

Flexi Gateway GPNT1

Expansion module - gateway

SICK
Sensor Intelligence.



Described product

Flexi Gateway GPNT1

Manufacturer

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Original document

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1 About this document

1.1 Purpose of this document

These operating instructions contain the information required during the life cycle of the safety controller.

Operating instructions of the safety controller must be made available to all people who work with the device.

1.2 Scope

Product

This document applies to the following products:

- Product code: Flexi Gateway GPNT1
- “Operating instructions” type label entry: 8024567

Document identification

Document part number:

- This document: 8024581
- Available language versions of this document: 8024567

You can find the current version of all documents at www.sick.com.

Other documents relevant for the product

Table 1: Available documents

Document	Title	Part number
Operating instructions	Flexi Compact safety controller	8024573
Operating instructions	FLX3-XTDI1 Expansion module for safety controllers	8024571
Operating instructions	FLX3-XTDO1 Expansion module for safety controllers	8024570
Operating instructions	FLX0-GPNT1 Expansion module for safety controllers	8024567
Operating instructions	FLX0-GETC1 Expansion module for safety controllers	8024566
Operating instructions	FLX0-GCAN1 Expansion module for safety controllers	8024572
Operating instructions	Flexi Loop Safe Series Connection Hardware	8015834
Operating instructions	Flexi Loop in the Safety Designer Software	8018174
Competence brochure	Guide for Safe Machinery	8008007

1.3 Target groups and structure of these operating instructions

These operating instructions are intended for the following target groups: project developers (planners, developers, designers), installers, electricians, safety experts (such as CE authorized representatives, compliance officers, people who test and approve the application), operators, and maintenance personnel.

These operating instructions are organized by the life phases of the device: project planning, mounting, electrical installation, commissioning, operation and maintenance.

The table below shows the target groups and how – for many applications – these are typically divided up between the manufacturer and the entity operating the machine in which the device is to be integrated:

Area of responsibility	Target group	Specific chapters of these operating instructions ¹⁾
Manufacturer	Project developers (planners, developers, designers)	Project planning, page 13 Technical data, page 31
	Installers	Mounting, page 16
	Electricians	Electrical installation, page 17
	Safety experts	Project planning, page 13 Commissioning, page 24 Technical data, page 31
Operating entity	Operators	Troubleshooting, page 29
	Maintenance staff	Troubleshooting, page 29 Ordering information, page 48

¹⁾ Chapters not listed here are intended for all target groups. All target groups must follow all of the safety and warning instructions in all chapters of the operating instructions!

In other applications, the operating organization is also the manufacturer of the equipment with the corresponding allocation of the target groups.

1.4 Further information

www.sick.com

The following information is available via the Internet:

- Data sheets and application examples
- CAD files and dimensional drawings
- Certificates (such as the EU declaration of conformity)
- Guide for Safe Machinery. Six steps to a safe machine
- Safety Designer (software for configuring safety solutions made by SICK AG)

1.5 Symbols and document conventions

The following symbols and conventions are used in this document:

Safety notes and other notes



DANGER

Indicates a situation presenting imminent danger, which will lead to death or serious injuries if not prevented.

**WARNING**

Indicates a situation presenting possible danger, which may lead to death or serious injuries if not prevented.

**CAUTION**

Indicates a situation presenting possible danger, which may lead to moderate or minor injuries if not prevented.

**NOTICE**

Indicates a situation presenting possible danger, which may lead to property damage if not prevented.

**NOTE**

Indicates useful tips and recommendations.

Instructions to action

- ▶ The arrow denotes instructions to action.
- 1. The sequence of instructions for action is numbered.
- 2. Follow the order in which the numbered instructions are given.
- ✓ The check mark denotes the result of an instruction.

2 Safety information

2.1 General safety notes

Product integration



DANGER

The product can not offer the expected protection if it is integrated incorrectly.

- ▶ Plan the integration of the product in accordance with the machine requirements (project planning).
 - ▶ Implement the integration of the product in accordance with the project planning.
-

Mounting and electrical installation



DANGER

Death or severe injury due to electrical voltage and/or an unexpected startup of the machine

- ▶ Make sure that the machine is (and remains) disconnected from the voltage supply during mounting and electrical installation.
 - ▶ Make sure that the dangerous state of the machine is and remains switched off.
-

Repairs and modifications



DANGER

Improper work on the product

A modified product may not offer the expected protection if it is integrated incorrectly.

- ▶ Apart from the procedures described in this document, do not repair, open, manipulate or otherwise modify the product.
-

2.2 Intended use

The Flexi Compact safety controller is a freely configurable control for safety applications.

Sensors and switching elements (e.g. light curtains, laser scanners, switches, sensors, encoders, emergency stop pushbuttons) are connected to the safety controller and are linked logically. The corresponding actuators of the machines or systems can be switched off safely via the switching outputs of the safety controller.

The gateway is an extension module of the safety controller. The gateway module enables a safety controller to send data to a network for control and diagnostic purposes, and to receive data from the network.

Incorrect use, improper modification or manipulation of the product will invalidate any warranty from SICK; in addition, any responsibility and liability of SICK for damage and secondary damage caused by this is excluded.

The product is only suitable for use in industrial environments.

2.3 Improper use

Among others, the safety controller is not suitable for the following applications:

- Outdoors
- Underwater

- In explosion-hazardous areas
- In residential areas

2.4 Cybersecurity

Overview

To protect against cybersecurity threats, it is necessary to continuously monitor and maintain a comprehensive cybersecurity concept. A suitable concept consists of organizational, technical, procedural, electronic, and physical levels of defense and considers suitable measures for different types of risks. The measures implemented in this product can only support protection against cybersecurity threats if the product is used as part of such a concept.

You will find further information at www.sick.com/psirt, e.g.:

- General information on cybersecurity
- Contact option for reporting vulnerabilities
- Information on known vulnerabilities (security advisories)

2.5 Requirements for the qualification of personnel

The product must be configured, installed, connected, commissioned, and serviced by qualified safety personnel only.

Project planning

You need safety expertise to implement safety functions and select suitable products for that purpose. You need expert knowledge of the applicable standards and regulations.

Mounting, electrical installation and commissioning

You need suitable expertise and experience. You must be able to assess if the machine is operating safely.

Configuration

You need suitable expertise and experience. You must be able to assess if the machine is operating safely.

Operation and maintenance

You need suitable expertise and experience. You must be instructed in machine operation by the machine operator. For maintenance, you must be able to assess if the machine is operating safely.

3 Product description

3.1 Configuration of the safety controller

Configuration of the safety controller

A safety controller comprises the following components:

- A main module
- Up to 12 optional expansion modules (excluding maximum 1 gateway)

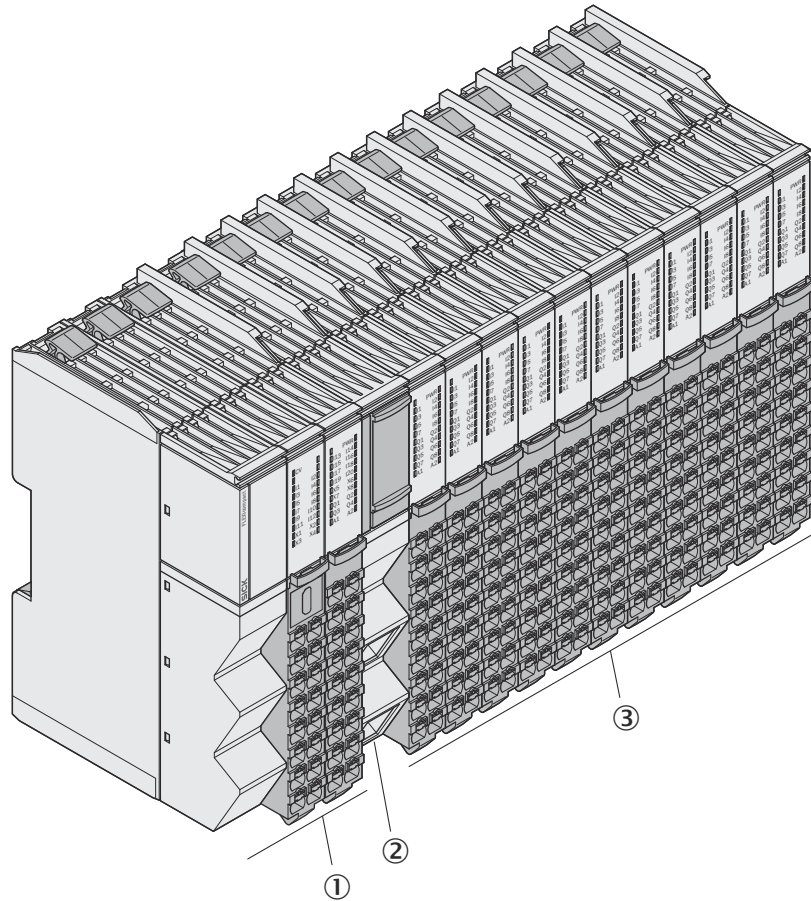


Figure 1: Example maximum configuration

- ① Main module
- ② Expansion module - gateway
- ③ IO expansion module

Complementary information

- The gateway and IO expansion modules can be arranged arbitrarily.

3.2 Overview of the module

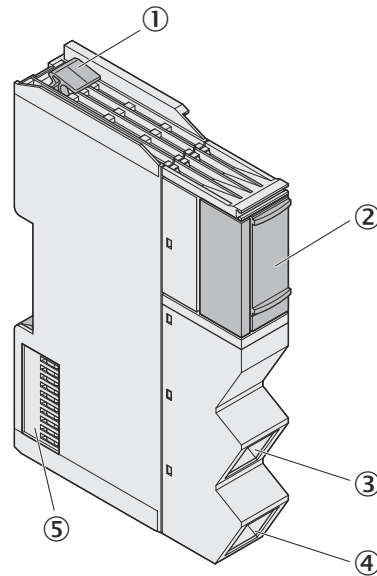


Figure 2: Gateway expansion module

- ① Release element of the module
- ② Display
- ③ RJ45 female connector
- ④ RJ45 female connector
- ⑤ Backplane bus

3.3 Design and function of the module

Prerequisites

- The module can only be operated with a main module.

Configuration

Table 2: Interfaces of the module

Description	Quantity
Ethernet (RJ45 female connector)	2

Function

The module enables a safety controller to send data to a network for control and diagnostic purposes, and to receive data from the network.

The module offers the following functions:

- Integration into a PROFINET IO network as a field device
- Communication of multiple applications with the safety controller via TCP/IP sockets
- Configuration of the safety controller via TCP/IP

The module is equipped with an integrated switch. The switch enables the module to be connected to another Ethernet component (e.g., to a computer) without having to interrupt the connection of the fieldbus network.

Complementary information

- Voltage is supplied to the module via the backplane bus. Communication with the main module of the safety controller also occurs via the backplane bus.

3.4 Status indicators

Status indicators

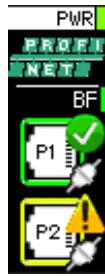


Figure 3: Status indicators

Status indicator

Table 3: Status indicator

Labeling	Color	Function
PWR (power)	Green/Red	Device status
BF	Green	PROFINET operational status
P1 ... P2	Green/yellow/white	Network activity for Ethernet RJ45 female connector 1 and female connector 2

Further topics

- ["Status indicators", page 25](#)
- ["Troubleshooting", page 29](#)
- ["Operation", page 25](#)

4 Project planning

4.1 Design

Installation site

- The safety controller must be protected against condensation and conductive contamination, e.g. in an IP54 control cabinet.
- Mounting on a 35 mm × 7.5 mm mounting rail in accordance with IEC 60715.
- The mounting rail is connected to the functional earth.
- Mounting rail is mounted on a mounting plate.
- Mounting plate is connected to functional earth.
- Mounting in a vertical orientation (on a horizontal mounting rail).
- Take suitable ESD protection measures.

Air circulation

To ensure sufficient air circulation and cooling, sufficient distance must be kept in the control cabinet above and below the module.

Provide an adequate clearance in front of the module (front side) for the connected cables.

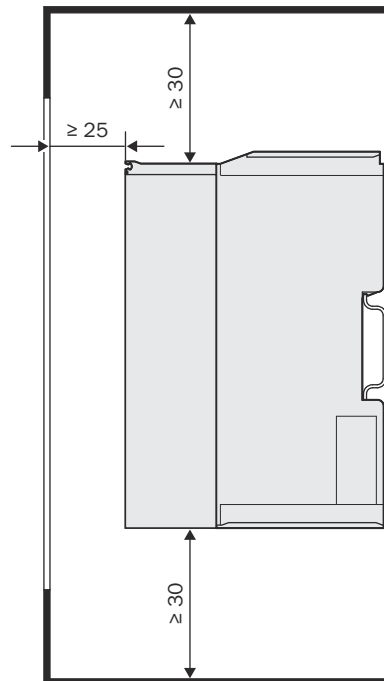


Figure 4: Clearances for adequate air circulation

Required distance:

- Above and below the module: ≥ 30 mm
- In front of the module: ≥ 25 mm

4.2 Integration into the network

4.2.1 Network topology

The gateway is suitable for the following network topologies:

- Star
- Line

- Ring
- Tree

4.2.2 Integration via the fieldbus interface

Prerequisites

- GSDML file (device description file) is installed in the hardware catalog of the higher-level controller.

Parameters to be configured

Parameter:

- Unique device name
- If applicable, the IP address of the router with associated subnet mask

You can configure the parameters via the following interfaces:

- Safety Designer
- Configuration software for the relevant fieldbus network
- PROFINET controller
- Display on the gateway

Complementary information

You can find the required device description file and the device symbol for integration into a higher-level controller in the following locations:

- On the Internet on the gateway product page at www.sick.com
- In the configuration software program directory on the computer

4.2.3 Integration via the TCP/IP socket interface

Overview

You can integrate the gateway into a network via TCP/IP sockets in parallel to the fieldbus.

The gateway supports multiple TCP/IP socket interfaces. This enables multiple applications to communicate with the safety controller at the same time.

Table 4: TCP/IP socket interfaces

Number of TCP/IP socket interfaces	4
Number of possible connections per TCP/IP socket	6
Total number of connections	24

Important information



NOTE

Remote TCP/IP connections with excessive signal propagation times can be unstable. Signal propagation times > 300 ms may result in the connection being terminated.

- ▶ Take account of signal propagation times in the case of remote TCP/IP connections.
- ▶ Use the ping command to check the signal propagation time.
- ▶ If necessary, change the routing.

Client or server

You configure the module as a client or as a server in Safety Designer.

- When the module is configured as a server, the application reads the input data from the module (polling).
- When the module is configured as a client, the module writes the input data to the application.

Further topics

- ["Configuring the TCP/IP socket interfaces", page 20](#)

5 Mounting

5.1 Mounting procedure

For information on the mounting process, please see the operating instructions:

- “Flexi Compact” (SICK part number 8024573)

5.2 Module exchange

Approach

1. Disconnect the module and the connected components from all voltage sources.
2. Remove the module.
3. Mount the new module.

6 Electrical installation

6.1 Connecting

Prerequisites

- Mounting is completed.
- Electrical installation is carried out according to the project planning.
- Dangerous condition of the machine is and remains off during the electrical installation.
- The outputs of the safety controller do not affect the machine during electrical installation.

6.1.1 RJ45 port connection

Prerequisites

Network cable requirement:

- Type: 100Base-TX
- Cables with RJ45 connections
- Twisted pair Ethernet cable, maximum length 100 m in accordance with EN 50173
- Use of wire pairs 1/2 and 3/6
- Shielded cables
- Cat 5 STP or higher

Connection

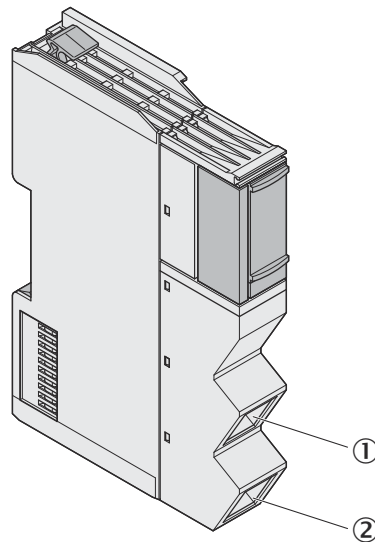


Figure 5: Connections

- ① RJ45 Ethernet female connector, port 1
- ② RJ45 Ethernet female connector, port 2

7 Configuration

7.1 Delivery state

The device is not configured in the delivery state.

7.2 Overview

For more information on configuring the safety controller, see the operating instructions:

- “Flexi Compact” (SICK part number 8024573)

7.3 Offline, online and security configuration

Overview

All configuration parameters are assigned to a configuration group. The configuration groups differ, for example, when transmitting and saving the configuration.

The following configuration groups are available

- Offline configuration
- Online configuration
- Security configuration

Offline configuration

All offline configuration parameters are written to the safety controller using the **Transfer to device** function. The offline configuration includes, for example, all parameters of the hardware configuration.

These parameters can only be configured in the configuration software.

To configure the parameters, no connection to the safety controller must exist. Only establish a connection to the safety controller when you want to transfer the configuration.

The application is stopped while the configuration is transferred to the safety controller.

The offline configuration is stored in the SmartPlug. A (defective) module can be replaced with a compatible module without having to reconfigure the device. The offline configuration must be compatible with the physical safety controller.

Within the offline configuration, a distinction is made between the following configuration data.

Configuration data:

- Safety configuration
Configuration data that affect the safety function of a device, e.g., configuration of safety capable inputs, safety outputs, logic, ...
- Standard configuration
Configuration data that affect the non-safety function of a device, e.g., configuration of test outputs, configuration of non-safe modules.
- Non-functional configuration
Configuration data that have no effect on the functioning of the device, e.g. tag names, comments in the logic, project information of the user

Online configuration

Each of the online configuration parameters have their own transfer option and can be individually written to the safety controller. The online configuration includes, for example, the parameters relating to the network settings.

These parameters can be configured in the configuration software or via a module with a display.

To configure the parameters using the configuration software, a connection to the safety controller must exist.

The application does not need to be stopped while the configuration is transferred to the safety controller.

The online configuration is saved in and read back from the SmartPlug using the module position and the module type. If the module position is maintained, a (defective) module can be replaced with a compatible module without having to reconfigure the device. If the module position is changed, the saved parameters will not work. If, for example, the module position of a gateway is changed, the connection parameters need to be reconfigured before a connection to the safety controller can be established. The old module positions are corrected when writing an offline configuration.

If online configuration parameters are configured without a SmartPlug inserted, these settings will only apply temporarily until the safety controller is restarted or a SmartPlug is inserted.

Security configuration

The security configuration includes the following parameters:

- Passwords for user groups

These parameters can only be configured in the configuration software.

The application does not need to be stopped while the configuration is transferred to the safety controller.

The security configuration is saved in the SmartPlug. A (defective) module can be replaced with a compatible module without having to reconfigure the device.

Further topics

- ["Display menu", page 25](#)

7.4 Configuring the network interfaces

7.4.1 Configuring the higher-level controller

Approach

1. Load the device description file into the configuration software of the higher-level controller. Follow the instructions in the online help or in the user manual of the configuration tool to do so.
2. Search the hardware catalog to find the desired device, e.g., use the search function and enter "SICK".
3. Add the device to the project and connect to the controller.
4. Select submodules of the cyclical process data. Only one input submodule and one output submodule can be active at any one time.
5. Specify where they are to be addressed in memory.
6. Configure properties such as the update time for the cyclical I/O data exchange of the gateway.
7. Assign a PROFINET name to the gateway.

Complementary information

You can find the device description file and device symbol on the gateway product page at www.sick.com.

The selected submodules of the higher-level controller must match the selected submodules in the configuration software.

Further topics

- ["Configuring the output data \(routing to CPU\)", page 21](#)
- ["Configuring the input data \(routing to network\)", page 22](#)

7.4.2 Addressing

7.4.2.1 Configuring the connection data

Overview

The IP address is normally assigned by the PROFINET controller (e.g. higher-level control system). The gateway also allows you to configure the safety controller via TCP/IP. In this case, it may be necessary to assign an IP address to the gateway before setting up the PROFINET network.

Approach

1. In the main navigation pane, click **Configuration**.
2. In the navigation tree of the required module, select the **Addressing** menu item.
3. Enter the device name in the **PROFINET name** field.
4. Enter the **IP address**, the **Subnet mask**, and an IP address for a **Standard gateway**.

Complementary information

The MAC address is printed on the type label of the device.

7.4.2.2 Reading and transmitting values

Overview

If the values in the project and the values in the device differ, you can read the values from the device and apply them to the project or transfer the values from the project to the device.

Approach

1. In the main navigation pane, click **Configuration**.
2. In the navigation tree of the required module, select the **Addressing** menu item.
3. Perform the required action:
 - Click on **Read from device**. The values are read from the device and adopted in the project.
 - Click on **Transmit to device**. The values are read from the device and adopted in the project.

7.4.3 Deactivating alarms

Approach

1. In the main navigation pane, click **Configuration**.
 2. In the navigation pane under **GPNT1**, select the **PROFINET Alarms** menu item.
 3. Select the **Alarms are deactivated** option.
- ✓ The alarms will no longer be transmitted to the higher-level control system.

7.4.4 Configuring the TCP/IP socket interfaces

Overview

The module supports four TCP/IP socket interfaces. Multiple applications can communicate with the safety controller at the same time. For each TCP/IP socket, six connections are possible, i.e. 24 connections in total.

The TCP/IP socket interfaces operate in parallel to the PROFINET interface.

Important information



NOTE

The module sends “keep alive messages” neither as a server nor as a client. After 120 s, a timeout occurs and the TCP/IP connection is lost.

To maintain the TCP/IP connection, the external application must request or send data at least every 120 s.



NOTE

COS update: At high loads (e.g., very quickly changing process data), status changes can get lost because the internal send buffer cannot be cleared in time.

Approach

1. In the main navigation pane, click **Configuration**.
2. In the navigation pane under **GPNT**, select the **TCP/IP configuration** menu item.
3. Enable the **Addressing** option for the required TCP/IP socket.
- ✓ Applications can communicate with the module via TCP/IP sockets.
4. Use at least one of the following configuration options:

Table 5: Configuration options

Option	Description
Listen on (server mode)	Configures the socket as a server. You specify the Port on which the module “listens”.
Connect to (client mode)	Configures the socket as a client. You specify the IP address and the Port of the application.
Enable COS update (COS: Change of State)	When data in the input records change the status, the module writes the input records to the application. When a status change occurs, the module writes all input records to the application. You configure which input records the module writes to the application.
Enable auto update and COS Update rate [ms]	In addition to Enable COS update : When the update rate is reached, the module writes the input records to the application.

Complementary information

- The recommended port numbers are 9100 to 9103.
- Port 0 and Port 9000 are reserved and must not be used.
- Port numbers 0 to 1023 are managed by the Internet Assigned Numbers Authority (IANA) and should not be used in order to avoid collisions.

Further topics

- ["Telegrams for input records \(polling\)", page 38](#)
- ["Telegram for input records in CoS mode or Auto Update mode", page 39](#)
- ["Telegrams for output data", page 41](#)

7.4.5 Configuring the output data (routing to CPU)

Overview

The gateway can receive up to 100 bytes of output data from a higher-level control system. The actual data volume and contents depends on how the output data are configured in the higher-level control system.

The CPUc2 main module can receive up to 50 bytes of output data from a higher-level control system. The actual data volume and contents depends on how the output data are configured in the higher-level control system.

The configuration of the output data includes the following points:

- Specifying the routing
- Optional: Enter the tag names for the data received from the network

The data volume must match the data volume set in the configuration of the higher-level control system otherwise the connection will be refused.

Approach

1. In the main navigation pane, click **Configuration**.
2. In the navigation pane under **CPU main module > Fieldbus**, select the **Fieldbus** menu item.
3. In the navigation tree of the required module, select **Routing to CPU**.
4. In the **Data used from GSDML file** drop-down menu, select the data volume configured in the higher-level control system.
- ✓ A red guide line shows the end of the configured data volume.
5. Select a routing template and drag it onto a single byte or several bytes of the output data block.
Data that are to be written by the TCP/IP socket interface must be located below the red line. Write accesses to values above the red line are reserved for PROFINET.
- ✓ The bits, bytes or data formats are available as inputs in the logic editor.
- ✓ Each bit, byte or data format inherits a default tag name from the routing.
6. If required, edit the default tag name in the **Properties** tab.

Complementary information

Table 6: Colors of the bytes and bits of a record

Color	Meaning
Light blue	The byte or the bit is empty.
Blue	The byte or the bit is occupied. The relevant module, input or output is configured in the hardware configuration of the safety controller.
Gray	The byte or the bit is occupied. The relevant module, input or output is not yet configured in the hardware configuration of the safety controller.

You can monitor the status of the communication with the network. A status bit for the receipt of data from the network is provided for this. If the gateway detects a fault in the communication, it sets the contents of the output records and the associated status bit to Null.

7.4.6 Configuring the input data (routing to network)

Overview

The gateway can send up to 100 bytes of input data to a higher-level control system.

The CPUc2 main module can send up to 50 bytes of input data to a higher-level control system.

The data volume must match the data volume set in the configuration of the higher-level control system otherwise the connection will be refused.

The input data can comprise the statuses of the inputs and outputs, the logic results, or diagnostic data.

Approach

1. In the main navigation pane, click **Configuration**.
2. In the navigation pane under **CPU main module > Fieldbus**, select the **Fieldbus** menu item.
3. In the navigation tree of the required module, select **Routing to network**.
4. In the **Data used from GSDML file** drop-down menu, select the data volume configured in the higher-level control system.
- ✓ A red guide line shows the end of the configured data volume.
5. Select the required input data and drag it onto a single byte or several bytes of the input data block.

The following input data are available:

 - **Routing Templates** contains templates for the routing of data from the logic editor.
 - **Inputs** contain the input values of the modules.
 - **Outputs** contain the output values of the modules as well as the logic results from the logic editor.
 - **Diagnostics** contains the checksums and status information of the modules.
- ✓ The bits, bytes or data formats are available as individual outputs in the logic editor.
- ✓ Each bit, byte or data format inherits a default tag name from the routing.
6. If required, edit the default tag name in the **Properties** tab.

Complementary information

Table 7: Colors of the bytes and bits of a record

Color	Meaning
Light blue	The byte or the bit is empty.
Blue	The byte or the bit is occupied. The relevant module, input or output is configured in the hardware configuration of the safety controller.
Gray	The byte or the bit is occupied. The relevant module, input or output is not yet configured in the hardware configuration of the safety controller.

The status of the communication with the network can be monitored. A status bit for the sending of data to the network is provided for this. If the gateway detects a fault in the communication, it sets the contents of the input records and the associated status bit to Null. The bit also switches to Null if the gateway is not ready for operation or the safety controller was stopped via the configuration software.

8 Commissioning

8.1 Check during commissioning and modifications

The thorough check is intended to ensure that the safety functions are fulfilling their planned purpose and whether persons are being adequately protected.

- ▶ Carry out the checks specified in the test plan of the manufacturer of the machine and the operating entity.

9 Operation

9.1 Operation of the display

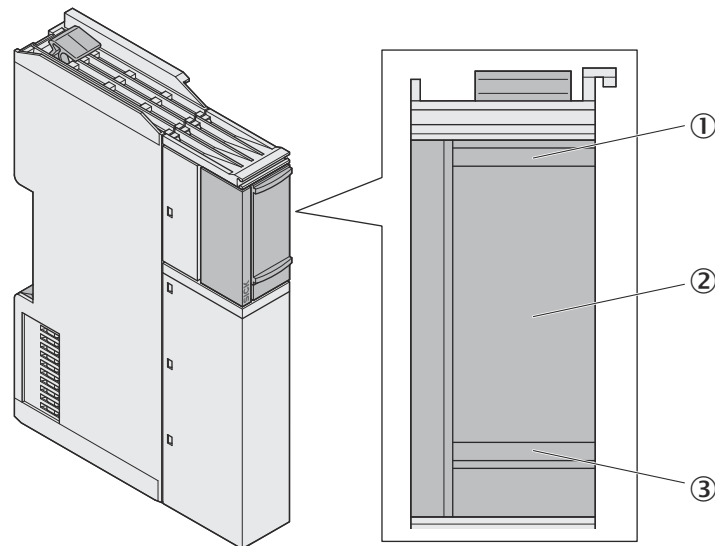


Figure 6: Display

- ① Up
- ② Confirm
- ③ Down

9.2 Display menu

Display menu

The display menu contains three submenus:

- **Info** Device, system and project information
- **Diag** Diagnostic information
- **Setup** Settings

You can configure the following, for example, in the Setup submenu:

- IP addressing
- Activation or deactivation of the fieldbus alarms
- Display brightness
- System reset

Complementary information

If you use a display (e.g., on a gateway) to configure settings on the safety controller that can also be configured using the configuration software, the configuration in the SmartPlug is updated accordingly.

9.3 Status indicators

Possible indications

Table 8: PWR and CV indications

Display PWR	Display CV Main module	Description	Measures
○	○	No supply voltage	► Switch on the supply voltage to the main module.

Display PWR	Display CV Main module	Description	Measures
◐ Red / green (1 Hz)	○	Self-test is in progress or the safety controller is being initializing.	
◑ Green (1 Hz)	see table 9, page 26	Application is ready to run.	▶ Press the start button in the configuration software.
◑ Red / green (1 Hz)	see table 9, page 26	Application is running. A recoverable external error is present at this module.	▶ Check the connection settings and cabling to the fieldbus master.
● Green	see table 9, page 26	Application is running.	
◐ Red (1 Hz)	○	Configuration is invalid.	▶ Check the module type and version. ▶ Adjust the configuration using the configuration software. ▶ Run diagnostics using the configuration software.
◐ Red (2 Hz)	○	Critical error, presumably at this module. The application was stopped. All outputs of the safety controller are switched off.	▶ Switch the supply voltage off and then on again. ▶ If the fault persists, replace the module. ▶ Run diagnostics using the configuration software.
● Red	○	Critical error, presumably at another module. The application was stopped. All outputs of the safety controller are switched off.	▶ Switch the supply voltage off and then on again. ▶ If the fault persists, replace the module where the PWR ◐ is showing red (2 Hz). ▶ Run diagnostics using the configuration software.

○ LED off. ◐ LED flashes. ● LED illuminates.

Table 9: CV indications

Display CV Main module	Description	Measures
○	see table 8, page 25	
● Yellow	Configuration is verified.	
◐ Yellow (1 Hz)	Configuration is not verified.	▶ Verify the configuration using the configuration software.
◐ Yellow (2 Hz)	See the Flexi Compact Safety Controller operating instructions (8024573)	
◐ Yellow (lights up every 2 s)	See the Flexi Compact Safety Controller operating instructions (8024573)	

○ LED off. ◐ LED flashes. ● LED illuminates.

Table 10: BF indications

Display BF	Description	Measures
○	Gateway not initialized or not active.	
◐ Green (1 Hz)	Gateway initialized	
● Green	Process data can be read and written.	
◐ Red (2 Hz)	Incorrect parameter or error in the PROFINET configuration.	

Display BF	Description	Measures
● Red	Connection error, no connection to the higher-level controller	

○ LED off. ● LED flashes. ● LED illuminates.

Further topics

- ["Status indicators", page 12](#)

9.4 Regular thorough check

The thorough check is intended to ensure that the safety functions are fulfilling their planned purpose and whether persons are being adequately protected.

- ▶ Carry out the checks specified in the test plan of the manufacturer of the machine and the operating entity.

10 Maintenance

10.1 Regular thorough check

The thorough check is intended to ensure that the safety functions are fulfilling their planned purpose and whether persons are being adequately protected.

- ▶ Carry out the checks specified in the test plan of the manufacturer of the machine and the operating entity.

11 Troubleshooting

11.1 Possible faults

Important information



NOTE

If a fault response can result in an undesired valid status, you should evaluate the associated status bits in the logic to initiate suitable measures.

Possible faults and their causes

Table 11: Faults in the logic

Fault	Responses	Causes
Voltage supply A1 / A2 of the main module is lower than the operating range	<ul style="list-style-type: none"> • Safety controller switches to the No supply voltage status • Voltage supply module status bit = 0 • Status indicators are off 	<ul style="list-style-type: none"> • Fault in the voltage supply • Line break • Interruption due to a fuse
Voltage supply of the main module is higher than the operating range	<ul style="list-style-type: none"> • Safety controller switches to the critical error status • Internal error module status bit = 0 	<ul style="list-style-type: none"> • Fault in the voltage supply • Short-circuit to other voltage-carrying line

Critical error status

Consequences of the critical error status:

- All applications are stopped.
- All safety outputs are switched off.
- All process data = 0
- Evaluation of the process data status bits in the logic is no longer possible.
- Only limited diagnostics can be performed in the critical error status.

Alternatives to resetting the critical error status:

- Restart by switching the voltage supply off and on again
- Software reset using the configuration software

Complementary information

The status indicators and diagnostic messages may provide additional information.

Further topics

- ["Status indicators", page 25](#)

12 Decommissioning

12.1 Disposal

Approach

- ▶ Always dispose of unusable devices in accordance with national waste disposal regulations.



Complementary information

SICK will be glad to help you dispose of these devices on request.

13 Technical data

13.1 Data sheet

General data

Table 12: General data

Climatic conditions	
Ambient operating temperature	
At altitudes up to 2,000 m above sea level	-25 °C ... +55 °C
At altitudes up to 2,000 m above sea level ... 3,000 m above sea level	-25 °C ... +50 °C
At altitudes 3,000 m above sea level ... 4,000 m above sea level	-25 °C ... +45 °C
Storage temperature	-25 °C ... +70 °C
Air humidity	10% ... 95%, non-condensing
Operating altitude	Max. 4,000 m above sea level
Mechanical strength	
Vibration resistance	5 Hz ... 200 Hz / 1 g (EN 60068-2-6)
Shock resistance, single shock	15 g, 11 ms (EN 60068-2-27)
Operating data	
Protection class	III (EN 61140)
Immunity to interference	EN 61000-6-2
Emitted interference	EN 61000-6-4
Connections	
Connection type	RJ45 female connectors
Network cable requirements	<ul style="list-style-type: none"> • Type: 100Base-TX • Cables with RJ45 connections • Twisted pair Ethernet cable, maximum length 100 m in accordance with EN 50173 • Use of wire pairs 1/2 and 3/6 • Shielded cables • Cat 5 STP or higher
Housing	
Enclosure rating	IP20 (EN 60529)
Contamination rating	2 (IEC 61010-1)
Control device type	Open device (IEC 61010-2-201)
Weight (± 5%)	108 g

Voltage supply

Table 13: Voltage supply

Supply voltage U_B	Voltage is supplied from the main module via the back-plane bus. See the Flexi Compact operating instructions, part number: 8024573
Max. power loss	3.3 W
Current consumption at nominal voltage	135 mA

PROFINET fieldbus data

Table 14: PROFINET interface

Fieldbus	PROFINET
Connection type	2 × female connectors, RJ45
Supported protocol versions	PROFINET specification V2.3
GSDML	Acc. to GSDML specification V2.34
Cycle time	1 ms, 2 ms, 4 ms, 8 ms, 16 ms ...
Conformance	Conformance Class C
Network management	<ul style="list-style-type: none"> • SNMP • MIB-2 • LLDP in accordance with IEEE 802.1AB • MRP client support • IRT, without synchronized application
Net load	Net load class III in accordance with security level 1 test
Switch properties	<ul style="list-style-type: none"> • 2 port real-time switch compliant with IEEE 802 • Conformance Class C
Port properties	<ul style="list-style-type: none"> • 100Base-TX • Auto-negotiation • Auto-crossover (MDIX) • Auto-polarity
Diagnostics	<ul style="list-style-type: none"> • I&M data sets 0 ... 5 • PROFINET alarms
Additional services	<ul style="list-style-type: none"> • TCI communication via TCP/IP • TCP/IP socket communication with up to 24 applications at the same time
Additional interfaces	TCP/IP communication via port 9000

13.2 Data exchange in the network**13.2.1 PROFINET****Process images**

The safety controller provides process images of different sizes.

You select a suitable process image in the configuration of the higher-level controller. The process images are available there as submodules. You select a submodule for the input data and a submodule for the output data.

You configure the contents of the input data in the higher-level controller. You configure the contents of the output data and the length of the selected submodule in Safety Designer.

Table 15: Submodules for PROFINET

Name	Size	Transmission direction
Input10Bytes	10 bytes	Gateway→Higher-level controller
Input12Bytes	12 bytes	Gateway→Higher-level controller
Input20Bytes	20 bytes	Gateway→Higher-level controller
Input24Bytes	24 bytes	Gateway→Higher-level controller
Input30Bytes	30 bytes	Gateway→Higher-level controller
Input36Bytes	36 bytes	Gateway→Higher-level controller
Input40Bytes	40 bytes	Gateway→Higher-level controller

Name	Size	Transmission direction
Input48Bytes	48 bytes	Gateway→Higher-level controller
Input50Bytes	50 bytes	Gateway→Higher-level controller
Input60Bytes	60 bytes	Gateway→Higher-level controller
Input80Bytes	80 bytes	Gateway→Higher-level controller
Input100Bytes	100 bytes	Gateway→Higher-level controller
Output10Bytes	10 bytes	Higher-level controller→Gateway
Output20Bytes	20 bytes	Higher-level controller→Gateway
Output30Bytes	30 bytes	Higher-level controller→Gateway
Output40Bytes	40 bytes	Higher-level controller→Gateway
Output50Bytes	50 bytes	Higher-level controller→Gateway
Output60Bytes	60 bytes	Higher-level controller→Gateway
Output80Bytes	80 bytes	Higher-level controller→Gateway
Output100Bytes	100 bytes	Higher-level controller→Gateway

Further topics

- ["Configuring the output data \(routing to CPU\)", page 21](#)

13.2.1.1 Data for acyclic access

The index is used to specify data that can be read or written acyclically.

13.2.1.1.1 Input data and output data

Table 16: Indexes of the input data and output data

Index	Contents	Data type	Size	Access
1100	Input values	BYTE	100 bytes	Read only
1101	Output data	BYTE	100 bytes	Read only

13.2.1.1.2 Checksums

Table 17: Indexes of the checksums

Index	Contents	Data type	Size	Access
1200	Overall checksum value	UINT	4 bytes	Read only
1201	Safety checksum	UINT	4 bytes	Read only
1202	Standard checksum	UINT	4 bytes	Read only
1203	Reserved	UINT	4 bytes	Read only
1204	Verification checksum	UINT	4 bytes	Read only

13.2.1.1.3 Module status

Overview

The first 32 bytes contain the module statuses of the CPU. This is followed by 8 bytes each for the module statuses of the expansion modules. The order depends on the hardware configuration. The content depends on the type of expansion module.

Module status

Table 18: Indexes of the module status

Index	Contents	Data type	Size	Access
1300	Module status information	ARRAY of BYTE	544 bytes	Read only

Module status bits for main module

Table 19: Module status bits for main module

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Reserved		Voltage supply	Configuration is valid	Reserved	External error	Internal error	operational status 1 = Run 0 = Other
Byte 1 ... 3	Reserved							
Byte 4	User-defined status bit 7 (CPU logic)	User-defined status bit 6 (CPU logic)	User-defined status bit 5 (CPU logic)	User-defined status bit 4 (CPU logic)	User-defined status bit 3 (CPU logic)	User-defined status bit 2 (CPU logic)	User-defined status bit 1 (CPU logic)	User-defined status bit 0 (CPU logic)
Byte 5	User-defined status bit 15 (CPU logic)	User-defined status bit 14 (CPU logic)	User-defined status bit 13 (CPU logic)	User-defined status bit 12 (CPU logic)	User-defined status bit 11 (CPU logic)	User-defined status bit 10 (CPU logic)	User-defined status bit 9 (CPU logic)	User-defined status bit 8 (CPU logic)
Byte 6 ... 7	Reserved							
Byte 8	Reserved	Fast shut off status (all grouped)	Reserved					
Byte 9	Reserved				Status 17, 18 Dual-channel evaluation	Status 15, 16 Dual-channel evaluation	Status 13, 14 Dual-channel evaluation	Status 11, 12 Dual-channel evaluation
Byte 10	Status 18	Status 17	Status 16	Status 15	Status 14	Status 13	Status 12	Status 11
Byte 11	Status Q4 Short-circuit to Low	Status Q4 Short-circuit to High	Status Q3 Short-circuit to Low	Status Q3 Short-circuit to High	Status Q2 Short-circuit to Low	Status Q2 Short-circuit to High	Status Q1 Short-circuit to Low	Status Q1 Short-circuit to High
Byte 12 ... 16	Reserved							
Byte 17	Reserved				Status 115, 116 Dual-channel evaluation	Status 113, 114 Dual-channel evaluation	Status 111, 112 Dual-channel evaluation	Status 109, 110 Dual-channel evaluation
Byte 18	Status 116	Status 115	Status 114	Status 113	Status 112	Status 111	Status 110	Status 109
Byte 19 ... 24	Reserved							
Byte 25	Reserved						Status 119, 120 Dual-channel evaluation	Status 117, 118 Dual-channel evaluation
Byte 26	Reserved				Status 120	Status 119	Status 118	Status 117
Byte 27 ... 31	Reserved							

Module status bits for XTDI

Table 20: Module status bits for XTDI

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Reserved					External error	Reserved	
Byte 1	Reserved				Status 17, 18 Dual-channel evaluation	Status 15, 16 Dual-channel evaluation	Status 13, 14 Dual-channel evaluation	Status 11, 12 Dual-channel evaluation
Byte 2	Status 18	Status 17	Status 16	Status 15	Status 14	Status 13	Status 12	Status 11
Byte 3 ... 7	Reserved							

Module status bits for XTDO

Table 21: Module status bits for XTDO

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Reserved	Fast shut off status (all grouped)	Auxiliary voltage supply	Reserved		External error	Reserved	
Byte 1	Reserved				Status 17, 18 Dual-channel evaluation	Status 15, 16 Dual-channel evaluation	Status 13, 14 Dual-channel evaluation	Status 11, 12 Dual-channel evaluation
Byte 2	Status 18	Status 17	Status 16	Status 15	Status 14	Status 13	Status 12	Status 11
Byte 3	Status Q4 Short-circuit to Low	Status Q4 Short-circuit to High	Status Q3 Short-circuit to Low	Status Q3 Short-circuit to High	Status Q2 Short-circuit to Low	Status Q2 Short-circuit to High	Status Q1 Short-circuit to Low	Status Q1 Short-circuit to High
Byte 4 ... 6	Reserved							
Byte 7	Status Q8 Short-circuit to Low	Status Q8 Short-circuit to High	Status Q7 Short-circuit to Low	Status Q7 Short-circuit to High	Status Q6 Short-circuit to Low	Status Q6 Short-circuit to High	Status Q5 Short-circuit to Low	Status Q5 Short-circuit to High

Module status bits for gateway

Table 22: PROFINET gateway module status bits

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Reserved	Data valid Gateway → network	Data valid Network → Gateway	Reserved		External error	Reserved	
Byte 1	Reserved	Matching submodule selection	Status of process data transmission ¹⁾	Reserved				
Byte 2 ... 3	Reserved							
Byte 4	Reserved				Socket 4 client status	Socket 3 client status	Socket 2 client status	Socket 1 client status
Byte 5 ... 7	Reserved							

1) PROFINET: If a configured connection cannot be established after 90 s, the **Status of process data transmission** bit = 0.
 TCP socket interface (gateway as client): If a configured connection cannot be established after 60 s, the **Socket X Client Status** bit = 0. The **Socket X Client Status** bit is also 0 if an already established client connection is terminated.

Complementary information

- The module status bits have the following meanings:

- 0 = Error
- 1 = No error
- If a module is not present, all bits of the module are set to logical 1.
- Bits reserved for future use are always logical 1.
- The status bytes of each module are transmitted as a 32-bit word in big endian format, i.e. the most significant byte (MSB = byte 3) is transmitted first and the least significant byte (LSB = byte 0) last.

13.2.1.1.4 Product codes

Overview

Product codes are 4-byte coded device type codes.

The product codes of the individual safety controller modules are available in an ARRAY.

- The first 4 bytes contain the product code of the CPU.
- The second 4 bytes contain the product code of the SmartPlug.
- The subsequent 4 byte segments contain the product codes of the expansion modules.

Product codes

Table 23: Index of the product codes

Index	Contents	Data type	Size	Access
1500	Product codes	UINT	66 x 4 bytes = 264 bytes	Read only

Description of the product codes

Table 24: Product codes

Product codes	Description
0x30 01 00 00	CPUc1 main module
0x31 01 00 00	CPUc2 main module
0x00 05 00 00	EtherCAT gateway expansion module
0x00 06 00 00	PROFINET gateway expansion module
0x00 07 00 00	CANopen gateway expansion module
0x30 0B 00 00	XTDI IO expansion module
0x30 0C 00 00	XTDO IO expansion module
0x30 FF 00 00	SmartPlug

Complementary information

If the application queries the product codes of modules that are not physically available, the safety controller returns the value 0x00000000 (= not present) for those modules.

13.2.1.1.5 Project data

Overview

Contains the project data from the configuration software of the safety controller.

Project data

Table 25: Indexes of the project data

Index	Contents	Data type	Size	Access
1600	Device name	UTF8 STRING	64 bytes	Read only
1601	Project name	UTF8 STRING	64 bytes	Read only
1602	Application name	UTF8 STRING	64 bytes	Read only
1603	User name (optional)	UTF8 STRING	64 bytes	Read only
1604	Description	UTF8 STRING	100 bytes	Read only

Complementary information

- Unused characters in the STRING are padded with blanks.

13.2.1.2 I&M data

Table 26: I&M data available

Parameter	Description	Write access
I&M record 0		
Vendor_ID	Ident number, awarded by PNO, in the case of SICK 0x0101	-
OrderID	Part number of the gateway	-
IM_Serial_Number	Serial number of the gateway	-
IM_Hardware_Revision	Hardware version of the gateway	-
IM_SWRevision_Functional_Enhancement	Firmware version of the gateway	-
IM_SWRevision_Bug_Fix		-
IM_SWRevision_Internal_Change		-
IM_REVISION_COUNTER	Version of the I&M record	-
IM_Profile_ID		-
IM_Profile_Specific_Type		-
IM_Version_Major		-
IM_Version_Minor		-
IM_Supported	Information about further supported I&M records	-
I&M record 1		
IM_Tag_Function	System ID	Yes
IM_Tag_Location	Location identifier	Yes
I&M record 2		
IM_Date	Installation date	Yes
I&M record 3		
IM_Descriptor	Comment	Yes

13.2.2 TCP/IP socket interface

Data for the TCP/IP socket interface

The safety controller can communicate via the TCP/IP socket interface in parallel to the fieldbus network.

- Input record 1 (100 bytes): Process data from the safety controller to the application
- Input record 2 (32 bytes): Checksums
- Input record 3 (128 bytes): Module status
- Input record 4 (12 bytes): Reserved
- Input record 5 (14 bytes): Product codes
- Input record 6 (138 bytes): Project data
- Input record 7 (242 bytes): Safety controller configuration
- Output record, divided into output data segment 1 to 5 (20 bytes each): process data from the application to the safety controller

13.2.2.1 TCP/IP telegrams

Overview

Special telegrams are used to exchange data between the application and the module. These telegrams have the following telegram structure.

Table 27: Telegram structure

0	1	n
Command	Parameter ¹⁾											Data ¹⁾		

¹⁾ The content and the length depend on the particular command.

Important information



NOTE

To maintain the TCP/IP connection, the external application must request or send data at least every 120 s.

Behavior in case of invalid or incorrect telegrams

If the module receives an invalid or incorrectly formatted telegram, the module sets the most significant bit of the command word to 1. For example, the command 001Fh becomes 801Fh.

13.2.2.1.1 Telegrams for input records (polling)

Structure of the telegram

Table 28: Request for input reports

Telegram part	Data type	Value
Command	UINT	00F1h
Parameter Request input record 1	UINT	0 = Do not send record 1 = Send record
Parameter Request input record 2	UINT	0 = Do not send record 1 = Send record
Parameter Request input record 3	UINT	0 = Do not send record 1 = Send record
Parameter Request input record 4	UINT	0 = Do not send record 1 = Send record

Telegram part	Data type	Value
Parameter Request input record 5	UINT	0 = Do not send record 1 = Send record
Parameter Request input record 6	UINT	0 = Do not send record 1 = Send record
Parameter Request input record 7	UINT	0 = Do not send record 1 = Send record

Table 29: Response to request for input records

Telegram part	Data type	Value
Command	UINT	001Fh
Parameter Length of input record 1	UINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of input record 2	UINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of input record 3	UINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of input record 4	UINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of input record 5	UINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of input record 6	UINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of input record 7	UINT	0 = Record not contained in data field Non-null = Length of the record
Data	ARRAY of BYTE	Data from the input records

Further topics

- ["Input values", page 42](#)

13.2.2.1.2

Telegram for input records in CoS mode or Auto Update mode

Overview

The higher-level controller can request that the module send data cyclically or when a change of status occurs.

Important information



NOTE

In CoS mode, it is possible at higher loads, e.g., for very rapidly changing process data, for an overrun of the internal send buffer to occur. New messages are added to the internal send buffer more quickly than other messages are removed. This can lead to individual messages being lost. The memory of the send buffer can only be reused for new messages after the recipient acknowledges receipt using the ACK bit in the TCP protocol.

- ▶ The time between two queries increases to ≤ 40 ms.
- ▶ Make sure that the recipient acknowledges the received data as quickly as possible.

Structure of the telegrams

Table 30: Telegram from the higher-level controller – Request for CoS or Auto Update mode

Telegram part	Data type	Value
Command	UINT	00E1h
Request input record 1	UINT	0 = Do not send record 1 = Send record
Request input record 2	UINT	0 = Do not send record 1 = Send record
Request input record 3	UINT	0 = Do not send record 1 = Send record
Request input record 4	UINT	0 = Do not send record 1 = Send record
Request input record 5	UINT	0 = Do not send record 1 = Send record
Request input record 6	UINT	0 = Do not send record 1 = Send record
Request input record 7	UINT	0 = Do not send record
Update frequency of the heartbeat messages	UINT	0 = Deactivate heartbeat messages Non-zero = Activate heartbeat message at a specified frequency in milliseconds <ul style="list-style-type: none"> • Minimum = 40 ms • Maximum = 60 s

Table 31: Response telegram from module for confirmation

Telegram part	Data type	Value
Command	UINT	001Eh

Table 32: Telegram from the module with the input records

Telegram part	Data type	Value
Command	UINT	002Eh
Parameter Length of input record 1	UINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of input record 2	UINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of input record 3	UINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of input record 4	UINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of input record 5	UINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of input record 6	UINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of input record 7	UINT	0 = Record not contained in data field Non-null = Length of the record
Data	UINT	Data from the input records

Further topics

- ["Configuring the TCP/IP socket interfaces", page 20](#)

13.2.2.1.3 Telegrams for output data

Important information



NOTE

The TCP/IP interface shares its memory space with the fieldbus. The fieldbus has priority. The output data of the fieldbuses overwrite the output data of the TCP/IP interface.

Memory store for the output data

The memory store for the output data contains a total of 100 bytes and is subdivided virtually into five segments of 20 bytes each. This allows up to five applications to write output data independently of each other.

Table 33: Start byte of the output data segments

Output data segment	Start byte
1	0
2	20
3	40
4	60
5	80

The length of the output data segments is variable. This allows different writing scenarios.

Examples:

- Five applications write 20 bytes each into output data segments 1 ... 5.
- One application writes 40 bytes into output data segment 1, 3, other applications write 20 bytes each into output data segments 3 ... 5.
- One application writes 100 bytes into output data segment 1.

Structure of the telegram

Table 34: Telegram from the higher-level controller – Writing the output data segments

Telegram part	Data type	Value
Command	UDINT	00F2h
Parameter Length of output data segment 1	UDINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of output data segment 2	UDINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of output data segment 3	UDINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of output data segment 4	UDINT	0 = Record not contained in data field Non-null = Length of the record
Parameter Length of output data segment 5	UDINT	0 = Record not contained in data field Non-null = Length of the record
Data	ARRAY of BYTE	Data for the output data segments

Table 35: Response telegram from the module

Telegram part	Data type	Value
Command	UDINT	002Fh
Parameter Status	UDINT	0 = Success – output data segments were written correctly. 1 = Error – output data segments were not able to be written.

Further topics

- ["Output data", page 46](#)

13.2.2.2 Input values**13.2.2.2.1 Process data to the higher-level controller****Process data to the higher-level controller**

Table 36: Input record 1 – Process data to the higher-level controller

Memory space	Contents	Data type	Size
Byte 0 ... 99	Configured process data	BYTE	100 bytes

You configure the contents in the configuration software.

Further topics

- ["Configuring the input data \(routing to network\)", page 22](#)

13.2.2.2.2 Checksums

Table 37: Input record 2 – Checksums

Memory space	Contents	Data type	Size
Byte 0 ... 3	Overall checksum value	BYTE	4 bytes
Byte 4 ... 7	Safety checksum	BYTE	4 bytes
Byte 8 ... 11	Standard checksum	BYTE	4 bytes
Byte 12 ... 15	Reserved	BYTE	4 bytes
Byte 16 ... 19	Verification checksum	BYTE	4 bytes
Byte 20 ... 31	Reserved	BYTE	12 bytes

13.2.2.2.3 Module status**Overview**

The first 32 bytes contain the module statuses of the CPU. This is followed by 8 bytes each for the module statuses of the expansion modules. The order depends on the hardware configuration. The content depends on the type of expansion module.

Module status

Table 38: Input record 3 – Module status

Memory space	Contents	Data type	Size
Byte 0 ... 7	CPU status info part 1 of 4	ARRAY of BYTE	8 bytes
Byte 8 ... 15	CPU status info part 2 of 4	ARRAY of BYTE	8 bytes
Byte 16 ... 23	CPU status info part 3 of 4	ARRAY of BYTE	8 bytes

Memory space	Contents	Data type	Size
Byte 24 ... 31	CPU status info part 4 of 4	ARRAY of BYTE	8 bytes
Byte 32 ... 39	Module status info 1	ARRAY of BYTE	8 bytes
Byte 40 ... 47	Module status info 2	ARRAY of BYTE	8 bytes
...			
Byte 496 ... 543	Module status info 64	ARRAY of BYTE	8 bytes

Module status bits for main module

Table 39: Module status bits for main module

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Reserved		Voltage supply	Configuration is valid	Reserved	External error	Internal error	operational status 1 = Run 0 = Other
Byte 1 ... 3	Reserved							
Byte 4	User-defined status bit 7 (CPU logic)	User-defined status bit 6 (CPU logic)	User-defined status bit 5 (CPU logic)	User-defined status bit 4 (CPU logic)	User-defined status bit 3 (CPU logic)	User-defined status bit 2 (CPU logic)	User-defined status bit 1 (CPU logic)	User-defined status bit 0 (CPU logic)
Byte 5	User-defined status bit 15 (CPU logic)	User-defined status bit 14 (CPU logic)	User-defined status bit 13 (CPU logic)	User-defined status bit 12 (CPU logic)	User-defined status bit 11 (CPU logic)	User-defined status bit 10 (CPU logic)	User-defined status bit 9 (CPU logic)	User-defined status bit 8 (CPU logic)
Byte 6 ... 7	Reserved							
Byte 8	Reserved	Fast shut off status (all grouped)	Reserved					
Byte 9	Reserved				Status I7, I8 Dual-channel evaluation	Status I5, I6 Dual-channel evaluation	Status I3, I4 Dual-channel evaluation	Status I1, I2 Dual-channel evaluation
Byte 10	Status I8	Status I7	Status I6	Status I5	Status I4	Status I3	Status I2	Status I1
Byte 11	Status Q4 Short-circuit to Low	Status Q4 Short-circuit to High	Status Q3 Short-circuit to Low	Status Q3 Short-circuit to High	Status Q2 Short-circuit to Low	Status Q2 Short-circuit to High	Status Q1 Short-circuit to Low	Status Q1 Short-circuit to High
Byte 12 ... 16	Reserved							
Byte 17	Reserved				Status I15, I16 Dual-channel evaluation	Status I13, I14 Dual-channel evaluation	Status I11, I12 Dual-channel evaluation	Status I9, I10 Dual-channel evaluation
Byte 18	Status I16	Status I15	Status I14	Status I13	Status I12	Status I11	Status I10	Status I9
Byte 19 ... 24	Reserved							
Byte 25	Reserved						Status I19, I20 Dual-channel evaluation	Status I17, I18 Dual-channel evaluation

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 26	Reserved				Status I20	Status I19	Status I18	Status I17
Byte 27 ... 31	Reserved							

Module status bits for XTDI

Table 40: Module status bits for XTDI

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Reserved					External error	Reserved	
Byte 1	Reserved				Status I7, I8 Dual-channel evaluation	Status I5, I6 Dual-channel evaluation	Status I3, I4 Dual-channel evaluation	Status I1, I2 Dual-channel evaluation
Byte 2	Status I8	Status I7	Status I6	Status I5	Status I4	Status I3	Status I2	Status I1
Byte 3 ... 7	Reserved							

Module status bits for XTDO

Table 41: Module status bits for XTDO

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Reserved	Fast shut off status (all grouped)	Auxiliary voltage supply	Reserved		External error	Reserved	
Byte 1	Reserved				Status I7, I8 Dual-channel evaluation	Status I5, I6 Dual-channel evaluation	Status I3, I4 Dual-channel evaluation	Status I1, I2 Dual-channel evaluation
Byte 2	Status I8	Status I7	Status I6	Status I5	Status I4	Status I3	Status I2	Status I1
Byte 3	Status Q4 Short-circuit to Low	Status Q4 Short-circuit to High	Status Q3 Short-circuit to Low	Status Q3 Short-circuit to High	Status Q2 Short-circuit to Low	Status Q2 Short-circuit to High	Status Q1 Short-circuit to Low	Status Q1 Short-circuit to High
Byte 4 ... 6	Reserved							
Byte 7	Status Q8 Short-circuit to Low	Status Q8 Short-circuit to High	Status Q7 Short-circuit to Low	Status Q7 Short-circuit to High	Status Q6 Short-circuit to Low	Status Q6 Short-circuit to High	Status Q5 Short-circuit to Low	Status Q5 Short-circuit to High

Module status bits for gateway

Table 42: PROFINET gateway module status bits

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Reserved	Data valid Gateway → network	Data valid Network → Gateway	Reserved		External error	Reserved	
Byte 1	Reserved	Matching submodule selection	Status of process data transmission ¹⁾	Reserved				
Byte 2 ... 3	Reserved							
Byte 4	Reserved				Socket 4 client status	Socket 3 client status	Socket 2 client status	Socket 1 client status

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

1) PROFINET: If a configured connection cannot be established after 90 s, the **Status of process data transmission** bit = 0.
 TCP socket interface (gateway as client): If a configured connection cannot be established after 60 s, the **Socket X Client Status** bit = 0. The **Socket X Client Status** bit is also 0 if an already established client connection is terminated.

Complementary information

- The module status bits have the following meanings:
 - 0 = Error
 - 1 = No error
- If a module is not present, all bits of the module are set to logical 1.
- Bits reserved for future use are always logical 1.
- The status bytes of each module are transmitted as a 32-bit word in big endian format, i.e. the most significant byte (MSB = byte 3) is transmitted first and the least significant byte (LSB = byte 0) last.

13.2.2.2.4 Product codes

Overview

Product codes are 4-byte coded device type codes.

The product codes of the individual safety controller modules are available in an ARRAY.

- The first 4 bytes contain the product code of the CPU.
- The second 4 bytes contain the product code of the SmartPlug.
- The subsequent 4 byte segments contain the product codes of the expansion modules.

Product codes

Table 43: Input record 5 – Product codes

Memory space	Contents	Data type	Size
Byte 0 ... 263	Product codes	UDINT	66 x 4 bytes = 264 bytes

Description of the product codes

Table 44: Product codes

Product codes	Description
0x30 01 00 00	CPUc1 main module
0x31 01 00 00	CPUc2 main module
0x00 05 00 00	EtherCAT gateway expansion module
0x00 06 00 00	PROFINET gateway expansion module
0x00 07 00 00	CANopen gateway expansion module
0x30 0B 00 00	XTDI IO expansion module
0x30 0C 00 00	XTD0 IO expansion module
0x30 FF 00 00	SmartPlug

Complementary information

If the application queries the product codes of modules that are not physically available, the safety controller returns the value 0x00000000 (= not present) for those modules.

13.2.2.2.5 Project data

Overview

Contains the project data from the configuration software of the safety controller.

Project data

Table 45: Input record 6 – Project data

Memory space	Contents	Data type	Size
Byte 0 ... 63	Device name	STRING	64 bytes
Byte 64 ... 127	Project name	STRING	64 bytes
Byte 128 ... 191	Application name	STRING	64 bytes
Byte 192 ... 255	User name (optional)	STRING	64 bytes
Byte 256 ... 319	Description	STRING	100 bytes

Complementary information

- Unused characters in the STRING are padded with blanks.
- If the description is longer than 100 bytes, the content is truncated.

13.2.2.2.6 Configuration of the safety controller

Overview

The record contains the metadata for the individual modules of the safety controller.

Configuration of the safety controller

Table 46: Input record 7 – Safety controller configuration

Memory space	Contents	Data type	Size
Byte 0 ... 31	Product code	UINT	4 bytes
Byte 32 ... 49	Type code	UINT	4 bytes
Byte 50 ... 81	Part number	UINT	4 bytes
Byte 82 ... 113	Serial number	UINT	4 bytes
Byte 114 ... 145	HCSV version	UINT	4 bytes
Byte 146 ... 177	firmware version	UINT	4 bytes
Byte 178 ... 31	Hardware version	UINT	4 bytes

13.2.2.3 Output data

13.2.2.3.1 Process data to the safety controller

Process data to the safety controller

Table 47: Output data segment 1 ... 5 – Process data to the safety controller

Memory space	Contents	Data type	Size
0 ... 19	Output data segment 1	BYTE	20 bytes
20 ... 39	Output data segment 2	BYTE	20 bytes
40 ... 59	Output data segment 3	BYTE	20 bytes
60 ... 79	Output data segment 4	BYTE	20 bytes
80 ... 99	Output data segment 5	BYTE	20 bytes

13.3 Dimensional drawings

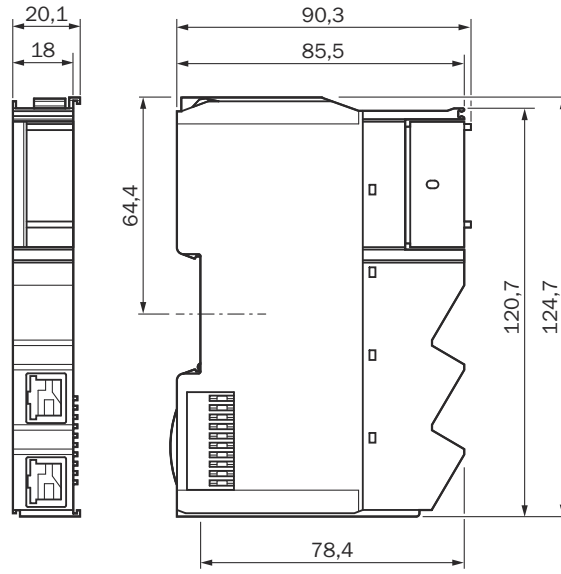


Figure 7: Dimensional drawing

14 Ordering information

14.1 Scope of delivery

- Expansion module - gateway
- Operating instructions for download: www.sick.com

14.2 Ordering information for main module

Table 48: Ordering information for main module

Part	Type code	Part number
CPUc1 main module <ul style="list-style-type: none"> • 20 safety capable inputs • 8 test outputs • 4 safety outputs 	FLX3-CPUC100	1085349
CPUc2 main module <ul style="list-style-type: none"> • 20 safety capable inputs • 8 test outputs • 4 safety outputs • Ethernet interface (female RJ45 Ethernet connector) for Modbus® TCP 	FLX3-CPUC200	1085351

14.3 Ordering information for expansion module

Ordering information for IO expansion module

Table 49: Ordering information for IO expansion module

Part	Type code	Part number
Expansion module XTDI1 <ul style="list-style-type: none"> • 8 safety capable inputs • 8 test outputs 	FLX3-XTDI100	1085353
Expansion module XTDO1 <ul style="list-style-type: none"> • 8 safety capable inputs • 8 safety outputs 	FLX3-XTDO100	1085354

Ordering information for gateway expansion module

Table 50: Ordering information for gateway expansion module

Part	Type code	Part number
GPNT1 PROFINET-IO gateway	FLX0-GPNT100	1085356
GETC1 EtherCAT® gateway	FLX0-GETC100	1085357
The GCAN1 CANopen gateway	FLX0-GCAN100	1085363

14.4 Ordering information for accessories

Table 51: Ordering information for accessories

Part	Type code	Part number
Front connector with opening for SmartPlug <ul style="list-style-type: none"> • 16 spring terminals 	FLX0-ACC0300	6069666
Front connector <ul style="list-style-type: none"> • 18 spring terminals 	FLX0-ACC0200	6066285

Part	Type code	Part number
SmartPlug	FLX3-SMPL100	2106852
Housing end cap	FLX0-ACC0400	5340579

15 Annex

15.1 Conformities and certificates

You can obtain declarations of conformity, certificates, and the current operating instructions for the product at www.sick.com. To do so, enter the product part number in the search field (part number: see the entry in the “P/N” or “Ident. no.” field on the type label).

15.1.1 EU declaration of conformity

Excerpt

The undersigned, representing the manufacturer, herewith declares that the product is in conformity with the provisions of the following EU directive(s) (including all applicable amendments), and that the standards and/or technical specifications stated in the EU declaration of conformity have been used as a basis for this.

- ROHS DIRECTIVE 2011/65/EU
- EMC DIRECTIVE 2014/30/EU

15.1.2 UK declaration of conformity

Excerpt

The undersigned, representing the following manufacturer herewith declares that this declaration of conformity is issued under the sole responsibility of the manufacturer. The product of this declaration is in conformity with the provisions of the following relevant UK Statutory Instruments (including all applicable amendments), and the respective standards and/or technical specifications have been used as a basis.

- Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012
- Electromagnetic Compatibility Regulations 2016

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