VAHLE

TECHNICAL DOCUMENTATION

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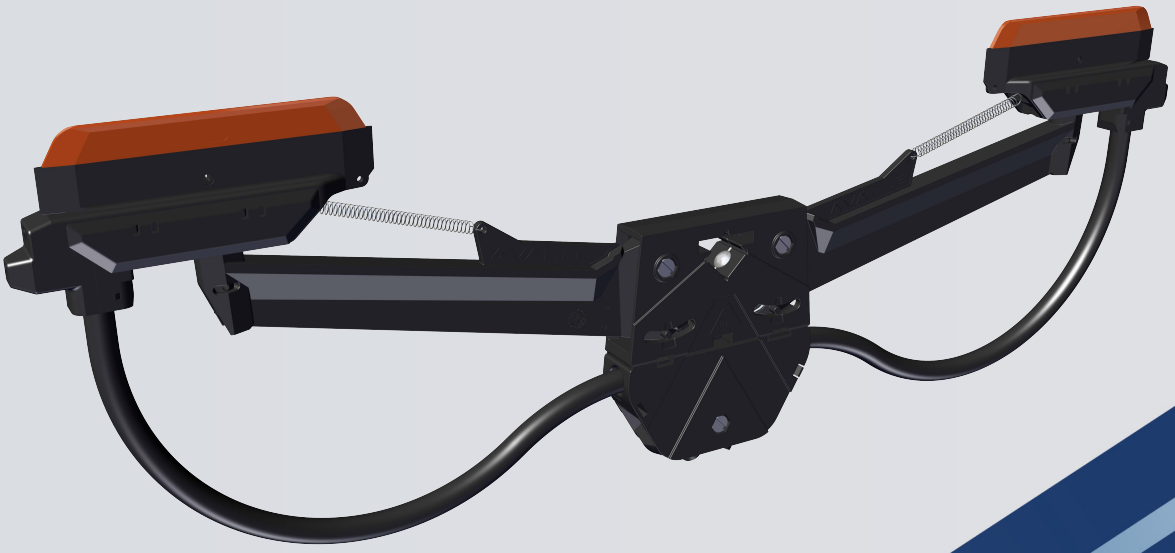

DOCUMENTATION
INSTALLATION MANUAL
EN-V 1.03

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1 GENERAL

1.1 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 serve the basic understanding and may deviate from the actual version.

1.2 Symbols

Safety instructions in this manual are identified by symbols. Each safety instruction begins with 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.

1.3 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.

1.4 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.

1.5 Customer service

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Country of origin: Germany

1.6 Warranty

1.6.1 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 if one or several of the following situations arise(s):

- If the product is modified without permission from 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.

2 SAFETY INSTRUCTIONS

2.1 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!

2.2 General risks

The following section describes residual risks that arise even if the device 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.

2.2.1 Danger from electrical energy

Perform the following safety work according to VDE 0105-100 (this work must be carried out by a qualified electrician, see chapter: "2 security").

Activate

The required separation distances must be established.

Secure against restart

During work, a prohibition sign must be attached reliably on switching handles or drives of switches, control units, pressure and sensing devices, safety parts, circuity 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 absence of voltage

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 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 adjacent, live parts or isolate them

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

DANGER!

Danger of life due to electrical current!

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

► Make sure that the components are not live or in tension unauthorized approximation.

2.3 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.

2.4 Personnel requirements

2.4.1 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 if 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.

2.5 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 to ensure 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 and hearing protection acc. 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.

2.6 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), respectively the new Accident Prevention Regulations – Principles of Prevention (DGUV Regulation 1; Germany) must always be observed.

2.7 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

2.8 Signage

The following symbols and information signs may be in the work area. They apply to the immediate environment of their location.

DANGER!

Danger of life due to electrical current!

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

► Make sure that the components are not live or in tension unauthorized approximation.

WARNING!

Hazard from illegible signs!

Over time, labels and signs may become soiled or otherwise illegible so that hazards may not be recognized or necessary operating instructions may not be followed.

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

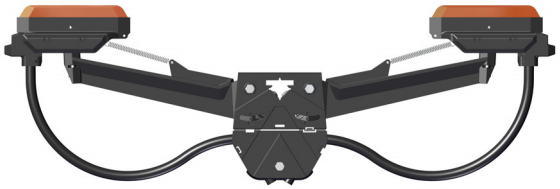
NOTICE!

Observe instructions!

Use the identified device only after this documentation has been read and understood in full.

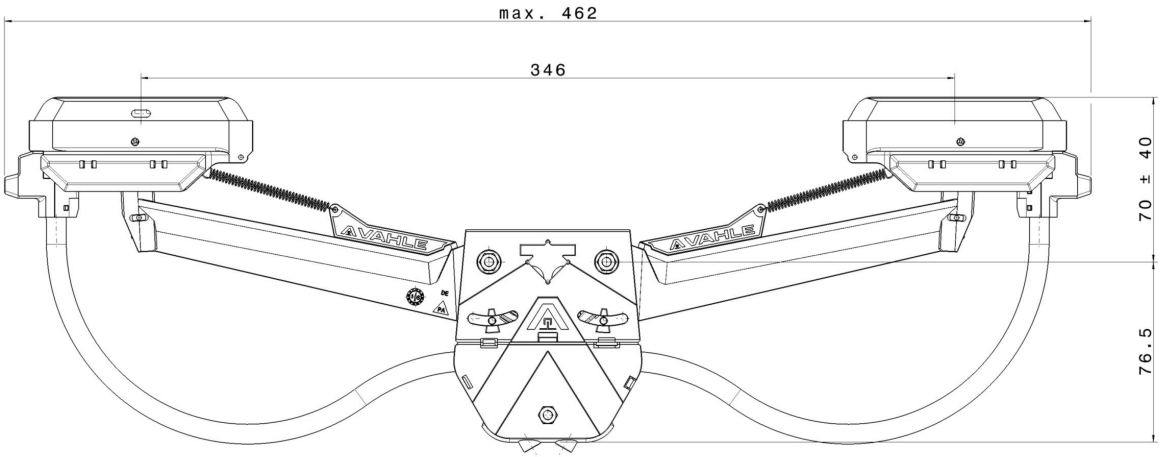
3 LAYOUT AND FUNCTION

3.1 Collector



Current collector Multi Collect 125		
for U15, U25, VKS		
for funnel operation		
Max. current	[A]	125
Max. voltage	[V]	750
Stroke	[mm]	± 40
Lateral deflection	[mm]	± 40
Contact pressure	[N]	approx. 9 N per carbon brush
Connecting cable	[mm^2]	2.5 - 10
Installation dimension	[mm]	70
Temperature range	[C°]	-15 to +70

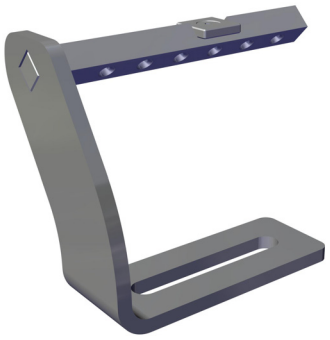
Current collector	Weight [kg]	Phase black	PE yellow
SA_Multi_Collect125PH	0.362	0171800/00	-
SA_Multi_Collect125PE	0.356	-	0171801/00



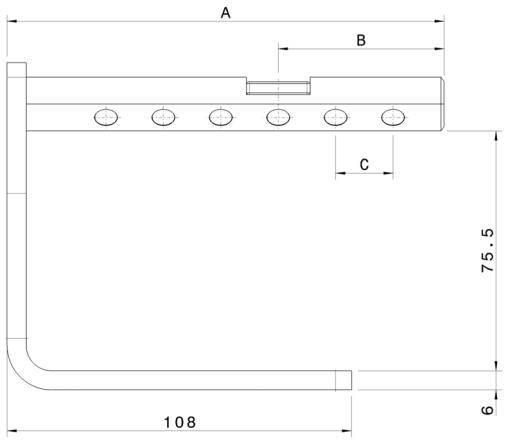
NOTICE!

► If your technical requirements are not met, please contact the manufacturer.

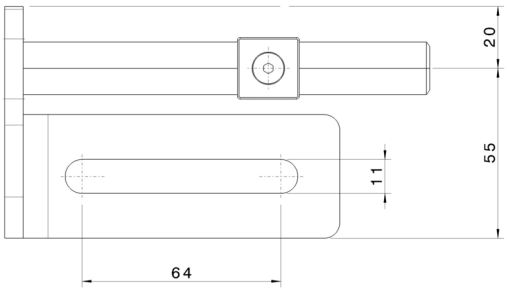
3.2 Driver



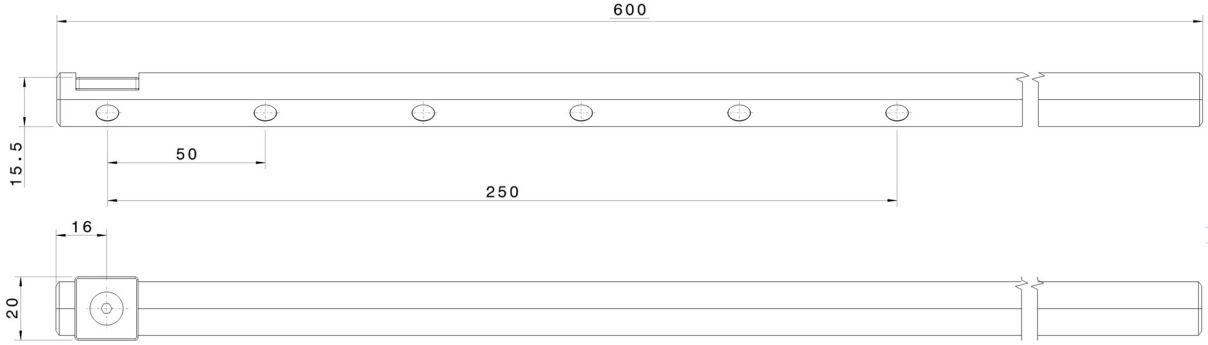
Driver MN-UMA12HS-6-18-137-PE52-Z4 (pictured)		
System		U15, VKS
Ident-No.		0171798/00
Number of poles		6
Attachment		Screw joint
Weight	[kg]	0.536
Dimension A	[mm]	137
Dimension B	[mm]	52
Dimension C	[mm]	18



Driver MN-UMA12HS-4-50-197-PE16-Z4		
System		U25
Ident-No.		0171799/00
Number of poles		4
Attachment		Screw joint
Weight	[kg]	0.606
Dimension A	[mm]	197
Dimension B	[mm]	16
Dimension C	[mm]	50



Driver MN-UMS12-6-50-600-PE16-Z4		
System		U25
Ident-No.		0171804/00
Number of poles		max. 6
Attachment		Welding
Weight	[kg]	0.710



3.3 Connecting cables

FLA	
Highly flexible for current collector with screw terminal	
Length [m]	2
Temperature range [° C]	-15 to +70
Longer connecting cable available	

Type	Connecting cable			Ident.-No.	
	Weight [kg]	A [mm]	$Ø_{max.}$ [mm]	Phase black	PE yellow
AL-AEA2,5PE-32-3,7-2000-D	0.038	2.50	4.00	-	0143079/00-2
AL-AEA2,5PH-32-4,4-2000-A	0.038	2.50	4.00	0143080/00-2	-
AL-AEA4PE-40-4,4-2000-D	0.063	4.00	5.50	-	0143077/00-2
AL-AEA4PH-40-5,6-2000-A	0.063	4.00	5.50	0143078/00-2	-
AL-AEA6PE-55-5,5-2000-D	0.085	6.00	6.00	-	0143075/00-2
AL-AEA6PH-55-5,9-2000-A	0.085	6.00	6.00	0143076/00-2	-
AL-AEA10PE-63-8,2-2000-D	0.160	10.00	9.00	-	01743073/00-2
AL-AEA10PH-63-8,4-2000-A	0.160	10.00	9.00	0143074/00-2	-

4 COMMISSIONING

4.1 Safety instructions for installation

DANGER!

Danger of life due to electrical current!

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

► Make sure that the components are not live or in tension unauthorized approximation.

DANGER!

Risk of fatal injuries from electrical current in wet conditions

Contact with wet electrically live components may result in fatal injuries.

► In wet conditions, take particular care that the relevant components are not live and protected against unauthorized access.

► 5 Observe safety rules.

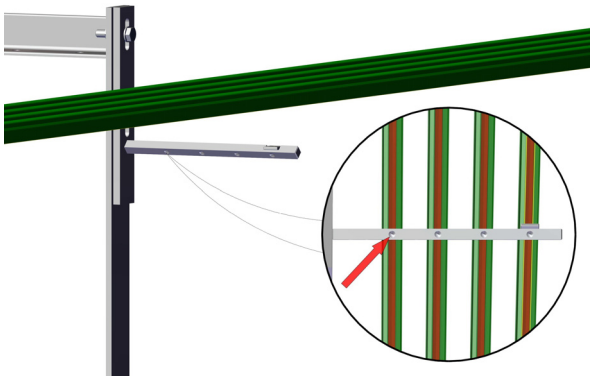
CAUTION!

Danger of fingers being crushed

There is a danger of crushing at the moving parts of the current collectors.

► Proceed carefully during installation and pay attention to the crushing points.

4.2 Installation



Driver assembly

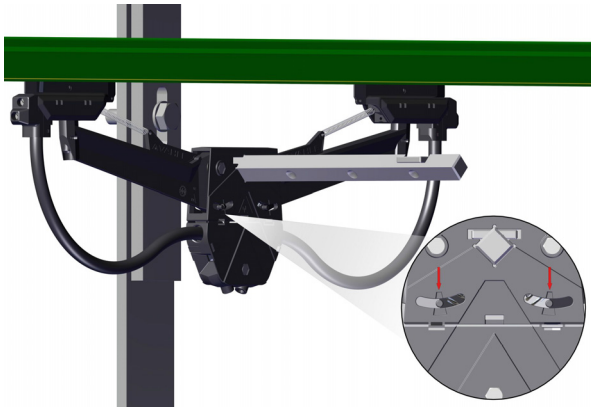
Assembly steps:

1. Align the recesses on the driver with the phases. The spacing of the recesses corresponds to the phase spacing.
2. Select the position of the driver so that the distance of the current collector to other surrounding obstacles will be more than 10 mm in downward direction.
3. Attach the driver in this position to the structure provided by the customer.

Installing PH current collector

Assembly steps:

1. Slide the individual PH current collectors onto the driver so that they snap into place in the correct positions.



Installation dimension check

NOTICE!

After you have mounted the current collectors, check that the installation dimensions are correct. The indicator must be in the marked area.

NOTICE!

The alignment of the system can be checked at any time by means of a camera monitoring system installed by the customer for the installation check indicator.

Installing PE current collector

1. Slide the PE current collector into the intended position.

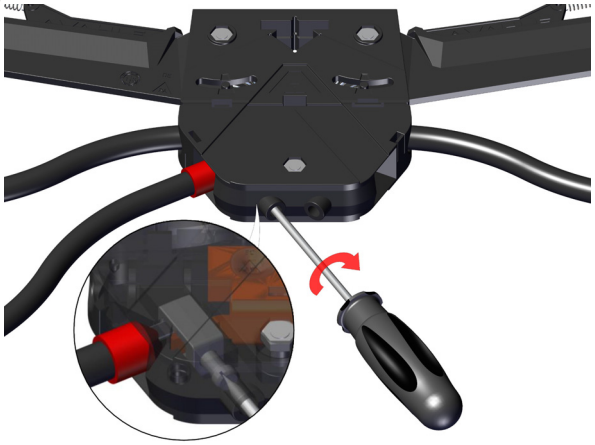
NOTICE!

Options for connecting the current collector:

- ► Option 1: Connection to existing connection box
- ► Option 2: Remove the connection box and connect directly.

NOTICE!

Selection of the suitable connecting cable can be found under chapter: 3.3 "Connecting cables".



Current collector connection option 1

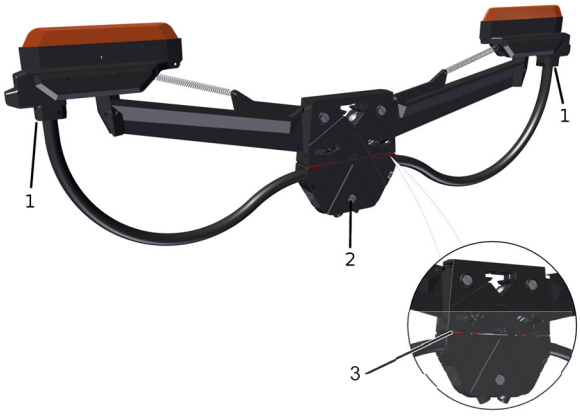
Required tools:

⚒ Screwdriver

Cable connection:

1. Select your current strength from the table below and insert the single or double connection (2.5 - 10 mm²), wire end ferrule) right and left into the cable connection.
2. Tighten the contact screw with 1.2 Nm to ensure a tight seat of the cables.
3. Fasten the on-site cables to provide strain relief.

max. current [A]	singel connection [mm²]	double connection [mm²]	
30	2.5	-	-
40	4	2.5	2.5
55	6	2.5	2.5
63	10	4	4
80	-	4	4
110	-	6	6
125	-	10	10



Current collector connection option 2

Required tools:

⚒ Screwdriver

Removing the connection box:

1. Disconnect the pre-assembled cables from the carbon brush sockets (1).
2. Remove the screw (2).
3. Spread the two halves of the connection box.
4. Remove the cable connection.
5. Break off the two halves at the predetermined breaking points (3).

NOTICE!

► The connection box may no longer be used and must be disposed of.

Cable connection:

1. Connect a highly flexible cable and tighten the M4 screw with 1.2 Nm. (1)
2. Attach the cable with a strain relief and without restricting the movement of the carbon brushes.

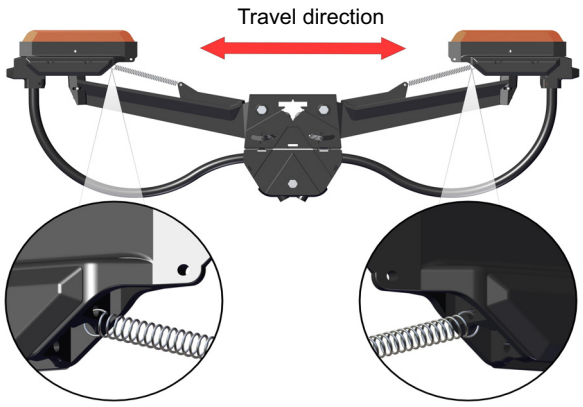
max. current [A]	Carbon brush Nr.1 [mm²]	Carbon brush Nr.2 [mm²]
60	2.5	2.5
80	4	4
110	6	6
125	10	10

Adjusting the spring position

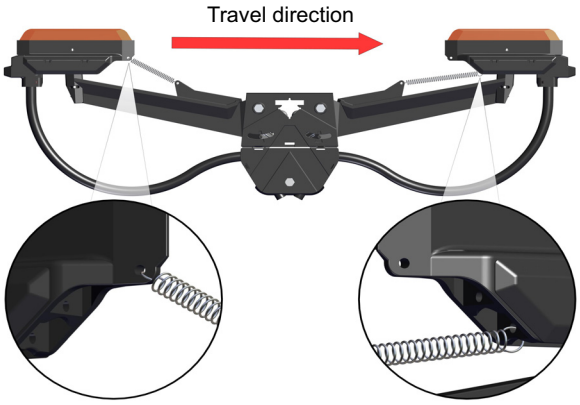
Benötigte Werkzeuge:

⚒ needle-nosed pliers

For various applications, the position of the springs must be adjusted according to the following conditions:



Funnel/reversing operation (factory preset)	
left spring:	center position
right spring:	center position



Trailing operation	
Travel direction:	one-sided operation
left spring:	top position
right spring:	bottom position

5 MAINTENANCE

5.1 Maintenance intervals

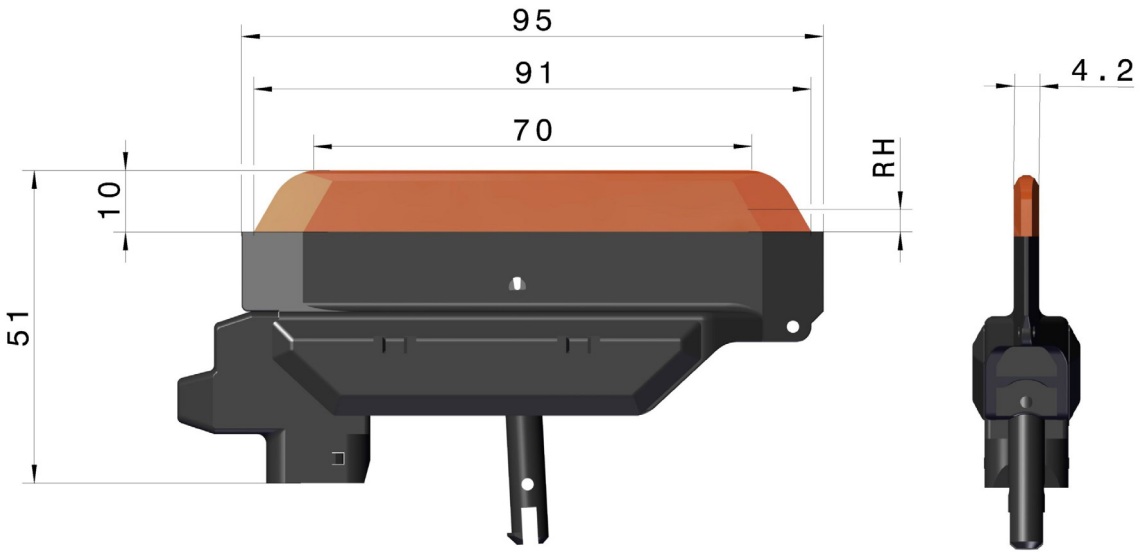
Interval	Service/monitoring	Personnel
Daily	• Check safety equipment and operating behavior.	Operator
Monthly	Visual inspection of general condition. Replace damaged/defective parts. **Mechanical check:** • Check mobility of joints, bearings, and hinge pins. Inspection for mechanical damage of any type. • Inspection of connection lines for damage and correct installation. The connection lines must not impede the mobility of the current collectors. **Electrical check:** • Check for wear of graphite contacts, firm seat of all contact screws and cable attachments. • Check remaining height of graphite contact. See Carbon brushes. The carbon brush must be replaced when the respective residual height is reached. **Tightening torque:** • The tightening torque of the contact screw is 1.2 Nm.	Technician/electrically qualified person
after 2 changes of the carbon brush	• Replace current collector	Technician/electrically qualified person

In case of damage to the current collectors, inspect the conductor system for damage.

5.2 Wear parts

Carbon brushes

Type	for	Weight [kg]	Thickness [mm]	ID no.
KMK 63	U15, U25	0.25	4.2	0171788/00



KMK 63	U15	U25
RH [mm]	1.5	5

Springs

Type	ID no.
Return spring RF3	0153849/00

NOTICE!

Please contact the manufacturer if you are unable to identify desired spare parts with this overview, e.g. when custom components are used.

5.3 Replacing the carbon brush

DANGER!

Danger of life due to electrical current!

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

► Make sure that the components are not live or in tension unauthorized approximation.

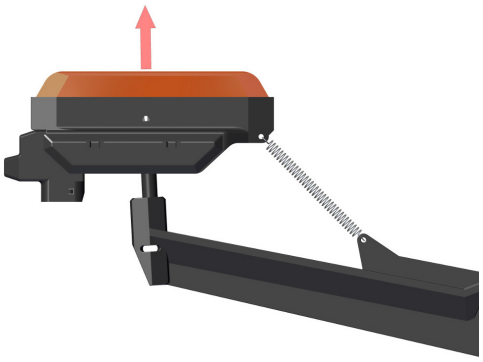
CAUTION!

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

► Wear breathing protection mask acc. to EN 149, min. protection level FFP3. Vahle ID no.: 10017880

► Never blow out the mask with compressed air.

The general safety instructions in the operating instructions of the conductor system have to be read and obeyed!



Replacing the carbon brush

Benötigte Werkzeuge:

⚒ needle-nosed pliers

Assembly steps:

1. Disconnect the cables from the carbon brush socket.
2. Pull the carbon brush with the socket upwards.
3. Detach the spring from the carbon brush socket.
4. Replace the carbon brush including the socket.
5. Attach the spring to the new carbon brush socket (note direction of travel).
6. Press the carbon brush socket back onto the current collector arm.
7. Reconnect the cables.

6 TRANSPORT AND STORAGE

6.1 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: 0 °C to +45 °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.

6.2 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.

7 DISASSEMBLY AND DISPOSAL

7.1 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 life due to electrical current!

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

► Make sure that the components are not live or in tension unauthorized approximation.

7.2 Safety Instructions for removal/replacement

During disassembly, always observe the information in chapter 2 .

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.

7.3 Disposal

When the system reaches the end of its useful life, the system must be dismantled and disposed of in an environmentally sound manner in accordance with the valid local regulations and laws.

NOTICE!

Electronic scrap is hazardous waste. For the disposal, please observe the local valid regulation and relevant laws in the respective country.

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Technical Documentation

DQS - certified in accordance DIN EN ISO 9001:2015 OHSAS 18001:2007