Table of contents

1. Basic information

1.1. Notes on the operating manual

This operating manual has been prepared in accordance with the product-specific and application-relevant requirements from laws, ordinances, regulations, technical standards, directives and contracts. Information pertaining to the function, use, mounting, maintenance and disposal of the load suspension device is conveyed by this operating manual. The operating manual must be read carefully before commissioning and must always be available to the operator of the load suspension device!

Observance of the information in the operating manual is essential to guarantee safe commissioning and maintenance of the load suspension device. Ensure that the operating manual has been read and understood before all work with or on the load suspension device. The manufacturer shall not be held liable for damage that occurs due to disregard of these operating instructions.

Supplement the operating manual with:

- Directives based on national accident prevention and environmental protection regulations
- Instructions regarding the organisation of work, working processes, responsibilities of the personnel employed, including supervisory and reporting obligations which take account of company-specific factors

1.2. Accuracy when going to press

Technical data such as dimensional information and weight information are valid on the date of this operating manual being printed. The data cited may differ in details from the actual version of the load suspension device without there being any change to the fundamental information.

1.3. Purpose

The load suspension device is used for lifting and moving loads.

1.4. Intended use

The load suspension device may only be used by operating personnel assigned and instructed to do so, and taking account of the applicable regulations, DIN EN 13155 and DGUV Rule 109-017. The load suspension device shall be used only within the defined limits (↗ chapter 1.6, page 3).

1.5. Foreseeable erroneous use

Any use that is not cited under proper intended use or from the following scenarios shall be considered improper use (↗ chapter 5.5, page 23):

- Unauthorised alterations
- Disregard of the operating manual
- Use of unsuitable spare parts or wearing parts

1.6. Limits of the machine

- Service life: 10 years or < 16,000 load changes
- Temperature limits for use, transport and storage: -20 °C up to +80 °C
- In the case of extreme conditions, consult with the manufacturer

Before using the load suspension device in unusual environments (high humidity, salty, corrosive, caustic, or similar) or for handling hazardous goods (e.g. molten materials, radioactive materials, etc.), consult with the manufacturer.

1.7. Designations

1.7.1. Load-bearing equipment

Load-bearing equipment includes load suspension devices, attachment equipment and load carriers.

1.7.2. Load suspension device

Load suspension device is equipment that is not part of the lifting machine, that can be connected with the load carrier of the lifting machine in order to pick up the load.

Load suspension devices include balancers, C-hooks, container slings, hangers, casting ladles, grippers, claws, clamps, buckets, load-lifting magnets, pallet slings, lifting lugs, beams, vacuum lifters and tongs, for example. Load suspension devices can also be connected to the lifting machine via couplings that are intended for frequent disconnection.

1.7.3. Attachment equipment

Attachment equipment is not part of the lifting machine and provides a connection between load carrier and load or the load carrier and load suspension device.

The attachment equipment includes, for example, endless ropes, hook chains, hook ropes, lifting straps, chain slings, eye ropes, ring chains, round slings, suspension harnesses, further detachable connection parts, e.g. shackles and other accessory parts.

1.7.4. Load carrier

A load carrier is a device that is permanently connected to the lifting machine for attaching load suspension devices, attachment equipment or loads. Other than rope and chain driven hoists, load carriers also include crane hooks, gripper, beams, tongs, etc. that are permanently fastened to the lifting rope or lifting chain.

1.7.5. Operator (operating company)

The operator is the natural or legal person who uses the load suspension device, or on whose behalf it is used, i.e. the manager responsible for production.

1.7.6. Operating personnel

Operating personnel are individuals trained or instructed to carry out the relevant task, who are authorised to:

- Set up the load suspension device for the particular production task
- Operate the load suspension device during production
- Remedy disruptions to production
- Clean the load suspension device.

1.7.7. Maintenance personnel

Maintenance personnel are individuals trained and authorised to carry out the relevant tasks, who perform maintenance and repair work on the load suspension device.

1.8. Guarantee and liability

The load suspension device shall be used exclusively in accordance with the proper intended use defined in this operating manual (↗ chapter 1.4, page 3). Any other or additional use is deemed to be non-intended. The manufacturer is not liable for damage resulting from this. The risk shall be borne solely by the operator or user. Warranty claims arising from improper operation or inadequate maintenance will not be accepted. The manufacturer provides no warranty whatsoever for the proper installation of the load suspension device into the wider system.

Spare parts comply with the technical requirements defined by the manufacturer. Installation of third-party components can cause damage and compromise functionality. The provision of guarantee services is void for the whole load suspension device if:

- Third-party components are used
- Original parts are modified without approval from the manufacturer or are tampered with
- Handling, care, and maintenance of the load suspension device are not carried out in the proper manner

Wear parts are excluded from the warranty.

Please note that this manual is based on data which was up to date at the time of publishing, and that it may be modified without prior notice. The manufacturer reserves the right to modify the systems without providing any notice, and does not provided any warranty for reconditioned load suspension devices, which were previously supplied from our works.

2. Safety

2.1. Standards and directives

Directives	
2006/42/EC	Directive 2006/42/EC of the European Parliament and Council from the 17th May 2006 regarding machinery and the amendment to Directive 95/16/EC (new version)

Table 1: Applied directives

Standards	
DIN EN 13155	Cranes - Safety - Loose load suspension devices
DIN EN ISO 12100	Safety of machinery – General design principles - Risk assessment and risk reduction (ISO 12100:2010)

Table 2: Applied standards

2.2. Composition of safety instructions

The safety instructions in this document are identified with safety symbols and are designed in accordance with the SAFE principle. They contain information on the type and source of the hazard, possible consequences and measures to avoid the danger.

!	**DANGER** Warns of an accident that will occur if the instructions are not followed. The accident results in serious, possibly fatal injuries or even death, e.g. through contact with electrical units, through crushing or due to falling objects.

!	**WARNING** Warns of an accident that could occur if the instructions are not followed. The accident can result in serious, possibly fatal injuries or even death, e.g. through contact with electrical units, through crushing or due to falling objects.

!	**CAUTION** Warns of an accident that could occur if the instructions are not followed. The accident can result in minor injuries, e.g. burns, skin injuries or crushing.

2.3. Symbols used

The following symbols, numbers and notes are used in the operating manual:

Symbol	
↗	*Cross reference* to another section.

Table 3: Symbols used

Numbers	
1, 2, 3,… I, II, III,…	Numbers (e.g. in illustrations, drawings, or similar) identify individual parts and/or relate to the corresponding numbers in brackets (1), (2), (3), etc. or (I), (II), (III), etc. in the adjacent text.

Table 4: Number used

Notes	
1. - ▪	Instructions which have a set order that must be followed are sequentially numbered. Instructions that can be performed in any order are identified with a dash. Bulleted lists are identified with a square dot

Table 5: Notes

Important information, particularly safety-relevant information, is marked with corresponding pictograms. Follow the instructions to avoid hazardous situations with consequential physical injuries or property damage.

	**General warning sign**

Figure 1: General warning sign

	**Warning: Electrical energy** Warns of possible imminent danger due to electrical energy.

Figure 2: Warning: Electrical energy

	**Suspended loads** Warns of possible imminent danger due to a suspended load.

Figure 3: Warning: Suspended load

	**Warning of crushing hazard** Warns of possible imminent danger due to crushing of body or parts of the body.

Figure 4: Warning of crushing hazard

	**Warning: Risk of injury to hands** Warns of possible imminent danger of hand injuries.

Figure 5: Warning: Risk of injury to hands

	**Warning of obstacles in head area** Warns of possible imminent danger due to objects in the head area.

Figure 6: Warning of obstacles in head area

	**Warning: Hot surface** Warns of possible imminent danger due to contact with hot surfaces or components.

Figure 7: Warning - hot surfaces

2.4. Labelling on the load suspension device

Symbol	Meaning
	Warning: Suspended load
	Warning of crushing hazard
	Warning of obstacles in head area
	General information for the use of the load suspension device
	Test placard
5000 kg	Load-bearing capacity
	Type plate

Table 6: Labelling on the load suspension device

2.5. Operating personnel requirements

All persons who work with the load suspension device must have read and understood the complete operating manual. All work on the load suspension device shall be carried out only by properly trained and instructed specialist personnel. Personnel undergoing training shall carry out work on the load suspension device only under the supervision of a technical specialist.

2.5.1. Personal protective equipment

The personnel tasked with working on and with the load suspension device shall wear personal protective equipment in accordance with the tasks to be carried out:

- Protective gloves
- Protective shoes
- Safety helmet with overhead transport
- Hair net with long hair

2.5.2. Authorised personnel

Only use trained or instructed personnel. Observe the legally prescribed minimum working age! Clearly define the areas of responsibility of personnel for operation, set-up, maintenance, and repair!

Make sure that only personnel ordered to do so work on the load suspension device! Define who has responsibility for transport, and allow them to reject unsafe instructions from third parties!

Initially, only allow those who are being trained, on an apprenticeship, being introduced to the job, or undergoing general training to work on the load suspension device under the constant supervision of an experienced person!

!	**WARNING** Danger to personnel, material property, and the environment from improper operation or maintenance of the load suspension device. Only authorised persons are permitted to work on the load suspension device.

2.6. Obligations of the operator

The operator must ensure that persons who work with the load suspension device

- are aware of the basic regulations regarding occupational safety and accident prevention, and have received instruction on operating the load suspension device.
- are trained and briefed and know the clearly stipulated responsibilities involved with the operation and maintenance
- have read and understood this operating manual
- use personal protective equipment properly

In addition, the operating company must also ensure, that

- the load suspension device is used exclusively in accordance with its proper intended use
- any fire protection measures required have been undertaken
- the operating manual is available to the personnel at all times
- the safety equipment has been regularly checked in accordance with legal stipulations
- the load suspension device will be taken out of operation or overhauled after the maximum permitted number of load changes per DIN EN 13155
- regulation BGV DGUV Rule 109-017, Chapter 2.8 as well as other engineering rules (e.g. EN standards, other BGV regulations, national and international applicable standards and regulations) are observed and complied with.

2.7. How to respond to danger and in the event of accidents

2.7.1. Preventive measures

- Always be prepared for accidents
- Store first aid equipment such as first aid kits, fire extinguishers, blankets, etc. in an accessible location
- Familiarise personnel with accident reporting, first aid, and rescue equipment
- Keep access routes unobstructed for emergency service vehicles

2.7.2. In the event of danger

- Stop all work immediately
- Start administering first aid
- Recover personnel from the danger zone
- Inform those in charge on this site
- Notify a doctor and/or the fire brigade
- Remove any obstructions to emergency service vehicles in access routes

2.8. Hazards and residual risks

The operating manual is drafted in general terms, and relates only directly to the technology of the supplied load suspension device. The load suspension device is integrated into an existing lifting or crane system. Its precise use is unknown to the manufacturer. The CE Declaration of Conformity and the operating manual are therefore restricted directly to the supplied load suspension device.

If the load suspension device is involved in other applications or affects particular working practices within the company, it may be necessary to carry out an additional internal risk assessment which factors in the load suspension device. In this case, it is incumbent on the operator or the new supplier to carry out a risk assessment in accordance with the Machinery Directive for the entire process, and to generate their own operating manual.

The load suspension device may only be used for the purposes described in the operating manual. Non-intended use can lead to significant personal injury and damage to property. The manufacturer explicitly emphasises that they cannot give any kind of warranty for the proper installation of the load suspension device into the wider system. The supplied load suspension device was produced based upon the load, force, and geometry information for the product, supplied by the customer.

!	**DANGER** As a rule, the use of a load suspension device is not restricted to one fixed, unchanging method of operation. The manufacturer is therefore unable to assess the actual use of the device on site.

3. General information on the load suspension device

According to DUGV rule 100- 500, load suspension devices are equipment that is not part of the lifting machine, that can be connected with the load carrier of the lifting machine in order to pick up the load.

The load suspension device shall only be used in interlocking operation. Frictionally engaged operation shall only be employed if the load suspension device has been specifically designed and dimensioned for this in terms of its form and function.

DANGER
Load suspension devices designed for interlocking operation shall not be used for frictionally engaged operation under any circumstances!

The load suspension device shall not be used without the type plate, load-bearing capability information, CE sign and test sticker.

The load suspension device must be inspected prior to use. Make sure that:

- all markings are properly legible
- the load suspension device does not exhibit any cracking, indentations, or other material defects
- the load suspension device is never repaired or modified by welding, heating, or bending, as this could impair its strength

It is necessary to subject the load suspension device to regular inspections. These must be conducted at least to the standards of the country in which the load suspension device will be used. This is necessary because the load suspension device can be deformed during use by wear, improper use, etc., which results in changes to the material structure. This inspection should be performed by specialist personnel at least every six months. This interval is decreased if the load suspension device is subjected to critical operating conditions.

For each load suspension device, the operating manual is an essential constituent part, which must be read through carefully by the operator/user and kept safely at the point of use. The presence of the operating manual does not release anyone from their obligations to carry out checks.

WARNING
The commissioning, operation, maintenance and repair of the beam shall be carried out only in accordance with the instructions in this operating manual. For this reason, read through the operating manual carefully!

Standard DIN EN 13155 covers hazards in conjunction with the mechanical strength of load suspension devices up to 16,000 load changes. After that the load suspension device must be taken out of service or scrapped as the maximum life expectancy of the load suspension device has been reached.

The largest possible temperature range for use of the load suspension device is -20°C to +80°C. Load suspension devices with frictionally engaged load pick-up points are an exception to this (0°C to +80°C). Usage temperature ranges that deviate from this must be discussed with the manufacturer.

When the load suspension device is being used, it is forbidden to stand underneath suspended loads or in the general hazard area. It is necessary to ensure that the load suspension device cannot swing when moving as otherwise damage could be incurred by it striking objects.

The load suspension device shall only be used for vertical lifting with evenly (symmetrical) distributed loads. In the case of load suspension devices with multiple load attachment points, ensure that the load is distributed evenly.

3.1. Mechanical load-bearing parts

As a matter of principle, the following regulations apply per DIN EN 13155 for the mechanical load-bearing parts of load suspension devices:

- The load suspension device must be dimensioned such that it is able to withstand a static load of three times the load-bearing capacity and such that the load will still be held even if this results in permanent deformations
- The load suspension device must be dimensioned such that it is able to

withstand a static load of twice the load-bearing capacity without permanent deformations

- Load suspension devices that are intended for tilting during operation must be dimensioned for an incline angle of at least 6° more than the max. working angle
- Load suspension devices that are not intended for tilting during operation must be dimensioned for an incline angle of at least 6°

3.2. Attachment equipment

Only crane hooks with safety catches shall be used. The hanging eye of the load suspension device must have enough space in the crane hook and must be free-moving. Crane hooks and load hooks shall not be loaded on the tips! In the case of load suspension devices with permanently attached load hooks, the max. permissible incline angle is 10° off vertical (Figure 8). In the case of load hooks an adjustable mounts or other adjustment devices, the max. permissible incline angle is 2° off vertical (Figure 9). Pulling at an angle is generally prohibited.

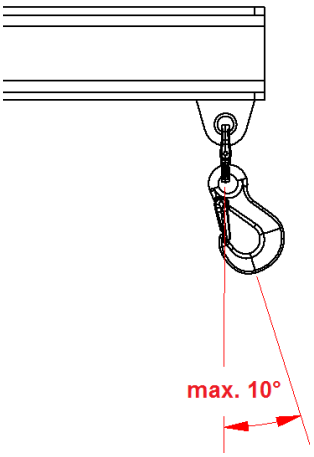

Figure 8: Max. incline angle with fixed load attachment

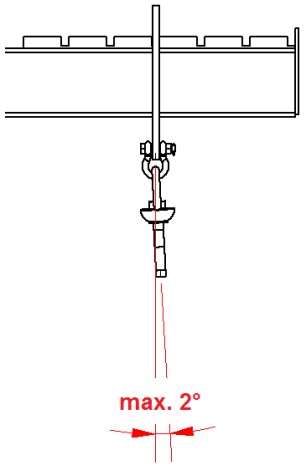

Figure 9: Max. incline angle with adjustable load attachment

3.3. Set-down parts

Load handling devices must be stored stably. They are considered to be stored stably if it does not topple over in any direction when subjected to a tilt angle of 10°. This can be achieved through the design of the load suspension device or through an additional device, e.g. a frame or support. Support trestles and set-down feet can be procured from the manufacturer for this purpose.

Load suspension devices are to be stored protected from the influences of weather or aggressive substances per DGUV rule 109-017 insofar as these can impair safety.

3.4. Connection of the load suspension device with the lifting machine

When connecting the load suspension device with a lifting machine it is necessary to ensure that interlocking is possible to prevent unintended loosening of this connection, before lifting. In addition, safety devices must be present to prevent hazards or damage to the beam during storage, during connection with the crane or during release from the crane.

3.5. Attaching the load to the load suspension device

When attaching a load, ensure that all attachment parts, fittings and accessory parts are correctly selected in accordance with the load-bearing capacity and type of attachment.

Attachment equipment with mechanical damage, deformations, expired test certificates or where the max. permissible reduction in cross-sectional area has been exceeded, shall not be used. This applies to eyes, bars, shackles, chains, chain accessories, hooks etc. Information on the permissible cross-sectional dimensions can be found in DGUV rule 109-017. All attachment parts, fittings and accessory parts must be free-moving.

The load shall be attached such that both damage to the load and to the attachment equipment is prevented. If the attachment equipment passes over edges, use specific edge protectors! Please observe the product-specific instructions!

When attaching a load, it is also necessary to ensure that the load is adequately stable in order to withstand the tilting forces. In addition, the level of the load's centre of gravity should also be observed and subjected to a critical assessment.

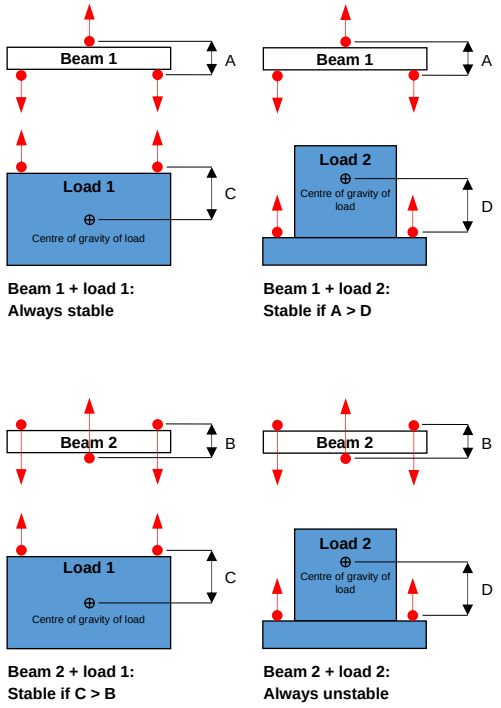

Figure 10: Example of the level of the load's centre of gravity

In Figure 10 beam 1 has a positive stability height and beam 2 has a negative stability height. Load 1 has a positive stability height and load 1 has a negative stability height. The stability from the combination of beam and load must be positive. Although the example only shows a two-dimensional situation, the principle can be applied to all horizontal turning axes. The load must be held in more than one vertical level in order to be stable in the direction of both horizontal axes.

An object with a narrow base and a high centre of gravity will topple more easily than an object with a wide base and low centre of gravity. Because the height of the centre of gravity increases relative to the width of the base, a point is reached where the object will topple if it is not supported by external means. At this point the object is considered unstable. The greater the required support, the more unstable the object. A similar situation arises with a suspended load. There are unavoidable forces present that attempt to topple the load (e.g. wind, acceleration, braking). It is therefore important when attaching a load, to ensure that the load is adequately stable in order to withstand these tilting forces. A load is intrinsically stable if the attachment point lies above the centre of gravity.

If the attachment points of a load suspension device are adjustable, the attachment points must be secured to prevent unintended loosening of the load suspension device. In the case of load suspension devices with adjustable crane or load attachment points, the adjustment and the attachment must always be implemented symmetrically.

3.6. Selection of suitable load suspension and attachment equipment

Load suspension and attachment equipment should be selected such that their load-bearing capacity, type, length and load fastening methods are suitable for the transport task in hand and such that they can safely pick up the load without undesired movements such as slipping, tilting, turning or swinging.

The crane eye, suspension links or loops or similar must be free-moving in the load hook of the lifting machine. There must be no risk of detachment from the lifting machine or crane hook due to the angle between the two lines. Even incline angles from 45° in the lifting machine or crane hook could be hazardous depending on the crane design! The area of the hook tips or the latch shall not be loaded.

3.6.1. Suitable attachment equipment

For lifting and transport of loads, suitable attachment equipment could include:

- **Ropes** - For loads with smooth, oily or slippery surfaces as well as hook ropes for the connection between the crane hook and the attachment eyes of the load. Ropes are well suited to being fed through under the load.

- **Chains / chain slings** - For loads with high temperatures and loads with non-slip surfaces as well as sharp-edged carriers or profiles (observe reduction in load-bearing capacity in the case of sharp edges and high temperatures)

- **Lifting straps and round slings** - For loads with particularly slippery or sensitive surfaces, such as rollers, shafts, finished parts, painted parts, etc.

- **Combined rope/chain slings** - For the transport of profile steel and on construction sites, if sharp-edged loads are to be lashed with the middle area of the attachment equipment (chain) and the rope used to be passed through under the load

Unsuitable attachment equipment include, for example:

- Ropes for sharp-edged or hot loads/materials
- Chains for loads with smooth or slippery surfaces
- Lifting straps and round slings for sharp-edged loads without suitable edge protection or for loads over 100°C

3.6.2. Selection and checking of attachment points

Use only tested, approved, standard-compliant attachment points that have the required load-bearing capacity to attach the load! Never attach to wrapping wire, straps, or similar. These products are suitable only for tying up bundles of load – never for lifting!

Check the attachment points for mechanical damage, deformations, expired test certificates or the max. permissible reduction in cross-sectional area having been exceeded. Information on the permissible cross-sectional dimensions can be found in DGUV rule 109-017. All attachment parts, fittings and accessory parts must be free-moving.

Ring bolts and ring nuts shall not be loaded perpendicular to the plane of the ring under any circumstances! Pulling at an angle is only permitted up to a max. 45° incline angle. When pulling at an angle, observe the load-bearing information in the manufacturer's documentation or in DIN 580.

3.6.3. Observe angle of inclination

The use of multi-line attachment equipment requires particular care! The load hooks into which the attachment equipment is hung, should be located directly above the centre of gravity of the load. If the lines exhibit an incline angle, the inclined pulling and the resultant lateral forces on the attachment points must be taken into account! The attachment points and the length of the attachment equipment must be selected such that the incline angle lies in the range stipulated on the attachment equipment's load-bearing capacity placard - most often between 45° and 60° (Figure 11).

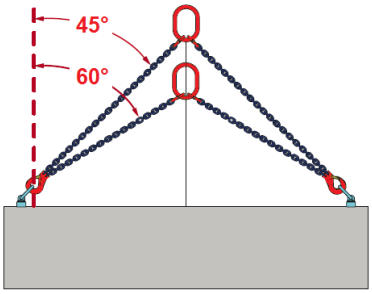

Figure 11: Example of permissible incline angle for chain sling

Ideally, all incline angles should be the same and should be at least 15° as the load will hang more stably then and the load can be better distributed to both lines. The 60° incline angle shall not be exceeded under any circumstances!

!	**DANGER** Observe incline angle with multi-line attachment equipment! Incline angles greater than 60° are not permitted!

If some of the lines are unused on multi-line attachment equipment, the loose lines are to be hung in the suspension head so that they cannot unintentionally hook onto something

during the lifting process. The load-bearing capacity of the lines being used is decreased accordingly.

Either reduce the load-bearing capacity values cited on the suspension device by the utilisation factors below (Figure 12), or determine the permissible load-bearing capacity for this lifting process by using the number of lines being used and the load-bearing capacity table. The load-bearing capacity table can be found in the documentation from the manufacturer of the individual attachment equipment.

Total number of lines	Number of lines used	Utilisation factor for the stipulated load-bearing capacity
Two lines	1	1/2
Three and four lines	2	2/3
Three and four lines	1	1/3
Four lines	3	Full load-bearing capacity

Figure 12: Utilisation factor for multi-line chain sling

3.7. Lifting loads

When a load is being lifted, the crane hook must remain above the centre of gravity at all times (Figure 13).

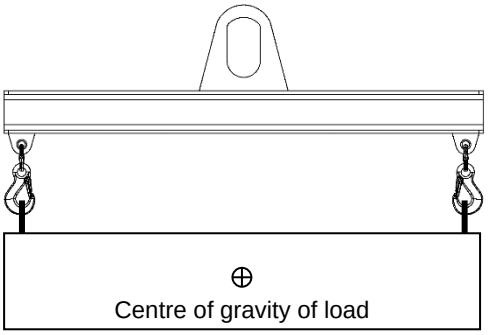

Figure 13: Centre of gravity of load

If the crane hook is not over the centre of gravity, the whole system will be tilted during lifting until the centre of gravity is under the crane hook. The higher the load attachment equipment is arranged, the lower the system must tilt to achieve the “centre of gravity under the crane hook” position. Per DIN EN 13155 the permissible maximum incline of the load attachment equipment is 6° (Figure 14). Please note that there can be situations where an incline of 6° can already result in a critical attachment and such instances must be subjected to individual assessment.

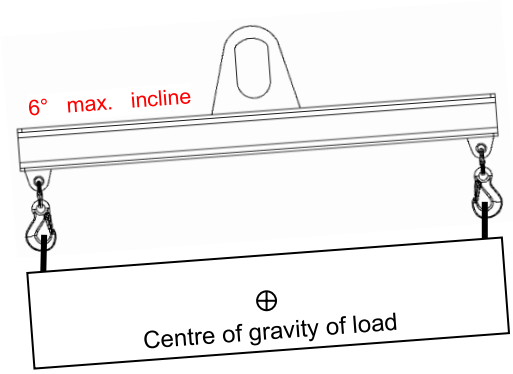

Figure 14: Permissible incline of the load attachment

4. Beams

Beams are load suspension devices that comprise one or more parts. Beams are equipped with attachment points in order to simplify the handling of loads, which are attached at one or more points. The beams described below are designed for fixed, central crane suspension. Depending on the design, chain slings can also be used to attached the loads.

4.1. Big-Bag beams

4.1.1. Intended use

Big-Bag beams (Figure 15) are used for lifting and transporting Big-Bags (woven plastic bags). Big-Bag beams have beams arranged in a cross and a fixed, generally central, crane suspension point (custom versions possible). Big-Bags can be attached by hanging the Big-Bag loops into each of the four attachment points (standard: welded-on hooks) at the ends of the beams. Shackles, hooks, chain slings or similar could also be used as optional attachment points.

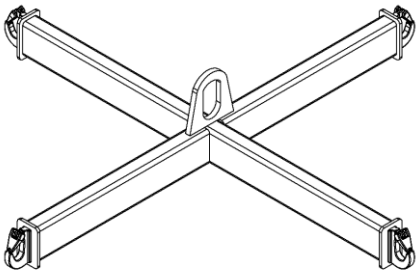

Figure 15: Big-Bag beam

As an option, Big-Bag beams can also be delivered with negative construction height, i.e. the load attachment point is located higher than the crane attachment point. This construction style is not stable when hanging from the crane hook unloaded. The lifting process must be carried out with great care! The centre of gravity of the load must lie significantly below the load attachment point.

When lifting the beams, all four loops of the Big-Bag must be securely picked up by the welded-on hooks. If attachment points other than welded-on hooks are used care must be taken to ensure that the are securely fastened to the load. The safety devices on the hooks must all be closed.

Lifting with fewer than four attachment points is not permitted. Observe the permissible load-bearing capacity of the beam. When lifting Big-Bags that are packed closely together, the resultant friction can cause the permissible load-bearing capacity to be exceeded!

4.1.2. Hazards and residual risks

!	**DANGER** Never transport with fewer than 4 attachment points or with unsecured attachment points.

!	**DANGER** Overloading of the beam due to asymmetrical loading.

4.2. Bar beams

4.2.1. Intended use

Bar beams are used for lifting parts that require at least two attachment points for stability. With two attachment points, 50% of the weight of the load is distributed to each of the two attachment points. If the beam has more than two attachment points, the respective max. permissible loading of the attachment points must be taken into account.

In general, bar beams have a fixed, central crane suspension point (optionally also with chain sling or adjustable crane suspension point, eye for one or two crane operation, bar suspension for double hook, and similar possible).

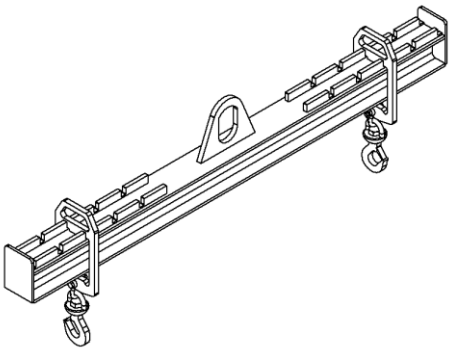

Figure 16: Adjustable bar beam

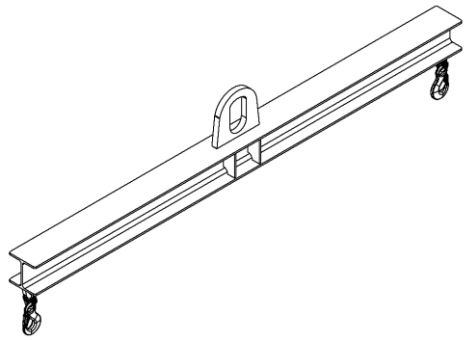

Figure 17: Simple bar beam

With adjustable bar beams (Figure 16), the attachment points can be adjusted with corresponding stops. This enables the gripping width to be adapted and adjustments can be made for the centre of gravity of the load. Simple bar beams (Figure 17) have rigid attachment points on the load side.

The load attachment is generally always implemented symmetrically to the crane attachment and perpendicular to the beam. When doing so, ensure that the centre of gravity of the load is always located vertically underneath the crane hook. When attaching the load, observe the permissible incline of the load attachment points (Figure 8 and Figure 9, page 9). Load attachment points could be, for example:

- Hooks (swivel hooks, eye hooks, or similar)
- Belts, straps, slings
- Chain slings, shackles
- Screw-on plates, or similar

4.2.2. Hazards and residual risks

DANGER
Ensure that the load is arranged symmetrically. There is a risk of overloading the attachment points with asymmetric loading.

DANGER
Exceeding the 6° permissible incline not permitted.

DANGER
The adjustment of the load pick-up points or the adjustable crane attachment shall only be carried out whilst set down in unloaded condition! There is a risk of the complete system toppling over!

4.3. H-beams

4.3.1. Intended use

H-beams are used for lifting parts that require more than two attachment points for stability and that require an optimised distribution of the load across the surface. H-beams generally have a fixed, central crane suspension point (optionally also with chain sling or adjustable crane suspension point, eye for one or two crane operation, bar suspension for double hook, and similar possible) and fixed or adjustable load attachment points.

With adjustable H-beams (Figure 18), the load attachment points can be adjusted with corresponding stops. This enables the gripping width to be adapted and adjustments can be made for the centre of gravity of the load.

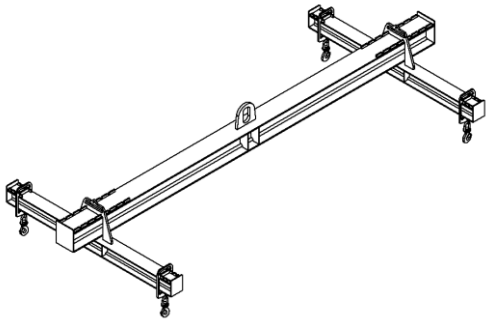

Figure 18: Adjustable H-beam

Simple H-beams (Figure 19) have either adjustable load attachment points in longitudinal direction and rigid load attachment points in transverse direction on the load side or rigid load attachment points in transverse and longitudinal direction.

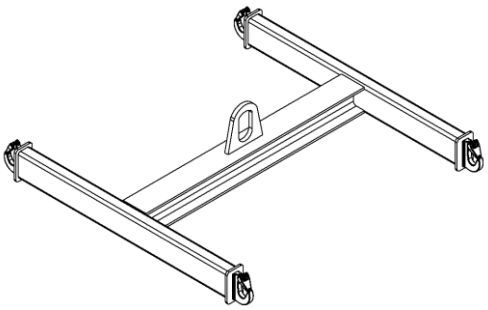

Figure 19: Simple H-beam

The load attachment is generally always implemented symmetrically to the crane attachment and perpendicular to the beam. When doing so, ensure that the centre of gravity of the load is always located vertically

underneath the crane hook. When attaching the load, observe the permissible incline of the load attachment points (Figure 8 and Figure 9, page 9). Load attachment points could be, for example:

- Hooks (swivel hooks, eye hooks, or similar)
- Belts, straps, slings
- Chain slings, shackles
- Screw-on plates, or similar

4.3.2. Hazards and residual risks

DANGER
Ensure that the load is arranged symmetrically. There is a risk of overloading the attachment points with asymmetric loading.

DANGER
The adjustment of the load pick-up points or the adjustable crane attachment shall only be carried out whilst set down in unloaded condition! There is a risk of the complete system toppling over!

DANGER
Exceeding the 6° permissible incline not permitted.

4.4. Star beams

4.4.1. Intended use

Star beams are used for lifting parts that require more than two attachment points for stability and that require an optimised distribution of the load across the surface. Star beams have a central crane suspension point (optionally also with chain sling or bar suspension for double hook, or similar) and three fixed or adjustable carriers usually arranged with a spread angle of 120°, with fixed or adjustable load attachment points.

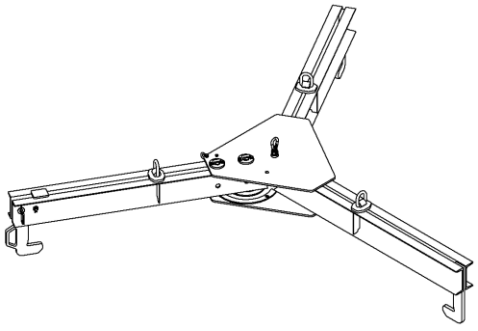

Figure 20: Simple star beam

Simple star beams (Figure 20) have rigid attachment points on the load side, i.e. the gripping width cannot be adjusted.

The load attachment is generally always implemented symmetrically to the crane attachment and perpendicular to the beam. When doing so, ensure that the centre of gravity of the load is always located vertically underneath the crane hook. When attaching the load, observe the permissible incline of the load attachment points (Figure 8 and Figure 9, page 9). Load attachment points could be, for example:

- Hooks (swivel hooks, eye hooks, or similar)
- Belts, straps, slings
- Chain slings, shackles
- Screw-on plates, or similar

4.4.2. Hazards and residual risks

DANGER
The adjustment of the load pick-up points shall only be carried out whilst set down in unloaded condition! There is a risk of the complete system toppling over!

DANGER
Overloading of the beam due to asymmetrical load attachment points.

DANGER
Exceeding the 6° permissible incline not permitted.

4.5. Cross-shaped beams

4.5.1. Intended use

Cross-shaped beams are used for lifting parts that require more than two attachment points for stability and that require an optimised distribution of the load across the surface. They usually have a central crane suspension point (optionally also with chain sling or bar suspension for double hook, or similar) and four fixed or adjustable carriers with fixed or adjustable load attachment points. In the case of adjustable attachment points, ensure that the attachment points are always set to be symmetrical with regard to the crane suspension.

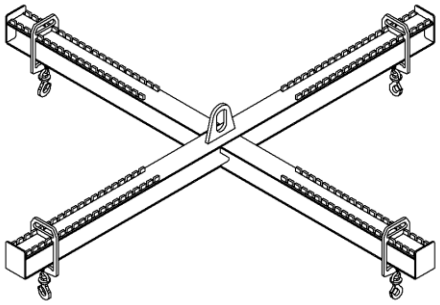

Figure 21: Adjustable cross-shaped beam

With adjustable cross-shaped beams (Figure 21), the attachment points can be adjusted with corresponding stops. This enables the gripping width to be adapted and adjustments can be made for the centre of gravity of the load.

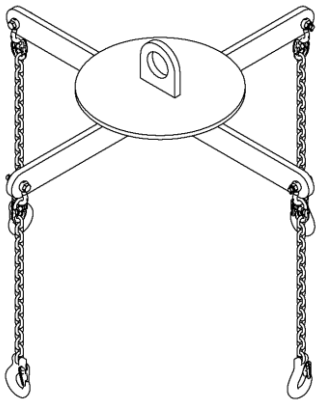

Figure 22: Simple cross-shaped beam

Simple cross-shaped beams (Figure 22) have rigid attachment points on the load side, i.e. the gripping width cannot be adjusted.

The load attachment is generally always implemented symmetrically to the crane attachment and perpendicular to the beam. When doing so, ensure that the centre of gravity of the load is always located vertically underneath the crane hook und all provided load attachment points are be used. When attaching the load, observe the permissible incline of the load attachment points (Figure 8 and Figure 9, page 9). Load attachment points could be, for example:

- Hooks (swivel hooks, eye hooks, or similar)
- Belts, straps, slings
- Chain slings, shackles
- Screw-on plates, or similar

4.5.2. Hazards and residual risks

!	**DANGER** Overloading of the beam due to asymmetrical load attachment points.
!	**DANGER** The adjustment of the load pick-up points shall only be carried out whilst set down in unloaded condition! There is a risk of the complete system toppling over!

!	**DANGER** Exceeding the 6° permissible incline not permitted.

4.6. Pallet cage beams

4.6.1. Intended use

Pallet cage beams (Figure 23) are used for lifting and transporting pallet cages. They usually have a central crane suspension point (optionally also with chain sling or bar suspension for double hook, or similar) and four load attachment points.

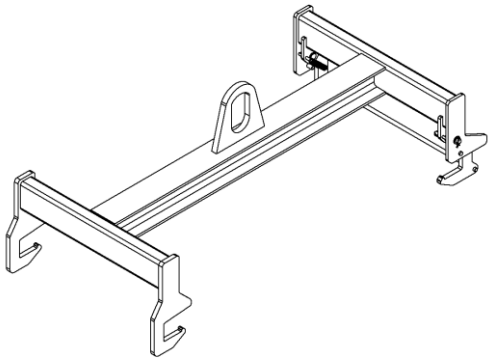

Figure 23: Pallet cage beams

The load attachment is generally always implemented symmetrically to the crane attachment and perpendicular to the beam. When doing so, ensure that the centre of gravity of the load is always located vertically underneath the crane hook.

4.6.2. Hazards and residual risks

!	**DANGER** Overloading of the beam due to asymmetrical load attachment points.

!	**DANGER** Exceeding the 6° permissible incline not permitted.

4.7. Extendable beams

4.7.1. Intended use

Extendable beams are used for lifting and transporting loads. Thanks to the adjustable nature of the attachment points, extendable beams can be used in many areas where the load attachment points must move horizontally. Extendable beams are an ideal enhancement for lifting processes using 2-line chain slings. The load suspension can be implemented through welded-on eyes, shackles, eyehooks, turning hooks, welded-on hooks with safety flaps, long hooks, chain attachments, or similar. Eyes for chain attachment are usually provided on the crane side (custom designs possible).

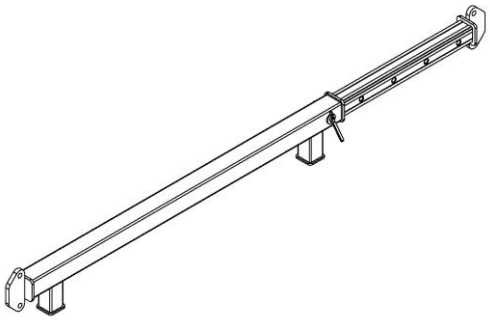

Figure 24: Adjustable extendable beam

The length of the extendable beam can be changed by telescoping the beam with the stops provided (Figure 24). Ensure that the telescopic beam is locked again and that the 60° max. incline angle of the chain sling is not exceeded!

The load attachment is generally always implemented symmetrically to the crane attachment and perpendicular to the beam. When doing so, ensure that the centre of gravity of the load is always located vertically underneath the crane hook.

4.7.2. Hazards and residual risks

DANGER
Ensure that the load is arranged symmetrically. There is a risk of overloading the attachment points with asymmetric loading caused by unequal chain lengths.

DANGER
The adjustment of the load pick-up points shall only be carried out whilst set down in unloaded condition! There is a risk of the complete system toppling over!

DANGER
Overloading of the beam due to the 60° max. permissible chain incline angle being exceeded.

4.8. Long hook beams

4.8.1. Intended use

Long hook beams are most often used for lifting rotationally symmetrical parts that require more than two attachment points for stability and that require an optimised distribution of linear loads. They usually have a central crane suspension point (optionally also with chain sling or bar suspension for double hook, or similar).

With adjustable long hook beams, the attachment points can be adjusted with corresponding stops. This enables the gripping width to be adapted and adjustments can be made for the centre of gravity of the load.

Simple long hook beams have rigid attachment points on the load side, i.e. the gripping width cannot be adjusted.

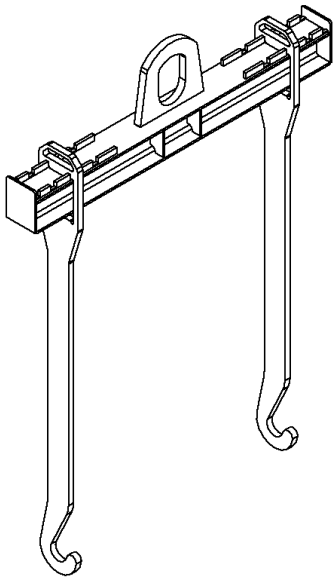

Figure 25: Adjustable long hook beam

The load attachment is generally always implemented symmetrically to the crane attachment and perpendicular to the beam.

When doing so, ensure that the centre of gravity of the load is always located vertically underneath the crane hook.

The carrying shaft or rod of the load and the laminated hooks must be kept free of oil and grease at all times. The load must be secured to prevent lateral movement. In addition, the carrying shaft or rod projecting beyond the laminated hooks must be guaranteed.

4.8.2. Hazards and residual risks

DANGER
The adjustment of the load pick-up points shall only be carried out whilst set down in unloaded condition! There is a risk of the complete system toppling over!

DANGER
Overloading of the beam due to asymmetrical load attachment points.

DANGER
Exceeding the 6° permissible incline not permitted.

DANGER
All attachment points must be dry and free of grease and oil in order to prevent the load sliding.

DANGER
There is a danger of crushing when attaching the load.

4.9. Forklift beams

4.9.1. Intended use

With the help of forklift beams it is possible to use a forklift as a crane for lifting and transporting loads. Forklift beams can be picked up with the tines of the forklift, secured by means of clamping screws, locking pins, or similar, to prevent them slipping or loosening and are equipped with a central swivel hook for attaching loads (custom designs possible). The forklift beams can also be equipped with adjustable attachment points, load arms and special fixtures, e.g. for turning, rotating or similar (Figure 26).

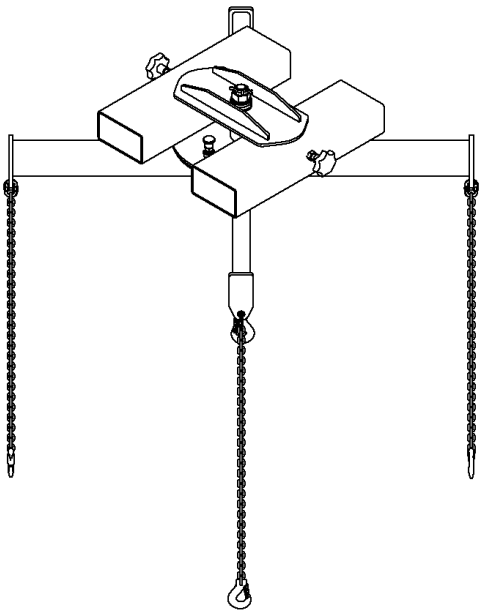

Figure 26: Forklift beam

When using forklift beams note that the stipulated load-bearing capacity of a forklift may change depending on the reach and angle of the forks and mast. For this reason it is necessary to take into account the net weight of the forklift beam as well as the resultant residual load-bearing capacity of the forklift.

Shock loads with the forklift (e.g. due to lifting too quickly) as well as the swinging of the load when driving must be avoided. The driving speed must be selected accordingly. Loads must always be transported close to ground level.

In the case of forklift beams with more than one load attachment, ensure that the load is distributed symmetrically. The maximum load-bearing capacities of the individual load attachment points shall not be exceeded.

4.9.2. Hazards and residual risks

DANGER
Use without fastening to the forklift tines is forbidden.

DANGER
Disregard of the load-bearing capacity of the forklift.

4.10. C-hooks

4.10.1. Intended use

C-hooks are C-shaped load suspension devices. These can be designed with or without counter weights depending on the application (Figure 27). They are used for lifting loads with openings, such as coils, rolls, rings, bushings, etc.

C-hooks usually have a central, fixed crane suspension point as well as a lower load arm, usually horizontal, to pick up the load. The incline of the lower load arm of the unloaded C-hook shall not exceed 5° from horizontal.

In order to prevent the load sliding or falling, one of the following measures should be implemented per DIN EN 13155:

- Incline of the C-hook rearwards with an incline angle of 5° or more in loaded condition
- In the case of C-hooks for transporting steel coils, the lower arm shall adopt a horizontal or rearwards inclined position in loaded condition
- A chain, strap or bar to close the opening of the C-hook
- A clamping system to secure the load
- An end stop on the lower arm

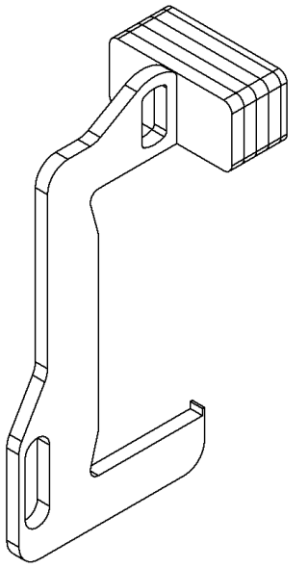

Figure 27: C-hook with counterweight

For ease of operation, C-hooks can be furnished with additional hand grips to make it easier to thread the C-hook into the goods to be picked up.

The centre of gravity of the gripped materials must always be below the supporting edge of the lower load arm. In addition, the lower load arm must be inclined at least 5° upwards when the C-hook is loaded (horizontal is also permitted in the case of steel coils). This ensures that the load cannot slip off the load arm. For all other loads, suitable safety devices must be present in order to secure the load against slipping.

Transporting coils with the centre of gravity in front of the crane suspension point will inevitably lead to the load arm tilting in the negative direction (downwards) and is forbidden in all circumstances!

Severe swinging movements or striking against objects must be avoided during the transport!

4.10.2. Hazards and residual risks

!	**DANGER** Failure to use safety devices or disregard of the safely incline angle of the lower load arm.
!	**DANGER** Disregard of the centre of gravity of the load.
!	**DANGER** Gripped materials dropping due to severe swinging movements or striking against objects.
!	**DANGER** There is a danger of crushing when attaching or picking up the load. .

4.11. Gripper

4.11.1. Intended use

Grippers are load suspension devices for lifting and transporting loads, which grip at defined points using form-locking (Figure 28) or using friction-locking (Figure 29).

Frictionally engaged operation shall only be employed if the load suspension device has been specifically designed and dimensioned for this in terms of its form and function. In the case of friction-locking operation, both the gripper and the load must be dry and free of oil and grease. In addition, ensure that there is sufficiently high friction between the load and the friction lining of the load suspension device so that adequate clamping force can be achieved. The greatest possible temperature range when using load suspension devices with friction-locking load pick-up points is 0°C to +80°C. Usage temperature ranges that deviate from this must be discussed with the manufacturer.

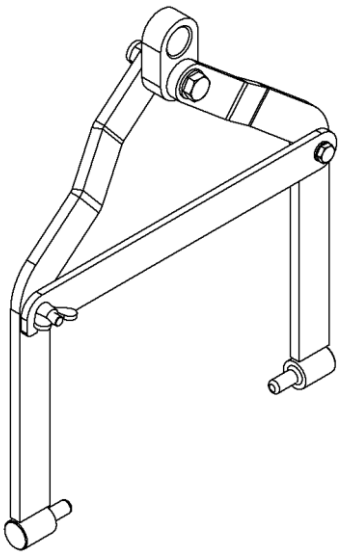

Figure 28: Example of gripper with form-locking

Grippers generally have a mechanism for holding the gripper open. The mechanism can be operated manually via locking or latching pins, bars, clamping levers, or similar, or can have an automated system whereby the setting down or lifting up of the gripper or the load unlocks or locks the gripper.

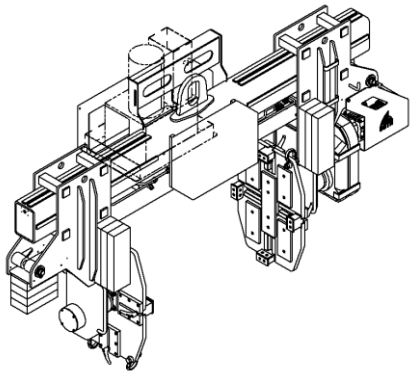

Figure 29: Example of gripper with friction-locking

There is a danger of crushing when attaching the load! Use the hand grips provided and never reach between the load and the load suspension device. Persons are forbidden from being underneath the load or being in the hazard area! The gripper shall be used only for the approved and described load. Lifting and transporting of other loads is not permitted or must be agreed with the manufacturer before starting with such work! It is not permitted to go beyond the maximum and minimum operating limits set by the manufacturer!

4.11.2. Hazards and residual risks

!	**DANGER** There is a danger of crushing when attaching or picking up the load.
!	**DANGER** Disregard of the defined load and operating limits results in the risk of the load slipping off the gripper. Observe friction values!
!	**DANGER** Gripped materials dropping due to severe swinging movements or striking against objects.
!	**DANGER** All attachment points must be dry and free of grease and oil in order to prevent the load sliding.
!	**DANGER** Overloading of the beam due to asymmetrical load attachment points.

4.12. Turning beams

4.12.1. Intended use

Turning beams are used for turning and pivoting heavy or unwieldy loads. Components are fixed in place and moved securely to the correct position. In doing so, high turning speeds and turning angles of up to 360° are possible.

Thanks to the adjustable gripping width, turning beams with lifting straps or chains can be used universally. The loads can be turned manually or with electrical motors. Turning beams generally have a central crane suspension point, which can be adjusted manually or with electrical motors (custom designs such as eyes for single or double crane operation, chain or bar suspension for double hooks, or similar possible). The load attachment is generally always implemented symmetrically to the crane attachment and perpendicular to the beam. When doing so, ensure that the centre of gravity of the load is always located vertically underneath the crane hook. In the case of turning beams with adjustable crane attachment, the position of the centre of gravity of the load can be individually adjusted. When attaching the load, observe the permissible incline of the load suspension device (Figure 8 and Figure 9, page 9).

All of the statements and instructions in this operating manual are also applicable and binding for turning beams! **Important supplementary information and safety instructions for turning beams can be found in the annex of the documentation (test log).**

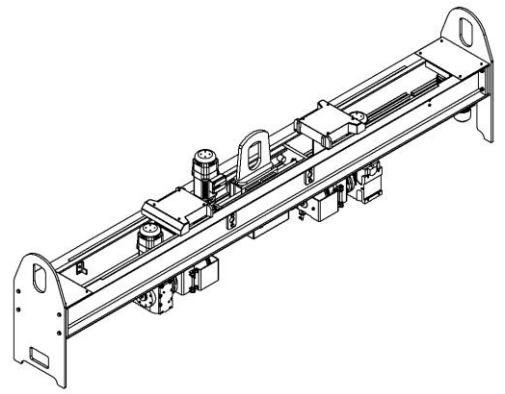

Figure 30: Turning beam

4.13. Custom designs

4.13.1. Intended use

Alongside the load attachment equipment listed in this operating manual, various custom designs are also possible to suit the respective application (Figure 31).

All of the statements and instructions in this operating manual are also applicable for the operation and use of these custom designs! **Important supplementary information and safety instructions for turning beams can be found in the annex of the documentation (test log).**

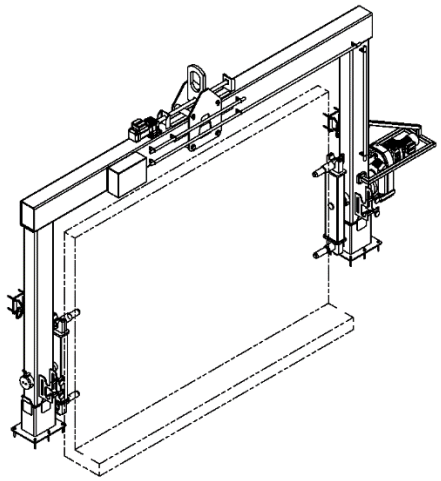

Figure 31: Example custom design

5. Using the load suspension device

5.1. Preparations

The load suspension lies in its equipment storage place. The pick-up point of the load suspension device is connected to the corresponding crane hook. A suitable lifting device with sufficient loading capacity must be used.

5.2. Slinging the load

The load-bearing capacity (WLL) cited on the load suspension device is the maximum load permitted to be attached. In doing so, the net weight of all attachment equipment used (chains, ropes, straps, slings, etc.) must also be included to calculate the weight of the load to be transported. Together with the net weight of the load suspension device, the load-bearing capacity of the crane used shall not be exceeded under any circumstances. Only attachment points and attachment equipment which are adequately dimensioned for the weight of the load and the pulling direction should be used.

It is only permitted to lift or transport a single load or a single securely bundled unit of loads at any one time!

On lifting beams with fixed crane or load suspensions, only symmetrical loads should be slung to the beam, or there is a risk of unacceptable movement of the load. When a load is being lifted, the crane hook must remain above the centre of gravity at all times. If the crane hook is not over the centre of gravity, the whole system will be tilted during lifting until the centre of gravity is under the crane hook. Ensure that the load does not swing when being lifted.

In the case of load suspension devices with adjustable crane or load suspensions, the centre of gravity of the load must be estimated beforehand and the adjustable attachment points (e.g. centre eye, load hook, belt rollers) adjusted to suit the load being lifted. Then lift the load off the ground a little by means of ropes, chains, lifting straps etc. with the load hooks, belt rollers or similar connected to the load suspension device. If this results in the load suspension device hanging at an incline, set the load back down again and change the position of the attachment points accordingly. The transport shall only be undertaken once a renewed lifting attempt demonstrates that the load suspension device remains horizontal.

Since the load suspension device with load will never hang absolutely level, according to DIN EN 13155 a max. angle of inclination of 6° is defined as permissible. The 6° maximum permissible incline angle of the load suspension device shall not be exceeded at any time.

During attachment, the level of the load's centre of gravity should also always be observed and subjected to a critical assessment! There is no issue if the centre of gravity is lower than the slinging points on the load. Wherever the centre of gravity is higher than the load slinging points, particular attention is required! In such cases, incorrect attachment could cause the system to turn over completely!

!	**WARNING** Use the drive of the lifting device to attach the crane hook. Do not reach in-between crane hook or load and the attachment point of the load suspension device.

!	**CAUTION** When attaching the load-bearing equipment, the operator must ensure that the load-bearing equipment can be operated in such a way that the operator is not endangered by the equipment, the load carrier or the load.

5.3. Moving the load

The operator is only permitted to initiate a load movement once they are sure that the load is correctly attached and that there are no people in the hazard area. When lifting, ensure that the load is stably positioned in order to prevent accidents due to tilting, rolling or impacts. This also applies to loads that are adjacent or underneath. Lifted goods shall always be transported slowly and carefully and close to ground level. Standing beneath a raised load is prohibited. Do not leave a load raised or in the tensioned state for an extended period of time or unsupervised.

The operator shall always stand at a safe distance of one arm's length to the side of the load suspension device. When not being used,

the load suspension device should be stored stably. In the event of functional faults, take the load suspension device out of service immediately.

!	**DANGER** Suspended loads! When moving the load, pay attention to the routes taken by the lifting device. Do not carry the suspended load over personnel and deny access underneath the load while it is suspended.

!	**WARNING** Use the drive of the lifting device to release the crane hook. Do not reach in-between crane hook or load and the attachment point of the load suspension device.

5.4. Setting the load down

When setting the load down make sure that the depositing site is unobstructed, clean, and level.

!	**WARNING OF CRUSHING HAZARD** Use the drive of the lifting device to release the crane hook. Do not reach in-between crane hook or load and the attachment point of the load suspension device.

5.5. Improper use

The load-bearing capacity (WLL) of the load suspension device shall not be exceeded. No alterations shall be carried out on the load suspension device. The use of the load suspension device for transporting personnel is forbidden. When transporting the load, avoid swinging movements and striking objects. The transport of more than one load or a load that can move, loosen or fall during transportation is forbidden. It is prohibited to attach loads and lift them by means of any binding wire or strapping that may be present! The application of lateral pulling forces to the load suspension device is forbidden. The safety catches of the hooks being used must always be closed once the ropes, lifting straps or chains have been attached. Do not allow the load suspension device to fall from great heights. The device may not be used in atmospheres capable of exploding.

5.6. Transport, storage, decommissioning and disposal

The following points should be observed during the transport of the load suspension device:

- Do not drop or throw the load suspension device, always set it down carefully
- Use suitable transport equipment. This should be appropriate to the local conditions.

The following points must be observed for the storage or temporary decommissioning of the load suspension device:

- Store the device in a clean and dry location, as well protected from frost as possible
- Protect the device from dirt, moisture and damage with a suitable cover
- If the device is to be put back into service after having been decommissioned, it must first be subjected to renewed checking by a capable person

After decommissioning, the parts of the load suspension device, and the operating materials (oil, grease, etc.) if applicable, should be disposed of or submitted for recycling in accordance with legal provisions.

6. Inspections

The load suspension device was subjected to an internal production control at the manufacturer's site. In accordance with the existing national/international accident prevention regulations and safety regulations, the load suspension device must be checked by a capable person in accordance with the hazard assessment of the manufacturer

- Before the initial commissioning
- Before recommissioning after being stored
- After major alterations
- At least 1x per year

The respective operational conditions (e.g. in electro-plating, or similar) may result in shorter checking intervals being required.

!	**CAUTION** Hazard due to incorrect assembly or incorrect or unapproved spare parts. When replacing components, use only original parts or parts approved by the manufacturer.

!	**CAUTION** Danger of injury through structural failure due to corrosion or other decomposition processes. Check the load suspension device for damage at regular intervals. Do not use the load suspension device when damaged.

6.1. Inspections before initial commissioning

Before initial commissioning, the load suspension device must be inspected by a competent (qualified) person in accordance with DGUV Rule 109-017, and may only be put into operation once any detected deficiencies have been rectified.

The inspections before initial commissioning are mostly visual inspections and function checks. These must include:

- Checking the condition of the components, load carrier and equipment or devices
- The condition of the load-bearing structure with regard to damage, wear, corrosion or other alterations
- Correct assembly
- Presence and effectiveness of all safety devices

Paint damage should be repaired in order to prevent corrosion. All linkage points and sliding surfaces should be lightly lubricated. The device should be cleaned if heavy soiled.

Furthermore, the presence of the type plate, with the following information, should be checked:

- Details of the manufacturer
- Loading capacity
- Unladen weight
- Serial number
- CE mark

The inspection and commissioning must be documented in the inspection certificate.

6.2. Inspection before commencing work

The load suspension device should be subjected to a visual inspection by the user/operator before starting work. The inspections are mostly visual inspections and function checks. These must include:

- Checking the condition of the components and devices (damage, cracks, deformations, wear)
- Correct assembly as well as the presence and effectiveness of all safety devices
- Contamination that could influence or impair the operation of the load suspension device

It is also necessary to ensure that the surfaces of the goods to be lifted where the load suspension device will attach are free of grease, paint, dirt, scale and coatings. In particular with load attachment equipment using friction-locking systems, it is necessary to ensure that the surfaces are dry and free of grease and oil (↗ chapter 4.11, page 20)!
Paint damage should be repaired in order to prevent corrosion. All linkage points and sliding

surfaces should be lightly lubricated. The device should be cleaned if heavy soiled.

6.3. Regular inspections

Each load suspension device must be inspected by a competent (qualified) person at least once a year, according to DGUV Rule 109-017. Depending on usage conditions, inspections at shorter intervals may also be required. This applies to particularly frequent use, increased wear, corrosion, temperature effects, and greater susceptibility to failure.

All moving parts, i.e. hook, bolts, shackles, chain links, screw connections, cotters, springs, axles, rollers, cable pulleys, gas springs, etc. must be checked for completeness, functional safety, as well as wear and mobility. The max. reduction in area for the wear of moving parts stated in BGV regulation DGUV Rule 109-017 must be accounted for.

In addition, the presence of the type plate and identification of the load suspension device must be checked.

For load suspension devices that are soiled or coated with substances like paint, salts, etc. during use, prior cleaning may be necessary.

The inspection must be documented in the inspection certificate.

6.4. Extraordinary inspections

Extraordinary inspections according to DGUV Rule 109-017 must be performed on load suspension devices after repairs, damage, and other occurrences, which could have an effect on their loading capacity.

The scope of this inspection is in accordance with the nature and scope of the damage, repair work, or other occurrence, and must be determined on a case-by-case basis. Accessories must be checked against the relevant provisions of BGV regulation DGUV Rule 109-017.

The checks must include:

- Checking the condition of the components, load carrier and equipment or devices
- The condition of the load-bearing structure with regard to damage, wear, corrosion or other alterations
- Correct assembly
- Presence and effectiveness of all safety devices

All moving parts, i.e. hook, bolts, shackles, chain links, screw connections, cotters, springs, axles, rollers, cable pulleys, gas springs, etc. must be checked for completeness, functional safety, as well as wear and mobility. The max. reduction in area for the wear of moving parts stated in BGV regulation DGUV Rule 109-017 must be accounted for.

Paint damage should be repaired in order to prevent corrosion. All linkage points and sliding surfaces should be lightly lubricated. The device should be cleaned if heavy soiled.

7. Maintenance

Alongside the checks stipulated in chapter 6, the load suspension device must also be serviced at regular intervals. Whilst Big-Bag beams (Figure 15) or bar beams (Figure 16, Figure 17), for example, are largely maintenance-free, extendable beams (Figure 24), grippers (Figure 28), turning beams (Figure 30) or custom designs (Figure 31), for example, require particular attention with regard to regular maintenance.

Alongside the tasks and regulations cited in the previous chapters, slide surfaces, bearings and other turning and sliding connections, for example, must be lubricated or greased at regular intervals. Screwed connections must be checked to ensure that they are safe and functioning properly and re-tightened if necessary. Different tightening torques (Table 7) are required for this depending on the size of screw used (unless otherwise stipulated).

Tightening torques (Nm) for steel screws with regular threads			
Dimensions	Tightening torque		
Strength class	8.8	10.9	12.9
M 8 x 1.25	25	36	43
M 10 x 1.50	49	72	84
M 12 x 1.75	85	125	145
M 14 x 2.00	135	200	235
M 16 x 2.00	210	310	365
M 18 x 2.50	300	430	500
M 20 x 2.50	425	610	710
M 22 x 2.50	580	830	970
M 24 x 3.00	730	1050	1220
M 27 x 3.00	1100	1550	1800
M 30 x 3.50	1450	2100	2450

Table 7: Tightening torques for steel screws

8. Repairs

No repairs should be carried out without consulting the manufacturer. If a repair is performed by the operator after consulting the manufacturer, the load suspension device must be checked anew before recommissioning (↗ chapter 6, page 24). This also applies in the event of recommissioning after an extended period of downtime.

9. Directories

9.1. Figures

9.2. Tables

Version 04/2019 (ENG), translation of the original operating manual for load suspension devices