TracFeed® NSV

Wheel tensioner

MANUAL

Read the instructions prior to performing any task!

Rail Power Systems GmbH
Garmischer Strasse 35
81373 Munich
Germany
Telephone: +49 89 41999-0
Fax: +49 89 41999-270
Email: info@rail-ps.com
Internet: www.rail-ps.com

Document number: 3EGF002103D0017-de
Translation of the original

Purpose of this manual

This manual enables the safe and efficient handling of the product.

Illustrations in this manual are intended to facilitate basic understanding and may differ from the actual design.

Before starting any work, personnel must have carefully read this manual and understood its contents. Compliance with all safety rules and instructions in this manual is a prerequisite for safe work.

In addition, local occupational health and safety regulations and general safety rules must be observed for the operational area of the product.

Target group

This manual is aimed at the following target groups:

- Installation personnel
- Installation inspectors
- Service personnel

For more information about the target groups and the qualifications that they require to perform the activities described in this manual, see “Qualification” on page 13.

Scope

Tensioning device with TracFeed® NSV wheel tensioner

Limitation of liability

All specifications and guidelines in this manual have been compiled taking account of the applicable standards and regulations, the present state of technology and the experience and insights we have gained over many years.

The manufacturer accepts no liability for damage due to:

- Failure to comply with this manual
- Improper use
- Deployment of untrained personnel
- Unauthorised modifications
- Technical modifications
- Use of unauthorised spare parts

The actual scope of supply may differ from the descriptions and depictions in this operating manual in the case of special designs, additional ordering options, or as a result of the latest technical modifications.

The obligations agreed in the supply contract as well as the manufacturer’s general terms and conditions and the legal regulations applicable at the time of conclusion of the contract shall apply.

Warranty terms

The warranty terms are included in the manufacturer’s general terms and conditions.

Supplemental directives

Copyright

Table of revisions

Date	Revision	Change
18/05/2020	01	Released after rewriting

Customer service

Our customer service division is available to provide technical information.

In addition, our employees are always interested in acquiring new information and experience gained from practical application; such information and experience may help improve our products.

Tel.: +49 89 41999-0

Fax: +49 89 41999-270

Email: info@rail-ps.com

Table of contents

Table of contents

1 Introduction

1.1 Abbreviations used

Abbreviation	Explanation
NSV	Tensioning device (from the German “Nachspannvorrichtung”)
TracFeed® ALU 2000	Overhead contact line variant TracFeed® ALU 2000
TracFeed® ALU 3000	Overhead contact line variant TracFeed® ALU 3000

1.2 Symbols used

Safety instructions

Safety instructions in this manual are marked with symbols. The safety instructions are introduced by signal words that express the extent of the hazard.

DANGER!
This combination of symbol and signal word indicates an imminently hazardous situation that will result in death or severe injuries unless avoided.

WARNING!
This combination of symbol and signal word indicates a potentially hazardous situation that could result in death or severe injuries unless avoided.

CAUTION!
This combination of symbol and signal word indicates a potentially hazardous situation that could result in minor or slight injuries unless avoided.

NOTICE!
This combination of symbol and signal word indicates a potentially hazardous situation that could result in damage to property unless avoided.

ENVIRONMENT!
This combination of symbol and signal word indicates potential hazards to the environment.

Safety instructions in operating instructions

Safety instructions may refer to specific, individual instructions. Such safety instructions are incorporated into the instructions so that they do not interrupt the reading flow when carrying out the activity. The signal words described above are used.

Example:

1. Unscrew the screw.
2. **CAUTION!**
   Risk of pinching at the lid!

   Close the lid carefully.
3. Tighten the screw.

Editorial symbols

This symbol highlights useful tips and recommendations as well as information for efficient and fault-free operation.

Additional identifiers

In order to highlight handling instructions, results, lists, references and other elements, the following identifiers are used in this manual:

Identification	Explanation
→	Step-by-step instructions
⇨	Results of instructions
↯	References to sections of this manual and accompanying documents
■	Lists without a specific sequence

1.3 Accompanying documents

- Safety data sheet for Licinol UN 2 (↯ *Appendix “Safety data sheets” on page 102*)

NOTICE!
Find out and take account of country-specific regulations.

TracFeed® is a registered trademark of Rail Power Systems GmbH.

1.4 Standards used

Standard	Designation
DIN VDE 0105-100	Operation of electrical installations
DIN VDE 0105-103	Operation of electrical installations – Part 103: Particular requirements for railways
prEN 50119:2017	Railway applications – Fixed installations – Electric traction overhead contact lines; German version

1.5 Conformity

EU directives specify varying requirements for the declaration of conformity. These requirements shall be provided for the project-specific design.

The TracFeed® NSV wheel tensioner complies with the requirements of EN 50119.

1.6 Training

Training courses can be requested from the Sales department.

2 Safety

2.1 Intended use

The tensioning device with TracFeed® NSV wheel tensioner may only be used to compensate changes to the length of the overhead contact line.

The intended use also includes compliance with all the information in this manual.

Any use that exceeds or differs from the intended use shall be considered improper use.

Improper use

DANGER!

Danger from improper use.

Improper use of the device can result in dangerous situations.

- Do not operate the device in potentially explosive areas.
- Only install and operate the device in accordance with the technical data, the usage limitations, the contractually agreed specifications and the delivery conditions with the supplied accessories.
- Do not make any unauthorised modifications, manipulations or conversions.
- Never use the device for any use other than adjusting the length of the contact wire and catenary wire in the overhead contact line.

No claims of any kind will be entertained if such claims result from improper use.

2.2 Owner's responsibility

Owner

The owner is the natural or legal person who operates the device for commercial or economic purposes or transfers the device to a third party for use and who bears the legal product liability for the protection of the user, personnel or third parties during the operation.

Owner's obligations

The device is used in the commercial sector. The owner of the device must therefore comply with statutory occupational safety requirements.

In addition to the safety instructions in this manual, the applicable health and safety and environmental regulations for the application area of the device must be complied with.

In this regard, the following applies in particular:

- The owner must inform himself about the applicable industrial safety regulations and, in addition, perform a risk assessment to determine hazards that arise due to the specific working conditions at the operating site of the device. The owner must then implement this information in the form of manuals governing operation of the device.
- The owner is obliged to confer with the office responsible for railway operation (control room) before beginning any work and to jointly agree on safety measures (e.g. flagmen or line closure). Before commencing work, ensure that the safety measures are effective.
- The owner must provide personnel with sufficient information regarding possible dangers that could arise during railway operation and regarding safety measures. The owner must instruct personnel to follow the orders of the office responsible for railway operation.
- The owner must clearly lay down and specify responsibilities with respect to installation, commissioning, operation, troubleshooting and repairs of the device.
- The owner must provide personnel with the necessary protective equipment and instruct personnel that wearing the necessary protective equipment is mandatory.
- The owner must ensure that all persons who deal with the device have read and understood this manual. In addition, the owner must provide personnel with training and information about hazards at regular intervals.
- During the entire operating time of the device, the owner must assess whether the manuals issued comply with the present status of regulations, and must update the manuals if necessary.
- The owner must immediately report accidents to the supervisory authorities where a person has been killed or seriously injured or the device has been significantly damaged.
- The owner must immediately report operating events that attract public attention to the supervisory authorities.

Furthermore, the owner is responsible for ensuring that the device is always in a technically faultless condition. Therefore, the following applies:

- The owner must have the device checked at regular intervals by trained specialist personnel to ensure full functionality and completeness.
- The owner must ensure that all safety devices are regularly checked to ensure full functionality and completeness.

2.3 Personnel requirements

Insufficient qualification

DANGER!

Risk of injury if personnel are insufficiently qualified!

If unqualified personnel perform work on the device or are in the device's danger zone, hazards may arise that can result in death or severe injuries. Substantial damage to property can also occur.

- All work may only be carried out by appropriately qualified or trained personnel.
- All work on the electrical system may only be carried out by appropriately qualified electricians.
- Keep unqualified/untrained personnel away from the danger zones.

General requirements

The workforce may only consist of persons who are at least 18 years old, who can be expected to perform their work reliably and who are mentally and physically capable. Their suitability must have been established by a company medical officer appointed by the owner before starting the activity for the first time. Persons with impaired reactions due to, for example, the consumption of drugs, alcohol, or medication are prohibited.

Records must be kept about persons who are involved with the control and monitoring of the operating process. These records must particularly show their suitability, training, results of tests, supervision, instruction and further training.

When selecting personnel, the applicable age-related and occupation-related regulations for the operating site must be observed.

Qualification

Personnel require the following qualifications:

Authorised service personnel
Authorised service personnel have been authorised by Rail Power Systems GmbH to perform servicing activities on the switchgear panel. The manufacturer's service personnel can prove their authorisation by presenting a dated certificate issued by Rail Power Systems GmbH that specifically names the personnel in question.

Qualified electrician
The qualified electrician is able to execute tasks on electrical equipment and independently detect and avoid any possible dangers thanks to his training, expertise and experience, as well as knowledge of all applicable regulations.

The qualified electrician has been specially trained for the work environment in which he is active and is familiar with all relevant standards and regulations.

Qualified electrician for high and medium voltage
Qualified electricians for high and medium-voltage are able to safely perform work on high and medium-voltage equipment thanks to their training, experience and knowledge. Qualified electricians for high and medium voltage are able to avoid dangers to themselves, to third parties and to material assets during their activities by implementing risk prevention measures from the rules and regulations that apply at the operating site regarding the handling of high and medium voltage. Qualified electricians for high and medium voltage have been instructed in the specific features of the Rail Power Systems GmbH switchgear panel.

In particular, qualified electricians for high and medium voltage have the following knowledge, which they can prove in the form of certification that is officially recognised at the operating site for the switchgear panel:

- Specific hazards when handling high and medium-voltage components (e.g. arcing)
- Disconnecting and earthing high and medium-voltage components
- Verifying that high and medium-voltage components are dead
- Reading and understanding circuit diagrams and the meaning of circuit symbols
- Function and structure of high and medium-voltage networks and railway energy supply systems
- Special features of high and medium voltage with direct and alternating current
- Owner’s specifications regarding isolation and disconnection

Thanks to the above-mentioned, verifiable knowledge, qualified electricians for high and medium voltage are able to perform the following tasks without endangering themselves or third parties:

- Disconnecting from the on-site power supply
- Verifying that the installations are dead
- Manually switching controls
- Earthing and short-circuiting
- Performing specific maintenance tasks

Specialized personnel
Specialised personnel are personnel, who due to their specialized training, skills, and experience, as well as knowledge of the applicable standards and regulations, are capable of executing the tasks assigned to them, and of recognizing possible hazards and avoiding them on their own.

Train drivers
Due to their training, experience and knowledge, train drivers are able to operate or accompany a traction unit. They are able to present country-specific certification of their suitability (e.g. a railway vehicle driving permit in accordance with VDV guideline 753).

Unauthorised persons

WARNING!

Risk of fatal injury for unauthorised persons due to hazards in the working environment.

Unauthorised persons who do not meet the requirements described here will not be familiar with the dangers in the working environment. Therefore, unauthorised persons face the risk of severe injuries or death.

– Unauthorised persons must be kept away from the danger zone of the working environment.
– If in doubt, address the persons in question and ask them to leave the working environment area.
– Cease work while unauthorised persons are in the working environment area.

Instruction

The owner must instruct the personnel on a regular basis. To improve traceability, a training log must be created with at least the following contents:

- Date of the training
- Name of the trainee
- Contents of the training
- Name of the trainer
- Signatures of the trainee and trainer

2.4 Personal protective equipment

Personal protective equipment is used to minimise health and safety risks to personnel during work.

Personnel must wear personal protective equipment while carrying out the different operations at and with the device. This equipment will be indicated separately in the individual chapters of this manual.

- It is mandatory to put on the requisite personal protective equipment before starting the respective work.
- Always follow the instructions for personal protective equipment posted in the work area.

Description of personal protective equipment

The personal protective equipment is described below:

Hearing protection
Hearing protection protects against hearing damage caused by the effects of noise.

High-vis clothing
Wear high-vis clothing to make you more visible to others. Wear high-vis clothing in particular when working in the vicinity of rail tracks.

Dispose of high-vis clothing after use or have it cleaned professionally to maintain its high visibility.

Industrial safety helmet
Industrial safety helmets protect the head from falling objects, suspended loads and impact with stationary objects.

Protective clothing
Protective clothing is closely fitting clothing with a low tear resistance, narrow sleeves and without protruding parts. It primarily serves to protect against being trapped in moving machine parts. Do not wear rings, chains and other jewellery.

Protective gloves
Protective gloves protect the hands from abrasion, scrapes, punctures or deeper injuries as well as contact with hot surfaces.

Safety footwear
Safety footwear provides protection against heavy falling parts and slipping on slippery surfaces. Safety footwear has an antistatic sole and complies with protection class S3 in accordance with EN ISO 20345.

Safety goggles
Safety goggles protect your eyes from flying parts and spraying liquids.

Safety helmet with visor
The safety helmet with visor provides protection against falling and flying parts and protection of the eyes and face against flames, sparks, embers, hot particles or exhaust gases.

2.5 Dangers

2.5.1 Basic dangers

Working in the vicinity of rail tracks

WARNING!

Danger to life from railway traffic!

Carelessness when working in the vicinity of rail tracks can result in severe to fatal injuries.

- Observe the national regulations concerning work in the vicinity of rail tracks.
- Before beginning any work, confer with the office responsible for railway operation (control room) and jointly agree on safety measures (e.g. flagmen or line closure).
- Before commencing work, ensure that the safety measures (e.g. flagmen or line closure) are effective.
- Only perform work on overhead contact lines in favourable weather conditions.
- Do not perform work on overhead contact lines without another person present.
- If using a flagman, make sure that visual contact and, if necessary, spoken contact is ensured at all times.
- When working in tunnels and at night, ensure sufficient illumination of the work area at all times.

Work at heights

WARNING!

Risk of injury due to work at heights performed inattentively!

Inattentive work on ladders or lifting platforms during assembly and maintenance work can lead to injury.

- When working on ladders, make sure that the ladder stands securely on a solid and level surface.
- When performing any work with a lifting platform, the accident prevention regulations and safety regulations of BGR 500 must be observed.
- If necessary, have a second person secure the ladder.
- If applicable, use fall-arresting equipment.

Electric current

DANGER!

Danger to life from electric current!

Potentially fatal voltages occur on railway systems and in the vicinity of overhead contact lines.

- Have all work carried out by trained specialist personnel only. Personnel must be sufficiently informed of the potential hazards that may occur in railway operations.
- Never carry out work when it is raining.
- Before beginning any work, confer with the office responsible for railway operation (control room) and jointly agree on safety measures (e.g. flagmen or line closure).
- If there is any damage to the insulation, immediately disconnect the power supply and carry out repairs.
- When working on or in the vicinity of overhead contact lines, take measures at the workplace to ensure and secure a de-energised state. Observe the five safety rules:
  1. Disconnect from the power supply.
  2. Secure against re-connection.
  3. Verify that the system is dead.
  4. Earth and short-circuit.
  5. Cover or shield adjacent live parts.
- Do not make any alterations to the product.

2.5.2 Work and danger zone

Danger zone

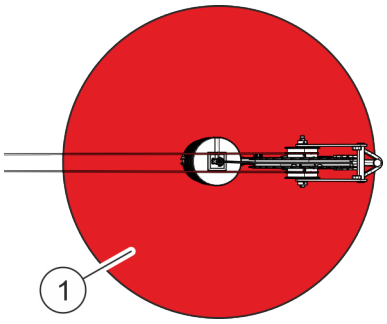


Fig. 1: Danger zone

The danger zone has a radius of at least the height of the set of weights (Fig. 1/1) measured around the installed set of weights.

Live work area

Persons without instruction or training in electrical engineering:

Do not enter the area with a radius of 3 m around the installed set of weights.

Qualified electricians:

Do not enter the area with a radius of 1.5 m around the installed set of weights.

2.6 Behaviour in the event of fire and accidents

Preventive measures

- Always be prepared for fire and accidents.
- Keep first-aid equipment (first-aid kit, blankets etc.) and fire extinguishing equipment functional and ready to hand.
- Familiarise personnel with accident notification, first-aid and rescue equipment.
- Keep access routes clear for rescue vehicles.

Measures in the event of fire and accidents

- If present, immediately activate Hazard Off using Hazard Off equipment.
- If there is no danger to your own health and if it is necessary, switch off the medium voltage switchgear assembly and the DC switchgear assembly.
- If there is no danger to your own health, rescue people from the danger zone.
- Initiate first-aid measures if required.
- Notify the fire brigade and/or rescue services.
- In the event of fire: If there is no danger to your own health, fight the fire with fire extinguishing equipment and continue fire-fighting until the arrival of the fire brigade.
- Inform the responsible person at the operating site.
- Clear access routes for rescue vehicles.
- Brief rescue services.

2.7 Environmental protection

ENVIRONMENT!

Danger for the environment due to improper handling of environmentally harmful substances!

Improper handling of environmentally materials, especially improper disposal, can lead to considerable damage for the environment.

– Always observe the instructions specified below for the handling of environmentally harmful substances and their disposal.
– If environmentally harmful substances are accidentally released to the environment, immediately take suitable measures. In case of doubt, inform the local authorities about the damage and inquire about the appropriate measures to be taken.

The following environmentally harmful substances are used:

Lubricants

Lubricants like greases and oils contain toxic substances. They may not be released into the environment. Disposal must be carried out by a specialist disposal company.

Safety data sheets for the lubricants in the axle of the wheel tensioner can be found in ↳ *Appendix “Safety data sheets” on page 102*.

3 Design and function

3.1 Overview

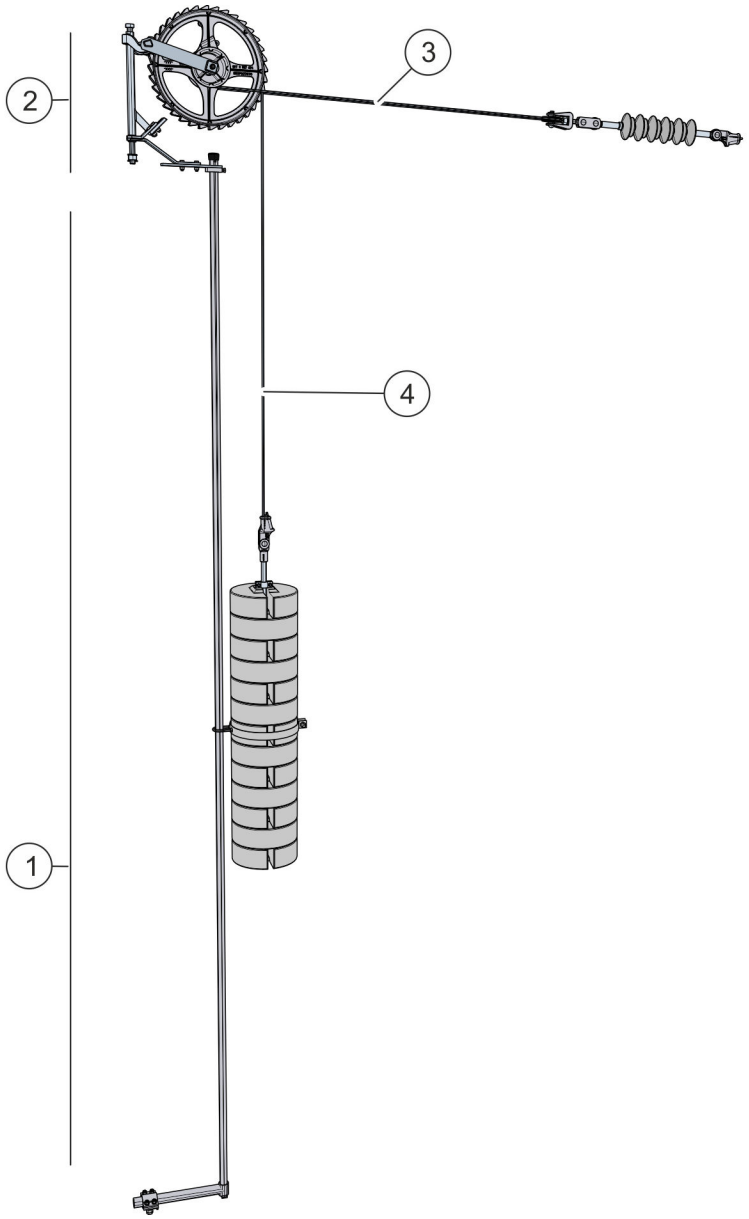


Fig. 2: Overview of tensioning device with TracFeed® NSV wheel tensioner

1 Set of weights and weight guide
2 Wheel tensioner
3 Wheel tensioner cable for contact wire or catenary wire
4 Wheel tensioner cable for set of weights

Function

When the lengths of the catenary wire and contact wire alter due to temperature fluctuations, the tensioning device with TracFeed® NSV wheel tensioner keeps the tensile forces in the overhead contact line as constant as possible, which keeps the sag of the contact wire as constant as possible.

The catenary wire and contact wire must be anchored in the system. The TracFeed® NSV wheel tensioners can be arranged next to each other or offset above one another. The layout is defined during the planning phase and it varies depending on the mast type, the surroundings, the requirements for the track section and the spatial requirements. All variants of the TracFeed® NSV wheel tensioner are installed in a similar fashion.

Versions

Various versions of the TracFeed® NSV wheel tensioner are available, depending on the requirements for the overhead contact line. This document describes the following versions:

3EGF001661

3EGF001674

3EGF006445

3EGF001669

3EGF006371

3.1.1 Fastening

The fastening elements are used to fix the wheel tensioner to the mast or in the tunnel.

Tunnel

In tunnels, the wheel tensioner is fastened by anchor rails.

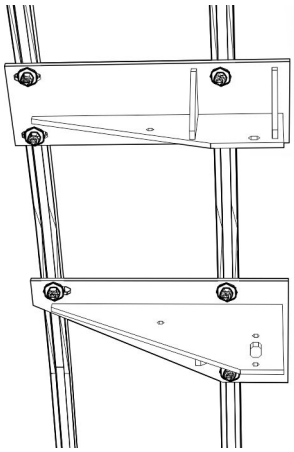


Fig. 3: Anchor rails with fastening elements

Double I-beam

On a double I-beam, the fastening elements are bolted onto anchor rails.

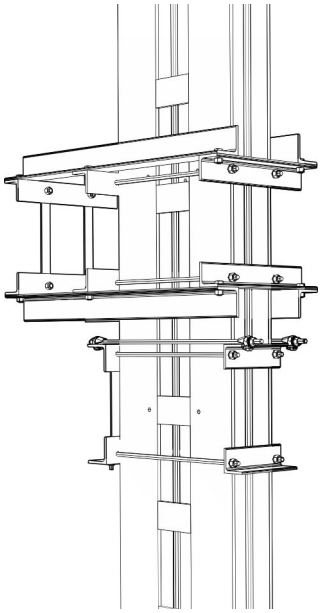


Fig. 4: Double I-beam with fastening elements

Round mast

On round masts, the wheel tensioner is fastened by aluminium brackets.

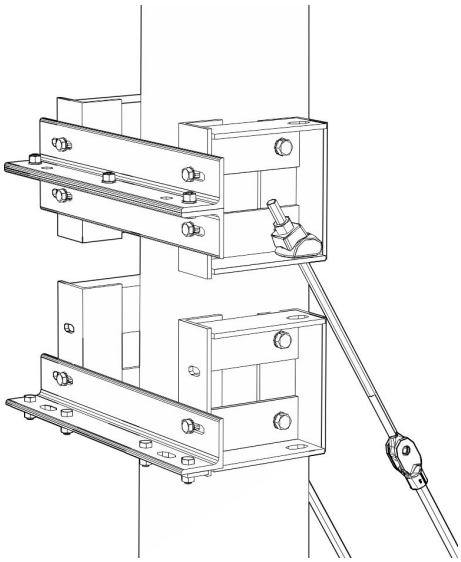


Fig. 5: Round mast with aluminium brackets for fastening

Angled mast

On angled masts, the wheel tensioner is fastened by angle irons.

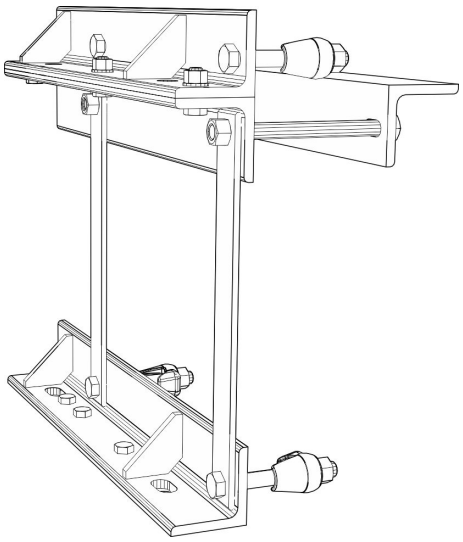


Fig. 6: Angle irons for fastening to an angled mast

Concrete mast

On concrete masts, the wheel tensioner can be fastened using aluminium brackets or a strap tie.

Special steel mast

On special steel masts, the mounting parts are fitted to the welded-on attachment parts.

3.1.2 Wheel tensioner

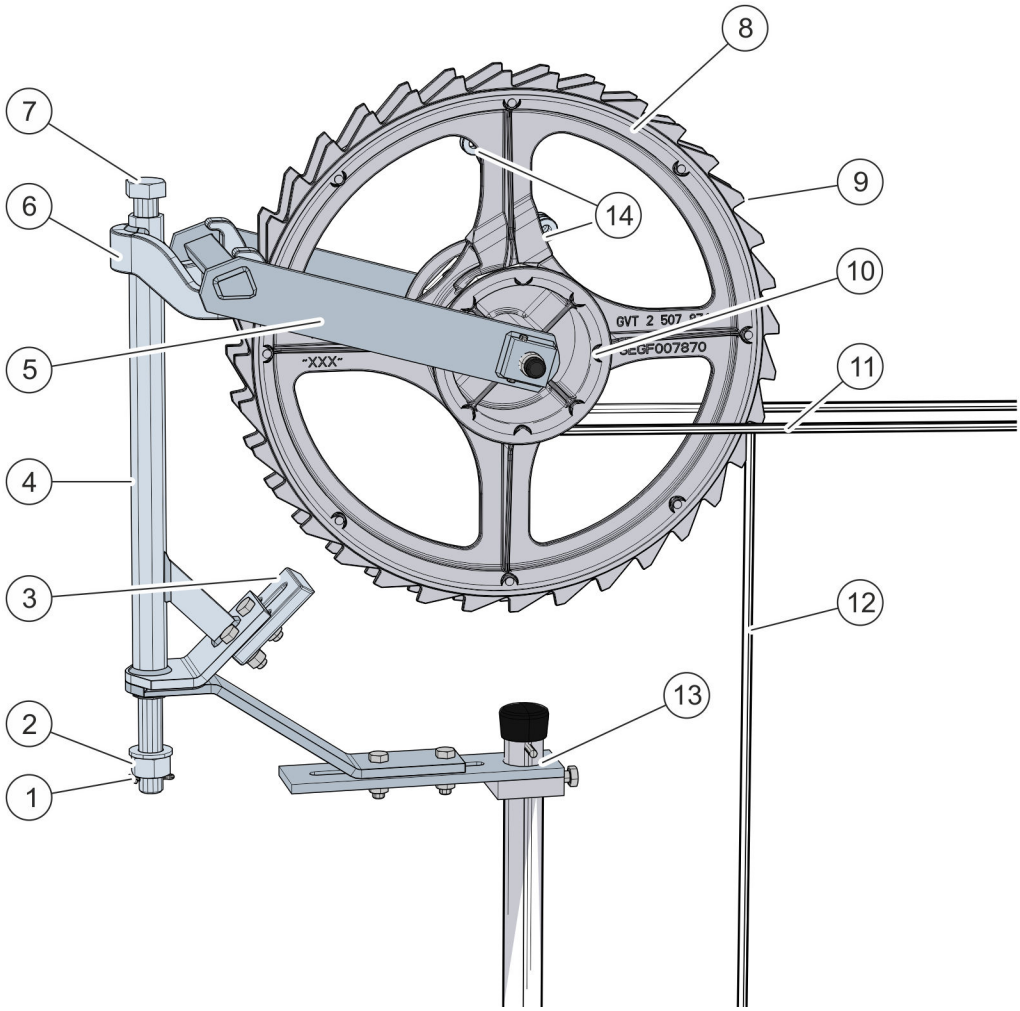


Fig. 7: TracFeed® NSV wheel tensioner

1 Split pin
2 Locking nut
3 Catch plate
4 Rotating axis
5 Rocker
6 Shackle
7 Fulcrum pin
8 Wheel body: large reel for wheel tensioner cable for set of weights
9 Wheel body: wheel tensioner cog
10 Wheel body: small reel for wheel tensioner cable, contact wire/catenary wire
11 Wheel tensioner cable for contact wire/catenary wire
12 Wheel tensioner cable for set of weights
13 Bracket for guide tube
14 Wheel body: wedge-shaped openings

3.1.3 Set of weights

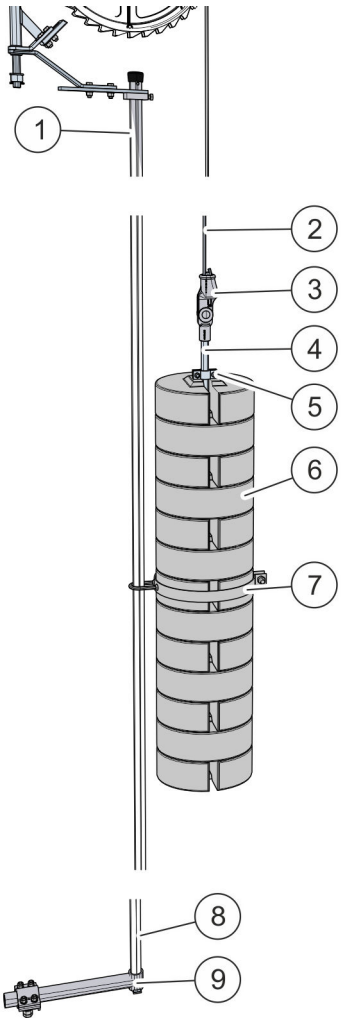


Fig. 8: Set of weights

1 Weight guide
2 Wheel tensioner cable for set of weights
3 Wedge-type dead-end clamp
4 Weight rod
5 Clamp
6 Tension weight
7 Weight guide clamp
8 Weight guide
9 Bracket

3.2 Safety devices

3.2.1 Catch plate

The wheel body (Fig. 7/8) drops if there is a tear or break in the catenary wire or contact wire. The catch plate (Fig. 7/3) then engages in the wheel tensioner cogs (Fig. 7/9). This stops the tension weights (Fig. 8/6) from falling to the ground in the event of a malfunction, preventing further deformation of the overhead contact line with the resultant risk of the contact wire droppers breaking.

3.2.2 Protective cover

A safety plate is installed in front of sets of weights in tunnels. This prevents people from entering the range of movement of the set of weights.

3.2.3 Safety cage (optional)

A safety cage can be installed around the set of weights. The safety cage prevents people from entering the range of movement of the set of weights, e.g. in the vicinity of train platforms.

3.3 Type code

There is only a product label on the wheel body, and it is the same for all versions.

3.4 Scope of supply

The tensioning device with TracFeed® NSV wheel tensioner is delivered as individual subassemblies. These are assembled before installation. Depending on the purchase order, the wheel tensioners are delivered either with a cable wound on in the factory or with a separate cable.

3.5 Accessories and tools

The following tools and large equipment are required during installation and maintenance:

Bolt cutters

Bridge

Cable clamp

Cable ties

Contact wire clamp

Fixture for holding the wheel body on the rocker

Hoisting equipment

Inductance thermometer
Inductance thermometer for measuring the contact wire temperature

Jack

Lifting equipment

Mounting fixture for tensioning devices

Moving iron
Moving iron for releasing the contact wire

Soft plastic hammer

Spirit level

Textile adhesive tape

Vehicle with work platform

4 Technical data

4.1 Mechanical data

Wheel tensioner for TracFeed® ALU 2000

Open track

Data	Value	Unit
Mass	27	kg
Tensile force	20	kN
Material for suspension	EN AW DX51D + Z 275	
Order number	3EGF001661	

Wheel tensioner for TracFeed® ALU 3000

Open track

Data	Value	Unit
Mass	28	kg
Tensile force	30	kN
Material for suspension	EN X5CrNi18-10	
Order number	3EGF001674	

Tunnel version

Data	Value	Unit
Mass	29	kg
Tensile force	30	kN
Material for suspension	EN X5CrNi18-10	
Order number	3EGF001669	

Data	Value	Unit
Mass	25	kg
Tensile force	30	kN
Material for suspension	EN X5CrNi18-10	
Order number	3EGF006371	

Technical data

Mechanical data

Wheel tensioner for TracFeed® ALU 2000 and TracFeed® ALU 3000

Open track

Data	Value	Unit
Mass	28	kg
Tensile force	30	kN
Material for suspension	EN AW DX51D + / 275	
Order number	3EGF006445	

Alloys

Component	Alloy
Wheel body	EN AC 44200 – AlSi12(a)
Incidentals (screws, nuts, washers, lock rings etc.)	A2-70
Cast steel components	EN JM1030 - GJMW-400-5 hot-dip galvanised
Cast aluminium parts	EN AC 42100 – AlSi7Mg0.3 T6
Steel components (rocker, suspension)	EN AW DX51D + Z 275 – S235 JRG2 hot-dip galvanised Optional: EN X5CrNi18-10 – 1.4301

Accessories

Accessories	Order number	Cross section (mm²)
Steel cable, impregnated with bitumen	3EGF002731	55

Required cable lengths

Installation type	Cable installation location	Cable length (mm)
Parallel	to the catenary wire	6 200
	to the contact wire	6 200
	to the catenary wire weight	5 450
	to the contact wire weight	5 450
One above the other	to the catenary wire	6 200
	to the contact wire	6 200
	to the catenary wire weight	6 150

Installation type	Cable installation location	Cable length (mm)
	to the contact wire weight	5 450
One in front of the other	to the catenary wire	5 750
	to the contact wire	6 750
	to the catenary wire weight	6 400
	to the contact wire weight	5 650

4.2 Environmental conditions

Data	Value
Ambient temperature	-30 to +70 °C

5 Transport, packaging and storage

5.1 Transport

5.1.1 Safety instructions for transport

Improper transport

CAUTION!

Risk of injury due to heavy packages!

Improper transport can result in injuries.

– Before transporting the packages, secure them against falling or toppling over.
– Always involve two persons when moving the packages.

Improper transport

NOTICE!

Property damage due to improper transport!

Packages can fall or topple over during improper transport. This can result in extensive property damage.

– When unloading the packages on arrival, as well as during transport, proceed with caution and observe the symbols and instructions on the packages.
– Note the weight. Always have two persons transport the packages to their installation location.
– Only remove the packaging immediately prior to installation.
– Only use the intended attachment points.
– Avoid hard impacts, throwing and damage in general.
– If transported by sea, shrink-wrap the packaging in film to prevent contact with salty air.

5.1.2 Transport

Transporting pallets with a forklift or pallet truck

Packages that are attached to pallets may be transported with a forklift or pallet truck under the following conditions:

- The forklift or pallet truck is designed for the weight of the packages.
- The package is securely attached to the pallet.
- The driver is licensed to drive the forklift or pallet truck in accordance with the locally applicable regulations.

Transporting

Protective equipment:
- Industrial safety helmet
- Protective clothing
- Safety footwear
- Protective gloves

1. Drive the forklift or pallet truck with the forks between or under the bars of the pallet.
2. Insert the forks so that they protrude from the opposite side.
3. Ensure that the pallet cannot tip over if there is an eccentric centre of gravity.
4. Lift the pallet with the package and transport it to the intended location.
5. When transporting the device in the vicinity of the rail track, have two people carry it.

Transporting packages with a crane

WARNING!

Danger to life from suspended loads!

Loads can swing out and fall down during lifting processes. This can lead to severe to fatal injuries.

– Never step under suspended loads or in their swivel area.
– Only move loads under supervision.
– Only use approved hoists and load-carrying equipment with sufficient load-bearing capacity.
– Do not use torn or frayed load-carrying equipment.
– Do not place load-carrying equipment such as ropes and straps on sharp edges and corners; do not knot and do not twist them.
– Set the load down when leaving the work place.

Under certain circumstances, the package may include transport instructions that exceed the instructions described below. Comply with these instructions.

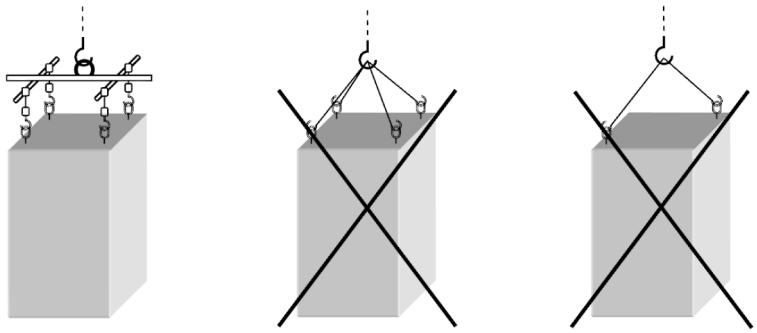


Fig. 9: Transport with a crane

Packages that have lifting eyes can be transported with a crane under the following conditions:

- The crane and other lifting gear are designed for the weight of the packages.
- The operator is authorised to operate the crane.

Attaching

Protective equipment:
- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety footwear

Special tool:
- Lifting equipment

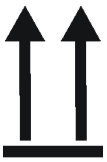
1. **WARNING!**
   Risk of injury and danger of property damage due to packages toppling over!

   Only transport the packages by crane with lifting equipment. This can be ordered as an option.

   Attach the lifting equipment in accordance with Fig. 9.
2. Ensure that the package is suspended straight; if applicable, pay attention to an eccentric centre of gravity.
3. Transport the package to the installation location.

5.2 Symbols on the packaging

Top



The arrowheads of the symbol indicate the top side of the package. They must always point upwards, otherwise the contents could be damaged.

Attach here

Only attach sling gear (chain sling, webbing sling) to the positions marked with this symbol.

Weight, attached load

Indicates the weight of the packages.

Handle the package indicated appropriately to its weight.

5.3 Inspection at delivery

On receipt, immediately inspect the delivery for completeness and transport damage.

Proceed as follows in the event of externally apparent transport damage:

- Do not accept the delivery, or only accept it subject to reservation.
- Note the extent of the damage on the transport documentation or the shipper's delivery note.
- Initiate complaint procedures.

Issue a complaint in respect of each defect immediately following detection. Damage compensation claims can only be made within the applicable complaint deadlines.

5.4 Storage

Store the packages under the following conditions:

- Do not expose to aggressive media.
- Avoid mechanical shocks.
- If stored for longer than three months, check the general condition of all parts and packaging at regular intervals.

Under certain circumstances, more stringent storage instructions than the requirements specified here may be affixed to packages. Comply with these instructions accordingly.

5.5 Packaging

About the packaging

The individual packages are packaged in accordance with the anticipated transport conditions. Recyclable materials are used for the packaging.

The packaging is intended to protect the individual components against transport damage and other damage prior to installation. Therefore, do not destroy the packaging and only remove it shortly before installation.

Handling packaging materials

Dispose of packaging material according to the applicable legal provisions and local regulations.

ENVIRONMENT!

Danger to the environment due to incorrect disposal!

Packaging materials are valuable raw materials and can often be re-used or usefully reconditioned and recycled. Incorrect disposal of packaging materials may pose risks to the environment.

– Dispose of packaging materials in an environmentally friendly manner.
– Observe the locally applicable disposal regulations. If necessary, commission a specialist company with the disposal.

Pallet cages can be returned to Rail Power Systems.

6 Put in a voltage-free state

We differentiate between three working methods: working in a de-energised state, working in a live state and working near live parts. All three methods require effective safety measures to be taken against electric shock and against the effects of short circuits and fault arcs.

The following provides a brief summary of the requirements for working in a de-energised state. During work, the required insulation level must be ensured, e.g. by attaching solid insulation material or maintaining a sufficient air gap. National provisions must be complied with.

6.1 Safety rules

The local, country-specific safety rules apply.

In Germany, these include the five safety rules:

1. Disconnect from the power supply.

Chapter 6.1.1 “Disconnecting” on page 37

2. Secure against re-connection.

Chapter 6.1.2 “Securing against re-connection” on page 38

3. Verify that the system is dead.

Chapter 6.1.3 “Verifying that the system is dead” on page 38

4. Earth and short-circuit.

Chapter 6.1.4 “Earthing and short-circuiting (E&SC)” on page 38

5. Cover or shield adjacent live parts.

Chapter 6.1.5 “Covering or shielding live adjacent parts” on page 38

6.1.1 Disconnecting

Disconnecting the device refers to two areas:

- Primary side
- Secondary side

The part of the system on which work is to be performed must be disconnected from all sources of supply. The disconnection must involve isolating distances in the air or equivalent insulation in order to ensure that no flashover takes place.

Primary side

The device is not designed for primary side disconnection. A quasi-safe state can be established by stopping operation and switching off the line section.

6.1.2 Securing against re-connection

Re-connection must be reliably prevented.

Depending on the legal situation, it may be necessary to attach a prohibition sign here, for example.

6.1.3 Verifying that the system is dead

→ In the work area, verify that all poles are dead using suitable measuring/testing equipment or voltage testers.

6.1.4 Earthing and short-circuiting (E&SC)

In high-voltage systems and some low-voltage systems, all parts on which work is to be carried out must be earthed and short-circuited at the work location.

The earthing and short-circuiting equipment must first be connected to the earthing system and then to the parts to be earthed. The earthing and short-circuiting equipment must be visible from the work location, if possible. If this is not possible, it must be attached as close to the work location as possible.

It must be ensured that the earthing and short-circuiting equipment, cables and connections are suitable and designed for the short-circuit stress at the installation location.

Personnel:
- Qualified electrician

Protective equipment:
- Safety helmet with visor
- Protective clothing
- Protective gloves
- Safety footwear

6.1.5 Covering or shielding live adjacent parts

If it is not possible to disconnect parts of the system in the vicinity of the work location, additional safety measures must be taken before commencing work, as defined for “working near live parts”.

The safety distances that must be kept from active (live) parts, as specified under “Protection by means of distances and oversight”, must be maintained at all times.

For example, in EN 10110-1, the minimum distance for all persons without electrotechnical instruction is 3 m for 1 kV to 25 kV, and 1.5 m for all persons with special instruction (electricians, electrically instructed persons).

7 Assembly

7.1 Safety instructions for assembly

Electric current

DANGER!

Danger to life from electric current!

Potentially fatal voltages occur on railway systems and in the vicinity of overhead contact lines.

- Have all work carried out by trained specialist personnel only. Personnel must be sufficiently informed of the potential hazards that may occur in railway operations.
- Before beginning any work, confer with the office responsible for railway operation (control room) and jointly agree on safety measures (e.g. flagmen or line closure).
- If there is any damage to the insulation, immediately disconnect the power supply and carry out repairs.
- When working on or in the vicinity of overhead contact lines, take measures at the workplace to ensure and secure a de-energised state. Observe the five safety rules:
  1. Disconnect from the power supply.
  2. Secure against re-connection.
  3. Verify that the system is dead.
  4. Earth and short-circuit.
  5. Cover or shield adjacent live parts.
- Do not make any alterations to the TracFeed® NSV wheel tensioner.

Working in the vicinity of rail tracks

WARNING!

Danger to life from railway traffic!

Carelessness when working in the vicinity of rail tracks can result in severe to fatal injuries.

- Observe the national regulations concerning work in the vicinity of rail tracks.
- Before beginning any work, confer with the office responsible for railway operation (control room) and jointly agree on safety measures (e.g. flagmen or line closure).
- Before commencing work, ensure that the safety measures (e.g. flagmen or line closure) are effective.
- Only perform work on overhead contact lines in favourable weather conditions.
- Do not perform work on overhead contact lines without another person present.
- If using a flagman, make sure that visual contact and, if necessary, spoken contact is ensured at all times.
- When working in tunnels and at night, ensure sufficient illumination of the work area at all times.

Falling components

WARNING!

Risk of injury due to falling components!

During installation of the device, falling parts can cause severe injuries.

- Never carry out installation work alone.
- When working on subassemblies at height, make sure that there are no persons below the work area.
- Wear personal protective equipment when carrying out any work (protective clothing, safety footwear, safety helmet, high-visibility vest, protective gloves where applicable).
- Secure components against falling.

Work at heights

WARNING!

Risk of injury due to work at heights performed inattentively!

Inattentive work on ladders or lifting platforms during assembly and maintenance work can lead to injury.

- When working on ladders, make sure that the ladder stands securely on a solid and level surface.
- When performing any work with a lifting platform, the accident prevention regulations and safety regulations of BGR 500 must be observed.
- If necessary, have a second person secure the ladder.
- If applicable, use fall-arresting equipment.

Falling weights

WARNING!

Risk of injuries and property damage due to falling weights!

Errors during installation of the blocking device can lead to the weights falling down in the event of a wire break or torn cable.

- Install the blocking device properly.

Sharp-edged components

CAUTION!

Risk of crushing and shearing when installing metal parts!

Careless handling of components can result in injuries and cuts on hands and other parts of the body.

- Always take care when installing components.
- Note that some components are heavy.
- Prevent slipping and uncontrolled movements of the components.

7.2 Tightening torques

WARNING!

Danger due to incorrect screw tightening torques!

If screws are tightened to the wrong tightening torque, components may become loose and cause injuries or property damage.

- Never exceed the maximum permissible screw tightening torque.
- Check the screw tightening torques at regular intervals.
- Always comply with the applicable guidelines and design criteria for screw connections.

Screw material	Unalloyed and alloyed steels as per EN ISO 898-1			Rust-resistant and acid-resistant A2/A4 steels as per DIN EN ISO 3506-1		Copper
$R_{P\ 0.2\ min}$ =	240 N/mm²	300 N/mm²	640 N/mm²	450 N/mm²	600 N/mm²	540 N/mm²
Strength class	4.6/4	5.6/5	8.8/8	70	80	
Thread	Tightening torque [Nm]					
M6	3	4	9	6	9	8
M8	8	10	23	16	22	20
M10	15	20	46	32	43	39
M12	25	38	80	56	75	68
M16	60	90	195	135	180	165
M20	120	180	390	280	370	330
	175	265	570	405	535	-

7.3 Preparations

Personnel:
- Train drivers

Protective equipment:
- Safety footwear
- High-vis clothing

Special tool:
- Vehicle with work platform
- Hoisting equipment

1. Make sure that the construction site is undisturbed.
2. Enter the construction site in accordance with the owner's regulations.

7.3.1 Installing the weight rod

7.3.1.1 Weight rod for mast

The weight rod for sets of weights on the mast is delivered with a pre-assembled square washer, clamp and matching joint.

7.3.1.2 Weights rods for tunnels

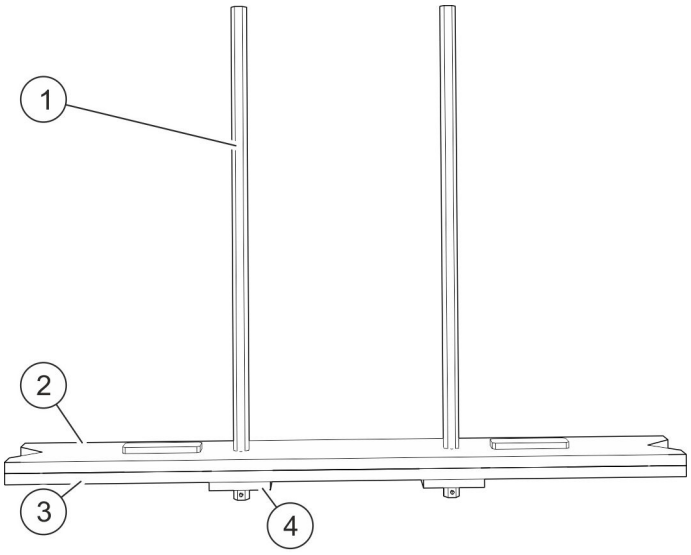


Fig. 10: Weight rod in a tunnel

1 Weight rod
2 Top base plate
3 Bottom base plate
4 Square washer

Weight rods for sets of weights in tunnels are delivered as individual parts and they are assembled on site.

In the case of sets of weights weighing 15 kN or more, two base plates are used.

Attaching the weight rods

1.

This step is omitted for sets of weights weighing less than 15 kN.

CAUTION!
Risk of crushing and shearing between the weight rod and base plate!

Carefully guide the first weight rod (Fig. 10/1) through the top base plate (Fig. 10/2) from above.

In the case of sets of weights weighing up to 15 kN, this base plate is sufficient for installing the weights.

2.

CAUTION!
Risk of crushing and shearing between the weight rod and base plate!

Carefully guide the first weight rod through the bottom base plate (Fig. 10/3) from above.

3.

CAUTION!
Risk of crushing and shearing between the weight rod and plate!

Carefully slide the square washer onto the section of the first weight rod that protrudes below.

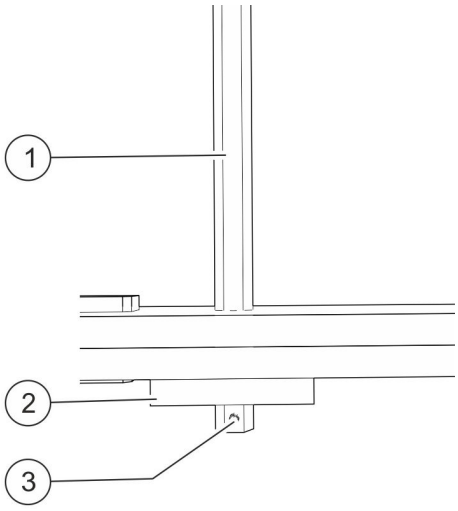


Fig. 11: Plate on weight rod in a tunnel

1 Weight rod
2 Square washer
3 Grooved pin

4. Secure the square washer (Fig. 11/2) with the grooved pin (Fig. 11/3).
5. Repeat steps 1 to 4 to install the second weight rod.
   ⇨ The weight rods are installed on the set of weights for the tunnel.

7.3.2 Installing the tension weights on the weight rod

Swinging weight rod

CAUTION!

Risk of injury from swinging weight rod!

While the weight rod is suspended from the forklift, there is a risk of severe injuries due to the rod swinging.

– Do not move the forklift while there are persons in the swinging range.
– Do not move the forklift while the tension weights are installed.

Falling weights

CAUTION!

Risk of crushing due to falling weights!

During installation of the weights on the weight rod, falling weights can cause severe injuries.

– Wear personal protective equipment when carrying out any work (protective clothing, safety footwear, high-visibility clothing, protective gloves, industrial safety helmet).
– Always carry out installation work with two persons.

Risk of crushing

CAUTION!

Risk of crushing when attaching the weights!

When the weights are being attached to the weight rod, there is a risk of weights slipping and causing severe injuries to hands and arms.

– Wear personal protective equipment when carrying out any work (protective clothing, safety footwear, high-visibility clothing, protective gloves, industrial safety helmet).
– Slide the weights onto the weight rod carefully.

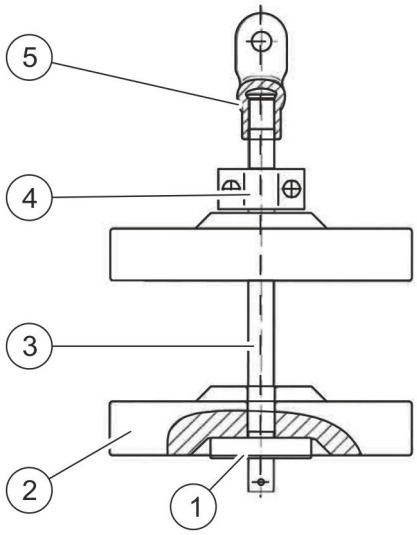


Fig. 12: Set of weights, cross section

1 Square washer
2 Weight
3 Weight rod
4 Clamp
5 Joint

Installing tension weights for set of weights on the mast

Personnel:
- Specialized personnel

Protective equipment:
- High-vis clothing
- Safety footwear
- Protective gloves
- Protective clothing
- Industrial safety helmet

1. **CAUTION!**
   Risk of crushing between the joint and weight rod!

   Carefully screw the joint (Fig. 12/5) onto the weight rod and make sure that the thread is fully countersunk.
2. Tighten by hand.
3. Attach a strap to the joint.
4. Hook the strap on the weight rod (Fig. 12/3) onto the forks of a forklift.
5. **CAUTION!**
   Risk of injury due to slipping weight rod!

   Make sure that the strap on the weight rod cannot slip.
6. Use the forklift to lift the weight rod up until the bottom end of the weight rod is hanging at about knee height.

   Raising the height of the sets of weights reduces the strain on your back when lifting.
7. Take hold of the first weight with both hands on the sides and lift it up.

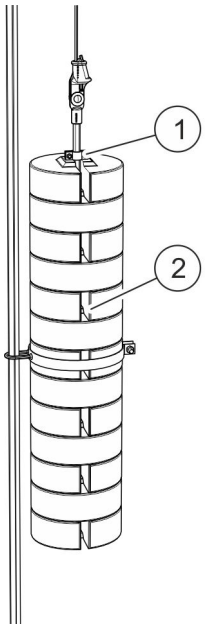


Fig. 13: Set of weights

1 Clamp at locking height
2 Opening in the set of weights

8. **CAUTION!**
Risk of crushing due to slipping weight!

Slide the first weight down onto the weight rod until the rod is in the middle of the weight.

⇨ The first tension weight is attached to the weight rod.

The weights have to be rotated alternately by 180°.

9. Rotate the next weight by 180° and take hold of it with both hands.

10. **CAUTION!**
Risk of crushing due to slipping weight!

Lift the weight and slide it onto the weight rod until the recess on the underside fits precisely onto the raised part of the weight underneath.

11. Attach the required number of weights as specified in the project documentation to the weight rod.

12. **CAUTION!**
Risk of injury due to slipping weights!

Make sure that the openings on the weights that are turned the same way around (Fig. 13/2) are precisely aligned above each other.

⇨ The weights are securely on top of each other, protected against slipping.

13. Secure all the weights with the clamp (Fig. 12/4).

14. **CAUTION!**
Risk of injury due to swinging set of weights!

Carefully lower the set of weights and set it down on the ground.

15. Remove the strap from the joint.

Installing the tension weights for set of weights in a tunnel

Personnel:
- Specialized personnel

Protective equipment:
- High-vis clothing
- Safety footwear
- Protective gloves
- Protective clothing
- Industrial safety helmet

Prerequisite:

- The weight rods have been installed as described in *Chapter 7.3.1.2 “Weights rods for tunnels” on page 43*.

1. **CAUTION!**
   Risk of crushing between the joint and weight rod!

   Carefully screw the joint (Fig. 12/5) onto the weight rod and make sure that the thread is fully countersunk.
2. Tighten by hand.
3. Attach a strap to the joint.
4. Hook the strap on the weight rod (Fig. 12/3) onto the forks of a forklift.
5. **CAUTION!**
   Risk of injury due to slipping weight rod!

   Make sure that the strap on the weight rod cannot slip.
6. Use the forklift to lift the weight rod up until the base plate is hanging at about knee height.

Raising the height of the sets of weights reduces the strain on your back when lifting.

7. Take hold of the first weight with both hands on the sides and lift it up.

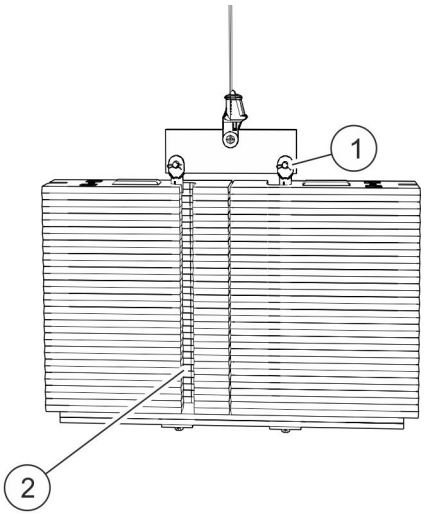


Fig. 14: Set of weights

1 Joint
2 Opening in the set of weights

8. **CAUTION!**
Risk of crushing due to slipping weight!

Slide the first weight down onto the weight rod until the rod is in the middle of the weight.

⇨ The first tension weight is attached to the weight rod.

9. Take hold of the next weight with both hands on the sides.

10. **CAUTION!**
Risk of crushing due to slipping weight!

Lift the weight and slide it onto the weight rod until the recess on the underside fits precisely onto the raised part of the weight underneath.

11. Attach the required number of weights as specified in the project documentation to the weight rod.

12. **CAUTION!**
Risk of injury due to slipping weights!

Make sure that the openings on the weights (Fig. 13/2) are precisely aligned above each other.

⇨ The weights are securely on top of each other, protected against slipping.

13. Secure all the weights with the clamp (Fig. 12/4).

14. **CAUTION!**
Risk of injury due to swinging set of weights!

Carefully lower the set of weights and set it down on the ground.

15. Remove the strap from the joint.

7.3.3 Calibrating and installing the wheel tensioner mounting

Mounting heights

The mounting heights depend on the position at which the wheel tensioners are to be installed. In each case, you measure from the top edge of the small reel on the wheel tensioner in question.

Determining the mounting points for the top and bottom fastening elements of the wheel tensioner mounting:

Top mounting: H(mount,top) = e + h(FD) + value (table *on page 51*) + 250 mm

Bottom mounting: H(mount,bottom) = e + h(FD) + value (table *on page 51*) - 250 mm

e = difference between top edge of foundation and top edge of rail

Tab. 1: Height of the centre of the wheel tensioner mounting above the contact wire of the catenary system used

Layout	Contact wire (mm)	Catenary wire (mm)
Next to each other	900	900
One above the other	500	1 200
One in front of the other	500	1 250
In a tunnel	500	1 000

Concrete masts generally already contain fastening sockets that are inserted into them during production on the basis of the layout planning.

Bolted connections

Tighten all bolted connections that are not specified otherwise in accordance with *Chapter 7.2 “Tightening torques” on page 42*.

7.3.3.1 Calibrating and installing on the mast

If the wheel tensioner mounting is installed on a mast when the mast is horizontal rather than when it is upright, the work steps are still the same. The wheel tensioner mountings simply have to be aligned again once the mast has been erected.

7.3.3.1.1 Concrete mast

The mounting heights on a concrete mast are generally determined by the height of the fastening sockets. The fastening sockets are inserted into the concrete during production.

Fastening with a strap tie

Due to the different tools used for installing the strap tie, the installation instructions vary depending on the tool manufacturer.

Note the installation instructions from the tool manufacturer.

Fastening with aluminium brackets

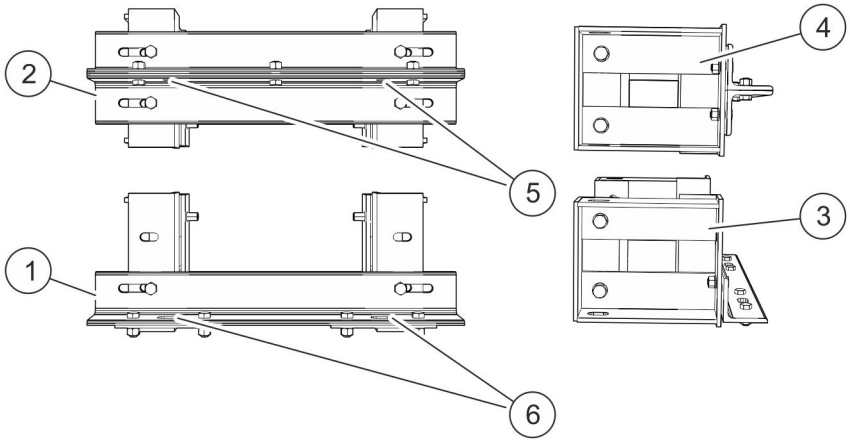


Fig. 15: Aluminium brackets, front view and side view

1 Bottom aluminium bracket
2 Top aluminium bracket
3 Mast fastening for bottom aluminium bracket
4 Mast fastening for top aluminium bracket
5 Hole for fulcrum pin
6 Hole for fulcrum pin

Personnel:
- Specialized personnel

Protective equipment:
- Industrial safety helmet
- Protective gloves
- Safety footwear
- High-vis clothing

1. Determine the mounting height (table *on page 51*).
2. Screw the mounting parts for the bottom bracket (Fig. 15/3) into the fastening sockets on the mast.
3. Screw the mounting parts for the top bracket (Fig. 15/4) into the fastening sockets on the mast.
4. **CAUTION!**
   Risk of crushing if a bracket slips!

   Carefully screw the bottom bracket (Fig. 15/1) onto the mounting parts loosely enough that it can still slide.

5. Screw the two top brackets (Fig. 15/2) onto the fastening sockets on the mast.
6. Connect the top bracket (Fig. 15/2) with three bolted connections.
7. **CAUTION!**
   Risk of crushing if a bracket slips!

   Carefully screw the top brackets (Fig. 15/2) onto the mounting parts loosely enough that the top brackets can still slide.
8. Align all the brackets horizontally with the help of a spirit level.
9. Align the two top aluminium brackets (Fig. 15/2) vertically to the middle of the mast axis.
10. Align the bottom aluminium bracket (Fig. 15/1) as follows: the holes for fastening the fulcrum pin in the top aluminium brackets (Fig. 15/5) are located centrally above the holes for fastening the fulcrum pin in the bottom aluminium bracket (Fig. 15/6).
11. Retighten all the bolted connections.

    ⇨ The wheel tensioner mounting is affixed to the mast.

7.3.3.1.2 Angled mast

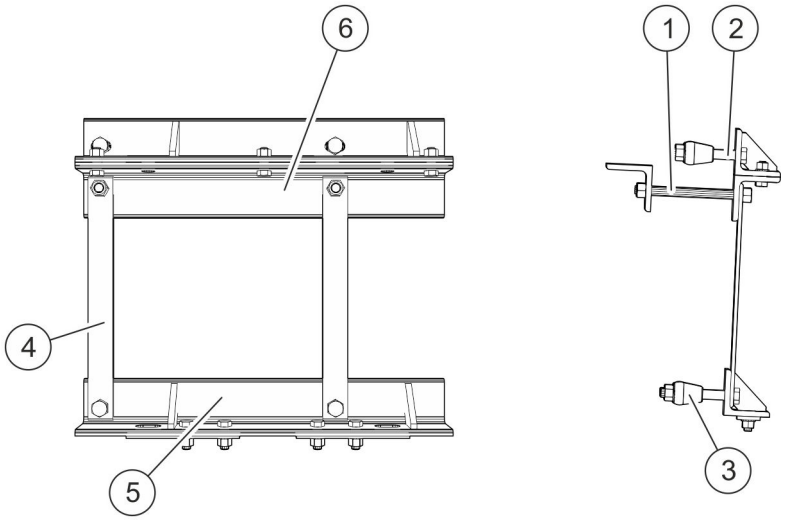


Fig. 16: Wheel tensioner mounting on an angled mast

1 Threaded rod
2 Threaded rod
3 Claw
4 Connection plate
5 Bottom angle iron
6 Top angle iron

Personnel:	■ Specialized personnel
Protective equipment:	■ Industrial safety helmet ■ Protective gloves ■ Safety footwear ■ High-vis clothing

1. Determine the mounting height (table *on page 51*).
2. Use a tape measure to calibrate the middle of the mounting.
3. Calibrate the attachment points for the bottom angle iron.
4. Fasten the bottom angle iron and the connection plates to the mast with two claws, loosely enough that they can still slide.
5. Fasten the top angle iron and the top part of the connection plates to the mast using the counter bracket and two threaded rods, loosely enough that they can still slide.

7.3.3.1.3 Special steel mast

The mounting heights for installation one in front of the other are determined by the height of the welded-on attachment parts in the case of high-speed overhead contact lines. The attachment parts are welded on during production of the mast.

7.3.3.2 Calibrating and installing in a tunnel

The wheel tensioners for the catenary wire and contact wire are each attached to a separate tunnel segment, regardless of the tunnel design.

Personnel:
- Specialized personnel

Protective equipment:
- Industrial safety helmet
- Protective gloves
- Safety footwear
- High-vis clothing

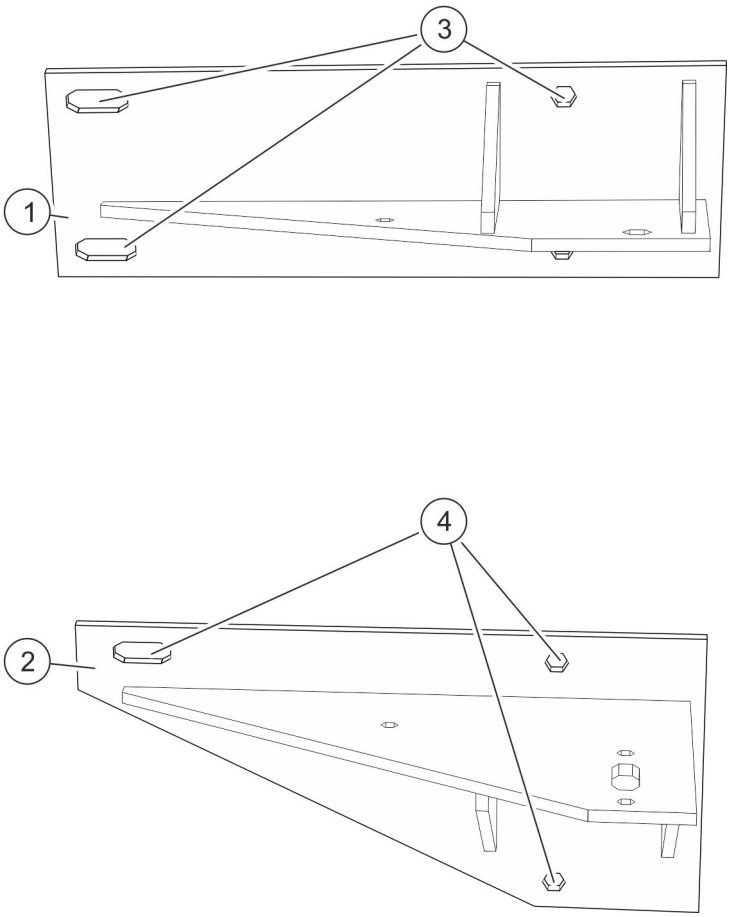


Fig. 17: Fastening on an anchor rail

1 Top mounting part
2 Bottom mounting part
3 Holes for stud bolts
4 Holes for stud bolts

Prerequisite:

- The anchor rails are present in the tunnel.

1. Determine the mounting height (table *on page 51*).

2.

The catenary wire and contact wire are tensioned on two separate tunnel segments.

Calibrate the height of the catenary wire or contact wire on the wheel tensioner.

3. **CAUTION!**
Risk of crushing if the mounting part slips!

   Carefully affix the top mounting part (Fig. 17/1) to the corresponding holes (Fig. 17/3) using three stud bolts, approximately in its final position according to the project documentation.

4. With a spirit level, align the top mounting part centrally between the two anchor rails.

5. Tighten the bolted connections to the corresponding torque (*Chapter 7.2 “Tightening torques” on page 42*).

6. **CAUTION!**
Risk of crushing if the mounting part slips!

   Carefully fasten the bottom mounting part (Fig. 17/2) to the intended holes (Fig. 17/4) using three stud bolts, approximately in its final position on the anchor rails and loosely enough that it can still slide.

7. Align the bottom mounting part horizontally with the help of a spirit level.

8. Align the bottom mounting part vertically so that the slotted hole for the fulcrum pin is located in the centre of the hole for the fulcrum pin in the top mounting part.

9. Tighten the bolted connections for the bottom mounting part to the corresponding torque (*Chapter 7.2 “Tightening torques” on page 42*).

   ⇨ The wheel tensioner mounting is affixed to the tunnel.

7.3.4 Unpacking and inspecting the wheel tensioner

Personnel:
- Specialized personnel

Protective equipment:
- Industrial safety helmet
- Protective gloves
- Safety footwear
- High-vis clothing

1. **CAUTION!**
Risk of injury when lifting the wheel tensioner!

   Work in a pair to lift the device out of the pallet cage.

2. Inspect the device for visible transport damage or defects.

Issue a complaint for each defect immediately following detection. Damage compensation claims can only be made within the applicable claim periods.

7.3.5 Winding cables onto the wheel tensioner

Depending on the purchase order, wheel tensioners are delivered either with cables wound onto them ex works or without. For wheel tensioners that are delivered ex works without cables wound on, we recommend winding on the cables before installing the wheel tensioner on the mast.

Required cable lengths

Installed next to each other

Data	Value	Unit
Wheel tensioner cable to catenary wire	6 200	mm
Wheel tensioner cable to contact wire	6 200	mm
Wheel tensioner cable to catenary wire weight	5 450	mm
Wheel tensioner cable to contact wire weight	5 450	mm

Installed one above the other

Data	Value	Unit
Wheel tensioner cable to catenary wire	6 200	mm
Wheel tensioner cable to contact wire	6 200	mm
Wheel tensioner cable to catenary wire weight	6 150	mm
Wheel tensioner cable to contact wire weight	5 450	mm

Installed one in front of the other

Data	Value	Unit
Wheel tensioner cable to catenary wire	5 750	mm
Wheel tensioner cable to contact wire	6 750	mm
Wheel tensioner cable to catenary wire weight	6 400	mm
Wheel tensioner cable to contact wire weight	5 650	mm

Personnel:	■ Specialized personnel
Protective equipment:	■ Industrial safety helmet ■ Protective gloves ■ Safety footwear ■ High-vis clothing
Special tool:	■ Soft plastic hammer ■ Bolt cutters ■ Cable ties ■ Fixture for holding the wheel body on the rocker ■ Textile adhesive tape

Cutting the cables to length

1. **CAUTION!**
   Risk of cuts when touching the ends of the cables!

   Carefully mask cut surfaces with textile adhesive tape to prevent the cable from unravelling.

2. Use bolt cutters to cut the cables to length in accordance with the project specifications.

Attaching the cables to the set of weights

3. **CAUTION!**
   Risk of crushing between rocker and fixture!

   Carefully hook the rocker on the wheel tensioner onto the fixture.

Fig. 18: Rod through wheel tensioner

4. Guide the rod on the fixture through the side of the wheel tensioner.

   ⇨ The wheel tensioner is secured against rotating.

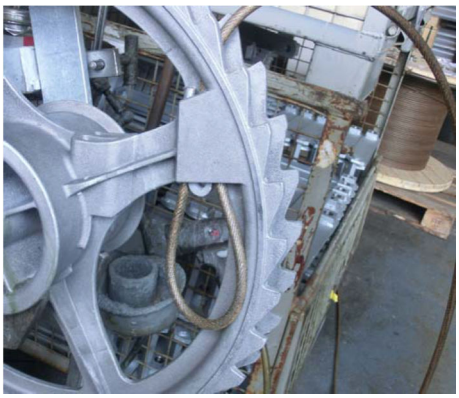


Fig. 19: Loop with wedge on the large reel

Fig. 20: Hammering in the wedge

Fig. 21: End of cable secured

Attaching the cables to the catenary system

5. Insert the shorter cable into the wedge-shaped opening on the large reel and thread it out again in a loop around the wedge.

   Pull the end of the cable approximately 1 cm out of the wedge-shaped opening.

6. **CAUTION!**
   Risk of crushing and burns on the cable!

   Make sure that the cable is not crossed and is not running over any part of your body.

7. Firmly grasp the end of the cable with both hands.
8. Tighten the cable with a firm tug.
9. Hammer in the wedge with a soft plastic hammer.
10. Pull the rod out of the side of the wheel tensioner on the fixture.

    ⇨ The locking mechanism is released.

11. Wind the cable onto the large reel, making sure that it does not cross over.
12. Secure the end of the cable with cable ties.
13. Guide the rod on the fixture through the side of the wheel tensioner.

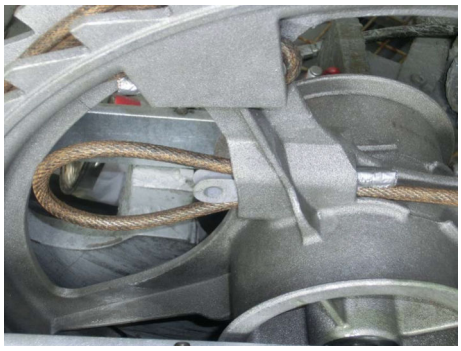


Fig. 22: Loop with wedge on the small reel

14. Insert the longer cable into the wedge-shaped opening on the small reel and thread it out again in a loop around the wedge.

    Pull the end of the cable approximately 1 cm out of the wedge-shaped opening.

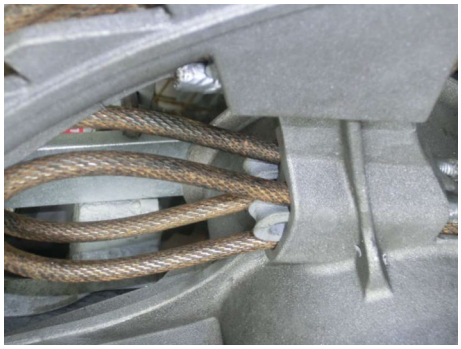


Fig. 23: Two loops on the small reel

15. Pull the second end of the cable through the second wedge-shaped opening and thread it out again in a loop around the wedge.

    Pull the end of the cable approximately 1 cm out of the wedge-shaped opening.

16. **CAUTION!**
    Risk of crushing and burns on the cable!

    Make sure that the cable is not crossed and is not running over any part of your body.

17. Firmly grasp the end of the cable with both hands.

18. Tighten the cable with a firm tug.

19. Hammer in the wedge with a soft plastic hammer.

20. Pull the rod out of the side of the wheel tensioner on the fixture.

    ⇨ The locking mechanism is released.

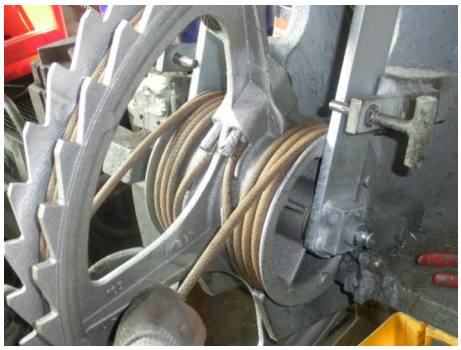


Fig. 24: Cable wound onto the small reel

21. Wind the cable onto the small reel, making sure that it does not cross over.

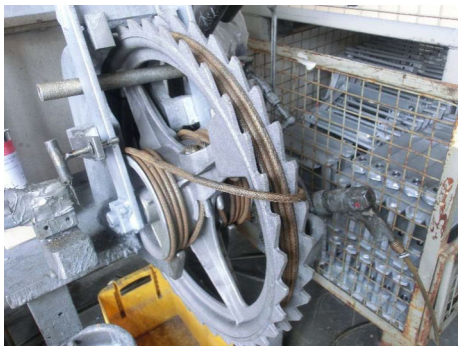


Fig. 25: End of cable in contact

22. Wind the cable firmly onto the small reel until the loop is in contact with the large reel.

23. Secure the end of the cable with cable ties.

Installing the anchor clevis

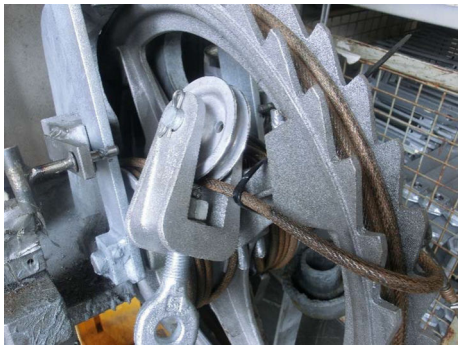


Fig. 26: Anchor clevis installed

24. Undo the bolt on the anchor clevis and remove the pulley.

25. Place the anchor clevis around the wound cable on the wheel tensioner.

26. Guide the pulley into the opening on the anchor clevis and secure with the bolt.

27. Secure the bolt with the split pin.

⇨ The pulley for the catenary system is attached to the wheel tensioner.

7.4 Installing the wheel tensioner

7.4.1 Fastening the wheel tensioner

Attaching the wheel tensioner to the mounting

Personnel:
- Specialized personnel

Protective equipment:
- Industrial safety helmet
- Protective gloves
- Safety footwear
- High-vis clothing

Prerequisites:

- The tensioning masts are positioned and aligned.
- The installation work will not be disturbed by operational parameters.

1. Remove the fulcrum pin from the tube for the wheel tensioner suspension and keep it to hand.

2. 

CAUTION!
Risk of crushing and shearing between the mounting parts and wheel tensioner!

Carefully lift up the wheel tensioner between the top and bottom mounting parts.

3. Align the wheel tensioner so that the holes on the mounting parts are in contact with the tube of the wheel tensioner.

4. Insert the fulcrum pin through the hole in the top mounting part, through the tube on the wheel tensioner suspension and through the slotted hole in the bottom mounting part.

5. Screw a locking nut onto the bottom end of the fulcrum pin and tighten it.

The wheel tensioner suspension must be able to rotate freely.

6. Insert a split pin into the hole in the bottom part of the fulcrum pin.

Attaching wires

Personnel:
- Specialized personnel

Protective equipment:
- High-vis clothing
- Safety footwear
- Protective gloves
- Protective clothing
- Safety goggles

The deflection of the wheel element should not exceed 30°. If larger values are to be present, careful checks are necessary during the planning phase.

1. Unwind the wires according to the wire temperature (*“Adjustment table” on page 77*).
2. Wind the wires onto the small reel so that they are in contact with the large wheel.
3. Make sure that the wires are wound onto the wheel body without crossing over.

Adjusting the wheel tensioner axis

On a mast or in a rectangular tunnel

Personnel:
- Specialized personnel

Protective equipment:
- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety footwear
- Safety goggles

1. Place a spirit level vertically against the wheel body.
2. Move the wheel body to vertical by moving the adjusting link at the bottom end of the fulcrum pin.

In a tunnel with a basket arch or circular cross section

Personnel:
- Specialized personnel

Protective equipment:
- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety goggles

1. Place a spirit level vertically against the wheel body.
2. Move the adjusting link at the bottom end of the fulcrum pin to adjust the reel axis of the wheel body vertically to the cable axis.

7.4.2 Attaching the set of weights

Installing the set of weights on the mast

Personnel:
- Specialized personnel

Protective equipment:
- High-vis clothing
- Safety footwear
- Protective gloves
- Protective clothing
- Industrial safety helmet

Special tool:
- Hoisting equipment

Risk of burns

1. 

CAUTION!
Risk of burns on cable and wires!

Carefully move the cable winding to its basic setting.

Risk of crushing

2. 

CAUTION!
Risk of crushing between the joint and weight rod!

Carefully check whether the joint is fully bolted onto the weight rod.

3. Attach a strap to the joint of the set of weights.
4. Use hoisting equipment to lift the set of weights up to the wedge-type dead-end clamp of the wheel tensioner cable on the large wheel.
5. Bolt the joint of the set of weights into the wedge-type dead-end clamp of the wheel tensioner cable.
6. Make sure that the set of weights is suspended from the wheel tensioner cable.
7. Carefully release the set of weights from the strap on the hoisting equipment.
8. Make sure that the clamp is in contact with the weights and is securing them in place.
9. Secure sets of weights to prevent uncontrolled swinging until the weight guide is installed.

Installing sets of weights in a tunnel

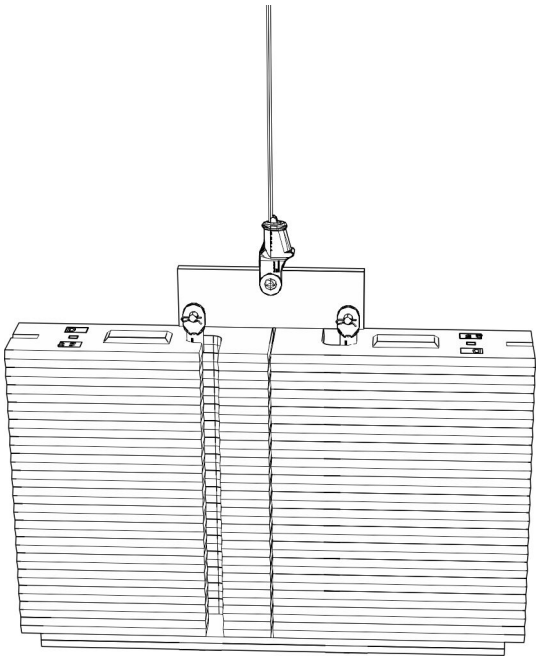


Fig. 27: Sets of weights in a tunnel

Personnel:
- Specialized personnel

Protective equipment:
- High-vis clothing
- Safety footwear
- Protective gloves
- Protective clothing
- Industrial safety helmet

Special tool:
- Hoisting equipment

Risk of burns

1. **CAUTION!**
   Risk of burns on cable and wires!

   Carefully move the cable winding to its basic setting.

2. Attach a strap to the connecting piece between the two sets of weights.

3. **CAUTION!**
   Risk of injury if the sets of weights swing out!

   Use hoisting equipment to carefully lift the sets of weights up to the wedge-type dead-end clamp of the wheel tensioner cable on the large wheel.

4. Bolt the connecting piece between the two sets of weights into the wedge-type dead-end clamp of the wheel tensioner cable.

5. **CAUTION!**
Risk of injury if the sets of weights slip!

Make sure that the sets of weights are suspended from the wheel tensioner cable.

6. Carefully release the sets of weights from the strap on the hoisting equipment.

7.4.3 Installing the weight guide on the mast

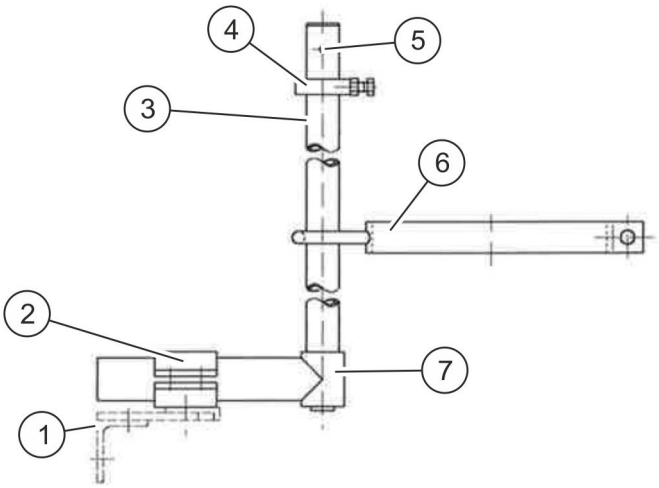


Fig. 28: Weight guide on the mast

1 Mast mounting
2 Clip
3 Guide tube
4 Adjusting ring
5 Grooved cylindrical pin
6 Guide clip
7 Pipe clamp

Calibrating the mast mounting

Personnel:
- Specialized personnel

Protective equipment:
- Protective clothing
- Industrial safety helmet
- Protective gloves
- Safety footwear
- High-vis clothing

Special tool:
- Spirit level

The height of the mast mounting is generally determined in the planning documents.

1. Allow a distance of 10 mm between the grooved cylindrical pin and the bracket.
2. Calibrate and mark out the mast mounting.

Installing the mast mounting

Personnel:
- Specialized personnel

Protective equipment:
- Protective clothing
- Industrial safety helmet
- Protective gloves
- Safety footwear
- High-vis clothing

1. Make sure that the construction site is undisturbed.
2. Enter the construction site in accordance with the owner's regulations.
3. Screw the clip (Fig. 28/2) into the slotted hole so that it moves easily.
4. Fasten the guide clip (Fig. 28/6) and adjusting ring (Fig. 28/4) on the guide tube (Fig. 28/3).
5. Guide the upper end of the guide tube (Fig. 28/3) into the bracket for the guide tube on the tensioning device.
6. Move the guide tube (Fig. 28/3) into the pipe clamp (Fig. 28/7) on the underside.
7. Position the guide ring and fasten it using the grooved cylindrical pin (Fig. 28/5).

The final position is adjusted once the wheel tensioner has been connected to the contact line and the temperature setting has been adjusted.

8. Only tighten the screws lightly.

Installing the mast mounting on an angled mast

Personnel:
- Specialized personnel

Protective equipment:
- High-vis clothing
- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety footwear
- Safety goggles
- Hearing protection

Special tool:
- Spirit level

1. Make sure that the construction site is undisturbed.
2. Enter the construction site in accordance with the owner's regulations.
3. Fasten the mast mounting on the angled mast with two claws and hexagon bolts.
4. Bolt the clip for the pipe clamp (Fig. 29/1) onto the mast mounting so that it can still slide easily.
5. Fasten the pipe clamp (Fig. 29/3) to the clip (Fig. 29/1) loosely enough that it can still slide easily.
6. Align the pipe clamp and clip visually and pre-adjust them.
7. If the diagonal struts on the mast require you to do so, shorten the pipe clamp (Fig. 29/3).

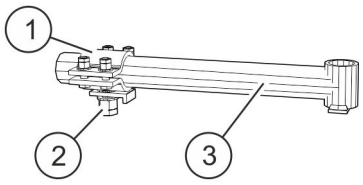


Fig. 29: Pipe clamp and clip

1 Clip
2 Locking nut
3 Pipe clamp

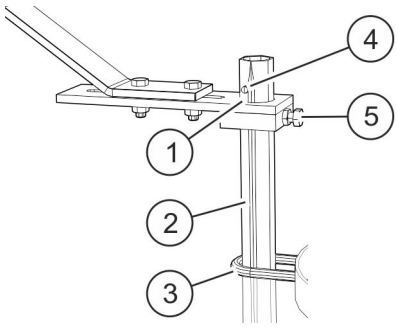


Fig. 30: Guide tube and adjusting ring

1 Bracket for guide tube
2 Guide tube
3 Guide clamp on the set of weights
4 Grooved cylindrical pin
5 Adjusting ring

8. Slide the guide tube (Fig. 30/2) through the guide clip on the set of weights (Fig. 30/3), through the adjusting ring (Fig. 30/5) and through the bracket for the guide tube (Fig. 30/1).
   ⇨ The guide tube is held in the bracket for the guide tube.
9. Secure the guide tube with the grooved cylindrical pin (Fig. 30/4).
10. Make sure that the grooved cylindrical pin (Fig. 30/4) is at a distance of 10 mm from the bracket (Fig. 30/1).
11. Mark the guide tube (Fig. 30/2) at a maximum of 2 cm protrusion below the pipe clamp.
12. Shorten the guide tube (Fig. 30/2) to the required length at its bottom end.
13. Place the guide tube (Fig. 30/2) in the pipe clamp (Fig. 29/3).
14. Slide the adjusting ring (Fig. 30/5) into the top position on the bracket for the guide tube (Fig. 30/1) and screw it tight.
15. Adjust the bracket (Fig. 30/1) and pipe clamp (Fig. 29/3) so that the guide tube (Fig. 30/2) is vertical.

16. Tighten the screws on the bracket and on the pipe clamp.
    ⇨ The guide tube is fixed in place.
17. Screw the locking nut (Fig. 29/2) onto the clip (Fig. 29/1) of the pipe clamp and tighten it.

7.4.4 Installing the weight guide in a tunnel

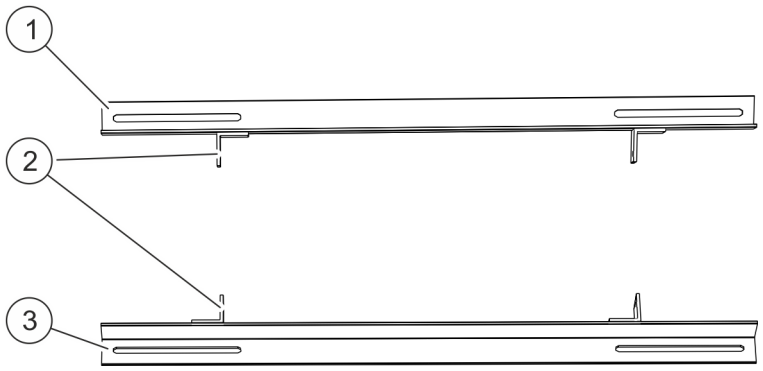


Fig. 31: Fastening for weight guide in a tunnel

1 Top mounting part
2 Attachment points for connection plates
3 Bottom mounting part

7.4.4.1 In a round tunnel

Personnel:
- Specialized personnel

Protective equipment:
- High-vis clothing
- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety footwear
- Safety goggles
- Hearing protection

Special tool:
- Spirit level

Calibrating and installing the mounting parts

1. Calibrate the installation height of the top and bottom mounting parts in accordance with the project visualisation.
2. Fasten the top mounting part to the anchor rails using two stud bolts.

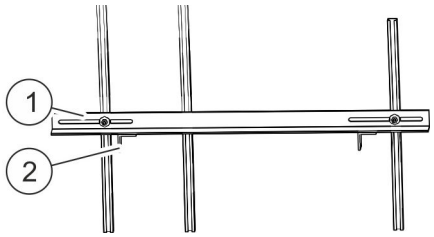


Fig. 32: Top mounting part

1 Top mounting part
2 Attachment point for connection plate

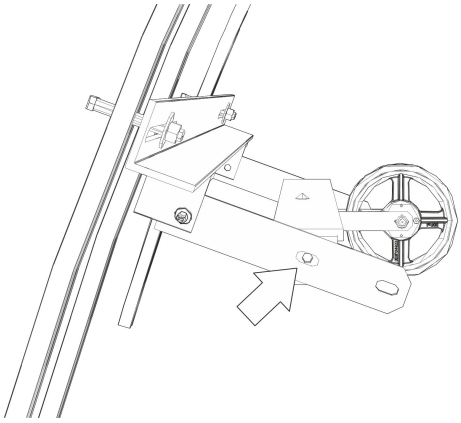


Fig. 33: Installing the pulley

Fastening the sliding angle bracket

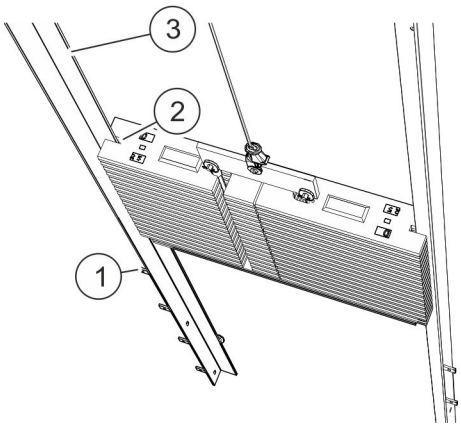


Fig. 34: Sliding angle bracket for weight guide in a tunnel

1 Mounting plate for the protective cover
2 Lateral recesses on the weights

3. Align the top mounting part horizontally using a spirit level and vertically to the centre of the cable axis of the wheel tensioner cable.

4. Lightly bolt on the connection plates for the pulley mounting with one hexagon bolt each, inserted from the outside of the mounting part (Fig. 32/2).

When doing this, bolt one of the connection plates to the inside of the mounting part and the other connection plate to the outside of the mounting part.

5. Bolt on the pulley with its mounting between the two top connection plates, using two hexagon bolts in the middle slotted hole on the connection plates (Fig. 33).

6. Fasten the bottom mounting part to the anchor rails using two stud bolts. Align it horizontally using a spirit level and vertically to the centre of the cable axis of the wheel tensioner cable.

7. Lightly bolt on the connection plates for the bottom mounting part using one hexagon bolt on each on the outsides of the mounting part.

When doing this, bolt the connection plate that is bolted to the inside of the top mounting part onto the outside of the mounting part at the bottom, and vice versa.

⇨ The bevelled side sticks out from the wall.

8. Push sliding angle brackets for the weight guide (Fig. 34/3) into the recesses on the weights on the left and right (Fig. 34/2) and fasten them with one hexagon bolt each on the top connection plate, in the slotted hole at the back and on the bottom connection plate.

9. Use a spirit level to align the sliding angle brackets horizontally as per the project specifications above the top edge of the rail and vertically towards the wall/track.

10. Tighten the screws on the connection plates.

3 Sliding angle bracket

7.4.4.2 In a rectangular tunnel

Personnel:
- Specialized personnel

Protective equipment:
- High-vis clothing
- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety footwear
- Safety goggles
- Hearing protection

Special tool:
- Spirit level

1. Calibrate the mounting bracket on the anchor rails so that the distance between the outer edge of the mounting bracket and the cable axis of the wheel tensioner cable is approximately 657 mm.
2. Fasten the mounting bracket loosely enough that it can still slide with one stud bolt on each of the anchor rails.
3. Mount the connection plates to the outside of the mounting brackets with one hexagon bolt each and tighten the bolts slightly.
4. Push sliding angle brackets into the recesses on the weights on the left and right and fasten them with one hexagon bolt each on the top connection plate and bottom connection plate.
5. Use a spirit level to align the sliding angle bracket vertically in the longitudinal direction to the weights and tighten the stud bolts on the sliding angle bracket.
6. In the recesses on the weights, maintain a gap between the edge of the sliding angle bracket and the weight so that the distance between the front edge of the sliding angle bracket and the cable axis of the wheel tensioner is 557 mm.
7. Use a spirit level to align the sliding angle brackets horizontally as per the project specifications above the top edge of the rail and vertically towards the wall or track.
8. Tighten the screws on the connection plates.

7.4.4.3 Installing a protective cover in a tunnel

Personnel:
- Specialized personnel

Protective equipment:
- High-vis clothing
- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety footwear
- Safety goggles
- Hearing protection

Prerequisite:

- The weight guide has been installed in the tunnel.

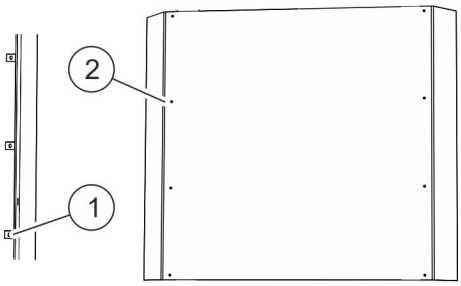


Fig. 35: Mounting plates and protective cover

1 Mounting plate
2 Hole in protective cover

1. Make sure that the construction site is undisturbed.
2. Enter the construction site in accordance with the owner's regulations.
3. Bolt the protective cover to the mounting plates (Fig. 35/1) using four flat-head screws each on the right and left slide rails.

7.4.5 Anchoring and connecting to the overhead contact line

Personnel:	■ Qualified electrician for high and medium voltage ■ Specialized personnel
Protective equipment:	■ Industrial safety helmet ■ Protective clothing ■ Protective gloves ■ Safety footwear ■ Safety goggles ■ Hearing protection ■ High-vis clothing
Special tool:	■ Spirit level ■ Moving iron

The contact wire is installed on the inner wheel tensioner on the side facing the track.

1. Clamp the wheel tensioner on the suspension.

Risk of crushing and shearing

2.

CAUTION!
Risk of crushing and shearing on the moving wheel tensioner!

Pull the contact wire and catenary wire to the next unclamped wheel tensioner. The weights must hang freely and the overhead contact line must move freely from the clamped wheel tensioner to the unclamped wheel tensioner.

3. Install the fixed point of the catenary wire and contact wire.

4. Release the clamped wheel tensioner.

5. Adjust the overhead contact line.

6. Install the contact wire droppers.

7. Adjust the lateral position of the support points.

8. Line up the wheel axes vertically.

9. If the compensating sheave/disc is not horizontal, use two moving irons to rotate the contact wire out of the last contact wire dropper until a horizontal position is achieved.

10. Align the guide pins with a spirit level.

11. Check all the screws and tighten them to the required torque.

The insulators are not attached until two weeks have passed, due to the elongation of the wires.

7.5 Adjusting the temperature settings

Personnel:
- Specialized personnel

Protective equipment:
- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety footwear
- Safety goggles
- Hearing protection
- High-vis clothing

Special tool:
- Jack
- Cable clamp
- Contact wire clamp
- Mounting fixture for tensioning devices
- Bridge
- Inductance thermometer

Prerequisites:

- The catenary system has been completed except for the insulators in the retensioning system.
- The fixed point has been installed.

Risk of burns

1. 

CAUTION!
Risk of burns on the contact wire!

Measure the contact wire temperature with the inductance thermometer.

2. Measure the height adjustment for the stack of weights.
3. Attach the mounting fixture for tensioning devices to the deflection pulley and connect it to the jack.
4. Tighten the catenary wire or contact wire with the wheel tensioner cable.

Sets of weights are initially installed in the default position, i.e. they are adjusted to the height at which they should be when the catenary wire or contact wire is subjected to temperature-dependent elongation at 20 °C.

5. Adjust the set of weights to the temperature on the contact wire by tightening or slackening the jack (*"Adjustment table" on page 77*).
6. Cut the insulator with the bridge into the catenary wire and remove the jack.
7. Check the settings for the wheel tensioner axis and readjust as necessary.

8. Check the position of the weight guide using a spirit level and readjust it as necessary.

Adjustment table

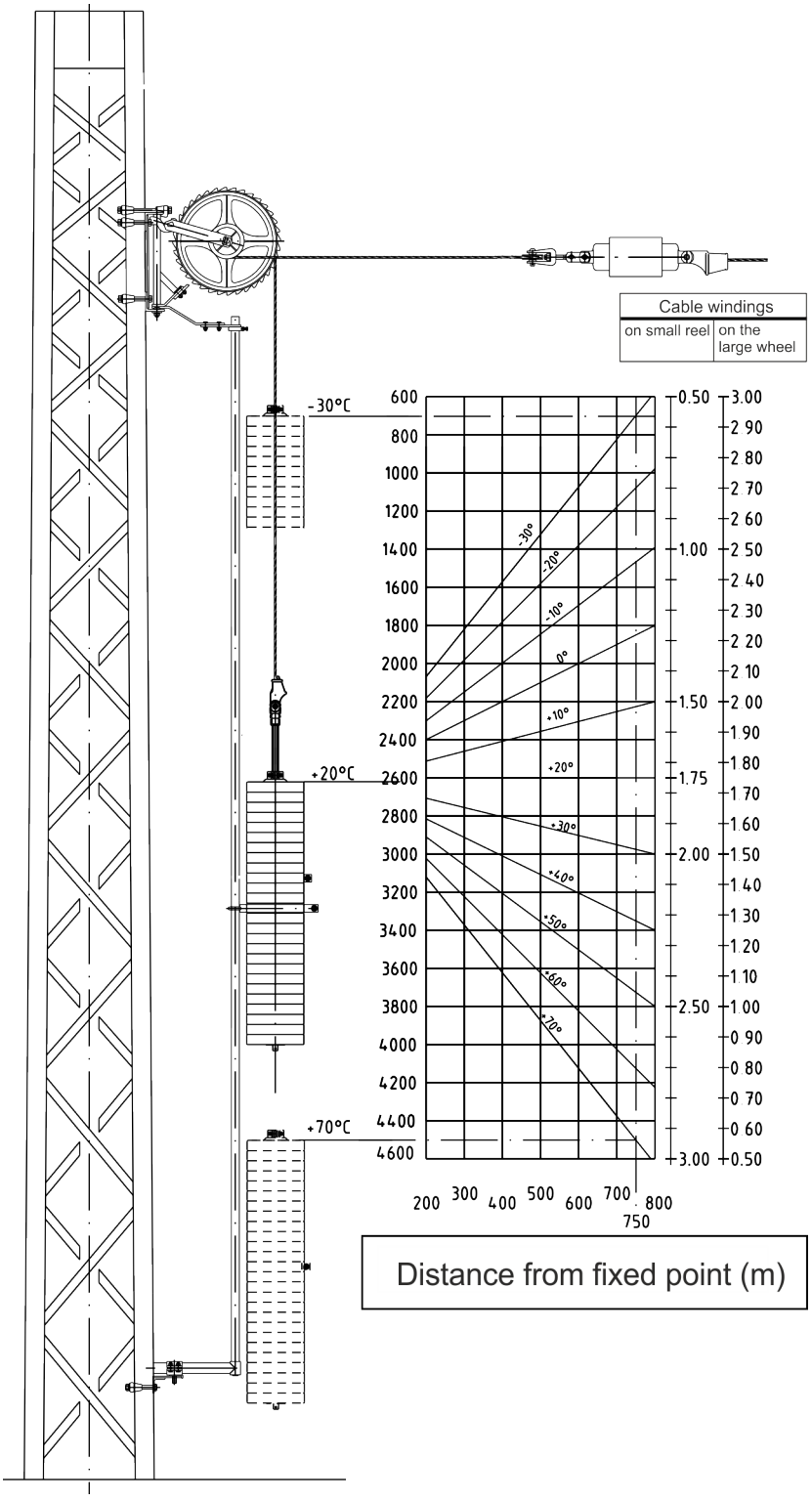


Fig. 36: Adjustment table

Tab. 2: Height adjustment in m for set of weights for TracFeed® ALU 2000

Temperature/half retensioning length	750 m	700 m	650 m	600 m	550 m	500 m	450 m	400 m	350 m	300 m	250 m	200 m
-30 °C	0.55	0.68	0.81	0.94	1.07	1.20	1.33	1.46	1.59	1.72	1.85	1.98
-25 °C	0.75	0.87	0.98	1.10	1.22	1.33	1.45	1.57	1.68	1.80	1.92	2.03
-20 °C	0.94	1.05	1.15	1.25	1.36	1.46	1.57	1.67	1.77	1.88	1.98	2.08
-15 °C	1.14	1.23	1.32	1.41	1.50	1.59	1.68	1.77	1.86	1.96	2.05	2.14
-10 °C	1.33	1.41	1.49	1.57	1.64	1.72	1.80	1.88	1.96	2.03	2.11	2.19
-5 °C	1.53	1.59	1.66	1.72	1.79	1.85	1.92	1.98	2.05	2.11	2.18	2.24
0 °C	1.72	1.77	1.83	1.88	1.93	1.98	2.03	2.08	2.14	2.19	2.24	2.29
5 °C	1.92	1.96	1.99	2.03	2.07	2.11	2.15	2.19	2.23	2.27	2.31	2.34
10 °C	2.11	2.14	2.16	2.19	2.21	2.24	2.27	2.29	2.32	2.34	2.37	2.40
15 °C	2.31	2.32	2.33	2.34	2.36	2.37	2.38	2.40	2.41	2.42	2.44	2.45
20 °C	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
25 °C	2.69	2.68	2.67	2.66	2.64	2.63	2.62	2.60	2.59	2.58	2.56	2.55
30 °C	2.89	2.86	2.84	2.81	2.79	2.76	2.73	2.71	2.68	2.66	2.63	2.60
35 °C	3.08	3.04	3.01	2.97	2.93	2.89	2.85	2.81	2.77	2.73	2.69	2.66
40 °C	3.28	3.23	3.17	3.12	3.07	3.02	2.97	2.92	2.86	2.81	2.76	2.71
45 °C	3.47	3.41	3.34	3.28	3.21	3.15	3.08	3.02	2.95	2.89	2.82	2.76
50 °C	3.67	3.59	3.51	3.43	3.36	3.28	3.20	3.12	3.04	2.97	2.89	2.81
55 °C	3.86	3.77	3.68	3.59	3.50	3.41	3.32	3.23	3.14	3.04	2.97	2.86
60 °C	4.06	3.95	3.85	3.75	3.64	3.54	3.43	3.33	3.23	3.12	3.02	2.92
65 °C	4.25	4.13	4.02	3.90	3.78	3.67	3.55	3.43	3.32	3.20	3.08	2.97
70 °C	4.45	4.32	4.19	4.06	3.93	3.80	3.67	3.54	3.41	3.28	3.15	3.02

Tab. 3: Height adjustment in m for set of weights for TracFeed® ALU 3000

Temperature/half retensioning length	700 m	650 m	600 m	550 m	500 m	450 m	400 m	350 m	300 m	250 m	200 m
-30 °C	0.60	0.74	0.89	1.03	1.17	1.32	1.46	1.60	1.74	1.89	2.03
-25 °C	0.78	0.91	1.04	1.17	1.30	1.43	1.56	1.69	1.82	1.95	2.08
-20 °C	0.97	1.08	1.20	1.32	1.43	1.55	1.67	1.78	1.90	2.02	2.13
-15 °C	1.15	1.25	1.35	1.46	1.56	1.67	1.77	1.87	1.98	2.08	2.18
-10 °C	1.33	1.42	1.51	1.60	1.69	1.78	1.87	1.96	2.06	2.15	2.24
-5 °C	1.51	1.59	1.67	1.74	1.82	1.90	1.98	2.06	2.13	2.21	2.29
0 °C	1.69	1.76	1.82	1.89	1.95	2.02	2.08	2.15	2.21	2.28	2.34
5 °C	1.87	1.93	1.98	2.03	2.08	2.13	2.18	2.24	2.29	2.34	2.39
10 °C	2.06	2.09	2.13	2.17	2.21	2.25	2.29	2.33	2.37	2.41	2.44
15 °C	2.24	2.26	2.29	2.31	2.34	2.37	2.39	2.42	2.44	2.47	2.50
20 °C	2.42	2.43	2.44	2.46	2.47	2.48	2.50	2.51	2.52	2.54	2.55
25 °C	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60
30 °C	2.78	2.77	2.76	2.74	2.73	2.72	2.70	2.69	2.68	2.66	2.65
35 °C	2.96	2.94	2.91	2.89	2.86	2.83	2.81	2.78	2.76	2.73	2.70
40 °C	3.14	3.11	3.07	3.03	2.99	2.95	2.91	2.87	2.83	2.79	2.76
45 °C	3.33	3.27	3.22	3.17	3.12	3.07	3.02	2.96	2.91	2.86	2.81
50 °C	3.51	3.44	3.38	3.31	3.25	3.18	3.12	3.05	2.99	2.92	2.86
55 °C	3.69	3.61	3.53	3.46	3.38	3.30	3.22	3.14	3.07	2.99	2.91
60 °C	3.87	3.78	3.69	3.60	3.51	3.42	3.33	3.24	3.14	3.05	2.96
65 °C	4.05	3.95	3.85	3.74	3.63	3.53	3.43	3.33	3.22	3.12	3.02
70 °C	4.23	4.12	4.00	3.88	3.77	3.65	3.53	3.42	3.30	3.18	3.07
75 °C	4.42	4.29	4.16	4.03	3.90	3.77	3.64	3.51	3.38	3.25	3.12
80 °C	4.60	4.46	4.31	4.17	4.03	3.88	3.74	3.60	3.46	3.31	3.17

7.6 Adjusting the blocking device

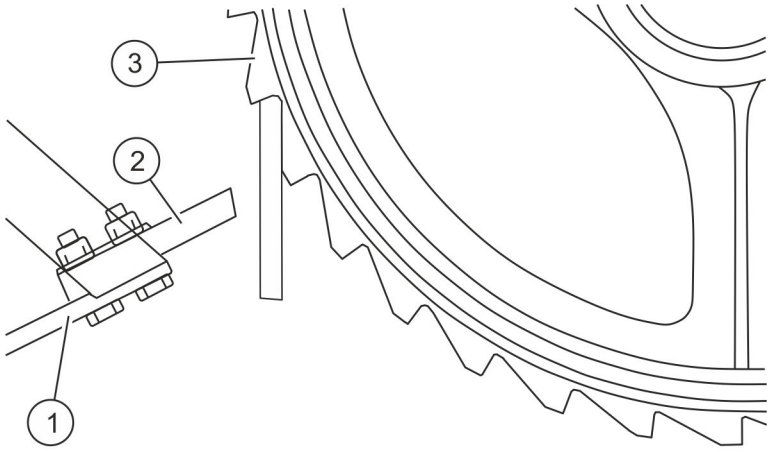


Fig. 37: Blocking device

1 Blocking device: angle bracket
2 Blocking device: catch plate
3 Wheel body: tensioning wheel cog

Personnel:
- Specialized personnel

Protective equipment:
- Industrial safety helmet
- Protective gloves
- Safety footwear
- High-vis clothing

Prerequisite:

- The contact line system is switched off and earthed.

1. Loosen the screws on the slotted hole until the catch plate can slide easily.

2. Measure the distance between the catch plate and the perpendicular of the tensioning wheel cogs with a folding meter.

3. Adjust the distance between the catch plate and the perpendicular of the tensioning wheel cogs to precisely 20 mm.

Risk of crushing

4.

CAUTION!
Risk of crushing on the tensioning wheel!

Carefully tighten the screws on the slotted hole until it is no longer possible to slide the catch plate.

⇨ The catch plate is fixed in place.

7.7 Final checks

Conclude by checking the following:

- Are the cables wound onto the wheel bodies evenly and without crossing over?
- Do the cables run freely, not passing over or along any edges?
- Are the weight guide and the weight clamps installed properly?
- Is the distance between the wheel plate and the tensioning wheel cog horizontal through the deflection pulley, as per the specifications?
- Is the wheel tensioner suspension movable?
- Is the wheel tensioner movable?

8 Maintenance

8.1 Safety instructions for maintenance

Electric current

DANGER!

Danger to life from electric current!

Potentially fatal voltages occur on railway systems and in the vicinity of overhead contact lines.

- Have all work carried out by trained specialist personnel only. Personnel must be sufficiently informed of the potential hazards that may occur in railway operations.
- Before beginning any work, confer with the office responsible for railway operation (control room) and jointly agree on safety measures (e.g. flagmen or line closure).
- If there is any damage to the insulation, immediately disconnect the power supply and carry out repairs.
- When working on or in the vicinity of overhead contact lines, take measures at the workplace to ensure and secure a de-energised state.
  Observe the five safety rules:
  1. Disconnect from the power supply.
  2. Secure against re-connection.
  3. Verify that the system is dead.
  4. Earth and short-circuit.
  5. Cover or shield adjacent live parts.
- Do not make any alterations to the TracFeed® NSV wheel tensioner.

Working in the vicinity of rail tracks

WARNING!

Danger to life from railway traffic!

Carelessness when working in the vicinity of rail tracks can result in severe to fatal injuries.

- Observe the national regulations concerning work in the vicinity of rail tracks.
- Before beginning any work, confer with the office responsible for railway operation (control room) and jointly agree on safety measures (e.g. flagmen or line closure).
- Before commencing work, ensure that the safety measures (e.g. flagmen or line closure) are effective.
- Only perform work on overhead contact lines in favourable weather conditions.
- Do not perform work on overhead contact lines without another person present.
- If using a flagman, make sure that visual contact and, if necessary, spoken contact is ensured at all times.
- When working in tunnels and at night, ensure sufficient illumination of the work area at all times.

8.2 Maintenance plan

Interval	Maintenance work	Personnel
Annually	Visual inspection for damage/corrosion, including on the wheel bodies and weights	Authorised service personnel
	Check that all weights are present and complete (in the case of individual weight segments)	Authorised service personnel
	Check that sets of weights move freely	Authorised service personnel
	Visual inspection of the cables for damage, unravelling of individual cable wires	Authorised service personnel

9 Faults

In the case of defects of the system or the components during the warranty period, warranty claims can only be made if the fault is documented on the supplementary sheet and returned together with the defective component(s). If this is not done, Rail Power Systems reserves the right to reject warranty claims.

The following chapter describes possible causes of faults and how to rectify them.

If faults occur increasingly, reduce the maintenance intervals accordingly.

If the information provided here does not rectify a fault, contact the manufacturer; see *“Customer service” on page 4*.

9.1 Safety instructions for fault clearance

Electric current

DANGER!

Danger to life from electric current!

Potentially fatal voltages occur on railway systems and in the vicinity of overhead contact lines.

- Have all work carried out by trained specialist personnel only. Personnel must be sufficiently informed of the potential hazards that may occur in railway operations.
- Before beginning any work, confer with the office responsible for railway operation (control room) and jointly agree on safety measures (e.g. flagmen or line closure).
- If there is any damage to the insulation, immediately disconnect the power supply and carry out repairs.
- When working on or in the vicinity of overhead contact lines, take measures at the workplace to ensure and secure a de-energised state. Observe the five safety rules:
  1. Disconnect from the power supply.
  2. Secure against re-connection.
  3. Verify that the system is dead.
  4. Earth and short-circuit.
  5. Cover or shield adjacent live parts.
- Do not make any alterations to the TracFeed® NSV wheel tensioner.

Working in the vicinity of rail tracks

WARNING!

Danger to life from railway traffic!

Carelessness when working in the vicinity of rail tracks can result in severe to fatal injuries.

- Observe the national regulations concerning work in the vicinity of rail tracks.
- Before beginning any work, confer with the office responsible for railway operation (control room) and jointly agree on safety measures (e.g. flagmen or line closure).
- Before commencing work, ensure that the safety measures (e.g. flagmen or line closure) are effective.
- Only perform work on overhead contact lines in favourable weather conditions.
- Do not perform work on overhead contact lines without another person present.
- If using a flagman, make sure that visual contact and, if necessary, spoken contact is ensured at all times.
- When working in tunnels and at night, ensure sufficient illumination of the work area at all times.

Improperly executed fault clearance work

DANGER!

Risk of injury due to improper fault clearance!

Improperly executed fault clearance work can result in severe to fatal injuries and significant damage to property.

- Only allow qualified electricians to perform work on the electrical system.
- Before starting work, ensure there is sufficient assembly space is available.
- Ensure orderliness and cleanliness at the installation location. Loosely stacked or scattered components and tools could cause accidents.
- If components have been removed, ensure they are installed correctly, reinstall all fastening elements and comply with the screw tightening torques.
- Note the following before putting the system back into operation:
  - Make sure that all fault clearance work was carried out and completed in accordance with the specifications and information in this manual.
  - Make sure that there are no persons in the danger zone.
  - Make sure that all covers and safety equipment are installed and functioning properly.

9.2 Indication of a fault

Indication of a fault:

- The cogs of the wheel tensioner are in contact with the catch plate.
- The weight guide clamp reaches the top or end limit stop of the weight guide rod.

9.3 Fault table

Fault description	Cause	Remedy
Cable tear outside the insulated area	External causes	Replace wheel tensioner.
Cable tear inside the insulated area	External causes, cable running up against wheel body	Replace wheel tensioner, check layout.
Bracing forces not correct	Blocked cantilever arm (external cause), missing weights	Check cantilever arm (up to fixed point), check weights are present and complete.

Faults

Fault table

After a wire break or cable tear, the wheel tensioner has to be completely replaced as the tensioning wheel cogs could be damaged.

10 Spare parts

10.1 Incorrect spare parts

Incorrect spare parts

WARNING!

Risk of injury to persons due to the use of incorrect spare parts!

The use of incorrect or defective spare parts can cause dangers for personnel and may lead to damage, malfunctions or total failure.

– Only use spare parts that have been approved by Rail Power Systems.
– If there is any doubt, always contact our customer service.

NOTICE!

Loss of warranty

The manufacturer warranty is voided if unapproved spare parts are used.

10.2 Spare parts list

Spare parts in general

Spare part	Material	Order number	Comment
Wheel tensioner cable 50 mm², bitumen-coated	Steel, thermally galvanised	3EGF002731	-
Protective cover, tunnel	EN AW-6082 T6	3EGF012534	-
Train platform protective cage for 2 sets of weights next to each other	EN S235JR	3EGF001755	Fastening material, specify mast type and dimensions when placing order
Train platform protective cage for 1 set of weights, D203	EN AW-6082 T6	3EGF006411	
Train platform protective cage for 1 set of weights, D300	EN AW-6082 T6	3EGF011973	
Train platform protective cage for 1 set of weights, D350	EN AW-6082 T6	3EGF010470	
Train platform protective cage for 1 set of weights, D410	EN AW-6082 T6	3EGF010471	

Spare parts

Spare parts list

Weight guide for round tunnel

Spare part	Material	Order number	Comment
Top mounting bracket	EN AW-6082 T6	3EGF015556	Anchor, right
	EN AW-6082 T6	3EGF015557	Anchor, left
Mounting bracket, bottom	EN AW-6082 T6	3EGF015558	Anchor, right
	EN AW-6082 T6	3EGF015559	Anchor, left
Connection plate L320	EN AW-6060 T66	3EGF020284	-
Connection plate L440	EN AW-6060 T66	3EGF020285	-
Connection plate L520	EN AW-6060 T66	3EGF020286	-
Connection plate L640	EN AW-6060 T66	3EGF020287	-
Sliding angle bracket, right	EN AW-6082 T6	3EGF015539	-
Sliding angle bracket, left	EN AW-6082 T6	3EGF015540	-
Deflection pulley incl. mounting	EN AW-6082 T6	3EGF013578	-

Weight guide for rectangular tunnel

Spare part	Material	Order number	Comment
Connection plates	EN AW-6060 T66	3EGF012680	Both needed 4x for each weight guide
	EN AW-6060 T66	3EGF012681	
Sliding angle bracket, left, L4000	EN AW-6082 T6	3EGF012514	-
Sliding angle bracket, left, L4950	EN AW-6082 T6	3EGF012515	-
Sliding angle bracket, right, L4000	EN AW-6082 T6	3EGF012516	-
Sliding angle bracket, right, L4950	EN AW-6082 T6	3EGF012517	-

Weight guide for open track

Spare part	Material	Order number
Weight guide clamp D208	EN X5CrNi18-10	3EGF011338
Weight guide clamp D305	EN X5CrNi18-10	3EGF011339
Weight guide clamp D355	EN X5CrNi18-10	3EGF011340
Weight guide clamp D415	EN X5CrNi18-10	3EGF011337
Weight guide rod L6400	EN AW-6082 T6	3EGF019490
Weight guide rod L8000	EN AW-6082 T6	3EGF019489
Weight guide clip	EN AW-6082 T6	3EGF003104
Pipe clamp L500	EN AW-6082 T6	3EGF003098
Pipe clamp L600	EN AW-6082 T6	3EGF008385
Pipe clamp L750	EN AW-6082 T6	3EGF003099
Pipe clamp L1000	EN AW-6082 T6	3EGF003100
Adjusting ring	EN AW-6082 T6	3EGF001786
Sealing cap	PVC	3EGF002877

Weight rods and associated weight plates

Designation	Material	Order number	Number of weights	Resultant bracing force
Weight plate D205 H123 25 kg	EN-JL 1020	3EGF019529	-	-
Weight rod H1599	EN S235JR+C	3EGF019555	13	10 kN
Weight rod H2019	EN S235JR+C	3EGF019565	17	13 kN
Weight plate D202 H62 12.5 kg	EN-JL 1020	3EGF019530	-	-
Weight rod H1599	EN S235JR+C	3EGF019555	26	10 kN
Weight rod H2019	EN S235JR+C	3EGF019565	34	13 kN
Weight plate D412 H56.6 50 kg	EN-JL 1020	3EGF019533	-	-
Weight rod H394 *	EN S235JR+C	3EGF019553	6	10 kN
Weight rod H452 *	EN S235JR+C	3EGF019563	8	13 kN
Weight rod H791	EN S235JR+C	3EGF019539	14	21 kN
Weight rod H1017	EN S235JR+C	3EGF019541	18	27 kN
Weight plate D302 H27.5 12.5 kg	EN-JL 1020	3EGF019532	-	-
Weight rod H715	EN S235JR+C	3EGF019550	13	10 kN
Weight rod H935	EN S235JR+C	3EGF019650	17	13 kN
Weight plate D302 H55 25 kg	EN-JL 1020	3EGF019531	-	-
Weight rod H1100	EN S235JR+C	3EGF019535	20	15 kN
Weight rod H1540	EN S235JR+C	3EGF019543	28	21 kN
Weight rod H1980	EN S235JR+C	3EGF019545	36	27 kN
Weight plate D350 H115 25 kg	C26/30	3EGF001736	-	-
Weight rod H1495	EN S235JR+C	3EGF019547	13	10 kN
Weight rod H1955	EN S235JR+C	3EGF019557	17	13 kN
Weight rod H2300	EN S235JR+C	3EGF015475	20	15 kN

Weight plate tunnel H43 26.5 kg	EN-JL 1020	3EGF003122	-	-
Weight rod H276	EN S235JR+C	3EGF018693	12	10 kN
Weight rod H362	EN S235JR+C	3EGF018694	16	13 kN
Weight rod H423	EN S235JR+C		18	15 kN
Weight rod H595	EN S235JR+C	3EGF015543	26	21 kN
Weight rod H767	EN S235JR+C	3EGF013546	34	27 kN

* additionally 1 x 3EGF019531

Fastening for wheel tensioner

Spare part	Material	Order number	Mast width/ diameter	Alignment	Anchor from
Rectangular tunnel, top	EN S355J2G3	3EGF013155	-	Anchor, right	-
	EN S355J2G3	3EGF013156	-	Anchor, left	-
Rectangular tunnel, bottom	EN S355J2G3	3EGF018704	-	Anchor, right	-
	EN S355J2G3	3EGF018703	-	Anchor, left	-
Round tunnel, top	EN S355J2G3	3EGF012217	-	Anchor, right	-
	EN S355J2G3	3EGF012218	-	Anchor, left	-
Round tunnel, bottom	EN S355J2G3	3EGF012219	-	Anchor, right	-
	EN S355J2G3	3EGF012220	-	Anchor, left	-
Concrete mast one in front of the other **	EN AW-6082 T6	3EGF001711	D300-460	-	Contact wire
	EN AW-6082 T6	3EGF001714	D300-460	-	Catenary wire
	EN AW-6082 T6	3EGF001712	D440-560	-	Contact wire
	EN AW-6082 T6	3EGF001715	D440-560	-	Catenary wire
	EN AW-6082 T6	3EGF001713	D540-660	-	Contact wire
	EN AW-6082 T6	3EGF001717	D540-660	-	Catenary wire
Concrete mast next to each other **	EN AW-6082 T6	3EGF001703	D300-460	-	-
	EN AW-6082 T6	3EGF001704	D440-560	-	-
	EN AW-6082 T6	3EGF001706	D540-660	-	-
Special steel mast one in front of the other **	EN S235JR	3EGF016569	-	Anchor, left	Contact wire
	EN S235JR	3EGF016570	-	Anchor, right	Contact wire
	EN S235JR	3EGF016571	-	Anchor, left	Catenary wire
	EN S235JR	3EGF016572	-	Anchor, right	Catenary wire

Spare part	Material	Order number	Mast width/ diameter	Alignment	Anchor from
Angled mast next to each other **	EN S235JR	3EGF009667	B440-640	Anchor, right	-
	EN S235JR	3EGF009668	B440-640	Anchor, left	-

** requires fastening sockets inserted into the mast

*** specify mast width when placing order

11 Disassembly and disposal

11.1 Safety information for disassembly and disposal

Electric current

DANGER!

Danger to life from electric current!

Potentially fatal voltages occur on railway systems and in the vicinity of overhead contact lines.

- Have all work carried out by trained specialist personnel only. Personnel must be sufficiently informed of the potential hazards that may occur in railway operations.
- Before beginning any work, confer with the office responsible for railway operation (control room) and jointly agree on safety measures (e.g. flagmen or line closure).
- If there is any damage to the insulation, immediately disconnect the power supply and carry out repairs.
- When working on or in the vicinity of overhead contact lines, take measures at the workplace to ensure and secure a de-energised state. Observe the five safety rules:
  1. Disconnect from the power supply.
  2. Secure against re-connection.
  3. Verify that the system is dead.
  4. Earth and short-circuit.
  5. Cover or shield adjacent live parts.
- Do not make any alterations to the TracFeed® NSV wheel tensioner.

Working in the vicinity of rail tracks

WARNING!

Danger to life from railway traffic!

Carelessness when working in the vicinity of rail tracks can result in severe to fatal injuries.

- Observe the national regulations concerning work in the vicinity of rail tracks.
- Before beginning any work, confer with the office responsible for railway operation (control room) and jointly agree on safety measures (e.g. flagmen or line closure).
- Before commencing work, ensure that the safety measures (e.g. flagmen or line closure) are effective.
- Only perform work on overhead contact lines in favourable weather conditions.
- Do not perform work on overhead contact lines without another person present.
- If using a flagman, make sure that visual contact and, if necessary, spoken contact is ensured at all times.
- When working in tunnels and at night, ensure sufficient illumination of the work area at all times.

Improper disassembly

WARNING!

Risk of injury due to improper disassembly.

Stored residual energy, angular components, sharp edges and corners on and in the device or on the tools needed can cause injuries.

- Ensure sufficient space before starting work.
- Handle exposed, sharp-edged components with caution.
- Pay attention to orderliness and cleanliness in the workplace. Loosely stacked or scattered components and tools could cause accidents.
- Disassemble the components properly. Note that some components are heavy. If necessary, use lifting equipment.
- Secure components so that they cannot fall down or topple over.
- Contact Rail Power Systems customer service if anything is unclear.

11.2 Disassembly

Personnel:
- Specialized personnel

Protective equipment:
- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety footwear
- Safety goggles
- Hearing protection
- High-vis clothing

Prerequisite:

- The contact line system is switched off and earthed.

1. Loosen all the screws on the wheel tensioner so that it can be moved easily.
2. Remove insulators.
3. Clamp the wheel tensioner.
4. Release the tension weights.
5. Release the guide pin.
6. Remove the remaining brackets and mounting accessories and dispose of them in an environmentally friendly manner.

   Release the guide pin.
7. Properly clean the assemblies and components and dismantle them in observance of applicable local occupational and environmental safety regulations.

11.3 Disposal

If no return or disposal agreement has been signed, recycle the dismantled components appropriately:

- Dispose of metals as scrap.
- Recycle plastic elements.
- Sort and dispose of the remaining components according to the material.

ENVIRONMENT!

Danger to the environment due to incorrect disposal!

Incorrect disposal may pose risks to the environment.

– If in doubt, obtain information about disposal in accordance with the environmental regulations from the local municipal authorities or specialised waste disposal companies.

12 Index

Index

Appendix

A Safety data sheets

LUBRITECH
Special Application Lubricants

LUBRICANTS. TECHNOLOGY. PEOPLE. FUCHS

SAFETY DATA SHEET

According to Regulation (EC) No. 1907/2006 (REACH) Article 31, Annex II as amended.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name: LICINOL UN 2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Lubricating grease
Uses advised against: No uses advised against identified.

1.3 Details of the supplier of the safety data sheet

Manufacturer / Supplier	FUCHS LUBRITECH GmbH Werner-Heisenberg-Straße 1 67661 Kaiserslautern/Germany
Telephone:	+49 (0) 6301 3206-0
Fax:	+49 (0) 6301 3206-940
Contact Person:	FUCHS LUBRITECH GmbH - Product Safety Management
Telephone:	+49 (0) 6301 3206-0
Fax:	+49 (0) 6301 3206-940
E-mail:	flt.reach@fuchs.com

1.4 Emergency telephone number: +49 (0) 6301 3206-0

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

The product has been classified and labelled as hazardous according to regulation (EU) 1272/2008 (CLP).

Classification according to Regulation (EC) No 1272/2008 as amended.

Health Hazards

Skin sensitizer	Category 1	H317: May cause an allergic skin reaction.

Hazard summary

Physical Hazards: No data available.

2.2 Label Elements

Contains: carboxylic acid zinc salt

Signal Words: Warning

Hazard Statement(s): H317: May cause an allergic skin reaction.

Precautionary Statements

Prevention: P280: Wear protective gloves/protective clothing/eye protection/face protection.

Response: P333+P313: If skin irritation or rash occurs: Get medical advice/attention.

2.3 Other hazards: By handling of mineral oil products and chemical products no particular hazard is known when normal precautions (item 7) and personal protective equipment (item 8) are kept. The product may not be released into the environment without control.

SECTION 3: Composition/information on ingredients

3.2 Mixtures

General information: Lubricating grease: Thickener system and additives in solvent refined mineral oil.

Chemical name	Identifier	Concentration *	REACH Registration No.	Notes
carboxylic acid zinc salt	EINECS: 282-762-6	1,00 - <5,00%	01-2119988500-34	

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.
PBT: persistent, bioaccumulative and toxic substance.
vPvB: very persistent and very bioaccumulative substance.

Classification

Chemical name	Identifier	Classification	
carboxylic acid zinc salt	EINECS: 282-762-6	CLP:	Aquatic Chronic 3;H412, Skin Sens. 1;H317, Eye Irrit. 2;H319

CLP: Regulation No. 1272/2008.

For the wording of the listed hazard statements refer to section 16.

Please note that the mineral oils and petroleum distillates used in our products are severely refined and have a DMSO extract < 3% as measured by method IP 346 and are not classified as carcinogenic according to Note L of Annex VI of Regulation EC 1272/2008."

SECTION 4: First aid measures

General: Instantly remove any clothing soiled by the product.

4.1 Description of first aid measures

Inhalation:	Supply fresh air; consult doctor in case of symptoms.
Eye contact:	Promptly wash eyes with plenty of water while lifting the eye lids.
Skin Contact:	Wash with soap and water.
Ingestion:	Rinse mouth thoroughly.
4.2 Most important symptoms and effects, both acute and delayed:	May cause skin and eye irritation.
4.3 Indication of any immediate medical attention and special treatment needed	Get medical attention if symptoms occur.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media:	CO_2, fire extinguishing powder or fog like water spraying. Extinguish larger fires with alcohol resistant foam or spray water with suitable surfactant added
Unsuitable extinguishing media:	Water with a full water jet.
5.2 Special hazards arising from the substance or mixture:	During fire, gases hazardous to health may be formed.

5.3 Advice for firefighters

Special fire fighting procedures:	Move container from fire area if it can be done without risk. Dispose of fire debris and contaminated fire fighting water inaccordance with official regulations. Collect contaminated fire fighting water separately. It must not enter drains.
Special protective equipment for fire-fighters:	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:	Not required.
6.2 Environmental Precautions:	Avoid release to the environment. Environmental manager must be informed of all major spillages. Prevent further leakage or spillage if safe to do so. Do not allow to enter drainage system, surface or ground water.

6.3 Methods and material for containment and cleaning up: Scrape up spillage or absorb with absorbing material. Dispose of the material collected according to regulations. Stop the flow of material, if this is without risk.

6.4 Reference to other sections: See Section 8 of the SDS for Personal Protective Equipment. See Section 7 for information on safe handling See Section 13 for information on disposal.

SECTION 7: Handling and storage:

7.1 Precautions for safe handling: Provide adequate ventilation. Observe good industrial hygiene practices. Do not eat, drink or smoke when working with the product. Take usual precautions when handling mineral oil products or chemical products.

7.2 Conditions for safe storage, including any incompatibilities: Local regulations concerning handling and storage of waterpolluting products have to be followed.

7.3 Specific end use(s): Not applicable

Storage Class: 11, Combustible solids

SECTION 8: Exposure controls/personal protection

8.1 Control Parameters

Occupational Exposure Limits

Chemical name	Type	Exposure Limit Values	Source
carboxylic acid zinc salt - Inhalable fraction.	MAK	2 mg/m3	Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (2011)
carboxylic acid zinc salt - Inhalable fraction.	MAK	2 mg/m3	Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (2011)
carboxylic acid zinc salt - Respirable fraction.	MAK	0,1 mg/m3	Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (2011)
carboxylic acid zinc salt - Respirable fraction.	MAK	0,1 mg/m3	Germany. DFG MAK List (advisory OELs). Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (DFG), as amended (2011)

8.2 Exposure controls

Appropriate engineering controls: Provide adequate ventilation. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Individual protection measures, such as personal protective equipment

General information:	Wash hands before breaks and after work. Use personal protective equipment as required. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment. The usual precautionary measures should be adhered to inhandling the chemicals or the mineral oil products.
Eye/face protection:	Safety glasses (EN 166) recommended during refilling.
Skin protection	
Hand Protection:	Material: Nitrile-butadiene rubber (NBR). Min. Breakthrough time: >= 480 min Recommended thickness of the material: >= 0,38 mm Avoid long-term and repeated skin contact. Suitable gloves can be recommended by the glove supplier. Use skin protection cream for preventive skin protection. Protective gloves, where permitted in acc. to safety directions. The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
Other:	Do not carry cleaning cloths impregnated with the product in trouser pockets. Wear suitable protective clothing.
Respiratory Protection:	Not relevant, due to the form of the product.
Thermal hazards:	Not known.
Hygiene measures:	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Discard contaminated footwear that cannot be cleaned.
Environmental Controls:	No data available.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	
Physical state:	solid
Form:	Paste
Color:	Amber
Odor:	Characteristic
Odor Threshold:	Not applicable for mixtures
pH:	Not applicable
Freezing point:	> 180 °C
Boiling Point:	Not applicable
Flash Point:	Value not relevant for classification
Evaporation Rate:	Not applicable for mixtures
Flammability (solid, gas):	Value not relevant for classification
Flammability Limit - Upper (%)–:	Value not relevant for classification
Flammability Limit - Lower (%)–:	Value not relevant for classification
Vapor pressure:	Not applicable for mixtures

Vapor density (air=1):	Not applicable for mixtures
Density:	0,95 g/cm3 (15 °C)
Solubility(ies)	
Solubility in Water:	Insoluble in water
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	Not applicable for mixtures
Autoignition Temperature:	Value not relevant for classification
Decomposition Temperature:	Value not relevant for classification
NLGI:	2
Explosive properties:	Value not relevant for classification
Oxidizing properties:	Value not relevant for classification
9.2 Other information	No data available.

SECTION 10: Stability and reactivity

10.1 Reactivity:	Stable under normal use conditions.
10.2 Chemical Stability:	Stable under normal use conditions.
10.3 Possibility of hazardous reactions:	Stable under normal use conditions.
10.4 Conditions to avoid:	Stable under normal use conditions.
10.5 Incompatible Materials:	Strong oxidizing substances. Strong acids. Strong bases.
10.6 Hazardous Decomposition Products:	Thermal decomposition or combustion may liberate carbon oxides and other toxic gases or vapors.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Oral
Product:

Not classified for acute toxicity based on available data.

Dermal
Product:

Not classified for acute toxicity based on available data.

Inhalation
Product:

Not classified for acute toxicity based on available data.

Specified substance(s)

carboxylic acid zinc salt	LC 50 (Rat, 4 h): > 42 mg/l

Skin Corrosion/Irritation:
Product: Based on available data, the classification criteria are not met.

Serious Eye Damage/Eye Irritation:
Product: Based on available data, the classification criteria are not met.

Respiratory or Skin Sensitization:
Product: Skin sensitizer: Based on available data, the classification criteria are met.
Respiratory sensitizer: Based on available data, the classification criteria are not met.

Germ Cell Mutagenicity
Product: Based on available data, the classification criteria are not met.

Carcinogenicity
Product: Based on available data, the classification criteria are not met.

Reproductive toxicity
Product: Based on available data, the classification criteria are not met.

Specific Target Organ Toxicity - Single Exposure
Product: Based on available data, the classification criteria are not met.

Specific Target Organ Toxicity - Repeated Exposure
Product: Based on available data, the classification criteria are not met.

Aspiration Hazard
Product: Based on available data, the classification criteria are not met.

Other adverse effects: No data available.

SECTION 12: Ecological information

12.1 Toxicity

Acute toxicity
Product: Based on available data, the classification criteria are not met.

Fish
Specified substance(s)

carboxylic acid zinc salt	LC 50 (Fish, 96 h): > 100 mg/l (OECD 203)

Aquatic Invertebrates
Specified substance(s)

carboxylic acid zinc salt	EC 50 (Water Flea, 48 h): > 100 mg/l (OECD 202)

Chronic ToxicityProduct: Based on available data, the classification criteria are not met.

12.2 Persistence and Degradability

Biodegradation
Product: Not applicable for mixtures

Specified substance(s)
carboxylic acid zinc salt — (OECD 301B) Not readily degradable.

12.3 Bioaccumulative potential
Product: Not applicable for mixtures

12.4 Mobility in soil:
Product: Not applicable for mixtures

12.5 Results of PBT and vPvB assessment: The product does not contain any substances fulfilling the PBT/vPvB criteria.

12.6 Other adverse effects: No data available.

Water Hazard Class (WGK): WGK 1: slightly water-endangering.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

General information: Dispose in accordance with all applicable regulations.

Disposal methods: Do not empty into drains; dispose of this material and its container in a safe way. When storing used products, ensure that the waste categories and mixing instructions are observed.

European Waste Codes

12 01 12*: spent waxes and fats

SECTION 14: Transport information

ADR/RID

14.1 UN Number:	–
14.2 UN Proper Shipping Name:	–
14.3 Transport Hazard Class(es)	
Class:	Non-dangerous goods
Label(s):	–
Hazard No. (ADR):	–
Tunnel restriction code:	–
14.4 Packing Group:	–
14.5 Environmental hazards:	–
14.6 Special precautions for user:	–

ADN

14.1 UN Number:	–
14.2 UN Proper Shipping Name:	–
14.3 Transport Hazard Class(es)	
Class:	Non-dangerous goods
Label(s):	–
14.3 Packing Group:	–
14.5 Environmental hazards:	–
14.6 Special precautions for user:	–

IMDG

14.1 UN Number:	–
14.2 UN Proper Shipping Name:	–
14.3 Transport Hazard Class(es)	
Class:	Non-dangerous goods
Label(s):	–
EmS No.:	–
14.3 Packing Group:	–
14.5 Environmental hazards:	–
14.6 Special precautions for user:	–

IATA

14.1 UN Number:	–
14.2 Proper Shipping Name:	–
14.3 Transport Hazard Class(es):	
Class:	Non-dangerous goods
Label(s):	–
14.4 Packing Group:	–
14.5 Environmental hazards:	–
14.6 Special precautions for user:	–

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code: Not applicable.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture:

EU Regulations

Regulation (EC) No. 2037/2000 Substances that deplete the ozone layer: none

Regulation (EC) No. 850/2004 on persistent organic pollutants: none

National Regulations

Water Hazard Class (WGK): WGK 1: slightly water-endangering.

15.2 Chemical safety assessment: No Chemical Safety Assessment has been carried out.

Product name: LICINOL UN 2

SECTION 16: Other information

Revision Information: Vertical lines in the margin indicate an amendment.

Wording of the H-statements in section 2 and 3

H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H412	Harmful to aquatic life with long lasting effects.

Other information: The classification complies with the current EU lists; however, it has been supplemented with expert literature information and information provided by/about our company. It was derived from the test data and/or the application of the conventional method.

Revision Date: 23.09.2019

Disclaimer: The data contained in this safety data sheet are based on our current knowledge and experience and are given to the best of our knowledge and belief. It characterizes the product only with regard to safety requirements for handling, transport and disposal. The data do not describe the product's properties (tech. product specification). Neither should any agreed property nor the suitability of the product for any specific technical application be deduced from the data contained in this safety data sheet. Modifications on this document are not allowed. The data are not transferable to other products. In the case of mixing the product with other products or in the case of processing, the data in this safety data sheet are not necessarily valid for the new-made material. It is the responsibility of the recipient of the product to observe federal, state and local law. Please contact us to obtain up-to-date safety data sheets. This document was issued electronically and has no signature.