

OPERATION INSTRUCTION

ELECTRIC CHAIN HOISTS

Don't start the assembly respectively the installation as well as handling and maintenance until all requirements for the compliance with the instruction manual are created and until the personnel, who will be responsible for assembly, installation, handling or maintenance has read and understood the operating instructions.

These operating instructions address only experts and competent persons in the sense of BGV D8, BGV A2 and BGV C1 as well as personnel instructed by the operator.

- Translation of the operating instruction for electric chain hoists -

Printing date: 15.06.2010

Revision status: 1.2

D-04838 Eilenburg
Uferstraße 23

Tel.: +49-(0)3423-6922-0
Fax: +49-(0)3423-6922-99

Internet: www.chainmaster.de
E-Mail: info@chainmaster.de

CHAINMASTER Bühnentechnik GmbH

This document is version 1.2 of the operating instruction for electric chain hoists .

Revision administration

Revision	Date	File name	Author	Description
1.0	03.09.08	Kettenzug_MB-SB_DE_2008-09-30.doc	Jörg Manthei	Adjustment of layout, technical revision
1.1	05.01.10	Chainhoist_MB_SB_EN_2010-01-05_EN.doc	Jörg Manthei	Revision according to directive 2006/42/EC
1.2	15.06.10	Chainhoist_MB_SB_EN_2010-06-15_EN.doc	Jörg Manthei	Revision page 10 (national standards), 11 (environment conditions)

Table list

Table 1 plastics chain bags	27
Table 2 connection screws with torques for hook tackles	29
Table 3 connection screws with torques for hook blocks	30
Table 4 pre-fuse	32
Table 5 test and maintenance works	39
Table 6 air gap of the brakes	42
Table 7 measurement of chain dimensions	47
Table 8 duty rate for short time duty	48
Table 9 duty rate for intermittent duty	48
Table 10 alternative oils	49
Table 11 amount of oil	49

Source file: Chainhoist_MB_SB_EN_2010-06-15_EN.doc

Printing date: 15.06.2010

Revision start: 13.05.2008

Revision end: 15.06.2010

Revision status: 1.2

D-04838 Eilenburg
Uferstraße 23

Tel.: +49-(0)3423-6922-0
Fax: +49-(0)3423-6922-99

Internet: www.chainmaster.de
E-Mail: info@chainmaster.de

CHAIN MASTER Bühnentechnik GmbH

Table of contents

1. Foreword	5
1.1. Liability	5
1.2. Warranty	5
1.3. Copyright	6
1.4. Important terms in the operating instruction	7
1.4.1. Expert	7
1.4.2. Competent person	7
1.4.3. Electrical equipment authorized personnel	7
1.4.4. Operating personnel	7
1.5. General symbols in the operating instruction	8
1.6. Symbols for the distinction of hoisting machines	9
1.7. Regulations and standards	9
2. Safety advice and information	11
2.1. Safety advice for chain hoists and controls	11
2.1.1. Environment conditions	11
2.1.2. Intended usage	12
2.1.3. Incorrect usage	13
2.1.4. Advice regarding the secure usage of electric energy	14
2.1.5. Safety devices	14
2.1.6. Changes to the delivery status	14
2.1.7. Accessories and spare parts	14
2.1.8. Briefing	15
2.1.9. Operating instruction	15
2.1.10. Storage and transport	15
2.2. Selection advice for the control of electric chain hoists according to C1	16
3. Advice regarding compulsory tests	17
3.1. Tests on electrical equipment	17
3.2. Tests on electric chain hoists	17
3.2.1. Tests when used according to BGV D6	17
3.2.2. Tests when used according to BGV D8	17
3.2.3. Tests when used according to VPLT SR2.0 (D8 Plus)	17
3.2.4. Tests when used according to BGV C1	17
3.3. Test periods	18
3.4. Documentation of the test	18
4. Technical overview	19
4.1. Assembly possibilities	19
4.2. Schematic sketch of the load chain configuration	20
4.3. Explanation of type designation	20
4.4. Sectional view	21
5. Assembly instruction	22
5.1. Mechanical assembly	22
5.1.1. Suspension of the electric chain hoist	22
5.1.1.1. Suspension with double hole suspension eye	22
5.1.1.2. Suspension with single hole suspension eye	22
5.1.1.3. Suspension with hook suspension	23
5.1.2. Fitting and replacing load chain	24
5.1.2.1. Replacing of chain guide and hold down	25
5.1.2.2. Fitting for single fall version – delivery without preassembled piece of load chain	25
5.1.2.3. Fitting for single fall version – delivery with preassembled piece of load chain	26
5.1.2.4. Fitting for double fall version	26
5.1.3. Chain bag	27
5.1.3.1. Assembly of the chain bag	27
5.1.3.2. Oversize chain bags	28
5.1.4. Hook tackle	29
5.1.5. Hook block	30
5.1.6. Gear ventilation for stationary chain hoists	31

5.1.7. Electric chain hoists for inverted use	31
5.2. Electric equipment and connection	32
5.2.1. Voltages	32
5.2.2. Mains connection	32
5.2.3. Direct control	33
5.2.4. Low voltage control (contactor control)	33
5.2.5. Electric limit switch for lift limitation	34
5.2.6. Control cable with control pendant	34
5.2.7. Electronic lifting power limitation	35
6. Directions and prohibitions for use	36
6.1.1. Requirements for the operating personnel	36
6.1.2. Dangers for people and environment	36
6.1.3. Precautions and codes of practice	36
6.1.4. Performance of motional processes	37
6.1.5. Behaviour in case of a failure	37
6.1.6. Behaviour in case of an accident	38
6.1.7. Maintenance and repairs	38
6.1.8. Test	38
7. Maintenance	39
7.1. Performance of test and maintenance works	39
7.2. Testing of wear	40
7.3. Maintenance and adjustment of the DC disc brake	40
7.3.1. Electric control of brakes – mode of operation –	40
7.3.2. Configuration of the single brake	40
7.3.3. Adjustment of the air gap of the single brake	41
7.3.4. Configuration of the double brake	41
7.3.4.1. Operational brake – configuration and function –	42
7.3.4.2. Safety brake – configuration and function –	42
7.3.5. Adjustment of the air gap of the operational and safety brake	42
7.3.5.1. Adjustment of the air gap of the operational brake	43
7.3.5.2. Adjustment of the air gap of the safety brake	43
7.3.6. Checking brake function	43
7.3.7. Individual test of operational and safety brake	43
7.3.8. Replacement of brake lining	44
7.4. Sliding clutch	44
7.4.1. Mode of operation of sliding clutch	44
7.4.2. Adjusting the clutch	45
7.4.3. Mode of operation of the slide clutch for the slow speed motor of version 9.1	45
7.4.4. Adjusting the clutch on the slow speed motor of the version 9.1	46
7.4.5. Test of sliding clutch	46
7.5. Chain guide plate	46
7.6. Load chain	46
7.6.1. Lubrication of the load chain before commissioning and during operation	46
7.6.2. Testing of wear and measuring wear of the load chain	46
7.7. Measuring wear and replacing the load hook	47
8. Duty rate of an electric chain hoist	48
8.1. Short time duty	48
8.2. Intermittent duty	48
8.3. Example for the determination of the duty rate	49
9. Lubrication	49
9.1. Lubrication of the hook block and the hook tackle	49
9.2. Gear lubrication	49
10. Determination of the S.W.P.	50
10.1. Measures to be taken at the end of the S.W.P.	50
11. Disposal	50
A.1. Checklist for tests	51

1. Foreword

Thank you for purchasing our ChainMaster-product.

ChainMaster-products are designed for the extreme usage in stage technology and stood the test in many occasions.

Our operating instruction explains the proper work with the different ChainMaster-products and the maintenance. Please observe especially the safety advice.

You must read and understand the operating instruction before starting the transport, assembly, start-up or maintenance of the product. Please observe the completeness of the operating instruction according to the table of contents.

1.1. Liability

These operating instructions were developed with the greatest care possible. The information, dates, remarks and instructions contained herein comply with the printing date. But these operating instructions can slightly differ from the performance dates or other characteristics of the products due to the continuous enhancement.

The operating instructions are subject to alterations and additions, which will be implemented without previous announcement, especially if the manual contains technical mistakes or misspellings.

This operating instruction does not contain a declaration which represents a guarantee in the sense of § 443 BGB and no information regarding the expected usage according to the contract in the sense of § 434 para. 1 clause 1 No. 1 BGB.

Claims for alterations of products, which are already delivered, can't be lodged neither from the descriptions or other information contained in these operating instructions nor from the illustrations.

Our warranty and liability for defects on the delivered product including these operating instructions complies only with the regulations of the purchase contract under exclusion of further claims.

1.2. Warranty

We assume the warranty for the operating instruction being developed in accordance with the general technical and functional parameters of the delivered technical product.

We don't assume any warranty for defects and damages, which are caused due to operating errors, nonobservance of the operating instruction including maintenance not performed according to this manual.

A warranty or liability claim for damages to people and property is excluded especially if they can be put down to one or various of the following reasons:

- Improper usage,
- Incorrect transport, incorrect assembly,
- Operation of the technical product with defective safety equipment or with improperly installed or inoperable safety and protection devices,
- Nonobservance of advice in the operating instruction regarding transport, storage, assembly, start-up, operation, disassembly, maintenance and repairs of the machine,
- Arbitrary constructural modifications at the machine
- Arbitrary modification of the parameters mentioned in the operating instruction,
- Insufficient inspection of machine parts which are subject to wear and tear,

- Removal of facility parts respectively installation of spare parts or additional devices which are not delivered or allowed by ChainMaster,
- Arbitrary executed adjustments on safety equipment,
- Exceedance of the prescribed inspection periods according to the accident prevention guidelines,
- Improperly executed repairs,
- Events of disaster caused by foreign bodies or by force majeure.

Wear and tear elements are not subject to the warranty.

1.3. Copyright

This operating instruction is protected by copyright. They are exclusively intended for the operators of the product, its personnel and for other people employed by the operator for maintenance purposes. A transfer to third parties is not permitted.

Duplication, distribution and other utilization, also in extracts, is not permitted without consent of ChainMaster.

Non-compliance can have consequences by penal and civil law.

1.4. Important terms in the operating instruction

The following definitions comply with the text of the definitions by the government safety organisations.

1.4.1. Expert An expert is a person with special knowledge in the field of safety-related and machine-related facilities due to a professional education and experience and who is familiar with the relevant federal health and safety regulations, with the regulations by the government safety organisations and with the generally acknowledged rules of technology (e.g. DIN standards, VDE-provisions (Association of German Electricians), technical regulations of other member states of the European Union or other contractual states of the Agreement on the European Economic Area). The person must be able to check and evaluate the occupational safety status of safety-related and machine-related facilities and produce an assessment thereof.

1.4.2. Competent person A competent person is a person with sufficient knowledge in the field of safety-related and machine-related facilities due to a professional education and experience and who is familiar with the relevant federal health and safety regulations, with the regulations by the government safety organisations and with the generally acknowledged regulations of technics (e.g. DIN standards, VDE-provisions (Association of German Electricians), technical regulations of other member states of the European Union or other contractual states of the Agreement on the European Economic Area) so that the person is able to evaluate the occupational safety status of safety-related and machine-related facilities.

1.4.3. Electrical equipment authorized personnel An electrical equipment authorized personnel in the sense of the accident prevention regulation is a person, who can evaluate the assigned tasks and can recognise possible dangers due to a professional education, knowledge and experiences and knowledge of the relevant regulations.

1.4.4. Operating personnel A member of the operating personnel is a person, who was briefed by the employer according to point 2.1.8 on the work with the technical device, whose operation is described in this operating instruction.

1.5. General symbols in the operating instruction

In this operating instruction we warn against possible damages to people or property and give advice regarding the operation. Universally valid national regulations regarding health and labour protection must also be observed. For simplifying orientation the corresponding chapters are marked with the following symbols:



(W00) Warning against danger

This symbol marks operating sequences or steps which can cause serious personal injuries if the operating instruction is not observed. This symbol also marks chapters in the operating instruction which can cause damages to the equipment when not observed.



(W06) Warning against dangers due to floating loads

This symbol marks chapters in the operating instruction which warn against dangers due to floating loads or due to the general usage of hoisting machines. Nonobservance can cause serious personal injuries or death.



(W08) Warning against dangerous voltage

Touching live parts can cause serious injuries or death. Only electrical equipment authorized personnel is allowed to remove parts of the housing (cover of electric devices).



(W23) Warning against risk of crushing

This symbol marks chapters in the operating instruction which warn against possible dangers due to crushing or trapping of body parts. Nonobservance can cause serious injuries.



(E03) First aid

This symbol marks chapters in the operating instruction which give advice regarding the behaviour in cases of accidents. Nonobservance can cause the development of further dangerous situations.



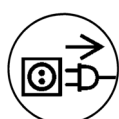
(M02) Use hard hat

This symbol marks chapters in the operating instruction which warn against dangers of head injuries. Nonobservance can cause serious head injuries.



(M05) Use protection shoes

This symbol marks chapters in the operating instruction which warn against the danger of foot injuries.



(M13) Remove power plug before opening

This symbol marks chapters in the operating instruction which require the removal of an electric device from the power network before performing the instructions in this chapter to avoid accidents due to dangerous voltage.



(M14) Disconnect before starting to work

This symbol also marks chapters in the operating instruction which require the removal of an electric device from the power network before performing the instructions in this chapter to avoid accidents due to dangerous voltage.



Sentinels

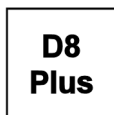
Special advice and hints regarding the handling and operation or fault clearance are marked with this symbol.

1.6. Symbols for the distinction of hoisting machines



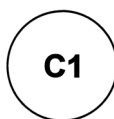
Hoisting machines according to D8

This symbol is used for marking hoisting machines which comply with the requirements of BGV D8. These types of hoisting machines must not be used for moving loads above people. A secondary safety component is required if hoisting machines according to "D8" are used for holding loads above people and the hoisting machine must be completely unloaded.



Hoisting machines according to D8 Plus

This symbol is used for marking hoisting machines the specification of which complies with the requirements of "D8 Plus" according to VPLT SR 2.0. These types of hoisting machines must not be used for moving loads above people. Loads above people can be hold with this hoisting machine without additional safety precautions.



Hoisting machines according to C1

This symbol is used for marking hoisting machines which comply with the requirements of BGV C1. These types of hoisting machines can be used both for holding and moving loads above people. The control of the hoisting machines must also comply with the requirements.

Chapters in this operating instruction, which only apply for certain hoisting machines, are also marked with these symbols

1.7. Regulations and standards

When working with the electric chain hoists and their controls various regulations and standards in their valid versions have to be observed in addition to the remarks in this operating instruction. Some of the applied regulations and standards are listed below. This list does not make a claim to be complete. The corresponding national regulations have to be observed in other countries.

European Regulations

EC-Machine directive	2006/42/EC
EC-Directive relating to electromagnetic compatibility	2004/108/EC

National Regulations

BetrSichV	Regulations regarding safety and health protection for the provision of work equipment and their usage, regarding safety when operating facilities which require supervision and regarding the set-up of operational work protection
-----------	--

BGV accident prevention regulations

BGV A1	Principles of prevention
BGV A2	Electrical facilities and equipment
BGV C1	Staging and Production Facilities for the Entertainment Industry
BGV D6	Cranes
BGV D8	Winches, Lifting and Hoisting Devices
BGG 905	Rules for Testing Cranes
BGG 912	Rules for Testing Safety and Mechanical Equipment in Staging and Production Facilities for the Entertainment Industry
BGG 956	Logbook for winches, lifting and hoisting devices
BGG 956-1	Remarks for the inspection of winches, lifting and hoisting devices
BGR 500 Kap. 2.8	Load carrying devices in hoisting machine operations

Harmonized regulations

EN ISO 12100-1	Safety of machinery -- Basic concepts, general principles for design -- Part 1: Basic terminology, methodology
EN ISO 12100-2	Safety of machinery -- Basic concepts, general principles for design -- Part 2: Technical principles
EN ISO 13849-1	Safety-related parts of control systems -- Part 1: General principles for design
EN ISO 13849-2	Safety of machinery -- Safety-related parts of control systems -- Part 2: Validation
EN ISO 13850	Safety of machinery -- Emergency stop -- Principles for design
EN ISO 14121-1	Safety of machinery -- Risk assessment -- Part 1: Principles
EN 818-7	Short link chain for lifting purposes. Safety. Fine tolerance hoist chain, Grade T
EN 14492-2	Cranes - Power driven winches and hoists - Part 2: Power driven hoists.
EN 50178	Electronic equipment for use in power installations
EN 60034-1	Rotating electrical machines. Part 1 - Rating and performance
EN 60034-5	Rotating electrical machines. Degrees of protection provided by the integral design of rotating electrical machines
EN 60034-12	Rotating electrical machines – Part 12: Starting performance of single-speed three-phase cage induction motors
EN 60204-32	Safety of machinery. Electrical equipment of machines. Part 32: Requirements for hoisting machines
EN 60529	Degrees of Protection Provided by Enclosures (IP Code)
EN 60947-1	Specification for low-voltage switchgear and control gear. Part 1: General rules
EN 60947-3	Low-voltage switchgear and control gear - Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units
EN 60947-4-1	Low-voltage switchgear and control gear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters
EN 60950-1	Information technology equipment - Safety - Part 1: General requirements
EN 61000-6-2	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6-4	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
EN 61800-5-1	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy

National standards and other technical specifications

DIN 685-5	Round steel link chains; utilization
DIN 15405-1	Lifting hooks; inspection of forged hooks in service
DIN 56950	Entertainment technology - Machinery installations - Safety requirements and inspections
DIN VDE 0701-0702	Inspection after repair, modification of electrical appliances - Periodic inspection on electrical appliances - General requirements for electrical safety
FEM 9.511	Rules for the design of series lifting equipment: Classification of mechanisms
FEM 9.683	Series lifting equipment; Selection of hoisting and travelling motors
FEM 9.751	Series lifting equipment; Power driven series hoist mechanisms; Safety
FEM 9.755	Serial hoist units; Measures for achieving safe working periods
SQ P2	IGVV codes of Practice for Event Technology – Electric Chain Hoists (Replacement for VPLT SR2.0)

2. Safety advice and information

2.1. Safety advice for chain hoists and controls

2.1.1. Environment conditions


- Electric chain hoists and controls can be stored within a temperature range of -20°C and +60°C and can be operated with the mentioned duty rate within an environmental temperature between -20°C and +40°C. The motors are manufactured according to the requirement of Insulation Class F.
- For use in higher environmental temperature the duty rate has to be reduced correspondingly.
- The maximum air humidity is 50%, non-condensing.
- Cranes in outdoor use require a roof for the park position.



- Nonobservance of the operation and storage temperature can affect material characteristics of individual equipment parts adversely and malfunctions and damages can occur.
- Connect the equipment only to a TN three-phase power system with the voltage and frequency mentioned on the type plate.
- A neutral conductor is usually mandatory for the electrical connection of electric chain hoists and controls.

Details can be found in the wiring diagram!



- A clockwise rotating field is necessary for the connection of the equipment to the mains power supply.
- The voltage deviation at the power supply connection must not exceed +/- 5%.
- Parts of this equipment can contain frequency-regulated parts. If this equipment is operated via residual-current-operated protective devices (RCD) only AC/DC sensitive residual-current-operated protective devices  (Type B) must be used to avoid a disturbance of the protection measurements and to guarantee the protection for indirect contact.
- No pulsed current sensitive protective devices must be connected ahead of electric circuits with AC/DC sensitive residual-current-operated protective devices.
- The power supply must comply with the requirements of EN 60204-32 para.4.3.
- Foreign facilities, which are operated adjacently must comply with the requirements of EN 61000-6-2 regarding interference resistance and with EN 61000-6-4 regarding transient emission (Electromagnetic compatibility).

An authorisation by ChainMaster is required before operating the hoists and their controls in an aggressive atmosphere or outside the temperature ranges mentioned above. It may be necessary to use parts made of different material.

2.1.2. Intended usage

Electric chain hoists are intended for lifting and lowering loads vertically and to travel horizontally with those lifted loads with trolleys. Every other mode of use can cause severe damage and is prohibited and the risk is on the operator's responsibility.

Please observe e.g. the following points when using the chain hoists in the intended way:



- don't exceed the permitted deflexion angle for wire and chain direction changes,
- consider the resulting forces,
- don't change counterweights in a way that parts of the system are overloaded,
- and
- avoid damages on wires and chains.

ChainMaster chain hoists according to D8, D8 Plus and C1 are used for moving and holding loads in the event technology. Another usage has to be cleared with ChainMaster in advance.

A previous consultation with ChainMaster is required if the electric chain hoist should be used for the transport of molten material or similar dangerous goods.

Electric chain hoists and controls can only be operated if the assembly and installation had been carried out as prescribed and if all parts are functional and free of visible damages.

A test according to point 3.2 has to be carried out before the first start-up.



Chain hoists must not be loaded beyond the permitted bearing load. (Details regarding the safe working load can be found on the type plate and on the load hook.)

The selection and dimensioning of all bearing elements in the power flow (like e.g. suspension points and slings) has to be carried out by the operator under consideration of the resulting loads and risks.

The prescribed rotational maintenance has to be carried out on a regular basis and the required tests has to be performed within the prescribe period of time during the complete use period of the chain hoists and controls.

To ensure a safe working process the health and safety regulations, especially the regulations by the accident insurance company and the generally acknowledged rules of technology in their current valid version have to be observed.

All works which are performed in connection with the technical product mentioned in this manual have to consider the remarks, instruction and prohibitions herein.

If this device is used in connection with other technical products the manuals of the manufacturers of the other technical products have to be observed as well. Other requirements, which occur from further statutory provisions on the usage side, have to be observed as well. The advices in this operating instruction remain unaffected.

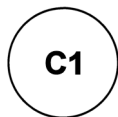
The facility has to be shut down immediately if a deficiency occurs on the technical product which could cause inevitable risks for the involved people. Further operation has to be prohibited until the deficiency is fixed.

The correct remediation of the deficiency and the correct function has to be checked by a person mentioned in point 1.4.1 – 1.4.3 before a new start-up.

Another usage than the one intended by ChainMaster has to be cleared with ChainMaster generally in advance.

2.1.3. Incorrect usage

The following usage and operation prohibitions apply for chain hoists by ChainMaster:



- Transport of people (unless the hoist is especially constructed for this case)
- Pulling loads which are tilted or dragging loads, tearing off loads
- Moving of loads without intervisibility
- Moving of loads above people with chain hoists according to BGV D8 und D8 Plus
- Holding loads above people with chain hoists according to BGV D8 without secondary safety component
- Excess of the permitted safe working load capacity according to the information on the load hook and type plate
- Usage of safety switches and comparable devices for the regular operation
- **Exceptions for BGV C1 chain hoists according to § 26 para. 6 of BGV C1**
 “If an operational limit switch fails during a performance or production, the machinery may continue to be operated, with special care, until the end of said performance or production, on the basis of the operator’s view or instructions given by another person.”
- Use of the sliding clutch as a limiter during normal operation
- Inching operation
- Operation of the technical product with defective safety equipment or with improperly installed or inoperable safety and protection devices
- Use of hoists with worn rubber elements or without rubber buffer on hook tackle, hook block or lift limiter
- Operation with twisted chain, caused by throwing the hook block through the two vertical chains or wrong mounted fix chain end on casing
- Using a lifting chain, which is longer than the chain bag capacity stated under the chain bag (see marking on chain bag)
- Manipulation on devices for lifting power limitation or on other safety devices
- Operation with missing or illegible warnings and security advices on the devices
- Moving trolley by pulling control pendant or control cable, even if these are relieved of strain
- Using the hoist with higher duty rate as marked on the specification plate
- Carrying out repairs without special knowledge
- Unattended operation of the facility
- Operation by unauthorised people
- Starting initial operation before an expert or a trained specialist has inspected the equipment
- Using the hoist without having done the regular inspection
- Operation after the S.W.P. is exceeded

2.1.4. Advice regarding the secure usage of electric energy



The electric chain hoists and the appropriate controls work with electric energy.

- Before first usage please make sure, that all electrical wires are connected safely, that all wires are without damages and that the whole equipment could be switched off by a main switch.
- In case of a failure, the whole facility has to be shut off by using the EMERGENCY-STOP button or by switching off the main switch.
The correct remediation of the deficiency and the correct function has to be checked by a person mentioned in point 1.4.1 – 1.4.3 before a new start-up.
- A sufficient wire cross section has to be observed which is adapted to the length of the cable and the current load rating when using extension cables. You have to choose a wire type, which suits the particular purpose in each case.
- The cables have to be laid in a way that they are protected against damages and tensile load.
- Couplers must not be connected or disconnected in live status.
Exceptions are CEE-couplers up to a nominal current of 63 A, which generally have a sufficient switching capacity according to EN 60309-1.
- Only couplers may be used which are suitable for the occurring demands.

2.1.5. Safety devices



Changes regarding the adjustment of safety devices may only be performed by experts according to section 1.4.1 and 1.4.2 on operator's responsibility, if these changes are necessary due to usage and if appropriate adjustment possibilities are exists.

The safe operation of chain hoists and controls may not be influenced by changes on the adjustments of the safety devices.

Changes on the safety devices for increasing the load capacity are not permitted.

The adjustment of the EMERGENCY- and operational limit switches have to be adapted to the actual lifting area on the usage site.

2.1.6. Changes to the delivery status



Changes on the chain hoists and controls to the delivery status may only be executed after consultation with the manufacturer and under usage of original parts purchased from the manufacturer.

Exceptions are adjustments on safety devices according to point 2.1.5, if these are necessary due to usage.

Increasing the load capacity by simply changing the adjustments of the lifting force limiter is *not* allowed.

All changes may only be performed by competent persons and have to be documented in the logbook.

2.1.7. Accessories and spare parts

Accessories used for operating chain hoists and controls must comply with the effective technical standards.

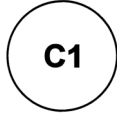
Only original accessories and spare parts according to the spare part list and other specifications by the manufacturer have to be used for the installation in chain hoists and controls or for the direct mounting on chain hoists.

The manufacturer cannot be held responsible for failures and breakdowns caused by use of not original or wrong spare parts.

2.1.8. Briefing



The employer has to make sure that all people involved in the independent operation and maintenance of hoists or technical devices are briefed before starting their work so that they are able to reliably fulfil their tasks.



When using technical devices in the sense of BGV C1 for dangerous scenic processes which require certain behaviour, the briefing has to be repeated in appropriate intervals. The demand for a repetition of the briefing can include a briefing before every rehearsal or show.

2.1.9. Operating instruction

The employer has to make sure that this operating instruction is available in a legible and complete version at every usage site of the device described in the instruction and that the operating personnel has read this operating instruction thoroughly before starting to work.

2.1.10. Storage and transport

The electric chain hoists and controls have to be handled carefully during storage and transport. They must not be tossed and bumped. Electric chain hoists and controls for a mobile usage should be stored and transported in containers especially constructed for this kind of usage.

2.2. Selection advice for the control of electric chain hoists according to C1

C1

The required minimum configuration for controls for C1 electric chain hoists has to be chosen depending on the type of usage.

The following table was published by the government safety organisation and should assist with the decision making.

Type of usage		Minimum configuration for	
		Set-up Operation	Scenic Movement
1	Single load	G	G
2	Load with two hoists	G	G+Z1
3	Load with more than two hoists	G+Z1	G+Z3 or G+Z1+Z2+Z4
4	Bending moment free load	G+Z1	G+Z1+Z2
5	Surface load with three hoists	G+Z1	G+Z3 or G+Z1+Z2+Z4
6	Surface load with more than three hoists	G+Z3 or G+Z1+Z4	G+Z3
7	Guided loads	G+Z1+Z4	G+Z3+Z4

G Basic configuration

Z Additional configuration

Z1 Asynchronous run with group switching off

Z2 Reset via synchrony point

Z3 Synchronous group run (way- and time synchrony) or synchronisation

Z4 Underload switch-off (slack-chain-protection)

3. Advice regarding compulsory tests¹

3.1. Tests on electrical equipment

The employer has to make sure that the electronic facilities and devices are tested for their correct working order:

1. before the first start-up or after an modification or maintenance *before* a new start-up by an electrical equipment authorized personnel or under the direction of an electrical equipment authorized personnel or under survey of this person
and
2. In certain intervals.

The applied electrical regulations, especially DIN EN 60204-32 and DIN VDE 0701-0702, have to be observed during the test performance.

3.2. Tests on electric chain hoists

Electric chain hoists have to be tested before the first usage and afterwards in regular intervals. The demands on the test comply with the type of usage. The usage of electric chain hoists is possible according to:

BGV D6	Cranes
BGV D8	Winches, Lifting and Hoisting Devices
VPLT SR2.0	Provision and Use of Electric Chain Hoists
BGV C1	Staging and Production Facilities for the Entertainment Industry

3.2.1. Tests when used according to BGV D6

The demand for a test complies with BGV D6 §25. This regulation indicates that cranes have to be tested before the first start-up, after extensive modifications and annually by an expert. The annual test can also be performed by a competent person. Details about the test and a checklist can be found in BGG 905.

3.2.2. Tests when used according to BGV D8

The demand for a test complies with BGV D8 §23. This regulation indicates that electrical chain hoists have to be tested before the first start-up, after extensive modifications and annually by a competent person. Details about the test and a checklist can be found in BGG 956 respectively BGG 956-1.

3.2.3. Tests when used according to VPLT SR2.0 (D8 Plus)

The demand for a test also complies with BGV D8 §23. This regulation indicates that electrical chain hoists have to be tested before the first start-up, after extensive modifications and annually by a competent person. Details about the test and a checklist can be found in BGG 956 respectively BGG 956-1.

3.2.4. Tests when used according to BGV C1

The demand for a test complies with BGV C1 §33. This regulation indicates that safety-related and machine-related devices have to be tested before the first start-up and after extensive modifications by an expert. Regular tests have to be performed annually according to BGV C1 §34 by a competent person and every 4 years by an expert. Details about the test and a checklist can be found in BGG 912.

▪ ¹ A checklist for the tests can be found at the end of the operating instruction.

3.3. Test periods

Regulations regarding the test periods are provided by the accident prevention regulation of the insurers.

The test intervals are determined in a way that occurring defects, which have to be expected, can be detected in due time.

The maintenance advices in the operating instruction must also be observed to keep the frequency of occurrence of defects, which can affect the operating safety, as low as possible.

3.4. Documentation of the test

The employer has to make sure that a confirmation of the test results for the devices is documented.

The test results must be recorded in a logbook. A certificate about the last test has to be provided at every usage site of the device.

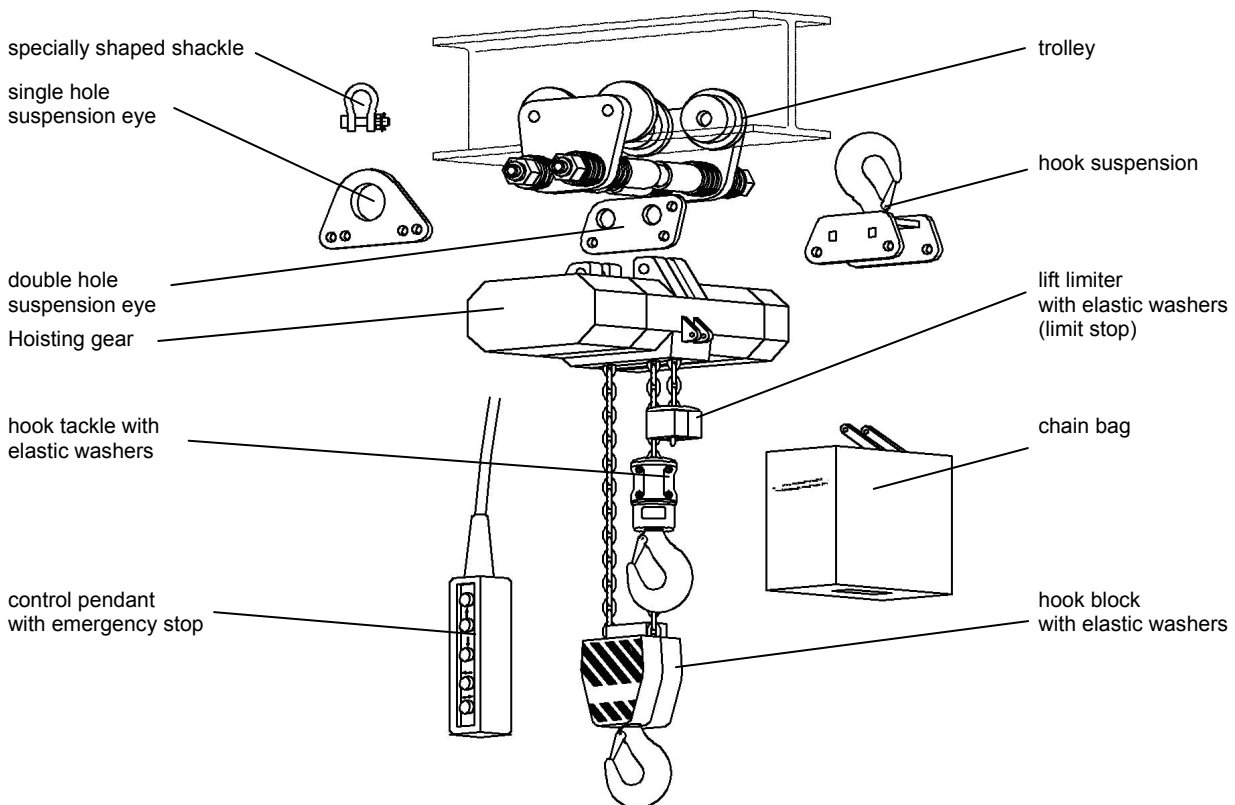
4. Technical overview

4.1. Assembly possibilities

The simple building block system makes it easy to convert the electric chain hoists. The usage is stationary, manual or electric travelling trolleys can be provided, and the installation of greater hoisting and operating heights is also possible.

Most models allow the choice of single or double fall versions. For a limitation of the double fall version please observe also the advices in section 5.1.2.4.

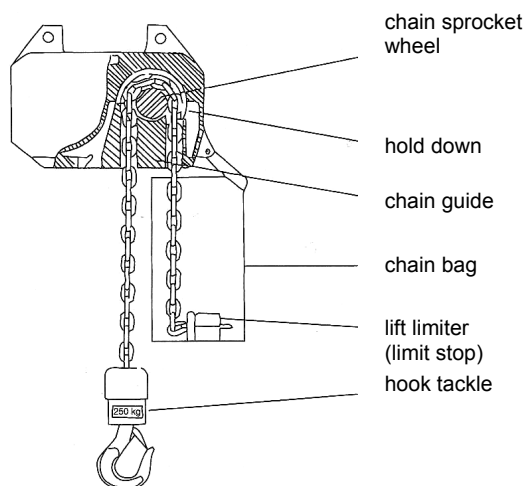
For the mobile usage, there is a higher risk of a twisted chain or that the chain can be twisted by throwing the hook block through the two vertical chains. That's the reason why chain hoists shouldn't be used for the mobile usage in the double fall version.



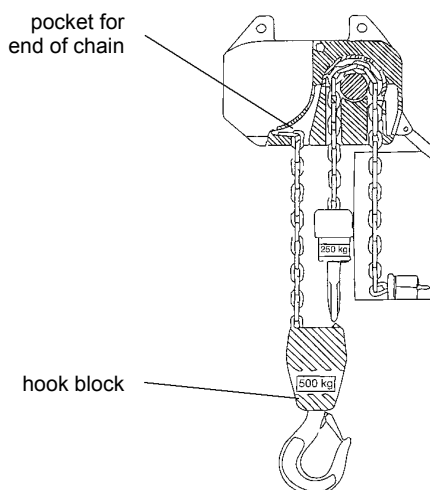
Picture 1 assembly possibilities

4.2. Schematic sketch of the load chain configuration

Use manufacturer's original chains only, as these meet the high stress and service life standards required and the requirements on dimensional accuracy.



Picture 2 single fall version

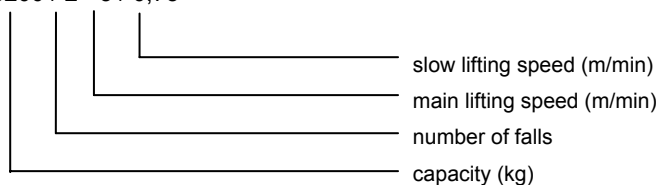


Picture 3 double fall version

4.3. Explanation of type designation

Example: Version 7.1

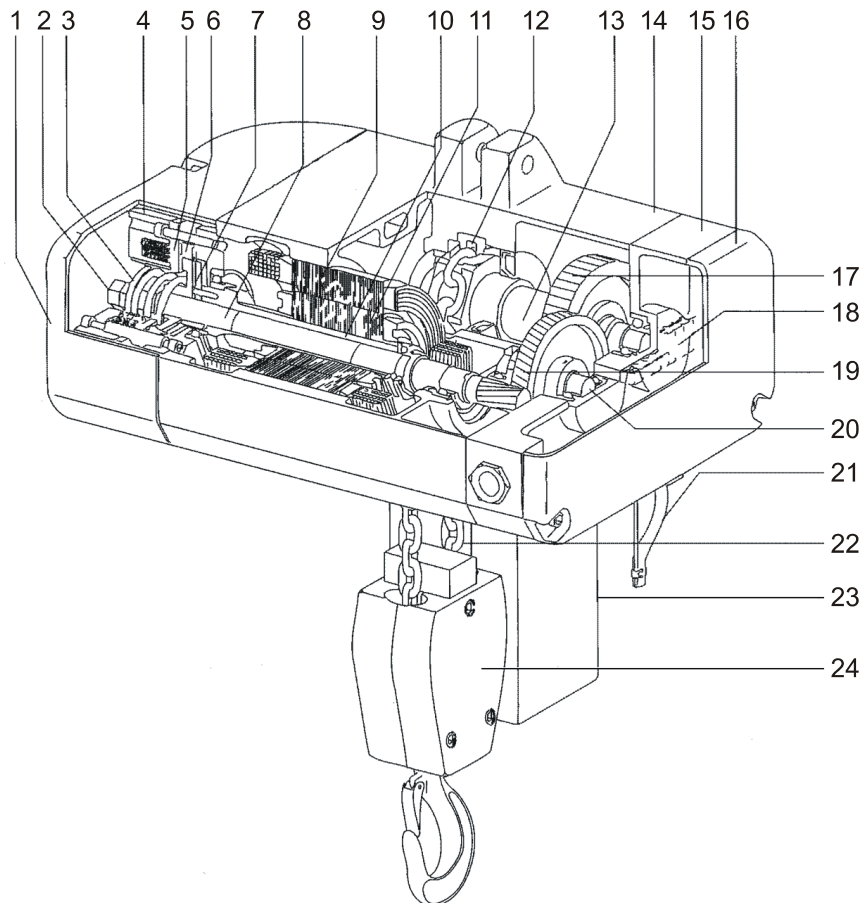
Type 3200 / 2 - 3 / 0,75



The technical dates can be found on the type plate of the electric chain hoist and in the corresponding "Logbook for the crane".

4.4. Sectional view

part no.	designation	part no.	designation
1	Brake cover	13	Drive shaft
2	Pressure nut	14	Casing
3	Clutch compression spring	15	Gear cover
4	Magnet for DC brake	16	Control cap
5	Retaining plate	17	Wheel VI
6	Brake disc	18	Terminal strip for mains cable
7	Clutch disc	19	Wheel IV
8	Motor pinion shaft	20	Pinion shaft V
9	Stator	21	Control cable
10	Clutch hollow shaft	22	Load chain
11	Rotor	23	Chain bag
12	Hold down	24	Hook block complete



Picture 4 sectional view

5. Assembly instruction

Assembly work should only be carried out by competent persons in accordance with BGV D8 sect. 24. Observe the remarks in the operating manual for a smooth assembly process.

5.1. Mechanical assembly

5.1.1. Suspension of the electric chain hoist

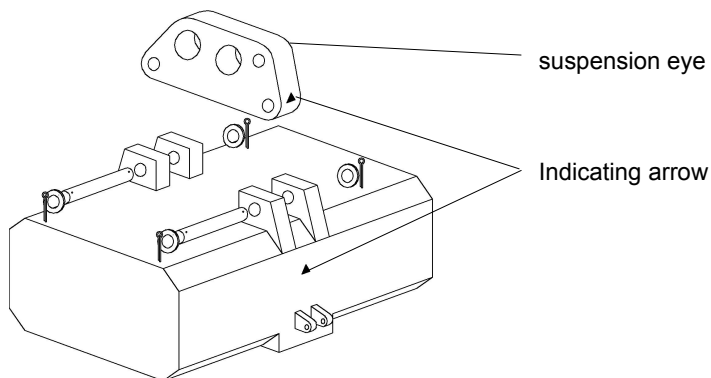
There are several suspension eyes available for the assembly of electric chain hoists on trolleys or stationary suspension points. A hook suspension is also possible for special usage purposes.

5.1.1.1. Suspension with double hole suspension eye

The double hole suspension eye is exclusively used for the assembly of electric chain hoists on a double bolt trolley. If an electric chain hoist should be mounted on a single bolt trolley a single hole suspension eye should be used.

Assembly: The delivered double hole suspension eye must be inserted into the specially provided suspension holes on the electric chain hoist and pinned into place with the two bolts. Use washers with the lock bolts and secure position with eyebolts.

Caution: The marking arrow on the suspension eye must be on the same side as the chain bag of the hoist.



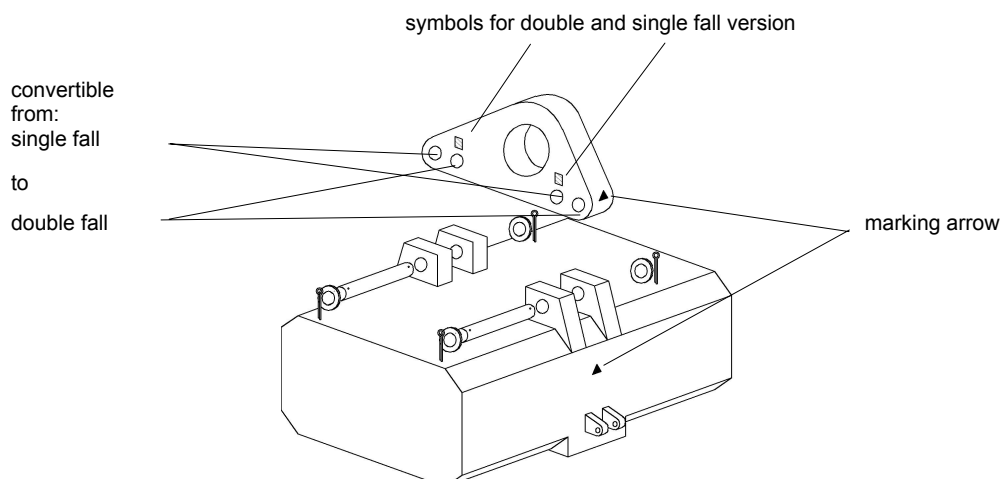
Picture 5 suspension with double hole suspension eye

5.1.1.2. Suspension with single hole suspension eye

Assembly: The delivered single hole suspension eye must be inserted into the specially provided suspension holes on the electric chain hoist and pinned into place with the two bolts. Use washers with the lock bolts and secure position with eyebolts. The holes to be used differ in the single and double fall version and are marked with symbols on the eye.

Caution: The marking arrow on the hook suspension must be on the same side as the chain bag of the hoist.





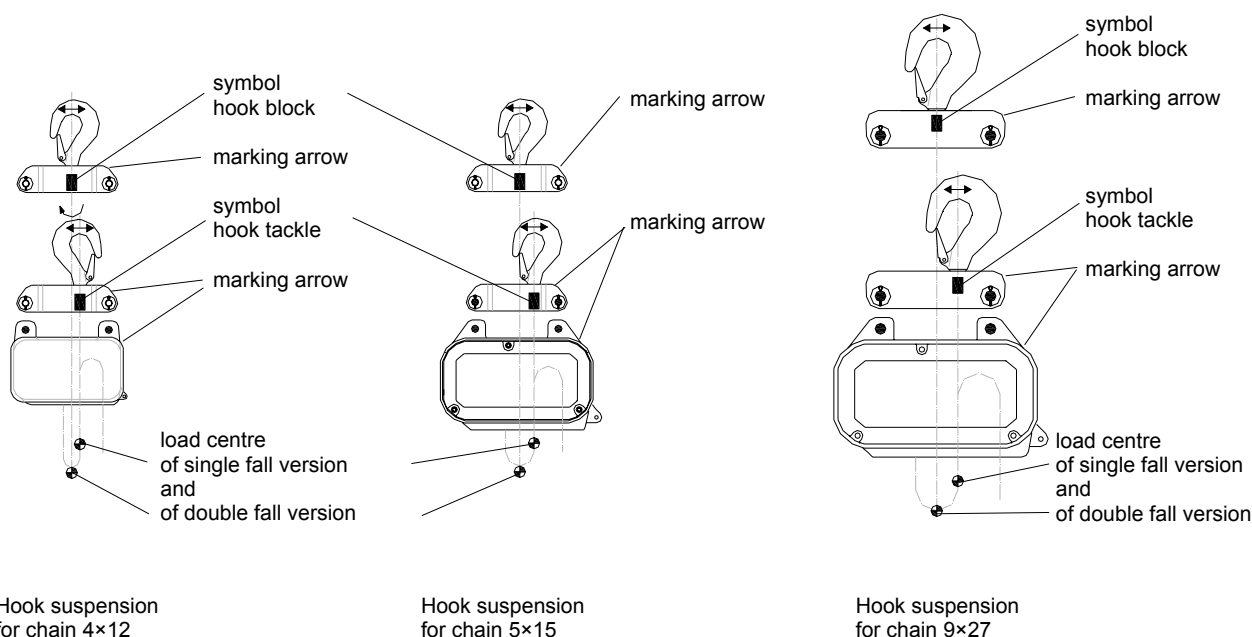
Picture 6 suspension with single hole suspension eye

5.1.1.3. Suspension with hook suspension

Assembly: The hook suspension must be inserted into the specially provided suspension holes on the electric chain hoist and pinned into place with the two bolts. Use washers with the lock bolts and secure position with eyebolts.

Attention: The indicating arrow of the hook suspension must be on the side of the chain bag of the hoist!

The holes to be used for a hook suspension for chain 7×22, 11×31 and 11.3×31 differ in the single and double fall version and are marked with symbols on the hook suspension.



Hook suspension for chain 4×12

Hook suspension for chain 5×15

Hook suspension for chain 9×27

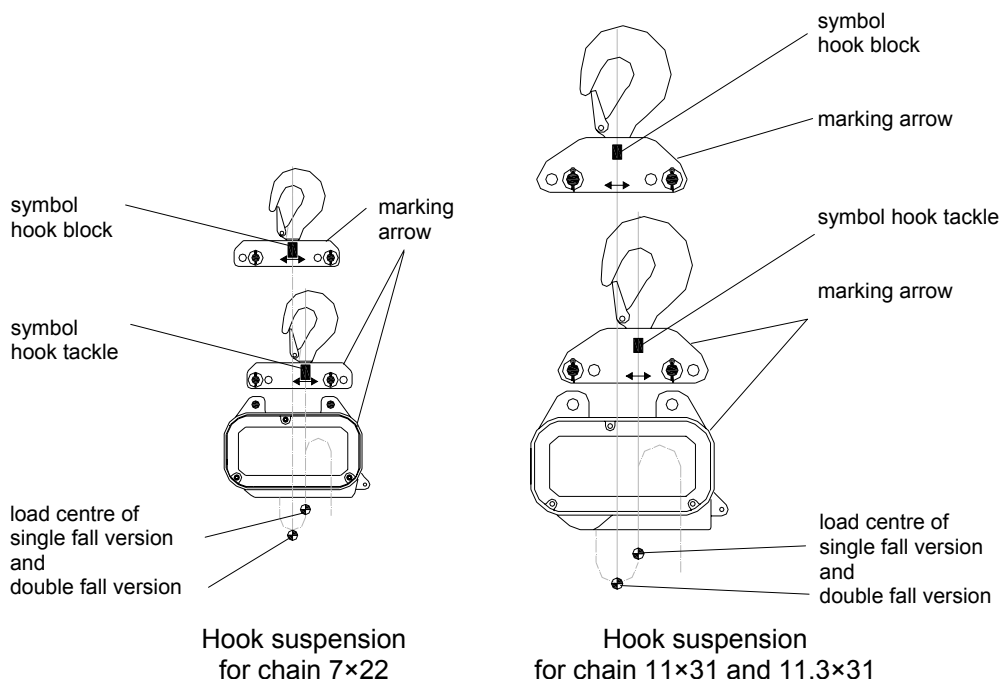
Picture 7 hook suspension for chain 4×12, 5×15 and 9×27

Converting: The traverses of the hook suspensions for chain 4x12, 5x15 und 9x27 have two holes for the reception of the hook. The hook is factory-set in one of the two holes depending on the configuration (single or double fall). Afterwards the security pin of the hook nut can't be removed without any damages. Therefore a subsequent change between the single and double fall version is not possible.



For the conversion a hook suspension in the corresponding version (single or double fall) is necessary. The two versions of hook suspensions for single or double fall operation are marked with the appropriate symbols (hook tackle or hook block) for a single or double fall operation.

Caution: For changing the hook suspension of version 1-1.3 for the double fall version the traverse of the suspension has to be turned additionally by 180° degrees (see Picture 7 left side). The marking arrows of the respective symbol for hook tackle or hook block must be at the same side as the chain bag of the hoist.



Picture 8 hook suspension for chain 7x22, 11x31 and 11.3x31

Converting: It has to be observed during changing of number of falls or the assembly of the chain hoist, that the marking arrow of the hook suspension is situated on the same side as the chain bag of the hoist (see Picture 8). A change from single fall to double fall version can be done by putting the two bolts into the relevant holes at the hoist casing. The relevant holes are marked with a symbol for double fall and another symbol for single fall on the hook suspension block. The bolts have to be secured with washers and eyebolts.



5.1.2. Fitting and replacing load chain

Before fitting the load chain the chain hoist must be connected to the power supply und must be ready for operation. The connection to the power supply is described in section 5.2 on page 32.

Caution: Before replacing the load chain the lift limiters must be removed. When equipping the chain hoist with electrical limit switches for lifting range limitation, their adjustments must be changed. The operation of the lift limiter and the electrical limit switches must be tested after fitting or replacing of the load chain.



Caution: In the case of models 6.1 and 8.1 the clutch must be relieved of stress by loosening the pressure nut (see part no. 2 in Picture 4 respectively part no. 9 in Picture 42) before carrying out this work. The clutch must be adjusted again as described in chapter 7.4 after assembling of the load chain.



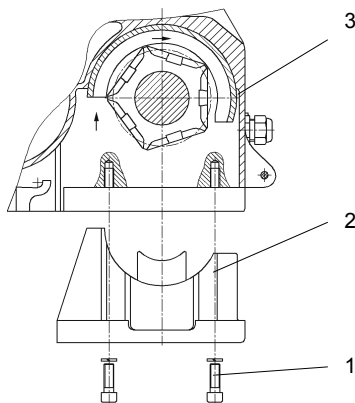
For version 9.1 only the clutch of the slow speed motor must be relieved of stress (part no. 7 in Picture 44). The chain has to be assembled by using the slow speed only.

5.1.2.1. Replacing of chain guide and hold down

Caution: The chain guide and the hold down have to be changed when replacing the load chain due to reaching the wear boundary or due to damages (see section 7.6.2).
The chain guide and hold down can be replaced after removing the whole chain from the chain hoist. The hook tackle or the lift limiter has to be removed first.
If the chain hoist is equipped with electrical limit switches their adjustments have to be changed, if necessary.



Caution: Different combinations of hold downs / chain guides are used. Hold downs can only be installed in combination with the appropriate chain guides. In case of doubt the serial number of the electric chain hoist has to be mentioned when purchasing spare parts.



1. Loosen four screws (1).
2. Remove chain guide (2).
3. Press hold down (3) in direction of dead end of the chain, using the screwdriver (arrow in Picture 9).
4. When inserting the new hold down (3), take care that the chamfered end shows in the direction of the chain bag.
5. Push in the chain guide and screw tight.
6. Fit the load chain like described in point 5.1.2.2.

Picture 9 replacing the chain guide and the hold downs

5.1.2.2. Fitting for single fall version – delivery without preassembled piece of load chain

1. Push the pull-in wire (special tool) into and through the chain guide cross plate shown in Picture 10 until the wire hook is pushed out on the opposite side.
2. Starting with the flat chain link, hang chain end with wire hook into the chain pocket.
3. Allow chain to be fed in using inching control on push button (Picture 11).
4. Attach rubber block onto chain end and assemble load hook (Picture 12). Please consider the torques in table Table 2 on page 29.
5. Lower load hook to the lowest position.
6. Press the rubber buffer for lift limiter*, included in delivery, onto the dead end of the chain.

Attention:

If the rubber block of the lift limiter has a vulcanised steel disc, this disc has to show in the direction of the electric chain hoist casing during installation.

7. Fix lift limiter* approx. 50 cm before the chain end (Picture 13). Fix the lift limiter for oversize chain bags in a way that the distance of the lift limiter to the chain end equals the height of the chain bag.
8. Mount chain bag as described in 5.1.3. The dead end of the chain will be fixed on the chain bag so the chain can't fall out.
9. Lubricate chain well and let it run into the chain bag.

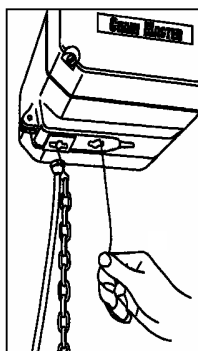
Caution: Let the dead end of chain run into the chain bag by pressing the up button on the control and using the hoist motor to prevent knots inside the chain bag. Allow filling of the chain bag only by running the chain through the hoist by using the motor. To prevent knots inside the chain bag do not put the chain in the box manually



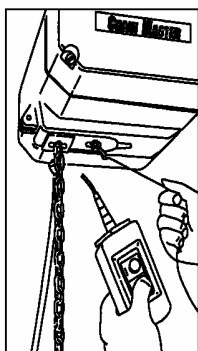
* Lift limiter

The lift limiter is designed to prevent the dead end of chain running out of the hoist. It is used as an emergency stop and cannot be used regularly as a lower limit switch.

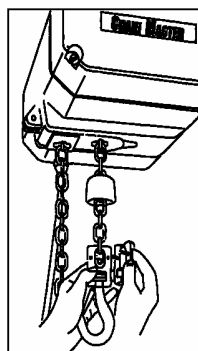




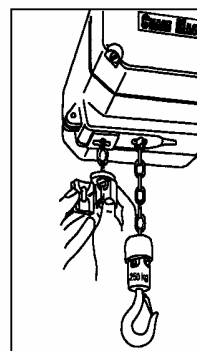
Picture 10 (step 1)



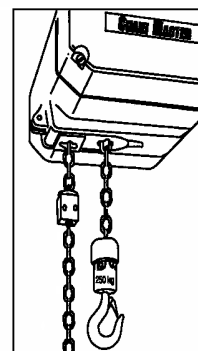
Picture 11 (step 3)



Picture 12 (step 4)



Picture 13 (step 7)



Picture 14

Fitting the load chain in single fall version

5.1.2.3. Fitting for single fall version – delivery with preassembled piece of load chain

A short piece of chain is already fitted in these models so the fitting of the chain into the chain hoist is not necessary. The assembly is carried out according to the following steps:

1. Always hang the connecting piece, included in the delivery, into the inserted chain on the chain bag side and then attach the load chain to be drawn in.
2. Continue as described in 5.1.2.2 under point 3.

Caution: When changing the load chain and converting to other numbers of falls, never allow the chain to come out of the casing completely, always pull in new chain or a short piece of chain with the connecting piece. (pay attention to point 5.1.2). After having mounted the new load chain remove the short piece of chain and connecting piece.



5.1.2.4. Fitting for double fall version

Caution: Chain hoists with limit switches for the upper end position mounted outside the chain hoist can't be converted into the double fall version.



The following models can't be converted into the double fall version:

- MB1.1/23B 320/1-4
- MB1.1/22B 320 1-6
- SB1.1/13B 160/1-4
- SB1.1/14B 160/1-6

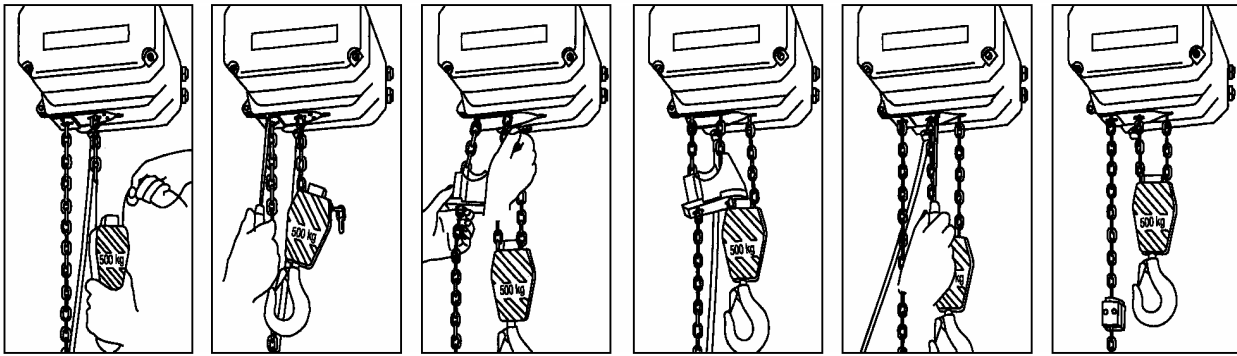
For material strength reasons the casing pocket for fitting in the chain end piece had been removed (see Picture 3) for these models.

1. First insert the load chain into the chain hoist casing as described in point 5.1.2.2 or point 5.1.2.3. Make sure that the first chain piece lies flat on the chain wheel.
2. Pull the chain through the hook block using the pull-in wire (special tool) (Picture 15).

Caution: Never allow the chain to be twisted between the chain outlet and the hook block! If an assembly with an untwisted chain according to Picture 16 or Picture 17 is not possible one chain link has to be cut and removed to allow correct assembly. Do not turn or swivel the hook block around the horizontal axis between the two chain falls.



3. Release the 4 screws of the chain guide (see Picture 9) and lower the chain guide (Picture 16).
4. The chain end which has been pulled out of the hook block must be laid flat into the chain hoist casing pocket as shown in Picture 3 or Picture 17.
5. Fix chain guide onto casing again (Picture 19).
6. Check again that chain is not twisted. (Picture 20)
7. Lubricate the chain well over the full length.



Picture 15 (step 2) Picture 16 (step 3) Picture 17 (step 4) Picture 18 Picture 19 (step 5) Picture 20 (step 6)

Fitting the load chain in double fall version

5.1.3. Chain bag

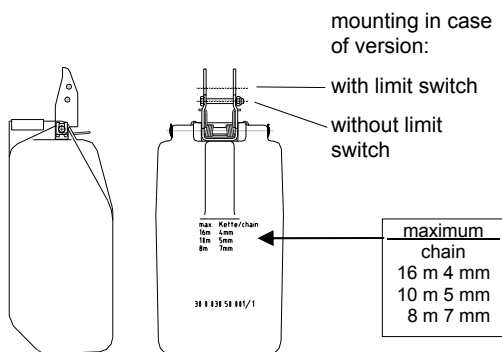
5.1.3.1. Assembly of the chain bag

The following chain bags are made from plastics (see picture 21):

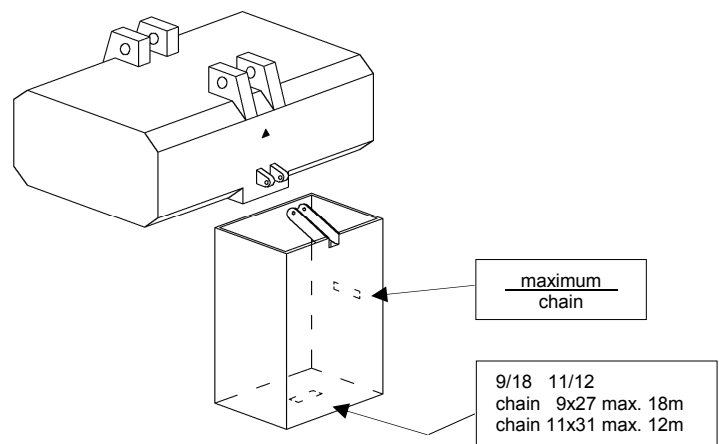
chain dimension	max filling quantity	type of chain bag
5×15	10 m	5/10 7/8
7×22	8 m	

Table 1 plastics chain bags

Chain bags with bigger capacity as shown in the Table 1 are made from canvas material (see Picture 22).



Picture 21 plastics chain bag



Picture 22 canvas chain bag

Caution: Ensure that the appropriate chain bag is used for the applied chain dimension of the chain hoist (see labelling with chain dimension and filling quantity on the chain bag).
Do not overload the chain bag!

Caution: When replacing chain bags please observe that chain bags for chain hoists, which are equipped with a chain guide plate, have a suspension which has another bending.



The mounting of the chain bag is carried out according to Picture 21 with screws and a self-locking nut. The nut has to be torqued till the screw is seated correctly. The self-locking nut has to be replaced after repeated assembly of the chain bag if the retaining effect of the nut can no longer be guaranteed.

The mounting of the chain bag will be carried out as described below:

1. Fit the end of the dead end chain with lift limiter and rubber buffer into the chain bag when the chain is almost completely extended.
2. Mount the chain bag to the suspension on the chain hoist with the screw included in the delivery. Fit the last chain piece of the dead end chain between the suspensions and mount it with the same screw.
The chain end of the dead end chain must not be twisted by more than $\frac{1}{4}$ turns.
3. Make sure that the lift limiter is installed according to 5.1.2.2 so that it is lying on the bottom of the chain bag.
4. Run the complete chain into the chain bag with a lifting operation of the chain hoist
5. Check the filling height according to the marking on the side of the chain bag (Picture 21 and Picture 22).

5.1.3.2. Oversize chain bags

If the chain weights more than approx. 22 kg, the strain of the chain bag has to be relieved with a special canvas strainer strap. This strap must be strained by means of a ratchet and the correct position must be checked with the partly filled chain bag (chain weight approx. 10kg).

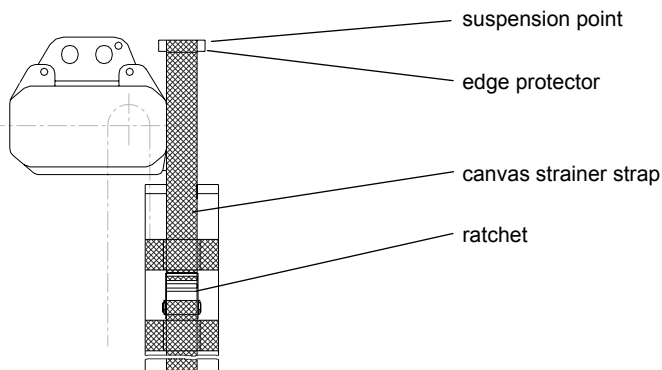
The use of these chain bag types is not permitted without relief by a canvas strainer strap!



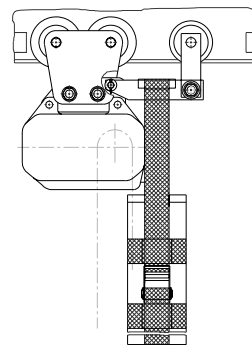
The suspension point of this strap for a stationary suspended hoist has to be provided by the customer (see Picture 23), as the local conditions are unknown.

If the hoist is fitted to a trolley the manufacturer provides a dual trolley to fit the chain bag strainer strap (special option – see Picture 24). Please take care that the strainer strap has to be tightened in accordance with this manual and inspected in regular intervals and corrected if necessary.

Please use the edge protectors at the suspension points (see Picture 23).



Picture 23 stationary suspended electric chain hoist

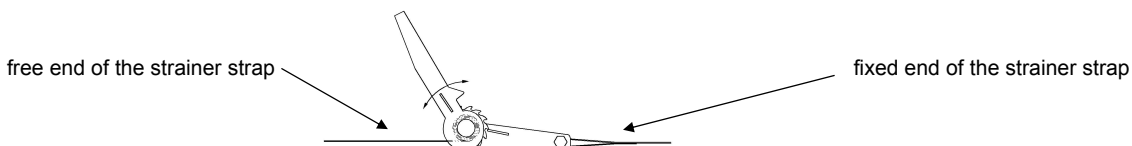


Caution!
Not suitable for single bolt trolleys

Picture 24 electric chain hoist with chain bag suspended at the tandem trolley
(Not suitable for curved beams. In special cases ask the manufacturer.)

The suspension point for the strainer strap has to be provided by the customer.

The end of the strainer strap has to be fixed and tightened with the strainer strap and the ratchet as shown in Picture 25.

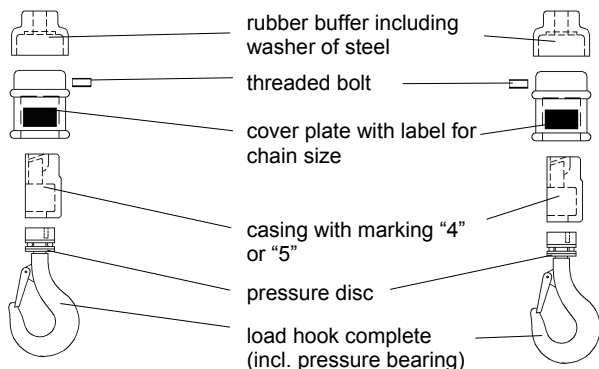


Picture 25 strain strap with ratchet

5.1.4. Hook tackle

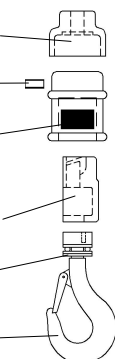
The hook tackle used to attach loads for hoists in single-fall version.

Hook tackle
for chain 4×12



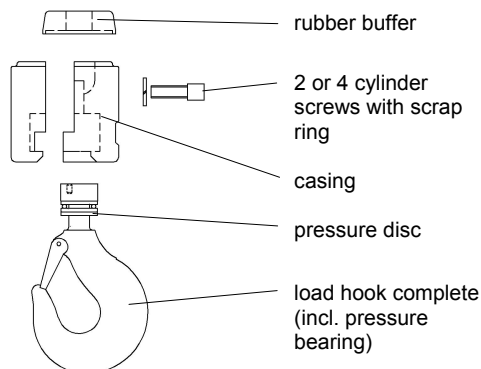
(the casted piece shows the number "4" as a permanent mark)

Hook tackle
for chain 5×15



(the casted piece shows the number "5" as a permanent mark)

Hook tackle for chains
7×22, 9×27, 11×31 and 11.3×31



Picture 26 assembly of hook tackles

To avoid mistakes the chain size (4 or 5) is marked in the chain pocket in the casing for hook tackles for chain 4x12 and 5x15. The usage of the hook tackle is only permitted for the intended chain size.

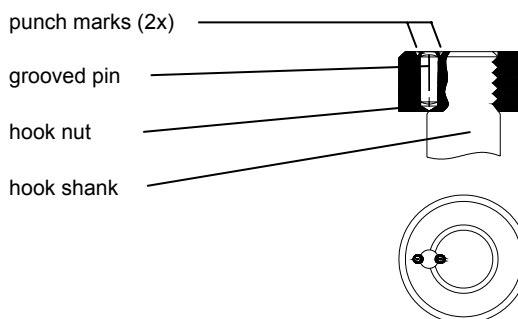
Hook tackles may only be mounted with functional rubber blocks (Picture 26).

For the assembly of the hook tackles please tighten the connection screws with the following torques:

Hook tackle designation	Max. load capacity (kg)	Dimension of screws	Qty.	Tightening torque (Nm)
Hook tackle chain 4×12	320	-	-	-
Hook tackle chain 5×15	320	-	-	-
Hook tackle chain 7×22	1000	M10×30 DIN 912	2	35
Hook tackle chain 9×27	1600	M12×30 DIN 912	2	50
Hook tackle chain 11×31	2500	M12×35 DIN 912	2	50
Hook tackle chain 11.3×31	3200	M12×35 DIN 912	2	50

Table 2 connection screws with torques for hook tackles

During maintenance work the condition of the load hook and of the rubber buffer has to be checked (wear and centre punch spacing) according to section 7.7. For the 4×12 and 5×15 chain hook tackle the plastic cover (in Picture 26 cover plate) has to be checked additionally and changed if worn. Furthermore the pressure bearing, the safety latch and the condition of the pin, which secures the hook nut, have to be checked. The grooved pin has to be secured by 2 punch marks (see Picture 27). If required the axial bearing has to be cleaned and greased.

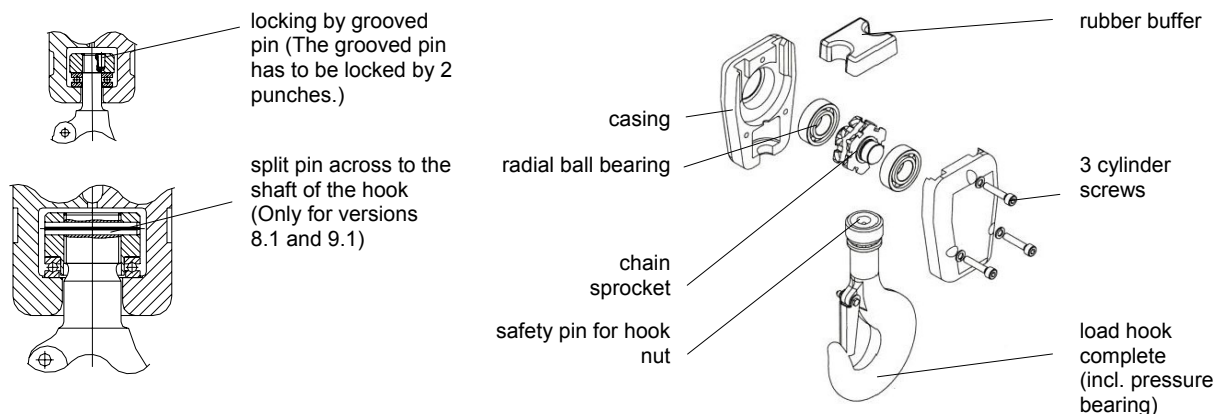


Picture 27 hook nut locking

5.1.5. Hook block

The hook block is used to attach the load in double-fall version.

Hook block for chain
4×12, 5×15, 7×22, 9×27, 11×31 and 11.3×31



Picture 28 assembly of hook block

Hook blocks may only be mounted with functional rubber buffers (Picture 28).

For the assembly of the hook blocks please tighten the connection screws with the following torques:

Hook tackle designation	Max. load capacity (kg)	Dimension of screws	Qty.	Tightening torque (Nm)
Hook tackle chain 4×12	500	M5×35 DIN 912	2/1	6/4*
Hook tackle chain 5×15	500	M6×35 DIN 912	2/1	10/6*
Hook tackle chain 7×22	2000	M8×50 DIN 912	2/1	20/10*
Hook tackle chain 9×27	2000 / 3200	M10×50 DIN 912	2/1	35/20*
Hook tackle chain 11×31	5000	M12×60 DIN 912	3	35
Hook tackle chain 11.3×31	6300	M12×60 DIN 912	3	35

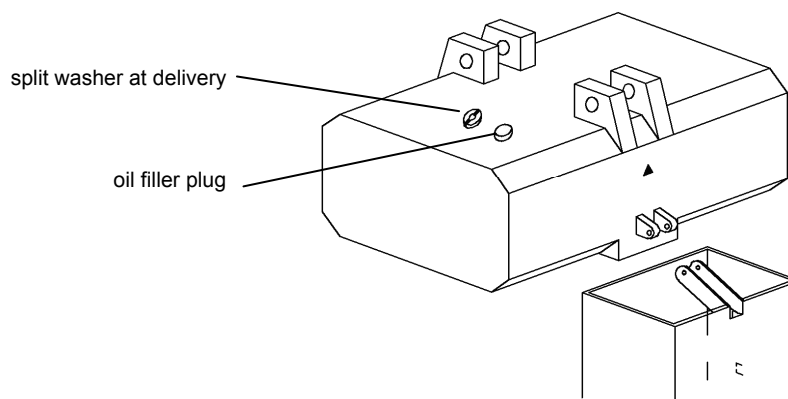
* Torques marked with * only apply for upper screw near the rubber buffer.
This one screw has to be locked into the threaded bore hole with a registered screw locking paste.

Table 3 connection screws with torques for hook blocks

At all maintenance work the condition of all the parts has to be checked according to 5.1.4. The condition of the chain sprocket and of the ball bearing has to be checked as well (inspection for wear of chain sprocket see 7.2). If required the bearings have to be cleaned and greased.

5.1.6. Gear ventilation for stationary chain hoists

The chain hoists are equipped with oil filler and drain plug on the top and bottom side of the casing. Having completed assembly, the split washer has to be placed under the oil filler plug (top side of casing) to avoid oil leakage due to high pressure inside the gearbox (see Picture 29). You will find this split washer fastened with a piece of self adhesive tape next to the oil filler plug. Chain hoists with a low duty rate (e.g. usage for stage machinery) are not equipped with a split washer.



Picture 29 gear ventilation

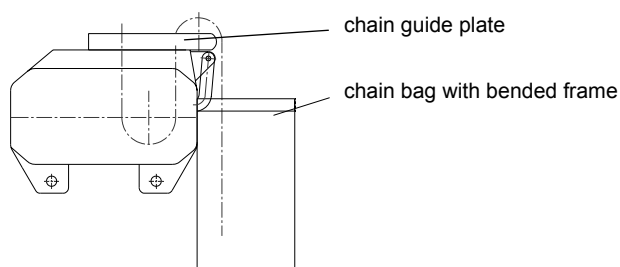
For outdoor use, high air humidity and big differences in temperatures the use of the split washer is not recommended.

The usage of the split washer is also not recommended for a mobile use of the chain hoists (e.g. usage for inverted use) to avoid oil loss in case of improper storage.

5.1.7. Electric chain hoists for inverted use

Electric chain hoists can be delivered for inverted use. It is possible for most models to convert the hoist to this mode. The necessary parts can be supplied by the manufacturer! Consult the manufacturer before starting the conversion! If the hoist is used in inverted mode in open air it is necessary to prevent the hoist from rainwater to prevent a slack flow in the hold down or the chain guide.

Caution: Chain hoists with limit switches or with control levers for limit switches mounted on the outside must not be used in the inverted use mode!
Chain hoists which should be used in the inverted mode must be equipped with a chain guide plate.
If the hoist is used upside down the load fall and the dead end of chain is showing to the top. For safe use both chain falls have to be kept tighten at all times. If not taken care of this advice, the hoist and the chain can be destroyed which can produce dangerous situations. Nonobservance of this advice can cause a chain choking in the chain guide and so a destruction of the hoist and the chain.



Picture 30 electric chain hoist for inverted use

5.2. Electric equipment and connection

The installation of the electric connections must be carried out in accordance with the applicable regulations. The state of the art for the electric equipment of hoists is described in DIN EN 60204-32.

After having completed the electric installation check them in accordance with point 19 of DIN EN 60204-32. If the electric chain hoists are delivered without connections and plugs the installation has to be carried out by the customer. The usage of a neutral conductor is necessary for a few circuit variants. Details on the connection and function of the chain hoist can be found in the wiring diagram.

It must be able to disconnect the mains power supply at all poles by means of a main switch in accordance with DIN EN 60204-32 section 5.3. Work on the electric installation may only be carried out by authorized personnel for electrical equipment. The equipment must first be disconnected from the power supply before start of work, must be secured against switching-on and the de-energised state of the equipment has to be checked.



5.2.1. Voltages

All chain hoists work with rotary current and have a standard voltage of 400 V 3~ 50 Hz or 230 V 3~ 50 Hz. Different voltages and frequencies are possible.

The electric chain hoists with one lifting speed are suitable for operation with a wide voltage range of 380 - 415 Volt (220 – 240 V) for 50 Hz.

5.2.2. Mains connection

In order to ensure the proper functionality of the hoist, the power must be connected to a clockwise (CW)–turning 3 phase AC supply. Connection has to be corrected if deviations occur. Power connection is correct, when the control button for lifting the load is pressed and the chain hoist moves the load upwards.

Before the connection check if the mains voltage agrees with that specified on the type plate. Connect mains current supply lines and control line in accordance with wiring diagram.

The connection is carried out after removal of the casing cover from the control side. A cable with a diameter of at least 1.5 mm² is required for the connection.



Fuses (slowly blowing) in front of main switch:

Model	Fuses (slowly blowing) 400 V	Fuses (slowly blowing) 230 V
1 / 1.1 / 1.3	4 A	4 A
2 / 3 / 4 / 4.1 / 4.3	6 A	10 A
4.2 / 5 / 5.1 / 6 / 6.1 / 7 / 7.1 / 7.2 / 8.1 / 8.2 / 8.3 / 9.1	10 A	20 A

Table 4 pre-fuse

After connection the proper function has to be tested. Press button for lift (or choose the direction lift and push run button). If the load moves downwards, the rotary field has to be checked and the connection has to be adjusted accordingly (Disconnect mains supply before!).

5.2.3. Direct control

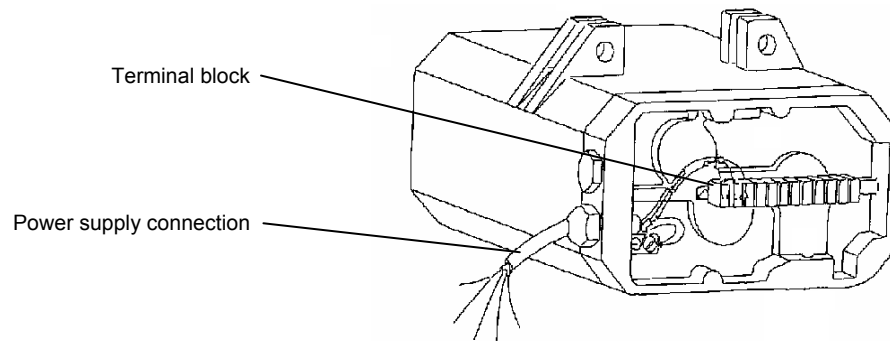
Caution: It is strictly prohibited to use 5-pole plug connections for the usage in the feed cable to the chain hoists for direct control.

The prohibition is a security against an unexpected start-up when the CEE plug is accidentally put into a normal CEE socket.



The control of the motor for direct control is carried out by a direct switching of the rotary current. Chain hoists for direct control are normally equipped with a connecting cable with a 4-pole CEE plug. If the chain hoist is not equipped with a connecting cable and plug, the connection can be carried out as described in 5.2.2.

The feeder clamps for chain hoists for direct control are situated under the casing cover. The brake contactor and the brake rectifier can also be installed here. Some models have this devices installed on the opposite site, directly next to the brake. In some cases the coil of the brake contactor is current winding and will be operated in one phase in series connection with the motor winding.

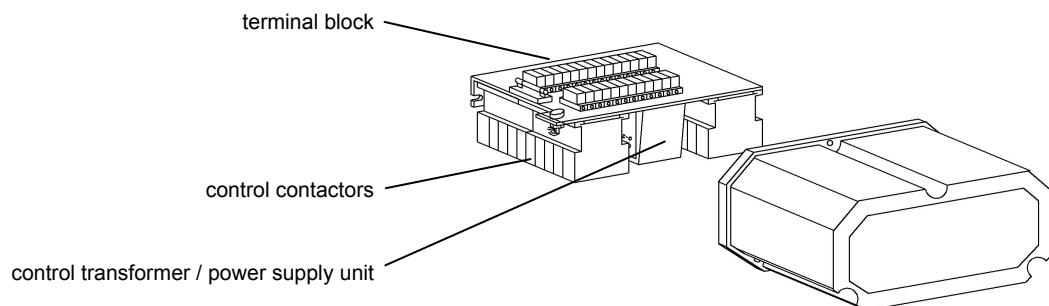


Picture 31 version with direct control

5.2.4. Low voltage control (contactor control)

The control components for chain hoists for low voltage control are situated under the casing cover. The feeder clamps can also be found here. Chain hoists which work as stand-alone device are additionally equipped with a control transformer or power supply unit with the corresponding control fuse. Further components can also be installed, e.g. the evaluation unit for the electronic lifting power limitation (see 5.2.7).

Low voltage controls work with 24 V AC or DC by default, other control voltages are possible.



Picture 32 version with low voltage control

5.2.5. Electric limit switch for lift limitation

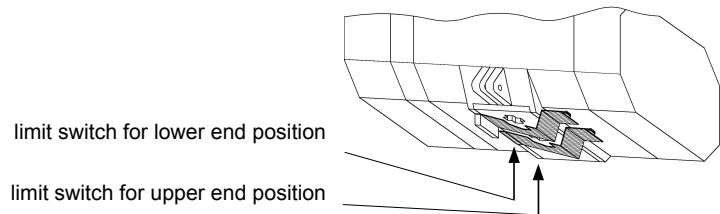
On request the electric chain hoists with low voltage control can be fitted out with electric limit switches to limit the highest and lowest hook positions.

Caution: Please make sure during operation that the lifting direction shown on the control pendant agrees to the real hoist movement as this is absolutely necessary for the safe operation of the limit switches (see 5.2.2). The safe operation of the respective limit switches for lifting and lowering has to be checked.



The limit switch for lowering is activated by the lift limiter mounted on the chain; the limit switch for lifting is activated directly by the hook tackle. If the lifting range should be limited in upper direction, an additional lift limiter (with rubber block) has to be installed on the load fall of the chain above the hook tackle.

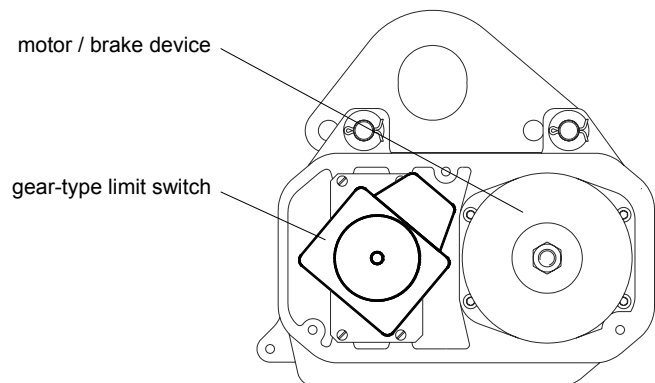
Moving the lift limiter on the chain can limit the usable lifting range.



Picture 33 electric limit switches for low voltage control

Chain hoists can also be equipped with a gear-type limit switch. This device can be found within the chain hoist next to the brake. The gear-type limit switch can be equipped with 2, 4 or 6 limit switches which work independently. An individual switching position can be adjusted with an adjusting spindle for each switch.

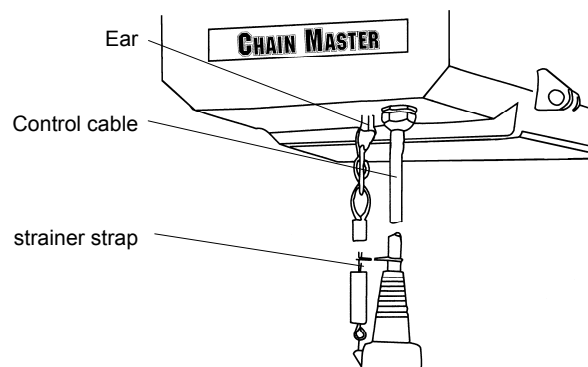
Detailed information about the adjustment of the gear-type limit switch can be found in a separate instruction. This instruction will be delivered with the documentation if the chain hoist is equipped with a gear-type limit switch.



Picture 34 equipment with gear-type limit switch

5.2.6. Control cable with control pendant

For chain hoists which are equipped with a pendant button panel the control cable comes out of the casing downwards. Next to the cable inlet is an ear for fastening the strainer strap. Make sure that no traction forces are influencing the control cable during the installation. The length of the strainer strap has to be adjusted if necessary.



Picture 35 strainer strap of the control cable

5.2.7. Electronic lifting power limitation

Chain hoists with low voltage control can be equipped with an electronic device for lifting power limitation. For this purpose the chain hoist is equipped with a force sensor which measures the forces on the load fall. The evaluation and the switch-off will be carried out by an evaluation unit, which is installed in the chain hoist. The shut-down threshold for underload (if the chain is slack) and overload can be adjusted separately on the evaluation unit. A further adjustable switching signal is used for the sensor supervision and switches the control of the chain hoist off, if there is a sensor defect, an interruption of the sensor cable or a power dip of the evaluation unit.

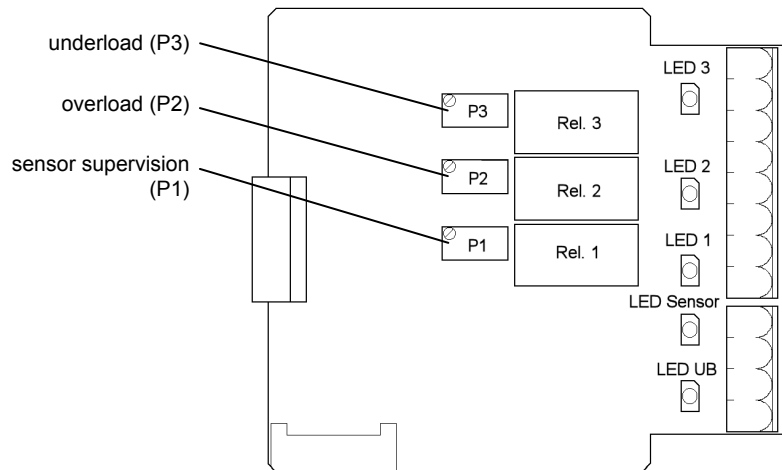
Caution: It is not permitted to increase the load capacity by manipulating the adjustments of the electronic lifting power limitation.



The evaluation unit is situated under the cover of the low voltage control (Picture 32). The electronic board is protected by a cover. After removal of that cover the 3 adjustment devices for the shut-down thresholds are accessible. The switching state for the three switching functions will be indicated by a LED.

The LEDs are situated on the right side of the relay, next to the adjustment devices. The LED "sensor" lights up if the force sensor is connected and the operating voltage LED "UB" lights up if the device is supplied with voltage.

adjustment device:



Picture 36 evaluation unit of the electronic lifting power limitation

The chain hoist must be suspended for the adjustment so that the force sensor is operative. The following steps have to be performed for adjusting the switching thresholds:

1. Remove cover from evaluation unit.
2. Turn P1 counter clockwise until the corresponding LED 1 lights up.
3. If LED 2 (overload) is not lighting up, turn P2 counter clockwise until LED 2 lights up and lifting of the test load is possible.
4. If LED 3 (underload) is lighting up, turn P3 clockwise until LED 3 lapses.
5. Lift maximum test load (overload) and turn P1 counter clockwise till the corresponding LED 1 lights up.
6. Turn P1 for 2 -3 turns further (The adjustment value should be so high that it can never be reached by maximum load).
7. Turn P2 clockwise with maximum load (overload) till the corresponding LED 2 lapses.
8. Drop maximum test load (overload) – LED 2 must lights up again.
9. Lift maximum test load again for control purposes – a switch-off has to take place.
10. Drop test load, lift nominal load. There mustn't be a switch-off.
11. Drop test load, lift underload test load (standard: 10% of nominal load).
12. Turn P3 counter clockwise so that the corresponding LED 3 lights up.
13. Check lowering; lowering may only be possible with activated underload bridging.
14. Slightly increase test load and check lowering again. LED 3 has lapsed and lowering must be possible without activating the underload bridging.
15. Drop test load and mount cover of evaluation unit.

6. Directions and prohibitions for use

The modern construction of the electric chain hoist guarantees safety and economic usage when it is operated appropriately. The patented safety sliding clutch is mounted between motor and brake which allows for a safe braking of the load without pressure on the clutch.

The electric chain hoist may only be operated if it is properly mounted and works accurately.

6.1.1. Requirements for the operating personnel

The Operation of the electric chain hoist may only be performed by people who were authorised with the employer and were briefed by the employer regarding the function and the operational conditions according to section 2.1.8. The person must be suitable for this task from the physical and sanitary point of view.

The operating personnel must observe the operating instruction.

6.1.2. Dangers for people and environment



- When operating the hoist, especially for improper use, there are risks due to oscillating and falling loads and falling and tumbling objects.
- There is a risk of crushing, cropping and of being pulled in the chain hoist at some parts of the hoist and the load in the direct operation area.

6.1.3. Precautions and codes of practice



- Before the assembly mobile hoists have to subject to a visual test, including all parts necessary for the operation (e.g. slings, controls, cables). A functional test has to be performed before every new commissioning at a new site.
- Inspect the external condition and the function of brakes and emergency limiters (except sliding clutch) before starting the operation.
- When moving loads a minimum clearance of 0.5 m to the environmental parts has to be observed.
- Hoists have to be mounted in a way that they can move freely during operation. Load chains have to be moved in a way that they can go in and out without any interruptions.
Casings and chains must not touch any other parts of the construction during operation.
- Personal protective equipment (hard hat, protective shoes, protective gloves) has to be used to avoid injuries during assembly and disassembly of hoists and when a person moves around in the working area of hoists and when loads are suspended.
- Loads may only be transported by means of the bearing elements above the hoists and not via other parts or the casing.
- The maximum allowable load capacity of hoists has to be observed.
- Load may only be lifted vertically upwards, pulling loads is not allowed.
- Loads may only be moved if they are properly fixed with permitted slings.
- Load chains may not be turned around edges.
- Connectors of slings (e.g. bolts from shackles) have to be secured against automatic loosening.

- Loads may only be lifted from a standing position with the lowest lifting speed available. Slack suspensions have to be stressed before starting to lift loads.
- Lifting loads have to be carried out in a way that loads can not oscillate and swing.
- Secondary safety component have to be used for holding loads above people with chain hoists according to BGV D8.
- It has to be observed that the outgoing chain can leave the hoist safely because of her own weight.
If not, the chain can be trapped inside the hoist and can break the casing of the hoist.
- Chains must not be twisted during operation.
- Touching the chain is prohibited during operation.
- When using a double fall hoist it has to be observed that the chain does not get twisted by throwing the hook block through the two vertical chains.
- Don't lower the double fall hook up to a position, where the chain gets slack.
- Switch off the control and secure the control against unauthorised usage when leaving the operator station.
- When using chain hoists in a version according to D8 the load has to be put down to the ground or has to be secured when leaving the operator station. If this is not possible, the area must be closed by means of a barrier.
- When using a trolley the load capacity value must be higher than the value of the electric chain hoist or must be equal.
- When using the hoist with a trolley at arm's reach (height of the trolley beam < 2.5m) it is forbidden to hold extremities into the operating radius.
- Move electric chain hoists with push trolleys only by pulling on the load, the hook block or the hook tackle.



6.1.4. Performance of motional processes

- The operator has to assure oneself by means of the symbols on the control that the move will be carried out in the correct direction before activating devices to start the motional process.
- Motional processes which can cause any dangers have to be carried out only if the speed is appropriate for the situation and
 1. if protection devices are available for securing the concerned area or
 2. if the concerned area will be controlled by the machine operator and
 3. if the concerned area is clearly and constantly marked.
- People who are authorised for operating the device may not endanger oneself or other people when moving the hoist.
- The unnecessary stay in the moving range of the hoist is prohibited.
- If the view is insufficient, the operator has to be instructed by someone else.
- Instructions for starting motional processes have to be issued quite clearly.



6.1.5. Behaviour in case of a failure

- In case of a failure the hoist has to be switched off immediately.
- Determined failures have to be reported immediately to the person in charge.
- Failures may only be removed by competent personnel according to section 1.4.1 – 1.4.3.

6.1.6. Behaviour in case of an accident



- Stop operation immediately and the scene of the accident have to be secured!
 - For accidents involving electrical current, disconnect the circuit by switching it off or by removing the power plug.
 - Call first-aiders!
 - Dial emergency telephone code
 - Report the accident to the person in charge.
-

6.1.7. Maintenance and repairs

- Hoists have to be maintained according to section 7 in regular intervals.
 - Maintenance and repairs may only be carried out by competent personnel according to 1.4.1 - 1.4.3
 - Before starting the maintenance or repairs the equipment must first be disconnected from the current supply must be secured against a restart and a de-energised state of the connection has to be determined when working on the electrical equipment
 - Maintenance and repairs may only be carried out without any lifted loads.
-

6.1.8. Test

- Tests on hoists and electrical equipment can be carried out if necessary but at least once a year according to section 3.

7. Maintenance

- All maintenance work must be carried out by competent personnel.
- The maintenance Table 5 lists the parts and functions to be tested and the necessary maintenance work. Defects have to be reported to the operator in writing immediately. The operator initiates the rectification of a defect by competent personnel.
- Maintenance work may only be carried out if the electric chain hoist is not loaded.
- The electric chain hoist has to be disconnected from the current supply before starting the maintenance work.
- Shorten the periods between maintenance works in very demanding operating conditions, e.g. multi-shift operation, high number of switching actuation, poor environmental conditions.



Caution: Information regarding the performed maintenance and tests and the replacement of components, which have to be checked regularly, have to be recorded in the crane logbook.

7.1. Performance of test and maintenance works

The regulations and standards in section 1.7 have to be observed when performing any test and maintenance works.

The intervals in the following table are only reference values. If the hoist is working hard (two or three shifts, high percentage of work with nominal load, dusty or high temperature environment) this maintenance work has to be done more frequently.

Test and maintenance		daily	3 month	annually
visual inspection of the overall condition		•		
Functional test	brake	•		
	emergency stop (except sliding clutch)	•		
	Sliding clutch		•	
maintenance or adjustment	brake			•
	Sliding clutch			•
wear of the load chain (see 7.6)			•	
lubrication of the load chain			•	
wear of the rubber elements (visual check)			•	
lubrication of hook block and hook tackle acc. to chapter 9.1/ check condition of the pin which prevent the hook nut from loosening and chisel punch marks				•
check condition of safety latch of the hook		•		
universal checks of	all screws			•
	hold down, chain guide			•
	safety devices			•
check of the condition and safe positioning of the chain bag and condition of the canvas material as well			•	
check of the control equipment, power cable and control pendant				•
check of the trolleys and wheels				•

Table 5 test and maintenance works

The electric chain hoist is designed in accordance with FEM 9.511. If the hoist is used under the conditions of FEM 9.511, including the described frequency of maintenance work, the electric chain hoist must be overhauled after 10 years.



7.2. Testing of wear

- Inspect suspension hooks (for the version with hook suspension) and load hooks for deformation (measure centre punch spacing see 7.7), rust and crack formation.
- The chain sprocket in the hook block must be replaced if the running surface is worn by about 1 mm.
- Replace rubber block on lift limiter, hook tackle / hook block if worn.
- Inspect the chain regularly according to section 7.6 for wear and damages.
- Inspect chain guide and hold down for wear and damages.
- For hoists with chain guide plate, check this plate regularly for wear and damages.

7.3. Maintenance and adjustment of the DC disc brake

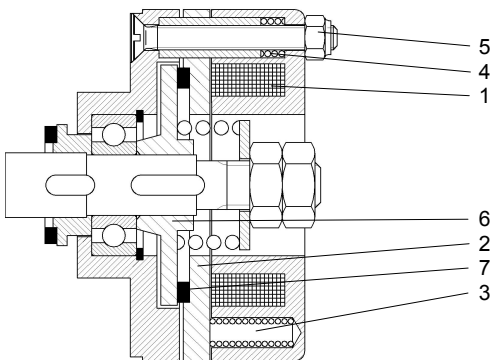
The DC disc brake needs very little maintenance.

7.3.1. Electric control of brakes – mode of operation –

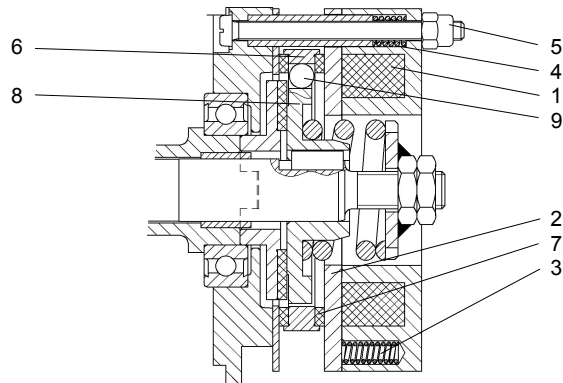
The DC disc brake is supplied through a rectifier circuit. It operates according to the fail safe principle. If there is a power failure, the brake acts automatically so that the load is held safely in every position. To shorten the braking distance the brake is operated in a DC circuit. (When a double brake is used only the operational brake is switched in a DC-circuit so the safety brake has a delayed reaction).

The different switching types for the brakes in direct control and low voltage control can be found in the corresponding circuit diagrams.

7.3.2. Configuration of the single brake



Picture 37 construction of the brake for version 1-1.3



Picture 38 construction of the brake for version 2-9.1

Construction of the DC disc brake

The DC disc brake consists of the magnetic coil (1), the anchor plate (2), brake pressure springs (3), the 3 positioning springs (4), the 3 self-locking adjusting nuts (5) and the brake disc (6) with the brake lining (7).

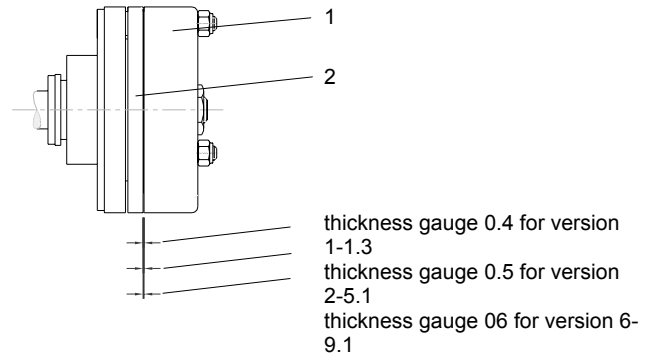
The DC disc brake consists of the magnetic coil (1), the anchor plate (2), brake pressure springs (3), the 3 positioning springs (4), the 3 self-locking adjusting nuts (5), and the brake ring (6) with the 2 pieces of brake lining (7), the brake hub (8), which is form-locking connected with the brake ring (6) by 3 balls (9).

7.3.3. Adjustment of the air gap of the single brake

Caution: If, after a long period of use (about 500,000 brake operations), the air gap between the magnetic coil (1) and anchor plate (2) has increased to approx. 0.8 mm, the brake must be adjusted as follows:



1. Put thickness gauge between magnetic coil (1) and anchor plate (2) (inserting not more than 10 mm).
2. Tighten the 3 adjusting nuts until the air gap between magnetic coil (1) and anchor plate (2) reaches the dimension as defined in Picture 39.
3. Finally check the right size and regularity of the air gap with thickness gauge.
4. After repeated adjustment of the brake, the 3 self-locking nuts must be replaced as their locking function becomes ineffective.



Picture 39 adjusting the single brake

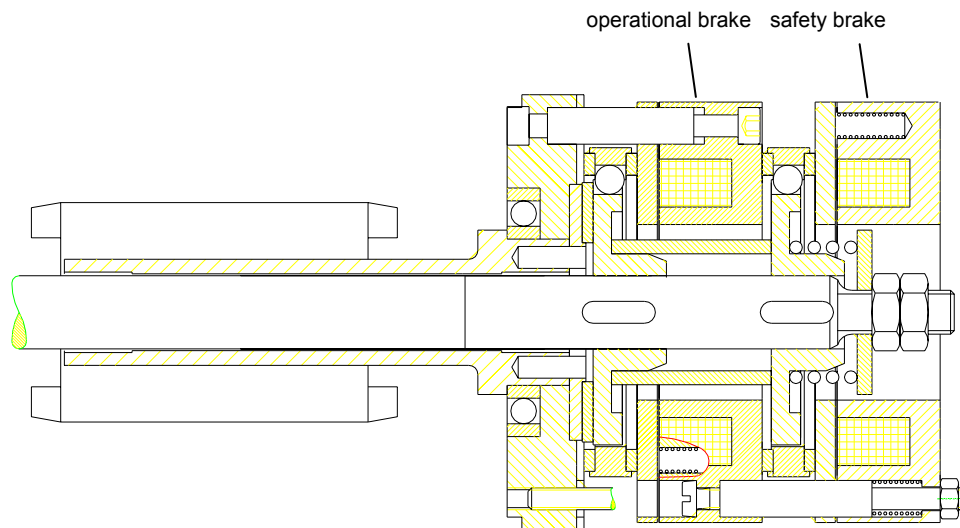
7.3.4. Configuration of the double brake

Chain hoists according to D8Plus (VPLT SR2.0) or BGV C1 are equipped with a double brake.

The operational brake and the safety brake are independently working brakes. They are mounted in series on the motor pinion shaft. The brake mounted inside (motor-sided) is the operational brake, the other on is the safety brake. Both brakes are DC disc brakes with the same principle of operation.

**D8
Plus**

C1

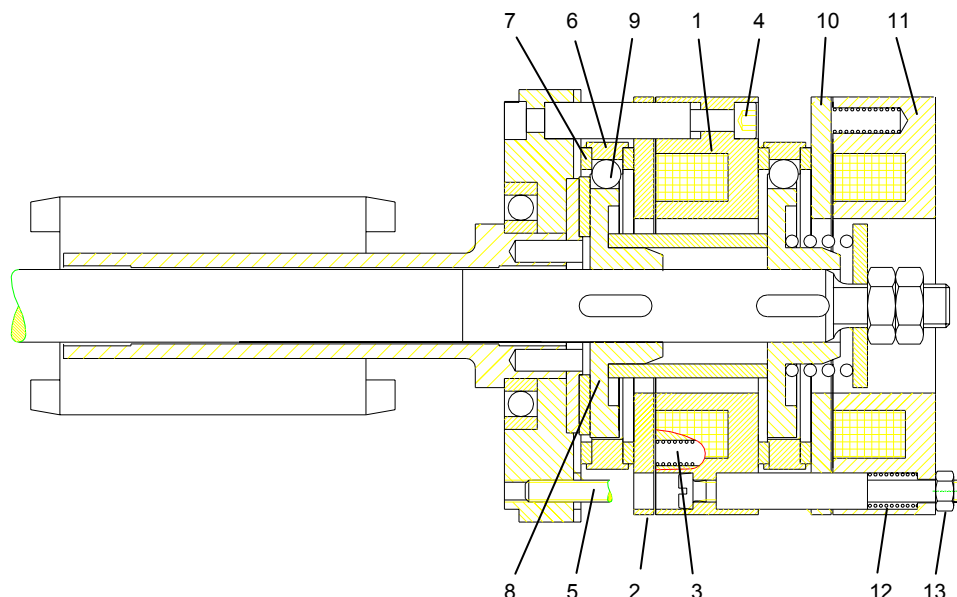


Picture 40 arrangement of operational and safety brake

7.3.4.1. Operational brake – configuration and function –

The configuration and function is equal to the single brake (7.3.2). The brake magnet of the operational brake is also switched in a DC-circuit so that it can react immediately.

The operational brake consists of the magnet (1) with the magnet coil, the anchor plate (2), the 3 pieces brake pressure springs (3) (not shown), the 3 pieces magnet fastening screws (4), the 3 pieces adjustment screws (5) (not shown), the brake ring (6) with 2 pieces brake lining (7) and the brake ring hub (8) which is form-locking connected with the brake ring (6) by 3 balls (9).



Picture 41 configuration of the brake components

7.3.4.2. Safety brake – configuration and function –

The function of the safety brake equals the single brake (7.3.2). The brake magnet of the safety brake is switched in an AC-circuit so the brake reacts slightly delayed. So the braking distances get longer and the dynamic impact of both brakes is reduced.

The configuration equals the single brake (7.3.2). The difference to the operational brake (7.3.4.1) is that the magnet (11) is carried by 3 supporting springs (12) and the adjustment of the air gap is carried out by means of 3 self-locking nuts (13).

7.3.5. Adjustment of the air gap of the operational and safety brake

Caution: If, after a long period of use (about 500,000 brake operations), the air gap between the magnetic coil (1) and anchor plate (2) has increased to approx. 0.8 mm, the brake must be adjusted.
Adjust at first the air gap of the operational brake and afterwards the air gap of the safety brake. The air gap to be adjusted for operational and safety brake is the same.

The air gap to be adjusted is:

Version	Air gap (mm)
SB1.1	0.4
SB2 – SB4.2	0.5
SB6 – SB8.3	0.6

Table 6 air gap of the brakes

**D8
Plus**

C1

7.3.5.1. Adjustment of the air gap of the operational brake

1. Put thickness gauge according to the version (table 6) between magnet (1) and anchor plate (2) of operational brake (insert max. 10 mm).
2. Loosen the three adjustment screws (5) by turning right. The adjustment screws move in the direction of the casing so that the magnet of the operational brake loosens.
3. Fasten the 3 magnet fastening screws (4) till the gap between the between magnet (1) and anchor plate (2) of operational brake equals the thickness auf the gauge.
4. Fasten the 3 adjustment screws (5) by turning left till the magnet of the operational brake (1) is fixed.
5. Retighten the magnet fastening screws (4).
6. Finally check the right size and regularity of the air gap with thickness gauge.

7.3.5.2. Adjustment of the air gap of the safety brake

1. Put thickness gauge between anchor plate (10) and magnet (11) (insert max. 10 mm).
2. Turn the three self-locking nuts (13) to the right till the air gap between magnet (11) and anchor plate (10) equals the gauge thickness mentioned in Table 6.
3. Finally check the right thickness and regularity of the air gap with thickness gauge.
4. After repeated adjustment of the brake, the 3 self-locking nuts must be replaced as their locking function becomes ineffective.

7.3.6. Checking brake function

When braking the nominal load during the lowering process, the braking distance should not be longer than three chain link lengths and the load should not be braked in a jerking manner. If the braking distance is longer, check the pressure springs for breach and fatigue. Check the required DC-switching of the brake according to the circuit diagram and the function of the switching devices, if necessary.

7.3.7. Individual test of operational and safety brake

The brakes have to be tested individually to determine the full effectiveness of both the operational and safety brake. The tests must be carried out during the maintenance work and are performed with nominal load.

The brake magnets are connected via plugs which are situated directly next to the brake components of the chain hoist. These plugs have to be plugged off and on for the individual tests of the brakes.

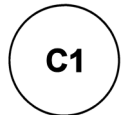
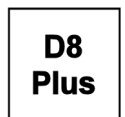
The plug to the operational brake is marked with "1" and the plug to the safety brake is marked with "2". A further plug next to the brake component is used for a permanent opening of the brakes to provide a test voltage. This plug is marked with "P" and is charged even if the chain hoist is standing still.

Depending on the version of the chain hoist (e.g. direct control) such a plug is possibly not available. In this case a separate testing device is necessary (available as additional equipment).

In some special versions the test can be part of a control. Details about the performance of the test can be found in the corresponding manual.

Caution: The plugs of the brake magnets are connected to main power. The chain hoist has to be disconnected before activating the plugs to avoid injuries due to current.

Caution: The braking distance during the test of the safety brake can be up to 30 cm depending on the lifting speed due to the delayed switch-off of the safety brake. An appropriate run out for the test load has to be provided during the test.



Test of the operational brake:

1. Disconnect plug "1"
2. Connect plug "1" with test plug "P" (or the separate test device)
3. Perform the brake test with the moving nominal load.
4. Disconnect test plug "P" (or the separate test device)
5. Connect both parts of plug "1".

Test of the security plug:

1. Disconnect plug "2"
2. Connect plug "2" with test plug "P" (or the separate test device)
3. Perform the brake test with the moving nominal load.
4. Disconnect test plug "P" (or the separate test device)
5. Connect both parts of plug "2".

7.3.8. Replacement of brake lining

The brake lining (part 7 in Picture 37) of brake type B1 till B1.3 has to be replaced when the thickness of it is less than 2.0 mm.

The brake lining (part 7 in Picture 38) of brake type B2 till B5.1 has to be replaced when the thickness of it is less than 2.0 mm and the brake lining of brake type B6 till B9.1 has to be replaced when the thickness of it is less than 3.0 mm.

7.4. Sliding clutch

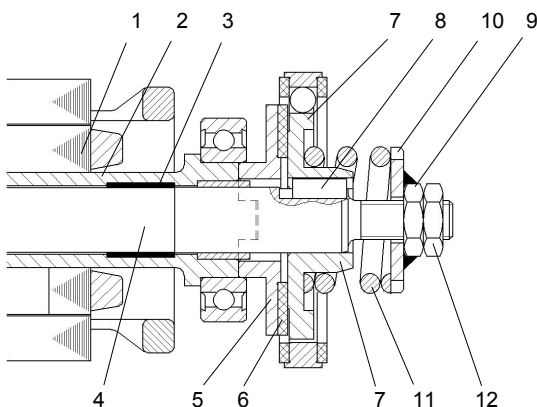
The sliding clutch is located between the motor and the brake so that the power from the brake to the load is transmitted by gear parts in form-fitting connection. Even if the clutch is seriously worn, the load will not fall uncontrolled as the load can be held in every position by the brake.

The sliding clutch operates as a dry clutch under usage of a non-asbestos lining

The sliding clutch is an emergency limiter and it is not allowed to use it permanently. That means it is not allowed to run the hook block or tackle or the lift limiter against the body of the hoist to limit the lifting movement for standard operation as they are emergency limits only.



7.4.1. Mode of operation of sliding clutch



The rotor (1) is tightly connected with the hollow shaft (2). The hollow shaft (2) is mounted with the bearing bushes (3), which do not require lubrication or maintenance, on the motor pinion shaft (4). The motor power is transmitted through the hollow shaft (2) with the coupling flange (5), through the asbestos-free clutch lining (6) to the brake hub (7). The brake hub (7) is rigidly connected with the motor pinion shaft (4) by means of a feather key (8) so that the driving force is conducted into the gear. The clutch torque for transmitting the force is set externally with the adjusting nut (9) on the spring collar (10) through the compression spring (11). The pressure nut (9) is secured by the counter nut (12). So the screw can't move.

Picture 42 construction of the sliding clutch for versions 2 - 9.1

Caution:

The sliding clutch of the versions 1-1.3 and the slow speed motor of the version 9.1 are located at each side of the rotor (similar to Picture 44).



Note:

The clutch has to be adjusted in such a manner, that the nominal load can be lifted safely under all operating conditions.
The sliding clutch acts as a direct actuated lifting load limiter according to DIN EN 14492, point 5.2.2.2.1. With hanging load on the hook, the correctly adjusted clutch shall start to slide at approx. 120% of the nominal load. Deviations may occur due to very high or very low lifting speeds.

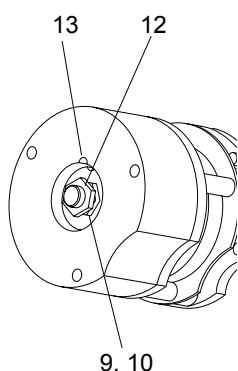


7.4.2. Adjusting the clutch

It is recommended to approach the casing with the hook tackle once to activate the clutch. The slide period should not be longer than 2 – 3 seconds.

Caution:

This method is not allowed for the models B8.1 – B9.1 due to the high clutch forces. The clutch can alternatively activated by using an overload.



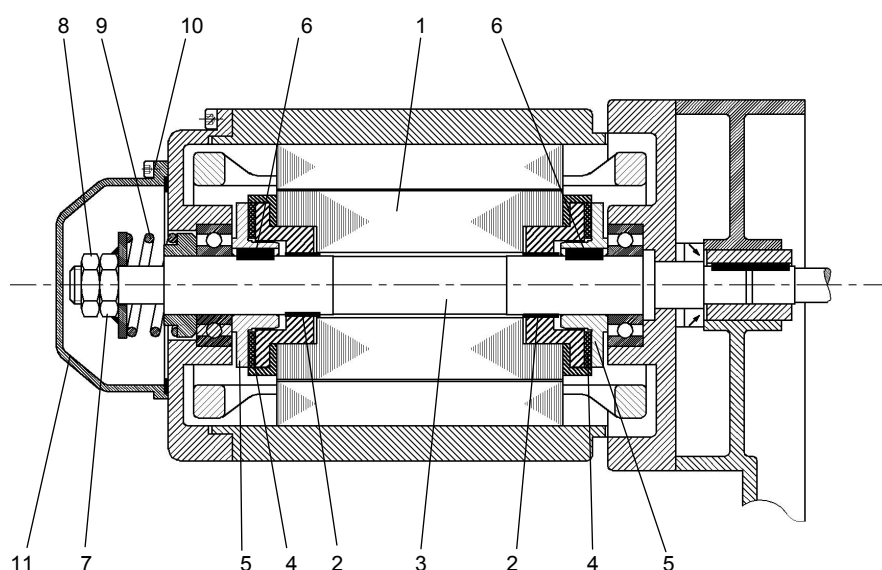
1. Turn the pressure nut (9) with the welded-on spring collar (10) until the lock washer groove is in line with the groove at the magnet (13).
2. Insert a bar (screwdriver) into the magnet (13) and hold the spring collar with the pressure nut (10) in place. Then loosen the lock nut (12).
3. Tighten the compression spring (11) with the pressure nut (9) sensitively to exactly the point where the test load is raised.
4. Secure the pressure nut (9) again with the lock nut (12) with torque wrench, values as listed below:

clutch version 1-1.3	hex. nut M12×1.5 DIN 936	torque 30 Nm
clutch version B2-5.1	hex. nut M12×1.5 DIN 936	torque 30 Nm
clutch version B6-9.1	hex. nut M16×1.5 DIN 936	torque 75 Nm
5. Test the clutch setting once more by raising the nominal load to the uppermost load position and test the reaction of the sliding clutch with approx. 120% of the nominal load. The slide period should not be longer than 2 – 3 seconds.

Picture 43 adjusting nut for clutch power

7.4.3. Mode of operation of the slide clutch for the slow speed motor of version 9.1

The rotor (1) is mounted with two bearing bushes (2), which do not require lubrication or maintenance on the motor pinion shaft (3). The torque of the motor is transmitted through the two clutch linings (4) on the clutch hubs (5), which are rigidly connected with the pinion shaft (3) by means of feather keys (6). The clutch torque can be set externally with the adjusting nut on the spring collar (7) through the compression spring (9).



Picture 44 construction of the sliding clutch for the slow speed motor of version 9.1

7.4.4. Adjusting the clutch on the slow speed motor of the version 9.1

(part numbers relate to Picture 44 construction of the sliding clutch for the slow speed motor of version 9.1)

1. Remove the screws (10) and the cap (11) and the spring plate of the limit switch for lifting movement underneath the hoist body (without part no.)
2. Loosen the lock nut (8).
3. Tighten the compression spring (9) with the pressure nut (7) sensitively to exactly that point where the test load is just raised.
4. Secure the pressure nut (7) with the lock nut (8).
5. Test the clutch setting once more by raising the nominal load to the uppermost load position. The slide period should not be longer than 2 – 3 seconds.
6. Mount the cap (11) and the limit switch spring plate again.

7.4.5. Test of sliding clutch

A visual inspection has to be performed regarding the state of the clutch and wear. High abrasion or a blue colouration of the components can be indications for an overload. In this case the clutch lining and the pressure spring have to be replaced if necessary because a correct adjustment is no longer possible.

The function test is carried out with nominal load. The load has to be raised several times from a standing position and when it is suspended. Afterwards a test is carried out with approx. 120% of the nominal load. At this point the clutch should start to slide.

When using the clutch as emergency limiter the test is carried out by approaching the lift limiters in both directions. The test will be performed with every possible lifting speed. The slide period should not be longer than 2 – 3 seconds.

7.5. Chain guide plate

If the chain hoist is equipped with an additional chain guide plate this plate has to be checked for high wear or damages. Pay attention to the chain cross. If there are damages which prevent the chain from a free flow the chain guide plate has to be replaced. Small damages (burr) can possibly be removed with a round file.



7.6. Load chain

Hoist chains are means of carrying which require official approval. Therefore, it is important to observe the guidelines issued by the trade association's centre for accident prevention with regard to round steel chains in hoisting operation, the guidelines for general inspection and test specifications in accordance with DIN 685-5, BGV D8, BGV D6 and DIN EN 818-7.

7.6.1. Lubrication of the load chain before commissioning and during operation

The links along the entire length of the load chain must be lubricated with penetrating gear lubricant oil before starting operation for the first time and regularly during operation, without loads in each case. Subsequent lubrication, whereby the links must be cleaned first, depends on the degree of use and the operating conditions.

A dry-film lubricant, e.g. lubricating varnish, graphite powder, should be used when ambient influences are conducive to wear (sand, emery).



7.6.2. Testing of wear and measuring wear of the load chain

The continuous monitoring of the load chain is compulsory according to DIN 685 section 5 respectively UVV BGV D8 & 27. The load chain must be tested before starting operation and after approx. 200 operating hours or 10,000 load cycles under normal conditions or more often under demanding and severe conditions.

Testing must cover checking links, particularly at their points of contact, for wear, cracks, deformation and other damages.



The chain must be replaced:

- if the nominal thickness at the points of contact is reduced by 10%,
- if a chain link is elongated by 5%, or an eleven links piece of chain is elongated by 2%,
- if the links are rigid.

The wear limit can be determined with the following table. For this purpose, check measurements will be carried out on selected individual link pieces and partial measurements over 11 link pieces.

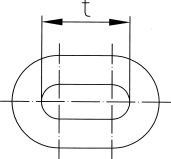

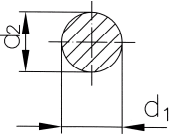
chain dimensions mm	link dimension	4×12	5×15	7×22	9×27	11×31	11.3×31
measure 1 link inside max. measurement t		12.6	15.8	23.1	28.4	32.6	32.6
11 chain links		134.6	168.3	246.8	302.9	347.8	347.8
measure chain link diameter $d_m = \frac{d_1 + d_2}{2}$ min. measurement $d_m = 0.9d$		3.6	4.5	6.3	8.1	9.9	10.2

Table 7 measurement of chain dimensions

If the maximum dimensions in Table 7 (also for individual link pieces) are exceeded, the load chain must be replaced according to 5.1.2.2 and the following.

When replacing the chain, the chain guide and the hold down also have to be replaced (see 5.1.2.1)

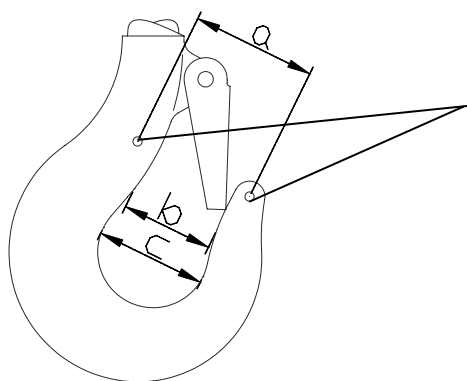
Caution! Only original spare parts by the hoist manufacturer may be used as replacement chain.



7.7. Measuring wear and replacing the load hook

Load hooks are components which require official approval. According to DIN 15401 part 1 load hooks have to be replaced if there is an enlargement of more than 10%. Check the distance between the chisel punch marks (value a) and value b and c.

The set-points can be found in the hook certificate in the 'Inspect and test logbook'.



chisel punch marks on both sides

value a: distance of centre punches
value b: smallest distance on safety latch
value c: largest diameter inside the hook

Picture 45 measurement of wear on load hood

The load hook has to be replaced, if

- values a, b or c are exceeded by 10%
- formation of cracks
- mechanical damages and deformation
- hugh formation of rust

Further test and maintenance notes for hook tackles and hook blocks see also section 5.1.4 and 5.1.5. The hooks of the hook suspension have to be checked in the same way.

8. Duty rate of an electric chain hoist

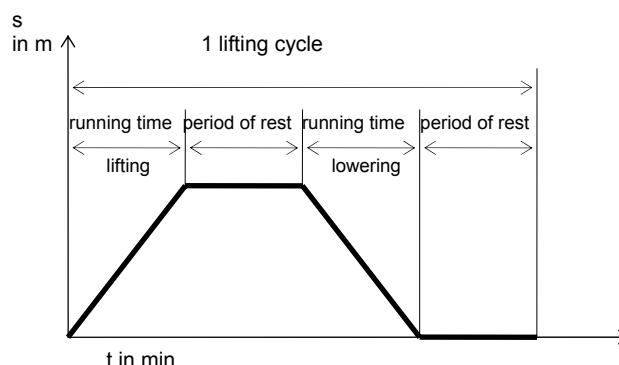
The duty rate (DR) and the number of operating cycles in one hour must not be higher than as shown on the specification plate of the hoist or in a technical data table. (see FEM 9.683).

The duty rate, expressed as the cyclic duration factor (c.d.f.) is the ratio of

running time to running time + period of rest

formula:

$$c.d.f. = \frac{\text{running time} \times 100\%}{\text{running time} + \text{period of rest}}$$



The duty rate is limited by the permissible degree of heat in the lifting motor. The running time is dependent on the necessary lifting height, lifting speed of the electric chain hoist and the number of lifting motions required for a particular transport procedure (transport of goods, feeding machines or installation purposes).

The duty rate applies for a maximum environmental temperature of 40°C. If the environmental temperature is higher, the duty rate must be reduced. It is difficult in practice to take note of the duty rate during the lifting operation. We, therefore, give the following practical guidelines:

8.1. Short time duty

This duty type is not permissible for the slower speed of hoisting motors with two lifting speeds. After having reached the maximum running time a break is required and the hoist can be further used in intermittent duty mode.

The permissible operating periods without cooling interval (with maximal 10 activations) when operation starts and with a motor temperature of approx. 20° C are following:

duty rate c.d.f.	duty group acc. to FEM 9.511	duty group acc. to ISO 4301	operating period * acc. to FEM 9.683 (t _B in min)
25 %	1 Bm	M 3	15
40 %	2 m	M 5	30

Table 8 duty rate for short time duty

* The operating period's t_B of the ChainMaster chain hoists are higher then required acc. to FEM 9.683.

8.2. Intermittent duty

Operation must be interrupted whenever the highest permissible operating time is reached. The following breaks are necessary depending on the duty rate c.d.f. of the electric chain hoist:

duty rate c.d.f.	break (min)
15 %	5 times running time
20 %	4 times running time
25 %	3 times running time
30 %	2.5 times running time
40 %	1.5 times running time
50 %	1 times running time
60 %	0.66 times running time

Table 9 duty rate for intermittent duty

8.3. Example for the determination of the duty rate

The electric chain hoist type 500/1-10 have to lift loads of 500 kg to a height of 5 m.

Performance dates:	Load capacity	500 Kg
	Lifting speed	10 m/min
	Duty rate	40 %
	Duty group of the hoist	2m

At the beginning of the lifting operation the electric chain hoist has a temperature of approx. 20 °C.

$$\text{c.d.f.} = \frac{5 \text{ m lifting} + 5 \text{ m lowering}}{10 \text{ m/min lifting speed}} = 1 \text{ min for each lifting cycle}$$

During the operation without break (short-time duty = max. 30 minutes without break acc. to FEM 9.683) max. 30 lifting cycles are possible.

After 30 minutes of operating time, 1.5 minutes break for each minute of operating time must be taken (i.e. 1.5 times of the operating time). This break is usually necessary for slinging and taking off loads.

Note: Cooling periods are imperative for extreme lifting heights (from 10 metres on). Low lifting speed should only be used for precise lowering and lifting. It is not suitable when greater lifting heights shall be driven through.



Note: To protect the lifting motor a thermal overload sensor is offered as an option. A thermal overload can't be installed in electric chain hoists with direct control.

9. Lubrication

9.1. Lubrication of the hook block and the hook tackle

Lubricate the anti-friction bearings on the hook and the chain sprocket after approx. 20,000 lifting cycles or once a year; if in heavy use shorten the interval.



9.2. Gear lubrication

The gear is already filled with oil by the manufacturer. The oil must be changed if the hoist is going to be overhauled. An oil change is not necessary during service life. The oil has to be disposed in accordance with the law of environment protection.

Use oil for 220 mm²/s at 40° C. The following oils can be used

Supplier	Designation
Castrol	Alpha Zn 200
ESSO	EP 200
Mobil	Mobilgear 630
Shell	Omala 220
ELF	Reduktelf SP 220
BP	XP 220 BP Energol GR

Table 10 alternative oils

The necessary amount of oil needed for the different versions of electric chain hoists is shown in table 11.

Version (basic type)	Amount (litre)
1 / 1.1 / 1.3	0.2
2 / 3 / 4 / 4.1 / 4.2 / 4.3 / 5 / 5.1	0.25
6 / 6.1 / 7 / 7.1 / 7.2 / 8.1 / 8.2 / 8.3 / 9.1	0.5

Table 11 amount of oil

10. Determination of the S.W.P.

Within the framework of the periodic test the used part of the theoretic service life (residual service life) has to be determined according to BGV D8 §23 respectively BGV D6 §26. Notes regarding this determination and a table about its verification can be found in the logbook.

10.1. Measures to be taken at the end of the S.W.P.

After the hoist or its components have reached the end of the S.W.P. (see point 10) the hoist or its components have to be overhauled or have to be disposed in an environmentally friendly way.

11. Disposal

If the electric chain hoist can't be used any longer it has to be disassembled and the individual components have to be disposed or recycled separately depending on the type of material.

Lubricants like oils or fats and non-reusable parts have to be disposed in accordance to the laws of environment protection.

A.1. Checklist for tests



Test notes for periodic tests of electric chain hoists when used according to BVG D8, when used as a crane according to BVG D6, or when used according to BGV C1.

Usage according to

- ☐ BGV D6
- ☐ BGV D8
- ☐ D8 Plus (VPLT SR2.0)
- ☐ BGV C1

Owner:

Year of construction:

Type:

Serial-No.:

Inspector:

Date:

				(x) = fulfilled, (-) = not fulfilled, (0) = not necessary				
Item	Inspection group	Component to be inspected	Applicable / available	Condition / Maintenance	Function	Repair / replacement necessary	Revision necessary again	Remarks
1	Crane documents	Manufacturer declaration / declaration of conformity						
		Crane logbook						
		Operation instruction						
2	Notice / markings	Notice of operation regulations						
		Type plate						
		Declarations regarding loads on load suspension means, load capacity diagrams						
		Information and prohibition signs						
		Other security markings						
3	Safety clearances	Safety clearances						
		- up						
		- down						
		- to the side						
4	Ladders, runways and stages	- within						
		Stairs, ladders						
		Runways and stages						
		Steps, ladder steps, arboreal						
		Flooring of runways / stages						
		Protection against falling (grabs, hand rails, intermediate bars, back protections)						

				(x) = fulfilled, (-) = not fulfilled, (0) = not necessary					
Item	Inspection group	Component to be inspected		Applicable / available	Condition / Maintenance	Function	Repair / replacement necessary	Revision necessary again	Remarks
5	Slewing unit	Foundation, bottom attachment							
		Wall attachment							
		Welding seams							
		Screw connection, nut locks							
		Beam horizontal							
		Pillar vertical							
		Inspect the function of the brakes for the slewing unit and limit switches / end stops.	Slewing drive						
			Slewing unit brake						
			Slewing end stops / buffers						
Limit switches									
6	Crane construction	Supports, beams							
		Bearings, pillars, bars							
		Connections, attachments							
		Force transmission points into building construction							
		Foundations							
		Boltings							
7	Crane gantry / crane track / crane carriage (crane travelling unit)	Bridge, gantry, support, crane pontoon							
		Connections, attachments							
		Tracks: track gauge, distortion							
		Track sweeper							
		Locking devices							
		Wind bracing (anti-storm-device)							
		Driving wheels, carrying wheels							
		Power drive unit:							
		Lubrication of gearing, pinions, track rollers							
		Power drive unit:							
		Power transmission, clutches							
		Securing of danger areas							
		Inspect the function of the brakes for the crane carriage and limit switches / end stops.	Travelling drive						
			Brakes						
End stops / buffers									
Limit switches									
8	Trolley construction / trolley carriage (crab - cross travelling unit)	Beam, suspension and connection bolts							
		Connections, attachments							
		Tracks: track gauge, distortion							
		Track sweeper							
		Locking device							
		Wind bracing (anti-storm-device)							
		Driving wheels, carrying wheels							
		Power drive unit:							
		Lubrication of gearing, pinions, track rollers							
		Power drive unit:							
		Power transmission, clutches							
		Securing of danger areas							
		Inspect the function of the brakes for the crab drive and limit switches / end stops.	Crab drive						
			Brakes						
			End stops / buffers						
			Limit switches						

				x) = fulfilled, (-) = not fulfilled, (0) = not necessary				
Item	Inspection group	Component to be inspected	Applicable / available	Condition / Maintenance	Function	Repair / replacement necessary	Revision necessary again	Remarks
9	Hoisting gear ChainMaster	General inspection for points of impact, cracks, breaks and damages: Casing, cover, cap, suspension elements, chain bag mounting element, suspension eye						
		for double fall version: condition of casing pocket for chain end mounting – see Picture 3 in operation instruction						
		Screw connections, bolts, eyebolts						
		Case sealing						
		Chain guide: Complete disassembly and inspection for cracks, breaks, wear (especially high enlargements of chain inlet cross) – see Picture 9 in operation instruction						
		Hold down: Complete disassembly and inspection for cracks, breaks, wear						
		Chain actuator wheel Inspection for damages and wear						
		Chain guide plate: Inspection for breaks and wear (especially high enlargements of chain inlet cross)						
		Hoisting gear brake(s) - cleaning from abrasion						
		- visual inspection of condition and discolouration due to thermic overheat						
		- check, that brake parts are free of lubricants and corrosion						
		- check lining thickness (section 7.3.8) and replace if necessary						
		- inspection of air gap(s) and readjustment if necessary (sections 7.3.3 respectively 7.3.5)						
		- inspect rectifier board(s) for damages and check if eclectic connections are securely seated						
		- inspection of cables of brake coil(s) for damages and check that eclectic connections are securely seated						
		- brake test with nominal load (section 7.3.6)						
		- individual test of brakes if hoist is equipped with double brake (section 7.3.7), with nominal load for each brake						
		Sliding clutch - inspection for wear and function test (section 7.4.5)						
		- readjustment, if necessary (sections 7.4.2 and 7.4.4)						
		- The clutch of the slow speed motor has to be tested separately for version 9.1 (sections 7.4.3 and 7.4.4)						

			(x) = fulfilled, (-) = not fulfilled, (0) = not necessary					
Item	Inspection group	Component to be inspected	Applicable / available	Condition / Maintenance	Function	Repair / replacement necessary	Revision necessary again	Remarks
10	Load chain / chain bag	Load chain:						
		- visual inspection for condition, corrosion and lubrication according to section 7.6.1						
		- inspection for wear and inspection of wearout limit according to section 7.6.2						
		- inspection of chain end fastening in hoist casing for double fall version (see item 9)						
		Chain bag:						
		- check condition of chain bag material and seams						
		- inspection for cracks in the around of the chain bag bail (metal frame)						
		- inspection of bottom plate for damages						
11	Hook tackle / hook block / hook suspension / lift limiter and rubber buffer	- inspection of screw locking of suspension						
		- check condition and adjustment of strainer strap for oversize chain bag (see 5.1.3.2)						
		Hook tackle (single fall version)						
		- inspection of load capacity information label						
		- inspect casing for points of impact, cracks, breaks and damages						
		- check fastening of screw connections						
		- inspect rubber buffer for wear; and replacement if necessary						
		- inspection of chain pocket and chain end fastening in hook tackle						
		- inspection of plastic cap for wear and existence of security screws for hook tackle for chain 4x12 mm and 5x15 mm						
		- inspection of load hook for enlargements, cracks, breaks, damages and corrosion (see sections 5.1.4 and 7.7)						
		- inspection and lubrication of pressure bearing						
		- inspection of hook nuts (grooved pin, security centre punch) according to 5.1.4						
		- inspection of condition and function of load hook security (rivet, tension spring, locking pawl)						

			(x) = fulfilled, (-) = not fulfilled, (0) = not necessary					
Item	Inspection group	Component to be inspected	Applicable / available	Condition / Maintenance	Function	Repair / replacement necessary	Revision necessary again	Remarks
11	Continuation - Hook tackle / hook block / hook suspension / lift limiter and rubber buffer	Hook block (double fall version)						
		- inspection of load capacity information label						
		- inspect casing for points of impact, cracks, breaks and damages						
		- check fastening of screw connections						
		- inspect rubber buffer for wear; replacement, if necessary						
		- inspection of chain pocket of deflexion pulley for wear (see section 7.2)						
		- inspection and lubrication of bearings of chain deflexion						
		- inspection of load hook for enlargements, cracks, breaks, damages and corrosion (see section 5.1.4, 5.1.5 and 7.7)						
		- inspection and lubrication of pressure bearing						
		- inspection of hook nuts (grooved pin, security centre punch) according to 5.1.4						
		- inspection of condition and function of load hook security (rivet, tension spring, locking pawl)						
		Hook suspension						
		- inspection of load capacity information label						
		- inspection of correct installation position (single respectively double fall version) according to section 5.1.1.3						
		- inspect traverse of hook suspension for points of impact, cracks, breaks and damages						
		- check splints of the bolts						
		- inspect load hook for enlargements, cracks, breaks, damages and corrosion (see section 5.1.4 and 7.7)						
		- inspection of hook nuts (grooved pin, security centre punch) according to 5.1.4						
		- inspection of condition and function of load hook security (rivet, tension spring, locking pawl)						
		Lift limiter:						
		- inspection of external conditions (deformation, cracks, breaks) - inspection of chain pocket - inspect fastening of screw connections - inspect proper assembly (fastened at least on the 3 rd chain piece)						
		Rubber buffer of lift limiter						
		- inspection for wear and replacement, if necessary; observe direction of installation (see section 5.1.2.2)						

			(x) = fulfilled, (-) = not fulfilled, (0) = not necessary					
Item	Inspection group	Component to be inspected	Applicable / available	Condition / Maintenance	Function	Repair / replacement necessary	Revision necessary again	Remarks
12	Electric equipment	Security in general:						
		- visual inspection of the complete electric equipment for dangers due to exposed live parts (protection against direct contact)						
		- inspection of the continuous connection of the protective conductor system by measurement (EN 60204-32 section 19.2)						
		- Test of insulating resistance for all electric circuits by measurement (EN 60204-32 section 19.3). – The test of the insulation capacity for circuits with electronic operating resources is carried out by a residual current measurement.						
		Devices for switching the supply on and off:						
		- check if an electric supply or crane disconnect switch is provided (alternatively a plug / socket combination for hoists with a total power consumption of < 3kW)						
		- inspection of marking						
		- check of condition and function						
		- check of effectiveness of all pole disconnect						
		- check of the electric connections that they are tight						
		Electric operating resources in general:						
		- visual inspection of condition and fastening						
		- inspection of marking						
		Main current and control cable:						
		- inspection of all cables and conducts for crushing, buckling and rubbing						
		- inspection of conduits, run of the cables and fastening						
		- check of all cable lead-in's for condition, tightness and function						
		Conductor rail system:						
		- check of condition and function						
		- inspection of contact protection for points accessible for people						
		slip rings / slip ring bodies:						
		- check of condition and function						
		- inspection of protection against contact for points accessible for people						
		Cable reels:						
		- check of condition and function						
		- inspection of spring tension respectively of clutch torque						

			(x) = fulfilled, (-) = not fulfilled, (0) = not necessary					
Item	Inspection group	Component to be inspected	Applicable / available	Condition / Maintenance	Function	Repair / replacement necessary	Revision necessary again	Remarks
12	Continuation - Electric equipment	Cable chains / cable trolleys:						
		- inspection of cable fastening						
		- check of condition and function of cable trolleys						
		- inspection of carrier function						
		- inspection of inadmissible tension on the cables						
		Casing of electric operating resources:						
		- check of marking, condition, sealing and closing						
		Fuses, protection devices:						
		- visual inspection of condition						
		- comparison of the adjustment respectively ampere rating values with those mentioned in the documentation						
		- function test of RCD devices						
		Connectors / plug connections:						
		- check of condition and function						
		- inspection of cable lead-in's and traction relief						
		- inspection on every terminal block is electric connection are securely seated						
		Terminal blocks, terminals and interconnecting terminals:						
		- inspection on every terminal block is electric connection are securely seated						
		- inspection of all connected wires for inadmissible tension						
		Switching devices:						
		- visual inspection						
		- check of fastening of switching devices						
		- inspection of electrical connections (fastening of screw connections)						
		- function test of all switching devices						
		Operating and control units:						
		- visual inspection						
		- check of condition of rubber sleeves on push-buttons						
		- check of fastening of control devices						
		- inspection of electrical connections (fastening of screw connections)						
		- function test of all operating and control units						

			(x) = fulfilled, (-) = not fulfilled, (0) = not necessary					
Item	Inspection group	Component to be inspected	Applicable / available	Condition / Maintenance	Function	Repair / replacement necessary	Revision necessary again	Remarks
13	Control equipment / control function	Control devices in general:						
		- visual inspection						
		- inspection of function marking (colour and labelling)						
		Protection against unauthorised usage:						
		- inspection if protection exists and function test						
		Selection switch for operation modes:						
		- function test of all operation modes						
		- inspection of priority to all other control functions (except emergency stop)						
		Interlocking of multiple operating stations:						
		- test of efficiency						
		Emergency stop:						
		- inspection of marking (yellow background, red operating element)						
		- check of effectiveness of emergency stop						
		- check of effectiveness of latch mechanism after pushing operating element						
		- check that reset doesn't activate an automatically restart						
		- if there are more than one devices for activating the emergency stop: separate function test for every device						
		Function of crane carriage:						
		- function test of crane carriage						
		- inspection that movement direction equals to display						
		- efficiency test of interlocking for countermovement						
		- check of electric switch-off at the beginning of the operating radius						
		- check of electric emergency switch-off at the beginning of the operating radius						
		- check of electric switch-off at the end of the operating radius						
		- check of electric emergency switch-off at the end of the operating radius						
		Function of trolley carriage						
		- function test of trolley carriage						
		- inspection that movement direction equals to display						
		- efficiency test of interlocking for countermovement						
		- check of electric switch-off at the beginning of the operating radius						
		- check of electric emergency switch-off at the beginning of the operating radius						
		- check of electric switch-off at the end of the operating radius						
		- check of electric emergency switch-off at the end of the operating radius						

			(x) = fulfilled, (-) = not fulfilled, (0) = not necessary					
Item	Inspection group	Component to be inspected	Applicable / available	Condition / Maintenance	Function	Repair / replacement necessary	Revision necessary again	Remarks
13	Continuation - Control equipment / control function	Function of hoisting gear:						
		- function test of lifting drive unit						
		- inspection that movement direction equals to display						
		- efficiency test of interlocking for countermovement						
		- inspection of upper electric limit switch						
		- inspection of upper electric emergency limit switch						
		- inspection of lower electric limit switch						
		- inspection of lower electric emergency limit switch						
		- inspection of electric overload protection						
		- check if it is possible to lower the load when overload protection is activated						
		- check of underload switch-off						
		- check of bridging function for underload switch-off						
		Displays/ signaling units:						
		- visual and functional inspection						
		- inspection of function marking (colour and labelling)						
		Signals and warnings:						
		- check of efficiency and function						
		Timer, measurement and monitoring relays:						
		- visual inspection of condition						
		- comparison of the adjustment respectively trigger values with those mentioned in the documentation						
		- function test by provoking the trigger values						
		Other monitoring devices:						
		-						
		-						
		-						
		-						
		-						

Remarks:

CHAIN MASTER