Controller description

SCM

Mobile safety controller

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Translation of the original
STB_0015_SCM, 1, en_GB

Table of contents

STB_0015_SCM, 1, en_GB

1 Information on the description

1.1 Revision history

We reserve the right to make changes to the information present in this document, which result from our constant effort to improve our products.

Version	Date	Comment/reason for change
1	12.2022	SCM with fan, first released version

1.2 How to use and store the description

This documentation forms part of the product. It contains important information and notes on using the product. It affects:

- Mechanical and electrical installation
- Commissioning
- Operation
- Maintenance and service

To work safely with the product, it is necessary to observe the safety notes and action instructions. All persons working with the product must have understood the user information in this description and apply it conscientiously. The operator must fulfil his duty of care and ensure that all persons working with the product have read and understood the user information and are implementing it.

This description forms part of the product and must be accessible to all persons working with the product at all times.

1.3 Applicable documents

If the device/system is part of a project-specific system layout, the documents found in the project documentation also apply.

The following documents are considered part of this documentation and provided as separate documents.

- *'GER device drawing'* for the mobile safety controller SCM
- *'ANS connection plan'* for the mobile safety controller SCM
- *'SMX error list'* for the BBH safety controller SMX*

The separate documentation for connected devices and components applies.

* the BBH safety controller used depends on the project and can be taken from the SMX project file

1.4 Copyright protection

1.5 Illustrations

The illustrations that accompany this description have been purposely selected. They are provided for basic understanding and may differ from the actual design. No claims shall be accepted for possible discrepancies.

1.6 Brands

The popular names, trade names, production descriptions, etc. used in this description may constitute trademarks even without special designations and as such may be subject to legal requirements.

2 Warranty and liability

2.1 Warranty

The warranty only covers production defects and faulty components.

The manufacturer assumes no responsibility for damages caused during transport or unpacking. In no case and under no circumstances will the manufacturer be liable for defects or damages caused by misuse, incorrect installation or inadequate environmental conditions or from dust or corrosive substances.

Consequential damages are excluded from the warranty.

Should you have further questions regarding the warranty, please contact the supplier.

2.2 Limitation of liability

All information and notes in this description have been compiled taking into account the applicable standards and regulations, the state of the art and our many years of knowledge and experience.

Conductix-Wampfler Automation GmbH assumes no liability for damage and malfunctions during operation due to:

- Failure to comply with the description
- Non-intended use
- Use by untrained personnel
- Unauthorised alteration or modification
- Use of the product, despite negative transport inspection

Furthermore, Conductix-Wampfler Automation GmbH's warranty obligation will cease to exist in case of a failure to comply with the description.

3 Safety instructions

This section contains information on all safety aspects for optimum protection of personnel and for safe operation without malfunctions.

To prevent dangers, these notes must be read and followed by personnel. Only then can safe operation be guaranteed.

Of course, all legally applicable general safety and accident prevention regulations must be complied with.

Conductix-Wampfler Automation GmbH assumes no liability for damage or accidents that were caused by non-observance of these safety notes.

3.1 Warning concept

This description contains notes that must be observed for your own personal safety and to avoid property damage. Notes regarding your personal safety are highlighted by a warning triangle; notes regarding property damage do not have a warning triangle.

When several hazard levels occur, the warning always refers to the highest level. If a warning of injury to persons is indicated with a warning triangle, the same warning might include an additional warning of property damage.

3.1.1 Arrangement of warnings

If warnings refer to an entire section, they are placed at the beginning of the section (e.g. chapter start).

If warnings refer to a specific action instruction, they are placed in front of the respective action instruction.

3.1.2 Structure of warnings

- **SIGNAL WORD**
- ↳ Type of danger and its source
- ↳ Possible consequences, if not observed
- ↳ Danger avoidance measures
- ↳ Preventive measures

3.1.3 Signal words

Warnings are indicated using signal words based on hazard levels.

Signal word	Meaning
⚠ WARNING!	This combination of symbol and signal word indicates a possible dangerous situation that can result in death or serious injury if it is not avoided.
NOTICE!	This combination of symbol and signal word indicates a possible dangerous situation that can result in material damage if it is not avoided.

3.1.4 Hazard symbols

Warnings of the groups 'danger' and 'warning' are content-based. They are presented with clear danger symbols.

Warnings of the 'caution' group do not have a specific danger symbol.

Warning signs	Type of danger
	Warning – high-voltage.
	Warning – danger of falling.
	Warning – falling objects.
	Warning – danger zone.

3.1.5 Suggestions and recommendations

This symbol indicates important information to help you handle the product.

3.2 Intended use

The mobile safety control system (SCM) has been designed and constructed exclusively for use in accordance with the intended purpose described below:

The mobile safety control system is a device for industrial and commercial installations, which safely monitors movements of material-handling vehicles controlled by an Conductix/LJU vehicle control system. By evaluating connected safety sensors, all movements are safely stopped by the SCM in the event of a fault or danger. The material-handling vehicle is brought to a safe operating condition.

The mobile safety control system is intended for connection to a vehicle control system belonging to the project and may only be operated together with it.

The WNR number (60.....) of the vehicle control system associated with the project is indicated in the "Remarks:" section on the title page of the SCM's connection diagram.

The intended use includes compliance with all of the information in this manual and the associated documents.

Any use apart beyond that intended or other types of use are regarded as misuse.

3.3 Foreseeable incorrect use

Any use that goes beyond this description is forbidden.

⚠ WARNING!

Hazard from non-intended use!

Any use of the device other than and/or beyond the intended use can cause hazardous situations.

- Only use the device as intended.
- It is paramount to comply with all the specifications and permitted conditions at the place of use.
- Do not use the device in potentially explosive atmospheres.
- Do not operate the device in environments with harmful oils, gases, vapours, dusts, radiation, etc.

3.4 Modifications and alterations

For the purpose of avoiding hazards and for ensuring optimum performance, any modifications, additions, or alterations to the device require Conductix-Wampfler Automation GmbH's express consent.

3.5 Responsibility of the operator

The device is used in an industrial environment. The operator of the device is therefore subject to statutory obligations regarding work safety.

In addition to the work safety instructions in this description, the safety, accident prevention and environmental regulations applicable to the area where the device is used must be complied with.

The following applies in particular:

- The operator must familiarise with the applicable work safety regulations and must also determine the dangers that are posed by the particular work conditions at the location of use by means of a risk assessment. This must be realised in the form of operating instructions for operating the device.
- This description must be kept within easy reach of the device and be accessible to those persons charged with working both on and with the device at all times.
- The specifications of the description must be adhered to fully and unconditionally!
- The device may only be operated when in a perfect and operationally safe condition. The device must be checked for detectable defects prior to each time it is put into service.
- The system operator must ensure that the responsibilities for activities on the system are unambiguously defined and only adequately qualified personnel familiar with the operating and safety regulations are working on and with the device.

3.6 Personnel and qualifications

The product / system belonging to this description may only be handled by personnel qualified for the respective task. This is done taking into account the descriptions associated with the particular task, especially the safety and warning information contained therein.

Due to their training and experience, qualified personnel are able to recognize risks and avoid possible hazards when dealing with this product / system.

⚠ WARNING!

Injury hazard from insufficient qualification!

Improper handling can cause substantial bodily harm or material damage.

3.7 Special hazards

⚠ WARNING!

Live parts

Should the safety control system be installed near exposed supply cables (e.g. conductor lines), there is an immediate danger to life if live parts are touched.

- Before carrying out any work on the safety control system, disconnect the system from the power supply and secure the system against being switched on again.
- Work on electrical components may only be carried out by qualified electricians or persons instructed and supervised by a qualified electrician in accordance with the electrical engineering regulations.

3.8 Safety devices

⚠ WARNING!

Danger to life from non-functioning safety devices!

Security devices ensure a maximum degree of safety during operation. Safety can only be guaranteed if the safety devices are intact.

- Never override safety devices.
- Before starting work, check whether the safety devices are fully functional.
- Report any faulty safety devices immediately.
- Get faulty safety devices repaired immediately.

Connected safety equipment

For further detailed information about which safety devices are connected to the controller, please refer to the connection diagram of the controller.

4 Product description

4.1 Function

The mobile safety control system SCM (Safety control system Mobile) monitors all movements of a material-handling vehicle for the safe operation of the vehicle within a system. In order to implement and guarantee safe functions, a compact, TÜV-certified programmable SMX safety control system from BBH PRODUCTS is installed in the SCM as a safety module. This safety module is used to implement safe speed/position detection of the drive axes that need to be monitored and to evaluate connected safety sensors.

The SCM is connected to the vehicle control system of the material-handling vehicle and integrated into the safety circuit of the vehicle control system. Events from encoders and safety sensors directly connected to the SCM are constantly evaluated and processed by the SCM. In the event of a fault or danger, all movements of the material-handling vehicle are safely stopped by the safety control system.

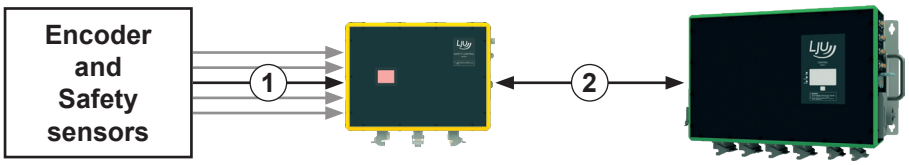

Fig. 1: Evaluation of connected encoders and safety sensors

1 Connection of external encoders and safety sensors to safe digital inputs of the SCM
2 Data exchange with the vehicle control system

Messages are shown directly in the display of the SCM and, if programmed, are output in the display of the connected vehicle control system and reported to the higher-level system controller.

Externally actuated peripherals (e.g. signal lights) can optionally be actuated directly by the SCM. Devices to be actuated are connected to safe outputs of the SCM for this purpose.

4.2 Structure

The mobile safety controller SCM is a compact device. The most important components of the SCM are shown in the figure below.

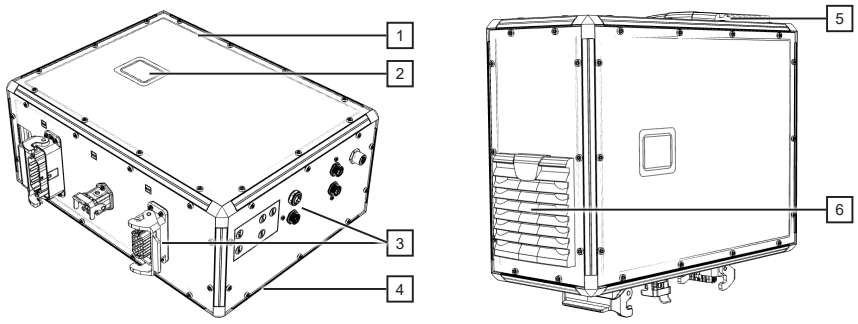

Fig. 2: SCM basic device

1 Housing with internal electronics and safety module SMX
2 Display window
3 The electrical connections are led out of the device in the form of industrial plug-in connectors
4 4 mounting holes on the rear of the device
5 Outlet filter on the top of the device
6 Filter fan on the left side of the device

4.3 Type label

The following figure shows the layout of a device type label.

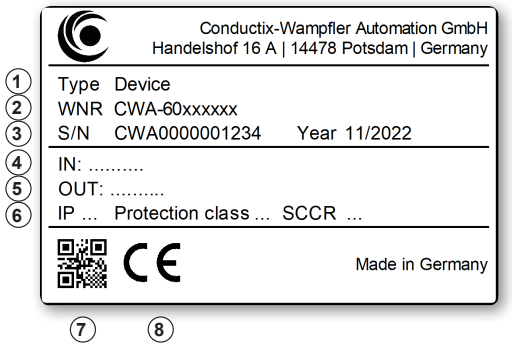

Fig. 3: Device type label

1 Model name
2 WNR item number
3 Serial number, year of construction
4 Input data
5 Output data
6 Protection type, protection class, short-circuit current
7 QR-Code (serial number)
8 CE marking

5 Transport and storage

5.1 Transport

NOTICE!

Transport

Incorrect or improper transport may cause damage to the device.

- Only trained personnel are allowed to transport the device.
- If necessary, use suitable transport aids.
- Transport the devices with utmost care.
- Observe the symbols on the packaging.
- Do not remove packaging and transport securing devices until you are ready to start with the installation.

5.2 Transport inspection

Check the delivery for completeness and transport damage upon receipt.

Proceed as follows in case of any apparent damage:

- Refuse to accept the delivery or accept it only conditionally. Take note of the extent of the damage and write it down on the carrier's transport documents or delivery note.
- Initiate a complaints process and report the incident to the supplier. If Conductix-Wampfler Automation is your direct supplier you will find our contact information in this document.
  ↳ *Chapter 'Customer service and addresses' on page 59*

Claims for damages

Claim any defect as soon as it becomes apparent. Damages can only be claimed within the applicable claim periods.

5.3 Storage

NOTICE!

Storage

Incorrect or improper storage may cause damage to the device.

- Cover connections with protective caps during storage.
- Avoid mechanical stress and vibrations.
- Store in a dry and dust-free location.
- Regularly check the condition of the stored device.
- Keep environmental conditions as specified in the technical information.
- Keep the storage temperature as specified in the technical information.

6 Mechanical installation

Objective

This section provides details on the mechanical installation. Electrical installation is possible following successful mechanical installation.

Responsible party

The system integrator (e.g. system builder, operator) is responsible for trouble-free and safe installation. As the contact person, he responds to all the fitter's queries regarding safe-to-use equipment; e.g.:

- Fire protection
- Electrical equipment
- Ladders and scaffolding
- Requirements for assembly tools
- Lifting and transportation

Required personnel

Due to their training and experience, only qualified and appropriately instructed personnel are able to correctly assess the respective initial situation, identify risks and avoid hazards.

Personnel required for installation:

- Adequately qualified fitter

Required personal protective equipment

The person responsible must ensure that the personnel under his responsibility are wearing the required personal protective equipment. The required personal protective equipment satisfies the requirements for the work to be carried out and all the requirements demanded by the scope of work.

Personal protective equipment that fulfils its intended purpose:

- protects its wearer from injury;
- reduces the seriousness and severity of potential injuries.

Wear:

- Work protection clothing
- Safety shoes
- Protective gloves
- Protective goggles

Safety in the work area

- Note the safety signs in the area around the system.
- Pay attention to the safety notes in additional applicable documentation (supplier documents).

Work safety

Pay attention to company and task-specific work safety regulations, as well as the country-specific legal and safety regulations applicable at the location of use.

Wear additional protective equipment

As an employee, you wear protective equipment supplied by the area supervisor. If work tasks have been delegated only temporarily, then you also wear any protective equipment that has become additionally required.

Special hazards

⚠ WARNING!

Live parts

Should the safety control system be installed near exposed supply cables (e.g. conductor lines), there is an immediate danger to life if live parts are touched.

- Before carrying out any work on the safety control system, disconnect the system from the power supply and secure the system against being switched on again.
- Work on electrical components may only be carried out by qualified electricians or persons instructed and supervised by a qualified electrician in accordance with the electrical engineering regulations.

⚠ WARNING!

Danger of falling

Danger of falling if the control system is mounted on typical assembly sites of a monorail.

- Provide safe ascent for all activities on the control system.
- Always use certified climbing aids.

⚠ WARNING!

Falling loads

Risk of fatality due to falling objects

- Do not stand under loads.
- Seal off areas of mechanical installation.
- Seal off danger areas.

6.1 Open spaces and cooling

Clearance

To ensure air circulation for cooling the SCM, make sure there is sufficient clearance around the SCM.

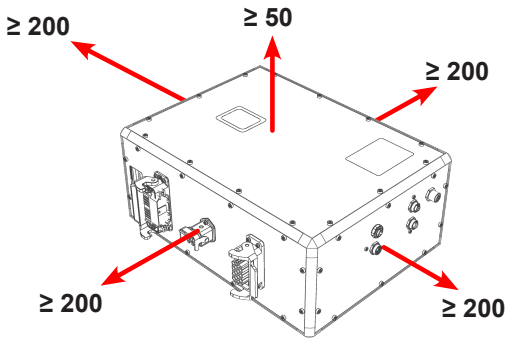

Fig. 4: Clearances around the SCM (mm)

Clearance

Maintaining this clearance also provides the required space for installation.

Cooling

To ensure the cooling of the SCM, make sure that there is a sufficient air supply via the filter fan on the left side of the device and an unobstructed heat dissipation via the outlet filter on the top of the device.

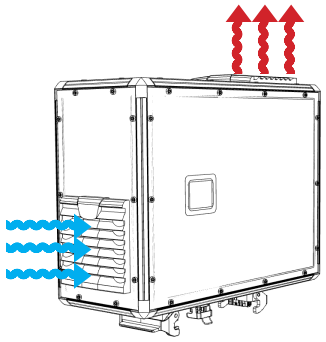

Fig. 5: Cooling

In addition, unobstructed heat dissipation through the rear side of teh device must be ensured. Adequate convection is to be ensured through a large-surface-area connection on a heat-dissipating bearing or by means of adequate air circulation.

Preventing heat sources
Prevent sources of heat in the immediate vicinity of the control system.

Device drawing
A detailed [GER] device drawing is enclosed as a separate document.

6.2 Installation location and position

Installation location

The SCM is intended for direct installation on the material-handling vehicle.

Observe the following points for the installation location of the SCM:

- Observe the clearances for cooling.
- Choose the position of the SCM so that collisions with system components are excluded.
- Install the SCM in such way that connections are accessible at all times.
- Do not cover the display of the SCM.
- Do not cover air inlets and air outlets.

Installation position

The recommended installation position is horizontal or lying down.

- **horizontal** - The electrical connections of the device point downwards.
- **lying down** - The display points upwards.

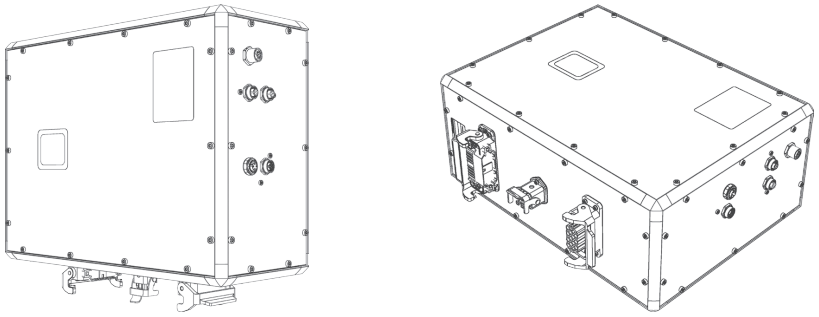

Fig. 6: Recommended installation positions

6.3 Installation

NOTICE!

Dampen impacts and vibrations

If the device is subjected to impermissible heavy impacts or vibrations, the amplitude and acceleration must be attenuated by means of appropriate measures.

- Use vibration-damping and vibration-eliminating systems.

Installation

Use exclusively the fixing holes of the SCM for fixing the SCM to the material-handling vehicle!

Install the SCM as follows:

1. Assemble suitable brackets on the material-handling vehicle for assembling the SCM.
2. Fix the SCM to the brackets by means of secure, non-loosening screw connections.

Fixing points

The SCM has four fixing holes on the rear of the device.

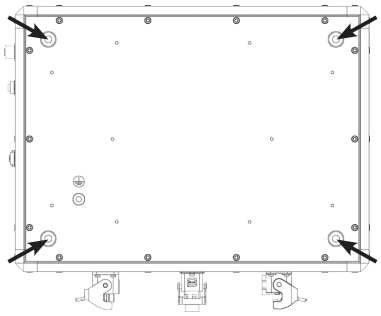

Fig. 7: Fixing holes

Number of fixing holes	4
Thread	M8
Max. screw depth	20 mm
Tightening torque	20 Nm

Mounting dimensions

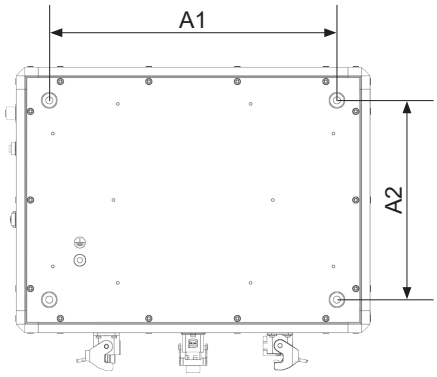

Fig. 8: Mounting dimensions

Housing dimensions (W × H × D)	A1	A2
400 mm × 300 mm × 171 mm	325 mm	225 mm
500 mm × 300 mm × 171 mm	425 mm	225 mm

Alternative attachment points

If the attachment points do not match those of the carrier unit, then other adapters are available for fixing upon request.

Device drawing

A detailed [GER] device drawing is enclosed as a separate document.

7 Electrical installation

Objective

This section provides details on the electrical installation. Commissioning is possible following successful electrical installation.

Responsible party

The system integrator (e.g. system builder, operator) is responsible for trouble-free and safe electrical installation. As the contact person, he responds to all the fitter's queries regarding safe-to-use equipment; e.g.:

- Fire protection
- Electrical equipment
- Ladders and scaffolding
- Requirements for assembly tools

Required personnel

Due to their training and experience, only qualified and appropriately instructed personnel are able to correctly assess the respective initial situation, identify risks and avoid hazards.

Personnel required for electrical installation:

- Qualified electrician
- Adequately qualified fitter under the direction and supervision of a qualified electrician

Required personal protective equipment

The person responsible must ensure that the personnel under his responsibility are wearing the required personal protective equipment. The required personal protective equipment satisfies the requirements for the work to be carried out and all the requirements demanded by the scope of work.

Personal protective equipment that fulfils its intended purpose:

- protects its wearer from injury;
- reduces the seriousness and severity of potential injuries.

Wear:

- Work protection clothing
- Safety shoes
- Protective gloves
- Protective goggles

Safety in the work area

- Note the safety signs in the area around the system.
- Pay attention to the safety notes in additional applicable documentation (supplier documents).

Work safety

Pay attention to company and task-specific work safety regulations, as well as the country-specific legal and safety regulations applicable at the location of use.

Wear additional protective equipment

As an employee, you wear protective equipment supplied by the area supervisor. If work tasks have been delegated only temporarily, then you also wear any protective equipment that has become additionally required.

Special hazards

⚠ WARNING!

Live parts

Should the safety control system be installed near exposed supply cables (e.g. conductor lines), there is an immediate danger to life if live parts are touched.

- Before carrying out any work on the safety control system, disconnect the system from the power supply and secure the system against being switched on again.
- Work on electrical components may only be carried out by qualified electricians or persons instructed and supervised by a qualified electrician in accordance with the electrical engineering regulations.

⚠ WARNING!

Danger of falling

Danger of falling if the control system is mounted on typical assembly sites of a monorail.

- Provide safe ascent for all activities on the control system.
- Always use certified climbing aids.

7.1 Electrical connection procedure

NOTICE!

Damage to the device

Improper device connection may result in damage.

- De-energise the device prior to working on it!

NOTICE!

Malfunctions due to improper device connection

Improper device connection may lead to malfunctions during operation.

- Always follow the connection instructions.

Perform the following steps to make the electrical connection of the SCM:

1. Earth the SCM.
2. Connect the SCM electrically.

Connection diagram

A detailed connection diagram [ANS] is enclosed as a separate document.

7.2 Earthing the SCM

The device must be earthed in order to operate correctly. To do this, connect the PE connection on the rear of the device to the system PE in accordance with EN 60204-1.

The PE connection is marked by the symbol for protective earth ⏚.

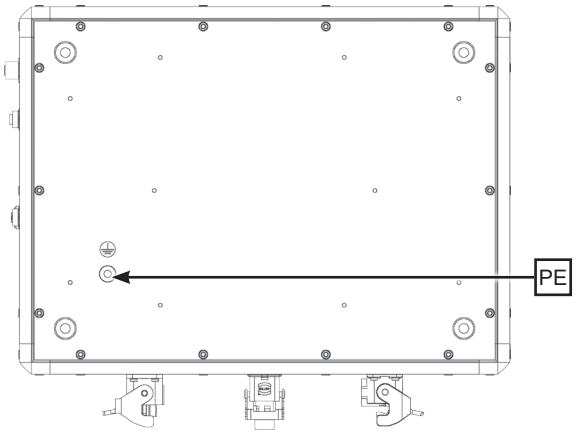

Fig. 9: PE connection

Threaded hole	M6, 16 mm deep
Tightening torque	6 Nm max.
Cable type	Green/yellow insulated single-core wire
Wire cross-section	2.5 mm^2 min.

7.3 Connect the SCM electrically

⚠ WARNING!

Improper connection of the SCM

Improper device connection may lead to malfunctions during operation.

- The SCM mobile safety control system is intended for connection to a vehicle control system belonging to the project.
  - □ Only connect the SCM to the vehicle control system belonging to the project.
  - □ The WNR number (60.....) of the vehicle control system associated with the project is indicated in the *'Remarks:'* section on the title page of SCM's connection diagram.
- Disconnect the SCM from the power supply before carrying out any work on the SCM!
- Be sure to follow the connection instructions.

Connect the SCM electrically as follows:

1. Ensure that no voltage is present before connecting.
   - Switch off the associated vehicle controller.
2. Connect the SCM with the vehicle controller and connect sensors and external peripherals.
   - Only connect the vehicle controller and external components to the SCM according to the connection diagram *[ANS]*.
   - To ensure that the protection class is achieved, only use the supplied plugs and threaded M12 plug connectors.
   - Secure plug connections against accidental loosening by means of appropriate safeguards (brackets, screw caps).
   - Do not connect cables under tension. Use strain reliefs.

Connection diagram

A detailed connection diagram [ANS] is enclosed as a separate document.

8 Commissioning

Objective

This section provides details on correct commissioning. Daily operation can start following successful commissioning.

Responsible party

The system integrator (e.g. system builder, operator) is responsible for trouble-free and safe commissioning. As the contact person, he responds to all the commissioner's queries regarding safe-to-use equipment; e.g.:

- Fire protection
- Electrical equipment
- Ladders and scaffolding

Required personnel

Due to their training and experience, only qualified and appropriately instructed personnel are able to correctly assess the respective initial situation, identify risks and avoid hazards.

Personnel required for commissioning:

- Staff of Conductix-Wampfler Automation GmbH
- Sufficiently trained specialist personnel

Required personal protective equipment

The person responsible must ensure that the personnel under his responsibility are wearing the required personal protective equipment. The required personal protective equipment satisfies the requirements for the work to be carried out and all the requirements demanded by the scope of work.

Personal protective equipment that fulfils its intended purpose:

- protects its wearer from injury;
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Pay attention to company and task-specific work safety regulations, as well as the country-specific legal and safety regulations applicable at the location of use.

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As an employee, you wear protective equipment supplied by the area supervisor. If work tasks have been delegated only temporarily, then you also wear any protective equipment that has become additionally required.

Special hazards

⚠ WARNING!

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- Work on electrical components may only be carried out by qualified electricians or persons instructed and supervised by a qualified electrician in accordance with the electrical engineering regulations.

⚠ WARNING!

Danger of falling

Danger of falling if the control system is mounted on typical assembly sites of a monorail.

- Provide safe ascent for all activities on the control system.
- Always use certified climbing aids.

8.1 Commissioning the SCM

⚠ WARNING!

Danger due to erroneous configuration and programming

If the safety controller is commissioned without valid configuration, programming and validation of the safety functions or changes are made to the configuration or the programming at a later date, there is a direct risk to life.

- The safety controller may only be configured, programmed and commissioned by specially trained experts who have been authorised by the system manufacturer or the system operator.

The commissioning and the associated implementation of the required safety functions takes place by means of system-specific configuration, programming, verification and validation of the safety module SMX (safety controller from BBH PRODUCTS) in the device.

Configuration, programming, verification and validation of the BBH safety controller take place using SafePLC software.

- **Configuration and programming**
  The BBH safety controller has projekt-dependent configuration and function-dependent programming. Parameters are set and hardware is logically linked together.
- **Verification**
  All settings and links are checked for correctness and logic, saved in a configuration file and a program file and then transmitted to the BBH safety controller.
- **Validation**
  In order to complete the commissioning, all parameters and links for safeguarding the programmed safety functions are re-checked, approved and documented in a validation report.

8.1.1 Commissioning by Conductix-Wampfler Automation GmbH

If the safety control system is configured, programmed and commissioned by Conductix-Wampfler Automation GmbH, it is handed over with a valid safety project after commissioning. This means that

- A system-specific safety project has been created and saved in a project file.
- A valid safety project is uploaded to the safety control system.
- Safe operation is guaranteed.

Note

If the safety control system has been commissioned by Conductix-Wampfler Automation GmbH and changes are subsequently made to the configuration or programming, then the person who made the changes shall be responsible and liable for the correct function and safe operation of the safety control system.

8.1.2 Commissioning by the customer/system manufacturer

If the safety control system is commissioned by the customer/system manufacturer, a valid safety project must be loaded in the safety control system before commissioning.

Chapter 'Transferring a safety project' on page 39

Note

A valid safety project was created by Conductix-Wampfler Automation GmbH following initial commissioning and handed over to the customer/system manufacturer, but it can also be requested subsequently through our customer service.

8.2 Transferring a safety project

For commissioning and updating purposes or after replacing the safety control system, it is necessary to transfer a valid safety project to the safety control system.

Note

The following instructions describe how to transfer a safety project using the software 'SafePLC²' from a project file.

It is not possible to modify the project.

Requirement

The following is required to transfer the safety project:

- Service computer with SafePLC software installed *'SafePLC²'* from BBH PRODUCTS
- Project file *.slp2
- Network cable
- Optional adapter (depending on the type of service interface)
  see ANS connection diagram

Program overview

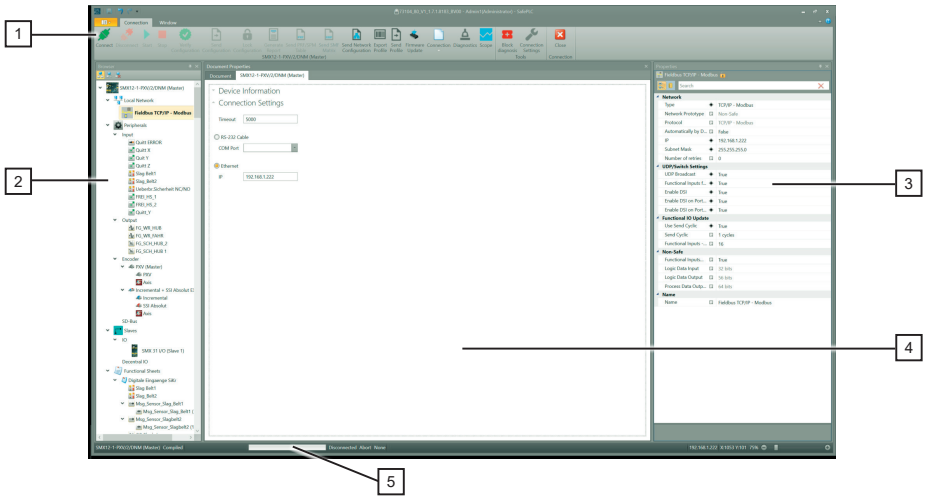


Fig. 10: SafePLC² - program overview

1 Menu bar
2 Project browser
3 Properties window
4 Work area
5 Progress indicator

Procedure

⚠ WARNING!

Unexpected movements

Unexpected movements of vehicles and machines in the system area can lead to serious injuries and material damage.

Make sure that no vehicles and machines in the immediate vicinity can perform unexpected movements or start up automatically while work is carried out on the safety control system.

- Stop vehicles and machines in the system area.
- Secure vehicles and machines to prevent them from starting up and restarting automatically.

Transfer the safety project to the safety control system as follows:

1. Connect the service computer to the service interface of the safety control system.
   ↳ see ANS connection diagram
2. Open the project file with the SafePLC software and confirm the message *'Dongle not found'*.
3. Query the IP address in the project.
   - Select the fieldbus interface under item *[Local Network]* in the project browser and open the properties by clicking the left mouse button.
   - You can find the *[IP]* in the Properties window.
4. Connect the SafePLC software to the safety control system.
   - Press the button *[Device Interface]* in the menu bar.
   - Press the button *[Connection Settings]* in the menu bar.
   - As an interface, select *[Ethernet]* and enter the IP address.
   - Press the button *[Connect]* in the menu bar and, in the dialogue that then appears, enter the *[SMX Serial no.]* of the safety control system as a password.
     ↳ You can find the "SMX Serial no." on the additional sticker on the underside of the device of the safety control system.
   - Confirm the alert message *'Differing configuration'*.

   ⇨ The SafePLC software is connected to the safety control system.
5. Stop the monitoring program in the safety control system.
   - Press the button *[Stop]* in the menu bar.

   ⇨ The monitoring program is stopped.
   [5] is shown in the safety control system display.

6. Transfer the new safety configuration to the safety control system.

- Press the button *[Send Configuration]* in the menu bar.

⇨ The security configuration is transferred.
Wait until the configuration has been completely transferred.
↳Observe the progress bar at the bottom of the program window.

7. Transfer the new network configuration to the safety control system.

- Press the button *[Send Network Configuration]* in the menu bar.

⇨ The network configuration is transferred.
Wait until the configuration has been completely transferred.
↳Observe the progress bar at the bottom of the program window.

8. Verify the new configuration.

- Press the button *[Verify Configuration]* in the menu bar.

⇨ The configuration of the safety project is compared with the project in the safety control system. If the configurations match, start the safety control system.

9. Start the safety control system.

- Press the button *[Start]* in the menu bar.

⇨ The safety control system is started and runs through a start-up sequence.
The safety control system is ready for operation when *[4]* is shown in the display.

10. Disconnect the connection to the safety control system.

- Press the button *[Disconnect]* in the menu bar.
- Close the SafePLC software.
- Disconnect the cable connection from the service computer to the safety control system.

11. Check the safety control system for correct functioning and finally return the system to normal/automatic mode.

9 Operation

Special hazards

⚠ WARNING!

Operation only with valid configuration and programming

If the safety controller is operated without system-specific and function-dependent configuration, programming and validation of the safety functions, there is a direct risk to life.

- Check the safety controller for valid configuration, programming and validation of the safety functions before operation.

⚠ WARNING!

Danger to life from non-functioning safety devices!

Security devices ensure a maximum degree of safety during operation. Safety can only be guaranteed if the safety devices are intact.

- Never override safety devices.
- Before starting work, check whether the safety devices are fully functional.
- Report any faulty safety devices immediately.
- Get faulty safety devices repaired immediately.

9.1 Switching the SCM on and off

The SCM is connected to the vehicle control system of the material-handling vehicle and is supplied with voltage by it. When the vehicle control system is switched on, the SCM is in operation.

9.1.1 Switching the SCM on

To switch on the SCM, switch on the vehicle control system.

⇨ The configuration is loaded and the monitoring program is started.

The SCM is ready for operation if [4] appears on the display.

9.1.2 Switching the SCM off

To switch off the SCM, switch off the vehicle control system.

A hard power-off of the SCM is also possible. No data is lost.

9.2 Operation

The safety controller does not have any control elements.

If the safety controller is operating normally without errors, all safety functions are active in accordance with the programmed logic.

9.3 Displays

Individual operating statuses are displayed alphanumerically using the 7-segment display of the BBH safety controller and can be read off in the display window of the safety controller.

9.3.1 Start displays

A start sequence is run through during the starting procedure.
Status messages are displayed one after the other in the display window until the system is in normal operation (display *[4]*):

Fig. 11: Start displays

Note

Displays may vary depending on the project!
Not all displays need to appear during the starting procedure.

The following table lists the most important start displays.

Display	Designation	Description
[1]	*STARTUP*	System start with checking and loading of the configuration/firmware data
[2]	*SENDCONFIG*	Distribution of the configuration/firmware data and re-checking of this data. Then range checking of the configuration data is carried out.
[3]	*STARTUP BUS*	Initialization of the bus system
[b]	*STATUS BUS*	Bus status messages during initialization
[4]	*RUN*	System started, safety controller operating normally without errors

9.3.2 Operating display

If the safety controller is operating normally without errors, [4] appears in the display window:

Fig. 12: Display during normal operation

Display	Designation	Description
[4]	*RUN*	Safety controller operating normally without errors. All safety functions are active in accordance with the programmed logic.

9.3.3 Error indicators

In the event of an error, the error type is displayed as a letter in the display window, followed by five individual digits (1 x module no. + 4 x error code). The error is displayed repeatedly until the cause has been remedied and the error has been acknowledged.

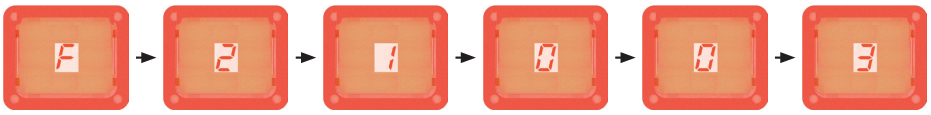


Fig. 13: Error display example 'F1003' in module 2

Display	Designation	Description
[F]	Error type	**F** *[Fatal Error]* - serious exception error **A** *[Alarm]* - functional error **E** *[ECS Alarm]* - sensor alarm message
[2]	Module no.	Number of the internal slave module in which the error occurred
[1][0][0][3]	Four-digit error code	Coded error or alarm message

Detailed information about error types and error codes as well as information about the error causes and troubleshooting can be found in the 'SMX error list'.

↳ *The error list is enclosed with this description as a separate document.*

10 Faults, maintenance, service

Personnel

Maintenance, cleaning and servicing must only be performed by trained and qualified personnel. Personnel who are to be trained or instructed are only allowed to perform activities under the constant supervision of a trained and qualified individual.

Special hazards

⚠ WARNING!

Live parts

Should the safety control system be installed near exposed supply cables (e.g. conductor lines), there is an immediate danger to life if live parts are touched.

- Before carrying out any work on the safety control system, disconnect the system from the power supply and secure the system against being switched on again.
- Work on electrical components may only be carried out by qualified electricians or persons instructed and supervised by a qualified electrician in accordance with the electrical engineering regulations.

10.1 Faults

Faults are displayed as error and alarm messages in the display window of the SCM:

- **F** *[Fatal Error]* – serious exception error
- **A** *[Alarm]* – functional error
- **E** *[ECS Alarm]* - sensor alarm message

see also ↬ *Chapter 'Displays' on page 45*

If prgrammed error and alarm messages are also displayed in the display of the connected vehicle controller and output to the system controller.

Detailed information about error types and error codes as well as information about the error causes and troubleshooting can be found in the 'SMX error list'.

↬ *The error list is enclosed with this description as a separate document.*

10.2 Function testing

In order to provide safety, the user must carry out regularly a function test of the safety functions.

Function testing:

- Test the modules used in the parametrisation of the BBH safety controller (inputs, outputs, monitoring functions and logic modules) with regard to their functionality or shut-off.
- Every change made to the system requires adaptation of the safety functions!
  Check whether the modules used in the parametrisation still comply with the requirements of the current system specification.

Prescribed interval

- 12 months

Detailed information can be found in the programming manual for the BBH safety controller SMX.*
Download: www.bbh-products.de

** BBH safety controller SMX wich is used depends on the project and can be found in the delivered safety project*

10.3 Maintenance and cleaning

10.3.1 Maintenance

NOTICE!

Mechanical loads may lead to device failure.

- Check the device for damage at regular intervals.
- Opening the device for testing purposes is not intended.

Service the device as follows:

- **Brackets**
  - □ Check for loose connections.
- **Connections**
  - □ Check for loose connections.
  - □ Check cable insulation.
  - □ Cover any ports not being used.
- **Indicators**
  - □ Remove soiling.
- **Recommended maintenance interval**
  - □ 6 months

10.3.2 Cleaning

NOTICE!

Damage to the device due to improper cleaning

- Do not use any cleaning agents, such as methylated spirits, or other cleaners!
- Do not clean with sharp objects!

Clean the device as follows:

- **Device**
  - □ Clean with dry cloths only.
- **Recommended cleaning intervals**
  - □ 6 months

10.3.3 Fan - check and change the filters

According to the level of dust exposure, the filter of the filter fan and the outlet filter must be check regularly and replaced as necessary.

Manufacturer recommendation:

- Check at the latest after 2000 operating hours

For detailed information on replacing the filters, please refer to the manufacturer's manual.
www.rittal.com

Used fan type: Chapter 'Technical Data' on page 55

10.4 Removing/replacing the SCM

10.4.1 Removing the SCM

Remove the safety controller as follows:

1. Switch off the safety controller.
   - To do this, switch off the power supply for the safety controller.
2. Disconnect all electrical plug-in connectors from the safetay controller.
3. Dismantle the safety controller.
4. If the safety controller is subsequently going to be disposed of, pay attention to the disposal information.
   Chapter 'Disposal' on page 53

10.4.2 Replacing SCM

⚠ WARNING!

Commissioning only with valid configuration and programming

If the safety controller is commissioned without valid configuration, programming and validation of the safety functions, there is a direct risk to life.

- The safety controller may only be commissioned by specially trained experts who have been authorised by the system manufacturer or the system operator.
- Check the safety controller for valid configuration, programming and validation of the safety functions before commissioning.
- A safety controller is configured, programmed and validated in a system-specific way. All settings are saved in a configuration file and a program file. Following repair or replacement of the controller, the saved configuration and the saved program must be re-transmitted to the controller.

Note

A valid safety project was created by Conductix-Wampfler Automation GmbH following initial commissioning and handed over to the customer/ system manufacturer, but it can also be requested subsequently through our customer service.

Replace the safety controller as follows:

1. Switch off the safety controller.
   - To do this, switch off the power supply for the safety controller.
2. Disconnect all electrical plug-in connectors from the safety controller.
3. Dismantle the safety controller.
4. Check the new safety controller for transport damage.
5. Check the device type of the new safety controller.
6. Mechanically install the new safety controller.
   ↳ *Chapter ‘Mechanical installation’ on page 21*
7. Make the electrical connections of the new safety controller.
   ↳ *Chapter ‘Electrical installation’ on page 29*
   Pay attention to the connection plan ANS!
8. Commission the new safety controller.
   ↳ *Chapter ‘Commissioning’ on page 35*
   Ensure that the system-specific safety project is valid!

10.5 Opening the SCM

In general, opening the safety controller is neither necessary nor intended. If the safety controller needs to be opened, please pay attention to the following instructions.

Removing the front panel

Special tool: ■ Torx TX10 torque screwdriver

1. Switch off the power supply to the safety controller.
2. Unscrew all fixing screws of the front panel using the Torx screwdriver, and carefully remove the front panel.

Fitting the front panel

Special tool: ■ Torx TX10 torque screwdriver

1. Fit the front panel to the safety controller and align it correctly.

   Pay attention to the position of the display window!
2. Fit the front panel using the fastening screws. Tighten the screws with a max. torque of 1.5 Nm.

10.6 Repairing the SCM

If you need to repair the device, please refer to your closest service partner or contact Conductix-Wampfler Automation GmbH directly.

Chapter 'Customer service and addresses' on page 59

Repairs

Faulty devices may only be repaired by Conductix-Wampfler staff or specialists trained by Conductix-Wampfler.

In the event of repairs by unauthorised persons, all warranty claims against Conductix-Wampfler Automation GmbH are invalidated.

11 Disposal

If no return or disposal agreements exist, the individual components are to be properly dismantled and then separated and disposed of pursuant to current regulations or taken for recycling.

The device comprises electric and electronic components. Separate and dispose of them according to applicable provisions.

Follow the hazardous materials directive, in particular the regulations on handling hazardous materials.

♲ Materials designated for recycling are to be disposed of as per the respective recycling procedure.

12 Technical Data

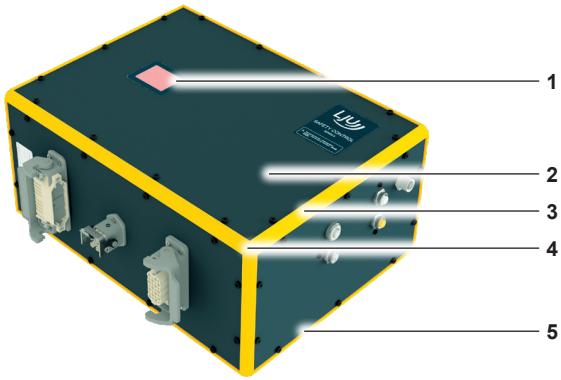
12.1 General information

Installation data

Place of installation	on the material-handling vehicle.
Fixing	4 × Fixing hole M8, 20 mm deep Tightening torque 20 Nm max.
Housing dimensions * W × H × D	400 mm × 300 mm × 171 mm 500 mm × 300 mm × 171 mm
Weight *	7.2 kg min. to 10.0 kg max.
Cooling	active cooling with fan: Rittal filter fan SK 3237.124 and outlet filter SK 3237.200
Protection class	IP 54

* depending on type and without additional brackets

Material



Nr.	Designation	Material
1	Display window	Plastic
2	Front and side panels	Aluminium
3	Edge profile	Aluminium with plastic cover ABS
4	Profile corner	ABS plastic
5	Mounting panel	Aluminium

Ambient conditions

Ambient temperature	+10 to +45 °C
Storage temperature	-10 to +50 °C
Relative humidity	< 80 % non-condensing

12.2 Electrical data

Electrical connection data

Supply voltage	24 V DC (-15 %, +20 %)
Current consumption *	3 A max.
External fuse protection **	min. 30 V DC, max. 3,15 A
Power consumption *	72 W max.
Reverse polarity protection	Yes
Protection class	III

* without additional consumers
** fuse in connected vehicle controller

Inputs/outputs *

Digital inputs	Nominal data: 24 V DC / 20 mA
Digital outputs	Nominal data: 24 V DC / 2 A
Relay outputs	Nominal data: 24 V DC / 2 A
Auxiliary outputs	Nominal data: 24 V DC / 250 mA

* Number depending on type

Interfaces

Hybrid Interface Power supply/data	Ethernet interface Protocol: UDP Transmission rate: 10 Mbit/s max.
Service interface	Ethernet interface Protocol: TCP/IP Transmission rates: 10/100/1000 Mbps

12.3 Technical safety key data

Safety module of the SCM

Method	Freely programmable and configurable modular safety controller
Manufacturer	BBH PRODUCTS GmbH
Type *	SMX11 COMPACT Safety controller SMX12 COMPACT Safety controller SMX100 MODULAR Safety controller
Safety key data	PI in accordance with EN 13849: PL e SIL in accordance with EN 61508: SIL 3
Display	7-segment LED, single-digit
Manufacturer's address	BBH PRODUCTS GmbH Böttgerstraße 40 92637 Weiden, Germany

Safety module of the SCM

Website	*www.bbh-products.de*

* SMX safety controller wich is used depends on the project and can be found in the delivered safety project

Detailed key data for the safety controller which is used can be found in the manufacturer's manuals and data sheets.
www.bbh-products.de

12.4 Connections and pin configuration

Connections and pin configuration depend on the type!
For connection designations, connection types and connection assignment (pin configuration), please refer to the connection diagram.

A detailed connection diagram [ANS] is enclosed as a separate document.

12.5 Cables

Cable requirement data cables (M12 connections)

Cable type	Data cable flexible, twisted pair, shielded
Wire cross section *	0.25 mm^2 min.

* * Also observe the manufacturer's specifications of the connected device!

Cable requirement signal cables (Harting plug connections)

Cable type	Data cable flexible
Wire cross section	0.75 mm^2

Network cable line regulation

Cable type	Network cable min. Cat. 5 in accordance with DIN EN 50173-1
Cable length	100 m max.

Cable requirement hybrid cable

Cable type	Hybrid cable Ethernet hybrid CAT5 (100 MBit/s), 8-pin, Y-coded M12 connector on Y-coded M12 connector, power with Ethernet (PWE)
Wire cross section	4x 0.15 mm^2 (data) 4x 0.6 mm^2 (supply)
Cable length	Max. 10,000 mm
Cable recommendation	Phoenix Contact Hybrid cable NBC-MSY/ 1.0-94H/MSY SCO

12.6 Approvals and standards

Conformity

Devices made by Conductix-Wampfler Automation GmbH have been designed to comply with EU directives. Please contact Conductix-Wampfler Automation GmbH if you wish to obtain a copy of the EU Declaration of Conformity.

12.7 Device drawing and connection diagram

Device drawing

A detailed [GER] device drawing is enclosed as a separate document.

Connection diagram

A detailed connection diagram [ANS] is enclosed as a separate document.

13 Customer service and addresses

Customer service

Our service team is available to provide technical information.

- **Conductix-Wampfler Automation - Service**
  Phone: +49 331 887344-15 | Fax: +49 331 887344-19
  E-mail: service.potsdam@conductix.com

Service forms

Service forms are available for download under www.conductix.com.

Please send completed service forms to service.potsdam@conductix.com.

Further contacts

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For further addresses of sales and service locations, visit:

- *www.conductix.com*

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