IGVW

Interessengemeinschaft
Veranstaltungswirtschaft

>>SQP2

Chain hoist

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der fachverband DTHG Deutsche Theatertechnische Gesellschaft

EVVC

FAMAB

VPLT.

Legend

Some explanatory notes regarding the structure of the standards:
SQ Standard of Quality
O Organisation
P Code of practice/working procedure
Q Qualification
1, 2, 3, ... consecutive numbering
O Organisation/Documentation
Internal set-up and organisation of operations/
Documentation and certification of processes
P Code of practice/working procedure
Supply and use of working materials
Q Qualification
Qualification of skilled workers and specialists

Preliminary note

SQ Standards are intended to define the quality levels required of services provided within the event technology industry.

SQ Standards take into consideration current legal positions and on that basis, provide a description of the industry's specialised working procedures.

They contain a summary of the applicable legal standards and requirements in areas of industrial safety and health protection.

This Quality Standard has been developed by the responsible working group of the igvw (Entertainment Technology Industry Association) in cooperation with the DGUV (German Social Accident Insurance) and the working group of the safety engineers from the German public broadcasting organisations: ARD, ZDF Medienakademie, ARTE, BR, Bavaria, DR, DW, HR, IRT, MDR, NDR, ORF, RB, RBB, RBT, RTL, SF, SR, Studio Hamburg, SWR, WDR and ZDF.

Notes on use:

This pdf file is annotated with interactive links and bookmarks.
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The solutions described in this igvw Standard do not rule out the validity of other solutions that guarantee the same standard of safety, as laid down within the technical regulations of other member nations of the European Union or Turkey, or other member states of the European Economic Area.

Please note:
Wherever possible gender-free nouns and pronouns have been used. Where this is not possible the male noun or pronoun has been used to improve readability, but also is meant to refer to females.

1 Area of application

The Standard applies to the supply and use of electric chain hoists in the setup of productions and events.

2 Normative and informal references

DIN EN 818-7: 2008-09
Short link chain for lifting purposes – Safety – part 7: Fine tolerance hoist chain – Grade T (Types T, DAT and DT)

DIN EN 60204-32: 2009-03
Safety of machinery – Electrical equipment of machines -
Part 32: Requirements for hoisting machines

DIN EN 61508: 2002-11
Functional safety of electric/electronic/programmable safety-related electronic systems

DIN EN 62061 (DIN VDE 0113-50): 2005-10
Safety of machinery – Functional safety of electric, electronic and programmable electronic safety-related control systems

DIN EN 62079: 2001-11
Preparation of instructions – structuring, content and presentation

DIN EN ISO 13849-1: 2008-12
Safety of machinery – safety-related parts of control systems – Part 1: General principles for design

DIN 56950: 2004-05
Event technology – machinery installations – Safety requirements and inspections

DIN EN ISO/IEC 17025: 2005-08
General requirements for the competence of testing and calibration laboratories

BGV C 1 / GUV-V C 1
Event and production locations for staged performance

BGV D 8 / GUV-V D 8
Winches, lifting and pulling devices

BGI 810-3 Edition 02-2008
Safety at productions and events – overhead loads

BGG / GUV-G 912 Edition 04-2009
Guidelines for the testing of machinery installations on stages and in studios

igvw SQ Q2 Edition 2010
General principles for event rigging

3 Definitions

D 8 Electric chain hoist
The D 8 electric chain hoist conforms to the requirements set out in BGV D 8 for the industrial operation of lifting gear and is not to be used for moving or holding loads overhead. In event and stage technology a D 8 chain hoist may only be used to lift loads during setup and dismantling.

D 8 Plus Electric chain hoist
The D 8 Plus Electric chain hoist is constructed and dimensioned in such a way that the moving of overhead loads is possible provided that no persons are standing under the load and that it is not necessary to install a secondary suspension when the hoist is switched off.

C 1 Electric chain hoist
The C 1 Electric chain hoist is based on the requirements of the BGV C 1 / GUV – V C 1 and is therefore fundamentally suitable for holding and moving overhead loads.

Please note:
The terms D 8, D 8 Plus and C 1 electric chain hoist are derived from the regulations of the DGUV (German Social Accident Insurance). .

Set-up mode
Set-up mode denotes the hand-controlled moving of loads with electric chain hoists in order to get them into position. This normally takes place during rehearsal for staged performances.

Please note:
In set-up persons may stand under the load, provided the hoists and control units conform to the requirements of the BGV C 1 / GUV – V C 1.

Electric chain hoist
Electrically powered lifting device with round steel link chains as load-bearers. In contrast with the classical industrial usage of lifting gear, in event technology the electric chain hoist is mainly used as a self-climbing hoist.

Self-climbing hoist
describes the method of use in which the electric chain hoist climbs up its own chain. (See the diagram in the appendix!)

Group drive
is the simultaneous operation of more than one electric chain hoist using the same control unit.

Asynchronous group drive with group stop
Is the asynchronous operation of more than one electric chain hoist controlled through the same unit, whereby in the case of a fault in one hoist the whole group is automatically stopped.

Synchronous group drive with group stop
is the monitored or regular operation of more than one electric chain hoist, whereby in the case of a fault in one hoist, the whole group is automatically stopped.
A distinction is made between distance- and time-synchronous drives:

Distance-synchronous:
All electric chain hoists in one group cover the same distance in a given period of time.

Time-synchronous:
The electric chain hoists in one group cover in a given period of time different distances.

Load
is the sum of all weights and acting forces (e.g. dynamic loads or excessive loading due to failure).

Working load limit
is the load that the electric chain hoist is constructed to lift.

Specialist / A qualified person
A specialist is a person who can prove that he has at least the following qualifications (indicating aptitude, competence and technical accomplishment):
• he has successfully completed a technical education,
• as a result of his current job practice he has sufficient technical know-how and at least one year's practical experience in testing electric chain hoists within the event industry,
• he has sufficient knowledge of:
– the legal principles (workplace safety laws, regulations and technical rules and standards),
– the rules, regulations and decisions of the social accident insurance,
– current technical standards (e.g. EN-, DIN- and VDE-Standards),
– information supplied by the manufacturer of the machinery-related devices that are to be tested,
– can carry out a risk assessment involving the machinery-related devices,
• he has knowledge of and experience in the use of appliances or tools required for the testing,

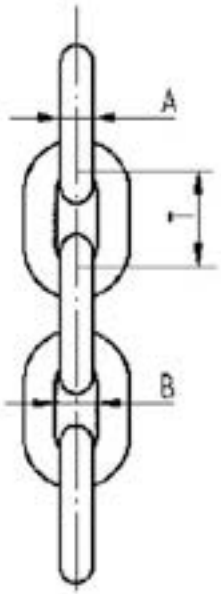
• he is able to make a judgement on the safety status of machinery installations based on latest technical knowledge and can summarise this on a standardised check-list.

Authorised expert / a person qualified through particular specialised knowledge
An authorised expert is someone who has, for example, completed a degree course at a university or technical college and has at least three years practical experience in the construction or testing of machinery-related devices, and who has successfully attended the authorisation course of the social accident insurance as per § 36 BGV C 1 / GUV – V C 1.

Safety backup
Second, independent device that secures the load to prevent it from falling.

Compensator
Mechanical appliance that balances asymmetrically distributed loads when more than one chain is being used.

Pitch of the chain
The inner measurement (T in mm) of a chain link.



Load system
Combination of load, load suspension means and sling gear.

Statically determinate load system
In statically determinate load systems all loads and reactions (applied loads of the individual electric chain hoists and therefore of the suspension points) are known.

Statically determinate load systems are:
- Loads on individual electric chain hoists (point load)
- Distributed loads on two electric chain hoists
  (single span girders with or without flange)
- hinged, linked single span girders on more than two electric chain hoists
- Equally distributed loads on three electric chain hoists

Statically indeterminate load systems
In statically indeterminate load systems the reactions (applied loads of the individual electric chain hoists and therefore of the suspension points) have not been properly determined.
Statically indeterminate load systems are for instance:
- Distributed loads on more than two electric chain hoists (multi-span girders)
- Area loads on more than three electric chain hoists
- Guided loads

4 Supply

Electric chain hoists are available in a variety of designs and with differing safety features. The choice of electric chain hoists is therefore of great importance, whereby attention must be paid to possible risks that can be anticipated in specific operating conditions.
For non-portable equipment installed in event locations electric chain hoists should always be used that conform to BGV C 1 / GUV – V C 1 on account of their method of use and the possible risks.
This requirement may only be deviated from when a risk assessment shows conclusively that other technical solutions provide adequate safety.

Type of use	D 8	D 8 with safety back-up	D 8 Plus	C 1
Holding of Loads	prohibited	allowed as per Table 3	allowed as per Table 3	allowed as per Table 3
Set-up, dismantling or installation	prohibited	prohibited	prohibited	allowed as per Table 4
Movement on stage	prohibited	prohibited	prohibited	allowed as per Table 4
Complicated movement on stage	prohibited	prohibited	prohibited	allowed as per Table 4

Table 1:
Types of operation of electric chain hoists when persons are present beneath the load.

In the event industry electric chain hoists are to be used that comply with the specifications laid down in paragraph 4.1 “Constructional requirements”.

4.1 Constructional requirements

Specific uses within the entertainment industry have different constructional requirements.

Requirement	D 8	D 8 Plus	C 1
Motor group	at least M 3	at least M 3	as per DIN 56950
Dimension of motor	Single lifting capacity	Double lifting capacity	Double lifting capacity
Operating coefficient of the load bearing material (tensile strength)	at least 5	at least 10	At least10
Slip clutch as protection against overloading	yes	no[1]	no
Number of brakes (or a self-locking gearbox)	1	2	2
Operating limit switch	possible	Possible	yes
Emergency limit switch	no	no	yes
Overload monitoring	Slip clutch	Protection against overloading 1	Cutout at 120% of the lifting capacity
Underload monitoring	no	no	as per load system

1) In statically indeterminate systems: cutoff at 120% of the lifting capacity.

In statically determinate load systems: overload protection through slip clutch is possible.

4.1.1 Electrical fittings and control systems

The installation of the power supply, the control system, and the choice of electrical equipment must prevent the occurrence of dangerous operating conditions in the event of a malfunction.
The electrical equipment (e.g. controller, wiring, arrangement) of electric chain hoists must, in particular, fulfill the requirements of DIN EN 60204-32 (Safety of machinery – Electrical equipment of machines - Part 32: Requirements for hoisting machines).

The electrical equipment must fulfill the following minimum requirements:
• rotating field and phase monitoring
• emergency off- and stop-switches within reach of the operator
• protection against electric shocks
• protection against accidental start-up and automatic restart after failure and restoration of power
• protection against influences of the environmental surroundings
• selection of the direction of movement
control device for movement

Additional requirements can be found in EN 60204-32.

If electronic or electronically programmable control systems are used, their safety-related features must fulfill the requirements of
a) DIN EN 62061 (DIN VDE 0113-50)
or
b) DIN EN ISO 13849
or
c) DIN EN 61508.

4.1.2 Protection against over- or underloading

Electric chain hoists with a lifting capacity of more than 1000 kg must be fitted with an overload safety device.

An overload safety device is always required for D 8 Plus electric chain hoists. If a load control system is installed, it must be guaranteed that any necessary switch-off takes place sufficiently quick (see section 5.3).
If in the course of the risk assessment it becomes necessary to measure a load, this may not be done using the power supply of the motor, because a load measurement must be possible when the electric chain hoist is stationary and thus in a power-off status.

4.1.3 Load system-dependent requirements for the holding of loads in the air above persons

When D 8 or D 8 Plus electric chain hoists are used to hold loads above persons, the actions listed in tables 3 and 4 must be clearly complied with. Statically determinate load systems require additional measures when D 8 electric chain hoists are used.

Table 3
Additional measures to be taken when D 8 and D 8 Plus electric chain hoists are used for statically determinate loads. Additional measures are to be taken when D 8 or D 8 Plus electric chain hoists are used for statically indeterminate load systems.

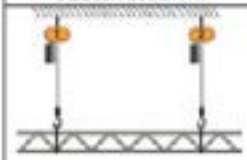
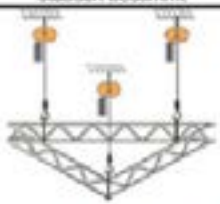
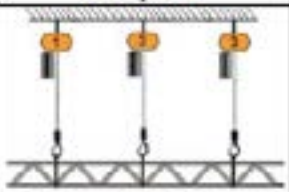
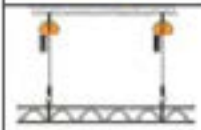
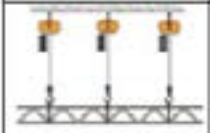
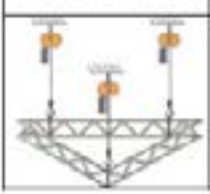
Lastsystem	D 8	D 8 Plus
 statisch bestimmt	D 8 mit Sekundärsicherung	D 8 Plus
 statisch bestimmt	D 8 mit Sekundärsicherung	D 8 Plus
 statisch bestimmt	D 8 mit Sekundärsicherung	D 8 Plus

Table 4
Additional measures are to be taken when D 8 or D 8 Plus electric chain hoists are used for statically indeterminate load systems.

Lastsystem	D 8	D 8 Plus
 statisch unbestimmt	D 8 mit Sekundärsicherung ggf. mit Lastmessung	D 8 Plus ggf. mit Lastmessung
 statisch unbestimmt	D 8 mit Sekundärsicherung ggf. mit Lastmessung	D 8 Plus ggf. mit Lastmessung
	D 8 mit Sekundärsicherung ggf. mit Lastmessung	D 8 Plus ggf. mit Lastmessung

4.1.4 Load system-dependent requirements for the moving of loads in the air above persons

When C1 electric chain hoists are used to move and hold loads above persons, the control systems must, in addition to the basic features listed in table 2 and depending on the type of load system at hand, also fulfill the requirements described in table 5.

Lastsystem	Einsatz zum Aufbau und Einrichten	Einfache Szenenfahrten mit Sichtverbindung	Komplexe Szenenfahrten mit Sichtverbindung und voneinander abhängigen Bewegungen
	C 1	C 1	C 1 bei Kollisionsgefahr +E1 +E4
	C 1	C 1 +E2	C 1 +E1+E2+E4
	C 1 +E3 oder C 1 +E1+E2	C 1+E3 oder C 1 +E1+E2	C 1 +E1+E3+E4
	C 1	C 1 +E1+E2 oder C 1 +E3	C 1 +E1+E2+E4

	C 1 +E3 oder C 1 +E1+E2	C 1 +E3	C 1 +E1+E3+E4
	C 1 +E3 oder C 1 +E1+E2	C 1 +E1+E3 oder C 1 +E1+E2	C 1 +E1+E3+E4

Control Extensions
E1=Underload switch-off.
E2=Asynchronous group drive with group stop
E3=Synchronous group drive
E4=Control requirements collision lock

Table 5: Demands on additional equipment for BGV-C1 electro chain hoists. The control unit must monitor movement and, if necessary, switch off, in order to exclude the possibility of a collision of the loads being moved, including all rigged objects or decoration. Alternatively the control requirement E4 collision lock may be replaced by organisational measures. Each person (safety posts) guarding a source of danger must have direct access to an emergency stop device.

4.2 Information for users

The manufacturer must supply with the hoist a user manual in German that provides the user with information regarding the intended use of the electric chain hoist.
The manual must contain all information required for the safe and proper use of the electric chain hoist. In this respect it must inform the user about the residual risks and warn him of them.
The user manual must be compiled according to the basic principles of EN 62079.

The user manual must specify whether:
-training is required, personal protective equipment is required,
-additional separative or non-separative safety devices should possibly be provided for.

No possible use of the electric chain hoist may thereby be excluded that could reasonably be expected from the designation or description of an electric chain hoist.
The user manual must warn of foreseeable incorrect operation.

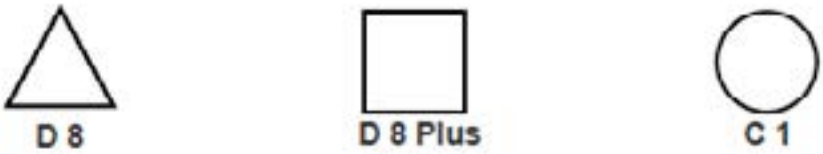
The user manual must cover:
- transport,
- set-up and dismantling,
- installation and setting-up
- putting into operation,
- use (installation, programming or conversion, operation, cleaning, trouble-shooting and maintenance) of the electric chain hoist and, when applicable

• placing out of service,
• dismantling, and
• disposal.

4.3 Labelling

The following labels must be permanently and visibly fixed to the electric chain hoist:
a) unambiguous identification
- name and address of the manufacturer
year and month of construction (yy/mm)
description of the machine
- description of the series or type
- serial number
b) mode of application
- designation (D 8, D 8 Plus, C 1)
c) information for safe operation e.g.:
- mass (expressed in kilograms) of the electric chain hoist itself and/or its detachable parts (dead weight)
- working load limit in kilograms
- motor type
- nominal speed of the hoisting mechanism (m/min)
- specifications of the power supply:
• voltage (V)
• current (A)
• frequency (Hz)
• power (kW)
- duty cycle

Labelling and inscriptions on the casing of the electric chain hoist should remain legible during its entire expected lifespan. The use of symbols or written warning notices with the inscription “Danger” is prohibited.
The labelling should be supplemented by clear geometric forms that are visible in all operating conditions.
The equivalents are:



[geometric forms of triangle “D 8,” square “D 8 Plus,” and circle “C 1.”]

4.4 Contents of operating manuals

The operating manual or other written instructions must among other things contain:

a) information on transport, operation, and storage of the electric chain hoist, for instance:
- storage conditions for the electric chain hoist
- dimensions, mass information, position of centre(s) of gravity
- information on use (e.g. illustrations showing the attachment points of the electric chain hoist)

b) information on the installation and putting into operation of the electric chain hoist, e.g.:
- requirements for anchorage and shock absorption
- requirements for assembly and erection
- instructions for the attachment of loads
- space requirement for operation and maintenance
- permissible environmental conditions (e.g. temperature, humidity, vibration, electromagnetic radiation)
- instructions for connection to power supplies (particularly with regard to protection against electrical overload)
- advice on disposal
- if necessary, recommendations regarding safety measures to be taken by the user, e.g. additional safe operating ranges, warning signs and signals

c) information on the electric chain hoist itself, for instance:
- an exact description of the electric chain hoist and accessories
- the complete designated range of operation, including any possible prohibited uses, whereby allowance should if necessary be made for the different models of the electric chain hoist
- diagrams (particularly illustrations of the safety functions)
- details of noise and vibration that may be produced by the hoist
- technical data on the electrical equipment
- safety-related components of the electrical and electronic control systems data that confirms that the electric chain hoist complies with mandatory requirements (declaration of conformity)

d) information on the use and operation of the electric chain hoist, e.g. on:
- the intended use
- a description of the operating elements
- handling and performance during set-up and dismantling
- operation and method of shut down (particularly for emergency stops)

- risks that could not be eliminated through the manufacturer's safety measures
- special risks that can occur in particular areas of application and when particular accessories are in use, and details of specific safety equipment that is required in these situations
- operational mistakes that could normally be foreseeable, and prohibited operations
- malfunction detection and identification, repairing and re-starting after an intervention
- recommended personal protection equipment and necessary training

e) information on maintenance by the user:
- type and frequency of inspections with regard to safety functions

f) information on servicing by expert staff
- information on servicing work that requires particular expert knowledge or abilities and that therefore should only be carried out by trained staff (e.g. maintenance staff or specialists)
- instructions for servicing work (e.g. the replacement of parts) that requires no special knowledge and that therefore can be carried out by the user (e.g. operating staff)
- acquisition of spare parts and the carrying-out of repairs
- drawing and diagrams that make it possible for the maintenance staff to rationally carry out their duties (particularly fault detection)

g) information concerning withdrawal from use
- on discard criteria for hoisting gear
- on discard criteria for the electric chain hoist
- with instructions on what to do when damage occurs
- on dismantling and disposal

h) instructions for emergency situations, e.g.:
- warnings about possible emissions or leakages of harmful substances and, when possible, information on cleaning agents to be used against the effects of those substances

5 Use

Only those electric chain hoists may be used that comply with the definitions listed in Section 4 “Supply”. Electric chain hoists are to be used in accordance with the following regulations.
“Use” means the operation, transport, storage, maintenance and inspection of working equipment.
Before electric chain hoists are put to use, an evaluation of possible risks must be carried out in order to ascertain all measures necessary for a risk-free use. These measures must be capable of guaranteeing the workplace- and health-safety of all persons involved, as well as preventing damage to buildings, furnishings and working equipment.
The evaluation of possible risks must take into account the on-site circumstances, all operating conditions, (foreseeable) accidents and the behavior of the persons involved.

5.1 Qualification and responsibility

The duties of the responsible persons must be defined and differentiated. The responsibility of the promoter and/or owner of the venue remains unaffected.
The qualification required for the planning, set-up and dismantling, as well as for the operation itself, depends on the degree of risk involved.
Further information concerning the necessary qualifications is to be found in the igvw Standard SQ Q2 “Competence in Event Rigging”.
The supervisor in charge approves the electric chain hoists for use. This approval may not be given until it is proved that the inspections listed in section 6 of this Standard of Quality have been duly carried out. A handover to another user must be recorded in written form (see appendix III).

5.2 Assessment of risks connected with the use of electric chain hoists

The safe operation of electric chain hoists in the event industry can only be effected with proper consideration of all components and influences and the resulting safety-related measures.
In this way it is possible to choose suitable working procedures and the necessary equipment. The assessment of risks takes place during the planning phase and from the beginning takes all conditions into account.
These are in particular:
- the presence of persons under the load
- the type of load to be hoisted
- the type of operation
the time framework

All measures described in the following paragraphs are derived from the result of the risk assessment.

5.3 Safety measures for the use of electric chain hoists

• The supervisor in charge must work out a set of instructions on the basis of the risk assessment in order to regulate conduct during set-up and dismantling as well as during the operation of electric chain hoists. These instructions apply for the specific job and are to be distributed to the staff.
When the risk of workplace injuries and damage to health cannot be excluded through technical and organisational safety measures, the employer must provide suitable personal protective equipment (PPE) and other aids, which must be used in the intended manner by staff and other endangered persons.
A self-employed individual must keep his PPE at hand and use it in the intended manner.
The PPE supplied for the set-up and dismantling of electric chain hoists must in particular include:
Protective or safety shoes, gloves, headgear, and, if necessary, PPE against a fall.

• The operator of a building is responsible for the type, load bearing capacity and quality of the attachment points within the building that are provided by him. He must provide suitable documentation (for instance a load capacity plan) about these.
• The choice and dimensioning of all load-bearing elements in the distribution of forces (e.g. attachment point, girder clamp, shackle, steel rope, electric chain hoist, truss) must be made after consideration of the applied loads and risks that may occur in each specific case.
(see BGI 810-3)
• If damage to the load carrying structure through an overload due to differences in synchronised speed of the electric chain hoists cannot be excluded, D 8 and D 8 Plus electric chain hoists must be fitted with overload protection as per paragraph 4.1.3.
C 1 electric chain hoists must be fitted with a control unit of the type C 1+ E3 with the stipulated fault tolerance. The group switch-off must work in both directions.
• The choice of electric chain hoists with regard to their lifting capacity must be made in such a way that no overload can occur. It is sensible not to use an electric chain hoist to its full capacity.
• When choosing attachment points within the building the dynamic load components (e.g. impact coefficients) must be taken into account in the calculation.

• A load measurement must be made when the risk of an overload of individual elements exists (e.g. attachment points, suspension points, electric chain hoists, load suspension devices) involving, for instance:
- line loads on more than two electric chain hoists
- area loads on more than three electric chain hoists
guided loads
• With lifting speeds of 8 m/min or less, in set up/dismantling or installation modes the normal operator reaction will be quick enough, so that it is sufficient to have acoustic warning signals that tell the operator to shut off the driving command when a safety device is activated. (Example: an external load monitor not connected to the motor control unit).
• Before every set-up it is mandatory to check that the attachment points in the building are in a proper condition. This can be done with a visual inspection and a comparison of the data in the building-operator's documentation.
• When D 8 electric chain hoists are used to hold loads above persons, secondary suspensions as safety backups are an absolute necessity. Secondary suspensions must be used that allow no distance of fall (see BGI 810-3).
• When D 8 and D 8 Plus electric chain hoists are used their drive mechanism and brakes must be removed from the power supply when persons are underneath.
• Before set-up a visual inspection must be made of the electric chain hoists and all parts and appliances that are necessary for the job on hand (e.g. slinging equipment, controls, cables, tools and working equipment). (see 6.3.1)
• Electric chain hoists are to be hung in such a way that the chain does not make contact anywhere and cannot become twisted when wound. In particular, the attachment of a load (for instance a truss) to more than one electric chain hoist must not be allowed to cause the chain to become twisted.
• When self-climbing hoists are used it must be ensured that the chain will run easily into the chainbox. The chain must also run easily in and out when it is slack and not loaded.
When compound chain hoists are used it must be ensured that the multiple chain strands do not become twisted.
• In special cases of operation (for instance ground support, loudspeaker towers) the chains of the electric chain hoists may be diverted with pulleys. The circumference of the pulley must measure at least 10 x the pitch length of the size of chain being used. The profile of the pulley must be shaped in such a way that the load works only on the flat chain links and the standing chain links are not subjected to bending stress. The pulleys must be made of a material that will not damage the chain.
(see DIN 56 950: 2004-5 "entertainment technology – machinery installations

– safety requirements and inspections” 5.2.5.2 driving chain pulleys and diverting chain pulleys for steel chains)
• There are two different ways of chain diversion in tower systems:

- The chain host is attached to the foot of the tower, whereby the electric chain hoist must be at a sufficient distance from the tower truss for it not to collide with the sleeve block. The applied load to the tower is equal to twice the load to be lifted.

- The chain hoist is attached to the sleeve block or the truss, so that it rises and falls with the rig. This works like a pulley. The lifting capacity is doubled and the lifting speed halved. The applied load to the tower is equal to the load to be lifted.
• When a compensator is used care must be taken to ensure that the centre of gravity is not moved in an improper way and that the lifting capacity is great enough in all installation positions.
(see Appendix II)

• Cables and wires must be laid so that they do not run over sharp edges, are not squashed and not subjected to any tensile loads.

• The movement process of the electric chain hoist and the load must be overseen by the operator.
(see BGV D 8 / GUV – V D 8 § 29 “Initiating the movement of the load”)
Instructions for the starting of movement processes must be given clearly and unequivocally.

• For scenic movements and the set-up process of area loads or guided loads using C 1 electric chain hoists, overload cut-off and underload cut-off are to be set in a suitable ratio to the actual load. Experience has shown values approximately 20% above or below the actual weight to be correct.

• For scenic movements that are to run automatically (e.g. at discotheques, trade fairs and exhibitions), the lifting path must be situated outside the area to which any persons have access. The lifting path must be restricted by safety equipment.
This kind of operation needs to be monitored and controlled using suitable control units.

6 Inspections

The contractor is obliged to provide safe electric chain hoists.
In order to ensure that only electric chain hoists are put to use that are in a proper condition, an inspection is necessary, not only before they are first put on the market, but also before each one is used for the first time.
To ensure that the electric chain hoists operate safely during set-up and use, they must be inspected in connection with their operational use. This way possible deficiencies or damage can be detected soon enough to be corrected. Repeated inspections are necessary in order to recognise in due time deficiencies and damage that can occur during the operation of electric chain hoists.
After significant modification or an overhaul an inspection is necessary to check that the chain hoist has been restored to a proper condition.
If, as a result of the inspection, doubts arise about the safe operation of an electric chain hoist, this hoist may not be put into use until the defects have been rectified and a second inspection has shown the electric chain hoist to be safe.

6.1 Basic principles of inspections

The manufacturer of electric chain hoists must make inspections on the basis of:
BGV C 1 / GUV – V C 1 “Event and production locations for staged performance”
BGV D 8 “Winches, lifting and pulling devices”
BGG 912 / GUV – G 912 “Guidelines for the testing of machinery installations on stages and in studios”
DIN EN 818-7:2008-09 “Short link chain for lifting purposes – Safety – part 7: Fine tolerance hoist chain – Grade T (Types T, DAT and DT)”
DIN 56950 “Entertainment technology – machinery installations – Safety requirements and inspections”

6.2 Inspections before use

When electric chain hoists are supplied for purchase the inspections listed in this section must be carried out or be shown to have been carried out.
Each purchase leads to a handing-over to the buyer and is concluded with a formal (commercial or administrative) inspection as to whether the contractual agreement has been complied with, and with a technical inspection and the handing-over of the documentation required from the manufacturer or intermediary.

6.2.1 Inspections before manufacture

The contractor may only provide electric chain hoists for which the manufacturer can supply the following inspection results and documents:
construction and manufacturing documentation, in particular:
functional description,
danger and risk analysis,
construction and manufacturing documentation and proof of specifications,
compliance with the product documentation, in particular construction and lifting capacity,
safety features and user manuals.

6.2.2 Inspections before entry into service

Inspections before entry into service are carried out on the electric chain hoist when it is ready for use. For this the documentation from previous inspections (inspections before manufacture) and the declaration of compliance must be to hand.
The qualifications required of the inspecting person are dependent on the complexity of the individual electric chain hoist and the risks that could originate from it.

Before the electric chain hoist is put into service the contractor checks the following criteria:
completeness of the electric chain hoist
proof of previous inspections
- declarations of compliance
- labelling
- compliance with selection criteria
- the reliable and safe condition and functionality of the safety devices
- the manufacturer’s technical documentation

(see paragraphs 4.2 to 4.4)

The contractor makes sure that the results of the inspections carried out before entry into service are documented and kept available.

6.3 Inspections during use

The safe status of the electric chain hoist should be sustained during use. Within the framework of a period of use the contractor carries out risk assessments. In this connection he must determine and evaluate the influences that cause damage, taking into account the different kinds of operating mode, and then devise and implement suitable measures to

counteract them.
As a result the contractor decides on the type and extent of inspections after set-up and dismantling and after any unusual occurrences, as well as on the deadlines for recurring inspections and the qualifications demanded of the person who is commissioned to carry them out.

6.3.1 Inspections during set-up and use

During set-up (on-site erection) and each time before use the safe condition of the electric chain hoist must be established with a visual inspection and a functionality test.
These include:
- a check for external damage or wear
- provision for the particular circumstances of the surroundings
- tests with the help of a checklist

The qualification of the person making the inspection depends on the job for which the electric chain hoist is being used and the amount of risk involved.

6.3.2 Regular inspections

Electric chain hoists are to be inspected according to the type and frequency of their use, so that defects and damage can be detected in proper time.
The deadlines for inspection are laid down by the contractor as part of the risk assessment, taking into account
- existing information from the manufacturer,
- influences that may cause damage,
- operative experience,
- other information on the latest state of technology.

During inspections any defects are assessed and decisions made on further use before the next regular inspection.
(See Appendix IV – Checklist for regular inspections)

Inspections with set intervals, taking the operational and on-site conditions into account, are well proven within the event technology industry.
For D 8 electric chain hoists:
Inspection by a specialist every 12 months

For D 8 Plus and C 1 electric chain hoists
Inspection by a specialist every 12 months
Inspection by an authorised expert every 48 months

Deviation from these established deadlines must be justified in writing by the contractor. Relevant reasons could be, for instance, the operating conditions, maintenance intervals and frequency of use.The results of the regular inspections are to be documented and kept available at the company.

6.3.3 Extraordinary inspections

Extraordinary inspections are necessary in particular:
- in the event of damage
- after a long period of non-use
- after substantial modification of the electric chain hoist

The replacement of parts with ones of the same type is not considered to be a substantial modification.
The electric chain hoist may not be used again until an inspection has proved that safe operation can be guaranteed.

6.4 Documentation

The results of all inspections are to be documented.
For the purpose of depicting the complete history of an electric chain hoist it is advisable to keep all inspection documents together in one inspection book.

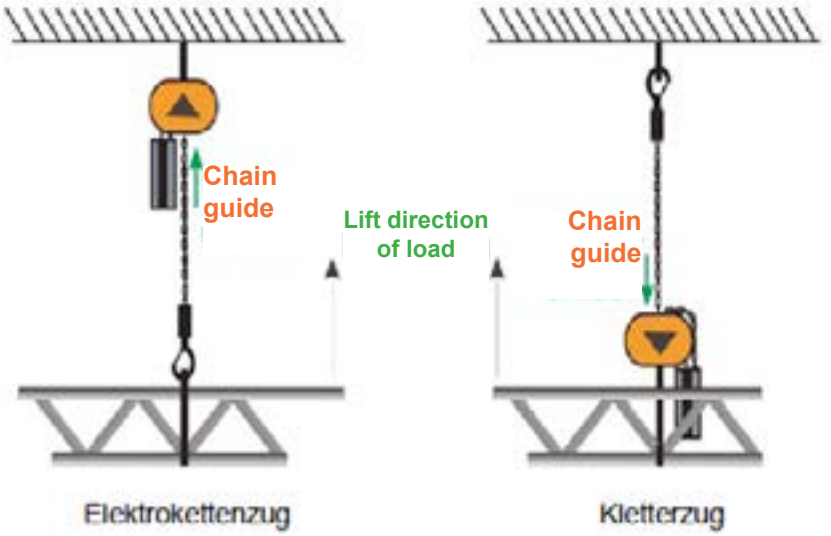
The documentation must be adequate and can contain the following:
- declaration of compliance of the manufacturer
- inspection instructions and criteria of the manufacturer
- confirmation of inspections made by the manufacturer
- confirmation of inspections made before entry into service
- inspections made after substantial modification
- risk assessments upon divergence from established inspection deadlines
- proof of regular inspections
- results of re-examinations

The documentation of inspections made during set-up and use depends on the type of use of the electric chain hoist.

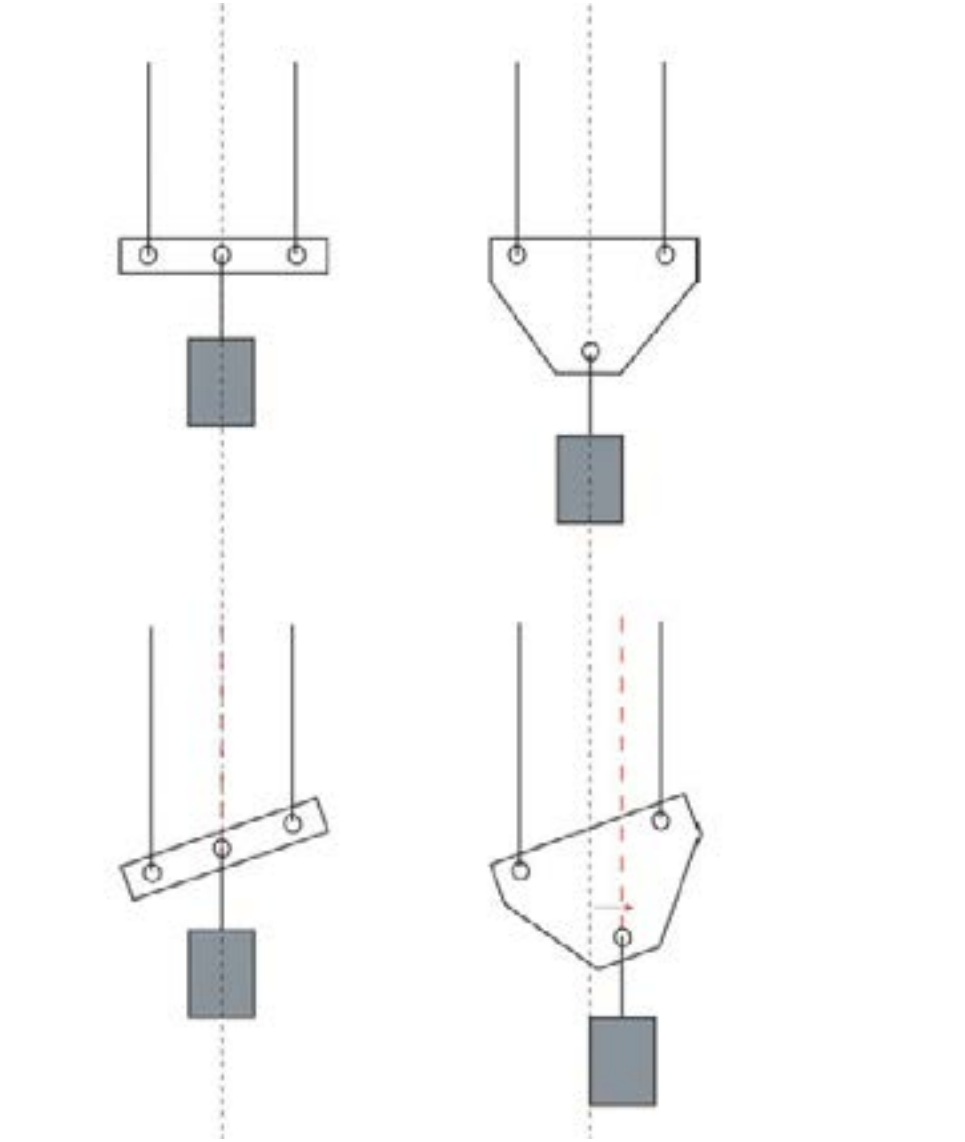
The written result of the last inspection must be kept available at the site of operation. This can be provided by an inspection sticker on the electric chain hoist showing the date of the inspection, the basis of the inspection and the name of the inspector.
If the documentation is compiled electronically, suitable quality assurance measures are required (for instance in accordance with EN ISO/IEC 17025: 2000, paragraph 5.4.7).

Appendices

Appendix I – Illustration of an electric chain hoist and self-climbing hoist



Appendix II - Illustration of the compensator principle



The greater the height of the construction, the greater the displacement of the centre of gravity when there are tolerances in synchronisation or an asymmetrical distribution of the load.

Appendix III – A sample handover protocol

Declaration concerning the correct construction and readiness for use of electric chain hoists
manufacture:
place of manufacture:

customer:

company:
address:
person responsible:

supplier:

company:
address:
person responsible:

The supplier herewith declares to the customer that all equipment and materials utilised by him in the construction of the electric chain hoist conform with the corresponding regulations and accepted technical standards.
He furthermore declares that the complete assembly of the electric chain hoist has been carried out in accordance with the corresponding regulations and accepted technical standards and that the electric chain hoist is handed over to the customer as being ready to use.
The required documents and individual certificates are to be enclosed. These include, for example, the material certificates, the static calculations, or the protocols of necessary inspections that have been carried out.

date: _____ signature of supplier:_____

date: _____ signature of customer:_____

Appendix IV – Check-list for regular inspections

object	criteria
User information	
1.1 General labelling	
· type plates Information on: manufacturer, year of manufacture, type, identification-no., dead weight, engine type, identification symbol D 8,D 8PLUS, C 1	
- mounting	
- legibility	
- completeness	
- durability	
1.2 Safety and health protection identification	
· danger notices	
- condition	
- perceptibility	
1.3 User manual	
· area of application	
· content	
· circuit diagrams	
- legibility	
- condition	
- availability	
2 Control devices	
2.1 Protection against unauthorised use	

· main control devices and their operating elements

- condition
- functioning
- mobility
- labelling
- shut-off facility

2.2 Control devices for starting and stopping and their operating elements

· lifting, lowering
- condition
- functioning
- mobility
- permanent marking of directions of movement
- protection against accidental triggering and unauthorised use
- reciprocal locking of operating elements in case of there being more than one control unit

2.3 Emergency control facilities

- functioning
- mobility
- ease of identification

3 Load-bearing structure

- condition
- fissures
- distortion, corrosion
- mobility and wear of steering, spools, bearings, hinges
- attachment and safeguarding of detachable connections
- effectiveness of locking devices

4 Engines

4.1 Transmission

- leakage
- functioning
- connection between engine parts

- generation of noise
- lubrication
- efficiency, if necessary to be self-locking
- condition
- wear

4.3 Brakes

- condition
- functioning

4.4 Steel chains

· chains
· chain links
· chain rollers
· chain wheels
· clamping mechanism
· safety of pinch points

- condition
- functioning
- mobility
- wear
- extension / pitch
- fissures
- securing of bolts (e.g. with rivet-heads or rings)

4.5 Load hooks

- distortion
- wear
- fissures
- corrosion
- pinching in hook apertures
- securing of hook nuts
- securing of hooks

5 Special safety devices

· signal equipment
· operating limit switch
· emergency cut-off switch
· slack chain switch

· safety edges
· re-start security
· speed regulator
· display systems
· load limiting systems

- condition
- functioning
- completeness
- effectiveness
- mounting
- distortion
- mobility of the switching elements
- cleanliness
- condition of pressure springs
- inevitability

6 Locking devices

- condition
- functioning
- effectiveness

7 Electrical and electronic equipment

· cables
· conduits
· movable cables
· strain relief
· cable entry points
· shut-off options
· group drive
· safety devices
· switchgear
· position limit switches
· Insulation and condition of covering

- functioning
- effectiveness
- damage, wear
- mounting
- adherence to tolerances

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