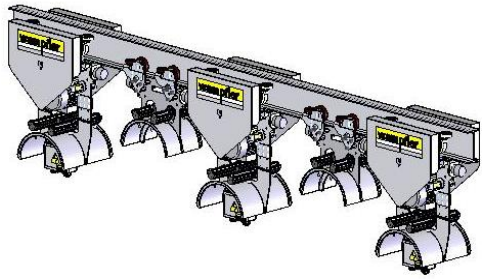
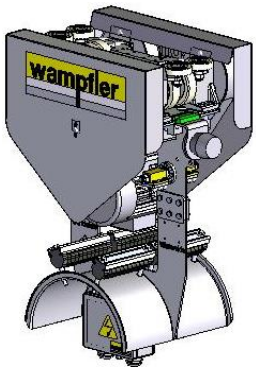
Installation Instruction

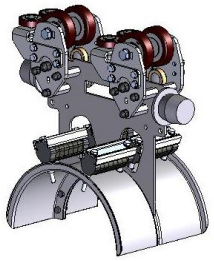
Festoon System
Cable Trolley Program 365/380

MV0380-0036b-EN

Festoon system with motorized cable trolleys and non-motorized cable trolleys







C O N T E N T S

Installation Instruction

Festoon System
Cable Trolley Program 365/380

MV0380-0036b-EN

Installation Instruction

MV0380-0036b-EN

Festoon System
Cable Trolley Program 365/380

1 General advice

1.1 General security advice

1.1.1 Safety and alarm signs

The following symbols and designations will be used in this operating instructions as safety and alarm signs:

WARNING! Threat to life or physical condition!
Serious damage to persons or deadly accidents can happen when working and operating instructions with this symbol are not observed accurately. Any sign of the category "Warning" must be **strictly** observed.

ATTENTION! Damage to machines/material!
Momentous damage to machines and/or material can be the consequence if working and operating instructions with this symbol are not observed accurately. Any sign of the category "Attention" must be followed **precisely**.

ADVICE!
Working will be more effective and easier, if working and operating instructions with this symbol are observed.

INFORMATION!
Refers to another valid document.

1.2 General safety regulations and organizational measures

The operating instructions must be within reach at the location of the cable trolley system any time. In addition it is important to observe the general legal regulations for the prevention of accidents and protection of the environment.
The operator must observe the following standards, regulations and directives for the operation of the cable trolley system:

EC-machine directives	
EC-low voltage directives	
EN 292	Safety of machines
IEC 60-1	Rotating electrical machines
IEC 60-5	Electrical types of enclosure
IEC 364	Electric installations
IEC 947-5-1	Low-voltage switching stations
UVV	Regulations for the prevention of accidents on cranes

Before starting work the operating and maintenance staff must have read and understood the operating instructions and in particular the safety directives. Protective equipment for the operating and maintenance staff must be provided and worn.

The operator of the installation or an authorized person must supervise the correct handling of the system with respect to safety and prevention of damage.

1.3 Special safety advice

During transport/assembly:
- Fasten components and larger assembly groups carefully to suitable and technically faultless hoist units/load-carrying equipment with sufficient load capacity.

For connection:
- Connections must only be finished by specially skilled staff.

During commissioning:
- Visual controls and compulsory tests must be carried out prior to the first commissioning and during daily commissioning.
- Avoid each operation that is causing security worries
- Only operate the system with functional protection and safety devices
- Notify any damage at the cable trolley system immediately to the responsible person
- Protect the cable trolley system from unintended or unauthorized use

See also conventional application chapter 1.8.

For cleaning / maintenance / repair / servicing:
- For overhead assembly works use the provided access aids and working platforms.
- Do not use machine parts as access aids.
- Check cables for chafe marks and damage.
- Care for safe and environmentally sound emptying, collection and disposal of operating and auxiliary supplies.
- Safety devices that have been removed for assembly, maintenance and repair works, must be remounted and checked immediately after termination of those works.
- Observe the maintenance and inspection intervals specified in the maintenance instructions.
- Observe the statements in the operating/maintenance instructions for the replacement of components.
- Secure the maintenance and repair area.

- Secure the cable trolley system during maintenance works from unexpected switch-on.
- Secure detached parts from falling down.
- Switch off power supply switch and secure from unauthorized switch-on.
- During maintenance works retighten and secure the detached bolted connection as prescribed.
- Replace mounting elements and sealings that are not usable any more (e.g. self-locking nuts, disks, splints, O-rings, sealings, glued or micro-encapsulated screws.
- Cleaned, wiped-off or removed lubricated or greased spots must be relubricated as prescribed after termination of the maintenance and repair works.

1.4 Hints for protection from danger

Dangerous areas must be clearly marked by danger signs and secured by barriers. It must be secured that hints about dangerous areas will be observed.

Dangers can be produced by:
- improper application
- insufficient observance of the safety advice
- insufficient execution of test and maintenance works

1.4.1 Danger by mechanical influences

WARNING! Threat to life or physical condition!
Unconsciousness and injuries by:
- Crushing, shearing, cutting, winding
- Pulling in, pushing, stinging, rubbing
- Sliding, stumbling, falling

Causes:
- Crushing, shearing and winding areas
- Breakage and bursting of parts

Possibilities of protection:
- Keep floor, equipment and machines clean
- Remove leakage
- Observe required safety distances

1.4.2 Danger by electric energy/current

At first all disturbances must be analyzed, then the cause of the disturbance must be eliminated.
Works on electric systems or operating facilities must only be carried out by qualified staff or by instructed people under the direction and supervision of a qualified person and according to the electrical regulations.

WARNING! Threat to life or physical condition!
Death by electric shock, injuries and burns by:

- Touching
- Faulty insulation
- Faulty maintenance and repair
- Short circuit

Causes:

- Contact with, touching of or immediate proximity to not insulated current-carrying, live parts
- Application of a not insulated tools
- freely located, electro-conductive parts after breakdown of the insulation
- Insufficient execution of the safety control after maintenance works.
- Installation of incorrect fuses

Possibilities of protection:

- Machine and system parts that are subject to maintenance works must be disconnected from the supply and secured from reactivation.
- Test activated parts for disconnection from the supply first and cover and safeguard live parts.
- Control the electric equipment at regular intervals
- Replace loose or damaged cables immediately
- Always replace blown fuses by equivalent ones
- Avoid touching live parts
- Use a tension-insulated tool

1.5 Technical status

These operating instructions have been issued in July 2005.

1.6 Technical details

INFORMATION!
See technical documentation.

1.7 Recurring tests

Each operator must duly enter all test, maintenance and repair works into the test book and have them approved by the responsible person/surveyor. Warranty will be restricted in case of inexact or missing entries.

ATTENTION! Damage to machines/material!
Apparatus and equipment must be checked by a technical expert at regular intervals. Basically he has to carry out visual and functional controls, ascertaining the condition of components as to damage, abrasion, corrosion and other changes. Moreover he will judge about the completeness and efficiency of the safety devices. For the evaluation of wearing parts it may be required to dismount the parts.

ATTENTION! Damage to machines/material!
All periodic tests have to be initiated by the operator.

1.8 Conventional application

The cable trolley system has been constructed according to the latest technology and the approved safety-engineering regulations and has been checked for security by the manufacturer. Cable trolley systems may only be operated in a technically perfect condition according to the regulation and by trained, safety-conscious personal.
Conventional use of the system also includes the observance of the operating, maintenance and repair conditions specified by the manufacturer.

Unconventional use are:
- Exceeding the projected loads
- Exceeding the projected speeds
- Excessive decelerations
- Use of in inappropriate cables (see also chapter 3.5)
- Change of atmospheric conditions (transfer of the projected place of installation)
- Overloading the electric drives
- Bridging or switching off the electric sensors or switches
- Installation of technically unsuitable guiding systems (e.g. tracks not coming up to the requested dimensions, corroded tracks, offset at the track transitions etc.)
- Projecting edges at insufficient distances at the crane construction around the cable trolleys.

The manufacturer is not responsible for any damage to the system or to persons if the system is not used according to the regulations.

1.9 Hints for the use of the installation instructions

As a supplement to the operating instructions the operator must observe the following documentations (if applicable):

- Order-related documentations
- Mounting instructions
- Maintenance instructions
- Operating instructions of installed electrical equipment
- Drawings
- Spare parts list
- Drafts

2 Needed tools

Screw-wrench

Ratchet drill

Caliper

Tool box

Tape measure

Paint-brush, paint

Tensiometer

Welding apparatus

Electric installation tools

Grease/oil

3 Special installation instructions

3.1 Track

The operator is responsible for the safe fixation of the track beam and for controls as to wear, corrosion, damage.

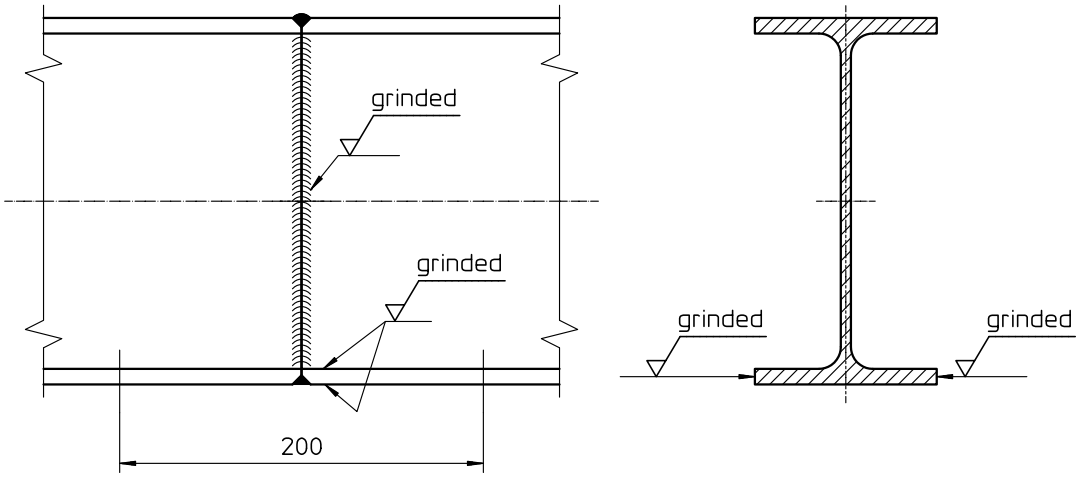
The following items have to be observed for the assembly of the track beam:

ATTENTION! Damage to machines/material!

- Generally the track beams must be protected from corrosion by appropriate measures.
- When welding several beams these must have the same deviations in dimension, form and position.
- The beam flanges must be aligned very accurately on a horizontal and vertical level.
- Transport damage, rolling faults etc. at the track beam are not permissible.
- Adjusted spots (welding, grinding etc.) at the track beam must be protected again against corrosion by appropriate measures.

Draft 1: Grinding of welded track beams

ATTENTION! Damage to machines/material!
Edges and offsets on welded track beams must be straightened by grinding over a length of 200 mm.



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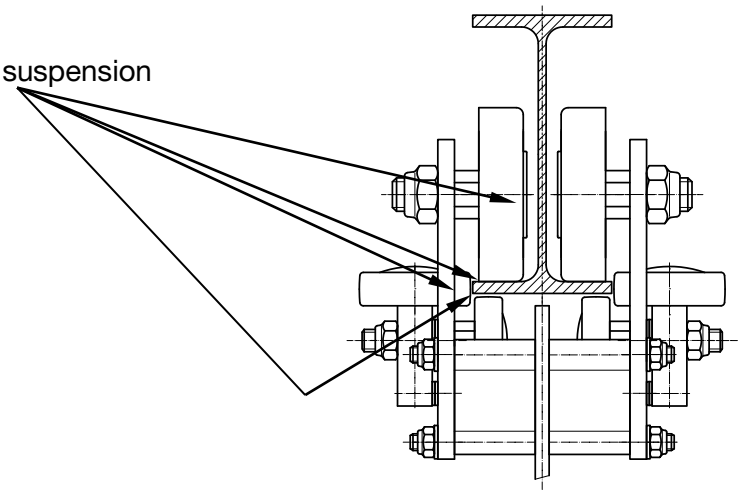
Draft 2: Construction of welded track beams without offset

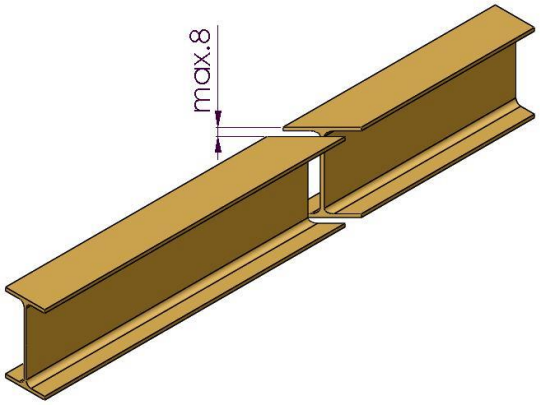
ATTENTION! Damage to machines/material!
Welded seams on the track beam must be without offset at possible points of contact on the chassis. Fixing elements and suspension pieces are not permitted at the points of contact on the chassis.

No offset, fixing elements, suspension pieces etc.



Draft 3: I-Beam joint on not welded track beams:

ATTENTION! Damage to machines/material!
On not welded beam joints the gap between the beams may be **max. 8 mm**. Cutting is made at an angle of 45°. See also draft 4.



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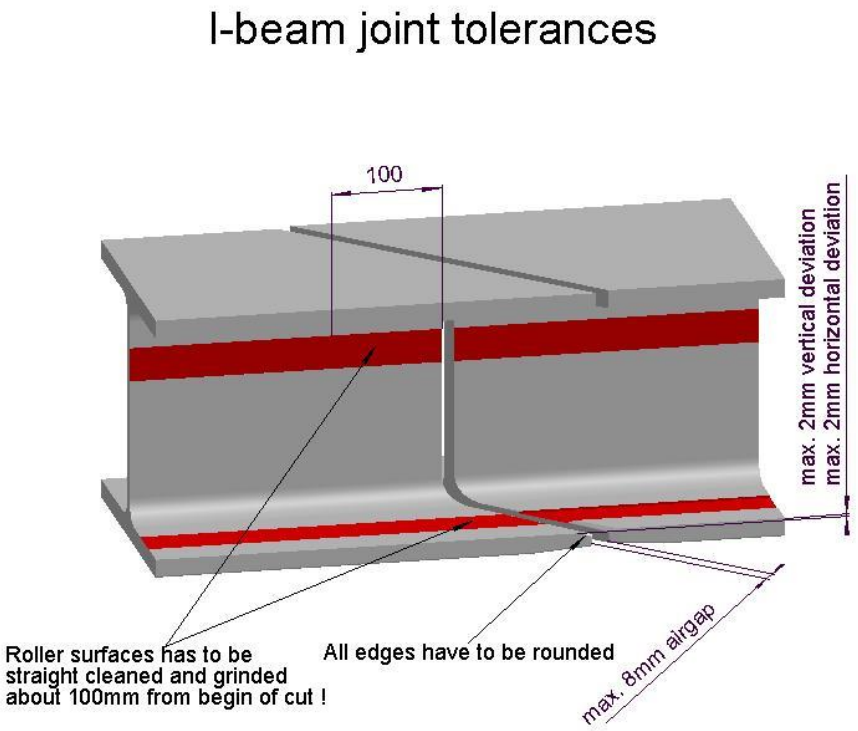
Draft 4: I-Beam joint tolerances

ATTENTION! Damage to machines/material!
The vertical and horizontal offset on the I-Beam joint have to be max. ± 2 mm. All edges have to be rounded. The roller surfaces have to be straight cleaned and grinded about 100mm from the beginning of the cut on both sides.



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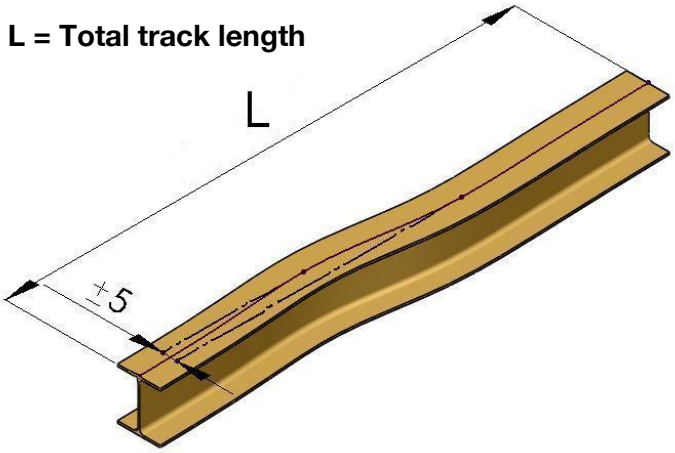
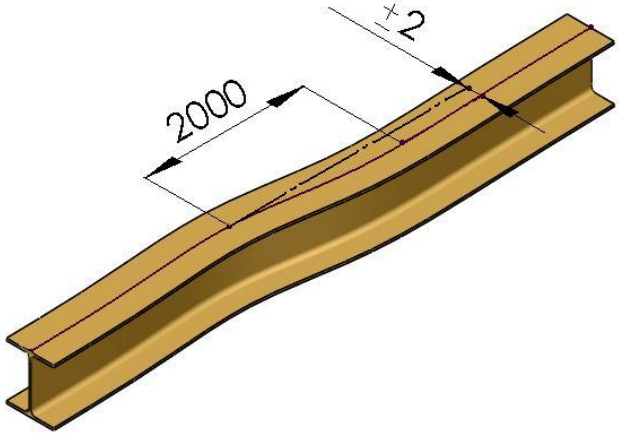
Draft 5: Horizontal dimension deviation at the track beam

ATTENTION! Damage to machines/material!
The horizontal dimension deviation over the total length of the track beam may be max. ± 5 mm, within 2 m however only ± 2 mm.

L = Total track length





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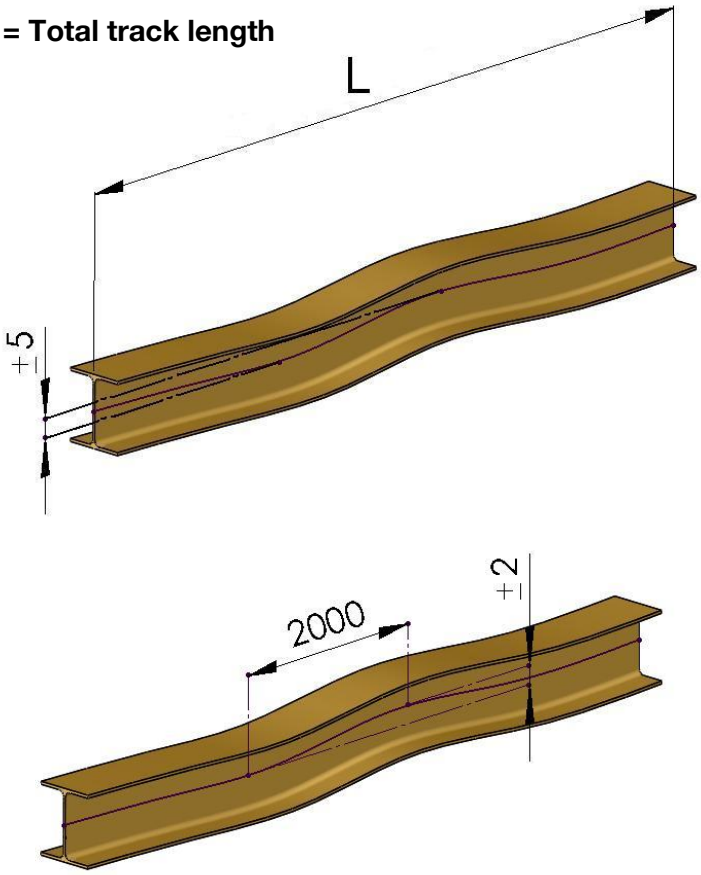
Draft 6: Vertical dimension deviation at the track beam

ATTENTION! Damage to machines/ material!
The vertical dimension deviation over the total length of the track beam may be max. ± 5 mm, within 2 m however only ± 2 mm.

L = Total track length



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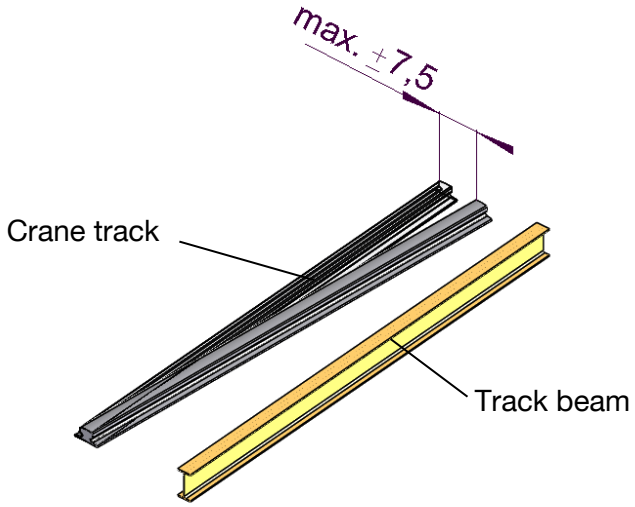
Draft 7: Horizontal offset of the crane track to the track beam

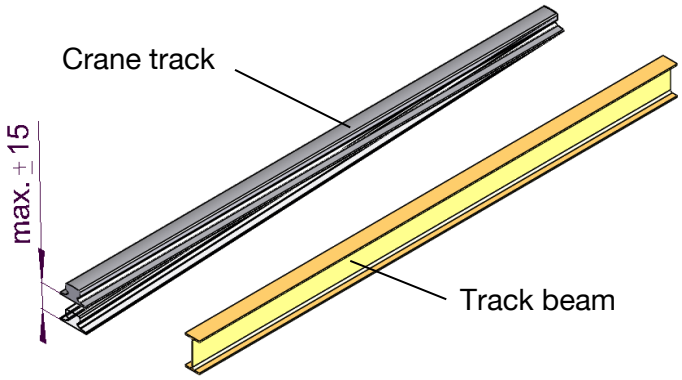
ATTENTION! Damage to machines/ material!
The horizontal offset of the crane track to the track beam may be max. ± 7.5 mm. In this tolerance the possible offset of the crane track is included. Higher tolerances require a written approval by Wampfler AG.



NOTE!
When exceeding these tolerances it is recommended to install towing clamps.

Draft 8: Vertical offset of the crane track to the track beam

ATTENTION! Damage to machines/material!
The vertical offset of the crane track to the track beam may be max. ± 15 mm. In this tolerance the possible offset of the crane track is included. Higher tolerances require a written approval by Wampfler AG.



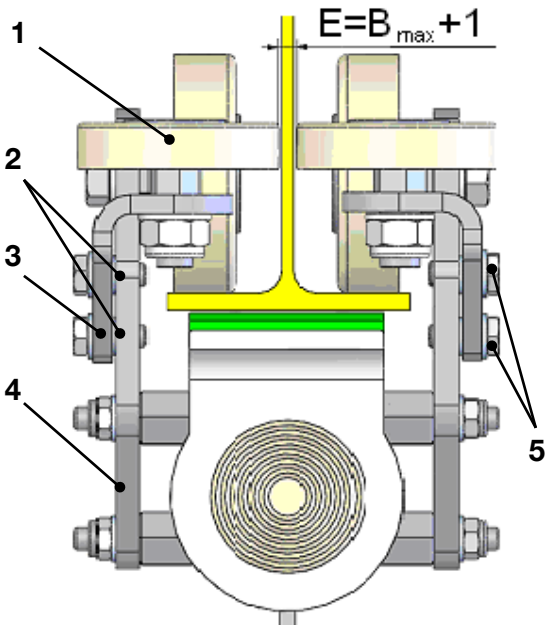
NOTE!
When exceeding these tolerances it is recommended to install towing clamps.

3.2 Adjustment of the chassis on cable trolleys

The guide rollers of the chassis are adjusted ex works to the max. plus-width tolerance of the track beam stated with the order.

ATTENTION! Damage to machines/material!
- Prior to commissioning the system it is required to inspect the chassis and adapt the adjustment of the horizontal guide rollers to the actual tolerances of the horizontal guide rollers of the track beam.
- On chassis guided by the web of the beam it may occur that the adjustment cannot be made ex works depending on the type of cable trolley. This must be made prior to commissioning the system at the installation site of the crane. Ensure a tight fit of the horizontal guide rollers.
- Chassis with horizontal guide rollers must be checked for wear according to the maintenance instructions. If a proper guidance of the cable trolleys is no longer possible due to worn out guide rollers, the guide rollers must be readjusted or replaced.
- On chassis of motorized cable trolleys guided by the web of the beam pre-adjustment ex works may not be made. This must be checked on site and adjustment to the actual width of the track beam and fixation must be made if required.

Draft 9: Examination and adjustment of the horizontal guide rollers



The completely mounted cable trolleys are pushed one after the other onto the track beam from the front side. The adjustment of the horizontal guide rollers (1) can be made by removing or adding the washers (2) between side shield (4) and horizontal guide plate (3). This is an advantage especially on beams with a strong minus tolerance. For dismounting – mounting of the horizontal guide plate the screws (5) must be secured with **LOCTITE 243**.
The horizontal guide rollers (1) have been adjusted ex works to the max. plus tolerance of the track beam and have to be checked for the existing clearance.
The setting dimension E:

$$\mathbf{E = B_{max} + 1}$$

B_{max}: max. thickness of Web

3.3 Fixation of the end clamp at the beam

The following has to be observed for the fixation of the end clamp to the beam:

ATTENTION! Damage to machines/material!

- Differences in altitude of more than 5mm between trolley and end clamp buffer must be compensated by mounting a shim plate.
- When mounting cable trolleys with buffers on one side only, it must be observed that the buffers always come up against end stops or buffer against buffer, but never end stop against end stop.
- During the assembly the end clamp must be aligned with a **max. permissible deviation of 1°** to the longitudinal and transverse axis of the track beam.
- A shearing plate of 15 to 20 mm has been welded directly after the end clamp to absorb the buffer loads, in order to prevent shearing load onto the fixing screws and transmit the loads of the end clamp onto the track beam.

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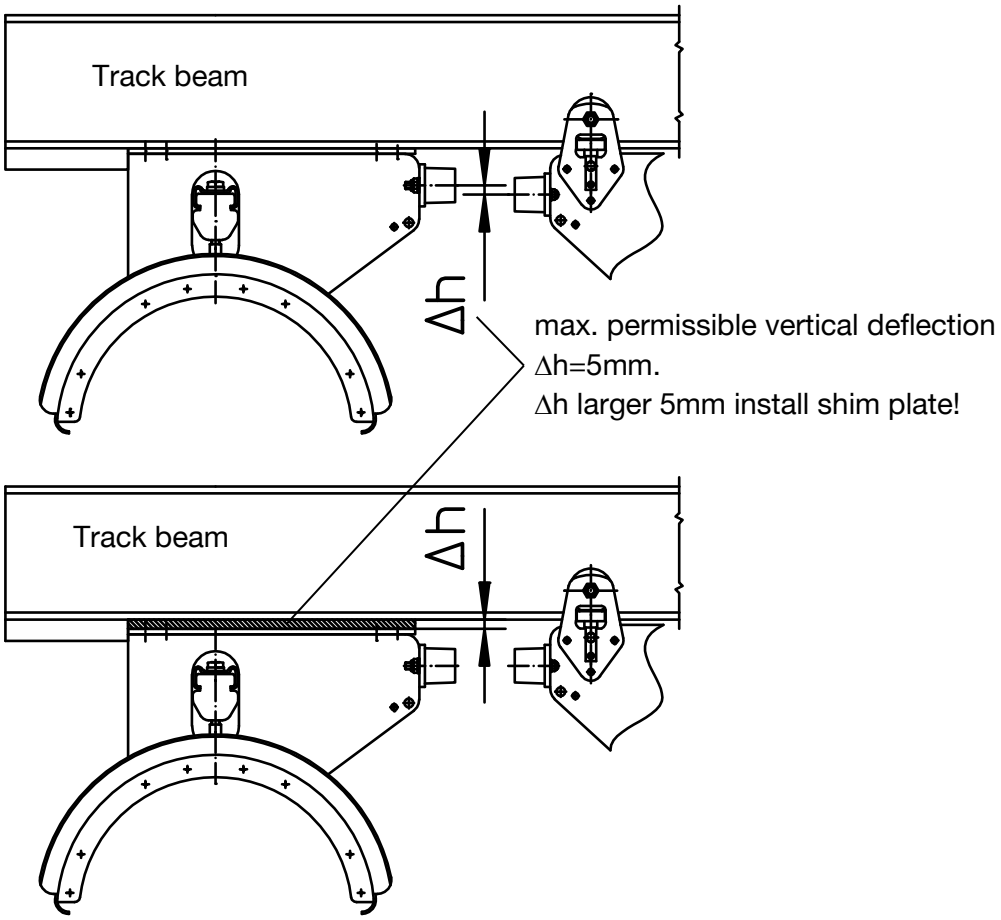
Drift 10: Height compensation of the end clamp by a shim plate



Fixation of the end clamp is made with screws at the lower flange of the track beam, where the respective drilling template must be provided. These screws must be screwed together and locked with lock nuts according to DIN 985.

WARNING! Threat to life or physical condition!
If end clamps with rubber element shock absorber are installed it is prohibited to stay behind the end clamp during operation. For the buffer stroke the piston rod requires more than 200 mm of free space into the direction of the track beam.

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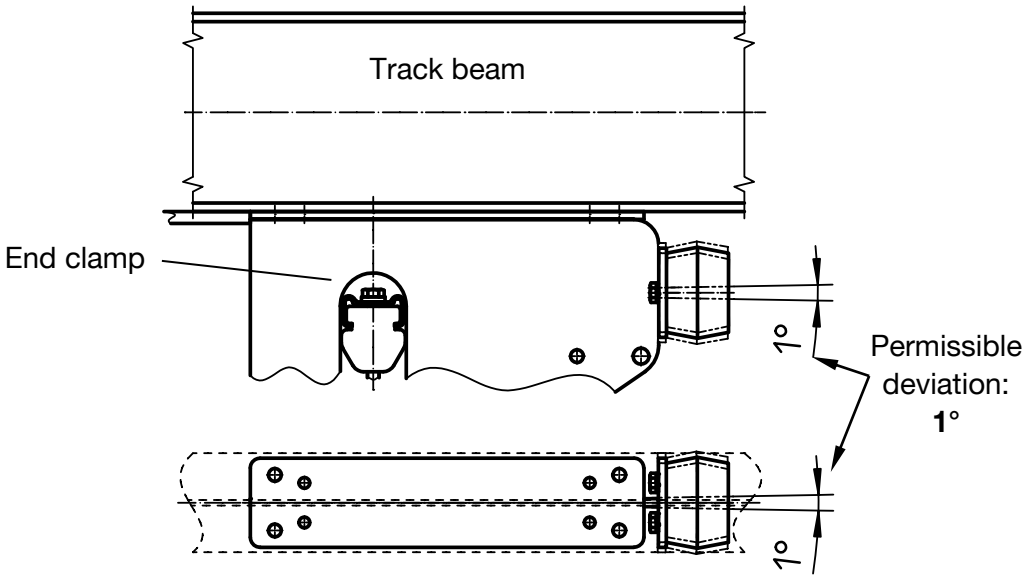
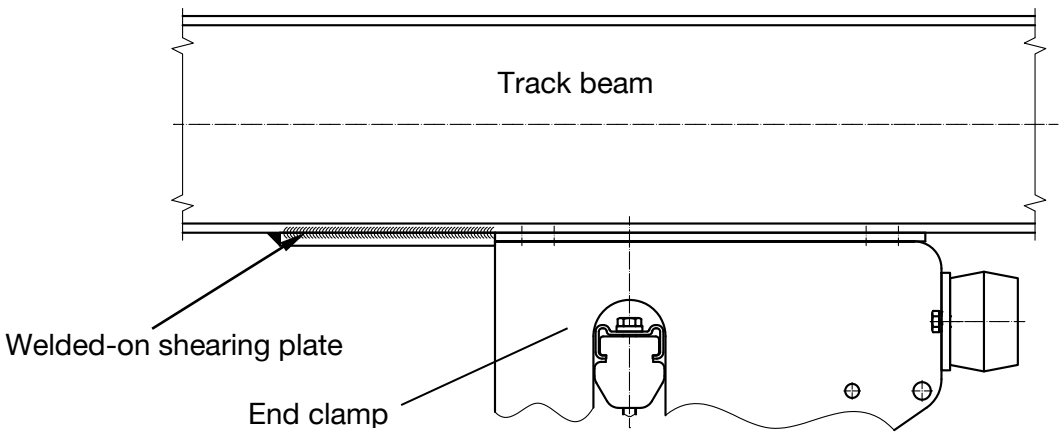
Draft 11: Permissible deviation of the end clamp to the track beam



Draft 12: Welded-on shearing plate at the track beam



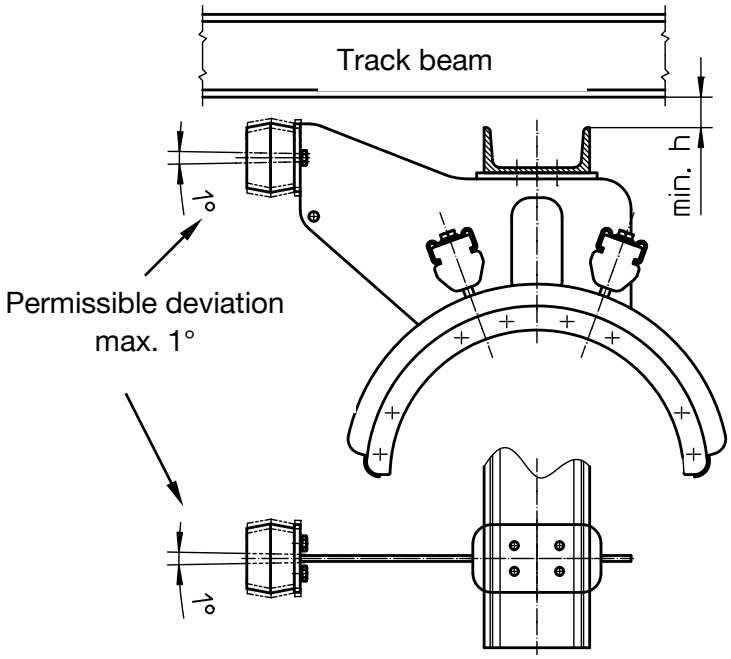
3.4 Fixation of the towing clamp at the towing arm of the crane

The following must be observed for the fixation of the towing clamp at the towing arm:

ATTENTION! Damage to machines/material!

- Differences in altitude of more than 5 mm between trolley and towing clamp buffers or between towing clamp and deflector must be compensated by the assembly of a shim plate.
- For the assembly of the cable trolleys with buffers on one side only it must be observed that the buffer comes up against the end stop or buffer against buffer, but never end stop against end stop.
- During the assembly the towing clamp must be aligned with a **max. permissible deviation of 1°** to the longitudinal axis and transverse axis of the track beam.
- The clearance h between towing arm and lower edge of track beam must be at least 12 mm.

Draft 13: Permissible deviation of the towing clamp to the track beam



The towing clamp is fixed to the towing arm with screws. The screws must be screwed together and locked with lock nuts according to DIN 985.

3.4.1 Rubber element shock absorber at the end clamp and/or towing clamp

WARNING! Threat to life or physical condition!
For all assembly works at end- and towing-clamps with rubber element shock absorber, it must be observed that the buffer elements are without initial tension.

3.5 Installing cables

ATTENTION! Damage to machines/material!
Use appropriate flexible cables only.

3.5.1 Installing round cables

ATTENTION! Damage to machines/material!
An improper arrangement of the cables in the cable package and the loop causes damage to cables and the cable trolley technique.

The cable arrangement projected for this cable trolley system must be observed. The following rules are recommended:

- Install the cables free of twists.
- Balance of torque of the cable packages to the track beam center.
- Cables with large copper cross section must be arranged symmetrically and to the trolley center.
- On multi-level cable trolleys it is required to place the cables with the highest weight per meter onto the upper support.
- On multi-level cable trolleys the cables of the upper supports must be installed with a little less additional length than the respective cables on the lower supports.
- When using round cable clamps it is required to install cables at the outside of the supports that are suitable for the fixation of the round cable clamps.
- The clamping yokes on the supports must be tightened so that thinner cables will not be pulled through during operation. Use additional clamping pieces if required.

We cannot assume any warranty for cables on cable packages that have not been projected by Wampfler AG.

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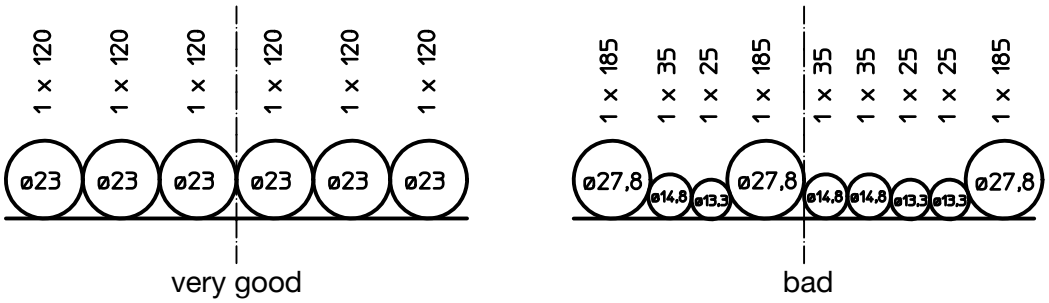
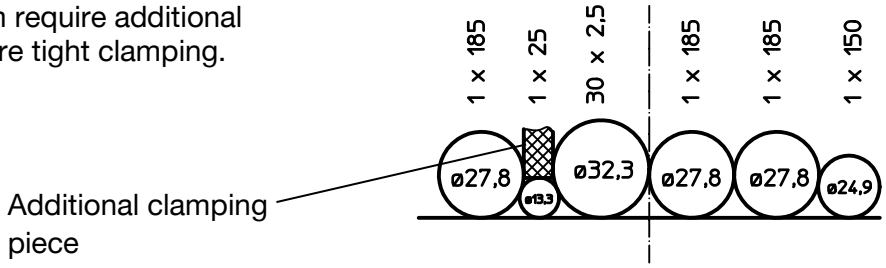
Draft 14: Differences in diameter

The diameters of the round cables should not differ too much, if possible, to guarantee tight clamping on the cable supports.



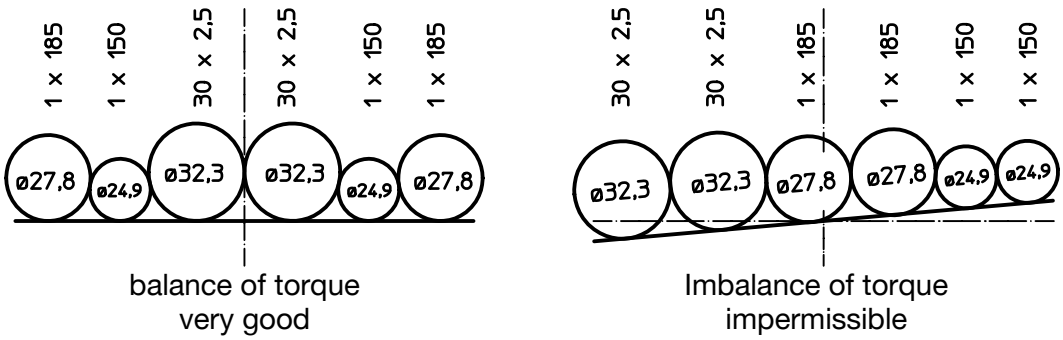
Draft 15: Use of additional clamping pieces

Differences in diameter of cables placed side by side of more than 15 mm require additional clamping pieces to ensure tight clamping.



Draft 16: Balance of torque of the cables

Observe the balance of torque when positioning the cables. Place the thicker, heavier cables into the center.



3.5.2 Round cable clamps

INFORMATION!
See mounting instructions MV0310-0005-E.

ATTENTION! Damage to machines/material!
- Improper positioning of the round cable clamps causes damage to cables and the cable trolley technique.
- Improper fixation and arrangement of the cables in the round cable clamp causes damage to cables and the cable trolley technique.

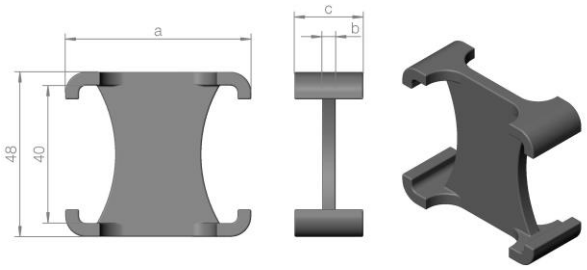
Observe free movement of the cables in the window of the round cable clamp.

3.6 Distance pieces

INFORMATION!
See mounting instructions MV0310-0005-E.

ATTENTION! Damage to machines/material!
Improper positioning of the distance pieces in round cable clamps or removing those causes damage to cables and the cable trolley technique.

Draft 17: Distance piece



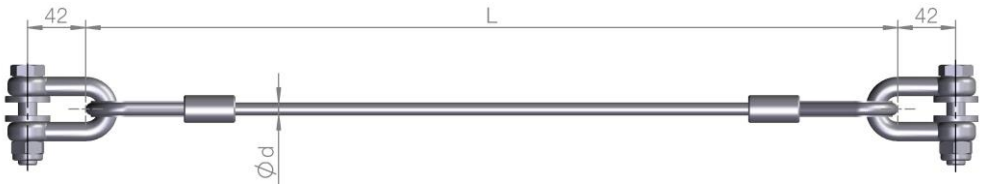
3.7 Tension relief ropes

The tension relief ropes must be mounted according to the mounting instructions.

INFORMATION!
See mounting instructions MV0310-0004-E.

ATTENTION! Damage to machines/material!
Make sure that the shackles and thimbles are free to move after the assembly.

Draft 18: Tension relief rope



3.7.1 Check of tension relief rope and withdrawal criteria

Tension relief ropes must be withdrawn immediately if any defects have been found. They must be withdrawn (replaced). A tension relief rope must be withdrawn if one or several of the following criteria have been found:

1 Broken wires
2 Structural changes
3 Corrosion
4 Wear

ATTENTION! Damage to machines/material!
Tension relief ropes must be controlled at regular intervals. The inspections must be made after intervals of 12 months at the latest.

The following rope deformations are criteria for withdrawal:

- Corkscrew deformation: A tension relief rope must be withdrawn as soon as it has reached a corkscrew deformation of the axle height of 1/3 of the rope diameter.
- Basket formation: Withdrawal in case of basket formation.
- Loop formation: Withdrawal in case of extensive changes in the rope structure due to the formation of loops.
- Wire loosening: Withdrawal in case of wire loosening caused by corrosion or wear.
- Knot formation: Withdrawal in case of knot formation, i,e. thickening in the steel rope
- Contractions: Withdrawal in case of strong contractions.

- Curl-like deformations: withdrawal, if tension relief ropes have suffered lasting deformations, because they have been pulled over an edge.
- Drawn grommets: Withdrawal in case of drawn grommets.
- Breaks: Withdrawal, if tension relief ropes got broken due to impacts from outside.

3.7.2 Maintenance of tension relief ropes

NOTE!
Tension relief ropes and the appropriate connecting elements and load-securing devices must be maintained. We recommend regular maintenance at intervals of 4 weeks with wire rope spray.

3.8 Assembly of motorized cable trolleys

The motorized cable trolleys are supplied pre-mounted on appropriate transport supports or pallets.
The cable trolleys are marked with **“1”**, **“2”** or **“3”** according to their position in the system drawing.

ATTENTION! Damage to machines/material!
The order of the motorized cable trolleys on the track beam is binding! The installation position according to the system drawing must be kept.

3.8.1 Dismounting – mounting of the toothed belt

NOTE!
Assembly works at the PowerGrip HTD toothed belt drive must comply with the particularities of the belt construction. The more careful the manufacturer’s recommendations are kept, the more favorable are the operating behavior, the degree of utilization and the lifetime.

During operation the toothed belt requires a defined pre-tension. An unnecessarily high pre-tension reduces the lifetime of the drive unit, increases the bearing load and the wear of the teeth. If the pre-tension is too low, the belt teeth will not engage properly, which can cause the belt to overleap under strong load.

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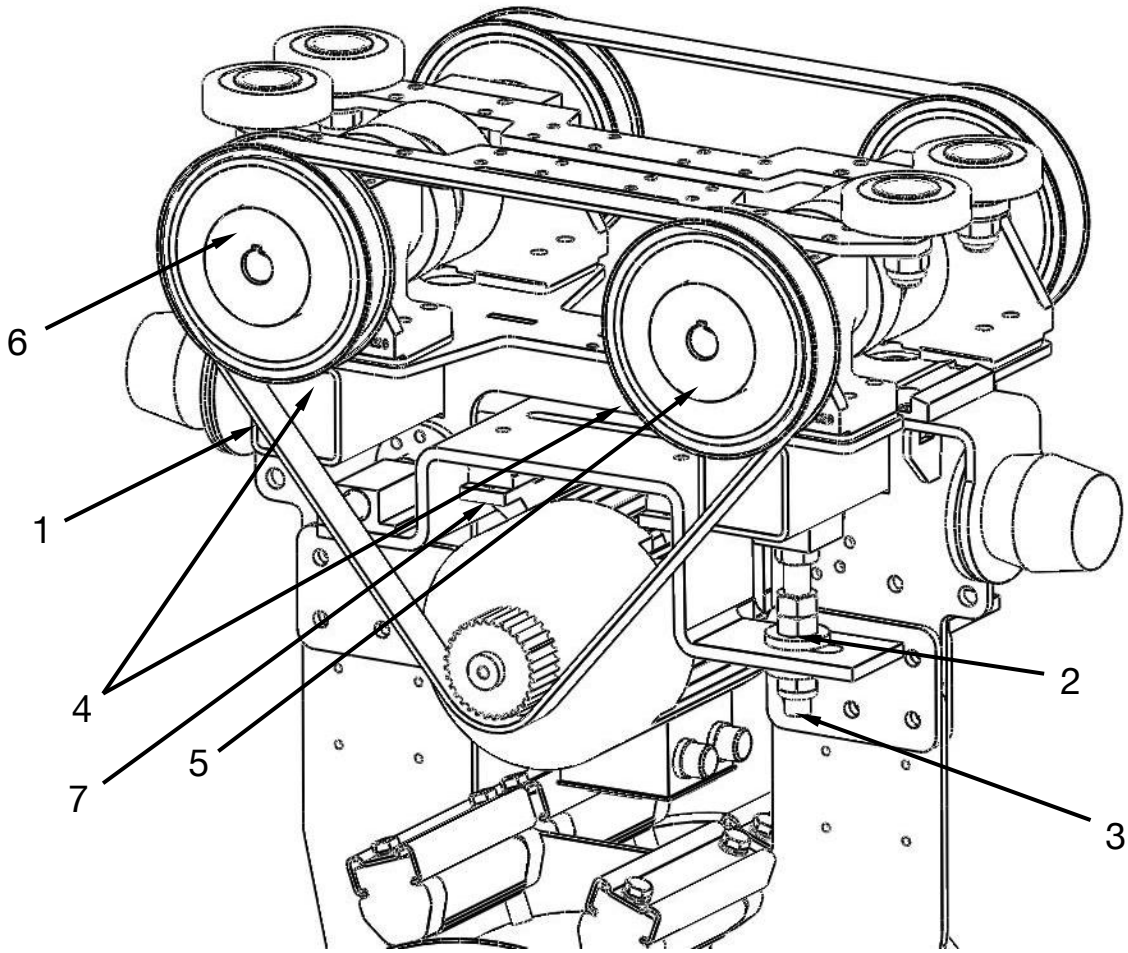
Draft 19: Motorized cable trolley



According to the mounting instructions of the toothed belt manufacturer the cable trolleys are supplied with a pre-tensioned belt (1). When dismounting or replacing the belt it is required to detach the hexagon nuts (2) and (3), so that the belt can be pulled laterally over the washer disk (4) of the toothed belt. For the installation follow the reverse order. Secure hexagon nut (2) and (3) with **LOCTITE 243**.

Disassembly - mounting steps:

1. Detach hexagon nuts (2) and (3).
2. Lift the toothed belt over the toothed-belt pulleys (5) and (6). Do not use force.
3. Installation of the new or the old undamaged toothed belt.
4. Generate pretension of the belt by turning the hexagon nut (3) on both sides.
5. Check belt tension with a tensiometer (observe operating instructions).
6. Lock hexagon nuts (2) and (3). Secure with **LOCTITE 243**.

ATTENTION! Damage to machines/material!
The belt tension must be checked regularly.
Use a tensiometer for these checks (e.g. WF tensiometer of Walther Flender). The min. and max. frequency can be seen from the corresponding drawing of the motorized cable trolley. Due to their not existing extensibility toothed belts must never been drawn by force onto the toothed disks and never be rolled over the washer disk by force.

3.8.2 Disassembly – assembly electric motor

WARNING! Threat to life or physical condition!
Connection and maintenance of the electric drive may only be carried out by qualified personnel.

WARNING! Threat to life or physical condition!
For all works at the electric motor it is important to observe the corresponding operating conditions of the manufacturer.

The drive must only be operated when the data on the rating plate of the direct current motor are in conformance with the network.
For outdoor operation the motors are provided with a corrosion-resisting varnish. Any damage to the varnish must be repaired.
It must be observed that both the incoming and the outgoing supply lines are tension-relieved.

Disassembly – mounting steps:

WARNING! Threat to life or physical condition!
It is essential that the voltage supply of the motor is interrupted.

1. The toothed belt must be dismounted as shown in chapter 3.8.1 (see draft 18).
2. Remove the additional motor anti-fall device first.
3. The motor can be taken off laterally after having detached the corresponding screw with or without the rubber to metal rail (7). It is essential to provide an appropriate anti-fall device during the assembly.
4. The three-phase motor is fixed onto the motor plate with the screws. Pay attention to the installation of the rubber to metal rail (7). The screw locking has to be made with **LOCTITE 243**.

ATTENTION! Damage to machines/material!
Prior to fixing the electric motor definitely it must be adjusted so that the toothed-belt drive is in parallel alignment. An improper adjustment causes increased wear or can cause the destruction of the toothed belt and the toothed-belt pulley.

5. The anti-fall device for the motor must be remounted in any case. The installation of new parts is compulsive.
6. Pretension toothed belt as prescribed.
7. For the connection of the motor cable compare the supply voltage. Check and keep the given terminal assignment. Clamping is made by qualified personnel only.

ATTENTION! Damage to machines/material!
The defined rotational direction of the motor must be kept.

3.9 Assembly of the magnet limit switch component assembly

WARNING! Threat to life or physical condition!
Connection and maintenance of the magnet limit switches must only be carried out by qualified personnel.

ATTENTION! Damage to machines/ material!
Unprofessional assembly and commissioning of the magnet limit switches causes damage to machines and property.

The drive order for the motorized cable trolleys in the end position will be switched off by means of the magnet limit switches. The switch-off is only effected into the traveling direction and is independent of the crane main trolley. The switch-off ensures the faultless operation of the festoon system even under extreme conditions.

Each magnet limit switch is assigned to a specific magnet.

The mounting positions of the magnets/limit switches must be realized exactly, see system drawing. Possibly the water-side position of the limit switches must be readjusted, i.e. the limit switches must be mounted exactly above the motorized cable trolleys when the system is completely extended (end position of the crane main trolley into the direction of the water).

The supply voltage for the limit switches is provided by the control of the clamping bar, see circuit diagram.

4 Commissioning of the cable trolley system

Commissioning of the cable trolley system is made and documented in cooperation with the operator. The required personnel for commissioning, such as driver, electrician, mechanics must be provided by the operator free of charge for the duration of commissioning. Free access to the crane system must be guaranteed.
After successful commissioning Wampfler will be handed out a document authorized by the operator, that the system is in conformance with the requirements.
Commissioning must be made according to the checklist "Commissioning check list".

4.1 Controls after the assembly of the cable trolley system

- Check cable trolleys for proper condition, proper function, proper flexibility, tight fit, deformation.
- Check electrical connections and supply lines for safe guidance and safe fit.
- Check running beam for efficiency.
- Check crane periphery for projecting edges, tight fit, flexibility.

4.2 Function control of the cable trolley system

For commissioning the cable trolley system must be operated with nominal load.

4.3 Operation of the cable trolley system

For operation it is important to observe the safety advice in chapter 1.

4.4 Emergency operation of motorized cable trolleys

ATTENTION! Damage to machines/ material!
In case of disturbances on one or several drives of the cable trolley system, it is only permitted to operate the system temporarily and with **reduced main trolley speed**, until the cause of the failure has been eliminated. The full availability of the system must be guaranteed within **one shift**, however after having unloaded the respective transport unit (container ship, cargo ship etc.) by the crane service. **Until that time the max. permissible main trolley speed must be limited to less than 120 m/min.**

5 Commissioning checklist

5.1 Mechanical control of the cable trolley system and accessories

A	Control at the non operated system	checked
A1	End clamp mounted at the correct height, equipped with the following welded shearing plate.	☐
A2	The towing clamp is mounted at the correct height in horizontal position and hits the buffer of the first cable trolley ideally and centrically.	☐
A3	Inserted screws have a sufficient length and are locked. Screw extensions are according to the standard.	☐
A4	All screwed connections on cable trolleys, towing trolleys, end and towing clamps are tightened.	☐
A5	Motorized cable trolley is traveling centrically on the track of the cable trolley system.	☐
A6	Horizontal guide rollers on motorized cable trolleys are adjusted and locked at the web of beam or beam flange according to the guidelines.	☐
A7	The motor is installed horizontally in the motorized cable trolley, the belt tension has been adjusted to the motorized cable trolley according to the regulations.	☐
A8	Sequence of the motorized and non motorized cable trolleys according to the system drawing.	☐
A9	Terminal box at the motorized cable trolley is installed on the correct side, see system drawing.	☐
A10	Cable entries (cable glands) at the terminal box of the motorized cable trolleys are tightened or not used entries are locked by the respective blind glands.	☐
A11	Cables are placed on supports according to the specifications (suggestion for cable assignment).	☐
A12	Loop lengths of the cables are according to the specifications in the documentation.	☐

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A	Control at the non operative system	checked
A13	The cables are installed free of twists.	☐
A14	Cable clamping bars on the supports are equally and correctly tightened.	☐
A15	The cables do not show any damage from transport or assembly.	☐
A16	Cable terminations (installation lengths) are sufficiently laid with the correct length on the end clamp or towing arm side.	☐
A17	Cable clamps in the loops are mounted on the same height according to the system drawing with the necessary offset.	☐
A18	Cable clamping bars in the loops are correctly tightened.	☐
A19	Special attaching parts, such as distance pieces for optical fibers or thinner cables, are mounted.	☐
A20	Length of the installed tension relief ropes per cable loop according to the documentation. Differences are taken into account for shorter / longer loops and motorized cable trolleys.	☐
A21	Shackles for the attachment of the tension relief ropes are mounted freely movable as prescribed.	☐
A22	Quantity and length of the rubber ropes to be used per cable loop are according to the documentation.	☐
A23	Tension relief ropes and rubber ropes are mounted free of twists.	☐
A24	Limit switch for the cable trolley system are mounted and connected according to the specified dimensions (system drawing and mounting instructions) and connected. North Pole or South Pole of the magnets with the corresponding arrangement of the limit switches are taken into account.	☐
A25	Control of the steel construction at the maintenance platform for collision-free entrance of the cable trolley system. No catching, hooking of cables, tension relief ropes and rubber ropes.	☐
A26	Rail (I-profile) for cable trolleys is mounted straight in alignment with the crane beam according to the tolerance requirements.	☐
A27	Rail junctions are without height or lateral offset.	☐
A28	Welded junctions are smoothed on all roller running surfaces.	☐
A29	Collapsible junction (e.g. at STS cranes) is constructed and ground according to our tolerance requirements.	☐

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B	**Control at the operated system:** **Main trolley travel with 10% main trolley speed from the cable trolley station / end clamp side into the direction of the seaside / towing arm side until the festoon is completely extended.**	**checked**
B1	There is so much room between cable trolley and crane construction over the complete distance that collisions with cable trolleys or attaching parts will not occur.	☐
B2	Running rail at the boom passage does not show any offset, cable trolleys are running over smoothly.	☐
B3	Drive motors are running evenly without jerks.	☐
B4	When the motorized cable trolleys pass the position of the appropriate limit switch into the direction of the water side, the corresponding limit switch signals are transmitted to the control unit..	☐
B5	The speed of the motorized cable trolleys produces a constant winding of the complete festoon.	☐
B6	Control of the cable loops at the max. extended festoon according to the specification.	☐
	Main trolley travel with 10% main trolley speed from the seaside / towing arm side into the direction of the cable trolley station / end clamp side up to the final position.	**checked**
B7	All drive motors have the same rotating direction and travel into the direction of the station.	☐
B8	Drive motors are running evenly without jerks.	☐
B9	When the motorized cable trolleys pass the position of the appropriate limit switch into the direction of the station, the corresponding limit switch signals will be transmitted when that position has been reached and the drives will be switched off.	☐
B10	The speed of the motorized cable trolleys produces a constant contraction of the complete festoon.	☐

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C	**Main trolley travel with 30% main trolley speed from the cable trolley station into the direction of the seaside / towing arm side until the festoon is completely wound off. Stop and back to the station**	**checked**
C1	Drive motors are running evenly without jerks.	☐
C2	When the motorized cable trolleys pass the position of the appropriate limit switch into the direction of the water side, the corresponding limit switch signals are transmitted to the control unit.	☐
C3	The speeds of the motorized cable trolleys produces a constant extension and contraction of the festoon.	☐

D	**Main trolley travel with 50% main trolley speed from the cable trolley station into the direction of the seaside / towing arm side until the festoon is completely extended, stop, back to the station**	**checked**
D1	Drive motors are running evenly without jerks.	☐
D2	When the motorized cable trolleys pass the position of the appropriate limit switch into the direction of the water side, the corresponding limit switch signals are transmitted to the control unit.	☐
D3	Speeds of the motorized cable trolleys produces a constant extension and contraction of the complete festoon.	☐

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E	**Main trolley travel with 50% main trolley speed from the cable trolley station into the direction of the seaside / towing arm side until the festoon is completely extended, back in counter operation without stopping, until the station.**	**checked**
E1	Drive motors are running evenly without jerks.	☐
E2	Motors have enough torque during counter operation and do not tilt.	☐
E3	When the motorized cable trolleys pass the position of the appropriate limit switch into the direction of the water side, the corresponding limit switch signals are transmitted to the control unit.	☐
E4	The speeds of the motorized cable trolleys produce a constant extension and contraction of the complete festoon.	☐

F	**Main trolley travel with 80% main trolley speed from the cable trolley station into the direction of the seaside / towing arm side until the festoon is completely extended, back in counter operation until the station.**	**checked**
F1	Drive motors are running evenly without jerks.	☐
F2	Motors have enough torque during counter operation and do not tilt.	☐
F3	When the motorized cable trolleys pass the position of the appropriate limit switch into the direction of the water side, the corresponding limit switch signals are transmitted to the control unit.	☐
F4	The speeds of the motorized cable trolleys produce a constant extension and contraction of the complete festoon.	☐

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G	**Main trolley travel with 100 % main trolley speed from the cable trolley station into the direction of the seaside / towing arm side until the festoon is completely extended, back in counter operation without stopping, until the station.**	**checked**
G1	Drive motors are running evenly without jerks.	☐
G2	Motors have enough torque during counter operation and do not tilt.	☐
G3	When the motorized cable trolleys pass the position of the appropriate limit switch into the direction of the water side, the corresponding limit switch signals are transmitted to the control unit.	☐
G4	The speeds of the motorized cable trolleys produce a constant extension and contraction of the complete festoon.	☐

H	**Main trolley travel with 100% main trolley speed from seaside / towing arm side limit position until immediately before the station area, back in counter operation without stopping.**	**checked**
H1	Drive motors are running evenly without jerks.	☐
H2	Motors have enough torque during counter operation and to not tilt.	☐
H3	When the motorized cable trolleys pass the position of the appropriate limit switch into the direction of the water side, the corresponding limit switch signals are transmitted to the control unit.	☐
H4	The speeds of the motorized cable trolleys produce a constant extension and contraction of the complete festoon.	☐

I	**Documentation**	**checked**
I1	Documentations are available at the customer	☐

Installation Instruction

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