

microScan3 - PROFINET

Safety laser scanner

TIA Portal



Described product

microScan3 - PROFINET

Manufacturer

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Original document

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1 About this document

1.1 Purpose of this document

This integration example guides you step by step through the process of integrating a safety laser scanner of type microScan3 – PROFINET (all variants) into a Siemens TIA Portal project.

Depending on the application, it is possible that this example may not suit your specific application case. The experts at SICK can, on request, assist you with the integration.

SICK cannot guarantee that the following integration example will be error-free when implemented, e.g., due to future changes to SIMATIC Manager STEP 7. SICK assumes no liability for any damage that may result from the use of this integration example.

This example was created using version V14 + SP1 of TIA Portal. The descriptions in this document may therefore vary for future versions of the software.

1.2 Scope

Product

This document applies to the following products:

- Product designation: microScan3 - PROFINET

Document identification

Document part number:

- This document has the following part number: 8026545
- All available language versions of this document are available under the following part number: 8026531

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

1.3 Target groups

This document is intended for system integrators who want to integrate the safety laser scanner into their application.

1.4 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 Integration

2.1 Preparing for the integration

Approach

1. Update Safety Designer and TIA Portal to the latest release (version and, if applicable, hotfix).
2. Configure the safety laser scanner using Safety Designer. Some parameters can only be specified via Safety Designer.

2.2 Installing microScan3 - PROFINET GSDML

Overview

The GSDML file contains the device description of the safety laser scanner for the controller. It only needs to be installed once.

Important information

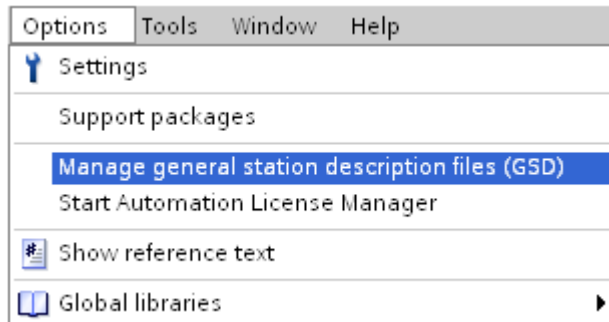


NOTE

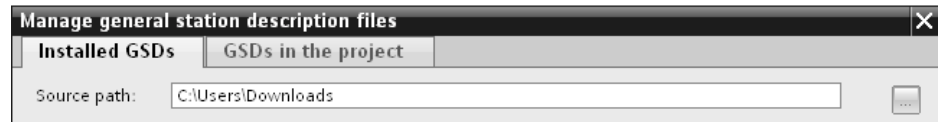
Always install the latest GSDML file in the controller.

Approach

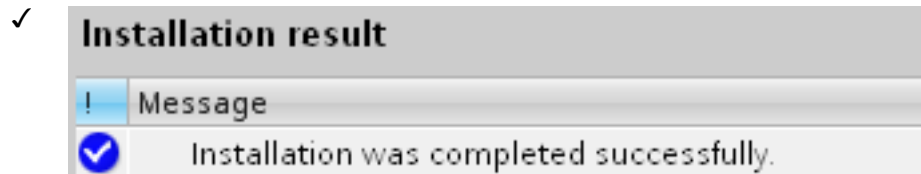
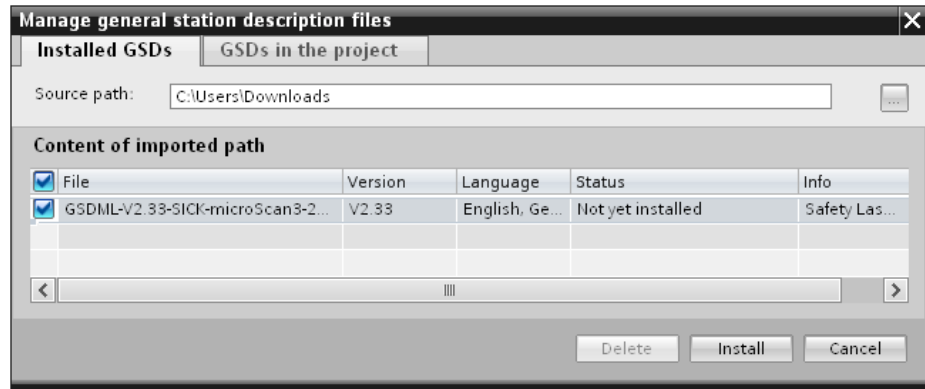
1. The current GSDML file for integrating the safety laser scanner into the controller can be downloaded at www.sick.com.
2. In TIA Portal: **Options > Manage general station description files**



3. Select the folder containing the GSDML file.



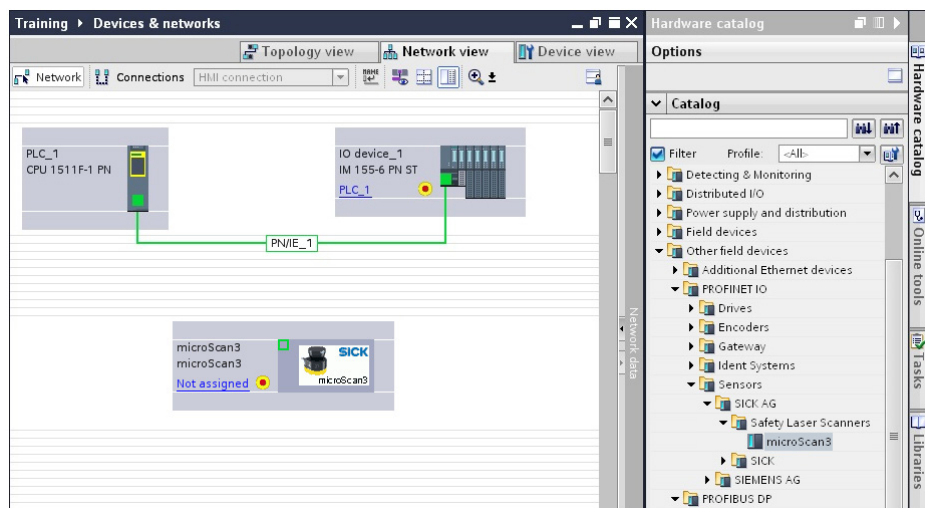
4. Select the GSDML file checkbox and click on **Install**.



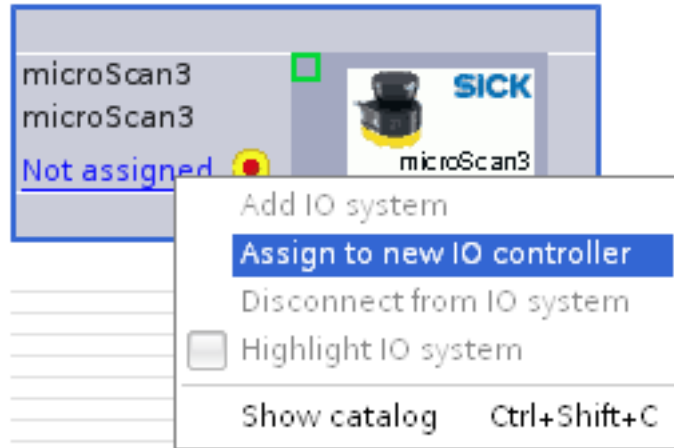
2.3 Integrating the safety laser scanner

Approach

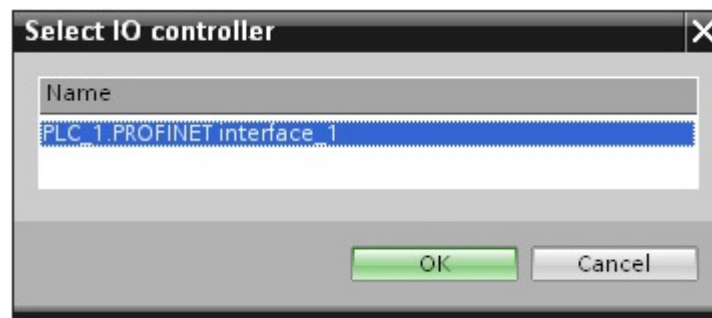
1. In the **Network view** tab: Double-click on **microScan3**. Alternatively, use drag and drop to drag **microscan3** into the working range. You will find **microScan3** under **Other field devices > PROFINET IO > Sensors > SICK AG**.



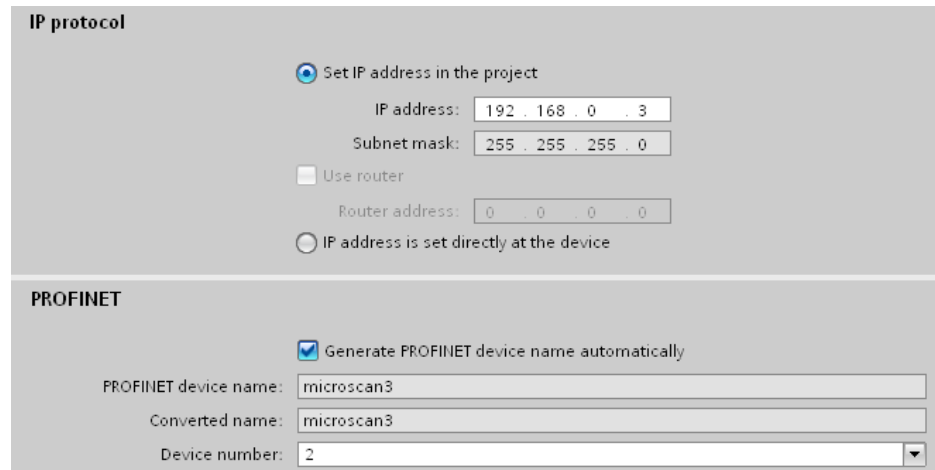
2. Right-click on **Not assigned** and select **Assign to new IO controller**.



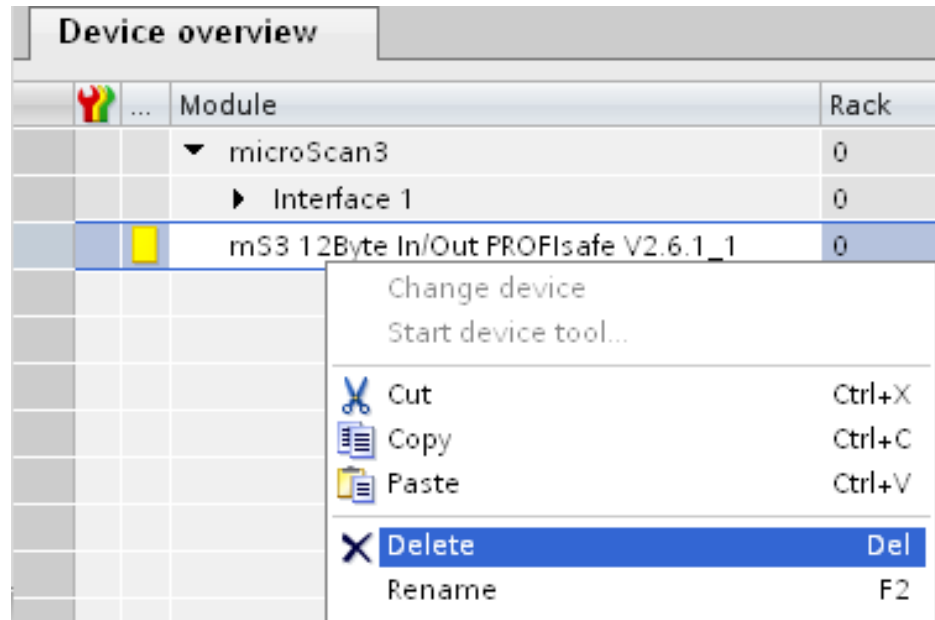
3. Select a suitable IO controller and click **OK** to confirm.



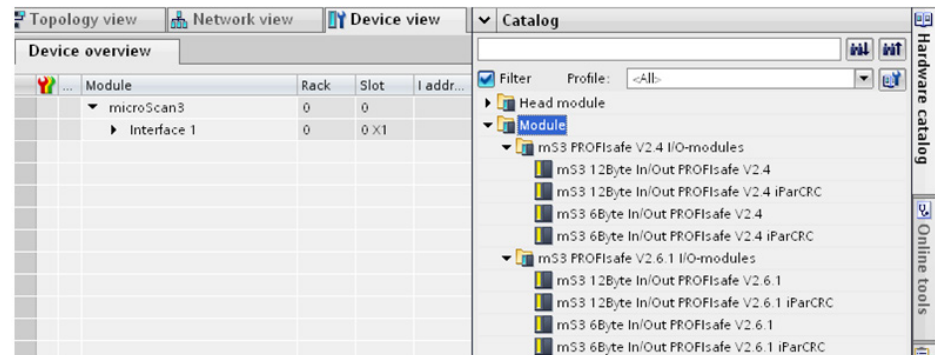
4. In the **Network view** tab, double-click on **microScan3**.
5. **Properties > General > Ethernet addresses**
6. Enter the **IP address** and **Converted name** (=PROFINET device name). The entered values must match the values configured in Safety Designer.



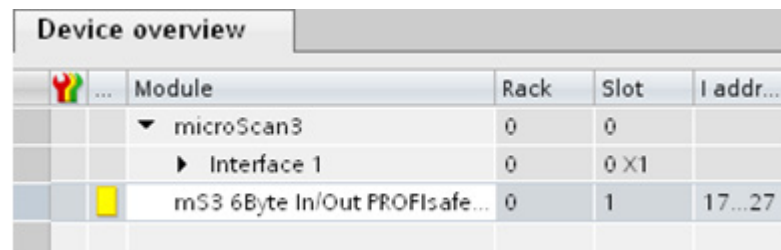
7. Expand the **Device overview** and **Hardware catalog** and select a suitable module. [see "Overview of the process images", page 12](#)
8. If applicable, right-click on the standard module (highlighted in yellow) and select **Delete** to remove it.



- To add a new module, double-click on the desired module in the **Catalog**. Alternatively, use drag and drop to drag the desired module into **Device overview**.



- Click on the module (e.g., mS3 6Byte In/Out...)



- Properties > General > PROFIsafe**
- Enter the **F_Dest_Add** and, if applicable, **F_iPar_CRC F_WD_Time**. The entered values must match the values configured in Safety Designer.
- If applicable, enter the **f_WD_Time**.
[see "Overview of the PROFIsafe parameters", page 11](#)

F_SIL: SIL2
 F_CRC_Length: 4-Byte-CRC
 F_Block_ID: 1
 F_Par_Version: 1
 F_Source_Add: 1
 F_Dest_Add: 100
 F_Par_CRC_WithoutAddresses: 0
 F_Passivation: Device/Module
 F_CRC_Seed: CRC-Seed24/32
 Manual assignment of F-monitoring time
 F_WD_Time: 150 ms
 F_iPar_CRC: F4714023
 F_Par_CRC: 45712
 F-I/O DB manual number assignment

14. **Properties > General > I/O addresses**

15. Enter the **Start address**. The value is generated automatically in TIA Portal but can be modified if necessary.

I/O addresses
Input addresses
 Start address: 17
 End address: 27
 Organization block: —
 Process image: —

✓ The safety laser scanner has been successfully integrated into the hardware configuration.

3 Overview of the PROFIsafe parameters

Several PROFIsafe parameters are available. Of these parameters, the following are relevant for integrating the device.

- **F_Dest_Add**
F destination address. For PROFIsafe communication, the safety laser scanner needs a clear F_Dest_Add. You need to enter the same value as the one configured in Safety Designer.
- **F_WD_Time**
Watchdog time (monitoring time) for the cyclical service. The watchdog time should be long enough to tolerate short delays in communication. It does, however, have an effect on the response time of the overall system (for example in the event of a fault) and is therefore safety-relevant.
The default value is 150 ms. This is adequate in many cases. The integrator needs to check the value and, if necessary, adjust it to avoid errors at a later time.
- **F_iPar_CRC**
Checksum of the safety configuration. Is used to check whether the safety-relevant settings were changed. The entered value must match the value configured in Safety Designer for the configuration checksum (function and network). It is only needed if a process image is used where F_iPar_CRC is checked (module with the suffix -iParCRC). This parameter must be updated if the configuration of the safety laser scanner is modified in any way. If the parameter is not updated (e.g., due to an unauthorized modification of the configuration), the controller goes into the safe state.

4 Overview of the process images

Variants

The microScan3 - PROFINET supports 8 PROFIsafe process images (in the controller: **modules**). The 8 process images can be divided into 2 groups depending on the PROFIsafe version (2.4 or 2.6.1). Which process images to use depends on the version of PROFIsafe that the controller supports. If you do not know which PROFIsafe version your controller supports, use the process images for PROFIsafe version 2.4.

PROFIsafe version 2.4	PROFIsafe version 2.6.1
12-byte	12-byte
12-byte with iParCRC	12-byte with iParCRC
6-byte	6-byte
6-byte with iParCRC	6-byte with iParCRC

The process images differ with regard to their size (6 bytes or 12 bytes) and the incorporation of the iParCRC parameter.

6-byte process images must be used in the following cases:

- Only a limited range of peripheral addresses are available in your application.
- The microScan3 PROFINET is replacing a safety laser scanner of type S3000 PROFINET.
- The safety software for your S7 does not support 12-byte process images.

If your application requires constant monitoring of the checksums of the sensor configuration, use a process image with iParCRC.

Structure of the process image (12 bytes)

Table 1: Safety-related PROFIsafe process image: input of the device, output of the control

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved				ActivateS-tandbyMode	StopAlarm-Detection	Reserved	TriggerRun-Mode
1	SetMonitoringCaseNoTable1							
2	Reserved							
3	Reserved							
4	Reserved							
5	Reserved							
6	Reserved							
7	Reserved							
8	Reserved							
9 ¹⁾	TriggerReset-CutOff-Path08	TriggerReset-CutOff-Path07	TriggerReset-CutOff-Path06	TriggerReset-CutOff-Path05	TriggerReset-CutOff-Path04	TriggerReset-CutOff-Path03	TriggerReset-CutOff-Path02	TriggerReset-CutOff-Path01
10	Reserved							
11	Reserved						TriggerDeviceReboot-WithNetwork	TriggerDeviceRebootWithoutNetwork

1) Cut-off paths 5 to 8 are only available for the Pro performance package.

Table 2: Safety-related PROFIsafe process image: output of the device, input of the control

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved		ManipulationStatus	ReferenceContourStatus	ContaminationError	ContaminationWarning	StandbyModeActive	RunModeActive
1 ¹⁾	SafeCutOff-Path08	SafeCutOff-Path07	SafeCutOff-Path06	SafeCutOff-Path05	SafeCutOff-Path04	SafeCutOff-Path03	SafeCutOff-Path02	SafeCutOff-Path01
2	Reserved							
3 ¹⁾	NonsafeCutOffPath08	NonsafeCutOffPath07	NonsafeCutOffPath06	NonsafeCutOffPath05	NonsafeCutOffPath04	NonsafeCutOffPath03	NonsafeCutOffPath02	NonsafeCutOffPath01
4	Reserved							
5 ¹⁾	ResetRequiredCutOff-Path08	ResetRequiredCutOff-Path07	ResetRequiredCutOff-Path06	ResetRequiredCutOff-Path05	ResetRequiredCutOff-Path04	ResetRequiredCutOff-Path03	ResetRequiredCutOff-Path02	ResetRequiredCutOff-Path01
6	Reserved							
7	CurrentMonitoringCaseNoTable1							
8	Reserved							
9	Reserved							
10	Reserved							
11	Reserved						DeviceError	ApplicationError

1) Cut-off paths 5 to 8 are only available for the Pro performance package.

Table 3: Non-safety-related PROFINET process image: output of the device, input of the control

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved		ManipulationStatus	ReferenceContourStatus	ContaminationError	ContaminationWarning	StandbyModeActive	RunModeActive
1 ¹⁾	StatusSafeCutOff-Path08	StatusSafeCutOff-Path07	StatusSafeCutOff-Path06	StatusSafeCutOff-Path05	StatusSafeCutOff-Path04	StatusSafeCutOff-Path03	StatusSafeCutOff-Path02	StatusSafeCutOff-Path01
2	Reserved							
3 ¹⁾	NonsafeCutOffPath08	NonsafeCutOffPath07	NonsafeCutOffPath06	NonsafeCutOffPath05	NonsafeCutOffPath04	NonsafeCutOffPath03	NonsafeCutOffPath02	NonsafeCutOffPath01
4	Reserved							
5 ¹⁾	ResetRequiredCutOff-Path08	ResetRequiredCutOff-Path07	ResetRequiredCutOff-Path06	ResetRequiredCutOff-Path05	ResetRequiredCutOff-Path04	ResetRequiredCutOff-Path03	ResetRequiredCutOff-Path02	ResetRequiredCutOff-Path01
6	Reserved							
7	CurrentMonitoringCaseNoTable1							
8	Reserved							
9	Reserved							
10	Reserved							
11	Reserved						DeviceError	ApplicationError

1) Cut-off paths 5 to 8 are only available for the Pro performance package.

Structure of the process image (6 bytes)

Table 4: Safety-related PROFIsafe process image: input of the device, output of the control

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved				ActivateS- tandbyMode	StopAlarm- Detection	Reserved	TriggerRun- Mode
1	SetMonitoringCaseNoTable1							
2	Reserved							
3 ¹⁾	TriggerReset- CutOff- Path08	TriggerReset- CutOff- Path07	TriggerReset- CutOff- Path06	TriggerReset- CutOff- Path05	TriggerReset- CutOff- Path04	TriggerReset- CutOff- Path03	TriggerReset- CutOff- Path02	TriggerReset- CutOff- Path01
4	Reserved							
5	Reserved						TriggerDevi- ceReboot- WithNetwork	TriggerDevi- ceRebootWi- thoutNet- work

1) Cut-off paths 5 to 8 are only available for the Pro performance package.

Table 5: Safety-related PROFIsafe process image: output of the device, input of the control

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved		Manipula- tionStatus	Reference- ContourSta- tus	Contamina- tionError	Contamina- tionWarning	Standbymo- deActive	RunModeac- tive
1 ¹⁾	SafeCutOff- Path08	SafeCutOff- Path07	SafeCutOff- Path06	SafeCutOff- Path05	SafeCutOff- Path04	SafeCutOff- Path03	SafeCutOff- Path02	SafeCutOff- Path01
2 ¹⁾	NonsafeCu- tOffPath08	NonsafeCu- tOffPath07	NonsafeCu- tOffPath06	NonsafeCu- tOffPath05	NonsafeCu- tOffPath04	NonsafeCu- tOffPath03	NonsafeCu- tOffPath02	NonsafeCu- tOffPath01
3 ¹⁾	ResetRequir- edCutOff- Path08	ResetRequir- edCutOff- Path07	ResetRequir- edCutOff- Path06	ResetRequir- edCutOff- Path05	ResetRequir- edCutOff- Path04	ResetRequir- edCutOff- Path03	ResetRequir- edCutOff- Path02	ResetRequir- edCutOff- Path01
4	CurrentMonitoringCaseNoTable1							
5	Reserved						DeviceError	Applicatio- nError

1) Cut-off paths 5 to 8 are only available for the Pro performance package.

Table 6: Non-safety-related PROFINET process image: output of the device, input of the control

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved		Manipula- tionStatus	Reference- ContourSta- tus	Contamina- tionError	Contamina- tionWarning	Standbymo- deActive	RunModeac- tive
1 ¹⁾	StatusSafe- CutOff- Path08	StatusSafe- CutOff- Path07	StatusSafe- CutOff- Path06	StatusSafe- CutOff- Path05	StatusSafe- CutOff- Path04	StatusSafe- CutOff- Path03	StatusSafe- CutOff- Path02	StatusSafe- CutOff- Path01
2 ¹⁾	NonsafeCu- tOffPath08	NonsafeCu- tOffPath07	NonsafeCu- tOffPath06	NonsafeCu- tOffPath05	NonsafeCu- tOffPath04	NonsafeCu- tOffPath03	NonsafeCu- tOffPath02	NonsafeCu- tOffPath01
3 ¹⁾	ResetRequir- edCutOff- Path08	ResetRequir- edCutOff- Path07	ResetRequir- edCutOff- Path06	ResetRequir- edCutOff- Path05	ResetRequir- edCutOff- Path04	ResetRequir- edCutOff- Path03	ResetRequir- edCutOff- Path02	ResetRequir- edCutOff- Path01
4	CurrentMonitoringCaseNoTable1							
5	Reserved						DeviceError	Applicatio- nError

1) Cut-off paths 5 to 8 are only available for the Pro performance package.

Addressing the bits in the controller

The bits of the process images can be accessed in the logic using the following scheme: **Ix.x** and **Qx.x**. The start byte (byte 0) is relative to the specified **Start address**.

If **Start address** is set to the value 17, then the output bit 0.0 in the logic can be accessed as **Q17.0**. The input bit 3.1 then corresponds to **I20.1**.

5 Notes on implementing the process images

Safety-related cut-off paths and non-safety-related cut-off paths

In the following example, cut-off paths 1 (protective field) and 4 (contour detection field) are safety-related. Cut-off paths 2 and 3 (warning fields) are non-safety-related.

When incorporating the cut-off paths into the logic, the user can select a suitable byte from the assembly. A cut-off path with a protective field or contour detection field is always regarded as safety-related. A cut-off path with a warning field is always regarded as non-safety-related.

Table 7: Example 6-byte process image

Function (Safety Designer)	Field type	Allocation in the process image	Data	Safe
Cut-off path 1	Protective field	Safety-related cut-off path 1	I1.0	Yes
Cut-off path 2	Warning field	Non-safety-related cut-off path 2	I2.1	No
Cut-off path 3	Warning field	Non-safety-related cut-off path 3	I2.2	No
Cut-off path 4	Contour detection field	Safety-related cut-off path 4	I1.3	Yes

Behavior with mixed field types

When a cut-off path with safe and non-safe fields (e.g., protective field and warning field) is used in different monitoring cases and the monitoring case with the warning field is active, then the safe cut-off path is deactivated. As a result, the bit for this safe cut-off path is LOW and the display of the safety laser scanner indicates the OFF state.

The following example illustrates this behavior in the configuration and in the display of the device. All fields are clear in this example (no field detection).

Monitoring case ?	Inpt. cond. ?	Cut-off path ?
	Rx: Process image (6 Byte)	Cut-off path 1 Cut-off path 2
1 Name <input type="text" value="Monitoring case :"/> <input type="checkbox"/> Sleep mode	Activate monitoring case via Rx: Process image (6 Byte) Number 1	Field set (1) Field (1) Field (2)
2 Name <input type="text" value="Monitoring case :"/> <input type="checkbox"/> Sleep mode	Activate monitoring case via Rx: Process image (6 Byte) Number 2	Field set (2) Field (1) Field (2)
ank lines		
Safe output		<input type="text" value="1"/> <input type="text" value="2"/>



6 Troubleshooting

Error indicators in TIA Portal

CPU error	Possible causes
Hardware component not available due to type mismatch	<ul style="list-style-type: none"> Incorrect microScan3 PROFIsafe module configured in TIA Portal. Incorrect process image selected in Safety Designer.
Safety Program: Error in PROFIsafe communication with F-IO	F_WD_Time set too short.
IO device failure - IO device not found	<ul style="list-style-type: none"> Incorrect PROFINET device name Faulty connection between the safety laser scanner and the controller (e.g., defective cable) Voltage supply to the safety laser scanner is interrupted
Mismatch of failsafe destination address (F_Dest_Add)	F_Dest_Add does not match the configuration in Safety Designer.
Inconsistent iParameters (iParCRC error)	F_iPar_CRC does not match the configuration in Safety Designer.

Error indicators on the microScan3 – network LEDs

The safety laser scanner has two PROFINET LEDs in addition to the Ethernet LEDs.

Table 8: Bus error LED, inscription: BF

LED status	Meaning	Troubleshooting
○	No supply voltage or PROFINET communication not active or device is not configured	<ul style="list-style-type: none"> ▶ Check power supply, wiring and connected communication partners. ▶ Restart device. ▶ Check the configuration of the device.
● Green	PROFINET communication is active	–
◐ Green	No connection to control unit	<ul style="list-style-type: none"> ▶ Check PROFINET names. ▶ Check the control unit. ▶ Start the controller.
● Red	Serious error, device not ready	<ul style="list-style-type: none"> ▶ Check device. ▶ Restart device. ▶ Replace device.
◐ Red	Incorrect PROFINET configuration	<ul style="list-style-type: none"> ▶ Check the PROFINET configuration, in particular F_Dest_Add.
◑ Red/green	PROFINET alarm is active	<ul style="list-style-type: none"> ▶ Check the cause of the error in the configuration program of the controller and observe the help text. ▶ Check the alarm in the Safety Designer.

Table 9: System error LED, inscription: BF

LED status	Meaning	Troubleshooting
○	No supply voltage or PROFIsafe communication not initialized or not active or incorrect process image selected	<ul style="list-style-type: none"> ▶ Trigger or launch PROFIsafe communication. ▶ Check whether the same process image is selected in the controller and in the device (6 bytes or 12 bytes)

LED status	Meaning	Troubleshooting
● Green	PROFIsafe communication is active	–
● 0.5 Hz, green	Passivation of the device has been completed, e.g. after communication error or connection termination	▶ Perform reintegration of the device.
● 2 Hz, green	A process image with F_iPar_CRC is used, but value 0 is specified as F_iPar_CRC.	▶ Enter the correct F_iPar_CRC in the configuration program of the controller. ▶ Use process image without F_iPar_CRC.
● Red	Serious error, device not ready	▶ Check and restart the device. ▶ Replace device.
● Red	Incorrect PROFIsafe configuration	▶ Check the PROFIsafe parameters, in particular, F_Dest_Add, WD_Time, F_iPar_CRC. ▶ Check the PROFINET connection (see table 8, page 18).

Diagnostics using the display

You can use the buttons at the front of the safety laser scanner to display the PROFINET alarms.

1. Press the OK button twice.
2. **Diagnostics > PROFINET alarms**



NOTE

Note: Active alarms are also displayed in the **CPU diagnostics buffer** in Safety Designer and in TIA Portal.

Why does “Waiting for input” appear on the display?

- The safety laser scanner has not yet received a valid bit from the controller for selecting a monitoring case.
- There is an error in the PROFINET/PROFIsafe parameters.

S3000 PROFINET vs microScan3 - PROFINET

If the microScan3 - PROFINET is replacing a safety laser scanner of type S3000 PROFINET, take into consideration that the process image has a different structure even though the size of the process image remains the same at 6 bytes.