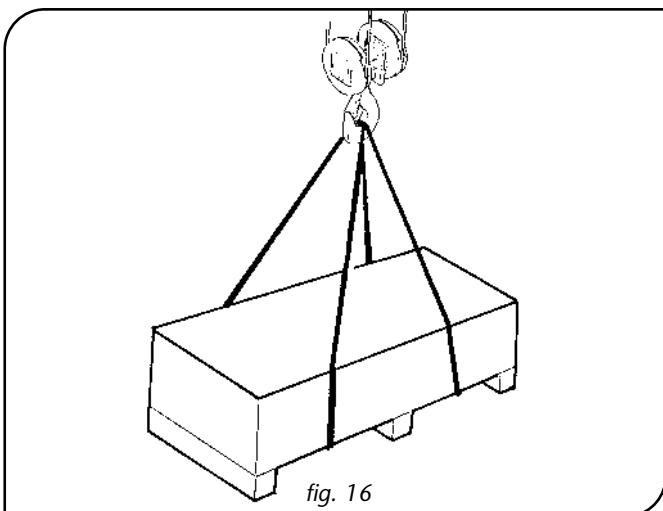
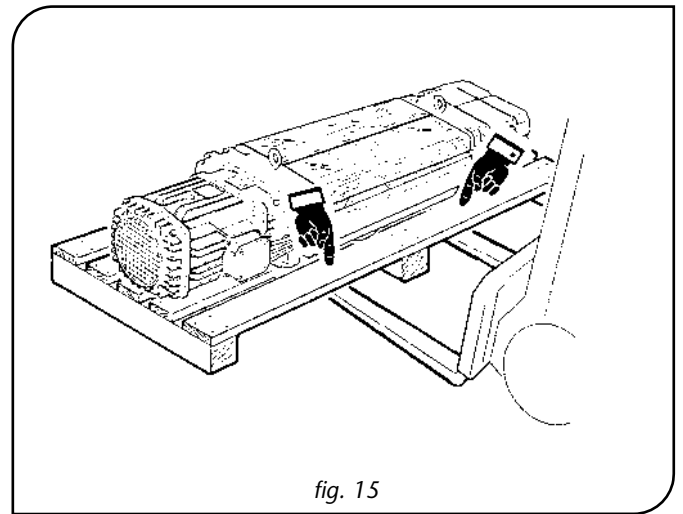
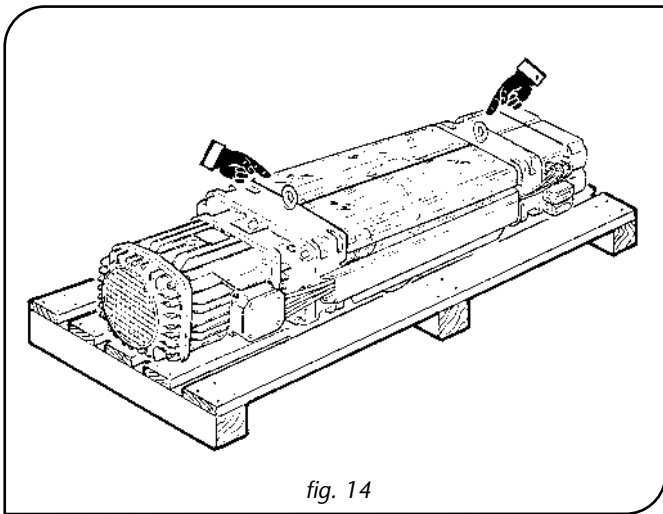
##### (A) DRH hoists in fixed execution or supplied without trolley:

1. The DRH hoist is always fitted with handling eyebolts, located in the upper part of the carrying flanges, which allow handling by a lifting accessory (2 –fall chain or rope sling) fitted with suitable hooks (fig. 14).  
Handling by eyebolts/sling requires the use of a lifting device (overhead travelling crane, jib crane, travelling crane, hoists, etc) chosen according to the weight indicated on the item to be handled.
2. If the hoist is laid down on a pallet the handling of the hoist will be carried out by a forklift truck or transpallet chosen according to the weight to be handled, by inserting the loading forks of the trolley or transpallet in the places designed for the purpose (fig. 15).  
If the hoist has to be removed from the pallet, the eyebolts and lifting apparatus will need to be used as described and illustrated in point (A -1) (fig. 14).
3. If the hoist is inside a chest or cage, the handling of these can be carried out with means, suitable for the purpose chosen according to the load to be handled, and positioned in the points illustrated on the packing.

In particular, according to their typology, these can be used:

- lifting apparatus (crane) and related accessories (slings) - (fig. 16).
- forklift trucks or transpallets (fig. 17).

The extraction of the hoist from the chest or cage should be carried out only by using lifting apparatus / a lifting accessory/ the hoist eyebolts, as described and illustrated in point (A-1) - (fig. 14).



**(B) DRH hoists with DST/N/S and DST/R trolleys:**

1. The DRH hoist is generally assembled with the relevant configuration of a designated DST trolley.  
The trolley/hoist unit is fitted with handling points which, when necessary, allow the handling by a lifting accessory, 4-fall chain or rope sling, provided with suitable hooks (fig. 18).  
Handling by a sling requires the use of lifting apparatus (overhead travelling crane, jib crane, travelling crane, hoists, etc.) chosen according to the weight indicated on the item to be handled.
2. If the trolley/hoist unit is set down on the pallet, the handling of the unit must be carried out with a forklift truck or transpallet chosen according to the weight indicated on the item to be handled, inserting the loading forks of the trolley or of the transpallet in the places designed for the purpose, as described and illustrated in point (A - 2) - (fig. 15).
3. If the trolley/hoist unit is inside a chest or cage, its handling can be carried out as described and illustrated in point (A - 2) - (fig. 16 - 17).  
The extraction of the trolley/hoist unit from the chest or cage must be carried out only by using lifting apparatus/ lifting accessory/ eyebolts of the hoist, as described and illustrated in point (B - 1) - (fig. 18).

**(C) DRH hoists with DRT trolleys:**

1. The DRT hoist is always fitted on the related DRT double girder trolley which is fitted with four eyebolts which allow the handling of the whole trolley/hoist unit, by means of a lifting accessory (4 fall chain or rope sling) provided with suitable hooks (fig. 19).  
Handling by means of a sling requires the use of lifting apparatus (overhead travelling crane, jib crane, travelling crane, hoists, etc.), chosen according to the weight indicated on the item to be handled.
2. If the trolley/hoist unit is set down on a pallet the handling of it should be carried out by a forklift truck or transpallet chosen according to the weight indicated on the item to be handled, inserting the loading forks of the forklift truck or transpallet in the places designed for the purpose, as described and illustrated in point (A-2) - (fig. 15).
3. If the trolley/hoist unit contained inside a chest or cage, the handling of it can be carried out as described and illustrated in point (A - 2) - (fig. 16-17).  
The extraction of the trolley/hoist unit from the chest or cage must be carried out only by using lifting apparatus/ a lifting accessory/eyebolts of the hoist, as described and illustrated in point (C-1) - (fig. 19).



*In every configuration the hoist must be released from its anchorage ties, before it is extracted/removed from the chest or pallet.*

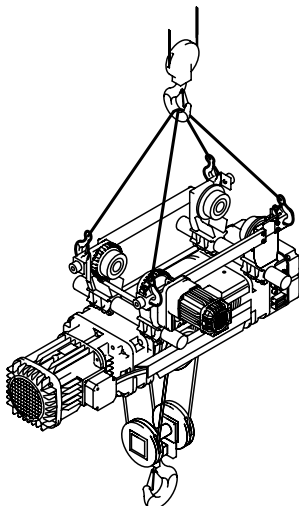


fig. 18

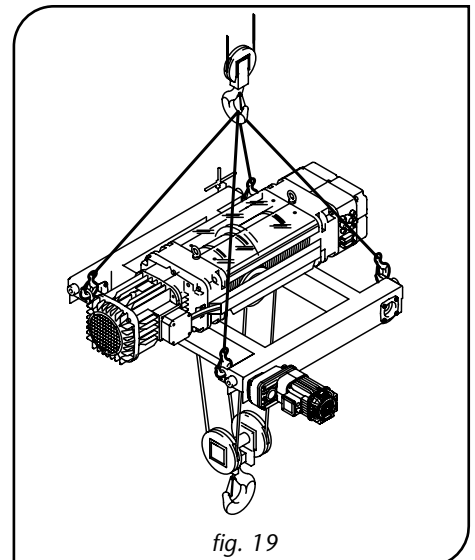
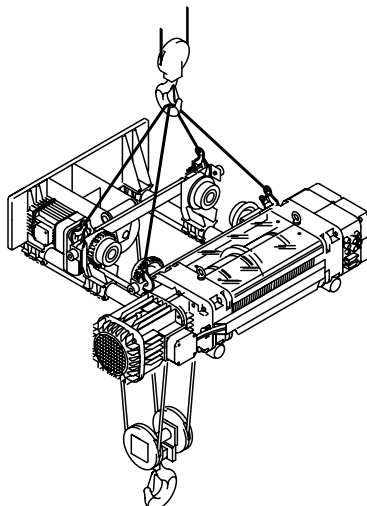


fig. 19

#### 4.2.4 Handling



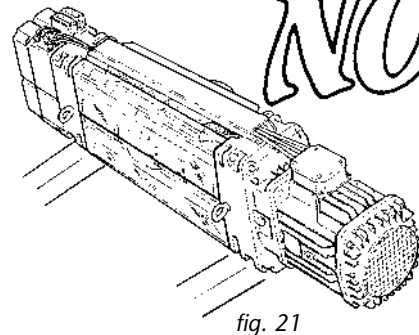
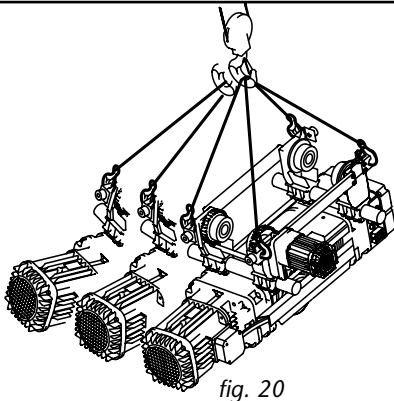
*For the handling of DRH hoist proceed as follows:*



- Allocate a limited, suitable area, with a level floor or surface, for the unloading operations and setting down on the ground of the pallet or of the chest or cage containing the material.
- Considering the typology of the packing and what was described and illustrated in point 4.2.3, allocate the necessary equipment for the unloading and handling of the DRH hoist (or of the trolley/hoist unit) and of any related accessories, taking into account their weight, headroom dimensions and handling and/or suspension elements.
- The use of special equipment is not required.
- Items of any accessories with a weight lower than 30 kg (as opposed to those over 30 kg), do not carry any indication of weight and can be handled by hand
- Carry out handling and move the hoist, or the trolley/hoist very carefully, to the zone allocated for unloading and avoiding oscillations, swinging and dangerous unbalancing (fig. 20).
- After handling, check that the item is in good condition and that there has been no damage.



- *The handling of the hoist, with or without a related trolley, must be carried out with great care and with adequate lifting and transport means so as not to create dangers due to the risk of losing stability.*
- *The hoist and related trolley must be set down or fixed in a stable way in all phases of handling, transport and storage and they must not be tilted or laid down in a vertical position or on one side (fig. 21).*



#### 4.2.5 Removing the packing

- Open the packing and take out the various parts by using suitable equipment according to their weight and handling points (see point 4.2.3).
- Check that all materials making up the supply are intact and that no parts or accessories are missing. Inform the manufacturer as soon as possible of any damage or things missing.
- If storage of the material is required follow the instructions in paragraph 4.6.1 "Storage and conservation of parts".



*If the hoist is fitted with a DST trolley and on a pallet, do not remove the unit from the pallet or related fixing systems as they will be necessary for the following phases of assembly at a height.*



*Dispose of any packing in accordance with regional laws regarding wood, plastic, cardboard by differentiated recycling.*

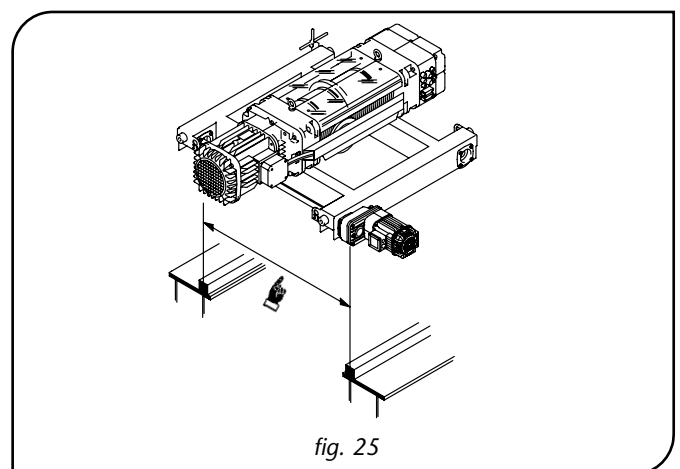
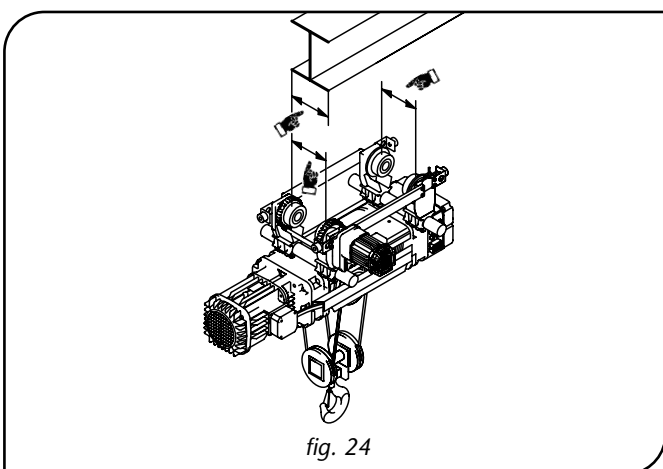
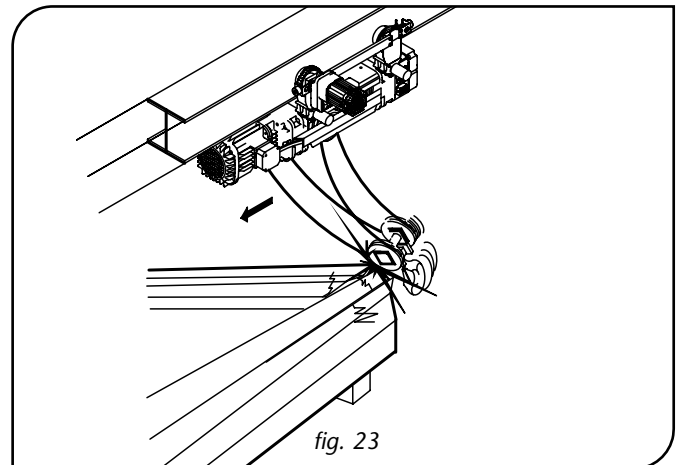
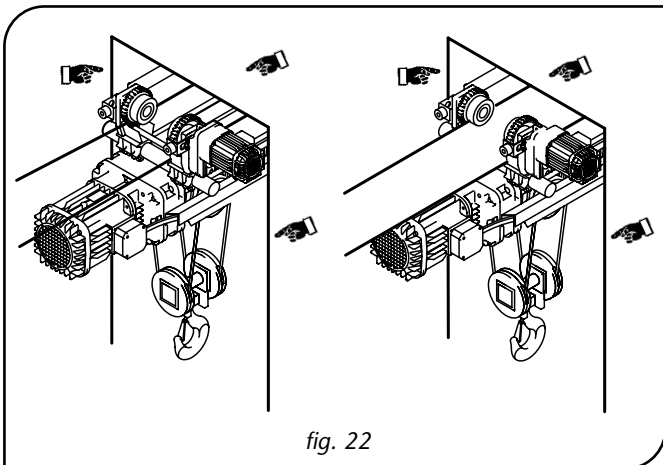
### 4.3 Preparing the place of installation



To allow the installation of the DRH electric wire rope hoist with or without the relative trolley, the following operations must be carried out:



- Check the suitability of the carrying structures on which the hoist is to operate, in relation to the actions and static reactions and dynamics connected with its functioning and use
- Check the installation height and the relative manoeuvre spaces available for the size of the hoist (fig. 22)
- Check that the hook run is adequate for the needs and that it does not meet with obstacles (fig. 23).
- If the hoist is fitted with a DST single girder trolley, check the width of the girder wing which must correspond to that designated for the trolley wheels (fig. 24).
- If the hoist is fitted with a DRT double girder trolley, check the gauge of the tracks of the girders which must correspond to that designated for the trolley wheels (fig. 25).
- Check the suitability and correct functioning of the electric system: power line, power socket and if not part of the supply, control panel, push-button panel.
- Install the relevant signs to indicate the presence of operations with a crane in motion.



It is also necessary to check that:

- the instructions for use manual corresponds to the hoist to be installed.
- the lifting capacity of the hoist is the same as or greater than the loads to be lifted.
- the intensity of the service corresponds to the FEM classification shown on the labels on the hoist.



## 4.4 Installation of the hoist and related trolley

For the installation of the DRH electric wire rope hoist in the various configurations of supply:

- 4.4.1 Hoist, without trolley, designed for set-down or suspended installation
- 4.4.2 Hoist fitted with normal DST/N or DST/S trolley
- 4.4.3 Hoist fitted with reduced dimension DST/R trolley
- 4.4.4 Hoist fitted with double girder DRT trolley

follow the instructions in this chapter and **note that**:



- *When the controls (push-button panel, BT apparatus) are excluded from the supply, the hoist is incomplete.*
- *Any devices for completing the hoist must be installed by and at the client's responsibility, and it is recommended that the relative operations are carried out by a ground hoist or before starting lifting operations with it.*
- *It is forbidden to put into service the hoist before they have been completed to conform with the rules, standards and legislation currently in force.*



*Lifting and installing the hoist at a height must be carried out by qualified, trained staff equipped with:*

- *adequate individual safety measures (e.g. helmet, gloves, safety harness, etc.)*
- *work equipment (e.g. forklift truck, scaffolding etc.) suitable for the purpose*



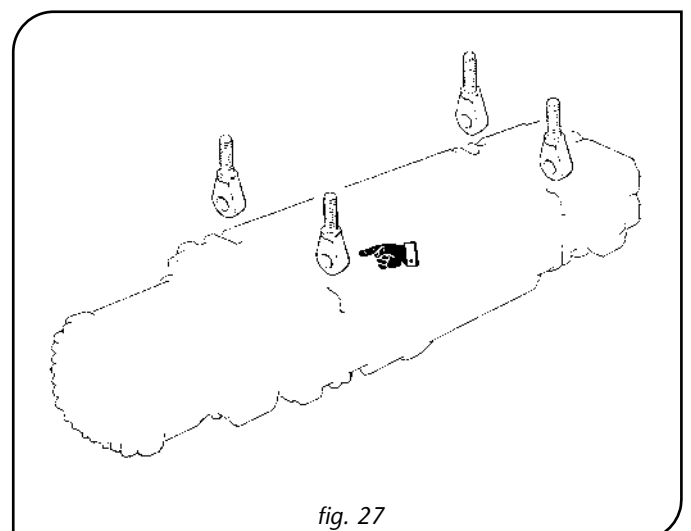
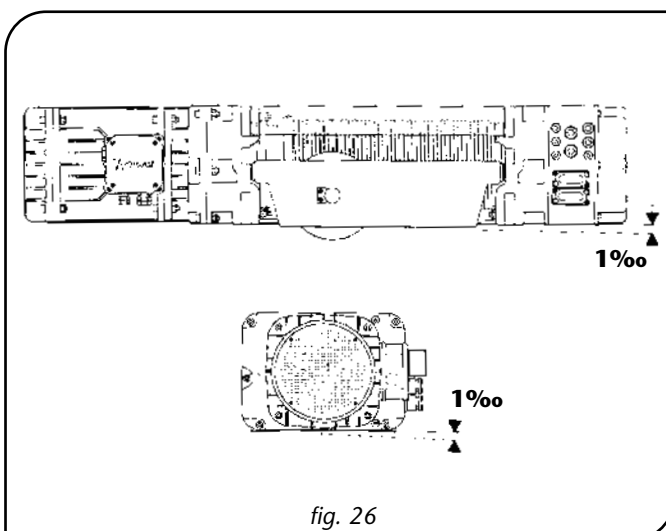
*And following a careful evaluation of the following parameters:*

- *typology of the workplace, its environmental characteristics, type of floor surface*
- *height of the girder in relation to the loading surface and available space*
- *dimensions and weight of the hoist to be installed.*

### 4.4.1 Hoist, without trolley, designed for set-down or suspended installation

The DRH electric wire rope hoists, when they are supplied without a trolley, are designed to be installed with suspension/setting down eyebolts supplied, in the following executions:

- **Set-down execution**, on a surface that allows the fixing of the eyebolts having a **levelness allowance between the points resting on the surface = of  $\pm 1\text{‰}$**  (fig. 26).
- **Suspended execution**, connecting the eyebolts in the upper parts of the hoist (fig. 27).



If the DRH electric wire rope hoist must be installed in set-down execution, the setting down of the hoist, in fixed position or on a trolley not supplied by DONATI, is foreseen with four eyebolts connected in the lower part of the carrying casing.



The fixing of the hoist must be carried out with threaded spigot eyebolts (part of the usual supply series and available in a separate kit), ready to be connected by means of the pivots located in the lower part of the carrying casing of the hoist

The assembling of the eyebolts must be carried out according to the following procedure:



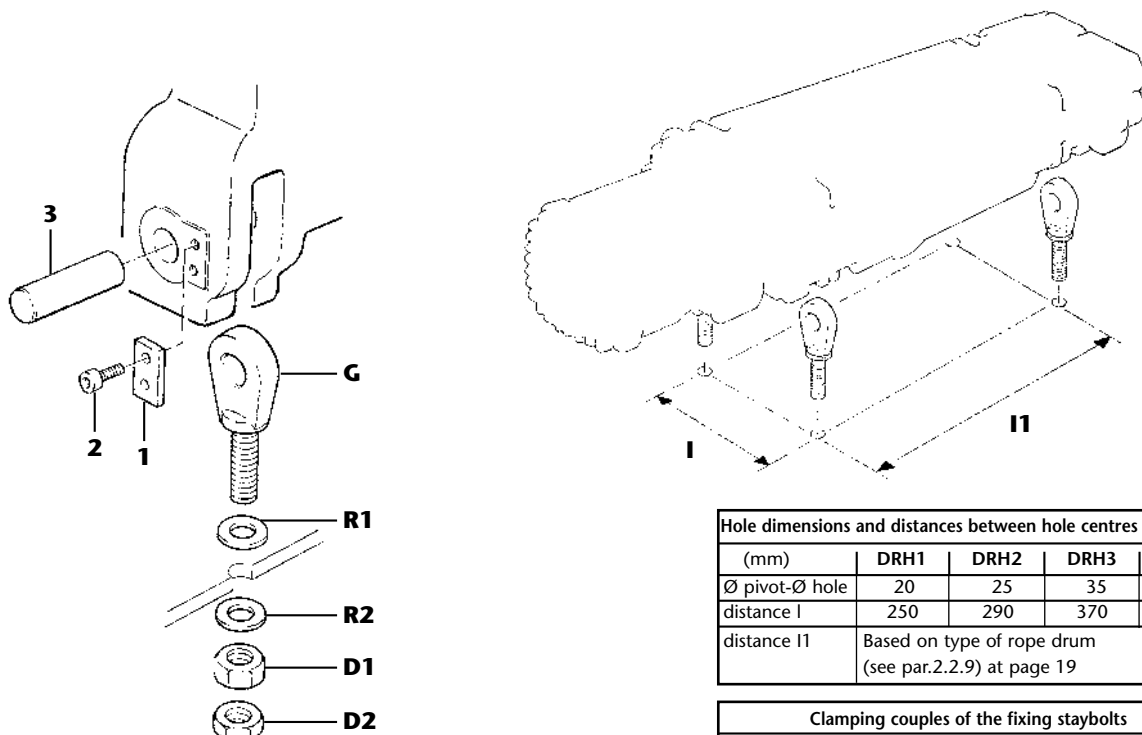
The assembly of the threaded spigot eyebolts in the lower part of the carrying casing of the DRH hoist (fig. 28):



1. Operating in the lower zone of the load-bearing flanges, first on one side and then the other, remove the fixing plates -1-, by unscrewing the screws -2-.
2. Extract the pivots -3- from the respective slots.
3. Insert the eyes of the eyebolts -G- in the lower parts of the load-bearing flanges of the DRH hoist.
4. Reconnect the pivots -3- in the respective slots, ensuring that they pass through the eye of the eyebolt -G-.
5. Position the fixing plates -1- and secure them with the related screws -2-.
6. Check that the eyebolts are not forced into place.

The fixing of the hoist to a supporting surface involves inserting the threaded spigots in their respective holes, the dimensions and wheel base of which must correspond to the heights shown in the table (fig. 28) respecting the following procedure:

- Before inserting the threaded spigots of the eyebolts in their respective holes, interpose the washers -R1-.
- Once the spigots are inserted in their respective holes and the hoist is set down, insert the washer -R2-, screw tight the wide nut -D1- and, finally, having tightened it by applying the couples shown in the table (fig. 28), screw tight the medium- sized safety lock nut -D2-.



| Hole dimensions and distances between hole centres for fixing |  |      |      |      |
|---|--|------|------|------|
| (mm)  | DRH1   | DRH2 | DRH3 | DRH4 |
| Ø pivot-Ø hole  | 20   | 25   | 35   | 45   |
| distance I  | 250  | 290  | 370  | 460  |
| distance I1   | Based on type of rope drum<br>(see par.2.2.9) at page 19 |      |      |      |

| Clamping couples of the fixing staybolts |        |        |         |
|--|--------|--------|---------|
| DRH1                                     | DRH2   | DRH3   | DRH4    |
| M 16                                     | M 20   | M 24   | M 30    |
| Nm 225                                   | Nm 439 | Nm 759 | Nm 1508 |

fig. 28

If the DRH electric wire rope hoist must be suspended, in fixed position or on a trolley **not** supplied by DONATI, the suspension of the hoist can be carried out by using the eyebolts which must be connected in the respective slots situated in the upper part of the hoist.

The pivots, which are part of the supply, are positioned, in the lower part of the hoist, so their removal and their movement in the upper zone must be carried out according to the following operating procedure:



*Removal of the pivots from the lower zone and their assembly in the upper zone to allow the suspension of the hoist (fig. 29):*



1. Remove the protection canopy -1- by unscrewing the relative fixing screws -2-
2. Remove the limit switch cover -3- with the screws -4-, until you free completely the suspension holes -5- in which the relative fixing/suspension pivots are connected -6-.
3. Operating in the lower zone of the carrying casing, first on one side and then the other, remove the fixing plates -7-, by unscrewing the screws -8-.
4. Extract the fixing/suspension pivots -6- from the respective lower holes of the carrying casing.
5. Connect the pivots -6- in the respective suspension holes -5- taking care to insert the eye of the eyebolt in the suspension space -G-, which must be passed through by the pivot -6-.
6. Position the fixing plates -7- and secure them with the relative screws -8-.
7. Put back the limit switch cover -3- taking care not to alter any calibrations/limit switch settings. Fix the cover with the screws -4- tightening them completely and carefully.
8. Put back the protection canopy -1- and fix it with the screws -2-.
9. Before inserting the threaded spigots of the eyebolts in the respective holes, interpose the washers -R1-.
10. Once the spigots are inserted in the holes and the hoist is set down, insert the washer -R2-, screw tight the wide nut -D1- and finally, having tightened it by applying the couples shown in the table (fig. 28), screw tight the medium-sized safety lock nut -D2-.

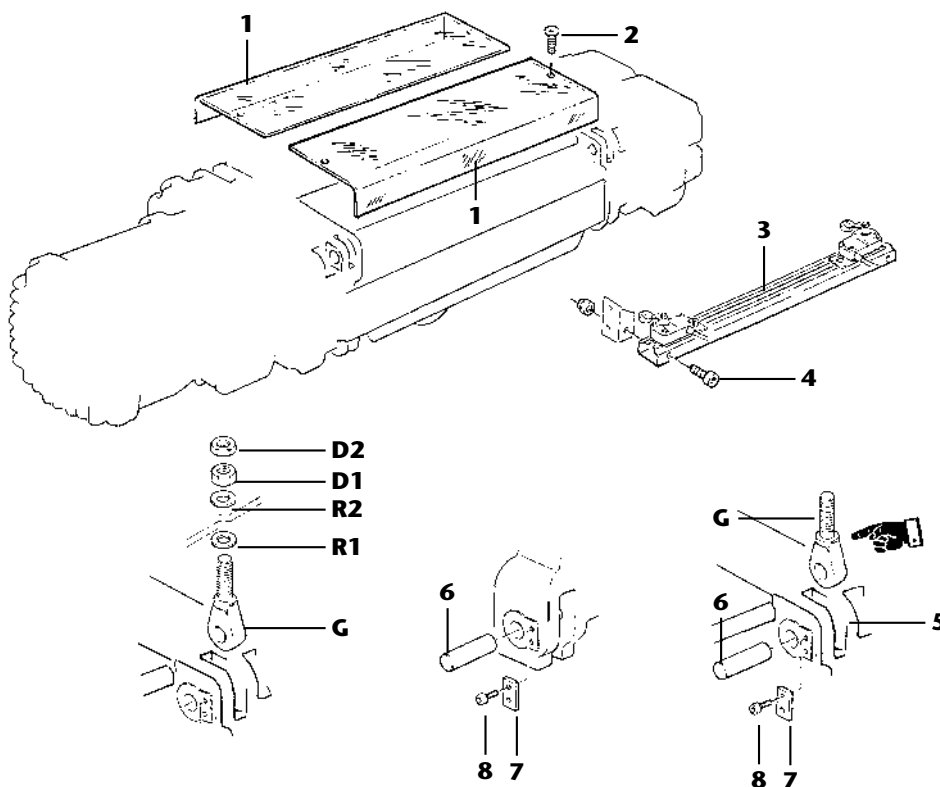




fig. 29


4.4.2 Hoist fitted with normal DST/N or DST/S trolley

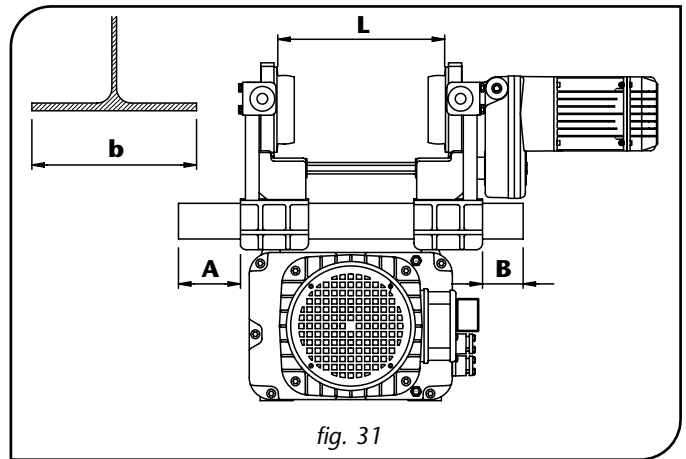
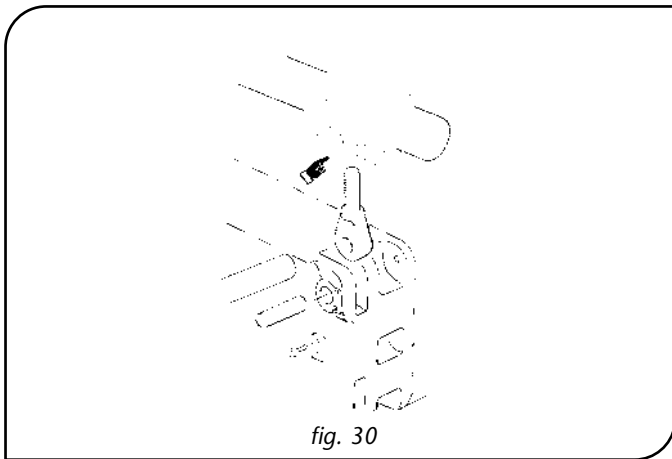


- Generally the DST/N trolleys and always the DST/S trolleys, are delivered pre-assembled on the respective DRH hoist with an internal space between the wheels (L) already set for the girder on which the trolley/hoist, according to the contractual agreements, is to be installed.
- To allow the possibility of modifying the internal space of the wheels for different and/or successive settings, the relative heights of reference (A) and (B) for DST/N trolleys are shown below for the different girders.
- The correct clamping of the trolley brackets on the bars is ensured by at least two bolts. The third bolt cannot be installed in some cases because of interference with the suspension of the hoist (fig. 30).



Before proceeding to the installation at a height, check the setting of the internal space (L) of the trolley wheels according to the width (b) of the sliding girder wing as for the heights shown in the table (fig. 31).





| Heights (A) and (B) of the DST/N trolleys in relation to the type and width of the beam wing |     |            |                       |                                  |                             |                            |                            |                            |                            |                            |                            |                            |                            |         |    |      |     |         |     |
|--|-----|------------|-----------------------|----------------------------------|-----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|---------|----|------|-----|---------|-----|
| Type of beam   |     |            | beam wing (b)<br>(mm) | inner wheel (L)<br>-0 +1<br>(mm) | wheel clearance (X)<br>(mm) | DST/N 1                    |                            |                            |                            | DST/N 2                    |                            |                            |                            | DST/N 3 |    |      |     | DST/N 4 |     |
| INP  | IPE | HEA<br>HEB |                       |                                  |                             | 2 fall DRH1<br>Height (mm) | 4 fall DRH1<br>Height (mm) | 2 fall DRH2<br>Height (mm) | 4 fall DRH2<br>Height (mm) | 2 fall DRH3<br>Height (mm) | 4 fall DRH3<br>Height (mm) | 2 fall DRH4<br>Height (mm) | 4 fall DRH4<br>Height (mm) |         |    |      |     |         |     |
|  |     |            | A                     | B                                | A                           | B                          | A                          | B                          | A                          | B                          | A                          | B                          | A                          | B       | A  | B    | A   | B       |     |
| 200  |     |            | 90                    | 94                               | 2                           | 158                        | 102                        | 145                        | 115                        | 160                        | 100                        |                            |                            |         |    |      |     |         |     |
|  | 180 |            | 91                    | 95                               | 2                           | 157                        | 101                        | 144                        | 114                        | 159                        | 99                         |                            |                            |         |    |      |     |         |     |
| 220  |     |            | 98                    | 102                              | 2                           | 154                        | 98                         | 141                        | 111                        | 156                        | 96                         |                            |                            |         |    |      |     |         |     |
|  | 200 |            | 100                   | 104                              | 2                           | 153                        | 97                         | 140                        | 110                        | 155                        | 95                         |                            |                            |         |    |      |     |         |     |
| 240  |     |            | 106                   | 110                              | 2                           | 150                        | 94                         | 137                        | 107                        | 152                        | 92                         |                            |                            |         |    |      |     |         |     |
|  | 220 |            | 110                   | 114                              | 2                           | 148                        | 92                         | 135                        | 105                        | 150                        | 90                         |                            |                            |         |    |      |     |         |     |
| 260  |     |            | 113                   | 117                              | 2                           | 146                        | 90                         | 133                        | 103                        | 148                        | 88                         |                            |                            |         |    |      |     |         |     |
| 280  |     |            | 119                   | 123                              | 2                           | 143                        | 87                         | 130                        | 100                        | 145                        | 85                         | 125                        | 85                         | 165     | 85 |      |     |         |     |
|  | 240 |            | 120                   | 124                              | 2                           | 143                        | 87                         | 130                        | 100                        | 145                        | 85                         | 125                        | 85                         | 165     | 85 |      |     |         |     |
| 300  |     |            | 125                   | 129                              | 2                           | 141                        | 84                         | 128                        | 97                         | 143                        | 82                         | 123                        | 82                         | 163     | 82 |      |     |         |     |
| 320  |     |            | 131                   | 135                              | 2                           | 138                        | 82                         | 125                        | 95                         | 140                        | 80                         | 120                        | 80                         | 160     | 80 |      |     |         |     |
|  | 270 |            | 135                   | 139                              | 2                           | 136                        | 79                         | 123                        | 92                         | 138                        | 77                         | 118                        | 77                         | 158     | 77 | 126  | 79  | 168     | 77  |
| 340  |     |            | 137                   | 141                              | 2                           | 135                        | 78                         | 122                        | 91                         | 137                        | 76                         | 117                        | 76                         | 157     | 76 | 125  | 78  | 167     | 76  |
|  |     | 140        | 140                   | 144                              | 2                           | 133                        | 77                         | 120                        | 90                         | 135                        | 75                         | 115                        | 75                         | 155     | 75 | 123  | 77  | 165     | 75  |
| 360  |     |            | 143                   | 147                              | 2                           | 132                        | 76                         | 119                        | 89                         | 134                        | 74                         | 114                        | 74                         | 154     | 74 | 122  | 76  | 164     | 74  |
| 380  |     |            | 149                   | 153                              | 2                           | 128                        | 72                         | 115                        | 85                         | 130                        | 70                         | 110                        | 70                         | 150     | 70 | 118  | 72  | 160     | 70  |
|  | 300 |            | 150                   | 154                              | 2                           | 128                        | 72                         | 115                        | 85                         | 130                        | 70                         | 110                        | 70                         | 150     | 70 | 118  | 72  | 160     | 70  |
| 400  |     |            | 155                   | 159                              | 2                           | 125                        | 69                         | 112                        | 82                         | 127                        | 67                         | 107                        | 67                         | 147     | 67 | 115  | 69  | 157     | 67  |
|  | 330 |            | 160                   | 164                              | 2                           | 123                        | 67                         | 110                        | 80                         | 125                        | 65                         | 105                        | 65                         | 145     | 65 | 113  | 67  | 155     | 65  |
|  | 360 |            | 170                   | 174                              | 2                           | 118                        | 62                         | 105                        | 75                         | 120                        | 60                         | 100                        | 60                         | 140     | 60 | 108  | 62  | 150     | 60  |
|  | 400 | 180        | 180                   | 184                              | 2                           | 113                        | 57                         | 100                        | 70                         | 115                        | 55                         | 95                         | 55                         | 135     | 55 | 103* | 57* | 145*    | 55* |
|  | 450 |            | 190                   | 194                              | 2                           | 108                        | 52                         | 95                         | 65                         | 110                        | 50                         | 90                         | 50                         | 130     | 50 | 98   | 52  | 140     | 50  |
|  | 500 | 200        | 200                   | 204                              | 2                           | 103                        | 47                         | 90                         | 60                         | 105                        | 45                         | 85                         | 45                         | 125     | 45 | 93*  | 47* | 135*    | 45* |
|  | 550 |            | 210                   | 214                              | 2                           | 98                         | 42                         | 85                         | 55                         | 100                        | 40                         | 80                         | 40                         | 120     | 40 | 88   | 42  | 130     | 40  |
|  | 600 | 220        | 220                   | 224                              | 2                           | 93                         | 37                         | 80                         | 50                         | 95                         | 35                         | 75                         | 35                         | 115     | 35 | 83*  | 37* | 125*    | 35* |
|  |     | 240        | 240                   | 244                              | 2                           | 83                         | 27                         | 70                         | 40                         | 85                         | 25                         | 65                         | 25                         | 105     | 25 | 73*  | 27* | 115*    | 25* |
|  |     | 260        | 260                   | 264                              | 2                           | 73                         | 17                         | 60                         | 30                         | 75                         | 15                         | 55                         | 15                         | 95      | 15 | 63*  | 17* | 105*    | 15* |
|  |     | 280        | 280                   | 284                              | 2                           | 63                         | 7                          | 50                         | 20                         | 65                         | 5                          | 45                         | 5                          | 85      | 5  | 53   | 7   | 95      | 5   |
|  |     | 300**      | 300                   | 304                              | 2                           | 54                         | -2                         | 41                         | 11                         | 55                         | -3                         | 32                         | -4                         | 73      | -5 | 44   | -2  | 86      | -4  |
|  |     |            | 350                   | 354                              | 2                           | 88                         | 32                         | 75                         | 45                         | 90                         | 30                         | 70                         | 30                         | 110     | 30 | 78   | 32  | 120     | 30  |
|  |     |            | 400                   | 404                              | 2                           | 63                         | 7                          | 50                         | 20                         | 65                         | 5                          | 45                         | 5                          | 85      | 5  | 53   | 7   | 95      | 5   |

(\*) Not valid for HEA - HEB

(\*\*) The width (b) of the beams HEA and HEB is never > 300 mm.

The max. admissible beams are: DST/N 1 = HEA 400 - HEB 300; DST/N 2 = HEA 500 - HEB 360; DST/N 3 = HEA 900 - HEB 600; DST/N 4 = HEA 1000 - HEB 900



*For the installation at a height, proceed in the following way:*

**NOTE:** *This operation must be done jointly by at least 2 operators qualified at least to the level shown on the right.*

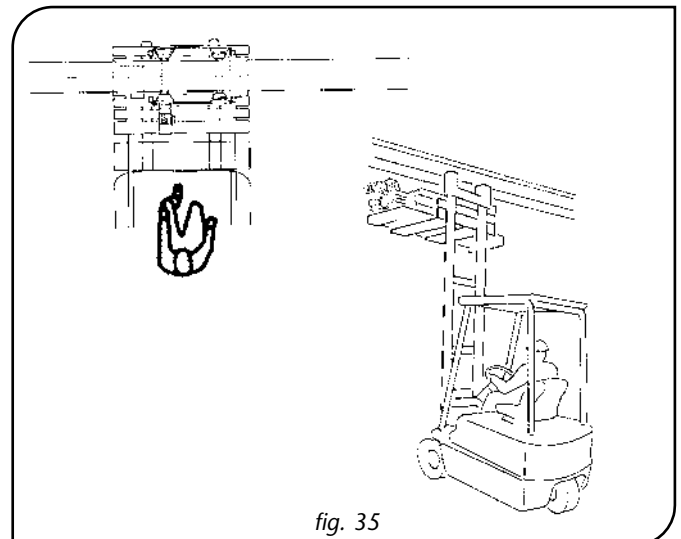
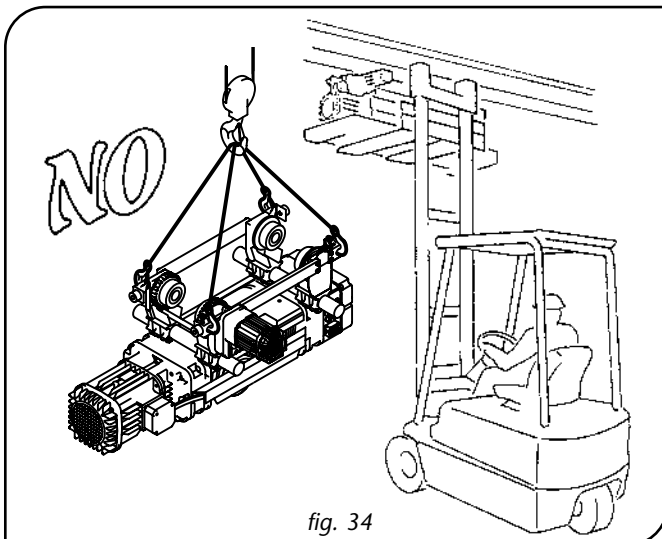
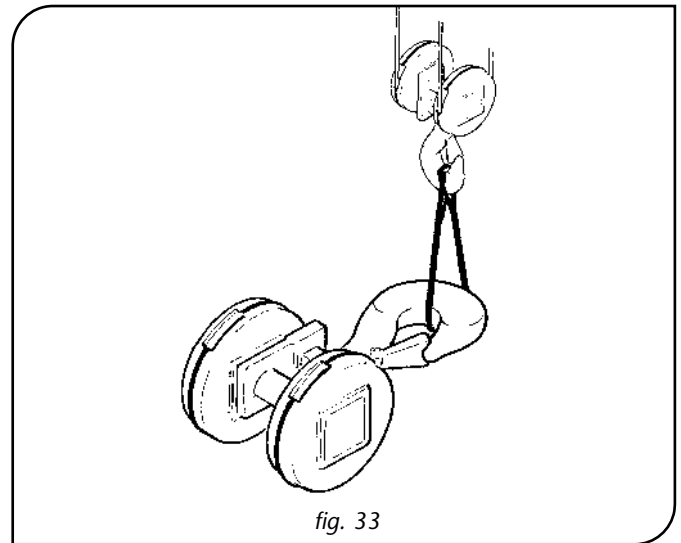
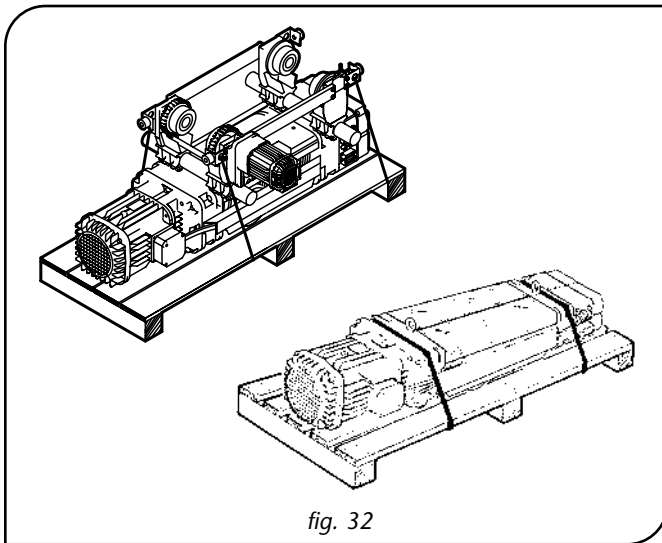


1. Where necessary, fit the hoist/trolley with any missing devices (controls). If the hoist/trolley has not been previously placed on the pallet, position it on the pallet and tie it firmly to ensure maximum stability (fig. 32).
2. Remove and dispose of any protective packing in accordance with the legislative measures currently in force.
3. Release the hook block from the fastenings, if not already installed on the hoist, and position it on the floor, taking care to lift it with suitable means when its weight is over 30 kg (the weight, when necessary, is indicated on the item). Always use the hook as a point of harnessing or handling in the case of manual handling (fig. 33)



*The installation on the girder at a height of the hoist/trolley unit positioned on a pallet must be carried out **SOLELY** by **ELEVATING** it with the help of a forklift truck, or a raisable platform or of other means suitable for the purpose and **NEVER BY LIFTING**, because the slings would make the assembling on the girder difficult or dangerous (fig. 34).*

4. Carry out the picking up and handling of the pallet with a forklift truck or other suitable means, positioning the pallet in such a way that the vertical axis of the girder is perpendicular to that of the hoist and the horizontal axes of both are parallel (fig. 35).

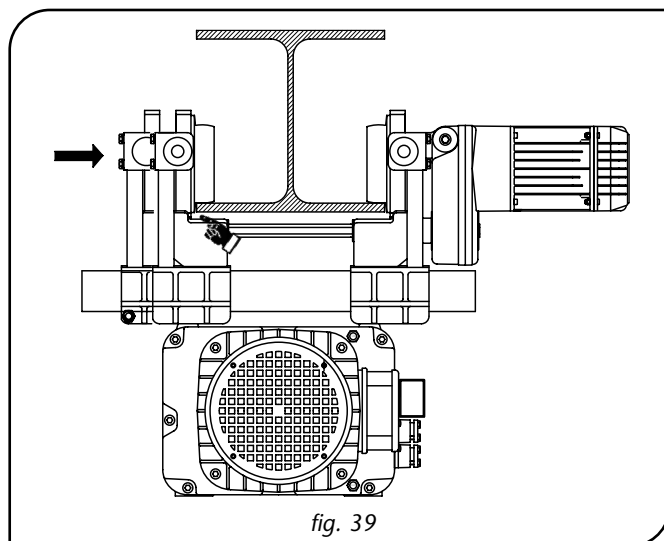
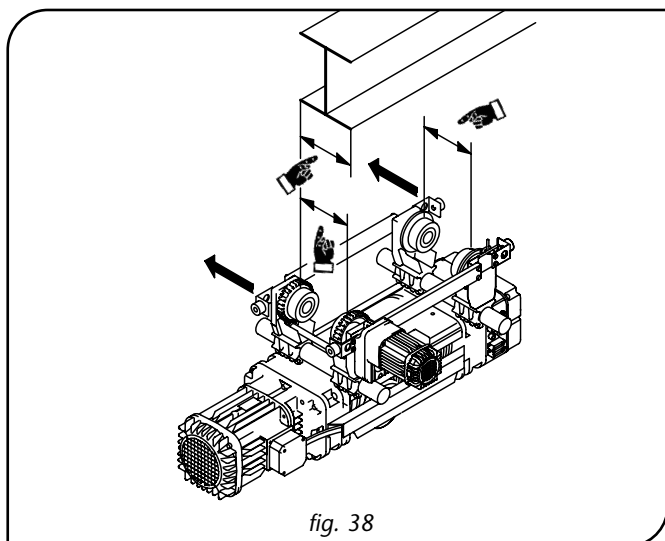
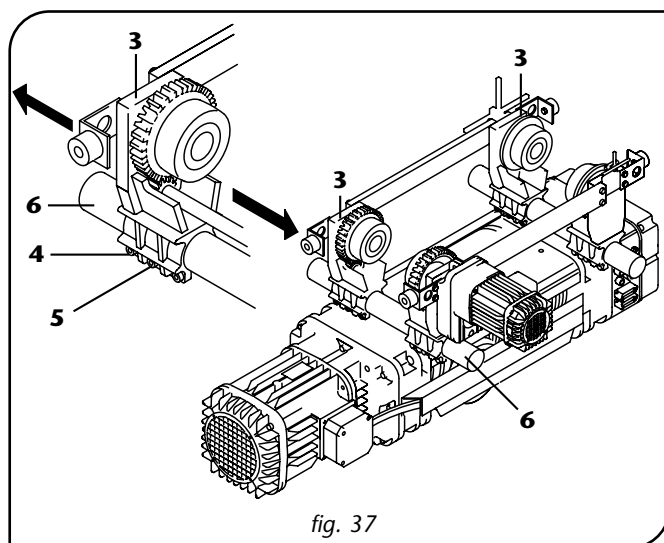
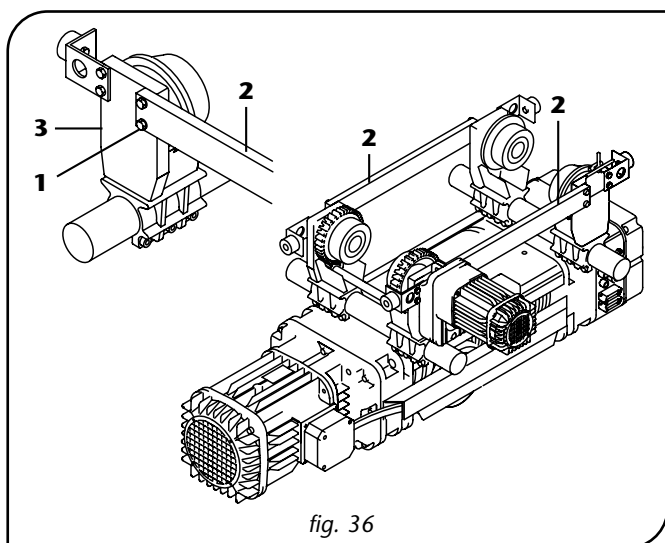


5. For DST/N trolleys, loosen, without unscrewing them completely, the fixing screws -1- of the horizontal plates -2- of the vertical plates -3- opposite the motoreducer side, so that they are not rigidly constrained together (fig. 36).
6. Loosen, without unscrewing them completely, the self-blocking nuts -4- of the brackets -5- which fix the plates -3- to the bars -6-, so that the plates can slide freely on the bars (fig. 37).
7. Let both plates slide -3- on the bars -6- so as to widen the preset width of the wheels, until the internal space between the wheels is greater than that of the girder wing (fig. 38).



*Operate SOLELY on the plates opposite the motoreducer unit side and NEVER REMOVE the plates on the motoreducer side (only for DST/N trolleys).*

8. Using a mobile scaffold or raisable platform, an operator reaches the installation height of the girder, while the other operator lifts the pallet, slowly and without oscillating the load, until reaching the lower edge of the sliding girder of the trolley (fig. 35).
9. The operator at a height, from the scaffold gives instructions to the forklift truck operator to:
  - lift the pallet slowly and levelly until the trolley/hoist is inserted in the girder, so that the lower edge of the wheels exceeds the height of the sliding track of the girder
  - go forward with the forklift truck a few centimetres to draw the edges of the wheels of the **unremoved plates** to be level with the edge of the girder (In the DST/N trolleys those on the motoreducer side).
10. Operating from the scaffold at a height, let the previously removed plates slide on the bars, until the edges of the wheels are level with the edge of the girder (fig. 39).
11. Lower the loading forks of the forklift truck, until the trolley wheels are resting on the girder wing.



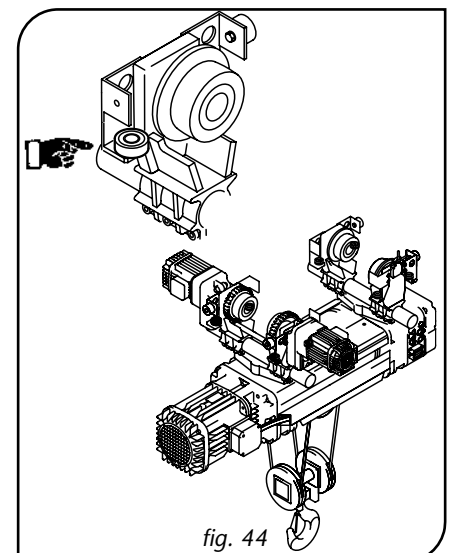
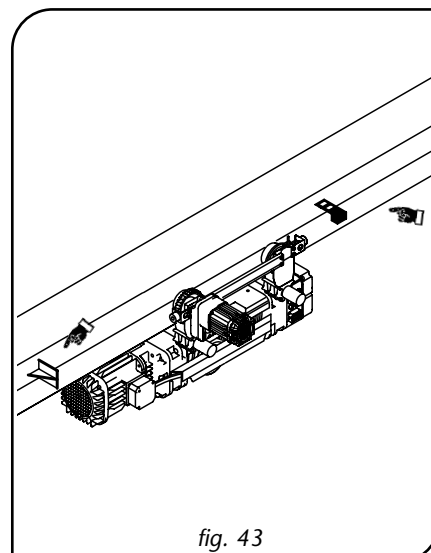
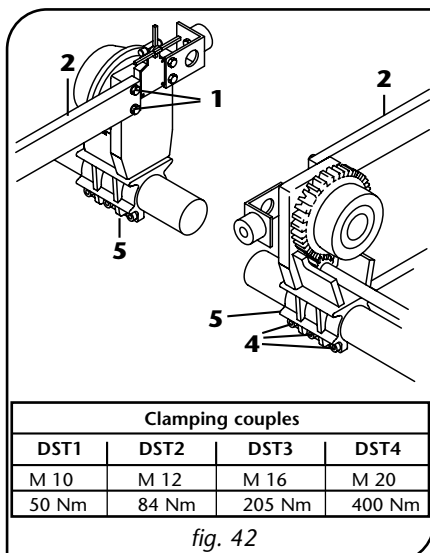
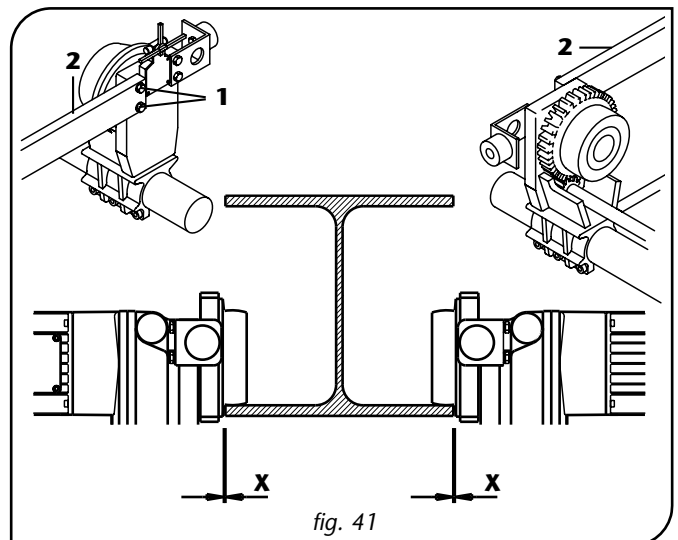
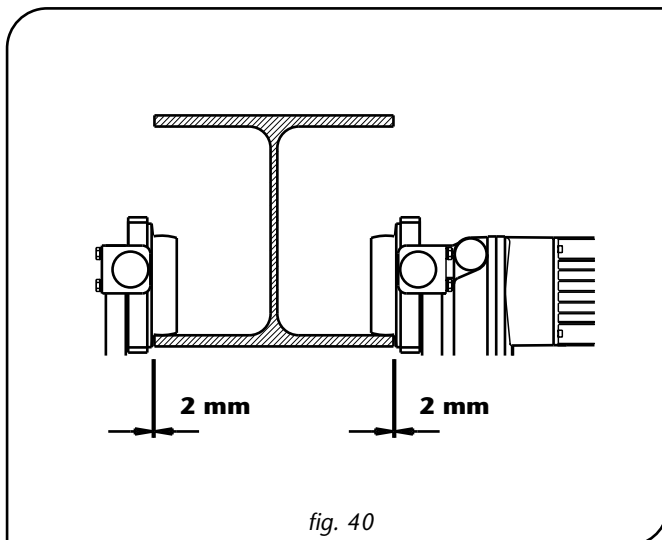
12. Check that all four sliding tracks of the trolley wheels are resting correctly on the girder and that between their edge and the wing of the section bar there is a clearance of 2 mm max. on either side (fig 40).
13. For the DST/S trolleys remove the connection plates -2- by unscrewing the screws -1- (the plates must be stored for any subsequent reinstallation or maintenance). Check that there is a "X" clearance of 3/5mm max on either side between the wheel edges and the girder wing in the rectilinear part (fig. 41).
14. Release the trolley/hoist from its fastenings and bring the pallet to the ground with the forklift truck.
15. Tighten the fixing screws -1- of the connecting plates -2- (only for DST/N trolleys).
16. Tighten the self-blocking nuts -4- of the brackets -5- applying the clamping couples shown in the table with a dynamometric spanner (fig. 42).
17. Operating from the scaffold, at a height, position at the ends of the sliding girder: (fig 43).

- the actuators for the electric limit switches of the trolley so as to determine the required run.
- the mechanical limit switches acting on the rubber buffers of the trolley, which must enable the trolley run to stop safely in the case of the electric limit switches failing to work.

18. For DST/S articulated trolleys, having carried out the electrical connections described in paragraph 4.4.5, position and set the eccentric supports on the curvilinear stretch so that the guide rollers are in contact with the edge of the girder (fig 44).

19. The setting of the rollers takes place in the following way:

- 1) Loosen the nut and the locknut
- 2) Using a spanner for M12 hexagonal-head screws regulate the eccentric until the roller is resting on the girder wing.
- 3) Tighten the nut and the locknut.



#### 4.4.3 Hoist fitted with reduced dimension DST/R trolleys



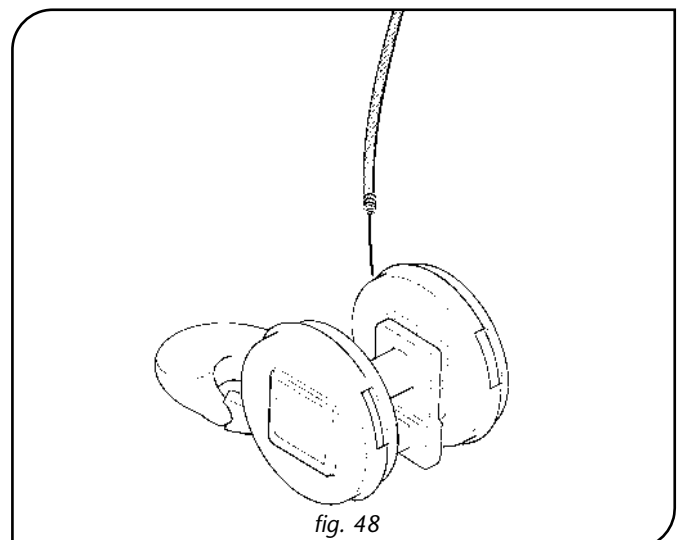
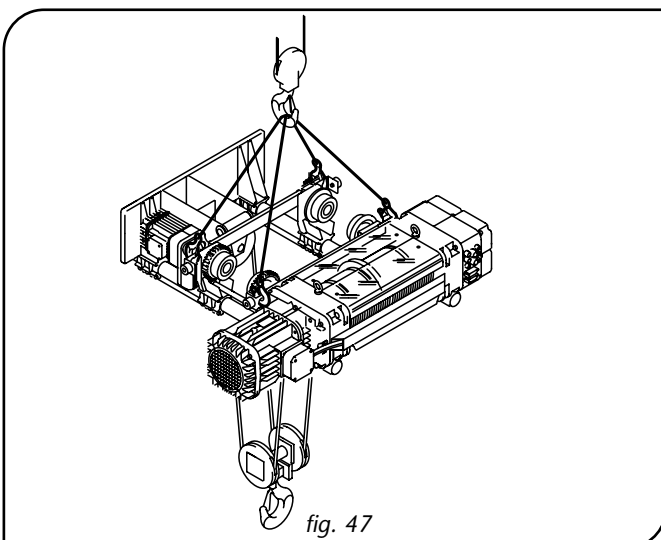
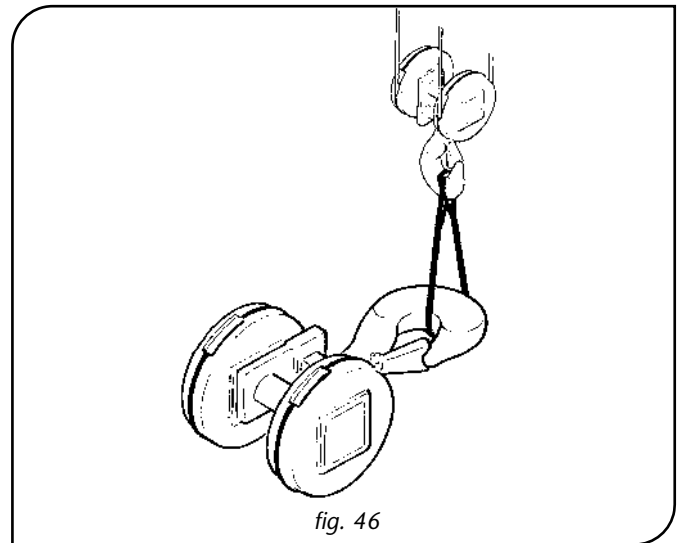
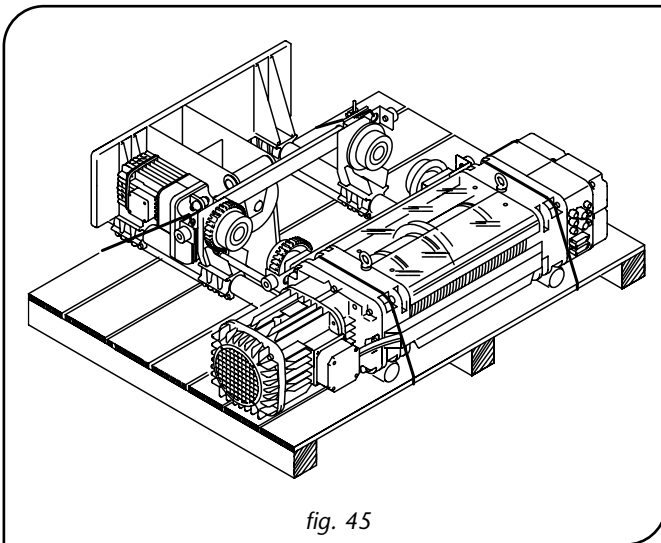
Generally DST/R trolleys are delivered with the respective DRH already preinstalled.



For installation at a height proceed in the following way:  
**NOTE:** This operation must be performed jointly by at least two operators who have a qualification not less than the one shown on the right.



1. Where necessary, fit the hoist/trolley with any missing devices (controls). If the hoist/trolley has not been previously placed on the pallet, position it on the pallet and tie it firmly to ensure maximum stability (fig. 45).
2. Remove and dispose of any protective packing in accordance with the legislative measures currently in force.
3. Release the hook block from its fastenings, where it is a separate item and not already installed on the hoist, position it on the ground, taking care to lift it with suitable means when its weight is over 30 kg (the weight, when necessary, is indicated on the item). Always use the hook as a point of harnessing or handling in the case of manual handling (fig. 46).
4. If the hook block is already installed on the hoist, arrange its fitting in the following way:
  - release the trolley/hoist from the fastenings which tie it to the pallet, harness it at the points shown (fig. 47) and lift it about 1 m.
  - install the hook block (fig. 48) as described in point 4.5.2 (fig. 82-83).
  - put the hoist back on the pallet and again attach its safety fastening.





The installation on the girder at a height of the hoist/trolley unit positioned on a pallet must be carried out **SOLELY** by **ELEVATING** it with the help of a forklift truck, or a raisable platform or of other means suitable for the purpose and **NEVER BY LIFTING**, because the slings would make the assembling on the girder difficult or dangerous (fig. 34).

5. Carry out the picking up and handling of the pallet using a forklift truck or other suitable means, positioning the pallet in such a way that the vertical axis of the girder is perpendicular to that of the hoist and the horizontal axes of both are parallel (fig. 49).
6. Loosen, without unscrewing them completely, the fixing screws -1- of the horizontal plates -2- of the vertical plates on the balance weight side -3- until they are not rigidly constrained together, as well as the self-blocking nuts -4- of the brackets -5- which fix the plates -3- on the balance weight side of the bars -6- (fig. 50).
7. In order to make the plates -3- on the balance weight side slide freely on the bars -6- remove from the brackets -5- the spacers -7-, by unscrewing the nuts completely -4- and taking out the screws -8- (fig. 51).
8. Let both plates slide -3- on the bars -6- so as to widen the preset width of the wheels, until the internal space between the wheels is greater than that of the girder wing (fig. 52).

NOTE: In fig. 52 you can see where add the ballast as described in step 17 to pag. 57.



Operate **SOLELY** on the plates on the balance weight side and **NEVER REMOVE** either the plates on the hoist side or the balance weight itself.

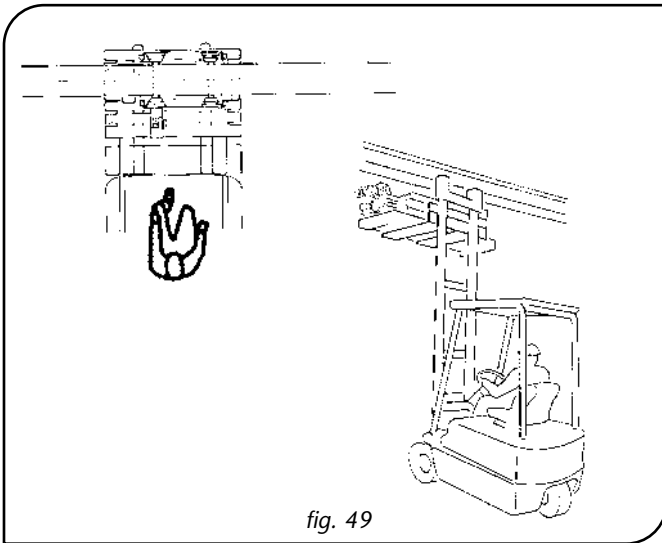


fig. 49

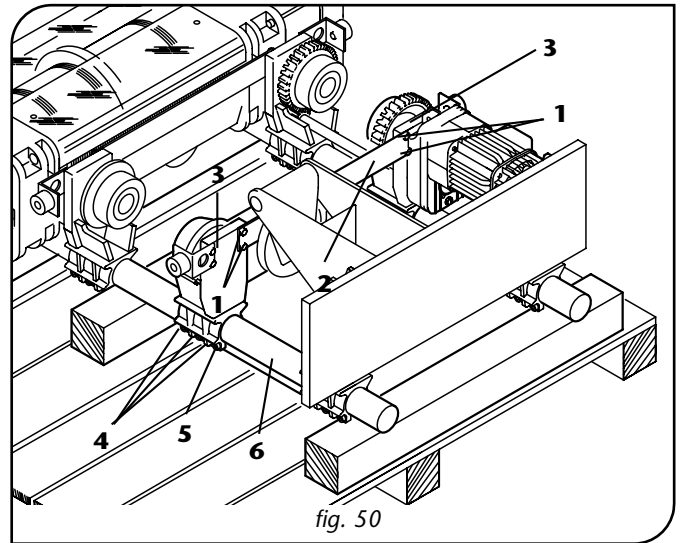


fig. 50

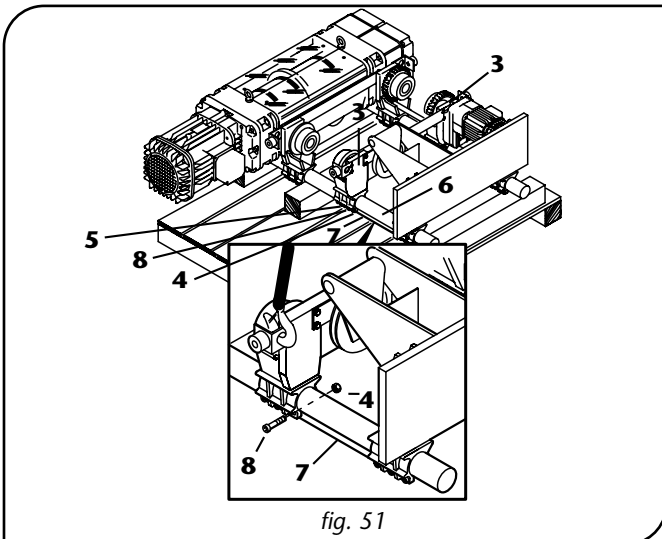


fig. 51

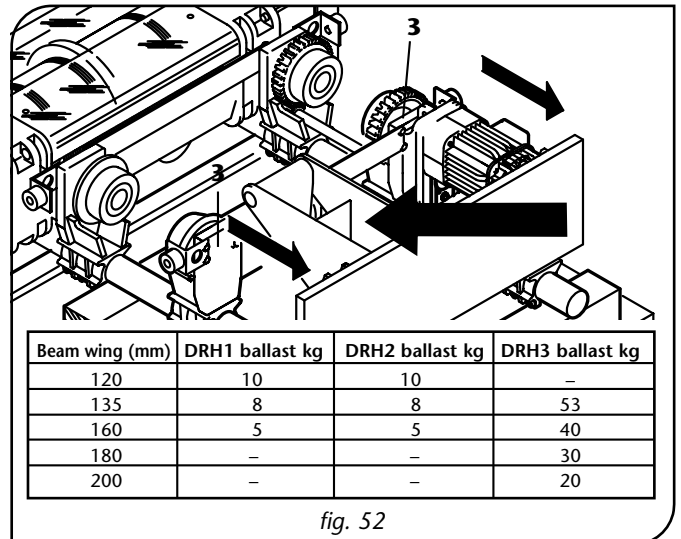


fig. 52

9. Using a mobile scaffold or raisable platform, an operator reaches the installation height of the girder, while the other operator lifts the pallet, slowly and without oscillating the load, to draw level with the lower edge of the sliding girder of the trolley.
10. The operator at a height, from the scaffold, gives instructions to the forklift truck operator to:
  - lift the pallet slowly and levelly until the trolley/hoist is inserted in the girder, so that the lower edge of the wheels exceeds the height of the sliding track of the girder.
  - go forward with the forklift truck a few centimetres to draw the edges of the wheels of the **plates on the hoist side level** to the edge of the girder.
11. Operating from the scaffold at a height, let the **plates on the balance weight side** slide on the bars to draw the edges of the wheels level to the edge of the girder (fig. 53).
12. Lower the loading forks of the forklift truck, until the trolley wheels are resting on the girder wing.
13. Check that all four sliding tracks of the trolley wheels are resting correctly on the girder and that between their edge and the wing of the section bar there is a maximum clearance of 2 mm on either side (fig. 54).
14. Release the trolley/hoist from its fastenings and bring the pallet to the ground with the forklift truck.
15. Tighten completely the fixing screws -1- of the stiffening plates -2- and put back the spacers -7-.
16. Tighten the self-blocking nuts -4- of the brackets -5- (fig. 55) applying the clamping couple shown in the table, with a dynamometric spanner (fig. 56).
17. **In case of beam width as per fig. 52, add weight into the counterbalance in order to guarantee the balancing of the hoist/trolley.**
18. Operating from the scaffold, at a height, position at the ends of the sliding girder: (fig. 57).
  - the actuators for the electric limit switches of the trolley so as to determine the required run.
  - the mechanical limit switches acting on the rubber buffers, which enable the trolley run to stop safely in case of the electric limit switches failing to work.

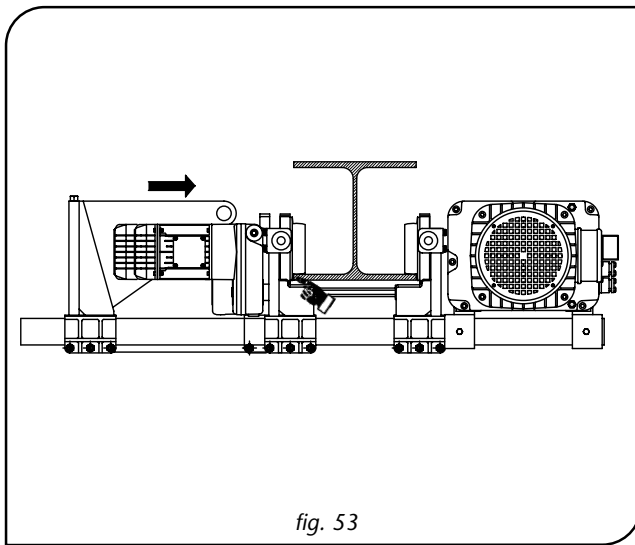


fig. 53

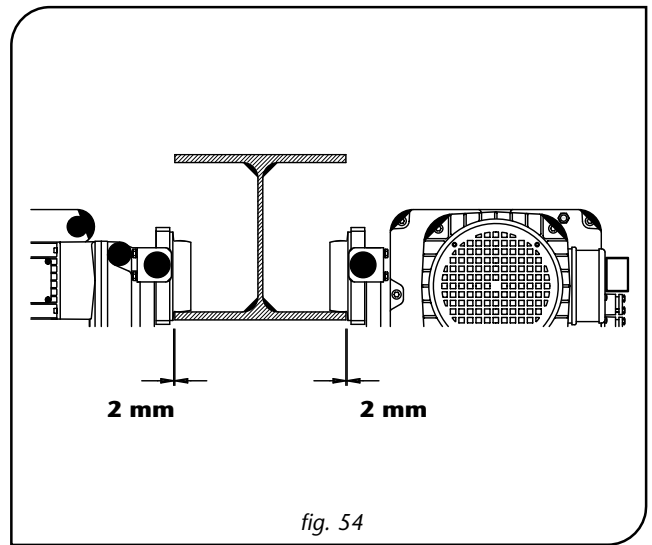


fig. 54

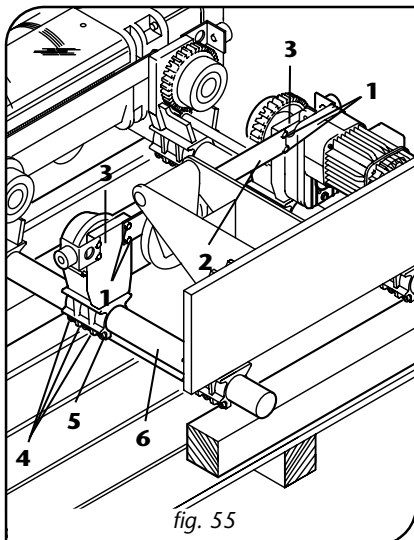


fig. 55

| Nut clamping couples -4- |       |        |        |
|--------------------------|-------|--------|--------|
| DST1                     | DST2  | DST3   | DST4   |
| M 10                     | M 12  | M 16   | M 20   |
| 50 Nm                    | 84 Nm | 205 Nm | 400 Nm |

| Screw clamping couples -1- |       |       |       |
|----------------------------|-------|-------|-------|
| DST1                       | DST2  | DST3  | DST4  |
| M 6                        | M 8   | M 10  | M 14  |
| 8 Nm                       | 12 Nm | 25 Nm | 67 Nm |

fig. 56

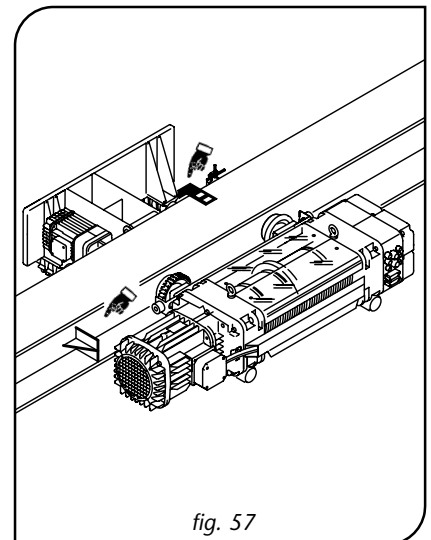




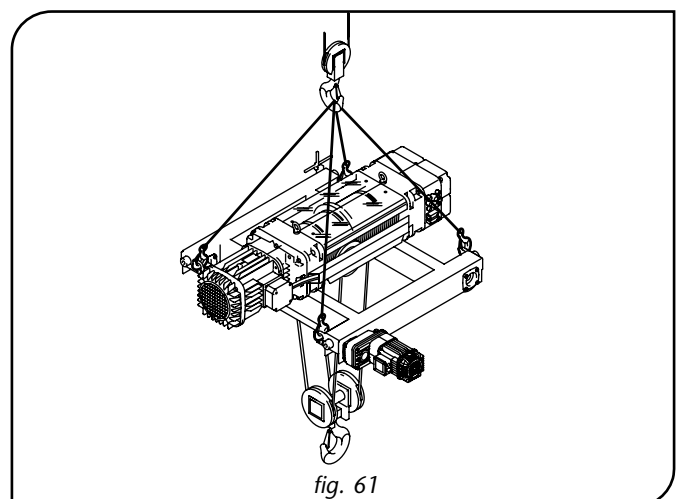
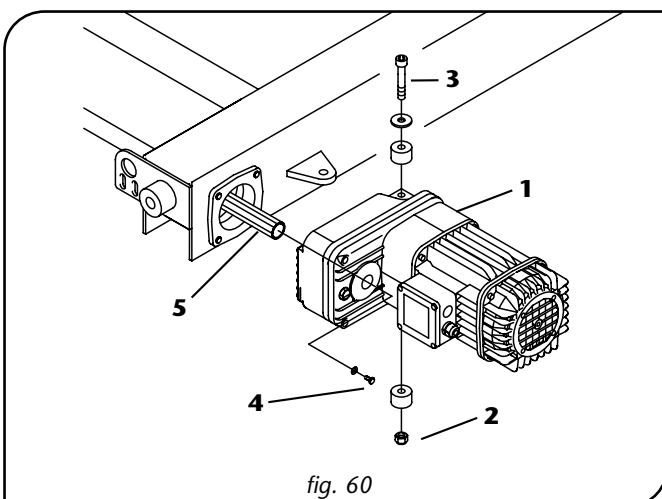
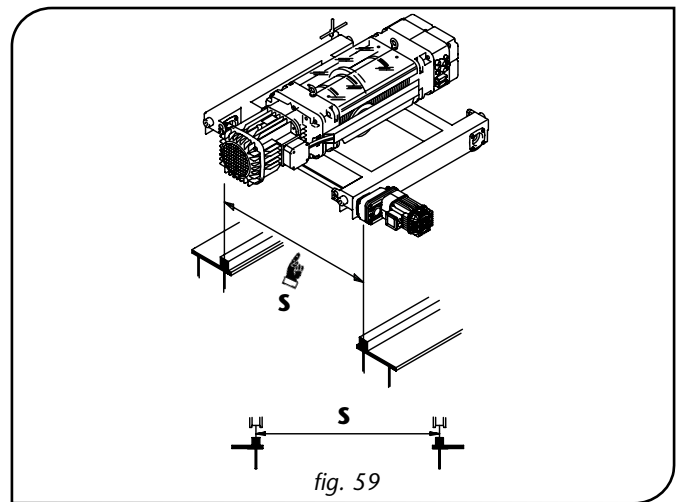
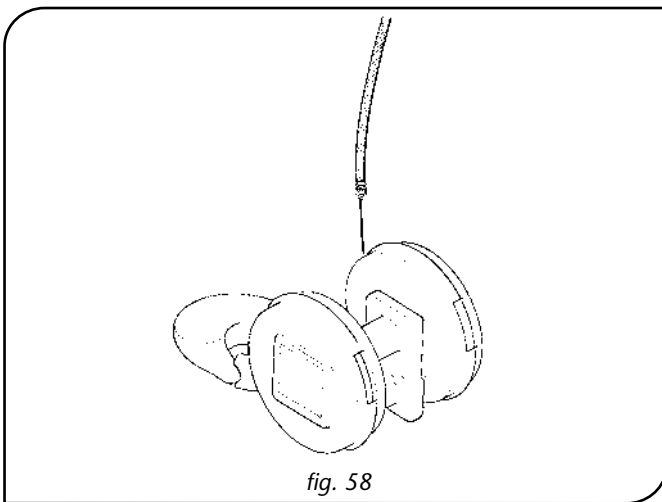


fig. 57

#### 4.4.4 Hoist equipped with DRT double girder trolley

|   |   |   |
|---|---|---|
|  | <p>The DRH hoist, combined and pre-assembled with the DRT trolley, is generally fitted onto a double girder crane (travelling crane, gantry, etc.)</p>  |   |
|  | <p>The movement and installation of the trolley/hoist onto the support girders, whether on the ground or suspended, must be carried out <b>EXCLUSIVELY</b> using <b>LIFTING</b> equipment (travelling crane, movable cranes, hoists, etc.) combined with suitable harnesses fixed to the eyebolts on the DRT trolley.</p> |   |
|  | <p>Before installing the DRH hoist with the DRT double girder trolley, whether onto girders on the ground or suspended, proceed with the following operations:</p>  |  |

1. If the trolley/hoist group is set on a pallet, free it from its bindings, then remove and dispose of any protective packaging material according to regulatory norms in force regarding such materials.
2. Free the block from any bindings present, separately and not already mounted onto the hoist, then proceed with positioning it on the ground, being careful to lift it using suitable equipment if its weight exceeds 30 Kg (the mass, when necessary, is indicated on the package), and always using the hook as a harness, or sling, in the case of manual handling (fig. 58).
3. Free the gearmotor -1- from the fastenings, (where is as a disjoint package and not already mounted on the trolley) and mount it on the splined shaft (transmission bar -5-), block it with the screw and washer -4-; mount the screw -3- and the nut -2-, and the relative shock absorbers and kasher being sure to compress the shock absorbers of about 2 mm total (1+1). (fig. 60).
4. Verify to make certain the gauge (S) corresponds to that of the girders onto which it is to be installed (fig. 59).
5. Use suitable harnesses to hook onto the lifting eyebolts on the trolley frame, and lift the load using lifting equipment that is capable of sustaining its handling weight and height; lift the entire trolley/hoist group, disengaging it from the pallet (fig. 61).





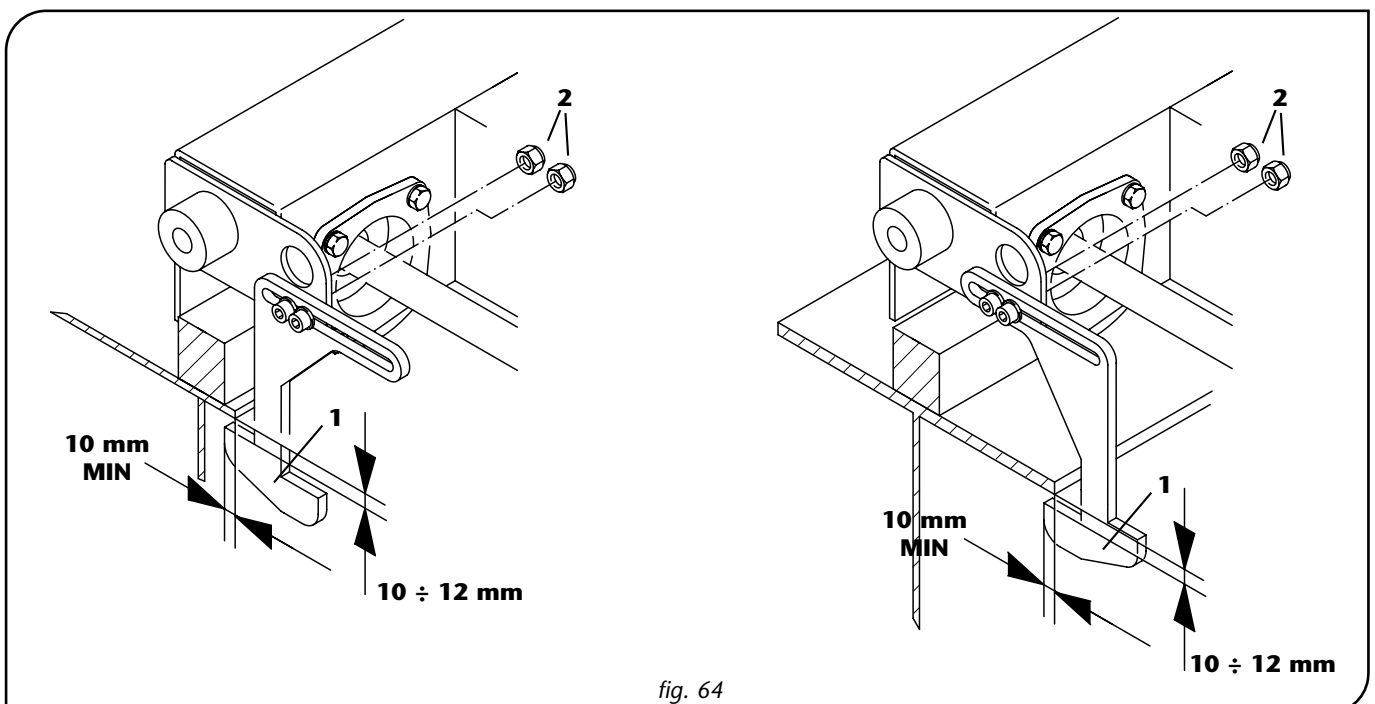
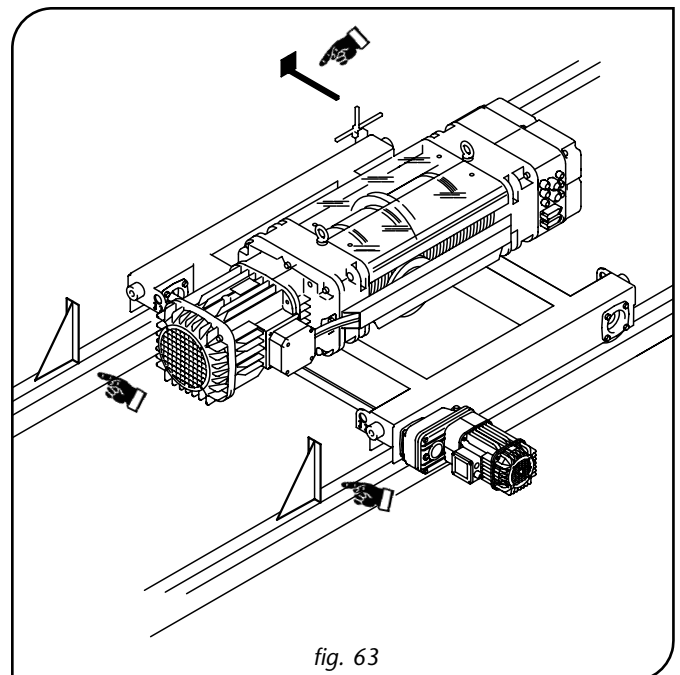
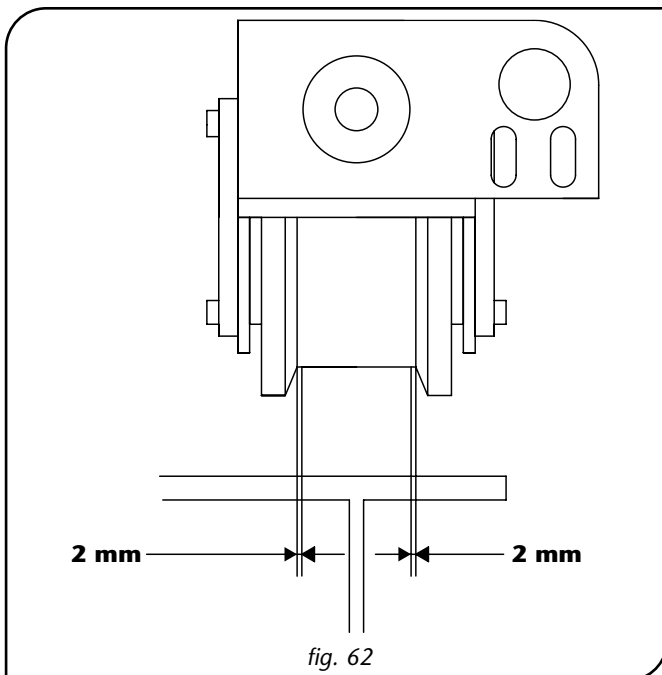
To install the DRH hoist combined with the DRT double girder trolley onto girders positioned on the ground, proceed as follows:



1. Avoid dangerous oscillations when handling the trolley/hoist group, maintaining the lower line of the wheels at a distance of approximately 1 m from the ground, and bring it to the area designated for its assembly onto the girders.
2. Slowly lower the trolley/hoist group, setting it level onto the girders it will operate on, checking to make certain the wheels are correctly placed onto the rails on the girders, and establishing a clearance of at least 2 mm on each side between their edges and the rail (fig. 62).
3. Unhook the harnesses from the eyebolts on the trolley.
4. At the ends of the sliding beams, set: (fig. 63).

- the trolley's electrical limit switches so as to determine the desired travel.
- the mechanical endstops, by regulating the rubber buffers, designed to safely stop the trolley's run should the electrical limit switches fail to operate.

5. Assemble the anti-derailing devices -1- (fig. 64), regulating them so as to provide a clearance, with respect to the lower line of the edge/wing of the girders, of approx. 10/12 mm. Then proceed with tightening the nuts -2-.

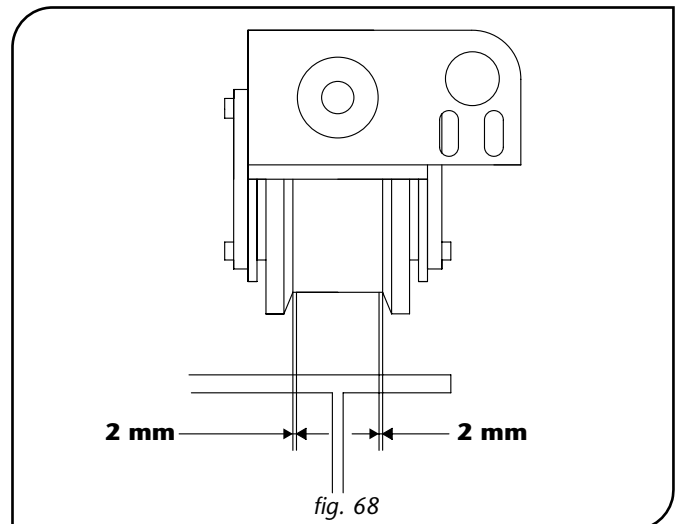
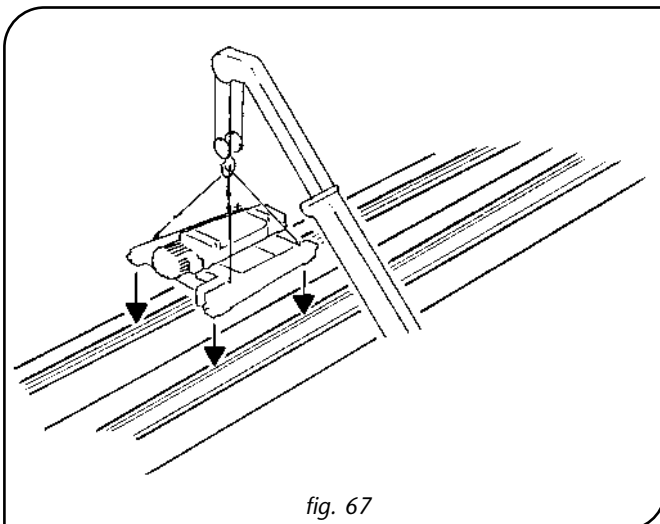
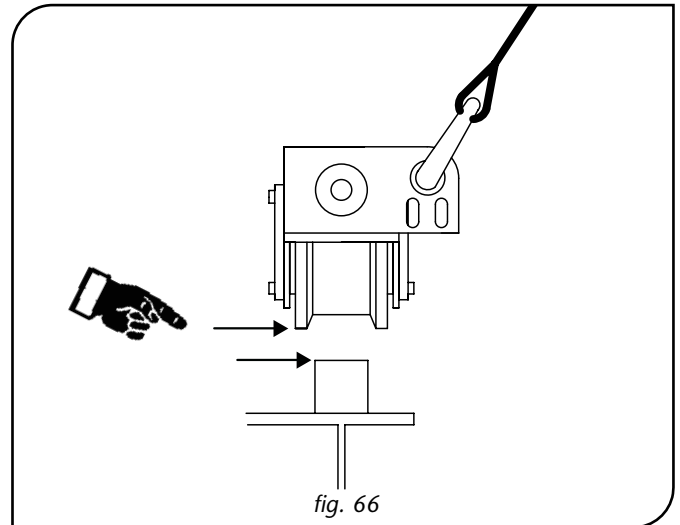
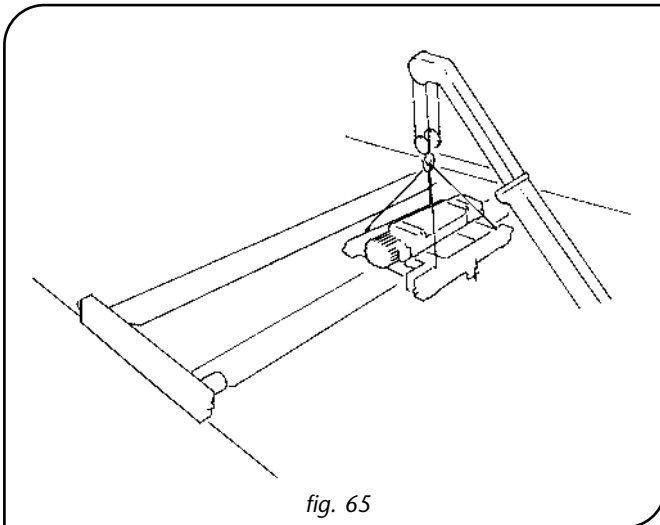





*The use of a MOVABLE CRANE is recommended in installing the DRT double girder trolley onto suspended girders. For assembly operations, proceed as follows:*  
**NOTE: This operation must be conducted jointly with at least 2 operators whose qualifications at least match the requirements requested.**





1. Avoid dangerous oscillations when handling the trolley/hoist group, maintaining the lower line of the wheels at a distance of approximately 1 m from the ground, and bring it to the area designated for its lifting onto the suspended girders.
2. Using a mobile scaffolding or raisable platform, one operator reaches the installation height, while the mobile crane operator lifts the trolley/hoist group slowly, avoiding oscillations, until reaching the height of the trolley's sliding girders (fig. 65).
3. The operator positioned on the scaffolding or raised platform provides instructions for the mobile crane operator, for:
  - slowly lifting the trolley/hoist group, setting it level so that the lower line of the wheels exceeds the distance of the trolley's sliding rails (fig. 66)
  - advancing with the movable crane until the wheels on the trolley/hoist group are vertical with their respective rails (fig. 67)
  - slowly lowering and positioning the trolley/hoist group, setting it level onto the girders it will operate on, checking to make certain the wheels are correctly placed onto the rails on the girders, and establishing a clearance of at least 2 mm on each side between their edges and the rail (fig. 68).
4. Operating from the raised scaffolding/platform, unhook the harnesses from the trolley eyebolts.
5. Operating from the raised scaffolding/platform, at the ends of the girders, set: (fig. 63).
  - the trolley's electrical limit switches so as to determine the desired travel
  - the mechanical endstrokes, by regulating the rubber buffers, designed to safely stop the trolley's run should the electrical limit switches fail to operate.
6. Assemble the anti-derailing devices -1- using the nuts -2- to regulate them in relation to the dimensions of the wing on the girders (fig. 64).



#### 4.4.5 Collegamenti elettrici

|   |  |
|---|--|
|  | <p>The DRH electric wire rope hoists and related trolleys can be supplied in the following configurations (see chapter 2):</p> <ul style="list-style-type: none"> <li>• Complete with incorporated controls (low voltage control panel and related push-button panel). In this case, all the cabling is already pre-fitted and only the power line needs connecting to the terminal block contained in the control equipment, located in the opposite side to the motor (fig. 69).</li> <li>• Without controls, as they are designed to be controlled by an external control panel. On request, the DRH hoist can be fitted with a frame for the connections and the cabling of all the electrical uses on the hoist (fig. 70).</li> </ul> |
|---|--|

|   |  |   |
|---|--|---|
|  | <p>To prepare the electrical connections proceed in the following way:</p> |  |
|---|--|---|

1. Check the suitability and the correct functioning of the electrical system:

- power line, which must be fitted with a padlockable disconnecting switch
- outlet and/or towing arm of power lines in festooned cable
- earthing system

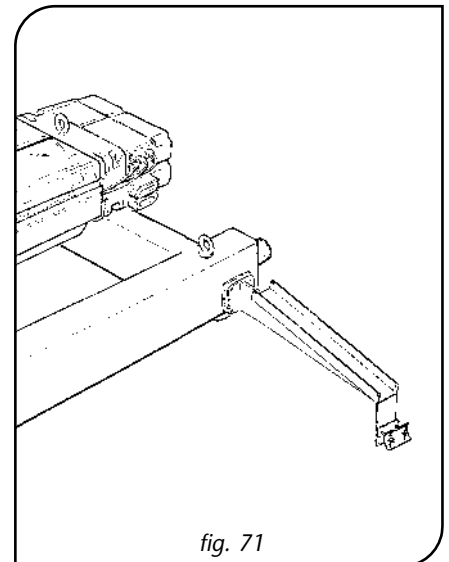
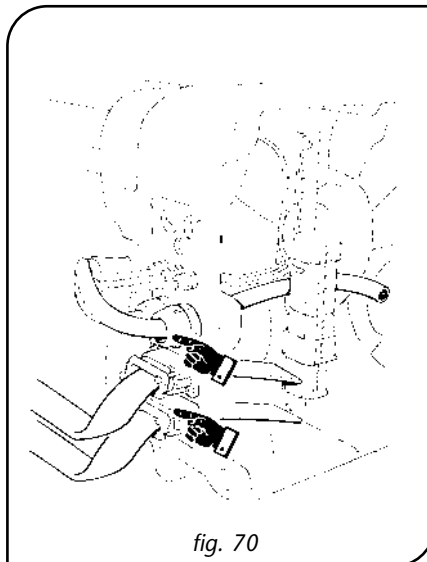
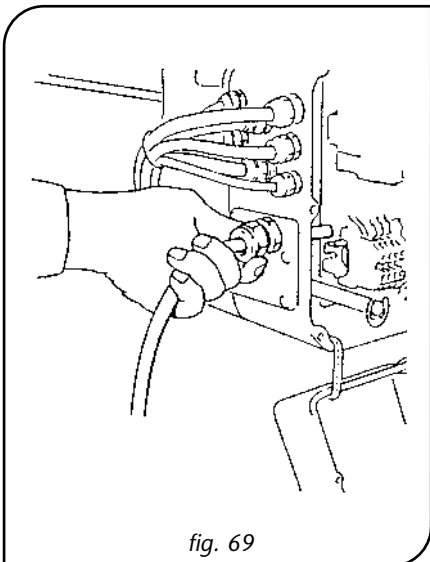
and if not part of the supply:


- control panel external to the hoist
- push-button control panel



2. In the case of the DRH wire rope hoist fitted with trolley, arrange the installing of the towing arm of the festooned power cables (fig. 71).

3. Convey the cable, which must be clamped with the appropriate cable press, if the hoist is equipped with an incorporated control board (fig 69).

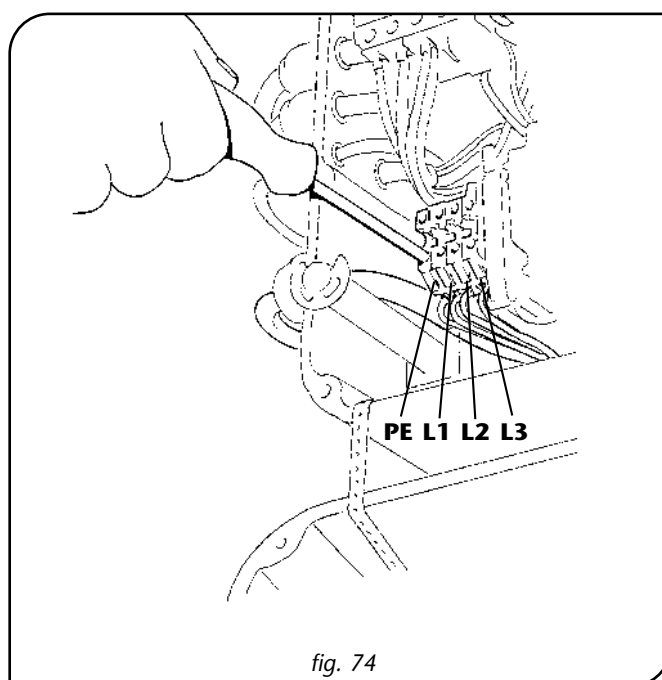
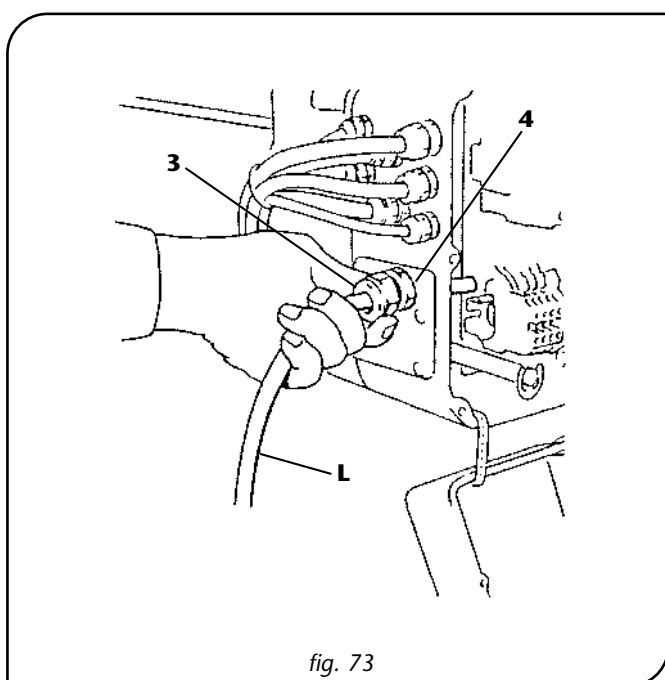
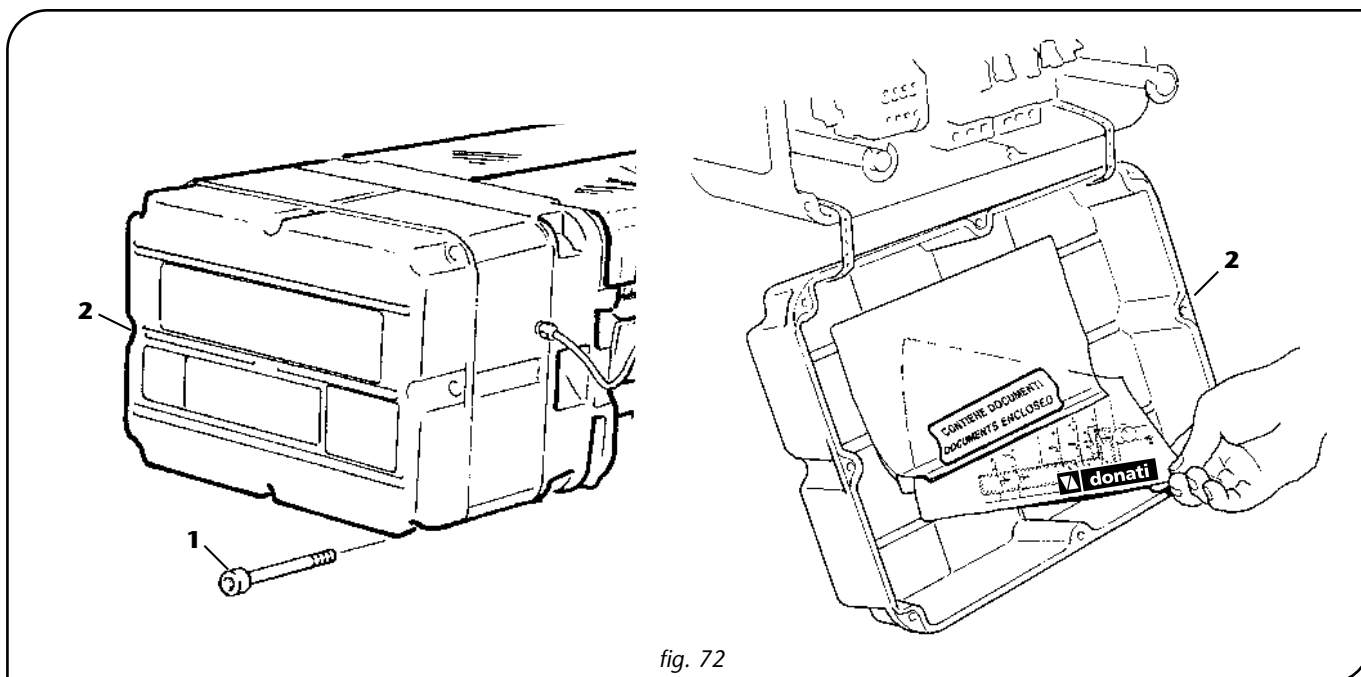
4. Convey all the electrical cables which must be clamped with appropriate cable presses, if the hoist is equipped with a connection frame (fig. 70).



|   |   |
|---|---|
|  | <ul style="list-style-type: none"> <li>• Never carry out electrical connections with live power</li> <li>• Never make precarious connections or flying connections</li> <li>• Clamp down completely the cable presses</li> <li>• Procure the electrical circuit diagrams for the DRH hoist on which you are working.</li> </ul> |
|---|---|

|   |   |   |
|---|---|---|
|  | <p>To make electrical connections, if the hoist IS FITTED with an incorporated control board, proceed in the following way:</p> |  |
|---|---|---|

1. Ensure that the power line cable is not live, putting the general power switch for the hoist in the "O" or "OFF" position, arranging if available its closure with a padlock or attaching a sign forbidding manoeuvres.
2. Operate at a height using suitable working equipment (mobile scaffold, raisable platform, etc.) and using adequate personal protective safety measures (gloves, safety harnesses etc.).
3. Completely unscrew the screws -1- which fix the cover of the space on the side of the apparatus (the one opposite the motor), remove the cover -2- and check that there is an electrical circuit diagram inside the control board (fig. 72).
4. Loosen the ring -3- of the cable clamp -4-, put the line cable -L- in the cable clamp and clamp completely the cable clamp ring (fig. 73).
5. Connect the quadripolar line cable in the respective clamps -L1-L2-L3-, connecting the yellow/green conductor to the earthing clamp (PE) and taking care to clamp completely the clamps to prevent uncertain contacts (fig. 74).
6. Put the electrical circuit diagram back in the space in the apparatus, put the cover back -2- taking care not to damage the gasket and/or the related holding surface and tighten all the screws completely -1- (fig. 72).

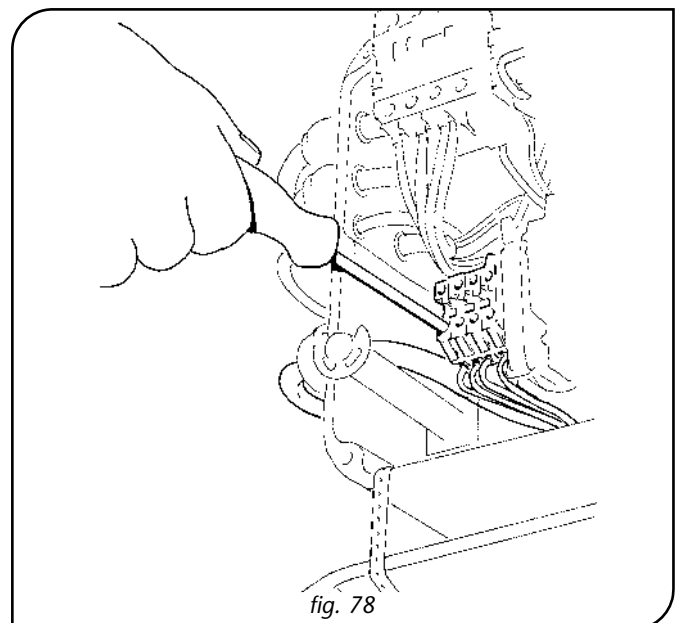
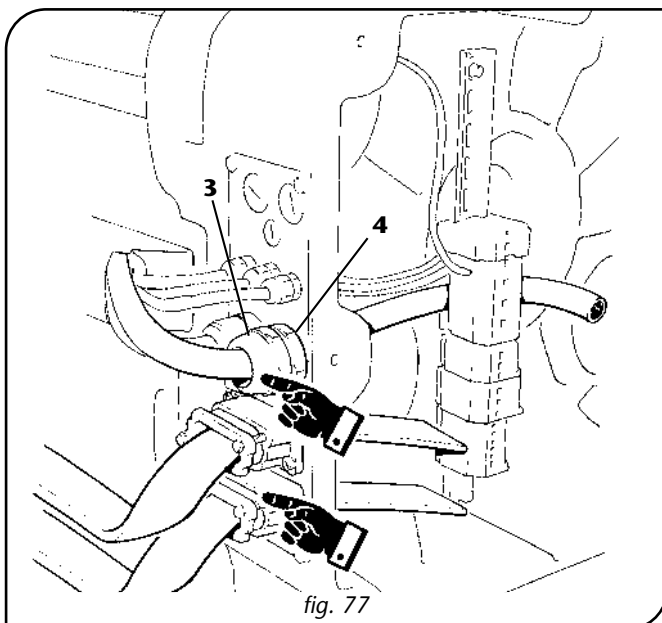
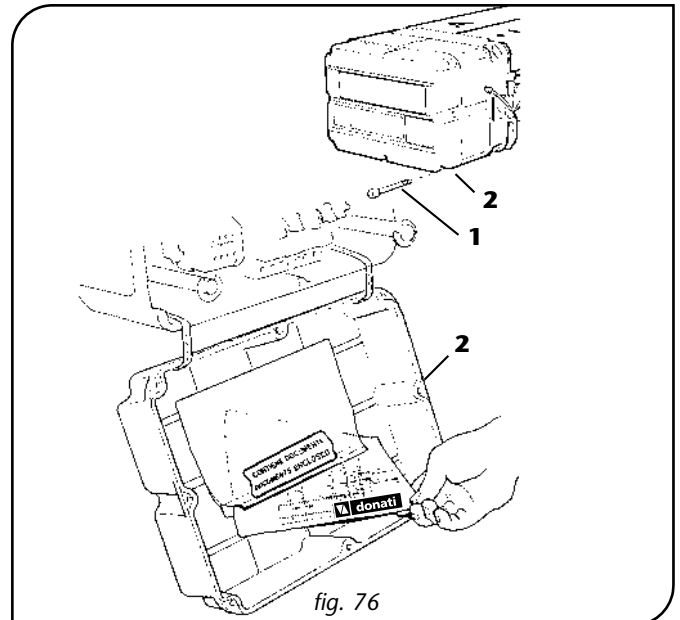
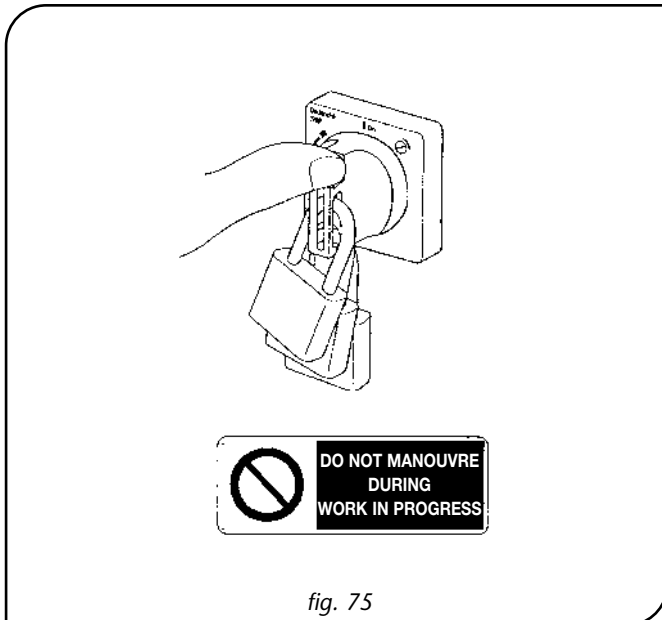




To make electrical connections, if the hoist IS NOT FITTED with an incorporated control board, proceed in the following way:

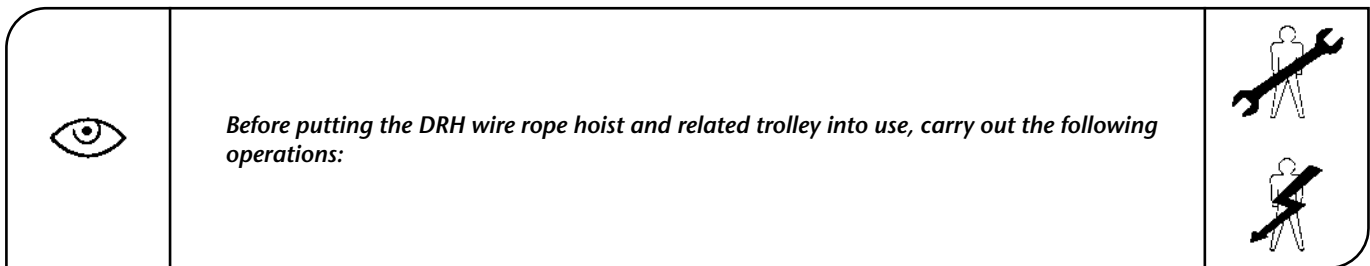


1. Operate at a height using suitable working equipment (mobile scaffold, raisable platform, etc.) and using adequate personal protective measures (gloves, safety harnesses, etc.).
2. Ensure that the power supply cables (motor cables) are not live, putting the line disconnecting switch in the "O" or "OFF" position, arranging, if available, for its closure with a padlock, or attaching a sign forbidding manoeuvres (fig. 75).
3. Completely unscrew the screws -1- which fix the cover in the space on the electrical connections side (the one opposite the motor) remove the cover, -2- and check that there is an electrical circuit diagram inside the space (fig. 76).
4. Loosen the rings -3- of the cable clamps -4- for round cables and put the related conductors in the cable clamps. Loosen the screws of the cable clamps for flat cables and put the related flat cables in the cable clamps. Tighten completely all the rings of the round cable clamps and the screws of the flat cable clamps (fig. 77).
5. Connect all the round and flat cables on the terminal block following the instructions shown on the electrical circuit diagram, taking care to connect all the yellow/green conductors to their respective earthing clamps and to tighten completely all the clamps to prevent uncertain contacts (fig. 78).
6. Put the electrical circuit diagram back in the connections space, put the cover back -2- taking care not to damage the gasket and/or the related holding surface and tighten all the screws completely -1- (fig. 76).

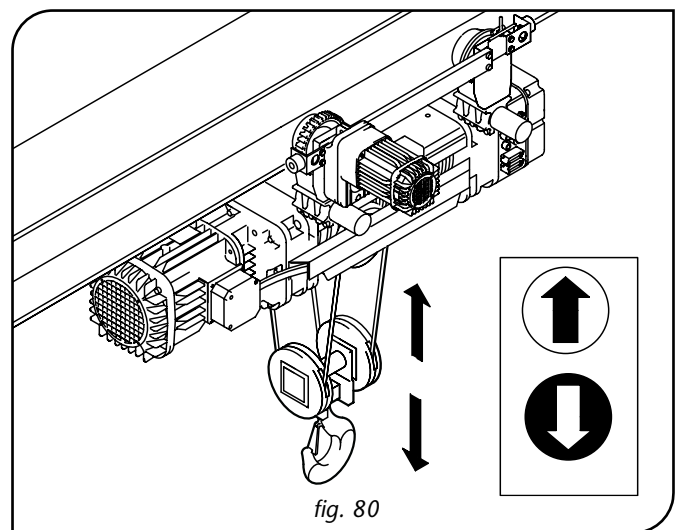
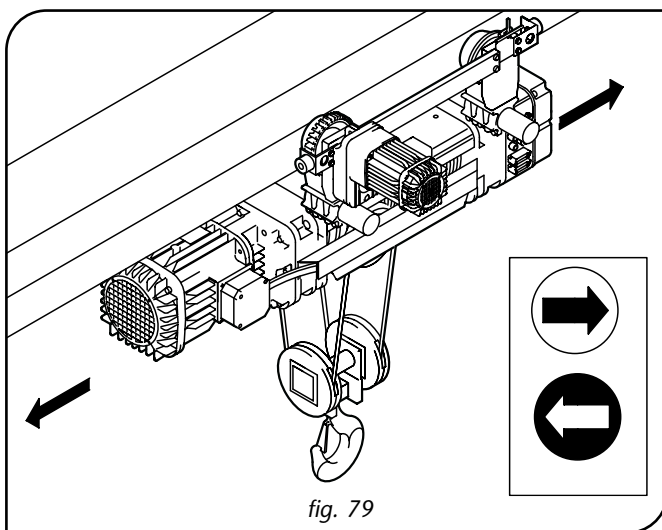


## 4.5 Putting the machine into operation

### 4.5.1 Preliminary operations



- **Lubrication of the mechanisms:** (see also point 6.3.4 "Cleaning and lubrication")
  - Ensure that there are no lubricant leaks.
- **Checking the electrical system is in a suitable condition:**
  - Check that the travelling limit switches are installed, correctly positioned and blocked.
  - Check that the voltage and line frequency, shown on the respective motor plates, correspond to those designed for the functioning.
  - Check that the voltage value to the motors is within the limits of +/- 10% of the nominal value.
- **Checking the efficiency and the suitable condition of the structures for the installation of the hoist:**
  - Ascertain the solidity and adequacy of the structures on which the hoist is installed
  - Check, in the case of the hoist with trolley, that the sliding tracks of the wheels are intact, which must be free from obstacles, upward projecting bumps, depressions, and foreign bodies.
  - Check the useful manoeuvring spaces and ascertain any potential interference
  - Check that there are end catches and striker plates of the trolley limit switches
- **Checking the functioning of the correct rotation direction of the motors:**
  - If the hoist is fitted with an electric trolley, activate the "right/left" buttons (fig. 79) and check that the trolley moves in the corresponding directions
  - Carry out the same checks on the "ascent/descent" control of the hoist taking care to make it function first in one direction (descent) and then in the other (ascent) with two brief impulses necessary only to ascertain the correct direction of rotation (fig. 80).
  - If the direction of the movements does not correspond to the function foreseen by the button pressed, stop the manoeuvre immediately and invert the connection of two phases of the incoming power line in the control board or the connection of the related motors.



*If the rotation direction of the motors does not correspond to the controls of the push-button control panel, the electric limit switches do not halt the movement. Consequently, when available, always proceed first to the checking of the travelling movements and then to the checking of the lifting to prevent dangerous situations which could occur due to the failure of the lifting limit switches.*

#### 4.5.2 Fitting the hook block



To fit the hook block, when it is not already fitted on the DRH hoist, proceed in the following way:



These operations can be performed:

- At a height, with the help of suitable equipment, for hoists in fixed suspended position, or fitted with DST/N - S or DRT trolley.
- On the ground, before installation at a height, for hoists in fixed positions which have difficulty of access to anchorage crosshead.

1. Operating at a height on the scaffold/platform or on the ground, removing the pin -2- with the related snap ring, disconnect the lever -L- of the overload device -LC- from the anchorage cross head -1-, let the lever rotate downwards -L- until the anchorage pivot -3- can be freely extracted and thus allows the anchorage to be disassembled -4- (fig. 81).
2. Operating on the ground with the push-button control panel, press the descent button until the wire rope is completely unwound, taking care not to let the descent limit switch intervene (this operation is not necessary for hoists positioned on the ground and/or not yet installed at a height).
3. Prepare the hook block on the ground, on the perpendicular line of the hoist and insert the rope end in the hook block according to the type of hoist (2, 4, 6 or 8 fall) as shown in the scheme. Use if possible an iron wire temporarily fixed, with adhesive tape, to the rope end, to facilitate the operations of passing the wire rope between the pulleys (fig. 82).
4. In the case of 4-fall hoists, provide for the geometrical arrangement of the hook block as follows (fig. 83):
  - Figure 1 for hoists with drum short (C) or normal (N)
  - Figure 2 for hoists with drum long (L) or extra long (X).

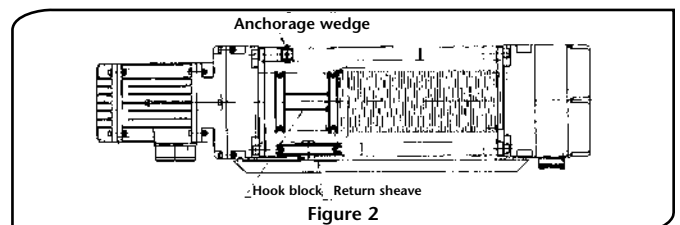
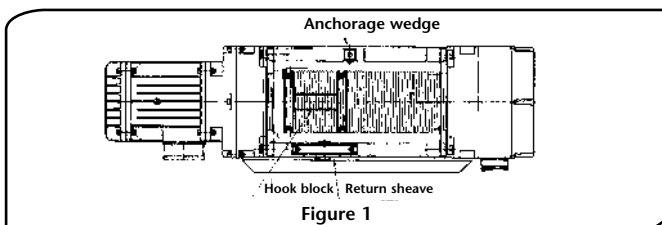
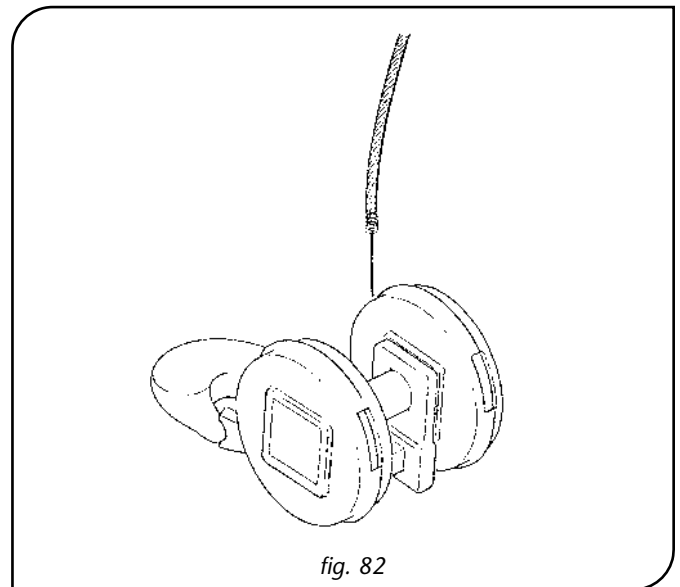
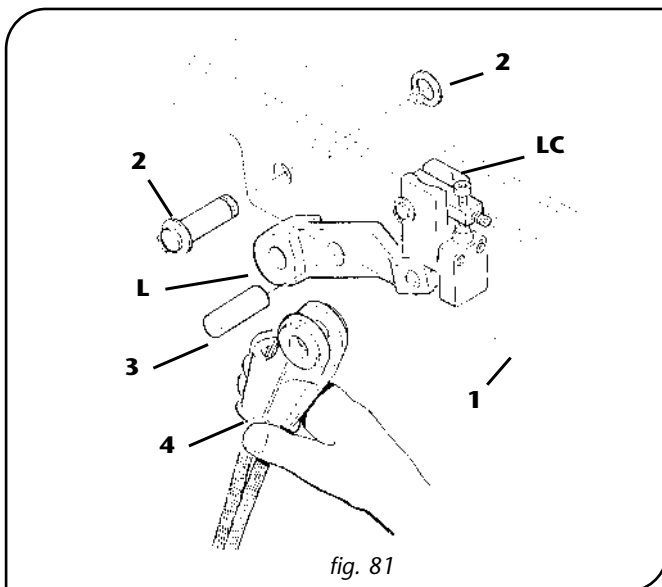
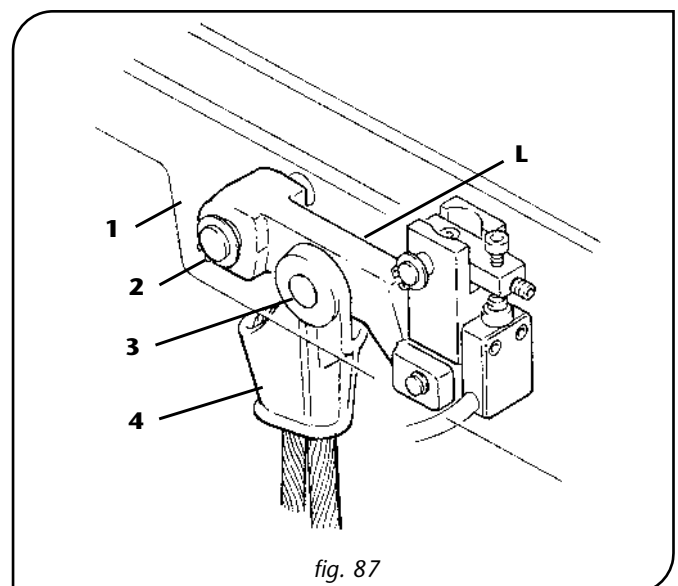
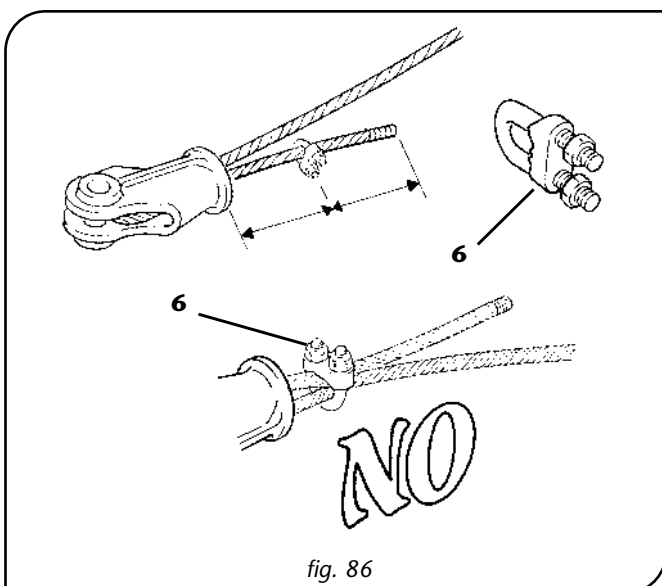
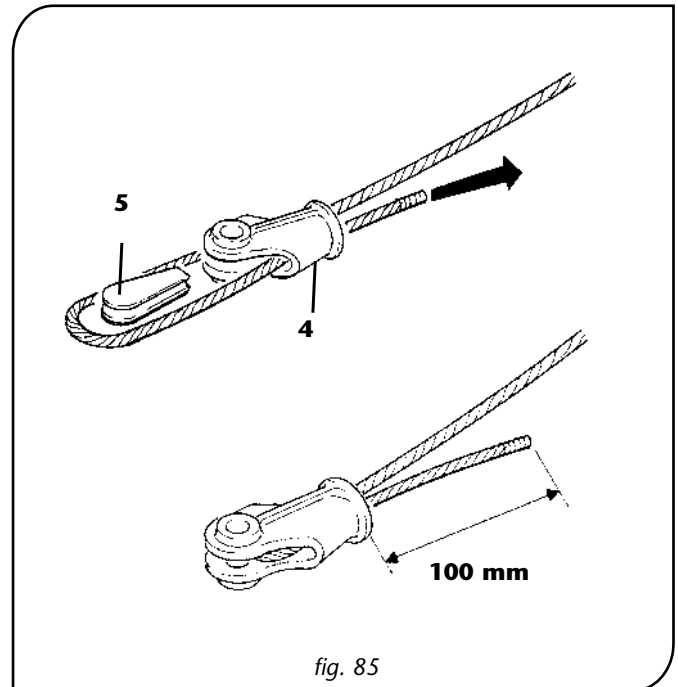
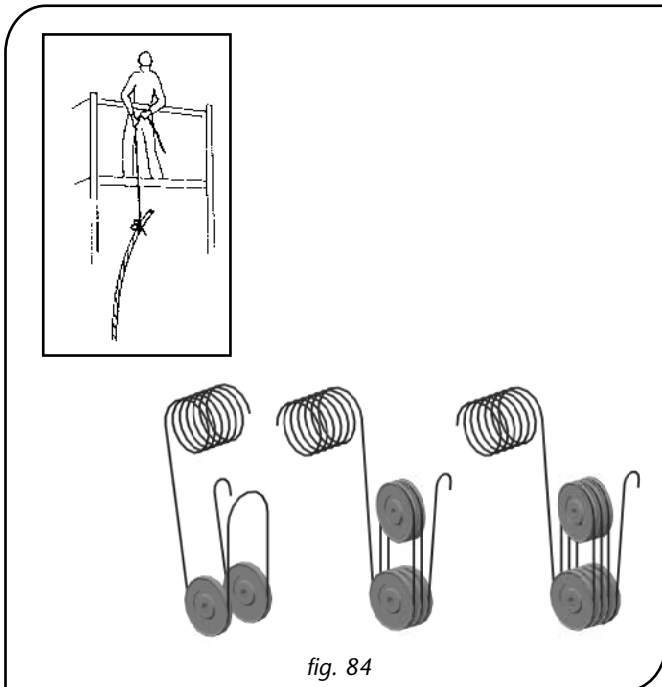





fig. 83


5. In the case of 4-fall hoists, pass the wire rope through the transmission pulley positioned on the hoist and, in the case of 6 or 8-fall hoists, pass the wire rope through the transmission pulley positioned on the trolley. When the transmission pulley is positioned at a height, tie the rope end with a cord securely and firmly, and then, from the top of the scaffold/platform positioned at a height the operator lifts the rope end using the cord (fig. 84).
  6. Introduce the rope end in the anchorage -4- and having inserted the wedge -5- let the end of the wire rope come out from the lower edge of the anchorage checking that the end comes out 100 mm from the anchorage (fig. 85).
  7. Insert the safety clamp -6- on the free length of 100 mm positioning it 50 mm from the edge of the anchorage and tighten the nuts completely (fig. 86).
  8. With the pivot -3- connect the anchorage -4- to the lever -L- fixing the lever, using the pin -2- and the related snap ring, to the anchorage cross head -1- (fig. 87).
- In the 4-fall hoists installed at a height lift the anchorage as in point 4 of the sequence described above.

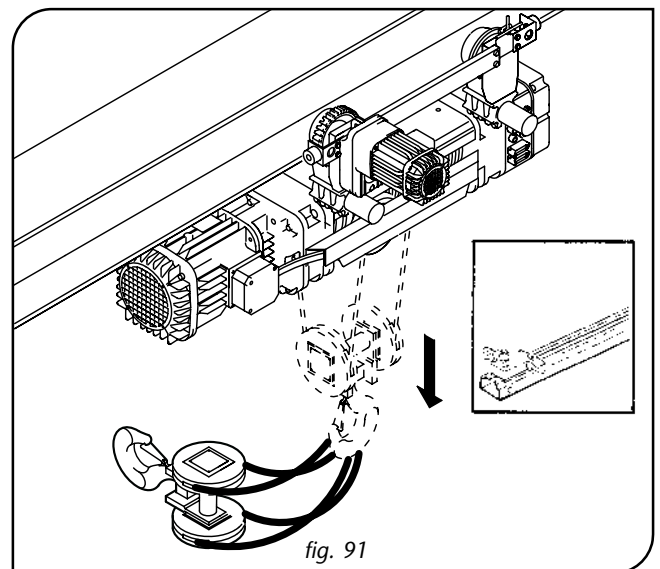
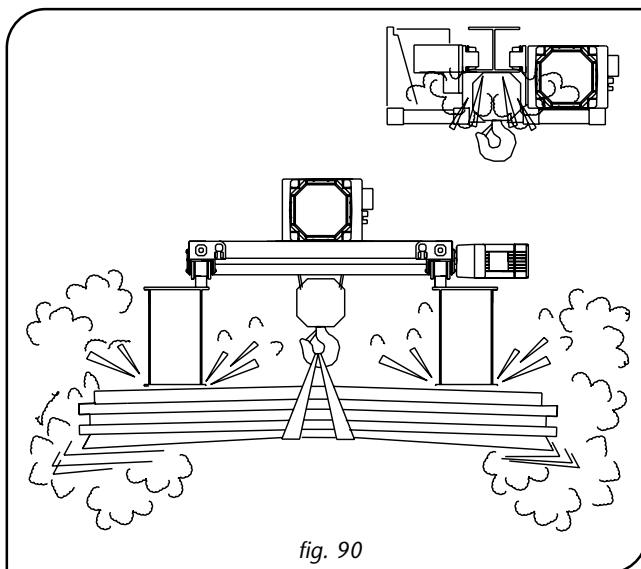
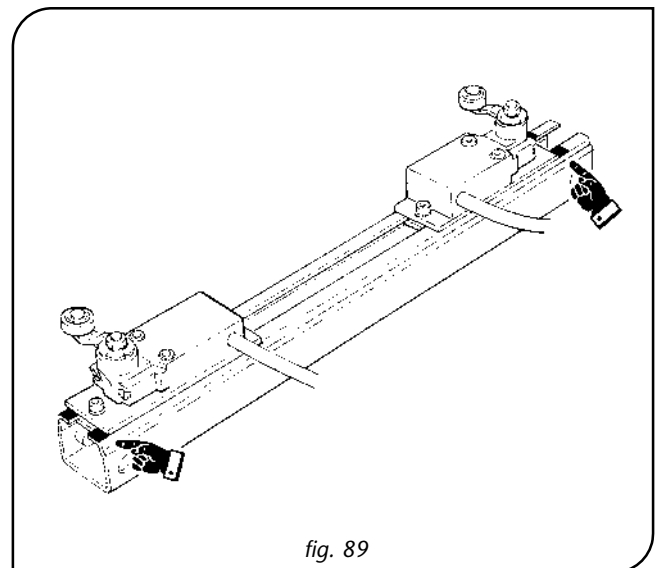
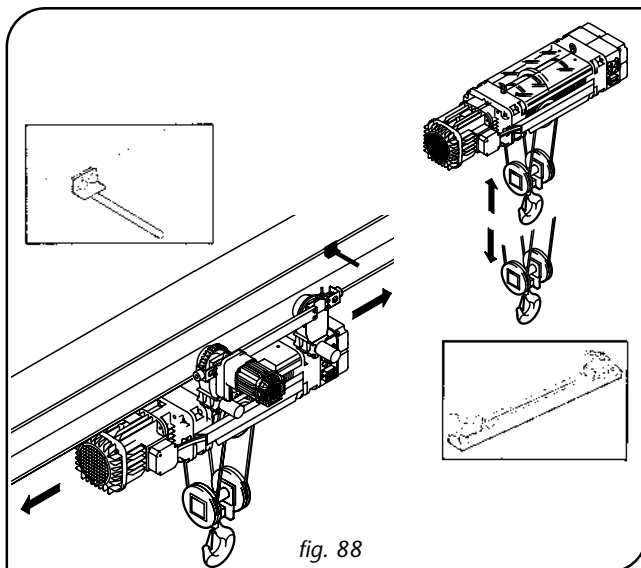


4.5.3 Adjustments and trial runs

|   |  |
|---|--|
|  | <p>The DRH electric wire rope hoists and, when included, the trolleys are fitted with sensitive electrical micro-limit switches which delimit the run (fig. 88):</p> <ul style="list-style-type: none"> <li>• of the hoist in ascent and descent.</li> <li>• of the trolley along the sliding girder.</li> </ul> |
|---|--|

|   |  |   |
|---|--|---|
|  | <p>Adjusting the lifting limit switch devices:</p> |  |
|---|--|---|

|   |   |
|---|---|
|  | <ul style="list-style-type: none"> <li>• The positions of max ascent and of max descent are marked by a red demarcation striker plate, which <b>MUST NEVER</b> be passed (fig. 89).</li> <li>• When the hoist is fitted with a reduced dimension DST/R trolley or double girder DRT trolley, the ascent limit switch <b>MUST</b> be adjusted to prevent the risk of collision of the load and/or of the hook block or parts of the hoist with the structure of the girder/s (fig. 90).</li> <li>• In any configuration the heights of maximum approach of the hook block in ascent, indicated in point 2.2.9, <b>MUST NOT</b> be reduced.</li> <li>• The descent limit switch <b>MUST</b> be regulated according to the effective run that the hook can perform. The adjusting in descent is also necessary to prevent the hook resting on the floor causing the wobbling of the wire ropes (fig. 91).</li> </ul> |
|---|---|



1. Check that the movements of the hoist correspond to the indications shown on the respective ascent and descent buttons of the push-button control panel:
  - push, with a quick movement, the ascent button and check that the hook goes up
  - do the same operation with the descent button, the hook should go down

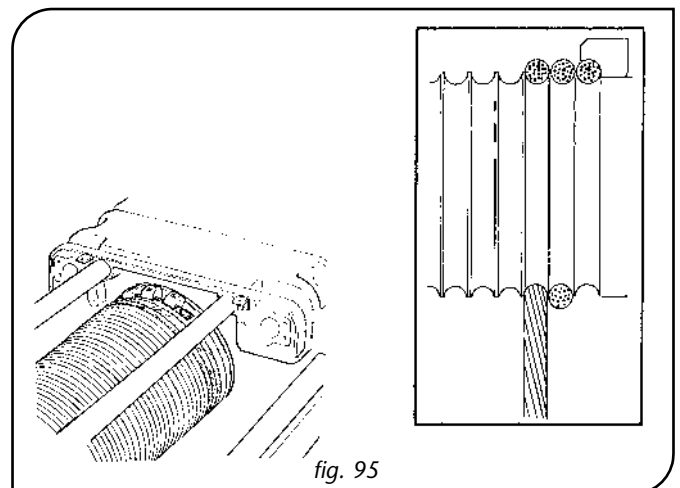
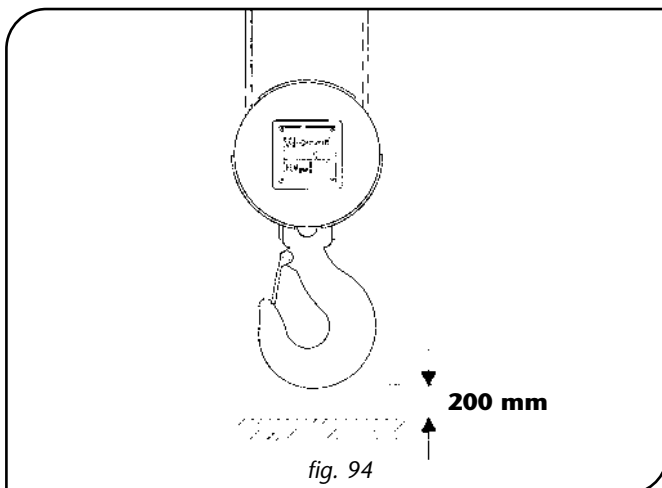
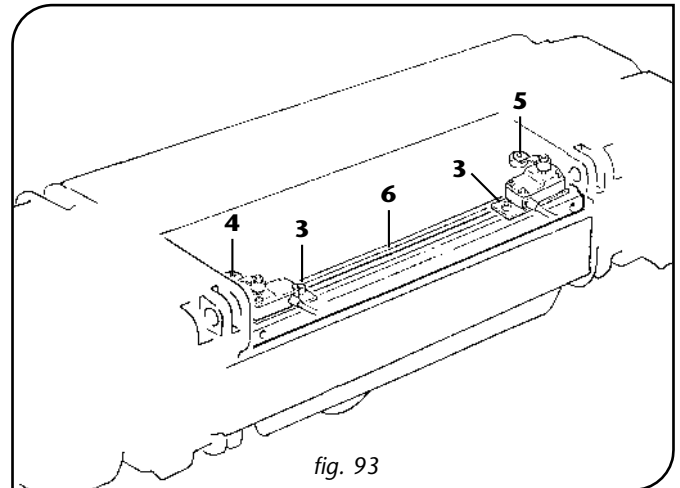
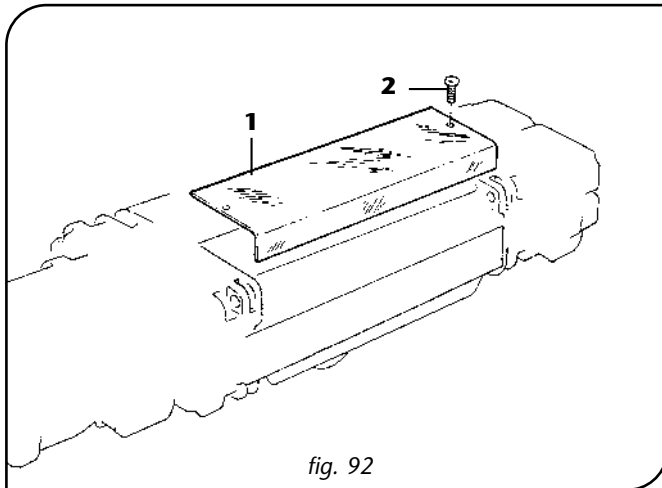


- *If this does not happen stop the movement of the hoist and invert the connection of the two phases in the line terminal block of the control board.*
- *Do not intervene on the internal connections of the hoist or push-button panel*
- *If the direction of rotation of the motors does not correspond to the controls, the limit switches do not halt the movement and situations of DANGER can occur!*

2. Remove the protection canopy -1-, only on the limit switches side, by unscrewing the screws -2- (fig. 92).
3. Bring the hook block to the required position of maximum ascent or maximum descent.
4. Loosen the screws -3- so that the ascent limit switch -4- or the descent limit switch -5- can freely run along the section bar -6- and position the ascent limit switch, and/or descent limit switch, in the most suitable position, so that they intervene when the hook block is in the required position (fig. 93).
5. Tighten the fixing screws completely so that the ascent limit switches and/or descent limit switches stay firmly positioned in the prefixed position.
6. Let the hook block run for the entire predetermined hook run, do repeated ascent and descent test runs activating the respective limit switches and checking the correct intervention once the point of the striker plate has been reached in ascent and descent.
7. Check, according to the foreseen configuration, that the height of approach of the hook going up is not less than that stated in point 2.2.9 (Height H1-Height E or E3).
8. Put back the protection canopy at the end of the operation.



- *The adjustment of the descent limit switches MUST NOT allow the lower edge of the hook to go less than a distance of 200 mm from the ground (fig. 94).*
- *The adjustment of the hook in the maximum descent position MUST always ensure a minimum of 3 turns of wire rope completely wound on the drum (fig. 95).*



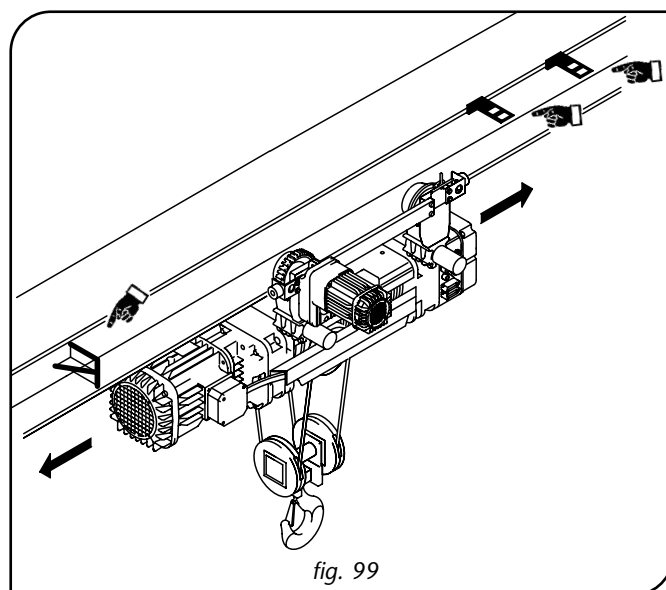
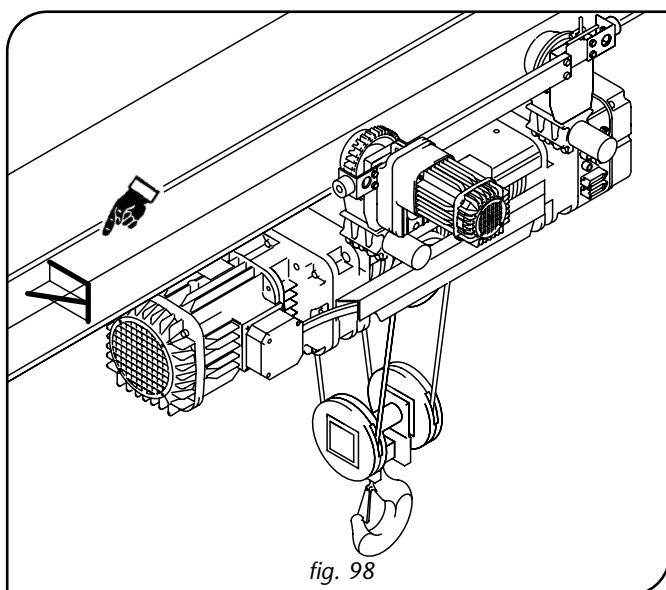
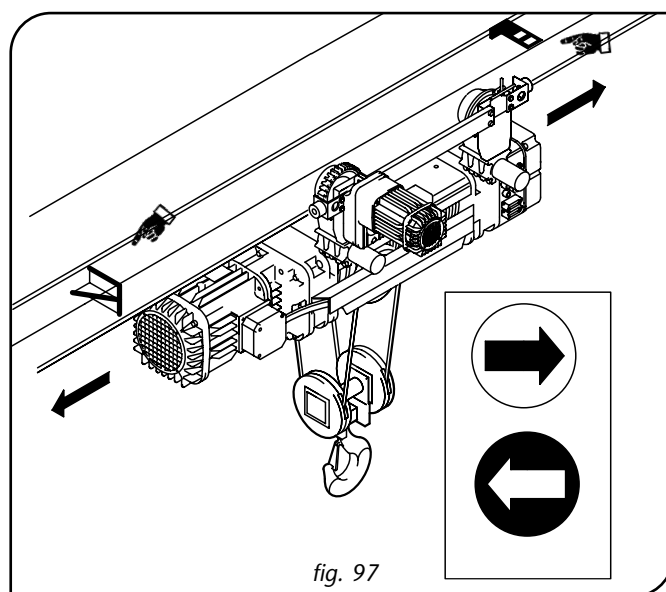
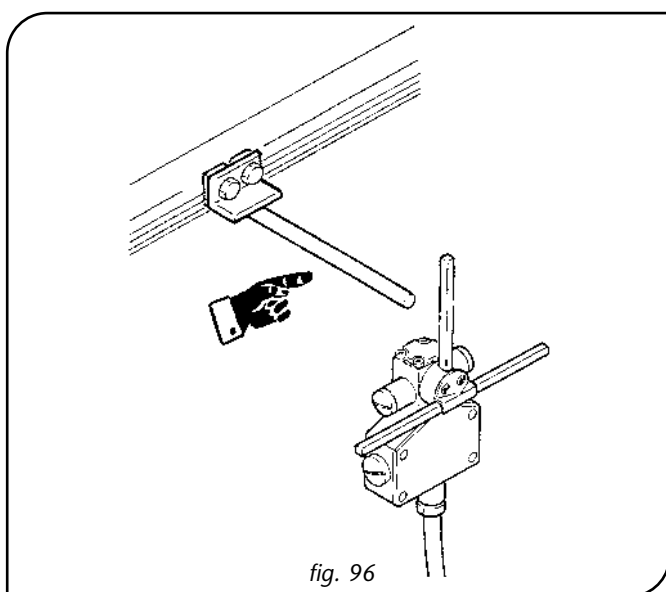


*Adjusting the limit switch devices of the trolley (if part of the supply):*



1. Check the correct positioning of the actuators of the electric limit switches of the trolley (fig. 96).
2. Ascertain that the run of the trolley is the one required and, if necessary, adjust the limit switches.

- The test run of the limit switches is carried out by bringing the trolley to the extreme limit of its run on the girder using the right/left buttons. Do the test run several times, the trolley should stop in the prefixed position and ensure an adequate "over run", before reaching the mechanical stops on the ends, and avoid the collision of the hoist with the fixed structures (fig. 97).
- Check the correct positioning of the mechanical striker plates on the ends of the girder which must be adequate for the potential impact with the rubber absorbers of the trolley if the electric limit switches should fail to work (fig. 98).
- Ensure the adequate positioning of any pre-slowng down devices in the case of 2-speed trolleys, to avoid reaching the striker plates of the limit switches on the ends at maximum speed (fig. 99).



**All the LIFTING AND TRAVELLING automatic limit switches are emergency controls with safety functions and not for working and MUST NOT be subjected to habitual and/or continuous use. If habitual and/or continuous use is required, supplementary limit switches for operational service must be installed, fitted so that they act before the emergency limit switches.**



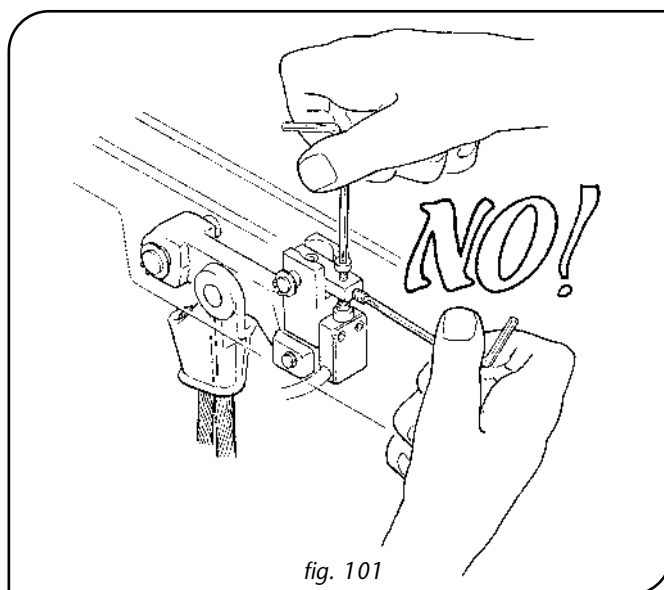
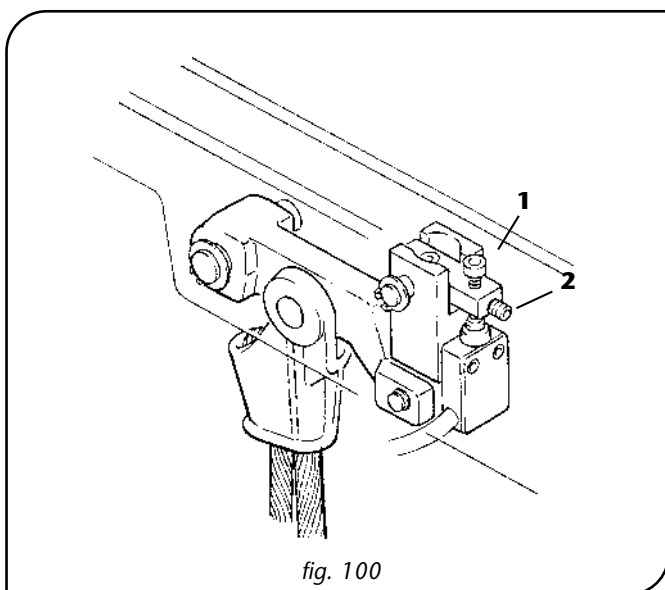
*Calibration of the overload device:*

DONATI TECHNICIAN



DONATI SERVICE

- The overload device of the DRH wire rope hoist has been duly registered and calibrated by **DONATI SOLLEVAMENTI S.r.l.** considering the **lifting capacity and the FEM service group foreseen for the hoist.** Following the test run, the micrometric adjusting screw for the calibrations -1- is blocked with the grub screw -2- and subjected to tamperproof sealing (fig. 100).
- The overload device is a component with the safety function of **preventing overload** and the calibrations **MUST NOT** be changed (fig. 101).
- Where a new calibration is necessary, such an operation **MUST BE** performed by the technical service of **DONATI SOLLEVAMENTI S.r.l.** or by staff trained and authorized by the company.



- The overload device **MUST** be connected to the control board according to the instructions detailed in the related electrical circuit diagrams.
- The overload device **MUST NOT** be tampered with and the calibrations **MUST NOT** be modified.



#### 4.5.4 Testing the hoist - Suitability of use



- The DRH electric wire rope hoists and related trolleys have been tested by the manufacturer to ascertain their functional and performance response. However such testing must be repeated after installation in order to ensure the optimal, safe functional performance of the hoist and trolley in their place of installation.
- The testing phases require a precise sequence of operations which, described as follows must be strictly followed by the technicians in charge.

Having done the functional "empty" test runs, proceed to the dynamic test runs; these test runs are carried out with weights of value corresponding to the lifting capacity of the label plate of the hoist increased by the coefficient of overload 1.1 (load equal to 110% of the nominal load). The static test runs are done with a coefficient of overload of 1.25 (load equal to 125% of the nominal load).



*All tests must be carried out in no windy conditions.*



*Proceed to the testing of the DRH wire rope hoist and, if available, the related trolley, in the following way:*



- **Empty test runs:**

- activate the switch/disconnecting switch
- put the emergency stop switch in the position which allows movement
- press the "gear/alarm" button (if available)
- check the lifting function by pressing the ascent/descent buttons
- check the travelling function by pressing the right/left buttons
- in the case of movements at two speeds check the functionality
- check the functioning of the electrical limit switches of all the movements.

- **Dynamic test runs:**

- prepare adequate weights for the test runs with load equal to **nominal lifting capacity x 1.1** and suitable equipment for the harnessing and lifting of the load
- harness the load, taking care to position the hook vertically to avoid skew rope falls
- slowly tension the sling so as not to cause tearing, if available do the test runs with load using the "slow" speed
- slowly lift the load and check that this happens with no difficulty and that there are no anomalous noises, clear deformations or sagging in the structure
- repeat the test run at maximum speed, doing the preceding checks
- check the functionality of the "ascent and descent" limit switches
- check the functionality of the lifting brake, checking that the weight is braked in adequate time and that there is no skidding of the load, after releasing the button.
- carry out the same checks also for the trolley travelling movements, checking the functionality of the "right and left" limit switches, without bringing the load to the maximum height (lift it to a height of one metre from the ground).
- operate first at slow speed, if available, and then at maximum speed
- check the correct sliding of the trolley on the girder, and ascertain that there are no noises, evident deformations or anomalous sagging of the structures.
- check the functioning of the "emergency stop" button which must stop and inhibit all the movements. Any function of the hoist and/or trolley must stop, in the shortest possible time and space, without showing anomalies, side skids, dangerous oscillations, etc. which threaten the stability.
- check the braking spaces and stopping spaces during lifting and travelling.

Indicative amplitude of these spaces:

- in the descent movement with maximum load it is between 6 and 8 cm
- in the travelling movement of the trolley, which moves at a speed of 16 or 20 m/min, it is between 15 and 30 cm.
- In both cases consistent oscillations of the load must be avoided.

- **Static test run:**

- lift the load used for the dynamic test runs, stop it in suspended position at a height of 50 cm, gradually apply weights on it until reaching an overload value equal to 25% of the nominal maximum lifting capacity.
- leave the weight suspended for no less than 10 minutes.
- check that the weight suspended (load + overload) does not yield (the lifting brake must not skid) and that there are no evident deformations or sagging of the structure.
- check the functioning of the overload device which must exclude and deactivate all the functions of the hoist and of the trolley with the exclusion of the descent movement.



*During the static test the overload device must deactivate the ascending movement, the descending movement must not be activated.  
The testing of the hoist/trolley must be repeated at the annual checks, see point 6.3.4. The results of the testing must be noted in the checks register, see chapter 8.*

## ➤ 5. - FUNCTIONING AND USE OF THE HOIST ◀

### 5.1 Functions of the hoist

#### 5.1.1 Intended use – Foreseen use – Designated use

The **electric rope hoist** is a machine which is usually used to lift an unguided load vertically with a hook or using suitable engagement accessories.

When the hoist is combined with a **trolley**, which runs up at a height along one or two girders, it can ensure both lifting and horizontal movement of the load.

All lifting movements (ascent and descent) and transverse movements (right and left) **must be activated electrically** and can be controlled either with the push-button panel or remote control.

The **electric rope hoist and the relative trolleys**, installed at a height, can equip a monorail or be the lifting unit of other machines in which they are incorporated, such as: overhead travelling crane, gantry, and jib cranes, etc. in single girder and double girder versions.

Furthermore, the **electric rope hoist**, placed at a height or on the ground, can be used in various fixed – position configurations.

Two main movements are possible:

- **vertical**; lifting of the load with a hook and movement of the ropes of the electric hoist
- **horizontal**; translation of the load through movement of the electric trolley along the girder.

These movements can be controlled with (fig. 102):

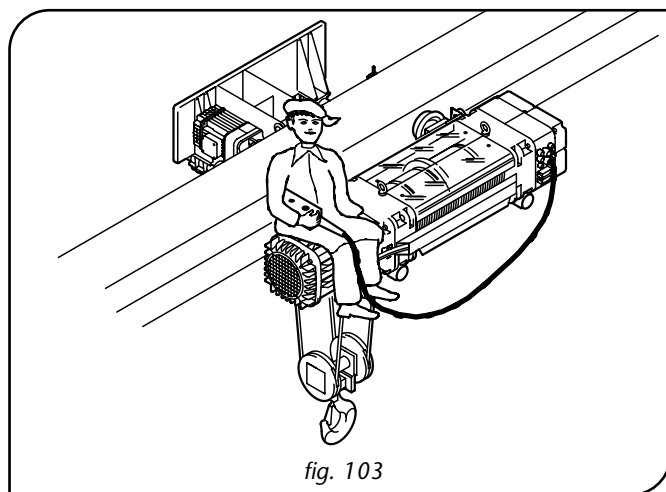
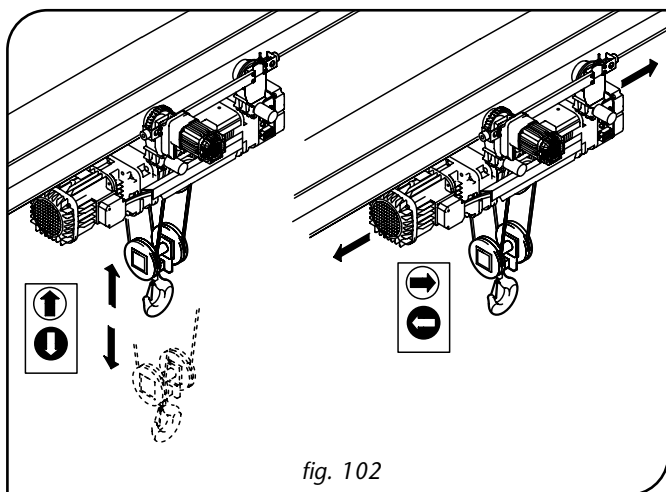
- push-buttons or actuators of **ascent** and **descent** for lifting the hoist (main and auxiliary)
- push-buttons or actuators of **right** and **left** for **trolley transverse** (main and auxiliary)

They activate the function when held down and the control for low auxiliary speeds for lifting and translation can be activated in the following ways:

- **with separate actuators** which keep the “high” and “low” speed controls separate.
- **with a single actuator** with two positions, the first position is the “low” speed control and the second position is the “high” speed.

The **push-button panel**, when supplied, *has an emergency stop button*, which is red and mushroom-shaped, which activates the stop function when pressed right down.

To allow the hoist to work it is necessary to bring the **emergency stop** button to its most “raised” position and then push the start **buttons**. The push-button panel can be used by the operator on the ground while following the translation movement of the trolley. The hoist can also be controlled through a remote-control system, the functions of the buttons are the same as the ones on the pendant push-button panel.




- *When the hoist is controlled using the remote-control the push-button panel is not attached to the hoist itself, therefore, the operator must always take the utmost care during manoeuvres and never lose sight of the work area or of the load being moved so as not to threaten his own safety and/or that of other people present*
- *It is forbidden to control the hoist and/or trolley while sitting or standing on it (fig. 103).*

### 5.1.2 Permitted loads, loads not permitted

The loads must:


- Be of a form, dimensions, mass, balancing and temperature suitable to the characteristics of the place in which they will be handled and they must be compatible with the performance of the hoist.
- Have suitable handling points and/or fitted with accessories which prevent accidental falls.
- Be stable and not subject to changing their static or physical configuration during handling.


|   |  |
|---|--|
|  | <p><i>Handling of the following loads is not permitted:</i></p> <ul style="list-style-type: none"> <li>• one with a weight greater than the nominal capacity of the hoist (fig. 104)</li> <li>• with an uneven mass with respect to the centre of gravity.</li> <li>• with surfaces which are not resistant enough to withstand the pressure of the hold.</li> <li>• those which are classified as dangerous (e.g. flammable, explosive, radioactive material), because of their chemico-physical characteristics.</li> <li>• harmful toxic materials or products, unless handled in suitable safety containers (e.g.: corrosive chemical products, products having biological risks, etc.).</li> <li>• loose foodstuffs, which may come into direct contact with parts of the hoist or with its lubricants.</li> <li>• those which may change their static and/or chemico-physical configuration or their centre of gravity during handling.</li> <li>• those without the accessories outlined in the following point.</li> </ul> |
|---|--|

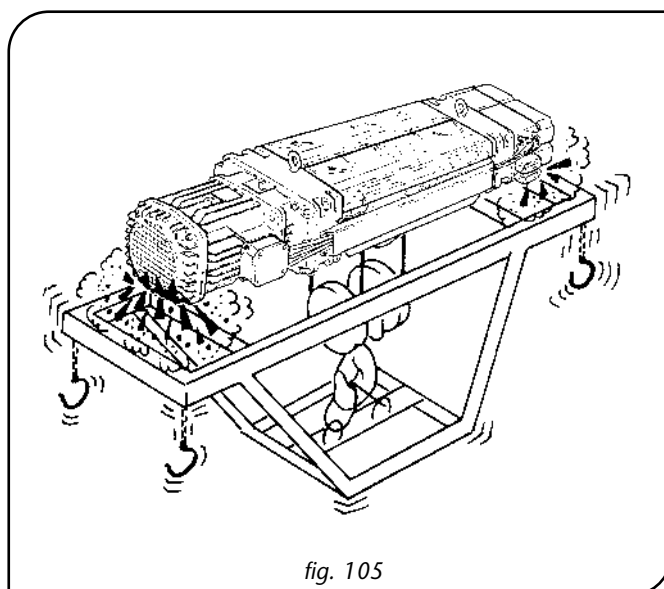
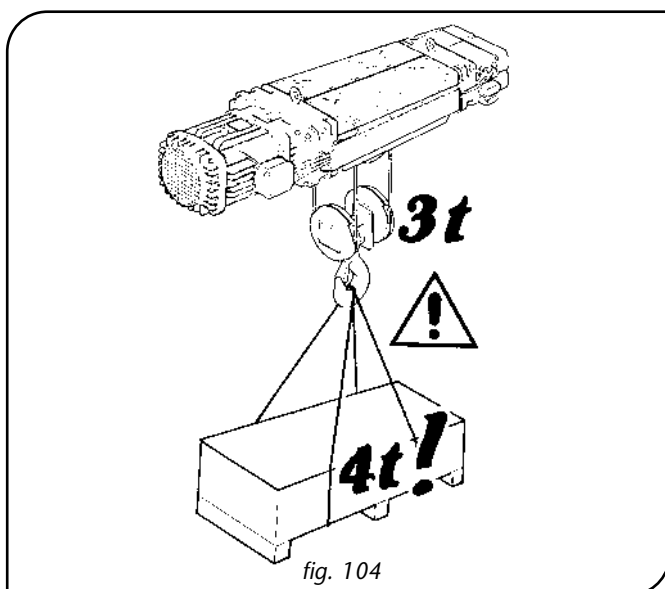
### 5.1.3 Lifting accessories

The following are usually allowed:

- Slings consisting of ropes and/or chains and/or strips made of textile fibres
- Lifting accessories which are located between the load and the lifting hook including: balances, plies, holdfasts, magnets and electromagnets, etc.
- The use of such accessories must strictly comply with the specifications supplied by the manufacturers.

|   |  |
|---|--|
|  | <p><i>The following accessories are not usually allowed:</i></p> <ul style="list-style-type: none"> <li>• those with functional characteristics which may provoke a level of dynamic stress superior to that admissible for the hoist or accidental overloading.</li> <li>• those which may collide with parts of the hoist or trolley (fig. 105).</li> <li>• those which compromise free handling of the load.</li> <li>• those which are connected to independent electrical lines.</li> </ul> |
|---|--|

|   |  |
|---|--|
|  | <p><i>The weight of the lifting accessories must be subtracted from the nominal capacity of the hoist.</i></p> |
|---|--|



## 5.2 Operating conditions

### 5.2.1 Operating environment

- The operating environment must have the following characteristics:
- **temperature:** min.  $-10^{\circ}\text{C}$ ; max.  $+40^{\circ}\text{C}$ , max. relative humidity 80%, maximum altitude 1000 m above sea level.
- **indoor use:** as the hoist is not exposed to atmospheric conditions no particular precautions need be taken.
- **outdoor use:** the hoist may be exposed to atmospheric conditions during and after use. The electric parts of the hoist and trolley have IP55 protection, however, protecting the hoist and trolley with a shelter of some kind is recommended (fig. 106).

To avoid oxidation protect the structure by using a suitable treatment and lubricating the mechanisms.



*In the standard version the hoist must not be used in environments or areas:*

- *With highly corrosive and/or abrasive vapours, smoke or dust (when this cannot be avoided intensify the maintenance cycles).*
- *Where there are flames and/or heat above the temperature permitted.*
- *With risks of fire or explosion and where flameproof and spark-proof components are required.*
- *Where strong electromagnetic fields are present which can generate an accumulation of electrostatic charge.*
- *In direct contact with loose foodstuffs.*

### 5.2.2 Danger zones and people exposed to risk

Danger zones are all areas, in any operative phase, where the people present can be subjected to a risk which constitutes a danger for their safety, health or psychophysical integrity. It is necessary to inform the **people potentially** exposed, that the hoist operator does not always work with sufficient visibility to prevent all potential risks of crushing, hitting and dragging. These people must, therefore, take care to avoid exposing themselves to such risks during manoeuvres in these areas (fig. 107).



*The purchaser must adequately signal danger zones to forbid or limit access by outside people or unauthorised staff in the areas where the hoist operates, as outlined by the current regulations in force.*

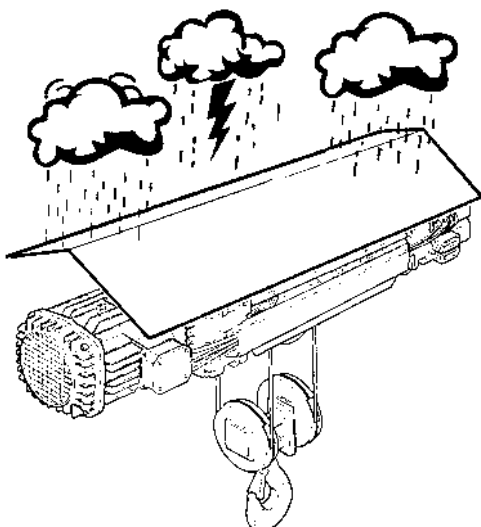


fig. 106

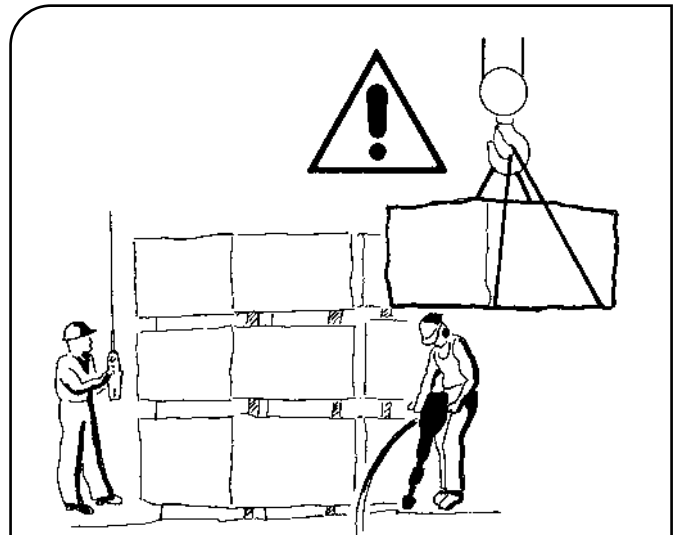




fig. 107

### 5.2.3 Illumination of the work area




The DRH electric rope hoist and relative trolley do not have their own lighting system. Therefore, the work place of the hoist operator must be adequately illuminated in order to guarantee maximum visibility.

|   |   |   |
|---|---|---|
|  | <ul style="list-style-type: none"> <li>• The level of illumination must guarantee the maximum level of safety possible for the operation of the hoist (fig. 108).</li> <li>• The installation of a supplementary lighting system is obligatory in zones with insufficient illumination, avoiding shadows which impede or reduce visibility in the operative and/or neighbouring areas.</li> </ul> |  |
|---|---|---|

### 5.2.4 The operator


The operators are all those who, from time to time, perform the following activities on the hoist:

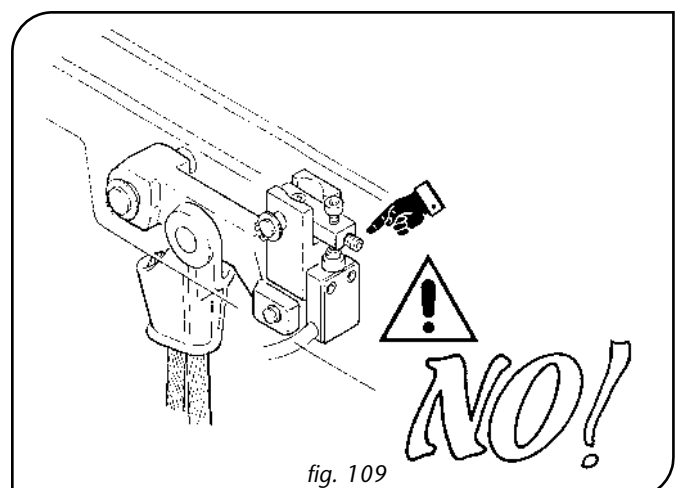
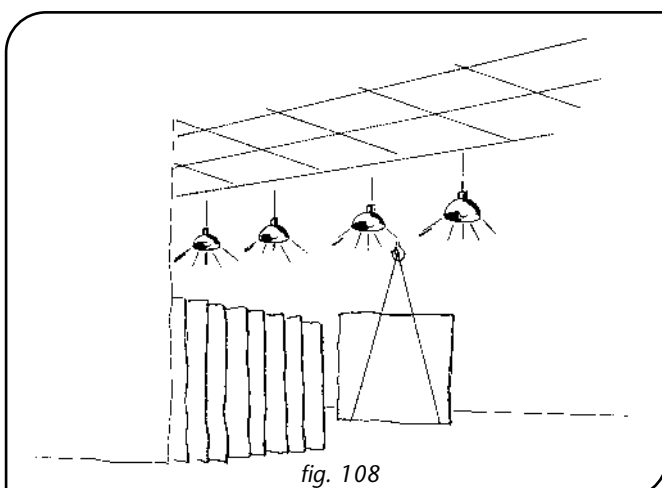
- transportation, handling, assembling, installation, regulation and testing
  - starting, use, cleaning, maintenance and repair
  - disassembly, dismantling, and demolition
- **The operators** must be people suited to the work and psychophysically able to cope with the demands connected to the activities related to the hoist during all operative phases and in particular during the slinging and handling phases.
  - **The hoist operator** must position himself so as not to compromise his own safety, foreseeing and/or preventing and, therefore, avoiding possible dropping of the load being transported, and dangerous movements. He must follow the specifications supplied to ensure maximum safety for himself and for others during use of the machine, in particular, he must strictly adhere to the specifications contained in this manual.

|   |  |  |
|---|--|--|
|  | <ul style="list-style-type: none"> <li>• The operator must not let anybody come near during the handling of the hoist and forbid the use to external people, in particular to people under 16 years of age.</li> <li>• The use of the hoist is forbidden to non-authorized or untrained people.</li> <li>• The operator must use suitable personal protection devices (D.P.I. = gloves, protective footwear).</li> </ul> | <br> |
|---|--|--|

### 5.2.5 The lifting capacity of the hoist

The lifting capacity of the hoist, in its original operative configuration, is clearly indicated on a plate attached to it and also to the hook block and is visible from the command post.

|   |   |
|---|---|
|  | <p><i>The loading capacity of the hoist and its accessories must never be overcome by applying overloads or modifying the settings of the loading limiter (fig. 109).</i></p> |
|---|---|



### 5.2.6 Manoeuvres

It is a good rule to perform one movement at a time, because only in this way can a manoeuvre be started, stopped and constantly followed by the operator, who also has to avoid continuously switching the machine on and off even for little movements.

- Engagement of the load by the hook of the hoist and by the lifting accessories must be carried out with great care, delicately and without jolting.
- Begin a lifting operation by slowly stretching the ropes until the load has been lifted by a few centimetres, stop the manoeuvre and check the hold and stability of the load.
- At the end of the manoeuvre, place the load on the ground carefully and remove the hook of the hoist.



- *Operate with care and diligence, follow the manoeuvre constantly and visually check the balance of the mass being moved.*
- *Avoid sharp or jolting movements which are very damaging to the stability of the load because of the dynamic effects which are generated.*
- *Never lift loads with an unbalanced and non barycentric engagement. Never neglect to hook the load and secure all original sling accessories. Do not secure the load with improvised slinging.*

### 5.2.7 Lifting

The operator must take care to always keep the lifting ropes stretched and never to let the hook rest on either the ground or the loads to be lifted. The loose ropes can become twisted, come out of the windings of the drum or out of the pulleys of the hook block, form knots, become even severely damaged and create sudden dangerous situations. The operator must absolutely avoid carrying out oblique pulls, which are always dangerous and difficult to control especially oblique pulls parallel to the axis of the drums. They can cause damage to the rope guide and slots of the drum resulting in irregular winding (fig.110).

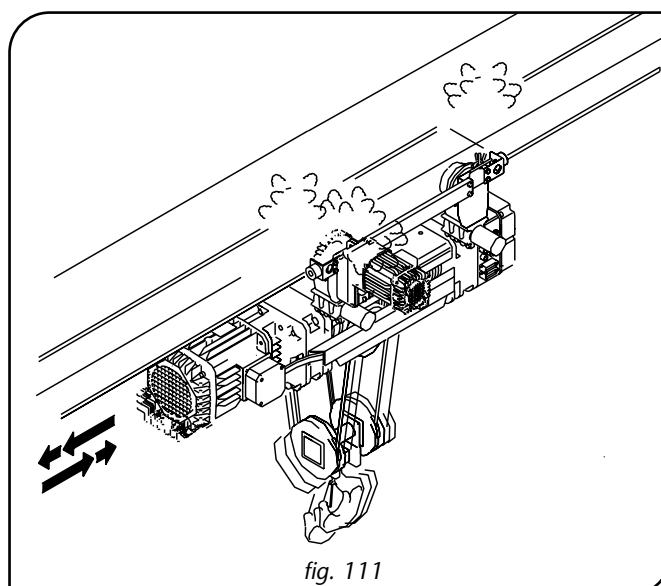
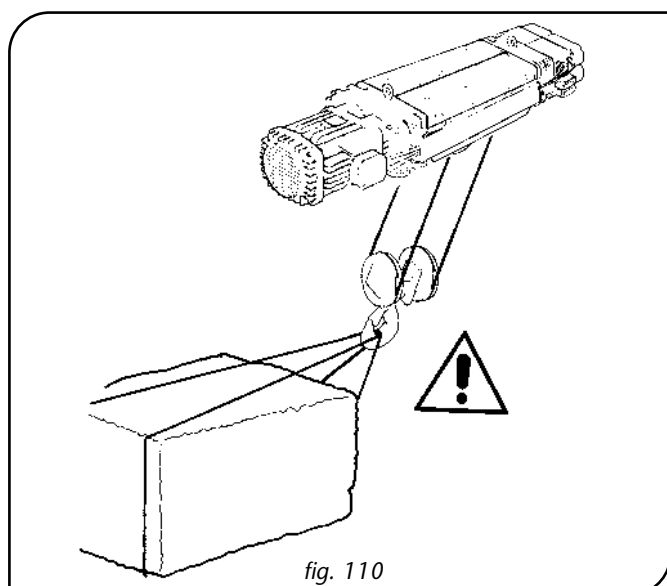


*Check the efficiency of the ropes and hooks periodically.*



### 5.2.8 The trolley translation

The travel limit switches are usually located near the end of the beam so as to maximise the travel of the trolley. Therefore, avoid, especially near the end of the beam, repeated short impulse translation manoeuvres and sudden changes of direction which, as well as causing damage to the mechanical organs, can also cause the load to swing dangerously with risks of hitting or violent collision between the trolley and the mechanical stops at the end of the beam (fig. 111).



### 5.2.9 Safety devices

Cutting out the power supply of the DRH rope hoist and relative trolley must be done by switching off the line switch-selector and/or by pushing the "emergency stop" button on the push-button panel.



An electric and/or mechanical lock prevents simultaneous use of commands for the two directions of the motors for both high and low speeds.

A lack of voltage causes all movements of the hoist and trolley to be stopped immediately, as the motors are equipped with an automatic braking device.



A safety latch is installed on the lifting hook to prevent accidental unhooking of the slinging and/or load (fig. 112).

The lifting and transverse limit switches bound the maximum vertical and horizontal travel of the hook. They are emergency devices and are not suitable for turning off the machine or to begin new operations.

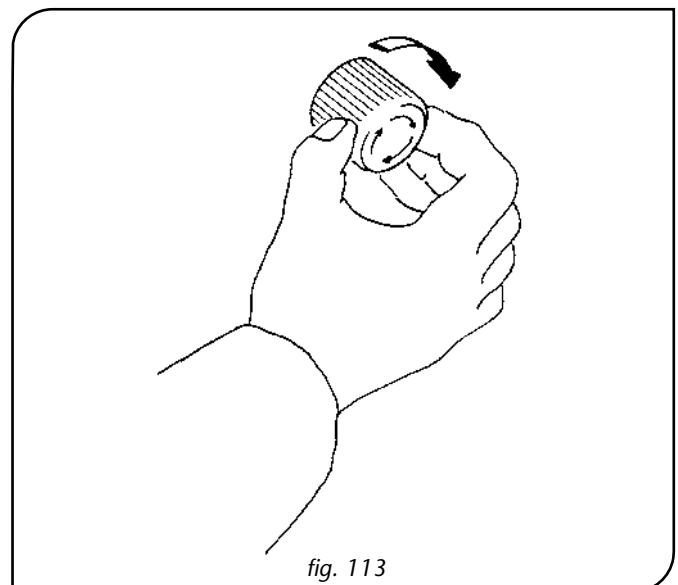
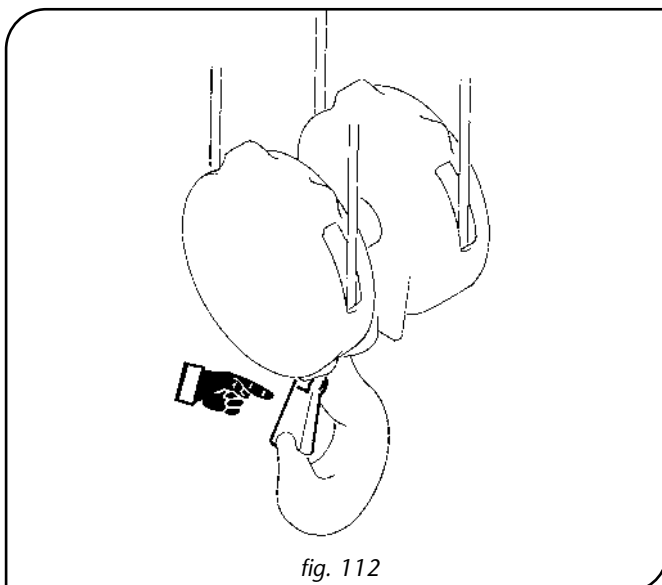
The overload device, prevents the use of hoist overload because, when its calibration values are exceeded, the control circuit of the micro switch of the device provides an electrical signal, in order to stop the dangerous movements. The calibration of overload device installed on DRH wire rope hoists, is within values corresponding to the rated capacity plus the following percentages: min. 20% and max. 25%.

|   |   |   |
|---|---|---|
|  | <ul style="list-style-type: none"> <li>• <i>When the safety devices are not supplied by DONATI SOLLEVAMENTI S.r.l., they must be installed by the purchaser.</i></li> <li>• <i>Use of the hoist and/or application of the CE mark, shown here on the right, is forbidden before the hoist has been completed according to the specifications detailed in this point.</i></li> </ul> |  |
|---|---|---|

### 5.3 Setting up – Starting the hoist

|   |   |   |
|---|---|---|
|  | <p><i>To begin operational activities carry out the following operations:</i></p> |  |
|---|---|---|

1. Visually check the integrity of the DRH rope hoist, trolley and other structures if installed. Pay particular attention to the rope, hook and related safety latch.
2. Carry out all preliminary checks as described in paragraph 5.5 "Criteria and precautions of use"
3. Turn on the power supply by putting the main switch in the "ON" or "1" position
4. Ensure that no people are exposed in danger zones
5. Place the red mushroom-shaped "emergency stop" button in the position which allows movement (fig. 113)
6. Activate all functions by pushing, if available, the "forward" button, and at the beginning of manoeuvres use the "alarm" button, if available, which activates an acoustic signal.
7. Verify proper functioning of the safety devices by checking the movements as described in paragraph 5.1 "Functions of the hoist".



## 5.4 Stopping the hoist – Switching off at the end of use

### Normal stopping:

- Normal stopping of the controlled functions simply requires the relevant buttons to be released, which, by returning to the “0” position, stops all corresponding movements. They are instantly blocked and kept in a stable, safe state by the brakes of the motors.

### Emergency stopping:

- The emergency stop must be used only when danger conditions occur, which require the hoist to be immediately and completely stopped.

|  |   |  |
|--|---|--|
|  | <ul style="list-style-type: none"> <li>• If there are serious or unknown anomalies, stop the machine immediately by pushing the red mushroom-shaped emergency stop button located on the control panel and wait for the intervention of the technician responsible for the machine.</li> <li>• Do not use the emergency stop button for normal stopping of the controlled functions.</li> </ul> |  |
|--|---|--|

### Putting the machine back into operation after an emergency stop:

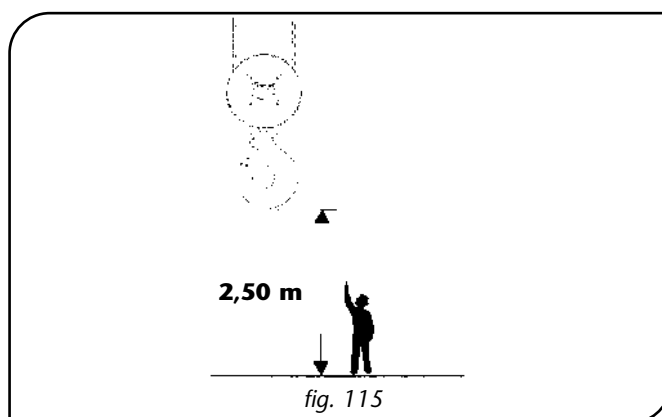
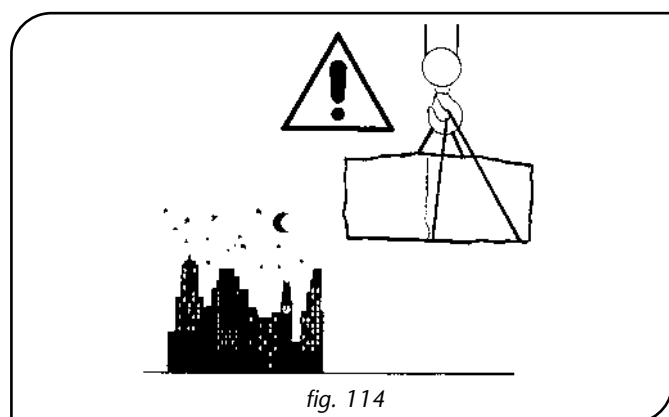
|  |   |  |
|--|---|--|
|  | In order to put the machine back into operation, after an emergency stop, it is necessary to: |  |
|--|---|--|

1. Remove the problems which caused the emergency stop.
2. Unlock the “emergency stop” button by returning it to the forward position.
3. Repeat the procedure described in points 6 and 7 in paragraph 5.3 “Setting up - Starting the hoist”.

### Stopping and shutting down the hoist at the end of work:

|  |   |  |
|--|---|--|
|  | To shut down the hoist at the end of work it is necessary to: |  |
|--|---|--|

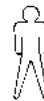
1. Set down the load in the decided place. Never leave the load suspended (fig. 114)
2. Free the lifting hook of any slinging used to move the load.
3. Position the hoist/trolley in the defined parking area for inoperative periods.
4. Lift the hook to a height of no less than 2.5 m so that it does not obstruct or create danger for people or things below the hoist (fig. 115).
5. Stop movements of the hoist by pushing the red mushroom-shaped “emergency stop” button right in.
6. Place the push-button panel out of the way so it does not constitute an obstruction.
7. Remove the voltage by turning off the line disconnecting switch – place the lever in the “0” or “OFF” position.



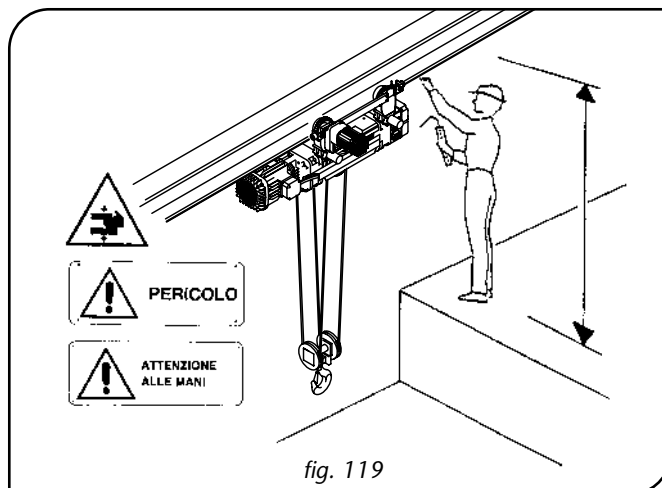
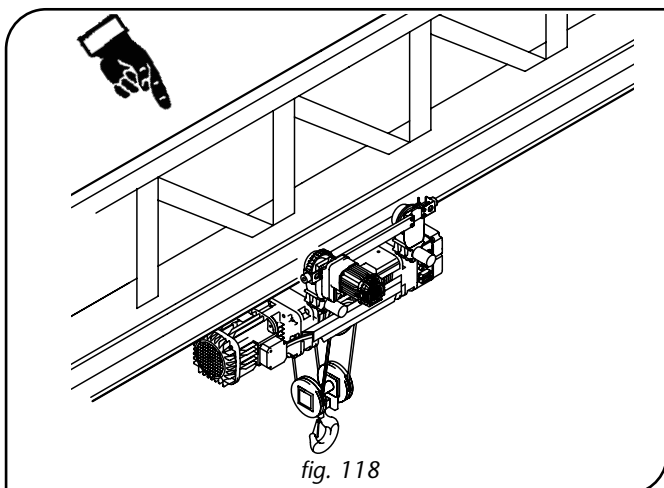
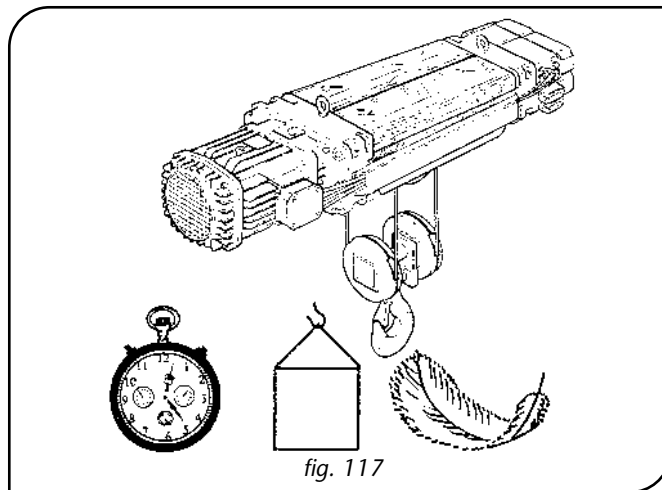
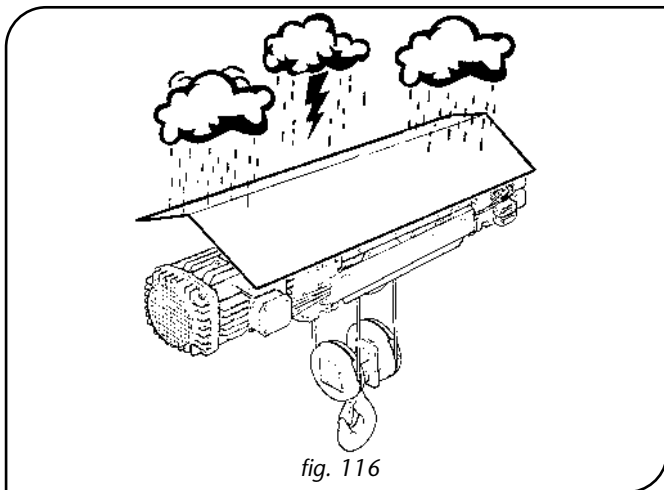
## 5.5 Criteria and precautions of use



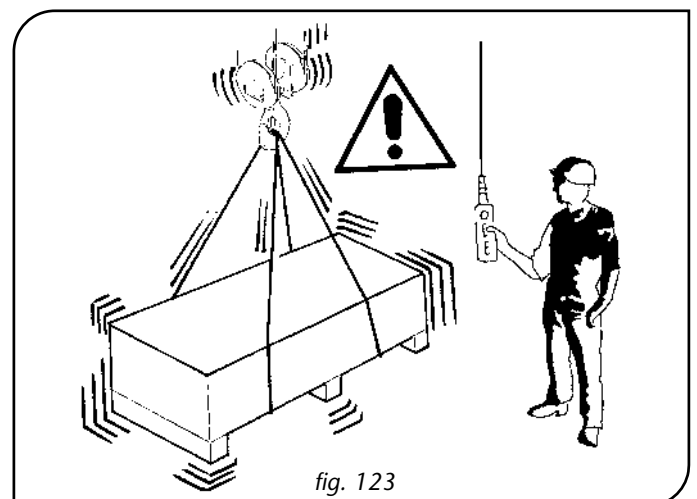
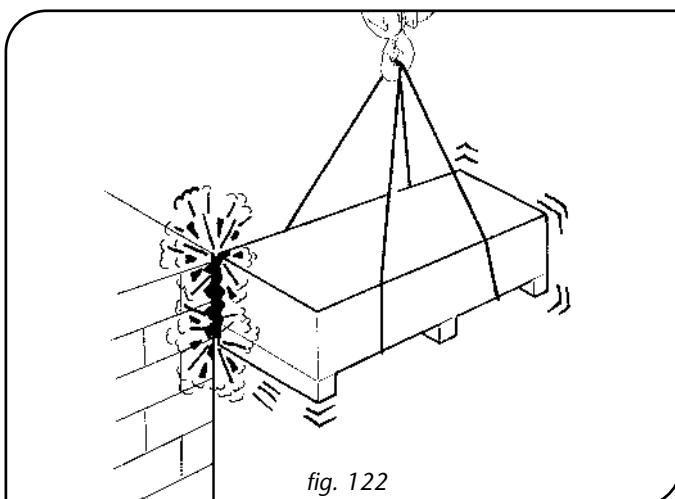
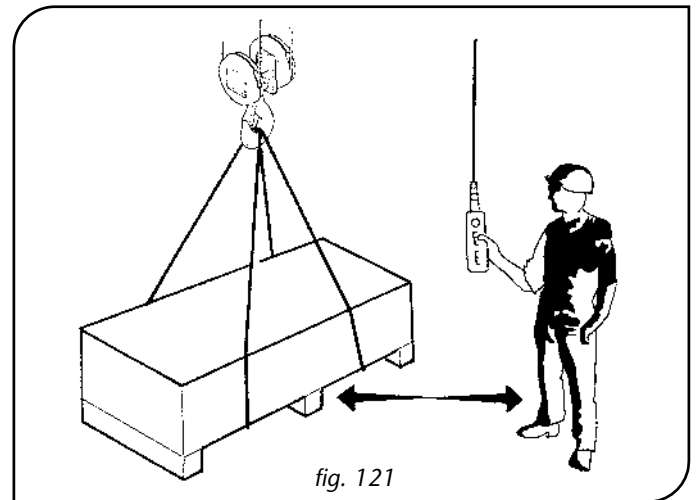
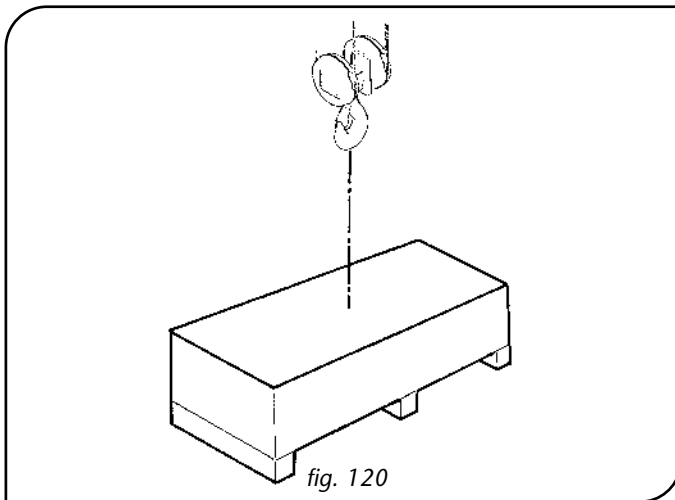
- *The correct use of the DRH electric rope hoists and of the relative trolleys guarantees the safe and full performance of the machine.*
- *These potentialities are only guaranteed if the following instructions are strictly adhered to:*



- **ALWAYS** follow the directions and instructions in the use and maintenance manual and check the integrity of the components and parts of the hoist.
- **ALWAYS** ensure that the hoist operates in an environment protected from atmospheric agents (rain, wind, snow, etc.), or, if in the open, that it has adequate shelter or protection (fig. 116).
- **ALWAYS** check that the capabilities of the hoist correspond with the job which needs to be done (work cycles – intermittence – duration of use – load to be moved) - (fig. 117).
- **ALWAYS** check the suitability of the structures which support the hoist and trolley (fig. 118).
- **ALWAYS** verify that the running girder is placed at a height which ensures that the operator cannot interfere with the body of the hoist. If this is not possible then appropriate shields or signs must be provided in the danger zone (fig. 119).
- **ALWAYS** verify, before performing the manoeuvre, that the area in which the trolley runs is free of obstacles.
- **ALWAYS** check that the level of maintenance of the hoist (cleanliness, lubrication) and its main components (ropes, hook, push-button panel, etc.) is acceptable.
- **ALWAYS** verify the suitability and functioning of the electrical wiring; in particular, check that the motors are functioning properly.
- **ALWAYS** verify correct response of the movements of the hoist and trolley.
- **ALWAYS** test the functioning of the “emergency stop” button.



- **ALWAYS** ensure that the hoist hook is centred on the perpendicular of the load before slinging and moving the load (fig. 120).
- **ALWAYS** appropriately secure the load slings to the lifting hook and stretch the slings with slow and safe moves.
- **ALWAYS** ensure that the hook is not worn, damaged or without spring catch.
- **ALWAYS** check the efficiency of the brakes and of the limit switches.
- **ALWAYS** operate outside the manoeuvring area of the lifted load (fig. 121).
- **ALWAYS** check the efficiency of ropes, blocks, hook and push-button panel and that they are all intact.
- **ALWAYS** signal the starting of the handling.
- **ALWAYS** ensure that during handling (lifting and translation) the load does not meet obstacles (fig. 122).
- **ALWAYS** operate in the best conditions as far as lightening and load visibility are concerned.
- **ALWAYS** carry out the handling avoiding jogging.
- **ALWAYS** avoid combinations of handlings, such as operating the lifting and the translation push-buttons at the same time and be careful not to cause hunting of the load (fig. 123).
- **ALWAYS** use "slow" speeds for approaching and positioning operations.
- **ALWAYS**, push the red "emergency stop" on the push-button panel before leaving the command post and switch off the cut-out switch.
- **ALWAYS** point out any functioning anomalies (defective performances, possible breakings, incorrect movements and unusual noise) to the person in charge of the specific department and put the machine out of service.
- **ALWAYS** follow the maintenance program and record, for each check, any specific observation regarding hooks, ropes, brakes and limit switches.



## 5.6 Constraints of use

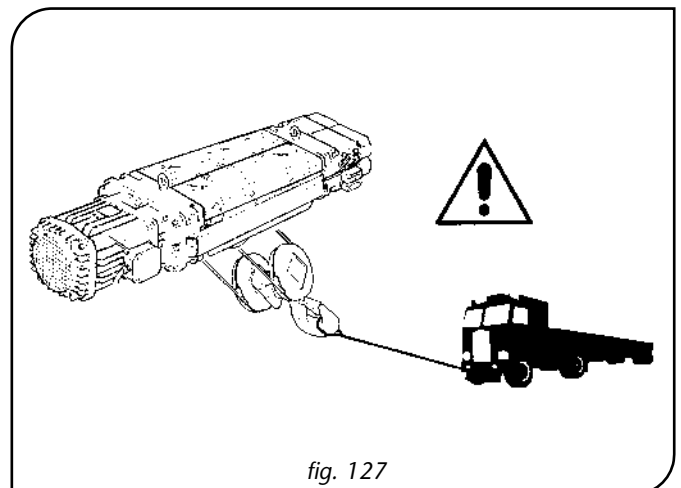
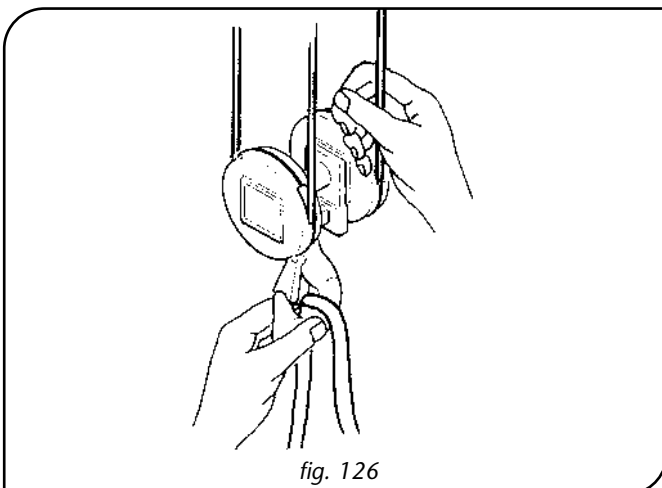
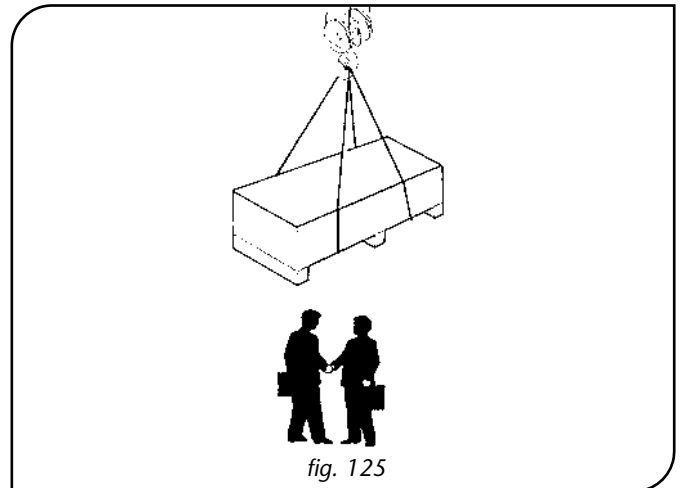
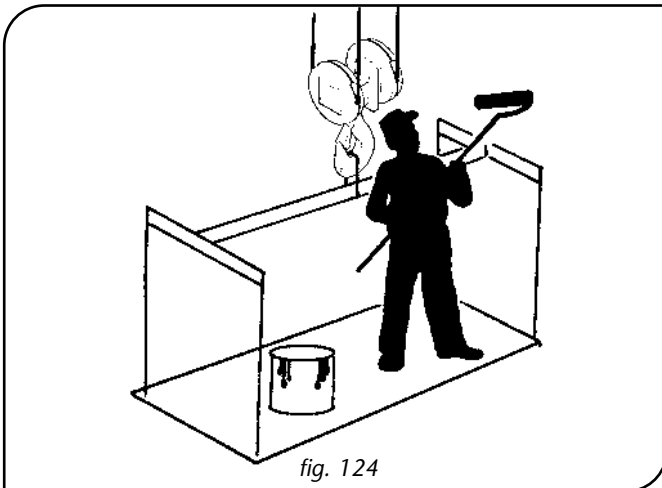


- *The use of the hoist for manoeuvres which are not permitted, improper use and a lack of maintenance can carry risks of danger for the health and safety of the operator and of the people in the area, as well as risks of damage for the work environment and can compromise the functionality and intrinsic safety of the machine.*
- *The actions described below, which obviously cannot cover the entire range of possible "bad uses" of the hoist, are the most predictable ones, and are absolutely forbidden:*

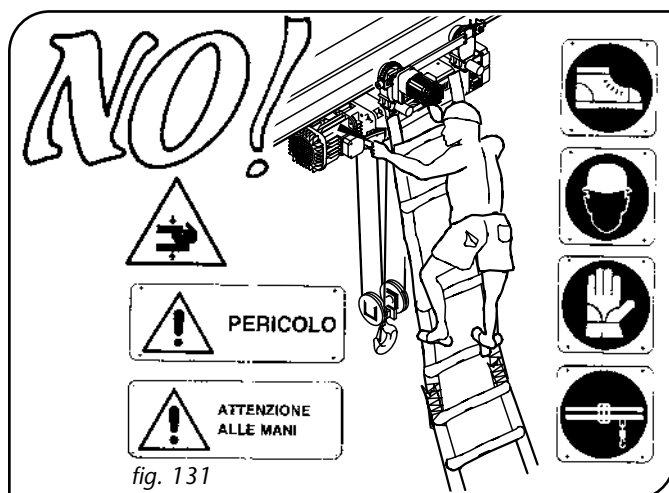
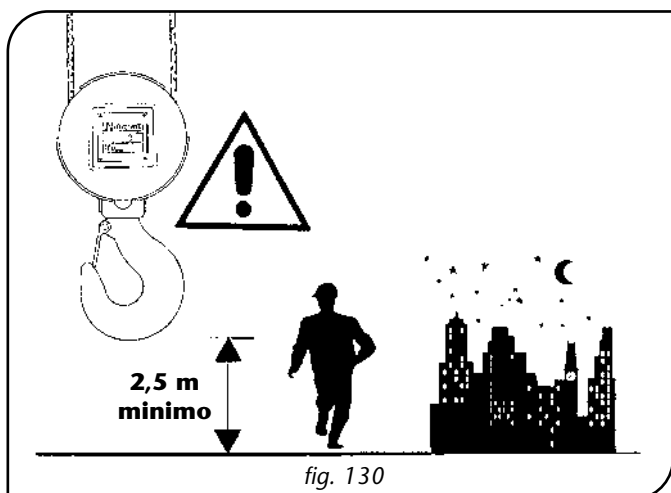
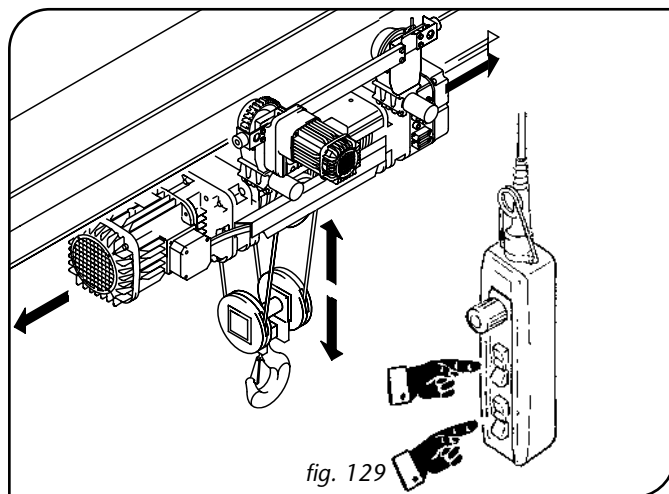
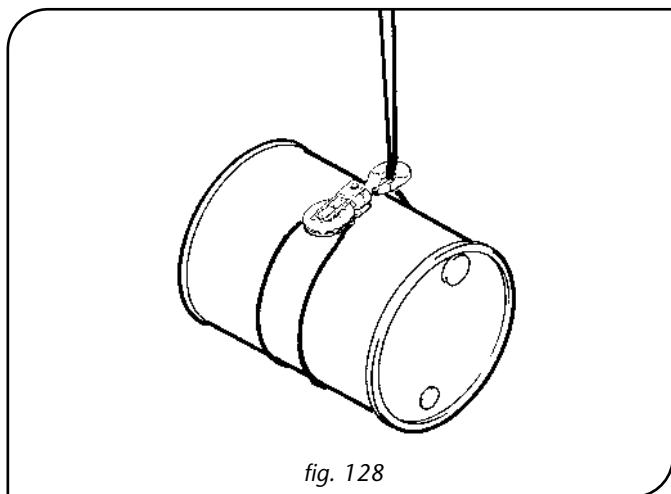


### 5.6.1 Use not intended and not allowed – Foreseeable and unforeseeable inappropriate use

- **NEVER** use the hoist to lift and transport people (fig. 124).
- **NEVER** stop, work, manoeuvre or pass under a suspended load (fig. 125).
- **NEVER** lift loads heavier than the nominal lifting capacity of the hoist.
- **NEVER** permit unqualified staff or under 16 years of age to use the hoist.
- **NEVER** use the hoist unless psychophysically suited to the work.
- **NEVER** use the hoist unless provided with suitable work clothes and/or personal protection.
- **NEVER** touch rotating pulleys, moving ropes, the "tightened" slings in contact with the load or between the hook and the slinging (fig. 126).
- **NEVER** operate without taking the necessary care during manoeuvres and handling.
- **NEVER** leave the load unattended.
- **NEVER** use the hoist for jobs other than those for which it was designed, do not use it for other operations such as painting ceilings, changing light bulbs, etc.
- **NEVER** allow the load or hook block to swing during translation.
- **NEVER** place the ropes in a diagonal position for pulling.
- **NEVER** pull or drag a mass with the hoist (fig. 127).



- **NEVER** use the lifting rope as slinging for the load (fig. 128).
- **NEVER** lift loads with the point of the hook.
- **NEVER** perform a hook run, after having positioned the load, in a way which causes the rope to wobble.
- **NEVER** employ two simultaneous movements when using the hoist or the trolley, wait until one movement has come to a complete stop before beginning another (fig. 129).
- **NEVER** leave the hoist exposed to atmospheric agents (rain, wind, snow, etc.) when work has been terminated.
- **NEVER** use the automatic limit switches continuously.
- **NEVER** employ the hoist when there is a large drop in the voltage or when one of the phases is lacking.
- **NEVER** perform sudden changes of direction during handling operations.
- **NEVER** press the control buttons on the push-button panel repeatedly.
- **NEVER** modify the functions or the characteristics of the hoist and/or its components.
- **NEVER** carry out temporary repairs or procedures for putting the machine back into operation which do not comply with the instructions.
- **NEVER** employ the hoist in areas where the use of flameproof component is required.
- **NEVER** tamper with the settings of the safety devices (limit switches and overload device).
- **NEVER** use non-original spare parts or spare parts which have not been recommended by the manufacturer.
- **NEVER** assign exceptional maintenance or repair work to staff not trained by the manufacturer.
- **NEVER** leave the hoist at the end of a job without having lifted the hook block and relative hook to a height no lower than 2.5 m (fig. 130).
- **NEVER**, during maintenance work: (fig. 131).
- lean ladders on the hoist or trolley.
- carry out work without having removed the load.



## ➤ 6. - MAINTENANCE OF THE HOIST ◀

### 6.1 Safety precautions

The precautions to prevent accidents contained in this paragraph must always be strictly adhered to during maintenance work, with the aim of avoiding damage to staff and to the hoist.

Such precautions are covered in greater detail in this chapter, whenever a procedure which may carry a risk of damage or accident is required, through **WARNING** and **DANGER** notes:



*WARNING notes precede an operation which, if not correctly carried out, may cause damage to the hoist and to the relative trolley.*



*DANGER notes precede an operation which, if not correctly carried out, may cause injury to the operator*

### 6.2 The qualifications of maintenance staff

Based on the requirements of **ISO 9927-1:1994**, maintenance of electric wire rope hoist series DRH and related trolleys, must be entrusted to maintainers of proven experience that, for their basic training, have adequate knowledge in the field of lifting equipment and are sufficiently familiar with the rules for determining the deviations from the conditions of operation of electric hoists and their components.



*All maintenance personnel must also:*

- *know the laws in force related to accident prevention during work carried out on machines with motor transmissions and be able to apply them*
- *have read and understood chapter 3 "Safety and Accident Prevention"*
- *recognise irregularities regarding functioning and when necessary take necessary measures to rectify them.*



*Special recommendations regarding maintenance:*

1. If performed correctly maintenance work guarantees the safety of hoist operators and reduces downtime to a minimum after a breakdown.
2. Repairs carried out opportunistically prevent further deterioration of the hoist.
3. When possible always use original spare parts and products.





*Maintenance work must be carried out, when possible, while the hoist is not connected to the power supply and in safe conditions, using suitable tools and adequate personal protection devices, in accordance with the regulations in force, and affixing a sign with the warning: "MAINTENANCE WORK IN PROGRESS".*



*For problems which may come about or to order spare parts contact the DONATI SOLLEVAMENTI S.r.l. Technical Assistance Service.*

### 6.3 Maintenance plan



The maintenance plan includes ordinary types of work, such as inspections, checks and tests conducted by the operator and/or by qualified staff appointed for normal company maintenance and periodical maintenance, which includes replacement, adjustments and lubrication, carried out by technical staff trained for the job through specific courses and publications.



|   |   |   |
|---|---|---|
|  | <ul style="list-style-type: none"> <li>• As maintenance work can be carried out at a dangerous height, staff must have appropriate means of support (scaffolding, platform, ladders etc.) which allows the work to be performed in safe conditions.</li> <li>• Staff must also have suitable individual protection devices (D.P.I.).</li> </ul> |  |
|---|---|---|



#### 6.3.1 Daily and periodical maintenance

It includes maintenance work which can be performed directly by the hoist operator or by qualified staff, as instructed in this publication and/or in attached documentation, which do not require the use of special instruments or equipment.

Maintenance operations are divided into:

|   |  |   |
|---|--|---|
|  | <p><b>Daily intervention to be performed by the hoist operator:</b></p> <ul style="list-style-type: none"> <li>• general visual check</li> <li>• functional checks: motor tests, limit-switch tests, empty test runs, push-button tests of "stopping" and of the other functions of the push-button panel</li> <li>• check of the state of the wire rope and hook</li> </ul> |  |
|---|--|---|































|   |  |   |
|---|--|---|
|  | <p><b>Monthly intervention to be performed by qualified staff:</b></p> <ul style="list-style-type: none"> <li>• Visual check of every gear and for possible lubricant leakage</li> <li>• Function check of the break at full load</li> <li>• Check that anomalous noise and/or vibration are not present</li> <li>• See to the lubrication of the gears and limit switches to guarantee normal functioning and to limit wear</li> <li>• Check the functionality and integrity of the push-button panel and relative cable</li> </ul> |  |
|---|--|---|

|   |   |   |
|---|---|---|
|  | <p><b>Quarterly checks to be performed by qualified staff:</b></p> <ul style="list-style-type: none"> <li>• Check the efficiency and wear of the: hook, rope and rope guide</li> <li>• Check wear of rope drum and pulleys</li> <li>• Check wear of wheels, sprocket wheels, guide rollers of the trolley</li> <li>• Verify efficiency and functionality of overload switch</li> <li>• Visual check inside switchboard for the presence of dust</li> <li>• Check for oxidised contacts: to be covered, after cleaning, with a very thin layer of Vaseline</li> <li>• Check of lubrication of mobile trolley of any festooned cable and cable check</li> <li>• Check efficiency and integrity of electricity supply line and its components</li> <li>• Loaded check of motors and brakes and verify level of wear</li> </ul> |  |
|---|---|---|

### 6.3.2 Frequency and deadlines for maintenance work

The frequency of the following operations is for DRH hoists used in normal working conditions and is valid up to the M6 group (ISO norm 4301-1:1986) or 3 m (FEM rule 9.511/86).

If the hoist is used normally and correctly for a daily 8 hour shift, overhaul can take place after a period of about 10 years (FEM rule 9.755/93). If used during a number of shifts then the maintenance periods must be reduced proportionately.

| Table of periodic checks and maintenance            |  |  |   |   |      |
|---|--|--|---|---|------|
| Object of the check                                 | Verifiche periodiche   |  |   |   | Page |
|   | Daily  | Monthly  | Quarterly   | Annually  |      |
| Checks<br>Inspections - Testing                     |  General visual checks.<br>Verify good functioning    |  General visual inspections                                       |   Wear check |   Annual test | 70   |
| Structural elements<br>Welding<br>Pivots and hinges |  |  |   |  Wear and efficiency check<br>Check bolted and welded joints                                     | 86   |
| Rope<br>Securing elements                           |  Visual inspection                                  |  |  Wear and efficiency check   |   | 87   |
| Lifting hook  |  Visual inspection and check safety latch           |  |  Wear and efficiency check   |   | 89   |
| Hook block pulleys<br>Transmission pulleys          |  |  |  Wear and efficiency check   |   | 90   |
| Rope drum shell<br>Rope grip guide                  |  |  |  Wear and efficiency check   |   | 90   |
| Lifting reducer<br>Translation reducer              |  |  Noise check  |   |   | 91   |
| Lifting motor<br>Transverse motor                   |  Check correct functioning                          |  |  Loaded testing  |   | 91   |
| Lifting brake<br>Transverse brake                   |  Check correct functioning                          |  Loaded testing of braking distances                            |  Loaded testing<br>Wear check  |   | 92   |
| Wheels and sprockets<br>DST/S Guide rollers         |  |  |  Wear check  |   | 93   |
| Trolley<br>buffers                                  |  |  |   |  Wear and efficiency check   | 93   |
| Electrical system<br>Push-button panel and cable    |  Check correct functioning                          |  Visual inspection for external breakage pushbutton panel/cable |  Wear and efficiency check   |   | 94   |
| Overload switch                                     |  |  |  Loaded testing to verify operation  |  Calibration check   | 95   |
| Lifting limit switch<br>Translation limit switch    |  Check correct functioning                          |  |  Loaded testing<br>Wear and efficiency check   |   | 96   |
| Cleaning<br>and lubrication                         |  Check correct state of cleanliness and lubrication |  Inspection of general lubrication                              |  Leakage check<br>Lubricate ropes, hook and mechanisms                                       |   | 97   |

### 6.3.3 Check of efficiency of parts and components



For the individual parts of the DRH electric rope hoists and relative trolleys the following instructions must be strictly adhered to:



Annual check of the efficiency of structural elements, pivots and hinges (fig. 132):



- The metal structures, as well as normal alterations due to environmental factors and wear of mobile parts (hinges), can be subject, even inadvertently or during handling operations, to bumps, contact or grazing with other equipment or to anomalous strain which can cause damage to the frames, welding and pivots. Therefore, after careful cleaning, the structures must periodically undergo scrupulous checks to ensure their suitability and if necessary, any damage be remedied.
- The brackets, composed of plates and pivot, which form hinged elements, are subject to wear as they are mobile, swinging elements exposed to sliding friction in the areas of contact. If excessive wear is found, substitute them during the check.
- All screw bolts, high resistance plugs and pins must be disassembled and carefully checked annually, and so must the relative seating.



Repair or substitute hinged parts where one finds:

- **deformation:** lengthening, crushing, staining, bending
- **wear:** worn parts, scarcement, incisions, abrasions, corrosion, oxidation, scratching, peeling point
- **breakage:** cracks in the welding, cracking, cuts or incisions, broken parts
- **variation of a section  $\geq 10\%$ , or of the diameter or thickness  $\geq 5\%$  compared to initial values.**

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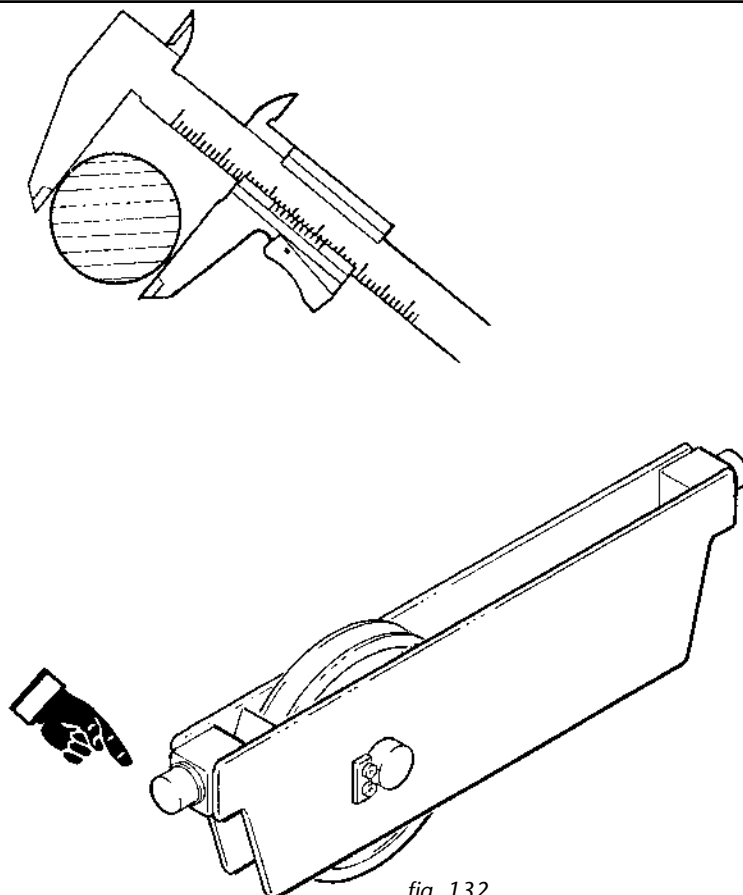


fig. 132



Quarterly check of efficiency of the lifting rope and of the fixing elements (anchorage with wedge) - (fig. 133):



• **Rope check:**

- The rope and rope guide undergo wear
- Check the state of the rope to localise any degradation
- Regular lubrication will lengthen its life
- It is often possible to improve a rope performance by ascertaining what causes deterioration by examining used ropes.
- During inspections it is worthwhile to carefully examine the parts of the rope which wind around the pulleys and which are near the fixing points at the ends
- Record in the checks register the date and results of the examination so that in the future, the time when the rope will have to be replaced can be predicted
- The decision to replace the rope, in accordance with the ISO 4309:2004, must be determined by the number and position of breaks in the threads which make up the strands, by the level of wear and corrosion and by other relevant damage or lacerations
- The breaks are often difficult to see as the ends of the broken threads stay in the original position and do not stick out from the surface of the rope
- In order to find these breaks it is necessary to remove the lubricant which covers the rope, scrape a piece of soft wood along the length of it and, if possible, bend the rope by hand, in order to force the ends of the threads to stick up and become visible
- Perform a check "with no load" so that detecting a break is easier
- Check for any deformations of the rope, which may be of helicoidal type; with a reduced diameter concentrated in short lengths; with local flattening of the rope or angular deformations due to external causes of high intensity. In the first situation the deformation causes irregular movements of the rope during dragging, these movements are the main cause of increased wear and breakage of the threads, the second situation is frequently found at the anchorage points at the ends of the rope.

• **During rope inspections check for (see ISO 4309:2004):**

- **The number of broken threads**
- **Any reduction in the diameter of the rope**
- **Corrosion and wear of the rope**
- **Deformation of the rope**
- **Any effects which may have been caused by heat exposure**



- **The rope must be replaced if it shows (see ISO standard 4309:2004):**
  - a reduction in the diameter  $\geq 7\%$  due to corrosion and wear
  - one or more broken strands
  - deformation with: permanent bends, flattening etc.
  - the rope core coming out
  - one or more strands which are loose or sticking out even when under strain
  - the total number of broken threads, in a length = to 6 diameter,  $\geq 10\%$  of the number of threads in the external strand (see "rope formation" - fig. 133)
  - alterations caused by unusual thermal input (recognisable externally by the annealed iron colour that the rope assumes)
  - **PF** for the characteristics of the rope of the DRH hoists see table (fig. 133).
  - **During rope checks, the operator must wear gloves in order to avoid the danger of pricking or perforation due to contact with broke threads!**
  - **For rope replacement see point 6.6.1 "Replacing the wire ropes of the hoist"**
- **The fixing (anchorage with wedge) must be replaced if it shows:** deformation, wear, cuts, or necking, even if only in one point  $\geq 5\%$



Characteristics of the DRH hoist ropes (fig. 133)

| DRH | Ropes<br>Ø<br>(mm) | Rope<br>type:<br>- Crossed<br>- Right | Class | Breakage load<br>required<br>(kN)<br>(minimum<br>guaranteed) | Rope formation<br>(minimum required)<br>* | N°broken strands visible. Max.<br>admissible on a length of rope<br>equal to |                 | Length of the rope<br>(m) |                   |            |          |            |            |   |    |    |    |    |     |
|-----|--------------------|---------------------------------------|-------|--|---|--|-----------------|---------------------------|-------------------|------------|----------|------------|------------|---|----|----|----|----|-----|
|     |                    |                                       |       |  |   | 6<br>diameters   | 30<br>diameters | N°<br>falls               | Type of rope drum |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       |       |  |   |  |                 |                           | C                 | N          | L        | X1         | X2         |   |    |    |    |    |     |
| 1   | 7                  | Normal                                | B     | 30,4   | 114 strands Right/Left                    | 3  | 6               | 2<br>4                    | 20<br>21          | 28<br>29   | 53<br>41 | 72<br>61   | 94<br>81   |   |    |    |    |    |     |
|     |                    |                                       | M     | 42,1   | 152 strands Left                          | 3  | 6               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | A     | 48,1   | 145 strands Left                          | 3  | 6               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    | Antitwist                             | B     | 35,3   | 133 strands Right/Left                    | 2  | 4               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | A     | 48,8   | 133 strands Right/Left                    | 2  | 4               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | M     | 42,0   | 114 strands Right/Left                    | 6  | 12              |                           |                   |            |          |            |            |   |    |    |    |    |     |
| 2   | 8                  | Normal                                | M     | 42,0   | 114 strands Right/Left                    | 6  | 12              | 2<br>4                    | 25<br>26,5        | 33<br>34,5 | 58<br>46 | 73<br>62,5 | 91<br>78,5 |   |    |    |    |    |     |
|     |                    |                                       | A     | 61,6   | 152 strands Right/Left                    | 3  | 6               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | M     | 46,1   | 133 strands Right/Left                    | 2  | 4               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    | Antitwist                             | A     | 60,5   | 133 strands Right/Left                    | 2  | 4               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | B     | 53,1   | 114 strands Right/Left                    | 3  | 6               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | M     | 69,6   | 200 strands Left                          | 3  | 6               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     | 9                  | Normal                                | M     | 69,6   | 200 strands Left                          | 3  | 6               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | A     | 74,6   | 145 strands Left                          | 3  | 6               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | M     | 58,4   | 133 strands Right/Left                    | 2  | 4               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    | Antitwist                             | A     | 76,6   | 133 strands Right/Left                    | 2  | 4               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | M     | 121,7  | 216 strands Right/Left                    | 14   | 29              |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | A     | 138,7  | 227 strands Right/Left                    | 13   | 26              |                           |                   |            |          |            |            |   |    |    |    |    |     |
| 3   | 12                 | Normal                                | M     | 121,7  | 216 strands Right/Left                    | 14   | 29              | 2<br>4<br>6<br>8          | 26<br>28          | 34<br>36   | 62<br>48 | 80<br>64   | 100<br>84  |   |    |    |    |    |     |
|     |                    |                                       | A     | 136,2  | 133 strands Right/Left                    | 2  | 4               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | M     | 102,0  | 114 strands Right/Left                    | 5  | 10              |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    | Antitwist                             | A     | 136,2  | 133 strands Right/Left                    | 2  | 4               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | B     | 102,0  | 114 strands Right/Left                    | 5  | 10              |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | M     | 142,5  | 216 strands Left                          | 7  | 14              |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     | 13                 | Normal                                | M     | 142,5  | 216 strands Left                          | 7  | 14              |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | A     | 163,4  | 145 strands Left                          | 3  | 6               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | A1    | 154,0  | 216 strands Left                          | 9  | 18              |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    | Antitwist                             | B     | 121,8  | 133 strands Right/Left                    | 2  | 4               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | A     | 159,8  | 133 strands Right/Left                    | 2  | 4               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | M     | 189,7  | 216 strands Right/Left                    | 14   | 29              |                           |                   |            |          |            |            |   |    |    |    |    |     |
| 4   | 15                 | Normal                                | M     | 189,7  | 216 strands Right/Left                    | 14   | 29              | 2<br>4<br>6<br>8          | 32<br>34          | 40<br>42,5 | 72<br>54 | 98<br>78   | 124<br>106 |   |    |    |    |    |     |
|     |                    |                                       | A     | 219,2  | 253 strands Right/Left                    | 14   | 29              |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | M     | 176,9  | 216 strands Right/Left                    | 7  | 14              |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    | Antitwist                             | A     | 212,7  | 133 strands Right/Left                    | 2  | 4               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | B     | 176,9  | 216 strands Right/Left                    | 7  | 14              |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | M     | 215,9  | 216 strands Left                          | 7  | 14              |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     | 16                 | Normal                                | M     | 215,9  | 216 strands Left                          | 7  | 14              |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | A     | 236,0  | 216 strands Left                          | 7  | 14              |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | A1    | 268,0  | 269 strands Left                          | 11   | 22              |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    | Antitwist                             | B     | 184,4  | 133 strands Right/Left                    | 2  | 4               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | M     | 242,1  | 133 strands Right/Left                    | 2  | 4               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     |                    |                                       | A     | 255,0  | 238 strands Right/Left                    | 2  | 4               |                           |                   |            |          |            |            |   |    |    |    |    |     |
|     | 16,2               | Normal                                | A     | 296,0  | 152 strands Left                          | 3  | 6               |                           |                   |            |          |            |            | 4 | 34 | 42 | 54 | 78 | 106 |

\* Left: only left cross lay.

Right/Left: left cross lay rope recommended, right cross lay rope acceptable.



Quarterly check of the efficiency of the lifting hook (fig. 134):



• The hook of the hook block must be examined and any anomalies related to the following, recorded:

- Deformation, lengthening, incisions, wear, corrosion, abrasion
- The integrity and functionality of the safety device on the hook (safety latch)
- Excessive friction, the hook must rotate and move freely in all directions with smooth movements and no jolting. If this is not the case it is necessary to dismantle it and examine the bearing.
- Wear of the area in contact with the slinging.

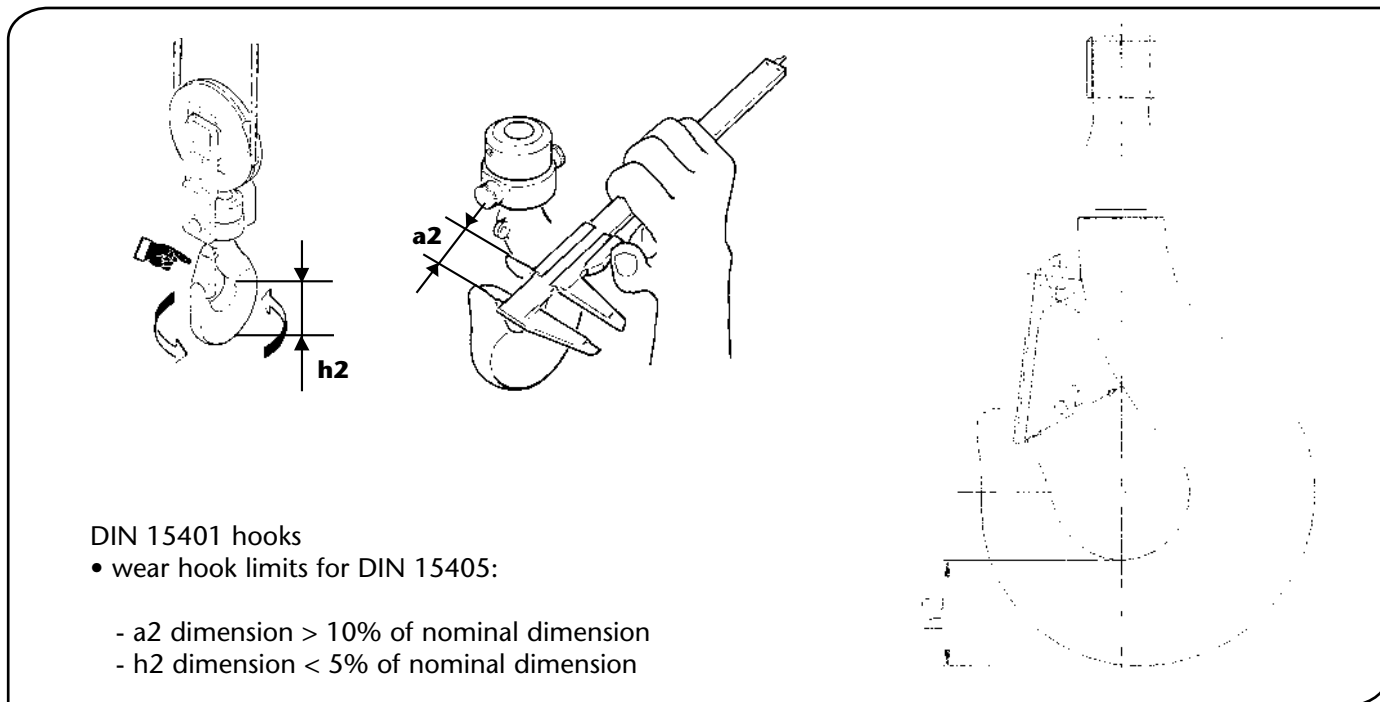


Substitute the hook when the following are found:

- permanent deformation of the opening with enlargement > 10%
- dimensional reductions in any point > 5%
- to check the dimensional characteristics of the hook see the table (fig. 134) (see also DIN regulation 15405)
- for replacement procedures contact the technical assistance service at DONATI SOLLEVAMENTI S.r.l.



Hook characteristics of DRH hoist (fig. 134)



DIN 15401 hooks

• wear hook limits for DIN 15405:

- a2 dimension > 10% of nominal dimension
- h2 dimension < 5% of nominal dimension

| Size DRH | N° Falls | Type of hook related to the capacity (kg) and FEM Group |         |          |         |          |         |          |         | Hook dimensions Dimension (mm) |     |    |
|----------|----------|---|---------|----------|---------|----------|---------|----------|---------|--------------------------------|-----|----|
|          |          | FEM 1Bm   |         | FEM 1Am  |         | FEM 2m   |         | FEM 3m   |         | a2                             | h2  |    |
|          |          | Capacity  | Type N° | Capacity | Type N° | Capacity | Type N° | Capacity | Type N° |                                |     |    |
| 1        | 2/1      | -   | -       | 1250     | -       | 1000     | -       | 800      | -       | 38                             | 37  |    |
|          |          | -   | -       | 1600     | 08V     | 1250     | 08V     | 1000     | 08V     |                                |     |    |
|          |          | -   | -       | 2000     | -       | 1600     | -       | 1250     | -       |                                |     |    |
|          | 4/1      | -   | -       | -        | 1600    | -        | 1250    | -        | 1000    | -                              | 45  | 48 |
|          |          | -   | -       | -        | 2000    | -        | 1600    | -        | 1250    | -                              |     |    |
|          |          | 3200  | 1.6V    | 2500     | 1.6V    | 2000     | 1.6V    | 1600     | 1.6V    |                                |     |    |
| -        |          | -   | 3200    | -        | 2500    | -        | 2000    | -        |         |                                |     |    |
| 2        | 2/1      | -   | -       | 1600     | -       | 1250     | -       | 1000     | -       | 45                             | 48  |    |
|          |          | -   | -       | 2000     | 1.6V    | 1600     | 1.6V    | 1250     | 1.6V    |                                |     |    |
|          |          | -   | -       | 2500     | -       | 2000     | -       | 1600     | -       |                                |     |    |
|          |          | -   | -       | 3200     | -       | 2500     | -       | 2000     | -       |                                |     |    |
|          | 4/1      | 5000  | 2.5T    | 3200     | 2.5T    | 2500     | 2.5T    | 2000     | 2.5T    | 50                             | 58  |    |
|          |          | -   | -       | 4000     | -       | 3200     | -       | 2500     | -       |                                |     |    |
| -        |          | -   | 5000    | 2.5T     | 4000    | 2.5T     | 3200    | 2.5T     |         |                                |     |    |
| 3        | 2/1      | -   | -       | 2500     | -       | 2000     | -       | 1600     | -       | 50                             | 58  |    |
|          |          | -   | -       | 3200     | 2.5T    | 2500     | 2.5T    | 2000     | 2.5T    |                                |     |    |
|          |          | -   | -       | 4000     | -       | 3200     | -       | 2500     | -       |                                |     |    |
|          |          | -   | -       | 5000     | -       | 4000     | -       | 3200     | -       |                                |     |    |
|          |          | -   | -       | 6300     | -       | 5000     | -       | 4000     | -       |                                |     |    |
|          |          | -   | -       | 6300     | 2.5T    | 5000     | 2.5T    | 4000     | 2.5T    |                                |     |    |
|          | 4/1      | -   | -       | 5000     | -       | 4000     | -       | 3200     | -       | 63                             | 75  |    |
|          |          | -   | -       | 6300     | 5T      | 5000     | 5T      | 4000     | 5T      |                                |     |    |
|          |          | 10000   | 5T      | 8000     | 5T      | 6300     | 5T      | 5000     | 5T      |                                |     |    |
|          |          | -   | -       | 10000    | -       | 8000     | -       | 6300     | -       |                                |     |    |
|          |          | -   | -       | 12500    | -       | 10000    | -       | 8000     | -       |                                |     |    |
|          |          | -   | -       | 12500    | 5T      | 10000    | 5T      | 8000     | 5T      |                                |     |    |
| 6/1      | -        | -   | 20000   | 10S      | 16000   | 10S      | -       | -        | 90      | 106                            |     |    |
| 8/1      | -        | -   | 25000   | 10S      | 20000   | 10S      | -       | -        |         |                                |     |    |
| 4        | 2/1      | -   | -       | 5000     | -       | 4000     | -       | 3200     | -       | 63                             | 75  |    |
|          |          | -   | -       | 6300     | 5T      | 5000     | 5T      | 4000     | 5T      |                                |     |    |
|          |          | -   | -       | 8000     | -       | 6300     | -       | 5000     | -       |                                |     |    |
|          |          | -   | -       | 10000    | -       | 8000     | -       | 6300     | -       |                                |     |    |
|          | 4/1      | -   | -       | 10000    | -       | 8000     | -       | 6300     | -       | 90                             | 106 |    |
|          |          | 16000   | 10P     | 12500    | 10P     | 10000    | 10P     | 8000     | 10P     |                                |     |    |
|          |          | -   | -       | 16000    | -       | 12500    | -       | 10000    | -       |                                |     |    |
|          |          | -   | -       | 20000    | -       | 16000    | -       | 12500    | -       |                                |     |    |
|          |          | 25000   | 10T     | 25000    | 10T     | 20000    | 10T     | -        | -       |                                |     |    |
|          | 6/1      | -   | -       | 32000    | 12T     | 25000    | 12T     | -        | -       | 100                            | 118 |    |
|          | -        | -   | -       | -        | 32000   | -        | -       | -        |         |                                |     |    |
|          | 50000    | 12T   | 40000   | 12T      | -       | -        | -       | -        |         |                                |     |    |
| 8/1      | -        | -   | -       | -        | 40000   | 12V      | -       | -        |         |                                |     |    |



Quarterly check of the efficiency of the pulleys (hook block and/return) - (fig. 135):



• The pulleys of the hook block or return must be examined in the following way:

- Examine every single pulley in rotation and ensure normal functioning; if anomalies are found, disassemble it and check the bearing
- Check for wear of the throat
- Check that the pulleys rotate freely. The pulleys of the hook block can easily be checked visually by observing the inclination during ascent and descent, with no load.



Substitute the pulleys if they show:

- a reduction of the diameter of the throat  $> 5\%$
- for replacement procedures contact the technical assistance service at DONATI SOLLEVAMENTI S.r.l.



Quarterly check of the efficiency of the rope drum shell/rope guide (fig. 136):



• Once cleaned, the rope drum must be carefully checked to verify:

- The tightening of the screws of the rope fixing clamp and the state of wear of the rope race of the rope drum
- The integrity of the thread of the drum, rope guide, slides and of the rope-grip spring
- That there is no clearance in the bearings, both in a radial and axial direction, by levering between the drum and the lower stay bolt
- Correct operation of the rope guide and of the bronze reaction arms. (There must not be excessive clearance or jolting movements)



- If worn, replace the components of the rope guide. (see point 6.6.1)
- It is forbidden to carry out corrective maintenance on the rope drums
- Any extra maintenance work on the rope drums must be carried out by the assistance service of DONATI SOLLEVAMENTI S.r.l. or by staff authorised by them.

DONATI TECHNICIAN



DONATI SERVICE

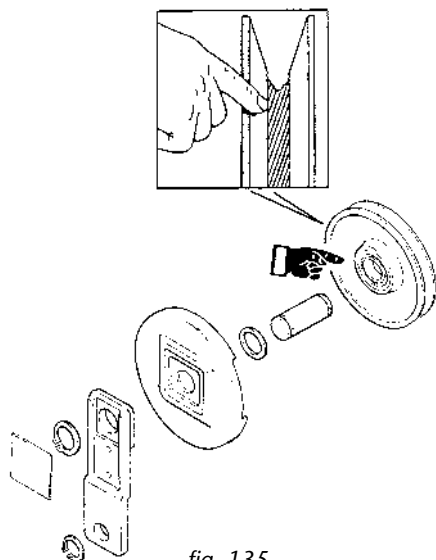


fig. 135

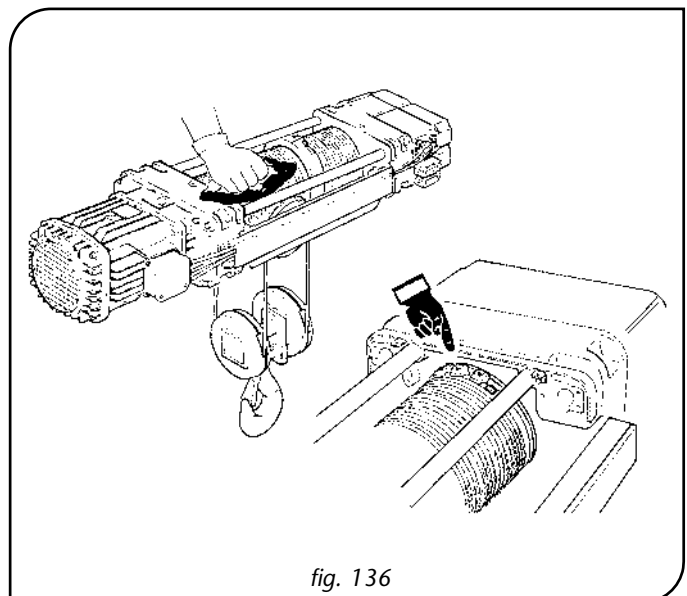


fig. 136



Monthly check of the efficiency of the hoist and trolley reducers (fig. 137):



- Check that the noise produced by the reducers does not show variations of intensity. Excessive vibrations or noise indicate wear of the teeth or bearing failure
- Check there are no lubricant leakages



**WARNING:**

- The reducers are lubricated for life and do not need any maintenance or lubricant added

**IN CASE OF ANOMALY:**

- It is forbidden to carry out corrective maintenance on the lifting or translation reducers
- Any extra maintenance work on the reducers must be carried out by the assistance service of DONATI SOLLEVAMENTI S.r.l. or by staff authorised by them

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DONATI SERVICE



Quarterly check of the efficiency of the hoist and trolley motors (fig. 138):



- Clean the motor of the hoist or trolley, eliminating dust from the casing which could hinder normal cooling; check that the ventilation inlets and outlets are not blocked
- Using a nominal load, check that no abnormal noises are heard (humming, rubbing)
- Check that the temperature of the casing does not reach more than 110°C. If it does, look for the causes and verify the operations which the hoist was made for (see point 6.7 "Breakdowns and solutions")
- Check the absorption and voltage by comparing them with the nominal values indicated on the plate of every motor (also see motor information in point 2.2.10 of this publication)



**IN CASE OF ANOMALY:**

- It is forbidden to carry out internal corrective maintenance on the lifting and transverse motors
- Any extra maintenance work on the lifting and transverse motors must be carried out by the assistance service of DONATI SOLLEVAMENTI S.r.l. or by staff authorised by them.

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DONATI SERVICE

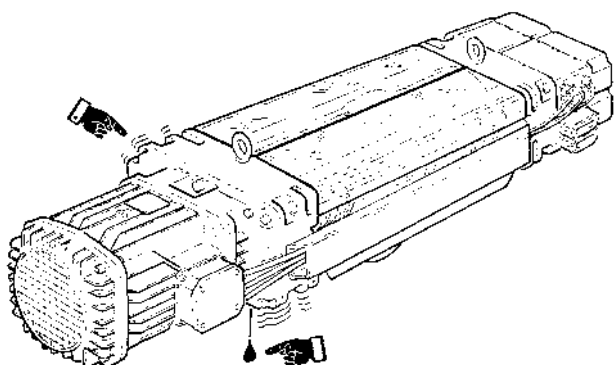


fig. 137

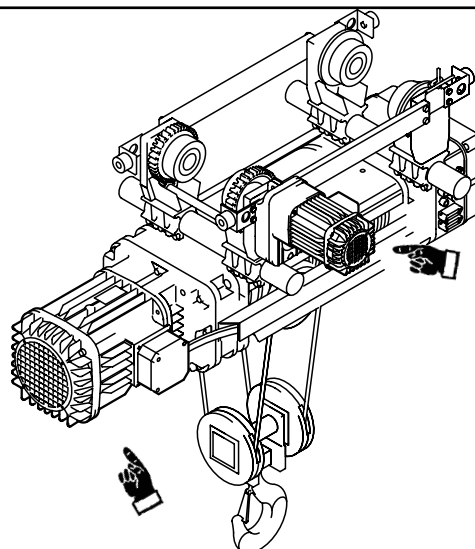


fig. 138



*Monthly check of braking distances.*



- Ensure that braking distances, with a nominal load, are not greater than those designated (fig. 139).



*When values greater than those in the table are found, see to the adjustment of the brake as described in paragraph 6.4 "Adjustments"*



|               |                    | Braking distance (mm) with nominal load |      |      |      |     |
|---------------|--------------------|---|------|------|------|-----|
| Hoist size => |                    | DRH1                                    | DRH2 | DRH3 | DRH4 |     |
| 2 falls       | Speed<br>12 m/min  | Maximum limit before adjustment         | 120  | 150  | 180  | 210 |
|               |                    | Best value following adjustment         | 40   | 50   | 60   | 70  |
|               | Speed<br>8 m/min   | Maximum limit before adjustment         | 90   | 120  | 150  | 180 |
|               |                    | Best value following adjustment         | 30   | 40   | 50   | 60  |
| 4 falls       | Speed<br>6 m/min   | Maximum limit before adjustment         | 60   | 75   | 90   | 105 |
|               |                    | Best value following adjustment         | 20   | 25   | 30   | 35  |
|               | Speed<br>4 m/min   | Maximum limit before adjustment         | 45   | 60   | 75   | 90  |
|               |                    | Best value following adjustment         | 15   | 20   | 25   | 30  |
| 6 falls       | Speed<br>2,7 m/min | Maximum limit before adjustment         | -    | -    | 50   | 60  |
|               |                    | Best value following adjustment         |      |      | 20   | 20  |
| 8 falls       | Speed<br>2 m/min   | Maximum limit before adjustment         | -    | -    | 40   | 45  |
|               |                    | Best value following adjustment         |      |      | 15   | 15  |

*fig. 139*



*Quarterly check of the efficiency of the hoist and trolley motors:*



- Check that the brake unlocks correctly whenever work has been done, ensuring that the rotor does not remain locked in by the brake and /or there is no rubbing present
- With a nominal load, check that the brake, once the push-button has been released, keeps the load suspended for at least 10 minutes without showing signs of it yielding or slipping. If slipping occurs, place the load on the ground, cut out the electricity supply and check for wear on the surfaces of the brake lining and of the brake block. Also check for any other anomalies
- When necessary, adjust the brake and/or replace the brake cover with brake lining as described in paragraphs 6.4 "Adjustments" and 6.6 "Replacement"



- *Replace the brake cover with a new brake lining when instability of the load is found, even after having adjusted the brake itself*

**IN CASE OF ANOMALY:**

- *It is forbidden to carry out corrective maintenance on the lifting and transverse self-braking motors*
- *Any extra maintenance work on the lifting and transverse motors must be carried out by the assistance service of DONATI SOLLEVAMENTI S.r.l. or by staff authorised by them.*

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*Quarterly checking of the efficiency of the wheels, sprockets and guide rollers (fig. 140):*



- Check the state of wear and tear on the edges and rotating bands of the travelling trolleys and of the guide rollers in the articulated version
- Check also ball bearings which need to be replaced where there is excessive noise or excessive friction, "jolting" rotation, difficult and/or irregular
- Check the state of wear and tear of the toothed crowns of the wheels and of the related sprockets the state of lubrication. Where necessary carry out lubrication of the gears after careful cleaning or on replacing both wheels and sprockets
- In the DRT trolleys with a transmission bar, check the keying clearance between wheel and bar and reducer; where there is clearance it is necessary to replace the bar and/or the wheels.



*Replace the wheels and/or guide rollers of the trolley if:*

- the thickness of the wheel edge is reduced by  $\geq 50\%$
- the rotation diameter of the wheel has wear of  $\geq 5$  mm
- the toothed crown of the wheel or sprocket shows heavy wear, in this case the transmission sprockets must also be replaced
- the rotating diameter of the roller shows wear  $\geq 2$  mm
- when it is necessary to replace the drive wheels, to obtain the best functional and duration guarantee, replacement of both the drive wheels and related sprockets is recommended
- for the procedure for replacing wheels, for all trolley types, see point 6.6 "Replacement of parts and components"



*Annual check of the efficiency of the trolley buffers (fig. 141):*

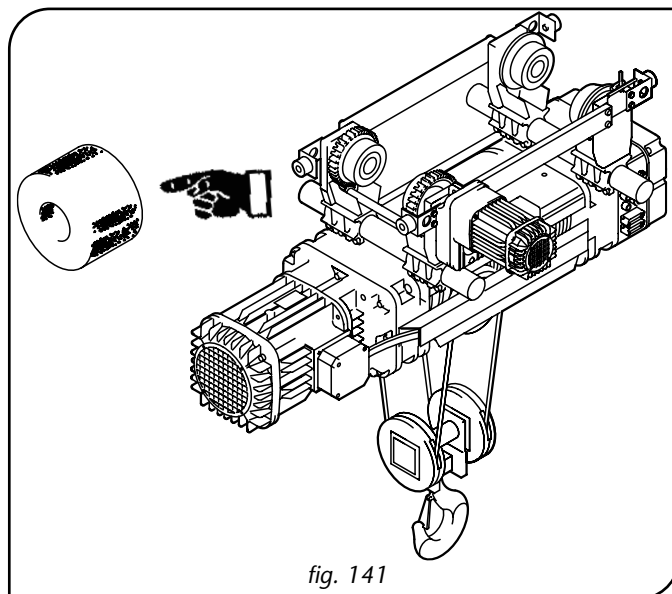
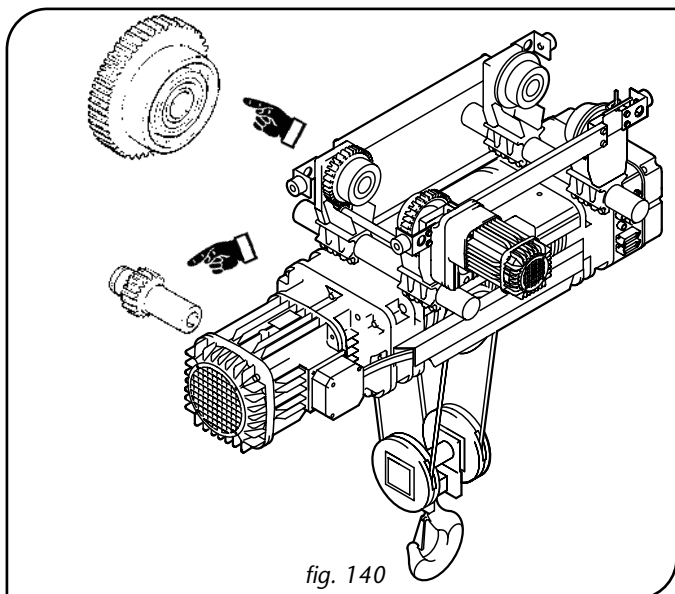


- Check that the end stops are not deformed and that there are no signs of sagging in their fixing to the structures and that the buffer is intact and fixed well to its support.



*Replace the buffers when there are:*

- signs of breaking or permanent deformation, cuts, abrasion, incisions





**Quarterly checking of the efficiency of the electrical control system (fig. 142):**  
 (in the case of the hoist and related trolley with incorporated BT control panel)  
**WARNING! Some of the operations described below are carried out with live power, operate with the maximum caution.**



- To carry out the internal check of the control apparatus, remove the screws -1- from the cover -2- Disactivate the motor fuses (fig. 142A). Remove the screws -3- which fix the panel -4- and take off the panel itself to allow access to the contactors located on the back (fig. 142B)
- Operating with the push-button panel, check that the moving parts of the contactors move with minimum friction; otherwise the force of the electromagnet could be insufficient to ensure good pressure between the contacts
- Check, to avoid uncertain contacts, heating or noises, that the current to the coils is of the correct value
- Check the efficiency of the conductors and the earthing connections, including the screws of the earth clamps, and if necessary fix them
- Check that the clamps are tightened well; check that the identification number is clearly visible and integral to the clamp; check the thermoinsulating material is intact and if there are cracks or breaking replace it immediately
- Prepare a regular stock of each type of fuse installed (see electrical circuit diagram), so as to replace a fuse rapidly when necessary
- Check all the holding gaskets of the covers and cable clamps
- Check that there is clear labelling on the cover.



- Do not hesitate to replace the electrical component, if it is no longer giving sufficient guarantee of functional reliability
- Never carry out improvised repairs
- Use original spare parts



**Monthly checking of the push-button panel and related cable**



- Check the state of conservation of the push-button panel, the functionality and efficiency of all the buttons, clean them and remove any sludge from the button casing. Check that labelling is legible. Check the holding gaskets.
- Check the state of conservation of the multipolar cable of the push-button panel and of all the flexible cables checking there are no cuts, abrasions, peeling and uncovered conductors. Ascertain the efficiency of the weak suspension ties of the push-button panel and of their correct fixing to the hoist body.



**Where there is breaking of the push-button panel, cuts and peeling of the cable, inform the electric maintenance officer for replacement.**

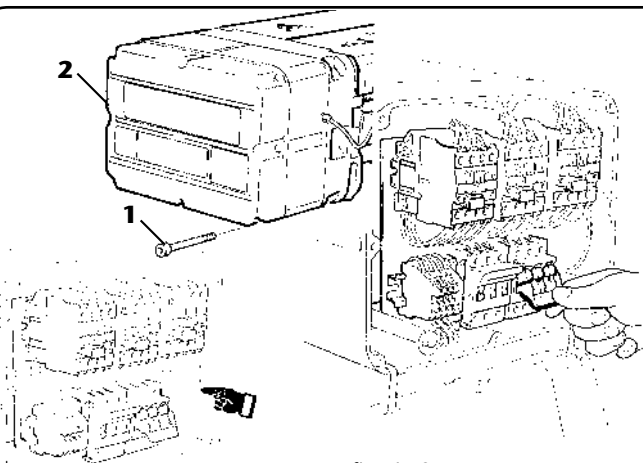


fig. 142a

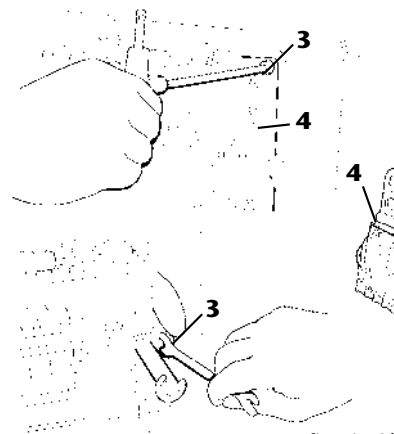


fig. 142

fig. 142b



Quarterly checking of the efficiency of the overload device (fig. 143):

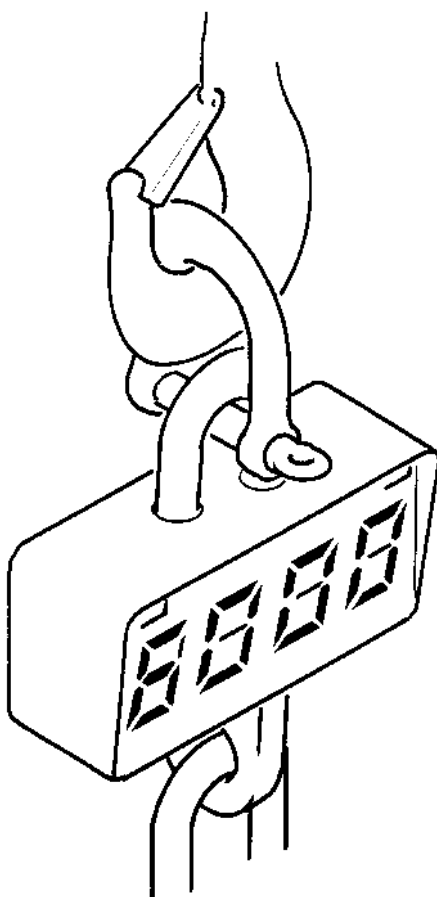


The hoist is fitted with an overload device control at an intervention threshold.

- The device is made up of an electromechanical lever-operated system, precalibrated pivots and springs which measure the deformations due to overload and act on the contact of micro switches, which open the power circuit of the coils of the control contactors of the electrical equipment.
- The intervention of the device signals the reaching of the maximum load limit admissible and if fitted with B.T. incorporated, stops all the functions (lifting and travelling) except that of descent.
- Check the correct intervention by checking that its functioning intervenes with a load between 120% and 125% of the nominal load.
- Repeat the operation several times checking the repetitivity of the release values.
- Check the mechanical integrity and the cleanliness of the mobile elements (lever and pivots) and check the correct tightening of the split pins and of the fixing screws of the micro switch.



- *The overload devices are controls which perform safety functions and their breakdown or malfunctioning can seriously threaten the safety of people exposed to them!*
- *The checking of the calibration value of the release limit of the intervention threshold of the overload device must be carried out, as prescribed by regulation FEM 9.761, at least once a year using known value weights duly preset and/or with the help of a charge cell with visualisation of the stress values*
- *Note in the checks register the values found following the annual calibration checks of the overload device.*
- *Do not tamper with or disconnect the overload device, or modify the preset calibration values*
- *If a new calibration of the device is necessary, this operation must be done by the assistance service of DONATI SOLLEVAMENTI S.r.l. or by staff authorised by DONATI SOLLEVAMENTI S.r.l.*



**EXAMPLE FOR A HOIST OF LIFTING CAPACITY 5000 kg**

**MAXIMUM LIMIT 6250 kg  
(5000 + 25%)**

**MINIMUM LIMIT 6000 kg  
(5000 + 20%)**

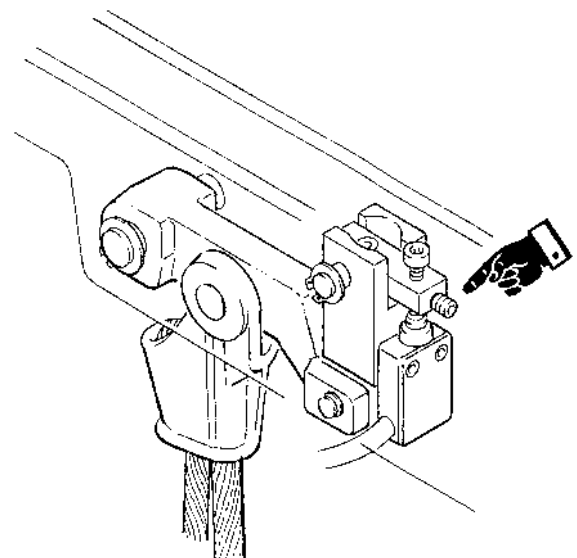


fig. 143



Quarterly checking of the efficiency of the hoist and trolley unit limit switches (fig. 144)



- Check the conservation state and the correct intervention (activate the limit switches several times) and in particular, their functioning during a normal manoeuvre at full load trying, when available, first at low speed
- Check the correct tightening of the cable clamps, covers and holding gaskets
- Check the mechanical integrity of the moving elements (lever and spring) and check the tightening of the fixing screws.



- **The limit switches are controls with safety functions and their breakdown or malfunctions can threaten the safety of people exposed to them!**
- **Do not hesitate to replace the limit switch under examination if it cannot ensure sufficient guarantee of functional reliability.**
- **Never carry out improvised repairs!**
- **Use original spare parts**

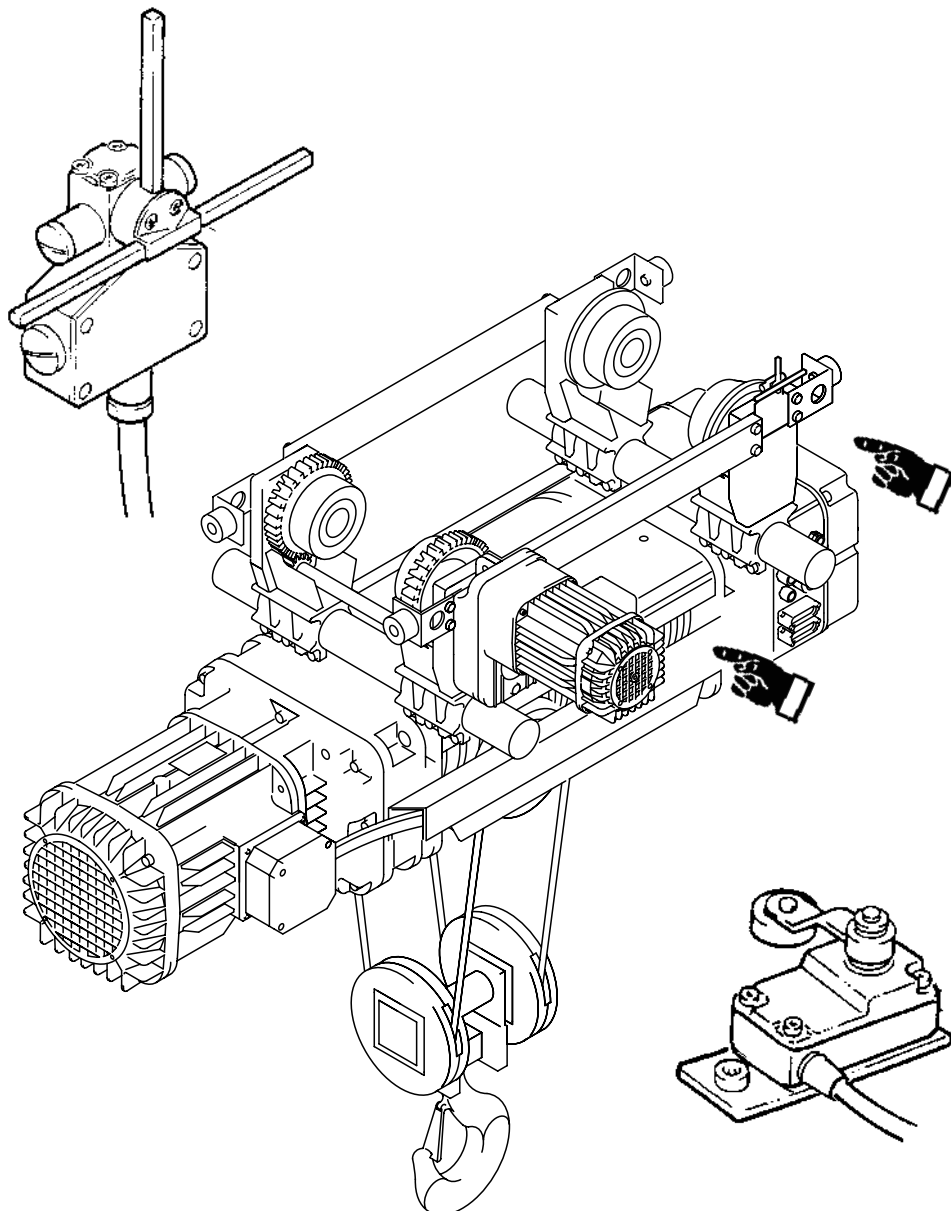






fig. 144

**6.3.4 Cleaning and lubrication of the hoist**


|   |  |   |
|---|--|---|
|  | <p><i>Cleaning can be carried out by staff who are not highly specialised.<br/>It is necessary periodically to keep the hook, the hook block and the push-button panel clean.<br/>Cleaning at a height must be carried out by qualified staff equipped with suitable means and personal protection measures.<br/>These operations are necessary every three months to allow the performing of the periodical checks.</i></p> |  |
|---|--|---|

- Cleaning can be simply done using means, equipment, and detergents and solvents commonly used in general cleaning operations of industrial equipment as there are no particular contraindications regarding the use of products or materials.
- Clean away any foreign fouling substances with aspirators, absorbent cloths, etc.
- Dry the grease and/or oil in excess on the parts.

|   |   |   |
|---|---|---|
|  | <p><i>The careful lubrication of the mechanism of the hoist is necessary to guarantee the efficient service the hoist is intended for, as well as its duration.</i></p> |  |
|---|---|---|

- In time the lubricating power diminishes due to the stress, so the reintroduction or renewal of the lubricants is necessary.
- The lubrication of the hoist is very simple and can be done following strictly the instructions contained in this manual.
- The hoist and trolley reducers are lubricated for life and do not need any lubricant replacing.
- Carry out the checks following the frequency shown in the following table "Periodical lubrication interventions" and using the types of lubricants recommended or corresponding to them, drying the superfluous oil or grease with a cloth.

| COMPONENT                    | TYPE OF LUBRICANT   |                       | FREQUENCY |
|------------------------------|---------------------|-----------------------|-----------|
|                              | OIL                 | GREASE                |           |
| Trolley wheels and sprockets |                     | Agip Blasia GR MU3    | 3 months  |
| Wire rope                    | Agip 360 EP/F       |                       | 3 months  |
| Drum and hook block pulleys  | Agip Blasia OIL 320 | or Agip Blasia GR MU3 | 3 months  |
| Stop bearing of hook         |                     | Agip Blasia GR MU3    | 3 months  |

|   |  |
|---|--|
|  | <ul style="list-style-type: none"> <li>• <i>Lubricants, solvents and detergents are products which are toxic or damaging to health</i></li> <li>• <i>If they come into direct contact with the skin they can cause irritation</i></li> <li>• <i>If inhaled they can cause serious poisoning</i></li> <li>• <i>If swallowed they can cause death</i></li> <li>• <i>Use them with care using adequate personal protection measures (DPI)</i><br/><i>Do not dump them, dispose of them in conformity with the legislative measures currently in force for toxic/harmful waste.</i></li> </ul> |
|---|--|

## 6.4 Setting and adjustments

### 6.4.1 Lifting brake adjustment (conical motor)



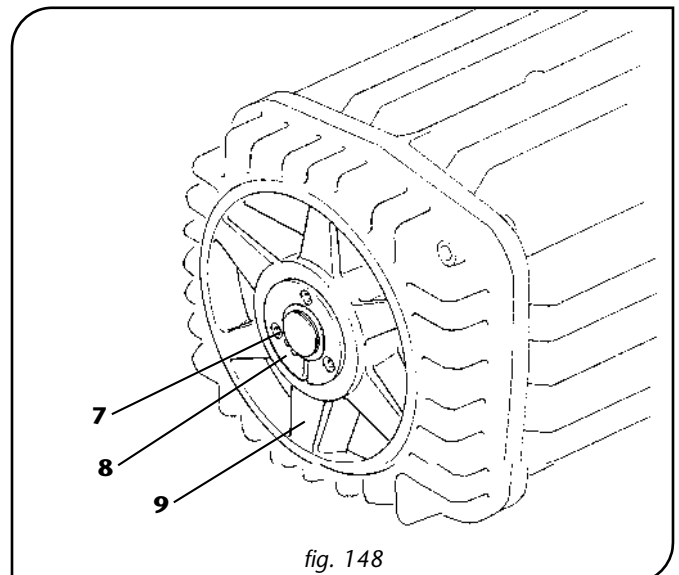
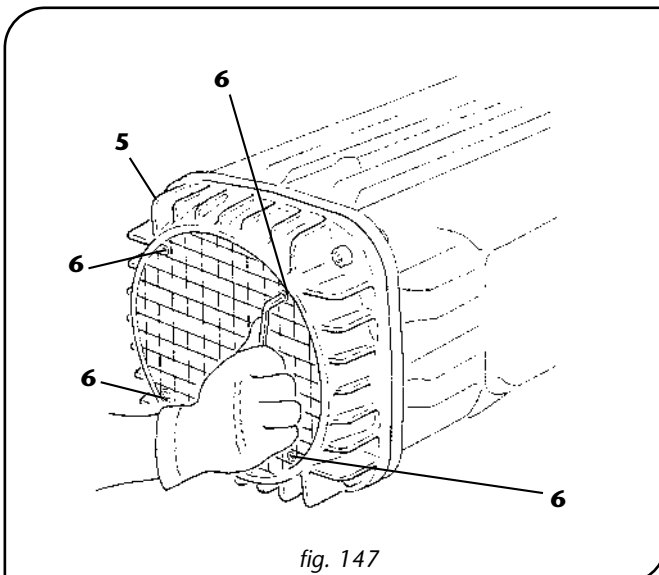
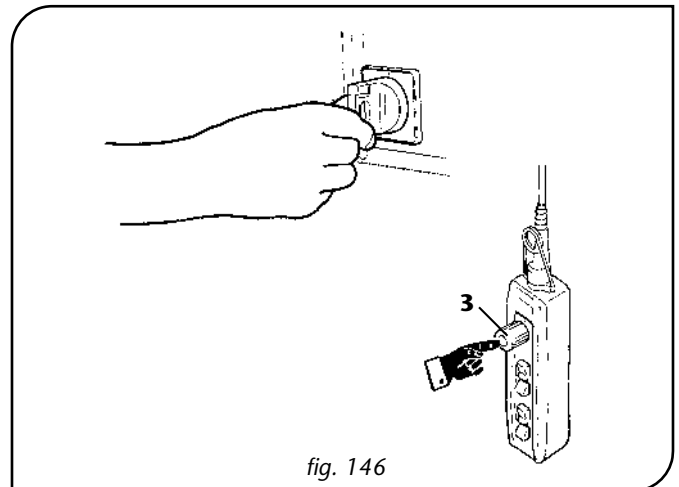
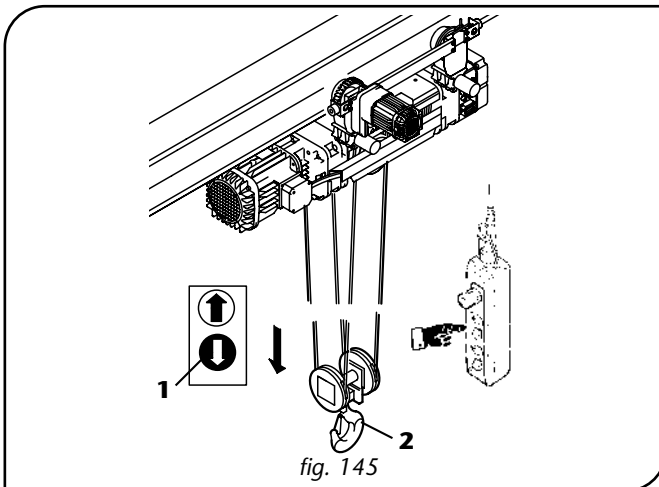
- The hoist motor is self-braking type with axial movement of the rotor.
- The braking is mechanical and ensured by a conical brake block integral with the rotor which, in a power failure, is pushed by a spring in contact with the brake lining of the brake cover.
- The asbestos-free brake lining are subjected to greater or lesser wear depending on the intensity of use.
- The wear on the brake lining increases the clearance between the gasket and the brake block. This involves a progressive loss of the braking couple with consequent slipping of the brake and lengthening of the braking spaces. For this reason the adjustment of the clearance of the brake could be necessary.



To set the hoist motor brake proceed as follows:

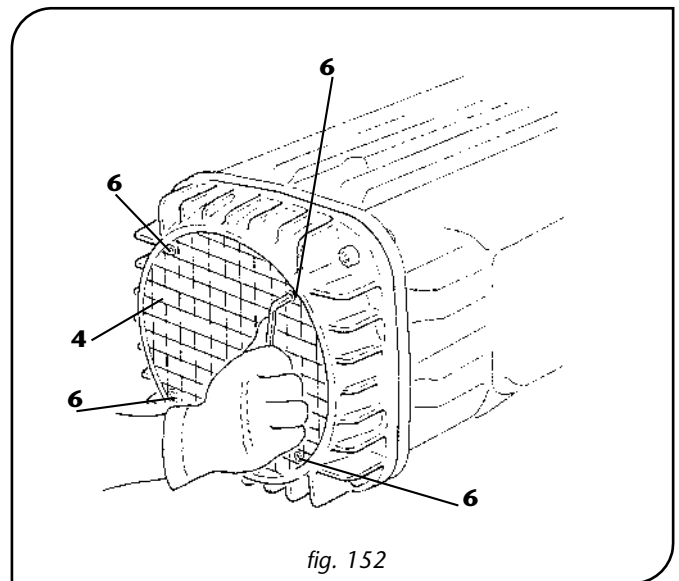
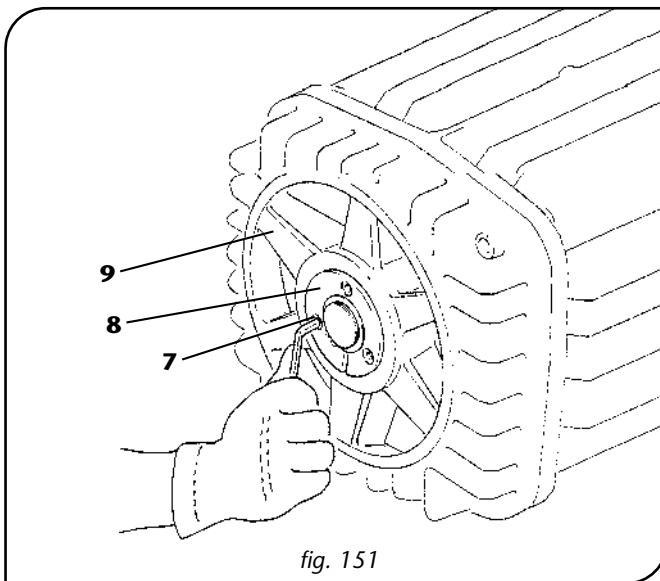
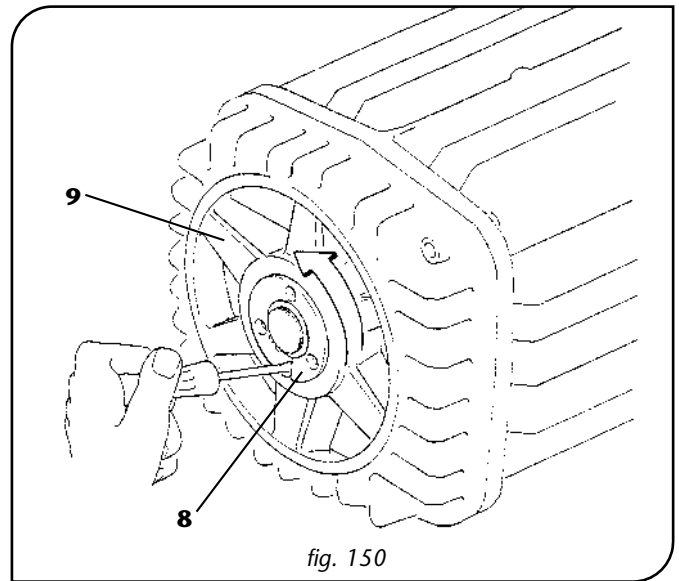
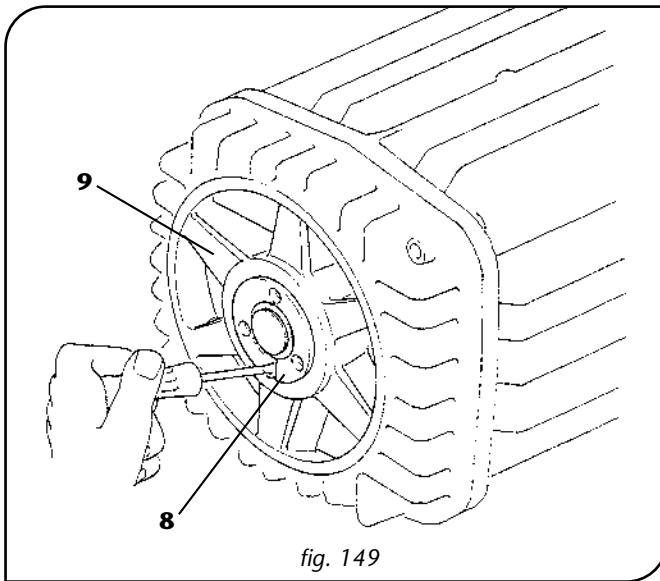


1. Activating the descent button -1- of the push-button panel, bring the hook block to the position of maximum descent -2- and release any load (fig. 145).
2. Remove live current from the hoist by pressing the emergency stop button -3-; put the lever of the disconnecting line switch in the "O" or "OFF" position, reach the working zone safely, carrying the push-button panel to a height to prevent it being activated from the ground (fig. 146).
3. Operating at a height, remove the protection grill -4- positioned on the brake cover of the hoist -5- by unscrewing completely the four screws -6- (fig. 147).
4. Unscrew completely the three screws -7- from the blocking ring -8- of the brake block -9- (fig. 148).



5. Remove the ring from the block by unblocking it, if necessary using a screwdriver in the notch of the ring (fig. 149).
6. Turn the ring 360° (1 complete turn) in anticlockwise direction -8-, considering that one complete turn of the ring causes an axial movement of 1 mm of the brake block -9- (fig. 150).
7. Bring the block -9- to the ring again and match up the relative holes.
8. Put back the three screws -7- in the original place on the ring -8- screwing them up again on the block -9- (fig. 151).
9. Put back the grill -4- by screwing up completely the four screws -6- (fig. 152).
10. At the end of the operation check that the setting of the brake, with recovery of the clearance, has been done correctly, checking (first empty and then with a nominal load) that:
  - the rotation of the motor is free, without anomalous noises, chafing of the brake or overheating of the brake cover
  - the brake intervenes silently and the load is braked without showing slipping

11. If you experience anomalies referred to in paragraph 10, a re-adjustment.



- If the adjustment of the hoist brake has been carried out several times and after the last adjustment the stability of the load is not guaranteed yet (excessive slipping of load, see point 6.3.3), it is necessary to replace the brake cover with a new gasket, using SOLELY original spare parts.
- For brake replacing operations see point 6.6.2

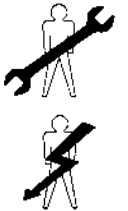
### 6.4.2 Lifting brake adjustment (cylindrical motor DRH4 24kW)



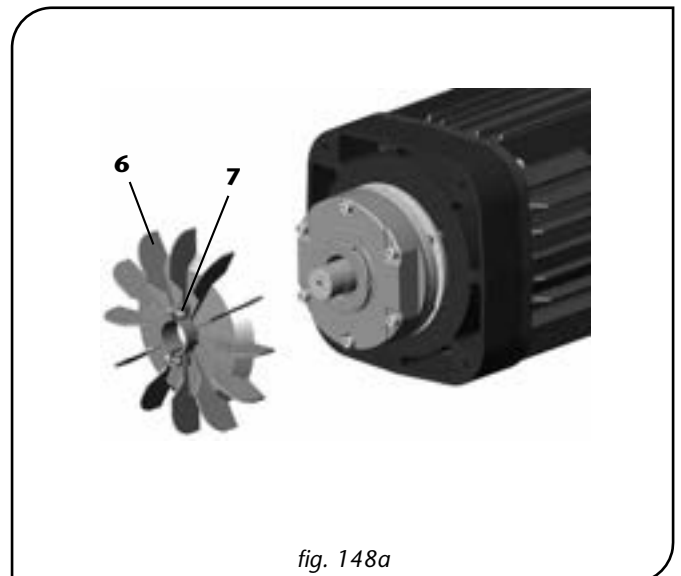
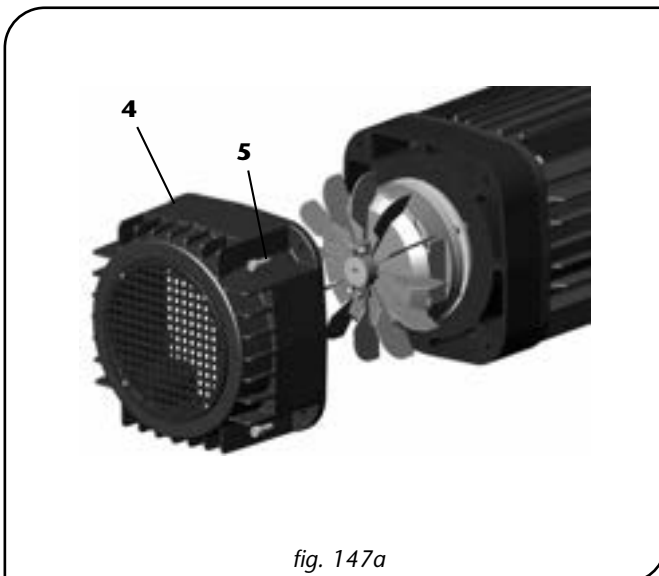
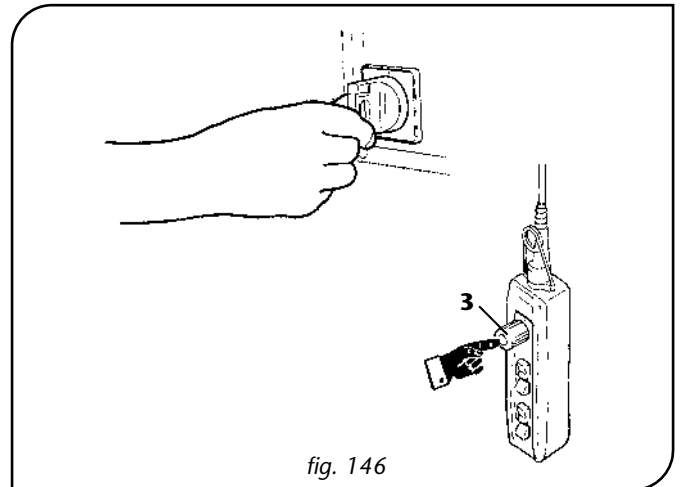
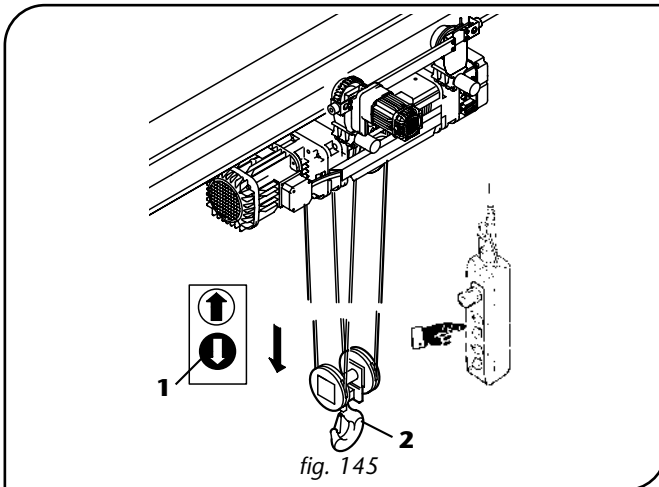
- Hoist motor is cylindrical type with electro-magnetic brake with spring in DC current.
- Braking is mechanical due to sprigs that pull the keeper against the disk, so braking motor shaft.
- Brake gaskets ,asbestos free, can wear less or more according with service intensity.
- Brake gasket wearing increases the clearance between keeper and gasket. This causes a progressive lost of braking torque ,having so longer braking space. For this reason could be necessary the brake magnetic gap adjustment.
- When brake magnetic gap reaches 0.9 mm go to adjustment.



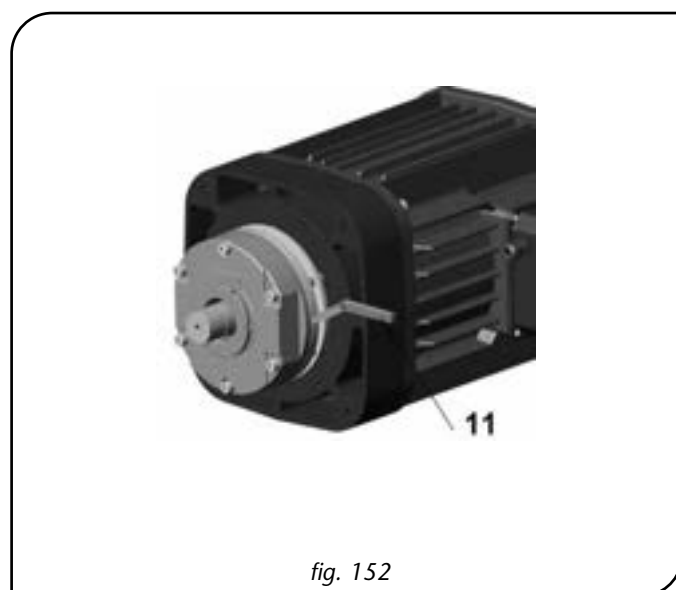
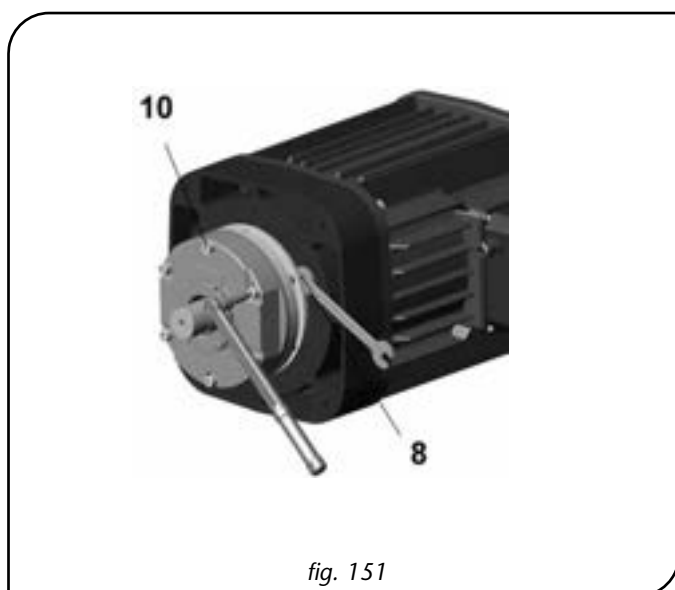
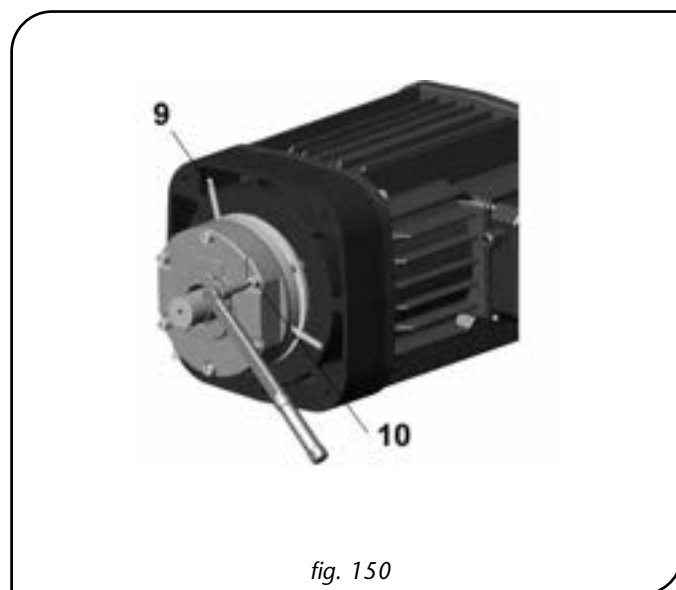
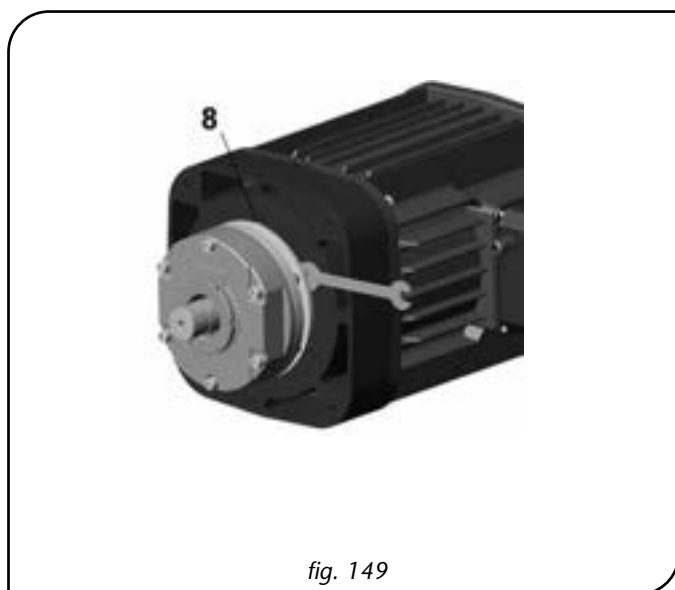
To adjust hoist motor brake go in this way:



1. Acting on down push button -1-, take the hook block in down position -2- and keep out the load (fig. 145).
2. Keep out tension at the hoist pushing circuit brake switch -3-; switch in "O" or "OFF" position, reach the work area, keep on the pendant push button to avoid any other ground activation (fig. 146).
3. Remove motor cover -4- screwing out the four screws -5- (fig. 147a).
4. Remove the fan -6- screwing out the screws -7- (fig. 148a).



5. Loosen register screws -8- using an hexagonal wrench (fig. 149a).
6. Dowel 3 blades thickness -9- of 0.8 mm near fixing screws positioned at 120°, between the magnet and the keeper, leaving them inserted during all adjustment.
7. Adjust magnetic gap thickness screwing the fixing screws TCEI -10- using a setscrew wrench with a crossed sequence, until to reach a light strength on the thickness blades (fig. 150a).
8. Tighten register screws -8-, with an hexagonal wrench, against the motor shield.
9. Loosen fixing screws TCEI -10- about **1 turn**, extract the thicknesses and tighten the screws -10- with a dynamometric wrench adjusted at **46 Nm** with a crossed sequence (fig. 151a).
10. Check with a thickness gauge -11- that magnetic gap value is **0.5 ± 0.05 mm** (fig. 152a).
11. When magnetic gap value is NOT in tolerances stated at **point 6**, go to a new adjustment.



- Check the total thickness value of brake disk (friction material + metallic disk).  
When the thickness reaches a value of 8.1 mm go to disk replacement, using SOLELY original spare parts.
- For brake disk replacing operations see point 6.6.3

### 6.4.3 Setting the braking torque on the traversing motor



- The self-braking trolley motor features axial rotor shifting.
- The braking action is mechanical and is provided by a conical braking block that is integral with the rotor, which, in the absence of power, is pushed by a spring in contact with the brake cover's braking lining.
- The asbestos-free brake linings are subject to a more or less accentuated wear, depending on the operating intensity.
- Wear on the brake linings increases the gap between the lining and the braking block. This results in a progressive loss of braking torque, with a consequent sliding of the brake and longer braking spaces required; for this reason, the brake must be adjusted accordingly.
- The braking torque can be set either:
  - A) By setting the braking torque externally, for limited wear or in modifying preset torque parameters
  - B) By recovering the brake clearance internally, for excessive wear on the brake lining resulting in an increased axial travel for the motor shaft > than 1 mm.



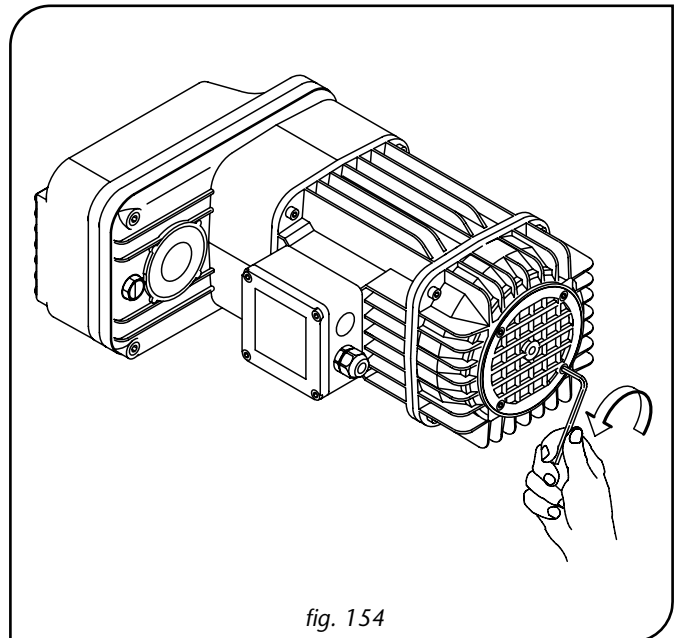
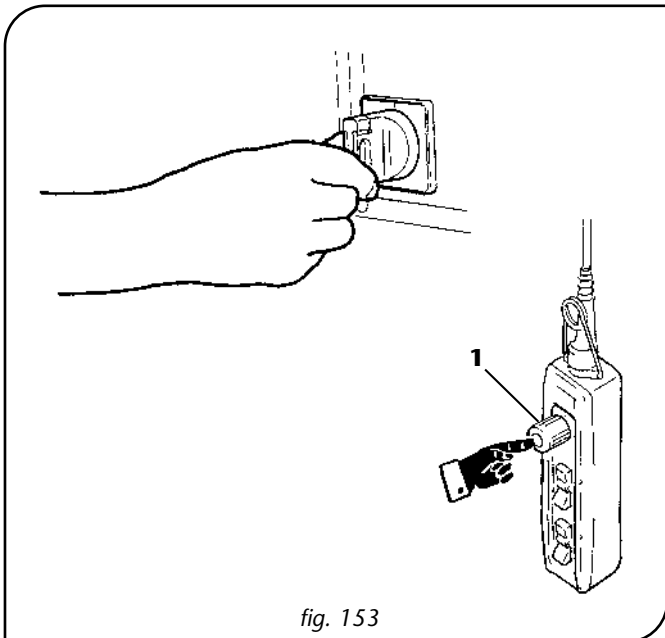
Adjustments to the trolley motor brake:

- A) External adjustment of the braking torque
- B) Internal recovery of the braking clearance



To adjust the brake on the travel motors, whether externally regulating the braking torque **A)**, or recovering the braking clearance internally **B)**, the following **PRELIMINARY OPERATIONS** must be observed:

1. Cut off the trolley's power supply by pressing the emergency stop button -1-; set the line cut-off switch lever to the "O" or "OFF" position, then safely access the work area, taking the keypad up to the work area so as to avoid its being activated from the ground (fig. 153).
2. Operating from the raised work area, remove the plastic grid (vent) by completely unfastening the four screws (fig. 154).



### A) - External adjustment of the braking torque:

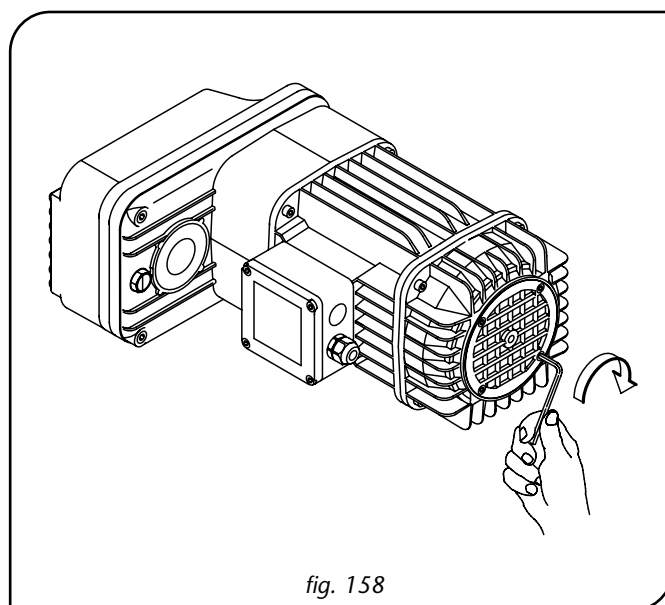
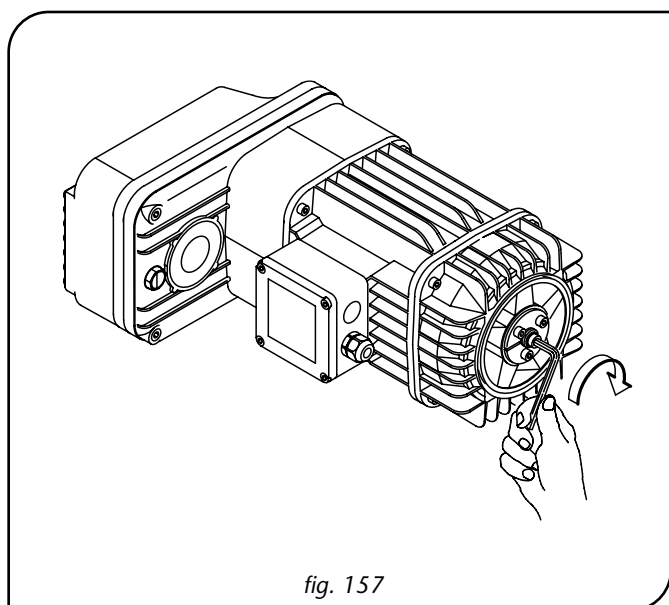
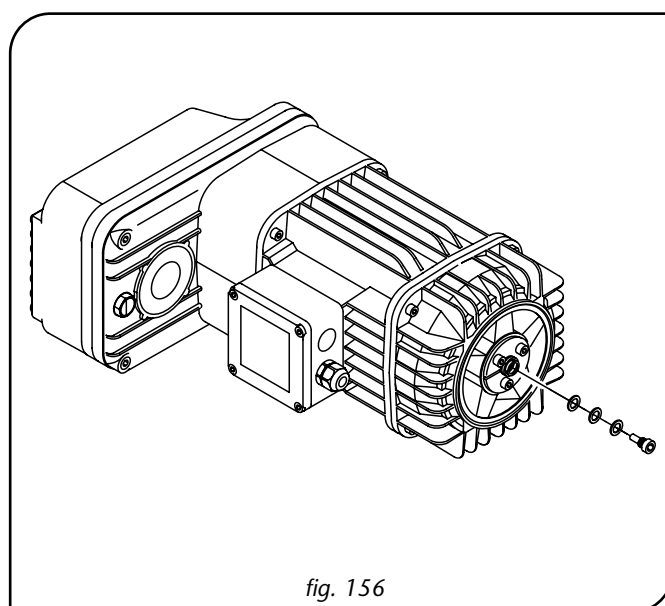
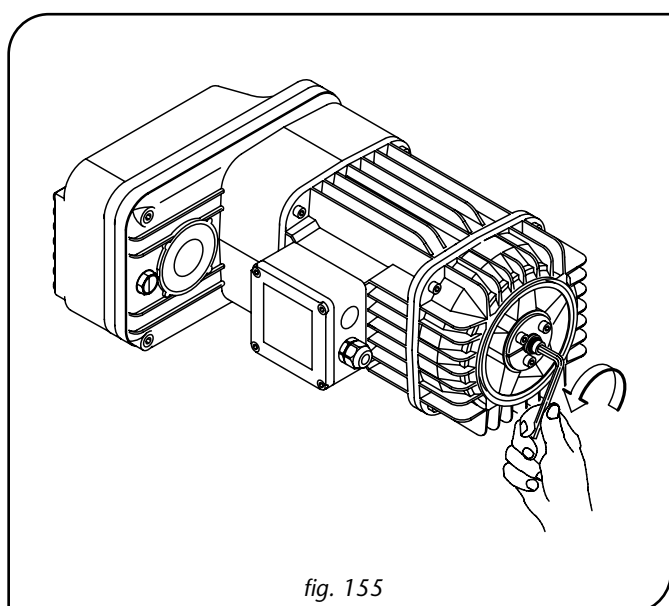
- To increase or decrease the desired braking torque, proceed as follows:

1. Loosen the central Allen screw (fig. 155).

- **To increase the braking torque:** remove one or more washers until obtaining the desired increase in braking torque (fig. 156). With all the washers inserted below the Allen screw, the spring thrust is at a minimum, and consequently so is the braking torque.

2. Reposition the central Allen screw (with the desired number of washers) and securely tighten the Allen screw (fig. 157).

3. Perform running and braking tests, and if necessary repeat the operations outlined above until obtaining the desired braking torque, after having reassembled the vent and securely tightened the Allen screws (fig. 158).



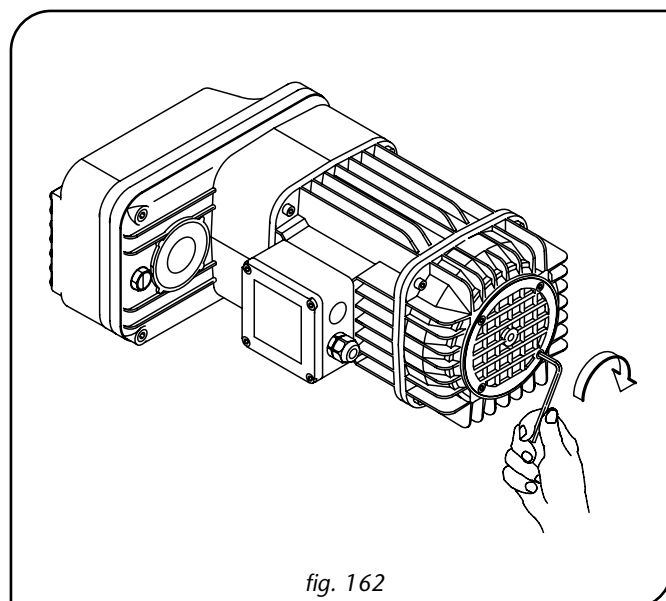
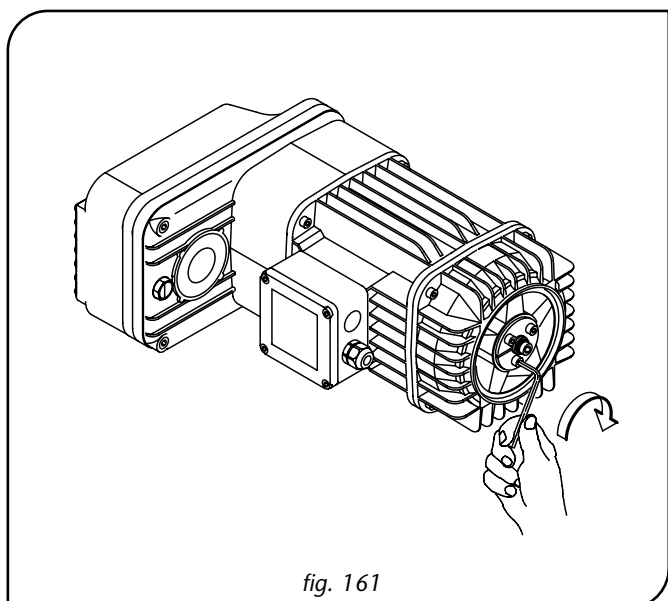
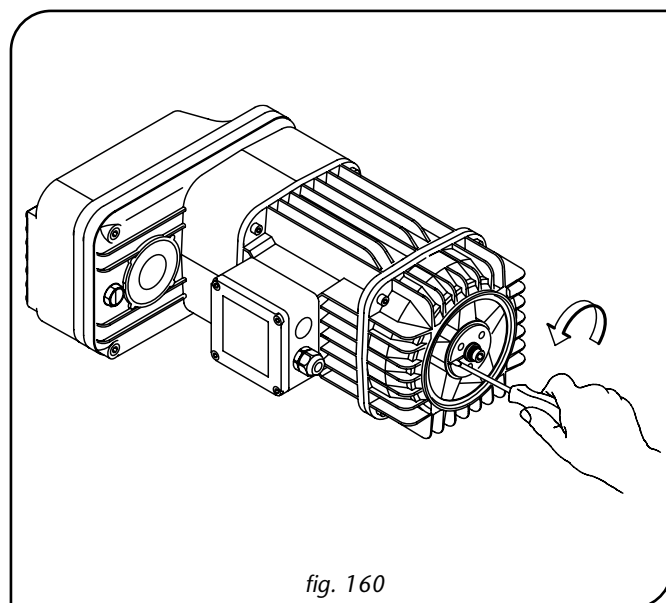
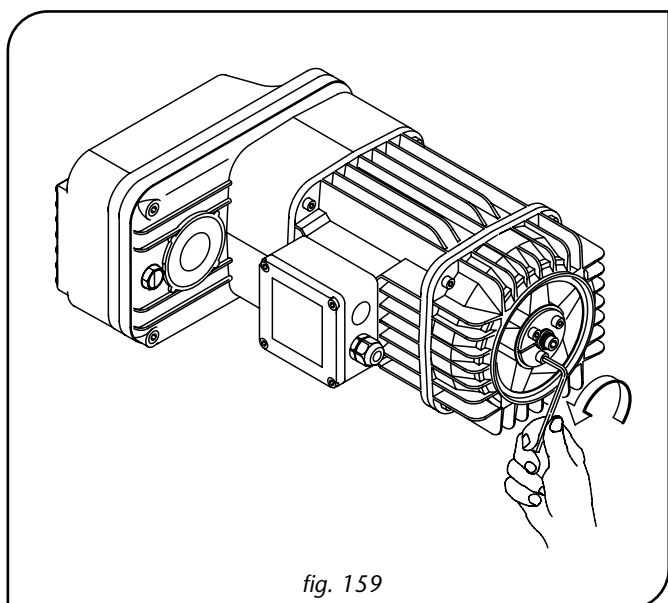
*If several attempts are made at adjusting the braking torque and the desired braking space is not obtained, proceed as outlined under "Internal recovery of the braking clearance".*

### B) - Internal recovery of the braking clearance:

1. Operating from the raised scaffolding/platform, remove the protective grid (vent) positioned on the brake cover by completely unfastening the four screws (fig. 154).
2. Unscrew the three screws on the brake block lock ring nut completely (fig. 159).
3. Remove the ring nut from the block by releasing it, if necessary using a screwdriver in the notch (fig. 160).
4. Turn the ring nut counter-clockwise by 360° (1 complete turn), considering that one complete turn of the ring nut generates an axial shifting of 1 mm on the brake block.
5. Draw the block in towards the ring nut by lining up the holes.
6. Reset the three screws in their original position on the ring nut, fastening them back onto the block (fig. 161).
7. Reassemble the grid (vent) by fastening the four screws completely (fig. 162).

Once these operations have been completed, check to make certain the brake adjustment, with the clearance recovery, has been correctly performed, verifying (firstly without and subsequently with a nominal load) that:

- The motor rotates freely, without any abnormal noises, brake friction or overheating of the brake cover.
- The brake operates silently and the trolley comes to a stop without any slipping.

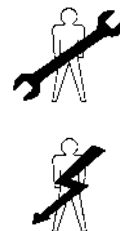


*If several attempts are made at adjusting the braking torque and the desired braking space is not obtained, proceed with replacing the motor cover, as outlined under section 6.6.4 of the manual, ordering original spare parts EXCLUSIVELY.*

## 6.5 Dismantling the hoist and related trolley



Where it is necessary to disassemble the DRH wire rope hoist and related trolley to fit them to a new installation or to subject them to maintenance and/or repairs which require work on the ground (e.g.: replacement of the trolley wheels), proceed as described in the following points:



The disassembling operations must be carried out by qualified staff trained for the purpose, equipped with:

- adequate personal protection measures (e.g.: helmet, gloves, safety harnesses, etc.)
- work equipment (e.g.: forklift truck or travelling crane and scaffold) adequate for the purpose

And after a careful evaluation of the following parameters:



- typology of the workplace, its environmental characteristics, type of ground
- height of the girder and available spaces
- dimensions and weight of the hoist to disassemble



- For hoists installed on trolleys, even if only the disassembly of the hoist is necessary, the disassembly of the entire hoist/trolley unit is recommended.
- When possible or necessary, disassemble the hook block as described in point 6.6.1 or at least position it at a height which does not obstruct the disassembling operations.

### 6.5.1 Disassembling of the hoist

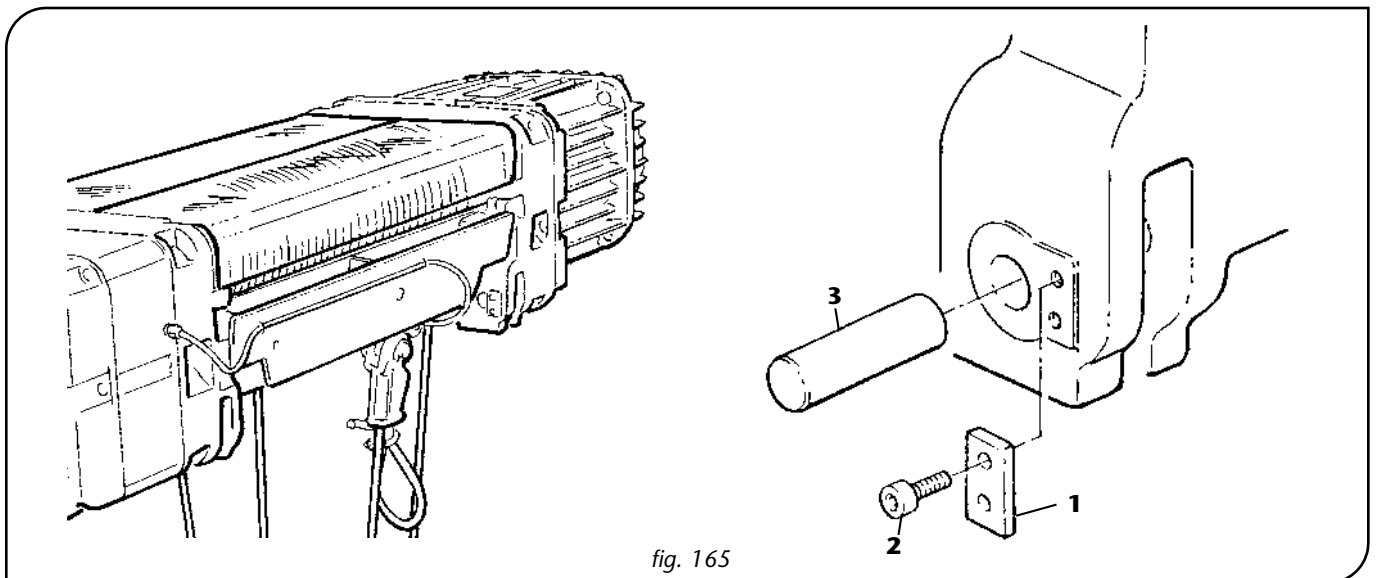
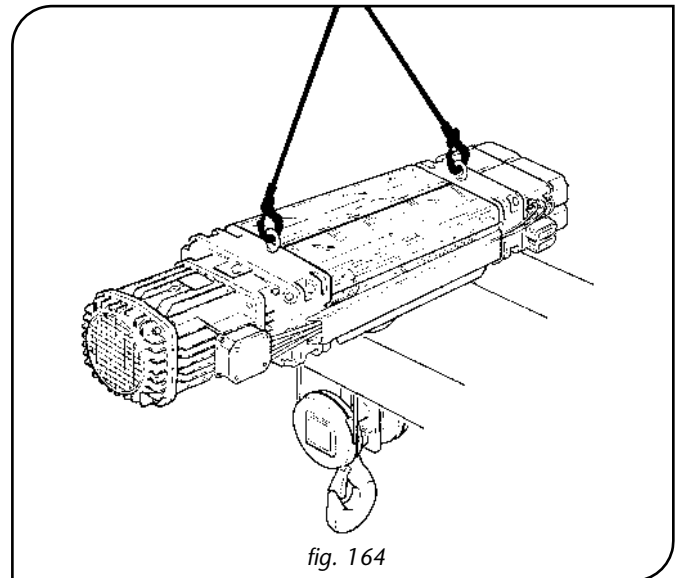
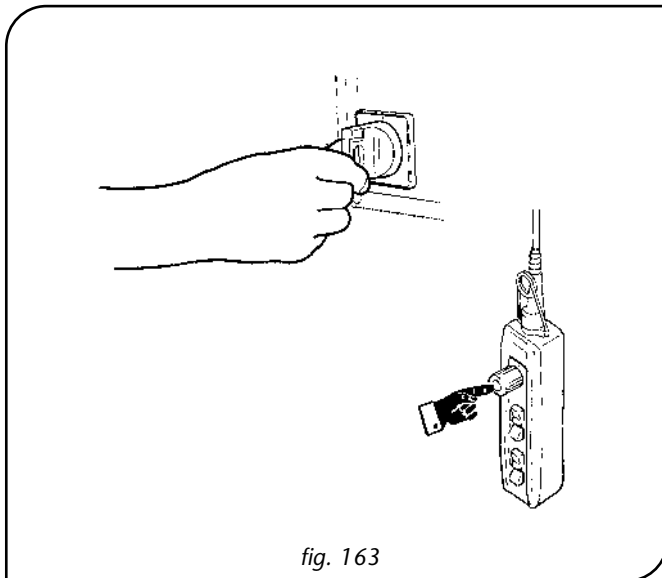
- Remove the live current to the trolley pushing the emergency stop button -1-; put the lever of the disconnecting switch in the "O" or "OFF" position, reach the working zone safely, bringing to a height the push-button panel to prevent it being activated from the ground (fig. 163).
- Operating at a height disconnect all the electrical connections inside the connection frame or incorporated control board.

#### 3A) Hoist in set-down execution:



*The handling of the hoist must be carried out SOLELY by using a LIFTING apparatus and with the help of suitable slings fixed to the suspension eyebolts.*

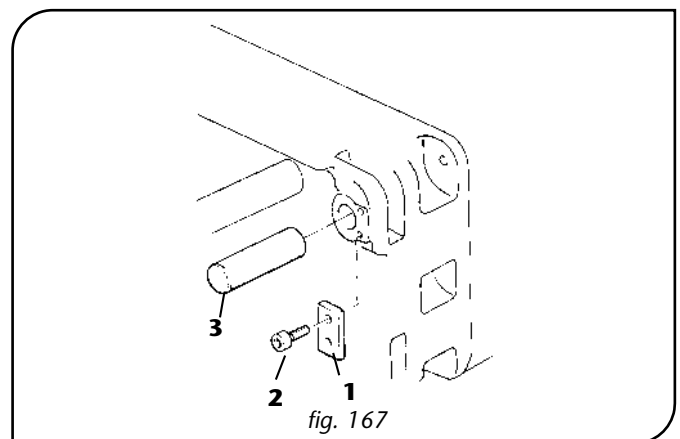
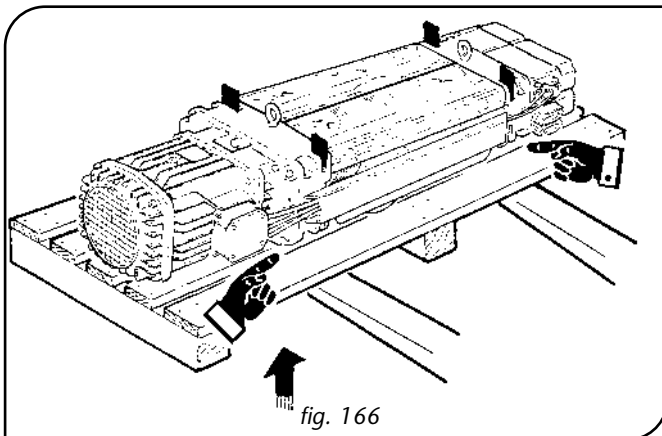
- Put a 2-rope fall sling connecting the handling ends inside the eyebolts (fig. 164) of the hoist.
- Remove the fixing plate -1- of the pivot -3- by unscrewing the screws -2-. Take out the fixing pivots -3- from the respective slots (fig. 165).
- Lift with care and position the hoist in the foreseen place.



**3B) Hoist in suspended execution:**

*The handling of the hoist positioned on the pallet must be carried out SOLELY by a LOWERING operation with the help of a forklift truck, or with a platform which can be raised or with other means suitable for the purpose.*

- Put a pallet ready of dimensions adequate for the loading forks on the forklift truck.
- Bring the pallet under the hoist until the feet of the hoist are in contact with the surface of the pallet (fig. 166).
- Remove the fixing plates -1-, by unscrewing the screws -2- and taking out the fixing pivots -3- from the respective slots (fig. 167).
- Lower with caution the loading forks of the forklift truck to position the pallet in the required place.

**6.5.2 Disassembling of the hoist with single girder trolley**

*The handling of the hoist/trolley unit positioned on the pallet must be carried out SOLELY by a LOWERING operation with the help of a forklift truck, or with a platform which can be raised or with other means suitable for the purpose.*

- Remove the live current to the trolley pressing the emergency stop button -1-; put the lever of the disconnecting switch in the "O" position, reach the working zone safely, bringing to a height the push-button panel to prevent it being activated from the ground (fig. 168).
- Operating at a height disconnect all the electrical connections inside the connection frame or any control board incorporated.
- Put a pallet of adequate dimensions ready on the loading forks of the forklift truck.
- Bring the pallet under the hoist until the feet of the hoist are in contact with the surface of the pallet. Lift slowly for few centimetres to detach the wheels from the girder (fig. 169).



*For trolleys not supplied by DONATI SOLLEVAMENTI S.r.l. see the specific procedures of the relative manufacturer.*

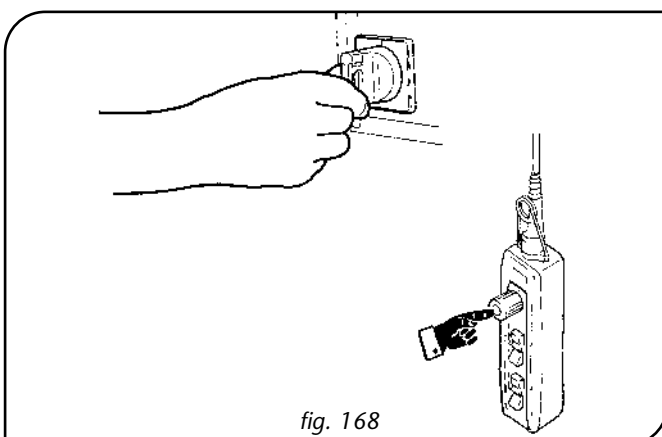


fig. 168

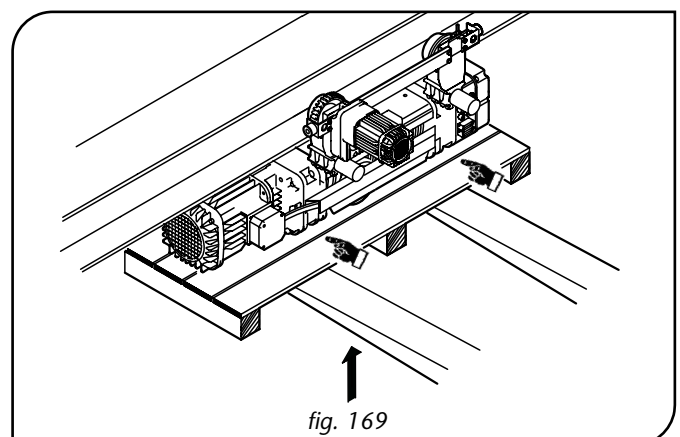


fig. 169

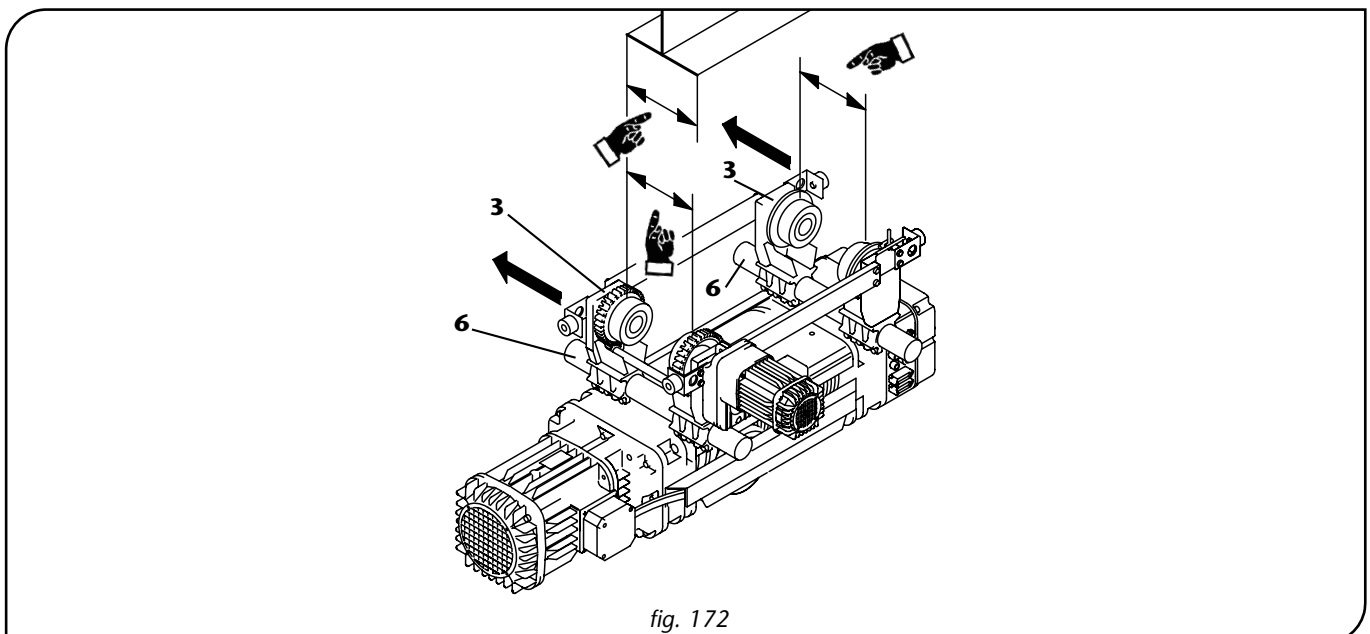
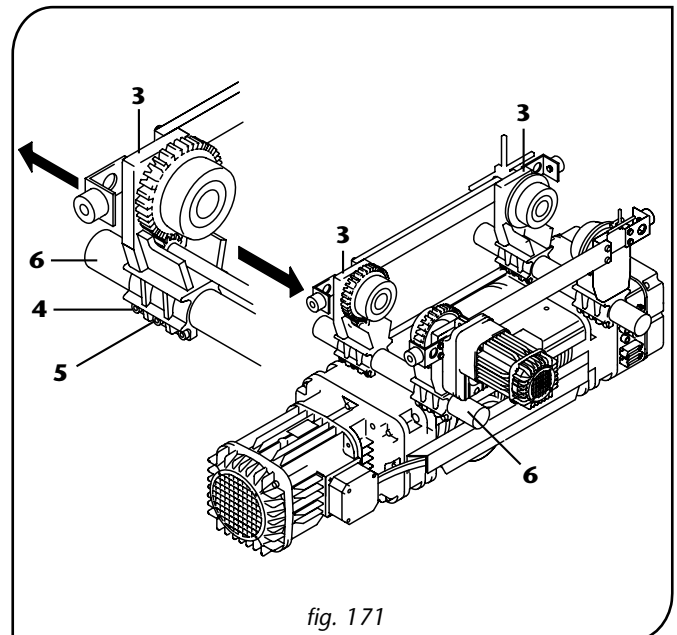
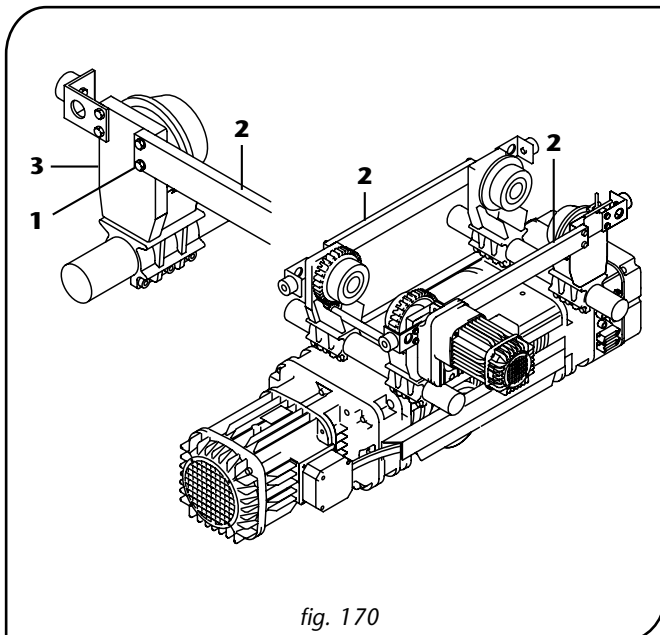
5A) Hoist on normal DST/N trolley:

- For DST/N trolleys, loosen without unscrewing them completely, the fixing screws -1- of the horizontal plates -2- of the vertical plates -3- opposite the motoreducer side, until they are no longer rigidly constrained together (fig. 170).
- Loosen, without unscrewing them completely, the self-blocking nuts -4- of the brackets -5- which fix the plates -3- to the bars -6-, until the plates can slide freely on the bars (fig. 171).
- Let both plates slide -3- on the bars -6- to increase the preset width of the wheels until the internal space obtained between the wheels is greater than that of the girder wing (fig. 172).



Operate **SOLELY** on the plates opposite the motoreducer group side and **NEVER REMOVE** the plates on the motoreducer side (note valid only for DST/N trolleys)

- Move backwards with the forklift truck so as to free the internal dimensions of the wheel in respect to the girder wire.
- Lower with caution the loading forks of the forklift truck until the pallet is positioned in the required position.

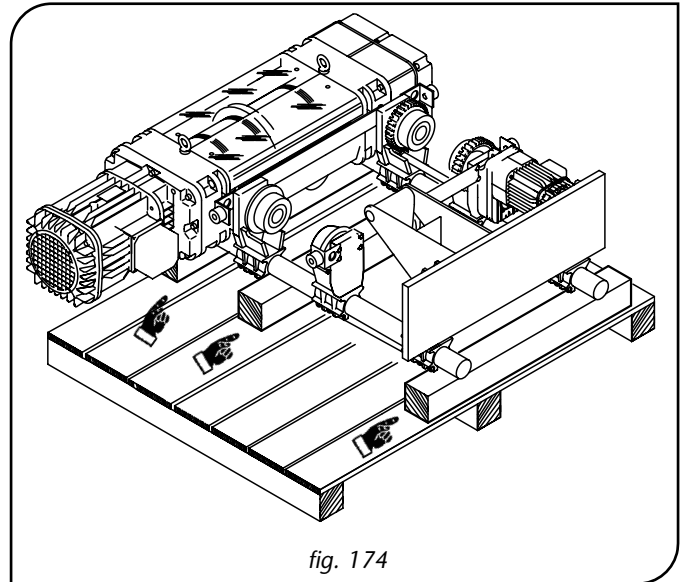
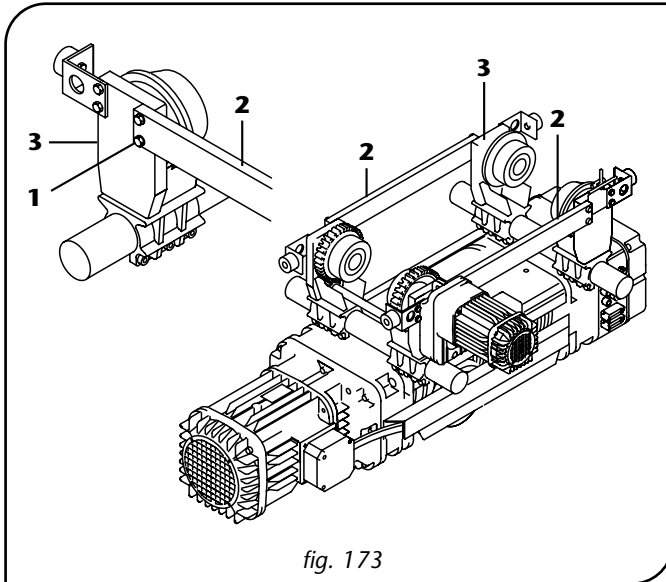


## 5B) Hoist on DST/S articulated trolley



*It is recommended that where possible this operation be carried out with the hoist trolley positioned on the rectilinear section of the sliding girder*

- Put back the horizontal connecting plates -2- of the vertical plates -3- by using the fixing screws -1- (fig. 173) without tightening them.
- Proceed as described in point 5A.

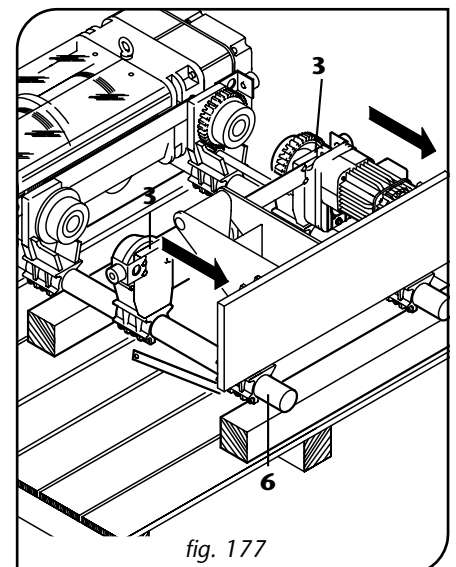
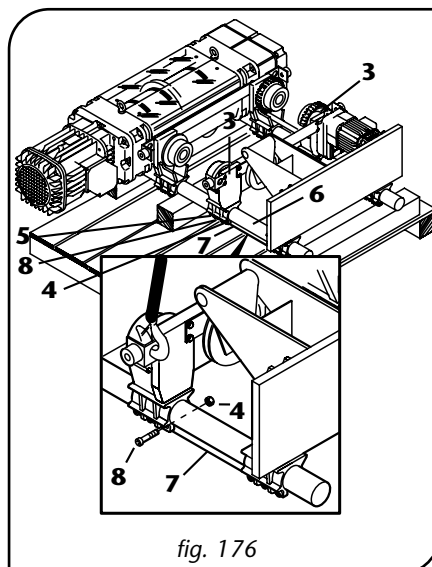
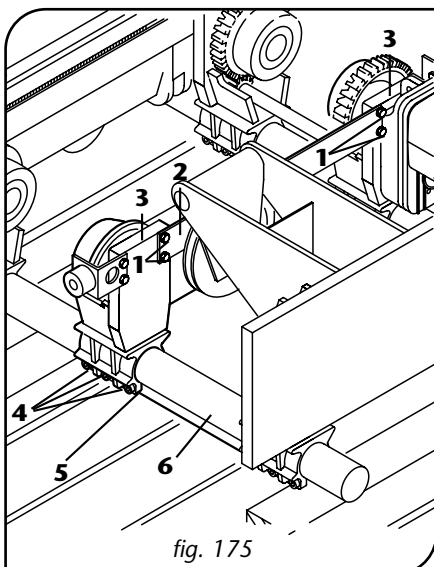


## 5C) Hoist on reduced dimension DST/R trolley:



*In this configuration it is necessary to position on the pallet adequate thickness (fig. 174) so that the plates of the trolley on the balance weight side slide freely on the bars.*

- Loosen, without unscrewing them completely, the fixing screws -1- of the horizontal plates -2- of the vertical plates on the balance weight side -3-, until they are no longer rigidly connected together, as well as the self-blocking nuts -4- of the brackets -5- which fix the plates -3- on the balance weight side to the bars -6- (fig. 175).
- In order to make plates -3- on the balance weight side slide freely on the bars -6- remove from the brackets -5- the spacers -7-, by unscrewing completely the nuts -4- and taking off the screw -8- (fig. 176).
- Let both the plates slide -3- on the bars -6- so as to increase the space between the wheels, until an internal space between the wheels is obtained which is greater than that of the girder wing (fig. 177).
- Proceed as described in point 5A.



### 6.5.3 Disassembling the hoist with double girder DRT trolley



*The handling of the hoist/trolley unit must be carried out SOLELY with a LIFTING apparatus (overhead travelling crane, travelling crane, hoists, etc.) and with the relevant slings fixed to the eyebolts on the DRH trolley.*

- Attach a 4-rope fall sling, using a lifting apparatus adequately chosen in relation to the handling weight and to the handling height, to the attachment points of the trolley (fig. 178)
- Operating at a height (scaffold, platform, gallery), put back the eyebolts in the relevant places of the trolley (if removed)
- Remove the antiderailing devices -1- by unscrewing the relative nuts -2- (fig. 179)
- Lift with care and/or position the trolley/hoist in the foreseen place.

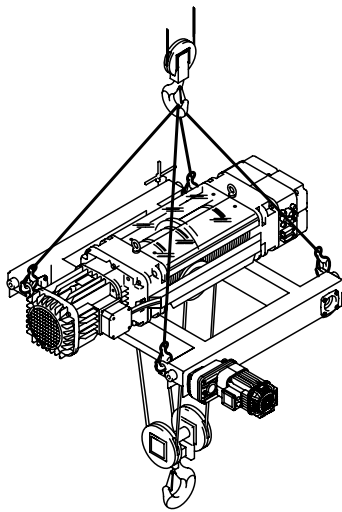


fig. 178

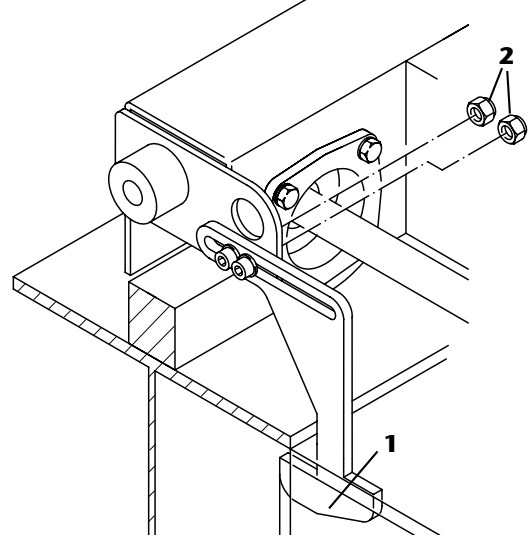


fig. 179




## 6.6 Replacement of parts and components



To ensure the operating safety of the DRH wire rope hoist and related trolley original spare parts prescribed by DONATI SOLLEVAMENTI S.r.l. must be used.

### 6.6.1 Replacing the wire ropes of the hoist

#### REMAINING RISKS ON A HOIST IN THE WIRE ROPE-REPLACING PHASE

| DANGER/RISK   | BAN/WARNING  | OBLIGATION/PREVENTION  |
|---|--|--|
|  <p>Risk of dangers of entanglement/crushing in the case of contact with the rotating drum in wire rope-replacing phase.</p> |  <p><b>Warning!</b> Exposure to the moving parts can cause dangerous situations.<br/><b>It is forbidden</b> to put the hoist into action if the removed protective covers have not been put back.</p> |  <ul style="list-style-type: none"> <li>• Allocate the wire rope-repairing operations to qualified maintenance staff</li> <li>• Compulsory use of protective gloves.</li> </ul> |



- During wire rope replacement, to prevent the rope spring projecting, it is **COMPULSORY** to use the special "Spring tightening" device (fig. 180), which is available from the DONATI SOLLEVAMENTI S.r.l. Service and Assistant Centres.
- In the case of DRH hoists intended to be operated on board of double girder trolleys, the replacement of the wire rope in working position could cause operating difficulties which create dangerous situations regarding safety. The maintenance officer, before carrying out the operation described below, must ensure that there is safety access to the working zones. If necessary, carry out the wire rope replacement after disassembling the hoist as described in paragraph 6.5.



To disassemble the old wire rope, proceed as follows:



1. Push the "descent" button on the push-button panel, until the intervention of the related limit switch, so that the hook block reaches the lowest possible height (fig.181).

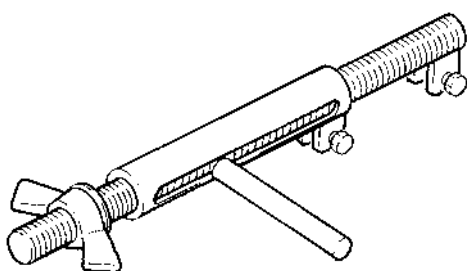


fig. 180

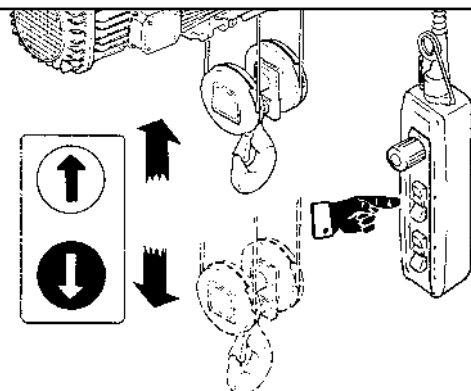


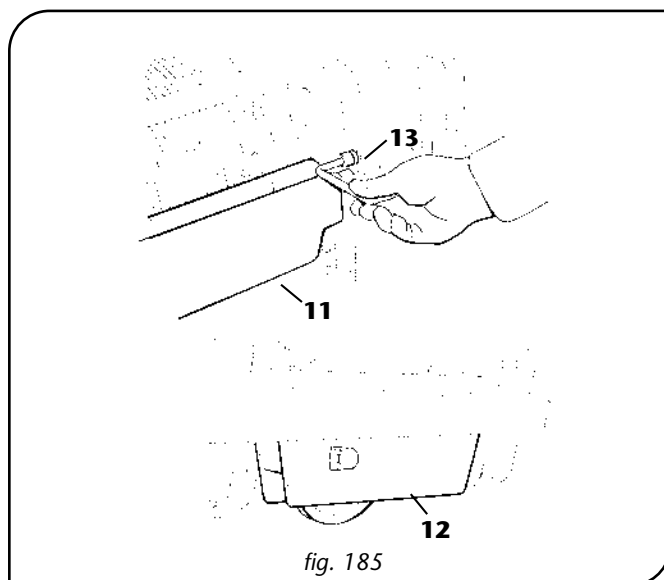
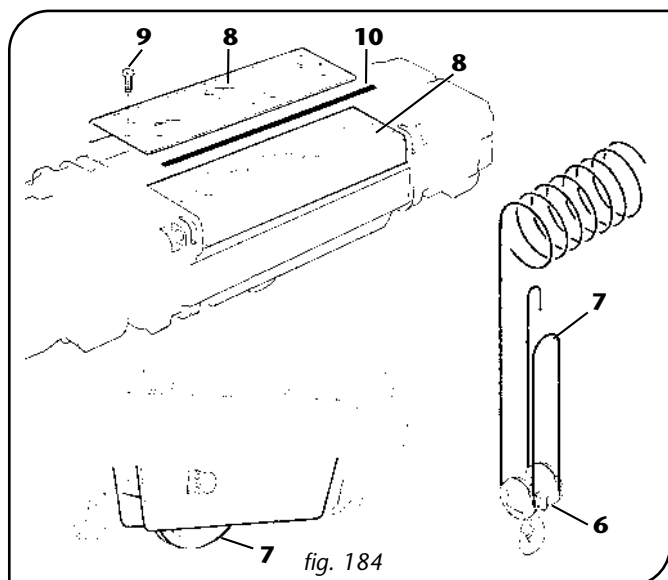
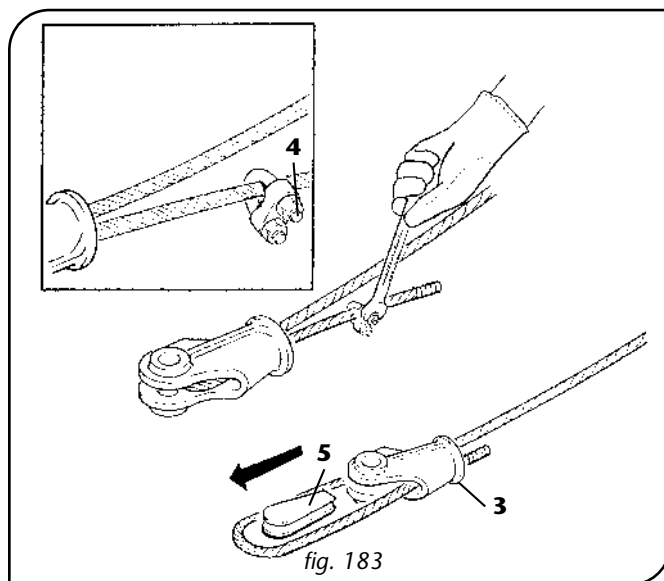
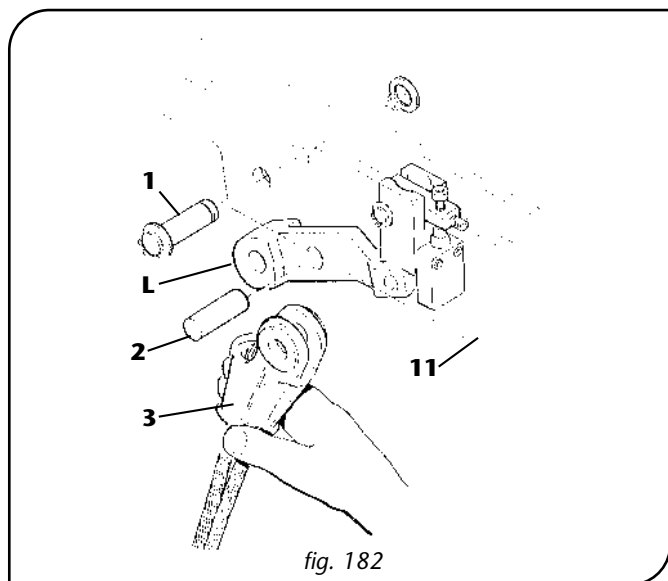
fig. 181

2. Operating at a height (from the floor of the mobile scaffold or from the raisable platform), having carried by hand the push-button control panel up to the level of the working area so that it cannot be activated from the ground, by removing the pin -1- using the relative snap pin, disconnect the lever -L- of the overload device of the anchorage cross head -11-, let the lever -L- rotate downwards until the anchorage pivot -2- can be taken off and thus allows the anchorage to be disassembled -3- (fig. 182).
3. Using a cord, having tied safely and firmly the anchorage, lower slowly by hand the cord until the anchorage reaches the ground.
4. Loosen the safety clamp -4-, remove the wire rope from the wedge -5- until the wedge is completely released and unwound from the anchorage -3- (fig. 183).
5. Take the wedge off the hook block -6- and, in the case of 4, 6 and 8-rope fall hoists, also from the transmission pulley -7-, bringing the rope end to the ground again.
6. Remove the protection canopy -8-, both from the limit-switch side and from the opposite side, by unscrewing the screws -9- and taking care not to lose the coupling gasket -10- of the two ends (fig. 184).

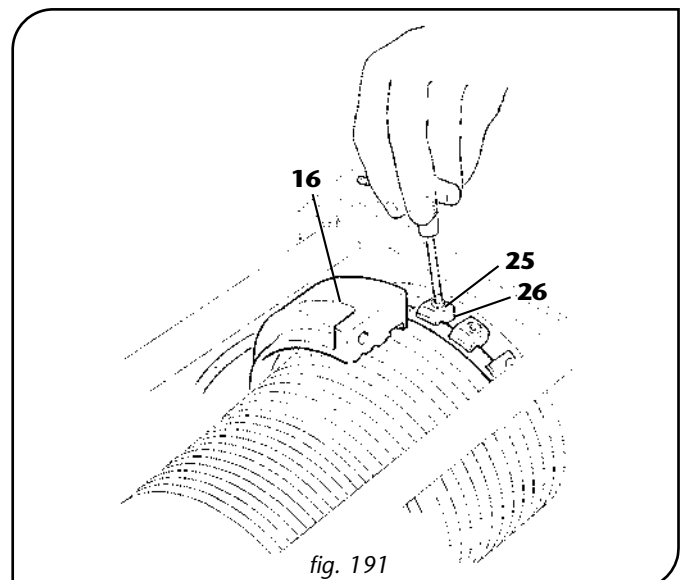
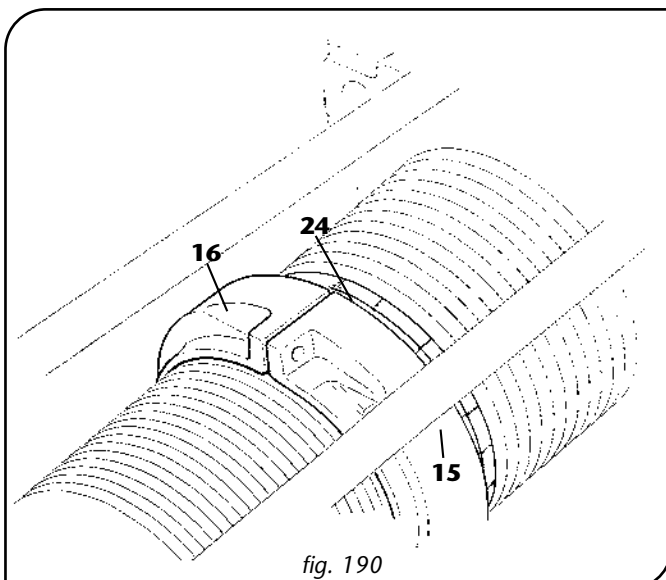
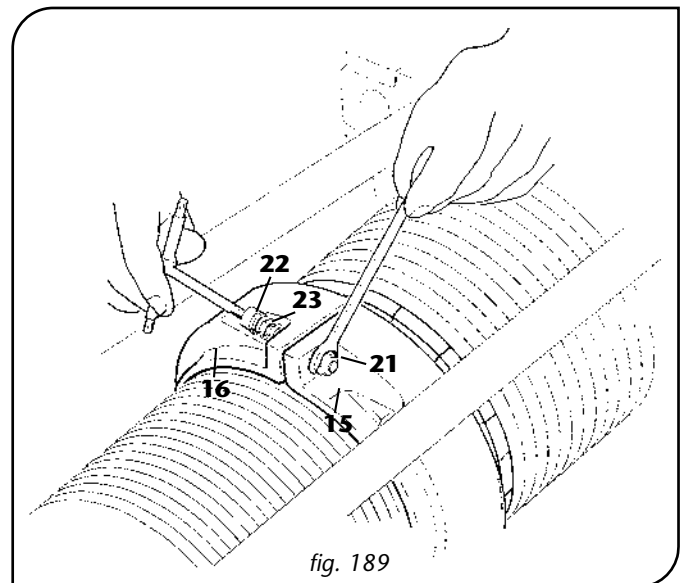
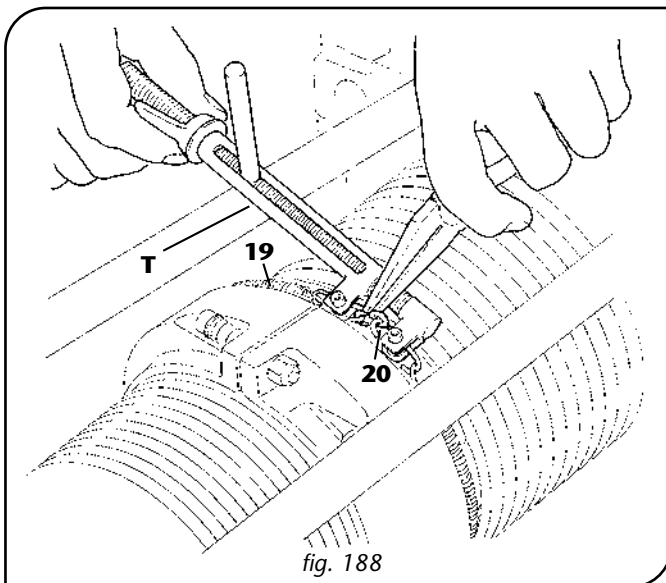
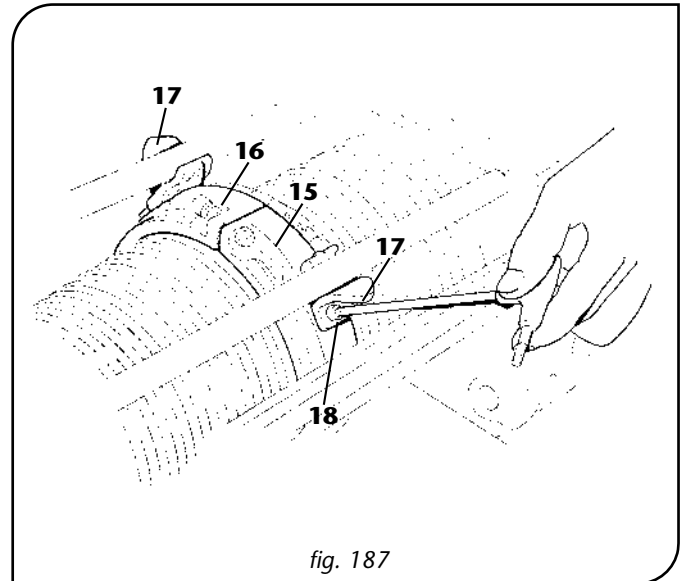
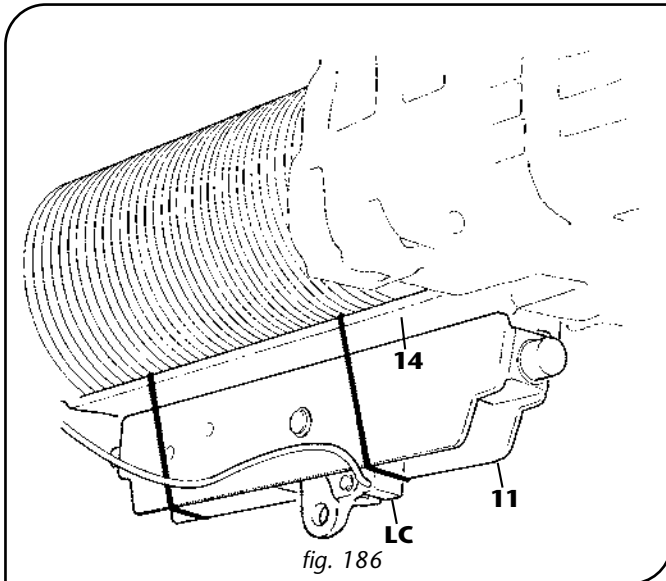


*The following instructions are valid for all versions of DRH electric wire rope hoists, except those in 4-rope fall execution with DST/R trolley and 6 and 8-rope fall.*

7. Disassemble the anchorage cross head -11- and, in the case of 4-rope fall hoists, the pulley assembly -12-, by removing the safety screws -13- (fig. 185).  
(In the hoists with DST/R trolley take off only the anchorage cross head and only in the case of the 4-rope fall version).
8. Tie temporarily, but safely and firmly, the anchorage cross head -11- to the lower connecting stay bolt -14- of the drum shell, taking care not to disconnect or damage the overload device -LC- or its cable (fig. 186).
9. Remove from the semi-rings -15- (on the opposite side to where the wire rope comes out) and -16- (on the side where the rope comes out) the bronze runners/reaction arms -17- by unscrewing the relative screws -18- (fig. 187).



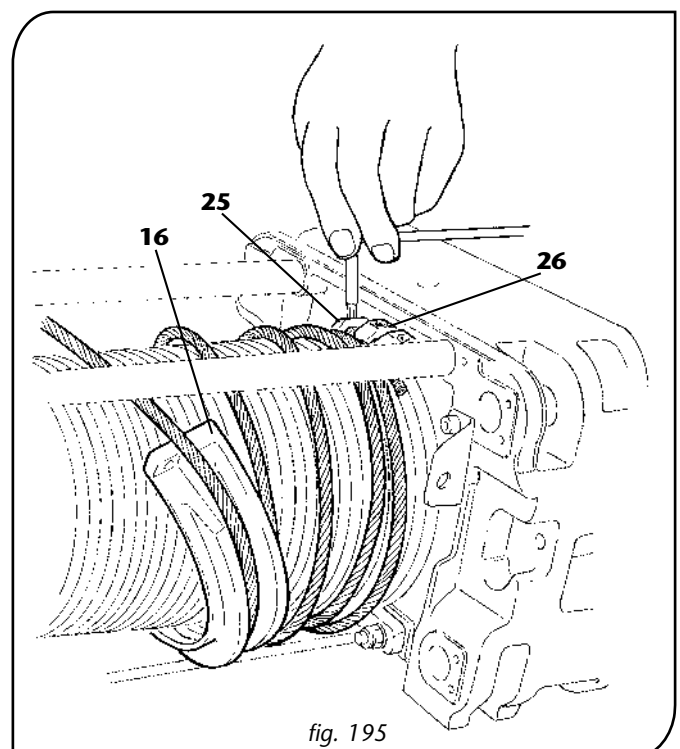
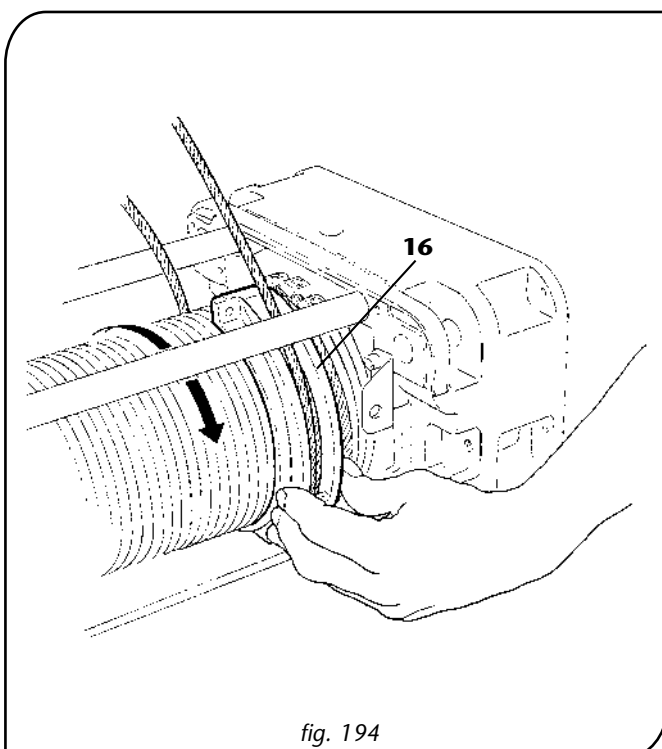
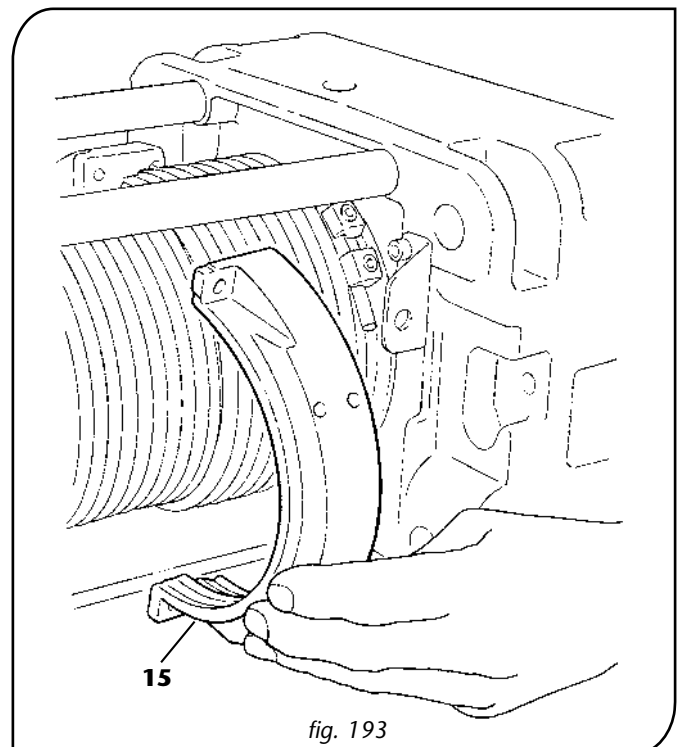
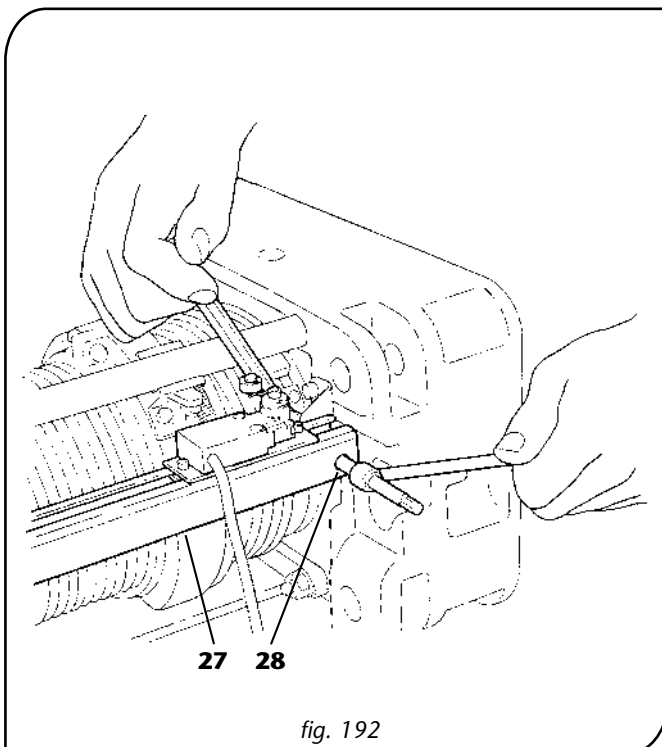
10. Disassemble the wire-clamping spring -19- using the special spring-tightening device -T- (fig. 180) and pliers to remove the clip -20- (fig. 188).
11. Unscrew the nuts -21-, take off the screws -22- and the relative spring -23- from the two semi-rings -15- and -16- (fig. 189).
12. Remove the semi-rings -15- (on the opposite side to where the wire comes out) and -16- (on the side where the wire comes out) taking care not to lose the relative wire-clamping runners -24- (fig. 190).
13. Loosen the screws -25- of the clamps -26- take out the wire rope and release the semi-ring -16- (fig.191).





The following instructions are valid only for DRH electric wire rope hoists in 4-rope fall execution with DST/R trolley and 6 and 8-rope fall.

7. Take off the limit switch cover -27- removing the respective screws -28-, taking care not to disconnect or change the setting of the limit switches (fig. 192).
8. Remove from the semi-rings -15- (on the opposite side to where the wire rope comes out) and -16- (on the side where the wire rope comes out) the bronze runners/reaction arms -17- by unscrewing the relative screws -18- (fig. 187).
9. Take off the wire-clamping spring -19- using the special spring-tightening device -T- (fig. 180) and pliers to remove the clip -20- (fig. 188).
10. Unscrew the nuts -21-, take off the screws -22- and relative springs -23- from the two semi-rings -15- and -16- (fig. 189).
11. Remove the semi-ring on the opposite side to where the wire rope comes out -15- (fig. 193).
12. Rotate the semi-ring on the side where the rope comes out -16- until the wire rope comes out upwards (fig. 194).
13. Loosen the screws -25- of the clamps -26-, take out the wire rope and release the semi-ring -16- (fig. 195).





When the old wire rope must be replaced with a new one:

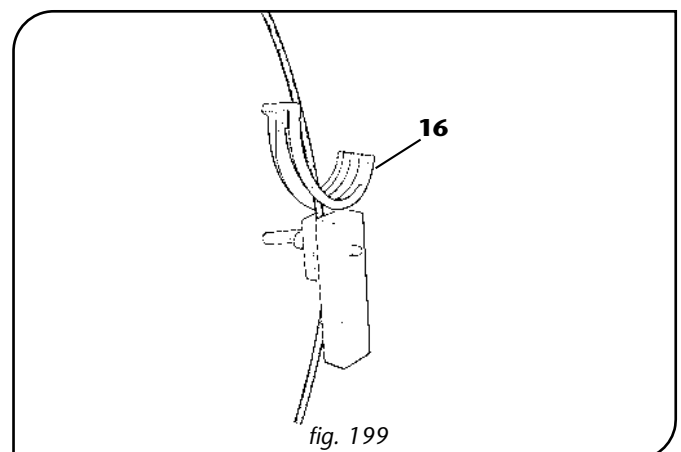
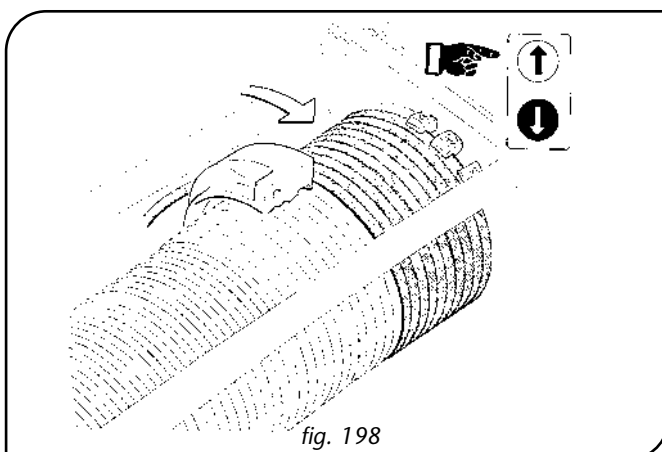
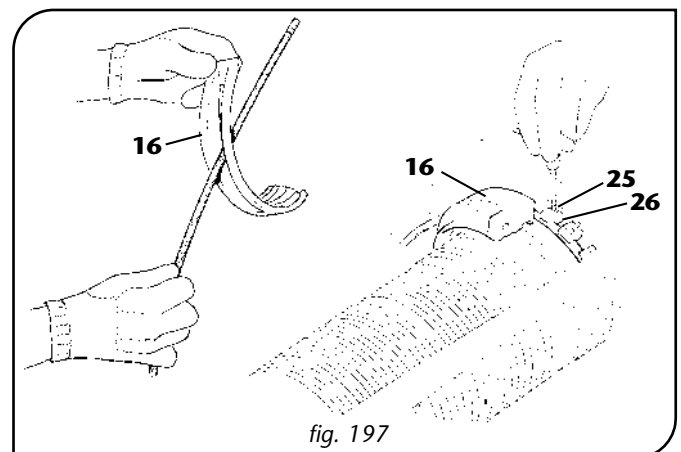
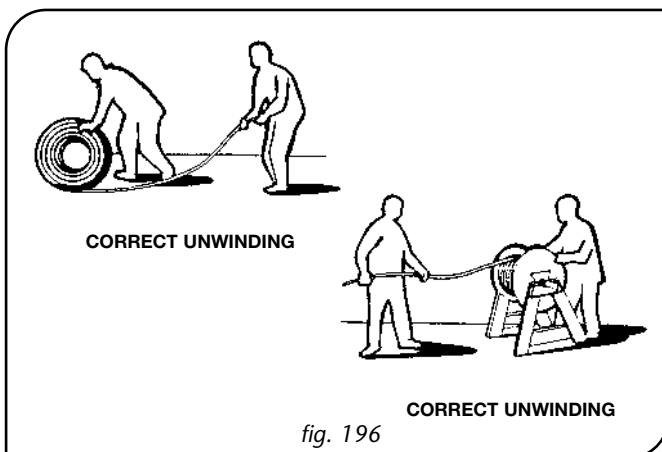
- NEVER USE wire ropes already used or for which the characteristics are not known, or wire ropes not fitted with a certificate or declaration from the manufacturer.
- Use SOLELY wire ropes which have the same characteristics (typology, resistance and length) of the old wire rope. (See table fig. 133 on page 88)
- Unwind the roll of the new wire rope without kinks or bends (fig. 196)



For the mounting of the new wire rope, proceed as follows:



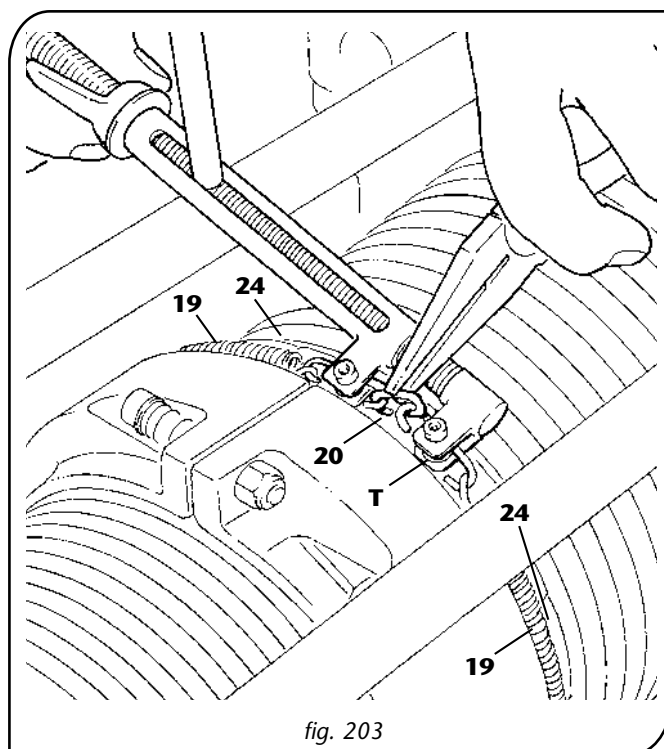
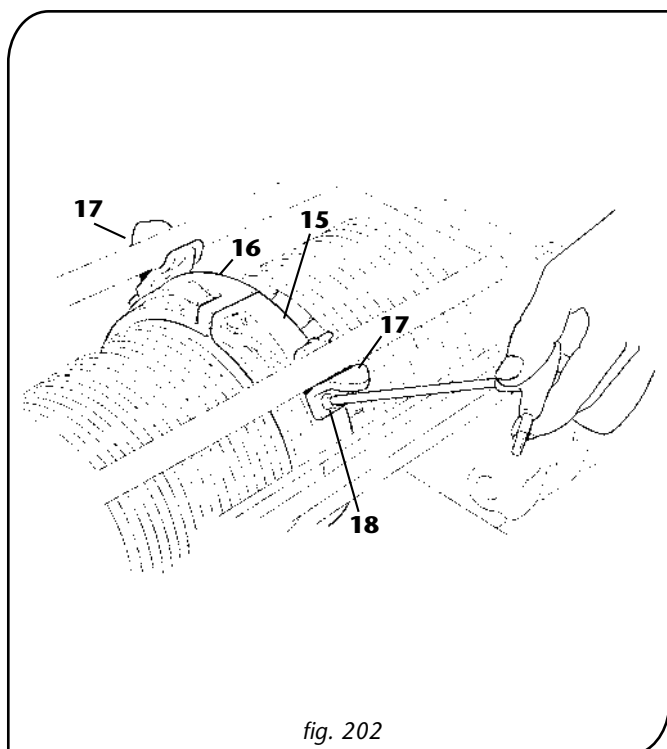
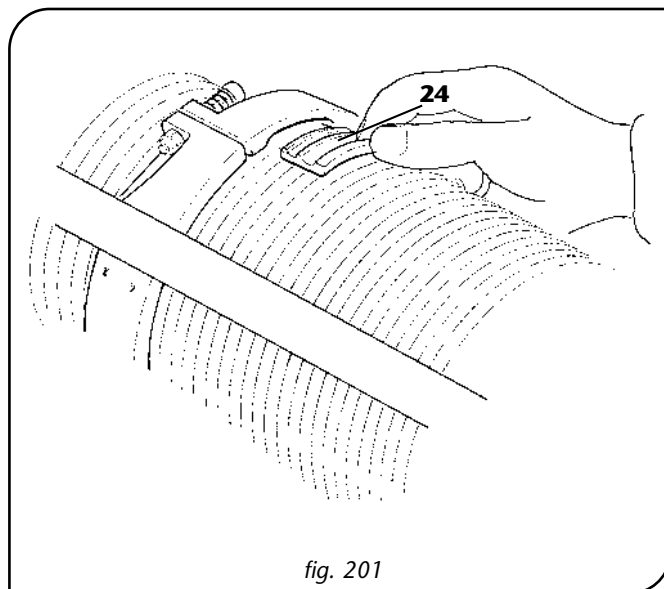
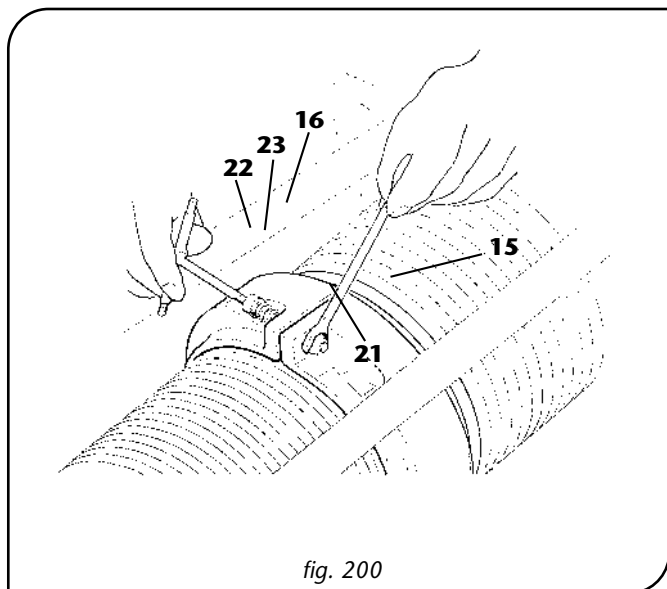
1. Clean and degrease thoroughly with suitable solvents (oil, trichlorethylene, etc.) the semi-rings -15- and -16- and the drum, drying them with a cloth so they can be examined carefully.
2. Bring the semi-rings level with the drum, matching up the respective threadings and check that there is no excessive clearance. Where necessary (pointed crests, sharp or heavy wear and tear) assess the need for replacing the semirings and possibly the drum.
3. Operating at a height, lift by hand up to the working level, both the pendant push-button panel and the new wire rope, using a cord tied safely and firmly to the wire rope end.
4. Insert the new wire rope in the slot of the semi-ring -16- and block the end of the wire rope with three wire rope clamps -26- tightening the respective screws completely -25- (fig. 197).
5. Press the "ascent" button of the push-button panel, and using protective gloves, keep the wire rope constantly taut and well adherent to the grooves of the drum letting the wire rope wind around for at least 10 lengths (fig. 198).
6. Without loosening the tension in the wire rope, put a weight onto the wire rope using a clamp, downstream from the semi-ring -16- and taking care not to deform the wire rope. The weight, replacing the manual tension, will prevent the unrolling of the wire rope from the drum (fig. 199).

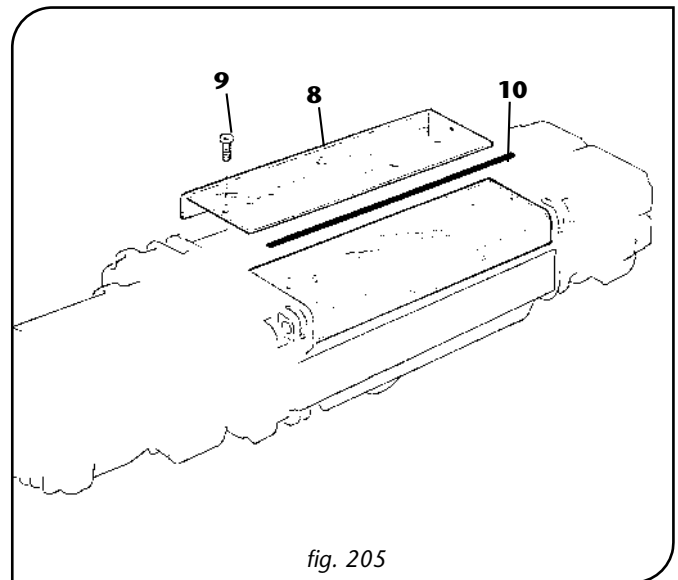
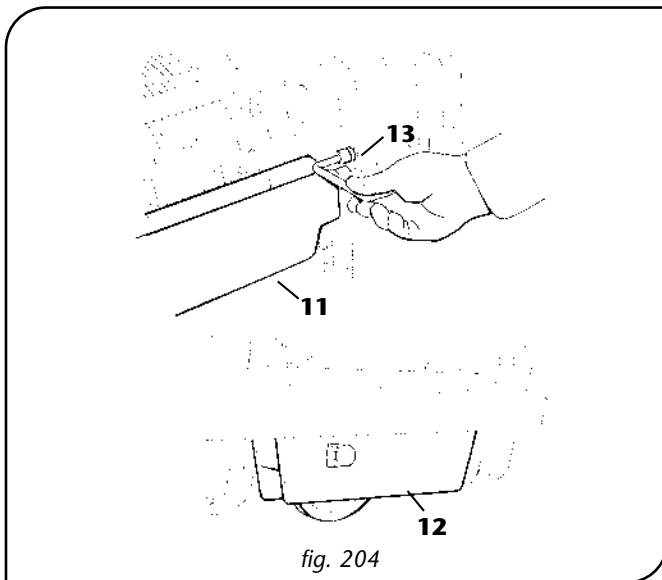




The following instructions are valid for all versions of DRH electric wire rope hoists, except those in 4-rope fall execution with DST/R trolley and 6 and 8-rope fall.

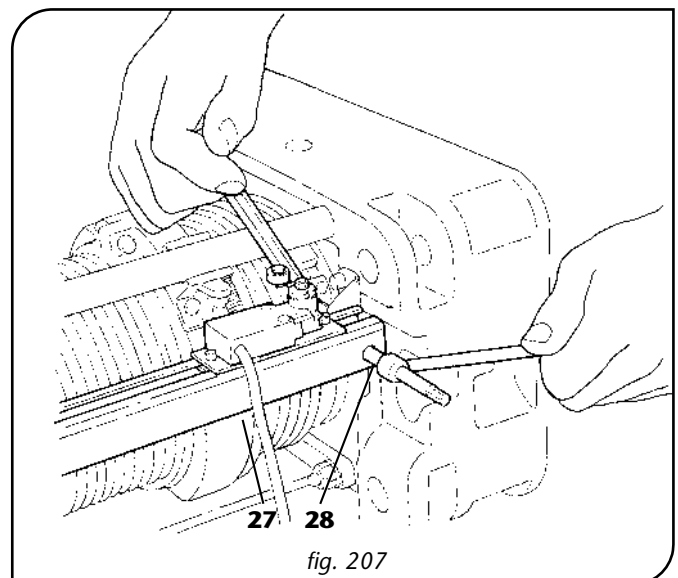
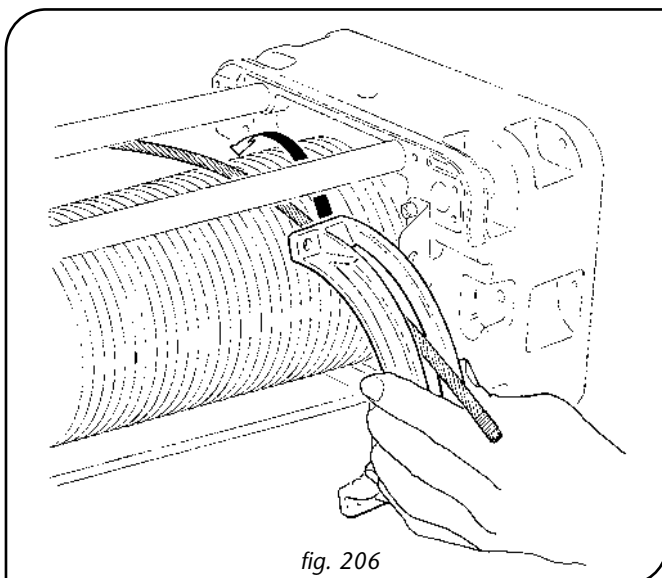
7. Bring together the two semi-rings -15- and -16- to the drum , inserting the screws -22- and the springs -23- and tightening the self-blocking nuts -21- until the springs are pre-charged -23-, taking care not to tighten them in a pack and to keep the whole ring-rope guide system elastic (fig. 200).
8. Insert, section by section, in the slot on the side of the rope ring, the wire rope-clamp runners -24- checking the correct slot (fig. 201).
9. Put back the runner/reaction arm -17- on the rope guide -16- and tighten the screws -18- (fig. 202).
10. Reposition the wire rope-clamping spring -19- in the place for the runners -24- and, using the special spring-tightening device -T-, pull it taut and couple the ends with the clip -20- (fig. 203).
11. Put back the anchorage cross head -11- and, in the case of 4-rope fall hoists, the sheave cross head -12-, putting back and tightening completely the safety screws -13- (fig. 204).
12. Put back the protection canopy -8- on the side opposite the limit switches, tightening the screws completely -9- and taking care to position the coupling gasket -10- of the two ends (fig. 205).
13. Carry out again all the sequences described in points 4.5.2 "Fitting the hook block" and 4.5.3 "Adjustments and trial runs". Lubricate the wire rope, the rope guide and drum.








*The following instructions are valid only for DRH electric wire rope hoists in 4-fall rope execution with DST/R trolley and 6 and 8-rope fall.*

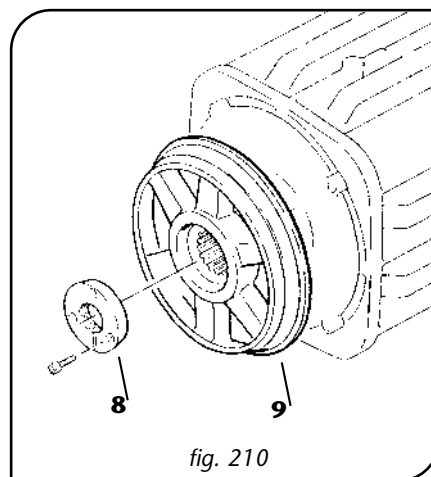
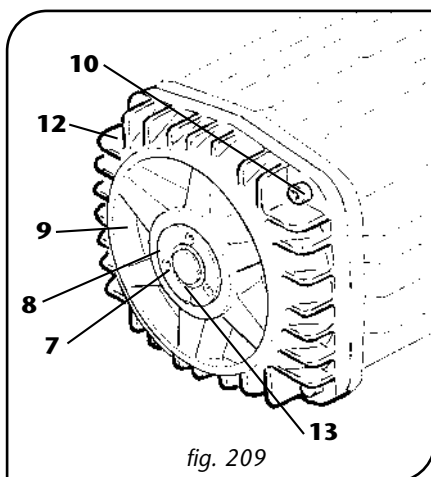
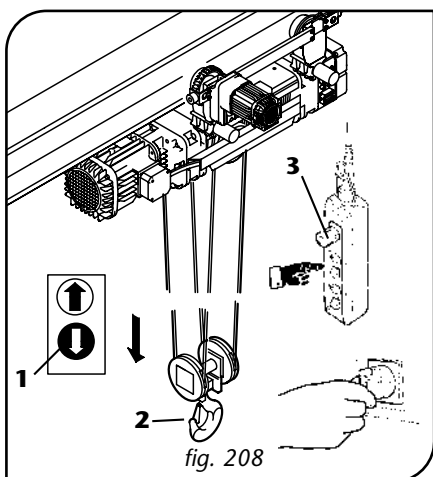
7. Bring to the drum the semi-ring on the side where the wire rope comes out -16- and rotate it towards the girder side, until the wire rope comes out downwards (fig. 206).
8. Bring the semi-ring to the opposite side to where the wire rope comes out -15- on the drum and match it up with the semi-ring on the side where the wire rope comes out -16-, insert the screws -22- and the springs -23- and tighten the self-blocking nuts -21- until the springs are pre-charged -23-, taking care not to tighten them in a pack and to keep the whole ring-rope guide system elastic (fig. 200).
9. Insert, section by section, in the slot on the side of the rope guide the rope-clamping runners -24- checking their correct sliding (fig. 201).
10. Put back the runner/reaction arm -17- on the rope guide -16- and tighten the screws -18- (fig. 202).
11. Reposition the wire rope-clamping spring -19- in the place for the runners -24- and using the special spring-tightening device -T-, pull it taut and couple the ends with the clip -20- (fig. 203).
12. Put back the limit switch cover -27- screwing up the respective screws -28- (fig. 207).
13. Put back the protection canopy -8-, on the opposite side to the limit switches, tightening completely the screws -9- and taking care to position the coupling gasket -10- of the two ends (fig. 205).
14. Carry out again all the sequences described in points 4.5.2. "Fitting the hook block" and 4.5.3 "Adjustments and trial runs". Lubricate the wire rope, rope guide and drum.



**6.6.2 Lifting brake replacement (conical motor)**

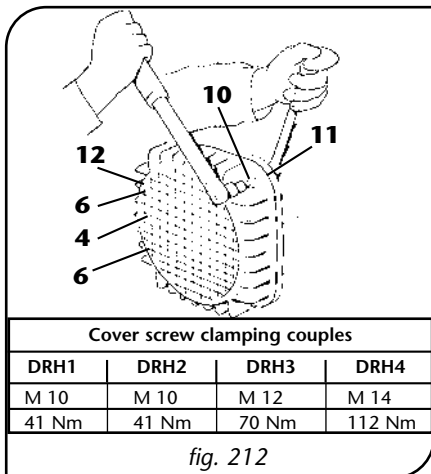
|   |   |  |
|---|---|--|
|  | <p>To replace the brake of the hoist motor, procede as follows:</p> | <br> |
|---|---|--|

1. Activating the descent switch -1- on the push-button panel, bring the hook block into the position of maximum descent -2- and release any load (fig. 208).
2. Remove the live power from the hoist pressing the emergency stop button -3-; put the level of the disconnettine switch in the "O" or "OFF" position, reach in safety the working zone, bringing to a height the push-button panel to prevent it being activated from the round (fig. 208).
3. Remove the brake cover -12- unscrewing completely the four screws -10- (fig. 209).
4. Remove the circlip -13- (fig. 209).
5. Unscrew completely the three screws -7- from the blocking ring -8- remove the brake shoe -9- (fig. 209).
6. Screw in blocking ring -8- to the end of the run and remove the brake shoe -9- (fig. 210).
7. Install the new brake shoe -9- and screw the blocking ring -8-. Fix again the blocking ring -8- to the brake shoe -9- using the three screw -7- (fig. 209) applying the couples shown in the table (fig. 211).
8. Put mount again the circlip -13- (fig. 209).
9. Install the brake cover -12- tightening it with the relative screws -10- and nuts -11- applying the couples shown in the table (fig. 212).
10. Procede to the test runs and check the braking spaces according to the table (fig. 213).
11. Where necessary, adjust the brake as described in point 6.4.1.



| Blocking ring clamping couples (7) |      |       |       |
|------------------------------------|------|-------|-------|
| DRH1                               | DRH2 | DRH3  | DRH4  |
| M 6                                | M 6  | M 8   | M 8   |
| 8 Nm                               | 8 Nm | 22 Nm | 22 Nm |

fig. 211



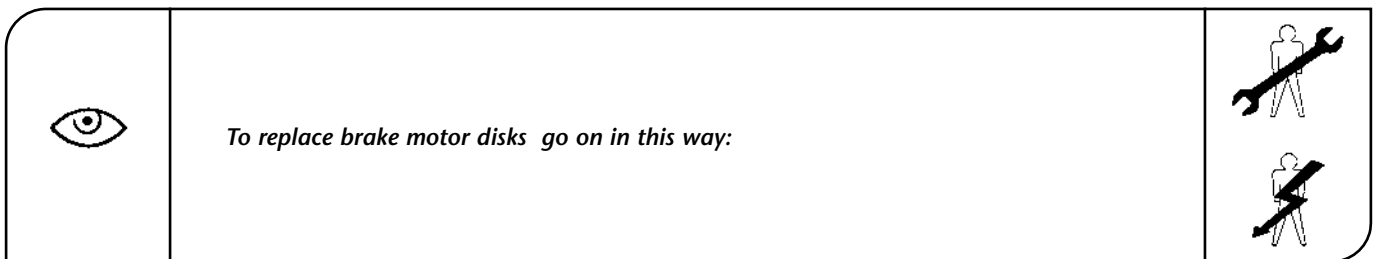
| Cover screw clamping couples |       |       |        |
|------------------------------|-------|-------|--------|
| DRH1                         | DRH2  | DRH3  | DRH4   |
| M 10                         | M 10  | M 12  | M 14   |
| 41 Nm                        | 41 Nm | 70 Nm | 112 Nm |

fig. 212

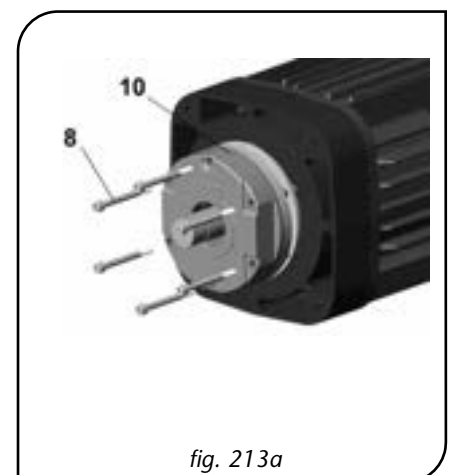
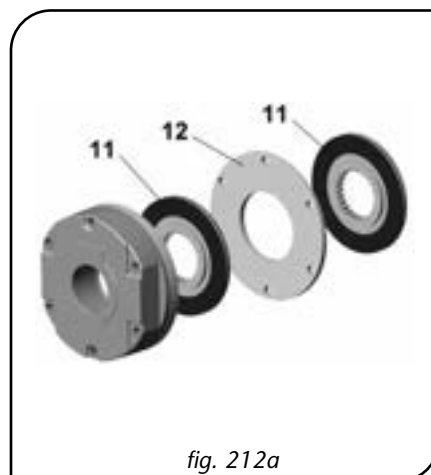
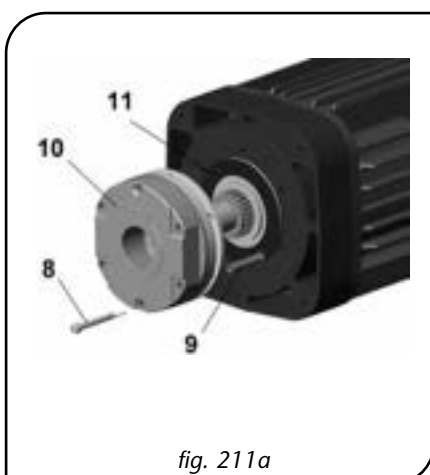
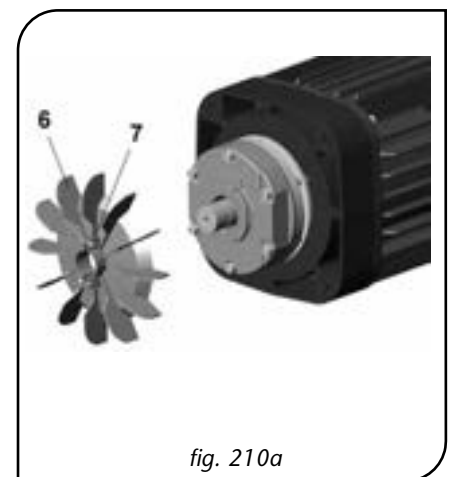
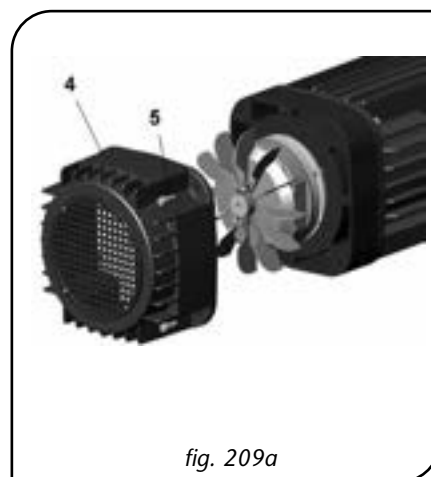
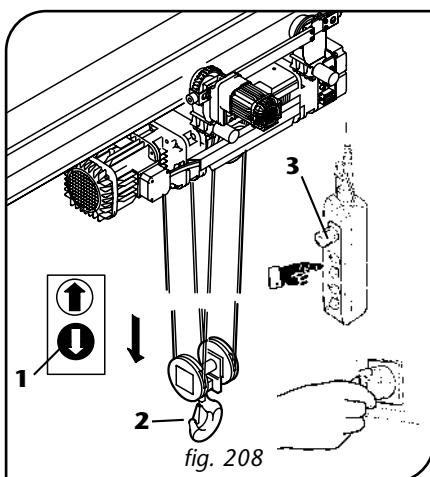
| Braking space with nominal load |               |             |                    |     |     |     |
|---------------------------------|---------------|-------------|--------------------|-----|-----|-----|
| N° falls                        | Speed (m/min) | Limit value | Braking space (mm) |     |     |     |
|                                 |               |             | Hoist size DRH     |     |     |     |
|                                 |               |             | 1                  | 2   | 3   | 4   |
| 2                               | 12            | maximum     | 120                | 150 | 180 | 210 |
|                                 |               | optimal     | 40                 | 50  | 60  | 70  |
|                                 | 8             | maximum     | 90                 | 120 | 150 | 180 |
|                                 |               | optimal     | 30                 | 40  | 50  | 60  |
| 4                               | 6             | maximum     | 60                 | 75  | 90  | 105 |
|                                 |               | optimal     | 20                 | 25  | 30  | 35  |
|                                 | 4             | maximum     | 45                 | 60  | 75  | 90  |
|                                 |               | optimal     | 15                 | 20  | 25  | 30  |
| 6                               | 2,7           | maximum     | 30                 | 40  | 50  | 60  |
|                                 | optimal       | 10          | 13                 | 16  | 20  |     |
| 8                               | 2             | maximum     | 22                 | 30  | 37  | 46  |
|                                 |               | optimal     | 7                  | 10  | 12  | 15  |

fig. 213

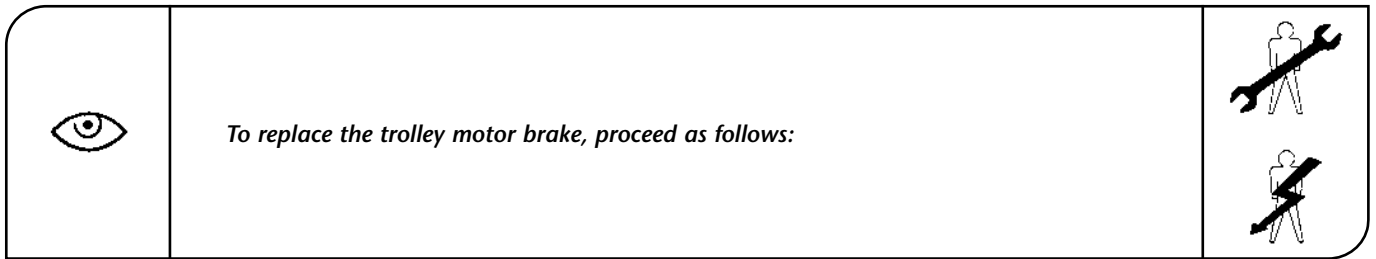
### 6.6.3 Lifting brake replacement (cylindrical motor DRH4 24kW)



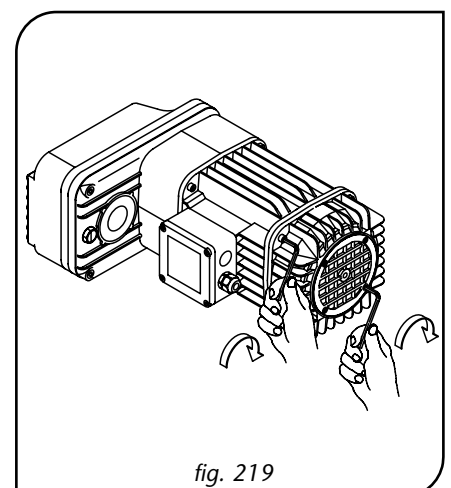
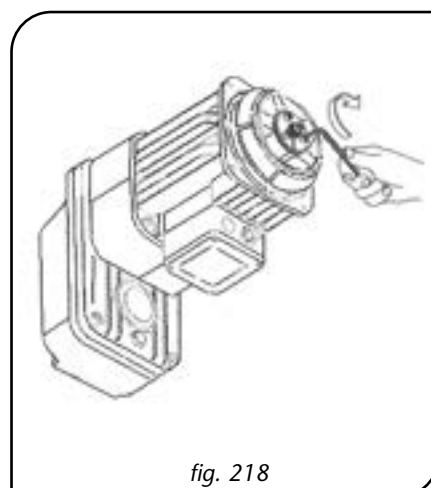
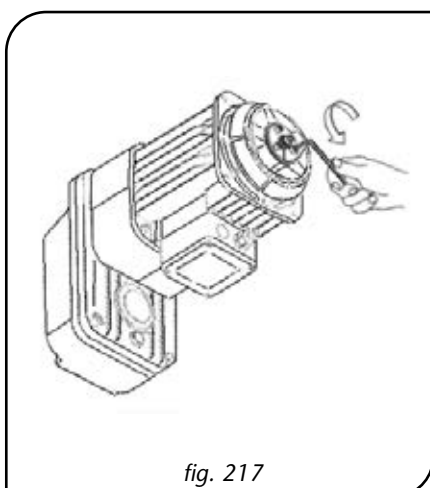
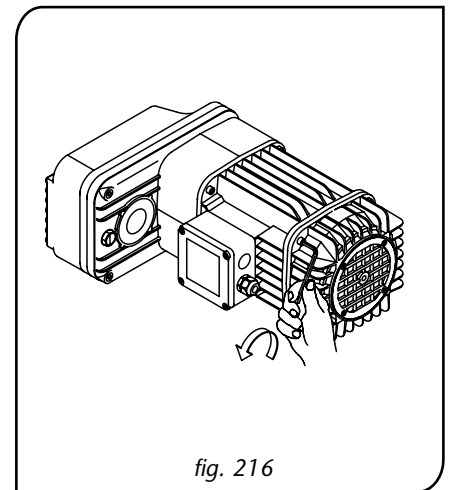
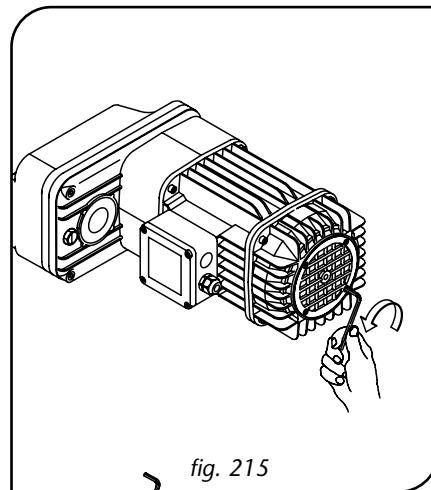
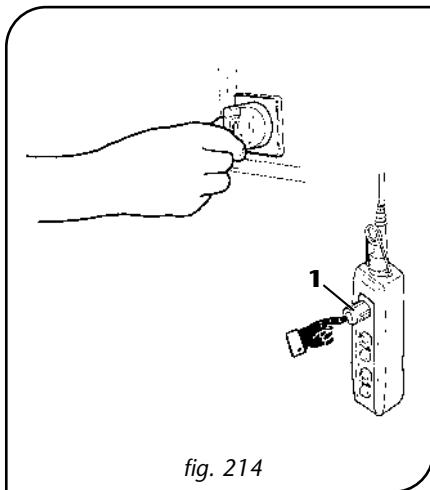
1. Acting on down push button -1- take the hook block in down position -2- and keep out the load (fig. 208).
2. Keep out tension at the hoist pushing circuit brake switch -3-, switch in "O" or "OFF" position, reach the work area, keep on the pendant push button to avoid any other ground activation.
3. Remove motor cover -4- screwing out the four screws -5- (fig. 209a).
4. Remove the fan -6- screwing the screws -7- (fig. 210a).
5. After having disconnected the brake supply cables from the Boiwo terminals inside connecting box, remove the fixing screws -8-, extract the brake group -10- and the disk -11- from the hub then remove the register screws -9- (fig. 211a).
6. Remove the keeper -12- and change the brake disks -11-. Insert the first disk on the hub and push it in contact with the shield then the second disk between the brake body and the keeper then tighten the register screws (fig. 212a).
7. Insert the brake group -10- on the hub then the fixing screws -8- (fig. 213a) then go to magnetic gap adjustment following 6.4.2 instructions.



### 6.6.4 Replacing the traverse brake



1. Cut off the trolley's power supply by pressing the emergency stop button -1-; set the line cut-off switch lever to the "O" or "OFF" position, then safely access the work area, taking the keypad up to the work area so as to avoid its being activated from the ground (fig. 214).
2. Operating from the raised scaffolding/platform, remove the protective grid (vent) positioned on the brake cover by completely unfastening the four screws (fig. 215).
3. Remove the motor's brake cover by completely unfastening the four screws (fig. 216).
4. Unscrew the three screws on the brake block lock ring nut completely (fig. 217).
5. Unscrew the ring nut completely and slide out the brake block with the worn out resistance material.
6. Assemble the new brake block (with the new resistance washer) and screw the ring nut back on entirely. Fasten the ring nut onto the brake block once again using the three screws. Reassemble the motor cover by tightening the screws and nuts (fig. 218-219).
7. Reassemble the grid by completely fastening the four screws (fig. 219).
8. Proceed with conducting operating tests and adjusting the braking torque as outlined at letter A of section 6.4.3.



### 6.6.5 Replacing the wheels of DST/N-S-R trolleys



*This operation must be carried out after disassembling of the hoist/trolley from the girder on which it is installed (see paragraph 6.5).*



*The replacement of all four wheels is recommended even if some of them appear to be in good condition.  
Assess moreover whether the transmission sprockets need replacing too.*



*For the replacement of the wheels proceed as follows: (fig. 220).*



- Remove the snap ring -1- and take off the wheels -2- (if necessary lever on the edges or use extractors).
- Put on the new wheels -2-, the snap rings -1-.
- Reinstall the hoist/trolley on the sliding girder as described in paragraph 4.4.

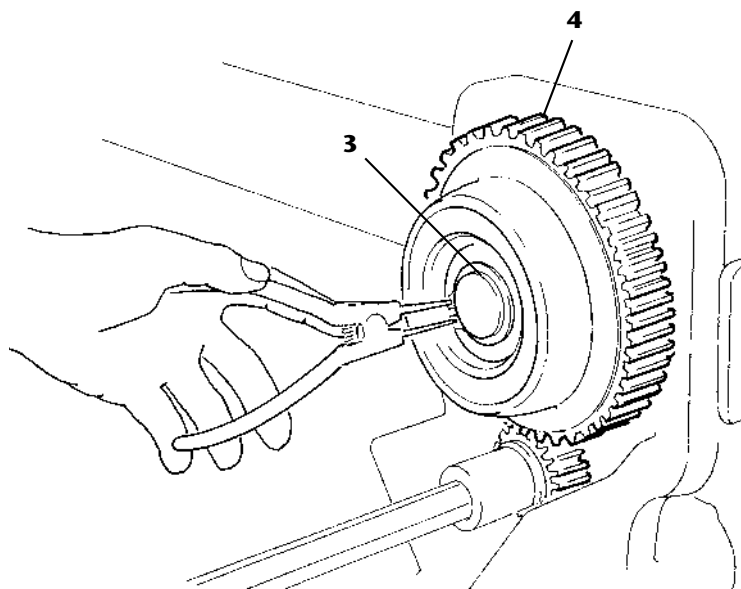


fig. 220

### 6.6.6 Replacing the wheels on the DRT double girder trolleys



*This operation must be carried out by priorly disassembling the hoist/trolley from the girder on which it is installed (see section 6.5).*



*It is advisable to replace all four wheels, even if one or more of them may appear to be in good condition.  
In addition, evaluate whether the drive shaft needs replacing as well.*



*To replace the wheels, proceed as follows: (fig. 221)*



- Position the double girder trolley onto a base which allows for sufficient space to slide out the wheels from the frame.
- Remove the gear motor -1- unscrewing the nut -2- from the screw -3- and extracting the screw and grover -4- as well as the shock absorbers and related washers, sliding it off the drive shaft -5-.
- Extract the drive shaft -5- from the traction wheel -6A-.
- Remove the wheel support units -7- unscrewing the screws -8- on the wheel -6A- sustaining it before extracting it from the frame.
- Remove the drive shaft -5-.
- Remove the wheel support units -7- unscrewing the screws -8- on the wheel -6B- sustaining it before extracting it from the frame.
- Assemble the new wheel -6B-, reassembling the wheel support units -7- by fastening them with the screws -8-.
- Slide the drive shaft -5- onto the wheel -6B- making certain to have previously inserted the internal wheel support -7- onto the wheel -6A-.
- Assemble the new wheel -6A-, reassembling the wheel support units -7- by fastening them with the screws -8-.
- Insert the drive shaft -5- onto the wheel -6A-.
- Reassemble the gear motor -1- onto the drive shaft -5-, blocking it in place with the screws -4-, then replace the screw -3- and nut -2- as well as the shock absorbers and washers, compressing the absorber pads by approximately 2 mm in total (1+1).
- Reinstall the hoist/trolley onto the running girders as outlined at section 4.4.4.

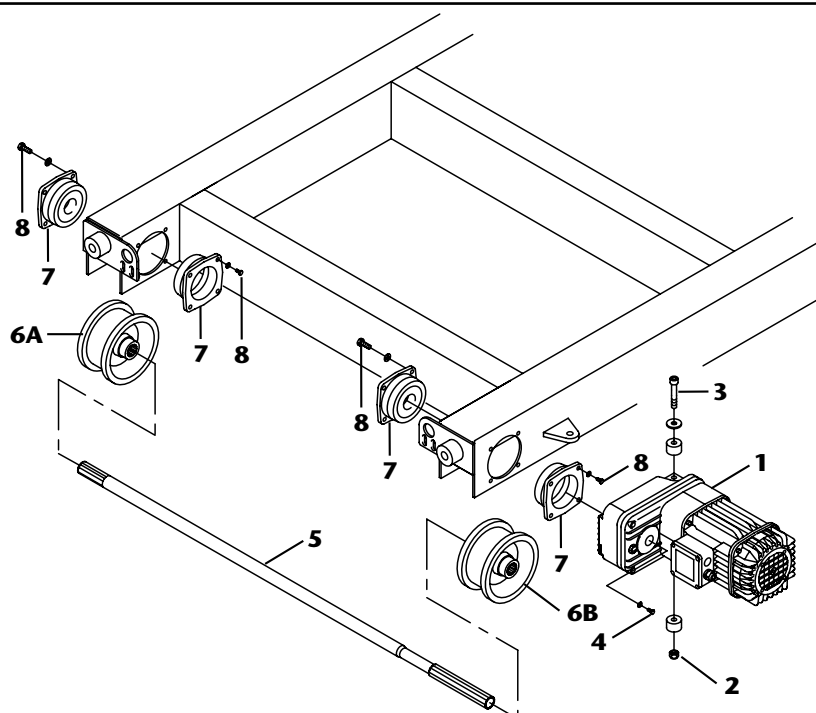


fig. 221

### 6.6.7 Replacing the hook side cheek of the hook block



Carry out the operation with the hook block dismantled from the hoist.  
For the dismantling and the reassembling of the hook block, see paragraph 6.6.1.



To be able to carry out the following operations, the following are needed:

- Portable drill with  $\varnothing 3$  mm point for removing aluminium rivets
- Riveter for fixing plates with  $\varnothing 3 \times 7$  mm rivets

#### Replacing the hook side cheek of the hook block for 2-rope fall hoists (fig. 222)

- Remove the label plate -1- before removing the fixing rivets (with a drill and tip  $\varnothing 3$  mm).
- Remove the screw -2- and the clip -3-.
- Remove the snap ring -4-.
- Take off the transverse support -5-.
- Take off the hook side cheek -6-.
- Install the new hook side cheek with the procedure in reverse.
- Fix the label plate on the transverse support with 4 rivets  $\varnothing 3 \times 7$  mm

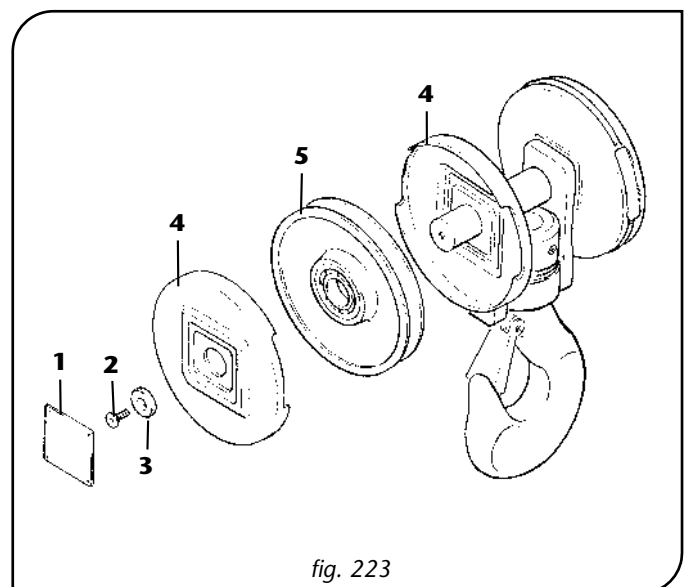
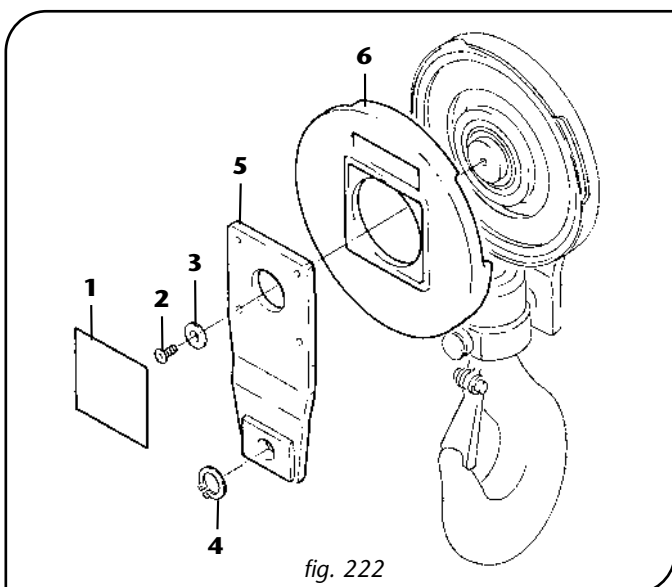
#### Replacing the hook side cheek of the hook block for 4-rope fall hoists (fig. 223)

##### External hook side cheek

- Remove the label plate -1- before removing the fixing rivets (with drill and tip  $\varnothing 3$  mm).
- Remove the screw -2- and the clip -3-.
- Remove the external hook side cheek -4-.
- Install the new hook side cheek with the procedure in reverse.
- Fix the label plate on the hook side cheek with 4 rivets  $\varnothing 3 \times 7$  mm.

##### Internal hook side cheek

- Remove the label plate -1- before removing the fixing rivets (with a drill and tip  $\varnothing 3$  mm).
- Remove the screw -2- and the clip -3-.
- Remove the external hook side cheek -4-.
- Take off the pulley -5-.
- Remove the internal hook side cheek -4-.
- Install the new hook side cheek with the procedure in reverse.
- Fix the label plate on the hook side cheek with 4 rivets  $\varnothing 3 \times 7$  mm.



## 6.7 Breakdowns and solutions

### 6.7.1 Main anomalies and malfunctionings

The most common conditions of bad functioning are shown, where reasonably predictable, in relation to the individual operating functions of the DRH electric wire rope hoist and related trolleys.

| FUNCTION =><br>FAULT<br>↓  | Lifting<br>hoist   | Travelling<br>trolley | Possible cause of fault   |
|--|--|-----------------------|---|
| it won't start   | X  |                       | <ul style="list-style-type: none"> <li>• ascent/descent limit switch</li> <li>• ascent/descent contactor</li> <li>• ascent/descent button</li> <li>• overload device</li> <li>• hoist motor</li> <li>• lifting motor fuses</li> </ul> |
| it won't start   | X  | X                     | <ul style="list-style-type: none"> <li>• hoist/trolley power cable</li> <li>• power line</li> <li>• low voltage transformer</li> <li>• line contactor</li> <li>• line fuses</li> </ul>  |
| it won't start   | -  | X                     | <ul style="list-style-type: none"> <li>• right/left limit switch</li> <li>• right/left contactor</li> <li>• right/left button</li> <li>• trolley motor</li> <li>• travelling motor fuses</li> </ul>                                   |
| it starts partially<br>(in one direction only)   | X  | X                     | <ul style="list-style-type: none"> <li>• limit switches or button of the inhibited function (independent from one another)</li> <li>• missing phase</li> </ul>  |
| the movement does not stop<br>in the due space   | X<br>inoltre il carico scivola<br>e non viene trattenuto | X                     | <ul style="list-style-type: none"> <li>• brake of the function</li> </ul>   |
| the movement does not stop<br>at the end of the run  | X  | X                     | <ul style="list-style-type: none"> <li>• brake of the function</li> <li>• limit switch of the function</li> </ul>   |
| the movement continues<br>even after releasing<br>the relative button                      | X  | X                     | <ul style="list-style-type: none"> <li>• direction button broken</li> <li>• related contactor</li> <li>• "false contact"</li> </ul>   |
| excessively loud lifting reducer   | X  | -                     | <ul style="list-style-type: none"> <li>• lacking lubrication</li> <li>• beyond the service cycle</li> </ul>   |
| excessively loud trolley reducer   | -  | X                     | <ul style="list-style-type: none"> <li>• too narrow play between wheel and girder</li> <li>• lacking lubrication</li> <li>• incorrect/too intense service</li> </ul>  |
| shrill noise of the brake in the<br>braking phases   | X  | X                     | <ul style="list-style-type: none"> <li>• dust present</li> <li>• excessive play</li> <li>• worn brake lining</li> </ul>   |
| shrill noise of the wheels<br>(functioning in jolts)                                       | -  | X                     | <ul style="list-style-type: none"> <li>• play between wheel and girder is incorrect</li> <li>• lacking lubrication</li> <li>• incorrect/too intense service</li> </ul>  |
| shrill noise of the wire rope<br>and/of the drum/transmission<br>pulley                    | X  | -                     | <ul style="list-style-type: none"> <li>• worn rope or drum/pulleys</li> <li>• lacking lubrication</li> <li>• incorrect/too intense service</li> </ul>   |
| the hoist jumps during<br>the travelling   | -  | X                     | <ul style="list-style-type: none"> <li>• incorrect contact between track and wheel</li> <li>• couplings of sliding girder are not aligned</li> </ul>  |
| the hoist and/or the trolley move<br>slowly or the hoist lifts the load<br>with difficulty | X  | X                     | <ul style="list-style-type: none"> <li>• drop in voltage</li> <li>• overload (due to no overload device)</li> <li>• seizure beginning in the reducer</li> <li>• incorrect contact between track and wheel</li> </ul>                  |
| live current is detected at the hook   | X  | -                     | <ul style="list-style-type: none"> <li>• faulty or broken electrical system</li> </ul>  |
| the trolley skids on the tracks<br>and does not travel                                     | -  | X                     | <ul style="list-style-type: none"> <li>• play between wheel and girder wing too narrow</li> <li>• obstacle on girder wing</li> <li>• oil or grease on girder wing</li> </ul>  |

### 6.7.2 Breakdowns of components and possible solutions

Causes of bad functioning of individual parts and possible solutions

| Type of fault  | Possible causes of the fault   | Possible actions to be taken   |
|--|--|--|
| wire rope jumps and loud noise is heard                                  | <ul style="list-style-type: none"> <li>breakdown of wire rope and/or drum or pulleys</li> <li>lacking lubrication</li> </ul>   | <ul style="list-style-type: none"> <li>replace wire rope, and if necessary the drum or pulleys</li> <li>lubricate wire rope, drum and pulleys</li> </ul>   |
| brakes skid  | <ul style="list-style-type: none"> <li>wear and tear of brake linings</li> <li>oil/grease present</li> </ul>   | <ul style="list-style-type: none"> <li>set the play or replace the gasket</li> <li>clean the gasket</li> </ul>   |
| brake heats excessively  | <ul style="list-style-type: none"> <li>incorrect service</li> <li>incorrect regulation</li> <li>working in unsuitable environmental conditions</li> </ul>  | <ul style="list-style-type: none"> <li>restore foreseen working conditions</li> <li>adjust brake</li> </ul>  |
| brake does not unblock   | <ul style="list-style-type: none"> <li>lacking electrical power</li> <li>incorrect regulation</li> </ul>   | <ul style="list-style-type: none"> <li>restore the voltage valves</li> <li>adjust brake</li> </ul>   |
| the brake tends to "stick"   | <ul style="list-style-type: none"> <li>working in unsuitable environmental conditions or outside the running service</li> </ul>  | <ul style="list-style-type: none"> <li>restore suitable conditions</li> </ul>  |
| the limit switch is blocked while opening, it does not go back to normal | <ul style="list-style-type: none"> <li>obstruction of activating head</li> <li>incorrect striking</li> <li>connections cut off</li> </ul>  | <ul style="list-style-type: none"> <li>cleaning and restoring of correct conditions</li> </ul>   |
| buttons on push-button panel are blocked "shut"                          | <ul style="list-style-type: none"> <li>obstruction of push-button control panel</li> </ul>   | <ul style="list-style-type: none"> <li>cleaning</li> <li>check the conductor</li> </ul>  |
| the contactors have "stuck" contacts                                     | <ul style="list-style-type: none"> <li>use in unsuitable environmental conditions or for unforeseen use</li> </ul>   | <ul style="list-style-type: none"> <li>restore the correct conditions of use</li> </ul>  |
| motor too warm   | <ul style="list-style-type: none"> <li>voltage variations are &gt; 10%</li> <li>little cooling</li> <li>environmental temperature &gt; than that foreseen</li> <li>use of hoist does not conform to running service foreseen</li> </ul>                                      | <ul style="list-style-type: none"> <li>ensure the correct voltage</li> <li>restore correct circulation of air</li> <li>gear characteristics of the motor</li> <li>adapt service conditions to those foreseen</li> </ul>  |
| motor won't start  | <ul style="list-style-type: none"> <li>burn out fuse</li> <li>contactor has cut off power</li> <li>overload, block due to high starting frequencies, insufficient protection</li> </ul>  | <ul style="list-style-type: none"> <li>replace fuse</li> <li>check the contactor of the function</li> <li>rewind the motor to ensure better protection</li> <li>check control device</li> </ul>  |
| motor has trouble starting   | <ul style="list-style-type: none"> <li>on starting the voltage or frequency are lowered with respect to the nominal value</li> </ul>   | <ul style="list-style-type: none"> <li>improve the line or power supply conditions</li> </ul>  |
| motor hums and absorbs a lot of power                                    | <ul style="list-style-type: none"> <li>faulty winding, rotor is in contact with the stator</li> <li>a power phase is locking</li> <li>reducer is blocked</li> <li>brake is blocked</li> <li>short circuit in the power cables</li> <li>short circuit in the motor</li> </ul> | <ul style="list-style-type: none"> <li>repair by a specialist</li> <li>check power supply and/or the contactor</li> <li>request intervention by a specialist</li> <li>check and if necessary set the brake</li> <li>eliminate the short circuit</li> <li>request the intervention of a specialist</li> </ul> |
| short circuit in the winding of the motor                                | <ul style="list-style-type: none"> <li>breakdown in the winding</li> </ul>   | <ul style="list-style-type: none"> <li>rewind the motor</li> </ul>   |
| false contact  | <ul style="list-style-type: none"> <li>involuntary activating of the function</li> </ul>   | <ul style="list-style-type: none"> <li>check the conductors of the push-button control panel</li> </ul>  |




### 6.7.3 Authorised staff for intervention in case of breakdown

The staff authorised to intervene in most cases of breakdown, or where not indicated differently, are expert maintenance people or trained with a specific preparation on mechanical and electrical parts. Where shown, however, the intervention of specialised suitably-trained staff or the technical staff of the manufacturer is necessary.


### 6.7.4 Putting out of service

If the hoist cannot be repaired, proceed to the putting out of service operations, signalling the breakdown with a sign; request the intervention of the assistance service.

## 6.8 Dismantling, disposal and scrapping

|   |   |  |
|---|---|--|
|  | <i>If the hoist or its components, whether broken, worn out or at the end of their designated life, should no longer be usable nor repairable their demolition must be carried out.</i> | <br> |
|---|---|--|


- The demolition of the DRH wire rope hoists and related trolleys must be carried out using suitable equipment chosen according to the nature of the material on which to intervene (e.g.: shears, ox hydrogen flame, saw, etc...)
- All the components must be dismantled and scrapped having been reduced to small pieces so that none of them can reasonably be used again.
- When the hoist and/or trolley are scrapped their parts must be disposed of taking into account the different nature of them (metals, oils and lubricants, plastic, rubber, etc.) using possibly specialised companies and in any case according to what the relevant law requires regarding solid industrial waste.


|  |   |
|--|---|
|  | <i>Do not try to use again parts or components of the hoist and of the related trolley which look intact but, after checks and/or replacements carried out by specialised staff, or by the manufacturer itself, have been declared no longer fit for use.</i> |
|--|---|



## 7. - SPARE PARTS




|   |  |
|---|--|
|  | <ul style="list-style-type: none"> <li>• <i>The DRH electric wire rope hoists and related trolleys are designed and manufactured, so as not to normally require spare parts DUE TO BREAKDOWNS or BREAKAGES, if used correctly and according to adequate maintenance as described in this manual.</i></li> <li>• <i>The parts and components subjected to normal wear and tear or deterioration are to be obtained from the manufacturer for a minimum period of 10 years.</i></li> </ul> |
|---|--|

|   |  |
|---|--|
|  | <ul style="list-style-type: none"> <li>• <i>Do not hesitate to replace the part and/or component under examination, if it does not give sufficient safety guarantees and/or functional reliability.</i></li> <li>• <i>Never carry out improvised repairs.</i></li> </ul> |
|---|--|

If it is necessary to replace broken parts it is compulsory to use only original spare parts , requesting them directly from:

|   |   |  |
|---|---|--|
|  |  <b>donati</b> | <b>Donati Sollevamenti s.r.l.</b><br>Via Quasimodo, 17 - 20025 Legnano (Milano) - Italy<br>Tel. +39 0331 14811 - Fax +39 0331 1481880<br>E-mail: <a href="mailto:info@donaticranes.com">info@donaticranes.com</a> - <a href="http://www.donaticranes.com">www.donaticranes.com</a> |
|---|---|--|

|   |   |
|---|---|
|  | <i>The use of non-original spare parts, as well as cancelling the warranty, can threaten the good functioning of the electric wire rope hoists and/or related trolleys.</i> |
|---|---|





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