

# Operating Instructions



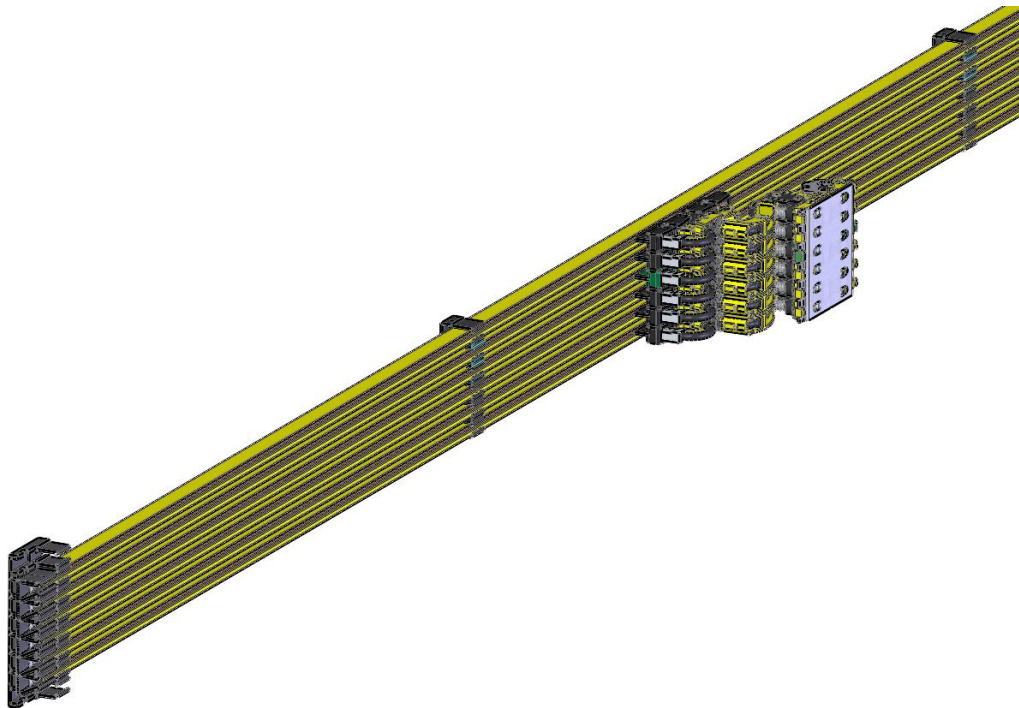
## Single-pole Conductor Rail System SingleFlexLine Program 0815

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### Order Number:

0815xx-...

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## Single-pole Conductor Rail System

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### 1 General Information

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#### 1.1 About this document

The information provided in this manual is designed to enable the conductor rail system to be used safely and efficiently.

This document is a component of the Conductor Rail System 0815 and must be kept accessible to personnel and in close proximity to the Conductor Rail System 0815 at all times. Personnel must read this document carefully and understand it before starting any work. Compliance with all safety and handling instructions provided in this document is a basic requirement for safe working.

Local accident protection regulations and general safety guidelines for the area of use of the conductor rail system also apply.

The illustrations in this document are provided for basic understanding and may deviate from the actual implementation of the system.

In addition to these operating instructions, the instructions located in the appendices for the individual assembled components also apply.

#### 1.2 Limitation of liability

All data and information in these operating instructions have been compiled while taking the valid standards and regulations as well as the state of the art and our many years of experience and knowledge into consideration.

The manufacturer accepts no liability for damage resulting from:

- Failure to comply with operating instructions
- Unintended use
- Use by untrained personnel
- Unauthorized modifications
- Technical changes
- Use of unauthorized replacement parts and accessories

The actual scope of delivery may differ from the explanations and descriptions provided here if the model in question is a special one, if additional equipment has been ordered or due to recent technical changes.

The obligations agreed upon in the delivery agreement and our General Terms and Conditions of Business apply, as do the Delivery Conditions of the manufacturer and all legal regulations applicable at the time the contract was concluded.

All products are subject to technical modifications within the context of improvement of function and further development.

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### 1.3 Copyright

This document is subject to copyright and is exclusively intended for internal use by customers.

Provision of the operating instructions to third parties, reproductions in any form – even in part – as well as the reuse and/or disclosure of their content are not permitted without the written approval of the manufacturer, except for the customer's internal use.

Breach or infringement will result in liability for damages. This shall not affect our right to assert claims for further loss or damage.

### 1.4 Replacement parts



**WARNING!**

#### **Incorrect replacement parts are a safety hazard!**

Incorrect or faulty replacement parts can impair safety and result in damage, malfunctions or complete failure.

→ Always use original replacement parts from the manufacturer!

Order replacement parts from your contracted dealer or directly from the manufacturer.

Contact details: See the last page of this document.

Replacement parts list: see Section 12.1 Applicable documents.

### 1.5 Material defects

The terms governing material defects can be found in the General Terms and Conditions of Business.

### 1.6 Technical support

For technical support please contact our staff from the Customer Support Department.

Contact details: See the last page of this document.

We are also always interested in new information, experiences and feedback from the field that can help us improve our products.

## 2 Safety Instructions

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### 2.1 Explanation of symbols

Safety and hazard information is identified in these operating instructions using symbols. Safety instructions are introduced by signal words that indicate the degree of the hazard. Always observe safety and hazard instructions, and work carefully to avoid accidents, bodily injury and damage to property!



**DANGER!**

... indicates an immediately hazardous situation, which, if not avoided, may result in death or serious injury.



**DANGER!**

... indicates an immediately hazardous situation due to electricity, which, if not avoided, may result in death or serious injury.



**WARNING!**

... indicates a possibly hazardous situation, which, if not avoided, may result in death or serious injury.



**WARNING!**

... indicates a possibly hazardous situation due to electricity, which, if not avoided, may result in death or serious injury.



**CAUTION!**

... indicates a possibly hazardous situation, which, if not avoided, may result in minor or moderate injury.



**Tips and recommendations:**

... indicates useful tips and recommendations as well as information for efficient and trouble-free operation.



**NOTE!**

... indicates actions that will help you prevent material damage.

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## 2.2 Personnel requirements

### 2.2.1 Qualifications



#### **Inadequately trained persons are at risk of injury!**

Unintended use can result in serious injury to persons and property.

→ All activities must only be performed by qualified personnel.

- Only persons who can be expected to perform their work reliably are acceptable personnel. People whose reactions are impaired by drugs, alcohol or medications, for example, are not authorized.
- When selecting personnel, all age- and occupation-specific guidelines applicable at the place of use must be observed.

The following qualifications are specified in the operating instructions for certain fields of activity.

#### ■ **Specialist personnel**

Consists of persons capable of performing assigned tasks and independently identifying and avoiding potential hazards based on their specialist training, knowledge and experience as well as their understanding of the applicable regulations.

Personnel are considered qualified if they have successfully concluded training, for example, as electricians, master electricians, electrical engineers or electrical technicians. Personnel are also considered qualified who have been employed correspondingly for several years, have been educated in theory and practice during that time and whose knowledge and skills in the trade required have been tested.

The operator of the machine or system must document that the corresponding certification, or other documentation of qualification, is available or had been submitted previously.

The installation, maintenance and commissioning of electrical equipment may only be conducted by qualified personnel (electricians) according to local regulations. Work with higher installation positions typically requires additional qualifications and certificates for the use of lifting devices and protective equipment. On the part the manufacturer, professional and proper handling of components is required. It is recommended that the installation personnel be trained by the manufacturer or that accompaniment of the installation by specialist fitters/supervisors be scheduled.

#### ■ **Operators**

Have been instructed in a training session by the operator with respect to the tasks assigned to them and the potential dangers arising from improper actions.

The operator of the machine or facility must document that the corresponding training has taken place.

#### ■ **Transport personnel**

Trained persons with appropriate training in transporting goods safely, who transport the material indoors and outdoors according to safety regulations.



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### 2.2.2 Unauthorized personnel



#### Danger due to unauthorized personnel!

Unauthorized persons who do not meet the requirements described here are not acquainted with the dangers in the working area.

- Keep unauthorized personnel out of the working area
- In case of doubt, address such persons and direct them away from the working area
- Stop work as long as unauthorized persons are in the working area

### 2.2.3 Training

Before commissioning the equipment, personnel must be trained by the operator. Log the implementation of training for better traceability.

Example of instruction log:

Date	Name	Type of Training	Training given by	Signature
11/5/2009	John Doe	First safety training for personnel	Horst Müller	

## 2.3 Personal protective equipment

**Always to be worn**

Depending on local conditions and regulations, the personal protective equipment includes the following elements:



#### Protective headgear

For protection against falling or flying parts and materials.



#### Protective gloves

For the protection of hands against friction, scrapes, punctures or deeper wounds, as well as against contact with hot surfaces.



#### Protective clothing

Primarily for protection against entrapment by moving machine parts. Work clothing must be close fitting with a low resistance to tearing; it must have close-fitting sleeves and no protruding parts.



#### Protective footwear

For protection against heavy falling parts and slipping on slippery floors.

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To be worn for special tasks



When carrying out special work, special protective equipment is recommended. Separate reference to this is made in the individual sections.

#### Protective eyewear

To protect the eyes against harmful influences, such as strong light, chemicals, dust, splinters or effects of the weather.



#### Hearing protection

For protection against loud noises and to prevent acoustic trauma.



#### Protective mask Class FFP3 (observe local regulations)

For protection against materials, particles, and organisms. Here: protection against dust from the current collector head and the PVC insulation of the conductor rail.

## 2.4 Intended use

The product is exclusively designed and built for the use described here (intended use).



**WARNING!**

#### Hazard due to unintended use!

Any application that deviates from or goes beyond the intended use of the devices can result in hazardous situations.

- Strictly follow all information in these operating instructions.
- Refrain from unintended use of the system! Prohibit any use of the system apart from its intended use!
- Observe the information on unintended use in Section 2.5

Claims of any kind due to damages from unintended use are excluded.

The operator bears sole liability for all damage that results from unintended use.

#### Intended use

The SingleFlexLine 0815 Conductor Rail System is an operating resource for customer construction of an electrical power supply system in indoor areas that are not accessible to the public. The conductor rail is an operational resource and thus has no actual operating mode, since this is determined by the application. Risks are limited only to the failure of mechanical components (e.g., falling components) and the hazard due to electrical current.

The SingleFlexLine 0815 Conductor Rail System is used to supply electricity to mobile electrical consumers.

One of its typical applications is, for example, to supply power to logistics shuttles inside a warehouse with horizontal storage racks or electrical overhead monorail systems (EMS) (in German, *Elektrohängebahnen* [EHB]).

Use other than in the application approved by the manufacturer must be examined by the system engineer as part of a risk assessment for the final product and is under the responsibility of the system engineer.

An extended approval by the manufacturer for the application is possible in certain cases and requires written approval after examination of the use case and ambient conditions.

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Compliance with these technical conditions is mandatory for the installation:

- The maximum permissible travel speed of the consumer is up to 600 m/min depending on the system.
- The conductor rail must only be installed horizontally.

### Electrical engineering operational requirements

- The electrical system must be secured in compliance with the locally applicable regulations.

## 2.5 Unintended use

Claims of any kind due to damage incurred during use that deviates from the intended use described above ("use other than the intended use") are excluded. The operator bears sole liability for all damage that result from unintended use.

Unintended use particularly includes the following types of use:

- Operation in unsuitable/unauthorized environmental conditions (see Section 3.3).
- Operation in an area accessible to the public.
- Operation within manual reach.
- Use in non-industrial applications.
- Overloading of the conductor rails by excessive current or voltage.
- Overloading of individual current collectors by excessive current or voltage.
- Operation at excessively high or low temperatures.
- Operating under ambient conditions that cause lasting damage to the materials used or drastically reduce insulating properties (e.g., chemical substances or gases).
- Operation under prohibited ambient conditions (see the specified ambient conditions depending on the product range).
- Operation in areas where flammable or explosive gases or dusts prevail.
- Operation in areas that require a higher protection class than IP 2X.
- Use as a walking or climbing aid.
- Walking on the conductor rail.
- Use of unsuitable cleaning agents (e.g., silicone oils or aromatic compounds).
- Use of the system with accessories that are not approved and not authorized by the manufacturer.
- Operation of the system by untrained personnel.
- The conductor rail system must **only** be operated under the environmental conditions detailed in Section 3! Unsuitable environmental conditions are described in Section 3.3.

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## 2.6 Protective measures to be taken by the operator/user

The product is used in the industrial sector. The operator of the conductor rail system is therefore subject to the legal obligations concerning workplace safety. In addition to the safety instructions in these operating instructions, all safety, accident protection and environmental regulations applicable to the use of the conductor rail system must also be observed. This particularly applies to the following:

- Work on electrical components of the system may only be conducted when in a **de-energized state**.
- The manufacturer/system engineer who installs the electrical equipment from Conductix-Wampfler must inform their self about the applicable occupational safety regulations and determine additional hazards in a risk assessment that result from the special working conditions at the place of use of the product. They must implement these in the form of operating instructions for the operation of the conductor rail system.
- During the entire time the conductor rail system is in use, the operator must check that these operating instructions still correspond to the current state of regulations and adapt them as necessary.
- The operator must clearly manage and define responsibilities for installation, operation, troubleshooting and maintenance.
- The operator must ensure that all employees involved with the conductor rail system have read and understood these operating instructions. In addition, the operator must also train the personnel at regular distances and inform them of hazards.
- The operator must provide personnel with all required protective equipment (work clothes, safety shoes, hearing protection, protective gloves, protective headgear, goggles, breathing mask).

The operator must keep the keys for the switching cabinets in a safe place. "Safe" means that only explicitly authorized personnel may have access to the keys. The keys may only be issued to technical personnel as described in **in a de-energized state**. See Section 2.2.1.

The operator is furthermore responsible for ensuring that the device is always in perfect working order. The following therefore applies:

- The operator must ensure that the service distances described in these operating instructions are observed.
- The operator must have all safety systems regularly inspected for functionality and completeness. If possible, this inspection should be conducted once a year, but at least as often as required under the applicable national regulations.
- If the conductor rail system has been modified, the safety systems must be inspected again and adapted to the changed conditions in such a way that the conductor rail system is safe again.

## 2.7 5 Safety Rules for working on electrical systems

Requirement:



### **De-energize the entire system and secure against unintentional switching on!**

Work on electrical systems must only be conducted when they are in a de-energized state. The **5 Safety Rules** (see DIN VDE 0150-100:2009-10/EN 50110-1:2004-11) must always be observed before starting any work.

1. Disconnect the system from power using the main switch.
2. Secure the main switch against being turned back on.
3. Verify the absence of a voltage through measuring.
4. Ground and short-circuit parts of the system on which work will be done.
5. Cover or block off neighboring parts that are still energized.

→ Only electricians or personnel trained in electrical work may disconnect power or approve reconnection of power after work carried out in the disconnected state!

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## 2.8 Special hazards

The following section lists residual risks determined on the basis of a risk assessment.

- Follow the safety instructions and the warnings in these operating instructions in order to reduce health hazards and avoid dangerous situations.
- A detailed risk analysis must be prepared for the system in which the conductor rail is integrated. The resulting measures must be implemented by the system engineer.
- PE and PE<sub>plus</sub> must always be designed redundantly. Continual engagement of both protective conductor connections must be monitored. For systems with transfers, two current collectors with double heads must be used.

### 2.8.1 Electrical hazards and sources of danger



**WARNING!**

#### Risk of death due to electrical shock!

Contact with energized components can lead to death or severe injury due to electrical shock. There is also a risk of injury from a shock reaction, falling or being thrown across the room as a result of an electrical shock.



Work on the following components is dangerous:

- Main power supply
- Parts under voltage: Line feed, cables, connections, conductor rail, connectors, current collectors, products and connections within switching cabinets, control systems, etc.
- Parts that are under voltage due to a fault.

#### Before working on the parts listed above:

- **Disconnect** the conductor rail system from the **power supply and secure it against switching on again** according to the 5 Safety Rules (see Section 2.5).

#### During work:

- Use insulated tools

#### Before switching on:

- Each time before the product or system is started, test the insulation resistance according to locally applicable technical standards, directives and legal regulations.
- Carry out locally required electrical tests.

#### Maintain electrical safety!

- Regularly test and maintain electrical equipment.
- If dangerous defects are identified, immediately take measures to correct the defects. Inform the system operator immediately.
- If it is not possible to correct the dangerous defect, block off/secure the area involved or turn the operating resource off and secure it against switching on again. Inform the system operator immediately.
- Immediately secure loose cables and replace damaged cables.
- Always replace blown fuses with fuses of the same rating.

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**DANGER!**

#### **Fire hazard due to overload or sparking!**

Fire hazards occur due to overloaded cables, electrical arcs, short circuits or sparking. Sparking can occur with poorly serviced, contaminated conductor rails or if the installation does not comply with the required tolerances.

- Permissible current values must be observed.
- Comply with tolerances during installation.
- Design and dimension systems in accordance with the permissible system load capacity and provide appropriate protection devices.
- Do not store inflammable and/or easily ignited materials near to conductor rails.
- Inspect, service and clean conductor rails regularly and in accordance with specifications. See Sections 8 and 9.

### 2.8.2 Mechanical hazards and sources of danger



**DANGER!**

#### **Risk of injury due to ensnarement or impact!**

Ensnarement and/or impact with moving conductor rails (slip ring) or current collectors connected to the machine and other components must be prevented.

- Cordon off the work area.
- Use caution when working in the vicinity of the danger zone, particularly if protective devices (covers, enclosures, control devices) have been removed or disabled.
- Use caution when working in the vicinity of the danger zone, particularly below the conductor rail.
- Wear personal protective equipment!



**WARNING!**

#### **Secure conductor rails against falling!**

- In application areas with personnel traffic and at an installation height of 3 m or more, conductor rails must be secured against falling.



**CAUTION!**

#### **Risk of puncture wounds and cuts!**

The packaging material can contain sharp objects such as nails, struts, steel bands and wood splinters that can cause injury to limbs.

- Wear personal protective equipment!
- Cordon off the work area!
- Use caution when working in the vicinity, particularly below the conductor rail!

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### 2.8.3 Danger due to dust and vapors



#### **Danger of sensitization, irritation of the mucous membranes and respiratory diseases due to dust and vapors!**

Abrasions from the sliding contact carbon brushes collect in the conductor rails and the guideway. This dust is very fine and is a health hazard. Frequent handling can result in sensitization. Persons who frequently spend longer periods in a heavily used system without protective equipment must reckon with the following consequences:

- Irritations of the mucous membranes
- Respiratory diseases
- Cancer

These consequences must also be expected if accumulations of dust are handled without proper care (e.g., removal of dust using compressed air).

- In workplaces with long-term exposure and heavily trafficked facilities, take effective measures to protect employees from the dust.
- During all work on the conductor rail system in which collected dust can be stirred up, wear personal protective equipment. In particular, wear personal protective equipment when cleaning the system.
  - Protective eyewear
  - Protective dust mask Class FFP3 (observe local regulations)
  - Protective gloves
  - Disposable coveralls

- Before starting work, clean the conductor rail in accordance with regulations. There are special instructions for this task; see Section 9.
- Protect the surroundings during cleaning works, for instance by covering or removing warehouse goods and blocking access to those areas in which dust could fall down on persons.
- **Do not blow out dust with compressed air;** vacuum it up instead. The vacuum cleaner must be equipped with a Class H fine filter.
- Do not eat, drink or smoke during work!



**DANGER!**

#### **Poisonous vapors/gases in case of fire!**

The standard insulation materials contain PVC. Poisonous vapors/gases (HCL) can be produced during fires.

- The building must be evacuated immediately.
- Notify the fire department.

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#### 2.8.4 Dangers relating to the operating environment

The following factors can give rise to hazards if the conductor rail is installed in this operational environment:

- Dusts
- Vapors/Gases
- Fog
- Chemical substances
- Moisture
- Liquids
- Radiation
- Temperature
- Contaminants

The **most important measure** to protect against these hazards is to only install the conductor rail system in locations where **appropriate operating conditions** prevail. See Section 2.4.

The system must be designed and operated in accordance with the prevailing ambient conditions.



**DANGER!**

#### **Risk of materials and components being damaged and losing functionality due to environmental influences!**

Environmental influences (dust/gases, chemical substances, liquids, radiation, etc.) can damage the materials and components, particularly the plastic parts, which can then pose dangers (breakage, loss of function). For example, hanger clamps can break and the conductor rail system can fall down.

→ Check influences depending on temperature, time of action, concentration and interactions.

→ Use in chemical works, galvanizing plants, electroplating plants, composting plants or in warehouses or installations where chemical substances (e.g., aromatics, benzene) are stored or processed must be checked in advance by Conductix-Wampfler.

The chemical resistance of plastic parts is critical in contact with oils, greases or various cleaning agents.

Major temperature variations can cause large expansions in the conductor rail system, particularly for long systems. Hanger clamps can break and the conductor rail system fall down, for example.

**The system must be designed and operated in accordance with the prevailing ambient conditions as part of the permissible operating conditions!**



**DANGER!**

#### **Risk of fire due to sparking!**

Highly flammable dusts, substances or gases in the vicinity of the conductor rail can be ignited by sparks! These substances must not be present in the vicinity of the conductor rail.



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**DANGER!**

### **Risk of injury due to energy storage!**

If consumers with energy storage are supplied by the conductor rail, these must be disconnected from the conductor rail or the energy storage system must be discharged according to the manufacturer's specifications before starting work and system checked for the absence of a voltage.

## 2.9 Conduct in the event of accidents and malfunctions

### **Measures to take in the event of accidents:**

- Shut down the system and secure it against unauthorized, unintentional and/or erroneous activation.
- Secure the danger zone.
- Remove persons from the danger zone.
- Initiate first aid measures.
- Alert the rescue services.
- Inform responsible parties at the operating site.
- Make access available for rescue vehicles.

### **Measures to take in the event of malfunctions:**

- Shut down the system and secure it against unauthorized, unintentional, and/or erroneous reactivation.
- Secure the work area against entry.
- Consult qualified personnel when analyzing the fault.
- Check for disconnection from power.
- Remove the product and replace it with a new product.
- Determine the cause of error and repair the product.

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### 3 Technical Data

#### 3.1 Electrical

Rated current for the overall system		10–54 A as an overall system with expansion units; (conductor rails: 10–100 A)
Rated current for current collectors*	Single current collector	Pure carbon: max. 16 A Copper–graphite: max. 35 A
	Double current collector	Pure carbon: 2 x 16 A Copper–graphite: max. 2 x 25 A
Rated voltage	<b>without</b> protective earth	max. 48 V AC/DC
	<b>with</b> protective earth (PE)	max. 500 V AC
Ohmic resistance at 35°C		0.745 Ω/1000 m
Impedance at 14 mm pole spacing		0.748 Ω/1000 m
Number of poles		Any (2-pole to 8-pole EMS system support)
Assignment		Protective earth (PE) 4. Pole from above
Conductor rail cross-section		25 mm <sup>2</sup>
Conductor material		Copper
Protection class		Protection against contact according to IP 23 insertion from below Protection against contact according to IP 21 insertion from the side

\*Current collector capacity depending on the current collector type! The current collector capacity is defined by the connected cable and is generally lower (see catalog)! Ambient temperatures and operating modes result in reduced current collector capacity (e.g., operating at a standstill, operating at elevated temperatures).

#### 3.2 Mechanical

Max. travel speed	Uninterrupted straight line 400 m/min
Ambient temperature	–5°C to +55°C
Maximum air humidity at +40°C	50 % RH
Max. operating temperature difference	40 K (in the ambient temperature range)
Altitude above sea level	≤ 2000 m
Installation situation/environment	Horizontal rail alignment/ interior (not vertical)
Direction of travel	Forward and backward (reversing) Insertion of the current collector from below or from the side
Pole spacing	14 mm

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#### 3.2.1 Lengths

Max. length of the installed conductor rail	Any, depending on the line feed design
Conductor bars	Max. 4000 mm (standard), 6000 mm and short lengths on request
Min. permissible conductor bar length	300 mm
Supplementary length per connection point	10 mm

#### 3.2.2 Installation orientation



**WARNING!**

##### Danger due to increased wear or damage!

- Install the current collector with its central axis exactly on the central axis of the conductor rail.
- The mean distance between the outrigger axis and the contact surface must be precisely complied with.



**WARNING!**

##### Loss of contact or increased heating!

Risk of injury due to loss of contact or increased heating if the current collector is operated outside the permissible installation position.

#### 3.2.3 Tolerances

The conductor rail must be installed within the following tolerances. Conductix-Wampfler does not accept any responsibility for the conductor rail's correct functioning if these tolerances are not observed. In such a case, Conductix-Wampfler does not accept any liability for problems that arise if the conductor rail system is not functioning correctly.

Conductor rails	X: $\pm 3$ mm; Y: $\pm 1$ mm (see Fig. 1)
Current collector*	X: $\pm 10$ mm; Y: $\pm 10$ mm (X: $\pm 15$ mm, Y: $\pm 15$ mm)
Force with which the current collector contacts the rail	Approx. 9 N

\*depending on the current collector type

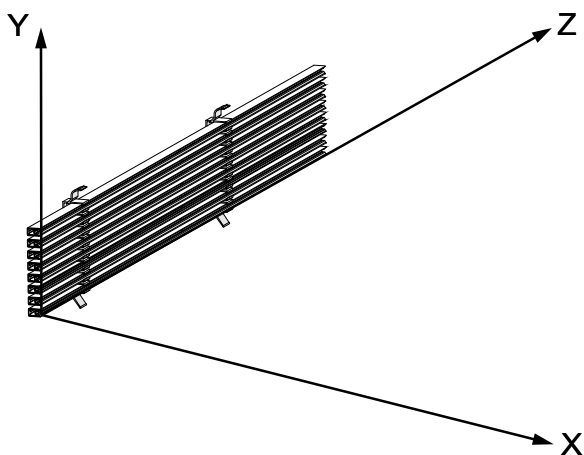


Fig. 1: Conductor bar 0815 coordinate system

## Single-pole Conductor Rail System

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### 3.3 Unsuitable environmental conditions

The conductor rail must **not be installed** and **not be operated** under these environmental conditions (see also Section 2.5, Section 2.8.4 and Section 3):

- Direct UV radiation (direct sunlight).
- In environments containing chemical substances or gases that can potentially permanently damage the conductor rail's materials (corrosion) or drastically impact the insulation.
- In ambient air that contains solvent vapors or aromatic compounds.
- In ambient air that contains flammable or explosive gases or dusts.
- In dusty environments.
- Outdoors with free weathering.
- In environments with relative humidity of more than 85 %.
- In close proximity to splashing water.
- In environments that require a higher protection class than IP 2X.



#### **WARNING!**

#### **Faults due to incorrect operating conditions!**

If the operating conditions change or are no longer within the specified range, the conductor rails can malfunction due to short circuits, premature aging and damage to electrical and mechanical components.

- The conductor rail must be switched off if the operating conditions are no longer within the permissible range described above.
- The conductor rail must be switched off if it gets wet or is soiled. Clean or dry as specified.
- Take the relevant measures to restore suitable operating conditions.

## Single-pole Conductor Rail System

### SingleFlexLine Program 0815

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## 4 Product Description and Functional Principles

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### 4.1 Brief description

Single-pole insulated conductor rails consist of individual conductor rails firmly fixed on a guideway. One or more current collectors fastened to one or more mobile consumers engage with the conductor rails with their current collector heads. The mobile consumers move along the guideway in a linear, track-guided manner. The current collector follows the movement of the mobile consumer and compensates for guideway deviations between the mobile consumer and the conductor rails (horizontally and vertically).

The electrical energy is transmitted into the conductor rail through line feeds and then fed to the current collector. The current collector head of the current collector is pressed against the conductor rail with a permanently present contact force. The electrical energy is transferred to the current collector head through the contact point and to the mobile consumer through a connecting cable on the current collector.

The SingleFlexLine 0815 Conductor Rail System is a modular conductor rail system is for customer installation of an electrical power supply for moving, rail-guided parts or ring arrangements. Any number of poles can be combined in conductor rail systems. The conductor rails can be adapted to the guideway profile route using a bending tool.

Examples of applications are:

- Electrical monorail systems (EMS)
- Logistics shuttles
- Packaging machines
- Small-parts warehouses

Single-pole Conductor Rail System  
SingleFlexLine Program 0815

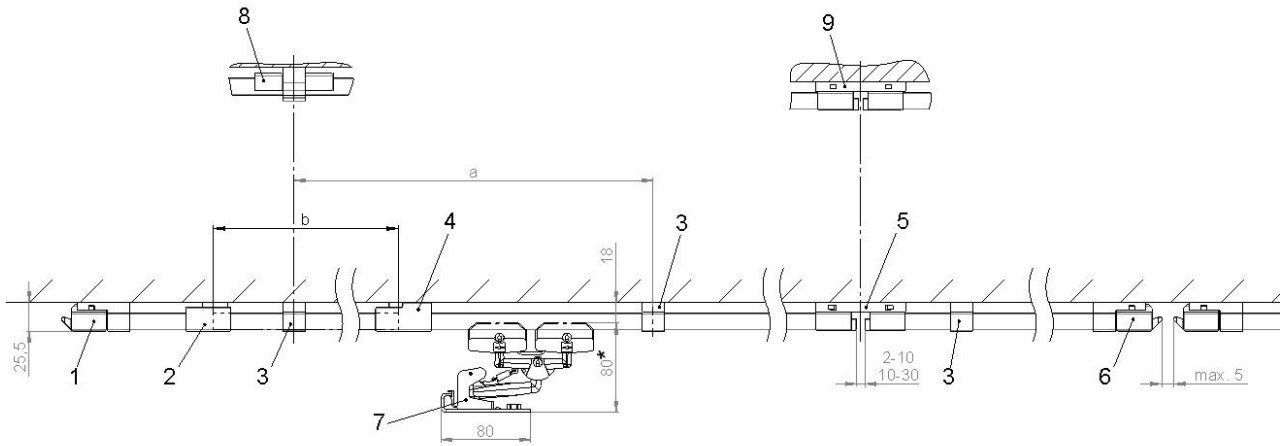
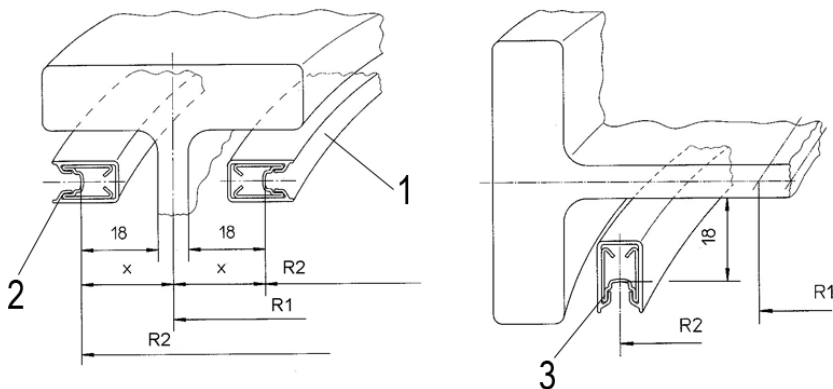


Fig. 2: System overview

\*The installation spacing depends on the current collector type (65 mm, 80 mm, 92 mm)

Pos.	Name
1	End cap
2	Connector
3	Hanger clamp
4	Line feed
5	Expansion unit
6	Transfer caps/ "long" end caps
7	Current collector
8	Hanger clamp with fixed point caps
9	Air gap insulation section without expansion travel



Pos.	Name
1	Inner bend
2	Outer bend
3	Horizontal bend

Fig. 3: Outer/inner bends and horizontal bend

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### Use of bends in horizontal and vertical curves

	Insertion direction of the current collector	
	Vertical (from below)	Horizontal (from the side)
<b>Horizontal curve</b>	Horizontal bend suspension distance: 400 mm bend radius: 1000 mm to $\infty$	Inner/outer bend suspension distance: 250 mm bend radius: 450 mm to $\infty$
<b>Vertical curve</b>	Inner/outer bend suspension distance: 250 mm Bend radius: 450 mm to $\infty$	Horizontal bend suspension distance: 400 mm bend radius: 1000 mm to $\infty$

a = Standard rail length

b = Max. suspension distance: In straight sections 500 mm  
For horizontal bends 400 mm  
For inner/outer bends 250 mm

The SingleFlexLine Conductor Rail System consists of:

- Current collector (interface to the system engineer/operator's machine)
- Conductor rails
- Connectors
- Expansion units
- Fixed points
- Hanger clamps (interface to the system engineer/operator's machine)
- Line feeds (interface to the system engineer/operator's machine)
- End caps/transfer caps for conductor rails
- Air gap insulation section
- Accessories (cross arms, cross-arm brackets, clamping brackets, outriggers) depending on the product range

The conductor rails are fastened to a straight, smooth surface provided by the customer using hanger clamps. The conductor rails are electrically and mechanically coupled using connectors. The conductor rail is supplied through line feeds with electrical energy that mobile consumers can tap continuously using current collectors.



Use the QR code ("click" or "scan"), to watch our animation **SingleFlexLine 0815 Overview**.

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### 4.2 Interfaces



All details are in the catalog, the installation instructions and possibly in the system-specific layout.

#### **Mechanical interfaces:**

- The current collector must be fastened to the mobile consumer of the machine. The manufacturer/operator of the machine/system must comply with the required installation clearances and tolerances throughout the entire guideway. The fastenings are typically secured by screws.
- The hanger clamp must be attached to the support structure/substructure of the machine. The manufacturer/operator of the machine/system must take into account the required suspension distances, the fastening positions and the loads. The fastenings are generally secured by screws or clip-in connections.

#### **Electrical interfaces:**

- The current collector head is connected to the electrical system of the mobile consumer via a flexible connecting cable. The connecting cable can be supplied in the scope of delivery. The facility manufacturer/operator of the machine/system must observe the required conductor cross-sections and when applicable, the design of the cable and ensure that it is installed flexibly and free of directional forces. The electrical design and integration into the overall electrical network are the responsibility of the facility manufacturer/operator. The connections are made via screw terminals or plug connectors.
- The conductor rail is fed with electrical energy from the network or from the machine/system via the line feed. A single-core cable is connected in the line feed. It is attached using cable lugs and screw connections, and sometimes using plugs. The connecting cables are not included in this delivery. The electrical design and integration into the overall electrical network are the responsibility of the facility manufacturer/operator.



## Single-pole Conductor Rail System SingleFlexLine Program 0815

### 4.3 Description of the components

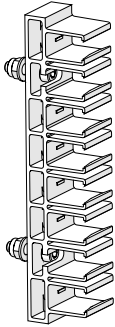


Fig. 4: Hanger clamp 0815

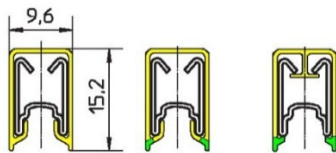


Fig. 5: Rail cross-section PH, PE and PE<sub>plus</sub> (with protection against interchanging)

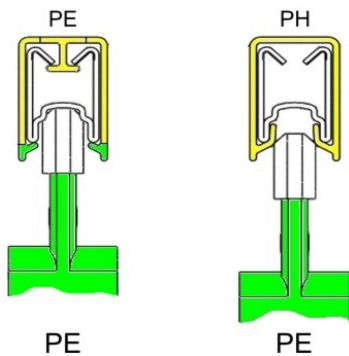


Fig. 6: PE<sub>plus</sub> principle

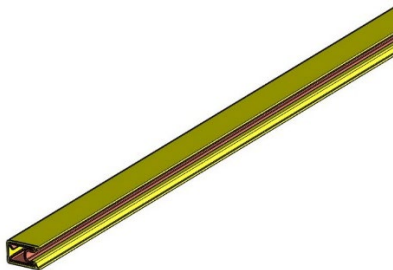


Fig. 7: Conductor rail

#### ■ Hanger clamp 0815

Hanger clamps for supporting the conductor rail. The hanger clamps listed in the catalog are screwable. In many cases, customer-specific hanger clamps that are inserted in the support profile or are screwed into it are used. The conductor rails slide into the hanger clamps longitudinally.

#### ■ Conductor rail

Copper rail with PVC insulation as PH and PE as well as PE<sub>plus</sub> rails can be supplied in 4000 mm and special 6000 mm lengths on request. PE and PE<sub>plus</sub> rails are marked in green/yellow. Phase rails are yellow.

Two protective conductor versions — PE and PE<sub>plus</sub> — are available for the conductor rail system. For new systems, the PE<sub>plus</sub> variant with protection against interchanging is used. For PE<sub>plus</sub> rails, the insulation is opened wider for a broader PE<sub>plus</sub> brush. The wider PE<sub>plus</sub> sliding contacts largely prevent (without use of force or damage) the sliding contacts from engaging in a phase rail. PE<sub>plus</sub> end caps are also wider open and recognizable by their green color.

PH = Phase conductor

PE = Protective conductor

PE<sub>plus</sub> = Protective conductor with protection against interchanging

## Single-pole Conductor Rail System SingleFlexLine Program 0815

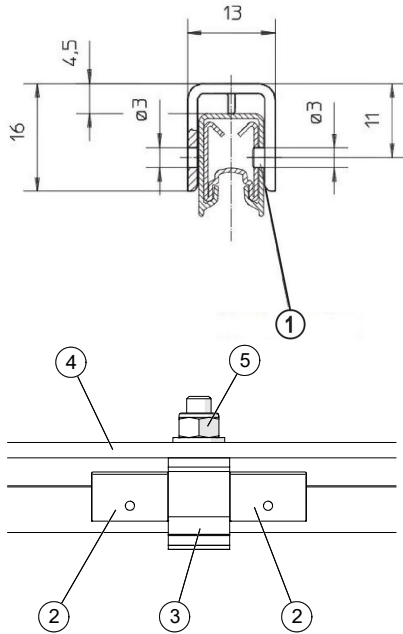


Fig. 8: Fixed point cap

### ■ Fixed point cap

For mechanical fixing of the conductor rail to the installation structure. Use of mechanical fixing on expanding sections with long systems.

- 1 = Insertion cam
- 2 = Fixed point cap
- 3 = Hanger clamp (screw on)
- 4 = Guideway profile
- 5 = Hanger clamp screw connection with cylinder screw and hexagon nut M4

The fixed point caps must be used with a hanger clamp screwed to the guideway profile.

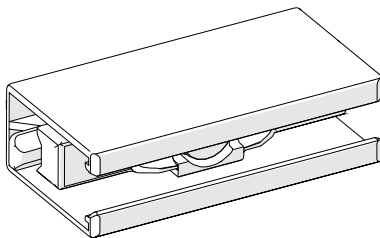


Fig. 9: Screwable connector

### ■ Connector

For mechanically and electrically connecting the individual rail sections (plug or quick-screw technology). The connectors are easily accessible from the front of the conductor rail. Each connection point is protected against contact by a plastic connector cap.

**NOTE:** The connector 081526-6 may only be used for closed slip ring applications! In addition, the connector 081526-6 must not be reused and connected rail bends must not be bent further.

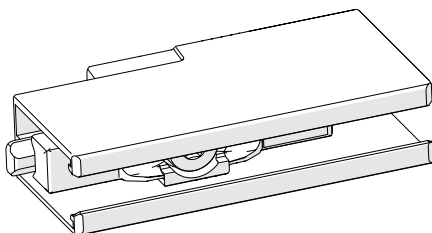


Fig. 10: Connector line feed

### ■ Line feed

The line feed is supplied through a connector line feed or an end cap line feed. A connector can be fed with a connector line feed at any point where the connector is located. The connection is established through crimping cable lugs for 1.5 mm<sup>2</sup>–10 mm<sup>2</sup> conductor cross-sections.

Another line feed option is via the end cap for a transfer or insulation section (max. 6 mm<sup>2</sup>).

For phases, double insulated cables must be provided for voltages > 48 V.

## Single-pole Conductor Rail System SingleFlexLine Program 0815

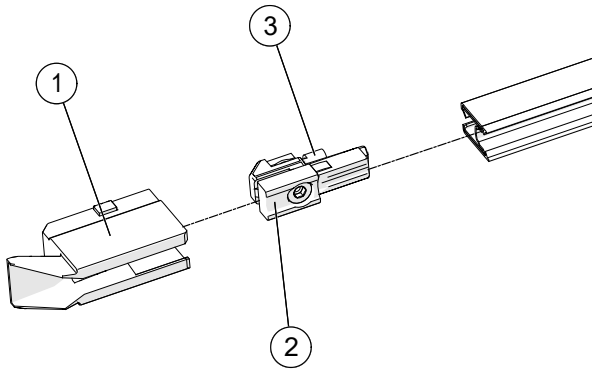


Fig. 11: End cap with line feed

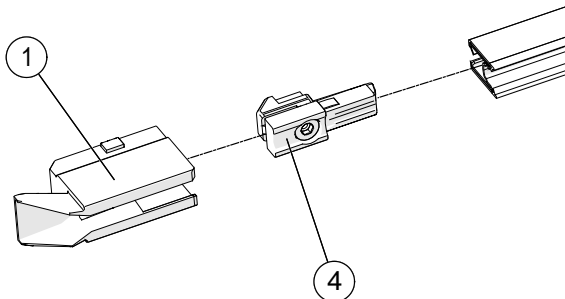


Fig. 12: End cap without line feed/crimping cable lug

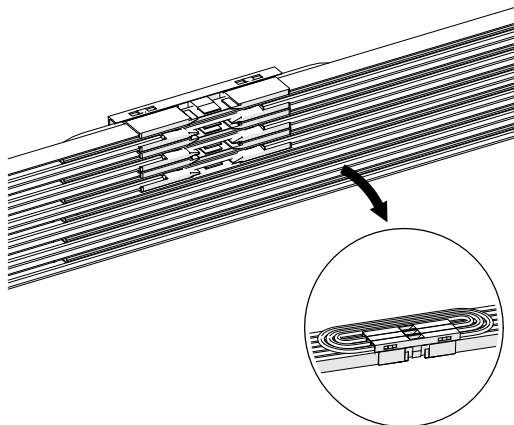


Fig. 13: Expansion module with 16 mm expansion gap

### ■ End caps/end cap units/line feed

These are used as insulating termination of rails and as guides for the sliding contact at a transfer. At a transfer, the current collector is guided from one rail section to the following section. The end cap unit consists of several end caps and a mounting plate or a mounting bar for multi-pole arrangements.

End caps and connectors are available as passive components and as line feeds. These components are similar to the passive components but have the option of connecting an electrical supply cable. The clamping unit for line feed modules differs from the passive components.

1 = End cap

2 = Clamping unit with crimping cable lug and connecting cable

3 = Crimping cable lug for connecting cable

4 = Clamping unit without crimping cable lug and connecting cable

The connection is made through crimping cable lugs for a 1.5 mm<sup>2</sup>–6 mm<sup>2</sup> conductor cross-section. For phases, double insulated connecting cables must be provided for voltages > 48 V.

### ■ Expansion module/Expansion unit

The expansion module/expansion unit is used to compensate for the thermal expansion of the installation structure/EMS rail and conductor rail.

Building expansion points must be taken into account in the installation of the conductor rail system.

Observe Section 6.3.3.5 for the mounting.

## Single-pole Conductor Rail System SingleFlexLine Program 0815

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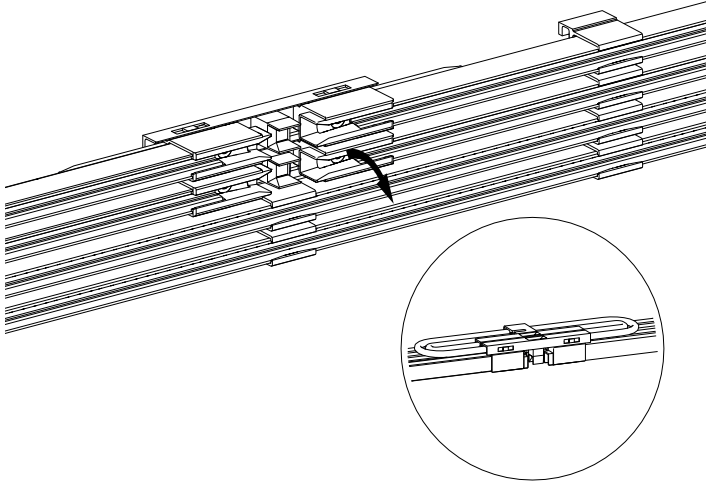


Fig. 14: Expansion module with 20 mm expansion gap



### NOTE!

**Expansion units reduce the system load capacity of the overall system!**

See Section 3.1

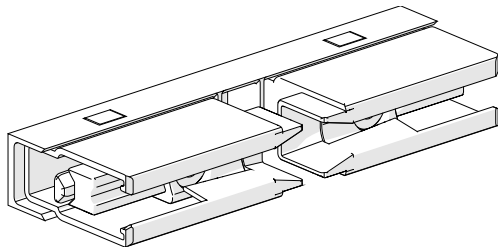


Fig. 15: Air gap insulation section

#### ■ Air gap insulation section

The air gap insulation sections are used for the electrical isolation of the conductor rail. The air gap insulation section consists of 2 opposing end caps and a connecting bar that is clipped over the end caps and thus connects them. The air gap insulation sections are available with and without a line feed option (see Section 6.3.3.6).

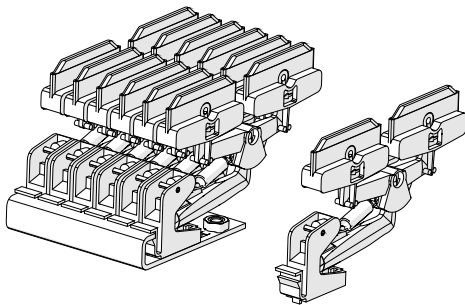


Fig. 16: Current collector and current collector unit

#### ■ Current collector

Current collector as a sliding electrical connection between conductor rail and the mobile consumer; typically designed as a multiple-pole unit.

## Single-pole Conductor Rail System SingleFlexLine Program 0815

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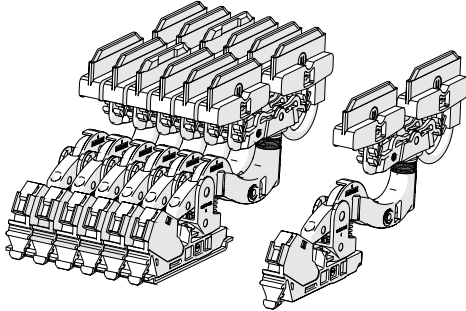


Fig. 17: Current collector and current collector unit (for ProEMS type)

## Single-pole Conductor Rail System

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#### 4.4 Accessories

The following accessory parts are specific, special components and can be additionally ordered from the manufacturer (see manufacturer catalog):

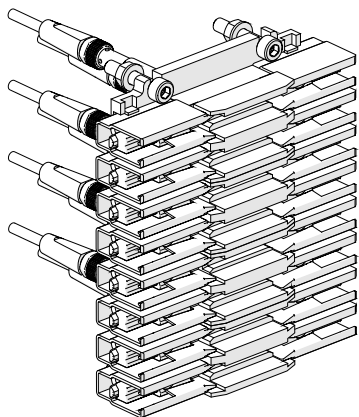


Fig. 18: Sliding contact sensor unit

##### ■ Sliding contact sensor unit

A sliding contact sensor unit is available for checking for the presence of the sliding contacts and conditional wear measurement, which can check the status of the sliding contacts in conjunction with control/evaluation logic provided by the customer (see BAL0815-0001).

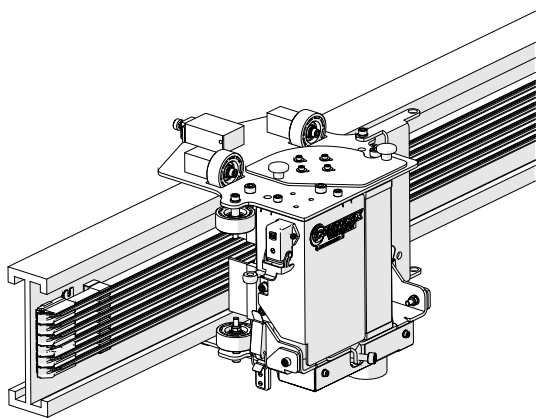


Fig. 19: Rail cleaner

##### ■ Suction head/conductor rail cleaning unit

Various solutions are available for removing loose buildup and deposits on conductor rails and EMS rails. Technical design and application details are available on request.

#### 4.4.1 Tools and materials

- Disassembly tool (Order No.: 081092)
- Drilling jig (see Section 6.3.3.8)
- Bending device (Order No.: 081091)
- Notching tool (Order No.: 081094)

## Single-pole Conductor Rail System

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### 5 Transport, Packaging and Storage

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#### 5.1 Safety

Required protective equipment:



#### **Risk of death due to suspended loads!**

Falling parts or uncontrolled swinging loads can lead to severe injury or even death.

- Never walk under suspended loads.
- Only use the attachment points provided; do not fasten lifting accessories to projecting machine parts or to eyelets on components.
- Be sure the lashing elements are firmly seated.
- Use only authorized lifting accessories and lashing elements with sufficient load capacity.
- Do not use torn or damaged ropes or straps; replace them with new ones.
- Do not attach ropes or straps at sharp corners and edges, and do not knot or twist them.
- Only move loads under supervision.
- Set down the load when leaving the workplace.
- Cordon off the work area.
- Work carefully when working in the vicinity, particularly below the conductor rail system.



#### **Risk of injury due to crushing skin and limbs!**

Skin and limbs can be crushed:

- When packing components and handling long loads.
  - If transport crates are dropped.
  - With incorrect suspension points for transport crates.
  - With incorrect and unauthorized loading of transport crates.
- Wear personal protective equipment!
- Use suitable lifting gear!

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**DANGER!**

#### **Risk of injury due to cutting and amputation!**

Cuts and amputations can occur:

- On packaging material (such as cartons, bands, etc.).
- On sharp edges of the conductor rail.

→ Wear personal protective equipment!



**CAUTION!**

#### **Risk of puncture wounds and cuts!**

The packaging material can contain sharp objects such as nails, struts, steel bands and wood splinters that can cause injury to limbs. Danger of conductor rails sliding out if the packaging units are held at an angle.

→ Wear personal protective equipment!

→ Cordon off the work area!

→ Use caution when working in the vicinity, particularly below the conductor rail.



**WARNING!**

#### **Damage from improper transport!**

Improper transport can result in substantial property damage.

→ When unloading packaged parts upon delivery and during internal transport, proceed with caution and observe the symbols and information on the packaging.

→ Use only the provided attachment points.

→ Only remove packaging shortly before installation.



**DANGER!**

#### **Risk of injury due to impacts and punctures/stabs from conductor rails sliding out!**

Risk of injury due to impacts and punctures/stabs from conductor rails sliding out when the packaging units are held at an angle, the packaging is damaged or through carelessness with long loads/transport crates.

→ Wear personal protective equipment!

→ Cordon off the work area!

## 5.2 Transport

Check the delivery for completeness and transport damage immediately on receipt.

If transport damage is externally visible, proceed as follows:

- Do not accept delivery or accept it only with reservations.
- Note the scope of damage on the transport documents, or on the transporter's delivery note.
- File a complaint.



## Single-pole Conductor Rail System

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#### NOTE!

File a complaint on every defect as soon as it is detected. Damage compensation claims may only be made within the applicable claim periods.

## 5.3 Packaging

The individually packaged parts have been packed in accordance with the anticipated transport conditions. Only environmentally friendly materials have been used for packaging.

The packaging is designed to protect the individual components from transport damage, corrosion and other damage until installation. As a result, do not destroy the packaging and remove it only shortly before installation.

#### Handling packaging materials:

Dispose of packaging material according to valid legal regulations and local guidelines.



#### WARNING!

#### Environmental damage due to improper disposal!

Packaging materials are valuable resources and can be reused or usefully processed or recycled in many cases.

- Dispose of packaging materials in an environmentally appropriate manner.
- Comply with locally applicable disposal guidelines; if necessary, engage a specialist to handle disposal.

## 5.4 Storage of packaged parts

#### Packaged parts must be stored under the following conditions:

- Do not store outdoors
- Store in a dry, dust-free place
- Do not expose to aggressive media
- Protect from direct sunlight
- Avoid mechanical vibrations.
- Storage temperature: -25°C to +55°C
- Relative air humidity: Maximum 60% without condensation
- When storing for more than 3 months, check the general condition of all parts and the packaging at regular distances. If necessary, refresh or replace the preservative.



#### NOTE!

In some cases, there may be instructions for storage on the packaged parts that go beyond the requirements listed here.

- Follow the instructions accordingly.

## Single-pole Conductor Rail System

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### 6 Installation

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#### 6.1 Safety

- Installation and initial commissioning may only be carried out by specially trained technicians.

Required protective equipment:



#### **Risk of death due to suspended loads!**

Falling loads can lead to severe injuries or even death.

- Never walk under suspended loads.
- Only move loads under supervision.
- Set down the load when leaving the workplace.
- Wear personal protective equipment!



#### **Injury due to improper installation and initial commissioning!**

Improper installation and initial commissioning can result in serious injury to persons and/or material damage.

- Before starting work, ensure that there is sufficient space for the installation.
- Handle open, sharp-edged components carefully.
- Ensure the installation area is tidy and clean! Loosely stacked or scattered components and tools are a source of hazards.
- Install components properly. Comply with the specified screw tightening torques.



#### **Poisonous vapors/gases in case of fire!**

The standard insulation materials contain PVC. Poisonous vapors/gases (HCL) can be produced during fires.

- The system operator must take this into account throughout the entire facility accordingly when planning and take the appropriate protective measures against fires.
- The building must be evacuated immediately.
- Notify the fire department.

## Single-pole Conductor Rail System

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**DANGER!**

#### **Risk of injury due to crushing skin and limbs!**

There is a risk of crushing of skin and limbs due to:

- Spring force/gravity (stored energy).
- Current collector (spring force) during installation, disassembly and maintenance.
- Be aware of the risk of falling conductor rail system components if they have not been properly installed or if operated in inappropriate operating conditions (e.g., environment that contains solvents).

- Only allow installation to be conducted by specialized technicians.
- When working on the conductor rail system, wear protective footwear, protective gloves, and protective headgear.
- When changing the sliding contacts, follow the separate instructions for this task. See Section 12.1.
- Only install the conductor rail system where suitable operating conditions prevail. See Section 3.3.



**DANGER!**

#### **Risk of injury due to ensnarement or impact!**

Ensnarement and/or impact with moving conductor rails (slip ring) or current collectors connected to the machine and other components must be prevented.

- Cordon off the work area.
- Use caution when working in the vicinity of the danger zone, particularly if protective devices (covers, enclosures, control devices) have been removed or disabled.
- Use caution when working in the vicinity of the danger zone, particularly below the conductor rail.
- Be aware of the risk of falling conductor rail system components if they have not been properly installed or if operated in inappropriate operating conditions (e.g., environment that contains solvents).
- Wear personal protective equipment!



**DANGER!**

#### **Risk of injury due to cutting and amputation!**

Cuts and amputations can occur:

- On sharp edges of the general components.
- On sharp edges of the conductor rails.
- On cut edges when trimming the conductor rails.
- On packaging materials (cartons, bands, etc.)

- Wear personal protective equipment!

## Single-pole Conductor Rail System

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**CAUTION!**

#### **Risk of puncture wounds and cuts!**

The packaging material can contain sharp objects such as nails, struts, steel bands and wood splinters that can cause injury to limbs.

- Wear personal protective equipment!
- Cordon off the work area!
- Use caution when working in the vicinity, particularly below the conductor rail.



**DANGER!**

#### **Risk of injury due to impacts and punctures/stabs from conductor rails sliding out!**

Risk of injury due to impacts and punctures/stabs from conductor rails sliding out when the packaging units are held at an angle, the packaging is damaged or through carelessness with long loads/transport crates.

- Wear personal protective equipment!
- Cordon off the work area!



**DANGER!**

#### **Risk of death due to electrical shock!**

Contact with components carrying electrical power can lead to death due to electrical shock or severe injury. Risk of injury due to shock reactions, falling or being thrown across the room due to electrical shock.

- The main power supply (from the building) must be disconnected in the installation area and secured against switching on again.
- Disconnect all voltage supply line feeds.
- Check whether a voltage is still present in the components and take measures where necessary.
- Install the conductor rail out of manual reach.
- Attach a sign stating "Risk of Death due to Electrical Shock" with the relevant hazard symbol in all areas with components under voltage.
- The customer must provide grounding for metallic components.
- The customer must provide protective devices.
- Ensure that there is sufficient stability in the area.



**WARNING!**

**The system must be designed and operated in accordance with the prevailing ambient conditions!**



**WARNING!**

#### **Secure conductor rails against falling**

- In application areas with personnel traffic and at an installation height of 3 m or more, conductor rails must be secured against falling!

## Single-pole Conductor Rail System

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**NOTE!**

A clearance to the side of the conductor rail of at least 4 mm from metal components must be maintained (see Fig. 20) to prevent mechanical collisions and guarantee sufficient electrical insulation distances!

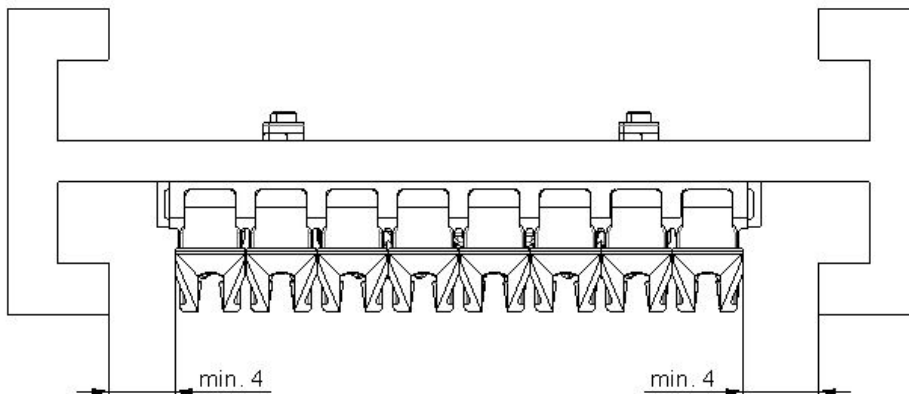


Fig. 20: Side clearance of at least 4 mm

## 6.2 Provide additional protection against accidental contact at the conductor rail end

An end cap is attached to the conductor rail end as protection against contact. In the case of double current collectors, a sliding contact that is **under voltage** can protrude from the end cap at the end of the conductor rail during operation. Touching this sliding contact may cause injury due to an electrical shock as well as by falling or being thrown across the room. The system operator must ensure that the current collector does not protrude or must ensure that the danger area is inaccessible (e.g., by providing protection against contact).



**CAUTION!**

### Take constructional protective measures!

- Use control technology to ensure that the current collector never travels beyond the end of the conductor rail.
- Also fit a contact guard that will safely cover the sliding contacts if they leave the conductor rail!



**CAUTION!**

### Alert personnel to the hazard!

- Attach a sign stating "Risk of Death due to Electrical Shock" with the relevant hazard symbol in all areas with components under voltage.

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### 6.3 Procedure

#### 6.3.1 Required tools

- Standard tools:
  - Measuring tape
  - Calipers
  - Scribe
  - Hexagonal screwdriver (3 mm)
  - Open-end wrench SW7
  - Screwdriver set
  - Cutting tool (e.g., cordless angle grinder) for producing short lengths
  - File for deburring cut edges after trimming
  - Cordless drill and countersink bit
  - Crimping tool
- Special tools:
  - Bending device (Order No.: 081091)
  - Rail disassembly tool
  - Drilling jig for transfer units
  - Torque wrench (2 Nm) with Bit 3 mm

#### Personnel:

- Installation by technical personnel only
- At least two people

#### 6.3.2 Customizing components

The customization of components is limited to the bending and trimming of the conductor rail.



#### NOTE!

**The trimming of the conductor rails must be conducted away from the installation area!**

## Single-pole Conductor Rail System SingleFlexLine Program 0815

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### 6.3.2.1 Trimming conductor rails

The conductor rails have a standard length of 4000 mm. Shorter lengths can be supplied but are generally produced on site.

#### Required tools:

- Cutting tool, preferably a battery angle grinder with 1 mm cutting disc for the finishing of short lengths.
- Half-round file #3, small, to deburr rail ends after trimming.

#### Work steps:

- Cut the conductor material and insulation to the same length.
- Saw the metal rail and PVC insulation away from the contact area using a cutting tool.
- Deburr the sawed end with a half-round file. Chamfer the contact surface in the entire rail base by 0.3–0.4 mm by 15° to guarantee a problem-free passage of the sliding contacts over the rail joint.



**CAUTION!**

#### Sharp edges and burrs result in increased wear of the sliding contacts!

A sharp edge and/or burr can rapidly wear away the carbon of the sliding contacts.

- Deburr the sawed end with a half round file.

- Clean the profile well and remove sawing debris

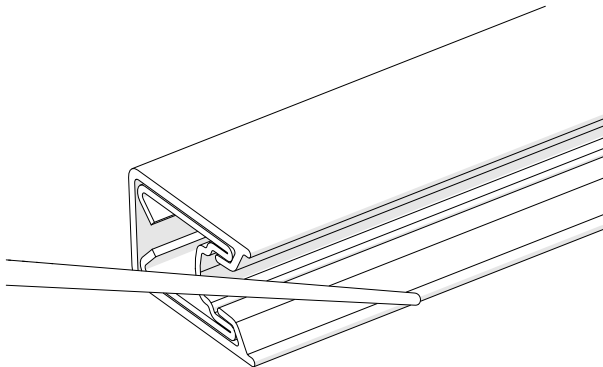


Fig. 21: Deburr the conductor rail with a smooth file



Use the QR code (“click” or “scan”), to watch our animation  
**Trimming Phase Rail and PE<sub>plus</sub> Rail, Notching for PE<sub>plus</sub> Rail.**

## Single-pole Conductor Rail System SingleFlexLine Program 0815

### 6.3.2.2 Making a notch for the PE<sub>plus</sub> rail

#### Required tools:

- Notching tool (Order No.: 081094) or side cutter for finishing the ends of the PE<sub>plus</sub> rail
- Drill Ø 5 mm



**The PE<sub>plus</sub> rail has a plastic bar in the insulating profile!**

→ A notch, i.e., the removal of the plastic bar, is required in order to be able to mount the connector (see Section 6.3.3.2) or the end cap (see Section 6.3.3.8) on the PE<sub>plus</sub> rail later.

→ If the notch was sawed away when cutting to length (see Fig. 22), this must be re-made with the notching tool or a side cutter (see Fig. 23).

→ Make a notch with the notching tool:

- Slide the insulating profile approx. 30 cm from the conductor bar.
- Place the notching tool on a firm mounting surface (e.g., a table) and push the insulating profile into the notching tool up to the stopper.
- Press the notching tool handle down.
- After the notch has been made, remove the insulating profile from the notching tool and reinsert the conductor bar back into the insulating profile.

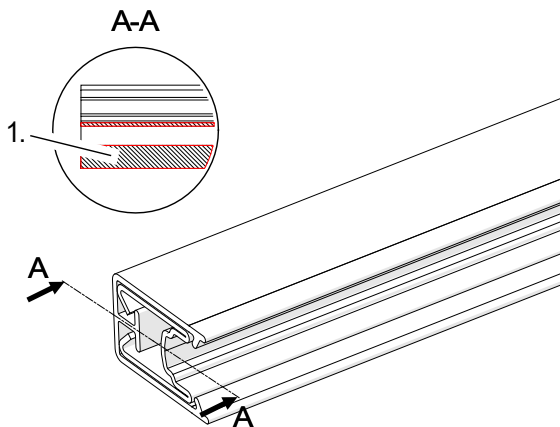


Fig. 22: PE<sub>plus</sub> rail without notching (with plastic bar)

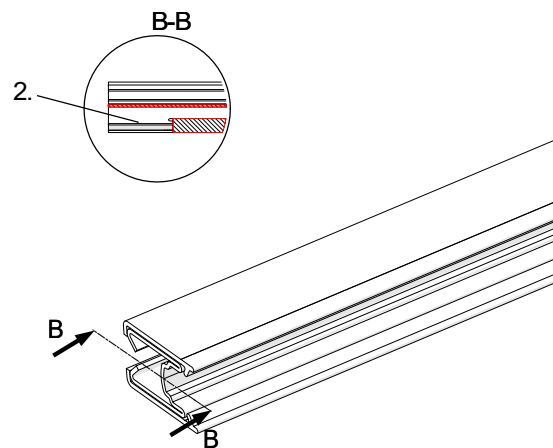


Fig. 23: PE<sub>plus</sub> rail with notching (without plastic bar)



Use the QR code ("click" or "scan"), to watch our animation **Cutting Phase Rail and PE<sub>plus</sub> Rail, Notching for PE<sub>plus</sub> Rail.**



## Single-pole Conductor Rail System SingleFlexLine Program 0815

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→ Make a notch with a side cutter:

- Slide the conductor bar out of the insulating profile.
- Drill the insulating profile (Ø 5 mm) (see Fig. 24).
- Cut a 19.5 mm long slot with the side cutter on both sides up to the drill hole (see Fig. 26).
- Deburr the insulating profile and clean the conductor bar. Reinsert the conductor bar back into the insulating profile.

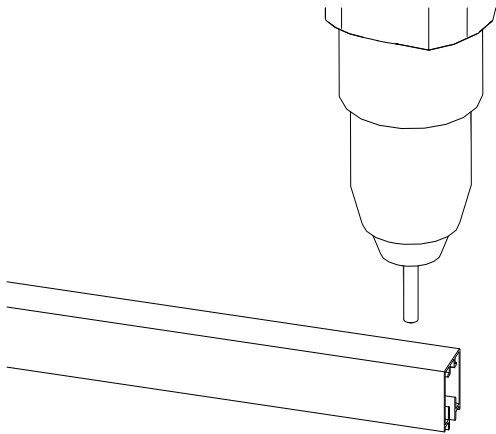


Fig. 24: Drill the hole for the notch in the insulating profile

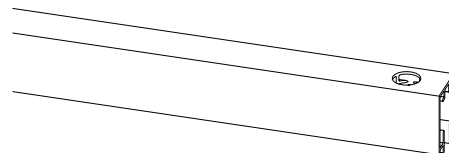


Fig. 25: Hole for the notch is drilled

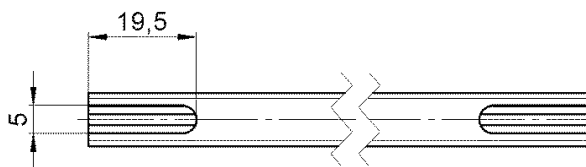


Fig. 26: Cut the slot up to the hole

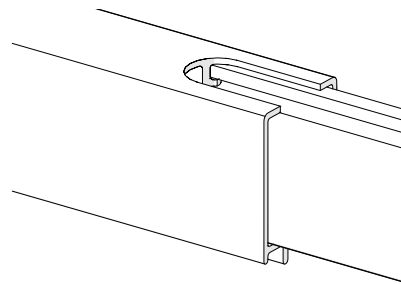


Fig. 27: Recess in insulating profile

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### 6.3.2.3 Making a bend in the conductor rail



**Read and observe the additional operating instructions!**

You can find additional information on the making a bend in a conductor rail in BAL0800-0004.

Conductor rail bends can be fabricated in the factory or on site. They are prepared using the bending device 081091. For large installations, electrically driven bending devices are available on request.

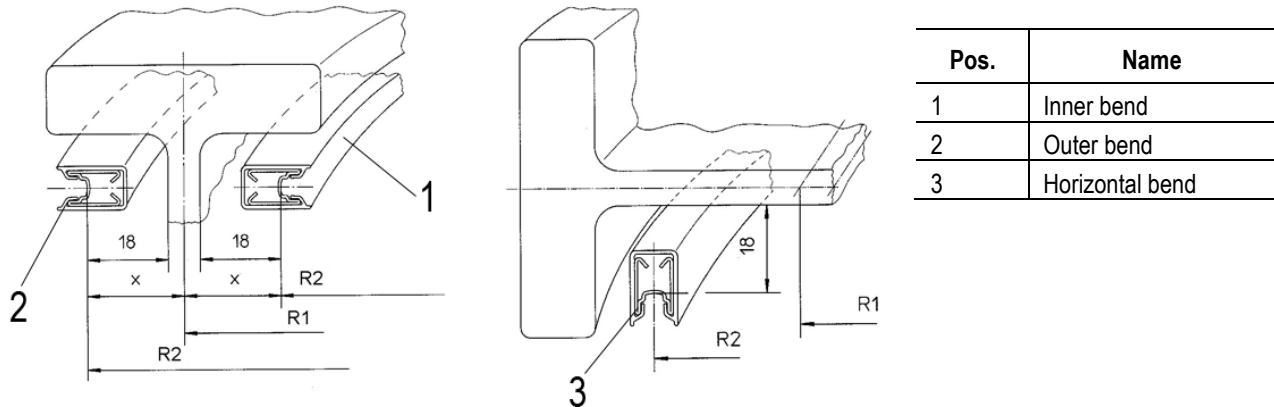


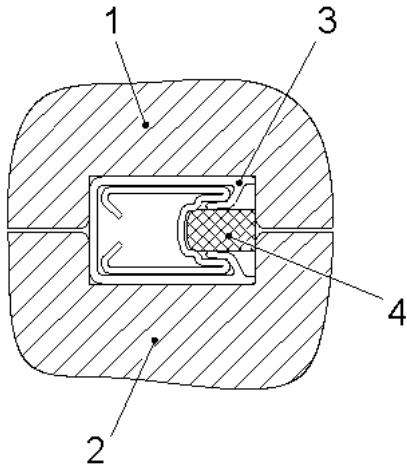
Fig. 28: Outer/inner bends and horizontal bend

#### Use of bends in horizontal and vertical curves

	Insertion direction of the current collector	
	Vertical (from below)	Horizontal (from the side)
<b>Horizontal curve</b>	Horizontal bend Suspension distance: 400 mm Bend radius: 1000 mm to $\infty$	Inner/outer bend Suspension distance: 250 mm Bend radius: 450 mm to $\infty$
<b>Vertical curve</b>	Inner/outer bend Suspension distance: 250 mm Bend radius: 450 mm to $\infty$	Horizontal bend Suspension distance: 400 mm Bend radius: 1000 mm to $\infty$

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To avoid undesired deformations of the conductor rail, the plastic insert supplied must be inserted in the slit in the contact surface before forming the bend and the removed once the bending process is complete.



Pos.	Name
1	Upper bending roller
2	Lower bending roller
3	Horizontal bend
4	Plastic insert 4x6 mm (white)
4	Insert PE <sub>plus</sub> for bending device 5.3x5 mm (black)

Fig. 29: Making a horizontal bend with a plastic insert



**Ensure that the insert PE<sub>plus</sub> is installed in the correct position!**

- When bending the PE<sub>plus</sub> rail, ensure that the installation position is correct.
- If necessary, re-measure (cut surfaces 5.3 mm or see surface A in Fig. 30)

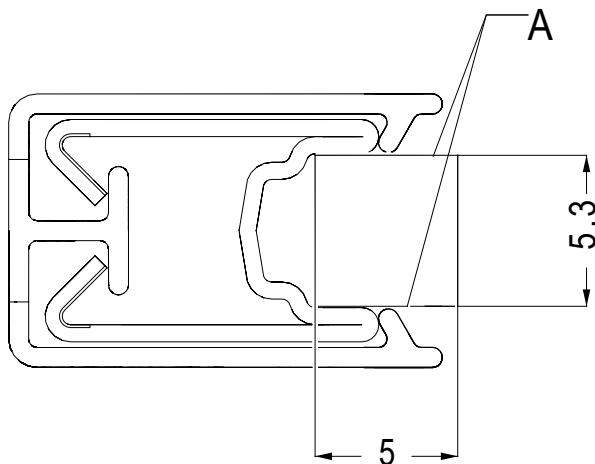


Fig. 30: Insert PE<sub>plus</sub>

## Single-pole Conductor Rail System

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#### Required tools:

- Bending device 081091

#### Work steps:

- Scribe the required bend on a flat surface (e.g., the floor).
- When making horizontal bends: Insert the plastic insert in the slot on the conductor rail contact surface with the insulating profile slid open.
- Using the setting spindle, move the upper bending roller upward until the rail section can be inserted into the recess provided in the bending device.
- Adjust the position of the bending roller downward and move the rail section back and forth.
- Bend the rail section by progressively advancing the central pressure roller.
- Repeat this process until the required radius is achieved.
- All subsequent rail sections that are to be formed to the same radius can now be bent using the existing setting.
- The rollers are designed for the various bends (horizontal/vertical, see BAL0800-0004 for the bending device for product ranges 0811 and 0815).



#### NOTE!

#### Use modified PE<sub>plus</sub> rails for conductor rail bends with radii < 1500 mm!

- Use modified PE<sub>plus</sub> rails (Order No.: 081516-4x15) for preparing conductor rail bends with radii < 1500 mm.

These rails are slotted on the rear side and can be bent without deformation of the insulation.

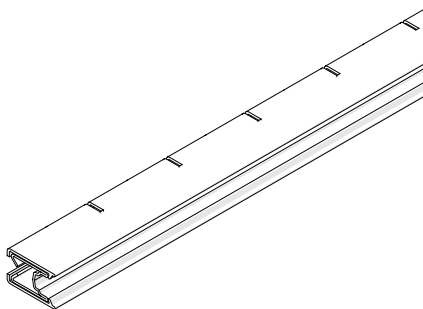


Fig. 31: Slotted PE<sub>plus</sub> rail

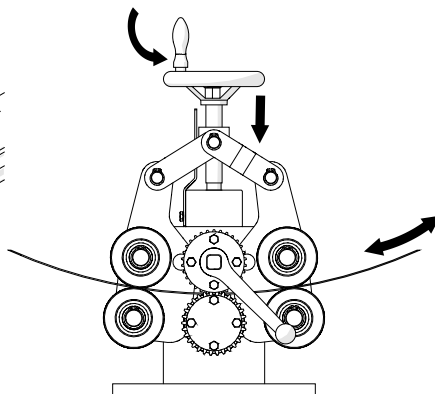


Fig. 32: Bending device (081091)



Use the QR code ("click" or "scan"), to watch our animation **Bending Rails.**

## Single-pole Conductor Rail System SingleFlexLine Program 0815

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### 6.3.3 Installing the conductor rail system



**NOTE!**

A clearance to the side of the conductor rail of at least 4 mm from metal components must be maintained (see Fig. 33) to prevent mechanical collisions and guarantee sufficient electrical insulation distances!

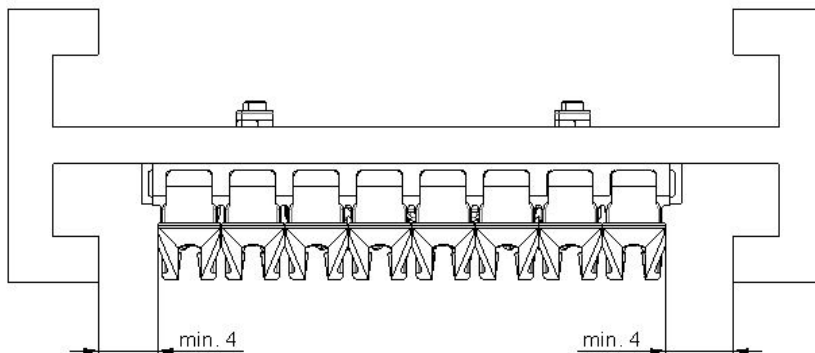


Fig. 33: Side clearance of at least 4 mm

#### Procedure during installation:

It makes sense to start the installation at one end cap and install the conductor rail along the route.

#### Work steps:

- Indicate the positions/installation locations for line feed, customer-side fixed points, terminal boxes, expansion units, isolating gaps and the guideway profile on the installation structure in accordance with the layout and allocation plan.
- Prepare the line feed and section transfers.
- Assemble the conductor rail (see Section 6.3.3.1).
- Install conductor rail sections including cut sections, lifters, conductor rail bends and fixed points.
- Prepare the cut sections and conductor rail bends in the switches.
- Check the mechanical installation.

#### Test steps to be performed during installation:

- Check the design against the layout and allocation plan.
- Maintain the hanger clamp distances; the rails must be properly engaged in the hanger clamp.
- All screw connections for the line feeds, connectors and end caps must be tightened to 2 Nm.
- All transfers and bends must be tested for functionality. Current collectors must not jam when passing through. Check for free passage with a single current collector.
- The cabling must be checked (routing, labeling, etc.).
- Conduct a continuity and insulation check.
- Check the set dimension of the expansion unit.

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### 6.3.3.1 Mounting the hanger clamps

The following must be observed when mounting the hanger clamps:

- Set the hanger clamps at distances of approx. 500 mm and at distances of 400 mm and 250 mm respectively for inner and outer horizontal bends. Mount the hanger clamps at a distance of 100 mm – 150 mm from the end cap (see Fig. 35).
- At transfers and connection points, a minimum distance to end caps, connectors and expansion units of at least 200 mm must be maintained. Here, the hanger clamps must be set so that hanger clamp collisions with other components of the system are avoided during expansion of the system.

Hanger clamps are screwed or clipped into customer-specific guideway profiles. When mounting, ensure that the pretensioning is not too great. Excessive pretensioning will distort the hanger clamp. There is a risk that the hanger clamp will no longer rest flat on the central bar of the EMS rails.

Nevertheless, the hanger clamp must be seated firmly enough in its position that it cannot dislocate freely in the guideway profile.

Frequently, the hanger clamps only become firmly seated in the EMS rail when the conductor rails have been installed.

- Provide additional fixing for clip-in hanger clamps that do not remain in their positions.

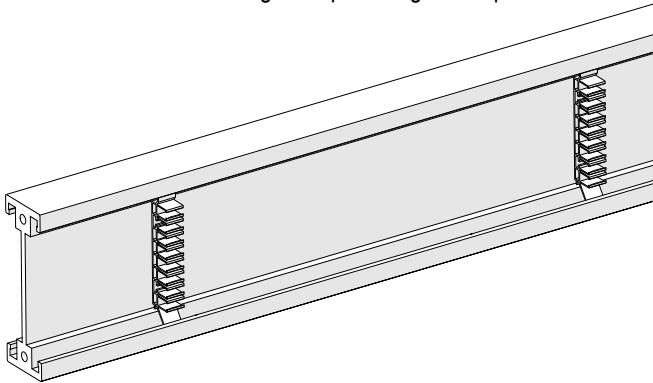


Fig. 34: Hanger clamp in EMS rail

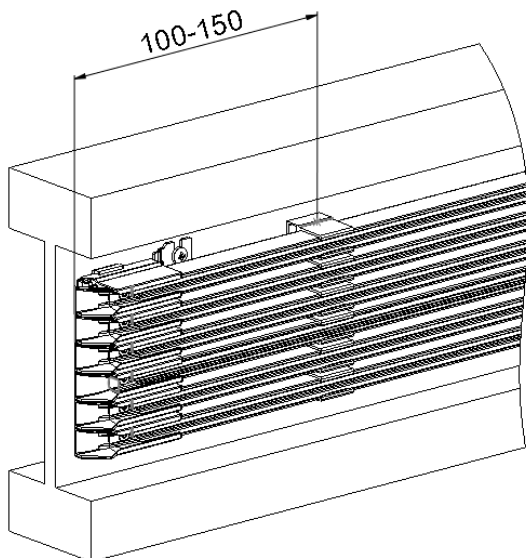


Fig. 35: Distance of the hanger clamp to the end cap

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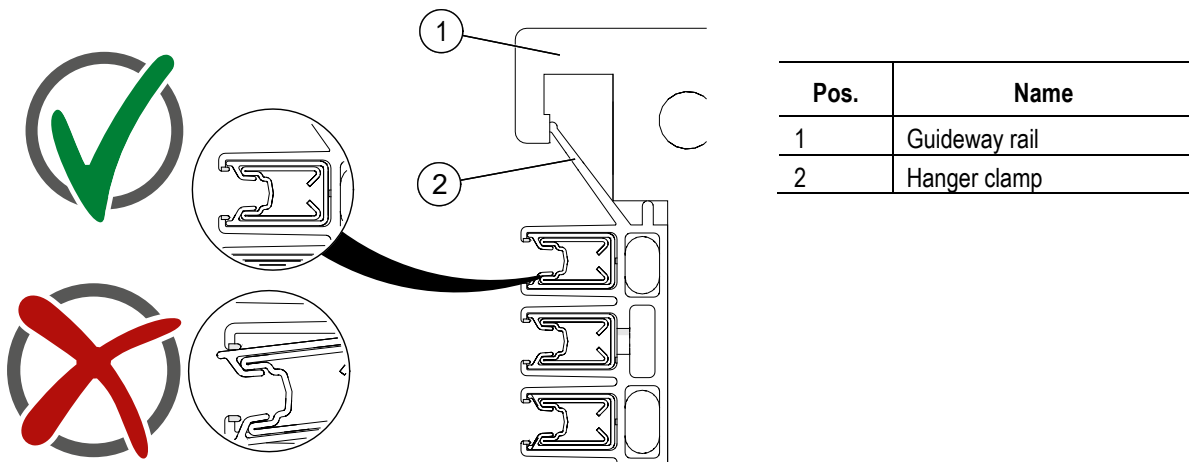


Fig. 36: Comparison of correctly and incorrectly engaged rail

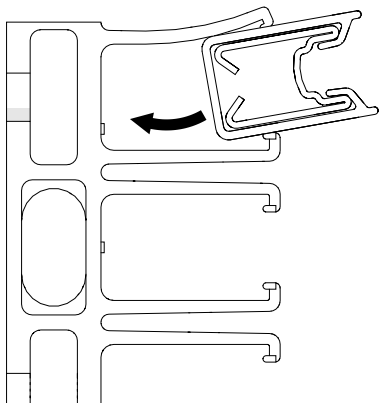


Fig. 37: Clip the hanger clamp into the conductor rail

**Standard hanger clamp for screwing on:**

To fasten the standard hanger clamps, drill holes must be drilled in the EMS rail. The drilling jig for support profile height 180 mm (Order No.: 2: 08-V015-0474-001) and the drilling jig for support profile 240 mm (Order No.: 08-V015-0474-002) are available to set the drill holes quickly and easily.

The holes for the hanger clamps are placed via the row of the female connectors (1). The row of the female connectors has markings (2 and 3 see Fig. 39 and Fig. 40) indicating the distance between the drill holes of the hanger clamps (detail C). The drill hole distance depends on the number of poles. The position of the holes can be adjusted in y-direction via the slotted holes (4).

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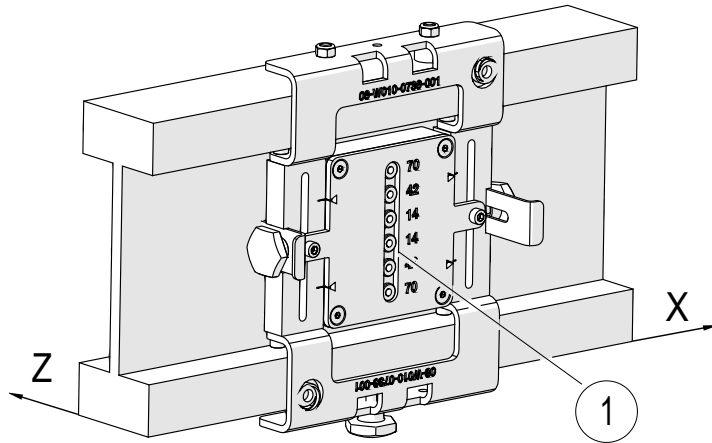


Fig. 38: Drilling jig for hanger clamp

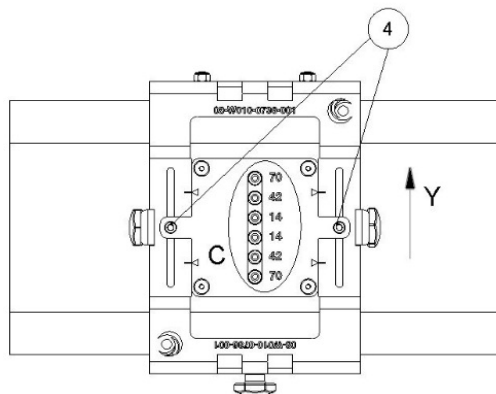


Fig. 39: Drill hole distance of the female connectors

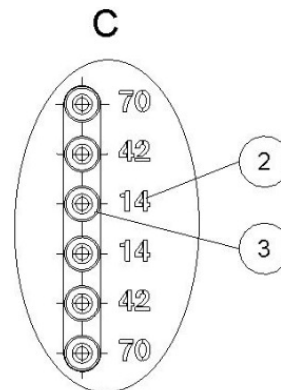


Fig. 40: Drill hole distance of the female connectors (detail C)

→ Screw the hanger clamp (6) onto the EMS track rail (7) with the cylinder screw and hexagon nut M4 (5) using a 7 mm open-end wrench.



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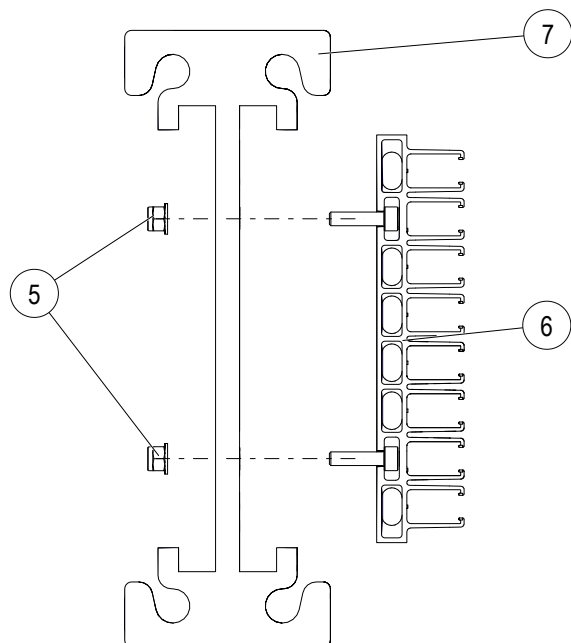


Fig. 41: Standard hanger clamps for screwing on



Use the QR code (“click” or “scan”), to watch our animation **Mounting Hanger Clamps (clip-in, screwable and turnable).**

#### 6.3.3.2 Mounting the fixed point

A fixed point consists of a hanger clamp and 2 fixed point clamps per pole. The positions of the fixed points are determined when planning the system. The correct positioning of the fixed points is crucial for the thermal expansion behavior of the conductor rail system.

##### Establishing a fixed point:

- Install a fixed point to the left and right of a hanger clamp per conductor rail pole. The fixed point cap is secured by an insertion cam in a hole in the side wall of the conductor rail.
- Scribe the position on the conductor rail before installation.
- Place the fixed point cap on the conductor rail as a drilling jig and drill a 3-mm hole through the insulation and copper profile on one side.
- Remove the fixed point cap and replace it after rotating through 180° and insert an insertion cam into the hole.

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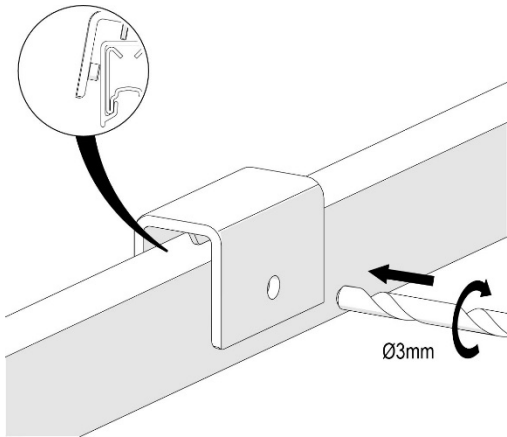


Fig. 42: Drill the hole for the insertion cam, insulating profile and copper element

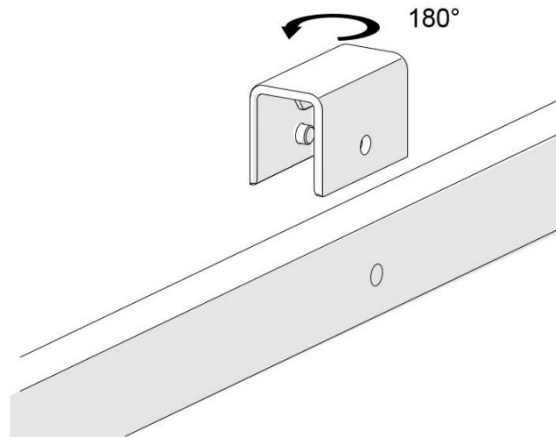


Fig. 43: Rotate the fixed point cap through 180°.

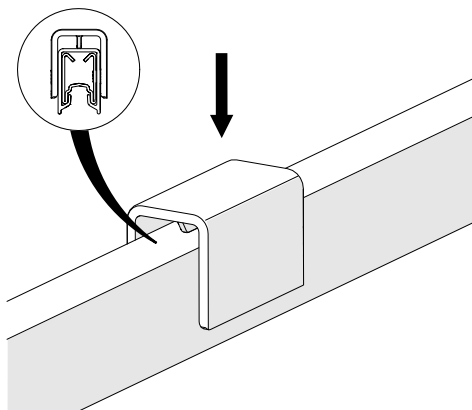


Fig. 44: Insert the insertion cam into the hole

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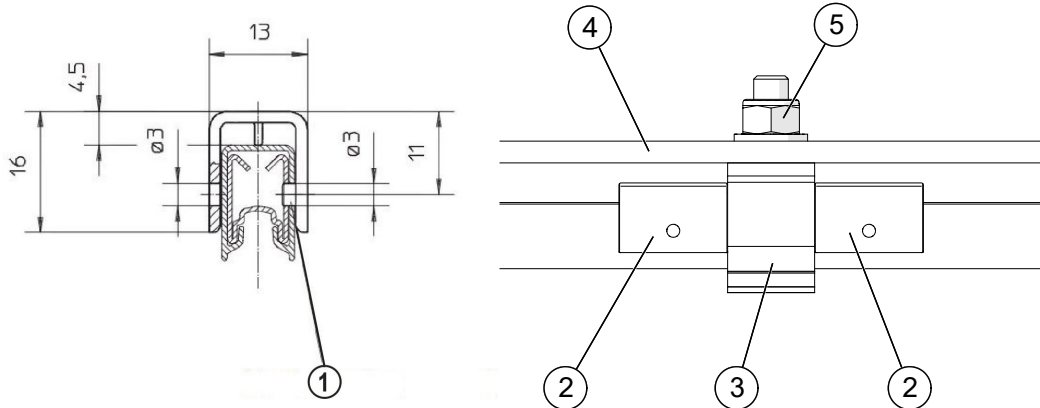


Fig. 45: Fully assembled fixed point

Pos.	Name
1	Insertion cam
2	Fixed point cap
3	Hanger clamp (to screw on)
4	Guideway profile
5	Hanger clamp screw connection with cylinder screw and hexagon nut M4



**Additional fixing of the hanger clamp is required for clip-in hanger clamps!**

For clip-in hanger clamps, the hanger clamp that is to be used as the fixed point must be additionally secured to the support profile/building structure with a screw.



Use the QR code ("click" or "scan"), to watch our animation **Mounting Fixed Point.**

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### 6.3.3.3 Mounting conductor rail and connectors (on straight routes)



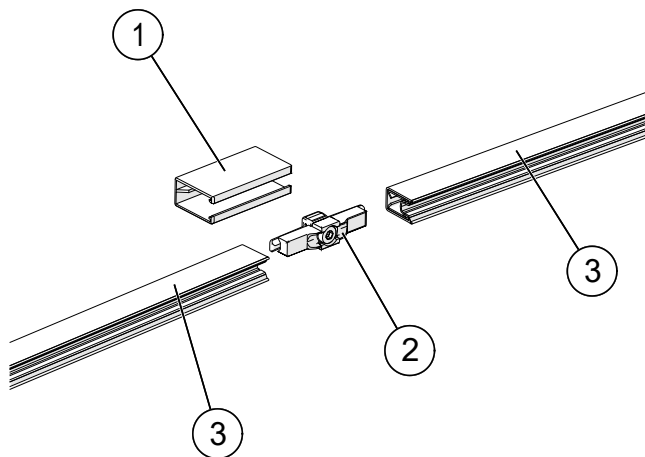
#### NOTE!

The connector (Order No.: 081526-6) may only be used for closed slip ring applications. The mounting of the connector is described in Section 6.3.3.4!

→ After installation of the hanger clamps and preparations of the transfers and line feed points, push the conductor rails into the hanger clamps, ensure that the conductor rails engage correctly, and the hanger clamp covers the insulation above and below (see Fig. 36).

→ To simplify the installation of the subsequent conductor rail, it makes sense **not** to engage the final meter of the conductor rail. This provides better accessibility of the conductor rail joint (EMS).

According to the guidelines of the automotive industry, the protective conductor (PE) is provided as the 4th pole counted from above. This also corresponds to the standards of conductor rail manufacturers.



Pos.	Name
1	Connector cap
2	Connectors
3	Conductor rail

Fig. 46: Connector and 2 conductor rails

Screw connections are used to connect 2 conductor rails. The connectors have a contact part and a rear clamping part.

→ Push the connector into the conductor rail such that the contact part sits in the interior of the conductor rail and the clamping part engages between the conductor rail and the rear insulation (see Fig. 48 and Fig. 49).



A light pressure on both sides of the side surface of the conductor rail may make it easier to push the connector in.

→ Push the connector into the two conductor rails as far as the stoppers and then lightly tighten the connector from the front. Then tighten the connector to 2 Nm with a torque wrench (see Fig. 50).

→ Put the insulating cap on from the back, engage it and check for secure hold.

→ Push the conductor rail into the hanger clamp next to the connection point until it engages.

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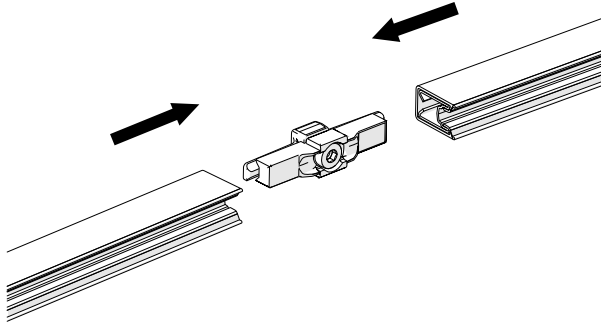


Fig. 47: Slide the rails onto the connector

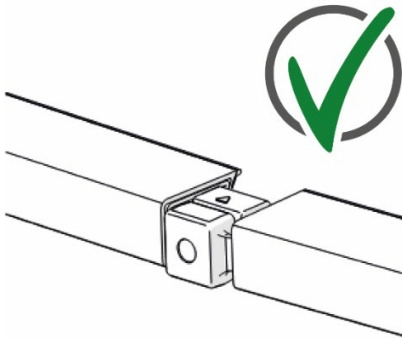


Fig. 48: Correct position of the clamp

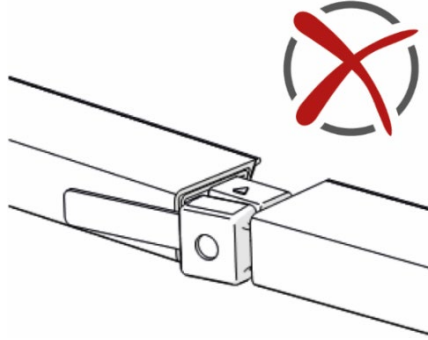


Fig. 49: Incorrect position of the clamp

Tighten the connector with  
a 3-mm Hexagonal screw-  
driver to **2 Nm**.

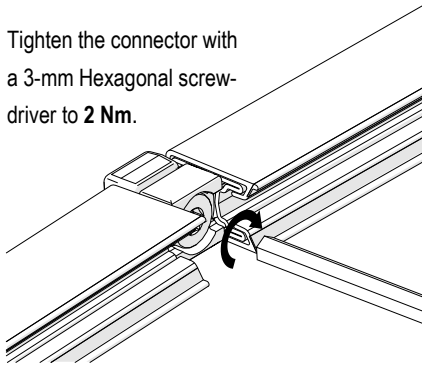


Fig. 50: Tighten the connector

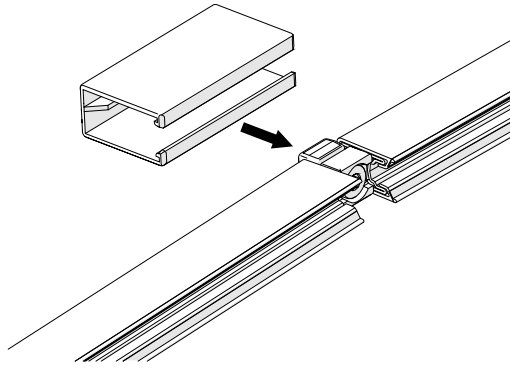


Fig. 51: Slide the connector cap over the rail connection



**NOTE!**

Ensure that the connector cap is completely engaged on both sides of the insulating profile!

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After mounting the connector cap, check the connection for solidity by gently pulling. If the conductor rails can be pulled apart, the connector clamp is most likely incorrectly mounted (see Fig. 49).

- Attach the connector cap centrally from behind and clip it into the insulating profile.
- Engage the conductor rails in the hanger clamps (see Fig. 52).

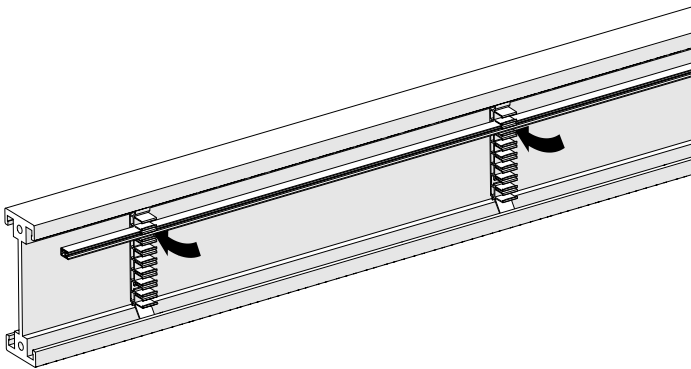


Fig. 52: Support profile with a conductor rail installed



### Conductor rails can become deformed when bent!

- Check conductor rail bends for the correct profile since conductor rails can deform when bent in the area of the insulation.
- Push a current collector through the conductor rail by hand. The current collector must slide through the conductor rail bend without jamming.
- For a PE<sub>plus</sub> rail, use a PE<sub>plus</sub> current collector with a broader brush

- If the connector cap cannot rest on the guideway profile, hanger clamps must be placed at maximum distances of 200 mm on both sides of the connector position (see Fig. 53).

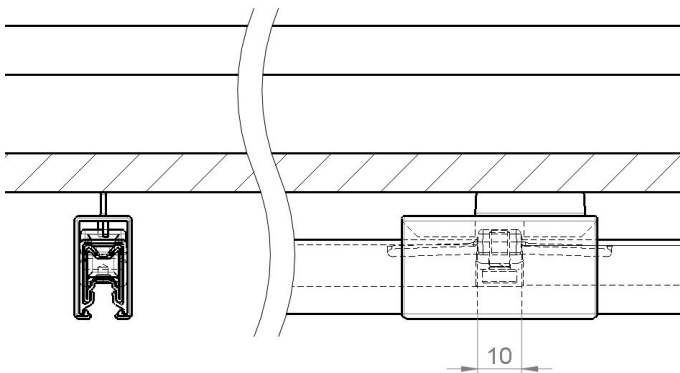


Fig. 53: Rail connector

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Use the QR code (“click” or “scan”), to watch our animation **Connecting Rails.**



During installation, a conductor rail may need to be taken out of a hanger clamp again. There is a disassembly tool for this (Order No.: 081092). This is used to disassemble the conductor rail fixed in the hanger clamp and end cap bars (see Fig. 54–Fig. 56; see Section 11.2).

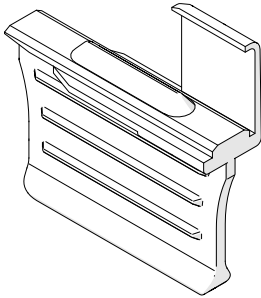


Fig. 54: Disassembly tool

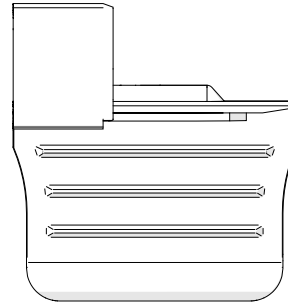


Fig. 55: Disassembly tool (side view)

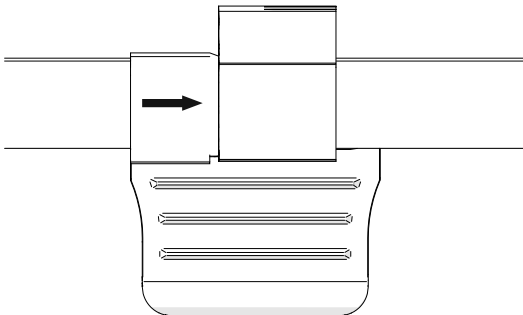


Fig. 56: Disassembly tool in use (side view)

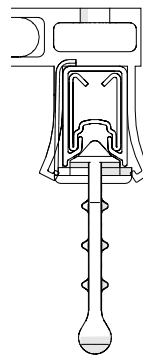


Fig. 57: Disassembly tool in use (front view)



Use the QR code (“click” or “scan”), to watch our animation **Using Dismantling Tool.**

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#### 6.3.3.4 Mounting conductor rail and connector (in closed slip ring applications)



**NOTE!**

The connector must not be used in straight routes, but rather only in closed slip ring applications!

The mounting of the connector on a straight route is described in Section 6.3.3.2.



**NOTE!**

The connector must not be reused!

#### Requirement:

The hanger clamps are mounted on the customer's support structure (substructure) at the appropriate distance.

#### Required tool:

- Plastic hammer

#### Work steps:

→ Mount the first conductor rail bend in the hanger clamp (B) up to, but not in the last hanger clamp (A). In order to connect the first conductor rail bend and the last conductor rail bend, it is important that the end of the first conductor rail bend is not yet mounted into the hanger clamp. In this way, the flexibility can be used at the last connection point (see Fig. 58).



The smaller the radius of the conductor rail bend, the greater the risk that the bend will be bent or deformed when it is connected. It may therefore be necessary to not mount the conductor rail bend in more than one hanger clamp.

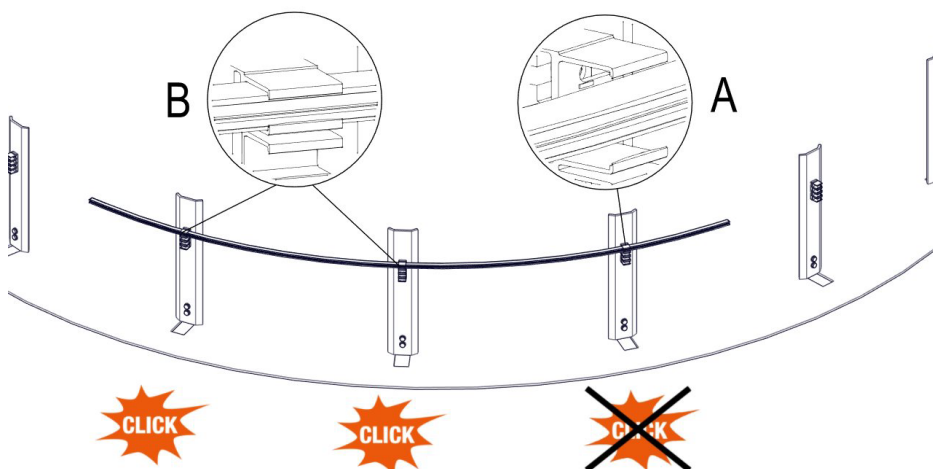


Fig. 58: Mount the first conductor rail bend



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→ Tap the connector (Pos. 2) into the end of the first conductor rail bend (Pos. 1) with a plastic hammer (see Fig. 59).

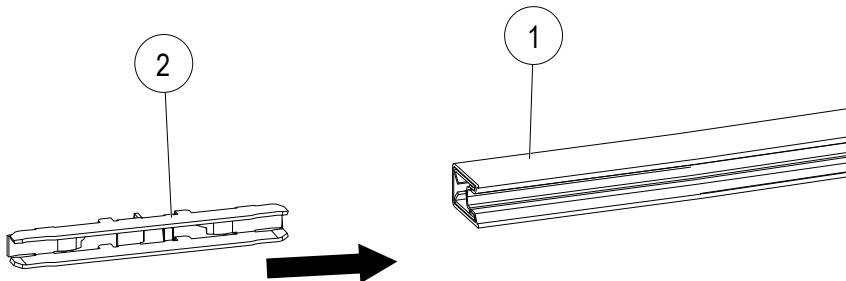


Fig. 59: Tap the connector (Pos. 2) into conductor rail bend (Pos. 1)

→ The connector stopper (Pos. 3) must be in contact with the insulating profile of the conductor rail (see Fig. 60).

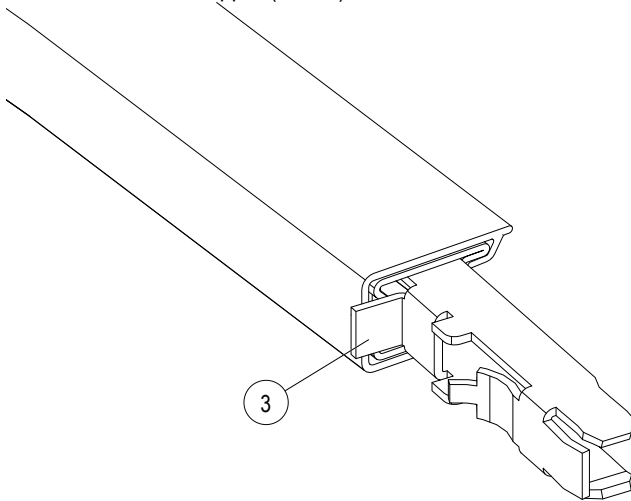


Fig. 60: The connector stopper (Pos. 3) is in contact with the insulating profile

→ Slide the second conductor rail bend (Pos. 4) without tools (e.g., hammer) into the connector (Pos. 3).

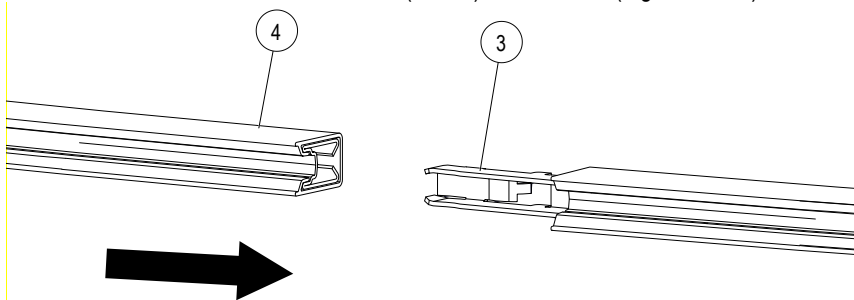


Fig. 61: Slide the second conductor rail bend (Pos. 4) into the connector (Pos. 3)

## Single-pole Conductor Rail System SingleFlexLine Program 0815

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→ Slide the connector cap (Pos. 5) over the insulating profile from behind (see Fig. 62) in order to mount the connector cap (Pos. 5) in the insulating profile (see Fig. 62 and Fig. 63). The connector cap (Pos. 5) must completely enclose the insulating profile (see Fig. 64).

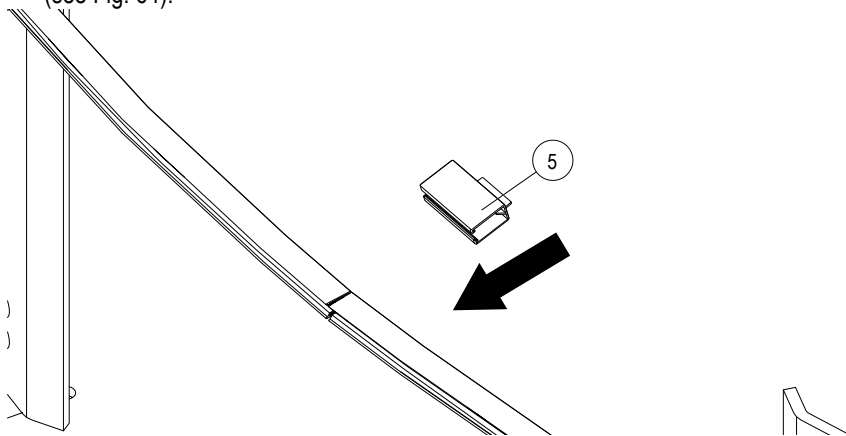


Fig. 62: Slide the connector cap (Pos. 5) from behind

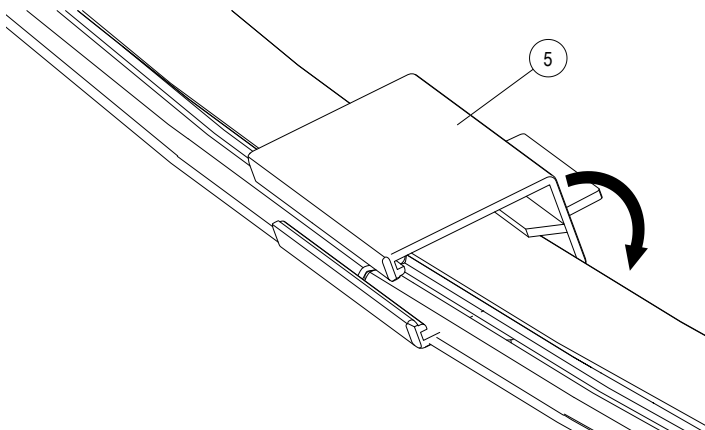


Fig. 63: Mount the connector cap (Pos. 5) in the insulating profile

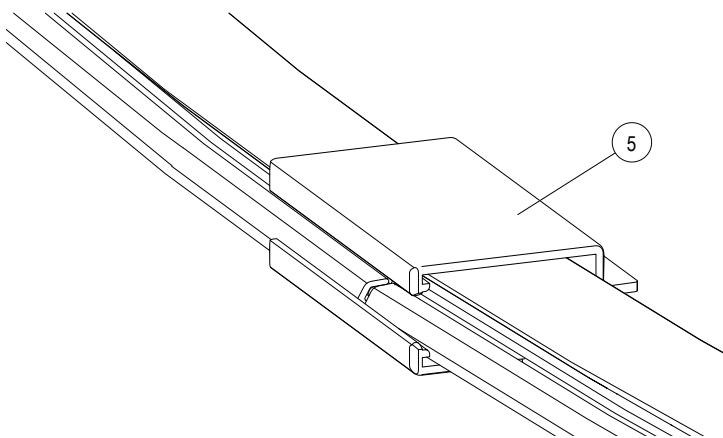


Fig. 64: The connector cap (Pos. 5) is completely mounted on the insulating profile

## Single-pole Conductor Rail System SingleFlexLine Program 0815

→ Mount or connect the further conductor rail bends in the same way in the customer's support structure (substructure)



**The conductor rail must not be bent further when the connector is mounted!**

### NOTE!

- Before the last conductor rail bend is mounted in the hanger clamp, slide the connector into the end of the last conductor rail bend up to the stopper (see Fig. 60).
- Mount the last conductor rail bend (Pos. 7) in the hanger clamp (B) up to, but in, the last hanger clamp (A) in order for the last connection point to be flexible. This means that the end of the first conductor rail bend (Pos. 6) and the end of the last conductor rail bend (Pos. 7) are not yet mounted in the hanger clamp (A) and are now hanging across from each other (see Fig. 65).



The smaller the radius of the conductor rail bend, the greater the risk that the bend will be bent further or deformed when it is connected. It may therefore be necessary to not mount the conductor rail bend in more than one hanger clamp.

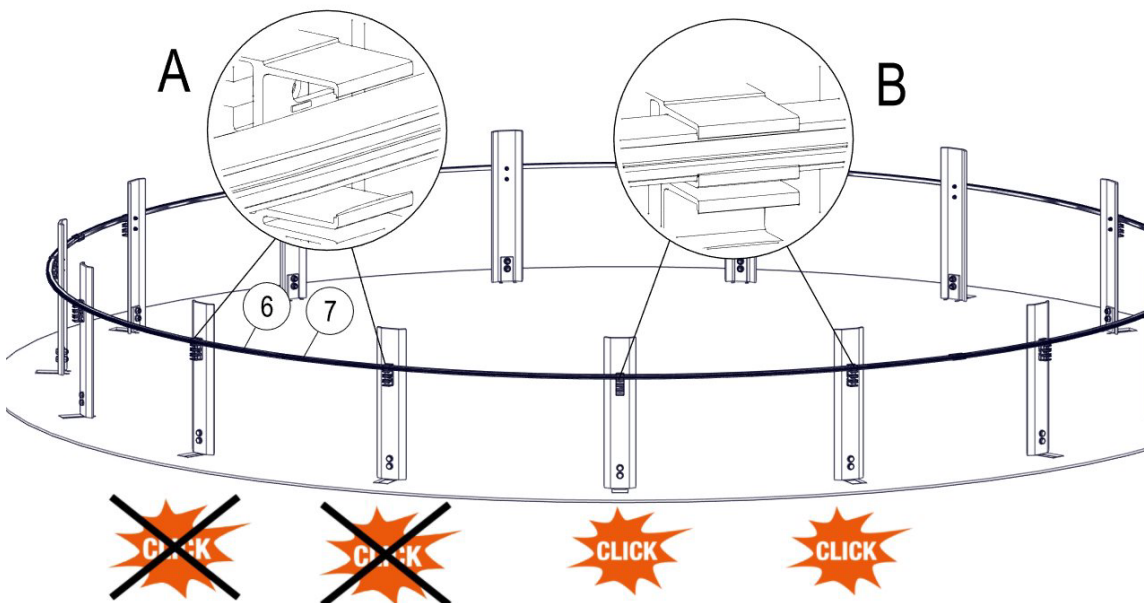


Fig. 65: Mount the last conductor rail bend

## Single-pole Conductor Rail System SingleFlexLine Program 0815

→ Slide the last conductor rail bend with the connector into the rail opening of the first conductor rail bend (see Fig. 66).

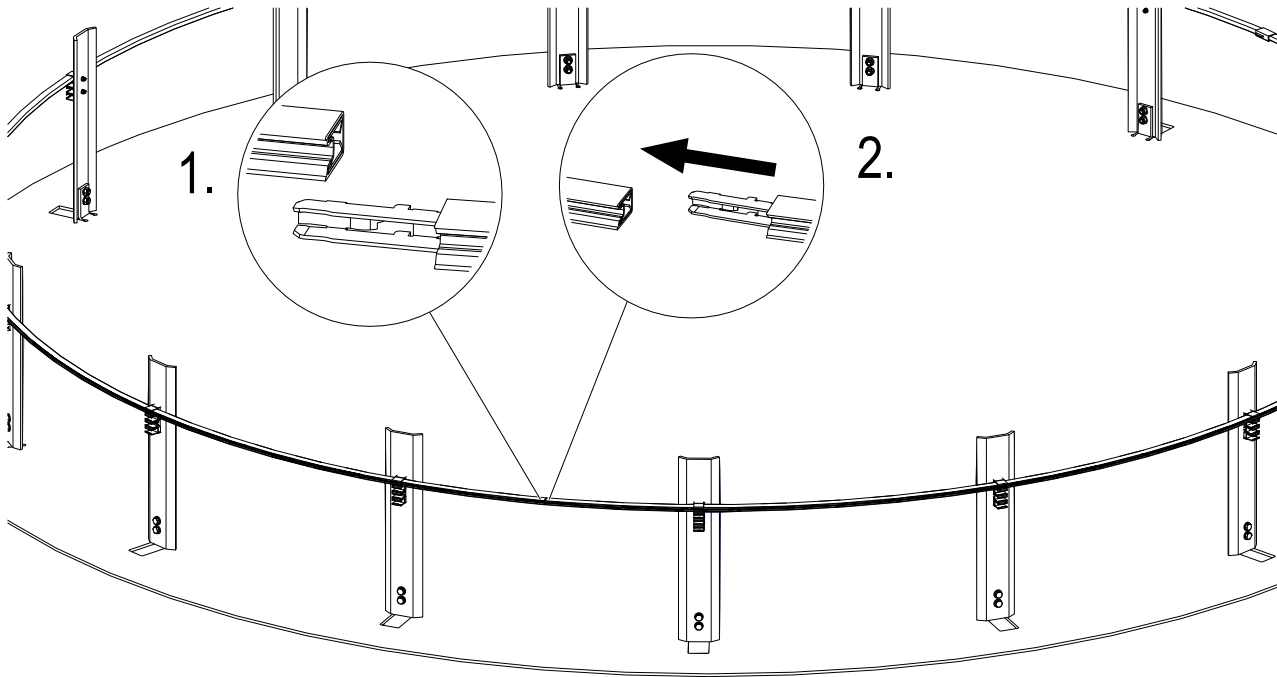


Fig. 66: Connect the last connection point

- Slide the connector cap over the connection point from behind and mount it in the insulating profile (see Fig. 62 - Fig. 64).
- Mount the first conductor rail bend and the last conductor rail bend in the hanger clamp.
- Connect or mount all other poles in the same way.



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**Mounting Plug-in Connector in Closed Slip Ring Applications.**

## Single-pole Conductor Rail System SingleFlexLine Program 0815

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### 6.3.3.5 Expansion unit and expansion module

An expansion unit is a component used to compensate for changes in length of a conductor rail pole and is supplied without conductor rails. It is installed the same as an air gap insulation section (see Section 6.3.3.6). An expansion module consists of expansion units and conductor rails for a specified route length. The mounting is described in Section 6.3.3.5.2 and in Section 6.3.3.5.3. The expansion unit and expansion module with an expansion gap of 20 mm are described below.

The use of an expansion unit or an expansion module is necessary if expansion occurs between two fixed points that can no longer be compensated for or absorbed by the individual components of the conductor rail system. Short lengths of < 20 m and low temperature changes of < 40 K can be absorbed by the individual components in the conductor rail system.

Expansion units and expansion modules are also used when the support profile has an expansion joint, e.g., at building transfers. Then the expansion path of the support profile must be absorbed by an expansion unit or expansion module.

Fixed points in terms of thermal expansion are end caps or fixed points of the conductor rail system since this is where the conductor rail is firmly connected to the support profile. Curves and bends in the support profile layout can also hinder the thermal expansion of a conductor rail and are therefore also classified as fixed points (natural fixed points).

<b>Expansion module length</b>	710 mm (without connector caps)
<b>Conductor cross-section</b>	Rail 25 mm <sup>2</sup> , expansion point 6 mm <sup>2</sup> with conductor loop
<b>Rated current</b>	Max. 54 A
<b>Cable type</b>	Double insulated cable (CE and UL)
<b>Ambient temperature</b>	-5°C to +55°C
<b>Storage temperature</b>	-25°C to +55°C



**DANGER!**

#### Risk of overload!

The rated current can only be achieved with suitable cable routing.

→ Ensure sufficient distance and ventilation.

→ If the cables are bundled or if there is insufficient ventilation, reduce the rated current according to the standard.



**NOTE!**

**Expansion units and expansion modules are not intended for use in bends or curves and may only be installed in straight routes!**

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The expansion module is available in different versions. See Table 1.

The individual modules can be combined with each other in such a way that multi-pole overall modules result. This not only results in a variety of possible combinations with regard to the number of poles, but also a high degree of flexibility in the PE position (see Fig. 67 and Fig. 68).

Number of Poles	PH/PE/PE <sub>plus</sub>	Order No.
2	PH	081564-611-3211
2	PE	081564-611-3212
3	PH	081564-611-3311
4	PH	081564-611-3411
4	PE	081564-611-3412
4	PE <sub>plus</sub>	081564-611-3415

Table 1: Expansion module variants

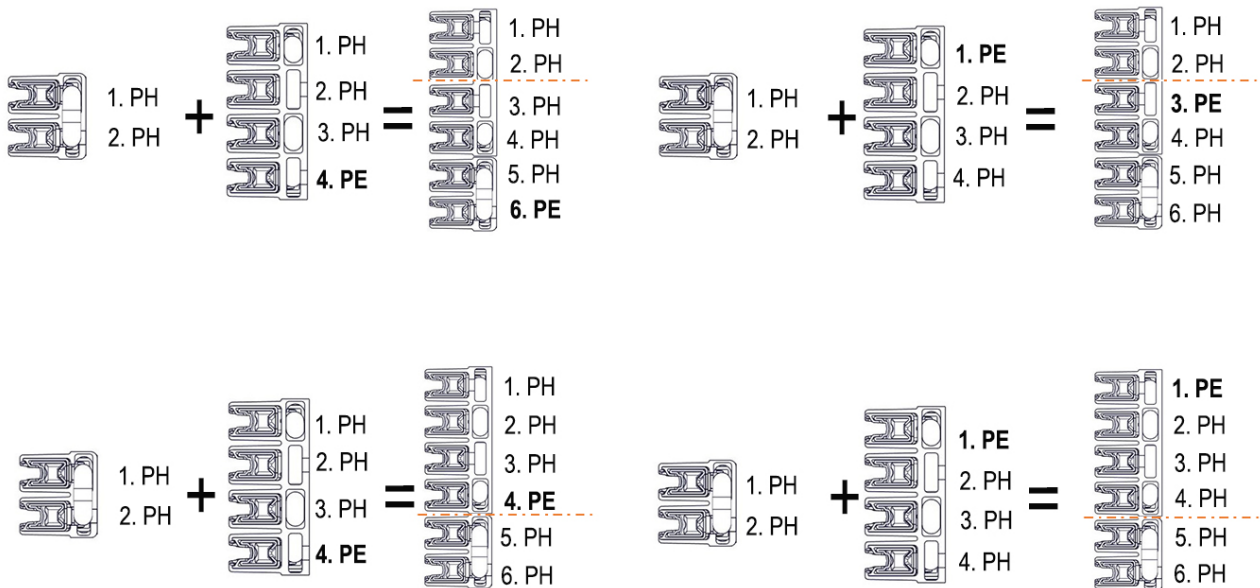


Fig. 67: 2-pole and 4-pole expansion modules result in a 6-pole expansion module

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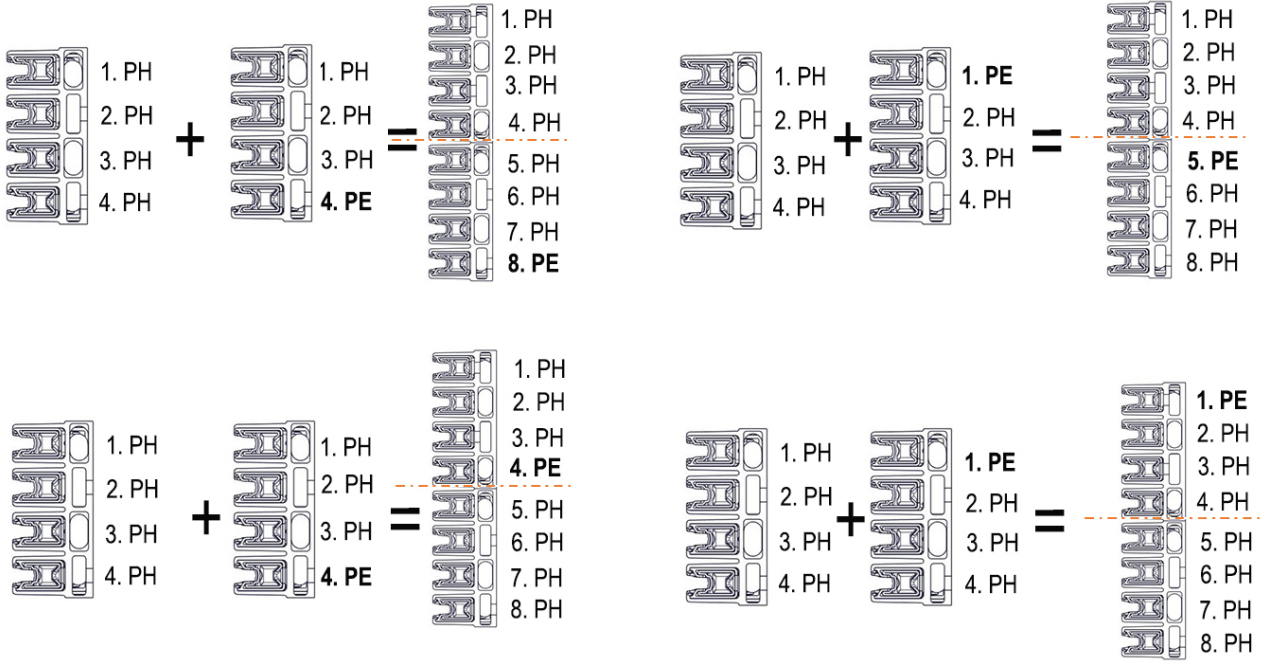


Fig. 68: 4-pole and 4-pole expansion modules result in an 8-pole expansion module



**NOTE!**

**A rear cable protrudes from the 3-pole expansion module version.  
This means that a distance of 14 mm from the customer-specific support profile must be maintained on this side!**

## Single-pole Conductor Rail System

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#### 6.3.3.5.1 Determine the number of expansion modules

The number and position of the expansion modules depends on the system layout, the operating temperature range and existing building expansion joints or customer-specific support profiles.

**Procedure:**

1. Determine the required expansion modules at building expansion joints and support profile expansions.
2. Determine the required expansion modules for straight support profile areas from 8 m.



**When planning, consider all temperature fluctuations within the entire life cycle of a system!**

**NOTE!**

**For example:**

A hall with a temperature fluctuation of 30 K is assumed for the facility system in Fig. 69. The corresponding values can be taken from Table 2 and Table 3:

		No expansion unit required	Intermediate length "a"	Freely expanding end	Example: Possible total length with "n" expansion units and 2 freely expanding ends				
					1	2	3	4	5
$\Delta t$	10 K	≤ 8 m	121 m	100 m	321 m	442 m	563 m	684 m	805 m
	20 K	≤ 8 m	60 m	100 m	260 m	320 m	380 m	440 m	500 m
	30 K	≤ 8 m	40 m	100 m	240 m	280 m	320 m	360 m	400 m
	40 K	≤ 8 m	30 m	100 m	230 m	260 m	290 m	320 m	350 m
	50 K	≤ 8 m	24 m	100 m	224 m	248 m	273 m	297 m	321 m

Table 2: For 1x20 mm expansion unit with complete utilization of the expansion gap

		No expansion unit required	Intermediate length "a"	Freely expanding end	Example: Possible total length with "n" expansion units and 2 freely expanding ends				
					1	2	3	4	5
$\Delta t$	10 K	≤ 8 m	60 m	100 m	260 m	320 m	380 m	440 m	500 m
	20 K	≤ 8 m	30 m	100 m	230 m	260 m	290 m	320 m	350 m
	30 K	≤ 8 m	20 m	100 m	220 m	240 m	260 m	280 m	300 m
	40 K	≤ 8 m	15 m	100 m	215 m	230 m	245 m	260 m	275 m
	50 K	≤ 8 m	12 m	100 m	212 m	224 m	236 m	248 m	261 m

Table 3: For 1x20 mm expansion unit when using the setting aid



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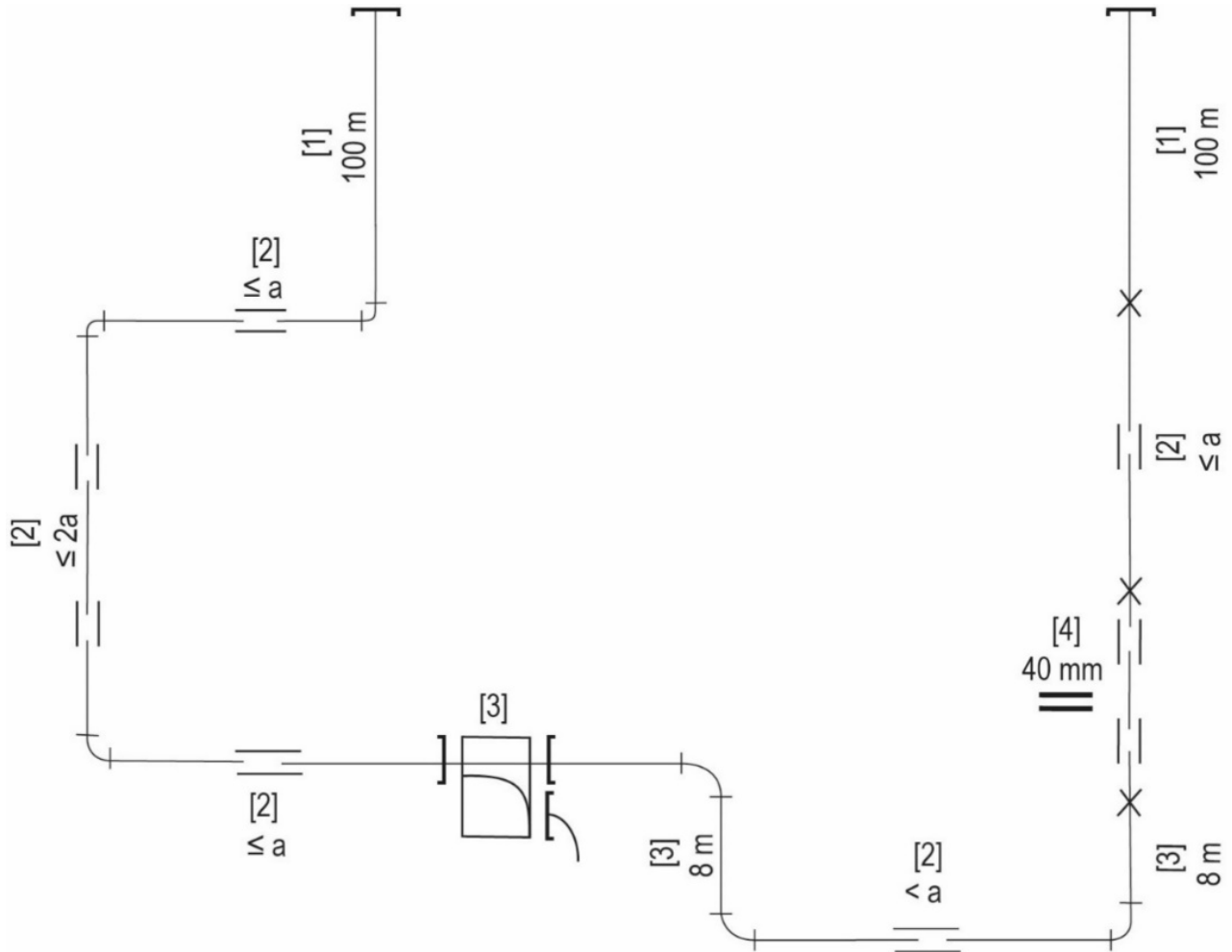


Fig. 69: System layout example

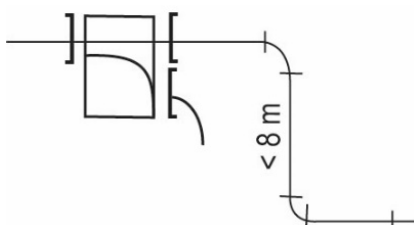
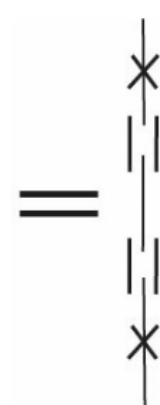
	Building expansion point
	Expansion module
	Fixed point
	Curves equate to fixed points
	Switch
	End cap

Single-pole Conductor Rail System

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No.	Route	Route characteristics	Number of expansion modules	Note
[1]		<ul style="list-style-type: none"> <li>- Straight segment</li> <li>- Length <math>\leq 100</math> m</li> <li>- Freely expanding end</li> </ul>	-	Curve radii $< 30$ m. In case of doubt, curves must be handled like fixed points
[2]		<ul style="list-style-type: none"> <li>- Length <math>&gt; 8</math> m, but <math>\leq 40</math> m</li> <li>- Lies between 2 fixing components</li> </ul>	1	Curve radii $< 30$ m. In case of doubt, curves must be handled like fixed points
[2]		<ul style="list-style-type: none"> <li>- Length <math>&gt; 8</math> m, but <math>\leq 80</math> m</li> <li>- Lies between 2 fixing components</li> </ul>	2	Curve radii $< 30$ m. In case of doubt, curves must be handled like fixed points
[2]		<ul style="list-style-type: none"> <li>- Straight segment</li> <li>- Length <math>&gt; 8</math> m, but <math>\leq 40</math> m</li> <li>- Lies between a curve and an end cap</li> </ul>	1	Curve radii $< 30$ m. In case of doubt, curves must be handled like fixed points
[2]		<ul style="list-style-type: none"> <li>- Straight segment</li> <li>- Length <math>&gt; 8</math> m, but <math>\leq 40</math> m</li> <li>- Lies between 2 fixing components</li> </ul>	1	

## Single-pole Conductor Rail System SingleFlexLine Program 0815

No.	Route	Route characteristics	Number of expansion modules	Note
[3]		<ul style="list-style-type: none"> <li>- Short segment</li> <li>- Length: &lt; 8 m</li> </ul>	-	
[4]		<ul style="list-style-type: none"> <li>- Straight segment with a building expansion point &lt; 40 mm</li> </ul>	2	<p>When determining the number of expansion modules, it must be taken into account that the expansion gap of the expansion module includes the building expansion point and the thermal expansion of the conductor rail, e.g., the expansion gap of the expansion module is always larger than the building expansion point.</p> <p>In this case, it is sometimes necessary to omit the fixed points between two expansion modules.</p>

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### 6.3.3.5.2 Mounting the expansion module with a setting aid

**Requirements:**

- The conductor rail system is fully mounted up to the position of the expansion module.
- The distance from the center of the connector to the hanger clamp (left and right of the expansion module) must be  $125 \pm 5$  mm. Move a hanger clamp if necessary. If a hanger clamp must be moved or supplemented with another hanger clamp, the distance to the next hanger clamp must not be greater than 500 mm (see Fig. 70).

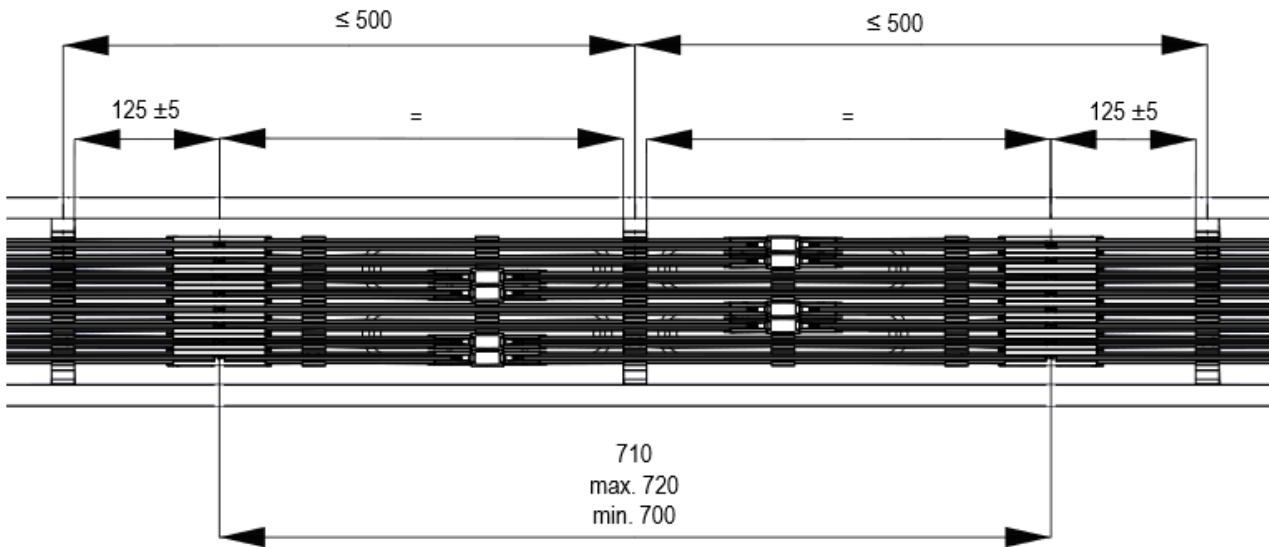


Fig. 70: Distance hanger clamps

- If the setting aids are available (Pos. 1 Order No.: 08-S902-0002P), these must be inserted in each expansion gap of the expansion module (Pos. 2) in such a way that they cannot be lost (see Fig. 71 to Fig. 72).

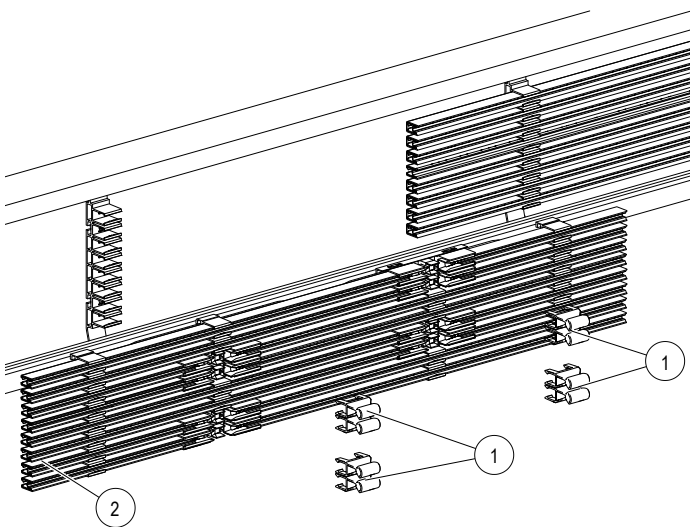


Fig. 71: Setting aids (Pos. 1) inserted in each expansion gap of the expansion module (Pos. 2)

## Single-pole Conductor Rail System SingleFlexLine Program 0815

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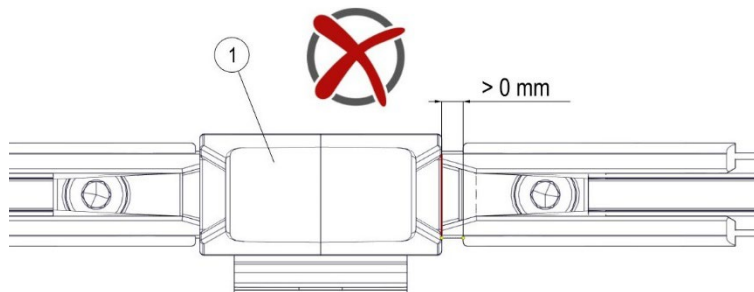


Fig. 72: Setting aid (Pos. 1) is incorrectly mounted

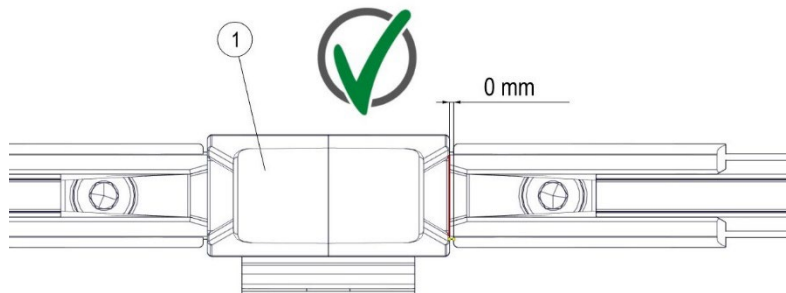


Fig. 73: Setting aid (Pos. 1) is correctly mounted

### Required tools:

Optional: Setting aid for setting the expansion gap (Order No.: 08-S902-0002P)

Plastic hammer

Torque wrench with a measuring range up to 2 Nm (Bit SW3)

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### Work steps:

→ Push the clamping unit of the connector (Pos. 3) completely into the conductor bar of each conductor rail pole (see Fig. 74). Ensure that the clamping unit is fully seated in the conductor bar. The clamping unit must not slip over the insulating profile (see Fig. 75) and the conductor rail must not shift backward (see Fig. 76).

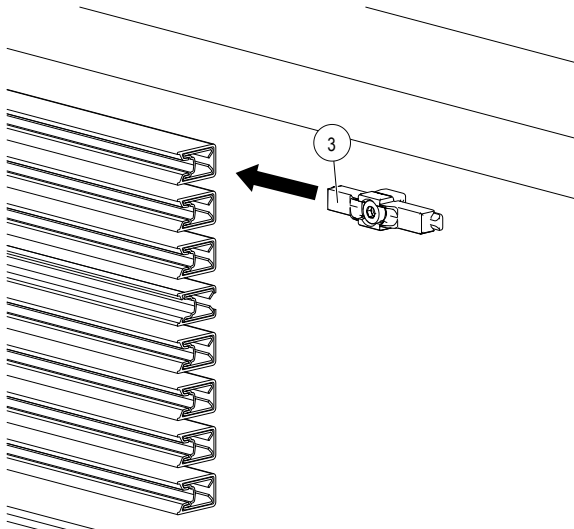


Fig. 74: Push the clamping unit of the connector (Pos. 3) completely into the conductor bar

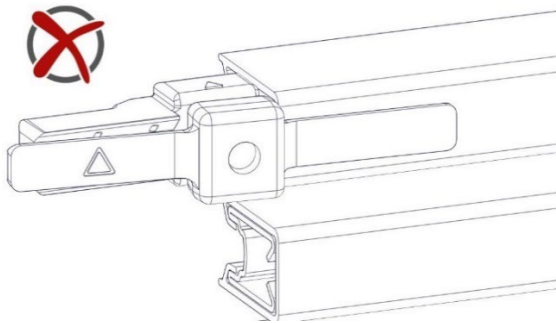


Fig. 75: Clamping unit slips over the insulating profile

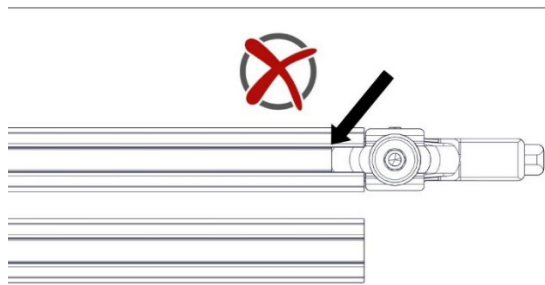


Fig. 76: Conductor bar has shifted

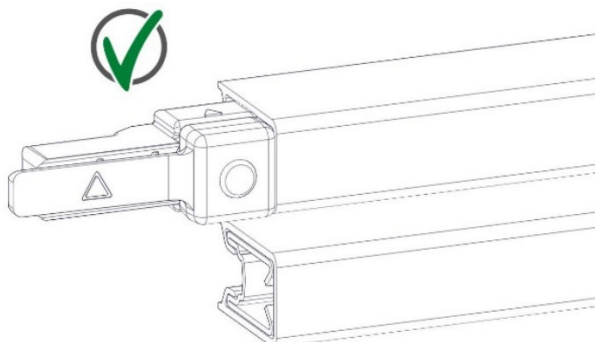


Fig. 77: Clamping unit is correctly mounted in the insulating profile

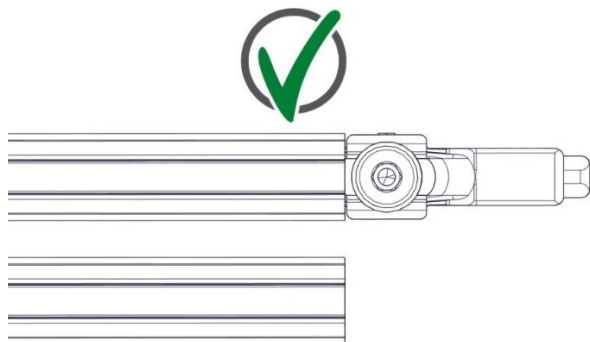


Fig. 78: Conductor bar has not shifted

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→ Slide the connector cap (Pos. 4) over the clamping unit (see Fig. 79). Ensure that the connector cap (Pos. 4) only fits over the clamping unit from one side, e.g., the higher side (Pos. A) of the connector cap (Pos. 4) must point in the direction in which the expansion module is to be mounted (see Fig. 81 and Fig. 80).

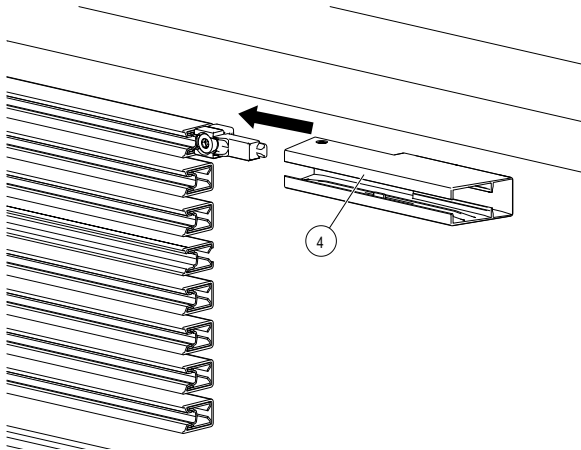


Fig. 79: Slide the connector cap (Pos. 4) over the clamping unit

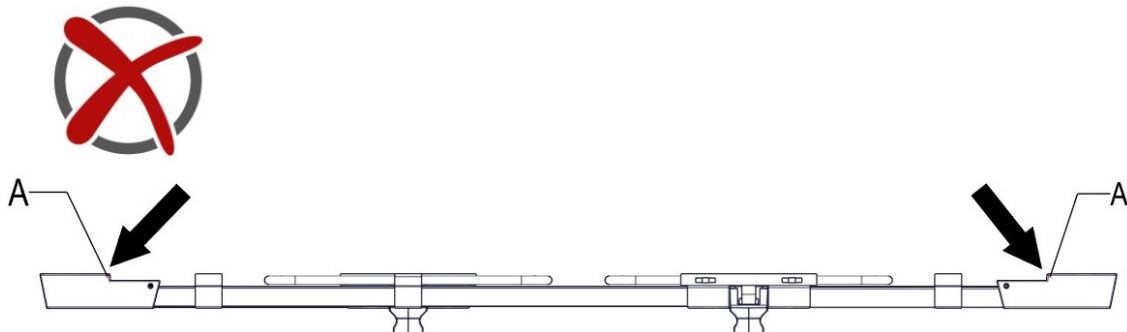


Fig. 80: Incorrect mounting of the connector cap

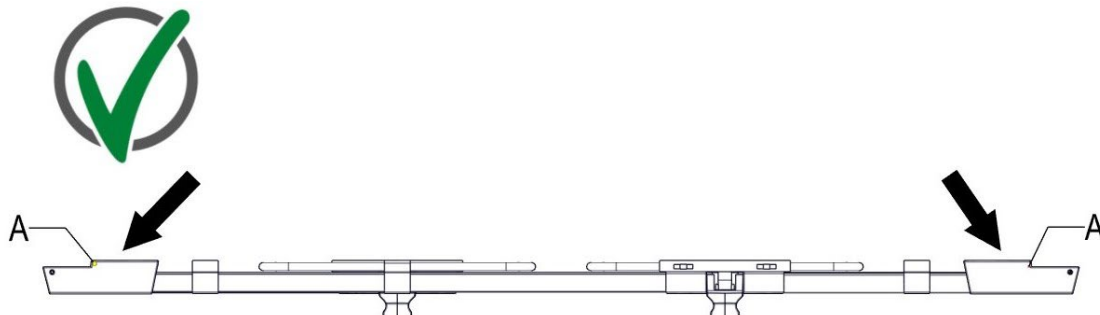


Fig. 81: Correct mounting of the connector cap

## Single-pole Conductor Rail System SingleFlexLine Program 0815

→ Hang the expansion module (Pos. 2) in the hanger clamps (see Fig. 82). The hanger clamp must be centered between the expansion joints (see also Fig. 70). It can also be aligned if required.

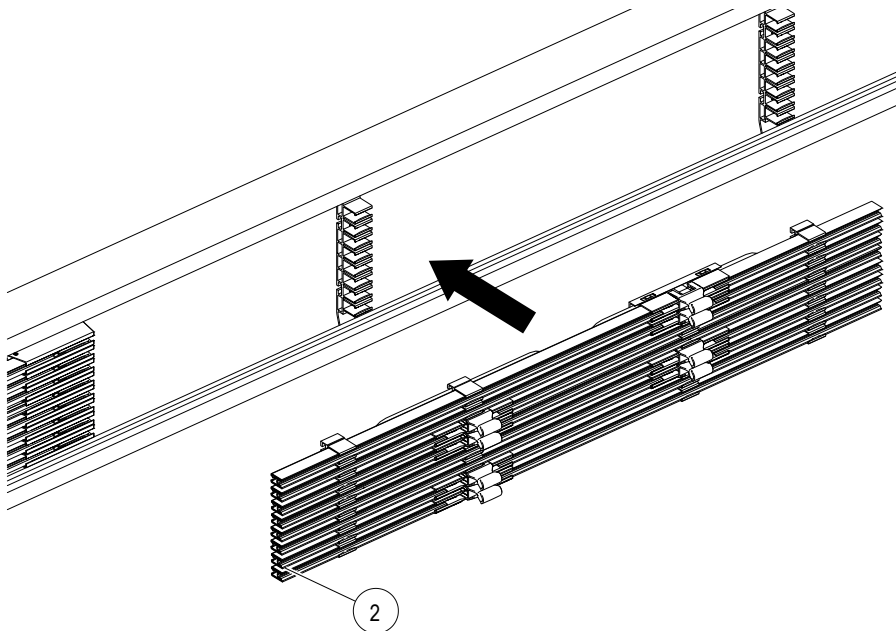


Fig. 82: Hang the expansion module in the hanger clamps

→ Carefully tap the expansion module into the clamping unit of the connector (see Fig. 83) with light taps (tool: plastic hammer) and tighten the socket head screw (Pos. 5) of the clamping unit with the specified torque (torque wrench: **2 Nm**, SW3) (see Fig. 84).

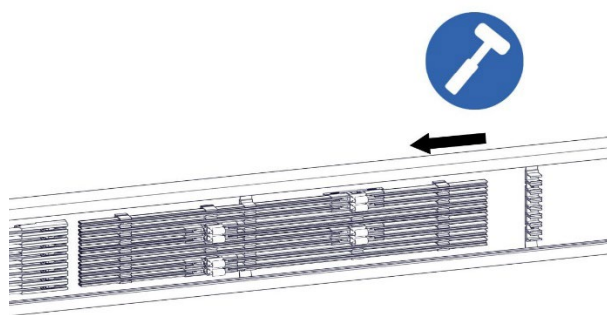


Fig. 83: Tap the expansion module into the clamping unit of the connector with a plastic hammer

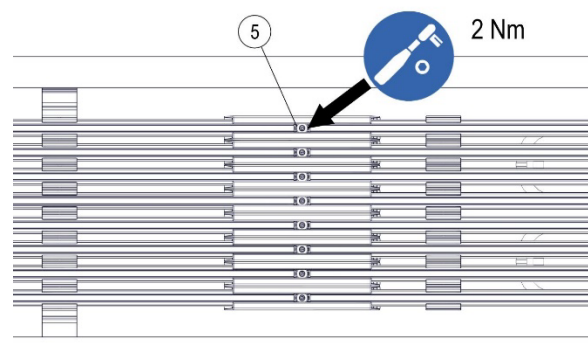


Fig. 84: Tighten the cylinder screw of the clamping unit



## Single-pole Conductor Rail System SingleFlexLine Program 0815

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### NOTE!

The insulating profile of the expansion module (Pos. 2) has a recess at each conductor rail pole end (see Fig. 85) so that the clamping unit (Pos. 3) does not slide out of the conductor bar and over the insulating profile (Pos. 2)!

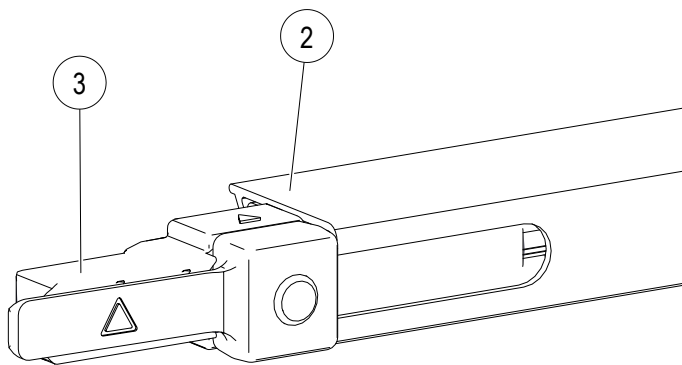


Fig. 85: Recess in the insulating profile of the expansion module (Pos. 2)

- Slide the clamping unit of the connector (Pos. 3) completely into each conductor rail pole of the next conductor rail (see Fig. 86). Ensure that the clamping unit is fully seated in the conductor bar. The clamping unit must not slip over the insulating profile (see Fig. 75) and the conductor rail must not shift backward (see Fig. 76).

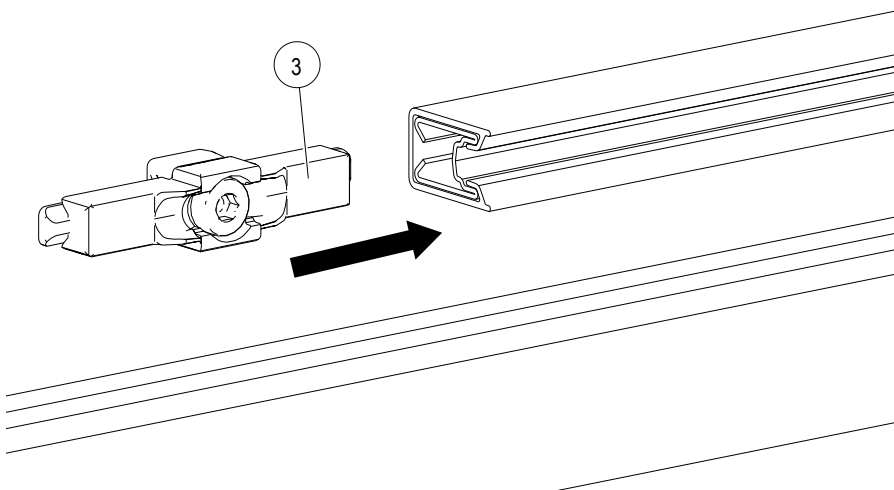


Fig. 86: Slide clamping unit of the connector (Pos. 3) into each conductor rail pole

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→ Slide the connector cap (Pos. 4) over the clamping unit (see Fig. 87). Ensure that the connector cap (Pos. 4) only fits over the clamping unit from one side, e.g., the higher side (Pos. A) of the connector cap (Pos. 4) must point in the direction in which the expansion module is to be mounted (see Fig. 81 and Fig. 80).

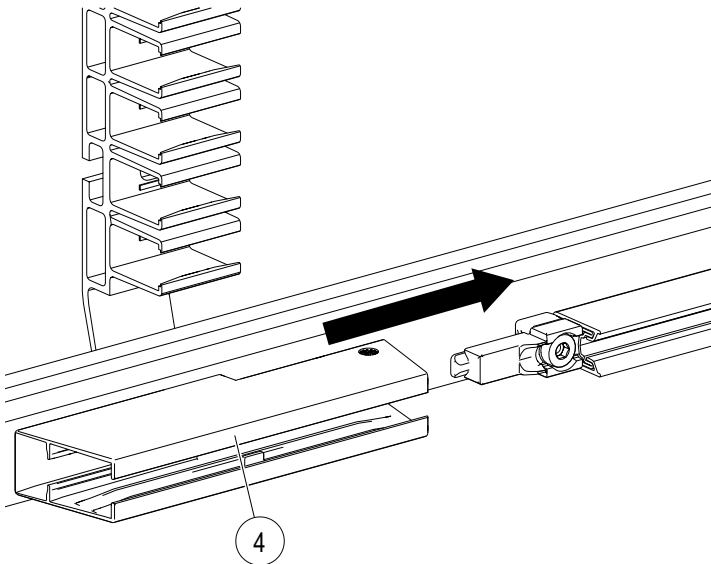


Fig. 87: Slide connector cap (Pos. 4) over the clamping unit of the connector

→ Hang the next conductor rail poles in the hanger clamp and carefully tap the other conductor rail poles into the clamping unit of the connector (see Fig. 88) with light taps (tool: plastic hammer) and tighten the cylinder screw of the clamping unit (Pos. 5) with the specified torque (torque wrench: **2 Nm**, SW3). The distance from the center of the connector to the hanger clamp must be  $125 \pm 5$  mm. See Fig. 89.

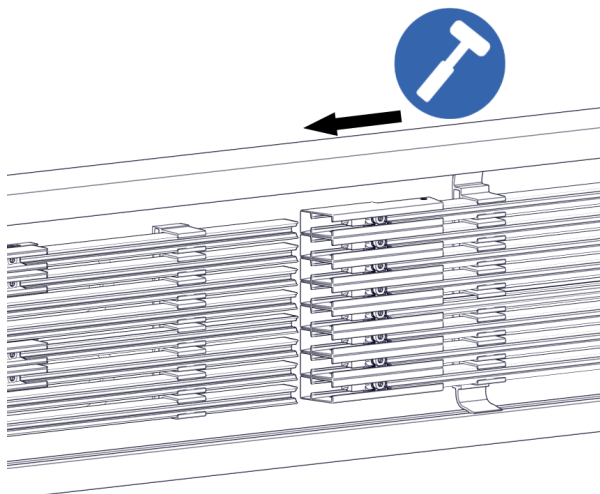


Fig. 88: Tap the other conductor rail poles into the clamping unit of the connector with a plastic hammer

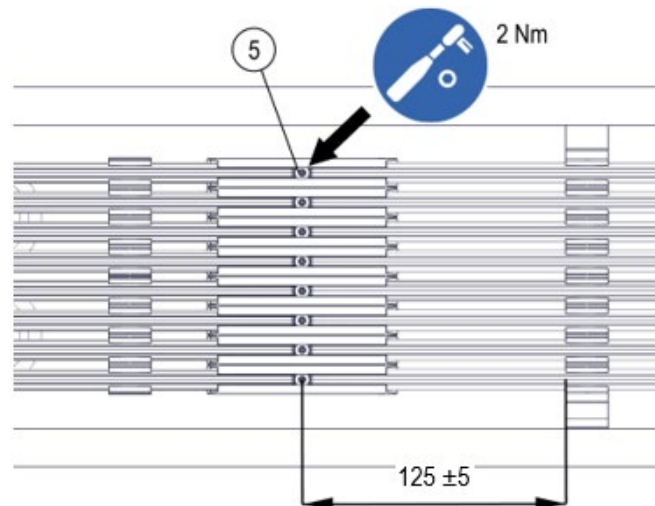


Fig. 89: Tighten the cylinder screw of the clamping unit

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→ Do not remove the setting aids from the expansion module until the following fixed point (see also BAL0815-0002) has been mounted. Check whether the dimension of every expansion gap is 20 mm (see Fig. 90).

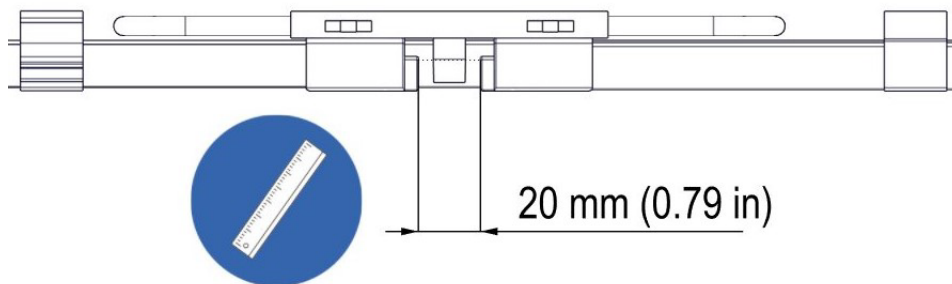


Fig. 90: The expansion gap is 20 mm



Use the QR code (“click” or “scan”) to watch our animation  
**Expansion Module with 20 mm Expansion Gap.**

## Single-pole Conductor Rail System

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#### 6.3.3.5.3 Mounting the expansion module without a setting aid

If no setting aids (Order No.: 08-S902-0002P) are available, the individual expansion gaps in the expansion unit or in the expansion module per conductor rail pole must be set according to the mounting temperature following the mounting and can be read from the following diagram (see Fig. 91). Fig. 91 was created on the basis of a full temperature range of 40 K and ensures easy setting.

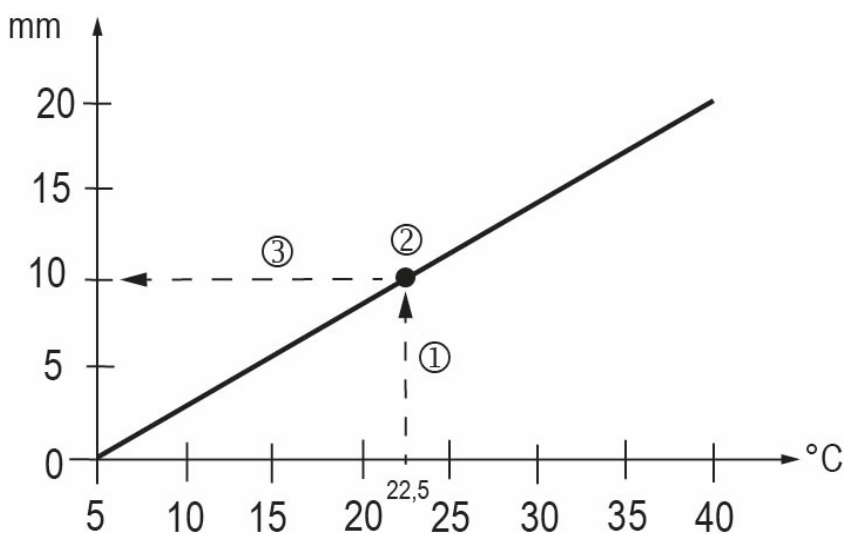


Fig. 91: Example for reading the setting dimension

#### For example:

This example assumes a hall with a temperature range of 0 to 40°C:

- 1.) Measure the mounting temperature (e.g., 22.5°C) and draw a vertical line up to the ascending line.
- 2.) Draw a horizontal line from the intersection on the incline line.
- 3.) Read and set the expansion gap setting dimension.

The expansion gap does not need to be set symmetrically, e.g., the setting dimension read does not necessarily need to be divided by two. It is also conceivable to set one area of the expansion gap to "0" while the other area of the expansion gap is set with the complete setting dimension (in the example: 10 mm).

## Single-pole Conductor Rail System SingleFlexLine Program 0815

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The setting dimension measures from plastic cap to plastic cap (Pos. 2) e.g., the setting dimension always includes the plastic bar (Pos. 1) (see Fig. 92).

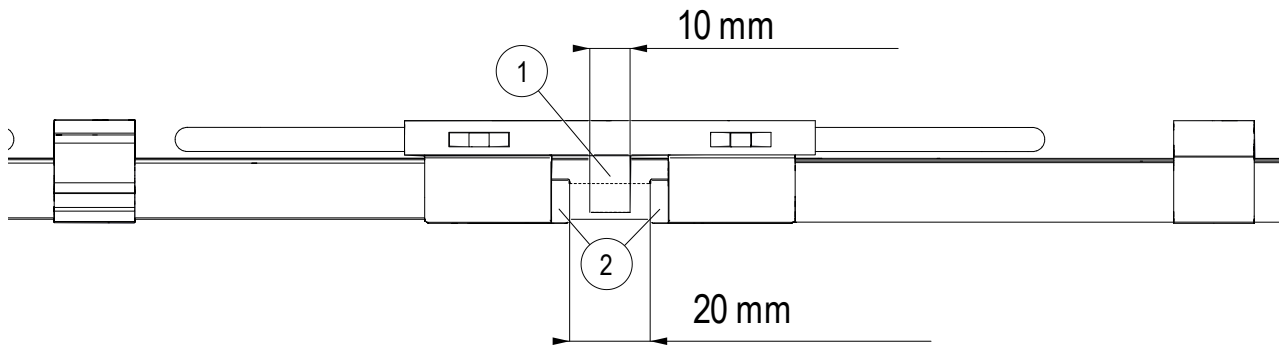


Fig. 92: Setting dimension including bar width (Pos. 1)

## Single-pole Conductor Rail System

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#### 6.3.3.6 Mounting air gap insulation section

Air gap insulation sections are used for electrical separation, e.g., for electrical segmentation or block separation. These are used on all or single poles depending on the required function.

The air gap insulation section can be installed with or without a line feed. The installation of the air gap insulation section with line feed is described in the following. The end cap is mounted to the air gap insulation section without line feed (see Section 6.3.3.8).



#### NOTE!

**Air gap insulation sections must not be installed in curves or bends!**

#### Required tools:

- Tape measure
- Scribe
- Cutting tool (e.g., cordless angle grinder)
- File
- Crimping tool
- Torque wrench (2 Nm) Bit 3 mm

#### Work steps:

→ Mount the conductor rail pole (Pos. 1), in which the air gap insulation section is to be installed, in the hanger clamps (see Fig. 93).

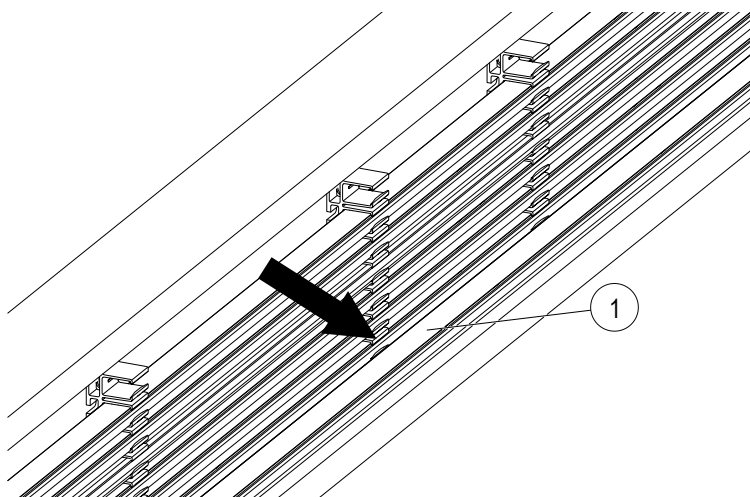


Fig. 93: Mount the conductor rail pole in the hanger clamps

## Single-pole Conductor Rail System SingleFlexLine Program 0815

- Mark the 46 mm dimension on the conductor rail at the desired point (see project-specific documents) and cut it out with a cutting tool (see Section 6.3.2.1) (see Fig. 94).
- Deburr the rail ends and clean any contaminants (shavings, etc.) (see Fig. 95).

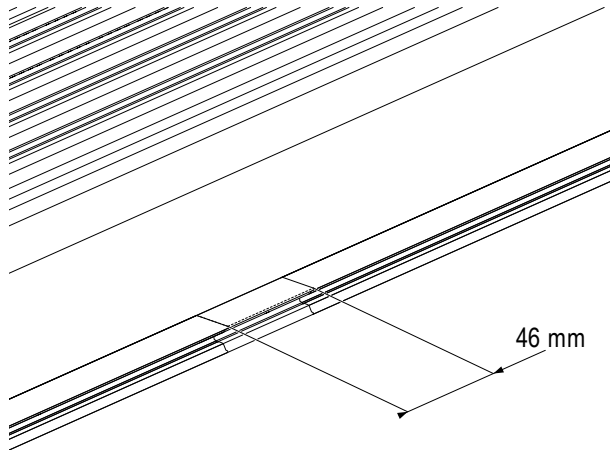


Fig. 94: Mark dimensions

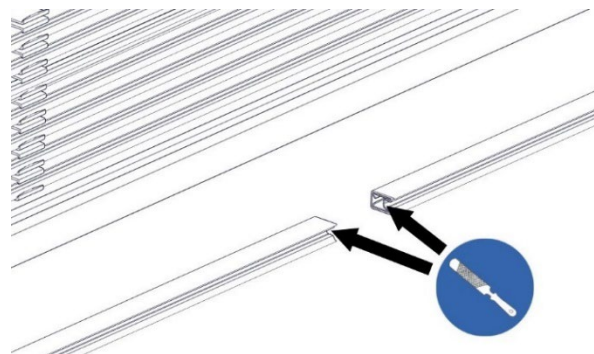


Fig. 95: Deburr rail ends

- Strip the connecting cable (Pos. 3) and crimp with the line feed clamp (Pos. 2) (see Fig. 96).

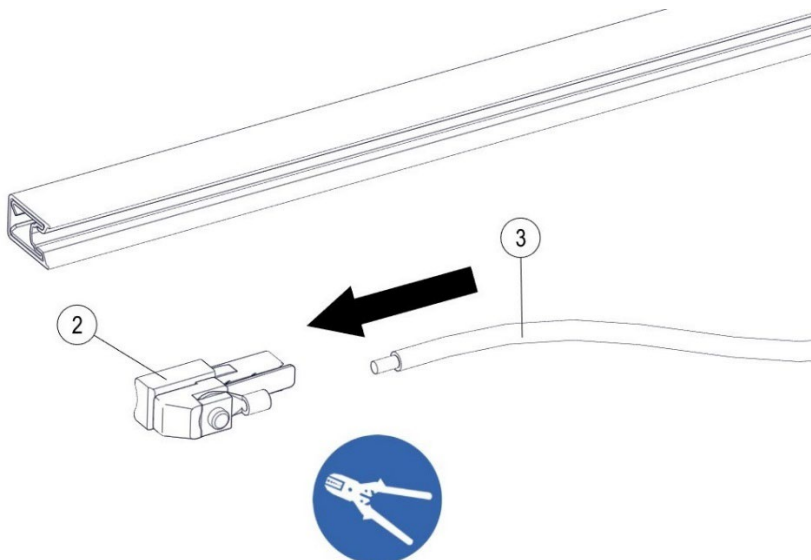


Fig. 96: Crimp connecting cable (Pos. 3) with line feed clamp (Pos. 2)

## Single-pole Conductor Rail System SingleFlexLine Program 0815

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→ Slide the line feed clamp with the crimped connection cable into both conductor rail ends (see Fig. 97).

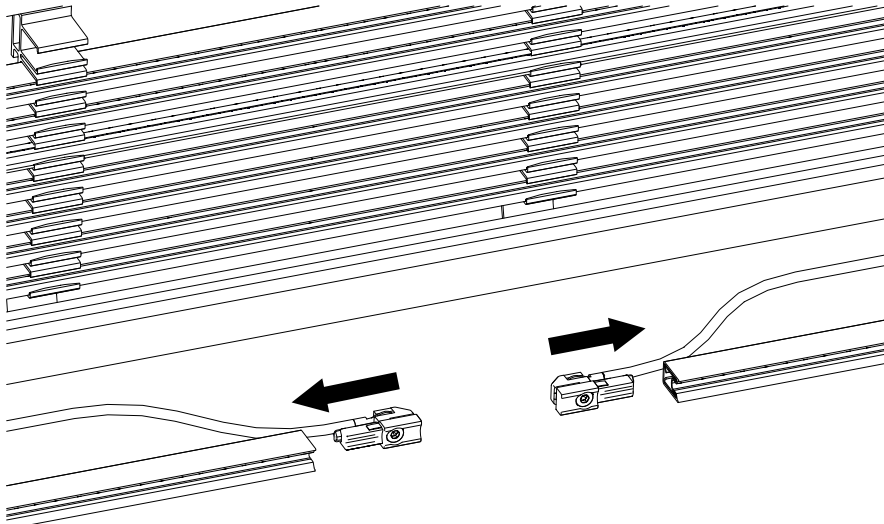


Fig. 97: Slide the line feed clamp into the conductor rail ends

→ Slide the end caps (Pos. 4) over both conductor rail ends (see Fig. 98). Ensure that the end cap (Pos. 4) completely encloses the insulating profile (Pos. 7) (see Fig. 99) and tighten the inner cylinder screw M 4x12 (Pos. 6) in the end cap (Pos. 4) with a torque wrench Bit 3 mm (torque 2 Nm) (see Fig. 100).

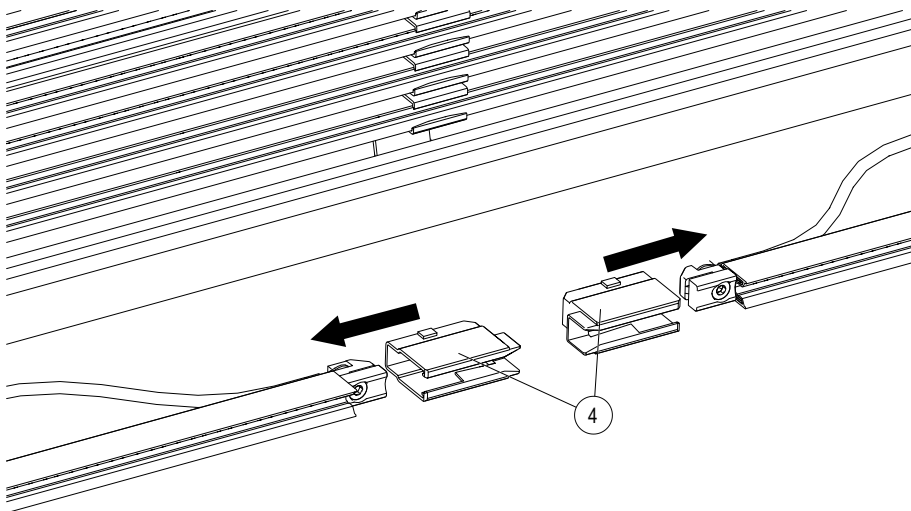


Fig. 98: Slide on end caps (Pos. 4)



## Single-pole Conductor Rail System SingleFlexLine Program 0815

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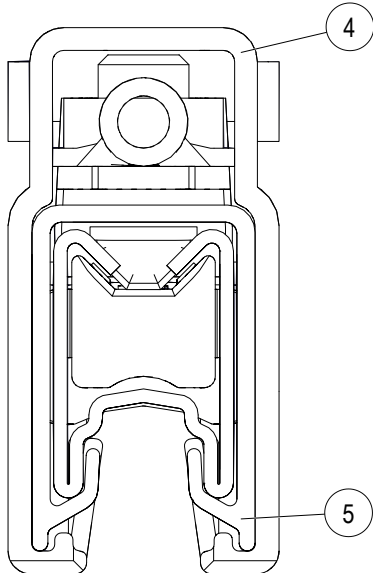


Fig. 99: End cap (Pos. 4) encloses the insulating profile (Pos. 5)

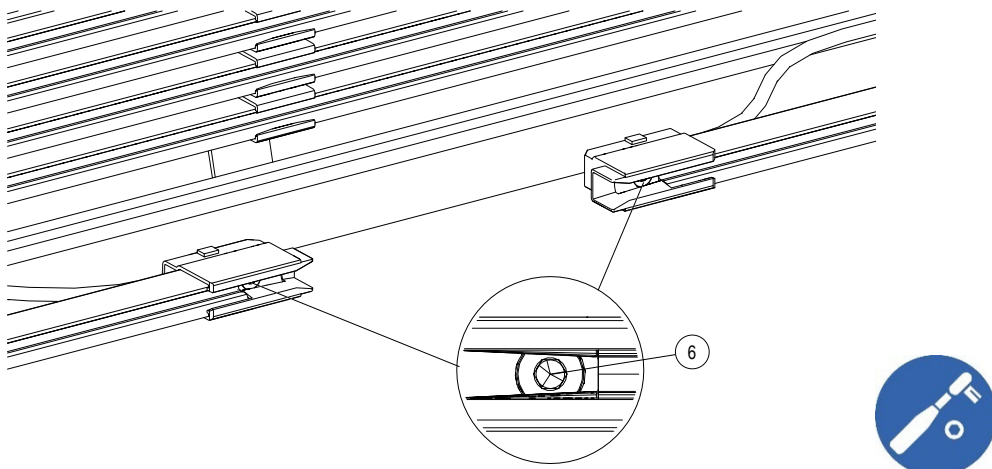


Fig. 100: Tighten cylinder screws (Pos. 6)



After mounting the end cap, check the connection for solidity by gently pulling.  
If the conductor rail can be pulled out, the line feed clamp is most likely incorrectly mounted (see Fig. 102).

## Single-pole Conductor Rail System SingleFlexLine Program 0815

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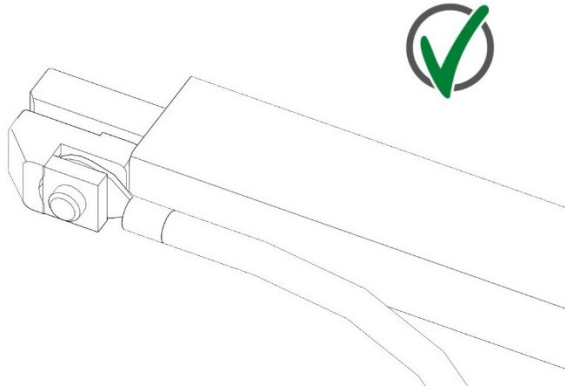


Fig. 101: Line feed clamp correctly mounted

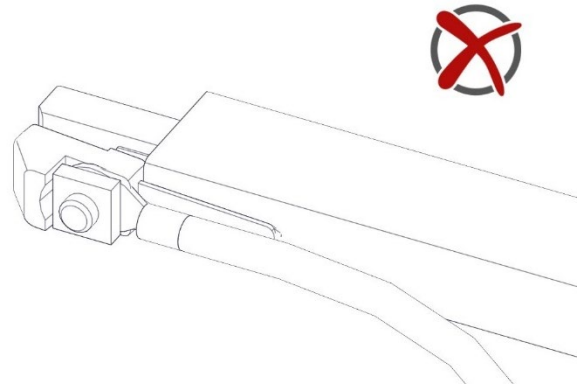


Fig. 102: Line feed clamp incorrectly mounted

→ Clip the connecting bar (Pos. 7) over the mounted end caps (see Fig. 103).

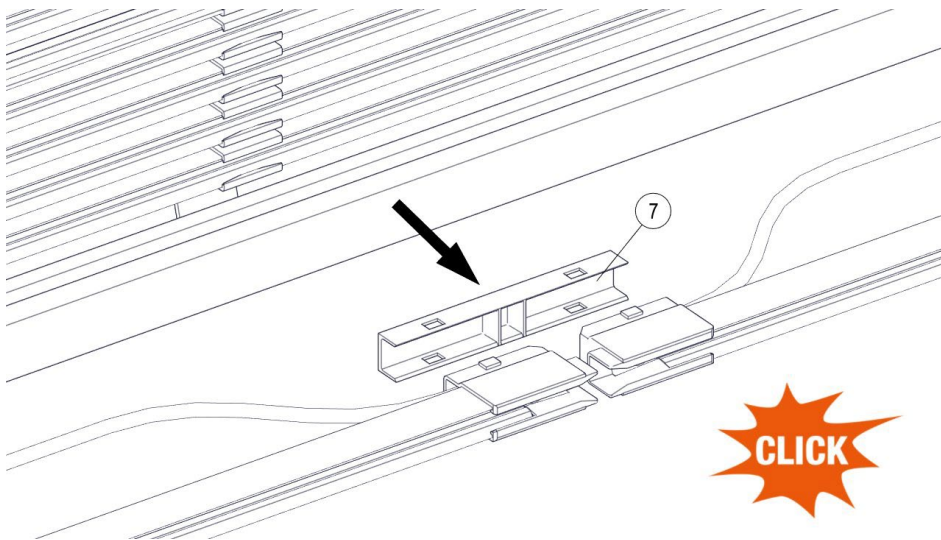


Fig. 103: Mount connecting bar (Pos. 7)

## Single-pole Conductor Rail System SingleFlexLine Program 0815

→ Re-mount the conductor rail with the installed air gap insulation section in the hanger clamp. The distance from the rear edge of the end cap to the hanger clamp is 30 mm (see Fig. 104). Ensure that the air gap insulation section is in contact with the support structure and not with a recess (see Fig. 106 and Fig. 105).

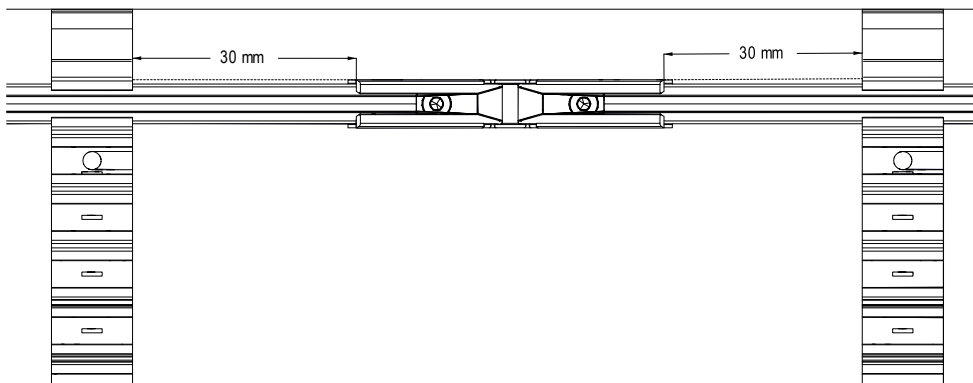


Fig. 104: Distance from the rear end cap edge to the hanger clamp

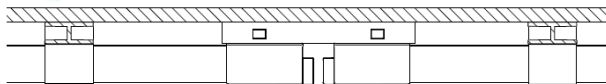


Fig. 105: Air gap insulation section is in contact with the support structure

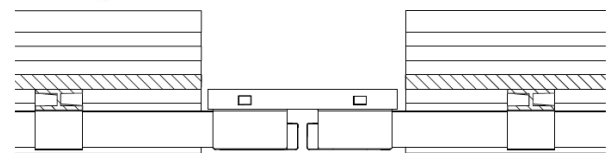


Fig. 106: Air gap insulation section is in contact with a recess



Use the QR code (“click” or “scan”) to see our animation **Mounting Air Gap Insulation Section**.

## Single-pole Conductor Rail System SingleFlexLine Program 0815

### 6.3.3.7 Mounting a section line feed

→ The section line feed is installed instead of a connector. Here, a different clamping part and a line feed cap with room for a connecting cable to run out of it are used.

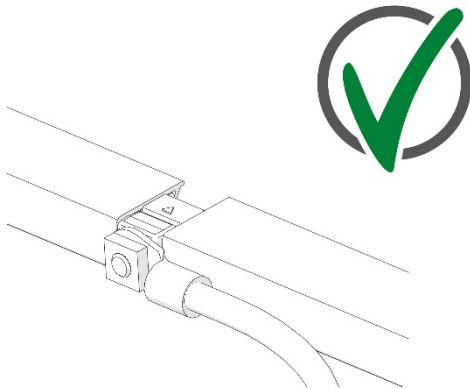


Fig. 107: Correct position of the clamping unit

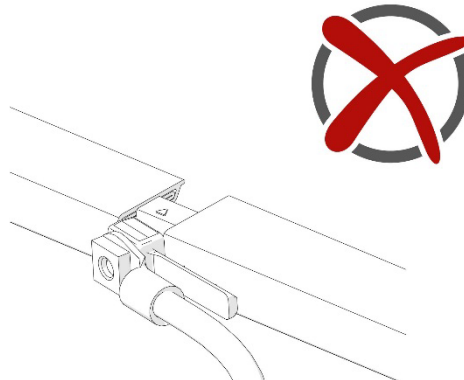


Fig. 108: Incorrect position of the clamping unit

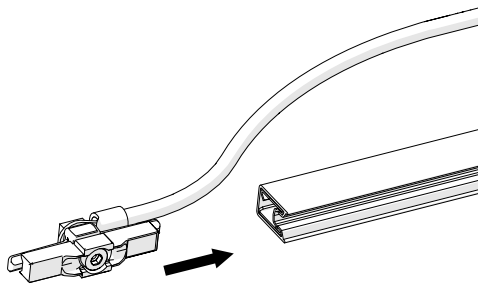


Fig. 109: Slightly loosen the screw connection with a screwdriver ( $\frac{1}{2}$  turn), locking the square nut to facilitate loosening if necessary

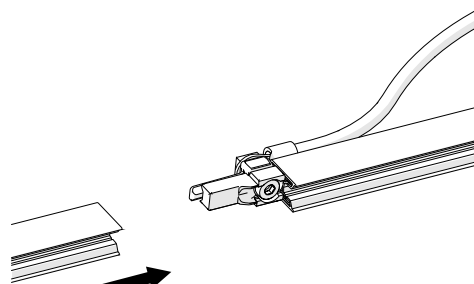


Fig. 110: Slide the rail section into the free end of the section line feed as far as the stopper

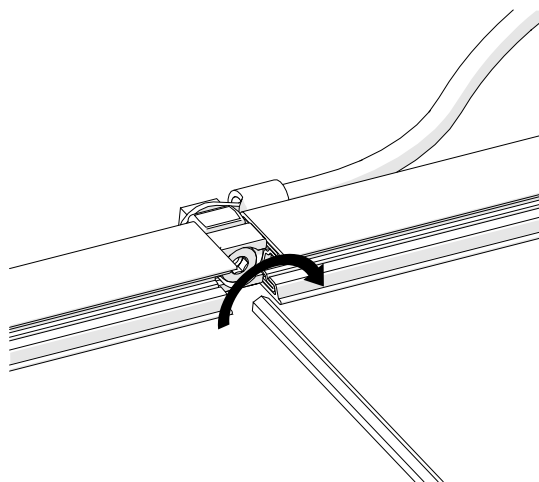


Fig. 111: Slide the line feed cover over the mounted connector line feed

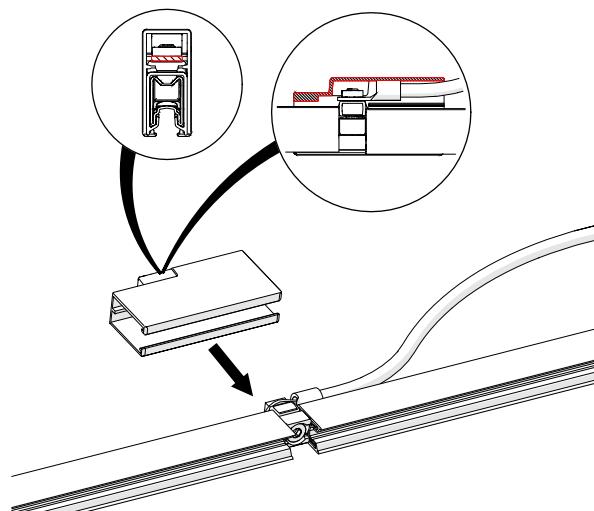


Fig. 112: Tighten the cylinder screw with 2 Nm

## Single-pole Conductor Rail System SingleFlexLine Program 0815

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After installing the end cap, check the connection for solidity by gently pulling. If the conductor rails can be pulled apart, the connector clamping unit is likely mounted incorrectly (see Fig. 107).

By using a section line feed, power can be supplied at any connection point in the route. The connection is made using a crimping cable lug of 1,5 mm<sup>2</sup> to 10 mm<sup>2</sup> max. For phases, double insulated connecting cables must be provided for voltages > 48 V (max conductor diameter 7 mm, see Fig. 113). Basically, use connecting cables only with copper conductors.

- Trim the feed cable and strip the insulation to the desired length.
- Crimp the crimping cable lug of the section line feed onto the end of the cable. Do **not** remove the crimping cable lug from the connector for this. Use a suitable crimping tool to connect the cable and cable lug.
- Loosen the screw with a hexagonal screwdriver SW3 and insert the connector parts into the installed rail with insulation profile (see Fig. 109).
- Slide the next rail section into the free end of the section line feed as far as the stopper (see Fig. 110).
- Tighten the cylinder screw to 2 Nm (see Fig. 111).
- Slide the contact-preventing line feed cap over the preassembled rail connector. Ensure that the square nut is aligned in the recess of the connector cap. Engage the line feed cap on both sides of the insulating profile (see Fig. 112).



### NOTE!

**Ensure that the connector cap is completely engaged on both sides of the insulating profile!**

- Provide a constructional strain relief for the feed cable.

If needed, any connector can be replaced by a line feed. If a line feed must be introduced into the route after completion of the installation, a 10-mm gap is cut into the rail. Then proceed as described above.

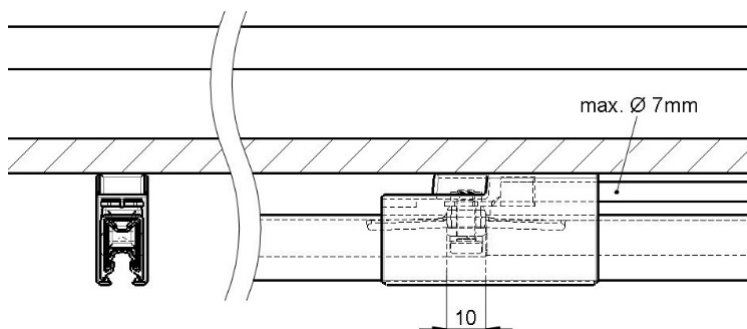


Fig. 113: Line feed cover

If the line feed cover cannot rest on the guideway profile, hanger clamps must be placed at maximum distances of 200 mm on both sides of the line feed position.



Preassembled line feed cables with clamping units installed can be ordered as a unit!

## Single-pole Conductor Rail System SingleFlexLine Program 0815

### 6.3.3.8 Mounting end caps and end line feeds



#### NOTE!

To allow the mounting of the end caps, a clearance of 110 mm from the beginning of the guideway profile must be maintained at the full height! (see Fig. 114)

Drill the guideway profile in accordance with the layout and allocation plan. The use of a drilling jig is recommended in order to ensure the exact position of the end caps. The drilling jig can be used both for straight transfers (e.g., entry into a lifter) and for angled cuts (e.g., switches). For further information see MV0815-0006.



For further information see MV0815-0006!

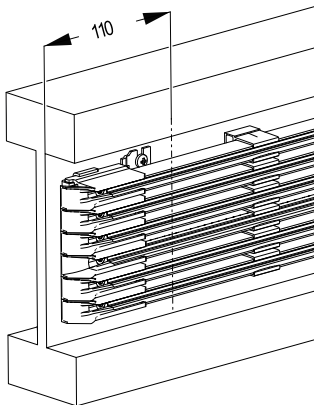


Fig. 114: Clearance for mounting the end caps

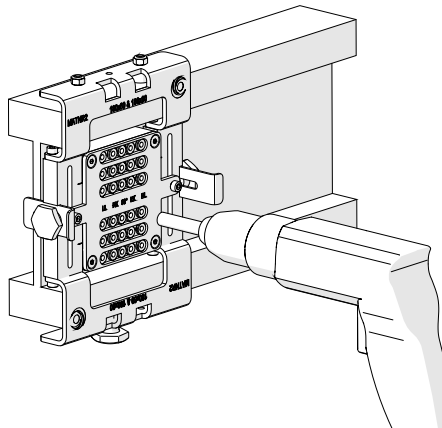


Fig. 115: Drilling jig (Order No.: 08-V015-0474)

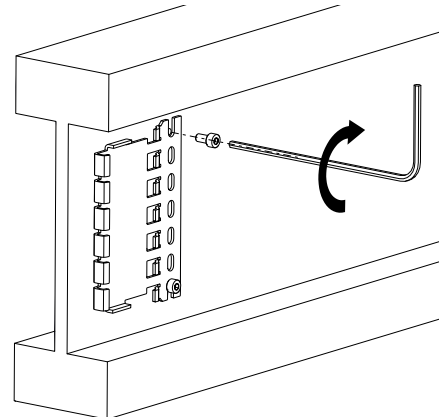


Fig. 116: Screw on the retaining plate

#### Tools:

- Self-tapping screws DIN 7500-1 M4, length □ profile bar width
- Drill diam. 3.6 mm
- Crimping tool

After installation of the end cap bar (existing systems) or the retaining plate (new systems) for the transfer caps, the end caps (with or without line feed) are installed.



#### CAUTION!

#### Ensure the correct positioning of the clamping unit!

Slide the clamping unit of the end cap into the conductor rail so that the contact part sits in the interior of the conductor rail and the clamping part engages between the conductor rail and the rear insulation (see Fig. 117 and Fig. 118).

## Single-pole Conductor Rail System SingleFlexLine Program 0815

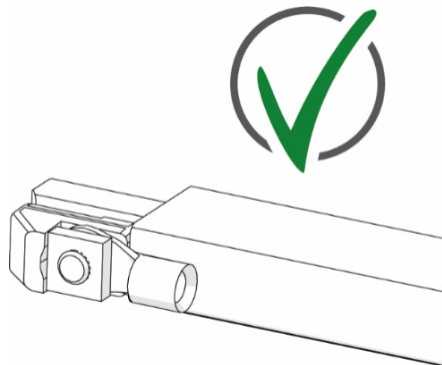


Fig. 117: Correct position of the clamping unit

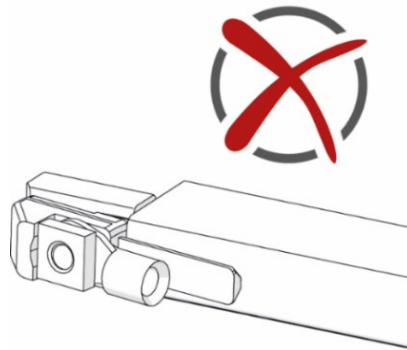


Fig. 118: Incorrect position of the clamping unit

For end line feeds, the power can be supplied at the end of the route. An end line feed consists of an end cap with a line feed clamping unit. The connection is made using a crimping cable lug with a conductor cross-section of 1.5 mm<sup>2</sup> to 6 mm<sup>2</sup>. For phases, doubly insulated connecting cables must be provided for voltages > 48 V. Basically, use connecting cables only with copper conductors.

→ Only for end line feeds:

- Trim the feed cable and strip the insulation to the desired length.
- Crimp the crimping cable lug of the end line feed onto the end of the cable. Do **not** remove the crimping cable lug from the connector for this.

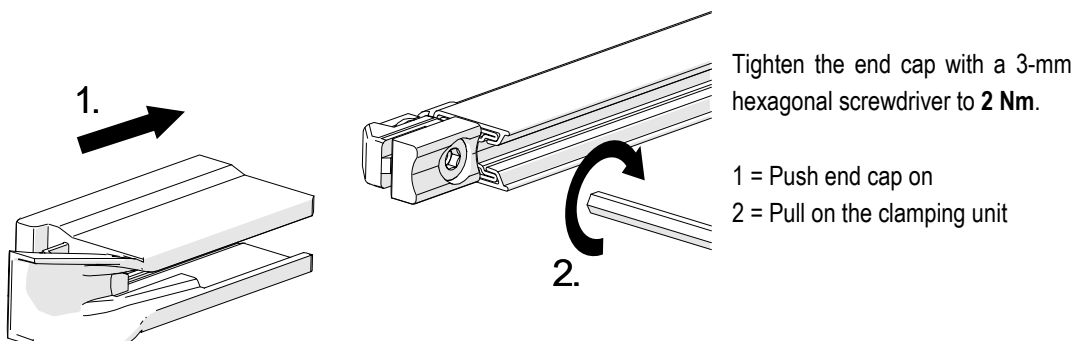


Fig. 119: Mounting the end cap

→ Tighten the cylinder screw to 2 Nm (see Fig. 119).

→ Provide a structural strain relief for the end line feed cable.

→ For a line feed with preassembled cable part, push the clamping unit onto the end of the rail. Possibly loosen the clamping screw somewhat and push the end cap onto the clamping part and the conductor rail.



After installing the end cap, check the connection for solidity by gently pulling. If the conductor rail can be pulled out, the line feed clamp is most likely mounted incorrectly (see Fig. 118).

## Single-pole Conductor Rail System SingleFlexLine Program 0815

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**NOTE!**

It is recommended that the conductor rail is not yet engaged in the adjacent hanger clamp!

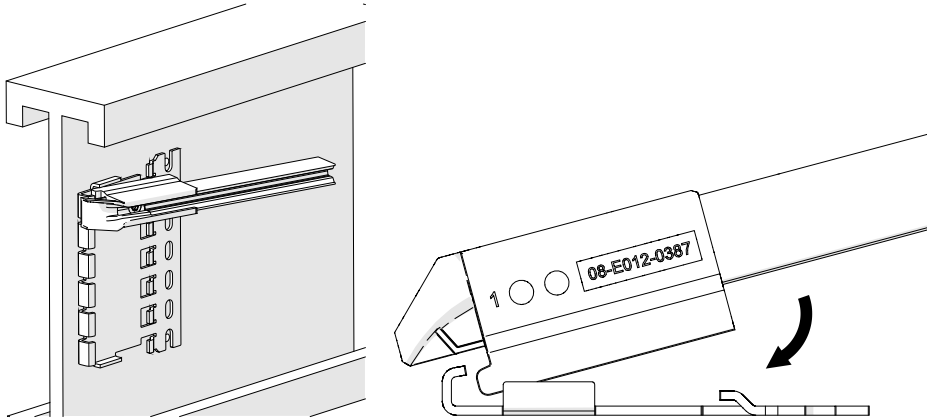


Fig. 120: Clip the conductor rail into place

→ Engage the end cap/end line feed into the retaining plate (see Fig. 120).



Use the QR code ("click" or "scan"), to watch our animation  
**Mounting End Cap for End Cap Bar and Clipping in Rail.**



## Single-pole Conductor Rail System SingleFlexLine Program 0815

### 6.3.4 Mounting the current collector

Different current collectors are used for existing and new systems:

Legacy systems	<p>Fig. 121: Single current collector (081506..., 081507...)</p>	<p>Tolerances in the X-axis and Y-axis: <math>\pm 10</math> mm</p> <p>1 = Strain relief (optional)</p> <table border="1"> <thead> <tr> <th>Number of Poles</th> <th>b</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>42</td> <td>54</td> </tr> <tr> <td>6</td> <td>70</td> <td>82</td> </tr> <tr> <td>8</td> <td>70</td> <td>110</td> </tr> <tr> <td>10</td> <td>70</td> <td>120</td> </tr> </tbody> </table>	Number of Poles	b	B	4	42	54	6	70	82	8	70	110	10	70	120
Number of Poles	b	B															
4	42	54															
6	70	82															
8	70	110															
10	70	120															
Legacy systems	<p>Fig. 122: Double current collectors (081508..., 081509...)</p>	<p>Tolerances in the X-axis and Y-axis: <math>\pm 10</math> mm</p> <p>1 = Strain relief (optional)</p> <table border="1"> <thead> <tr> <th>Number of Poles</th> <th>b</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>42</td> <td>54</td> </tr> <tr> <td>6</td> <td>70</td> <td>82</td> </tr> <tr> <td>8</td> <td>70</td> <td>110</td> </tr> <tr> <td>10</td> <td>70</td> <td>120</td> </tr> </tbody> </table>	Number of Poles	b	B	4	42	54	6	70	82	8	70	110	10	70	120
Number of Poles	b	B															
4	42	54															
6	70	82															
8	70	110															
10	70	120															



#### NOTE!

If the cable package with the strain relief (1) cannot be used, it must be ensured that the connection cables in the area directly behind the current collector are strain-relieved on site. No tensile forces and/or twisting forces may be transmitted to the current collector head. In addition, the connection cables must not be sharply kinked.



Conductix-Wampller recommends using the PE current collectors in assembly types 081506..., 081507..., 081508..., 081509... without cams, and the assembly types equipped with interchanging protection 081506..., 081507..., 081508..., 081509... with cams. Special towing plates with a slot at the PE position are also provided for the assembly. In the case of older systems, a replacement for these types must be considered.

## Single-pole Conductor Rail System SingleFlexLine Program 0815

The location of the PE slot position (see A in Fig. 123) on the towing plate can be read from the order number:

For example: 081055-14X08X006X000

In this example the last digit of the second to last block of digits is  $\neq 0$ , but rather a "6". This means that the location of the PE slot is in the 6th position:

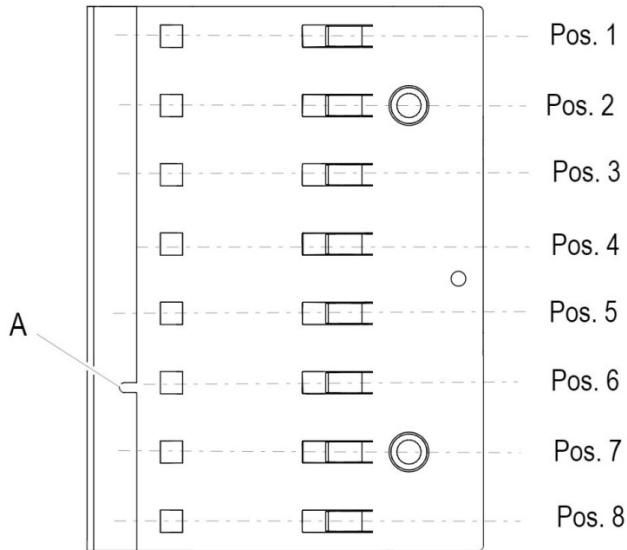


Fig. 123: Specification of the PE slot position in the towing plate

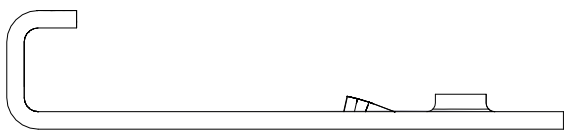


Fig. 124: Towing plate from the side

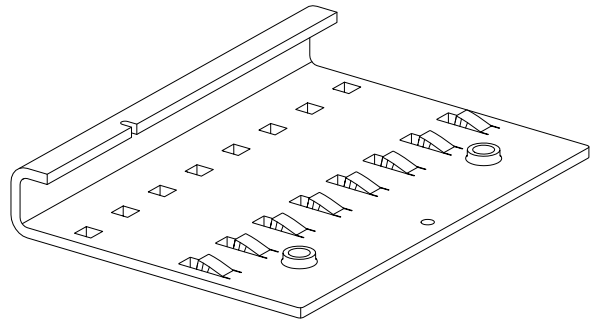


Fig. 125: Towing plate with PE slot



Use the QR code ("click" or "scan"), to watch our animation **Mounting Current Collector onto Towing Plate.**

## Single-pole Conductor Rail System SingleFlexLine Program 0815

New systems

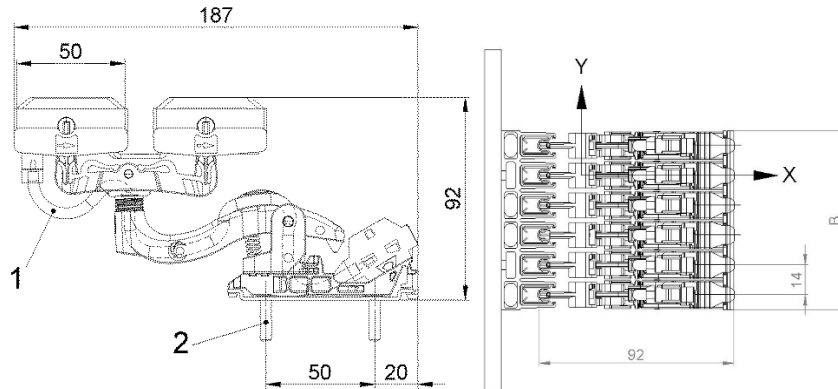


Fig. 126: EMS current collector (08150A / B...)

\*The screw is not part of the scope of delivery. It must be ordered separately.

Tolerances in the X-axis and Y-axis:  $\pm 15$  mm

1 = Integrated cable

2 = Hexagon screw M5 DIN EN 4017 (DIN 933)\*

Number of Poles	B
2	28
4	56
6	84
8	112
10	140



Use the QR code ("click" or "scan"), to watch our animation **EMS Current Collector Tolerances.**

## Single-pole Conductor Rail System SingleFlexLine Program 0815

The current collector is mounted onto the towing plate:

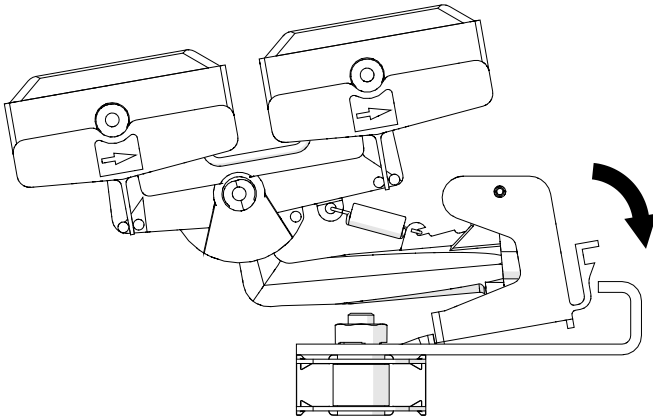


Fig. 127: Mount the PH current collector (Order No.: 081506..., 081507..., 081508..., 081509...) onto towing plate



Conductix-Wampfler recommends using the PE current collectors in assembly types 081506..., 081507..., 081508..., 081509...without cams, and the assembly types equipped with interchanging protection 081506..., 081507..., 081508..., 081509...with cams. Special towing plates with a slot at the PE position are also provided for the assembly. In the case of older systems, a replacement for these types must be considered.

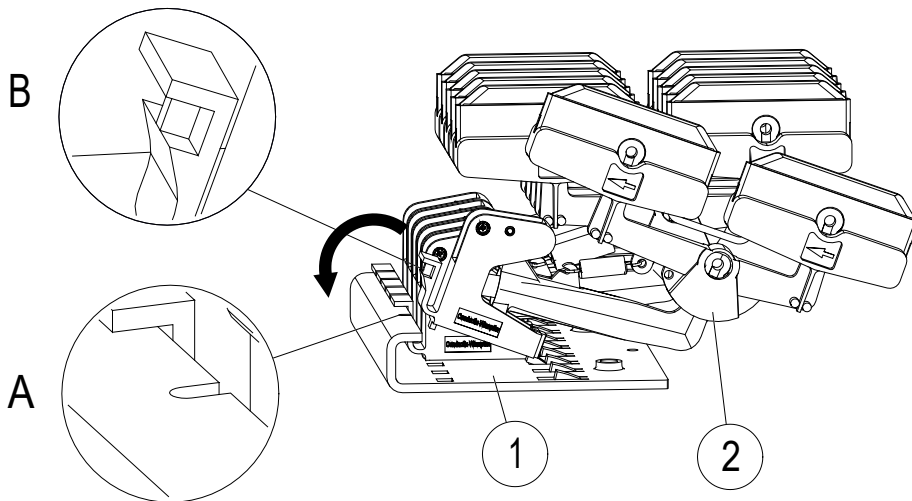
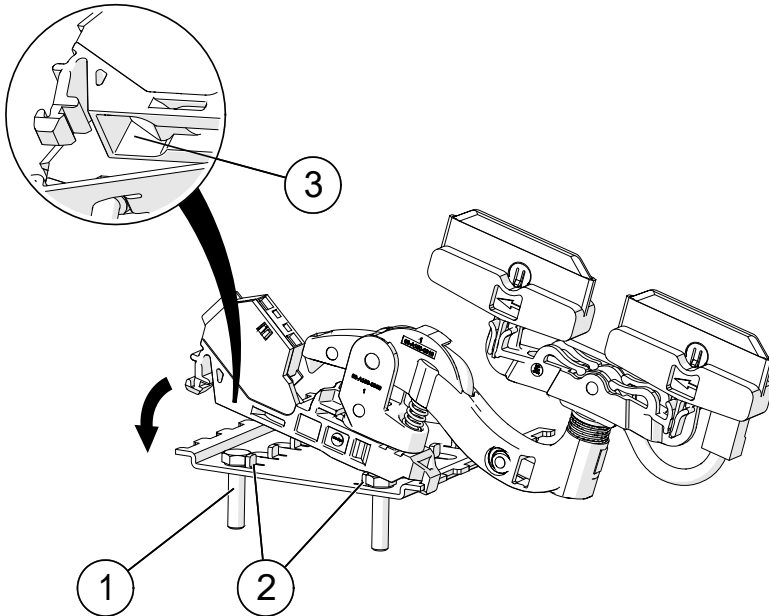


Fig. 128: Mount the PE current collector onto the towing plate

Pos.	Description
1	Towing plate
2	PE current collector
A	Slot in towing plate
B	PE current collector cam

## Single-pole Conductor Rail System SingleFlexLine Program 0815



Pos.	Description
1	DIN EN ISO 4017 M5 screws
2	Anti-rotation device
3	Room for screw head underneath current collector

Fig. 129: Mount the EMS current collector (08150A / B...) onto the towing plate



### NOTE!

**One screw can be placed on each pole at the EMS current collector!  
The screw heads are to be covered by the current collectors!**

- When installing current collectors, ensure that the installation position is correct.
- For types without an integrated cable guide, take care with the selection of the connecting cable and ensure the connecting cables are installed without tensile or directional forces:
  - Use only highly flexible Conductix-Wampller cables! Basically, only use connecting cables with copper conductors.
  - Use a blade receptacle with protective cap for the flexible connecting cables.
  - For phases, double insulated connecting cables must be provided for voltages > 48 V.
  - Do not bundle, fix or attach identification signs to the current collector connecting cable!
  - Do not allow foreign objects to protrude into the moving range of the current collector and connecting cables!
- For systems with curves/bends, ensure that the current collector is installed in the pivot or steering axis — only by doing this can it be ensured that the correct contact pressure is maintained when passing through (inner/outer) curves.



### DANGER!

#### Danger of electric shock!

Always protect unoccupied sockets on the current collector heads with protective caps!

The open connection must always be protected with a protective cap. This must also be observed when changing current collector heads (see Fig. 130).

# Single-pole Conductor Rail System

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**WARNING!**

**Risk of wear and damage!**

The distance from the securing base surface of the current collector to the running surface of the conductor rail is an important functional dimension. This dimension changes in curves if the current collector is not installed directly under the wheel contact point of the EMS hanger. If the distance from the wheel contact point is too great, the permissible tolerances may be exceeded in tighter curves. Result: Damage, high wear

→ Compliance with the installation tolerances must therefore be checked in the tightest curved section!

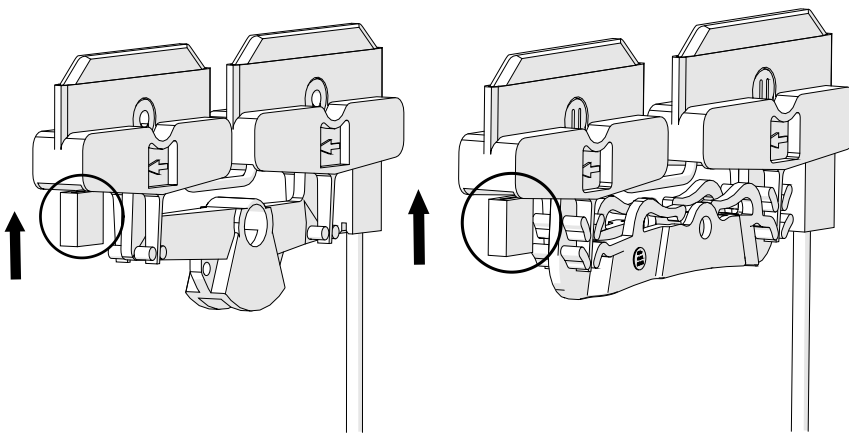


Fig. 130: Protect unoccupied current collector connecting cable with the protective cap provided (08150A / B...; 08150x...)



**NOTE!**

The protective cap is supplied pre-installed on the current collector. A replacement protective cap can be ordered as a packing unit with Order No.: 08-A025-0080!

Install all current collector cables with high flexibility and without tensile or directional forces!

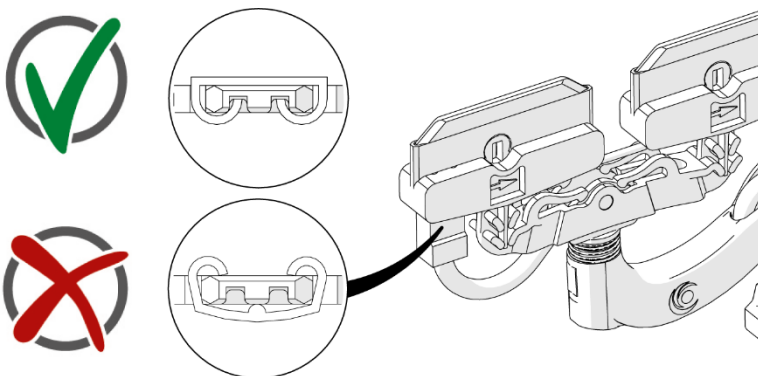


Fig. 131: Comparison of the correct and incorrect position of the socket sleeve

## Single-pole Conductor Rail System

### SingleFlexLine Program 0815

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#### WARNING!

##### **Bending up of the socket sleeve!**

If the socket sleeve is placed incorrectly on the collector brush, the socket sleeve bends up, the socket sleeve is damaged and the contact with the brush is minimized.

→ Ensure the socket is correctly positioned to prevent the socket sleeve from bending up!



#### CAUTION!

##### **Contact problems or increased heating!**

→ Clean the sliding contacts before commissioning and remove soiling, oxidation, pitting corrosion and other impurities by means of a brass brush or abrasive paper (320 grit).



#### DANGER!

##### **Risk of damage when cleaning the conductor rail!**

When cleaning, only loose or lightly adhering dust or foreign substances may be removed.

→ **Do not use contact spray** (formation of silicon carbide/abrasive and/or damage of plastic parts).

→ Only use abrasives or brushes as tools for removing heavy build-ups at minor burns under supervision.

→ Persistent use with removal of the lubricant layer or running surface damages the rail (see also WV0800-0001 and WV0800-0004)

#### **Typical installation errors that have a negative effect on the running behavior of the current collectors:**

- Conductor rails are not correctly engaged in the hanger clamp.
- Rail bends are tapered due to progressive bending.
- Switches and lifters are incorrectly set (end positions, dimensional tolerances) or yielding.
- Incorrect current collector connecting cable.
- Current collector connecting cable not used as (not free of directional and tensile forces).
- Installation positions are not within specification; permissible tolerances are exceeded in bends and curves.
- Rail joints and transfers have not been deburred.



Use the QR code ("click" or "scan"), to watch our animation **Mounting EMS Current Collector onto Towing Plate.**

## Single-pole Conductor Rail System SingleFlexLine Program 0815

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### 6.4 Additional documents



#### **Read and respect the additional operating instructions!**

You can find further information on the installation of conductor rail systems in the following instructions:

- MV0815-0006 Transfers
- BAL0815-0001 Sliding contact sensor unit
- BAL0800-0004 Bending device for product ranges 0811 and 0815



## Single-pole Conductor Rail System SingleFlexLine Program 0815

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### 7 Commissioning

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#### 7.1 Safety

##### Personnel:

- The conductor rail system must only be commissioned and operated for the first time after a repair by qualified electricians!
- The qualified electricians must meet the requirements described in Section 2.2.1.

##### Required protective equipment:



##### Requirement:



**WARNING!**

##### **Only operate the conductor rail system in areas inaccessible to the public!**

- Operation is only permitted in areas inaccessible to the public and out of manual reach.
- The danger zone must be enclosed by the customer or protection ensured by distance!



**WARNING!**

##### **Risk of injury due to improper commissioning!**

Improperly performed commissioning can lead to dangerous situations for personnel (see Section 7.2.1).

- Before commissioning, carry out the inspections on the inspection list of the manufacturer.
- Always measure the insulation resistance before commissioning the system. This must be conducted in compliance with the local technical standards, guidelines and legislation.
- Always ensure that all of the assembly and installation work has been fully completed before commissioning the system.
- Always ensure that all of the components have been properly installed before commissioning the system.

## Single-pole Conductor Rail System SingleFlexLine Program 0815

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### **Risk of injury due to crushing skin and limbs!**

There is a risk of crushing of skin and limbs due to:

- Spring force/gravity (stored energy).
- Current collectors (spring force) during preassembly, installation, operation, maintenance and disassembly (e.g., crushing of limbs between the current collector head and general components).
- Moving parts, when the system is in operation.

- Do not stand directly below the conductor rail system.
- Do not enter the danger zones of the system during operation. The operator/system manufacturer must ensure the technical protective measures are taken (covers, protection by distance, control technology, etc.).



### **Fire hazard due to overload or sparking!**

Fire hazards occur due to overloaded cables, electrical arcs, short circuits or sparking. Sparking can occur with poorly serviced, contaminated conductor rails or if the installation does not comply with the required tolerances.

Take the following measures:

- Conduct electrical testing as specified
- Permissible current values must be observed.
- Maintain tolerances during operation.
- Do not remove the specified electrical safety devices and protective devices.
- Do not store easily ignited materials near to conductor rails.
- Inspect, service, and clean conductor rails regularly and in accordance with specifications see Section 12.
- Dimensioning according to permissible system load capacity and provide for appropriate electrical protective devices.



### **Risk of injury due to ensnarement or impact!**

Ensnarement and/or impact with moving conductor rails (slip ring) or current collectors connected to the machine and other components must be prevented.

- Cordon off the work area.
- Use caution when working in the vicinity of the danger zone, particularly if protective devices (covers, enclosures, control devices) have been removed or disabled.
- Use caution when working in the vicinity of the danger zone, particularly below the conductor rail.
- Be aware of the risk of falling conductor rail system components if they have not been properly installed or if operated in inappropriate operating conditions (e.g., environment that contains solvents).
- Wear personal protective equipment!

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**DANGER!**

### **Risk of injury due to sensitizing material and dust!**

Dust from the sliding contacts collects in the conductor rails and the guide profile. This dust is very fine and is categorized as a health risk. Working regularly with the conductor rail system and/or not applying the requisite level of care when handling accumulated dust (e.g., cleaning the system with compressed air) can lead to sensitization.

- Do not eat and/or drink in the workplace.
- Wear personal protective equipment.



**CAUTION!**

### **Before switching the system on!**

- Ensure that all installation work has been completed and all the components have been properly installed.
- Each time before the product or system is started, measure the insulation resistance according to locally applicable technical standards, directives and legal regulations.
- Carry out locally required electrical tests.
- Ensure adequate stability on the device/system for the commissioning engineer.



**CAUTION!**

### **Before working on these components!**

- **Disconnect the conductor rail system from the power supply** according to the 5 Safety Rules and **secure it against being switched back on**. For the 5 Safety Rules, see Section 2.5.



**WARNING!**

**The system must be designed and operated in accordance with the prevailing ambient conditions!**



**WARNING!**

### **Secure conductor rails against falling**

- In application areas with personnel traffic and at an installation height of 3 m or more, conductor rails must be secured against falling.



**WARNING!**

### **Risk of injury due to hot components!**

Components can get hot during operation.

- Operation is only permitted in areas inaccessible to the public and out of manual reach.
- The danger zone must be enclosed by the customer or protection ensured by distance.
- Cordon off the work area.
- Use caution when working in the vicinity of the danger zone, particularly if protective devices (covers, enclosures, control devices) have been removed or disabled.
- Wear personal protective equipment!

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**7.2 Testing and initial commissioning**

**7.2.1 Inspection list**



**Risk of death due to electrical shock!**

**WARNING!**

Check	Checked
Installation height as per specifications (see Section 3)	
All installed components are clean, dry and undamaged.	
Installation clearances of the current collectors are as specified	
Have the contact surfaces of the sliding contacts been cleaned before commissioning and soiling, oxidation, pitting corrosion and other impurities removed by means of a brass brush or abrasive paper (320 grit)?	
Are the connecting cables installed without directional and tensile forces? The connecting cables must not pull on, press against or cause the current collectors to twist.	
Are the hanger clamp distances as specified? (see Section 6.3.3.1)	
Have the end caps been fitted correctly and to the first and end section?	
Are the end cap bars and fixed points properly installed as specified?	
Are the insulation profiles properly engaged in all hanger clamps?	
Are the rail joints at the connection points and the end caps deburred and correctly aligned?	
Are all electrical protection devices installed, tested and functioning? Are covers and barriers in place?	
Is the line feed properly connected?	
Are all metallic components (such as substructures/support structure) grounded as specified?	
Are all screws tightened to the specified tightening torque?	
Is the operating area tidy (no parts or tools)?	
Has the operating personnel been trained?	
All poles of the conductor rail system have been run through with a loose current collector. The current collector may not stick and must slide in the rail without hindrance	
Warning symbol "Electrical Shock" and type plate are installed by the manufacturer at a suitable location.	

.....

Date

Signature

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#### 7.2.2 Initial commissioning of the conductor rail system

1. Each time before the machine/system is started, measure the insulation resistance of the conductor rail system according to locally applicable technical standards, directives and legal regulations.
2. Carry out locally required electrical tests.
3. Perform a complete run along the conductor rail (walking pace).

**Remark:** Insulation resistance test according to EN 60204-1: 2006  $\geq 1 \text{ M}\Omega$  at a measuring voltage of 500 VDC. Exception for conductor bars, conductor rails and slip rings  $\geq 50 \text{ k}\Omega$  (EN 60204-1/18.3: 2006)



#### NOTE!

**The current collectors must not become caught, stick or scrape!**

→ Where necessary, repair any faults and perform setting tasks.

4. Visual inspection of the product/system:
  - Current collector undamaged and without signs of heavy wear.
  - Conductor rail components undamaged and in the proper location. No displacements or distortions. Check hanger clamps, end caps and fixed points in particular!
  - Check that there are no visible signs of heavy wear (chips, plastic parts, etc.). Signs of heavy wear indicate that installation clearances and their tolerances are not complied with. This can sometimes also be the case for individual sections of the route.

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## 8 Operation

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The only operations required to operate the conductor rail system are switching the power supply on and off to stop/activate the system, see Section 8.2.

The safety information in Section 8.1 must be observed to guarantee safety during operation.



**WARNING!**

**Only operate the conductor rail system in areas inaccessible to the public!**

Operation is only permitted in areas inaccessible to the public and out of manual reach.

→ The danger zone must be enclosed by the customer or protection ensured by distance!

### 8.1 Safety



**NOTE!**

**The system must only be operated by trained personnel!**



**WARNING!**

**Danger for unauthorized personnel!**

Unauthorized personnel are not familiar with the hazards in the working area.

→ Keep unauthorized personnel out of the working area.

→ In case of doubt, address such persons and direct them away from the working area.

→ Stop work as long as unauthorized persons are in the working area.

**Requirement:**



**DANGER!**

**Risk of injury due to ensnarement!**

There is a risk of being ensnared by moving parts when the system is in operation.

→ Do not enter the danger zones of the system during operation.

In order to comply with the **most important measures** for protection against hazards, the measures specified in Sections 2 and 3 must be observed. For information on foreseeable incorrect applications or unsuitable ambient conditions see Sections 2.5 and 3.3. in particular.

## Single-pole Conductor Rail System

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**DANGER!**

#### **Risk of injury due to falling conductor rails!**

The mountings of the conductor rail can fail and the conductor rail can fall down. Components can be damaged if the following or similar materials are stored in the vicinity of the conductor rail:

- Solvents that contain aromatic compounds and evaporate
  - Coating products and paints
  - Separating agents or coolants and lubricants
    - See Sections 3.3 and 2.8.4.
- Do not store any of the above or similar substances near the conductor rails.
- In application areas with personnel traffic and at an installation height of 3 m or more, conductor rails must be secured against falling.



**DANGER!**

#### **Risk of death due to electrical shock!**

Contact with components carrying electrical power can lead to death due to electrical shock or severe injury. Risk of injury due to shock reactions, falling or being thrown across the room due to electrical shock.

The conductor rail must not be operated under the following circumstances:

- If the conductor rail is heavily soiled.
- If the conductor rail becomes wet.
- If parts under voltage are exposed (insulating profile or the insulation of the connection cable are damaged).
- If the hanger clamp or insulation profile fail.
- If the conductor bar falls down and contacts a conductive material.

Take the following measures:

- Install the conductor rail out of manual reach.
- Attach a sign stating "Risk of Death due to Electrical Shock" with the relevant hazard symbol in all areas with access to parts under voltage.
- Secure the electrical system according to regulations.
- The customer must provide grounding for metallic components.
- The customer must provide protective devices.
- Install the conductor rail as described in the installation manual.
- Take environmental conditions into account, perform regular checks, maintain and clean as detailed in the instructions.
- Regularly clean the conductor rail and repair it if necessary.

## Single-pole Conductor Rail System

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**DANGER!**

#### **Fire hazard due to overload or sparking!**

Fire hazards occur due to overloaded cables, electrical arcs, short circuits or sparking. Sparking can occur with poorly serviced, contaminated conductor rails or if the installation does not comply with the required tolerances.

Take the following measures:

- Conduct electrical testing as specified before commissioning.
- Permissible current values must be observed.
- Maintain tolerances during operation.
- Do not remove the specified electrical safety devices and protective devices.
- Do not store easily ignited materials near to conductor rails.
- Inspect, service, and clean conductor rails regularly and in accordance with specifications see Section 12.
- Dimensioning according to permissible system load capacity and provide for appropriate electrical protective devices.



**WARNING!**

#### **Risk of injury due to hot components!**

Components can get hot during operation.

- Operation is only permitted in areas inaccessible to the public and out of manual reach.
- The danger zone must be enclosed by the customer or protection ensured by distance.
- Cordon off the work area.
- Use caution when working in the vicinity of the danger zone, particularly if protective devices (covers, enclosures, control devices) have been removed or disabled.
- Wear personal protective equipment!



**WARNING!**

#### **Risk of health issues due to respirable dust!**

Airborne dust can cause respiratory complaints and eye irritation.

- Clean regularly
- One result may be cancer

## 8.2 Normal operation

The Conductor Rail System 0815 is protected against accidental contact and suitable for use in indoor operations, such as for electric monorail systems (EMSs) or slip ring assemblies.



**WARNING!**

#### **Only operate the conductor rail system in areas inaccessible to the public!**

Operation is only permitted in areas inaccessible to the public and out of manual reach.

- The danger zone must be enclosed by the customer or protection ensured by distance!



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#### 8.3 Stopping the system

Requirement:



**DANGER!**

**Risk of injury due to electric shock!**

→ **Disconnect the conductor rail system from the power supply** according to the 5 Safety Rules and **secure it against being switched back on**. For the 5 Safety Rules, see Section 2.5.

#### 8.4 Continuing operation



**WARNING!**

**Risk of injury if safety equipment and protective devices are disabled!**

→ Before switching the system back on, ensure that all covers, safety systems and protective devices are installed and working properly.

**Before switching the system back on, ensure that:**

- The current collector heads are laying within the conductor rail for the entire length and the specified contact pressure must be applied.
  - There is no heavy soiling or objects in the conductor rails.
- Visually inspect the system.
- The insulation resistance corresponds to the locally applicable technical guidelines.
- Each time before the product or system is started, measure the insulation resistance according to locally applicable technical standards, directives and legal regulations.

#### 8.5 Perform regular maintenance and servicing

Perform regular maintenance and servicing in accordance with Section 9.



**WARNING!**

**Risk of malfunctions!**

Lack of maintenance and servicing can cause malfunctions and significant damage.

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### 9 Maintenance and Service

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#### 9.1 Safety



The system must only be serviced and maintained by specialist personnel!

Requirement:



Disconnect the system from power and secure against being switched on again.

Required protective equipment:



**WARNING!**

#### Risk of injury due to improperly executed maintenance and/or servicing tasks!

Improper or omitted maintenance or servicing work can result in serious injury to persons and/or material damage. Loosely stacked or components and tools that are left lying around are a source of danger. They are a trip hazards and improperly stored components can fall over or fall to the ground.

- Before starting work, ensure that there is sufficient space for installation.
- Ensure that the installation area is tidy and clean!
- If components have been removed, be careful to reinstall them properly, replace all fastening elements and comply with screw tightening torques.



**DANGER!**

#### Risk of injury due to dust!

Dust due to abrasion (sliding contacts, copper rails, plastic) can cause respiratory complaints, choking and eye irritation.

- Clean the system before starting work.
- Wear personal protective equipment.
  - Protective eyewear
  - Protective dust mask Class FFP3 (observe local regulations)
  - Protective gloves
  - Disposable coveralls
- Prevent contamination of the environment (e.g., people, goods, production facilities, etc.) while cleaning by taking appropriate measures (use covers, barriers, filter systems),

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#### WARNING!

##### **Risk of injury due to materials and substances!**

Respiratory complaints and eye irritation may occur due to airborne dust. There is a health hazard due to airborne respirable dust. One result may be cancer.

- Clean regularly! Before starting work, clean the conductor rail in accordance with regulations. See Section 12.1.
- Clean the system before starting work!
- Wear personal protective equipment.
- Prevent contamination of the environment (e.g., people, goods, production facilities, etc.) by taking appropriate measures (use covers, barriers, filter systems).
- **Do not blow out dust with compressed air.** Instead, vacuum it up. The vacuum cleaner must be equipped with a Class H fine filter.
- Eating and/or drinking at the workplace is prohibited!
- Do not smoke while cleaning!
- See Section 2.8.3 for further information.



#### DANGER!

##### **Risk of injury due to ensnarement or impact!**

Ensnarement and/or impact with moving conductor rails (slip ring) or current collectors connected to the machine and other components must be prevented.

- Cordon off the work area!
- Use caution when working in the vicinity of the source of danger.
- Use caution when working in the vicinity of the danger zone, particularly if protective devices (covers, enclosures, control devices) have been removed or disabled.
- Wear personal protective equipment!



#### CAUTION!

##### **Risk of impacts, puncture wounds and cuts!**

Hazard due to moving or falling parts during maintenance/servicing.

- Wear personal protective equipment!
- Cordon off the work area!
- Use caution when working in the vicinity, particularly below the conductor rail

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**DANGER!**

### **Risk of injury due to crushing skin and limbs!**

Skin and limbs can be crushed:

- When packing components and handling long loads
- If transport crates are dropped
- With incorrect suspension points for transport crates
- With incorrect and unauthorized loading of transport crates

→ Wear protective gloves!



**DANGER!**

### **Risk of death due to electrical shock!**

Contact with components carrying electrical power can lead to death due to electrical shock or severe injury. Risk of injury due to shock reactions, falling or being thrown across the room due to electrical shock.

- The main power supply (from the building) must be disconnected in the maintenance/servicing area and secured against switching on again.
- Disconnect all voltage supply line feeds.
- Check whether a voltage is still present in the components and take measures where necessary.
- The customer must provide grounding for metallic components.
- The customer must provide protective devices.



**WARNING!**

### **Fire hazard due to overload or sparking!**

Fire hazards occur due to overloaded cables, electrical arcs, short circuits or sparking.

- Before recommissioning, ensure that all work has been completed and all components have been properly installed.
- Conduct electrical testing as specified.
- Permissible current values must be observed.
- Electrical fuses must be installed in accordance with regulations.
- Warn against misuse.
- Do not store easily ignited materials near to conductor rails.
- Dimensioning according to permissible system load capacity and provide for appropriate electrical protective devices.

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**WARNING!**

#### **Risk of injury due to hot components!**

Components can get hot during operation.

- Operation is only permitted in areas inaccessible to the public and out of manual reach.
- The danger zone must be enclosed by the customer or protection ensured by distance.
- Cordon off the work area.
- Use caution when working in the vicinity of the danger zone, particularly if protective devices (covers, enclosures, control devices) have been removed or disabled.
- Wear personal protective equipment!



**CAUTION!**

#### **Alert personnel to the hazard!**

- Attach a sign stating "Risk of Death due to Electrical Shock" with the relevant hazard symbol in all areas with access to components under voltage for specialist personnel, for example.



**CAUTION!**

#### **Before working on these components!**

- **Disconnect the conductor rail system from the power supply** according to the 5 Safety Rules and **secure it against being switched back on**. For the 5 Safety Rules, see Section 2.5.



**WARNING!**

#### **Risk of injury if safety equipment is switched off!**

- Never switch off safety equipment.

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### Performing maintenance work on current collectors



#### Risk of injury due to crushing skin and limbs!

There is a risk of crushing of skin and limbs due to:

- Spring force/gravity (stored energy).
- Current collector (spring force) during installation, disassembly and maintenance.
- Be aware of the risk of falling conductor rail system components if they have not been properly installed or if operated in inappropriate operating conditions (e.g., environment that contains solvents).
- Moving parts when the system is in operation.

- Only have work done by trained technicians.
- When working on the conductor rail system, wear protective footwear, protective gloves, and a protective headgear.
- When changing the sliding contacts, follow the separate instructions for this task. See Section 12.1.
- Only install the conductor rail system where suitable operating conditions prevail. See Section 3.3.

### Replacing conductor rails

#### Required protective equipment:



#### Risk of injury due to cutting and amputation!

The ends of the conductor bars can have sharp edges, particularly if they were cut to size at the construction site and have not been deburred.

- Wear protective gloves and protective footwear.
- During installation: Carefully deburr the insulation profile and conductor bars after sawing.
- During disassembly: Handle cut, removed conductor rails with care and store them properly (transport or other containers)
- Be aware of sharp edges in the surroundings of the installation surface and avoid contact.

## 9.2 Tools and materials

The maintenance work on the conductor rail must be performed using commercially available metric tools.

Maintenance work	Tool
Measure the height of the sliding contacts	Calipers
Measure the contact force of the sliding contacts	Spring balance with a measuring range of 0 to 20 N

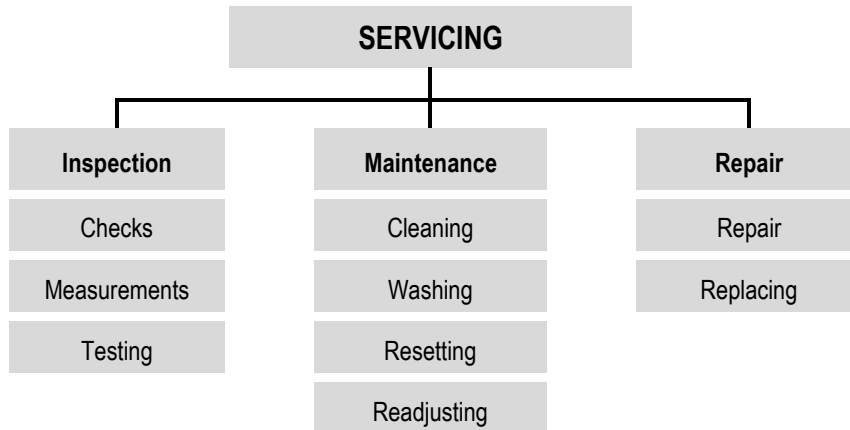
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### 9.3 Maintenance plan

The following tasks fall under the category "Servicing":



The following sections describe the maintenance tasks required for optimal and trouble-free operation. The tasks specified and performed as per the maintenance plan must be logged.

If regular inspections reveal increased wear, the corresponding maintenance intervals should be shortened in accordance with the actual signs of wear.

Contact the manufacturer in case of any questions regarding maintenance tasks and intervals — see the service address on the last page. The operator must take responsibility for organizing the following maintenance measures in order to comply with warranty requirements and for general prevention of damage.

- Inspection, maintenance and repair work must only be carried out by trained, qualified technicians!
- Inspection, maintenance and repair measures must always be documented!

Maintenance Instructions WV0800-0002 contains more detailed descriptions of the maintenance work.



**NOTE!**

**The functioning and availability of the conductor rail system are dependent on the quality of the contact surface!**

Copper conductor rails are dependent on a lubricant-patina running surface that builds up during operation and should not be removed (no sanding or brushing off). Follow the instructions in WV0800-0004.

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Required protective equipment:



**DANGER!**

#### **Danger of sensitization, irritation of the mucous membranes and respiratory diseases due to dust!**

Dust from the sliding contacts collects in the conductor rails and the guide profile. This dust is very fine and is categorized as a health risk. Working regularly with the conductor rail system and/or not applying the requisite level of care when handling accumulated dust (e.g., cleaning the system with compressed air) can lead to sensitization. People who frequently spend longer periods of time in a heavily used facility without protective equipment must expect the following **consequences**:

- Irritations of the mucous membranes
  - Respiratory diseases
  - Cancer
- In workplaces with long-term exposure and heavily trafficked facilities, take effective measures to protect employees from the dust.
- Personal protective equipment must be worn during all works on the conductor rail system during which accumulated dust is disturbed.
- The following personal protective equipment must be worn during cleaning operations:
- Protective eyewear
  - Protective dust mask Class FFP3 (observe local regulations)
  - Protective gloves
  - Disposable coverall
- Before starting work, clean the conductor rail in accordance with regulations (see WV0800-0001).
- Protect the surroundings during cleaning work, for instance by covering or removing warehouse goods and blocking access to those areas in which dust could fall down on persons.
- **Do not blow out dust with compressed air.** Instead, vacuum it up. The vacuum cleaner must be equipped with a Class H fine filter.
- Do not eat and/or drink while cleaning!
- Do not smoke while cleaning!



**NOTE!**

#### **Risk of explosion!**

Airborne dust, open flames or other sources of ignition can result in explosion.



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The following table covers the most usual test steps. You can find details for cleaning and maintenance in WV0800-0001 and WV0800-0002. The cleaning distance is individual and depends on the degree of contamination and the intensity of the use of the system. Do not remove the patina under any circumstances! You can find details on the use of copper rails in WV0800-0004.

Interval	Servicing task	To be performed by																																		
Daily	Visual inspection ■ Is there heavy soiling or objects in the conductor rail?	Operators																																		
4 weeks after commissioning/500 km  Thereafter: Quarterly/semi-annually	<p><b>Visual inspection:</b></p> <ul style="list-style-type: none"> <li>Check whether the contact areas of the sliding contacts are worn.</li> <li>→ If the wear limit "a" (ratio between insulation and sliding contacts) has been reached or exceeded, replace the current collector</li> </ul> <p>For other current collectors see Section 6.3.4</p> <p>Fig. 132: Sliding contact wear limit</p> <table border="1"> <thead> <tr> <th>Pos.</th> <th>Name</th> <th>Wear Limit "a"</th> <th>Type of Current Collector</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Contact surface of the conductor rail</td> <td>1 mm</td> <td>Phase</td> </tr> <tr> <td>2</td> <td>Middle joint</td> <td>2 mm</td> <td>PE<sup>2</sup></td> </tr> </tbody> </table> <p><sup>2</sup> The wear limit of PE equals 2 mm to ensure the PE function, particularly with PE<sub>plus</sub>.</p> <p><sup>1</sup> The tolerance varies according to the current collector type (see Section 6.3.4).</p> <table border="1"> <thead> <tr> <th>Current Collector Type</th> <th>Distance</th> <th>Axis</th> <th>Tolerance</th> </tr> </thead> <tbody> <tr> <td rowspan="2">081506... 081507...</td> <td rowspan="2">65 mm</td> <td>X</td> <td>±10 mm</td> </tr> <tr> <td>Y</td> <td>±10 mm</td> </tr> <tr> <td rowspan="2">081508... 081509...</td> <td rowspan="2">80 mm</td> <td>X</td> <td>±10 mm</td> </tr> <tr> <td>Y</td> <td>±10 mm</td> </tr> <tr> <td rowspan="2">08150A... 08150B...</td> <td rowspan="2">92 mm</td> <td>X</td> <td>±15 mm</td> </tr> <tr> <td>Y</td> <td>±15 mm</td> </tr> </tbody> </table>	Pos.	Name	Wear Limit "a"	Type of Current Collector	1	Contact surface of the conductor rail	1 mm	Phase	2	Middle joint	2 mm	PE <sup>2</sup>	Current Collector Type	Distance	Axis	Tolerance	081506... 081507...	65 mm	X	±10 mm	Y	±10 mm	081508... 081509...	80 mm	X	±10 mm	Y	±10 mm	08150A... 08150B...	92 mm	X	±15 mm	Y	±15 mm	Technician
Pos.	Name	Wear Limit "a"	Type of Current Collector																																	
1	Contact surface of the conductor rail	1 mm	Phase																																	
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		Y	±10 mm																																	
08150A... 08150B...	92 mm	X	±15 mm																																	
		Y	±15 mm																																	

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Interval	Servicing task	To be performed by
	<ul style="list-style-type: none"> <li>■ Check the sliding contact insulation for cracks and abrasion. → replace the current collector if the sliding contact insulation is damaged or cracked.</li> <li>■ Check the insulation for wear, soiling and burn marks. → If necessary, clean insulation profile or repair the site of damage.</li> <li>■ Ensure that there are no constrictions inside the individual poles of the insulation profile (dust or adhering dirt). → Clean the insulation profile with a vacuum cleaner or brush or replace.</li> <li>■ Ensure that the insulation is not affected by foreign bodies (shavings, fluids, contamination, etc.; risk of short circuit). → Clean or replace components, if it is not possible to fully restore the insulating properties.</li> </ul>	
	<p><b>Functional test:</b></p> <ul style="list-style-type: none"> <li>→ Check for the presence of springs.</li> <li>→ Check the correct installation position of the current collector (see Section 6.3.4).</li> <li>→ Change the fastening position in the event of deviation.</li> <li>■ The required contact force is ensured by the correct fastening position of the current collector.</li> <li>■ However, if measurement of the contact force is required, the following steps must be taken: <ul style="list-style-type: none"> <li>→ Attach a suitable spring balance to the current collector arm as close as possible to the middle joint of the two current collector heads. Pull the current collector head vertically away from the conductor bar using the spring balance.</li> <li>→ Reading the measured value: Check the value measured by the spring balance when the sliding contact lifts off the sliding surface! The contact force must be <math>9 \pm 0.5</math> N.</li> </ul> </li> <li>■ Check the freedom of movement of each individual current collector arm. → If necessary, clean or replace entire current collector.</li> <li>■ Check the vertical and lateral tolerance of the current collectors relative to the conductor rail. → If necessary, correct the mounting position. <ul style="list-style-type: none"> <li>■ Ensure that the connecting cable is not twisted at the current collector head and that the cable loop is not exerting directional forces on the current collector head. This must apply in every position of the current collector arm.</li> </ul> </li> <li>→ If necessary, clean insulation profile or repair defect.</li> </ul>	

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### 10 Troubleshooting

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#### Risk of injury due to improper troubleshooting!

Improper troubleshooting can result in serious injury to person and property.

→ Contact the manufacturer in case of malfunction.

→ Only allow troubleshooting to be conducted by personnel from or authorized by the manufacturer.

The faults that, to Conductix-Wampfler's best knowledge, tend to arise are listed in the following table (see Section 10.1) together with their corresponding remedial measures.

#### Required protective equipment:



#### Requirement:



Faults must only be repaired by qualified personnel!



#### Risk of injury due to crushing skin and limbs!

There is a risk of crushing of skin and limbs due to:

- Spring force/gravity (stored energy).
- Current collector (spring force) during installation, disassembly and maintenance.
- Be aware of the risk of falling conductor rail system components if they have not been properly installed or if operated in inappropriate operating conditions (e.g., environment that contains solvents).
- Moving parts, when the system is in operation.

→ Do not enter the danger zones of the system during operation.

→ Only have installation conducted by trained technicians.

→ When working on the conductor rail system, wear protective footwear, protective gloves and a protective headgear.

→ When changing the sliding contacts, follow the separate instructions for this task. See Section 12.1

→ Only install the conductor rail system where suitable operating conditions prevail. See Section 3.3.

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**WARNING!**

### **Only operate the conductor rail system in areas inaccessible to the public!**

Operation is only permitted in areas inaccessible to the public and out of manual reach.

- The danger zone must be enclosed by the customer or protection ensured by distance!



**DANGER!**

### **Risk of injury due to dust!**

Dust due to abrasion (sliding contacts, copper rails, plastic) can cause respiratory complaints, choking and eye irritation.

- Clean the system before starting work.
- Wear personal protective equipment.
  - Protective eyewear
  - Protective dust mask Class FFP3 (observe local regulations)
  - Protective gloves
  - Disposable coverall
- Prevent contamination of the environment (e.g., people, goods, production facilities, etc.) while cleaning by taking appropriate measures (use covers, barriers, filter systems).



**WARNING!**

### **Risk of injury due to materials and substances!**

Respiratory complaints and eye irritation may occur due to airborne dust. There is a health hazard due to airborne respirable dust. One result may be cancer.

- Clean regularly! Before starting work, clean the conductor rail in accordance with regulations. See Section 12.1
- Clean the system before starting work!
- Wear personal protective equipment.
- Prevent contamination of the environment (e.g., people, goods, production facilities, etc.) by taking appropriate measures (use covers, barriers, filter systems).
- **Do not blow out dust with compressed air.** Instead, vacuum it up. The vacuum cleaner must be equipped with a Class H fine filter.
- Do not eat and/or drink while cleaning!
- Do not smoke while cleaning!
- See Section 2.8.3 for further information.

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**DANGER!**

### **Risk of injury due to cutting and amputation!**

Cuts and amputations can occur on:

- Sharp edges of the general components
- Sharp edges of the conductor rails
- Cut edges when trimming the conductor rails
- Packaging materials (cartons, bands, etc.)

→ Wear personal protective equipment!



**DANGER!**

### **Risk of injury due to ensnarement or impact!**

Ensnarement and/or impact with moving conductor rails (slip ring) or current collectors connected to the machine and other components must be prevented.

→ Cordon off the work area

→ Use caution when working in the vicinity of the danger zone, particularly if protective devices (covers, enclosures, control devices) have been removed or disabled.

→ Wear personal protective equipment!



**CAUTION!**

### **Risk of puncture wounds and cuts!**

The packaging material can contain sharp objects such as nails, struts, steel bands and wood splinters that can cause injury to limbs.

→ Wear personal protective equipment!

→ Cordon off the work area!

→ Use caution when working in the vicinity, particularly below the conductor rail.



**DANGER!**

### **Risk of death due to electrical shock!**

Contact with components carrying electrical power can lead to death due to electrical shock or severe injury. Risk of injury due to shock reactions, falling or being thrown across the room due to electrical shock.

→ The main power supply (from the building) must be disconnected in the installation area and secured against switching on again.

→ Disconnect all voltage supply line feeds.

→ When decommissioning, check whether a voltage is still present in the components and take measures where necessary.

→ The danger zone must be enclosed by the customer or protection ensured by distance.

→ The customer must provide grounding for metallic components.

→ The customer must provide protective devices.

→ Ensure that there is sufficient stability in the area.

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**CAUTION!**

### **Before working on these components!**

- **Disconnect the conductor rail system from the power supply** according to the 5 Safety Rules and **secure it against being switched back on**. For the 5 Safety Rules, see Section 2.5.



**CAUTION!**

### **Before switching the system on!**

- Each time before the product or system is started, measure the insulation resistance according to locally applicable technical standards, directives and legal regulations.
- Carry out locally required electrical tests.



**CAUTION!**

### **Alert personnel to the hazard!**

- Attach a sign stating "Risk of Death due to Electrical Shock" with the relevant hazard symbol in all areas with access to components under voltage.



**WARNING!**

### **Fire hazard due to overload or sparking!**

Fire hazards occur due to overloaded cables, electrical arcs, short circuits or sparking.

- Before recommissioning, ensure that all work has been completed and all components have been properly installed.
- Conduct electrical testing as specified.
- Permissible current values must be observed.
- Electrical fuses must be installed in accordance with regulations.
- Warn against misuse.
- Do not store easily ignited materials near to conductor rails.
- Dimensioning according to permissible system load capacity and provide for appropriate electrical protective devices.



**WARNING!**

### **Risk of injury due to hot components!**

Components can get hot during operation.

- Operation is only permitted in areas inaccessible to the public and out of manual reach.
- The danger zone must be enclosed by the customer or protection ensured by distance.
- Cordon off the work area.
- Use caution when working in the vicinity of the danger zone, particularly if protective devices (covers, enclosures, control devices) have been removed or disabled.
- Wear personal protective equipment!

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#### 10.1 Fault correction table

Fault	Cause	Corrective measures
The sliding contacts are unevenly worn.	The current collector heads' range of movement is restricted.	Only use original Conductix-Wampller current collector heads, check cable position (make sure cables can move freely). Install current collector as specified in Section 6.3.4. Check the installation position at various points in the system.
	Contact pressure is too high or low.	Install current collector as specified in Section 6.3.4; use superfine-stranded class-6 connecting cables (in accordance with ICE 602228).
Sliding contact insulation is abraded on the side down to the sliding contacts.	If installed horizontally: The current collector's height is not correctly adjusted.	Replace current collector heads; correctly adjust the height of the current collector.
The sliding contacts wear out too fast.	Sharp edges on the line feed clamps, conductor rails, connections between the conductor rails	Smoothen sharp edges with a file, compressed-air grinder or sanding paper.
	Conductor rails soiled or scorched in places.	Check current values; clean rails as specified in maintenance instruction WV0800-0001; if necessary, replace conductor rails.
	Contact pressure too high.	Install current collector as specified in Section 6.3.4. Check the installation position at various points in the system.
The power supply is interrupted, the contact is disrupted.	End segment and line feed clamps are not properly connected.	Tighten all screws to the specified torque, see Section 6.3.2.1; If necessary, retrim and reinstall the crimping cable lug.
	Current collector not properly connected.	Install current collector as specified in Section 6.3.2.1; correct connecting cable, replace if necessary
	Contact pressure too low.	Only use original Conductix-Wampller current collectors, check cable position (make sure cables can move freely). Install current collector as specified in Section 6.3.4; correct connecting

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Fault	Cause	Corrective measures
		cable, replace if necessary. Check the installation position at various points in the system.
	Collision with system components	Check the system's layout, fasten the affected components in such a way that they cannot be collided with, replace damaged components.
	Abrasive dust has collected at one of the more frequently used transfer points (where the direction of travel is reversed).	Adjust the consumer's movement profile. Move over the end position to push the collected abrasive dust out of the conductor bar. Clean the conductor bar.
Insulating profile is not engaged in the hanger clamp.	Conductor rail has not been properly mounted.	Clip in the insulation profile, check components, replace if necessary
	Use of damaged components.	Replace damaged components.



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### 11 Disassembly and Disposal

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#### 11.1 Safety

##### Personnel:

- Must only be conducted by trained technicians. At least 2 people

##### Requirement:



Disconnect the system from power and secure against being switched on again.

##### Required protective equipment:



**WARNING!**

##### **Risk of injury due to improper disassembly!**

Stored residual energy, sharp components, sharp points and edges on and in the device or the required tools can cause injury.

- Ensure that there is sufficient space before starting work.
- Handle open, sharp-edged components carefully.
- Ensure that the workplace is tidy and clean! Loosely stacked or scattered components and tools are a source of hazards.
- Dismount components properly. Be aware of the dead weights of the components. If necessary, use lifting gear.
- Secure components so that they cannot fall or fall over.
- Consult the manufacturer in case of doubt.



**DANGER!**

##### **Risk of injury due to ensnarement or impact!**

Ensnarement and/or impact with moving conductor rails (slip ring) or current collectors connected to the machine and other components must be prevented.

- Cordon off the work area.
- Use caution when working in the vicinity of the danger zone, particularly if protective devices (covers, enclosures, control devices) have been removed or disabled.
- Wear personal protective equipment!

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**DANGER!**

#### **Risk of injury due to cutting and amputation!**

Cuts and amputations can occur on:

- Sharp edges of the conductor rails.
- Cut edges when trimming rails.

- Wear personal protective equipment!
- Cordon off the work area!
- Use caution when working in the vicinity, particularly below the conductor rail



**DANGER!**

#### **Risk of injury due to crushing skin and limbs!**

There is a risk of crushing of skin and limbs due to:

- Spring force/gravity (stored energy).
- Current collector (spring force) during installation, disassembly and maintenance.
- Falling parts of the conductor rail system in the case of improper disassembly.
- Moving parts when the system is in operation.

- Do not enter the danger zones of the system during operation.
- When working on the conductor rail system, wear protective footwear, protective gloves and protective headgear.



**DANGER!**

#### **Risk of death due to electrical shock!**

Contact with components carrying electrical power can lead to death due to electrical shock or severe injury. Risk of injury due to shock reactions, falling or being thrown across the room due to electrical shock.

- The main power supply (from the building) must be disconnected in the disassembly area and secured against switching on again.
- Disconnect all voltage supply line feeds.
- When decommissioning, check whether a voltage is still present in the components and take measures where necessary.

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**DANGER!**

#### **Risk of injury due to dust!**

Dust due to abrasion (sliding contacts, copper rails, plastic) can cause respiratory complaints, choking and eye irritation.

- Clean the system before starting work.
- Wear personal protective equipment.
  - Protective eyewear
  - Protective dust mask Class FFP3 (observe local regulations)
  - Protective gloves
  - Disposable coveralls
- Prevent contamination of the environment (e.g., people, goods, production facilities etc.) while cleaning by taking appropriate measures (use covers, barriers, filter systems).



**WARNING!**

#### **Risk of injury due to materials and substances!**

Respiratory complaints and eye irritation may occur due to airborne dust. There is a health hazard due to airborne respirable dust. One result may be cancer.

- Clean the system before starting work!
- Wear personal protective equipment.
- Prevent contamination of the environment (e.g., people, goods, production facilities etc.) by taking appropriate measures (use covers, barriers, filter systems).
- **Do not blow out dust with compressed air.** Instead, vacuum it up. The vacuum cleaner must be equipped with a Class H fine filter.
- Do not eat and/or drink while cleaning!
- Do not smoke while cleaning!
- See Section 2.8.3 for further information.

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#### 11.2 Disassembly

After the system is no longer in use, the device must be disassembled and environmentally friendly disposal carried out.

##### Before starting disassembly:



**DANGER!**

##### **Risk of injury due to impacts and punctures/stabs from conductor rails sliding out!**

Risk of injury due to impacts and punctures/stabs from conductor rails sliding out when the packaging units are held at an angle, the packaging is damaged or through carelessness with long loads/transport crates.

- Wear personal protective equipment!
- Cordon off the work area!

→ Remove operating and auxiliary materials as well as residual processing material and dispose of them in an environmentally appropriate manner.



**WARNING!**

##### **Be aware of dangers due to electric shock, harmful dusts, sharp edges and moving parts!**

→ Clean the subassemblies and components properly and disassemble them under observation of applicable local occupational safety and environmental protection regulations.

##### 11.2.1 Disassemble the conductor rails



**WARNING!**

##### **Risk of injury due to improper disassembly!**

Stored residual energy, sharp components, sharp points and edges on and in the device or the required tools can cause injury.

- Ensure that there is sufficient space before starting work.
- Handle open, sharp-edged components carefully.
- Ensure that the workplace is tidy and clean!
- Disassemble components properly.
- Consult the manufacturer in case of doubt.

##### Personnel

- May only be carried out by trained technicians
- At least two people

##### Required tools

- Disassembly tool (see Section 6.3.3.3 and page 55)
- Hexagonal screwdriver SW 2.5
- Hexagonal screwdriver SW 3
- Open-end wrench SW 7
- Flat-head screwdriver 1.2 x 6.5x150 mm
- Cutting tool (e.g., jigsaw)
- Tools for securing

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**CAUTION!**

#### **Risk of injury when removing the connector!**

The connector is very large compared to the insulation profile and the conductor bar and e.g., a saw blade could easily become trapped in it. The saw could also jump and injure the installer.

→ When separating the 4-m rail sections, keep at a distance of at least 100 mm from the end of the insulation profile.



**CAUTION!**

#### **Reusing disposable components can create hazards!**

Reusing a connector or expanding rivet can create the following hazards:

- The connection is not perfect and reliable.
  - Expanding rivet: There is a risk that conductor rails may come loose, become quickly worn or destroyed.
  - Connectors: High-resistance connection, heating, fire hazard reduced performance.
- Dispose of disassembled connectors and expanding rivets and replace with new ones. Do not re-use!

## 11.3 Disposal



**DANGER!**

#### **Risk of death due to electrical shock!**

Contact with components carrying electrical power can lead to death due to electrical shock or severe injury. Risk of injury due to shock reactions, falling or being thrown across the room due to electrical shock.

- The main power supply (from the building) must be disconnected in the disassembly area and secured against switching on again.
- Disconnect all voltage supply line feeds.
- When decommissioning, check whether a voltage is still present in the components and take measures where necessary.

In the absence of a return or disposal agreement, disassembled components must be recycled as follows:

- All metal parts must be scrapped.
- Plastic components must be sent for recycling.
- The other components are to be disposed of according to their material composition.



**CAUTION!**

#### **Environmental damage due to improper disposal!**

Electrical waste, electronic components, lubricants and other auxiliary materials are subject to hazardous waste disposal regulations and may only be disposed of by authorized specialists.

Local authorities or special disposal companies can provide information about environmentally appropriate disposal.

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### 12 Further Documents

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#### 12.1 Applicable documents

Seq. no.	Document number	Document name
01	WV0800-0001	Cleaning conductor rails
02	WV0800-0002	Conductor rail maintenance plan
03	MV0815-0006	Transfers
04	MV0815-0008	Code band profile for product range 0815
05	BAL0800-0004	Bending device for product ranges 0811 and 0815
06	BAL0815-0001	Sliding contact sensor unit

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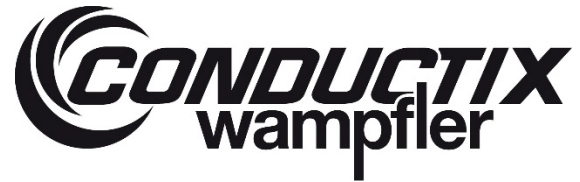
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## Operating Instructions



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