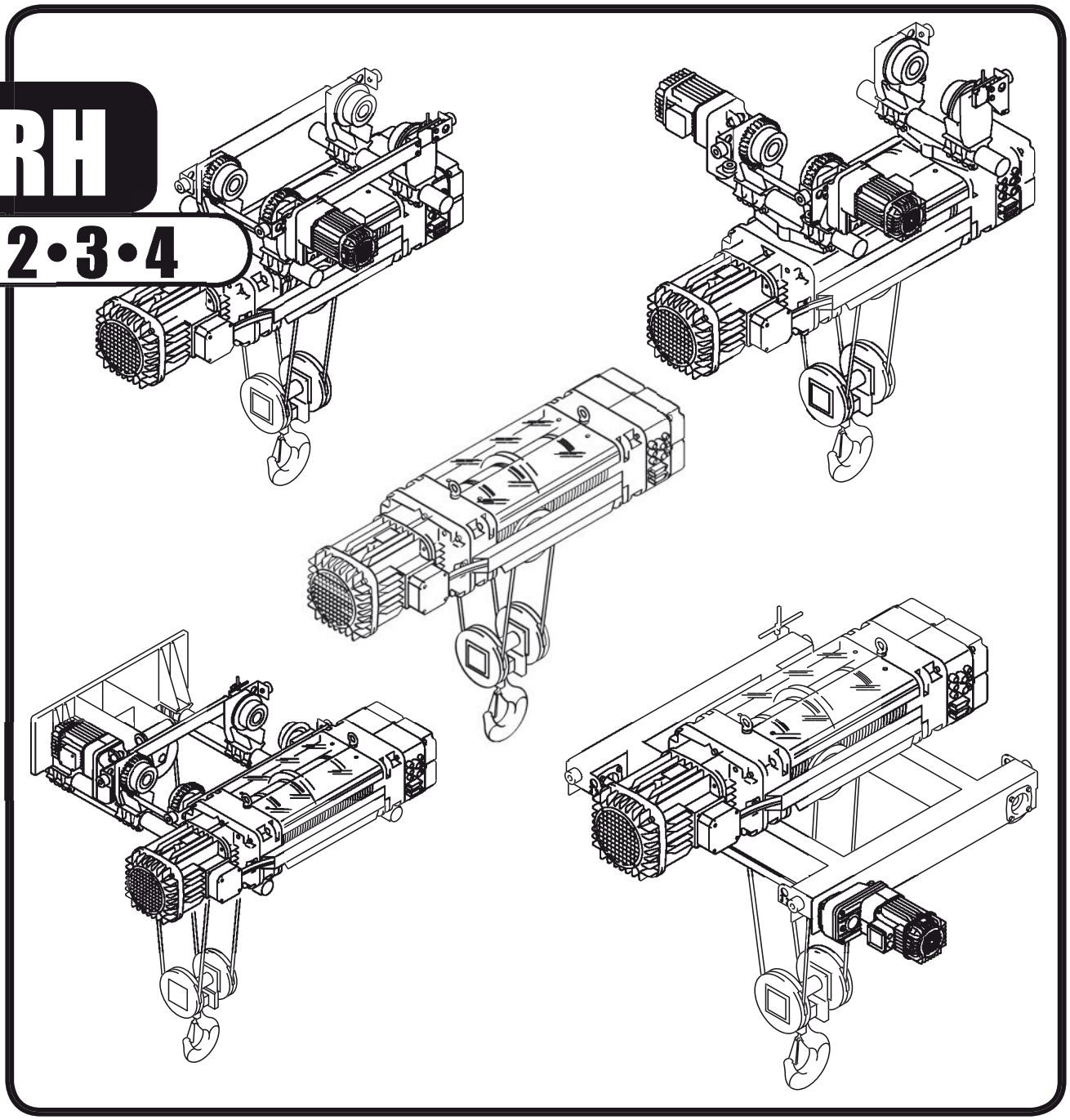
KMAN
16MG05

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

donati

INSTRUCTIONS FOR USE

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

KMAN16MG05

INDEX

INDEX

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:

Donati Sollevamenti s.r.l.
Via Quasimodo, 17 - 20025 Legnano (Milano) - Italy
Tel. +39 0331 14811 - Fax +39 0331 1481880
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.

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
	Danger	• Indicates a danger with risk of accident, possibly fatal. • 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! • **Follow the instructions scrupulously!**
	Warning	• Represents a warning note of attention of possible deterioration of the hoist or of a personal object of the operator. • **Important warning which requires one's utmost care.**
	Warning / Note	• Indicates a warning or a note about key functions or useful information.
	Visual observation **Action to be taken**	• A printed eye can indicate to the reader that: a) He should proceed to a visual observation b) He should proceed to the operating sequence. c) It is necessary to take a reading, to check a signal, etc.

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 - Annexe 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: ☐ Suspended ☐ Rested			
Crane structure : ☐Single girder ☐Double girder	Type :	Serial Nr :	Year :
Jib crane: ☐Bracket ☐ Arm ☐ Column	Type :	Serial Nr :	Year :
Electric hoist : ☐ Wire rope ☐ Chain	Type :	Serial Nr :	Year :
Trolley : ☐ Electric ☐ Mechanical ☐ Push	Type :	Serial Nr :	Year :
Capacity (kg) :			

Is in according to the Comunitary 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 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)
UNI 9466/94 - Lifting appliances shell drum. Design requirements (for wire rope hoists DRH series)
DIN 15401 - Lifting hooks for lifting appliances; Single hooks
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 9.671/88 - 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 9.683/95 - Selection of lifting and travel motors
FEM 9.755/93 - Measures for achieving safe working periods for serial hoists units (S.W.P.)
FEM 9.941/95 - 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-authorised 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.

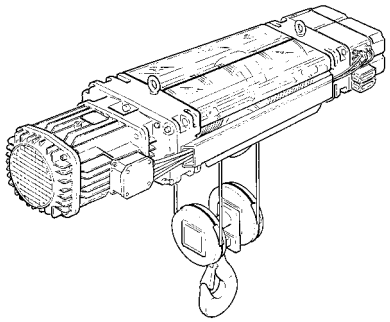


fig. 1

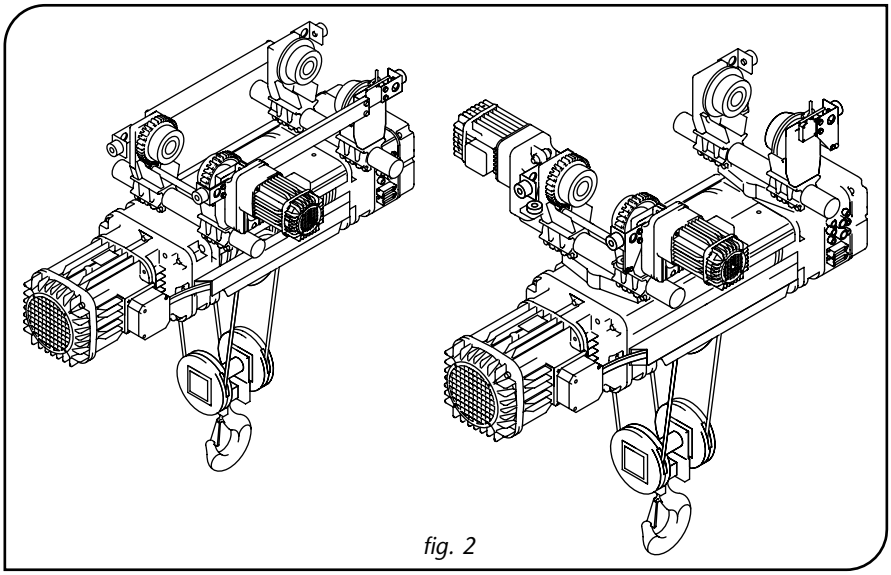


fig. 2

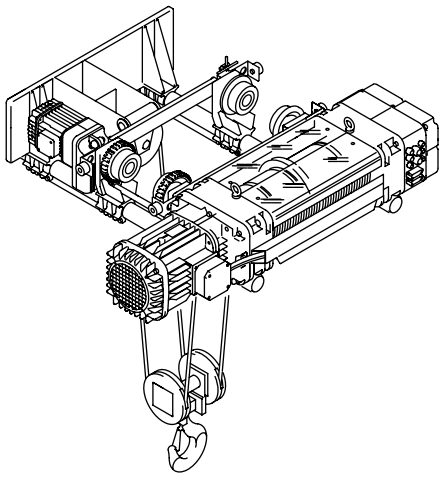


fig. 3

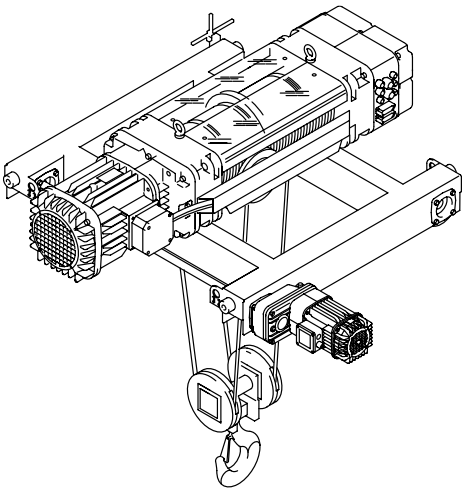


fig. 4

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)

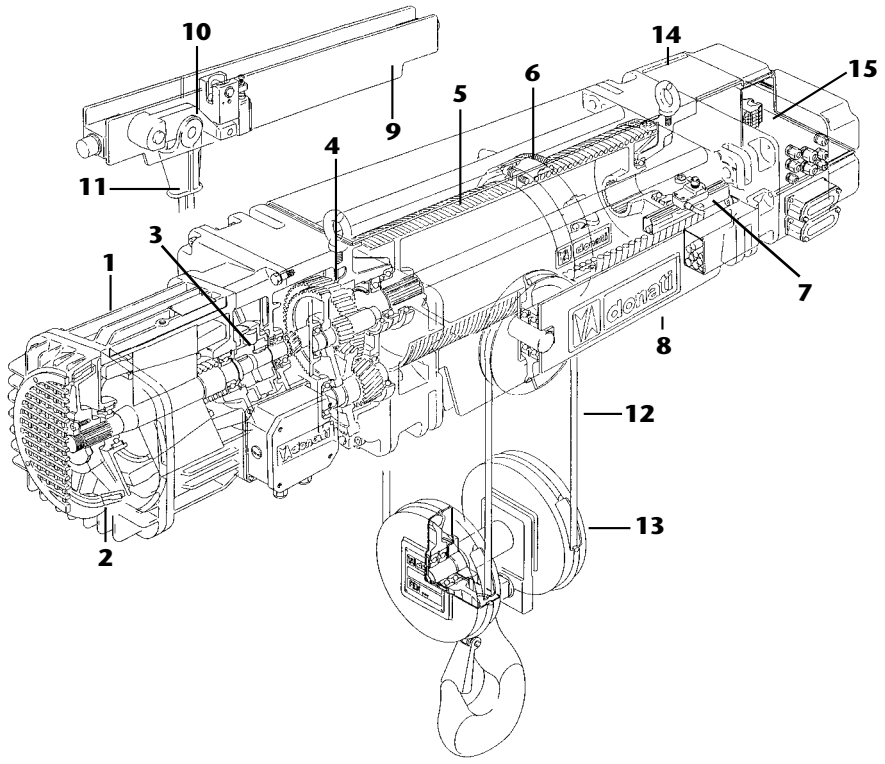


fig. 5

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 lubrification. 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)

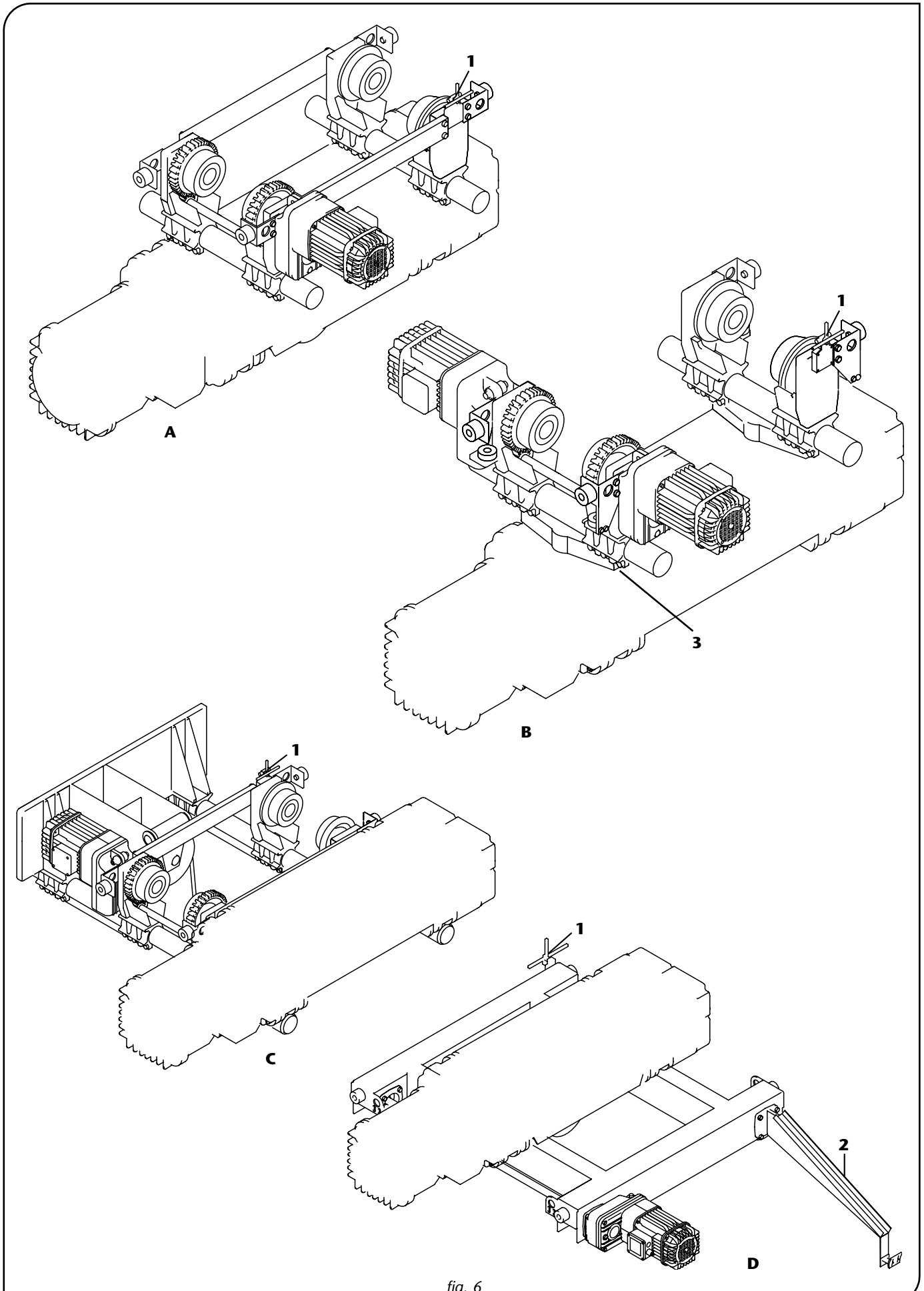


fig. 6

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 applicances"
- 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° C; maximum +40° 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

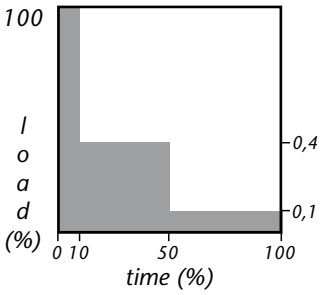
- This is determined by the heaviest load to be lifted.

!	***The nominal lifting capacity of the hoist must be ≥ the actual lifting capacity***	***Lifting capacity = kg***

2) Stress level

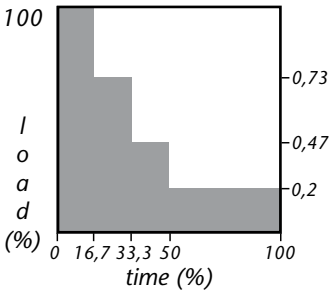
- The stress level is determined considering the actual entity of the loads lifted and it is ascribable to one of the four spectrums of load shown below which determine the type of service.

1) Light



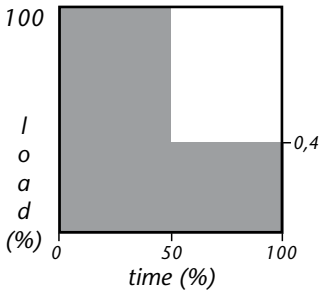
Hoists which rarely lift maximum loads but mainly reduced loads

2) Medium



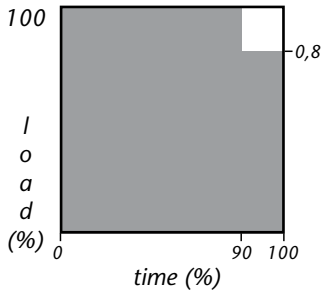
Hoists which lift approximately the same number of maximum, medium and reduced loads

3) Heavy



Hoists which frequently lift the maximum load but normally medium loads

4) Very Heavy

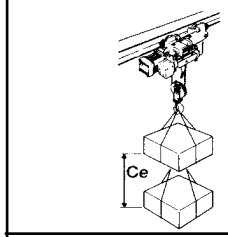


Hoists which regularly lift loads approximately equal to the maximum load

3) Average duration of daily use - Tm=Hours

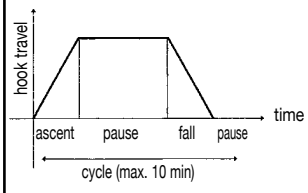
- For **lifting** operations the average duration of use is calculated in the following way:

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



Actual hook run
AHR = m

It is the average of the actual runs of the load

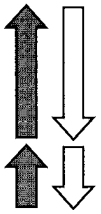


Operative cycles
C/h = N° cycles per hour

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

Running time
Rt = hours

Hoist running time in a whole day

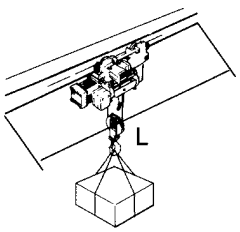


Lifting speed
S = m/min.

It is the distance covered by the load in a minute

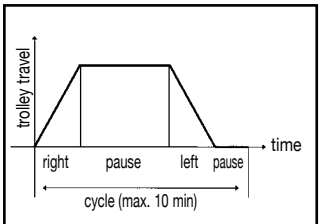
- For **travel** operations the average duration of use is determined in the following way:

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



Actual average run
AAR (m) = L/2

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

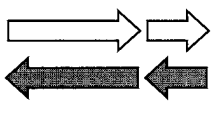


Operative cycles
C/h = N° cycles for hour

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

Running time
Rt = ore

It is the running time of the trolley in a day



Travel speed
S = m/min.

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 classifiled 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	> 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)	$250x10^3$	$500x10^3$	$100x10^4$	$200x10^4$	$400x10^4$	$> 4x10^6$
	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)	$125x10^3$	$250x10^3$	$500x10^3$	$100x10^4$	$200x10^4$	$400x10^4$
	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)	$63x10^3$	$125x10^3$	$250x10^3$	$500x10^3$	$100x10^4$	$200x10^4$
	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)	$32x10^3$	$63x10^3$	$125x10^3$	$250x10^3$	$500x10^3$	$100x10^4$
Service group of the mechanisms of lifting and travelling		as per ISO 4301-1	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**
		as per FEM 9.511	**1Bm**	**1Am**	**2m**	**3m**	**4m**	**5m**
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:

Tm (hour) = **(AHR x C/h x Rt) / (30 x S) = (2,5 x 8 x 8) / (30 x 4) = 1,33 h**

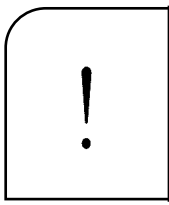
In the table in section 2.2.7, in relation to the Capacity (6300 kg), at a Medium level of stress (2) and at an average daily running time (Tm = 1,33h) it is possible to determine the rope hoist, with 4/1 falls of rope, which is:

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

2) Check of the time of life:
Hours of running 10 years **Tm x D/y x 10 years = 1,33 x 220 x 10 = 2933** (hours) < **of the 3200** (maximum hours possible) ⇨ **ok**
N° of cycle of work in 10 years **C/h x Rt x D/y x 10 years = 8 x 8 x 220 x 10 = 140800** (cycles) < **of the 250000** (maximum hours possible) ⇨ **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 paragraph3.5.3 - 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 → *(single-grooved drum)*			*8 falls (8/1)*			*6 falls (6/1)*		*4 falls (4/1)*				*2 falls (2/1)*		
Capacity kg	**Letter**		**DRH Type in relation to FEM group** (ISO)			**DRH Type in relation to FEM group** (ISO)		**DRH Type in relation to FEM group** (ISO)				**Tipo DRH nel gruppo FEM** (ISO)		
	reducer	**capacity**	**1Bm** (M3)	**1Am** (M4)	**2m** (M5)	**1Am** (M4)	**2m** (M5)	**1Bm** (M3)	**1Am** (M4)	**2m** (M5)	**3m** (M6)	**1Am** (M4)	**2m** (M5)	**3m** (M6)
800	**L**	**D**												**12L3•D**
800	**V**	**D**												**12V3•D**
1000	**L**	**E**									**14L3•E**		**12L2•E**	**12L3•E**
1000	**V**	**E**									**14V3•E**		**12V2•E**	**22V3•E**
1250	**L**	**F**									**14L3•F**	**12L1•F**		**12L3•F**
1250	**V**	**F**									**14V3•F**	**12V1•F**	**22V2•F**	**22V3•F**
1600	**L**	**G**									**14L3•G**	**12L1•G**	**12L2•G**	**22L3•G**
1600	**V**	**G**									**14V3•G**		**22V2•G**	**32V3•G**
2000	**L**	**H**								**14L2•H**	**14L3•H**	**12L1•H**	**22L2•H**	**22L3•H**
2000	**V**	**H**								**14V2•H**	**24V3•H**	**22V1•H**	**32V2•H**	**32V3•H**
2500	**L**	**I**							**14L1•I**		**14L3•I**	**22L1•I**	**22L2•I**	**32L3•I**
2500	**V**	**I**							**14V1•I**	**24V2•I**	**24V3•I**		**32V2•I**	**32V3•I**
3200	**L**	**J**							**14L1•J**	**14L2•J**	**24L3•J**	**22L1•J**	**32L2•J**	**32L3•J**
3200	**V**	**J**						**14V0•J**		**24V2•J**	**34V3•J**		**32V2•J**	**42V3•J**
4000	**L**	**K**							**14L1•K**	**24L2•K**	**24L3•K**	**32L1•K**	**32L2•K**	**32L3•K**
4000	**V**	**K**							**24V1•K**	**34V2•K**	**34V3•K**	**32V1•K**	**42V2•K**	**42V3•K**
5000	**L**	**L**							**24L1•L**	**24L2•L**	**34L3•L**	**32L1•L**	**32L2•L**	**42L3•L**
5000	**V**	**L**						**24V0•L**		**34V2•L**	**34V3•L**		**42V2•L**	
6300	**L**	**M**							**24L1•M**	**34L2•M**	**34L3•M**	**32L1•M**	**42L2•M**	**42L3•M**
6300	**V**	**M**								**34V2•M**	**44V3•M**	**42V1•M**		
8000	**L**	**N**							**34L1•N**	**34L2•N**	**34L3•N**	**42L1•N**	**42L2•N**	
8000	**V**	**N**							**34V1•N**	**44V2•N**	**44V3•N**			
10000	**L**	**O**							**34L1•O**	**34L2•O**	**44L3•O**	**42L1•O**		
10000	**V**	**O**						**34V0•O**		**44V2•O•**	**44S3•O**	**42S1•O**		
12500	**L**	**P**							**34L1•P**	**44L2•P**	**44L3•P**			
12500	**V**	**P**							**44V1•P**	**44S2•P**	**44S3•P**			
16000	**L**	**Q**					**36L2•Q**		**44L1•Q**	**44L2•Q**				
16000	**V**	**Q**						**44V0•Q**	**44S1•Q**	**44S2•Q**				
20000	**L**	**R**			**38L2•R**	**36L1•R**			**44L1•R**	**44L2.R**				
20000	**V**	**R**							**44S1•R**					
25000	**L**	**S**		**38L1•S**			**46L2•S**	**44L0•S**	**44M1.S**					
25000	**V**	**S**					**46S2•S**							
32000	**L**	**T**				**46L1•T**	**46L2.T**							
32000	**V**	**T**				**46S1•T**								
40000	**L**	**U**		**48L1•U**	**48L2•U**									
40000	**V**	**U**		**48S1•U**										
50000	**L**	**V**	**48L0•V**											
50000	**V**	**V**	**48S0•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

2 4 L 2 • L •

Size:
1 - 2 - 3 - 4

N° rope falls:
2 = 2 falls (2/1)
4 = 4 falls (4/1)
6 = 6 falls (6/1)
8 = 8 falls (8/1)

Type of reducer:
© M-Cylindrical = Slow
4 m/min a 4/1 falls
© S-Cylindrical = Fast
3 m/min a 8/1 falls
4 m/min a 6/1 falls
6 m/min a 4/1 falls
12 m/min a 2/1 falls
L = Slow
2 m/min a 8/1 falls
2.7 m/min a 6/1 falls
4 m/min a 4/1 falls
8 m/min a 2/1 falls
V = Fast
6 m/min a 4/1 falls
12 m/min a 2/1 falls

0 = 1 Bm (M3)
1 = 1 Am (M4)
2 = 2 m (M5)
3 = 3 m (M6)

Type of drum:
N = Normal
C = Short
L = Long
1 = Extra long - X1 (1ª size)
2 = Extra long - X2 (2ª size)
X = Special

Capacity letter:
L = 5000 kg

Speed of hoist:
S = 1 Speed
W = 2 Speed

DST Trolley

D S 1 A G

Configuration type
Monorail suspended

Size:
1 - 2 - 3 - 4

Version:
A = Normal
B = Low headroom
C = Articulated
D = Oscillanting

Speed of trolley: m/min
E = 8
F = 10
G = 16
H = 20
D = 16/4
W = 20/5

DRT Trolley

D R 1 A G 0

Configuration type
Double girder trolley

Size:
1 - 2 - 3 - 4

Gauge: mm
A = 1000
B = 1200
C = 1400
D = 2240
E = 2800
X = Special

Version:
0 = Hoist on top of trolley
S = suspended hoist
T = Trasversal

Trolley speed: m/min
E = 8
F = 10
G = 16
H = 20
D = 16/4
W = 20/5

2.2.8 Characteristics and technical data

Capacity (kg)	FEM Groupe of the hoist	Life and service reducers/ motors(1)	Data of the DRH electric wire rope hoists													Type of trolley on the hoist	
			Type	Speed at 50 Hz (m/min.)		Motor power (kW)		Lifting height (m) with rope drum(2) (3)					Rope(2)			monorail DST – N/R	double girder DRT
			DRH	1 Speed	2 Speed	1 Speed	2 Speed	C	N	L	X1	X2	N° falls	Ø/Type (mm)			
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 (kg)	FEM Groupe of the hoist	Life and service reducers/ motors(1)	Data of the DRH electric wire rope hoists													Type of trolley on the hoist	
			Type DRH	Speed at 50 Hz (m/min.)		Motor power (kW)		Lifting height (m) with rope drum(2) (3)					Rope(2)			monorail DST – N/R	double girder DRT
				1 Speed	2 Speed	1 Speed	2 Speed	C	N	L	X1	X2	N° falls	Ø/Type (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	34VO•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.

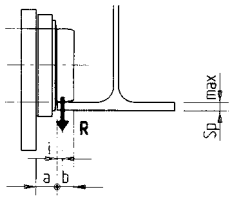
Breaking load of the ropes (minimum granted kN)																							
Hoist type →	DRH1			DRH2					DRH3							DRH4							
Ø Rope →	Ø 7 mm			Ø 8 mm		Ø 9 mm			Ø 12 mm		Ø 13 mm					Ø 15 mm		Ø 16 mm				Ø 16,2 mm
Strength classes →	B	M	A	M	A	B	M	A	M	A	B	M	A	A1		M	A	B	M	A	A1		A
Normal (kN)	30,4	42,1	48,1	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 Type - Size		1 Speed: 8 or 10 m/min.(1)				1 Speed: 16 or 20 m/min.(1)				2 Speed: 16/4 or 20/5 m/min.(1)			
		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	ϒ1	ϒ2	71 - 4	0,16	ϒ1	ϒ2	71 - 2	0,32	ϒ1	ϒ2	71 - D	0,32/0,07
	3	ϒ1	ϒ2	80 - 4	0,25	ϒ1	ϒ2	80 - 2	0,50	ϒ1	ϒ2	80 - D	0,50/0,12
	4	ϒ1	ϒ2	80 - 4	0,32	ϒ1	ϒ2	80 - 2	0,63	ϒ1	ϒ2	80 - D	0,63/0,15
DRT double girder	1	ϒ1	ϒ2	71 - 4	0,16	ϒ1	ϒ2	71 - 2	0,32	ϒ1	ϒ2	71 - D	0,32/0,07
	2	ϒ1	ϒ2	80 - 4	0,25	ϒ1	ϒ2	80 - 2	0,50	ϒ1	ϒ2	80 - D	0,50/0,12
	3	ϒ1	ϒ2	80 - 4	0,32	ϒ1	ϒ2	80 - 2	0,63	ϒ1	ϒ2	80 - D	0,63/0,15
		ϒ1	ϒ2	100 - 4	0,63	ϒ1	ϒ2	100 - 2	1,25	ϒ1	ϒ2	100 - D	1,25/0,31
	4	ϒ1	ϒ2	100 - 4	0,63	ϒ1	ϒ2	100 - 2	1,25	ϒ1	ϒ2	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

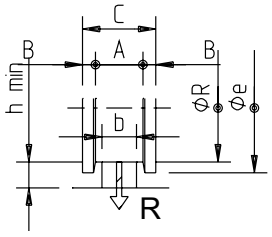
DST N/S R	Ø R Wheel (mm.)	Dimensions (mm) i	a	b	Thick max. (mm.)
DST1	100	8	35	18	20
DST2	125	12	35	29	23
DST3	200	19	45	38	36
DST4	250	22	50	43	42



Position of the DST wheels on the beam

Dimensions of the DRT wheels and relevant rails

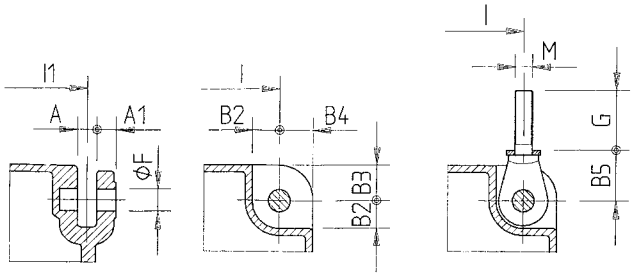
DRT	Ø R Wheel (mm)	Dimensions (mm) Wheel A	B	C	Ø e	Binario h min.	b min.	b max.
DRT1	125	50	15	80	150	30	30	40
DRT2	160	55	19	93	190	30	30	45
DRT3	200	60	20	100	230	30	40	50
DRT4	250	70	20	110	280	40	50	60



Position of the DRT trolley wheels on the rail

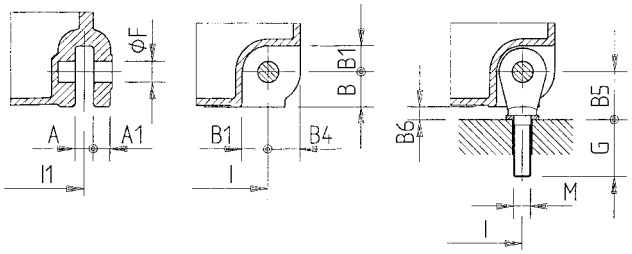
Fissaggio dei paranchi a fune DRH in esecuzione sospesa ed appoggiata

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.



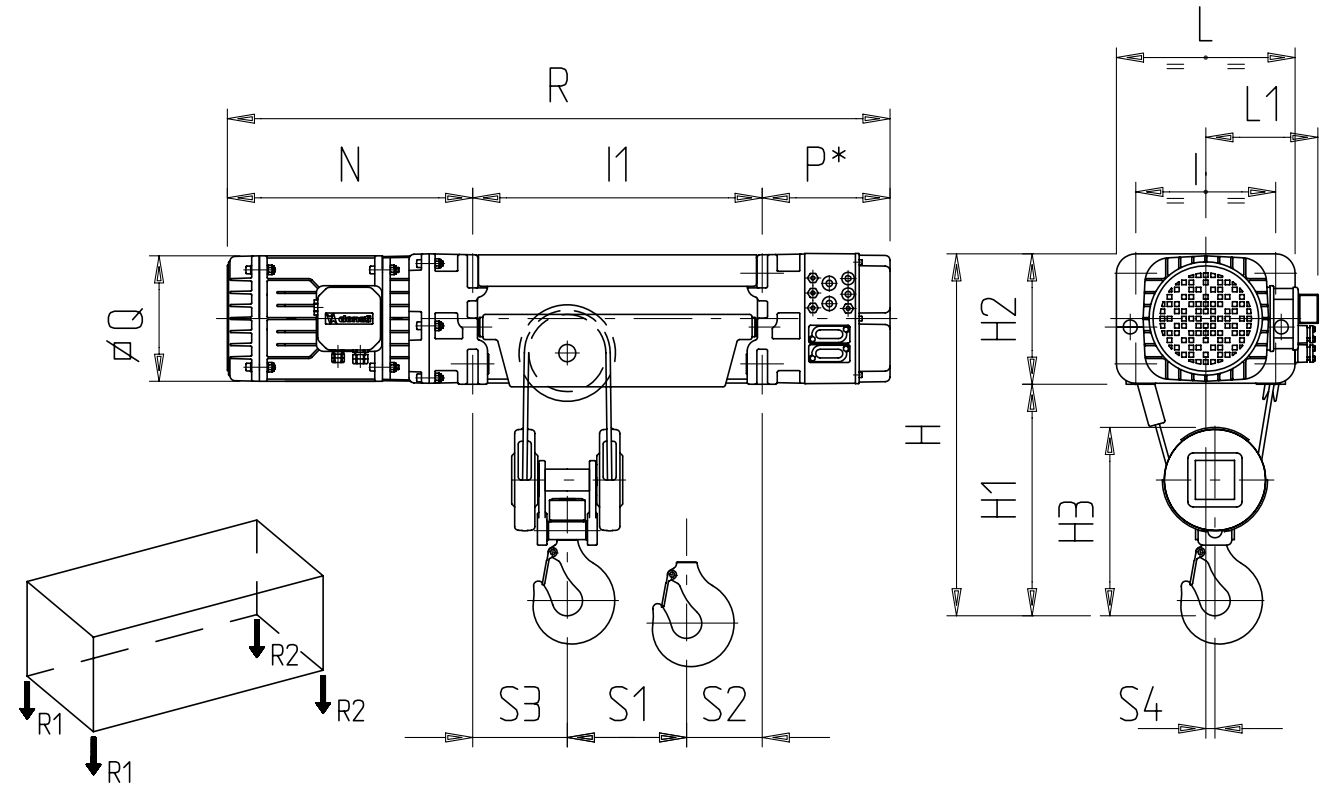
The universal eyebolt suspension is supplied as a standard.
For dimensions I e I1 see page DRH of set-down/suspended suspension

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



S2 = I1 – S3 – S1

Series DRH electric wire rope hoists DRH series with 2 and 4 falls of rope in fixed, standing and suspended configuration

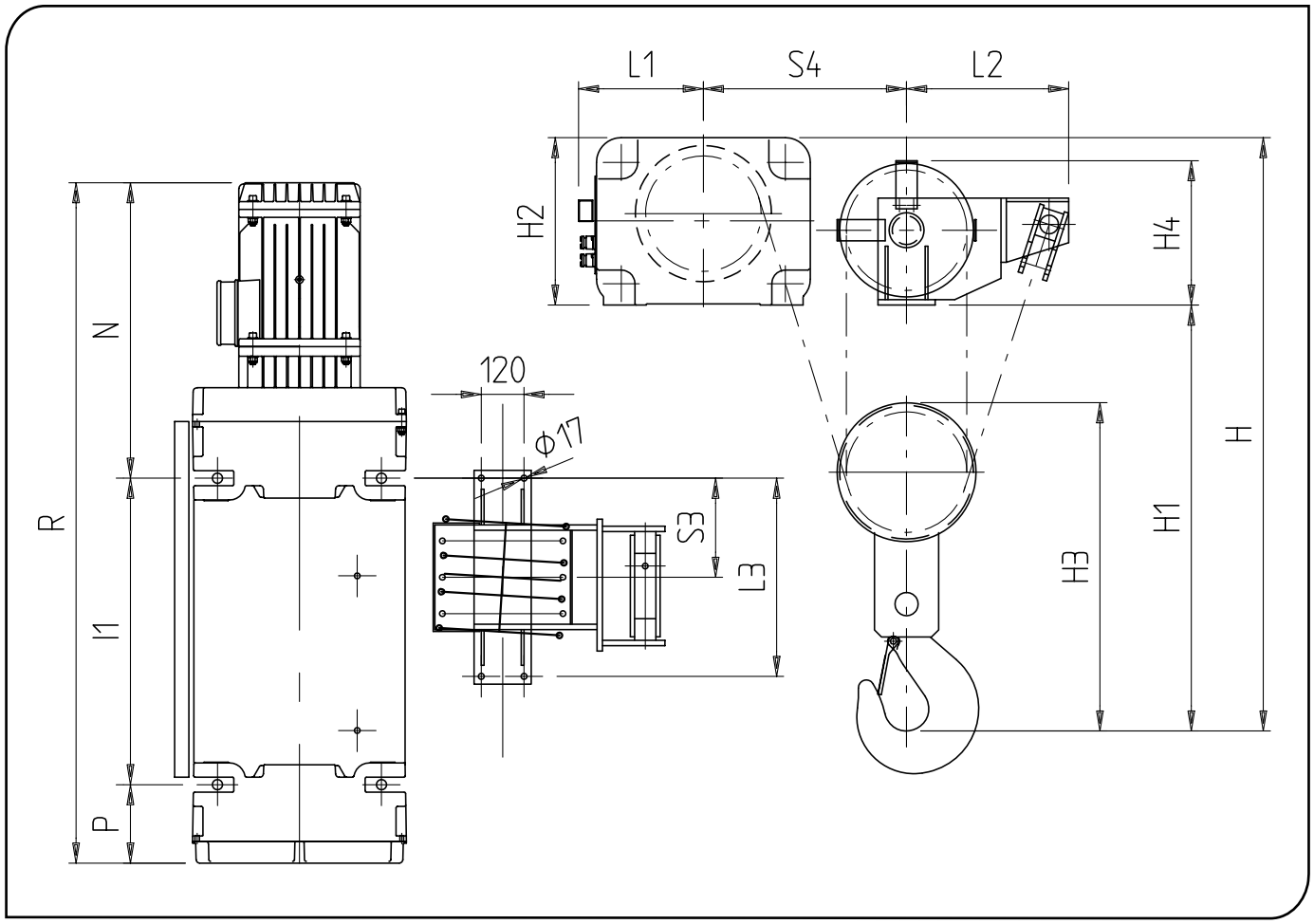
* DRH3 and DRH4 with Low Voltage Control Box, the dimension P has to be: DRH3 = 330; DRH4 = 360

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

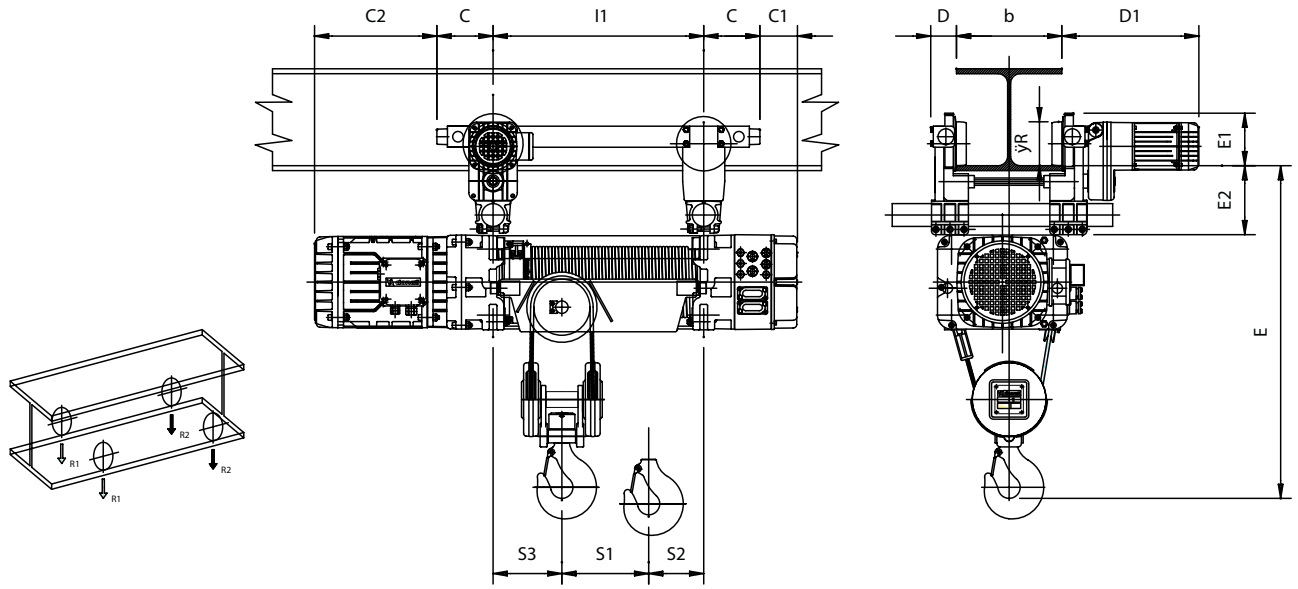


Rope falls N°	DRH	Overall dimensions (mm)									
		H	H1	H3	H4	L2	L3	S4	L1	N	P
6/1	3	1435	1055	777	330	350	330	415	290	705	205
	4	1665	1195	922	410	355	360	470	360	855	220
	©4	1665	1195	922	410	355	360	470	360	1015	220
8/1	3	1435	1055	777	330	420	450	515	290	705	205
	4	1665	1195	922	410	455	556	570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

© Hoist DRH4 with cylindrical motor

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



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

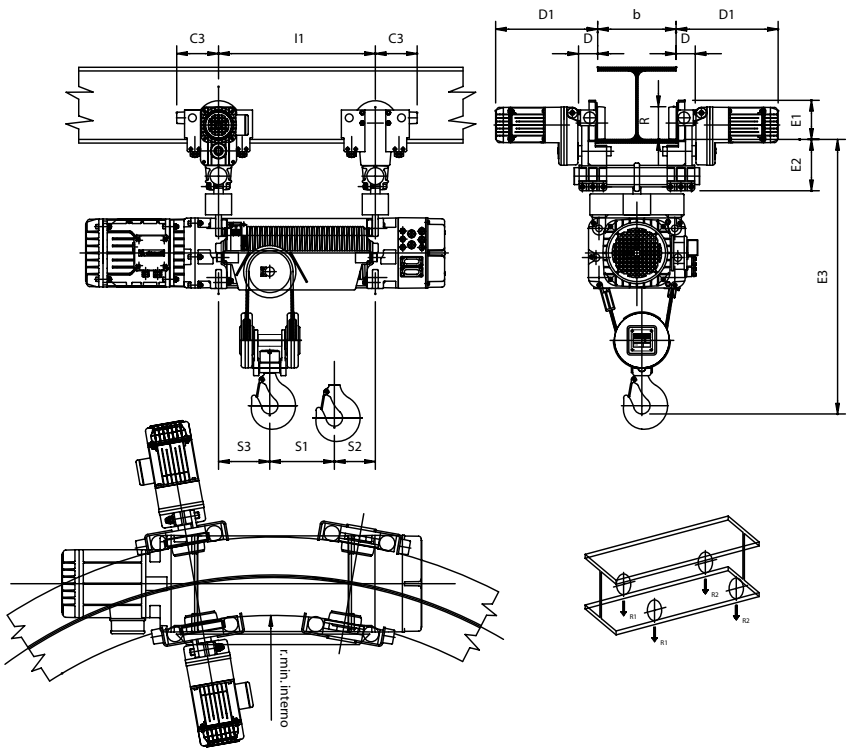
Electric wire rope hoist DRH series with 2 and 4 ropes falls with normal headroom trolley "N"

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

© Hoist DRH4 with cylindrical motor

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

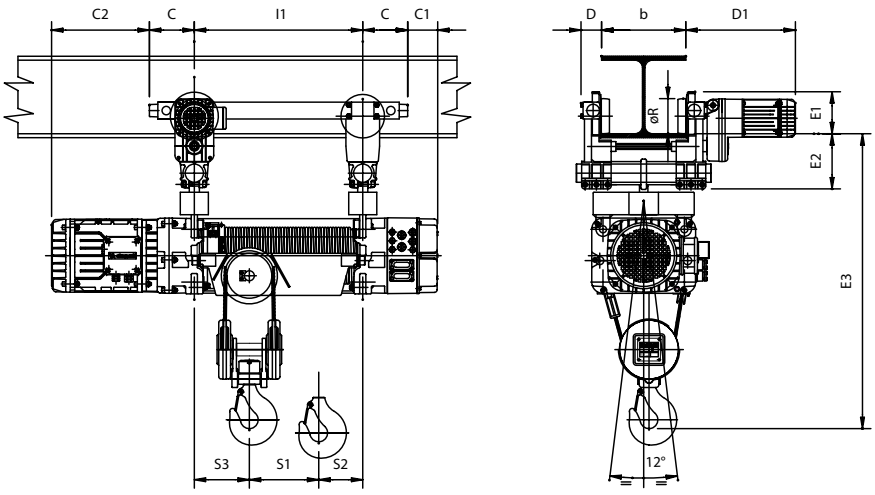
Falls N°	Type DRH	Trolley DST N/S	Overall dimensions (mm)		
			C3	r. min	E3
2/1	1	1	156	1500	960
	2	1	156	1500	1090
	3	2	160	1600	1400
	4	3	280	1600	1860
4/1	1	1	156	1500	920
	2	2	160	1600	1050
	3	3	280	1600	1490
	4	4	327	1800	1810



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

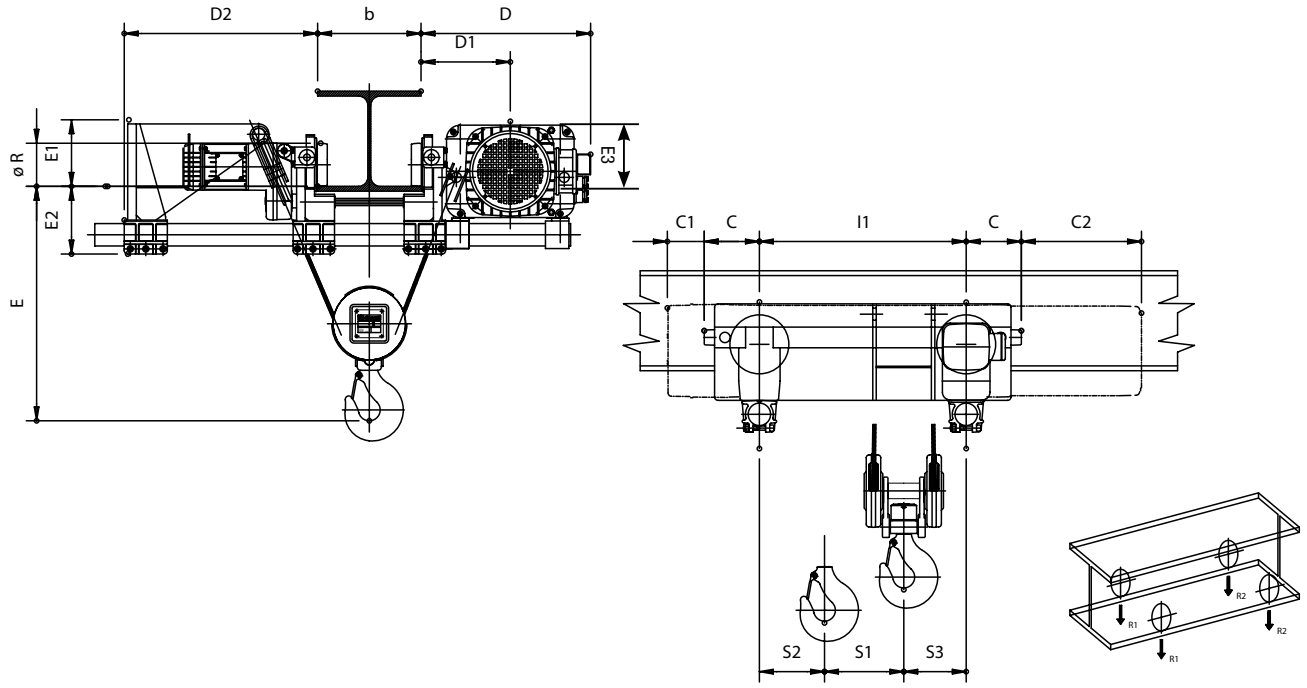
Carrello DST	DST1N	DST2N	DST3N	DST4N	DST1R	DST2R	DST3R	DST4R	DST1S/O	DST2S/O	DST3S/O	DST4S/O
Min beam width (mm)	90	119	135	180	90	119	135	180	100	135	170	210
Max thickness (mm)	20	23	36	42	20	23	36	42	20	23	36	42
Min radius (mm)	/	/	/	/	/	/	/	/	1500	1600	1600*	1800

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

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

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

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



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

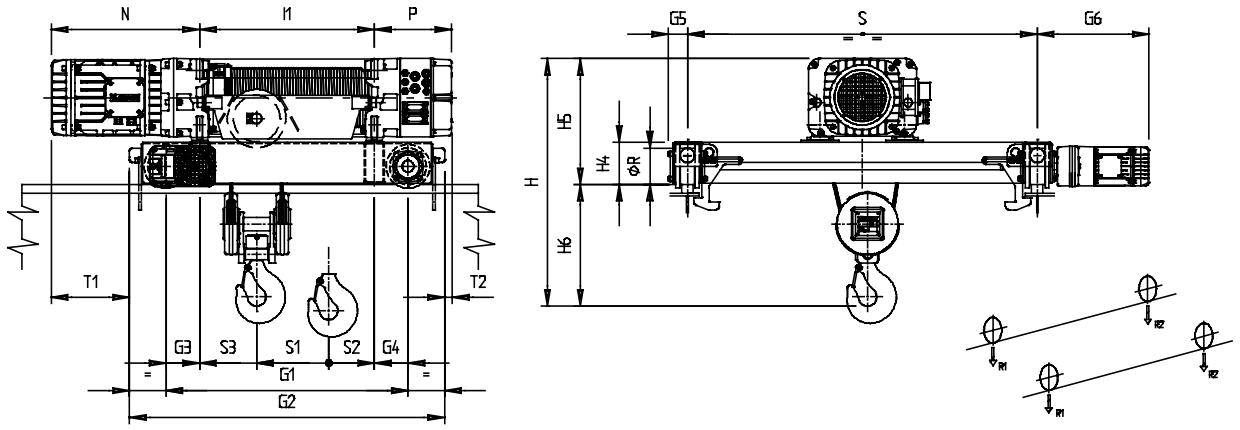
Electric wire rope hoists DRH series with 2 and 4 ropes falls with low headroom trolley "R"

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

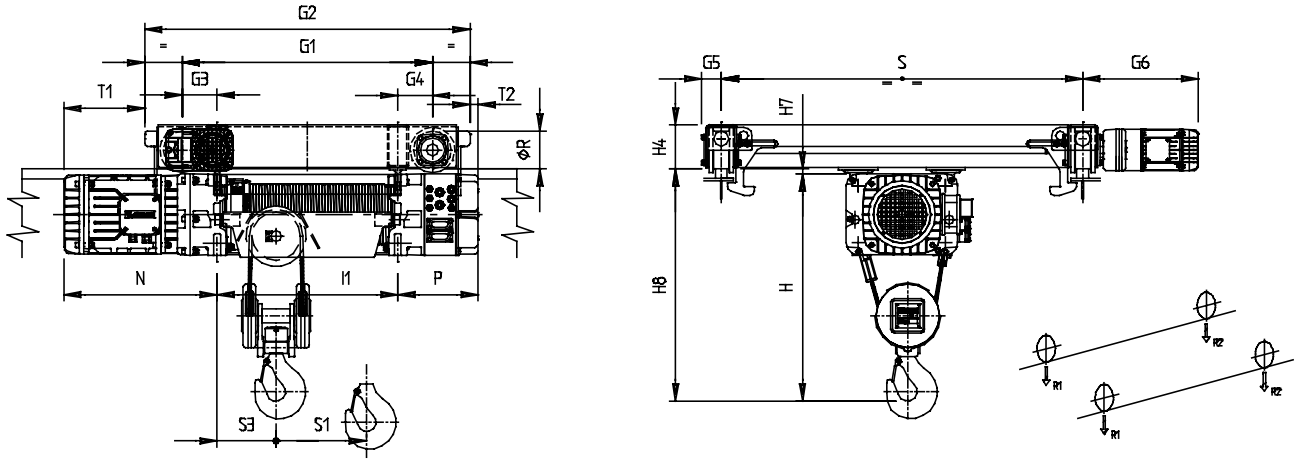
(*) Foreseen gauge of standard production is S = 1000 mm.
on request it can be supplied with gauge S = 1200 mm.

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 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
				X2	336	1770	2000	120	120	66	392	245	20	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
				X2	406	1770	2000	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
				X2	1000	2230	2542	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
				X2	1846	2710	3096	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
				X2	1901	2710	3096	180	180	90	520	642	-153	200	228	720
Trolley DRT3 with hoists DRH4 (25t)																
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

© Hoist DRH4 with cylindrical motor

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

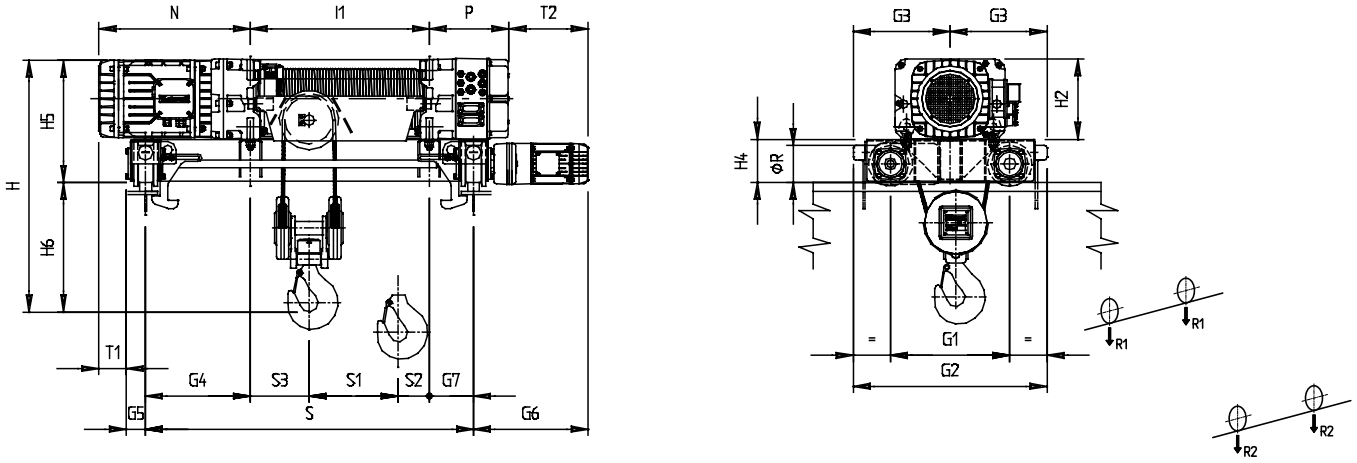
(*) Foreseen gauge of standard production is S = 1000 mm. on request it can be supplied with gauge S = 1200 mm.

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 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
				X2	336	1770	2000	120	120	66	392	245	20	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
				X2	406	1770	2000	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
				X2	1000	2230	2542	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
				X2	1846	2710	3096	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
				X2	1901	2710	3096	180	180	90	520	642	-153	200	228	11

© Hoist DRH4 with cylindrical motor

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



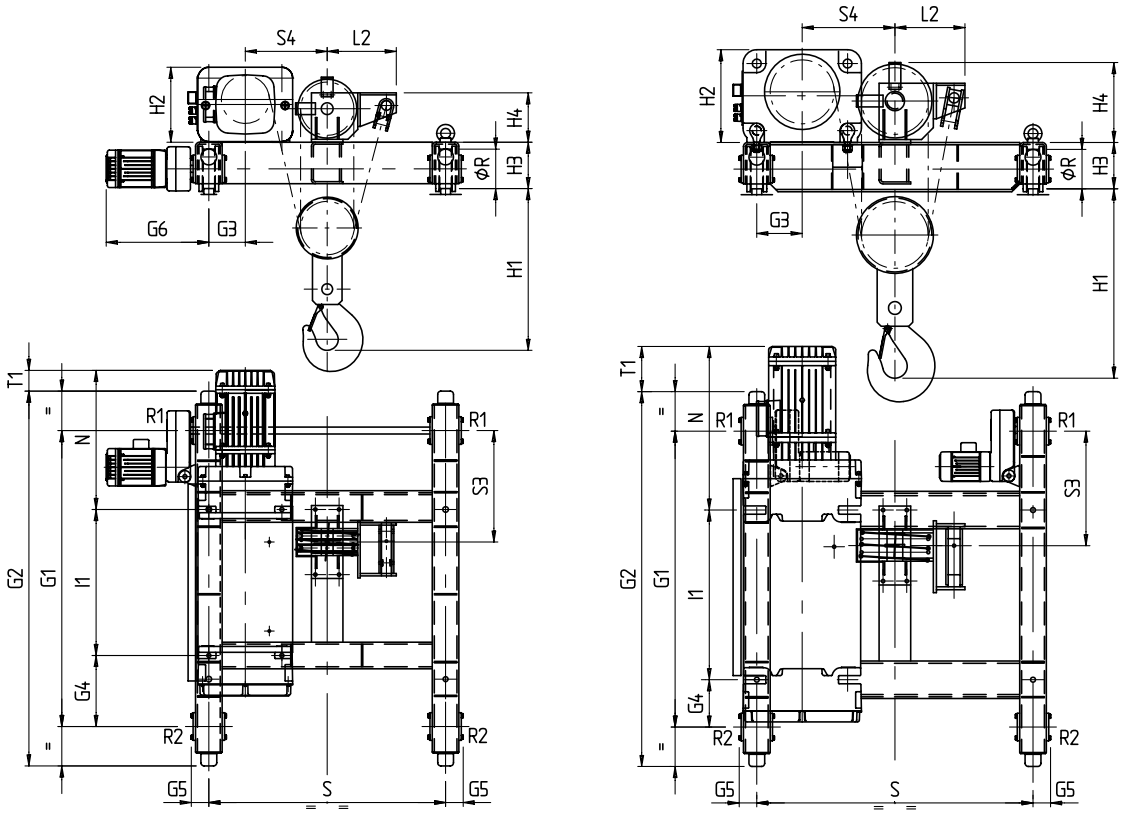
For dimensions I1 – S1 – S2 – S3 – N – P – H2 see page 19
H = H5 + H6

Electric wire rope hoists DRH series with 2 and 4 ropes falls with double girder trolley DRT, hoist set-down trasversal 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	G7	T1	T2	ØR	H4	H5	H6 2 tiri	H6 4 tiri
2/1 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
			1200	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
			1400	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
			1200	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
			1200	N	1295	600	986	493	200	90	520	140	725	440	200	228	698	768	722

© Hoist DRH4 with cylindrical motor

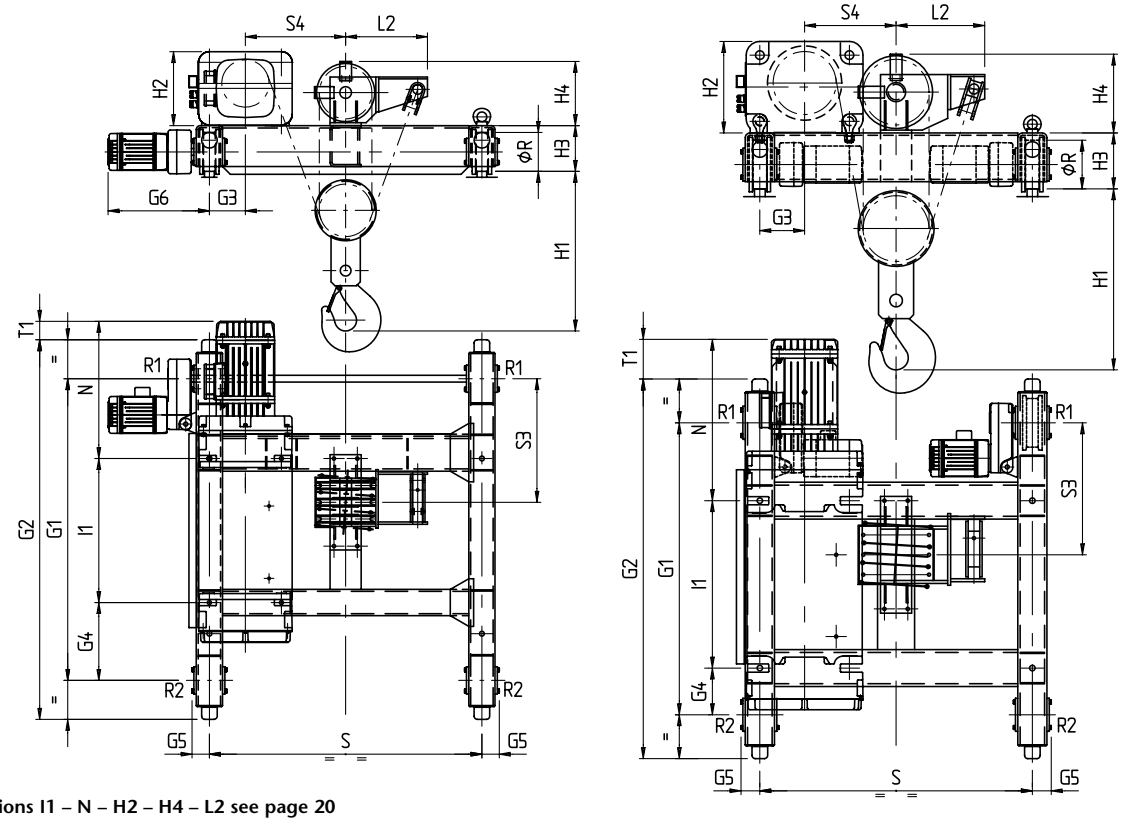
DRT double girder trolley for DRH wire rope hoist –Version with 6 rope falls (6/1)
Reactions on the supports see page 33



For dimensions I1 – N – H2 – H4 – L2 see page 20

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
			L	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
			X1	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
			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
			L	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
			X1	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
			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



For dimensions I1 – N – H2 – H4 – L2 see page 20

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

© Hoist DRH4 with cylindrical motor

Reactions on the supports

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

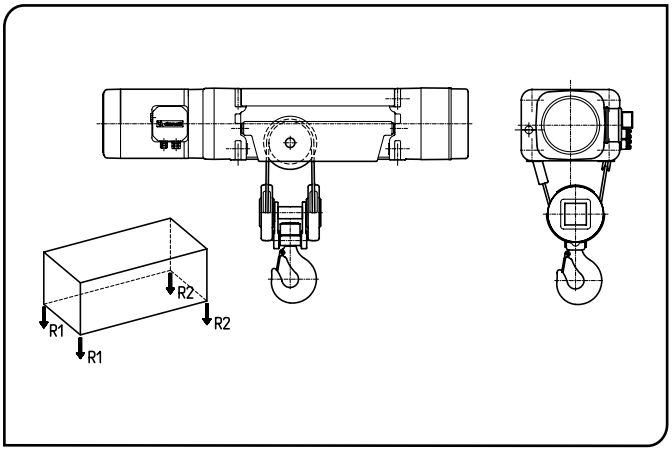
Version with 2 falls of rope (2/1)											
Hoist		Static reactions: R1; R2 = daN									
DRH	Capacity (kg)	Drum C		Drum N		Drum L		Drum X1		Drum X2	
		R1	R2	R1	R2	R1	R2	R1	R2	R1	R2
1	800	349	117	373	97	410	69	428	62	442	58
	1000	425	141	455	115	500	79	520	70	536	64
	1250	521	170	557	138	611	93	636	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)											
Hoist		Static reactions: R1; R2 = daN									
DRH	Capacity (kg)	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)									
Hoist		Static reactions: R1; R2 = daN							
DRH	Capacity (kg)	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)									
Hoist		Static reactions: R1; R2 = daN							
DRH	Capacity (kg)	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

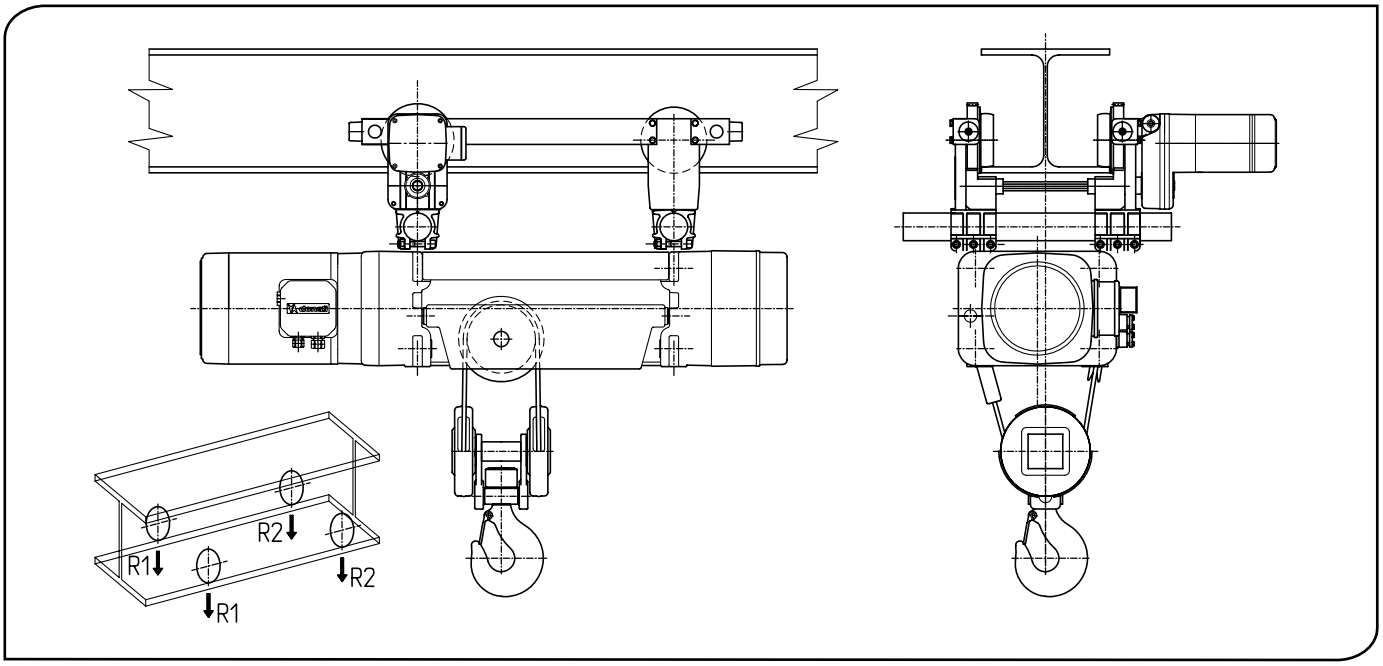


Single girder DST/N/S trolleys for DRH electric wire rope hoists – 2 rope falls version (2/1)

Hoist		Static reactions: R1; R2 = daN									
DRH	Capacity (kg)	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)

Hoist		Static reactions: R1; R2 = daN									
DRH	Capacity (kg)	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

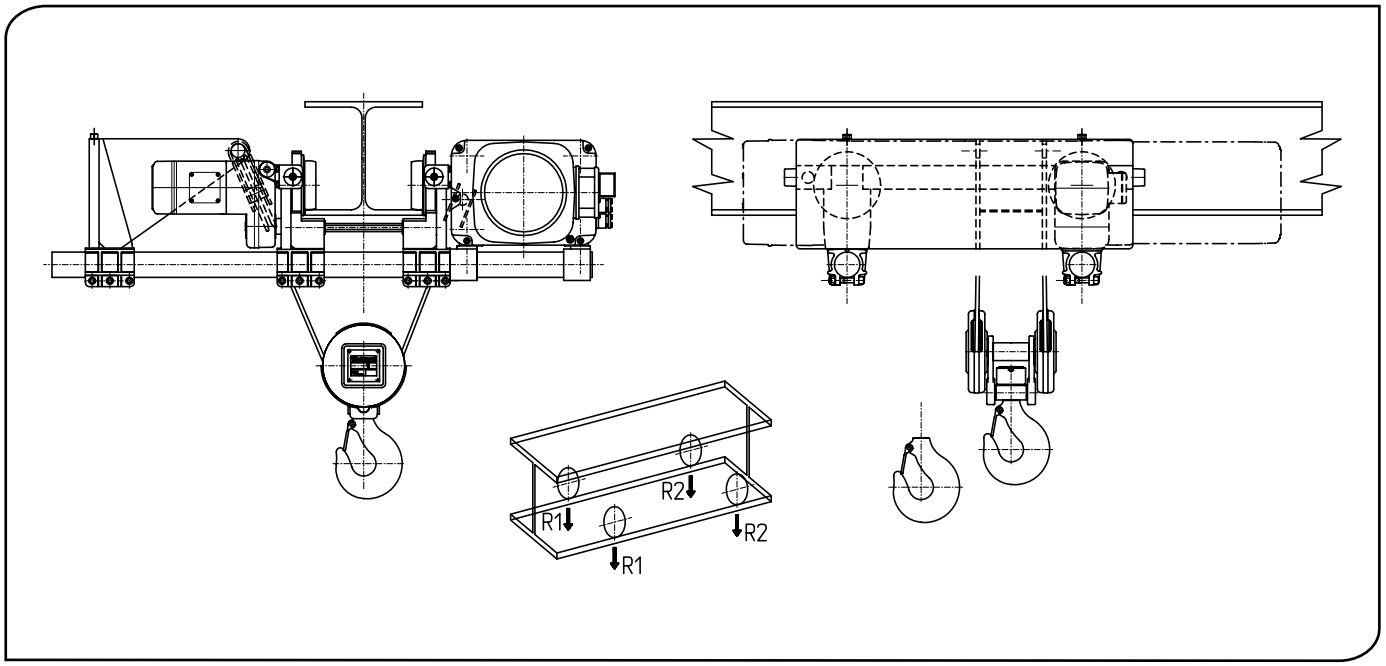


Single girder DST/R trolleys for DRH electric wire rope hoists – 2 rope falls version (2/1)

Hoist		Static reactions: R1; R2 = daN									
DRH	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)

Hoist		Static reactions: R1; R2 = daN									
DRH	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)

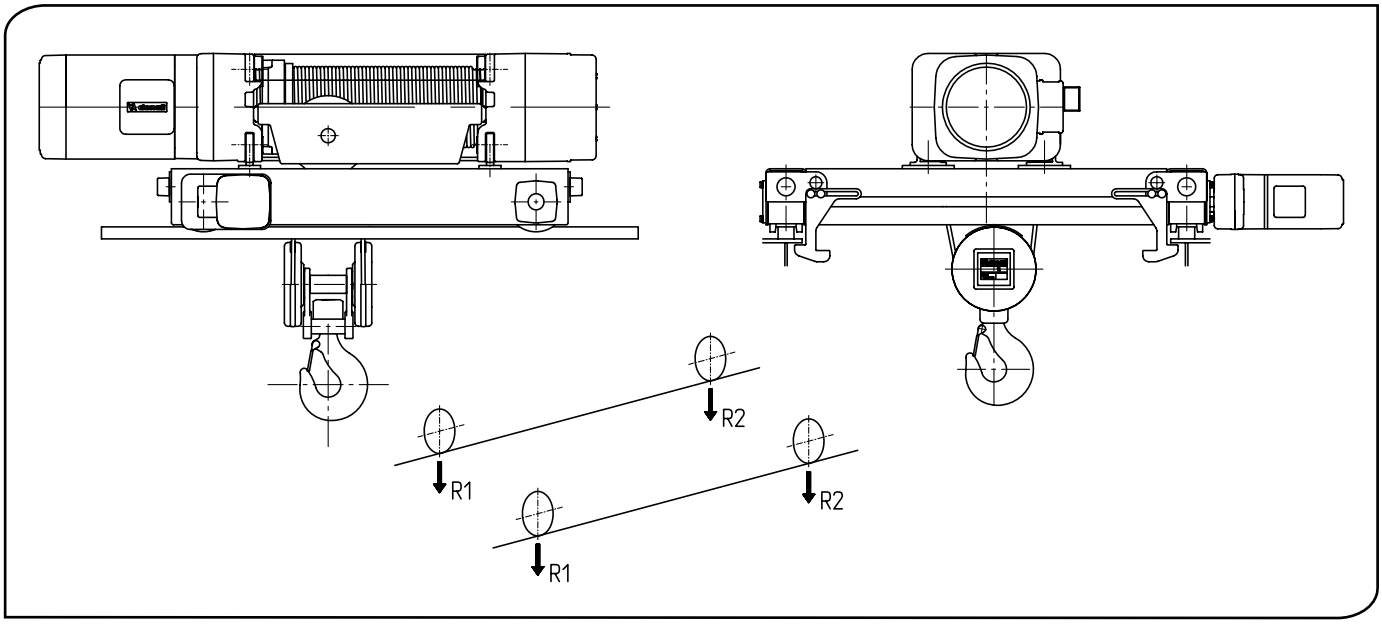
Version with 2 falls of rope (2/1)

Hoist DRH	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)

Hoist DRH	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

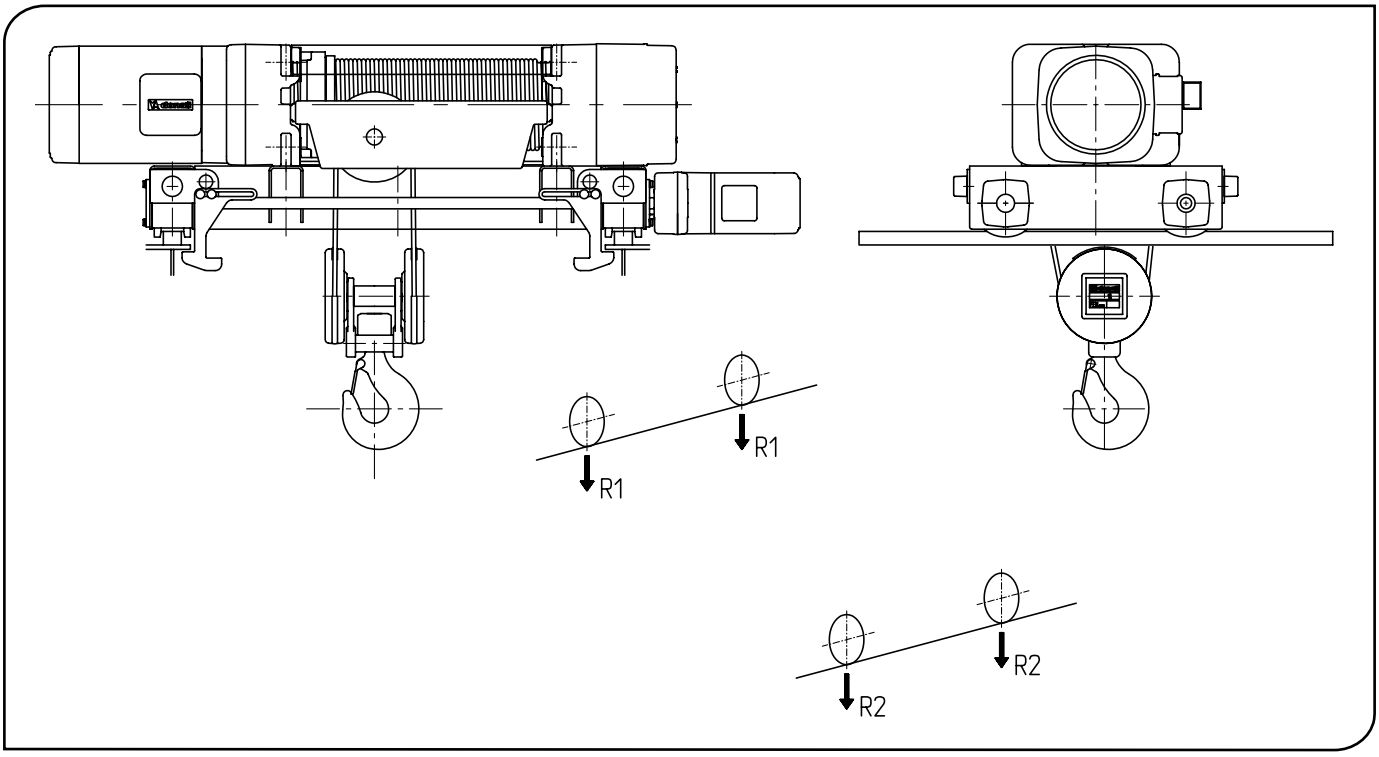
* Only in set-down execution



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
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
	40000	11600	9600	13950	7350	15050	6400	16442	5101
	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 φ	Ia - (A) 400V - 50Hz	In - (A) 400V - 50Hz	Power current fuse (A) 400V - 50Hz	Minimum section of power cables 400V - (Δ U20V)	
									ϕ mm²	L = m
1	112K4RH1/3	4	1Am 2m 3m	3	0.75	40	8	16	2.5	≤ 30
	112K5RH1/3	4/12	1Am 2m 3m	3/1	0.72/0.5	38/13	8/6.6	16	2.5	≤ 30
2	132K4RH2/3	4	1Am 2m 3m	5	0.75	58	12	20	4	≤ 30
	132K5RH2/3	4/12	1Am 2m 3m	5/1.65	0.78/0.5	50/17	12/10	20	4	≤ 30
3	160K4RH3/2	4	1Am 2m 3m	10	0.8	110	22	32	6	≤ 30
	160K5RH3/2	4/12	1Am 2m 3m	10/3.3	0.77/0.46	100/20	24/18	32	6	≤ 30
4	180K4RH4/2	4	1Am 2m 3m	16	0.82	175	34	63	10	≤ 20
	180K5RH4/2	4/12	1Am 2m 3m	16/5.3	0.78/0.42	170/55	38/30	63	10	≤ 20
4 Cylindrical	180C4RH4	4	1Am 2m 3m	24	0.88	330	48	80	16	≤ 20
	180C5RH4	4/12	1Am 2m 3m	24/7.8	0.88/0.5	330/80	48/32	80	16	≤ 20

Trolley DST DRT	Motor Type	Poles	Group FEM	Power (kW)	COS φ	Ia - (A) 400V - 50Hz	In - (A) 400V - 50Hz
DST 1 DST 2 DRT 1	71K3P	2/8	1Am 2m 3m	0.32/0.07	0.7/0.55	3.8/1.2	1.0/0.8
	71C2P	2	1Am 2m 3m	0.32	0.72	6	1.0
	71C4P	4	1Am 2m 3m	0.16	0.5	4	1.0
DST 3 DRT 2	80K3P	2/8	1Am 2m 3m	0.5/0.12	0.85/0.6	5.5/1.6	1.3/1.1
	80K2P	2		0.50	0.8	5.6	1.3
	80K4P	4		0.25	0.65	3.3	0.9
DST 4 * DRT 3	80K3PL	2/8	1Am 2m 3m	0.63/0.15	0.82/0.57	6.8/1.9	1.6/1.3
	80K2PL	2		0.63	0.75	7.7	1.7
	80K4PL	4		0.32	0.65	3.9	1.1
** DRT 3 *** DRT 4	100K3P	2/8	1Am 2m 3m	1.25/0.31	0.84/0.6	16/3.6	3.1/1.8
	100K2P	2	1Am 2m 3m	1.25	0.83	16	2.9
	100K4P	4	1Am 2m 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 ΔU, of the length and of the section of the power cable (ΔU max 5%):

ΔU = 1.73 • L • Ia • cosφ / X • ϕ [V]
L = ΔU • X • ϕ / 1.73 • cosφ • Ia [m]
ϕ = 1.73 • L • Ia • cosφ / ΔU • X [mm2]

Values in the formula:

ΔU = Fall in tension [V]
Ia = Start-up current [A]
L = Length of cable [m]
ϕ = Section of the cable [mm2]
X = Conductivity Cu=57 m/Qmm
cosφ = Power factor

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
 OPERATOR	**Hoist operator:** 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.
 MECHANICAL MAINTENANCE OFFICER	**Mechanical maintenance officer:** 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.
 ELECTRICAL MAINTENANCE OFFICER	**Electrical maintenance officer:** 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.
 MECHANICAL TECHNICIAN	**Mechanical technician:** Qualified technician authorised to carry out operations of a complex and exceptional mechanical nature.
 ELECTRICAL TECHNICIAN	**Electrical technician:** 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:

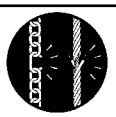
- To read the technical documentation carefully;
- To find out about the functioning and the positioning of the emergency stop device;
- To know which safety devices are installed on the hoist and where they are positioned;

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. 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 instuctuctions 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
 **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.	 • **It is forbidden** to lift loads while people are passing through the related manoeuvre area. • **It is forbidden** to transit, remain or manoeuvre under the suspended load.	  • The operator must follow the indications to obtain maximum safety by observing the indications in this manual. • Obligation to do periodical checks of the wire rope and the hook.
  **Risk from dangers of entanglement and/or crushing** after contact with wire ropes and pulleys in motion.	 • **Warning!** Exposure to the parts in motion can create dangerous situations. • **It is forbidden** to touch wire ropes and pulleys in motion.	 • Obligation to use protective gloves during the phases of positioning of the hook block for putting the load in the sling.

RISKS DURING MAINTENANCE

DANGER/RISK	BAN/WARNING	OBLIGATION/PREVENTION
 **Risk from danger of electrocution-electric shock** during maintenance of electrical equipment without having disactivated the electric power supply.	  **It is forbidden** to intervene on electrical equipment before having switched off the hoist from the electric power line.	  • Entrust electrical maintenance operations to qualified staff. • Carry out checks on electrical equipment prescribed in the manual.
  **Risk from entanglement/ crushing** in case of contact with the drum in rotation in the wire rope replacing phase.	 • **Warning!** Exposure to the parts in motion can create dangerous situations. • **It is forbidden** to turn the hoist on again if the removed protection has not been put back in place.	  • Entrust wire rope replacement operations to qualified maintenance staff. • Obligation to use protective gloves.

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.

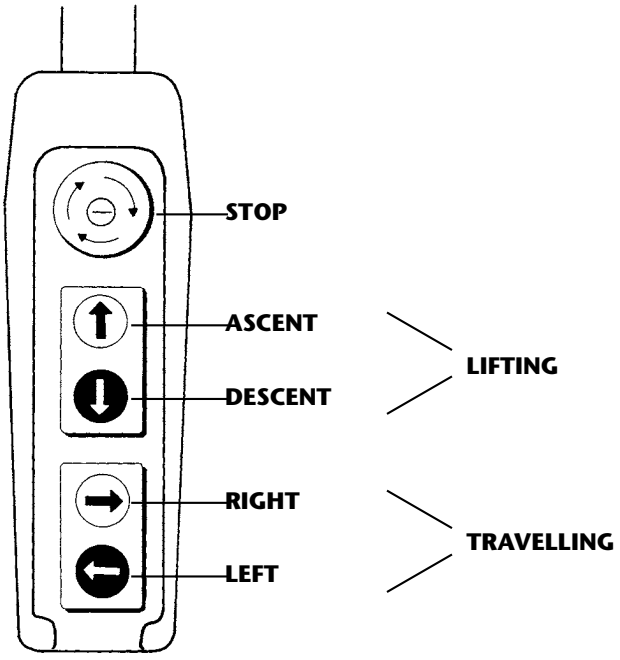
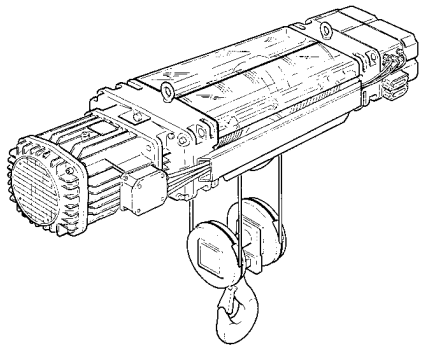


fig. 7

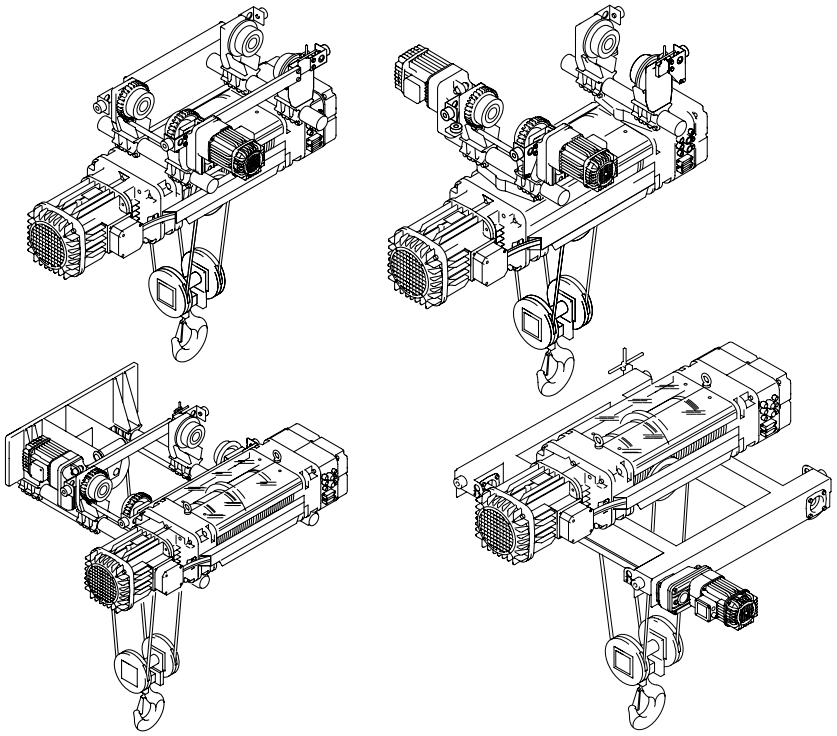
The electric wire rope hoist and related trolley, according to contractual agreements, can be supplied **complete with or without control devices and systems** (control panel with push-button panel).

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.

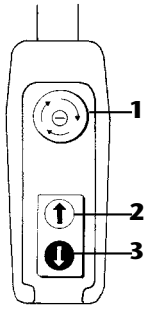
Different variants of the DRH rope hoist can be supplied (with or without a trolley, with one or two speeds) giving the following configuration for the devices on the pushbutton control panel:



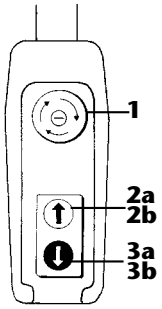
Set-down DRH rope hoist



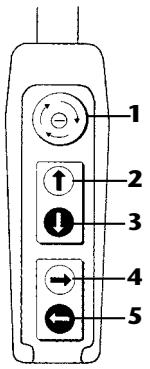
DRH rope hoist with electric translation trolleys, types:DST/N-S - DST/R - DRT



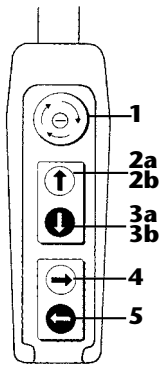
Single speed hoist



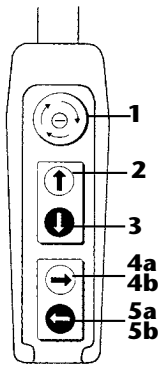
Two speed hoist



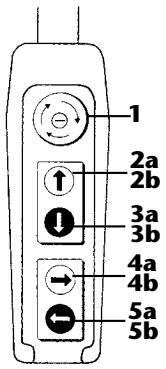
Single speed hoist Single speed trolley



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.

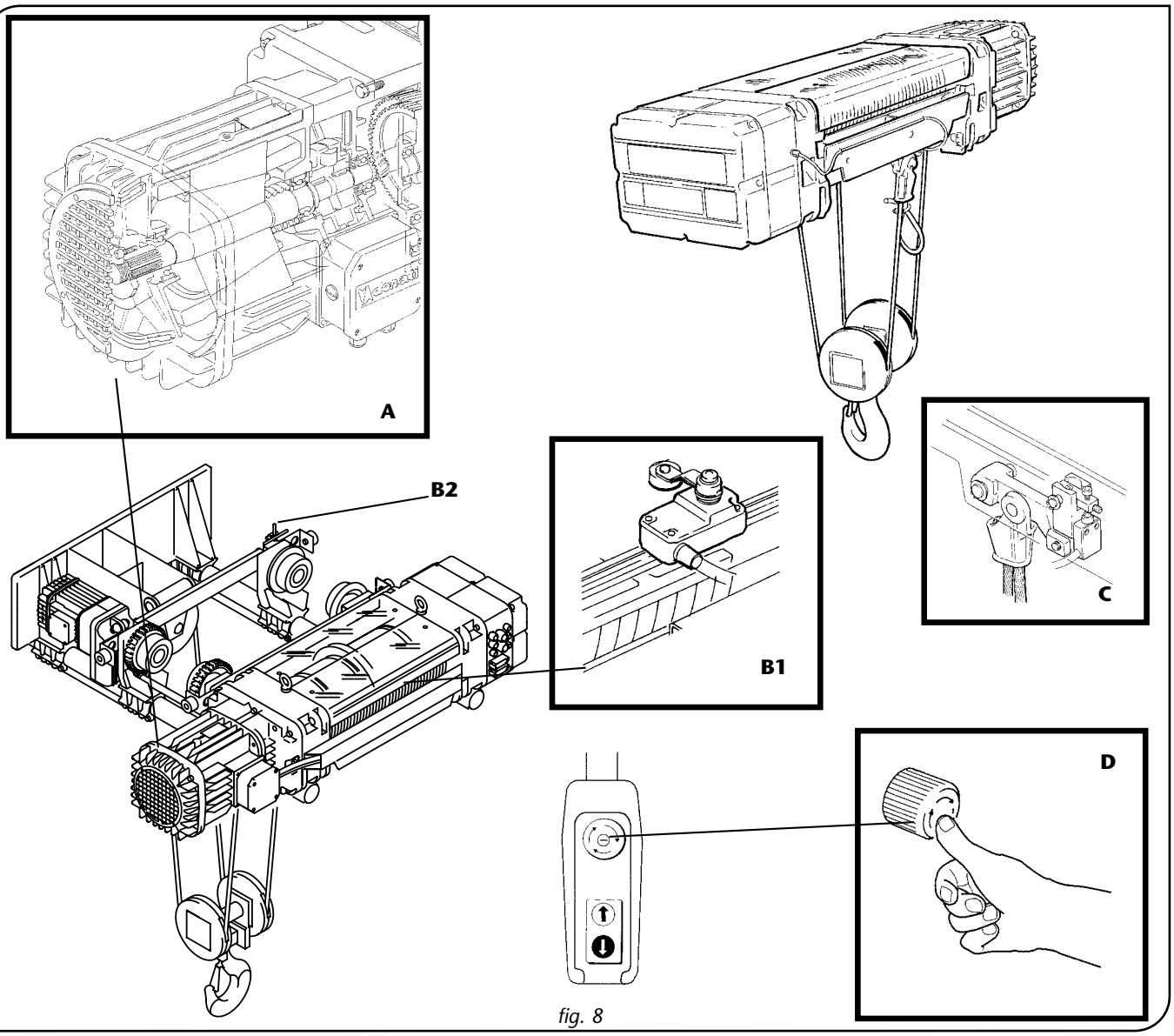


fig. 8

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).

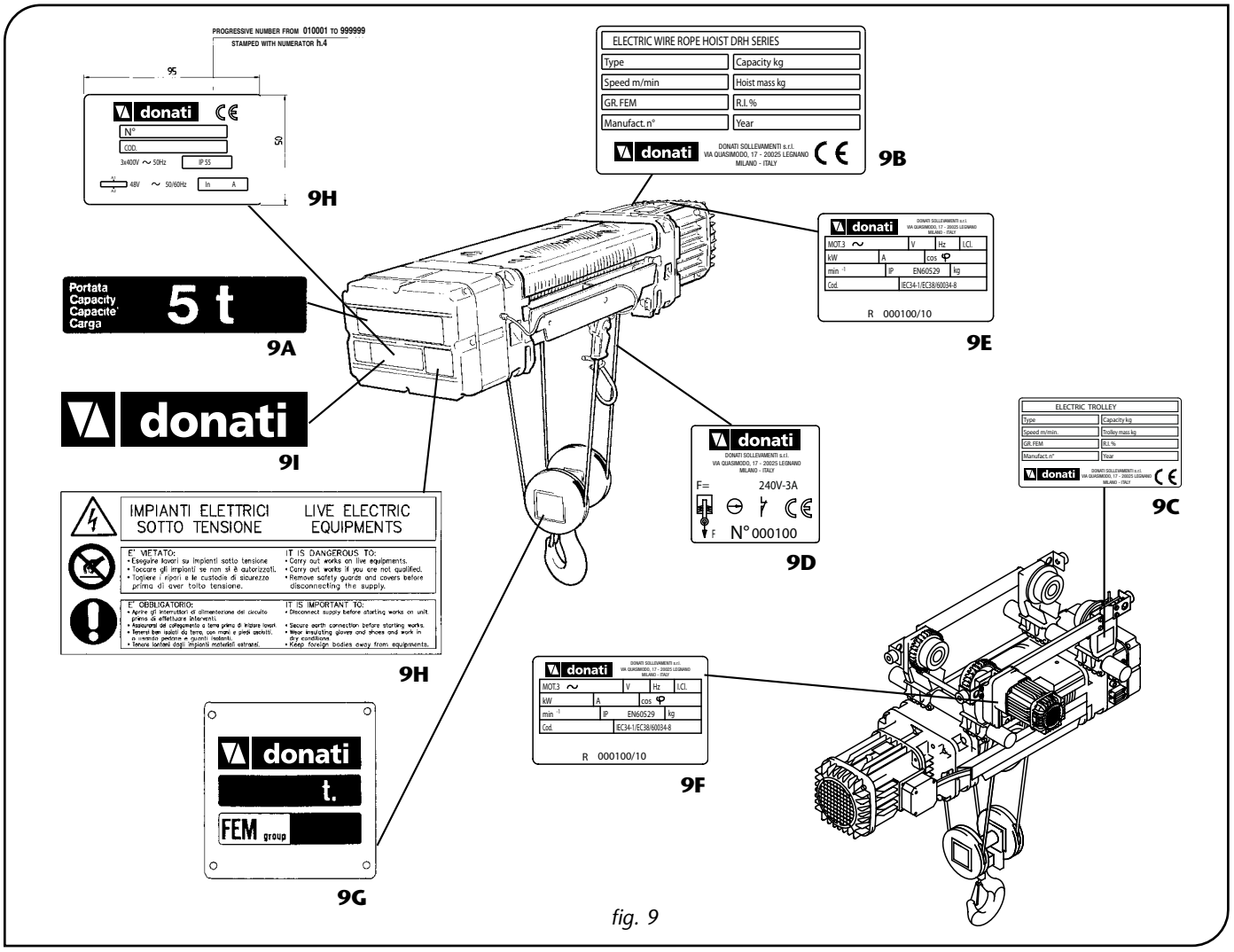


fig. 9

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.

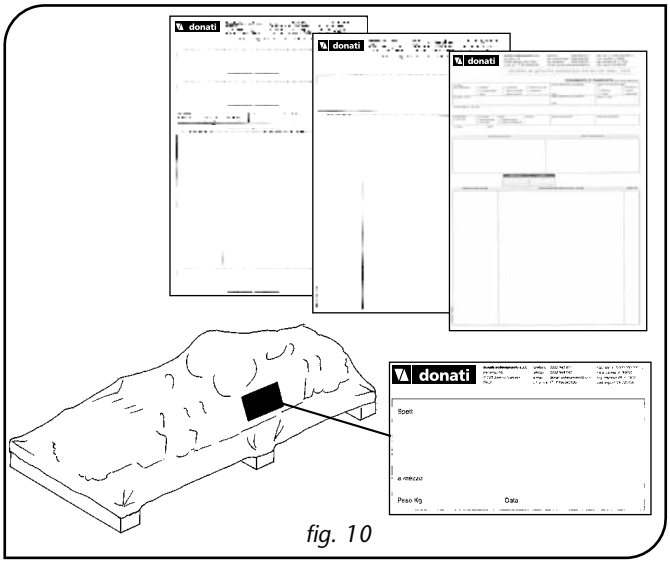


fig. 10

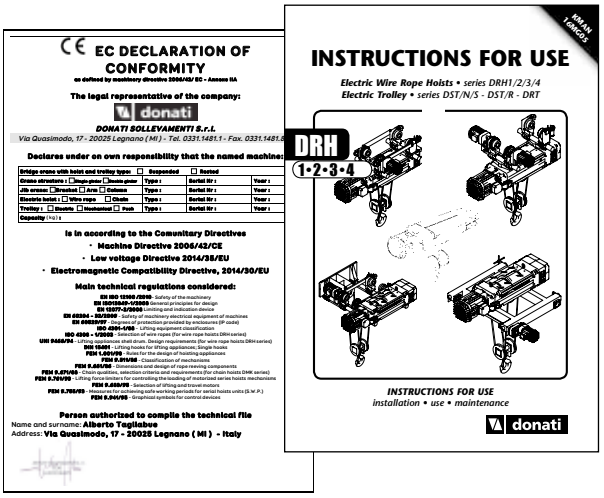


fig. 11

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°C and +60°C with relative humidity of 80%. For different environmental conditions it is necessary to provide special packing.

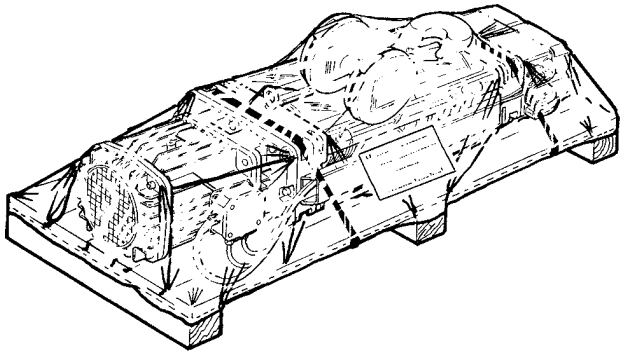


fig. 12

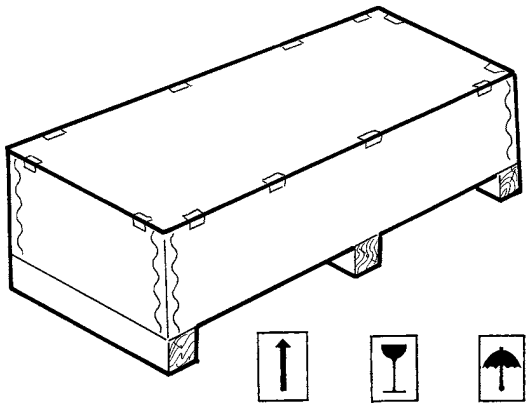


fig. 13

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).

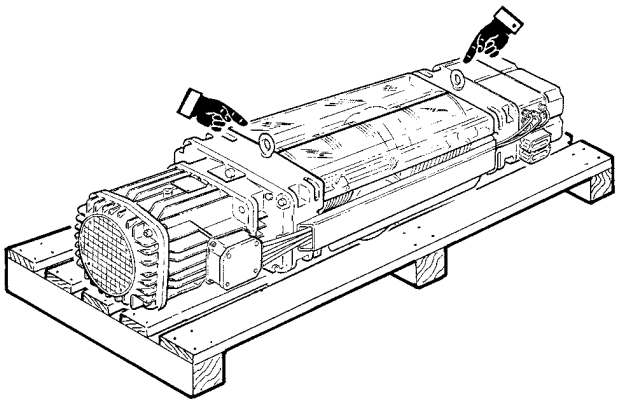


fig. 14

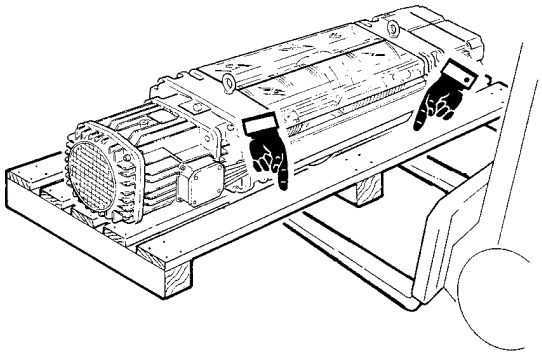


fig. 15

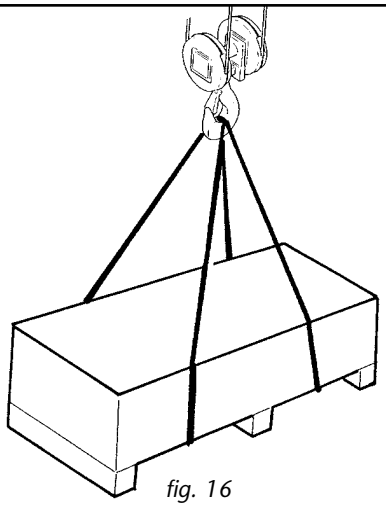


fig. 16

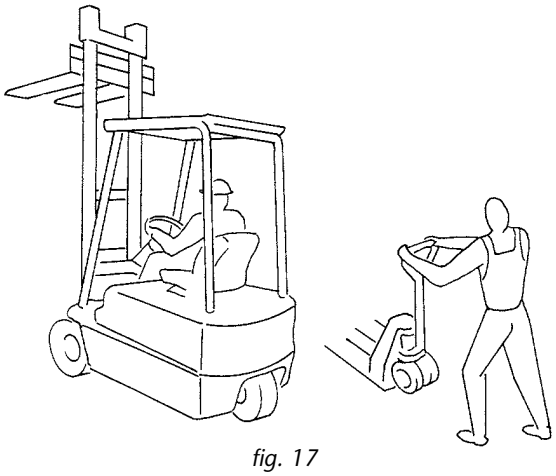


fig. 17

(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.

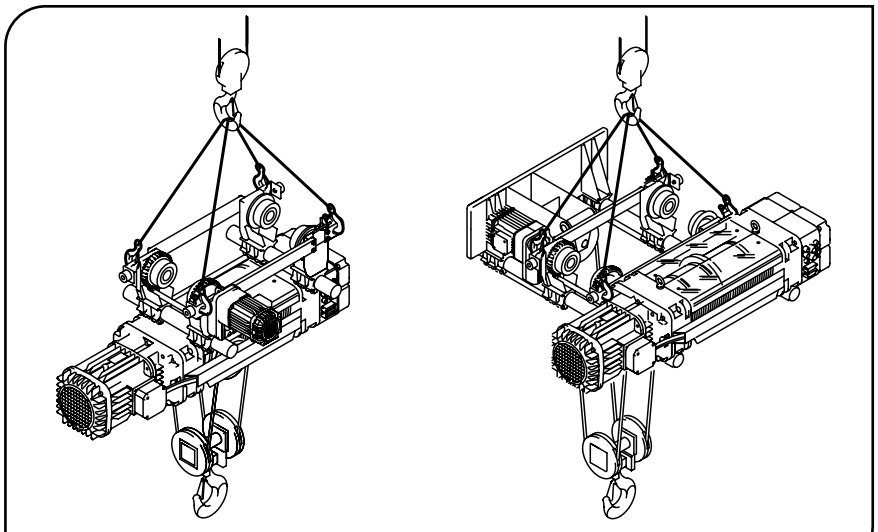


fig. 18

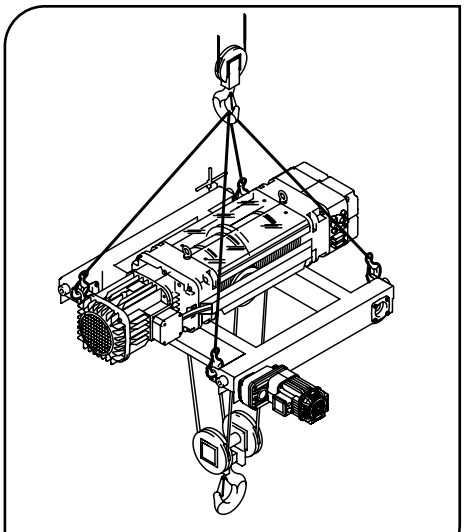


fig. 19

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).***

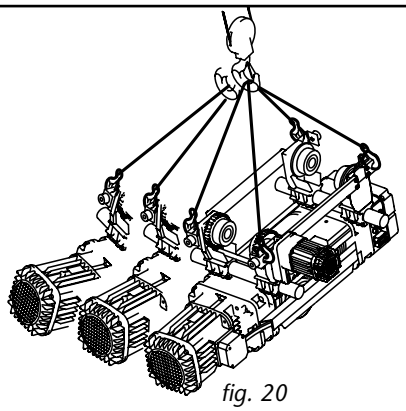


fig. 20

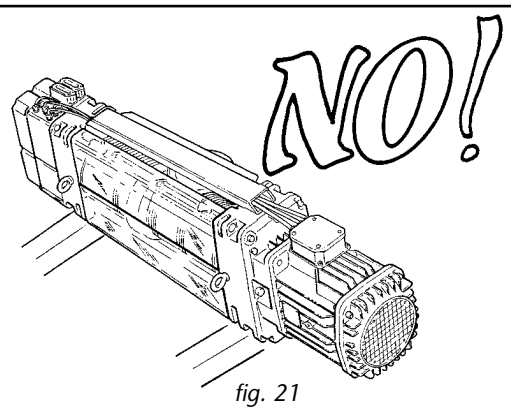


fig. 21

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.

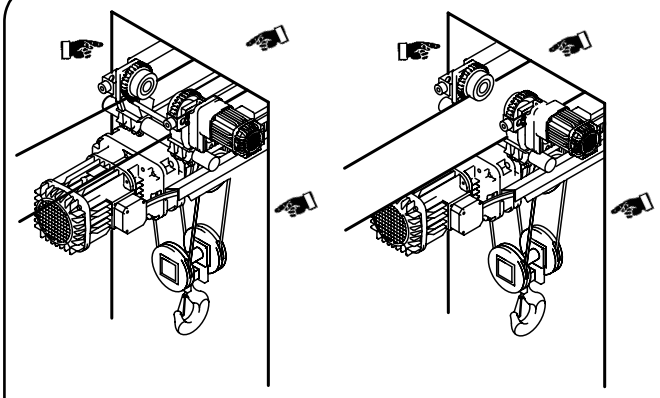


fig. 22

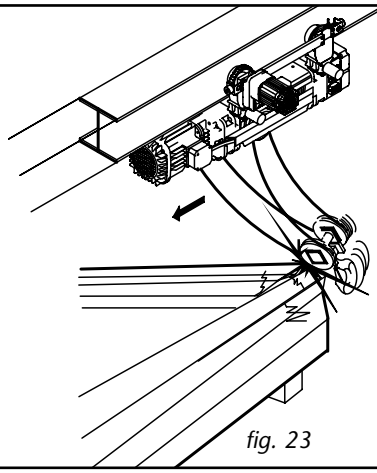


fig. 23

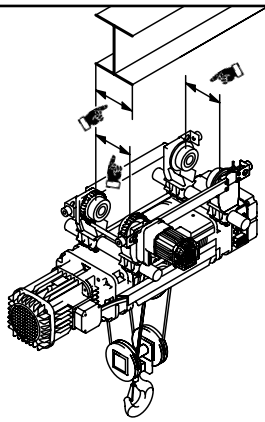


fig. 24

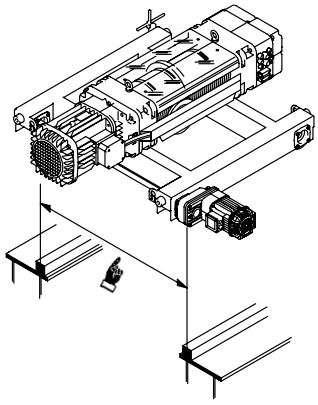


fig. 25

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 ± 1‰** (fig. 26).
- **Suspended execution,** connecting the eyebolts in the upper parts of the hoist (fig. 27).

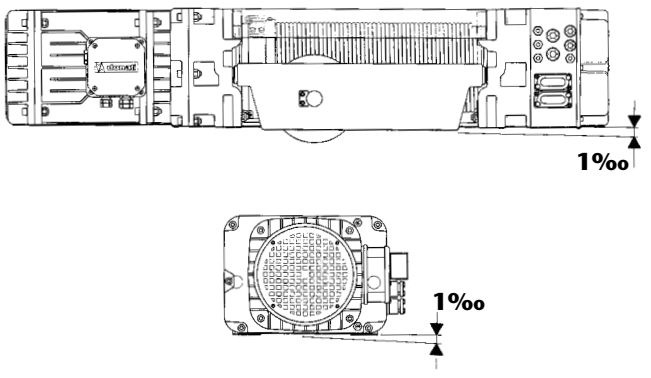


fig. 26

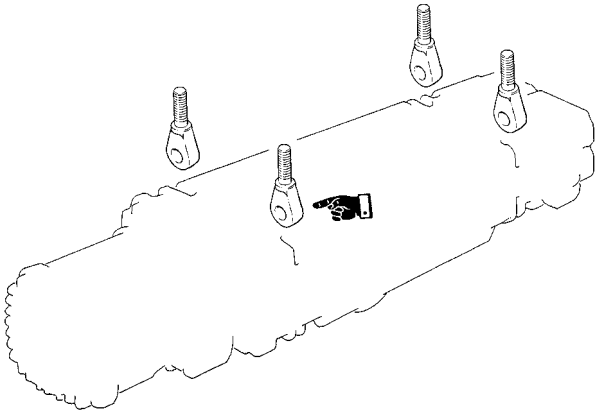


fig. 27

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

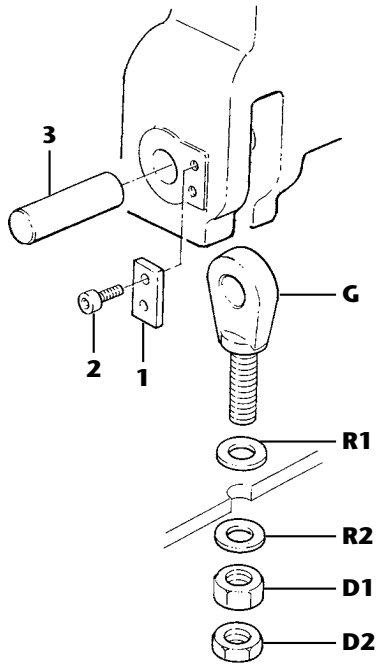
The assembling of the eyebolts must be carried out according to the following procedure:

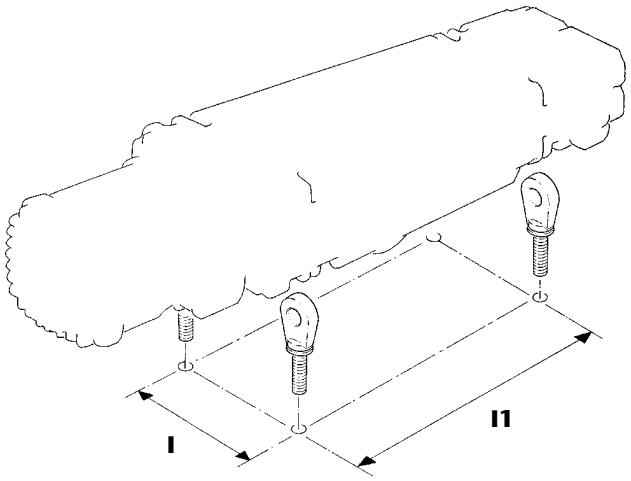
The assembly of the threaded spigot eyebolts in the lower part of the carrying casing of the DRH hoist (fig. 28):

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 (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**-.

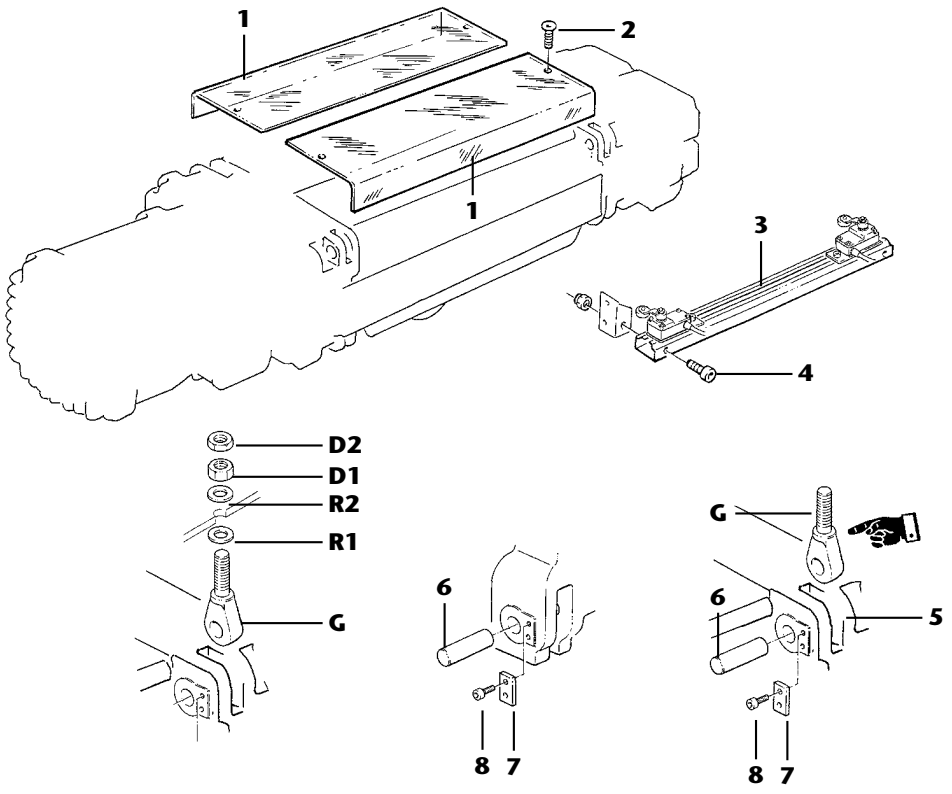


fig. 29

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).

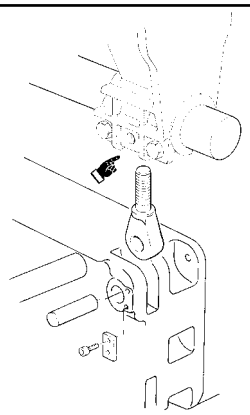


fig. 30

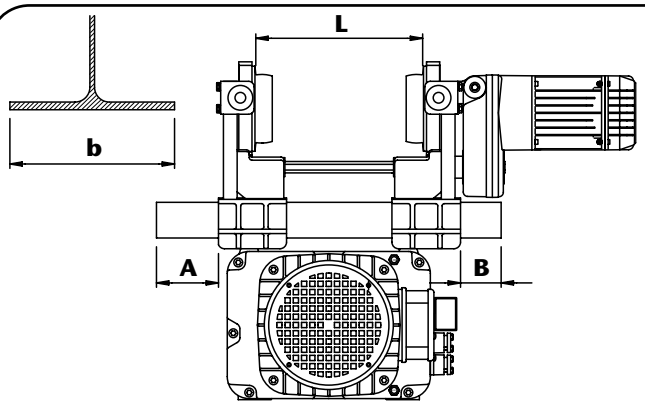


fig. 31

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)	inner wheel (L) -0 +1	wheel clearance (X)	DST/N 1						DST/N 2				DST/N 3				DST/N 4	
INP	IPE	HEA HEB	(mm)	(mm)	(mm)	2 fall DRH1 Height (mm) A	B	4 fall DRH1 Height (mm) A	B	2 fall DRH2 Height (mm) A	B	4 fall DRH2 Height (mm) A	B	2 fall DRH3 Height (mm) A	B	4 fall DRH3 Height (mm) A	B	2 fall DRH4 Height (mm) A	B	4 fall DRH4 Height (mm) 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*	105*	55*
	450		190	194	2	108	52	95	65	110	50	90	50	130	50	98	52	140	50	100	50
	500	200	200	204	2	103	47	90	60	105	45	85	45	125	45	93*	47*	135*	45*	95*	45*
	550		210	214	2	98	42	85	55	100	40	80	40	120	40	88	42	130	40	90	40
	600	220	220	224	2	93	37	80	50	95	35	75	35	115	35	83*	37*	125*	35*	85*	35*
		240	240	244	2	83	27	70	40	85	25	65	25	105	25	73*	27*	115*	25*	75*	25*
		260	260	264	2	73	17	60	30	75	15	55	15	95	15	63*	17*	105*	15*	65*	15*
		280	280	284	2	63	7	50	20	65	5	45	5	85	5	53	7	95	5	55*	5*
		300**	300	304	2	54	-2	41	11	55	-3	32	-4	73	-5	44	-2	86	-4	46*	-4*
			350	354	2	88	32	75	45	90	30	70	30	110	30	78	32	120	30	80	30
			400	404	2	63	7	50	20	65	5	45	5	85	5	53	7	95	5	55	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).

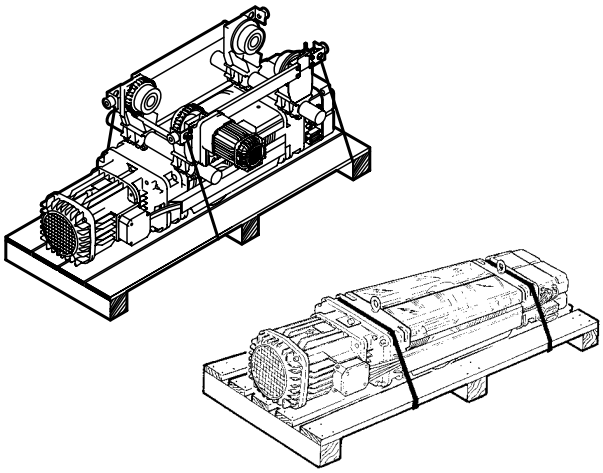


fig. 32

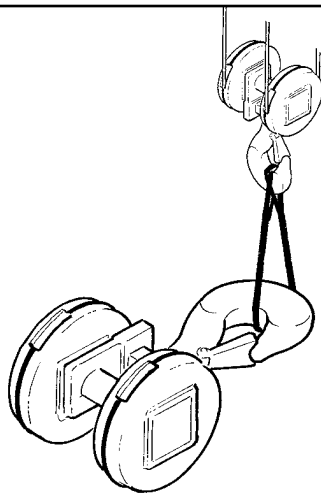


fig. 33

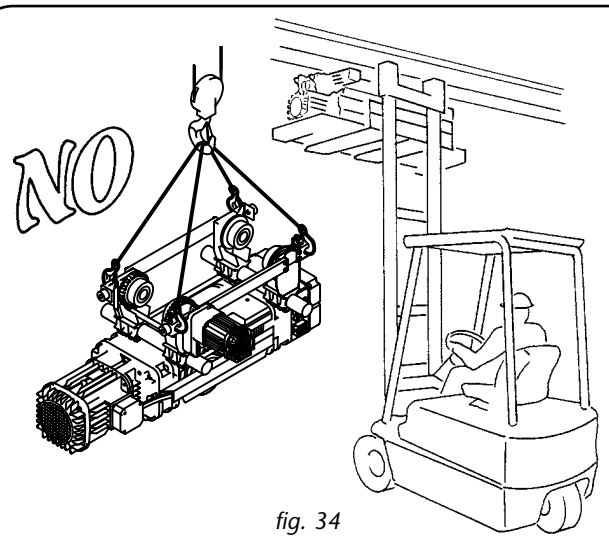


fig. 34

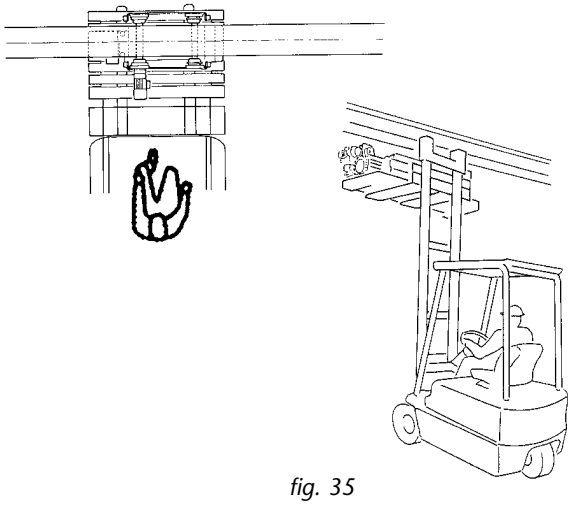


fig. 35

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 thetrolley/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.

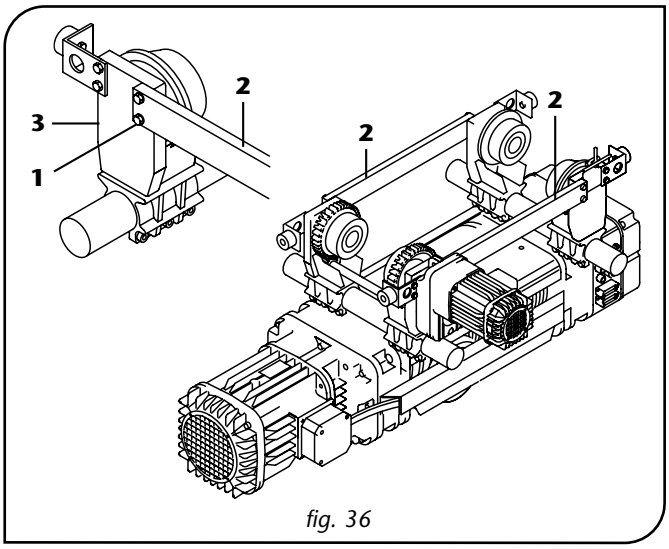


fig. 36

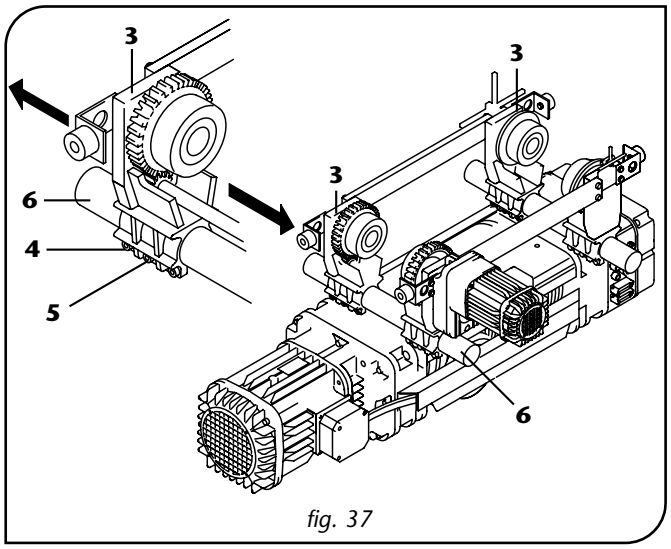


fig. 37

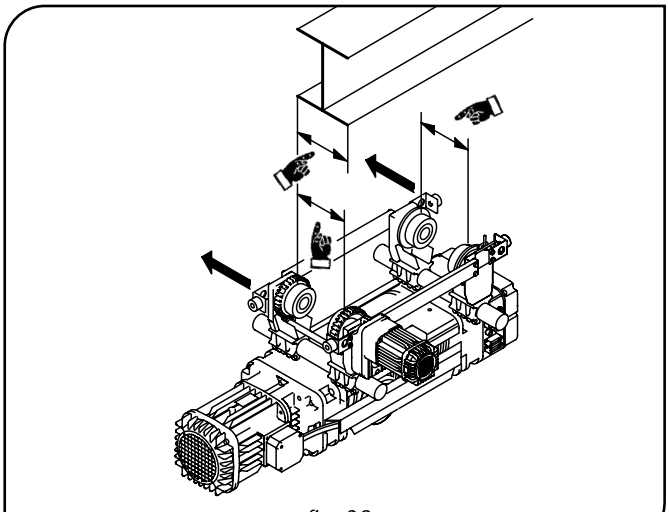


fig. 38

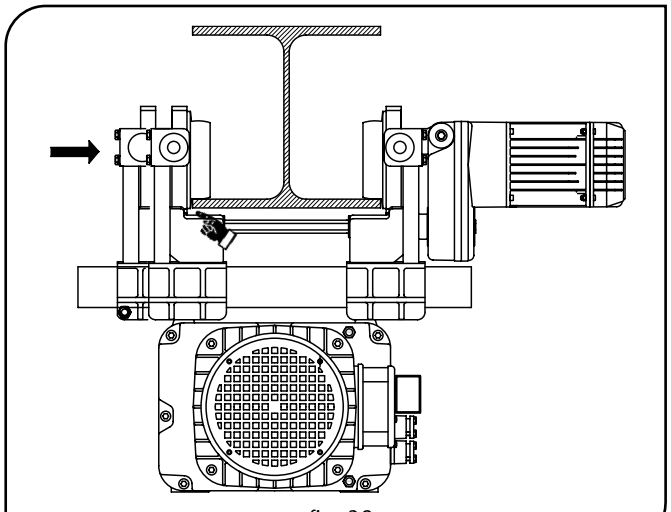


fig. 39

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.

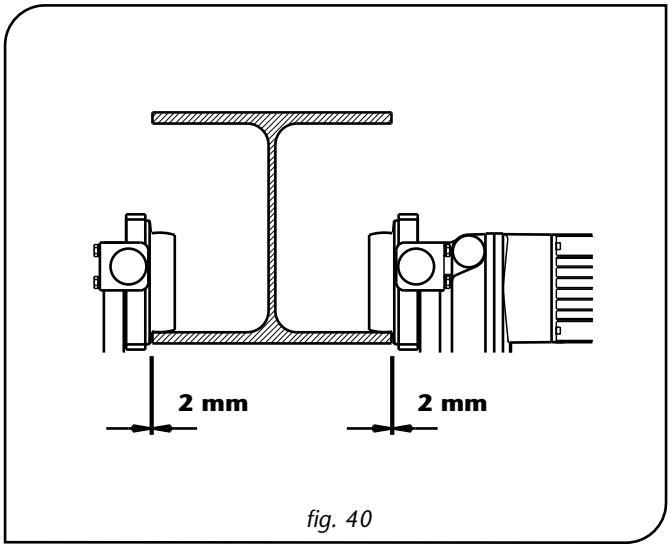


fig. 40

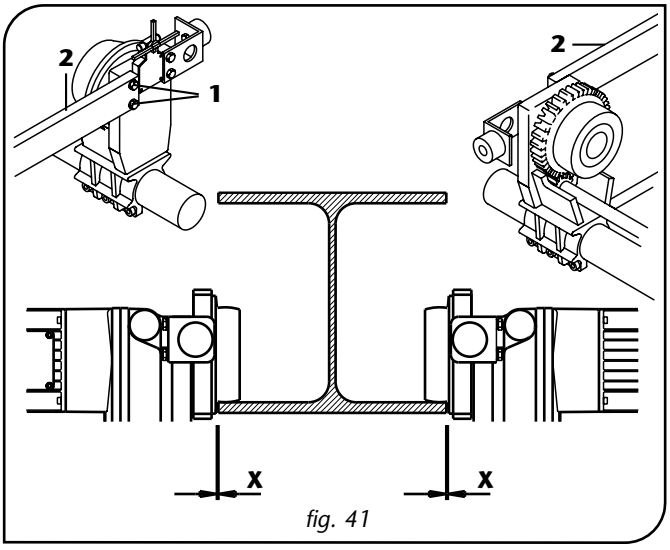
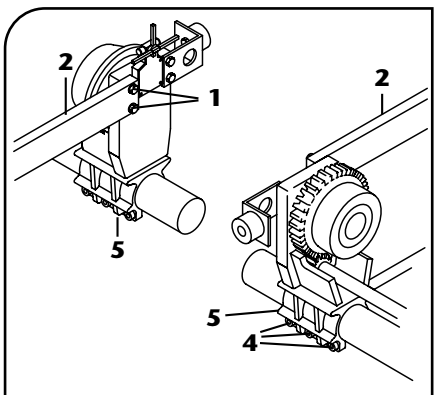


fig. 41



Clamping couples			
DST1	**DST2**	**DST3**	**DST4**
M 10	M 12	M 16	M 20
50 Nm	84 Nm	205 Nm	400 Nm

fig. 42

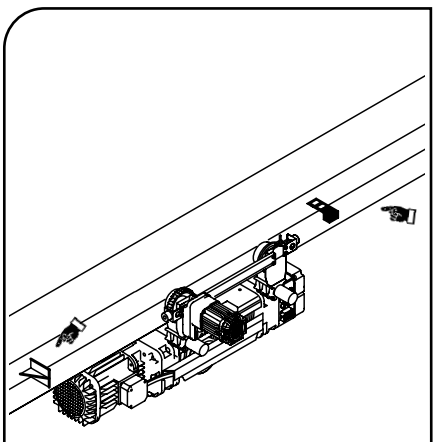


fig. 43

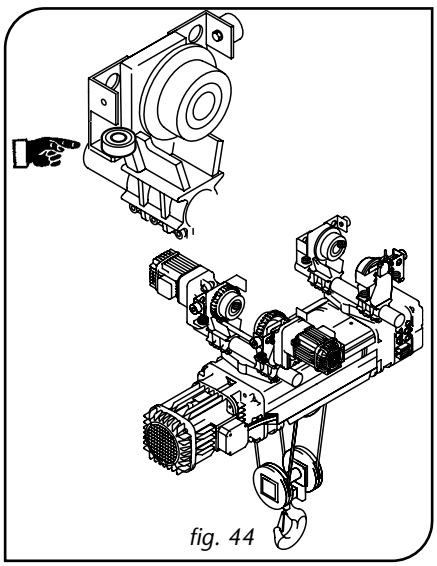


fig. 44

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 1m.
   - 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.

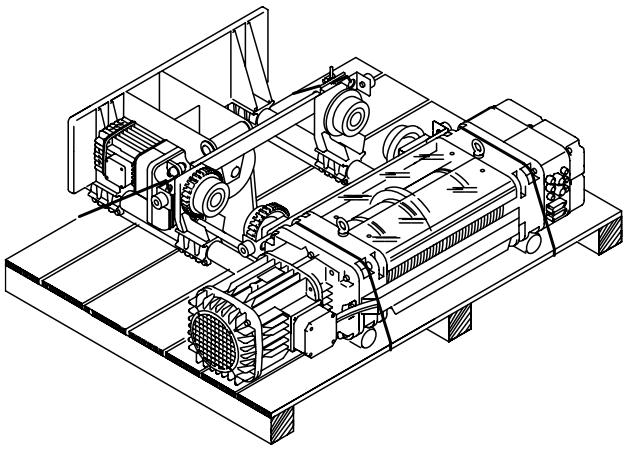


fig. 45

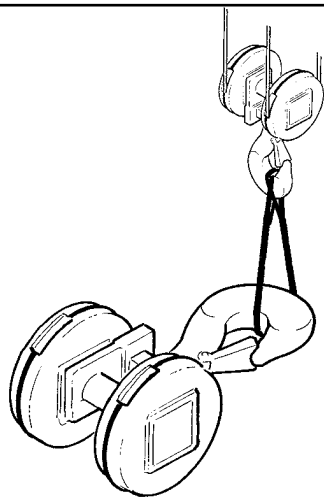


fig. 46

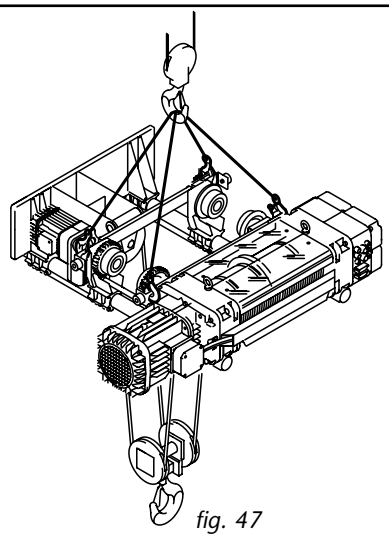


fig. 47

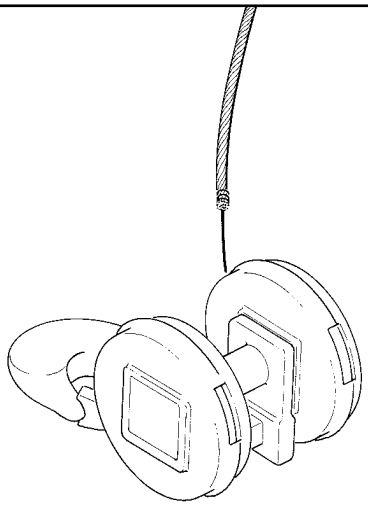


fig. 48

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.

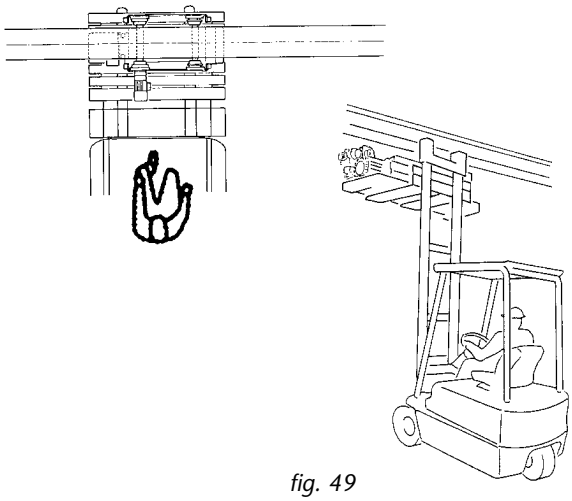


fig. 49

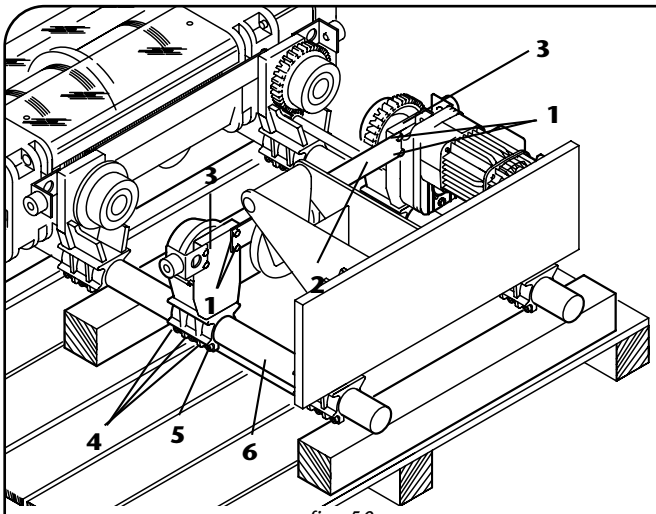


fig. 50

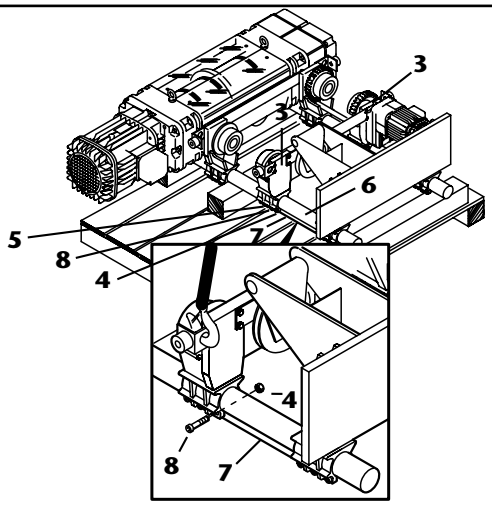
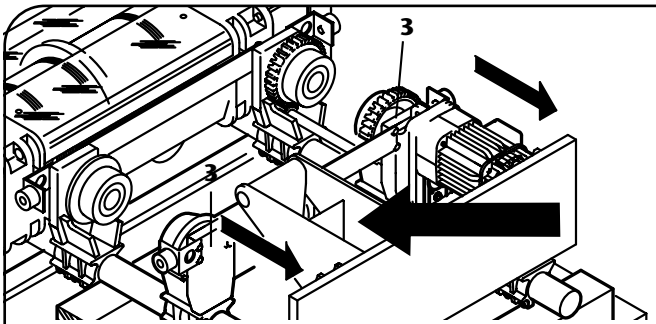


fig. 51



Beam wing (mm)	DRH1 ballast kg	DRH2 ballast kg	DRH3 ballast kg
120	10	10	–
135	8	8	53
160	5	5	40
180	–	–	30
200	–	–	20

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.

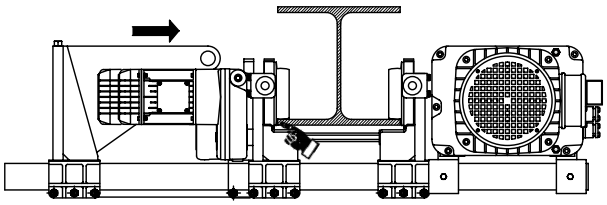


fig. 53

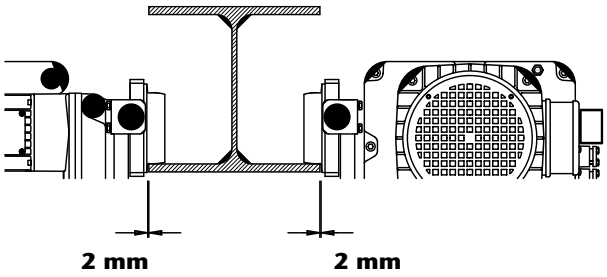


fig. 54

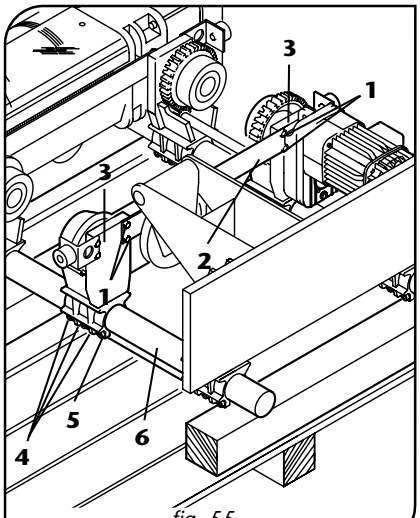


fig. 55

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

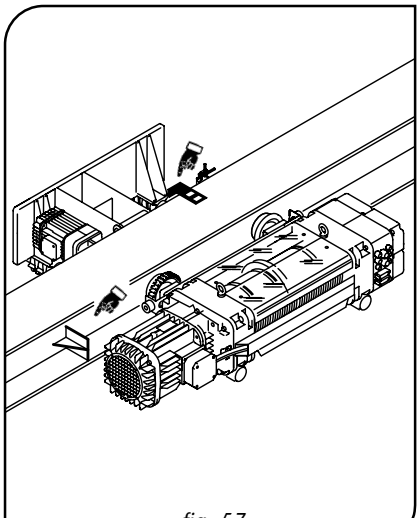


fig. 57

4.4.4 Hoist equipped with DRT double girder trolley

The DRH hoist, combined and pre-assembled with the DRT trolley, is generally fitted onto a double girder crane (travelling crane, gantry, etc.)

The movement and installation of the trolley/hoist onto the support girders, whether on the ground or suspended, must be carried out EXCLUSIVELY using LIFTING equipment (travelling crane, movable cranes, hoists, etc.) combined with suitable harnesses fixed to the eyebolts on the DRT trolley.

Before installing the DRH hoist with the DRT double girder trolley, whether onto girders on the ground or suspended, proceed with the following operations:

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 screww -**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).

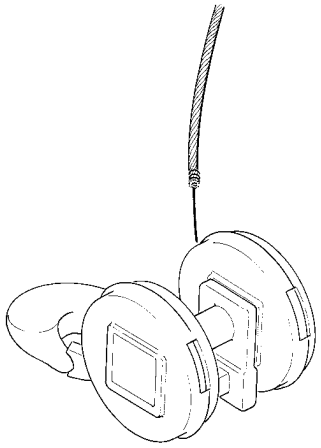


fig. 58

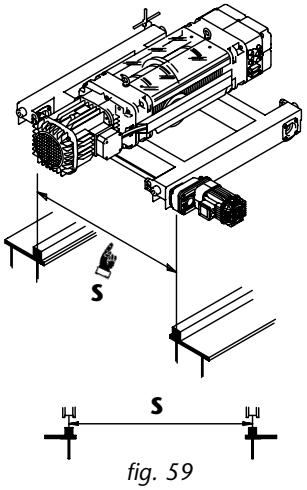


fig. 59

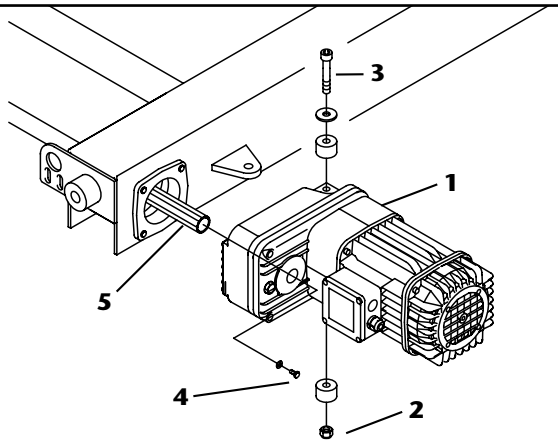


fig. 60

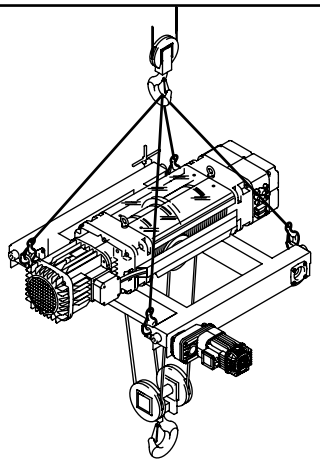


fig. 61

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 endstrokes, 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-**.

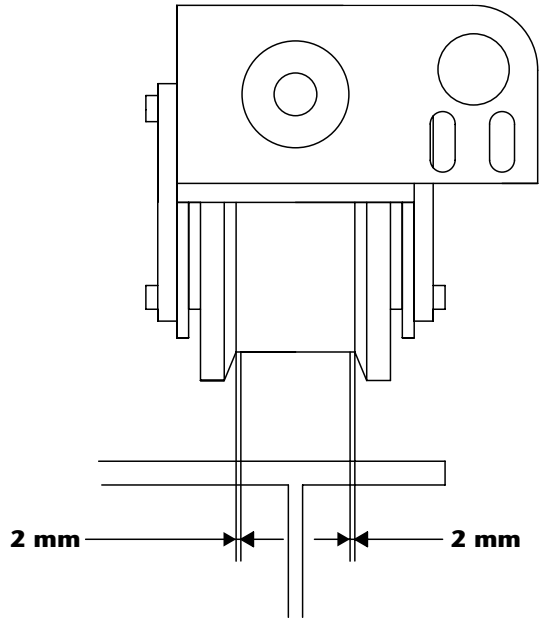


fig. 62

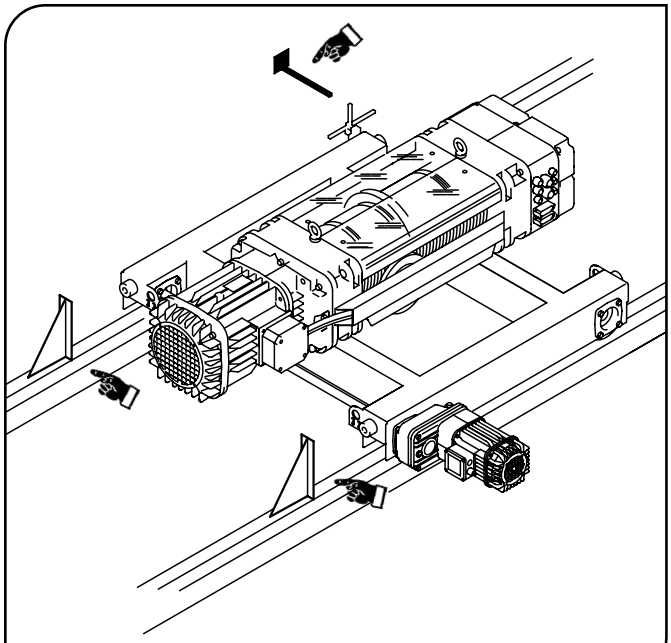


fig. 63

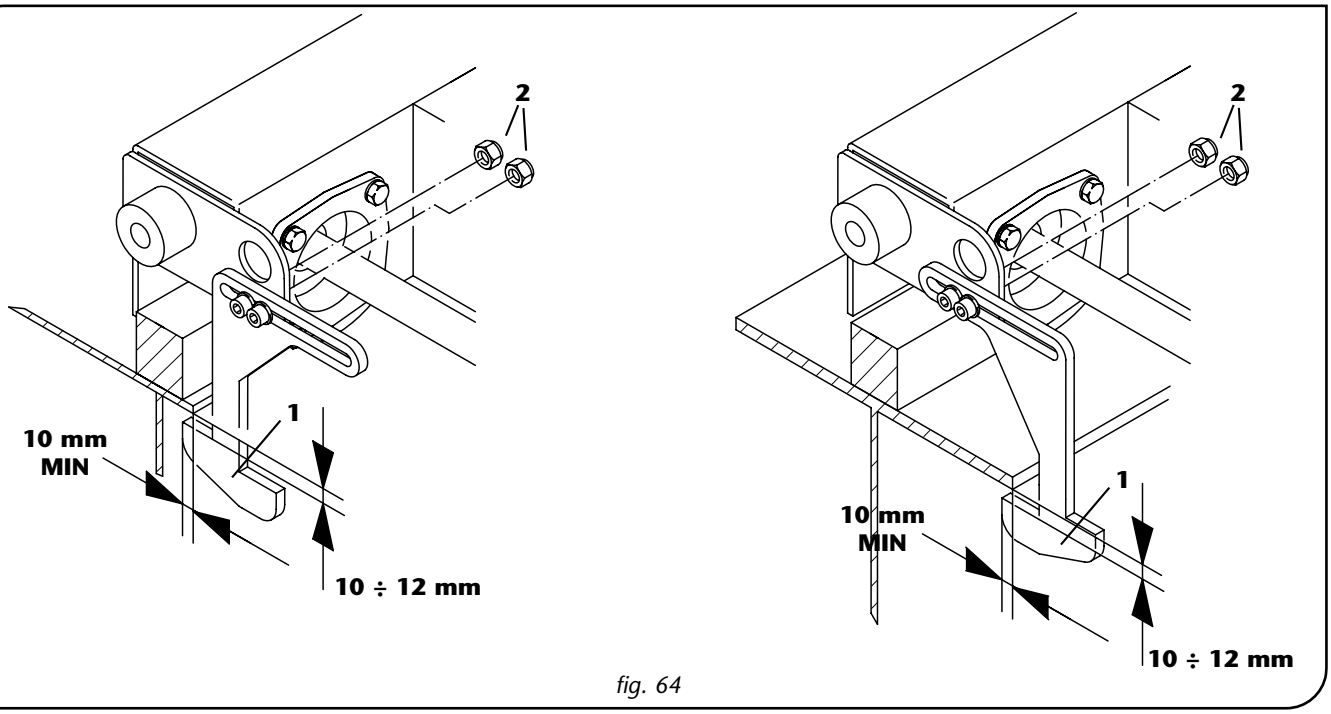


fig. 64

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).

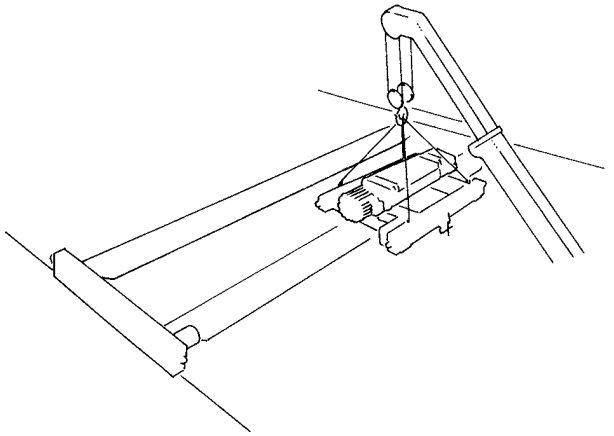


fig. 65

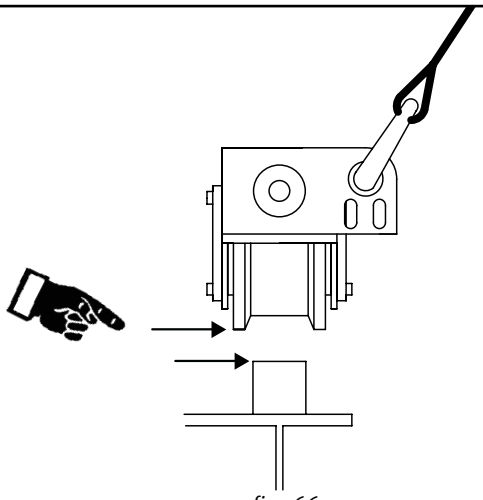


fig. 66

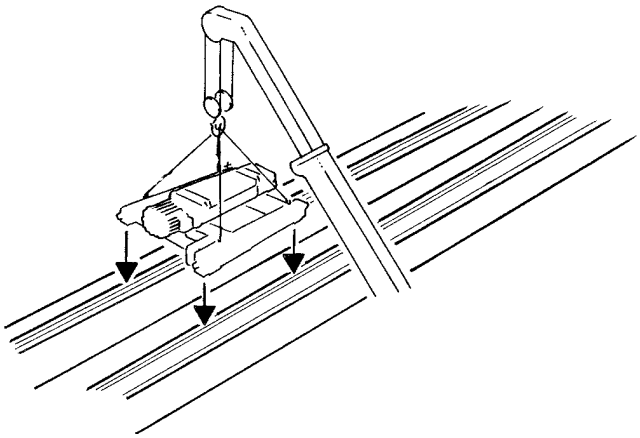


fig. 67

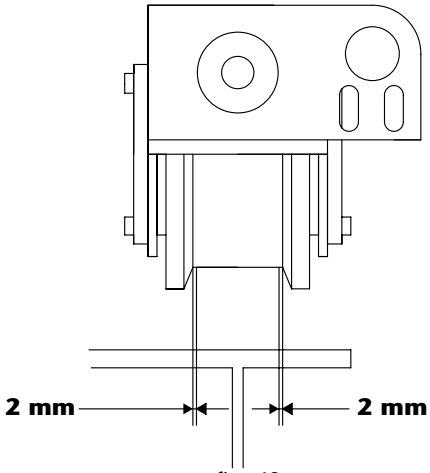


fig. 68

4.4.5 Collegamenti elettrici

The DRH electric wire rope hoists and related trolleys can be supplied in the following configurations (see chapter 2):

- *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).*
- *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).*

To prepare the electrical connections proceed in the following way:

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 related 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).

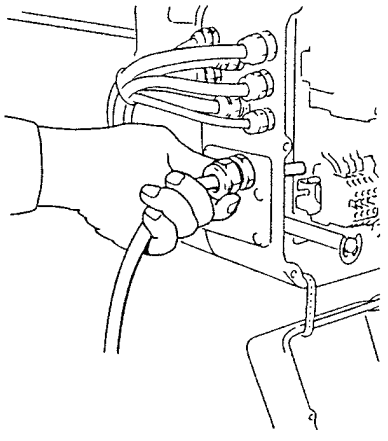


fig. 69

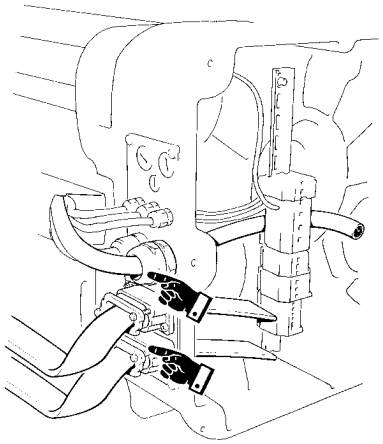


fig. 70

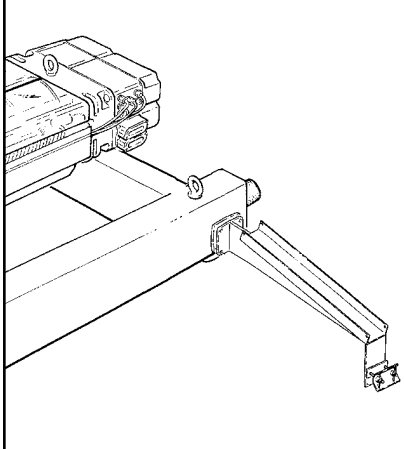


fig. 71

- *Never carry out electrical connections with live power*
- *Never make precarious connections or flying connections*
- *Clamp down completely the cable presses*
- *Procure the electrical circuit diagrams for the DRH hoist on which you are working.*

To make electrical connections, if the hoist IS FITTED with an incorporated control board, proceed in the following way:

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).

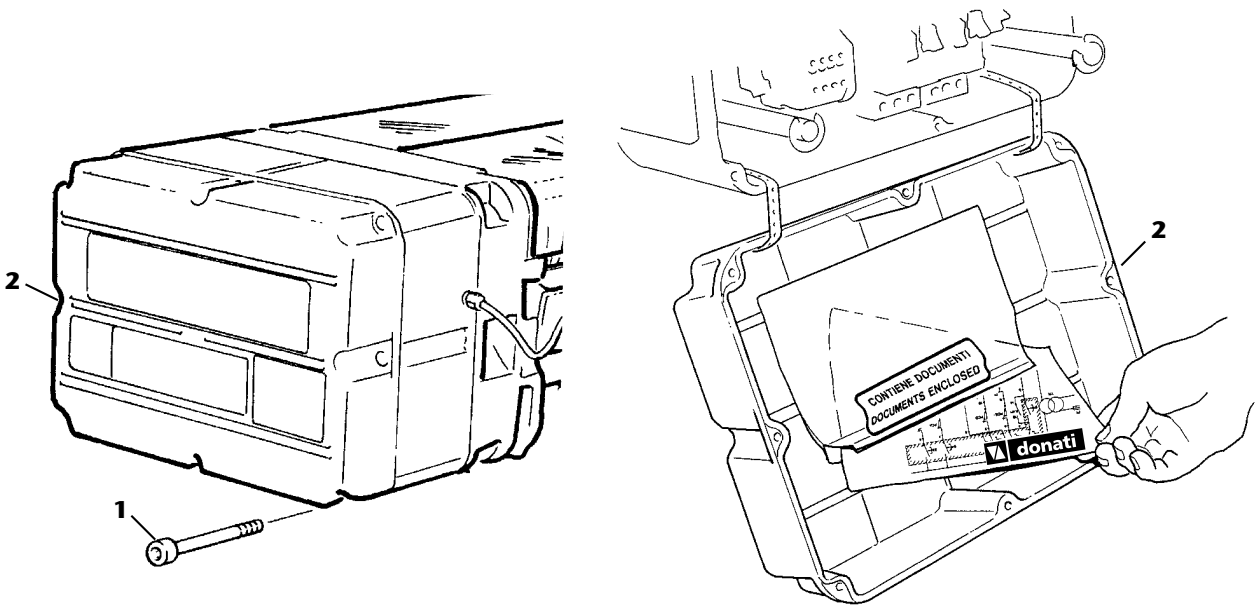


fig. 72

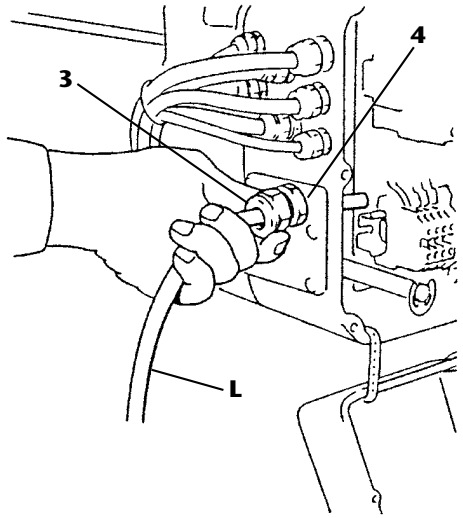


fig. 73

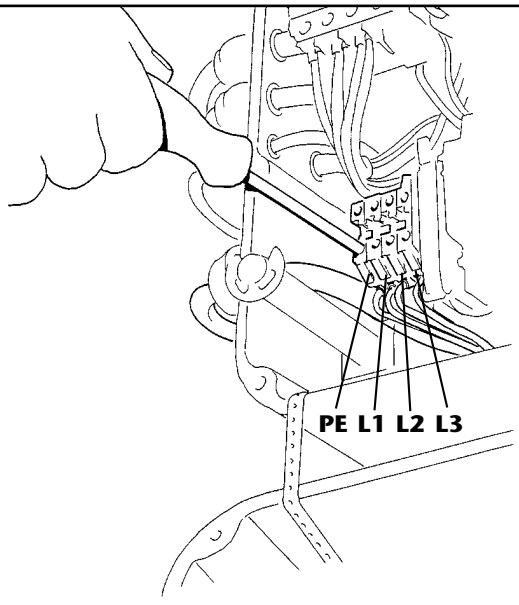


fig. 74

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).

fig. 75

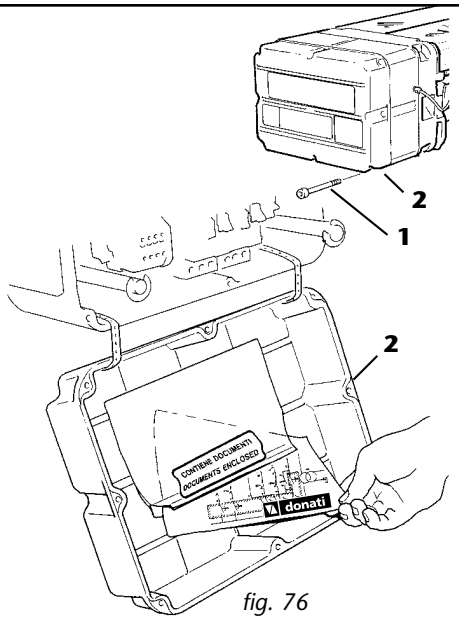


fig. 76

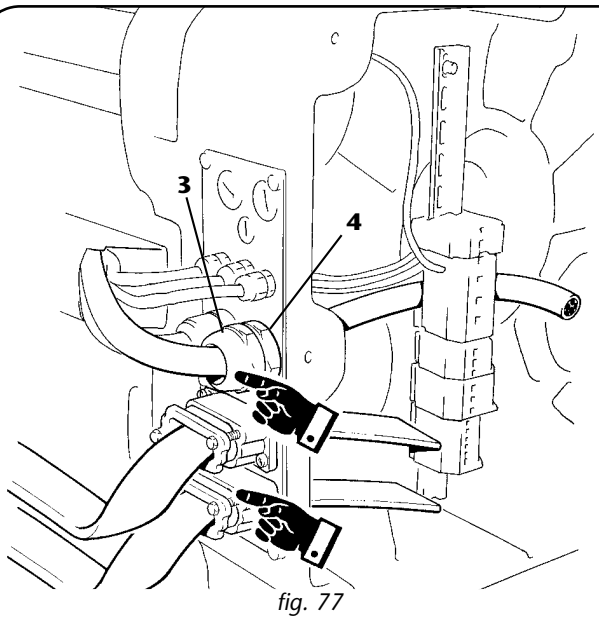


fig. 77

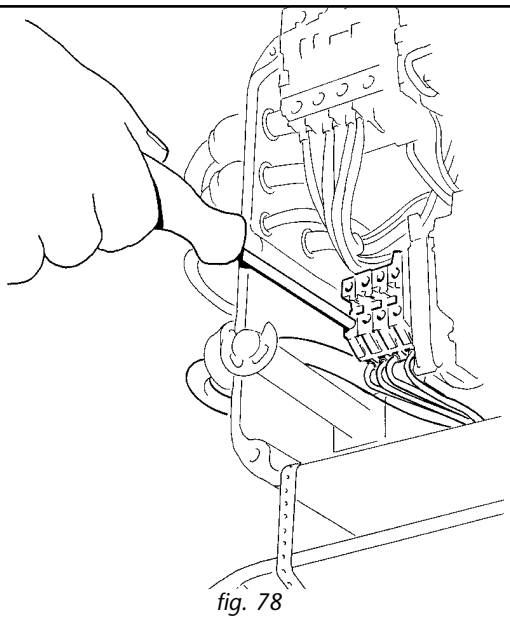


fig. 78

4.5 Putting the machine into operation

4.5.1 Preliminary operations

Before putting the DRH wire rope hoist and related trolley into use, carry out the following 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.

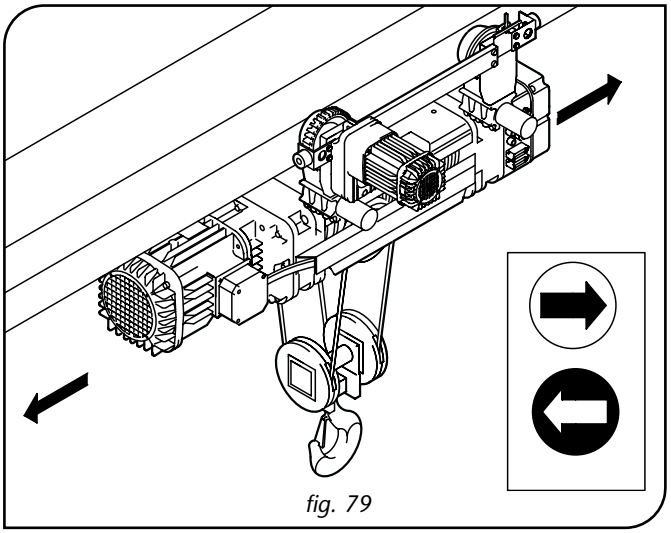


fig. 79

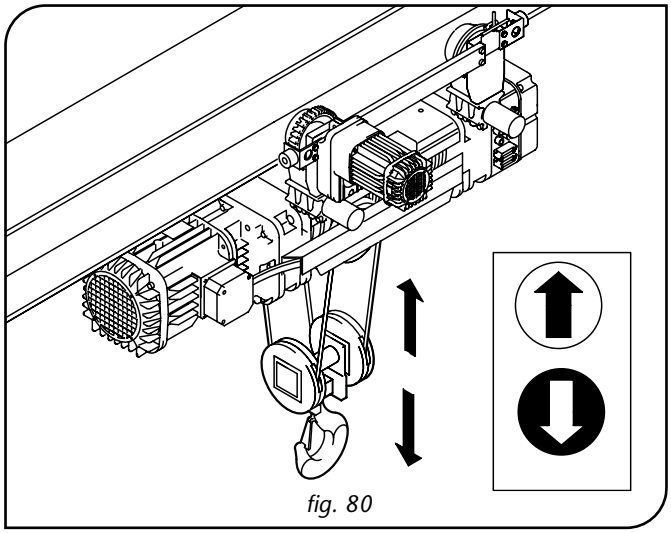


fig. 80

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).

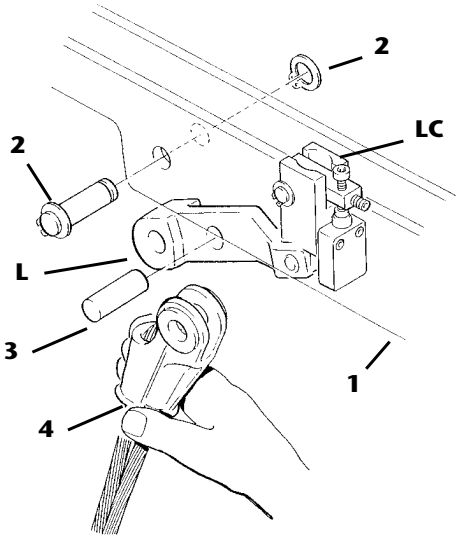


fig. 81

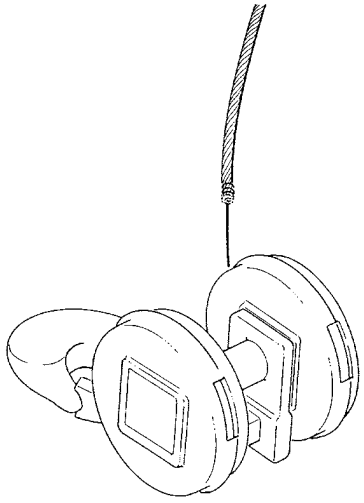


fig. 82

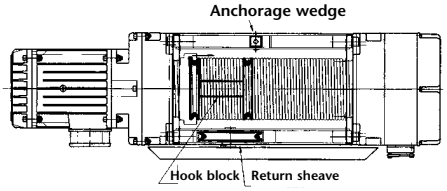


Figure 1

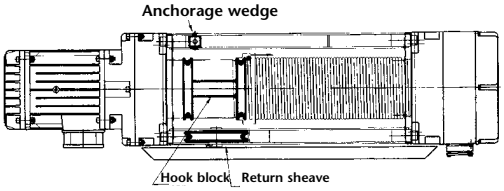


Figure 2

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 eight, 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.

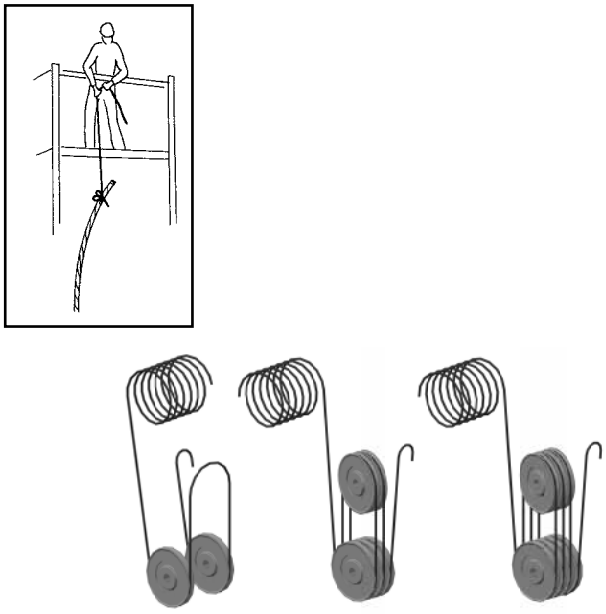


fig. 84

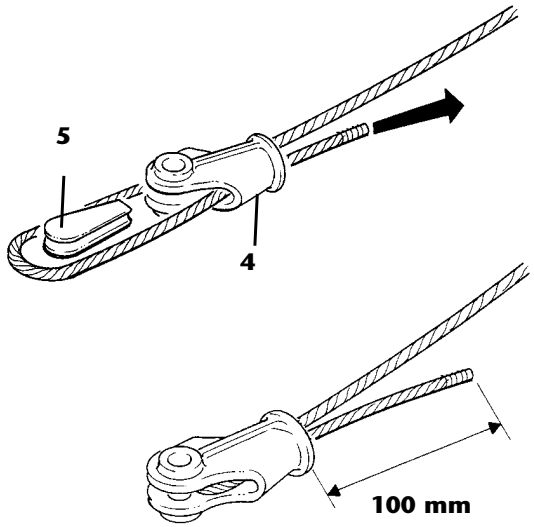


fig. 85

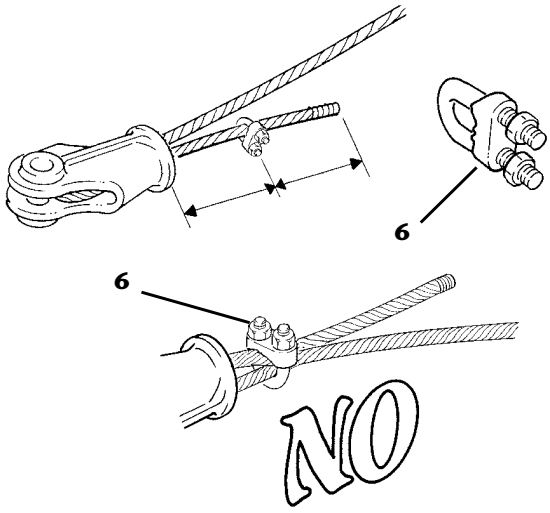


fig. 86

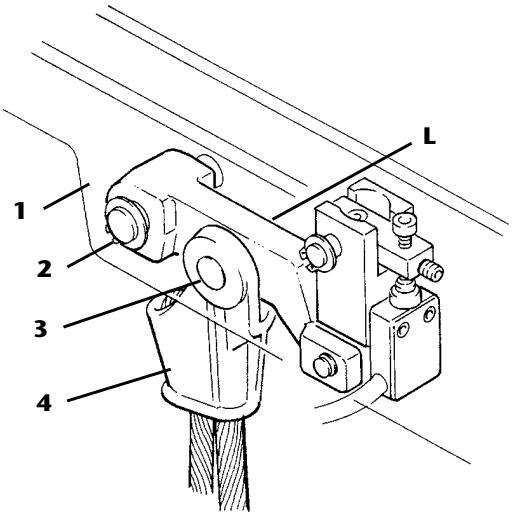


fig. 87

4.5.3 Adjustments and trial runs

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):
- *of the hoist in ascent and descent.*
- *of the trolley along the sliding girder.*

Adjusting the lifting limit switch devices:

- *The positions of max ascent and of max descent are marked by a red demarcation striker plate, which MUST NEVER be passed (fig. 89).*
- *When the hoist is fitted with a reduced dimension DST/R trolley or double girder DRT trolley, the ascent limit switch MUST 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).*
- *In any configuration the heights of maximum approach of the hook block in ascent, indicated in point 2.2.9, MUST NOT be reduced.*
- *The descent limit switch MUST 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).*

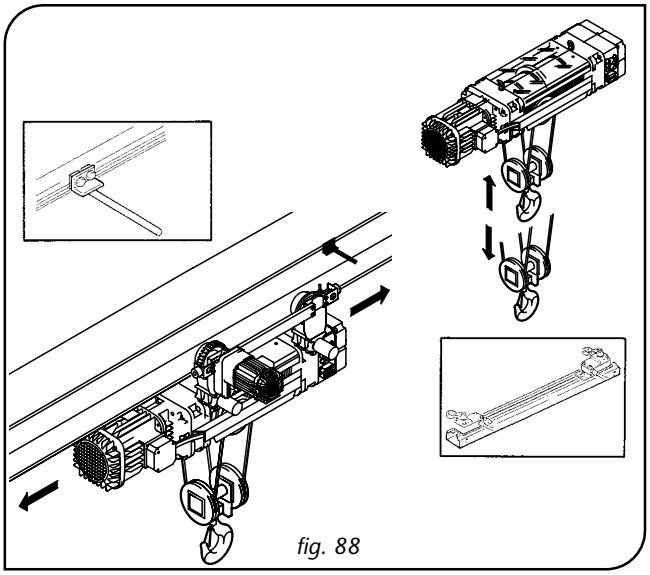


fig. 88

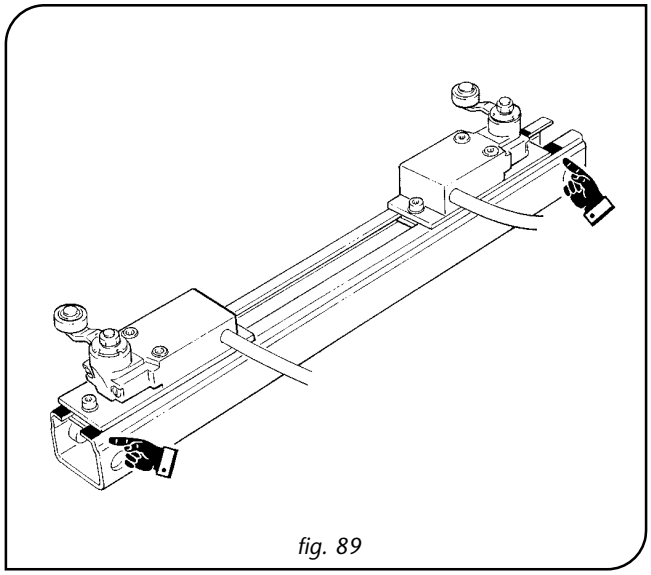


fig. 89

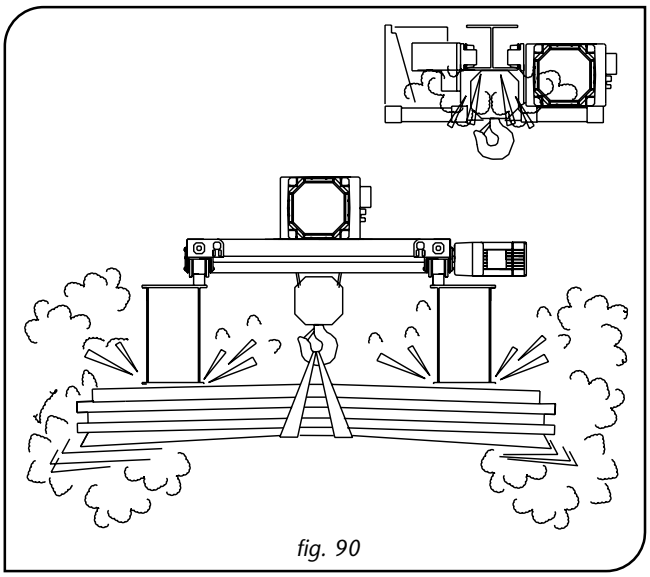


fig. 90

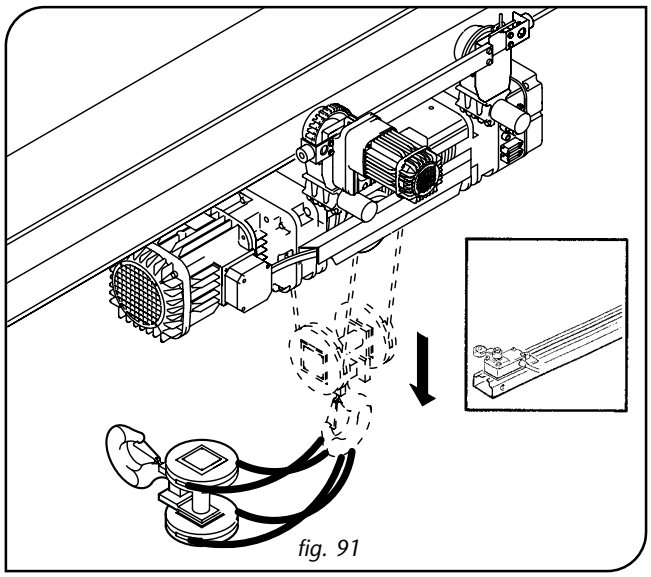


fig. 91

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).***

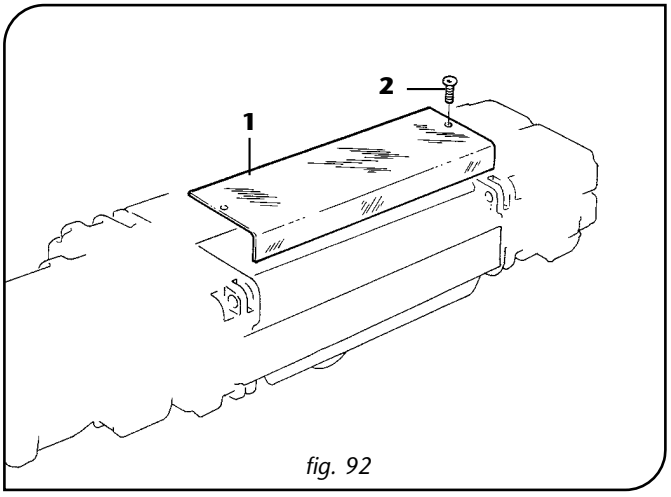


fig. 92

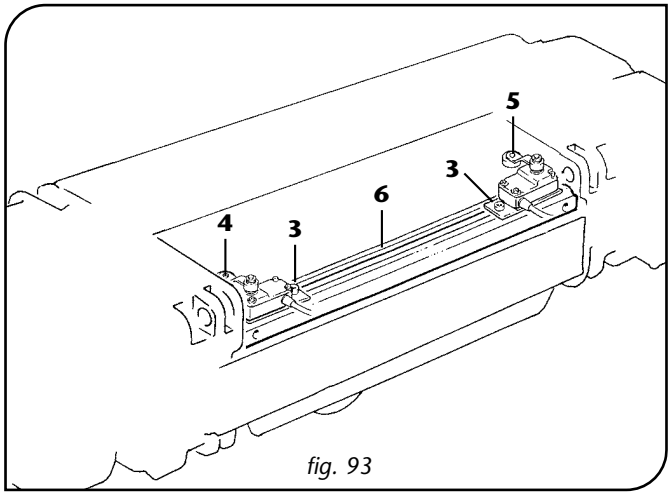


fig. 93

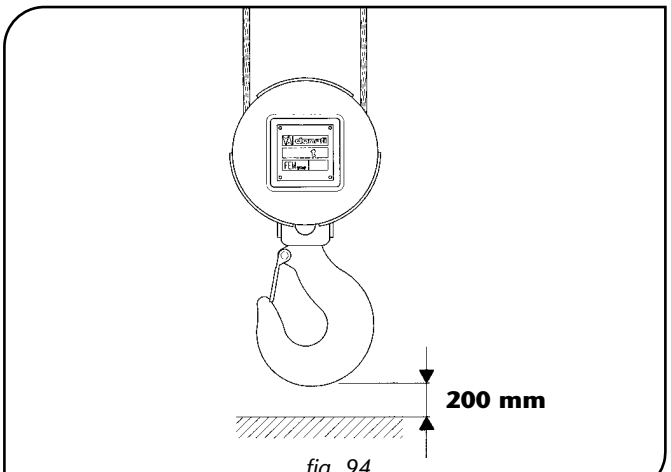


fig. 94

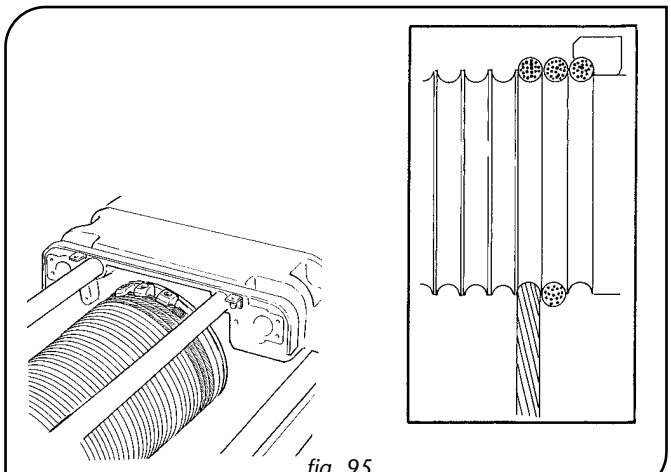


fig. 95

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-slowing 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).

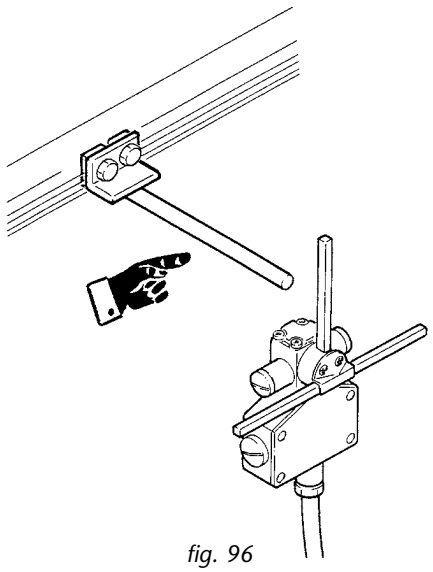


fig. 96

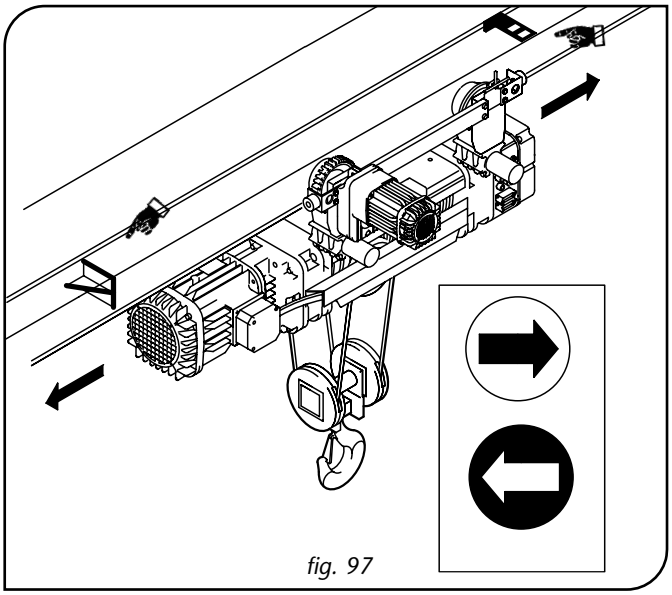


fig. 97

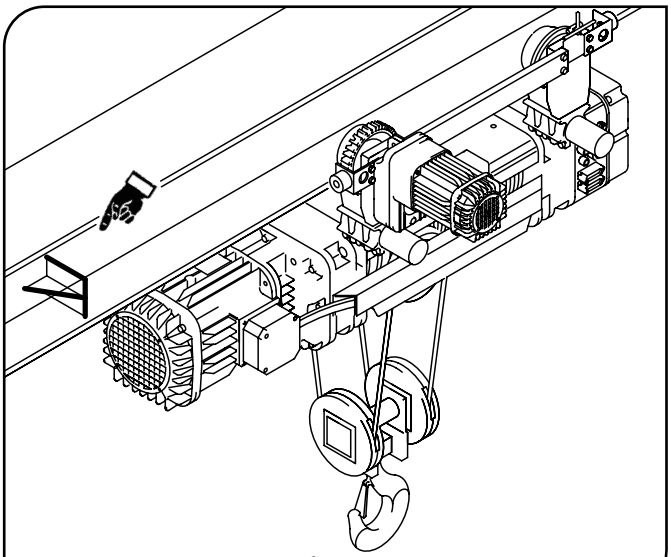


fig. 98

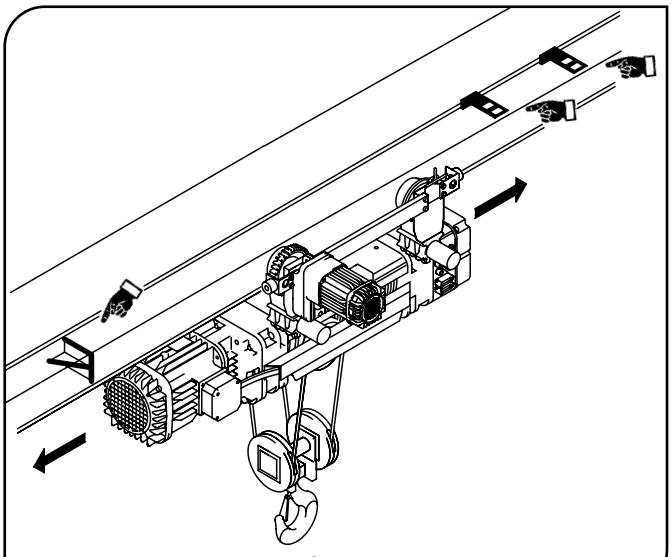


fig. 99

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.

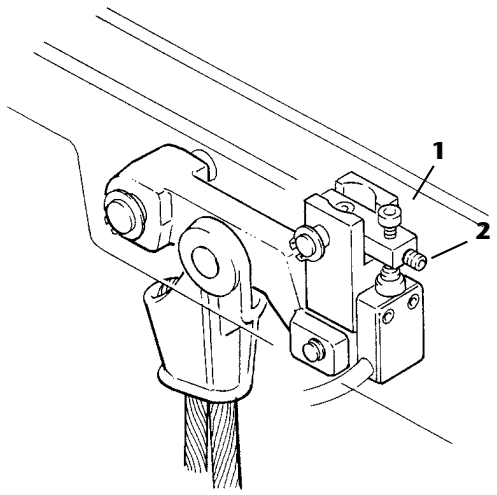


fig. 100

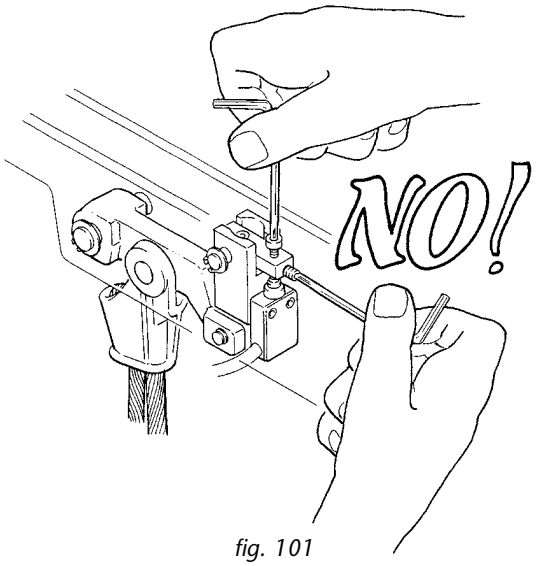


fig. 101

- ***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.***

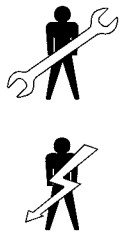
4.5.4 Testing the hoist - Suitability of use

- ***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 disactivate 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 disactivate the ascenting movement, the descenting 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.

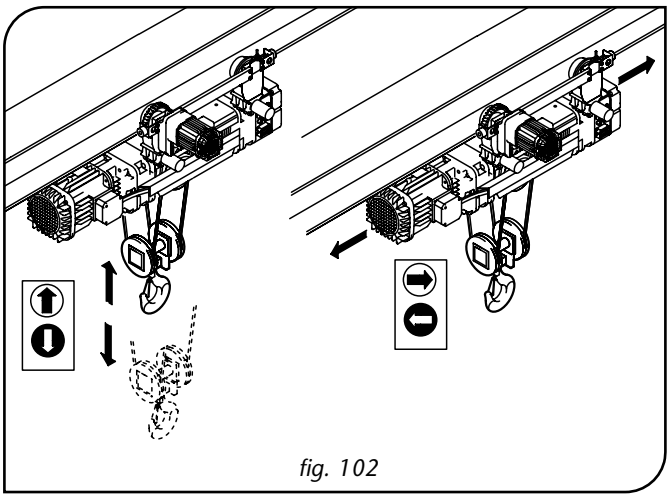


fig. 102

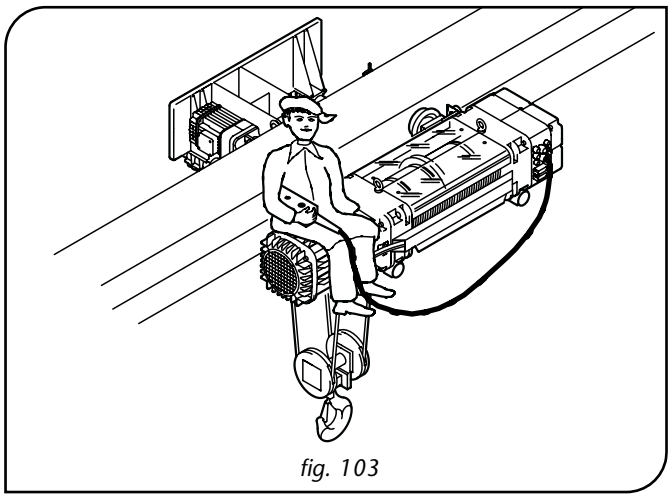


fig. 103

- ***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.

⚠

Handling of the following loads in not permitted:
- *one with a weight greater than the nominal capacity of the hoist (fig. 104)*
- *with an uneven mass with respect to the centre of gravity.*
- *with surfaces which are not resistant enough to withstand the pressure of the hold.*
- *those which are classified as dangerous (e.g. flammable, explosive, radioactive material), because of their chemicophyisical characteristics.*
- *harmful toxic materials or products, unless handled in suitable safety containers (e.g.: corrosive chemical products, products having biological risks, etc.).*
- *loose foodstuffs, which may come into direct contact with parts of the hoist or with its lubricants.*
- *those which may change their static and/or chemicophisycal configuration or their centre of gravity during handling.*
- *those without the accessories outlined in the following point.*

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.

⚠

The following accessories are not usually allowed:
- *those with functional characteristics which may provoke a level of dynamic stress superior to that admissible for the hoist or accidental overloading.*
- *those which may collide with parts of the hoist or trolley (fig. 105).*
- *those which compromise free handling of the load.*
- *those which are connected to independent electrical lines.*

⚠

The weight of the lifting accessories must be subtracted from the nominal capacity of the hoist.

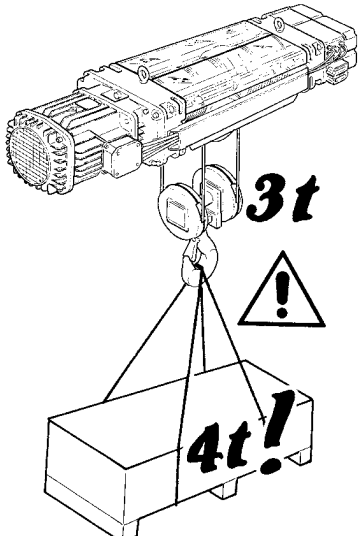


fig. 104

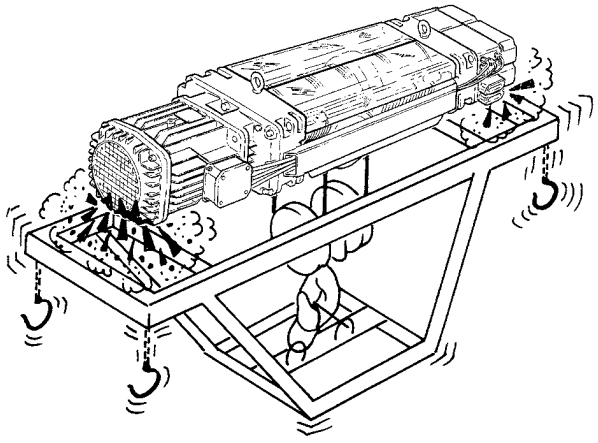


fig. 105

5.2 Operating conditions

5.2.1 Operating environment

• The operating environment must have the following characteristics:

- **temperature:** min. –10°C; max. +40°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.

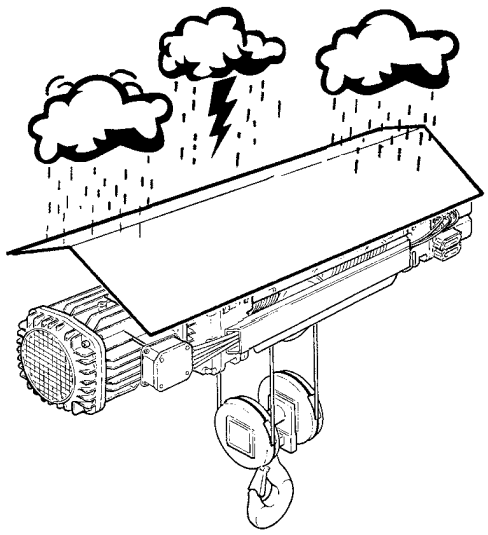


fig. 106

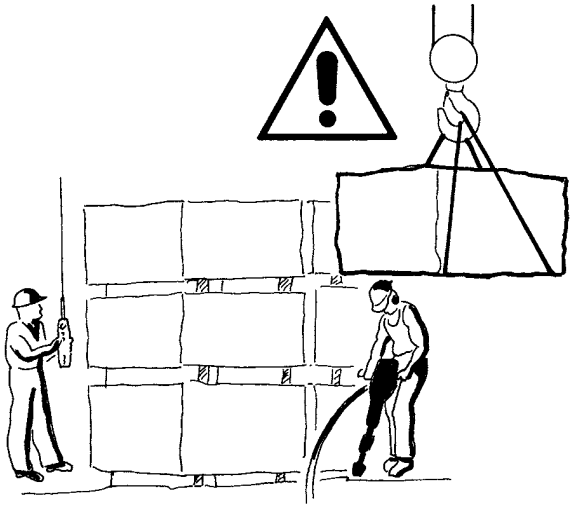


fig. 107

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.

- ***The level of illumination must guarantee the maximum level of safety possible for the operation of the hoist (fig. 108).***
- ***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.***

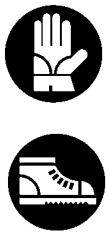
5.2.4 The operator

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.

- ***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.***
- ***The use of the hoist is forbidden to non-authorised or untrained people.***
- ***The operator must use suitable personal protection devices (D.P.I. = gloves, protective footwear).***



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.

The loading capacity of the hoist and its accessories must never be overcome by applying overloads or modifying the settings of the loading limitator (fig. 109).

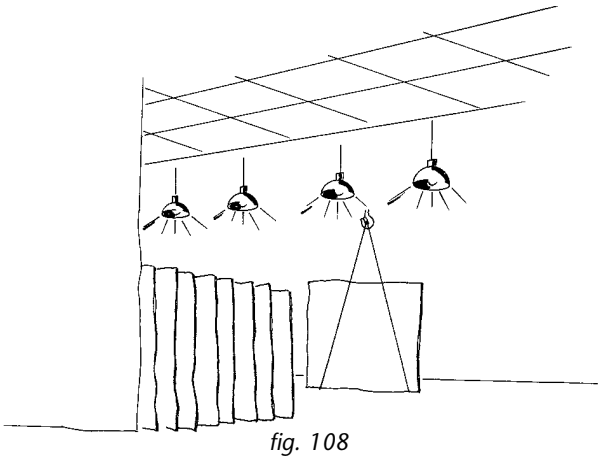


fig. 108

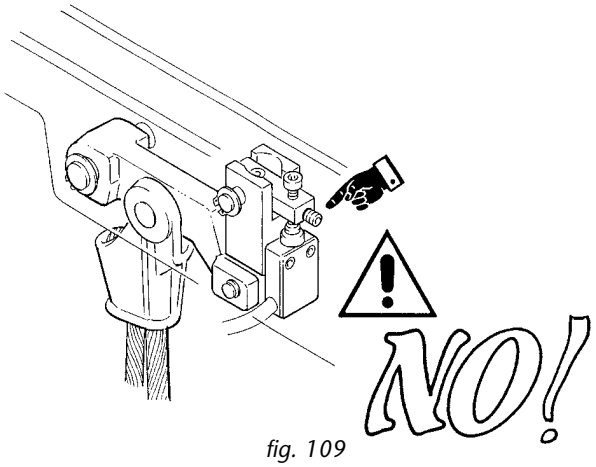


fig. 109

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 lose 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).

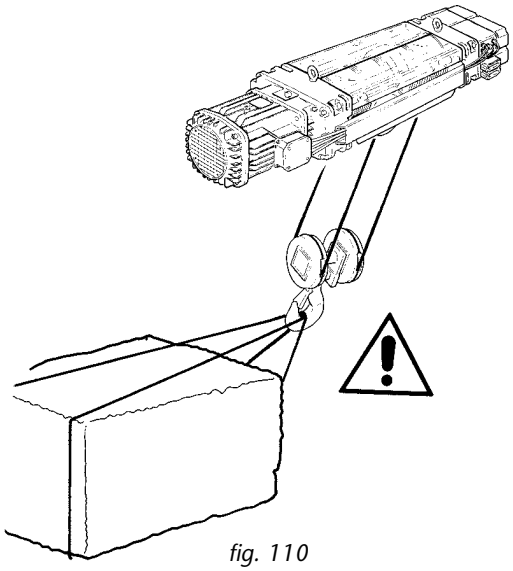


fig. 110

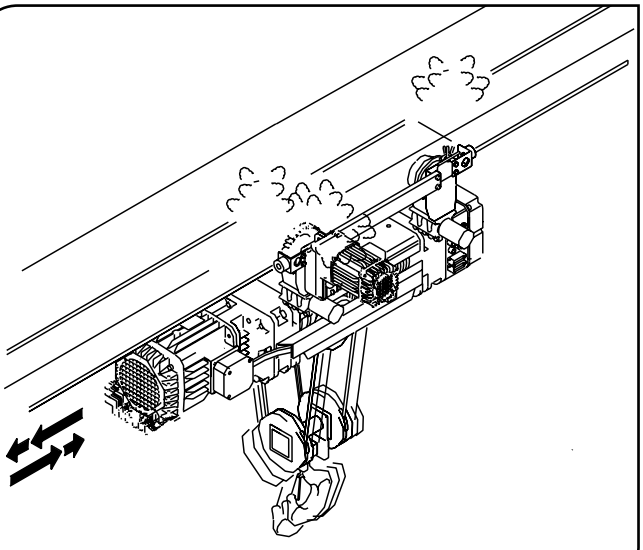


fig. 111

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%.

- ***When the safety devices are not supplied by DONATI SOLLEVAMENTI S.r.l., they must be installed by the purchaser.***
- ***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.***

CE

5.3 Setting up – Starting the hoist

To begin operational activities carry out the following operations:

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".

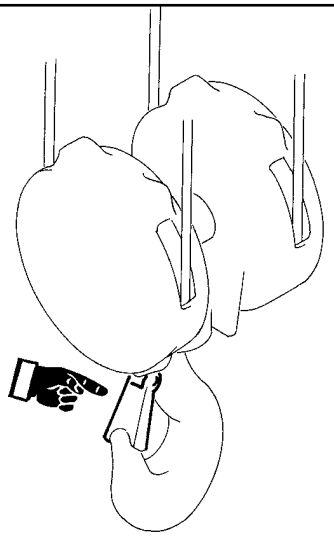


fig. 112

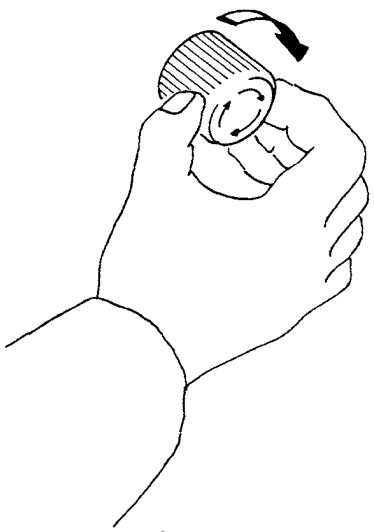


fig. 113

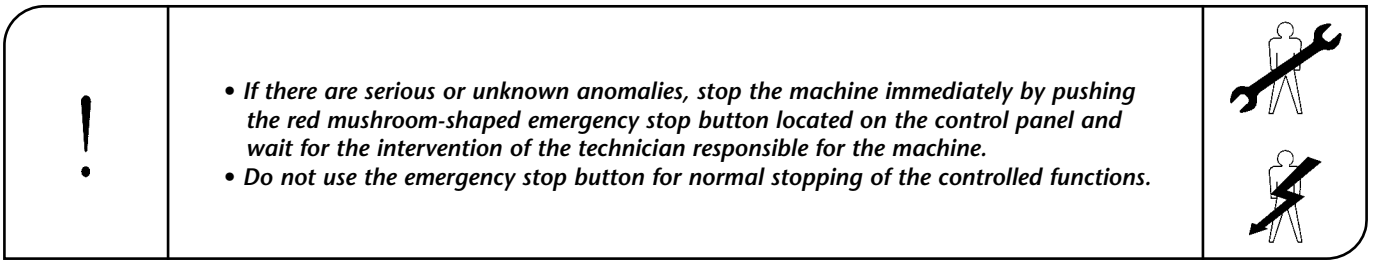
5.4 Stopping the hoist – Switching off at the end of use

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.

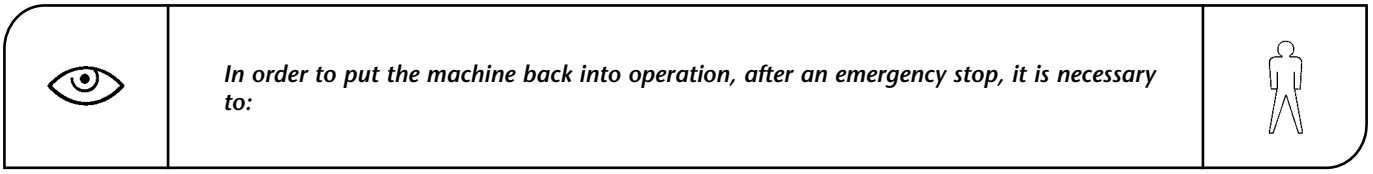
Emergency stopping:

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



- *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.*
- *Do not use the emergency stop button for normal stopping of the controlled functions.*

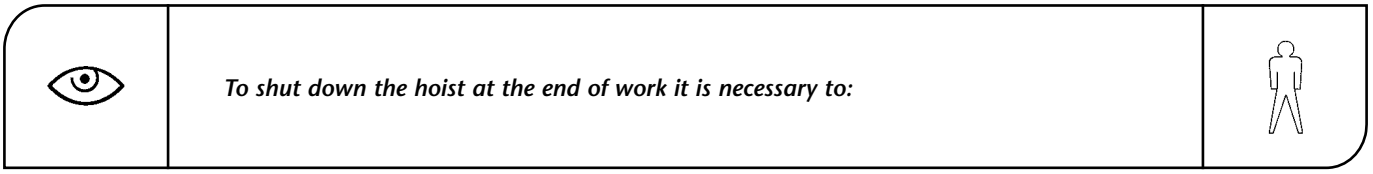
Putting the machine back into operation after an emergency stop:



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.

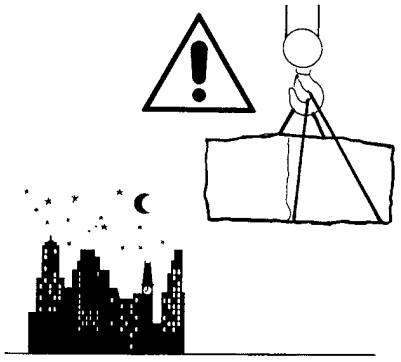


fig. 114

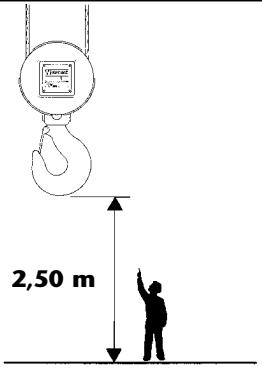
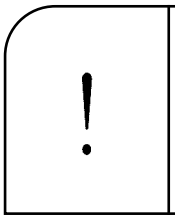


fig. 115

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.

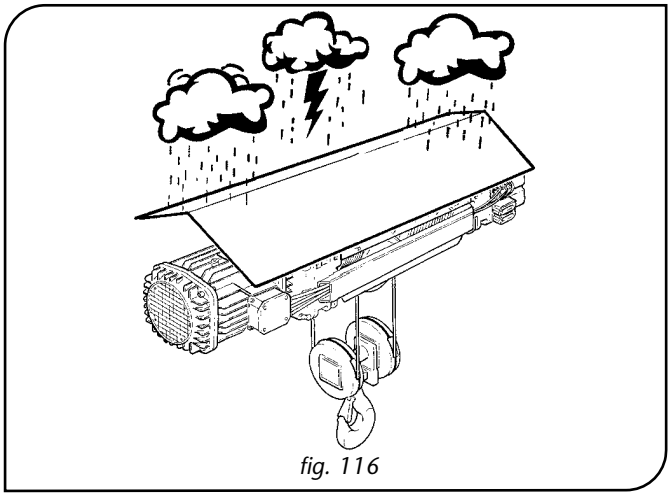


fig. 116

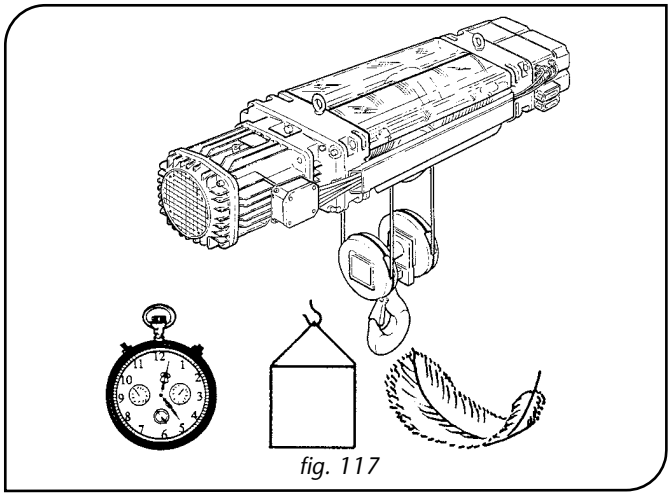


fig. 117

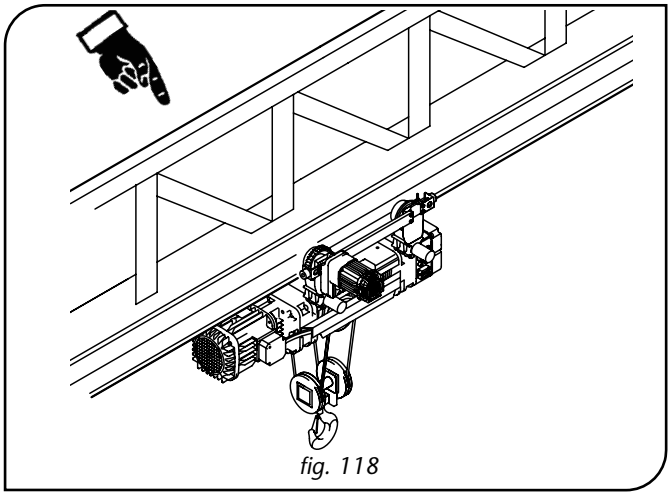


fig. 118

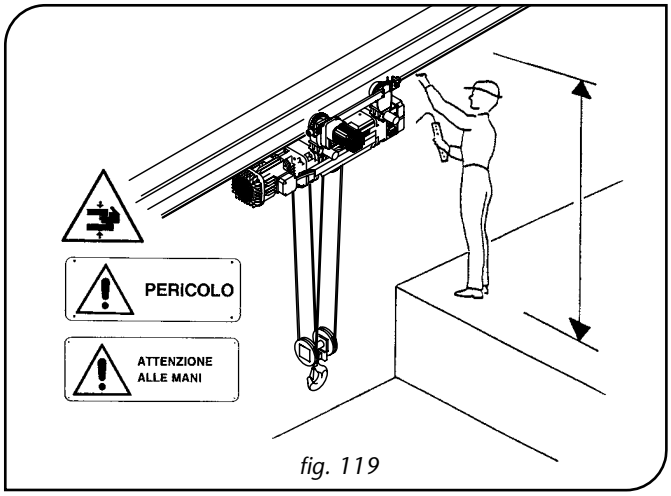


fig. 119

- **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.

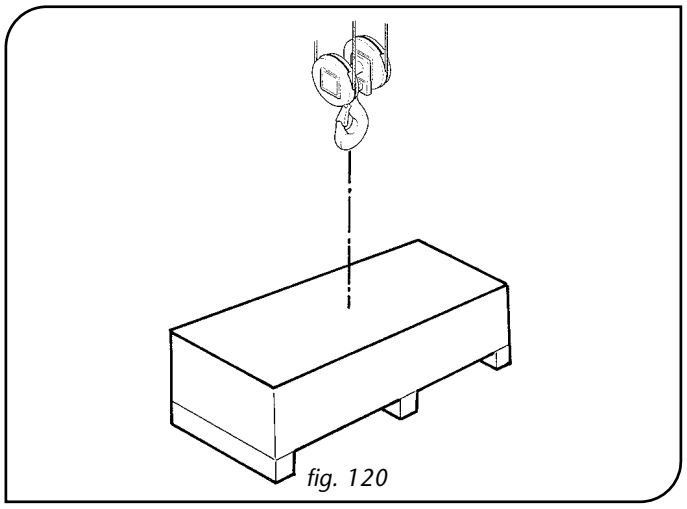


fig. 120

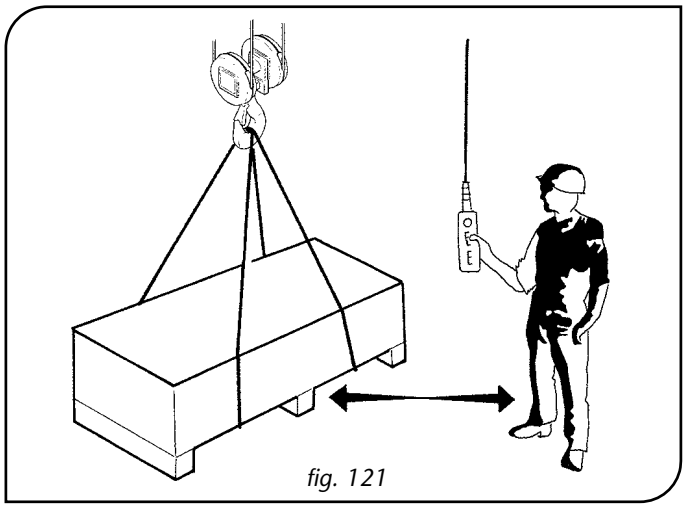


fig. 121

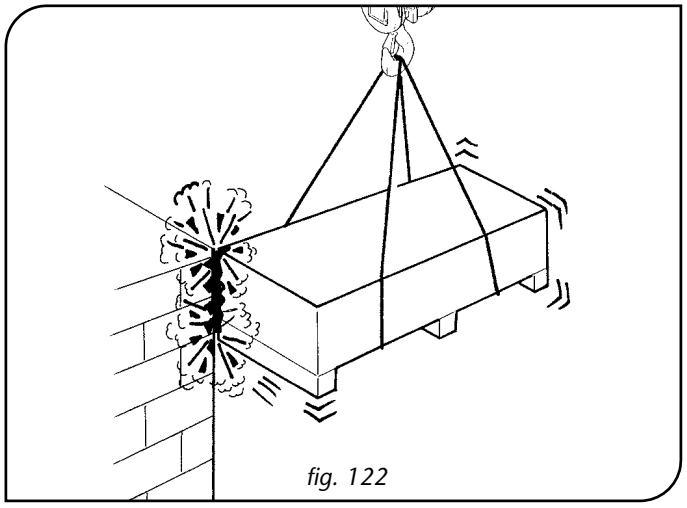


fig. 122

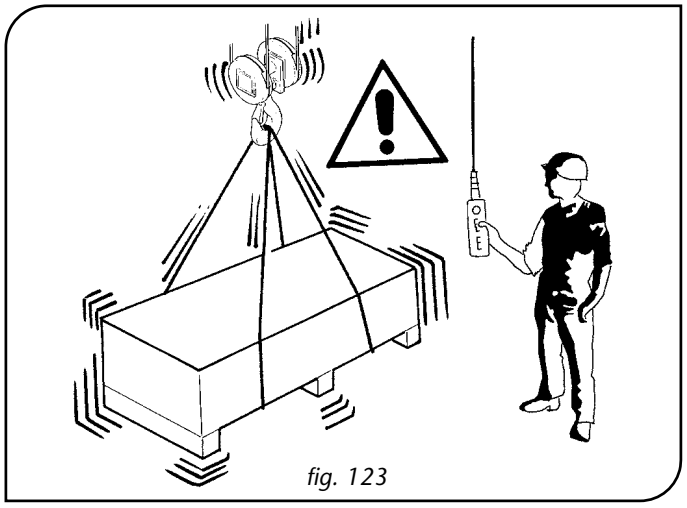


fig. 123

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).

fig. 124

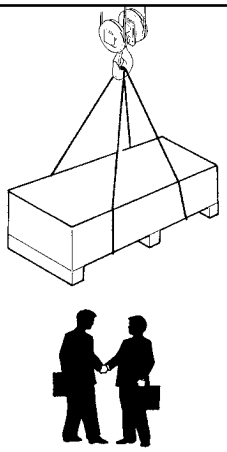


fig. 125

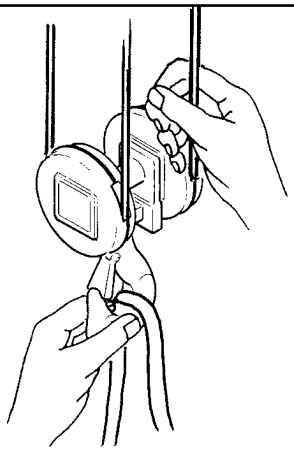


fig. 126

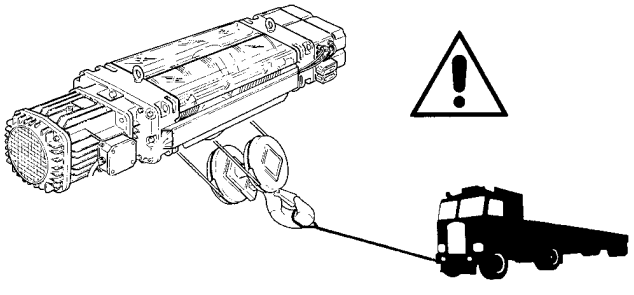


fig. 127

- **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 atmospherics 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.
- ˆ**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.

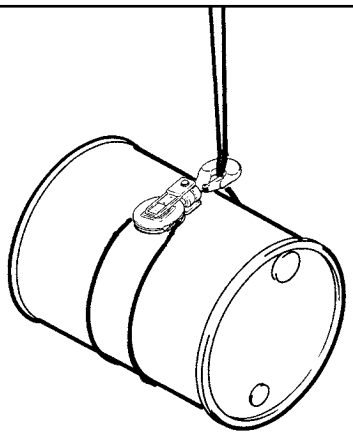


fig. 128

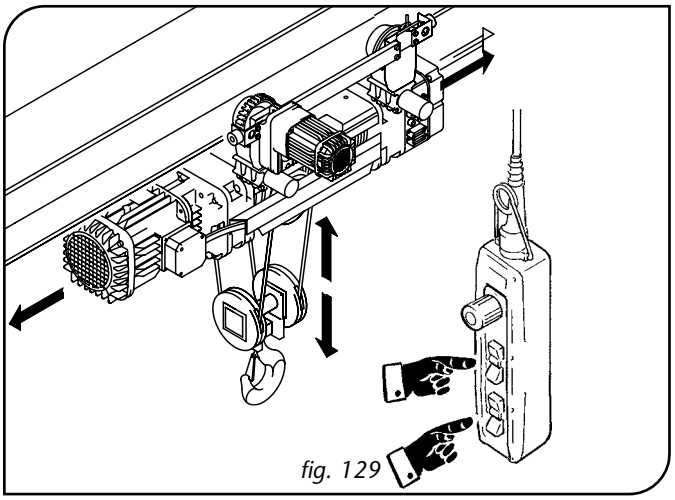


fig. 129

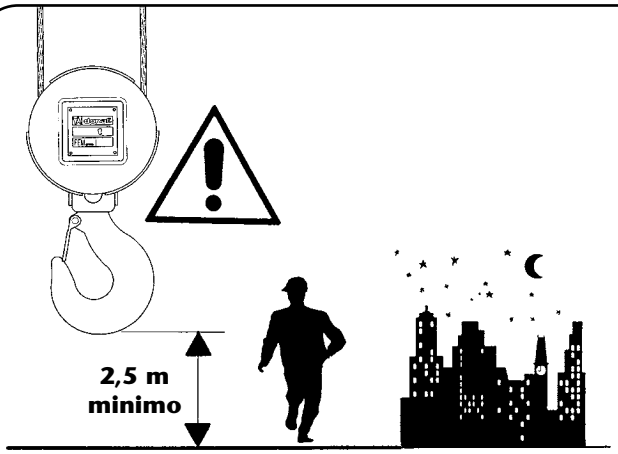


fig. 130

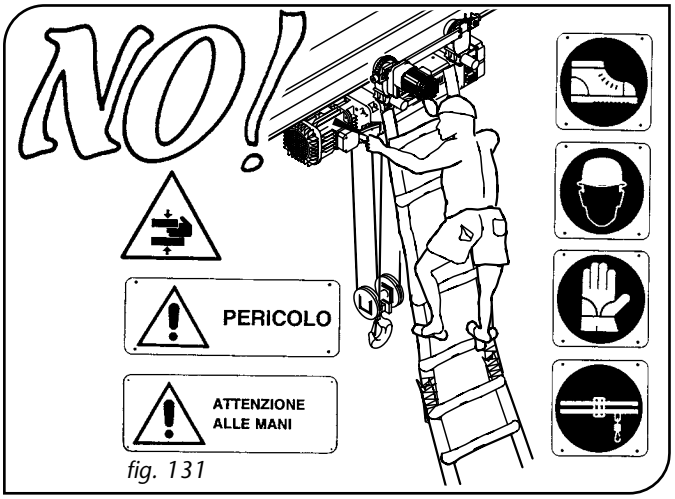


fig. 131

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 the 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.

⚠	*II 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 opportunely 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.

- ***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.***
- ***Staff must also have suitable individual protection devices (D.P.I.).***

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:

Daily intervention to be performed by the hoist operator:

- *general visual check*
- *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*
- *check of the state of the wire rope and hook*

Monthly intervention to be performed by qualified staff:

- *Visual check of every gear and for possible lubricant leakage*
- *Function check of the break at full load*
- *Check that anomalous noise and/or vibration are not present*
- *See to the lubrication of the gears and limit switches to guarantee normal functioning and to limit wear*
- *Check the functionality and integrity of the push-button panel and relative cable*

Quarterly checks to be performed by qualified staff:

- *Check the efficiency and wear of the: hook, rope and rope guide*
- *Check wear of rope drum and pulleys*
- *Check wear of wheels, sprocket wheels, guide rollers of the trolley*
- *Verify efficiency and functionality of overload switch*
- *Visual check inside switchboard for the presence of dust*
- *Check for oxidised contacts: to be covered, after cleaning, with a very thin layer of Vaseline*
- *Check of lubrication of mobile trolley of any festooned cable and cable check*
- *Check efficiency and integrity of electricity supply line and its components*
- *Loaded check of motors and brakes and verify level of wear*

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 Inspections - Testing	General visual checks. Verify good functioning	General visual inspections	Wear check	Annual test	70
Structural elements Welding Pivots and hinges				Wear and efficiency check Check bolted and welded joints	86
Rope 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 Transmission pulleys			Wear and efficiency check		90
Rope drum shell Rope grip guide			Wear and efficiency check		90
Lifting reducer Translation reducer		Noise check			91
Lifting motor Transverse motor	Check correct functioning		Loaded testing		91
Lifting brake Transverse brake	Check correct functioning	Loaded testing of braking distances	Loaded testing Wear check		92
Wheels and sprockets DST/S Guide rollers			Wear check		93
Trolley buffers				Wear and efficiency check	93
Electrical system 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 Translation limit switch	Check correct functioning		Loaded testing Wear and efficiency check		96
Cleaning and lubrication	Check correct state of cleanliness and lubrication	Inspection of general lubrication	Leakage check 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 ≥ 10%, or of the diameter or thickness ≥ 5% compared to initial values.***

DONATI TECHNICIAN

DONATI SERVICE

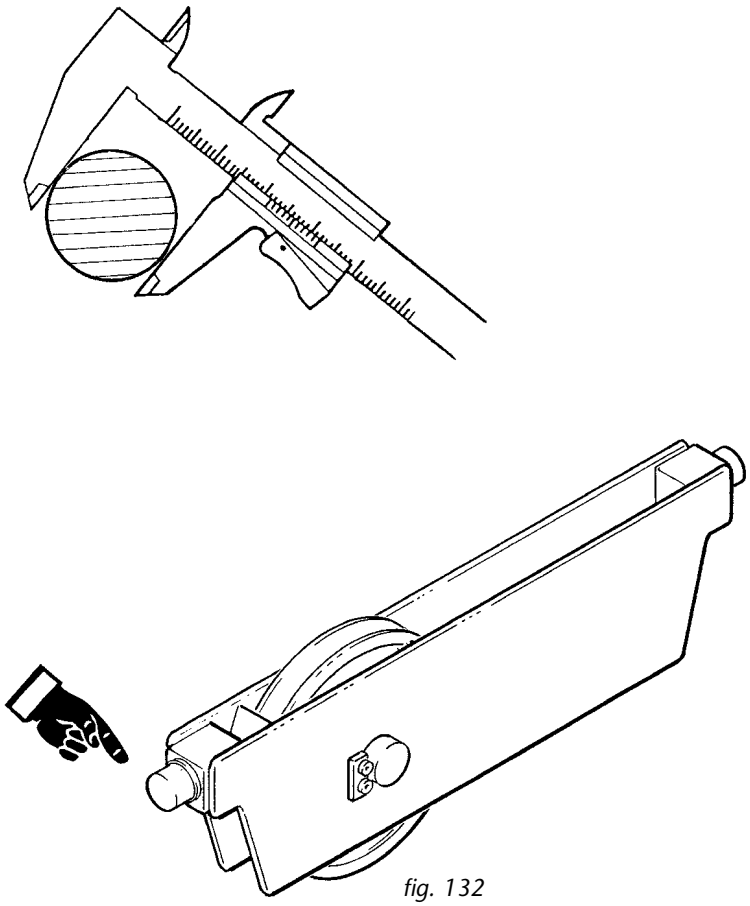


fig. 132

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 ≥ 7% due to corrosion and wear*
- *one or more broken strands*
- *deformation with: permanents 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, ≥ 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)*
- ***PFor 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 ≥ 5%

Characteristics of the DRH hoist ropes (fig. 133)

DRH	Ropes Ø (mm)	Rope type: - Crossed - Right	Class	Breakage load required (kN) (minimum guaranteed)	Rope formation (minimum required) *	N°broken strands visible. Max. admissible on a length of rope equal to 6 diameters	30 diameters	N° falls	Length of the rope (m) Type of rope drum C	N	L	X1	X2
1	7	Normal	B	30,4	114 strands Right/Left	3	6	2	20	28	53	72	94
			M	42,1	152 strands Left	3	6	4	21	29	41	61	81
			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						
2	8	Normal	M	42,0	114 strands Right/Left	6	12	2	25	33	58	73	91
			A	61,6	152 strands Right/Left	3	6	4	26,5	34,5	46	62,5	78,5
		Antitwist	M	46,1	133 strands Right/Left	2	4						
			A	60,5	133 strands Right/Left	2	4						
	9	Normal	B	53,1	114 strands Right/Left	3	6						
			M	69,6	200 strands Left	3	6						
			A	74,6	145 strands Left	3	6						
		Antitwist	M	58,4	133 strands Right/Left	2	4						
			A	76,6	133 strands Right/Left	2	4						
3	12	Normal	M	121,7	216 strands Right/Left	14	29	2	26	34	62	80	100
			A	138,7	227 strands Right/Left	13	26	4	28	36	48	64	84
		Antitwist	A	136,2	133 strands Right/Left	2	4	6	-	36	64	79	-
	13	Normal	B	102,0	114 strands Right/Left	5	10	8	-		69,5	85,5	-
			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						
4	15	Normal	M	189,7	216 strands Right/Left	14	29	2	32	40	72	98	124
			A	219,2	253 strands Right/Left	14	29	4	34	42	54	78	106
		Antitwist	A	212,7	133 strands Right/Left	2	4	6	-	42,5	73,5	97,5	-
	16	Normal	B	176,9	216 strands Right/Left	7	14	8	-	48	80	105	-
			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):*

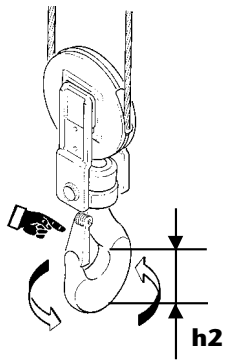
• The hook of the hook block must be examined and any anomalies related to the following, recorded:

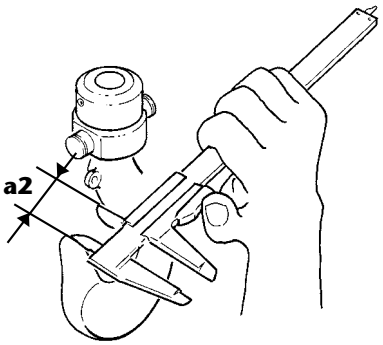
- Deformation, lengthening, incisions, wear, corrosion, abrasion
- The integrity and functionality of the safety device on the hook (safety latch)
- Excessive friction, the hook must rotate and move freely in all directions with smooth movements and no jolting. If this is not the case it is necessary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

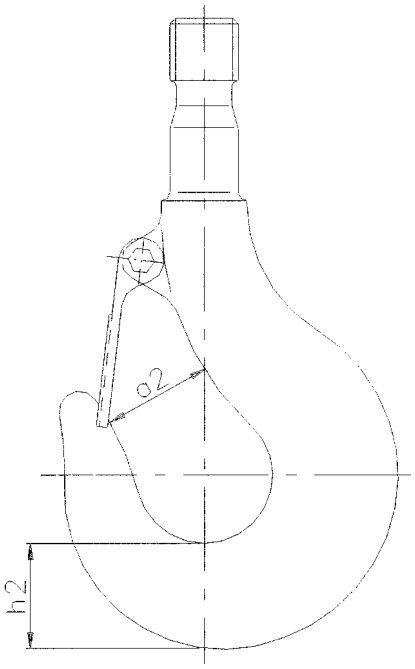
Substitute the hook when the following are found:

- *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			
		Capacity	Type N°	Capacity	Type N°	Capacity	Type N°	Capacity	Type N°	a2	h2
1	2/1	–	–	1250	08V	1000	08V	800	08V	38	37
		–		1600		1250		1000			
		–		2000		1600		1250			
	4/1	–	1.6V	1600	1.6V	1250	1.6V	1000	1.6V	45	48
		–		2000		1600		1250			
		3200		2500		2000		1600			
		–		3200		2500		2000			
		–		4000		3200		2500			
2	2/1	–	–	1600	1.6V	1250	1.6V	1000	1.6V	45	48
		–		2000		1600		1250			
		–		2500		2000		1600			
		–		3200		2500		2000			
	4/1	–	2.5T	3200	2.5T	2500	2.5T	2000	2.5T	50	58
		5000		4000		3200		2500			
		–		5000		4000		3200			
		–		6300		5000		4000			
3	2/1	–	–	2500	2.5T	2000	2.5T	1600	2.5T	50	58
		–		3200		2500		2000			
		–		4000		3200		2500			
		–		5000		4000		3200			
		–		6300		5000		4000			
	4/1	–	5T	5000	5T	4000	5T	3200	5T	63	75
		–		6300		5000		4000			
		10000		8000		6300		5000			
		–		10000		8000		6300			
		–		12500		10000		8000			
	6/1	–	–	20000	10S	16000	10S	–	–	90	106
	8/1	–	–	25000	10S	20000	10S	–	–		
4	2/1	–	–	5000	5T	4000	5T	3200	5T	63	75
		–		6300		5000		4000			
		–		8000		6300		5000			
		–		10000		8000		6300			
	4/1	–	10P	10000	10P	8000	10P	6300	10P	90	106
		16000		12500		10000		8000			
		–		16000		12500		10000			
		–		20000		16000		12500			
		25000	10T	25000	10T	20000	10T	–	–		
	6/1	–	–	32000	12T	25000	12T	–	–	100	118
		–		–		32000		–			
	8/1	50000	12T	40000	12T	–	–	–	–		
		–	–	–	–	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

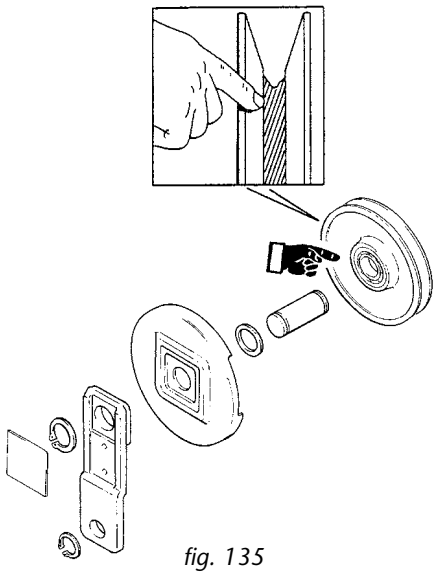


fig. 135

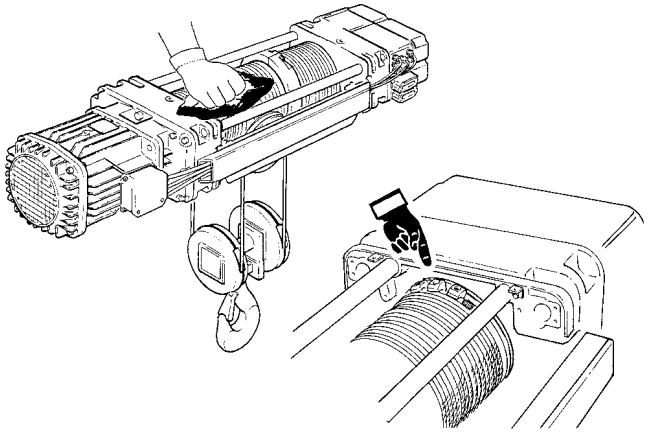


fig. 136

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***

DONATI TECHNICIAN

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.***

DONATI TECHNICIAN

DONATI SERVICE

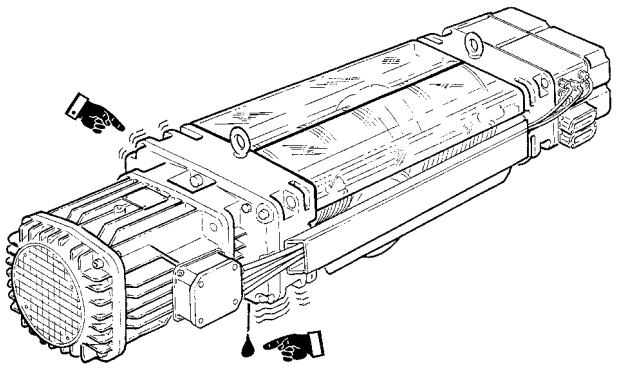


fig. 137

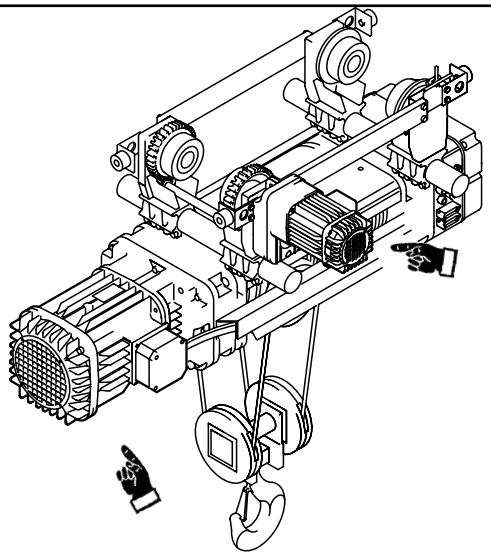


fig. 138

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 12 m/min	Maximum limit before adjustment	120	150	180	210
		Best value following adjustment	40	50	60	70
	Speed 8 m/min	Maximum limit before adjustment	90	120	150	180
		Best value following adjustment	30	40	50	60
4 falls	Speed 6 m/min	Maximum limit before adjustment	60	75	90	105
		Best value following adjustment	20	25	30	35
	Speed 4 m/min	Maximum limit before adjustment	45	60	75	90
		Best value following adjustment	15	20	25	30
6 falls	Speed 2,7 m/min	Maximum limit before adjustment	–	–	50	60
		Best value following adjustment			20	20
8 falls	Speed 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"

DONATI TECHNICIAN

• 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.

DONATI SERVICE

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 ≥ 50%***
- ***the rotation diameter of the wheel has wear of ≥ 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 ≥ 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***

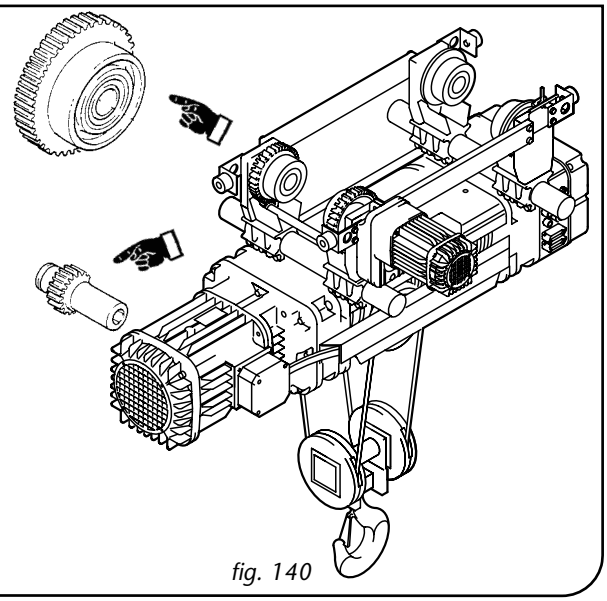


fig. 140

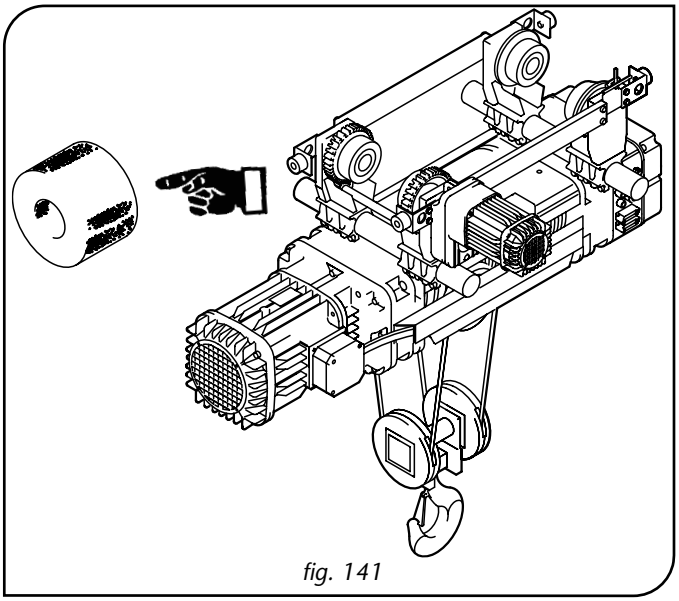


fig. 141

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 non 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.

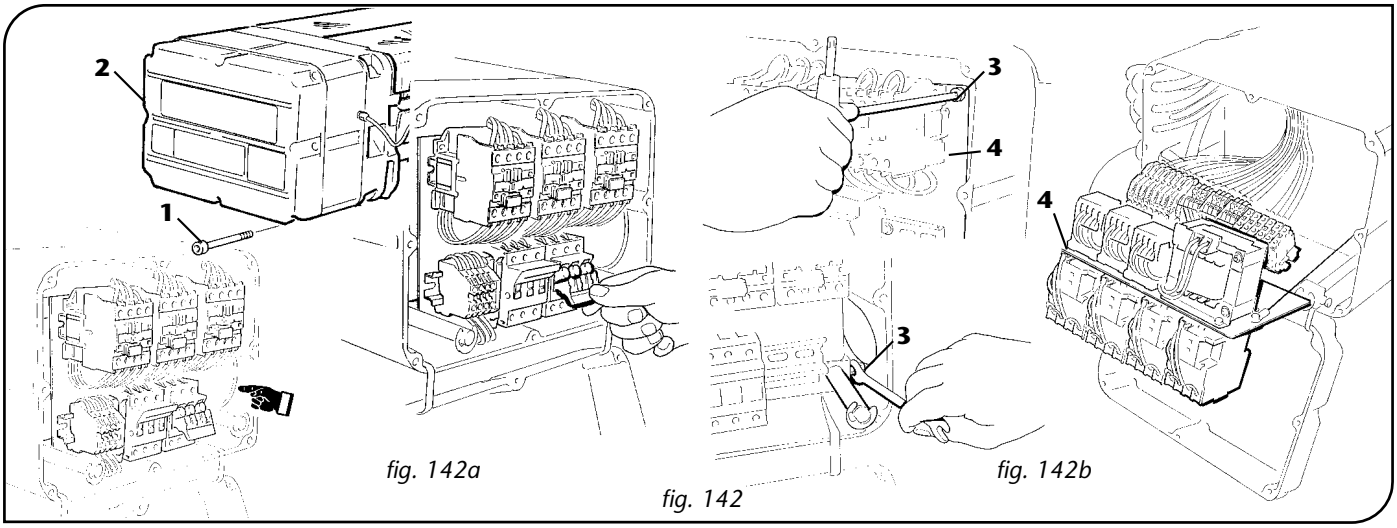


fig. 142a *fig. 142b*

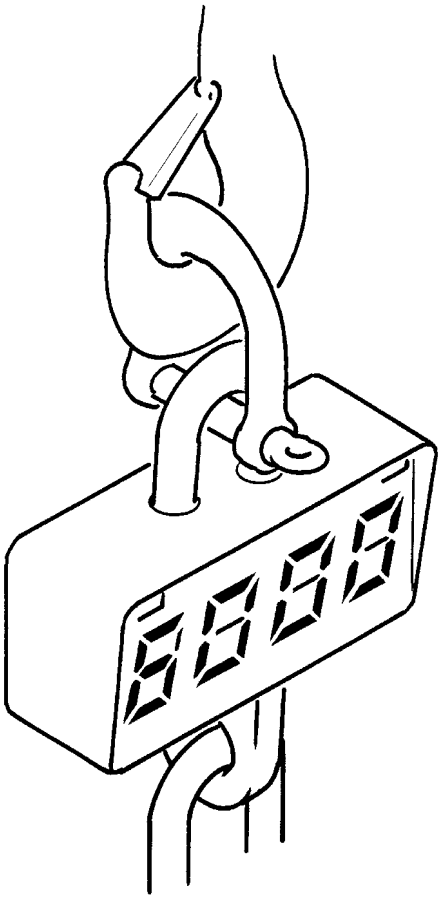
fig. 142

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%)

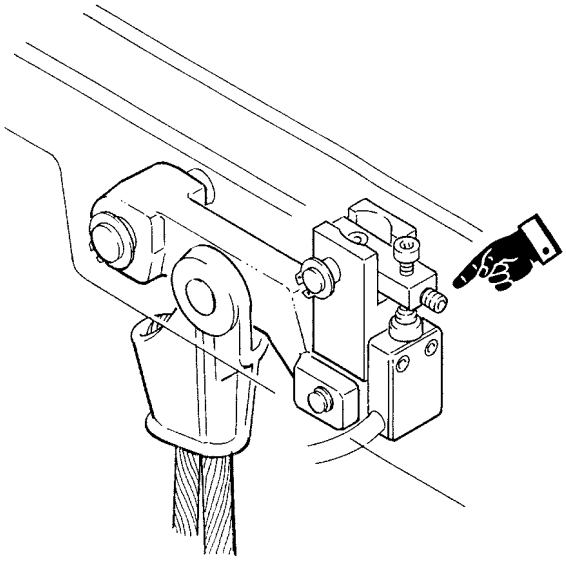


fig. 143

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***

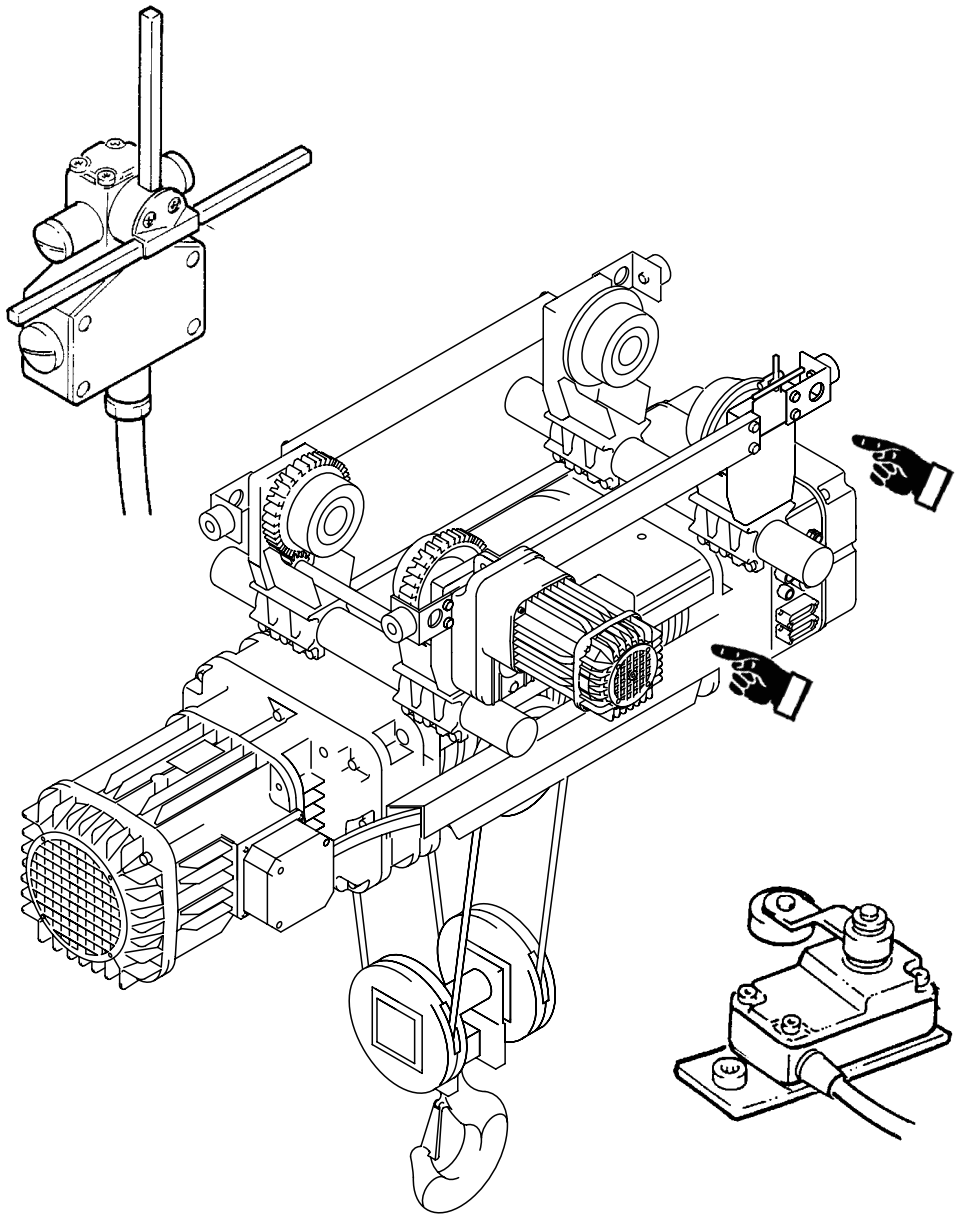
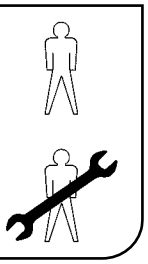


fig. 144

6.3.4 Cleaning and lubrication of the hoist

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



- 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.

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.

- 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

- ***Lubricants, solvents and detergents are products which are toxic or damaging to health***
- ***If they come into direct contact with the skin they can cause irritation***
- ***If inhaled they can cause serious poisoning***
- ***If swallowed they can cause death***
- ***Use them with care using adequate personal protection measures (DPI)***
  Do not dump them, dispose of them in conformity with the legislative measures currently in force for toxic/harmful waste.

6.4 Setting and adjustments

6.4.1 Lfting 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).

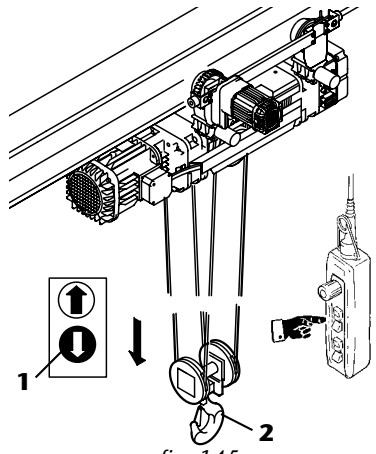


fig. 145

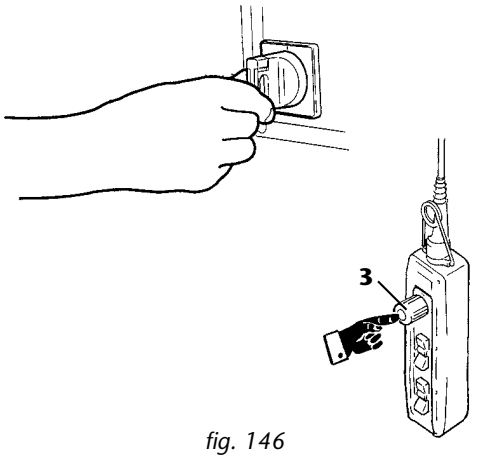


fig. 146

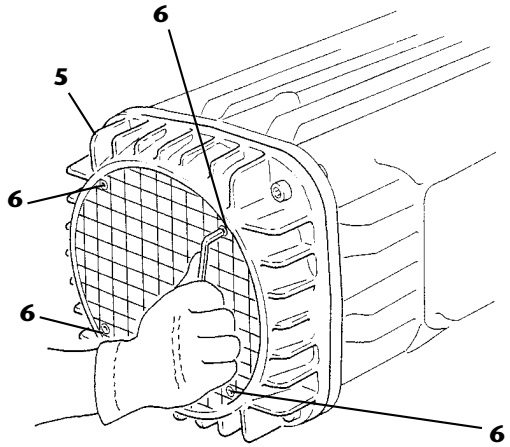


fig. 147

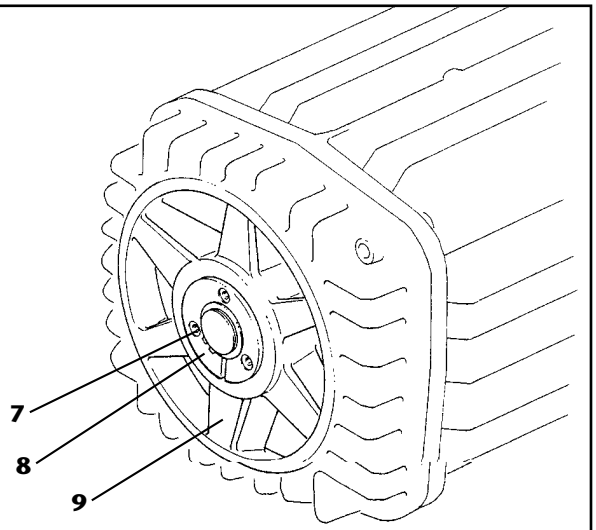


fig. 148

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.

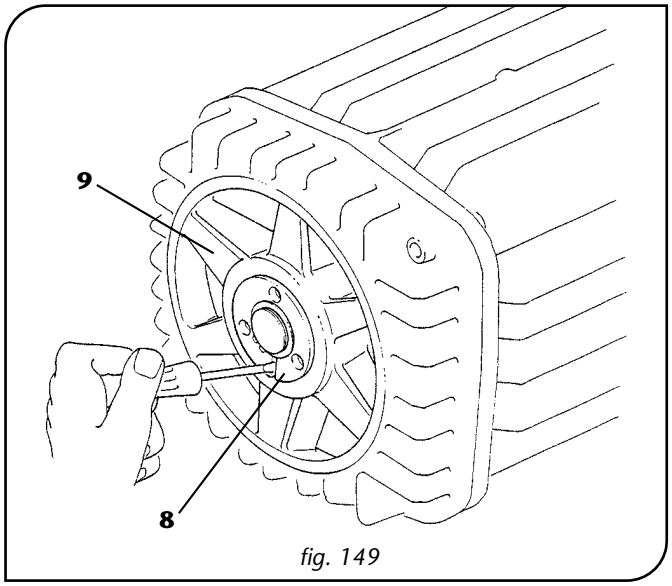


fig. 149

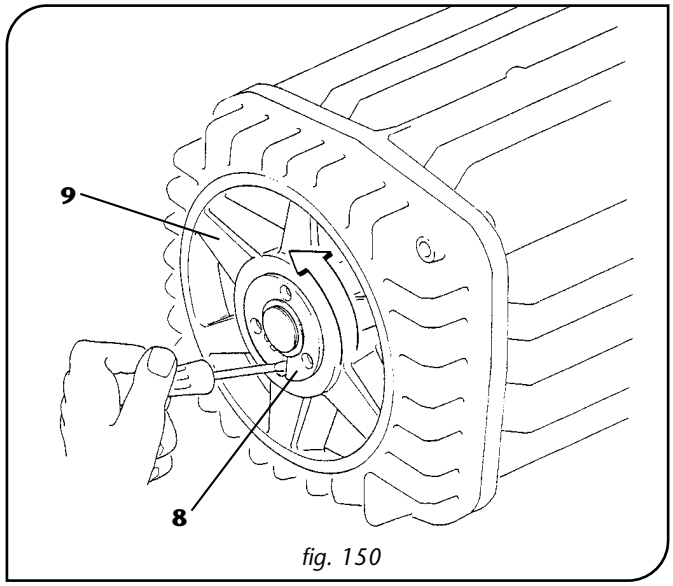


fig. 150

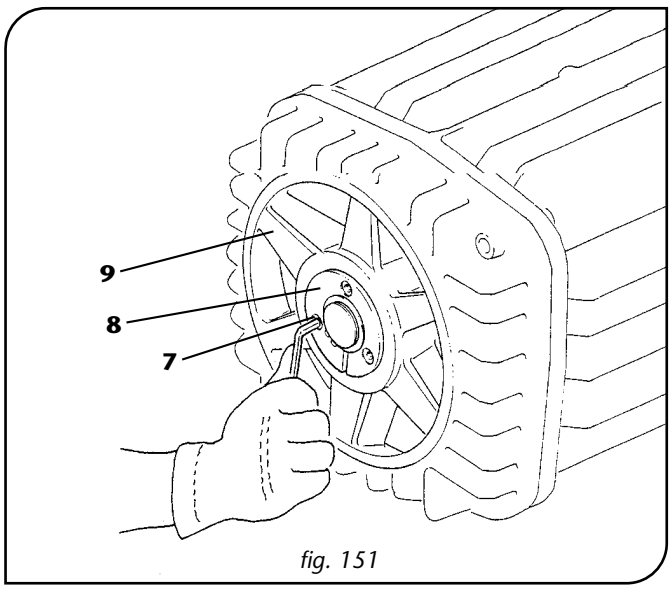


fig. 151

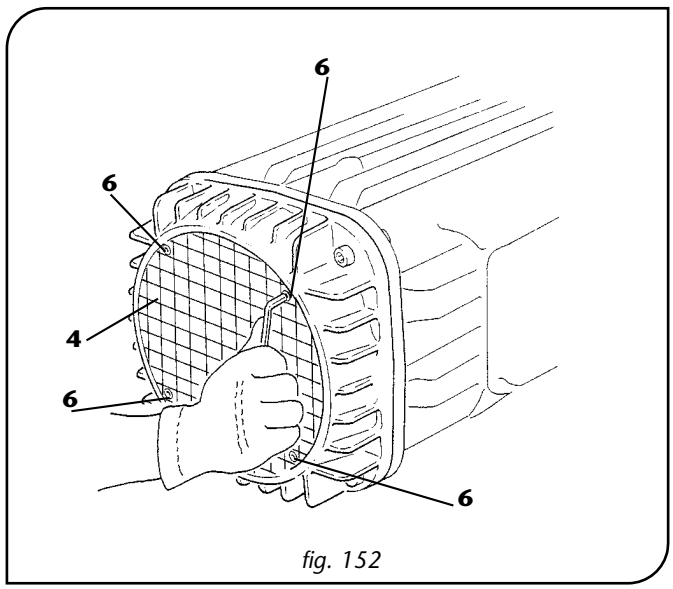


fig. 152

• 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 fun -**6**- screwing out the screws -**7**- (fig. 148a).

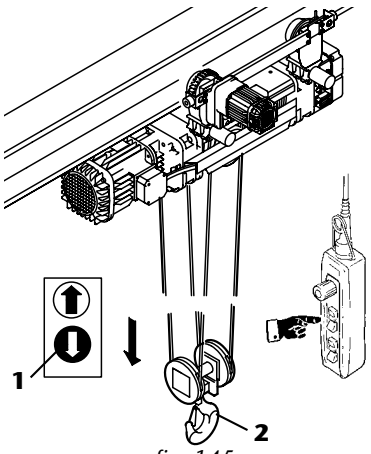


fig. 145

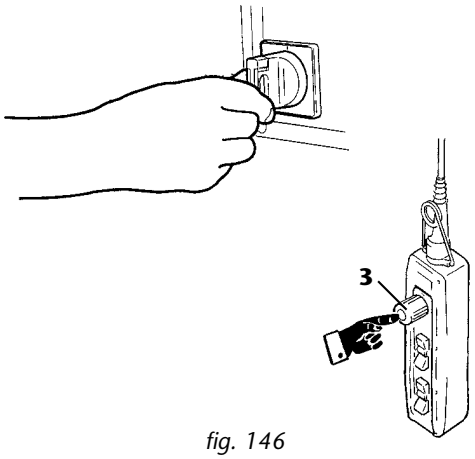


fig. 146

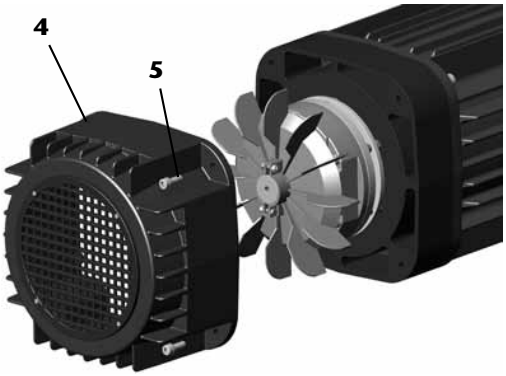


fig. 147a

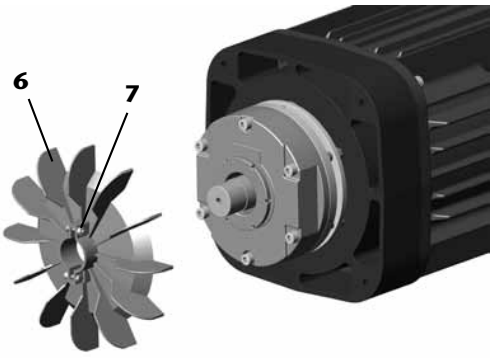


fig. 148a

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.

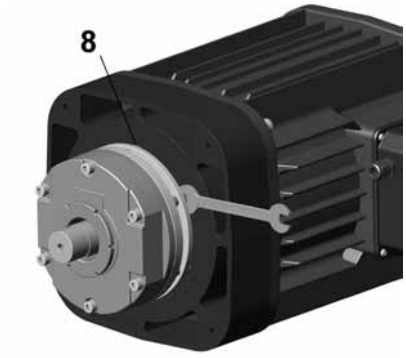


fig. 149

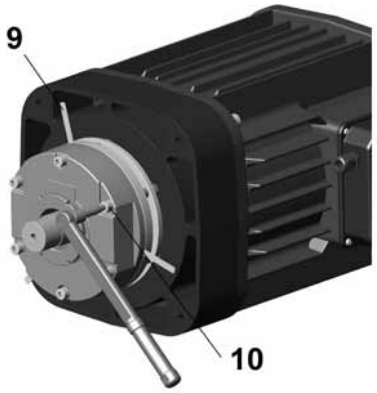


fig. 150

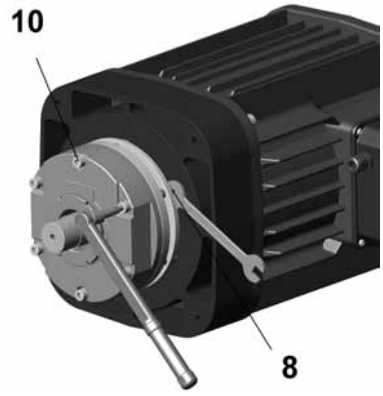


fig. 151

fig. 152

- ***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).

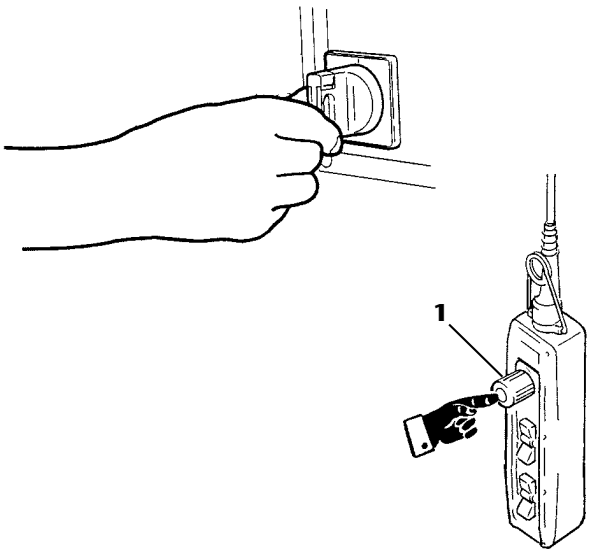


fig. 153

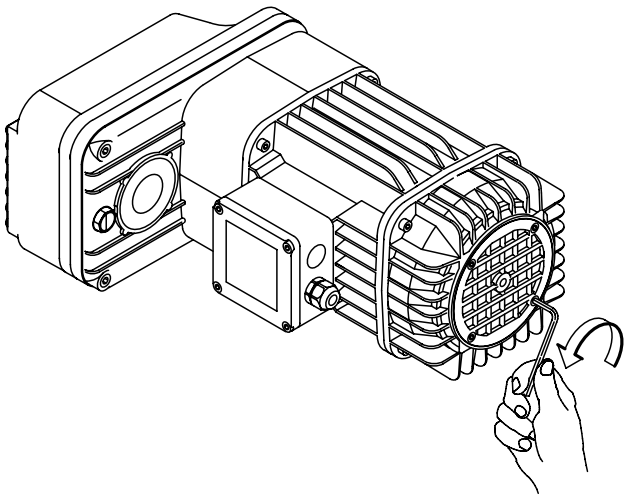


fig. 154

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).

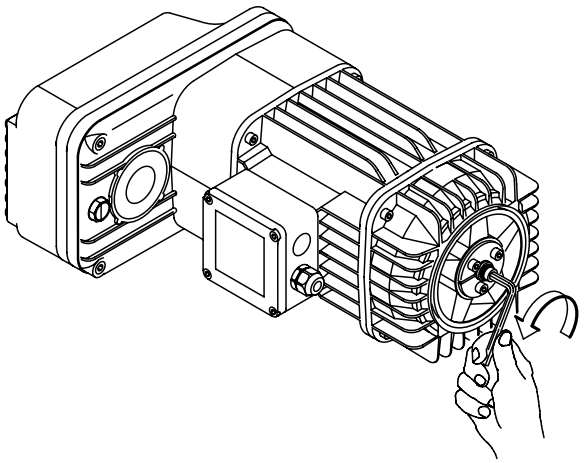


fig. 155

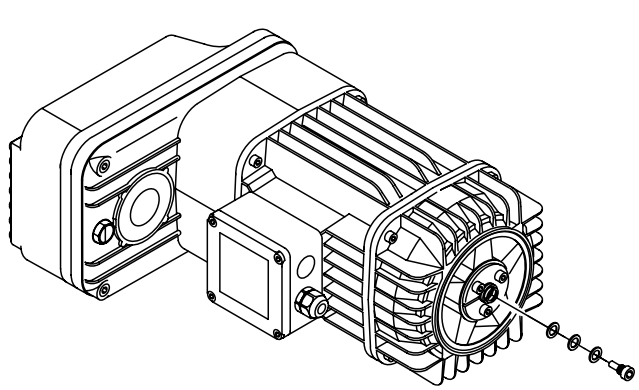


fig. 156

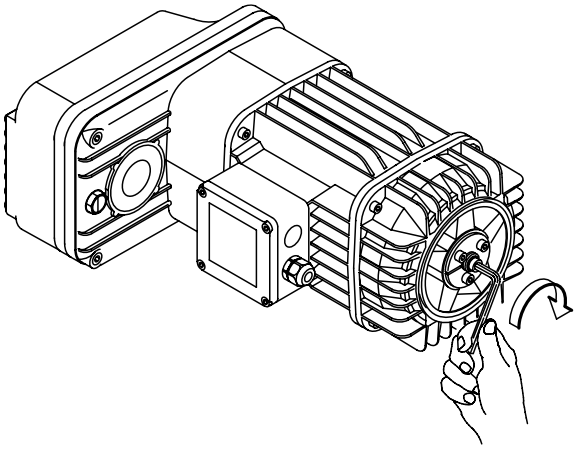


fig. 157

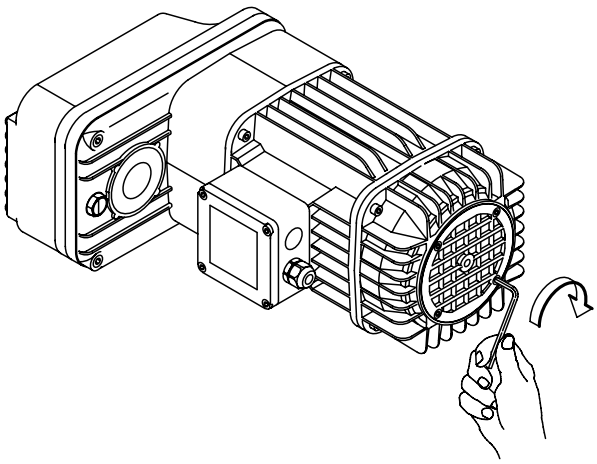


fig. 158

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.

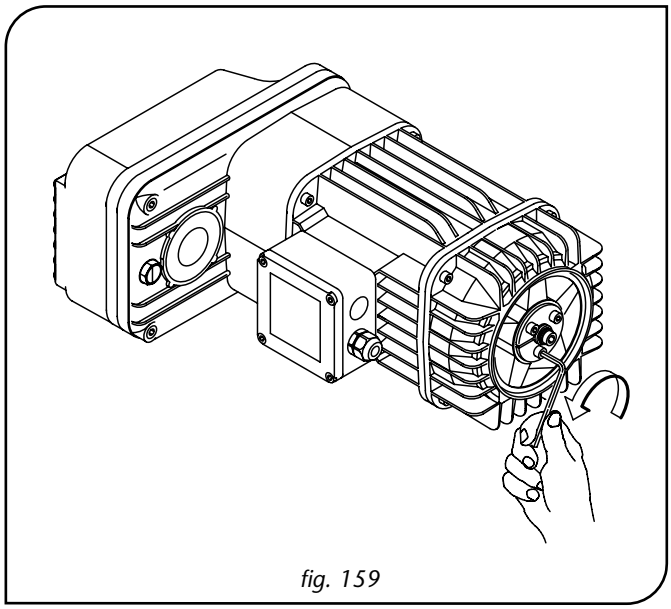


fig. 159

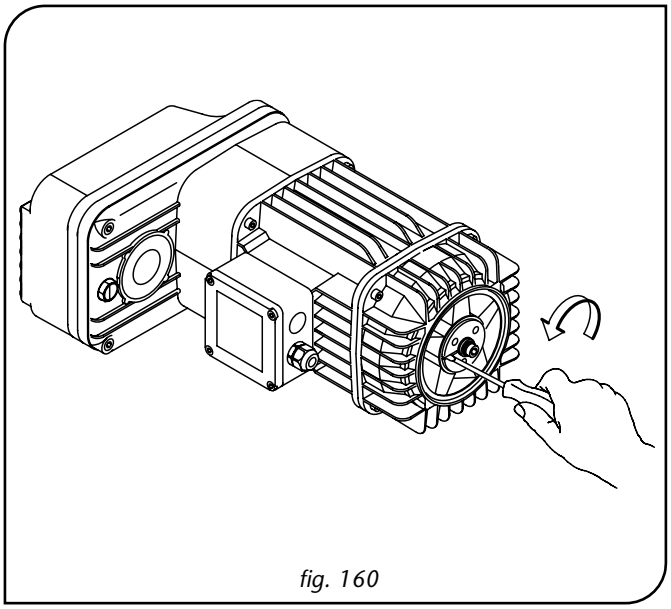


fig. 160

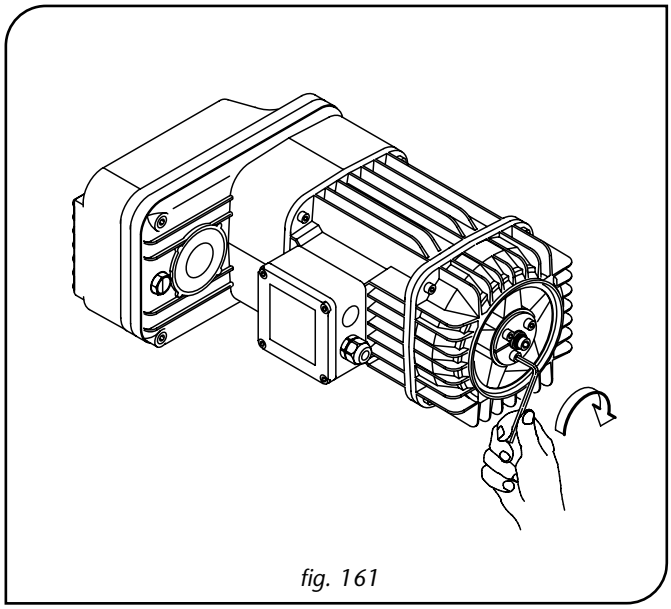


fig. 161

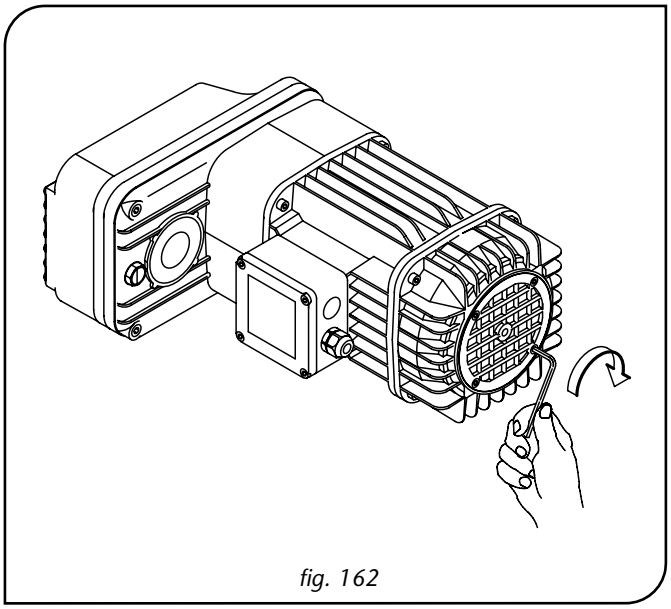
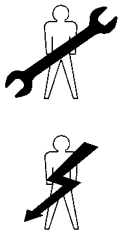


fig. 162

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 obstacle 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.

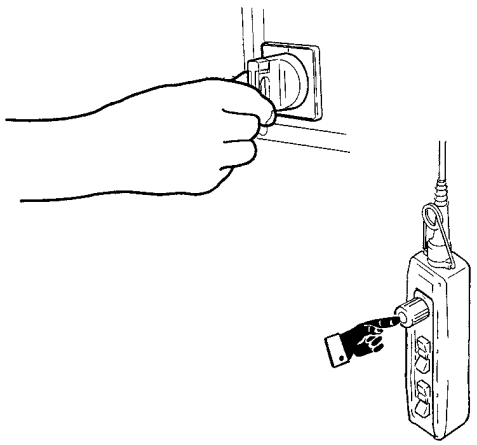


fig. 163

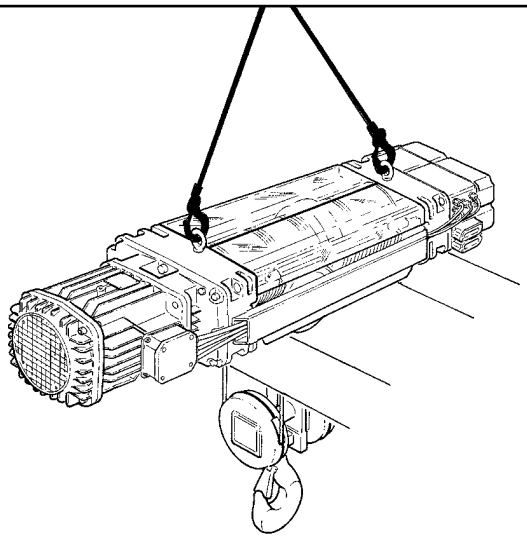


fig. 164

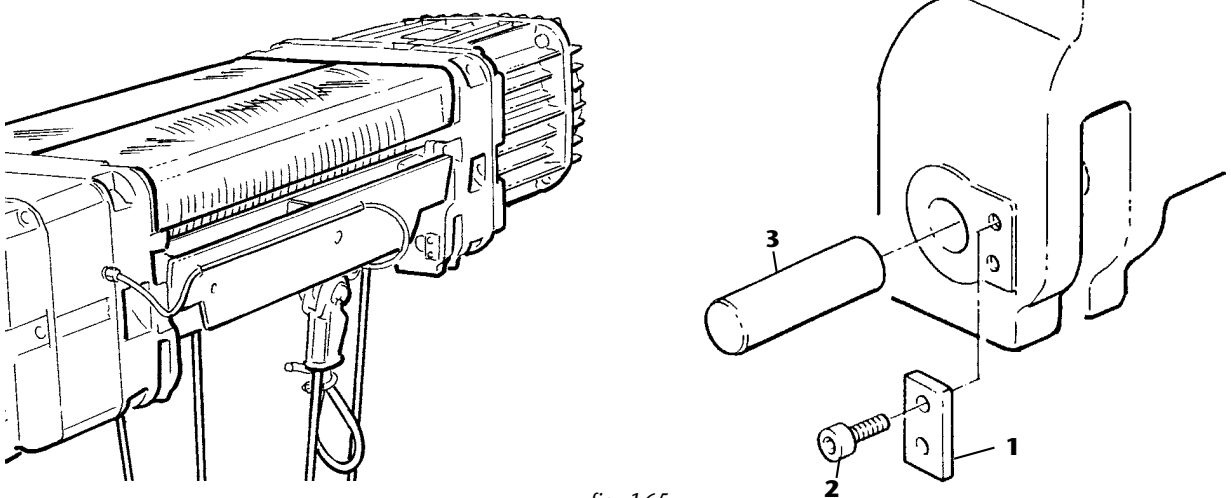


fig. 165

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.

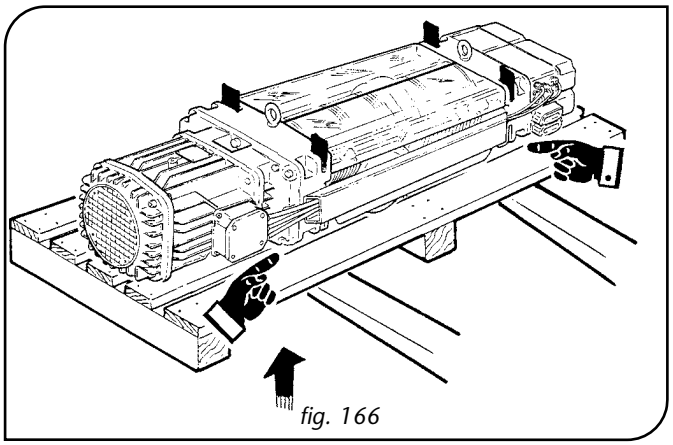


fig. 166

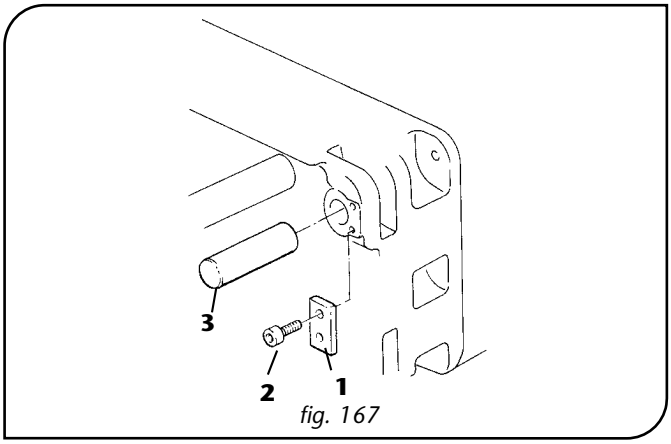


fig. 167

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.

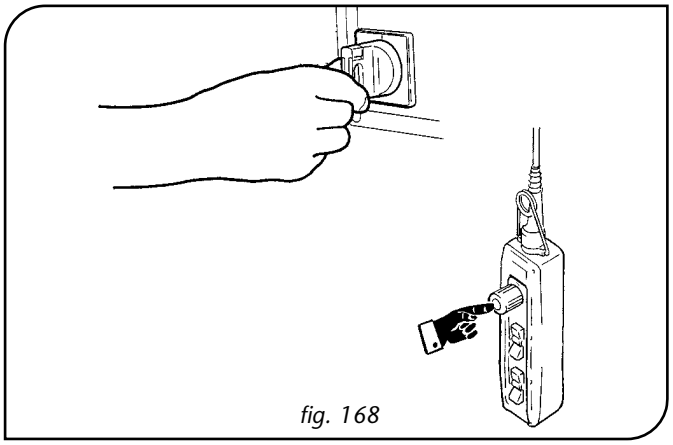


fig. 168

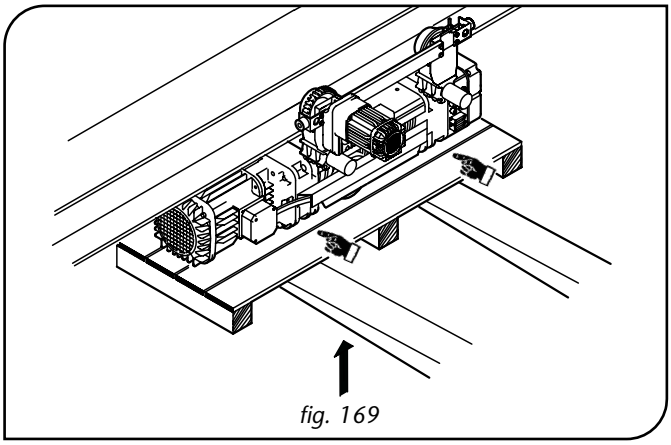


fig. 169

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.

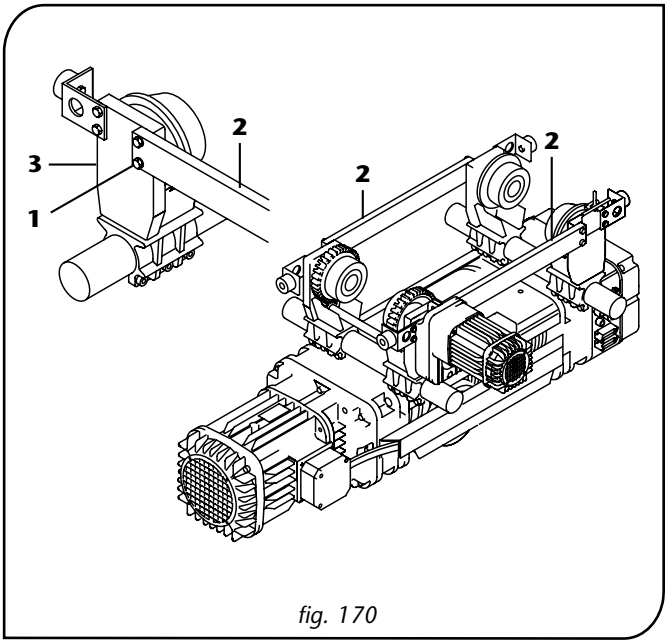


fig. 170

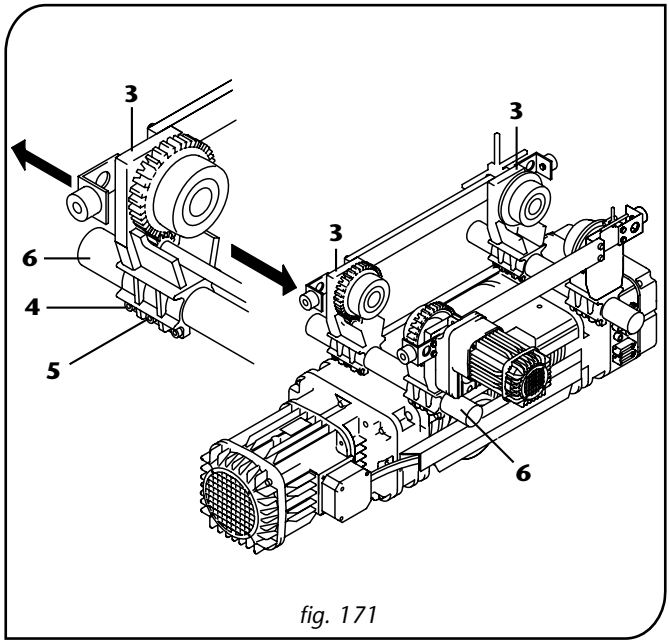


fig. 171

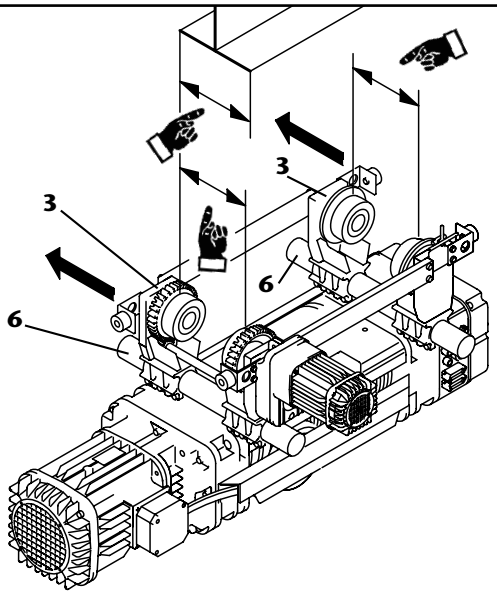


fig. 172

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.**

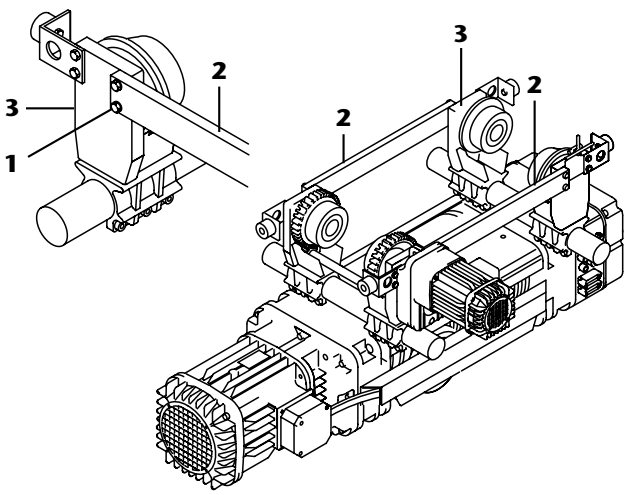


fig. 173

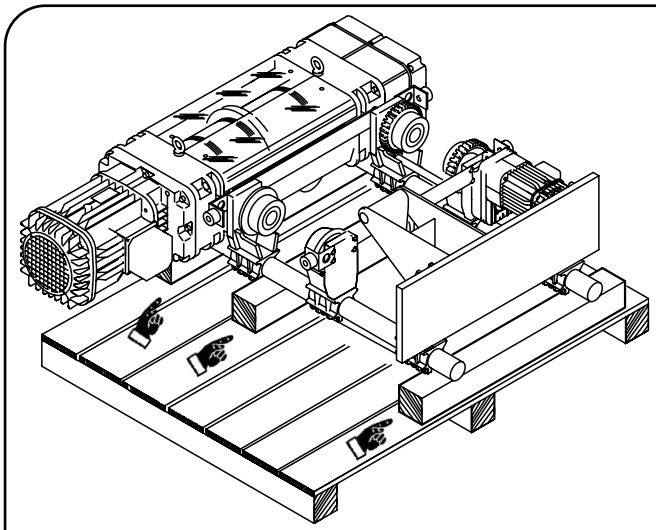


fig. 174

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.**

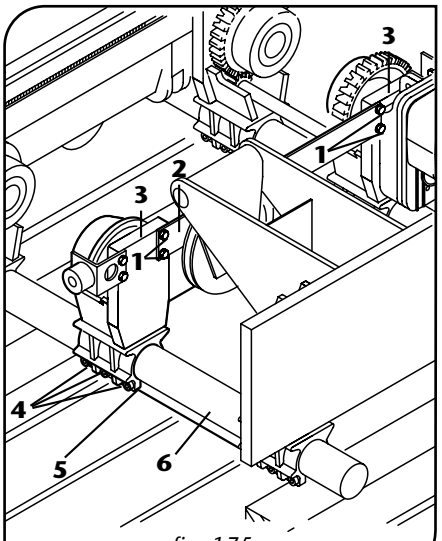


fig. 175

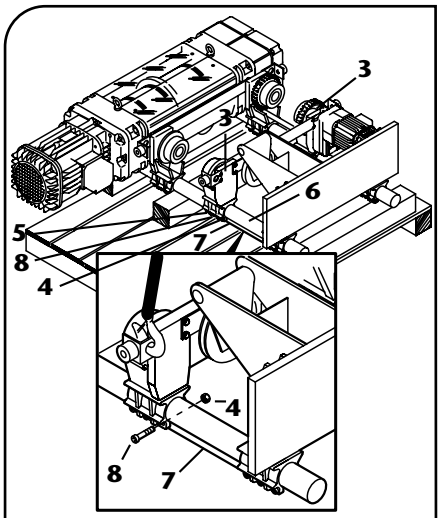


fig. 176

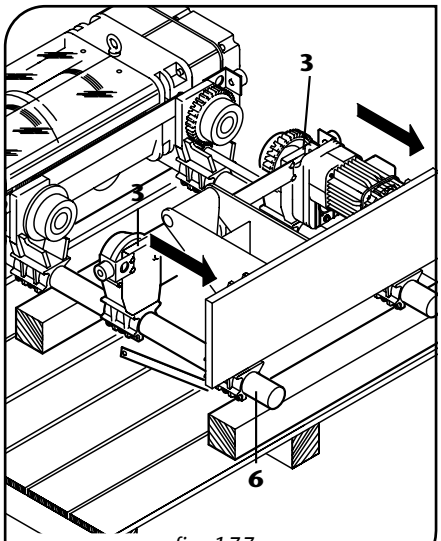


fig. 177

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.

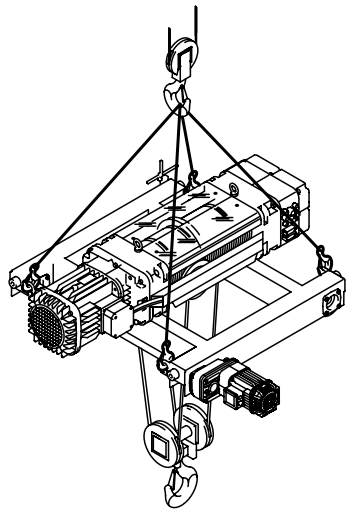


fig. 178

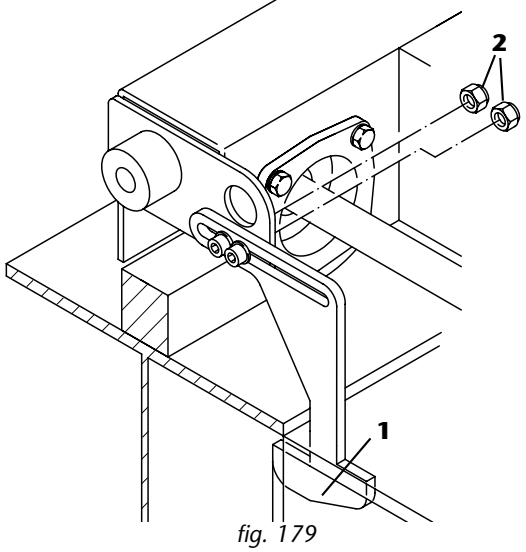


fig. 179

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.

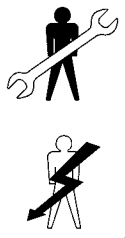
6.6.1 Replacing the wire ropes of the hoist

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

DANGER/RISK	BAN/WARNING	OBLIGATION/PREVENTION
  **Risk of dangers of entanglement/ crushing** in the case of contact with the rotating drum in wire rope-replacing phase.	 **Warning!** Exposure to the moving parts can cause dangerous situations. **It is forbidden** to put the hoist into action if the removed protective covers have not been put back.	  • Allocate the wire rope-repairing operations to qualified maintenance staff • Compulsory use of protective gloves.

- *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).

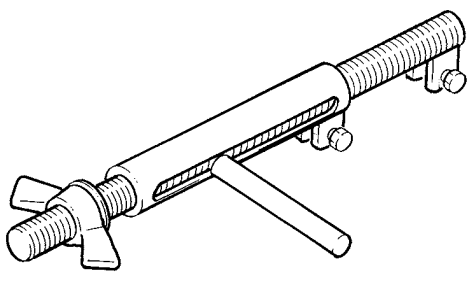


fig. 180

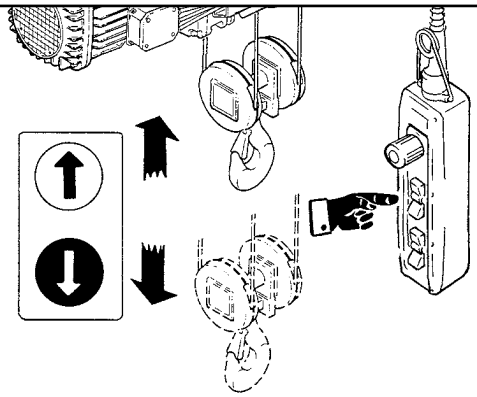


fig. 181

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).

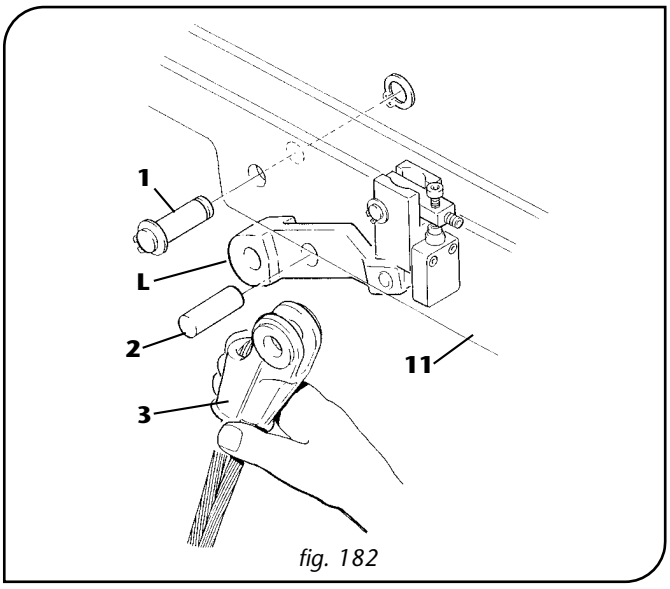


fig. 182

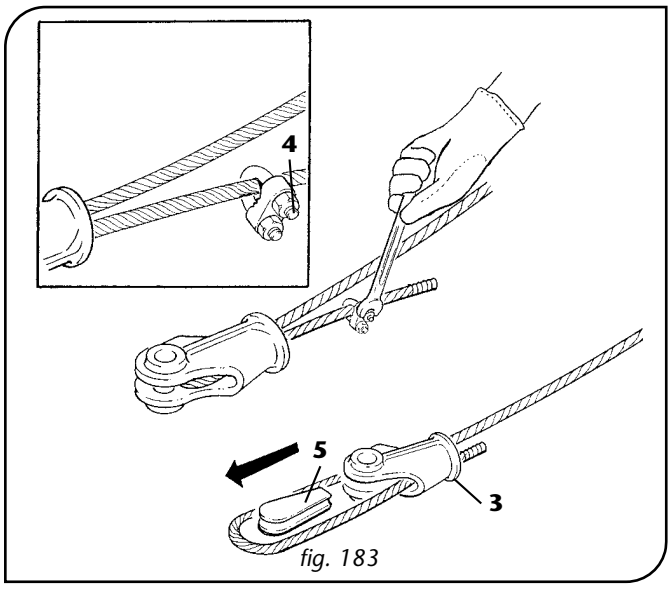


fig. 183

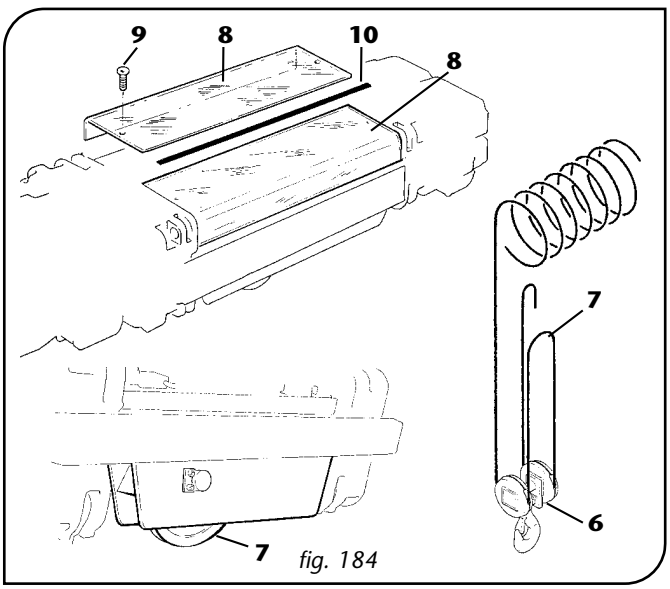


fig. 184

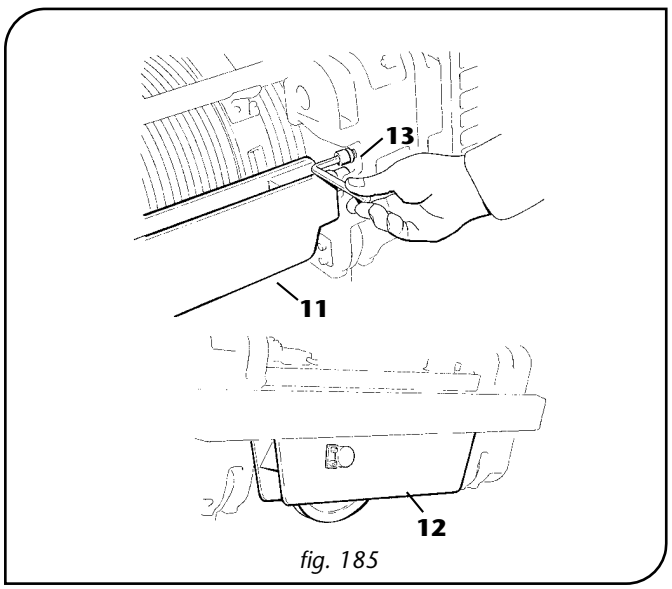


fig. 185

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).

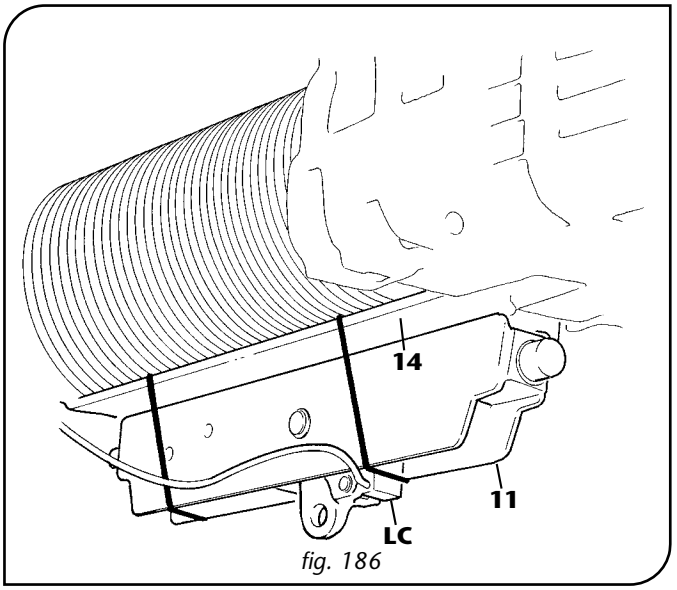


fig. 186

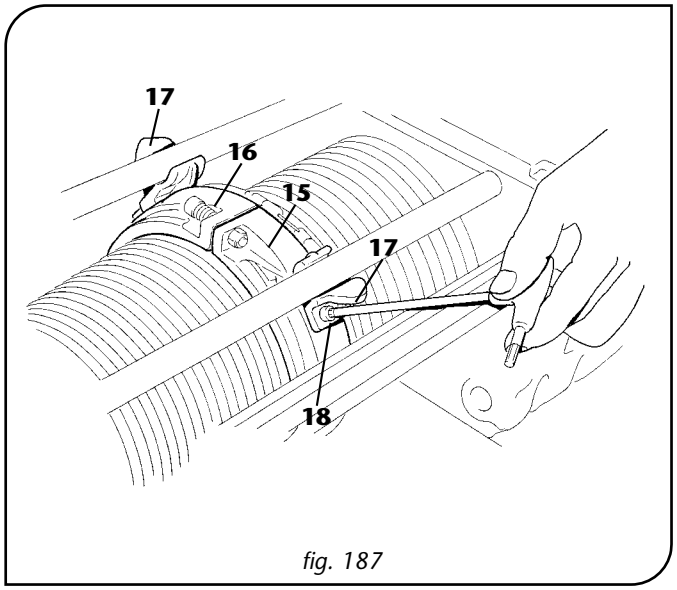


fig. 187

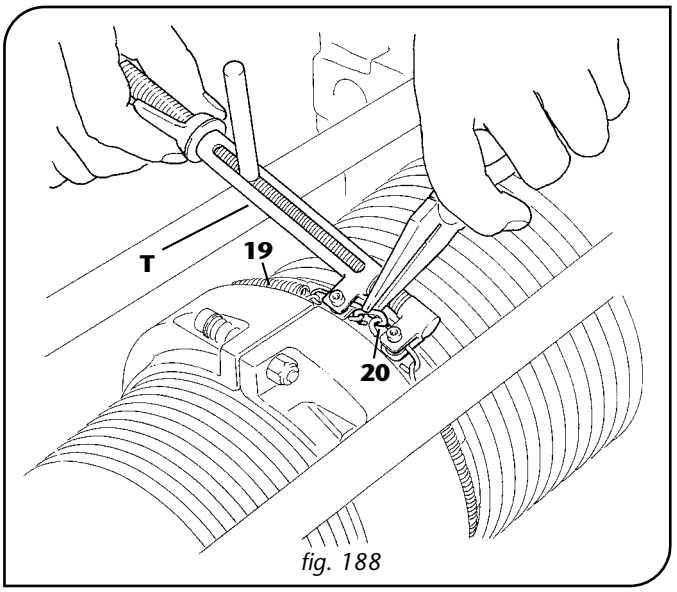


fig. 188

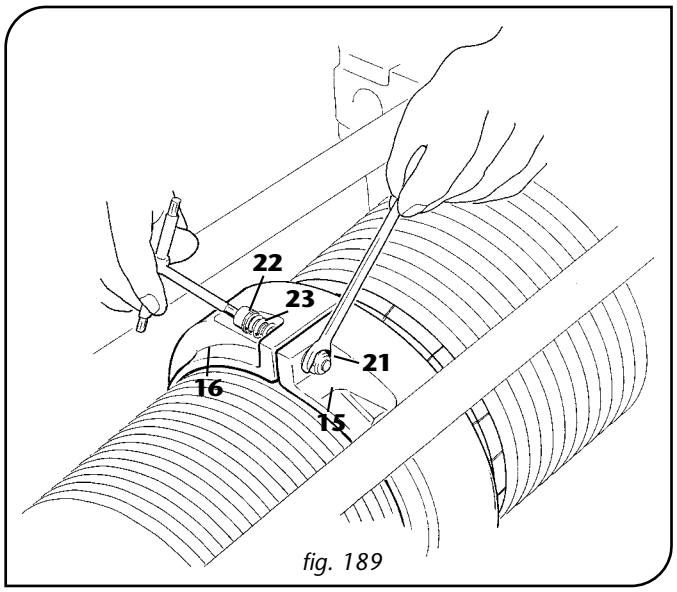


fig. 189

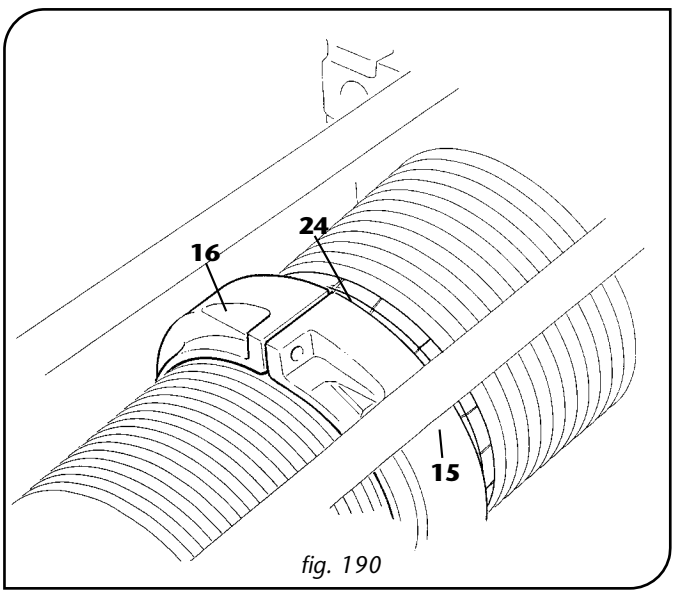


fig. 190

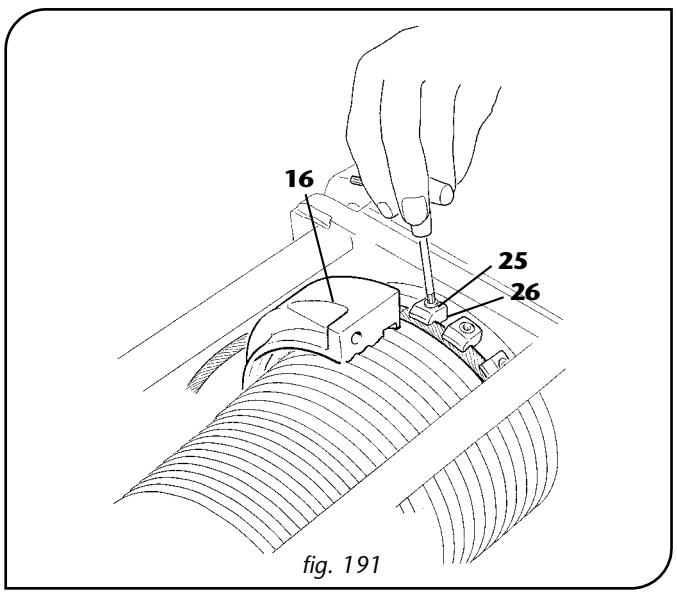


fig. 191

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).

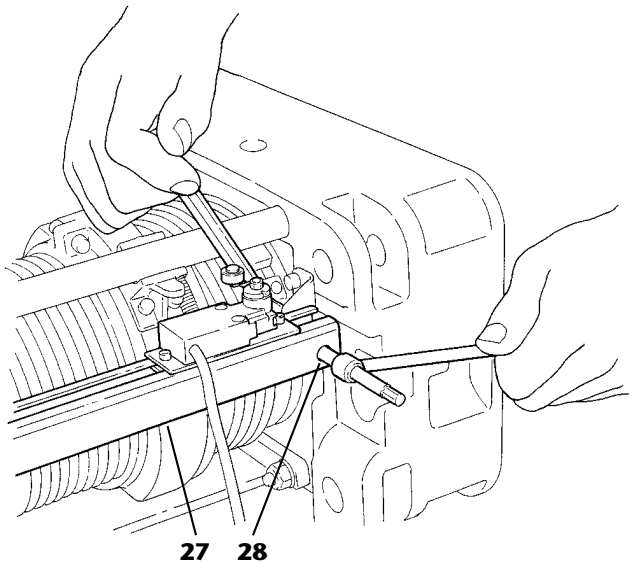


fig. 192

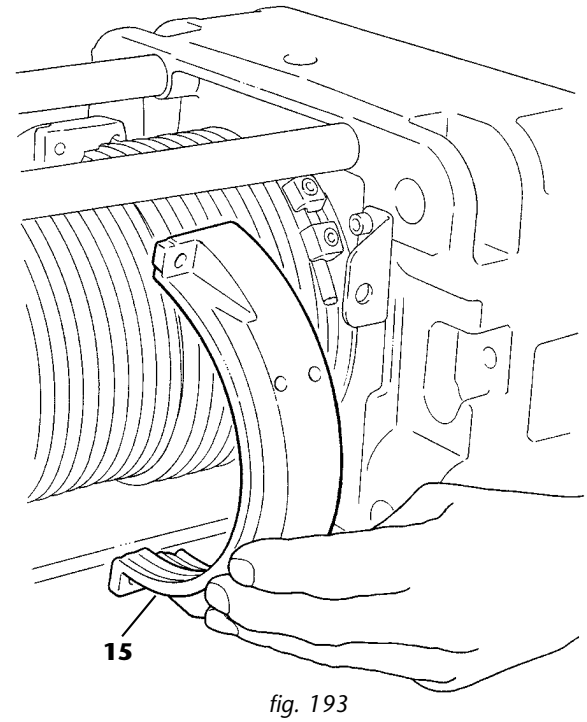


fig. 193

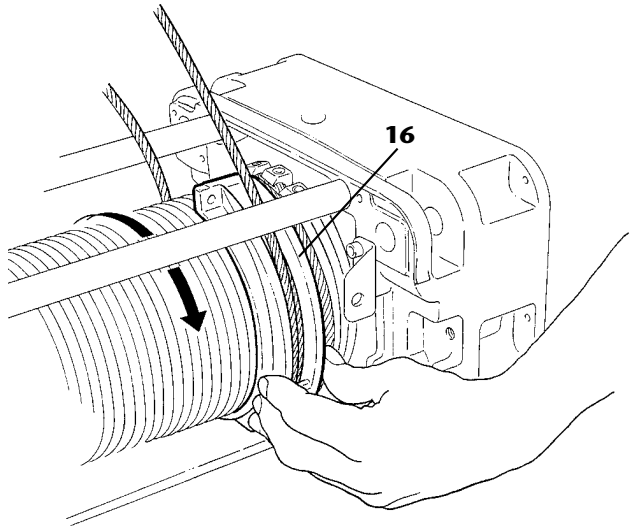


fig. 194

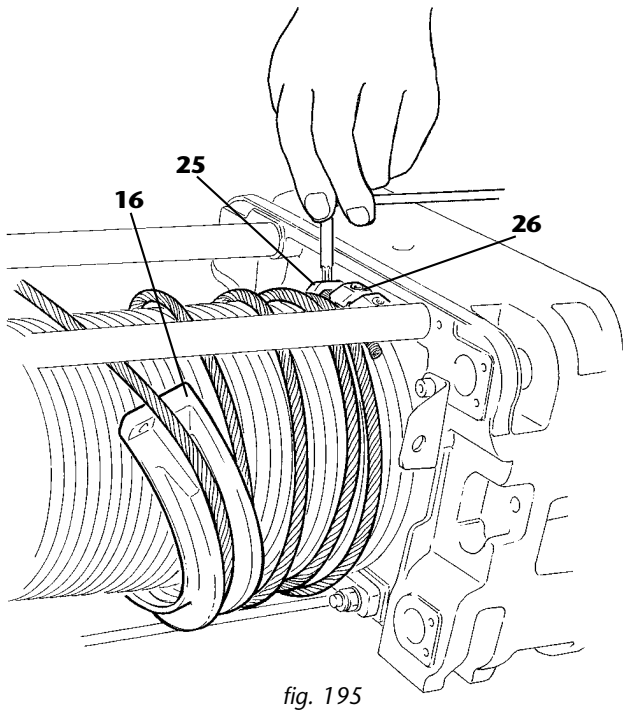


fig. 195

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).

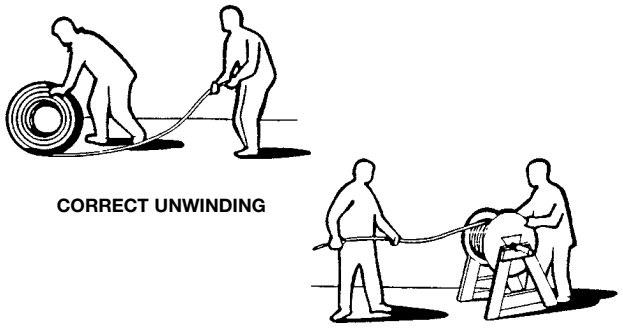


fig. 196

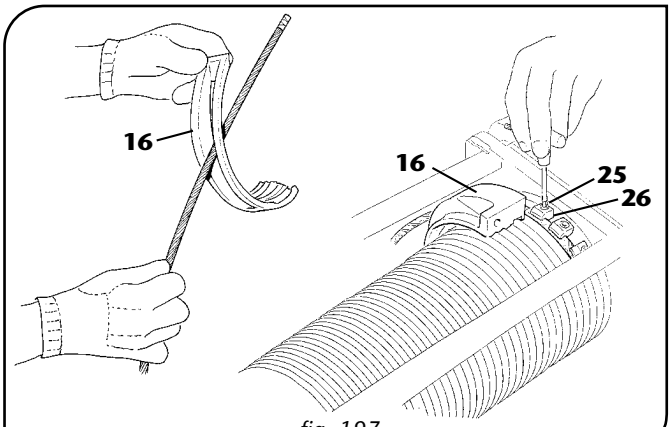


fig. 197

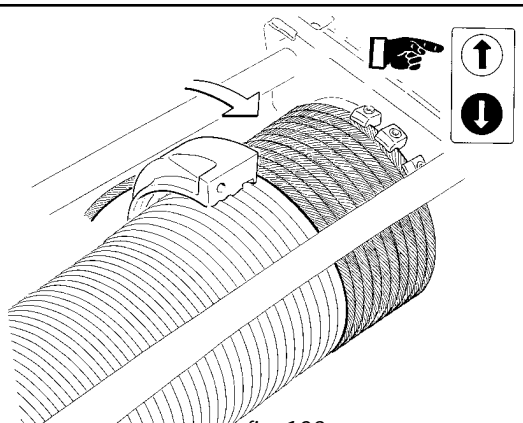


fig. 198

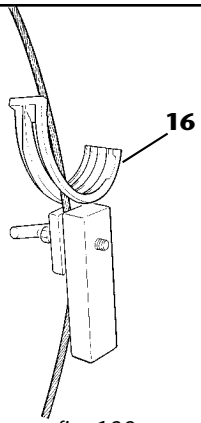


fig. 199

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.

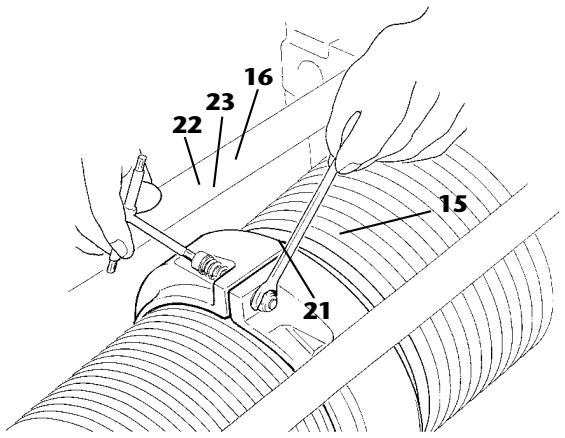


fig. 200

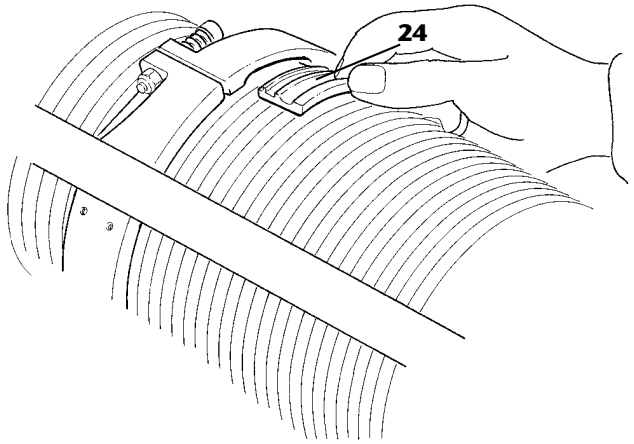


fig. 201

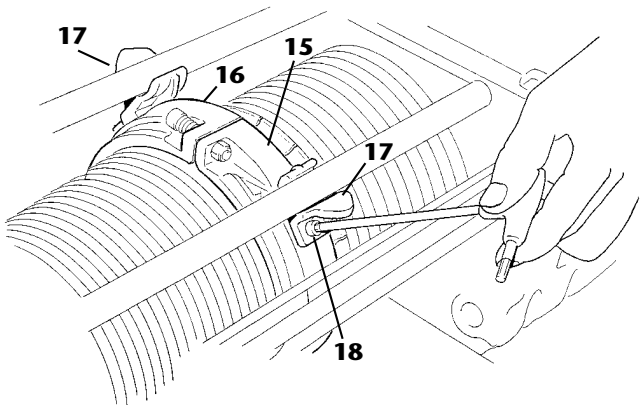


fig. 202

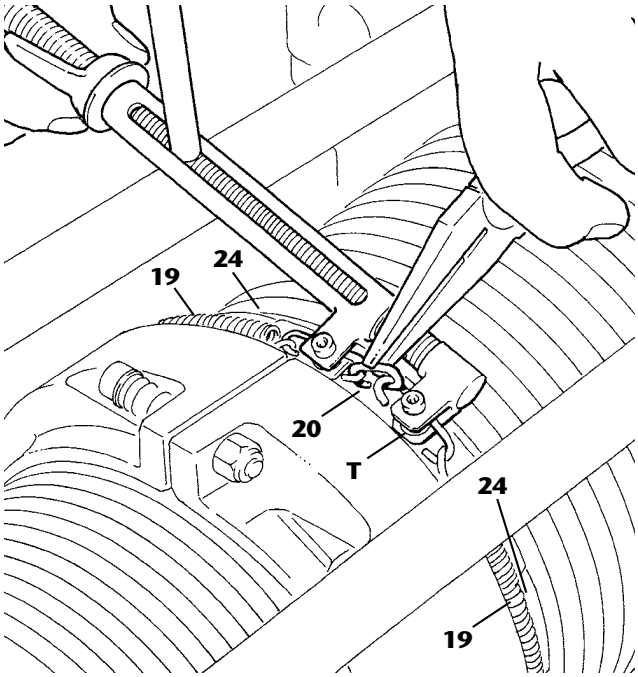


fig. 203

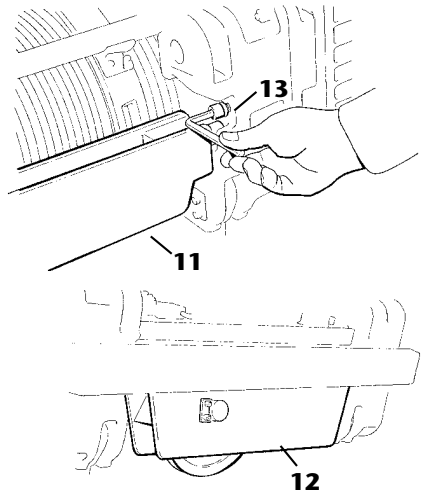


fig. 204

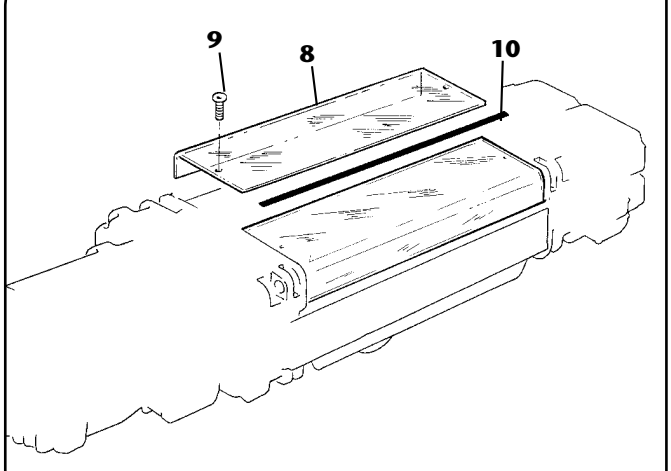


fig. 205

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.

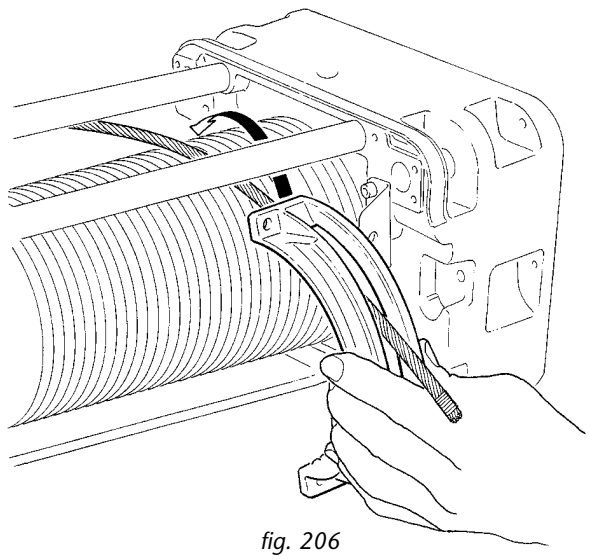


fig. 206

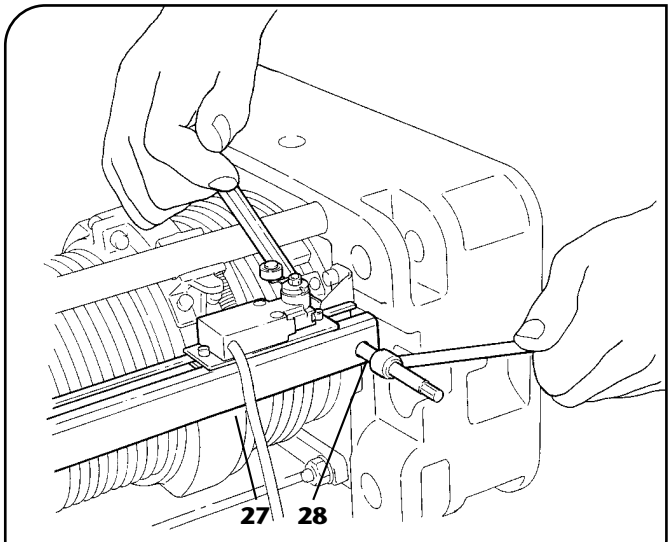


fig. 207

6.6.2 Lifting brake replacement (conical motor)

To replace the brake of the hoist motor, procede as follows:

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.

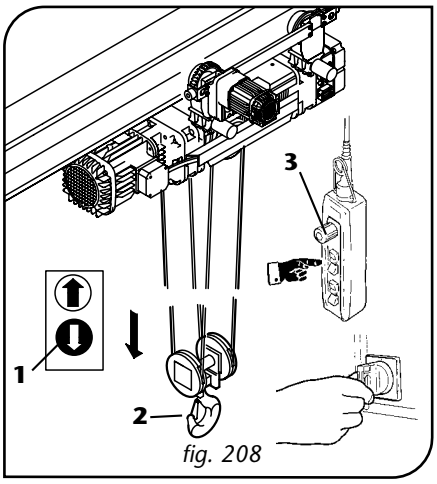


fig. 208

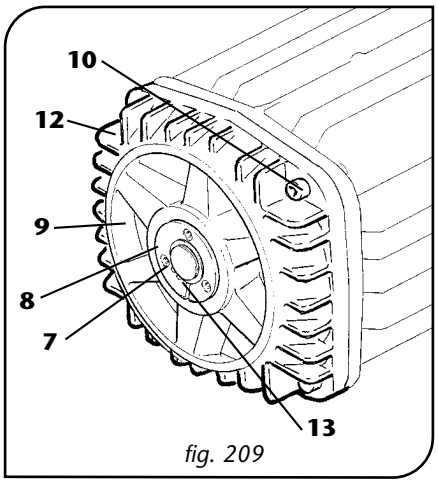


fig. 209

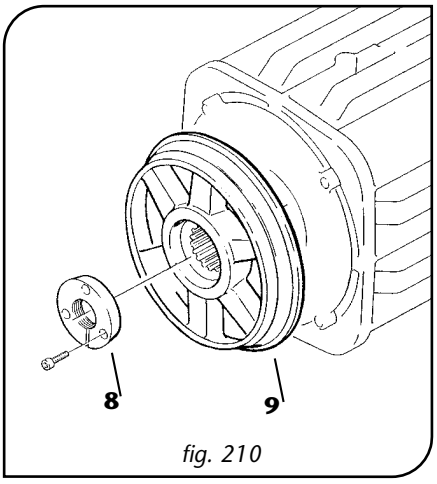
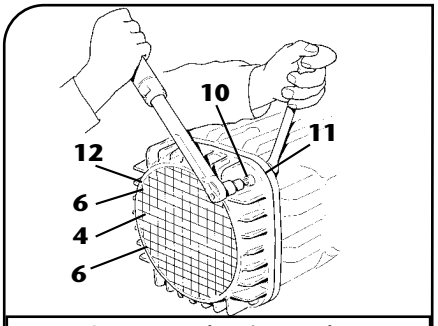


fig. 210

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)

To replace brake motor disks go on in this way:

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 fun -**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.

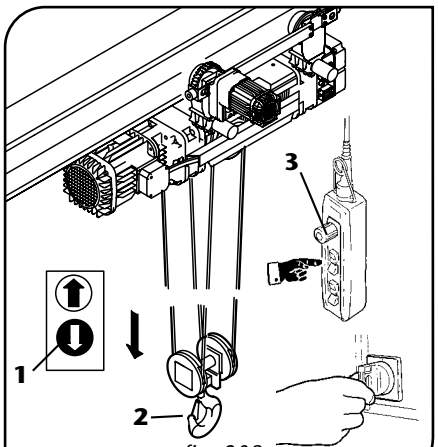


fig. 208

fig. 209a

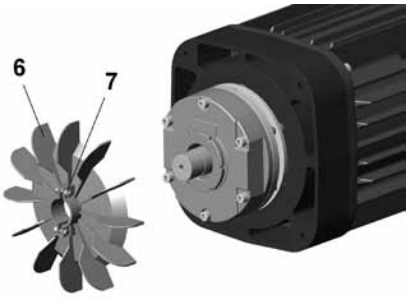


fig. 210a

fig. 211a

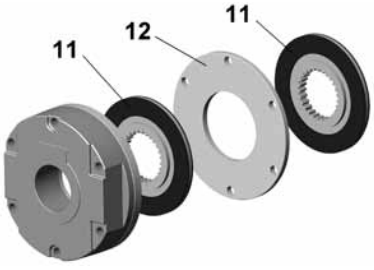


fig. 212a

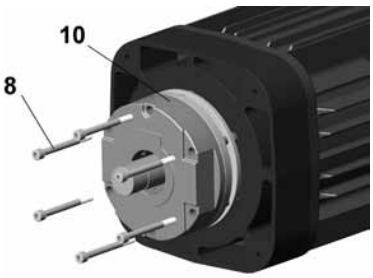


fig. 213a

6.6.4 Replacing the traverse brake

To replace the trolley motor brake, proceed as follows:

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.

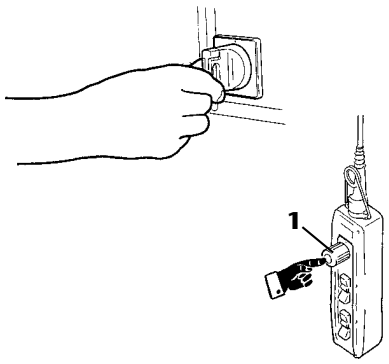


fig. 214

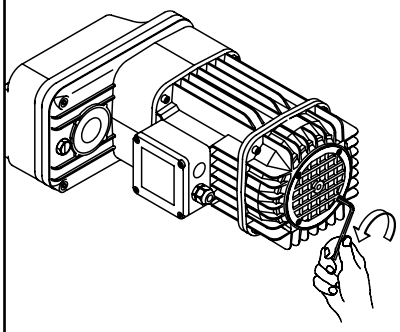


fig. 215

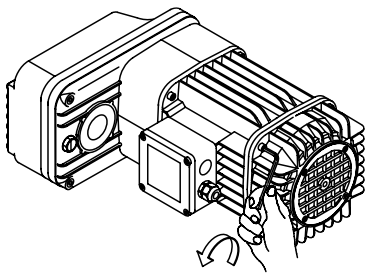


fig. 216

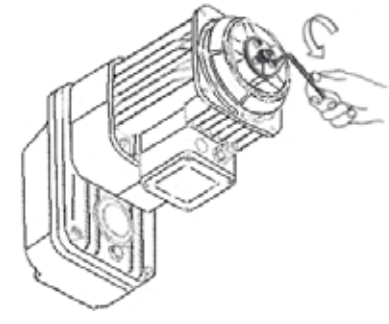


fig. 217

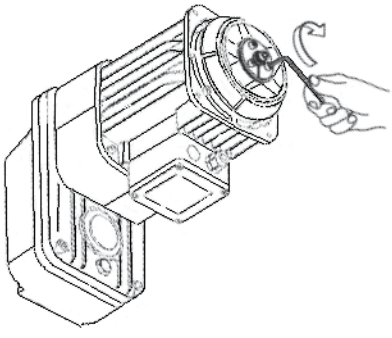


fig. 218

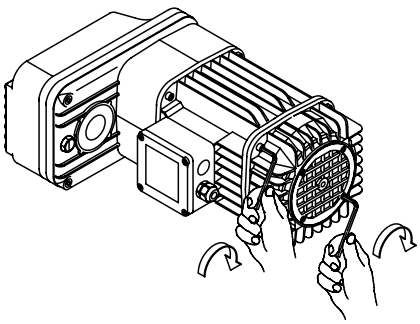


fig. 219

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.

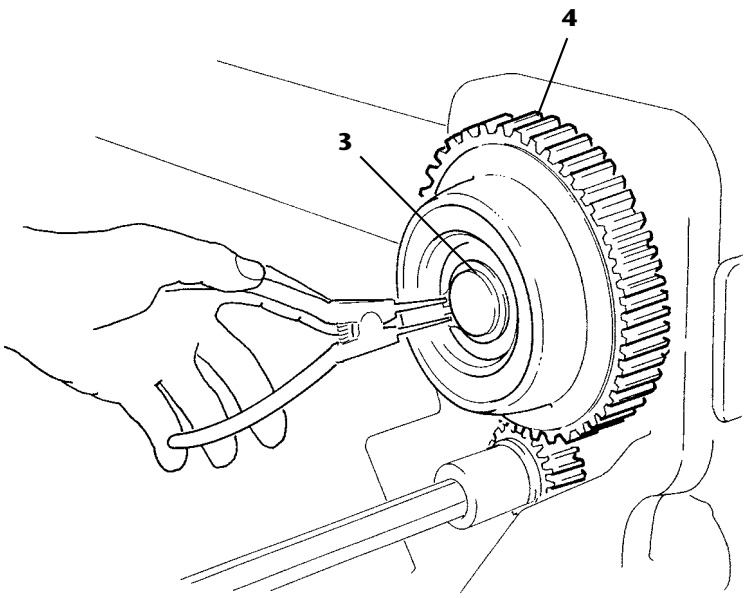


fig. 220

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.

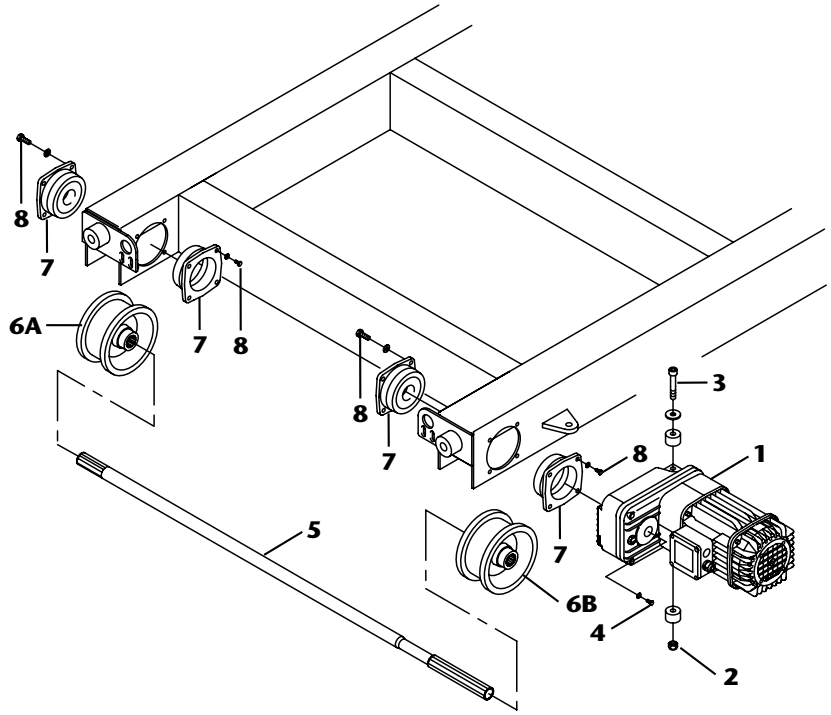


fig. 221

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 ø 3 mm point for removing aluminium rivets*
- *Riveter for fixing plates with ø 3x7 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 Ø 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 Ø 3x7 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 ø3 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 Ø 3x7mm.

Internal hook side cheek

- Remove the label plate -**1**- before removing the fixing rivets (with a drill and tip ø3 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 Ø 3x7mm.

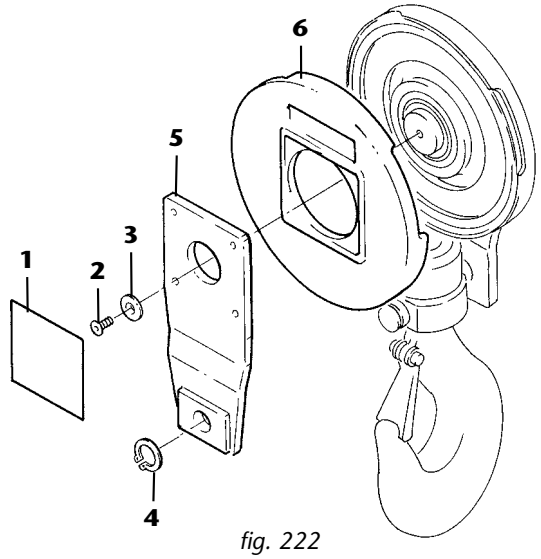


fig. 222

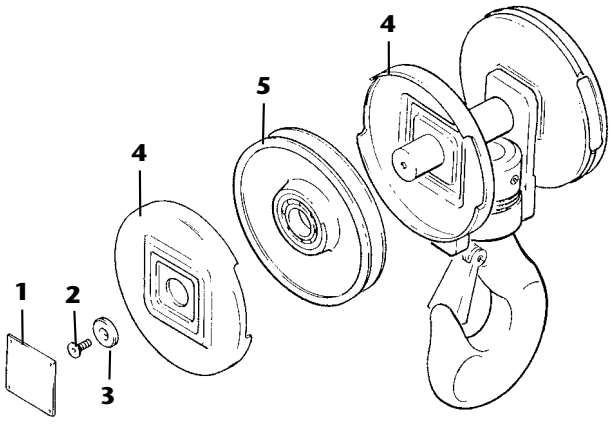


fig. 223

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 => FAULT ⇓	Lifting hoist	Travelling trolley	Possible cause of fault
it won't start	**X**		• ascent/descent limit switch • ascent/descent contactor • ascent/descent button • overload device • hoist motor • lifting motor fuses
it won't start	**X**	**X**	• hoist/trolley power cable • power line • low voltage transformer • line contactor • line fuses
it won't start	-	**X**	• right/left limit switch • right/left contactor • right/left button • trolley motor • travelling motor fuses
it starts partially (in one direction only)	**X**	**X**	• limit switches or button of the inhibited function (independent from one another) • missing phase
the movement does not stop in the due space	**X** inoltre il carico scivola e non viene trattenuto	**X**	• brake of the function
the movement does not stop at the end of the run	**X**	**X**	• brake of the function • limit switch of the function
the movement continues even after releasing the relative button	**X**	**X**	• direction button broken • related contactor • "false contact"
excessively loud lifting reducer	**X**	-	• lacking lubrication • beyond the service cycle
excessively loud trolley reducer	-	**X**	• too narrow play between wheel and girder • lacking lubrication • incorrect/too intense service
shrill noise of the brake in the braking phases	**X**	**X**	• dust present • excessive play • worn brake lining
shrill noise of the wheels (functioning in jolts)	-	**X**	• play between wheel and girder is incorrect • lacking lubrication • incorrect/too intense service
shrill noise of the wire rope and/of the drum/transmission pulley	**X**	-	• worn rope or drum/pulleys • lacking lubrication • incorrect/too intense service
the hoist jumps during the travelling	-	**X**	• incorrect contact between track and wheel • couplings of sliding girder are not aligned
the hoist and/or the trolley move slowly or the hoist lifts the load with difficulty	**X**	**X**	• drop in voltage • overload (due to no overload device) • seizure beginning in the reducer • incorrect contact between track and wheel
live current is detected at the hook	**X**	-	• faulty or broken electrical system
the trolley skids on the tracks and does not travel	-	**X**	• play between wheel and girder wing too narrow • obstacle on girder wing • oil or grease on girder wing

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	• breakdown of wire rope and/or drum or pulleys • lacking lubrication	• replace wire rope, and if necessary the drum or pulleys • lubricate wire rope, drum and pulleys
brakes skid	• wear and tear of brake linings • oil/grease present	• set the play or replace the gasket • clean the gasket
brake heats excessively	• incorrect service • incorrect regulation • working in unsuitable environmental conditions	• restore foreseen working conditions • adjust brake
brake does not unblock	• lacking electrical power • incorrect regulation	• restore the voltage valves • adjust brake
the brake tends to "stick"	• working in unsuitable environmental conditions or outside the running service	• restore suitable conditions
the limit switch is blocked while opening, it does not go back to normal	• obstruction of activating head • incorrect striking • connections cut off	• cleaning and restoring of correct conditions
buttons on push-button panel are blocked "shut"	• obstruction of push-button control panel	• cleaning • check the conductor
the contactors have "stuck" contacts	• use in unsuitable environmental conditions or for unforeseen use	• restore the correct conditions of use
motor too warm	• voltage variations are > 10% • little cooling • environmental temperature > than that foreseen • use of hoist does not conform to running service foreseen	• ensure the correct voltage • restore correct circulation of air • gear characteristics of the motor • adapt service conditions to those foreseen
motor won't start	• burn out fuse • contactor has cut off power • overload, block due to high starting frequencies, insufficient protection	• replace fuse • check the contactor of the function • rewind the motor to ensure better protection • check control device
motor has trouble starting	• on starting the voltage or frequency are lowered with respect to the nominal value	• improve the line or power supply conditions
motor hums and absorbs a lot of power	• faulty winding, rotor is in contact with the stator • a power phase is locking • reducer is blocked • brake is blocked • short circuit in the power cables • short circuit in the motor	• repair by a specialist • check power supply and/or the contactor • request intervention by a specialist • check and if necessary set the brake • eliminate the short circuit • request the intervention of a specialist
short circuit in the winding of the motor	• breakdown in the winding	• rewind the motor
false contact	• involuntary activating of the function	• check the conductors of the push-button control panel

6.7.3 Authorised staff for intervention in case of breakdown

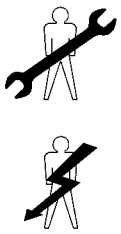
The staff authorised to intervene in most cases of breakdown, or where not indicated differently, are expert maintenance people or trained with a specific preparation on mechanical and electrical parts. Where shown, however, the intervention of specialised suitably-trained staff or the technical staff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

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.



- 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.

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.

7. - SPARE PARTS

- *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.*
- *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.*

- *Do not hesitate to replace the part and/or component under examination, if it does not give sufficient safety guarantees and/or functional reliability.*
- *Never carry out improvised repairs.*

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

Donati Sollevamenti s.r.l.
Via Quasimodo, 17 - 20025 Legnano (Milano) - Italy
Tel. +39 0331 14811 - Fax +39 0331 1481880
E-mail: info@donaticranes.com - www.donaticranes.com

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.

Mediaprint - Milano 06-2017 16MG05

Donati Sollevamenti s.r.l.
Via Quasimodo, 17 - 20025 Legnano (Milano) - Italy
Tel. +39 0331 14811 - Fax +39 0331 1481880
E-mail: info@donaticranes.com - www.donaticranes.com