ORIGINAL OPERATING INSTRUCTIONS

INSULATED CONDUCTOR RAIL
U35

SYSTEM MANUAL
INSTALLATION MANUAL
MAINTENANCE MANUAL

EN | V1.04 | DCL 081

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1 DOCUMENT HISTORY

Material number	Version	Edition	Description/changes
-	1.01	06/2019	First edition
-	1.02	04/2021	INSTALLATION DESCRIPTION
-	1.03	02/2023	Adjustment of Phase Distances Technical Data Note on Conductor Rail Wear Installation Description Protective Measures
-	1.04	02/2026	• Adaptation of warranty conditions chapter • Adjustment Technical Data (4) • Adjustment System Overview Illustration (5.1) • Adjustment Connection Material Chapter • Adjustment Track Section Feeding Chapter • Adjustment Hanger/Holder Chapter • Adjustment Labeling Drawing Transfer guide Chapter(5.3.6) • Adjustment Expansion section Chapter • Adjustment Insulated Section Chapter • Adjustment Current Collector Chapter (5.3.10) • Adjustment Assembly Hangers Chapter • Adjustment Assembly Conductor rail Chapter • Adjustment Assembly Creation of shorter lengths Chapter (6.3.5) • Adjustment Assembly Transfer guide Chapter • Adjustment Assembly Feeds Chapter • Adjustment Assembly Fix points Chapter • Adjustment Assembly Current collector Chapter • Adjustment Assembly Connection & Repair Chapter • Adjustment Assembly Conductor rail Chapter • Adjustment Cleaning Chapter(8.5) • Adjustment Disposal Chapter(9.3.4) • Revision Illustrations – New Cover Caps Chapter • Editorial Revision Adaptation Corporate Design Chapter

2 GENERAL

2.1 About these instructions

These operating instructions enable the safe and efficient handling of our VAHLE products. This document is an integral part of the installation and must be kept accessible to operating and maintenance personnel in the immediate vicinity. The basic requirement for safe working is compliance with all specified safety instructions and instructions. This documentation does not give instructions for operating the plant/machine in which our system is integrated. In addition, the local accident prevention regulations and general safety regulations for the use of the system apply. Diagrams are for basic understanding and may deviate from the actual version.

2.2 Symbols

Safety instructions in this manual are identified by symbols. Each safety instruction begins with a signal word that indicates the severity of the hazard. The various types of warnings and safety instructions and their structure are explained below.



DANGER!

The source of the hazard is described here.

This combination of a symbol and a signal word indicates an immediately dangerous situation that will result in death or serious injury unless avoided.

► The actions to prevent the hazard are identified here.



DANGER!

The source of an electrical hazard is described here.

This combination of a symbol and a signal word indicates an immediately dangerous situation related to electricity that will result in death or serious injury unless avoided.

► The actions to prevent the hazard are identified here.



WARNING!

The source of the hazard is described here.

This combination of a symbol and a signal word indicates a potentially dangerous situation that may result in death or serious injury unless avoided.

► The actions to prevent the hazard are identified here.



CAUTION!

The source of the hazard is described here.

This combination of a symbol and a signal word indicates a potentially dangerous situation that may result in light or moderate injury unless avoided.

► The actions to prevent the hazard are identified here.



NOTICE!

The source of the hazard is described here.

This combination of a symbol and a signal word indicates a potentially dangerous situation that may result in property or environmental damage unless avoided.

► The actions to prevent the hazard are identified here.



NOTICE!

This indicates a reference to another place in this text or another document.

This combination of a symbol and a signal word indicates a reference to another place in this text or in a different document.

► The places in the text or references to other documents are identified here.



TIPS AND RECOMMENDATIONS!

► Simple tips and recommendations from our long years of experience are provided here.

2.3 Copyright protection

The contents of this manual are protected by copyright. Their use is permitted within the scope of the use of the installation. No further use is permitted without the written permission of the manufacturer. This manual may not be copied, given to any third party, reproduced in any form or by any means, including, but not limited to, exploitation and/or communication of the contents without the written permission of the manufacturer, except for internal purposes.

2.4 Disclaimer

The information in this document has been compiled in consideration of applicable standards and regulations, accepted rules of engineering, as well as our years of knowledge and experience.

The manufacturer shall not be liable for damages resulting from:

- Failure to observe the technical documentation
- Uses other than the intended use
- Use by personnel without the required training
- Unauthorized modifications or technical changes
- Use of non-approved spare parts or accessories

The actual scope of delivery may vary from the descriptions and images in this document in case of custom versions, the selection of additional order options, or due to latest technical changes.

The obligations agreed in the supply contract, the general terms and conditions and the terms and conditions of delivery, and the laws and regulations applicable at the time the contract was signed all apply.

We reserve the right to make technical changes to improve the usability and for further development.

2.5 Customer service

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2.6 Warranty

2.6.1 Warranty terms and conditions

The information in this document has been compiled in consideration of applicable standards and regulations, accepted rules of engineering, as well as our accumulated years of knowledge and experience.

The warranty period and the scope of the warranty are defined in the terms of the contract and the general terms and conditions of delivery of Vahle GmbH & Co. KG.

Our general terms of warranty and delivery are published on our website. www.vahle.de



⚠ WARNING!

No liability in case of unauthorized changes, modifications, or accessories!

Changes or modifications to the delivered product require the permission of the manufacturer. Genuine spare parts and manufacturer-approved accessories provide safety. The use of non-approved parts voids any liability of the manufacturer.

► Always consult the manufacturer first!

The warranty immediately expires in particular f one or several of the following situations arise(s):

- If the product is modified in whole or in part without permission of Vahle.
- If the operator independently performs repairs during the warranty period or has repairs performed by third parties.
- If the product has been handled or maintained inappropriately.
- If parts are used that are not original parts approved by Vahle.
- If the information in this documentation is not observed.
- If in this context applicable directives and standards are not complied.

3 SAFETY INSTRUCTIONS

3.1 Safety

This section gives an overview of all important safety aspects relating to the protection of personnel as well as the safe use and fault-free operation. Other, task-specific safety instructions can be found in the sections on the individual phases of the product's life.



DANGER!

Failure to observe the safety instructions may result in risks to life and health!

3.2 Intended use / foreseeable misuse

The insulated conductor rails have been specially developed for a wide variety of mobile applications such as gantry cranes, loading bridges, lifts or roller shutters. Their open design makes the conductor rails particularly maintenance-friendly. For use in harsh environmental conditions, the conductor is made of aluminum with a stainless steel running surface. Additional features are short installation times due to the small number of different parts.

Safety

The conductor rails have been designed in acc. with VDE 0100. They meet today's requirements for the safety of conductor rails and are contact-protected in acc. with VDE 0470-Part 1 (protection class IP 2X). The current collectors are protected against contact only if the carbon brushes are fully located in the conductor rails. For conductor rail systems located at arm's length, where under normal operation the current collectors leave the conductor rails, contact protection must be provided on site, e.g. by means of barriers or by switching off. This, however, only applies to voltages above 25 volts AC or 60 volts DC.

The VDE finger shows that it cannot touch live parts. The insulation rail covering the conductor rail offers good insulation for maximum safety. Several rails can be combined with one another. Only little space is required.



Conductor systems with any number of poles can be configured.
Standard rail sections for U 35 are 6.25 m long. Shorter sections are available. The ground conductor is marked with a continuous yellow stripe on the insulating housing. The non-exchangeability of the current collectors between ground conductors and phases is ensured.

Current collectors

Depending on the application, single or double current collectors are used.
The specified continuous current strengths apply to current collectors in stationary operation on conductor rail profiles with copper contact surfaces. With AE conductor rails, current collectors of current consumers that are permanently operating under load at a single position or at very low travel speeds of 10 m/min may only be loaded with approx. 50 % of their continuous current.
The length of the current collector connection cable may not exceed 3 m if the downstream overcurrent protection device is not designed to handle the capacity of the connection cable. Refer also to DIN VDE 0100, part 430 and DIN EN 60204-32. (Note: this is often the fact if more than one collector is used in the system).

Appropriate use also includes observance of all information provided in these instructions.

Any use beyond or other than the appropriate use, conversion or other modification is to be considered misuse and prohibited.



⚠ WARNING!

Danger in case of improper use!

Improper use may give rise to hazardous situations.

- ► Only ever use the system for its intended purpose.
- ► Never let untrained personnel operate the system.
- ► Never modify or alter the system improperly.
- ► Never operate the system in ways that contradict the safety instructions.
- ► Never operate the system at higher than specified currents or voltages.
- ► Never operate the system with carbon brushes made by other manufacturers.

Claims for damages resulting from improper use shall be invalid.

3.3 General risks

The following section describes residual risks that arise even if the product is used as intended. Observe the safety instructions listed here in the other sections of these instructions to reduce the risk of injuries or damage to property and equipment and to avoid dangerous situations.

Do not change or modify the system inappropriately!



⚠ WARNING!

Risk of death from improper replacement or removal!

Errors during the removal or replacement of components may cause life-threatening situations or significant property damage

- ► Observe the safety instructions before beginning any removal work.

3.3.1 Danger from electrical energy

Perform the following safety work in accordance with VDE 0105-100 (this work must be carried out by a qualified electrician, see section "2 Safety").

Disconnect

Required isolating distances must be established.

Secure against re-switching

During work, a prohibition sign must be attached reliably on switching handles or drives of switches, control units, pressure and sensing devices, safety parts, circuit breakers that have been used to unlock a system part or that can be used to connect electricity. If this is not possible, then the clearly associated prohibition sign must be nearby. Existing mechanical interlocking devices against restart must be used for manually operated switches.

Determine that the system is de-energized

Absence of voltage is to be determined at or as close as possible to the work site at all poles. Absence of voltage must be checked with a voltage tester immediately before and after use.

Grounding and short-circuiting

Parts on which work will be performed at the work place must first be grounded and then short circuited. Grounding and short-circuiting must be visible from the workplace. Deviating from the above, it is permitted to ground and short-circuit near the work place if this is required due to the local conditions or for safety reasons. Devices for grounding and short-circuiting must always first be connected with the grounding system or the ground electrode and afterwards with the parts to be grounded. Grounding and short circuiting may be waived in certain low-voltage systems (see VDE 0100-100).

Cover or block adjacent live parts

Before starting work, check whether it is appropriate to make adjacent parts voltage-free.



DANGER!

Danger of death due to electrical current!

Contact with live parts can result in life-threatening injuries.

► Make sure that the relevant components are not live or under voltage, and that there is no unauthorized approximation.

3.4 Responsibilities of the operating company

Definition of the operating company

The owner is listed in the order confirmation and has the following owner obligations:

Owner obligations

The system is put to commercial use. The owner of the system is therefore subject to laws and regulations on workplace health and safety. In addition to the safety instructions in this document, the safety, accident prevention, and environmental regulations for the system's field of application must be followed. The following applies in particular:

- The owner ensures protection against electric shock (contact protection).
- The owner must inform himself about applicable workplace health and safety regulations and conduct a risk assessment for additional hazards that may arise from the special operating conditions at the installation site. These must be implemented as facility instructions for the operation of the system.
- Over the entire time, the owner has to verify that the instructions drafted by him for the operation of the system conform to the current state of applicable regulations and adapt the instructions as necessary.
- The owner must clearly define responsibilities for the installation, operation, maintenance, and cleaning of the system.
- The owner must ensure that all employees who handle the system have read and understood the operating instructions. The owner is also required to provide training periodically and instruct personnel about the risks.

The owner is also responsible for ensuring that the system is always in good technical condition. The following therefore applies:

- The owner must ensure that the maintenance intervals described in this documentation are observed.
- Control and safety devices provided by the owner for the operation of the system must be checked for completeness and functional safety.
- The owner must ensure that assembly and installation comply with EN 60204.
- The owner must ensure that all components are de-energized in the event of an emergency off. This applies in particular to the parallel busbar.

3.5 Personnel requirements

3.5.1 Qualifications

The tasks described in this manual present various requirements to the qualifications of the persons performing them.



⚠ WARNING!

Hazard in case of insufficient qualification of personnel!

Insufficiently qualified persons are unable to judge the risks when working on the system, which puts them and others at risk of severe or fatal injuries.

- ► All work must be performed by qualified personnel only.
- ► Insufficiently qualified personnel must stay out of the work area.

Operator

The operator has been instructed by the owner about the tasks assigned to him and the risks of inappropriate actions. An operator may perform tasks that go beyond normal operation only if this is indicated in the instructions and the owner has expressly assigned him with such a task.

Electrically qualified person (see VDE 0105-100)

Due to their professional training, knowledge, experience, and knowledge of the relevant standards and regulations, professional electricians are able to carry out work on electrical installations and to independently recognize and avoid possible hazards. The professional electrician has been specifically trained for his/her professional working environment and is conversant with the relevant standards and regulations.

Qualified personnel

Qualified personnel are able, based on their technical training, knowledge, experience, and familiarity with applicable regulations, to perform the assigned tasks and independently detect and avoid potential hazards.

Instructed personnel

The instructed person has been instructed by the owner about the assigned tasks and the risks of inappropriate actions. Such persons must also have read and understood these safety instructions and observe them during their work.

This may need to be confirmed by the customer/user with a signature.

3.6 Personal protective equipment

Every person who is instructed to work on the system or in the vicinity of the system (support personnel) must wear personal protective clothing/equipment for the suitable type of their work. Personal protective equipment has the purpose of protecting personnel against hazards to their health and safety at work. The owner is responsible for ensuring that protective equipment is worn.

Personal protective equipment is described below:



Safety shoes

Safety shoes protect against falling parts as well as against slipping.



Protective goggles

Protective goggles protect against flying particles and liquid sprays.



Helmet

Helmets protect against falling or flying parts and materials.



Gloves

Gloves protect hands against chafing and abrasion, cuts and punctures, as well as against contact with hot surfaces.



Protective work clothes

Work clothing is close fitting and resistant to tearing, with close-fitting sleeves and without any projecting parts. It is designed to protect against being caught by moving parts of machinery. However, it must not reduce mobility. Do not wear rings, necklaces, or other jewelry. Long hair must be covered (cap, hat, hairnet, or similar). Fall-arrest equipment, face protection, and hearing protection according to DGUV Regulation 112-189.



Hearing protection

To protect against severe and permanent hearing loss.



Breathing protection

To protect against severe and chronic conditions of the airways.

3.7 Safety devices



WARNING!

Danger from non-functional safety devices!

Non-functional or disabled safety devices cause a risk of severe injuries or even death.

- ► Before beginning any work, verify that all safety devices are functional and installed properly.
- ► Never disable or override safety devices.

In addition to locally applicable safety regulations, the following safety instructions must be observed.

The following accident prevention regulations (UVV; Germany) and the new Accident Prevention Regulations – Principles of Prevention (DGUV Regulation 1; Germany) must always be observed.

3.8 Conduct in case of danger or accident

Precautions:

- Have first-aid equipment (first-aid kit, blankets, etc.) and fire extinguisher ready.
- Maintain free access for emergency services vehicles.

Conduct in case of accident:

- Secure site of accident and call first-aid personnel.
- Alert emergency services.
- Provide first aid.

3.9 Signage

The following symbols and instruction signs are located in the work area. They relate to the immediate environment in which they are installed.



DANGER!

Danger of death due to electrical current!

Contact with live parts can result in life-threatening injuries.

► Make sure that the relevant components are not live or under voltage, and that there is no unauthorized approximation.



WARNING!

Danger from illegible signs!

Over time, labels and signs can get dirty or can become unreadable in other ways, which means that the dangers are not identified and that operating instructions cannot be followed.

► Always keep all safety, warning, and operating instructions in a legible condition.



NOTICE!

Follow instructions!

Only use the designated product after this documentation has been completely read and understood.

4 TECHNICAL DATA

Technical specifications - mechanical		
Max. traveling speed without funnel/transfer	[m/min]	600
Traveling speed with funnel	[m/min]	100
Max. traveling speed with transfer guide	[m/min]	180
Distance between pins on current collector UST200/35, UDST 400/35 and UE feed	[mm]	60/90 (depending on arrangement)
Distance between pins on current collector UST300/35, UDST 600/35 and UEG feed	[mm]	130
Curved sections		only ex-works, on request
Max. hanger spacing (straight section)	[mm]	2500
Max. hanger spacing (horizontal curves RH<15 m)	[mm]	1250
Max. hanger spacing (vertical curves RH<15 m)	[mm]	2500

Technical specifications - system		
Max. system length without expansion section	[m]	250
Standard length conductor rail	[mm]	6250
Standard length expansion section	[mm]	2500

Technical specifications of current collector		
Current collector stroke	[mm]	max. ± 70 (depending on current collector)
Current collector lateral deflection	[mm]	max. ± 80 (depending on current collector)
Current collector contact pressure	[N]	max. 70 (depending on current collector)

Operating conditions		
Operating temperature for standard version	[°C]	- 30 to + 55
Operating temperature for heat-resistant version	[°C]	- 30 to + 85
Operating temperature for HT version	[°C]	- 30 to + 130
Flammability (isolation profile)		Flame-retardant, self-extinguishing, UL 94 V0
Application		Indoor installations/outdoor installations

Technical specifications - electrical

Technical specifications - electrical		
Possible number of pins		unlimited
Max. connection cross section	[mm²]	max. 4 x 185 (depending on feed type)
Conductor material		copper or aluminum/stainless steel
Protection class		IP23 with hanging arrangement
Dielectric strength according to DIN 53481	[kV/mm]	> 25
Special Electrical strength according to IEC 60093	[Ω / cm]	> 1 x 10^{16} (Depending on arrangement)
Surface resistivity according to IEC 60093	[Ω]	2,1 x 10^{15} (Depending on arrangement)
Comparative tracking index according to IEC 60093	[mm]	30

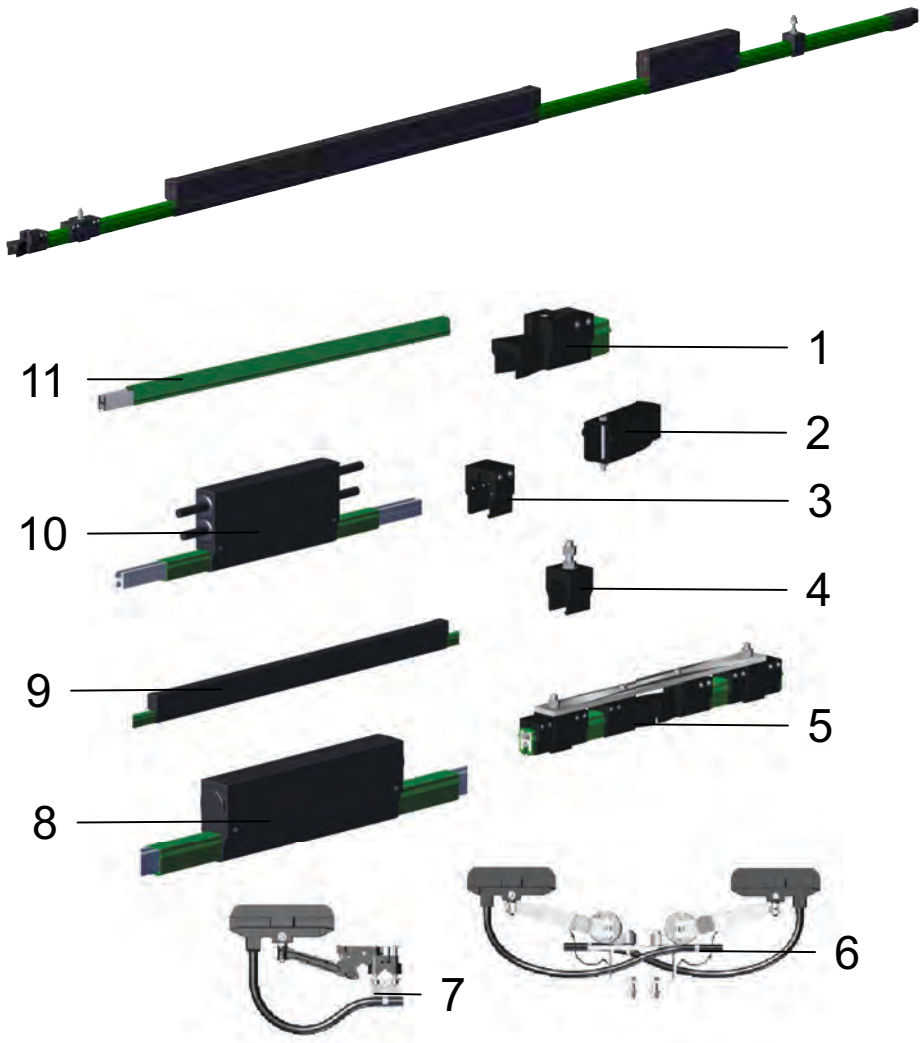
Type	Conductor cross section [mm²]	Creepage distance of insulation	Max. nominal voltage [V]	Max. nominal current at 100% (*80% duty cycle (35 °C) [A]	Resistance [1] [Ω]	Impedance [1] at phase spacing [Ω / 1 0 0 0] 90 mm	Impedance [1] at phase spacing [Ω / 1 0 0 0] 130 mm
U35/200C	200	85	1000	600	0.094	0.156	0.174
U35/300C	300	85	1000	720	0.060	0.138	0.159
U35/400C	400	85	1000	860	0.046	0.132	0.154
U35/500C *	500	85	1000	1150	0.034	0.131	0.152
U35/230 AE [2]	230	85	1000	500	0.134	0.183	0.199
U35/450 AE [2]	450	85	1000	800	0.069	0.143	0.163
U35/600 AE [2]	600	85	1000	1000	0.052	0.136	0.156

(1) At frequency of 50 Hz and 20 °C

*(2) For the AE conductor rail, current collectors of consumers that operate continuously at one spot or at very low travel speeds of approx. 10 m/min under load may only be operated at about 50% of their nominal current at 100% (*80%) duty cycle.*

5 LAYOUT AND FUNCTION

5.1 System overview



*Not all components of this product group are shown.

Position	Component designations
1	Transfer guide
2	End cap
3	Locating clamp
4	Hanger
5	Conductor dead section
6	Double current collector
7	Single current collector
8	Fixed connector
9	Expansion joint
10	Feed terminal
11	U35 conductor rail

5.2 Brief system description

Conductor rail

The conductor rail permits a combination of two conductor materials (copper and aluminum/stainless steel) and application-specific insulation profiles, which are available in standard, heat-resistant and HT versions.

Hangers

The maximum hanger spacing is determined by the operating conditions. More details can be found in the documents provided at the time of order placement.

For systems in difficult operating and environmental conditions (high humidity, electroplating, chemical plants, etc.), the installation of separate hangers is always required. Hangers with creepage distance extension shall be used to prevent electric flashovers.

Joints

Screwed joint connectors are used for the electrical and mechanical connection of the conductor rail sections.

Isolating sections

Isolating sections are electrical interruptions of the conductors. The purpose of traveling over the current collectors during operation is to generate a voltage interruption.

Conductor isolating sections are available for sectionalizing control circuits, feed tracks, maintenance sections, etc.

Locating clamp

A fixed point for the controlled longitudinal expansion of the profiles can be created with the aid of two locating clamps and one hanger.

Linear expansions Expansion joint

- The connector rails are permanently connected to each other by means of conductor rail connectors to form a continuous conductor profile. The joints are screwed between the two connected conductor rails and travel along with the conductor rail joint.
- Expansion joints are required in special cases only. For instance to compensate for a structural expansion joint in the building, for system lengths exceeding 250 m, or for system-specific fixpoints on both ends of the system.

Feed terminals

The feed terminal is mounted between rail sections instead of a joint. Single-core cables are to be used as supply cables.
The synergies mentioned above do not apply to the U35/600 AE variant! Please consult with our technical department.

Transfer funnels and transfer guides

Transfer guides are the contact-protected ends of the conductor rails at the end of the lines and mechanical line interruptions (switches, dead sections, turntables, etc.).

Funnels allow the current collectors to leave the conductor rail or to enter the conductor rail from outside. Special current collectors are required for this purpose.

Current collectors

The current collectors are usually mounted on the moving consumer, with single or double current collectors being used depending on the application. The number depends on the power to be transmitted and is configured accordingly.

Curves

The insulated conductor rails can be used in horizontal and vertical curves.

Chemical resistance

Insulation profiles in the standard version (color green) and in the heat-resistant version (color gray) are resistant to mineral oil, grease, caustic soda (25 - 50%), concentrated hydrochloric acid and sulphuric acid up to 50%.



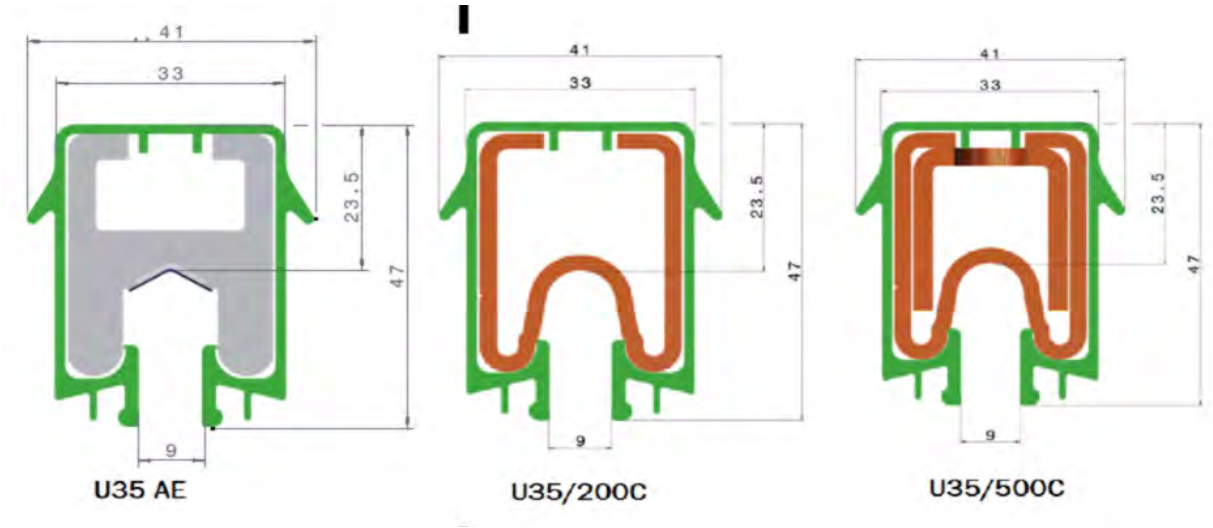
⚠ CAUTION!

Please contact us if the conductor rails are to be used in galvanizing plants, pickling plants and pressing plants.

In such cases, the exact requirements must be reviewed again and considered accordingly.

5.3 Assembly overview

5.3.1 Rail material



Type keys	
U	insulated U-conductor rail profile
35	Housing size
200-600	Conductor cross section [mm²]
C	Copper conductor
AE	Aluminum conductor with stainless steel running surface

The ID numbers must be added for the following table:

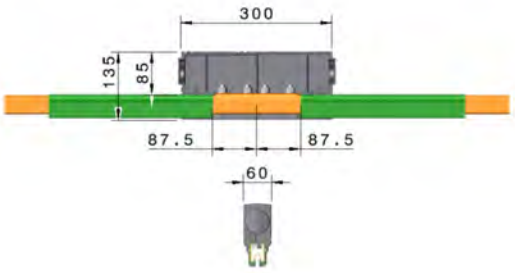
The last digit of the ID no. • indicates the individual length in meters. Please add 1, 2, 3, 4, 5 or 6 to the ID no.

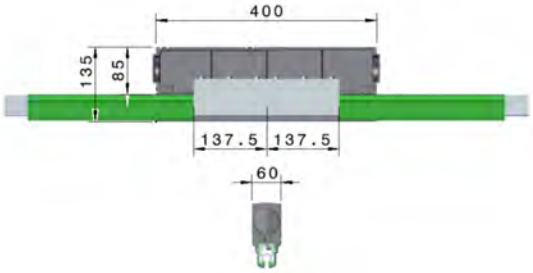
Standard version phase -30 to +50 °C color green	Weight [kg/m]	Phase ID no.	PE ID no.
U35/200 C	2.400	017520•	017526•
U35/300 C	3.400	017521•	017527•
U35/400 C	4.300	017522•	017528•
U35/500 C	6.100	017533•	017534•
U35/230 AE	1.070	017541•	017542•
U35/450 AE	1.650	017545•	017546•
U35/600 AE	2.112	017564•	017566•

Heat-resistant version (heat-resistant) -30 to +85 °C color gray	Weight [kg/m]	Phase ID no.	PE ID no.
U35/200 C	2.400	017523•	017529•
U35/300 C	3.400	017524•	017530•
U35/400 C	4.300	017525•	017531•
U35/500 C	6.100	017535•	017536•
U35/230 AE	1.070	017543•	017544•
U35/450 AE	1.650	017547•	017548•
U35/600 AE	2.112	017562•	017565•

Halogen-free version phase HT version (130 °C) -30 to +130 °C color granite gray	Weight [kg/m]	Phase ID no.	PE ID no.
U35/200 C	2.400	017571•	017572•
U35/300 C	3.400	017573•	017574•
U35/400 C	4.300	017587•	017588•
U35/500 C	6.100	017575•	017576•
U35/230 AE	1.070	017577•	017578•
U35/450 AE	1.650	017579•	017580•
U35/600 AE	2.112	017585•	017586•

5.3.2 Connecting material



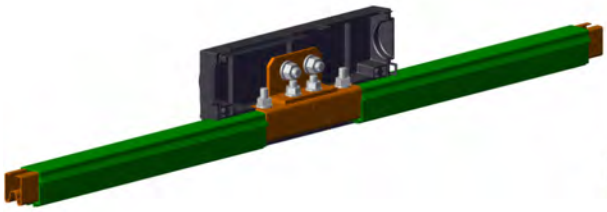


Type	Weight [kg/m]	Ident. No.
VM-UV35/200-B	0.882	0175574
VM-UV35/200-C-K4	1.105	0175798
VM-UV35/230-450AE	0.658	0175798
VM-UV35/230-450AE-B	1.028	0175987
VM-UV35/230-450AE-B-K4	1.032	0175986
VM-UV35/230-450AE-C	1.234	0175985
VM-UV35/230-450AE-C-K4	1.247	0175984
VM-UV35/300-B	0.882	0175012
VM-UV35/400-B	1.021	0175126

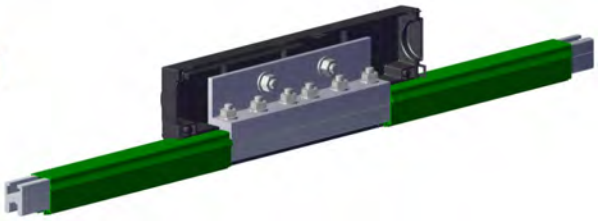
Type	Weight [kg/m]	Ident. No.
VM-UV35/400-B-K4	1.021	0175127
VM-UV35/400-C-K4	1.369	0175738
VM-UV35/500-B	1.273	0175369
VM-UV35/500-C-K4	1.273	0175740
VM-UV35/600AE-B	1.000	0175983
VM-UV35/600AE-B-K4	1.467	0175982
VM-UV35/600AE-C	1.000	0175981
VM-UV35/600AE-C-K4	1.547	0175980

5.3.3 Line feed

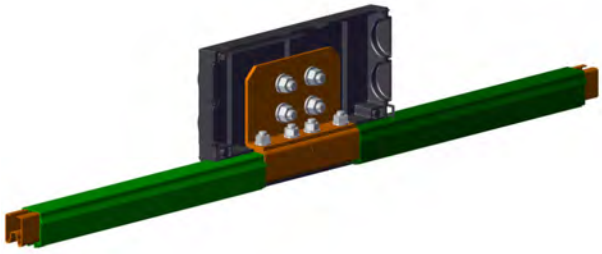
UE35



UE35/AE



UEG35



UEG35/AE



Type (Copper)	Connection max. [mm²]	Weight [kg]	Ident. No.
UE 35/200-400	2 x 150	1264	0175040
UE 35/200-400-M	2 x 150	1264	0175548
UE 35/200-400 K4(1)	2 x 150	1264	0175043
UE 35/200-400 K4(1)-M	2 x 150	1264	0175549
UE 35/500	2 x 150	1204	0175397
UE 35/500-M	2 x 150	1204	0175907
UE 35/500 K4(1)	2 x 150	1204	0175398
UE 35/500 K4(1)-M	2 x 150	1204	0175908
UEG 35/200-400	4 x 185	1930	0175105
UEG 35/200-400-M	4 x 185	1930	0175147
UEG 35/200-400 K4(1)	4 x 185	1930	0175106

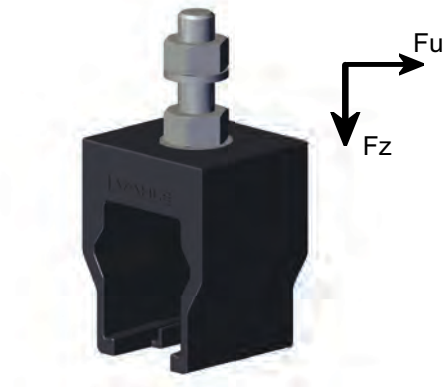
Type (Copper)	Connection max. [mm²]	Weight [kg]	Ident. No.
UEG 35/200-400 K4(1)-M	4 x 185	1930	0175324
UEG 500	4 x 185	1998	0175371
UEG 500-M	4 x 185	1998	0175394
UEG 500 K4(1)	4 x 185	1998	0175372
UEG 500 K4(1)-M	4 x 185	1998	0175417
UE 35/200-400 HT	2 x 150	1264	0175824
UE 35/200-400 HT-M	2 x 150	1264	0175826
UE 35/200-400 HT K4(1)	2 x 150	1264	0175825
UE 35/200-400 HT K4(1)-M	2 x 150	1264	0175827
UE 35/500 HT	2 x 150	1204	0175828
UE 35/500 HT-M	2 x 150	1204	0175845
UE 35/500 HT K4(1)	2 x 150	1204	0175829
UE 35/500 HT K4(1)-M	2 x 150	1204	0175846
UEG 35/200-400 HT	4 x 185	1930	0175780
UEG 35/200-400 HT-M	4 x 185	1930	0175788
UEG 35/200-400 HT K4(1)	4 x 185	1930	0175787
UEG 35/200-400 HT K4(1)-M	4 x 185	1930	0175789
UEG 500 HT	4 x 185	1998	0175747
UEG 500 HT-M	4 x 185	1998	0175778
UEG 500 HT K4(1)	4 x 185	1998	0175777
UEG 500 HT K4(1)-M	4 x 185	1998	0175779

Type (Aluminium-Stainless Steel)	Connection max. mm²	Weight [kg]	Ident. No.
UE 35 AE	2 x 150	0872	0175489
UE 35 AE-M	2 x 150	0872	0175905
UE35 AE- K4(1)	2 x 150	0872	0175490
UE35 AE-M K4(1)-M	2 x 150	0872	0175906
UE 35/600 AE	2 x 150	1617	0175693
UE 35/600 AE-M	2 x 150	1617	0175707
UE 35/600 AE K4(1)	2 x 150	1617	0175694
UE 35/600 AE K4(1)-M	2 x 150	1278	0175708
UEG 35 AE	4 x 185	1278	0175487
UEG 35 AE-M	4 x 185	1278	0175521
UEG 35 AE-K4(1)	4 x 185	1278	0175488
UEG 35 AE-K4(1)-M	2 x 150	2058	0175522
UEG 35/600 AE	2 x 150	2058	0175674
UEG 35/600 AE -M	2 x 150	2058	0175675
UEG 35/600 AE -K4(1)	2 x 150	2058	0175628
UEG 35/600 AE -K4(1)-M	2 x 150	2058	0175676
UE 35 AE HT	2 x 150	0872	0175830

Type (Aluminium-Stainless Steel)	Connection max. mm²	Weight [kg]	Ident. No.
UE 35 AE-HT-M	2 x 150	0872	0175903
UE35 AE- HT-K4(1)	2 x 150	0872	0175831
UE 35 AE-M HT-K4(1)-M	2 x 150	0872	0175904
UE 35/600 AE HT	2 x 150	1617	0175909
UE 35/600 AE-HT-M	2 x 150	1617	0175910
UE 35/600 AE HT-K4(1)	2 x 150	1617	0175911
UE 35/600 AE HT-K4(1)-M	2 x 150	1278	0175912
UEG 35 AE HT	4 x 185	1278	0175832
UEG 35 AE-HT-M	4 x 185	1278	0175834
UEG 35 AE-HT-K4(1)	4 x 185	1278	0175833
UEG 35 AE-HT-K4(1)-M	2 x 150	2058	0175835
UEG 35/600 AE HT	2 x 150	2058	0175841
UEG 35/600 AE -HT-M	2 x 150	2058	0175843
UEG 35/600 AE -HT-K4(1)	2 x 150	2058	0175842
UEG 35/600 AE -HT-K4(1)-M	2 x 150	2058	0175844

5.3.4 Hanger/holder

Insulated hanger

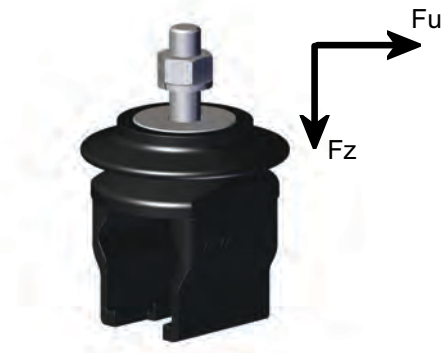


Designation	Weight [kg]	ID no.:
UAD 35	0.204	0175667
UAD 35 K4(1)	0.204	0175637

NOTICE!

- ▶ permissible breaking force Fu: 4000 N
- ▶ permissible tensile force Fz: 1800 N
- ▶ Tightening torque M12: 35 Nm
- ▶ Max. clamping area: 13 mm

Insulated hanger with creepage distance extension (insulator function)(2)



Designation	Weight [kg]	ID no.:
UIM 35	0.330	0175946
UIM 35 K4(1)	0.330	0175945

NOTICE!

- ▶ permissible breaking force Fu: 6000 N
- ▶ permissible tensile force Fz: 2000 N
- ▶ Creepage distance: 120 mm
- ▶ Tightening torque M12: 35 Nm
- ▶ Max. clamping area: 13 mm

5.3.5 Locating clamp/fixed point

Locating clamp



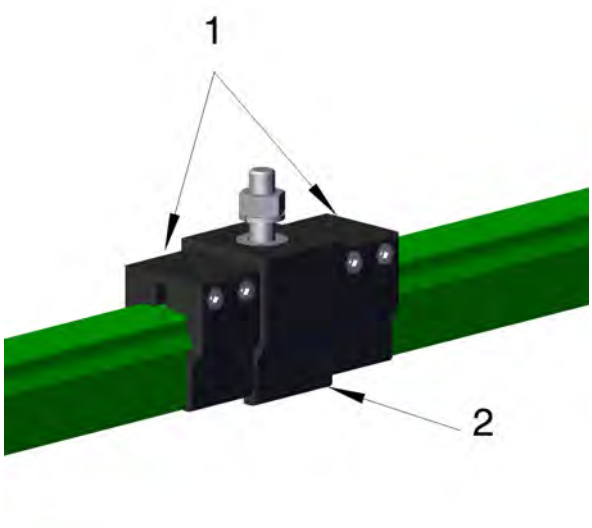
Designation	Weight [kg]	ID no.:
USK35 K	0.74	0175039

NOTICE!

- ► After installation, check the rail opening: 9±1 mm
- ► Tightening torque M6: 5 Nm
- ► Max. clamping area: 13 mm

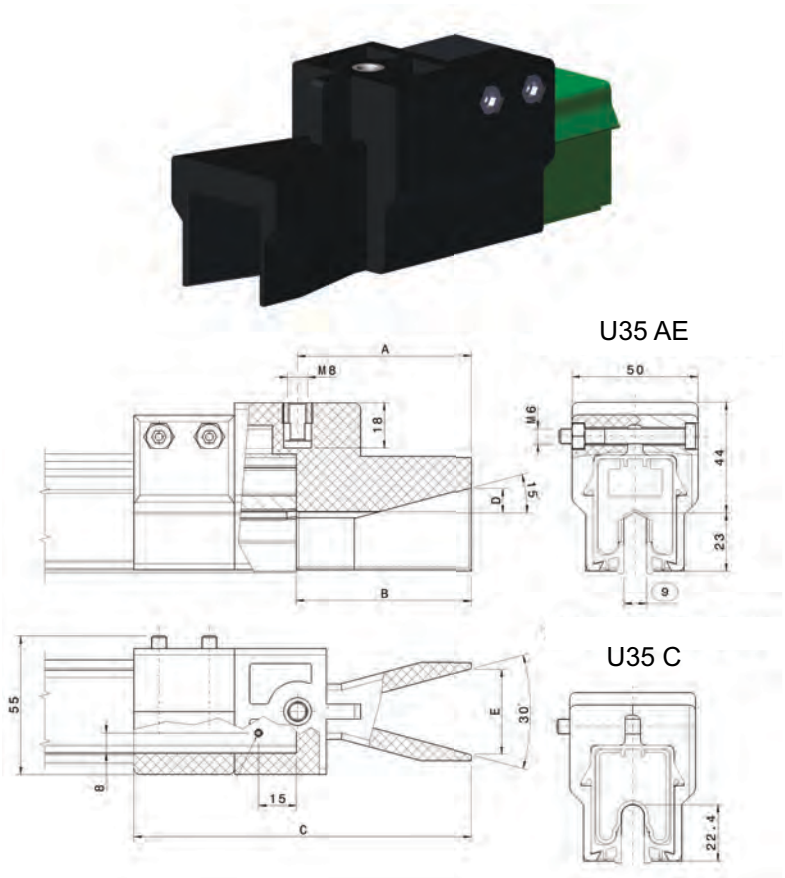
Fixed point

A fixed point for the controlled longitudinal expansion of the profiles can be created with the aid of two locating clamps and one hanger.



Position	Designation	ID no.:
1	Locating clamp	0175039
2	Hanger (example)	0175667

5.3.6 Transfer guide



NOTICE!

- For rail interruptions.
- Installation in systems according to layout plan
- Maximum vertical and lateral offset: ± 6 mm.
- Air gap during transitions max. 20 mm.
- Tightening torque for M6= 5 Nm.
- Maximum distance to the next hanger: 250 mm.
- Check rail opening after assembly.

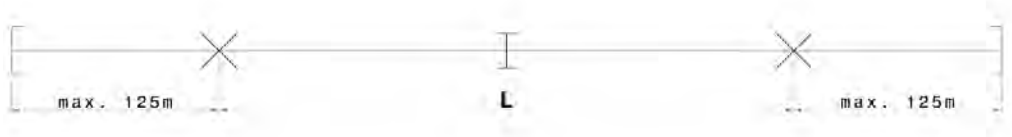
Model	Designation	Ident. No.	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
01	US35 C-K4	0175677	69.5	70	134.5	9.7	33.8
02	US35 AE-K4	0175678	69.5	70	134.5	9.7	33.8
03	US35 C-01-K4	0175814	49.5	50	114.5	4.5	23.5
04	US35 AE-01-K4	0175815	49.5	50	114.5	4.5	23.5
05	US35 C-K4-M	0175928	69.5	70	134.5	9.7	33.8
06	US35 AE-K4-M	0175929	69.5	70	134.5	9.7	33.8
07	US35 C-01-K4-M	0175930	49.5	50	114.5	4.5	23.5
08	US35 AE-01-K4-M	0175931	49.5	50	114.5	4.5	23.5

5.3.7 Expansion joint

Expansion sections

Expansion sections consist of one expansion joint and one fixed joint, mounted on a rail section of 2.5 m. They are used from a system length of 250 m and feature a maximum **expansion of 90 mm**.

Schematic diagram



Symbol for fixed point

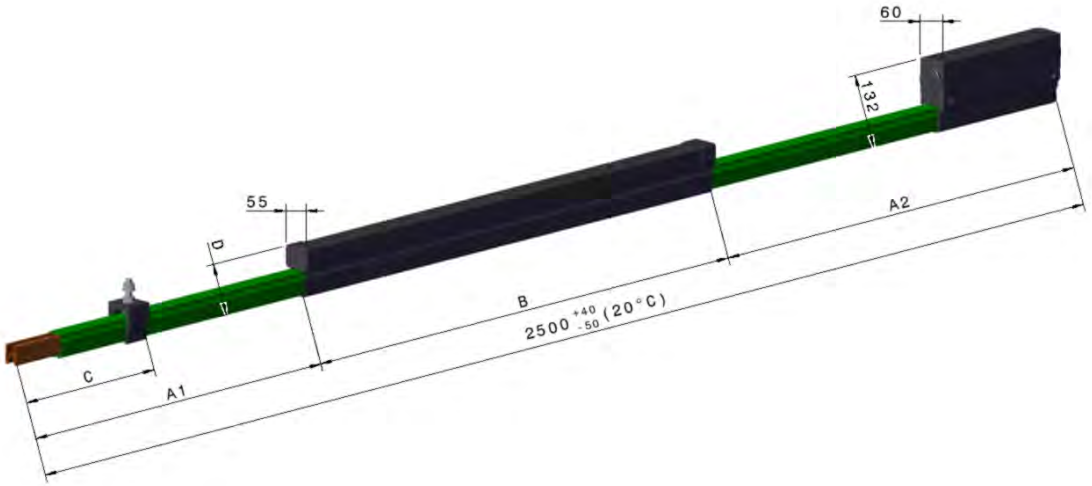
Symbol for expansion joint

Determining the expansion sections

$$n = \frac{L_1}{L}$$

n = Number of UDV (rounded up)
L_1 = Total length of the system- 250
L = max. expansion distance per UDV- see table

UDV 35/200-500 C		UDV 35/230-600 AE	
to Δt [°C]	max. L [m]	to Δt [°C]	max. L [m]
30	176	30	130
40	132	40	97.5
50	105.5	50	78
60	88	60	65



Type	A1 [mm]	A2 [mm](2)	B [mm]	C [mm]	D [mm]
UDV 35/200-400C K4	631.5	631.5	1237	300-500	127
UDV 35/500C K4	631.5	631.5	1237	300-500	127
UDV 35/230-450AE K4	640	255	1605	300-500	127
UDV 35/600AE K4	640	255	1605	300-390	127

Standard version, green

Type	Weight [kg]	Ident. No.	
		Phase	PE
UDV 35/200-400C K4(1)	16.00	0175527	0175528
UDV 35/500C K4(1)	17.50	0175540	0175541
UDV 35/230-450AE K4(1)	21.00	0175964	0175965
UDV 35/600AE K4(1)	21.00	0175968	0175969

Heat-resistant version, gray

Type	Weight [kg]	Ident. No.	
		Phase	PE
UDV 35/200-400C K4(1)	16.00	0175529	0175530
UDV 35/500C K4(1)	17.50	0175542	0175543
UDV 35/230-450AE K4(1)	21.00	0175964	0175965
UDV 35/600AE K4(1)	21.00	0175970	0175971

HT Version, granite gray

Type	Weight [kg]	Ident. No.	
		Phase	PE
UDV 35/200-400C HT K4(1)	16.00	0175700	0175701
UDV 35/500C HT K4(1)	17.50	0175702	0175703
UDV 35/230-450AE HT K4(1)	21.00	0175966	0175967
UDV 35/600AE HT K4(1)	21.00	0175972	0175973

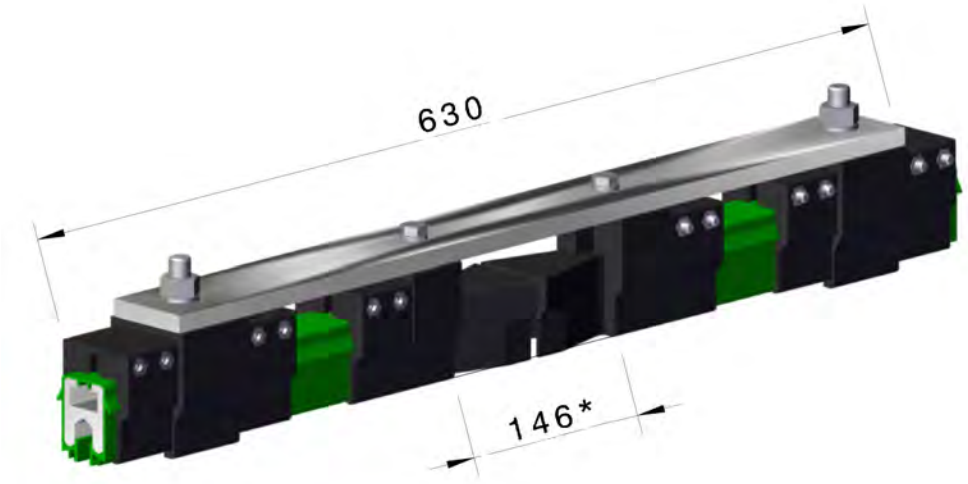
(1) Non-rusting version

(2) For AE rail expansion sections, no hangers may be installed in area A2.

(3) 150 m when using the hanger UIM35.

5.3.8 Isolating sections

Conductor dead section



* without power transmission

Type	Weight [kg]	ID no.
ST-LT/U35AE-L	1.330	0175629
ST-LT/U35AE-M	1.330	0175636
ST-LT/U35C-L	1.330	0175679
ST-LT/U35C-M	1.330	0175699

NOTICE!

- ► Type M: Installation at the factory
- ► Type L: Loose delivery

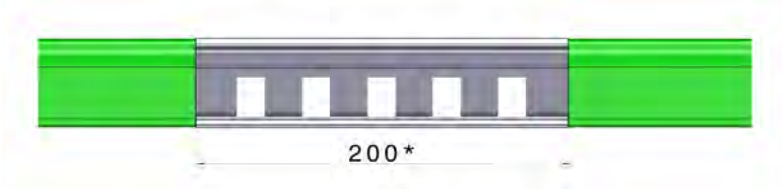
Isolating section

Two conductor dead sections are used to protect against voltage bridging and to isolate maintenance, control and feed sections.

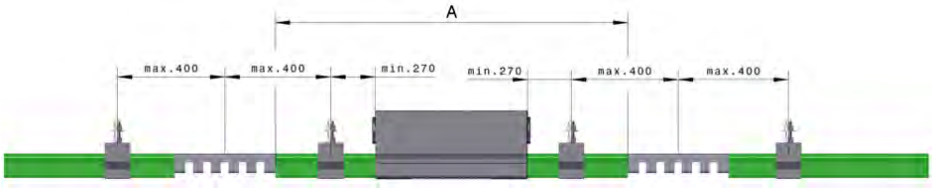
NOTICE!

The following must be observed when using isolating sections:

- A hanger must be provided on both sides. Max. distance from the center of the isolating section: 400 mm.
- When installing isolating sections, the feed terminals must also be installed at the factory (conductor rail, hangers and feed terminals must be ordered separately).
- For distance **"A"**, the number and type of current collectors and the stopping distance of mobile current consumers must be taken into account



* without power transmission

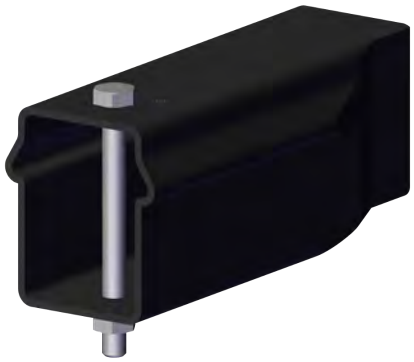


Type	Weight [kg]	ID no.
ST-IT/35/200-M	0.200	0175062
ST-IT/35/300-M	0.200	0175063
ST-IT/35/400-M	0.200	0175064
ST-IT/35/500-M	0.200	0175399
ST-IT/35/230-M	0.200	0175499
ST-IT/35/450-M	0.200	0175500
ST-IT/35/200-L	0.200	0175101
ST-IT/35/300-L	0.200	0175102
ST-IT/35/400-L	0.200	0175103
ST-IT/35/500-L	0.200	0175400
ST-IT/35/230-L	0.200	0175497
ST-IT/35/450-L	0.200	0175498

NOTICE!

- Type M: Installation at the factory
- Type L: Loose delivery as spare part

5.3.9 End cap



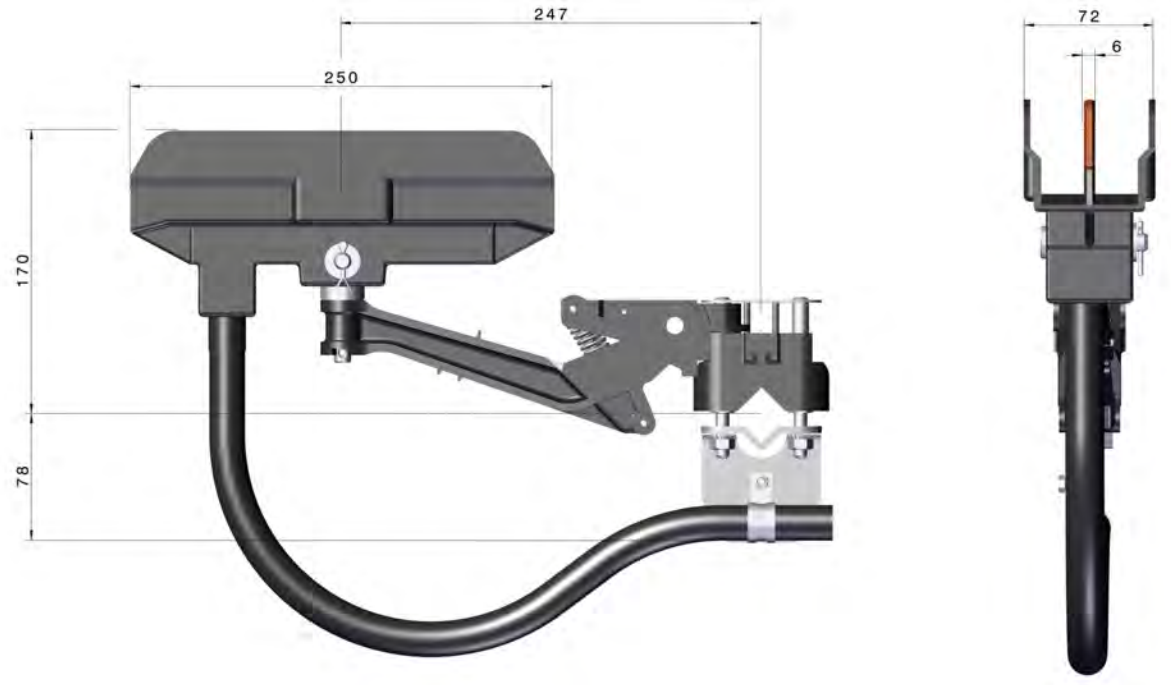
Designation	Weight [kg]	ID no.:
UK35-M	0.064	0175171
UK35-L	0.064	0175060

NOTICE!

- ► Type M: Installation at the factory
- ► Type L: Loose delivery

5.3.10 Current collector

5.3.10.1 Current collector UST/USTR



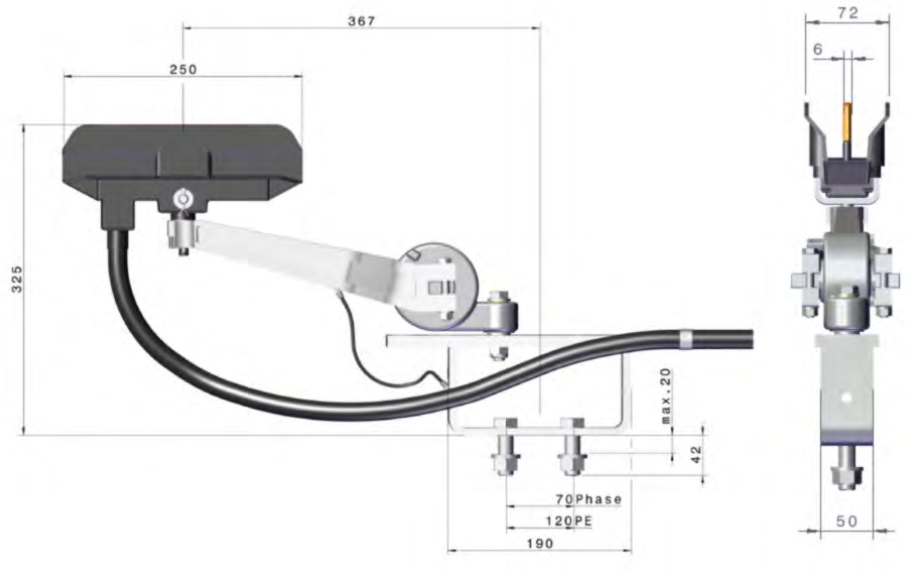
USTR current collectors should be used if the rail opening is on the side.

Designation	Nominal current* [A]	Connecting cable		Width [mm]	Weight [kg]	ID no.	
		[A/mm²]	[d_{max}/mm]			Phase black	PE yellow
UST 200/35	200	50	21	72	4.000	0175068	0175069
USTR 200/35	200	50	21	78	4.000	0175169	0175170
UST 200/35 HT	200	50	21	72	4.000	0175893	0175894
USTR 200/35 HT	200	50	21	78	4.000	0175895	0175896

* Nominal current at 100 % operating time (duty cycle) - For AE conductor rails, current collectors that remain in one position permanently or for longer periods of time, or that travel at speeds of less than 10 m/min under load, may only be loaded/operated at approx. 50 % of their nominal current.

NOTICE!

- With (3 m) connection cable (free cable length: 2.6 m)
- Stroke: ± 50 mm
- Lateral deflection: ± 50 mm
- Contact pressure: approx. 30 N



USTR current collectors should be used if the rail opening is on the side.

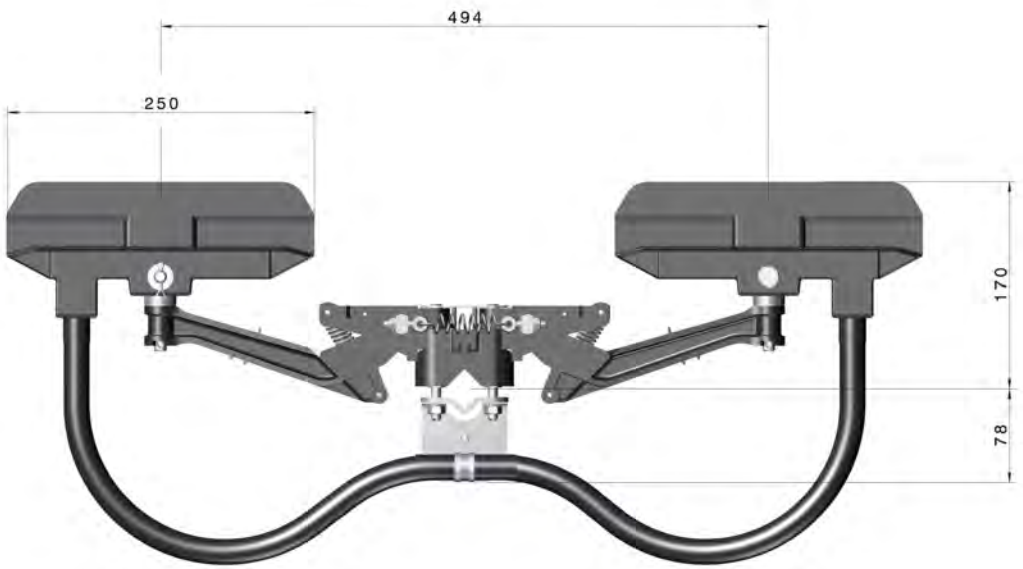
Designation	Nominal current* [A]	Connecting cable [A/mm²]	[d_{max}/mm]	Width [mm]	Weight [kg]	ID no. Phase black	ID no. PE yellow
UST 300/35	200	95	26	72	10.900	0175087	0175088
USTR 300/35	200	95	26	110	10.900	0175320	0175321
UST 300/35 HT	200	95	26	72	10.900	0175897	0175898
USTR 300/35 HT	200	95	26	110	10.900	0175899	0175900

* Nominal current at 100 % operating time (duty cycle) - For AE conductor rails, current collectors that remain in one position permanently or for longer periods of time, or that travel at speeds of less than 10 m/min under load, may only be loaded/operated at approx. 50 % of their nominal current.

NOTICE!

- With (3 m) connection cable (free cable length: 2.6 m)
- Stroke: ± 80 mm
- Lateral deflection: ± 80 mm
- Contact pressure: approx. 50-70 N

5.3.10.2 Double current collector UDST/UDSTR



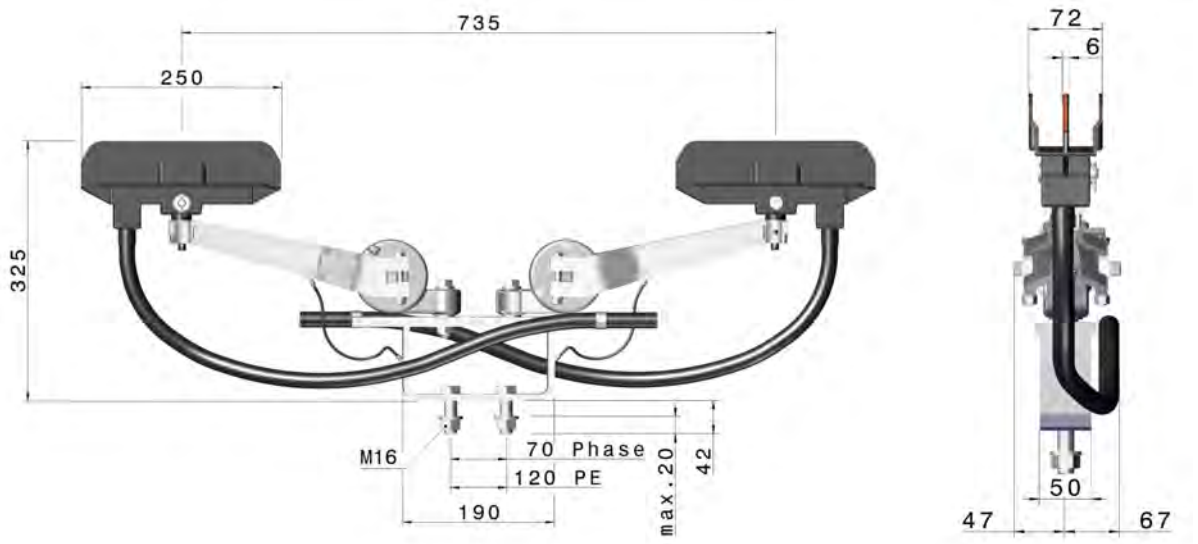
USTR current collectors should be used if the rail opening is on the side.

Designation	Nominal current* [A]	Connecting cable [A/mm²]	[d_{max}/mm]	Weight [kg]	ID no. Phase black	ID no. PE yellow
UDST 400/35	400	50	21	7.000	0175072	0175073
UDSTR 400/35	400	50	21	7.000	0175185	0175186
UDST 400/35 HT	400	50	21	7.000	0175695	0175696
UDSTR 400/35 HT	400	50	21	7.000	0175769	0175770

* Nominal current at 100 % operating time (duty cycle) - For AE conductor rails, current collectors that remain in one position permanently or for longer periods of time, or that travel at speeds of less than 10 m/min under load, may only be loaded/operated at approx. 50 % of their nominal current.

NOTICE!

- With (2x3 m) connection cable (free cable length: 2.6 m)
- Stroke: ± 50 mm
- Lateral deflection: ± 50 mm
- Contact pressure: approx. 30 N



Designation	Nominal current* [A]	Connecting cable [A/mm²]	[d_{max}/mm]	Weight [kg]	ID no. Phase black	ID no. PE yellow
UDST 600/35	600	95	26	18.300	0175089	0175090
UDSTR 600/35	600	95	26	18.300	0175174	0175175
UDST 600/35 HT	600	95	26	18.300	0175697	0175698
UDSTR 600/35 HT	600	95	26	18.300	0175901	0175902

* Nominal current at 100 % operating time (duty cycle) - For AE conductor rails, current collectors that remain in one position permanently or for longer periods of time, or that travel at speeds of less than 10 m/min under load, may only be loaded/operated at approx. 50 % of their nominal current.

NOTICE!

- With (2x3 m) connection cable
- Stroke: ± 70 mm
- Lateral deflection: ± 80 mm
- Contact pressure: approx. 50 - 70 N per carbon brush

5.3.11 Connection cables

Designation	Phase/PE	Weight [kg]	ID no.
Connecting cable RKA 50mm², 3m in length	Phase	2.200	0175084
Connecting cable RKA-HT 50mm², 3m in length	Phase	2.200	0175657
Connecting cable RKA 50mm², 3m in length	PE	2.200	0175085
Connecting cable RKA-HT 50mm², 3m in length	PE	2.200	0175658
Connecting cable RKA 95mm², 3m in length	PE	3.300	0175991
Connecting cable RKA 95mm², 3m in length	Phase	3.300	0175990

* Other types and lengths on request

5.4 Heating

General information on heating

The heating of the conductor system is carried out by a heating conductor that is drawn into the hollow chamber of the conductor rail profile. The heating cable and the heating circuit length are designed for a heating output between 15–25 W/m. The operating voltage is 230 V, 400 V (see order confirmation or system-specific installation drawing). In exceptional cases, e.g. with short heating lengths, the supply is provided via a transformer with the corresponding secondary voltage. The heating conductor lengths are supplied 1 m longer than the conductor rail length to ensure easier installation.

A heating circuit begins and ends in a feed terminal for heating system, where the heating conductor is connected to the cold conductor. The cold conductor is then routed up to the heating control unit. Within the heating circuit, it may occur that the individual heating cables need to be connected (across poles). At this point a cold conductor bridge must be installed. At this point, the feed terminal for heating system (heating wire) is again connected to the cold conductor (H07RNF) in a heating conductor feed, and on the other conductor rail section, it is supplied again according to the same principle.

NOTICE!

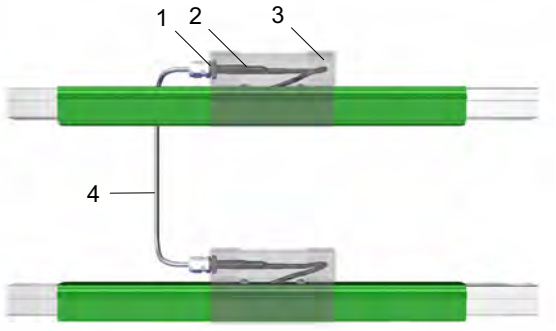
- ► For the U15, the expansion connectors are not heatable and must therefore be bridged.
- ► Supply lines from the heating feed terminal to the terminal box/feed terminal for heating system must be supplied and installed by the customer.

⚠ CAUTION!

Risk of damage!

The heating system may only be switched on if the temperature is below +5 °C. The length of the heating circuit may not be shortened arbitrarily to prevent the conductor rail from becoming too hot or too cold. Too much heat destroys the insulation profile. If the temperature is too low, the thawing temperature will not be reached. The same applies to a voltage other than the intended voltage or a different type of heating cable.

If conductor systems are equipped with isolating sections, these may not be bridged with heating conductors! The heating sections are to be installed in such a way that they end at the isolating sections. Heating conductors may also be used in maintenance areas, in which case the heating conductors must also be switched off when the maintenance area is switched off.



1 Strain relief
2 Connection thermistor/wiring
3 UEH housing
4 Bridge

Heating cable for U35

Every conductor rail cross-section of the U35 is heatable.
The following heating cables are approved: **Heating wire EYCEX 5203**

Resistance [Ω / m]	Ident. No.	Outer diameter [mm]
0.10	0196381	5.2
0.15	0196382	4.9
0.20	0196383	4.8
0.32	0196384	4.9
0.38	0196385	4.8
0.48	0196386	4.7
0.60	0196387	4.5
0.70	0196388	4.5
0.81	0196389	4.6
1.00	0196390	4.5
1.44	0196391	4.4
2.00	0196392	4.6
3.00	0196393	4.4
4.00	0196394	4.2
4.40	0196395	4.3
5.16	0196396	4.3
5.60	0196397	4.2

Special components for U35

Component	Ident. No.
Feed terminal for heating system UEH 35L	0175189
Feed terminal for heating system UEH 35M	0175120
Connecting material for heating conductor/cold conductor	1005308
Terminal box for conductor rail	0108059
Bridge 6 mm² for heating cable, 300 mm long	10010159

Expansion joint with heating conductor bridge for U35

Expansion joint with heating conductor bridge	Standard Green up to +55 °C	Warm-resistant Gray up to +85 °C	Heat-resistant Black up to +130 °C
UDVH 35/200-400C K4 PH	0175533	0175537	/
UDVH 35/200-400C K4 PE	0175534	0175538	/
UDVH 35/500C K4 PH	0175544	0175546	/
UDVH 35/500C K4 PE	0175545	0175547	/
UDVH 35/230-450 AE K4 PH	0175531	0175535	0176044
UDVH 35/230-450 AE K4 PE	0175532	0175536	0176043
UDVH 600 AE AE K4 PH	0176042	0176040	0176032
UDVH 600 AE AE K4 PE	0176041	0176039	0176031

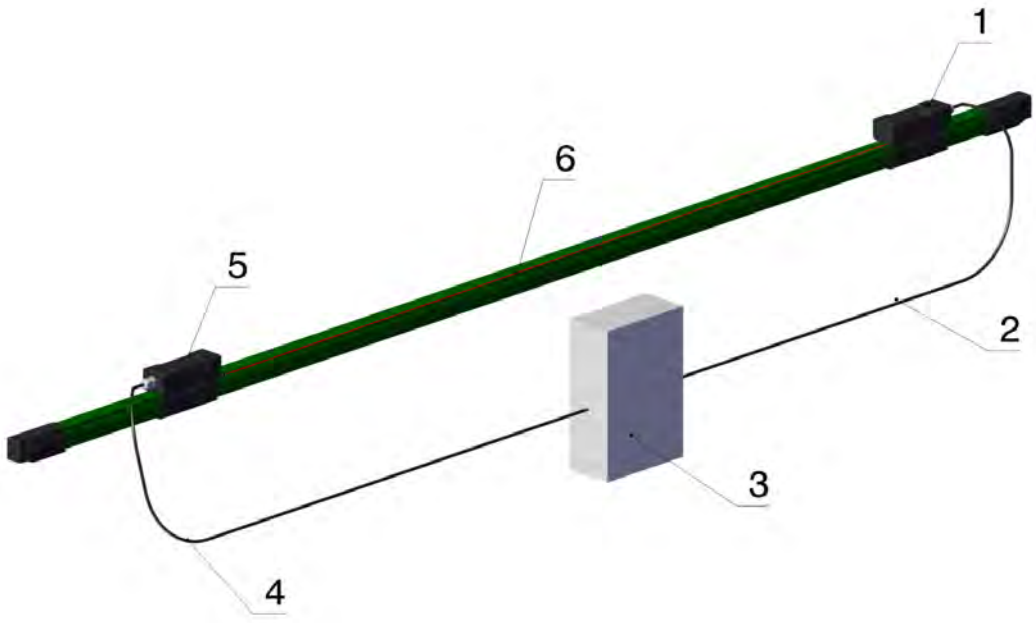
Standard heating control unit for U35

230V Current capacity [A]	Ident. No. with timer switch Yes	No	Special features
16	0107252	0107248	
25	0107253	0107249	
35	0107254	0107250	
50	0107255	0107251	

400V Current capacity [A]	Ident. No. with timer switch Yes	No	Special features
16	0107246	0107243	VA: 0107936
25	0195559	0107244	
35	0107247	0107245	
50	0175168	0195710	

System example 1 - Simple heating

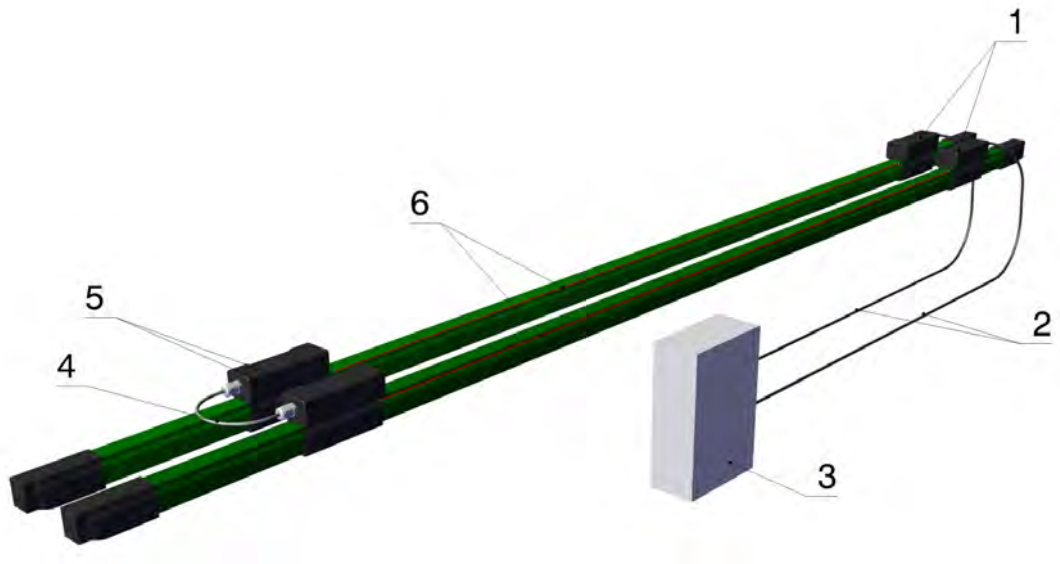
The simple principle of conductor rail heating consists of an infeed terminal and an outfeed terminal, a heating wire and a connection box.



1 Heating infeed terminal
2 Wiring
3 Connection box / heating conductor control
4 Wiring
5 Heating infeed terminal as "outfeed terminal"
6 Heated part of the conductor rail (heating wire)

System example 2 - Heating with pole change via bridge

In order to generate a pole change, bridging can be implemented. Instead of proceeding as in example 1, the heating wire can also be bridged on an opposite pole and fed back.



1 Heating infeed terminals
2 Wiring
3 Connection box / heating conductor control
4 Bridging
5 Heating infeed terminal as "outfeed terminal"
6 Heated part of the conductor rail (heating wire)

NOTICE!

Generally, item 2 must be provided by the customer.

6 COMMISSIONING

6.1 Safety instructions for commissioning



WARNING!

Risk of injury in case of improper operation!

Improper operation may result in serious injury or property damage.

- ► Observe the safety instructions from section “3 Safety instructions.”
- ► Are all acceptance reports available? (initial startup)
- ► Are there no people in the danger zones?
- ► Was the assembly performed completely according to instructions?
- ► Have excess materials, tools and auxiliary devices been cleared from the danger zones?
- ► Has the electrical system been powered up by an authorized electrically trained person (see section “3 Safety instructions”)



WARNING!

Danger to unauthorized persons!

Unauthorized persons who do not meet the requirements described here do not know the dangers in the respective work area.

- ► Keep unauthorized persons away from the work area.
- ► If in doubt, speak to people and expel them from the work area.
- ► Interrupt the work as long as the unauthorized persons are in the work area.



WARNING!

Risks to due inadequately trained personnel!

Insufficiently qualified persons cannot assess the risks involved in working with the system and may expose themselves and others to the risk of severe or even fatal injuries.

- ► All work must be performed by qualified personnel only.
- ► Insufficiently qualified personnel must stay out of the work area.



WARNING!

Risk of injury from falling parts!

In case of improper use (faulty assembly, misuse, failure to perform maintenance, etc.), there is a risk of parts falling down.

- ► Wear a helmet
- ► Perform regular maintenance



⚠ CAUTION!

Danger of crushing between the individual components!

During assembly there is a risk of crushing of the extremities between the individual components.

- ► Take care of your extremities.
- ► Wear personal protective equipment. (see section: 3)



NOTICE!

The conductor rail material is susceptible to corrosion.

Corrosion can occur when working on the conductor rail with tools.

- ► Only tools that have not previously been used for ferritic materials may be used.
- ► Own tools should be used for the different materials (aluminum, copper, stainless steel).
- ► Chip-forming work (grinding etc.) must not be performed in the vicinity of the conductor rail system.



NOTICE!

The following points have to be strictly observed during assembly!

- ► Appropriate handling of materials.
- ► Clean and metallic bright surfaces on all contact points.
- ► Smooth crossovers, free of burrs, of the conductor rail profiles at the ends in order to avoid breakdowns and a high carbon brush wear.
- ► Firm tightening of all screws using the screw lock provided and observing the stated tightening torques.
- ► Exact alignment of the conductor rail to the guide system.
- ► Damaged materials must not be installed.
- ► Observe all applicable regulations governing installation of the plant.

6.2 Operation/decommissioning

6.2.1 Operation

Operation is understood to be trouble-free, normal operation. Check system as per the maintenance schedule in section: „8 “. If defects occur, stop using the system to prevent damage.

6.2.2 Decommissioning

Switch off the system and secure it against restarting. Disconnect the entire power supply from the system physically.

Perform the following safety work in accordance with VDE 0105-100 (this work must be carried out by a qualified electrician, see section "2 Safety").

Disconnect

Required isolating distances must be established.

Secure against re-switching

During work, a prohibition sign must be attached reliably on switching handles or drives of switches, control units, pressure and sensing devices, safety parts, circuit breakers that have been used to unlock a system part or that can be used to connect electricity. If this is not possible, then the clearly associated prohibition sign must be nearby. Existing mechanical interlocking devices against restart must be used for manually operated switches.

Determine that the system is de-energized

Absence of voltage is to be determined at or as close as possible to the work site at all poles. Absence of voltage must be checked with a voltage tester immediately before and after use.

Grounding and short-circuiting

Parts on which work will be performed at the work place must first be grounded and then short circuited. Grounding and short-circuiting must be visible from the workplace. Deviating from the above, it is permitted to ground and short-circuit near the work place if this is required due to the local conditions or for safety reasons. Devices for grounding and short-circuiting must always first be connected with the grounding system or the ground electrode and afterwards with the parts to be grounded. Grounding and short circuiting may be waived in certain low-voltage systems (see VDE 0100-100).

Cover or block adjacent live parts

Before starting work, check whether it is appropriate to make adjacent parts voltage-free.



DANGER!

Danger of death due to electrical current!

Contact with live parts can result in life-threatening injuries.

► Make sure that the relevant components are not live or under voltage, and that there is no unauthorized approximation.

6.3 Installation

6.3.1 Assembly preparation

Tools and Measuring equipment

The following devices, tools and measuring equipment are necessary for assembly of the conductor rails with accessories.

- Suitable means of transport for bringing the conductor rail to the installation site (full-area support of the conductor rail).
- adjustable torque wrench (5-100 Nm)
- 1 x set of open-end and ring wrench each (SW10-24)
- Steel rule + folding rule
- Engineer's hammer (size 200)
- Screwdriver set (slot-head + Phillips)
- Hand drill + twist drill bits (Ø=3 mm; Ø=6,5 mm; Ø=13 mm; Ø=18 mm)
- Flat file and round file (Ø=6 mm)
- Metal saw
- Hair brush for contact grease
- Thermometer
- Scotch Bride (ID no: 10007350)
- contact grease (ID no: 0121502/00)

Torques for screw connections



CAUTION!

For screw connections, the tightening torques indicated below must be strictly observed:

Bolt size	Torque [Nm]
M 6	5
M 8	12
M 10	35
M 12	40
M 16	100

6.3.2 Installing support brackets

The support brackets are required for mounting the U35 hangers. The implementation is carried out **by the customer**.



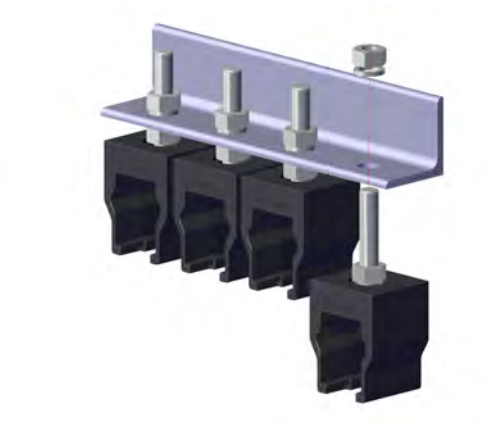
Example illustration of a support bracket

NOTICE!

Observe the following installation distances and tolerances:

- Angle tolerance: ± 1°
- Hanger spacing for straight installation and inner and outer curves max. 2500 mm (± 10 mm).
- Hanger spacing for horizontal curves with a **radius of ≤ 15 m:** ≤ 1250 mm (±10 mm)
- Hanger spacing for horizontal curves with a **radius of ≥ 15 m:** **≤ 2500 mm (±10 mm)**

6.3.3 Installation hangers



Step 1

Required tools:

⚒ None

Assembly instructions:

1. Attach the insulated hangers with the rail holder to the support brackets as shown.

NOTICE!

- Please refer to the required torques listed in the table from chapter: „6.3.1 “.

- Note the spacing between phases and hangers shown in the system/installation plan supplied.



Step 2

Required tools:

⚒ Reversible ratchet

Assembly instructions:

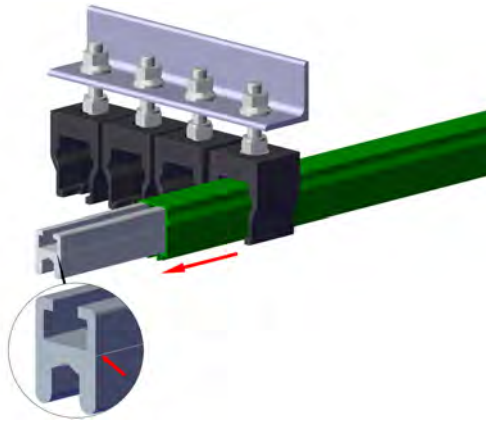
1. Tighten the nuts to 35 Nm.

⚠ WARNING!

Risk of severe personal injury!

► To make visual inspection easier, the bolts must be marked after tightening.

6.3.4 Assembly of conductor rail



NOTICE!

- ► Make sure that the conductor rail is not inserted into the wrong recesses of the holders. Ensure that everything fits correctly!
- ► It must be possible to easily move the conductor rails in the hangers. If necessary, realign the hangers to avoid hindering the longitudinal expansion of the conductor rail

Step 1

Required tools:

⚒ None

Assembly instructions:

1. Slide the conductor rails into the rail holders or insulated hangers.
2. Assemble the conductor rail so that the groove continuously faces to one side **(1)**.

NOTICE!

- ► In order to achieve a smooth transition at the joints of the conductor rail sections, they must be mounted in the rolling direction.
- ► For identification purposes, the conductor profile has a longitudinal, rolled groove on one side **(1)**.



Step 2

Required tools:

⚒ Torque wrench

Assembly instructions:

1. The ends of the conductor rail sections are ready for installation in the joints. Push them directly in front of each other and fix this position.

NOTICE!

► To ensure correct current transition, the contact surfaces between the fixed joint and the conductor rails must be metallic bright. For this purpose, you can use Scotch-Brite (Ident. No.: 10007350). Then coat them thinly with contact grease.

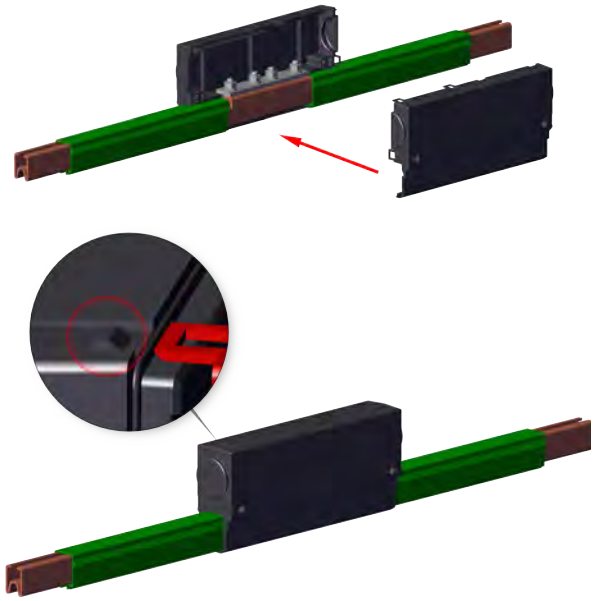
► The joint has a marker which makes it easy to identify the center.

⚠ **CAUTION!**

Risk of damage!

The conductor rail ends are to be mounted on the contact surface without air gap and offset

2. Place the fixed joint centrally onto the conductor rail ends and tighten all M 10 bolts to **35 Nm**.



Step 3

Required tools:

⚒ Slot-head screwdriver

Assembly instructions:

1. Place the halves of the cover caps at the joint so that the conductor rail is firmly enclosed and the clips interlock.
2. Press the halves of the cover caps firmly together so that the clips snap into place.

9.3.2 Disassembly of caps Joints/feed

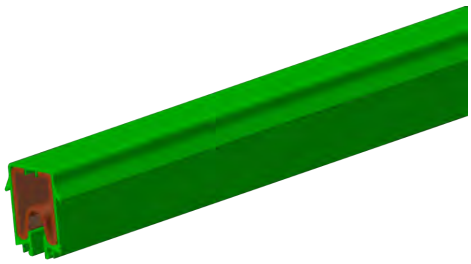
NOTICE!

Screwing the caps

In normal operation, the caps are closed by clips. Optionally, however, they can also be screwed.

► If one of the fastening clips breaks during installation, the cap must be screwed.

6.3.5 Assembly and making shorter lengths



Step 1

Required tools:

⚒ None

Assembly instructions:

1. Insert the conductor rail profile on one side as far as the flush stop of the insulating profile.



Step 2

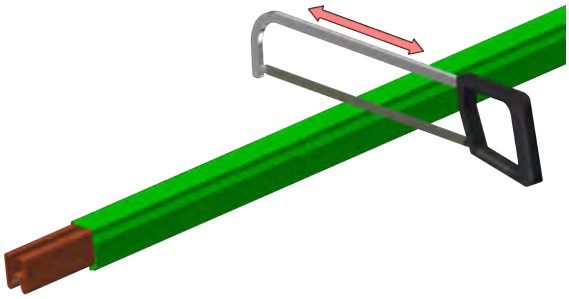
Required tools:

⚒ Square, tape measure, marking tool

Assembly instructions:

1. Mark the desired conductor rail length **“L”**.

Type	Dimension A [mm]
U35/200-500 C	176
U35/230-450 AE	176
U35/600 AE	275



Step 3

Required tools:

⚒ Saw

Assembly instructions:

1. Saw the profile at the marked point and then de-burr it.



Step 4

Required tools:

⚒ None

Assembly instructions:

1. Push the insulation profile back onto the conductor rail so that the conductor rail profile protrudes symmetrically at both ends.

DANGER!

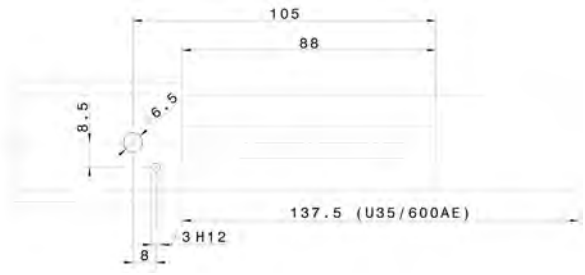
- ► For the AE rail version, the stainless steel sliding surface must be chamfered before installation.
- ► ? Risk of injury! For the AE rail version, do not saw the profile from the top – saw it from the side where the profile is open.

NOTICE!

- ► The installation of undersized lengths is carried out in the same way as the installation of sections (see Chapter”6.3.4 ”).
- ► For the U35 500C, an elongated hole (11 × 75 mm) must be made directly at the saw cut for use as a feeder or connector.

6.3.6 Mounting end caps

The end caps form the contact-protected end of the conductor rail and are usually installed on the corresponding conductor rail sections at the factory.





Step 1

Required tools:

- ⚒ Marking tool
- ⚒ Tape measure

Assembly instructions:

1. For the U35/600 AE, shorten the conductor rail profile by 50 mm to 88 mm.

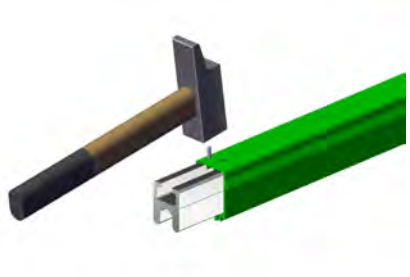
Step 2

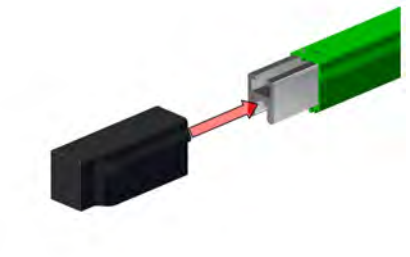
Required tools:

- ⚒ Electric drill
- ⚒ Drill Ø=6.5 mm

Assembly instructions:

1. Drill a hole with Ø=6.5 mm, as shown in the adjacent drawing from step 1, from **below** (view on stainless steel strip) through the conductor rail and the insulation profile.
2. Drill another hole with Ø=3 mm into the conductor rail from **above**, as shown in the adjacent drawing from step 1.







Step 3

Required tools:

⚒ Hammer

Assembly instructions:

1. Carefully drive the supplied locking pin (Ø 3 x 32 mm) into the prepared hole. This pin serves to fix the insulation profile to the conductor rail profile.

⚠ CAUTION!

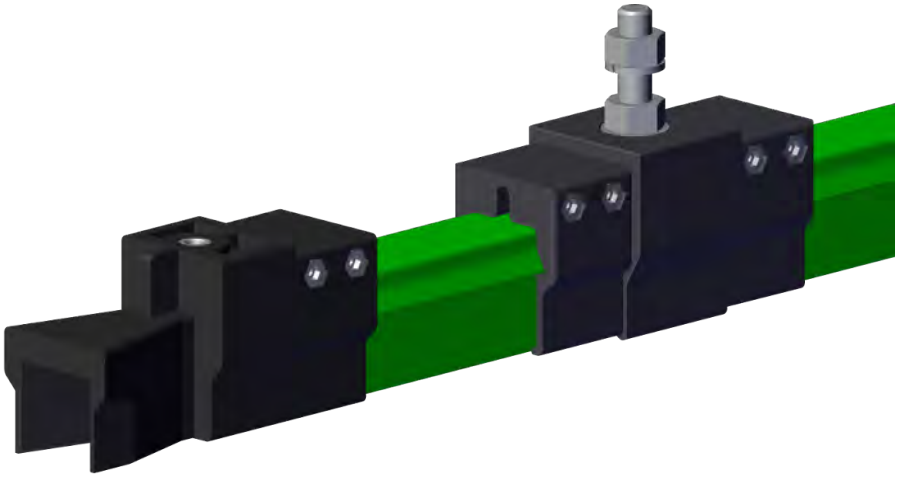
Risk of damage

- ► Only perform light strokes with the hammer.
- ► Work accurately when drilling and avoid drilling into other parts of the conductor rails.
- ► The locking pin must be completely covered by the end cap.

2. Push on the end cap and fasten it with the plastic screw (hand-tight).

6.3.7 Installing the transfer guides

Transfer guides are used at switches, lifting stations, and removable rail sections.



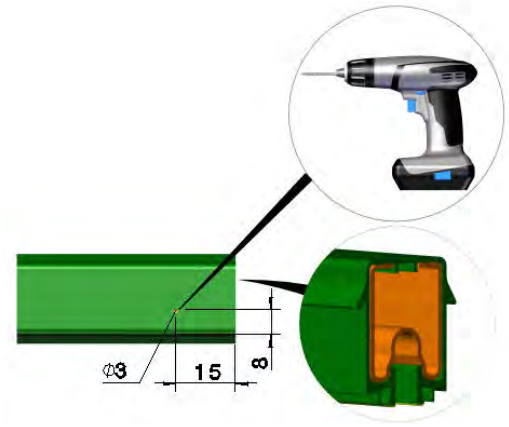
NOTICE!

The following points must be observed during installation:

- At a maximum distance of 130 mm from the front edge of the transfer guide, a hanger must be provided, with one locating clamp on each side of the suspension.
- **Maximum vertical and lateral offset: ± 6 mm.**
- **Air gap during transitions max. 20 mm.**
- The transfer guide can be factory-mounted into a conductor rail section and delivered ready for installation. If on-site installation is required, proceed as follows:

Assembly of transfer guides (not pre-assembled).

If the transfer guides are not delivered pre-assembled, the following assembly steps must be observed.



Step 1

Assembly instructions:

1. Insert the conductor rail profile on one side as far as the flush stop of the insulating profile.

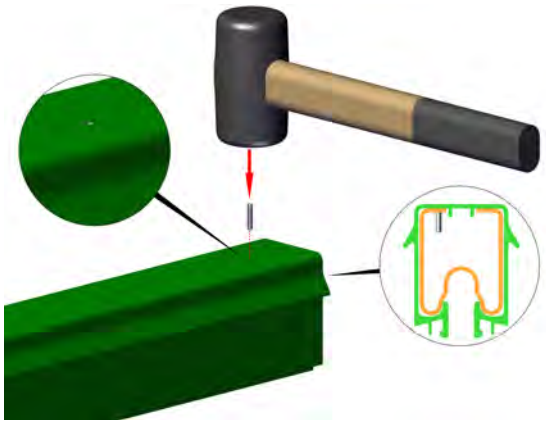
Step 2

Required tools:

- ⚒ Marking tool
- ⚒ Electric drill
- ⚒ Drill Ø=3 mm

Assembly instructions:

1. Mark the drill hole as shown in the sketch and drill a hole with Ø = 3 mm through the insulation profile and the conductor rail.



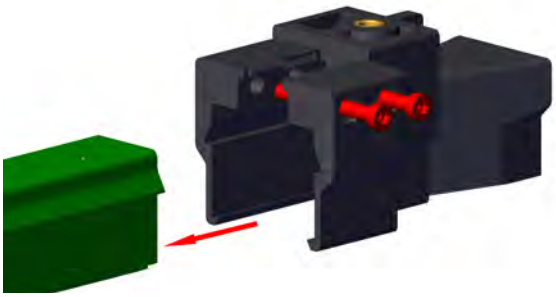
Step 3

Required tools:

- ⚒ Rubber mallet

Assembly instructions:

1. Drive the 3 mm tension pin flush into the insulation profile.



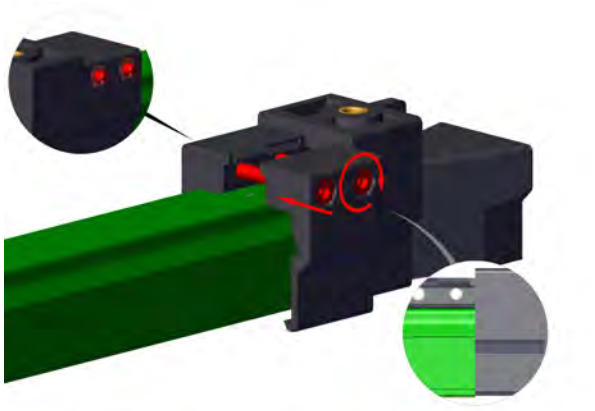
Step 4

Required tools:

- ⚒ Allen key

Assembly instructions:

1. Loosen the screws of the cap on the transfer guide and slide it onto the end of the profile.



Step 5

Required tools:

⚒ Allen key

Assembly instructions:

1. Slide the transfer guide onto the end of the profile until it reaches the stop, and tighten the cap of the transfer guide.

NOTICE!

- ► Check rail opening after assembly: 9± 1 mm
- ► Tightening torque M6: 5 Nm
- ► Maximum clamping area: 13 mm.

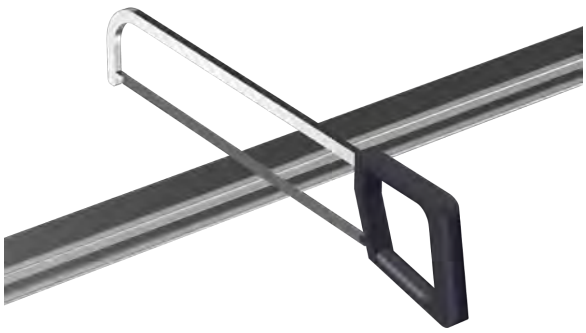
6.3.8 Installing isolating sections

Isolating sections are used to electrically isolate the conductor rail. They are pre-assembled at the factory according to your customer-specific specifications, but can also be used during assembly.

NOTICE!

You should consider the following points before assembly:

- ► Any cut edges must always be neatly deburred.
- ► In the case of multi-pole systems, the isolating sections must be exactly adjacent to each other!
- ► The conductor rail must be additionally suspended before and after the isolating section at a maximum distance of approx. 400 mm!
- ► Make sure that the conductor rail profile protrudes equally on both sides before you mark the section!



Step 1

Required tools:

⚒ Marking tool

⚒ Metal saw

Assembly instructions:

1. Completely pull the conductor rail profile out of the insulation profile and mark the profile at the point where an isolating section is to be created.
2. Cut the conductor rail profile at the previously marked point.



Step 2

Required tools:

- ⚒ Marking tool
- ⚒ Metal saw

Assembly instructions:

1. Shorten both conductor rail profiles by 100 mm each and deburr them.

NOTICE!

- ► With the AE rail variant, the stainless steel contact surface must be chamfered before installation!
- ► With the U35/500 C rail, the internal U profile must also be shortened by 55 mm in relation to the external copper profile.



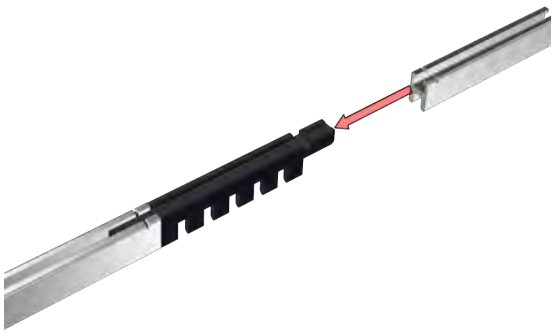
Step 3

Required tools:

- ⚒ Marking tool
- ⚒ Metal saw

Assembly instructions:

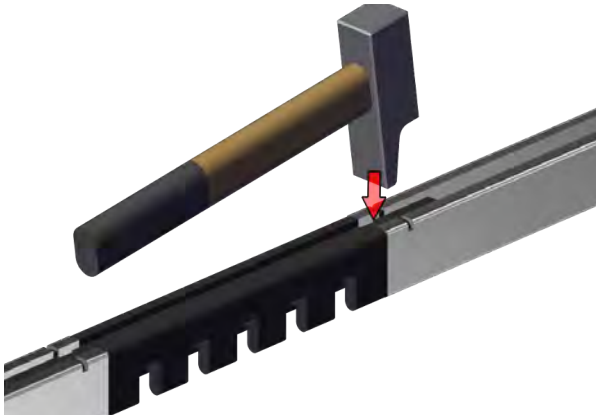
1. Make a saw cut in the conductor rail profiles at one end from the top, as shown in the drawing above.
2. Deburr the cut surfaces cleanly.



Step 4

Assembly instructions:

1. Push the conductor rail profile onto the pins of the insulating piece.



Step 5

Required tools:

⚒ Hammer

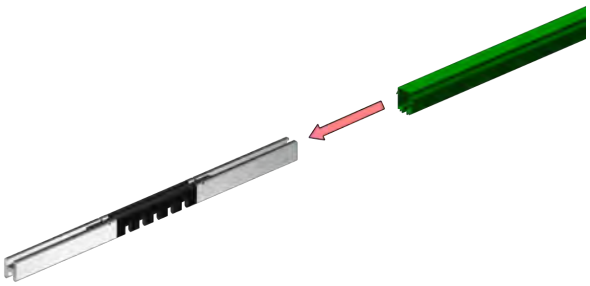
Assembly instructions:

1. Now drive the tongues created in the sawing step into the pins with a hammer.

⚠ CAUTION!

Risk of damage

► Only perform light strokes with the hammer, as the rail could be damaged.



Step 6

Assembly instructions:

1. Now push the conductor rail back into the insulating profile.

Two conductor dead sections are used to protect against voltage bridging and to isolate maintenance, control and feed sections.

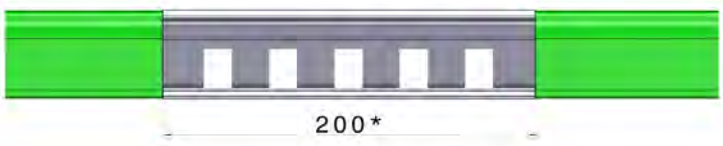
NOTICE!

The following must be observed when using isolating sections:

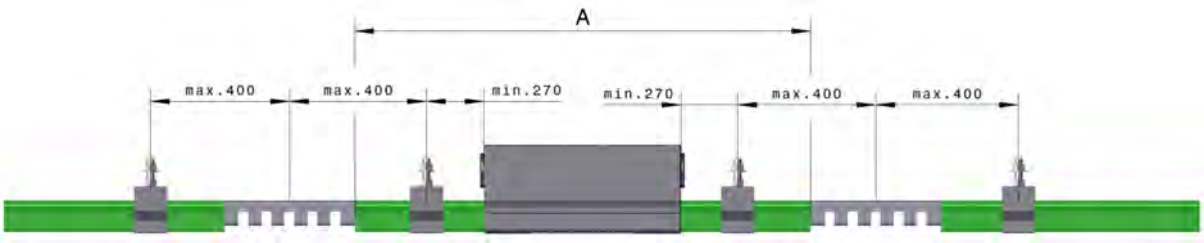
► A hanger must be provided on both sides. Max. distance from the center of the isolating section: 400 mm.

► When installing isolating sections, the feed terminals must also be installed at the factory (conductor rail, hangers and feed terminals must be ordered separately).

► For distance **"A"**, the number and type of current collectors and the stopping distance of mobile current consumers must be taken into account

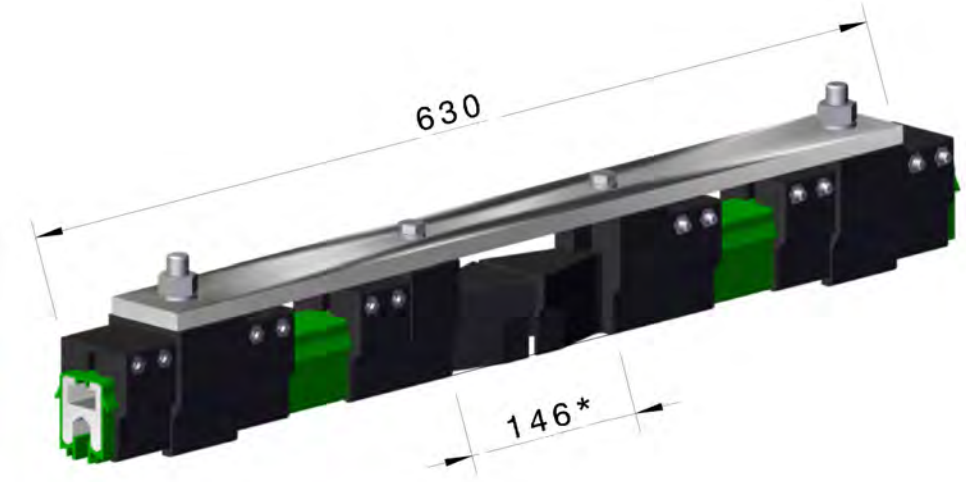


*powerless



6.3.9 Installing conductor dead section

Conductor dead section



* 146 mm without power transmission

Step 1

Required tools:

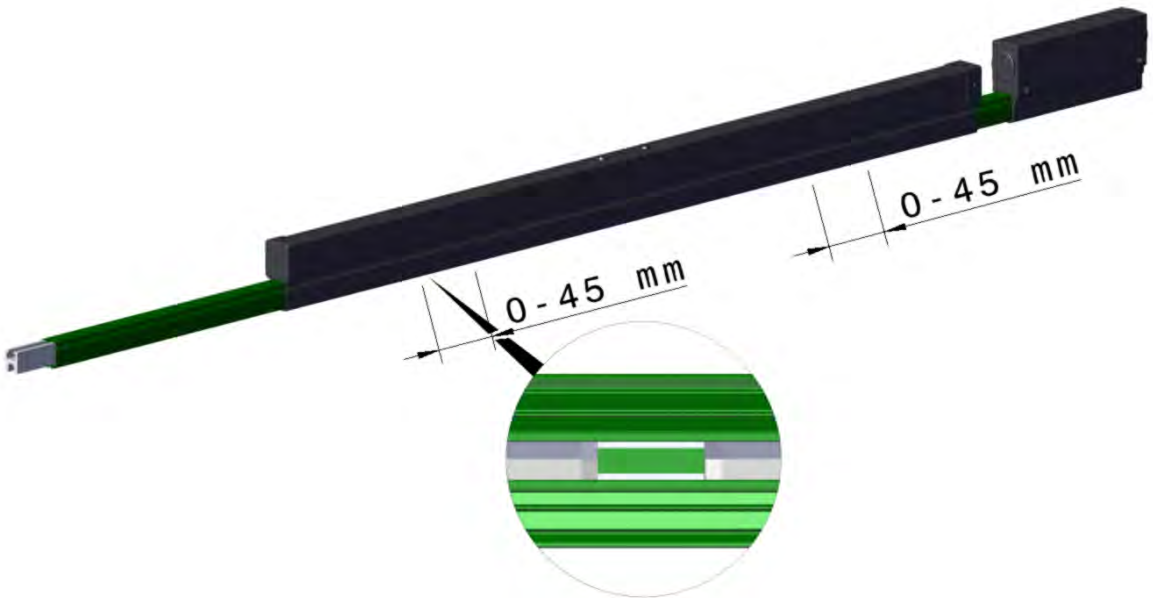
⚒ Wrench

Assembly instructions:

1. Cut the conductor rail at the desired point, as per Chapter: „6.3.8 .“
2. Shorten both conductor rails **by 73 mm each** and deburr them properly.
3. Push the conductor rail onto the conductor dead section and secure it with the supplied locating clamps.

6.3.10 Installation of expansion joints

The expansion sections are factory-assembled as conductor rail sections with two expansion joints and one fixed joint. For installation of the expansion rail sections, see Chapter “6.3.4 ”



NOTICE!

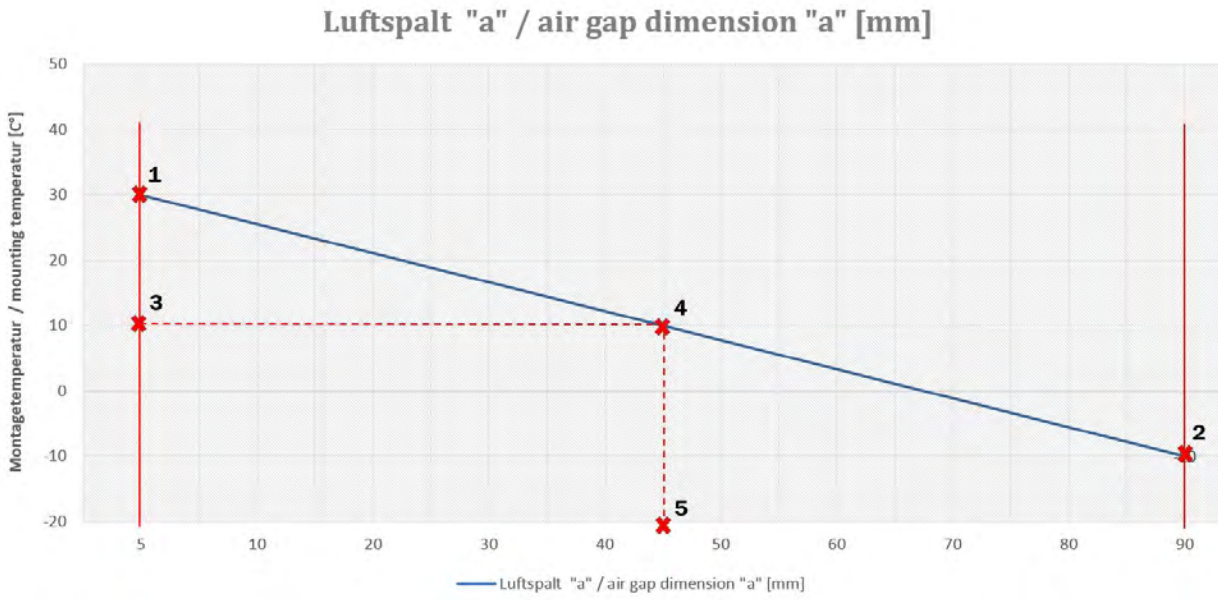
You should consider the following points before assembly:

- ► Expansion sections are used in straight system layouts with a length exceeding 250 m.
- ► The total expansion distance of an expansion section is 2x45 mm. The maximum length "L" of the expansion distance for an expansion section depends on the maximum temperature difference (ΔT) (see tables below).

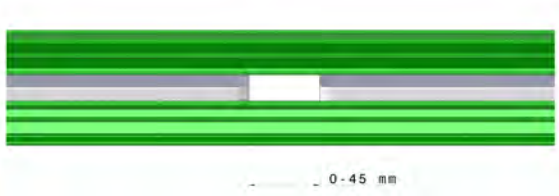
To determine the total air gap "a" to be set for the expansion joints, proceed as follows:

UDV 35 C					
ΔT	[°C]	max. L [m]	ΔT	[°C]	max. L [m]
30		176.0	50		105.5
40		132.0	60		88.0

UDV 35 AE					
ΔT	[°C]	max. L [m]	ΔT	[°C]	max. L [m]
30		130.0	50		78.0
40		97.5	60		65.0



Example from diagram:
Max. ambient temperature = 30 °C
Min. ambient temperature = -10 °C
Temperature difference = 40 °C
Installation temperature = 10 °C
Air gap = 45 mm



Step 1

Required tools:

⚒ None

Assembly instructions:

1. Enter the highest (1) and lowest (2) operating temperature at 0 mm and 90 mm respectively
2. Connect both points with a straight line.
3. Now enter the temperature prevailing during installation horizontally into the drawing (3).
4. Read off the intersection of both lines (4) and from there draw a vertical line to the X-axis of the diagram and read off the air gap "a" (5) that is to be set.
5. Connect both points with a straight line.

Step 2

Required tools:

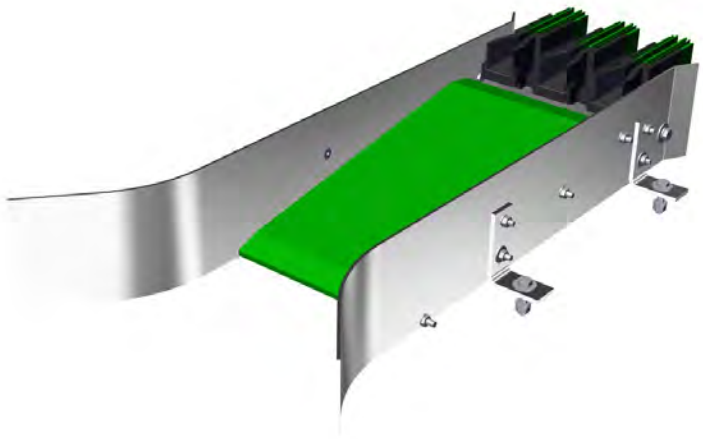
⚒ None

Assembly instructions:

1. Divide the determined air gap "a" evenly between a1 and a2 and set these values at the expansion joint.

6.3.11 Installing transfer funnel

The transfer funnels are supplied pre-assembled but without conductor system. They are mounted on solid, vibration-free support brackets.



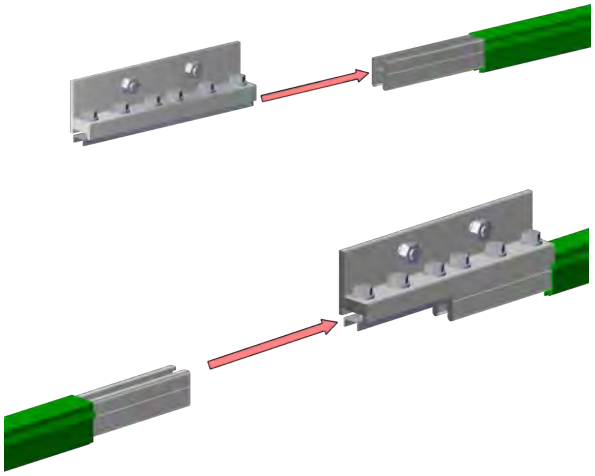
NOTICE!

The following points should be noted when installing the transfer funnel:

- The stroke and deflection tolerances of the current collectors in the entrance area of the transfer funnel are limited to max. ± 20 mm.
- The entrance speed of the current collectors into the funnel is limited to 100 m/min and must be strictly observed.

6.3.12 Feed terminal installation

Feeds as fixed joints.



The feeds can also be used in place of a fixed joint.

Step 1

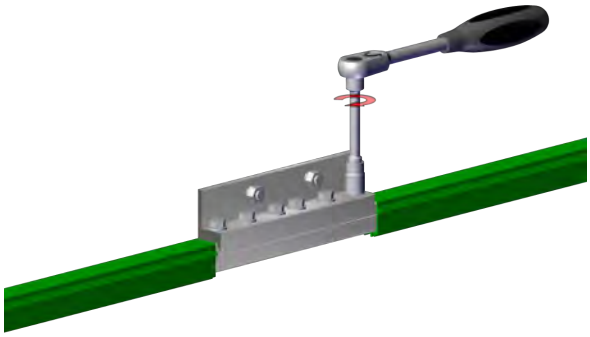
Assembly instructions:

1. Slide back the insulation profile and insert the conductor profile into the feed as shown.

Step 2

Assembly instructions:

1. Slide back the insulation profile on the other side as well and insert the conductor profile into the feed as shown.



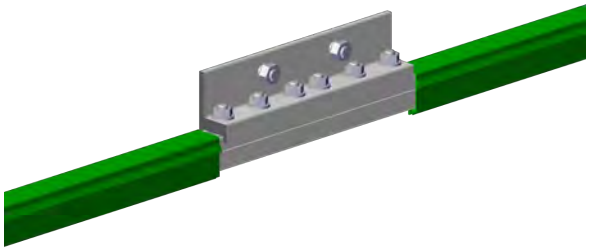
Step 3

Required tools:

⚒ Torque wrench

Assembly instructions:

1. Tighten the screws to the specified torque. You can find the torque specifications in the chapter 6.3.1.



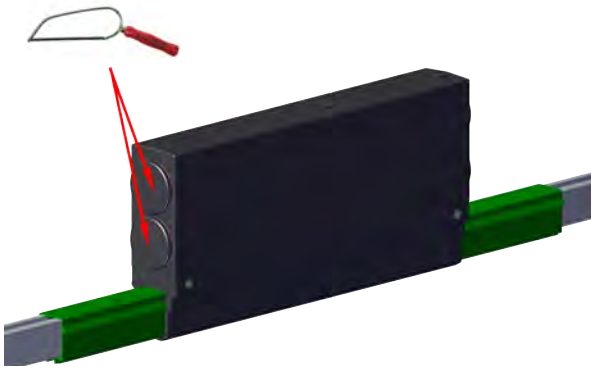
Step 4

Required tools:

⚒ Torque wrench

Assembly instructions:

1. Slide the insulation profiles back onto or in front of the feed.



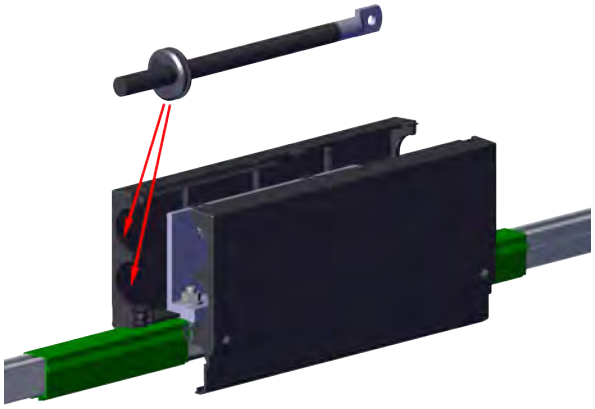
Step 5

Required tools:

⚒ Saw

Assembly instructions:

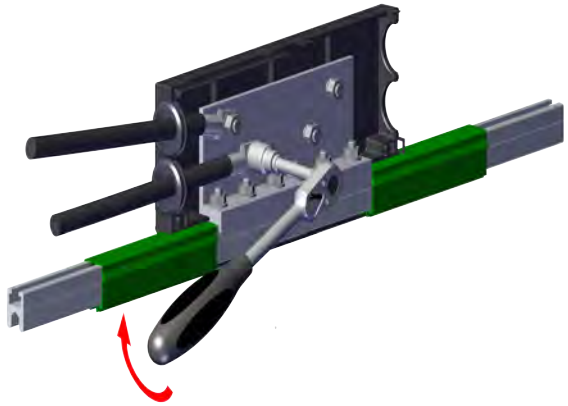
1. Saw the required openings in the cap for cable entry.
2. Deburr the opening.



Step 6

Assembly instructions:

1. Slide the grommet onto the supply line.
2. Feed the supply line through the prepared opening. Make sure the grommet sits in the opening and seals it.



Step 7

Required tools:

⚒ Allen key

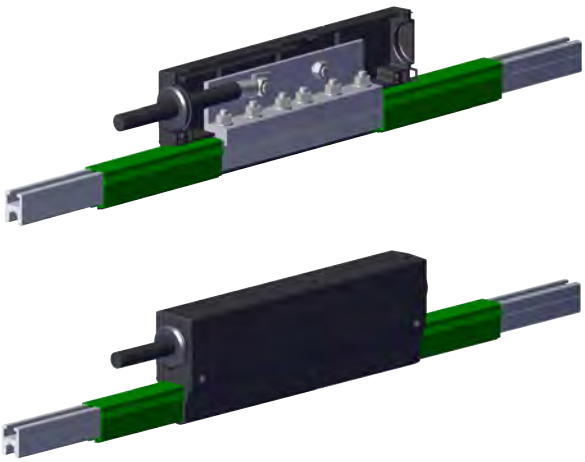
Assembly instructions:

1. Connect the supply line.
2. Tighten the fastening bolts for the supply lines to a tightening torque of 40 Nm (M12).

NOTICE!

Risk of damage

► The connection cables must be relieved of strain and must not hinder the freedom of movement of the current collectors and the expansion of the conductor rail.



Step 8

Assembly instructions:

1. Place the halves of the cover caps at the joint so that the conductor rail is firmly enclosed and the clips interlock.
2. Press the halves of the cover caps firmly together so that the clips snap into place.

9.3.2 Disassembly of caps Joints/feed

NOTICE!

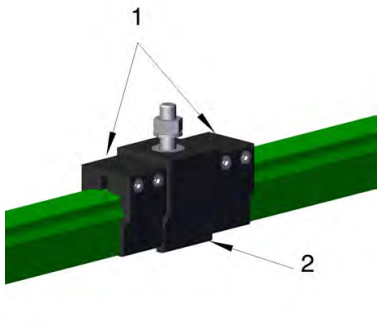
Screwing the caps

In normal operation, the caps are closed by clips. Optionally, however, they can also be screwed.

► If one of the fastening clips breaks during installation, the cap must be screwed.

6.3.13 Fixed point installation

Fixed joints are required in order to ensure controlled longitudinal expansion in the overall system.



Step 1

Prerequisites:

✓ The suspension as described in chapter 6.3.3

Assembly instructions:

1. Mount two locating clamps to the right and left of the hanger.

NOTICE!

Check the assembly!

► Make sure the insulation profile is not compressed by the locating clamps.

6.3.14 Installing current collector



The connection cable must not be resting on anything.



Do not lay the connection cable flat, crush it, or kink it.



Do not place any load on the connection cable.



Do not secure the connection cable with cable ties.



Connection cable laid correctly.

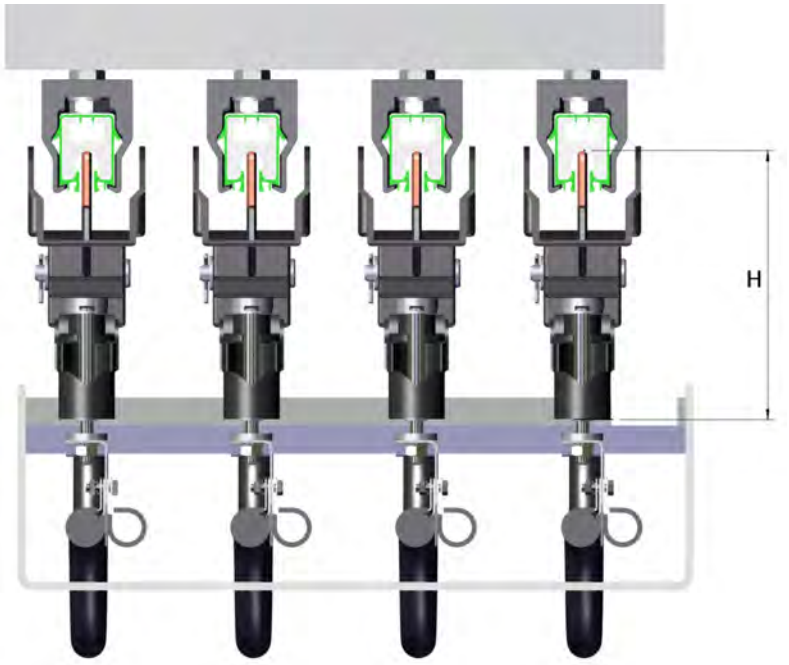
NOTICE!

Note for installing current collectors

- The connecting cables must be installed with zero strain and high flexibility to prevent distortion, pulling or pressure on the collector contacts and to avoid restricting the current collector's movement.
- Only highly flexible, double-insulated connecting cables may be used (for voltages > 48 V)! In the event of repair, a cable lug with crimping technology must be used for flexible connecting cables.
- The current collector's connecting cable must not be bundled or fixed in place.
- Labels for cable identification must not be attached to the movable loop section.
- No foreign objects may be present in the movement zone or installation area of the current collectors and connecting cables.
- Foreign objects such as mounting screws must be selected to ensure they do not restrict the mobility of cables or current collectors.
- The loop length specified in the technical documentation between the fastening point on the carbon brush and the strain relief must be observed.
- In systems with curves, the current collector should ideally be mounted at the height of the wheel exit point, i.e., at the center of motion or in the steering axis of the chassis. Excessive misalignment or lateral deflection affects the distance to the conductor bar and thus the contact pressure. In the worst-case scenario, this may lead to increased wear on the collector contacts and conductor system, potentially damaging the entire installation. Compliance with the tolerances at the narrowest point is absolutely essential.

Current collector installation dimensions

„**H**“ depends on the current collector series (see 5.3.10 Current collector).



Current collectors of the UST 200/35 and UDST 400/35 series.

Installation



⚠ CAUTION!

For the protective-earth current collector, the towing arm is milled to a triangular shape at one end.

► The fastening of the towing arm must always be carried out at the non-milled end!

Step 1

Required tools:

⚒ Wrench

Assembly instructions:

1. Fasten the current collectors onto the customer-side carrier construction.



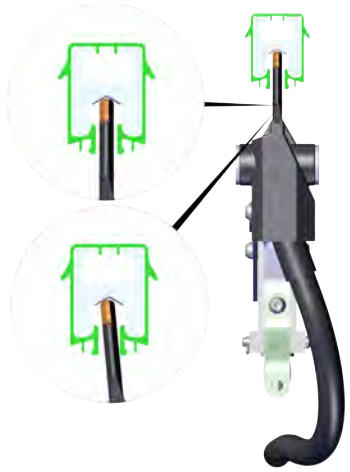


⚠ CAUTION!

Observe the following information:

► Clamp the connection cable carefully to the connecting cable.

► Ensure that the carbon brush is relieved from the cable tension and that any twisting is prevented.





Step 2

Required tools:

⚒ Wrench

Assembly instructions:

1. Align the towing arms precisely with the conductor rail, otherwise the installation dimensions cannot be maintained. A lateral angular tolerance of max. ± 2° is permitted.

Step 3

Assembly instructions:

1. Connect the current collector to the customer-side connecting cable.

NOTICE!

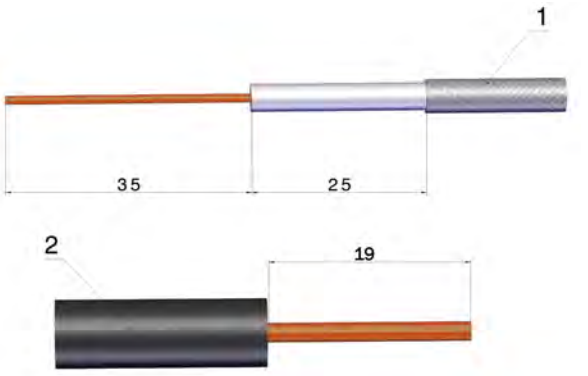
Note on current collectors of the UST 300/35 and UDST 600/35 series:

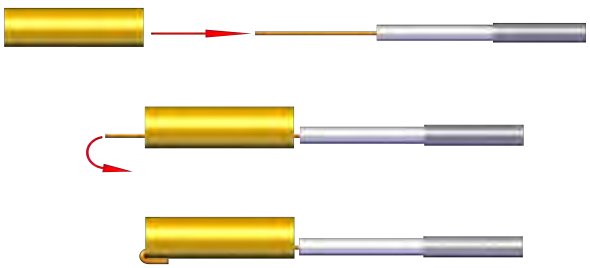
- ► These are mounted on site-built structures with drill holes of Ø 18 mm or slotted holes, according to the spacing of their bolts.
- ► To ensure interchangeability is avoided, note the different spacing of the fastening bolts:
  Phase: 70 mm
  PE: 120 mm
  Angular tolerance: ± 1°.

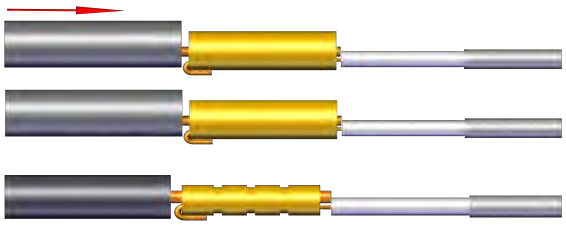
6.4 Heating installation

6.4.1 Connection and repair of heating conductors

Connection or repair of heating conductors









Step 1

Required tools:

- ⚒ Stripping pliers
- ⚒ Knife
- ⚒ Wire cutter
- ⚒ Crimping pliers
- ⚒ Hot air blower

Assembly instructions:

1. Strip the insulation from the heating conductor (1) and the wiring (2) and shorten the outer wire mesh by 25 mm (see illustration).
2. Push the shrink tubing (2 x 45 mm) and (1 x 65 mm) onto the wiring (heating conductor).

Step 2

Assembly instructions:

1. Push the joint connector onto the resistor and bend the wire.

NOTICE!

After crimping, the shrink tubing can no longer be fitted!

► Slide the shrink tubing onto the wiring or heating wire beforehand.

Step 3

Assembly instructions:

1. Insert the wiring or heating conductor into the joint connector.
2. Use crimping pliers to crimp the butt joint connector.

Step 4

Assembly instructions:

1. Seal the transition between the connection with 45 mm shrink tubing using a hot air blower.







Step 5

Assembly instructions:

1. Seal the entire connection between wiring and heating conductor with 65 mm shrink tubing.

Step 6

Assembly instructions:

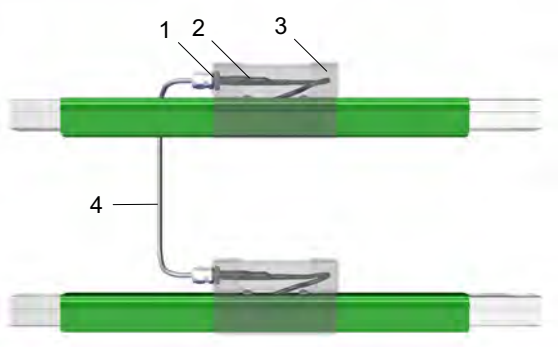
1. Seal the entire heating conductor-heating conductor connection with 220 mm heat shrink tubing.

⚠ CAUTION!

Risk of damage!

The heating system may only be switched on if the temperature is below +5 °C. The length of the heating circuit may not be shortened arbitrarily to prevent the conductor rail from becoming too hot or too cold. Too much heat destroys the insulation profile. If the temperature is too low, the thawing temperature will not be reached. The same applies to a voltage other than the intended voltage or a different type of heating cable.

If conductor systems are equipped with isolating sections, these may not be bridged with heating conductors! The heating sections are to be installed in such a way that they end at the isolating sections. Heating conductors may also be used in maintenance areas, in which case the heating conductors must also be switched off when the maintenance area is switched off.

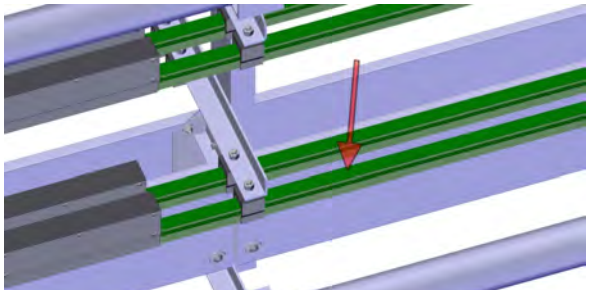


1 Strain relief
2 Connection thermistor/wiring
3 UEH housing
4 Bridge

NOTICE!

At least two persons are required for installation. Significantly faster assembly is possible with three persons. It is advisable to lay out each heating cable lengthwise at the beginning of installation work.

6.4.2 Pulling in heating wire and installing feed terminal





Step 1

Required tools:

⚒ Marking tool

Assembly instructions:

1. Mark the position at which you intend to install a heating feed terminal.

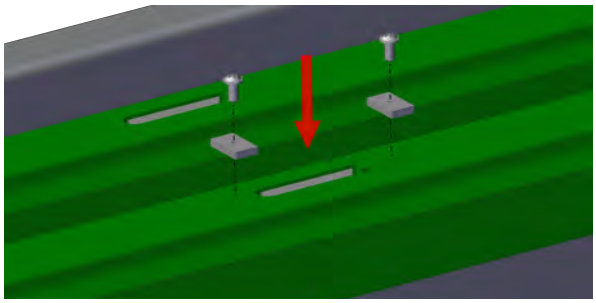
Step 2

Assembly instructions:

1. Drill a slotted hole at the previously marked position and two lateral fixing holes as shown in the illustration on the left. You are free to choose which tools you use for this, but it is important that the surfaces are neatly deburred and that the inner running surfaces of the conductor rail are not damaged.

NOTICE!

- ► All cut and drilling surfaces must be smoothly deburred.
- ► The inner running surface of the profile must not be damaged --> Remove insulating profile before cutting or drilling if necessary.



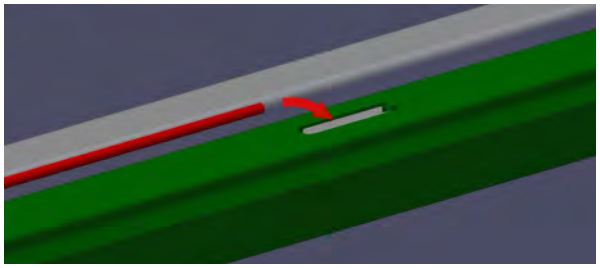
Step 3

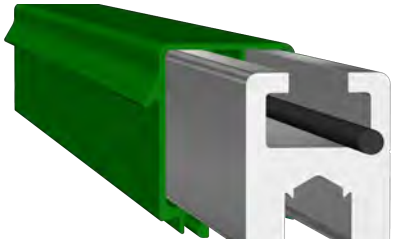
Required tools:

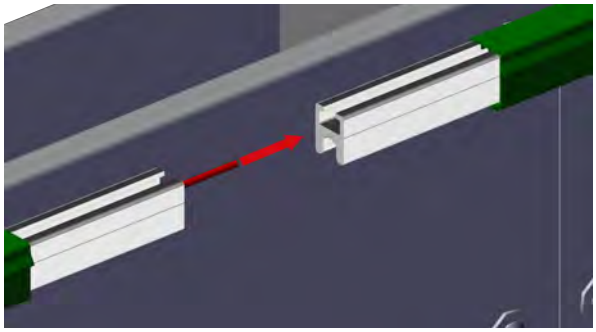
⚒ Phillips screwdriver

Assembly instructions:

1. Fasten the safety blocks with screws as shown.

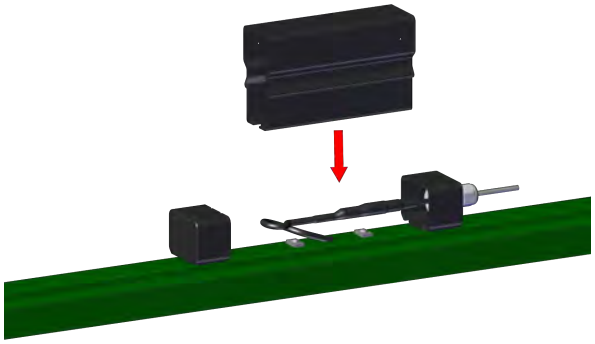






Installing the feed terminal





Step 4

Assembly instructions:

1. Carefully pull the heating wire into the profile. Leave approx. 30 cm of heating wire protruding from the feed opening to connect the feed terminal.

⚠ CAUTION!

Do not draw the heating wire through the lower "free space section", as the conductor rail and current collector could be severely damaged. There is also an increased risk of short circuits!

► Only draw the heating wire into the conductor rail profile as shown.

NOTICE!

It is recommended to draw the heating wire into the conductor rail profile prior to installation.

Step 5

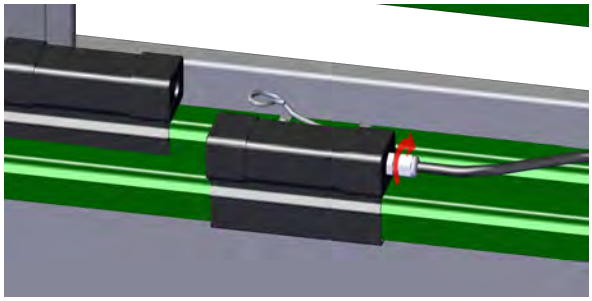
Assembly instructions:

1. Connect the heating conductor/wiring as described in chapter: “6.4.1 “.

Step 6

Assembly instructions:

1. Slide the terminal cap over the connected heating conductor as shown. Check that the cover has engaged properly.

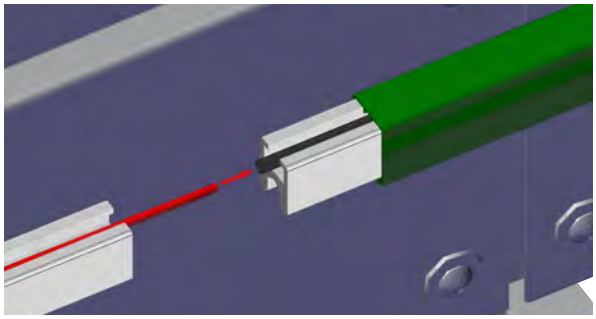


Step 7

Assembly instructions:

1. Tighten the strain relief and check everything is firmly seated.

6.4.3 Drawing in heating wire through expansion section



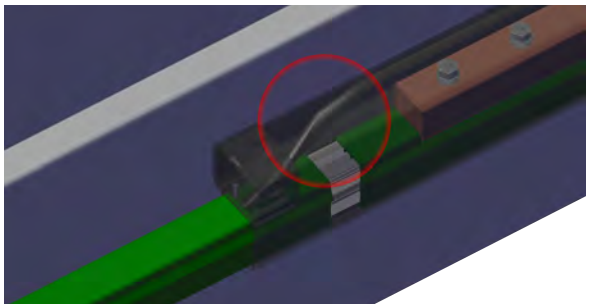
Step 1

Required tools:

⚒ None

Assembly instructions:

1. Now thread the heating wire (red) through the protective tubing of the expansion section.



Step 2

Required tools:

⚒ Phillips screwdriver

Assembly instructions:

1. There is a bottleneck inside the expansion section (see illustration). At this point the heating wire must be rotated slightly to feed it through.

⚠ CAUTION!

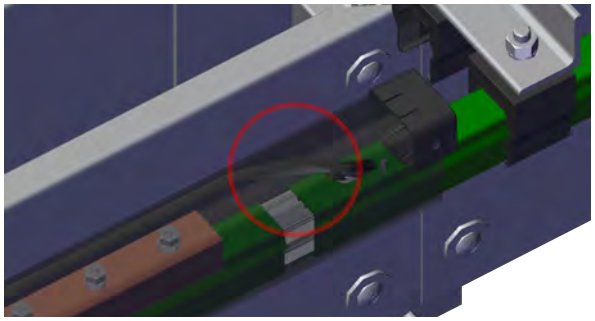
Risk of damage

This bottleneck section of the protective tubing in the expansion section can be damaged during assembly.

► Make sure that the heating wire has no sharp edges and carefully feed the heating wire through the expansion section.

⚠ CAUTION!

The expansion section is sealed and may not be opened!



Step 3

Required tools:

⚒ None

Assembly instructions:

1. The same bottleneck must be overcome at the end of the expansion section. Proceed as in step 2.

6.5 Condition after the installation



DANGER!

An adequate grounding as per IEC 60204-1/ 60204-32 must be ensured after the installation of the profile!



WARNING!

The responsible assembly manager must check the system for the following parts or situations after assembly and issue and sign an acceptance certificate!

- Check the general functionality of the system.
- Clearances of the line transitions and transfers.
- Open spaces and interfering edges.
- Random sample checking of tightening torques.
- Correct connection and routing of the cables.
- Check of the feed terminals and their wirings.
- Have all required parts been installed safely and according to instructions.
- Current collector units.



NOTICE!

A trial run must be performed after proper installation. The following points must be observed in this regard:

- Perform the first trial run at reduced speed.
- The current collectors must run in the rail without vibration.
- No sparks must form on the carbon brush. (Formation of sparks indicates a dirty or oxidized contact surface).
- For any created shorter lengths, a smooth transition at the conductor rail ends must be ensured.
- In particular, ensure smooth entry and exit at the transfer guides and funnels.

7 MALFUNCTIONS

7.1 Safety information about malfunctions



WARNING!

Risk of injury in case of improper troubleshooting!

Improper troubleshooting may cause serious injuries or property damage.

► Ensure sufficient installation space before beginning any work.

► Switch off power supply, verify that the system is free of voltage, and secure against switching back on.

7.2 Procedure in the event of malfunction

General principle:

- In the event of malfunctions that pose an immediate hazard to persons or property, immediately activate the safety devices.
- Determine the cause of the fault.
- Notify the person in charge at the place of operation.



NOTICE!

The inspection and maintenance tasks listed in the technical documentation must be performed and documented regularly:

(location, spare part, task performed, date, name of inspector).

► Only persons with the required training, qualification and authorization may perform troubleshooting work on the system.

8 MAINTENANCE

The main aim of this section is to maintain the system's target condition and operational capability. By avoiding malfunctions and unplanned downtimes, regular maintenance can increase the utilization rate. Efficient planning of maintenance work and material is a prerequisite. In order to carry out safe maintenance by appropriately trained personnel, the following instructions must be observed:



DANGER!

Danger of death due to electrical current!

Contact with live parts can result in life-threatening injuries.

► Make sure that the relevant components are not live or under voltage, and that there is no unauthorized approximation.



NOTICE!

The inspection and maintenance work listed in the technical documentation must be performed and documented regularly

(location, spare part, task performed, date, name of inspector)

► System fault elimination may only be carried out by trained, qualified, and authorized persons.

Date	Name	Maintenance/servicing work	Instructions given by	Signature

8.1 Safety information about repairs



DANGER!

Before beginning any work, ensure that the system is free of voltage and remains so for the duration of the work. Observe the safety instructions in the section 3 Safety instructions!



WARNING!

Risk of injury due to improperly performed maintenance work!

Improper maintenance can result in serious personal injury or property damage.

- ► Ensure that there is sufficient clearance before starting work.
- ► Pay attention to order and cleanliness in the workplace!
- ► Follow the procedure according to3 Safety instructions before starting work.



WARNING!

Danger due to insufficiently qualified persons!

Insufficiently qualified persons cannot assess the risks involved in operating the system and expose themselves and others to the risk of serious or fatal injuries.

- ► Have all work performed only by persons qualified for the task.
- ► Inadequately qualified persons should be kept away from the work area.



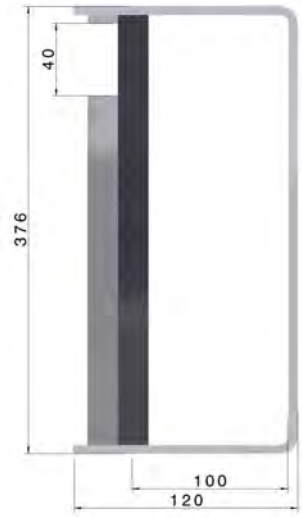
CAUTION!

Tripping hazard due to protruding parts

There is a tripping hazard during the work.

- ► Watch out for steps and holes in the floor when walking inside the work area and the danger zone. There must be no loose objects in the work area.

8.2 Spare parts



Designation	Weight [kg]	ID no.:
MN-UM24HS-600-Z4	2.713	0175076

Type series UST 300/35, UDST 600/35, USTR 300/35 and UDSTR 600/35



Designation	Weight [kg]	ID no.:
SK-KMU300/35-20-X	0.302	0175077



Designation	Weight [kg]	ID no.:
SA-KF011	0.500	0175078



Designation [phase]	Weight [kg]	ID no.:
SA-UT-011-PH	0.550	0175080



Designation [PE]	Weight [kg]	ID no.:
SA-UT-011-PE	0.550	0175081



Designation [phase]	Weight [kg]	ID no.:
SA-UT-012-PH	0.800	0175082



Designation [PE]	Weight [kg]	ID no.:
SA-UT-012-PE	0.800	0175083



Designation [phase]	Weight [kg]	ID no.:
SA-UT-013-PH	0.780	0175550



Designation [PE]	Weight [kg]	ID no.:
SA-UT-013-PE	0.780	0175551



Designation [phase]	Weight [kg]	ID no.:
SA-UT-014-PH	0.940	0175552



Designation [PE]	Weight [kg]	ID no.:
SA-UT-014-PE	0.940	0175553



Designation	Weight [kg]	ID no.:
SA-ZF6-B-2.25-17.3-56.5-CFS FD.-ST	0.023	0170167



Designation	Weight [kg]	ID no.:
SA-ZF7-A-2.5-16.5-59-AER	0.024	0160719



Designation	Weight [kg]	ID no.:
SA-KBK	0.150	0175107



Designation [phase]	Weight [kg]	ID no.:
AL-RKA50/13PH-203-20-3000-C	2.220	0175084
AL-RKA50/13PH-203-20.6-3000-B	3.847	0175657

Designation [PE]	Weight [kg]	ID no.:
AL-RKA50/13PE-203-20-3000-C	2.220	0175085
AL-RKA50/13PE-203-20.6-3000-B	2.614	0175658

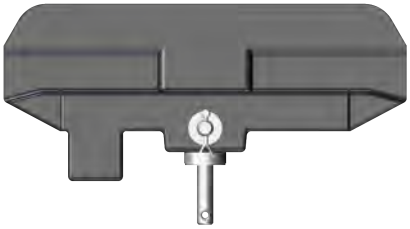


Designation	Weight [kg]	ID no.:
SA-AS-M12X25-K4	0.054	0175401

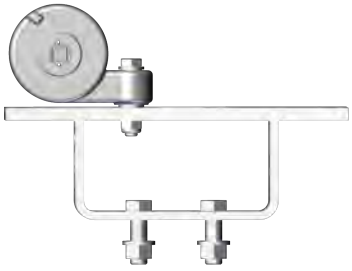
Type series UST 300/35, UDST 600/35, USTR 300/35 and UDSTR 600/35



Designation	Weight [kg]	ID no.:
SK-KMU300/35-20-X	0.302	0175077

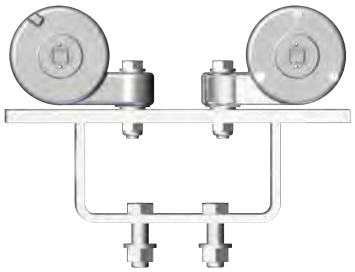


Designation	Weight [kg]	ID no.:
SA-KF011	0.500	0175078

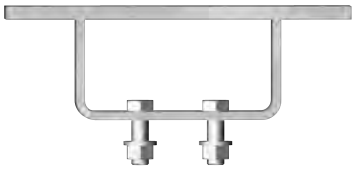


Designation [phase]	Weight [kg]	ID no.:
SA-UT-015-PH	6.085	0175554

Designation [PE]	Weight [kg]	ID no.:
SA-UT-015-PE	6.753	0175555



Designation [phase]	Weight [kg]	ID no.:
SA-UT-016-PH	7.574	0175556
Designation [PE]	**Weight [kg]**	**ID no.:**
SA-UT-016-PE	8.242	0175557



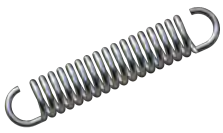
Designation [phase]	Weight [kg]	ID no.:
SA-UT-021-PH	3.178	0175095
Designation [PE]	**Weight [kg]**	**ID no.:**
SA-UT-021-PE	3.846	0175096



Designation	Weight [kg]	ID no.:
SA-HE002	0.844	0175093



Designation [U(D)ST]	Weight [kg]	ID no.:
SA-FG200	2.064	0175049
Designation [U(D)STR]	**Weight [kg]**	**ID no.:**
SA-FG200-R-RE	2.071	0175562



Designation	Weight [kg]	ID no.:
SA-ZF8-A-3-24-68-DFR	0.048	0175558



Designation [phase]	Weight [kg]	ID no.:
AL-RKA95/12PH-315-26-3000-C	3.750	0175149
AL-RKA95/13PH-315-26-3000-B	3.811	0175659
Designation [PE]	**Weight [kg]**	**ID no.:**
AL-RKA95/13PE-315-26-3000-C	3.750	0175150
AL-RKA95/13PE-315-26-3000-B	3.814	0175660



Designation	Weight [kg]	ID no.:
SA-AS-M12X25-K4	0.054	0175401

8.3 Conductor system maintenance

NOTICE!

Wear of the conductor rail thickness

Occasionally, the conductor rail may show increased wear due to irregular maintenance, highly frequented installations, difficult environmental conditions or inaccurate installation.

- Installations that may be affected by increased wear must be inspected regularly. For example, in the case of increased deposition of abrasive particles, unevenness in the running surface, in the course of the track or unevenness of suspension points.
- The minimum contact rail thickness must not be less than:
  0.3 mm with a contact pressure per current collector <= 7 N
  0.4 mm for a contact pressure per current collector > 7 N <= 12 N
  0.5 mm for a contact pressure per current collector > 12 N <= 35 N
  0.8 mm with a contact pressure per current collector > 35 N
- The measurement of the current bar strength can be done by Vahle specialists. For this purpose, please contact Vahle Customer Service (2.5 Customer service).



On transfer guides for switches, lifting stations etc., the max. **vertical and lateral offset of ± 6 mm** must not be exceeded. The maximum **air gap between the opposing transfer guides is 20 mm.**

Interval	Service/monitoring tasks	Personnel
Daily	• Check safety equipment and operating behavior of the system.	Operator
Monthly	• Visual inspection of general condition. Also take note of expansion of the conductor rails and of burn marks. In the case of damage or burn marks, the affected parts must be replaced. • In particular, remove accumulated carbon brush dust at separating points and transfer guides (using a hand brush). • Remove any small burn marks or discoloration caused by a rust film on the contact surface by scouring with a nonwoven abrasive. **Do not use a powered brush.** Replace the conductor rail if it is not possible to remove the burn marks. • Check mechanical and electrical connections, particularly on the feed terminals and tighten if necessary (in doing so observing the prescribed torques) • If the guide slot and the contact surface are heavily soiled, we recommend: - cleaning with a high-pressure cleaning device using a water jet. • - cleaning with cleaning liquid **Rivolta SLX 500**	Technician/electrically qualified person
If required	• Remove dust deposits (e.g. carbon brush dust, coupler abrasion) and other particle deposits, if present. Cleaning acc. to Chapter: „8.5 “	Technician/electrically qualified person

In case of damage to the conductor rails, the associated components such as current collectors must be inspected for damage.

8.4 Current collector maintenance

Interval	Interval	Service/monitoring tasks	Personnel
Every 2 months	**Mechanical checks**	Check mobility of joints, bearings, and hinge pins. Inspection for mechanical damage.	Operator
	Electrical check	Check for wear of carbon brushes, firm seat of all contact screws and cable attachments. Replace the carbon brushes in good time so that the remaining height does not fall below 29 mm	Technician/electrically qualified person
	Check contact pressure	Pull the carbon brush out of the conductor rail by means of the center spring balance. The contact pressure should be approx. 30 N per carbon brush (type series UST 200/35, UDST 400/35) or 50-70 N per carbon brush (type series UST 300/35; UDST 600/35).	Qualified persons

8.5 Cleaning

After having been de-energized, the profiles can be cleaned with an industrial vacuum cleaner to remove loose dust or graphite deposits. Please consult VAHLE for information and intervals for intensive cleaning or wet cleaning.



⚠ CAUTION!

For maintenance and cleaning work where graphite contact dust may get into the ambient air, breathing protection must be used:

- ► Breathing protection mask acc. to EN 149, min. protection level FFP3.
  Vahle product ID: 10017880
- ► Never blow out the mask with compressed air.
- ► Use vacuum with class m filter (according to TRGS 505).
- ► Do not eat, drink or smoke during work.

Dust in the vacuum cleaner bag or the air filter can be disposed of as commercial waste in the usual quantities (up to about 2 liters). Larger quantities must be disposed of in a controlled manner according to applicable law.

Generally, no firm interval recommendations are given for cleaning. The conductor rail normally only needs cleaning in case of very heavy soiling.



TIPS AND RECOMMENDATIONS!

In case of strong contamination by light scorch marks or firmly adhering dirt, conductor cleaners with a special cleaning fleece can be requested. These can then be mounted on the vehicle so that the conductor rails are cleaned during operation (not permanent).

9 TRANSPORT AND STORAGE

9.1 Safety instructions for transport and storage



NOTICE!

Damage due to improper transport or storage. Improper transport or storage may cause significant property damage!

- ► Storage temperature: -20 °C to +70 °C
- ► Storage location: Indoors, dry, no exposure to chemicals.
- ► Do not expose to direct sunlight.
- ► Exercise caution and observe the symbols on the packaging while unloading the pieces at delivery or during transport on the facilities.

9.2 Transport inspection

Check the delivery for completeness and transport damage upon receipt!

If any external damage is found:

- Refuse delivery or accept delivery only conditionally.
- Note the scope of the damage in the transport documents or on the carrier's delivery note.



NOTICE!

The delivery may be damaged during transport!

Report all defects as soon as they are found. Claims for damages can only be made during the applicable period.

- ► Document and report the defects found.

Conductor rail

- Transport and storage in wooden crates.
- Transport by truck



NOTICE!

Incorrect unpacking can lead to damage!

Improper unpacking may lead to property damage and personal injury.

- ► Only handle sections using lifting equipment which allows full-surface support or at least a three-point support, for example by using a lifting traverse.

9.3 Disassembly and disposal

9.3.1 Preparation for disassembly

- Switch off the system and secure it against switching back on.
- Physically disconnect the entire power supply from the system.
- Loosen and remove all screws.



DANGER!

Danger of death due to electrical current!

Contact with live parts can result in life-threatening injuries.

► Make sure that the relevant components are not live or under voltage, and that there is no unauthorized approximation.

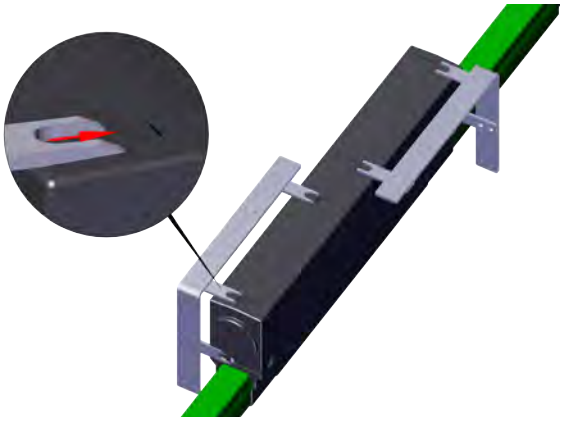
9.3.2 Disassembly of caps Joints/feed



NOTICE!

The disassembly tool (0176157) must be adapted depending on the cap.

► The forks for the respective caps can be screwed on at different positions.



Remove cap

Prerequisites:

✓ The disassembly tool (0176157) has been prepared for the corresponding cap (see note above).

Operating steps:

1. Attach the two parts of the disassembly tool to the cap as shown.
2. Slide the forks of the disassembly tool under the clips to release them.
3. Remove the caps.



DANGER!

Operation without caps.

Without the caps, there is a risk to life due to the missing touch protection.

► After disassembly, make sure the system is not operated without caps.

► 6.3.12 Feed terminal installation

9.3.3 Disassembly

During disassembly, always observe the information in section 3.3.1 .



⚠ WARNING!

Risk of death from improper replacement or removal!

Errors during the removal or replacement of components may cause life-threatening situations or significant property damage

► Observe the safety instructions before beginning any removal work.



⚠ CAUTION!

All accessories must be checked for wear.

Only defect-free parts may be reused.

► Use only genuine VAHLE spare parts.

9.3.4 Disposal

General

Current national regulations on site are decisive for disposing of/recycling components, machines and systems.



NOTICE!

Dangers from incorrect disposal/operator's responsibility

Risk of environmental damage/loss of valuable raw materials

- ► Incorrect disposal can lead to environmental damage.
- ► **Electronic waste is hazardous waste!**
- ► The most current, valid guidelines, laws and regulations of the respective economic area or country in which components are disposed of/recycled apply.
- ► The product operator is responsible for proper disposal/recycling.
- ► Old electrical devices contain valuable raw materials. **These must not be disposed of in residual waste!**

Disposal instructions

Individual product parts to be disposed of must be separated, depending on their nature. Currently valid local regulations must be observed.
Overview of parts / subassemblies that must be disposed of separately:

- Electronic waste (circuit boards)
- Batteries and accumulators
- Plastic
- Sheet metal
- Copper
- Aluminum

Information about the WEEE Directive (2021/19/EU)

The WEEE Directive does **not** apply to the products described **because the products fall under the exception under Article 2 "Scope."** Products described are used in large industrial tools, stationary large systems and mobile machines that are not intended for road traffic and are made available and designed exclusively for professional use (B2B).

Manufacturer's obligation to provide information

(according to ElektroG, Germany)

Options for returning, disposing of and recycling old devices

- The most current, valid guidelines, laws and regulations apply locally.
- The operator, as a professional user of the products, is responsible for properly disposing of or recycling (old) products.
- Contact a recycling or disposal company specializing in electronic waste.

Note on data protection

- The operator or his employees must ensure compliance with data protection on their **own responsibility**.
- Personal data present on the assembly to be disposed of or stored in the assembly must be removed by the operator or securely and permanently deleted -> **operator's own responsibility**.
  - **Data on the assembly**: stickers, labels, etc.
  - **Data stored in the assembly / device**: electronically stored data, etc.

Meaning of the symbol "crossed-out garbage can with black bars"

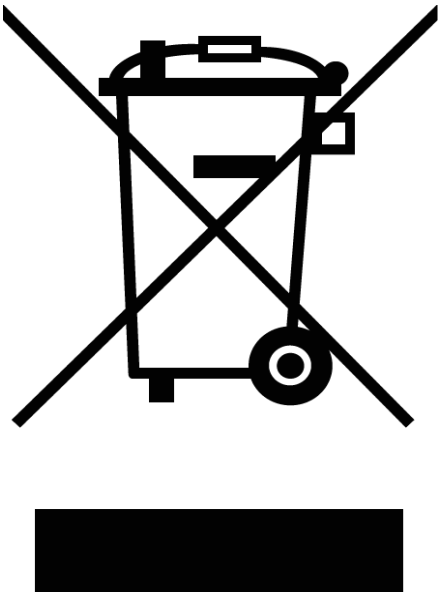


Fig. 9-1 Symbol

- Symbol according to WEEE Directive 2012/19/EU or ElektroG (Germany)
- The symbol is attached to the name plate where possible. Otherwise, the symbol can be found on the product packaging.
- Meaning of the symbol:
  - Symbol for the separate collection of electrical and electronic equipment
  -> The product must not be disposed of as unsorted waste,
  but must be taken to separate collection points for disposal/recycling.
  -> The black bar under the symbol indicates that after August 13, 2005,
  the product was placed on the market

10 PROTECTIVE MEASURES

10.1 EU conformity declaration

VAHLE

EU - Declaration of conformity

Paul Vahle GmbH & Co. KG, Westicker Str. 52, D-59174 Kamen (Germany)

We herewith declare that the products specified hereafter conform to the relevant EU regulations. This declaration will be void when amendments not approved by us will be made to the products.

Product Group	**52**
Product	**Unipole Insulated Conductor System**
Type	**U35** **incl. accsessories**
Relevant EU Regulation	**2014 / 35 / EU** **(Low Voltage Directive)**
Placement of CE-marking	**1996**

The following harmonized standards respectively other technical norms and Specifications have been applied:

EN 60204-1:	**2006 / AC: 2010**
EN 60204-32:	**2008**
EN 60529:	**1991 / AC:1993**

This declaration is not an assurance of properties.

The safety hints mentioned in the product documentation must be followed.

Kamen, 19.01.2017

i.V. Michael Heitmann

Michael Heitmann
Manager Mechanical Engineering

Paul Vahle GmbH & Co. KG · Postfach 1720 · D-59172 Kamen · Tel. 02307/704-0 · Fax 02307/704-444 · eMail: info@vahle.de

10.2 UKCA

VAHLE

UKCA - Declaration of conformity

Paul Vahle GmbH & Co. KG, Westicker Str. 52, D-59174 Kamen (Germany)

We herewith declare that the products specified hereafter conform to the relevant UK regulations. This declaration will be void when amendments not approved by us.

Product Group	**52**
Product	**Unipole Insulated Conductor System**
Type	**U35** **incl. accsessories**
Relevant UK Regulation	**Electrical Equipment (Safety) Regulation 2016**
First CE / UKCA - marking	**1996 / 2022**

The following harmonized standards respectively other technical norms and Specifications have been applied:

EN 60204-1:	**2018**
EN 60204-32:	**2008**

This declaration is not an assurance of properties.

The safety hints mentioned in the product documentation must be followed.

Kamen, 21.10.2022

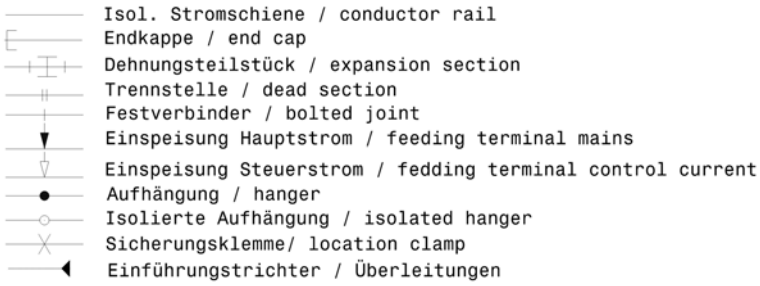
i.V. Michael Heitmann

Michael Heitmann
Director Quality Management

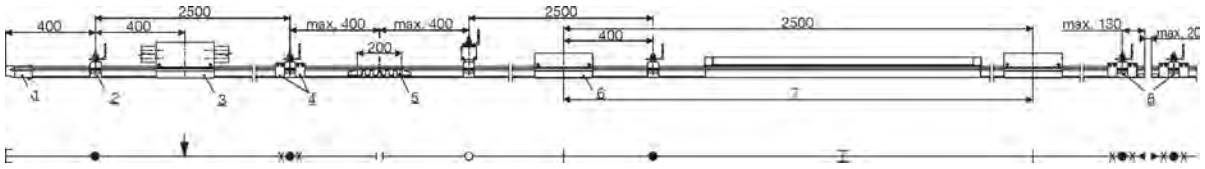
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11 INSTALLATION PLANS

Legende Verlegepläne



Beispiel Systemübersicht Verlegeplan



1 Endkappe / end cap
2 Aufhängung / hanger
3 Einspeisung / feeding terminal
4 Sicherungsklemme (Festpunkt) / location clamp
5 Trennstelle / dead section
6 Festverbinder / bolted joint
7 Dehnungsteilstück / expansion section
8 Überleitungsstück / transfer guide

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CE

TECHNICAL DOCUMENTATION