

Industrial Controls

Command/signaling devices SIRIUS ACT with PROFINET IO




System Manual

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

 DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.
 WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.
 CAUTION
indicates that minor personal injury can result if proper precautions are not taken.
NOTICE
indicates that property damage can result if proper precautions are not taken.


If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

 WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

1.1 Responsibility of the user for system configuration and functionality

The products described here have been developed to carry out safety-related functions as part of a complete plant or machine.

In general, a complete safety system consists of sensors, evaluation units, signaling devices and methods for safe tripping.

It is the responsibility of the manufacturer to ensure that the system or machine is functioning properly as a whole.

Siemens AG, its regional offices, and associated companies (hereinafter referred to as "Siemens") cannot guarantee all the properties of an overall installation or machine that has not been designed by Siemens.

Nor can Siemens assume liability for recommendations that appear or are implied in the following description. No new guarantee, warranty, or liability claims beyond the scope of the Siemens general terms of supply are to be derived or inferred from the following description.

1.2 Purpose of the manual

This manual describes the many different possible uses of the SIRIUS ACT devices with PROFINET IO and provides the following information:

Information about integrating the SIRIUS ACT devices with PROFINET IO into the system environment. Information about the principle of operation, selection, installation, and connection of the SIRIUS ACT devices with PROFINET IO plus technical data, e.g. dimension drawings.

The information in this manual enables you to configure and commission the SIRIUS ACT devices with PROFINET IO.

1.3 Required basic knowledge

A general knowledge of the following areas is needed to understand this documentation:

- Low-voltage controls and distribution
- Digital circuit logic
- Automation technology
- PROFINET
- TIA Portal
- Safety systems/technology

1.4 Scope of the manual

The manual is valid for the corresponding SIRIUS ACT (3SU1) command and signaling devices with PROFINET IO.

It contains a description of the devices that are valid at the time of publication.

1.5 Siemens Industry Online Support

Information and service

At Siemens Industry Online Support you can obtain up-to-date information from our global support database quickly and simply. To accompany our products and systems, we offer a wealth of information and services that provide support in every phase of the lifecycle of your machine or plant – from planning and implementation and commissioning, right through to maintenance and modernization:

- Product support
- Application examples
- Services
- Forum
- mySupport

Link: Siemens Industry Online Support (<https://support.industry.siemens.com/cs/ww/en>)

Product support

Here you will find all the information and comprehensive know-how for your product:

- **FAQs**

Our replies to frequently asked questions.

- **Manuals/operating instructions**

Read online or download, available as PDF or individually configurable.

- **Certificates**

Clearly sorted according to approving authority, type and country.

- **Characteristics**

For support in planning and configuring your system.

- **Product announcements**

The latest information and news concerning our products.

- **Downloads**

Here you will find updates, service packs, HSPs and much more for your product.

- **Application examples**

Function blocks, background and system descriptions, performance statements, demonstration systems, and application examples, clearly explained and represented.

- **Technical data**

Technical product data for support in planning and implementing your project.

Link: Product support (<https://support.industry.siemens.com/cs/ww/en/ps>)

mySupport

With "mySupport", your personal work area, you get the very best out of your Industry Online Support experience. Everything enables you to find the right information - every time.

The following functions are now available:

- **Personal messages**
Your personal mailbox for exchanging information and managing your contacts
- **Requests**
Use our online form for specific solution suggestions, or send your technical request direct to a specialist in Technical Support
- **Notifications**
Make sure you always have the latest information - individually tailored to your needs
- **Filter**
Simple management and re-use of your filter settings from Product Support and the Technical Forum
- **Favorites / Tags**
Create your own "knowledge base" by assigning "Favorites" and "Tags" to documents – simple and efficient
- **Entries last viewed**
Clear history of the entries you have most recently viewed
- **Documentation**
Configure and compile individual documentation concepts from different manuals – quickly and without complications
- **Personal data**
Change personal data and contact information here
- **CAX data**
Simple access to thousands of items of CAX data such as 3D models, 2D dimension drawings, EPLAN macros and much more.

1.6 Further documentation

SIRIUS product documentation

The range of technical documentation for the various SIRIUS products is available on the Internet (<https://support.industry.siemens.com/cs/ww/en/ps/16027>).

SIMATIC product documentation

The range of technical documentation for the various SIMATIC products and automation systems is available on the Internet (<http://www.siemens.com/simatic-tech-doku-portal>).

mySupport documentation

Using the mySupport "Documentation" function, you can compile your own "Documentation" from the manuals in Product Support. However, you can also include other Product Support content such as FAQs or characteristics in the documentation that you compile. You can therefore create your own manual by combining complete manuals or just excerpts from them. You can export the manual as a PDF file or in a format that can be post-edited.

You can find mySupport on the Internet (<http://support.industry.siemens.com/My/ww/en/documentation>).

1.7 DataMatrix code and Siemens Industry app

DataMatrix code

A DataMatrix code is lasered onto the SIRIUS ACT devices with PROFINET IO.

DataMatrix codes are standardized in ISO/IEC 16022. The DataMatrix codes on Siemens devices use ECC200 coding for powerful error correction.

The following device information is encoded in the DataMatrix codes as a bit stream:

- Article number
- Serial number
- If applicable, MAC address

This information is stored in the following format in the DataMatrix code:

1P	Article number	+	23S MAC address	+	S FID
Data identifier	Net content	Separator		Separator	

Note

The information content is displayed without spaces.

This machine-readable information simplifies and accelerates handling of the respective devices.

As well as fast access to the serial numbers of the respective devices for unique identification, the DataMatrix codes simplify communication with Siemens Technical Support.

SIEMENS Industry Support App

DataMatrix codes primarily enable extremely fast and convenient access to all the device-specific information available on an article number in the SIEMENS Service & Support Portal, such as operating instructions, manuals, data sheets, FAQs, etc.

We offer the SIEMENS Industry Support App free for this purpose. It can be used on most commercially available smartphones and tablets.

The SIEMENS Industry Support App is available for iOS and Android-based devices and can be accessed via the following links:



Android



iOS

1.8 Recycling and disposal

These devices can be recycled thanks to their low pollutant content.

For environmentally compatible recycling and disposal of your old device, contact a company certified for the disposal of electronic waste.

1.9 Technical Assistance

Up-to-the-minute information

You can obtain further assistance by calling the following numbers:

Technical Assistance:

Telephone: +49 (911) 895-5900 (8 a.m. to 5 p.m. CET)

Fax: +49 (911) 895-5907

or on the Internet at:

E-mail: (<mailto:technical-assistance@siemens.com>)

Internet: (<http://www.siemens.com/sirius/technical-assistance>)

Safety information

2.1 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions only form one element of such a concept.

Customer is responsible to prevent unauthorized access to its plants, systems, machines and networks. Systems, machines and components should only be connected to the enterprise network or the internet if and to the extent necessary and with appropriate security measures (e.g. use of firewalls and network segmentation) in place.

Additionally, Siemens' guidance on appropriate security measures should be taken into account. For more information about industrial security, please visit:
<http://www.siemens.com/industrialsecurity>

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends to apply product updates as soon as available and to always use the latest product versions. Use of product versions that are no longer supported, and failure to apply latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under:
<http://www.siemens.com/industrialsecurity>

2.2 General safety information

 **DANGER**

Hazardous voltage.

Will cause death or serious injury.

- Disconnect the system and all devices from the power supply before starting work.
- Secure against switching on again.
- Verify that the equipment is not live.
- Ground and short-circuit.
- Erect barriers around or cover adjacent live parts.

 **DANGER**

Hazardous voltage.

Will cause death or serious injury.

Qualified Personnel.

The equipment / system may only be commissioned and operated by qualified personnel. For the purpose of the safety information in these operating instructions, a "qualified person" is someone who is authorized to energize, ground, and tag equipment, systems, and circuits in accordance with established safety procedures.

 **WARNING**

Safe functional extra-low voltage

The 3SU1 modules with a supply voltage of 24 V DC must be operated with safe functional extra-low voltage (SELV, PELV). This means these modules may only be subjected to a voltage of U_m even in the event of a fault. The following applies to these 3SU1 modules: $U_m < 60.0 \text{ V}$.

You will find more detailed information about safe functional extra-low voltage in the data sheets of the power supplies to be used.

 **CAUTION**

Safe equipment operation

Safe operation of the equipment is only ensured with certified components.

NOTICE

Perform a function test

EMERGENCY STOP devices must always undergo a function test during commissioning before the plant is put into operation.

NOTICE

Radio interference

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take suitable measures.
--

Note

SIRIUS ACT devices with PROFINET IO are designed exclusively for installation and operation in weatherproof, stationary housings / control cabinets / enclosures in degree of protection > IP x4.

Note

LEDs and LED modules are designed solely for use with SIRIUS ACT devices. They are not suitable for use in domestic lighting systems.

Note

Always make sure that the components (particularly those with a holder, modules or actuator) are securely installed (free from vibration). Mount them on a support of at least 1 mm thickness.

Note

SIRIUS ACT with PROFINET is not VLAN-capable (Virtual Local Area Networking)

The interface modules can only be operated in a PROFINET line on which the VLAN functionality has been deactivated, i.e. without VLAN tagging. VLAN functionality is deactivated per default for all IE switches. The transmission of VLAN tags for individual ports can be deactivated for a single IE switch. Use this option to ensure that SIRIUS ACT with PROFINET is always operated at a port/in a PROFINET line for which the transmission of VLAN tags has been deactivated.

System description

3.1 SIRIUS ACT with PROFINET IO communication system

The SIRIUS ACT with PROFINET IO communication system has been designed to help you connect command and signaling devices to a control system. This system reduces the amount of wiring work required, enabling you to save time and resources.

Application area

SIRIUS ACT devices with PROFINET IO are always operated in combination with SIRIUS ACT command and signaling devices. This system can be used for any application involving programmable logic controllers (PLC) that have a PROFINET connection. It can also be used in combination with fail-safe CPUs that support the PROFIsafe protocol.

Customer benefits

Integration in STEP 7:

The SIRIUS ACT with PROFINET IO system is integrated in STEP 7. Visualization of the individual modules speeds up and simplifies the configuring process. If you do not have STEP 7, you can use a GSDML file to configure the system (possible only if the interface module is not fail-safe).

Integrated safety technology:

Thanks to the PROFIsafe communication integrated in the fail-safe interface module (3SU1 IM F), you can incorporate a device, e.g. the EMERGENCY STOP, as a fail-safe component. You can therefore create a system compliant with a safety category up to SIL 3 (PL e).

Tamper-proofing

SIRIUS ACT devices with PROFINET IO are rendered tamper-proof by the following properties:

- Use of original Siemens firmware
- Operating modes with predefined functions

Quick and easy installation:

Simply snap the modules onto the SIRIUS ACT command and signaling devices and then wire up the modules using a flat ribbon cable. This is done by inserting the end of the flat ribbon cable into the module and moving the lever until it engages. The modules are interconnected by this method. If you now connect up the 24 V DC power supply, you can test the system before connecting it to the controller.

High flexibility thanks to additional connection options (fail-safe interface module)

If your application includes other equipment apart from the SIRIUS ACT command and signaling devices, you can simply connect it up using the extra interfaces on the fail-safe interface module (3SU1 IM F). The following interfaces are provided:

- 4 digital inputs (DI)
- Digital output (DQ)
- Analog input (AI) optimized for the 3SU12 potentiometer

Ease of maintenance

The following features support maintenance:

- SIRIUS ACT modules can be mounted on / removed from the holder without the need for any additional accessories / tools. This means that you can quickly replace a (defective) device.
- When a device (interface module) is replaced, you do not need to re-wire it. The terminals can be disconnected from the defective device and then connected to the new device.
- The starting parameters including the safe PROFIsafe address (F-destination address), PROFINET parameters (IP address, PROFINET device names) and configuration are stored in the memory module. As a result, there is no need to enter these data again after a (fail-safe) interface module has been replaced.

3.2 Fail-safe automation systems and fail-safe modules

Fail-safe automation systems

Fail-safe automation systems (F systems) are used in plants with increased safety requirements. F systems control processes which can reach a safe state immediately by being shut down. In other words, F systems control processes which do not pose any danger for personnel or the environment when they are shut down directly.

Safety Integrated

Safety Integrated is the holistic safety concept for the automation and drive technology supplied by Siemens.

Proven automation technologies and systems are deployed for the purposes of safety. Safety Integrated contains the complete safety chain from encoder and actuator, fail-safe modules through to the controller, including the safety-oriented communication using standard fieldbuses. Drives and controllers also perform safety tasks in addition to their function tasks.

Fail-safe modules

Fail-safe modules assure a certain degree of residual error probability, i.e. fail-safe performance, that is specified by the corresponding SIL (Safety Integrity Level) or PL (Performance Level).

The F-CPU communicates with a fail-safe module using the PROFIsafe safety-related bus profile.

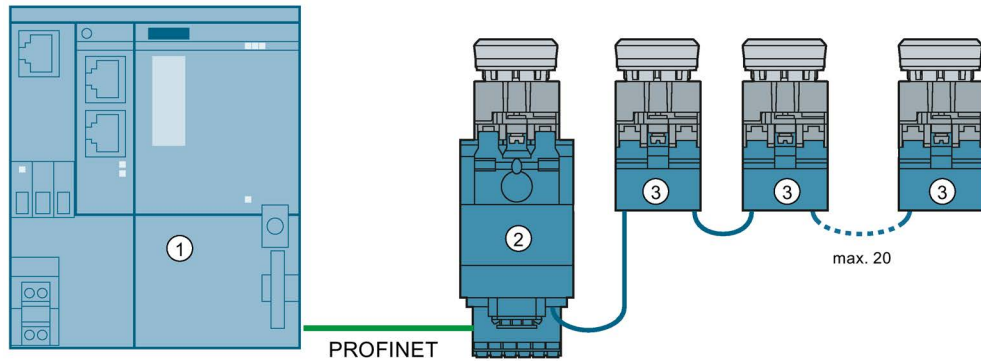
Scope of application of the fail-safe SIRIUS ACT with PROFINET IO interface module

The SIRIUS ACT fail-safe interface module can communicate with a fail-safe CPU by means of the PROFINET standard and the PROFIsafe bus profile. Safety-relevant information is transferred to the CPU via PROFIsafe. This fail-safe interface module can be used to integrate an EMERGENCY STOP that forms part of the safety chain.

3.3 Assembly

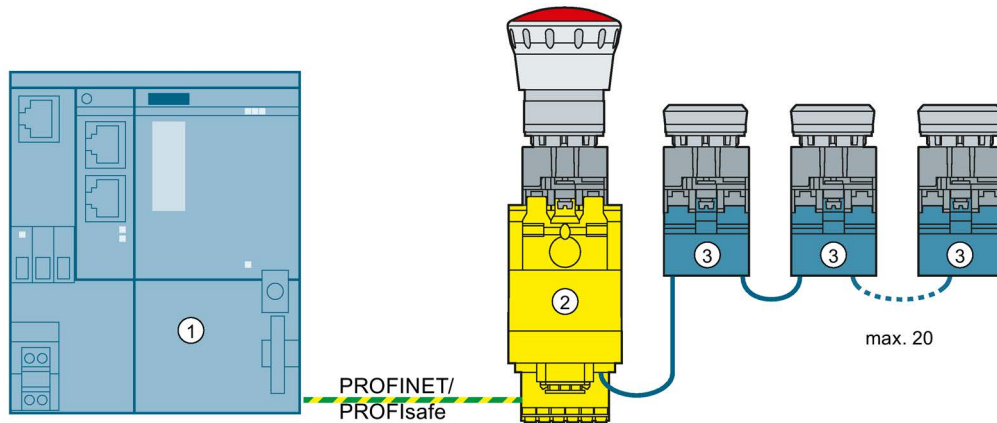
The diagrams below illustrate the available options for configuring SIRIUS ACT command and signaling devices.

Configuration with CPU, interface module and terminal modules (typical diagram)



- ① CPU / PLC
- ② Interface module
- ③ Terminal module (maximum 20)

Configuration with a fail-safe CPU, fail-safe interface module and terminal modules (typical diagram)



- ① F-CPU / PLC
- ② Fail-safe interface module
- ③ Terminal module (maximum 20)

The SIRIUS ACT communication solution enables you to connect command and signaling devices simply, quickly and with minimal wiring to a programmable logic controller (PLC).

Using PROFINET's open Industrial Ethernet standard, you will be able to set up complex input stations easily and efficiently. This system also permits the integration of safety functions via PROFIsafe, enabling you, for example, to integrate an EMERGENCY STOP quickly and simply without the need for additional hardware.

You do not need to address individual stations (SIRIUS ACT command and signaling devices). Thanks to "option handling", it is easy to extend an application without reconfiguring it, helping you to save time, resources and hardware.

The general system configuration comprises an interface module that establishes communication to the PLC via PROFINET, and up to 20 terminal modules. These modules are interconnected by a 7-wire standard flat ribbon cable. The entire system is supplied with 24 V DC. You only need to connect the supply voltage to the interface module.

The cabling for the entire system is maximum 10 m in length. The length of cable between two modules must not exceed 100 cm.

As regards configuration, you need only observe the following rules:

- If the application includes a safety-oriented device (e.g. EMERGENCY STOP), the fail-safe interface module must be mounted on this device.
- If the application does not include any safety-oriented device, you can mount the interface module on any SIRIUS ACT command and signaling device of your choice.
- The interface module is always the first station in the line-up. The terminal modules are then mounted downstream of the interface module in the sequence required for your application.
- The mounting sequence of individual modules can be visualized in the TIA Portal. This enables you to make a visual comparison between software and hardware.

3.4 Interface modules

The SIRIUS ACT interface module is used to establish communication between the controller and the SIRIUS ACT system. The interface module has an RJ45 socket to which the PROFINET cable can be connected.

The features of SIRIUS ACT interface modules are as follows:

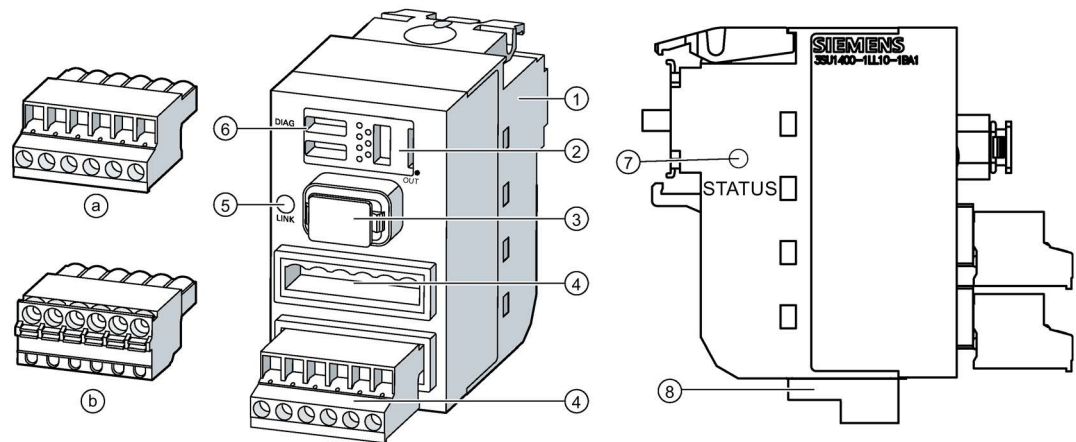
- Degree of protection IP20
- The Failsafe Interfacemodul for Command and signalling devices SIRIUS ACT with PROFINET IO (3SU1) is designed primarily for use with a SIRIUS ACT EMERGENCY STOP pushbutton. It can also be used with other standard SIRIUS ACT devices (mounted on a SIRIUS ACT holder).
- Easy installation
- The brightness of LEDs can be parameterized (SIRIUS ACT LED module).
- LED flashing frequency. The flashing frequency can be parameterized.
- One PROFINET interface
- Capable of firmware updates
- Further digital inputs, digital outputs and analog inputs are provided on the fail-safe interface module.
- You can use a flat ribbon cable to connect up to 20 terminal modules to the interface module.
- When a defect develops on the interface module, you can replace it without using a programming device thanks to the exchangeable memory module (supplied as standard with fail-safe interface module).

3.4.1 Fail-safe interface modules

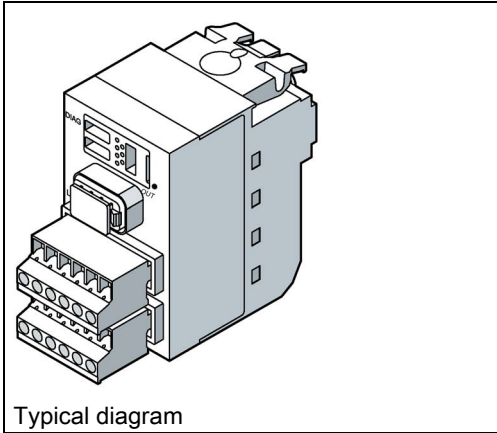
The Failsafe Interfacemodul for Command and signalling devices SIRIUS ACT with PROFINET IO (3SU1 IM F) can be used for applications with a safety level of up to SIL 3 (PL e). The 3SU1 IM F is mounted directly on the SIRIUS ACT command and signaling device that will be integrated in the safety chain. It is installed in the SIRIUS ACT 3-slot holder (article number: 3SU15.0-0AA10-0AA0).

Note

If the application includes a fail-safe device (e.g. EMERGENCY STOP pushbutton), the fail-safe interface module must be mounted on the fail-safe device.



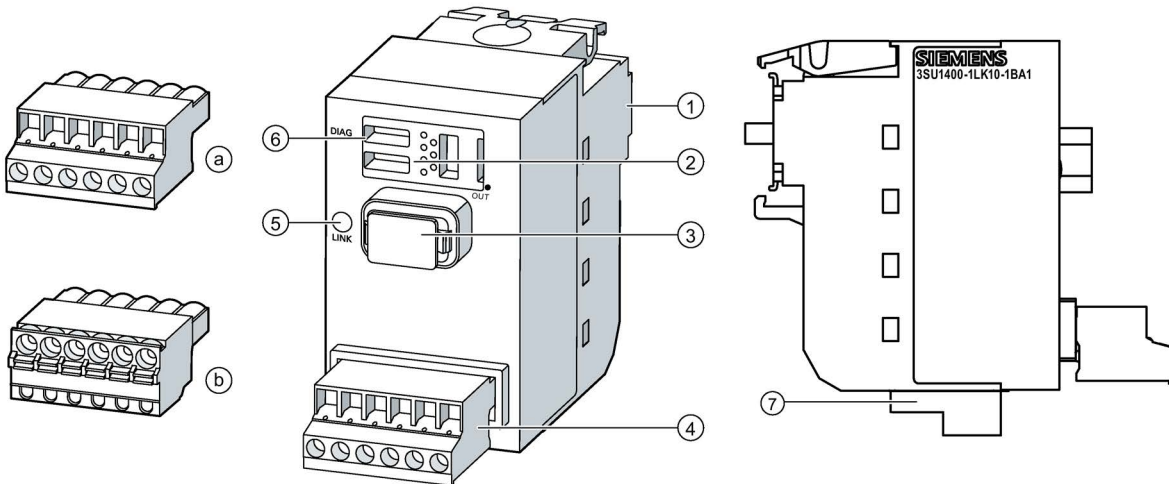
- ① Interface for mounting on the SIRIUS ACT 3-slot holder (article number: 3SU15.0-0AA10-0AA0).
- ② Interfaces for internal connections of SIRIUS ACT devices using optionally designed 7-wire flat ribbon cable (article number: 3SU1900-0K.80-0AA0).
- ③ Exchangeable memory module (3RK39310-AA00) supplied as standard.
- ④ Interfaces and power supply connected by screw terminals (a) or spring-loaded terminals (b):
 - 1 x digital output (DQ) as per IEC 60947-1
 - 4 x digital inputs (DI) as per IEC 60947-1 24 V DC / $I_e = 25$ mA short-circuit proof
 - 1 x analog input (AI) 10-bit A/D SIRIUS ACT potentiometer (article number: 3SU12.0-2P.10-1AA0)
 - 24 V DC power supply
- ⑤ LINK LED
The LINK LED indicates the status of PROFINET communication.
- ⑥ DIAG LED
The DIAG LED indicates the system state.
- ⑦ STATUS LED
The STATUS LED indicates the status of the fail-safe function.
- ⑧ Protective collar for PROFINET connection

 <p>Typical diagram</p>		Article number
	• Screw terminals	3SU1400-1LL10-1BA1
	• Spring-type terminals	3SU1400-1LL10-3BA1

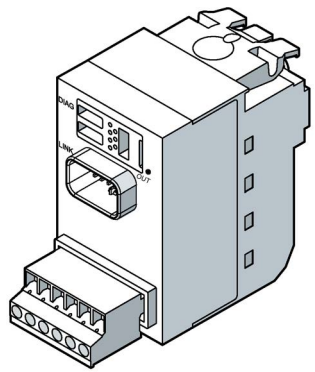
3.4.2 Interface modules

The interface module (3SU1 IM) can be mounted on any SIRIUS ACT command and signaling device. It is installed in the SIRIUS ACT 3-slot holder (article number: 3SU15.0-0AA10-0AA0).

The interface module (3SU1 IM) is used for applications without safety-oriented functions.



- ① Interface for mounting on the SIRIUS ACT 3-slot holder (article number: 3SU15.0-0AA10-0AA0).
- ② Interfaces for internal connections of SIRIUS ACT devices using optionally designed 7-wire flat ribbon cable (article number: 3SU1900-0K.80-0AA0).
- ③ Exchangeable memory module (optional accessories article number: 3RK3931-0AA00)
- ④ Interfaces and power supply connected by screw terminals (a) or spring-loaded terminals (b):
 - 24 V DC power supply
- ⑤ LINK LED
The LINK LED indicates the status of PROFINET communication.
- ⑥ DIAG LED
The DIAG LED indicates the system state.
- ⑦ Protective collar for PROFINET connection

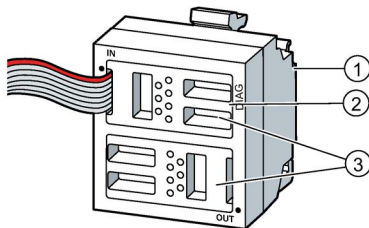
 <p>Typical diagram</p>		Article number
	<ul style="list-style-type: none"> • Screw terminals 	3SU1400-1LK10-1AA1
	<ul style="list-style-type: none"> • Spring-type terminals 	3SU1400-1LK10-3AA1

3.5 Terminal modules

With SIRIUS ACT terminal modules, you can simply use a 7-wire flat ribbon cable to connect SIRIUS ACT command and signaling devices to the interface module or other terminal modules - no special tools are required. The terminal modules are mounted on the 3-slot holder (article number: 3SU15.0-0AA10-0AA0) of the SIRIUS ACT product range. By combining terminal modules with interface modules, you can create a system that comprises up to 21 SIRIUS ACT command and signaling devices.

The features of SIRIUS ACT terminal modules are as follows:

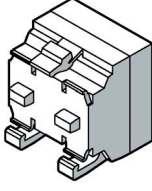
- Degree of protection IP20
- DIAG LED on rear panel
- Easy installation
- Integrated dimmable LEDs (command module and LED module, LED module)
- Flashing LEDs (command module and LED module, LED module)



- ① Interface for mounting on the SIRIUS ACT 3-slot holder (article number: 3SU15.0-0AA10-0AA0)
- ② DIAG LED
The DIAG LED indicates the module state.
- ③ Interfaces for internal connections of SIRIUS ACT devices using optionally designed 7-wire flat ribbon cable (article number: 3SU1900-0K.80-0AA0).

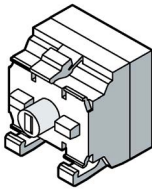
3.5.1 Command module

- Two spring contacts that are moved by the SIRIUS ACT actuator.
- Used on SIRIUS ACT command devices without illumination, e.g. pushbuttons, selectors.

 Typical diagram	Article number
	3SU1400-1MA10-1BA1

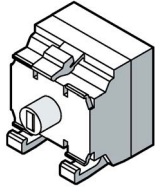
3.5.2 Command and LED module

- Two spring contacts that are moved by the SIRIUS ACT actuator, illumination LED (for illuminating command and signaling devices).
- 6 different colors: red, yellow, green, blue, white, amber
- Used on illuminable SIRIUS ACT command devices, e.g. illuminated pushbuttons, illuminable twin pushbuttons.

 Typical diagram		Article number
	• Amber	3SU1401-1MC00-1CA1
	• Red	3SU1401-1MC20-1CA1
	• Yellow	3SU1401-1MC30-1CA1
	• Green	3SU1401-1MC40-1CA1
	• Blue	3SU1401-1MC50-1CA1
	• White	3SU1401-1MC60-1CA1

3.5.3 LED module

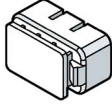
- Illumination LED (for illuminating command and signaling devices)
- 6 different colors: red, yellow, green, blue, white, amber
- Used on illuminable SIRIUS ACT signaling devices, e.g. indicator lights

 Typical diagram		Article number
	• Amber	3SU1401-1ME00-1DA1
	• Red	3SU1401-1ME20-1DA1
	• Yellow	3SU1401-1ME30-1DA1
	• Green	3SU1401-1ME40-1DA1
	• Blue	3SU1401-1ME50-1DA1
	• White	3SU1401-1ME60-1DA1

3.6 Accessories

3.6.1 Memory module

The memory module enables fast device replacement without engineering tools or specialist engineering know-how. The memory module is supplied as standard with fail-safe interface modules.

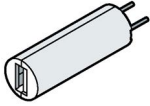
 <p>Typical diagram</p>	<p>Article number</p> <p>3RK3931-0AA00</p>
--	---

The following data are stored on the memory module by the interface modules.

- Fail-safe interface module:
 - F parameters (F address)
 - PROFINET parameters (IP address, PROFINET device names)
 - Configuration (option handling parameters)
- Interface module:
 - PROFINET parameters (IP address, PROFINET device names)
 - Configuration (option handling parameters)


3.6.2 Optionally integrated illumination LED

The optionally integrated illumination LED (for illuminating command and signaling devices) increases flexibility by allowing you to quickly replace the LED on the interface module.

 <p>Typical diagram</p>		Article number
	• Amber	3SU1401-3BA00-5AA0
	• Red	3SU1401-3BA20-5AA0
	• Yellow	3SU1401-3BA30-5AA0
	• Green	3SU1401-3BA40-5AA0
	• Blue	3SU1401-3BA50-5AA0
	• White	3SU1401-3BA60-5AA0

3.6.3 Flat ribbon cable

- 7-wire flat ribbon cable
- Pitch: 1.27 mm
- Cross section: 0.081 mm² (per stranded wire)

 <p>Typical diagram</p>		Article number
	• 5 m	3SU1900-0KQ80-0AA0
	• 10 m	3SU1900-0KP80-0AA0

Assembly

4.1 Notes on installation

Installation location

You may only install interface modules or terminal modules in enclosures, cabinets or electrical equipment rooms. These enclosures, cabinets or electrical equipment rooms must only be accessible using a key or tool. Access to them must be restricted to specially trained or authorized personnel. The ambient conditions for operation of the devices must be taken into account.

Note

SIRIUS ACT devices with PROFINET IO are designed exclusively for installation and operation in weatherproof, stationary housings / control cabinets / enclosures in degree of protection > IP x4.

Mounting position

You can mount SIRIUS ACT devices in any position. The preferred mounting position is vertical on a vertical wall.

SIRIUS ACT holder

Mount the SIRIUS ACT modules (interface and terminal modules) on the standard holder (three-slot holder) for the SIRIUS ACT pushbuttons and indicator lights.

You can only mount one interface module or one terminal module on a SIRIUS ACT device. You can simply snap the interface module and the terminal modules onto the SIRIUS ACT holder - no special tools are required. Use a flat-blade screwdriver to remove the modules.

Article designation of SIRIUS ACT standard holder:

- Metal holder: Article number 3SU1550-0AA10-0AA0
- Plastic holder: Article number 3SU1500-0AA10-0AA0

Installation of fail-safe devices

Please observe the following installation sequence when using fail-safe devices, e.g. EMERGENCY STOP:

1. Install the fail-safe interface module on the fail-safe device (e.g. EMERGENCY STOP):
2. Then install the terminal modules.

If you are using more than one fail-safe device in your application, you will need to install another fail-safe interface module and connect this interface module by means of a PROFINET SWITCH.

Permissible cable lengths

- The permissible cable length of the flat ribbon cable between modules is max. 1 m.
- The permissible cable length of the overall installation is max. 10 m.

Module combinations

The terminal modules can comprise a combination of contact, LED, test modules and support terminals or LED test modules. Observe the following sequence when installing:

1. First mount 3 standard modules next to each other on the holder.
2. Wire the 3 standard modules.
3. Then plug the terminal module (command module) into the second module tier.

The following applies to the 1st and 2nd tier:

- The 3 holder positions in the first tier must be occupied by 1-pole contact module / LED module / support terminal or LED test module.
- In the second tier it is possible to mount the terminal module (3SU1400-1MA10-1BA1), see Fig. "Mounting a terminal module with contact modules (typical example)" in chapter Combining terminal modules.

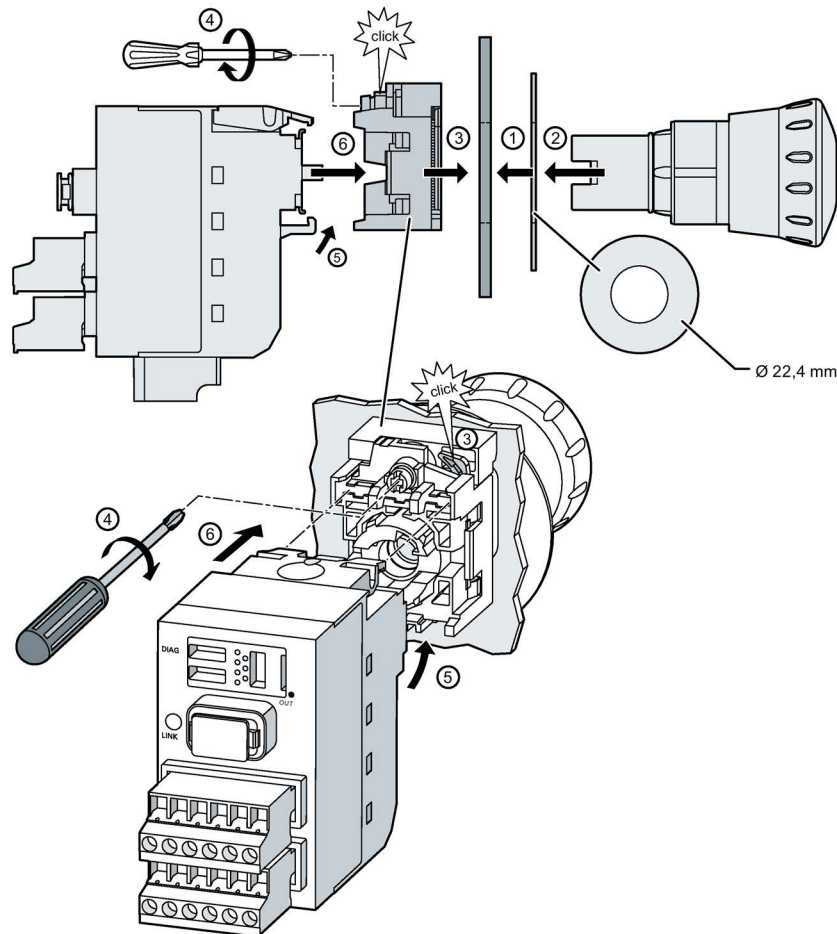
SIRIUS ACT with PROFINET combined with standard wiring

For the variant SIRIUS ACT with PROFINET combined with standard wiring only terminal module 3SU1400-1MA10-1BA1 can be used.

4.2 Mounting interface modules

You can mount the interface module on the standard holder for the SIRIUS ACT command and signaling devices.

The following figure shows a typical sequence of steps for mounting the interface module, holder, command and signaling devices and accessories.



Procedure

1. Hold the backing plate (optional accessory) against the front plate.
2. Insert the actuating / signaling element (in this example: EMERGENCY STOP mushroom pushbutton) from the front through the opening in the backing plate and the front plate.
3. Fit the holder from behind
4. Tighten the screw on the holder (screwdriver as per ISO 8764-1-PZD1; tightening torque 1.0 ... 1.2 Nm).
5. Snap the interface module onto the rear face of the holder.
To do this, fit the narrow snap hook into the matching contour on the holder.
6. Engage the broad snap hook into the matching contour on the holder.
Make sure that the hooks are securely engaged.

4.3 Mounting terminal modules

You can mount the terminal modules on the standard holder for the SIRIUS ACT pushbuttons and indicator lights. There are the following installation options:

- 1 terminal module
- 1 terminal module with 2 contact modules and an LED module (or LED test module) in the middle position
- 1 terminal module with 3 contact modules

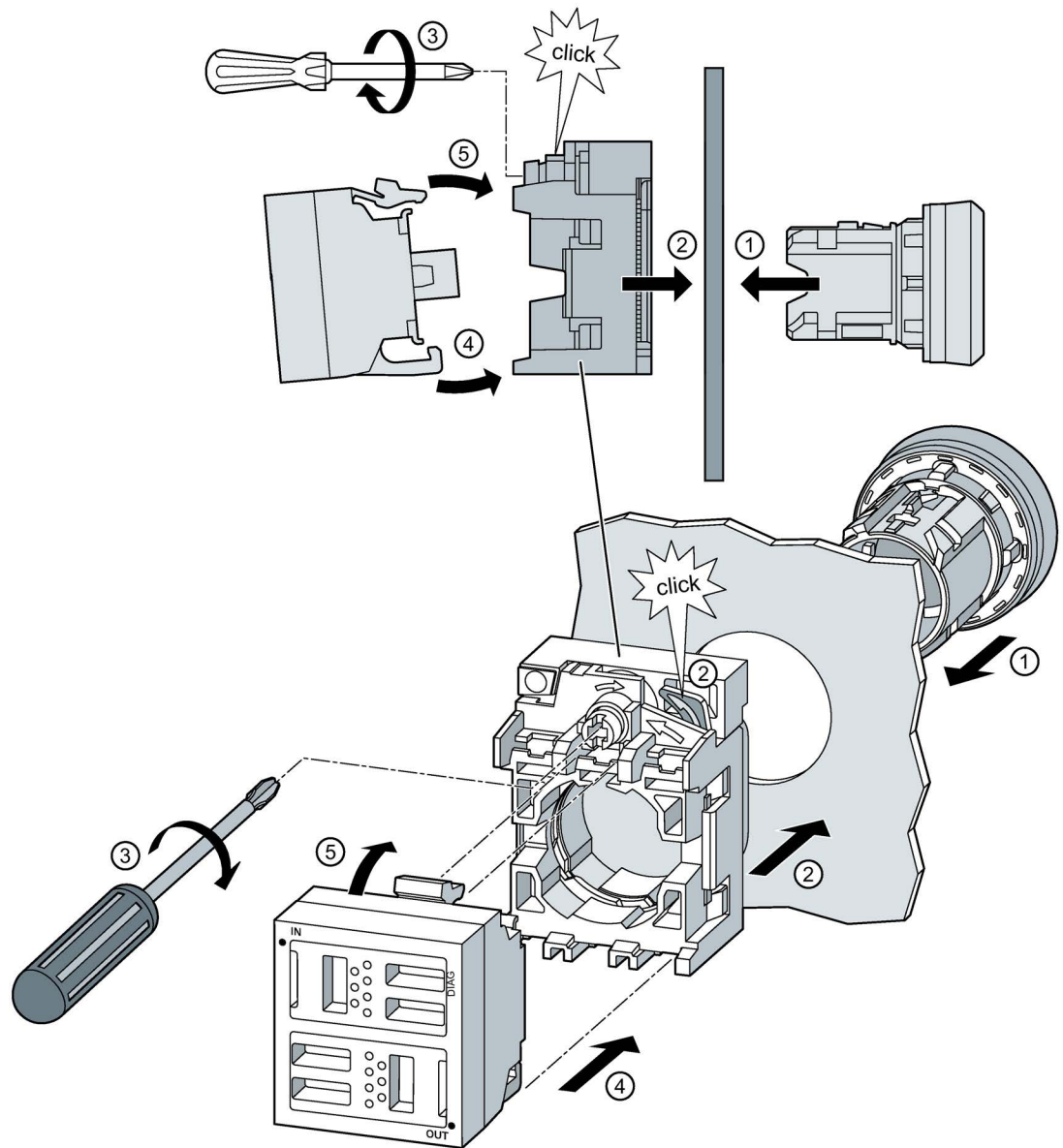
The following figures show a typical sequence of steps for mounting terminal modules, holders, pushbuttons and indicator lights and accessories.

Mounting a terminal module

3SU1400-1MA10-1BA1

3SU1401-1MC.0-1CA1

3SU1401-1ME.0-1DA1



Procedure

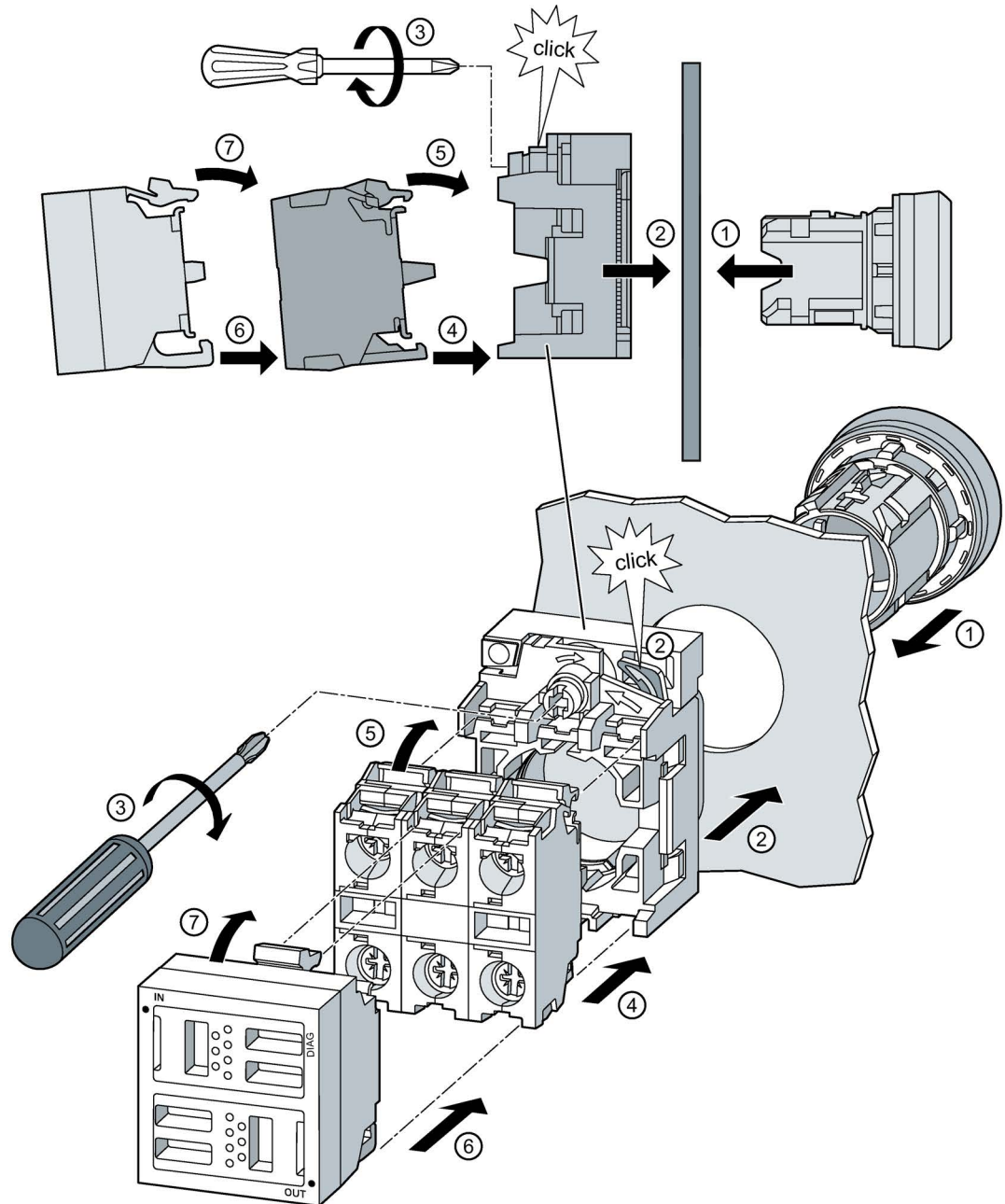
1. Insert the actuating / signaling element from the front into the opening of the front plate.
2. Fit the holder from behind
3. Tighten the screw on the holder (screwdriver as per DIN ISO 8764-1-PZD1; tightening torque 1.0 ... 1.2 Nm).

4.3 Mounting terminal modules

4. Snap the terminal module onto the rear face of the holder.
To do this, fit the narrow snap hook into the matching contour on the holder.
5. Engage the broad snap hook into the matching contour on the holder.
Make sure that the hooks are securely engaged.

Mounting a terminal module with contact modules (typical example)

3SU1400-1MA10-1BA1



Procedure

1. Insert the actuating / signaling element from the front into the opening of the front plate.
2. Fit the holder from behind
3. Tighten the screw on the holder (screwdriver as per DIN ISO 8764-1-PZD1; tightening torque 1.0 ... 1.2 Nm).

4.3 Mounting terminal modules

4. In order to mount the command module you have to mount 3 modules. Snap the contact, LED or test modules onto the rear face of the holder. To do this, fit the narrow snap hook into the matching contour on the holder.
5. Engage the broad snap hook into the matching contour on the holder. Make sure that the hooks are securely engaged.
Make the wiring connections for the contact, LED or test modules.
6. Snap the terminal module onto the rear face of the contact, LED or test modules.
To do this, fit the narrow snap hook of the command module into the matching contour on the modules.
7. Engage the broad snap hook of the command module into the matching contour on the modules.
Make sure that the hooks are securely engaged.

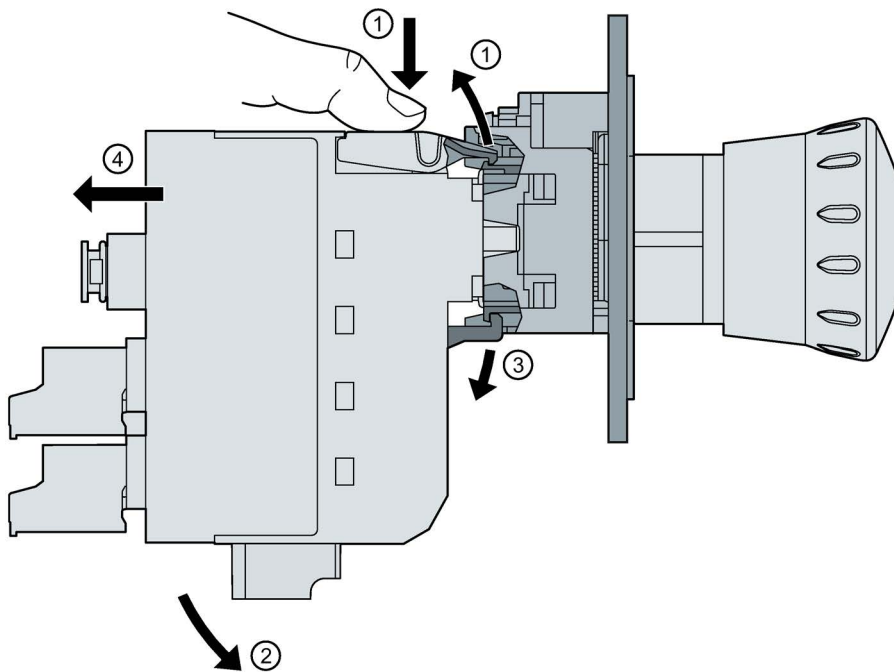
4.4 Replacing / removing a module

Removing an interface module

In order to replace or remove an interface module, proceed as follows:

1. Press the broad snap hook downwards.
2. Let the interface module swing forwards away from the holder.
3. Release the interface module downwards.
4. Remove the interface module from the holder.

The figure below shows the sequence of steps needed to replace or remove a module.



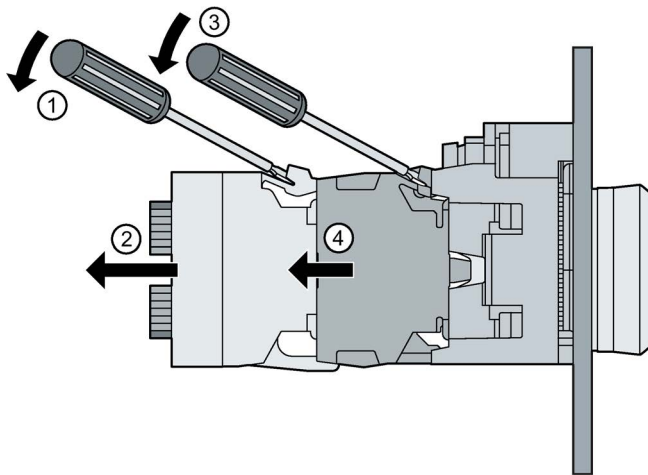
You can find more information about replacing modules in chapter "Device replacement (Page 90)":

Removing a terminal module

In order to replace or remove a terminal module (example shown here has optional contact modules), proceed as follows:

1. Insert a screwdriver into the opening of the broad snap hook of the terminal module. Press the screwdriver down to open the latch of the terminal module.
2. Release the terminal module downwards and separate it from the contact modules.
3. Insert a screwdriver into the opening of the latches (broad snap hook) of the contact modules. Press the screwdriver down to open the latches of the modules.
4. Remove the contact modules.

The figure below shows the sequence of steps needed to replace or remove a module.

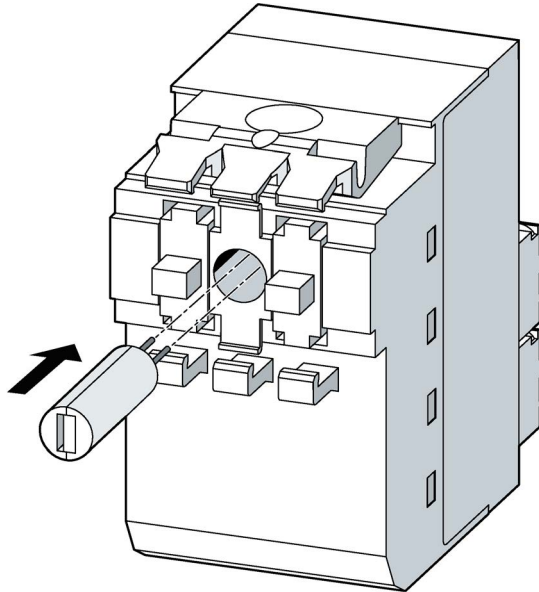


4.5 Mounting an optionally integrated illumination LED

You can install an integrated illumination LED (article number): 3SU1401-3BA.0-5AA0) in the interface module.

It is mounted on the rear face of the interface module. The optionally integrated illumination LED has a groove which fits neatly into the matching guideway in the interface module.

The following figure shows the typical installation of the integrated illumination LED.



Connection

5.1 Rules and regulations

Introduction

Depending on the application area, the SIRIUS ACT with PROFINET IO communication system, being a part of plants and systems, requires the observance of special rules and regulations.

This chapter provides an overview of the most important rules that you need to observe when you integrate SIRIUS ACT with PROFINET IO into a plant or system.

Specific application

Observe the safety and accident prevention regulations (e.g. Machinery Directive, Low-Voltage Directive) that apply to specific applications.

EMERGENCY STOP devices

NOTICE

Perform a function test

EMERGENCY STOP devices must always undergo a function test during commissioning before the plant is put into operation.

Exclude the risk of dangerous plant states

WARNING

Exclude the risk of dangerous plant states

Dangerous operating states must not be allowed to develop when the plant restarts after a voltage dip or power failure

and bus communication is reestablished following a fault.

An EMERGENCY STOP must be forced if necessary!

When the EMERGENCY STOP apparatus is released, the system must not start up in an uncontrolled or undefined manner.

Line voltage

Aspects that you need to consider in relation to the line voltage are described below:

- For stationary installations or systems that do not have all-pole line disconnect switches, the building installation must include an all-pole disconnecter unit.
- For load power supplies, the rated voltage range set must correspond to the local line voltage.
- For all the electrical circuits of SIRIUS ACT devices with PROFINET IO, the fluctuation/deviation of the line voltage from the rated value must be within the permissible tolerance (- 15 %; + 10 %).

24 V DC supply

The 24 V DC voltage for the system as a whole is supplied via the interface module (terminal strip).

The terminal modules are supplied with voltage via the flat ribbon cable.

Aspects that you need to consider in relation to the 24 V DC supply are described below:

- For buildings: If overvoltages pose a hazard, you must provide lightning protection systems for external lightning protection (e.g. lightning protection elements).
- For 24 V DC supply cables and signal cables: If overvoltages pose a hazard, you must provide lightning protection systems for internal lightning protection.
- For 24 V DC supply: Provide safe (electrical) isolation of the extra-low voltage (SELV/PELV) in accordance with IEC 60364-4-41.

WARNING

Safe functional extra-low voltage

The 3SU1 modules with a supply voltage of 24 V DC must be operated with safe functional extra-low voltage (SELV, PELV). This means these modules may only be subjected to a voltage of U_m even in the event of a fault. The following applies to these 3SU1 modules: $U_m < 60.0 \text{ V}$.

You will find more detailed information about safe functional extra-low voltage in the data sheets of the power supplies to be used.

Protection against external electrical interference

The measures that you need to take in order to protect your system against electrical interference or faults are described below:

- You must ensure that supply, signal and bus cables are correctly routed and installed.
- In the case of signal and bus cables, you must ensure that the plant or system cannot reach a potentially dangerous state as the result of a cable/wire break or a cross circuit.

5.2 General safety information

DANGER

Hazardous voltage.

Will cause death or serious injury.

- Disconnect the system and all devices from the power supply before starting work.
- Secure against switching on again.
- Verify that the equipment is not live.
- Ground and short-circuit.
- Erect barriers around or cover adjacent live parts.

DANGER

Hazardous voltage.

Will cause death or serious injury.

Qualified Personnel.

The equipment / system may only be commissioned and operated by qualified personnel. For the purpose of the safety information in these operating instructions, a "qualified person" is someone who is authorized to energize, ground, and tag equipment, systems, and circuits in accordance with established safety procedures.

WARNING

Safe functional extra-low voltage

The 3SU1 modules with a supply voltage of 24 V DC must be operated with safe functional extra-low voltage (SELV, PELV). This means these modules may only be subjected to a voltage of U_m even in the event of a fault. The following applies to these 3SU1 modules: $U_m < 60.0 \text{ V}$.

You will find more detailed information about safe functional extra-low voltage in the data sheets of the power supplies to be used.

CAUTION

Safe equipment operation

Safe operation of the equipment is only ensured with certified components.

NOTICE

Perform a function test

EMERGENCY STOP devices must always undergo a function test during commissioning before the plant is put into operation.

NOTICE

Radio interference

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take suitable measures.
--

Note

SIRIUS ACT devices with PROFINET IO are designed exclusively for installation and operation in weatherproof, stationary housings / control cabinets / enclosures in degree of protection > IP x4.

Note

LEDs and LED modules are designed solely for use with SIRIUS ACT devices. They are not suitable for use in domestic lighting systems.

Note

Always make sure that the components (particularly those with a holder, modules or actuator) are securely installed (free from vibration). Mount them on a support of at least 1 mm thickness.

Note

SIRIUS ACT with PROFINET is not VLAN-capable (Virtual Local Area Networking)

The interface modules can only be operated in a PROFINET line on which the VLAN functionality has been deactivated, i.e. without VLAN tagging. VLAN functionality is deactivated per default for all IE switches. The transmission of VLAN tags for individual ports can be deactivated for a single IE switch. Use this option to ensure that SIRIUS ACT with PROFINET is always operated at a port/in a PROFINET line for which the transmission of VLAN tags has been deactivated.

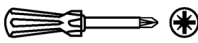
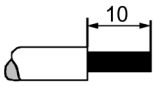
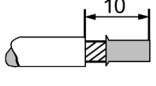
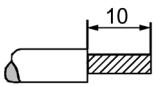
5.3 Wiring rules

Interface module screw terminal connection

Procedure

1. Insert the connecting lead into the screw terminal
2. Tighten the screws (tightening torque 0.5 to 0.6 Nm)
3. Insert the screw terminal into the interface module

Conductor cross-sections:

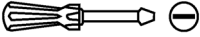
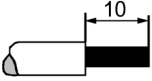
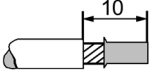
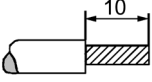
 DIN ISO 8764-1-PZD1	0.5 ... 0.6 Nm 4.4 to 5.3 lb in
	1 x 0.20 ... 2.5 mm ² 2 x 0.20 ... 1.5 mm ²
	1 x 0.25 ... 2.5 mm ² 2 x 0.20 ... 1.0 mm ²
	1 x 0.2 ... 2.5 mm ² 2 x 0.2 ... 1.5 mm ²
AWG	30 to 12

Interface module spring-loaded terminal connection

Procedure

1. Insert a flat-blade screwdriver into the unlocking groove of the spring-loaded terminal
2. Insert the connecting lead into the spring-loaded terminal
3. Insert the spring-loaded terminal into the interface module

Conductor cross-sections:

 3RA2908-1A (diameter 3.0 mm x 0.5 mm)	—
	1 x 0.2 ... 2.5 mm ²
	1 x 0.25 ... 2.5 mm ²
	1 x 0.2 ... 2.5 mm ²
AWG	26 to 12

Connection between interface module and terminal module

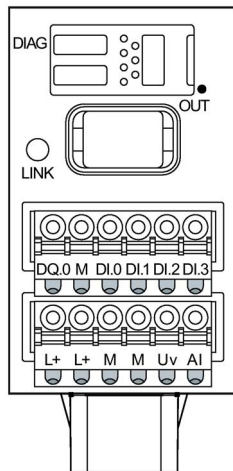
Use a 7-wire flat ribbon cable (3SU1900-0K.80-0AA0) with the specified diameter and pitch as the communication link between the interface module and the terminal modules. The maximum cable length when wiring the modules is 10 m. The spacing between the modules is permitted to be < 1 m.

You can also find further information in chapters "Assembly (Page 33)", "Connecting the flat ribbon cable (Page 55)" and "Interconnecting modules using the flat ribbon cable (Page 56)".

5.4 Terminal assignments interface module

All interface modules have one or more removable terminals that are either spring-loaded or screw terminals.

Fail-safe interface module (IM F)



2 spring-loaded or screw terminals (6-pole) are available for connecting DI, DQ, AI and the supply cables:

X3	DQ.0	M	DI.0	DI.1	DI.2	DI.3
X2	L+ (24 V DC)	L+ (24 V DC)	M	M	U _v (Ref. 2.5 V)	AI (potentiometer)

DI: Standard digital inputs according to IEC 60947-1, table on page 2, type 1

DQ: Standard digital output according to IEC 60947-1, table on page 3, 24 V DC I_e = 100 mA, short-circuit protection

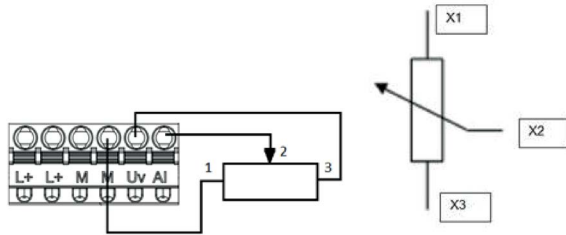
AI: Voltage analog input for connecting the SIRIUS ACT potentiometer: 10-bit A/D resolution, 1000 values (0 to 100 % of the potentiometer) in increments of 0.1

Note

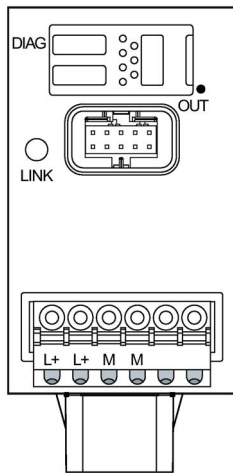
To prevent any damage to the equipment, do not connect any cables to terminal X2 that are intended for terminal X3 and vice versa.

Connection of the potentiometer

Connect the cursor (x2) to A1 and the remaining resistor contacts x1 to M and x3 to U_v.



Interface module (IM)



One spring-loaded or screw terminal (6-pole) is available for connecting the supply cables:

X2	L+ (24 V DC)	L+ (24 V DC)	M	M	---	---
----	-----------------	-----------------	---	---	-----	-----

5.5 Interface module wiring

WARNING

Hazardous Voltage

Can Cause Death, Serious Injury, or Property Damage.

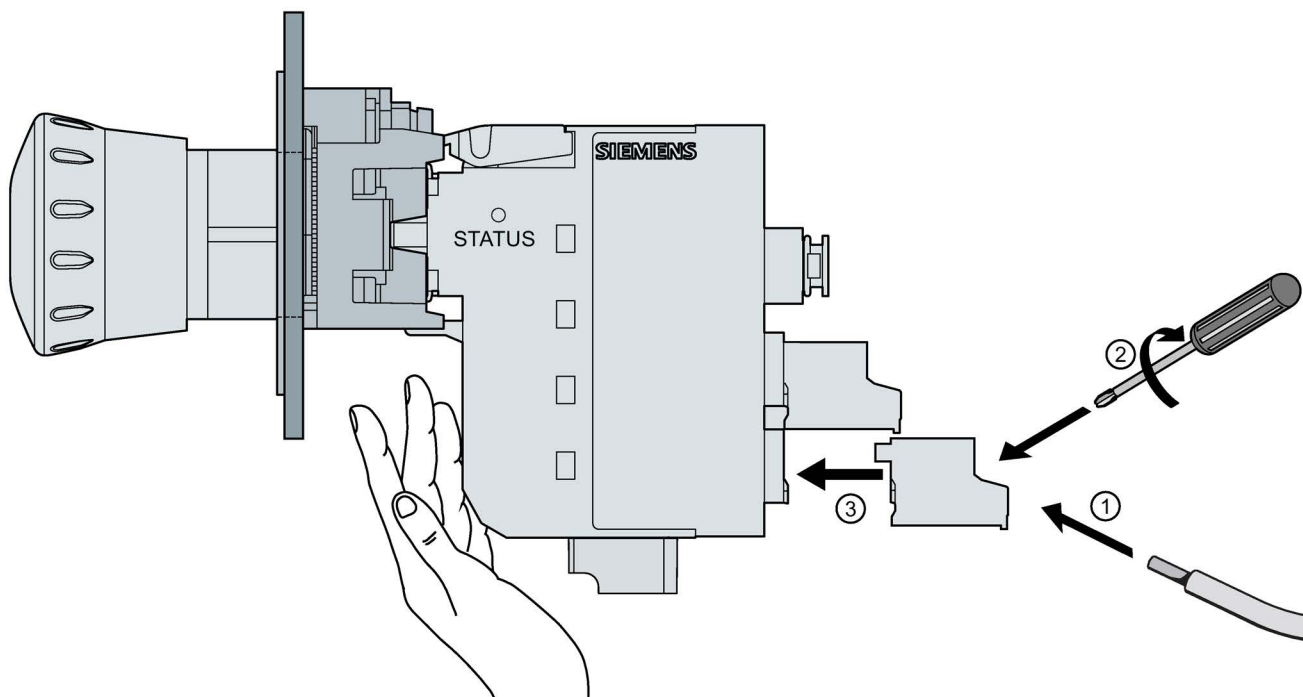
Before starting work, therefore, disconnect the system and devices from the power supply.

Requirements

The insulation on the connection cables must be properly stripped to a length of 10 mm.

Procedure for screw-type terminal blocks

The following figure illustrates the wiring procedure using the example of a fail-safe interface module.



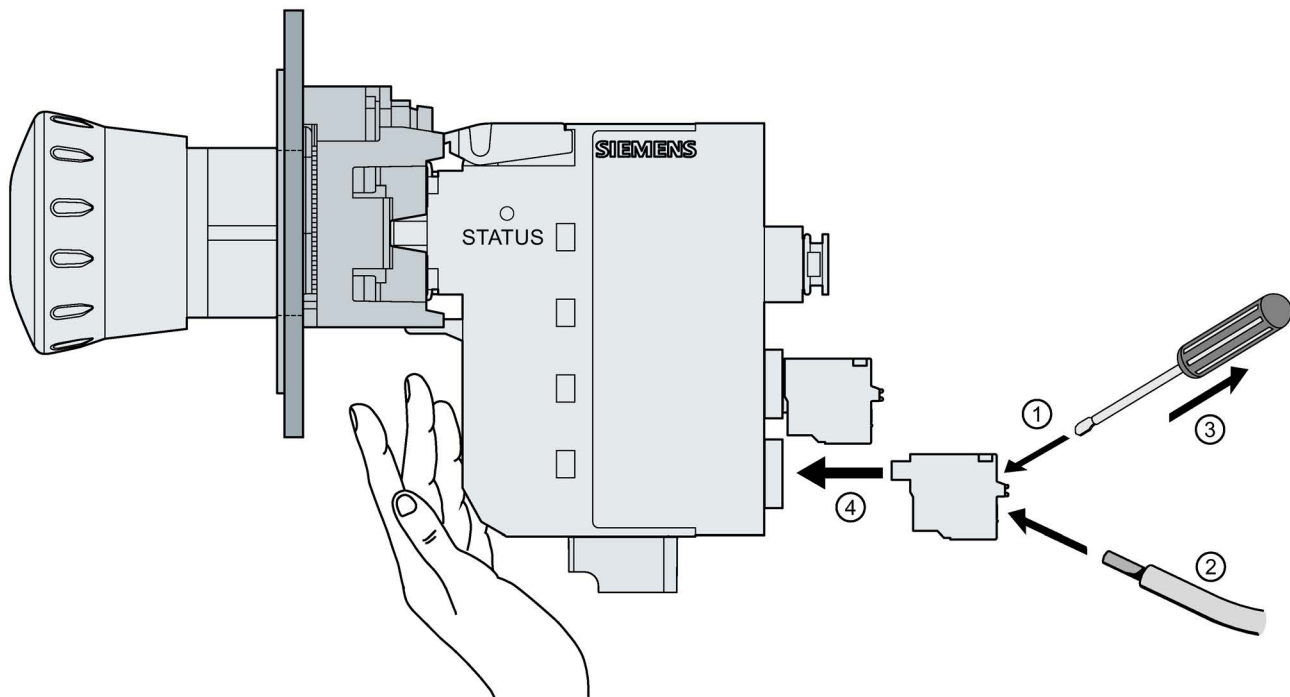
- ① Insert the relevant cable into the square opening on the screw-type terminal until it engages. Hold the cable in the screw terminal.
- ② Tighten the screw of the terminal in which the cable is inserted. Pull on the cable to ensure it is screwed tight.
- ③ Install the terminal, holding the rear panel of the interface module securely.

Note

To prevent any damage to the equipment, do not connect any cables to terminal X2 that are intended for terminal X3 and vice versa.

Procedure for spring-loaded terminal blocks

The following figure illustrates the wiring procedure using the example of a fail-safe interface module.



- ① To release the clamping springs, insert the flat-head screwdriver as far as it will go into the square opening of the spring-loaded terminal.
- ② Insert the cable into the oval opening as far as it will go.
Hold the cable in the spring-loaded terminal.
- ③ Remove the screwdriver.
Pull on the cable to ensure it is tight.
- ④ Install the terminal, holding the rear panel of the interface module securely.

Note

To prevent any damage to the equipment, do not connect any cables to terminal X2 that are intended for terminal X3 and vice versa.

5.6 Connecting the flat ribbon cable

Required tools

To connect the flat ribbon cable (article number: 3SU1900-0K.80-0AA0), you will need a screwdriver with a flat blade to use as a lever.

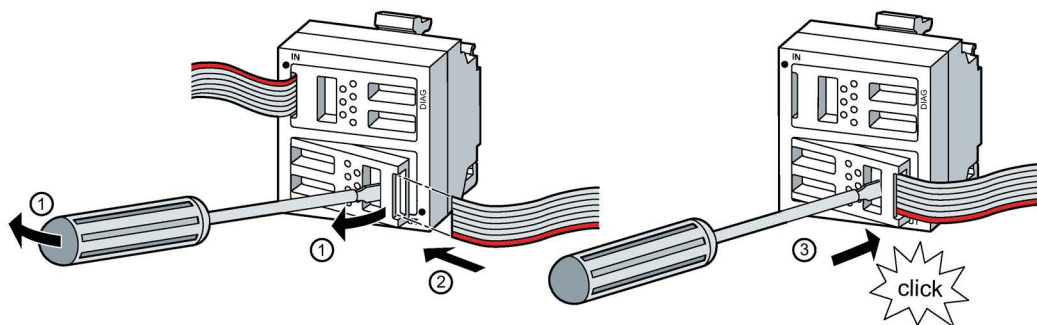
Connection

Using terminal modules as examples, the procedure for connecting the flat ribbon cable is illustrated below. The flat ribbon cable is connected to the interface modules by the same method.

Note

Maximum cable length

The maximum cable length between the individual modules is 100 cm.



Proceed as follows to connect up the flat ribbon cable:

1. Slide the screwdriver into the opening in the module. Then use it as a lever to open the clamping mechanism.
2. Slide the flat ribbon cable as far as it will go into the open clamping mechanism.
3. Press the clamping mechanism back into its original position. The clamping mechanism must sit flush after the cable has been inserted.

Result: The conductors of the ribbon cable are connected by means of the insulation displacement terminals.

Note

Alignment of the flat ribbon cable

When making connections, make sure that the flat ribbon cable is correctly aligned.

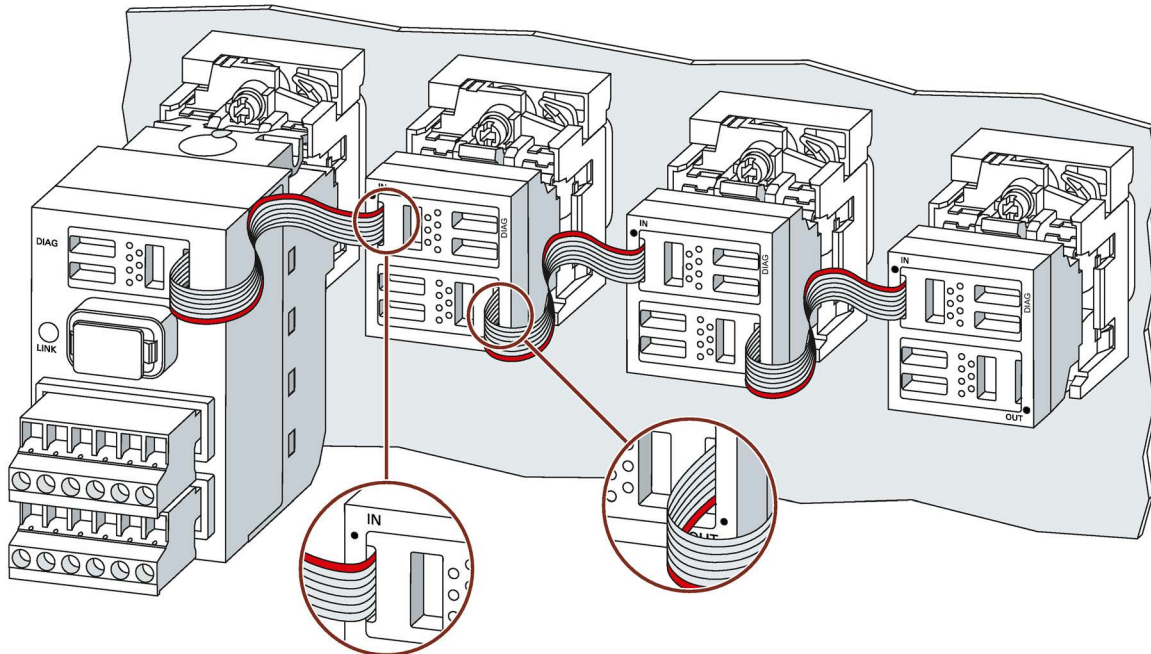
The edge of the flat ribbon cable that is colored red (PIN 1) must point outwards. The red edge must be aligned with the dot marked on the module housing.

5.7 Interconnecting modules using the flat ribbon cable

The interface module must always be the first module to which the flat ribbon cable is connected. In other words, the interface module is always the point at which the ribbon cable connection begins.

You must always align the red edge of the cable with the dot marked on each module.

The figure below shows a typical wiring arrangement for SIRIUS ACT devices with PROFINET IO.



A module will not be destroyed if it is wired incorrectly. The modules are protected against polarity reversal.

You will find additional information in the chapter "Diagnostics (Page 93)".

You can open and reclose the cable connection.

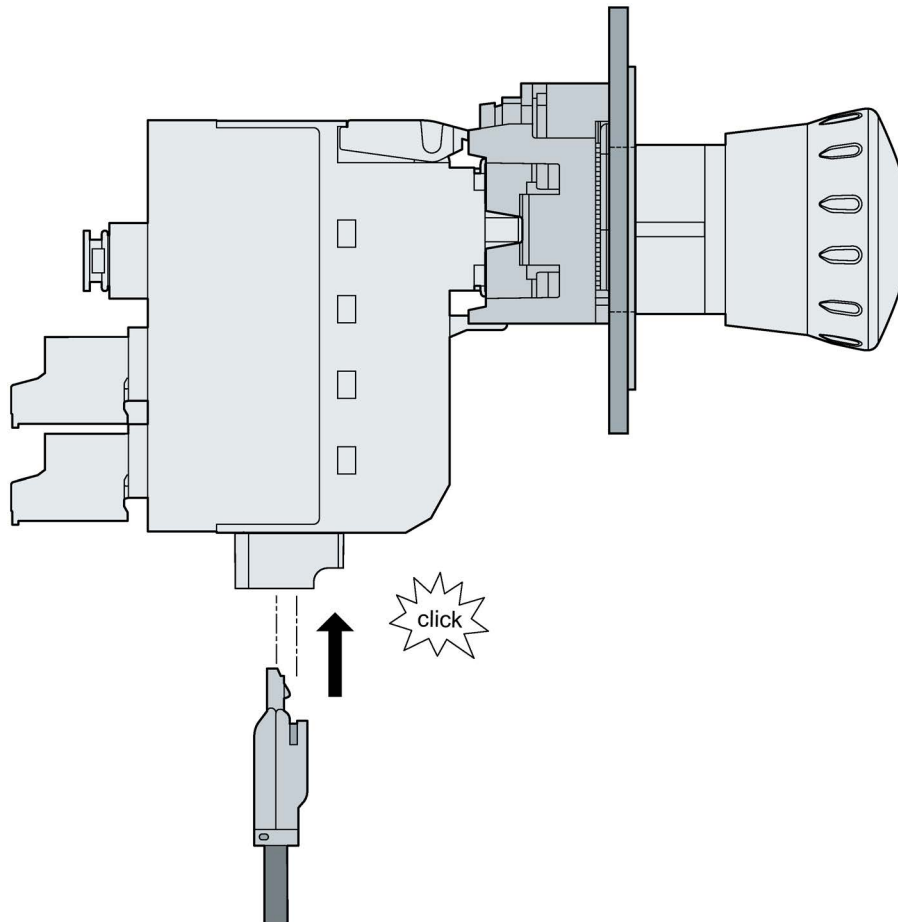
Note

Opening and closing the cable connection

It is not possible to contact the cable conductor again in exactly the same position. Please shorten the cable to create a new contact point. A module can be connected a maximum of 5 times, after which it may need to be replaced.

5.8 PROFINET connection

The PROFINET cable is connected underneath the interface module.



5.9 Supply voltage

The 24 V DC voltage for the system as a whole is supplied via the interface module (terminal strip).

 **WARNING**

Safe functional extra-low voltage

The 3SU1 modules with a supply voltage of 24 V DC must be operated with safe functional extra-low voltage (SELV, PELV). This means these modules may only be subjected to a voltage of U_m even in the event of a fault. The following applies to these 3SU1 modules:

$U_m < 60.0 \text{ V}$.

You will find more detailed information about safe functional extra-low voltage in the data sheets of the power supplies to be used.

Configuring

6.1 Configuring SIRIUS ACT with PROFINET IO

Introduction

You configure and assign parameters to SIRIUS ACT devices with PROFINET IO (interface modules, terminal modules) using STEP 7, TIA Portal or configuring software supplied by another manufacturer.

"**Configuring**" means arranging, setting and networking devices and modules within the device or network view. Modules can be represented graphically with STEP 7/TIA Portal. As with a "**real**" line-up of SIRIUS ACT PROFINET devices, a specific number of terminal modules can be "plugged in" in the device view.

As the automation system powers up, the interface module compares the configured target configuration to the actual configuration of the station. The reaction of the interface module to faults in the hardware configuration can be programmed in the configuration control (option handling).

You can find further information in chapter "Configuration control (Page 71)".

"**Parameter assignment**" means setting the properties of the components used. During parameter assignment, the hardware parameters are set and the settings for data exchange are made:

- Properties of the modules to which parameters can be assigned
- Settings for data exchange between components

The parameters are downloaded to the interface module.

Configuring in third-party systems

SIRIUS ACT devices can be configured in third-party systems using the GSD file (possible only if the interface module is not fail-safe).

You can find the PROFINET GSD files under the following link (<https://support.industry.siemens.com/cs/ww/en/ps/109746180>):

Requirements for configuration of the interface module

Table 6- 1 Requirement for installing the interface module

Configuration software	Requirements	Installation information
<ul style="list-style-type: none"> • STEP 7 (TIA Portal) as of V13 SP1 • V13 SP1 with HSP_0132 • V14 with HSP_0132 	PROFINET IO	STEP 7 online help

6.2 Identification and maintenance data

Brief description of the identification data

Identification data is information stored in the interface module that supports the user with the following activities:

- Checking the system configuration
- Locating modified system hardware
- Troubleshooting a system

Identification data help you to uniquely identify SIRIUS ACT devices with PROFINET IO online.

The identification data can be edited with the configuration tool of the automation system (e.g. STEP 7) and transferred to the device or read out of the device online.

In STEP 7, the identification data are displayed on the "Module status" and "Properties ..." tab cards and loaded into the module with "Load module identification data ..." with menu item "Target System." It is possible to transfer data already in the device into the configuration with "Load module identification data into the programming device" when configuring via GSD file (see STEP 7 Online Help for more information about this function).

Only the identification and maintenance data (I&M) can be edited: I&M 1 to I&M 3.

The following identification data records are supported:

- I&M 0: Identification (device identification); read only
- I&M 1: Higher-level designation / location designation
- I&M 2: Installation date
- I&M 3: Additional information

6.3 Hardware detection for SIRIUS ACT with PROFINET IO in TIA Portal V14

The new function "Hardware detection" for SIRIUS ACT with PROFINET IO has been added in TIA Portal V14 and you can use it to read connected terminal modules into your project.

1. Create a project with a CPU and an interface module
2. Assign parameters to the CPU and the interface module (device name, IP address, etc.)
3. Load the project to the CPU
4. Check whether the interface module is accessible, e.g. using the "Online & diagnostics" view
5. Select the interface module in the network view or device view
6. The function for reading in connected terminal modules can be selected from two different menus:
 - Using the menu: Online ⇒ Hardware detection
 - Using the context menu (right mouse button) of the interface module ⇒ Hardware detection

The status of the hardware detection routine can be monitored in the message window.

After successful detection of the hardware, the detected terminal modules are displayed in the device view of the interface module. Then load the project to the CPU again.

Note

The "Hardware detection" function never changes terminal modules that have already been configured or deletes them from the project, but merely adds newly detected terminal modules to the project.

Details of any conflicts identified by the function between existing configured terminal modules and those that have been detected online are displayed in the message window.

6.4 Configuring the interface module

After you have pasted the interface module into the workspace of the device view or network view, you can access the configuring dialogs by selecting the relevant interface module and the "Properties" tab.

Note

Changes to parameter settings (applies only to fail-safe interface module)

Changes to the parameter assignment result in modifications to the safety program when it is recompiled. A new acceptance may therefore be required.

6.5 Assigning the F-destination address (applies only to fail-safe interface module)

The F-destination address is permanently stored on the memory module of the fail-safe interface module.

Note

The supply voltage L+ must be connected to the fail-safe interface module while the F-destination address is assigned.

You can find further information about assigning the F-destination address in the programming and operating manual SIMATIC Safety - Configuring and Programming (<https://support.industry.siemens.com/cs/document/54110126/simatic-industrial-software-simatic-safety-configuring-and-programming?dti=0&lc=en-WW>) PROFIsafe addresses for F IOs of PROFIsafe address type 2 and in the online help for STEP 7.

6.5.1 Assigning F-destination addresses with the fail-safe interface module

6.5.1.1 Introduction

The fail-safe interface module does not have a DIL switch that you can use to assign a unique F-destination address for each module. Instead, you assign the PROFIsafe address for the fail-safe interface module directly from STEP 7.

You can manually change the F-destination addresses set by the F system in the hardware configuration.

You parameterize the F-destination address in the hardware configuration for the fail-safe interface module. For supported configurations, the F source address matches the parameter "Basis for PROFIsafe addresses" of the relevant F-CPU.

In the following instances, the F-destination address must be assigned again to the fail-safe interface module:

- Intentional modification of the F-destination address
- Modification of the "Basis for PROFIsafe addresses" parameter of the associated F-CPU (changes the F-source address).
- Commissioning of a mass-produced machine

In the following instances, the F-destination address need not be assigned again to the fail-safe interface module:

- Supply voltage ON/OFF
- Replacement of a defective interface module (in need of repair) without a programming device/PC using the existing memory module.

Basic procedure


1. Configure the F-destination address and the F-source address in the hardware configuration in STEP 7.
2. Identify the fail-safe interface module to which you want to assign the configured F-destination address (together with the F-source address).
3. Assign the F-destination address (together with F-source address) to the fail-safe interface module.

6.5.1.2 Identifying a fail-safe interface module

Requirement

The following requirements must be met:

- The F-CPU and the fail-safe interface module (STEP 7 / TIA Portal: IM 3SU1F PN) have already been configured.
- The configuration has been downloaded.
- The F-CPU and the fail-safe interface module can be accessed online.

 WARNING
PROFIsafe addresses
By clicking on the "Identification" button, you are confirming that the fail-safe PROFIsafe addresses for the fail-safe interface module are correct.
You should therefore proceed carefully when confirming the fail-safe interface module based on LED flashing or on the serial number of the fail-safe interface module.

Procedure

Proceed as follows to identify the fail-safe interface module:

1. Set up an online connection to the F-CPU which is responsible for operating the fail-safe interface module.
 2. In the network view, select the fail-safe interface module to which you want to assign the F-destination address (together with the F-source address).
 3. Open the context menu and select "Assign F-destination address".
 4. Under "Identification", select your chosen method of identifying the F modules.
 - "By LED flashing"
This is the default setting. The status LED of the interface module to be identified flashes amber while identification is in progress.
 - "With the serial number"
If you do not have a direct view of the interface module, you can use the serial number to identify the fail-safe interface module (STEP 7 / TIA-Portal: IM 3SU1F PN).
-
- Note**
- By comparison with the serial number printed on the fail-safe interface module, the displayed serial number might also include the number of a year. The serial numbers are nevertheless identical.
-
5. In the column headed "Assign", select all of the fail-safe interface modules to which you want to assign the F-destination address (together with the F-source address).
 6. Click on the "Identification" button. Monitor the STATUS LED of those fail-safe interface modules to which you want to assign an F-destination address to check whether it flashes amber. If you are using the serial number as an identification guide, compare the displayed serial number to the serial number of the fail-safe interface module.

6.5.1.3 Assigning a fail-safe destination address

Requirement

The fail-safe interface module has been successfully identified.

Procedure

To assign an F-destination address, proceed as follows:

1. In the column headed "Confirm", activate the fail-safe interface modules to which you want to assign the F-destination address.
2. Click on the "Assign F-destination address" to assign the F-destination address (together with F-source address) of the fail-safe interface module. To do this, you may need to enter the password of the F-CPU.

In order to assign the F-destination address (together with the F-source address), you must confirm the dialog "Confirm assignment" within 60 seconds.

6.5.1.4 Changing the F-destination address and the F-source address

Note

Please note that if you change the F-destination address or the F-source address of an F IO, you must carry out an acceptance test including a check of the changes you have made in the safety printout.

The safety printout function generates documentation about the safety program and so helps you to carry out system acceptance tests!

1. Change the F-destination address or F-source address in the hardware configuration.
2. Compile the hardware configuration.
3. Download the hardware configuration to the F-CPU.
4. Select "Assign F-destination address" from the shortcut menu.
5. Proceed as described under "Identifying a fail-safe interface module (Page 64)" and "Assigning an F-destination address" (Page 65).

6.6 Parameter

6.6.1 Parameters of the interface module

6.6.1.1 Enable device reconfiguration via user program

You can find information about reconfiguring the device in chapter "Configuration control (option handling) (Page 71)".

6.6.1.2 Brightness

You can dim the illumination LEDs (for illuminating SIRIUS ACT command and signaling devices) You can adjust the luminosity by setting software parameters. The brightness can also be changed in the operation mode (via DS130).

- There are 4 luminosity settings available:
 - 100 % (default setting - full luminosity/no dimming)
 - 70 %
 - 40 %
 - 10 %

6.6.1.3 Flashing frequency

The flashing frequency of the LEDs can be set to various values (including zero - continuous light). You can adjust the flashing frequency by setting software parameters. The flashing frequency can also be changed in the operation mode (via DS130).

- There are 4 flashing frequency settings available:
 - 0 Hz - continuous light (default setting)
 - 0.1 Hz (5 s ON, 5 s OFF)
 - 0.5 Hz (1 s ON, 1 s OFF)
 - 2 Hz (0.25 s ON, 0.25 s OFF)

6.6.1.4 Applying settings to all connected terminal modules

This parameter transfers the settings of the parameters "Brightness" and "Flashing frequency" to all connected terminal modules.

- If you select this parameter, you can no longer individually adjust the settings of the parameters "Brightness" and "Flashing frequency" for all of the connected terminal modules.

6.6.1.5 Selection of NO/NC contacts

For every terminal module and interface module you can select NC contacts or NO contacts either via the TIA Portal or using the GSD file.

- If an NC contact has been selected, bit 1 is set in the process image for the contact that is not active.
- If an NO contact has been selected, bit 0 is set in the process image for the contact that is not active.

A description of these bits can be found in DS130.

6.7 Process image

6.7.1 Overview of the process data

Modules	Slot	Process image of the inputs	Process image of the outputs	Note
Fail-safe interface module	0	---	---	PN interface
	1	1 byte	1 byte	I/O digital – 6DI / 2DQ
	2	2 bytes		I/O analog – 10-bit AI
	3	6 bytes	1 byte	PROFIsafe
Interface module	0	---	---	PN interface
	1	1 byte	1 byte	I/O digital – 2DI / 1DQ
	2	---	---	Slot not assigned
	3	---	---	Slot not assigned
Command module		1 byte	---	Command module - 2DI
LED module		---	1 byte	LED module - 1 DQ
Command and LED module		1 byte	1 byte	Command and LED module - 2DI / 1 DQ

6.7.2 Process image input (PII)

Fail-safe interface module

Slot 1, digital inputs

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved	Reserved	DI3	DI2	DI1	DI0	Contact 2	Contact 1

DI0 - DI3 are the 4 external digital inputs of the fail-safe interface module.

Contacts 1/2 are the signals from the contact modules.

Slot 2, analog inputs

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Low byte of the 16-bit analog value							
1	High byte of the 16-bit analog value							

These 2 bytes contain 10 bits of useful data. Bits 1.2 to 1.7 are not used in process data and are always set to 0.

Slot 3, PROFIsafe - 6 bytes

1 byte - process data

1 byte - quality byte

1 byte - control/status

3 bytes – CRC

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Process data bits input							
0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	IN0.0
	Quality bits input (QBAD_lx)							
1	Reserved - good	Reserved - good	Reserved - good	Reserved - good	Reserved - good	Reserved - good	Reserved - good	Q0.0
2	Status byte							
3 ... 5 (3 bytes)	PROFIsafe CRC2 3 bytes							

Interface module

Slot 1, digital inputs

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Contact 2	Contact 1

Contacts 1/2 are the signals from the contact modules

Terminal modules

Slots 4 - 23, terminal module 1 - terminal module 20

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Terminal module x				Terminal module x			
	Reserved	Reserved	Reserved	Ready	Reserved	Reserved	Contact 1	Contact 0

The Ready bit is transferred via the process image to the interface module, but not to the PLC.

The bytes of the process image input are used and supported for terminal modules with inputs (DI) – command module, and command and LED module.

6.7.3 Process image output (PIQ)

Fail-safe interface module

Slot 1, digital outputs

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	DQ0	LED

DQ0 is the external digital output of the fail-safe interface module – connected via a tab connection (terminal on the rear face of the fail-safe interface module).

The output bit "LED" is used to switch over the optionally integrated illumination LED (optional, only when illumination LED is inserted).

The entire address byte is reserved for the PIQ in the engineering software. Only those bits that are relevant and used are displayed as IO tags (address Qx.0, Qx.1).

Slot 3, PROFIsafe - 4 bytes

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Control byte							
1 ... 3	PROFIsafe CRC2 3 bytes							

Interface module

Slot 1, digital outputs

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	LED

The reserved bits can be used if a larger number of digital outputs is required.

The output bit "LED" is used to switch over the optionally integrated illumination LED (optional, only when illumination LED is inserted).

The entire address byte is reserved for the PIQ in the engineering software. Only those bits that are relevant and used are displayed as IO tags (address Qx.0).

Terminal modules

Slots 4 - 23, terminal module 1 - terminal module 20

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Terminal module x				Terminal module x			
0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	LED

Bit 0 is used on terminal modules to switch over the illumination LED.

The bytes of the process image output are used and supported for the LED module and for the command and LED module.

The entire address byte is reserved for the PIQ in the engineering software. Only those bits that are relevant and used are displayed as IO tags (address Qx.0).

Configuration control (option handling)

7.1 Configuration control

Introduction

Configuration control (option handling) is used to operate various standard machine configuration levels in one project without changing the configuration or the user program.

Operating principle of configuration control

You can use configuration control to operate different standard machine configurations with a single configuration of the SIRIUS ACT system.

- A station master is configured in a project (maximum configuration). The station master comprises all modules needed for all possible plant parts of a modular standard machine.
- The project's user program provides for several station options for various standard machine configuration levels as well as selection of a station option. A station option uses, for example, only some of the configured modules of the station master and these modules are inserted in the slots in a different order.
- The standard machine manufacturer selects a station option for a configuration level of the standard machine. To do this, the manufacturer does not need to modify the project or load a modified configuration.

You use a control data record you have programmed to notify the interface module as to which modules are missing or located on different slots in a station option as compared to the station master. The configuration control does not have an influence on the I/O addresses, the diagnostic addresses or the parameter assignment of the modules.

Configuration control allows you to flexibly vary the configuration. This is only possible if the station option can be derived from the station master.

Benefits

- Simple project management and commissioning by using a single STEP 7 project for all station options.
- Simple handling for maintenance, versioning and upgrade:
 - Regardless of how many machine variants exist, there is only one copy of the documentation and user program, making them much easier to maintain and upgrade.
 - Options can be retrofitted easily without the need to reconfigure the system. Retrofitted modules can also be placed at the end of the station irrespective of the slot configuration.
- Hardware savings: Only those terminal modules are installed that are required for the machine's current station option.

Procedure

To set up the configuration control, follow these steps:

Step	Action	See ...
1	Enable configuration control in STEP 7	Chapter Configuring (Page 73)
2	Create control data record	Chapter Creating the control data record (Page 74)
3	Transfer control data record	Chapter Transferring the control data record in the startup program of the CPU (Page 80)

7.2 Configuring

Requirements

- Engineering tool (e.g. STEP 7)
- Interface module (IM 3SU1 PN) or fail-safe interface module (IM 3SU1F PN)
- You have assigned the interface module to an IO controller.

Required steps

Activate the "Enable reconfiguration of device with user program" parameter when configuring the interface module in STEP 7 (TIA Portal). You will find this parameter in the "Module parameters" menu under "General".

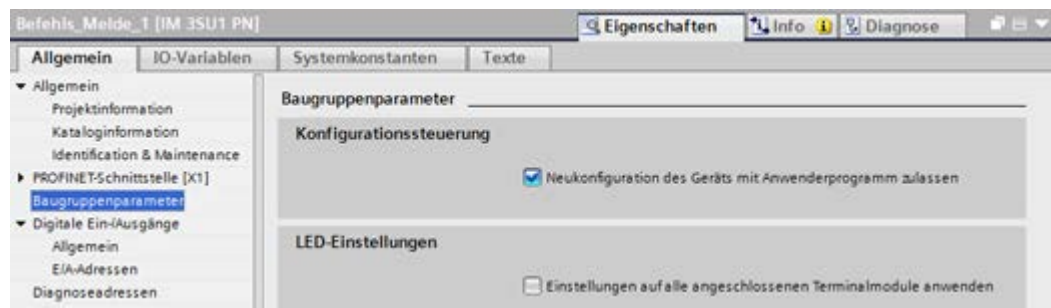


Figure 7-1 Activating the configuration control

7.3 Creating the control data record

7.3.1 Introduction

Required steps

Proceed as follows to create a control data record for the configuration control:

1. Create a PLC data type that contains the structure of the control data record.

The figure below shows a PLC data type "CTR_REC" that contains the structure of the control data record for a SIRIUS ACT interface module.

CTR_REC							
	Name	Datentyp	Defaultwert	Erreic..	Sichtb..	Einst..	Kommentar
1	Block_Length	USInt	28	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4 + (Anzahl Steckplätze)
2	Block_ID	USInt	196	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3	Version	USInt	4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4	Subversion	USInt	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5	Slot 0	USInt	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
6	Slot 1	USInt	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
7	Slot 2	USInt	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
8	Slot 3	USInt	3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
9	Slot 4	USInt	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
10	Slot 5	USInt	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
11	Slot 6	USInt	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
12	Slot 7	USInt	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
13	Slot 8	USInt	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
14	Slot 9	USInt	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
15	Slot 10	USInt	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
16				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz

Figure 7-2 Creating control data record 196

2. Create a global data block.
3. In the data block, create an array that is based on the PLC data type you have already created.
4. Enter the slot assignments in the column headed "Start value" in the control data records.

The figure below shows the global data block "ConfDB". The data block "ConfDB" contains an array [0 ... 5] of PLC data type "CTR_REC".

ConfDB		Name	Datentyp	Startwert	R...	E...	Si...	E...	Kommentar
1	▼	Static			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2	■	Option	Int	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Auswahl des Steuerdatensatzes
3	▼	ConfigControl	Array[0..5] of *CTR_REC*		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4	▶	ConfigControl[0]	*CTR_REC*		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5	▶	ConfigControl[1]	*CTR_REC*		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
6	■	Block_Length	USInt	28	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4 + (Anzahl Steckplätze)
7	■	Block_ID	USInt	196	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
8	■	Version	USInt	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
9	■	Subversion	USInt	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
10	■	Slot 0	USInt	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
11	■	Slot 1	USInt	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
12	■	Slot 2	USInt	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
13	■	Slot 3	USInt	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
14	■	Slot 4	USInt	7	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
15	■	Slot 5	USInt	8	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
16	■	Slot 6	USInt	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz
17	■	Slot 7	USInt	-	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener "realer" Steckplatz

Figure 7-3 Data block for the configuration control

Rules

Observe the following rules:

- The interface module ignores slot entries in the control data record outside the station master.
- The control data record must include the entries up to the last slot of the station option.
- It is not permissible to assign more than one configured slot to the same real slot, i.e. each slot of a station option may only be entered once in the control data record.

7.3.2 Structure of the control data record

Slot assignments

The following table shows the possible slots for various modules:

Modules	Possible slots	Note
Interface module	0	The interface module (slot 0) is not an element of the configuration control; instead, it controls the configuration control. The interface module always occupies slots 0 to 3.
Terminal modules	4 - 23	-

Control data record (V1 - simplified control data record)

Byte	Element	Coding	Explanation
0	Block length	4 + number of slots	Header
1	Block ID	196	
2	Version	4	
3		0	
4	Slot 0 of the station master	0	These slots are occupied by the interface module and cannot therefore be changed by the configuration control.
5	Slot 1 of the station master	1	
6	Slot 2 of the station master	2	
7	Slot 3 of the station master	3	
8	Slot 4 of the station master	Slot assignment in the station option	Control element: Specifies the slot assignments of individual 3SU1 terminal modules.
:	:	:	
4 + (max. slot)	Last slot of the station master	Slot assignment in the station option	The value that you need to enter in the relevant byte is determined by the following rule: <ul style="list-style-type: none"> • If the module is included in the station option, enter the slot number of the module. • If the module is not included in the station option, enter 255 (0xFF).

7.3.3 Structure of the feedback data record

Functional principle

The feedback data record provides you with information about the correctness of your module assignments and therefore helps you to identify any assignment errors in the control data record. The feedback data record is a separate data record 197 V2.0 which only exists if a configuration control has been configured.

Slot assignments

The feedback data record refers to the configured station structure and always comprises the maximum configuration limit. The maximum configuration limit comprises 24 slots (slots 0 to 3 permanently assigned to the interface module, and slots 4 to 23 for the terminal modules of the command and signaling devices). It is possible to partially read the feedback data record.

The table below shows the assignments between modules and slots:

Modules	Possible slots	Note
Interface module	0	The interface module (slot 0) is not an element of the configuration control; instead, it controls the configuration control. The interface module always occupies slots 0 to 3.
Terminal modules	4 - 23	-

Feedback data record

Byte	Element	Coding	Meaning
0	Block length	4 + (number of slots x 2)	Header
1	Block ID	197	Status = 1: <ul style="list-style-type: none"> Module from station master is inserted in the station option Slot is marked as non-existent in the control data record Status = 0: <ul style="list-style-type: none"> Module removed from slot Incorrect module is inserted in the station option* Slot is unused in the station master
2	Version	2	
3		0	
4	Status of slot 1	0/1	
5	Reserved	0	
6	Status of slot 2	0/1	
7	Reserved	0	
8	Status of slot 3	0/1	
9	Reserved	0	
10	Status of slot 4	0/1	
11	Reserved	0	
12	Status of slot 5	0/1	
13	Reserved	0	
:	:	:	
4 + ((max. number - 1) x 2)	Status of max. slot	0/1	
4 + ((max. number - 1) x 2) + 1	Reserved	0	

* Not possible if the slot is marked as a non-existent slot.

The feedback data record 197 in version 2.0 is already in use for other modules that support configuration control. For reasons of consistency, this data record is also used for SIRIUS ACT, even though this system does not allow slots 0 to 3 to be changed by configuration control. Please note that feedback data record 197 does not contain any information about slot 0 (unlike control data record 196).

Note

The feedback data record always contains the complete data for all configured modules.

As long as no control data record has been transmitted, the data record 197 is compiled on the assumption of a 1-to-1 module assignment (station master → station option).

Error messages

As the feedback data record is read, the instruction RDREC returns the following error messages via the block parameter STATUS if an error is detected:

Error code	Meaning
80B1H	Inadmissible length; the length specification in data record 197 is not correct.
80B5H	Configuration control not configured.
80B8H	Parameter error The following events cause a parameter error: <ul style="list-style-type: none">• Incorrect block ID in the header (value is not 197)• Invalid version identifier set in the header• A reserved bit has been set• The same slot in the station option has been assigned to more than one slot in the station master

7.4 Transferring the control data record in the startup program of the CPU

Parameters of the instruction WRREC

Individual parameters of the instruction WRREC are explained below. You need to supply these parameters with certain values in the context of the configuration control. You can find more information about the instruction WRREC in the online help for STEP 7.

ID	<p>Use:</p> <ul style="list-style-type: none"> for S7-300 and S7-400 CPUs: the diagnostic address of the interface module. for S7-1200 and S7-1500 CPUs: the hardware identifier of the interface module. <p>Hardware identifier</p> <p>If you have selected the interface module in the network view or device view, you will find the hardware identifier on the "System constants" tab of the inspector window. Use the value of the system constant "<Name-of-interface-module>~Head".</p>
INDEX	Data record number: 196 (decimal)
RECORD	<p>Control data record to be transferred.</p> <p>For information about the structure of the control data record, refer to chapter Creating the control data record (Page 74).</p>

Error messages

If an error is detected, the instruction WRREC returns the following error messages via the block parameter STATUS:

Error code	Meaning
80B1H	Inadmissible length; the length specification in data record 196 is not correct.
80B5H	Configuration control not configured.
80E2H	Data record was transmitted in the wrong OB context. The data record must be transferred in the startup program.
80B8H	<p>Parameter error</p> <p>The reasons for a parameter error are as follows:</p> <ul style="list-style-type: none"> Incorrect block ID in the header (value is not 196) Invalid version identifier in the header A reserved bit has been set An invalid slot in the station option has been assigned to a slot of the station master. <p>Examples:</p> <ul style="list-style-type: none"> a terminal module has been assigned to one of the slots 0 ... 3 the station option includes empty slots (e.g. slots 4 and 6 are occupied, but slot 5 is not) <ul style="list-style-type: none"> The same slot in the station option has been assigned to more than one slot in the station master

Selecting the station option in the user program

To ensure that the CPU recognizes the station option that you wish to operate, you must set up a means of selecting the different control data records in the user program. You can implement this selection using, for example, an int variable that references an array element.

Please note that the variable used to select the control data record must be stored in the retentive memory area. If the variable is not stored retentively, it will be initialized as the CPU powers up and thus be unusable for the purpose of selecting the station option.

Special points to be noted when transferring the control data record to the interface module

- If you have activated the configuration control, the station is not ready to operate without a control data record. Until a valid control data record is transferred, the inputs and outputs are "absent" from the viewpoint of the CPU and exhibit substitute value behavior. The interface module continues to exchange data.
- The control data record is stored retentively in the interface module. Please note:
 - Provided that the configuration has not been modified, the control data record 196 does not need to be written again during CPU restart.
 - If you write a control data record with a modified configuration to the interface module, it will cause station failure in the SIRIUS ACT PROFINET IO system. The original data record 196 will be deleted and the new data record 196 stored in the retentive memory. The station will then restart with the modified configuration.

7.5 Behavior during operation

Effect of discrepancy between station master and station option

The online display and the display in the diagnostic buffer (module o.k. or module defective) always refer to configuration of the station master, but not to the station option with a deviating configuration.

Example:

A module delivers a diagnosis. This module is configured in slot 4 in the station master, but is inserted in slot 3 in the station option (missing module; see example in the next chapter). The online view (station master) shows a defective module in slot 4. In the real physical setup, the module at slot 3 signals an error via an LED display.

Behavior when modules are missing

If modules are entered as "missing" in the control data record, the automation system behaves as follows:

- Modules marked as "missing" in the control data record do not deliver a diagnosis, their status is always o.k. The value status is o.k.
- Direct write access to the missing outputs or write access to the process image of the missing outputs: Does not work; no access error is reported.
- Direct read access to the missing inputs or read access to the process image of the missing inputs: value delivered is "0"; no access error is reported.

7.6 Examples of a configuration control

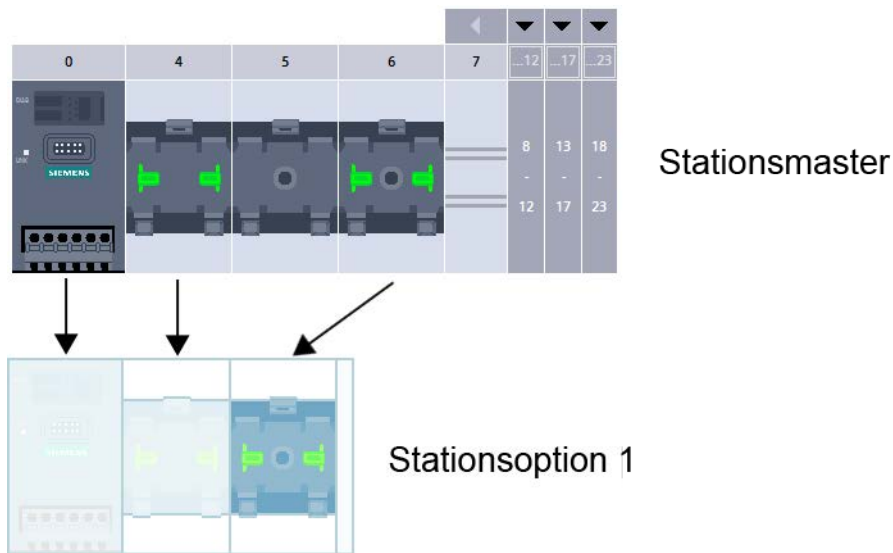
A description is given below of the process of configuring a station master in STEP 7; the station master comprises an interface module and three terminal modules for command and signaling devices.

The configuration control is used to derive two station options from the station master:

- Station option 1: One module is missing
- Station option 2: The module sequence is changed

Station option 1: One module is missing

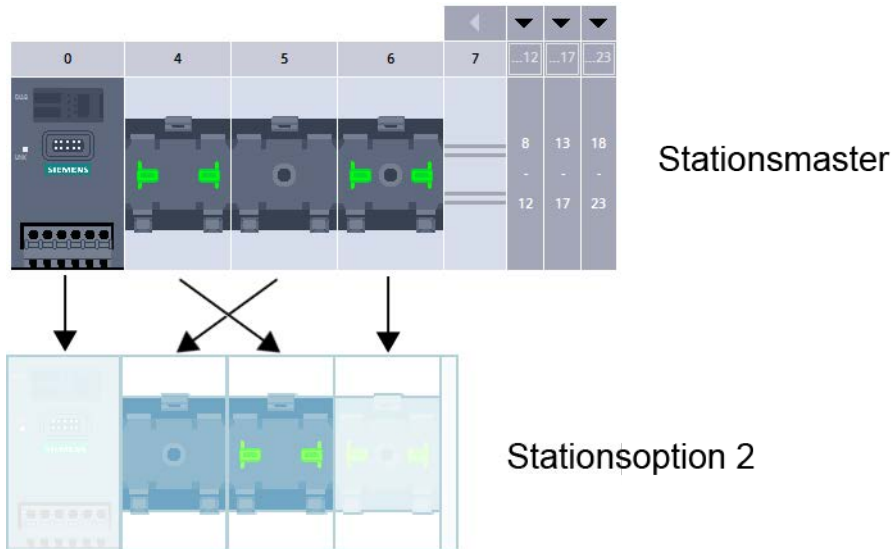
The module inserted in slot 5 in the station master is missing from station option 1. Enter the value 255 (= missing) accordingly in slot 5 in the control data record. The last terminal module then shifts forward into slot 5. (No empty spaces are allowed in a station.)



ConfDB								
	Name	Datentyp	Startwert	R...	E...	S...	E...	Kommentar
5	ConfigControl[1]	*CTR_REC*			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
6	Block_Length	USInt	28		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4 + (Anzahl Steckplätze)
7	Block_ID	USInt	196		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
8	Version	USInt	4		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
9	Subversion	USInt	0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
10	Slot 0	USInt	0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener *realer* Steckplatz
11	Slot 1	USInt	1		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener *realer* Steckplatz
12	Slot 2	USInt	2		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener *realer* Steckplatz
13	Slot 3	USInt	3		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener *realer* Steckplatz
14	Slot 4	USInt	4		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener *realer* Steckplatz
15	Slot 5	USInt	255		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener *realer* Steckplatz
16	Slot 6	USInt	5		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener *realer* Steckplatz
17	Slot 7	USInt	0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener *realer* Steckplatz
18					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Zugewiesener *realer* Steckplatz

Station option 2: The module sequence is changed

The modules in slots 4 and 5 have been swapped over.



ConfDB									
	Name	Datentyp	Startwert	R...	E...	S...	E..	Kommentar	
6	ConfigControl[2]	*CTR_REC*			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
7	Block_Length	USInt	28		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			4 + (Anzahl Steckplätze)
8	Block_ID	USInt	196		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
9	Version	USInt	4		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
10	Subversion	USInt	0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
11	Slot 0	USInt	0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			Zugewiesener "realer" Steckplatz
12	Slot 1	USInt	1		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			Zugewiesener "realer" Steckplatz
13	Slot 2	USInt	2		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			Zugewiesener "realer" Steckplatz
14	Slot 3	USInt	3		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			Zugewiesener "realer" Steckplatz
15	Slot 4	USInt	5		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			Zugewiesener "realer" Steckplatz
16	Slot 5	USInt	4		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			Zugewiesener "realer" Steckplatz
17	Slot 6	USInt	6		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			Zugewiesener "realer" Steckplatz
18	Slot 7	USInt	0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			Zugewiesener "realer" Steckplatz
19					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			Zugewiesener "realer" Steckplatz

Commissioning

8.1 Introduction

This chapter contains information about the following subjects:

- Commissioning of SIRIUS ACT interface modules on PROFINET IO

Preconditions for commissioning

Note

Testing

You are responsible for the safety of your system. Before finally commissioning your system, therefore, carry out comprehensive function tests as well as all required safety tests.

Make sure that you also test for potential foreseeable errors/faults. By doing this, you will ensure that the system cannot pose a risk to personnel or property while it is in operation.

8.2 Procedure when commissioning

1. Install the interface module.
See chapter: Mounting interface modules (Page 35)
2. Connect the interface module.
 - Supply voltage
 - PROFINET IOSee chapter: Connection (Page 45)
3. Connect the interface module to the 24 V DC supply.
See chapter: Connection (Page 45) and Rules and regulations (Page 45)
4. LED test of SIRIUS ACT devices.
After the power supply has been plugged in, all illuminated SIRIUS ACT command and signaling devices will light up for about 2 seconds.
5. Diagnosis of correct installation and correct connection.
After the power supply has been plugged in, all of the DIAG LEDs on the rear face of the interface module or terminal modules must light up green. You can find the DIAG LED next to the cable entry point.
6. Function test on terminal modules
You can perform a function test on the SIRIUS ACT devices without the CPU as follows: Operate the actuator on the front face of the SIRIUS ACT device. The DIAG LED of the terminal module must then flash green.

Maintenance

9.1 Firmware update

Introduction

During operation it may be necessary to update the firmware (e.g. to extend the available functions).

The interface module firmware is updated using firmware files.
The retentive data are retained after the firmware has been updated.

The following option is available for updating firmware:

- online via PROFINET (with STEP 7)

Requirements

- You have downloaded the file(s) for the firmware update from the Product Support web page. The original Siemens firmware provides additional tamper protection.

On this web page, select:

- Automation Technology > Industrial Controls > Command and Signaling Devices > SIRIUS ACT Pushbuttons and Indicator Lights > Modules for Actuators and Indicators

From there, navigate to the specific type of module that you want to update. To continue, click on the "Software downloads" link under "Support". Save the desired firmware update files.

- Before installing the firmware update, make sure that the modules are not being used.

Note

Supply voltage during a firmware update

The supply voltage L+ must be applied to the module on starting and during the firmware update.

Additional requirement for fail-safe modules

 WARNING

Checking the firmware version for F reliability

Before using a new firmware version, always check whether it is permitted for use in the respective module.

The permissible firmware version is specified in the appendices of the SIRIUS ACT PROFINET Safety certificate.

Note

Requirement for updating the firmware on a separate CPU

Always update the firmware with a separate CPU.

Installing the firmware update

 WARNING

Risk of impermissible system states

The CPU must be switched to the STOP state as a result of the firmware update being installed. STOP can affect the operation of an online process or a machine.

Unexpected operation of a process or a machine can lead to fatal or severe injuries and/or to property damage.

Before installing the firmware update, make sure that the interface module is not involved in an active process.

Procedure using STEP 7

Proceed as follows to perform an online firmware update with STEP 7:

1. Select the module in the device view.
2. Select the "Online & diagnostics" command from the shortcut menu.
3. Select the "Firmware update" group in the "Functions" folder.
4. Click the "Browse" button in the "Firmware update" area to select the path to the firmware update files.
5. Select the appropriate firmware file. The table in the firmware update area lists all modules for which an update is possible with the selected firmware file.
6. Click the "Run update" button. If the module can interpret the selected file, the file is downloaded to the module.

Updating the firmware

The box "Activate firmware after update" is always checked.

After the firmware has been successfully downloaded, it is accepted by the module which then continues operation on the new firmware. It is not necessary to switch off the voltage.

Behavior during the firmware update

Note the following behavior of the LEDs during the firmware update of the relevant interface module:

- The DIAG LED flashes red/green.
- The STATUS LED flashes red/green (only on the fail-safe interface module).

Behavior after the firmware has been updated without errors

After the firmware update, check the firmware version of the interface module on which the firmware has been updated.

Note the following behavior of the LEDs after a successful firmware update:

- The DIAG LED flashes green.
- The STATUS LED flashes green (only on the fail-safe interface module).
- The LINK LED lights up green.

Reference


You can find more information about the procedure in the STEP 7 online help.


9.2 Device replacement

Defective devices

Replace a defective device with a new device. Note the following safety instructions and the described procedure when doing so. Device replacement must be carried out by authorized specialist personnel.

Safety information

 WARNING
Hazardous Voltage Can Cause Death, Serious Injury, or Damage to Property.
Hazardous electrical voltages can cause electric shock, burns and damage.
<ul style="list-style-type: none">• Turn off and lock out all power supplying the system and device before working on the device.

 WARNING
Hazardous Voltage Can cause death, serious injury, or damage to property. Carry out function test of the system
To ensure the safety of the system, any changes to it or any replacement of defective components must be followed by a thorough and successfully completed function test of the system.
A complete function test consists of the following tests:
<ul style="list-style-type: none">• Configuration test (test of the configuration)• System test (wiring test of the connected sensors and actuators)

Note

Recycling and disposal

Dispose of existing packing material in accordance with applicable regulations or recycle it.

SIRIUS ACT devices can be recycled thanks to a low-pollutant manufacturing process. For environmentally-friendly recycling and disposal of your electronic waste, please contact a company certified for the disposal of electronic waste.

Note

When replacing a device, you do not need to re-wire it. You can disconnect the terminals from the defective device and then connect them to the new device. When doing this, make sure that you follow the specified sequence.

Please also note that the 7-wire flat ribbon cable must be shortened by the length of the damaged part when you are using terminal modules.

Replacing an interface module with memory module inserted

Note

Replace a defective device only with a device of an identical type.

Note

It is not possible to replace a fail-safe interface module without the memory module because fail-safe modules cannot operate without a memory module.

1. Disconnect the supply voltage. This can be done easily by removing the plug-in contact from the interface module.
2. Pull the PROFINET connector out of the interface module.
3. Remove the defective interface module.
4. Take the memory module out of the interface module.
5. Mount the new device.
6. Fit the memory module from the old device into the replacement unit (interface module).
7. Connect up the interface module (supply voltage and PROFINET).
8. Switch on the supply voltage again.

**WARNING****System restart after module replacement**

Can cause death, serious injury, or damage to property.

Take appropriate measures to prevent unintentional restarting and to ensure a defined start of the system.

Note

You are obliged to perform a function test after you have replaced a fail-safe interface module.

You can find additional information in chapters "Mounting interface modules (Page 35)" and "Connection (Page 45)".

Replacing an interface module without memory module inserted

Note

Replace a defective device only with a device of an identical type.

1. Disconnect the supply voltage. This can be done easily by removing the plug-in contact from the interface module.
2. Pull the PROFINET connector out of the interface module.
3. Remove the defective interface module.
4. Mount the new device.
5. Connect up the interface module (supply voltage and PROFINET).
6. Switch on the supply voltage again.
7. Reconfigure the interface module.



WARNING

**System restart after module replacement
Can cause death, serious injury, or damage to property.**

Take appropriate measures to prevent unintentional restarting and to ensure a defined start of the system.

You can find additional information in chapters "Mounting interface modules (Page 35)" and "Connection (Page 45)".

Replacing a terminal module

1. Disconnect the power supply from the interface module or switch off the power supply.
2. Open the clamping mechanisms at the defective terminal module and pull out the flat ribbon cables.
3. Remove the defective terminal module.
4. Mount the new terminal module.
5. Connect up the new terminal module.
6. Switch on the supply voltage again.

You can find additional information in chapters "Mounting terminal modules (Page 36)" and "Connection (Page 45)".

Diagnostics

10.1 Diagnostics - scenarios

4 different possible errors and their diagnosis are depicted schematically in the following scenarios.

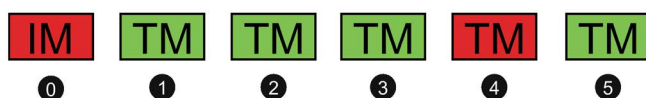
IM: Interface module

TM: Terminal module

Scenario 1:

Fault symptoms:

- The DIAG LED of the interface module is flashing red
- The DIAG LED of terminal module 4 is flashing red, downstream modules are o.k. (DIAG LED of terminal 5 is green)



Possible cause:

- Terminal module no. 4 is defective

Diagnostics procedure

1. Disconnect the power supply.
2. Replace terminal module no. 4.
3. Reconnect the power supply.
4. Check the diagnostic display.
If all DIAG LEDs are green, the fault has been rectified.

If the diagnostic display is the same, replace the terminal module with red flashing DIAG LED again because the new terminal module is also defective (unlikely). If the diagnostic LEDs display other fault symptoms, they must be compared to other fault scenarios.

General procedure:

Replace the modules on which the DIAG LED is flashing red. Also check, and if necessary, replace the cable connections on the front face of the modules with a red flashing DIAG LED.

Scenario 2:**Fault symptoms:**

- The DIAG LED of the interface module is flashing red
- The DIAG LED of terminal module 4 is flashing red, the downstream terminal module no. 5 also has red DIAG LED.

**Possible cause:**

The fact that the DIAG LEDs of terminal modules 4 and 5 are flashing indicates that the power supply to the modules is OK.

- Terminal module no. 4 is defective
- Since it is less likely that both modules are defective, there may be a communication failure between terminal modules 3 and 4 (possibly a wiring error).
- Terminal module 4 and terminal module 5 are both defective.

Diagnostics procedure

1. Disconnect the power supply.
2. Replace terminal module no. 4.
3. Reconnect the power supply.
4. Check the diagnostic display.
If all DIAG LEDs are green, the fault has been rectified.

If the same fault symptoms are displayed again, continue as follows:

1. Disconnect the power supply.
2. Check, and if necessary, replace the cable connections between terminal modules 3 and 4.
3. Reconnect the power supply. Check the diagnostic display.
If all DIAG LEDs are green, the fault has been rectified.

If the diagnostic display is the same, replace the terminal module with red flashing DIAG LED again because the new terminal module is also defective (unlikely). If the diagnostic LEDs display other fault symptoms, they must be compared to other fault scenarios.

General procedure:

Replace the modules on which the DIAG LED is flashing red. Check, and if necessary, replace the cable connections on the front face of the modules with a red flashing DIAG LED.

Scenario 3:**Fault symptoms:**

- The DIAG LED of the interface module is flashing red
- No LED display on terminal module 3 or any of the downstream modules.

**Possible cause:**

- The power supply between terminal modules 2 and 3 is interrupted.
- There is a wiring error between terminal modules 2 and 3.
- All of the terminal modules downstream of module 2 are defective (less likely).

Diagnostics procedure

1. Disconnect the power supply.
2. Check the cable connection between terminal modules 2 and 3.
3. Reconnect the power supply.
4. Check the diagnostic display.
If all DIAG LEDs are green, the fault has been rectified.

If the same fault symptoms are displayed again, compare them to other diagnostic displays.

General procedure:

Replace the modules on which the DIAG LED is flashing red. Check, and if necessary, replace the cable connections on the front face of the modules with a red flashing DIAG LED.

Scenario 4:

Fault symptoms:

- The DIAG LED of the interface module is flashing red
- The DIAG LED on terminal module 3 is not illuminated, all DIAG LEDs on the downstream modules are flashing red.
Since the DIAG LEDs on the modules downstream of terminal module 3 are flashing red, you can safely assume that the power supply to these modules is o.k.



Possible cause:

- Terminal module no. 3 is defective; can no longer operate its own LED and is no longer communicating with the downstream modules.

Diagnostics procedure

1. Disconnect the power supply.
2. Check the cable connection between terminal modules 2 and 3.
3. Reconnect the power supply.
4. Check the diagnostic display.
If all DIAG LEDs are green, the fault has been rectified.

If the diagnostic display is the same, replace the terminal module with red flashing DIAG LED again because the new terminal module is also defective (unlikely). If the diagnostic LEDs display other fault symptoms, they must be compared to other fault scenarios.

General procedure:

Replace the modules on which the DIAG LED is flashing red. Check, and if necessary, replace the cable connections on the front face of the modules with a red flashing DIAG LED.

Scenario 5:**Fault symptoms:**

- The DIAG LED of the interface module is flashing red
- The DIAG LEDs of the terminal modules are illuminated green (or flash green when the command device is operated)



Figure 10-1 D5

Possible cause:

- The terminal module line-up is not correctly configured (target and actual configurations do not match)
- The interface module is defective or malfunctioning
- Safety module malfunction or system stop (only on fail-safe interface module)

Diagnostics procedure

1. Check your configuration.
2. Check the diagnostic display.
If all DIAG LEDs are green, the fault has been rectified.

If the same fault symptoms are displayed again, continue as follows:

1. Disconnect the power supply.
2. Replace the interface module.
3. Reconnect the power supply.
4. Check the diagnostic display.
If all DIAG LEDs are green, the fault has been rectified.

General procedure:

Replace the modules on which the DIAG LED is flashing red. Check, and if necessary, replace the cable connections on the front face of the modules with a red flashing DIAG LED.

10.2 Diagnostics - interface module

DIAG LED	Module status	Meaning	Network diagnostics
Off	Interface module off	<ul style="list-style-type: none"> No power supply Power cable (+24 V/GND) is not connected or is defective Cable is connected incorrectly 	<ul style="list-style-type: none"> None of the DIAG LEDs of the terminal modules is illuminated
Off	Interface module is defective	<ul style="list-style-type: none"> Device is defective 	<ul style="list-style-type: none"> None of the DIAG LEDs of the terminal modules is illuminated
Green	Normal status	<ul style="list-style-type: none"> Everything o.k. 	<ul style="list-style-type: none"> All module DIAG LEDs are illuminated green
Flashes red	Interface module is defective	<ul style="list-style-type: none"> Internal error 	<ul style="list-style-type: none"> All DIAG LEDs of the connected terminal modules are illuminated green
Flashes red	Terminal module malfunction	<ul style="list-style-type: none"> Terminal module or wiring defect 	<ul style="list-style-type: none"> One or more DIAG LEDs of the connected terminal modules are illuminated green or off
Flashes green		<ul style="list-style-type: none"> Interface module is powering up No hardware configuration CPU in STOP mode 	<ul style="list-style-type: none"> The DIAG LEDs of the terminal modules are illuminated/flashing green, or are off or flashing red
Alternate red/green flashing		<ul style="list-style-type: none"> Firmware update in progress 	

10.3 Diagnostics - terminal module

DIAG LED	Module status	Meaning	Network diagnostics
Off	Module off	<ul style="list-style-type: none"> Wire break between interface module and terminal modules. No power supply to terminal module 	<ul style="list-style-type: none"> DIAG LED on interface module flashing red None of the DIAG LEDs of the downstream terminal modules is illuminated
Off	Module defective	<ul style="list-style-type: none"> Wiring error Terminal module defective 	<ul style="list-style-type: none"> None of the DIAG LEDs of the downstream terminal modules is illuminated All of the DIAG LEDs of the upstream terminal modules are illuminated green or are off The DIAG LED of the interface module is flashing red
Green	Normal status	Everything o.k.	<ul style="list-style-type: none"> All modules are illuminated green
Flashes red	<ul style="list-style-type: none"> Module defective Communications error 	Internal error (electronic) or defect data cables	<ul style="list-style-type: none"> All of the DIAG LEDs of the downstream terminal modules are flashing red or illuminated green All of the DIAG LEDs of the upstream terminal modules are illuminated green The DIAG LED of the interface module is flashing red

10.4 Status and fault displays

The tables below explain the meanings of the status and fault displays.

DIAG LED

The DIAG LED indicates the status of the fail-safe function.

DIAG LED	Meaning	Description
Off	Supply voltage not present or too low	Check the supply voltage or switch it on
Flashes green	Startup	LED flashes for at least 3 s
	STOP	No error
	Firmware update	No error
Green	RUN	No error
Flashes green	Startup/configured status	No hardware configuration Firmware update
Flashes red	Fault status/system stop <ul style="list-style-type: none"> • Interface module or terminal modules is/are malfunctioning • Safety modules malfunctioning or in system stop • Faulty configuration 	LED flashes for at least 3 s
	Fault	LED flashing or illuminated
Flashes red or flashes green	"Station flash test" (ping)	LED flashes for at least 3 s

LINK LED

The LINK LED indicates the status of PROFINET communication.

	Meaning
Link LED	
Green	Ethernet cable connected
Off	Ethernet cable not connected or no power supply
Flashes red	To identify the module

STATUS LED

The STATUS LED indicates the status of the fail-safe elements of the F module.

LED Status	Meaning
Alternate red/green flashing	Firmware update or passivated (PROFIsafe)
Green flashing	Device power-up, non-configured state (waiting for startup data records from CPU)
Amber flashing	During assignment of F address (F address assignment)
Illuminated amber	F address is wrong or missing
Illuminated green	Safety mode (no active faults)
Flashing red	Fault mode (fault, but not yet diagnosable via data records)
Illuminated red	System stop (serious fault)
Off	No power supply

Technical data

11.1 Standards

IEC 61508:2010 SIL 3	Functional safety of electrical/electronic/programmable electronic safety-related systems
EN ISO 13849-1:2008 PL e EN62061:2005 SIL CL3	Safety of machinery: Safety-related parts of control systems Safety of machinery - functional safety of electrical/electronic/programmable electronic safety-related systems
EN ISO 13850	Safety of machinery - Emergency stop function - Principles for design
EN 60947-5-5	Control circuit devices and switching elements - Electrical emergency stop devices with mechanical latching function
IEC 61511:2003	Functional safety – Safety instrumented systems for the process industry sector
NFPA 79:2007	Electrical standard for industrial machinery
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
IEC 61784-3-3:2007	Profiles for functional safety communications in industrial networks, Part 3-3

11.2 Response times

Reaction time (in error-free operation)

The reaction time is the time until a system responds at the output after a change of an input variable, i.e. the time between the event and the action, e.g. terminal to terminal or sensor to actuator for operational switching.

The reaction time in error-free operation is calculated to define the process in the system. This time is **not** suitable for the determining safety distances in the system.

Fault reaction time (reaction time in the event of a fault)

The fault reaction time is the time between detecting a hazardous fault in a system and that system entering the safe state.

Verification of reaction times in the case of safety circuits

When safety equipment is commissioned, steps must be taken to verify that it will shut down within a maximum permissible time after the safety function has been requested.

To provide this verification, you must determine the reaction times of the application you have configured.

WARNING

Level of Safety

Can Cause Death, Serious Injury, or Damage to Property.

Note that the calculation of the reaction times affects the level of safety and influences the overall design of the system.

Relevant times

When calculating system reaction times, the following times need to be taken into account:

- In the case of device faults, the device switches to the safe state (system stop or fault mode). In this case, communication via PROFIsafe is interrupted. The higher-level F-CPU detects this interruption within the PROFIsafe timeout period and must then itself take action to ensure that the entire system switches to a safe state.
PROFIsafe timeout period: min. 60 ms
- The time taken to transmit the safety request (EMERGENCY STOP) from the EMERGENCY STOP contacts (on fail-safe interface module) to the higher-level F-CPU = 30 ms + PROFINET update time

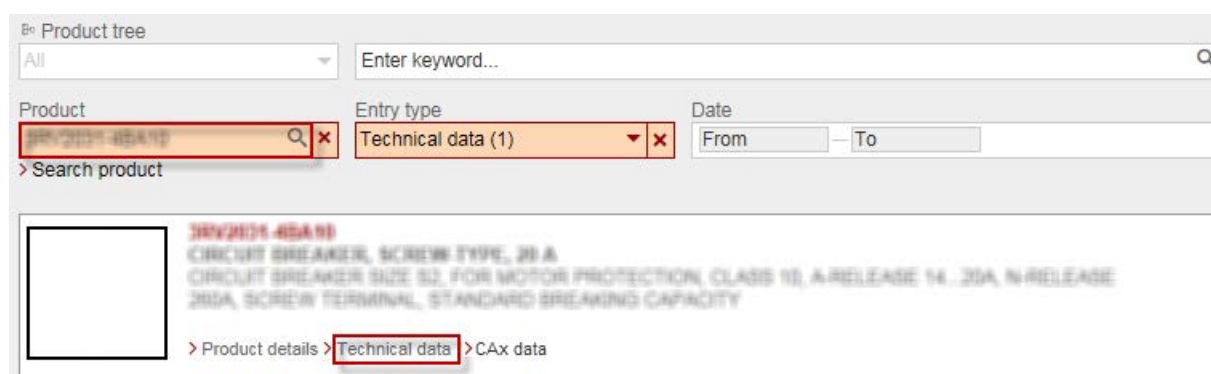
The PROFINET transmission time can be set to between 2 and 512 ms. The factory setting is 2 ms.

11.3 Technical data in Siemens Industry Online Support

Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/ps/16444/td>).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data link.



The screenshot shows the Siemens Industry Online Support search interface. At the top, there is a search bar with the text "Enter keyword..." and a search icon. Below the search bar, there are three filters: "Product" with the value "3RV2131-4BA11", "Entry type" with the value "Technical data (1)", and "Date" with "From" and "To" fields. Below the filters, there is a search button labeled "> Search product". The search results are displayed in a table with one entry for the product "3RV2131-4BA11". The entry includes a product image placeholder, the product name, and a description: "CIRCUIT BREAKER, SCREW TYPE, 20 A, CIRCUIT BREAKER SIZE S2, FOR MOTOR PROTECTION, CLASS 10, A-RELEASE 14, 30A, N-RELEASE 200A, SCREW TERMINAL, STANDARD BREAKING CAPACITY". Below the product name, there is a breadcrumb trail: "> Product details > Technical data > CAx data".

Further information about SIRIUS ACT devices with PROFINET IO can be found in the following chapters of this manual:

- Interface modules (Page 24)
- Fail-safe interface modules (Page 25)
- Command module (Page 29)
- Command and LED module (Page 29)
- LED module (Page 30)
- Accessories (Page 31)

11.4 Safety data

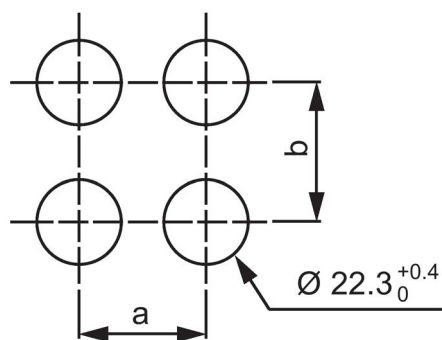
The table shows the safety data of the fail-safe interface modules.

Data	3SU1400-1LL10-1BA1 3SU1400-1LL10-3BA1
Ambient temperature during operation	-25 ... +60 °C
Safety integrity level (SIL) / according to IEC 61508	3
Performance Level (PL) / according to EN ISO 13849-1	PL e / Cat. 4
IP degree of protection	IP20
SIL claim limit (subsystem) / according to EN 62061	CL3
Voltage type / of input voltage	24 V DC
PFH _D / with high demand rate / according to EN 62061 [1 per h]	5.951 E ⁻¹⁰
PFD / with low demand rate / according to EN 62061 [1 per h]	2.426 E ⁻⁰⁶
Repeat test	1 per year
Service life of device	20 years

Dimension drawings

12.1 Minimum clearances

The modules (interface modules, terminal modules) can be installed side by side with the following center-to-center spacing.



	a	b
Interface modules	40 mm	PROFINET 90° angle plug: 100 mm PROFINET straight plug: 120 mm
Terminal modules	30 mm	40 mm

12.2 Mounting depths

The following diagrams show the mounting depths that you will need inside the control cabinet. The front plate thickness is between 1 and 6 mm.

The 3SU1 holder compensates for the different front plate thicknesses.

All dimensions in mm in diagrams below.

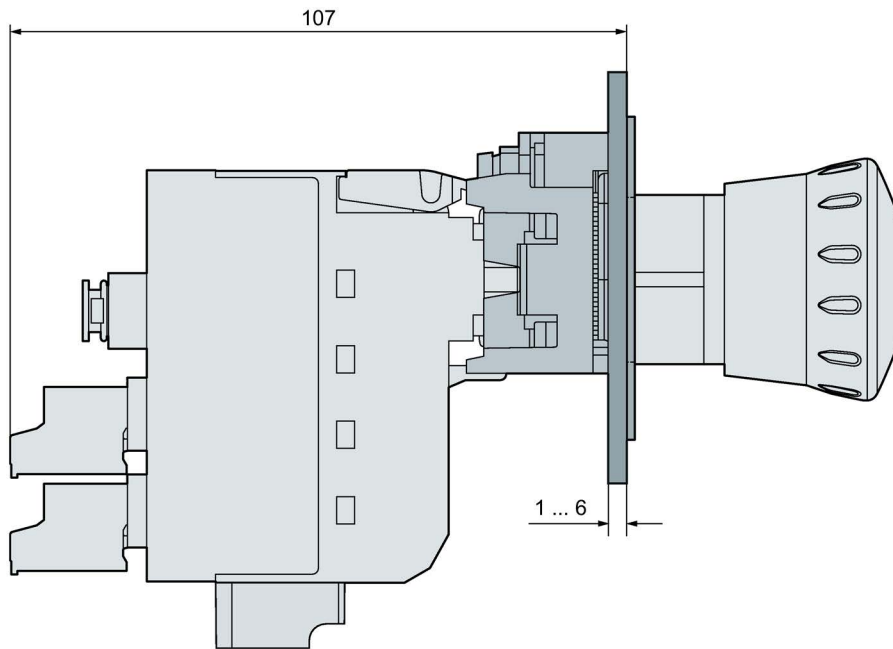


Figure 12-1 Interface module directly attached to the holder

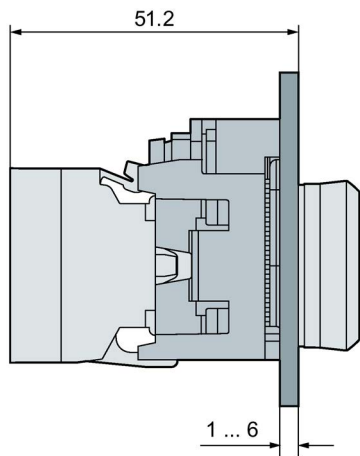


Figure 12-2 Terminal module directly attached to the holder

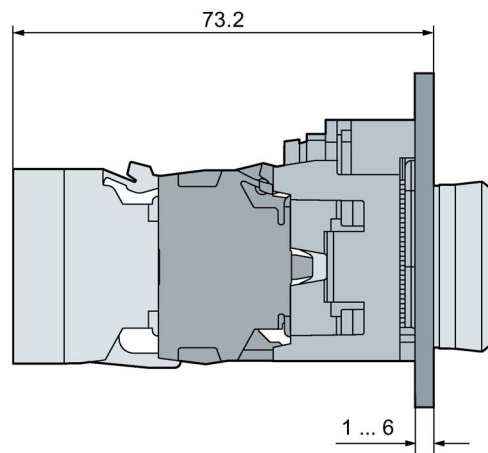


Figure 12-3 Terminal module on standard contact module and one LED module or one test module inserted*

* You must insert a module in all three positions in the first tier.

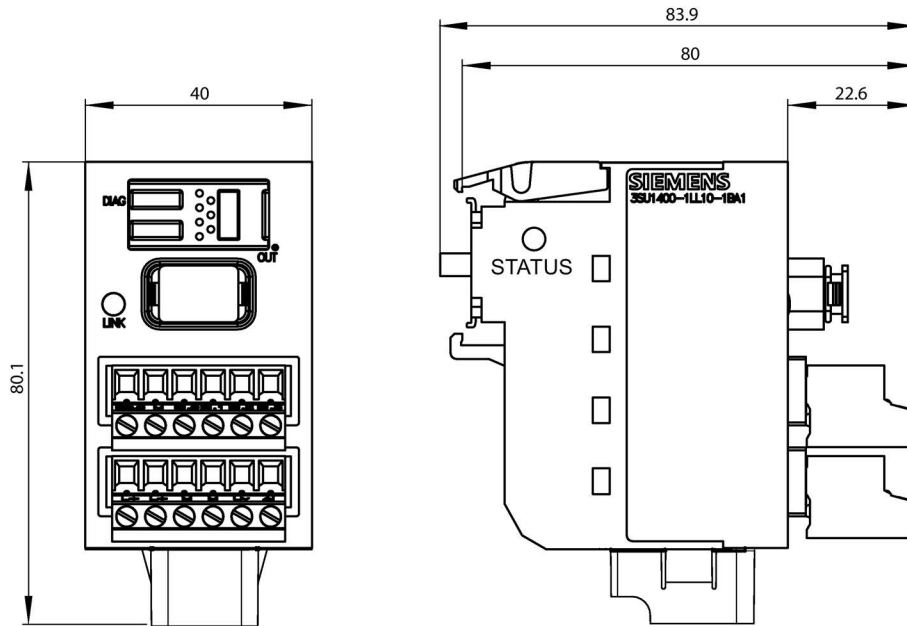
Only attach the terminal module version without LED. The LED module mounted in the middle position of the holder is used to illuminate the command or signaling position. This LED module needs to be controlled separately.

You can alternatively attach the terminal modules to contact, LED or test modules. You cannot attach the modules to a terminal module or an interface module.

12.3 Fail-safe interface modules

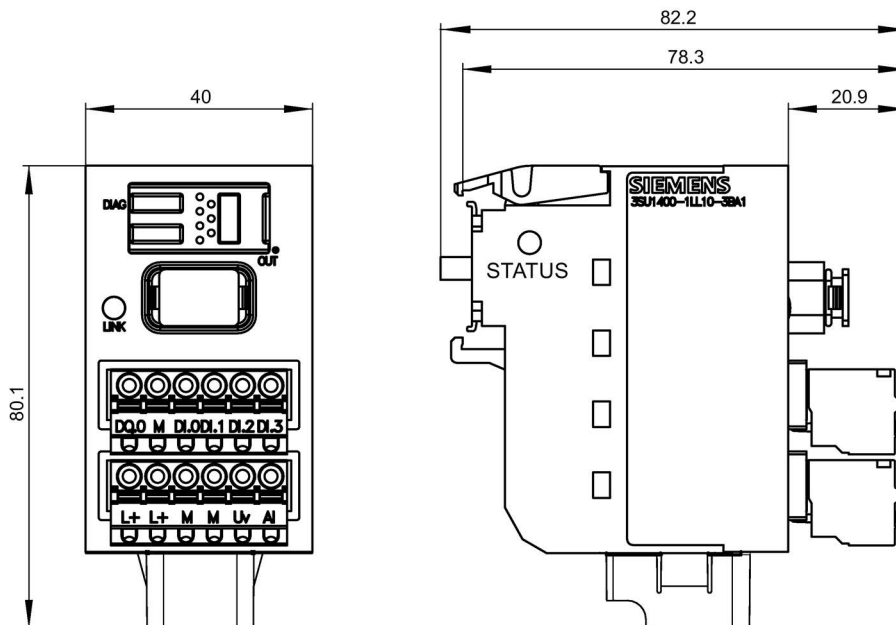
Fail-safe interface module (screw terminals)

Article No.: 3SU1400-1LL10-1BA1



Fail-safe interface module (spring-loaded terminals)

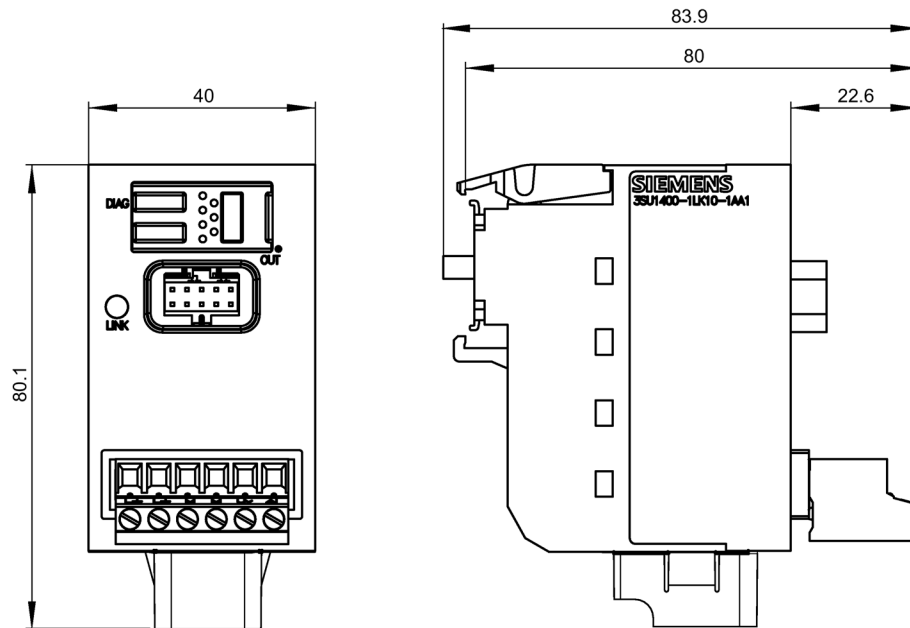
Article No.: 3SU1400-1LL10-3BA1



12.4 Interface modules

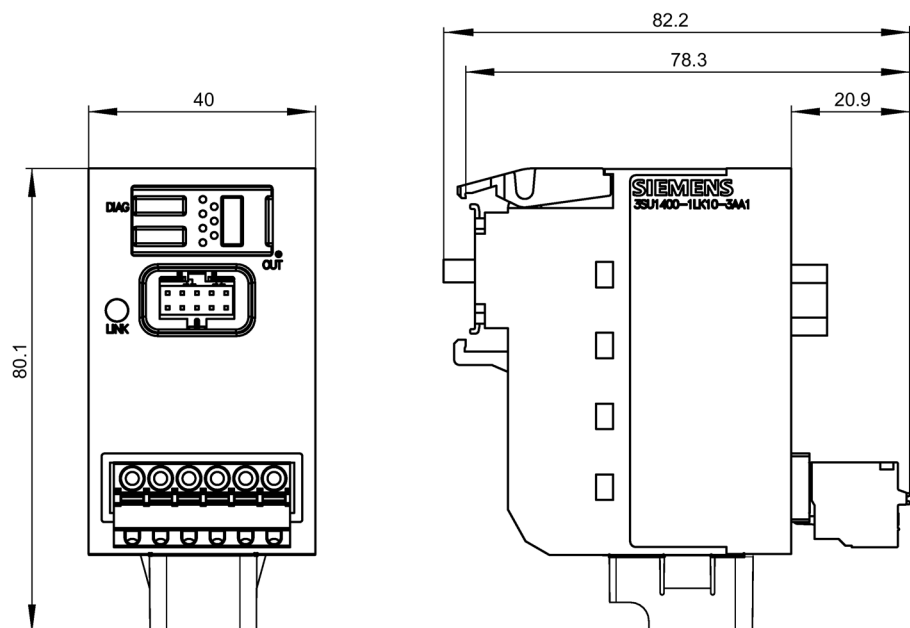
Interface module (screw terminals)

Article No.: 3SU1400-1LK10-1AA1



Interface module (spring-loaded terminals)

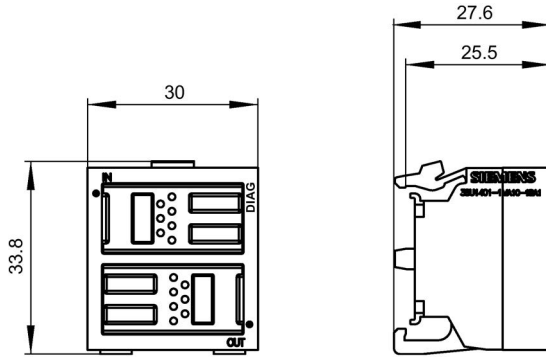
Article No.: 3SU1400-1LK10-3AA1



12.5 Terminal modules

Command module

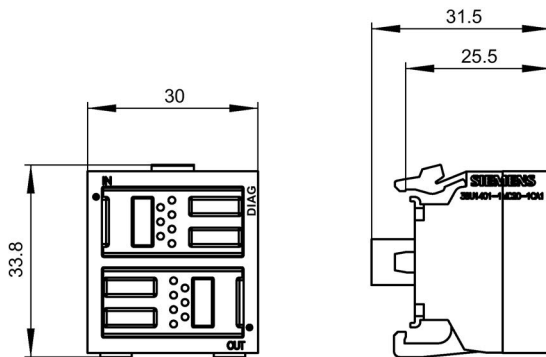
Article No.: 3SU1400-1MA10-1BA1



Command and LED module

Article No.: 3SU1401-1MC20-1CA1

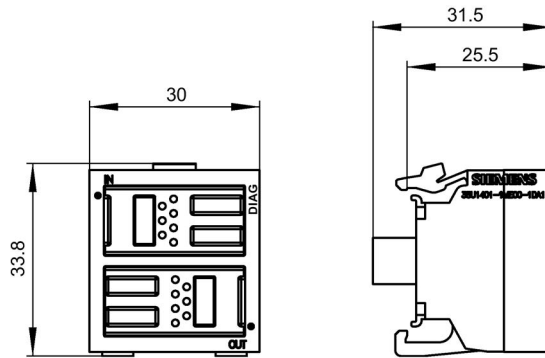
3SU1401-1MC(3,4,5,6,0)0-1CA1



LED module

Article No.: 3SU1401-1ME00-1DA1

3SU1401-1ME(2,3,4,5,6)0-1DA1



Data records

A.1 Device-specific diagnostics DS92

Byte.Bit	Meaning	Fault/error number	Comment
0.0 - 1.7	Reserved		
2.0	Device fault (GF)	0x1080	Irrecoverable fault detected following self-diagnostics (self-test, contactor contacts, switching element, etc.). Remedy: Replace the device.
2.1	Group fault (SF)		At least one (machine) fault is present
2.2	Reserved		
2.3	Group warning (SW)		At least one warning is present
2.4 - 2.7	Reserved		
3.0 - 3.1	Reserved		
3.2	Configuring error (PF)		Configuring group error. See below for individual errors.
3.3	PROFIsafe fault (PSF)		3SU1 IM F passivated
3.4 - 3.7	Reserved		
4.0 - 4.7	Reserved		
5.0	F address assignment		Set during F address assignment process
5.1 - 5.7	Reserved		
6.0 - 6.7	Reserved		
7.0	Internal discrepancy error	0x315	The module has detected an internal fault. Possible cause: <ul style="list-style-type: none"> Increased EMC interference / module is defective. Remedy: <ul style="list-style-type: none"> Replace the module if the fault is active continuously Possible cause: <ul style="list-style-type: none"> With the fail-safe interface module, only one switching element is centrally actuated, not both at the same time! Remedy: <ul style="list-style-type: none"> Press both switching elements simultaneously
7.1 - 7.7	Reserved		
8.0 - 8.8	Reserved		
9.0 - 9.7	Reserved		
10.0 - 10.5	Reserved		

A.1 Device-specific diagnostics DS92

Byte.Bit	Meaning	Fault/error number	Comment
10.6	EXPECTED <> REAL slot configuration	0x1094	System startup: <ul style="list-style-type: none"> • There is difference between the current and configured positions of the terminal module. • Make sure that the terminal module is actually inserted in the configured position.
		0x100d	Wiring error in operation: <ul style="list-style-type: none"> • The terminal module wiring is incorrect or missing. • Check all cables and connections and following all installation instructions.
10.7	Reserved		
11.0	Reserved		
11.1	Parameterization error	0x1095	<ul style="list-style-type: none"> • The interface module has not been parameterized or is incorrectly parameterized. • Changes to parameter settings are rejected in the current operating state. Remedy: <ul style="list-style-type: none"> • Correct the parameter settings and apply the corrected settings. • Change the operating state and repeat the parameterization.
11.2 - 11.7	Reserved		
12.0 - 13.7	Reserved		
14.0	External memory module is not inserted	0x100F	(3SU1 F) The external memory module is missing, incorrect, inaccessible (defective) or temporarily inaccessible. Remedy: <ul style="list-style-type: none"> • Check/replace the memory module or try to access it again.
14.1 - 14.7	Reserved		
15.0 - 15.7	Reserved		
16.0	CPU/master stop		
16.1 - 16.7	Reserved		
17.0 - 17.7	Reserved		
18.0 - 18.1	Reserved		
18.2	Installed firmware is invalid / inconsistent	0x11b	The firmware is incomplete and/or the firmware expansions are incomplete or incompatible. Remedy: <ul style="list-style-type: none"> • Execute a complete firmware update. • Check any generated fault messages. • Check to see whether or not the firmware update has been interrupted.
18.3 - 18.7	Reserved		
19.0 - 19.7	Reserved		

Byte.Bit	Meaning	Fault/error number	Comment
20.0	Error in safety destination address (F_Dest_Add).	0x40	The PROFIsafe driver has detected a different destination address. Remedy: <ul style="list-style-type: none"> Check the parameter assignments for the PROFIsafe driver and the address settings for the fail-safe module.
20.1	Invalid safety destination address (F_Dest_Add)	0x41	The PROFIsafe driver has detected a prohibited destination address. Remedy: <ul style="list-style-type: none"> Check the parameter assignments for the PROFIsafe driver.
20.2	Invalid safety source address (F_Source_Add)	0x42	The PROFIsafe driver has detected a prohibited source address. Remedy: <ul style="list-style-type: none"> Check the parameter assignments for the PROFIsafe driver.
20.3	The value of the safety watchdog time is 0 ms (F_WD_Time)	0x43	The PROFIsafe driver has detected an invalid watchdog time. Remedy: <ul style="list-style-type: none"> Check the parameter assignments for the PROFIsafe driver.
20.4	Parameter F_SIL exceeds SIL of special device application	0x44	The PROFIsafe driver has detected a discrepancy between the communication SIL setting and the application SIL setting. Remedy: <ul style="list-style-type: none"> Check the parameter assignments for the PROFIsafe driver.
20.5	Parameter F_CRC_Length does not match the generated values	0x45	The PROFIsafe driver has detected a discrepancy in the CRC length. Remedy: <ul style="list-style-type: none"> Check the parameter assignments for the PROFIsafe driver.
20.6	F-parameter version is set incorrectly	0x46	The PROFIsafe driver has detected an incorrect version or an invalid F_Block_ID. Remedy: <ul style="list-style-type: none"> Check the parameter assignments for the PROFIsafe driver.
20.7	CRC1 error	0x47	The fail-safe parameters for the PROFIsafe driver are inconsistent. Remedy: <ul style="list-style-type: none"> Check the parameter assignments for the PROFIsafe driver.
21.0 - 21.3	Reserved		

Byte.Bit	Meaning	Fault/error number	Comment
21.4	Operator acknowledgement required		The higher-level CPU is ready for reintegration of the 3SU1 IM F. Fault remedied, but 3SU1 F still passivated.
21.5	PROFIsafe communication error (timeout)	0x318	The PROFIsafe driver has detected a timeout. Possible causes: <ul style="list-style-type: none"> • The PROFIsafe timeout period is set incorrectly. • Bus fault Remedy: <ul style="list-style-type: none"> • Check the parameter assignments. • Make sure that the communication system is functioning correctly.
21.6	PROFIsafe communication error (CRC)	0x319	The PROFIsafe driver has detected a CRC error. Possible causes: <ul style="list-style-type: none"> • Bus fault Remedy: <ul style="list-style-type: none"> • Make sure that the communication system is functioning correctly.
22.0 - 29.7	Reserved		

A.2 Device parameter DS130

Byte.Bit	Meaning	Unit	Value range	Factory setting
0.0 - 1.7	Reserved			
Hardware configuration				
2.0 - 4.7	Reserved			
5.0 - 5.6	Reserved			
5.7	Enable device reconfiguration via user program		[0] disabled [1] enabled	[0] disabled
Parameters				
6.0 - 6.1	Interface module: LED settings - brightness	%	10, 40, 70, 100	100
6.2 - 6.3	Interface module: Selection of NO/NC contacts (from firmware V1.1.0)		[0] NO contact [1] NC contact	[0] for Standard [1] for Safety
6.4 - 6.5	Interface module: LED settings - flashing frequency	Hz	0 (continuous light) 0.1 0.5 2	0 (continuous light)
6.6	Applying settings to all connected terminal modules		[0] disabled [1] enabled	[0] disabled
6.7 - 8.7	Reserved			
9.0 - 9.1	Terminal module 1 (slot 4): LED brightness	%	10, 40, 70, 100	100
9.2 - 9.3	Terminal module 1: Selection of NO/NC contacts (from firmware V1.1.0)		[0] NO contact [1] NC contact	[0] NO contact
9.4 - 9.5	Terminal module 1: LED flashing frequency	Hz	0 (continuous light) 0.1 0.5 2	0 (continuous light)
9.6 - 9.7	Reserved			
10.0 - 10.1	Terminal module 2 (slot 4): LED brightness	%	10, 40, 70, 100	100
10.2 - 10.3	Reserved			
10.4 - 10.5	Terminal module 2: LED flashing frequency	Hz	0 (continuous light) 0.1 0.5 2	0 (continuous light)
10.6 - 10.7	Reserved			
...	
28.0 - 28.1	Terminal module 20 (slot 23): LED brightness	%	10, 40, 70, 100	100

Byte.Bit	Meaning	Unit	Value range	Factory setting
28.2 - 28.3	Terminal module 20: Selection of NO/NC contacts (from firmware V1.1.0)		[0] NO contact [1] NC contact	[0] NO contact
28.4 - 28.5	Terminal module 20: LED flashing frequency	Hz	0 (continuous light) 0.1 0.5 2	0 (continuous light)
28.6 - 28.7	Reserved			
29.0 - 29.7	Reserved			

A.3 DS196

Byte	Element	Coding	Explanation
0	Block length	4 + number of slots	Header
1	Block ID	196	
2	Version	4	
3		0	
4	Slot 0 of the station master	0	These slots are occupied by the interface module and cannot therefore be changed by the configuration control.
5	Slot 1 of the station master	1	
6	Slot 2 of the station master	2	
7	Slot 3 of the station master	3	
8	Slot 4 of the station master	Slot assignment in the station option	Control element: Specifies the slot assignments of individual 3SU1 terminal modules.
:	:	:	
4 + (max. slot)	Last slot of the station master	Slot assignment in the station option	The value that you need to enter in the relevant byte is determined by the following rule: <ul style="list-style-type: none"> • If the module is included in the station option, enter the slot number of the module. • If the module is not included in the station option, enter 255 (0xFF).

A.4 DS197

Byte	Element	Coding	Meaning
0	Block length	4 + (number of slots x 2)	Header
1	Block ID	197	Status = 1: <ul style="list-style-type: none"> Module from station master is inserted in the station option Slot is marked as non-existent in the control data record Status = 0: <ul style="list-style-type: none"> Module removed from slot Incorrect module is inserted in the station option* Slot is unused in the station master
2	Version	2	
3		0	
4	Status of slot 1	0/1	
5	Reserved	0	
6	Status of slot 2	0/1	
7	Reserved	0	
8	Status of slot 3	0/1	
9	Reserved	0	
10	Status of slot 4	0/1	
11	Reserved	0	
12	Status of slot 5	0/1	
13	Reserved	0	
:	:	:	
4 + ((max. number - 1) × 2)	Status of max. slot	0/1	
4 + ((max. number - 1) × 2) + 1	Reserved	0	

* Not possible if the slot is marked as a non-existent slot.