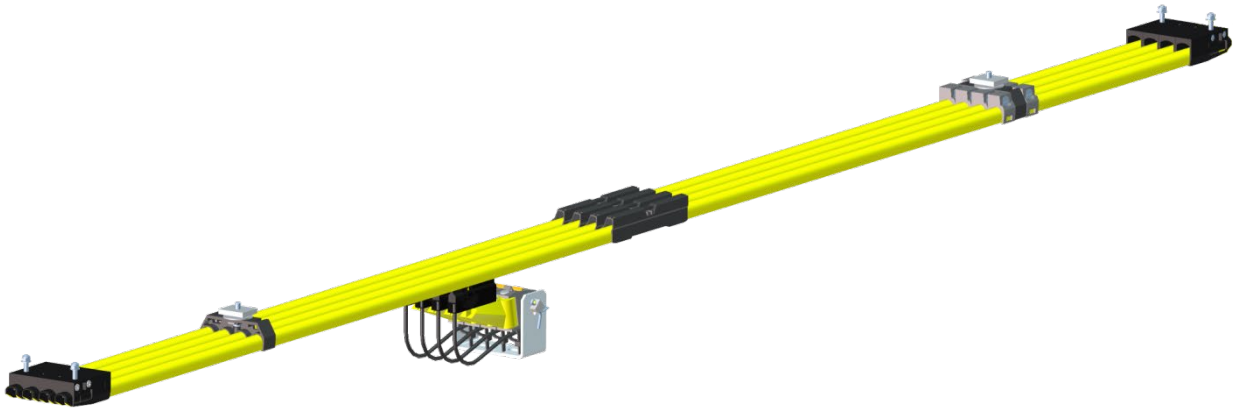
Operating Instructions

Single Pole Conductor Rail System

SingleFlexLine Program 0811

Order Number:

0811xx-...



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1 General Information

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 and must be kept accessible to personnel and in close proximity to the conductor rail system at all times. All 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 conductor rail system.

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

1.2 Limitation of liability

All applicable standards and regulations, the latest technological standards and our many years of experience have been taken into account when formulating the information and notices in this manual.

The manufacturer accepts no liability for damages resulting from:

- Failure to comply with operator instructions
- Improper use
- Use by untrained personnel
- Unauthorized modifications
- Technical changes
- Use of unauthorized replacement parts or 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 the 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.

1.3 Copyright

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 information: See the last page of this document.
Replacement parts list: See Section 12.1 Other 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

Our Customer Support staff is available for technical support.

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

2 Safety Instructions

2.1 Explanation of symbols

Safety and hazard information is identified in these operator 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 moderate or minor injury.

Tips and recommendations:

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

ATTENTION!

… indicates actions that will help you prevent material damage.

2.2 Personnel requirements

2.2.1 Qualifications

WARNING!

Inadequately trained persons are at risk of injury!

Improper 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. Persons whose responsiveness is influenced by drugs, alcohol, or medications, for example, are not permitted.
- When selecting personnel, all age- and occupation-specific regulations applicable at the place of use must be observed.

The following qualifications are specified in the operator 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 carried out by qualified personnel (electricians) in accordance with local regulations. Work with higher installation positions usually 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.
- **Users**

  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**

  are trained persons who transport the material indoors and outdoors in accordance with safety regulations.

2.2.2 Unauthorized personnel

WARNING!

Danger due to unauthorized personnel!

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

→ Keep unauthorized personnel away from the working area

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

→ Stop working as long as unauthorized personnel 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
05.11.2009	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, puncture 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.

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.

Safety 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.

Breathing mask (FFP-3—according to country-specific requirements)

For protection against materials, particles, and organisms. In this case, for protection against the dust produced by the sliding contacts and the insulation of the conductor rail.

2.4 Intended use

The conductor rail system is exclusively designed and built for the use described here (its intended use).

WARNING!

Hazard due to improper use!

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

→ Follow all information in these operator instructions strictly

→ Refrain from improper use of the system

→ Respect the instructions on improper use in Section 2.5

We do not accept any liability for damage arising from improper use.
The operator bears sole liability for all damage that results from improper use.

Intended use

The SingleFlexLine 0811 conductor rail system is an operating resource for customer construction of an electrical energy-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 danger from electrical current.

The SingleFlexLine 0811 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 electrified monorail system (EMS).

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.

Compliance with these technical conditions is mandatory for the installation:

- The maximum travel speed is up to 400 m/min depending on the system (straight line without interruption).
- The conductor rail should preferably be installed horizontally with current collector insertion from below or from the side. For vertical installation, contact Conductix-Wampfler.

Electrical engineering operational requirements

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

2.5 Improper 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 results from improper use.

Improper use in particular includes the following forms of use:

- Operation in unsuitable environmental conditions (see Section 3.3). The conductor rail system must **only** be operated under the environmental conditions detailed in Section 3.
- Installation 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
- 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
- Use of the system by untrained personnel

2.6 Protective measures by the operator/user

The conductor rail system is designed for use in an industrial setting. 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 operator 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 carried out when **disconnected from power**.
- The operator must inform him/herself of applicable workplace safety guidelines and identify any additional hazards that may arise under the specific working conditions at the place of use of the device. This knowledge must be expressed in the form of operator 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 of the slip ring assembly.
- 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 intervals and inform them of hazards.
- The operator must provide personnel with all required protective equipment (work clothes, safety shoes, hearing protection, protective gloves, safety helmet, 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 Section 2.2.1.

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

- The operator must ensure that the service intervals described in these operator instructions are observed.
- The operator must have all safety systems regularly inspected for functionality and completeness. If possible, this inspection should be carried out 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

Power down the entire system and secure against unintentional switching on!

Work on electrical systems must only be carried out when they are disconnected from the power supply. The 5 Safety Rules (see DIN VDE 0150-100:2009-10/EN 50110-1:2004-11).

Note before starting work:

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

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

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 operator instructions in order to reduce health hazards and avoid dangerous situations.

2.8.1 Electrical hazards and sources of danger

DANGER!

Risk of death by electrocution!

Contact with energized components can lead to death or severe injury by 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
- Live parts: Infeed, cables, connections, conductor rail, connectors, current collectors, devices and connections within switching cabinets, control systems, etc.
- Parts that have become live due to a fault

Before working on the parts listed above:

→ **Switch off the power supply** of the conductor rail system according to the 5 Safety Rules and **secure it against being switched on** again (see Section 2.7).

During work:

→ Use insulated tools

Before switching on:

→ Every time before the device 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 deficiencies are identified, take measures to correct the deficiencies without delay. Inform the system operator immediately

→ If it is not possible to correct the dangerous deficiency, block off the area involved or turn the equipment off and secure it against being switched 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

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 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 appropriate protection devices provided

→ Do not store combustible and/or easily ignited materials near conductor rails

→ Check, service and clean conductor rails regularly and as prescribed. See Section 8 and 9

2.8.2 Mechanical hazards and sources of danger

DANGER!

Risk of injury due to ensnarement or impact!

An 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, in particular if protective devices (covers, enclosures, control devices) have been removed or disabled

→ Use caution when working in the vicinity of the danger zone, in particular below the conductor rail

→ Wear personal protective equipment!

NOTE!

Secure components against falling!

Possible falling components must be determined in the customer analysis as part of the operator's risk and hazard analysis.

→ The operator must take appropriate measures

2.8.3 Danger due to dust and vapors

WARNING!

Danger of sensitization, mucous membrane irritation and respiratory disease due to dust!

Dust from the sliding contacts collect in the conductor rails and the track profile. 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 plants, 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

- Safety eyewear
- Dust mask, Class FFP3
- Protective gloves
- Disposable coveralls

→ For soiled and dusty conductor lines, clean them as prescribed before starting work. 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**, but rather vacuum it away. The vacuum must be equipped with a Class H fine filter

→ Do not eat, drink or smoke during work!

DANGER!

Poisonous gases during fire!

In case of fire in the facility, the plastic parts of the conductor rail system emit poisonous gases (HCl).

→ The building must be evacuated immediately

→ Notify the fire department

2.8.4 Dangers related to the operational environment

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

- Dusts
- Gases
- Chemical substances
- Liquids
- Radiation
- Major temperature variations

The **most important action** for protection from these hazards is to only install the conductor rail system in locations where **suitable operating conditions** pertain; see Section 3.3.
The system must be designed and operated in accordance with the prevailing ambient conditions.

DANGER!

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

Environmental influences (gases, substances, liquids, radiation, etc.) can damage the components, particularly the plastic parts. For example, hanger clamps can break and the conductor rail system can fall down.

→ Examine the influencing factors of temperature, exposure time, 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 verified in advance by Conductix-Wampfler

The resistance of plastic parts is critical when 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. For example, hanger clamps can break and the conductor rail system can fall down.

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

DANGER!

Fire hazard 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.

DANGER!

Hazard 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 voltage.

2.9 Conduct in the event of accidents and malfunctions

Actions 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 to rescue vehicles

Actions 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 device and replace it with a new device
- Determine the cause of fault and repair the device

3 Technical data

System	Single pole conductor rail system for use in electrified monorail systems (EMS) and similar applications in indoor and weather-protected outdoor areas
Installation orientation	Preferably horizontal. Current collector insertion from below or from the side. For vertical installation, contact Conductix-Wampfler.
Rail system length	4000 mm
Pole spacing	20 mm
Suspension interval	nominal 400 - 1000 mm (see table Hanger Clamps)
Maximum system length	Dependent upon the infeed concept - theoretically any system length is possible
Travel speed	maximum 400 m/min (straight line without interruption)
Ambient temperature	-10°C to +55°C
Maximum temperature difference	Δ K 50° C
Maximum insulation temperature	Standard (PVC): 85°C, heat-resistant variant (PPE + PS-I): 115°C
Protection type	IP 23 (rail system, current collector only when inserted)
Storage	-30 to +40°C; store away from sunlight, avoid condensation
Minimum installation temperature	-10°C (recommended installation temperature: Above 0°C)
Local approvals	UL / CSA / GOST-R / EAC
Max. Air humidity at +40°C	50 % rel. H
Altitude above sea level	≤ 2000 m
Direction of travel	Forwards and backwards (reversing)

Conductor material	Hot-dip galvanized steel	Electrolytic copper	Data metal
Type	**081112**	**0811116**	**081118**
Rated current at 100 % ED and 35°C Duty cycle according to EU Directive [A]	32	100	10
Rated voltage	nominal 690 V / 500 V UL (minimum voltage 24V / minimum current 3 A)		
Ohmic resistance at +35°C [Ω / 1000 m] +20°C [Ω / 1000 m]	 5.506 5.122	 0.743 0.703	 29.313 29.200
Impedance at +35° C [Ω / 1000 m] Impedance at +20°C [Ω / 1000 m]	5.507 5.122	0.750 0.709	29.314 29.202
Moment of inertia Ix [cm4] Moment of inertia Iy [cm4]	0.024 0.048		
Modulus of resistance Wx [cm³] Modulus of resistance Wy [cm³]	0.048 0.076		

NOTE!

Current collector capacity:

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).

Chemical resistance	
Insulating material	PVC: Good general chemical resistance PPE + PS-I: Average chemical resistance, critical when in direct contact with oils, not suitable for outdoor use in direct sunlight.
Installation material	PC, PA, PBT: Good general chemical resistance, partly limited
Conductor material	Data metal: Good chemical resistance Galvanized steel: Limited resistance Copper: Limited resistance

Information regarding resistances are general notes and depend on the temperature, exposure time, concentration and interactions and must be verified in individual cases. Before usage in critical environmental conditions such as chemical operations, galvanizing plants, compost works and warehouses and locations with high concentrations of aromates, benzols and other substances from these material groups, we ask that you please contact us for the purpose of alternative installation positions and materials and possibly necessary additional components.

Insulation profile	
Materials	Stabilized hard PVC; Yellow (RAL 1018) or PPE + PS-I (halogen-free) (RAL 1021)
Dielectric strength	22.4 kV (PVC), 45 kV (PPE + PS-I) according to DIN 53481
Leakage current resistance	400 <CTI according to IEC 112 / VDE 0303 (PPE + PS-I: 300 CTI)
Flammability	Compliant with requirements for insulating materials in accordance with UL 94 V-1; Flame retardant and self-extinguishing (IEC 60695-11-10), halogen-free PPE-SB

Note: Some restrictions may apply in combinations of specific requirements

3.1 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!

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

3.2 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: ±3 mm; Y: ±5 mm (see Fig.1)
Current collector	X: ±10 mm; Y: ±10 mm (X: ±15 mm, Y: ±15 mm)
Force with which the current collector contacts the rail	3 N – 7.5 N (depending on current collector type, see Fig. 24 - Fig. 26)*

*Other tolerances must be observed depending on the current collector type

Current Collector Type	Max. Tolerance in X Direction	Max. Tolerance in Y Direction
Current collector in short-arm version with 40 mm and 63 mm contact length (081101-XXXX)	± 16 mm	± 20 mm
Current collector in long-arm version with 63 mm contact length (081102-XXXX)	± 30 mm	± 30 mm
Current collector for the EMS area	± 10 mm	± 10 mm

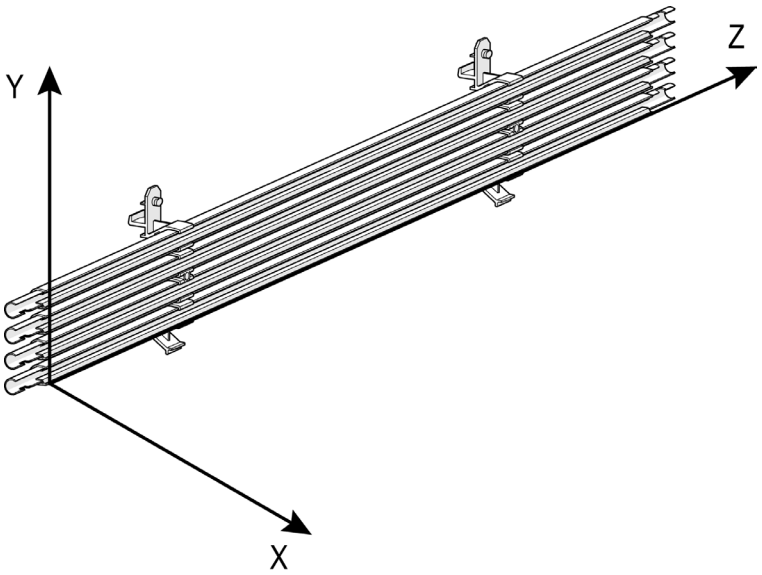


Fig.1 : Coordinate System Conductor Rail 0811

3.3 Unsuitable ambient conditions

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

- Operation at excessively high or low temperatures (<-10° C, > 55° C)
- In environments containing chemical substances or gases that can potentially permanently damage the conductor rail's materials (corrosion) or drastically impact on the insulation
- In ambient air that contains solvent vapors or aromatic compounds
- In ambient air that contains flammable or explosive gases or dusts
- In flammable or explosive materials in the vicinity, particularly below the conductor rail
- 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 dirty. Clean or dry as prescribed

→ Take the relevant measures to restore suitable operating conditions

4 Product Description and Mode of Operation

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 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 infeeds and then fed to the current collector. The 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 collector head through the contact point and to the mobile consumer through a connection cable on the current collector.

The SingleFlexLine 0811 conductor rail system is a modular conductor rail system 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 route of the track profile using a bending device (see Fig. 34 and Fig. 43).

The conductor materials are copper, stainless steel and, for simple, short systems, a version with galvanized steel. In contrast to typical, linear rail systems, electrified monorail systems (EMS), circular and oval tracks have multiple infeeds and with most small consumers, voltage drop is therefore not a critical factor. For the technical implementation of multiple feeds, the transition caps and end caps can be used as infeed points.

The Conductor Rail System 0811 uses proven and unique bayonet couplings, which is used by enlarging the rail notch as an expansion unit. Special expansion units are not necessary.

The connection to the power supply network is made via infeed connectors with a connection possibility on the bayonet component. Here, feed shoes with connection options (flat plug connection or crimp connection) are screwed onto the bayonet connector. In addition, the end caps or transition caps can be easily upgraded by using optional feed shoes as feeds.

Examples of applications are:

- Electrified monorail systems (EMS)
- Logistics shuttles
- Packaging machines
- Small-parts warehouses
- Panel storage systems
- Conveying systems in circular and oval arrangements
- …

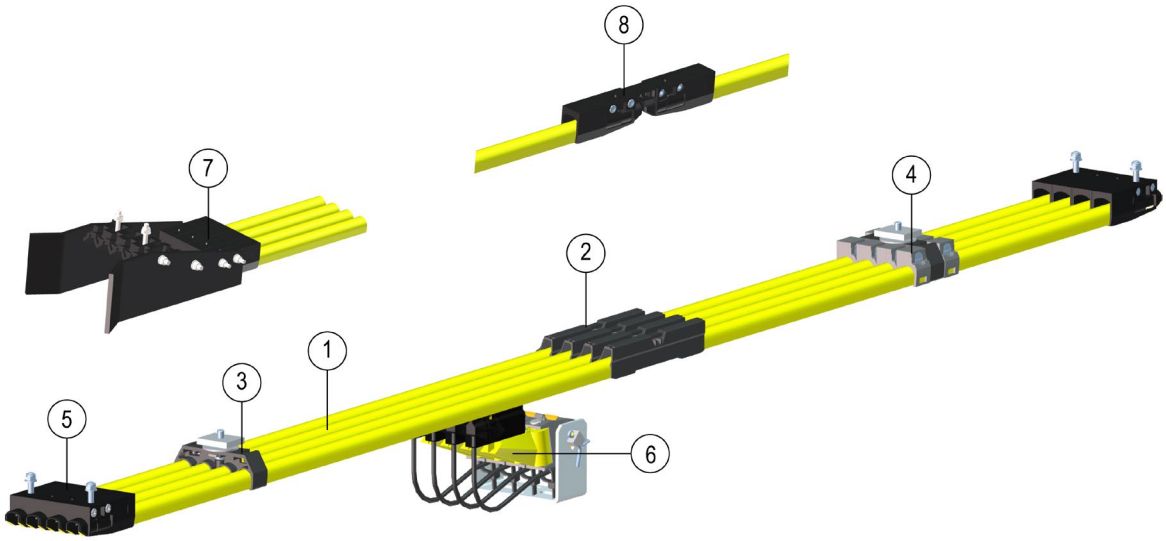


Fig. 2: System overview

Item	Name
1	Conductor rail
2	Rail connector (with bayonet connector)
3	Hanger clamp
4	Anchor clamp
5	End cap (with infeed possible)
6	Current collector
	Examples of additional modules
7	Pickup guide
8	Air gap

Single Pole Conductor Rail System

SingleFlexLine Program 0811

The rail track is straight or in curves. A distinction is made between horizontal and vertical rail arrangements

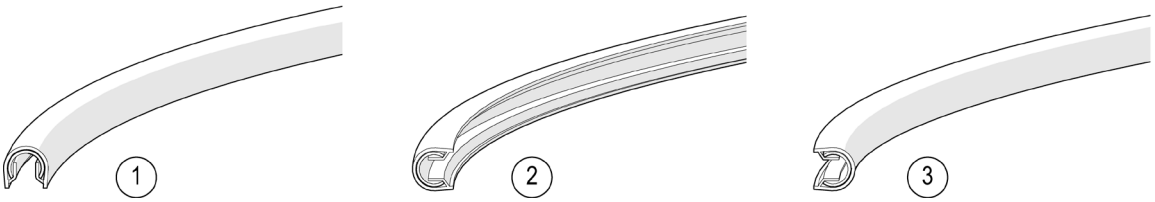


Fig. 3 Horizontal curves / Inner and outer curves (horizontal arrangement)

Item	Name
1	Horizontal curves
2	Inner curves
3	Outer curves

Use the QR Code ("click" or "scan") to watch our **SingleFlexLine 0811 System Overview** animation.

4.2 Interfaces

All details are in the catalog and the installation instructions and when applicable, in the system 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 generally secured by screws.
- The hanger clamp must be fastened to the track profile of the machine. The manufacturer/operator of the machine/system must take into account the required suspension intervals, the fastening positions and the loads. The fastenings are generally secured by screws or snap-fit connections.

Electrical interfaces:

- The head of the current collector is connected to the electrical system of the mobile consumer via a flexible connection cable. The connection cable can be supplied. The 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 plant 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 infeed. A single-core cable is connected in the infeed. Fastening is done via feed shoes and occasionally via plugs. The connection cable is not included in this delivery. The electrical design and integration into the overall electrical network are the responsibility of the plant manufacturer/operator.

4.3 Description of the components

The SingleFlexLine 0811 Conductor Rail System consists of:

- Hanger clamp (interface to the system engineer/operator's machine)
- Conductor rails
- Anchor clamps
- Current collector (interface to the system engineer/operator's machine)
- Rail connectors with bayonet connectors
- Rail connectors as expansion units
- Infeeds (interface to the system engineer/operator's machine)
- End caps/transition caps for conductor rails
- Air gaps
- Accessories (cross arms, cross-arm brackets, clamping brackets, outriggers) depending on the product range
- Tools: Bending device, notching and cutting tool, straightening mandrel and hanger clamp pliers

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 infeeds with electrical energy that mobile consumers can continuously tap using current collectors.

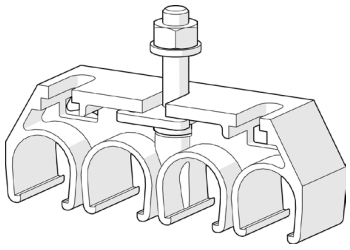


Fig. 4: Hanger clamp 0811 (screw-on, e.g.. on mounting bracket)

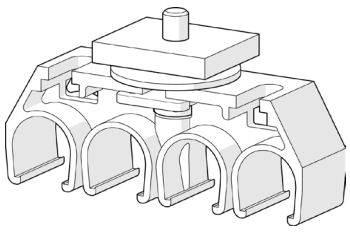


Fig. 5: Hanger clamp 0811 (with fastening components for C-rail)

- **Hanger clamp 08114*****

Hanger clamps for supporting the conductor rail. The hanger clamps are screw-on or intended for mounting on a C-rail.

The hanger clamps listed in the catalog are screw-on. In many cases, customer-specific hanger clamps that engage into the track profile or are screwed into it are used. The conductor rails slide into the hanger clamps longitudinally.

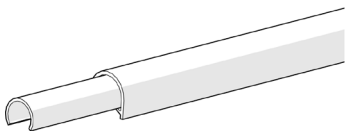


Fig. 6: 100 A solid copper conductor rail

- **Conductor rails 08111*****

Conductor rail with PVC insulation as PH and PE as well as PE_{plus} rails in 4000 mm. PE and PE_{plus}– rails are marked green/yellow. Phase rails are yellow.

Two PE conductor versions PE and PE_{plus} are available for the conductor rail system. For new systems, the PE_{plus} variant with error prevention is used. With PE_{plus} rails, the insulation is still open for a wider PE_{plus} sliding contact. The wider PE_{plus} sliding contacts largely prevent (without power impact / damage) the engagement of the sliding contacts in

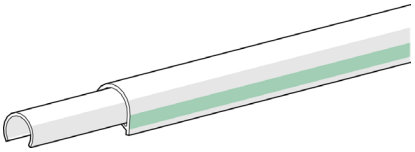


Fig. 7: 10 A Data metal conductor rail (PE pole shown)

a phase rail. PE_{plus} end caps are also open wider and are recognizable by their green color.

PH = Phase conductor

PE = Protective conductor

PE_{plus}= Protective conductor with error prevention

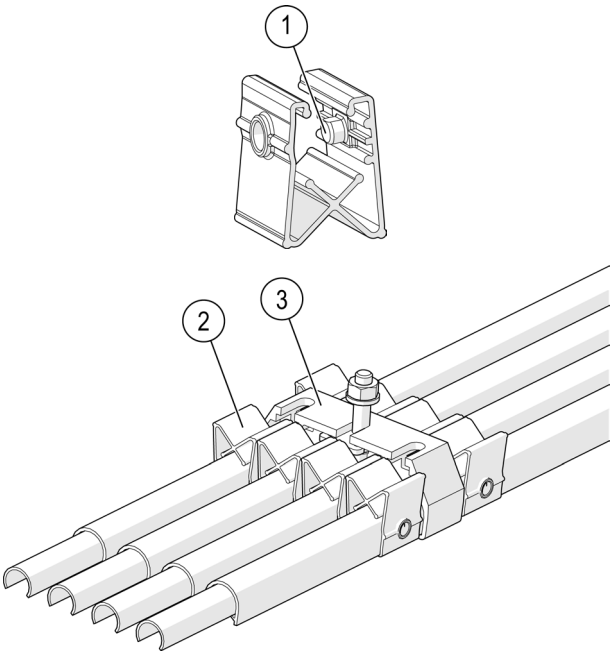


Fig. 8: Anchor point

- **Anchor point 081133**

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

The anchor point is clipped onto the rail, whereby the clamp fixes the engagement cam onto the rail.

1 = Engagement cam

2 = Anchor point

3 = Hanger clamp

- The anchor point must be used with a hanger clamp screwed to the guideway profile.

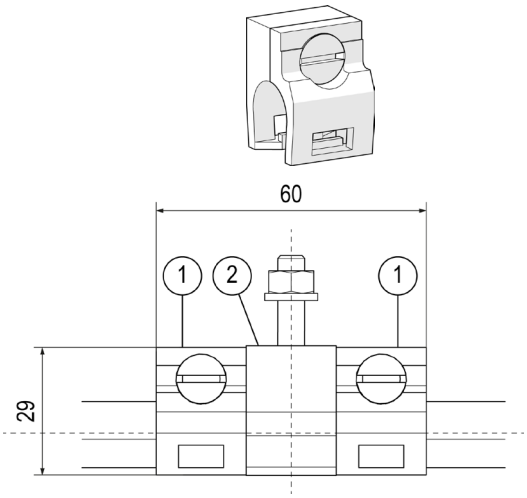


Fig. 9: Anchor point (securely seated)

- **Anchor point 081131 / 081132**

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

1 = Anchor clamp

2 = Hanger clamp

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

The component is clamped onto the rail by tightening the screw at the anchor point.

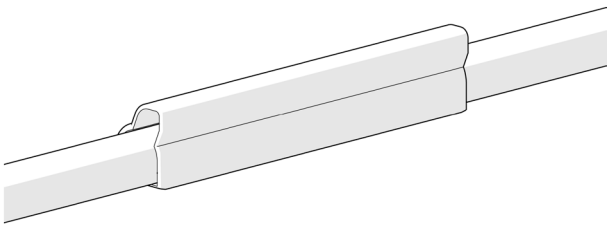


Fig. 10: Rail connector (one-piece for infeed up to 6mm²)

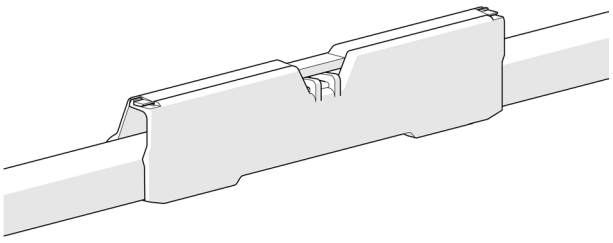


Fig. 11: Rail connector (two-part for infeed up to10 mm²)

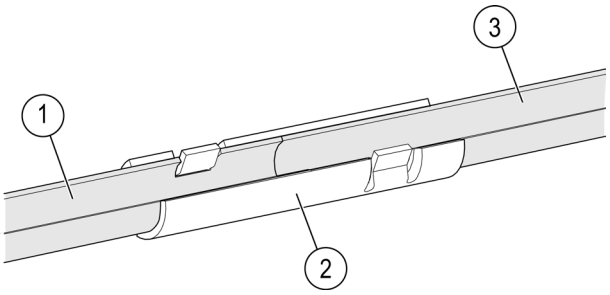


Fig. 12: Rail connector (illustration turned, view without connector cap)

- **Rail connector 08112*****

For the mechanical and electrical connection of the individual rail sections (quick installation with bayonet lock 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.

1 = Conductor rail
2 = Bayonet connector
3 = Conductor rail

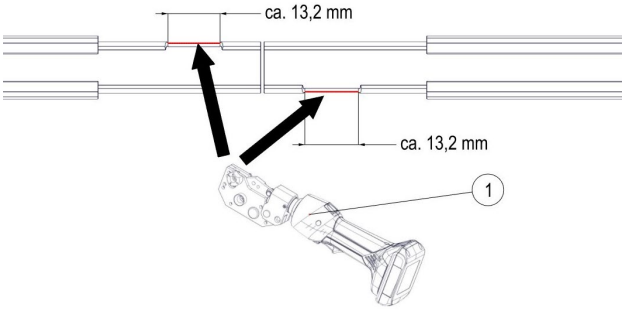


Fig. 13: Make a notch for expansion units with a notching and cutting tool (1)

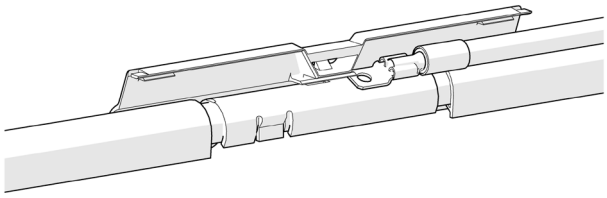


Fig. 14: Infeed connector with flat plug connection 35 A (not for PE/Protective conductor connection), 4-6 mm²

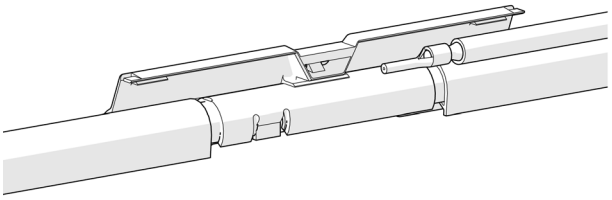


Fig. 15: Infeed connector with crimp connection 45 A and PE/Protective conductor connection, 4-6 mm²

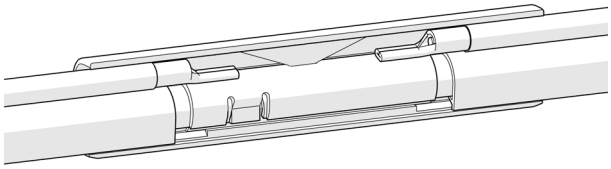


Fig. 16: Infeed connector with crimp connection 100 A and PE/Protective conductor connection, max.10 mm²

Rail connector as expansion unit

If the conductor rail is mounted, for example, in the support structure (substructure) of the crane runway or along the building structure, changes in length will result in changes in length of the track profile and the conductor rail. These different expansions due to the self-heating or irradiation of external heat sources must be compensated for in order to avoid compression or warping of the conductor rail.

The 0811 Conductor Rail System does not require any special expansion units; the rail connectors with bayonet connector 081121 and 081122 used simultaneously serve as expansion units. For use as an expansion unit, a wider notch is provided at the ends of the rail see Section 6.4.3.4. The wider notch is made with the specially developed notching and cutting tool (1) (Order No.: 08-W100-0602).

Infeed 08115

Power is supplied through a connector or end cap infeed. With the infeed via connector, it is possible to feed in at any point at the location of a connector. The connection is made by flat connectors (35 A) or crimp terminals (45 A and 100 A) for 1.5mm² - 10 mm² cable cross-section.

Another infeed option is via the end cap for a transfer or gap (4-6 mm²).

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

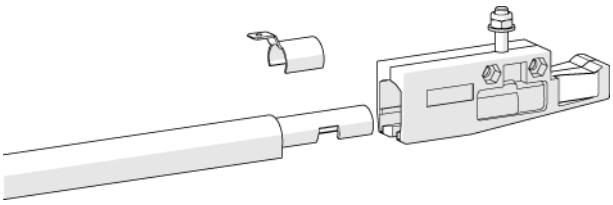


Fig. 17 End cap for rail ends and transfers

- **End cap for rail ends and transfers**

The end cap is used as a transfer element and insulating termination of a rail.

In conjunction with the feed shoes, the end cap can be used as a feed point.

Note: For protective conductor connections, use the feed shoes with crimped connection!

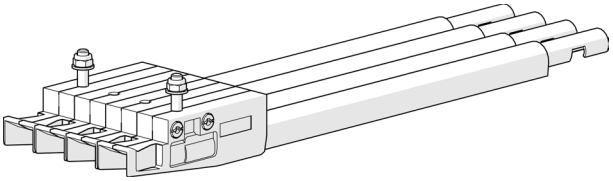


Fig. 18: End cap 081174

- **End cap 081174**

The end cap is used as a termination and contact protection of a free rail end and allows for the transfer of the current collector (sliding contact) between two separate rail sections.

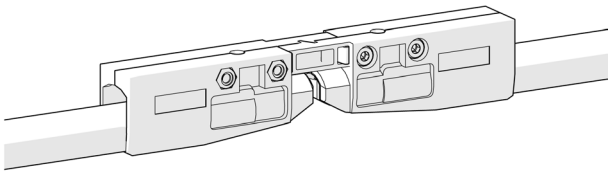


Fig. 19: Air gap

- **Air gap 08119* - ****

The air gaps are used for the electrical isolation of the conductor rail. The air gap consists of 2 opposing end caps that are connected by plugging together. The air gaps, like the end caps, provide an infeed option (see End caps / End cap units / Infeeds)

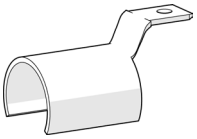


Fig. 20: Feed shoe with flat plug connection

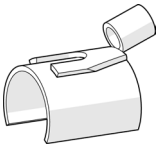


Fig. 21: Feed shoe with crimp connection

- **Feed shoe 081154-****

The end caps and air gaps can be upgraded by using optional feed shoes as infeeds.

The feed shoes are turned on the metal rail of the conductor bar of the conductor rail.

Feed shoe for DIN blade receptacle

- only for phase and control conductors, **not** for protective conductors
- Connection through DIN blade receptacle
- 35 A, max. 4-6 mm^2

Feed shoe for crimp connection

- only for phase, control and protective conductors
- Connection through crimp connection
- 45 A, max. 4-6 mm^2

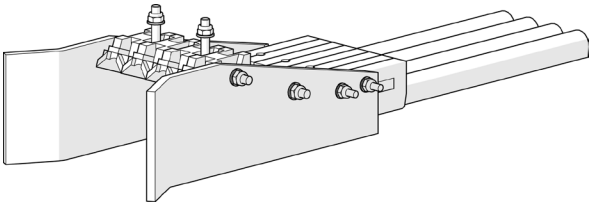


Fig. 22: Pickup guide short version

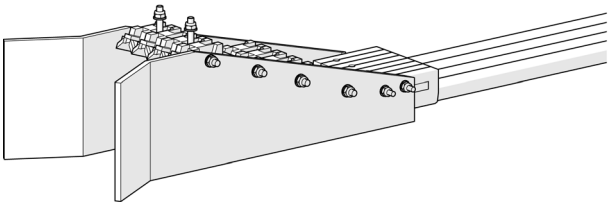


Fig. 23: Pickup guide long version

- **Pickup guide 081182-****

Pickup guides are used at transfer points with greater distances or as entry points for additional vehicles.

When using a hopper, spacers should be used on the collector head to keep the heads outside the conductor rail at pole distance. The hoppers are constructed as insulation components and are subject to the wear of the plastic treads.

For systems with pickup guides, there must be an appropriate number of current collectors installed at intervals that ensure that the exact number of current collectors required for the current demand is always engaged.

DANGER!

Hazard due to exposed current collectors!

The user must ensure that while the collectors are between pickup guides, they are de-energized or protected against accidental contact.

Current collector

Depending on application and function, different types of current collectors are used:

- Short-arm current collector with sliding contact lengths 40 and 63 mm
- Long-arm current collector with sliding contact lengths 40 and 63 mm
- Current collector with phase intervention protection PE^{plus}
- Special designs

Sliding contact material

- Copper graphite heads for higher current loads and systems with hoppers.
- Graphite carbons, preferably for low currents, and data signals, with higher running quality and low transfer resistance to the conductor rail, are not suitable for systems with hoppers/transfers with discontinuities (risk of breakage in the event of a collision).

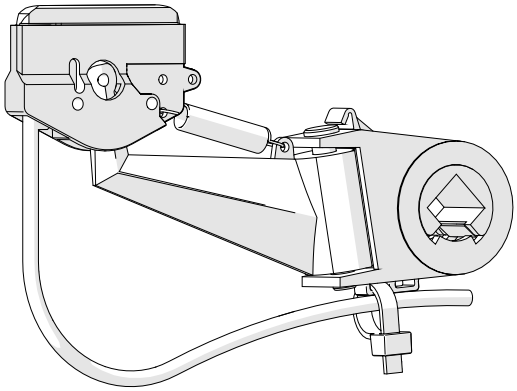


Fig. 24: Single current collector, short-arm version, 40 mm

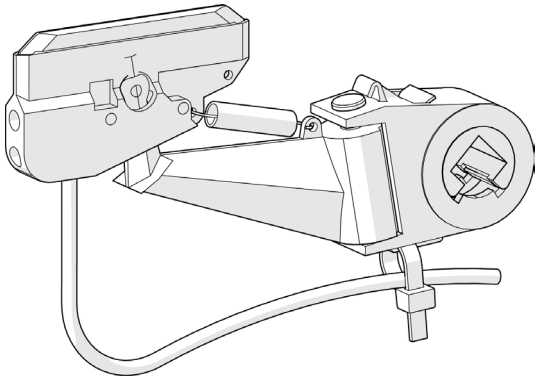


Fig. 25: Current collector 081101, short-arm version, 63 mm

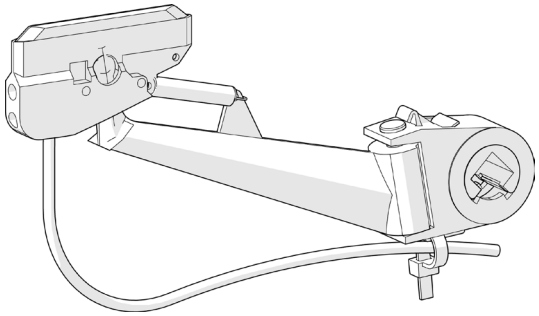


Fig. 26: Current collector 081102, long-arm version, 63 mm

- **Current collector (short-arm version)**

Current collector as a sliding electrical connection between conductor rail and the moving consumer. Usually designed as a multiple pole unit.

Short-arm version for compact installation situations and little rail deviation from the ideal line.

- Current collector 081101 in short-arm version with 40 mm sliding contact for 16 A and 40 A, contact pressure 3 N
- Current collector 081101 in short-arm version with 63 mm sliding contact for 16 A and 55 A, contact pressure 7.5 N

- **Current collector (long-arm version)**

Long-arm version for applications with larger deviations of up to max. 30 mm from the ideal line.

Current collector 081102 in long-arm version with 63 mm sliding contact for 16 A and 55 A, contact pressure 5 N

4.4 Accessories

The following accessory parts are specific, special components and can be additionally ordered from the manufacturer (see KAT0811-0002):

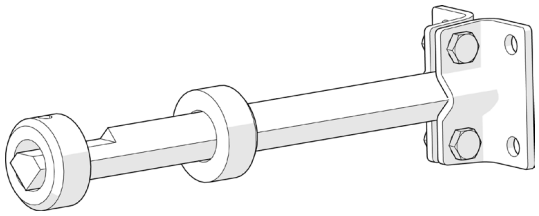


Fig. 27: Outrigger for current collector

- **Outrigger for current collector**

Outrigger for holding of max. 7 single current consumers. The current collector is positioned via the adjusting ring. The protective conductor-current conductor is positioned at the recess at the end of the outrigger arm.

The outrigger is attached to the vehicle via the flange with four screws.

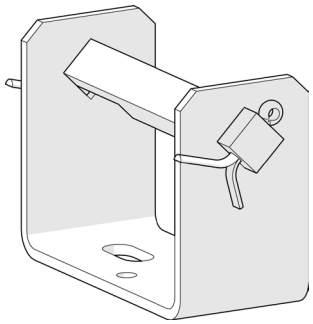


Fig. 28: Support bracket for single current collector

- **Support bracket for single current collector**

Different sizes are available depending on the number of poles. The single current collectors are positioned on the support bracket. The protective conductor-current collector can only be mounted in the outer position above the recess.

The support bracket is fastened to the vehicle with two screws.

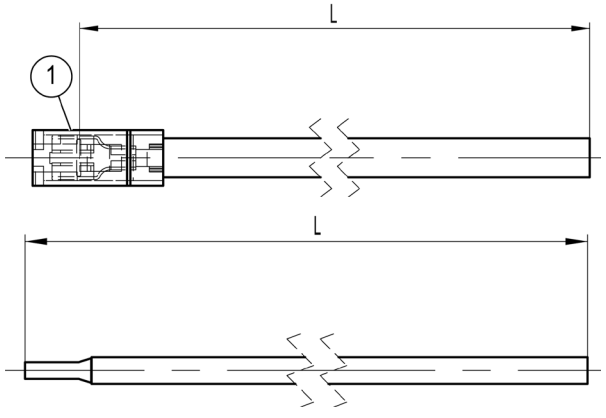


Fig. 29: Connection cable for current collector 081101/02

Connection cables for current collector 081101/081102

Connection cable assembled with AMP-connector for current collector with short sliding contact (40 mm), delivery length 1 m.

1 = AMP- connector (complete)

Connection cable (double insulated/highly flexible) assembled with cable end sleeve for current collector with long sliding contact (63 mm) delivery length 1 m.

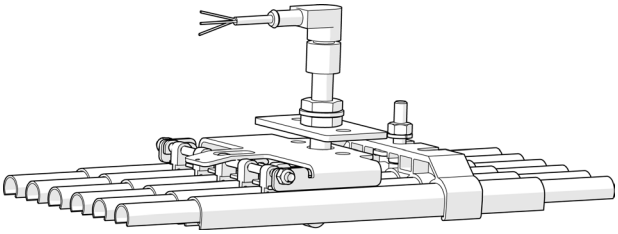


Fig. 30: Sliding contact sensor unit

- **Sliding contact sensor unit**

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

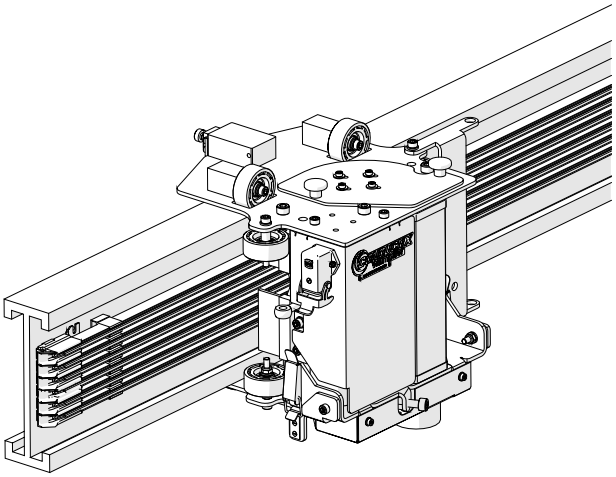


Fig. 31: Rail cleaner

- **Suction head / Conductor rail cleaning unit**

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

4.5 Special work tools

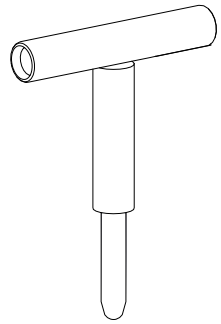


Fig. 32: Straightening mandrel (Order No.: 081083)

- **Straightening mandrel (Order No.: 081083)**

For straightening deformed conductor rails (Reasons for deformation can be damage during transport or after cutting the conductor bar).

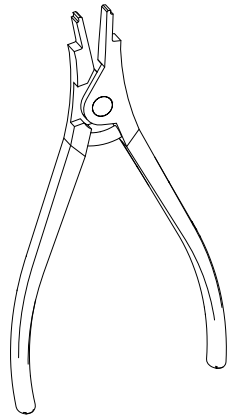


Fig. 33: Hanger clamp pliers (Order No.: 081085)

- **Hanger clamp pliers (Order No.: 081085)**

For disassembly of the conductor rail. The hanger clamps are bent in order to remove the rails.

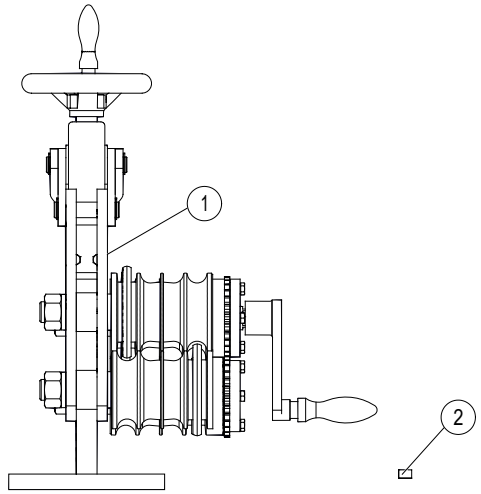


Fig. 34: Bending device (1) (Order No.: 081081) with plastic bending insert (2) (Order No.: 08-V015-0084)

- **Bending device (Order No.: 081081*)**

With this three-roll bending device (1) conductor rails with sliding insulation profiles can be bent in all four directions. By adjusting the upper adjustment spindle, every curve with a bending radius of 500 mm to ∞ vertical and 1500 mm to ∞ horizontal can be produced on site.

Smaller bend radii are available on request. In order to avoid deformation during a lateral bending of the rail, the supplied plastic bending insert (2) (Order No.: 08-V015-0084) must first be inserted into the rail and pulled out again after the bending process.

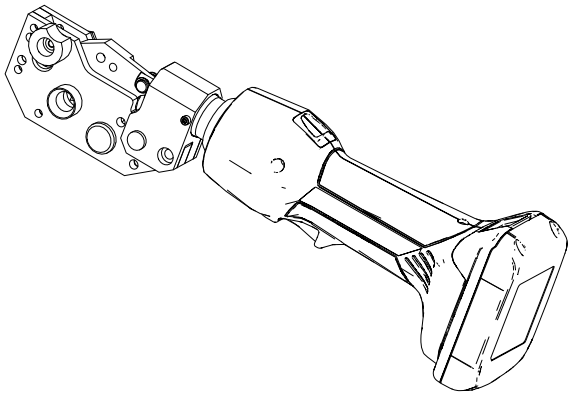


Fig. 35: Notching and cutting tool
(Order No.: 08-W100-0602)

■ **Notching and cutting tool (Order No.: 08-W100-0602)**
When cutting conductor rails to length for fittings or cutting points, etc., new notches for the bayonet connection must be made at the cut end of the rail. The enlargement of the normal notch for the expansion units is also realized with this tool.
The electrohydraulic tool enables precise and ergonomic cutting and connector notching at the conductor rail ends.
The tool is based on the Klauke device series and uses Makita battery technology to ensure a worldwide supply of replacement batteries and replacement parts.

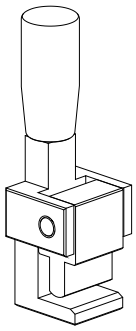


Fig. 36: Drilling jig for PH/PE rails

■ **Drilling jig for anchor points with pins (Order No.: PH and PE: 08-V015-0502-001, PE_{plus}: 08-V015-0502-002)**
If an anchor point with pins is used, a hole for the anchor point pins must be drilled into the insulation profile.
The drilling jig is for the PH/PE and PE_{plus} rails..

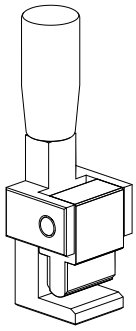


Fig. 37:Drilling jig for PE_{plus} rails

5 Transport, Packaging and Storage

5.1 Safety

Recommended protective equipment:

DANGER!

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

→ Ensure that lashing components are properly 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 before leaving the workplace

→ Cordon off the work area

→ Work carefully when working in the vicinity, particularly below the conductor rail system

DANGER!

Risk of injury by crushing of 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 injury due to conductor rails sliding out!

Risk of injury due to conductor rails sliding out when the packaging units are held at an angle or through carelessness with long loads.

→ Wear personal protective equipment!

→ Cordon off the work area!

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

WARNING!

Risk of injury from cuts and cutting off!

Cuts and cuttings off can occur:

- On the packaging material (e.g.: cartons, bands, etc.)
- On sharp edges of the conductor rail

→ Wear personal protective equipment!

WARNING!

Risk of puncture wounds and cuts!

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

→ Wear personal protective equipment!

ATTENTION!

Damage due to 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

→ Only use the attachment points provided

→ Only remove packaging shortly before installation

5.2 Transport

Immediately upon receipt, check the delivery for completeness and transport damage

If transport damage is externally visible, proceed as follows:

- Do not accept delivery, or accept it only conditionally
- Note the scope of damage on the transport documents, or on the transporter's delivery note
- Initiate a complaint with photos of the damage, if possible

ATTENTION!

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

5.3 Packaging

The individual packages are packed appropriately for the expected transportation conditions.
The packing has the function of protecting the individual components against damage, corrosion, etc., until they are finally installed. Hence, do not destroy the packaging; remove it only shortly before installation.

Handling packaging materials:
Dispose of packaging material according to applicable legal regulations and local guidelines.

CAUTION!

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

Store packaged parts 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: -30 to +40° C
- Relative air humidity: Maximum 60 % without condensation
- In case of a storage time of more than 3 months, check the general condition of all parts at regular intervals. If necessary, refresh or replace the preservative.

ATTENTION!

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

→ Follow the instructions accordingly

6 Installation

6.1 Safety

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

Recommended protective equipment:

WARNING!

Risk of death due to suspended loads!

Falling loads can cause serious injuries or even death.

→ Never walk under suspended loads

→ Only move loads under supervision

→ Set down the load before leaving the workplace

→ Wear personal protective equipment!

DANGER!

Risk of injury from improper installation!

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

→ Before starting work, make sure there is sufficient space for the installation

→ Handle open, sharp-edged components carefully

→ Ensure the installation area is clean and tidy! Loosely stacked or scattered components and tools are a source of hazards

→ Install components properly. Comply with the specified screw tightening torques

DANGER!

Poisonous gases during fire!

In case of fire in the facility, the plastic parts (PVC) of the conductor rail system emit poisonous gases (HCl).

→ The system operator must take this into account accordingly when planning and take the appropriate protective measures

→ The building must be evacuated immediately

→ Notify the fire department

DANGER!

Risk of injury by crushing of 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, dismantling and maintenance
- Falling conductor rail system components, if they have not been properly installed or if operated under inappropriate operating conditions (e.g., environment that contains solvents)

→ Only allow installation to be conducted by trained technicians

→ When changing the sliding contacts, observe the separate documentation.
See Section 12.1

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

→ Wear personal protective equipment!

DANGER!

Risk of injury due to ensnarement or impact!

An 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, in particular if protective devices (covers, enclosures, control devices) have been removed or disabled

→ Use caution when working in the vicinity of the danger zone, in particular below the conductor rail

→ Wear personal protective equipment!

DANGER!

Risk of injury due to cutting and cuttings off!

Cuts and cuttings off 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!

DANGER!

Risk of puncture wounds and cuts!

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

→ Wear personal protective equipment!

→ Cordon off the work area!

DANGER!

Risk of injury due to conductor rails sliding out!

Risk of injury due to conductor rails sliding out when the packaging units are held at an angle or through carelessness with long loads.

→ Wear personal protective equipment!

→ Cordon off the work area!

DANGER!

Risk of death by electrocution!

Contact with components carrying electrical power can lead to death or severe injury by electrocution. Danger 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 electricity supply infeeds

→ Check whether a voltage is still present in the components and take measures where necessary

→ Attach a sign stating "Risk of Death by Electrocution" with the relevant hazard symbol in all areas with live components

→ The customer must ground metallic components

→ The customer must provide protective devices

→ Make sure there is sufficient stability in the area

WARNING!

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

NOTE!

Secure components against falling!

Possible falling components must be determined in the customer analysis as part of the operator's risk and hazard analysis.

→ The operator must take appropriate measures

6.2 Providing additional protection against accidental contact at the conductor rail end

An end cap is attached to the conductor rail end as protection against accidental contact. When using dual current collectors, one of the sliding contacts, which **will be live**, might protrude from the end cap of the conductor rail. Touching this sliding contact may cause injury from an electric shock as a result of falling or being thrown across the room. The system operator must ensure that the current collector does not project, instead remaining within the conductor rails, or must make the danger area inaccessible (e.g., by providing protection against accidental contact).

DANGER!

Take structural protective measures!

→ Use control technology to ensure that the current collector never travels beyond the end of the conductor rail or

→ Install additional contact protection, which covers the sliding contact when leaving the contact rail

DANGER!

Alert personnel to the hazard!

→ Attach a sign stating "Risk of Death by Electrocution" with the relevant hazard symbol in all areas with live components

6.3 System layout

The following illustration provides an overview of the arrangement of the components and distances in the Conductor Rail System 0811:

Conductor rail system with screw-on hanger clamps on C-rails

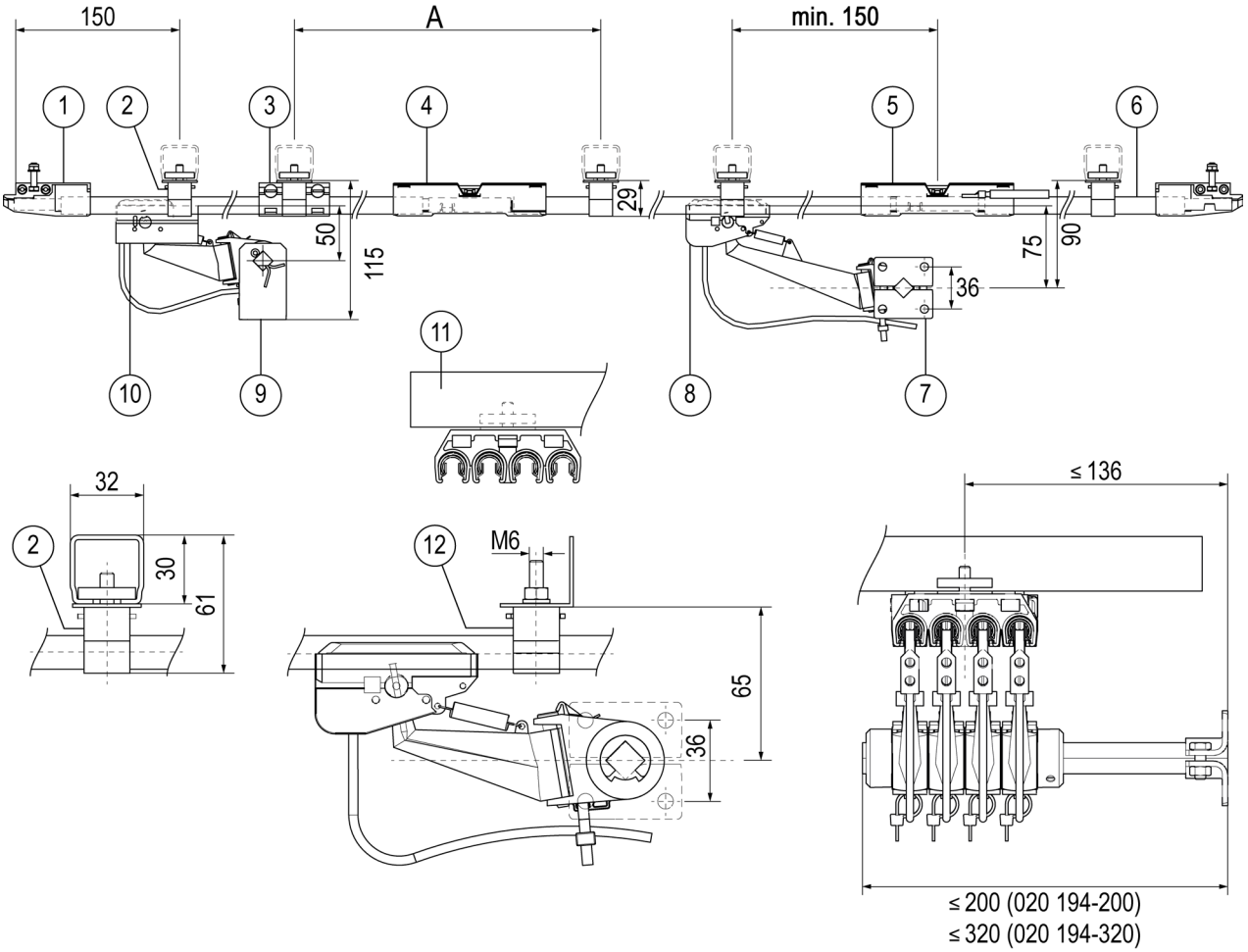


Fig. 38: Components in a conductor rail system

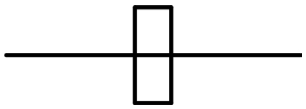
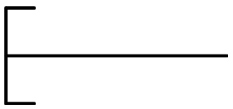
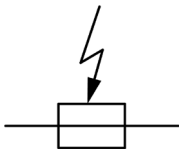
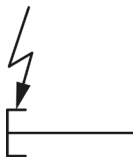
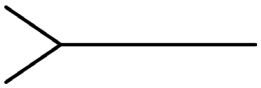
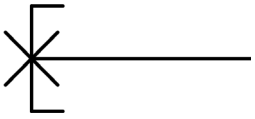
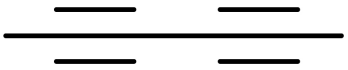
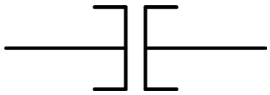
1	End cap
2	Hanger clamp (mounting on C-rail)
3	Anchor clamp
4	Rail connector
5	Infeed
6	Conductor rail
A	See Table 2 in Section 6.4.3.1

7	Outrigger for current collector
8	Current collector (long-arm)
9	Support bracket for current collector
10	Current collector (short-arm)
11	C-rail
12	Hanger clamp (mounting on angle)

Single Pole Conductor Rail System

SingleFlexLine Program 0811

Legend of the symbols in the installation plan:

Symbol	Meaning	Symbol	Meaning
	Conductor rail		Hanger clamp
	Connector		End cap
	Section infeed		End feed
	Pickup guide		Anchor point
	Hanger clamp as anchor point		End cap as anchor point
	Hanger clamp with right and left anchor points		Expansion unit
	Air gap		

Use the QR Code ("click" or "scan") to watch our **SingleFlexLine 0811 System Overview** animation.

6.4 Installation of mechanical components

6.4.1 Required tools

- Standard tools:
  - Measuring tape
  - Calipers
  - Scribe
  - Cutting tool (e.g., precision saw): Precision saw with special saw blade for aluminum profiles and aluminum plates (e.g., Festool** Special Saw Blade 216x2.3x30 TF64 (Number of teeth 64) or Bosch Expert for Aluminum 216x2.8x30 HW64 (Number of teeth 64))
  - File for deburring cut edges after trimming
    - Precision finishing file, grade of cut ≥ 3
  - Cordless drill and countersink bit
  - Screwdriver set
  - Allen key S 3 and S 5
  - Straightening mandrel (for bending deformed conductor rails)
  - Rail holding clamp pliers (for bending deformed conductor rails), (Order No.: 081085)
- Special tools:
  - Bending device (Order No.: 081181)
  - Straightening mandrel (for straightening deformed conductor rails) (Order No.: 081083)
  - Hanger clamp pliers (for straightening deformed conductor rails) (Order No.: 081085)
  - Notching and cutting tools (for trimming the conductor rail and notching the rail end, for making bayonet connector notches for the rail connectors as well as making the notching for the expansion units. (Order No.: 08-W100-0602)
  - Torque wrench (3 Nm) with 5 mm Allen key for rail holding clamp

Personnel:

- Installation only by technical personnel, at least 2 persons

6.4.2 Customizing components

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

ATTENTION!

Do not adapt the conductor rail where it is installed (cut to length, bend, etc.); do the work at a separate workstation!

6.4.2.1 Trimming a conductor rail

The conductor rail has a standard length of 4000 mm. Shorter lengths are available but are usually produced on the construction site.

Required tools:

- Notching and cutting tools (Order No.: 08 W100-0602)
- File for deburring the ends e.g., precision finishing file with grade of cut ≥ 3
- Precision saw with special saw blade for aluminum profiles and aluminum plates (e.g., Festool** Special Saw Blade 216x2.3x30 TF64 (Number of teeth 64) or Bosch Expert for Aluminum 216x2.8x30 HW64 (Number of teeth 64))
- Jack pliers

Working steps when using a precision saw:

→ Cut the conductor rail and insulation to the desired length from the grinding area using the notching and cutting tools or a precision saw.

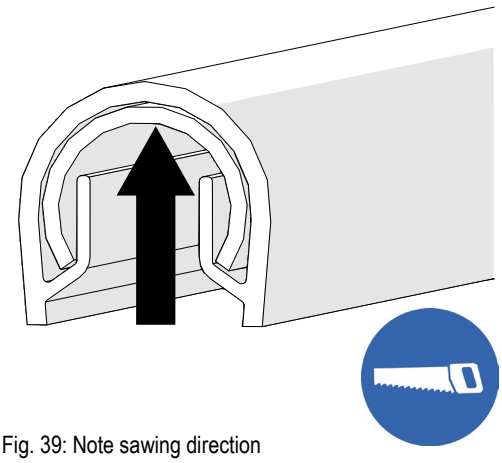


Fig. 39: Note sawing direction

→ Deburr the sawed end with a smooth file. Chamfer the contact surface on the entire rail base approx. 0.3–0.4 mm by 15° to ensure a problem-free passage of the sliding contacts over the rail joint.

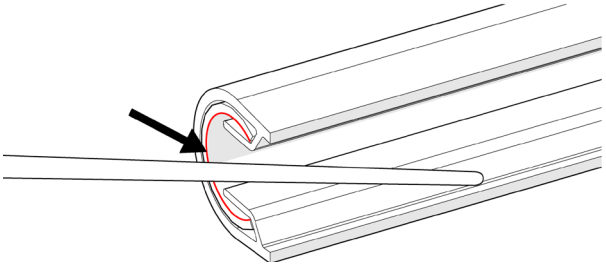


Fig. 40: Deburr the conductor rail with a smooth file

ATTENTION!

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

A sharp edge and/or burr can quickly wear away the sliding contacts.

→ Remove the insulation at the shortened end to 40 mm from the conductor rail (must be 40 mm shorter at both ends). To do this, move the insulation beyond the conductor bar and cut to length with a precision saw. Push insulation back.

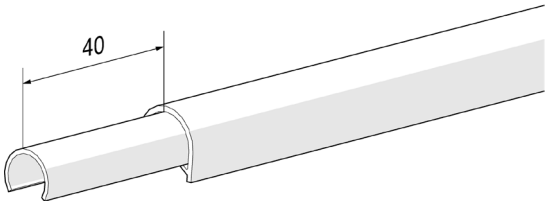


Fig. 41: Cut the insulation

→ If the conductor end is required for a connection, this must be disengaged with the notching and cutting tools in order to engage the rail with the bayonet lock.

→ Clean the insulation profile thoroughly and remove sawdust.

→ Straighten any bent rail ends with the straightening mandrel (Order No.: 081083) or a pair of pliers.

Use the QR Code ("click" or "scan") to watch our **Cutting Rails and Make Notches for Connectors** animation.

6.4.2.2 Making a curve in the conductor rail

Read and follow the additional operator instructions!

The bending of the conductor rail is described in detail in document - BAL0800-0004!

For the production of horizontal and vertical curves, it is recommended to use the bending device (Order No.: 081081).

Conductor rail curves can be fabricated in the factory or on site. They are manufactured using the Bending Device 081181. For large installations, electrically powered bending devices are available upon request. For extensive installations, request our technical advice!

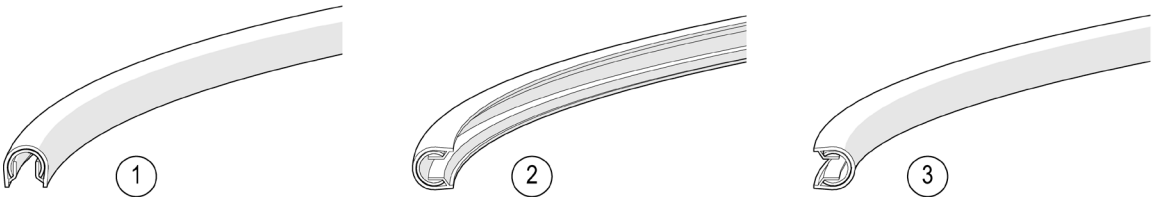


Fig. 42 Horizontal curve / Inner and outer curve (horizontal arrangement)

Item	Name
1	Horizontal curve
2	Inner curve
3	Outer curve

Suspension distance and bending radii of bends in horizontal and vertical curves

		Engagement direction of the current collector	
Curve	**Material conductor line**	**Vertical (from below)**	**Horizontal (from the side)**
Horizontal curve	**Galvanized steel rail** **Data metal rail**	**Horizontal curve** Bend radius ex works: > 1,500 mm Bend radius installation location: > 2,000 mm	**Inner curve/Outer curve** Bend radius ex works: > 900 mm Bend radius installation location: > 1,200 mm
	Copper rail	**Horizontal curve** Bending radius ex works: > 960 mm Bending radius installation location: > 1,500 mm	**Inner curve/Outer curve** Bend radius ex works: > 260 mm Bend radius installation location: > 500 mm
Vertical curve	**Galvanized steel rail** **Data metal rail**	**Inner curve/Outer curve** Bend radius ex works: > 900 mm Bend radius installation location: > 1,200 mm	**Horizontal curve** Bend radius ex works: > 1,500 mm Bend radius installation location: > 2,000 mm
	Copper rail	**Inner curve/Outer curve** Bend radius ex works: > 260 mm Bend radius installation location: > 500 mm	**Horizontal curve** Bend radius ex works: > 960 mm Bend radius installation location: > 1,500 mm

Tab. 1: Bend radii for conductor line

A straight piece of approx. 65 mm is required at the end of the curves in each case so that the connector can be mounted!

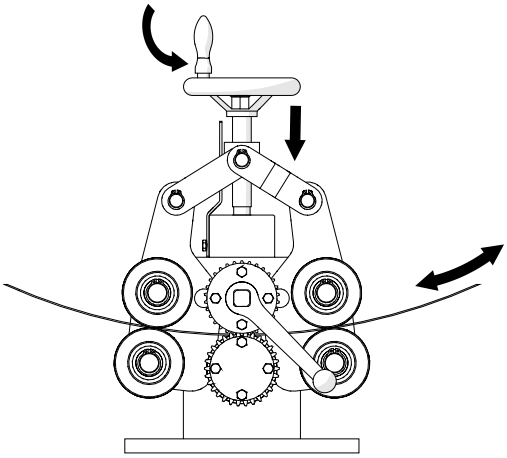


Fig. 43: Bending device (081081)

Work steps:

→ Scribe the required curve on a flat surface (e.g., the floor).

→ Using the setting spindle, move the upper curve roller upwards until the rail section can be inserted into the cutout provided in the bending device.

→ Adjust the position of the bending roller downwards 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 different curves (horizontal/vertical) (see BAL0800-0004).

ATTENTION!

Conductor rails can become deformed when bent!

→ Check conductor rail curves for the correct profile as 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 curve without jamming

→ For PE_{plus} conductor rail, use a PE_{plus} current conductor with a wider sliding contact

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

6.4.3 Installing the conductor rail system

Procedure for the installation:

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

Work steps:

→ Indicate the positions/installation locations on the substructure for infeed, customer's anchor points, junction boxes, expansion points, isolating gaps in accordance with the system layout and layout plan.

→ Prepare the infeed and section transfers.

→ Installing the conductor rail (see Section 6.4.3.2).

→ Install conductor rail sections including cut sections, lifters, conductor rail curves and anchor points.

→ Check the mechanical installation.

Test steps to be performed during installation:

→ Check the design against the layout and layout plan.

→ Maintain the hanger clamp intervals; the rails must be properly engaged in the hanger clamp.

→ All transfers and curves must be tested for functionality. Current collectors must not jam when passing through. Check for free passage with a single current collector. Rail end deformations are to be removed e.g., with the hanger clamp pliers (Order No.: 081085).

→ Cable routing (laying, marking, etc.) must be checked.

→ Check horizontal and vertical deviation of the conductor rail system! The deviation from the ideal line may be max. ± 5 mm.

6.4.3.1 Install hanger clamps

The following distances must be observed when installing the hanger clamps:

Conductor rail (Standard length 4 m)	Max. Suspension distance in monorail systems	
	in straight sections	with curves
Steel rails and data metal rails	0.8 m	0.4 m
Copper rail	0.5 m	0.4 m

Tab. 2: Hanger clamp installation distances

→ The suspension distance of the first hanger clamp is max. 150 mm from the end of the pickup guide or end cap. Each subsequent hanger clamp is installed in uniform distances (see Table 2).

→ At transfers and connection points, a minimum distance to end caps, connectors and expansion units should be within a range of 100 mm to 200 mm. Here, the hanger clamps must be set in such a manner that with an expansion of the system, collisions between the hanger clamps and other system components are avoided.

There are several types of hanger clamps and customer-specific solutions. The following describes the two most common types:

- Clip-on hanger clamps in EMS profiles
- Standard hanger clamps for screwing on

Clip-on hanger clamps in EMS profiles

Clip-on hanger clamps are clipped onto the EMS profile at specific distances (see Table 2). The hanger clamps are individually adapted to the customer profile to allow for a quick installation. The hanger clamps can use the full height of the profile or existing mounting holes.

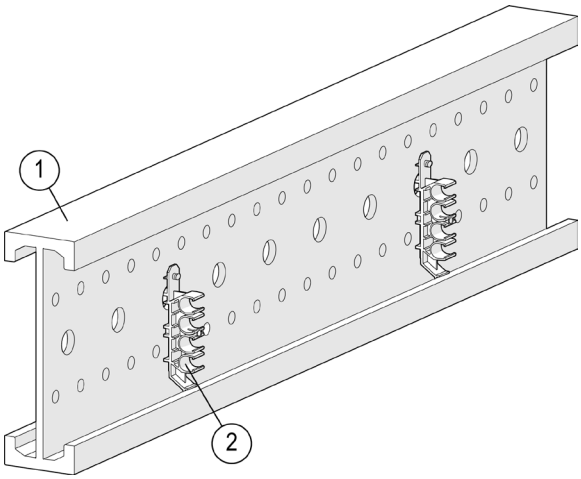


Fig. 44: Clip-on hanger clamps on EMS profile with existing holes (example)

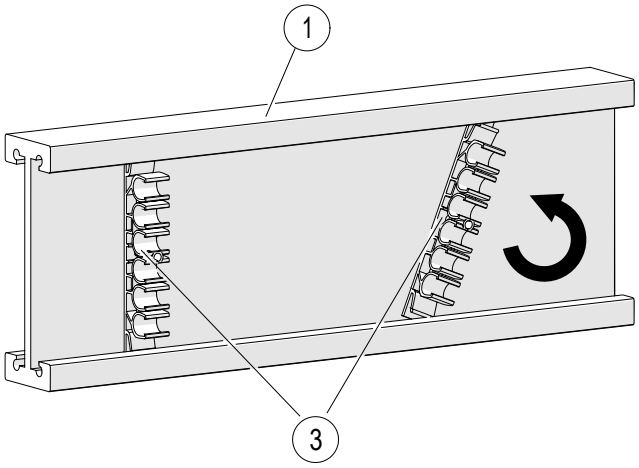


Fig. 45: Clip-on / Screw-in hanger clamp on EMS profile without existing holes (example)

Item	Name
1	EMS profile
2	Clip-on hanger clamp (for existing holes)
3	Clip-on/Screw in hanger clamp (for installation in guideway profile groove)

Work steps:

→ Install the hanger clamps by clipping on or screwing them into the EMS profile.

After mounting the hanger clamps, they must be checked for tightness. The hanger clamp should sit firmly but without too much tension in the track profile. Frequently, the hanger clamps only become firmly seated in the EMS profile when the conductor rails have been installed.

Contact Conductix-Wampfler if the hanger clamps are not tight.

ATTENTION!

When installing, 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 profile.

The hanger clamps must not be freely displaceable!

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Standard hanger clamp for screwing on:

Screw-on hanger clamps are fastened to the customer's support structure (substructure) with threaded screws or square nuts for mounting on Conductix-Wampfler C-rails or clamping arms.

Work steps:

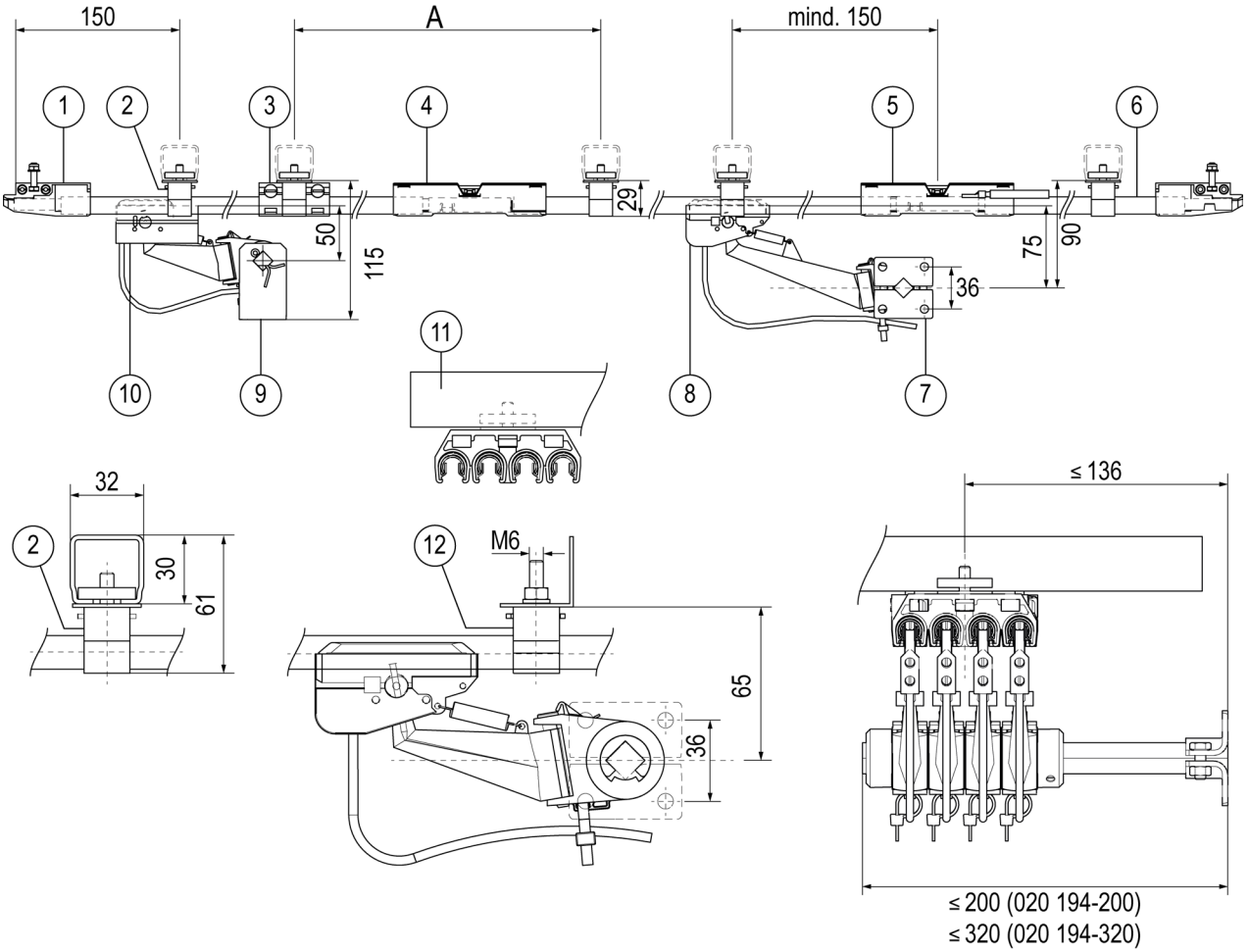


Fig. 46: Components in a conductor rail system

1	End cap
2	Hanger clamp (mounting on C-rail)
3	Anchor clamp
4	Rail connector
5	Infeed
6	Conductor rail
A	See Table 2 in Section 6.4.3.1

7	Outrigger for current collector
8	Current collector (long-arm)
9	Support bracket for current collector
10	Current collector (short-arm)
11	C-rail
12	Hanger clamp (mounting on angle)

→ Define hanger clamp position according to system layout.

→ Screw on hanger clamp at the specified distance. The minimum distances to other components must be observed (see Fig. 46).

→ Tighten the screws of the hanger clamps to a torque of max. 3 Nm.

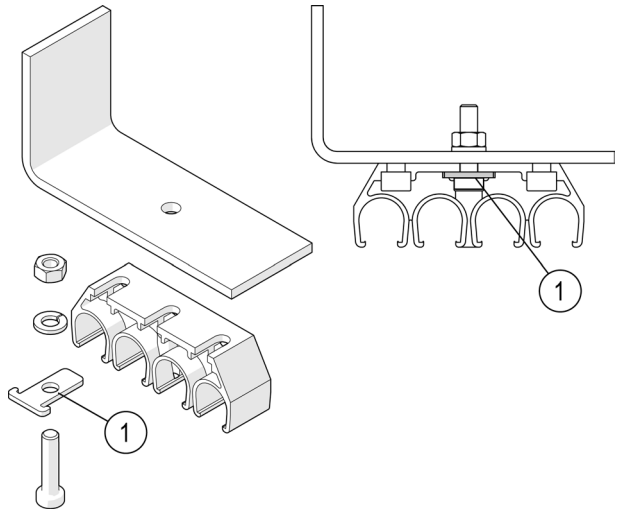
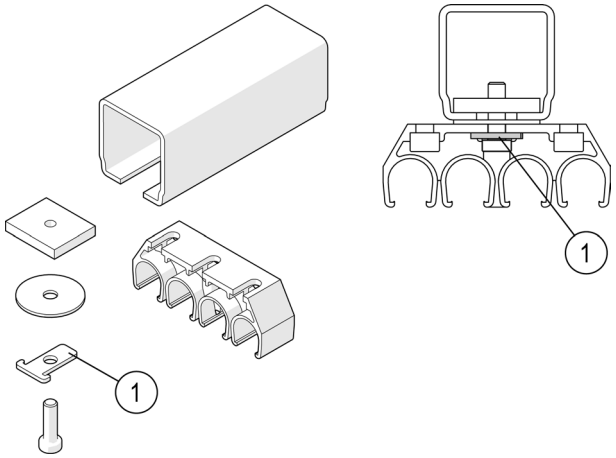
Mounting with angle to substructure	Mounting on C-rail or clamping arm
	

Fig. 47: Screw-on hanger clamps with insert (1)

ATTENTION!

In order to avoid overloading the hanger clamps in the area of the screw connection, a special insert (1) is provided for distributing the clamping force. Mounting without this insert can lead to failure of the connection and is not permitted.

NOTE!

For systems that are operated in towing mode, Conductix-Wampfler recommends mounting the insert (1) in the preferred direction of travel of the current collector (see Fig. 48)!

If the current collector collides with the hanger clamp, the plastic of the hanger clamp presses against the insert (1) and is therefore not pushed away.

If the hanger clamp is mounted against the preferred current collector travel direction (see Fig. 49), the hanger clamp is no longer anchor and is pushed away.

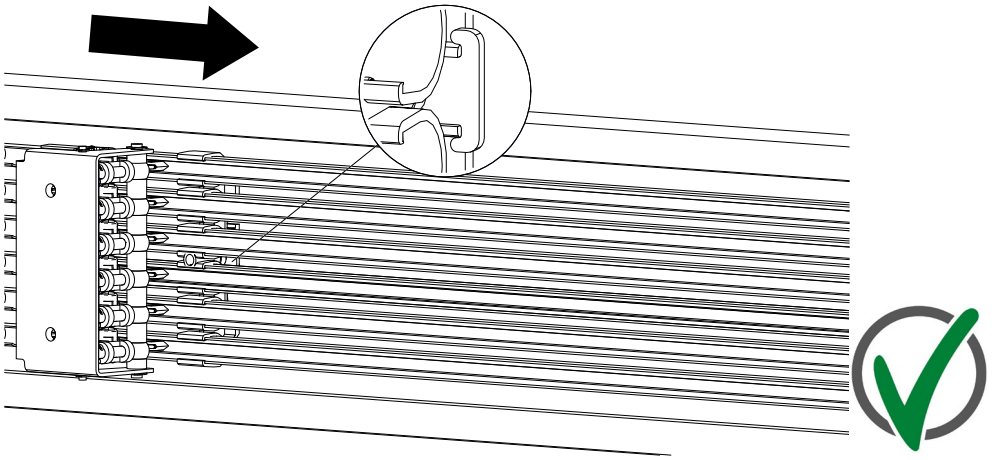


Fig. 48: Insert is mounted in the travel direction of the current collector

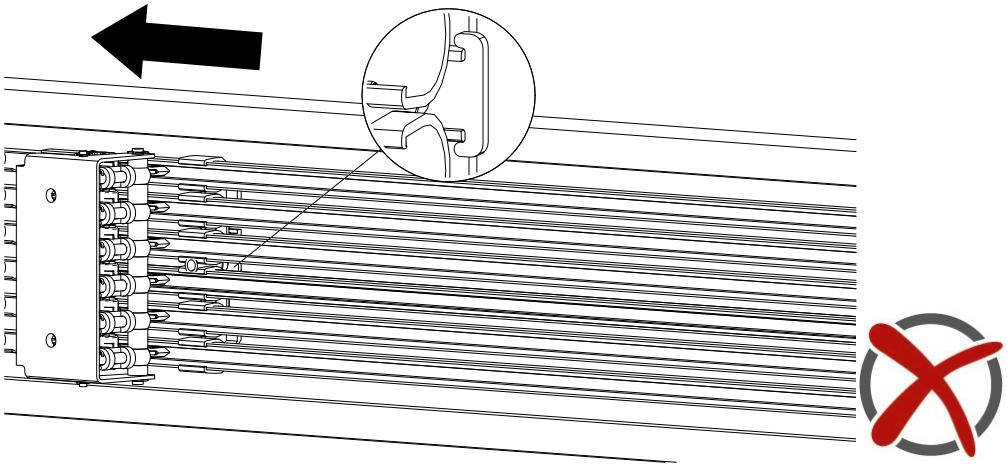


Fig. 49: Insert is mounted against the travel direction of the current collector

Use the QR Code ("click" or "scan") to watch our **Mount Hanger Clamp (clip-on, screw-on and screw-in)** animation.

6.4.3.2 Mount the conductor rail

NOTE!

Secure components against falling!

Possible falling components must be determined in the customer analysis as part of the operator's risk and hazard analysis.

→ The operator must take appropriate measures

Work steps:

→ Mount the conductor rail according to the system layout (observe the position of the phases and protective conductor).

→ Screw the first conductor rail into the hanger clamps. Ensure that the conductor rails clip in correctly and the hanger clamp covers the insulation profile above and below (see Fig. 52). The hanger clamps are elastic and thus allow easy clipping on/screwing in of the conductor rail into the hanger clamp.

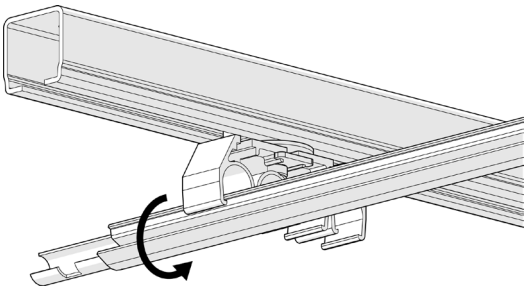


Fig. 50: Screw rail into hanger clamp

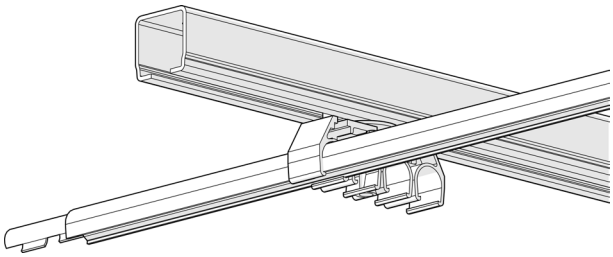


Fig. 51: Rail screwed into hanger clamp

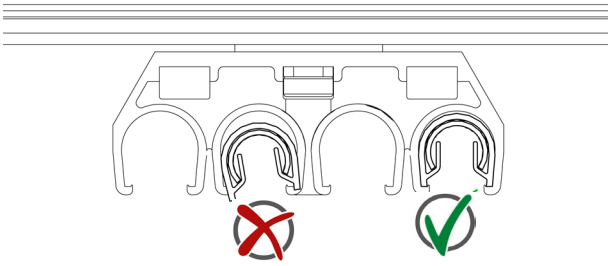


Fig. 52: Comparison of correctly and incorrectly engaged rail

→ Mount all additional poles in the same way.

To simplify the installation of the subsequent conductor rail, it makes sense not to clip on the last two meters of the current conductor rail. This provides better accessibility when connecting the conductor rail (also with EMS profiles).

6.4.3.3 Installing the rail connector

The mechanical and electrical connection of the conductor rail is made by means of a connector consisting of a bayonet connector and a cap. If connectors with one-piece connector caps are used (see Fig. 53), these must be pushed onto the conductor rail **before** mounting the rail connectors on the rail ends. After installing the connector, slide the connector cap back onto it (see Fig. 58).

Two-piece connector caps (see FigFig. 54) can be installed after assembly of the connector by plugging them together. The connector cap must audibly click into place.

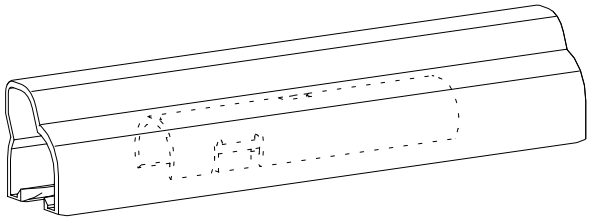


Fig. 53:One-piece connector cap with bayonet connector

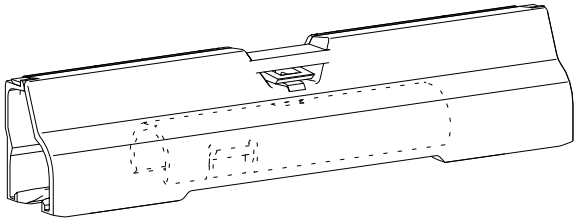


Fig. 54: Two-piece connector cap with bayonet connector

For shortened conductor rails, the recess at the shortened end must first be disengaged for the notching and cutting tools (see documentation for the notching and cutting tools MV0811-0018).

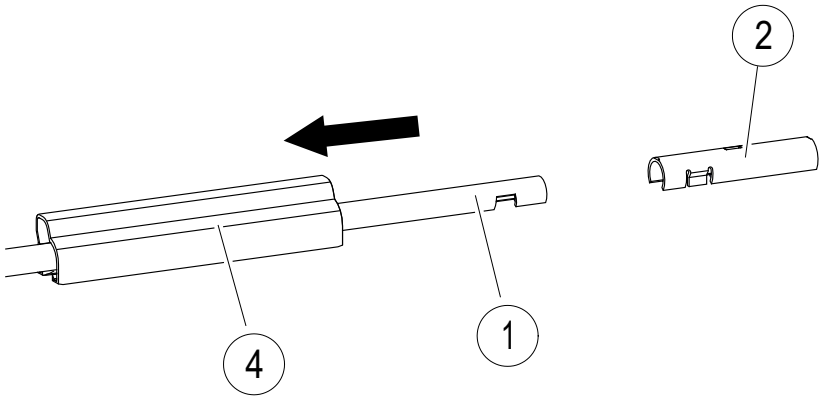


Fig. 55: Slide in one-piece connector cap

Work steps:

→ Slide the bayonet connector (2) onto the conductor rail (1) so that the tab (B) and the notch (A) are at the same height (see Fig. 56).

→ Turn the bayonet connector (2) 90° so that the tab (B) snaps into place (see Fig. 56).

→ Slide the second conductor rail (3) into the bayonet connector so that the tab (B) and the notch (A) are at the same height (see Fig. 56).

→ Turn the second sanding lines (3) by 90°, so that the tab (B) locks into place (see Fig. 56).

→ Slide the one-piece connector cap (4) over the bayonet connector and snap into place or attach a two-piece connector cap. The connector caps must hook into the lower part of the insulating profile.

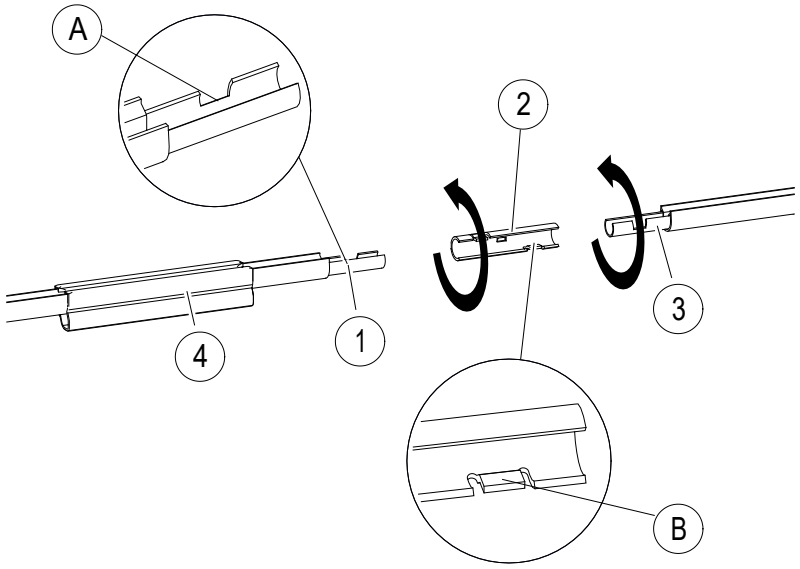


Fig. 56: Mounting the bayonet connector

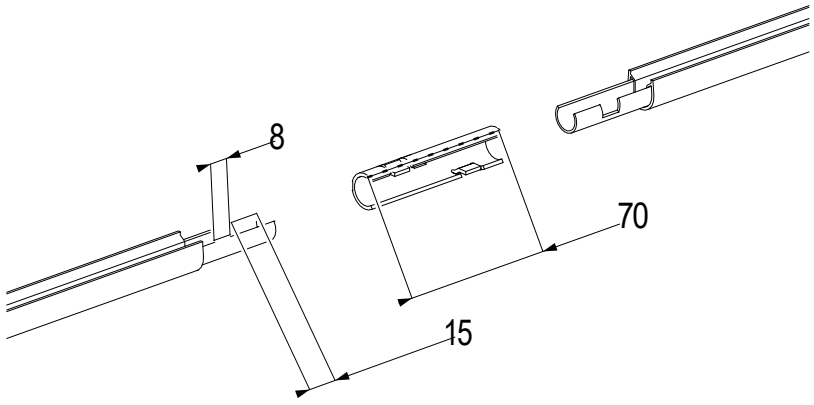


Fig. 57: Dimensions of the bayonet connector, tab and notch

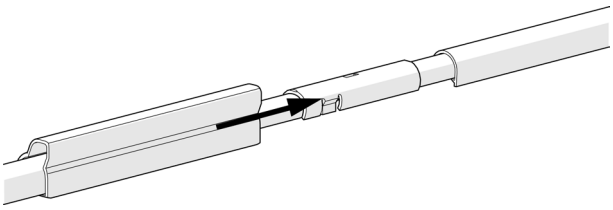


Fig. 58: Slide on one-piece connector cap

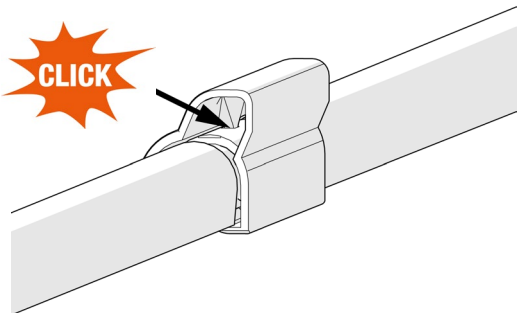


Fig. 59: Engage one-piece connector cap

ATTENTION!

After the one-piece cap has been mounted, no additional force may be applied!

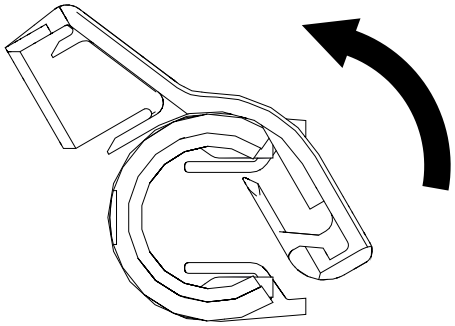


Fig. 60: Clip the first cap half onto the rail

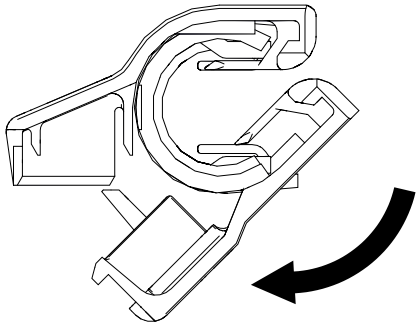


Fig. 61: Clip the second cap half onto the rail

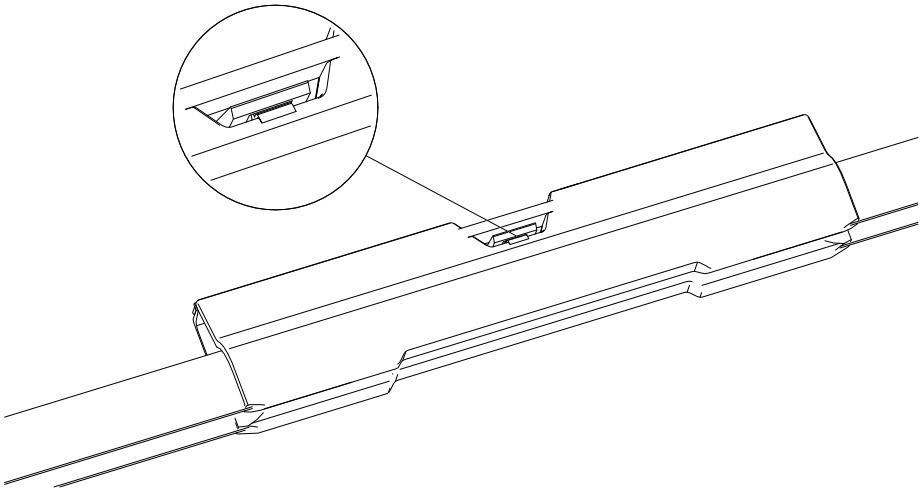


Fig. 62: Two-piece connector cap is clipped onto the rail

ATTENTION!

The bayonet connector must not be pressed onto the conductor rail!
As a result, the bayonet connector is bent and will lose its contact and guidance functions.

→ If the connector cap cannot rest on the guideway profile, hanger clamps must be placed at maximum distances of 150 mm on both sides of the connector position.

→ The insulating profiles must still have room in the caps for expansion when the temperature changes.

Use the QR Code ("click" or "scan") to watch our **Rail Connection and Section Infeed** animation.

6.4.3.4 Install expansion units

The different temperature-dependent expansions of the conductor rails used in an EMS profile as well as the elongation of the building or the mounting surface necessitate suitable compensation measures depending on the plant conditions.

The elongation of the support structure (substructure) and the conductor rail is compensated by expansion units. For this purpose, the existing notch in the rail end is increased by the notching and cutting tool, whereby the range of movement of the conductor rail in the connector is increased. The additional notching is done by the notching and cutting tool. The expansion unit is then mounted analogous to normal connectors (see Fig. 63).

The number and location of the expansion units in a conductor rail can be found in the system layout. There are always anchor points between the expansion units.

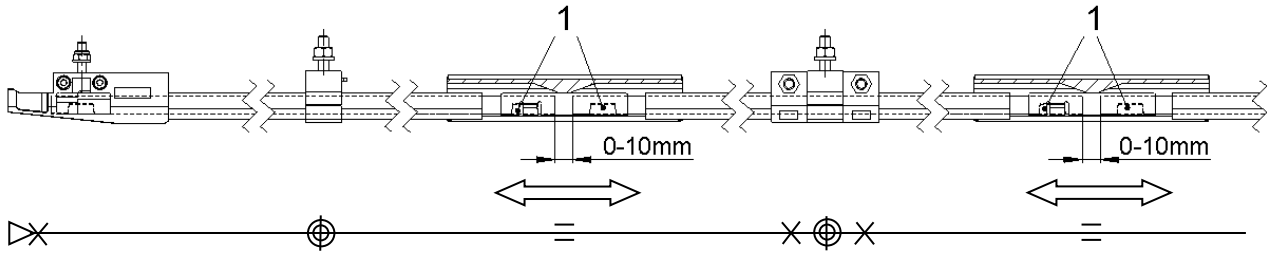


Fig. 63: Schematic view: Function of the expansion points in the expansion unit

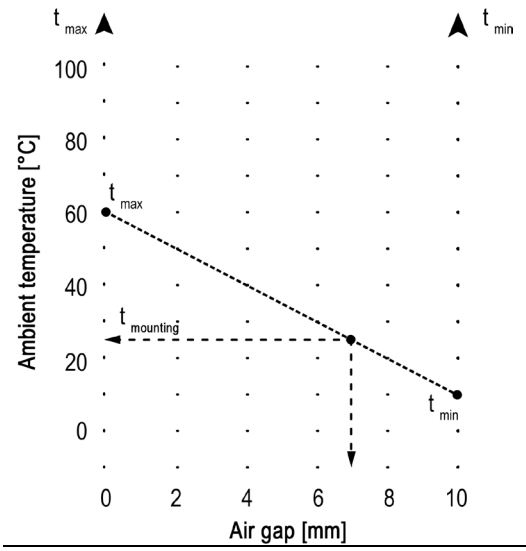
1 = Notch in the rail

Work steps:

→ The notch of both ends of the rail is increased by 5 mm in each case with an expansion unit, whereby each expansion unit point generates a 10 mm expansion clearance (see documentation for the notching and cutting tools MV0811-0018).

→ During installation, the ambient temperature must be taken into account (see Fig. 64), i.e. at high ambient temperatures, the conductor rails in the expansion units are rather set on impact and with low ambient temperatures, they are set with more distance, i.e. with a large air gap.

→ Install expansion units with the conductor rails (installation is identical to the rail connectors, see Section 6.4.3.3).



Example

- Ambient temperature range +10 to +60 ° C
- Ambient temperature during installation: +25°C
- T_{min}= lowest temperature in the application area
- T_{max} = highest temperature in the field of application

→ Enter connection from t_{min} to t_{max}

→ Enter the ambient temperature during installation and determine the intersection with the distance t_{min} - t_{max}

→ Read the air gap width and take into account the air gap during installation.

Fig. 64: Air gap setting to the given ambient temperature

A blank diagram for determining air gaps can be found in Section 11.4

Use the QR Code ("click" or "scan") to watch our **Mount Expansion Unit (Set Air Gaps)** animation.

6.4.3.5 Installing the anchor point

By mounting anchor points in front of and behind a hanger clamp, the conductor rail is firmly connected to the support structure (substructure) at this point. The "sliding" of the conductor rails in the hanger clamp is no longer possible at an anchor point.

NOTE!

Pay attention to the installation direction of the insert in the hanger bracket!

The hanger bracket, to which an anchor point clamp is to be attached on the right and left, must be screwed to the support structure (substructure). The hanger clamp insert must be mounted in the direction of travel of the current collector (see Section 6.4.3.1 or Note on P 56).

The conductor rail can normally slide in the hanger clamp. The conductor rail is mechanically fixed within the support structure (substructure) through anchor points. It makes sense to always position anchor points of the conductor rail at anchor point positions of the support structure (substructure).

There are two different versions of the anchor point, a screw-on version that clamps and a clip-on version that fixes the conductor rail via a pin. To the clip-on version, either a depth limiter (adjusting ring (3) or marking on the drill) or the mounting block (1) (wooden section/strip approx. 6.5mm $_{-0.2}$ wide and e.g. 50-100 mm long) can be used.

Mounting the anchor point 081133 (with pin) without drilling jig:

Tools: Drill (ø 5 mm) with adjusting ring (pos. 3), mounting block (1) 6.5 mm $_{-0.2}$ wide and e.g. 50 – 100 mm long.

Adjusting ring (3) and mounting block (1) are not included in delivery!

Wear protective eyewear!

→ Mount screw-on hanger clamp as described in Section 6.4.3.1.

→ Clip the conductor rail onto the screw-on hanger clamp. To the right and left of the hanger clamp, mark the future position of the anchor point on the insulating profile with a pen. **NOTE:** At the conductor rail poles where the insert of the rail holder is seated, space must be planned according to the insert.

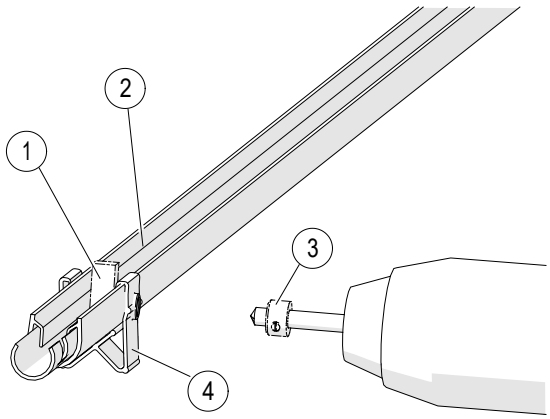


Fig. 65: Drill anchor point

→ Unhook the conductor rail from the hanger clamp again.

→ Hook the anchor point (Item 4) into the rail (Item 2) so that the drill hole (Ø 5 mm) is on the outside.

→ Drill the insulation profile with adjusting ring (3), marking on the drill or mounting block (1). Press the anchor point against the rail from below with your finger while drilling.

→ When drilling, ensure that the outer insulation and the conductor bar are drilled through. The internal insulation must remain intact.
Drilling depth: 5-7 mm

→ After drilling, remove the mounting block from the rail.

→ Detach the anchor point and turn it so that the pin can be inserted into the drill hole in the insulation.

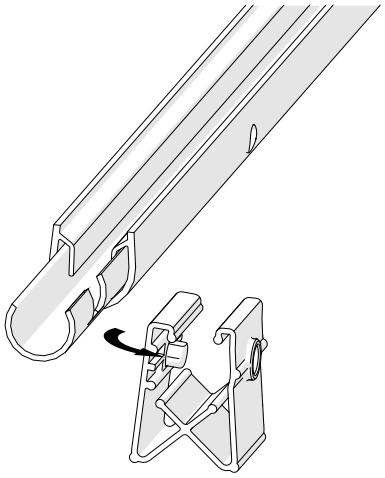


Fig. 66: Turn anchor point

→ Place the clips (5) from above on the rail so that the pin can be inserted into the drill hole. Then clip the opposing clips onto the rail.

→ Clip the conductor rail, including the anchor point, into the hanger clamp.

→ Mount all additional conductor rail poles in the same way.

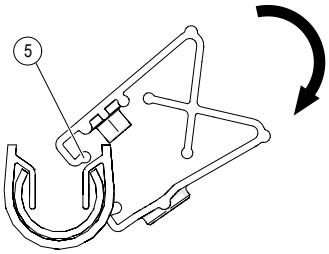


Fig. 67: Clip on the anchor point

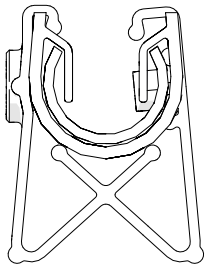


Fig. 68: Anchor point is clipped (end position)

Mount the anchor points 081133 (with pins) with drilling jig (PH/PE: 08-V015-0502-001, PE_{plus}: 08-V015-0502-002):

Required tools: Drill (ø 5 mm) with adjusting ring, pin (e.g., white or red), drilling jig 08-V015-0502-001 or 08-V015-0502-002 (depending on the conductor rail variant used**).**

Wear protective eyewear!

→ Mount the screw-on hanger clamp, as described in Section 6.4.3.1.

→ Clip the conductor rail into the screw-on hanger clamp. To the right and left of the hanger clamp, mark the future position. **NOTE**: At the conductor rail poles where the insert of the rail holder is seated, space must be planned according to the insert.

→ Unhook the conductor rail from the hanger clamp again.

→ Open the drilling jig (1) using the handle (see Fig. 69).

→ Push the clamping unit (2) of the drilling jig into the conductor rail so that the drilling jig (1) is flush with the marking (M) (see Fig. 69 and Fig. 70).

→ Place the adjusting ring (3) on the drill (drilling depth: **18 mm**) and drill through the drill bushing (4) until the adjusting ring is in contact with the bushing (see Fig. 71).

→ To change to the second marking, open the drilling jig by its handle and lay it flat on the second marking.

→ Drill the second hole.

→ Clip the pins of the anchor points into the hole (see Fig. 67 and Fig. 68).

→ Clip the conductor rail, including the anchor point, into the hanger clamp.

→ Mount all additional conductor rail poles in the same way.

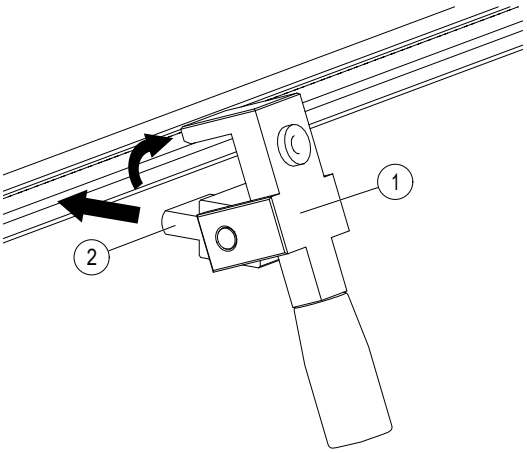


Fig. 69: Position drilling jig

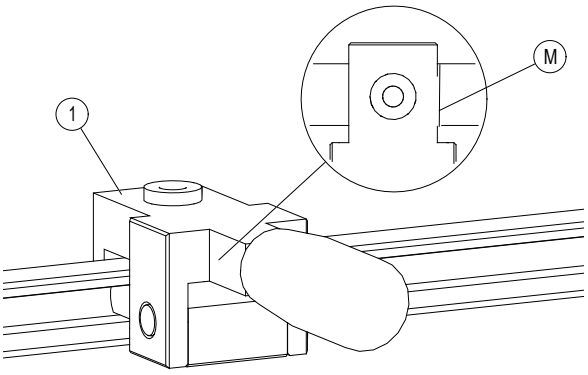


Fig. 70: Lay the drilling jig on the marking

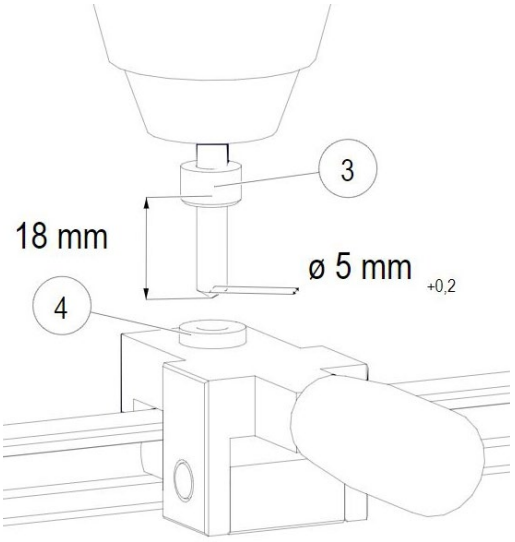


Fig. 71: Hole for anchor point dirlled

Mounting of the anchor point 081131/081132 (screwed):

→ Mount the screw-on hanger clamp as described in Section 6.4.3.1.

→ Define the position of the anchor point according to the expansion situation or system layout.

→ Push two anchor point clamps (1) onto each conductor rail.

→ Engage the conductor rail in the hanger clamp (2), which should be an anchor point. In each case, an anchor point clamp must be in front of and behind the hanger clamp.

→ Screw the anchor point clamp (1) on the left and right of the hanger clamp (2) to the rail with 1-3 Nm.

→ Check clamping of anchor point. Conductor rail must no longer slide in the hanger clamp!

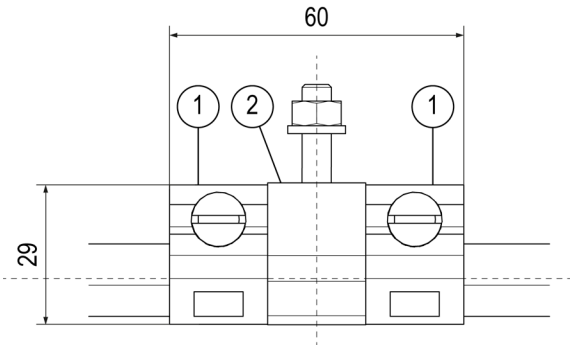


Fig. 72: Mount anchor points

Use the QR Code ("click" or "scan") to watch our **Mount Anchor Point (with pins) 081133** animation.

Single Pole Conductor Rail System

SingleFlexLine Program 0811

Use the QR Code ("click" or "scan") to watch our **Drilling Jig for Anchor Point with Pins** animation.

Use the QR Code ("click" or "scan") to watch our **Mount Anchor Point (screw-on) 081131/081132** animation.

6.4.3.6 Install air gap

Air gaps are used for the electrical isolation and segmentation of system sections and to divide a line into sections. An air gap consists of two opposing end caps.

The air gap must generally be supported by the support structure (substructure) (e.g.: EMS profile). The air gap can optionally be screwed to the support structure (substructure). Drill holes (1) are provided for this.

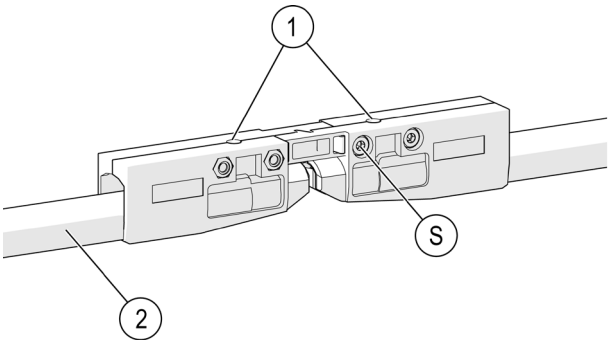


Fig. 73: Air gap

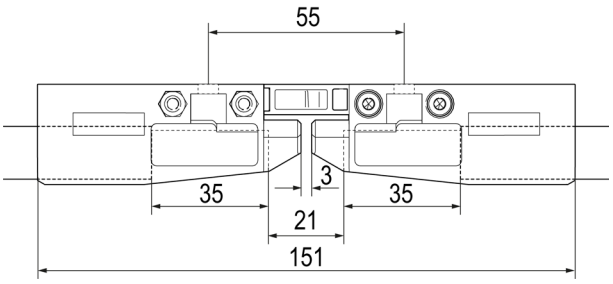


Fig. 74: Mounting dimensions of the air gap

Work steps:

→ For exact positioning of the air gap, a conductor rail can be attached to the one end of the air gap. The distance between the two conductor rails in an air gap is 21 mm (see Fig. 74).

→ Insert the conductor rail into the air gap.

→ Tighten side screws (S) to fix the conductor rails.

ATTENTION!

A potential difference in the two conductor lines in the air gap leads to electrical erosion in the rail with a current collector transferring.

Therefore, avoid potential constructive differences!

Use the QR Code ("click" or "scan") to watch our **Mount Air Gap** animation.

6.4.3.7 Mount end caps

End caps are used to close rail end points and for protection against accidental contact with the rails. They are screwed onto the support structure (substructure) using M5 screws. The mounting holes must be drilled on-site according to the system layout.

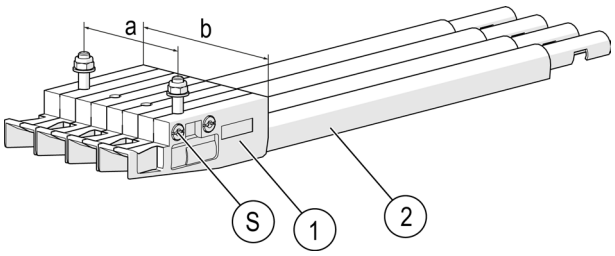


Fig. 75: End cap

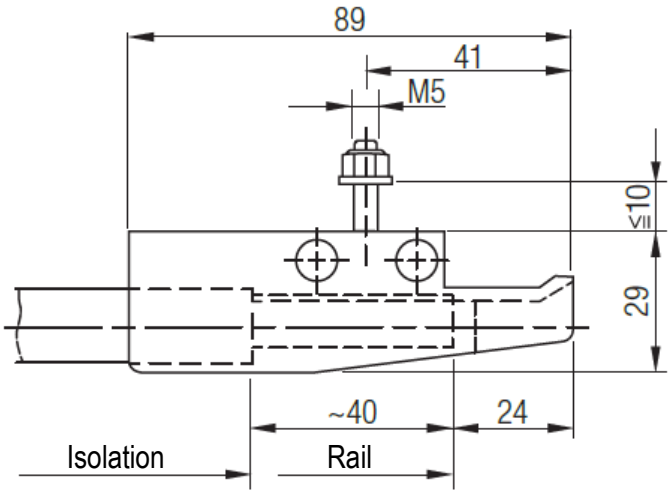


Fig. 76: Dimensional drawing: End cap 081174 Insulation profile - Conductor bar

End Cap	Order Number		
Number of Poles		Dimension a (mm)	Dimension b (mm)
1-pole	081174-20x1x0	–	–
3-pole	081174-20x3x0	40	60
4-pole	081174-20x4x0	60	80
5-pole	081174-20x5x0	40	100
6-pole	081174-20x6x0	60	120

Tab. 3: Mounting dimensions for end caps

Work steps:

→ Determine the location of the end cap and mark the mounting holes. For precise positioning of the end caps, conductor rails that have been placed on the end cap and clipped into one or two hanger clamps can be used.

→ Drill the two mounting holes.

→ Mount end cap (1) on the support structure (substructure)

→ Insert the conductor rail (2) into the end cap (1).

→ Tighten side screws (S) to fix the conductor rails.

Single Pole Conductor Rail System

SingleFlexLine Program 0811

Use the QR Code ("click" or "scan") to watch our **Mount End Cap Bar** animation.

6.4.3.8 Infeed

The electrical feed may be at a connector location or at the ends. The electrical connection is made via feed connectors or feed shoes on the end caps.

Infeed via feed shoes

The installation of the feed connectors is analogous to the connectors via the bayonet connection (see Section 6.4.3.3).
Before attaching the connector cap, the electrical cable must be connected at the crimp or flat plug connection.

Work steps:

→ Connect or crimp the electrical line to the soldered crimp or flat plug connection of the bayonet connector (see Fig. 78 to Fig. 80).
→ Mount the feed connector in the same way as the connector (see Section 6.4.3.3).
→ Attach the caps (one-piece or two-piece) as protection against accidental contact. With the one-piece cap, this must be pushed onto the conductor rail end before the connection (see Fig. 55)

NOTE!

Pay attention to the position of the cap (one-piece and two-piece)!

The flat plug connections or crimp connections are soldered outside the center. The cap must therefore be installed accordingly: The straight side of the cap (A) (one-piece or two-piece) must be located where the connection (1) is located (see Fig. 77).

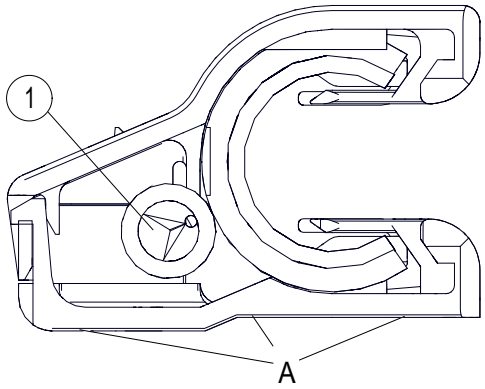


Fig. 77: The electrical connection is outside the center

Use the QR Code ("click" or "scan") to watch our **Connect Rails and Section Infeed** animation.

ATTENTION!

For protective conductors, only feed shoes with crimped connection are permitted, see Fig. 21.

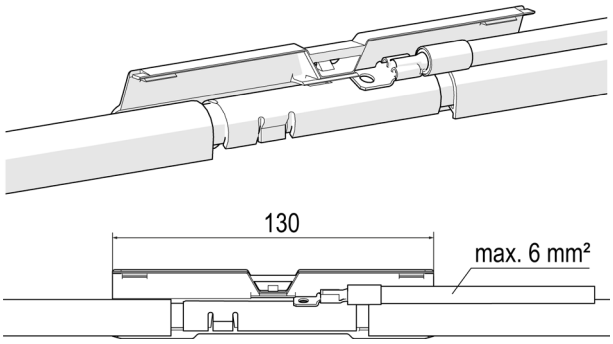


Fig. 78: Electrical feed with connector 35 A

Infeed with flat plug connection 35 A
- Rated current 100 % ED: 35 A
- Not for PE / Protective conductor connection
- Infeed with insulating cover PH
- Versions: One-piece cap / two-piece cap

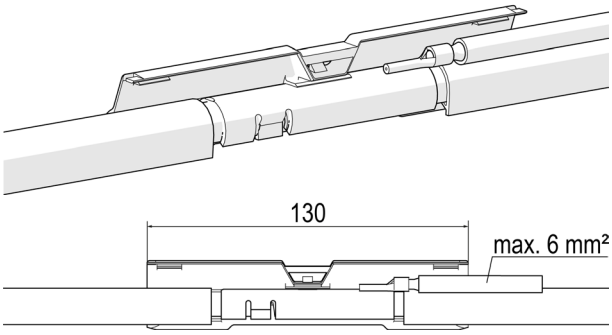


Fig. 79: Electrical feed with connector 45 A

Infeed with crimp connection 45 A
- Rated current 100 % ED: 45 A
- PE / Protective conductor connection
- Infeed with insulating cover PH + PE
- Versions: One-piece cap / two-piece cap

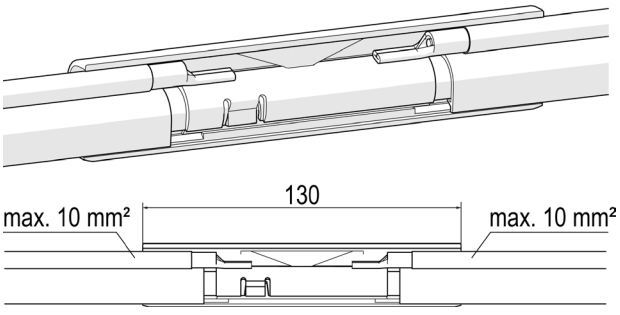


Fig. 80: Electrical feed with connector 100 A

Infeed with crimp connection 100 A
- Rated current 100 % ED: 100 A
- PE / Protective conductor connection
- Infeed with insulating cover PH + PE
- Versions: Cap two-piece

Infeed points at the end cap and at the air gap

The electrical connection to the conductor rails at the end caps or air gaps is realized at the rail ends. For this purpose, special feed shoes are screwed onto the rail end (distance 4 mm) and covered by the end cap or the air gap cap. The electrical connection is made via a crimped connection (see Fig. 21) or via a 6.3 mm AMP connection lug (see Fig. 20) and line-side flat plugs.

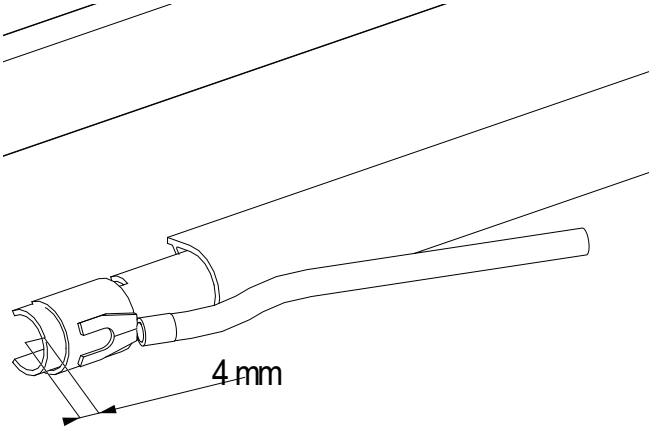


Fig. 82: Distance from conductor bar to feed shoe

Work steps:

Turn the feed shoe (1) onto the conductor rail (2), **do not** clip it!

ATTENTION!

Do not clip the feed shoe! When clipping, the feed shoe bends and loses contact pressure.

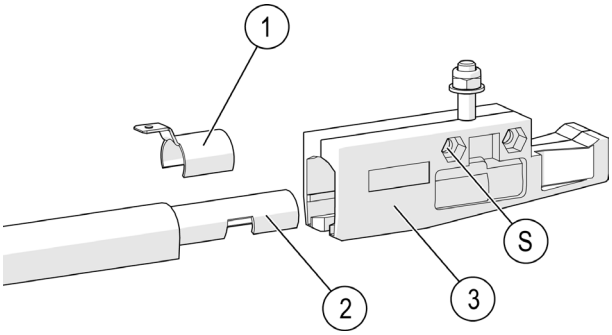


Fig. 83: Infeed on the end cap

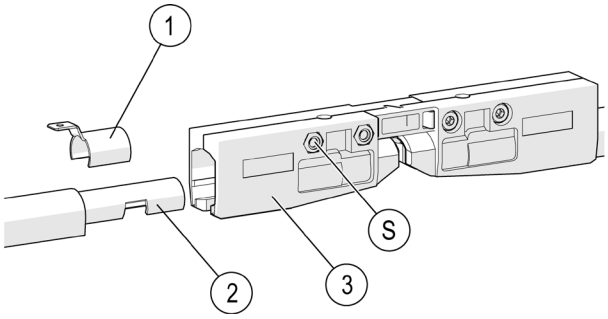


Fig. 84: Infeed at the air gap

ATTENTION!

Only feed shoes with crimped connection are permitted for protective conductors, see Fig. 21.

→ Connect the connection cable to the feed shoe (1), either by crimping the stripped wire by means of a cable crimping tool or by a DIN blade receptacle.

→ Push the end cap (3) or the air gap (3) onto the conductor rail (with mounted feed shoe) and fix it with the aid of the side screws (S). See Section 6.4.3.6 and 0.

Electrical and mechanical testing after fitting the feed shoes

→ Check end caps and connection for secure and correct seating. The insulating profile of the conductor rail must be covered by the end cap/air gap. Ensure contact protection from the busbar.

→ The plug must be firmly attached to the connection lug on the feed shoe.

→ The wiring must be electrically conductive (if necessary, a continuity test is recommended).

Use the QR Code ("click" or "scan") to watch our **Mount End Cap Bar** animation.

Use the QR Code ("click" or "scan") to watch our **Mount Air Gap** animation.

6.4.3.9 Installing the pickup guide

Pickup guides are used for separation points at a greater distance from each other or as an entry point for additional vehicles.

The positions of the infeed funnels are to be taken from the system layout.

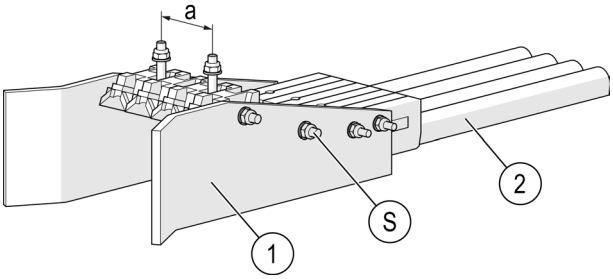


Fig. 85: Pickup guide short version

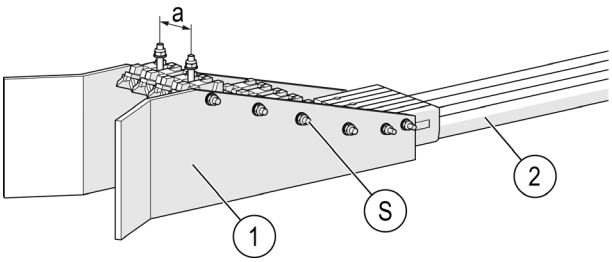


Fig. 86: Pickup guide long version

The pickup guide is attached to the support structure (substructure) by means of two M5 screws. The holes must be drilled on site according to the system layout.

Note that the mounting surface for the funnels is not at the same level as, for example, the mounting surface for the hanger clamps.

Work steps:

→ Determine the position of the pickup guide (1) and mark the mounting holes (see dimension **a** in Tab. 4). For exact positioning of the pickup guide, the pickup guide can be plugged onto the guide rails (2).
→ Drill the two mounting holes.
→ Mount the pickup guide (1) on the support structure (substructure).
→ Insert the conductor rails (2) into the end caps of the pickup guides (1) and align parallel to the edge of the pickup guide
→ Tighten side screws (S) to fix the conductor rails.

Type	Order No.	Number of Poles	a
Pickup guide 2-pole	081182-20x2x08	2	-
Pickup guide 3-pole	081182-20x3x08	3	20
Pickup guide 4-pole	081182-20x4x08	4	40

Tab. 4: Pickup guide distance measure a

After completing the installation of the pickup guide, the following must be checked:

→ Is the height correctly adjusted?
→ Is the gap correct?
→ Does the current collector run smoothly through the conductor rail poles?

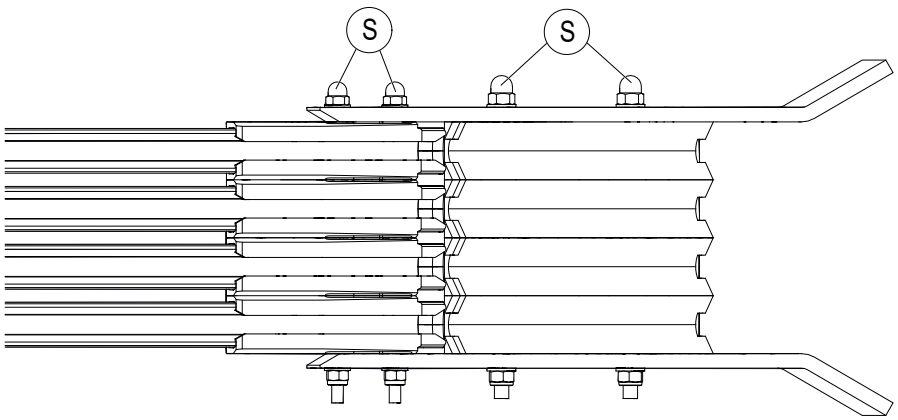


Fig. 87: Slightly loosen the four side screws (S)

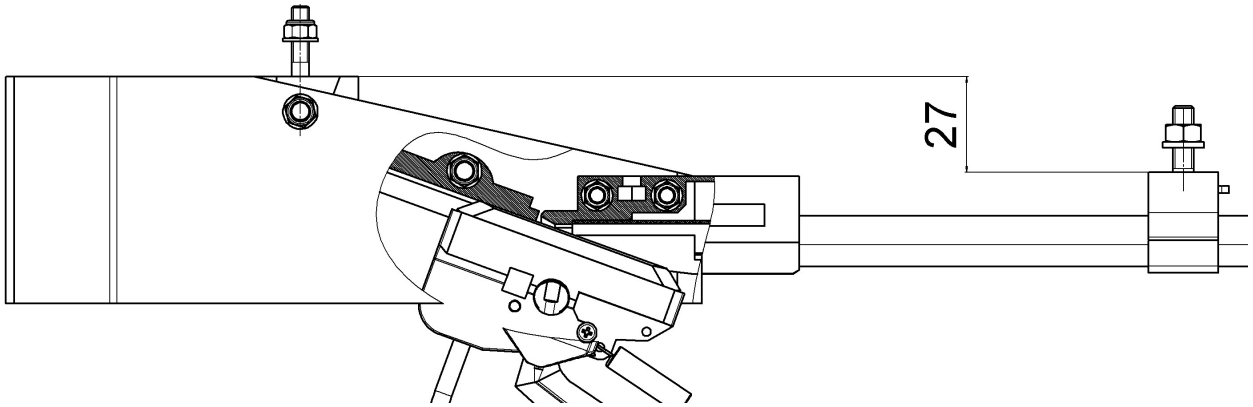


Fig. 88: Pickup guide 0811

6.4.3.9.1 Pickup guide 081182 - short version

The short version of the pickup guide is used for short-arm current collector 081101 and long-arm current collector 081102 for transfer operations. They compensate for a horizontal deflection of ± 15 mm and a vertical deflection of ± 8 mm. The max. permissible transfer speed is 60 m/min. Higher speeds must be requested from Conductix-Wampfler.

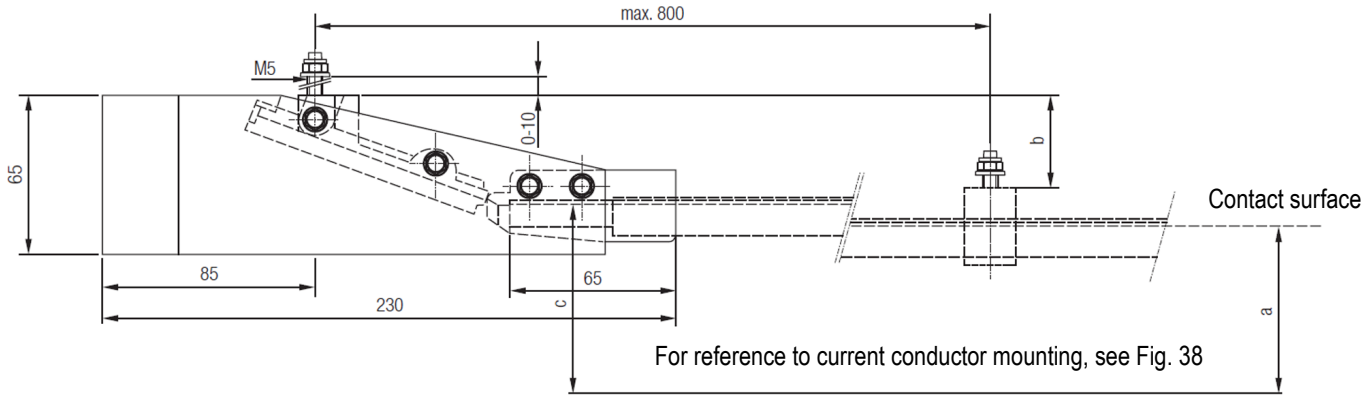


Fig. 89: Pickup guide 081182 – short version

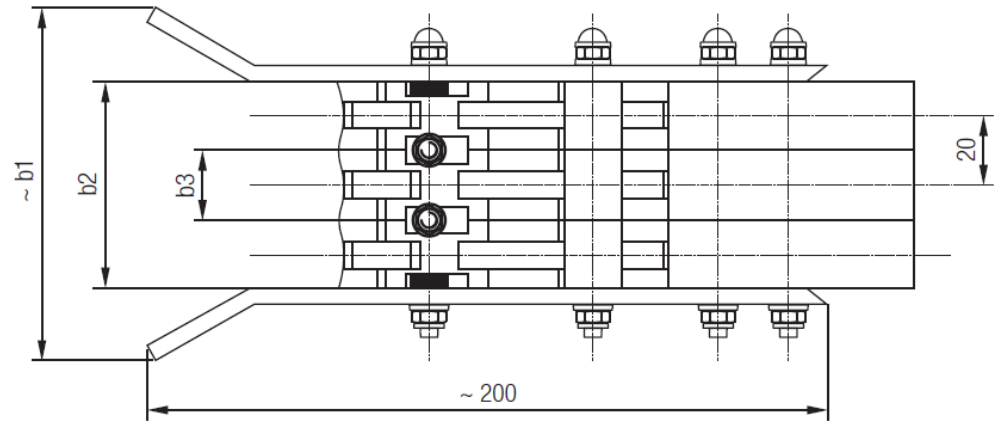


Fig. 90: Pickup guide 081182 – short version

Type	a [mm]	b [mm]	c [mm]
Current collector, short-arm	50	38	60
Current collector long-arm	75	43	90

Tab. 5: Normal distance "a", suspension distance "b" and clearance dimension "c"

The specified normal distance **"a"**; between the center line of the current conductor and the conductor rail must be modified at the suspension point of the pickup guide by suspension distance **"b"** so that the corresponding clearance **"c"** is ensured at this point.

For systems with pickup guides, there must be an appropriate number of current collectors installed at an interval that ensures that the exact number of current collectors required for the current demand is always engaged.

The user must ensure that while the collectors are between pickup guides, they are de-energized or protected against accidental contact.

Type	Order Number	Number of Poles*	b1 [mm]	b2 [mm]	b3 [mm]	Weight [kg]
Pickup guide 2-pole	081182-20x2x08	2	80	40	-	0.190
Pickup guide 3-pole	081182-20x3x08	3	100	60	20	0.280
Pickup guide 4-pole	081182-20x4x08	4	120	80	40	0.370

Tab. 6: Distance dimensions for pickup guide (short version)

*Higher pole numbers are available upon request

6.4.3.9.2 Pickup guide 081182 - long version

The long version of the pickup guide is used for long-distance current collector 081102 for transfer operations. They compensate for a horizontal deflection of ± 30 mm and a vertical deflection of ± 25 mm. The max. permissible transfer speed is 80 m/min. Higher speeds must be requested from Conductix-Wampfler.

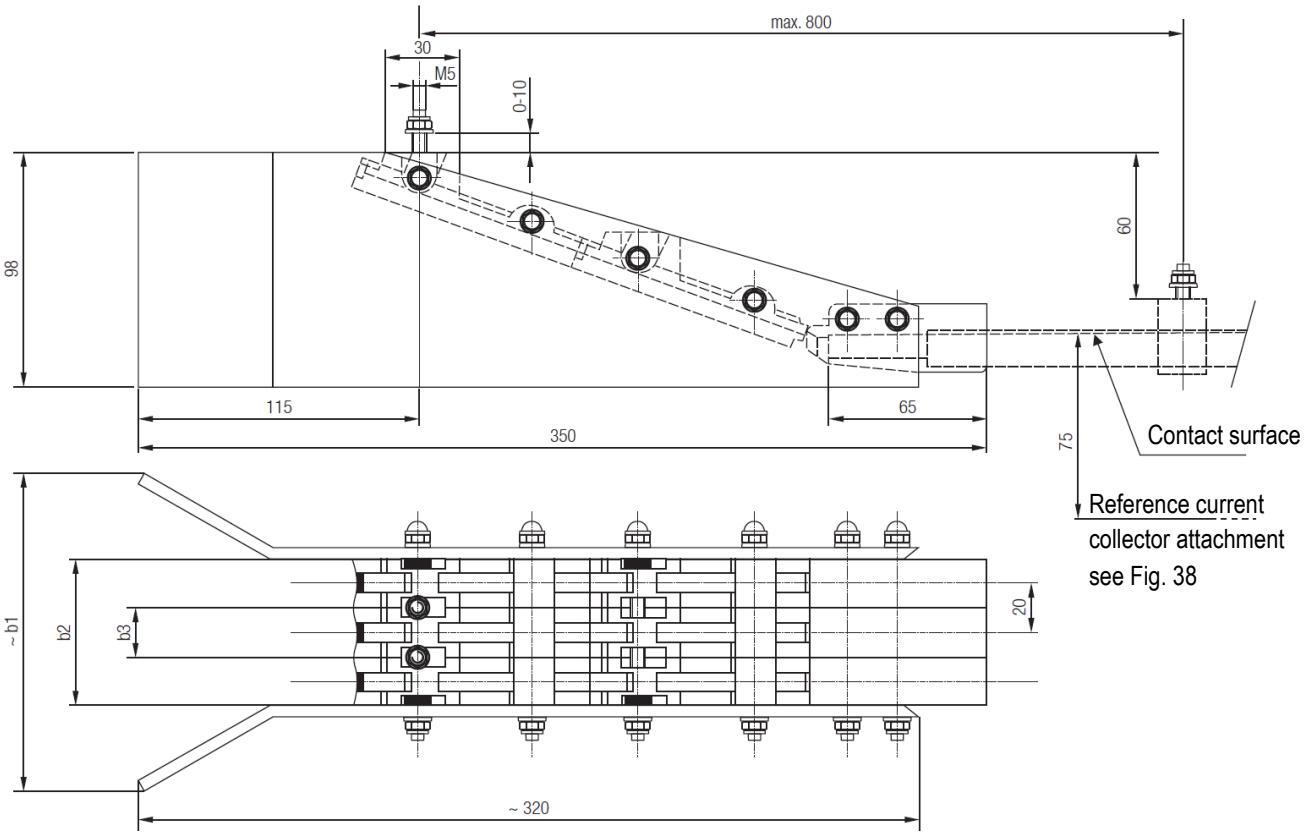


Fig.91: Pickup guide 081182 - long version

For systems with pickup guides, there must be an appropriate number of current collectors installed at an interval that ensures that the exact number of current collectors required for the current demand is always engaged.

The user must ensure that while the collectors are between pickup guides, they are de-energized or protected against accidental contact.

Type	Order number	Number of poles*	b1 [mm]	b2 [mm]	b3 [mm]	Weight [kg]
Pickup guide 2-pole	081182-20x2x25	2	110	40	-	0.540
Pickup guide 3-pole	081182-20x3x25	3	130	60	20	0.600
Pickup guide 4-pole	081182-20x4x25	4	150	80	40	0.660

Tab. 7: Distance dimensions for pickup guide (long version)

*Higher pole numbers are available on request

6.4.4 Installing the current collector

Generally speaking, three types of current conductors are used:

- Short-arm current conductor with short sliding contact (40 mm)
- Short-arm current conductor with long sliding contact (63 mm)
- Long arm current conductor with long sliding contact (63 mm)

The current collectors are mounted on the vehicle with an outrigger (Order No.: 020194-200) or a support bracket (Order No.: 081050-20x).
For this purpose, the current collectors are placed on the axis of the outrigger or a support bracket. There is a recess on the outside of the protective conductor current collector; so an incorrect installation of the protective conductor is excluded.

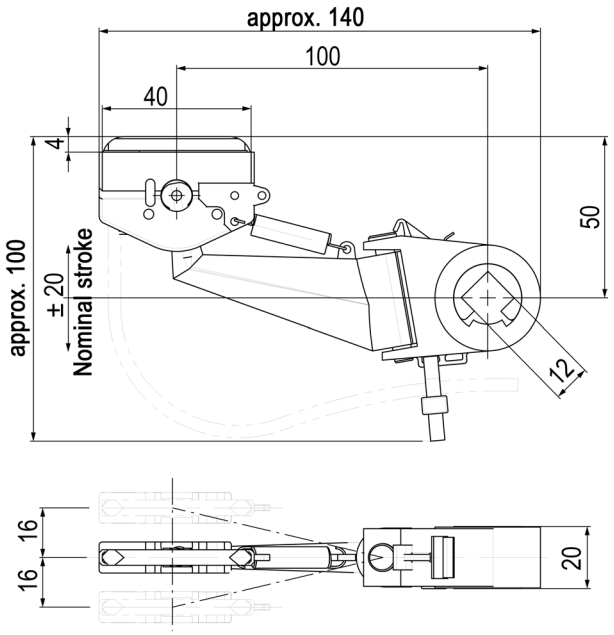


Fig. 92: Short-circuit current collector with short sliding contact (40 mm)

Short-circuit current collector with short sliding contact (40 mm) for compact installation situations and low rail misalignment to the ideal line

Clamping force: 3 N
Nominal stroke ± 20 mm
Lateral deflection ± 16 mm
Electricity: 16 A and 40 A

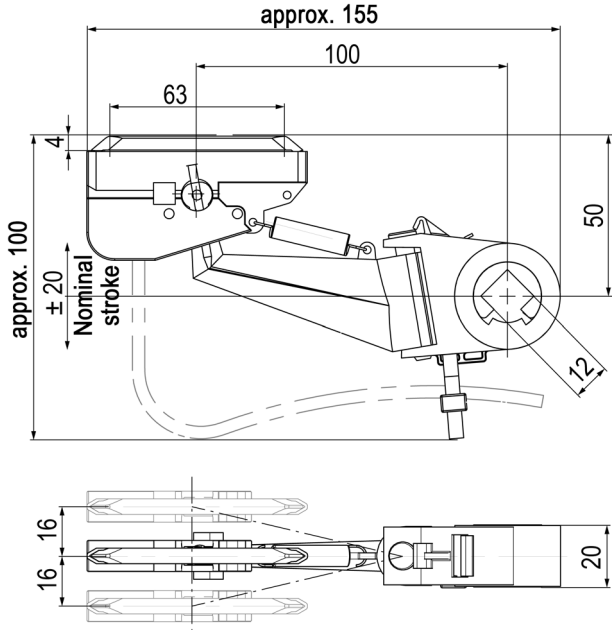


Fig. 93: Short-circuit current conductor with long sliding contact (63 mm)

Short-arm current collector with long sliding contact (63 mm) for compact installation situations and low rail misalignment for the ideal line, but for higher currents

Clamping force: 7.5 N
Nominal stroke ± 20 mm
Lateral deflection ± 16 mm
Electricity: 16 A and 55 A

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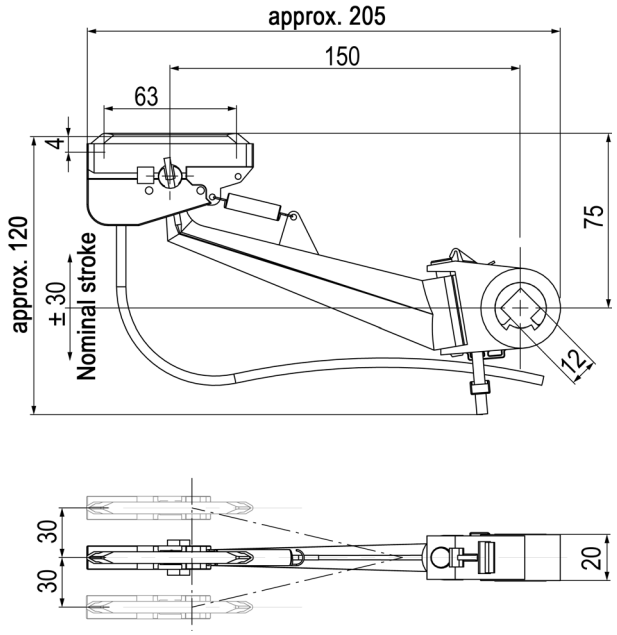

Fig. 94: Long-arm current conductor with long sliding contact (63 mm)

Long-arm current conductor with long sliding contact (63 mm) for normal installation situations and for higher currents

Clamping force: 5 N
Nominal stroke ± 30 mm
Lateral deflection ± 30 mm
Electricity: 16 A and 55 A

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Requirements for mounting the current conductors

- Make connection cable straight and highly flexible in order to avoid deflection, pulling or pressing on the sliding contacts or movement restrictions of the current collector (see illustrations below).
- Only use only highly flexible Conductix-Wampfler cables! In principle, connection cables with copper conductors are to be used (connection cables must be ordered separately).
- Use ferrules with insulation collars for the flexible connection cables.
- For phases, doubly insulated connection cables must be provided for voltages > 48 V.
- Do not bundle, fix or attach identification signs to the current collector connection cable!
- Do not allow foreign objects to protrude into the moving range of the current collector and connection cables!
- Select foreign objects such as fastening screws so that the movement of cables and current collectors is not affected.
- If the current collectors are mounted on maintenance openings as is typical for overhead monorail systems, allow sufficient space for the lines.
- If the current collectors are to be installed within maintenance hatches, as is common with electrified monorail systems, sufficient free space for the cables must be
- In systems with curves, the ideal mounting position for the current conductor is directly at the height of the wheel contact point (in the pivot point or in the steering axis) of the guideways. In the case of different positions and internal and external curves, the distances to the rail and thus the contact forces change. In the worst case, the sliding contacts and rail track can cause increased wear and tear to the point of damage to the system.

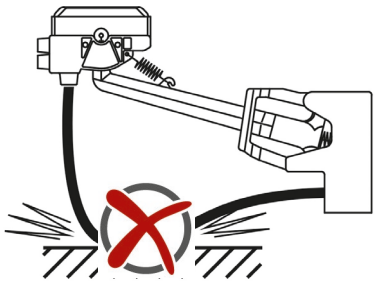

Fig. 95: Connection cable must not abut

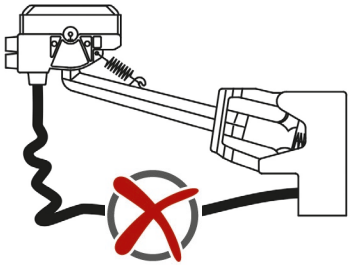

Fig. 96: Do not compress or kink the connection cable

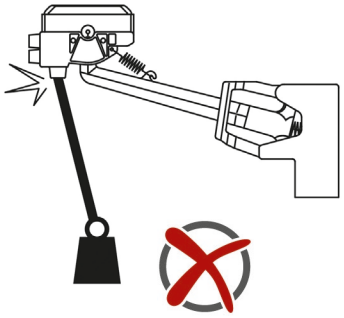

Fig. 97: Do not load the connection cable

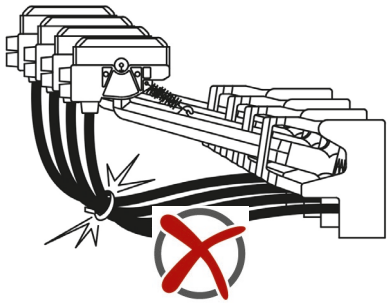

Fig. 98: Do not fix connection cable with cable tie

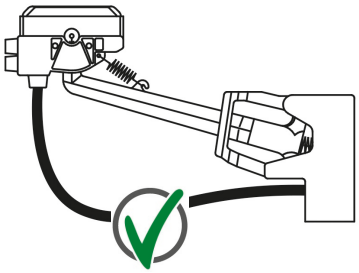

Fig.: 99 Connection cable laid correctly

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In order to ensure a trouble-free transfer of the current collector at transfer points, the following additional conditions should be observed:

- Conductix-Wampfler recommends the use of current collectors with a long sliding contact (63 mm)
- Distance of opposing end caps not larger than 3 mm (see Fig. 100)
- Height and lateral offset not greater than 2 mm (see Fig. 100 and Fig. 101)

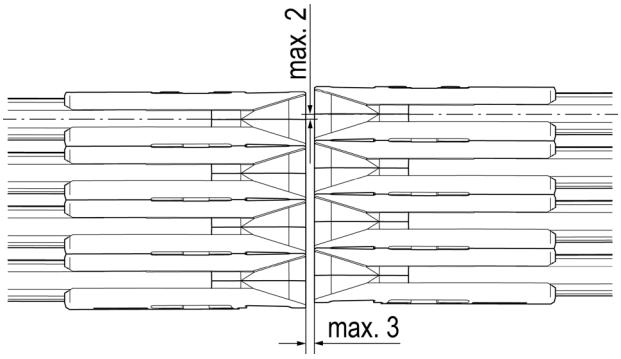


Fig. 100: Maximum deviation horizontal

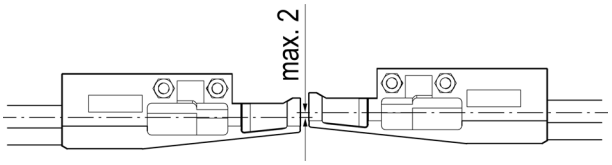


Fig. 101: Maximum deviation vertical

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, e.g., in curves when the current collector is not installed directly under the guideway 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!

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

Work steps:

→ When installing current collectors, make sure the installation position is correct.

→ Place current conductors on the axis of the outrigger (2) or the support bracket (4) (maximum four current conductors). Insert protective conductor current collector onto the recess in the axis.

→ The outrigger is mounted with four screws on the connecting flange (3) to a suitable point of the vehicle.

→ The support bracket (5) is mounted on the vehicle with two screws.

→ For systems with curves, 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.

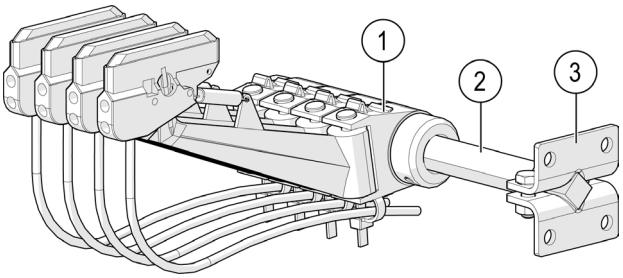


Fig. 102: Mounting the current collector on the outrigger

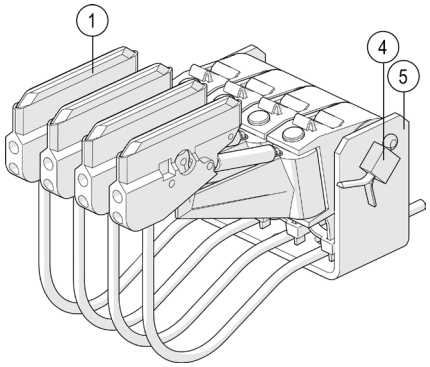


Fig. 103: Mounting of the current collector with the support bracket

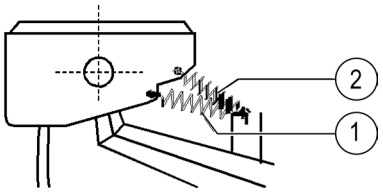
Use the QR Code ("click" or "scan") to watch our **Mount Support Bracket** animation.

Use the QR Code ("click" or "scan") to watch our **Mount Outrigger** animation.

Towing and reversing operation

For EMS systems, current conductors are generally used for towing in the execution. By applying the spring, which holds the sliding contact in the direction of travel, this drift is counteracted as much as possible. Towing current collectors are used in systems where motion in one direction of travel predominates. Travel in the opposite direction is possible.

Current conductors in reversing mode are used for systems with uniform distribution of the direction of movement, e.g., moving trolleys, cranes, etc.



1 - Position spring in reversing mode
2 - Position spring in towing mode

Fig. 104: Stabilizing spring for towing and reversing operation

Use of spacers on the current conductors for entries in the pickup guide

If the current collectors are used in conductor rails with pickup guide, the current collectors are to be provided laterally with spacers that keep the current collectors at pole distance when entering the conductor rail.

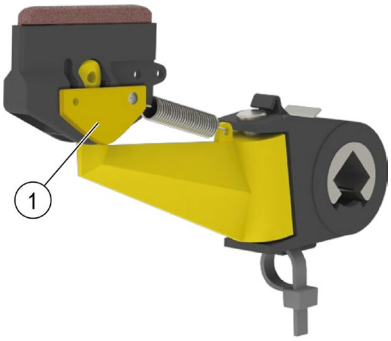


Fig. 105: Current collector with lateral spacers

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

- Conductor rails are not correctly clipped into the hanger clamp
- Rail joints and transfers have not been deburred
- Rail curves are narrowed by progressive bending
- Rail transfers on switches and lifters are incorrectly set (end positions, dimensional tolerances) or are yielding
- Incorrect current-collector-connection cable
- Current collector connection cable not used according to specification (not free of directional and tensile forces)
- Installation positions are not within specification. Permissible tolerances exceeded in curves

6.5 Electrical installation

6.5.1 Conductor bar

Pay attention to the selection of the connection cable and to a tension-free laying.

→ Select cables with suitable cross section.
→ For phases, doubly insulated connection cables must be provided for voltages > 48 V.
→ At infeed points that change their position when the system is subjected to a thermal expansion, the connection cable must be laid with a flexible loop.
→ Connection cable with a strain relief provided on site.

6.5.2 Current collector

Pay attention to the selection of the connection cable and to a correct and tension-free laying of the connection cables (see Fig. 95 to Fig.: 99).

→ Only use highly flexible Conductix-Wampfler cables! In principle, connection cables with copper conductors are to be used.
→ Use ferrules with insulation collars for the flexible connection cables.
→ For phases, doubly insulated connection cables must be provided for voltages > 48 V.
→ Do not bundle, fix or attach identification signs to the current collector connection cable!
→ Do not allow foreign objects to protrude into the moving range of the current collector and connection cables!

6.6 Further documents

Read and follow the additional operator instructions!

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

- MV0811-0011 Sliding contact control unit
- MV0811-0013 Pickup guide
- MV0811-0015 Reinforcement for air gap
- MV0811-0018 Notching and cutting tool
- MV0811-0021 Brief Instructions Conductor Rail System SingleFlexLine 0811
- BAL0800-0004 Bending device for product ranges 0811 and 0815

7 Commissioning

7.1 Safety

Personnel:

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

Recommended protective equipment:

WARNING!

Risk of injury due to improper commissioning!

An improperly conducted 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. Follow the locally applicable technical standards, guidelines and laws.

→ 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.

CAUTION!

Ensure a free travel range before beginning the commissioning!

CAUTION!

Contact problems or increased heating!

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

→ Avoid standstill operation with high currents during commissioning as far as possible. The sliding contacts are not yet ground and can therefore heat up more.

DANGER!

Risk of injury by crushing of skin and limbs!

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

→ 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.)

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 installation does not comply with the required tolerances.

Take the following measures:

→ Conduct electrical testing as prescribed

→ Permissible current values must be observed

→ Maintain tolerances during operation

→ Do not remove the prescribed electrical safety devices and protective devices

→ Do not store easily ignited materials near to conductor rails

→ Check, service and clean conductor rails regularly and as prescribed. See Section 12

DANGER!

Risk of injury due to ensnarement or impact!

An 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, in particular if protective devices (covers, enclosures, control devices) have been removed or disabled

→ Use caution when working in the vicinity of the danger zone, in particular below the conductor rail

→ Falling conductor rail system components, if they have not been properly installed or if operated under inappropriate operating conditions (e.g., environment that contains solvents)

→ 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

→ Every time before the device 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

DANGER!

Risk of death by electrocution!

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

→ Customer-side grounding of metallic components must be present

→ Customer-side protective devices must be present

7.2 Test and initial commissioning

7.2.1 Test list

Test	Tested
Has the correct installation height been observed (see Section 3)?	
Are all installed components clean, dry and undamaged?	
Are the end cap bars and anchor points properly installed as specified?	
Are the rail ends at the connection points and at the end caps deburred and correctly aligned?	
Are all screws tightened with the specified tightening torque?	
Is the operating area tidy (no parts or tools)?	
Has the operating personnel been trained?	
Have the "Electric Flash" symbol and the name plate been affixed in a suitable location by the manufacturer?	
Have the hanger clamps been mounted at the correct distances (see Section 6.4.3.1)?	
Are the insulation profiles properly clipped into all hanger clamps (see Section 6.4.3.2 as well as Fig. 52)?	
Have the specified installation clearances of the current conductor been observed (see Section 6.4.4)?	
Have the contact surfaces of the sliding contacts been cleaned before commissioning and dirt, oxidation, pitting corrosion and other impurities removed by means of a brass brush or abrasive paper (320 grit)?	
Are the connection cables installed without directional and tensile forces? The connection cables must not pull on, press against or cause the current collectors to twist (see Fig. 95 Fig.: 99).	
Have all poles of the conductor rail system been run through with a loose current collector? The current collector may not stick and must slide into the conductor bar without hindrance.	
Are the end caps present at the beginning and end and mounted correctly?	
Are all electrical protection devices installed, tested and functioning?	
Are covers and barriers in place?	
Is the infeed properly connected?	
Are all metallic components (e.g., EMS profile) grounded as specified?	
Has the insulation resistance* of the conductor rail system been measured according to local technical standards, guidelines and laws?	
Have the specified national electrical tests been carried out?	

***Note:** Insulation resistance test according to EN 60204-1: 2006 ≥ 1 MΩ with measuring voltage 500 VDC. Exception for busbars, conductor rails and slip rings ≥ 50 kΩ (EN 60204-1/18.3:

…….. ……..

Date Signature

7.2.2 Initial commissioning of the conductor rail system

→ Perform an inspection along the complete run of the conductor rail.

ATTENTION!

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

Where necessary, repair any faults and perform setting tasks.

After initial commissioning, a further review must be conducted to detect any damage or problems in the system.

Visual inspection of the device/system after initial commissioning:

→ 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 anchor 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.

8 Operation

The only operations required to operate the conductor rail system are switching the power supply on and off to stop/activate the system as prescribed in Section 8.3.
The safety information in Section 8.1 must be observed in order to ensure safety during operation.

8.1 Safety

DANGER!

Risk of death by electrocution!

Contact with components carrying electrical power can lead to death or severe injury by electrocution. Danger 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 very dirty

→ If the conductor rail becomes wet

→ If electrically live parts are exposed (insulating profile or the insulation of the connection cable are damaged)

→ If the hanger clamp or insulation profile fail

→ If the conductor rail falls down and contacts a conductive material

Take the following measures:

→ Ensure proper electrical protection at all times

→ Ensure grounding of metallic components at all times

→ Ensuring the function of the customer's protective devices at all times

→ Regularly check, maintain and clean the conductor rail, repair if necessary

DANGER!

Risk of injury due to entrapment!

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

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

WARNING!

Unauthorized personnel are at risk!

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

→ The system must only be operated by trained personnel!

→ Keep unauthorized personnel away from the working area

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

→ Stop working as long as unauthorized personnel are in the working area

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

DANGER!

Risk of injuries from falling conductor rails!

The hanger clamps 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:

- Foodstuffs that contain aromatic compounds that can evaporate
- Coating products and paints
- Separating agents or coolants and lubricants
- See Section 3.3 and 2.8.4

→ Do not store any of the above or similar substances near the conductor rails

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 installation does not comply with the required tolerances.

Take the following measures:

→ Conduct electrical testing as prescribed before commissioning

→ Permissible current values must be observed

→ Maintain tolerances during operation

→ Do not remove the prescribed electrical safety devices and protective devices

→ Do not store easily ignited materials near to conductor rails

→ Check, service and clean conductor rails regularly and as prescribed. See Section 12

WARNING!

Risk of health issues due to respirable dust!

Airborne dust can cause respiratory complaints and eye irritation.

→ Clean regularly

8.2 Normal operation

The conductor rail system 0811 is protected against accidental contact and is suitable for use in indoor operations such as for electrified monorail systems (EMS) or slip ring assemblies.

8.3 Stopping the system

DANGER!

Risk of injury due to electric shock!

→ **Switch off the power supply** of the conductor rail system according to the 5 Safety Rules and **secure it against being switched on again**. 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 property

Before switching the system back on, ensure that:

- The collector heads must lie within the conductor rail for the entire length and the prescribed contact pressure must be applied
- There is no coarse dirt or objects in the conductor rails

→ Visually inspect the system

- The insulation resistance corresponds to the locally applicable technical guidelines

→ As needed, before the device or system is started, measure the insulation resistance according to locally applicable technical standards, directives and legal regulations

- Visual inspection of the device/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 anchor 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.

9 Service and Maintenance

9.1 Safety

Recommended protective equipment:

DANGER!

Risk of injury due to electric shock!

→ **Switch off the power supply** of the conductor rail system according to the 5 Safety Rules and **secure it against being switched on again**. For the 5 Safety Rules, see Section 2.5

DANGER!

Risk of death by electrocution!

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

→ Disconnect all electricity supply infeeds

→ Check whether a voltage is still present in the components and take measures where necessary

→ The customer must ground metallic components

→ The customer must provide protective devices

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.

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

→ Before starting work, make sure there is sufficient space for the installation

→ Ensure the installation area is clean and tidy!

→ If components have been removed, be careful to reinstall them properly, replace all fastening elements and comply with screw tightening torques

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 a tool only partially to remove strong adhesion of the light burn points. This work should only be carried out by qualified personnel.

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

DANGER!

Danger of injury due to dust and abrasion!

Breathing difficulties and eye irritation can occur due to dust thrown up and abrasion of the sliding contacts, copper bars and plastic. There is a health hazard due to airborne respirable dust. Sensitization may occur if handling the conductor rail frequently and / or carelessly handling dust accumulation. **Cancer, mucous membrane irritation and respiratory diseases** can be a consequence of frequent and prolonged stays in a heavily used facility without protective equipment.

Observe the following measures:

→ Clean regularly! If necessary before starting work, clean the conductor rail according to the instructions (follow WV0800-0001) see Section 12.1.

→ Wear personal protective equipment

  → Safety eyewear

  → Dust mask, Class FFP3

  → 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)

→ **Do not blow out dust with compressed air**, but rather vacuum it away. The vacuum 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

DANGER!

Risk of injury due to entrapment!

An 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, in particular if protective devices (covers, enclosures, control devices) have been removed or disabled

→ Wear personal protective equipment!

WARNING!

Risk of impact, 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

WARNING!

Fire hazard due to overload or sparking!

A fire hazard can occur due to overloads of the cable, electrical arcing or short-circuits.

→ Before recommissioning, ensure that all work has been completed and all components have been properly installed

→ Conduct electrical testing as prescribed

→ 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 by hot surfaces!

Components can get hot during operation.

→ Allow components to cool before servicing.

→ Wear personal protective equipment!

ATTENTION!

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). Observe the maintenance instructions WV0800-0004!

DANGER!

Risk of explosion!

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

Performing maintenance work on the current collectors

DANGER!

Risk of injury by crushing of skin and limbs!

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

→ Current collector (spring force) during installation, dismantling and maintenance

→ Have work done only by trained technicians

→ Wear personal protective equipment!

→ When changing the carbon brush, follow the separate instructions for this task. See Section 12.1

Replacing conductor rails

DANGER!

Risk of injury due to cutting and cuttings off!

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 safety gloves and safety boots

→ Carefully deburr the insulation profile and conductor bars after sawing.

→ Handle cut, removed conductor rails with care and store them properly (transport or other container)

→ Be on the lookout for sharp edges in the surroundings of the installation surface and avoid contact.

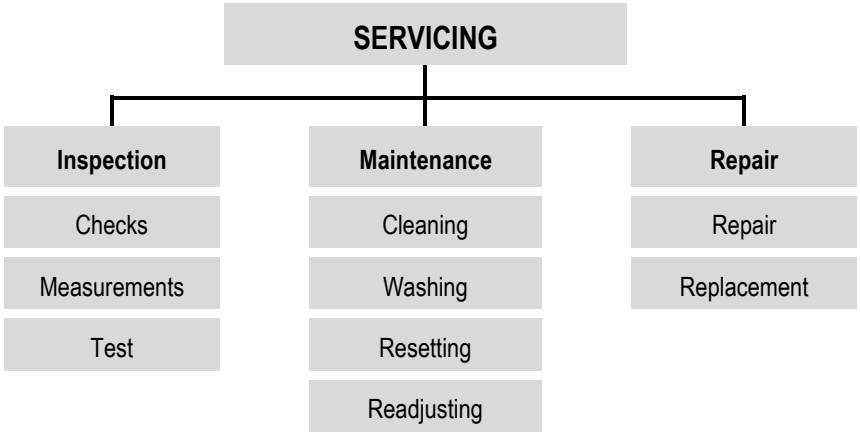
9.2 Tools and materials

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

Maintenance work	Tool
Measure height of sliding contacts	Calipers
Determine contact pressure of sliding contacts	Spring scale with a measuring range of 0 N to 20 N

9.3 Maintenance schedule

The following tasks fall under the category “Servicing”:



The separate maintenance instruction WV0800-0002 contains the measures required for optimal and trouble-free operation. It also contains the required maintenance intervals.

The tasks specified and performed as per the maintenance plan must be logged.

If regular checks reveal increased wear, the required 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!

→ Be sure to observe the safety instructions in Section 9.1!

Performance of the maintenance work

→ All maintenance work must be carried out in accordance with the separate maintenance instruction WV0800-0002!

→ Maintenance intervals must be observed.

→ The maintenance must be documented.

10 Fault Elimination

10.1 Safety

Wear recommended protective equipment:

WARNING!

Danger of injury due to improper troubleshooting!

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

→ Contact the manufacturer in case of malfunction

→ Allow troubleshooting to be carried out only 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 together with their corresponding remedial measures (see Section 10.2).

CAUTION!

Before working on these components!

→ **Switch off the power supply** of the conductor rail system according to the 5 Safety Rules and **secure it against being switched on again**. For the 5 Safety Rules, see Section 2.5

DANGER!

Risk of death by electrocution!

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

→ Disconnect all electricity supply infeeds

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

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

→ The customer must ground metallic components

→ The customer must provide protective devices

→ Make sure there is sufficient stability in the area

DANGER!

Risk of injury by crushing of skin and limbs!

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

- Current collector (spring force) during installation, dismantling and maintenance
- Falling conductor rail system components, if they have not been properly installed or if operated under inappropriate operating conditions (e.g., environment that contains solvents)

DANGER!

Danger of injury due to dust and abrasion!

Breathing difficulties and eye irritation can occur due to dust thrown up and abrasion of the sliding contacts, copper bars and plastic. There is a health hazard due to airborne respirable dust. One result may be cancer.

→ Clean regularly! If necessary, clean the system according to the instructions before starting work. See Section 12.1

→ Use personal protective equipment

- → Safety eyewear
- → Dust mask, Class FFP3
- → 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)

→ **Do not blow out dust with compressed air**, but rather vacuum it away. The vacuum must be equipped with a Class H fine filter

→ See Section 2.8.3 for further information

DANGER!

Risk of injury due to cutting and cuttings off!

Cuts and cuttings off 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!

An 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, in particular if protective devices (covers, enclosures, control devices) have been removed or disabled

→ Wear personal protective equipment!

CAUTION!

Before switching the system on!

→ Every time before the device or system is started, measure the insulation resistance according to locally applicable technical standards, directives and legal regulations

→ Carry out locally required electrical tests

WARNING!

Danger of injury from hot surfaces!

Components can get hot during operation.

→ Wear personal protective equipment!

→ Allow hot surfaces to cool before removing the fault

DANGER!

Danger due to improperly completed maintenance work!

→ Before recommissioning, ensure that all work has been completed and all components have been properly installed

→ Conduct electrical testing as prescribed

→ Electrical fuses must be installed in accordance with regulations.

10.2 Fault remedy table

Fault	Cause	Corrective measures
Sliding contacts are worn unevenly	The current collector heads' range of movement is restricted.	Only use original Conductix-Wampfler collector heads, check cable position (make sure cables can move freely). Mount current collector according to Section 6.4.4. Check the installation position at various points in the system.
	Contact pressure is too high or low.	Mount current collector according to Section 6.4.4; use superfine-stranded class-6 connecting cables (in accordance with ICE 602228).
Sliding contact insulation is on the side except for the sliding contacts abraded.	For horizontal installation: The height of the current conductor is not set correctly.	Replace current collector heads; correctly adjust the height of the current collector.
Sliding contacts wear out too fast.	Sharp edges on the power terminal, conductor rails, connections between the conductor rails.	Smooth out sharp edges with a file, compressed-air grinder or sanding paper.
	Conductor rails dirty or scorched in places.	Check current values; clean rails as specified in maintenance instruction WV0800-0002; if necessary, replace conductor rails.
	Contact pressure too high.	Mount current collector according to Section 6.4.4. Check the installation position at various points in the system.
The power supply gets interrupted, the contact is disrupted.	End segment and power terminal are not properly connected.	Tighten all screws to the specified torque, see 6.4.2.1; If necessary, recrimp and reinstall the crimping cable lug

Fault	Cause	Corrective measures
	Current collector not properly connected.	Mount current collector according to Section 6.4.4; Correct the connection line, replace it if necessary.
	Contact pressure too low.	Only use original Conductix-Wampfler current collectors, check cable position (make sure cables can move freely). Mount current collector according to Section 6.4.4; Correct connection line, replace it 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 bars. Clean the conductor bars.
Insulating profile is not clipped into the hanger clamp.	Conductor rail has not been properly fitted.	Snap in the insulation profile, check components, replace if necessary
	Use of damaged components.	Replace damaged components.

11 Disassembly and Disposal

11.1 Safety

Personnel:

- Must only be performed by trained technicians. Recommendation: Min. 2 persons

Recommended protective equipment:

Requirement:

DANGER!

Prior to starting the disassembly:

→ **Completely de-energize the conductor rail system and secure against reconnection**

DANGER!

Risk of death by electrocution!

Contact with components carrying electrical power can lead to death or severe injury by electrocution. Danger 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 dismantling area and secured against switching on again

→ Disconnect all electricity supply infeeds

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

WARNING!

Danger 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.

→ Make sure there is sufficient space before starting work

→ Handle open, sharp-edged components carefully

→ Make sure the workplace is tidy and clean! Loosely stacked or scattered components and tools are a source of hazards

→ Disassemble components properly. Be aware of the dead weights of the components. If necessary, use lifting gear

→ Secure components so they cannot fall or topple

DANGER!

Risk of injury due to cutting and cutting off!

Cuts and cuttings off can occur on the:

- 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 by crushing of skin and limbs!

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

- Current collector (spring force) during installation, dismantling and maintenance
- Falling parts of the conductor rail system in the case of improper dismantling

DANGER!

Danger of injury due to dust and abrasion!

Breathing difficulties and eye irritation can occur due to dust thrown up and abrasion of the sliding contacts, copper bars and plastic. There is a health hazard due to airborne respirable dust. One result may be cancer.

→ Clean regularly! If necessary, clean the system according to the instructions before starting work. See Section 12.1

→ Wear personal protective equipment

  → Safety eyewear

  → Dust mask, Class FFP3

  → 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)

→ **Do not blow out dust with compressed air**, but rather vacuum it away. The vacuum must be equipped with a Class H fine filter

→ See Section 2.8.3 for further information

WARNING!

Risk of injury when removing the connector!

The connector is very large compared to the insulation profile and the conductor bars 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 segments, keep at a distance of at least 100 mm from the end of the insulation profile

CAUTION!

Reusing disposable components can give rise to hazards!

Reusing a connector, for example, can give rise to the following hazards:

- The connection is not perfect and reliable
- High-resistance connection, heating, fire hazard, reduced performance

→ Dispose of disassembled connectors and replace with new ones. Do not reuse!

11.2 Disassembly

When the device has reached the end of its useful life, disassemble it and dispose of it in an environmentally compatible way.

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

→ Clean the subassemblies and components properly, and dismantle and dispose of them in compliance with locally applicable occupational safety and environmental protection regulations.

Required tools

- Hanger clamp pliers for disassembly (Order No.: 081085)
- Allen key SW 3
- Allen key SW 5
- Wrench SW 7
- Screwdriver set
- Cutting tool (e.g., precision saw)
- Tools for securing

11.3 Disposal

In the absence of a return or disposal agreement, dismantled 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.

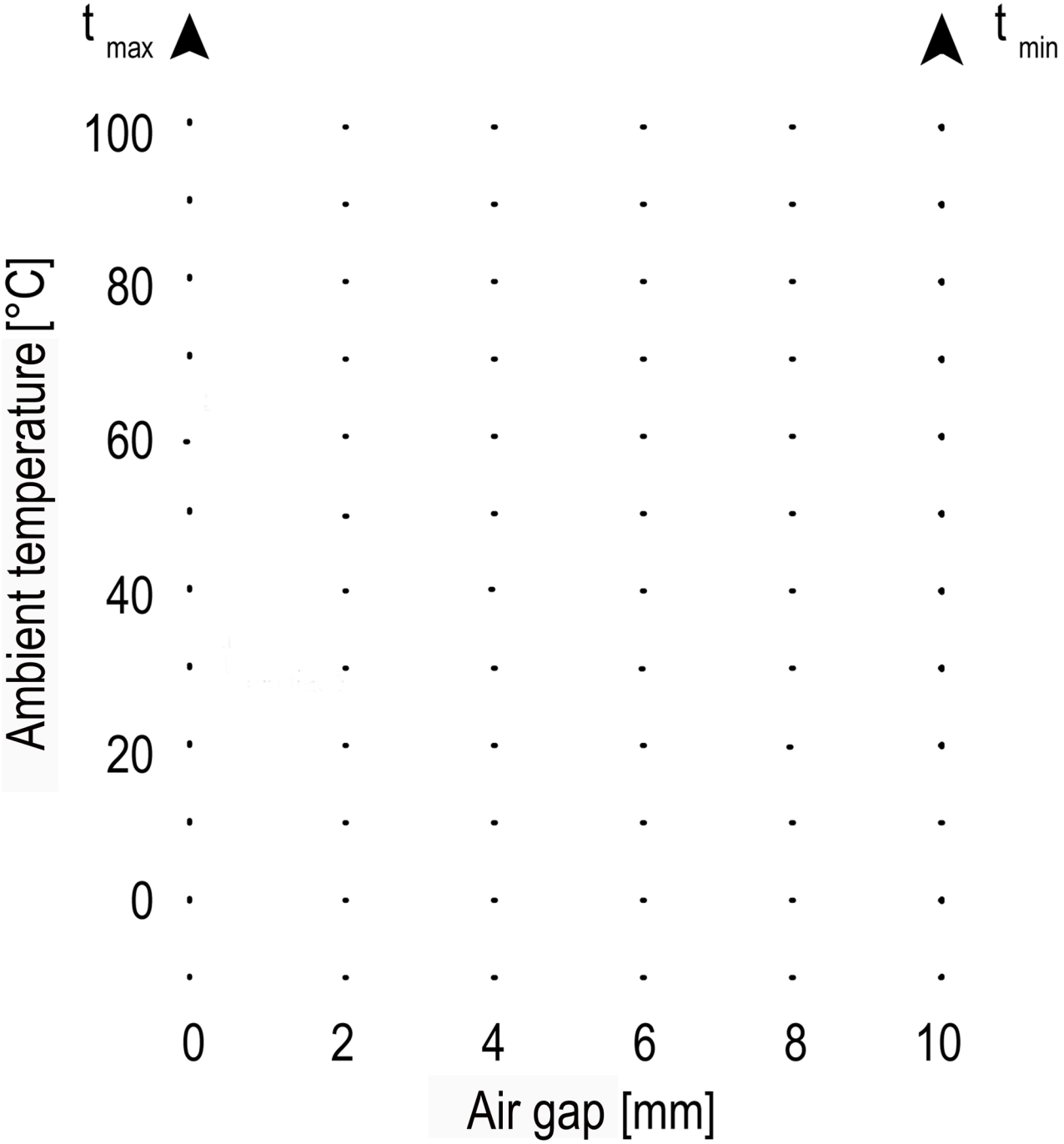
CAUTION!

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 specialist disposal companies can provide information regarding environmentally appropriate disposal.

11.4 Diagram for air gaps



12 Further documents

12.1 Other applicable documents

ID No.	Document Number	Document Name
01	WV0800-0001	Cleaning of Conductor Rails
02	WV0800-0002	Maintenance Schedule Conductor Rails
03	MV0811-0011	Sliding contact control unit
04	MV0811-0013	Pickup guides
05	MV0811-0015	Reinforcement of the air gap isolating section
06	MV0811-0018	Notching and Cutting Tool
07	BAL0800-0004	Bending Device for Rails programs 0811 and 0815
08	BAL0815-0001	Collector Brush Sensor Unit

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Conductix-Wampfler GmbH
Rheinstraße 27 + 33
79576 Weil am Rhein - Märkt
Germany

Phone: +49 (0) 7621 662-0
Fax: +49 (0) 7621 662-144
info.de@conductix.com
www.conductix.com

Importer for the United Kingdom:
Conductix-Wampfler Ltd.
1, Michigan Avenue
Salford
M50 2GY
United Kingdom

Phone: +44 161 8480161
Fax: +44 161 8737017
info.uk@conductix.com
www.conductix.com