ORIGINAL OPERATING INSTRUCTIONS

VCL COMPACT CONDUCTOR SYSTEM

SYSTEM MANUAL
INSTALLATION MANUAL
MAINTENANCE MANUAL

EN | V1.05 | DCL 049

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1 DOCUMENT HISTORY

Material number	Version	Edition	Description/changes
-	1.01	12/2020	First edition
-	1.02	08/2023	• Note Use of a conductor as a neutral conductor (chapter 5.1) • Adjusting the traveling speed (chapter 4) • Adjusting the color of individual hangers (chapter 5.6.5) • Adjusting the order of assembly and assembly instructions • Amendment to weights and auxiliary supports (chapter 5.6.6) • Amendment to the expansion concept (chapter 6.2.10) • Amendment to the note on fixed points (chapter 5.1) • Note on conductor rail thickness (chapter 8.3) • Adjustment of remaining height of carbon brushes (8.2) • Replacing the PASK carbon brush (chapter 8.4) • Filter class cleaning (chapter 8.5) • UL and UKCA certification added (chapter 11) • Editorial revision
-	1.03	09/2023	• Permissible voltage adjusted to 60 V • Fixed point assembly instructions (drilling template) added • Expansion concept adjusted • Usage limits for VCL system set
-	1.04	01/2025	• Adaption of corporate design • Supplement to chapter Disposal • Revisions removed from ident.no.
-	1.05	01/2026	• Supplement to chapter end segment with feed terminal

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.

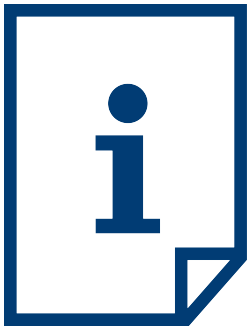


NOTICE!

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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Web: http://www.vahle.de
Country of origin: Germany

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

VCL compact conductor systems (type VCL2+VCL3) are contact-protected 2- to 3-pin conductor rails. The conductor systems can be combined with any number of pins and allow direct routing in track supports and support profiles. The conductor rail is only to be used for indoor installations. It can be mounted hanging or laterally.

Appropriate use includes following all the information 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 misuse!

Misuse may cause dangerous situations.

- ► Never use the system for anything but the intended use.
- ► Never let non-instructed personnel operate the system.
- ► Never modify or change the system improperly.
- ► Never operate the system in ways that disregard the safety instructions.
- ► Never use the system for outdoors applications.
- ► Never operate the system at higher currents or voltages.
- ► Never operate the system with contacts made by other manufacturers.
- ► Never expose the system to large amounts of water.

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.

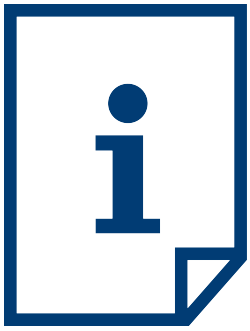


WARNING!

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

4.1 VCL2

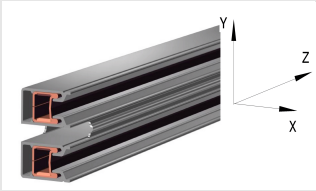
Technical specifications - electrical		
Nominal current VCL2/100C at 35 °C	[A]	100(1)
Conductor cross section VCL2/100C	[mm²]	25
Resistance VCL2/100C	[Ω / 1 0 0 0 m]	0,721
Impedance(2) VCL2/100C	[Ω / 1 0 0 0 m]	0,723
Nominal current VCL2/40F at 35 °C	[A]	40(4)
Conductor cross section VCL2/40F(3)	[mm²]	25
Resistance VCL2/40F	[Ω / 1 0 0 0 m]	3,844
Impedance(2) VCL2/40F	[Ω / 1 0 0 0 m]	3,846
Nominal voltage without ground conductor (PE) AC/DC	[V]	48
Nominal voltage with ground conductor (PE) AC	[V]	Max. 500
Number of pins		2
Allocation		2 x phase / 1 x phase + PE
Cross section connection cable	[mm²]	6 - 16
Conductor material		Copper (CU) or steel (F)
Protection class		IP2X
Dielectric strength according to DIN 53481	[kV/mm]	22,4
Volume resistivity according to IEC 60093	[Ω x cm]	2 x 10^{15}
Surface resistance according to IEC 60093	[Ω]	2 x 10^{13}
Comparative tracking index according to IEC 60093		> 400

(1) at max. 80% duty cycle
(2) With 15mm phase spacing and a frequency of 50Hz
(3) VCL2/40 F - max. feed length: 100 m
(4) at 100 % duty cycle

Technical specifications - mechanical		
Max. traveling speed	[m/min]	400
Travel direction		Reversing operation
Distance pin	[mm]	15
Max. hanging distance	[mm]	800

Technical specifications - system		
Max. system length without expansion section	[m]	150
Standard length conductor system	[mm]	4000 (shorter lengths available upon request)
Length of end segment with feed terminal	[mm]	1000
Length of end segment with end cap	[mm]	1000
Length of line feed	[mm]	1000
Length of expansion section	[mm]	1000
Length-effective portion of connectors	[mm/side]	0,7

Tolerances		
Conductor system X-axis:	[mm]	± 3
Conductor system Y-axis:	[mm]	± 3
Conductor rail connectors Z-axis:	[mm]	0.7 + 1 per side
Current collectors X-axis:	[mm]	± 15 (DEAS ± 12)
Current collectors Y-axis:	[mm]	± 20



Operating conditions		
Operating temperature	[°C]	- 30 to + 55
Max. air humidity at Ambient temperature 10 °C to 40 °C	[%]	98, non-condensing
Max. deviation of operating temperature	[K]	50
Flammability (insulating housing)		Flame-retardant, self-extinguishing, UL 94 V0
Application		Indoor facilities

NOTICE!

UL certification

► For design with UL certification, please consult the manufacturer.

4.2 VCL3

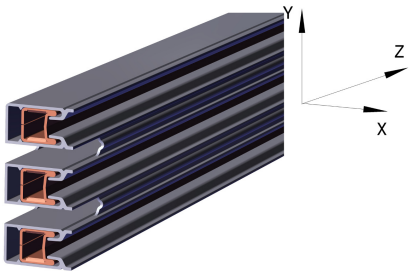
Technical specifications - electrical		
Nominal current VCL3/100C at 35 °C	[A]	100(1)
Conductor cross section VCL3/100C	[mm²]	25
Resistance VCL3/100C	[Ω / 1 0 0 0 m]	0,721
Impedance(2) VCL3/100C	[Ω / 1 0 0 0 m]	0,723
Nominal current VCL3/40F at 35 °C	[A]	40(4)
Conductor cross section VCL3/40F(3)	[mm²]	25
Resistance VCL3/40F	[Ω / 1 0 0 0 m]	3,844
Impedance(2) VCL3/40F	[Ω / 1 0 0 0 m]	3,845
Nominal voltage without ground conductor (PE) AC/DC	[V]	48
Nominal voltage with ground conductor (PE) AC	[V]	Max. 500
Number of pins		3
Allocation		3 x phase / 2 x phase + PE
Cross section connection cable	[mm²]	16
Conductor material		Copper (CU) or steel (F)
Protection class		IP2X
Dielectric strength according to DIN 53481	[kV/mm]	22,4
Volume resistivity according to IEC 60093	[Ω x cm]	2 x 10^{15}
Surface resistance according to IEC 60093	[Ω]	2 x 10^{13}
Comparative tracking index according to IEC 60093		> 400

(1) at max. 80% duty cycle
(2) With 15mm phase spacing and a frequency of 50Hz
(3) VCL2/40 F - max. feed length: 100 m
(4) at 100 % duty cycle

Technical specifications - mechanical		
Max. traveling speed	[m/min]	400
Distance pin	[mm]	15
Max. hanging distance	[mm]	800
Travel direction		Reversing operation

Technical specifications - system		
Max. system length without expansion section*	[m]	150
Standard length conductor system	[mm]	4000 (shorter lengths available upon request)
Length of end segment with feed terminal	[mm]	1000
Length of end segment with end cap	[mm]	1000
Length of line feed	[mm]	1000
Length of expansion section	[mm]	1000
Length-effective portion of connectors	[mm/side]	0,7

Tolerances		
Conductor system X-axis:	[mm]	± 3
Conductor system Y-axis:	[mm]	± 3
Conductor rail connectors Z-axis:	[mm]	0.7 + 1 per side
Current collectors X-axis:	[mm]	± 15 (DEAS ± 12)
Current collectors Y-axis:	[mm]	± 20
Contact pressure current collector	[N]	approx. 8



Operating conditions		
Operating temperature	[°C]	- 30 to + 55
Max. air humidity at Ambient temperature 10 °C to 40 °C	[%]	98, non-condensing
Max. deviation of operating temperature	[K]	50
Flammability (insulating housing)		Flame-retardant, self-extinguishing, UL 94 V0
Application		Indoor facilities

NOTICE!

UL certification

► For design with UL certification, please consult the manufacturer.

4.3 VMT

Technical specifications		
Support profile version		Steel
Grid dimension of compact holder	[mm]	100
Bearer length	[mm]	6000
Max. hanger spacing (lateral/suspended)	[mm]	3500/3000

Technical specifications - system dependent		
Number of poles		4-6
Temperature range	[°C]	-30 to +55
Application area		Indoor installations

5 LAYOUT AND FUNCTION

5.1 System description VCL2/VCL3

The compact wiper line VCL was developed especially for various applications in intralogistics. With its compact dimensions and durability, the VCL possesses the ideal properties for potential shuttle applications in automated small parts stores or for other transfer carriages. Additional features are short installation times due to the small number of different components (–50%) and the robust clip fastening system.

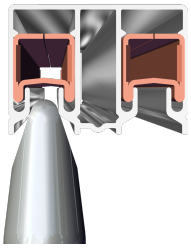
The VCL comes in two-pin or multiple-pin versions.

Safety

The compact wiper line has been designed according to VDE 0100. It meets today's requirements on the safety of a conductor system and is 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.

If the cross section of the neutral conductor is smaller than the outer conductor cross section, it is necessary to protect it against overcurrent and short circuiting; version in accordance with IEC60364-4-43 (HD 60364-4-43).

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



Application

Only for indoor systems with travel speeds of up to 400 m/min.

Hangers

The maximum distance between the hangers is 0.8 m.

Connector

Joint connectors are used for the electrical and mechanical connection of the conductor rail sections. Every connection point is protected against contact with a cover cap.

Fixed points

Fixed points secure the conductor system to prevent it from moving and thus form the fixed points attaching it to the higher-level steel structure.

Longitudinal expansions

- The conductor rails are permanently connected to each other by means of conductor rail connectors to form a continuous conductor profile. The connecting caps are clamped between the two connected conductor rails and travel along with the conductor rail joint.
- To compensate for changes in length, the insulation profile is 7.5 mm shorter for end segments and 15 mm shorter for the conductor system itself. The transfer guide also serves as an end cap, feed terminal and fixpoint. Generally, the feed terminal is also the fixpoint and the end cap is the moving part.
- Expansion sections are required in special cases only. For instance to compensate for a structural expansion joint in the building, for system lengths exceeding 150 m, or for fixpoints on both ends of the system.
- Systems with expansion sections require detailed project planning by VAHLE.

Feeds

The infeed can be realized as an end feed via the transfer guides or on the line as a line feed.

Transfer guides

Transfer guides are the contact-protected ends of the conductor rails at the end of the lines and mechanical line interruptions (switches, lifting stations, etc.). Transfer guides are available with or without feed capability.

Current collector

The current collectors are manufactured from impact-resistant plastic and stainless steel parts. The current is drawn via a carbon brush. 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. See also DIN VDE 0100, Part 430 and DIN EN 60204-32. (Notice: The above often occurs when there are several current collectors per system.) The cross section of the supplied connecting cables is designed for the stated nominal currents. The reduction factors according to DIN VDE 0298-4 must be observed for the various laying procedures. According to DIN EN 60204-1 and DIN EN 60204-32, the continuity of the ground conductor system via wiper contacts must be ensured using suitable measures. As a simple and suitable measure, it is recommended to double the PE current collector.

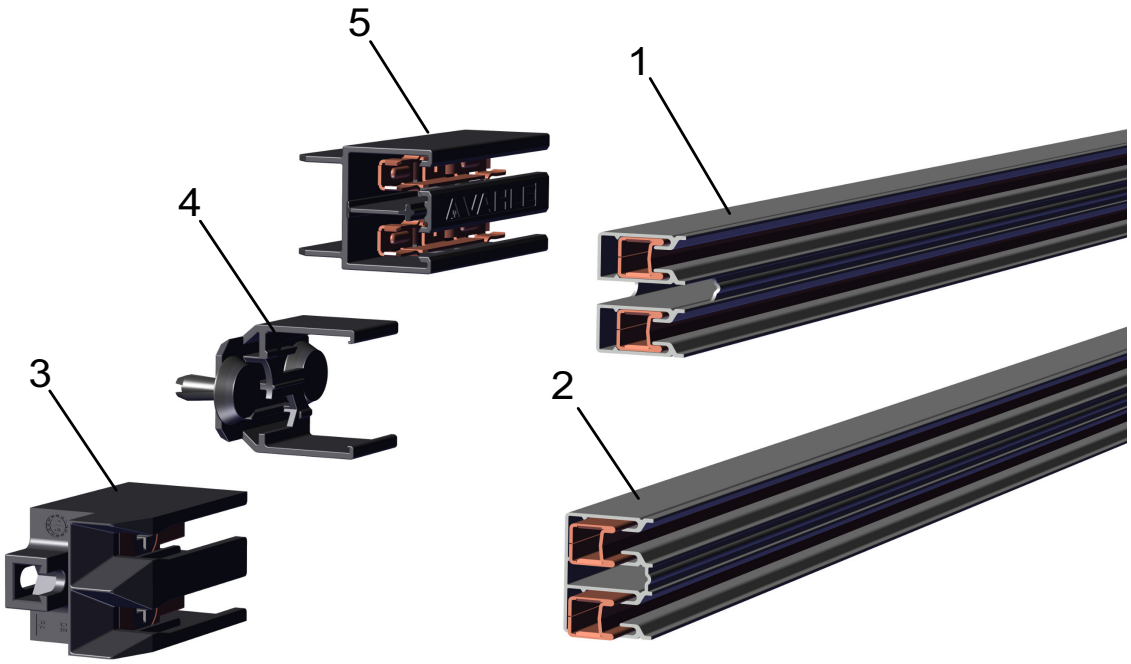
Further remarks

- (VCL2-50/40A) - The fixpoint may only be installed in the system 1x. Normally the end of the conductor system is fixed at the location of the feed terminal. The end cap/transfer guide on the other end may not be fixed. If both ends need to be fixed because of the system, an expansion section is required.

  (100 A variant) - Here the power is not fed in via the transfer guides, rather only via a line feed.
- Rail holder spacing according to chapter: „6.2.1 “.
- Connectors cannot be removed again, therefore align and install them carefully.
- (Shuttle applications without VMT profile) - The connector caps must rest on the installation surface to prevent any incorrect deflection or warping of the conductor system.
- The shortest permissible rail segment is 300 mm.

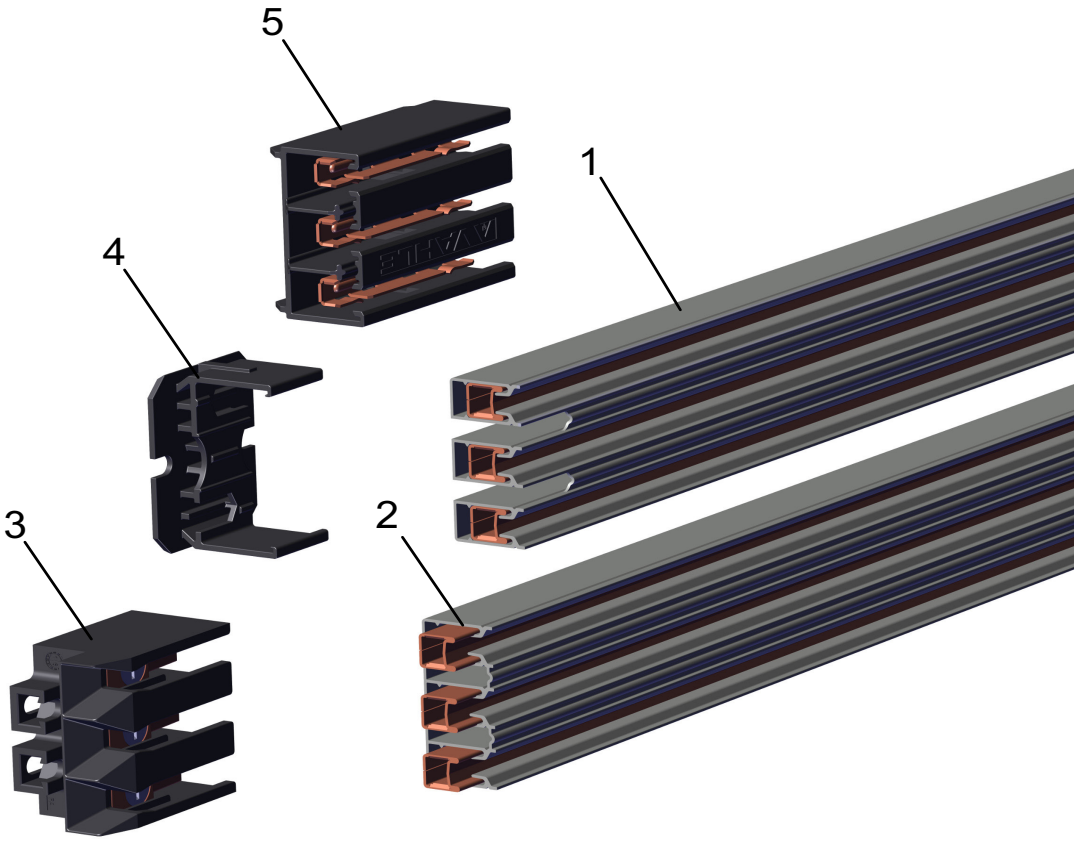
5.2 System overview VCL2/VCL3

System overview VCL2 (2-pin)



1 End segment
2 Conductor system
3 Transfer guide with/without fixpoint
4 Hanger
5 Connector material

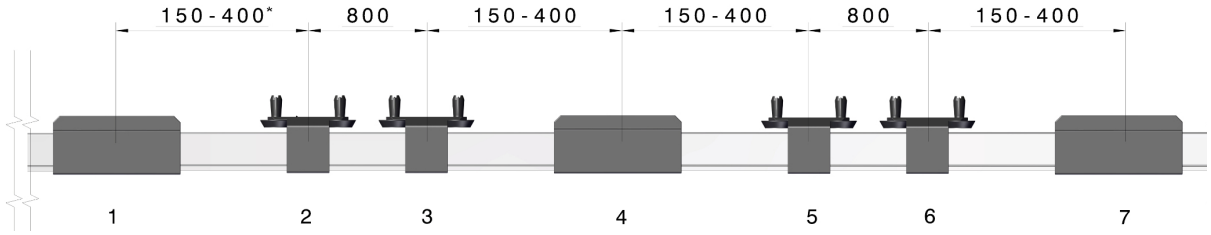
System overview VCL3 (3-pin)



1 End segment
2 Conductor system
3 Transfer guide with/without fixpoint
4 Hanger
5 Connector material

5.2.1 Arrangement examples

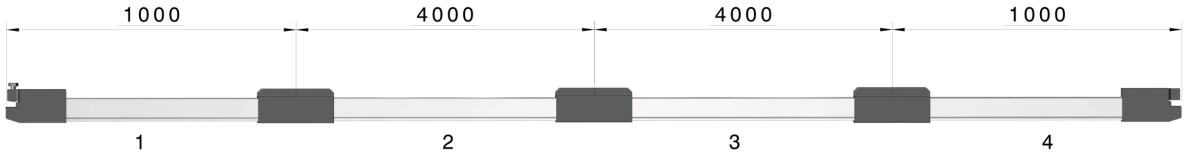
Arrangement example 1 - hangers / connectors



1 Connector
2 Hanger
3 Hanger
4 Connector
5 Hanger
6 Hanger
7 Connector

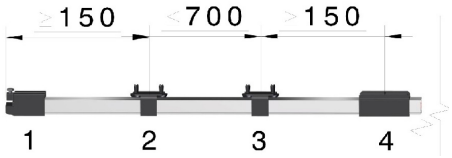
* only applies if the connector cap can be supported. For exposed connectors strictly adhere to the spacing of 150 mm

Arrangement example 2 - Fixed end segment / sliding end segment



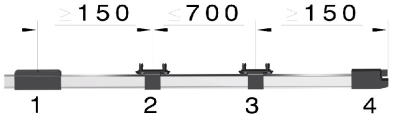
1 Fixed end segment
2 Conductor system
3 Conductor system
4 Sliding end segment

Arrangement example 3 - Fixed end segment



1 Transfer guide used as fixpoint
2 Hanger
3 Hanger
4 Connector

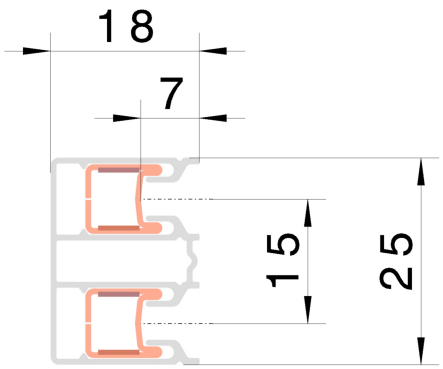
Arrangement example 4 - Sliding end segment



1 Connector
2 Hanger
3 Hanger
4 Sliding transfer guide

5.3 Device overview VCL2

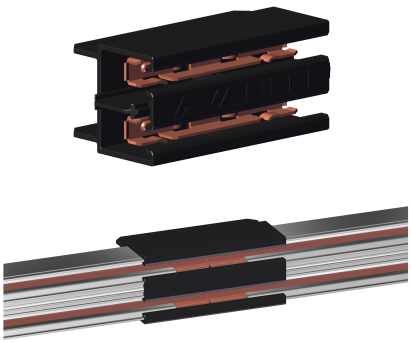
5.3.1 Segment



Segment Section Phase	
VCL2/100C-1000SSD	0281521
VCL2/100C-2000SSD	0281522
VCL2/100C-3000SSD	0281523
VCL2/100C-4000SSD	0281524
VCL2/40F-1000SSD	0281541
VCL2/40F-2000SSD	0281542
VCL2/40F-3000SSD	0281543
VCL2/40F-4000SSD	0281544
Weight 100C [kg]	2,406
Weight 40F [kg]	2,190
Delivery length [mm]	4000
Hanger spacing [mm]	800

Segment Section Phase + PE	
VCL2/100C-1000HSC	0281531
VCL2/100C-2000HSC	0281532
VCL2/100C-3000HSC	0281533
VCL2/100C-4000HSC	0281534
VCL2/40F-1000HSC	0281551
VCL2/40F-2000HSC	0281552
VCL2/40F-3000HSC	0281553
VCL2/40F-4000HSC	0281554
Weight 100C [kg]	2,406
Weight 40F [kg]	2,190
Delivery length [mm]	4000
Hanger spacing [mm]	800

5.3.2 Connecting material



Joint connector, plug-in	
VM-VCL2-7	0281559
Weight [kg]	0,024

5.3.3 End segment

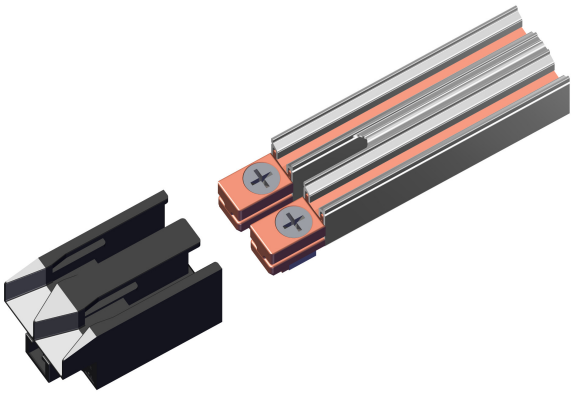


End segment Phase	
VCL2/100C-SSD	0281510
VCL2/40F-SSD	0281516
Weight [kg]	0,324
Delivery length [mm]	1000

Segment Section Phase + PE	
VCL2/100C-HSC-R*	0281515
VCL2/100C-HSC-L*	0281518
VCL2/40F-HSC-R*	0281517
VCL2/40F-HSC-L*	0281519
Weight [kg]	0,297
Delivery length [mm]	1000

*Lines with PE marking require 1x end segment...-HSC-R and 1x end segment...-HSC-L

5.3.4 Transfer guide



Transfer guide	
US-VCL2-7-F (with fixpoint)	0281556
US-VCL2-7 (with fixpoint)	0281555
Weight [kg]	0,055
Lateral / vertical offset [mm]	3
Feed-in power [A]	50
Pre-assembled units with connecting cable are available upon request	

The transfer guide can be used with and without feed terminal. It is also used as an end cap and as a fix-point in connection with the provided support profile.

5.3.5 Hanger/holder



Hanger 2-pin	
AH-VCL2-7	0281520

NOTICE!

► Customer-specific hangers on request.

5.3.6 Expansion joint

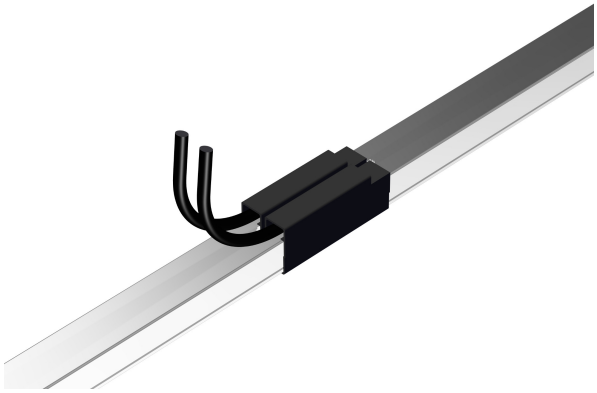


Expansion section Phase		
DT-DVCL2/100C-SSD		0281506
DT-DVCL2/40F-SSD		0281508
Weight	[kg]	0,279
Delivery length	[mm]	1000
Max. current	[A]	50*

Expansion section Phase + PE		
DT-DVCL2/100C-HSC		0281507
DT-DVCL2/40F-HSC		0281509
Weight	[kg]	0,324
Delivery length	[mm]	1000
Max. current	[A]	50*

* Currents greater than 50 A can be achieved with additional feed terminals and cable bridges (detailed project planning by VAHLE required)

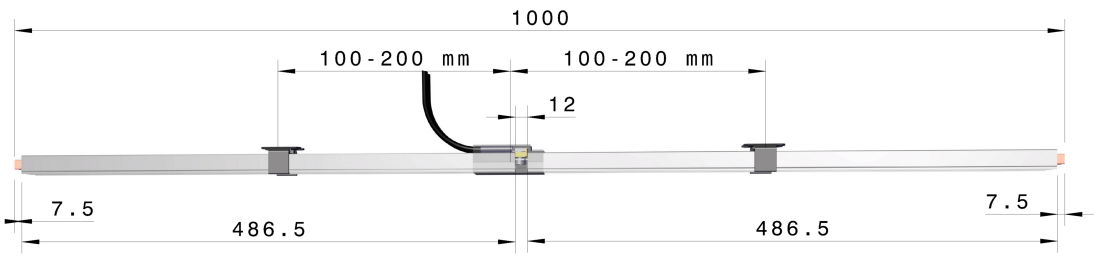
5.3.7 Line feed



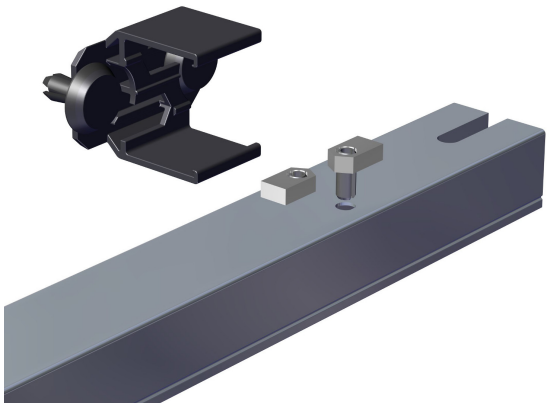
Line feed* Phase		
ES-VCL2/100C-SSD (50A)		0281502
ES-VCL2/100C-100A-SSD (100A)**		0281622
ES-VCL2/40F-SSD (50A)		0281504
Weight	[kg]	0,324
Delivery length	[mm]	1000
Max. current**	[A]	50 to 100

Line feed* Phase + PE		
ES-VCL2/100C-HSC (50A)		0281503
ES-VCL2/100C-100A-HSC (100A)**		0281623
ES-VCL2/40F-HSC (50A)		0281505
Weight	[kg]	0,297
Delivery length	[mm]	1000
Max. current**	[A]	50 to 100

*Pre-assembled straight section with connection on request.
** 100 amp variant



5.3.8 Fixpoint terminal

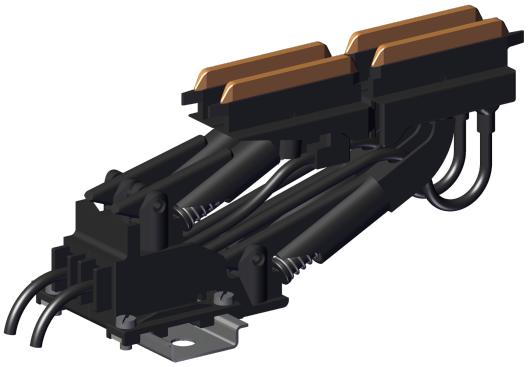


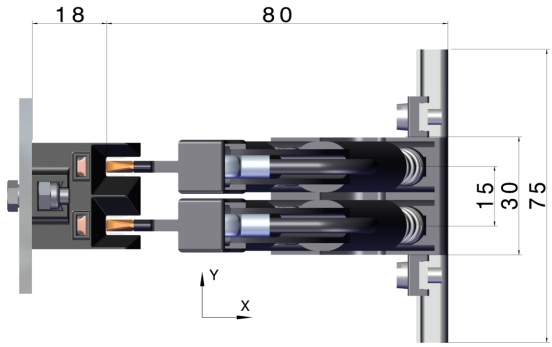
Fixpoint terminal		
FK-AH-VCL2/3		0281527
Weight	[kg]	0,020

NOTICE!

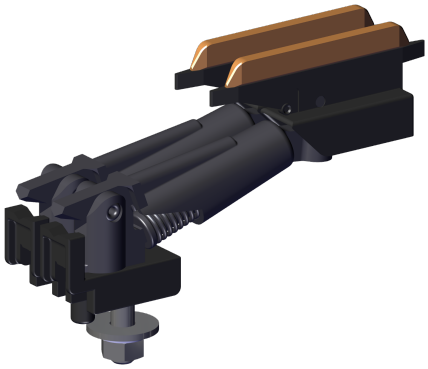
► Permissible for voltages up to 60 V.

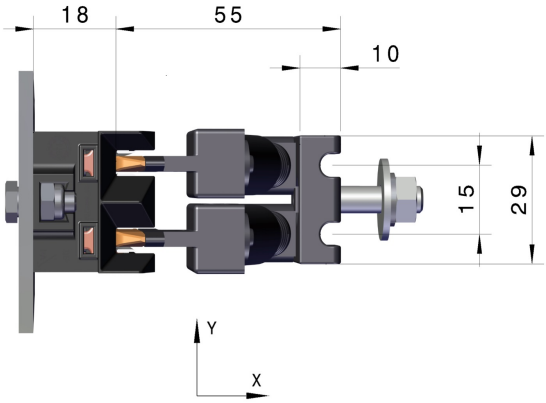
5.3.9 Current collector





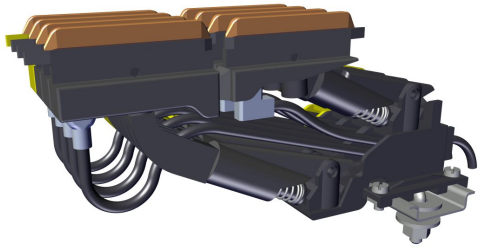
Current collector DEAS		
SA-DEAS-2/30-2-SS-2,5-0/2-2-PA (for control current)		2823983/...-0
SA_DEAS-2-30-2-HS-2,5-0/2-2-PA (for main power with PE)		2823998/...-0
Weight	[kg]	0,4
Number of poles		2
Phase spacing	[mm]	15
Max. current	[A]	30
Stroke	[mm]	± 12
Lateral deflection	[mm]	± 20
Contact pressure approx. per carbon brush	[N]	4
Suitable for funnel		

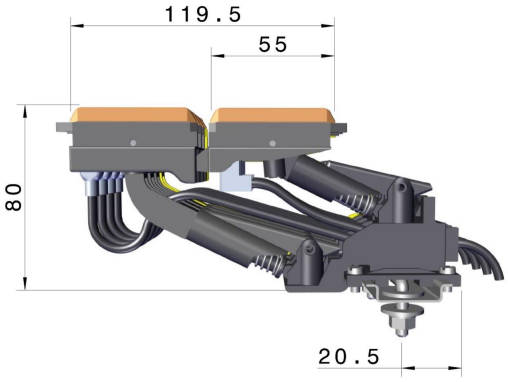




Current collector EASL		
SA-EASL-20-2-SS-0-2-PA-V.E. (For control current)		2823982/...-0
SA-EASL-20-2-HS-0-2-2-PA-V.E. (For main power with PE)		2823997/...-0
Weight	[kg]	0,098
Number of poles		2
Phase spacing	[mm]	15
Max. current	[A]	20
Stroke	[mm]	± 15
Lateral deflection	[mm]	± 20
Contact pressure approx. per carbon brush	[N]	4

Current collector for 4-pin application (only VCL2)





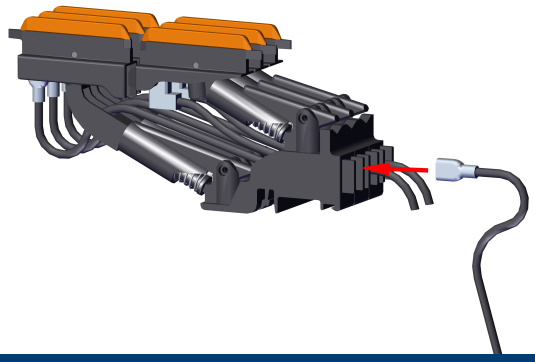
Double current collector		
SA-DEAS-2/30-4-HS-2,5-1/4-4		2823606
Weight	[kg]	0,708

NOTICE!

A 4-pin single current collector can be combined with a customized mounting consisting of the current collectors EASL for control current (2823982/...-0) and EASL for main current with PE (2823997/...-0).

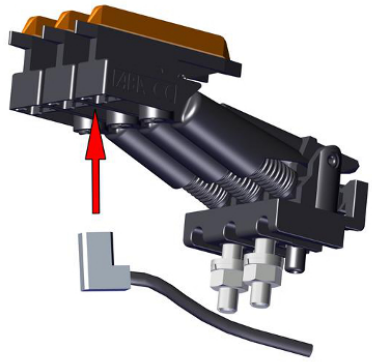
5.3.10 Connecting cables for collector

Connecting cables for DEAS current collector



FLA - type	Pin	Color	Cable cross section [mm²]	Outer diameter Ø [mm]	ID no. 1 m	ID no. 3 m
AL-FLA2,5PH...-6,3	Phase	Black	2,5	4,5	2809171	2809173
AL-FLA2,5PE...-6,3	PE	Green/yellow	2,5	3,9	2809175	2809177
AL-FLA4PH...-6,3	Phase	Black	4	5,3	2823085	2823085/...-3
AL-FLA4PE...-6,3	PE	Green/yellow	4	4,9	2823086	2823086/...-3

Connecting cables for EASL current collector



WFLA - type	Pin	Color	Cable cross section [mm²]	Outer diameter Ø [mm]	ID no. 1 m	ID no. 3 m
AL-WFLA2,5PH...-6,3	Phase	Black	2,5	4,5	0168107/...-1	0168107/...-3
AL-WFLA2,5PE...-6,3	PE	Green/yellow	2,5	3,9	0168108/...-1	0168108/...-3

5.3.11 Connection cables

Connecting cable for transfer guides, double insulated, flexible M5



RKLA for M5 - type	Pin	Color	Cable cross section [mm^2]	Outer diameter Ø [mm]	ID no. 1 m	ID no. 5 m
Al-RKLA2,5PH...-M5	Phase	Black	2,5	4,5	2808971	2808971/...-5
Al-RKLA2,5PE...-M5	PE	Green/yellow	2,5	3,9	2808958	2808958/...-5
Al-RKLA4PH...-M5-HL	Phase	Black	4	5,3	2821809	2821809/...-5
Al-RKLA4PE...-M5-HL	PE	Green/yellow	4	4,9	2821810	2821810/...-5
Al-RKLA6PH...-M5-HL	Phase	Black	6	6,5	2808965	2808965/...-5
Al-RKLA6PE...-M5-HL	PE	Green/yellow	6	6,3	2808967	2808967/...-5

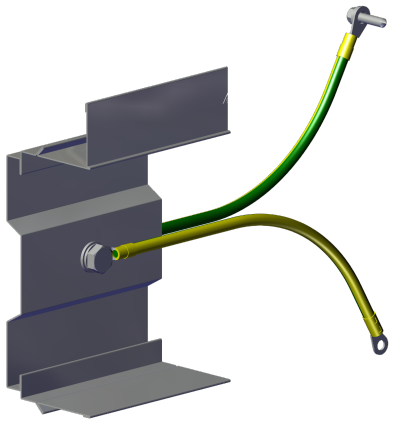
Connecting cable, for line feeds, double insulated, flexible, M6



RKLA for M6 - type	Pin	Color	Cable cross section [mm²]	Outer diameter Ø [mm]	ID no. 1 m	ID no. 5 m
Al-RKLA2,5PH...-M6	Phase	Black	2,5	4,5	2808979	2808979/...-5
Al-RKLA2,5PE...-M6	PE	Green/yellow	2,5	3,9	2808978	2808978/...-5
Al-RKLA4PH...-M6-HL	Phase	Black	4	5,3	2808751	2808751/...-5
Al-RKLA4PE...-M6	PE	Green/yellow	4	4,9	2808752	2808752/...-5
Al-RKLA6PH...-M6	Phase	Black	6	6,5	2808745	2808745/...-5
Al-RKLA6PE...-M6-HL	PE	Green/yellow	6	6,3	2808759/...	2808759/...-5
AL-RKLA10PH...-M6-HL	Phase	Black	10	8,3	2808753/...	2808753/...-5
AL-RKLA10PE...-M6-HL	PE	Green/yellow	10	7,9	2808754/...	2808754/...-5
AL-RKLA16PH...-M6-HL	Phase	Black	16	10,7	2808756/...	2808756/...-5
AL-RKLA16PE...-M6-HL	PE	Green/yellow	16	9,2	2808762/...	2808762/...-5

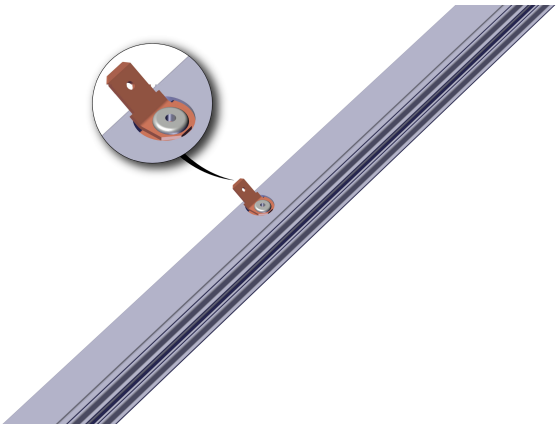
5.3.12 Equipotential bonding

Equipotential bonding at transfer guide or line feed



Equipotential bonding cable	
VSPA-VMT-600-VCL	0171817
Weight [kg]	0,142
Delivery without profile	
Equipotential bonding from VCL profile to VMT profile	

Equipotential bonding at rail section



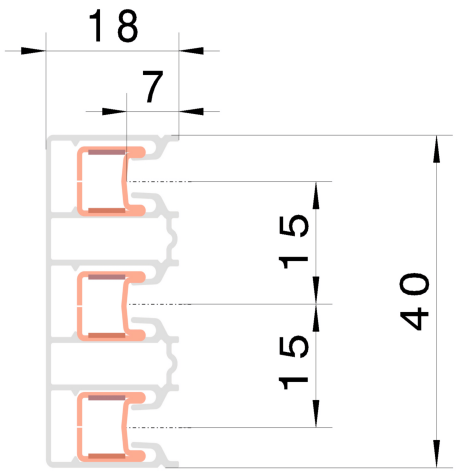
Rail section with PE grounding	
VCL2/40F-1000HSCP	0281547
VCL2/100C-1000HSCP	0281548

Equipotential bonding cable	
VSPA-VMT-VCL2/3-100C(40F)-1000HSCP	0171841
For rail sections with VMT	

Equipotential bonding cable	
AL-IFKA6-PE0,25-6,3RK	10006117
For rail sections without VMT	

5.4 Device overview VCL3

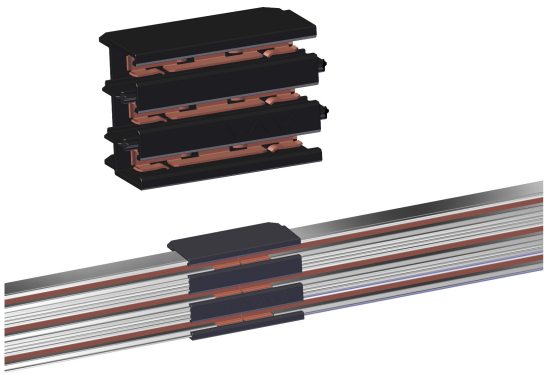
5.4.1 Segment



Segment Section Phase	
VCL3/100C-4000SSD	0281584
VCL3/100C-3000SSD	0281583
VCL3/100C-2000SSD	0281582
VCL3/100C-1000SSD	0281581
VCL3/40F-1000SSD	0281601
VCL3/40F-2000SSD	0281602
VCL3/40F-3000SSD	0281603
VCL3/40F-4000SSD	0281604
Weight 100C (4m) [kg]	3,522
Weight 40F (4m) [kg]	3,300
Delivery length [mm]	4000
Hanger spacing [mm]	800

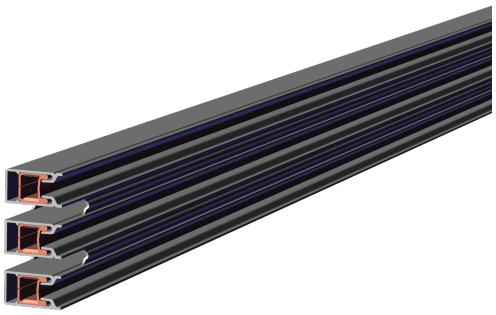
Segment Section Phase + PE	
VCL3/100C-4000HSC	0281594
VCL3/100C-3000HSC	0281593
VCL3/100C-2000HSC	0281592
VCL3/100C-1000HSC	0281591
VCL3/40F-4000HSC	0281614
VCL3/40F-3000HSC	0281613
VCL3/40F-2000HSC	0281612
VCL3/40F-1000HSC	0281611
Weight 100C (4m) [kg]	3,522
Weight 40F (4m) [kg]	3,300
Delivery length [mm]	4000
Hanger spacing [mm]	800

5.4.2 Connecting material



Joint connector, plug-in	
VM-VCL3-7	0281577
Weight [kg]	0,035

5.4.3 End segment

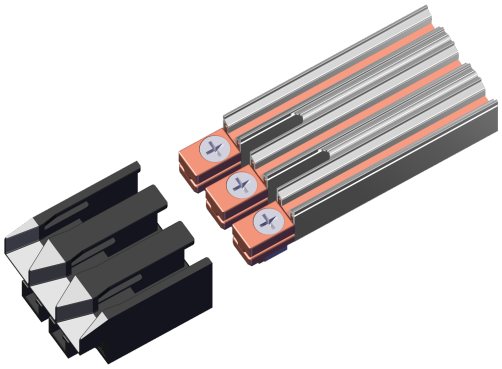


End segment Phase	
ESM-VCL3/100C-SSD	0281578
ESM-VCL3/40F-SSD	0281585
Weight (1m) [kg]	0,662
Delivery length [mm]	1000

Segment Section Phase + PE	
ESM-VCL3/100C-HSC-R*	0281579
ESM-VCL3/100C-HSC-L*	0281580
ESM-VCL3/40F-HSC-R*	0281586
ESM-VCL3/40F-HSC-L*	0281587
Weight (1m) [kg]	0,662
Delivery length [mm]	1000

*Lines with PE marking require 1x end segment...-HSC-R and 1x end segment...-HSC-L

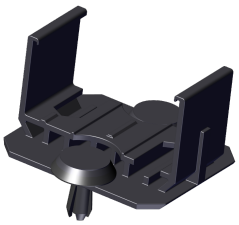
5.4.4 Transfer guide



Transfer guide	
US-VCL3-7-F (with fixpoint)	0281588
US-VCL3-7 (with fixpoint)	0281589
Weight [kg]	0,073
Lateral / vertical offset [mm]	3
Feed-in power [A]	50
Pre-assembled units with connecting cable are available upon request	

The transfer guide can be used with and without feed terminal. It is also used as an end cap and as a fix-point in connection with the provided support profile.

5.4.5 Hanger/holder

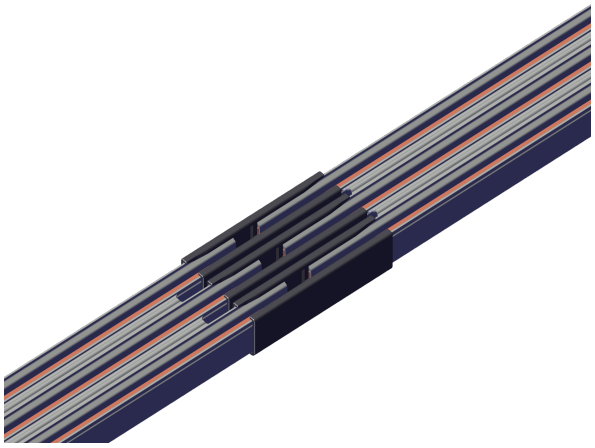


Hanger, 3-pin	
AH-VCL3-7	0281590

NOTICE!

► Customer-specific hangers on request.

5.4.6 Expansion joint

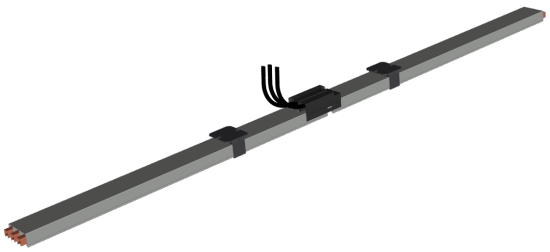


Expansion section Phase		
DT-DVCL3/100C-SSD		0281599
DT-DVCL3/40F-SSD		0281605
Weight	[kg]	0,953
Delivery length	[mm]	1000
Max. current	[A]	50*

Expansion section Phase + PE		
DT-DVCL3/100C-HSC		0281600
DT-DVCL3/40F-HSC		0281606
Weight	[kg]	0,953
Delivery length	[mm]	1000
Max. current	[A]	50*

* Currents greater than 50 A can be achieved with additional feed terminals and cable bridges (detailed project planning by VAHLE required)

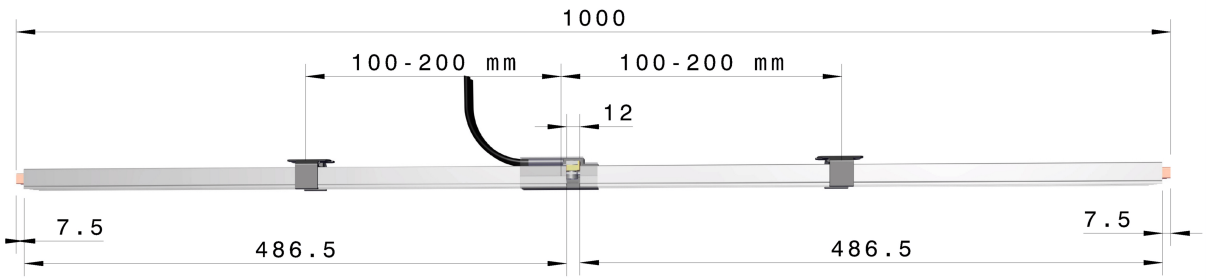
5.4.7 Line feed



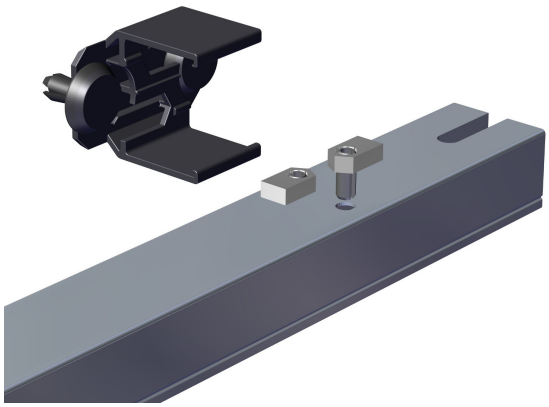
Line feed* Phase		
ES-VCL3/100C-50A-SSD		0281595
ES-VCL3/100C-100A-SSD**		0281620
ES-VCL3/40F-SSD		0281597
Weight	[kg]	0,947
Delivery length	[mm]	1000
Max. current**	[A]	50 to 100

Line feed* Phase + PE		
ES-VCL3/100C-50A-HSC		0281596
ES-VCL3/100C-100A-HSC**		0281621
ES-VCL3/40F-HSC		0281598
Weight	[kg]	0,947
Delivery length	[mm]	1000
Max. current**	[A]	50 to 100

*Pre-assembled section with connection on request.
** 100 ampere - variant



5.4.8 Fixpoint terminal

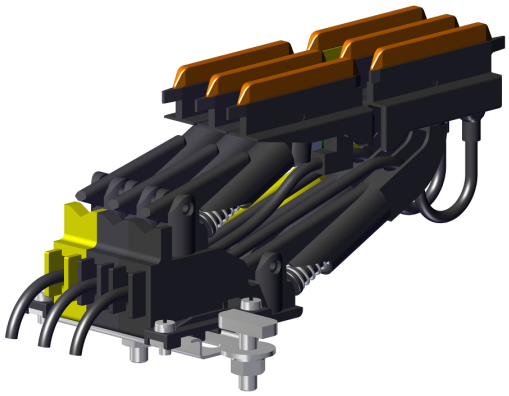


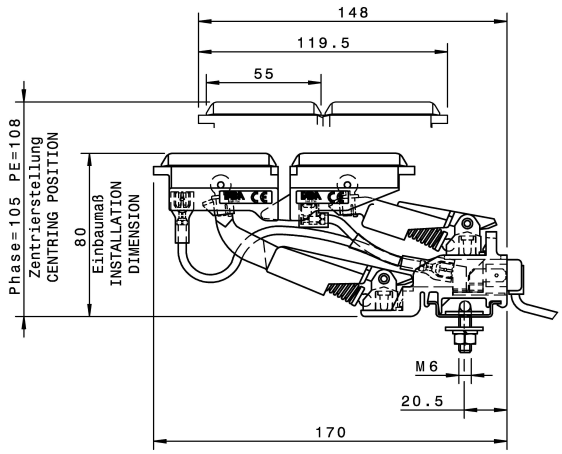
Fixpoint terminal		
FK-AH-VCL2/3		0281527
Weight	[kg]	0,020

NOTICE!

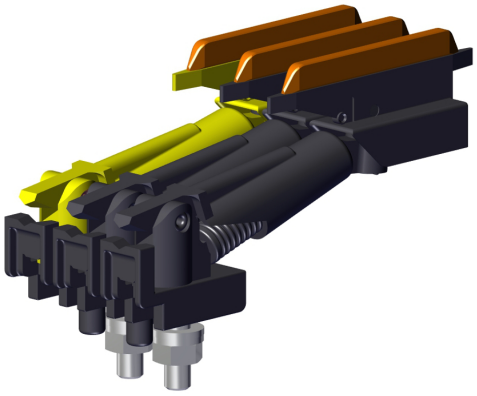
► Permissible for voltages up to 60 V.

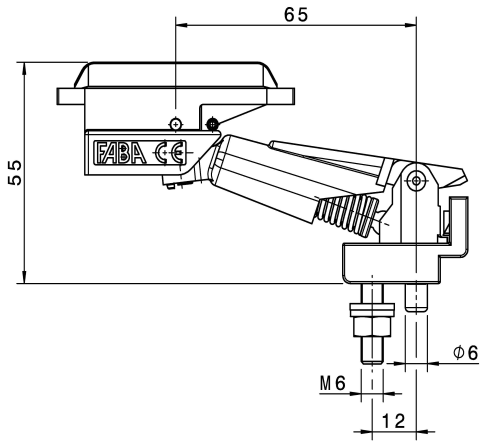
5.4.9 Current collector





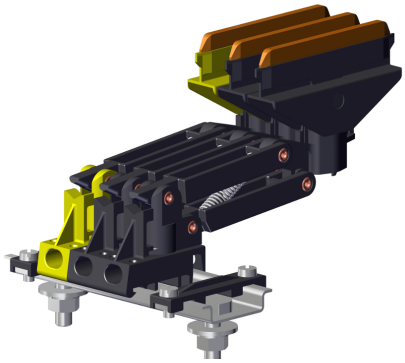
Current collector DEAS		
SA-DEAS-2/30-2-SS-3,5-0/2-2-PA (for controller)		0281610
SA_DEAS-2-30-2-HS-3,5-0/2-2-PA (for main power with PE)		0281615
Weight	[kg]	0,4
Number of poles		3
Phase spacing	[mm]	15
Max. current	[A]	30
Stroke	[mm]	± 12
Lateral deflection	[mm]	± 20
Contact pressure aprox. per carbon brush	[N]	4
Suitable for funnel		





Current collector EASL		
SA-EASL-20-3-SS-0-2-PA-V.E. (For control current)		0281616
SA-EASL-20-3-HS-0-2-2-PA-V.E. (For main power with PE)		0281617
Weight	[kg]	0,12
Number of poles		3
Phase spacing	[mm]	15
Max. current	[A]	20
Stroke	[mm]	± 15
Lateral deflection	[mm]	± 20
Contact pressure aprox. per carbon brush	[N]	4

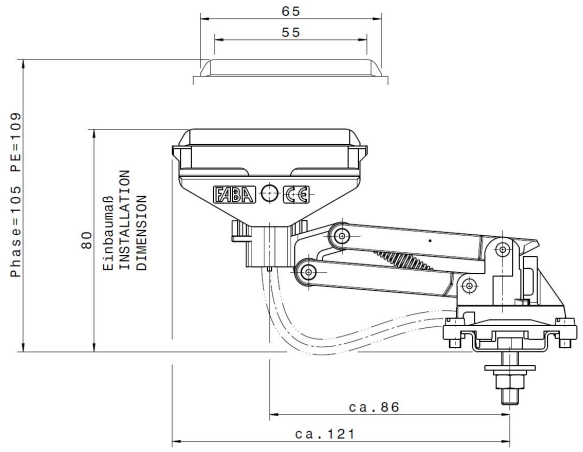
Current collector for 3- to 6-pin application



PASK Current collector	Ident. No.
SA-PASK-50-3L-HS/3-4	0281633
SA-PASK-50-3R-HS/3-4	0281634
SA-PASK-50-4L-HS/4-4	0281624
SA-PASK-50-4R-HS/4-4	0281627
SA-PASK-50-5L-HS/5-6	0281625
SA-PASK-50-5R-HS/5-6	0281628
SA-PASK-50-6L-HS/6-6	0281626
SA-PASK-50-6R-HS/6-6	0281629

The letter (in bold) indicates the version of the current collector. The illustration shows the right hand version. Z. B. SA-PASK-50-3**L**-HS/3-4

R = right version, **L** = left version



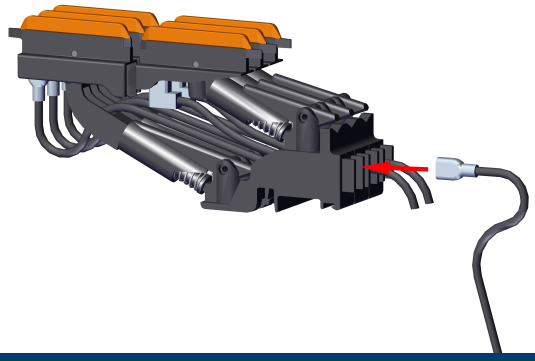
PASK Current collector		
Phase spacing	[mm]	15
Max. current	[A]	50
Stroke	[mm]	± 15
Lateral deflection	[mm]	± 20
Contact pressure approx. per carbon brush	[N]	4
PE in lower position		

NOTICE!

Use only for VCL 3 HS (with PE) and VCL 4-6 with VMT.

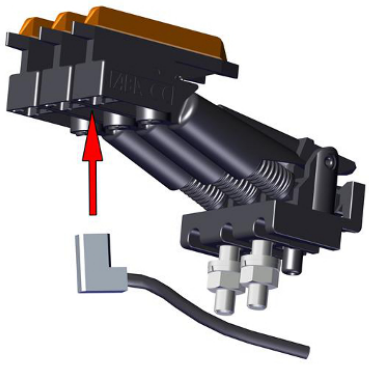
5.4.10 Connecting cables for collector

Connecting cables for DEAS current collector



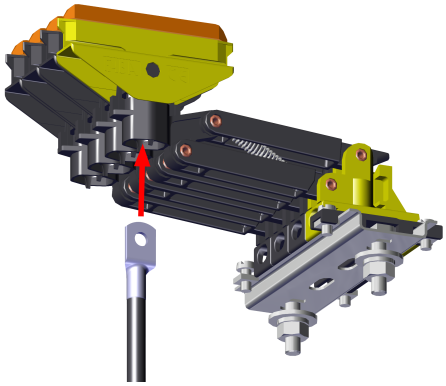
FLA - type	Pin	Color	Cable cross section [mm²]	Outer diameter Ø [mm]	ID no. 1 m	ID no. 3 m
AL-FLA2,5PH...-6,3	Phase	Black	2,5	4,5	2809171	2809173
AL-FLA2,5PE...-6,3	PE	Green/yellow	2,5	3,9	2809175	2809177
AL-FLA4PH...-6,3	Phase	Black	4	5,3	2823085	2823085/...-3
AL-FLA4PE...-6,3	PE	Green/yellow	4	4,9	2823086	2823086/...-3

Connecting cables for EASL current collector



WFLA - type	Pin	Color	Cable cross section [mm²]	Outer diameter Ø [mm]	ID no. 1 m	ID no. 3 m
AL-WFLA2,5PH...-6,3	Phase	Black	2,5	4,5	0168107/...-1	0168107/...-3
AL-WFLA2,5PE...-6,3	PE	Green/yellow	2,5	3,9	0168108/...-1	0168108/...-3

Connecting cable for PASK current collector



RKLA for M4 - type	Pin	Color	Cable cross section [mm²]	Outer diameter Ø [mm]	ID no. 1 m	ID no. 3 m
AL-RKLA6PH...-M4	Phase	Black	6	6,5	2808737	2808737/...-3
AL-RKLA6PE...-M4	PE	Green/yellow	6	6,3	2808738	2808738/...-3

5.4.11 Connection cables

Connecting cable for transfer guides, double insulated, flexible M5



RKLA for M5 - type	Pin	Color	Cable cross section [mm²]	Outer diameter Ø [mm]	ID no. 1 m	ID no. 5 m
Al-RKLA2,5PH...-M5	Phase	Black	2,5	4,5	2808971	2808971/...-5
Al-RKLA2,5PE...-M5	PE	Green/yellow	2,5	3,9	2808958	2808958/...-5
Al-RKLA4PH...-M5-HL	Phase	Black	4	5,3	2821809	2821809/...-5
Al-RKLA4PE...-M5-HL	PE	Green/yellow	4	4,9	2821810	2821810/...-5
Al-RKLA6PH...-M5-HL	Phase	Black	6	6,5	2808965	2808965/...-5
Al-RKLA6PE...-M5-HL	PE	Green/yellow	6	6,3	2808967	2808967/...-5

Connecting cable, for line feeds, double insulated, flexible, M6

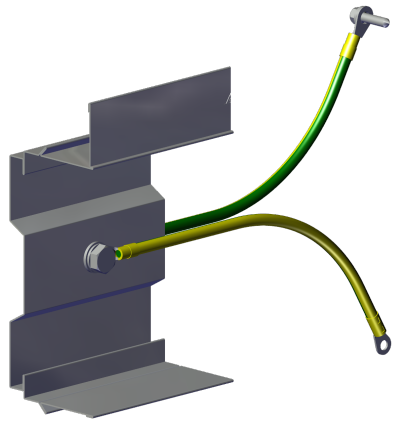


RKLA for M6 - type	Pin	Color	Cable cross section [mm²]	Outer diameter Ø [mm]	ID no. 1 m	ID no. 5 m
Al-RKLA2,5PH...-M6	Phase	Black	2,5	4,5	2808979	2808979/...-5
Al-RKLA2,5PE...-M6	PE	Green/yellow	2,5	3,9	2808978	2808978/...-5
Al-RKLA4PH...-M6-HL	Phase	Black	4	5,3	2808751	2808751/...-5
Al-RKLA4PE...-M6	PE	Green/yellow	4	4,9	2808752	2808752/...-5

RKLA for M6 - type	Pin	Color	Cable cross section [mm²]	Outer diameter Ø [mm]	ID no. 1 m	ID no. 5 m
AI-RKLA6PH...-M6	Phase	Black	6	6,5	2808745	2808745/...-5
AI-RKLA6PE...-M6-HL	PE	Green/yellow	6	6,3	2808759/...	2808759/...-5
AL-RKLA10PH...-M6-HL	Phase	Black	10	8,3	2808753/...	2808753/...-5
AL-RKLA10PE...-M6-HL	PE	Green/yellow	10	7,9	2808754/...	2808754/...-5
AL-RKLA16PH...-M6-HL	Phase	Black	16	10,7	2808756/...	2808756/...-5
AL-RKLA16PE...-M6-HL	PE	Green/yellow	16	9,2	2808762/...	2808762/...-5

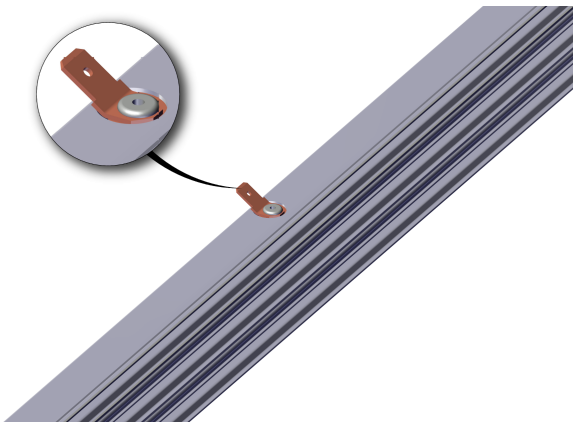
5.4.12 Equipotential bonding

Equipotential bonding at transfer guide or line feed



Equipotential bonding cable	
VSPA-VMT-600-VCL	0171817
Weight [kg]	0,142
Delivery without profile	
Equipotential bonding from VCL profile to VMT profile	

Equipotential bonding at rail section



Rail section with PE grounding	
VCL3/40F-1000HSCP	0281638
VCL3/100C-1000HSCP	0281637

Equipotential bonding cable	
VSPA-VMT-VCL2/3-100C(40F)-1000HSCP	0171841
For rail sections with VMT	

Equipotential bonding cable	
AL-IFKA6-PE0,25-6,3RK	10006117
For rail sections without VMT	

5.5 System description VMT

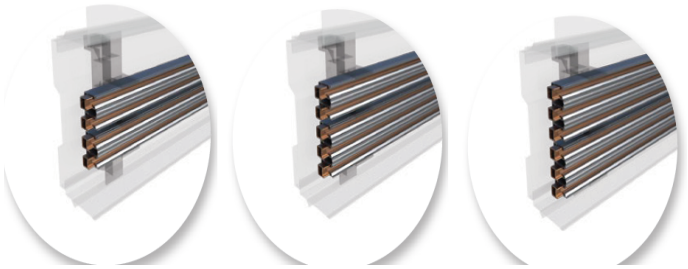
The modular ALL-IN-ONE solution for your warehouse technology - VCL & VMT

The VCL compact conductor system is generally available as a two- and three-pin variant. Combining these two conductor rails allows up to 6-pin conductor systems to be realized. In addition to the power supply for the shuttle technology, the VCL is also suited for use in SPW and pallet SRM applications as well as other compact moving and transfer carriage applications in the small and medium power range up to 100 amperes.

With the new VAHLE multi-bearer, VAHLE has developed a product that is specially tailored to the many requirements of floor-guided storage and conveyor systems, such as storage and retrieval systems and transfer carriages. Please contact us in the case of other applications, e.g. in crane technology. Displacement and positioning systems can of course also be used in parallel. A further plus for the user are the large hanger distances, which enable quick and cost-effective installation.



The following illustrations show configuration examples. From left to right, a 4-pin, 5-pin, and a 6-pin variant demonstrate the variability of the system.



System features

- Supports several standard conductor systems
- Hanger spacing up to 3.5 meters
- Quick and easy installation using plug and clamping systems
- Mechanical protection of the conductor rail system
- Temperature-independent system rigidity
- Trade-association compliant design of the support profile
- Integration of optical travel sensor and positioning systems
- Universal hangers for all common upright profiles
- 4- to 6-pin; 40–100 A with identical installation space
- 12 to 500V
- IP2X contact protection
- Electrical protection through equipotential bonding
- Easy replacement of partial sections or individual sections

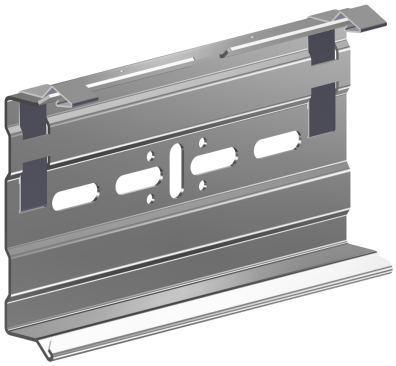
5.6 Device overview VMT

5.6.1 Profile



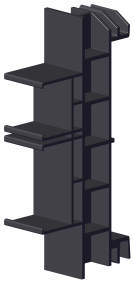
Profile		
VMT-6000		0171546
Weight	[kg]	12.336
Delivery length	[mm]	6000

5.6.2 Terminal connector



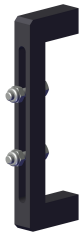
Terminal connector		
KV-VMT		0171536
Weight	[kg]	0.845

5.6.3 Compact hanger



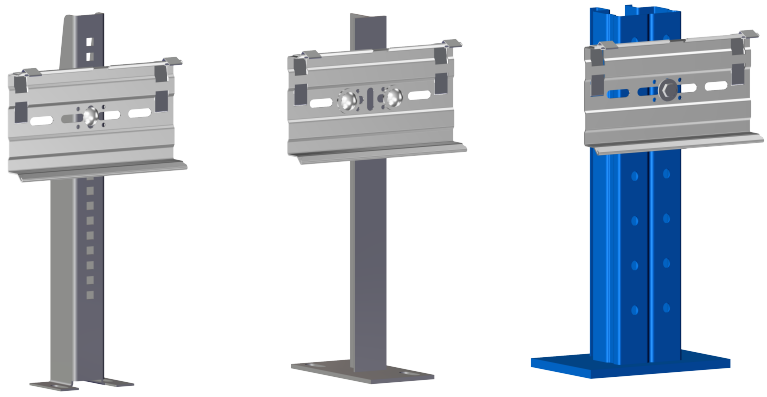
Compact holder	Weight [kg]	Ident-No.
KH-VCL4-VMT	0,385	0171818
KH-VCL5-VMT	0,394	0171819
KH-VCL6-VMT	0,403	0171820

5.6.4 Adapter for fixpoint

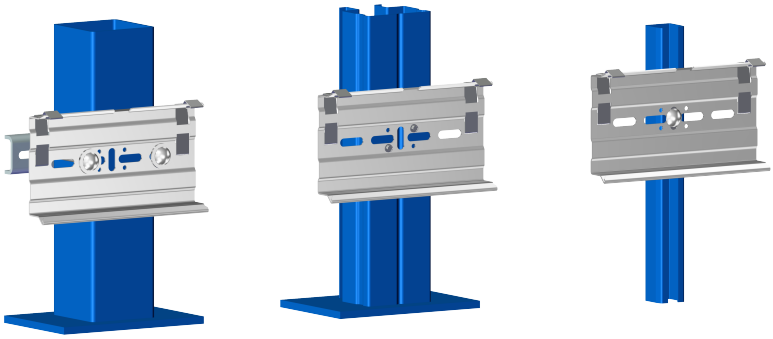


Adapter for fixpoint		
Adapter-US-VCL4-5-6-F-VMT-K		0171821
Weight	[kg]	0,025

5.6.5 Single hangers



1 2 3

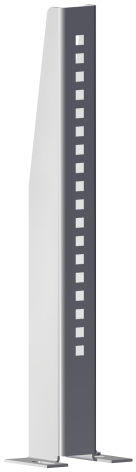


4 5 6

Position	Type	Description	Tightening torque [Nm]	Clamping area [mm]	Weight [kg]	Ident. No.
1	VMT-HS-S	Screw console (for auxiliary support HSE)	15		0.882	0171839
2	VMT-SPW	Clamping console (for auxiliary support HST)	15		1.062	0171539
3	VMT-S	Screw console	15		0.902	0171547
4	VMT 55 -125	Clamping console	15	55 to 65	1.600	0171552
				65 to 75	1.590	0171553
				75 to 85	1.610	0171554
				85 to 95	1.588	0171555
				95 to 105	1.620	0171556
				105 to 115	1.656	0171537
				115 to 125	1.638	0171538
5	VMT-BS	Screw console	7		0.848	0171540
6	VMT S1/2	Clamping console with insert nut	15		0.909	0171578

5.6.6 Auxiliary supports

Auxiliary support HSE



Type	Height [mm]	Weight [kg]	ID no.
HRL-HSE-300	300	1,316	0781697
HRL-HSE-350	350	1,580	0781758
HRL-HSE-400	400	1,637	0781710
HRL-HSE-450	450	1,694	0781694
HRL-HSE-500	500	1,878	0781677

Auxiliary support HST



Type	Height [mm]	Weight [kg]	ID no.
HRL-HST-50-250	250	2,151	0157172
HRL-HST-50-300	300	2,364	0152804
HRL-HST-50-350	350	2,635	0156393
HRL-HST-50-400	400	2,728	0152661
HRL-HST-50-450	450	3,119	0156492
HRL-HST-50-500	500	3,288	0152662
HRL-HST-50-550	550	3,483	0153246
HRL-HST-50-600	600	3,732	0152663
HRL-HST-50-650	650	3,927	0157183
HRL-HST-50-700	700	4,398	0152664

5.6.7 Edge protector for line feed

Feed-through grommet		
DA 230/300/20		10024601
Weight	[kg]	0,009

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 Installation VCL2 / VCL3

6.2.1 Assembly preparation

NOTICE!

The following installation steps only show illustrations of the VCL2. Unless explicit reference is made in the individual descriptions, the descriptions always apply to the VCL2 and VCL 3 system.

Tools and Measuring equipment

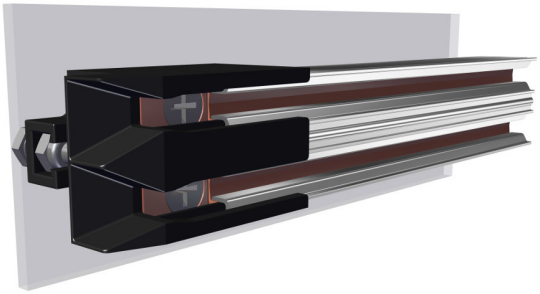
The following devices, tools and measuring equipment are required for assembly of the conductor rails with accessories.

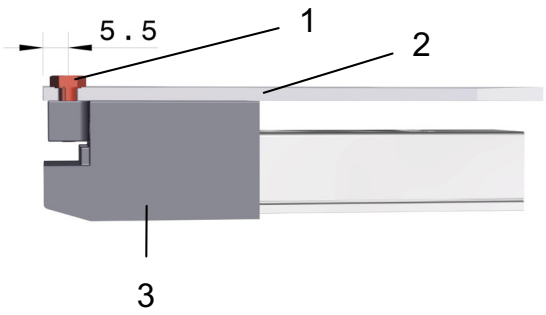
- Suitable means of transport for bringing the conductor rail to the installation site (full-area support of the conductor rail).
- adjustable torque wrench for 1.4 Nm, 5 Nm, 7 Nm and 15 Nm
- ¼" reversible ratchet with an extension and nut with SW 7
- 200 mm steel rule
- Allen wrench, 4 mm
- soft face hammer head, about 50 mm in diameter
- Screwdriver set
- mounting block
- Mounting handle for connector
- Cutting tool for making shorter lengths
- File for deburring the rail ends when making shorter sections
- Screw clamp for fixing the conductor system during the guide process

Preparation

- Protective measures have to taken against unauthorized access and operation during the installation work
- The installation site must be clean and free of all objects
- There has to be adequate lighting over the entire installation site
- Tools for proper assembly of the system have to be available

Drill out mounting holes for fixpoint





1 M4 screw (mounting)
2 Mounting plate
3 Fixpoint / Transfer guide



Assembly instructions

Prerequisites:

✓ Clean and tidy workplace.

Required tools:

⚒ Drill 4.5 mm

Assembly instructions:

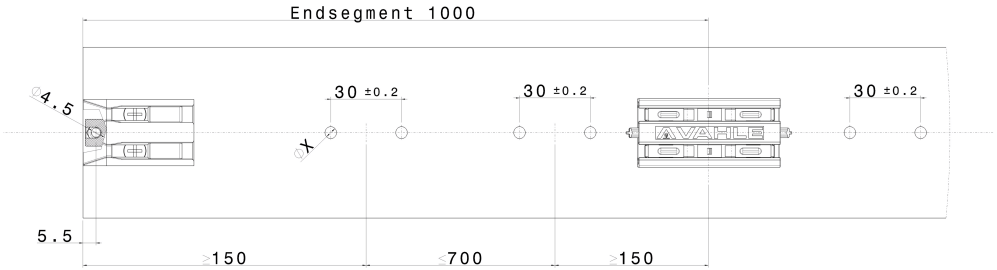
1. Determine position for the bore hole and fix in position.
2. Drill hole with 4.5 mm dia.

Drill out mounting holes for holder

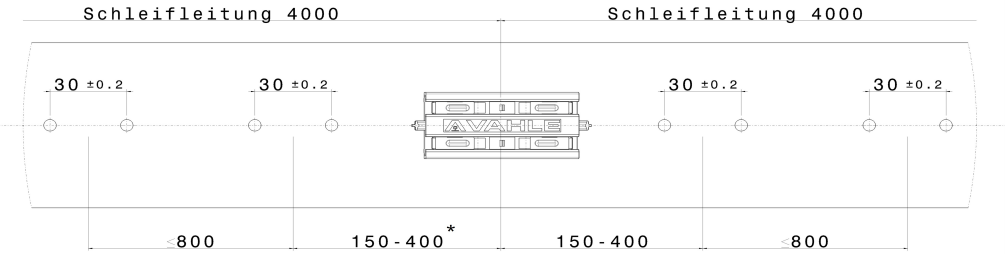
Arrangement examples can be derived from the drilling patterns shown below. The "X" dimension describes the diameter for the bore hole which is dependent on the plate thickness (position 2).



End segment with fixpoint

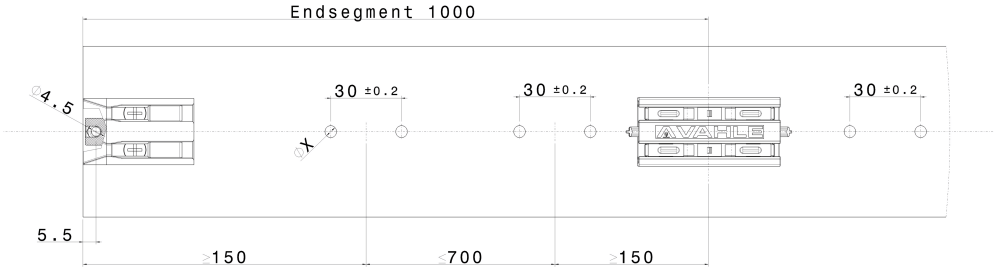


Conductor system



* only applies if the connector cap can be supported. For exposed connectors adhere to the spacing of 150 mm.

End segment without fixpoint





Assembly instructions

Prerequisites:

✓ Clean and tidy workplace.

Required tools:

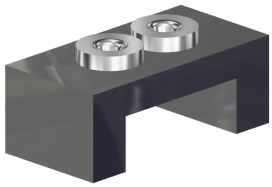
⚒ Drill bit according to table below (4.6 mm - 4.9 mm)

Assembly instructions:

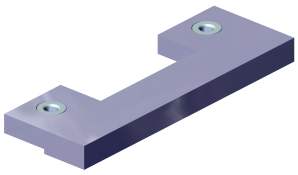
1. Determine position for the bore hole using the drilling template and fix in place.
2. Drill hole with "X" mm dia.

Diameter "X" of the mounting bore holes [mm]	Plate thickness [mm] (Position 2)
4,6	3
4,7	4
4,8	5
4,9	6

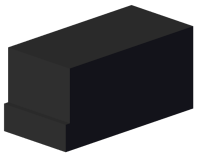
6.2.1.1 Installation aids



Drilling template for fixpoint terminal		
MZ-BS-AH-VCL2		0281525
MZ-BS-AH-VCL3		0281608
Weight	[kg]	0,050



Drilling template for VCL in VMT		
MZ-BS-VMT-FP-VCL		0171840
Weight	[kg]	0,109



Assembly safety device		
Ident-No.		0281526
Weight	[kg]	0,050



Mounting handle for feed terminal VCL		
MZ-MH-ES-VCL		10027863
Weight	[kg]	0,096



Mounting handle		
Ident-No.		2809348
Weight	[kg]	0,010



Chop saw		
Ident-No.		165276
Weight	[kg]	6,5



Hexagon socket SW4		
Ident-No.		2812962
Weight	[kg]	0,036



Screw driver PH1		
Ident-No.		2812963
Weight	[kg]	0,014



File FSF		
Ident-No.		2812964
Weight	[kg]	0,085

6.2.2 Determining the system lengths

The conductor rail joints of the conductor system are manufactured with an air gap of 0.7mm +1mm. The precise system length can therefore only be roughly calculated. Generally, every system should be designed with standard components. Standard components have the following lengths:

Component	Length [mm]
Conductor system segment	4000
End segment, start	1000
End segment, end	1000

Component*	Length [mm]
Line feed	1000
Expansion joint	1000

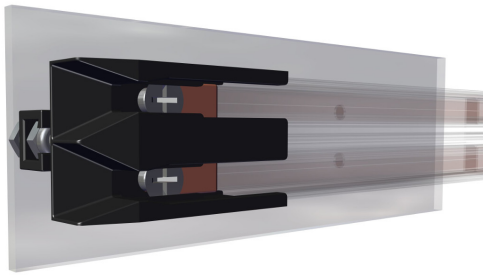
*Only if needed

Possible system lengths with 0.7 mm air gap at joint			
Standard lengths [mm]	Number of end segments	Number of straight sections	Number of connectors
6001.40	2	1	2
10002.10	2	2	3
14002.80	2	3	4
18003.50	2	4	5
22004.20	2	5	6
26004.90	2	6	7
30005.60	2	7	8
34006.30	2	8	9
38007.00	2	9	10
42007.70	2	10	11
46008.40	2	11	12
50009.10	2	12	13
54009.80	2	13	14



Possible system lengths with 0.7 mm air gap at joint			
Standard lengths [mm]	Number of end segments	Number of straight sections	Number of connectors
58010.50	2	14	15
62011.20	2	15	16
66011.90	2	16	17
70012.60	2	17	18
74013.30	2	18	19
78014.00	2	19	20
82014.70	2	20	21
86015.40	2	21	22
90016.10	2	22	23
94016.80	2	23	24
98017.50	2	24	25
102018.20	2	25	26
106018.90	2	26	27
110019.60	2	27	28
114020.30	2	28	29
118021.00	2	29	30
122021.70	2	30	31
126022.40	2	31	32
130023.10	2	32	33
134023.80	2	33	34
138024.50	2	34	35
142025.20	2	35	36
146025.90	2	36	37
150026.60	2	37	38

6.2.3 End segment with feed terminal (fixpoint)



Step 1

Prerequisites:

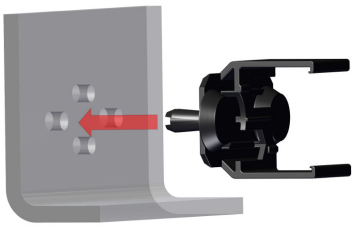
✓ Clean and tidy workplace.

Required tools:

⚒ ¼" reversible ratchet SW 7

Assembly instructions:

1. Mount the transfer guide to the carrier using the included screws with a **tightening torque of 3 Nm**.



Step 2

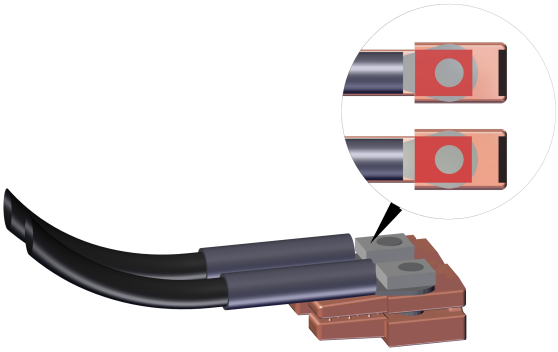
Required tools:

⚒ Plastic hammer

Assembly instructions:

1. Mount the hangers to the carrier using suitable expanding rivets.
2. Use the plastic hammer for fixing.

Step 3



Assembly instructions:

1. Connect the screw terminal with the feed cable.

NOTICE!

► Ensure the nut is correctly aligned before inserting the screw clamp into transfer guide (see detail).

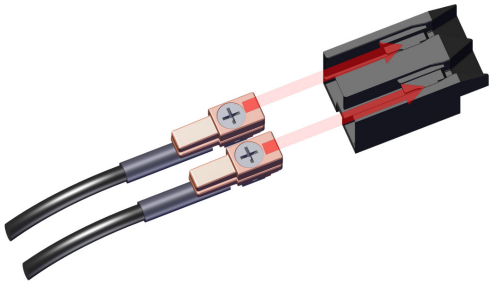


DANGER!

Danger of death due to electrical current!

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

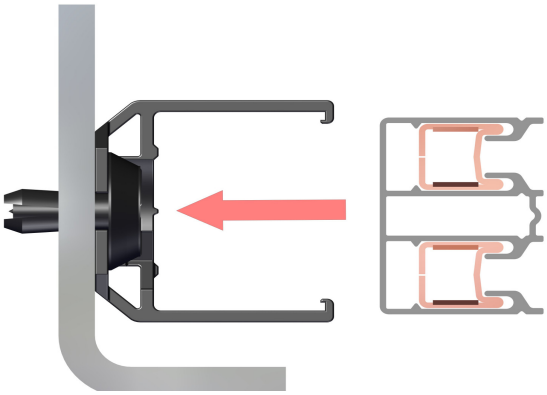
► Make sure that the relevant components are not live or under voltage, and that there is no unauthorized approximation.



Step 4

Assembly instructions:

1. The screw head must point in the direction of the running surface
2. Push the screw terminals with feed cable into the transfer guide.



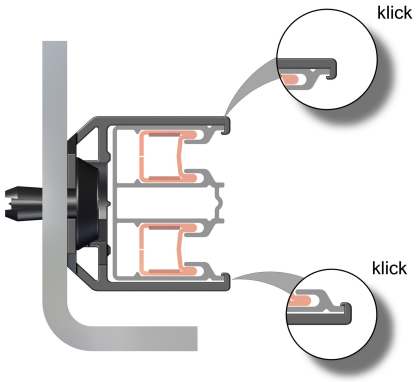
Step 5

Assembly instructions:

1. Push the profile into the holder as illustrated
2. Check for firm seating.

NOTICE!

► Make sure that the holders have properly snapped in place.



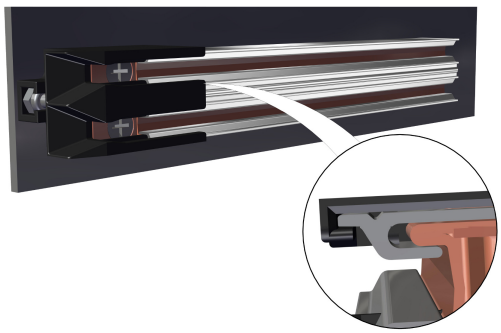
⚠ CAUTION!

Danger of crushing between the individual components!

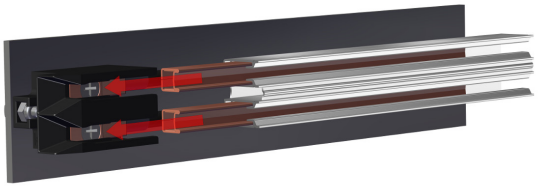
During assembly there is a risk of crushing of the extremities between the individual components.

► Take care of your extremities.

► Wear personal protective equipment. (see Chapter: 3)

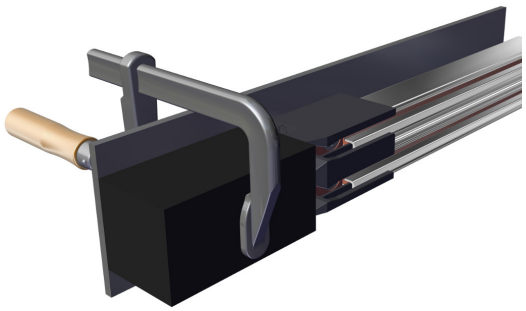


Step 6



Assembly instructions:

1. Mount the end segment.
2. Pull the conductor rail from the insulating housing for approx. 100 mm.
3. Slide the conductor rail and insulating housing into the transfer guide with screw terminal up to the stop.
4. Tighten the countersunk screws on the screw terminal with **tightening torque = 2 Nm**.



Step 7

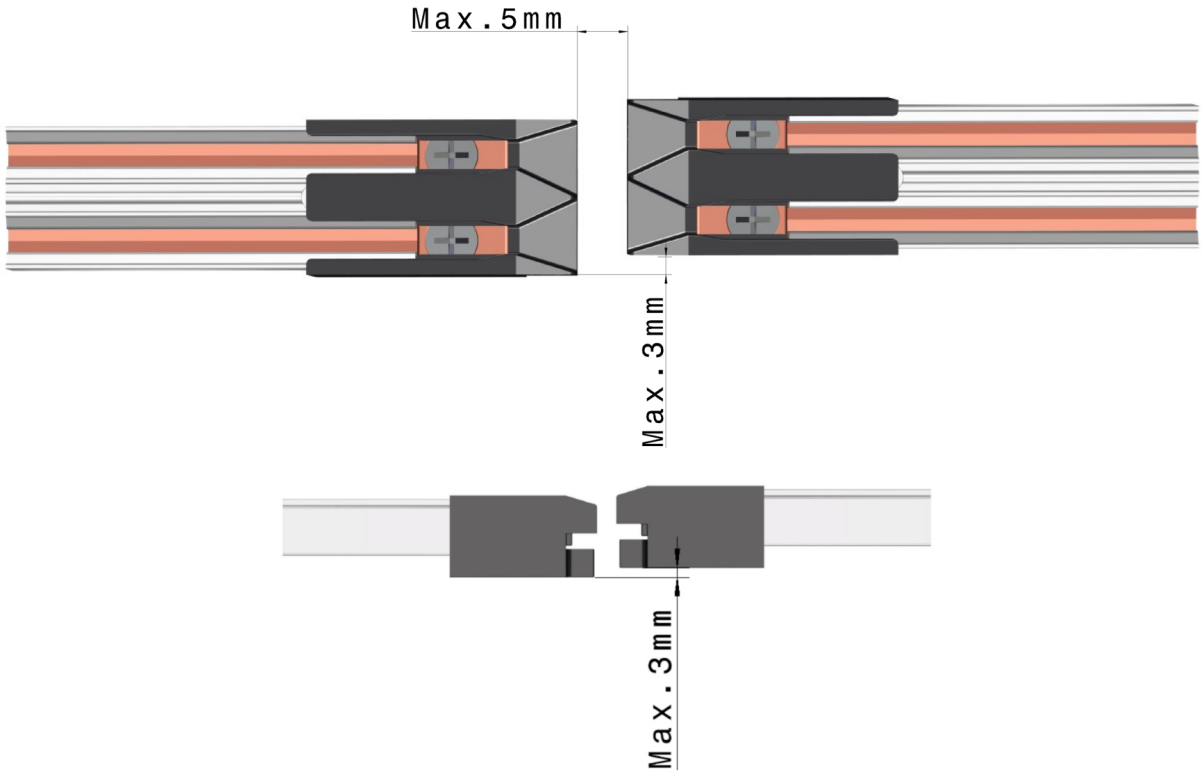
Required tools:

⚒ Assembly safety device

Assembly instructions:

1. Attach the assembly safety device to the transfer guide using a screw clamp (to relieve the fixpoint during connector installation).

6.2.4 Transfer guides



NOTICE!

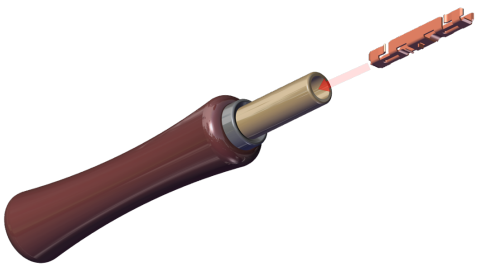
- ▶ One of the two transfer guides must be mounted as a fixpoint.
- ▶ The transfer guides may only have an **air gap of between 1 mm and 5** mm.
- ▶ The **lateral offset may not be more than 3** mm.
- ▶ The **vertical offset may not be more than 3** mm.
- ▶ For assembly steps please refer to chapter: „6.2.3 “.

NOTICE!

Adjustment of the expansion gap in sections between two fixed points

- ▶ Additional fixed points are required when using expansion sections (see chapter 6.2.10) and are always installed on either side of the expansion section.
- ▶ The expansion gaps on the expansion sections are adjusted after the first fixed point of a section has been set.. The second fixed point of the section can then be set.

6.2.5 Line material



Step 1

Prerequisites:

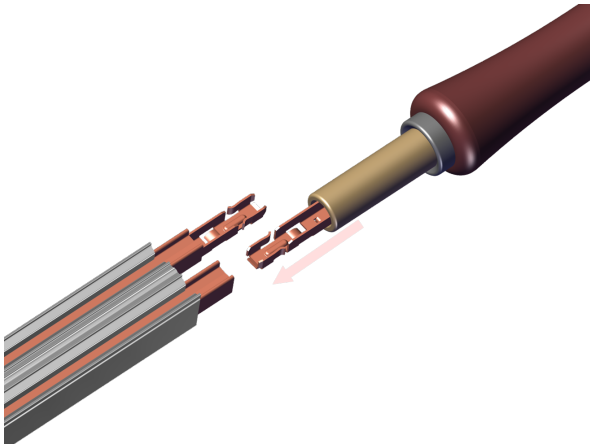
✓ Clean and tidy workplace.

Required tools:

⚒ Mounting handle

Assembly instructions:

1. Push the conductor rail connector into the opening of the mounting handle.



Step 2

Required tools:

⚒ Mounting handle

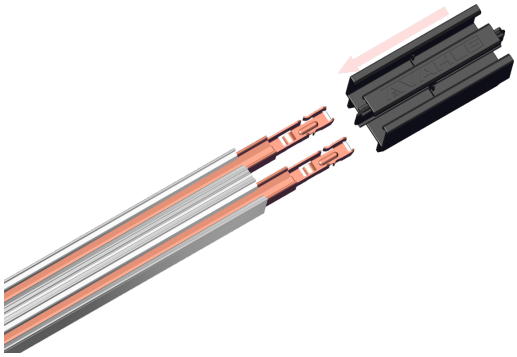
⚒ Plastic hammer

Assembly instructions:

1. Hammer the connector into the conductor rail joint with the mounting handle and a plastic hammer.

⚠ CAUTION!

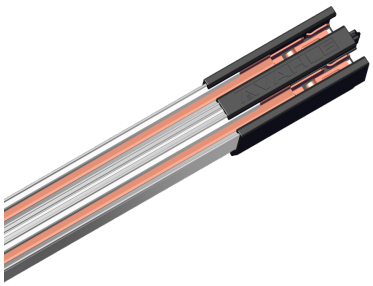
The connector is not reusable. If assembly is unsuccessful or the connection is faulty, please proceed as described in Chapter: "6.2.6 ".



Step 3

Assembly instructions:

1. Push the connector cap onto the conductor system up to the stop.



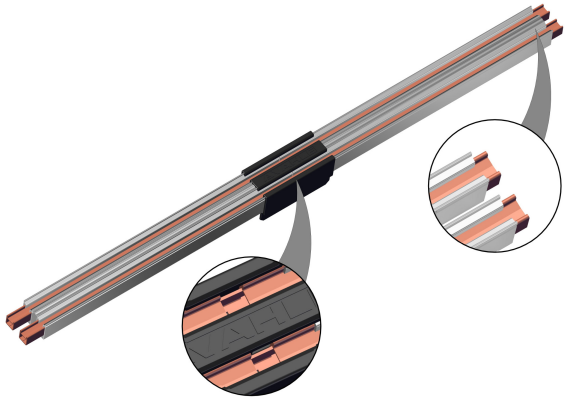
⚠ CAUTION!

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.

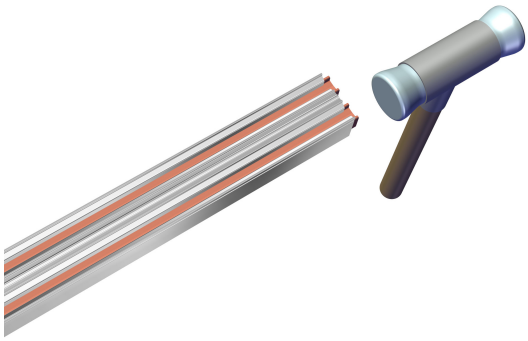
► Wear personal protective equipment. (see Chapter: 3)



Step 4

Assembly instructions:

1. Mount the next conductor system in the intended hanger as described in Chapter: "6.2.3 ".



Step 5

Required tools:

⚒ Plastic hammer

Assembly instructions:

1. Hammer the conductor system up to the stop using the plastic hammer.

NOTICE!

Repeat these steps until you have reached the penultimate 4-meter section. Determine the exact length to the end point and adapt the last sections accordingly.

6.2.6 Renewing conductor rail joints

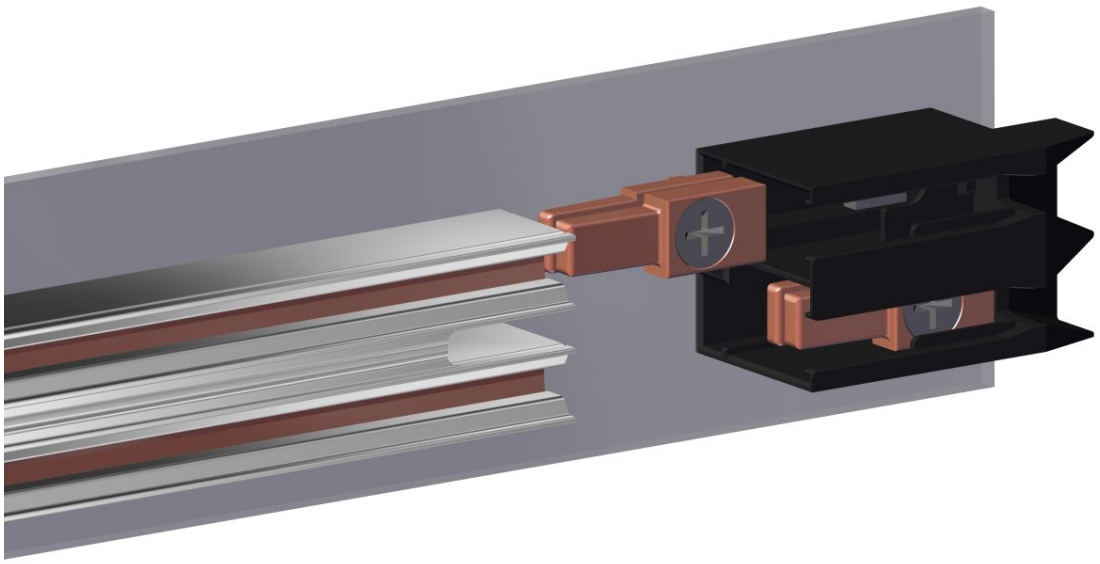
Assembly/disassembly steps

⚒ Cutting tool

⚒ Deburring tool

1. Detach the conductor line from the rail holder so that it is possible to use the cutting tool.
2. Cut out the connection point.
3. Reestablish the required overhang of the conductor rail to the insulating housing.
4. Deburr the cut edges.
5. Mount new connector with connecting cap, see Chapter: „6.2.5 “.

6.2.7 End segment with end cap (sliding)



<u>Assembly instructions</u>

Requirements:

✓ Clean and tidy workplace.

Required tools:

⚒ Screw driver PH1

Assembly steps:

1. Mount the connectors and connecting cap on the last section.
2. Clip the end segment into the hanger and connect the section.
3. Insert the screw terminals in both conductor rail ends and push the transfer guide over the terminals. Mount the screws with **3 Nm**.

NOTICE!

► Screw torque: Observe 3 Nm!

4. Remove the assembly safety device on the infeed side which was mounted in Chapter: „6.2.3 “.

6.2.8 Shorter lengths

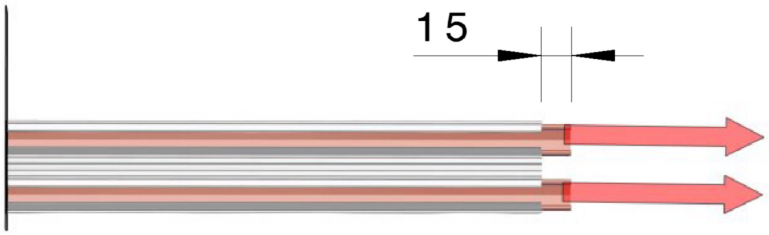
NOTICE!

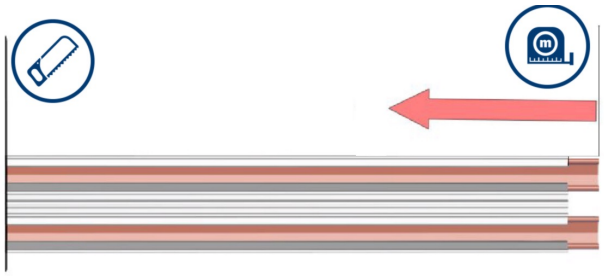
► To reach the desired system length, normally only the last 1-2 profiles are adapted! It is not recommended to shorten profiles within the system!

⚠ CAUTION!

► To ensure smooth and impairment-free running of the current collectors/carbon brushes, the cut surfaces must always be carefully deburred.

► Shorter lengths may not be below 300 mm!





<u>Assembly instructions</u>

Requirements:

✓ Clean and tidy workplace.

Required tools:

⚒ Tape measure

⚒ Handsaw, chop saw

⚒ File

Assembly steps:

1. Pull the copper profile out of the insulating housing for exactly 15 mm and make sure that the copper is flush with the insulating profile on the other side.
2. Hold the tape measure to the copper and mark the desired length.
3. Cut the insulating profile including copper to length. Push the copper back 7.5 mm into the insulating profile so that you now have 7.5 mm of copper protruding from each side of the insulating profile.
4. The cut surface must be cleanly deburred. Then mount the profile in the respective position.

6.2.9 Alternative fixed point (optional)

NOTICE!

Adjustment of the expansion gap in sections between two fixed points

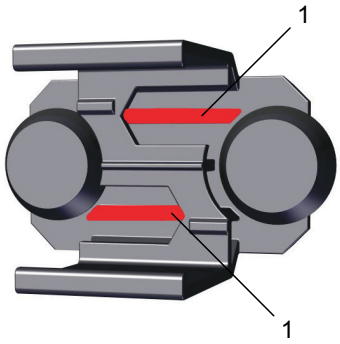
- Additional fixed points are required when using expansion sections (see chapter 6.2.10) and are always installed on either side of the expansion section.
- The expansion gaps on the expansion sections are adjusted after the first fixed point of a section has been set.. The second fixed point of the section can then be set.

NOTICE!

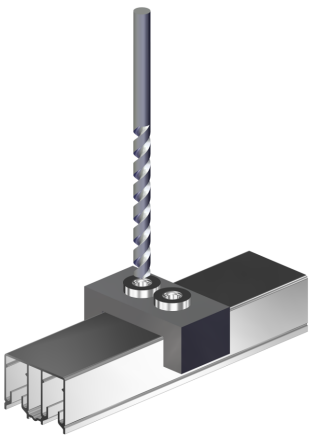
- The fixed point is generally realized by means of the transfer guide as described in chapter: "6.2.4 ". In special cases a fixpoint can also be realized using a hanger. On the back of the conductor line, each hanger has two recesses for fixing.

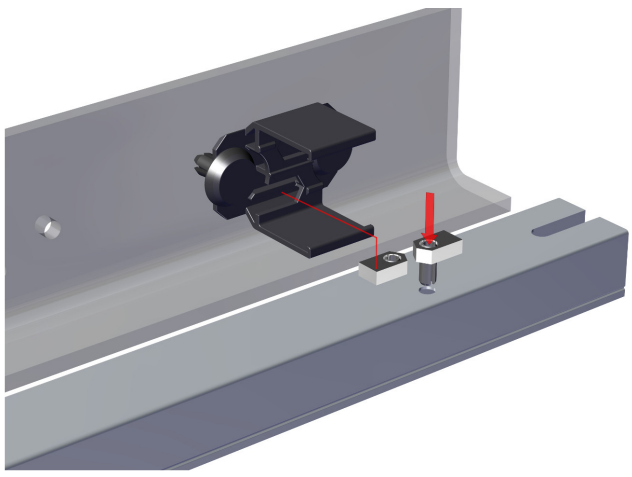
⚠ CAUTION!

- This type of fixed point may only be used for systems with up to 60V.
- For systems with higher voltages please contact Vahle in advance!



1 Recess for fixpoint







<u>Assembly instructions</u>

Prerequisites:

✓ Clean and tidy workplace.

Required tools:

⚒ Tape measure

⚒ Drill

⚒ Drilling template for fixpoint terminal

Installation steps:

1. Position the drilling device on the point of the conductor system where you intend to mount the fixed point.



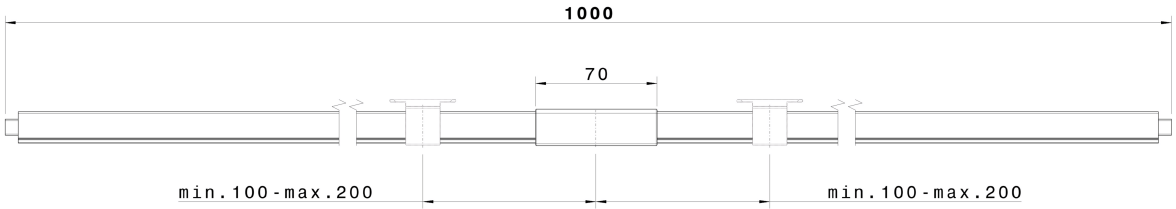
NOTICE!

► Do **not** drill through the contact surface of the conductor rail!

► Before starting to drill, check the conductor rail protrusion (copper profile) on both sides. The conductor rail must protrude by 7.5 mm on both sides.

2. With help of the drilling device, drill through the insulating housing and the back of the conductor system.
3. Press the fixpoint clamps into the previously drilled holes and align them with the recesses of the hangers.
4. Now mount the conductor system in the hangers as usual.

6.2.10 Expansion sections (optional)



NOTICE!

- Systems < 150 m in length with a one-sided fixed point (standard systems) do not require any expansion sections!
- The use of the VCL system is limited to the following:

  - VCL 2/100 C and VCL 3/100 C for the pallet shuttle system.
  - Operation max. 60 V
  - Max. current load 50 A

  Please note project-specific documents during assembly and commissioning.
- Expansion sections are always delivered pre-assembled!
- Observe hanging distances!
  Expansion sections should be installed centrally between two fixed points.
- The mounting clip serves to fix the expansion section in position during assembly and is included in the scope of delivery!

Expansion concept

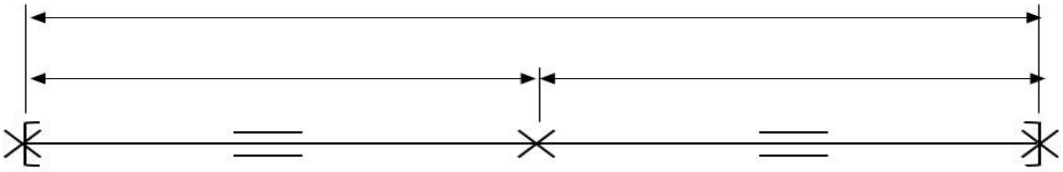


Fig. 6-1 Concept 1: Systems with a fixed point on both sides
Number of expansion sections and fixed points according to the following table

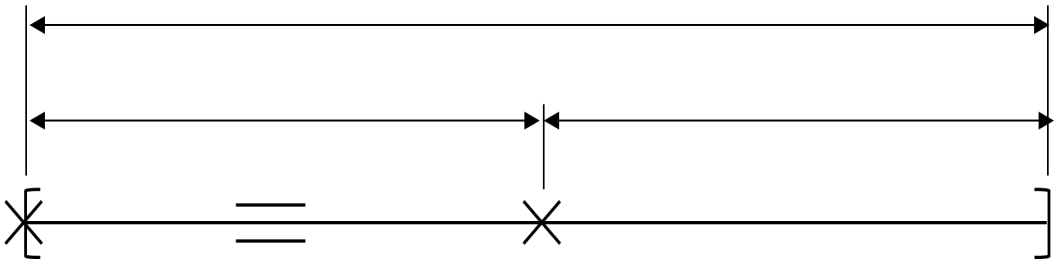


Fig. 6-2 Concept 2: Systems >150 m
Number of expansion sections and fixed points according to the following table

Symbols used	
	End cap
	Fixed point
	Expander

Table: Determination of the number of required expansion sections
(Number of fixed points = Expansion sections + 1)

Max. permissible length of the expansion section L [m]				
Max. deviation of ambient temperature [K]				
60 m	45 m	35 m	25 m	20 m
10 K	20 K	30 K	40 K	50 K

Example: System fixed point on both sides (concept 1)
System length = 90 m, max difference in ambient temperature = 20 K

Result: 2 expansion sections / 3 fixed points must be provided.

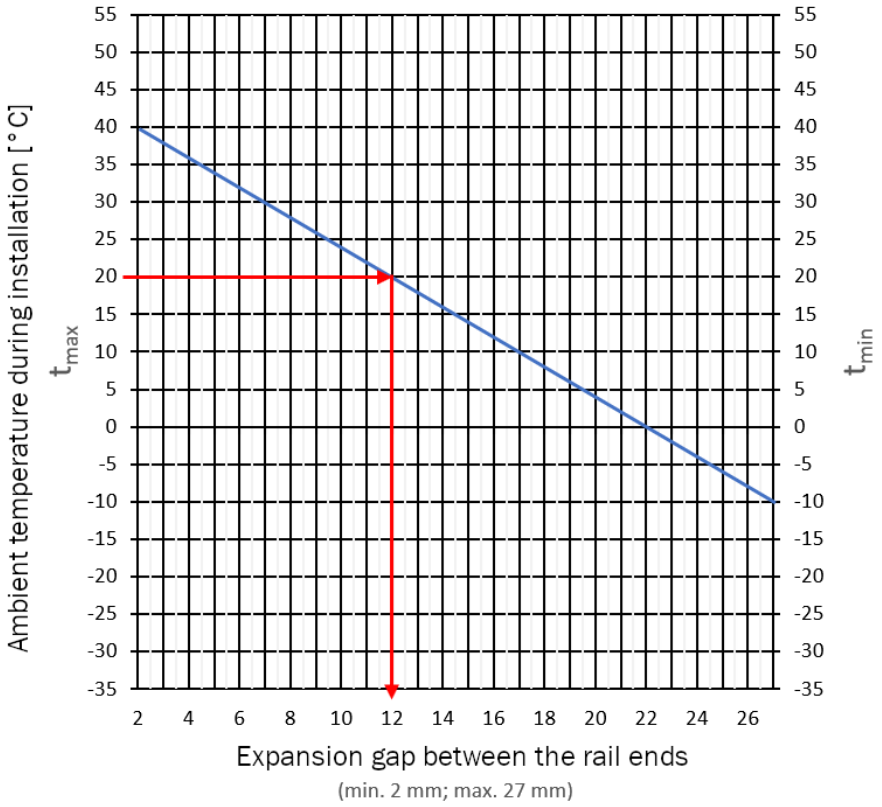
Determination of the expansion gap to be set

NOTICE!

Adjustment of the expansion gap at the expansion section

The expansion gap at the expansion section can be seen in the following diagram. See also page 64.

- t_{min}= Lowest operating temperature occurring in the respective application
- t_{max}=Highest possible operating temperature in the respective application



Example from diagram:
Max. ambient temperature = 40 °C
Min. ambient temperature = -10 °C
Temperature difference = Δ 50 °C
Installation temperature = 20 °C
Expansion gap to be adjusted = approx. 12 mm

NOTICE!

Adjustment of the expansion gap in sections between two fixed points

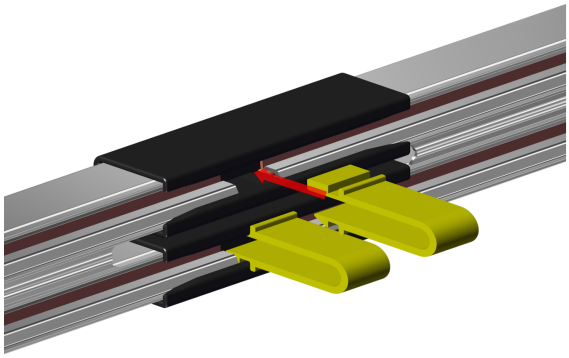
- Additional fixed points (see chapter 6.2.9) are required when using expansion sections and are always installed on either side of the expansion section.
- The expansion gaps on the expansion sections are adjusted after the first fixed point of a section has been set.. The second fixed point of the section can then be set.

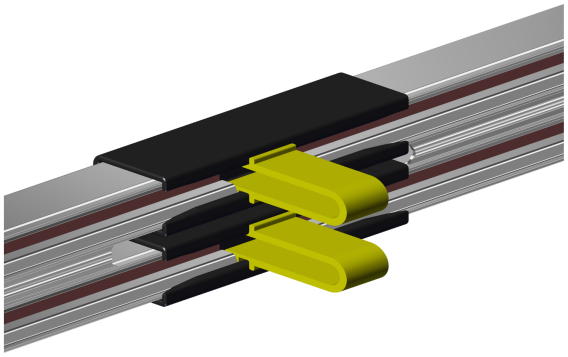
Installation



⚠ CAUTION!

► Only remove the mounting clip once the entire section has been assembled. Otherwise the expansion section is compressed and proper function is no longer guaranteed.





Step 1

Installation steps:

1. Before installing the expansion section in the line, press the mounting clip into the expansion gap.
2. Mount the expansion joint in the intended line section as described in chapter: "6.2.8 ".

Step 2

Assembly instructions:

1. Draw a line connecting t_{min} to t_{max}.
2. Draw a horizontal line from the ambient temperature during installation to the line connecting t_{min} to t_{max}.
3. Read off the intersection of both lines and from there draw a vertical line to the X-axis of the diagram and read off the expansion gap that is to be set.

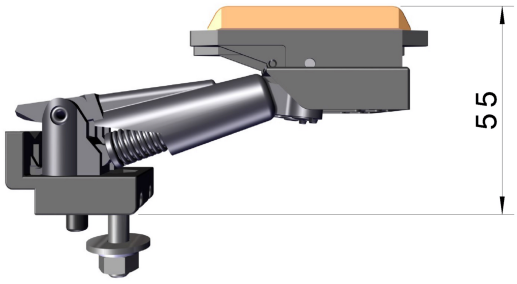
Step 3

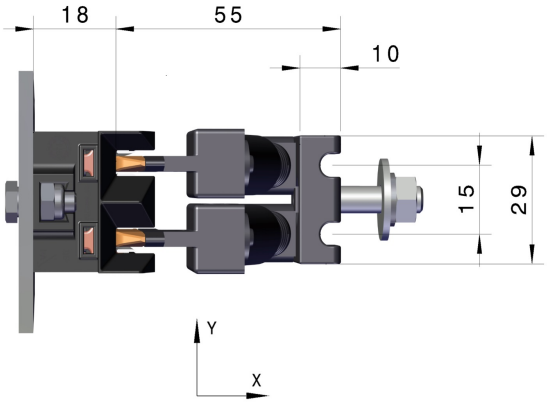
Assembly instructions:

1. Set the value determined in this way at the expansion sections.

6.2.11 Current collector

Single current collector assembly - EASL





Assembly instructions

Prerequisites:

✓ Clean and tidy workplace.

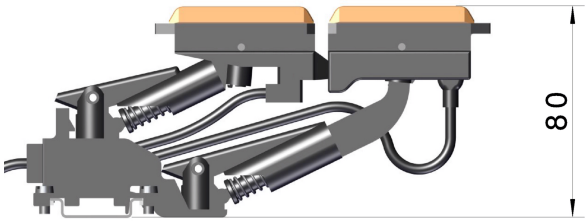
Installation steps:

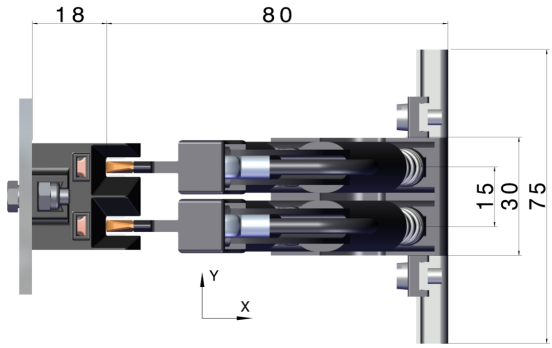
1. Align the current collector with the conductor system (phase center off).

NOTICE!

- ▶ Installation dimensions: 55 mm
- ▶ Suitable for funnel
- ▶ Phase spacing 15 mm
- ▶ Max. current: 20 A
- ▶ Tolerance X-direction: ± 15 mm
- ▶ Tolerance Y-direction: ± 20 mm
- ▶ Contact pressure: approx. 4 N per carbon brush
- ▶ The current collector must be able to move freely. Connection cables may not restrict or impede movement.

Double current collector assembly - DEAS





Assembly instructions

Prerequisites:

✓ Clean and tidy workplace.

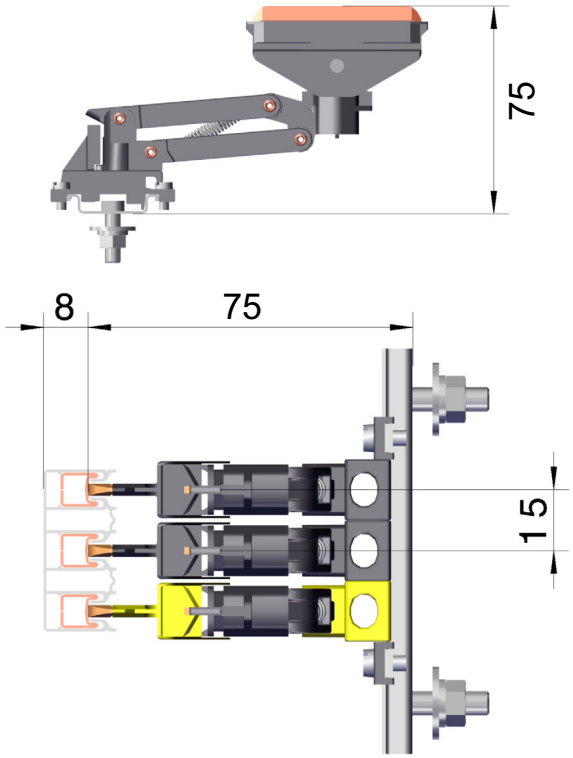
Installation steps:

1. Align the current collector with the conductor system (phase center off).

NOTICE!

- ▶ Installation dimensions: 80 mm
- ▶ Phase spacing 15 mm
- ▶ Max. current: 30 A
- ▶ Tolerance X-direction: ± 12 mm
- ▶ Tolerance Y-direction: ± 20 mm
- ▶ Contact pressure: approx. 4 N per carbon brush
- ▶ The current collector must be able to move freely. Connection cables may not restrict or impede movement.

Installing current collector - PASK



Assembly instructions

Prerequisites:

✓ Clean and tidy workplace.

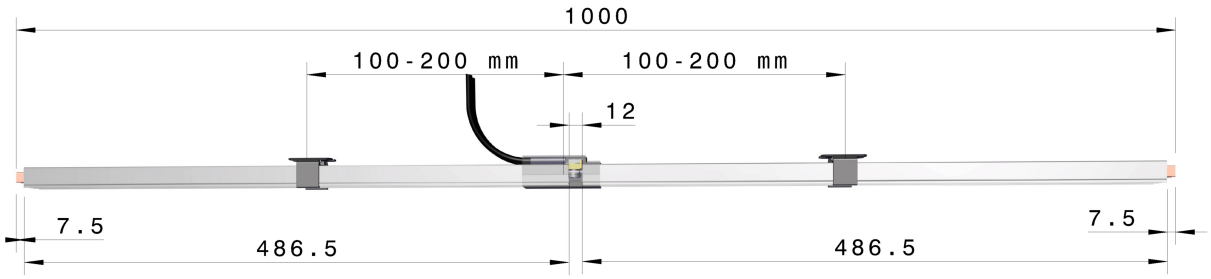
Installation steps:

1. Mount the current collectors in the intended position.
2. Align the current collector with the conductor system (phase center off).

NOTICE!

- ► Installation dimension: 75 mm
- ► Number of poles: 2-3
- ► Phase spacing 15 mm
- ► Max. current: 50 A
- ► Stroke and lateral deflection: see chapter 5.4.9 Current collector.
- ► Contact pressure: approx. 4 N per carbon brush
- ► The current collector must be able to move freely. Connection cables may not restrict or impede movement.

Line feed





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.



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.

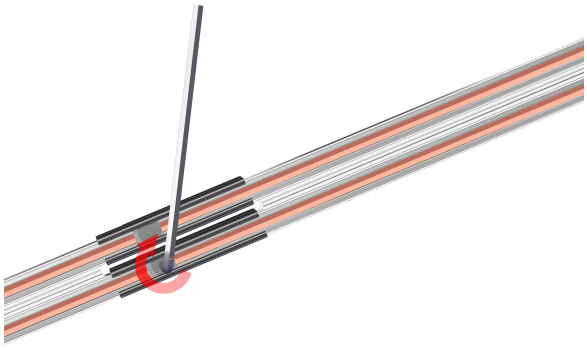
► Wear personal protective equipment. (see Chapter: 3.1)



NOTICE!

► Line feeds are always delivered pre-assembled and without connecting cable.

► Observe hanging distances.



Step 1

Prerequisites:

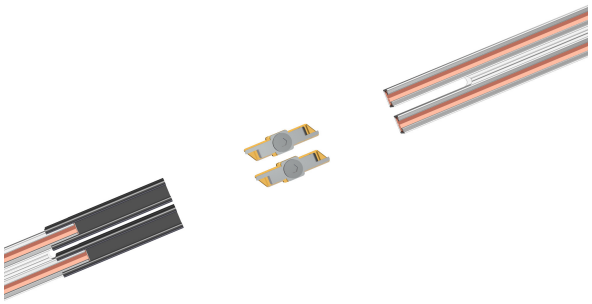
✓ Clean and tidy workplace.

Required tools:

⚒ Hexagon socket

Assembly instructions:

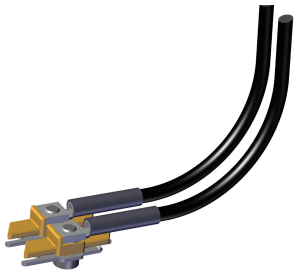
1. Loosen the screws at the joint connector using a hexagon socket wrench



Step 2

Assembly instructions:

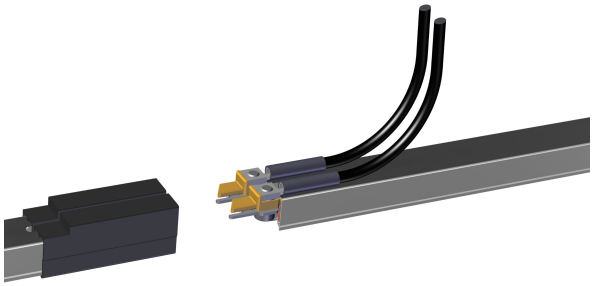
1. Pull the two conductor system parts apart and remove the connection terminals.



Step 3

Assembly instructions:

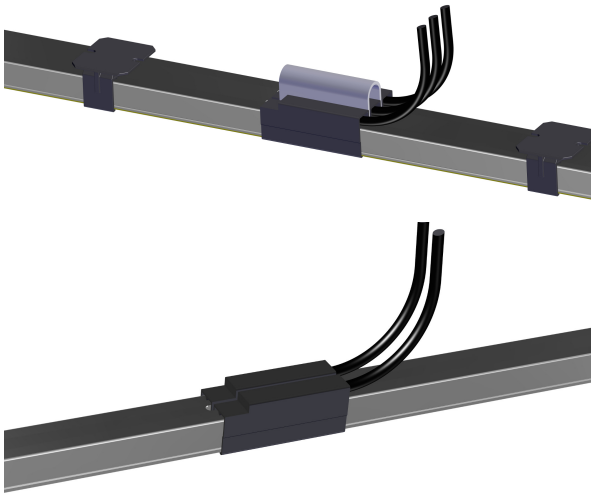
1. Connect the connection terminals to the screw terminals. At this stage only tighten the screws by hand.



Schritt 4

Assembly instructions:

1. Insert the screw terminals with connection cable back into the conductor system and push them into the cover caps.



Schritt 5

Required tools:

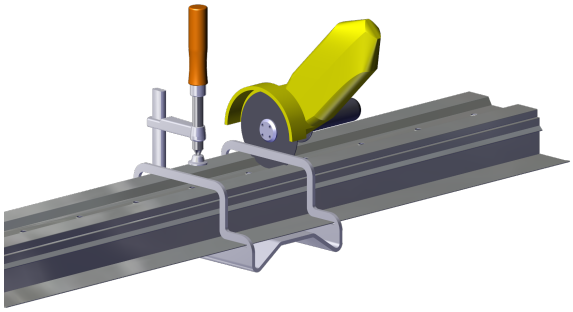
⚒ Mounting handle (Siehe 6.2.1.1 Installation aids)

Assembly instructions:

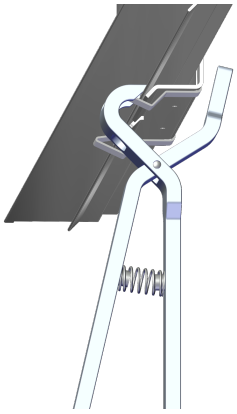
1. Place the mounting handle on the butt connector from behind over a joint connector .
2. Now screw the hexagon socket screws to the corresponding connection terminal with 7 Nm. (transfer guide M5; feed terminal M6). The mounting handle prevents twisting during screwing.
3. Remove the mounting handle.
4. Repeat step 5 for the other terminals.
5. Mount the line feed in the intended line section as described in Chapter: „6.2.8 “.

6.3 Installation VMT

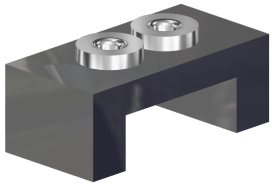
6.3.1 Mounting aids VMT



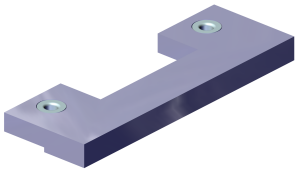
Sawing device		
Ident-No.		0171561
Weight	[kg]	2,570



Installation pliers		
Ident-No.		0171533
Weight	[kg]	0,700



Drilling template for fixpoint terminal		
MZ-BS-AH-VCL2		0281525
MZ-BS-AH-VCL3		0281608
Weight	[kg]	0,050



Drilling template for VCL in VMT		
MZ-BS-VMT-FP-VCL		0171840
Weight	[kg]	0,109

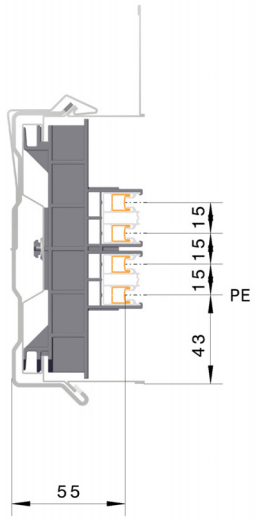


Cylinder Saw		
MZ-Zylindersäge-VCL-VMT-D30mm		10028018
Weight	[kg]	0,400

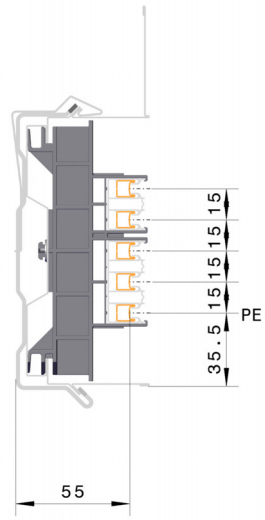


6.3.2 Arrangement VCL in VMT

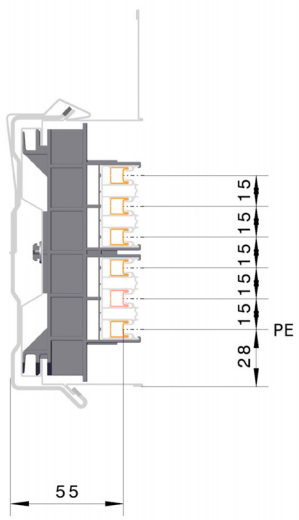
KH-VCL4-VMT



KH-VCL5-VMT



KH-VCL6-VMT



6.3.3 Installation VMT profile



⚠ CAUTION!

When the VMT is hanging, i.e. the opening is facing downwards, the following restrictions apply:

- Hanging spacing: max. 3 meters
- The VMT hangers are installed in staggered arrangement. This means that the clamping springs are arranged alternately on the left or right
- In the case of hanging spaces of less than 2 meters, the alternate fixing of the hangers is not required.



NOTICE!

- Please observe the following torques regarding the different hangers:
- The **AV-VMT-BS** hangers are fixated with drill screws

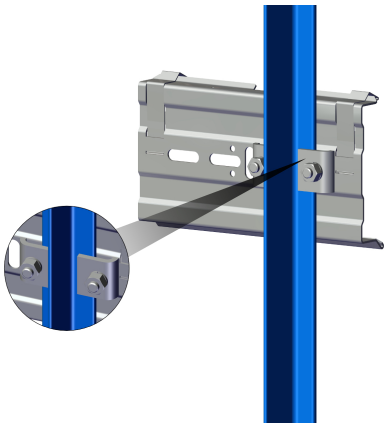


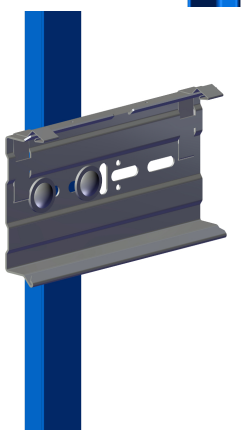
NOTICE!

Observe the following installation distances

- Hanging spacing: max. 3.5 meters
- The first and last hanger have to be max. 500 mm from the end of the VMT.
- The distance of the hangers to the connecting material must be min. 350 mm.
- The hangers must be mounted parallel and at right angles to the guide rail.

Position	Type	Description	Tightening torque [Nm]	Clamping area [mm]	Weight [kg]	ID no.
1	VMT-HS-S	Screw console (for auxiliary support HSE)	15		0.882	0171839
2	VMT-SPW	Clamping console (for auxiliary support HST)	15		1.062	0171539
3	VMT-S	Screw console	15		0.902	0171547
4	VMT 55 -125	Clamping console	15	55 to 65	1.600	0171552
				65 to 75	1.590	0171553
				75 to 85	1.610	0171554
				85 to 95	1.588	0171555
				95 to 105	1.620	0171556
				105 to 115	1.656	0171537
				115 to 125	1.638	0171538
5	VMT-BS	Screw console	7		0.848	0171540
6	VMT S1/2	Clamping console	15		0.909	0171578





Step 1

Prerequisites:

✓ Upright must be installed correctly and straight.

Required tools:

⚒ Wrench/ reversible ratchet

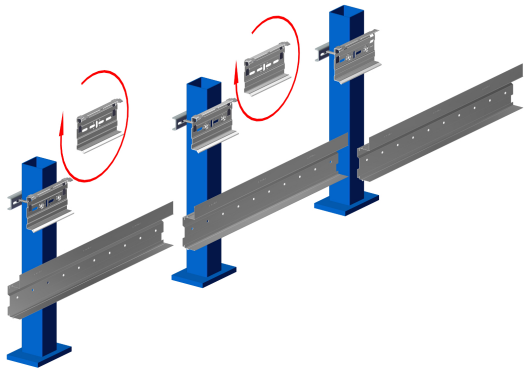
Assembly instructions:

NOTICE!

The assembly of the AH-VMT-SPW clamping console is shown as an example. With the exception of the AV-VMT-BS console, all consoles are assembled in a similar way.

► The AV-VMT-BS clamping console is fixed with drill screws **(ST 5.5 = 7Nm)**.

1. Attach the clamping consoles or the screw consoles (dependent on the selected type). Tighten the M10 screws to a **torque of 15 Nm**. Ensure that the clamping springs always face upwards. For other clamping springs, please use the torques specified in the table above.



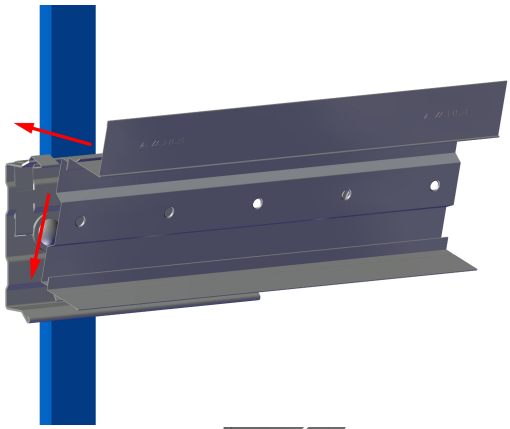
Step 2

Assembly instructions:

1. Lay out the VMT sections at the approximate position according to the installation plan, and then hang them in the mounted hangers.

NOTICE!

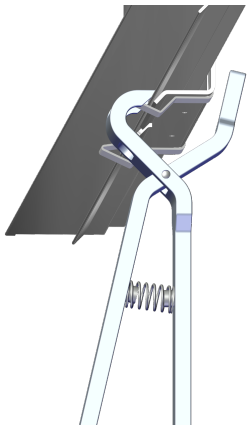
The connectors must be turned before assembly so that the clamping springs face downwards.



Step 3

Assembly instructions:

1. Insert the profiles as shown into the hangers and lock the clamping springs using the installation pliers (next illustration). Make sure that the springs have properly snapped in place.



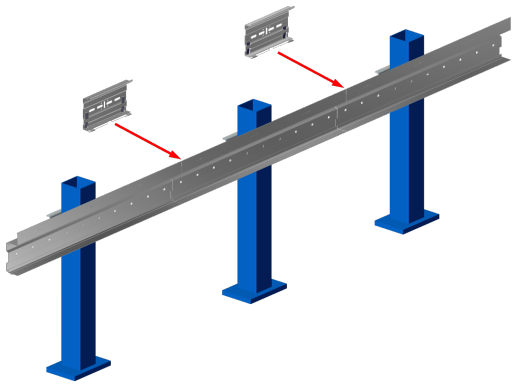


⚠ CAUTION!

Danger of crushing between the individual components!

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

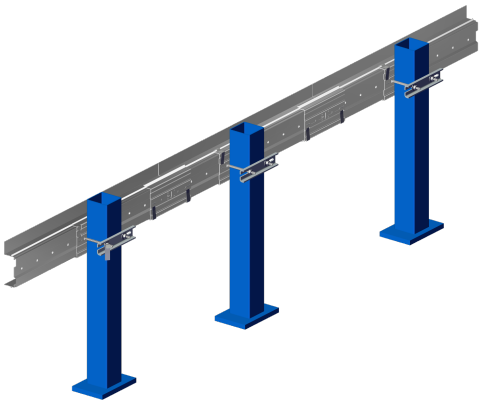
- ► Take care of your extremities.
- ► Wear personal protective equipment. (see section: 3)



Step 4

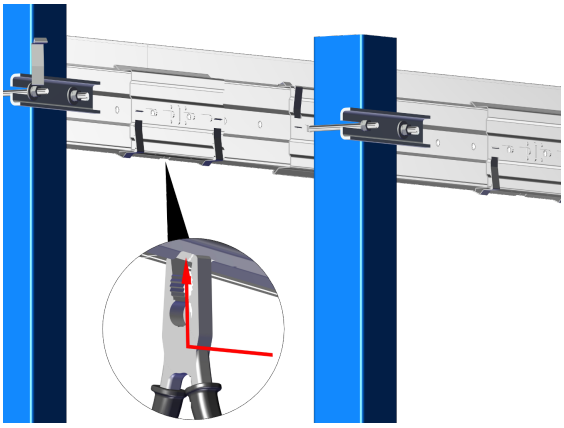
Assembly instructions:

1. Attach the connection sections and lock them using the installation pliers (as shown in Step 3).



NOTICE!

► Install the VMT sections with a **max. air gap of 0 to 2 mm** to one another.



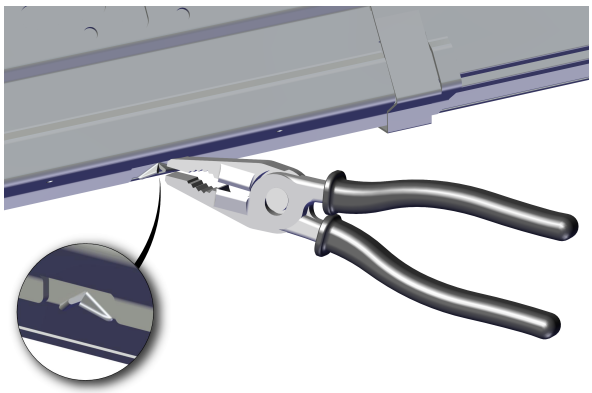
Step 5

Required tools:

⚒ Combination or pipe wrench

Assembly instructions:

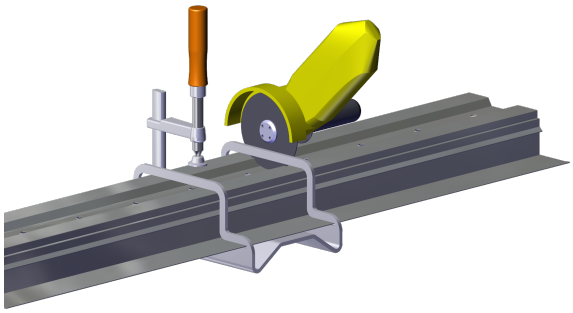
1. When all VMT sections and connectors are installed, slightly interlock the VMT ends at the connector using a combination or pipe wrench.



NOTICE!

This interlocking (approx. 30° downwards) prevents unintentional shifting of the connector onto the VMT profile.

6.3.4 Creating VMT shorter lengths



Step 6

Required tools:

⚒ Sawing device SV-VMT

Assembly instructions:

1. If required, you can create shorter lengths on the construction side using the SV-VMT sawing device.
2. Deburr the cut edges.

⚠ CAUTION!

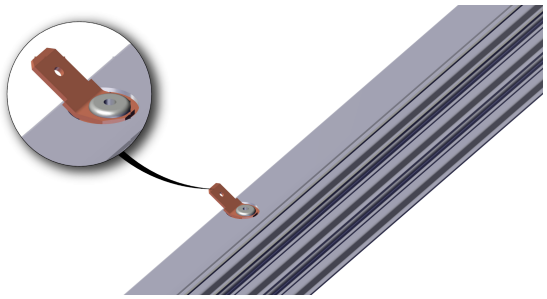
Danger of injury!

Serious cutting injuries can occur if the cut edge is not deburred.

► Ensure that the cut edge is properly deburred.

6.3.5 Equipotential bonding at section with VMT

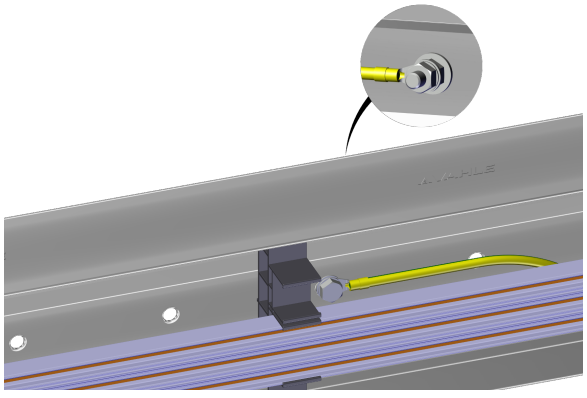
Equipotential bonding installation at section



⚠ CAUTION!

To guarantee the protective measures, a low impedance connection including protective-/equipotential bonding conductor is essential!

See IEC 60364-4-41.



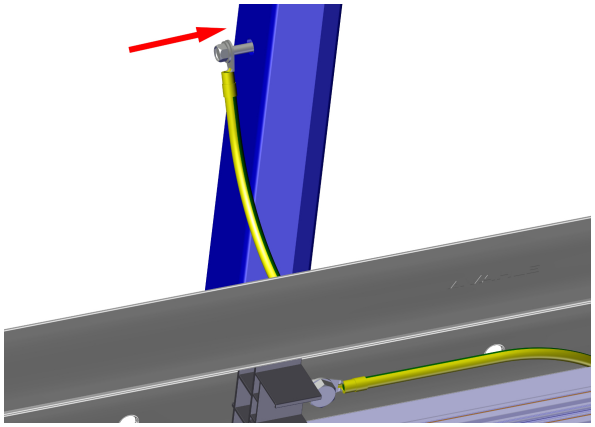
Step 1

Required tools:

⚒ Wrench

Assembly instructions:

1. Screw the equipotential bonding cable (5.3.12 Equipotential bonding or 5.4.12), as shown, to a point on the VMT profile and to the section of the equipotential bonding bracket.



Step 2

Required tools:

⚒ Wrench + drill

Assembly instructions:

1. Screw the equipotential bonding cable, as shown, to a point of the steel framework and the back of the VMT profile.

6.3.6 Feed terminal installation with VMT

Feed terminal installation

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.

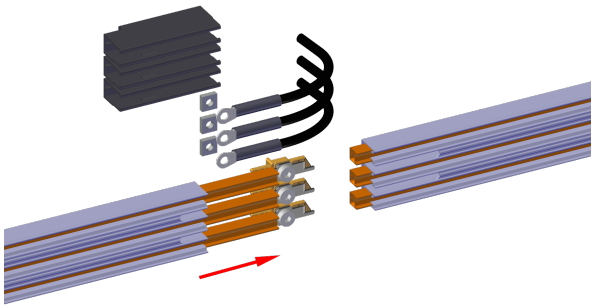
CAUTION!

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: 3.6)



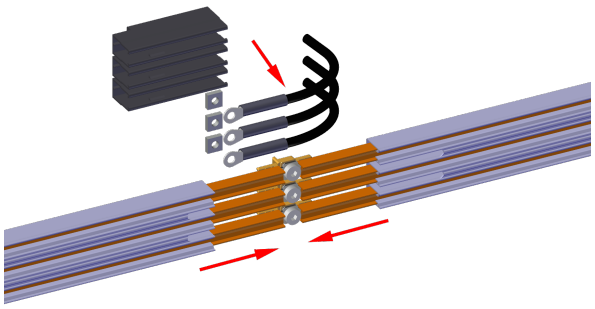
Step 1

Required tools:

⚒ Hexagon socket

Assembly instructions:

1. Loosen the screws and pull the copper rods out from one side (see illustration)



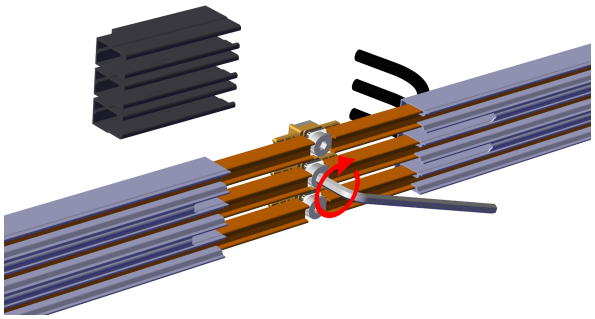
Step 2

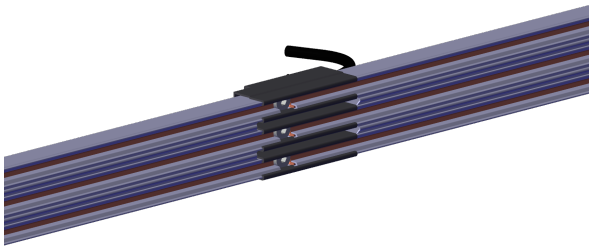
Required tools:

⚒ None

Assembly instructions:

1. Arrange the feed components and the VCL rail as illustrated.





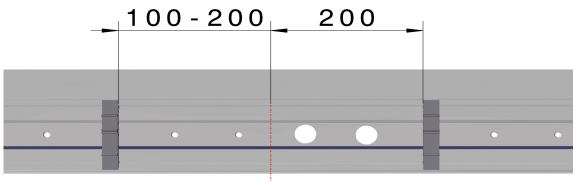
Step 3

Required tools:

⚒ Hexagon socket

Assembly instructions:

1. Tighten the screws with a torque of 5.5 Nm (50A feed) or 9.5 Nm (100A feed).



Step 4

Required tools:

⚒ Hole saw (see 6.3.1 Mounting aids VMT)

Assembly instructions:

1. Find the position of the feed on the system plan supplied. The feed must be 200 mm from the hanger on the side to which the connecting cables are routed.
2. In this area between the feed and the hanger, make two holes (Ø 30 mm) in the VMT so that the connecting cables for the feed can be routed outside. Note the additional specifications in chapter: „ “.
3. Deburr the sections.
4. Insert the edge protectors (see 5.6.7 Edge protector for line feed) into the holes.

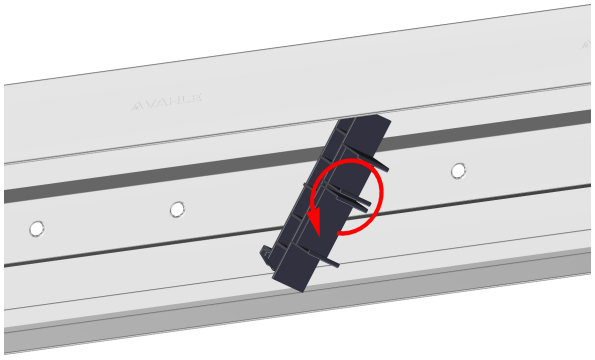
NOTICE!

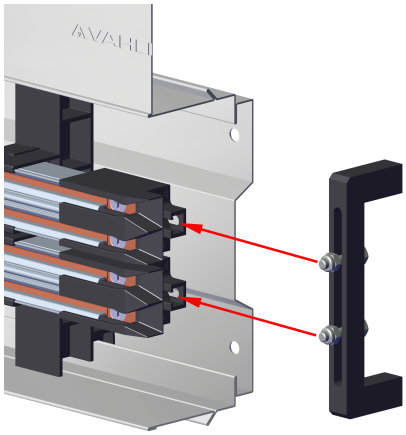
Feed at the end segment in the VMT

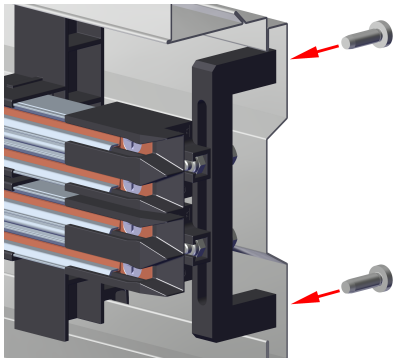
► When installing the feed in the VMT, a hole (Ø 30 mm) with edge protector must also be made in the VMT at the end segment in order to route the connecting cables safely.

► See 6.2.3 End segment with feed terminal (fixpoint).

6.3.7 Installation of VCL profile in the VMT







Step 1

Required tools:

⚒ None

Assembly instructions:

1. Turn the holders into the corresponding boreholes (as in illustration). (Grid dimension 100 mm).

NOTICE!

Observe the hanger distances from the supplied system or installation plan!

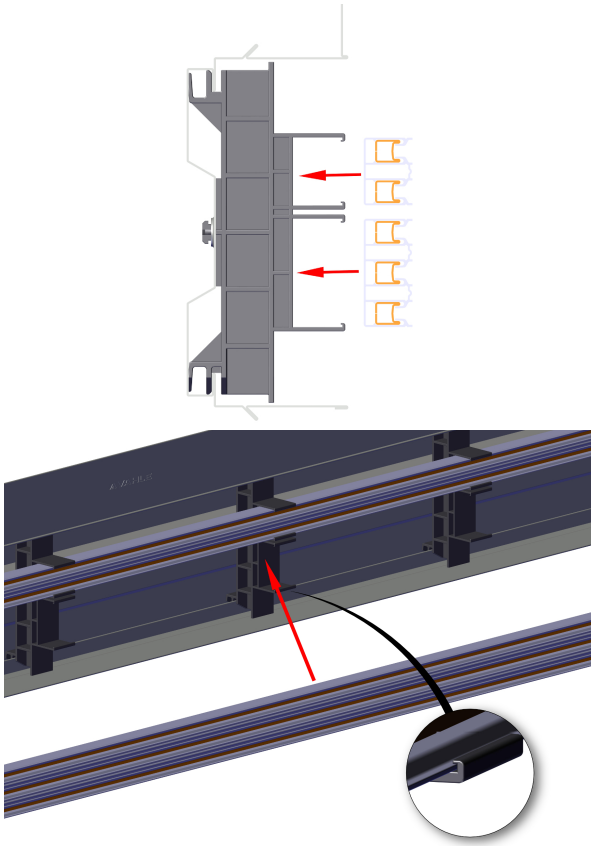
Step 2

Required tools:

⚒ Assembly safety device

Assembly instructions:

1. Click the first section into the holder.
2. Use the drilling template (6.3.1 Mounting aids VMT) to drill the holes for the adapter into the VMT profile.
3. Attach the adapter to the transfer guide and the VMT profile.



Step 3

Assembly instructions:

1. Click the remaining conductor rails into the profiles. Make sure that the lugs of the holders are properly snapped in place (see figure below).
2. For other transfer guides, proceed as described in **step 2**.

NOTICE!

The profile connectors should be mounted outside the VMT profile, as in section 6.2.5 !

NOTICE!

The poles are arranged in accordance with 6.3.2 Arrangement VCL in VMT.

6.4 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.

6.5 Operation/decommissioning

6.5.1 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.

6.5.2 Decommissioning

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

7 MALFUNCTIONS

7.1 Safety information about malfunctions



⚠ WARNING!

Risk of injury in case of improper troubleshooting!

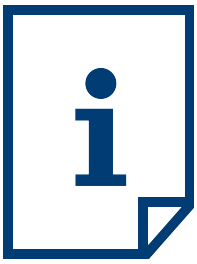
Improper troubleshooting may cause serious injuries or property damage.

- ► 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:

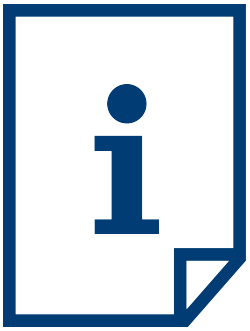


DANGER!

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!

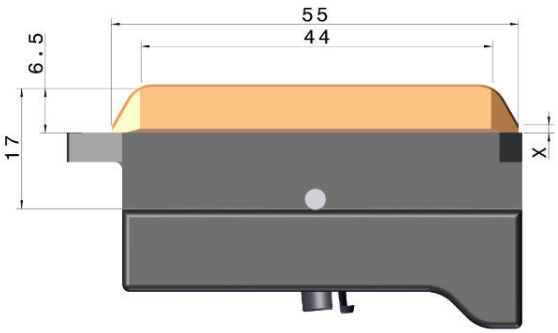
Tripping hazard due to protruding parts

There is a tripping hazard during the work.

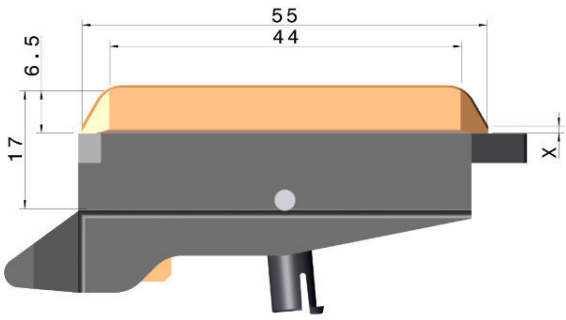
- ► Watch out for steps and holes in the floor when walking inside the work area and the danger zone. There must be no loose objects in the work area.

8.2 Wear parts

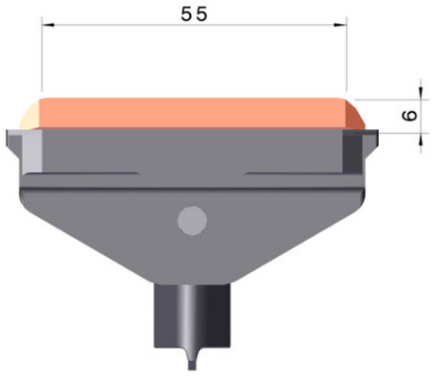
Wear parts for current collector



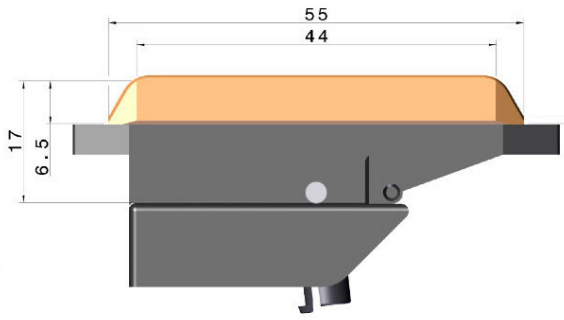
for DEAS
back replacement head



for DEAS
front replacement head



for PASK



for EASL

Type	Description	X=residual height [mm]	Weight [kg]	Ident. No.
SK-EK-DEAS-2/30-PH-36-6.3-H	Rear replacement head	1	0,016	2808580
SK-EK-DEAS-2/30-PE-36-6.3-H	Rear replacement head	1	0,016	2808581
SK-EK-DEAS-2/30-PH-36-6.3-V	Front replacement head	1	0,016	2808575
SK-EK-DEAS-2/30-PE-36-6.3-V	Front replacement head	1	0,016	2808576
SK-EK-PAS-50-PH-31-M4	---	1	0,016	2808295
SK-EK-PAS-50-PE-31-M4	---	1	0,016	2808296
SK-EK-EAS-20-PH-36-6.3-PA	---	1	0,014	2820750/...-PA
SK-EK-EAS-20-PE-36-6,3-PA	---	1	0,014	2820751/...-PA

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.

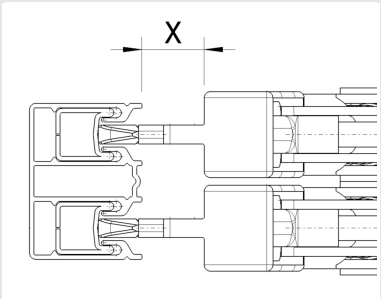
- ► Installations that may be affected by increased wear must be inspected regularly. For example, in the case of increased deposition of abrasive particles, unevenness in the running surface, in the course of the track or unevenness of suspension points.
- ► The minimum contact rail thickness must not 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 track switches, the lifting station etc., the max. **vertical and lateral offset of 3 mm** must not be exceeded. The maximum **air gap between the opposing transfer guides is 5 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 non-woven 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 (observe the prescribed torques)	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	Service/monitoring tasks	Personnel
daily	• Check safety equipment and operating behavior of the system.	Operator
monthly	**Mechanical checks** • Check mobility of joints, bearings, and hinge pins. Inspection for mechanical damage of any type. **Electrical checks** • Check for wear of carbon brushes, tight fit of all contact screws and cable attachments. • Clean oxidized contact screws and cable ends and restore the protection of these locations. • Carbon brushes should be replaced in good time so that the mounts of the carbon brushes do not grind on the contact surface, or the outer edges of the cover plate touch the conductor rail. • Dimension "X" in the sketch shown below must not fall below 4.5 mm.  **Contact pressure check** • Pull the carbon brush out of the conductor rail by means of a center spring balance. **The contact pressure should be approx. 4 N per carbon brush**	Technician/electrically qualified person

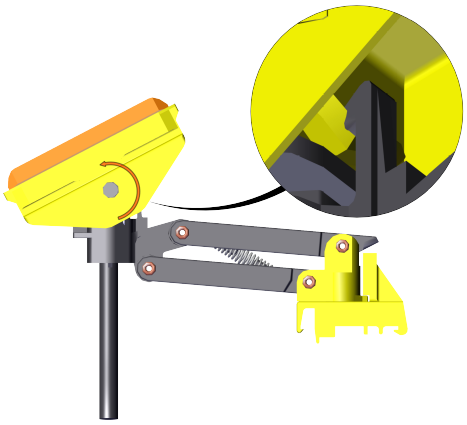
In case of damage to the current collector, the associated components of the current conductor system must be checked for damage.

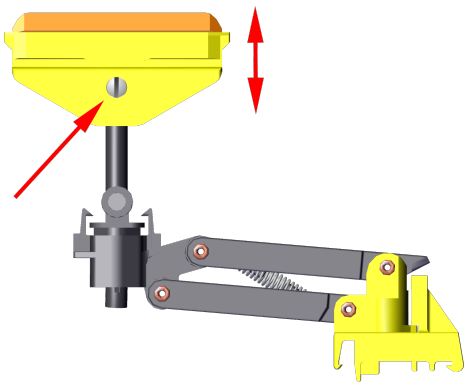
8.4.1 Replacing the carbon brush

DEAS/EASL

- Detach the connection cables
- Pull out the carbon brush with its mount upwards and replace it
- Mount connection cable and then clean the contact surfaces of the carbon brush

PASK





Loosening the socket

Prerequisites:

✓ Ensure that the system is disconnected from power and remains so for the duration of the work.

Work steps:

1. Fold the carbon brush away from the arm as shown until the catches on the attachment are released.
2. Remove the carbon brush mount by pulling upwards.

Replacing the carbon brush

Required tools:

⚒ Slot-head screwdriver

Work steps:

1. Loosen the indicated screws slightly.
2. Pull the carbon brush mount from the connection cable.
3. Connect the new carbon brush mount to the connection cable again.
4. Tighten the indicated screw again by hand.
5. Place the carbon brush mount back on the arm and push the connection cable down through the guide.

The carbon brush must engage and tilt easily in both directions.

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.

10 DISASSEMBLY AND DISPOSAL

10.1 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.

10.1.1 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.

10.2 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"

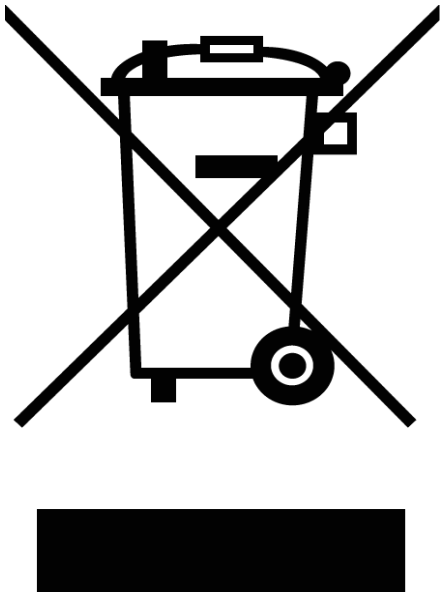


Fig. 10-1 Symbol

- 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

11 PROTECTIVE MEASURES

11.1 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	**84**
Product	**Compact coonductor system**
Type	**VCL** **incl. Accessories**
Relevant EU Regulation	**2014 / 35 / EU** **(Low Voltage Directive)**
Placement of CE-marking	**2020**

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, 09.11.2020

i.V. Michael Heitmann

Michael Heitmann
Manager Testing & Services

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

11.2 UL

CERTIFICATE OF COMPLIANCE

Certificate Number	E48031
Report Reference	E48031-20190301
Issue Date	2020-FEBRUARY-19
Issued to:	Paul Vahle GmbH & Co. KG Postfach 1720 59172 Kamen GERMANY
This certificate confirms that representative samples of	CRANE AND HOIST ELECTRIFICATION SYSTEMS VCL2 Series, VCL3 Series
	Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	UL508 & CSA C22.2 NO. 14-18, Industrial Control Equipment UL857 & CSA C22.2 NO. 27-09, Busways CSA C22.2 NO. 33-M1984, Construction and Test of Electric Cranes and Hoists UL746C, Polymeric Materials - Use in Electrical Equipment Evaluations
Additional Information:	See the UL Online Certifications Directory at https://iq.ulprospector.com for additional information.

This *Certificate of Compliance* does not provide authorization to apply the UL Mark. Only the UL Follow-Up Services Procedure provides authorization to apply the UL Mark.

Only those products bearing the UL Mark should be considered as being UL Certified and covered under UL's Follow-Up Services.

Look for the UL Certification Mark on the product.

Bruce Mahrenholz, Director North American Certification Program

UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at http://ul.com/aboutul/locations/

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11.3 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	**84**
Product	**Compact coonductor system**
Type	**VCL** **incl. Accessories**
Relevant UK Regulation	**Electrical Equipment (Safety) Regulation 2016**
First CE / UKCA - marking	**2020 / 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

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

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vahle.com/contact

CE

TECHNICAL DOCUMENTATION