

English
7.9.2007



SERVICE MANUAL FOR HOIST

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R&M Materials Handling, Inc.
 4501 Gateway Boulevard
 Springfield, Ohio 45502
 P.: (937) 328-5100
 FAX: (937) 325-5319



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



Keep the instructions in a safe place for future reference.

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1 Major update history (only in English)

Section	Description	Date	Handled by
Hook operated control limit switch	Construction of hook operated control limit switch added.	26.8.2004	KHHJII
Second brake	Construction and service of second brake, brake release and manual crank added.	23.9.2004	KHHJII
Rope guide	Construction of rope guide added (ø 608 mm).	9.12.2004	KHHJII
Lubricant volumes, travel gears	Lubricant volumes for larger trolley gears added.	11.1.2005	KHTJPU
Wire rope	Rope inspection criterions changed (minimum wire brakes).	13.1.2005	KHHASI
Drum brake	Construction and service of drum brake added.	28.2.2005	KHHJII
Installation of normal headroom trolley	Installation instructions for normal headroom trolley added (Drum size 608 mm).	20.4.2005	KHHJII
Installation of double girder trolley	Checks of trolley buffers during installation added.	10.5.2005	KHJII
Rope drum service	Check of free rotation. Replacement of axial locking part. (Drum size 303/355/406 mm)	10.5.2005	KHHASI
Recommended tightening torques	Replacement of self locking nuts (Nyloc).	10.5.2005	KHHASI
Maintenance interval table	Inspection interval of hoisting machinery and coupling changed. Inspection interval for drum brake added.	10.5.2005	KHHJII
Hoisting machinery, service	Inspection and replacement of coupling clarified.	10.5.2005	KHHJII
Trolley buffers	Trolley buffer inspection instructions added.	10.5.2005	KHHJII
Wedge housing, assembly	Replacement of split pin.	18.5.2005	KHHJII
Lubricants	Lubricant type for couplings changed.	25.5.2005	KHTJPU
Commissioning	Inspection of rope anchorage	13.9.2005	KHHJII
Lubricants	Lubricant type and volumes for hoisting gears (GEN4) changed.	21.9.2005	KHTJPU
Rope anchorage	Drawings updated.	29.9.2005	
Hook-block, rope reeving and return sheaves	Hook forging dimensions updated.	5.10.2005	
Installation, Normal headroom trolley	Straight beam heading added. Curved beam instructions added.	9.12.2005	
Hoisting motor and brake	Hoisting brake details updated.	9.12.2005	KHMJER
Construction, Rope guide	Drawings updated.	10.1.2006	
Construction - Low Headroom Trolley Hoist - Hoisting limit switch Drum size 243 mm	New hoist size added (drum diameter 243 mm)	13.1.2006	KHHJII



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<ul style="list-style-type: none"> - Hook operated upper limit switch - Rope drum - Rope guide - Overload protection <p>Installation</p> <ul style="list-style-type: none"> - Low headroom trolley <p>Lubricants</p> <ul style="list-style-type: none"> - Lubricant quantities 			
Using the pushbutton controller	Drawings updated.	16.1.2006	
Construction, Rope guide	Rope guide assembly instruction added (drum diameter 608 mm).	5.4.2006	KHHJII
Installation, curved beam	Drawing updated.	18.4.2006	KHHJII
Hook block	Thrust bearing assembly updated.	16.8.2006	KHHJII
Construction, Wire rope	Update on rope assembly (True vertical lift)	30.8.2006	KHHASI
Commissioning, Inspections without load	Limit switch adjustment and motion direction test updated.	30.8.2006	KHHPPU
Rope anchorage assembly	Wedge housing assembly direction updated (drum diameter 243 mm)	6.10.2006	KHHMHE
Construction, Hoisting limit switch	New limit switch assembly instructions added.	19.3.2007	KHHPPU
Construction, Rope guide	New rope guide assembly instructions added (drum diameter 608 mm)	21.3.2007	KHHJII
Construction, Hoisting limit switch	C-dimensions for Low headroom trolley updated	14.8.2007	KHHMHE
Construction, Overload protection	Load sensor instructions updated.	14.8.2007	KHHJII
Construction, Sheave support	Sheave support and rope anchorage support service instructions added.	14.8.2007	KHHMHE
Construction, Drum wear inspection	Drum wear inspection added.	14.8.2007	KHHJII



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2 Introduction

2.1 Instructions

The instructions for safe and effective installation, operation and maintenance of the hoist are included in the hoist delivery. The hoist itself is also provided with labels and markings. The instructions are issued on paper and/or on CD-ROM. The instructions for using digital CD-ROMs are printed on the packaging. Read the instructions supplied with the hoist before installation and commissioning.



Keep the instructions in a safe place for future reference.

2.2 Symbols

The following symbols are used in the instructions:



Warning!



Caution



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3 Safe operation

3.1 Intended use of the hoist and ambient conditions

The hoist is intended for lifting and moving goods. The hoist may not be used for lifting and moving people. The hoist is intended for indoor use or for use in outdoor premises when specially equipped for the purpose. The ambient temperature should be -10 ... +40°C (14...104°F), with explosive proof hoists - 20 ... +40°C (14...104°F), or, if specially equipped, -20 ... +50°C (-4...122°F). The relative humidity of the ambient should be less than 90%. If the hoist is used in exceptional ambient conditions (such as in a windy area, a corrosive atmosphere or in an area prone to earthquakes) or is used to handle dangerous materials (such as molten metal), any need for special equipment must be determined with the manufacturer or the manufacturer's representative.

3.2 Sound intensity level

The sound intensity level of the hoist in an operating location will not exceed 70dB (A).

3.3 Service classification of hoist

Safe and effective operation of the hoist is dependent on correct classification of the hoist's operating group. According to FEM9.511 standard the hoist's operating group can be determined from its:

- load spectrum
- average daily operating time

3.3.1 Load spectrum

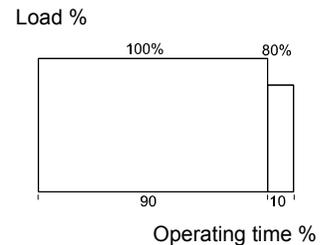
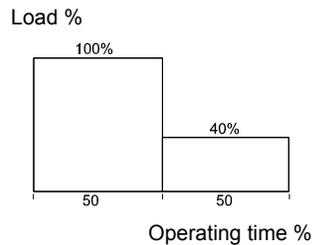
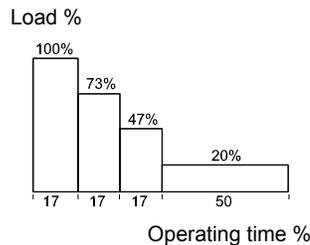
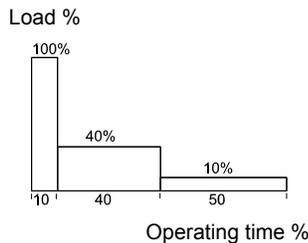
The load spectrum can be determined from the table below.

LIGHT
 Occasional full load.
 Usually light load.
 Small fixed load.

MEDIUM
 Occasional full load.
 Usually light load.
 Average fixed load.

HEAVY
 Repetitive full load.
 Usually average load.
 Heavy fixed load.

VERY HEAVY
 Usually almost full load.
 Very heavy fixed load.



3.3.2 Average daily operating time

The average daily operating time of the hoist can be calculated from the running time of the hoisting machinery [hours/day].

$$t = \frac{2 * H * N * T}{V * 60}$$

- H = average hoisting height [m]
- N = number of work cycles per hour [cycles/h]
- T = daily working time [h]
- V = hoisting speed [m/min]



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3.3.3 Determining the operating group of the hoist

When the load spectrum and the average daily operating time of the hoist are identified, the hoist's operating group is obtained from the table below.

Load spectrum	Average daily operating time (hours per day)					
	ISO/FEM					
	≤ 0.5	≤ 1	≤ 2	≤ 4	≤ 8	≤ 16
LIGHT			M3 1Bm	M4 1Am	M5 2m	M6 3m
MEDIUM		M3 1Bm	M4 1Am	M5 2m	M6 3m	M7 4m
HEAVY	M3 1Bm	M4 1Am	M5 2m	M6 3m	M7 4m	
VERY HEAVY	M4 1Am	M5 2m	M6 3m	M7 4m		

3.4 Safe working principles

Carefully following safe working principles is one of the most effective ways of preventing damage to property and injury to personnel. The operator, serviceman and work manager for the hoist should be familiar with the safe working principles for the hoist. A service organization authorized by the manufacturer can provide training for operating the hoist and any maintenance services needed under a separate agreement.

Misuse of the hoist or improper servicing may result in an accident that cannot be prevented by the safety equipment. Crane Operator, operation and safety training will introduce the operator to the essential safe handling of loads with the hoist equipment and safety procedures to follow. Service training can also provide the preventive maintenance requirements of the hoist to prevent equipment failure effecting production and/or safety.

Work management has an important role in implementing the principles for using the hoist safely. Work management must ensure that the hoist and its accessories are fit for the intended purpose, and that servicing and maintenance of the equipment is carried out as scheduled. Management must also ensure that personnel are adequately trained in the safe operation of handling loads.



The hoist operator, the hoist serviceman and personnel in charge of hoist operation and servicing shall be familiar with and comply with the safe working principles described in the instructions.



Read all safety instructions supplied with products.



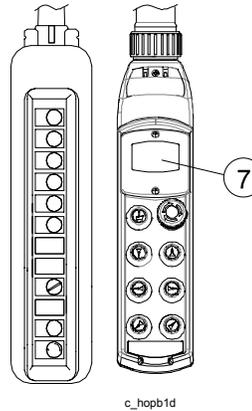
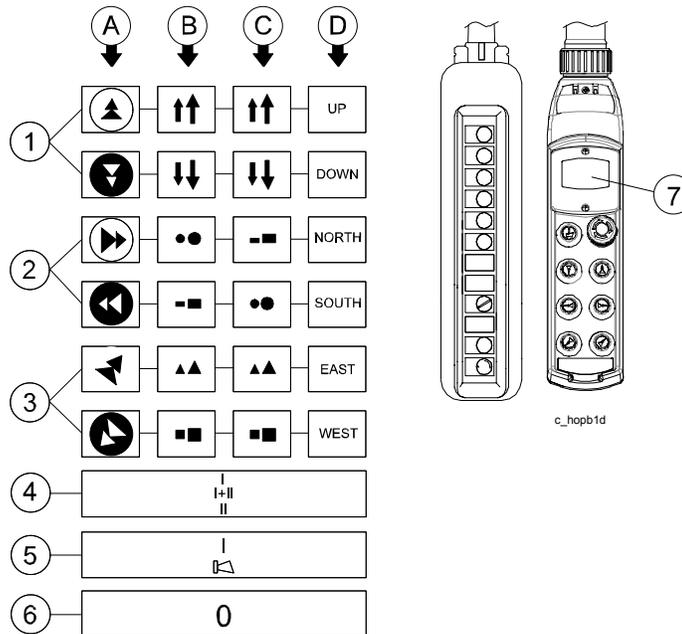
Study meaning of stickers on products.

3.5 Using the pushbutton controller

The hoisting and travel motions of the hoist as well as crane travel motions are controlled with the pushbutton controller or by remote control. Some pushbutton controllers and remote control units are provided with a selector switch that allows the same controller unit to be used to control several hoists and/or cranes. If the hoist has remote control (infrared or radio control) separate operating instructions for the remote controller are provided with the hoist. The direction symbols on the pushbutton controller conform to local requirements.



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c_hopb1d

- A. Markings in compliance with FEM and DIN standards
- B. Markings in compliance with SEN standard
- C. Markings in compliance with SFS standard
- D. Markings in compliance with ANSI standard
- 1. Up/Down pushbutton
- 2. Right/Left pushbutton for trolley
- 3. Forwards/Backwards pushbutton for bridge of crane
- 4. Hoist selection pushbutton (only if the pushbutton controls several hoists)
- 5. On pushbutton and warning signal
- 6. Emergency stop pushbutton (released by turning, lockable in some models)

Use the following procedure to start up a hoist that is in standby mode:

- Release the emergency stop pushbutton (6) by turning it. Use a key to release if it is the lockable type.
- Press the On pushbutton (5). The hoist is now ready for operation.



If the pushbutton controller includes a selection switch, check that the hoist selection switch (4) is in the correct position before using pushbuttons (1), (2) and (3).

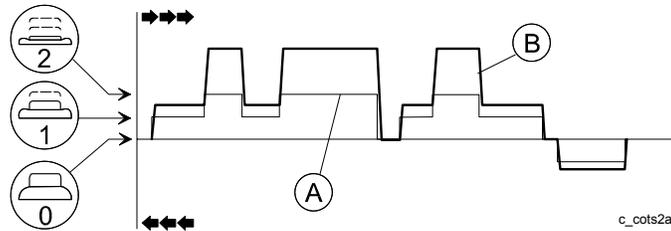
After operating the hoist, return it to standby mode as follows:

- Run the hoist to the correct parking position. Stop all hoist motions.
- When all hoist motions have ceased, press the emergency stop pushbutton (6). The pushbutton will lock.



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3.5.1 Using the pushbuttons (two steps, contactor control)



A. Position of pushbutton (0, 1 and 2)
B. Speed

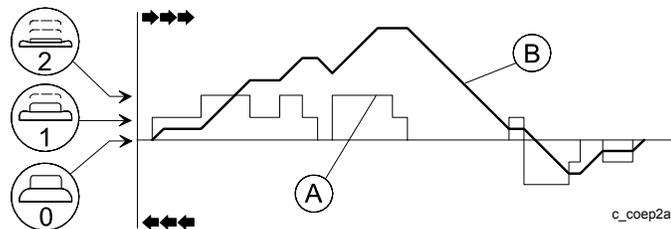
The position of the pushbutton affects the speed as follows:

- Position 0: Neutral position. Motion stops.
- Position 1: Slow speed.
- Position 2: High speed.



A skilled operator always uses the low speed (step 1) when starting to hoist. Slack is taken out of rigging and the wire rope is subjected to the load in the low speed. Be aware of load balance as the load is hoisted from floor level. Proceed to high speed (step 2) when the load is clear of all obstacles. When lowering the load, a skilled operator controls the lowering speed from High to Low speed when setting the load. Low speed allows time to maneuver load into position. Minimal jogging (or inching) may be required. DO NOT JOG FROM NEUTRAL TO HIGH SPEED POSITION OR VICE VERSA.

3.5.2 Using the pushbuttons (EP-mode, optionally used with Inverter controls)



A. Position of pushbutton (0, 1 and 2)
B. Speed

Variable speed with 2 step pushbutton - (Electronic Potentiometer)

The position of the pushbutton affects the speed as follows:

- Position 0: Neutral Position. Controls motion to slowdown and stop.
- Position 1: Start in low speed and Hold speed Command.
 - When starting the movement in first step, go to low speed is initiated.
 - When speeding up (pushing step 2, accelerate to high speed) and a desired speed is reached return to position 1, the Inverter control will hold the speed the motion has reached. A quick, back and forth movement between position 1 & 2 can provide the crane operator variable speeds for safer and more productive operation.
 - When slowing down (release button to neutral) and returning to position 1, the Inverter control will hold the speed the motion has attained. A quick, back and forth movement between position 0 & 1 again provides



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the crane operator variable speeds to minimize swing, reducing the slowdown ramp time to stop, providing safer and productive operation.

- Position 2: Accelerate to high (maximum) speed



Inverter Drives provide state of the art control in the hoist, bridge and trolley motions of industrial cranes. A skilled operator can benefit from this type of control system. Note an established acceleration or speed up ramp time will minimize the motion from achieving full speed instantly, minimizing load swing. Position 2 is the High speed command but the ramping time to full speed allows the operator to hold any speed between Low and High by returning to the first position, commanding - HOLD SPEED.

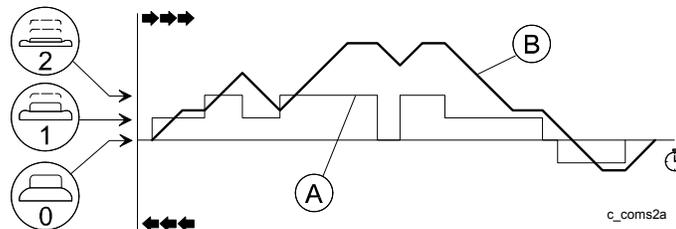


NOTICE: when the pushbutton is returned to neutral, an established deceleration or slowdown ramp time is in full control of the motion before STOP. A skilled operator can use this ramp time to his advantage by pushing in position 1, to command HOLD SPEED. The motion will hold the speed the motion has slowed down to.



EMERGENCY STOP WILL ALWAYS STOP MOTION IMMEDIATELY!

3.5.3 Using the pushbuttons (two speeds, controlled by Inverter)



- A. Position of pushbutton (0, 1 and 2)
- B. Speed

Two step pushbutton - Low and High Speed with Soft Starting and Soft Stopping

The position of the pushbutton affects the speed as follows:

- Position 0: Neutral Position. Controls motion to slowdown and stop.
- Position 1: Accelerate to low speed.
- Position 2: Accelerate to High speed.



Frequency Inverter Drives provide state of the art control in the hoist, bridge and trolley motions of industrial cranes. This simple control has two speeds, Low and High, but with the advantage of speeding up smoothly to minimize swing. When returning to Low Speed or Stop a smooth slowing down occurs to minimize swing.



NOTICE: when the pushbutton is returned to neutral, an established deceleration or slowdown ramp time is in full control of the motion before STOP.



EMERGENCY STOP WILL STOP MOTION IMMEDIATELY.



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4 Hoist manufacturer

4.1 Hoist identification data

The type marking and serial number of the hoist are shown on the rating plate attached to the hoist and in the inspection records supplied with the hoist.



Always state the serial number of the hoist when ordering spare parts or service.

4.2 Directives and standards

The hoist and hoist components meet the requirements of the relevant FEM standard. The hoist complies with the European legislation and harmonized standards currently in force.

The hoist and hoist components meet the requirements of the following European Community directives:

- EC Directive on the safety of machinery 98/37/EC
- EC Low voltage directive 73/23/EC
- EC EMC directive 89/336/EC

The following harmonized standards have been applied to the product:

- EN 292 -1, Safety of machinery. Basic concepts and general principles for design. Part 1: Basic concepts and methods
- EN 292 -2, Basic concepts and general principles for design. Part 2: Technical principles and specifications
- EN 1050, Safety of machinery. Principles for risk assessment
- EN 60204-32, Safety of machinery. Electrical equipment for machinery. Part 1: General requirements

The quality standard applied by the manufacturer is:

- EN 29001/ISO9001, Quality Systems

The following international technical standards have been applied to the product:

- FEM 1.001 Section 4; Rules for the design of hoisting appliances, Checking for fatigue and choice of mechanism components
- FEM 9.901 Design of serial lifting equipment

4.3 Manufacturer's contact details (R&M)

Contact details for the manufacturer of the hoist:

Manufacturer's name and address

R&M Materials Handling, Inc

4501 Gateway Boulevard
 Springfield, OH 45502
 USA

Telephone number:

+1 937 328 5100

Fax number:

+1 937 325 5319

For further information about the product, operational training and servicing, please contact the manufacturer's representative located closest to you.



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4.3.1 Spare parts

Spare parts for the hoist are specified in the separate spare parts catalogue delivered with the hoist. Always state the serial number marked on the rating plate of the hoist when ordering spare parts. Always use genuine spare parts and lubricants approved by the manufacturer of the hoist. R&M reserves the right to revoke warranty terms when non original parts are used.



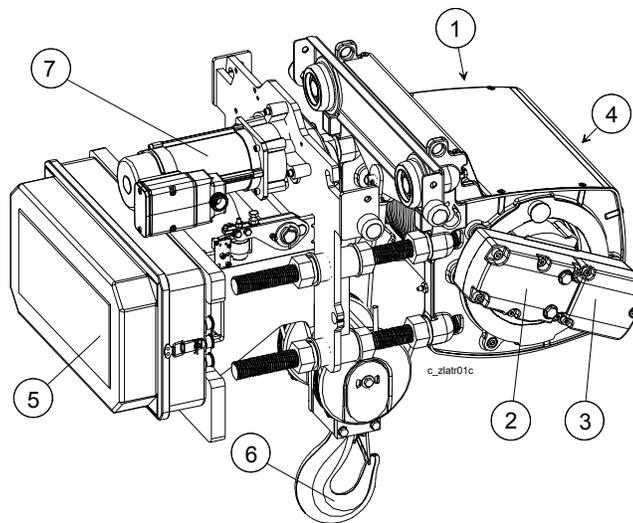
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5 Construction

5.1 Low Headroom Trolley Hoist

The low headroom hoist trolley is a hoist model that is installed on the bottom flange of the main beam. The low headroom hoist allows maximum effective use of the available lifting height.

Drum size \varnothing 243 mm

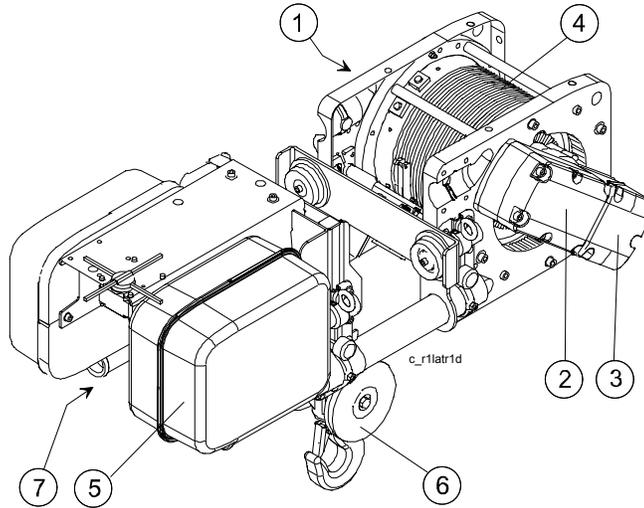


1. Hoisting motor and brake
2. Hoisting gear
3. Connection box
4. Rope drum
5. Electric cubicle
6. Hook-block
7. Travelling machinery



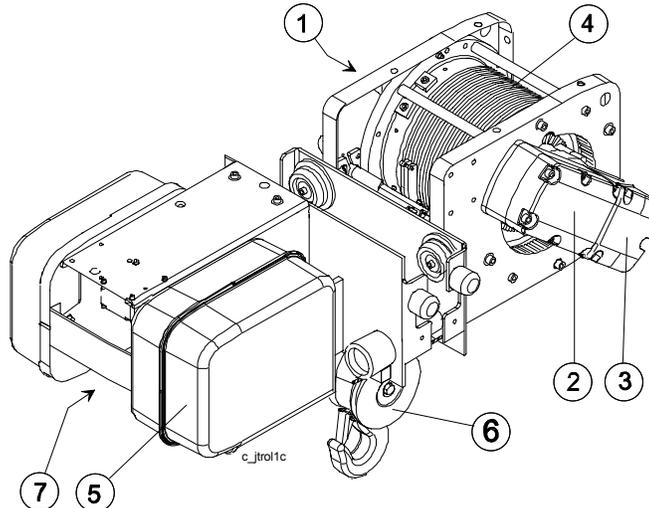
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Drum size ϕ 303/355 mm



- 1. Hoisting motor and brake
- 2. Hoisting gear
- 3. Connection box
- 4. Rope drum
- 5. Electric cubicle
- 6. Hook-block
- 7. Travelling machinery

Drum size ϕ 303 mm, low profile

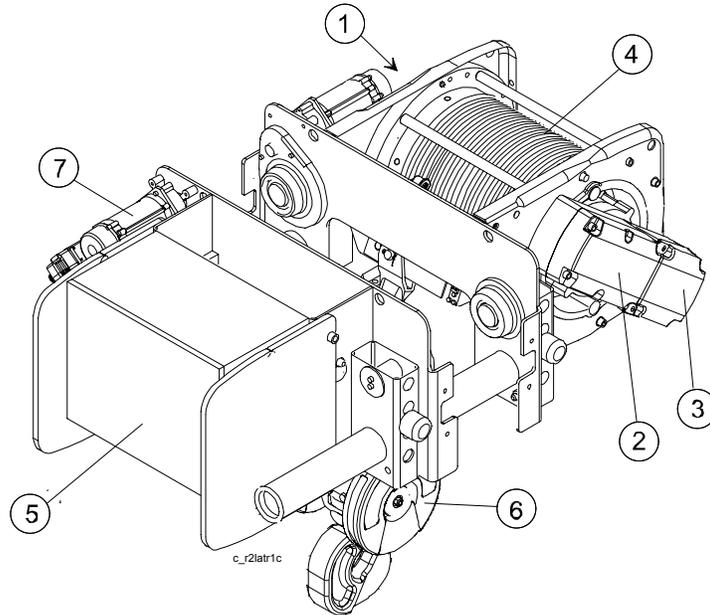


- 1. Hoisting motor and brake
- 2. Hoisting gear
- 3. Connection box
- 4. Rope drum
- 5. Electric cubicle
- 6. Hook-block
- 7. Travelling machinery



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Drum size ϕ 406 mm



1. Hoisting motor and brake
2. Hoisting gear
3. Connection box
4. Rope drum
5. Electric cubicle
6. Hook-block
7. Travelling machinery

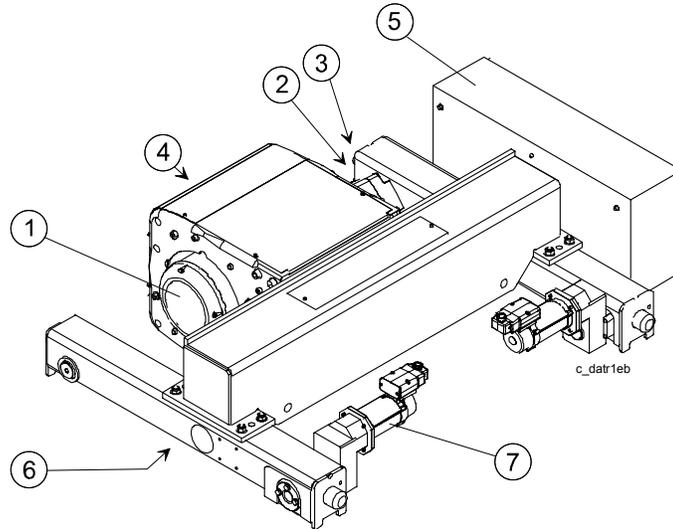
5.2 Double-girder Trolley Hoist

Double-girder trolleys are available in numerous versions, where the available height above the main girders determines the construction. Double-girder trolleys are commonly used in applications where heavy load handling is required.



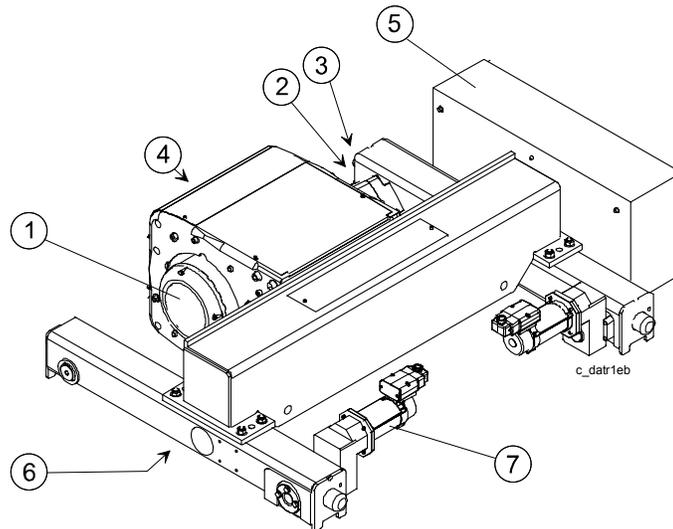
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Drum size ϕ 303/355 mm



- 1. Hoisting motor and brake
- 2. Hoisting gear
- 3. Connection box
- 4. Rope drum
- 5. Electric cubicle
- 6. Hook-block
- 7. Travelling machinery

Drum size ϕ 406 mm

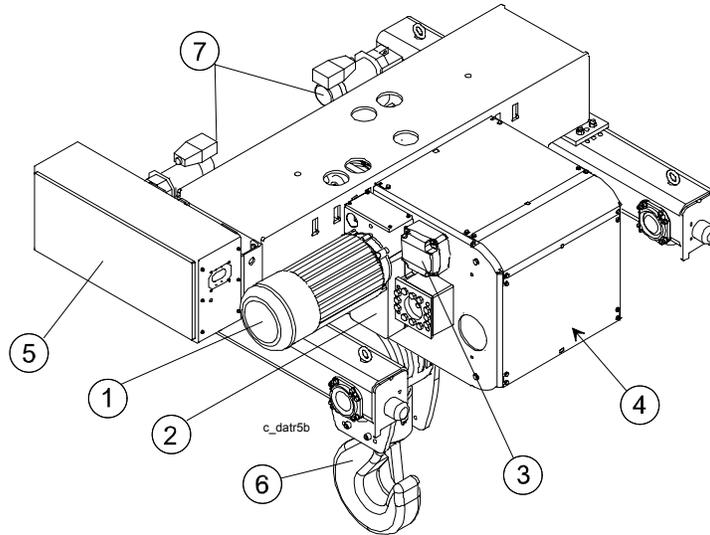


- 1. Hoisting motor and brake
- 2. Hoisting gear
- 3. Connection box
- 4. Rope drum
- 5. Electric cubicle
- 6. Hook-block
- 7. Travelling machinery



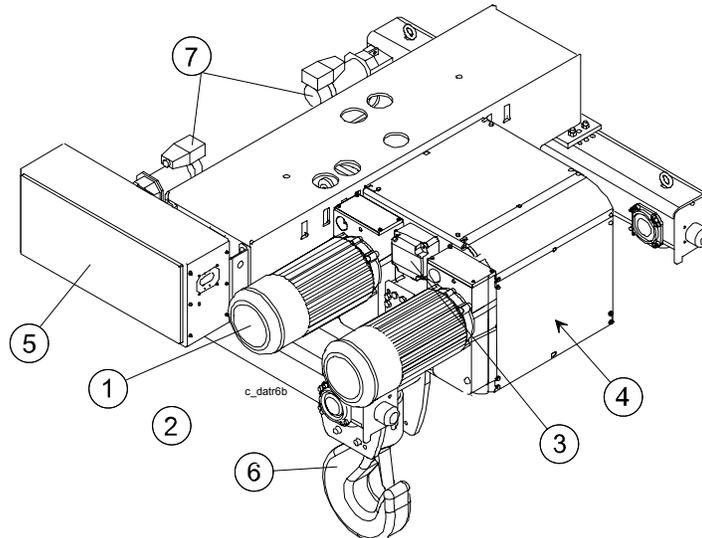
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Drum size ϕ 608 mm



- 1. Hoisting motor and brake
- 2. Hoisting gear
- 3. Connection box
- 4. Rope drum
- 5. Electric cubicle
- 6. Hook-block
- 7. Travelling machinery

Drum size ϕ 608 mm (two hoisting motors)



- 1. Hoisting motor and brake
- 2. Hoisting gear
- 3. Connection box
- 4. Rope drum
- 5. Electric cubicle
- 6. Hook-block
- 7. Travelling machinery

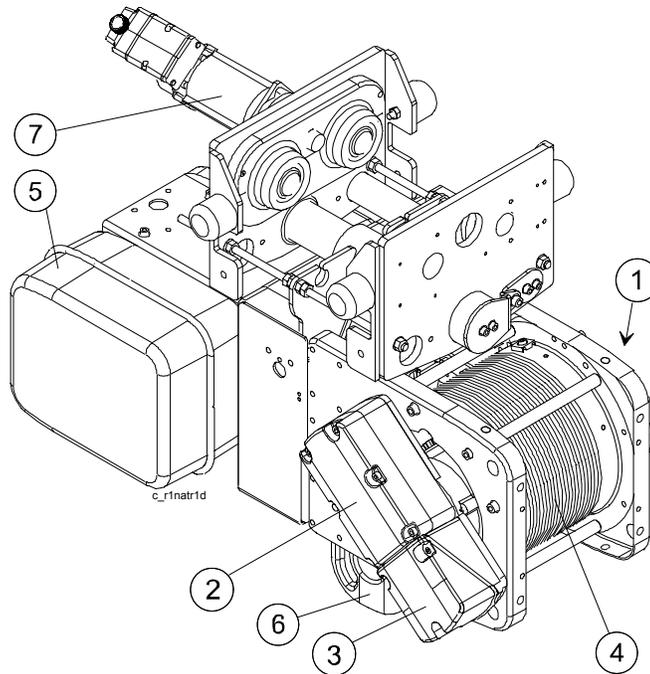


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5.3 Normal Headroom Trolley Hoist

The normal headroom trolley hoist hangs under a single beam. Normal headroom trolleys can be used with straight or curved beams.

Drum size ϕ 303/355 mm

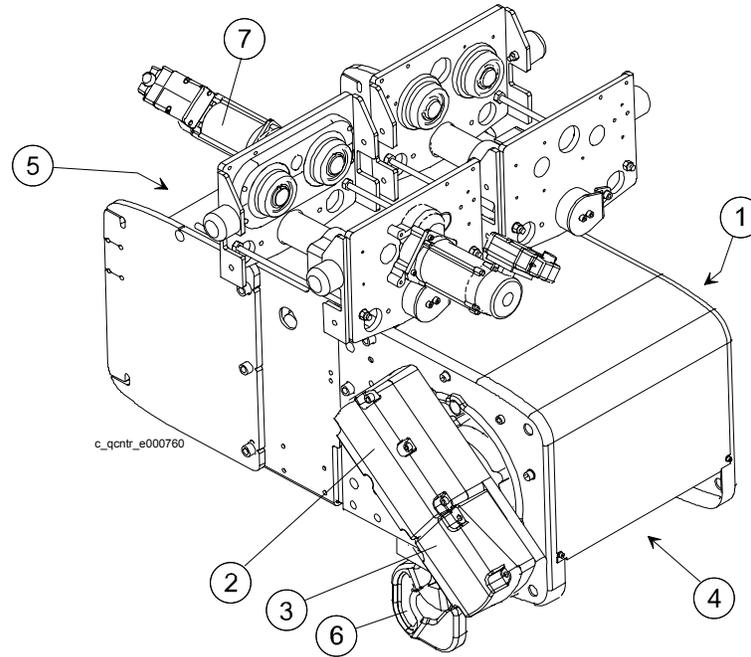


1. Hoisting motor and brake
2. Hoisting gear
3. Connection box
4. Rope drum
5. Electric cubicle
6. Hook-block
7. Travelling machinery



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Drum size ϕ 406 mm



1. Hoisting motor and brake
2. Hoisting gear
3. Connection box
4. Rope drum
5. Electric cubicle
6. Hook-block
7. Travelling machinery

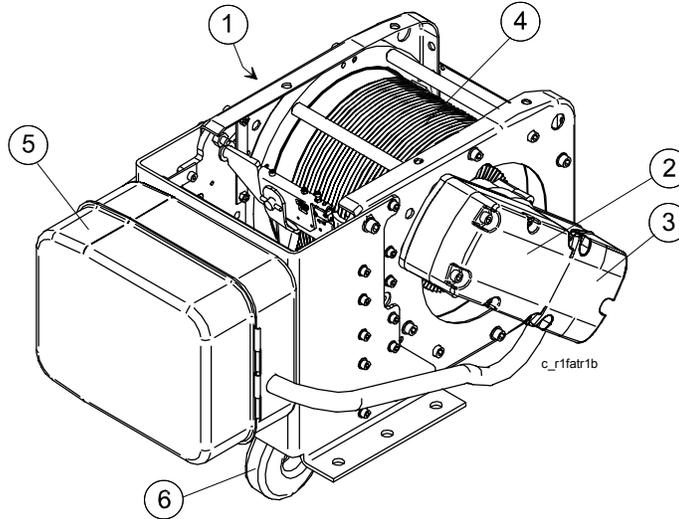
5.4 Fixed Hoist

Fixed hoists do not have any trolley and are used in applications where horizontal movement is not needed.



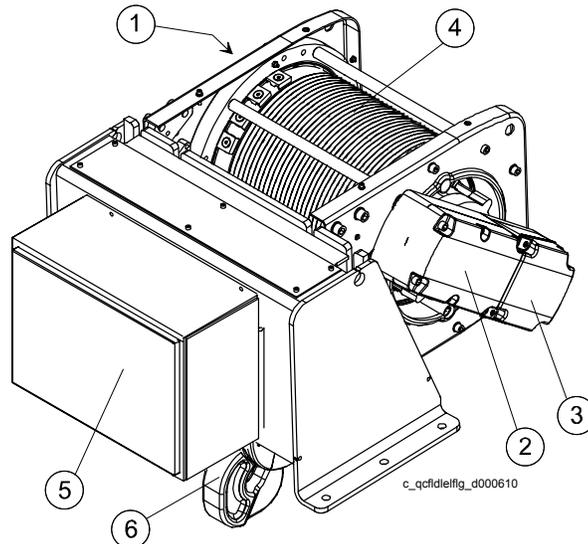
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Drum size ϕ 303/355 mm



1. Hoisting motor and brake
2. Hoisting gear
3. Connection box
4. Rope drum
5. Electric cubicle
6. Hook-block

Drum size ϕ 406 mm

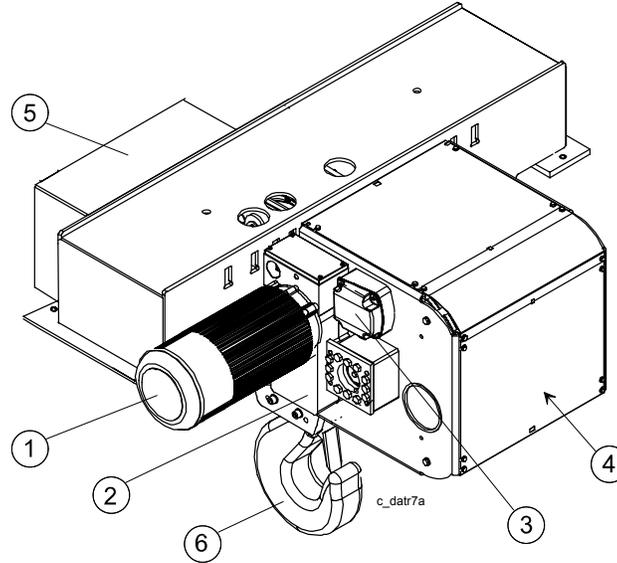


1. Hoisting motor and brake
2. Hoisting gear
3. Connection box
4. Rope drum
5. Electric cubicle
6. Hook-block



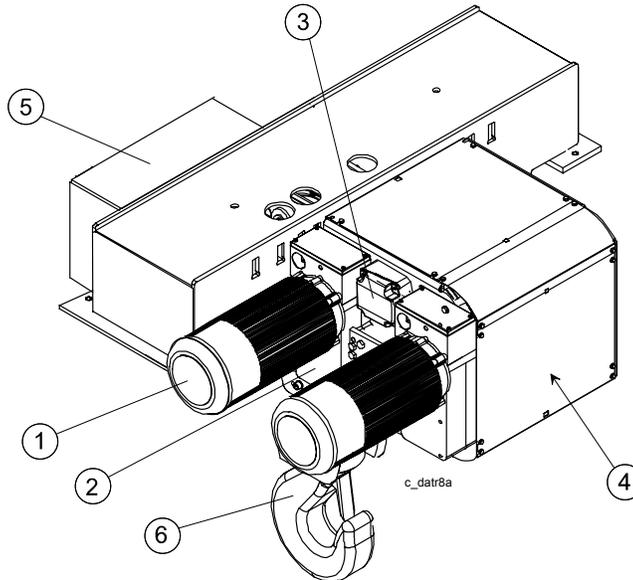
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Drum size ϕ 608 mm



- 1. Hoisting motor and brake
- 2. Hoisting gear
- 3. Connection box
- 4. Rope drum
- 5. Electric cubicle
- 6. Hook-block

Drum size ϕ 608 mm (two motors)



- 1. Hoisting motor and brake
- 2. Hoisting gear
- 3. Connection box
- 4. Rope drum
- 5. Electric cubicle
- 6. Hook-block

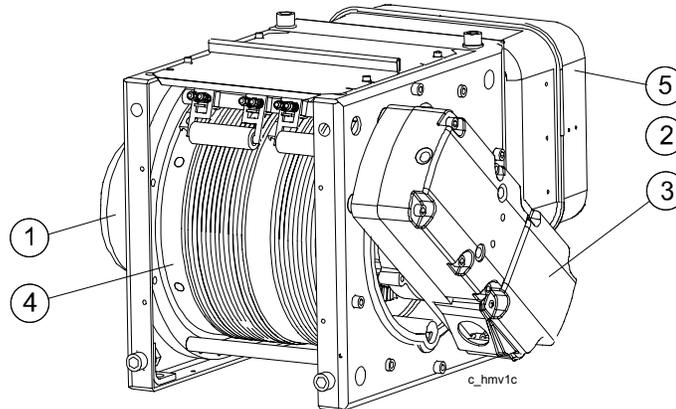


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5.5 Machinery Hoist

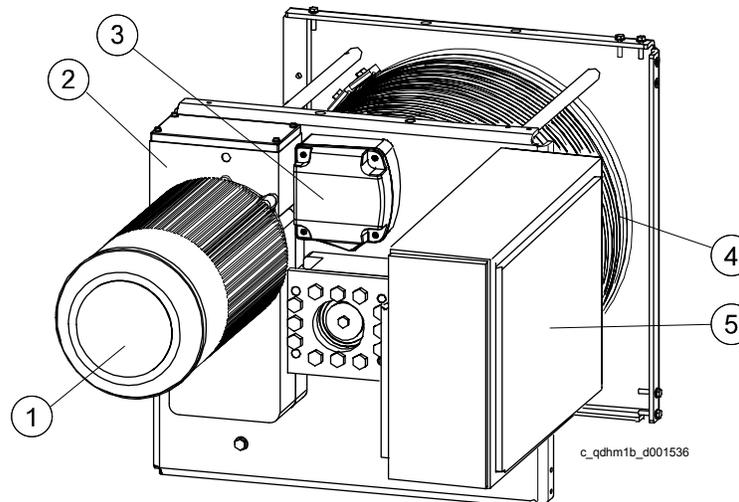
A machinery hoist does not include a hook or travelling machinery. Machinery hoists are used in applications where only lifting or pulling is required. Machinery hoists can be mounted in different positions according to the required lifting or pulling angle.

Drum size ϕ 303/355/406 mm



1. Hoisting motor and brake
2. Hoisting gear
3. Connection box
4. Rope drum
5. Electric cubicle

Drum size ϕ 608 mm



1. Hoisting motor and brake
2. Hoisting gear
3. Connection box
4. Rope drum
5. Electric cubicle



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5.6 Trolley buffers

The hoisting trolley is provided with rubber buffers. Some models are equipped with buffer extensions.

5.6.1 Service

- Check that the buffers and runway end stops are in good condition. Replace broken buffers.
- Check that the hoist buffers bump into the runway end stops or buffers of other trolley.

5.7 Hoisting machinery

The main components of the hoisting machinery are the hoisting motor, gear and rope drum. Power from the motor is transmitted via the rim gear of the transmission to the rope drum. One end of the transmission train that is comprised of the hoisting motor, gearing and rope drum is fixed to the end flanges of the hoisting machinery.

5.7.1 Service

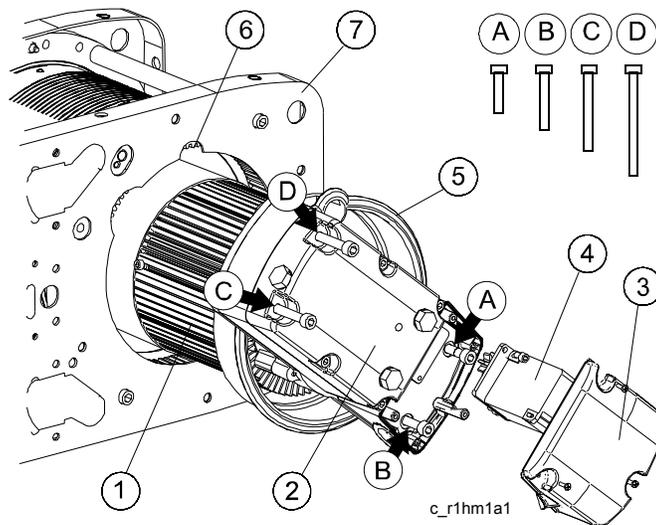
- Check and replace the coupling between motor and gearbox. Note the exceptional service interval.

See the sections “**Service**” of the individual components for details.

5.7.2 Assembly

Drum size \varnothing 303/355/406 mm

The motor and gearbox are attached as a complete sub-assembly inside the rope drum. The motor-gearbox subassembly must be extracted from the drum as a whole, in case any work on the gearbox, motor or coupling is required.



1. Hoisting motor
2. Hoisting gearbox
3. Cover of connection box
4. Hoisting limit switch



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- 5. Cover of rim gear
- 6. Rim gear
- 7. End flanges of hoisting machinery
- A, B, C, D Fixing screws for hoisting machinery

Disassembly:

- Lower the hook to the ground. Switch OFF the power supply to the hoist.
- Remove the protective cover of the hoisting machinery.
- Lock the rope drum with i.e. a wooden wedge, to prevent it from rotating.



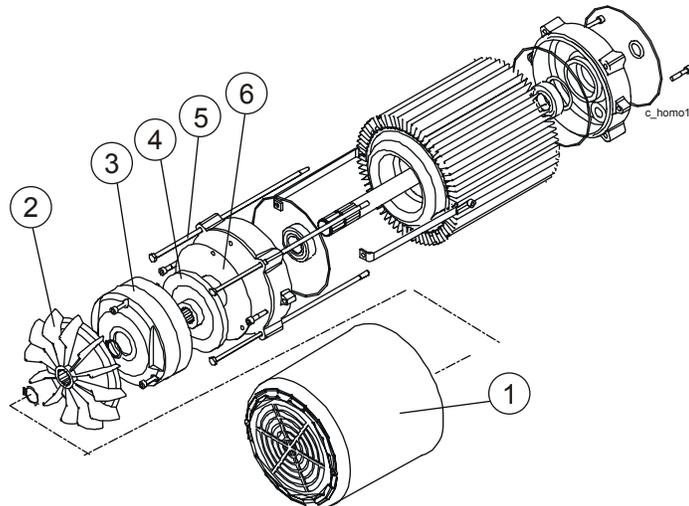
The weight of the rope may cause the drum to rotate when the gearbox is detached.

- Open the cover of the connection box on the gearbox (3).
- Extract the power feed connector for the hoisting motor.
- Remove the brake wires from the connector
- Detach the rotating limit switch (4).
- Loosen the cable entry and remove the cable and rotating limit switch from the connection box.



In some models you must remove the wires from the limit switch and the terminal strip.

- Remove the fixing screws A and C from the hoisting machinery and replace them with thread bars (Drum size \varnothing 303/355 mm: M8x600, Drum size \varnothing 406 mm: M12x 800).
- Remove the fixing screws B and D



- 1. Fan cover
- 2. Fan
- 3. Brake
- 4. Brake disc
- 5. Fixing screws for motor
- 6. Friction plate

- Remove the fan cover (1).
- Remove the fan (2).
- Raise the hoisting motor at the brake-end and extract the machinery from the rope drum.



Use lifting aid, such as a chainhoist for the bigger/heavier models

- Lower the machinery to rest on the gearbox with the motor facing upwards.



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Handle the motor-gearbox subassembly with care. Avoid damaging the inner dust-ring and the rim gear cover.

- Remove the fixing screws of the brake and remove the brake (3), brake disc (4) and friction plate (6). Carefully guide the connection wires and plug through the hole in the gearbox.
- Remove the fixing screws for the motor.
- Extract the motor from the gearbox. Carefully guide the power feed wires and plug through the hole in the gearbox.
- Remove the coupling.

Re-assembly:

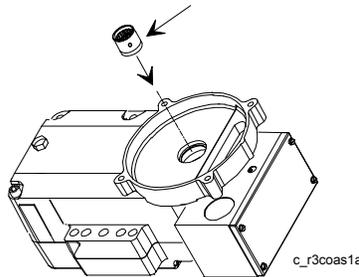


It is advised to change the coupling each time when hoisting machinery is disassembled.

- Lubricate the inside of the coupling.
- Place the coupling on the gearbox shaft and assure that it fits tight and correct.



The groove in the coupling MUST face the gearbox side!



- Place the motor onto the gearbox and guide the wires through the holes into the gearbox.
- Make sure that the motor's shaft fits correctly into the splines of the coupling.



Do NOT tighten the assembling bolts of the motor before the motor fits correctly and straight in the flange of the gearbox. There is a risk to damage or misplace the inner circlips of the coupling when using force.

- Rotate the motor shaft by hand. Make sure the shaft rotates freely and that the drive pinion of the gearbox rotates simultaneously.
- Tighten the motor fixing bolts to the correct torque.
- Assemble the friction plate (6). Text "REIBSEITE" must be against the friction disc (4) (if applicable).
- Assemble the brake disk and the brake. Do not tighten the brake fixing bolts yet, the shaft should be able to rotate freely.
- Insert the motor-gearbox subassembly into the drum



Use lifting aid, such as a chainhoist for the bigger/heavier models



Handle the motor-gearbox subassembly with care. Avoid damaging the inner dust-ring and the rim gear cover.

- Be aware of:
 - Guide pins on the bearing rim flange.

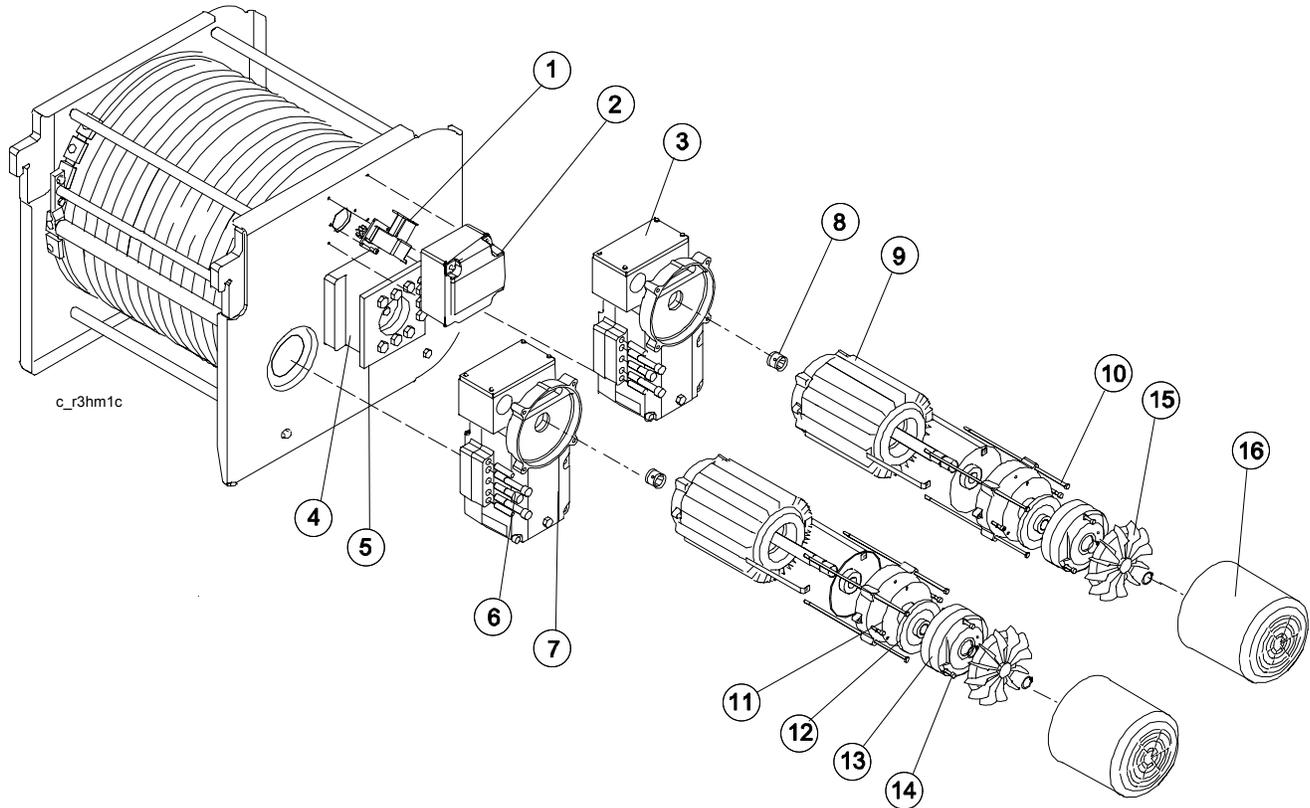
- Drive pinion of the gear fits correctly into the gear-rim of the drum. Rotate the motor's shaft on the brake-end side to guide the pinion into the gear-rim and to check the right fitting.
- Fasten the bolts B & D.
- Remove the thread bars and fasten the bolts A & C.
- Tighten the bolts to the correct torque.
- Re-assemble the hoist limit switch.
- Insert the brake wires into the plug and re-connect the power feed connector.
- Tighten the brake fixing screws.
- Remove the drum-locking device (wooden wedge).
- Re-assemble the protective cover of the hoisting machinery.
- Test the proper operation of all movements and functions



In many cases it is necessary to re-adjust the limit switch. Be aware of incorrect settings during testing the operation.

Drum size \varnothing 608 mm

In the models with drum size \varnothing 608mm, the motor(s) can be extracted from the gearbox separately.



1. Hoisting limit switch
2. Cover hoisting limit switch
3. Connection box
4. Drum-bearing house
5. Fixing plate for gearbox
6. Fixing screws for gearbox
7. Hoisting gearbox
8. Coupling.



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9. Hoisting motor
10. Fixing screws for motor
11. Friction plate.
12. Brake disc.
13. Hoisting brake
14. Fixing screws for hoisting brake
15. Fan.
16. Fan cover.

Disassembly:

- Lower the hook to the ground. Switch OFF the power supply to the hoist.
- Remove the protective cover of the hoisting machinery.
- Lock the rope drum with i.e. a wooden wedge, to prevent it from rotating.



The weight of the rope may cause the drum to rotate when the gearbox is detached.

- Open the connection-box (3) and remove the wires.
- Securely suspend the hoisting motor with i.e. a chain hoist.
- Remove the fan cover (16) and the fan (15)
- Remove the fixing screws of the brake (14) and remove the brake (13), brake disc (12) and friction plate (11).
- Remove the motor fixing screws (10)
- Extract the motor (9) from the gearbox (7).
- Remove the coupling (8).
- Remove the fixing screws for the gearbox (6) and the fixing plate for the gearbox (5).
- Extract the gearbox (7) from the hoist.

Re-assembly:



It is advised to change the coupling each time when hoisting machinery is disassembled.

- Lubricate the inside of the coupling.
- Place the coupling on the gearbox shaft and assure that it fits tight and correct.



The groove in the coupling MUST face the gearbox side!

- Fit the gearbox in it's place Be aware of:
 - Guide pins on the bearing-house.
 - Drive pinion of the gear fits correctly into the gear-rim of the drum. Rotate the gearbox's shaft to guide the pinion into the gear-rim and to check the right fitting.
- Fit the gearbox fixing plate (5) on its place and fasten the fixing bolts (6).
- Tighten the bolts to the correct torque.
- Place the motor onto the gearbox and guide the wires through the holes into the connection box.
- Make sure that the motor's shaft fits correctly into the splines of the coupling.



Do NOT tighten the assembling bolts of the motor before the motor fits correctly and straight in the flange of the gearbox. There is a risk to damage or misplace the inner circlips of the coupling when using force.

- Tighten the motor fixing bolts (10) to the correct torque.



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- Assemble the friction plate (11). Text "REIBSEITE" must be against the friction disc (12) (if applicable).
- Assemble the brake disc (12) and the brake (13). Tighten the fixing screws (14) for the brake.
- Re-assemble the fan (15) and the fan cover (16).
- Reconnect the motor wires and close the connection box.
- Remove the drum-locking device (wooden wedge).
- Re-assemble the protective cover of the hoisting machinery.
- Test the proper operation of all movements and functions

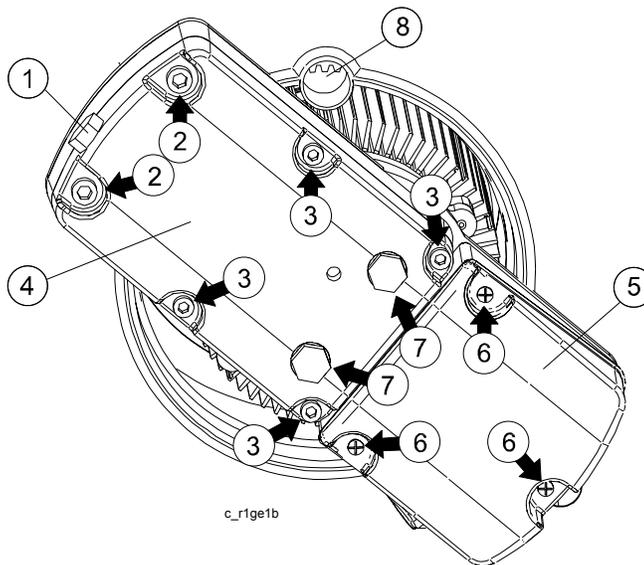


In many cases it is necessary to re-adjust the limit switch. Be aware of incorrect settings during testing the operation.

5.8 Hoisting gearbox

The hoisting gearbox comprises multistage spur gear transmission. The lubricant for the hoisting gear is semi-fluid grease. When used in conformance with the operating group classification of the hoist, the gearbox lubricant does not need to be changed during the Safe Working Period (SWP). If the hoist is operated in extremely cold conditions, the factory-installed grease must be replaced with synthetic transmission grease. Refer to the section "**Lubricants**" for further instructions.

Drum size ϕ 243/303/355/406 mm

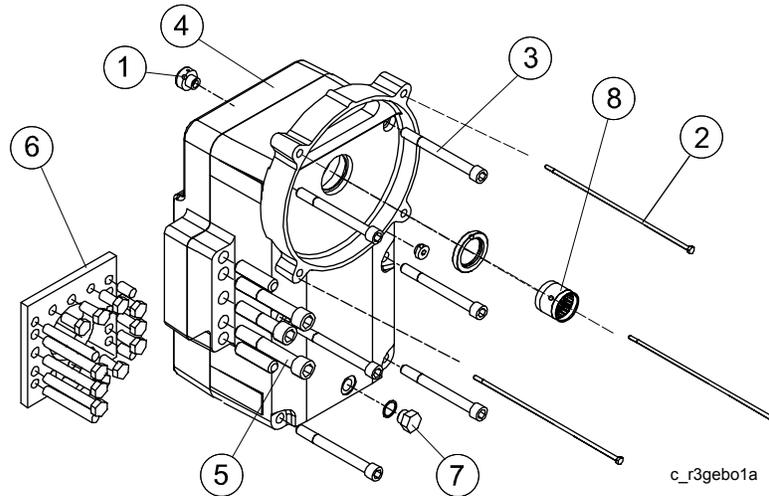


1. Breather plug
2. Fixing screws for hoisting machinery
3. Fixing screws for gearbox cover
4. Gearbox cover
5. Cover of connection box
6. Fixing screws for cover of connection box
7. Gearbox plug
8. Inspection hole for gear rim



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Drum size ϕ 608 mm



- 1. Breather plug
- 2. Fixing screws for hoisting motor
- 3. Fixing screws for gearbox cover
- 4. Gearbox cover
- 5. Fixing screws for gearbox
- 6. Fixing plate for gearbox
- 7. Gearbox plug
- 8. Coupling

5.8.1 Service

- Check the gearbox visually for leakage.
- In case the gearbox shows signs of excessive leakage, find the reason for this and replace the worn part, or the complete gearbox.
- Check the breather-plug breaths freely and clean if needed.
- Check for any excessive vibration and/or noise.



If the factory-installed grease is topped up with a different lubricant, ensure that the lubricant is compatible. Refer to the section **“Lubricants”** for further instructions.

5.8.2 Assembly

See section: **“Hoisting machinery, Assembly”** for details.



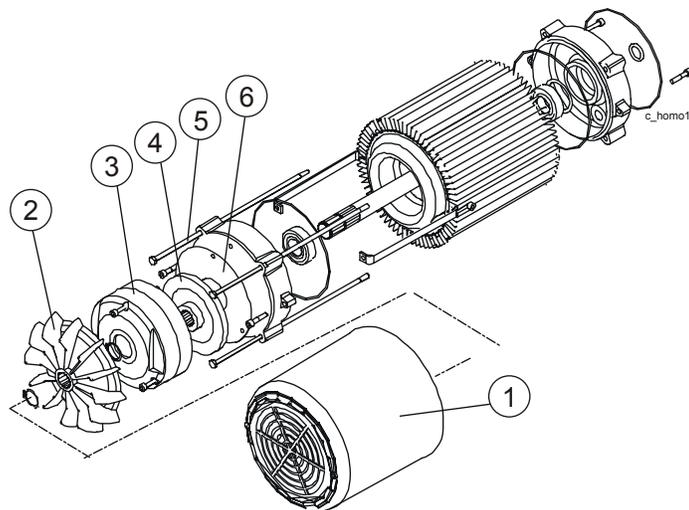
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5.9 Hoisting motor and brake

Standard hoists are equipped with two-speed squirrel-cage motors, which are especially designed and manufactured for hoisting duty. The motors incorporate a cylindrical rotor and class F insulation, and are conform to the protection standard IP54/DIN40050.

Optionally, the hoist can be equipped with a inverter and specially designed motors for this duty. These are one-speed squirrel-cage motors with increased insulation of the windings. In addition, these motors are equipped with a speed sensor as a standard.

The hoisting brake is an electromagnetic safety brake that is closed by spring force.



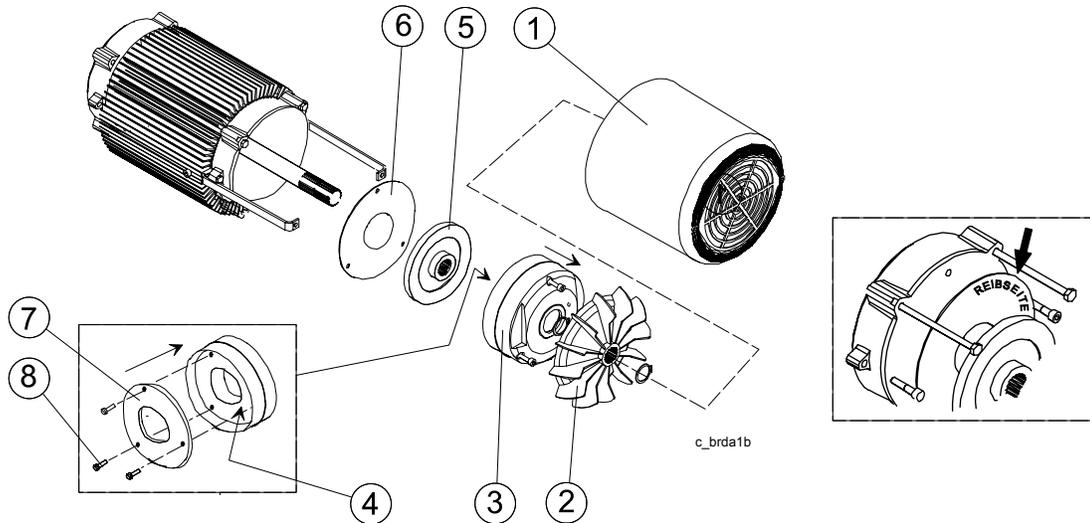
1. Fan cover
2. Fan
3. Brake
4. Brake disc
5. Fixing screws for motor
6. Friction plate

5.9.1 Service

5.9.1.1 Hoisting motor

- Check that the hoisting motor operates properly when loaded.
- Check for any excessive noise, vibration and/or heat.
- Clean the cooling-ribs surface when needed.

5.9.1.2 Brake



- 1. Fan cover
- 2. Fan
- 3. Brake
- 4. Inside of the brake
- 5. Brake disc
- 6. Friction plate
- 7. Anchor plate
- 8. Fixing screws

- Lower the hook to the ground. Switch OFF the power supply to the hoist.
- Remove the protective cover of the hoisting machinery.
- Lock the rope drum with i.e. a wooden wedge, to prevent it from rotating.



The weight of the rope may cause the drum to rotate when the gearbox is detached.

- Remove the fan cover (1) and fan (2).



Do not pull the fan by the fins! Place your fingers behind the fan and carefully pull the fan off the shaft.

- Remove the fixing screws for the brake.
- Detach the brake (3).
- Check the brake type on the rating plate fixed to the brake.
- Measure the thickness of the brake disc (5).
- Replace the brake disc if the thickness is less then the minimum thickness as according to the below table.

Brake type and size	Original thickness of the brake disc [mm]	Minimum thickness of the brake disc [mm]	Tightening torque for brake fixing screws [Nm] / [lbf.ft]	Tightening torque for anchor plate screws [Nm] / [lbf.ft]
NM39972NR#	7.00	6,6	5.0 / 3.7	5.0 / 3.7
NM38721NR#	8.00	7,6	9 / 6.6	2.5 / 1.8
NM38720NR#	8.00	7,6	9 / 6.6	2.5 / 1.8
NM38730NR#	10.40	10,1	9 / 6.6	2.5 / 1.8
NM38740NR#	11.15	10.4	22 / 16.2	5.0 / 3.7



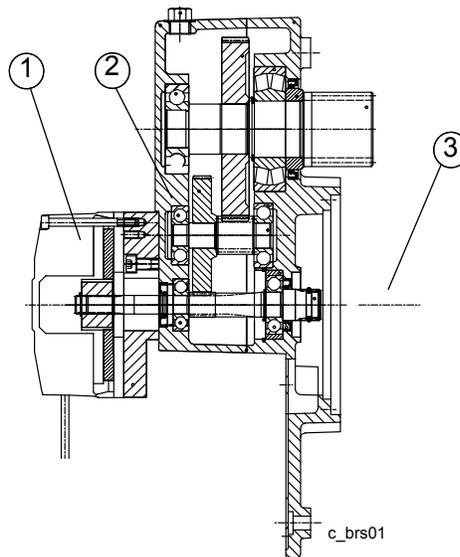
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Brake type and size	Original thickness of the brake disc [mm]	Minimum thickness of the brake disc [mm]	Tightening torque for brake fixing screws [Nm] / [lbf.ft]	Tightening torque for anchor plate screws [Nm] / [lbf.ft]
NM38741NR#	11.15	10.4	22 / 16.2	5.0 / 3.7
NM38751NR#	14.00	13.2	22 / 16.2	11.0 / 8.1
NM38753NR#	14.00	13.6	22 / 16.2	11.0 / 8.1

- Check the physical condition of the teeth on the brake disc.
- Check the wear of the friction plate (6). Replace the friction disc if it has worn thin.
- Clean the inside of the brake (4).
 - Remove the fixing screws (8).
 - Remove the anchor plate (7).
 - Clean the anchor plate and brake armature.
 - Re-assemble the brake.
- Clean the brake disc (5) and the friction plate (6)
- Re-assemble in the reverse order. Assemble the friction plate (6) text "REIBSEITE" against the friction disc (5) (if applicable).

5.10 Second brake

The second brake is an electromagnetic safety brake, which is closed by spring force. The second brake operates as holding brake when the motion has stopped and the main brake has closed. The second brake closes with a small delay and opens simultaneously with the main brake. The second brake is attached to the primary shaft of the hoisting gear, whereas the hoisting motor with the main brake is attached to the other end of the shaft.



1. Brake
2. Hoisting gear
3. Hoisting motor

Brake type and size	Original thickness of the brake disc [mm]	Minimum thickness of the brake disc [mm]	Tightening torque for brake fixing screws [Nm] / [lbf.ft]
NM39330NR#	10.40	10,1	9 / 6.6



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Brake type and size	Original thickness of the brake disc [mm]	Minimum thickness of the brake disc [mm]	Tightening torque for brake fixing screws [Nm] / [lbf.ft]
NM39340NR#	11.15	10.4	22 / 16.2
NM39351NR#	14.00	13.2	22 / 16.2

5.11 Manual brake release for hoisting motor (for brake type NM387**)



The manual brake release is allowed to use only in case of emergency.



Potential energy of load will heat up the brake rapidly. Follow the instructions for usage carefully.



Faulty usage of the manual brake release can cause uncontrolled lowering of the load.



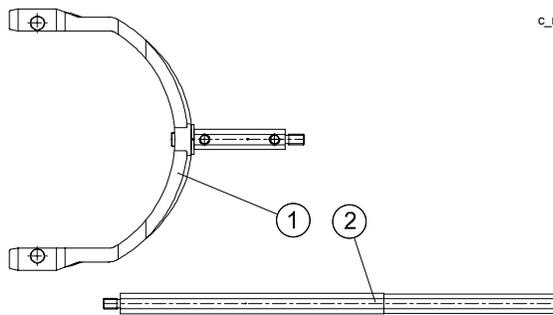
It is recommended to contact a service agency authorised by the manufacturer. Especially trained personnel are able to ensure safe lowering of the load.



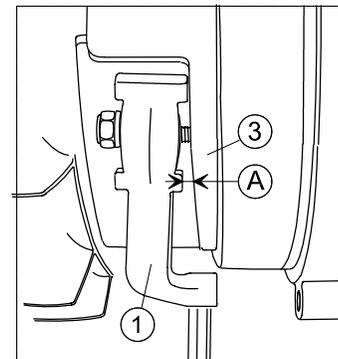
In hoists models equipped with a second brake (optional), the second brake must be detached before installing brake release fork to the main brake.



In hoist models equipped with 2 hoisting motors (and thus 2 main brakes), both brakes must be manually opened with levers simultaneously. This action requires 2 persons to carry out.



c_mobr1b



- 1. fork lever (assembled to hoisting motor brake)
- 2. lever arm
- 3. brake frame
- A. gap, (>1.8 mm)

5.11.1 Assembling the manual brake release

- Ensure that the fork lever (1) can move freely. Gap (A) between fork the lever (1) and brake frame (3) must be at least 1.8 mm.
- Screw the lever arm (2) into fork lever (1).



In hoists with drum Ø 406mm and drum length H (1250mm) or J (1600 mm), the brake is installed in the end of gearbox.



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5.11.2 Brake release usage instructions



Secure the area under and around the hoist. Warn the personnel on the shop floor and the supervisors about the intended action



Make sure the area under the hoist is free of obstacles.



Beware that the motor rotational speed does not exceed the rated rotational speed.



Ensure that the brake's temperature does not increase uncontrolled

Lower the load as follow:

- Pull the lever arm carefully to open the brake and release immediately when motor starts to rotate.
- Pull and release a few times to study how the rotational speed is growing.
- Once known how the rotational speed behaves, open the brake shortly and close again before the rotational speed reaches the maximum.
- Let the brake cool down for at least one minute after five times manually opening the brake.



When the brake's temperature exceeds 100 °C (water drop boils), let it cool down for a longer period at higher intervals (e.g. after 4 times opening the brake). Overheating the brake will damage the friction material and the load may drop.

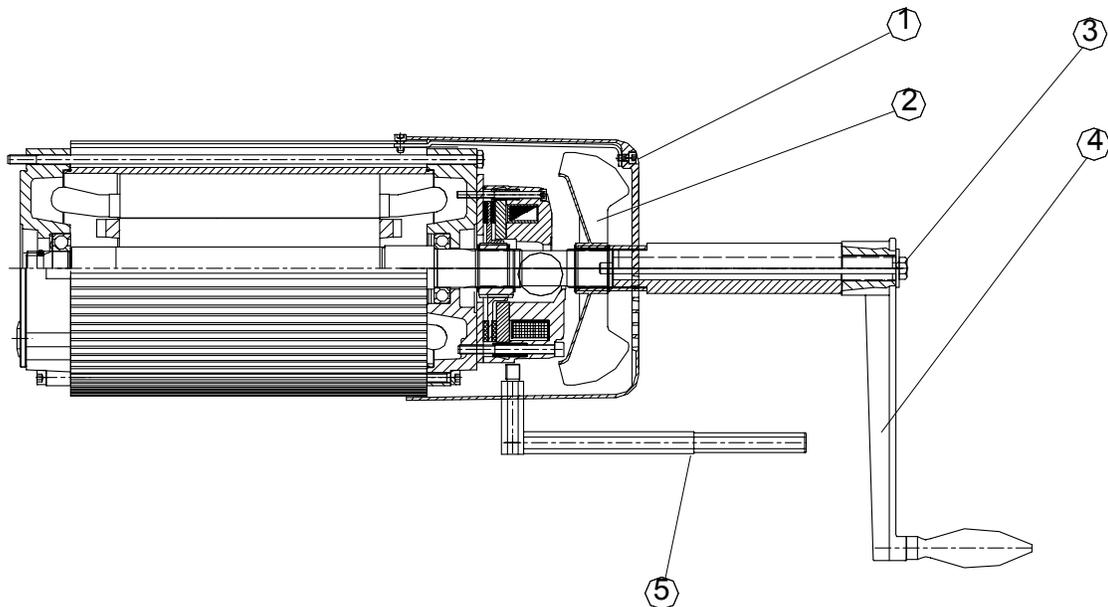
- Repeat the procedure until the load is lowered safely to the floor.

5.12 Manual crank

Manual brake release and manual crank is used to move the load in case of power failure.



In hoist models equipped with 2 hoisting motors (and thus 2 main brakes), both brakes must be manually opened with levers simultaneously and both motors must be equipped with a crank. This action requires 2 persons to carry out.



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5.12.1 Assembling the manual crank

- Switch OFF the power supply to the hoist
- Remove fan cover (1)
- Remove retainer ring and fan (2)
- Install the crank (4) onto shaft gearing and tighten with bolt (3) to the shaft's centre thread.
- Screw the lever arm (5) into fork lever.



Hoist with 406 mm drum diameter and drum length H (1250mm) and J (1600 mm) the brake is installed in the end of gearbox. Fork lever and crank should be assembled here.

5.12.2 Operating the manual crank



It is preferred to use the manual crank only for lifting the load, or lowering very small loads. Lowering heavy loads should be done by the manual brake release only (without the crank).

- Take strong hold to the crank by one hand
- Pull releasing lever (5) carefully with your another hand.
- Move load by rotating manual crank



Do not pull the lever too much and too abrupt, but open the brake with care. Sudden unsuspected rotation of the crank can cause serious injury!



Do not let the motor gain too high speed. Release the lever immediately (closing the brake) in case the motor, and thus the crank, starts rotating too fast or when the force to the crank becomes too big for you too hold under control.



Do not let go of the crank before the brake is closed

5.12.3 Before normal operation of the hoist

- Remove manual crank (4)
- Remove the lever arm (5) from the lever
- Install fan and retainer ring (2)
- Install fan cover (1)
- Switch ON the power supply to the hoist

5.12.4 Assembly

For assembly instructions of the hoisting motor, refer to the section **“Hoisting machinery, assembly”** and follow the instructions for removing and re-assembling the brake.



In those models where the motor is located inside the drum, it is not possible to remove the brake wires without extracting the complete motor-gearbox subassembly from the drum. In this case, it is advised to cut the brake wires near the brake, and re-connect the wires to the new brake with a proper screw- or shrink-connector. Do not use a plug-connection!



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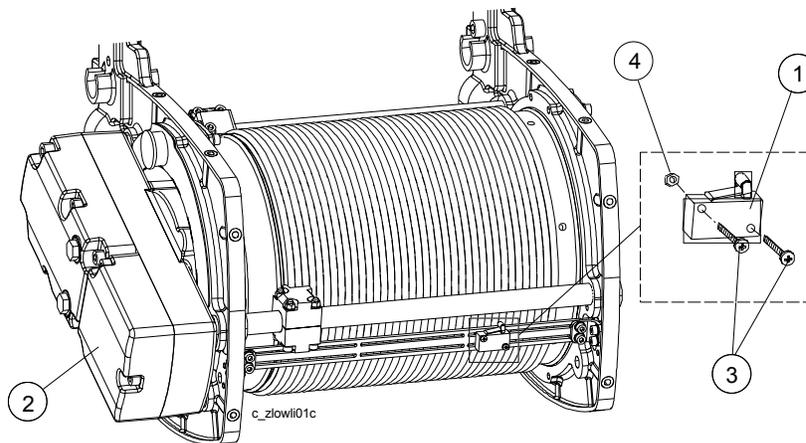
5.13 Hoisting limit switch Drum size ϕ 243 mm

The roller lever limit switch unit for hoisting is located under the drum cover, on the limit switch fixing plate.

5.13.1 Service

- Check the proper tripping point of lower limit function.
- Check that the locking screws (3) are tight.
- Check the wiring for loose connections.

Assembly



1. Hoist limit switch
2. Connection box cover
3. Fixing screws for limit switch
4. Fixing nut

Disassembly:

- Switch OFF the power supply to the hoist.
- Remove the connection-box cover (2).
- Remove the wires from the limit switch connector in the connection-box.
- Remove the fixing screws (3).
- Extract the limit switch (1).

Re-assembly:

- Fit the limit switch carefully in its place, so that the roller lever is in correct position and in front of the limit switch fixing plate.
- Tighten the fixing screws (3)
- Re-connect the wires.
- Switch ON the power supply to the hoist and check the proper functioning of the limit switch.



In many cases it is necessary to re-adjust the limit switch. Be aware of incorrect settings during testing the operation.



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Adjustment

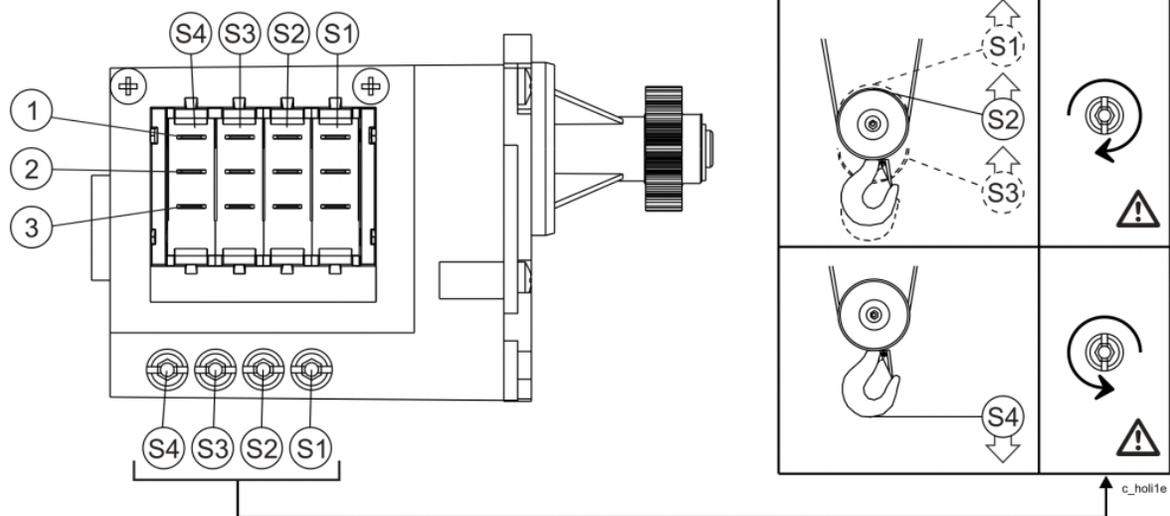
- Lower the hook to approx. 100mm above the floor.
- Loosen the fixing screws (3).
- Move limit switch along the fixing plate until the limit roller lever switch is just activated.
- Tighten the fixing screws and test the operation. The downwards motion must stop at the described distance.
- Repeat step 1...4 until the correct setting is achieved.
- Re-assemble drum cover and close the connection-box.



Make sure that there is at least 5 turns of the rope left on the drum when the hook is at the lowest position. Otherwise rope guide and rope clamp could interfere and damage.

5.14 Hoisting limit switch (new, white)

The rotary hoist limit switch contains four contacts, with the below described default functions. The rotary limit switch unit for hoisting is located in the connection box on the hoisting gearbox.



S1. Supervision limit for phase sequence of hoisting (or hoisting safety limit).

S2. Upper limit of hoisting.

S3. Slowdown limit switch for hoisting.

S4. Lower limit for hoisting.

1. NC contact

2. NO contact

3. Common contact

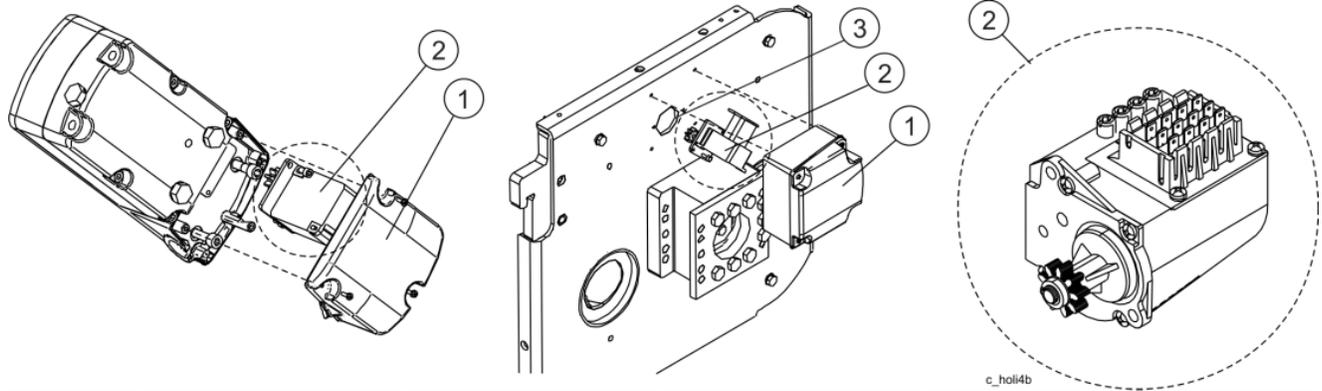


Notice the right direction of adjusting screw rotation

5.14.1 Service

- Check the proper tripping point of all limiting functions.
- Check the wiring for loose connections.

5.14.2 Assembly



1. Hoist limit switch
2. Connection-box cover
3. Fixing screws limit switch

Disassembly:

- Switch OFF the power supply to the hoist.
- Remove the connection-box cover (2).
- Remove the wires from the limit switch.
- Remove the fixing screws (3).
- Extract the limit switch (1).

Re-assembly:

- Fit the limit switch carefully in its place, so that the pinion fits into the gear-rim of the drum.
- Tighten the fixing screws (3)
- Re-connect the wires.
- Switch ON the power supply to the hoist and check the proper functioning of the limit switch.

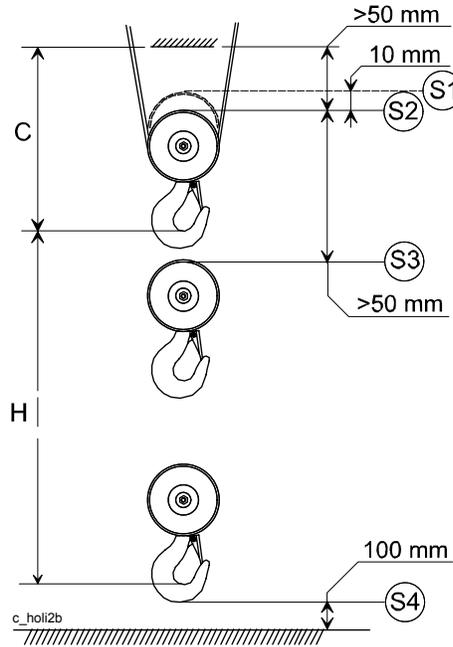


In many cases it is necessary to re-adjust the limit switch. Be aware of incorrect settings during testing the operation.



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5.14.3 Adjustment



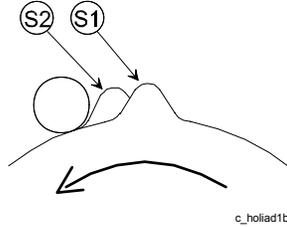
- S1. Measurement for phase sequence supervision limit
- S2. Measurement for upper limit of hoisting
- S3. Measurement for slowdown limit of hoisting
- S4. Measurement for lower limit of hoisting
- C. Minimum distance of hook from bearing surface of hoist travel wheel
- H. Maximum lifting height

- Lower the hook to approx. 100mm above the floor.
- Turn the screw "S4" until the limit switch "S4" is just activated.
- Test the operation. The downward motion must stop at the described distance.
- Raise the hook until the top of the hook-block is approx. 100mm under the bottom flange of the main girder or other fixed structure.
- Turn the screw "S3" until the limit switch "S3" is just activated.
- Test the operation. The upward motion must slow down to Low speed at the described distance.
- Raise the hook until the top of the hook-block is approx. 50mm under the bottom flange of the main girder or other fixed structure.
- Turn the screw "S2" until the limit switch "S2" is just activated.
- Test the operation. The upward motion must stop at the described distance.
- Raise the hook to the up most position, until the motion is stopped by the upper limit switch "S2".



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- Turn the screw “S1” so that it will activate **just after** “S2” (in upwards direction).



- Close the connection-box.

5.14.4 Fine adjustment

If maximum height of lift is needed, fine-tune the upper and lower limit of hoisting.



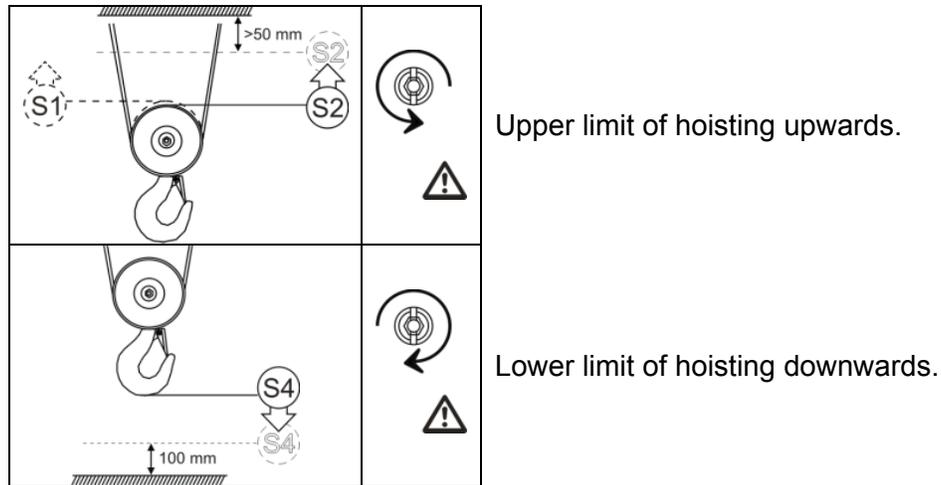
Do not exceed the minimum distances



Notice the right direction of adjusting screw rotation



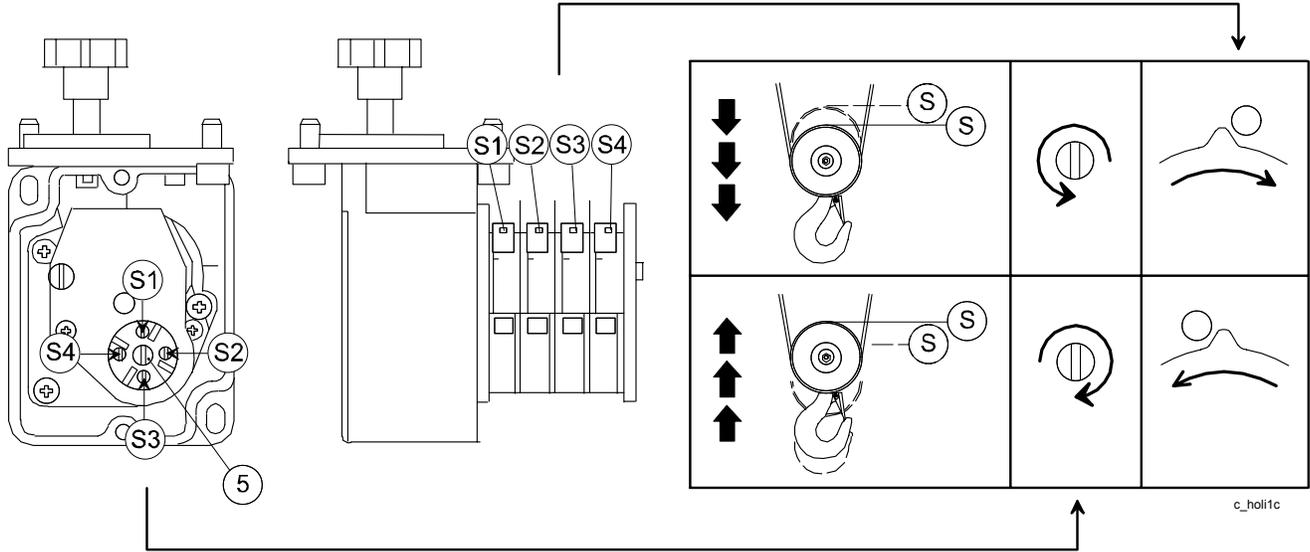
Readjust “S1”, if “S2” is fine-tuned



- S1. Supervision limit for phase sequence of hoisting (or hoisting safety limit).
- S2. Upper limit of hoisting.
- S3. Slowdown limit switch for hoisting.
- S4. Lower limit of hoisting.

5.15 Hoisting limit switch (old, black)

The rotary hoist limit switch contains four contacts, with the below described default functions. The rotary limit switch unit for hoisting is located in the connection box on the hoisting gearbox.



- S1. Supervision limit for phase sequence of hoisting (or hoisting safety limit).
- S2. Upper limit of hoisting.
- S3. Slowdown limit switch for hoisting.
- S4. Lower limit for hoisting.
- 5. Locking screw for adjustment mechanism.

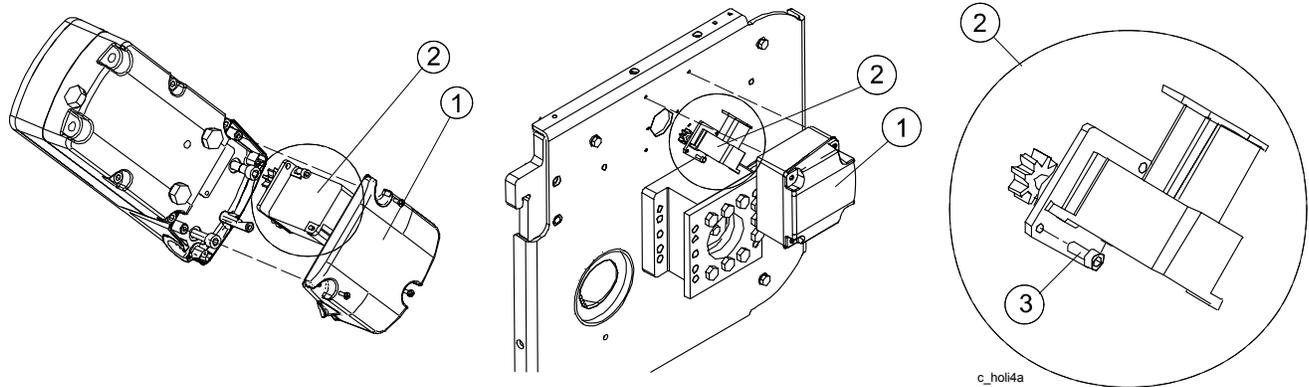
5.15.1 Service

- Check the proper tripping point of all limiting functions.
- Check that the locking screw (5) is tight.
- Check the wiring for loose connections.



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5.15.2 Assembly



1. Hoist limit switch
2. Connection-box cover
3. Fixing screws limit switch

Disassembly:

- Switch OFF the power supply to the hoist.
- Remove the connection-box cover (2).
- Remove the wires from the limit switch.
- Remove the fixing screws (3).
- Extract the limit switch (1).

Re-assembly:

- Fit the limit switch carefully in its place, so that the pinion fits into the gear-rim of the drum.
- Tighten the fixing screws (3)
- Re-connect the wires.
- Switch ON the power supply to the hoist and check the proper functioning of the limit switch.

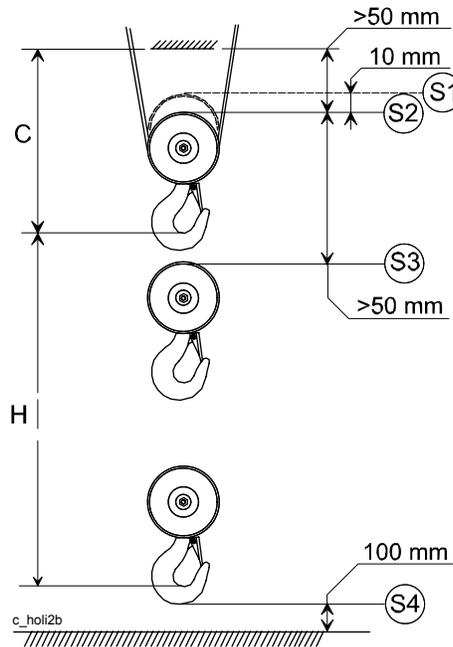


In many cases it is necessary to re-adjust the limit switch. Be aware of incorrect settings during testing the operation.



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5.15.3 Adjustment



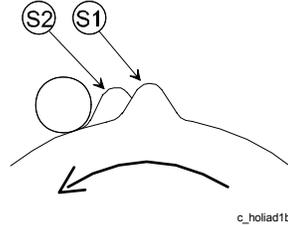
- S1. Measurement for phase sequence supervision limit
- S2. Measurement for upper limit of hoisting
- S3. Measurement for slowdown limit of hoisting
- S4. Measurement for lower limit of hoisting
- C. Minimum distance of hook from bearing surface of hoist travel wheel
- H. Maximum lifting height

- Lower the hook to approx. 100mm above the floor.
- Loosen the locking screw (5)
- Turn the screw "S4" until the limit switch "S4" is just activated.
- Tighten the locking screw and test the operation. The downwards motion must stop at the described distance.
- Repeat step 1...4 until the correct setting is achieved.
- Raise the hook until the top of the hook-block is approx. 100mm under the bottom flange of the main girder or other fixed structure.
- Loosen the locking screw (5)
- Turn the screw "S3" until the limit switch "S3" is just activated.
- Tighten the locking screw and test the operation. The upwards motion must slow down to Low speed at the described distance.
- Repeat step 6...9 until the correct setting is achieved.
- Raise the hook until the top of the hook-block is approx. 50mm under the bottom flange of the main girder or other fixed structure.
- Loosen the locking screw (5)
- Turn the screw "S2" until the limit switch "S2" is just activated.
- Tighten the locking screw and test the operation. The upwards motion must stop at the described distance.
- Repeat step 11...14 until the correct setting is achieved.



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- Raise the hook to the upmost position, until the motion is stopped by the upper limit switch “S2”.
- Loosen the locking screw (5)
- Turn the screw “S1” so that it will activate **just after** “S2” (in upwards direction).

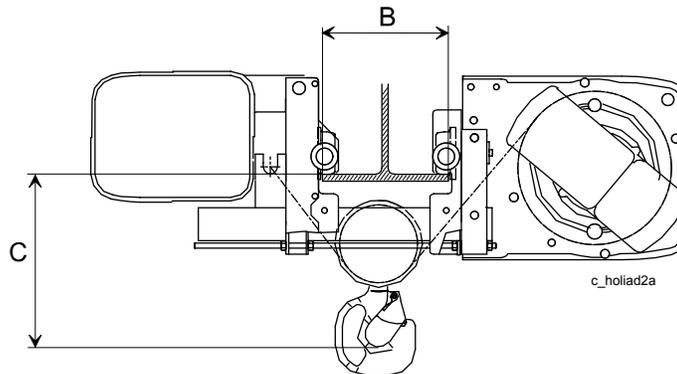


- Tighten the locking screw and close the connection-box.



In Low Headroom models, the C-dimension depends on the wheel-gauge of the trolley!

When the B-dimension increases, the fleet angle of the ropes with the hook in the upmost position changes accordingly. To avoid overloading the ropes, overload device, return sheaves and other structures, the minimum C-dimension may not be smaller than the dimensions as below.



C-dimensions for Low Headroom Trolley, drum diameter 303 mm

Rope reeving 02 (Standard hook with RSN1 hook forging), nominal load 1600kg

B [mm]	80-230	250	300	350	400	450	500	550	600	650	690
Min. C [mm]	375	390	420	450	480	510	540	570	605	635	660

Rope reeving 04 (Standard hook with HBC1.6 hook forging), load 2880kg (90%*nominal load)

B [mm]	80	100	130-320	350	400	450	500	550	600	650	690
Min. C [mm]	350	340	325	340	365	390	415	440	465	490	510

Rope reeving 04 (Standard hook with HBC1.6 hook forging), nominal load 3200kg

B [mm]	80	100	130-240	300	350	400	450	500	550	600	650	690
Min. C [mm]	350	340	325	365	400	435	470	500	535	570	600	630

C-dimensions for Low Headroom Trolley, drum diameter 355 mm

Rope reeving A2 (Standard hook with RSN1 hook forging), nominal load 1600kg

B [mm]	100-253	300	350	400	450	490
Min. C [mm]	410	440	470	505	535	560

Rope reeving A4 (Standard hook with HBC1.6 hook forging), nominal load 3200kg



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B [mm]	100	120-240	300	350	400	450	490
Min. C [mm]	350	340	380	415	450	480	510

Rope reeving 02 (Standard hook with RSN1 hook forging), nominal load 2500kg

B [mm]	100-253	300	350	400	450	500	550	600	650	690
Min. C [mm]	435	465	500	530	560	595	625	660	690	715

Rope reeving 04 (Standard hook with HBC2.5 hook forging), nominal load 5000kg

B [mm]	100	150	200	260-305	350	400	450	500	550	600	650	690
Min. C [mm]	490	470	450	420	450	485	520	550	585	620	650	680

Rope reeving 04 (Special hook with HBC2.5 hook forging), nominal load 6300kg

B [mm]	100	150	200	260-305	350	400	450	500	550	600	650	690
Min. C [mm]	505	485	465	435	465	500	535	565	600	635	665	695

C-dimensions for Low Headroom Trolley, drum diameter 406 mm

Rope reeving 02 (Standard hook with HBC2.5 hook forging), nominal load 5000kg

B [mm]	100	150	200	250	290-430	450	500	550	600	610
Min. C [mm]	630	615	600	585	570	585	615	645	680	685

Rope reeving 04 (Standard hook with HBC5 hook forging), nominal load 10000kg

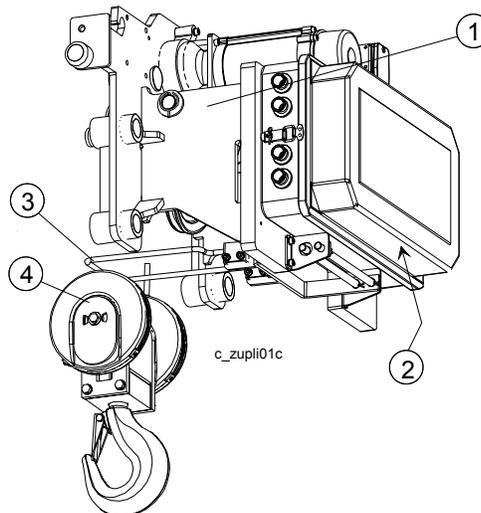
B [mm]	100	150	200	250	290-430	450	500	550	600	610
Min. C [mm]	610	595	575	555	530	555	585	620	650	655

Rope reeving 04 (Special hook with HBC5 hook forging), nominal load 12500kg

B [mm]	100	150	200	250	290-430	450	500	550	600	610
Min. C [mm]	655	640	620	600	585	600	635	665	700	705

5.16 Hook operated upper limit switch (ø 243 mm)

Hook operated limit switch has 2 steps, normal limit switch and extra safety limit switch. In first step limit switch trips hoisting movement when hook reaches the adjustable lever. Hoisting movement is possible again after tripping as soon as hook has been lowered from the switching area. Safety switch is safety switch will cut the main power if normal switch fails. In this case hoisting or lowering is not possible, until the reason for limit switch failure has been solved.



- 1. Hoist
- 2. Limit switch inside the electric panel
- 3. Limit switch lever
- 4. Hook



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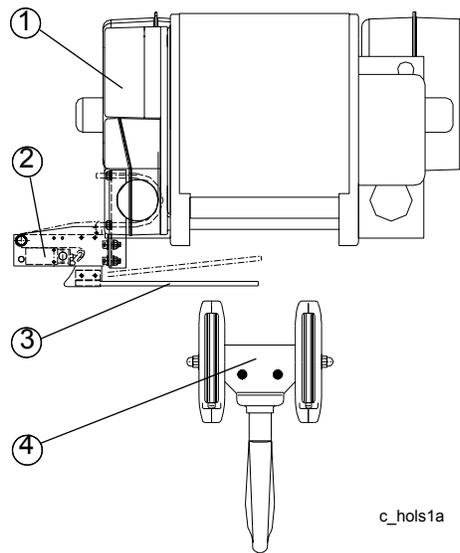
5.16.1 Service

- Check the proper tripping point of upper limit function.
- Test safety limit switch function manually monthly.
- Check the wiring for loose connections.

5.17 Hook operated control limit switch (ø 303, 355, 406, 608 mm)

Hook operated limit switch trips hoisting movement when hook reaches the adjustable lever. Hook operated limit switch can be automatic reset or manually reset. With automatic reset hoisting movement is possible again after tripping as soon as hook has been lowered from the switching area. Hook operated limit switch with automatic reset can be used as a working limit before standard upper limit tripping height.

With manual reset hoisting movement is not possible before limit switch has been manually re-activated. Hook operated limit switch with manual reset can be used as a back-up switch for the standard upper limit. When manual reset limit is used as back-up switch and switch stops the hoisting movement, function of rotating limit switch have to be checked and corrected before using the hoist again. Hook operated limit switch increases hook approach (hook-rail distance).



c_hols1a

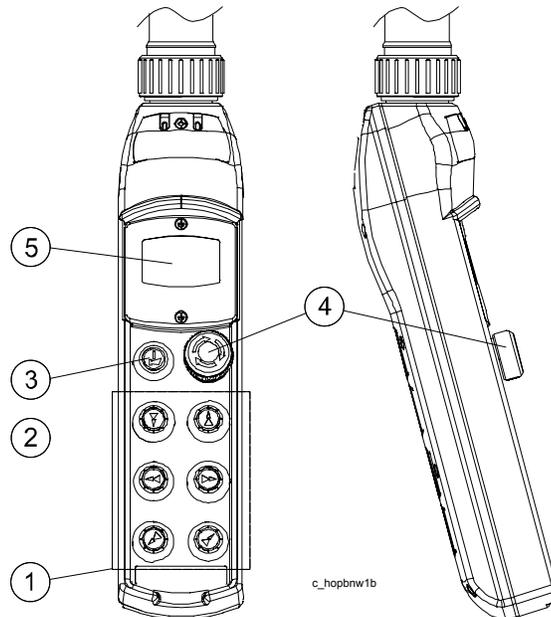
1. Hoist
2. Limit switch
3. Limit switch lever
4. Hook

5.18 Pushbutton controller

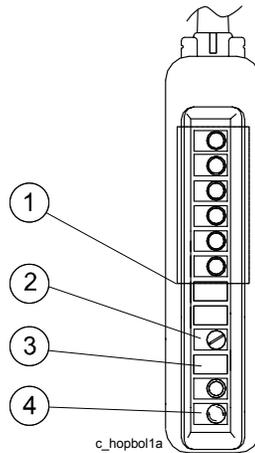
Operating instructions for pushbutton controller are described in section ***“Using the pushbutton controller”***.



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1. Movement pushbuttons
2. Hoist selection pushbutton (only if pushbutton controls several hoists)
3. On pushbutton and warning signal
4. Emergency stop pushbutton
5. Display (optional)



1. Movement pushbuttons
2. Hoist selection pushbutton (only if pushbutton controls several hoists)
3. On pushbutton and warning signal
4. Emergency stop pushbutton

5.18.1 Service

- Switch OFF the power supply to the hoist.
- Open the pushbutton controller.



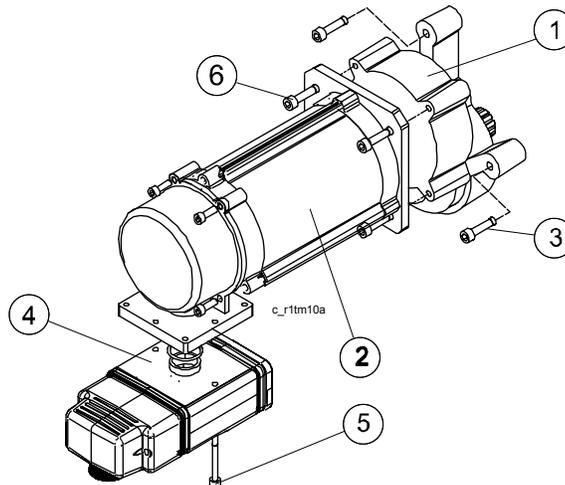
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- Check the wires for loose connection.
- Check that the switch-elements are in good condition and not loose.
- Check the pushbutton rubbers, emergency stop button and other eventual selector switches are in good condition.
- Check the cable entry and the plug (if applicable) are tight and in good condition.
- Close the pushbutton controller.
- Check the buttons move freely and do not stick.
- Switch ON the power supply to the hoist and check all functions.
- Check the display readings (if applicable)

5.19 Travelling machinery

The travelling machinery provides the cross-travelling motion of the trolley. The traveling machinery consists of a squirrel-cage motor and a gearbox. The motor can be either a 2-speed motor, controlled by contactors or a 1-speed motor controlled by an inverter. The 1-speed motors have a built-in compact brake, whereas the 2-speed motors are equipped with an external electro-mechanical brake. The gearbox comprises multistage spur gear transmission, running in grease lubrication. When used in conformance with the operating group classification of the hoist, the gearbox lubricant does not need to be changed during the Safe Working Period (SWP). If the hoist is operated in extremely cold conditions, the factory-installed grease must be replaced with synthetic transmission grease. Refer to the section “**Lubricants**” for further instructions.

Low Headroom & Normal Headroom trolleys

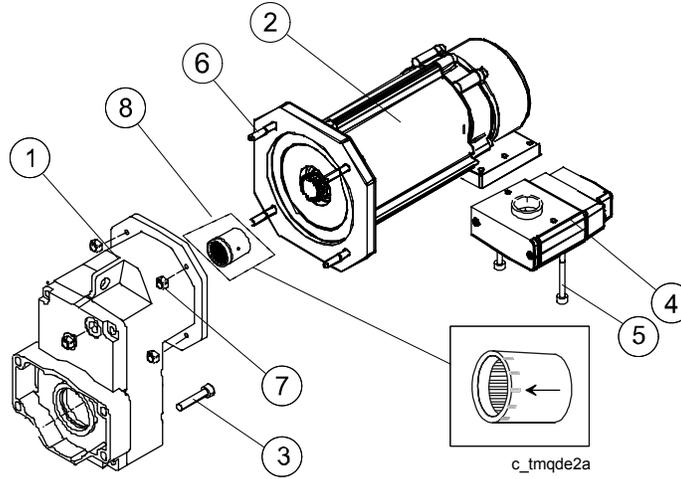


1. Gear
2. Motor
3. Gearbox fixing screws.
4. Junction box
5. Junction box fixing screws
6. Motor fixing screws



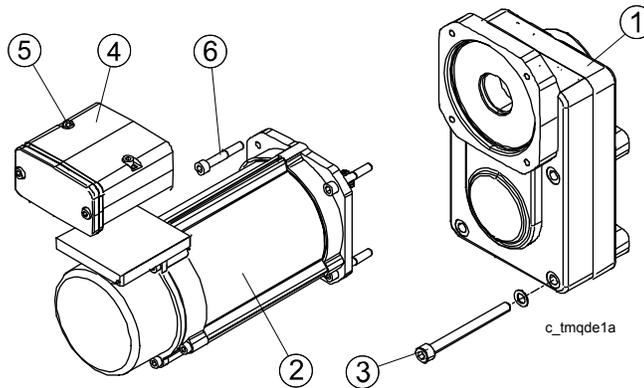
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Double girder trolleys, drum size ϕ 303/355/406 mm



1. Gear
2. Motor
3. Gearbox fixing screws.
4. Junction box
5. Junction box fixing screws
6. Motor fixing screws
7. Securing nuts
8. Coupling

Double girder trolleys, drum size ϕ 608 mm



1. Gear
2. Motor
3. Gearbox fixing screws.
4. Junction box
5. Junction box fixing screws
6. Motor fixing screws



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5.19.1 Service

5.19.1.1 *Traveling motor*

- Check that the traveling motor operates properly when loaded.
- Check for any excessive noise, vibration and/or heat.
- Clean the cooling-ribs surface when needed.

5.19.1.2 *Traveling gearbox*

- Check the gearbox visually for leakage.
- In case the gearbox shows signs of excessive leakage, find the reason for this and replace the worn part, or the complete gearbox.
- Check the breather-plug (if applicable) breaths freely and clean if needed.
- Check for any excessive vibration and/or noise.



If the factory-installed grease is topped up with a different lubricant, ensure that the lubricant is compatible. Refer to the section “**Lubricants**” for further instructions.

5.19.1.3 *Traveling brake*

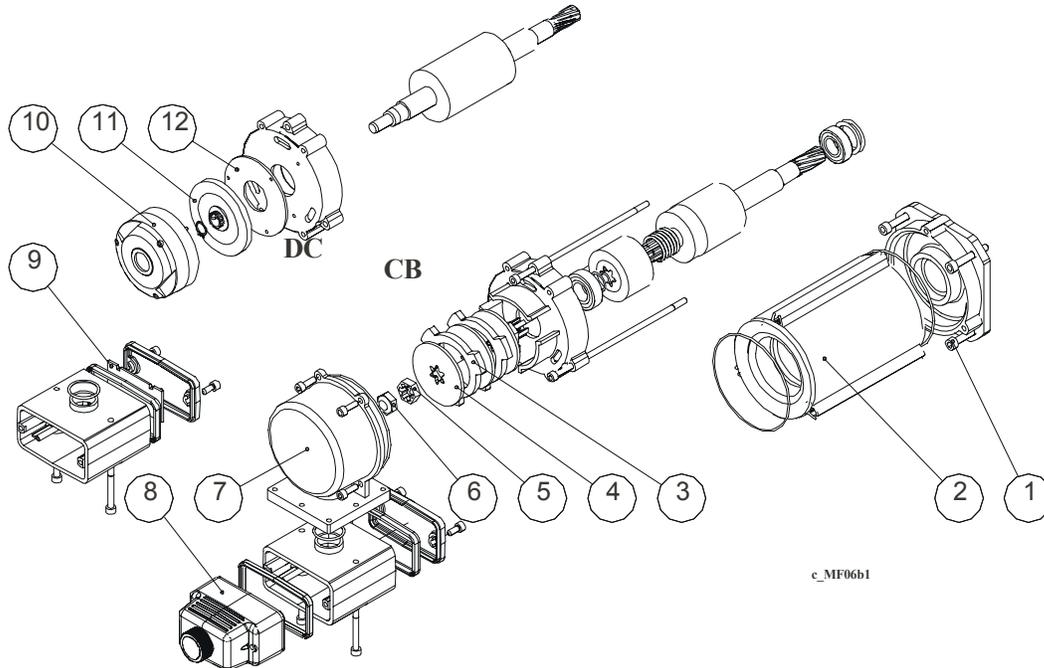
- Remove the end-cap of the motor.
- Check the air gap of the brake.



If the air gap is greater than 0,2...0,3 mm, the brake disc may be worn out. Check the thickness of the brake disc.

- Adjust the air gap when needed.
- Remove dust and dirt from the brake.
- Close the end-cap and check the proper functioning.

5.20 MF06 Travelling motor with Compact- / DC-brake



c_MF06b1

- DC. DC-brake
 CB. Compact brake
1. Fixing screws for travelling gear
 2. Travelling motor
 3. Friction disc
 4. Brake discs
 5. Aluminium ring
 6. Adjustment nut for brake air gap (self-locking)
 7. Motor cover
 8. Power supply plug
 9. Rectifier (DC brake motor)
 10. Brake (DC brake motor)
 11. Brake disc (DC brake motor)
 12. Friction plate (DC brake motor)

5.20.1 Adjustment of Compact-brake air gap

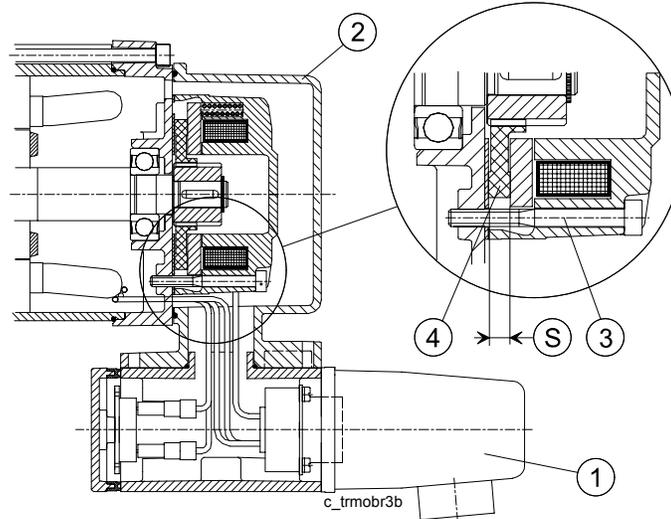
- Ensure there is no danger of live voltage.
- Remove the power supply plug (8) for the travelling machinery.
- Open the motor cover (7).
- Push the brake disk (4) and measure the air gap between the adjustment nut (6) and aluminium ring (5). The air gap have to be 0.2 - 0.3 mm. If needed adjust the air gap using the adjustment nut (6).
- Fasten the motor cover (7) and the power supply plug (8).

5.20.2 Removing the Compact-brake

- Ensure there is no danger of live voltage.
- Remove the power supply plug (8) for the travelling machinery.
- Open the motor cover (7).

- Unscrew the adjustment nut (6) for the brake air gap.
- Extract the brake parts. If the thickness of the friction material is less than 5 mm, replace all the brake parts.
- Re-assemble in the reverse sequence.
- Adjust the brake air gap. Refer to the section 'Adjustment of Compact-brake air gap'.

5.20.3 Removing DC-brake and inspection of brake friction disc



1. Power supply plug
2. Motor cover
3. Brake fixing screws
4. Brake friction disc
- S. Thickness of brake friction disc

- Ensure there is no danger of live voltage.
- Remove the power supply plug (1) for the travelling machinery.
- Open the motor cover (2).
- Unscrew the brake fixing screws (3).
- Check the brake type on the rating plate fixed to the brake. Measure the thickness of the brake disc (4). Replace the brake disc if it has worn thin.

Brake type and size	Min. thickness of brake disc	Tightening torque for brake fixing screws
NM38710NR#, 2 Nm	5.8 mm	2.5 Nm / 1.8 lbf.ft
NM38711NR#, 4 Nm	5.95 mm	2.5 Nm / 1.8 lbf.ft

- Re-assemble in the reverse sequence.



Tighten the fixing screws of the brake to the correct tightening torque.

5.20.4 Dismounting the travelling motor

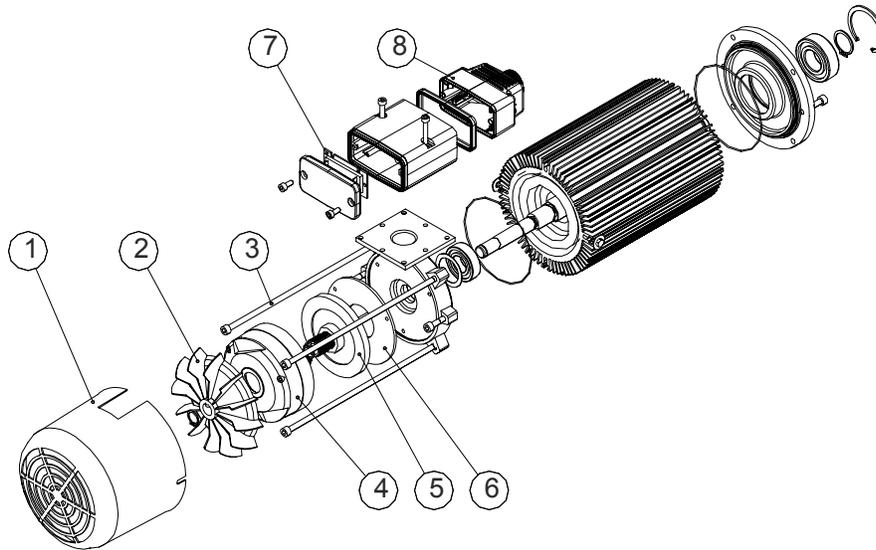
- Ensure there is no danger of live voltage.
- Remove the power supply plug (8) for the travelling machinery.
- Unscrew the fixing screws (1) for the motor.



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- Detach the motor from the gearbox.
- Re-assemble in the reverse sequence.

5.21 MF07 and MF10 Travelling motor



1. Fan cover
2. Fan / Flywheel
3. Fixing screws for motor
4. Brake
5. Brake disc
6. Friction plate
7. Rectifier
8. Power supply plug

5.21.1 Removing DC-brake and inspection of brake friction disc

- Ensure there is no danger of live voltage.
- Remove the power supply plug (8) for the travelling machinery.
- Open the motor cover (1).
- Remove the fan (2).
- Unscrew the brake fixing screws.
- Check the brake type on the rating plate fixed to the brake. Measure the thickness of the brake disc (5). Replace the brake disc if it has worn thin.

Brake type and size	Min. thickness of brake disc	Tightening torque for brake fixing screws
NM38770NR#, 16 Nm	6.8 mm	5 Nm / 3.7 lbf.ft
NM38771NR#, 8 Nm	6.65 mm	5 Nm / 3.7 lbf.ft
NM38720NR#, 21 Nm	7.6 mm	9 Nm / 6.6 lbf.ft

- Re-assemble in the reverse sequence.



Tighten the fixing screws of the brake to the correct tightening torque.



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5.21.2 Dismounting the travelling motor

- Ensure there is no danger of live voltage.
- Remove the power supply plug (8) for the travelling machinery.
- Unscrew the fixing screws (3) for the motor.
- Detach the motor from the gearbox.
- Re-assemble in the reverse sequence

5.22 Inverter for travel

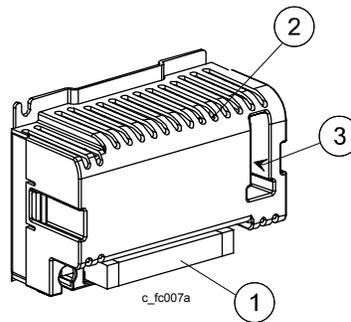
The electrical cubicle on the hoist contains a inverter that controls the speed of rotation of the travelling motor, according to the commands given by the operator.

The inverter has a signal LEDs (2) indicating its operating status and eventual malfunction.

The parameters of the inverter are pre-set at the factory, and usually do not require re-adjustment. In case re-adjustment is needed, please refer to the Service Manual of the respective inverter for details, or contact a representative of the manufacturer.

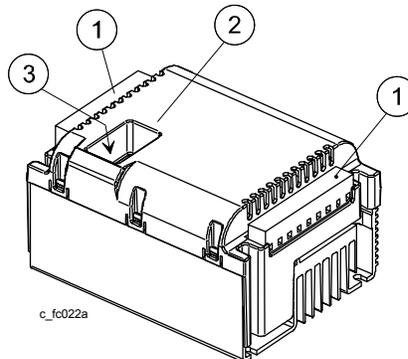
All electrical connections to the inverter are made via connector(s) (1).

0,7kW inverter



1. Connectors
2. Signal LEDs
3. Parameter switches

2,2kW inverter

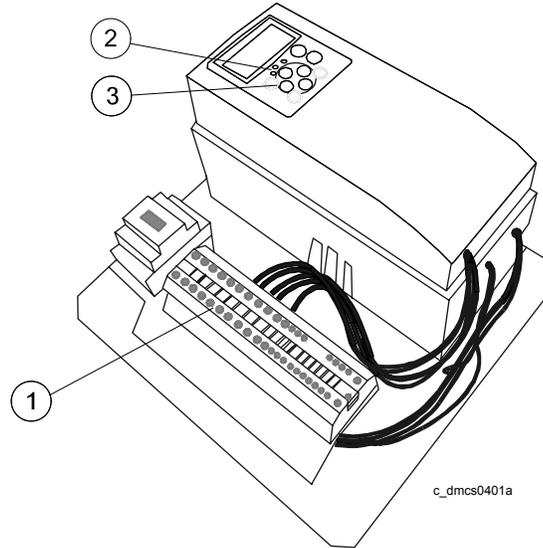


1. Connectors
2. Signal LEDs
3. Parameter switches



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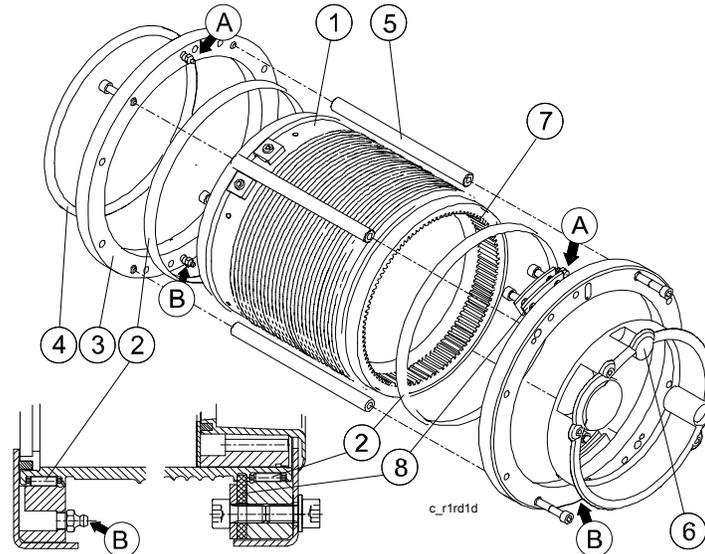
4 kW inverter



1. Connectors
2. Signal LEDs
3. Parameter switches

5.23 Rope drum

Drum size ϕ 243/303/355/406 mm



1. Rope drum
2. Bearing strips for rope drum
3. Bearing frame
4. Sealing
5. Connector rods for end flanges of rope drum
6. Rim gear cover and inspection hole
7. Rim gear
8. Drum axial locking part
- A. Lubrication point for drum bearing
- B. Lubrication point for drum bearing

5.23.1 Service, drum size ϕ 243/303/355/406 mm

- Check the proper rotation of rope drum with and without load. Pay attention to running sound of rope drum bearings and check that the rope drum does not touch with machinery end plates.
- Lower the hook to the ground.
- Check the grooves of the drum.



Healthy grooves are smooth and do not have sharp edges. In case of doubt, unwind some more rope from the drum and compare the used grooves with unused grooves.

- Lubricate the drum surface.
- Check the drum axial locking parts (8) for wear. Replace the axial locking part with new one.
- Lubricate the groove in the drum, in which the axial locking part is located.
- Lubricate the drum bearing.



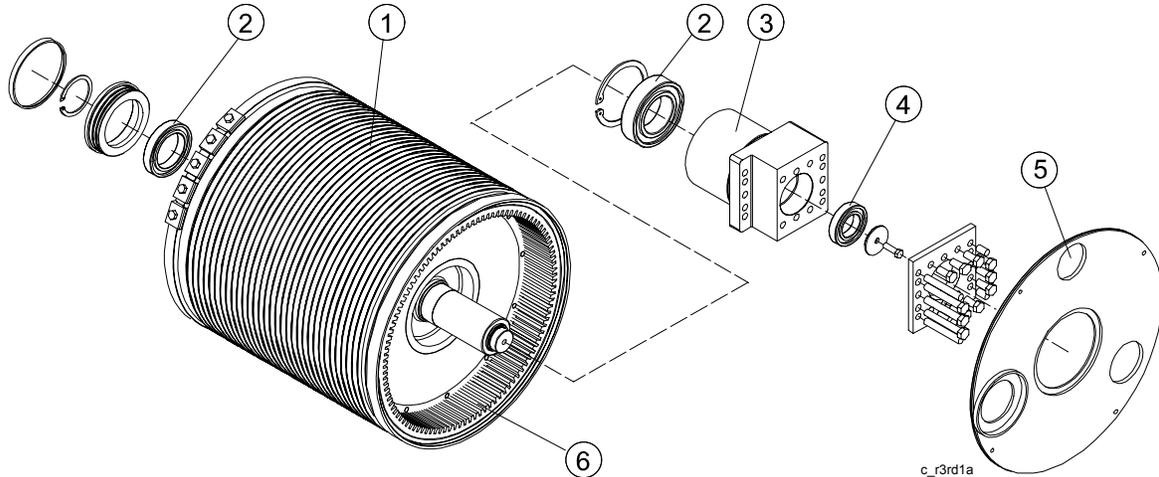
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Only lubricate the greasing points A OR B, but not both. During lubrication, the drum MUST rotate at least two complete rounds. Do not use excessive grease, as that may damage the bearings. Approximately two pumps of grease will suffice.

- Lubricate the gear-rim (7) through the inspection hole (6)

Drum size ϕ 608 mm



1. Rope drum
2. Bearing
3. Bearing frame
4. Sealing
5. Cover and inspection hole
6. Rim gear

5.23.2 Service, drum size ϕ 608 mm

- Lower the hook to the ground.
- Check the grooves of the drum.



Healthy grooves are smooth and do not have sharp edges. In case of doubt, unwind some more rope from the drum and compare the used grooves with unused grooves.

- Lubricate the drum surface.
- Lubricate the gear-rim (6) through the inspection hole (5)

5.23.3 Drum wear inspection

Wear shall be defined with help of drum circumference measure.

Drum diameter	243 mm	303 mm	355 mm	406 mm	406 mm	608 mm	608 mm	608 mm
Reeving				R0x	R2x	R0x	R2x	R2x
Nominal dimension								
D1 = Drum groove bottom diameter	236,5 mm	297 mm	347 mm	395 mm	398 mm	593 mm	597 mm	593 mm



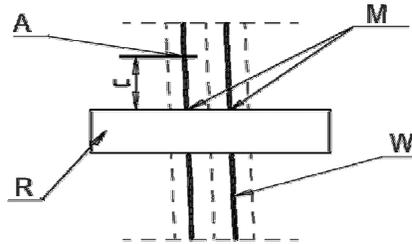
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D2 = Drum groove top diameter	242 mm	301,8 mm	353 mm	403,2 mm	404 mm	604,2 mm	605,2 mm	604,2 mm
D3 = Drum nominal diameter	243 mm	303 mm	355 mm	406 mm	406 mm	608 mm	608 mm	608 mm
P = Groove pitch	7,0 mm	7,2 mm	9,1 mm	12,5 mm	9,1 mm	17,1 mm	12,5 mm	17,1 mm
G = Groove depth	2,75 mm	2,4 mm	3,0 mm	4,1 mm	3,0 mm	5,6 mm	4,1 mm	5,6 mm
Drum groove circumference = $\Pi \times D1$	743 mm	933 mm	1090 mm	1241 mm	1250 mm	1863 mm	1876 mm	1863 mm
Acceptance criteria								
C = Circumference change, 0.4% of nominal	< 3,0 mm	< 3,7 mm	< 4,3 mm	< 5,0 mm	< 5,0 mm	< 7,4 mm	< 7,4 mm	< 7,4 mm
Groove depth change, 20% of nominal	< 0,6 mm	< 0,5 mm	< 0,6 mm	< 0,8 mm	< 0,6 mm	< 1,1 mm	< 0,8 mm	< 1,1 mm

Tools needed: caliper, tape ruler, square ruler, ruler (or flat bar), thin steel wire (piano wire or 0,8 .. 1,0 mm thickness welding wire).

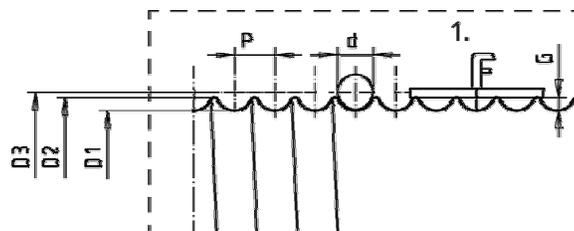
First measure reference circumference and groove depth on a drum area, which is not worn (= rope does not usually come out of the drum). Then do the same measures in at least 3 points on the drum where grooves are most worn.

Drum circumference



- Place min. 55 mm long ruler (R) or flat bar on the top of 3 grooves on the rope drum unworn area. Make sure by square ruler that the ruler is perpendicular to the grooves.
- Turn piano wire (W) one round around the rope drum on the bottom of the groove. Mark start and end points (M) on the wire by help of the ruler.
- Then mark the acceptance criteria (A) in the wire, to distance C mm from the end mark. When measuring worn grooves, compare the drum circumference to this mark. The maximum allowed difference in circumference between reference area and worn area is 0.4%.

Groove depth



- Place min. 55 mm long ruler or flat bar on the top of 3 grooves (1) on the rope drum unworn area
- Measure groove depth (G) placing caliper on the ruler.
- Repeat same measurement on the worn area of the drum.



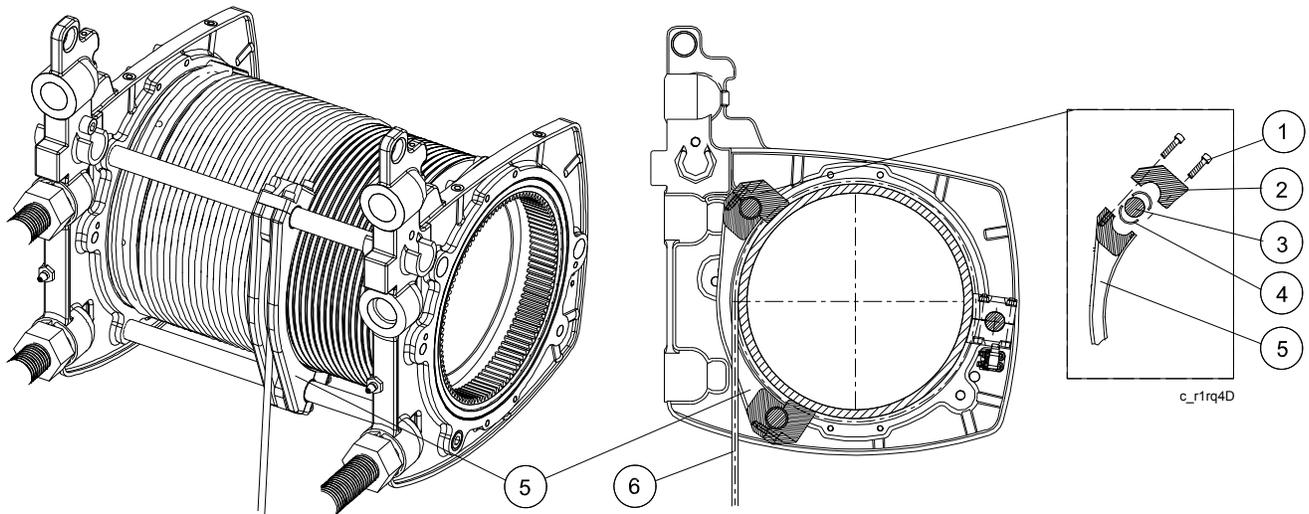
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- The maximum difference in groove depth between reference area and worn area is 20% of the nominal groove depth.

5.24 Rope guide

The rope guide ensures that the wire rope winds on the drum correctly and prevents the wire rope from jumping into the wrong groove.

Rope guide, drum size \varnothing 243 mm



1. Fixing screws
2. Bearing housing
3. Intermediate beam
4. Sleeve half
5. Rope guide
6. Rope

Assembly

- Put rope guide (5) on the intermediate beams
- Put the first halves of bearing sleeve (4) between rope guide (5) and intermediate beams (3).
- Put the second half of bearing to upper intermediate beam and install bearing housing (2) and fixing screws (1).
- Do the same to lower bearing.



Tighten the fixing screws and fixing nuts on all rope guides to the correct tightening torque. Refer to the section “Recommended tightening torques”. Inadequate or exceeded tightening might cause rope guide to failure in operation!



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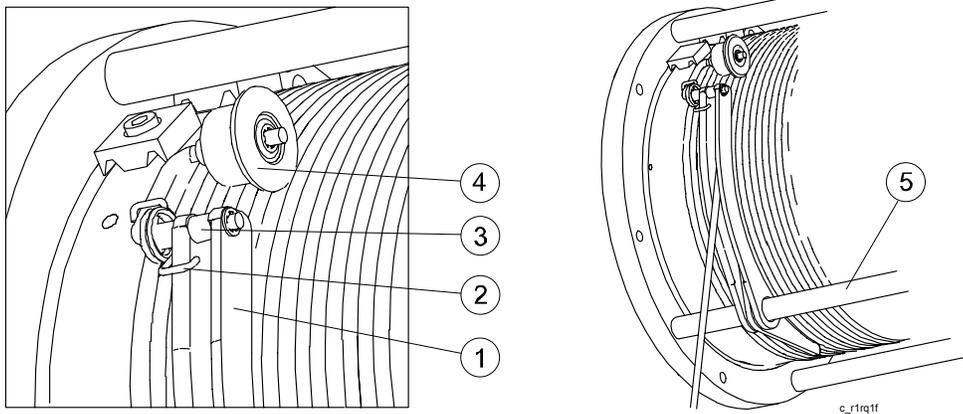
Disassembly

- Loosen fixing screws (1).
- Remove bearing housing and second half of sleeve on both ends of rope guide.
- Remove first halves of sleeves
- Remove rope guide



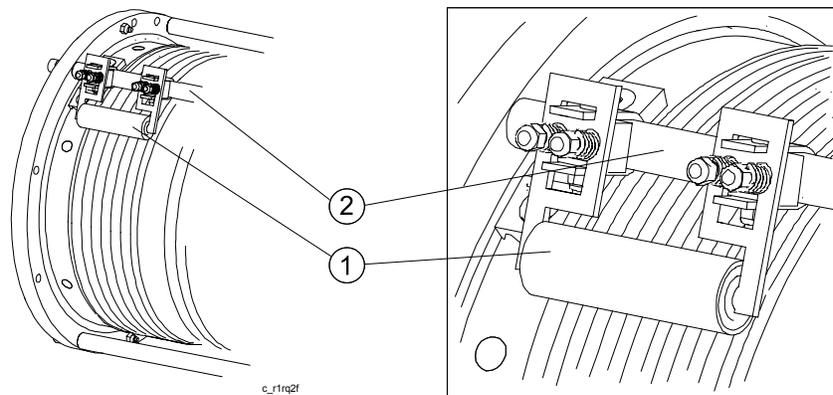
Note that 1 of 3 screws is longer, this should be located closest to the drum.

Rope guide, drum size \varnothing 303, 355, 406 mm



1. Rope guide
2. Rope press roll spring
3. Rope press roll axle
4. Rope press roll
5. Connector rod for end flanges of hoisting machinery

Pressure roller, machinery hoists

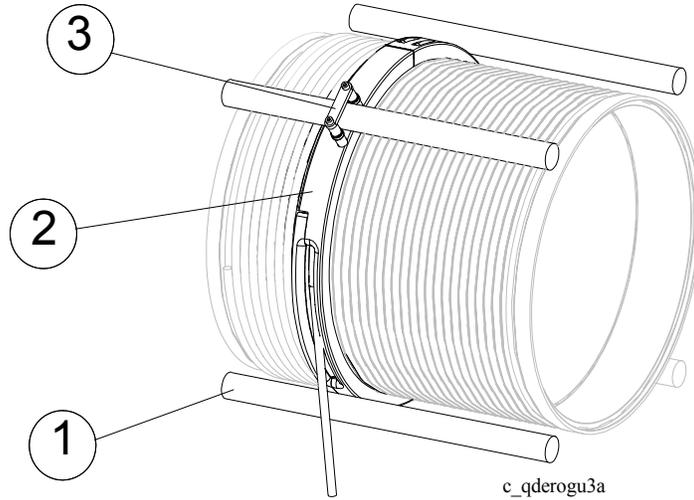


1. Rope press roll
2. Connector rod for end flanges of hoisting machinery



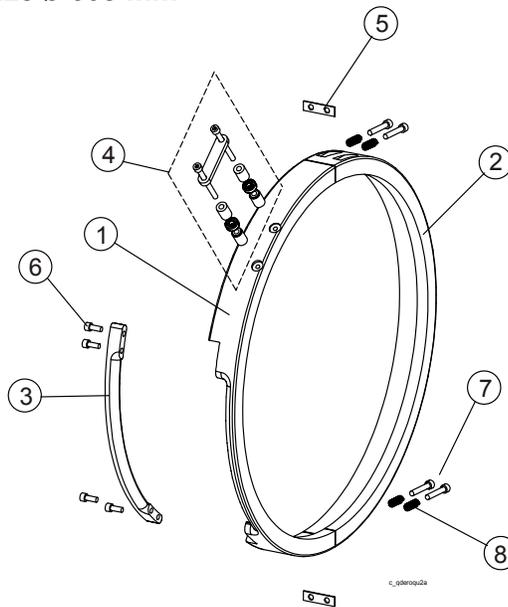
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Rope guide, drum size ϕ 608 mm



- 1. Connector rod for end flanges of hoisting machinery
- 2. Rope guide
- 3. Rotation support

Rope guide assembly, drum size ϕ 608 mm



- 1. Rim, front half
- 2. Rim, rear half
- 3. Rope slot locking bar
- 4. Rotation support
- 5. Rim spacer
- 6. Locking bar fixing screws
- 7. Rim fixing screws
- 8. Springs



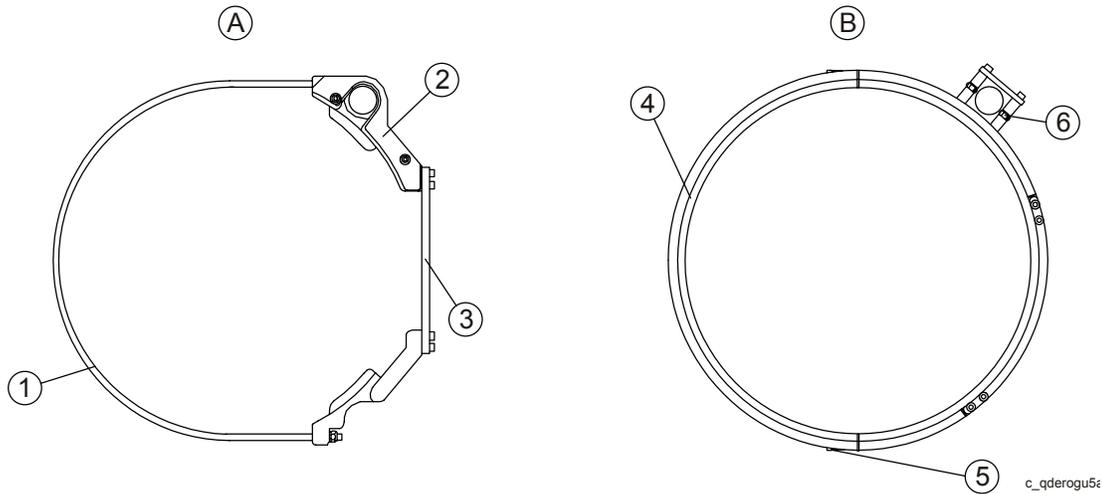
Fully disassemble the rope guide before installation



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Replacing an old style rope guide with a heavy-duty rope guide

When replacing an old style rope guide with a new style rope guide in true vertical lift hoist or machinery hoist, the hoisting limit switch setting for the hook's lower position may need re-adjusting to ensure safe operation. See the drawing below to identify the type of rope guide you have on the hoisting unit.

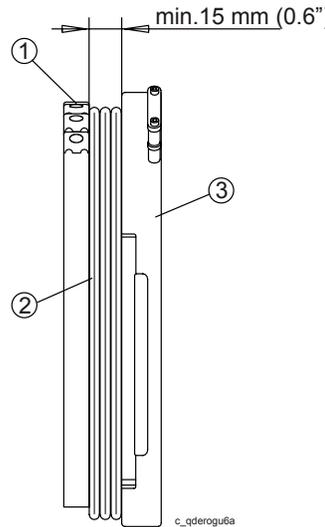


- A. Old style rope guide
- B. New style rope guide
- 1. Stainless steel rim at the bottom of the drum groove
- 2. Plastic support element
- 3. Straight front face plate
- 4. 60mm wide cast iron rim around the rope drum
- 5. Spring loaded rim joint
- 6. Roller bearing support assembly

The heavy-duty rope guide cannot travel as close to the rope fixing clamps on the rope drum as the old style rope guide. It takes approximately 10mm more space in that direction. After installing the heavy-duty rope guides, adjust the hoisting limit switch so that there is a minimum of 15mm gap between the rope guides and the rope fixing clamps when the hook is in its lowest position (see drawing below). Test-drive the hoist and re-adjust if necessary.



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1. Rope fixing clamps
2. Rope
3. Rope guide

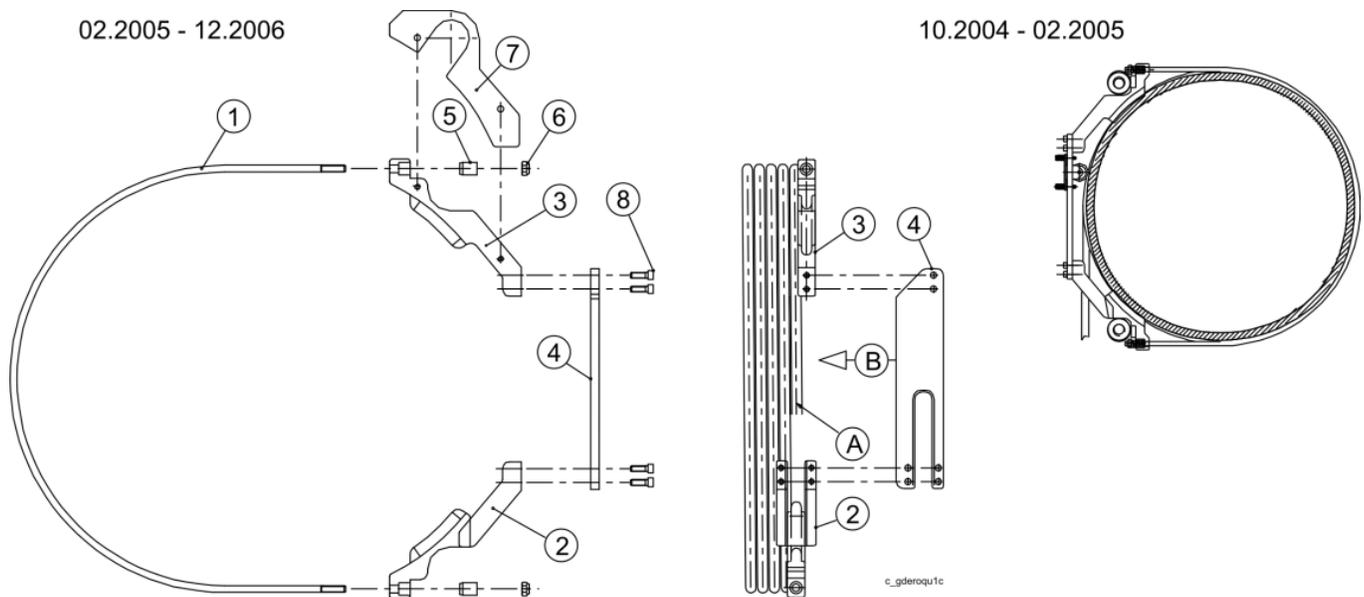
Assembly

- Dismount one intermediate shaft from the hoisting unit. It is recommended to remove the shaft that is at the top corner, opposite to the side where the rope leaves the drum. Place the front half of the rope guide (1) on the rope drum so that the grooved side is pointing away from the rope fixing clamps. The rope guide should be positioned so that the rope leaving from the drum comes through the slot at the front. The rope should be in the middle of the guide to be correct.
- Place the rear half of the rope guide (2) on the rope drum so that the fixing holes align with the front half of the rope guide.
- Fix the rope guide halves together with the M8x60 screws (7) and springs (8). Make sure that there are at least 2.5mm of spacer plates (5) between the rim halves at both ends. Tighten the screws until the springs are compressed to a length of 15mm.
- Fix the rope slot locking bar (3) in place with four M8x25 screws (6).
- Test the tightness of the rope guide by grabbing it by hand and rotating it around the rope drum and moving it back and forth in the drum's axial direction.
 - The rope guide should slide without effort on the rope drum. Friction between the rope guide and drum will cause wear on the drum and the guide.
 - The rope guide should be allowed to move axially one to three millimetres. This way it will be loose enough to not bind on the drum and tight enough to not rise up and jump to wrong drum groove.
 - If the rope guide feels too tight on the drum (i.e. no axial movement, requires effort to rotate around drum), add rim spacers (5) between the rope guide halves until proper tightness is achieved. If the rope guide feels too loose on the drum (i.e. over 3 millimetres of axial movement), remove rim spacers (5) from between the rope guide halves until proper tightness is achieved.
- Re-install the dismantled intermediate shaft.
- Install the rotation support (4) on the rope guide.
- After completing the installation, test drive the hoist while observing the rope guide travel through the whole height of lift. Test the tightness of the rope guide at both the upper hoisting limit and the lower hoisting limit to make sure there is no binding at either end. Adjust if necessary.

Disassembly

- Remove the rotation support (4) on the rope guide.
- Remove one intermediate shaft from the hoisting unit. It is recommended to remove the shaft that is at the top corner, opposite to the side where the rope leaves the drum.
- Remove the rope slot locking bar (3) and screws (6)
- Remove the rope guide rim fixing screws (7). When the screws are off, remove the springs (8) and the rim spacers (5).
- Remove the rear half of rope guide (2).
- Remove the first half of rope guide (1).

Rope guide assembly, drum size \varnothing 608 mm



A Rope leaves the rope drum
 B Rope fixing clamp side

- Fix the joint plate (4) to the guide frame upper half (3) with two M8x25 screws. The edge that has the rounding should point towards the rope fixing clamps.
- Place the upper frame half (3) against the drum groove. The correct groove is the first empty groove next to the rope.
- Place the plastic guide element (7) over the 50 mm diameter hoist intermediate shaft and fix it to the guide frame upper half (3) with two M8x35 screws. The plastic part should be on the side of the rope fixing clamps.
- Pass the rope through the joint plate (4) and place the lower frame half (2) against the drum groove. The correct groove is the one from which the rope leaves the drum (A).
- With the rope passing through both the joint plate (4) and the lower frame half (2), fix the joint plate and lower frame half together with two M8x25 screws.
- Pass the stainless steel rim (1) around the rope drum and into the groove that travels around the rope drum from the upper frame half (3) to the lower frame half (2). Pass the ends of the rim through both frame halves.



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- Pass the ends of the rim (1) through the sleeves (5) and press the sleeves into the sockets in the frame halves.
- Fix the rim in place with the two M10 Nyloc nuts (6). Follow the adjustment instructions to get the nuts to the proper tightness.

Rope guide initial adjustment

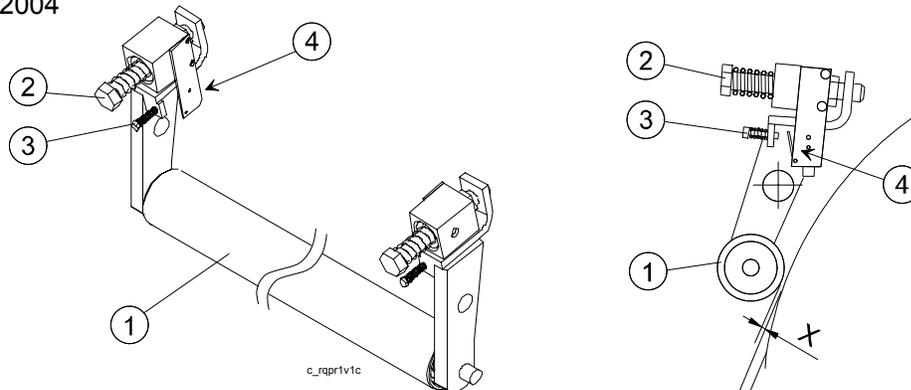
- Tighten the two Nyloc nuts (6) until the rope guide is snug against the rope drum. Tighten both nuts evenly, so that the rim ends go through the frames in a straight line. If either nut is tightened more than the other, the rim alignment will change and it might bent in adverse ways.
- Adjust the nuts so that the guide doesn't rotate around the drum by gravity alone, but will rotate if additional force is applied in up or down direction. The required additional force should be 20N-30N.

Rope guide test drive and final adjustment

- Test drive the hoist in both up and down direction. To pass the test drive, the rope guides must be able to travel through the whole height of lift without evidence of strong vibrations or excessive wear on the drum.
- If the rope guides vibrate strongly, it is likely that they are too tight against the drum. Loosen the upper Nyloc nut (6) by a quarter turn and retry. If the guides are still too tight, loosen the lower Nyloc nut by a quarter turn and retry. Continue loosening the nuts in turns until the vibrations disappear.
- If the rope guides become too loose against the drum, they will begin to rotate around the drum by gravity. As a result there will be an audible clanking noise each time the hoist is stopped after ascending load motion. This is a result of gravity pulling the loose guides against the intermediate shaft. If this occurs, tighten the Nyloc nuts in turns until the guides no longer rotate around the drum by gravity.

Pressure roller, drum size ϕ 608 mm

-> 10.2004



1. Pressure roll
2. Gap adjustment screw (X = 1mm gap between roller and rope)
3. Limit switch adjustment screw
4. Limit switch

Assembly

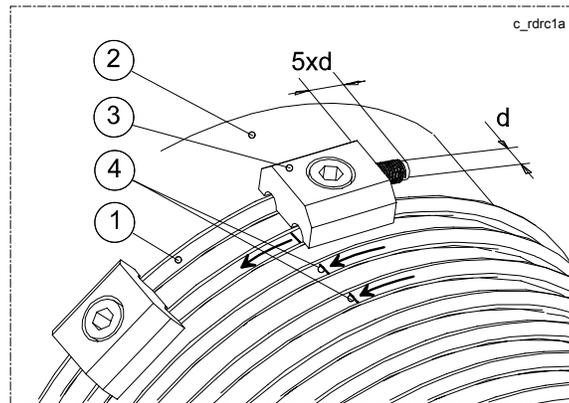
- The height of the pressure roll must be adjusted (2) so that there is always 1 mm gap between the rope and the roll.
- The limit switch triggering point must be adjusted (3) so that the limit switch is activated before the rope is climbed out of the groove.

5.25 Rope clamps

The rope is fixed to the rope drum with rope clamps. The number of rope clamps varies with the type of hoist.



In addition to the clamps on the rope ends, there must always be at least two full turns of rope on the drum when the hook is at its lowest position in order to provide friction.



1. Rope
2. Rope drum
3. Rope clamps
4. Friction turns

5.25.1 Service

- Check that the rope clamp-bolts are tight.
- Ensure there are at least two friction turns when the hook is at the lowest position.
- Make sure the rope end protrudes from the last clamp a distance of $5xd$.

5.26 Drum Brake

The drum brake has been designed as an extra safety device to the hoist. To obtain the maximum safety, it operates mechanically and applies directly to the rope drum. Drum brake has three different configurations, i.e. holding brake, overspeed brake and a construction with both holding and overspeed brake functions.



Drum brakes are tested and adjusted by the hoist manufacturer prior to delivery. Only qualified personnel, authorised by the manufacturer may install, adjust and service the drum brake.



Service and maintenance of the drum brake must be done at regular intervals as recommended by the manufacturer.



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The drum brake must always be kept clean. The braking torque reduces strongly if any grease or oil penetrates to the friction surfaces.

5.26.1 Holding Brake

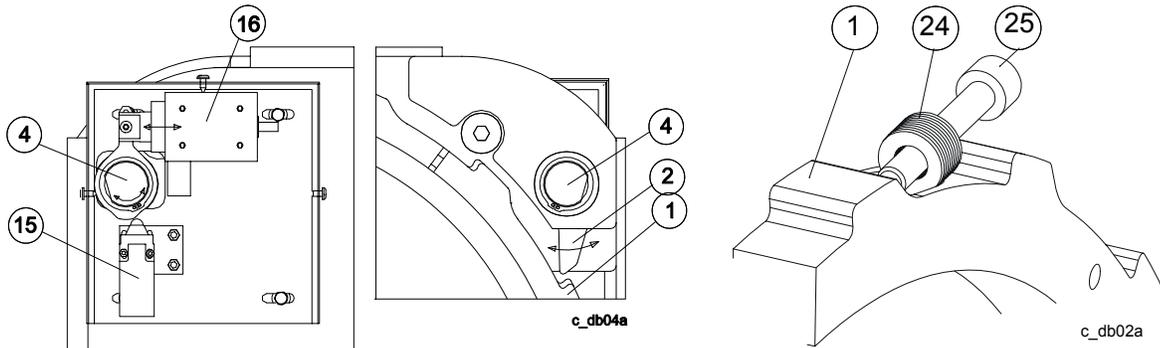
The holding brake acts as a second brake and mechanically locks the drum when the hoisting or lowering motion has stopped. When the operator starts hoisting or lowering, the holding brake will be released and driving upwards or downwards is possible. However, in case the main brake has slipped during standstill, the cam (2) may be locked against the brake rim (1) and the electromagnet (3) is not able to release the cam. In this case it is necessary to drive the hoist in upwards direction prior to powering, in order to release the drum brake.



Do not drive the hoist in the upper stop limit switch when handling heavy loads. Stop lifting as soon as the hoist enters the upper slow down limit.



In case the holding brake locks frequently, it may indicate wear of the main brake.



- 1.Brake rim
- 2.Cam
- 3.Electromagnet
- 16.Solenoid
- 24. Disc springs
- 25. Screw

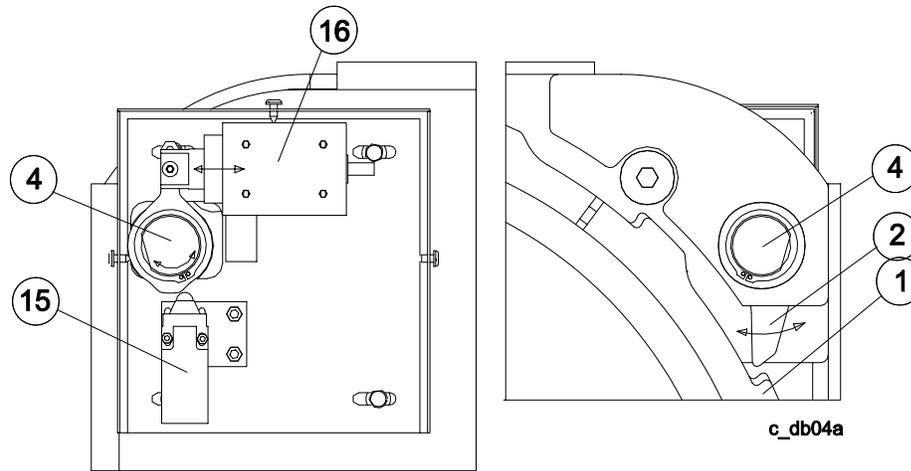
5.26.2 Service

- Check that the drum brake and surrounding surfaces are free from oil, grease, excessive dust and/or other substances that may reduce the effectiveness of the friction material of the drum brake.
- Check that the solenoid works properly and the cam closes against the brake rim.
- Manually activate the holding brake limit switch when operating in down direction and verify that hoisting is stopped in the down direction. Up direction should continue to operate.



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5.26.3 Adjusting holding brake



- 1. Brake rim
- 2. Detent arm
- 4. Shaft of the detent arm
- 15. Holding brake limit switch
- 16. Solenoid

1. Assemble the brake rims (1) together with disc springs (24, 10 pcs) and screws (25). All the disc springs must be placed so that the concave sides are facing in to the brake rim.
2. In the two brake rims model the connection points of the halves of both rims shall not be aligned, they must be 90 degrees apart. The 90 degrees placement is to reduce the risk of having two bolt connection teeth being contacted simultaneously by the detent arm.
3. Adjust the rims so that there is a difference of 5 mm (0.2") between the teeth of the two brake rims. The 5 mm difference is to allow one rim to begin the braking before the second rim engages to reduce the dynamic impact.
4. Tighten the brake rim screws (25) to a torque of 60 Nm (44 ft lb).
5. Check with the caliber that the gap between the brake rim halves is the same on both sides. This is to ensure the even tooth to tooth distances over the brake rim connection.
6. Adjust the holding brake limit switch (15) to be mechanically activated by the cam of the detent arm, when the solenoid de-energized.
7. Check that the detent arm (2) is touching the brake rim when the hoist is idle. When the solenoid is activated check that there is a clearance between teeth and detent arm.
8. Manually activate the holding brake limit switch when operating in down direction and verify that hoisting is stopped in the down direction. Up direction should continue to operate.

5.26.4 Overspeed Brake

Overspeed brake prevents the rope drum from an overspeed condition. Overspeed can occur when a component in the transmission or drive train fails and the load on the hook is heavy enough to cause an overspeeding of the drum.



In case the drum brake activates due to overspeed, always contact a representative of the hoist manufacturer. The hoist must not be used before the cause for an overspeed has been

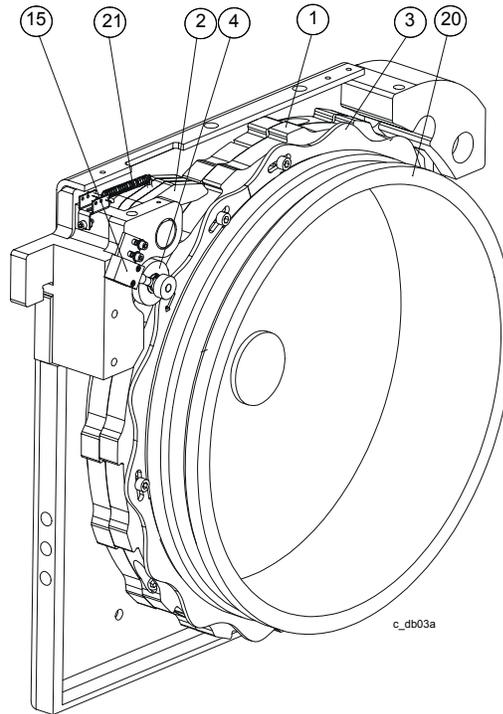


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found and repaired. The drum brake components must be checked for wear and damage and then adjusted per instructions.



After the drum brake has been activated do not jumper any controls to lower the load using the hoist.



1. Brake rim
2. Detent arm
3. Cam wheel
4. Follower
15. Micro switch
20. Rope drum
21. Adjustment spring

5.26.5 Service

- Check that the drum brake and surrounding surfaces are free from oil, grease, excessive dust and/or other substances that may reduce the effectiveness of the friction material of the drum brake.
- Helical spring
 - Check visually that there is no corrosion to the spring, and the spring is not worn at connection points.
- Follower roll
 - Check visually that the roll is not corroded.
 - Check that the roll is not worn more than 3 mm of its original diameter.
 - Test that the roll follows the cam wheel easily and it is fixed firmly to the detent arm.
- Limit switch
 - Check that the limit is securely fastened.



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- Check that the positioning of the limit switch is correct and will be contacted by the follower roll. The gap between the follower roll and limit switch is to be 0.5 mm measured on the cam wheel's highest point. Refer to the Drum Brake Adjusting instructions.
- Manually activate the holding brake limit switch when operating in down direction and verify that hoisting is stopped in the down direction. Up direction should continue to operate.
- Detent arm
- Check that the arm rotates easily on its shaft.

5.26.5.1 *Should An Overspeed Occur – Service after an emergency braking*

Should an overspeed braking occur, the hoist and overspeed brake shall be inspected, repaired and adjusted prior to further use of the hoist.



Extreme caution must be taken and the load must be removed from the hook of the hoist.

5.26.5.2 *Overspeed Condition – Find Fault*

- Find the reason for drum brake emergency braking. An overspeed occurs because of a failure in the drive transmission system of the hoist. Possibilities - The hoist brake has worn (steel on steel) / a coupling has sheared / a gear in the gearbox has stripped / a drive shaft has broken.

5.26.5.3 *Hoisting unit inspection after overspeed*

- Check the condition of the hoisting gear(s) and drum gear rim
 - No abnormal noises when driving
 - Check that the gear rim fitted inside the drum has not slipped
- Disassemble motor and check the condition of spline on motor shaft and on gear's primary shaft
 - No deformations or broken teeth allowed
- Change the coupling between the motor and gear
- Change the motor fixing bolts

5.26.5.4 *Hoisting Machinery inspection after overspeed*

- Check the rope drum
 - Check the rope grooves visually for any markings from the rope guide or wire rope
 - Check that there is no damage to rope end connection fixing parts
- Check the rope guides for damage
 - Check the body of rope guide for deformations
 - Check the guiding surface visually
- Change the drum end plate on hoisting machinery side
- Check the drum end plate on drum brake side
 - *Change drum end plate if any deformations or cracks are found. Pay special attention to hoisting unit support plates and to the area near the fixing point of the lower corner of the hoisting unit. If any bends or cracks are found the support plates must also be changed.*
- Change the hoisting unit fixing bolts
- Change the fixing bolts of intermediate beams

5.26.5.5 *Load beam inspection after overspeed*

- Check the load beam



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- Replace if deformations, cracks, broken welding seams, etc. are found around the hoisting unit fixing places.

5.26.5.6 *Other components inspection after overspeed*

- Check the fixing of counterweights
 - No deformations, cracks, etc. are allowed around the fixing places
- Check visually the hook block, upper sheave block, overload device and rope anchorage
 - No deformations allowed – change accordingly
- Inspect the rope
- Check the overload device with a load
- Check the operation of the hoist upper limit switch
- Check that the bridge and trolley wheels have not been damaged and are lying on the runway rails
- Check the fixing of the machinery hoist

5.26.5.7 *Drum brake inspection after overspeed*

- Check the detent arm for any damage
 - The edge should not be deformed out of shape
- Check the shaft of the detent arm
 - No deformation, cracks, etc. should be on the shaft
- Check the fixing hole for the detent arm
 - No deformation i.e. oval shape or cracks
- Change the brake rim(s), screws and disc springs
- Proceed with all other checks as in normal drum brake service
- Adjust the brake. Refer to the manufacturer's hoist test report.

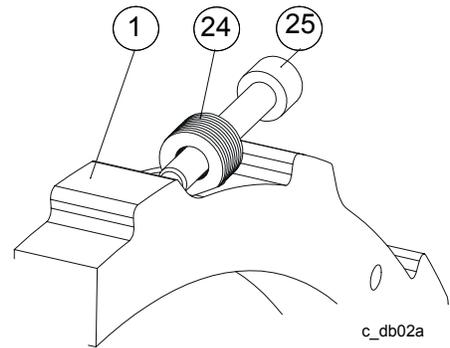
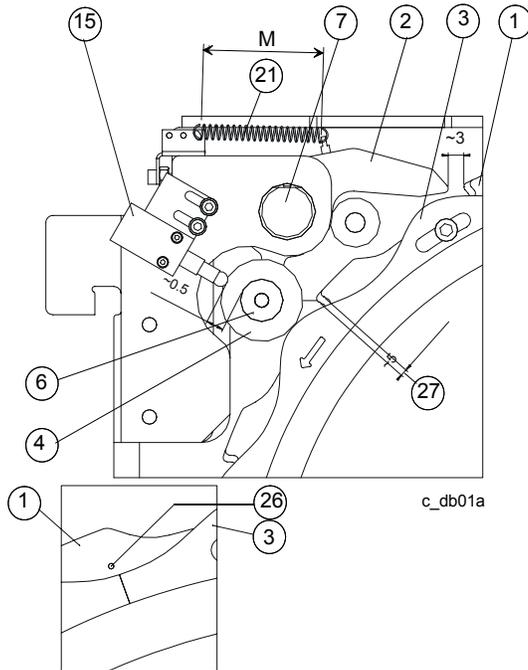
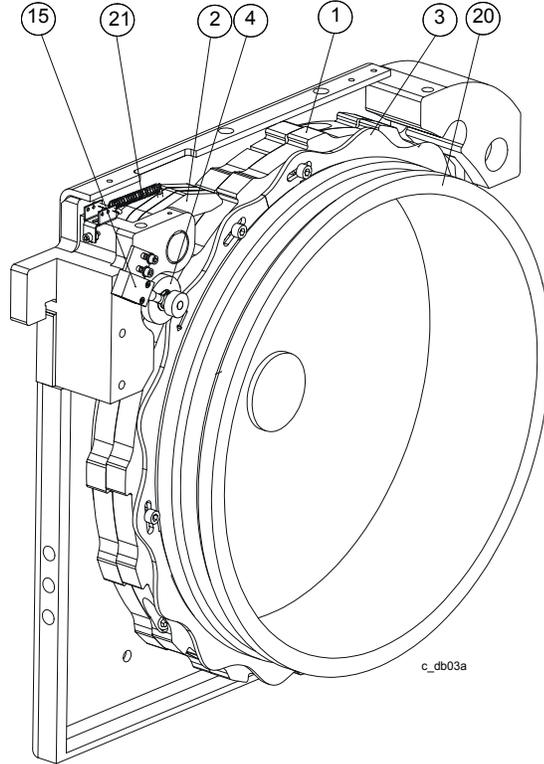


With every fifth emergency breaking the detent arm and its shaft has to be changed.



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5.26.6 Adjusting overspeed brake



- 1. Brake rim
- 2. Detent arm



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3. Cam wheel
4. Follower roll
6. Roll for limit switch
7. Shaft of detent arm
15. Over speed limit switch
21. Helical spring
24. Disc springs
25. Screw
26. Marking point
27. Only in models with drum diameter 608 mm with 2 hoisting motors

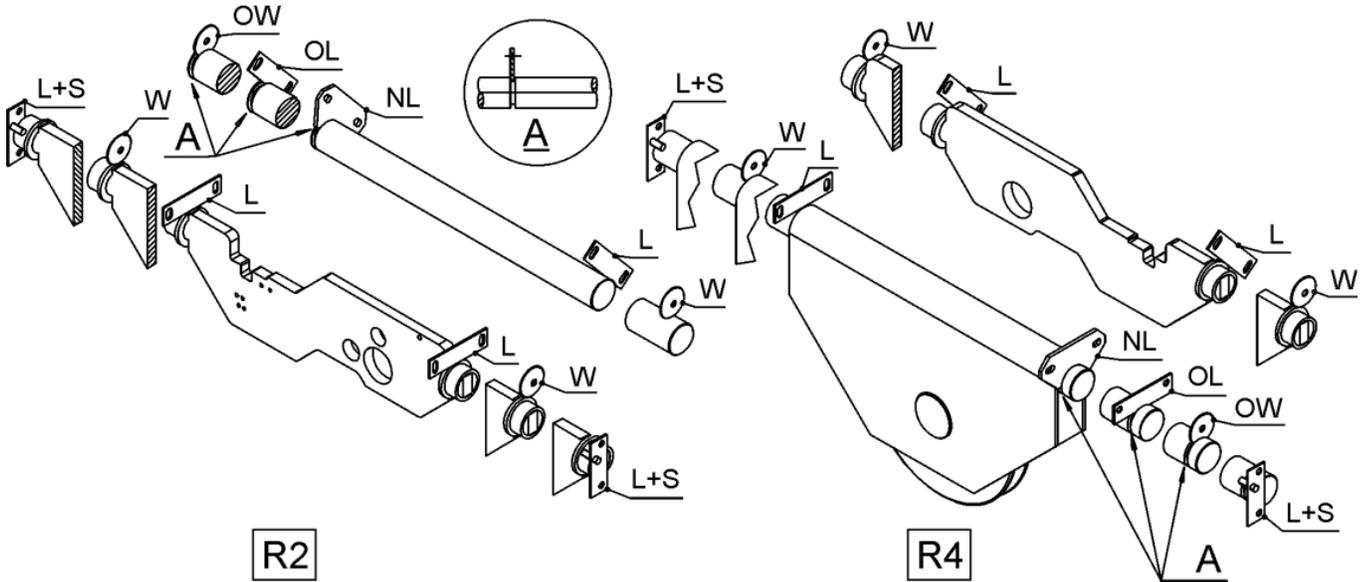
1. Assemble the brake rims (1) together with disc springs (24, 10 pcs) and screws (25). All the disc springs must be placed so that the concave sides are facing in to the brake rim.
2. In the two brake rims model the connection points of the halves of both rims shall not be aligned, they must be 90 degrees apart. The 90 degrees placement is to reduce the risk of having two bolt connection teeth being contacted by the detent arm when an overspeed braking occurs.
3. Adjust the rims so that there is a difference of 5 mm (0.2") between the teeth of the two brake rims. The 5 mm difference is to allow one rim to begin the braking before the second rim engages to reduce the dynamic impact.
4. Adjust the cam wheel (3) so that when the follower roll (4) is on the highest point of the cam wheel there is a clearance of 3 mm (0.12") between the head of the detent arm and the tooth of the brake rim. If the cam wheel is replaced, position the cam wheel by turning it until the marking point on the brake rim is aligned with the contact point of the cam wheel halves.
5. Adjust the gap between the limit switch (15) and the roll (6) to 0.5 mm (0.02"). Make this adjustment when the follower roll is on the highest level of the cam wheel.
6. Adjust the length M of the helical spring (21) to the value recorded on the Q drum brake report included in the delivered hoist documentation. The follower roll must be at the highest point on the cam wheel when the length of the spring is measured. Be aware that the spring must not be damaged. If damaged, replace the spring. Verify the spring type from the Q drum brake report.
7. Verify that the brake rim screws are loose allowing the brake rims to slide freely on the drum during the following test.
8. Test that the overspeed drum brake does not actuate when lowering the nominal load with full speed. If the drum brake activates, increase the M dimension to increase the follower roll tension on the cam wheel preventing premature drum braking action. Before repeating test verify that all rim and cam wheel positioning marks are correct according to steps 3, 4 and 5.
9. After successful testing tighten the brake rim screws (25) to a torque of 60 Nm (44 ft lb).
10. Check with the caliber that the gap between the brake rim halves is the same on both connections. This is to ensure the even tooth to tooth distances over the brake rim connection.
11. Manually activate the limit switch when operating in down direction and verify that hoisting is stopped in the down direction. Up direction should continue to operate.



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5.27 Sheave support and rope anchorage support

5.27.1 Service (R2 and R4 reevings)



L. Locking plate
 W Locking washer
 OW Old type washer
 L+S Locking plate + locking screw

L. Locking plate
 OL. Old type locking plate
 NL. New type locking plate
 W. Locking washer
 L+S Locking plate + locking screw

- Check that the support shaft and the rope anchorage plate (or overload device) are correctly in their slots.
- Check that the locking part is in the groove of the shaft in cases which there is no other block against the shaft's axial movement.



Replace locking washer (OW) or locking plate (OL) with the shaped locking plate (NL) if possible.
 Or replace locking washer (W) with the locking plate (L) if possible.

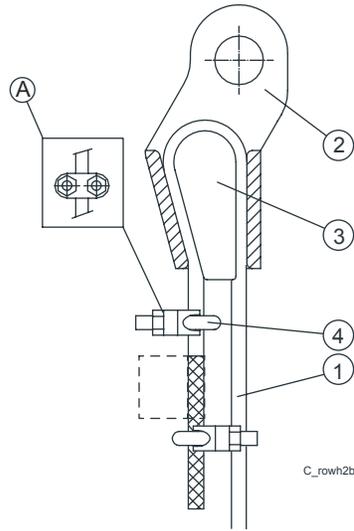
- Check that fixing screws are tight.
- Check that the sheave block and the rope anchorage can freely tilt with rope.
- Lubricate the load carrying surfaces in the ends of the shaft and the rope anchorage plate with a small amount of grease.

5.28 Rope anchorage

The free end of the rope is fixed in a suspended rope anchorage. The rope clamps ensure that the rope can not accidentally slip through the rope anchorage.

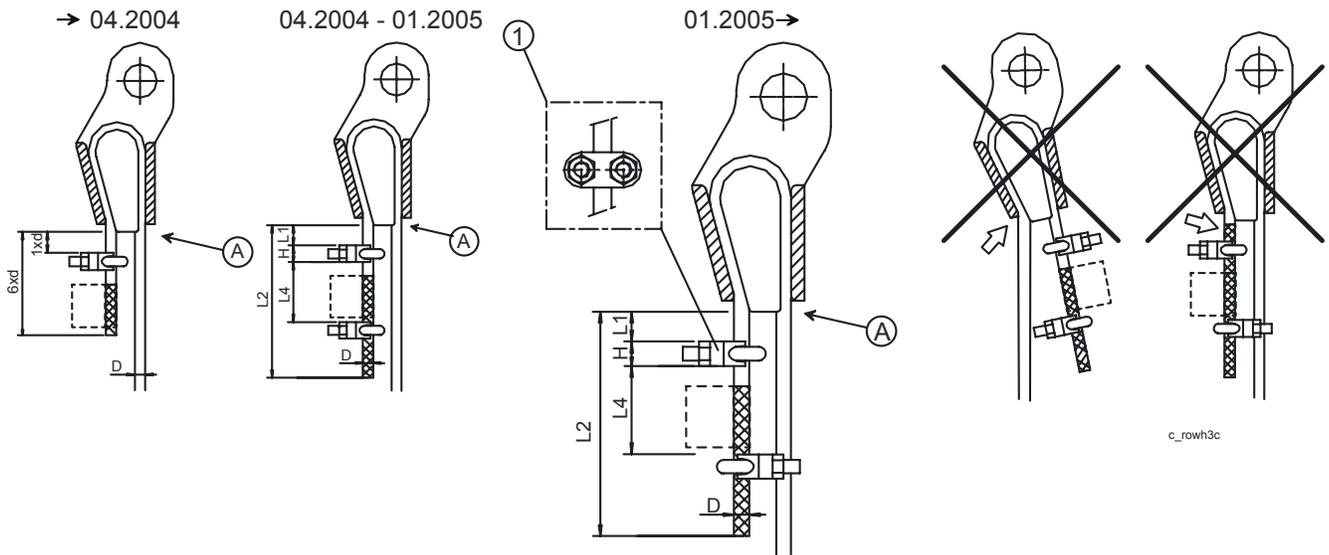


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- 1. Rope
- 2. Rope anchorage
- 3. Wedge
- 4. Rope clamp
- A. Rope drum ϕ 243 mm

5.28.1 Service



- 1. Rope drum ϕ 243 mm

D	L1 minimum	L2 minimum	L4	H	Thread	Torque
[mm]	[mm]	[mm]	[mm]	[mm]		[Nm]
6-7	15	100	65	12	M5	4
8-9	15	125	65	14	M6	8
11-12	25	165	65	18	M8	10

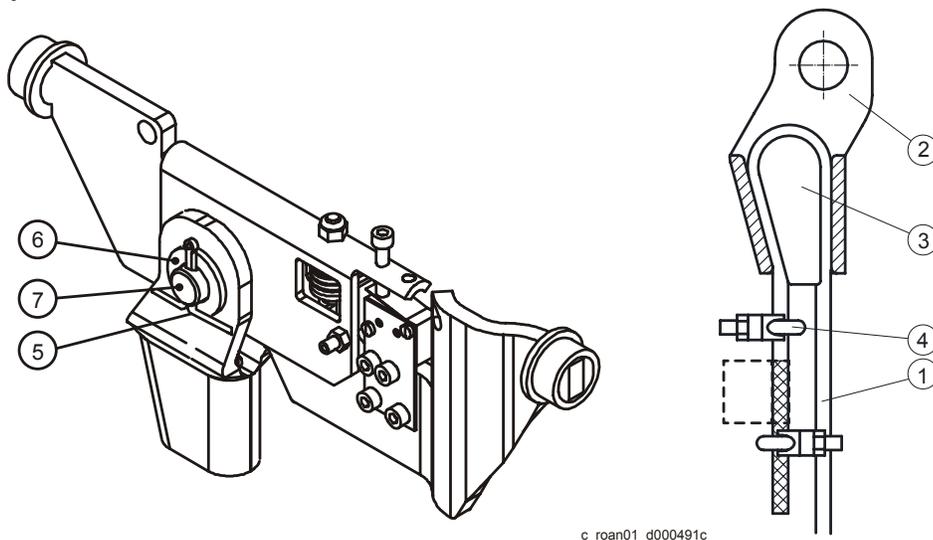


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13-14	25	194	65	23	M10	15
15-16	30	220	65	25	M12	18

- Check that the rope clamp-nuts are tight.
- Ensure that the rope has not slipped in the rope anchorage by comparing the measures with the stated measures in the table.
- Make sure the rope end protrudes from the rope anchorage as specified on table.
- Check the condition of the rope at point "A".
- Ensure that the rope is assembled inside the rope anchorage correctly.

5.28.2 Assembly



c_roan01_d000491c

1. Rope
2. Rope anchorage
3. Wedge
4. Rope clamp
5. Split-pin
6. Washer
7. Shaft

Disassembly:

- Lower the hook onto a stable platform. Pull some more rope off the drum with a gloved hand.
- Switch OFF the power supply to the hoist.
- Remove the split-pin (5).
- Remove the washers (6) and the shaft (7) while holding the rope anchorage (2).
- Slide the rope anchorage out of the overload device.
- Remove the rope clamps (4).
- Tap the wedge (3) out of the rope anchorage and remove the rope (1).



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Re-assembly:

- Insert the rope into the rope anchorage

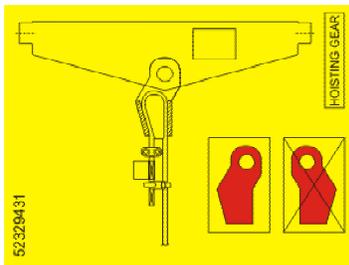


Make sure the rope enters the anchorage in the correct direction. See section: “Rope Anchorage, Service” for details

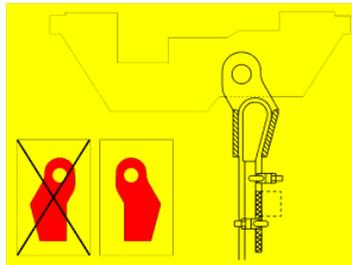
- Insert the wedge into the rope anchorage, making sure that a length of at least six times the rope diameter protrudes from the anchorage.
- Pull the rope firmly into the rope anchorage, so that the shaft easily fits into the suspension hole.
- Place the rope anchorage into the overload device and insert the shaft with the washers.



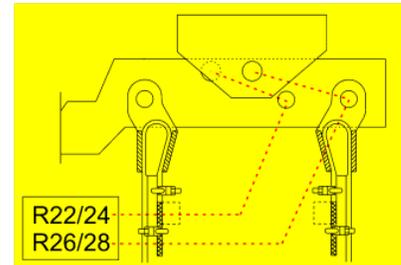
It is important that the rope anchorage is correctly mounted in the overload device. See the below table for details:



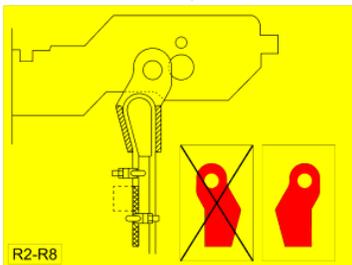
Drum ϕ 243



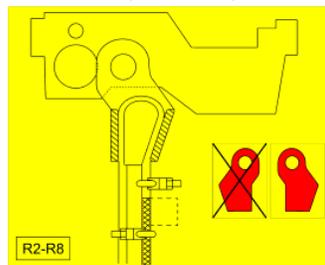
Drum ϕ 303 and ϕ 355



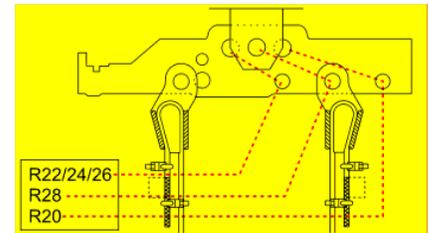
Drum ϕ 406



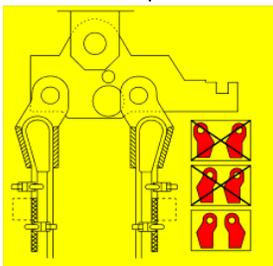
Drum ϕ 406



Drum ϕ 608



Drum ϕ 608



Drum ϕ 608

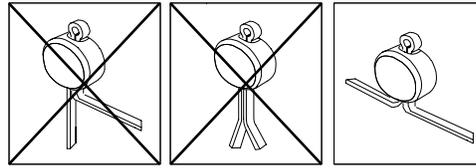
- Assemble the rope clamps on the protruding end of the rope and insert the split-pin. Bend the split-pin open.



Insert NEW cotter pin, DO NOT reuse a removed cotter pin.



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- Switch ON the power supply to the hoist.
- Raise the hook carefully to the upmost position. Constantly watch the rope on the drum and make sure that the movement stops before the rope guide reaches the end of the drum.
- Adjust the hoist limit switch when needed. See section: **“Hoisting limit switch, Assembly, Adjustment”** for details.

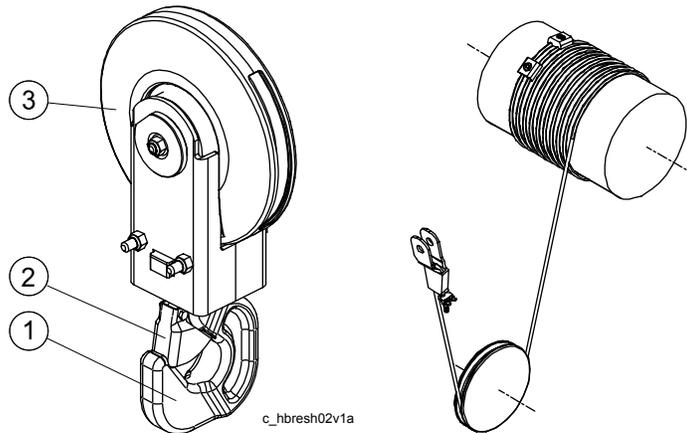
5.29 Hook-block, rope reeving and return sheaves

The hook-block consists of the hook forging, hook forging suspension and rope sheave(s). The hook forging is supplied with a safety-catch. The hook forging rotates in a pressure bearing. Optionally in some models, the hook-block can be supplied with a rams-horn forging, a locking device to prevent the forging from rotating, hook forging-insulation or non-standard forging dimensions.

A trolley with a hoist that has four or more rope falls is equipped with a rope sheave beam including one or more return sheaves.

The reeving depends on the type of hoist, the amount of ropes on the drum and the amount of rope falls. The reeving scheme is shown in the picture.

2-fall, 1-rope reeving, drum size ϕ 303/355/406 mm

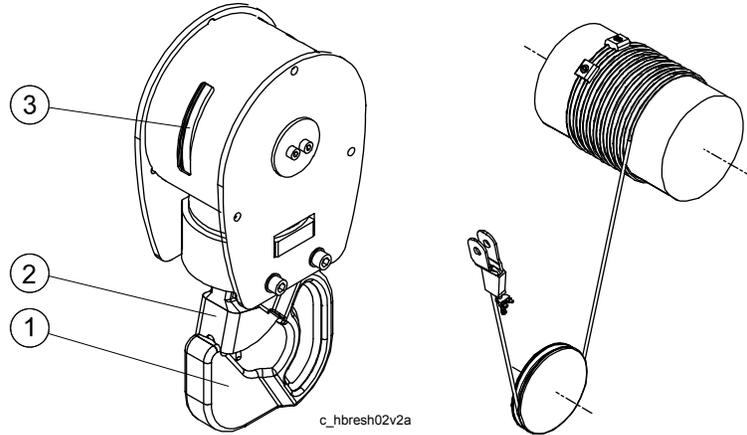


1. Hook forging
2. Safety-catch
3. Rope sheave



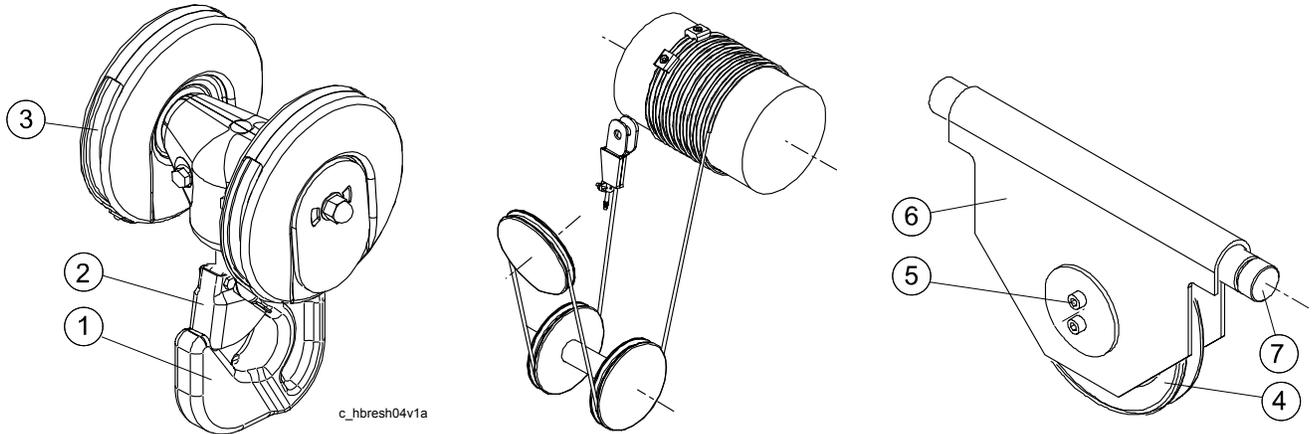
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2-fall, 1-rope reeving, drum size ϕ 608 mm



- 1. Hook forging
- 2. Safety-catch
- 3. Rope sheave

4-fall, 1-rope reeving, drum size ϕ 303/355/406 mm

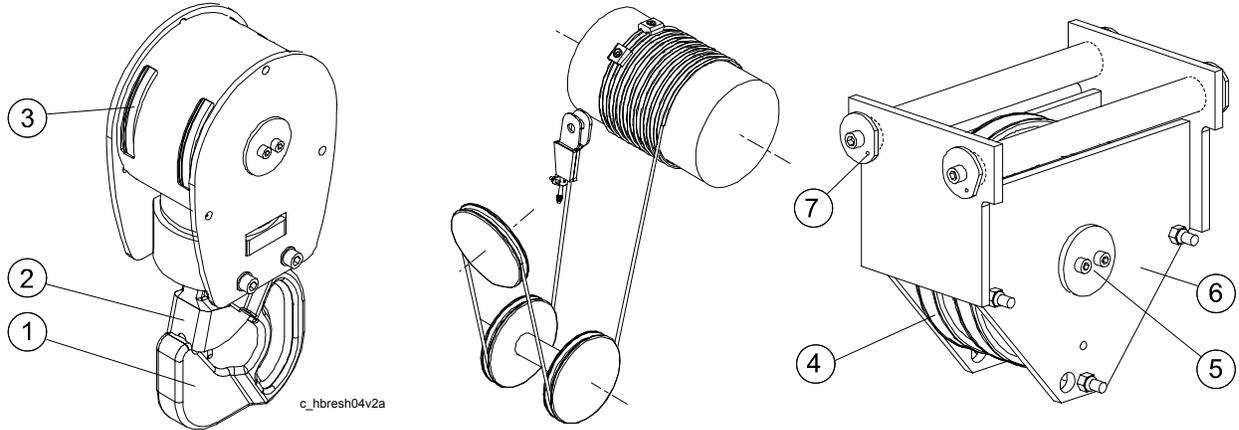


- 1. Hook forging
- 2. Safety-catch
- 3. Rope sheave
- 4. Return sheave
- 5. Return sheave shaft
- 6. Support frame
- 7. Support frame shaft



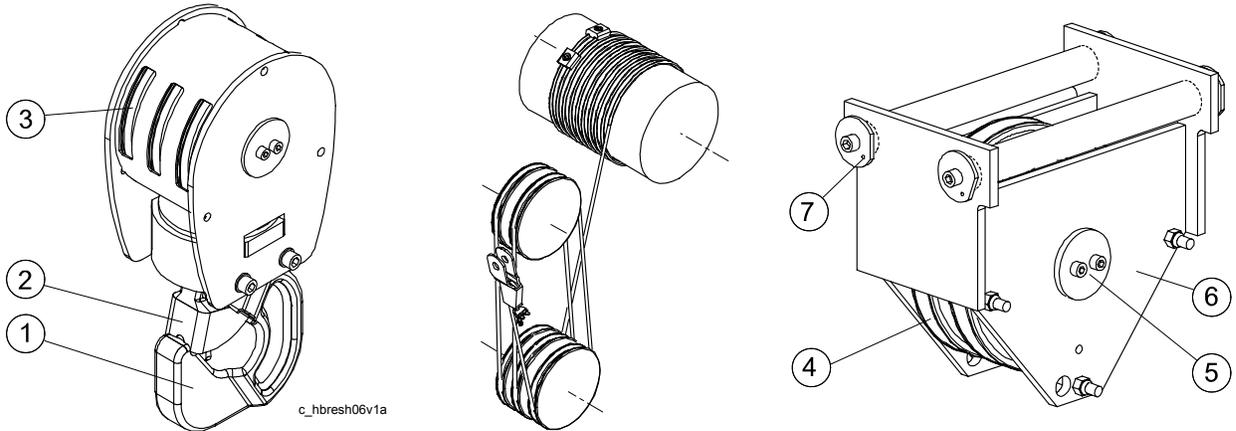
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4-fall, 1-rope reeving, drum size ϕ 608 mm



- 1. Hook forging
- 2. Safety-catch
- 3. Rope sheave
- 4. Return sheave
- 5. Return sheave shaft
- 6. Support frame
- 7. Support frame shaft

6-fall, 1-rope reeving, drum size ϕ 355/406/608 mm

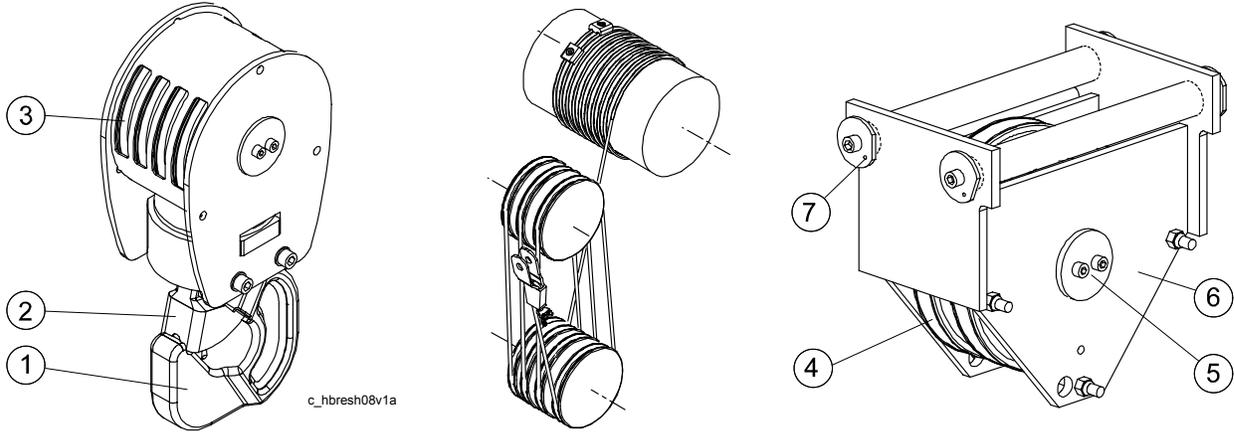


- 1. Hook forging
- 2. Safety-catch
- 3. Rope sheave
- 4. Return sheave
- 5. Return sheave shaft
- 6. Support frame
- 7. Support frame shaft



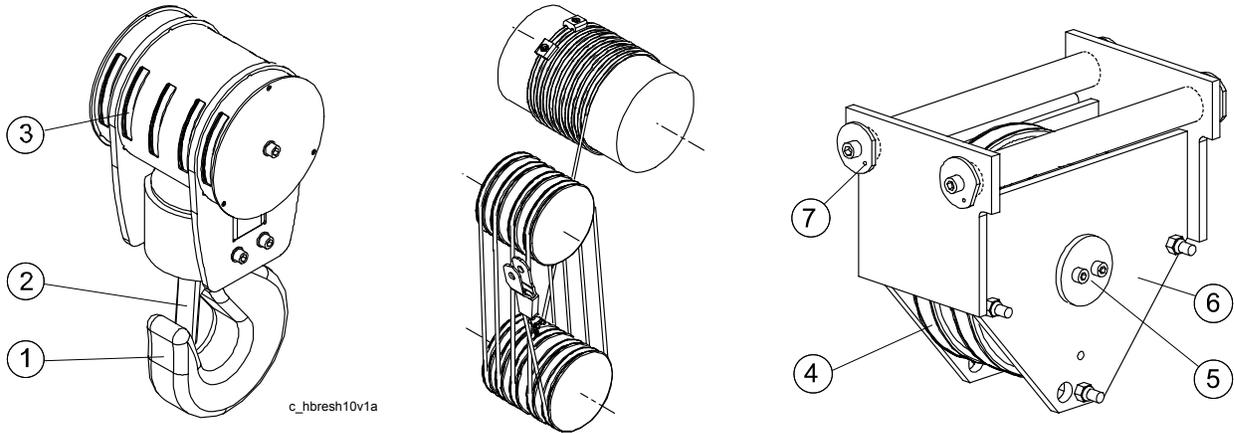
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8-fall, 1-rope reeving, drum size ϕ 355/406/608 mm



- 1. Hook forging
- 2. Safety-catch
- 3. Rope sheave
- 4. Return sheave
- 5. Return sheave shaft
- 6. Support frame
- 7. Support frame shaft

10-fall, 1-rope reeving, drum size ϕ 608 mm

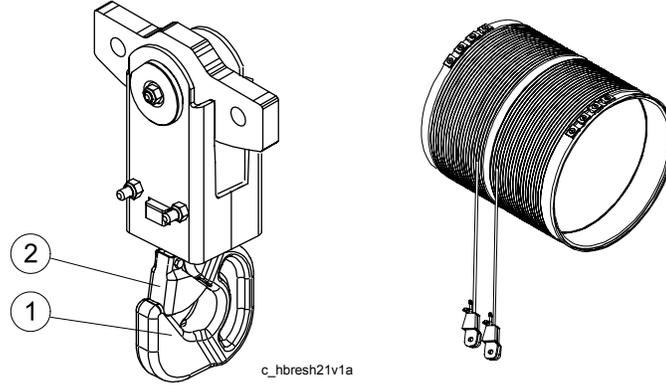


- 1. Hook forging
- 2. Safety-catch
- 3. Rope sheave
- 4. Return sheave
- 5. Return sheave shaft
- 6. Support frame
- 7. Support frame shaft



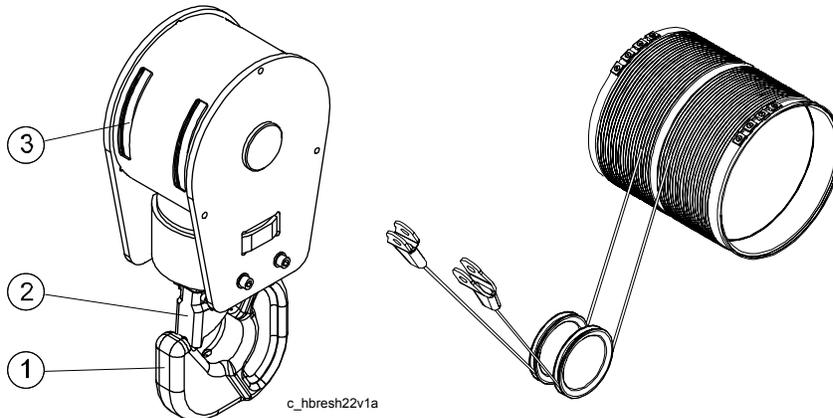
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1-fall, 2-rope reeving, drum size ϕ 355 mm



- 1. Hook forging
- 2. Safety-catch

2-fall, 2-rope reeving, drum size ϕ 406/608 mm

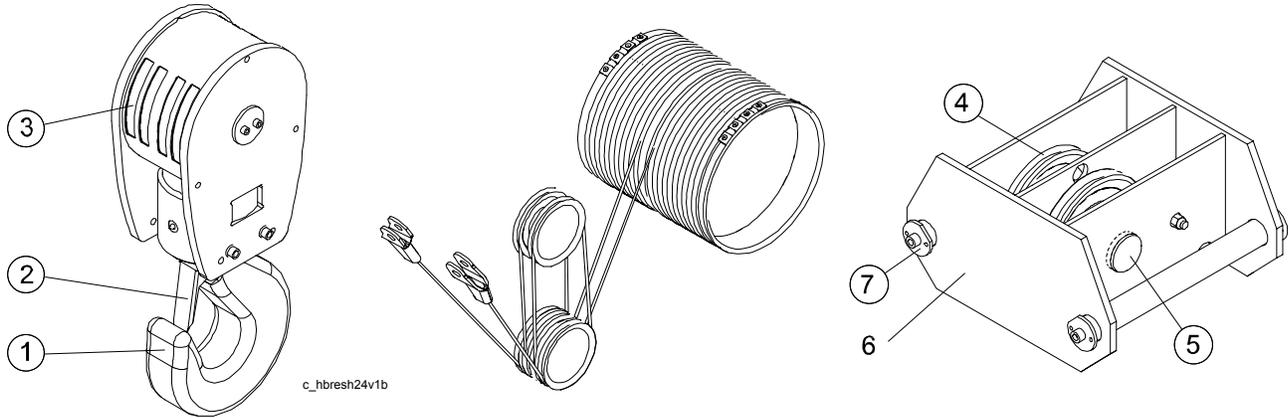


- 1. Hook forging
- 2. Safety-catch
- 3. Rope sheave



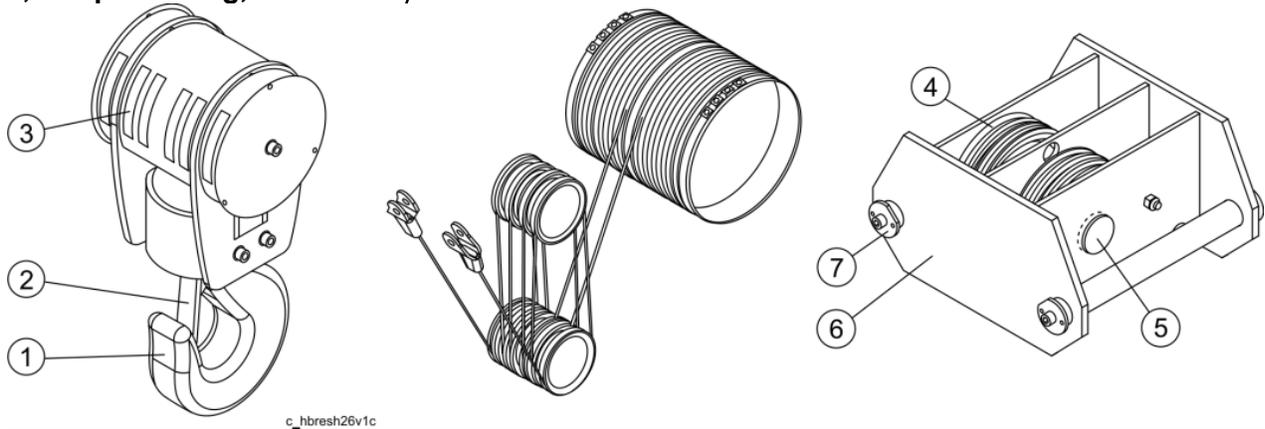
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4-fall, 2-rope reeving, drum size ϕ 406/608 mm



- 1. Hook forging
- 2. Safety-catch
- 3. Rope sheave
- 4. Return sheave
- 5. Return sheave shaft
- 6. Support frame
- 7. Support frame shaft

6-fall, 2-rope reeving, drum size ϕ 406/608 mm

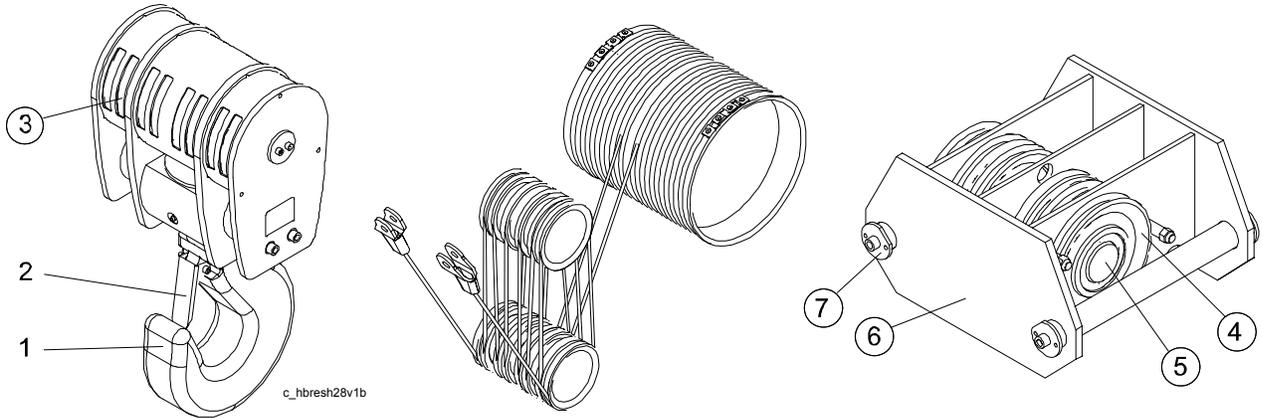


- 1. Hook forging
- 2. Safety-catch
- 3. Rope sheave
- 4. Return sheave
- 5. Return sheave shaft
- 6. Support frame
- 7. Support frame shaft



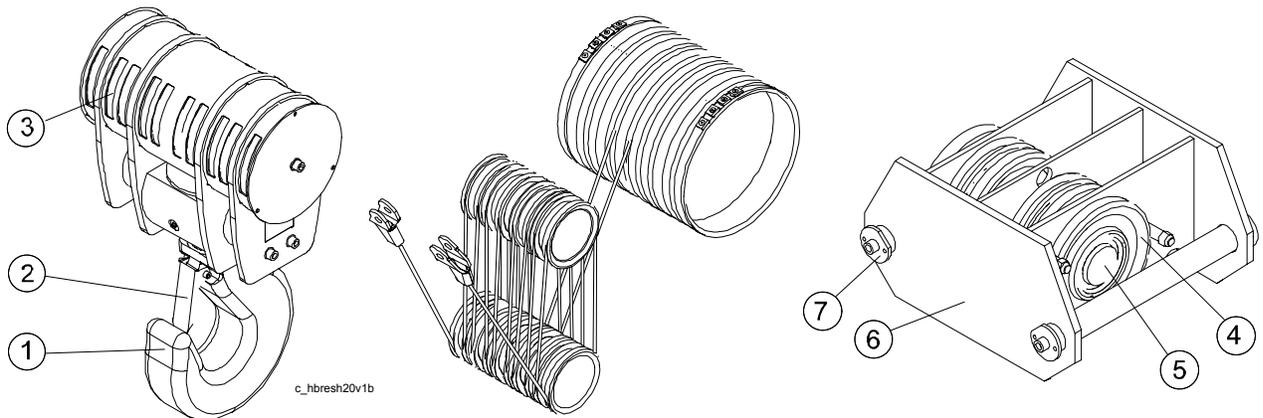
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8-fall, 2-rope reeving, drum size ϕ 406/608 mm



1. Hook forging
2. Safety-catch
3. Rope sheave
4. Return sheave
5. Return sheave shaft
6. Support frame
7. Support frame shaft

10-fall, 2-rope reeving, drum size ϕ 608 mm



1. Hook forging
2. Safety-catch
3. Rope sheave
4. Return sheave
5. Return sheave shaft
6. Support frame
7. Support frame shaft



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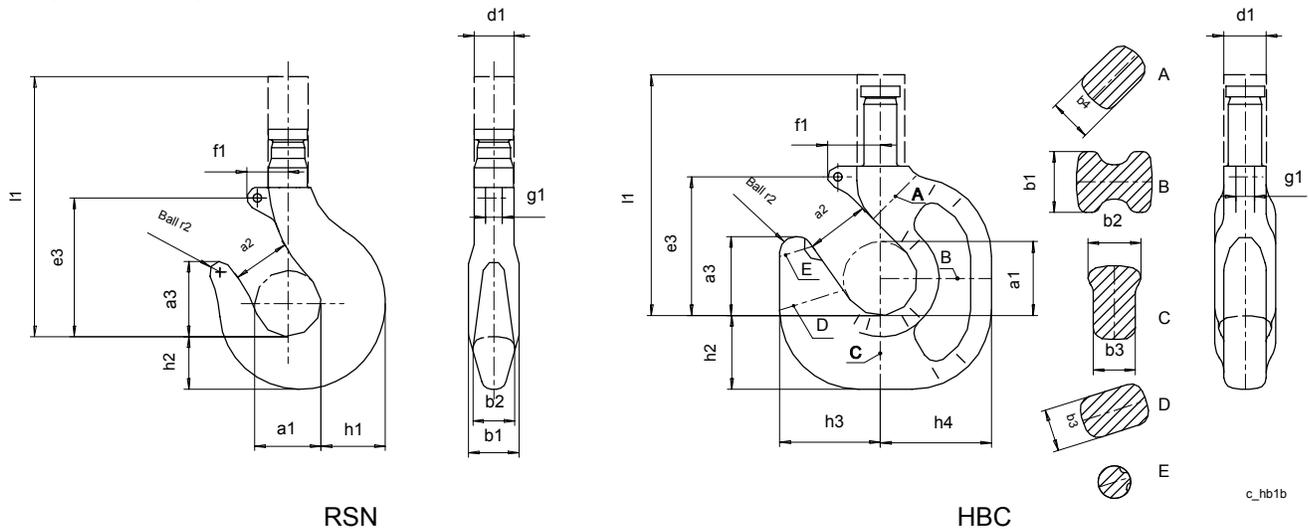
5.29.1 Service

- Check that the sheaves (3 and 4) rotate freely.
- Check the sheaves for wear and damage.
- Check the side-plates of the hook block are tight and not damaged.
- Check that the hook rotates freely.
- Check that the safety catch functions properly.
- Check the hook forging for wear, burrs, deformation and cracks.



When the safety catch is straight, but it is able to flip over the tip of the hook, check the hook forging dimensions.

RSN (DIN 15401) and HBC dimensions



	RSN										HBC		
	RSN 1	RSN 1.6	RSN 2.5	RSN 4	RSN 5	RSN 6	RSN 10	RSN 16	RSN 20	RSN 25	HBC 1.6	HBC 2.5	HBC 5
a ₁	50	56	63	71	80	90	112	140	160	180	56	63	80
a ₂	40	45	50	56	63	71	90	112	125	140	45	51	63
a ₃	57	64	72	80	90	101	127	160	180	202	60	65	84
b ₁	38	45	53	63	71	80	100	125	140	160	46	53	71
b ₂	32	38	45	53	60	67	85	106	118	132	40	45	60
b ₃	-	-	-	-	-	-	-	-	-	-	32	38	55
b ₄	-	-	-	-	-	-	-	-	-	-	32	38	45
d ₁	30	36	42	48	53	60	75	95	106	118	38	44	55
e ₃	105	118	132	148	165	185	221	280	330	360	105	118	148
f ₁	31	35	40	45	51	57	46	58	68	74	40	45	56
g ₁	12.5	14	16	16	18	18	23	33	33	38	14	16	18
h ₁	48	56	67	80	90	100	125	160	180	200	-	-	-
h ₂	40	48	58	67	75	85	106	132	150	170	56	65	90
h ₃	-	-	-	-	-	-	-	-	-	-	76	85	112
h ₄	-	-	-	-	-	-	-	-	-	-	84	100	130
l ₁	197	224	253	285	318	374	452	582	653	724	199	260	300
r ₂	8	9	10	12	14	16	20	25	28	32	12	15	18
weight (forging)	3.2 kg	4.5 kg	6.3 kg	8.8 kg	12.3 kg	17.1 kg	34 kg	66 kg	95 kg	136 kg	5.1 kg	8 kg	15 kg



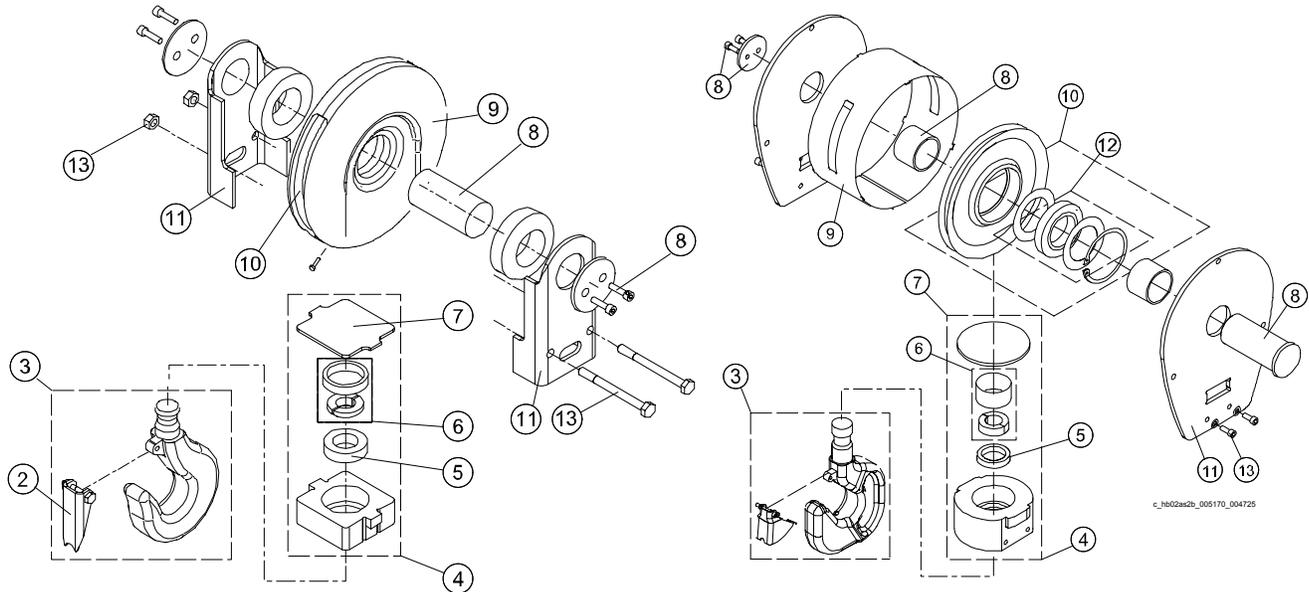
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Note: Safety latch on HBC forging decreases dimension a_2 about 5 mm and about 15mm on RSN forging.

	Hook forging standard	
	RSN	HBC
Dimension standard	DIN 15401	Oversized DIN 15401
Material standard	DIN 15400	DIN 15400

5.29.2 Hook block assembly

Hook block 2-fall, 1-rope reeving



2. Safety latch set
3. Hook forging.
4. Bearing set
5. Thrust bearing
6. Locking set
7. Cover plate
8. Shaft assembly
9. Sheave cover plate
10. Rope sheave
11. Side plate
12. Rope bearing sheave set
13. Hook block fixing bolts and nuts

Disassembly:

- Lower the hook onto a stable working-platform. Pull with a gloved hand some extra rope down from the drum, so that the hook-block is free. If needed, adjust the lower limit switch.
- Switch OFF the power supply to the crane.
- Remove the shaft fixing parts (8).

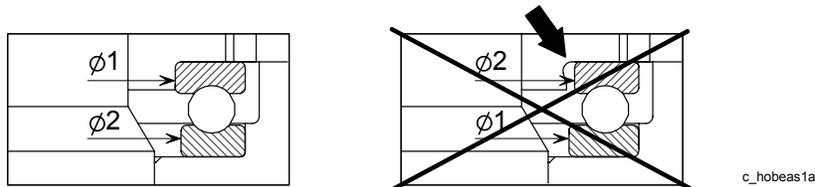


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- Remove the hook-block fixing parts (13).
- Remove the side plates (11).
- Remove the sheave cover screws and remove the sheave cover plate (9).
- Remove the cover plate (7), locking set (8) and thrust bearing (5).
- Extract the hook (3) from the bearing set (4).

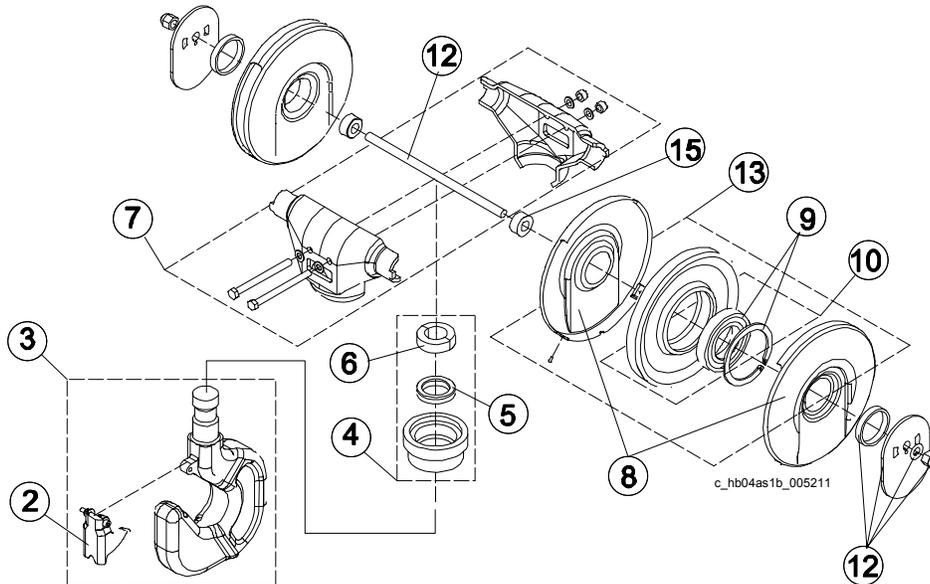
Re-assembly:

- Lubricate the thrust bearing and the hook shaft.
- Insert the hook (3) into the bearing house (4) and re-assemble the thrust bearing (5) and the locking set (6).



- Re-assemble the rope sheave (10), sheave cover plates (9) and the shaft (8).
- Insert the hook-assembly and the sheave-assembly into the side plates (11).
- Tighten the hook block fixing bolts and nuts (13) and the shaft assembly (8).
- Switch ON the power supply to the crane.
- Raise the hook block. Carefully guide the rope with a gloved hand until the hook block hangs free from the working platform.
- If the lower limit switch has been adjusted, re-adjust to the correct position.
- Test the operation of the hoist.

Hook block 4-fall, 1-rope reeving, drum size ϕ 303/355/406 mm



Note: The actual hook block outlook may vary slightly, depending on the manufacturing date!

- 2. Safety latch set
- 3. Hook forging.



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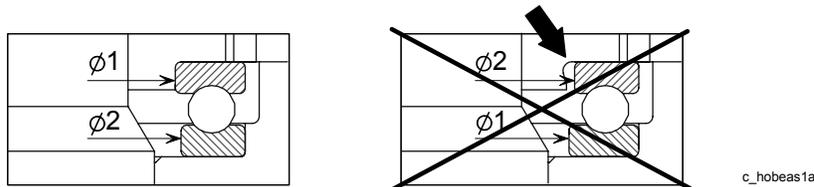
4. Hook bearing set
5. Thrust bearing
6. Locking ring
7. Bearing housing
8. Side plate
9. Sheave bearing set
10. Rope sheave
12. Shaft locking
13. Rope sheave set
15. Sleeve

Disassembly:

- Lower the hook onto a stable working-platform. Pull with a gloved hand some extra rope down from the drum, so that the hook-block is free. If needed, adjust the lower limit switch.
- Switch OFF the power supply to the crane.
- Remove the shaft locking parts (12).
- Extract the rope sheave set (13) from the shaft.
- Remove the sheave cover screws and remove the side plates (8).
- Remove bearing housing fixing screws (7).
- Remove the locking ring (6) and thrust bearing (5).
- Extract the hook (3) from the bearing set (4).

Re-assembly:

- Lubricate the thrust bearing and the hook shaft.
- Insert the hook (3) into the bearing house (4) and re-assemble the thrust bearing (5) and the locking ring (6).

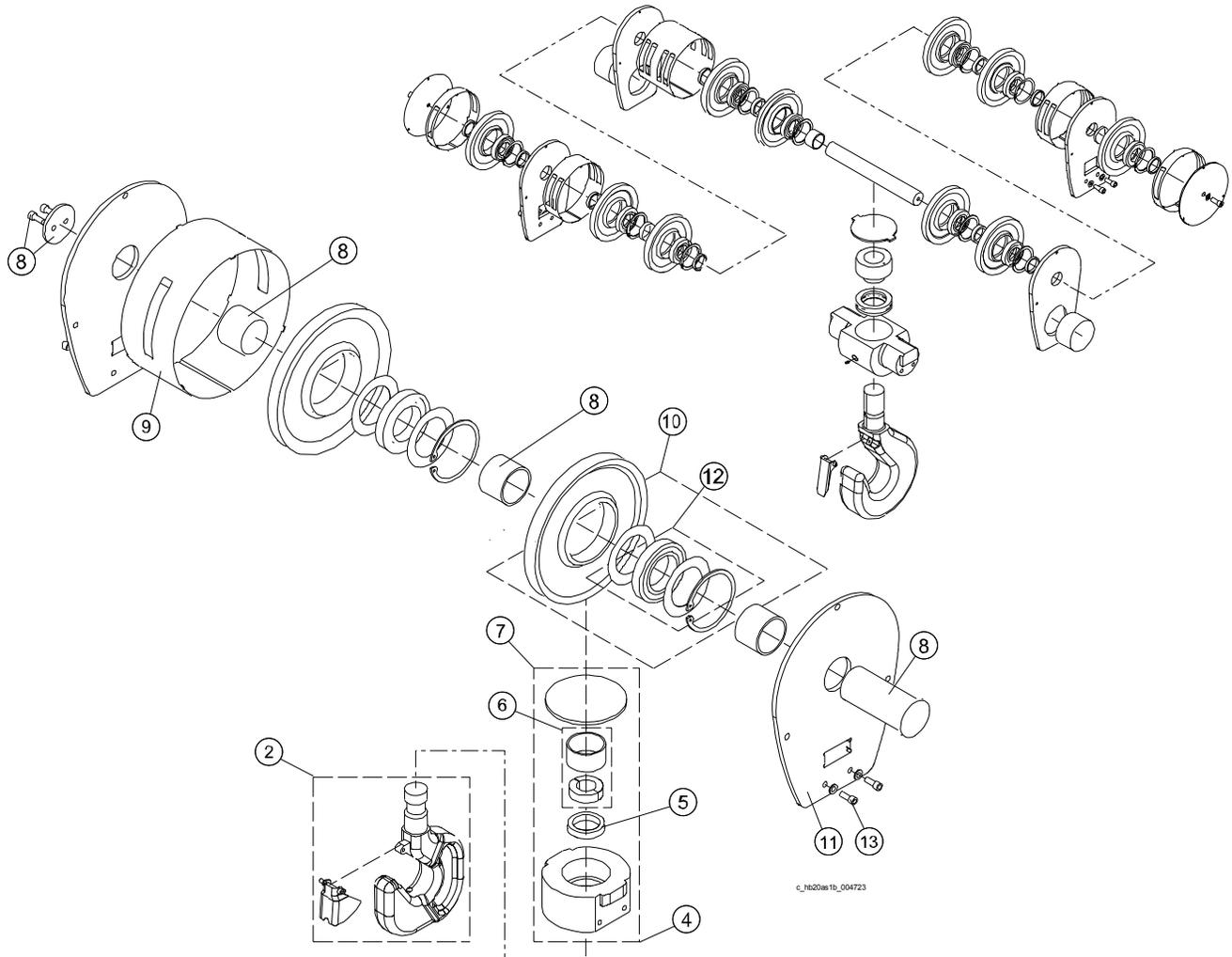


- Insert the hook-assembly into the bearing housing (7) and tighten the fixing screws hand-tight.
- Re-assemble the side plates (8), the rope sheaves (10) and the shaft locking parts (12).
- Ensure that the sheaves rotate freely before tightening the bearing housing fixing screws to the required torque.
- Switch ON the power supply to the crane.
- Raise the hook block. Carefully guide the rope with a gloved hand until the hook block hangs free from the working platform.
- If the lower limit switch has been adjusted, re-adjust to the correct position.
- Test the operation of the hoist.



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Hook block, all other models



Note: The actual hook block outlook may vary, depending on the size!

2. Safety latch set
3. Hook forging.
4. Hook bearing set
5. Thrust bearing
6. *) Locking ring or nut
7. Cover
8. Shaft & shaft locking screws
9. Sheave cover
10. Rope sheave
11. Side plate & side plate locking screws
12. Rope sheave bearing set

*) In bigger models the locking ring is replaced by a locking nut

***) Depending on the amount of rope falls, there are additional sheave, side plates and sheave covers

Disassembly:

- Lower the hook onto a stable working-platform. Pull with a gloved hand some extra rope down from the drum, so that the hook-block is free. If needed, adjust the lower limit switch.

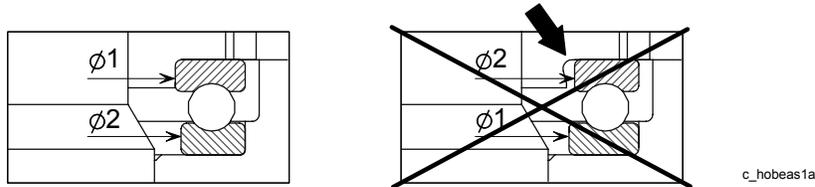


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- Switch OFF the power supply to the crane.
- Remove the shaft locking parts (8).
- Remove the side plate fixing parts (11)
- Extract the rope sheaves (10), sheave covers (9) and side plates (11).
- Remove the cover plate (7)
- Remove the locking ring (or nut) (6) and thrust bearing (5).
- Extract the hook (3) from the bearing set (4).

Re-assembly:

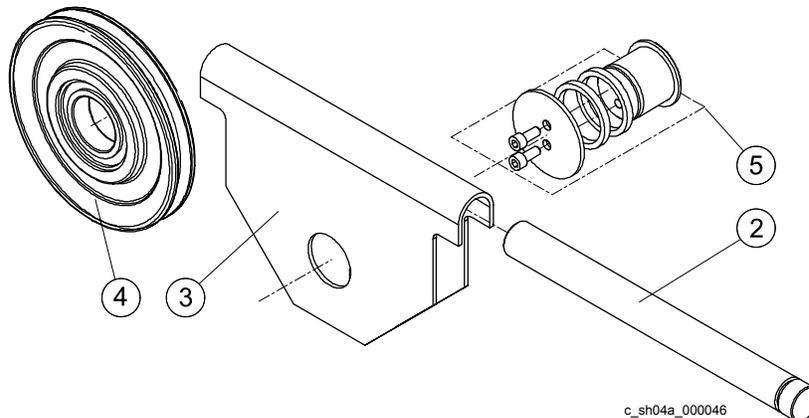
- Lubricate the thrust bearing and the hook shaft.
- Insert the hook (3) into the bearing house (4) and re-assemble the thrust bearing (5) and the locking ring (or nut) (6).



- Re-assemble the side plates (11), the rope sheaves (10), sheave cover (9) and shaft (8).
- Tighten all fixing screws to the required torque.
- Switch ON the power supply to the crane.
- Raise the hook block. Carefully guide the rope with a gloved hand until the hook block hangs free from the working platform.
- If the lower limit switch has been adjusted, re-adjust to the correct position.
- Test the operation of the hoist.

5.29.3 Return sheave assembly

Return sheave, 4-fall, 1-rope reeving, drum size ϕ 303/355/406 mm



- 2. Shaft
- 3. Sheave support
- 4. Rope sheave
- 5. Shaft set



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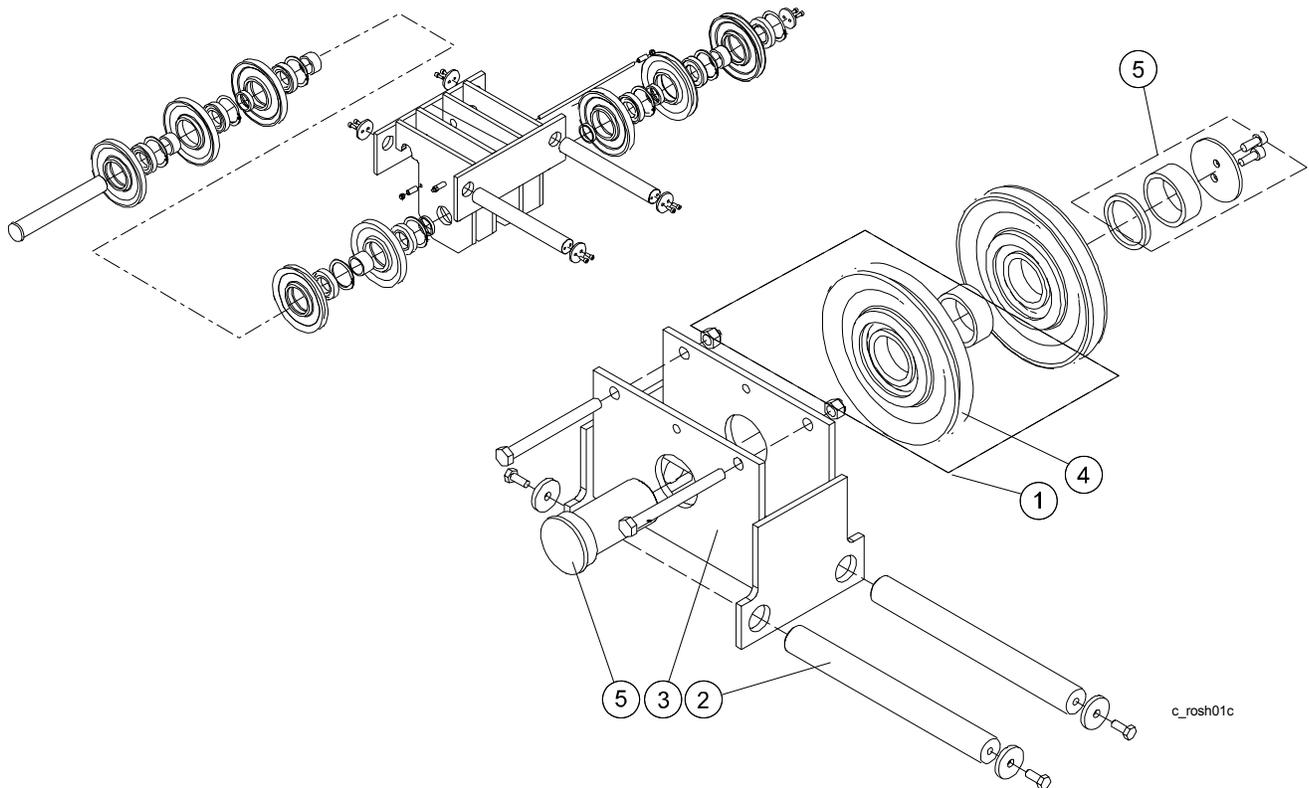
Disassembly:

- Lower the hook onto a stable working-platform. Pull with a gloved hand some extra rope down from the drum, so that the hook-block is free. If needed, adjust the lower limit switch.
- Switch OFF the power supply to the crane.
- Remove the shaft locking parts (5).
- Extract the shaft (5) and the rope sheave (4) from the shaft support (3).

Re-assembly:

- Insert the sheave (4) and the shaft (5) into the shaft support (3)
- Lock the shaft with the locking screws.
- Tighten all fixing screws to the required torque.
- Switch ON the power supply to the crane.
- Raise the hook block. Carefully guide the rope with a gloved hand until the hook block hangs free from the working platform.
- If the lower limit switch has been adjusted, re-adjust to the correct position.
- Test the operation of the hoist.

Return sheave, all other models



Note: The actual outlook may vary, depending on the size!

2. Support shaft
3. Support frame
4. Rope sheave
5. Sheave shaft, sleeves and locking parts



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Disassembly:

- Lower the hook onto a stable working-platform. Pull with a gloved hand some extra rope down from the drum, so that the hook-block is free. If needed, adjust the lower limit switch.
- Switch OFF the power supply to the crane.
- Remove the shaft locking parts (5).
- Extract the shaft (5) from the support frame (3).



Be aware: the sheaves, as well as the sleeves will come loose one by one when extracting the shaft.

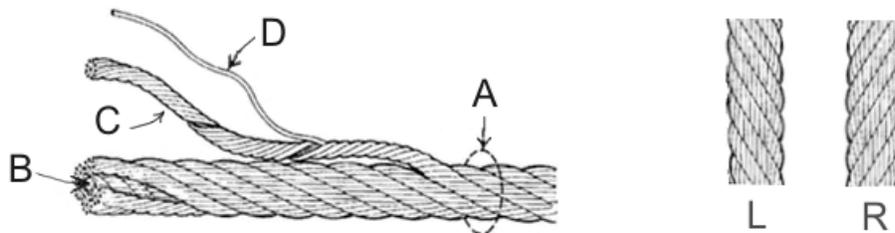
Re-assembly:

- Insert the shaft (5) into the shaft support (3), while inserting the sheaves (4) and sleeves.
- Lock the shaft with the locking screws.
- Tighten all fixing screws to the required torque.
- Switch ON the power supply to the crane.
- Raise the hook block. Carefully guide the rope with a gloved hand until the hook block hangs free from the working platform.
- If the lower limit switch has been adjusted, re-adjust to the correct position.
- Test the operation of the hoist.

5.30 Wire rope

The rope of the hoist is a wearing, load-bearing part. In order to ensure safe and efficient operation of the hoist, it is essential to follow the safe working principles described in the safety instructions. Regular inspection of the rope is a vital safety procedure requirement.

5.30.1 Wire rope structure



- A. Rope
- B. Rope core
- C. Strand
- D. Wire
- L. Left hand lay
- R. Right hand lay

Standard and heavy duty wire ropes have 8 outer strands and steel core. The steel core is covered by plastic in heavy duty rope. The lay of the outer strands is left handed in single rope hoists. True vertical hoists have two ropes, one left hand lay, another right hand lay.



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Rotation resistant ropes have more outer strands than standard ropes. Outer strands have left hand lay, while inner strands are in right hand lay.

5.30.2 Service

- Inspect the rope. Regular rope inspection and maintenance shall be carried out according to the guideline instructions below and according to international standard ISO 4309:2004.
- Lubricate the rope with suitable lubrication. Lubricant for wire rope shall be water resistant, non-adhesive, transparent thin oil, which is able to penetrate in the rope.



The rope shall be changed before the limits have been reached. Change the rope if there is a risk that limits are reached before the next examination.

5.30.2.1 Periodical examinations

Visual deformations and damages in the rope shall be inspected daily by the user. Wire ropes shall be inspected by authorized service personnel at least every 12 months or 10% SWP.

The inspection intervals should be shortened when:

- The hoist is used in heavy duty or process use (e.g. duty class M6 or higher, papermill cranes etc.)
- The hoist is used under harsh conditions (e.g. extreme temperatures, excessive dirt/dust or outdoors)
- Previous examinations indicated a high rate of wear.

In case of doubts, please contact the manufacturer for advice.

5.30.2.2 Discard criterias

Maximum number of broken wires in outer strands

Examination of the broken wires shall be made at least in the rope area, which has the most bendings over the rope sheaves during normal operation, and at the rope end near the wedge housing. Before the examination of broken wires, the examination areas shall be carefully cleaned. The wire breaks are better visible if the rope is lightly bended.



The internal examination of wire rope shall not be done in the regular maintenance, unless the person is trained for that examination (ISO4309 Annex D).

Standard Ropes and Heavy Duty Ropes

Rope diam. mm	Detected length mm	Maximum wire breaks	
		Duty class M4	Duty class M5, M6
6.2 - 6.5	40	3	6
	200	6	12
8	50	5	10
	250	10	20
11	70	5	10
	350	10	20
15	90	8	16
	450	16	32



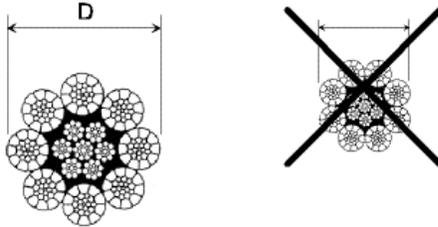
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Rotation Resistant Ropes

Rope diam. Mm	Rope construction	Detected length mm	Maximum wire breaks	
			Duty class M4	Duty class M5, M6
6.7	17 x 7	40	2	4
		200	4	8
8 – 8.5	24 x 7	50	2	4
		250	4	8
11 – 11.5	28x 7	70	2	4
		350	4	8
15	28 x7	90	2	4
		450	4	8

Local reduction of rope diameter

Rope diameter can decrease due to external or internal wear or damage. When the actual diameter of a standard or heavy duty rope has decreased 7 % of the nominal diameter the rope shall be changed. In rotation resistant ropes the decrease by 3% cause rope discard.



Local increase of rope diameter

Deformations inside the rope can cause increase of rope diameter. If the actual rope diameter is increased by 5%, the rope shall be changed.

Basket (birdcage) deformation



Basket deformation is a result of a difference in length between the rope core and outer strands. Rope with basket deformation shall be changed immediately.



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Protrusion of rope parts



Rope with rise up of core, strand or group of wires shall be changed immediately.

Loose outer strands



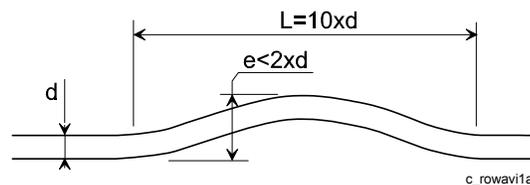
The outer strands of the ropes shall be tight, when the rope is not loaded. In standard and heavy duty ropes the outer strands can have small, visible gap under load. If the gap does not close when the load is released, the rope shall be changed.

Kink



Kink or tightened loop is created by a loop in the rope which has been tightened without allowing for rotation about its axis. Rope with a kink shall be changed immediately.

Bends



Bends and angular deformations are normally caused by external influence. Broken wires shall be carefully studied in the area of bends. Discard criteria for a bend is: $e < 2 \times d$ over a length of $10 \times d$. A milder bend can often be removed by carefully bending the rope by hand in the opposite curve. Rope with sharp bend shall be changed immediately.



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5.30.3 Assembly

Disassembly:

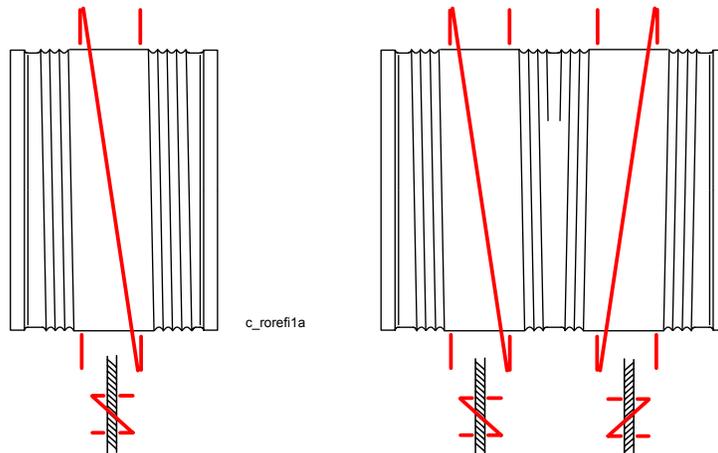
- Adjust (or by-pass) the lower limit switch so that the rope can be fully unwound from the drum
- Lower the hook onto a stable working-platform.
- Remove the rope guide, see section “*Rope guide, Assembly*” for details.
- Pull, with a gloved hand, the rope down from the drum, until the last turn.
- Switch OFF the power supply to the crane.
- Extract the rope anchorage from the overload device, see section “*Rope anchorage, Assembly*” for details and remove the rope from the anchorage.
- Pull the rope out from the hook block and return sheaves.
- Remove the rope clamps from the drum and remove the rope.



In some cases, it can be possible to pull the new rope on to the hoist by using the old rope and a cable-sock. Pay special care when using this practice. Make sure there is no risk for personal injuries and assure the new rope does not get damaged.

Re-assembly:

- Check that the new rope is compatible with the hoist. Check the rope certificate to determine whether the rope is of the correct diameter and breaking load.
- Unroll the cable (when delivered as a roll) or use a cable-reel stand (when delivered on a drum). Follow the principles as set out in standard ISO 4309.
- Fasten the rope end to the rope drum with the rope clamps.



- Switch ON the power supply to the crane.
- Run the rope onto the rope drum until enough free rope is available for the reeving, using the hoisting motor.
- Thread the rope through the rope sheave or rope sheaves as shown in the rope reeving diagram.
- Fix the rope in the rope anchorage, tighten it and fasten the rope clamp on the free end of the rope.



Place the rope in the rope anchorage the right way around.

- Place the rope anchorage in its suspension point. Fix the locking pins.
- Always adjust and check the limit switch for hoisting after replacing the rope. See section “*Hoisting limit switch, Adjustment*” for details.



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In two-rope systems (True Vertical Lift), replace both ropes simultaneously. Ensure that both ropes are exactly identical except right/left hand lay.



In two-rope systems (True Vertical Lift), ensure that both rope are of equal length. A small variation in length may cause the hook block and the balancing beam to tilt. Adjust the rope length by pulling one of the ropes further through the wedge housing, until the hook block hangs as straight as possible (maximum 5 degrees tilt allowed)

- New wire rope shall be taken in use by a load, which is of approx. 10 % of the nominal load. This load shall be lifted to the total lifting height 5 – 10 times. If the hook tries to turn around during the lifting, place the hook in the lowest position without load, open the rope end wedge housing and rotate the wedge housing until the hook is straight.



Note the correct position of the wedge housing (see sticker).

- Append the rope certificate for the new rope to the documentation for the hoist.

5.31 Overload protection

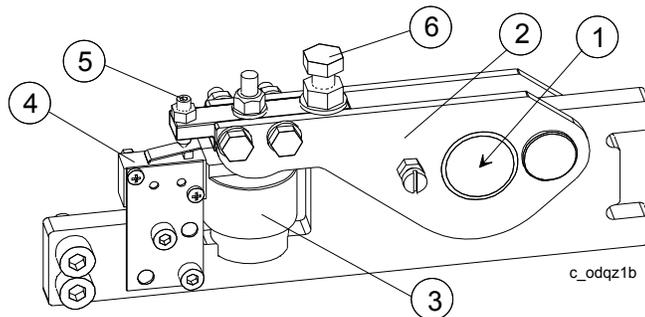
The overload protection prevents hoisting motion when there is an excessive load. The operating point of overload protection is stated in the written records for the test drive of the hoist.

Overload protection is achieved by either a mechanical switch or an electronic load sensor.

The mechanical switch is connected to the hoisting circuitry, and controls the hoisting contactor.

The load sensor is connected to a separate condition-monitoring unit. The condition monitoring unit prevents hoisting motion when there is an excessive load. The overload protectors with a load sensor are equipped with an additional safety limit-switch.

Overload device, mechanical switch (drum size ϕ 243 mm)

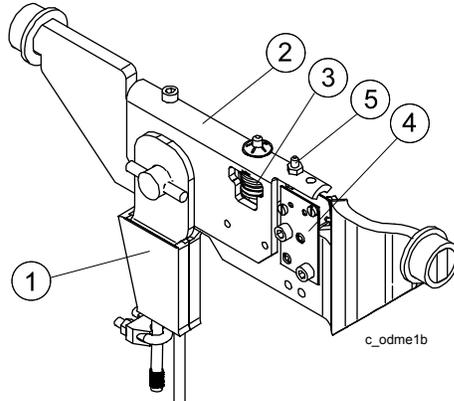


1. Rope anchorage
2. Lever mechanism
3. Set of plate springs
4. Mechanical limit switch
5. Adjustment screw for mechanical limit switch
6. Lever movement limiter



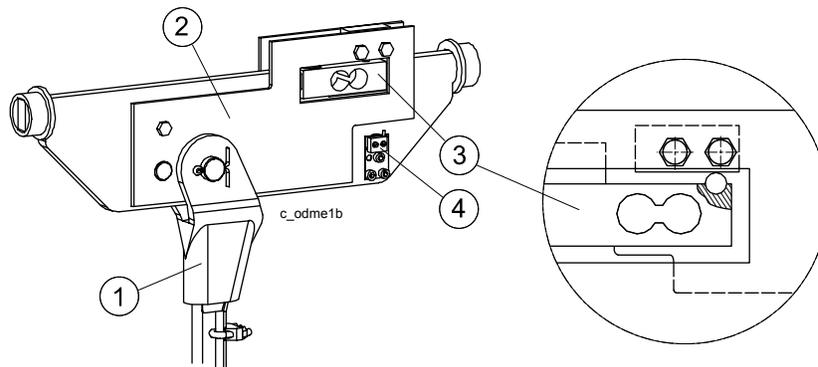
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Overload protection, mechanical switch



1. Rope anchorage
2. Lever mechanism
3. Set of plate springs
4. Mechanical limit switch
5. Adjustment screw for mechanical limit switch

Overload protection, load sensor



1. Rope anchorage
2. Lever mechanism
3. Load sensor
4. Safety limit switch



Safety limit switch (4) is designed for overload mechanism supervision, not for overload protection. Safety limit switch (4) does not measure load and it is no substitute for load sensor (3).

5.31.1 Service

- Check the good condition of the overload protection mechanism and the mechanical limit switch. Clean if needed
- Test the safety limit switch (4) operation by pressing the switch manually.



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Safety limit switch is not adjustable!

- Lubricate the pivot joint of the lever mechanism, the suspension support of the rope anchorage and the rocker bushings of the support beam with suitable thin oil.



Regulations in certain countries require that the operating point of overload protection is checked annually by conducting an overload test. If local requirements necessitate an overload test, conduct the annual inspection as follows:

- Prepare a test load that is 10 % heavier than the operating point for overload protection stated in the written records for the test drive of the hoist. Raise the test load a little and only once. If the overload protection halts the hoisting of the test load, it is operating correctly. If the overload protection does not prevent hoisting of the test load, the overload protection must be re-adjusted.



Only a service agent authorised by the manufacturer may adjust the overload protection.



Do not repeat the overload test unnecessarily. The overload test is an actual overload. The test can only be conducted in carefully prepared and properly supervised conditions.

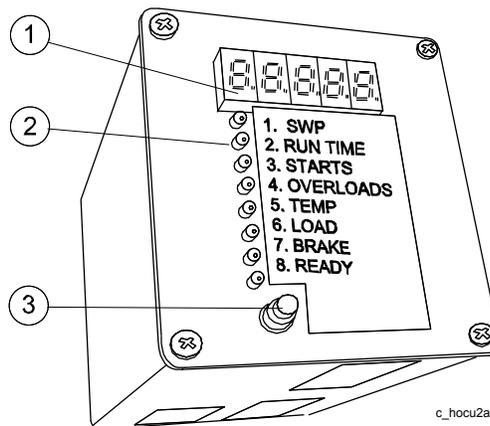
5.32 Condition monitoring unit

The electrical cubicle on the hoist contains the condition-monitoring unit that supervises the safe operation of the hoist. The unit collects data on functions that affect safety and calculates the remaining time in the Safe Working Period (SWP) during which the hoist can operate safely. Separate operating and servicing instructions for the condition-monitoring unit are delivered with the hoist.



Only qualified personnel authorized by the manufacturer of the hoist may do the programming of the condition-monitoring unit.

CU1

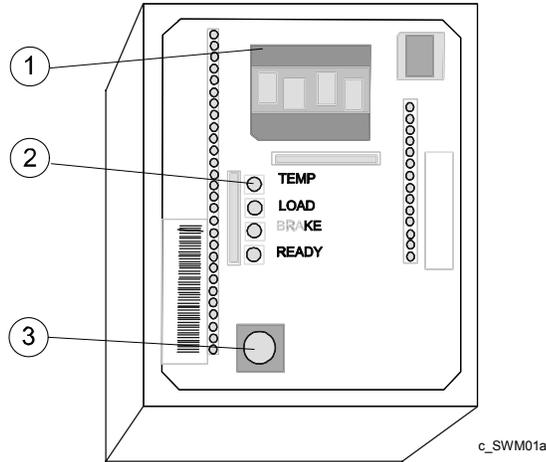


1. Digital display
2. Indicator LEDs
3. Programming buttons



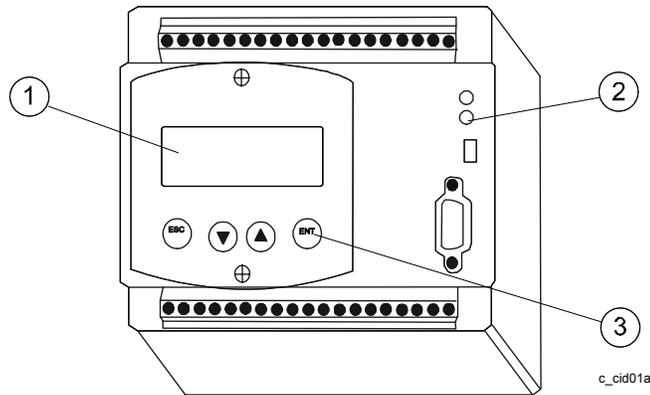
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SWM



1. Digital display
2. Indicator LEDs
3. Programming buttons

Condition monitoring unit



1. Digital display
2. Indicator LEDs
3. Programming buttons

5.32.1 Service

Consult with the service manual of the respective condition-monitoring unit for details.

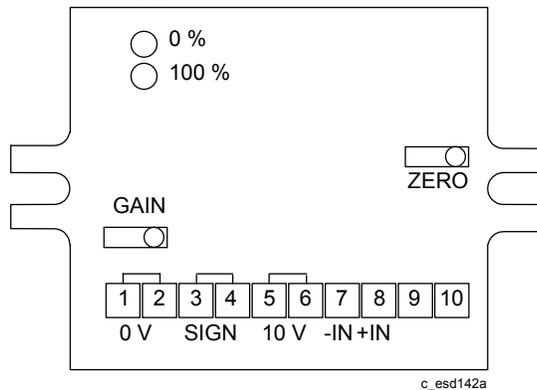
- Check that non of the fault-indicating LEDs are lit up, and that the display does not show an error message.
- Write down the primary monitoring values and keep a log of these.



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5.33 Load signal amplifier

The load signal amplifier amplifies the signal coming from the load sensor. The amplified signal is fed into the condition-monitoring unit. The LED's indicate the load, in percentage of the rated load of the hoist. 0% LED lights up when the lifted load is equal or less then 0% (indicating slack rope) whereas the 100% LED lights up when the load is equal or bigger then 100% (indicating overload).



c_esd142a

5.33.1 Adjustment

Adjustment with no load:

- Check that there is no load on hook.
- Adjust the trimmer "ZERO" to counterclockwise until the light "0 %" goes on.
- Adjust the trimmer "ZERO" back to clockwise until the light "0 %" goes off. Now the output signal should be about 4 VDC. Voltage can be measured between the terminals 1 and 3.

Adjustment with nominal load:



You may have to bypass overload protection on condition monitoring unit when lifting a test load.

Adjustment with 100% load:

- Lift up the rated load of the hoist.
- Adjust the trimmer "GAIN" clockwise until the light "100 %" goes on.
- Adjust the trimmer "GAIN" counterclockwise until the light "100 %" goes off. Now the output signal should be about 6 VDC. Voltage can be measured between the terminals 1 and 3.

If a 100% test-load is not available, adjustment can be done with any known load in between 50...110% of the rated load. In that case, the output voltage with the respective test load has to be calculated as follows:

$$U_{out} = \left(\frac{L_t}{L_r} \times 2 \right) + 4$$

U_{out} = Output voltage

L_t = Test load

L_r = Rated load

Adjustment with 50...110% load:

- Lift up the known test-load.
- Connect a Voltmeter between terminals 1 and 3.
- Adjust the trimmer "GAIN" clockwise until the voltmeter shows the correct respective voltage.



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Setup the condition monitoring unit always after load sensor amplifier adjustment! Refer to separate service manual for condition monitoring unit.

Terminal	Signal	To
1	0 VDC	Condition monitoring unit: 2
2	0 VDC	Load sensor (-Exc)
3	Signal	Condition monitoring unit: 3
4	Signal	Not connected
5	10 VDC	Condition monitoring unit: 4
6	10 VDC	Load sensor (+Exc)
7	-IN	Load sensor (Out)
8	+IN	Load sensor (Out)
9	SHLD	Load sensor (shield)
10	4 VDC	Not connected



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6 Installation

Familiarize yourself with the installation instructions delivered with the hoist before commencing. Pay attention to the instructions on safe operation of the hoist.

6.1 Prior to installation

Check the following basic requirements before commencing installation of the hoist:

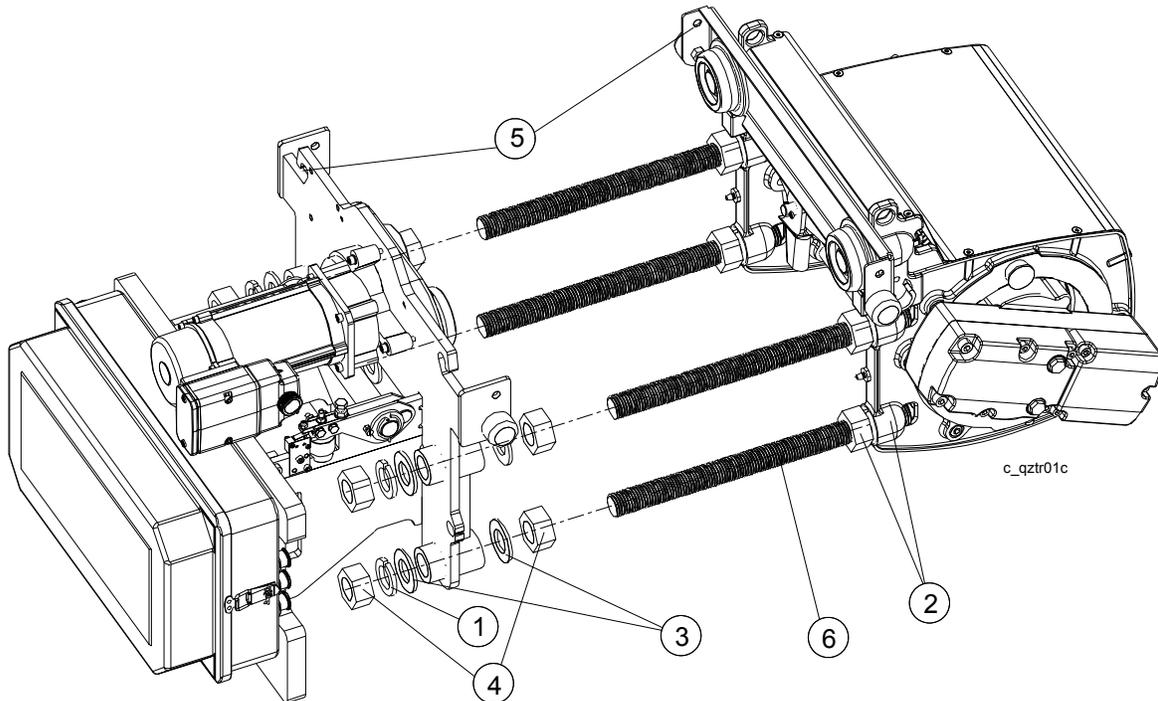
- Adequate personnel resources, such as competent fitters and work supervisors, have been allocated to the work.
- Sufficient and appropriate tools and equipment are available, such as lifting equipment and a test load.
- Sufficient time has been reserved for installation and testing.
- The hoist being installed is suitable for the application and operating environment.



It is recommended that qualified service personnel authorized by the manufacturer of the hoist do the installation work.

6.2 Low headroom trolley, drum size ϕ 243 mm

Clearance between the wheel flange and the main girder flange (measure X) must be 3...5 mm. Ensure that the clearance is equal on both ends of the trolley.



1. Locking washers
2. Fixing nuts
3. Plain washers
4. Adjusting nuts
5. Lifting mounts
6. Screw rods

- Remove the temporary transport supports. Take the hoist out of the packing and move it to the installation site. Lift the hoist using the lifting mounts (5).



Do not unscrew the fixing nuts on the hoisting machinery side!

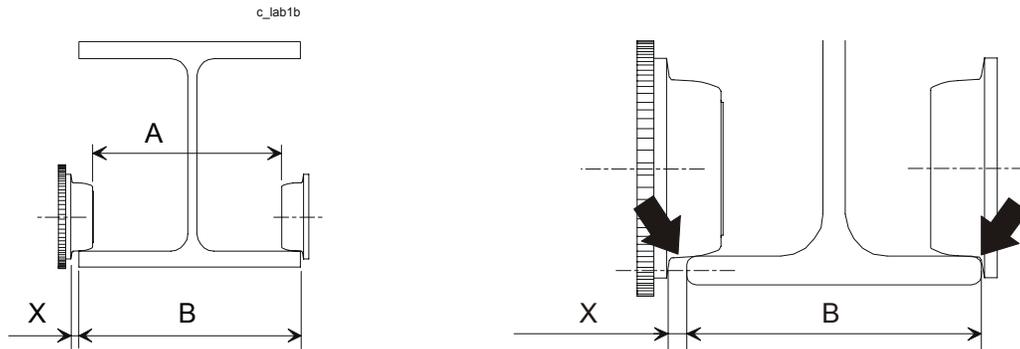
- Lift the hoist onto the beam. Adjust the X measurement until there is a gap of approximately 3...5mm between the flange of the travel wheels and the flange of the beam.
- Check the wheels of the trolley are correctly aligned.



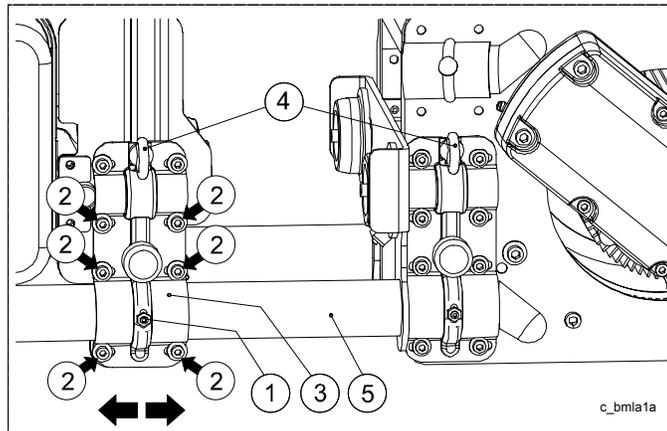
Tighten the adjusting nuts (4) on both sides to the correct tightening torque. Refer to the section "Recommended tightening torques".

6.3 Low headroom trolley

When installing a low headroom trolley, the wheel gauge has to be adjusted properly. Clearance between the wheel flange and the main girder flange (measure X) must be 3...5 mm. Ensure that the clearance is equal on both ends of the trolley.



Drum size ϕ 303mm



1. Locking screw and nut
2. Fixing screws for fixing bracket
3. Fixing bracket
4. Lifting lugs for raising the hoist
5. Frame tube

- Remove the temporary transport supports. Take the hoist out of the packing and move it to the installation site. Lift the hoist using the lifting lugs (4).
- Loosen the locking (1) on frame tubes of the trolley drive side. Loosen the lowest fixing screws (2) for the fixing brackets. Adjust the distance between the travel wheels (A) so that it is slightly wider than the beam flange (B) for installation purposes.



Do not unscrew the fixing screws for the fixing bracket on the hoisting machinery side!

- Lift the hoist onto the beam. Adjust the X measurement until there is a gap of approximately 3...5mm between the flange of the travel wheels and the flange of the beam. Use a nylon mallet to adjust the X measurement.
- Check the wheels of the trolley are correctly aligned.



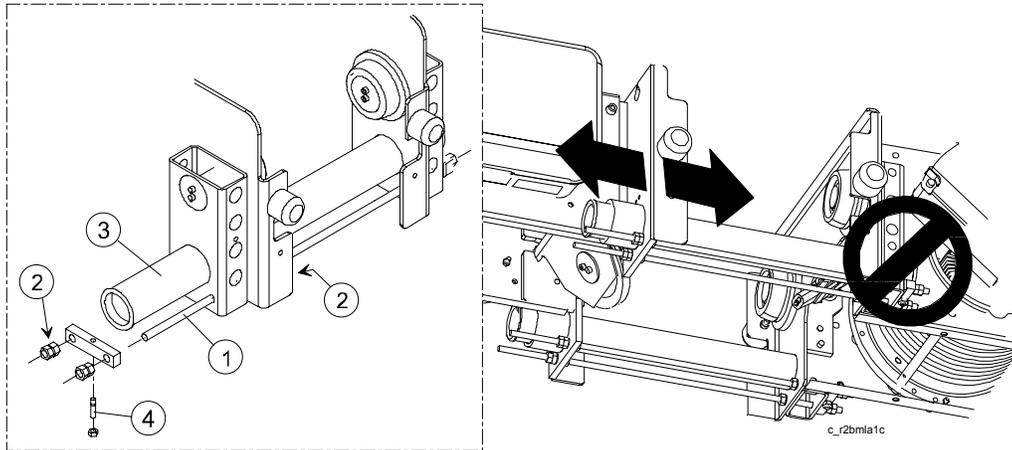
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Tighten the lowest fixing screws (2) for the fixing brackets of the trolley on both sides to the correct tightening torque. Refer to the section “Recommended tightening torques”.

- Tighten the locking screws (1) for trolley adjustment on both sides.

Drum size ϕ 355/406mm and ϕ 303 for low profile



1. Adjusting bar
2. Locking screws
3. Frame tube
4. Locking screw

- Remove the temporary transport supports. Take the hoist out of the packing and move it to the installation site. Lift the hoist using slings around the frame tube.
- Loosen the locking (2) of adjusting bar (1). Adjust the distance between the travel wheels (A) so that it is slightly wider than the beam flange (B) for installation purposes.



Do not loosen the fixing parts on the drum-side of the trolley

- Lift the hoist onto the beam. Adjust the X measurement until there is a gap of approximately 3...5mm between the flange of the travel wheels and the flange of the beam. Use a nylon mallet to adjust the X measurement.
- Check the wheels of the trolley are correctly aligned.



Tighten the locking screw (2) and (4) of the adjusting bar on both sides to the correct tightening torque. Refer to the section “Recommended tightening torques”.

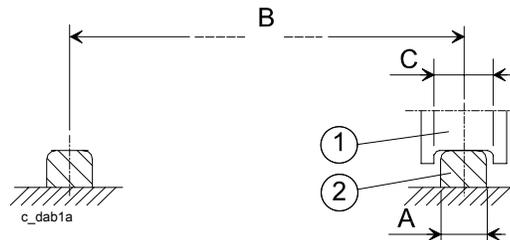
6.3.1 Outfitting the hoist

- Install the power supply. Refer to the section “**Connecting the to mains network**”.
- Adjust the limit switch for hoisting. Refer to the section “**Adjusting hoisting limit switch**”.
- Carry out the commissioning inspection and complete the commissioning log. Refer to the section “**Commissioning**”.



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6.4 Double-girder trolley



1. Travel wheel
2. Rail

- Remove the temporary transport supports. Take the hoist out of the packing and move it to the installation site. Lift the hoist using the lifting lugs provided.
- Check that the rail centers (B) on the main beam are suitable for the hoist trolley.
- Check that the groove (C) in the travel wheel is 15 mm wider than the rail width (A).
- Lift the hoist trolley onto the track.
- Check the proper installation and position of the runway end stops.
- Check that the hoist buffers are able to bump into the runway end stops or buffers of other trolley. Note that in some hoist models the position of buffers can be changed.

6.4.1 Outfitting the hoist

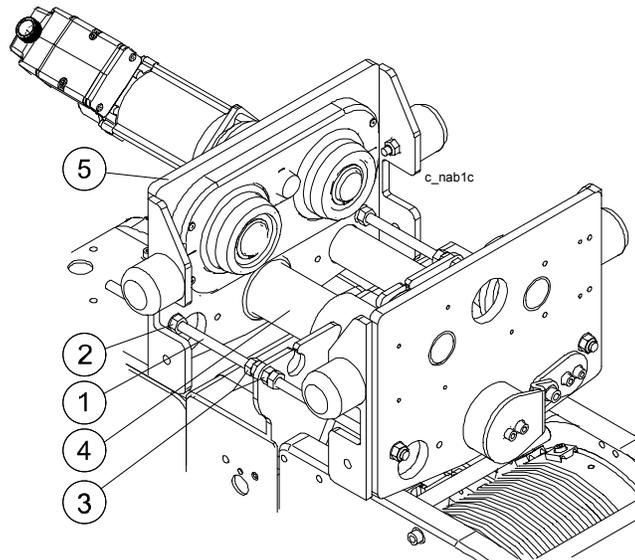
- Install the power supply. Refer to the section "**Connecting the to mains network**".
- Adjust the limit switch for hoisting. Refer to the section "**Adjusting hoisting limit switch**".
- Carry out the commissioning inspection and complete the commissioning log. Refer to the section "**Commissioning**".



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6.5 Normal headroom trolley

6.5.1 Straight beam



1. Adjusting bar
2. Adjusting nuts for flange width
3. Trolley positioning nuts
4. Frame tube
5. Trolley side plate

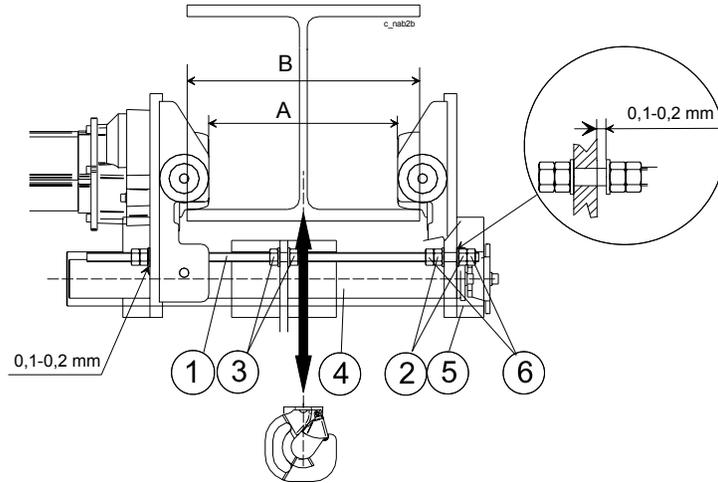
- Remove the temporary transport supports. Take the hoist out of the packing and move it to the installation site. Lift the hoist using the lifting lugs provided.
- Loosen the adjusting nuts for flange width (2). Adjust the distance between the travel wheels (A) so that it is slightly wider than the beam flange (B) for installation purposes.
- Lift the hoist onto the beam.
- Adjust the side plate (5) of the trolley inwards until there is a gap of approximately 3...5mm between the flange of the travel wheels and the flange of the beam. Tighten the nut (2) to the sideplate (5). On the other side of the sideplate leave 0.1 – 0.2 mm clearance between the nut (2) and the sideplate. Lock the nuts (2) to place by the extra nuts (6).
- Loosen the adjusting nuts for trolley positioning (3). Adjust the position of the trolley so that the hook is hanging below the centerline of the beam.



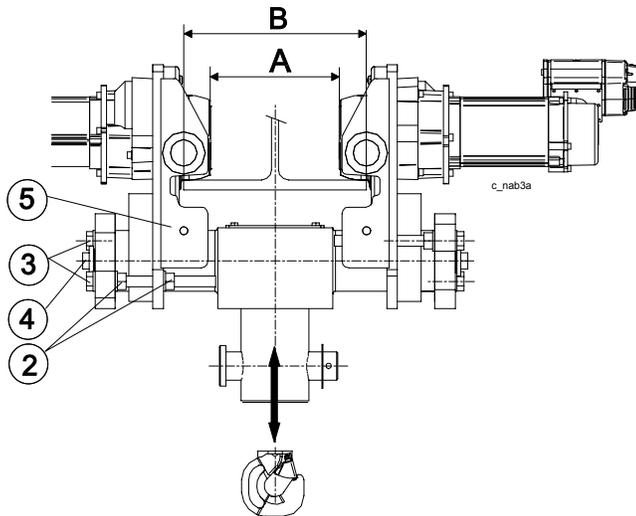
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Tighten the nuts (2)/(6) and (3) to the correct tightening torque. Refer to the section 'Recommended tightening torques'.



6.5.2 Curved beam, when two trolleys



- 2. Adjusting nuts for flange width
- 3. Trolley positioning nuts
- 4. Frame tube
- 5. Trolley side plate

- Remove the temporary transport supports. Take the hoist out of the packing and move it to the installation site. Lift the hoist using the lifting lugs provided.
- Loosen the tightening nuts for flange width (2). Adjust the distance between the travel wheels (A) so that it is slightly wider than the beam flange (B) for installation purposes by turning the screws (3). If necessary, open also the screws (4).
- Lift the hoist onto the beam.



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- Adjust the side plate (5) of the trolley inwards by turning the screws (3) until there is a gap of approximately 3...5mm between the flange of the travel wheels and the flange of the beam.
- Adjust the position of the trolley so that the hook is hanging below the centerline of the beam. Lock the position by tighten the nuts (2).



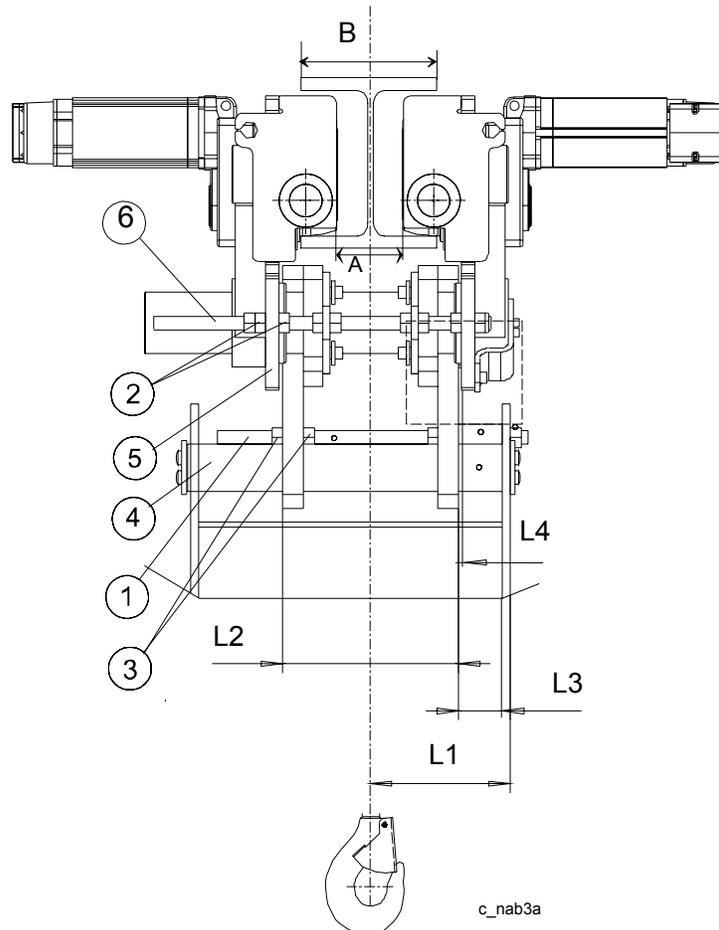
Tighten the nuts (2) and the screws (4) to the correct tightening torque. Refer to the section 'Recommended tightening torques'.

6.5.3 Outfitting the hoist

- Install the power supply. Refer to the section “**Connecting the to mains network**”.
- Adjust the limit switch for hoisting. Refer to the section “**Adjusting hoisting limit switch**”.
- Carry out the commissioning inspection and complete the commissioning log. Refer to the section “**Commissioning**”.

6.6 Normal headroom trolley, drum diameter 608 mm

6.6.1 Straight beam



1. Adjusting bar for trolley position
2. Adjusting nuts for flange width
3. Trolley positioning nuts
4. Frame tube
5. Trolley side plate
6. Adjusting bar for flange width

- Remove the temporary transport supports. Take the hoist out of the packing and move it to the installation site. Lift the hoist using the lifting points marked on the hoist.
- Loosen the adjusting nuts for flange width (2). Adjust the distance between the travel wheels (A) so that it is slightly wider than the beam flange (B) for installation purposes.
- Lift the hoist onto the beam.
- Adjust the side plate (5) of the trolley inwards until there is no gap between the flange of the travel wheels and the flange of the beam. Then adjust the other side plate (5) of the trolley inwards until there is a gap of approximately 3...5mm between the flange of the travel wheels and the flange of the beam.
- Loosen the adjusting nuts for trolley positioning (3).



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Adjust the position of the trolley so that the hook is hanging below the centerline of the beam. Select L-dimensions according to rope reeving and beam flange from table below.



Tighten the nuts (2) and (3) to the correct tightening torque. Refer to the section 'Recommended tightening torques'.

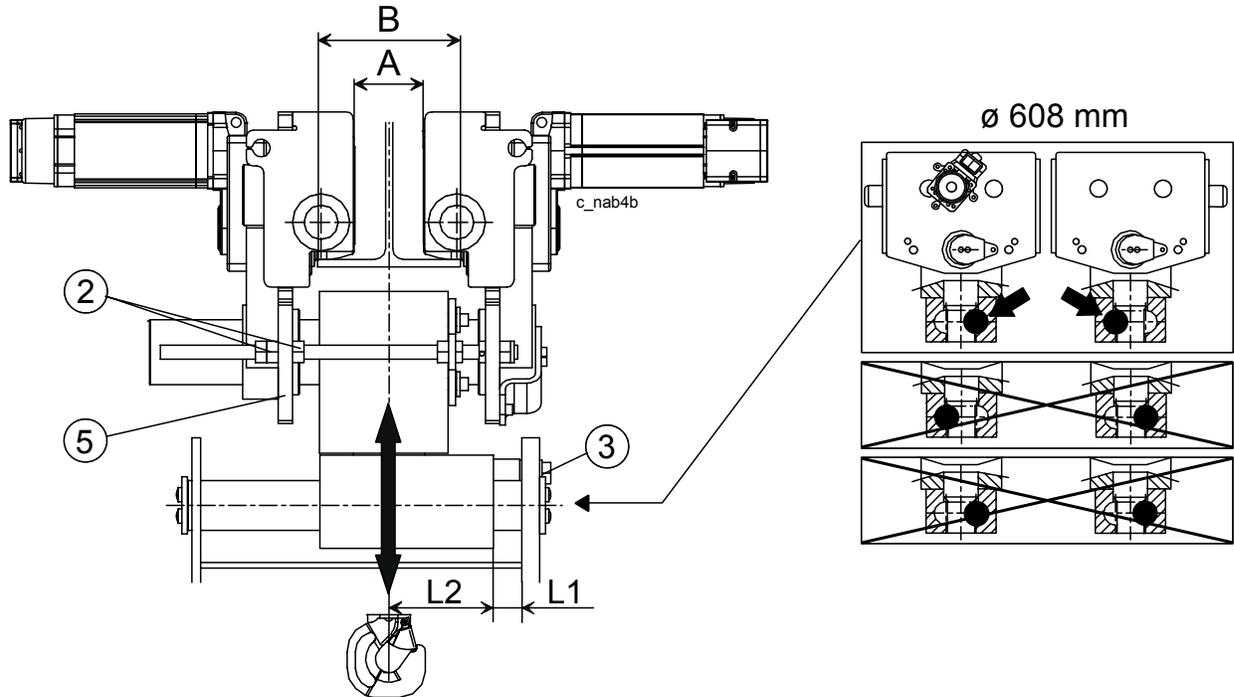
6.6.1.1 Standard reeving (1 rope from drum)

Falling ropes	B-dimension		L1		L2		L3		L4	
	(mm.)	Inch	(mm.)	Inch	(mm.)	Inch	(mm.)	Inch	(mm.)	Inch
2	100-200	3.9-7.9	122	4,8	120	4,7	37	1,5	B/2-30	B/2-1.2
	201-610	7.9-24	122	4,8	194	7,6	0	0	B/2-67	B/2-2.6
4	120-200	4.7-7.9	188.5	7,4	167	6,6	80	3,1	B/2-48	B/2-1.9
	201-330	7.9-13	188.5	7,4	247	9,7	40	1,6	B/2-88	B/2-3.5
	331-610	13-24	188.5	7,4	327	12,9	0	0	B/2-128	B/2-5
6	120-200	4.7-7.9	188.5	7,4	168	6,6	101	4	B/2-49	B/2-1.9
	201-330	7.9-13	188.5	7,4	248	9,8	61	2,4	B/2-89	B/2-3.5
	331-610	13-24	188.5	7,4	370	14,6	0	0	B/2-151	B/2-5.9
8 Single Trolley	200-330	7.9-13	220	8,7	248	9,8	71	2,8	B/2-89	B/2-3.5
	331-450	13-17.7	220	8,7	316	12,4	37	1,5	B/2-124	B/2-4.9
	451-610	17.7-24	220	8,7	390	15,4	0	0	B/2-161	B/2-6.3
8 Bogey Trolley	200-330	7.9-13	220	8,7	260	10,2	65	2,6	B/2-95	B/2-3.7
	331-450	13-17.7	220	8,7	316	12,4	37	1,5	B/2-124	B/2-4.9
	451-610	17.7-24	220	8,7	390	15,4	0	0	B/2-161	B/2-6.3

6.6.1.2 True vertical lift (2 ropes from drum)

Falling ropes	B-dimension		L1		L2		L3		L4	
	(mm.)	Inch	(mm.)	Inch	(mm.)	Inch	(mm.)	Inch	(mm.)	Inch
4	100-200	3.9-7.9	158	6,2	158	6,2	37	1,5	B/2-49	B/2-1.9
	201-330	7.9-13	232	9,1	232	9,1	0	0	B/2-86	B/2-3.4
	331-450	13-17.7	232	9,1	232	9,1	0	0	B/2-86	B/2-3.4
	451-610	17.7-24	232	9,1	232	9,1	0	0	B/2-86	B/2-3.4
8	100-200	3.9-7.9	158	6,2	158	6,2	74	2,9	B/2-49	B/2-1.9
	201-330	7.9-13	232	9,1	232	9,1	37	1,5	B/2-86	B/2-3.4
	331-450	13-17.7	306	12	306	12,0	0	0	B/2-123	B/2-4.8
	451-610	17.7-24	306	12	306	12,0	0	0	B/2-123	B/2-4.8
12 or 16	120-200	4.7-7.9	183	7,2	168	6,6	74	2,9	B/2-49	B/2-1.9
	201-330	7.9-13	183	7,2	242	9,5	37	1,5	B/2-86	B/2-3.4
	331-450	13-17.7	183	7,2	316	12,4	0	0	B/2-123	B/2-4.8
	451-610	17.7-24	183	7,2	316	12,4	0	0	B/2-123	B/2-4.8

6.6.2 Curved beam



- 2. Adjusting nuts for flange width
- 3. Trolley positioning nuts
- 5. Trolley side plate

- Remove the temporary transport supports. Take the hoist out of the packing and move it to the installation site. Lift the hoist using the lifting points marked on the hoist.
- Loosen the adjusting nuts for flange width (2). Adjust the distance between the travel wheels (A) so that it is slightly wider than the beam flange (B) for installation purposes.
- Lift the hoist onto the beam.
- Adjust the side plate (5) of the trolley inwards until there is no gap between the flange of the travel wheels and the flange of the beam. Then adjust the other side plate (5) of the trolley inwards until there is a gap of approximately 3...5mm between the flange of the travel wheels and the flange of the beam.
- Loosen the adjusting screws for trolley positioning (3).



Adjust the position of the trolley so that the hook is hanging below the centerline of the beam. Select L-dimensions according to rope reeving from table below.



Tighten the nuts (2) and the screws (3) to the correct tightening torque. Refer to the section 'Recommended tightening torques'.



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6.6.2.1 Standard reeving (1 rope from drum)

Falling ropes	L1		L2	
	(mm.)	Inch	(mm.)	Inch
2	0	0	97	3,82
4	18	0,71	146	5,75
6	40	1,57	146	5,75

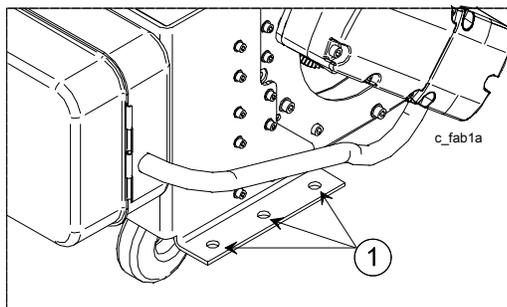
6.6.2.2 Standard reeving (2 ropes from drum)

Falling ropes	L1		L2	
	(mm.)	Inch	(mm.)	Inch
2	21	0,82	97	3,82
4	0	0	146	5,75
6	6	0,23	146	5,75
8	12	0,47	146	5,75

6.6.3 Outfitting the hoist

- Install the power supply. Refer to the section “**Connecting the to mains network**”.
- Adjust the limit switch for hoisting. Refer to the section “**Adjusting hoisting limit switch**”.
- Carry out the commissioning inspection and complete the commissioning log. Refer to the section “**Commissioning**”.

6.7 Installing the hoist, fixed trolley



- Remove the temporary transport supports. Take the hoist out of the packing and move it to the installation site.
- Check that the fixing holes in the site of location match the fixing holes (1) in the trolley.
- Lift the trolley into position. Fasten the fixing screws.

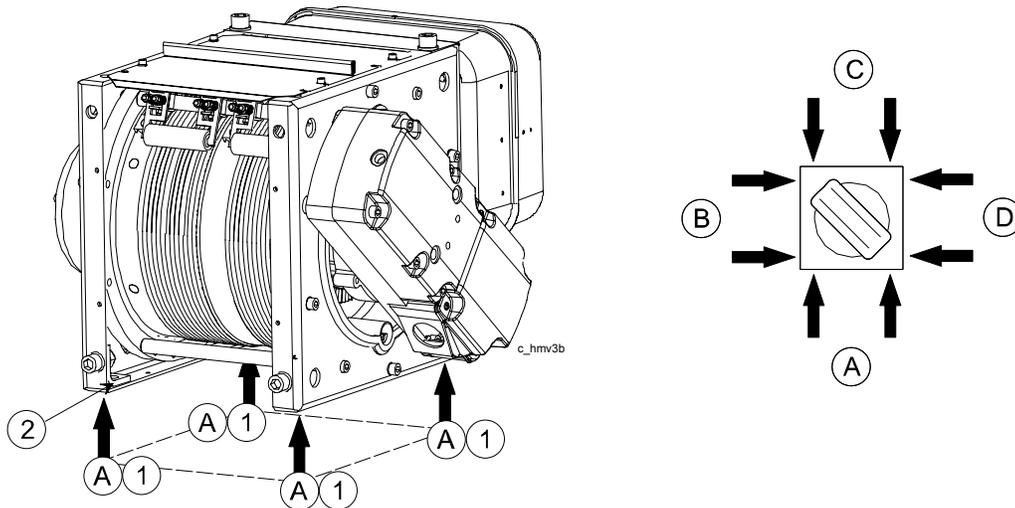


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6.7.1 Outfitting the hoist

- Install the power supply. Refer to the section “**Connecting the to mains network**”.
- Adjust the limit switch for hoisting. Refer to the section “**Adjusting hoisting limit switch**”.
- Carry out the commissioning inspection and complete the commissioning log. Refer to the section “**Commissioning**”.

6.8 Installing the hoist, machinery hoist



- Remove the temporary transport supports. Take the hoist out of the packing and move it to the installation site.
- Check that the fixing holes in the site of location match the fixing holes (1) in the hoist.
- Change electric cubicle position if needed.



All fixing directions A, B, C and D are possible. Move the fixing parts (2) to correct fixing corners.

- Lift the hoist into position. Fasten the fixing screws.
- Instal rope reeving.



Instal rope direction(s) according to manufacturer’s instruction. Be in contact with authorised hoist service.

6.8.1 Outfitting the hoist

- Install the power supply. Refer to the section “**Connecting the to mains network**”.
- Adjust the limit switch for hoisting. Refer to the section “**Adjusting hoisting limit switch**”.
- Carry out the commissioning inspection and complete the commissioning log. Refer to the section “**Commissioning**”.



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6.9 Connecting to the mains network

An electrical wiring diagram is delivered with the hoist. Carry out the following procedures before connecting the hoist to the mains network:

- Check that the rated voltages correspond to the main voltage. The voltages and frequencies marked on the rating plate of motors driven by inverter can deviate from the values on the rating plate for the hoist.
- If the hoist has been in storage for a long time or has been transported by sea, check that the motors are dry and measure their insulation resistance.
- Ensure that the power supply to the hoist is protected with fuses of the correct size.
- Check that the phase sequence is correct.
- Carefully check all connections.



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7 Commissioning

Before handing over the hoist, at least the inspections and adjustments listed below should be carried out. In some cases it is appropriate to carry out a more thorough inspection. The scope of the inspection depends on the operating range and application.

7.1 Inspections without load.

7.1.1 Inspecting the connections of electrical equipment

- Check that the connections of electrical devices comply with the wiring diagrams and meet local requirements. In particular, check connections that affect safety and control of the hoist.
- Check the cableways for electrical wiring. Make sure that wires do not snag on structures when the hoist and trolley are in motion.

7.1.2 Inspection of pushbutton controller and directions of rotation.

- Check that the pushbutton controller and pendant cable are in good condition. Check that the pushbutton controller is at the correct height.
- Press the direction buttons on the pushbutton controller and check that the resultant motions occur in the correct direction.



Check the resultant motion by pressing first the UP direction button even though the hook is near the upper limit.

- If there is an error in the direction of all movements it can be corrected by changing the sequence of two phases of the power supply. Change the phase sequence of the input power leads to the hoist.
- Check the operation of the emergency stop button.



Do not depress the emergency stop button unnecessarily.

7.1.3 Checking operating sound.

- Listen to the sound made when travelling and hoisting and assess whether the sound indicates an installation error.
- Check the vibration made when travelling and hoisting by feeling the hoist with your hand.

If the hoisting motor makes a loud intermittent noise and the hoist vibrates strongly, the problem may be in the power supply. Check and correct all phases in the power supply. If travelling motion produces a load noise or strong vibration, the trolley is probably incorrectly installed on the track. Check the trolley is properly mounted on the track.



Do not use the hoist before you have identified and eliminated the cause of excessive noise or vibration.

7.1.4 Inspection and adjustment of the hoisting limit switch.

- Adjust the limit switch for hoisting. Check the operation of the limit switch by running the hoist to the top and bottom limits.

Adjustment of the hoisting limit switch is described in the section **“Hoisting limit switch”**.



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For safety reasons the hoisting limit switch must always be adjusted before the commissioning tests are continued.

7.1.5 Inspection and adjustment of the limit switch for travel (not in all models)

- Adjust the triggering locations of the limit switch. Check the operation of the limit switch by running the hoist to the triggering locations.



For safety reasons the triggering locations of the limit switch for travel must be adjusted before the commissioning tests are continued.

7.1.6 Inspection of hook and operation of rope sheaves.

- Check that the rope sheaves rotate freely.
- Check the general outlook of the coating in case of bronze coated hooks.

7.1.7 Inspection of rope.

- Check that the rope has not been damaged in transport.
- Check that the rope is correctly reeved.
- Check the fixing of the rope ends.



Ensure that the rope is assembled inside the rope anchorage correctly.

- New wire rope shall be taken in use by a load, which is of approx. 10 % of the nominal load. This load shall be lifted to the total lifting height 5 – 10 times. If the hook tries to turn around during the lifting, place the hook in the lowest position without load, open the rope end wedge housing and rotate the wedge housing until the hook is straight.



Note the correct position of the wedge housing (see sticker).

7.1.8 Inspection of overload protection.

- Check that the overload protection mechanism operates correctly. Check that the rope anchorage and support beam move freely.

7.1.9 Inspection of trolley

- Check that the wheelbase of the trolley is correctly adjusted.
- Check the tightening and locking of all screws for trolley adjustment.
- Run the trolley at least 3...5 times over the whole length of the girder.

7.1.10 Inspection of brake operation.

- Check that the hoisting brake operates correctly in both up and down directions.

7.2 Inspections with test-load, 100% of the rated load of the hoist.

7.2.1 Inspection of motor current.

- Check the motor current in each phase during hoisting motion with rated load.



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The current should be in balance in all phases and may not exceed the ratings for the motor. Check the current at both hoisting speeds.

7.2.2 Inspection of running temperature.

If the thermal protection halts hoisting prematurely, identify the reason for overheating before continuing the commissioning tests.

7.2.3 Inspection of travelling machinery.

- Check that the acceleration and braking motions operate smoothly.
- Run the trolley at least 3...5 times over the whole length of the girder. Remove the paint coming loose from the runway of the trolley.

7.3 Inspections with overload, 110...125% of the rated load of the hoist.

7.3.1 Inspection of overload protection

- Check that the overload protection mechanism operates with an overload. The overload protection must prevent hoisting motion when the load exceeds the trigger load for the overload protection mechanism that is stated in the test drive. If the hoist is provided with a condition-monitoring unit, refer to the separate operating instructions for commissioning the condition-monitoring unit.

7.3.2 Inspection of brake operation.

- Lower the load in slow speed and stop. Ensure that the brake is able to stop the motion adequately.

7.3.3 Inspection of rope

- Ensure that the rope has not slipped in the rope anchorage by comparing the measures with the stated measures in the table. (see section Rope anchorage)

7.4 After the inspections.

7.4.1 Cleaning

- Check that all tools and materials used during installation are removed from the hoist and track.

7.4.2 User training

- Ensure that the hoist operator and supervision personnel are aware of the need for user training.



The authorized service organization of the hoist manufacturer can arrange user training by separate agreement.

7.4.3 Hand-over documents

- Check the documents delivered with the hoist. Ensure that entries in the documents are properly recorded and that the reference data in the documentation matches that on the type rating plates.



Compile a commissioning log for the hoist and keep it with the other documentation for the hoist.



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8 Maintenance

The lifetime of the hoist is divided into Safe Working Periods (SWPs). At the beginning of the Safe Working Period, a new hoist has an SWP% of 100. A Safe Working Period ends when the SWP% of the hoist is zero. When a Safe Working Period ends, a General Overhaul (GO) must be conducted, after which the hoist is assigned a new Safe Working Period, refer to the section 'General Overhaul, GO'. During the SWP, the safe and efficient operation of the hoist is contingent on regular servicing.



For the safety carry out the inspection and servicing procedures for the hoist in accordance with the table below.



To avoid any risk of spark with explosive proof hoists due to the friction of two mechanical parts, it is important to follow strictly the maintenance intervals. The safety of the equipment could be compromised if not.

8.1 Daily inspections



Carry out following daily inspection on start of each work shift. Do not use the hoist unless it is in proper condition. Contact a service agent authorized by the manufacturer immediately in case of doubts! The usage of a defective hoist can result in serious damages, injuries or death.

1	Inspection of the wire rope <ul style="list-style-type: none"> • Check the wire rope visually for kinking, crushing, corrosion, broken wires and broken strands • Check visually that the rope lays in the grooves of the drum and in the rope sheaves
2	Inspection of the hook block <ul style="list-style-type: none"> • Check that the hook moves freely in every allowed direction • Check the presence of the safety latch and it's functioning • Check the free and smooth rotation of the rope sheaves
3	Inspection of the hoist limit switch <ul style="list-style-type: none"> • Verify that the upper limit switches operate properly • Verify that the lower limit switch operates properly
4	Inspection of the pushbutton controller <ul style="list-style-type: none"> • Check the pushbutton controller for cracks or other signs of wear in the housing, and for loose or broken buttons • Verify that all pushbuttons and switches correspond to their intended functions and directions • Check the operation of the emergency button. Do not depress the emergency button while the hoist is running during this test. Instead, depress the emergency button and verify that no movement can be activated with the pushbuttons.



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8.2 Periodical inspections and servicing

The servicing intervals for the hoist are defined as SWP% periods. The actual operation of the hoist is taken into account in SWP%. If the hoist is provided with a condition monitoring unit, the SWP value can be read from the SWP-data counter display of the unit. Refer to the more detailed instructions given in the separate operating instructions for the condition monitoring unit. The SWP% corresponding to the SWP value can be found from the table below. Check the rating plate fixed to the hoist for classification of the hoist's operating group.

SWP value in relation to the SWP%						
Operating group of the hoist ISO (FEM)						
M3 (1Bm)	M4 (1Am)	M5 (2m)	M6 (3m)	M7 (4m)	M8 (5m)	SWP%
400	800	1600	3200	6300	12500	100%
360	720	1440	2880	5670	11250	90%
320	640	1280	2560	5040	10000	80%
280	560	1120	2240	4410	8750	70%
240	480	960	1920	3780	7500	60%
200	400	800	1600	3150	6250	50%
160	320	640	1280	2520	5000	40%
120	240	480	960	1890	3750	30%
80	160	320	640	1260	2500	20%
40	80	160	320	630	1250	10%
20	40	80	160	320	625	5%
4	8	16	32	63	125	1%
0	0	0	0	0	0	0%

The table below shows the service intervals for the hoist in SWP% periods and in calendar months. Items for inspection and servicing refer to the servicing procedures described earlier in these operating instructions. The servicing procedure must be carried out latest at the end of a SWP% period, or by the end of the stated number of calendar months. Hoists without a condition-monitoring device must follow a servicing procedure guide by calendar months. For ensuring the usability of the hoist the servicing intervals can be shortened.



Hoists used under harsh conditions may require a shorter servicing interval than stated in the table below. Consult with a representative of the manufacturer for a tailored service agreement.



If ambient temperature is frequently over 40 °C (104 F) the servicing interval is half of the interval stated in the table below.



Periodical inspecting and servicing procedure may only be carried out by a serviceman authorized by the hoist manufacturer or service personnel adequately trained by the hoist manufacturer.

Items for inspection and servicing	Interval			
	SWP% reduction	10%	40%	80%
Hoist classification	all	M5/M6	M3/M4	
Calendar period. Years		1	4	8



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Items for inspection and servicing		Interval			
		SWP% reduction	10%	40%	80%
		Hoist classification	all	M5/M6	M3/M4
		Calendar period. Years	1	4	8
1	Inspection of trolley wheels ¹⁾	X			
2	Inspection of buffers ¹⁾	X			
3	Inspection of hoisting machinery and coupling			X	
4	Inspection of hoisting gear	X			
5	Inspection of hoisting motor and brake	X			
6	Inspection of hoisting limit switch	X			
7	Inspection of push button controller	X			
8	Inspection of travelling machinery ¹⁾	X			
9	Inspection of frequency controller ¹⁾	X			
10	Inspection of rope drum	X			
11	Inspection of rope guide	X			
12	Inspection of rope clamps	X			
13	Inspection of drumbrake ¹⁾	X			
14	Inspection of rope anchorage	X			
15	Inspection of hook block	X			
16	Inspection of rope sheave beam ¹⁾	X			
17	Inspection of wire rope	X			
18	Inspection of overload protector	X			
19	Inspection of condition monitoring unit ¹⁾	X			
20	Annual inspection according to local requirements ²⁾	X			

¹⁾ Not all hoist types include this equipment.

²⁾ Germany: Inspection according to BGV D6 (bisherige UVV 8/VBG 9)

8.3 Calculation of Safe Working Period (SWP)

If the hoist is not provided with a condition-monitoring unit, the end of the Safe Working Period must be calculated in accordance with standard FEM 9.775. Calculation has to be carried out during each recurring inspection and servicing. The end of the Safe Working Period can be calculated as follow:



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8.3.1 STEP 1: Operating hours per inspection interval, T_i

$$T_i = \frac{2 * H * N * T * J}{V * 60}$$

- H = average hoisting height [m]
- N = number of work cycles per hour [cycles/h]
- T = daily working time [h]
- V = hoisting speed [m/min]
- J = working days during inspection interval [days]

8.3.2 STEP 2: Actual load spectrum factor per inspection interval, K_{mi}

Load spectrum factor can be calculated using following table:

Load %	Lifting time %	Factor k^3	Load spectrum factor
100 %	<input type="text"/>	1	<input type="text"/>
	+		+
80 %	<input type="text"/>	0.51	<input type="text"/>
	+		+
60 %	<input type="text"/>	0.22	<input type="text"/>
	+		+
40 %	<input type="text"/>	0.06	<input type="text"/>
	+		+
20 %	<input type="text"/>	0.01	<input type="text"/>
	+		+
0 %	<input type="text"/>	0	<input type="text"/>
	=		=
Sum:	100%		Sum: <input type="text"/>
			Divide by 100: /100 =
			Load spectrum factor, K_{mi} : <input type="text"/>

8.3.3 STEP 3: Partial duration of service, S_i [hours]

When the load spectrum factor of inspection interval K_{mi} and the operating hours per inspection interval T_i are identified, the Partial duration of service, S_i can be calculated as follow:

$$S_i = 1.2 * K_{mi} * T_i$$

8.3.4 STEP 4: Actual duration of service, S [hours]

Actual duration of service can be calculated when the earlier partial duration of inspection intervals is known.

$$S = S_1 + S_2 + \dots + S_i$$



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8.3.5 STEP 5: SWP% and remaining service life

SWP% and estimated remaining service life can be obtained from table below.

Hoist operating group marked on hoist's rating plate				SWP%	Estimated remaining service life [years]
M4 (1Am)	M5 (2m)	M6 (3m)	M7 (4m)		
Actual duration of service, S [h]				SWP%	
0	0	0	0	100%	10
80	160	320	630	90%	9
160	320	640	1260	80%	8
240	480	960	1890	70%	7
320	640	1280	2520	60%	6
400	800	1600	3150	50%	5
480	960	1920	3790	40%	4
560	1120	2240	4410	30%	3
640	1280	2560	5040	20%	2
720	1440	2880	5670	10%	1
800	1600	3200	6300	0%	0

When SWP% is zero, a General Overhaul (GO) must be conducted. Refer to section 'General Overhaul (GO)'.

8.4 General Overhaul, GO

Once the SWP% of the hoist reaches zero, the hoist has exhausted its theoretical lifetime. The probability of a defect in the hoist is therefore higher and operating safety is jeopardized. When the theoretical lifetime is exhausted, a General Overhaul (GO) of the hoist must be conducted. Only the hoist manufacturer or a service organization authorized by the hoist manufacturer may conduct a GO. The components in the hoist that have an impact on hoist lifetime are inspected in a GO and critical components are replaced. A new theoretical SWP is given to the hoist after completion of a GO.



When the Safe Working Period (SWP) of the hoist is exhausted, the hoist may only be used after a GO has been conducted.

If the hoist is not provided with a condition monitoring unit, the end of the Safe Working Period must be calculated in accordance with standard FEM 9.775, refer to section 'Calculation of the Safe Working Period'.

8.5 Recommended tightening torques

Recommended tightening torques for screws and nuts in the hoist.

Size	Tightening torque			
	Strength 8.8		Strength 10.9	
	[Nm]	[Ft lb]	[Nm]	[Ft lb]
M4	2.7	2.0	4.0	2.9
M5	5.4	4.0	7.9	5.8
M6	9.3	6.8	14	10.3
M8	23	17.0	33	24
M10	45	33.0	66	48.5



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Size	Tightening torque			
	Strength 8.8		Strength 10.9	
	[Nm]	[Ft lb]	[Nm]	[Ft lb]
M12	77	56.6	115	84.6
M14	125	92	180	132
M16	190	140	280	206
M18	275	202	390	287
M20	385	283	550	404
M22	530	390	750	552
M24	660	485	950	699
M27	980	721	1400	1030
M30	1350	993	1900	1398



It is recommended that the self locking nut (Nyloc nut) is replaced always when removed. Self locking nut can be reused max 5 times.



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9 Lubricants

9.1 Lubricant types



Use of a low-grade or incompatible lubricant can damage the gearing or bearings. Use only the original lubricants recommended by the manufacturer.

Usage	Installation	Trade name and number	Type	Operating temperature °C	Operating temperature °F
Hoisting gears (GEN1, GEN2 and GEN3 series) Travelling gears	Factory installed	Mobilux EP 004		-30...+120	-22...+248
	Alternative	Shell Alvania GC		-15...+80	+5...+176
	Alternative	Shell Alvania EP00		-15...+80	+5...+176
	Alternative	Shell Tivela Grease GL00	Synthetic	-30...+130	-22...+266
	Alternative	Neste Center Grease 00 EP		-35...+100	-31...+212
	Alternative	Castrol EPL 00		-35...+100	-31...+212
	Alternative	MOBILITH SHC 007	Synthetic	-50...+230	-58...+446
Hoisting gears (GEN4 series)	Factory installed	Mobil SHC 632	Synthetic	-35...+100	-31...+212
	Alternative	Neste Vaihteisto S 460 EP	Synthetic	-30...+100	-22...+212
	Alternative	Shell Omala HD 460	Synthetic	-25...+130	-13...+266
Bearings Couplings	Factory installed	Mobilith SHC460	Synthetic	-40...+235	-40...+455
	Alternative	Shell Albida Grease PPS	Synthetic	-30...+150	-22...+301
	Alternative	Neste Synlix	Synthetic	-40...+150	-40...+301
	Alternative	Castrol S	Synthetic	-40...+140	-40...+284
Ropes	Alternative	Shell Tellus 32		-	-
	Alternative	Bel Ray Wire Rope Lubricant		-	-
	Alternative	Bel Ray 6 in 1 Fluid		-	-
	Alternative	Brilub 50		-	-
Open transmissions Drum rim gear	Factory installed	Almagard 3752		-40...+250	-40...+482
	Alternative	Shell Albida GC		-40...+120	-40...+248
	Alternative	Neste Avora		-30...+150	-40...+301

Factory installed lubricant is being used unless otherwise specified by the customer.



If the transmission oil has to be topped up, make sure that the lubricant being added is compatible.
 If transmission oil has to be replaced, flush out the gearbox before filling up.

If the hoist is operated for long periods in extremely cold conditions (colder than -25 °C/-13 °F) or extremely hot conditions (hotter than + 55 °C/+131 °F), it is recommended that a synthetic lubricant is used.

Lubricant Almagard 3752 is manufactured by Lubrication Engineers Inc.



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9.2 Lubricant quantities

9.2.1 Lubricant volumes, hoisting gears

Drum size	Gear type	Volume	
φ 243 mm	GEN0	300 ml	10.6 fl.oz (Imperial)
φ 303 mm	GEN1	600 ml	21.1 fl.oz (Imperial)
φ 355 mm	GEN2	900 ml	31.7 fl.oz (Imperial)
φ 406 mm	GEN3	1400 ml	49.3 fl.oz (Imperial)
φ 608 mm	GEN4	2500 ml	88.0 fl.oz (Imperial)

9.2.2 Lubricant volumes, travelling gears

Hoist trolley type	Drum size	Gear type	Volume	
Low headroom Normal headroom	all	GEK1	20 ml	0.7 fl.oz (Imperial)
Double girder	φ 303 mm	GS2/GS3	400 ml	14.1 fl.oz (Imperial)
Double girder	φ 355/406/608 mm	GES3	250 ml	8.8 fl.oz (Imperial)
Double girder	φ 608 mm	GES4	500 ml	17.6 fl.oz (Imperial)
Double girder	φ 608 mm	GES5	1000 ml	35.2 fl.oz (Imperial)

9.2.3 Lubricant volumes, drum rim gear

Drum diameter	Volume	
φ 243 mm	50 ml	1.8 fl.oz (Imperial)
φ 303 mm	70 ml	2.5 fl.oz (Imperial)
φ 355 mm	100 ml	3.5 fl.oz (Imperial)
φ 406 mm	150 ml	5.3 fl.oz (Imperial)
φ 608 mm	500 ml	17.6 fl.oz (Imperial)



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10 Troubleshooting

The table below lists some of the faults and malfunctions that may occur in the hoist, their causes and the corrective actions needed to eliminate them.



If you are unable to identify and eliminate the fault using this table, contact a service agent authorized by the manufacturer.

Fault	Probable cause	Corrective action
The hoist is not operative.	Main supply power is not connected.	Switch the main power supply on. Release the Emergency Stop button. Press the Start button. See section 'Using the pushbutton controls'.
	A fuse has blown.	Replace the fuses.
	The hoisting motor has overheated and the temperature sensor is preventing operation.	Wait for the motor to cool. Avoid unnecessary and repetitive short starts.
	A motion has reached its limit.	Drive away from the limit.
	One phase is dead (no voltage).	Repair the power supply. See section 'Connecting to the mains network'.
The hoist is operative but does not hoist the load.	The hook is holding an overload.	Check that the load on the hook does not exceed the maximum permitted load.
The load slips downwards.	The hoisting brake is worn.	Contact a service agent authorized by the manufacturer. See section 'Hoisting motor'.
Hoist motions are in the wrong direction.	The phases of the power supply are connected wrongly.	Interchange the sequence of 2 phases of the power supply. Check the directions of motion. See section 'Connecting to the mains network'.
Travel motion is not operative or makes a load noise.	There are obstructions on the track.	Clear the track.
	Travel control is malfunctioning.	See section 'Inverter for travel'.