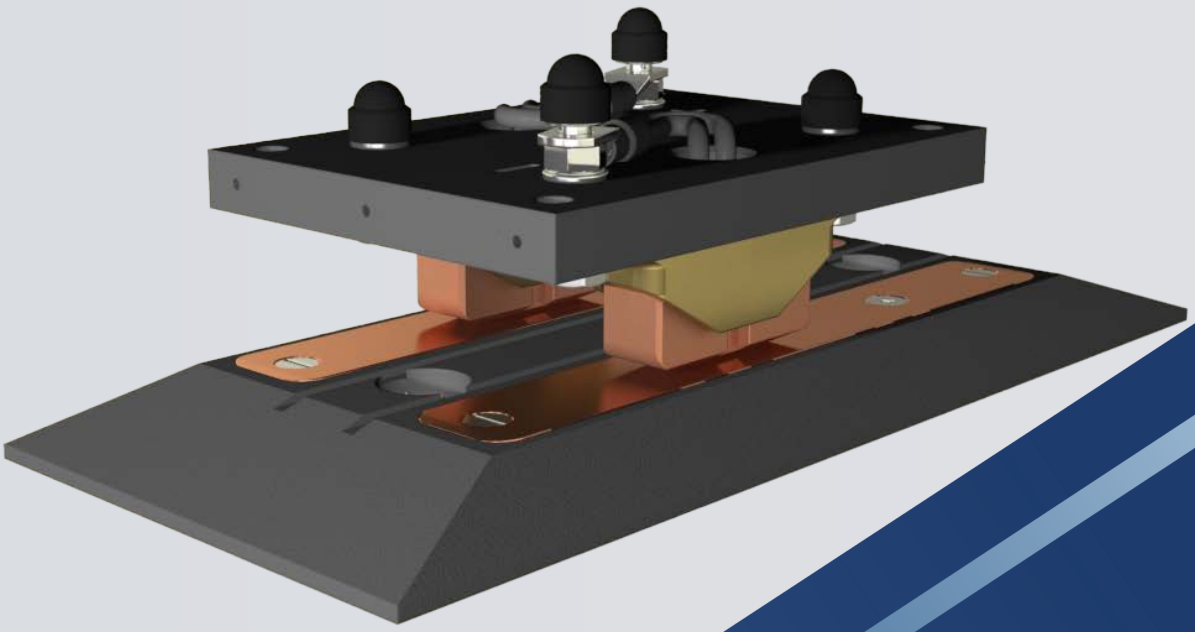
VAHLE

# TRANSLATION OF THE ORIGINAL GERMAN OPERATING INSTRUCTIONS

## BATTERY CHARGING CONTACTS



**SYSTEM MANUAL**
**INSTALLATION MANUAL**
**MAINTENANCE MANUAL**

**EN | V 1.03 | DCL145**

# TABLE OF CONTENTS

# 1 DOCUMENT HISTORY

| Material number | Version | Edition | Description/changes |
|---|---|---|---|
| - | 1.01 | 09/2019 | First edition |
| - | 1.02 | 12/2021 | Safety instructions for commissioning, Ident-No. adjustments, Note cleaning collector fleece, Adjustment charging current current collector system 7, UKCA |
| | 1.03 | 03/2023 | Adaptation of UL technical data, UL certification inserted, editorial revision |

# 2 GENERAL

## 2.1 About these instructions

## 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.

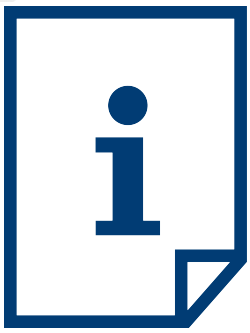
► The actions to prevent the hazard are identified here.

*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



## 2.4 Disclaimer

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

**The manufacturer shall not be liable for damages resulting from:**

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

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

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

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

## 2.5 Customer service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## 2.6 Warranty

### 2.6.1 Warranty terms and conditions

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

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

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

**⚠ WARNING!**

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

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

► Always consult the manufacturer first!

**The warranty immediately expires 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.

# 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

Typical applications for charging contacts are in driverless transport systems (AGVs), in warehouse and production logistics, as well as in shuttle systems and special vehicles.

The charging contacts are used to charge batteries and capacitors as well as to establish a direct electrical connection to the consumer.

Additional functions include data and signal transmission (pilot function, e.g. for CAN bus charging management)

The following standards must be observed during operation with regard to personnel and property protection:

- DIN EN 60204-1
- DIN EN 60204-32
- DIN EN 60664-1

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

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

**WARNING!**

**Danger in case of improper use!**

Misuse may cause dangerous situations.

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

Absence of voltage is to be determined at or as close as possible to the work site at all pins. 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 death due to electrical current!**

Contact with live parts can result in life-threating 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.
- The components may only be operated in machines with reverse polarity protection and short circuit protection.

# 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 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.

## 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-threating injuries.

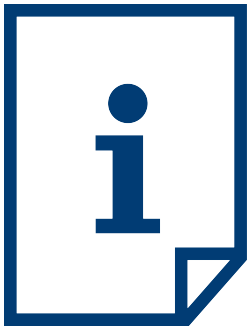
► Make sure that the relevant components are not live or under voltage, and that there is no unauthorized approximation.

**WARNING!**

**Danger from illegible signs!**

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

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



*NOTICE!*

**Follow instructions!**

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

# 4 TECHNICAL DATA

| Technical specifications | | |
|---|---|---|
| Voltage without ground conductor | [V DC / V AC] | 60 / 25[1] |
| Current load max. at 100 % duty cycle | [A] | 600 |
| Operating temperature | [°C] | - 30 to + 55 |
| Operation in humid conditions | [%] | 98 |
| Raising or lowering speed | [m/s] | 1[2] |
| Conductor material | | Copper (CU) |
| Flammability | | HB classification according to UL94<br>(UL versions = V0) |
| Application | | Dry indoor systems[3] |
| UL approval | | Optionally with "UL Recognized Component" approval according to UL 583 (Industrial Trucks Accessories, Battery Powered) and UL 3100 (Automated Mobile Platforms) available. Article identification ...-**UL** |

[1] Higher voltages up to 400 V on request.

[2] Higher speeds on request.

[3] Special applications possible with design modifications.

# 5 LAYOUT AND FUNCTION

## 5.1 Brief system description

Working with driverless transport systems (AGVs) requires high vehicle availability in order to achieve optimum economy.

One particular problem is posed by the drive battery and its charging. With modern high-performance batteries, the charging process can now be integrated into the normal operating process of the system.

In places where waiting times occur for operational reasons, battery charging stations can be installed (e.g. in buffer sections, reversal points, stops, etc). Optimal spatial integration of the charging station into the overall system is an important aspect. VAHLE has developed special battery charging contacts to meet these requirements.

The system consists of a charging contact and a respective current collector. Depending on customer-specific requirements, the charging contacts and current collectors can be installed on the floor, on the vehicle or as a charging station.

As a standard, the charging contacts are operated on contact bevels (raised and lowered) as a sliding contact, thereby creating an effect that supports cleaning.

Charging contacts can also be operated as a press-on type by means of an actuator (stationary). In this case, special attention should be paid to cleaning any potentially interfering oxide layers.

To prevent coarse dirt deposits on the charging contact, the current collector can be equipped with a cleaning brush.

The current collector/contact plate charging unit is designed for dry indoor installations with an operating voltage of 12-80 V. For nominal voltages above 25 VAC or 60 VDC, protection against direct contact is required on site. For special conditions such as humidity, outdoor use, large contact areas, etc., the relevant standards must be observed, in particular:

- DIN EN 60204-1
- DIN EN 60204-32
- DIN EN 60664-1

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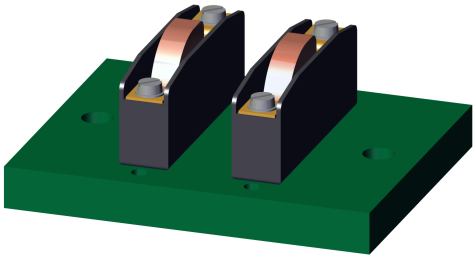
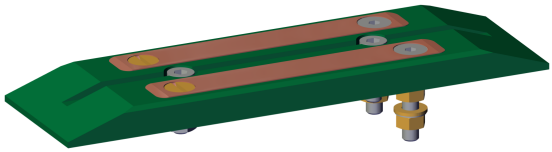
# 5.2 Assembly overview

## 5.2.1 System 1

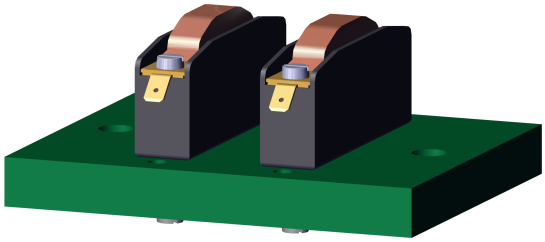


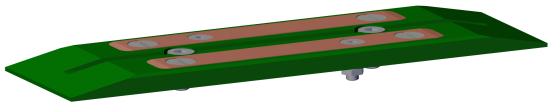


| AGV current collector | |
|---|---|
| Type | SA-BLS20-20-01 |
| ID no. | 0590207/00 |
| Number of poles | 2 |
| Charging current 100 % duty cycle [A] | 20 |
| Weight [kg] | 0.384 |
| for frontal contact | |

| AGV floor contact | |
|---|---|
| Type | BLK25-2-01 |
| ID no. | 0590042/00 |
| Number of poles | 2 |
| Charging current 100 % duty cycle [A] | 25 |
| Weight [kg] | 0.592 |

## 5.2.2 System 2

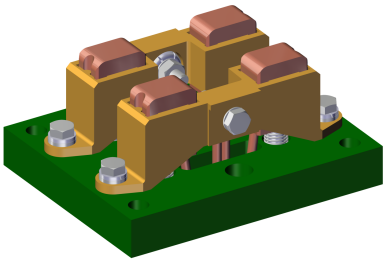




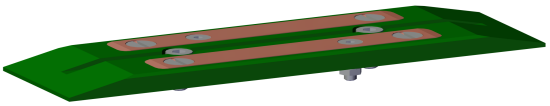
| AGV current collector | |
|---|---|
| Type | SA-BLS50-20-01 |
| ID no. | 0590672/00 |
| Number of poles | 2 |
| Charging current 100 % duty cycle [A] | 50 |
| Weight [kg] | 0.425 |
| for frontal contact | |

| AGV floor contact | |
|---|---|
| Type | BLK100-2-06 |
| ID no. | 0590736/00 |
| Number of poles | 2 |
| Charging current 100 % duty cycle [A] | 100 |
| Weight [kg] | 0.588 |

### 5.2.3 System 3

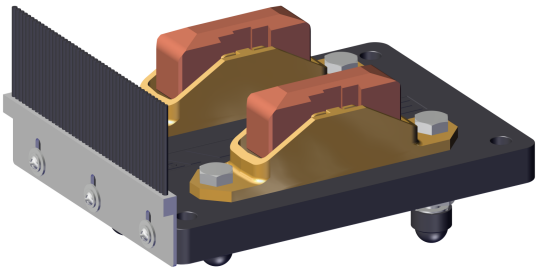


| AGV current collector | |
|---|---|
| Type | SA-BLS100-20-01 |
| ID no. | 0590541/00 |
| Number of poles | 2 |
| Charging current 100 % duty cycle [A] | 100 |
| Weight [kg] | 0.955 |
| for frontal contact | |

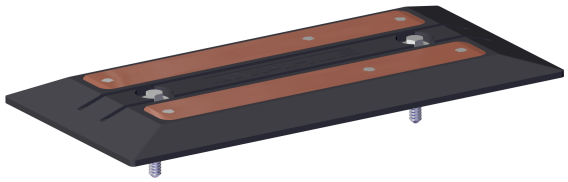


| AGV floor contact | |
|---|---|
| Type | BLK100-2-06 |
| ID no. | 0590736/00 |
| Number of poles | 2 |
| Charging current 100 % duty cycle [A] | 100 |
| Weight [kg] | 0.588 |

### 5.2.4 System 4

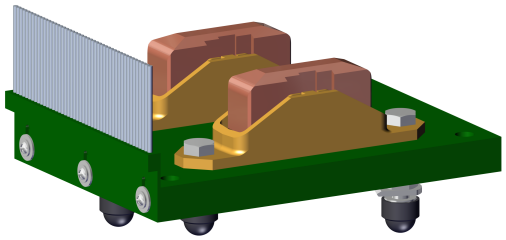


| AGV current collector | |
|---|---|
| Type | SA-BLS200-2-01 |
| ID no. | 0590872/00-MS |
| Number of poles | 2 |
| Charging current 100 % duty cycle [A] | 200 |
| Weight [kg] | 2.383 |
| Version | Molded component |
| with cleaning brush on front side, for frontal contact | |

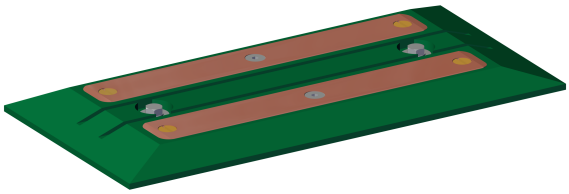


| AGV floor contact | |
|---|---|
| Type | BLK200-2-01 |
| ID no. | 0590873/00 |
| Number of poles | 2 |
| Charging current 100 % duty cycle [A] | 200 |
| Weight [kg] | 2.066 |
| Version | Molded component |

### 5.2.5 System 5

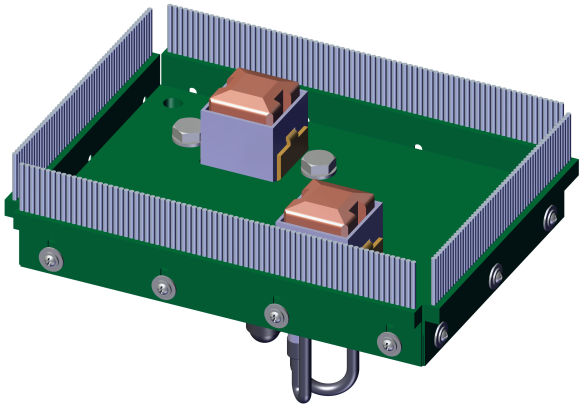


| AGV current collector | |
|---|---|
| Type | SA-BLS200-2-01-MS |
| ID no. | 0590000/00-MS |
| Number of poles | 2 |
| Charging current 100 % duty cycle [A] | 200 |
| Weight [kg] | 2.680 |
| Version | Milled component |
| with cleaning brush on front side, for frontal contact | |

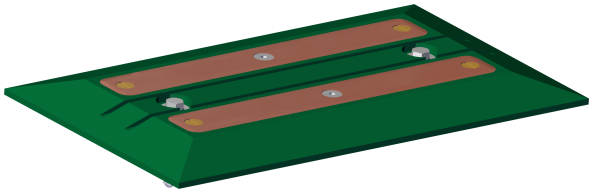


| AGV floor contact | |
|---|---|
| Type | BLK200-2-01 |
| ID no. | 0590001/00 |
| Number of poles | 2 |
| Charging current 100 % duty cycle [A] | 200 |
| Weight [kg] | 2.542 |
| Version | Milled component |

### 5.2.6 System 6

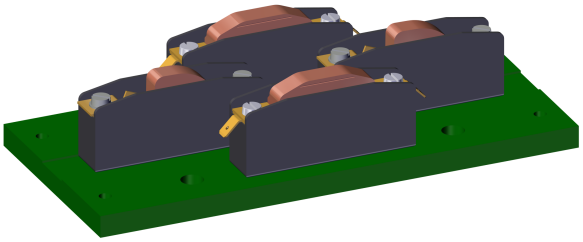


| AGV current collector | |
|---|---|
| Type | SA-BLS200-2QU-01 |
| ID no. | 0590013/00 |
| Number of poles | 2 |
| Charging current 100 % duty cycle [A] | 200 |
| Weight [kg] | 3.025 |
| With surrounding cleaning brush, for frontal and lateral contact via the contact bevel of the AGV floor contact. | |

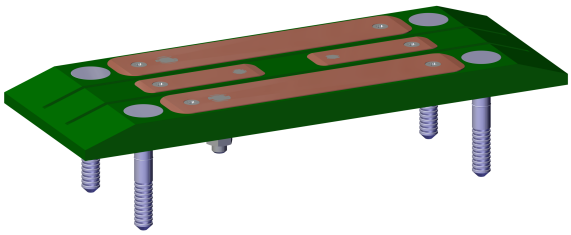


| AGV floor contact | |
|---|---|
| Type | BLK200-2Q-04 |
| ID no. | 0590565/00 |
| Number of poles | 2 |
| Charging current 100 % duty cycle [A] | 200 |
| Weight [kg] | 2.536 |
| With surrounding contact bevel | |

### 5.2.7 System 7

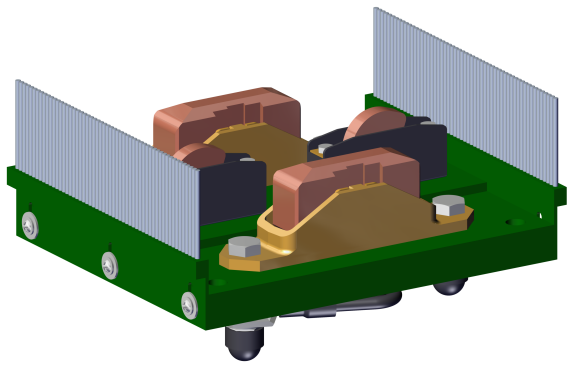


| AGV current collector | |
|---|---|
| Type | SA-BLS50-20/20-2-01 |
| ID no. | 0590637/00 |
| Number of poles | 2 |
| Number of poles, control current | 2 |
| Charging current 100 % duty cycle [A] | 50 |
| Weight [kg] | 0.614 |
| for frontal contact, with pilot function | |

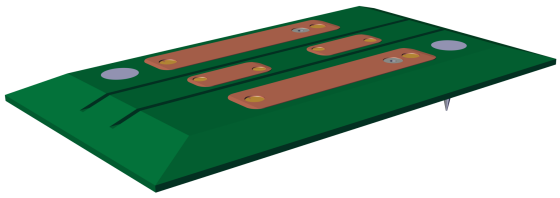


| AGV floor contact | |
|---|---|
| Type | BLK100-2/25-2-04 |
| ID no. | 0590624/00 |
| Number of poles | 2 |
| Number of poles, control current | 2 |
| Charging current 100 % duty cycle [A] | 100 |
| Weight [kg] | 1.143 |
| With pilot function | |

### 5.2.8 System 8

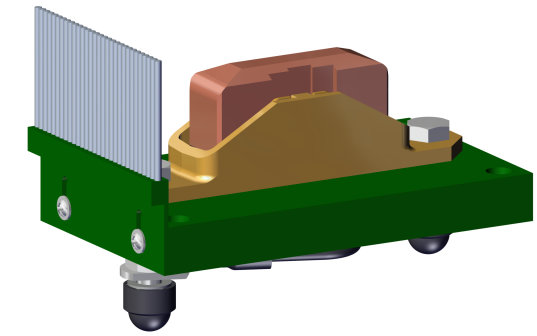


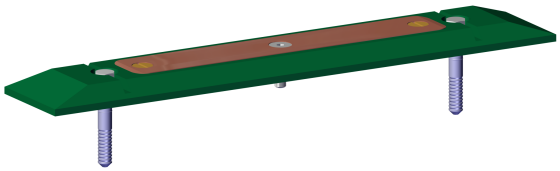
| AGV current collector | |
|---|---|
| Type | SA-BLS200-2B/20-2-01-MS |
| ID no. | 0590198/00-MS |
| Number of poles | 2 |
| Number of poles, control current | 2 |
| Charging current 100 % duty cycle [A] | 200 |
| Weight [kg] | 3.075 |
| with cleaning brushes on front side, for frontal contact, with pilot function | |



| AGV floor contact | |
|---|---|
| Type | BLK200-2/25-2-01 |
| ID no. | 0590062/00 |
| Number of poles | 2 |
| Number of poles, control current | 2 |
| Charging current 100 % duty cycle [A] | 200 |
| Weight [kg] | 2.726 |
| With pilot function | |

### 5.2.9 System 9

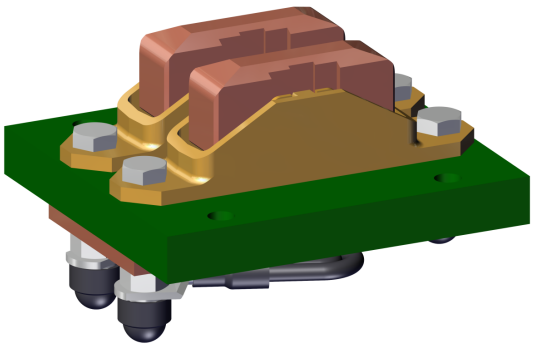


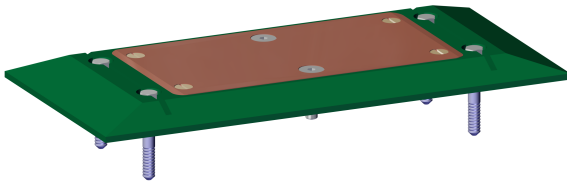


| AGV current collector | |
|---|---|
| Type | SA-BLS200-1-04 |
| ID no. | 0590035/00-MS |
| Number of poles | 1 |
| Charging current 100 % duty cycle [A] | 200 |
| Weight [kg] | 1.209 |
| with cleaning brush on front side, for frontal contact | |

| AGV current collector | |
|---|---|
| Type | SA-BLK200-1-02 |
| ID no. | 0590036/00 |
| Number of poles | 1 |
| Charging current 100 % duty cycle [A] | 200 |
| Weight [kg] | 0.944 |

### 5.2.10 System 10

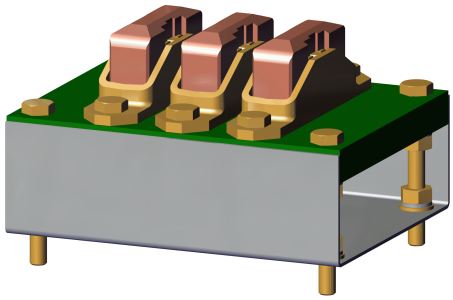


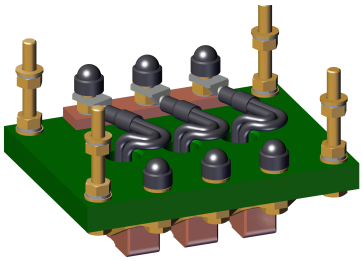


| AGV current collector | |
|---|---|
| Type | SA-BLS400-10-02 |
| ID no. | 0590114/00 |
| Number of poles | 1 |
| Charging current 100 % duty cycle [A] | 400 |
| Weight [kg] | 2.355 |
| for frontal contact | |

| AGV floor contact | |
|---|---|
| Type | BLK600-1-01 |
| ID no. | 0590044/00 |
| Number of poles | 1 |
| Charging current 100 % duty cycle [A] | 600 |
| Weight [kg] | 3.241 |

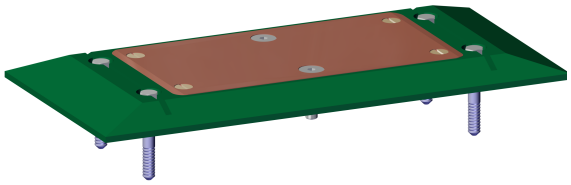
### 5.2.11 System 11





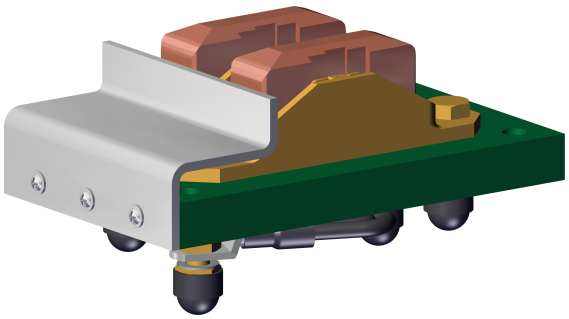
(Illustration without cover)

| AGV current collector | |
|---|---|
| Type | SA-BLS600-1A0-01 |
| ID no. | 0590043/00-MS |
| Number of poles | 1 |
| Charging current 100 % duty cycle [A] | 600 |
| Weight [kg] | 4.234 |
| for frontal contact | |

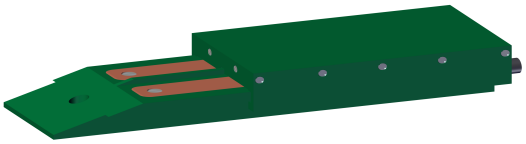


| AGV floor contact | |
|---|---|
| Type | BLK600-1-01 |
| ID no. | 0590044/00 |
| Number of poles | 1 |
| Charging current 100 % duty cycle [A] | 600 |
| Weight [kg] | 3.241 |

### 5.2.12 System 12



| AGV current collector | |
|---|---|
| Type | SA-BLS200-2E-01 |
| ID no. | 0590065/00 |
| Number of poles | 2 |
| Charging current 100 % duty cycle [A] | 200 |
| Weight [kg] | 2.095 |
| With slider, for frontal contact | |



| AGV floor contact | |
|---|---|
| Type | BLK200-2EA-01 |
| ID no. | 0590064/00 |
| Number of poles | 2 |
| Charging current 100 % duty cycle [A] | 200 |
| Weight [kg] | 4.062 |
| With sliding cover and 2x2 m connecting cable | |

# 6 COMMISSIONING

## 6.1 Safety instructions for commissioning

**DANGER!**

**Installation without contact protection - Risk of fatal injuries from electrical current!**

Contact with electrically live components may result in fatal injuries.

- ► During installation, a protection against personal injury/contact in accordance with DIN EN 60204-1 must be implemented.

**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 “3.3.1 Danger from electrical energy”)

**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!**

**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

**⚠ 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

*NOTICE!*

**Transport instructions**

- ► Never hold the unit by the carbon brushes or the power cable. Always transport the unit holding it by the plastic base plate or by the collector plate.

*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.
- ► Use own tools 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.

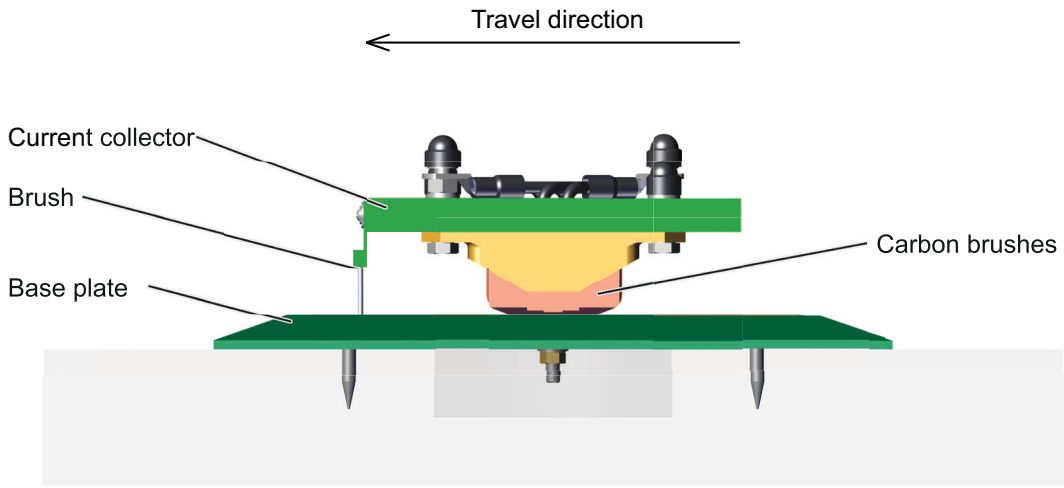
*NOTICE!*

**The following points have to be strictly observed during assembly!**

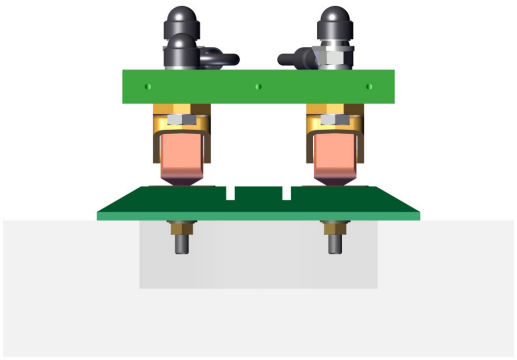
- ► Appropriate handling of materials.
- ► Clean and metallic bright surfaces on all contact points.
- ► Firm tightening of all screws using the screw lock provided and observing the stated tightening torques.
- ► Damaged materials must not be installed.
- ► Observe all applicable regulations governing installation of the plant.

# 6.2 Installation

## 6.2.1 General assembly instructions




View without brush



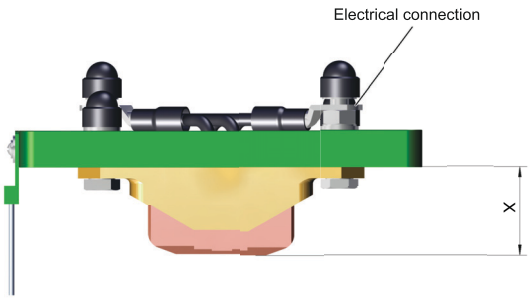
*NOTICE!*

- ► Always observe the relevant customer-specific drawings / documents during assembly.

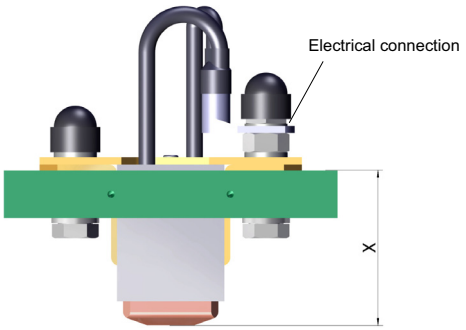
*NOTICE!*

- ► When selecting the fastening, make sure that the screw head does not protrude from the contour and that the screw connection is secured against loosening (e.g. Loctite threadlocker or locknut).
- ► Changes to installation dimensions by prior agreement.
- ► Increased wear at reduced tolerances possible after consultation.
  E.g. for SA-BLS200S 5 mm permissible wear at reduced tolerance + 2 / - 2 mm.
- ► Sufficient mechanical fastening of the components to the attachment structures must be ensured by the customer.

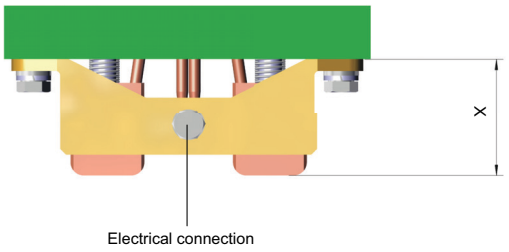
## 6.2.2 Connection options for current collectors



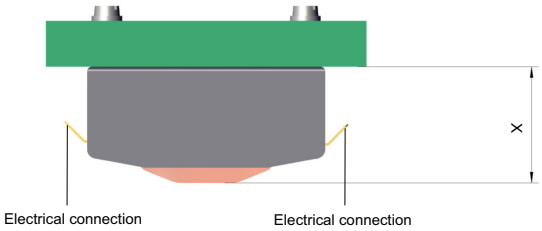

| Assembly | SA-BLS200S |
|---|---|
| Installation dimensions X [mm] | 48 |
| Torque, connection [Nm] | 18 |
| Disconnected height X [mm] | approx. 58 |
| Lift tolerance [mm] | ± 5 |
| Permissible wear [mm] | 2 |



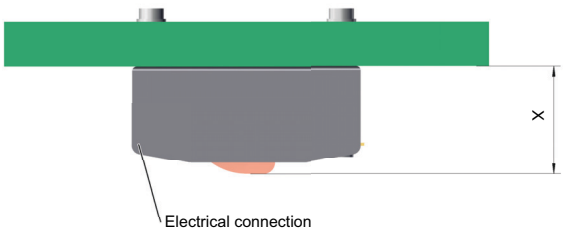

| Assembly | SA-BLS200Q |
|---|---|
| Installation dimensions X [mm] | 65 |
| Torque, connection [Nm] | 18 |
| Disconnected height X [mm] | approx. 75 |
| Lift tolerance [mm] | ± 5 |
| Permissible wear [mm] | 2 |




| Assembly | SA-BLS100 |
|---|---|
| Installation dimensions X [mm] | 40 |
| Torque, connection [Nm] | 5 |
| Disconnected height X [mm] | approx. 51 |
| Lift tolerance [mm] | ± 5 |
| Permissible wear [mm] | 2 |




| Assembly | SA-BLS50 |
|---|---|
| Installation dimensions X [mm] | 38 |
| Torque, connection [Nm] | 2 |
| Disconnected height X [mm] | approx. 44 |
| Lift tolerance [mm] | ± 4 |
| Permissible wear [mm] | 2 |




| Assembly | SA-BLS20 |
|---|---|
| Installation dimensions X [mm] | 37 |
| Torque, connection [Nm] | 2 |
| Disconnected height X [mm] | approx. 43 |
| Lift tolerance [mm] | + 3, - 2 |
| Permissible wear [mm] | 2 |

### 6.2.3 Installing current collector

*NOTICE!*

- ► Mount the current collectors with cleaning brush on the vehicle so that the cleaning brush is facing in the direction of travel.
- ► The current collector unit should rest on as large an area as possible around the mounting bore holes so as to ensure a secure hold.
- ► The carbon brush surface should be in full contact with the contact surface. Standard loading position in vicinity of connection and mounting material should be avoided.

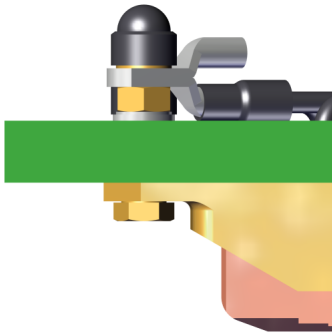
*NOTICE!*

- ► The contact surfaces on the current collector and on the floor contact must be cleaned with an abrasive fleece before initial startup.

**Installing current collector**

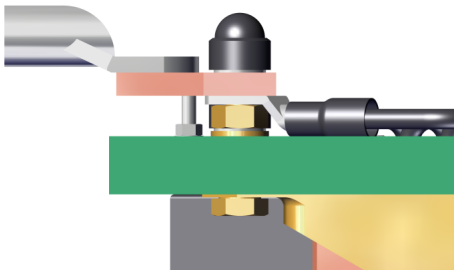
*Assembly steps:*

1. Mount the current collector unit at the correct installation height. Use the existing mounting bore holes or threaded inserts for this purpose.



*NOTICE!*

- ► Make sure not to damage the carbon brush connection cables during assembly.
- ► Some current collector types are equipped with factory-assembled connection cables. In this case it is particularly important to ensure that the cable lug of the current collector is connected directly to the customer's connection (cable lug, busbar, etc).
- ► Please note that the connecting cables are routed freely. Pulling or pressing on the carbon brushes should be avoided.



2. Connect the current collector package according to 6.2.2 Connection options for current collectors and applicable regulations.

### 6.2.4 Mounting floor contacts

⚠ CAUTION!

- ► Air and creepage distances according to IEC 60664-1 between phases and from phase to earth must be taken into account for operation. Regional standards must be observed!

*NOTICE!*

Charging contacts can be mounted on the side, on the floor or overhead.

When mounting on the floor, observe the following:

- ► The installation area must be outside the tracks of the vehicle wheels.
- ► The installation area must be sufficiently marked in order to avoid driving over it with other vehicles and tripping over the contact.
- ► We recommend positioning in loading bays or buffer sections, for example.

*NOTICE!*

- ► The contact surfaces on the current collector and on the floor contact must be cleaned with an abrasive fleece before initial startup.

**Mounting floor contact**

*Prerequisites:*

- ✓ During mounting, pay attention to any unevenness of the surface. The floor contact should evenly rest on as large an area as possible.
- ✓ Recesses should be as small as necessary. The minimum bending radii of the connection lines in particular must be taken into account in this respect.
- ✓ The plastic base plate should rest at least 15 mm on the outer edges.

*Assembly steps:*

1. Place the floor contact in the intended position.
2. Fasten the floor contact according to the customer drawing.
3. Connect the ground contact according to 6.2.5 Floor contact connection options and applicable regulations.
4. Seal the edge area of the plastic base plate with a suitable sealing material to protect the joint area from liquid and dust ingress.

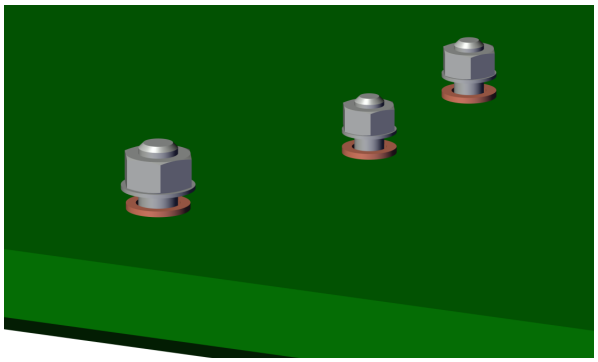
### 6.2.5 Floor contact connection options

*NOTICE!*

The electrical connection is made to the CU connection tubes or directly to the CU contact plates.
Required torque:

- M6: 8 Nm
- M8: 15 Nm
- M10: 18 Nm

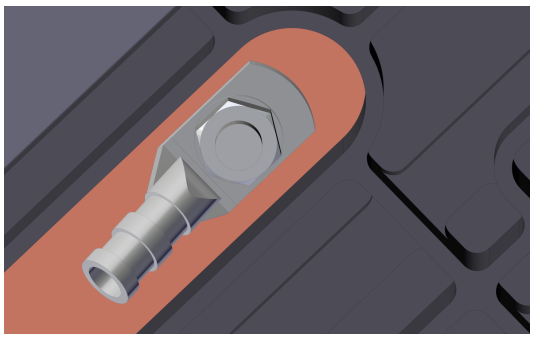
#### Option 1



**BLK Connection CU connection tube**

*The cable is connected to CU connection tubes which are connected to the CU contact plate.*

#### Option 2



**BLK connection CU contact plate**

*The cable is connected directly to the CU contact plate.*

*NOTICE!*

Customer-specific connection alternatives can be found in the customer drawing.

## 6.3 Condition after the installation

### Mechanical function test

After assembly and checking for correct polarity, check the mobility of the carbon brushes when they are de-energized, the dimension when the new brush is spring-loaded and the installation dimension (distance between mounting surface and upper side of CU contact surface).

### Checking after the first 100 cycles

Perform the following checks after the first 100 cycles of the system:

- Visual inspection of general condition. Replace damaged/defective parts.
- Check mechanical and electrical connections and re-tighten if necessary.
- Check the mobility of the carbon brushes and the free movement of the connection cable at the current collector.
- Check the maximum position offset depending on the application and installation position. Exceeding the tolerances can result in overloading of the contacts and carbon brushes

## 6.4 Operation/decommissioning

### 6.4.1 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.

### 6.4.2 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!**

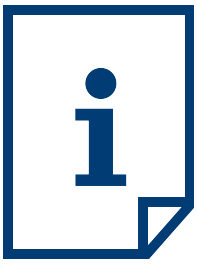
Improper troubleshooting may cause serious injuries or property damage.

- ► 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.

## 7.3 Troubleshooting table

| Malfunction | Cause | Remedy |
|---|---|---|
| Periodic charging or loss of charging current | Mechanical alignment | Check the mechanical alignment of the charging contact. |
| | Electrical connections | Check the electrical connections to the base charging contact and the carbon brush contact. |
| | Carbon brush contact | Check carbon brush pressure, carbon brushes and contact plate. |
| Damage to carbon brushes or contact plate | Mechanical alignment | Check the mechanical alignment of the charging contact. |

*NOTICE!*

**Improper troubleshooting**

Non-functional system

► In the event of faults and malfunctions, the cause of the fault must be determined and the damaged components must be replaced. After a malfunction has occurred and components have been replaced, proper assembly must be ensured in accordance with the instructions. A fault-free sequence must be verified.

# 8 MAINTENANCE

## 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 to3.3.1 Danger from electrical energy 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 Maintenance

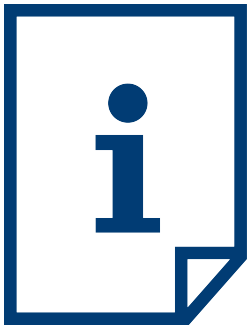
The main aim of this section is to maintain the system's target condition and operational capability. By avoiding malfunctions and unplanned downtimes, regular maintenance can increase the utilization rate. Efficient planning of maintenance work and material is a prerequisite. In order to carry out safe 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-threating 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**

(Place, replacement part, performed work, date, name of the inspector)

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

| Date | Name | Maintenance/servicing work | Instructions given by | Signature |
|---|---|---|---|---|
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# 8.3 Maintenance intervals

*NOTICE!*

**Damage due to improper cleaning**

► No solvents may be used for cleaning the contact surfaces and carbon brushes.

| Interval | Maintenance/monitoring tasks | Personnel |
|---|---|---|
| Daily | • Check safety equipment and operating behavior. | Operator |
| approx. every 10.000 cycles / monthly | • Check the carbon brushes and carbon brush springs in accordance with 8.4 Carbon brush.<br>• Check all electrical connections for corrosion. Ensure that all fastening elements are properly tightened.<br>• Check the maximum position offset depending on the application and installation position. Exceeding the tolerances can result in overloading of the contacts and carbon brushes<br>• Check the charging contact for wear and soiling. If necessary, remove dirt, oxidation, pitting corrosion and other soiling from the contact surfaces with a fine-grained non-woven abrasive.<br>• Visual inspection in particular of the carbon brush guides and carbon brush holders. | Technician/electrically qualified person |

*NOTICE!*

► Poor electrical connections can lead to increased electrical resistance and poor charging performance.

# 8.4 Carbon brush

### Carbon brush

The carbon brush must not fall below the defined wear limit. The current collector must be replaced once the wear limit has been reached. The dimension can be found in the customer-specific drawing.

### Carbon brush springs

The contact pressure of the carbon brush springs must not fall below the values in the following table. Measure the force required to push in the carbon brushes. If the contact pressure is no longer sufficient, the entire current collector unit must be replaced.

| Carbon brush | Minimum force, approx. [N] |
|---|---|
| BLS200 | 32 |
| BLS200Q | 35 |
| BLS100 | 20 (10 each per carbon brush) |
| ONST50<br>(SA-BLS50) | 5 |
| ONST10/20 (0166546/01)<br>ONST10/20 (0590603/00)<br>(SA-BLS20) | 3<br>8 |

# 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: 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.

*NOTICE!*

**Transport instructions**

- ► Never hold the unit by the carbon brushes or the power cable. Always transport the unit holding it by the plastic base plate or by the collector plate.

*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.
- ► Use own tools for the different materials (aluminum, copper, stainless steel).
- ► Chip-forming work (grinding etc.) must not be performed in the vicinity of the material, or the material must be covered in such a way that no soiling or damage can occur.

## 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.

## 9.3 Storage

### Packaging

When storing charging contacts or components, care must be taken that the carbon brush contact surface and contact plate are protected against dirt, debris, abrasion, oil, grease and corrosion. Plastic bags are recommended as protection for the charging contacts or components.

### Long-term storage

Store charging contacts or components in a dry environment to prevent corrosion or oxidation on the carbon brush contact surfaces.

Clean carbon brush and carbon brush contact surfaces before use and remove dirt, oxidation, pitting corrosion and other soiling with a brass brush or non-woven abrasive (320 grit).

# 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-threating injuries.

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

## 10.2 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.

## 10.3 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 its disposal, please observe the locally applicable regulations and relevant laws in the respective country.**

# 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 | **11** |
| Product | **Battery changing system** |
| Type | **BLS, BLK**<br>**incl. accessories** |
| Relevant EU Regulation | **2014 / 35 / EU**<br>**(Low Voltage Directive)** |
| Placement of CE-marking | **99** |

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, 02.03.2018

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 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 | **11** |
| Product | **Battery changing system** |
| Type | **BLS, BLK**<br>**incl. accessories** |
| Relevant UK Regulation | **Electrical Equipment (Safety) Regulation 2016** |
| First CE / UKCA - marking | **1999 / 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

# 11.3 UL Certificate of compliance

## CERTIFICATE OF COMPLIANCE

| | |
|---|---|
| **Certificate Number** | UL-US-2249574-0 |
| **Report Reference** | AU6527-20221223 |
| **Date** | 4-Jan-2023 |
| **Issued to:** | Paul Vahle GmbH & Co. KG<br>Westicker Strasse 52 Kamen 59174<br>Germany |
| **This is to certify that representative samples of** | YCFT2 - Industrial Truck Accessories, Battery Powered - Component<br>See Addendum Page for Product Designation(s).<br><br>Have been evaluated by UL in accordance with the component requirements in the Standard(s) indicated on this Certificate. UL Recognized components are incomplete in certain constructional features or restricted in performance capabilities and are intended for installation in complete equipment submitted for investigation to UL LLC. |
| **Standard(s) for Safety:** | UL 583, 10th Ed., Issue Date: 2012-8-15, Revision Date: 2021-5-14 |
| **Additional Information:** | See the UL Online Certifications Directory at https://iq.ulprospector.com for additional information |

This Certificate of Compliance indicates that representative samples of the product described in the certification report have met the requirements for UL certification. It does not provide authorization to apply the UL Recognized Component Mark. Only the Authorization Page that references the Follow-Up Services Procedure for ongoing surveillance provides authorization to apply the UL Mark.

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

Look for the UL Recognized Component Mark on the product.

Deborah Jennings-Conner, VP Regulatory Services

UL LLC

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# CERTIFICATE OF COMPLIANCE

**Certificate Number** UL-US-2249574-0
**Report Reference** AU6527-20221223
**Date** 4-Jan-2023

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements

| Model | Category Description |
|---|---|
| BLK100-2-06-UL | Industrial Truck Accessories, Battery Powered - Component |
| BLK100-2/25-2-04-UL | Industrial Truck Accessories, Battery Powered - Component |
| BLK200-2/25-2-01-UL | Industrial Truck Accessories, Battery Powered - Component |
| BLK200-2EA-01-UL | Industrial Truck Accessories, Battery Powered - Component |
| BLK200-2Q-04-UL | Industrial Truck Accessories, Battery Powered - Component |
| BLK25-2-01-UL | Industrial Truck Accessories, Battery Powered - Component |
| BLK600-1-01-UL | Industrial Truck Accessories, Battery Powered - Component |
| SA-BLK200-1-02-UL | Industrial Truck Accessories, Battery Powered - Component |
| SA-BLS100-2O-01-UL | Industrial Truck Accessories, Battery Powered - Component |
| SA-BLS20-2O-01-UL | Industrial Truck Accessories, Battery Powered - Component |
| SA-BLS200-1-04-UL | Industrial Truck Accessories, Battery Powered - Component |
| SA-BLS200-2B/2O-2-01-MS-UL | Industrial Truck Accessories, Battery Powered - Component |
| SA-BLS200-2E-01-UL | Industrial Truck Accessories, Battery Powered - Component |
| SA-BLS200-2QU-01-UL | Industrial Truck Accessories, Battery Powered - Component |
| SA-BLS400-1O-02-UL | Industrial Truck Accessories, Battery Powered - Component |
| SA-BLS50-2O-01-UL | Industrial Truck Accessories, Battery Powered - Component |
| SA-BLS50-2O/20-2-01-UL | Industrial Truck Accessories, Battery Powered - Component |
| SA-BLS600-1AO-01-UL | Industrial Truck Accessories, Battery Powered - Component |

Deborah Jennings-Conner, VP Regulatory Services

UL LLC

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# INDEX

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CE

**Technical Documentation**